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1104 Halton Terrace

Site Servicing and Stormwater Management Report

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MAPLE LEAF HOMES

1104 HALTON TERRACE

SITE SERVICING AND STORMWATER MANAGEMENT REPORT

Prepared for:

Maple Leaf Homes

Prepared By:

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Issued: October 19, 2021

Novatech File: 119024
Report Ref: R-2021-114

October 19, 2021

City of Ottawa
Planning, Infrastructure and Economic Development Department
Planning Services Branch
110 Laurier Ave. West, 4th Floor
Ottawa, Ontario
K1P 1J1

Attention: **Laurel McCreight, Planner**

Reference: **1104 Halton Terrace**
Site Servicing and Stormwater Management Report
Novatech File No.: 119024

Novatech has prepared this Site Servicing and Stormwater Management Report on behalf of Maple Leaf Homes for 1104 Halton Terrace.

The report outlines the detailed sanitary, water, and storm servicing / stormwater management for the proposed site plan.

Should you have any questions or comments, please do not hesitate to contact us.

Sincerely,

NOVATECH

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Project Coordinator

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1.0 INTRODUCTION

Novatech has been retained by Maple Leaf Homes to prepare a Site Servicing and Stormwater Management Report for 1104 Halton Terrace in North Kanata, Ottawa.

This report outlines the servicing and proposed storm drainage and stormwater management strategy for the site.

1.1 Background

The proposed development is located within the Kanata North Community west of the intersection of Halton Terrace and Old Carp Road. The development is approximately 0.72ha and is bounded by Halton Terrace to the south and east, Old Carp Road to the north, and existing residential to the west. Refer to **Figure 1** – Site Location and **Figure 2** – Site Plan.

Figure 1 – Site Location

The proposed development will consist of one 4-storey apartment building with underground parking consisting of 86 units. The proposed site plan is shown in **Figure 2**.

