FUNCTIONAL SERVICING REPORT

FOR

PROPOSED RESIDENTIAL DEVELOPMENT

2147925 ONTARIO INC. (McMaster Street & Meagan Drive)

LOCATED IN THE HAMLET OF GLEN WILLIAMS

McMASTER STREET & MEAGAN DRIVE

TOWN OF HALTON HILLS (GEORGETOWN)

September 2017

August 2019

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C.E. FILE: 09-015

REVISION LOG

Version	Date	Summary / Overview
1.0	May 2009	Issued to Town of Halton Hills, Halton Region and CVC for Review and Comment.
2.0	September 2017	Revised External Sanitary Sewer Alignment.
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- Figure 3 – Sanitary Drainage Area Plan;
- Section 5.3.2 - Preliminary Design, Reserve Capacity, and Opportunities for Upgrading; and
- Sanitary Sewer Design Sheet.

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A.0. INTRODUCTION

The 2147925 Ontario Inc. (McMaster Street & Meagan Drive) property is located south-west of McMaster Street and Meagan Drive and immediately south of the former railway line, in the Hamlet of Glen Williams, Town of Halton Hills. South-west of the property is Eighth Line. The site is surrounded by existing low density residential areas with open agricultural lands abutting the north-west limit. The site area is approximately 6.88 Hectares (17.00 Acres) in size and is irregular in shape. 2147925 Ontario Inc. proposes to develop the above site as a single detached residential development consisting of a total of 32 units. Refer to Appendix 'A' for the proposed Draft Plan of Subdivision as prepared by Mathews Planning and Management Ltd. which also includes a site location map (key plan). Dave Matthews of Mathews Planning Management Ltd. has since retired and now Glenn Wellings of Wellings Planning Consultants Inc. is looking after all planning matters.

In support of the proposed development, we provide this report to identify the methodology of the municipal servicing. This report will provide rationale and justification for proposed municipal services for the development; more specifically the report will substantiate the ability to provide municipal sanitary sewer, municipal water and a conceptual resolution for storm water management.

The conceptual engineering designs developed and evaluated herein for the provision of municipal servicing systems in support of the proposed development are in general conformity with good engineering practices and the guidelines and criteria of the Town of Halton Hills, Credit Valley Conservation, Halton Region and the Ministry of the Environment, Conservation and Parks.

B.0 EXISTING TOPOGRAPHICAL AND DRAINAGE PATTERNS

The natural topography for the site falls from the north at an approximate elevation of 275.00 metres to the south (at 271.00m) with average 1.0% slope.

The site for the most part is void of trees with the exception to the south boundary where there are small groupings of trees. Given the type of development proposed and the nature of disturbance related to construction activities and grading changes, we anticipate these trees can be preserved.

The site drains in three main directions which have been noted on the Pre-development Storm Tributary Plan as Outlets 1-3. Approximately 26% of the site (1.811 Ha) drains towards the existing ditch on Eighth Line via a 450 mm diameter culvert located within the adjacent property 12187 8th Line (Outlet 2). It should be noted that after further field investigations, it has been determined that the farmlands to the NW, which are external to the Site, (5.45 Ha) drain through the subject lands along the NW boundary and contributes to the drainage passing through Outlet 2. The south part of the property, approximately 67% (4.628 Ha) drains towards existing ditches and a 450 mm Dia. culvert located on the Eighth Line. The runoff is then captured by DICBs which routes the flow using a 675 mm diameter, concrete storm sewer pipes located on the south side of Eighth Line running parallel with the Eighth Line and ultimately discharges to Silver Creek through road side ditches of Wildwood Road (Outlet 1). The balance of the site drains towards Outlet 3 at the East limit of the Site using an existing ditch along former railway right-of way. It should be noted that a portion of the rear yards of the neighboring properties to the NE (0.525 Ha), which are external to the Site, also drain through the aforementioned ditch towards Outlet 3. Refer to Figure 5, Pre-development Storm Tributary Plan in Appendix ‘E’ for an illustration of the existing drainage patterns.

C.0. SANITARY SEWAGE CONVEYANCE AND TREATMENT

C.1. Sanitary Servicing and Conveyance

To substantiate the ability to provide sanitary servicing for the 2147925 Ontario Inc. development, a conceptual sanitary sewage conveyance system is detailed as follows.

A gravity sanitary sewer system is proposed to service all 32 residential lots of the subject development. Refer to Appendix 'E' for Figure 2, On-site Proposed Sanitary Tributary Plan detailing sanitary drainage catchments for the subject lands. As identified on the plan a proposed 200 mm diameter sanitary sewer can easily accommodate sanitary flows from the proposed development. It is also acknowledged the gradient of the sanitary sewer on-site will be a minimum of 1.00% with a minimum actual velocity of 0.405 m/sec at the upstream end. Refer to Appendix 'E' for Figure 2, On-site Proposed Sanitary Tributary Plan for the proposed sanitary sewer design chart and as indicated the invert elevation of the sewer at its upstream end (MH15A) is 271.50 metres which is approximately 3.0 metres below finished road grade, having more than sufficient depth to service the residential lots.

The route of the proposed external sewer is illustrated on Figure 1 in Appendix 'E' and extends from property limit at Meagan Drive, easterly along Oak Ridge Drive, northerly along Wildwood Road to Confederation Street, and then crossing the Credit River to the Glen Williams Pump Station (off Main Street). The sanitary sewer crossing of the Credit River and the tributary crossing of Wildwood Road between Beaver Street and Confederation Road will be installed using trenchless technologies either by directional drilling or auguring. The crossing of the existing 1050mm Dia. culvert on Main Street North of Confederation Road will be installed trenchless technologies or open cut if it feasible to do so. The most suitable option will be chosen during the detailed design stage based upon the provided geotechnical information.

C.2. Glen Williams Pump Station Capacity Analysis

Figure 1 (Appendix 'E') illustrates the proposed / existing tributary sanitary drainage areas to the Glen Williams Pump Station and incorporates; the existing Sheridan development, Future Bayfield and Northwest Confederation Lands off of Confederation Street, existing residential and commercial areas, an existing school, and the subject development lands – 2147925 Ontario Inc. (McMaster Street & Meagan Drive).

We reviewed the Stantec Consulting Ltd.'s "Master Servicing Plan and Financial Implementation Report – Sanitary and Water Servicing" Report which spoke to basically the same drainage area as described above. Excerpts of the Stantec report are attached in Appendix 'B'.

This capacity analysis will serve to some extent a refinement of the tributary area discussed within the aforementioned Master Servicing Plan Report. In support of the analysis refer to the following Appendices:

Excerpts from Master Servicing Plan and Financial Implementation Report:

B1 Sanitary and Water Servicing prepared by Stantec Consulting Ltd. Dated July 30, 2007:

- Section 3.1 - Sanitary Servicing Requirement;
- Figure 3 – Sanitary Drainage Area Plan;
- Section 5.3.2 - Preliminary Design, Reserve Capacity, and Opportunities for Upgrading; and
- Sanitary Sewer Design Sheet.

B2: Pump Station Site Plan & Main Street Plan & Profile As Built Drawings by Stantec Consulting Ltd.; and

B3: Internal and External Sanitary Sewer Design Sheets by Condeland Engineering Ltd.

Master Servicing Plan Summary Brief

The Hamlet of Glen Williams is generally on private sewage systems. The Stantec report illustrates the preliminary tributaries assessment and the orientation of the sanitary sewer. The development included 308 residential units, a school property, and surrounding commercial properties. Refer to Appendix 'B1' and Table 1 (below) for a detailed breakdown. Specifically, this includes 158 residential units within Sheridan, Bayfield, and Northwest Confederation Lands, 150 existing residential connections, the existing Glen Williams Public School and surrounding commercial properties. Sufficient capacity within the existing Silver Creek trunk sanitary sewer has been confirmed.

Review and Assessment

An updated sanitary tributary plan (Figure 1) and design sheet was prepared based on current information and is attached in Appendices D & B3 respectively. Included in the updated tributary plan is 338 residential units, the school and commercial properties. Consistent with the Master Servicing Plan Report, we have applied the same criteria to establish flow, namely 3.5 persons/unit with infiltration. Below is Table 1 which provides a summary comparing the updated sanitary drainage catchment area to the Master Servicing Plan Report, and our flow determination is 45.56 lps compared to 49.13 lps established previously.

The existing "Sheridan" Development has been completed with 89 lots, and is connected to the Glen Williams Pumping Station. We have included for your ease of reference As Built drawings of the Glen Williams Pumping Station and Main Street Plan & Profile, refer to Appendix 'B2'.

The “Bayfield” and “Glen Williams Estates” Developments have not proceeded yet nor has the construction of the sanitary gravity drain to the pumping station. We are proposing to include the subject “McMaster Street & Meagan Drive” Development, which consists of 32 residential units, as part of this system. Our flow determination for the residential developments is 20.79 lps compared to 24.00 lps established previous. We have maintained the flows allotted by the Master Servicing Plan Report for existing residential, school, and commercial properties of 25.13 lps The existing Glen Williams Pumping Station has a capacity of 50 litres per second. The developments of 188 residential lots of “Sheridan”, “Bayfield”, “Rinaldi”, and “McMaster Street & Meagan Drive” Subdivisions utilize 20.79 lps compared to 24.00 lps established in the 2007 Master Servicing Plan Report. While the remaining surplus capacity could be distributed to service existing/future school/commercial/residential properties as outlined in the Master Servicing Plan Report.

TABLE 1: GLEN WILLIAMS EXISTING PUMP CAPACITY ANALYSIS

	Stantec's MSP (July 2007)				Condeland's Update (August 2019)			
	Units	**Area (ha)**	**Pop**	**Flow (lps)**	**Units**	**Area (ha)**	**Pop**	**Flow (lps)**
CONSTRUCTED SHERIDAN DEVELOPMENT	91.0	36.0	319.0	14.00	89.0	20.4	312.0	9.88
PROPOSED BAYFIELD DEVELOPMENT	35.0	12.0	123.0	5.00	34.0	8.0	119.0	3.89
PROPOSED RINALDI (NORTHWEST) DEVELOPMENT	32.0	11.0	112.0	5.00	33.0	6.9	116.0	3.54
NEWLY PROPOSED DEVINS DEVELOPMENT	**NOT INCLUDED**				32.0	6.9	112.0	3.48
SUB-TOTAL RESIDENTIAL DEVELOPMENTS	**158.0**	**59.0**	**554.0**	**24.00**	**188.0**	**42.2**	**659.0**	**20.79**
ALLOWANCE FOR EXISTING RESIDENTIAL UNITS	150.0	52.5	525.0	22.00	150.0	52.5	525.0	21.64
TOTAL RESIDENTIAL	**308.0**	**111.5**	**1079.0**	**46.00**	**338.0**	**94.7**	**1184.0**	**42.43**
EXISTING COMMERCIAL (90 persons / ha)		1.5	135.0	1.88		1.5	135.0	1.88
EXISTING SCHOOL (40 persons / ha)		1.5	60.0	1.25		1.5	60.0	1.25
TOTAL	**308.0**	**114.5**	**1274.0**	**49.13**	**338.0**	**97.7**	**1379.0**	**45.56**
GLEN WILLIAMS PUMP CAPACITY (LPS)				50.00				50.00
EXCESS (LPS)				**0.87**				**4.44**

C.3. Treatment

Halton Region staff reported that the Georgetown Wastewater Treatment Plant (WWTP) has sufficient hydraulic capacity to accommodate the build out of the Georgetown urban area including the Hamlets of Norval, Stewarttown and Glen Williams.

C.4. Credit River Scour Analysis

The sanitary crossing of the Credit River will be constructed as part of a tri-party cost sharing agreement between the Subject, the “Bayfield” and “Glen Williams Estates” Developments. As such, the “Glen Williams Estates” development retained the services of GeoProcess Research Associates to evaluate the potential for scour from the channel bed to erode and expose the proposed sewer crossing. GeoProcess concluded that the with the approximate depth of the crossing being 2.1m - 2.3m below the bed of the channel, it is well outside of the risk zones for discharges below the 1:50-year return period. For the 1:50-year to 1:100-year discharges, the proposed crossing is within the moderate end of the low-to-moderate risk zone. Refer to Appendix ‘B4’ for more detail.

D.0. WATER SUPPLY AND DISTRIBUTION

D.1. Water Supply

Water supply is provided via connections to the existing watermain system on the surrounding municipal roads. A detailed water analysis was prepared and is attached in Appendix ‘D’;

Municipal Water Supply and Distribution Analysis (November 26, 2019).

The proposed residential subdivision is located within the Georgetown 6 Groundwater (G6G) Pressure Zone service area. The required centerline / ground elevations for the Site are at the highest end of the service area limitations for G6G. As a result, existing and proposed pressures for the service area around the Site range between 35-40psi under maximum daily/hourly demand scenarios.

Accordingly, two options are available for further discussion with applicable Regional staff in order to mitigate the ground elevation limitations for the area, and to increase the level of service to existing and proposed residents.

<u>Option One – Individual in-house booster pumps:</u>

May be installed at the main supply line / water meter location of every home within the proposed residential subdivision. Each in-house booster pump will increase pressures within the internal plumbing system of the home by approximately 20-40psi.

<u>Option Two – Construction of a local booster pumping station:</u>

This would involve isolating the low-pressure area and installing a booster pumping station to increase system pressures to an acceptable level. The infrastructure would include a by-pass to which the booster pump is attached, and a pump control/check valve on the main line. The booster pumping station would be constructed in a new valve chamber on the proposed 300mm diameter watermain within the easement connecting to Eighth Line.

In order to prevent critically high pressures at lower elevations, a check valve would be required to isolate the system at Oak Ridge Drive and Wildwood Road. Elevations lower than this point would not need to be boosted.

The booster pumping station would operate during low pressure conditions. When the pump control/check valve senses low pressure on the downstream side, it will close and initiate the booster pump to start. The check valve will close when the pressure is increased in the isolated area of the system. When the pressure in the system reaches an upper limit, the pump control/check valve will open and will signal the booster pump to shut down, thereby allowing the isolation check valve to also open. The pressure upper limit for the booster pump should be set so that unacceptable high pressures are avoided at the lowest elevations in the isolated area. Based on the broader service area for the proposed booster pumping station, cost-sharing discussions will be pursued with Regional staff should this option be implemented.

Concerns have been raised in the past by Glenn Williams residents living in proximity to the subject property regarding existing low water pressure issues. Given the history of low pressures in this area, Halton Region staff initiated a study in 2019 to investigate options to increase static pressures both to existing homes and to potential future development in the area. The study concluded that the low pressure issues can be alleviated by annexing this area to pressure zone G6B and utilizing existing capacity in the Moore Park Booster Station. Additional work would be required to validate the Moore Park Booster Station capacity. This solution would support higher static pressure in the Eden Oak area and remove the requirement for the local booster station. Although the Region has not confirmed the timing of implementation (design and construction) of this solution, the option of 2147925 Ontario Inc. (McMaster Street and Meagan Drive) proceeding with the design and construction of this ultimate solution may be available for further discussion with applicable Regional staff if economically viable.

D.2. Water Distribution –Proposed Watermain Network and Sizing

Water servicing distribution for the subject development will be provided by the proposed installation of a 200mm diameter PVC watermain along Street A. Refer to Figure 5, Conceptual Servicing Plan in Appendix 'E' for the proposed watermain alignment. As indicated on the plan the watermain will connect to existing 250mm diameter watermain terminus points on both McMaster Street and Meagan Drive. In addition, for security of supply and looping (water quality) purposes, a 300mm diameter PVC watermain is necessary along the existing 10 metre wide Regional servicing easement to connect with the existing 200mm diameter watermain on Eighth Line.

As noted in Section D.1 above; refer to detailed water servicing analysis in Appendix'D' for more information.

E.0. PROPOSED ROAD GRADE AND LOT GRADING DESIGN

E.1. Road Grade Design

Refer to Figure 5, Conceptual Grading Plan enclosed in Appendix 'E' for the conceptual road and lot grading design for the subject development. After further discussions with the Town's engineering staff, it has been specified that the proposed road's width is required to match the existing widths of McMaster Street and Meagan Drive. As such, a 20 metre Right-of-Way with a consistent 8.3 metre roadway width (back of curb to back of curb) has been proposed. The proposed road grade is designed to direct major storm overland flow from the McMaster Street and Meagan Drive road connections to an overall low-point adjacent to the proposed Stormwater Management (SWM) Pond Block. Road grade high-points are proposed at both Meagan Dr. and McMaster St. to ensure the Site drainage is self-contained no drainage is directed externally. Street A has been designed with generally flatter grades ranging from 0.60% to 1.70%. It should also be noted that the proposed angle bends have been designed with centerline road grades of 1.0% or greater ensuring gutter longitudinal slopes on the outside radius of the bends are at a minimum of 0.70% for adequate drainage.

E.2. Lot Grading Design

As described in the preceding section and as illustrated on Figure 6 the road grades range from 0.60% to 1.70%. The roadway is somewhat elevated as compared with the perimeter of the development area where existing grades must be matched. Therefore the proposed front lot grades are in general slightly higher than the rear lot grades. To accommodate this grading condition a split-lot drainage style is proposed for the majority of the residential lots. As indicated on the Conceptual Grading Plan, Figure 6, the grade differential between the front and the rear is minimal which results in very common house styles. Back-splits and basement walkout styles will not likely be possible, unless forced by artificially raising the houses. As the majority of lots back onto existing surrounding properties rear yard drainage will have to be intercepted by rear lot swales and then captured by rear lot catchbasins to direct storm drainage to the proposed storm sewer system.

It should also be noted that the lot grading and stormwater management pond grading designs have been coordinated with LGL Limited to ensure the established tree preservation zones around the perimeter of the Site have been respected. No grading or servicing works are proposed within these zones and the existing grade will be matched at the preservation limits.

F.0. STORMWATER MANAGEMENT QUANTITY AND QUALITY CONTROL

F.1 Existing Conditions, Pre-development Flow

Drainage from the subject land and external lands is conveyed in 7 sub catchments as noted below, as previously discussed in Section B and illustrated in Figure 7, in Appendix 'E':

The Soil types in this area are comprised of Sandy Silt, Clayey Silt and Sand, which have estimated percolation rates ranging from 12mm/hour to 30mm/hour based on the hydraulic conductivity values and are characterized as "well draining". Reference can be made to the Terraprobe Inc. Hydrogeological Assessment Report (Section 4.7, pp 20) for further details.

Utilizing SWMHYMO 2017 Version 4.05.4 program we have modeled the 2-year, 5-year, 10-year 25-year, 50-year, and the 100-year SCS Storm events. In addition, the Regional event (Hurricane Hazel) was modelled for comparison.

Below is the summary of the predevelopment flows for the various storm events in cubic meters per second.

Table F.1: Pre-Development Flows

Storm Event	300	301	302	303	304	603 (External)	604 (External)	301+302+303 (Outlet 1)	300+604 (Outlet 2)	304+603 (Outlet 3)
2yr	0.046	0.011	0.049	0.080	0.009	0.048	0.114	0.139	0.158	0.051
5yr	0.059	0.015	0.063	0.104	0.012	0.057	0.147	0.179	0.204	0.062
10yr	0.087	0.022	0.091	0.151	0.017	0.107	0.216	0.259	0.298	0.110
25yr	0.116	0.029	0.122	0.204	0.023	0.098	0.288	0.351	0.399	0.108
50yr	0.130	0.032	0.137	0.228	0.026	0.108	0.323	0.393	0.447	0.119
100yr	0.146	0.036	0.153	0.255	0.029	0.118	0.362	0.440	0.501	0.130
Regional	0.217	0.038	0.214	0.345	0.049	0.073	0.609	0.596	0.821	0.115

** Refer to SWMHYMO modeling input and output data files in Appendix C1*

As illustrated on the Pre-development Storm Tributary Plan (Figure 7) sub-catchment 300 represents the north-west portion of the Site having an area of 1.811 Ha. This sub-catchment along with the external sub-catchment 604 drains to Eighth Line via existing culverts through the abutting property south-west of the Site. Sub-catchment 301 represents 0.287 Ha located south-centrally in the plan and drains through two existing residential properties fronting the Eighth Line. Sub-catchments 302 and 303 represent a substantial portion of the subject lands, 1.731 Ha and 2.610 Ha respectively, also drain to the Eighth Line overland via existing swales on either side of an existing house fronting Eighth Line. Existing flow from areas 301, 302 and 303 cross the Eighth Line roadway via culverts and are then captured by a ditch-inlet catchbasins which connects to an existing 675mm storm sewer running parallel with the Eighth Line falling towards Wildwood Road to the south-east. Sub-catchment 304 represents the Northern portion of the Site having an area of 0.440 Ha. This sub-catchment along with the external sub-catchment 603 drains East using an existing ditch along former railway right-of way. We have combined the flows from sub-catchments 301, 302 and 303, sub-catchments 300 and 604 and sub-catchments 304 and 603 for the purposes of comparison with post-development conditions. An existing 6 metre wide municipal drainage easement lies between #12097 and #12111 Eighth Line providing the corridor for the storm drainage outlet for the proposed stormwater management pond facility.

F.2 Proposed Conditions, Post-development flow

<u>F.2.1 Quantity Control</u>

Utilizing SWMHYMO 17 Version 4.05.4 program we have modeled the 2-year, 5-year, 10-year, 25-year, 50-year, 100-year SCS Storm events and the Regional event (Hurricane Hazel).

It is our proposal to maintain some of the current outlets in order to meet the existing grading conditions surrounding the site.

Reference the Post-development Storm Tributary Plan (Figure 8, Appendix 'E') for an illustration of the post-development catchment areas. Under post-development conditions we have subdivided the Site area into three primary catchments: area 601, rear-lot drainage, will outlet at the same location as pre-development area 300 and area 604. The majority of the development (roads, driveways, homes and lots) will discharge to the proposed stormwater management pond and will be controlled to combined pre-development flows of sub-catchment areas 301, 302 and 303. Area 605, rear-lot drainage, will outlet at the same location as pre-development area 304 and area 603. As depicted on Figure 8 and previously noted; area 604 (which is external to the Site) drains through the subject lands along the NW boundary and contributes to the drainage passing through Outlet 2. This external drainage area was also modelled using SWHYMO however it is NOT tributary to the proposed stormwater management pond and diversion / conveyance of flows will be discussed in greater detail in Section F.3.0 of this report.

Below is the summary of the post-development uncontrolled flow for catchments 601 to 605; for the various storm events in cubic meters per second.

Table F.2: Post-development Flows

	601	602	603 External	604 External	605
2yr	0.078	0.525	0.009	0.107	0.012
5yr	0.094	0.629	0.011	0.136	0.015
10yr	0.159	1.194	0.021	0.214	0.028
25yr	0.160	1.087	0.019	0.273	0.026
50yr	0.176	1.191	0.021	0.305	0.028
100yr	0.194	1.365	0.023	0.343	0.031
Regional	0.089	0.923	0.014	0.609	0.019

** Refer to SWMHYMO modeling input and output data files in Appendix C1*

The proposed stormwater management pond facility is a Wetland Pond and will discharge to the existing Eighth Line storm sewer system via a piped outlet through the existing municipal easement. Storm discharge to this outlet must be controlled to pre-development flows from the primary development catchment area (602) and the pond facility provides the required quantity control and active storage volume. A comparison of pre-development controlled flow to post-development discharge is tabled as follows for outlets 1, 2 and 3, in cubic meters per second.

Table F.3: Pre and Post-development Flow Comparison

	Outlet 1		Outlet 2		Outlet 3	
	301+302+303 (Pre-Dev)	602 (Post-Dev through Pond)	300+604 (Pre-Dev)	601 (Post-Dev)	304+603 (Pre-Dev)	603+605 (Post Dev)
2yr	0.139	0.128	0.158	0.078	0.051	0.022
5yr	0.179	0.147	0.204	0.094	0.062	0.026
10yr	0.259	0.230	0.298	0.159	0.110	0.049
25yr	0.351	0.284	0.399	0.160	0.108	0.044
50yr	0.393	0.344	0.447	0.176	0.119	0.049
100yr	0.440	0.434	0.501	0.194	0.130	0.053
Regional	0.596	0.845	0.821	0.089	0.115	0.033

** Refer to SWMHYMO modeling input and output data files in Appendix C1*

As identified in the summary table above; catchment area 601 representing the proposed rear-yard areas draining overland to Eighth Line (via existing culverts); has post-development flow significantly less than pre-development flow (catchment 300 + 604) for the 2 to 100 year SCS storm events and the Regional storm event.

Catchment area 602 is controlled by the proposed SWM pond facility and as confirmed by Table F.3 (above); reduces Site discharge below pre-development levels (catchment are 301+302+303), for the 2 to 100 year SCS storm events. During the Regional storm event (with curve number CN 91) post-development flows exceed the pre-development flow levels however storage volume can be contained entirely within the SWM Pond block to a maximum water level of 270.40 metres, which is below surrounding grades. A weir within the SWM Pond control structure conveys the Regional flow safely to Eighth Line via DICB and the proposed sewer outlet.

Reference Hydrologic Parameter Calculations and Pond Stage-storage Discharge calculations in Appendix C2.

Further detailing of the proposed stormwater management pond and control structure etc. will be provided at Detailed Engineering Design stage following, Draft Plan Approval.

F.2.2 Quality Control

Catchment area 601 drains uncontrolled to Eighth Line, however given that it is comprised of rear-lot landscaped areas the stormwater can be considered generally clean and free of pollutants. In addition, given that this area will drain overland through lawns any suspended solids will be naturally filtered by the grass / plant material.

Water Quality control for the balance and majority of subject lands will be addressed by storage and extended storage within the proposed stormwater management pond. As identified previously, catchment area 602 is tributary to the pond. Storage and Extended Storage Quality control will be based on Level 1 or Enhanced Protection in accordance with Table 3.2 of the MOE Stormwater Management Planning and Design Manual, March 2003.

Table F.4: Quality Control Analysis

Watershed Area (Hectares) Catchment 602	Enhanced Protection Volume (cum) (105 cum/Ha)	Less Extended Detention Volume (cum) (40 cum/Ha)	Storage required (cum)
6.545	687.23	261.80	425.43

Based on water level elevation of 269.30, the Permanent Storage provided is 571.80 cu m. which exceeds the requirement. Refer to Pond Stage-storage Discharge calculations in Appendix C2. Further detailing of the proposed stormwater management pond quality control design will be provided at Detailed Engineering Design stage, following Draft Plan Approval.

F.3 External Drainage Area Diversion

Review of topographic survey, area base-mapping and field investigations have confirmed there is a significant external drainage area which drains along the NW boundary of the Site to an existing 450 mm diameter culvert located within the adjacent property 12187 8th Line and ultimately outlets to the Silver Creek. The external area is identified as catchment 604 on Figure 8 and has a total area of 5.45 hectares.

Flow Diversion Storm Sewer

To facilitate development of the subject lands and as well to improve existing drainage conditions; we are proposing to construct a separate internal storm sewer to divert the external drainage through the Site. The storm sewer will be designed to convey the 100-year storm pre-development flow as computed by the SWMHYMO modeling equal to 0.362 cms for catchment 604. A 600mm diameter storm sewer is required to convey this 100-year flow. The storm sewer will run along a proposed 5 metre wide servicing easement adjacent to the north boundary up to Street ‘A’, then along Street ‘A’ parallel to the Site’s primary storm sewer, and finally adjacent to the SWM pond and connecting to proposed MH3. The proposed storm sewer works will require the upsizing of approximately 201 metres of the existing 675mm diameter 8th Line storm sewer to the existing headwall outlet in order to convey the 100-yr flows. Capacity and erosive velocities of the existing roadside ditch and driveway culverts downstream of the headwall outlet will be analyzed including any potential mitigation measures at the detailed design stage. Refer to Appendix 'C3' for Storm Sewer Design Chart and Appendix 'E' for the Conceptual Servicing Plan (Figure 5), for the 600mm diameter storm sewer design / alignment.

F.4 Internal Storm Sewer Servicing

Reference Figure 5, Conceptual Servicing Plan in Appendix 'E' for the preliminary design / alignment of the development storm sewer system. Storm sewers, street and rear-lot catchbasins, and manholes are illustrated on the plan and provide capture / conveyance of storm flows to the proposed stormwater management pond. Conceptual alignment of the pond outlet sewer with connection to the existing storm sewer on Eighth Line is also depicted on the plan, for reference. The design of the storm sewer is presented on the Storm Sewer Design Chart in Appendix 'C3'.

F.5 Infiltration, Groundwater Re-charge

The proposed development of the lands will result in a significant increase in the impervious areas of the site due to the construction of the paved municipal roadways and house driveways, concrete curb / sidewalks, and house roof top areas etc. Therefore, there will be an increase in the runoff volume and a corresponding reduction of natural infiltration and evapo-transpiration under post-development conditions, when compared with pre-development conditions. To achieve water balance criteria and improve groundwater re-charge under post-development conditions there are a number of mitigation methods available. Given that the native soils are considered generally permeable consisting of sandy silt, clayey silt, and sand (identified in the Terraprobe Inc. Hydrogeological Assessment Report); encouraging ground-water re-charge through infiltration of stormwater run-off directly into the ground would be a recommended method. There are many infiltration techniques available to the designer, which all require some form of contact between the stormwater run-off and the native soils of the site, such as natural surface landscaped areas, soakaway pits, surface / subsurface infiltration trenching, and pervious pipe / catchbasins etc.

Given the type of development being single family houses; soak away pits to collect drainage from the house roof-top surfaces and rear-yard sub-surface infiltration trenching for capture of surface and/or roof drainage would be viable methods to utilize infiltration into the native soils. This technique is highly effective for infiltration, however it is dependent that the in-situ soils have adequate percolation rates; the recommended minimum Ministry of Environment (now M.E.C.P) level is 15 mm/hour. The native soils estimated percolation rates range from 12mm/hour to 30mm/hour based on the hydraulic conductivity values from the Terraprobe Hydrogeological Assessment Report (Section 4.7, pp 20). These rates would suggest that infiltration systems would be effective for the proposed development, **however** to determine accurate percolation rates it is necessary to conduct field testing of in-situ soils. Based on the field testing results the specific design / sizing of the infiltration galleries can be completed.

The design and locations of soak away pits / infiltration galleries will be determined at the Detailed Engineering Design Stage following Draft Plan approval.

G.0. PROPOSED EROSION CONTROL MEASURES

Prior to the Building Construction Program, the on-site sediment controls for the impoundment and filtering of the sediment-laden flow shall consist of the following measures:

A siltation control fence shall be installed along the entire perimeter of the development lands. This will control the quality of runoff and localize the areas of intense erosion and sedimentation. Construction access mud-mat will be installed to minimize the transportation of on-site soils onto existing municipal roads (i.e.: limit mud-tracking). Filter fabric shall be wrapped around all proposed catch-basin and rear-lot catchbasin lids in accordance with approved details. The proposed catchbasins shall be constructed with 0.60 meter sumps. Salt and sand from winter road maintenance, silt and other debris washed into the catchbasins will be collected in the sump areas instead of entering the storm conveyance system. For details on the proposed ESC measures, refer to Figures 9 and 10: Erosion Sedimentation Control Plan Stage I & 2 respectively.

Regular maintenance and all necessary repairs shall be performed, including the safe disposal of all sediment material. Maintenance, which in most cases will require the removal of sediment and the installation of a new device, shall be conducted when the level of performance of the implemented control device is reduced to less than 40% of its initial capacity based on the engineer's observation.

H.0. CONCLUSIONS AND RECOMMENDATIONS

On a basis of our investigation and examination, it is the conclusion of the writer that:

- The subject development can be drained for sanitary sewage purposes;
- In accordance with system improvement options presented in Section D.0., proposed fire and domestic water demands can be accommodated by the municipal water supply and distribution system;
- Adequate storm drainage and storm water management facilities for both quantitative and qualitative can be provided within the subject development area to neutralize the impact of urbanized runoff.

In summary, the existing municipal services are such that they can support the subject development.

Respectfully submitted by:

CONDELAND ENGINEERING LIMITED

Consulting Engineers and Project Managers

Jonathan Kapitanchuk
Intermediate Designer

Robert De Angelis, P.Eng.
Principal

I.0. REFERENCES

1) Halton Region, 2019. Version 4.0. *Water and Wastewater Linear Design Manual*.

2) Ministry of the Environment, 2003. *Stormwater Management Planning and Design Manual*.

3) Stantec Consulting Ltd., 2007. *Master Servicing Plan and Financial Implementation Report, Sanitary and Water Servicing, Prepared for Sheridan, Bayfield and Northwest Confederation Lands, Hamlet of Glen Williams, Town of Halton Hills, Region of Halton.*

4) Town of Halton Hills, 1999. *Subdivision Manual*.

5) Terraprobe Inc.,2021. *Hydrogeologic Assessment West Half Lot 21, Concession 9 (Esquesing) Glen Williams, Ontario.*

J.0. Acknowledgements

1) Mr. Steve Burt – Town of Halton Hills; Development Engineering Coordniator

2) Mr. Enzo Florio – Halton Region; Development Project Manager

3) Mrs. Nancy Falkenberg, M.Sc. – LGL Limited; Senior Botanist/ Ecologist

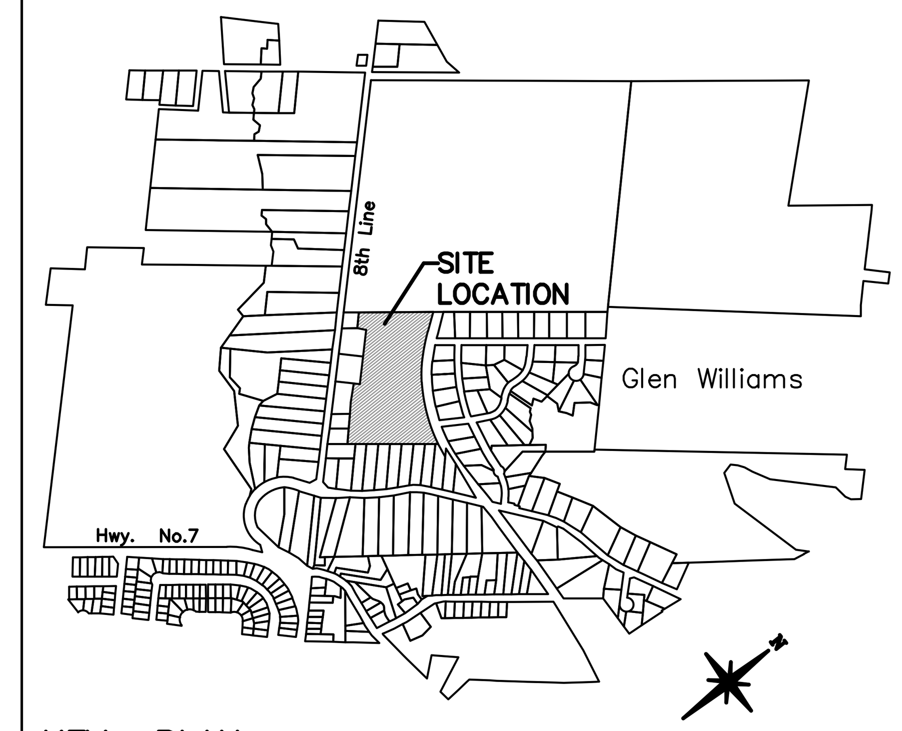
APPENDIX 'A'

Draft Plan of Subdivision

Prepared by

Matthews Planning & Management Ltd.

REVISED JUNE 22, 2018
REVISED MAY 10, 2018



KEY PLAN
NOT TO SCALE

DRAFT PLAN OF SUBDIVISION
OF
PART OF LOT 21
CONCESSION 9
(GEOGRAPHIC TOWNSHIP OF ESQUESING)
TOWN OF HALTON HILLS
REGIONAL MUNICIPALITY OF HALTON

SCALE: 1:750

25m 0 25 50m

METRIC:
DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

GENERAL NOTES

LAND USE	LOTS/BLOCKS	AREA(Ha.)
SINGLE-DETACHED RESIDENTIAL (@ 5 UNITS/NET Ha.)	LOTS 1-32	5.488
STORMWATER MANAGEMENT POND	BLOCK 33	0.439
ROAD 20m RIGHT-OF-WAY x 472m LENGTH		.959
TOTAL AREA		6.886 Hectares

FRONTAGES SHOWN AT 4.5m SETBACK LINE

ADDITIONAL NOTES
(UNDER SECTION 51 (2) OF THE PLANNING ACT)

INFORMATION REQUIRED BY CLAUSES a,b,c,e,f,g,j & l SHOWN ON DRAFT PLAN AND KEY PLAN.

(d) RESIDENTIAL, SWM POND
(h) MUNICIPAL SUPPLY TO BE MADE AVAILABLE
(i) CLAY LOAM
(k) FULL MUNICIPAL SERVICES TO BE MADE AVAILABLE

OWNERS CERTIFICATE
2147925 ONTARIO INC. BEING THE REGISTERED OWNERS OF THE SUBJECT LANDS HEREBY AUTHORIZE MATTHEWS PLANNING & MANAGEMENT LTD. TO PREPARE AND SUBMIT THIS DRAFT PLAN OF SUBDIVISION FOR APPROVAL.

2147925 ONTARIO INC.

MAY 15, 2009 SIGNATURE ON FILE

SURVEYORS CERTIFICATE
I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LANDS TO BE SUBDIVIDED AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

JUNE 1, 2009 SIGNATURE ON FILE
DAN C. DOLLIVER, ONTARIO LAND SURVEYOR
DOLLIVER SURVEYING INC.

CANADIAN INSTITUTE OF PLANNERS · MEMBER – MEMBRE · DAVID MATTHEWS · INSTITUT CANADIEN DES URBANISTES

MATTHEWS PLANNING & MANAGEMENT LTD.
Consultants in Planning and Land Economics
1267 Dorval Drive, Unit 47 Oakville, Ontario
L6M 3Z5 (416) 565-7480

FILE: DEVINS-R2.DWG

APPENDIX 'B'

Sanitary Servicing

APPENDIX 'B1'

Excerpts from Master Servicing Plan and Financial Implementation Report – Sanitary and Water Servicing by Stantec Consulting Ltd. Dated July 30, 2007:

- Section 3.1 - Sanitary Servicing Requirement;
- Figure 3 – Sanitary Drainage Area Plan;
- Section 5.3.2 - Preliminary Design, Reserve Capacity, and Opportunities for Upgrading; and
- Sanitary Sewer Design Sheet.

Appendix B-1 i)

3.0 Proposed Servicing Requirements

3.1 SANITARY SERVICING REQUIREMENTS

As previously noted herein, the sanitary system is to be designed to accommodate all three proposed developments. Two different methods were used to obtain the theoretical peak design flow for the system.

The first method was based on the contributing residential area from all three developments of 60 ha and a population density of 55 persons/ha. However, based on the requirement of the Secondary Plan that limits the size of the individual lots to be no less that 0.25 acres, the density of 55 persons/ha is considered too high and not a representative figure. Therefore, the theoretical peak flow calculated using this method was not considered to be a good representation of the actual flows.

The second method for the calculation of the theoretical peak flow was based on the number of contributing dwelling units. Based on the anticipated Draft Plans for the three developments, a total of 158 units is expected. Using a population density of approximately 3.5 persons per unit, this method yielded a theoretical peak flow of 24 l/s.

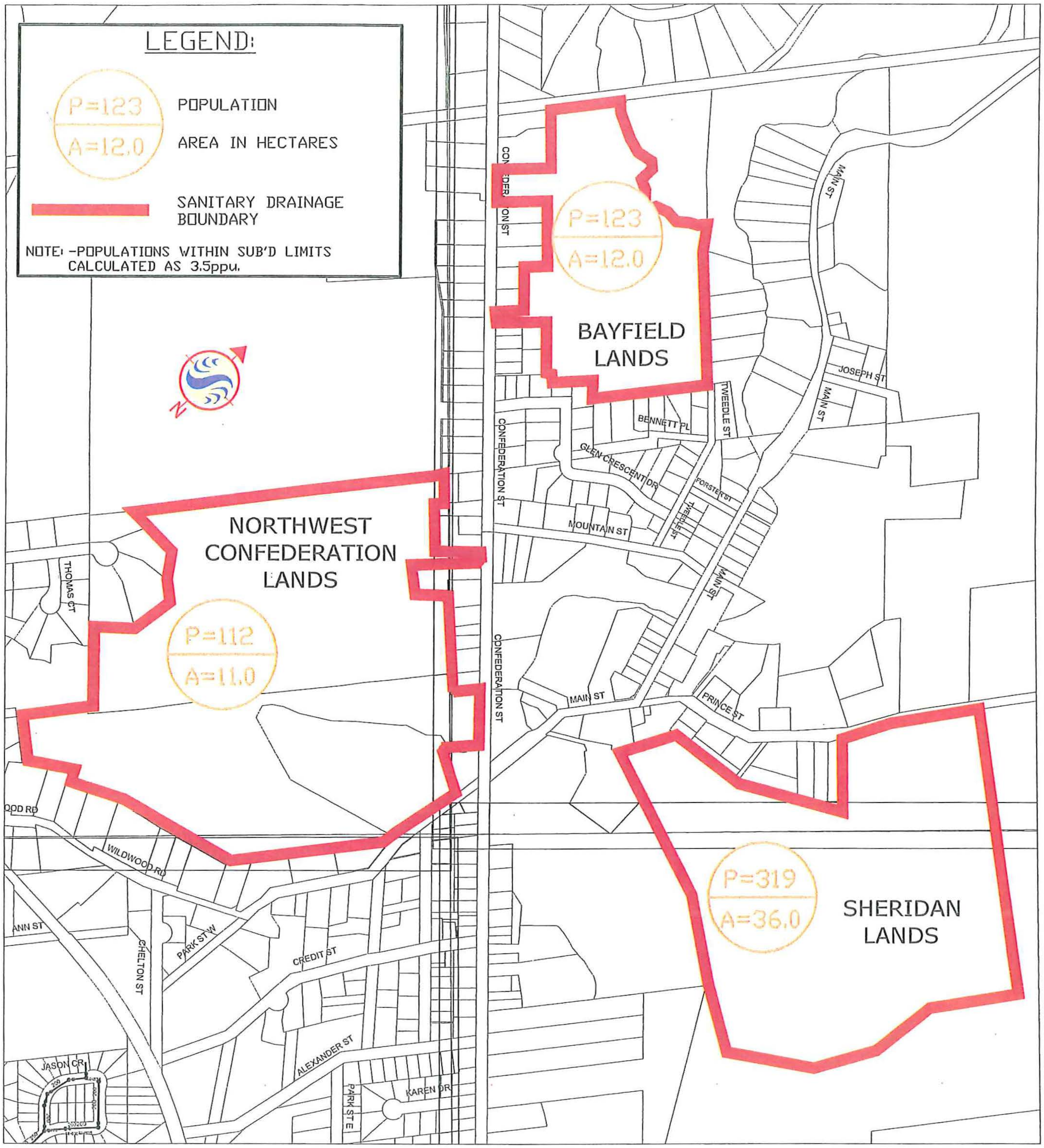
Therefore, the latter method (based on the number of contributing units) was used to determine the theoretical peak design flow for the proposed sanitary sewer system. Detailed calculations are attached in Appendix D. The following Figure 3 provides the approximate contributing area and contributing population for each development.

The sanitary system was sized to accommodate approximately two times the theoretical peak flow of 24 l/s, or 50 l/s, providing a residual capacity of 25 l/s for future connections in the Hamlet. Refer to section 5.3.2 for a discussion on residual or additional capacity.

3.2 WATER SERVICING REQUIREMENTS

A watermain distribution analysis was completed for the proposed Sheridan, Bayfield and Northwest Confederation lands. The intent of the analysis is to determine the appropriate watermain sizes that will distribute domestic and fire flow water demand scenarios in accordance with Region of Halton (Region) and Ministry of the Environment (MOE) pressure and distribution criteria. Refer to Appendix E for supporting calculations and select correspondence.

In order to provide adequate water circulation and fire protection capacity, the Sheridan lands require a second feed, in addition to the existing watermain on Prince Street, and an internally looped watermain connection. Based on preliminary modeling, it is recommended that a looped connection also be provided for the Bayfield and Northwest Confederation lands, although it is not required to achieve minimum fire protection flows. The details of the connections can be



V:\01603\active\160310944\design\drawing\FIG3-MSR.dwg
2006-08-16 03:58PM By: bleguerrier

Stantec Consulting Ltd. 49 FREDERICK STR., KITCHENER, ONTARIO N2H 6M7 TELEPHONE: (519) 579-4410 FAX: (519) 579-6733	GLEN WILLIAMS	FIGURE 3
	MASTER SERVICING REPORT	DATE: AUGUST 2006
		PROJECT: 1603-10944
	SANITARY DRAINAGE AREA PLAN	SCALE: N.T.S.

- The depth to the existing groundwater elevation at the top of the slope ranges from 16 m to 18 m below ground surface, which is nearly equivalent to the height of the slope itself. Therefore, the proposed sewer pipe will be situated above the groundwater table from the top of the slope to nearly the toe of the slope
- Trenchless technology is the construction methodology being proposed to install the sewer/ watermain and therefore no granular pipe bedding materials are required. Oftentimes it is the granular bedding material that acts as a conduit for preferential groundwater movement; however, that will not be the case with the trenchless method
- The alignment of the proposed sewer/watermain is parallel to the interpreted groundwater flow direction and therefore the sewer/watermain will not intercept groundwater as it is already traveling in the same down gradient flow direction as the sewer/watermain

5.3 SELECTION OF RECOMMENDED ALTERNATIVE AND PRELIMINARY DESIGN

5.3.1 Sanitary Servicing

As a result of the evaluation and discussions with the key agencies, etc., Pumping Station Alternative 4C combined with Sanitary Sewer Alternative 2A for the Sheridan lands and Sanitary Sewer Alternative 2 for the Bayfield lands are the recommended alternatives comprising the total servicing solution. The Northwest Confederation lands will connect into the pumping station directly via a sewer across the Credit River (in combination with proposed gravity sewers down Confederation Street for the Bayfield lands), as previously described in Section 4.1.2.2.

5.3.2 Preliminary Design, Reserve Capacity, and Opportunities for Upgrading

The calculated theoretical flow from the three proposed developments requires a pumping station to accommodate a flow of 24 l/s. However, the owners of the Sheridan property have indicated a willingness to provide a forcemain and to oversize the pumping station to provide approximately twice the required flow, or 50 l/s. The additional cost of the oversizing would be apportioned to the Sheridan lands only and not cost-shared between the three developers.

The proposed residual capacity could be allocated to service the school located on Prince Street, the existing commercial businesses (up to a total area of 1.5 ha) and approximately 150 additional homes or single detached equivalent units (SDEs). The supporting sanitary calculations are attached as Appendix D.

A preliminary design of the proposed sewage pumping station and forcemain was completed and a memo indicating the details of this design is attached as Appendix H. Both the pumping station and the forcemain were designed to accommodate a peak flow of 50 l/s. The pumping station would consist of a 3000 mm diameter wet well at a depth of approximately 10 m, along with two fixed speed submersible style wastewater pumps. A separate control building (approximately 35 m^2) will house the pump controls, generator, odor control system and other services. The station would require a 600V, three phase service, and would include an alarm and standby power generator with an automatic transfer switch. The station would be equipped with a bypass connection to allow for the connection of a portable pump in the event of an emergency or during major modifications. In the event of a complete failure of the station, an emergency gravity overflow will be installed.

A 200 mm diameter forcemain is required to accommodate the proposed flows.

A preliminary design of the recommended alternative has been completed including a site plan of the proposed pumping station and a profile that includes the proposed overflow for the pumping station. Please refer to Appendix G for an illustration of both the site plan and the profile.

During the design of the overflow at the pumping station, it was determined that since some of the basements of the existing homes on the west side of the river are at elevations lower than the river, there is not an overflow that would protect these basements in the case of a flood. Therefore, either backflow prevention valves would need to be provided, or sanitary services that provide for main floor levels only could be provided. If a service that accommodates main floor levels only is provided, the existing sanitary sewers on Mullen Place cannot be used, as the sewer system will not be low enough to accommodate them.

5.3.3 Water Servicing

There is an existing watermain system within the Hamlet; therefore, it is recommended that the Bayfield and Northwest Confederation lands connect into the existing system as discussed in Section 3.2 of this study.

The recommended route for the second watermain connection into the Sheridan lands is via the existing slope. This alternative coincides with the recommended alternative for the gravity sanitary sewer. Installing both the watermain and gravity sewer via the slope minimizes the impacts to the existing residents on Prince Street during construction and provides for an efficient design and construction procedure.

Stantec

SUBDIVISION

Glen Williams - Proposed Allocation of Residual Capacity

DATE: July 25, 2006
DESIGNED BY: JMK
CHECKED BY:

SANITARY SEWER

DESIGN SHEET

Region of Halton

DESIGN PARAMETERS

AVERAGE DAILY FLOW PER PERSON =	275	l/p/day	RESIDENTIAL:	0.000003183 cums/Ha
			COMMERCIAL:	0.00028646 cums/Ha
MINIMUM VELOCITY =	0.600	m/s	INDUSTRIAL:	0.00039786 cums/Ha
n =	0.013		INSTITUTIONAL:	0.0004 cums/Ha
MAX PEAK FAC.=	4.500		INFILTRATION:	0.000286 cums/Ha
MIN PEAK FAC.=	1.500		RESIDENTIAL HARMON PEAKING FACTOR	

LOCATION			RESIDENTIAL AREA AND POPULATION							COMM		INDUST		INSTIT		C+I+I	INFILTRATION			TOTAL	PIPE					
STREET	FROM M.H.	TO M.H.	AREA (ha)	POP. DENSITY (p/ha)	EQUIV. POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (m3/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (m3/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (m3/s)	FLOW (m3/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (m3/s)	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
School Site																										
Start of Run																0.000	0.00	0.00	0.000							
Middle of run	2	1	1.50	40	60	1.50	60	4.298	0.00082							0.000	1.50	1.50	0.000429	0.00125	100.00	200	0.5	0.023	0.73	0.34
End of Run	1															0.000	0.00	1.50	0.000							
Light Commercial																										
Start of Run																0.000	0.00	0.00								
Middle of run	3	1	1.50	90	135	1.50	135	3.365	0.00145							0.000	1.50	1.50	0.000429	0.00188	100.00	200	0.5	0.023	0.73	0.42
End of Run	1															0.000	0.00	1.50	0.000							
Residential																										
Start of Run																0.000	0.00	0.00								
Middle of run	4	1	52.50	10	525	52.50	525	3.963	0.007							0.000	52.50	52.50	0.015	0.022	100.00	200	0.5	0.023	0.73	0.84
End of Run	1															0.000	0.00	52.50	0.015							

SUBDIVISION	
Sheridan, Pilutti and Bayfield Lands	
DATE:	April 18, 2006
DESIGNED BY:	PQ
CHECKED BY:	RCL

SANITARY SEWER

DESIGN SHEET

Region of Halton

DESIGN PARAMETERS

AVERAGE DAILY FLOW PER PERSON =	275	l/p/day	RESIDENTIAL:	0.000003183 cums/Ha
			COMMERCIAL:	0.00028646 cums/Ha
MINIMUM VELOCITY =	0.600	m/s	INDUSTRIAL:	0.00039786 cums/Ha
n =	0.013		INSTITUTIONAL:	0 cums/Ha
MAX PEAK FAC.=	4.500		INFILTRATION:	0.000286 cums/Ha
MIN PEAK FAC.=	1.500		RESIDENTIAL HARMON PEAKING FACTOR	

LOCATION			RESIDENTIAL AREA AND POPULATION							COMM		INDUST		INSTIT		C+I+I	INFILTRATION			TOTAL	PIPE					
STREET	FROM M.H.	TO M.H.	AREA (ha)	POP. DENSITY (p/ha)	POP.*	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (m3/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (m3/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (m3/s)	FLOW (m3/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (m3/s)	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
Sheridan																										
Start of Run					0											0.000	0.00	0.00								
Middle of run	2	1	36.00		319	36.00	319	4.067	0.004							0.000	36.00	36.00	0.010	0.014	100.00	200	0.5	0.023	0.73	0.77
End of Run	1				0											0.000	0.00	36.00	0.010							
Bayfield																										
Start of Run					0											0.000	0.00	0.00								
Middle of run	3	1	12.00		123	12.00	123	4.218	0.002							0.000	12.00	12.00	0.003	0.005	100.00	200	0.5	0.023	0.73	0.55
End of Run	1				0											0.000	0.00	12.00	0.000							
Pilutti																										
Start of Run					0											0.000	0.00	0.00								
Middle of run	4	1	11.00		112	11.00	112	4.230	0.002							0.000	11.00	11.00	0.003	0.005	100.00	200	0.5	0.023	0.73	0.55
End of Run	1				0											0.000	0.00	11.00	0.000							
PS																										
Start of Run					0											0.000	0.00	0.00								
Middle of run	1	PS	0.00	0	554	59.00	554	3.951	0.007							0.000	0.00	59.00	0.017	0.024	100.00	250	0.5	0.042	0.85	0.88
End of Run	PS				0											0.000	0.00	59.00	0.017							

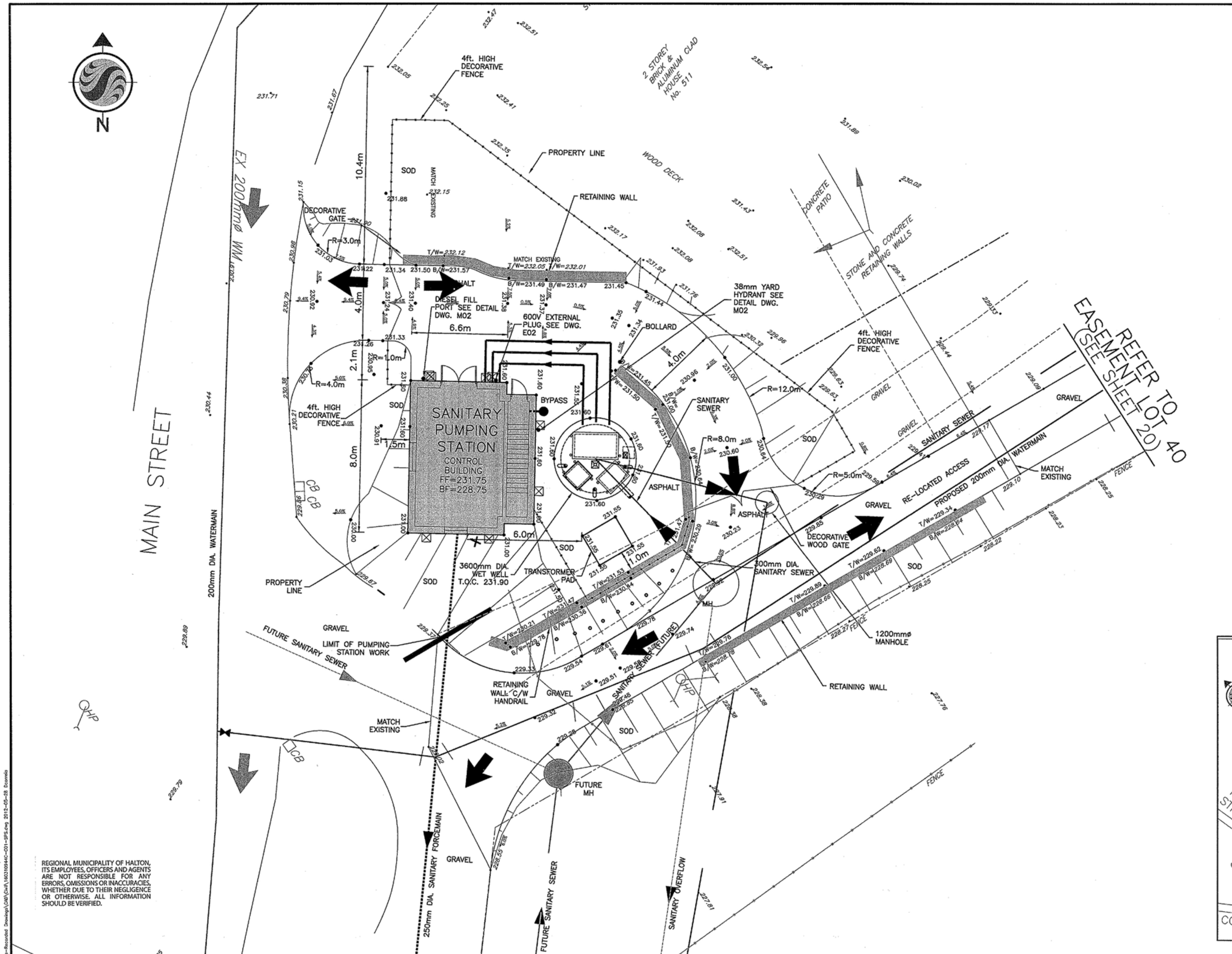
Note: Population based on 3.5 persons per unit

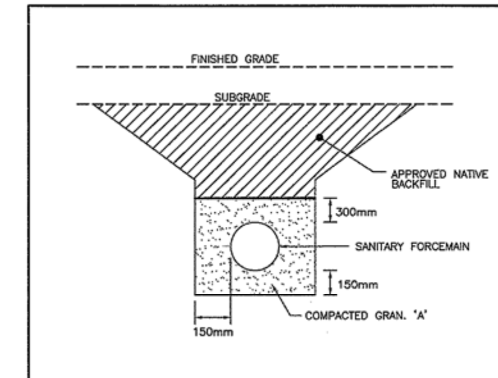
APPENDIX 'B2'

Pump Station Site Plan & Main Street Plan & Profile As Built Drawings

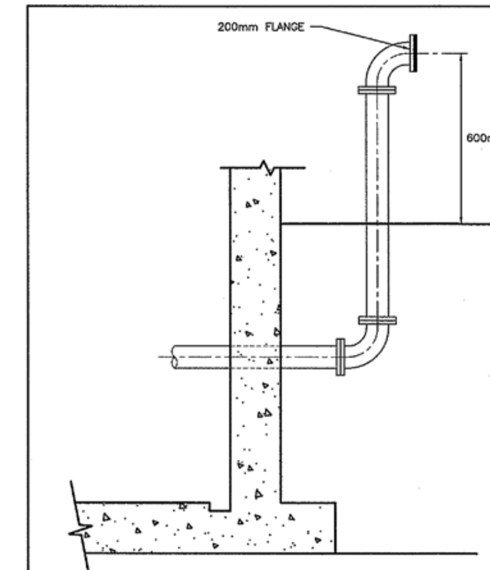
by Stantec Consulting Ltd.

PR-XXXX-XX X of X





BEDDING DETAIL
N.T.S.



BYPASS CONNECTION DETAIL
N.T.S.

KEY PLAN
N.T.S.

Notes:

1. BEDDING AND COVER MATERIAL FOR SANITARY SEWERS, SANITARY FORCEMAINS AND SERVICE CONNECTIONS SHALL BE GRANULAR 'A' COMPACTED TO 98% STANDARD PROCTOR DENSITY.
2. ALL SITE GATE VALVES COME WITH STEM OPERATING EXTENSIONS AS REQUIRED TO ENSURE OPERATING NUT IS MAXIMUM 0.3m BELOW GROUND LEVEL.
3. ALL JOINTS & FITTINGS ON FORCEMAIN WITHIN PUMPING STATION SITE ARE TO BE MECHANICALLY RESTRAINED.
4. FORCEMAIN TO BE CLASS 53 DUCTILE IRON OR SERIES 160 PVC.

Legend

- ASPHALT DRIVEWAY
- 307.37 PROPOSED SPOT ELEVATION
- PROPERTY LINE
- BUILDING ACCESS
- X TREES TO BE REMOVED
- HEAVY DUTY SILT FENCE
- TREE PROTECTION SILT FENCE
- EXTERIOR LIGHT

ASPHALT RESTORATION SCHEDULE:

-300mm GRAN 'B' COMPACTED TO 98% SPD
-150mm GRAN 'A' COMPACTED TO 100% SPD

NO	Date	By	REVISIONS	MANU	CAD
5	MAR 12	BM	AS-RECORDED		X
4	JUN 09	BM	REISSUED FOR CONSTRUCTION		X
3	JUN 08	BM	ISSUED FOR CONSTRUCTION		X
2	APR 08	BM	ISSUED FOR TENDER		X
1	FEB 08	BM	FIRST SUBMISSION		X

Design	RR	Ch'kd	X	Date: 2008 APRIL
Drawn	CDK	Ch'kd	X	
Scale 1:100				References

Field Notes

Stamp

APPROVALS

Municipal

Regional

Director, Engineering Services

Manager, Design Services

Stantec Consulting Ltd.
49 Frederick Street, Kitchener ON Canada N2H 6M7
Tel. 519 579 4410
Fax. 519 579 8664
www.stantec.com

Halton

TITLE
GLEN WILLIAMS W.W. PUMPING STATION
SITE PLAN
TOWN OF HALTON HILLS
(GEORGETOWN)

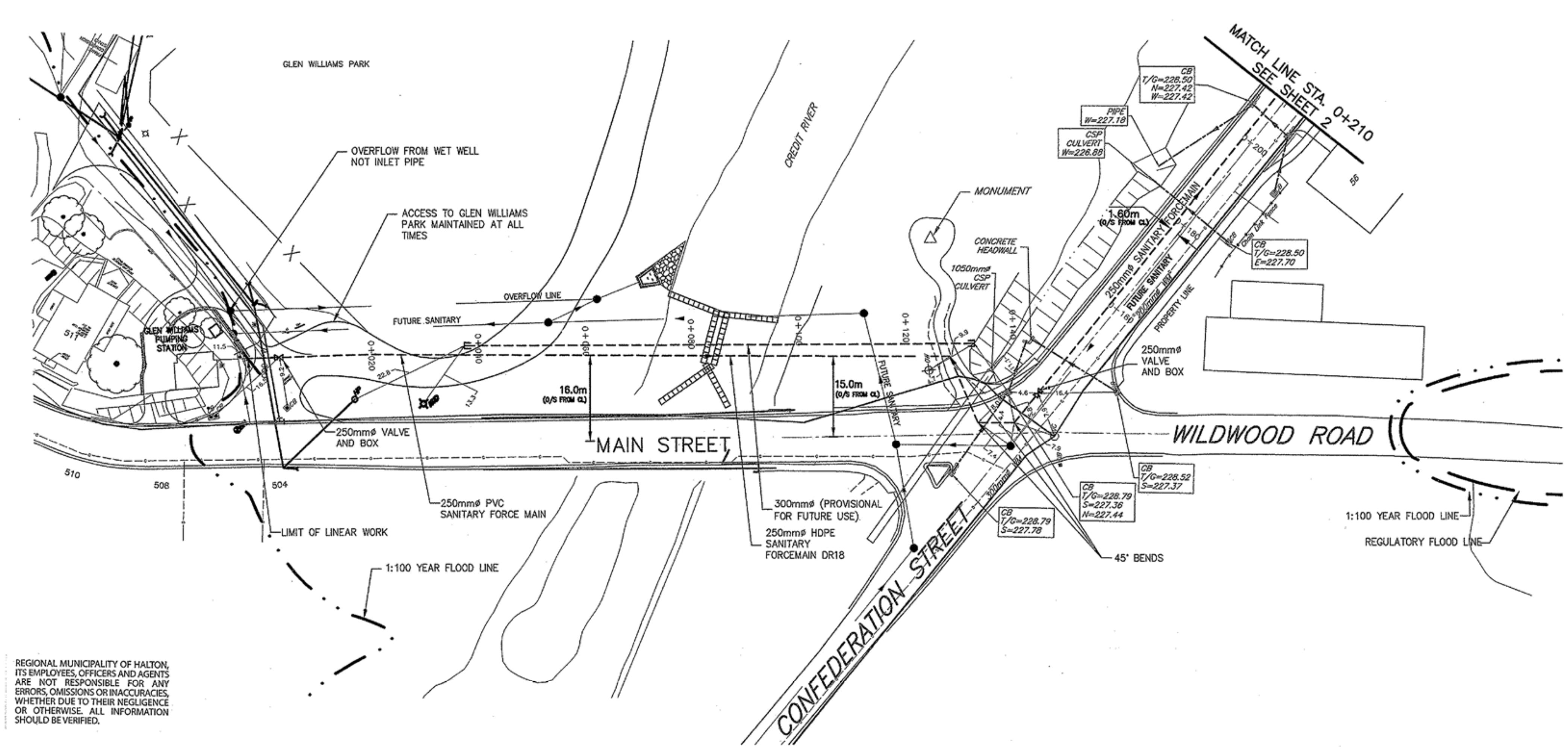
Consultant File NO 160310944

H-01231

CONTRACT NO DH-0242 08-20944-01

Drawing NO C01

SHEET OF



REGIONAL MUNICIPALITY OF HALTON, ITS EMPLOYEES, OFFICERS AND AGENTS ARE NOT RESPONSIBLE FOR ANY ERRORS, OMISSIONS OR INACCURACIES, WHETHER DUE TO THEIR NEGLIGENCE OR OTHERWISE. ALL INFORMATION SHOULD BE VERIFIED.

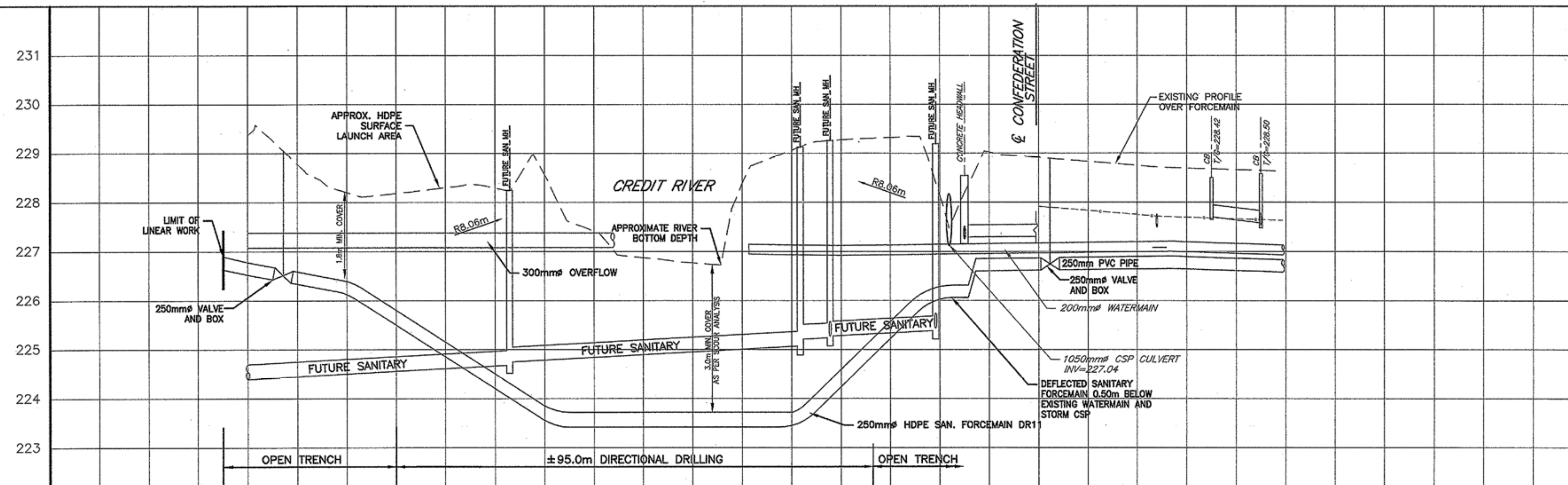
Notes

BENCHMARK:

1. CUT CROSS ON THE NW SIDE OF SIDEWALK OF THE BRIDGE NO. 1 (MAIN ST./CONFEDERATION ST. INTERSECTION). CONTROL STATION 106.
   ELEVATION: 234.028m
   IRON BAR IN SHOULDER EAST OF MAIN ST., SOUTH OF JOSEPH ST. CONTROL STATION 207.
   ELEVATION: 231.383m
2. TOPOGRAPHICAL SURVEY BY STANTEC CONSULTING LTD., DATED APRIL 2006. ADDITIONAL TOPOGRAPHICAL SURVEY BY STANTEC CONSULTING LTD., DATED JUNE 2008.
3. SANITARY FORCEMAIN MATERIAL SHALL BE AS FOLLOWS:
   • UNDERNEATH CREDIT RIVER – 250mm DIA. HIGH DENSITY POLYETHYLENE, DR 18 IN ACCORDANCE W/ CSA B182.6, OPSS 1840 AND OPSD 806.02
   • EVERYWHERE ELSE – PVC DR 18 IN ACCORDANCE W/ CSA B182.2, OPSS 1841 AND OPSD 806.040 AND OPSD 806.06
4. SANITARY FORCEMAIN SHOULD BE INSTALLED IN ACCORDANCE WITH OPSD 802.010 AND 802.014. BEDDING MATERIAL FOR SANITARY FORCEMAIN SHALL BE CLASS B COMPACTED TO MINIMUM 100% STANDARD PROCTOR DENSITY. BACKFILL NATIVE MATERIAL (DIRECTED BY GEOTECHNICAL ENGINEER) COMPACTED TO 100% STANDARD PROCTOR DENSITY.
5. PROPOSED SANITARY FORCEMAIN TO HAVE 1.0m MINIMUM HORIZONTAL SEPARATION FROM EXISTING GAS LINE.
6. REFER TO DETAIL SHEET 8, DWG. C09 FOR TYPICAL ROAD RESTORATION DETAILS.
7. DUMPSITE FOR SURPLUS FILL MATERIAL MAY BE SUBJECT TO SITE ALTERATION BY-LAW NO. 01-076. CONTRACTOR SHALL PROVIDE THE PROPOSED DUMPSITE LOCATION PRIOR TO COMMENCING ANY ON-SITE WORK FOR REVIEW BY THE TOWN.

Legend

- EXISTING STORM MANHOLE
- EXISTING STORM CATCHBASIN MANHOLE
- EXISTING CATCHBASIN
- EXISTING SANITARY MANHOLE
- EXISTING VALVE & BOX
- EXISTING HYDRANT
- PROPOSED SANITARY FORCEMAIN
- EXISTING SANITARY FORCEMAIN
- EXISTING SANITARY SEWER
- EXISTING WATERMAIN
- EXISTING STORM SEWER
- EXISTING GAS LINE
- EXISTING DRIP LINE



℄ ELEVATIONS	229.30	228.12	228.22	228.49	228.79	228.30	229.19	228.08	228.84	228.87	228.58	228.52	
SANITARY FORCEMAIN INVERTS													
STORM SEWER DRAINAGE INVERTS								N 227.18 W 227.21			S 227.62 N 227.50 E 227.45		
CHAINAGE	0+000	0+020	0+040	0+060	0+080	0+100	0+120	0+140	0+160	0+180	0+200	0+220	

H-01232

Nº	Date	By	Revisions
9	JUN 10	CM	AS-RECORDED
8	SEP 09	RW	ISSUED FOR FINAL APPROVAL
7	AUG 09	RW	ISSUED FOR FINAL APPROVAL
5	JUL 08	RW	ISSUED FOR FINAL APPROVAL
4	JUN 08	RW	REVISED FOR APPROVALS
3	MAY 08	MK	ISSUED FOR APPROVALS
2	APR 08	RW	ISSUED FOR TENDER
1	FEB 08	BM	FIRST SUBMISSION

Design — Ch'kd
Drawn — Ch'kd
Date: 2007 NOVEMBER
Scale: 1:500 Horiz. 1:50 Vert.
References

APPROVALS

MUNICIPAL: DESIGN ACCEPTED SUBJECT TO DETAIL CONSTRUCTION CONFORMING TO TOWN OF HALTON HILLS STANDARDS AND SPECIFICATIONS. THIS ACCEPTANCE IS NOT TO BE CONSTRUED AS VERIFICATION OF ENGINEERING CONTENT.
Signed — Dated
Engineering, Public Works & Building Services

REGIONAL: DESIGN OF SANITARY AND WATER SERVICES APPROVED SUBJECT TO DETAIL CONSTRUCTION CONFORMING TO HALTON REGION STANDARDS AND SPECIFICATIONS AND LOCATION APPROVAL FROM AREA MUNICIPALITY.
Signed — Dated
Planning & Public Works Department

Stamp: LICENSED PROFESSIONAL ENGINEER, R. M. WIERSMA, PROVINCE OF ONTARIO

Stantec Consulting Ltd.
49 Frederick Street
Kitchener ON Canada
N2H 6M7
Tel. 519 579 4410
Fax. 519 579 8664
www.stantec.com

Halton

SANITARY FORCEMAIN CONSTRUCTION
MAIN STREET
TOWN OF HALTON HILLS (GEORGETOWN)
GLEN WILLIAMS PUMPING STATION TO
JOHN STREET PUMPING STATION

Consultant File Nº 160310944
Regional Drawing Nº DH-0242
CONTRACT Nº #
Drawing Nº C02
SHEET 1 OF 8

APPENDIX ‘B3’

On-site and External Sanitary Design Chart

STREET	SUBAREA	FROM MH #	TO MH #	NO. OF UNITS	SECTION AREA (ha)	ACCUMULATED AREA (ha)	POPULATION	ACCUMULATED POPULATION	PEAKING FACTOR	PEAK DAY FLOW = (8)(0.003183)(9) (L/s)	INFILTRATION (L/s)	TOTAL FLOW = (10) + (11) (L/s)	PIPE DIAMETER (mm)	TYPE OF PIPE	PIPE LENGTH (m)	SLOPE (%)	FULL FLOW CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	**ACTUAL FLOW VELOCITY (m/s)**	UPPER END INVERT (m)	UPPER END MH LOSSES (m)	LOWER END INVERT (m)	REMARKS %FULL
(1)		**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**	**(13)**	**(14)**	**(15)**	**(16)**	**(17)**	**(18)**	**(19)**	**(20)**	**(21)**	**(22)**	**(23)**
2147925 ONTARIO INC.																							
STREET "A"	**A1**	MH 15A	MH 14A	7	1.26	1.259	25	25	4.37	0.341	0.360	**0.701**	200	PVC	73.85	1.00%	32.766	1.043	**0.418**	271.50		270.76	2.14%
STREET "A"	**A2**	MH 14A	MH 13A	2	0.51	1.772	7	32	4.35	0.436	0.507	**0.943**	200	PVC	15.09	1.00%	32.766	1.043	**0.457**	270.73	0.03	270.58	2.88%
STREET "A"	**A3**	MH 13A	MH 12A	6	1.23	3.004	21	53	4.31	0.720	0.859	**1.579**	200	PVC	94.00	1.00%	32.766	1.043	**0.533**	270.55	0.03	269.61	4.82%
STREET "A"	**A4**	MH 12A	MH 11A	6	1.29	4.296	21	74	4.28	1.001	1.229	**2.229**	200	PVC	86.00	1.00%	32.766	1.043	**0.592**	269.58	0.03	268.72	6.80%
STREET "A"	**A5**	MH 11A	MH 10A	1	0.20	4.498	4	77	4.27	1.047	1.286	**2.334**	200	PVC	16.99	1.00%	32.766	1.043	**0.602**	268.69	0.03	268.52	7.12%
STREET "A"	**A6**	MH 10A	MH 09A	2	0.42	4.916	7	84	4.26	1.140	1.406	**2.546**	200	PVC	44.56	1.00%	32.766	1.043	**0.617**	268.49	0.03	268.05	7.77%
STREET "A"	**A7**	MH 09A	MH 08A	8	1.53	6.450	28	112	4.23	1.508	1.845	**3.353**	200	PVC	89.86	1.00%	32.766	1.043	**0.669**	268.02	0.03	267.12	10.23%
MEAGAN DRIVE																							
MEAGAN DR.		MH 08A	MH 60	0	0.00	6.450	0	112	4.23	1.508	1.845	**3.353**	200	PVC	88.04	1.00%	32.766	1.043	**0.669**	267.09	0.03	266.21	10.23%
OAK RIDGE DRIVE																							
OAK RIDGE DR.	**A8 + A9**	MH 60	MH 61	52	17.42	23.870	182	294	4.08	3.820	6.827	**10.647**	200	PVC	94.38	0.50%	23.099	0.735	**0.719**	266.15	0.06	265.68	46.09%
OAK RIDGE DR.		MH 61	MH 62	0	0.00	23.870	0	294	4.08	3.820	6.827	**10.647**	200	PVC	82.90	0.50%	23.053	0.734	**0.718**	265.65	0.03	265.24	46.19%
OAK RIDGE DR.		MH 62	MH 63	0	0.00	23.870	0	294	4.08	3.820	6.827	**10.647**	200	PVC	19.54	0.51%	23.399	0.745	**0.727**	265.18	0.06	265.08	45.50%
OAK RIDGE DR.		MH 63	SAN MH 1A	0	0.00	23.870	0	294	4.08	3.820	6.827	**10.647**	200	PVC	68.00	0.50%	23.169	0.737	**0.721**	265.02	0.06	264.68	45.95%
WILDWOOD ROAD																							
WILDWOOD RD	**A10**	SAN MH 1A	SAN MH 2A	29	12.66	36.530	102	396	4.02	5.066	10.448	**15.514**	200	PVC	95.84	0.50%	23.169	0.737	**0.790**	264.62	0.06	264.14	66.96%
WILDWOOD RD		SAN MH 2A	SAN MH 3A	0	0.00	36.530	0	396	4.02	5.066	10.448	**15.514**	200	PVC	19.54	0.50%	23.169	0.737	**0.790**	264.11	0.03	264.01	66.96%
WILDWOOD RD		SAN MH 3A	SAN MH 4A	0	0.00	36.530	0	396	4.02	5.066	10.448	**15.514**	200	PVC	29.78	0.50%	23.169	0.737	**0.790**	263.98	0.03	263.83	66.96%
WILDWOOD RD		SAN MH 4A	SAN MH 5A	0	0.00	36.530	0	396	4.02	5.066	10.448	**15.514**	200	PVC	71.03	5.08%	73.865	2.351	**1.857**	263.80	0.03	260.19	21.00%
WILDWOOD RD		SAN MH 5A	SAN MH 6A	0	0.00	36.530	0	396	4.02	5.066	10.448	**15.514**	200	PVC	99.51	3.66%	62.650	1.994	**1.649**	260.15	0.04	256.51	24.76%
WILDWOOD RD		SAN MH 6A	SAN MH 7A	0	0.00	36.530	0	396	4.02	5.066	10.448	**15.514**	200	PVC	46.72	5.29%	75.361	2.399	**1.887**	256.47	0.03	254.00	20.59%
WILDWOOD RD		SAN MH 7A	SAN MH 8A	0	0.00	36.530	0	396	4.02	5.066	10.448	**15.514**	200	PVC	74.69	6.37%	82.697	2.632	**2.014**	253.96	0.05	249.20	18.76%
WILDWOOD RD		SAN MH 8A	SAN MH 9A	0	0.00	36.530	0	396	4.02	5.066	10.448	**15.514**	200	PVC	67.17	4.54%	69.815	2.222	**1.786**	249.15	0.05	246.10	22.22%
WILDWOOD RD		SAN MH 9A	SAN MH 10A	0	0.00	36.530	0	396	4.02	5.066	10.448	**15.514**	200	PVC	15.94	7.90%	92.095	2.931	**2.179**	246.06	0.04	244.80	16.85%
WILDWOOD RD		SAN MH 10A	SAN MH 11A	0	0.00	36.530	0	396	4.02	5.066	10.448	**15.514**	200	PVC	65.94	12.04%	113.693	3.619	**2.520**	244.74	0.06	236.80	13.65%
WILDWOOD RD		SAN MH 11A	SAN MH 12A	0	0.00	36.530	0	396	4.02	5.066	10.448	**15.514**	200	PVC	82.50	9.36%	100.244	3.191	**2.311**	236.72	0.08	229.00	15.48%
WILDWOOD RD		SAN MH 12A	SAN MH 13A	0	0.00	36.530	0	396	4.02	5.066	10.448	**15.514**	200	PVC	59.87	2.56%	52.425	1.669	**1.452**	228.93	0.07	227.40	29.59%
WILDWOOD RD		SAN MH 13A	SAN MH 14A	0	0.00	36.530	0	396	4.02	5.066	10.448	**15.514**	200	PVC	27.62	0.51%	23.308	0.742	**0.793**	227.37	0.03	227.23	66.56%
WILDWOOD RD		SAN MH 14A	SAN MH 15A	0	0.00	36.530	0	396	4.02	5.066	10.448	**15.514**	200	PVC	59.49	0.67%	26.860	0.855	**0.885**	227.20	0.03	226.80	57.76%
WILDWOOD RD		SAN MH 15A	SAN MH 16A	0	0.00	36.530	0	396	4.02	5.066	10.448	**15.514**	200	PVC	86.18	0.66%	26.639	0.848	**0.880**	226.77	0.03	226.20	58.24%
WILDWOOD RD	**A11**	SAN MH 16A	SAN MH 17A	0	0.13	36.660	12	408	3.21	4.170	10.485	**14.654**	200	PVC	74.94	0.50%	23.169	0.737	**0.779**	226.17	0.03	225.79	63.25%
WILDWOOD RD		SAN MH 17A	SAN MH 18A	0	0.00	36.660	0	408	4.02	5.212	10.485	**15.697**	200	PVC	50.40	5.63%	77.745	2.475	**1.929**	225.76	0.03	222.92	20.19%
MAIN STREET and CREDIT RIVER																							
MAIN ST	**A12 + A13 + A14**	SAN MH 18A	SAN MH 19A	214	111.62	148.280	749	1157	3.76	13.835	42.408	**56.243**	300	PVC	25.25	1.00%	96.618	1.367	**1.418**	222.83	0.09	222.58	58.21%
CREDIT RIVER BANK		SAN MH 19A	SAN MH 20A	0	0.00	148.280	0	1157	3.76	13.835	42.408	**56.243**	300	PVC	99.36	0.50%	68.319	0.967	**1.079**	222.52	0.06	222.02	82.32%
CREDIT RIVER BANK		SAN MH 20A	SAN MH 21A	0	0.00	148.280	0	1157	3.76	13.835	42.408	**56.243**	300	PVC	22.59	0.50%	68.319	0.967	**1.079**	221.96	0.06	221.85	82.32%

NOTES:

POPULATION DENSITY (Single Family Residential): New develop.= 55 persons / hectare or 3.5 persons per unit
DESIGN FLOW = 3.183x 10^-3 L/sec per person equivalent to 275 L per day per person
PEAKING FACTOR = $1 + 14/(4+P^{(1/2)})$
WHERE P = POP. IN 1000's
WET WEATHER INFILTRATION 0.286 L/s/ha

Designed by: J.J.K.
Checked by: M.E.H. P.Eng.
Date Modified: **9-24-2020**

REGION MUNICIPALITY OF HALTON
ENGINEERING AND PUBLIC WORKS DEPARTMENT
SANITARY SEWER DESIGN SHEET

SHEET 1 OF 1

APPENDIX ‘B4’

Credit River at Glen Williams: Fluvial Geomorphology and Scour Assessment Prepared by GeoProcess Research Associates

Credit River at Glen Williams: Fluvial Geomorphology and Scour Assessment

FINAL REPORT

Prepared for

Glen Ridge Estates Inc.
c/o Urbantech Consulting
3760 14th Avenue, Suite 301
Markham, ON L3R 3T7

July 7, 2020
Project No. P2019-371

Prepared by

GeoProcess Research Associates Inc.
133 King Street West
PO Box 65506 DUNDAS
Dundas, ON L9H 6Y6

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V3	July 7, 2020	Final	Issued for review	BDP	KAG

GeoProcess
RESEARCH ASSOCIATES

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1. Introduction

GeoProcess Research Associates Inc. (GRA) has been retained by Glen Ridge Estates Inc. to complete a fluvial geomorphic and scour assessment for the Credit River, as it relates to a planned buried sanitary sewer line crossing. The objectives of the study were to characterize the existing geomorphic conditions of the river near the crossing, identify erosion thresholds and estimate the scour potential for a range of flows. To address these objectives, a field assessment and geomorphic survey were undertaken. These data were used in conjunction with existing background information and hydraulic modelling to estimate potential scour depths at the proposed crossing location.