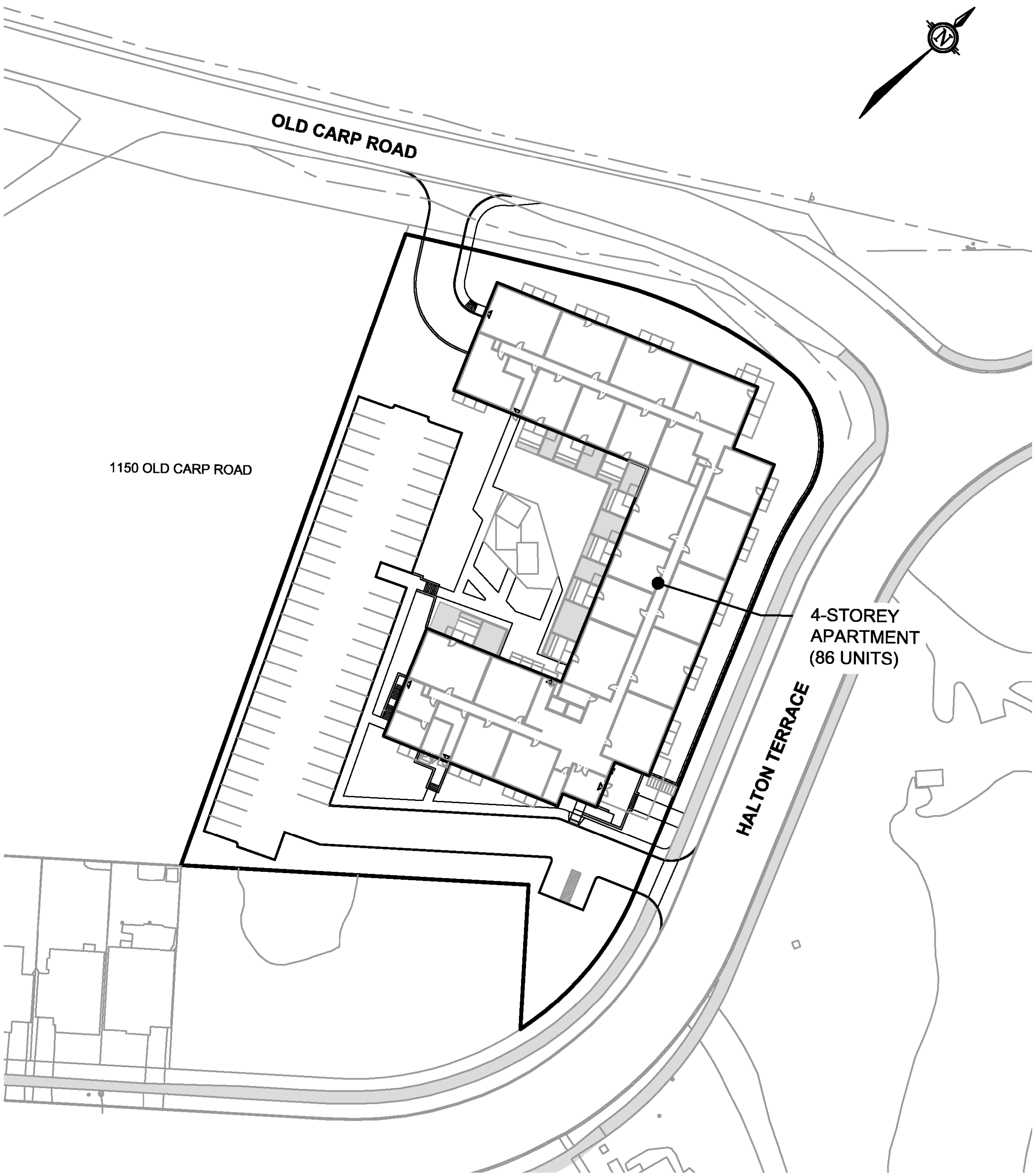

Figure 2 Site Plan

1.2 Additional Reports

This report provides information on the considerations and approach by which Novatech has designed and evaluated the proposed servicing for the Maple Leaf Homes Lands. This report should be read in conjunction with the following:

- *Geotechnical Investigation, Proposed Development, 1104 & 1150 Halton Terrace, completed by Paterson, Report: PG4872-1, dated May 3, 2019.*
- *Master Servicing Study Update for Morgan's Grant Subdivision, completed by J.L. Richards & Associates Limited, Ref. JLR 17730 dated September 2003.*

2.0 EXISTING CONDITIONS

2.1 Topography & Drainage

The proposed site is currently undeveloped and consists of agricultural lands with scattered mature trees. Access to the site is currently provided off Old Carp Road via a private gravel entrance.

The site generaly slopes northerly towards an existing ditch line within the Halton Terrace and Old Carp Road rights-of-way. The existing ditch is routed through a 500mm diameter culvert crossing Old Carp Road.

2.2 Subsurface Conditions

Paterson completed a geotechnical investigation in support of the development, consisting of 1104 Halton Terrace and 1150 Old Carp Road properties.

The principal findings of the geotechnical investigation are as follows:

- The existing soil profile consists of having a layer of topsoil ranging from 0.05m to 0.35m thick. Silty sand to clayey silt was generally encountered underlying the topsoil ranging from 0.6 to 0.9m thick. Glacial till consisting of light brown clayey silt with some sand, gravel, cobbles, and boulders was encountered underlying the silty sand to clayey silt layer ranging from 0.15m to 0.65m thick.
- Practical refusal was encountered at all test hole locations ranging from 0.45m to 2.15m below grade.
- Based on field observations, groundwater level is expected to be within the bedrock. Besides spring melt being encountered at TP 1-19 and TP 5-19, there was no groundwater encountered at all remaining test pits upon completion of excavation.

The report provides engineering guidelines based on Paterson's interpretation of the borehole information and project requirements. Refer to the above-noted report for complete details.

3.0 SANITARY SERVICING

3.1 Existing Conditions

Currently, there is an existing 250mm sanitary sewer along Halton Terrace with an existing manhole adjacent to the proposed site. Flows from the site will be routed through the Morgan's Grant Subdivision sanitary sewers, which eventually outlets into the East March Trunk sewer.

3.2 Proposed Sanitary Sewer Outlet

A 200mm sanitary sewer service will be installed connecting into the existing 250mm sanitary sewer network in Halton Terrace. The proposed outlet is consistent with the approved Morgan's Grant Master Servicing Study Update (J.L. Richards). The proposed sanitary layout can be seen on **Figure 3** below.

3.3 Design Criteria

Sanitary sewers, for the proposed development, are designed based on criteria established by the City of Ottawa in the following documents:

- Section 4.0 of the City of Ottawa Sewer Design Guidelines (October 2012).
- Technical Bulletin ISTB-2018-01 from the City of Ottawa regarding new sanitary design parameters. Design parameters from this technical bulletin will supersede values within the Sewer Design Guidelines (2012).

The resulting design parameters are summarized as follows:

Population Flow = 280 L/capita/day
Infiltration = 0.33 L/s/ha
Apartment = 1.8 persons per unit
Maximum Residential Peak Factor = 4.0
Harmon Correction Factor = 0.8
Minimum velocity = 0.6m/s
Manning's n = 0.013

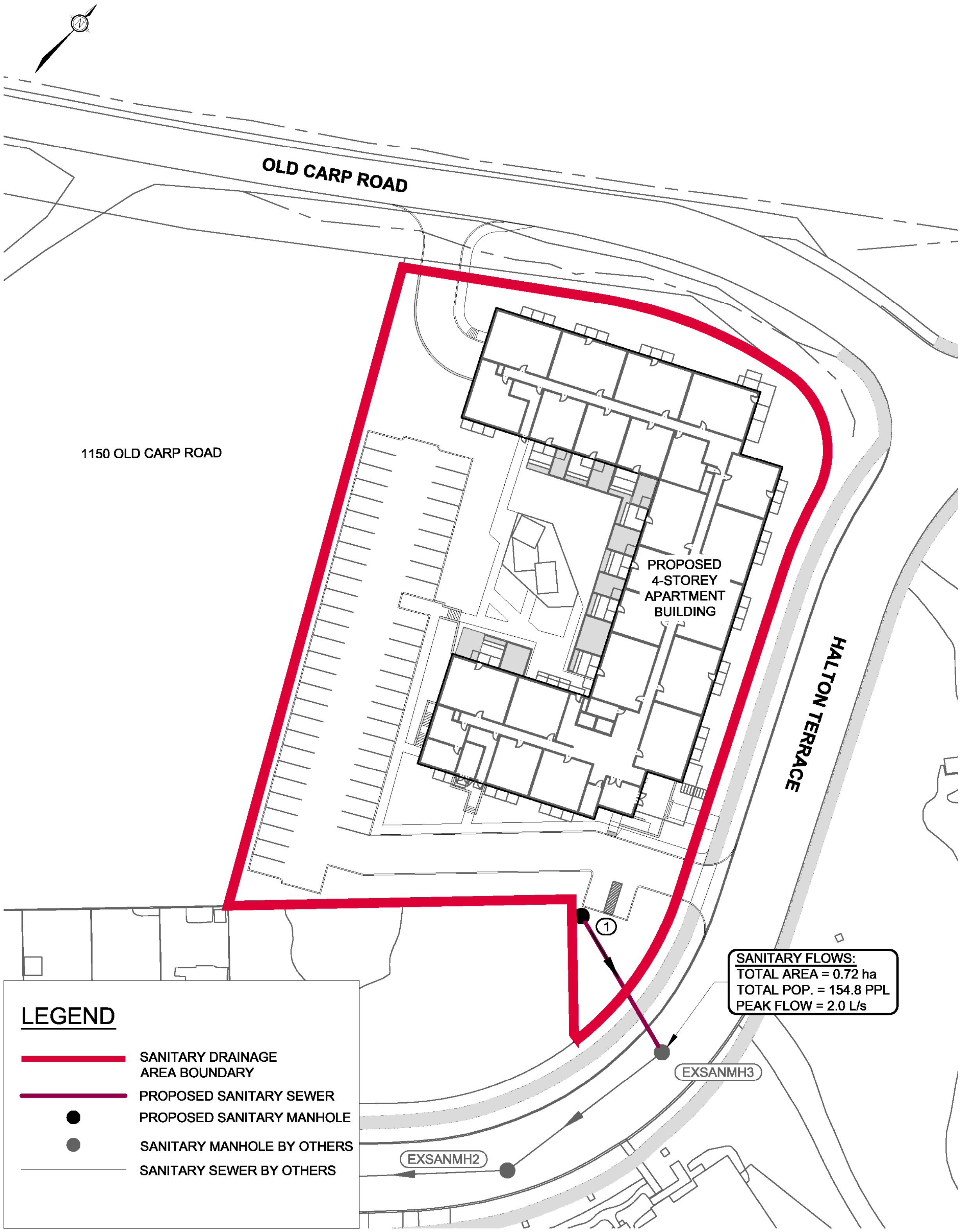

Figure 3 Proposed Sanitary System

3.4 Proposed Sanitary Sewer System

The calculated peak sanitary design flow for the development is 2.0 L/s. The total flow being directing to the 250mm sanitary sewer network in Halton Terrace, consisting of the proposed site and existing single-family homes is 2.5 L/s. The Morgan's Grant Master Servicing Study Update accounted for a total flow of 5.6 L/s through the existing 250mm sanitary sewers, exceeding the current calculated peak design flow of 2.5 L/s. For detailed calculations refer to the Sanitary Sewer Design Sheet located in **Appendix B**.