2. Methodology

2.1. Background Information

Several background sources were used for this assessment.

- Region of Halton Drawing No. DH0242 (June 2010): This drawing illustrates the previously constructed sanitary sewer forcemain and the proposed sanitary sewer. Also illustrated is the recommended installation depth of the previously constructed forcemain based on a previously completed scour assessment. This scour assessment was not reviewed as it was not in the Region's or Credit Valley Conservation's (CVC) records.
- Credit River Regulatory Hydraulic Model: This HEC-RAS model was obtained from CVC and used to develop boundary conditions and verify topographic and structure geometry in the local model developed for this assessment (discussed in further detail in Section 4).

2.2. Field Work Completed by GRA

A detailed geomorphic assessment was conducted on December 2, 2019. This assessment included a detailed geomorphic survey, an assessment of local fluvial processes, channel adjustments, and characterization of the channel bed material. The survey included the cross-sectional shape and longitudinal profile of the river for approximately 330 m in the study area. To determine the substrate grain size distribution a pebble count was conducted downstream of the bridge.

3. Existing Conditions

3.1. Credit River Watercourse Setting

The Credit River has a watershed area of approximately 1000 km^2. It originates near Orangeville and outlets to Lake Ontario in Mississauga. Land-use throughout the watershed is primarily rural and agricultural (~50%), with ~17% urban land-use that is concentrated in the lower portion of the watershed, downstream of the study area.

This study area is located in Glen Williams, around the most downstream Main Street bridge and adjacent to Glen Williams Park. Figure 1 shows the location and extent of the study area. Glen Williams is a turning point in the Credit River watershed due to the change in physiographic conditions, where the river turns southeast toward Lake Ontario after flowing south along the base of the Niagara Escarpment, transitioning to the South Slope physiographic region downstream of the study area.

3.2. Physiography and Geology

The study area is located immediately east of the Niagara Escarpment. Here, the Credit River follows a glaciofluvial spillway that stretches along the base of the escarpment from Belfountain to Glen Williams. Surficial deposits within the study area have been classified as modern alluvial floodplain deposits, consisting of undifferentiated gravel, sand, silt, clay and muck (OGS, 2010). Outside the study area, these alluvial deposits are interspersed with gravelly outwash deposits and surrounded by plains consisting of Halton Till. Figure 1 shows the geologic context within which the study area is situated.

3.3. Study Area Geomorphic Conditions

3.3.1. General Overview

Representative photos of the study area are provided in the table, below. As it flows towards the Main Street bridge (Photo 1), the Credit River bends to the southeast, a change from its predominant flow direction, which was southerly. The thalweg at this bend is located on the outer bend, where a scour pool has formed that is approximately 0.65 m lower than the downstream geomorphic control (a riffle crest). Standing waves observed on the outer bend indicate that this is a high-energy environment. The outer bank has been stabilized with riprap, which may be redirecting erosive energy to the thalweg and contributing to the scour and pool development here. The inner bend is significantly shallower, and a vegetated lobate bar has formed in the centre of the river, indicating that deposition is occurring away from the outside bend. The vegetation on this bar is indicative of the relative permanence of this feature. Overall, the rip rap bank revetment was observed to be stable.

Downstream of the Main Street Bridge (Photo 2) there is a long, straight run that extends for approximately 700 m, including beyond the study area extents. Immediately downstream of the bridge, the thalweg is located at the toe of the left bank, coinciding with a narrowing of the bankfull channel as the left bank redirects flow toward the centre of the river. Some erosion was noted on both banks immediately downstream of the bridge (Photo 3 and Photo 4). This localized bank erosion is likely the result of bridge scour as flow is contracted through the opening, focusing erosive energy on the banks and riverbed immediately downstream of the bridge. Approximately 10 m downstream of the bridge, the banks are well vegetated and stable, and the bed is comprised of coarse cobbles. There is a transition in substrate size from the bridge location to a point further downstream, which is discussed further in Section 3.3.3.

A berm is present in the left overbank area, likely constructed as a flood control measure to protect the adjacent park. The berm confines channel flow by limiting floodplain access, potentially increasing erosive energy through this portion of the channel. A boulder rock vane was constructed approximately 150 m downstream of the bridge, creating a slight backwater condition extending approximately 80 m upstream of the vane. This feature is providing grade control to limit bed degradation.

Aerial imagery from 1954 was obtained for the Glen Williams area (shown in Figure 2). The 1954 planform indicates that the reach was channelized, likely to accommodate development in Glen Williams. This explains the uniform channel conditions observed downstream of the bridge, in the study area.

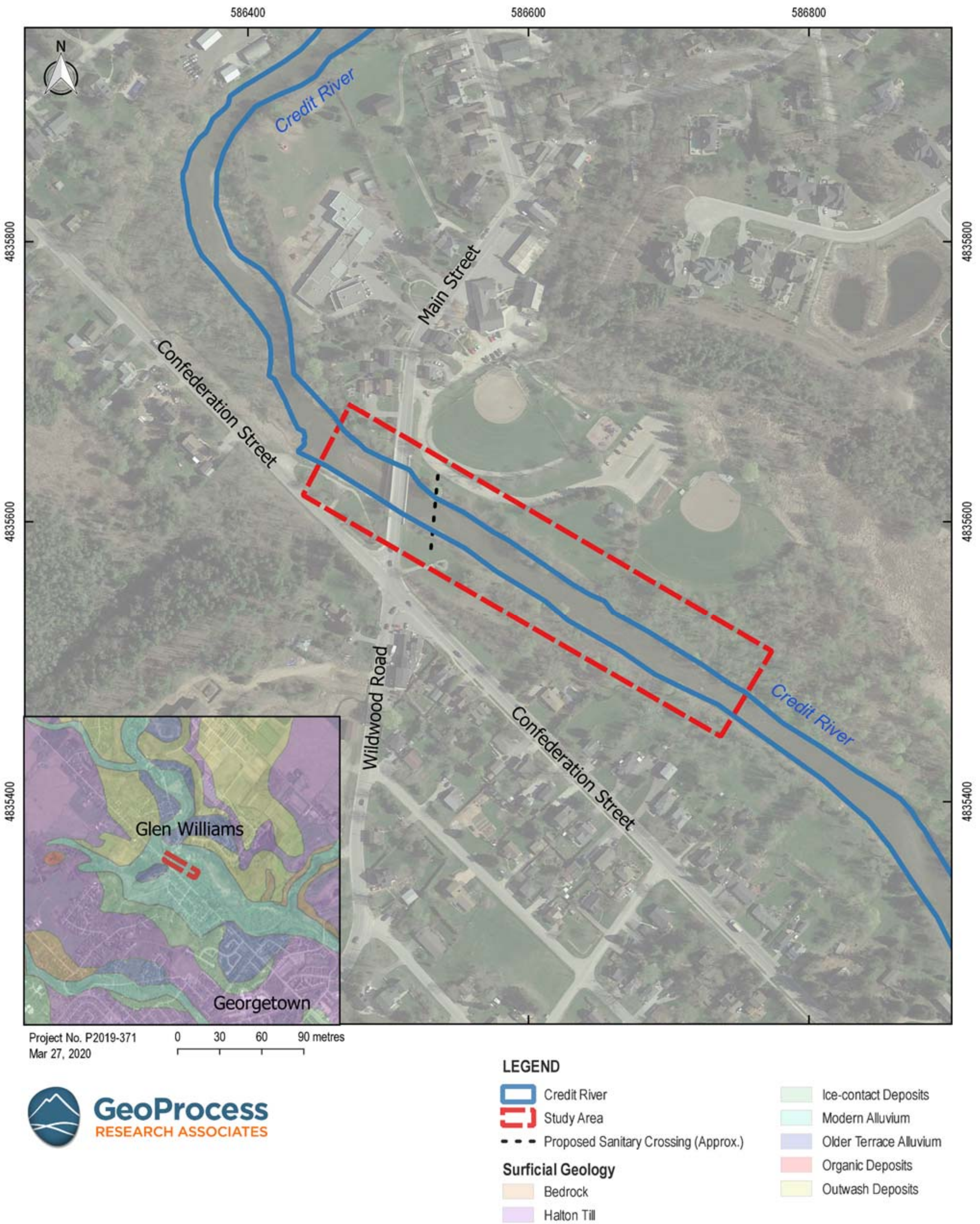

Figure 1: Study area location.

Photo 1: Main Street bridge looking upstream

Photo 2: Main Street bridge looking downstream

Photo 3: Right bank erosion downstream of bridge

Photo 4: Left bank downstream of bridge

3.3.2. Cross-Section and Profile

Seven cross-sections were surveyed; two upstream and five downstream of the bridge (cross-section locations shown in Figure 2). The bankfull gradient in the study area was measured to be 0.38%. Figure 3 illustrates the longitudinal profile, location of the surveyed cross-sections, surveyed water surface (on December 2, 2019) and the estimated bankfull stage and gradient for the study area.

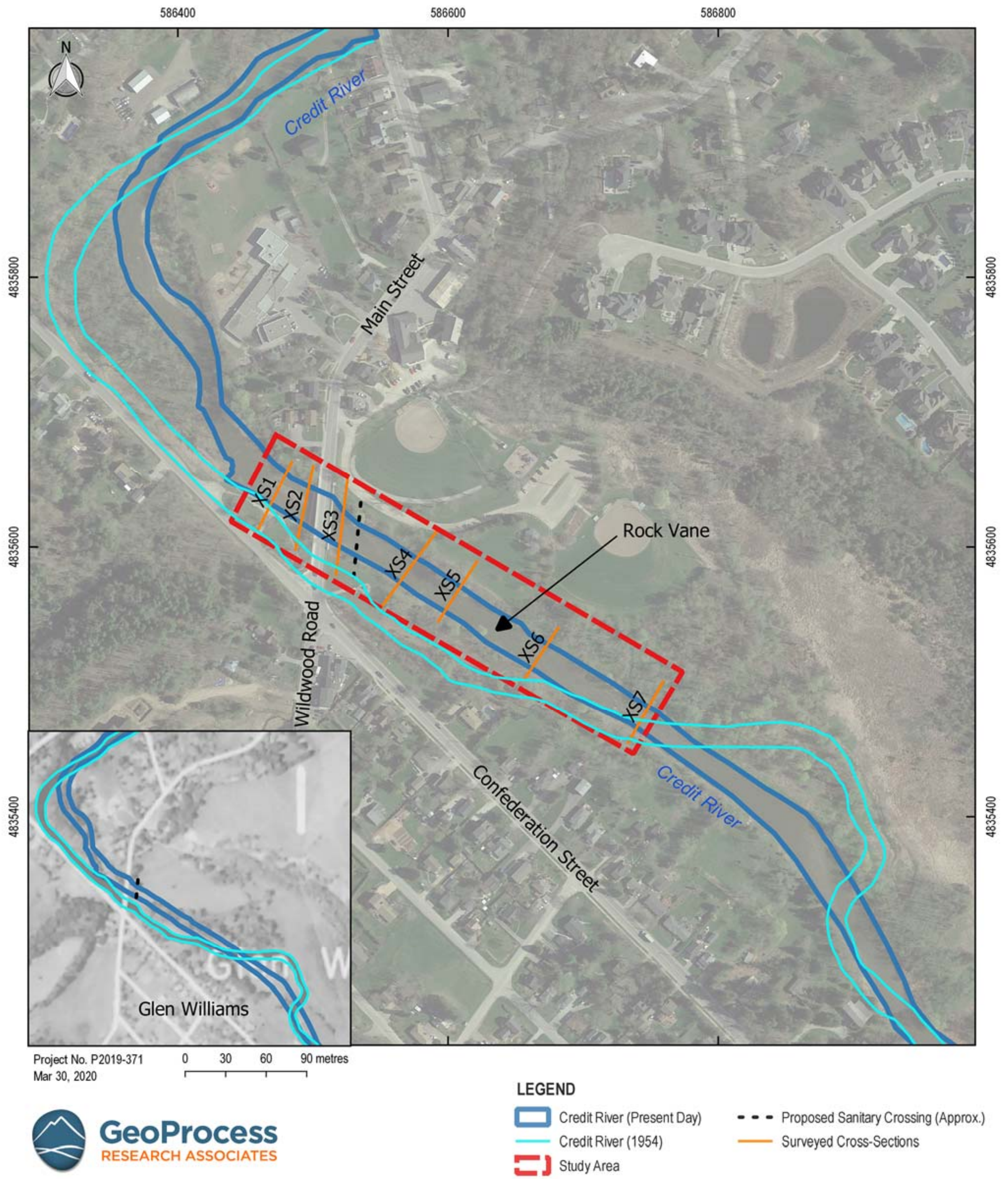

Figure 2: Surveyed cross-section locations and pre-channelized river alignment.

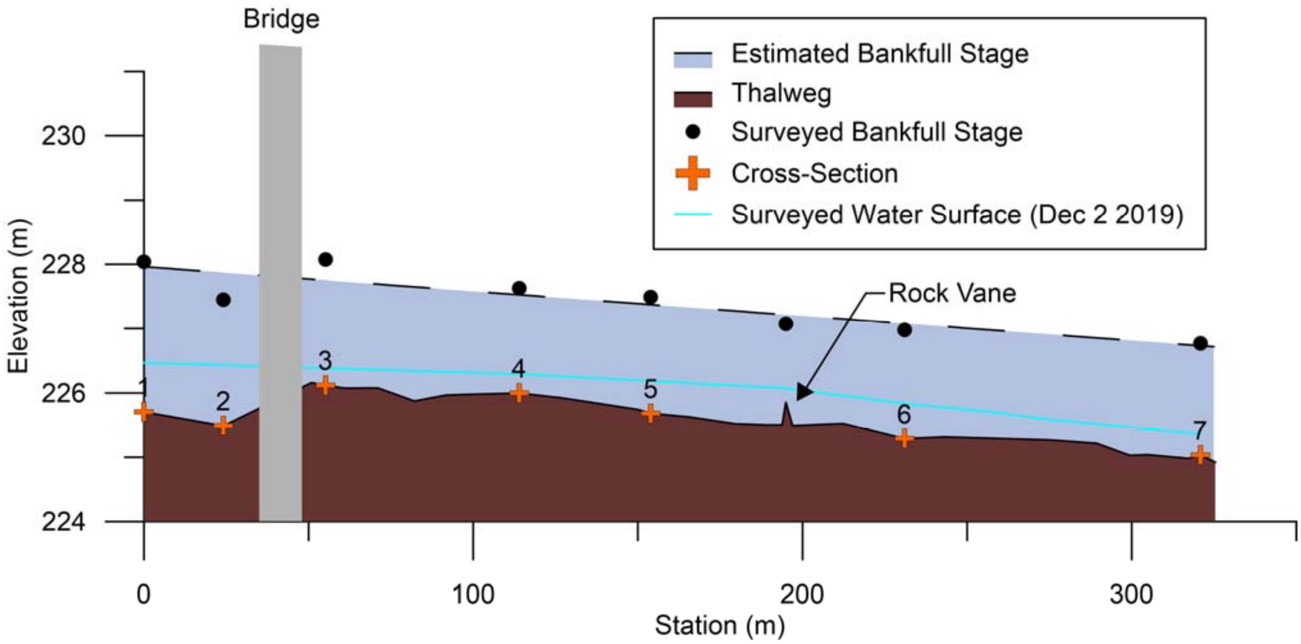

Figure 3: Longitudinal profile of the study reach illustrating the bed elevation, location of surveyed cross-sections, water surface elevation on the date of survey and the estimated bankfull stage and gradient.

The bankfull geometry and related hydraulics were calculated using the surveyed bankfull stage elevations and estimated bankfull gradient. Tables 1-4 provide a summary of the bankfull parameters upstream and downstream of the Main Street bridge. The graphical cross-sections are provided in Appendix A.

Table 1: Bankfull geometry upstream of Main Street bridge.

Cross-Section	Cross-Sectional Area (m^2)	Width (m)	Mean Depth (m)	Max Depth (m)	Wetted Perimeter (m)	Hydraulic Radius (m)	Width:Depth Rato (-)
XS1	48.55	33.01	1.47	2.33	34.14	1.42	22.45
XS2	32.87	30.54	1.08	1.96	32.03	1.03	28.37
Average	**40.71**	**31.77**	**1.27**	**2.15**	**33.09**	**1.22**	**25.41**

Table 2: Estimated bankfull hydraulics upstream of Main Street bridge.

Cross-Section	Discharge (m^3/s)	Velocity (m/s)	Froude #	Shear Stress (Pa)
XS1	108.09	2.23	0.60	53.00
XS2	58.91	1.79	0.56	38.26
Average	**83.50**	**2.01**	**0.58**	**45.63**

Table 3: Bankfull geometry downstream of Main Street bridge.

Cross-Section	Cross-Sectional Area (m^2)	Width (m)	Mean Depth (m)	Max Depth (m)	Wetted Perimeter (m)	Hydraulic Radius (m)	Width:Depth Rato (-)
XS3	60.18	37.99	1.58	2.30	39.06	1.54	23.98
XS4	40.19	30.27	1.33	1.82	31.05	1.29	22.79
XS5	40.59	28.64	1.42	1.81	29.32	1.38	20.20
XS6	35.70	28.84	1.24	1.69	29.27	1.22	23.30
XS7	41.48	30.62	1.35	1.84	31.29	1.33	22.60
Average	**43.63**	**31.27**	**1.38**	**1.89**	**32.00**	**1.35**	**22.57**

Table 4: Estimated bankfull hydraulics downstream of Main Street bridge.

Cross-Section	Discharge (m^3/s)	Velocity (m/s)	Froude #	Shear Stress (Pa)
XS3	141.35	2.35	0.60	57.44
XS4	84.07	2.09	0.59	48.26
XS5	88.77	2.19	0.59	51.60
XS6	71.77	2.01	0.58	45.47
XS7	88.14	2.12	0.59	49.41
Average	**94.82**	**2.15**	**0.59**	**50.44**

General consistency was noted between the cross-sectional parameters, with the upstream cross-sections having a larger maximum depth than the downstream cross-sections. XS1 to XS3 have the most variation from the mean, likely due to their proximity to the bridge. The uniformity in bed and cross-sectional morphology is likely explained by the previous channelization. The estimated bankfull discharge corresponds to an approximate 1:3-year return-period, which is higher than the commonly reported 1.5-year return-period for rural riffle-pool channels. Annable (1996) documented a range between 1.2-year and 2.4-year return-period for 26 riffle-pool channels in Southern Ontario. While the Credit River was included in that dataset, the locations assessed were well upstream of Glen Williams, thus their relationships cannot be directly applied to this area. The relatively large bankfull capacity of the channel is likely also explained by channelization, with the reach having been modified to increase its capacity to reduce flooding of adjacent residential areas. These modifications notwithstanding, the bankfull characteristics reported in Tables 1-4 are representative of the current geomorphic conditions in the study area.

3.3.3. Substrate

River substrate was characterized by a pebble count that was completed in the vicinity of the proposed sewer crossing, downstream of the bridge. Field observations indicated a trend of bed coarsening moving in the downstream direction, and the pebble count was completed upstream of the coarser material. This provided a conservative (relative to the bed material immediately downstream of the proposed crossing) estimate of substrate size, one that is representative of the conditions in the vicinity of the proposed crossing. The data indicates that the substrate material is composed of gravel and cobble ranging primarily from 20 – 250 mm, with trace sand and fine gravel (<5%). It is speculated that the bed material here is, at least in part, an artifact of the historic channelization (i.e. imported material) because of its armoured nature.

Table 5: Substrate percentile sizes.

Percentile	Size (mm)
D_{16}	22
D_{50}	61
D_{84}	121
D_{95}	173

3.3.4. Existing Conditions Summary

In summary, the Credit River in the study area has been historically channelized and armoured and is generally stable. While some indicators of channel processes associated with geomorphic instability (e.g. excess erosion and aggradation) were observed, these are considered localized instances and are highly influenced by the bridge structure and its hydraulic influence.

4. Erosion and Scour Assessment

4.1. Methods

4.1.1. Hydraulic Modelling

A local model was developed for the study area using HEC-RAS. The local model used geometry data from the GRA survey, which was supplemented with topographic data from the 2010 Southwestern Ontario Orthophotography Project (SWOOP) terrain data. The model was extended downstream to cross-section 23930 of the CVC regulatory HEC-RAS model. Water surface elevations from CVC's model at station 23930 were used as the downstream boundary conditions for the return-period flows (also taken from CVC's HEC-RAS model). The model geometry is summarized in Figure 4.

4.1.2. Erosion Thresholds (Fluvial Processes)

Erosion thresholds of the bed material were established using the measured grain sizes presented in Table 5. Critical shear stresses were established using both a modified Shields equation (Julien, 1995) and the size-selective approach of Komar (1987). These approaches are based on different underlying theories, with the Shields equation assuming grain independence (i.e. not considering influences of a sediment mixture of multiple grain sizes) and the Komar approach considering interactions between different grain sizes in a mixture. Both methods are appropriate for a coarse gravel/cobble bed.

Erosion thresholds are not directly used in the scour models employed in this study, although some models consider them implicitly. Instead, they are used to evaluate the bed entrainment potential by comparing the established erosion thresholds to the hydraulics estimated in both the bankfull hydraulics (Table 4) and the HEC-RAS model (100-year discharge conditions). This compliments the scour modelling (discussed below) by further quantifying potential bed erosion.

4.1.3. Scour Modelling

Following the CVC scour analysis guidelines (CVC, 2019), two possible methods for scour are available to establish the scour hazard limit (SHL); a simplified standard method and a detailed method. The simplified method produces an overly conservative estimate and is intended as a first approach when not enough data are available to conduct the detailed method. For this assessment, the detailed method using Equation 3 representing scour in the vicinity of bridge piers was used. While the Main Street bridge has no piers, local scour due to flow contraction still needs to be considered because it can often exceed general and natural scour processes.

There is no standardized method for estimating scour potential for gravel-bed rivers in close proximity to hydraulic infrastructure. To evaluate the susceptibility of the proposed sanitary line to erosion, bed scour was estimated using several different approaches, with the objective being convergence on a result. This multi-pronged approach was used because of the inherent variability of scour and bed mobility in gravel-bed systems, variability that is reflected in the multi-pronged calculations and estimation of potential scour.

The equation for the SHL in the vicinity of bridge peers is as follows:

$$SHL = G_s + L_s + N_s + FS$$

where G_s is the general scour (scour impacting the entire cross-section), L_s is local scour (in this case scour due to flow contraction associated with the bridge), N_s is natural scour (natural bed incision associated with long-term fluvial processes) and FS is a factor of safety. All the scour components were estimated for each return-period event.

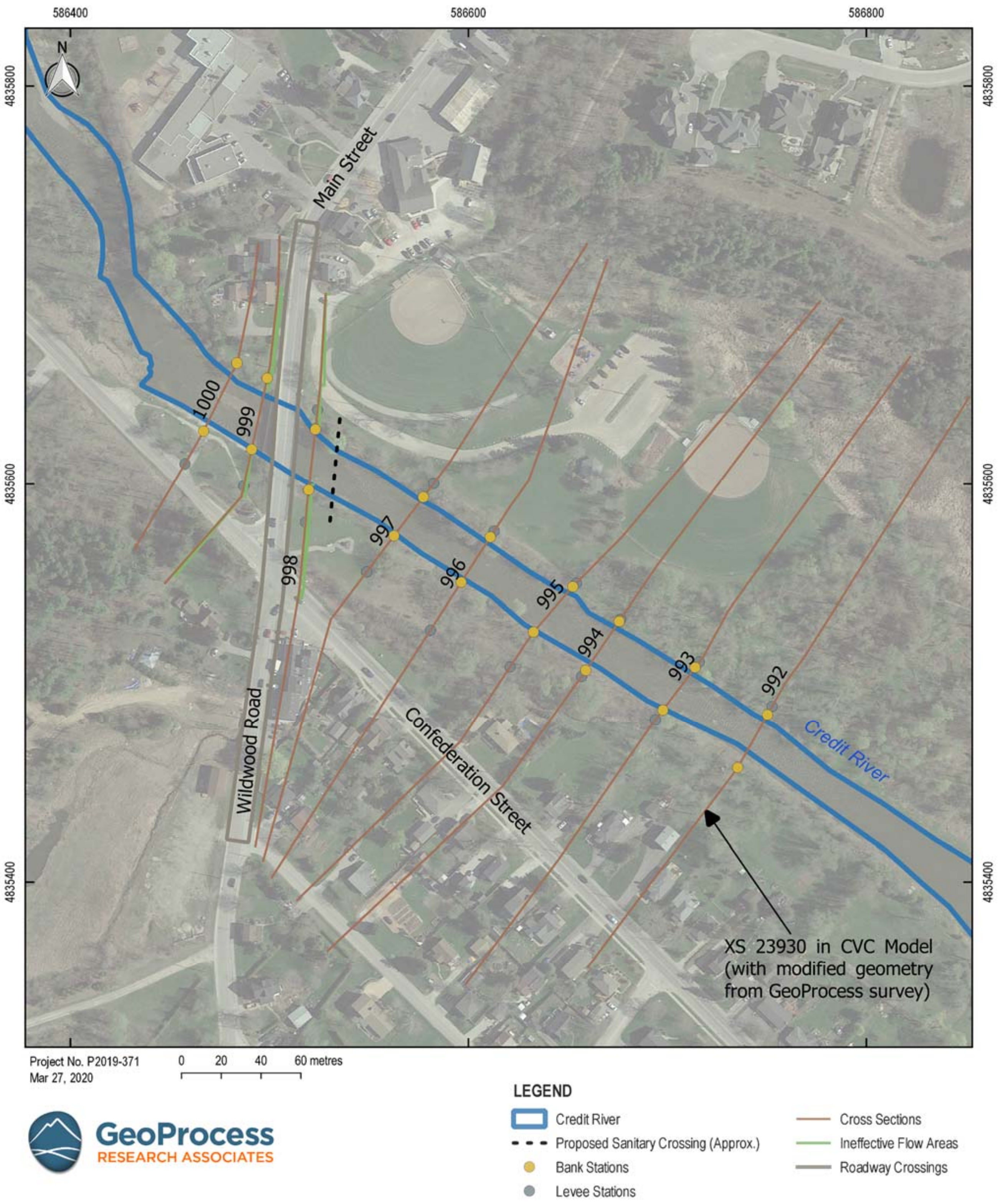

Figure 4: Local HEC-RAS model for scour assessment.

4.1.3.1. General Scour

General scour is the lowering of the channel bed associated with natural sediment entrainment processes (typically during flood conditions). It was was estimated using several different approaches, including those that consider armouring, regime equations and equilibrium slopes. As scour in gravel-bed rivers is a complex process and each equation has its own assumptions and limitations, the use of multiple approaches helps to limit the uncertainty associated with scour estimation.

Riverbed armouring occurs when smaller, more easily transportable, particles are entrained from the river bottom, leaving larger, less transportable, particles to comprise the bed. Julien (2002) and Borah (1989) provide models that predict the estimated scour depth that will produce an armour layer. In simple terms, as the riverbed scours to the depths predicted using these models (which are based on the D_{50} size), the bed will become coarser, and thus more resilient to erosion, potentially limiting the scour to less than what is predicted with the models.

Regime equations have been used to predict general scour. Pemberton and Lara (1984) used classic regime equations of Lacey (1931) and Blench (1970) to estimate general scour in natural channels. Haschenburger (1999) used a probabilistic approach to estimate general scour in single-thread gravel-bed rivers.

Equilibrium slopes have also been used to estimate the degree of incision corresponding to a reduction in upstream sediment supply (e.g. due to the construction of a dam or from urbanization). This concept stems from known responses in channel morphology due to a reduction in sediment supply. When supply is reduced, the sediment transport capacity (ability of the channel to convey sediment) of the channel surpasses the supply (actual amount of sediment delivered to the reach). The result is a channel adjustment by slope reduction (by way of bed scour or deposition), until capacity equals supply. Equilibrium slope models are available in the USDA (2007) engineering handbook and can be estimated based on the bed composition in the channel. The difference in depth between the equilibrium slope and existing slope can be estimated by comparing these slopes to a fixed downstream grade control (local base level). The slope will hinge about the grade-control point, as illustrated in Figure 5. If the equilibrium slope is less than the existing slope, incision is possible. If the equilibrium slope is greater, slope adjustments are predicted to be minimal as the bed is already resilient to erosion or in a depositional regime. For the study area, four equilibrium slope models developed for beds coarser than sand (representative of the Credit River) were used to estimate the equilibrium slope, and assume no upstream sediment supply (conservative estimate). The local base-level was assumed to be the downstream rock vane which provides grade control.

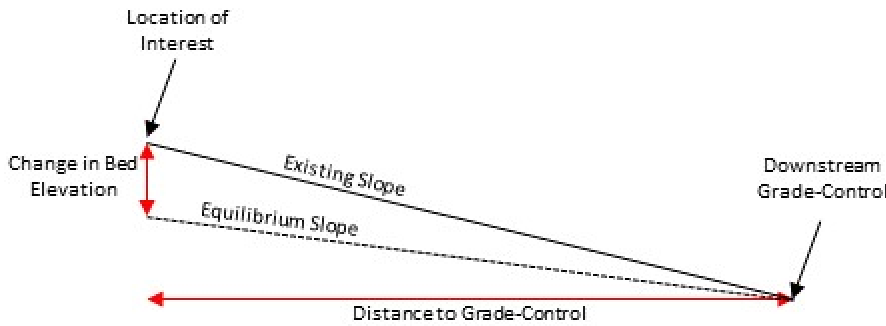

Figure 5: Equilibrium slope schematic.

4.1.3.2. Local Scour

Local scour is localized erosion within the channel bed, commonly attributed to an in-stream structure, obstruction, or forced contraction. It was estimated using both the Laursen live-bed and clear water contraction scour equations in FHWA (2012). These equations are based on the conservation of sediment transport, with live-bed scour occurring when hydraulic forces are sufficient to mobilize sediment into the contracted section, and clear water occurring when little sediment transport is occurring into the contracted section.

4.1.3.3. Natural Scour

CVC (2019) offers an estimate for N_s equal to 2.5 times the bankfull depth. For the study reach, this method estimates an overly conservative scour value, considering the coarse nature of the substrate and the downstream grade control provided by the rock vane. CVC (2019) also provides information on the natural post-glaciation incision rates of the Credit River at between 20-30 m in 10000 years (Figure 6). This is approximately 0.3 m within the 100-year planning horizon. Given the large size of the Credit River watershed, resiliency within the study reach (additional ability to absorb stress while maintaining form and function) and land-use upstream of the study area (predominantly agricultural), it is more representative to use the post-glaciation incision rate as the basis of the N_s estimate.

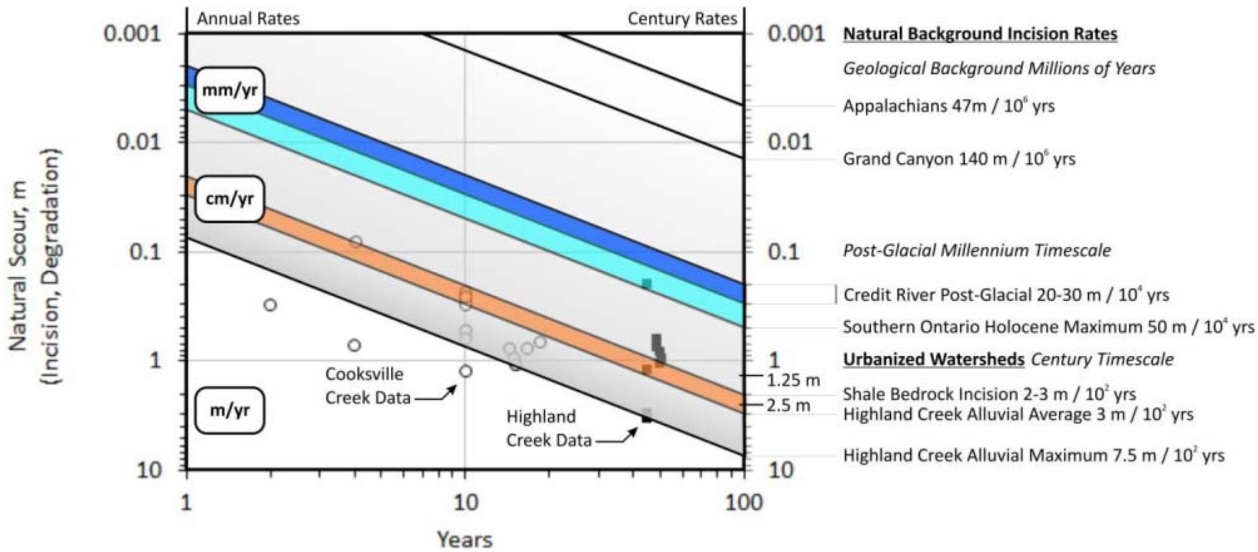

Figure 6: Geological and historical rates of vertical scour (CVC, 2019).

4.2. Results

Critical shear stress was calculated for the D_{50} and D_{84} percentiles (Table 6). The Komar equation results in similar critical shear stress for both percentiles, owing to the assumption that particles larger than the D_{50} are more exposed to hydraulic forces (as opposed to the grain independent (Shields) assumption). The applied channel shear stress for the 1:100-year, 1:25-year and 1:2-year discharges were compared to these critical shear stress estimates (Figure 7). Near critical flow conditions were estimated downstream of the bridge for the 1:100-year and 1:25-year discharges, owing to the berm containing the flow within the main channel. This condition may imply a potential hydraulic jump near this location, indicating increased scour potential due to flow confinement. The estimated bankfull channel shear stress (Table 4) is approximately equal to the critical erosion threshold of the D_{50} particle, with the 1:2-year shear stresses below both critical ranges. As previously discussed, the bed material coarsens in the downstream direction, thus the critical shear stresses shown below are considered conservative.

Table 6: Critical shear stress estimates for the D_{50} and D_{84} percentiles.

Percentile	Size (mm)	τ_{ci} (Komar, 1987) (Pa)	τ_c (Julien, 1995) (Pa)
D_{50}	62	45.19	50.54
D_{84}	121	59.05	102.18

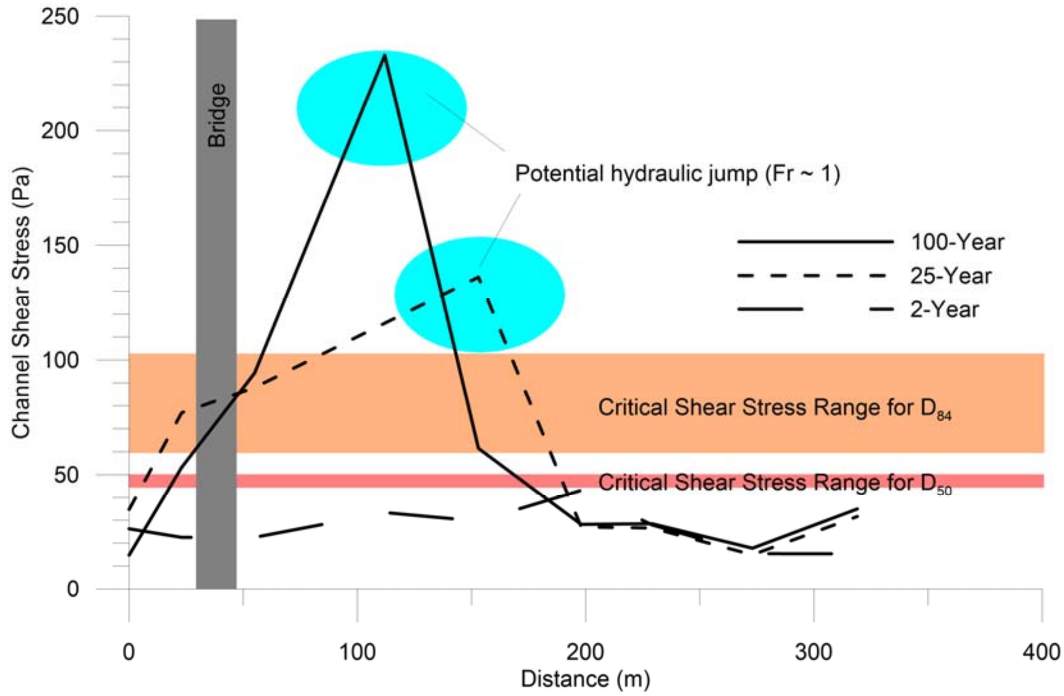

Figure 7: Main channel shear stress for 1:100-year, 1:25-year and 1:2-year discharges with critical shear stress ranges for D_{50} and D_{84} percentiles.

Scour estimates are summarized in Table 7. There is a range in the general scour predictions due to the different methods employed. The equilibrium slope methods provide the most conservative estimates of general scour. The armouring analysis indicates that, after approximately 4 to 25 cm of scour, the bed material will become coarser and thus more resistant to erosion. While true, the high shear stresses predicted downstream of the bridge means that scour has the potential too still occur within this armoured condition during large flood events.

Local scour results suggest that contraction scour is negligible for the more frequent flow regime (1:2-year and 1:5-year events). During moderate flood events (1:10-year and 1:25-year), contraction scour increases and starts to dominate the overall scour hazard. During large flood events (1:50-year and 1:100-year), there is between 0.6 m and 2.46 m of scour potential due to the flow contraction associated with the bridge and berm. Given that the shear stress exceeds critical thresholds (Figure 7), it is likely that live-bed scour is more representative. The overall scour hazard limits are summarized by level of risk in Table 8. The low, moderate and high-risk classifications are based on the maximum, average and minimum scour estimates for each category, respectively. It should be noted that the Haschenburger general scour estimate was not used as it was considered an outlier due to it being considerably lower than the others. Given that all scour categories were estimated based on conservative assumptions, an additional factor of safety was not considered necessary.

Table 7: Scour equation components for each return period discharge.

Scour Component	Equation		1:2-year Scour (m)	1:5-year Scour (m)	1:10-year Scour (m)	1:25-year Scour (m)	1:50-year Scour (m)	1:100-year Scour (m)
General Scour (G_s)	*Armouring*	Julien	0.12	0.12	0.12	0.12	0.12	0.12
		Borah	0.04	0.08	0.12	0.16	0.19	0.25
	Regime	Haschenburger	0.01	0.02	0.02	0.03	0.04	0.04
		Lacey	0.06	0.08	0.08	0.09	0.1	0.11
		Blench	0.13	0.09	0.11	0.11	0.12	0.13
	Equilibrium. Slope	Manning-Shields	0.42	0.43	0.43	0.43	0.43	0.43
		MPM	0.38	0.42	0.43	0.43	0.44	0.44
		Schoklitsch	0.4	0.42	0.43	0.43	0.44	0.44
		Henderson	0.13	0.23	0.27	0.29	0.31	0.32
Local Scour (L_s)	Live-Bed		0	0	0.18	0.54	2.36	2.46
	Clear Water		0	0	0	0.54	0.54	0.61
Natural Scour (N_s)			0.3	0.3	0.3	0.3	0.3	0.3

Table 8: Scour Hazard Limit summary (Depth below channel invert, in metres).

Risk	1:2-year	1:5-year	1:10-year	1:25-year	1:50-year	1:100-year
High	0.3	0.4	0.4	0.9	0.8	1.0
Moderate	0.5	0.5	0.6	1.1	1.9	2.1
Low	0.7	0.7	0.9	1.3	3.1	3.2

The inherent uncertainty associated with scour estimation produces a range of potential scour hazard limits, representing a spectrum of risk that varies based on the assumptions made in the scour modelling. For each scour parameter, multiple models having conservative assumptions were used to reflect this uncertainty, and the range was established based on using the minimum, average or maximum estimated values for each variable in the scour hazard equation. This risk spectrum is illustrated for each return period discharge in Figure 8.

The proposed sanitary drainage plan (Figure No. 6 in Urbantech Functional Servicing Report, 2020) indicates the sanitary line will be constructed at the same elevation as the existing forcemain, providing a minimum and average depth of cover of 2.1 m and 2.3 m, respectively (Figure 9). The depth of cover of the proposed sanitary crossing is well outside of the risk zones for discharges below the 1:50-year return period. For the 1:50-year and 1:100-year discharges, the proposed crossing is within the moderate end of the low-to-moderate risk zone.

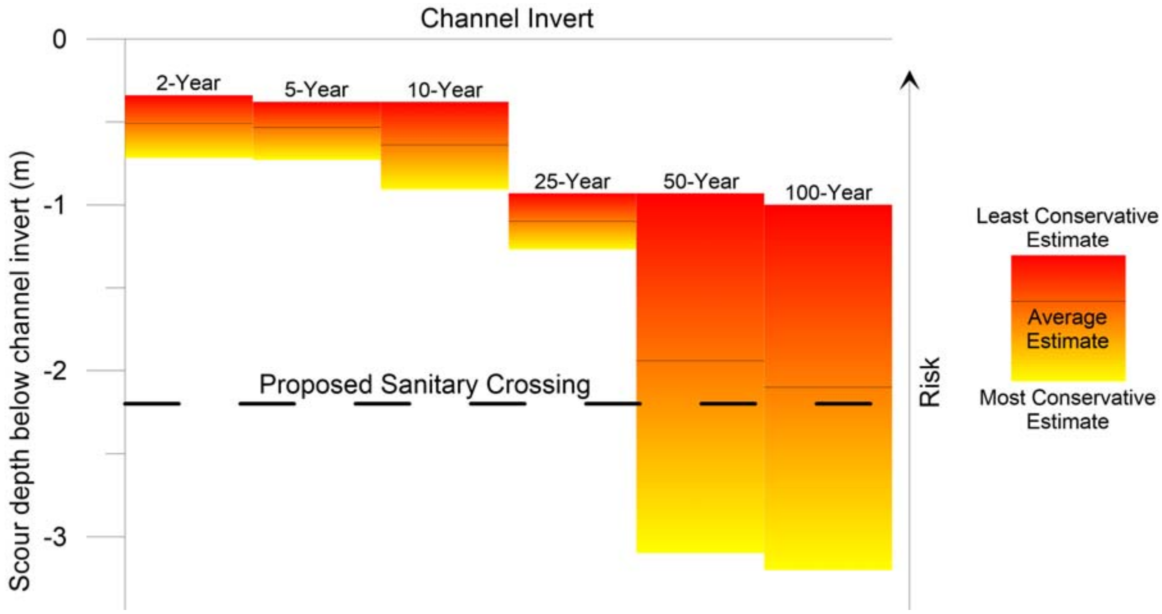

Figure 8: Risk spectrum for each return period discharge and approximate depth of proposed sanitary crossing (estimated from Urbantech Figure No. 6, Section A-A).

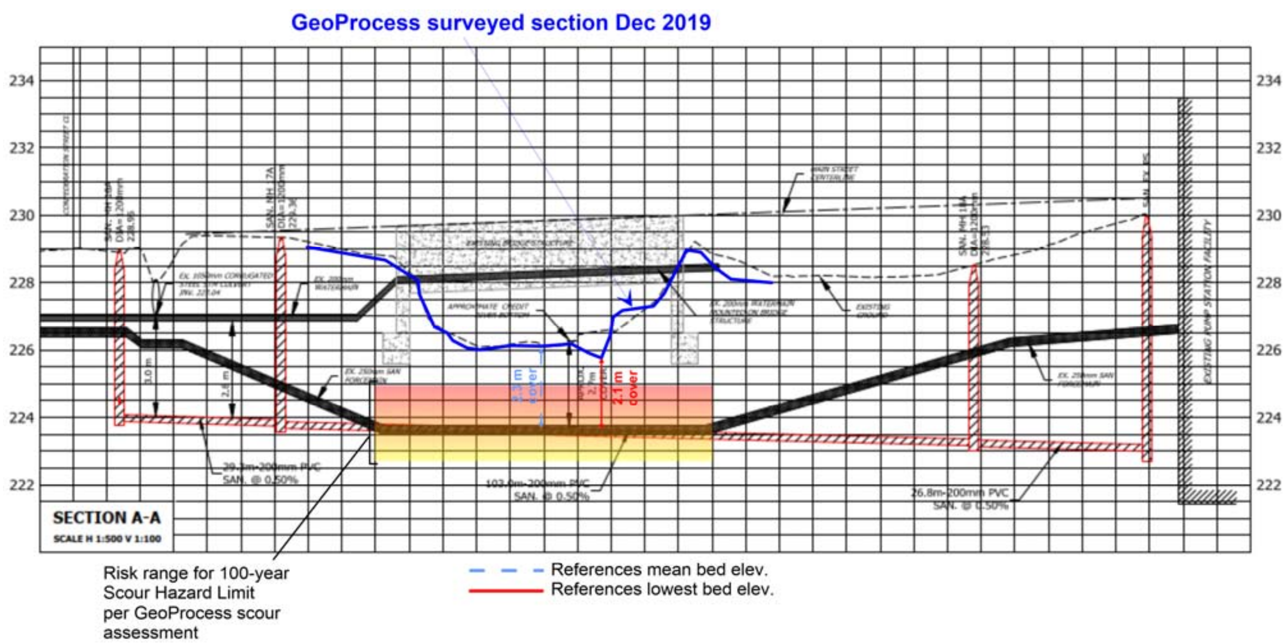

Figure 9: Urbantech proposed sanitary drainage plan (Figure No. 6) Section A-A with surveyed cross-section overlay and scour hazard limit risk range for the 1:100-year discharge.

4.3. Assumptions and Limitations

The results outlined above represent conservative estimates of scour. As previously mentioned, the D_{50} particles, and their associated entrainment characteristics, were used in the scour models. The selective entrainment of finer particles, however, will result in an armour layer coarser than this size, which will decrease potential scour. Also, the field observation of bed coarsening in the downstream direction and the grade controlling rock vane downstream were not considered in the scour assessment, further adding conservatism into the results.

The reach was assessed to be historically channelized with an armoured bed and geomorphically stable, showing only local indicators of erosion, likely a result of the Main Street bridge. The conservative approach, using multiple methods, aims to reduce inherent uncertainties associated with predicting scour in gravel-bed systems and uncertainties due to hydraulic modelling estimates (given that neither the local nor regulatory models are calibrated for the return period flows assessed).

5. Conclusions

GeoProcess Research Associates Inc. (GRA) has completed a Fluvial Geomorphology and Scour Assessment for the Credit River in Glen Williams for a proposed sanitary crossing. The assessment involved field and modelling investigations. Key conclusions are as follows:

1. The study reach is a 330 m long, historically channelized run having coarse gravel and cobble substrates. Overall, the reach is geomorphically stable, with localized instances of erosion associated with the Main Street bridge.
2. There is a boulder rock vane near the downstream limits of the study area that provides grade control.
3. Hydraulic modelling indicates that there is a potential for increased erosional forces caused by the flow confinement created by the contraction associated with the bridge and berm.
4. A risk-based approach was employed to evaluate the Scour Hazard Limit ranges for each return period discharge.
5. The proposed crossing, shown in the Functional Servicing Report (Urbantech, 2020), will have a minimum and average depth of cover of 2.1 m and 2.3 m, respectively, and coincides with the approximate elevation of the existing sanitary forcemain. The depth of cover of the proposed sanitary crossing is well outside of the Scour Hazard Limit for return period discharges less than the 1:50-year. For the 1:50-year and 1:100-year events, the scour risk is within the moderate end of the low-to-moderate risk zone based on the proposed depth of cover.

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CREDIT RIVER AT GLEN WILLIAMS: FLUVIAL GEOMORPHOLOGY AND SCOUR ASSESSMENT

Prepared for Glen Ridge Estates c/o Urbantech Consulting

July 7, 2020

Prepared by:

Ben Plumb, PhD, P.Eng.
River Engineer

Cameron Adams, BASc, EIT
Water Resources Specialist

Reviewed by:

Jeff Hirvonen, MASc
Principal

Cailey McCutcheon, MASc, P.Eng.
River Engineer

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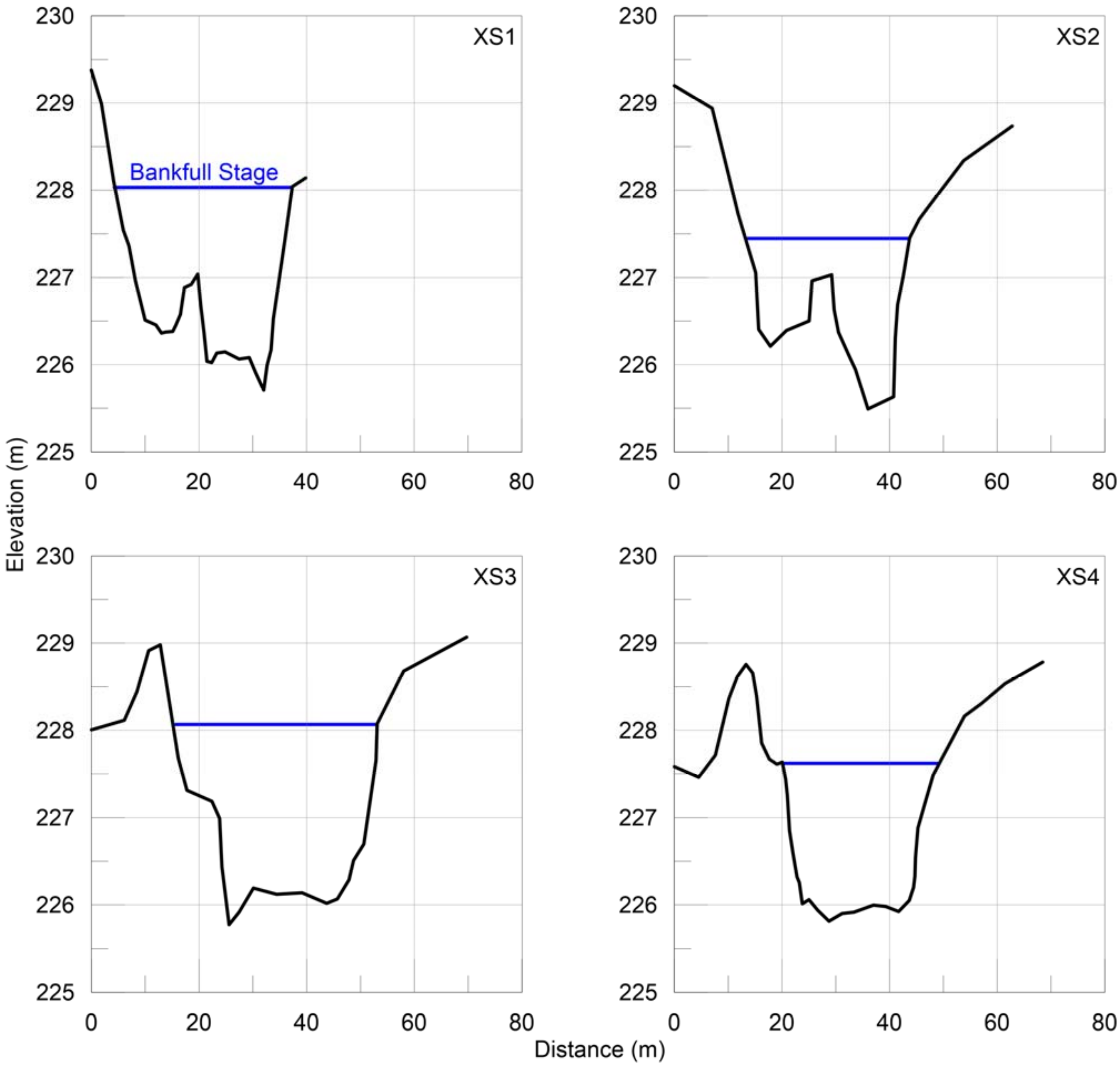
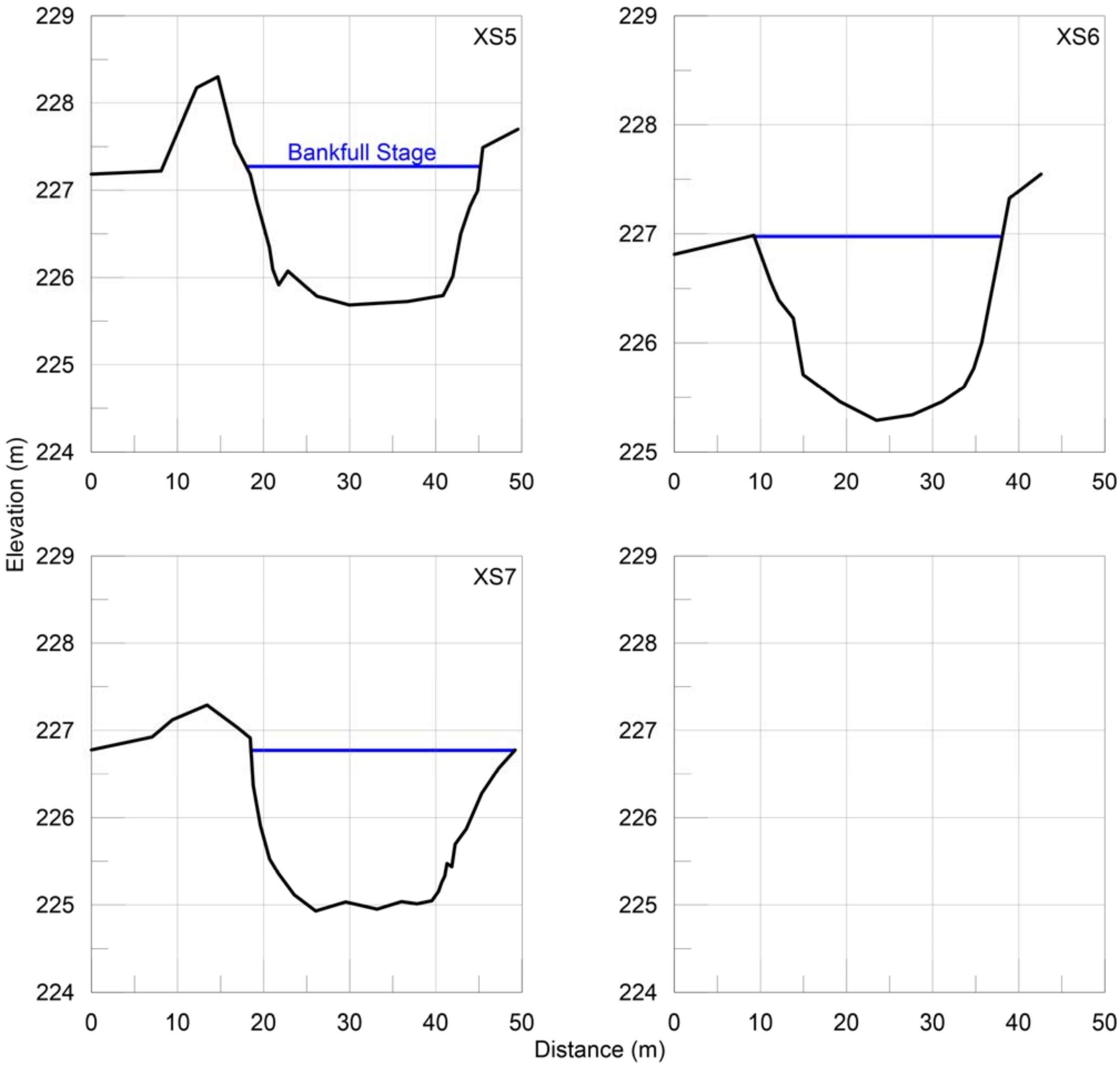
Project Number P2019-371

Appendix A

Surveyed Cross-Sections



Appendix Figure 1: GRA 2019 surveyed cross-sections 1 to 4.



Appendix Figure 2: GRA 2019 surveyed cross-sections 5 to 7.

Appendix B

HEC-RAS Output Summary

River Station	Q Total (m3/s)	Mean Channel Depth (m)	Q Channel (m3/s)	W.S. Elevation (m)	Vel Channel (m/s)	Shear Stress Channel (Pa)	Froude Channel (-)
1000	342.7	4.2	219.88	231.02	1.4	14.82	0.22
999	342.7	4.35	342.7	230.69	2.67	53.15	0.41
998	342.7	3.42	342.7	229.64	3.43	94.37	0.59
997	342.7	2.64	320.81	228.73	4.75	232.89	0.93
996	342.7	2.31	161.22	228.3	2.59	61.47	0.54
995	342.7	2.19	114.7	228.26	1.74	28.25	0.38
994	342.7	2.44	126.17	228.22	1.78	28.47	0.36
993	342.7	2.69	102.98	228.21	1.43	17.77	0.28
992	342.7	2.68	164.58	228.1	2	34.94	0.39

APPENDIX 'C'

Stormwater Management

APPENDIX 'C1'

- Summary of Input / Output Files of SWMHYMO modeling
- Pre-development 2-100 year and Regional
- Post-development 2-100 year and Regional

Pre-development 2-100 year and Regional

```
2     Metric units
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*#  Date         : 09-01-2020
*#  Modeller     : [JONATHAN KAPITANCHUK]
*#  Company      : Condeland Engineering Limited
*#  License #    :  4377549
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*%-----------------|------------------------------------------------------------|
ADD HYD                IDsum=[3], NHYD=["Outlet 2"], IDs to add=[1+2](maximum ten)
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
ROUTE PIPE             PTYPE=[1]circ, IDout=[9], NHYD=["culvert-1"], RNUMBER=[1],
                       PDIAM=[450](mm), PLNGTH=[45](m),
                       PROUGH=[0.025], PSLOPE=[0.011](m/m), IDin=[3],
                       RDT=[5](min)
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
DESIGN NASHYD          ID=[4], NHYD=["301"], DT=[5]min, AREA=[0.287](ha),
                       DWF=[0](cms), CN/C=[81], TP=[0.244]hrs,
                       RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
DESIGN NASHYD          ID=[5], NHYD=["302"], DT=[5]min, AREA=[1.731](ha),
                       DWF=[0](cms), CN/C=[81], TP=[0.412]hrs,
                       RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
DESIGN NASHYD          ID=[6], NHYD=["303"], DT=[5]min, AREA=[2.750](ha),
                       DWF=[0](cms), CN/C=[81], TP=[0.388]hrs,
                       RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
ADD HYD                IDsum=[7], NHYD=["outlet 1"], IDs to add=[4+5+6]
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
DESIGN NASHYD          ID=[8], NHYD=["304"], DT=[5]min, AREA=[0.44](ha),
                       DWF=[0](cms), CN/C=[81], TP=[0.628]hrs,
                       RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
DESIGN STANDHYD        ID=9, NHYD=["603"], DT=[5]min, AREA=[0.525](ha),
                       XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[81],
                       SLOPE=[0.5](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|------------------------------------------------------------|
ADD HYD                IDsum=[10], NHYD=["Outlet 3"], IDs to add=[8+9](maximum ten)
*%-----------------|------------------------------------------------------------|
FINISH
```

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

SSSSS   W   W   M   M   H   H   Y   Y   M   M    OOO          222     000    11   77777 =========
S        W W W   MM MM   H   H    Y Y    MM MM   O   O          2    0   0    11   7   7
SSSSS    W W W   M M M   HHHHH     Y     M M M   O   O          2    0   0    11       7 Ver4.05.4
    S     W W    M   M   H   H     Y     M   M   O   O        222    0   0    11      7  APR 2017
SSSSS     W W    M   M   H   H     Y     M   M    OOO         2      0   0    11     7   =========
                                                              2      0   0    11    7    # 4377549
      StormWater Management HYdrologic Model                  222     000    11    7    =========

*******************************************************************************************
*************************************  SWMHYMO Ver4.05.4  *********************************
******************  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: Condeland Engineering Limited               ++++++++++++++++++
++++++++++++++++++                Concord               SERIAL#:4377549       ++++++++++++++++++
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

*******************************************************************************************
******************            ++++++ PROGRAM ARRAY DIMENSIONS ++++++          ******************
******************            Maximum value for ID numbers  :     11          ******************
******************            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  ******************************
*******************************************************************************************
*                 RUN DATE: 2021-01-08     TIME: 13:42:15     RUN COUNTER: 000008          *
*******************************************************************************************
* Input   file: X:\Projects\09015\09015 - PRE2YR (2020-09-01).dat                          *
* Output  file: X:\Projects\09015\09015 - PRE2YR (2020-09-01).out                          *
* Summary file: X:\Projects\09015\09015 - PRE2YR (2020-09-01).sum                          *
* User comments:                                                                           *
* 1:_______________________________________________________________________________________*
* 2:_______________________________________________________________________________________*
* 3:_______________________________________________________________________________________*
*******************************************************************************************

--------------------------------------------------------------------------------------------
R0001:C00001---------------------------------------------------------------------------------
*#**************************************************************************
*#  Project Name: [2147925 Ontario Limited]    Project Number: [09-015]
*#  Date        : 09-01-2020
*#  Modeller    : [JONATHAN KAPITANCHUK]
*#  Company     : Condeland Engineering Limited
*#  License #   :  4377549
*#**************************************************************************
--------------------
| START             | Project  dir.:X:\Projects\09015\
--------------------- Rainfall dir.:X:\Projects\09015\
    TZERO =  4.00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 0001
    NSTORM=   0
--------------------------------------------------------------------------------------------
R0001:C00002---------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD          |   Area    (ha)=    1.811   Curve Number   (CN)= 81.00
| 01:300        DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .473

                               New rainfall entered directly by user.
                               TIME STEP= 5.00 min   # of STEPS=    200
                               DURATION =16.67 hrs   TOTAL RAIN=  43.87 mm

      TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN
     hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr
      0:05  21.420|   2:55   1.020|   5:45   3.050|   8:35   1.520|  11:25   1.020|  14:15    .510
      0:10   1.020|   3:00   1.020|   5:50   3.050|   8:40   1.520|  11:30   1.020|  14:20    .510
      0:15   1.020|   3:05   1.020|   5:55   4.060|   8:45   1.520|  11:35   1.020|  14:25    .510
      0:20   1.020|   3:10   1.020|   6:00   4.060|   8:50   1.520|  11:40   1.020|  14:30    .510
      0:25   1.020|   3:15   1.020|   6:05   5.840|   8:55   1.520|  11:45   1.020|  14:35    .510
      0:30   1.020|   3:20   1.020|   6:10   5.840|   9:00   1.520|  11:50   1.020|  14:40    .510
      0:35   1.020|   3:25   1.520|   6:15  13.210|   9:05   1.520|  11:55   1.020|  14:45    .510
      0:40   1.020|   3:30   1.520|   6:20  13.210|   9:10   1.520|  12:00   1.020|  14:50    .510
      0:45   1.020|   3:35   1.520|   6:25  28.960|   9:15   1.520|  12:05   1.020|  14:55    .510
      0:50   1.020|   3:40   1.520|   6:30  28.960|   9:20   1.520|  12:10   1.020|  15:00    .510
      0:55   1.020|   3:45   1.520|   6:35  60.450|   9:25   1.520|  12:15   1.020|  15:05    .510
      1:00   1.020|   3:50   1.520|   6:40  60.450|   9:30   1.520|  12:20   1.020|  15:10    .510
      1:05   1.020|   3:55   1.520|   6:45  10.670|   9:35   1.520|  12:25   1.020|  15:15    .510
      1:10   1.020|   4:00   1.520|   6:50  10.670|   9:40   1.520|  12:30   1.020|  15:20    .510
      1:15   1.020|   4:05   1.520|   6:55   6.600|   9:45   1.520|  12:35    .760|  15:25    .510
      1:20   1.020|   4:10   1.520|   7:00   6.600|   9:50   1.520|  12:40    .760|  15:30    .510
      1:25   1.020|   4:15   1.520|   7:05   4.830|   9:55   1.520|  12:45    .760|  15:35    .510
      1:30   1.020|   4:20   1.520|   7:10   4.830|  10:00   1.020|  12:50    .760|  15:40    .510
      1:35   1.020|   4:25   1.520|   7:15   4.570|  10:05   1.020|  12:55    .760|  15:45    .510
      1:40   1.020|   4:30   1.520|   7:20   4.570|  10:10   1.020|  13:00    .760|  15:50    .510
      1:45   1.020|   4:35   1.520|   7:25   3.300|  10:15   1.020|  13:05    .760|  15:55    .510
      1:50   1.020|   4:40   1.520|   7:30   3.300|  10:20   1.020|  13:10    .760|  16:00    .510
      1:55   1.020|   4:45   1.520|   7:35   2.790|  10:25   1.020|  13:15    .760|  16:05    .510
      2:00   1.020|   4:50   1.520|   7:40   2.790|  10:30   1.020|  13:20    .760|  16:10    .510
      2:05   1.020|   4:55   1.520|   7:45   2.790|  10:35   1.020|  13:25    .760|  16:15    .510
      2:10   1.020|   5:00   1.520|   7:50   2.790|  10:40   1.020|  13:30    .760|  16:20    .510
      2:15   1.020|   5:05   3.050|   7:55   2.790|  10:45   1.020|  13:35    .760|  16:25    .510
      2:20   1.020|   5:10   3.050|   8:00   2.790|  10:50   1.020|  13:40    .760|  16:30    .510
      2:25   1.020|   5:15   3.050|   8:05   2.790|  10:55   1.020|  13:45    .760|  16:35    .510
      2:30   1.020|   5:20   3.050|   8:10   2.790|  11:00   1.020|  13:50    .760|  16:40    .510
      2:35   1.020|   5:25   3.050|   8:15   2.790|  11:05   1.020|  13:55    .760|
      2:40   1.020|   5:30   3.050|   8:20   2.790|  11:10   1.020|  14:00    .760|
      2:45   1.020|   5:35   3.050|   8:25   1.520|  11:15   1.020|  14:05    .760|
      2:50   1.020|   5:40   3.050|   8:30   1.520|  11:20   1.020|  14:10    .760|

     Unit Hyd Qpeak  (cms)=     .146

     PEAK FLOW       (cms)=     .046 (i)
     TIME TO PEAK    (hrs)=   11.083
     DURATION        (hrs)=   20.250, (dddd|hh:mm:)=   0|20:15
     AVERAGE FLOW    (cms)=     .004
     RUNOFF VOLUME    (mm)=   17.611
     TOTAL RAINFALL   (mm)=   43.873
     RUNOFF COEFFICIENT   =     .401

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

--------------------------------------------------------------------------------------------
R0001:C00003---------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD          |   Area    (ha)=    5.450   Curve Number   (CN)= 81.00
| 02:604        DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .617

     Unit Hyd Qpeak  (cms)=     .337

     PEAK FLOW       (cms)=     .114 (i)
     TIME TO PEAK    (hrs)=   11.167
     DURATION        (hrs)=   21.083, (dddd|hh:mm:)=   0|21:05
     AVERAGE FLOW    (cms)=     .013
     RUNOFF VOLUME    (mm)=   17.611
     TOTAL RAINFALL   (mm)=   43.873
     RUNOFF COEFFICIENT   =     .401

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

--------------------------------------------------------------------------------------------
R0001:C00004---------------------------------------------------------------------------------
------------------------
| ADD HYD              |
| 03:Outlet 2          |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                      (ha)     (cms)    (hrs)      (mm)    (cms)
                        ID 1 01:300           1.811      .046   11.083    17.611    .000
                       +ID 2 02:604           5.450      .114   11.167    17.611    .000
                       ================================================================
                       SUM   03:Outlet 2      7.261      .158   11.167    17.611    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------------------
R0001:C00005---------------------------------------------------------------------------------
------------------------
| ROUTE PIPE culvert-1 | PIPE Number     =    1.00
| IN=03---> OUT=09     | Diameter    (mm)= 450.00
| DT=  5.0 min         | Length       (m)=  45.00
------------------------ Slope       (m/m)= .01100
                         Manning n       =    .025

     *** WARNING: MINIMUM PIPE SIZE REQUIRED =    453.22   (mm)
                  THIS SIZE WAS USED IN THE ROUTING.
                  THE CAPACITY OF THIS PIPE =       .16  (cms)

*** WARNING: New pipe size used for routing.
     <------------------- TRAVEL TIME TABLE ------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
        .024     .146E+00      .001         .261         2.87
        .048     .407E+00      .004         .407         1.84
        .072     .736E+00      .009         .524         1.43
        .095     .111E+01      .015         .623         1.20
        .119     .153E+01      .024         .709         1.06
        .143     .197E+01      .034         .785          .96
        .167     .243E+01      .046         .851          .88
        .191     .290E+01      .059         .909          .82
        .215     .339E+01      .072         .960          .78
        .239     .387E+01      .086        1.004          .75
        .262     .436E+01      .101        1.041          .72
        .286     .483E+01      .115        1.072          .70
        .310     .529E+01      .129        1.095          .68
        .334     .573E+01      .142        1.111          .67
        .358     .615E+01      .153        1.120          .67
        .382     .652E+01      .162        1.119          .67
        .406     .685E+01      .169        1.107          .68
        .429     .711E+01      .170        1.079          .70
        .453     .726E+01      .159         .983          .76

                                            <---- hydrographs ---->   <-pipe / channel->
                                  AREA    QPEAK    TPEAK    R.V.   MAX DEPTH  MAX VEL
                                  (ha)    (cms)    (hrs)    (mm)      (m)      (m/s)
   INFLOW : ID= 3: Outlet 2       7.261     .158   11.167  17.611     .372      1.119
   OUTFLOW: ID= 9: culvert-1      7.261     .158   11.167  17.611     .372      1.119

--------------------------------------------------------------------------------------------
R0001:C00006---------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD          |   Area    (ha)=     .287   Curve Number   (CN)= 81.00
| 04:301        DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .244

     Unit Hyd Qpeak  (cms)=     .045

     PEAK FLOW       (cms)=     .011 (i)
     TIME TO PEAK    (hrs)=   10.833
     DURATION        (hrs)=   18.667, (dddd|hh:mm:)=   0|18:40
     AVERAGE FLOW    (cms)=     .001
     RUNOFF VOLUME    (mm)=   17.611
     TOTAL RAINFALL   (mm)=   43.873
     RUNOFF COEFFICIENT   =     .401

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

--------------------------------------------------------------------------------------------
R0001:C00007---------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD          |   Area    (ha)=    1.731   Curve Number   (CN)= 81.00
| 05:302        DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .412

     Unit Hyd Qpeak  (cms)=     .160

     PEAK FLOW       (cms)=     .049 (i)
     TIME TO PEAK    (hrs)=   11.000
     DURATION        (hrs)=   19.917, (dddd|hh:mm:)=   0|19:55
     AVERAGE FLOW    (cms)=     .004
     RUNOFF VOLUME    (mm)=   17.611
     TOTAL RAINFALL   (mm)=   43.873
     RUNOFF COEFFICIENT   =     .401

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

--------------------------------------------------------------------------------------------
R0001:C00008---------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD          |   Area    (ha)=    2.750   Curve Number   (CN)= 81.00
| 06:303        DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .388

     Unit Hyd Qpeak  (cms)=     .271

     PEAK FLOW       (cms)=     .080 (i)
     TIME TO PEAK    (hrs)=   10.917
     DURATION        (hrs)=   19.667, (dddd|hh:mm:)=   0|19:40
     AVERAGE FLOW    (cms)=     .007
     RUNOFF VOLUME    (mm)=   17.611
     TOTAL RAINFALL   (mm)=   43.873
     RUNOFF COEFFICIENT   =     .401

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

--------------------------------------------------------------------------------------------
R0001:C00009---------------------------------------------------------------------------------
------------------------
| ADD HYD              |
| 07:outlet 1          |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                      (ha)     (cms)    (hrs)      (mm)    (cms)
                        ID 1 04:301            .287      .011   10.833    17.611    .000
                       +ID 2 05:302           1.731      .049   11.000    17.611    .000
                       +ID 3 06:303           2.750      .080   10.917    17.611    .000
                       ================================================================
                       SUM   07:outlet 1      4.768      .139   10.917    17.611    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------------------
R0001:C00010---------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD          |   Area    (ha)=     .440   Curve Number   (CN)= 81.00
| 08:304        DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .628

     Unit Hyd Qpeak  (cms)=     .027

     PEAK FLOW       (cms)=     .009 (i)
     TIME TO PEAK    (hrs)=   11.250
     DURATION        (hrs)=   21.083, (dddd|hh:mm:)=   0|21:05
     AVERAGE FLOW    (cms)=     .001
     RUNOFF VOLUME    (mm)=   17.611
     TOTAL RAINFALL   (mm)=   43.873
     RUNOFF COEFFICIENT   =     .401

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

--------------------------------------------------------------------------------------------
R0001:C00011---------------------------------------------------------------------------------
--------------------------
| DESIGN STANDHYD        |   Area    (ha)=     .52
| 09:603        DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
--------------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .26          .26
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=        .50          .50
     Length            (m)=      59.16        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      60.45        16.67
                over (min)        5.00        25.00
     Storage Coeff.  (min)=       2.81 (ii)   24.71 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=        .28          .05
                                                           *TOTALS*
     PEAK FLOW       (cms)=        .04          .01           .048 (iii)
     TIME TO PEAK    (hrs)=      10.67        11.00         10.667
     RUNOFF VOLUME    (mm)=      43.07        17.61         30.342
     TOTAL RAINFALL   (mm)=      43.87        43.87         43.873
     RUNOFF COEFFICIENT   =        .98          .40           .692
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

--------------------------------------------------------------------------------------------
R0001:C00012---------------------------------------------------------------------------------
------------------------
| ADD HYD              |
| 10:Outlet 3          |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                      (ha)     (cms)    (hrs)      (mm)    (cms)
                        ID 1 08:304            .440      .009   11.250    17.611    .000
                       +ID 2 09:603            .525      .048   10.667    30.342    .000
                       ================================================================
                       SUM   10:Outlet 3       .965      .051   10.667    24.537    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------------------
R0001:C00013---------------------------------------------------------------------------------
--------------------
| FINISH           |
--------------------
--------------------------------------------------------------------------------------------
********************************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
R0001:C00005  ROUTE PIPE      ->
*** WARNING: New pipe size used for routing.
R0001:C00011  DESIGN STANDHYD
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.
   Simulation ended on 2021-01-08     at 13:42:15
============================================================================================
```