The USF is at an elevation of 80.97m and is too low to provide a gravity connection for the underground parking floor drains (residential units will have a gravity connection). A pump will be required to connect the underground parking floor drains to the 200mm diameter sanitary service.

The downstream sanitary sewers within Halton Terrace have adequate capacity to accommodate the proposed development as shown in the sanitary design sheet provided in **Appendix B**.

4.0 WATERMAIN

4.1 Existing Conditions

The proposed development is located inside the EMR Pressure Zone. An existing 300mm watermain is located along Halton Terrace.

4.2 Proposed Watermain System

A 150mm water service will be installed connecting to the existing 300mm watermain in Halton Terrace. **Figure 4** highlights the proposed works and connection points for the proposed water service and hydrants. All existing watermain boundary conditions were provided by the City of Ottawa and are included in **Appendix C**.

4.3 Design Criteria

A fire flow demand of 333 L/s has been calculated as per the Fire Underwriter's Survey (FUS) and calculations are included in **Appendix C**. Watermain analysis was completed based on the following criteria:

<u>Demands:</u>

- Apartment Density 1.8 persons/unit
- Average Daily Demand 280 L/capita/day
- Max. Daily Demand 2.5 x Average Daily Demand
- Peak Hour Demand 2.2 x Maximum Daily Demand
- Fire Flow Demand Fire Underwriters Survey

<u>System Requirements:</u>

- Max. Pressure (Unoccupied Areas) 690 kPa (100 psi)
- Max. Pressure (Occupied Areas) 552 kPa (80 psi)
- Min. Pressure 276 kPa (40 psi) excluding fire flows
- Min. Pressure (Fire) 138 kPa (20 psi) including fire flows
- Max. Age (Quality) 192 hours (onsite)

<u>Friction Factors:</u>

- Watermain Size C-Factor
- 150mm 100
- 300mm 120

Hydraulic modeling of the Subject Site was completed using EPANET 2.0. EPANET is public domain software capable of modeling municipal water distribution systems by performing simulations of the water movement within a pressurized system. EPANET uses the Hazen-Williams equation to analyze the performance of the proposed watermain and considered the following input parameters: water demand, pipe length, pipe diameter, pipe roughness, and pipe elevation.

4.4 Hydraulic Analysis

A summary of the model results are shown below in **Table 4.1**, **Table 4.2** and **Table 4.3**. Full model results are included in **Appendix C**. Refer to **Figure 4** below for details about the node and pipe network.

Table 4.1: Summary of Hydraulic Model Results - Maximum Day + Fire Flow

Operating Condition	Minimum Pressure
333 L/s	272.33 kPa (B1)

Table 4.2: Summary of Hydraulic Model Results - Peak Hour Demand

Operating Condition	Maximum Pressure	Minimum Pressure
2.759 L/s through system	460.00 kPa (EXHYD2)	387.99 kPa (EXHYD1)

The hydraulic modeling summarized above highlights the maximum and minimum system pressures during Peak Hour conditions, and the minimum system pressures during the Maximum Day + Fire condition. Since the Maximum Day + Fire Flow pressures are above the minimum 140 kPa, and the Peak Hour Pressures onsite fall within the normal operating pressure range (345 kPa to 552 kPa) the proposed development can be adequately serviced.

Table 4.3: Summary of Hydraulic Model Results – Maximum Pressure Check

Operating Condition	Maximum Pressure	Minimum Pressure	Maximum Age
0.502 L/s through system	463.33 kPa (HYD3)	424.28 kPa (EXHYD1)	16.84 Hours (HYD2)

The average day pressures throughout the system are below 552 kPa, therefore pressure reducing valves are not required.

Water retention was analyzed at each node during average day demand. The maximum age throughout the system is within City standards.

A copy of the boundary conditions provided by the City of Ottawa, fire flow calculations, and detailed hydraulic analysis results are included in **Appendix C**.

There are no deviations from the City of Ottawa Design Guidelines – Water Distribution (2010).

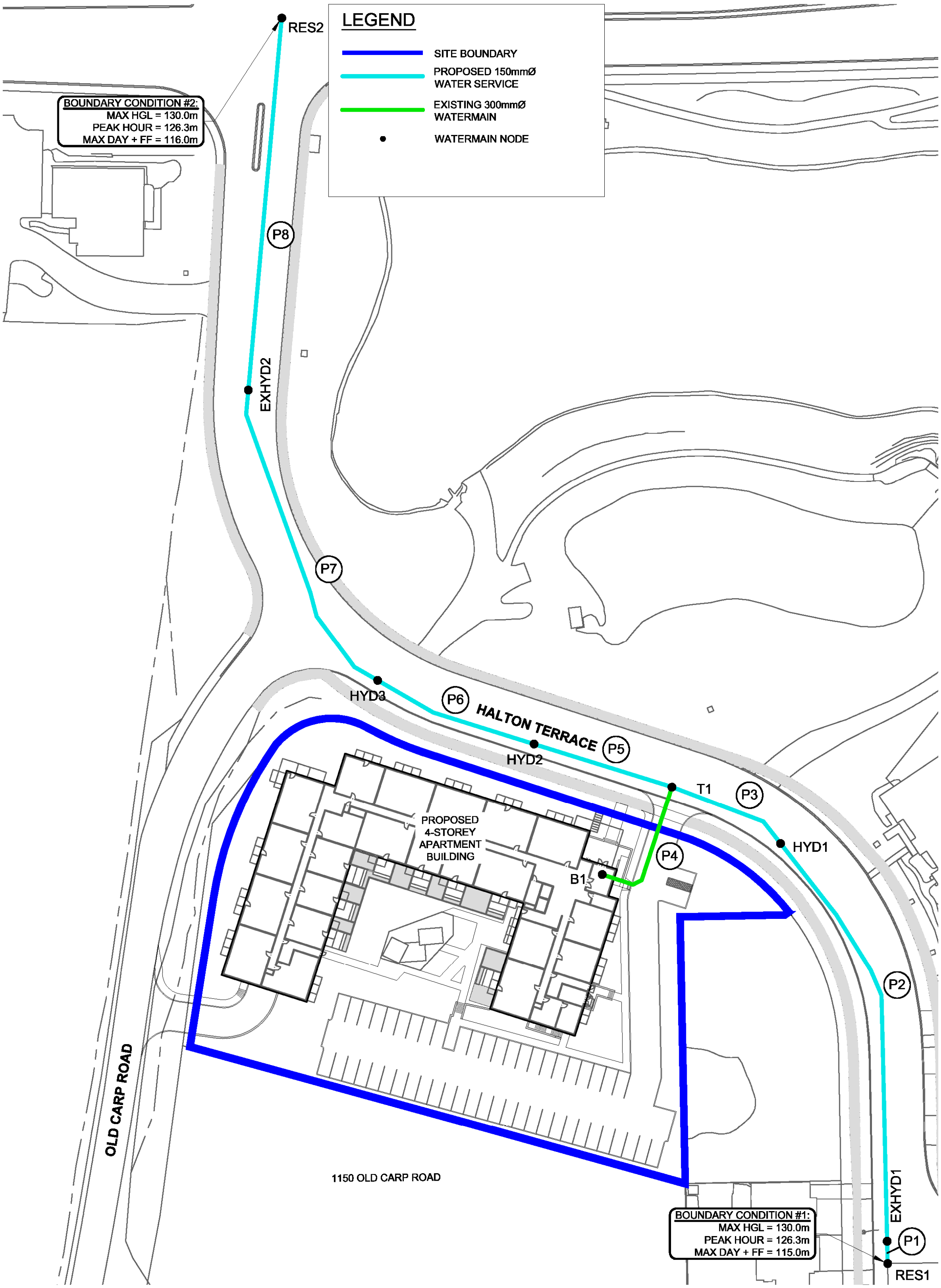

Figure 4 Proposed Watermain Network

5.0 STORM SEWER SYSTEM AND STORMWATER MANAGEMENT

5.1 Stormwater Management Criteria

The following stormwater management criteria for the proposed development was prepared in accordance with the City of Ottawa Sewer Design Guidelines (October 2012) and the Master Servicing Study Update for Morgan's Grant Subdivision (J.L. Richards, September 2003).