```
2     Metric units
*#**************************************************************************
*#  Project Name: [2147925 Ontario Limited]    Project Number: [09-015]
*#  Date         : 09-01-2020
*#  Modeller     : [JONATHAN KAPITANCHUK]
*#  Company      : Condeland Engineering Limited
*#  License #    :  4377549
*#**************************************************************************
START                TZERO=[4.0],  METOUT=[2],  NSTORM=[0],  NRUN=[1]
*%                    [  ] <--storm filename, one per line for NSTORM time
*%-----------------|-----------------------------------------------------------|
DESIGN NASHYD        ID=[1], NHYD=["300"], DT=[5]min, AREA=[1.811](ha),
                     DWF=[0](cms), CN/C=[81], TP=[0.473]hrs,
                     Rainfall hyetograph Five Yr SCS storm
                     Rainfall begins at four hours
                     31.75 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27
                     1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27
                     1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27
                     1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27
                     1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78
                     1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78
                     3.30 3.30 3.30 3.30 3.30 3.30 3.30 3.30 3.30 3.30
                     4.57 4.57 6.60 6.60 15.24 15.24 33.27 33.27 69.6 69.6
                     12.19 12.19 7.62 7.62 5.59 5.59 5.08 5.08 3.81 3.81
                     3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05
                     1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78
                     1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78
                     1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27
                     1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27
                     1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27
                     1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02
                     1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02
                     0.76 0.76 0.76 0.76 0.76 0.76 0.76 0.76 0.76 0.76
                     0.76 0.76 0.76 0.76 0.76 0.76 0.76 0.76 0.76 0.76
                     0.76 0.76 0.76 0.76 0.76 0.76 0.76 0.76 0.76 0.76
                     (mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
DESIGN NASHYD        ID=[2], NHYD=["604"], DT=[5](min), AREA=[5.45](ha),
                     DWF=[0](cms), CN/C=[81], TP=[0.617](hrs),
                     RAINFALL=[ , , , , ](mm/hour), END=-1
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
ADD HYD              IDsum=[3], NHYD=["Outlet 2"], IDs to add=[1+2](maximum ten)
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
ROUTE PIPE           PTYPE=[1]circ, IDout=[9], NHYD=["culvert-1"], RNUMBER=[1],
                     PDIAM=[450](mm), PLNGTH=[45](m),
                     PROUGH=[0.025], PSLOPE=[0.011](m/m), IDin=[3],
                     RDT=[5](min)
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
DESIGN NASHYD        ID=[4], NHYD=["301"], DT=[5]min, AREA=[0.287](ha),
                     DWF=[0](cms), CN/C=[81], TP=[0.244]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
DESIGN NASHYD        ID=[5], NHYD=["302"], DT=[5]min, AREA=[1.731](ha),
                     DWF=[0](cms), CN/C=[81], TP=[0.412]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
DESIGN NASHYD        ID=[6], NHYD=["303"], DT=[5]min, AREA=[2.750](ha),
                     DWF=[0](cms), CN/C=[81], TP=[0.388]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
ADD HYD              IDsum=[7], NHYD=["outlet 1"], IDs to add=[4+5+6]
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
DESIGN NASHYD        ID=[8], NHYD=["304"], DT=[5]min, AREA=[0.44](ha),
                     DWF=[0](cms), CN/C=[81], TP=[0.628]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
DESIGN STANDHYD      ID=9, NHYD=["603"], DT=[5]min, AREA=[0.525](ha),
                     XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[81],
                     SLOPE=[0.5](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
ADD HYD              IDsum=[10], NHYD=["Outlet 3"], IDs to add=[8+9](maximum ten)
*%-----------------|-----------------------------------------------------------|
FINISH
```

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

SSSSS  W   W   M   M   H   H   Y   Y   M   M   OOO         222     000    11   77777 =========
S      W W W   MM MM   H   H    Y Y    MM MM  O   O          2    0   0   11      7  7
SSSSS  W W W   M M M   HHHHH     Y     M M M  O   O          2    0   0   11      7 Ver4.05.4
    S   W W    M   M   H   H     Y     M   M  O   O  ==    222    0   0   11      7 APR 2017
SSSSS   W W    M   M   H   H     Y     M   M   OOO         2      0   0   11     7  =========
                                                            2      0   0   11    7    # 4377549
        StormWater Management HYdrologic Model              222     000    11    7    =========

*****************************************************************************************
*********************************  SWMHYMO Ver4.05.4  ***********************************
******************  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: Condeland Engineering Limited                ++++++++++++++++++
+++++++++++++++++                Concord                   SERIAL#:4377549     ++++++++++++++++++
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

*****************************************************************************************
******************          ++++++ PROGRAM ARRAY DIMENSIONS ++++++            *******************
******************          Maximum value for ID numbers  :      11           *******************
******************          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  ***************************
*****************************************************************************************
*                 RUN DATE: 2021-01-08     TIME: 13:42:31     RUN COUNTER: 000009          *
*****************************************************************************************
* Input   file: X:\Projects\09015\09015 - PRE5YR (2020-09-01).dat                          *
* Output  file: X:\Projects\09015\09015 - PRE5YR (2020-09-01).out                          *
* Summary file: X:\Projects\09015\09015 - PRE5YR (2020-09-01).sum                          *
* User comments:                                                                         *
* 1:_____________________________________________________________________________________*
* 2:_____________________________________________________________________________________*
* 3:_____________________________________________________________________________________*
*****************************************************************************************

-----------------------------------------------------------------------------------------
R0001:C00001-----------------------------------------------------------------------------
*#***********************************************************************
*#  Project Name: [2147925 Ontario Limited]    Project Number: [09-015]
*#  Date         : 09-01-2020
*#  Modeller     : [JONATHAN KAPITANCHUK]
*#  Company      : Condeland Engineering Limited
*#  License #    :  4377549
*#***********************************************************************
--------------------
| START              | Project  dir.:X:\Projects\09015\
-------------------- Rainfall dir.:X:\Projects\09015\
    TZERO =  4.00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 0001
    NSTORM=   0
-----------------------------------------------------------------------------------------
R0001:C00002-----------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD            |   Area    (ha)=    1.811   Curve Number   (CN)= 81.00
| 01:300         DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .473

                                New rainfall entered directly by user.
                                TIME STEP= 5.00 min   # of STEPS=    200
                                DURATION =16.67 hrs   TOTAL RAIN=  52.03 mm

           TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN
          hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr
           0:05  31.750|   2:55   1.270|   5:45   3.300|   8:35   1.780|  11:25   1.270|  14:15    .760
           0:10   1.270|   3:00   1.270|   5:50   3.300|   8:40   1.780|  11:30   1.270|  14:20    .760
           0:15   1.270|   3:05   1.270|   5:55   4.570|   8:45   1.780|  11:35   1.270|  14:25    .760
           0:20   1.270|   3:10   1.270|   6:00   4.570|   8:50   1.780|  11:40   1.270|  14:30    .760
           0:25   1.270|   3:15   1.270|   6:05   6.600|   8:55   1.780|  11:45   1.270|  14:35    .760
           0:30   1.270|   3:20   1.270|   6:10   6.600|   9:00   1.780|  11:50   1.270|  14:40    .760
           0:35   1.270|   3:25   1.780|   6:15  15.240|   9:05   1.780|  11:55   1.270|  14:45    .760
           0:40   1.270|   3:30   1.780|   6:20  15.240|   9:10   1.780|  12:00   1.270|  14:50    .760
           0:45   1.270|   3:35   1.780|   6:25  33.270|   9:15   1.780|  12:05   1.270|  14:55    .760
           0:50   1.270|   3:40   1.780|   6:30  33.270|   9:20   1.780|  12:10   1.270|  15:00    .760
           0:55   1.270|   3:45   1.780|   6:35  69.600|   9:25   1.780|  12:15   1.270|  15:05    .760
           1:00   1.270|   3:50   1.780|   6:40  69.600|   9:30   1.780|  12:20   1.270|  15:10    .760
           1:05   1.270|   3:55   1.780|   6:45  12.190|   9:35   1.780|  12:25   1.270|  15:15    .760
           1:10   1.270|   4:00   1.780|   6:50  12.190|   9:40   1.780|  12:30   1.270|  15:20    .760
           1:15   1.270|   4:05   1.780|   6:55   7.620|   9:45   1.780|  12:35   1.020|  15:25    .760
           1:20   1.270|   4:10   1.780|   7:00   7.620|   9:50   1.780|  12:40   1.020|  15:30    .760
           1:25   1.270|   4:15   1.780|   7:05   5.590|   9:55   1.780|  12:45   1.020|  15:35    .760
           1:30   1.270|   4:20   1.780|   7:10   5.590|  10:00   1.780|  12:50   1.020|  15:40    .760
           1:35   1.270|   4:25   1.780|   7:15   5.080|  10:05   1.270|  12:55   1.020|  15:45    .760
           1:40   1.270|   4:30   1.780|   7:20   5.080|  10:10   1.270|  13:00   1.020|  15:50    .760
           1:45   1.270|   4:35   1.780|   7:25   3.810|  10:15   1.270|  13:05   1.020|  15:55    .760
           1:50   1.270|   4:40   1.780|   7:30   3.810|  10:20   1.270|  13:10   1.020|  16:00    .760
           1:55   1.270|   4:45   1.780|   7:35   3.050|  10:25   1.270|  13:15   1.020|  16:05    .760
           2:00   1.270|   4:50   1.780|   7:40   3.050|  10:30   1.270|  13:20   1.020|  16:10    .760
           2:05   1.270|   4:55   1.780|   7:45   3.050|  10:35   1.270|  13:25   1.020|  16:15    .760
           2:10   1.270|   5:00   1.780|   7:50   3.050|  10:40   1.270|  13:30   1.020|  16:20    .760
           2:15   1.270|   5:05   3.300|   7:55   3.050|  10:45   1.270|  13:35   1.020|  16:25    .760
           2:20   1.270|   5:10   3.300|   8:00   3.050|  10:50   1.270|  13:40   1.020|  16:30    .760
           2:25   1.270|   5:15   3.300|   8:05   3.050|  10:55   1.270|  13:45   1.020|  16:35    .760
           2:30   1.270|   5:20   3.300|   8:10   3.050|  11:00   1.270|  13:50   1.020|  16:40    .760
           2:35   1.270|   5:25   3.300|   8:15   3.050|  11:05   1.270|  13:55   1.020|
           2:40   1.270|   5:30   3.300|   8:20   3.050|  11:10   1.270|  14:00   1.020|
           2:45   1.270|   5:35   3.300|   8:25   1.780|  11:15   1.270|  14:05   1.020|
           2:50   1.270|   5:40   3.300|   8:30   1.780|  11:20   1.270|  14:10   1.020|

     Unit Hyd Qpeak  (cms)=     .146

     PEAK FLOW       (cms)=     .059 (i)
     TIME TO PEAK    (hrs)=   11.000
     DURATION        (hrs)=   20.250, (dddd|hh:mm:)=   0|20:15
     AVERAGE FLOW    (cms)=     .006
     RUNOFF VOLUME    (mm)=   23.192
     TOTAL RAINFALL   (mm)=   52.035
     RUNOFF COEFFICIENT   =     .446

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

-----------------------------------------------------------------------------------------
R0001:C00003-----------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD            |   Area    (ha)=    5.450   Curve Number   (CN)= 81.00
| 02:604         DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .617

     Unit Hyd Qpeak  (cms)=     .337

     PEAK FLOW       (cms)=     .147 (i)
     TIME TO PEAK    (hrs)=   11.167
     DURATION        (hrs)=   21.083, (dddd|hh:mm:)=   0|21:05
     AVERAGE FLOW    (cms)=     .017
     RUNOFF VOLUME    (mm)=   23.192
     TOTAL RAINFALL   (mm)=   52.035
     RUNOFF COEFFICIENT   =     .446

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

-----------------------------------------------------------------------------------------
R0001:C00004-----------------------------------------------------------------------------
------------------------
| ADD HYD                |
| 03:Outlet 2            |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                        (ha)     (cms)    (hrs)      (mm)   (cms)
                     ID 1 01:300            1.811      .059   11.000    23.192    .000
                    +ID 2 02:604            5.450      .147   11.167    23.192    .000
                    ===============================================================
                    SUM   03:Outlet 2       7.261      .204   11.167    23.192    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----------------------------------------------------------------------------------------
R0001:C00005-----------------------------------------------------------------------------
------------------------
| ROUTE PIPE culvert-1 | PIPE Number     =    1.00
| IN=03---> OUT=09      | Diameter    (mm)=  450.00
| DT=  5.0 min          | Length       (m)=   45.00
------------------------ Slope      (m/m)=  .01100
                         Manning n       =    .025

     *** WARNING: MINIMUM PIPE SIZE REQUIRED =   498.13   (mm)
                  THIS SIZE WAS USED IN THE ROUTING.
                  THE CAPACITY OF THIS PIPE  =      .20  (cms)

*** WARNING: New pipe size used for routing.
     <------------------- TRAVEL TIME TABLE ------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
       .026     .177E+00      .001         .278         2.70
       .052     .492E+00      .005         .434         1.73
       .079     .889E+00      .011         .558         1.34
       .105     .134E+01      .020         .664         1.13
       .131     .184E+01      .031         .755          .99
       .157     .238E+01      .044         .836          .90
       .184     .293E+01      .059         .906          .83
       .210     .351E+01      .075         .968          .77
       .236     .409E+01      .093        1.023          .73
       .262     .468E+01      .111        1.069          .70
       .288     .526E+01      .130        1.109          .68
       .315     .584E+01      .148        1.141          .66
       .341     .639E+01      .166        1.166          .64
       .367     .693E+01      .182        1.184          .63
       .393     .743E+01      .197        1.193          .63
       .419     .788E+01      .209        1.192          .63
       .446     .828E+01      .217        1.179          .64
       .472     .859E+01      .219        1.149          .65
       .498     .877E+01      .204        1.047          .72

                                               <---- hydrographs ---->   <-pipe / channel->
                                       AREA    QPEAK     TPEAK    R.V.   MAX DEPTH  MAX VEL
                                       (ha)    (cms)     (hrs)    (mm)      (m)       (m/s)
     INFLOW : ID= 3: Outlet 2        7.261     .204    11.167  23.192     .409      1.192
     OUTFLOW: ID= 9: culvert-1       7.261     .204    11.167  23.192     .405      1.192

-----------------------------------------------------------------------------------------
R0001:C00006-----------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD            |   Area    (ha)=     .287   Curve Number   (CN)= 81.00
| 04:301         DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .244

     Unit Hyd Qpeak  (cms)=     .045

     PEAK FLOW       (cms)=     .015 (i)
     TIME TO PEAK    (hrs)=   10.833
     DURATION        (hrs)=   18.667, (dddd|hh:mm:)=   0|18:40
     AVERAGE FLOW    (cms)=     .001
     RUNOFF VOLUME    (mm)=   23.192
     TOTAL RAINFALL   (mm)=   52.035
     RUNOFF COEFFICIENT   =     .446

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

-----------------------------------------------------------------------------------------
R0001:C00007-----------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD            |   Area    (ha)=    1.731   Curve Number   (CN)= 81.00
| 05:302         DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .412

     Unit Hyd Qpeak  (cms)=     .160

     PEAK FLOW       (cms)=     .063 (i)
     TIME TO PEAK    (hrs)=   11.000
     DURATION        (hrs)=   19.917, (dddd|hh:mm:)=   0|19:55
     AVERAGE FLOW    (cms)=     .006
     RUNOFF VOLUME    (mm)=   23.192
     TOTAL RAINFALL   (mm)=   52.035
     RUNOFF COEFFICIENT   =     .446

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

-----------------------------------------------------------------------------------------
R0001:C00008-----------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD            |   Area    (ha)=    2.750   Curve Number   (CN)= 81.00
| 06:303         DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .388

     Unit Hyd Qpeak  (cms)=     .271

     PEAK FLOW       (cms)=     .104 (i)
     TIME TO PEAK    (hrs)=   10.917
     DURATION        (hrs)=   19.667, (dddd|hh:mm:)=   0|19:40
     AVERAGE FLOW    (cms)=     .009
     RUNOFF VOLUME    (mm)=   23.192
     TOTAL RAINFALL   (mm)=   52.035
     RUNOFF COEFFICIENT   =     .446

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

-----------------------------------------------------------------------------------------
R0001:C00009-----------------------------------------------------------------------------
------------------------
| ADD HYD                |
| 07:outlet 1            |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                        (ha)     (cms)    (hrs)      (mm)   (cms)
                     ID 1 04:301             .287      .015   10.833    23.192    .000
                    +ID 2 05:302            1.731      .063   11.000    23.192    .000
                    +ID 3 06:303            2.750      .104   10.917    23.192    .000
                    ===============================================================
                    SUM   07:outlet 1       4.768      .179   10.917    23.192    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----------------------------------------------------------------------------------------
R0001:C00010-----------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD            |   Area    (ha)=     .440   Curve Number   (CN)= 81.00
| 08:304         DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .628

     Unit Hyd Qpeak  (cms)=     .027

     PEAK FLOW       (cms)=     .012 (i)
     TIME TO PEAK    (hrs)=   11.250
     DURATION        (hrs)=   21.083, (dddd|hh:mm:)=   0|21:05
     AVERAGE FLOW    (cms)=     .001
     RUNOFF VOLUME    (mm)=   23.192
     TOTAL RAINFALL   (mm)=   52.035
     RUNOFF COEFFICIENT   =     .446

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

-----------------------------------------------------------------------------------------
R0001:C00011-----------------------------------------------------------------------------
--------------------------
| DESIGN STANDHYD          |   Area    (ha)=     .52
| 09:603         DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
--------------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .26          .26
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=        .50          .50
     Length            (m)=      59.16        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      69.60        25.00
                over (min)        5.00        20.00
     Storage Coeff.  (min)=       2.65 (ii)   21.28 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=        .29          .05
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .05          .01          .057 (iii)
     TIME TO PEAK    (hrs)=      10.67        10.92        10.667
     RUNOFF VOLUME    (mm)=      51.23        23.19        37.213
     TOTAL RAINFALL   (mm)=      52.03        52.03        52.035
     RUNOFF COEFFICIENT   =        .98          .45          .715
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

-----------------------------------------------------------------------------------------
R0001:C00012-----------------------------------------------------------------------------
------------------------
| ADD HYD                |
| 10:Outlet 3            |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                        (ha)     (cms)    (hrs)      (mm)   (cms)
                     ID 1 08:304             .440      .012   11.250    23.192    .000
                    +ID 2 09:603             .525      .057   10.667    37.213    .000
                    ===============================================================
                    SUM   10:Outlet 3        .965      .062   10.667    30.820    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----------------------------------------------------------------------------------------
R0001:C00013-----------------------------------------------------------------------------
--------------------
| FINISH             |
--------------------
-----------------------------------------------------------------------------------------
*****************************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
R0001:C00005  ROUTE PIPE      ->
*** WARNING: New pipe size used for routing.
R0001:C00011  DESIGN STANDHYD
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.
   Simulation ended on 2021-01-08     at 13:42:31
=========================================================================================
```

```
2     Metric units
*#****************************************************************************
*#  Project Name: [2147925 Ontario Limited]    Project Number: [09-015]
*#  Date          : 09-01-2020
*#  Modeller      : [JONATHAN KAPITANCHUK]
*#  Company       : Condeland Engineering Limited
*#  License #     :  4377549
*#****************************************************************************
START                 TZERO=[4.0],  METOUT=[2],  NSTORM=[0],  NRUN=[1]
*%                     [  ] <--storm filename, one per line for NSTORM time
*%-----------------|------------------------------------------------------------|
DESIGN NASHYD         ID=[1], NHYD=["300"], DT=[5]min, AREA=[1.811](ha),
                      DWF=[0](cms), CN/C=[81], TP=[0.473]hrs,
                      Rainfall hyetograph Ten Yr SCS storm
                      Rainfall begins at four hours
                      3.58 3.58 3.99 3.99 4.50 4.50 5.21 5.21 6.27 6.27 8.00 8.00
                      11.51 11.51 24.82 24.82 133.60 133.60 32.00 32.00 17.93
                      17.93 12.95 12.95 10.31 10.31 8.66 8.66 7.52 7.52 6.65 6.65
                      6.02 6.02 5.49 5.49 5.05 5.05 4.70 4.70 4.39 4.39 4.14 4.14
                      3.91 3.91 3.71 3.71](mm/hr), END=-1
*%-----------------|------------------------------------------------------------|
DESIGN NASHYD         ID=[2], NHYD=["604"], DT=[5](min), AREA=[5.45](ha),
                      DWF=[0](cms), CN/C=[81], TP=[0.617](hrs),
                      RAINFALL=[ , , , , ](mm/hour), END=-1
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
ADD HYD               IDsum=[3], NHYD=["Outlet 2"], IDs to add=[1+2](maximum ten)
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
ROUTE PIPE            PTYPE=[1]circ, IDout=[9], NHYD=["culvert-1"], RNUMBER=[1],
                      PDIAM=[450](mm), PLNGTH=[45](m),
                      PROUGH=[0.025], PSLOPE=[0.011](m/m), IDin=[3],
                      RDT=[5](min)
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
DESIGN NASHYD         ID=[4], NHYD=["301"], DT=[5]min, AREA=[0.287](ha),
                      DWF=[0](cms), CN/C=[81], TP=[0.244]hrs,
                      RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
DESIGN NASHYD         ID=[5], NHYD=["302"], DT=[5]min, AREA=[1.731](ha),
                      DWF=[0](cms), CN/C=[81], TP=[0.412]hrs,
                      RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
DESIGN NASHYD         ID=[6], NHYD=["303"], DT=[5]min, AREA=[2.750](ha),
                      DWF=[0](cms), CN/C=[81], TP=[0.388]hrs,
                      RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
ADD HYD               IDsum=[7], NHYD=["outlet 1"], IDs to add=[4+5+6]
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
DESIGN NASHYD         ID=[8], NHYD=["304"], DT=[5]min, AREA=[0.44](ha),
                      DWF=[0](cms), CN/C=[81], TP=[0.628]hrs,
                      RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
DESIGN STANDHYD       ID=9, NHYD=["603"], DT=[5]min, AREA=[0.525](ha),
                      XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[81],
                      SLOPE=[0.5](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|------------------------------------------------------------|
ADD HYD               IDsum=[10], NHYD=["Outlet 3"], IDs to add=[8+9](maximum ten)
*%-----------------|------------------------------------------------------------|
FINISH
```

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

SSSSS   W   W   M   M   H   H   Y   Y   M   M    OOO          222     000    11   77777 =========
S        W W W   MM MM   H   H    Y Y    MM MM   O   O           2    0   0   11   7   7
SSSSS   W W W   M M M   HHHHH     Y     M M M   O   O           2    0   0   11       7 Ver4.05.4
    S    W W    M   M   H   H     Y     M   M   O   O         222    0   0   11      7  APR 2017
SSSSS    W W    M   M   H   H     Y     M   M    OOO          2      0   0   11     7   =========
                                                              2      0   0   11    7    # 4377549
      StormWater Management HYdrologic Model                   222     000    11    7    =========

******************************************************************************************
*************************************  SWMHYMO Ver4.05.4  ********************************
*****************  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: Condeland Engineering Limited                +++++++++++++
+++++++++++++++++                Concord                  SERIAL#:4377549     +++++++++++++
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

******************************************************************************************
*****************            ++++++ PROGRAM ARRAY DIMENSIONS ++++++           ************
*****************            Maximum value for ID numbers  :      11          ************
*****************            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   *************************
******************************************************************************************
*               RUN DATE: 2021-01-08     TIME: 13:42:56     RUN COUNTER: 000010          *
******************************************************************************************
* Input   file: X:\Projects\09015\09015 - PRE10YR (2020-09-01).dat                       *
* Output  file: X:\Projects\09015\09015 - PRE10YR (2020-09-01).out                       *
* Summary file: X:\Projects\09015\09015 - PRE10YR (2020-09-01).sum                       *
* User comments:                                                                         *
* 1:_____________________________________________________________________________________*
* 2:_____________________________________________________________________________________*
* 3:_____________________________________________________________________________________*
******************************************************************************************

------------------------------------------------------------------------------------------
R0001:C00001------------------------------------------------------------------------------
*#************************************************************************
*#  Project Name: [2147925 Ontario Limited]    Project Number: [09-015]
*#  Date        : 09-01-2020
*#  Modeller    : [JONATHAN KAPITANCHUK]
*#  Company     : Condeland Engineering Limited
*#  License #   :  4377549
*#************************************************************************
--------------------
| START              | Project  dir.:X:\Projects\09015\
-------------------- Rainfall dir.:X:\Projects\09015\
    TZERO =  4.00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 0001
    NSTORM=   0
------------------------------------------------------------------------------------------
R0001:C00002------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD           |   Area    (ha)=    1.811   Curve Number   (CN)= 81.00
| 01:300          DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .473

                                New rainfall entered directly by user.
                                TIME STEP= 5.00 min   # of STEPS=     48
                                DURATION = 4.00 hrs   TOTAL RAIN=  55.82 mm

       TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN
      hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr
       0:05   3.580|   0:45   6.270|   1:25 133.600|   2:05  10.310|   2:45   6.020|   3:25   4.390
       0:10   3.580|   0:50   6.270|   1:30 133.600|   2:10  10.310|   2:50   6.020|   3:30   4.390
       0:15   3.990|   0:55   8.000|   1:35  32.000|   2:15   8.660|   2:55   5.490|   3:35   4.140
       0:20   3.990|   1:00   8.000|   1:40  32.000|   2:20   8.660|   3:00   5.490|   3:40   4.140
       0:25   4.500|   1:05  11.510|   1:45  17.930|   2:25   7.520|   3:05   5.050|   3:45   3.910
       0:30   4.500|   1:10  11.510|   1:50  17.930|   2:30   7.520|   3:10   5.050|   3:50   3.910
       0:35   5.210|   1:15  24.820|   1:55  12.950|   2:35   6.650|   3:15   4.700|   3:55   3.710
       0:40   5.210|   1:20  24.820|   2:00  12.950|   2:40   6.650|   3:20   4.700|   4:00   3.710

      Unit Hyd Qpeak  (cms)=     .146

      PEAK FLOW       (cms)=     .087 (i)
      TIME TO PEAK    (hrs)=    6.000
      DURATION        (hrs)=    7.583, (dddd|hh:mm:)=   0|07:35
      AVERAGE FLOW    (cms)=     .017
      RUNOFF VOLUME    (mm)=   25.904
      TOTAL RAINFALL   (mm)=   55.818
      RUNOFF COEFFICIENT   =     .464

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

------------------------------------------------------------------------------------------
R0001:C00003------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD           |   Area    (ha)=    5.450   Curve Number   (CN)= 81.00
| 02:604          DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .617

      Unit Hyd Qpeak  (cms)=     .337

      PEAK FLOW       (cms)=     .216 (i)
      TIME TO PEAK    (hrs)=    6.167
      DURATION        (hrs)=    8.417, (dddd|hh:mm:)=   0|08:25
      AVERAGE FLOW    (cms)=     .047
      RUNOFF VOLUME    (mm)=   25.904
      TOTAL RAINFALL   (mm)=   55.818
      RUNOFF COEFFICIENT   =     .464

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

------------------------------------------------------------------------------------------
R0001:C00004------------------------------------------------------------------------------
------------------------
| ADD HYD                |
| 03:Outlet 2            |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                       (ha)     (cms)    (hrs)      (mm)    (cms)
                       ID 1 01:300            1.811      .087    6.000    25.904     .000
                      +ID 2 02:604            5.450      .216    6.167    25.904     .000
                      ==============================================================
                      SUM   03:Outlet 2       7.261      .298    6.083    25.904     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------------------
R0001:C00005------------------------------------------------------------------------------
------------------------
| ROUTE PIPE culvert-1 | PIPE Number     =     1.00
| IN=03---> OUT=09     | Diameter   (mm)=  450.00
| DT=  5.0 min         | Length      (m)=   45.00
------------------------ Slope      (m/m)=  .01100
                         Manning n       =    .025

      *** WARNING: MINIMUM PIPE SIZE REQUIRED =    574.48   (mm)
                   THIS SIZE WAS USED IN THE ROUTING.
                   THE CAPACITY OF THIS PIPE  =       .30  (cms)

*** WARNING: New pipe size used for routing.
        <------------------- TRAVEL TIME TABLE ------------------->
        DEPTH       VOLUME     FLOW RATE    VELOCITY     TRAV.TIME
         (m)       (cu.m.)       (cms)        (m/s)         min
         .030     .235E+00       .002         .306          2.45
         .060     .655E+00       .007         .477          1.57
         .091     .118E+01       .016         .614          1.22
         .121     .179E+01       .029         .730          1.03
         .151     .245E+01       .045         .831           .90
         .181     .316E+01       .065         .919           .82
         .212     .390E+01       .086         .997           .75
         .242     .466E+01       .110        1.065           .70
         .272     .544E+01       .136        1.125           .67
         .302     .622E+01       .163        1.176           .64
         .333     .700E+01       .190        1.220           .61
         .363     .776E+01       .217        1.255           .60
         .393     .850E+01       .242        1.283           .58
         .423     .921E+01       .267        1.302           .58
         .454     .988E+01       .288        1.312           .57
         .484     .105E+02       .305        1.311           .57
         .514     .110E+02       .317        1.297           .58
         .544     .114E+02       .321        1.263           .59
         .574     .117E+02       .298        1.152           .65

                                            <---- hydrographs ---->   <-pipe / channel->
                               AREA    QPEAK     TPEAK     R.V.    MAX DEPTH  MAX VEL
                               (ha)    (cms)     (hrs)     (mm)       (m)      (m/s)
   INFLOW : ID= 3: Outlet 2      7.261     .298     6.083  25.904      .471     1.311
   OUTFLOW: ID= 9: culvert-1     7.261     .298     6.167  25.904      .471     1.311

------------------------------------------------------------------------------------------
R0001:C00006------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD           |   Area    (ha)=     .287   Curve Number   (CN)= 81.00
| 04:301          DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .244

      Unit Hyd Qpeak  (cms)=     .045

      PEAK FLOW       (cms)=     .022 (i)
      TIME TO PEAK    (hrs)=    5.667
      DURATION        (hrs)=    6.000, (dddd|hh:mm:)=   0|06:00
      AVERAGE FLOW    (cms)=     .003
      RUNOFF VOLUME    (mm)=   25.904
      TOTAL RAINFALL   (mm)=   55.818
      RUNOFF COEFFICIENT   =     .464

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

------------------------------------------------------------------------------------------
R0001:C00007------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD           |   Area    (ha)=    1.731   Curve Number   (CN)= 81.00
| 05:302          DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .412

      Unit Hyd Qpeak  (cms)=     .160

      PEAK FLOW       (cms)=     .091 (i)
      TIME TO PEAK    (hrs)=    5.917
      DURATION        (hrs)=    7.250, (dddd|hh:mm:)=   0|07:15
      AVERAGE FLOW    (cms)=     .017
      RUNOFF VOLUME    (mm)=   25.904
      TOTAL RAINFALL   (mm)=   55.818
      RUNOFF COEFFICIENT   =     .464

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

------------------------------------------------------------------------------------------
R0001:C00008------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD           |   Area    (ha)=    2.750   Curve Number   (CN)= 81.00
| 06:303          DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .388

      Unit Hyd Qpeak  (cms)=     .271

      PEAK FLOW       (cms)=     .151 (i)
      TIME TO PEAK    (hrs)=    5.917
      DURATION        (hrs)=    7.000, (dddd|hh:mm:)=   0|07:00
      AVERAGE FLOW    (cms)=     .028
      RUNOFF VOLUME    (mm)=   25.904
      TOTAL RAINFALL   (mm)=   55.818
      RUNOFF COEFFICIENT   =     .464

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

------------------------------------------------------------------------------------------
R0001:C00009------------------------------------------------------------------------------
------------------------
| ADD HYD                |
| 07:outlet 1            |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                       (ha)     (cms)    (hrs)      (mm)    (cms)
                       ID 1 04:301             .287      .022    5.667    25.904     .000
                      +ID 2 05:302            1.731      .091    5.917    25.904     .000
                      +ID 3 06:303            2.750      .151    5.917    25.904     .000
                      ==============================================================
                      SUM   07:outlet 1       4.768      .259    5.833    25.904     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------------------
R0001:C00010------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD           |   Area    (ha)=     .440   Curve Number   (CN)= 81.00
| 08:304          DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .628

      Unit Hyd Qpeak  (cms)=     .027

      PEAK FLOW       (cms)=     .017 (i)
      TIME TO PEAK    (hrs)=    6.167
      DURATION        (hrs)=    8.417, (dddd|hh:mm:)=   0|08:25
      AVERAGE FLOW    (cms)=     .004
      RUNOFF VOLUME    (mm)=   25.904
      TOTAL RAINFALL   (mm)=   55.818
      RUNOFF COEFFICIENT   =     .464

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

------------------------------------------------------------------------------------------
R0001:C00011------------------------------------------------------------------------------
--------------------------
| DESIGN STANDHYD         |   Area    (ha)=     .52
| 09:603          DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
--------------------------
                                 IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=        .26          .26
      Dep. Storage     (mm)=        .80         1.50
      Average Slope     (%)=        .50          .50
      Length            (m)=      59.16        40.00
      Mannings n           =       .013         .250

      Max.eff.Inten.(mm/hr)=     133.60        45.65
                 over (min)        5.00        15.00
      Storage Coeff.  (min)=       2.04 (ii)   16.68 (ii)
      Unit Hyd. Tpeak (min)=       5.00        15.00
      Unit Hyd. peak  (cms)=        .31          .07
                                                            *TOTALS*
      PEAK FLOW       (cms)=        .10          .02           .107 (iii)
      TIME TO PEAK    (hrs)=       5.50         5.67          5.500
      RUNOFF VOLUME    (mm)=      55.02        25.90         40.461
      TOTAL RAINFALL   (mm)=      55.82        55.82         55.818
      RUNOFF COEFFICIENT   =        .99          .46           .725
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

------------------------------------------------------------------------------------------
R0001:C00012------------------------------------------------------------------------------
------------------------
| ADD HYD                |
| 10:Outlet 3            |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                       (ha)     (cms)    (hrs)      (mm)    (cms)
                       ID 1 08:304             .440      .017    6.167    25.904     .000
                      +ID 2 09:603             .525      .107    5.500    40.461     .000
                      ==============================================================
                      SUM   10:Outlet 3        .965      .110    5.500    33.824     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------------------
R0001:C00013------------------------------------------------------------------------------
--------------------
| FINISH             |
--------------------
------------------------------------------------------------------------------------------
******************************************************************************************
      WARNINGS / ERRORS / NOTES
      -------------------------
R0001:C00005  ROUTE PIPE      ->
*** WARNING: New pipe size used for routing.
R0001:C00011  DESIGN STANDHYD
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.
   Simulation ended on 2021-01-08     at 13:42:56
==========================================================================================
```

```
2     Metric units
*#****************************************************************************
*#  Project Name: [2147925 Ontario Limited]    Project Number: [09-015]
*#  Date          : 09-01-2020
*#  Modeller      : [JONATHAN KAPITANCHUK]
*#  Company       : Condeland Engineering Limited
*#  License #     :  4377549
*#****************************************************************************
START                TZERO=[4.0],  METOUT=[2],  NSTORM=[0],  NRUN=[1]
*%                    [  ] <--storm filename, one per line for NSTORM time
*%-----------------|-------------------------------------------------------------|
DESIGN NASHYD        ID=[1], NHYD=["300"], DT=[5]min, AREA=[1.811](ha),
                     DWF=[0](cms), CN/C=[81], TP=[0.473]hrs,
                     Rainfall hyetograph Tewnty Five SCS storm
                     Rainfall begins at four hours
                     42.68 2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03
                     2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03
                     2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03
                     2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03
                     2.79 2.79 2.79 2.79 2.79 2.79 2.79 2.79 2.79 2.79
                     2.79 2.79 2.79 2.79 2.79 2.79 2.79 2.79 2.79 2.79
                     5.08 5.08 5.08 5.08 5.08 5.08 5.08 5.08 5.08 5.08
                     7.11 7.11 10.41 10.41 23.37 23.37 51.56 51.56 107.44 107.44
                     18.80 18.80 11.68 11.68 8.38 8.38 8.13 8.13 5.59 5.59
                     4.83 4.83 4.83 4.83 4.83 4.83 4.83 4.83 4.83 4.83
                     2.79 2.79 2.79 2.79 2.79 2.79 2.79 2.79 2.79 2.79
                     2.79 2.79 2.79 2.79 2.79 2.79 2.79 2.79 2.79 2.79
                     2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03
                     2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03
                     2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03
                     1.52 1.52 1.52 1.52 1.52 1.52 1.52 1.52 1.52 1.52
                     1.52 1.52 1.52 1.52 1.52 1.52 1.52 1.52 1.52 1.52
                     1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02
                     1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02
                     1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02
                     (mm/hr), END=-1
*%-----------------|-------------------------------------------------------------|
DESIGN NASHYD        ID=[2], NHYD=["604"], DT=[5](min), AREA=[5.45](ha),
                     DWF=[0](cms), CN/C=[81], TP=[0.617](hrs),
                     RAINFALL=[ , , , , ](mm/hour), END=-1
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
ADD HYD              IDsum=[3], NHYD=["Outlet 2"], IDs to add=[1+2](maximum ten)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
ROUTE PIPE           PTYPE=[1]circ, IDout=[9], NHYD=["culvert-1"], RNUMBER=[1],
                     PDIAM=[450](mm), PLNGTH=[45](m),
                     PROUGH=[0.025], PSLOPE=[0.011](m/m), IDin=[3],
                     RDT=[5](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
DESIGN NASHYD        ID=[4], NHYD=["301"], DT=[5]min, AREA=[0.287](ha),
                     DWF=[0](cms), CN/C=[81], TP=[0.244]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
DESIGN NASHYD        ID=[5], NHYD=["302"], DT=[5]min, AREA=[1.731](ha),
                     DWF=[0](cms), CN/C=[81], TP=[0.412]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
DESIGN NASHYD        ID=[6], NHYD=["303"], DT=[5]min, AREA=[2.750](ha),
                     DWF=[0](cms), CN/C=[81], TP=[0.388]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
ADD HYD              IDsum=[7], NHYD=["outlet 1"], IDs to add=[4+5+6]
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
DESIGN NASHYD        ID=[8], NHYD=["304"], DT=[5]min, AREA=[0.44](ha),
                     DWF=[0](cms), CN/C=[81], TP=[0.628]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
DESIGN STANDHYD      ID=9, NHYD=["603"], DT=[5]min, AREA=[0.525](ha),
                     XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[81],
                     SLOPE=[0.5](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|-------------------------------------------------------------|
ADD HYD              IDsum=[10], NHYD=["Outlet 3"], IDs to add=[8+9](maximum ten)
*%-----------------|-------------------------------------------------------------|
FINISH
```

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

 SSSSS   W   W   M   M   H   H   Y   Y   M   M    OOO         222     000    11   77777 =========
 S       W W W   MM MM   H   H    Y Y    MM MM   O   O          2    0   0   11   7   7
 SSSSS   W W W   M M M   HHHHH     Y     M M M   O   O          2    0   0   11       7 Ver4.05.4
     S    W W    M   M   H   H     Y     M   M   O   O        222    0   0   11      7  APR 2017
 SSSSS    W W    M   M   H   H     Y     M   M    OOO         2      0   0   11     7   =========
                                                              2      0   0   11    7    # 4377549
       StormWater Management HYdrologic Model                  222     000    11    7    =========

 ******************************************************************************************
 **************************************  SWMHYMO Ver4.05.4  ********************************
 ******************  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: Condeland Engineering Limited                ++++++++++
 ++++++++++++++++++              Concord                SERIAL#:4377549         ++++++++++
 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ******************************************************************************************
 ******************           ++++++ PROGRAM ARRAY DIMENSIONS ++++++            ***********
 ******************           Maximum value for ID numbers  :     11            ***********
 ******************           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   ***********************
 ******************************************************************************************
 *                 RUN DATE: 2021-01-08     TIME: 13:43:17     RUN COUNTER: 000011       *
 ******************************************************************************************
 * Input   file: X:\Projects\09015\09015 - PRE25YR (2020-09-01).dat                      *
 * Output  file: X:\Projects\09015\09015 - PRE25YR (2020-09-01).out                      *
 * Summary file: X:\Projects\09015\09015 - PRE25YR (2020-09-01).sum                      *
 * User comments:                                                                        *
 * 1:____________________________________________________________________________________*
 * 2:____________________________________________________________________________________*
 * 3:____________________________________________________________________________________*
 ******************************************************************************************

-------------------------------------------------------------------------------------------
R0001:C00001--------------------------------------------------------------------------------
*#***********************************************************************
*#  Project Name: [2147925 Ontario Limited]    Project Number: [09-015]
*#  Date         : 09-01-2020
*#  Modeller     : [JONATHAN KAPITANCHUK]
*#  Company      : Condeland Engineering Limited
*#  License #    :  4377549
*#***********************************************************************
--------------------
| START             | Project  dir.:X:\Projects\09015\
-------------------- Rainfall dir.:X:\Projects\09015\
    TZERO =  4.00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 0001
    NSTORM=   0
-------------------------------------------------------------------------------------------
R0001:C00002--------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD           |   Area    (ha)=    1.811   Curve Number   (CN)= 81.00
| 01:300         DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .473

                               New rainfall entered directly by user.
                               TIME STEP= 5.00 min   # of STEPS=    200
                               DURATION =16.67 hrs   TOTAL RAIN=  79.95 mm

      TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN
     hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr
      0:05  42.680|   2:55   2.030|   5:45   5.080|   8:35   2.790|  11:25   2.030|  14:15   1.020
      0:10   2.030|   3:00   2.030|   5:50   5.080|   8:40   2.790|  11:30   2.030|  14:20   1.020
      0:15   2.030|   3:05   2.030|   5:55   7.110|   8:45   2.790|  11:35   2.030|  14:25   1.020
      0:20   2.030|   3:10   2.030|   6:00   7.110|   8:50   2.790|  11:40   2.030|  14:30   1.020
      0:25   2.030|   3:15   2.030|   6:05  10.410|   8:55   2.790|  11:45   2.030|  14:35   1.020
      0:30   2.030|   3:20   2.030|   6:10  10.410|   9:00   2.790|  11:50   2.030|  14:40   1.020
      0:35   2.030|   3:25   2.790|   6:15  23.370|   9:05   2.790|  11:55   2.030|  14:45   1.020
      0:40   2.030|   3:30   2.790|   6:20  23.370|   9:10   2.790|  12:00   2.030|  14:50   1.020
      0:45   2.030|   3:35   2.790|   6:25  51.560|   9:15   2.790|  12:05   2.030|  14:55   1.020
      0:50   2.030|   3:40   2.790|   6:30  51.560|   9:20   2.790|  12:10   2.030|  15:00   1.020
      0:55   2.030|   3:45   2.790|   6:35 107.440|   9:25   2.790|  12:15   2.030|  15:05   1.020
      1:00   2.030|   3:50   2.790|   6:40 107.440|   9:30   2.790|  12:20   2.030|  15:10   1.020
      1:05   2.030|   3:55   2.790|   6:45  18.800|   9:35   2.790|  12:25   2.030|  15:15   1.020
      1:10   2.030|   4:00   2.790|   6:50  18.800|   9:40   2.790|  12:30   2.030|  15:20   1.020
      1:15   2.030|   4:05   2.790|   6:55  11.680|   9:45   2.790|  12:35   1.520|  15:25   1.020
      1:20   2.030|   4:10   2.790|   7:00  11.680|   9:50   2.790|  12:40   1.520|  15:30   1.020
      1:25   2.030|   4:15   2.790|   7:05   8.380|   9:55   2.790|  12:45   1.520|  15:35   1.020
      1:30   2.030|   4:20   2.790|   7:10   8.380|  10:00   2.790|  12:50   1.520|  15:40   1.020
      1:35   2.030|   4:25   2.790|   7:15   8.130|  10:05   2.030|  12:55   1.520|  15:45   1.020
      1:40   2.030|   4:30   2.790|   7:20   8.130|  10:10   2.030|  13:00   1.520|  15:50   1.020
      1:45   2.030|   4:35   2.790|   7:25   5.590|  10:15   2.030|  13:05   1.520|  15:55   1.020
      1:50   2.030|   4:40   2.790|   7:30   5.590|  10:20   2.030|  13:10   1.520|  16:00   1.020
      1:55   2.030|   4:45   2.790|   7:35   4.830|  10:25   2.030|  13:15   1.520|  16:05   1.020
      2:00   2.030|   4:50   2.790|   7:40   4.830|  10:30   2.030|  13:20   1.520|  16:10   1.020
      2:05   2.030|   4:55   2.790|   7:45   4.830|  10:35   2.030|  13:25   1.520|  16:15   1.020
      2:10   2.030|   5:00   2.790|   7:50   4.830|  10:40   2.030|  13:30   1.520|  16:20   1.020
      2:15   2.030|   5:05   5.080|   7:55   4.830|  10:45   2.030|  13:35   1.520|  16:25   1.020
      2:20   2.030|   5:10   5.080|   8:00   4.830|  10:50   2.030|  13:40   1.520|  16:30   1.020
      2:25   2.030|   5:15   5.080|   8:05   4.830|  10:55   2.030|  13:45   1.520|  16:35   1.020
      2:30   2.030|   5:20   5.080|   8:10   4.830|  11:00   2.030|  13:50   1.520|  16:40   1.020
      2:35   2.030|   5:25   5.080|   8:15   4.830|  11:05   2.030|  13:55   1.520|
      2:40   2.030|   5:30   5.080|   8:20   4.830|  11:10   2.030|  14:00   1.520|
      2:45   2.030|   5:35   5.080|   8:25   2.790|  11:15   2.030|  14:05   1.520|
      2:50   2.030|   5:40   5.080|   8:30   2.790|  11:20   2.030|  14:10   1.520|

     Unit Hyd Qpeak  (cms)=     .146

     PEAK FLOW       (cms)=     .116 (i)
     TIME TO PEAK    (hrs)=   11.000
     DURATION        (hrs)=   20.250, (dddd|hh:mm:)=   0|20:15
     AVERAGE FLOW    (cms)=     .011
     RUNOFF VOLUME    (mm)=   44.587
     TOTAL RAINFALL   (mm)=   79.949
     RUNOFF COEFFICIENT   =     .558

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

-------------------------------------------------------------------------------------------
R0001:C00003--------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD           |   Area    (ha)=    5.450   Curve Number   (CN)= 81.00
| 02:604         DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .617

     Unit Hyd Qpeak  (cms)=     .337

     PEAK FLOW       (cms)=     .288 (i)
     TIME TO PEAK    (hrs)=   11.167
     DURATION        (hrs)=   21.083, (dddd|hh:mm:)=   0|21:05
     AVERAGE FLOW    (cms)=     .032
     RUNOFF VOLUME    (mm)=   44.587
     TOTAL RAINFALL   (mm)=   79.949
     RUNOFF COEFFICIENT   =     .558

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

-------------------------------------------------------------------------------------------
R0001:C00004--------------------------------------------------------------------------------
------------------------
| ADD HYD                |
| 03:Outlet 2            |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                        (ha)     (cms)    (hrs)      (mm)   (cms)
                       ID 1 01:300             1.811      .116   11.000    44.587    .000
                      +ID 2 02:604             5.450      .288   11.167    44.587    .000
                      ==================================================================
                      SUM   03:Outlet 2        7.261      .399   11.167    44.587    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------------------
R0001:C00005--------------------------------------------------------------------------------
------------------------
| ROUTE PIPE culvert-1 | PIPE Number     =    1.00
| IN=03---> OUT=09     | Diameter    (mm)= 450.00
| DT=  5.0 min         | Length       (m)=  45.00
------------------------ Slope      (m/m)= .01100
                         Manning n       =   .025

     *** WARNING: MINIMUM PIPE SIZE REQUIRED =   641.00   (mm)
                  THIS SIZE WAS USED IN THE ROUTING.
                  THE CAPACITY OF THIS PIPE =     .40  (cms)

*** WARNING: New pipe size used for routing.
      <------------------- TRAVEL TIME TABLE ------------------->
         DEPTH      VOLUME    FLOW RATE   VELOCITY    TRAV.TIME
          (m)      (cu.m.)      (cms)       (m/s)        min
          .034     .293E+00      .002        .329         2.28
          .067     .815E+00      .009        .513         1.46
          .101     .147E+01      .022        .661         1.14
          .135     .222E+01      .039        .785          .96
          .169     .305E+01      .061        .894          .84
          .202     .393E+01      .086        .989          .76
          .236     .486E+01      .116       1.072          .70
          .270     .581E+01      .148       1.146          .65
          .304     .677E+01      .182       1.210          .62
          .337     .775E+01      .218       1.265          .59
          .371     .871E+01      .254       1.312          .57
          .405     .967E+01      .290       1.350          .56
          .439     .106E+02      .325       1.380          .54
          .472     .115E+02      .357       1.400          .54
          .506     .123E+02      .386       1.411          .53
          .540     .131E+02      .409       1.410          .53
          .574     .137E+02      .425       1.395          .54
          .607     .142E+02      .430       1.359          .55
          .641     .145E+02      .400       1.239          .61

                                          <---- hydrographs ---->   <-pipe / channel->
                                  AREA    QPEAK     TPEAK    R.V.   MAX DEPTH  MAX VEL
                                  (ha)    (cms)     (hrs)    (mm)      (m)      (m/s)
   INFLOW : ID= 3: Outlet 2       7.261     .399    11.167  44.587     .526      1.410
   OUTFLOW: ID= 9: culvert-1      7.261     .400    11.167  44.587     .524      1.410

-------------------------------------------------------------------------------------------
R0001:C00006--------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD           |   Area    (ha)=     .287   Curve Number   (CN)= 81.00
| 04:301         DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .244

     Unit Hyd Qpeak  (cms)=     .045

     PEAK FLOW       (cms)=     .029 (i)
     TIME TO PEAK    (hrs)=   10.750
     DURATION        (hrs)=   18.667, (dddd|hh:mm:)=   0|18:40
     AVERAGE FLOW    (cms)=     .002
     RUNOFF VOLUME    (mm)=   44.587
     TOTAL RAINFALL   (mm)=   79.949
     RUNOFF COEFFICIENT   =     .558

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

-------------------------------------------------------------------------------------------
R0001:C00007--------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD           |   Area    (ha)=    1.731   Curve Number   (CN)= 81.00
| 05:302         DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .412

     Unit Hyd Qpeak  (cms)=     .160

     PEAK FLOW       (cms)=     .122 (i)
     TIME TO PEAK    (hrs)=   11.000
     DURATION        (hrs)=   19.917, (dddd|hh:mm:)=   0|19:55
     AVERAGE FLOW    (cms)=     .011
     RUNOFF VOLUME    (mm)=   44.587
     TOTAL RAINFALL   (mm)=   79.949
     RUNOFF COEFFICIENT   =     .558

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

-------------------------------------------------------------------------------------------
R0001:C00008--------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD           |   Area    (ha)=    2.750   Curve Number   (CN)= 81.00
| 06:303         DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .388

     Unit Hyd Qpeak  (cms)=     .271

     PEAK FLOW       (cms)=     .204 (i)
     TIME TO PEAK    (hrs)=   10.917
     DURATION        (hrs)=   19.667, (dddd|hh:mm:)=   0|19:40
     AVERAGE FLOW    (cms)=     .017
     RUNOFF VOLUME    (mm)=   44.587
     TOTAL RAINFALL   (mm)=   79.949
     RUNOFF COEFFICIENT   =     .558

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

-------------------------------------------------------------------------------------------
R0001:C00009--------------------------------------------------------------------------------
------------------------
| ADD HYD                |
| 07:outlet 1            |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                        (ha)     (cms)    (hrs)      (mm)   (cms)
                       ID 1 04:301              .287      .029   10.750    44.587    .000
                      +ID 2 05:302             1.731      .122   11.000    44.587    .000
                      +ID 3 06:303             2.750      .204   10.917    44.587    .000
                      ==================================================================
                      SUM   07:outlet 1        4.768      .351   10.917    44.587    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------------------
R0001:C00010--------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD           |   Area    (ha)=     .440   Curve Number   (CN)= 81.00
| 08:304         DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .628

     Unit Hyd Qpeak  (cms)=     .027

     PEAK FLOW       (cms)=     .023 (i)
     TIME TO PEAK    (hrs)=   11.167
     DURATION        (hrs)=   21.083, (dddd|hh:mm:)=   0|21:05
     AVERAGE FLOW    (cms)=     .003
     RUNOFF VOLUME    (mm)=   44.587
     TOTAL RAINFALL   (mm)=   79.949
     RUNOFF COEFFICIENT   =     .558

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

-------------------------------------------------------------------------------------------
R0001:C00011--------------------------------------------------------------------------------
--------------------------
| DESIGN STANDHYD         |   Area    (ha)=     .52
| 09:603         DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
--------------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .26          .26
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=        .50          .50
     Length            (m)=      59.16        40.00
     Mannings n          =        .013         .250

     Max.eff.Inten.(mm/hr)=     107.44        56.46
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.23 (ii)   15.68 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .30          .07
                                                             *TOTALS*
     PEAK FLOW       (cms)=        .08          .03            .098 (iii)
     TIME TO PEAK    (hrs)=      10.67        10.83          10.667
     RUNOFF VOLUME    (mm)=      79.15        44.59          61.867
     TOTAL RAINFALL   (mm)=      79.95        79.95          79.949
     RUNOFF COEFFICIENT   =        .99          .56            .774
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

-------------------------------------------------------------------------------------------
R0001:C00012--------------------------------------------------------------------------------
------------------------
| ADD HYD                |
| 10:Outlet 3            |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                        (ha)     (cms)    (hrs)      (mm)   (cms)
                       ID 1 08:304              .440      .023   11.167    44.587    .000
                      +ID 2 09:603              .525      .098   10.667    61.867    .000
                      ==================================================================
                      SUM   10:Outlet 3         .965      .108   10.667    53.988    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------------------
R0001:C00013--------------------------------------------------------------------------------
--------------------
| FINISH            |
--------------------
-------------------------------------------------------------------------------------------
*******************************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
R0001:C00005  ROUTE PIPE      ->
*** WARNING: New pipe size used for routing.
R0001:C00011  DESIGN STANDHYD
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.
   Simulation ended on 2021-01-08     at 13:43:17
===========================================================================================


```

```
2     Metric units
*#*****************************************************************************
*#  Project Name: [2147925 Ontario Limited]    Project Number: [09-015]
*#  Date         : 09-01-2020
*#  Modeller     : [JONATHAN KAPITANCHUK]
*#  Company      : Condeland Engineering Limited
*#  License #    :  4377549
*#*****************************************************************************
START                TZERO=[4.0],  METOUT=[2],  NSTORM=[0],  NRUN=[1]
*%                    [  ] <--storm filename, one per line for NSTORM time
*%-----------------|-------------------------------------------------------------|
DESIGN NASHYD        ID=[1], NHYD=["300"], DT=[5]min, AREA=[1.811](ha),
                     DWF=[0](cms), CN/C=[81], TP=[0.473]hrs,
                     Rainfall hyetograph fifty yr SCS Storm
                     Rainfall begins at four hours
                     49.10 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12
                     2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12
                     2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12
                     2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12
                     3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05
                     3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05
                     5.64 5.64 5.64 5.64 5.64 5.64 5.64 5.64 5.64 5.64
                     7.52 7.52 11.04 11.02 25.37 25.37 55.44 55.44 116.06 116.06
                     19.87 19.87 12.69 12.69 9.17 9.17 8.69 8.69 6.10 6.10
                     5.17 5.17 5.17 5.17 5.17 5.17 5.17 5.17 5.17 5.17
                     3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05
                     3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05
                     2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12
                     2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12
                     2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12
                     1.65 1.65 1.65 1.65 1.65 1.65 1.65 1.65 1.65 1.65
                     1.65 1.65 1.65 1.65 1.65 1.65 1.65 1.65 1.65 1.65
                     1.17 1.17 1.17 1.17 1.17 1.17 1.17 1.17 1.17 1.17
                     1.17 1.17 1.17 1.17 1.17 1.17 1.17 1.17 1.17 1.17
                     1.17 1.17 1.17 1.17 1.17 1.17 1.17 1.17 1.17 1.
                     (mm/hr), END=-1
*%-----------------|-------------------------------------------------------------|
DESIGN NASHYD        ID=[2], NHYD=["604"], DT=[5](min), AREA=[5.45](ha),
                     DWF=[0](cms), CN/C=[81], TP=[0.617](hrs),
                     RAINFALL=[ , , , , ](mm/hour), END=-1
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
ADD HYD              IDsum=[3], NHYD=["Outlet 2"], IDs to add=[1+2](maximum ten)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
ROUTE PIPE           PTYPE=[1]circ, IDout=[9], NHYD=["culvert-1"], RNUMBER=[1],
                     PDIAM=[450](mm), PLNGTH=[45](m),
                     PROUGH=[0.025], PSLOPE=[0.011](m/m), IDin=[3],
                     RDT=[5](min)
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
DESIGN NASHYD        ID=[4], NHYD=["301"], DT=[5]min, AREA=[0.287](ha),
                     DWF=[0](cms), CN/C=[81], TP=[0.244]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
DESIGN NASHYD        ID=[5], NHYD=["302"], DT=[5]min, AREA=[1.731](ha),
                     DWF=[0](cms), CN/C=[81], TP=[0.412]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
DESIGN NASHYD        ID=[6], NHYD=["303"], DT=[5]min, AREA=[2.750](ha),
                     DWF=[0](cms), CN/C=[81], TP=[0.388]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
ADD HYD              IDsum=[7], NHYD=["outlet 1"], IDs to add=[4+5+6]
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
DESIGN NASHYD        ID=[8], NHYD=["304"], DT=[5]min, AREA=[0.44](ha),
                     DWF=[0](cms), CN/C=[81], TP=[0.628]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
DESIGN STANDHYD      ID=9, NHYD=["603"], DT=[5]min, AREA=[0.525](ha),
                     XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[81],
                     SLOPE=[0.5](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|-------------------------------------------------------------|
ADD HYD              IDsum=[10], NHYD=["Outlet 3"], IDs to add=[8+9](maximum ten)
*%-----------------|-------------------------------------------------------------|
FINISH
```

```
==========================================================================================
SSSSS   W   W   M   M   H   H   Y   Y   M   M    OOO          222     000    11   77777 =========
S       W W W   MM MM   H   H    Y Y    MM MM   O   O           2    0   0   11   7   7
SSSSS   W W W   M M M   HHHHH     Y     M M M   O   O           2    0   0   11       7 Ver4.05.4
    S    W W    M   M   H   H     Y     M   M   O   O         222    0   0   11      7  APR 2017
SSSSS    W W    M   M   H   H     Y     M   M    OOO          2      0   0   11     7   =========
                                                              2      0   0   11    7    # 4377549
      StormWater Management HYdrologic Model                  222     000    11    7    =========

******************************************************************************************
**************************************  SWMHYMO Ver4.05.4  ********************************
******************  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: Condeland Engineering Limited               ++++++++++++
++++++++++++++++++                Concord             SERIAL#:4377549         ++++++++++++
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

******************************************************************************************
******************          ++++++ PROGRAM ARRAY DIMENSIONS ++++++            ************
******************          Maximum value for ID numbers  :     11            ************
******************          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   ************************
******************************************************************************************
*                 RUN DATE: 2021-01-08     TIME: 13:43:32     RUN COUNTER: 000012        *
******************************************************************************************
* Input   file: X:\Projects\09015\09015 - PRE50YR (2020-09-01).dat                       *
* Output  file: X:\Projects\09015\09015 - PRE50YR (2020-09-01).out                       *
* Summary file: X:\Projects\09015\09015 - PRE50YR (2020-09-01).sum                       *
* User comments:                                                                         *
* 1:_____________________________________________________________________________________*
* 2:_____________________________________________________________________________________*
* 3:_____________________________________________________________________________________*
******************************************************************************************

-------------------------------------------------------------------------------------------
R0001:C00001-------------------------------------------------------------------------------
*#**********************************************************************
*#  Project Name: [2147925 Ontario Limited]    Project Number: [09-015]
*#  Date         : 09-01-2020
*#  Modeller     : [JONATHAN KAPITANCHUK]
*#  Company      : Condeland Engineering Limited
*#  License #    :  4377549
*#**********************************************************************
--------------------
| START             | Project  dir.:X:\Projects\09015\
-------------------- Rainfall dir.:X:\Projects\09015\
    TZERO =  4.00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 0001
    NSTORM=   0
-------------------------------------------------------------------------------------------
R0001:C00002-------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD          |   Area    (ha)=    1.811   Curve Number   (CN)= 81.00
| 01:300        DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .473

                              New rainfall entered directly by user.
                              TIME STEP= 5.00 min   # of STEPS=    200
                              DURATION =16.67 hrs   TOTAL RAIN=  86.44 mm

      TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN
     hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr
      0:05  49.100|   2:55   2.120|   5:45   5.640|   8:35   3.050|  11:25   2.120|  14:15   1.170
      0:10   2.120|   3:00   2.120|   5:50   5.640|   8:40   3.050|  11:30   2.120|  14:20   1.170
      0:15   2.120|   3:05   2.120|   5:55   7.520|   8:45   3.050|  11:35   2.120|  14:25   1.170
      0:20   2.120|   3:10   2.120|   6:00   7.520|   8:50   3.050|  11:40   2.120|  14:30   1.170
      0:25   2.120|   3:15   2.120|   6:05  11.040|   8:55   3.050|  11:45   2.120|  14:35   1.170
      0:30   2.120|   3:20   2.120|   6:10  11.020|   9:00   3.050|  11:50   2.120|  14:40   1.170
      0:35   2.120|   3:25   3.050|   6:15  25.370|   9:05   3.050|  11:55   2.120|  14:45   1.170
      0:40   2.120|   3:30   3.050|   6:20  25.370|   9:10   3.050|  12:00   2.120|  14:50   1.170
      0:45   2.120|   3:35   3.050|   6:25  55.440|   9:15   3.050|  12:05   2.120|  14:55   1.170
      0:50   2.120|   3:40   3.050|   6:30  55.440|   9:20   3.050|  12:10   2.120|  15:00   1.170
      0:55   2.120|   3:45   3.050|   6:35 116.060|   9:25   3.050|  12:15   2.120|  15:05   1.170
      1:00   2.120|   3:50   3.050|   6:40 116.060|   9:30   3.050|  12:20   2.120|  15:10   1.170
      1:05   2.120|   3:55   3.050|   6:45  19.870|   9:35   3.050|  12:25   2.120|  15:15   1.170
      1:10   2.120|   4:00   3.050|   6:50  19.870|   9:40   3.050|  12:30   2.120|  15:20   1.170
      1:15   2.120|   4:05   3.050|   6:55  12.690|   9:45   3.050|  12:35   1.650|  15:25   1.170
      1:20   2.120|   4:10   3.050|   7:00  12.690|   9:50   3.050|  12:40   1.650|  15:30   1.170
      1:25   2.120|   4:15   3.050|   7:05   9.170|   9:55   3.050|  12:45   1.650|  15:35   1.170
      1:30   2.120|   4:20   3.050|   7:10   9.170|  10:00   3.050|  12:50   1.650|  15:40   1.170
      1:35   2.120|   4:25   3.050|   7:15   8.690|  10:05   2.120|  12:55   1.650|  15:45   1.170
      1:40   2.120|   4:30   3.050|   7:20   8.690|  10:10   2.120|  13:00   1.650|  15:50   1.170
      1:45   2.120|   4:35   3.050|   7:25   6.100|  10:15   2.120|  13:05   1.650|  15:55   1.170
      1:50   2.120|   4:40   3.050|   7:30   6.100|  10:20   2.120|  13:10   1.650|  16:00   1.170
      1:55   2.120|   4:45   3.050|   7:35   5.170|  10:25   2.120|  13:15   1.650|  16:05   1.170
      2:00   2.120|   4:50   3.050|   7:40   5.170|  10:30   2.120|  13:20   1.650|  16:10   1.170
      2:05   2.120|   4:55   3.050|   7:45   5.170|  10:35   2.120|  13:25   1.650|  16:15   1.170
      2:10   2.120|   5:00   3.050|   7:50   5.170|  10:40   2.120|  13:30   1.650|  16:20   1.170
      2:15   2.120|   5:05   5.640|   7:55   5.170|  10:45   2.120|  13:35   1.650|  16:25   1.170
      2:20   2.120|   5:10   5.640|   8:00   5.170|  10:50   2.120|  13:40   1.650|  16:30   1.170
      2:25   2.120|   5:15   5.640|   8:05   5.170|  10:55   2.120|  13:45   1.650|  16:35   1.170
      2:30   2.120|   5:20   5.640|   8:10   5.170|  11:00   2.120|  13:50   1.650|  16:40   1.000
      2:35   2.120|   5:25   5.640|   8:15   5.170|  11:05   2.120|  13:55   1.650|
      2:40   2.120|   5:30   5.640|   8:20   5.170|  11:10   2.120|  14:00   1.650|
      2:45   2.120|   5:35   5.640|   8:25   3.050|  11:15   2.120|  14:05   1.650|
      2:50   2.120|   5:40   5.640|   8:30   3.050|  11:20   2.120|  14:10   1.650|

     Unit Hyd Qpeak  (cms)=     .146

     PEAK FLOW       (cms)=     .130 (i)
     TIME TO PEAK    (hrs)=   11.000
     DURATION        (hrs)=   20.250, (dddd|hh:mm:)=   0|20:15
     AVERAGE FLOW    (cms)=     .012
     RUNOFF VOLUME    (mm)=   49.923
     TOTAL RAINFALL   (mm)=   86.441
     RUNOFF COEFFICIENT   =     .578

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

-------------------------------------------------------------------------------------------
R0001:C00003-------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD          |   Area    (ha)=    5.450   Curve Number   (CN)= 81.00
| 02:604        DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .617

     Unit Hyd Qpeak  (cms)=     .337

     PEAK FLOW       (cms)=     .323 (i)
     TIME TO PEAK    (hrs)=   11.167
     DURATION        (hrs)=   21.083, (dddd|hh:mm:)=   0|21:05
     AVERAGE FLOW    (cms)=     .036
     RUNOFF VOLUME    (mm)=   49.923
     TOTAL RAINFALL   (mm)=   86.441
     RUNOFF COEFFICIENT   =     .578

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

-------------------------------------------------------------------------------------------
R0001:C00004-------------------------------------------------------------------------------
------------------------
| ADD HYD              |
| 03:Outlet 2          |   ID:NHYD           AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                     (ha)     (cms)    (hrs)      (mm)   (cms)
                      ID 1 01:300           1.811      .130   11.000    49.923    .000
                     +ID 2 02:604           5.450      .323   11.167    49.923    .000
                     ===================================================================
                     SUM   03:Outlet 2      7.261      .447   11.167    49.923    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------------------
R0001:C00005-------------------------------------------------------------------------------
------------------------
| ROUTE PIPE culvert-1 | PIPE Number     =    1.00
| IN=03---> OUT=09     | Diameter    (mm)=  450.00
| DT=  5.0 min         | Length       (m)=   45.00
------------------------ Slope      (m/m)=  .01100
                         Manning n       =    .025

     *** WARNING: MINIMUM PIPE SIZE REQUIRED =   668.68   (mm)
                  THIS SIZE WAS USED IN THE ROUTING.
                  THE CAPACITY OF THIS PIPE  =      .45  (cms)

*** WARNING: New pipe size used for routing.
     <------------------- TRAVEL TIME TABLE ------------------->
       DEPTH      VOLUME     FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)       (cms)        (m/s)        min
       .035     .319E+00      .002         .338         2.22
       .070     .887E+00      .010         .528         1.42
       .106     .160E+01      .024         .679         1.10
       .141     .242E+01      .043         .808          .93
       .176     .332E+01      .068         .919          .82
       .211     .428E+01      .097        1.017          .74
       .246     .528E+01      .130        1.103          .68
       .282     .632E+01      .165        1.178          .64
       .317     .737E+01      .204        1.244          .60
       .352     .843E+01      .244        1.301          .58
       .387     .948E+01      .284        1.349          .56
       .422     .105E+02      .325        1.389          .54
       .458     .115E+02      .363        1.419          .53
       .493     .125E+02      .400        1.440          .52
       .528     .134E+02      .432        1.451          .52
       .563     .142E+02      .458        1.450          .52
       .598     .149E+02      .476        1.435          .52
       .633     .155E+02      .481        1.398          .54
       .669     .158E+02      .447        1.274          .59

                                           <---- hydrographs ---->   <-pipe / channel->
                                   AREA    QPEAK     TPEAK    R.V.   MAX DEPTH  MAX VEL
                                   (ha)    (cms)     (hrs)    (mm)      (m)      (m/s)
   INFLOW : ID= 3: Outlet 2       7.261     .447    11.167  49.923     .549      1.451
   OUTFLOW: ID= 9: culvert-1      7.261     .448    11.167  49.923     .547      1.451

-------------------------------------------------------------------------------------------
R0001:C00006-------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD          |   Area    (ha)=     .287   Curve Number   (CN)= 81.00
| 04:301        DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .244

     Unit Hyd Qpeak  (cms)=     .045

     PEAK FLOW       (cms)=     .032 (i)
     TIME TO PEAK    (hrs)=   10.750
     DURATION        (hrs)=   18.667, (dddd|hh:mm:)=   0|18:40
     AVERAGE FLOW    (cms)=     .002
     RUNOFF VOLUME    (mm)=   49.923
     TOTAL RAINFALL   (mm)=   86.441
     RUNOFF COEFFICIENT   =     .578

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

-------------------------------------------------------------------------------------------
R0001:C00007-------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD          |   Area    (ha)=    1.731   Curve Number   (CN)= 81.00
| 05:302        DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .412

     Unit Hyd Qpeak  (cms)=     .160

     PEAK FLOW       (cms)=     .137 (i)
     TIME TO PEAK    (hrs)=   11.000
     DURATION        (hrs)=   19.917, (dddd|hh:mm:)=   0|19:55
     AVERAGE FLOW    (cms)=     .012
     RUNOFF VOLUME    (mm)=   49.923
     TOTAL RAINFALL   (mm)=   86.441
     RUNOFF COEFFICIENT   =     .578

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

-------------------------------------------------------------------------------------------
R0001:C00008-------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD          |   Area    (ha)=    2.750   Curve Number   (CN)= 81.00
| 06:303        DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .388

     Unit Hyd Qpeak  (cms)=     .271

     PEAK FLOW       (cms)=     .228 (i)
     TIME TO PEAK    (hrs)=   10.917
     DURATION        (hrs)=   19.667, (dddd|hh:mm:)=   0|19:40
     AVERAGE FLOW    (cms)=     .019
     RUNOFF VOLUME    (mm)=   49.923
     TOTAL RAINFALL   (mm)=   86.441
     RUNOFF COEFFICIENT   =     .578

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

-------------------------------------------------------------------------------------------
R0001:C00009-------------------------------------------------------------------------------
------------------------
| ADD HYD              |
| 07:outlet 1          |   ID:NHYD           AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                     (ha)     (cms)    (hrs)      (mm)   (cms)
                      ID 1 04:301            .287      .032   10.750    49.923    .000
                     +ID 2 05:302           1.731      .137   11.000    49.923    .000
                     +ID 3 06:303           2.750      .228   10.917    49.923    .000
                     ===================================================================
                     SUM   07:outlet 1      4.768      .393   10.917    49.923    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------------------
R0001:C00010-------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD          |   Area    (ha)=     .440   Curve Number   (CN)= 81.00
| 08:304        DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .628

     Unit Hyd Qpeak  (cms)=     .027

     PEAK FLOW       (cms)=     .026 (i)
     TIME TO PEAK    (hrs)=   11.167
     DURATION        (hrs)=   21.083, (dddd|hh:mm:)=   0|21:05
     AVERAGE FLOW    (cms)=     .003
     RUNOFF VOLUME    (mm)=   49.923
     TOTAL RAINFALL   (mm)=   86.441
     RUNOFF COEFFICIENT   =     .578

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

-------------------------------------------------------------------------------------------
R0001:C00011-------------------------------------------------------------------------------
--------------------------
| DESIGN STANDHYD        |   Area    (ha)=     .52
| 09:603        DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
--------------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .26          .26
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=        .50          .50
     Length            (m)=      59.16        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     116.06        63.19
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.16 (ii)   15.02 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .31          .08
                                                            *TOTALS*
     PEAK FLOW       (cms)=        .08          .03           .108 (iii)
     TIME TO PEAK    (hrs)=      10.67        10.83         10.667
     RUNOFF VOLUME    (mm)=      85.64        49.92         67.782
     TOTAL RAINFALL   (mm)=      86.44        86.44         86.441
     RUNOFF COEFFICIENT   =        .99          .58           .784
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

-------------------------------------------------------------------------------------------
R0001:C00012-------------------------------------------------------------------------------
------------------------
| ADD HYD              |
| 10:Outlet 3          |   ID:NHYD           AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                     (ha)     (cms)    (hrs)      (mm)   (cms)
                      ID 1 08:304            .440      .026   11.167    49.923    .000
                     +ID 2 09:603            .525      .108   10.667    67.782    .000
                     ===================================================================
                     SUM   10:Outlet 3       .965      .119   10.667    59.639    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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R0001:C00013-------------------------------------------------------------------------------
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| FINISH           |
--------------------
-------------------------------------------------------------------------------------------
*******************************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
R0001:C00005  ROUTE PIPE      ->
*** WARNING: New pipe size used for routing.
R0001:C00011  DESIGN STANDHYD
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.
   Simulation ended on 2021-01-08     at 13:43:32
===========================================================================================
```

```
2     Metric units
*#*********************************************************************
*#  Project Name: [2147925 Ontario Limited]    Project Number: [09-015]
*#  Date        : 09-01-2020
*#  Modeller    : [JONATHAN KAPITANCHUK]
*#  Company     : Condeland Engineering Limited
*#  License #   :  4377549
*#*********************************************************************
START                 TZERO=[4.0],  METOUT=[2],  NSTORM=[0],  NRUN=[1]
*%                     [  ] <--storm filename, one per line for NSTORM time
*%-----------------|-----------------------------------------------------------|
DESIGN NASHYD         ID=[1], NHYD=["300"], DT=[5]min, AREA=[1.811](ha),
                      DWF=[0](cms), CN/C=[81], TP=[0.473]hrs,
                      Rainfall hyetograph one hundred yr SCS Storm
                      Rainfall begins at four hours
                      RAINFALL=[53.09 2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29
                      2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29
                      2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29
                      2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29
                      3.30 3.30 3.30 3.30 3.30 3.30 3.30 3.30 3.30 3.30
                      3.30 3.30 3.30 3.30 3.30 3.30 3.30 3.30 3.30 3.30
                      6.10 6.10 6.10 6.10 6.10 6.10 6.10 6.10 6.10 6.10
                      8.13 8.13 11.94 11.94 27.43 27.43 59.94 59.94 125.48 125.48
                      21.48 21.48 13.72 13.72 9.91 9.91 9.40 9.40 6.60 6.60
                      5.59 5.59 5.59 5.59 5.59 5.59 5.59 5.59 5.59 5.59
                      3.30 3.30 3.30 3.30 3.30 3.30 3.30 3.30 3.30 3.30
                      3.30 3.30 3.30 3.30 3.30 3.30 3.30 3.30 3.30 3.30
                      2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29
                      2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29
                      2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29
                      1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78
                      1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78
                      1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27
                      1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27
                      1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27]
                      (mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
DESIGN NASHYD         ID=[2], NHYD=["604"], DT=[5](min), AREA=[5.45](ha),
                      DWF=[0](cms), CN/C=[81], TP=[0.617](hrs),
                      RAINFALL=[ , , , , ](mm/hour), END=-1
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
ADD HYD               IDsum=[3], NHYD=["Outlet 2"], IDs to add=[1+2](maximum ten)
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
ROUTE PIPE            PTYPE=[1]circ, IDout=[9], NHYD=["culvert-1"], RNUMBER=[1],
                      PDIAM=[450](mm), PLNGTH=[45](m),
                      PROUGH=[0.025], PSLOPE=[0.011](m/m), IDin=[3],
                      RDT=[5](min)
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
DESIGN NASHYD         ID=[4], NHYD=["301"], DT=[5]min, AREA=[0.287](ha),
                      DWF=[0](cms), CN/C=[81], TP=[0.244]hrs,
                      RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
DESIGN NASHYD         ID=[5], NHYD=["302"], DT=[5]min, AREA=[1.731](ha),
                      DWF=[0](cms), CN/C=[81], TP=[0.412]hrs,
                      RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
DESIGN NASHYD         ID=[6], NHYD=["303"], DT=[5]min, AREA=[2.750](ha),
                      DWF=[0](cms), CN/C=[81], TP=[0.388]hrs,
                      RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
ADD HYD               IDsum=[7], NHYD=["outlet 1"], IDs to add=[4+5+6]
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
DESIGN NASHYD         ID=[8], NHYD=["304"], DT=[5]min, AREA=[0.44](ha),
                      DWF=[0](cms), CN/C=[81], TP=[0.628]hrs,
                      RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
DESIGN STANDHYD       ID=9, NHYD=["603"], DT=[5]min, AREA=[0.525](ha),
                      XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[81],
                      SLOPE=[0.5](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
ADD HYD               IDsum=[10], NHYD=["Outlet 3"], IDs to add=[8+9](maximum ten)
*%-----------------|-----------------------------------------------------------|
FINISH
```

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

 SSSSS   W   W   M   M   H   H   Y   Y   M   M    OOO          222     000    11   77777 =========
 S       W W W   MM MM   H   H    Y Y    MM MM   O   O           2    0   0   11   7   7
 SSSSS   W W W   M M M   HHHHH     Y     M M M   O   O           2    0   0   11       7 Ver4.05.4
     S    W W    M   M   H   H     Y     M   M   O   O         222    0   0   11      7  APR 2017
 SSSSS    W W    M   M   H   H     Y     M   M    OOO          2      0   0   11     7   =========
                                                               2      0   0   11    7    # 4377549
       StormWater Management HYdrologic Model                  222     000    11    7    =========

 *****************************************************************************************
 ***************************************  SWMHYMO Ver4.05.4  *****************************
 ******************  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: Condeland Engineering Limited                ++++++++++
 ++++++++++++++++++                Concord              SERIAL#:4377549         ++++++++++
 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 *****************************************************************************************
 ******************           ++++++ PROGRAM ARRAY DIMENSIONS ++++++            **********
 ******************           Maximum value for ID numbers  :     11            **********
 ******************           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   **********************
 *****************************************************************************************
 *                 RUN DATE: 2021-01-08     TIME: 13:44:07     RUN COUNTER: 000013       *
 *****************************************************************************************
 * Input   file: X:\Projects\09015\09015 - PRE100YR (2020-09-01).dat                     *
 * Output  file: X:\Projects\09015\09015 - PRE100YR (2020-09-01).out                     *
 * Summary file: X:\Projects\09015\09015 - PRE100YR (2020-09-01).sum                     *
 * User comments:                                                                        *
 * 1:____________________________________________________________________________________*
 * 2:____________________________________________________________________________________*
 * 3:____________________________________________________________________________________*
 *****************************************************************************************

-------------------------------------------------------------------------------------------
R0001:C00001---------------------------------------------------------------------------------
*#*************************************************************************
*#  Project Name: [2147925 Ontario Limited]    Project Number: [09-015]
*#  Date         : 09-01-2020
*#  Modeller     : [JONATHAN KAPITANCHUK]
*#  Company      : Condeland Engineering Limited
*#  License #    :  4377549
*#*************************************************************************
--------------------
| START             | Project  dir.:X:\Projects\09015\
-------------------- Rainfall dir.:X:\Projects\09015\
    TZERO =  4.00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 0001
    NSTORM=   0
-------------------------------------------------------------------------------------------
R0001:C00002---------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD          |   Area    (ha)=    1.811   Curve Number   (CN)= 81.00
| 01:300        DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .473

                               New rainfall entered directly by user.
                               TIME STEP= 5.00 min   # of STEPS=    200
                               DURATION =16.67 hrs   TOTAL RAIN=  93.48 mm

      TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN
     hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr
      0:05  53.090|   2:55   2.290|   5:45   6.100|   8:35   3.300|  11:25   2.290|  14:15   1.270
      0:10   2.290|   3:00   2.290|   5:50   6.100|   8:40   3.300|  11:30   2.290|  14:20   1.270
      0:15   2.290|   3:05   2.290|   5:55   8.130|   8:45   3.300|  11:35   2.290|  14:25   1.270
      0:20   2.290|   3:10   2.290|   6:00   8.130|   8:50   3.300|  11:40   2.290|  14:30   1.270
      0:25   2.290|   3:15   2.290|   6:05  11.940|   8:55   3.300|  11:45   2.290|  14:35   1.270
      0:30   2.290|   3:20   2.290|   6:10  11.940|   9:00   3.300|  11:50   2.290|  14:40   1.270
      0:35   2.290|   3:25   3.300|   6:15  27.430|   9:05   3.300|  11:55   2.290|  14:45   1.270
      0:40   2.290|   3:30   3.300|   6:20  27.430|   9:10   3.300|  12:00   2.290|  14:50   1.270
      0:45   2.290|   3:35   3.300|   6:25  59.940|   9:15   3.300|  12:05   2.290|  14:55   1.270
      0:50   2.290|   3:40   3.300|   6:30  59.940|   9:20   3.300|  12:10   2.290|  15:00   1.270
      0:55   2.290|   3:45   3.300|   6:35 125.480|   9:25   3.300|  12:15   2.290|  15:05   1.270
      1:00   2.290|   3:50   3.300|   6:40 125.480|   9:30   3.300|  12:20   2.290|  15:10   1.270
      1:05   2.290|   3:55   3.300|   6:45  21.480|   9:35   3.300|  12:25   2.290|  15:15   1.270
      1:10   2.290|   4:00   3.300|   6:50  21.480|   9:40   3.300|  12:30   2.290|  15:20   1.270
      1:15   2.290|   4:05   3.300|   6:55  13.720|   9:45   3.300|  12:35   1.780|  15:25   1.270
      1:20   2.290|   4:10   3.300|   7:00  13.720|   9:50   3.300|  12:40   1.780|  15:30   1.270
      1:25   2.290|   4:15   3.300|   7:05   9.910|   9:55   3.300|  12:45   1.780|  15:35   1.270
      1:30   2.290|   4:20   3.300|   7:10   9.910|  10:00   3.300|  12:50   1.780|  15:40   1.270
      1:35   2.290|   4:25   3.300|   7:15   9.400|  10:05   2.290|  12:55   1.780|  15:45   1.270
      1:40   2.290|   4:30   3.300|   7:20   9.400|  10:10   2.290|  13:00   1.780|  15:50   1.270
      1:45   2.290|   4:35   3.300|   7:25   6.600|  10:15   2.290|  13:05   1.780|  15:55   1.270
      1:50   2.290|   4:40   3.300|   7:30   6.600|  10:20   2.290|  13:10   1.780|  16:00   1.270
      1:55   2.290|   4:45   3.300|   7:35   5.590|  10:25   2.290|  13:15   1.780|  16:05   1.270
      2:00   2.290|   4:50   3.300|   7:40   5.590|  10:30   2.290|  13:20   1.780|  16:10   1.270
      2:05   2.290|   4:55   3.300|   7:45   5.590|  10:35   2.290|  13:25   1.780|  16:15   1.270
      2:10   2.290|   5:00   3.300|   7:50   5.590|  10:40   2.290|  13:30   1.780|  16:20   1.270
      2:15   2.290|   5:05   6.100|   7:55   5.590|  10:45   2.290|  13:35   1.780|  16:25   1.270
      2:20   2.290|   5:10   6.100|   8:00   5.590|  10:50   2.290|  13:40   1.780|  16:30   1.270
      2:25   2.290|   5:15   6.100|   8:05   5.590|  10:55   2.290|  13:45   1.780|  16:35   1.270
      2:30   2.290|   5:20   6.100|   8:10   5.590|  11:00   2.290|  13:50   1.780|  16:40   1.270
      2:35   2.290|   5:25   6.100|   8:15   5.590|  11:05   2.290|  13:55   1.780|
      2:40   2.290|   5:30   6.100|   8:20   5.590|  11:10   2.290|  14:00   1.780|
      2:45   2.290|   5:35   6.100|   8:25   3.300|  11:15   2.290|  14:05   1.780|
      2:50   2.290|   5:40   6.100|   8:30   3.300|  11:20   2.290|  14:10   1.780|

     Unit Hyd Qpeak  (cms)=     .146

     PEAK FLOW       (cms)=     .146 (i)
     TIME TO PEAK    (hrs)=   11.000
     DURATION        (hrs)=   20.250, (dddd|hh:mm:)=   0|20:15
     AVERAGE FLOW    (cms)=     .014
     RUNOFF VOLUME    (mm)=   55.821
     TOTAL RAINFALL   (mm)=   93.480
     RUNOFF COEFFICIENT   =     .597

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

-------------------------------------------------------------------------------------------
R0001:C00003---------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD          |   Area    (ha)=    5.450   Curve Number   (CN)= 81.00
| 02:604        DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .617

     Unit Hyd Qpeak  (cms)=     .337

     PEAK FLOW       (cms)=     .362 (i)
     TIME TO PEAK    (hrs)=   11.167
     DURATION        (hrs)=   21.083, (dddd|hh:mm:)=   0|21:05
     AVERAGE FLOW    (cms)=     .040
     RUNOFF VOLUME    (mm)=   55.821
     TOTAL RAINFALL   (mm)=   93.480
     RUNOFF COEFFICIENT   =     .597

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

-------------------------------------------------------------------------------------------
R0001:C00004---------------------------------------------------------------------------------
------------------------
| ADD HYD               |
| 03:Outlet 2           |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                       (ha)     (cms)    (hrs)      (mm)    (cms)
                     ID 1 01:300             1.811      .146   11.000    55.821     .000
                    +ID 2 02:604             5.450      .362   11.167    55.821     .000
                    =================================================================
                    SUM   03:Outlet 2        7.261      .501   11.167    55.821     .000

  NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------------------
R0001:C00005---------------------------------------------------------------------------------
------------------------
| ROUTE PIPE culvert-1 | PIPE Number     =    1.00
| IN=03---> OUT=09     | Diameter    (mm)=  450.00
| DT=  5.0 min         | Length       (m)=   45.00
------------------------ Slope      (m/m)=  .01100
                         Manning n       =    .025

     *** WARNING: MINIMUM PIPE SIZE REQUIRED =   697.64   (mm)
                  THIS SIZE WAS USED IN THE ROUTING.
                  THE CAPACITY OF THIS PIPE  =      .50  (cms)

*** WARNING: New pipe size used for routing.
     <------------------- TRAVEL TIME TABLE ------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
       .037     .347E+00      .003         .348         2.15
       .073     .965E+00      .012         .543         1.38
       .110     .174E+01      .027         .699         1.07
       .147     .264E+01      .049         .831          .90
       .184     .361E+01      .076         .945          .79
       .220     .466E+01      .108        1.046          .72
       .257     .575E+01      .145        1.134          .66
       .294     .688E+01      .185        1.212          .62
       .330     .802E+01      .228        1.280          .59
       .367     .918E+01      .273        1.339          .56
       .404     .103E+02      .318        1.388          .54
       .441     .114E+02      .363        1.429          .52
       .477     .125E+02      .407        1.460          .51
       .514     .136E+02      .447        1.482          .51
       .551     .146E+02      .483        1.493          .50
       .587     .155E+02      .513        1.492          .50
       .624     .162E+02      .533        1.476          .51
       .661     .169E+02      .539        1.438          .52
       .698     .172E+02      .501        1.311          .57

                                            <---- hydrographs ---->   <-pipe / channel->
                                  AREA    QPEAK     TPEAK    R.V.   MAX DEPTH  MAX VEL
                                  (ha)    (cms)     (hrs)    (mm)      (m)      (m/s)
   INFLOW : ID= 3: Outlet 2      7.261     .501    11.167  55.821     .573      1.492
   OUTFLOW: ID= 9: culvert-1     7.261     .501    11.167  55.821     .572      1.492

-------------------------------------------------------------------------------------------
R0001:C00006---------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD          |   Area    (ha)=     .287   Curve Number   (CN)= 81.00
| 04:301        DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .244

     Unit Hyd Qpeak  (cms)=     .045

     PEAK FLOW       (cms)=     .036 (i)
     TIME TO PEAK    (hrs)=   10.750
     DURATION        (hrs)=   18.667, (dddd|hh:mm:)=   0|18:40
     AVERAGE FLOW    (cms)=     .002
     RUNOFF VOLUME    (mm)=   55.821
     TOTAL RAINFALL   (mm)=   93.480
     RUNOFF COEFFICIENT   =     .597

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

-------------------------------------------------------------------------------------------
R0001:C00007---------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD          |   Area    (ha)=    1.731   Curve Number   (CN)= 81.00
| 05:302        DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .412

     Unit Hyd Qpeak  (cms)=     .160

     PEAK FLOW       (cms)=     .153 (i)
     TIME TO PEAK    (hrs)=   11.000
     DURATION        (hrs)=   19.917, (dddd|hh:mm:)=   0|19:55
     AVERAGE FLOW    (cms)=     .013
     RUNOFF VOLUME    (mm)=   55.821
     TOTAL RAINFALL   (mm)=   93.480
     RUNOFF COEFFICIENT   =     .597

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

-------------------------------------------------------------------------------------------
R0001:C00008---------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD          |   Area    (ha)=    2.750   Curve Number   (CN)= 81.00
| 06:303        DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .388

     Unit Hyd Qpeak  (cms)=     .271

     PEAK FLOW       (cms)=     .255 (i)
     TIME TO PEAK    (hrs)=   10.917
     DURATION        (hrs)=   19.667, (dddd|hh:mm:)=   0|19:40
     AVERAGE FLOW    (cms)=     .022
     RUNOFF VOLUME    (mm)=   55.821
     TOTAL RAINFALL   (mm)=   93.480
     RUNOFF COEFFICIENT   =     .597

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

-------------------------------------------------------------------------------------------
R0001:C00009---------------------------------------------------------------------------------
------------------------
| ADD HYD               |
| 07:outlet 1           |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                       (ha)     (cms)    (hrs)      (mm)    (cms)
                     ID 1 04:301              .287      .036   10.750    55.821     .000
                    +ID 2 05:302             1.731      .153   11.000    55.821     .000
                    +ID 3 06:303             2.750      .255   10.917    55.821     .000
                    =================================================================
                    SUM   07:outlet 1        4.768      .440   10.917    55.821     .000

  NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------------------
R0001:C00010---------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD          |   Area    (ha)=     .440   Curve Number   (CN)= 81.00
| 08:304        DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .628

     Unit Hyd Qpeak  (cms)=     .027

     PEAK FLOW       (cms)=     .029 (i)
     TIME TO PEAK    (hrs)=   11.167
     DURATION        (hrs)=   21.083, (dddd|hh:mm:)=   0|21:05
     AVERAGE FLOW    (cms)=     .003
     RUNOFF VOLUME    (mm)=   55.821
     TOTAL RAINFALL   (mm)=   93.480
     RUNOFF COEFFICIENT   =     .597

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

-------------------------------------------------------------------------------------------
R0001:C00011---------------------------------------------------------------------------------
--------------------------
| DESIGN STANDHYD        |   Area    (ha)=     .52
| 09:603        DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
--------------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .26          .26
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=        .50          .50
     Length            (m)=      59.16        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     125.48        70.65
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.10 (ii)   14.39 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .31          .08
                                                              *TOTALS*
     PEAK FLOW       (cms)=        .09          .03             .118 (iii)
     TIME TO PEAK    (hrs)=      10.67        10.83           10.667
     RUNOFF VOLUME    (mm)=      92.68        55.82           74.250
     TOTAL RAINFALL   (mm)=      93.48        93.48           93.480
     RUNOFF COEFFICIENT   =        .99          .60             .794
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

-------------------------------------------------------------------------------------------
R0001:C00012---------------------------------------------------------------------------------
------------------------
| ADD HYD               |
| 10:Outlet 3           |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                       (ha)     (cms)    (hrs)      (mm)    (cms)
                     ID 1 08:304              .440      .029   11.167    55.821     .000
                    +ID 2 09:603              .525      .118   10.667    74.250     .000
                    =================================================================
                    SUM   10:Outlet 3         .965      .130   10.667    65.848     .000

  NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------------------
R0001:C00013---------------------------------------------------------------------------------
--------------------
| FINISH            |
--------------------
-------------------------------------------------------------------------------------------
*******************************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
R0001:C00005  ROUTE PIPE      ->
*** WARNING: New pipe size used for routing.
R0001:C00011  DESIGN STANDHYD
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.
   Simulation ended on 2021-01-08     at 13:44:08
===========================================================================================
```

```
2     Metric units
*#****************************************************************************
*#  Project Name: [2147925 Ontario Limited]    Project Number: [09-015]
*#  Date          : 09-01-2020
*#  Modeller      : [JONATHAN KAPITANCHUK]
*#  Company       : Condeland Engineering Limited
*#  License #     :  4377549
*#****************************************************************************
START                TZERO=[4.0],  METOUT=[2],  NSTORM=[0],  NRUN=[1]
*%                    ["SCS10YR"] <--storm filename, one per line for NSTORM time
*%-----------------|-----------------------------------------------------------|
READ STORM           STORM_FILENAME=["Hazel.STM"]
*%-----------------|-------------------------------------------------------------------------|
DESIGN NASHYD        ID=[1], NHYD=["300"], DT=[5]min, AREA=[1.811](ha),
                     DWF=[0](cms), CN/C=[81], TP=[0.473]hrs,
                     Rainfall hyetograph Hazel SCS Storm
                     RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
DESIGN NASHYD        ID=[2], NHYD=["604"], DT=[5](min), AREA=[5.45](ha),
                     DWF=[0](cms), CN/C=[81], TP=[0.617](hrs),
                     RAINFALL=[ , , , , ](mm/hour), END=-1
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
ADD HYD              IDsum=[3], NHYD=["Outlet 2"], IDs to add=[1+2](maximum ten)
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
ROUTE PIPE           PTYPE=[1]circ, IDout=[9], NHYD=["culvert-1"], RNUMBER=[1],
                     PDIAM=[450](mm), PLNGTH=[45](m),
                     PROUGH=[0.025], PSLOPE=[0.011](m/m), IDin=[3],
                     RDT=[5](min)
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
DESIGN NASHYD        ID=[4], NHYD=["301"], DT=[5]min, AREA=[0.287](ha),
                     DWF=[0](cms), CN/C=[81], TP=[0.244]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
DESIGN NASHYD        ID=[5], NHYD=["302"], DT=[5]min, AREA=[1.731](ha),
                     DWF=[0](cms), CN/C=[81], TP=[0.412]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
DESIGN NASHYD        ID=[6], NHYD=["303"], DT=[5]min, AREA=[2.750](ha),
                     DWF=[0](cms), CN/C=[81], TP=[0.388]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
ADD HYD              IDsum=[7], NHYD=["outlet 1"], IDs to add=[4+5+6]
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
DESIGN NASHYD        ID=[8], NHYD=["304"], DT=[5]min, AREA=[0.44](ha),
                     DWF=[0](cms), CN/C=[81], TP=[0.628]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
DESIGN STANDHYD      ID=9, NHYD=["603"], DT=[5]min, AREA=[0.525](ha),
                     XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[81],
                     SLOPE=[0.5](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
ADD HYD              IDsum=[10], NHYD=["Outlet 3"], IDs to add=[8+9](maximum ten)
*%-----------------|-----------------------------------------------------------|
FINISH
```

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

 SSSSS   W   W   M   M   H   H   Y   Y   M   M    OOO         222     000    11   77777 =========
 S       W W W   MM MM   H   H    Y Y    MM MM   O   O          2    0   0   11   7   7
 SSSSS   W W W   M M M   HHHHH     Y     M M M   O   O          2    0   0   11       7 Ver4.05.4
     S    W W    M   M   H   H     Y     M   M   O   O        222    0   0   11      7  APR 2017
 SSSSS    W W    M   M   H   H     Y     M   M    OOO         2      0   0   11     7   =========
                                                              2      0   0   11    7    # 4377549
       StormWater Management HYdrologic Model                 222     000    11    7    =========

 ***********************************************************************************************
 **************************************  SWMHYMO Ver4.05.4  *************************************
 ******************  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: Condeland Engineering Limited               +++++++++++++++++++
 ++++++++++++++++++               Concord              SERIAL#:4377549         +++++++++++++++++++
 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ***********************************************************************************************
 ******************           ++++++ PROGRAM ARRAY DIMENSIONS ++++++           ******************
 ******************           Maximum value for ID numbers  :     11           ******************
 ******************           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   *****************************
 ***********************************************************************************************
 *                RUN DATE: 2021-01-08     TIME: 13:44:42     RUN COUNTER: 000014              *
 ***********************************************************************************************
 * Input   file: X:\Projects\09015\09015 - PREHAZEL (2020-09-01).dat                           *
 * Output  file: X:\Projects\09015\09015 - PREHAZEL (2020-09-01).out                           *
 * Summary file: X:\Projects\09015\09015 - PREHAZEL (2020-09-01).sum                           *
 * User comments:                                                                              *
 * 1:__________________________________________________________________________________________*
 * 2:__________________________________________________________________________________________*
 * 3:__________________________________________________________________________________________*
 ***********************************************************************************************

-------------------------------------------------------------------------------------------------
R0001:C00001--------------------------------------------------------------------------------------
*#***********************************************************************
*#  Project Name: [2147925 Ontario Limited]    Project Number: [09-015]
*#  Date         : 09-01-2020
*#  Modeller     : [JONATHAN KAPITANCHUK]
*#  Company      : Condeland Engineering Limited
*#  License #    :  4377549
*#***********************************************************************
--------------------
| START              | Project  dir.:X:\Projects\09015\
-------------------- Rainfall dir.:X:\Projects\09015\
    TZERO =  4.00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 0001
    NSTORM=   0
-------------------------------------------------------------------------------------------------
R0001:C00002--------------------------------------------------------------------------------------
--------------------
| READ STORM        |  Filename: X:\Projects\09015\Hazel.STM
| Ptotal= 212.00 mm|  Comments: Hazel last 12 hrs STM IN mm/hr
--------------------
      TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN
     hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr
      1:00   6.000|   3:00   6.000|   5:00  17.000|   7:00  23.000|   9:00  13.000|  11:00  38.000
      2:00   4.000|   4:00  13.000|   6:00  13.000|   8:00  13.000|  10:00  53.000|  12:00  13.000

-------------------------------------------------------------------------------------------------
R0001:C00003--------------------------------------------------------------------------------------
-------------------------
| DESIGN NASHYD          |   Area    (ha)=    1.811   Curve Number   (CN)= 81.00
| 01:300        DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
-------------------------   U.H. Tp(hrs)=     .473

     Unit Hyd Qpeak  (cms)=     .146

     PEAK FLOW       (cms)=     .217 (i)
     TIME TO PEAK    (hrs)=   14.250
     DURATION        (hrs)=   15.583, (dddd|hh:mm:)=   0|15:35
     AVERAGE FLOW    (cms)=     .053
     RUNOFF VOLUME    (mm)=  164.063
     TOTAL RAINFALL   (mm)=  212.000
     RUNOFF COEFFICIENT   =     .774

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

-------------------------------------------------------------------------------------------------
R0001:C00004--------------------------------------------------------------------------------------
-------------------------
| DESIGN NASHYD          |   Area    (ha)=    5.450   Curve Number   (CN)= 81.00
| 02:604        DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
-------------------------   U.H. Tp(hrs)=     .617

     Unit Hyd Qpeak  (cms)=     .337

     PEAK FLOW       (cms)=     .609 (i)
     TIME TO PEAK    (hrs)=   14.500
     DURATION        (hrs)=   16.417, (dddd|hh:mm:)=   0|16:25
     AVERAGE FLOW    (cms)=     .151
     RUNOFF VOLUME    (mm)=  164.063
     TOTAL RAINFALL   (mm)=  212.000
     RUNOFF COEFFICIENT   =     .774

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

-------------------------------------------------------------------------------------------------
R0001:C00005--------------------------------------------------------------------------------------
------------------------
| ADD HYD               |
| 03:Outlet 2           |    ID:NHYD           AREA     QPEAK    TPEAK      R.V.      DWF
------------------------                       (ha)     (cms)    (hrs)      (mm)    (cms)
                      ID 1 01:300             1.811      .217   14.250   164.063     .000
                     +ID 2 02:604             5.450      .609   14.500   164.063     .000
                     ===============================================================
                     SUM   03:Outlet 2        7.261      .821   14.417   164.063     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------------------------
R0001:C00006--------------------------------------------------------------------------------------
------------------------
| ROUTE PIPE culvert-1 | PIPE Number      =    1.00
| IN=03---> OUT=09     | Diameter    (mm)=  450.00
| DT=  5.0 min         | Length       (m)=   45.00
------------------------ Slope       (m/m)=  .01100
                         Manning n        =    .025

     *** WARNING: MINIMUM PIPE SIZE REQUIRED =   839.74   (mm)
                  THIS SIZE WAS USED IN THE ROUTING.
                  THE CAPACITY OF THIS PIPE  =      .82  (cms)

*** WARNING: New pipe size used for routing.
     <------------------- TRAVEL TIME TABLE ------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)     (cms)        (m/s)        min
        .044     .503E+00     .004         .394        1.90
        .088     .140E+01     .019         .614        1.22
        .133     .253E+01     .044         .791         .95
        .177     .382E+01     .080         .940         .80
        .221     .524E+01     .125        1.070         .70
        .265     .675E+01     .178        1.184         .63
        .309     .833E+01     .238        1.284         .58
        .354     .997E+01     .304        1.372         .55
        .398     .116E+02     .374        1.449         .52
        .442     .133E+02     .448        1.515         .50
        .486     .150E+02     .522        1.571         .48
        .530     .166E+02     .596        1.617         .46
        .575     .182E+02     .667        1.652         .45
        .619     .197E+02     .733        1.677         .45
        .663     .211E+02     .792        1.689         .44
        .707     .224E+02     .840        1.688         .44
        .751     .235E+02     .873        1.670         .45
        .796     .244E+02     .883        1.627         .46
        .840     .249E+02     .821        1.483         .51

                                                <---- hydrographs ---->   <-pipe / channel->
                                   AREA     QPEAK     TPEAK    R.V.   MAX DEPTH  MAX VEL
                                   (ha)     (cms)     (hrs)    (mm)      (m)      (m/s)
   INFLOW : ID= 3: Outlet 2        7.261     .821    14.417 164.063     .689      1.689
   OUTFLOW: ID= 9: culvert-1       7.261     .821    14.417 164.063     .689      1.689

-------------------------------------------------------------------------------------------------
R0001:C00007--------------------------------------------------------------------------------------
-------------------------
| DESIGN NASHYD          |   Area    (ha)=     .287   Curve Number   (CN)= 81.00
| 04:301        DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
-------------------------   U.H. Tp(hrs)=     .244

     Unit Hyd Qpeak  (cms)=     .045

     PEAK FLOW       (cms)=     .038 (i)
     TIME TO PEAK    (hrs)=   14.000
     DURATION        (hrs)=   14.000, (dddd|hh:mm:)=   0|14:00
     AVERAGE FLOW    (cms)=     .009
     RUNOFF VOLUME    (mm)=  164.063
     TOTAL RAINFALL   (mm)=  212.000
     RUNOFF COEFFICIENT   =     .774

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

-------------------------------------------------------------------------------------------------
R0001:C00008--------------------------------------------------------------------------------------
-------------------------
| DESIGN NASHYD          |   Area    (ha)=    1.731   Curve Number   (CN)= 81.00
| 05:302        DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
-------------------------   U.H. Tp(hrs)=     .412

     Unit Hyd Qpeak  (cms)=     .160

     PEAK FLOW       (cms)=     .214 (i)
     TIME TO PEAK    (hrs)=   14.167
     DURATION        (hrs)=   15.250, (dddd|hh:mm:)=   0|15:15
     AVERAGE FLOW    (cms)=     .052
     RUNOFF VOLUME    (mm)=  164.063
     TOTAL RAINFALL   (mm)=  212.000
     RUNOFF COEFFICIENT   =     .774

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

-------------------------------------------------------------------------------------------------
R0001:C00009--------------------------------------------------------------------------------------
-------------------------
| DESIGN NASHYD          |   Area    (ha)=    2.750   Curve Number   (CN)= 81.00
| 06:303        DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
-------------------------   U.H. Tp(hrs)=     .388

     Unit Hyd Qpeak  (cms)=     .271

     PEAK FLOW       (cms)=     .345 (i)
     TIME TO PEAK    (hrs)=   14.083
     DURATION        (hrs)=   15.000, (dddd|hh:mm:)=   0|15:00
     AVERAGE FLOW    (cms)=     .084
     RUNOFF VOLUME    (mm)=  164.063
     TOTAL RAINFALL   (mm)=  212.000
     RUNOFF COEFFICIENT   =     .774

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

-------------------------------------------------------------------------------------------------
R0001:C00010--------------------------------------------------------------------------------------
------------------------
| ADD HYD               |
| 07:outlet 1           |    ID:NHYD           AREA     QPEAK    TPEAK      R.V.      DWF
------------------------                       (ha)     (cms)    (hrs)      (mm)    (cms)
                      ID 1 04:301              .287      .038   14.000   164.063     .000
                     +ID 2 05:302             1.731      .214   14.167   164.063     .000
                     +ID 3 06:303             2.750      .345   14.083   164.063     .000
                     ===============================================================
                     SUM   07:outlet 1        4.768      .596   14.083   164.063     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------------------------
R0001:C00011--------------------------------------------------------------------------------------
-------------------------
| DESIGN NASHYD          |   Area    (ha)=     .440   Curve Number   (CN)= 81.00
| 08:304        DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
-------------------------   U.H. Tp(hrs)=     .628

     Unit Hyd Qpeak  (cms)=     .027

     PEAK FLOW       (cms)=     .049 (i)
     TIME TO PEAK    (hrs)=   14.500
     DURATION        (hrs)=   16.417, (dddd|hh:mm:)=   0|16:25
     AVERAGE FLOW    (cms)=     .012
     RUNOFF VOLUME    (mm)=  164.063
     TOTAL RAINFALL   (mm)=  212.000
     RUNOFF COEFFICIENT   =     .774

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

-------------------------------------------------------------------------------------------------
R0001:C00012--------------------------------------------------------------------------------------
-------------------------
| DESIGN STANDHYD        |   Area    (ha)=     .52
| 09:603        DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
-------------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .26          .26
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=        .50          .50
     Length            (m)=      59.16        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      53.00        48.83
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.96 (ii)   17.21 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .28          .07
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .04          .03          .073 (iii)
     TIME TO PEAK    (hrs)=      13.50        14.00        14.000
     RUNOFF VOLUME    (mm)=     211.19       164.06       187.627
     TOTAL RAINFALL   (mm)=     212.00       212.00       212.000
     RUNOFF COEFFICIENT   =       1.00          .77          .885
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

-------------------------------------------------------------------------------------------------
R0001:C00013--------------------------------------------------------------------------------------
------------------------
| ADD HYD               |
| 10:Outlet 3           |    ID:NHYD           AREA     QPEAK    TPEAK      R.V.      DWF
------------------------                       (ha)     (cms)    (hrs)      (mm)    (cms)
                      ID 1 08:304              .440      .049   14.500   164.063     .000
                     +ID 2 09:603              .525      .073   14.000   187.627     .000
                     ===============================================================
                     SUM   10:Outlet 3         .965      .115   14.000   176.883     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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R0001:C00014--------------------------------------------------------------------------------------
--------------------
| FINISH             |
--------------------
-------------------------------------------------------------------------------------------------
*************************************************************************************************
       WARNINGS / ERRORS / NOTES
       -------------------------
R0001:C00006  ROUTE PIPE      ->
*** WARNING: New pipe size used for routing.
R0001:C00012  DESIGN STANDHYD
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.
    Simulation ended on 2021-01-08      at 13:44:42
=================================================================================================
```

Post-development 2-100 year and Regional

```
2     Metric units
*#*****************************************************************************
*#  Project Name: [214925 ONTARIO LIMITED]    Project Number: [09-015]
*#  Date        : 18-09-2020
*#  Modeller    : [Jonathan Kapitanchuk]
*#  Company     : Condeland Engineering Limited
*#  License #   :  4377549
*#*****************************************************************************
START                TZERO=[4.0],  METOUT=[2],  NSTORM=[0],  NRUN=[1]
*%                    [  ] <--storm filename, one per line for NSTORM time
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*# DISCRITIZING THE 24 HOUR-2 YEAR SCS STORM THROUGH PROPOSED POND
*%------------------------------------------------------------------------------|
DESIGN STANDHYD      ID=1, NHYD=["601"], DT=[5]min, AREA=[0.624](ha),
                     XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[81],
                     Rainfall Hyetograph TWO YR SCS storm
                     Rainfall begins at four hours
                     21.42 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02
                     1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02
                     1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02
                     1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02
                     1.52 1.52 1.52 1.52 1.52 1.52 1.52 1.52 1.52 1.52
                     1.52 1.52 1.52 1.52 1.52 1.52 1.52 1.52 1.52 1.52
                     3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05
                     4.06 4.06 5.84 5.84 13.21 13.21 28.96 28.96 60.45 60.45
                     10.67 10.67 6.60 6.60 4.83 4.83 4.57 4.57 3.30 3.30
                     2.79 2.79 2.79 2.79 2.79 2.79 2.79 2.79 2.79 2.79
                     1.52 1.52 1.52 1.52 1.52 1.52 1.52 1.52 1.52 1.52
                     1.52 1.52 1.52 1.52 1.52 1.52 1.52 1.52 1.52 1.52
                     1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02
                     1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02
                     1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02
                     0.76 0.76 0.76 0.76 0.76 0.76 0.76 0.76 0.76 0.76
                     0.76 0.76 0.76 0.76 0.76 0.76 0.76 0.76 0.76 0.76
                     0.51 0.51 0.51 0.51 0.51 0.51 0.51 0.51 0.51 0.51
                     0.51 0.51 0.51 0.51 0.51 0.51 0.51 0.51 0.51 0.51
                     0.51 0.51 0.51 0.51 0.51 0.51 0.51 0.51 0.51 0.51
                     (mm/hr), END=-1
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
ROUTE PIPE           PTYPE=[1]circ, IDout=[8], NHYD=["Outlet 2"], RNUMBER=[1],
                     PDIAM=[450](mm), PLNGTH=[45](m),
                     PROUGH=[0.025], PSLOPE=[0.011](m/m), IDin=[1],
                     RDT=[5](min)
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
DESIGN STANDHYD      ID=3, NHYD=["602"], DT=[5]min, AREA=[6.545](ha),
                     XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[81],
                     SLOPE=[0.5](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
ROUTE RESERVOIR      IDout=[4],   NHYD=["Pond"],  IDin=[3],
                     RDT=[5](min),
                           TABLE of ( OUTFLOW-STORAGE ) values
                                        (cms) - (ha-m)
                                         [   0.0 ,  0.0 ]
                                      [    0.0574,0.0310]
                                      [    0.0994,0.0478]
                                      [    0.1283,0.0654]
                                      [    0.1518,0.0838]
                                      [    0.1721,0.1032]
                                      [    0.2013,0.1232]
                                      [    0.3065,0.1438]
                                      [    0.4566,0.1650]
                                      [    0.6394,0.1866]
                                      [    0.8493,0.2089]
                                      [    1.0829,0.2317]
                                       [   -1  ,  -1  ]     (max twenty pts)
*%-----------------------------------------------------------------------|
*%-----------------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
DESIGN STANDHYD      ID=5, NHYD=["603"], DT=[5]min, AREA=[0.101](ha),
                     XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[81],
                     SLOPE=[0.5](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|------------------------------------------------------------|
DESIGN STANDHYD      ID=6, NHYD=["605"], DT=[5]min, AREA=[0.137](ha),
                     XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[81],
                     SLOPE=[0.5](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|------------------------------------------------------------|
ADD HYD              IDsum=[7], NHYD=["Outlet 3"], IDs to add=[5+6]
*%-----------------------------------------------------------------------|
DESIGN NASHYD        ID=[9], NHYD=["604"], DT=[5](min), AREA=[5.45](ha),
                     DWF=[0](cms), CN/C=[81], TP=[0.617](hrs),
                     RAINFALL=[ , , , , ](mm/hour), END=-1
*%-----------------------------------------------------------------------|
FINISH
```

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

 SSSSS   W   W   M   M   H   H   Y   Y   M   M    OOO         222     000    11   77777 =========
 S       W W W   MM MM   H   H    Y Y    MM MM   O   O          2    0   0   11   7   7
 SSSSS   W W W   M M M   HHHHH     Y     M M M   O   O          2    0   0   11       7 Ver4.05.4
     S    W W    M   M   H   H     Y     M   M   O   O        222    0   0   11      7  APR 2017
 SSSSS    W W    M   M   H   H     Y     M   M    OOO         2      0   0   11     7   =========
                                                              2      0   0   11    7    # 4377549
       StormWater Management HYdrologic Model                  222     000    11    7    =========

 ******************************************************************************************
 **********************************  SWMHYMO Ver4.05.4  ************************************
 *****************  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: Condeland Engineering Limited                +++++++++++++++++
 +++++++++++++++++                Concord               SERIAL#:4377549        +++++++++++++++++
 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ******************************************************************************************
 *****************           ++++++ PROGRAM ARRAY DIMENSIONS ++++++            *****************
 *****************           Maximum value for ID numbers  :     11            *****************
 *****************           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   ******************************
 ******************************************************************************************
 *                 RUN DATE: 2021-01-08     TIME: 11:51:02     RUN COUNTER: 000001          *
 ******************************************************************************************
 * Input   file: X:\Projects\09015\09015 - Pond2yr (2020-09-01).dat                         *
 * Output  file: X:\Projects\09015\09015 - Pond2yr (2020-09-01).out                         *
 * Summary file: X:\Projects\09015\09015 - Pond2yr (2020-09-01).sum                         *
 * User comments:                                                                           *
 * 1:_______________________________________________________________________________________*
 * 2:_______________________________________________________________________________________*
 * 3:_______________________________________________________________________________________*
 ******************************************************************************************

------------------------------------------------------------------------------------------
R0001:C00001-------------------------------------------------------------------------------
*#*****************************************************************************
*#  Project Name: [214925 ONTARIO LIMITED]    Project Number: [09-015]
*#  Date        : 18-09-2020
*#  Modeller    : [Jonathan Kapitanchuk]
*#  Company     : Condeland Engineering Limited
*#  License #   :  4377549
*#*****************************************************************************
--------------------
| START             | Project  dir.:X:\Projects\09015\
-------------------- Rainfall dir.:X:\Projects\09015\
    TZERO =  4.00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 0001
    NSTORM=   0
------------------------------------------------------------------------------------------
R0001:C00002-------------------------------------------------------------------------------
*# DISCRITIZING THE 24 HOUR-2 YEAR SCS STORM THROUGH PROPOSED POND
--------------------------
| DESIGN STANDHYD          |   Area    (ha)=     .62
| 01:601        DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
--------------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=         .31           .31
     Dep. Storage     (mm)=         .80          1.50
     Average Slope     (%)=       21.42         21.42
     Length            (m)=       64.50         40.00
     Mannings n           =        .013          .250

                                New rainfall entered directly by user.
                                TIME STEP= 5.00 min   # of STEPS=    199
                                DURATION =16.58 hrs   TOTAL RAIN=  42.09 mm

       TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN
      hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr
       0:05   1.020|   2:55   1.020|   5:45   3.050|   8:35   1.520|  11:25   1.020|  14:15    .510
       0:10   1.020|   3:00   1.020|   5:50   4.060|   8:40   1.520|  11:30   1.020|  14:20    .510
       0:15   1.020|   3:05   1.020|   5:55   4.060|   8:45   1.520|  11:35   1.020|  14:25    .510
       0:20   1.020|   3:10   1.020|   6:00   5.840|   8:50   1.520|  11:40   1.020|  14:30    .510
       0:25   1.020|   3:15   1.020|   6:05   5.840|   8:55   1.520|  11:45   1.020|  14:35    .510
       0:30   1.020|   3:20   1.520|   6:10  13.210|   9:00   1.520|  11:50   1.020|  14:40    .510
       0:35   1.020|   3:25   1.520|   6:15  13.210|   9:05   1.520|  11:55   1.020|  14:45    .510
       0:40   1.020|   3:30   1.520|   6:20  28.960|   9:10   1.520|  12:00   1.020|  14:50    .510
       0:45   1.020|   3:35   1.520|   6:25  28.960|   9:15   1.520|  12:05   1.020|  14:55    .510
       0:50   1.020|   3:40   1.520|   6:30  60.450|   9:20   1.520|  12:10   1.020|  15:00    .510
       0:55   1.020|   3:45   1.520|   6:35  60.450|   9:25   1.520|  12:15   1.020|  15:05    .510
       1:00   1.020|   3:50   1.520|   6:40  10.670|   9:30   1.520|  12:20   1.020|  15:10    .510
       1:05   1.020|   3:55   1.520|   6:45  10.670|   9:35   1.520|  12:25   1.020|  15:15    .510
       1:10   1.020|   4:00   1.520|   6:50   6.600|   9:40   1.520|  12:30    .760|  15:20    .510
       1:15   1.020|   4:05   1.520|   6:55   6.600|   9:45   1.520|  12:35    .760|  15:25    .510
       1:20   1.020|   4:10   1.520|   7:00   4.830|   9:50   1.520|  12:40    .760|  15:30    .510
       1:25   1.020|   4:15   1.520|   7:05   4.830|   9:55   1.520|  12:45    .760|  15:35    .510
       1:30   1.020|   4:20   1.520|   7:10   4.570|  10:00   1.020|  12:50    .760|  15:40    .510
       1:35   1.020|   4:25   1.520|   7:15   4.570|  10:05   1.020|  12:55    .760|  15:45    .510
       1:40   1.020|   4:30   1.520|   7:20   3.300|  10:10   1.020|  13:00    .760|  15:50    .510
       1:45   1.020|   4:35   1.520|   7:25   3.300|  10:15   1.020|  13:05    .760|  15:55    .510
       1:50   1.020|   4:40   1.520|   7:30   2.790|  10:20   1.020|  13:10    .760|  16:00    .510
       1:55   1.020|   4:45   1.520|   7:35   2.790|  10:25   1.020|  13:15    .760|  16:05    .510
       2:00   1.020|   4:50   1.520|   7:40   2.790|  10:30   1.020|  13:20    .760|  16:10    .510
       2:05   1.020|   4:55   1.520|   7:45   2.790|  10:35   1.020|  13:25    .760|  16:15    .510
       2:10   1.020|   5:00   3.050|   7:50   2.790|  10:40   1.020|  13:30    .760|  16:20    .510
       2:15   1.020|   5:05   3.050|   7:55   2.790|  10:45   1.020|  13:35    .760|  16:25    .510
       2:20   1.020|   5:10   3.050|   8:00   2.790|  10:50   1.020|  13:40    .760|  16:30    .510
       2:25   1.020|   5:15   3.050|   8:05   2.790|  10:55   1.020|  13:45    .760|  16:35    .510
       2:30   1.020|   5:20   3.050|   8:10   2.790|  11:00   1.020|  13:50    .760|
       2:35   1.020|   5:25   3.050|   8:15   2.790|  11:05   1.020|  13:55    .760|
       2:40   1.020|   5:30   3.050|   8:20   1.520|  11:10   1.020|  14:00    .760|
       2:45   1.020|   5:35   3.050|   8:25   1.520|  11:15   1.020|  14:05    .760|
       2:50   1.020|   5:40   3.050|   8:30   1.520|  11:20   1.020|  14:10    .510|

     Max.eff.Inten.(mm/hr)=       60.45         29.05
                over (min)        5.00          5.00
     Storage Coeff.  (min)=         .96 (ii)     6.64 (ii)
     Unit Hyd. Tpeak (min)=        5.00          5.00
     Unit Hyd. peak  (cms)=         .34           .18
                                                             *TOTALS*
     PEAK FLOW       (cms)=         .05           .02           .073 (iii)
     TIME TO PEAK    (hrs)=       10.58         10.58         10.583
     RUNOFF VOLUME    (mm)=       41.29         16.44         28.865
     TOTAL RAINFALL   (mm)=       42.09         42.09         42.088
     RUNOFF COEFFICIENT   =         .98           .39           .686
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

------------------------------------------------------------------------------------------
R0001:C00003-------------------------------------------------------------------------------
-----------------------
| ROUTE PIPE Outlet 2  | PIPE Number     =    1.00
| IN=01---> OUT=08     | Diameter    (mm)= 450.00
| DT=  5.0 min         | Length       (m)=   45.00
----------------------- Slope      (m/m)=  .01100
                         Manning n       =    .025

       <------------------- TRAVEL TIME TABLE ------------------->
        DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
         (m)       (cu.m.)     (cms)        (m/s)        min
         .024     .144E+00     .001          .260        2.89
         .047     .402E+00     .004          .405        1.85
         .071     .725E+00     .008          .522        1.44
         .095     .110E+01     .015          .620        1.21
         .118     .150E+01     .024          .706        1.06
         .142     .194E+01     .034          .781         .96
         .166     .239E+01     .045          .847         .89
         .189     .286E+01     .058          .905         .83
         .213     .334E+01     .071          .956         .78
         .237     .382E+01     .085          .999         .75
         .261     .429E+01     .099         1.036         .72
         .284     .476E+01     .113         1.067         .70
         .308     .522E+01     .126         1.090         .69
         .332     .565E+01     .139         1.106         .68
         .355     .606E+01     .150         1.114         .67
         .379     .643E+01     .159         1.114         .67
         .403     .676E+01     .165         1.102         .68
         .426     .701E+01     .167         1.073         .70
         .450     .716E+01     .156          .979         .77

                                           <---- hydrographs ---->   <-pipe / channel->
                                   AREA     QPEAK    TPEAK    R.V.   MAX DEPTH  MAX VEL
                                   (ha)     (cms)    (hrs)    (mm)      (m)      (m/s)
    INFLOW : ID= 1: 601            .624      .073   10.583  28.865     .216      .961
   OUTFLOW: ID= 8: Outlet 2        .624      .078   10.583  28.865     .225      .977

------------------------------------------------------------------------------------------
R0001:C00004-------------------------------------------------------------------------------
--------------------------
| DESIGN STANDHYD          |   Area    (ha)=     6.55
| 03:602        DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
--------------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        3.27          3.27
     Dep. Storage     (mm)=         .80          1.50
     Average Slope     (%)=         .50           .50
     Length            (m)=      208.89         40.00
     Mannings n           =        .013          .250

     Max.eff.Inten.(mm/hr)=       60.45         14.00
                over (min)        5.00         30.00
     Storage Coeff.  (min)=        5.98 (ii)    29.47 (ii)
     Unit Hyd. Tpeak (min)=        5.00         30.00
     Unit Hyd. peak  (cms)=         .19           .04
                                                             *TOTALS*
     PEAK FLOW       (cms)=         .49           .08           .525 (iii)
     TIME TO PEAK    (hrs)=       10.58         11.00         10.583
     RUNOFF VOLUME    (mm)=       41.29         16.45         28.867
     TOTAL RAINFALL   (mm)=       42.09         42.09         42.088
     RUNOFF COEFFICIENT   =         .98           .39           .686

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

------------------------------------------------------------------------------------------
R0001:C00005-------------------------------------------------------------------------------
-----------------------
|  ROUTE RESERVOIR -> |    Requested routing time step =  5.0 min.
|  IN>03:602          |
| OUT<04:Pond         | ========================  OUTLFOW STORAGE TABLE  ========================
----------------------- OUTFLOW   STORAGE| OUTFLOW   STORAGE| OUTFLOW   STORAGE| OUTFLOW   STORAGE
                         (cms)   (ha.m.)|   (cms)   (ha.m.)|   (cms)   (ha.m.)|   (cms)   (ha.m.)
                          .000 .0000E+00|    .128 .6540E-01|    .201 .1232E+00|    .639 .1866E+00
                          .057 .3100E-01|    .152 .8380E-01|    .306 .1438E+00|    .849 .2089E+00
                          .099 .4780E-01|    .172 .1032E+00|    .457 .1650E+00|   1.083 .2317E+00

     ROUTING RESULTS              AREA     QPEAK     TPEAK       R.V.
     ----------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW > 03:602             6.545      .525    10.583     28.867
    OUTFLOW < 04:Pond            6.545      .128    11.083     28.867

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=   24.401
                  TIME SHIFT OF PEAK FLOW         (min)=    30.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=.6540E-01

------------------------------------------------------------------------------------------
R0001:C00006-------------------------------------------------------------------------------
--------------------------
| DESIGN STANDHYD          |   Area    (ha)=     .10
| 05:603        DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
--------------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=         .05           .05
     Dep. Storage     (mm)=         .80          1.50
     Average Slope     (%)=         .50           .50
     Length            (m)=       25.95         40.00
     Mannings n           =        .013          .250

     Max.eff.Inten.(mm/hr)=       60.45         15.68
                over (min)        5.00         25.00
     Storage Coeff.  (min)=        1.71 (ii)    24.16 (ii)
     Unit Hyd. Tpeak (min)=        5.00         25.00
     Unit Hyd. peak  (cms)=         .32           .05
                                                             *TOTALS*
     PEAK FLOW       (cms)=         .01           .00           .009 (iii)
     TIME TO PEAK    (hrs)=       10.58         10.92         10.583
     RUNOFF VOLUME    (mm)=       41.29         16.45         28.867
     TOTAL RAINFALL   (mm)=       42.09         42.09         42.088
     RUNOFF COEFFICIENT   =         .98           .39           .686
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

------------------------------------------------------------------------------------------
R0001:C00007-------------------------------------------------------------------------------
--------------------------
| DESIGN STANDHYD          |   Area    (ha)=     .14
| 06:605        DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
--------------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=         .07           .07
     Dep. Storage     (mm)=         .80          1.50
     Average Slope     (%)=         .50           .50
     Length            (m)=       30.22         40.00
     Mannings n           =        .013          .250

     Max.eff.Inten.(mm/hr)=       60.45         15.68
                over (min)        5.00         25.00
     Storage Coeff.  (min)=        1.88 (ii)    24.32 (ii)
     Unit Hyd. Tpeak (min)=        5.00         25.00
     Unit Hyd. peak  (cms)=         .32           .05
                                                             *TOTALS*
     PEAK FLOW       (cms)=         .01           .00           .012 (iii)
     TIME TO PEAK    (hrs)=       10.58         10.92         10.583
     RUNOFF VOLUME    (mm)=       41.29         16.45         28.867
     TOTAL RAINFALL   (mm)=       42.09         42.09         42.088
     RUNOFF COEFFICIENT   =         .98           .39           .686
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

------------------------------------------------------------------------------------------
R0001:C00008-------------------------------------------------------------------------------
------------------------
| ADD HYD                |
| 07:Outlet 3            |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                        (ha)     (cms)    (hrs)      (mm)   (cms)
                        ID 1 05:603             .101      .009   10.583    28.867    .000
                       +ID 2 06:605             .137      .012   10.583    28.867    .000
                       ==========================================================
                       SUM   07:Outlet 3        .238      .022   10.583    28.867    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------------------
R0001:C00009-------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD            |   Area    (ha)=    5.450   Curve Number   (CN)= 81.00
| 09:604        DT= 5.00 |   Ia       (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .617

     Unit Hyd Qpeak  (cms)=     .337

     PEAK FLOW       (cms)=     .107 (i)
     TIME TO PEAK    (hrs)=   11.167
     DURATION        (hrs)=   21.000, (dddd|hh:mm:)=   0|21:00
     AVERAGE FLOW    (cms)=     .012
     RUNOFF VOLUME    (mm)=   16.446
     TOTAL RAINFALL   (mm)=   42.088
     RUNOFF COEFFICIENT   =     .391

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

------------------------------------------------------------------------------------------
R0001:C00010-------------------------------------------------------------------------------
--------------------
| FINISH            |
--------------------
------------------------------------------------------------------------------------------
******************************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
R0001:C00002  DESIGN STANDHYD
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.
R0001:C00006  DESIGN STANDHYD
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.
R0001:C00007  DESIGN STANDHYD
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.
   Simulation ended on 2021-01-08     at 11:51:02
==========================================================================================
```

```
2     Metric units
*#****************************************************************************
*#  Project Name: [214925 ONTARIO LIMITED]    Project Number: [09-015]
*#  Date        : 18-09-2020
*#  Modeller    : [Jonathan Kapitanchuk]
*#  Company     : Condeland Engineering Limited
*#  License #   :  4377549
*#****************************************************************************
START                 TZERO=[4.0],  METOUT=[2],  NSTORM=[0],  NRUN=[1]
*%                     [  ] <--storm filename, one per line for NSTORM time
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
*# DISCRITIZING THE 24 HOUR-5 YEAR SCS STORM THROUGH PROPOSED POND
*%-----------------------------------------------------------------------------|
DESIGN STANDHYD       ID=1, NHYD=["601"], DT=[5]min, AREA=[0.624](ha),
                      XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[81],
                      Rainfall hyetograph Five Yr SCS storm
                      Rainfall begins at four hours
                      31.75 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27
                      1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27
                      1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27
                      1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27
                      1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78
                      1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78
                      3.30 3.30 3.30 3.30 3.30 3.30 3.30 3.30 3.30 3.30
                      4.57 4.57 6.60 6.60 15.24 15.24 33.27 33.27 69.6 69.6
                      12.19 12.19 7.62 7.62 5.59 5.59 5.08 5.08 3.81 3.81
                      3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05
                      1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78
                      1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78
                      1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27
                      1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27
                      1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27
                      1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02
                      1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02
                      0.76 0.76 0.76 0.76 0.76 0.76 0.76 0.76 0.76 0.76
                      0.76 0.76 0.76 0.76 0.76 0.76 0.76 0.76 0.76 0.76
                      0.76 0.76 0.76 0.76 0.76 0.76 0.76 0.76 0.76 0.76
                      (mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
ROUTE PIPE            PTYPE=[1]circ, IDout=[8], NHYD=["Outlet 2"], RNUMBER=[1],
                      PDIAM=[450](mm), PLNGTH=[45](m),
                      PROUGH=[0.025], PSLOPE=[0.011](m/m), IDin=[1],
                      RDT=[5](min)
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
DESIGN STANDHYD       ID=3, NHYD=["602"], DT=[5]min, AREA=[6.545](ha),
                      XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[81],
                      SLOPE=[0.5](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
ROUTE RESERVOIR       IDout=[4],   NHYD=["Pond"],  IDin=[3],
                      RDT=[5](min),
                            TABLE of ( OUTFLOW-STORAGE ) values
                                        (cms) - (ha-m)
                                         [   0.0 ,  0.0 ]
                                      [    0.0574,0.0310]
                                      [    0.0994,0.0478]
                                      [    0.1283,0.0654]
                                      [    0.1518,0.0838]
                                      [    0.1721,0.1032]
                                      [    0.2013,0.1232]
                                      [    0.3065,0.1438]
                                      [    0.4566,0.1650]
                                      [    0.6394,0.1866]
                                      [    0.8493,0.2089]
                                      [    1.0829,0.2317]
                                       [   -1  ,  -1  ]     (max twenty pts)
*%----------------------------------------------------------------------|
*%----------------------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
DESIGN STANDHYD       ID=5, NHYD=["603"], DT=[5]min, AREA=[0.101](ha),
                      XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[81],
                      SLOPE=[0.5](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
DESIGN STANDHYD       ID=6, NHYD=["605"], DT=[5]min, AREA=[0.137](ha),
                      XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[81],
                      SLOPE=[0.5](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
ADD HYD               IDsum=[7], NHYD=["Outlet 3"], IDs to add=[5+6]
*%----------------------------------------------------------------------|
DESIGN NASHYD         ID=[9], NHYD=["604"], DT=[5](min), AREA=[5.45](ha),
                      DWF=[0](cms), CN/C=[81], TP=[0.617](hrs),
                      RAINFALL=[ , , , , ](mm/hour), END=-1
*%----------------------------------------------------------------------|
FINISH
```

```
===========================================================================================
SSSSS   W   W   M   M   H   H   Y   Y   M   M    OOO          222     000    11   77777 =========
S       W W W   MM MM   H   H    Y Y    MM MM   O   O           2    0   0   11   7   7
SSSSS   W W W   M M M   HHHHH     Y     M M M   O   O           2    0   0   11       7 Ver4.05.4
    S    W W    M   M   H   H     Y     M   M   O   O         222    0   0   11      7  APR 2017
SSSSS    W W    M   M   H   H     Y     M   M    OOO          2      0   0   11     7   =========
                                                              2      0   0   11    7    # 4377549
      StormWater Management HYdrologic Model                  222     000    11    7    =========

*******************************************************************************************
*************************************  SWMHYMO Ver4.05.4  *********************************
*****************  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: Condeland Engineering Limited                +++++++++++++
+++++++++++++++++                Concord              SERIAL#:4377549         +++++++++++++
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

*******************************************************************************************
*****************           ++++++ PROGRAM ARRAY DIMENSIONS ++++++            *************
*****************           Maximum value for ID numbers  :     11            *************
*****************           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  ****************************
*******************************************************************************************
*                 RUN DATE: 2021-01-08     TIME: 11:51:25     RUN COUNTER: 000002         *
*******************************************************************************************
* Input   file: X:\Projects\09015\09015 - Pond5yr (2020-09-02).dat                        *
* Output  file: X:\Projects\09015\09015 - Pond5yr (2020-09-02).out                        *
* Summary file: X:\Projects\09015\09015 - Pond5yr (2020-09-02).sum                        *
* User comments:                                                                          *
* 1:______________________________________________________________________________________*
* 2:______________________________________________________________________________________*
* 3:______________________________________________________________________________________*
*******************************************************************************************

--------------------------------------------------------------------------------------------
R0001:C00001---------------------------------------------------------------------------------
*#***********************************************************************
*#  Project Name: [214925 ONTARIO LIMITED]    Project Number: [09-015]
*#  Date        : 18-09-2020
*#  Modeller    : [Jonathan Kapitanchuk]
*#  Company     : Condeland Engineering Limited
*#  License #   :  4377549
*#***********************************************************************
--------------------
| START             | Project  dir.:X:\Projects\09015\
-------------------- Rainfall dir.:X:\Projects\09015\
    TZERO =  4.00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 0001
    NSTORM=   0
--------------------------------------------------------------------------------------------
R0001:C00002---------------------------------------------------------------------------------
*# DISCRITIZING THE 24 HOUR-5 YEAR SCS STORM THROUGH PROPOSED POND
--------------------------
| DESIGN STANDHYD        |   Area    (ha)=     .62
| 01:601         DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
--------------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .31          .31
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=      31.75        31.75
     Length            (m)=      64.50        40.00
     Mannings n          =        .013         .250

                               New rainfall entered directly by user.
                               TIME STEP= 5.00 min   # of STEPS=    199
                               DURATION =16.58 hrs   TOTAL RAIN=  49.39 mm

      TIME    RAIN|  TIME    RAIN|  TIME    RAIN|  TIME    RAIN|  TIME    RAIN|  TIME    RAIN
     hh:mm   mm/hr| hh:mm   mm/hr| hh:mm   mm/hr| hh:mm   mm/hr| hh:mm   mm/hr| hh:mm   mm/hr
      0:05   1.270|  2:55   1.270|  5:45   3.300|  8:35   1.780| 11:25   1.270| 14:15    .760
      0:10   1.270|  3:00   1.270|  5:50   4.570|  8:40   1.780| 11:30   1.270| 14:20    .760
      0:15   1.270|  3:05   1.270|  5:55   4.570|  8:45   1.780| 11:35   1.270| 14:25    .760
      0:20   1.270|  3:10   1.270|  6:00   6.600|  8:50   1.780| 11:40   1.270| 14:30    .760
      0:25   1.270|  3:15   1.270|  6:05   6.600|  8:55   1.780| 11:45   1.270| 14:35    .760
      0:30   1.270|  3:20   1.780|  6:10  15.240|  9:00   1.780| 11:50   1.270| 14:40    .760
      0:35   1.270|  3:25   1.780|  6:15  15.240|  9:05   1.780| 11:55   1.270| 14:45    .760
      0:40   1.270|  3:30   1.780|  6:20  33.270|  9:10   1.780| 12:00   1.270| 14:50    .760
      0:45   1.270|  3:35   1.780|  6:25  33.270|  9:15   1.780| 12:05   1.270| 14:55    .760
      0:50   1.270|  3:40   1.780|  6:30  69.600|  9:20   1.780| 12:10   1.270| 15:00    .760
      0:55   1.270|  3:45   1.780|  6:35  69.600|  9:25   1.780| 12:15   1.270| 15:05    .760
      1:00   1.270|  3:50   1.780|  6:40  12.190|  9:30   1.780| 12:20   1.270| 15:10    .760
      1:05   1.270|  3:55   1.780|  6:45  12.190|  9:35   1.780| 12:25   1.270| 15:15    .760
      1:10   1.270|  4:00   1.780|  6:50   7.620|  9:40   1.780| 12:30   1.020| 15:20    .760
      1:15   1.270|  4:05   1.780|  6:55   7.620|  9:45   1.780| 12:35   1.020| 15:25    .760
      1:20   1.270|  4:10   1.780|  7:00   5.590|  9:50   1.780| 12:40   1.020| 15:30    .760
      1:25   1.270|  4:15   1.780|  7:05   5.590|  9:55   1.780| 12:45   1.020| 15:35    .760
      1:30   1.270|  4:20   1.780|  7:10   5.080| 10:00   1.270| 12:50   1.020| 15:40    .760
      1:35   1.270|  4:25   1.780|  7:15   5.080| 10:05   1.270| 12:55   1.020| 15:45    .760
      1:40   1.270|  4:30   1.780|  7:20   3.810| 10:10   1.270| 13:00   1.020| 15:50    .760
      1:45   1.270|  4:35   1.780|  7:25   3.810| 10:15   1.270| 13:05   1.020| 15:55    .760
      1:50   1.270|  4:40   1.780|  7:30   3.050| 10:20   1.270| 13:10   1.020| 16:00    .760
      1:55   1.270|  4:45   1.780|  7:35   3.050| 10:25   1.270| 13:15   1.020| 16:05    .760
      2:00   1.270|  4:50   1.780|  7:40   3.050| 10:30   1.270| 13:20   1.020| 16:10    .760
      2:05   1.270|  4:55   1.780|  7:45   3.050| 10:35   1.270| 13:25   1.020| 16:15    .760
      2:10   1.270|  5:00   3.300|  7:50   3.050| 10:40   1.270| 13:30   1.020| 16:20    .760
      2:15   1.270|  5:05   3.300|  7:55   3.050| 10:45   1.270| 13:35   1.020| 16:25    .760
      2:20   1.270|  5:10   3.300|  8:00   3.050| 10:50   1.270| 13:40   1.020| 16:30    .760
      2:25   1.270|  5:15   3.300|  8:05   3.050| 10:55   1.270| 13:45   1.020| 16:35    .760
      2:30   1.270|  5:20   3.300|  8:10   3.050| 11:00   1.270| 13:50   1.020|
      2:35   1.270|  5:25   3.300|  8:15   3.050| 11:05   1.270| 13:55   1.020|
      2:40   1.270|  5:30   3.300|  8:20   1.780| 11:10   1.270| 14:00   1.020|
      2:45   1.270|  5:35   3.300|  8:25   1.780| 11:15   1.270| 14:05   1.020|
      2:50   1.270|  5:40   3.300|  8:30   1.780| 11:20   1.270| 14:10    .760|

     Max.eff.Inten.(mm/hr)=      69.60        36.60
                over (min)        5.00         5.00
     Storage Coeff.  (min)=        .80 (ii)     5.41 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .34          .21
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .06          .03          .088 (iii)
     TIME TO PEAK    (hrs)=      10.58        10.58        10.583
     RUNOFF VOLUME    (mm)=      48.59        21.34        34.963
     TOTAL RAINFALL   (mm)=      49.39        49.39        49.389
     RUNOFF COEFFICIENT   =        .98          .43          .708
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  81.0    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.

--------------------------------------------------------------------------------------------
R0001:C00003---------------------------------------------------------------------------------
------------------------
| ROUTE PIPE Outlet 2  | PIPE Number     =    1.00
| IN=01---> OUT=08     | Diameter    (mm)=  450.00
| DT=  5.0 min         | Length       (m)=   45.00
------------------------ Slope      (m/m)=  .01100
                         Manning n       =    .025

     <------------------- TRAVEL TIME TABLE ------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
        .024     .144E+00      .001         .260         2.89
        .047     .402E+00      .004         .405         1.85
        .071     .725E+00      .008         .522         1.44
        .095     .110E+01      .015         .620         1.21
        .118     .150E+01      .024         .706         1.06
        .142     .194E+01      .034         .781          .96
        .166     .239E+01      .045         .847          .89
        .189     .286E+01      .058         .905          .83
        .213     .334E+01      .071         .956          .78
        .237     .382E+01      .085         .999          .75
        .261     .429E+01      .099        1.036          .72
        .284     .476E+01      .113        1.067          .70
        .308     .522E+01      .126        1.090          .69
        .332     .565E+01      .139        1.106          .68
        .355     .606E+01      .150        1.114          .67
        .379     .643E+01      .159        1.114          .67
        .403     .676E+01      .165        1.102          .68
        .426     .701E+01      .167        1.073          .70
        .450     .716E+01      .156         .979          .77

                                          <---- hydrographs ---->   <-pipe / channel->
                                  AREA    QPEAK     TPEAK    R.V.   MAX DEPTH  MAX VEL
                                  (ha)    (cms)     (hrs)    (mm)      (m)      (m/s)
   INFLOW : ID= 1: 601            .624     .088    10.583  34.963     .241      1.006
   OUTFLOW: ID= 8: Outlet 2       .624     .094    10.583  34.963     .252      1.023

--------------------------------------------------------------------------------------------
R0001:C00004---------------------------------------------------------------------------------
--------------------------
| DESIGN STANDHYD        |   Area    (ha)=    6.55
| 03:602         DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
--------------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.27         3.27
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=        .50          .50
     Length            (m)=     208.89        40.00
     Mannings n          =        .013         .250

     Max.eff.Inten.(mm/hr)=      69.60        19.94
                over (min)        5.00        25.00
     Storage Coeff.  (min)=       5.66 (ii)   26.04 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=        .20          .04
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .57          .11          .629 (iii)
     TIME TO PEAK    (hrs)=      10.58        10.92        10.583
     RUNOFF VOLUME    (mm)=      48.59        21.34        34.964
     TOTAL RAINFALL   (mm)=      49.39        49.39        49.389
     RUNOFF COEFFICIENT   =        .98          .43          .708

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  81.0    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.

--------------------------------------------------------------------------------------------
R0001:C00005---------------------------------------------------------------------------------
----------------------
| ROUTE RESERVOIR -> |    Requested routing time step =  5.0 min.
| IN>03:602          |
| OUT<04:Pond        | =======================  OUTFLOW STORAGE TABLE  =======================
---------------------- OUTFLOW   STORAGE| OUTFLOW   STORAGE| OUTFLOW   STORAGE| OUTFLOW   STORAGE
                        (cms)   (ha.m.)|  (cms)   (ha.m.)|  (cms)   (ha.m.)|  (cms)   (ha.m.)
                         .000 .0000E+00|   .128 .6540E-01|   .201 .1232E+00|   .639 .1866E+00
                         .057 .3100E-01|   .152 .8380E-01|   .306 .1438E+00|   .849 .2089E+00
                         .099 .4780E-01|   .172 .1032E+00|   .457 .1650E+00|  1.083 .2317E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     ----------------           (ha)     (cms)     (hrs)       (mm)
     INFLOW > 03:602           6.545      .629    10.583     34.964
    OUTFLOW < 04:Pond          6.545      .147    11.083     34.964

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  23.335
                  TIME SHIFT OF PEAK FLOW         (min)=   30.00
                  MAXIMUM  STORAGE   USED      (ha.m.)=.7998E-01

--------------------------------------------------------------------------------------------
R0001:C00006---------------------------------------------------------------------------------
--------------------------
| DESIGN STANDHYD        |   Area    (ha)=     .10
| 05:603         DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
--------------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .05          .05
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=        .50          .50
     Length            (m)=      25.95        40.00
     Mannings n          =        .013         .250

     Max.eff.Inten.(mm/hr)=      69.60        23.22
                over (min)        5.00        20.00
     Storage Coeff.  (min)=       1.62 (ii)   20.80 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=        .32          .06
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .01          .00          .011 (iii)
     TIME TO PEAK    (hrs)=      10.58        10.83        10.583
     RUNOFF VOLUME    (mm)=      48.59        21.34        34.964
     TOTAL RAINFALL   (mm)=      49.39        49.39        49.389
     RUNOFF COEFFICIENT   =        .98          .43          .708
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  81.0    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.

--------------------------------------------------------------------------------------------
R0001:C00007---------------------------------------------------------------------------------
--------------------------
| DESIGN STANDHYD        |   Area    (ha)=     .14
| 06:605         DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
--------------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .07          .07
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=        .50          .50
     Length            (m)=      30.22        40.00
     Mannings n          =        .013         .250

     Max.eff.Inten.(mm/hr)=      69.60        23.22
                over (min)        5.00        20.00
     Storage Coeff.  (min)=       1.77 (ii)   20.96 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=        .32          .06
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .01          .00          .015 (iii)
     TIME TO PEAK    (hrs)=      10.58        10.83        10.583
     RUNOFF VOLUME    (mm)=      48.59        21.34        34.964
     TOTAL RAINFALL   (mm)=      49.39        49.39        49.389
     RUNOFF COEFFICIENT   =        .98          .43          .708
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  81.0    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.

--------------------------------------------------------------------------------------------
R0001:C00008---------------------------------------------------------------------------------
------------------------
| ADD HYD              |
| 07:Outlet 3          |   ID:NHYD          AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                    (ha)     (cms)    (hrs)      (mm)    (cms)
                          ID 1 05:603        .101      .011   10.583    34.964    .000
                         +ID 2 06:605        .137      .015   10.583    34.964    .000
                         ==========================================================
                          SUM  07:Outlet 3   .238      .026   10.583    34.964    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------------------
R0001:C00009---------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD          |   Area    (ha)=    5.450   Curve Number   (CN)= 81.00
| 09:604         DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
-------------------------- U.H. Tp(hrs)=     .617

     Unit Hyd Qpeak  (cms)=      .337

     PEAK FLOW       (cms)=      .136 (i)
     TIME TO PEAK    (hrs)=    11.167
     DURATION        (hrs)=    21.000, (dddd|hh:mm:)=    0|21:00
     AVERAGE FLOW    (cms)=      .015
     RUNOFF VOLUME    (mm)=    21.340
     TOTAL RAINFALL   (mm)=    49.389
     RUNOFF COEFFICIENT   =      .432

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

--------------------------------------------------------------------------------------------
R0001:C00010---------------------------------------------------------------------------------
--------------------
| FINISH            |
--------------------
--------------------------------------------------------------------------------------------
*******************************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
R0001:C00002  DESIGN STANDHYD
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.
R0001:C00006  DESIGN STANDHYD
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.
R0001:C00007  DESIGN STANDHYD
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.
    Simulation ended on 2021-01-08      at 11:51:25
===========================================================================================
```

```
2     Metric units
*#****************************************************************************
*#  Project Name: [214925 ONTARIO LIMITED]    Project Number: [09-015]
*#  Date        : 18-09-2020
*#  Modeller    : [Jonathan Kapitanchuk]
*#  Company     : Condeland Engineering Limited
*#  License #   :  4377549
*#****************************************************************************
START                TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[1]
*%                    [  ] <--storm filename, one per line for NSTORM time
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
*# DISCRITIZING THE 24 HOUR-10 YEAR SCS STORM THROUGH PROPOSED POND
*%-----------------------------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
DESIGN STANDHYD      ID=1, NHYD=["601"], DT=[5]min, AREA=[0.624](ha),
                     XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[81],
                     Rainfall hyetograph Ten Yr SCS storm
                     Rainfall begins at four hours
                     3.58 3.58 3.99 3.99 4.50 4.50 5.21 5.21 6.27 6.27 8.00 8.00
                     11.51 11.51 24.82 24.82 133.60 133.60 32.00 32.00 17.93
                     17.93 12.95 12.95 10.31 10.31 8.66 8.66 7.52 7.52 6.65 6.65
                     6.02 6.02 5.49 5.49 5.05 5.05 4.70 4.70 4.39 4.39 4.14 4.14
                     3.91 3.91 3.71 3.71](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
ROUTE PIPE           PTYPE=[1]circ, IDout=[8], NHYD=["Outlet 2"], RNUMBER=[1],
                     PDIAM=[450](mm), PLNGTH=[45](m),
                     PROUGH=[0.025], PSLOPE=[0.011](m/m), IDin=[1],
                     RDT=[5](min)
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
DESIGN STANDHYD      ID=3, NHYD=["602"], DT=[5]min, AREA=[6.545](ha),
                     XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[81],
                     SLOPE=[0.5](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
ROUTE RESERVOIR      IDout=[4],   NHYD=["Pond"],  IDin=[3],
                     RDT=[5](min),
                           TABLE of ( OUTFLOW-STORAGE ) values
                                      (cms) - (ha-m)
                                       [   0.0 ,  0.0 ]
                                    [    0.0574,0.0310]
                                    [    0.0994,0.0478]
                                    [    0.1283,0.0654]
                                    [    0.1518,0.0838]
                                    [    0.1721,0.1032]
                                    [    0.2013,0.1232]
                                    [    0.3065,0.1438]
                                    [    0.4566,0.1650]
                                    [    0.6394,0.1866]
                                    [    0.8493,0.2089]
                                    [    1.0829,0.2317]
                                     [   -1  ,  -1  ]     (max twenty pts)
*%----------------------------------------------------------------------|
*%----------------------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
DESIGN STANDHYD      ID=5, NHYD=["603"], DT=[5]min, AREA=[0.101](ha),
                     XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[81],
                     SLOPE=[0.5](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
DESIGN STANDHYD      ID=6, NHYD=["605"], DT=[5]min, AREA=[0.137](ha),
                     XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[81],
                     SLOPE=[0.5](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
ADD HYD              IDsum=[7], NHYD=["Outlet 3"], IDs to add=[5+6]
*%----------------------------------------------------------------------|
DESIGN NASHYD        ID=[9], NHYD=["604"], DT=[5](min), AREA=[5.45](ha),
                     DWF=[0](cms), CN/C=[81], TP=[0.617](hrs),
                     RAINFALL=[ , , , , ](mm/hour), END=-1
*%----------------------------------------------------------------------|
FINISH
```

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

 SSSSS   W   W   M   M   H   H   Y   Y   M   M    OOO         222     000    11   77777 =========
 S       W W W   MM MM   H   H    Y Y    MM MM   O   O          2    0   0   11   7   7
 SSSSS   W W W   M M M   HHHHH     Y     M M M   O   O          2    0   0   11       7 Ver4.05.4
     S    W W    M   M   H   H     Y     M   M   O   O        222    0   0   11      7  APR 2017
 SSSSS    W W    M   M   H   H     Y     M   M    OOO         2      0   0   11     7   =========
                                                              2      0   0   11    7    # 4377549
       StormWater Management HYdrologic Model                 222     000    11    7    =========

 ******************************************************************************************
 **************************************  SWMHYMO Ver4.05.4  *******************************
 ******************  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: Condeland Engineering Limited               ++++++++++++
 ++++++++++++++++++               Concord              SERIAL#:4377549         ++++++++++++
 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ******************************************************************************************
 ******************           ++++++ PROGRAM ARRAY DIMENSIONS ++++++           ************
 ******************           Maximum value for ID numbers  :     11           ************
 ******************           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   ************************
 ******************************************************************************************
 *                 RUN DATE: 2021-01-08     TIME: 11:51:52     RUN COUNTER: 000003       *
 ******************************************************************************************
 * Input   file: X:\Projects\09015\09015 - Pond10yr (2020-09-02).dat                      *
 * Output  file: X:\Projects\09015\09015 - Pond10yr (2020-09-02).out                      *
 * Summary file: X:\Projects\09015\09015 - Pond10yr (2020-09-02).sum                      *
 * User comments:                                                                         *
 * 1:_____________________________________________________________________________________*
 * 2:_____________________________________________________________________________________*
 * 3:_____________________________________________________________________________________*
 ******************************************************************************************

------------------------------------------------------------------------------------------
R0001:C00001-------------------------------------------------------------------------------
*#**************************************************************************
*#  Project Name: [214925 ONTARIO LIMITED]    Project Number: [09-015]
*#  Date        : 18-09-2020
*#  Modeller    : [Jonathan Kapitanchuk]
*#  Company     : Condeland Engineering Limited
*#  License #   :  4377549
*#**************************************************************************
--------------------
| START              | Project  dir.:X:\Projects\09015\
-------------------- Rainfall dir.:X:\Projects\09015\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 0001
    NSTORM=   1
           #  1= [  ] <--storm filename, one per line for NSTORM time
------------------------------------------------------------------------------------------
R0001:C00002-------------------------------------------------------------------------------
*# DISCRITIZING THE 24 HOUR-10 YEAR SCS STORM THROUGH PROPOSED POND
--------------------------
| DESIGN STANDHYD        |   Area    (ha)=     .62
| 01:601        DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
--------------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .31          .31
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=       3.58         3.58
     Length            (m)=      64.50        40.00
     Mannings n          =        .013         .250

                               New rainfall entered directly by user.
                               TIME STEP= 5.00 min   # of STEPS=     47
                               DURATION = 3.92 hrs   TOTAL RAIN=  55.52 mm

      TIME    RAIN|  TIME    RAIN|  TIME    RAIN|  TIME    RAIN|  TIME    RAIN|  TIME    RAIN
     hh:mm   mm/hr| hh:mm   mm/hr| hh:mm   mm/hr| hh:mm   mm/hr| hh:mm   mm/hr| hh:mm   mm/hr
      0:05   3.580|  0:45   6.270|  1:25 133.600|  2:05  10.310|  2:45   6.020|  3:25   4.390
      0:10   3.990|  0:50   8.000|  1:30  32.000|  2:10   8.660|  2:50   5.490|  3:30   4.140
      0:15   3.990|  0:55   8.000|  1:35  32.000|  2:15   8.660|  2:55   5.490|  3:35   4.140
      0:20   4.500|  1:00  11.510|  1:40  17.930|  2:20   7.520|  3:00   5.050|  3:40   3.910
      0:25   4.500|  1:05  11.510|  1:45  17.930|  2:25   7.520|  3:05   5.050|  3:45   3.910
      0:30   5.210|  1:10  24.820|  1:50  12.950|  2:30   6.650|  3:10   4.700|  3:50   3.710
      0:35   5.210|  1:15  24.820|  1:55  12.950|  2:35   6.650|  3:15   4.700|  3:55   3.710
      0:40   6.270|  1:20 133.600|  2:00  10.310|  2:40   6.020|  3:20   4.390|

     Max.eff.Inten.(mm/hr)=     133.60        58.47
                over (min)        5.00        10.00
     Storage Coeff.  (min)=       1.19 (ii)    8.54 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=        .33          .12
                                                         *TOTALS*
     PEAK FLOW       (cms)=        .12          .03          .143 (iii)
     TIME TO PEAK    (hrs)=       1.42         1.50         1.417
     RUNOFF VOLUME    (mm)=      54.72        25.69        40.204
     TOTAL RAINFALL   (mm)=      55.52        55.52        55.520
     RUNOFF COEFFICIENT   =        .99          .46          .724
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

------------------------------------------------------------------------------------------
R0001:C00003-------------------------------------------------------------------------------
------------------------
| ROUTE PIPE Outlet 2  | PIPE Number     =    1.00
| IN=01---> OUT=08     | Diameter    (mm)=  450.00
| DT=  5.0 min         | Length       (m)=   45.00
------------------------ Slope      (m/m)=  .01100
                         Manning n       =    .025

     <------------------- TRAVEL TIME TABLE ------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
        .024     .144E+00      .001         .260        2.89
        .047     .402E+00      .004         .405        1.85
        .071     .725E+00      .008         .522        1.44
        .095     .110E+01      .015         .620        1.21
        .118     .150E+01      .024         .706        1.06
        .142     .194E+01      .034         .781         .96
        .166     .239E+01      .045         .847         .89
        .189     .286E+01      .058         .905         .83
        .213     .334E+01      .071         .956         .78
        .237     .382E+01      .085         .999         .75
        .261     .429E+01      .099        1.036         .72
        .284     .476E+01      .113        1.067         .70
        .308     .522E+01      .126        1.090         .69
        .332     .565E+01      .139        1.106         .68
        .355     .606E+01      .150        1.114         .67
        .379     .643E+01      .159        1.114         .67
        .403     .676E+01      .165        1.102         .68
        .426     .701E+01      .167        1.073         .70
        .450     .716E+01      .156         .979         .77

                                      <---- hydrographs ---->   <-pipe / channel->
                               AREA    QPEAK     TPEAK    R.V.   MAX DEPTH  MAX VEL
                               (ha)    (cms)     (hrs)    (mm)      (m)      (m/s)
   INFLOW : ID= 1: 601         .624     .143     1.417  40.204     .341      1.109
   OUTFLOW: ID= 8: Outlet 2    .624     .159     1.417  40.204     .383      1.112

------------------------------------------------------------------------------------------
R0001:C00004-------------------------------------------------------------------------------
--------------------------
| DESIGN STANDHYD        |   Area    (ha)=    6.55
| 03:602        DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
--------------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.27         3.27
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=        .50          .50
     Length            (m)=     208.89        40.00
     Mannings n          =        .013         .250

     Max.eff.Inten.(mm/hr)=     133.60        38.81
                over (min)        5.00        20.00
     Storage Coeff.  (min)=       4.36 (ii)   19.98 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=        .23          .06
                                                         *TOTALS*
     PEAK FLOW       (cms)=       1.11          .21         1.194 (iii)
     TIME TO PEAK    (hrs)=       1.42         1.67         1.417
     RUNOFF VOLUME    (mm)=      54.72        25.69        40.204
     TOTAL RAINFALL   (mm)=      55.52        55.52        55.520
     RUNOFF COEFFICIENT   =        .99          .46          .724
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

------------------------------------------------------------------------------------------
R0001:C00005-------------------------------------------------------------------------------
------------------------
|  ROUTE RESERVOIR -> |    Requested routing time step =  5.0 min.
|  IN>03:602          |
| OUT<04:Pond         | ========================  OUTLFOW STORAGE TABLE  ========================
---------------------- OUTFLOW   STORAGE| OUTFLOW   STORAGE| OUTFLOW   STORAGE| OUTFLOW   STORAGE
                        (cms)   (ha.m.)|   (cms)   (ha.m.)|   (cms)   (ha.m.)|   (cms)   (ha.m.)
                         .000 .0000E+00|    .128 .6540E-01|    .201 .1232E+00|    .639 .1866E+00
                         .057 .3100E-01|    .152 .8380E-01|    .306 .1438E+00|    .849 .2089E+00
                         .099 .4780E-01|    .172 .1032E+00|    .457 .1650E+00|   1.083 .2317E+00

     ROUTING RESULTS             AREA     QPEAK     TPEAK       R.V.
     ----------------------      (ha)     (cms)     (hrs)       (mm)
     INFLOW > 03:602            6.545     1.194     1.417     40.204
    OUTFLOW < 04:Pond           6.545      .230     2.083     40.204

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   19.304
                   TIME SHIFT OF PEAK FLOW         (min)=    40.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.1290E+00

------------------------------------------------------------------------------------------
R0001:C00006-------------------------------------------------------------------------------
--------------------------
| DESIGN STANDHYD        |   Area    (ha)=     .10
| 05:603        DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
--------------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .05          .05
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=        .50          .50
     Length            (m)=      25.95        40.00
     Mannings n          =        .013         .250

     Max.eff.Inten.(mm/hr)=     133.60        45.24
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       1.25 (ii)   15.94 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .33          .07
                                                         *TOTALS*
     PEAK FLOW       (cms)=        .02          .00          .021 (iii)
     TIME TO PEAK    (hrs)=       1.42         1.58         1.417
     RUNOFF VOLUME    (mm)=      54.72        25.69        40.204
     TOTAL RAINFALL   (mm)=      55.52        55.52        55.520
     RUNOFF COEFFICIENT   =        .99          .46          .724
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

------------------------------------------------------------------------------------------
R0001:C00007-------------------------------------------------------------------------------
--------------------------
| DESIGN STANDHYD        |   Area    (ha)=     .14
| 06:605        DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
--------------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .07          .07
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=        .50          .50
     Length            (m)=      30.22        40.00
     Mannings n          =        .013         .250

     Max.eff.Inten.(mm/hr)=     133.60        45.24
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       1.37 (ii)   16.06 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .33          .07
                                                         *TOTALS*
     PEAK FLOW       (cms)=        .03          .01          .028 (iii)
     TIME TO PEAK    (hrs)=       1.42         1.58         1.417
     RUNOFF VOLUME    (mm)=      54.72        25.69        40.204
     TOTAL RAINFALL   (mm)=      55.52        55.52        55.520
     RUNOFF COEFFICIENT   =        .99          .46          .724
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

------------------------------------------------------------------------------------------
R0001:C00008-------------------------------------------------------------------------------
------------------------
| ADD HYD              |
| 07:Outlet 3          |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                      (ha)     (cms)    (hrs)      (mm)   (cms)
                      ID 1 05:603             .101      .021    1.417    40.204    .000
                     +ID 2 06:605             .137      .028    1.417    40.204    .000
                     ===============================================================
                     SUM   07:Outlet 3        .238      .049    1.417    40.204    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------------------
R0001:C00009-------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD          |   Area    (ha)=    5.450   Curve Number   (CN)= 81.00
| 09:604        DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .617

     Unit Hyd Qpeak  (cms)=     .337

     PEAK FLOW       (cms)=     .214 (i)
     TIME TO PEAK    (hrs)=    2.083
     DURATION        (hrs)=    8.333, (dddd|hh:mm:)=   0|08:20
     AVERAGE FLOW    (cms)=     .047
     RUNOFF VOLUME    (mm)=   25.688
     TOTAL RAINFALL   (mm)=   55.520
     RUNOFF COEFFICIENT   =     .463

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

------------------------------------------------------------------------------------------
R0001:C00010-------------------------------------------------------------------------------
--------------------
| FINISH            |
--------------------
------------------------------------------------------------------------------------------
******************************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
R0001:C00002  DESIGN STANDHYD
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.
R0001:C00004  DESIGN STANDHYD
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.
R0001:C00006  DESIGN STANDHYD
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.
R0001:C00007  DESIGN STANDHYD
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.
   Simulation ended on 2021-01-08     at 11:51:52
==========================================================================================