- Provide a dual drainage system (i.e. minor and major system flows);
- Maximize the use of surface storage available on site;
- Control runoff to the allowable release rate specified in **Section 5.1.1** using on-site storage;
- Ensure that no surface ponding will occur on the paved surfaces (i.e. private drive aisles or parking areas) during the 2-year storm event; and,
- Ensure that ponding is confined within the parking areas at a maximum depth of 0.35m for both static ponding and dynamic flow.

5.1.1 Allowable Release Rate

The allowable release rate was established based on the restricted minor system flow of 70 L/s/ha (50.4 L/s) for all storms up-to and including the 100-year storm event.

5.2 Existing and Proposed Storm Infrastructure

Existing Conditions

Under existing conditions, storm runoff from the site generally flows northly to an existing ditch within the Halton Terrace and Old Carp Road rights-of-way. The existing ditch is routed through a 500mm diameter culvert crossing Old Carp Road, ultimately outletting to Shirley's Brook.

There are existing 375mm and 1500mm diameter storm sewers on Halton Terrace, outletting to the adjacent Morgan's Grant SWMF.

Proposed Conditions

The majority of runoff from the site will be routed to the 1500mm diameter storm sewer located at the main entrance on Halton Terrace. A small section of landscaped areas along Old Carp Road and Halton Terrace will be routed to the 375mm diameter storm sewer in Halton Terrace. Both storm sewers within Halton Terrace are directed to Morgan's Grant SWMF which provides water quality control. As such, on-site stormwater quality controls are not required. Refer to **Figure 5** for the storm servicing layout.