```

```
2     Metric units
*#****************************************************************************
*#  Project Name: [214925 ONTARIO LIMITED]    Project Number: [09-015]
*#  Date          : 18-09-2020
*#  Modeller     :[Jonathan Kapitanchuk]
*#  Company       : Condeland Engineering Limited
*#  License #    :  4377549
*#****************************************************************************
START                  TZERO=[4.0],  METOUT=[2],  NSTORM=[0],  NRUN=[1]
*%                      [  ] <--storm filename, one per line for NSTORM time
*%-------------------|------------------------------------------------------|
*%-------------------|------------------------------------------------------|
*# DISCRITIZING THE 24 HOUR-25 YEAR SCS STORM THROUGH PROPOSED POND
*%--------------------------------------------------------------------------|
DESIGN STANDHYD        ID=1, NHYD=["601"], DT=[5]min, AREA=[0.624](ha),
                       XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[81],
                       Rainfall hyetograph Tewnty Five SCS storm
                       Rainfall begins at four hours
                       42.68 2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03
                       2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03
                       2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03
                       2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03
                       2.79 2.79 2.79 2.79 2.79 2.79 2.79 2.79 2.79 2.79
                       2.79 2.79 2.79 2.79 2.79 2.79 2.79 2.79 2.79 2.79
                       5.08 5.08 5.08 5.08 5.08 5.08 5.08 5.08 5.08 5.08
                       7.11 7.11 10.41 10.41 23.37 23.37 51.56 51.56 107.44 107.44
                       18.80 18.80 11.68 11.68 8.38 8.38 8.13 8.13 5.59 5.59
                       4.83 4.83 4.83 4.83 4.83 4.83 4.83 4.83 4.83 4.83
                       2.79 2.79 2.79 2.79 2.79 2.79 2.79 2.79 2.79 2.79
                       2.79 2.79 2.79 2.79 2.79 2.79 2.79 2.79 2.79 2.79
                       2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03
                       2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03
                       2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03
                       1.52 1.52 1.52 1.52 1.52 1.52 1.52 1.52 1.52 1.52
                       1.52 1.52 1.52 1.52 1.52 1.52 1.52 1.52 1.52 1.52
                       1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02
                       1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02
                       1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02
                       (mm/hr), END=-1
*%-------------------|------------------------------------------------------|
*%-------------------|------------------------------------------------------|
ROUTE PIPE             PTYPE=[1]circ, IDout=[8], NHYD=["Outlet 2"], RNUMBER=[1],
                       PDIAM=[450](mm), PLNGTH=[45](m),
                       PROUGH=[0.025], PSLOPE=[0.011](m/m), IDin=[1],
                       RDT=[5](min)
*%-------------------|------------------------------------------------------|
*%-------------------|------------------------------------------------------|
DESIGN STANDHYD        ID=3, NHYD=["602"], DT=[5]min, AREA=[6.545](ha),
                       XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[81],
                       SLOPE=[0.5](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*%-------------------|------------------------------------------------------|
*%-------------------|------------------------------------------------------|
ROUTE RESERVOIR        IDout=[4],   NHYD=["Pond"],  IDin=[3],
                       RDT=[5](min),
                             TABLE of ( OUTFLOW-STORAGE ) values
                                         (cms) - (ha-m)
                                          [   0.0 ,  0.0 ]
                                       [    0.0574,0.0310]
                                       [    0.0994,0.0478]
                                       [    0.1283,0.0654]
                                       [    0.1518,0.0838]
                                       [    0.1721,0.1032]
                                       [    0.2013,0.1232]
                                       [    0.3065,0.1438]
                                       [    0.4566,0.1650]
                                       [    0.6394,0.1866]
                                       [    0.8493,0.2089]
                                       [    1.0829,0.2317]
                                        [   -1  ,  -1  ]     (max twenty pts)
*%-----------------------------------------------------------------------|
*%-----------------------------------------------------------------------|
*%-------------------|------------------------------------------------------|
DESIGN STANDHYD        ID=5, NHYD=["603"], DT=[5]min, AREA=[0.101](ha),
                       XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[81],
                       SLOPE=[0.5](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*%-------------------|------------------------------------------------------|
DESIGN STANDHYD        ID=6, NHYD=["605"], DT=[5]min, AREA=[0.137](ha),
                       XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[81],
                       SLOPE=[0.5](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*%-------------------|------------------------------------------------------|
ADD HYD                IDsum=[7], NHYD=["Outlet 3"], IDs to add=[5+6]
*%-----------------------------------------------------------------------|
DESIGN NASHYD          ID=[9], NHYD=["604"], DT=[5](min), AREA=[5.45](ha),
                       DWF=[0](cms), CN/C=[81], TP=[0.617](hrs),
                       RAINFALL=[ , , , , ](mm/hour), END=-1
*%-----------------------------------------------------------------------|
FINISH
```

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

SSSSS   W   W   M   M   H   H   Y   Y   M   M    OOO          222     000    11   77777 =========
S       W W W   MM MM   H   H    Y Y    MM MM   O   O           2    0   0   11   7   7
SSSSS   W W W   M M M   HHHHH     Y     M M M   O   O           2    0   0   11       7 Ver4.05.4
    S    W W    M   M   H   H     Y     M   M   O   O         222    0   0   11      7  APR 2017
SSSSS    W W    M   M   H   H     Y     M   M    OOO          2      0   0   11     7   =========
                                                              2      0   0   11     7   # 4377549
      StormWater Management HYdrologic Model                  222     000    11     7   =========

******************************************************************************************
**************************************  SWMHYMO Ver4.05.4  ******************************
*****************  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: Condeland Engineering Limited                 ++++++++++++++++++
+++++++++++++++++                Concord              SERIAL#:4377549          ++++++++++++++++++
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

******************************************************************************************
*****************           ++++++ PROGRAM ARRAY DIMENSIONS ++++++            ******************
*****************           Maximum value for ID numbers  :     11            ******************
*****************           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   ***********************
******************************************************************************************
*                 RUN DATE: 2021-01-08     TIME: 11:52:14     RUN COUNTER: 000004          *
******************************************************************************************
* Input   file: X:\Projects\09015\09015 - Pond25yr (2020-09-02).dat                        *
* Output  file: X:\Projects\09015\09015 - Pond25yr (2020-09-02).out                        *
* Summary file: X:\Projects\09015\09015 - Pond25yr (2020-09-02).sum                        *
* User comments:                                                                           *
* 1:_______________________________________________________________________________________*
* 2:_______________________________________________________________________________________*
* 3:_______________________________________________________________________________________*
******************************************************************************************

-------------------------------------------------------------------------------------------
R0001:C00001--------------------------------------------------------------------------------
*#*********************************************************************************
*#  Project Name: [214925 ONTARIO LIMITED]    Project Number: [09-015]
*#  Date         : 18-09-2020
*#  Modeller    :[Jonathan Kapitanchuk]
*#  Company     : Condeland Engineering Limited
*#  License #   :  4377549
*#*********************************************************************************
--------------------
| START             | Project  dir.:X:\Projects\09015\
-------------------- Rainfall dir.:X:\Projects\09015\
    TZERO =  4.00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 0001
    NSTORM=   0
-------------------------------------------------------------------------------------------
R0001:C00002--------------------------------------------------------------------------------
*# DISCRITIZING THE 24 HOUR-25 YEAR SCS STORM THROUGH PROPOSED POND
--------------------------
| DESIGN STANDHYD        |   Area    (ha)=     .62
| 01:601        DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
--------------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .31          .31
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=      42.68        42.68
     Length            (m)=      64.50        40.00
     Mannings n          =        .013         .250

                               New rainfall entered directly by user.
                               TIME STEP= 5.00 min   # of STEPS=    199
                               DURATION =16.58 hrs   TOTAL RAIN=  76.39 mm

      TIME    RAIN|  TIME    RAIN|  TIME    RAIN|  TIME    RAIN|  TIME    RAIN|  TIME    RAIN
     hh:mm   mm/hr| hh:mm   mm/hr| hh:mm   mm/hr| hh:mm   mm/hr| hh:mm   mm/hr| hh:mm   mm/hr
      0:05   2.030|  2:55   2.030|  5:45   5.080|  8:35   2.790| 11:25   2.030| 14:15   1.020
      0:10   2.030|  3:00   2.030|  5:50   7.110|  8:40   2.790| 11:30   2.030| 14:20   1.020
      0:15   2.030|  3:05   2.030|  5:55   7.110|  8:45   2.790| 11:35   2.030| 14:25   1.020
      0:20   2.030|  3:10   2.030|  6:00  10.410|  8:50   2.790| 11:40   2.030| 14:30   1.020
      0:25   2.030|  3:15   2.030|  6:05  10.410|  8:55   2.790| 11:45   2.030| 14:35   1.020
      0:30   2.030|  3:20   2.790|  6:10  23.370|  9:00   2.790| 11:50   2.030| 14:40   1.020
      0:35   2.030|  3:25   2.790|  6:15  23.370|  9:05   2.790| 11:55   2.030| 14:45   1.020
      0:40   2.030|  3:30   2.790|  6:20  51.560|  9:10   2.790| 12:00   2.030| 14:50   1.020
      0:45   2.030|  3:35   2.790|  6:25  51.560|  9:15   2.790| 12:05   2.030| 14:55   1.020
      0:50   2.030|  3:40   2.790|  6:30 107.440|  9:20   2.790| 12:10   2.030| 15:00   1.020
      0:55   2.030|  3:45   2.790|  6:35 107.440|  9:25   2.790| 12:15   2.030| 15:05   1.020
      1:00   2.030|  3:50   2.790|  6:40  18.800|  9:30   2.790| 12:20   2.030| 15:10   1.020
      1:05   2.030|  3:55   2.790|  6:45  18.800|  9:35   2.790| 12:25   2.030| 15:15   1.020
      1:10   2.030|  4:00   2.790|  6:50  11.680|  9:40   2.790| 12:30   1.520| 15:20   1.020
      1:15   2.030|  4:05   2.790|  6:55  11.680|  9:45   2.790| 12:35   1.520| 15:25   1.020
      1:20   2.030|  4:10   2.790|  7:00   8.380|  9:50   2.790| 12:40   1.520| 15:30   1.020
      1:25   2.030|  4:15   2.790|  7:05   8.380|  9:55   2.790| 12:45   1.520| 15:35   1.020
      1:30   2.030|  4:20   2.790|  7:10   8.130| 10:00   2.030| 12:50   1.520| 15:40   1.020
      1:35   2.030|  4:25   2.790|  7:15   8.130| 10:05   2.030| 12:55   1.520| 15:45   1.020
      1:40   2.030|  4:30   2.790|  7:20   5.590| 10:10   2.030| 13:00   1.520| 15:50   1.020
      1:45   2.030|  4:35   2.790|  7:25   5.590| 10:15   2.030| 13:05   1.520| 15:55   1.020
      1:50   2.030|  4:40   2.790|  7:30   4.830| 10:20   2.030| 13:10   1.520| 16:00   1.020
      1:55   2.030|  4:45   2.790|  7:35   4.830| 10:25   2.030| 13:15   1.520| 16:05   1.020
      2:00   2.030|  4:50   2.790|  7:40   4.830| 10:30   2.030| 13:20   1.520| 16:10   1.020
      2:05   2.030|  4:55   2.790|  7:45   4.830| 10:35   2.030| 13:25   1.520| 16:15   1.020
      2:10   2.030|  5:00   5.080|  7:50   4.830| 10:40   2.030| 13:30   1.520| 16:20   1.020
      2:15   2.030|  5:05   5.080|  7:55   4.830| 10:45   2.030| 13:35   1.520| 16:25   1.020
      2:20   2.030|  5:10   5.080|  8:00   4.830| 10:50   2.030| 13:40   1.520| 16:30   1.020
      2:25   2.030|  5:15   5.080|  8:05   4.830| 10:55   2.030| 13:45   1.520| 16:35   1.020
      2:30   2.030|  5:20   5.080|  8:10   4.830| 11:00   2.030| 13:50   1.520|
      2:35   2.030|  5:25   5.080|  8:15   4.830| 11:05   2.030| 13:55   1.520|
      2:40   2.030|  5:30   5.080|  8:20   2.790| 11:10   2.030| 14:00   1.520|
      2:45   2.030|  5:35   5.080|  8:25   2.790| 11:15   2.030| 14:05   1.520|
      2:50   2.030|  5:40   5.080|  8:30   2.790| 11:20   2.030| 14:10   1.020|

     Max.eff.Inten.(mm/hr)=     107.44        71.00
                over (min)        5.00         5.00
     Storage Coeff.  (min)=        .62 (ii)    3.85 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .34          .25
                                                            *TOTALS*
     PEAK FLOW       (cms)=        .09          .06           .150 (iii)
     TIME TO PEAK    (hrs)=      10.58        10.58         10.583
     RUNOFF VOLUME    (mm)=      75.59        41.71         58.651
     TOTAL RAINFALL   (mm)=      76.39        76.39         76.392
     RUNOFF COEFFICIENT   =        .99          .55           .768
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

-------------------------------------------------------------------------------------------
R0001:C00003--------------------------------------------------------------------------------
------------------------
| ROUTE PIPE Outlet 2  | PIPE Number     =    1.00
| IN=01---> OUT=08     | Diameter    (mm)=  450.00
| DT=  5.0 min         | Length       (m)=   45.00
------------------------ Slope      (m/m)=  .01100
                         Manning n       =    .025

     <------------------- TRAVEL TIME TABLE ------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
        .024     .144E+00      .001         .260         2.89
        .047     .402E+00      .004         .405         1.85
        .071     .725E+00      .008         .522         1.44
        .095     .110E+01      .015         .620         1.21
        .118     .150E+01      .024         .706         1.06
        .142     .194E+01      .034         .781          .96
        .166     .239E+01      .045         .847          .89
        .189     .286E+01      .058         .905          .83
        .213     .334E+01      .071         .956          .78
        .237     .382E+01      .085         .999          .75
        .261     .429E+01      .099        1.036          .72
        .284     .476E+01      .113        1.067          .70
        .308     .522E+01      .126        1.090          .69
        .332     .565E+01      .139        1.106          .68
        .355     .606E+01      .150        1.114          .67
        .379     .643E+01      .159        1.114          .67
        .403     .676E+01      .165        1.102          .68
        .426     .701E+01      .167        1.073          .70
        .450     .716E+01      .156         .979          .77

                                          <---- hydrographs ---->   <-pipe / channel->
                                  AREA    QPEAK     TPEAK    R.V.   MAX DEPTH  MAX VEL
                                  (ha)    (cms)     (hrs)    (mm)      (m)      (m/s)
   INFLOW : ID= 1: 601            .624     .150    10.583  58.651     .356      1.114
   OUTFLOW: ID= 8: Outlet 2       .624     .160    10.583  58.651     .387      1.110

-------------------------------------------------------------------------------------------
R0001:C00004--------------------------------------------------------------------------------
--------------------------
| DESIGN STANDHYD        |   Area    (ha)=    6.55
| 03:602        DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
--------------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.27         3.27
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=        .50          .50
     Length            (m)=     208.89        40.00
     Mannings n          =        .013         .250

     Max.eff.Inten.(mm/hr)=     107.44        46.65
                over (min)        5.00        20.00
     Storage Coeff.  (min)=       4.75 (ii)   19.27 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=        .22          .06
                                                            *TOTALS*
     PEAK FLOW       (cms)=        .91          .27          1.087 (iii)
     TIME TO PEAK    (hrs)=      10.58        10.83         10.583
     RUNOFF VOLUME    (mm)=      75.59        41.71         58.651
     TOTAL RAINFALL   (mm)=      76.39        76.39         76.392
     RUNOFF COEFFICIENT   =        .99          .55           .768
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

-------------------------------------------------------------------------------------------
R0001:C00005--------------------------------------------------------------------------------
-----------------------
|  ROUTE RESERVOIR -> |    Requested routing time step =  5.0 min.
|  IN>03:602          |
| OUT<04:Pond         | ========================  OUTLFOW STORAGE TABLE  ========================
---------------------- OUTFLOW   STORAGE| OUTFLOW   STORAGE| OUTFLOW   STORAGE| OUTFLOW   STORAGE
                        (cms)   (ha.m.)|   (cms)   (ha.m.)|   (cms)   (ha.m.)|   (cms)   (ha.m.)
                         .000 .0000E+00|    .128 .6540E-01|    .201 .1232E+00|    .639 .1866E+00
                         .057 .3100E-01|    .152 .8380E-01|    .306 .1438E+00|    .849 .2089E+00
                         .099 .4780E-01|    .172 .1032E+00|    .457 .1650E+00|   1.083 .2317E+00

     ROUTING RESULTS              AREA     QPEAK     TPEAK       R.V.
     ----------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW > 03:602             6.545     1.087    10.583     58.651
    OUTFLOW < 04:Pond            6.545      .284    11.000     58.651

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   26.178
                   TIME SHIFT OF PEAK FLOW         (min)=    25.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.1396E+00

-------------------------------------------------------------------------------------------
R0001:C00006--------------------------------------------------------------------------------
--------------------------
| DESIGN STANDHYD        |   Area    (ha)=     .10
| 05:603        DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
--------------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .05          .05
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=        .50          .50
     Length            (m)=      25.95        40.00
     Mannings n          =        .013         .250

     Max.eff.Inten.(mm/hr)=     107.44        53.97
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       1.36 (ii)   15.05 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .33          .08
                                                            *TOTALS*
     PEAK FLOW       (cms)=        .02          .00           .019 (iii)
     TIME TO PEAK    (hrs)=      10.58        10.75         10.583
     RUNOFF VOLUME    (mm)=      75.59        41.71         58.651
     TOTAL RAINFALL   (mm)=      76.39        76.39         76.392
     RUNOFF COEFFICIENT   =        .99          .55           .768
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

-------------------------------------------------------------------------------------------
R0001:C00007--------------------------------------------------------------------------------
--------------------------
| DESIGN STANDHYD        |   Area    (ha)=     .14
| 06:605        DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
--------------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .07          .07
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=        .50          .50
     Length            (m)=      30.22        40.00
     Mannings n          =        .013         .250

     Max.eff.Inten.(mm/hr)=     107.44        53.97
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       1.49 (ii)   15.18 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .33          .07
                                                            *TOTALS*
     PEAK FLOW       (cms)=        .02          .01           .026 (iii)
     TIME TO PEAK    (hrs)=      10.58        10.75         10.583
     RUNOFF VOLUME    (mm)=      75.59        41.71         58.651
     TOTAL RAINFALL   (mm)=      76.39        76.39         76.392
     RUNOFF COEFFICIENT   =        .99          .55           .768
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

-------------------------------------------------------------------------------------------
R0001:C00008--------------------------------------------------------------------------------
------------------------
| ADD HYD              |
| 07:Outlet 3          |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                      (ha)     (cms)    (hrs)      (mm)    (cms)
                      ID 1 05:603             .101      .019   10.583    58.651    .000
                     +ID 2 06:605             .137      .026   10.583    58.651    .000
                     ===============================================================
                     SUM   07:Outlet 3        .238      .044   10.583    58.651    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------------------
R0001:C00009--------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD          |   Area    (ha)=    5.450   Curve Number   (CN)= 81.00
| 09:604        DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .617

     Unit Hyd Qpeak  (cms)=     .337

     PEAK FLOW       (cms)=     .273 (i)
     TIME TO PEAK    (hrs)=   11.083
     DURATION        (hrs)=   21.000, (dddd|hh:mm:)=   0|21:00
     AVERAGE FLOW    (cms)=     .030
     RUNOFF VOLUME    (mm)=   41.710
     TOTAL RAINFALL   (mm)=   76.392
     RUNOFF COEFFICIENT   =     .546

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

-------------------------------------------------------------------------------------------
R0001:C00010--------------------------------------------------------------------------------
--------------------
| FINISH           |
--------------------
-------------------------------------------------------------------------------------------
*******************************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
R0001:C00002  DESIGN STANDHYD
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.
R0001:C00004  DESIGN STANDHYD
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.
R0001:C00006  DESIGN STANDHYD
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.
R0001:C00007  DESIGN STANDHYD
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.
   Simulation ended on 2021-01-08     at 11:52:14
===========================================================================================
```

```
2     Metric units
*#*****************************************************************************
*#  Project Name: [214925 ONTARIO LIMITED]    Project Number: [09-015]
*#  Date         : 18-09-2020
*#  Modeller     : [Jonathan Kapitanchuk]
*#  Company      : Condeland Engineering Limited
*#  License #    :  4377549
*#*****************************************************************************
START                TZERO=[4.0],  METOUT=[2],  NSTORM=[0],  NRUN=[1]
*%                    [  ] <--storm filename, one per line for NSTORM time
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
*# DISCRITIZING THE 24 HOUR-50 YEAR SCS STORM THROUGH PROPOSED POND
*%-----------------------------------------------------------------------------|
DESIGN STANDHYD      ID=1, NHYD=["601"], DT=[5]min, AREA=[0.624](ha),
                     XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[81],
                     Rainfall hyetograph fifty yr SCS Storm
                     Rainfall begins at four hours
                     49.10 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12
                     2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12
                     2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12
                     2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12
                     3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05
                     3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05
                     5.64 5.64 5.64 5.64 5.64 5.64 5.64 5.64 5.64 5.64
                     7.52 7.52 11.04 11.02 25.37 25.37 55.44 55.44 116.06 116.06
                     19.87 19.87 12.69 12.69 9.17 9.17 8.69 8.69 6.10 6.10
                     5.17 5.17 5.17 5.17 5.17 5.17 5.17 5.17 5.17 5.17
                     3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05
                     3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05
                     2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12
                     2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12
                     2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12 2.12
                     1.65 1.65 1.65 1.65 1.65 1.65 1.65 1.65 1.65 1.65
                     1.65 1.65 1.65 1.65 1.65 1.65 1.65 1.65 1.65 1.65
                     1.17 1.17 1.17 1.17 1.17 1.17 1.17 1.17 1.17 1.17
                     1.17 1.17 1.17 1.17 1.17 1.17 1.17 1.17 1.17 1.17
                     1.17 1.17 1.17 1.17 1.17 1.17 1.17 1.17 1.17 1.
                     (mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
ROUTE PIPE           PTYPE=[1]circ, IDout=[8], NHYD=["Outlet 2"], RNUMBER=[1],
                     PDIAM=[450](mm), PLNGTH=[45](m),
                     PROUGH=[0.025], PSLOPE=[0.011](m/m), IDin=[1],
                     RDT=[5](min)
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
DESIGN STANDHYD      ID=3, NHYD=["602"], DT=[5]min, AREA=[6.545](ha),
                     XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[81],
                     SLOPE=[0.5](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
ROUTE RESERVOIR      IDout=[4],   NHYD=["Pond"],  IDin=[3],
                     RDT=[5](min),
                           TABLE of ( OUTFLOW-STORAGE ) values
                                      (cms) - (ha-m)
                                       [   0.0 ,  0.0 ]
                                    [    0.0574,0.0310]
                                    [    0.0994,0.0478]
                                    [    0.1283,0.0654]
                                    [    0.1518,0.0838]
                                    [    0.1721,0.1032]
                                    [    0.2013,0.1232]
                                    [    0.3065,0.1438]
                                    [    0.4566,0.1650]
                                    [    0.6394,0.1866]
                                    [    0.8493,0.2089]
                                    [    1.0829,0.2317]
                                     [   -1  ,  -1  ]     (max twenty pts)
*%-----------------------------------------------------------------------|
*%-----------------------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
DESIGN STANDHYD      ID=5, NHYD=["603"], DT=[5]min, AREA=[0.101](ha),
                     XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[81],
                     SLOPE=[0.5](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
DESIGN STANDHYD      ID=6, NHYD=["605"], DT=[5]min, AREA=[0.137](ha),
                     XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[81],
                     SLOPE=[0.5](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
ADD HYD              IDsum=[7], NHYD=["Outlet 3"], IDs to add=[5+6]
*%-----------------------------------------------------------------------|
DESIGN NASHYD        ID=[9], NHYD=["604"], DT=[5](min), AREA=[5.45](ha),
                     DWF=[0](cms), CN/C=[81], TP=[0.617](hrs),
                     RAINFALL=[ , , , , ](mm/hour), END=-1
*%-----------------------------------------------------------------------|
FINISH
```

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

SSSSS   W   W   M   M   H   H   Y   Y   M   M    OOO         222     000    11   77777 =========
S       W W W   MM MM   H   H    Y Y    MM MM   O   O          2    0   0   11   7   7
SSSSS   W W W   M M M   HHHHH     Y     M M M   O   O          2    0   0   11       7 Ver4.05.4
    S    W W    M   M   H   H     Y     M   M   O   O        222    0   0   11       7  APR 2017
SSSSS    W W    M   M   H   H     Y     M   M    OOO         2      0   0   11      7  =========
                                                             2      0   0   11     7   # 4377549
      StormWater Management HYdrologic Model                 222     000    11     7   =========

******************************************************************************************
***********************************  SWMHYMO Ver4.05.4  **********************************
*****************  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: Condeland Engineering Limited                 ++++++++++++++++++
+++++++++++++++++                Concord                SERIAL#:4377549        ++++++++++++++++++
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

******************************************************************************************
*****************           ++++++ PROGRAM ARRAY DIMENSIONS ++++++             *************
*****************           Maximum value for ID numbers  :     11             *************
*****************           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   ************************
******************************************************************************************
*                 RUN DATE: 2021-01-08     TIME: 11:52:40     RUN COUNTER: 000005          *
******************************************************************************************
* Input   file: X:\Projects\09015\09015 - Pond50yr (2020-09-02).dat                        *
* Output  file: X:\Projects\09015\09015 - Pond50yr (2020-09-02).out                        *
* Summary file: X:\Projects\09015\09015 - Pond50yr (2020-09-02).sum                        *
* User comments:                                                                            *
* 1:_______________________________________________________________________________________*
* 2:_______________________________________________________________________________________*
* 3:_______________________________________________________________________________________*
******************************************************************************************

------------------------------------------------------------------------------------------
R0001:C00001------------------------------------------------------------------------------
*#************************************************************************
*#  Project Name: [214925 ONTARIO LIMITED]    Project Number: [09-015]
*#  Date         : 18-09-2020
*#  Modeller     : [Jonathan Kapitanchuk]
*#  Company      : Condeland Engineering Limited
*#  License #    :  4377549
*#************************************************************************
--------------------
| START              | Project  dir.:X:\Projects\09015\
-------------------- Rainfall dir.:X:\Projects\09015\
    TZERO =  4.00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 0001
    NSTORM=   0
------------------------------------------------------------------------------------------
R0001:C00002------------------------------------------------------------------------------
*# DISCRITIZING THE 24 HOUR-50 YEAR SCS STORM THROUGH PROPOSED POND
-------------------------
| DESIGN STANDHYD         |   Area    (ha)=      .62
| 01:601        DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
-------------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .31          .31
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=      49.10        49.10
     Length            (m)=      64.50        40.00
     Mannings n           =       .013         .250

                               New rainfall entered directly by user.
                               TIME STEP= 5.00 min   # of STEPS=     199
                               DURATION =16.58 hrs   TOTAL RAIN=  82.35 mm

      TIME    RAIN|  TIME    RAIN|  TIME    RAIN|  TIME    RAIN|  TIME    RAIN|  TIME    RAIN
     hh:mm   mm/hr| hh:mm   mm/hr| hh:mm   mm/hr| hh:mm   mm/hr| hh:mm   mm/hr| hh:mm   mm/hr
      0:05   2.120|  2:55   2.120|  5:45   5.640|  8:35   3.050| 11:25   2.120| 14:15   1.170
      0:10   2.120|  3:00   2.120|  5:50   7.520|  8:40   3.050| 11:30   2.120| 14:20   1.170
      0:15   2.120|  3:05   2.120|  5:55   7.520|  8:45   3.050| 11:35   2.120| 14:25   1.170
      0:20   2.120|  3:10   2.120|  6:00  11.040|  8:50   3.050| 11:40   2.120| 14:30   1.170
      0:25   2.120|  3:15   2.120|  6:05  11.020|  8:55   3.050| 11:45   2.120| 14:35   1.170
      0:30   2.120|  3:20   3.050|  6:10  25.370|  9:00   3.050| 11:50   2.120| 14:40   1.170
      0:35   2.120|  3:25   3.050|  6:15  25.370|  9:05   3.050| 11:55   2.120| 14:45   1.170
      0:40   2.120|  3:30   3.050|  6:20  55.440|  9:10   3.050| 12:00   2.120| 14:50   1.170
      0:45   2.120|  3:35   3.050|  6:25  55.440|  9:15   3.050| 12:05   2.120| 14:55   1.170
      0:50   2.120|  3:40   3.050|  6:30 116.060|  9:20   3.050| 12:10   2.120| 15:00   1.170
      0:55   2.120|  3:45   3.050|  6:35 116.060|  9:25   3.050| 12:15   2.120| 15:05   1.170
      1:00   2.120|  3:50   3.050|  6:40  19.870|  9:30   3.050| 12:20   2.120| 15:10   1.170
      1:05   2.120|  3:55   3.050|  6:45  19.870|  9:35   3.050| 12:25   2.120| 15:15   1.170
      1:10   2.120|  4:00   3.050|  6:50  12.690|  9:40   3.050| 12:30   1.650| 15:20   1.170
      1:15   2.120|  4:05   3.050|  6:55  12.690|  9:45   3.050| 12:35   1.650| 15:25   1.170
      1:20   2.120|  4:10   3.050|  7:00   9.170|  9:50   3.050| 12:40   1.650| 15:30   1.170
      1:25   2.120|  4:15   3.050|  7:05   9.170|  9:55   3.050| 12:45   1.650| 15:35   1.170
      1:30   2.120|  4:20   3.050|  7:10   8.690| 10:00   2.120| 12:50   1.650| 15:40   1.170
      1:35   2.120|  4:25   3.050|  7:15   8.690| 10:05   2.120| 12:55   1.650| 15:45   1.170
      1:40   2.120|  4:30   3.050|  7:20   6.100| 10:10   2.120| 13:00   1.650| 15:50   1.170
      1:45   2.120|  4:35   3.050|  7:25   6.100| 10:15   2.120| 13:05   1.650| 15:55   1.170
      1:50   2.120|  4:40   3.050|  7:30   5.170| 10:20   2.120| 13:10   1.650| 16:00   1.170
      1:55   2.120|  4:45   3.050|  7:35   5.170| 10:25   2.120| 13:15   1.650| 16:05   1.170
      2:00   2.120|  4:50   3.050|  7:40   5.170| 10:30   2.120| 13:20   1.650| 16:10   1.170
      2:05   2.120|  4:55   3.050|  7:45   5.170| 10:35   2.120| 13:25   1.650| 16:15   1.170
      2:10   2.120|  5:00   5.640|  7:50   5.170| 10:40   2.120| 13:30   1.650| 16:20   1.170
      2:15   2.120|  5:05   5.640|  7:55   5.170| 10:45   2.120| 13:35   1.650| 16:25   1.170
      2:20   2.120|  5:10   5.640|  8:00   5.170| 10:50   2.120| 13:40   1.650| 16:30   1.170
      2:25   2.120|  5:15   5.640|  8:05   5.170| 10:55   2.120| 13:45   1.650| 16:35   1.000
      2:30   2.120|  5:20   5.640|  8:10   5.170| 11:00   2.120| 13:50   1.650|
      2:35   2.120|  5:25   5.640|  8:15   5.170| 11:05   2.120| 13:55   1.650|
      2:40   2.120|  5:30   5.640|  8:20   3.050| 11:10   2.120| 14:00   1.650|
      2:45   2.120|  5:35   5.640|  8:25   3.050| 11:15   2.120| 14:05   1.650|
      2:50   2.120|  5:40   5.640|  8:30   3.050| 11:20   2.120| 14:10   1.170|

     Max.eff.Inten.(mm/hr)=     116.06        79.19
                over (min)        5.00         5.00
     Storage Coeff.  (min)=        .58 (ii)    3.54 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .34          .26
                                                         *TOTALS*
     PEAK FLOW       (cms)=        .10          .06         .165 (iii)
     TIME TO PEAK    (hrs)=      10.58        10.58       10.583
     RUNOFF VOLUME    (mm)=      81.55        46.55       64.048
     TOTAL RAINFALL   (mm)=      82.35        82.35       82.349
     RUNOFF COEFFICIENT   =        .99          .57         .778
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

------------------------------------------------------------------------------------------
R0001:C00003------------------------------------------------------------------------------
------------------------
| ROUTE PIPE Outlet 2  | PIPE Number      =     1.00
| IN=01---> OUT=08     | Diameter    (mm)=  450.00
| DT=  5.0 min         | Length       (m)=   45.00
----------------------- Slope       (m/m)=  .01100
                        Manning n        =    .025

     *** WARNING: MINIMUM PIPE SIZE REQUIRED =   460.54   (mm)
                  THIS SIZE WAS USED IN THE ROUTING.
                  THE CAPACITY OF THIS PIPE  =       .17  (cms)

*** WARNING: New pipe size used for routing.
     <------------------- TRAVEL TIME TABLE ------------------->
       DEPTH       VOLUME     FLOW RATE    VELOCITY     TRAV.TIME
        (m)       (cu.m.)      (cms)        (m/s)          min
        .024     .151E+00       .001         .264          2.84
        .048     .421E+00       .004         .412          1.82
        .073     .760E+00       .009         .530          1.42
        .097     .115E+01       .016         .630          1.19
        .121     .158E+01       .025         .717          1.05
        .145     .203E+01       .036         .793           .95
        .170     .251E+01       .048         .860           .87
        .194     .300E+01       .061         .919           .82
        .218     .350E+01       .075         .971           .77
        .242     .400E+01       .090        1.015           .74
        .267     .450E+01       .105        1.052           .71
        .291     .499E+01       .120        1.083           .69
        .315     .547E+01       .134        1.107           .68
        .339     .592E+01       .148        1.123           .67
        .364     .635E+01       .160        1.132           .66
        .388     .674E+01       .169        1.131           .66
        .412     .708E+01       .176        1.119           .67
        .436     .735E+01       .178        1.090           .69
        .461     .750E+01       .166         .994           .75

                                                <---- hydrographs ---->   <-pipe / channel->
                                   AREA    QPEAK     TPEAK     R.V.   MAX DEPTH  MAX VEL
                                   (ha)    (cms)     (hrs)     (mm)      (m)      (m/s)
   INFLOW : ID= 1: 601             .624     .165    10.583   64.048     .378      1.131
   OUTFLOW: ID= 8: Outlet 2        .624     .176    10.583   64.048     .409      1.120

------------------------------------------------------------------------------------------
R0001:C00004------------------------------------------------------------------------------
-------------------------
| DESIGN STANDHYD         |   Area    (ha)=     6.55
| 03:602        DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
-------------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.27         3.27
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=        .50          .50
     Length            (m)=     208.89        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     116.06        52.23
                over (min)        5.00        20.00
     Storage Coeff.  (min)=       4.61 (ii)   18.48 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=        .22          .06
                                                         *TOTALS*
     PEAK FLOW       (cms)=        .99          .31        1.191 (iii)
     TIME TO PEAK    (hrs)=      10.58        10.83       10.583
     RUNOFF VOLUME    (mm)=      81.55        46.55       64.048
     TOTAL RAINFALL   (mm)=      82.35        82.35       82.349
     RUNOFF COEFFICIENT   =        .99          .57         .778
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

------------------------------------------------------------------------------------------
R0001:C00005------------------------------------------------------------------------------
----------------------
| ROUTE RESERVOIR -> |    Requested routing time step =  5.0 min.
| IN>03:602          |
| OUT<04:Pond        | ======================= OUTFLOW STORAGE TABLE =======================
---------------------- OUTFLOW   STORAGE| OUTFLOW   STORAGE| OUTFLOW   STORAGE| OUTFLOW   STORAGE
                        (cms)    (ha.m.)|  (cms)    (ha.m.)|  (cms)    (ha.m.)|  (cms)    (ha.m.)
                         .000 .0000E+00|   .128 .6540E-01|   .201 .1232E+00|   .639 .1866E+00
                         .057 .3100E-01|   .152 .8380E-01|   .306 .1438E+00|   .849 .2089E+00
                         .099 .4780E-01|   .172 .1032E+00|   .457 .1650E+00|  1.083 .2317E+00

     ROUTING RESULTS              AREA     QPEAK     TPEAK       R.V.
     ----------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW > 03:602             6.545     1.191    10.583     64.048
   OUTFLOW < 04:Pond             6.545      .344    11.000     64.048

                    PEAK  FLOW  REDUCTION [Qout/Qin](%)=  28.914
                    TIME SHIFT OF PEAK FLOW        (min)=   25.00
                    MAXIMUM  STORAGE  USED        (ha.m.)=.1495E+00

------------------------------------------------------------------------------------------
R0001:C00006------------------------------------------------------------------------------
-------------------------
| DESIGN STANDHYD         |   Area    (ha)=      .10
| 05:603        DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
-------------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .05          .05
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=        .50          .50
     Length            (m)=      25.95        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     116.06        60.38
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       1.32 (ii)   14.41 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .33          .08
                                                         *TOTALS*
     PEAK FLOW       (cms)=        .02          .01         .021 (iii)
     TIME TO PEAK    (hrs)=      10.58        10.75       10.583
     RUNOFF VOLUME    (mm)=      81.55        46.55       64.048
     TOTAL RAINFALL   (mm)=      82.35        82.35       82.349
     RUNOFF COEFFICIENT   =        .99          .57         .778
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

------------------------------------------------------------------------------------------
R0001:C00007------------------------------------------------------------------------------
-------------------------
| DESIGN STANDHYD         |   Area    (ha)=      .14
| 06:605        DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
-------------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .07          .07
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=        .50          .50
     Length            (m)=      30.22        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     116.06        60.38
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       1.45 (ii)   14.53 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .33          .08
                                                         *TOTALS*
     PEAK FLOW       (cms)=        .02          .01         .028 (iii)
     TIME TO PEAK    (hrs)=      10.58        10.75       10.583
     RUNOFF VOLUME    (mm)=      81.55        46.55       64.048
     TOTAL RAINFALL   (mm)=      82.35        82.35       82.349
     RUNOFF COEFFICIENT   =        .99          .57         .778
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

------------------------------------------------------------------------------------------
R0001:C00008------------------------------------------------------------------------------
-----------------------
| ADD HYD              |
| 07:Outlet 3          |   ID:NHYD           AREA      QPEAK    TPEAK      R.V.     DWF
-----------------------                      (ha)      (cms)    (hrs)      (mm)    (cms)
                        ID 1 05:603          .101       .021   10.583    64.048    .000
                       +ID 2 06:605          .137       .028   10.583    64.048    .000
                       ==========================================================
                        SUM   07:Outlet 3     .238       .049   10.583    64.048    .000

  NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------------------
R0001:C00009------------------------------------------------------------------------------
-------------------------
| DESIGN NASHYD           |   Area    (ha)=    5.450   Curve Number   (CN)= 81.00
| 09:604        DT= 5.00 |   Ia       (mm)=    1.500   # of Linear Res.(N)=  3.00
------------------------- U.H. Tp(hrs)=     .617

     Unit Hyd Qpeak  (cms)=      .337

     PEAK FLOW       (cms)=      .305 (i)
     TIME TO PEAK    (hrs)=    11.083
     DURATION        (hrs)=    21.000, (dddd|hh:mm:)=   0|21:00
     AVERAGE FLOW    (cms)=      .034
     RUNOFF VOLUME    (mm)=    46.547
     TOTAL RAINFALL   (mm)=    82.349
     RUNOFF COEFFICIENT   =      .565

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

------------------------------------------------------------------------------------------
R0001:C00010------------------------------------------------------------------------------
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| FINISH           |
-------------------
------------------------------------------------------------------------------------------
******************************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
R0001:C00002  DESIGN STANDHYD
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.
R0001:C00003  ROUTE PIPE      ->
*** WARNING: New pipe size used for routing.
R0001:C00004  DESIGN STANDHYD
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.
R0001:C00006  DESIGN STANDHYD
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.
R0001:C00007  DESIGN STANDHYD
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.
   Simulation ended on 2021-01-08     at 11:52:40
==========================================================================================
```

```
2     Metric units
*#*************************************************************************
*#  Project Name: [214925 ONTARIO LIMITED]    Project Number: [09-015]
*#  Date         : 18-09-2020
*#  Modeller     : [Jonathan Kapitanchuk]
*#  Company      : Condeland Engineering Limited
*#  License #    :  4377549
*#*************************************************************************
START                TZERO=[4.0],  METOUT=[2],  NSTORM=[0],  NRUN=[1]
*%                    [  ] <--storm filename, one per line for NSTORM time
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
*# DISCRITIZING THE 24 HOUR-100 YEAR SCS STORM FOR THE DEVELOPMENT
*%-----------------------------------------------------------------------------|
DESIGN STANDHYD      ID=1, NHYD=["601"], DT=[5]min, AREA=[.624](ha),
                     XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[81],
                     Rainfall hyetograph one hundred yr SCS Storm
                     Rainfall begins at four hours
                     RAINFALL=[53.09 2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29
                     2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29
                     2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29
                     2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29
                     3.30 3.30 3.30 3.30 3.30 3.30 3.30 3.30 3.30 3.30
                     3.30 3.30 3.30 3.30 3.30 3.30 3.30 3.30 3.30 3.30
                     6.10 6.10 6.10 6.10 6.10 6.10 6.10 6.10 6.10 6.10
                     8.13 8.13 11.94 11.94 27.43 27.43 59.94 59.94 125.48 125.48
                     21.48 21.48 13.72 13.72 9.91 9.91 9.40 9.40 6.60 6.60
                     5.59 5.59 5.59 5.59 5.59 5.59 5.59 5.59 5.59 5.59
                     3.30 3.30 3.30 3.30 3.30 3.30 3.30 3.30 3.30 3.30
                     3.30 3.30 3.30 3.30 3.30 3.30 3.30 3.30 3.30 3.30
                     2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29
                     2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29
                     2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29 2.29
                     1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78
                     1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.78
                     1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27
                     1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27
                     1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27 1.27]
                     (mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
ROUTE PIPE           PTYPE=[1]circ, IDout=[8], NHYD=["Outlet 2"], RNUMBER=[1],
                     PDIAM=[450](mm), PLNGTH=[45](m),
                     PROUGH=[0.025], PSLOPE=[0.011](m/m), IDin=[1],
                     RDT=[5](min)
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
DESIGN STANDHYD      ID=3, NHYD=["602"], DT=[5]min, AREA=[6.545](ha),
                     XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[81],
                     SLOPE=[0.5](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
ROUTE RESERVOIR      IDout=[4],   NHYD=["Pond"],  IDin=[3],
                     RDT=[5](min),
                           TABLE of ( OUTFLOW-STORAGE ) values
                                      (cms) - (ha-m)
                                       [   0.0 ,  0.0 ]
                                    [    0.0574,0.0310]
                                    [    0.0994,0.0478]
                                    [    0.1283,0.0654]
                                    [    0.1518,0.0838]
                                    [    0.1721,0.1032]
                                    [    0.2013,0.1232]
                                    [    0.3065,0.1438]
                                    [    0.4566,0.1650]
                                    [    0.6394,0.1866]
                                    [    0.8493,0.2089]
                                    [    1.0829,0.2317]
                                     [   -1  ,  -1  ]     (max twenty pts)
*%----------------------------------------------------------------------|
*%----------------------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
DESIGN STANDHYD      ID=5, NHYD=["603"], DT=[5]min, AREA=[0.101](ha),
                     XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[81],
                     SLOPE=[0.5](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
DESIGN STANDHYD      ID=6, NHYD=["605"], DT=[5]min, AREA=[0.137](ha),
                     XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[81],
                     SLOPE=[0.5](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|
ADD HYD              IDsum=[7], NHYD=["Outlet 3"], IDs to add=[5+6]
*%----------------------------------------------------------------------|
DESIGN NASHYD        ID=[9], NHYD=["604"], DT=[5](min), AREA=[5.45](ha),
                     DWF=[0](cms), CN/C=[81], TP=[0.617](hrs),
                     RAINFALL=[ , , , , ](mm/hour), END=-1
*%----------------------------------------------------------------------|
FINISH
```

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

 SSSSS   W   W   M   M   H   H   Y   Y   M   M    OOO         222     000    11   77777 =========
 S       W W W   MM MM   H   H    Y Y    MM MM   O   O          2    0   0   11   7   7
 SSSSS   W W W   M M M   HHHHH     Y     M M M   O   O          2    0   0   11       7 Ver4.05.4
     S    W W    M   M   H   H     Y     M   M   O   O        222    0   0   11      7  APR 2017
 SSSSS    W W    M   M   H   H     Y     M   M    OOO         2      0   0   11     7   =========
                                                              2      0   0   11    7    # 4377549
       StormWater Management HYdrologic Model                 222     000    11    7    =========

 ****************************************************************************************
 **************************************  SWMHYMO Ver4.05.4  ******************************
 ******************  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: Condeland Engineering Limited              ++++++++++++
 ++++++++++++++++++                Concord              SERIAL#:4377549      ++++++++++++
 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ****************************************************************************************
 ******************            ++++++ PROGRAM ARRAY DIMENSIONS ++++++       *************
 ******************            Maximum value for ID numbers  :     11       *************
 ******************            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   **********************
 ****************************************************************************************
 *                 RUN DATE: 2021-01-08     TIME: 11:52:54     RUN COUNTER: 000006       *
 ****************************************************************************************
 * Input   file: X:\Projects\09015\09015 - Pond100y (2020-09-01).dat                      *
 * Output  file: X:\Projects\09015\09015 - Pond100y (2020-09-01).out                      *
 * Summary file: X:\Projects\09015\09015 - Pond100y (2020-09-01).sum                      *
 * User comments:                                                                        *
 * 1:____________________________________________________________________________________*
 * 2:____________________________________________________________________________________*
 * 3:____________________________________________________________________________________*
 ****************************************************************************************

--------------------------------------------------------------------------------------------
R0001:C00001--------------------------------------------------------------------------------
*#*******************************************************************************
*#  Project Name: [214925 ONTARIO LIMITED]    Project Number: [09-015]
*#  Date         : 18-09-2020
*#  Modeller     : [Jonathan Kapitanchuk]
*#  Company      : Condeland Engineering Limited
*#  License #    :  4377549
*#*******************************************************************************
--------------------
| START              | Project  dir.:X:\Projects\09015\
-------------------- Rainfall dir.:X:\Projects\09015\
    TZERO =  4.00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 0001
    NSTORM=   0
--------------------------------------------------------------------------------------------
R0001:C00002--------------------------------------------------------------------------------
*# DISCRITIZING THE 24 HOUR-100 YEAR SCS STORM FOR THE DEVELOPMENT
--------------------------
| DESIGN STANDHYD        |   Area    (ha)=     .62
| 01:601        DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
--------------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .31          .31
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=      53.09        53.09
     Length            (m)=      64.50        40.00
     Mannings n          =        .013         .250

                                New rainfall entered directly by user.
                                TIME STEP= 5.00 min   # of STEPS=    199
                                DURATION =16.58 hrs   TOTAL RAIN=  89.06 mm

        TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN
       hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr
        0:05   2.290|   2:55   2.290|   5:45   6.100|   8:35   3.300|  11:25   2.290|  14:15   1.270
        0:10   2.290|   3:00   2.290|   5:50   8.130|   8:40   3.300|  11:30   2.290|  14:20   1.270
        0:15   2.290|   3:05   2.290|   5:55   8.130|   8:45   3.300|  11:35   2.290|  14:25   1.270
        0:20   2.290|   3:10   2.290|   6:00  11.940|   8:50   3.300|  11:40   2.290|  14:30   1.270
        0:25   2.290|   3:15   2.290|   6:05  11.940|   8:55   3.300|  11:45   2.290|  14:35   1.270
        0:30   2.290|   3:20   3.300|   6:10  27.430|   9:00   3.300|  11:50   2.290|  14:40   1.270
        0:35   2.290|   3:25   3.300|   6:15  27.430|   9:05   3.300|  11:55   2.290|  14:45   1.270
        0:40   2.290|   3:30   3.300|   6:20  59.940|   9:10   3.300|  12:00   2.290|  14:50   1.270
        0:45   2.290|   3:35   3.300|   6:25  59.940|   9:15   3.300|  12:05   2.290|  14:55   1.270
        0:50   2.290|   3:40   3.300|   6:30 125.480|   9:20   3.300|  12:10   2.290|  15:00   1.270
        0:55   2.290|   3:45   3.300|   6:35 125.480|   9:25   3.300|  12:15   2.290|  15:05   1.270
        1:00   2.290|   3:50   3.300|   6:40  21.480|   9:30   3.300|  12:20   2.290|  15:10   1.270
        1:05   2.290|   3:55   3.300|   6:45  21.480|   9:35   3.300|  12:25   2.290|  15:15   1.270
        1:10   2.290|   4:00   3.300|   6:50  13.720|   9:40   3.300|  12:30   1.780|  15:20   1.270
        1:15   2.290|   4:05   3.300|   6:55  13.720|   9:45   3.300|  12:35   1.780|  15:25   1.270
        1:20   2.290|   4:10   3.300|   7:00   9.910|   9:50   3.300|  12:40   1.780|  15:30   1.270
        1:25   2.290|   4:15   3.300|   7:05   9.910|   9:55   3.300|  12:45   1.780|  15:35   1.270
        1:30   2.290|   4:20   3.300|   7:10   9.400|  10:00   2.290|  12:50   1.780|  15:40   1.270
        1:35   2.290|   4:25   3.300|   7:15   9.400|  10:05   2.290|  12:55   1.780|  15:45   1.270
        1:40   2.290|   4:30   3.300|   7:20   6.600|  10:10   2.290|  13:00   1.780|  15:50   1.270
        1:45   2.290|   4:35   3.300|   7:25   6.600|  10:15   2.290|  13:05   1.780|  15:55   1.270
        1:50   2.290|   4:40   3.300|   7:30   5.590|  10:20   2.290|  13:10   1.780|  16:00   1.270
        1:55   2.290|   4:45   3.300|   7:35   5.590|  10:25   2.290|  13:15   1.780|  16:05   1.270
        2:00   2.290|   4:50   3.300|   7:40   5.590|  10:30   2.290|  13:20   1.780|  16:10   1.270
        2:05   2.290|   4:55   3.300|   7:45   5.590|  10:35   2.290|  13:25   1.780|  16:15   1.270
        2:10   2.290|   5:00   6.100|   7:50   5.590|  10:40   2.290|  13:30   1.780|  16:20   1.270
        2:15   2.290|   5:05   6.100|   7:55   5.590|  10:45   2.290|  13:35   1.780|  16:25   1.270
        2:20   2.290|   5:10   6.100|   8:00   5.590|  10:50   2.290|  13:40   1.780|  16:30   1.270
        2:25   2.290|   5:15   6.100|   8:05   5.590|  10:55   2.290|  13:45   1.780|  16:35   1.270
        2:30   2.290|   5:20   6.100|   8:10   5.590|  11:00   2.290|  13:50   1.780|
        2:35   2.290|   5:25   6.100|   8:15   5.590|  11:05   2.290|  13:55   1.780|
        2:40   2.290|   5:30   6.100|   8:20   3.300|  11:10   2.290|  14:00   1.780|
        2:45   2.290|   5:35   6.100|   8:25   3.300|  11:15   2.290|  14:05   1.780|
        2:50   2.290|   5:40   6.100|   8:30   3.300|  11:20   2.290|  14:10   1.270|

     Max.eff.Inten.(mm/hr)=     125.48        88.38
                over (min)        5.00         5.00
     Storage Coeff.  (min)=        .54 (ii)    3.32 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .34          .26
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .11          .07          .182 (iii)
     TIME TO PEAK    (hrs)=      10.58        10.58        10.583
     RUNOFF VOLUME    (mm)=      88.26        52.10        70.178
     TOTAL RAINFALL   (mm)=      89.06        89.06        89.056
     RUNOFF COEFFICIENT   =        .99          .59          .788
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

--------------------------------------------------------------------------------------------
R0001:C00003--------------------------------------------------------------------------------
------------------------
| ROUTE PIPE Outlet 2  | PIPE Number     =    1.00
| IN=01---> OUT=08     | Diameter    (mm)=  450.00
| DT=  5.0 min         | Length       (m)=   45.00
------------------------ Slope      (m/m)=  .01100
                         Manning n       =    .025

     *** WARNING: MINIMUM PIPE SIZE REQUIRED =   477.13   (mm)
                  THIS SIZE WAS USED IN THE ROUTING.
                  THE CAPACITY OF THIS PIPE  =      .18  (cms)

*** WARNING: New pipe size used for routing.
     <------------------- TRAVEL TIME TABLE ------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
        .025     .162E+00      .001          .270        2.78
        .050     .451E+00      .004          .422        1.78
        .075     .815E+00      .010          .543        1.38
        .100     .123E+01      .018          .645        1.16
        .126     .169E+01      .028          .734        1.02
        .151     .218E+01      .039          .812         .92
        .176     .269E+01      .053          .881         .85
        .201     .322E+01      .067          .941         .80
        .226     .375E+01      .083          .994         .75
        .251     .429E+01      .099         1.039         .72
        .276     .483E+01      .116         1.078         .70
        .301     .536E+01      .132         1.109         .68
        .326     .587E+01      .148         1.133         .66
        .352     .636E+01      .162         1.150         .65
        .377     .681E+01      .175         1.159         .65
        .402     .723E+01      .186         1.158         .65
        .427     .759E+01      .193         1.146         .65
        .452     .788E+01      .196         1.116         .67
        .477     .805E+01      .182         1.017         .74

                                          <---- hydrographs ---->   <-pipe / channel->
                                   AREA    QPEAK     TPEAK    R.V.   MAX DEPTH  MAX VEL
                                   (ha)    (cms)     (hrs)    (mm)      (m)       (m/s)
   INFLOW : ID= 1: 601             .624     .182    10.583  70.178     .392      1.158
   OUTFLOW: ID= 8: Outlet 2        .624     .194    10.583  70.178     .425      1.147

--------------------------------------------------------------------------------------------
R0001:C00004--------------------------------------------------------------------------------
--------------------------
| DESIGN STANDHYD        |   Area    (ha)=    6.55
| 03:602        DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
--------------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.27         3.27
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=        .50          .50
     Length            (m)=     208.89        40.00
     Mannings n          =        .013         .250

     Max.eff.Inten.(mm/hr)=     125.48        67.67
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       4.47 (ii)   16.97 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .23          .07
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.07          .38         1.365 (iii)
     TIME TO PEAK    (hrs)=      10.58        10.75        10.583
     RUNOFF VOLUME    (mm)=      88.26        52.10        70.179
     TOTAL RAINFALL   (mm)=      89.06        89.06        89.056
     RUNOFF COEFFICIENT   =        .99          .59          .788
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

--------------------------------------------------------------------------------------------
R0001:C00005--------------------------------------------------------------------------------
-----------------------
|  ROUTE RESERVOIR -> |    Requested routing time step =  5.0 min.
|  IN>03:602          |
| OUT<04:Pond         | =========================  OUTLFOW STORAGE TABLE  =========================
----------------------- OUTFLOW   STORAGE| OUTFLOW   STORAGE| OUTFLOW   STORAGE| OUTFLOW   STORAGE
                          (cms)   (ha.m.)|   (cms)   (ha.m.)|   (cms)   (ha.m.)|   (cms)   (ha.m.)
                           .000 .0000E+00|    .128 .6540E-01|    .201 .1232E+00|    .639 .1866E+00
                           .057 .3100E-01|    .152 .8380E-01|    .306 .1438E+00|    .849 .2089E+00
                           .099 .4780E-01|    .172 .1032E+00|    .457 .1650E+00|   1.083 .2317E+00

     ROUTING RESULTS              AREA     QPEAK     TPEAK       R.V.
     ----------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW > 03:602             6.545     1.365    10.583     70.179
    OUTFLOW < 04:Pond            6.545      .434    10.917     70.178

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   31.759
                   TIME SHIFT OF PEAK FLOW         (min)=    20.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.1621E+00

--------------------------------------------------------------------------------------------
R0001:C00006--------------------------------------------------------------------------------
--------------------------
| DESIGN STANDHYD        |   Area    (ha)=     .10
| 05:603        DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
--------------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .05          .05
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=        .50          .50
     Length            (m)=      25.95        40.00
     Mannings n          =        .013         .250

     Max.eff.Inten.(mm/hr)=     125.48        67.67
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       1.28 (ii)   13.78 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .33          .08
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .02          .01          .023 (iii)
     TIME TO PEAK    (hrs)=      10.58        10.75        10.583
     RUNOFF VOLUME    (mm)=      88.26        52.10        70.178
     TOTAL RAINFALL   (mm)=      89.06        89.06        89.056
     RUNOFF COEFFICIENT   =        .99          .59          .788
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

--------------------------------------------------------------------------------------------
R0001:C00007--------------------------------------------------------------------------------
--------------------------
| DESIGN STANDHYD        |   Area    (ha)=     .14
| 06:605        DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
--------------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .07          .07
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=        .50          .50
     Length            (m)=      30.22        40.00
     Mannings n          =        .013         .250

     Max.eff.Inten.(mm/hr)=     125.48        67.67
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       1.40 (ii)   13.91 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .33          .08
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .02          .01          .031 (iii)
     TIME TO PEAK    (hrs)=      10.58        10.75        10.583
     RUNOFF VOLUME    (mm)=      88.26        52.10        70.179
     TOTAL RAINFALL   (mm)=      89.06        89.06        89.056
     RUNOFF COEFFICIENT   =        .99          .59          .788
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

--------------------------------------------------------------------------------------------
R0001:C00008--------------------------------------------------------------------------------
-------------------------
| ADD HYD               |
| 07:Outlet 3           |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
-------------------------                      (ha)     (cms)    (hrs)      (mm)    (cms)
                        ID 1 05:603            .101      .023   10.583    70.178     .000
                       +ID 2 06:605            .137      .031   10.583    70.179     .000
                       =================================================================
                       SUM   07:Outlet 3       .238      .053   10.583    70.178     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------------------
R0001:C00009--------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD          |   Area    (ha)=    5.450   Curve Number   (CN)= 81.00
| 09:604        DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .617

     Unit Hyd Qpeak  (cms)=     .337

     PEAK FLOW       (cms)=     .343 (i)
     TIME TO PEAK    (hrs)=   11.083
     DURATION        (hrs)=   21.000, (dddd|hh:mm:)=   0|21:00
     AVERAGE FLOW    (cms)=     .038
     RUNOFF VOLUME    (mm)=   52.102
     TOTAL RAINFALL   (mm)=   89.056
     RUNOFF COEFFICIENT   =     .585

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

--------------------------------------------------------------------------------------------
R0001:C00010--------------------------------------------------------------------------------
---------------------
| FINISH            |
---------------------
--------------------------------------------------------------------------------------------
********************************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
R0001:C00002  DESIGN STANDHYD
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.
R0001:C00003  ROUTE PIPE      ->
*** WARNING: New pipe size used for routing.
R0001:C00004  DESIGN STANDHYD
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.
R0001:C00006  DESIGN STANDHYD
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.
R0001:C00007  DESIGN STANDHYD
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.
   Simulation ended on 2021-01-08     at 11:52:54
============================================================================================
```

```
2     Metric units
*#*****************************************************************************
*#  Project Name: [214925 ONTARIO LIMITED]    Project Number: [09-015]
*#  Date         : 18-09-2020
*#  Modeller     : [Jonathan Kapitanchuk]
*#  Company      : Condeland Engineering Limited
*#  License #    :  4377549
*#*****************************************************************************
START                   TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[1]
*%                       ["SCS10YR"] <--storm filename, one per line for NSTORM time
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
*# DISCRITIZING THE REGIONAL STORM HAZEL THROUGH PROPOSED POND
*%------------------------------------------------------------------------------|
READ STORM              STORM_FILENAME=["HAZEL.STM"]
*%-----------------|------------------------------------------------------------|
DESIGN STANDHYD         ID=1, NHYD=["601"], DT=[5]min, AREA=[0.624](ha),
                        XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[91],
                        SLOPE=[0.5](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
ROUTE PIPE              PTYPE=[1]circ, IDout=[8], NHYD=["Outlet 2"], RNUMBER=[1],
                        PDIAM=[450](mm), PLNGTH=[45](m),
                        PROUGH=[0.025], PSLOPE=[0.011](m/m), IDin=[1],
                        RDT=[5](min)
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
DESIGN STANDHYD         ID=3, NHYD=["602"], DT=[5]min, AREA=[6.545](ha),
                        XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[91],
                        SLOPE=[0.5](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
ROUTE RESERVOIR         IDout=[4],   NHYD=["Pond"],  IDin=[3],
                        RDT=[5](min),
                              TABLE of ( OUTFLOW-STORAGE ) values
                                          (cms) - (ha-m)
                                           [   0.0 ,  0.0 ]
                                        [    0.0574,0.0310]
                                        [    0.0994,0.0478]
                                        [    0.1283,0.0654]
                                        [    0.1518,0.0838]
                                        [    0.1721,0.1032]
                                        [    0.2013,0.1232]
                                        [    0.3065,0.1438]
                                        [    0.4566,0.1650]
                                        [    0.6394,0.1866]
                                        [    0.8493,0.2089]
                                        [    1.0829,0.2317]
                                         [   -1  ,  -1  ]     (max twenty pts)
*%-----------------------------------------------------------------------|
*%-----------------------------------------------------------------------|
*%-----------------|------------------------------------------------------------|
DESIGN STANDHYD         ID=5, NHYD=["603"], DT=[5]min, AREA=[0.101](ha),
                        XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[81],
                        SLOPE=[0.5](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|------------------------------------------------------------|
DESIGN STANDHYD         ID=6, NHYD=["605"], DT=[5]min, AREA=[0.137](ha),
                        XIMP=[0.50], TIMP=[0.50], DWF=[0](cms), LOSS=[2], CN=[81],
                        SLOPE=[0.5](%), RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|------------------------------------------------------------|
ADD HYD                 IDsum=[7], NHYD=["Outlet 3"], IDs to add=[5+6]
*%-----------------------------------------------------------------------|
DESIGN NASHYD           ID=[9], NHYD=["604"], DT=[5](min), AREA=[5.45](ha),
                        DWF=[0](cms), CN/C=[81], TP=[0.617](hrs),
                        RAINFALL=[ , , , , ](mm/hour), END=-1
*%-----------------------------------------------------------------------|
FINISH
```

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

 SSSSS   W   W   M   M   H   H   Y   Y   M   M    OOO          222     000    11   77777 =========
 S        W W W   MM MM   H   H    Y Y    MM MM   O   O           2    0   0   11   7   7
 SSSSS    W W W   M M M   HHHHH     Y     M M M   O   O           2    0   0   11       7 Ver4.05.4
     S     W W    M   M   H   H     Y     M   M   O   O         222    0   0   11      7  APR 2017
 SSSSS     W W    M   M   H   H     Y     M   M    OOO          2      0   0   11     7   =========
                                                                2      0   0   11    7    # 4377549
       StormWater Management HYdrologic Model                   222     000    11    7    =========

 ******************************************************************************************
 **************************************  SWMHYMO Ver4.05.4  ******************************
 ******************  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.          ******************
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 ******************                  Gatineau, Quebec: (819) 243-6858            ******************
 ******************                  E-Mail: swmhymo@jfsa.com                    ******************
 ******************************************************************************************

 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 ++++++++++++++++++ Licensed user: Condeland Engineering Limited               ++++++++++++++++++
 ++++++++++++++++++                Concord                SERIAL#:4377549      ++++++++++++++++++
 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ******************************************************************************************
 ******************           ++++++ PROGRAM ARRAY DIMENSIONS ++++++          ******************
 ******************           Maximum value for ID numbers  :     11          ******************
 ******************           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   *******************************
 ******************************************************************************************
 *                  RUN DATE: 2021-01-08     TIME: 11:53:39     RUN COUNTER: 000007              *
 ******************************************************************************************
 * Input   file: X:\Projects\09015\09015 - PondHazl (2020-09-02).dat                         *
 * Output  file: X:\Projects\09015\09015 - PondHazl (2020-09-02).out                         *
 * Summary file: X:\Projects\09015\09015 - PondHazl (2020-09-02).sum                         *
 * User comments:                                                                            *
 * 1:________________________________________________________________________________________*
 * 2:________________________________________________________________________________________*
 * 3:________________________________________________________________________________________*
 ******************************************************************************************

-------------------------------------------------------------------------------------------
R0001:C00001---------------------------------------------------------------------------------
*#*****************************************************************************
*#  Project Name: [214925 ONTARIO LIMITED]    Project Number: [09-015]
*#  Date         : 18-09-2020
*#  Modeller     : [Jonathan Kapitanchuk]
*#  Company      : Condeland Engineering Limited
*#  License #    :  4377549
*#*****************************************************************************
--------------------
| START              | Project  dir.:X:\Projects\09015\
-------------------- Rainfall dir.:X:\Projects\09015\
    TZERO =   .00 hrs on       0
    METOUT=   2 (output = METRIC)
    NRUN  = 0001
    NSTORM=   1
           #  1=SCS10YR
-------------------------------------------------------------------------------------------
R0001:C00002---------------------------------------------------------------------------------
*# DISCRITIZING THE REGIONAL STORM HAZEL THROUGH PROPOSED POND
--------------------
| READ STORM         |  Filename: X:\Projects\09015\HAZEL.STM
| Ptotal= 212.00 mm|  Comments: Hazel last 12 hrs STM IN mm/hr
--------------------
      TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN
     hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr
      1:00   6.000|   3:00   6.000|   5:00  17.000|   7:00  23.000|   9:00  13.000|  11:00  38.000
      2:00   4.000|   4:00  13.000|   6:00  13.000|   8:00  13.000|  10:00  53.000|  12:00  13.000

-------------------------------------------------------------------------------------------
R0001:C00003---------------------------------------------------------------------------------
--------------------------
| DESIGN STANDHYD        |   Area    (ha)=     .62
| 01:601       DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
--------------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .31          .31
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=        .50          .50
     Length            (m)=      64.50        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      53.00        51.94
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       3.12 (ii)   17.02 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .27          .07
                                                           *TOTALS*
     PEAK FLOW       (cms)=        .05          .04          .089 (iii)
     TIME TO PEAK    (hrs)=       9.58        10.00        10.000
     RUNOFF VOLUME    (mm)=     211.20       188.06       199.627
     TOTAL RAINFALL   (mm)=     212.00       212.00       212.000
     RUNOFF COEFFICIENT   =       1.00          .89          .942
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  91.0    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.

-------------------------------------------------------------------------------------------
R0001:C00004---------------------------------------------------------------------------------
------------------------
| ROUTE PIPE Outlet 2  | PIPE Number     =    1.00
| IN=01---> OUT=08     | Diameter    (mm)=  450.00
| DT=  5.0 min         | Length       (m)=   45.00
------------------------ Slope      (m/m)=  .01100
                         Manning n       =    .025

     <------------------- TRAVEL TIME TABLE ------------------->
       DEPTH      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (cu.m.)      (cms)        (m/s)        min
       .024     .144E+00      .001         .260         2.89
       .047     .402E+00      .004         .405         1.85
       .071     .725E+00      .008         .522         1.44
       .095     .110E+01      .015         .620         1.21
       .118     .150E+01      .024         .706         1.06
       .142     .194E+01      .034         .781          .96
       .166     .239E+01      .045         .847          .89
       .189     .286E+01      .058         .905          .83
       .213     .334E+01      .071         .956          .78
       .237     .382E+01      .085         .999          .75
       .261     .429E+01      .099        1.036          .72
       .284     .476E+01      .113        1.067          .70
       .308     .522E+01      .126        1.090          .69
       .332     .565E+01      .139        1.106          .68
       .355     .606E+01      .150        1.114          .67
       .379     .643E+01      .159        1.114          .67
       .403     .676E+01      .165        1.102          .68
       .426     .701E+01      .167        1.073          .70
       .450     .716E+01      .156         .979          .77

                                             <---- hydrographs ---->   <-pipe / channel->
                                    AREA    QPEAK     TPEAK    R.V.   MAX DEPTH  MAX VEL
                                    (ha)    (cms)     (hrs)    (mm)      (m)      (m/s)
   INFLOW : ID= 1: 601              .624     .089    10.000 199.627     .245      1.011
   OUTFLOW: ID= 8: Outlet 2         .624     .089    10.000 199.627     .244      1.011

-------------------------------------------------------------------------------------------
R0001:C00005---------------------------------------------------------------------------------
--------------------------
| DESIGN STANDHYD        |   Area    (ha)=    6.55
| 03:602       DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
--------------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.27         3.27
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=        .50          .50
     Length            (m)=     208.89        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      53.00        51.91
                over (min)        5.00        20.00
     Storage Coeff.  (min)=       6.31 (ii)   20.21 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=        .19          .06
                                                           *TOTALS*
     PEAK FLOW       (cms)=        .48          .44          .923 (iii)
     TIME TO PEAK    (hrs)=      10.00        10.08        10.000
     RUNOFF VOLUME    (mm)=     211.20       188.06       199.627
     TOTAL RAINFALL   (mm)=     212.00       212.00       212.000
     RUNOFF COEFFICIENT   =       1.00          .89          .942

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  91.0    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.

-------------------------------------------------------------------------------------------
R0001:C00006---------------------------------------------------------------------------------
-----------------------
|  ROUTE RESERVOIR -> |    Requested routing time step =  5.0 min.
|  IN>03:602          |
| OUT<04:Pond         | ========================  OUTLFOW STORAGE TABLE  ========================
----------------------- OUTFLOW   STORAGE| OUTFLOW   STORAGE| OUTFLOW   STORAGE| OUTFLOW   STORAGE
                         (cms)   (ha.m.)|   (cms)   (ha.m.)|   (cms)   (ha.m.)|   (cms)   (ha.m.)
                          .000 .0000E+00|    .128 .6540E-01|    .201 .1232E+00|    .639 .1866E+00
                          .057 .3100E-01|    .152 .8380E-01|    .306 .1438E+00|    .849 .2089E+00
                          .099 .4780E-01|    .172 .1032E+00|    .457 .1650E+00|   1.083 .2317E+00

     ROUTING RESULTS             AREA     QPEAK     TPEAK       R.V.
     ----------------------      (ha)     (cms)     (hrs)       (mm)
     INFLOW > 03:602            6.545      .923    10.000    199.627
    OUTFLOW < 04:Pond           6.545      .845    10.083    199.627

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=   91.510
                    TIME SHIFT OF PEAK FLOW         (min)=     5.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.2085E+00

-------------------------------------------------------------------------------------------
R0001:C00007---------------------------------------------------------------------------------
--------------------------
| DESIGN STANDHYD        |   Area    (ha)=     .10
| 05:603       DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
--------------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .05          .05
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=        .50          .50
     Length            (m)=      25.95        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      53.00        48.83
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       1.80 (ii)   16.05 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .32          .07
                                                           *TOTALS*
     PEAK FLOW       (cms)=        .01          .01          .014 (iii)
     TIME TO PEAK    (hrs)=       9.33        10.00        10.000
     RUNOFF VOLUME    (mm)=     211.20       164.06       187.630
     TOTAL RAINFALL   (mm)=     212.00       212.00       212.000
     RUNOFF COEFFICIENT   =       1.00          .77          .885
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

-------------------------------------------------------------------------------------------
R0001:C00008---------------------------------------------------------------------------------
--------------------------
| DESIGN STANDHYD        |   Area    (ha)=     .14
| 06:605       DT= 5.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
--------------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .07          .07
     Dep. Storage     (mm)=        .80         1.50
     Average Slope     (%)=        .50          .50
     Length            (m)=      30.22        40.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      53.00        48.83
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       1.98 (ii)   16.23 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .31          .07
                                                           *TOTALS*
     PEAK FLOW       (cms)=        .01          .01          .019 (iii)
     TIME TO PEAK    (hrs)=       9.33        10.00        10.000
     RUNOFF VOLUME    (mm)=     211.19       164.06       187.627
     TOTAL RAINFALL   (mm)=     212.00       212.00       212.000
     RUNOFF COEFFICIENT   =       1.00          .77          .885
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

-------------------------------------------------------------------------------------------
R0001:C00009---------------------------------------------------------------------------------
------------------------
| ADD HYD              |
| 07:Outlet 3          |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                      (ha)     (cms)    (hrs)      (mm)    (cms)
                     ID 1 05:603              .101      .014   10.000   187.630    .000
                    +ID 2 06:605              .137      .019   10.000   187.627    .000
                    ===============================================================
                    SUM   07:Outlet 3         .238      .033   10.000   187.628    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------------------
R0001:C00010---------------------------------------------------------------------------------
--------------------------
| DESIGN NASHYD          |   Area    (ha)=    5.450   Curve Number   (CN)= 81.00
| 09:604       DT= 5.00 |   Ia      (mm)=    1.500   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .617

     Unit Hyd Qpeak  (cms)=     .337

     PEAK FLOW       (cms)=     .609 (i)
     TIME TO PEAK    (hrs)=   10.500
     DURATION        (hrs)=   16.417, (dddd|hh:mm:)=   0|16:25
     AVERAGE FLOW    (cms)=     .151
     RUNOFF VOLUME    (mm)=  164.063
     TOTAL RAINFALL   (mm)=  212.000
     RUNOFF COEFFICIENT   =     .774

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

-------------------------------------------------------------------------------------------
R0001:C00011---------------------------------------------------------------------------------
--------------------
| FINISH             |
--------------------
-------------------------------------------------------------------------------------------
******************************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
R0001:C00003  DESIGN STANDHYD
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.
R0001:C00007  DESIGN STANDHYD
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.
R0001:C00008  DESIGN STANDHYD
*** WARNING: Storage Coefficient is smaller than DT! Use a smaller DT or a larger area.
   Simulation ended on 2021-01-08     at 11:53:39
==========================================================================================
```

APPENDIX 'C2'

- Hydrologic Parameters and Flow Summary
- Pond Stage-storage Discharge Calculation

Determination Time of Concentration
MTO manual B4-5
Airport Formula

	Site Pre-Development Area					External Farmland Area	8th Line External Areas					
CATCHMENT AREA	300	301	302	303	304	604	A1	A2	A3	A4	A5	A6
Runoff Coefficient	0.25	0.25	0.25	0.25	0.25	0.20	0.45	0.45	0.45	0.45	0.45	0.45
length of channel (m)	295	65	280	260	309	235	166	58	94	25	265	157
Fall in channel (m)	3	0.5	4	4	1.43	0.90	2	0.5	0.3	0.6	4	1.45
Net Slope (%)	1.02%	0.77%	1.43%	1.54%	0.46%	0.38%	1.20%	0.86%	0.32%	2.40%	1.51%	0.92%
Area (Ha)	1.811	0.287	1.731	2.75	0.44	5.450	0.65	0.2	0.26	0.02	1.64	0.84
time of concentration (min)	47.33	24.36	41.22	38.76	62.81	61.74	25.67	16.95	29.95	7.94	30.11	27.26
Time of Peak (min)	28.40	14.62	24.73	23.26	37.69	37.04	15.40	10.17	17.97	4.76	18.07	16.35
Time of Peak (hours)	0.473	0.244	0.412	0.388	0.628	0.617	0.257	0.169	0.299	0.079	0.301	0.273

Determination of CN number

Soil Type: Oneida clay loam
Drainage Class: Well Drained
Soil Group: D (Source MTO Drainage Manual, Volume 3, Chapter H, Chart H2-6A)

CN: 81 (AMC II condition)

CN3 91

For Post Development conditions 600 **CN: 38 (AMC II condition)**

CN3 59

		300	301	302	303	304	603 (External)	604 (External)	301+302+303 (Outlet 1)	300+604 (Outlet 2)	304+603 (Outlet 3)
2yr	Pre-development Flow	0.046	0.011	0.049	0.080	0.009	0.048	0.114	0.139	0.158	0.051
5yr	Pre-development Flow	0.059	0.015	0.063	0.104	0.012	0.057	0.147	0.179	0.204	0.062
10yr	Pre-development Flow	0.087	0.022	0.091	0.151	0.017	0.107	0.216	0.259	0.298	0.110
25yr	Pre-development Flow	0.116	0.029	0.122	0.204	0.023	0.098	0.288	0.351	0.399	0.108
50yr	Pre-development Flow	0.130	0.032	0.137	0.228	0.026	0.108	0.323	0.393	0.447	0.119
100yr	Pre-development Flow	0.146	0.036	0.153	0.255	0.029	0.118	0.362	0.440	0.501	0.130
Hazel	Pre-development Flow	0.217	0.038	0.214	0.345	0.049	0.073	0.609	0.596	0.821	0.115

Post Development Analysis

	601	602	604
Runoff Coefficient	0.5	0.5	0.2
length of channel (m)	130	385	235
Fall in channel (m)	2.419	1.416	0.90
Net Slope (%)	1.86%	0.37%	0.38%
Area (Ha)	0.581	5.496	5.450
time of concentration (min)	18.17	53.39	61.74
Time of Peak (min)	10.90	32.03	37.04
Time of Peak (hours)	0.182	0.534	0.617
XIMP	0.5	0.5	
TIMP	0.5	0.5	

		601	602	603 (external)	604 (External)	605	Outlet 1 (Pond)	Outlet 2 (601)	Outlet 3 (605+603)
2yr	POST-development Flow	0.078	0.525	0.009	0.107	0.012	0.128	0.078	0.022
5yr	POST-development Flow	0.094	0.629	0.011	0.136	0.015	0.147	0.094	0.026
10yr	POST-development Flow	0.159	1.194	0.021	0.214	0.028	0.23	0.159	0.049
25yr	POST-development Flow	0.16	1.087	0.019	0.273	0.026	0.284	0.160	0.044
50yr	POST-development Flow	0.176	1.191	0.021	0.305	0.028	0.344	0.176	0.049
100yr	POST-development Flow	0.194	1.365	0.023	0.343	0.031	0.434	0.194	0.053
Hazel	POST-development Flow	0.089	0.923	0.014	0.609	0.019	0.845	0.089	0.033

769.44

****

CONDELAND ENGINEERING LIMITED
TECHNICAL DIVSION
STORM WATER MANAGEMENT ANALYSIS

****

PROJECT NUMBER:		09-015	
PROJECT LOCATION:		PROPOSED RESIDENTIAL DEVELOPMENT LOCATED IN THE HAMLET OF GLEN WILLIAMS McMASTER STREET & MEAGAN DRIVE	
CLIENT:	2147925 ONTARIO INC.	**DATE:**	18-Sep-20

****

SWM Pond Characteristics
Stage-Storage-Discharge Relationship

orifice dia =	0.300	weir length =	1.25
orifice area =	0.0707	weir height =	0.50
orifice Invert elev.=	269.30		
orifice centroid elev.=	269.45	weir elevation =	269.97

Contributing Area 602 = **6.545** ***Ha (includes SWM Pond Area)***

SWMHymo Results

Storm Event	301+302+303	Pond Q
2 yr	0.139	0.128
5 yr	0.179	0.147
10 yr	0.259	0.230
25 yr	0.351	0.284
50 yr	0.393	0.344
100 yr	0.440	0.434
Regional	0.596	0.845

ELEVATION	DEPTH	AREA	STORAGE	STORAGE		Head 1 on Orifice	Orifice Discharge (invert 272.5)	Head 2 on Weir	Weir Discharge (invert 269.96)	Total Discharge
(m)	(m)	(sq.m.)	(cu.m.)	(Ha-m)		(m)	(cum/sec)	(m)	(cum/sec)	(cum/sec)
268.30	0.00	176.61	0.00	0.0000		0.00	0.0000	0.00	0.00	0.0000
268.40	0.10	192.54	18.46	0.0018		0.00	0.0000	0.00	0.00	0.0000
268.50	0.20	209.14	38.54	0.0039		0.00	0.0000	0.00	0.00	0.0000
268.60	0.30	226.44	60.32	0.0060		0.00	0.0000	0.00	0.00	0.0000
268.70	0.40	244.43	83.86	0.0084	PERMANENT POOL	0.00	0.0000	0.00	0.00	0.0000
268.80	0.50	263.04	109.24	0.0109		0.00	0.0000	0.00	0.00	0.0000
268.90	0.60	282.28	136.50	0.0137		0.00	0.0000	0.00	0.00	0.0000
269.00	0.70	302.15	165.73	0.0166		0.00	0.0000	0.00	0.00	0.0000
269.10	0.80	1313.97	293.40	0.0293		0.00	0.0000	0.00	0.00	0.0000
269.20	0.90	1391.74	428.68	0.0429		0.00	0.0000	0.00	0.00	0.0000
269.30	1.00	1470.55	**571.80**	0.0572		0.00	0.0000	0.00	0.00	0.0000
269.30	1.00	1470.55	0.00	0.0000		0.00	0.0000	0.00	0.00	0.0000
269.40	1.10	1551.19	151.09	0.0151		0.00	0.0000	0.00	0.00	0.0000
269.50	1.20	1633.41	310.32	0.0310		0.05	0.0574	0.00	0.00	0.0574
269.60	1.30	1717.19	477.85	0.0478		0.15	0.0994	0.00	0.00	0.0994
269.70	1.40	1802.55	653.83	0.0654	ACTIVE STORAGE	0.25	0.1283	0.00	0.00	0.1283
269.80	1.50	1889.48	838.44	0.0838		0.35	0.1518	0.00	0.00	0.1518
269.90	1.60	1977.98	1031.81	0.1032		0.45	0.1721	0.00	0.00	0.1721
270.00	1.70	2031.83	1232.30	0.1232		0.55	0.1903	0.03	0.01	0.2013
270.10	1.80	2086.25	1438.20	0.1438		0.65	0.2069	0.13	0.10	0.3065
270.20	1.90	2141.24	1649.58	0.1650		0.75	0.2222	0.23	0.23	0.4566
270.30	2.00	2196.79	1866.48	0.1866		0.85	0.2366	0.33	0.40	0.6394
270.40	2.10	2252.90	2088.96	0.2089		0.95	0.2501	0.43	0.60	0.8493
270.50	2.20	2311.48	2317.18	0.2317		1.05	0.2629	0.53	0.82	1.0829

Water Levels

2-yr	269.70
5-yr	269.78
10-yr	270.03
25-yr	270.08
50-yr	270.12
100-yr	270.18
Regional	270.40

STAGE STORAGE TABLE (ACTIVE STORAGE)				
ELEV	AREA (sq. m)	DEPTH (m)	AVG END INC. VOL. (cu. m)	AVG END TOTAL VOL. (cu. m)
269.300	1,470.55	N/A	N/A	0.00
269.400	1,551.19	0.100	151.09	151.09
269.500	1,633.41	0.100	159.23	310.32
269.600	1,717.19	0.100	167.53	477.85
269.700	1,802.55	0.100	175.98	653.83
269.800	1,889.48	0.100	184.61	838.44
269.900	1,977.98	0.100	193.37	1031.81
270.000	2,031.83	0.100	200.49	1232.30
270.100	2,086.25	0.100	205.90	1438.20
270.200	2,141.24	0.100	211.38	1649.58
270.300	2,196.79	0.100	216.90	1866.48
270.400	2,252.90	0.100	222.48	2088.96
270.500	2,311.48	0.100	228.22	2317.18

STAGE STORAGE TABLE (PERMANENT POOL)				
ELEV	AREA (sq. m)	DEPTH (m)	AVG END INC. VOL. (cu. m)	AVG END TOTAL VOL. (cu. m)
269.000	1,238.04	N/A	N/A	0.00
269.100	1,313.97	0.100	127.67	127.67
269.200	1,391.74	0.100	135.25	262.92
269.300	1,470.55	0.100	143.12	406.04

STAGE STORAGE TABLE (FOREBAY)				
ELEV	AREA (sq. m)	DEPTH (m)	AVG END INC. VOL. (cu. m)	AVG END TOTAL VOL. (cu. m)
268.300	176.61	N/A	N/A	0.00
268.400	192.54	0.100	18.46	18.46
268.500	209.14	0.100	20.08	38.54
268.600	226.44	0.100	21.78	60.32
268.700	244.43	0.100	23.54	83.86
268.800	263.04	0.100	25.38	109.24
268.900	282.28	0.100	27.26	136.50
269.000	302.15	0.100	29.23	165.73

APPENDIX 'C3'

On-site and External Storm Sewer Design Chart

CONDELAND ENGINEERING LIMITED
350 CREDITSTONE ROAD, UNIT 200
CONCORD, ON, L4K 3Z2
(905) 695-2096

TOWN OF HALTON HILLS
ENGINEERING AND PUBLIC WORKS DEPARTMENT

10 MINUTE ENTRY TIME Q = AiR/360 **5 -YR STORM**

STREET	FROM	INVERT ELEV	TO	INVERT ELEV	DROP	A.	RUNOFF FACTOR		ACCUM.	INTENSITY	Q	PIPE DIA.	GRADE	CAPACITY	FULL FLOW VELOCITY	ACTUAL VELOCITY	LENGTH	SECT. TIME	TOTAL TIME FULL (Tc)	COMMENTS
	MH	m	MH	m	m	HA	(R)	(A x R)	A x R	mm/hr	cms	mm	%	cms	m/s	m/s	m	min.	min.	% FULL
																			10.000	
ON-SITE STORM SEWER																				
STREET "A"	MH 12	271.76	MH 11	271.27	0.075	0.900	0.5	0.450	0.450	95.81	**0.1198**	450	0.50%	**0.2015**	1.27	1.36	98.29	1.29	11.29	59.45%
STREET "A"	MH 11	271.20	MH 10	271.12	0.075	0.064	0.5	0.032	0.482	95.01	**0.1272**	450	0.50%	**0.2015**	1.27	1.38	14.84	0.20	11.49	63.15%
STREET "A"	MH 10	271.05	MH 9	270.47	0.020	2.024	0.5	1.012	1.494	90.25	**0.3746**	600	0.50%	**0.4339**	1.53	1.74	114.72	1.25	12.73	86.32%
STREET "A"	MH 9	270.45	MH 6	270.02		0.729	0.5	0.365	1.859	87.25	**0.4504**	675	0.50%	**0.5940**	1.66	1.84	86.37	0.87	13.60	75.82%
STREET "A"	MH 8	270.93	MH 7	270.49	0.020	1.157	0.5	0.579	0.579	96.36	**0.1549**	450	0.50%	**0.2015**	1.27	1.36	88.16	1.16	11.16	76.87%
STREET "A"	MH 7	270.47	MH 6	270.17		0.696	0.5	0.348	0.927	93.49	**0.2406**	525	0.50%	**0.3039**	1.40	1.46	60.04	0.71	11.87	79.17%
											100-YR									
POND #1	MH 6	269.80	HW 1	269.72		0.000		0.000	2.785	148.34	**1.1475**	900	0.50%	**1.2794**	2.01	2.33	15.42	0.13	13.73	89.69%
Flow Diversion Sewer (100-YR)																				
																			61.74	
	DICBMH 13	272.08	MH 14	271.94	0.050						**0.3620**	600	0.50%	**0.4339**	1.53	1.73	29.29	0.32	62.06	83.43%
	MH 14	271.89	MH 15	271.72	0.080						**0.3620**	600	0.50%	**0.4339**	1.53	1.73	33.52	0.36	62.42	83.43%
	MH 15	271.64	MH 16	271.15	0.050						**0.3620**	600	0.50%	**0.4339**	1.53	1.73	96.73	1.05	63.47	83.43%
	MH 16	271.10	MH 17	271.07	0.050						**0.3620**	600	0.50%	**0.4339**	1.53	1.73	7.76	0.08	63.56	83.43%
	MH 17	271.02	MH18	270.52	0.020	**SYMHYMO Modelled**					**0.3620**	600	0.50%	**0.4339**	1.53	1.73	99.36	1.08	64.64	83.43%
	MH18	270.50	MH19	270.01	0.080						**0.3620**	600	0.50%	**0.4339**	1.53	1.72	98.40	1.07	65.70	83.43%
	MH19	269.93	MH20	269.34	0.080						**0.3620**	600	0.73%	**0.5243**	1.85	2.02	80.66	0.72	66.43	69.05%
	MH20	269.26	MH 3	269.22							**0.3620**	600	0.50%	**0.4339**	1.53	1.64	7.50	0.08	66.51	83.43%

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TOWN OF HALTON HILLS
ENGINEERING AND PUBLIC WORKS DEPARTMENT

10 MINUTE ENTRY TIME Q = AiR/360 **5 -YR STORM**

STREET	FROM	INVERT ELEV	TO	INVERT ELEV	DROP	A.	RUNOFF FACTOR		ACCUM.	INTENSITY	Q	PIPE DIA.	GRADE	CAPACITY	FULL FLOW VELOCITY	ACTUAL VELOCITY	LENGTH	SECT. TIME	TOTAL TIME FULL (Tc)	COMMENTS
	MH	m	MH	m	m	HA	(R)	(A x R)	A x R	mm/hr	cms	mm	%	cms	m/s	m/s	m	min.	min.	% FULL
Discharge from Pond (100-YR)																				
POND #1	CTRL STR 1	269.30	MH 3	269.22	0.080						**0.4340**	675	1.14%	**0.8970**	2.51	2.86	7.12	0.05	66.51	48.38%
Easement	MH 3	269.14	MH 2	268.68	0.080	**SYMHYMO Modelled**					**0.7960**	825	0.93%	**1.3836**	2.59	2.95	49.25	0.32	66.83	57.53%
Easement	MH 2	268.60	MH 1	268.42							**0.7960**	825	0.90%	**1.3611**	2.55	2.83	20.36	0.13	66.96	58.48%

RUNOFF COEFFICIENTS (R)

0.30: PARK - OPEN SPACE - CEMETARIES
0.45: SINGLE FAMILY RESIDENTIAL
0.65: TOWNHOUSES
0.50: APARTMENTS & MEDIUM DENSITY
0.70: HEAVILY DEVELOPED AREA
INSTITUTIONAL
0.70-0.75: INDUSTRIAL
0.70 - 0.80: COMMERCIAL

PROJECT: 09**-015** ***EDEN OAK (MEAGAN DR & MCMASTER)***
CE#: 09-015
MINISTY REFERENCE:
CALCS BY: J.J.K.
CHECKED BY: M.E.H. **P.Eng.**
STORM: **5 -YEAR RAINFALL MINOR SYSTEMS**
100 -YEAR RAINFALL TOTAL CAPTURE
Date
9-09-2020

TOWN OF HALTON HILLS
ENGINEERING AND PUBLIC
WORKS DEPARTMENT
STORM SEWER DESIGN SHEET

SHEET 1 OF 1

APPENDIX 'D'

Municipal Water Supply and Distribution Analysis

CONDELAND

MUNICIPAL WATER SUPPLY AND DISTRIBUTION ANALYSIS

FOR

RESIDENTIAL SUBDIVISION DEVELOPMENT
2147925 ONTARIO INC.

TOWN OF HALTON HILLS,
REGIONAL MUNICIPALITY OF HALTON

NOVEMBER 26, 2019

C.E. FILE: 09-015

350 CREDITSTONE ROAD, UNIT 200
CONCORD, ONTARIO, L4K 3Z2
www.condeland.com

TELEPHONE: (905) 695-2095
FACSIMILE: (905) 695-2099

CONTENTS

1.0 BACKGROUND

2.0 PROPOSED LAND USE and SURROUNDING AREA

3.0 EXISTING SUPPLY and DISTRIBUTION SYSTEM

4.0 DESIGN and ANALYSIS CRITERIA

5.0 PROPOSED DOMESTIC DEMANDS

6.0 PROPOSED FIRE PROTECTION DEMANDS

7.0 HYDRAULIC MODEL ANALYSIS and RESULTS

8.0 PROPOSED DISTRIBUTION SYSTEM

9.0 CONCLUSIONS

APPENDIX

- Location Plan and Property Fabric
- Draft Plan of Subdivision and Conceptual Grading Plan
- Halton Region Master Plan Extracts
- Fire Flow Demand Calculations (Fire Underwriters Survey)
- Halton Region Data License Agreement, October 23, 2019
- In-House Booster Pump Information

REFERENCES

1. Halton Region Water and Wastewater Linear Design Manual, April 2019 Version 4.0

2. Halton Region Sustainable Halton Water and Wastewater Master Plan Executive Summary, September 12, 2011 - AECOM

3. MOECP Design Guidelines for Drinking-Water Systems, 2008 Publication

1.0 BACKGROUND

The following report is prepared in support of the 2147925 Ontario Inc. residential Draft Plan of Subdivision development application. The Subject Site (the Site) is located north of Wildwood Road and east of Eighth Line. It is geographically located within the community of Georgetown, the local area Municipality of Halton Hills and the Regional Municipality of Halton. The total Site area is approximately 7 hectares or 17 acres. Aerial photographs of the Site and surrounding areas (Location Plans) can be found in the Appendix.

The analysis includes a hydraulic examination of the existing municipal water supply and distribution system to ensure required system pressures and fire flow demands are achieved under a post-development scenario. Watermain sizes will be confirmed based on modelled results and in accordance with all applicable municipal engineering standards and criteria for the Site.

This report is a stand-alone analysis and will be utilized to complement the detailed watermain design for the development/Site.

2.0 PROPOSED LAND USE and SURROUNDING AREA

The subject property is currently vacant. The development proposal (Refer to Appendix for Draft Plan of Subdivision prepared by Matthews Planning and Management Ltd. with a revision date of June 22, 2018) contemplates the creation of 32 single-family estate residential lots.

The proposed development area is located adjacent to existing estate residential areas within the community of Georgetown. The existing residential areas south, east and west of the Site are currently connected to the existing municipal water distribution system.

Accordingly, connection points to the existing water distribution system are readily available and are described in further detail below.

3.0 EXISTING SUPPLY and DISTRIBUTION SYSTEM

The regional municipality (Halton Region) is responsible for the bulk supply, treatment and storage of water for the municipal water systems and for the distribution of the treated water to individual users.

The area immediately surrounding the Site (in Georgetown) relies on groundwater supply. Georgetown is serviced by three pressure zones, G5G, G6G and G7G, and is supplied by three well fields: Cedarvale, Princess Anne, and Lindsay Court.

The 2011 Sustainable Halton Water and Wastewater Master Plan identifies the southern portion of Georgetown will ultimately be connected to the South Halton Lake-Based Water Supply / Distribution System in order to support the projected 2031 Regional growth forecast. However, the subject Site and immediate surrounding area of Georgetown will remain connected to the groundwater supply.

The existing municipal infrastructure adjacent to the Site includes a 250mm diameter watermain located within the McMaster Street and Meagan Drive rights-of-way and a 200mm watermain within the Eighth Line right-of-way.

4.0 DESIGN and ANALYSIS CRITERIA

Halton Region's Water and Wastewater Linear Design Manual (dated April 2019) was referenced for relevant design and analysis criteria.

In accordance with Regional standards and criteria, all watermains shall be sized to meet the greater of the "maximum daily demand plus fire flow" or "maximum hourly" demand scenario. Fire flow demand shall be determined as outlined in the Water Supply for Public Fire Protection (1999) as prepared by the Fire Underwriters Survey (FUS).

FUS is financed by the Canadian Insurance industry. Its purpose is to survey fire protection conditions in Canadian municipalities thereby providing data and advisory services to fire insurance underwriters and public officials concerned.

Maximum sustained system operating pressures shall not exceed 700 kPa (100psi). Normal operating pressure should be approximately 350 to 550 kPa (50 to 80psi) and the pressure shall not drop below 275 kPa (40psi) at any point in the water distribution system. The maximum pressure in the distribution system should not exceed 700 kPa (100psi).

Under conditions of simultaneous maximum day plus fire flow demands, the pressure shall not drop below 140 kPa (20psi) at any point in the water distribution system.

Friction factors based on Hazen Williams 'C' values used for this analysis are summarized in Table 1 below.

TABLE 1 - Hazen Williams 'C' Values – Friction Factors

Diameter of Main (mm)	Pipe Material	'C' Factor
50	Copper	120
100 to 400	PVC / HDPE	130
400 and greater	Concrete Lined	110

5.0 PROPOSED DOMESTIC DEMANDS

The domestic water demand was calculated based on Halton Region's average day consumption rate of 275 litres per capita per day. Maximum-day and peak/maximum-hour factors of 2.25 and 4.00 respectively were used.

A population equivalency based on the proposed residential land use is calculated at 55 persons per hectare.

6.0 PROPOSED FIRE PROTECTION DEMANDS

The recommended fire flow for the proposed residential development area was calculated using the criteria indicated in the Water Supply for Public Fire Protection Manual, 1999, by Fire Underwriters Survey. Appropriate reductions and increases have been applied to the equation.

Detailed demand calculations can be found in Appendix. A summary of design flows is provided in Table 2 below.

TABLE 2 – Design Flows

Demand Scenario	Peaking Factor	Flow (l/s)	Notes
Average Day	1.00	1.21	Total Population = 379 persons
Max Hour	4.00	4.83	Total Population = 379 persons
Max Day	2.25	2.71	Max Day
Fire	N/A	136.04	Refer to **Appendix**

Note: Maximum Daily Demands plus Fire Flow will govern the design.

In accordance with applicable Halton Region design criteria for watermains, the municipal water distribution system shall be designed to accommodate max-day plus fire or peak hour demand scenarios whichever is greater.

7.0 HYDRAULIC MODEL ANALYSIS and RESULTS

Model setup, validation, scenarios and results are summarized below, and additional information is included in Appendices.

Halton Region's latest hydraulic model was used for the analysis. A Data License Agreement was signed on October 23, 2019. Refer to Appendix.

Two versions of the water model were utilized. One with existing pressure zone boundaries (2016) and the other with proposed pressure zone boundaries (2031 scenario). The first was used to analyze the current state of the existing system, and the second was used to analyze the ultimate state of the system. Refer to email correspondence with Halton Regional staff as included in Appendix.

The Georgetown Pressure Zone G6G is served by to Regional storage facilities. The 22^{nd} Sideroad Reservoir with a total head (top water level) elevation of 303.00m, and the Todd Road Tower with a total head (top water level) of 303.01m.

Actual operating (total head) water levels used in the InfoWater model scenarios (as provided by Halton Region) are 302.00m and 300.80 for the 22^{nd} Sideroad Reservoir and the Todd Road Tower respectively.

Maximum day and peak hour demand scenario results are summarized in Tables 3 and 4 below for both the 2016 and 2031 pressure zone boundaries respectively.

TABLE 3
Halton Region InfoWater Hydraulic Model Data
2016 Existing Pressure Zone Boundaries – Scenario Results

Junction	Location	Ground Elevation (m)	Max Day Pressure (psi)	Max Day HGL (m)	Peak Hour Pressure (psi)	Peak Hour HGL (m)
WFT16883	McMaster St. (West Limit)	274.28	37.7	300.79	34.8	298.79
WFT16885	Meagan Dr. (West Limit)	273.86	38.2	300.79	35.4	298.79
WFT783	Eighth Line	270.36	43.1	300.80	40.4	298.81

TABLE 4
Halton Region InfoWater Hydraulic Model Data
2031 Ultimate Pressure Zone Boundaries – Scenario Results

Junction	Location	Ground Elevation (m)	Max Day Pressure (psi)	Max Day HGL (m)	Peak Hour Pressure (psi)	Peak Hour HGL (m)
WFT16883	McMaster St. (West Limit)	274.28	37.6	300.70	34.3	298.40
WFT16885	Meagan Dr. (West Limit)	273.86	38.2	300.70	34.9	298.41
WFT783	Eighth Line	270.36	43.1	300.71	39.9	298.43

Refer to Appendix for detailed InfoWater model screenshot results.

The InfoWater model results indicate residual system pressures below 40psi under both maximum daily and peak/maximum hourly demand scenarios for both the 2016 and 2031 system models. Refer to Tables 3 and 4 above.

The existing westerly limits of the McMaster Street watermain (250mm diameter) yields a system residual pressure of 34.3psi under the 2031 peak hour demand scenario.

The existing westerly limits of the Meagan Drive watermain (250mm diameter) yields a system residual pressure of 34.9psi under the 2031 peak hour demand scenario.

FIGURE 1
2016 Peak/Maximum Hour Demand Scenario
(Existing Pressure Zone Boundaries)

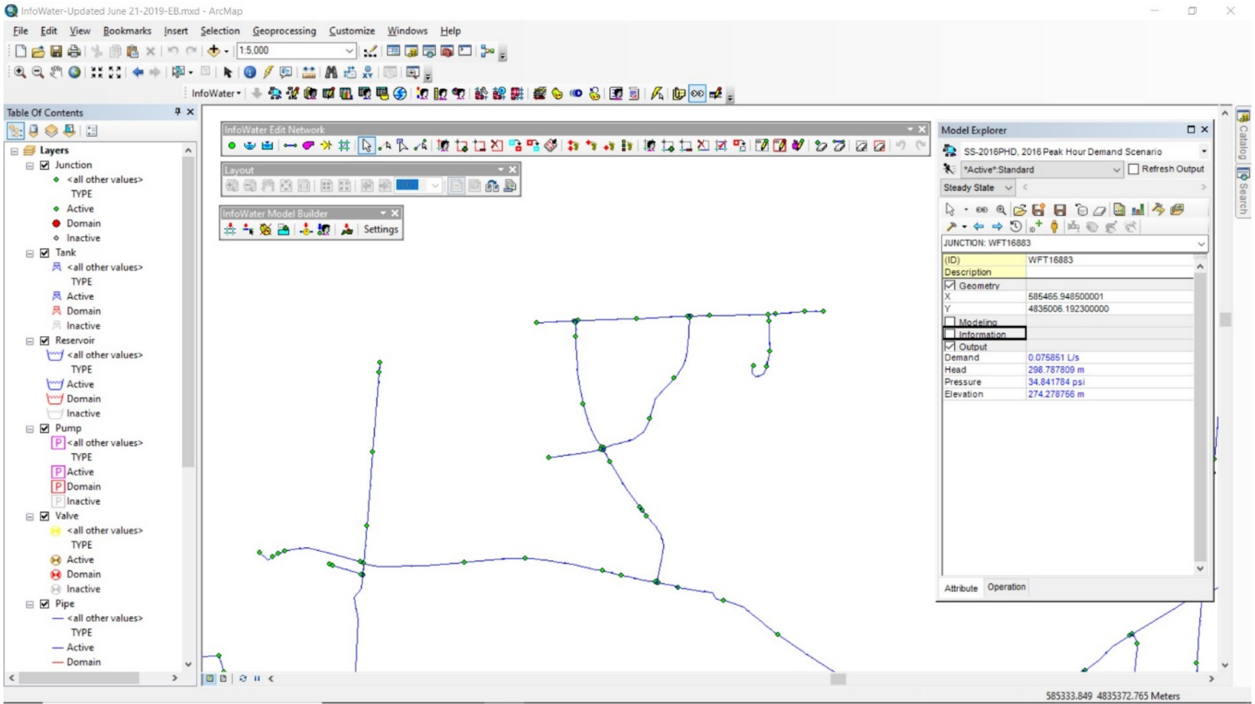
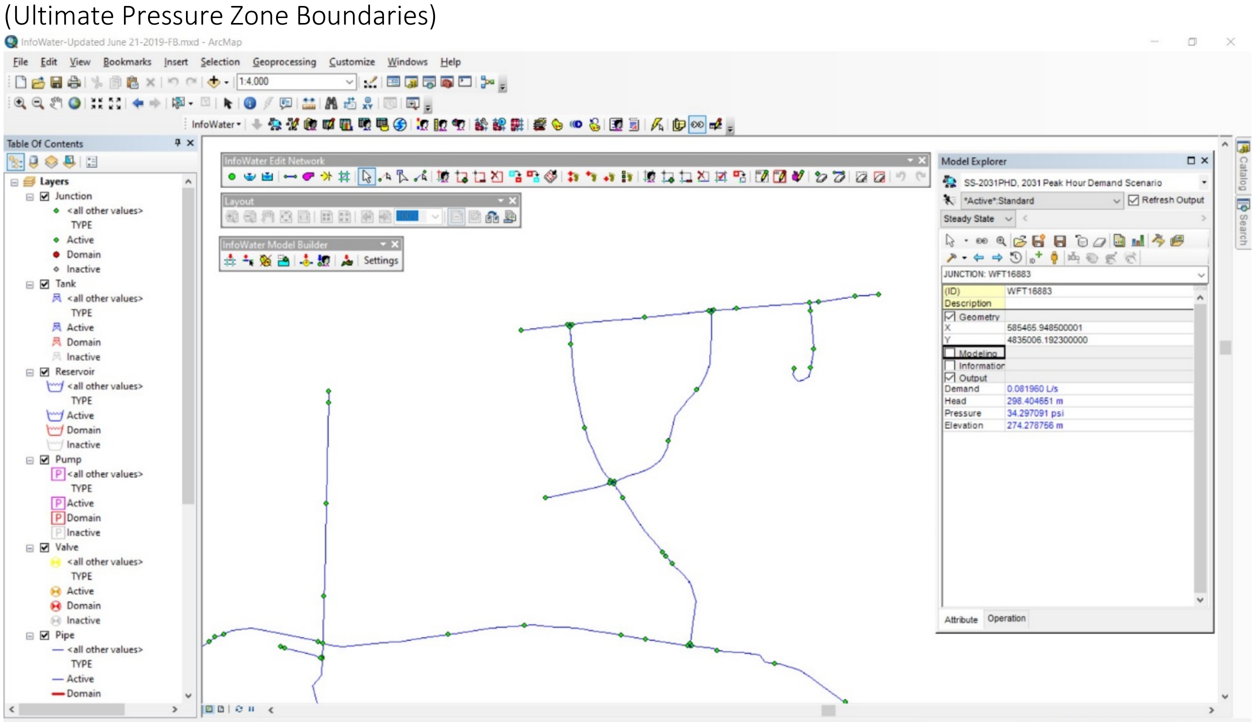
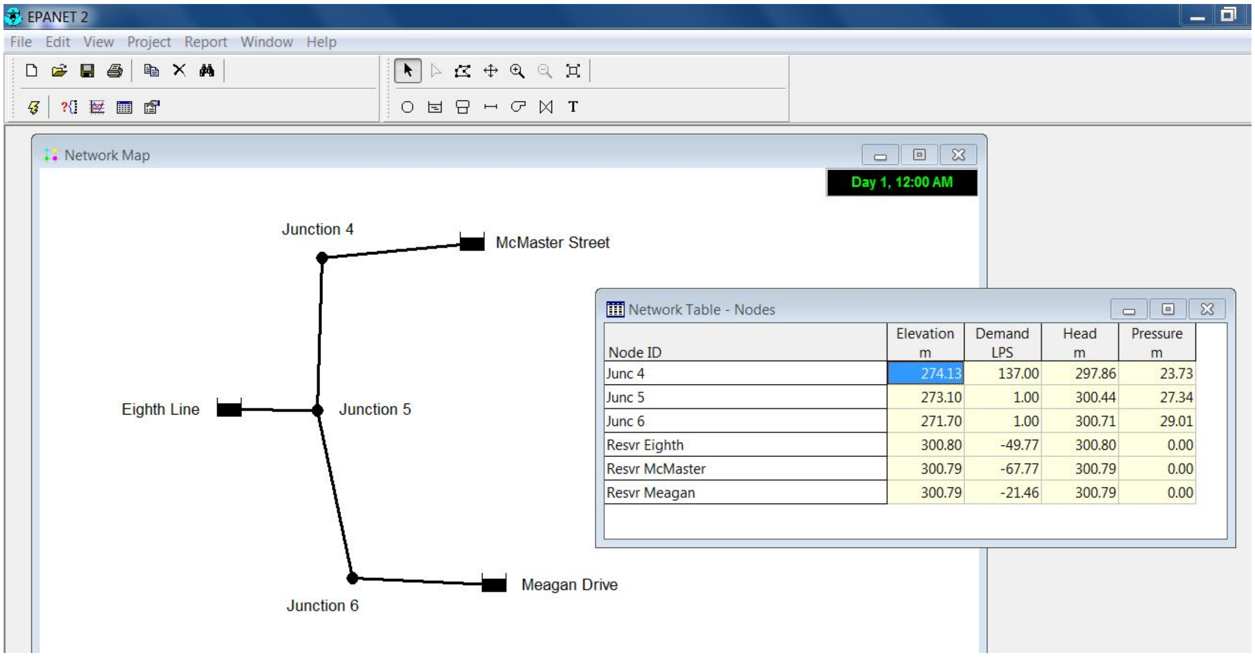


FIGURE 2
2031 Peak/Maximum Hour Demand Scenario
(Ultimate Pressure Zone Boundaries)



A maximum day plus fire flow demand scenario analysis was completed (using the EPANET software) based on boundary HGL levels from the Halton Region InfoWater model. Figure 3 below shows a schematic and summary of this analysis.

FIGURE 3
Max Day Plus Fire Demand Scenario
(Fire at Junction Node 4)



Node ID	Elevation m	Demand LPS	Head m	Pressure m
Junc 4	274.13	137.00	297.86	23.73
Junc 5	273.10	1.00	300.44	27.34
Junc 6	271.70	1.00	300.71	29.01
Resvr Eighth	300.80	-49.77	300.80	0.00
Resvr McMaster	300.79	-67.77	300.79	0.00
Resvr Meagan	300.79	-21.46	300.79	0.00

A fire was simulated at Junction 4 (McMaster Street being the northern most point of the proposed estate residential subdivision and the highest ground elevation of 274.13m). **Residual system pressures under the maximum day plus fire flow demand at this Junction indicate a residual pressure of 23.73m (232kPa or 33psi).** Fire flow demands can adequately be accommodated with residual system pressures exceeding the minimum requirement of 20psi.

Accordingly, the following observations are noted for the Georgetown G6G Pressure Zone:

1. Overall system supply (for both 2016 and 2031 models) is adequate under all demand scenarios;
2. Emergency storage capacity is adequate; and
3. Minimum fire flow demands / residual pressures can be achieved for the proposed estate residential subdivision.

Sub-standard residual system pressures (below 40psi) are a direct result of the ground elevations exceeding the top water level service boundaries of the 22nd Sideroad Reservoir and Todd Road Tower.

It is further noted, the large size of the proposed estate residential lots/homes and the length of individual service laterals to each lot, will exacerbate the sub-standard residual system pressure conditions experienced by future residents.

8.0 PROPOSED DISTRIBUTION SYSTEM

For the proposed estate residential subdivision:

The pressure at the building face is calculated as the residual pressure at the main less the head loss in the supply line. Based on the model results and using the Hazen-Williams formula to determine the head losses in the supply line. **Given the size of the proposed estate residential lots/units and the analysis results, it is recommended each lot be serviced with 50mm diameter copper laterals in order to minimize the additional system head loss due to friction within each of the service laterals.**

In 2011 Halton Region updated its Water and Wastewater Master Plan to account for anticipated growth throughout the Region to a planning horizon year of 2031. The Preferred Water Servicing Strategy is included in Appendix. **The overall Master Plan system improvements noted for the Georgetown G6G Pressure Zone do not eliminate the sub-standard maximum day or peak hour residual low pressure concerns noted above. This condition is true for both the existing and planned estate residential lots north of Wildwood Road and east of Eighth Line.**

9.0 CONCLUSIONS

The proposed residential subdivision is located within the Georgetown 6 Groundwater (G6G) Pressure Zone service area. The ground elevations of the Site are at the highest end of the service area limitations for G6G. As a result, existing and proposed pressures for the Site range between 35-40psi under maximum daily/hourly demand scenarios.

Accordingly, two options are available for further discussion with applicable Regional staff in order to mitigate the ground elevation limitations for the area, and to increase the level of service to existing and proposed residents.

Option One – Individual in-house booster pumps:

May be installed at the main supply line / water meter location of every home within the proposed residential subdivision. Each in-house booster pump will increase pressures within the internal plumbing system of the home by approximately 20-40psi. Refer to Appendix for typical details and additional information on in-house booster pumps.

Option Two – Construction of a local booster pumping station:

This would involve isolating the low-pressure area and installing a booster pumping station (to be owned and operated by the Region of Halton) to increase system pressures to an acceptable level. The infrastructure would include a by-pass to which the booster pump is attached, and a pump control/check valve on the main line. The booster pumping station would be constructed in a new valve chamber on the proposed 200mm diameter watermain within the easement connecting to Eighth Line.

In order to prevent critically high pressures at lower elevations, a check valve would be required to isolate the system at Oak Ridge Drive and Wildwood Road. Elevations lower than this point would not need to be boosted.

The booster pumping station would only operate during low pressure conditions. When the pump control/check valve senses low pressure on the downstream side, it will close and initiate the booster pump to start. The check valve will close when the pressure is increased in the isolated area of the system. When the pressure in the system reaches an upper limit, the pump control/check valve will open and will signal the booster pump to shut down. The isolation check valve will also open.

The pressure upper limit for the booster pump should be set so that unacceptable high pressures are avoided at the lowest elevations in the isolated area. The booster pumping station would be a permanent solution to the low-pressure problem.

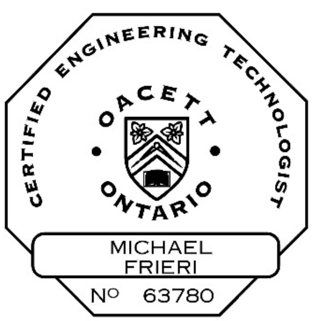
The booster pumping station would improve system pressures for the proposed subdivision as well as for the adjacent existing estate residential subdivision. It is our understanding Halton Regional staff are aware of existing low-pressure concerns raised by the current residents in this area. Based on the broader service area for the proposed booster pumping station, cost-sharing discussions will be pursued with Regional staff should this option be implemented.

The proposed subdivision will be serviced by a 200mm diameter PVC watermain by connecting to the existing watermain terminus points at the westerly limits of McMaster Street and Meagan Drive. In addition, for security of supply and looping (water quality) purposes, a 200mm diameter PVC watermain is necessary along the existing easement to connect with the existing 200mm watermain on Eighth Line.

Based on the above noted existing system improvement options, proposed fire and domestic water demands can be adequately accommodated by the municipal water supply and distribution system.

Trusting this satisfies all current needs. Should additional information and/or clarification be required, please do not hesitate to contact the undersigned.

Respectfully Submitted,



Michael Frieri, C.E.T.
Senior Consultant
Engineering, Land Development
And Project Management

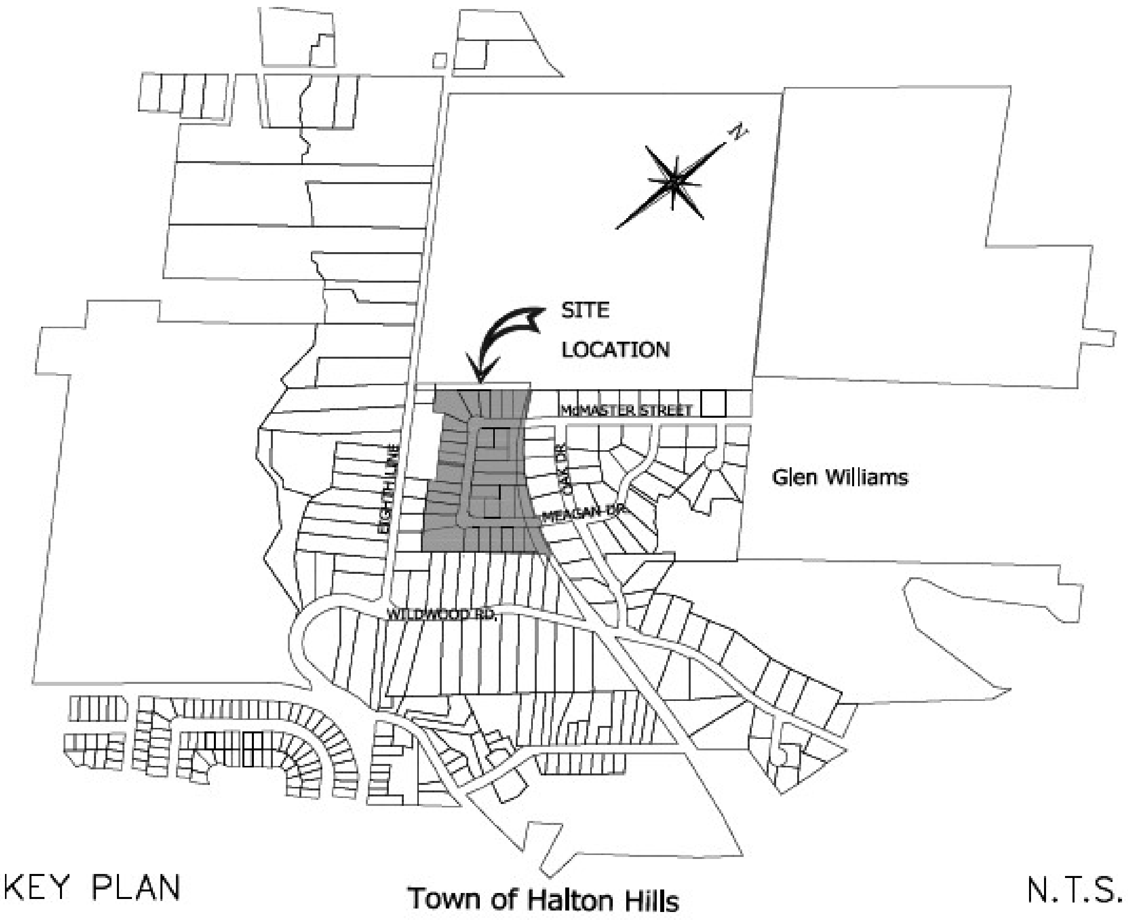
Robert P. DeAngelis, P. Eng.
Principal, Condeland Engineering Ltd.

APPENDIX

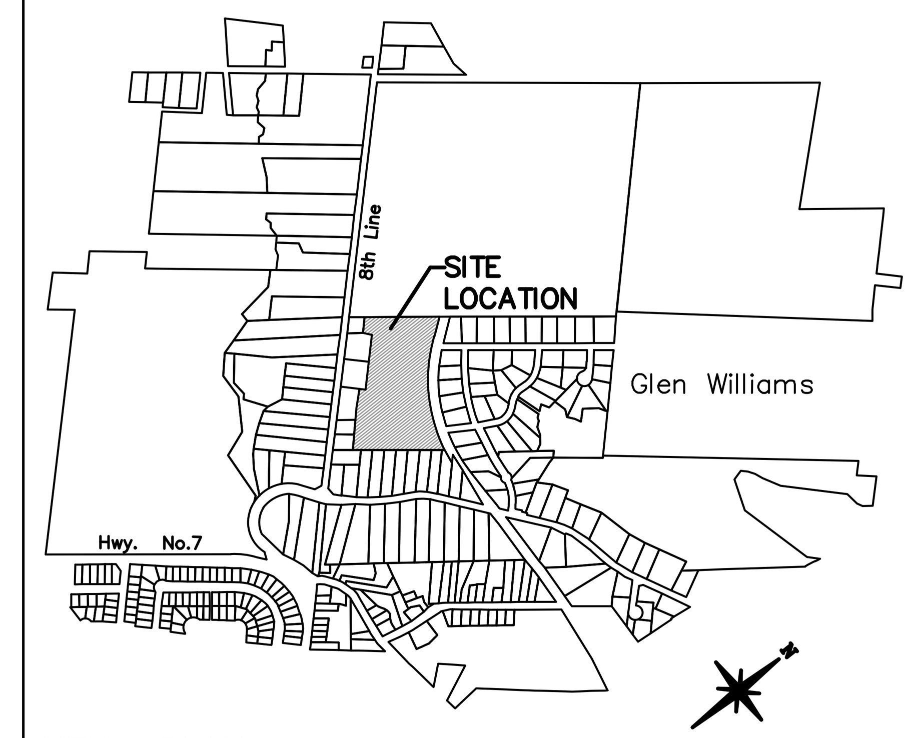
LOCATION PLAN

(NTS)

PROPERTY FABRIC



REVISED JUNE 22, 2018
REVISED MAY 10, 2018



KEY PLAN
NOT TO SCALE

DRAFT PLAN OF SUBDIVISION

OF

PART OF LOT 21
CONCESSION 9
(GEOGRAPHIC TOWNSHIP OF ESQUESING)
TOWN OF HALTON HILLS
REGIONAL MUNICIPALITY OF HALTON

SCALE: 1:750

25m 0 25 50m

METRIC:

DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

GENERAL NOTES

LAND USE	LOTS/BLOCKS	AREA(Ha.)
SINGLE-DETACHED RESIDENTIAL (@ 5 UNITS/NET Ha.)	LOTS 1-32	5.488
STORMWATER MANAGEMENT POND	BLOCK 33	0.439
ROAD 20m RIGHT-OF-WAY x 472m LENGTH		.959
TOTAL AREA		6.886 Hectares

FRONTAGES SHOWN AT 4.5m SETBACK LINE

ADDITIONAL NOTES

(UNDER SECTION 51 (2) OF THE PLANNING ACT)

INFORMATION REQUIRED BY CLAUSES a,b,c,e,f,g,j & l SHOWN ON DRAFT PLAN AND KEY PLAN.

(d) RESIDENTIAL, SWM POND
(h) MUNICIPAL SUPPLY TO BE MADE AVAILABLE
(i) CLAY LOAM
(k) FULL MUNICIPAL SERVICES TO BE MADE AVAILABLE

OWNERS CERTIFICATE

2147925 ONTARIO INC. BEING THE REGISTERED OWNERS OF THE SUBJECT LANDS HEREBY AUTHORIZE MATTHEWS PLANNING & MANAGEMENT LTD. TO PREPARE AND SUBMIT THIS DRAFT PLAN OF SUBDIVISION FOR APPROVAL.

2147925 ONTARIO INC.

MAY 15, 2009 SIGNATURE ON FILE

SURVEYORS CERTIFICATE

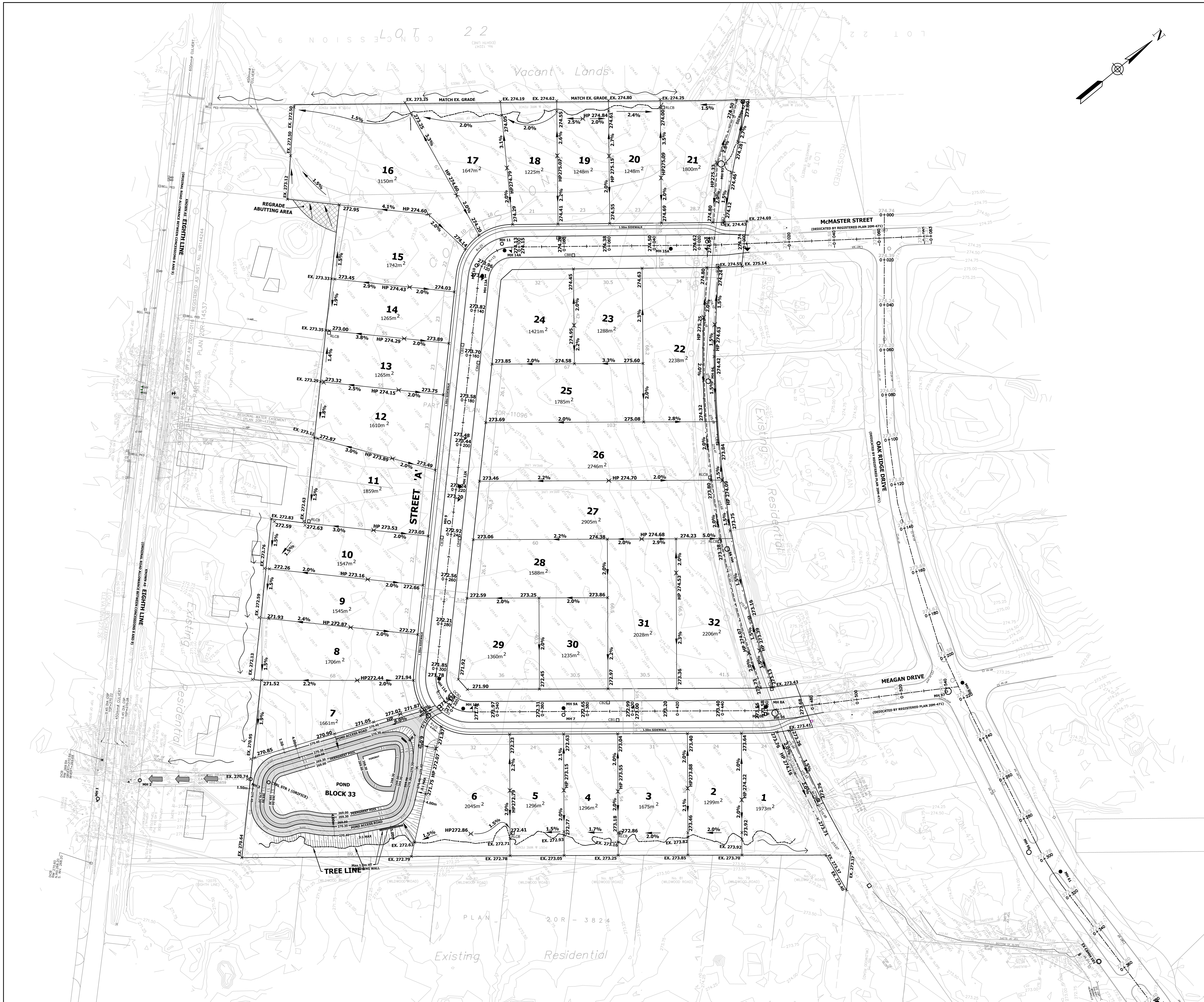
I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LANDS TO BE SUBDIVIDED AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

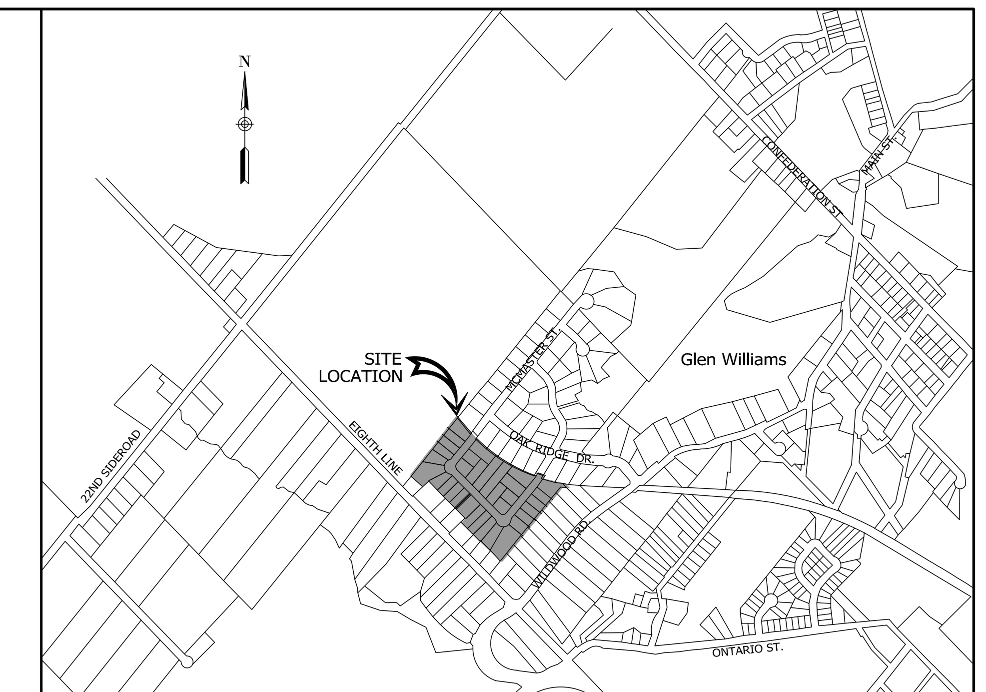
JUNE 1, 2009 SIGNATURE ON FILE
DAN C. DOLLIVER, ONTARIO LAND SURVEYOR
DOLLIVER SURVEYING INC.

CANADIAN INSTITUTE OF PLANNERS — MEMBER-MEMBRE — DAVID MATTHEWS — INSTITUT CANADIEN DES URBANISTES

MATTHEWS PLANNING & MANAGEMENT LTD.
Consultants in Planning and Land Economics
1267 Dorval Drive, Unit 47 Oakville, Ontario
L6M 3Z5 (416) 565-7480

FILE: DEVINS-R2.DWG





PLAN OF SURVEY ILLUSTRATING TOPOGRAPHY
TOWN OF HALTON HILLS
REGIONAL MUNICIPALITY OF HALTON

LEGEND

+191.84	PROPOSED ELEVATION
+ EX:191.84	EXISTING ELEVATION
HP 191.84	PROPOSED HIGH POINT ELEVATION
+ 191.84	EXISTING TOPO ELEVATION
	LOT LINE
0+000	PROPOSED CENTERLINE/STA
TPF TPF	SOLID TREE PROTECTION HOARDING

BEARINGS ARE UTM GRID, DERIVED FROM REAL TIME NETWORK (RTN) OBSERVATIONS, UTM ZONE 17, NAD83 (CSRS) (2010.0).
DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.999690.
ALL CURB ELEVATIONS ARE SHOWN TO THE TOP FACE OF CURB.

ELEVATION NOTE
ELEVATIONS SHOWN ON THIS PLAN ARE RELATED TO GEODETIC DATUM AND ARE DERIVED FROM GEOLOGICAL SURVEY OF CANADA BENCH MARK: No. 0011954U598F ELEVATION=258.735m, No. 00819668361 ELEVATION=252.480m

LOCAL BENCHMARK
CONCRETE NAIL LOCATED ON THE SOUTHWEST SIDE OF EIGHTH LINE, OPPOSITE MAIL BOX FOR ADDRESS No. 12124.
ELEVATION=271.26m
ALL DIMENSIONS AND ELEVATIONS ARE IN METRES UNLESS OTHERWISE NOTED PIPE SIZES ARE IN MILLIMETRES

REVISION	BLOCK	DATE	APPR. BY
.	.	.	.

RESIDENTIAL SUBDIVISION DEVELOPMENT
2147925 ONTARIO INC.

CONDELAND
CONSULTING ENGINEERS & PROJECT MANAGERS
350 Creditstone Road, Unit 200
Concord, Ontario L4K 3Z2
P: (905) 695-2096
F: (905) 695-2099

TOWN OF HALTON HILLS
Working Together Working for You!

Halton REGION

FIGURE 6 - CONCEPTUAL GRADING PLAN

DESIGNED BY: M.E.H.	DATE: SEPTEMBER 2019	CHECKED BY: M.E.H.	
DRAWN BY: A.G./V.B./G.M.	DRAWING NO. 09-015-13	CITY FILE:	
SCALE HOR 1:750	Sheet: 13 OF 18	REGION FILE:	

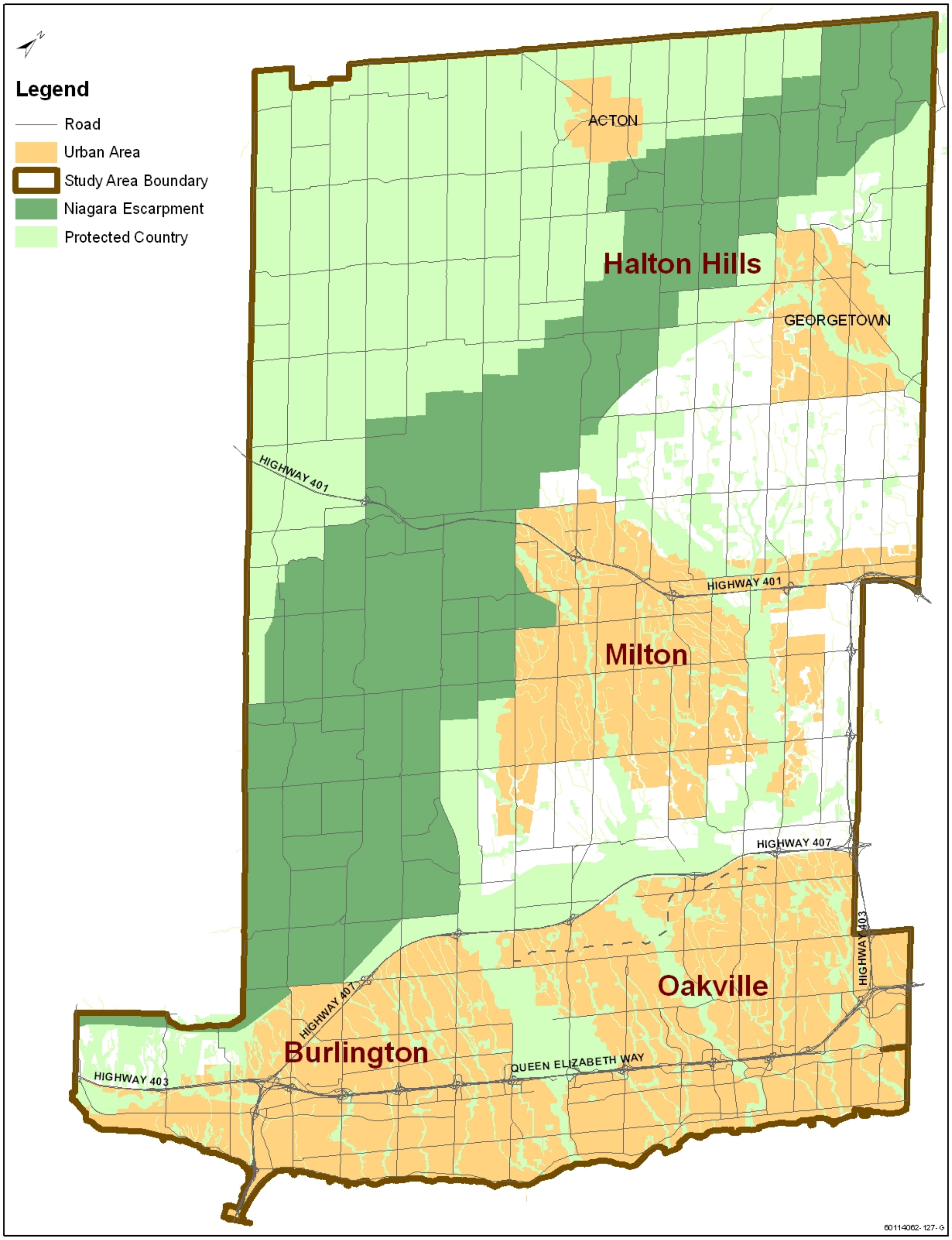
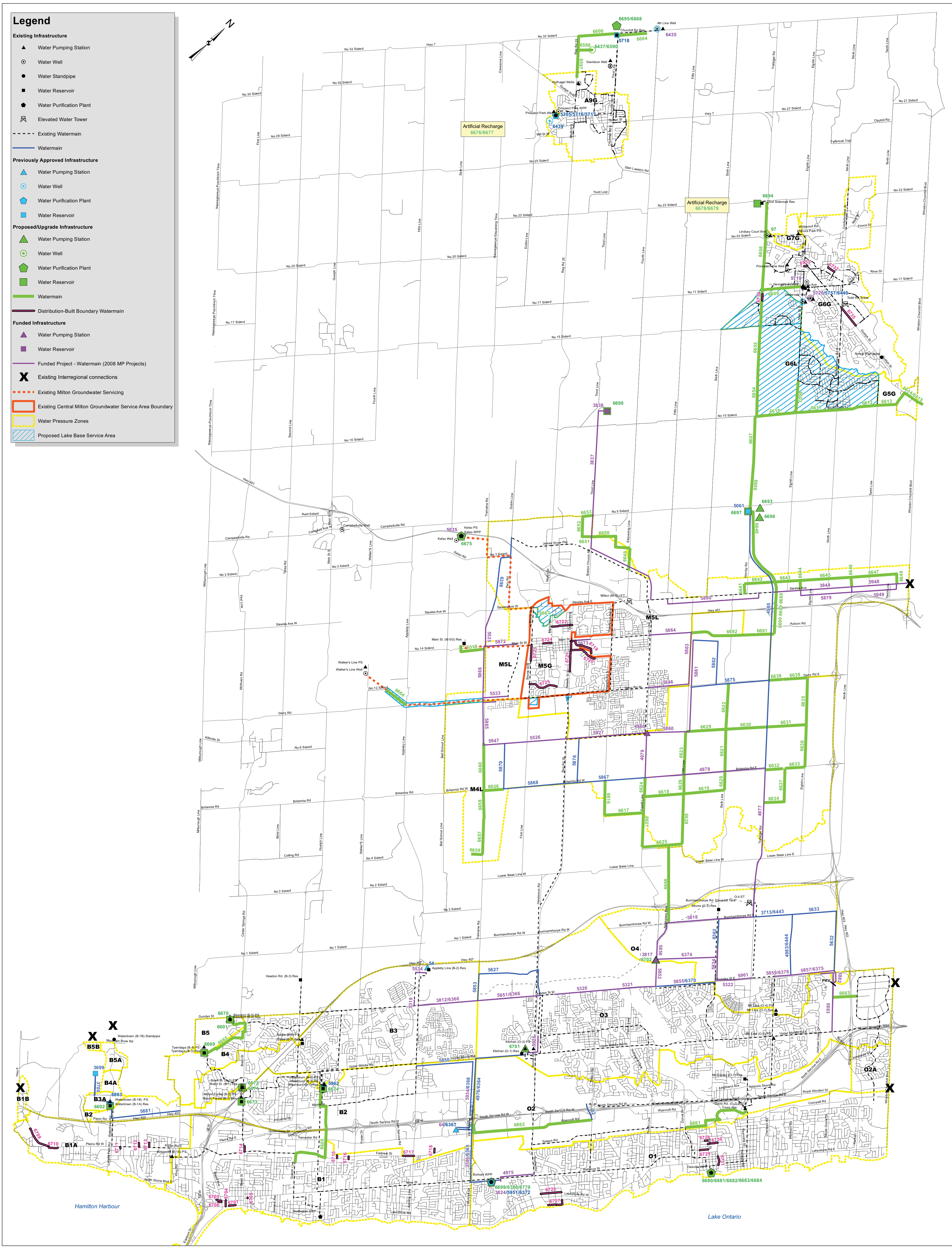


Figure 1 Sustainable Halton Study Area



Sustainable Halton
Water and Wastewater Master Plan
Executive Summary

Preferred Water Servicing Strategy

September, 2011
1:40,000
601140562-363-W

Attachment 1 - Water Capital Program

Region IPFS ID	Project Description	Municipality	Project Type	Total Estimated Cost (2012$)	EA Schedule	Project Start Year
Oakville						
82	400 mm Zone 2 WM on 3rd Line from Wyecroft Rd to North Service Road (Zone O2)	OAK	WM	$ 982,000	B (Satisfied though 2008 MP)	2017-2021
3713	400mm WM on Burnhamthorpe Rd from Trafalgar Rd to new North Oakville road. (Zone O4) (Design)	OAK	WM	$ 317,000	A+	2012-2016
4983	400 mm WM on new North Oakville road from Burnhamthorpe Rd to Dundas St (Zone O4) (Design)	OAK	WM	$ 424,000	A+	2012-2016
5627	600 mm WM through North Oakville Lands from Tremaine Rd to Bronte Rd (Zone O3)	OAK	WM	$ 7,238,000	A+	2012-2016
5632	300 mm WM on 9th Line from Burnhamthorpe Rd to Dundas St (Zone O4)	OAK	WM	$ 2,254,000	A+	2012-2016
5633	300 mm WM on Burnhamthorpe Rd from new North Oakville road to 9th Line (Zone O4)	OAK	WM	$ 2,342,000	A+	2012-2016
5853	600 mm WM on Tremaine Rd from Dundas St to approximately 950 m north (North Oakville Lands) (Zone O3)	OAK	WM	$ 1,330,000	A+	2012-2016
5951	Design of Burloak WPP Phase 2 Expansion from 55 to 165 ML/d.	OAK	WPP	$ 11,327,000	C	2012-2016
6362	600mm in North Oakville along 6th Line to Burnhamthorpe Rd (Zone O4)	OAK	WM	$ 2,005,000	A+	2012-2016
6364	1500 mm WM from Zone 2 Burloak PS to Kitchen Reservoir (Zone O1) (Construction)	OAK	WM	$ 53,062,000	C	2012-2016
6368	1050 mm WM from Burloak Pumping Station north on Burloak Dr to Upper Middle Rd (Zone B2) (Construction)	OAK	WM	$ 6,515,000	A+	2012-2016
6370	750 mm WM on Dundas St from 6th Line to WM #5321 at Dundas St and Neyagawa Blvd (Construction) (Zone O3)	OAK	WM	$ 5,030,000	A+	2012-2016
6372	Construction of Burloak WPP Phase 2 Expansion from 55 to 165 ML/d	OAK	WPP	$ 98,433,000	C	2012-2016
6443	400 mm WM on Burnhamthorpe Rd from Trafalgar Rd to new North Oakville road (Zone O4) (Construction)	OAK	WM	$ 1,828,000	A+	2012-2016
6444	400 mm WM from Burnhamthorpe Rd to Dundas St on new North Oakville road (Zone O4) (Construction)	OAK	WM	$ 2,449,000	A+	2012-2016
6661	900 mm Second Feedermain to Davis Road Booster Pumping Station (Zone O1)	OAK	WM	$ 14,171,000	B	2012-2016
6662	400 mm WM on Wyecroft Rd from Burloak Dr to 3rd Line (Zone O2)	OAK	WM	$ 10,973,000	A+	2017-2021
6663	400 mm WM from 9th Line on easement to Bristol Circle (Zone O3)	OAK	WM	$ 3,008,000	B	2012-2016
6680	Oakville WPP Intake Pipe Extension - Design	OAK	WPP	$ 1,500,000	C	2012-2016
6681	Oakville WPP Intake Pipe Extension - Construction	OAK	WPP	$ 8,500,000	C	2017-2021
6682	Class EA Study of Oakville WPP Expansion from 109 to 130 ML/d	OAK	WPP	$ 1,000,000	C	2012-2016
6683	Design of Oakville WPP Expansion from 109 to 130 ML/d.	OAK	WPP	$ 3,464,000	C	2012-2016
6684	Construction of Oakville WPP Expansion from 109 to 130 ML/d	OAK	WPP	$ 20,803,000	C	2012-2016
6702	40 ML/d expansion at the North Oakville Zone O4 Pumping Station (existing site)	OAK	P.S.	$ 4,536,000	B	2022-2026
6726	300 mm WM on Sovereign between Bronte Rd and East Street	OAK	WM	$ 2,652,000	A+	2017-2021
6727	300 mm WM on Ontario/East Street between Bronte Rd and Marine Drive	OAK	WM	$ 2,060,000	A+	2017-2021
6728	300 mm WM on Cowan Between Kerr Street and Inglewood Drive	OAK	WM	$ 611,000	A+	2022-2026
6729	300 mm WM on Deane between Kerr Street and Felan Ave	OAK	WM	$ 981,000	A+	2022-2026
6730	300 mm WM on Normandy between Kerr Street and Queen Mary Drive	OAK	WM	$ 651,000	A+	2027-2031
6731	300 mm WM on Forsythe between Rebecca Street and Burnet Street	OAK	WM	$ 577,000	A+	2027-2031
Subtotal Oakville				**$ 271,023,000**		
Burlington						
54	30 ML/d Pumping Station at Appleby Line Reservoir (Zone B3)	BUR	P.S.	$ 10,274,000	B (Satisfied though 2008 MP)	2012-2016
3699	4.5 ML North Aldershot in ground Reservoir (Zone B3A)	BUR	P.S.	$ 5,072,000	Being Satisfied Under Separate Planning Study	2012-2016
3700	400 mm WM from Waterdown Reservoir pumping station to new North Aldershot Reservoir (Zone B3A)	BUR	WM	$ 2,279,000	Being Satisfied Under Separate Planning Study	2012-2016
5850	1050 mm WM on Upper Middle Rd from Burloak Dr west to Appleby Line (Zone B2) (Construction)	BUR	WM	$ 8,514,000	A+	2012-2016
5881	400 mm WM from Waterdown pumping station along North Service Rd to King Rd (Zone B2)	BUR	WM	$ 6,598,000	B (Satisfied though 2008 MP)	2012-2016
6365	1800 mm WM from Burloak WPP to Burloak Zone 2 Booster Pumping Station (Zone O1) (Construction)	BUR	WM	$ 17,460,000	C	2012-2016
6367	120 ML/d Burloak Pumping Station Construction, Phase 1, 50 MLD (Zone B2)	BUR	P.S.	$ 12,522,000	B	2012-2016
6601	7.8 ML/d expansion at Beaufort Pumping Station (new site) (Zone B5)	BUR	P.S.	$ 2,015,000	B	2012-2016
6602	7.5 ML storage expansion at Waterdown Reservoir (existing site) (Zone B1A)	BUR	RES.	$ 7,767,000	A	2017-2021
6605	750 mm WM Second feed to Washburn Reservoir (Zone B1)	BUR	WM	$ 24,096,000	A+	2012-2016
6665	400 mm WM between Tyandanga Reservoir and Beaufort Reservoir (Zone B4)	BUR	WM	$ 6,602,000	B	2012-2016
6669	4.5 ML storage expansion at Tyandanga Reservoir (existing site) (Zone B3)	BUR	RES.	$ 4,660,000	A	2017-2021
6670	2.5 ML storage expansion at Beaufort Reservoir Expansion (new site) (Zone B4)	BUR	RES.	$ 3,275,000	B	2012-2016

Attachment 1 - Water Capital Program

Region IPFS ID	Project Description	Municipality	Project Type	Total Estimated Cost (2012$)	EA Schedule	Project Start Year
6671	6.6 ML/d expansion at Brant St Pumping Station (existing building) (Zone B3)	BUR	P.S.	$ 735,000	A	2012-2016
6672	11.5 ML storage expansion at Brant St Reservoir (existing site) (Zone B1)	BUR	RES.	$ 12,321,000	A	2017-2021
6673	5.5 ML storage expansion at Mount Forest Reservoir (existing site) (Zone B1)	BUR	RES.	$ 5,696,000	A	2017-2021
6674	13.5 ML storage expansion at Washburn Reservoir (existing site) (Zone B1)	BUR	RES.	$ 13,980,000	A	2012-2016
6699	Burloak Treatment Plant Expansion by 55 ML/d (Design) From 165 ML/d to 220 ML/d	BUR	WPP	$ 11,849,000	C	2022-2026
6700	Burloak Treatment Plant Expansion by 55 ML/d (Construction) From 165 ML/d to 220 ML/d	BUR	WPP	$ 76,008,000	C	2022-2026
6701	Kitchen Zone O3 Pumping Station expansion by 80 ML/d	BUR	P.S.	$ 12,000,000	B	2022-2026
6770	Burloak Treatment Plant Expansion by 55 ML/d (Class EA Study) From 165 ML/d to 220 ML/d	BUR	WPP	$ 1,323,000	C	2017-2021
6863	Waterdown Road Pumping Station Expansion (Zones B2, B3A & B5A)	BUR	P.S.	$ 5,265,000	B	2012-2016
6704	200 mm WM on Brock Ave from Elgin Street to Lakeshore Rd	BUR	WM	$ 325,000	A+	2017-2021
6705	200 mm WM on Regina Drive from Maple Avenue to Ecole Renaissance Schoolyard	BUR	WM	$ 271,000	A+	2017-2021
6706	250 mm WM on Bellview Rd from Maple Avenue to end	BUR	WM	$ 309,000	A+	2017-2021
6707	300 mm WM on Lakeshore Rd between Nelson Avenue and Burlington Avenue	BUR	WM	$ 869,000	A+	2022-2026
6708	300 mm WM on Elizabeth Street from James Street to approximately 15 m north	BUR	WM	$ 35,000	A+	2022-2026
6709	300 mm WM on Plains Rd East from north of Grandview Rd to twinned section on Plains	BUR	WM	$ 2,678,000	A+	2012-2016
6710	300 mm WM on Plains Road East (Twinning adjacent to 6709)	BUR	WM	$ 628,000	A+	2012-2016
6711	300 mm WM on Birchwood Avenue from Plains Rd East southwards towards Fairwood Place East	BUR	WM	$ 104,000	A+	2017-2021
6712	300 mm WM on Gallagher Rd from Plains Rd East to 160 m Northerly	BUR	WM	$ 239,000	A+	2017-2021
6713	300 mm WM on Downsview Rd from Plains Rd East to Dowland Crescent	BUR	WM	$ 223,000	A+	2017-2021
6714	300 mm WM on Brant from Fairview St to 180 m northerly	BUR	WM	$ 342,000	A+	2017-2021
6715	300 mm WM on Woodview Rd from Fairview Street to 100 m Northerly	BUR	WM	$ 181,000	A+	2017-2021
6716	200 mm WM from end of Commerce Court north to Fairview Street	BUR	WM	$ 268,000	A+	2017-2021
6717	300 mm WM on Fairview from Appleby to Taylor Crescent	BUR	WM	$ 1,137,000	A+	2017-2021
6718	300 mm WM on Oval Crescent heading due north from Fairview Street	BUR	WM	$ 250,000	A+	2017-2021
Subtotal Burlington				**$ 258,170,000**		
Milton						
5862	400 mm WM loop from 5th Line running east then south on new Milton Business Park Roads to Derry Rd west to 5th Line (Zone M4)	MIL	WM	$ 3,500,000	A+	2012-2016
5867	1200 mm WM on Britannia Rd from 4th Line to RR 25 (Zone M4)	MIL	WM	$ 19,529,000	B (Satisfied though 2008 MP)	2012-2016
5868	750 mm WM on Britannia Rd from #5867 to approximately 2,100 m west (to new Milton South road) (Zone M4)	MIL	WM	$ 7,599,000	A+	2012-2016
5870	400 mm WM on new Milton South road from Britannia Rd to Louis St Laurent Ave (Zone M4)	MIL	WM	$ 1,614,000	A	2012-2016
5875	900 mm WM on Derry Rd from new MIL Business Park Road to Trafalgar Rd (Zone M4)	MIL	WM	$ 9,523,000	B (Satisfied though 2008 MP)	2012-2016
5876	600 mm WM on new internal Milton road from Britannia Rd to Louis St Laurent Ave (Zone M4)	MIL	WM	$ 2,726,000	B (Satisfied though 2008 MP)	2012-2016
6318	300mm WM on No 14 Siderd from Tremaine Rd. to Milton Reservoir (Zone M5G)	MIL	WM	$ 1,046,000	A+	2012-2016
6398	600 mm WM on re-aligned Tremaine Rd from Steeles Avenue to existing watermain on Peru Rd south of Hwy 401 (Zone M5L)	MIL	WM	$ 6,433,000	B (Satisfied though 2008 MP)	2012-2016
6616	400 mm WM on Thompson Rd South from Britannia Rd to approx. 1,156 south (Zone M4)	MIL	WM	$ 1,633,000	A+	2022-2026
6617	400 mm WM on new roadway south of Britannia Rd from Thompson Rd South to 4th Line (Zone M4)	MIL	WM	$ 2,131,000	A+	2022-2026
6618	400 mm WM on new roadway south of Britannia Rd from 4th Line to 5th Line (Zone M4)	MIL	WM	$ 2,164,000	A+	2017-2021
6619	400 mm WM on new roadway south of Britannia Rd fom 5th Line to 6th Line (Zone M4)	MIL	WM	$ 1,458,000	A+	2017-2021
6620	400 mm WM on 6th Line from Britannia Rd to 600 m south (Zone M4)	MIL	WM	$ 1,008,000	A+	2017-2021
6621	400 mm WM on 6th Line from Britannia Rd to 1,500 m north (Zone M4)	MIL	WM	$ 2,584,000	A+	2017-2021
6622	400 mm WM on 6th Line from Derry Rd to new Rd 1,500 m south (Zone M4)	MIL	WM	$ 3,113,000	A+	2017-2021
6623	400 mm WM on 5th Line from Britannia Rd to 1,500 m north of Britannia Rd (Zone M4)	MIL	WM	$ 1,902,000	A+	2017-2021
6624	400 mm WM on 4th Line from Britannia Rd to 650 m south (Zone M4)	MIL	WM	$ 677,000	A+	2017-2021
6625	400 mm WM on Lower Base Line (East) from 4th Line to 5th Line (Zone M4)	MIL	WM	$ 2,538,000	A+	2022-2026
6626	400 mm WM on 5th Line from Britannia Rd to 650 m south (Zone M4)	MIL	WM	$ 688,000	A+	2017-2021
6627	400 mm WM on 4th Line from 650 m south of Britannia Rd to Lower Base Line (West) (Zone M4)	MIL	WM	$ 2,172,000	A+	2022-2026
6628	400 mm WM on 5th Line from 650 m south of Britannia Rd to Lower Base Line (West) (Zone M4)	MIL	WM	$ 2,882,000	A+	2022-2026
6629	600 mm WM on Louis St. Laurent Ave from 5th Line to 6th Line (Zone M4)	MIL	WM	$ 2,479,000	A+	2017-2021

Attachment 1 - Water Capital Program

Region IPFS ID	Project Description	Municipality	Project Type	Total Estimated Cost (2012$)	EA Schedule	Project Start Year
6630	600 mm WM on Louis St. Laurent Ave from 6th Line toTrafalgar Rd (Zone M4)	MIL	WM	$ 4,076,000	A+	2017-2021
6631	400 mm WM on Louis St. Laurent Ave from Trafalgar Rd to 8th Line (Zone M4)	MIL	WM	$ 2,549,000	A+	2017-2021
6632	400 mm WM on Britannia Rd from Trafalgar Rd to 600 m east (Zone M4)	MIL	WM	$ 1,002,000	A+	2017-2021
6633	400 mm WM on Britannia Rd from 600 m east of Trafalgar Rd to 8th Line (Zone M4)	MIL	WM	$ 1,091,000	A+	2022-2026
6634	400 mm WM on new Milton Rd from Trafalgar Rd to approximately 700 m east (Zone M4)	MIL	WM	$ 1,469,000	A+	2017-2021
6635	400 mm WM on 8th Line from Derry Rd. to approximately 1,600 m south (Zone M4)	MIL	WM	$ 2,756,000	A+	2022-2026
6636	400 mm WM on 8th Line from Britannia Rd to approximately 1,500 m north (Zone M4)	MIL	WM	$ 2,187,000	A+	2022-2026
6637	400 mm WM on new roadway from Britannia Rd to approx. 1,200 m south (Zone M4)	MIL	WM	$ 1,570,000	A+	2017-2021
6638	400 mm WM on Derry Rd from Trafalgar Rd to 500 m east (Zone M4)	MIL	WM	$ 548,000	A+	2017-2021
6639	400 mm WM on Derry Rd from 600 m east of Trafalgar Rd to 8th Line (Zone M4)	MIL	WM	$ 881,000	A+	2017-2021
6640	600 mm WM on Trafalgar Rd from Zone 4 Reservoir to 600 mm Zone M5L WM on Steeles Avenue (ID 3844) (Zone M5L)	MIL	WM	$ 6,463,000	B	2017-2021
6649	400 mm WM on Esquesing Line from James Snow Parkway to approximately 800 m north (Zone M5L)	MIL	WM	$ 1,188,000	A+	2017-2021
6650	400 mm WM on new roadway from Esquesing Line to Boston Church Rd (Zone M5L)	MIL	WM	$ 2,449,000	A+	2017-2021
6651	400 mm WM on new roadway from Boston Church Rd to approximately 360 m west (Zone M5L)	MIL	WM	$ 1,216,000	A+	2017-2021
6652	400 mm WM on new roadway from 360 m west of Boston Church Rd to No 5 Siderd (Zone M5L)	MIL	WM	$ 1,101,000	A+	2017-2021
6653	400 mm WM on No 5 Siderd from approximately 400 m west of 3rd Line to 3rd Line (Zone M5L)	MIL	WM	$ 435,000	A+	2017-2021
6656	400 mm WM on Britannia Rd from Tremaine Rd to approximately 700 m east (Zone M4)	MIL	WM	$ 1,118,000	A+	2012-2016
6657	400 mm WM on Tremaine Rd from 1,000 m south of Britannia Rd to 2,200 m south of Britannia Rd (Zone M4)	MIL	WM	$ 2,022,000	A+	2022-2026
6658	400 mm WM on Tremaine Rd from Britannia Rd to 1,000 m south of Britannia Rd (Zone M4)	MIL	WM	$ 1,375,000	A+	2022-2026
6659	400 mm WM on new road alignment from Tremaine Rd to approximately 360 m west (Zone M4)	MIL	WM	$ 437,000	A+	2022-2026
6660	400 mm WM on Tremaine Rd from Louis St Laurent to Britannia Rd West (Zone M4)	MIL	WM	$ 1,718,000	A+	2012-2016
6664	Relining of Walkers Line Well Feedermain with 150mm pipe within existing easement from West Appleby Line to Surge Tank (Zone M5L)	MIL	WM	$ 216,000	A+	2012-2016
6666	750 mm WM on James Snow Parkway from Burnhamthorpe Rd W to Lower Base Line W (Zone M4)	MIL	WM	$ 8,136,000	A+	2027-2031
6667	Lake Based Servicing Transfer (Zone M5L)	MIL	WM	$ 3,165,000	A+	2012-2016
6675	Kelso WPP Residual Management Study & optimization (Zone M5G)	MIL	WPP	$ 4,000,000	A	2012-2016
6688	400 mm WM on Trafalgar Rd from Steeles Avenue to Hwy 401 (Zone M5L)	MIL	WM	$ 374,000	B	2017-2021
6689	400 mm WM on Trafalgar Rd Hwy 401 Crossing (Zone M5L)	MIL	WM	$ 2,826,000	B	2012-2016
6690	400 mm WM on Trafalgar Rd from Hwy 401 to Main St Extension (Zone M5L)	MIL	WM	$ 1,196,000	B	2017-2021
6691	400 mm WM on Main St extension from Trafalgar Rd (Zone M5L)	MIL	WM	$ 1,887,000	A+	2017-2021
6692	400 mm WM on Main St extension from 5th Line to approximately 2,100 m east (Zone M5L)	MIL	WM	$ 3,964,000	A+	2017-2021
6698	10 ML storage expansion at Zone M5L Reservoir	MIL	RES.	$ 10,356,000	A	2022-2026
6719	300 mm WM on Main St. from Ontario St. to Easement, on Easement from Main St. to Nipissing Rd and on Nipissing Rd from Easement to 251 Nipissing Rd.	MIL	WM	$ 2,335,000	A+	2017-2021
6720	300 mm WM on Childs Drive from Ontario Street North to Robertson Crescent (Eastern entrance)	MIL	WM	$ 1,716,000	A+	2017-2021
6721	300 mm WM on Ontario Street North from Main Street East to Parkway Drive East	MIL	WM	$ 1,787,000	A+	2017-2021
6722	300 mm WM on Woodward Avenue between Martin Steet and Ontario Street North	MIL	WM	$ 1,919,000	A+	2022-2026
6723	400 mm WM on Bronte St between Main Street West and Barton Street	MIL	WM	$ 1,134,000	A+	2022-2026
6724	300 mm WM on Main Street East East between James Street and Martin Street	MIL	WM	$ 538,000	A+	2022-2026
6725	300 mm WM on Laurier Avenue between Bronte Street and Commercial Street	MIL	WM	$ 2,278,000	A+	2022-2026
Subtotal Milton				**$ 164,877,000**		
Halton Hills - Acton						
5716	Upgrade piping between Prospect Park Wells and WPP (Zone A9G)	HHACT	WPP	$ 377,000	A+	2012-2016
5717	Prospect Park WPP Expansion from 2.3 to 3.5 ML/d (Zone A9G)	HHACT	WPP	$ 3,513,000	C	2012-2016
5718	Acton Reservoir Expansion from 4.5 to 7.0 ML (Construction) (Zone A9G)	HHACT	RES	$ 3,017,000	A	2012-2016
6437	Acton Well Field Development and Treatment (Zone A9G)	HHACT	WPP	$ 1,543,000	C	2012-2016
6439	Prospect Park Well Field Upgrades (Zone A9G)	HHACT	WPP	$ 807,000	C	2012-2016
6590	Acton Supply Standby Well (Zone A9G)	HHACT	WPP	$ 1,625,000	C	2017-2021
6597	300 mm WM on Reg Rd 25 from new well connection to 640 m North of Wallace St (Zone A9G)	HHACT	WM	$ 1,069,000	A+	2012-2016
6598	300 mm WM from New Well to Reg Rd 25 (Zone A9G)	HHACT	WM	$ 444,000	C	2012-2016

Attachment 1 - Water Capital Program

Region IPFS ID	Project Description	Municipality	Project Type	Total Estimated Cost (2012$)	EA Schedule	Project Start Year
6600	300 mm WM on Reg Rd 25 from new well connection to No. 32 Siderd and on No. 32 Siderd from Reg Rd 25 to 3rd Line Reservoir (Zone A9G)	HHACT	WM	$ 1,684,000	A+	2022-2026
6604	150mm WM on 3rd Line from 3rd Line Reservoir to No. 32 Siderd and on No. 32 Siderd from 3rd Line to 950 m easterly (Zone A9G)	HHACT	WM	$ 721,000	A+	2022-2026
6668	Centralized Treatment at 3rd line Reservoir Class EA Study (Zone A9G)	HHACT	Study	$ 150,000	C	2017-2021
6676	Acton Artificial Recharge Study	HHACT	Study	$ 500,000	C	2012-2016
6677	Acton Artificial Recharge Capital Works	HHACT	WPP	$ 6,300,000	C	2012-2016
6695	Centralized Treatment at 3rd line Reservoir (Zone A9G)	HHACT	WPP	$ 1,541,000	C	2022-2026
Subtotal Halton Hills - Acton				**$ 23,291,000**		
Halton Hills - Georgetown						
97	Lindsay Court Well Field Expansion Class EA Study	HHGEO	Study	$ 350,000	B	2012-2016
4985	1200 mm WM on Trafalgar Rd from Britannia Rd to new Zone 4 Reservoir (Zone M4)	HHGEO	WM	$ 59,566,000	A+	2012-2016
5061	30 ML Reservoir, near Trafalgar Road and No.5 Siderd (Zone M4)	HHGEO	RES.	$ 32,440,000	B	2012-2016
5757	Cedarvale Capture Zone Assessment	HHGEO	Study	$ 300,000	N/A	2012-2016
6440	Cedarvale Well Field Upgrades (Zone G6G)	HHGEO	WPP	$ 1,375,000	C	2012-2016
6603	400 mm WM on 8th Line from 10th Siderd to existing 400 mm (Zone G6L)	HHGEO	WM	$ 1,623,000	A+	2017-2021
6606	750 mm WM on Trafalgar from the new Zone 4 Reservoir to approximately 1,650 m north (Zone G6L)	HHGEO	WM	$ 3,126,000	B	2017-2021
6607	750 mm WM on Trafalgar Rd from 1,650 m north of Zone 4 Reservoir to No 10 Siderd (Zone G6L)	HHGEO	WM	$ 3,510,000	B	2017-2021
6608	750 mm WM on Trafalgar from 15th Siderd to 22nd Siderd Lake Based Reservoir (Zone G6L)	HHGEO	WM	$ 12,170,000	B	2017-2021
6609	400 mm WM on 17th Siderd from Trafalgar Rd to Main St (Zone G6L)	HHGEO	WM	$ 1,744,000	A+	2017-2021
6610	600 mm WM on 10th Siderd from Trafalgar Rd to 8th Line (Zone G6L)	HHGEO	WM	$ 2,540,000	A+	2017-2021
6611	600 mm WM on No 10 Siderd from 8th Line to 9th Line (Zone G6L)	HHGEO	WM	$ 2,584,000	A+	2017-2021
6612	600 mm WM on No 10 Siderd from 9th Line to 10th Line (Zone G6L)	HHGEO	WM	$ 3,049,000	A+	2022-2026
6613	600 mm WM on No 10 Siderd from 10th Line to Adamson St S (Zone G6L)	HHGEO	WM	$ 1,502,000	A+	2022-2026
6614	600 mm WM on Adamson St from 10th Siderd to Guelph St and on Guelph St from Adamson St to 10th Siderd (Zone G6L)	HHGEO	WM	$ 2,489,000	B	2022-2026
6615	600 mm WM on No 10 Siderd from Guelph St to Bovaird Dr (Region of Peel) (Zone G6L)	HHGEO	WM	$ 1,843,000	A+	2022-2026
6654	750 mm WM on Trafalgar Rd from 10th Siderd to approximately 1,700 m north of 10th Siderd (Zone G6L)	HHGEO	WM	$ 3,763,000	A+	2017-2021
6655	750 mm WM on Trafalgar from 1,700 m north of 10th Siderd to 15th Siderd (Zone G6L)	HHGEO	WM	$ 3,375,000	A+	2017-2021
6678	Georgetown Artificial Recharge Study	HHGEO	Study	$ 500,000	C	2012-2016
6679	Georgetown Artificial Recharge Capital Works	HHGEO	WPP	$ 29,600,000	C	2012-2016
6693	20 ML/d Zone G6L pumping station at Zone 4 Reservoir	HHGEO	P.S.	$ 9,000,000	B	2017-2021
6694	10 ML Zone G6L Storage at 22nd Siderd	HHGEO	RES.	$ 10,905,000	B	2017-2021
6696	20 ML/d Zone M5L pumping station at Zone M4L Reservoir	HHGEO	P.S.	$ 2,000,000	B	2017-2021
6697	20 ML storage expansion at Zone M4 Resevoir	HHGEO	RES.	$ 20,712,000	A	2017-2021
6732	300 mm replacement on Easement from Rosetta Street to Victoria Street	HHGEO	WM	$ 507,000	A+	2027-2031
6733	300 mm replacement on Cross Street from Guelph Street to Main Street	HHGEO	WM	$ 200,000	A+	2027-2031
6734	300 mm in Trafalgar Road between Thompson Drive and Stewartown Rd	HHGEO	WM	$ 426,000	A+	2027-2031
6735	300 mm replacement on Guelph Street between Mountainview Rd North and Sinclair Ave	HHGEO	WM	$ 1,424,000	A+	2017-2021
Subtotal Halton Hills - Georgetown				**$ 212,623,000**		
Halton Hills - 401 Corridor						
6641	400 mm WM in the 401 growth corridor north of Steeles Ave parallel to Hornby Rd (Zone M5L)	HH401	WM	$ 1,084,000	A+	2017-2021
6642	400 mm WM in the 401 growth corridor north of Steeles from Hornby Rd to Trafalgar Rd (Zone M5L)	HH401	WM	$ 1,693,000	A+	2017-2021
6643	400 mm WM in the 401 growth corridor north of Steeles from Trafalgar Rd to approximately 400m east of 8th Line (Zone M5L)	HH401	WM	$ 2,469,000	A+	2017-2021
6644	400 mm WM in the 401 growth corridor from Steeles Ave to approximately 300 m north (Zone M5L)	HH401	WM	$ 1,067,000	A+	2017-2021
6645	400 mm WM in the 401 growth corridor north of Steeles Ave. from 1,000 m west of 9th Line to 900 m east of 9th Line (Zone M5L)	HH401	WM	$ 1,806,000	A+	2022-2026
6646	400 mm WM in the 401 growth corridor from Steeles Ave to approximately 330 m north (Zone M5L)	HH401	WM	$ 1,038,000	A+	2022-2026
6647	400 mm WM in the 401 growth corridor north of Steeles Ave. from 600 m west of 10th Line to 1,000 m east of 10th Line (Zone M5L)	HH401	WM	$ 1,998,000	A+	2022-2026
6648	400 mm WM in the 401 growth corridor from Steeles Ave to 340 m north (Zone M5L)	HH401	WM	$ 1,414,000	A+	2022-2026
Subtotal Halton Hills - 401 Corridor				**$ 12,569,000**		
Subtotal Halton Hills				**$ 248,483,000**		

Attachment 1 - Water Capital Program

Region IPFS ID	Project Description	Municipality	Project Type	Total Estimated Cost (2012$)	EA Schedule	Project Start Year
Region-Wide						
4950	SCADA Master Plan Review for Water Purification Plants and Distribution Systems	REG	Study	$ 200,000	N/A	2012-2016
5725	Water Servicing Master Plan Update	REG	Study	$ 1,715,000	N/A	2012-2016
5917	SCADA System Network Architecture Improvement Program (REG)	REG	Study	$ 150,000	N/A	2012-2016
5918	Electrical Utility Meter Monitoring Installation Program (SCADA) (REG)	REG	Study	$ 190,000	N/A	2012-2016
6189	Water Supply Capacity Annual Monitoring Report	REG	Study	$ 450,000	N/A	2012-2021
6190	Water Distribution System Analysis	REG	Study	$ 2,200,000	N/A	2012-2031
6685	Bulk Water Stations on Existing Sites	REG	P.S.	$ 1,868,000	A	2012-2016
6686	Bulk Water Stations on New Sites	REG	P.S.	$ 3,267,000	B	2012-2016
Subtotal Region-Wide				**$ 10,040,000**		
TOTAL				**$ 952,593,000**		

Halton Hills Residential Subdivision - 2147925 Ontario Inc.

Proposed Water Demand Calculations

Designed By:	Michael Frieri, C.E.T.
Checked By:	Michael Hall, P. Eng.
File No.:	09-015
Date:	November 21, 2019

Domestic Water Supply Demands:

Per Halton Region Linear Design Manual - April 2019

Average Daily Demand is 0.275 cubic metres/capital/day or 275 litres/capita/day
Max Hourly Demand Peaking Factor = 4.00
Max Day Demand Peaking Factor = 2.25

Maximum Occupant Load or Equivalent Land Use Population = 379 persons
Based on 55 persons/hectare equivalent population density @ 6.886 hectare area

Average Day Demand	1.21 L/s
Maximum Day Demand	2.71 L/s
Maximum Hourly Demand	4.83 L/s

Fire Protection Supply Demands:

Per Water Supply for Public Fire Protection Manual, 1999, by the Fire Underwriters Survey

STEP 1: Calculate Fire Flow

$$F = 220 \cdot C \cdot \sqrt{A} \cdot (\text{various adjustments})\ \text{L/min}$$

C = Coefficient related to type of construction:
- = 1.5 for wood frame construction (Structure essentially all combustable)
- = 1.0 for ordinary construction (brick or other masonry walls, combustable floor and interior)
- = 0.8 for non combustable construction (unprotected metal structure components, masonry or metal walls)
- = 0.6 for fire resistive construction (fully protected frame, floors, roof)

C =	1.0		
Total Floor Area =	465	m2	*(5,000 square feet)*
Floor Area Above =	0	m2	
Floor Area Below =	0	m2	
A =	465	m2	*Total Floor Area*
F =	4,744	L/min	
F =	5,000	L/min	*Round to the nearest 1000*

STEP 2: Adjust for building occupancy (Note: Number shall not be less then 2000 L/min)

- = - 25% (Non-Combustable)
- = - 15% (Limited Combustable)
- = 0 (Combustable)
- = + 15% (Free Burning)
- = + 25% (Rapid Burning)

Factor =	0	
F1 = F x Factor =	5,000	L/min

Halton Hills Residential Subdivision - 2147925 Ontario Inc.
Proposed Water Demand Calculations

STEP 3: Decrease F1 if building contains fire supression system

= - 50% (Automatic Sprinklers)
= - 30% (Adequately Designed System)
= Additional -10% if the water supply is standard for the system and the fire department hose lines required
= Additional -10% if the system is fully supervised

Factor =	0%	
F2 = F1 x Factor =	0	L/min

STEP 4: Increase F1 due to exposure / close proximity to other buildings (Note: Total shall not exceed 75%)

= 25% (0m to 3m)
= 20% (3.1m to 10m)
= 15% (10.1m to 20m)
= 10% (20.1m to 30.1m)
= 5% (30.1m to 45m)
= 0% (Greater then 45m)

Distances =	6m / 6m / 32m / 32m	
Factors =	20% + 20% + 5% + 5%	
Factor =	50%	*(max 75%)*
F3 = F1 x Factor =	2,500	L/min

STEP 5: Calculate Fire Flow (Note: Fireflow shall not be less then 2000 L/min or greater then 45,000 L/min)

Fire Flow =	F1 - F2 + F3		
F1 =	5,000	L/min	
- F2 =	0	L/min	
+ F3 =	2,500	L/min	
Fire Flow =	7,500	L/min	
Fire Flow =	8,000	L/min	*Round to the nearest 1,000*
Fire Flow =	133.33	L/s	

STEP 6: Calculate Total Water Demand (Max Day Demand + Fire Flow)

Recall Maximum Day Demand (see above) =	2.71 L/s
Total Fire Demand (Max Day plus Fire) =	136.04 L/s

DATA LICENSE AGREEMENT made the 23rd day of October, 2019

B E T W E E N:

THE REGIONAL MUNICIPALITY OF HALTON, (the "Region")

and

Condeland Engineering Ltd. (the "Licensee")

WHEREAS the Region has developed certain data ("Data") for the purpose of managing municipal information and Regional business;

AND WHEREAS the Licensee seeks access to the Data for the purposes outlined in Schedule "A", which is attached hereto and forming an integral part of this Agreement;

AND WHEREAS the Region has agreed to provide to the Licensee this Data in exchange for the Licensee's promises and covenants contained herein;

NOW THEREFORE IN CONSIDERATION OF THE MUTUAL PROMISES AND COVENANTS CONTAINED HEREIN, THE REGION AND THE LICENSEE MUTUALLY AGREE AS FOLLOWS:

The Data

1. The Region shall provide to the Licensee a non-transferable, non-exclusive license (the "License") to use the Data identified in Schedule "A".

Fee

2. The Licensee shall pay the Region a fee as outlined in Schedule "A" attached hereto.

Purpose

3. The Licensee shall use the Data for the purposes authorized in Schedule "A" and for no other purpose.

Delivery

4. The Region shall provide the Data to the Licensee. The Region shall not provide any technical or other support for the installation of the Data, which shall be the sole responsibility and expense of the Licensee. The Region shall not provide any technical support to the Licensee with respect to the Licensee's use of the Data.

5. The Licensee shall obtain and install at its own expense any software or hardware required for the use the Data. The Region shall not be responsible for the appropriateness of any software or hardware acquired by the Licensee for the use of the Data.

Property

6. The Data shall remain the property of the Region, and all rights that accrue from title and ownership shall remain with the Region. No rights of ownership are in any way transferred to or shared with the Licensee.

Confidentiality

7. The Licensee shall not disclose to any third party any trade secret of or confidential information about the Region that the Licensee may acquire through the use of the Data.

8. Where the Data contains information about an identifiable individual, the Licensee shall comply with all applicable provisions of the *Protection of Personal Information and Electronic Document Act*, S.C. 2000, c. 5, as amended, or the *Municipal Freedom of Information and Protection of Privacy Act*, R.S.O. 1990, c. M. 56, as amended, as may be applicable.

9. The Licensee, including its employees, servants, agents and consultants, shall not at any time before, during or after the completion of the Purpose, as defined in paragraph 3, divulge any confidential information communicated to or acquired by the Licensee or disclosed by the Region in the course of carrying out the Purpose provided for herein. Confidential Data and confidential information shall be Data and information which is mutually agreed upon by the Region and the Licensee. No such information shall be used by the Licensee before, during or after the completion of the Purpose on any other project without the prior written approval of the Region. The Licensee may disclose confidential Data to its employees or employees of consultants to whom disclosure is required for the Licensee's performance of the Services herein, but only after each such individual and organization has properly assumed confidentiality obligations identical in principle with those herein. The parties herein mutually agree that the confidentiality covenant contained herein shall survive the termination or discharge of this Agreement and extend for a period of five (5) years following either termination or the discharge of this Agreement.

10. The Licensee may contract with a consultant to carry out all or any part of the Purpose, as defined in paragraph 3.

Reproduction & Assignment

11. The Licensee shall not copy or otherwise reproduce the Data, except as required in order to carry out the purpose identified in paragraph 3 above, and the Licensee shall not in any way transfer, assign, sell or otherwise provide the Data to any third party. The Licensee shall refer all third party requests for the Data to the Region.

Changes to the Data

12. Any modifications or enhancements made to the Data shall remain the exclusive property of the Region.

13. The Region may at any time require the Licensee to provide to the Region all information relating to any modifications that the Licensee makes or has made to the Data. In addition, the Region may at any time request a report from the Licensee summarizing all changes made to the Data and the manner in which the Data is being used. Where the Region makes such a request, the Licensee shall provide the information within ten business days.

14. Where the Licensee uses the Data, or a portion thereof, in combination with other data to produce derivative works, the derivative works must be provided to the Region and may only be shared with

third parties upon receiving written consent from the Region. In the event the Region grants permission to share derivative works, said works shall only be provided to third parties in a non-digital format, unless otherwise explicitly allowed by the Region.

Errors in the Data

15. The Licensee shall notify the Region of any problems with or errors in the Data of which the Licensee may become aware of at any time during the term of this Agreement.

Updates

16. The Region shall not be obliged to update the Data or make any changes thereto at the request of the Licensee. The granting of rights to any new edition or version of the Data is subject to further agreement between the parties.

Citations

17. The Licensee shall cite the Data with the following information:

    This Data was provided by The Regional Municipality of Halton and the Region assumes no responsibility or liability for its use or accuracy.

No Representations or Warranties

18. The Licensee accepts the Data "as-is". The Region makes no representations or warranties, either express or implied, as to any matter in relation to the Data, including, without limitation, the condition, accuracy, quality or freedom from error of the Data or its fitness for any particular purpose. Without limiting the generality of the foregoing, the Licensee acknowledges that the Data was developed by the Region for its own purposes, and not for the purposes outlined in paragraph 3 above to which the Licensee intends to use this Data.

Indemnity

19. Neither the Region nor any of its councillors, officers, employees or agents shall be liable for any damages or losses resulting from any errors, omissions or inaccuracies in the Data, or from any use, interpretation or application of the Data, whether caused by the negligence of such councillors, officers, employees or agents or otherwise.

20. The Licensee assumes full responsibility for any risk associated with the use or misuse of the Data and will indemnify and save harmless the Region and its councillors, officers, employees and agents from any claim by a third party for any losses, costs or damages arising out of or related to the Licensee's use of the Data.

Term

21. The term of the license granted by this Agreement shall commence upon the delivery of the Data to the Licensee and shall extend for a period of 3 years/ months, ending on the 23rd day of October, 2022.

22. The Region may extend this Agreement for 0 additional term(s) upon the execution of a further Agreement, in a form to be approved by the Region.

Termination

23. This Agreement may be terminated as follows:

    (a) by either party upon delivery of thirty days advance written notice;

    (b) by the Region without notice in the event of a breach of any of the terms and conditions hereof by the Licensee; or

    (c) by the Region without notice in the event that the Licensee is petitioned into or files for bankruptcy.

24. The Region's right to terminate this Agreement shall not be affected by its failure to take action with respect to any previous default of this Agreement.

25. Immediately upon termination of this Agreement by expiry of the term or in the event of a breach of the terms and conditions by the Licensee, the Licensee agrees to return to the Region, or destroy, the Data, any and all copies and related materials.

Notice

26. Any notice, instruction or other communication required or permitted to be given to either party pursuant to this Agreement must be in writing and will be deemed sufficient to have been sufficiently given if sent to:

    (a) the Region:

    The Regional Municipality of Halton
    1151 Bronte Road
    Oakville, Ontario
    L6M 3L1
    Phone: 905-825-6000 x7189
    Attention: Chris Eden

    (b) the Licensee:
    Michael Frieri, C.E.T.
    Condeland Engineering Ltd.
    350 Creditstone Road, Unit 200
    Concord, Ontario L4K 3Z2
    mobile: 416-254-2062
    email: michael.frieri@hotmail.ca

27. Any notice shall be deemed to have been given to and received by the party to whom it is addressed:

    (a) if delivered, on the date of delivery; or

    (b) if mailed, then on the fifth day after the mailing thereof; or

    (c) if faxed, then on the date of transmission, unless it is after 5:00 p.m., or on a holiday, in which case it shall be effective on the next regular business day.

General Provisions

28. This Agreement shall be governed by and interpreted in accordance with the laws of the Province of Ontario.

29. This Agreement is binding upon and enures to the benefit of the parties and their respective successors.

30. If any provision of this Agreement shall be found or held to be invalid or unenforceable, that provision shall be severed from the remainder of this Agreement, which shall remain in full force and effect.

IN WITNESS WHEREOF the parties have hereunto set their hands and seals at the times and places indicated.

SIGNED, SEALED & DELIVERED

This 30 day of October 2019,

at the Town of Oakville
Province of Ontario

THE REGIONAL MUNICIPALITY OF HALTON

Per: ______________________
Director, Information Technology Division

This 23 day of October 2019,
at Vaughan
Province of Ontario

Condeland Engineering Ltd.

Per: Michael Fiini C.E.T.

SCHEDULE "A"

DATA SET	SOURCE
Water hydraulic model	Halton Region

Fee: The Licensee shall pay to the Region a fee in the amount of $0 in consideration of the Data described herein.

Purpose: The Data shall be used for the sole purpose of completing the proposed residential development application, known as "2147925 Ontario Inc. Residential Subdivision Development" and any other purpose authorized in writing by the Region.

Additional Disclaimers: Regional Contact Enzo Florio

DATA LICENSE AGREEMENT

made this 23rd day of October, 2019

Between

THE REGIONAL MUNICIPALITY OF HALTON

AND

Condeland Engineering Ltd.

RE: Water Distribution System Information Request

Eden, Chris <Chris.Eden@halton.ca>

Fri 2019-11-01 1:24 PM

To: 'Michael Frieri' <michael.frieri@hotmail.ca>
Cc: Florio, Enzo <Enzo.Florio@halton.ca>; Najak, Zahir <Zahir.Najak@halton.ca>; Robert De Angelis <rob@condeland.com>

1 attachments (150 KB)

20191101113347463.pdf;

Hi Michael,

I just got the signed agreement back today. Attached Is your copy of the fully signed agreement.

The data is too large to be emailed, so please follow the directions below to access the water model.

1. Type "ftp.halton.ca" in the address bar of your Internet Explorer. You will be prompted for User Name and Password.
2. Type "hrgiscc" for User Name (this can, however, appear automatically)
3. Type "opengis" for your Password and hit Enter
4. Scroll down to "Akbari" folder and double click to open
5. Copy the zipped folder(s) or the content and paste into your machine

Note:
There are two versions of the water model with extensions EB (Existing Pressure Zone Boundaries) and FB (Future Pressure Zone Boundaries). Use the first one for your analysis under the current status of the system (2016) and the last one for your analysis under the ultimate status of the system (2031).

Regards,
Chris.

From: Michael Frieri <michael.frieri@hotmail.ca>
Sent: Tuesday, October 29, 2019 8:47 AM
To: Eden, Chris <Chris.Eden@halton.ca>
Cc: Florio, Enzo <Enzo.Florio@halton.ca>; Najak, Zahir <Zahir.Najak@halton.ca>; Robert De Angelis <rob@condeland.com>
Subject: Re: Water Distribution System Information Request

Hi Chris,

Any updates on releasing the model data/files?

Thanks,
Michael Frieri
416-254-2062

From: Michael Frieri <michael.frieri@hotmail.ca>
Sent: October 23, 2019 6:33 PM
To: Eden, Chris <Chris.Eden@halton.ca>
Cc: Florio, Enzo <Enzo.Florio@halton.ca>; Najak, Zahir <Zahir.Najak@halton.ca>; Robert De Angelis

<rob@condeland.com>
Subject: Re: Water Distribution System Information Request

Hi Chris,

See attached signed page five of the DLA between Halton Region and Condeland. For your file and use. Please advise if you require further.

Best Regards,
Michael Frieri
416-254-2062

From: Eden, Chris <Chris.Eden@halton.ca>
Sent: October 23, 2019 9:55 AM
To: 'Michael Frieri' <michael.frieri@hotmail.ca>
Cc: Florio, Enzo <Enzo.Florio@halton.ca>; Najak, Zahir <Zahir.Najak@halton.ca>; Robert De Angelis <rob@condeland.com>
Subject: RE: Water Distribution System Information Request

Michael,

I apologize, I thought I had sent you the agreement, confused your request with another (I actually thought I was waiting on you to respond with the signed agreement).

Attached is the Data License Agreement (DLA), please sign page five of the agreement and scan and email it back to me.

Thanks,
Chris.

From: Michael Frieri <michael.frieri@hotmail.ca>
Sent: Wednesday, October 23, 2019 9:39 AM
To: Eden, Chris <Chris.Eden@halton.ca>
Cc: Florio, Enzo <Enzo.Florio@halton.ca>; Najak, Zahir <Zahir.Najak@halton.ca>; Robert De Angelis <rob@condeland.com>
Subject: Re: Water Distribution System Information Request

Hi Chris,

Any updates on the DLA for signature?

Please advise.

Thanks,
Michael Frieri
416-254-2062

From: Michael Frieri <michael.frieri@hotmail.ca>
Sent: October 10, 2019 1:23 PM
To: Eden, Chris <Chris.Eden@halton.ca>

Cc: Florio, Enzo <Enzo.Florio@halton.ca>; Najak, Zahir <Zahir.Najak@halton.ca>; Robert De Angelis <rob@condeland.com>
Subject: Re: Water Distribution System Information Request

Hi Chris,

Thanks for reaching out.

For your reference I've attached our conceptual servicing plan for the proposed residential subdivision.
The site is located north of Wildwood Road and east of Eighth Line (see pdf attached).
The development is referred to as "2147925 Ontario Inc. Residential Subdivision Development".

Please use the following information for the DLA:

Michael Frieri, C.E.T.
Condeland Engineering Ltd.
350 Creditstone Road, Unit 200
Concord, Ontario L4K 3Z2

mobile: 416-254-2062

email: michael.frieri@hotmail.ca

Let me know if you require further information and/or clarification.

Thanks,

mf

From: Eden, Chris <Chris.Eden@halton.ca>
Sent: October 10, 2019 8:56 AM
To: 'Michael Frieri' <michael.frieri@hotmail.ca>
Cc: Florio, Enzo <Enzo.Florio@halton.ca>; Najak, Zahir <Zahir.Najak@halton.ca>
Subject: RE: Water Distribution System Information Request

Hi Michael,

To complete a data license agreement (DLA), I just need a few things.

- Full contact information for you, (Email, Phone, Company Name, company address)
- Purpose: i.e., what development project is this for, (location, development name).

Once I get the DLA filled out, I will send it to you to sign. Once you have signed and returned it to me, I send it to our signing authority and once he has signed, I can release the data to you.

Just to make sure you know what you are asking for and would be getting from us, I understand you are asking for the Hydraulic model for water. We provide this model as the whole Region only. To use this model you will require "Innovyze InfoWater software".

If you have any questions, please feel free to contact me.

Chris.

Chris Eden
GIS Specialist (Planning)
Planning Services
Legislative & Planning Services
Halton Region
905-825-6000, ext. 7189 | 1-866-442-5866

halton.ca 311

From: Michael Frieri <michael.frieri@hotmail.ca>
Sent: Wednesday, October 9, 2019 10:37 AM
To: Florio, Enzo <Enzo.Florio@halton.ca>; Najak, Zahir <Zahir.Najak@halton.ca>
Cc: Eden, Chris <Chris.Eden@halton.ca>
Subject: Re: Water Distribution System Information Request

Thanks Enzo, much appreciated.

From: Florio, Enzo <Enzo.Florio@halton.ca>
Sent: October 9, 2019 10:28 AM
To: 'Michael Frieri' <michael.frieri@hotmail.ca>; Najak, Zahir <Zahir.Najak@halton.ca>
Cc: Eden, Chris <Chris.Eden@halton.ca>
Subject: RE: Water Distribution System Information Request

Hello Michael,

1. Please work with Chris Eden in obtaining the necessary DLA's for the modelling requests, Chris has been copied on this email.

2. Please reference the Region of Halton's Water and Wastewater Linear Design Manual for hydraulic operating parameters for the water distribution service

   https://www.halton.ca/Search?searchtext=linear+design&searchmode=anyword&audience=&topic=&filetype=&location=

3. Please contact our GIS and Information Management group for any other drawings requests at:

   GIS & Information Management
   1151 Bronte Rd., Oakville, ON L6M 3L1
   Tel: 905-825-6000 ext. 6032
   Fax: 905-825-0267
   Toll-free Tel: 1-866-4HALTON (1-866-442-5866)
   TTY: 905-827-9833
   E-mail: MapRequests@halton.ca

4. A copy of the Region of Halton's latest water master plan requirements/improvements for the area can be accessed online at the following location:

   https://www.halton.ca/For-Residents/Roads-Construction/Infrastructure-Master-Plans

If you have any further questions or concerns please feel free to contact me.

Thank you

Enzo

Enzo Florio
Development Project Manager
Planning Services
Legislative & Planning Services
Halton Region
905-825-6000, ext. 7161 | 1-866-442-5866

halton.ca 311

From: Michael Frieri <michael.frieri@hotmail.ca>
Sent: Wednesday, October 09, 2019 10:11 AM
To: Najak, Zahir <Zahir.Najak@halton.ca>
Cc: Florio, Enzo <Enzo.Florio@halton.ca>
Subject: Re: Water Distribution System Information Request

Thank you Zahir.

From: Najak, Zahir <Zahir.Najak@halton.ca>
Sent: October 9, 2019 9:53 AM
To: 'Michael Frieri' <michael.frieri@hotmail.ca>
Cc: Florio, Enzo <Enzo.Florio@halton.ca>
Subject: RE: Water Distribution System Information Request

Hi Michael,

I will ask Enzo, the project manager for this file to connect with you regarding your information request.

Zahir

Zahir Najak
Development Engineer
Planning Services
Legislative & Planning Services

Halton Region
905-825-6000, ext. 7183 | 1-866-442-5866

halton.ca 311

From: Michael Frieri <michael.frieri@hotmail.ca>
Sent: Tuesday, October 08, 2019 3:47 PM
To: Najak, Zahir <Zahir.Najak@halton.ca>
Subject: Water Distribution System Information Request

Hello Zahir,

I hope this email finds you well?

Further to our telephone conversation of several weeks ago, I am preparing (in conjunction with Condeland Engineering) a water distribution analysis report and hydraulic model for the proposed residential subdivision development identified on the attached key plan.

Can you please refer me to the appropriate individual at Halton Region that could provide me with the following information regarding the attached proposed development area:

1. current water model for the area
2. hydraulic operating parameters for the water distribution service area in question
3. existing grading and as-built watermain data for all existing/adjacent areas
4. a copy of your latest water master plan requirements/improvements for the area

Please call me on my cell phone at any time if you require additional information and/or clarification.

Thanks,
Michael Frieri
416-254-2062

APPENDIX 'E'

Conceptual Design Figures

Fig. 1: Glen Williams Pump Station Sanitary Tributary Plan

Fig. 2: Proposed On-site Sanitary Tributary Plan

Fig. 3: Proposed External Sanitary Tributary Plan

Fig. 4.1 to Fig. 4.6: External Sanitary Sewer Plan and Profile

Fig. 5: Conceptual Servicing Plan

Fig. 6: Conceptual Grading Plan

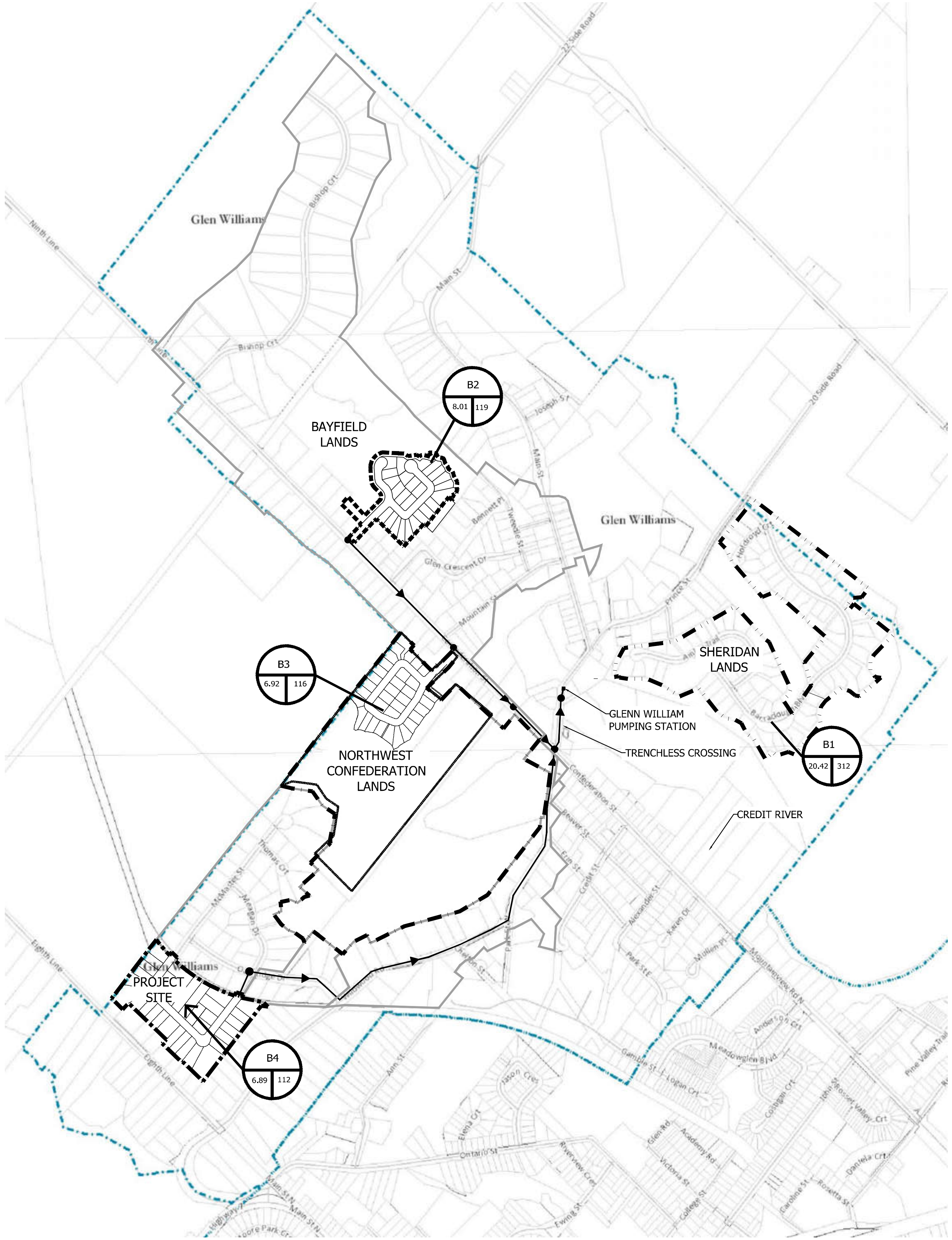
Fig. 7: Pre-development Storm Tributary Plan

Fig. 8: Post-development Storm Tributary Plan

Fig. 9: Conceptual Erosion and Sediment Control Plan Stage I

Fig. 10: Conceptual Erosion and Sediment Control Plan Stage 2

Fig. 11: Conceptual Erosion and Sediment Control Details



LEGEND:

- CONSTRUCTED SHERIDAN DEVELOPMENT
- PROPOSED BAYFIELD DEVELOPMENT
- PROPOSED NORTHWEST CONFEDERATION DEVELOPMENT
- PROPOSED DEVINS DEVELOPMENT
- EXISTING DEVELOPMENT
- A1 — TRIB. ID; 12 — POPULATION; 12.33 — AREA (HA)
- 1200mm DIA. SANITARY MANHOLE
- SANITARY SEWER 200mm DIA. PVC @ 0.50%

BEARINGS ARE UTM GRID, DERIVED FROM REAL TIME NETWORK (RTN) OBSERVATIONS, UTM ZONE 17, NAD83 (CSRS) (2010.0).
DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.999690.
ALL CURB ELEVATIONS ARE SHOWN TO THE TOP FACE OF CURB.

ELEVATION NOTE

ELEVATIONS SHOWN ON THIS PLAN ARE RELATED TO GEODETIC DATUM AND ARE DERIVED FROM GEOLOGICAL SURVEY OF CANADA BENCH MARK: No. 0011954U598F ELEVATION=258.735m, No. 00819668361 ELEVATION=252.480m

LOCAL BENCHMARK

CONCRETE NAIL LOCATED ON THE SOUTHWEST SIDE OF EIGHTH LINE, OPPOSITE MAIL BOX FOR ADDRESS No. 12124. ELEVATION=271.26m

ALL DIMENSIONS AND ELEVATIONS ARE IN METRES UNLESS OTHERWISE NOTED PIPE SIZES ARE IN MILLIMETRES

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FIGURE 1 - GLEN WILLIAMS PUMP STATION SANITARY TRIBUTARY PLAN

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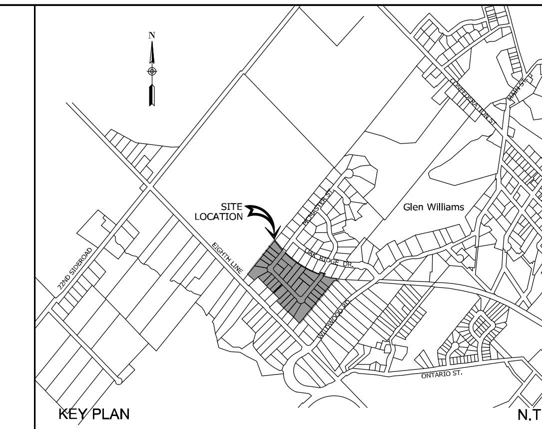

PLAN OF SURVEY ILLUSTRATING TOPOGRAPHY
TOWN OF HALTON HILLS
REGIONAL MUNICIPALITY OF HALTON

LEGEND:

- SANITARY DRAINAGE AREA
- AREA (HA) — 1.237HA
- POPULATION — 1.05
- No. OF UNITS — 25
- PROPOSED SANITARY MANHOLE
- SANITARY SEWER FLOW DIRECTION

BEARINGS ARE UTM GRID, DERIVED FROM REAL TIME NETWORK (RTN) OBSERVATIONS, UTM ZONE 17, NAD83 (CSRS) (2010.0).
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FIGURE 2 - PROPOSED ON SITE SANITARY TRIBUTARY PLAN

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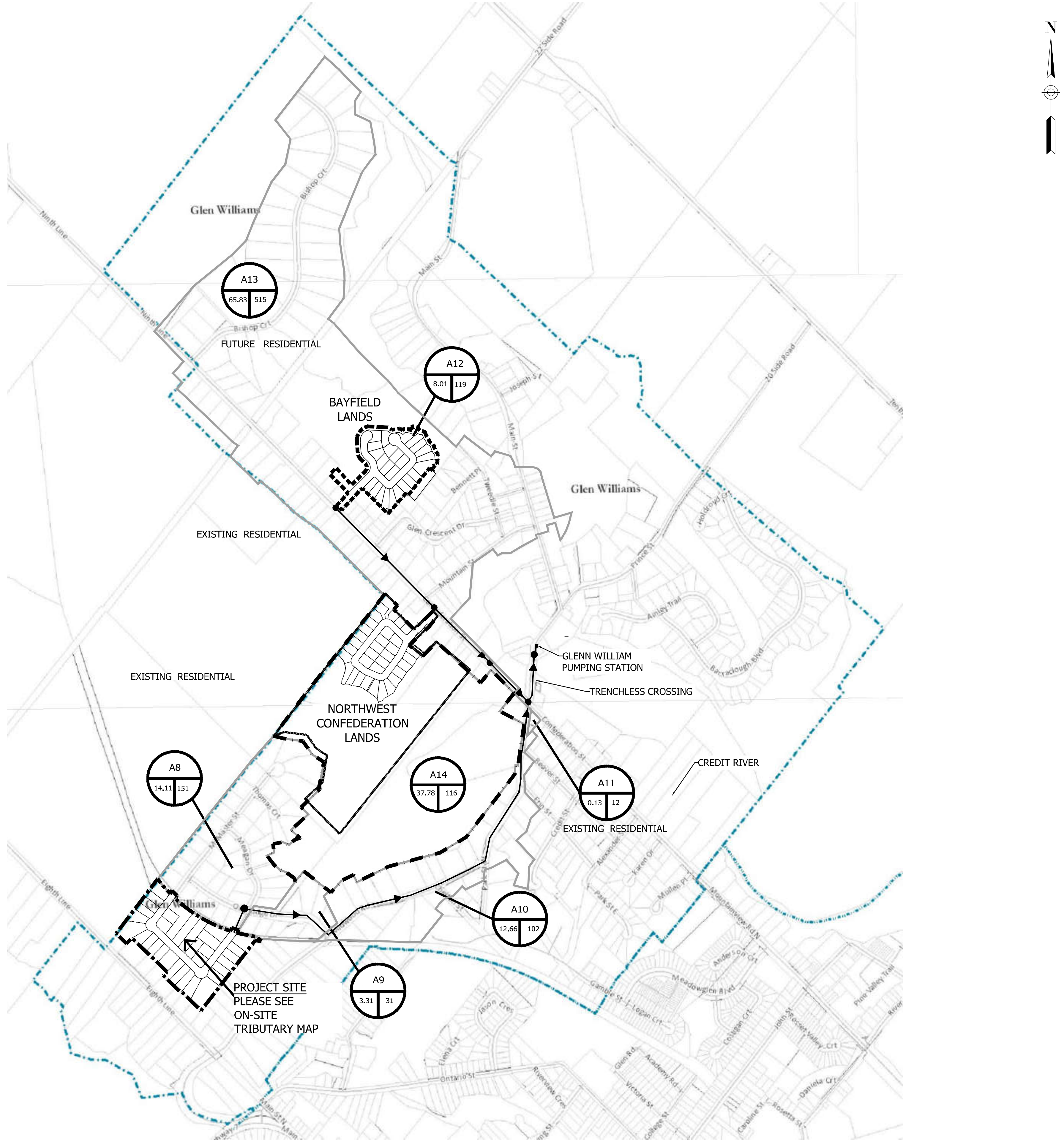

LEGEND:

- PROPOSED BAYFIELD DEVELOPMENT
- PROPOSED NORTHWEST CONFEDERATION DEVELOPMENT
- PROPOSED DEVINS DEVELOPMENT
- EXISTING DEVELOPMENT
- TRIB. ID / POPULATION / AREA (HA) — A1, 12.33, 12
- 1200mm DIA. SANITARY MANHOLE
- SANITARY SEWER 200mm DIA. PVC @ 0.50%

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FIGURE 3 - PROPOSED EXTERNAL SANITARY TRIBUTARY PLAN

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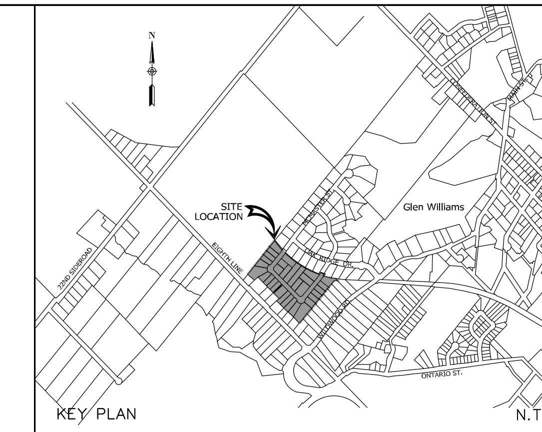
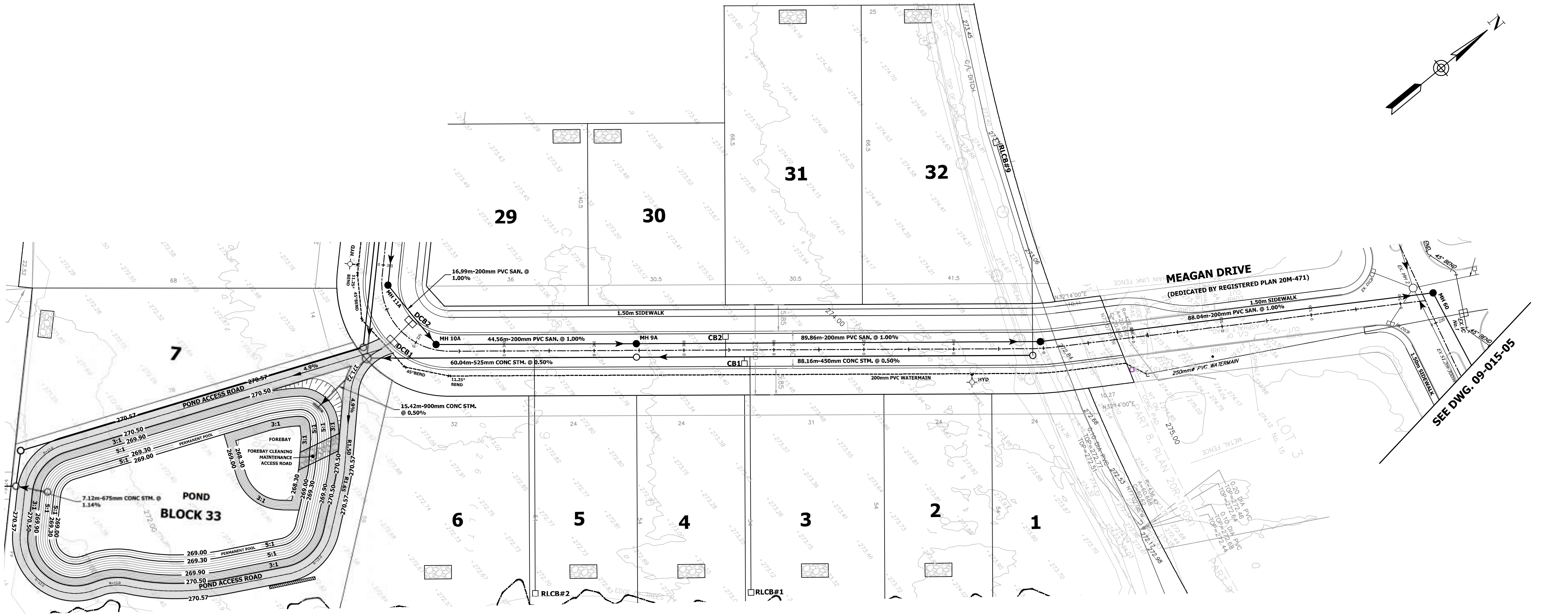


PLAN OF SURVEY ILLUSTRATING TOPOGRAPHY
TOWN OF HALTON HILLS
REGIONAL MUNICIPALITY OF HALTON

LEGEND

Symbol	Description	Symbol	Description
EX.200mm PVC WATERMAIN	EXISTING WATERMAIN		LOT LINE
EX. 50m-200mm PVC STM	EXISTING STORM DIRECTION OF FLOW	MH20A	PROPOSED SANITARY MANHOLE & NUMBER
EX. DCB	EXISTING DITCH INLET CATCHBASIN	MH20	PROPOSED STORM MANHOLE & NUMBER
EX.MH	EXISTING STORM MANHOLE	CB	PROPOSED CATCHBASIN
	EXISTING WATERMAIN PLUG	RLCB	PROPOSED REAR LOT CATCHBASIN
100m-200mm PVC SAN @ 1.00%	PROPOSED SANITARY SEWER DIRECTION OF FLOW	DCB	PROPOSED DOUBLE CATCHBASIN
100m-600mm CONC STM @ 1.00%	PROPOSED STORM SEWER DIRECTION OF FLOW	HW	PROPOSED HEADWALL
100m-900mm CONC STM @ 1.00%	PROPOSED STORM SEWER >900mm DIRECTION OF FLOW	HYD.	PROPOSED HYDRANT & VALVE
150mm PVC WATERMAIN	PROPOSED WATERMAIN	V&B	PROPOSED WATER VALVE & BOX
	PROPOSED SANITARY SERVICE		
	PROPOSED STORM SERVICE		
	PROPOSED WATER SERVICE AND CURB STOP		
0+000	PROPOSED CENTERLINE/STA		



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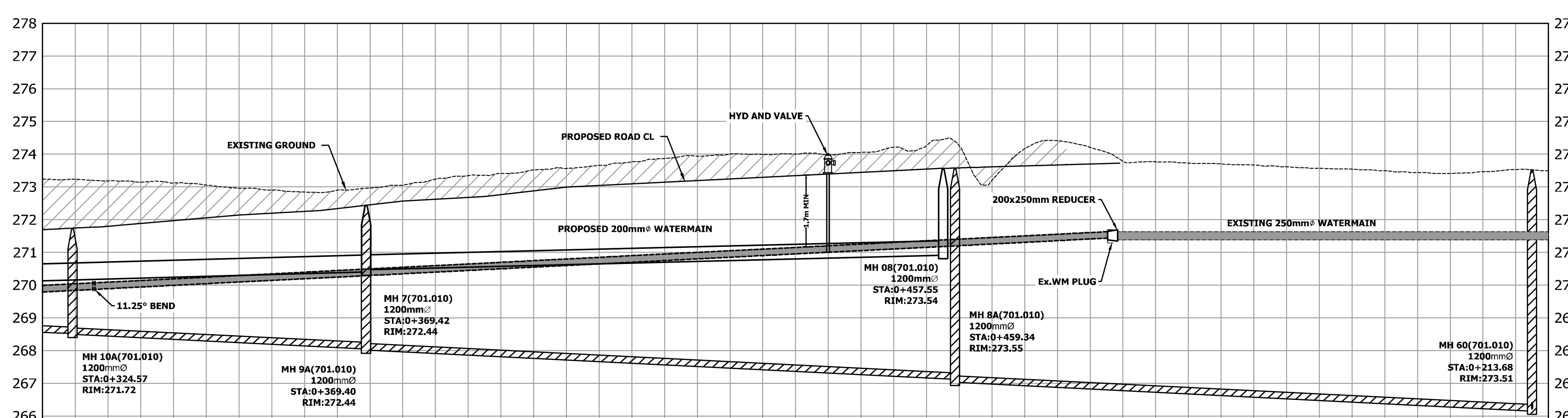

SANITARY SEWER INVERT	W268.52 NE268.49 — 44.56m-200mmØ PVC SAN. @ 1.00% — SW268.05 NE268.02 — 89.86m-200mmØ PVC SAN. @ 1.00% — SW267.12 NE267.03 — 88.04m-200mmØ PVC SAN. @ 1.00% — E266.21 SW266.15											SANITARY SEWER INVERT
STORM SEWER INVERT	60.04m-525mm CONC STM. @ 0.50% — NE270.47 SW270.40 — 88.16m-450mm CONC STM. @ 0.50% — SW270.91											STORM SEWER INVERT
STORM SEWER INVERT												STORM SEWER INVERT
PROPOSED/EXISTING CENTERLINE ELEVATION	271.970 / 272.116	272.251 / 272.943	272.621 / 273.238	272.990 / 273.563	273.196 / 273.934	273.396 / 273.980	273.582 / 274.259	274.211	273.701	273.543	273.465	PROPOSED/EXISTING CENTERLINE ELEVATION
CENTERLINE CHAINAGE	0+340	0+360	0+380	0+400	0+420	0+440	0+460	0+480	0+500	0+520	0+540	CENTERLINE CHAINAGE

FIGURE 4.1 - EXTERNAL SANITARY SEWER PLAN AND PROFILE

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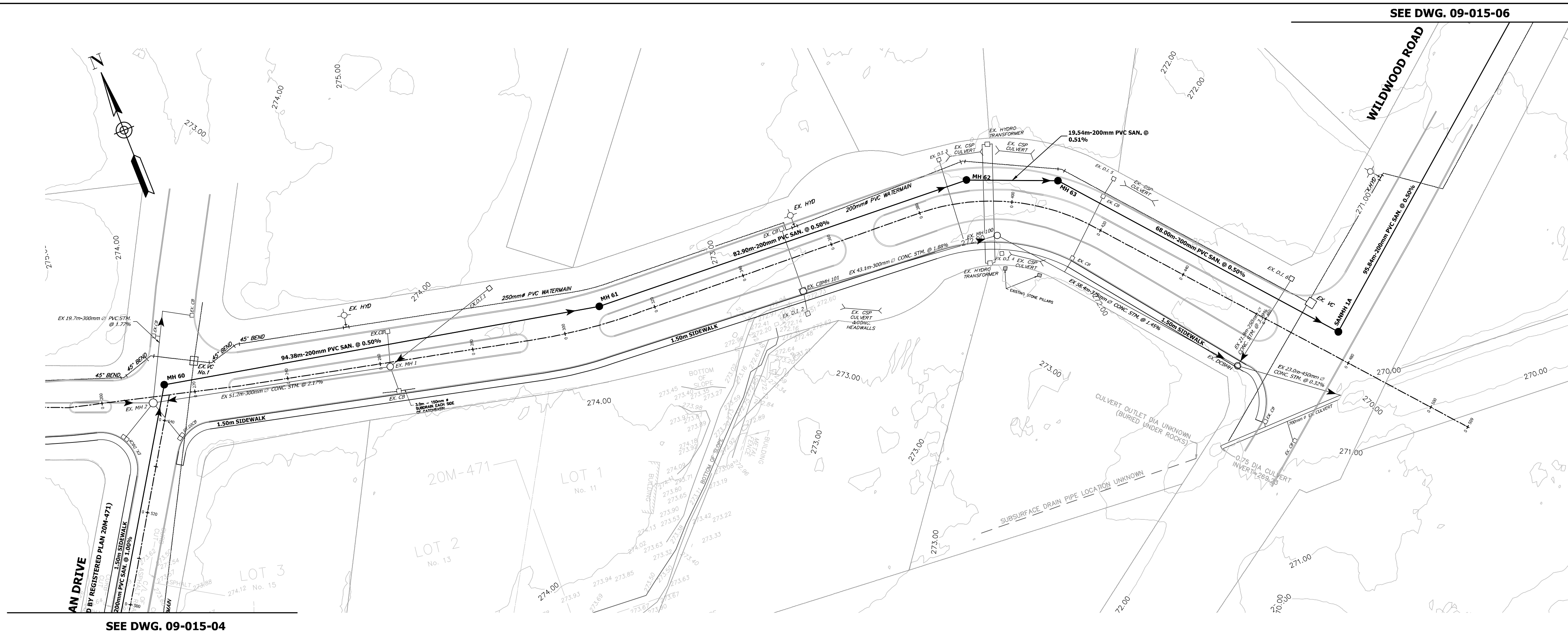

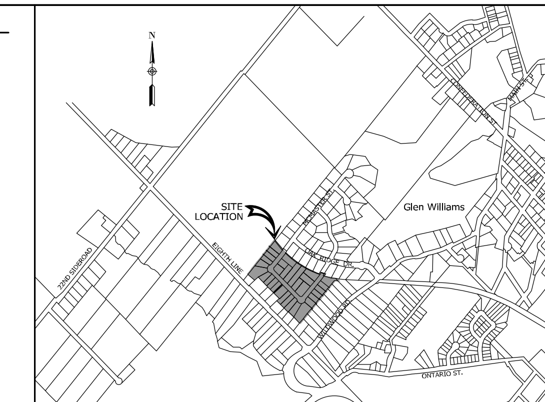

KEY PLAN N.T.S.

PLAN OF SURVEY ILLUSTRATING TOPOGRAPHY
TOWN OF HALTON HILLS
REGIONAL MUNICIPALITY OF HALTON

LEGEND

Symbol	Description
EX.200mm PVC WATERMAIN	EXISTING WATERMAIN
EX. 50m–200mm PVC STM	EXISTING STORM DIRECTION OF FLOW
EX. D.I.	EXISTING DITCH INLET
EX. DICB	EXISTING DITCH INLET CATCHBASIN
EX. CB	EXISTING CATCHBASIN
EX.DCBMH	EXISTING DOUBLE CATCHBASIN MANHOLE
EX.MH	EXISTING STORM MANHOLE
EX.HYD	EXISTING HYDRANT & VALVE
EX.HW	EXISTING HEADWALL
V&B	EXISTING WATER VALVE & BOX
100m-200mm PVC SAN @ 1.00%	PROPOSED SANITARY SEWER DIRECTION OF FLOW
100m-900mm CONC STM @ 1.00%	PROPOSED STORM SEWER > 900mm DIRECTION OF FLOW
0+000	PROPOSED CENTERLINE/STA
MH20A	PROPOSED SANITARY MANHOLE & NUMBER
MH20	PROPOSED STORM MANHOLE & NUMBER

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ELEVATION NOTE

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LOCAL BENCHMARK

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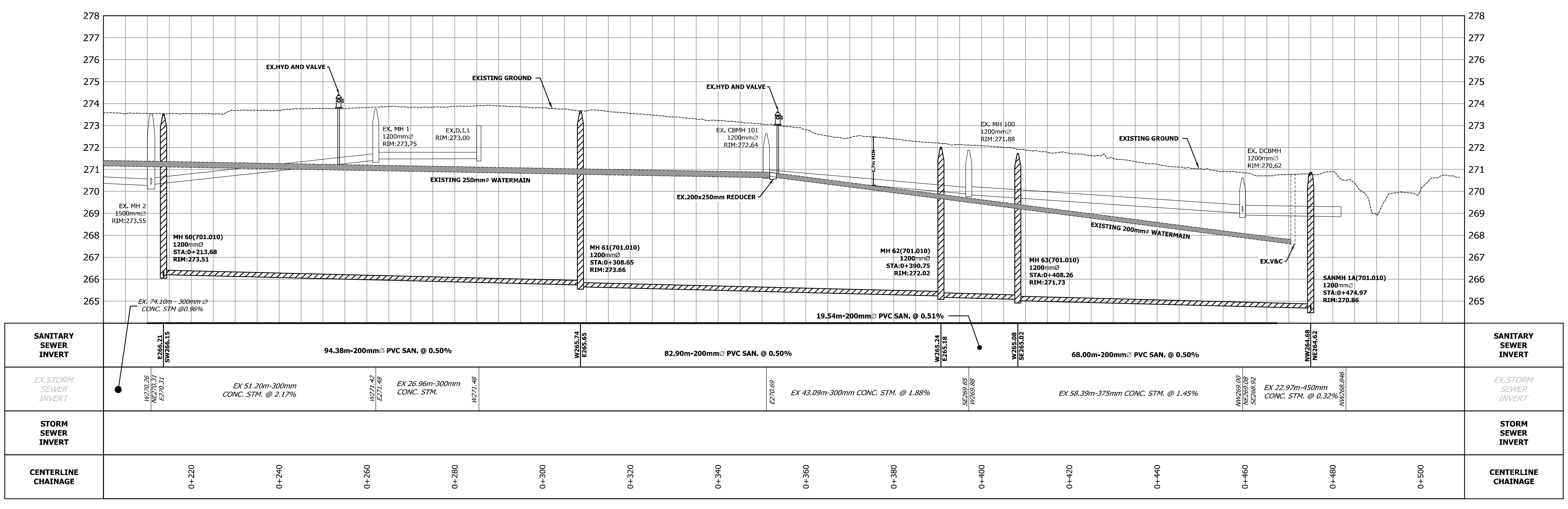

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FIGURE 4.2 - EXTERNAL SANITARY SEWER PLAN AND PROFILE

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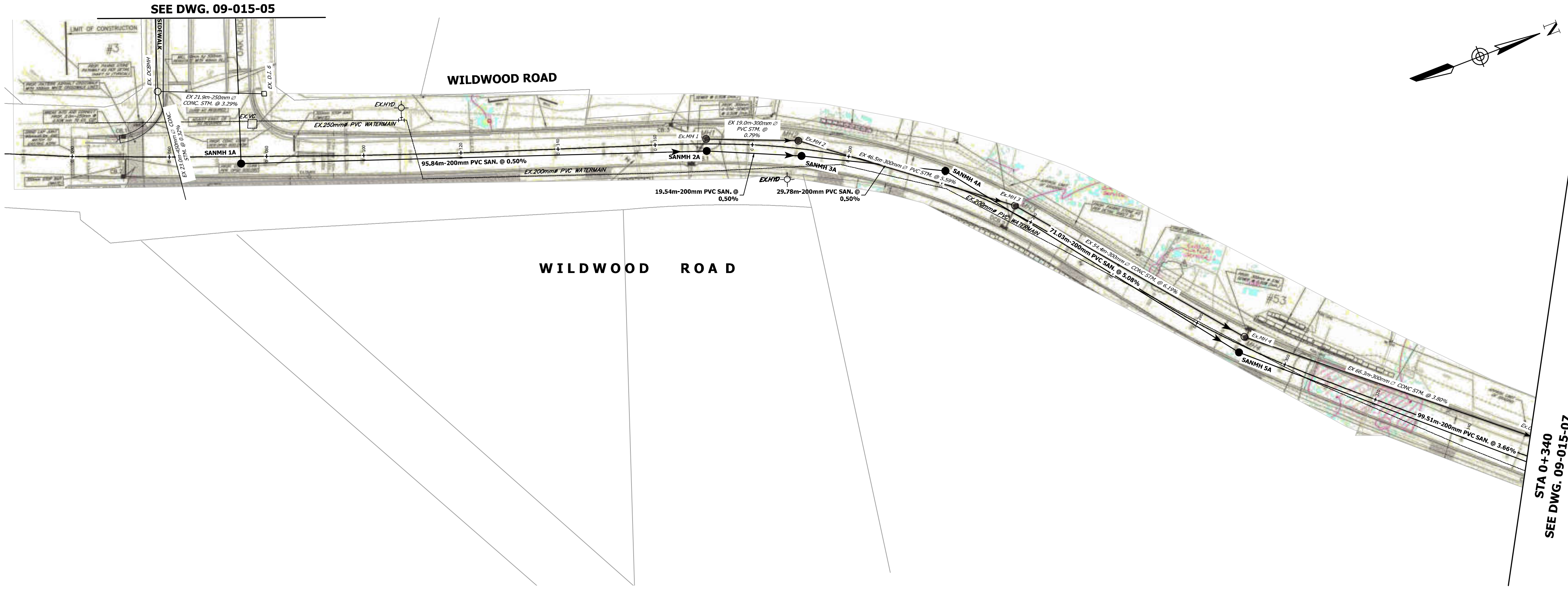

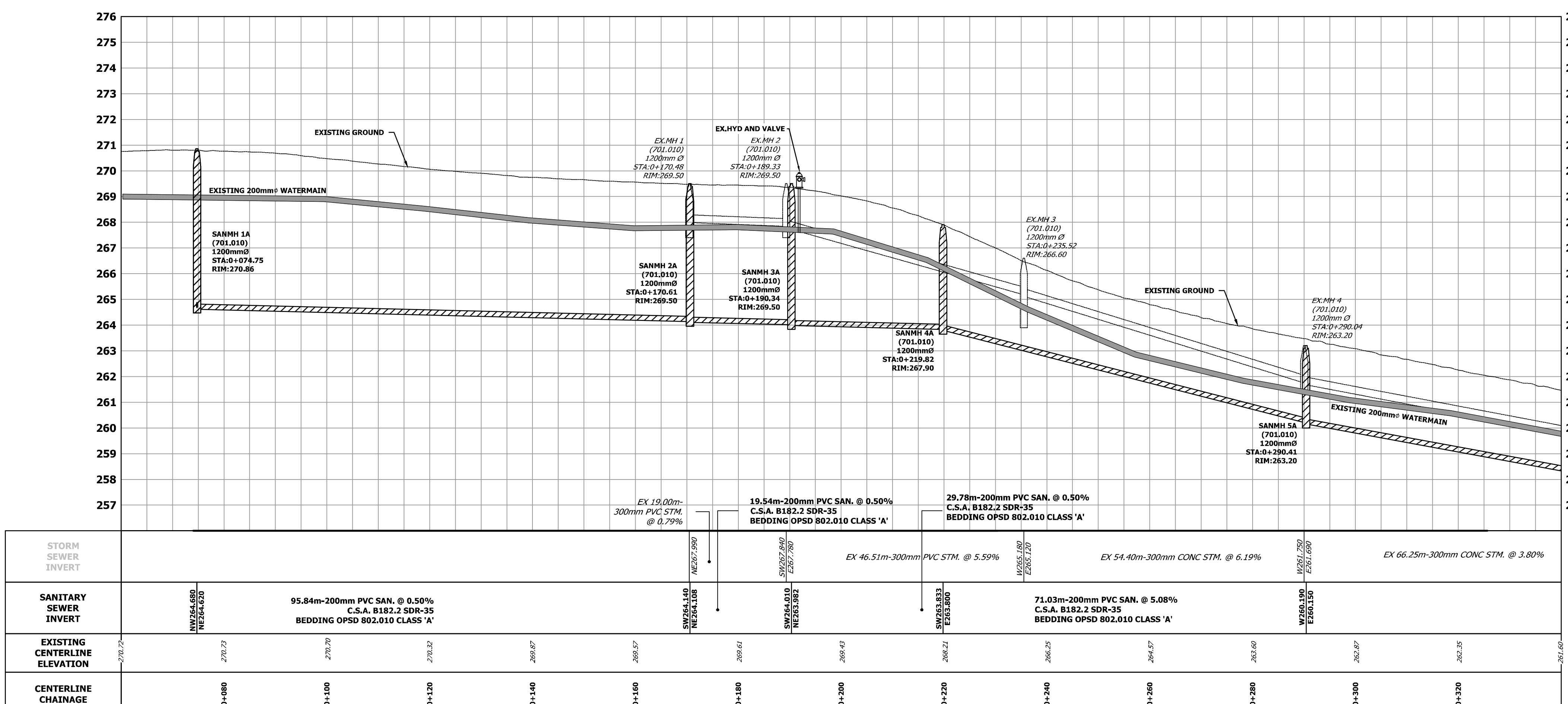

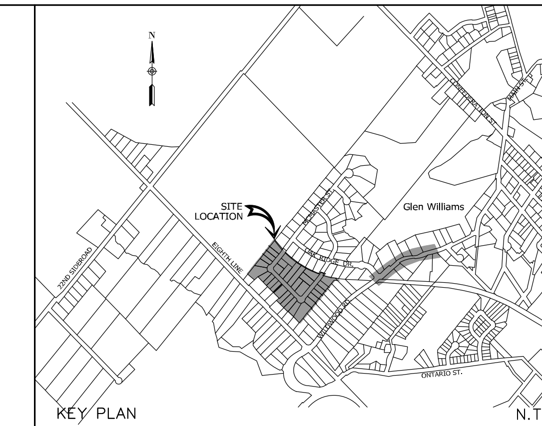

PLAN OF SURVEY ILLUSTRATING TOPOGRAPHY
TOWN OF HALTON HILLS
REGIONAL MUNICIPALITY OF HALTON

LEGEND

- 100m-200mm PVC SAN @ 1.00% — PROPOSED SANITARY SEWER DIRECTION OF FLOW
- MH20A — PROPOSED SANITARY MANHOLE & NUMBER
- 100m-600mm CONC STM @ 1.00% — EXISTING STORM SEWER DIRECTION OF FLOW
- MH20 — EXISTING STORM MANHOLE & NUMBER

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FIGURE 4.3 - EXTERNAL SANITARY SEWER PLAN AND PROFILE

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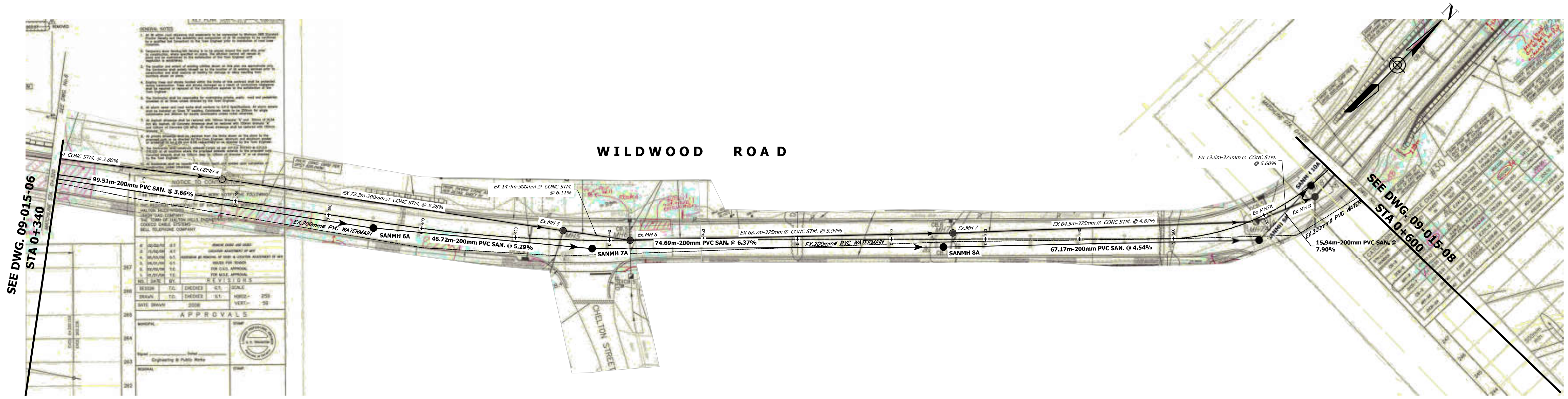
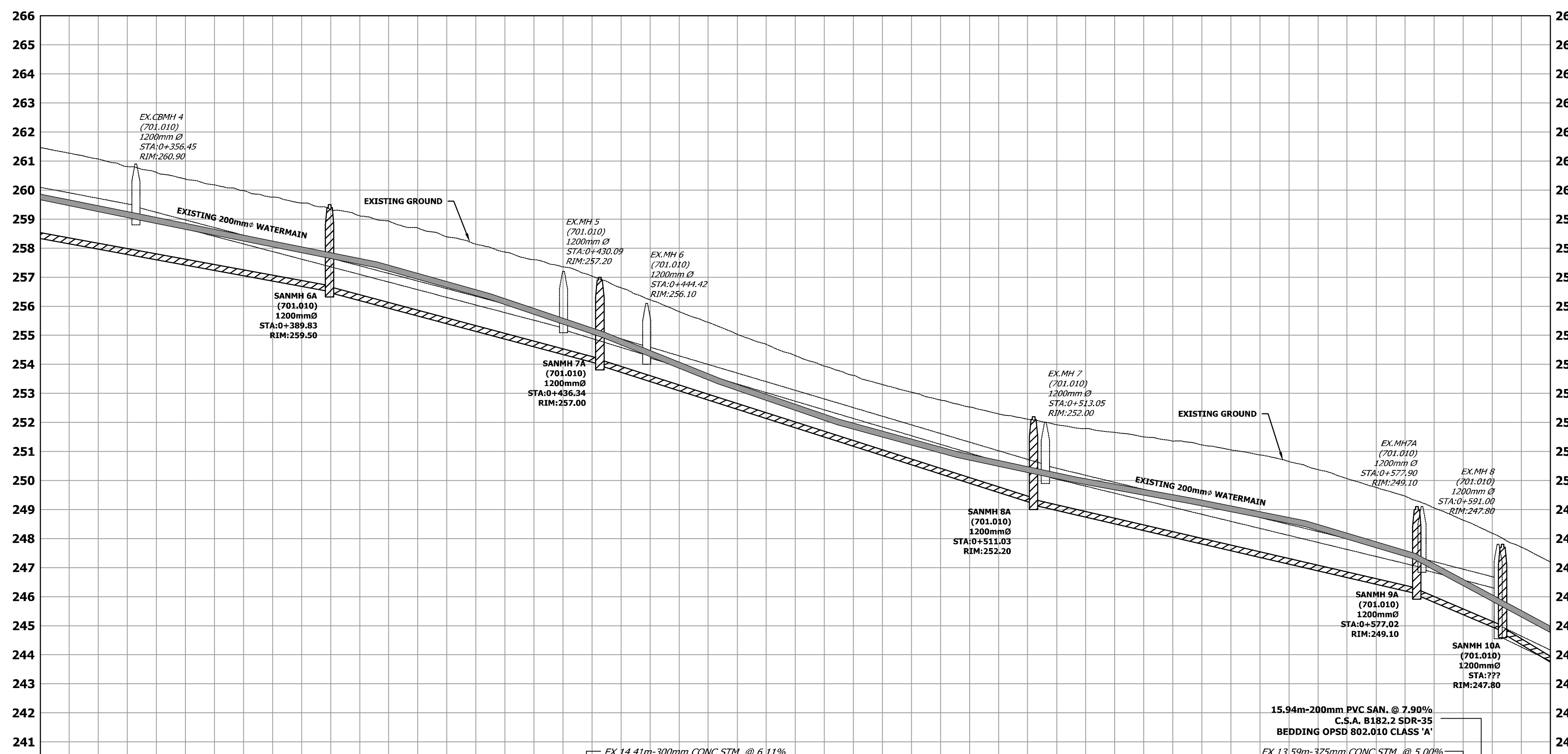
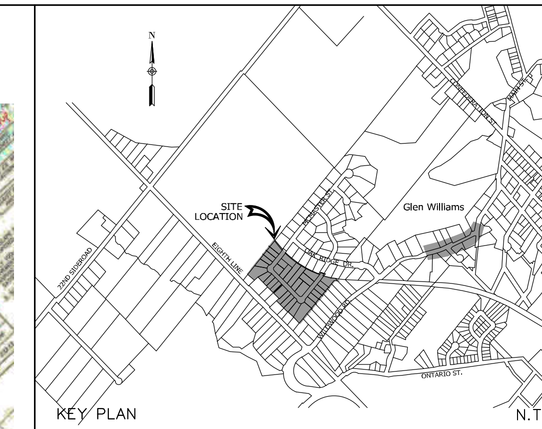




STORM SEWER INVERT	W259.170 / E259.120; EX 73.34m-300mm CONC STM. @ 5.28%; W255.250 / E255.190; W254.310 / NE254.250; EX 68.65m-375mm CONC STM. @ 5.94%; SW250.170 / NE250.140; EX 64.53m-375mm CONC STM. @ 4.87%; SW247.000 / NE246.940; SW246.260 / N244.650
SANITARY SEWER INVERT	99.51m-200mm PVC SAN. @ 3.66% C.S.A. B182.2 SDR-35 BEDDING OPSD 802.010 CLASS 'A'; W256.510 / E256.470; 46.72m-200mm PVC SAN. @ 5.29% C.S.A. B182.2 SDR-35 BEDDING OPSD 802.010 CLASS 'A'; W254.000 / NE253.960; 74.69m-200mm PVC SAN. @ 6.37% C.S.A. B182.2 SDR-35 BEDDING OPSD 802.010 CLASS 'A'; SW249.200 / NE249.150; 67.17m-200mm PVC SAN. @ 4.54% C.S.A. B182.2 SDR-35 BEDDING OPSD 802.010 CLASS 'A'; SW246.100 / N246.060; S244.800 / N244.740
EXISTING CENTERLINE ELEVATION	261.60, 260.79, 259.98, 259.18, 258.06, 256.71, 255.11, 253.74, 252.64, 251.79, 251.06, 250.26, 249.07, 246.92
CENTERLINE CHAINAGE	0+360, 0+380, 0+400, 0+420, 0+440, 0+460, 0+480, 0+500, 0+520, 0+540, 0+560, 0+580



PLAN OF SURVEY ILLUSTRATING TOPOGRAPHY
TOWN OF HALTON HILLS
REGIONAL MUNICIPALITY OF HALTON

LEGEND

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- MH20A — PROPOSED SANITARY MANHOLE & NUMBER
- 100m-600mm CONC STM @ 1.00% — EXISTING STORM SEWER DIRECTION OF FLOW
- MH20 — EXISTING STORM MANHOLE & NUMBER

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FIGURE 4.4 - EXTERNAL SANITARY SEWER PLAN AND PROFILE

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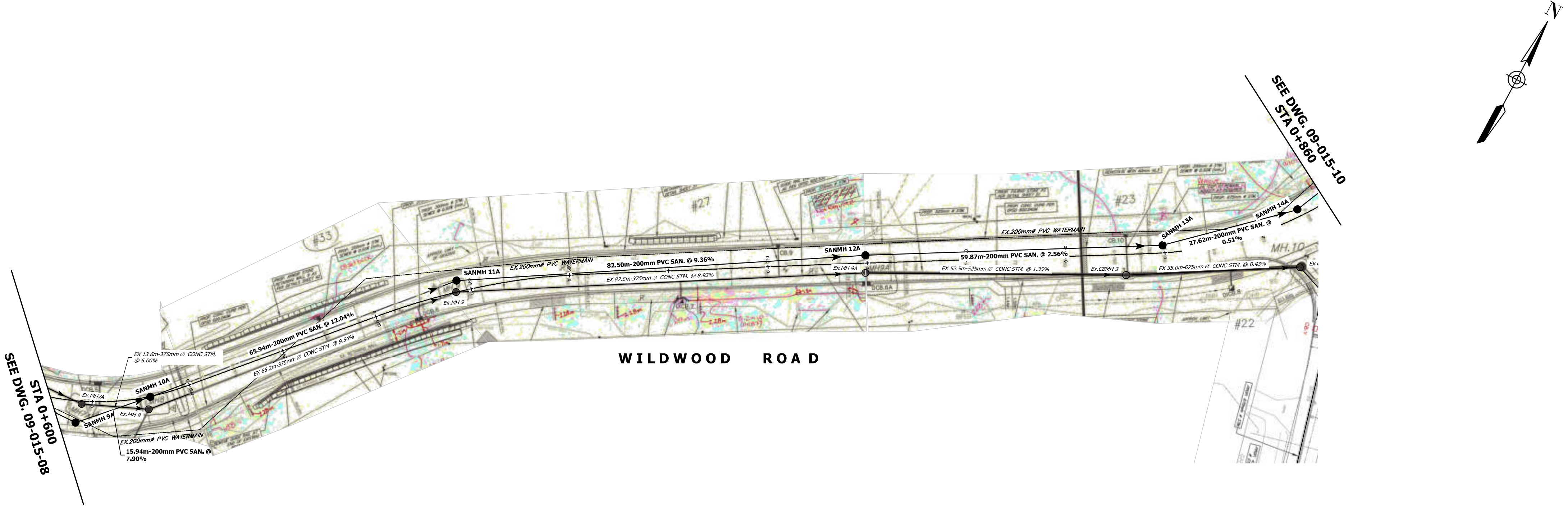
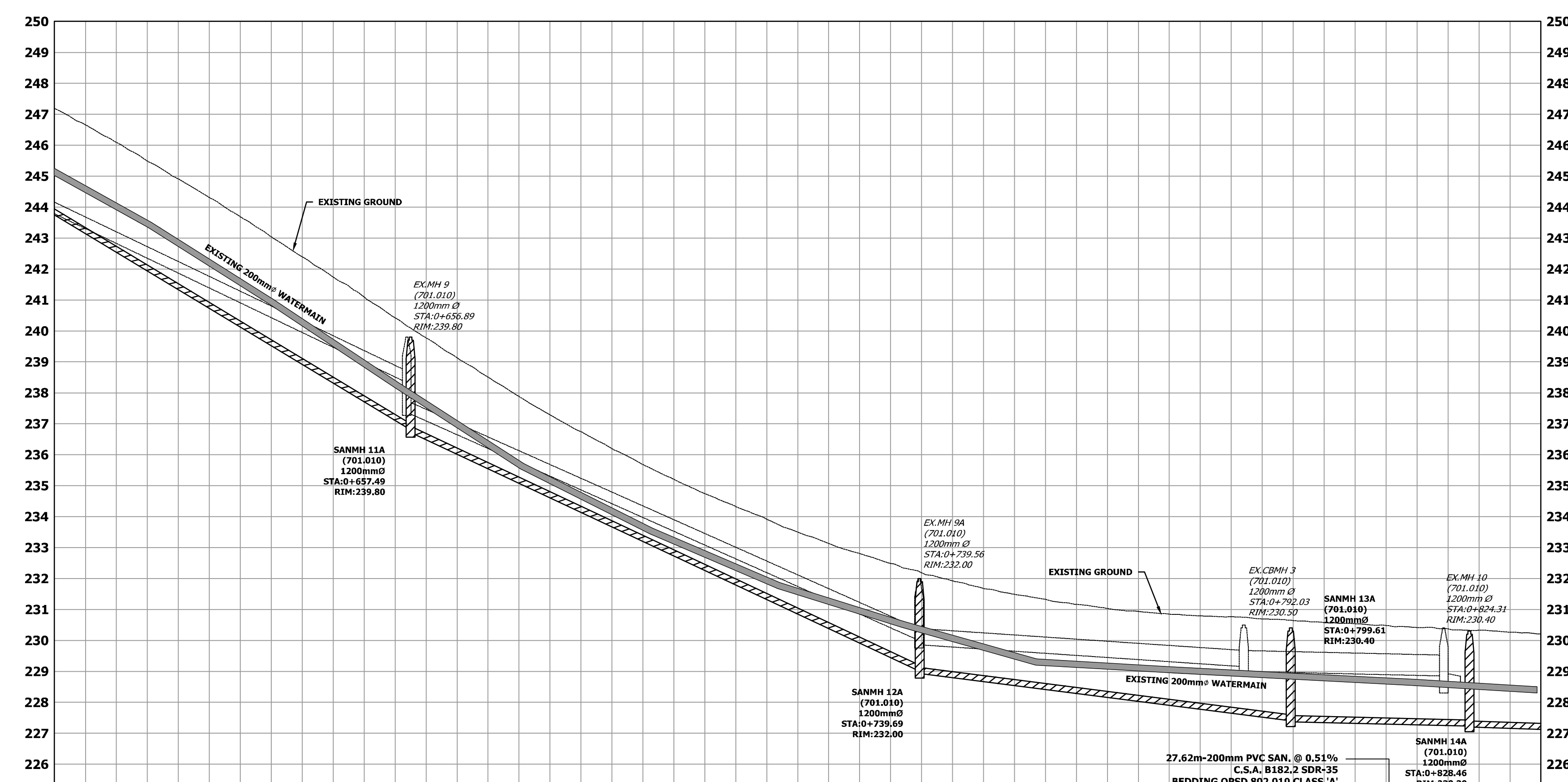
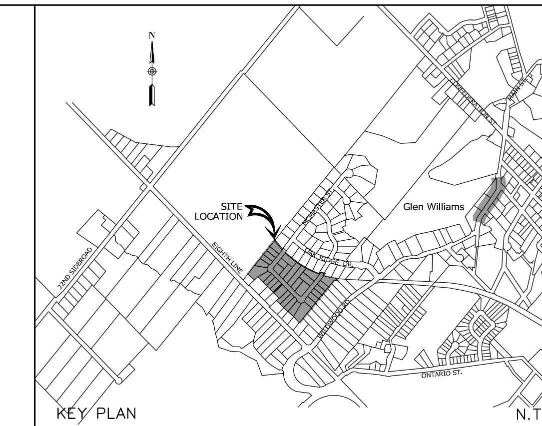
DRAWN BY: A.G./V.B./G.M.	DRAWING NO. 09-015-07	CITY FILE:
SCALE HOR 1:500	Sheet: 07 OF 18	REGION FILE:





STORM SEWER INVERT	EX 66.23m-375mm CONC STM. @ 9.54%		S238.330 NE237.370	EX 82.50m-375mm CONC STM. @ 8.93%			SW230.000 NE229.860	EX 52.52m-525mm CONC STM. @ 1.35%		SW229.150 NE229.000	EX 35.02m-675mm CONC STM. @ 0.43%	SW228.850 E228.700	
SANITARY SEWER INVERT	65.94m-200mm PVC SAN. @ 12.04% C.S.A. B182.2 SDR-35 BEDDING OPSD 802.010 CLASS 'A'		S236.800 NE236.720	82.50m-200mm PVC SAN. @ 9.36% C.S.A. B182.2 SDR-35 BEDDING OPSD 802.010 CLASS 'A'			SW229.000 NE228.930	59.87m-200mm PVC SAN. @ 2.56% C.S.A. B182.2 SDR-35 BEDDING OPSD 802.010 CLASS 'A'		SW227.400 N227.370		S227.230 N227.200	
EXISTING CENTERLINE ELEVATION	246.92 / 244.63	242.44	239.78	237.19	234.98	233.25	232.07	231.09	230.72	230.48	230.44		230.34
CENTERLINE CHAINAGE	0+620	0+640	0+660	0+680	0+700	0+720	0+740	0+760	0+780	0+800	0+820		



PLAN OF SURVEY ILLUSTRATING TOPOGRAPHY
TOWN OF HALTON HILLS
REGIONAL MUNICIPALITY OF HALTON

LEGEND

- 100m-200mm PVC SAN @ 1.00% — PROPOSED SANITARY SEWER DIRECTION OF FLOW
- MH20A — PROPOSED SANITARY MANHOLE & NUMBER
- 100m-600mm CONC STM @ 1.00% — EXISTING STORM SEWER DIRECTION OF FLOW
- MH20 — EXISTING STORM MANHOLE & NUMBER

BEARINGS ARE UTM GRID, DERIVED FROM REAL TIME NETWORK (RTN) OBSERVATIONS, UTM ZONE 17, NAD83 (CSRS) (2010.0).
DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.999690.
ALL CURB ELEVATIONS ARE SHOWN TO THE TOP FACE OF CURB.

ELEVATION NOTE
ELEVATIONS SHOWN ON THIS PLAN ARE RELATED TO GEODETIC DATUM AND ARE DERIVED FROM GEOLOGICAL SURVEY OF CANADA BENCH MARK: No. 0011954U598F ELEVATION=258.735m, No. 00819668361 ELEVATION=252.480m

LOCAL BENCHMARK
CONCRETE NAIL LOCATED ON THE SOUTHWEST SIDE OF EIGHTH LINE, OPPOSITE MAIL BOX FOR ADDRESS No. 12124. ELEVATION=271.26m
ALL DIMENSIONS AND ELEVATIONS ARE IN METRES UNLESS OTHERWISE NOTED PIPE SIZES ARE IN MILLIMETRES

REVISION	BLOCK	DATE	APPR. BY
2	REVISED AS PER TOWN/REGION/CBC COMMENTS	MAR/24/2021	M.E.H.
1	REVISED AS PER TOWN/REGION/CBC COMMENTS	NOV/21-2019	M.E.H.

RESIDENTIAL SUBDIVISION DEVELOPMENT
2147925 ONTARIO INC.

LICENSED PROFESSIONAL ENGINEER
M.E.HALL
MAR/24/2021
PROVINCE OF ONTARIO

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CONSULTING ENGINEERS & PROJECT MANAGERS
350 Creditstone Road, Unit 200
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FIGURE 4.5 - EXTERNAL SANITARY SEWER PLAN AND PROFILE

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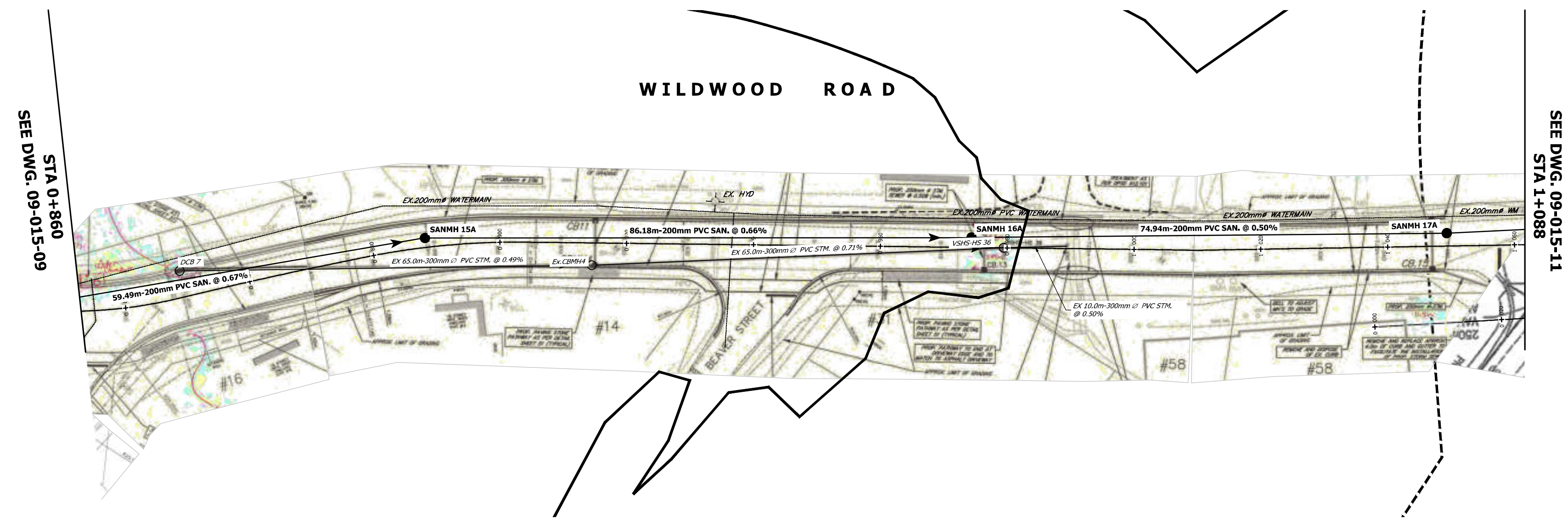
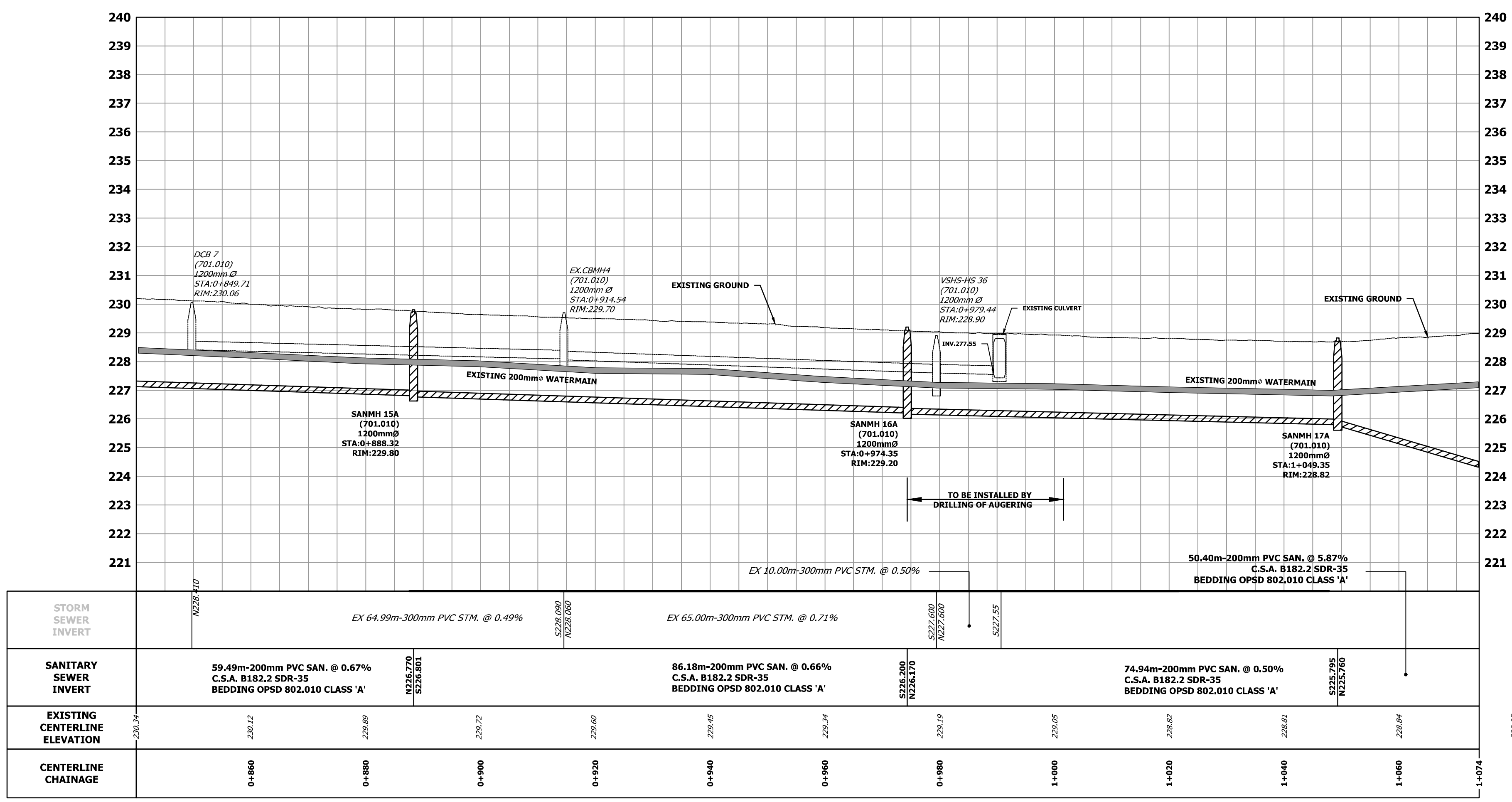
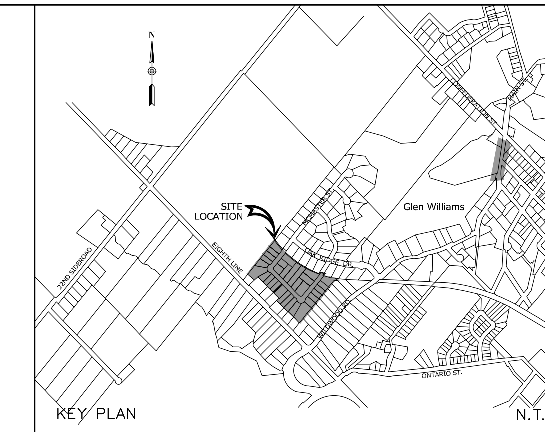
DRAWN BY: A.G./V.B./G.M.	DRAWING NO. 09-015-09	CITY FILE:
SCALE HOR 1:750	Sheet: 09 OF 18	REGION FILE:







PLAN OF SURVEY ILLUSTRATING TOPOGRAPHY
TOWN OF HALTON HILLS
REGIONAL MUNICIPALITY OF HALTON

LEGEND

- PROPOSED SANITARY SEWER DIRECTION OF FLOW
- PROPOSED SANITARY MANHOLE & NUMBER
- EXISTING STORM SEWER DIRECTION OF FLOW
- EXISTING STORM MANHOLE & NUMBER
- 100YR FLOODLINE
- REGULATORY FLOODLINE

BEARINGS ARE UTM GRID, DERIVED FROM REAL TIME NETWORK (RTN) OBSERVATIONS, UTM ZONE 17, NAD83 (CSRS) (2010.0).
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ELEVATION NOTE
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LOCAL BENCHMARK
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2	REVISED AS PER TOWN/REGION/CBC COMMENTS	MAR/24/2021	M.E.H.
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CONSULTING ENGINEERS & PROJECT MANAGERS
350 Creditstone Road, Unit 200
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FIGURE 4.6 - EXTERNAL SANITARY SEWER PLAN AND PROFILE

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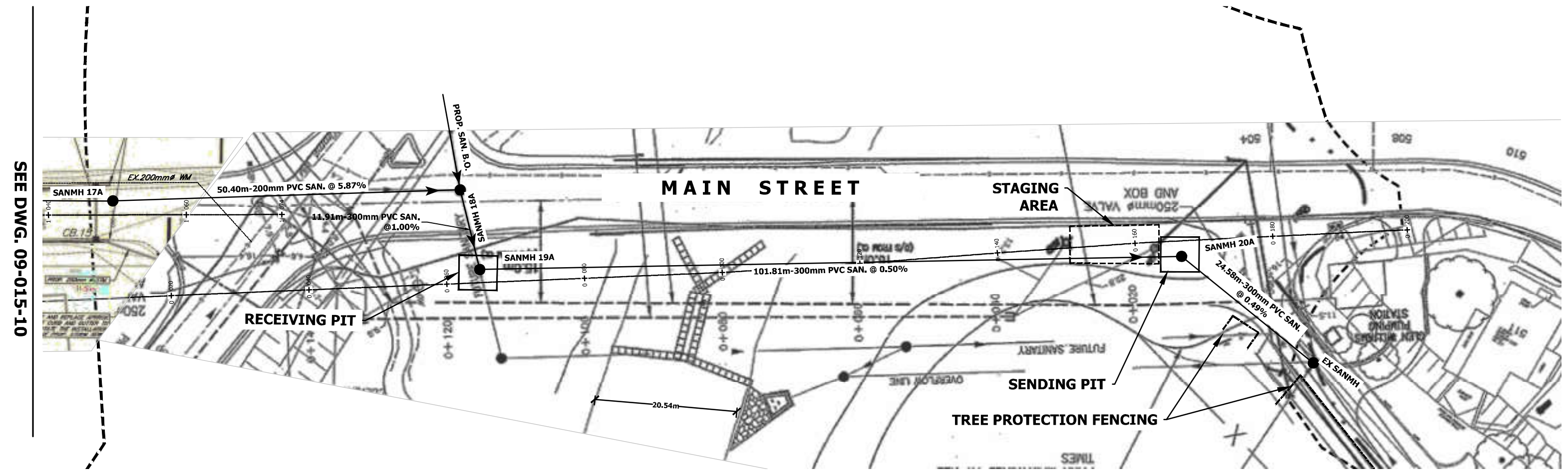
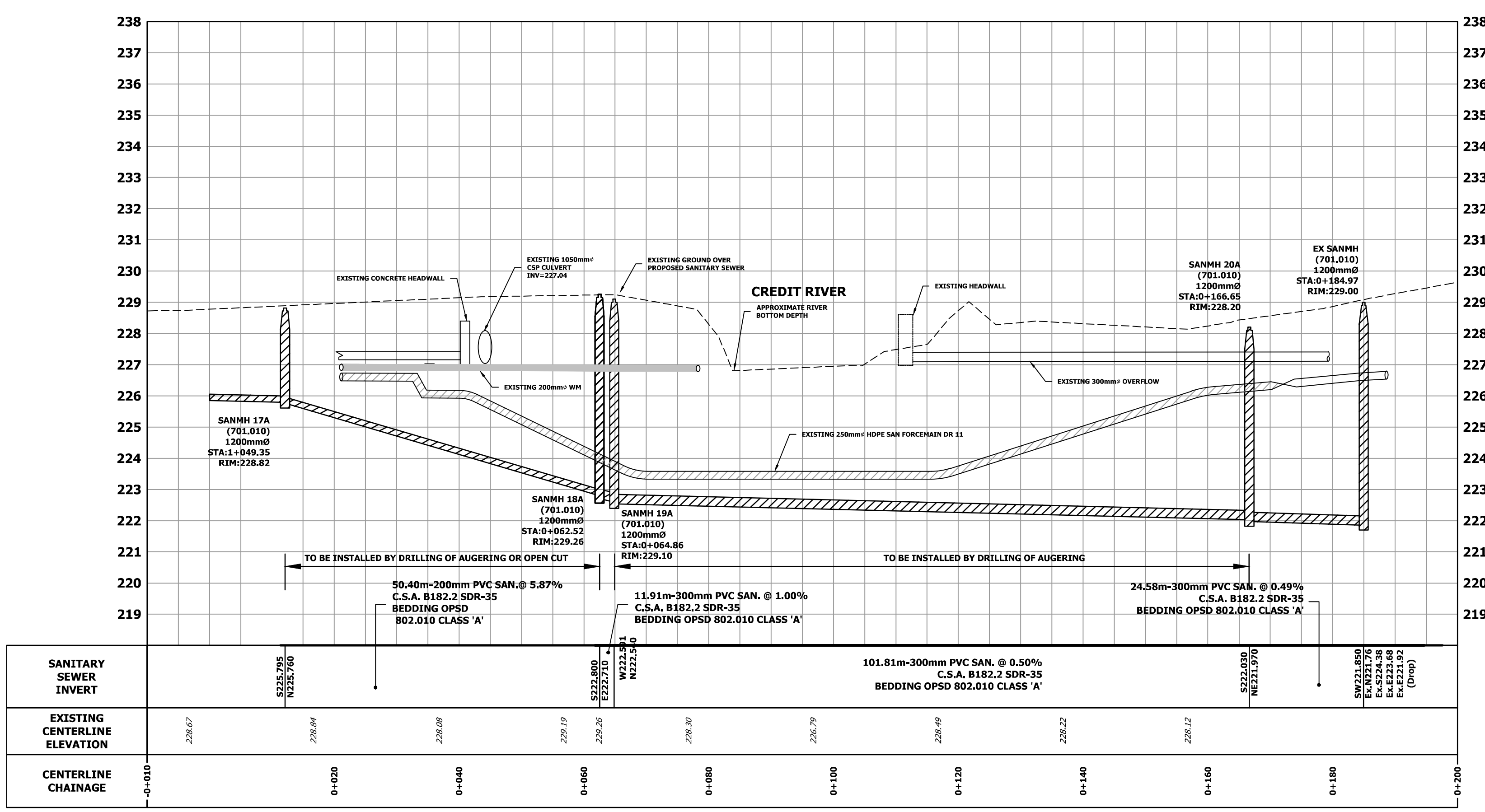
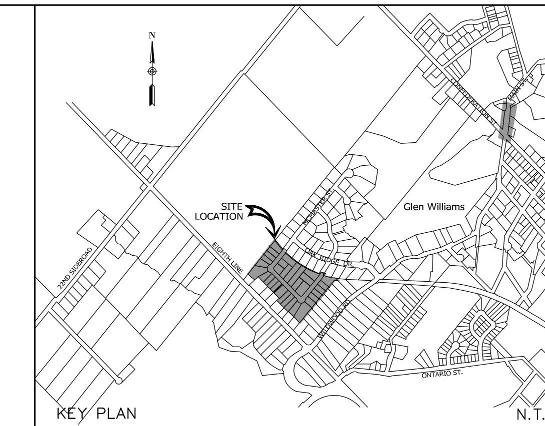
DRAWN BY: A.G./V.B./G.M.	DRAWING NO. 09-015-10	CITY FILE:
SCALE HOR 1:500 VER 1:100	Sheet: 10 OF 18	REGION FILE:

NOTE:

THE CROSSING OF THE WATER COURSE IS TO BE UNDERTAKEN DURING THE COLD-WATER TIMING WINDOW OF JUNE 15th - SEPTEMBER 15th







PLAN OF SURVEY ILLUSTRATING TOPOGRAPHY
TOWN OF HALTON HILLS
REGIONAL MUNICIPALITY OF HALTON

LEGEND

100m-200mm PVC SAN @ 1.00%	PROPOSED SANITARY SEWER DIRECTION OF FLOW
● MH20A	PROPOSED SANITARY MANHOLE & NUMBER
- - - - -	100YR FLOODLINE
———	REGULATORY FLOODLINE

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ELEVATION NOTE
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1	REVISED AS PER TOWN/REGION/CBC COMMENTS	NOV/21-2019	M.E.H.
REVISION	BLOCK	DATE	APPR. BY

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M.E.HALL
MAR/24/2021
PROVINCE OF ONTARIO

CONDELAND
CONSULTING ENGINEERS & PROJECT MANAGERS
350 Creditstone Road, Unit 200
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FIGURE 4.7 - EXTERNAL SANITARY SEWER PLAN AND PROFILE

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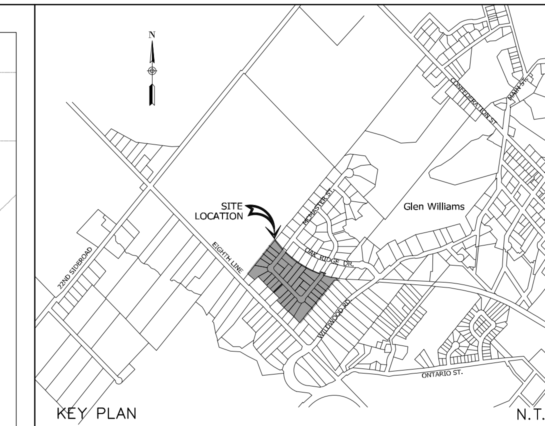
DRAWN BY: A.G./V.B./G.M.	DRAWING NO. 09-015-11	CITY FILE:	
SCALE HOR 1:500	Sheet: 11 OF 18	REGION FILE:	



PLAN OF SURVEY ILLUSTRATING TOPOGRAPHY
TOWN OF HALTON HILLS
REGIONAL MUNICIPALITY OF HALTON

LEGEND

- EX.200mm PVC WATERMAIN — EXISTING WATERMAIN
- EX. 50m–200mm PVC STM — EXISTING STORM DIRECTION OF FLOW
- EX. D.I. — EXISTING DITCH INLET
- EX. DICB — EXISTING DITCH INLET CATCHBASIN
- EX. CB — EXISTING CATCHBASIN
- EX.DCBMH — EXISTING DOUBLE CATCHBASIN MANHOLE
- EX.MH — EXISTING STORM MANHOLE
- EX.HYD — EXISTING HYDRANT & VALVE
- EX.HW — EXISTING HEADWALL
- V&B — EXISTING WATER VALVE & BOX
- EXISTING WATERMAIN PLUG
- 100m-200mm PVC SAN @ 1.00% — PROPOSED SANITARY SEWER DIRECTION OF FLOW
- 100m-600mm CONC STM @ 1.00% — PROPOSED STORM SEWER DIRECTION OF FLOW
- 150mmø PVC WATERMAIN — PROPOSED WATERMAIN
- 100m-900mm CONC STM @ 1.00% — PROPOSED STORM SEWER >900mm DIRECTION OF FLOW
- DENOTES INFILTRATION GALLERY/ SOAKAWAY PIT LOCATION
- PROPOSED SANITARY SERVICE
- PROPOSED STORM SERVICE
- PROPOSED WATER SERVICE AND CURB STOP
- 0+000 — PROPOSED CENTERLINE/STA
- LOT LINE
- TPF — SOLID TREE PROTECTION HOARDING
- MH20A — PROPOSED SANITARY MANHOLE & NUMBER
- MH20 — PROPOSED STORM MANHOLE & NUMBER
- CB — PROPOSED CATCHBASIN
- DCB — PROPOSED DOUBLE CATCHBASIN
- PCS — PROPOSED POND CONTROL STRUCTURE
- HW — PROPOSED HEADWALLS
- HYD. — PROPOSED HYDRANT & VALVE
- V&B — PROPOSED WATER VALVE & BOX

BEARINGS ARE UTM GRID, DERIVED FROM REAL TIME NETWORK (RTN) OBSERVATIONS, UTM ZONE 17, NAD83 (CSRS) (2010.0).
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PROFESSIONAL ENGINEER
M.E.HALL
MAR/24/2021
PROVINCE OF ONTARIO

CONDELAND
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350 Creditstone Road, Unit 200
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FIGURE 5 - CONCEPTUAL SERVICING PLAN

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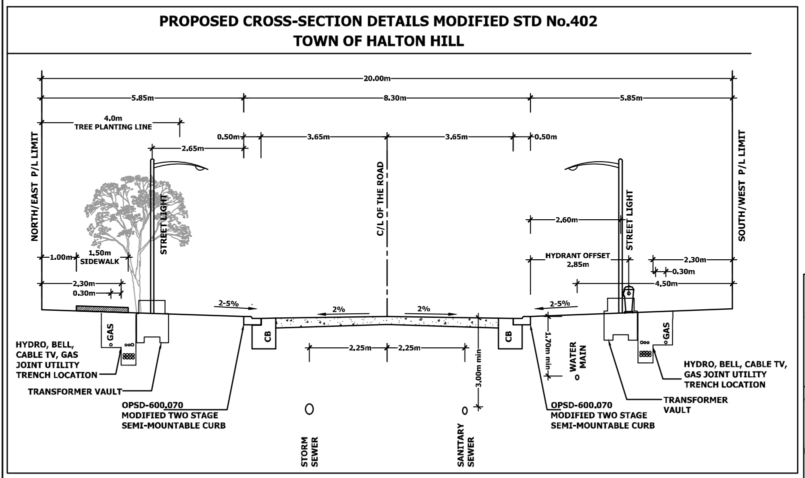
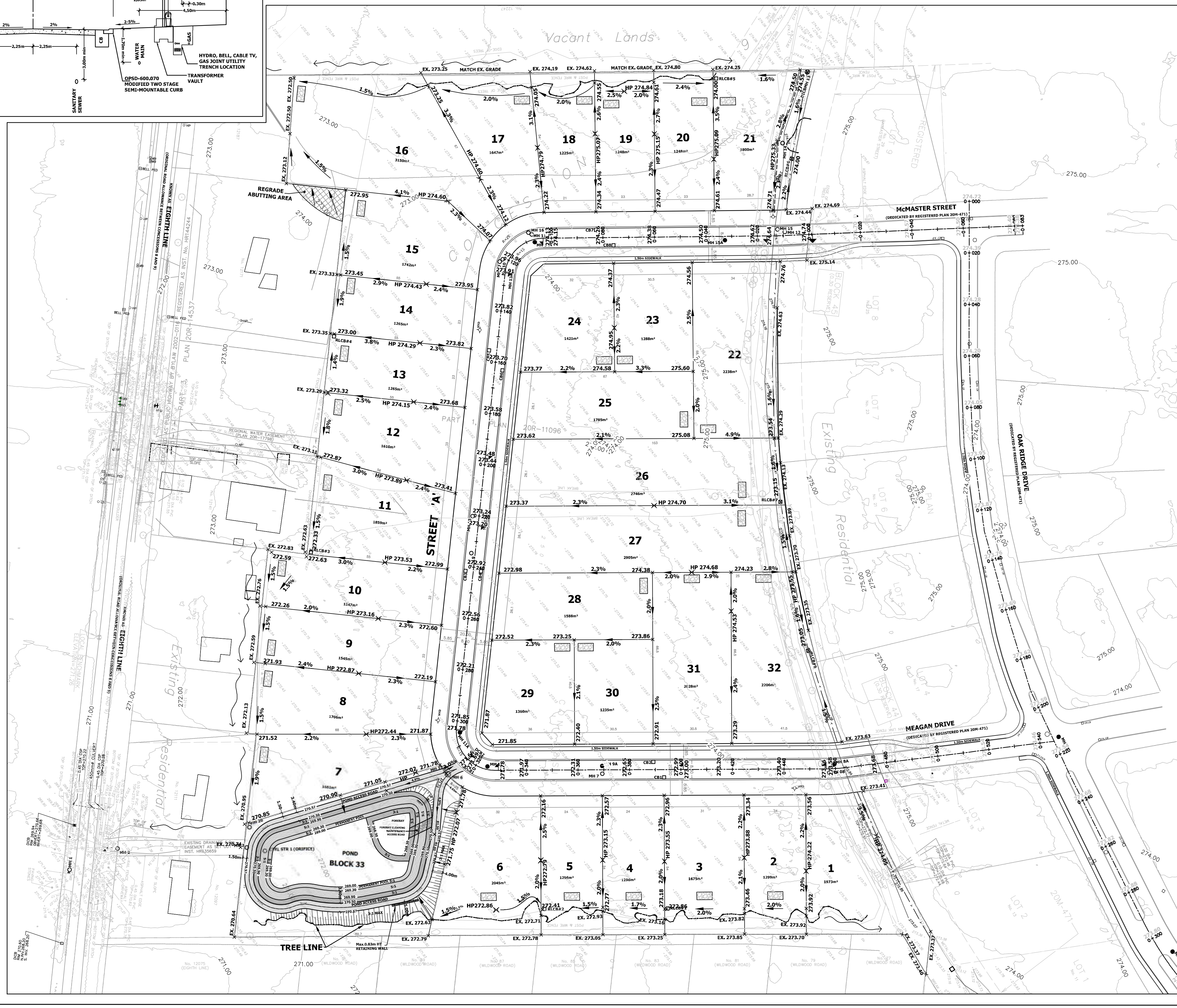
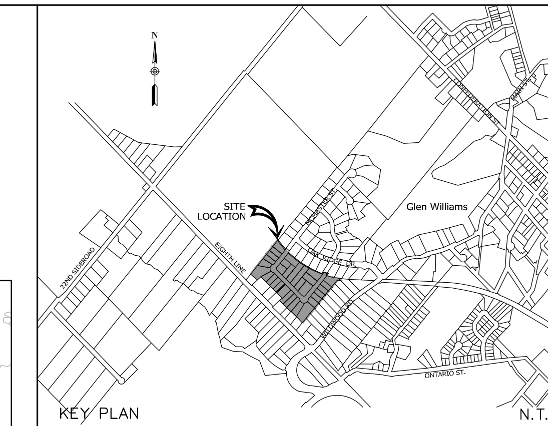
DRAWN BY:	A.G./V.B./G.M.	DRAWING NO.	09-015-12	CITY FILE:	
SCALE HOR 1:750		Sheet:	12 OF 18	REGION FILE:	







PLAN OF SURVEY ILLUSTRATING TOPOGRAPHY
TOWN OF HALTON HILLS
REGIONAL MUNICIPALITY OF HALTON

LEGEND

+191.84	PROPOSED ELEVATION
+ EX:191.84	EXISTING ELEVATION
HP 191.84	PROPOSED HIGH POINT ELEVATION
+ 191.84	EXISTING TOPO ELEVATION
	LOT LINE
0+000	PROPOSED CENTERLINE/STA
TPF	SOLID TREE PROTECTION HOARDING

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REVISION	BLOCK	DATE	APPR. BY

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LICENSED PROFESSIONAL ENGINEER
M.E.HALL
MAR/24/2021
PROVINCE OF ONTARIO

CONDELAND
CONSULTING ENGINEERS & PROJECT MANAGERS
350 Creditstone Road, Unit 200
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FIGURE 6 - CONCEPTUAL GRADING PLAN

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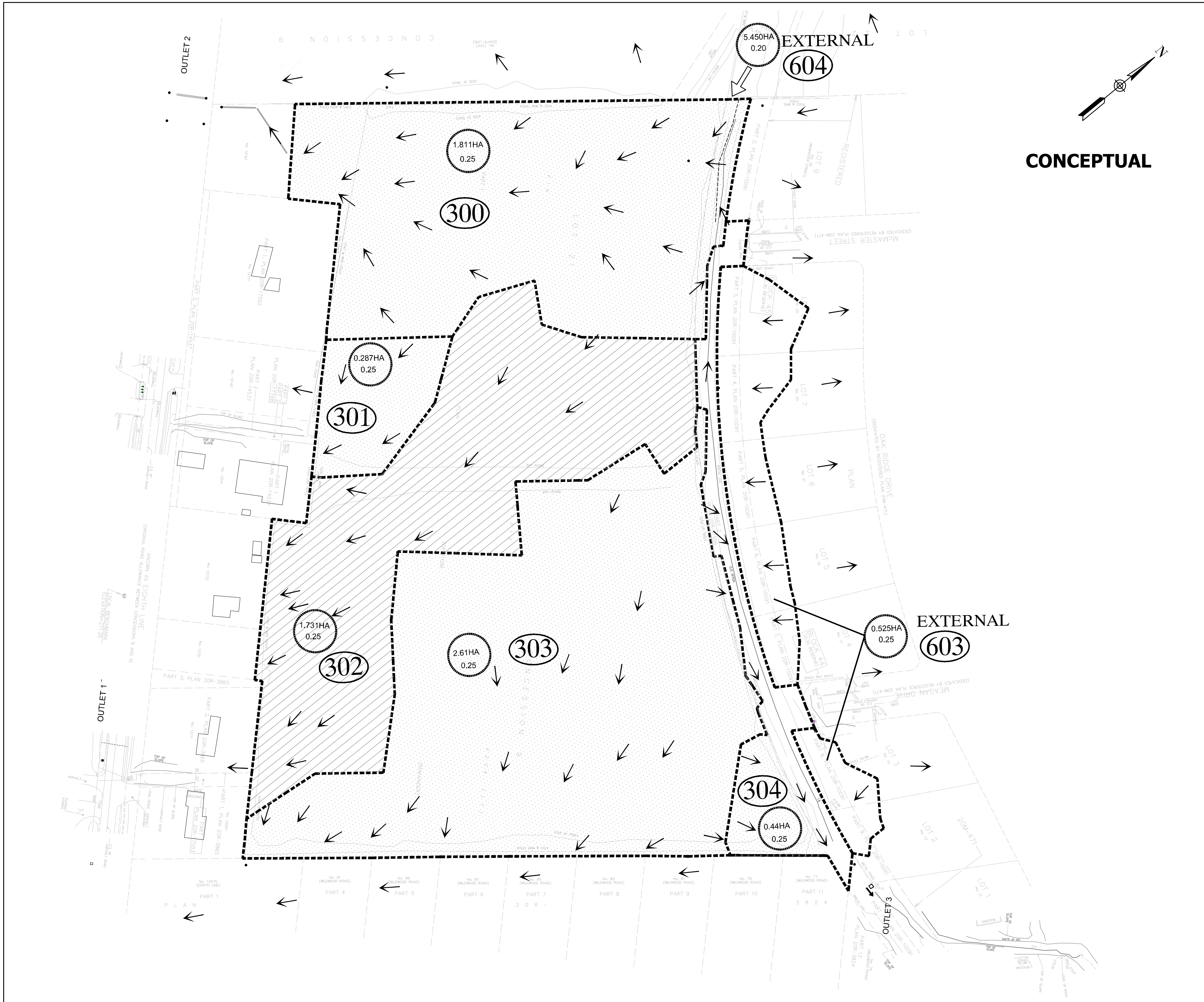

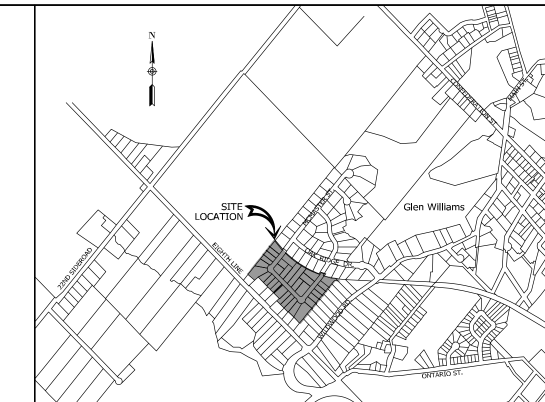

PLAN OF SURVEY ILLUSTRATING TOPOGRAPHY
TOWN OF HALTON HILLS
REGIONAL MUNICIPALITY OF HALTON

LEGEND

- PROPERTY LINE
- TRIBUTARY AREA BOUNDARY
- 1.000HA — STORM TRIBUTARY AREA HA
- 0.5 — RUNOFF COEFFICIENT
- 300 — SUB CATCHMENT AREA ID.
- FLOW DIRECTION

BEARINGS ARE UTM GRID, DERIVED FROM REAL TIME NETWORK (RTN) OBSERVATIONS, UTM ZONE 17, NAD83 (CSRS) (2010.0).
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REVISION	BLOCK	DATE	APPR. BY

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M.E.HALL
MAR/24/2021
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FIGURE 7 - PRE-DEVELOPMENT STORM TRIBUTARY PLAN

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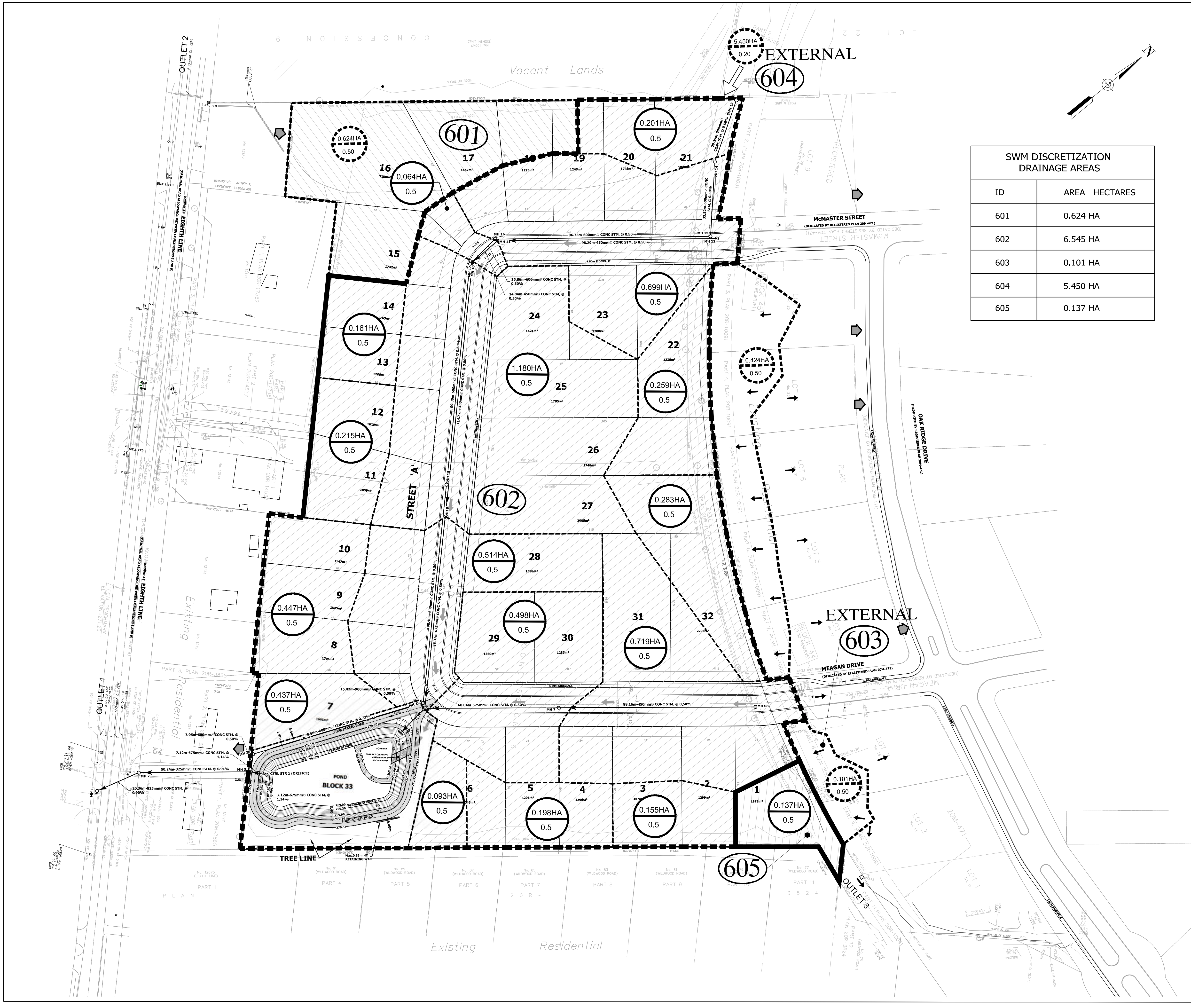
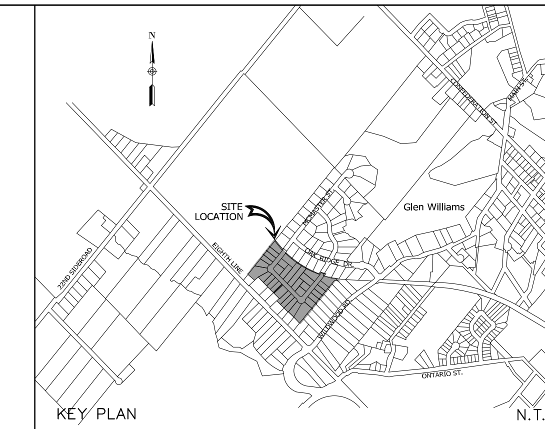
DRAWN BY: A.G./V.B./G.M.	DRAWING NO. 09-015-14	CITY FILE:
SCALE HOR 1:750	Sheet: 14 OF 18	REGION FILE:



SWM DISCRETIZATION DRAINAGE AREAS	
ID	AREA HECTARES
601	0.624 HA
602	6.545 HA
603	0.101 HA
604	5.450 HA
605	0.137 HA



KEY PLAN N.T.S.

PLAN OF SURVEY ILLUSTRATING TOPOGRAPHY
TOWN OF HALTON HILLS
REGIONAL MUNICIPALITY OF HALTON

LEGEND

- TRIBUTARY AREA BOUNDARY
- 1.050HA / 0.5 — STORM TRIBUTARY AREA (HA), RUNOFF COEFFICIENT
- EXTERNAL TRIBUTARY AREA BOUNDARY
- 0.424HA / 0.50 — EXTERNAL STORM TRIBUTARY AREA (HA), EXTERNAL RUNOFF COEFFICIENT
- 600 — SUB CATCHMENT AREA ID.
- OVERLAND FLOW ARROW

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2	REVISED AS PER TOWN/REGION/CBC COMMENTS	MAR/24/2021	M.E.H.
1	REVISED AS PER TOWN/REGION/CBC COMMENTS	NOV/21–2019	M.E.H.
REVISION	BLOCK	DATE	APPR. BY

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2147925 ONTARIO INC.

PROFESSIONAL ENGINEER — M.E.HALL — MAR/24/2021 — PROVINCE OF ONTARIO

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FIGURE 8 - POST DEVELOPMENT STORM TRIBUTARY PLAN

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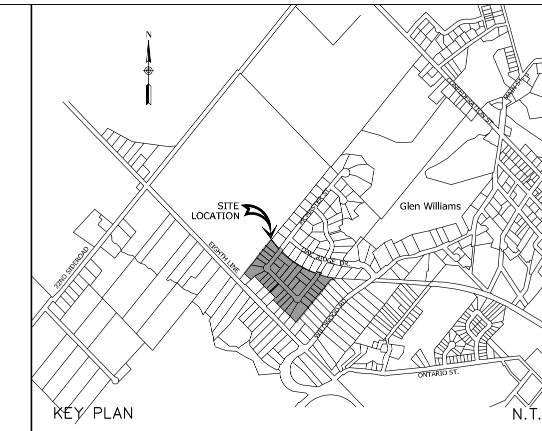
DRAWN BY: A.G./V.B./G.M.	DRAWING NO. 09-015-15	CITY FILE:
SCALE HOR 1:750	Sheet: 15 OF 18	REGION FILE:

EXCAVATED SEDIMENTATION TRAP CALCULATION (125 cu.m/ha)

TRAP ID	TRIB AREA (ha)	VOLUME REQUIRED (cu.m)	LENGTH (m)	WIDTH (m)	DEPTH (m)	VOLUME PROVIDED (cu.m)
1 (POND)	6.26	783	-	-	-	2441
2	0.62	78	11	5.5	1.5	91

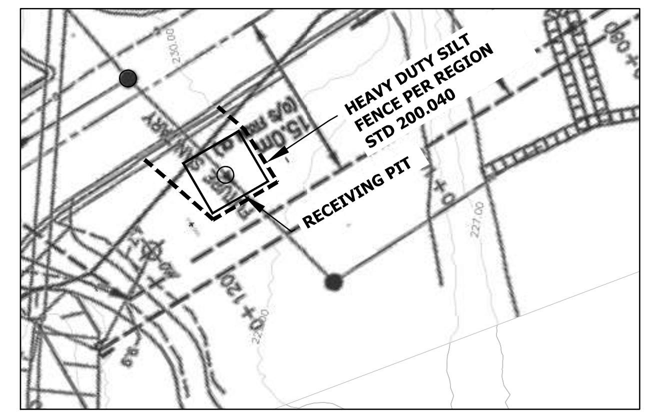
NOTE:
FOR EROSION SEDIMENT CONTROL DETAILS SEE DRAWING 09-015-18



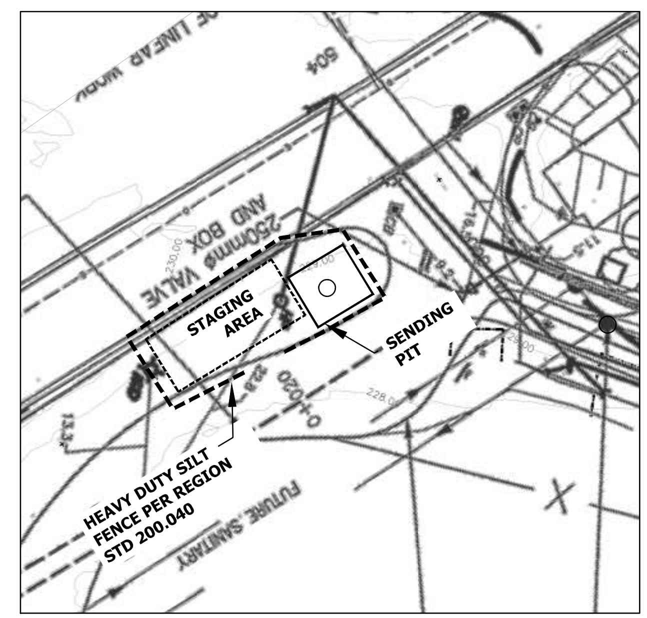
PLAN OF SURVEY ILLUSTRATING TOPOGRAPHY
TOWN OF HALTON HILLS
REGIONAL MUNICIPALITY OF HALTON

LEGEND

- +191.84 PROPOSED ELEVATION
- SILT FENCE
- 0.3% INTERCEPTION SWALE
- DENOTES SHEET FLOW
- DENOTES SEDIMENTATION TRAP
- PROPOSED MUD-MAT



RECEIVING PIT ESC DETAIL



SEND PIT ESC DETAIL

BEARINGS ARE UTM GRID, DERIVED FROM REAL TIME NETWORK (RTN) OBSERVATIONS, UTM ZONE 17, NAD83 (CSRS) (2010.0).
DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.999690.
ALL CURB ELEVATIONS ARE SHOWN TO THE TOP FACE OF CURB.

ELEVATION NOTE
ELEVATIONS SHOWN ON THIS PLAN ARE RELATED TO GEODETIC DATUM AND ARE DERIVED FROM GEOLOGICAL SURVEY OF CANADA BENCH MARK: No. 0011954U598F ELEVATION=258.735m, No. 00819668361 ELEVATION=252.480m

LOCAL BENCHMARK
CONCRETE NAIL LOCATED ON THE SOUTHWEST SIDE OF EIGHTH LINE, OPPOSITE MAIL BOX FOR ADDRESS No. 12124. ELEVATION=271.26m

ALL DIMENSIONS AND ELEVATIONS ARE IN METRES UNLESS OTHERWISE NOTED PIPE SIZES ARE IN MILLIMETRES

REVISION	BLOCK	DATE	APPR. BY
2	REVISED AS PER TOWN/REGION/CBC COMMENTS	MAR/24/2021	M.E.H.
1	REVISED AS PER TOWN/REGION/CBC COMMENTS	NOV/21-2019	M.E.H.

RESIDENTIAL SUBDIVISION DEVELOPMENT
2147925 ONTARIO INC.

LICENSED PROFESSIONAL ENGINEER
M.E.HALL
MAR/24/2021
PROVINCE OF ONTARIO

CONDELAND
CONSULTING ENGINEERS & PROJECT MANAGERS
350 Creditstone Road, Unit 200
Concord, Ontario L4K 3Z2
P: (905) 695-2096
F: (905) 695-2099

TOWN OF HALTON HILLS
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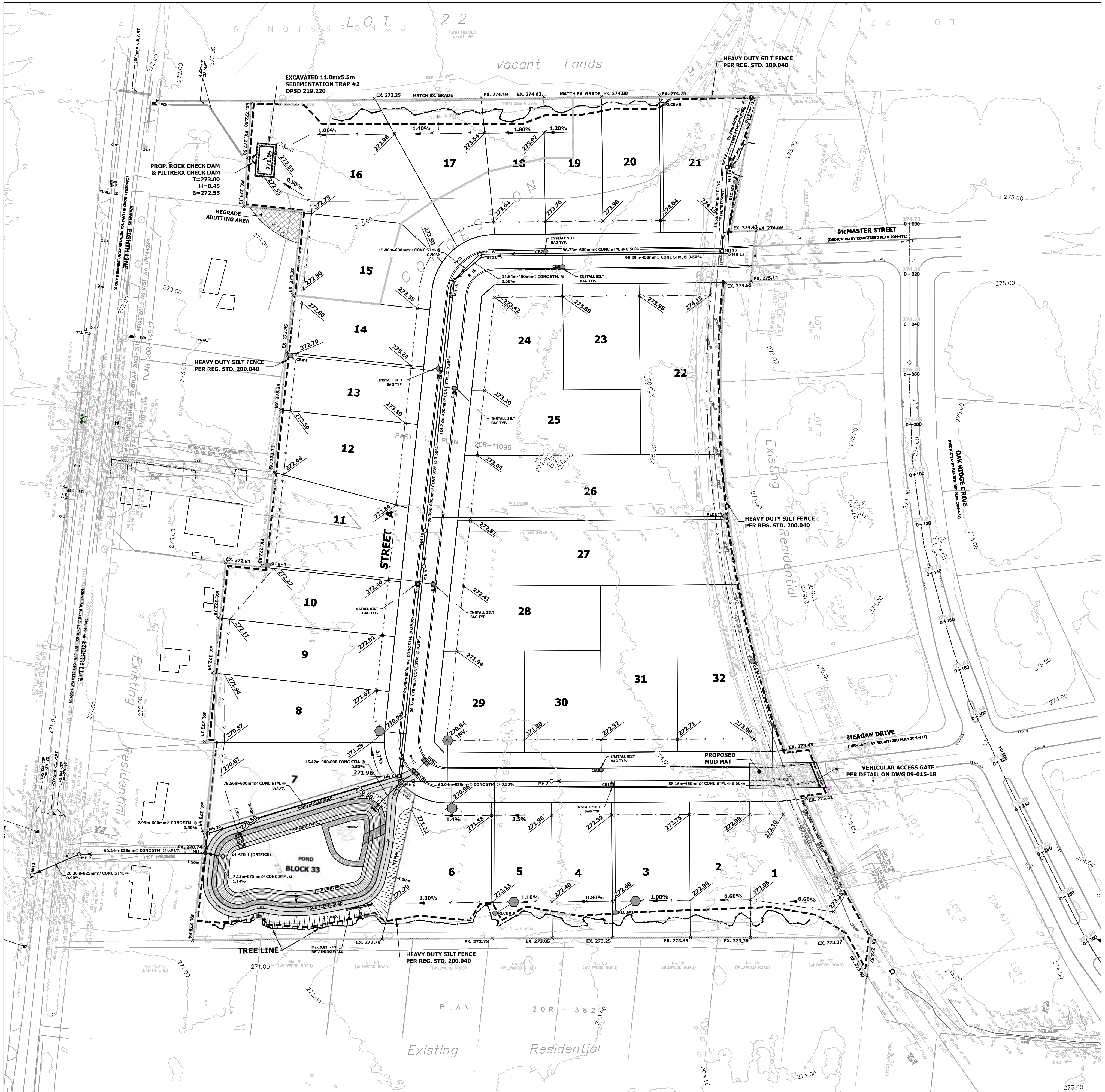
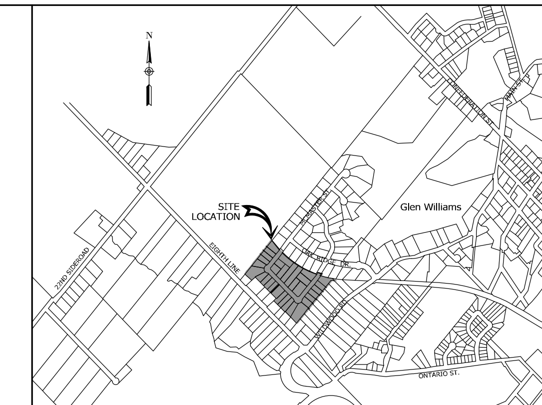
Halton REGION

FIGURE 9 - CONCEPTUAL EROSION AND SEDIMENT CONTROL PLAN STAGE I

DESIGNED BY: M.E.H.	DATE: MARCH 2021	CHECKED BY: M.E.H.
DRAWN BY: A.G./V.B./G.M.	DRAWING NO. 09-015-16	CITY FILE:
SCALE HOR 1:750	Sheet: 16 OF 18	REGION FILE:



NOTE:
FOR EROSION SEDIMENT CONTROL DETAILS SEE DRAWING 09-015-18



KEY PLAN N.T.S.

PLAN OF SURVEY ILLUSTRATING TOPOGRAPHY
TOWN OF HALTON HILLS
REGIONAL MUNICIPALITY OF HALTON

LEGEND

- MH20 — PROPOSED STORM MANHOLE & NUMBER
- CB — PROPOSED CATCHBASIN
- DCB — PROPOSED DOUBLE CATCHBASIN
- PCS — PROPOSED POND CONTROL STRUCTURE
- HW — PROPOSED HEADWALLS
- 100m-600mm CONC STM @ 1.00% — PROPOSED STORM SEWER DIRECTION OF FLOW
- PROPOSED STORM SERVICE
- TPF — SOLID TREE PROTECTION HOARDING
- SILT FENCE
- 0.3% — INTERCEPTION SWALE
- DENOTES SILT PROTECTION FOR STREET CB's
- DENOTES SHEET FLOW
- DENOTES SEDIMENTATION TRAP

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REVISION	BLOCK	DATE	APPR. BY
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1	REVISED AS PER TOWN/REGION/CBC COMMENTS	NOV/21–2019	M.E.H.

RESIDENTIAL SUBDIVISION DEVELOPMENT
2147925 ONTARIO INC.

LICENSED PROFESSIONAL ENGINEER M.E.HALL MAR/24/2021 PROVINCE OF ONTARIO

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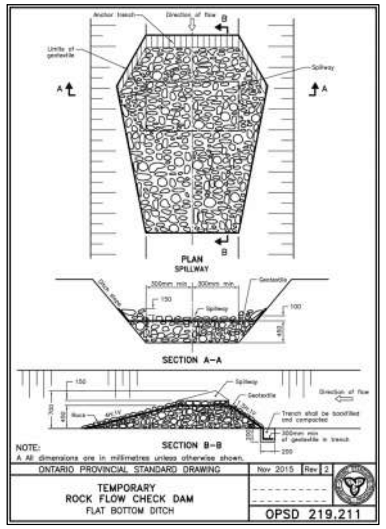
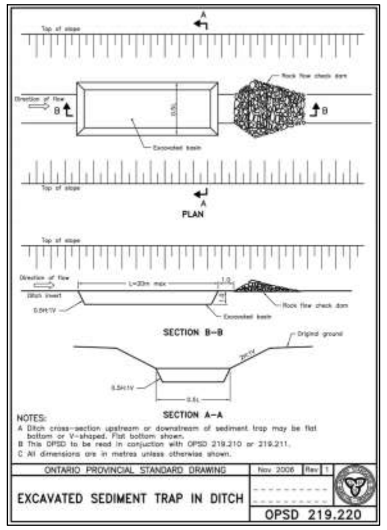
FIGURE 10-CONCEPTUAL EROSION AND SEDIMENT CONTROL PLAN STAGE II

DESIGNED BY: M.E.H.	DATE: MARCH 2021	CHECKED BY: M.E.H.
DRAWN BY: A.G./V.B./G.M.	DRAWING NO. 09-015-17	CITY FILE:
SCALE HOR 1:750	Sheet: 17 OF 18	REGION FILE:

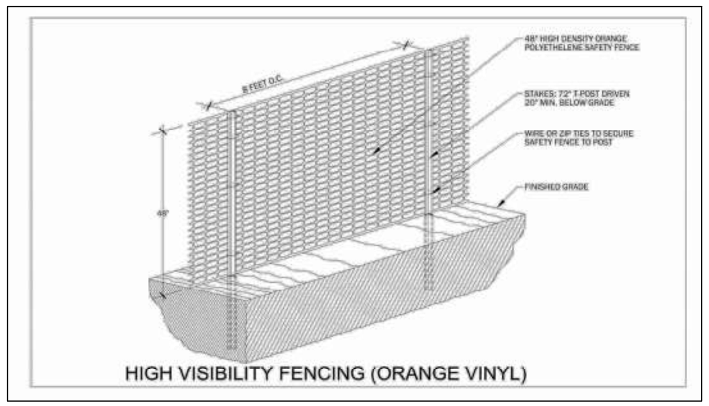




ESC MEASURE INTERNAL TO THE SITE	TIMING FOR INSTALLATION	INSPECTION/MAINTENANCE REQUIREMENTS	TIMING FOR REMOVAL
PHASE 1 - Topsoil Stripping and Area Grading			
– Siltation Control Fence placed at grading limits (OPSD 219.131)	Prior to topsoil stripping.	Consultant to arrange inspection with Town Staff once installation is complete. Consultant to undertake weekly inspections and after each rainfall event, including weekly reporting. Regular maintenance to remove accumulated sediment once 50% of capacity.	Just prior to final grading, replacement with phase 2 measures, or construction of municipal services.
– Additional Siltation Control Fence placed at rear lot limits as shown on ESC plan (OPSD 219.131)			
– Construction Mud Mat (detailed on ESC drawing) DS-217	Prior to topsoil stripping.		
– Drainage/Interceptor swales (OPSD 219.211)	During pre-grading works.		
– Rock Check Dams (OPSD 219.220)	During pre-grading works.		
– Sediment Trap (illustrated on ESC drawing) (OPSD 219.220)	During pre-grading works.		
– Others as required by Town or CVC.	Prior to topsoil stripping.		
PHASE 2 - Municipal Servicing Construction			
– Grass Vegetation hydroseeding of topsoil & restoration areas	Topsoil and restoration areas to be seeded within 2 weeks after grading is completed.	Consultant to undertake weekly inspections and after each rainfall event, including weekly reporting. Regular maintenance to remove accumulated sediment once 50% of capacity is exceeded and repair ESC measures as required. Dynamic relocation of swales based on construction process	Just prior to final grading or building construction.
– Drainage/Interceptor swales (OPSD 219.211)			
– Storm drain inlet protection (detailed on ESC drawing)			
– Others as required by Town or TRCA	To be assessed as the issue is identified.		
PHASE 3 - Building Construction			
– Maintenance and repairs to all remaining ESC measures as per detailed inspection with Town Inspector.	Prior to building construction, ESC measures to be repaired as per Town deficiency list.	Detailed Inspection of all remaining ESC measures with Town Inspector. Consultant to undertake weekly inspections and after each rainfall event, including weekly reporting. Regular maintenance to remove accumulated sediment once 40% of capacity is exceeded.	Just prior to final topsoil and sodding of lot/block areas.
– Removal of identified Phase 1 or 2 measures			
– CB's to have silt traps until lots sodded			

DISTURBED AREAS TO BE HYDROSEEDED FOLLOWING STAGE I, INCLUDING SCARIFICATION OUTSIDE OF GROWING SEASON.

NOTE:
FOR CONSTRUCTION STAGING PLEASE REFER TO CONSTRUCTION MANAGEMENT REPORT.



STANDARD NOTES:

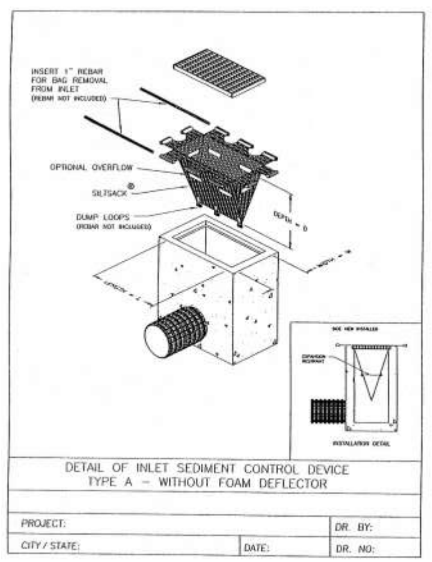
1. "EROSION AND SEDIMENT CONTROL (ESC) MEASURES WILL BE IMPLEMENTED PRIOR TO, AND MAINTAINED DURING THE CONSTRUCTION PHASES, TO PREVENT ENTRY OF SEDIMENT INTO THE WATER. ALL DAMAGED EROSION AND SEDIMENT CONTROL MEASURES SHOULD BE REPAIRED AND/OR REPLACED WITHIN 48 HOURS OF THE INSPECTION."
2. "DISTURBED AREAS WILL BE MINIMIZED TO THE EXTENT POSSIBLE, AND TEMPORARILY OR PERMANENTLY STABILIZED OR RESTORED AS THE WORK PROGRESSES."
3. "ALL IN-WATER AND NEAR WATER WORKS WILL BE CONDUCTED IN THE DRY WITH APPROPRIATE EROSION AND SEDIMENT CONTROLS."
4. "THE EROSION AND SEDIMENT CONTROL STRATEGIES OUTLINED ON THE PLANS ARE NOT STATIC AND MAY NEED TO BE UPGRADED/AMENDED AS SITE CONDITIONS CHANGE TO MINIMIZE SEDIMENT LADEN RUNOFF FROM LEAVING THE WORK AREAS. IF THE PRESCRIBED MEASURES ON THE PLANS ARE NOT EFFECTIVE IN PREVENTING THE RELEASE OF A DELETERIOUS SUBSTANCE, INCLUDING SEDIMENT, THEN ALTERNATIVE MEASURES MUST BE IMPLEMENTED IMMEDIATELY TO MINIMIZE POTENTIAL ECOLOGICAL IMPACTS. CVC ENFORCEMENT OFFICER SHOULD BE IMMEDIATELY CONTACTED. ADDITIONAL ESC MEASURES TO BE KEPT ON SITE AND USED AS NECESSARY."
5. "AN ENVIRONMENTAL MONITOR WILL ATTEND THE SITE TO INSPECT ALL NEW CONTROLS, AS WELL AS ON A REGULAR BASIS, OR FOLLOWING RAIN/SNOWMELT EVENT, TO MONITOR ALL WORKS, AND IN PARTICULAR WORKS RELATED TO EROSION AND SEDIMENT CONTROLS, DEWATERING OR UNWATERING, RESTORATION AND IN- OR NEAR- WATER WORKS. SHOULD CONCERNS ARISE ON SITE THE ENVIRONMENTAL MONITOR WILL CONTACT THE CVC ENFORCEMENT OFFICER AS WELL AS THE PROPONENT.
6. "ALL ACTIVITIES, INCLUDING MAINTENANCE PROCEDURES, WILL BE CONTROLLED TO PREVENT THE ENTRY OR PETROLEUM PRODUCTS, DEBRIS, RUBBLE, CONCRETE OR OTHER DELETERIOUS SUBSTANCES INTO THE WATER. VEHICULAR REFUELING AND MAINTENANCE WILL BE CONDUCTED A MINIMUM OF 30 METRES FROM THE WATER."
7. "ALL GRADES WITHIN THE REGULATORY FLOOD PLAN WILL BE MAINTAINED OR MATCHED.
8. "THE PROPONENT/CONTRACTOR SHALL MONITOR THE WEATHER SEVERAL DAYS IN ADVANCE OF THE ONSET OF THE PROJECT TO ENSURE THAT THE WORKS WILL BE CONDUCTED DURING FAVOURABLE WEATHER CONDITIONS. SHOULD AN UNEXPECTED STORM ARISE, THE CONTRACTOR WILL REMOVE ALL UNFIXED ITEMS FROM THE REGIONAL STORM FLOOD PLAN THAT WOULD HAVE THE POTENTIAL TO CAUSE A SPILL OR AN OBSTRUCTION TO FLOW, E.C., FUEL TANKS, PORTAPOTTIES, MACHINERY, EQUIPMENT, CONSTRUCTION MATERIALS, ETC."
9. "ALL DEWATERING/UNWATERING SHALL BE TREATED AND RELEASED TO THE ENVIRONMENT AT LEAST 30 METRES FROM A WATERCOURSE OR WETLAND AND ALLOWED TO DRAIN THROUGH A WELL-VEGETATED AREA. NO DEWATERING EFFLUENT SHALL BE SENT DIRECTLY TO ANY WATERCOURSE, WETLAND OR FOREST, OR ALLOWED TO DRAIN ONTO DISTURBED SOLS VWTHN THE WORK AREA. THESE CONTROL MEASURES SHALL BE MONITORED FOR EFFECTIVENESS AND MAINTAINED OR REVISED TO MEET THE OBJECTIVE OF PREVENTING THE RELEASE OF SEDIMENT LADEN WATER."
10. ALL ACCESS TO THE WORK SITE SHALL BE McMASTER STREET.

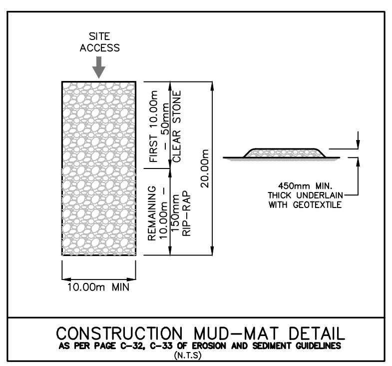
NOTES:

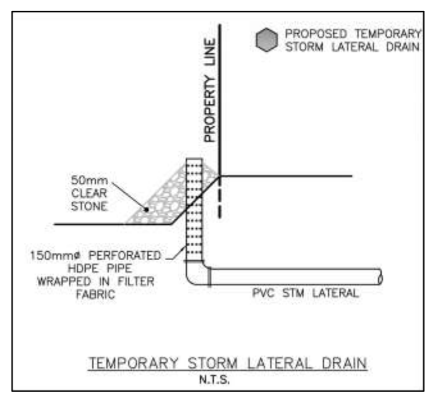
1. SILTATION CONTROL FENCING, CONSTRUCTION MUD-MAT AND ROCK CHECK DAMS TO BE INSTALLED PRIOR TO ANY CONSTRUCTION ON SITE.
2. THE REGULAR INSPECTIONS SHOULD BE OCCURRING DURING ALL CONSTRUCTION STAGES. INSPECTION OF ALL SILTATION AND EROSION CONTROL DEVICES IS REQUIRED DURING EARTHWORKS, UNDERGROUND SERVICING, ROAD CONSTRUCTION AND BUILDING. COPY OF INSPECTION REPORT SHOULD BE SUBMITTED TO THE CITY GRADING & MUNICIPAL INSPECTION SECTION OF THE ENGINEERING DEPARTMENT.
   - 2.1. WEEKLY. AFTER EVERY RAINFALL EVENT.
   - 2.2. AFTER SIGNIFICANT SNOWMELT EVENT.
   - 2.3. DAILY DURING EXTENDED RAIN OR SNOWMELT EVENT.
3. ALL REPAIRS TO BE COMPLETED WITHIN 48 HOURS OF NOTIFICATION BY BUILDER/CONTRACTOR.
4. VEHICLE TRACKING CONTROL/MUD MATS MUST BE MADE TO PREVENT THE TRANSPORT OF SEDIMENT ONTO THE PAVED SURFACE.
   - 4.1. THE PAD SHOULD BE AS PER EROSION AND SEDIMENT CONTROL GUIDELINES (DECEMBER 2006).
   - 4.2. THE GRANULAR MATERIAL WILL REQUIRE PERIODIC REPLACEMENT.
5. INTERCEPTOR SWALES TO BE CONSTRUCTED AS PER LAYOUT ON THIS DRAWING. SWALES SHOULD BE COMPACTED AND CONSTRUCTED WITH MAX. 2:1 SIDE SLOPES. RIP-RAP STABILIZATION REQUIRED AT THE OUTLET.
6. EROSION CONTROL MATS TO BE APPLIED TO CONVEYANCE SWALE AND DITCHES.
7. ALL FILL MATERIAL TO BE CLEAN AND FREE OF TRASH, RUBBISH, GLASS, LIQUID OR TOXIC CHEMICALS OR GARBAGE MATERIALS.

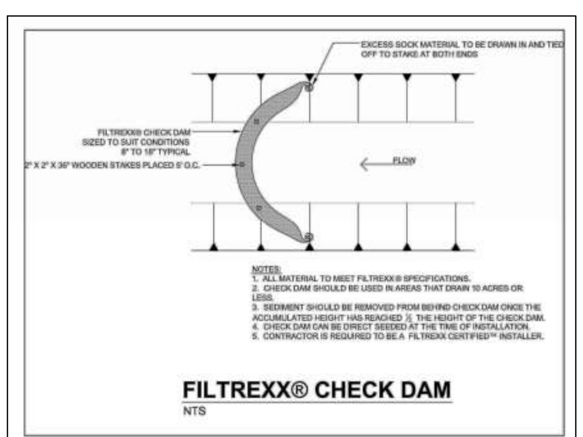
NOTES:

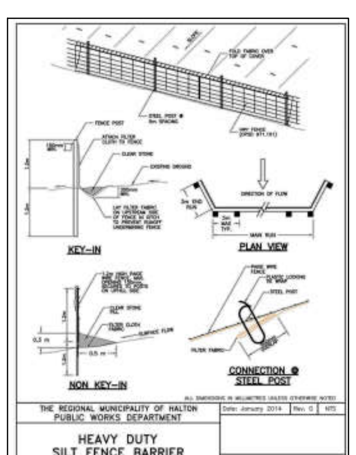
1. THE ESC STRATEGIES OUTLINED ON THE PLANS ARE NOT STATIC AND MAY NEED TO BE UPGRADED/AMENDED AS SITE CONDITIONS CHANGE TO PREVENT SEDIMENT RELEASES TO THE NATURAL ENVIRONMENT. THE CVC ENFORCEMENT OFFICE WILL BE CONTACTED IMMEDIATELY SHOULD THE EROSION AND SEDIMENT CONTROL PLANS CHANCE FROM THE APPROVED PLANS. FAILED ESC MEASURES WILL BE REPAIRED IMMEDIATELY.
2. ALL ACTIVITIES, INCLUDING MAINTENANCE PROCEDURES, WILL BE CONTROLLED TO PREVENT THE ENTRY OF PETROLEUM PRODUCTS, DEBRIS, RUBBLE, CONCRETE OR OTHER DELETERIOUS SUBSTANCES INTO THE WATER. VEHICULAR REFUELING AND MAINTENANCE WILL BE CONDUCTED 30 MATERS FROM THE WATER.

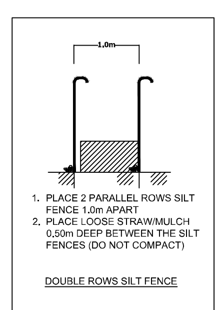


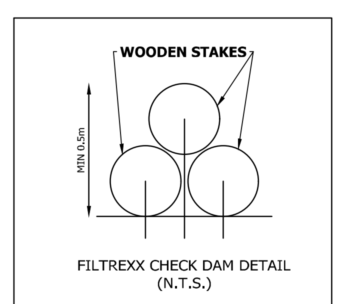


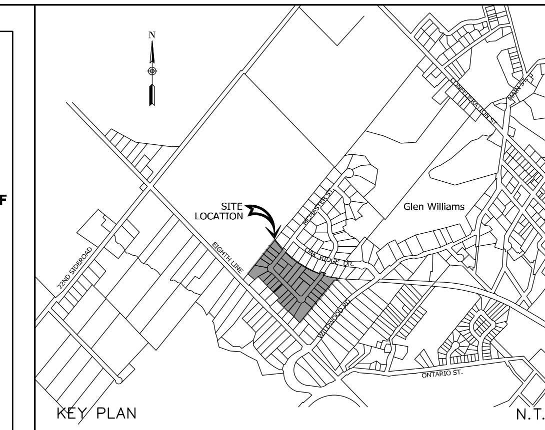












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TOWN OF HALTON HILLS
REGIONAL MUNICIPALITY OF HALTON

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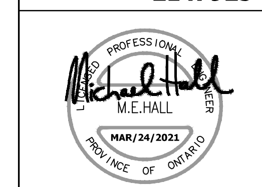

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FIGURE 11 - CONCEPTUAL EROSION AND SEDIMENT CONTROL DETAILS

DESIGNED BY: M.E.H.	DATE: MARCH 2021	CHECKED BY: M.E.H.
DRAWN BY: A.G./V.B./G.M.	DRAWING NO. 09-015-18	CITY FILE:
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