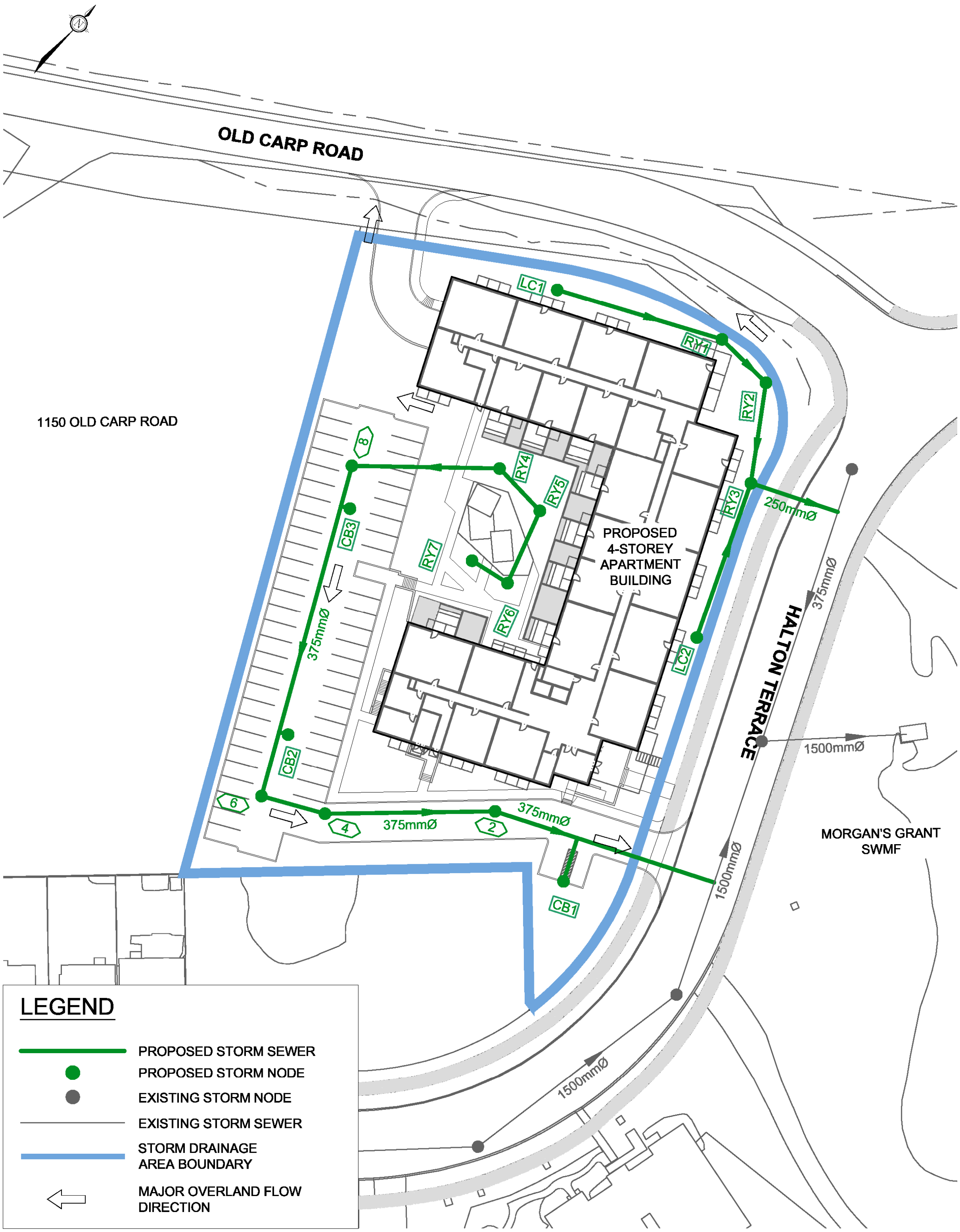

Figure 5 Proposed Storm System

5.2.1 Minor System (Storm Sewers)

Storm servicing has been provided using a dual-drainage system. Runoff from frequent events will be conveyed by the proposed storm sewers (minor system), while flows from large storm events that exceed the capacity of the minor system will be stored underground using Stormtech SC-740 arch-type chambers, on the surface in road sags, and/or conveyed overland along defined overland flow routes (major system).

Storm Sewer Design Criteria

The following is the storm sewer design criteria [Ottawa Sewer Design Guidelines (Oct. 2012)]:

- Rational Method (Q) = 2.78CIA, where
    - Q = peak flow (L/s)
    - C = runoff coefficient
        - C = (0.70 * %Imp.) + 0.20
    - I = rainfall intensity for a 2-year return period (mm/hr)
        - $I_{2yr} = 732.951 / [(Tc(min) + 6.199)]^{0.810}$
    - A = site area (ha)
- Minimum Pipe Size = 250 mm; Minimum / Maximum Full Flow Velocity = 0.8 m/s / 3.0 m/s

The on-site storm sewers are sized to convey peak flows corresponding to a 2-year return period storm event based on the Rational Method. Refer to the storm sewer design sheets provided in **Appendix D**.

Underground Storage

Underground storage will be required to attenuate runoff from the site. Underground storage will be provided using Stormtech SC-740 arch-type chambers (or approved equivalent), which are covered in 50mm dia. (D_{50}) clearstone. A total of 36 storage chambers will provide 92.6 m^3 of storage. Refer to **Appendix D** for further details. The proposed layout of underground storage chambers is shown on the General Plan of Services (drawing 119024-GP).

Inlet Control Devices

Inlet control devices (ICDs) are to be installed within the selected catchbasins and rear-yard catchbasins. The ICDs have been sized to control minor system peak flows to the Halton Terrace storm sewer to the allowable release rate and to ensure that no ponding occurs during the 2-year storm event.

Hydraulic Grade Line

The storm sewers for the proposed site have been designed to ensure the hydraulic grade line (HGL) for a 100-year storm event will provide a minimum 0.30 m clearance from the underside of footing (USF) elevation.

5.2.2 Major System Design

The site has been designed to convey private roadway and parking area runoff from storms that exceed the minor system capacity to Halton Terrace through the private entrance. The landscaped areas adjacent Halton Terrace and Old Carp Road have been designed to convey runoff that exceed the minor system capacity to the existing ditch along Old Carp Road. A third major overland flow route is provided for the shared amenity area, which is directed adjacent the underground parking ramp and outlets to the existing ditch along Old Carp Road. The site has been graded to ensure the 100-year peak overland flows are confined within the parking and landscaped areas.

Approximately 0.038 ha of land flows uncontrolled to either Halton Terrace or the existing ditch along Old Carp Road and accounts for the only flows being directed off-site. These flows are included as part of the minor system release rate.

Surface/Underground Storage

The stage-storage curves for each inlet were calculated based on the proposed Grading Plan (drawing 119024-GR) and the proposed underground storage chamber locations. The total storage shown in the stage-storage curves at each inlet is provided in **Appendix D**. Approximately 92.6 m^3 of underground storage and 169.5 m^3 of surface storage is available on-site.

The total storage provided underground and on the surface is as follows:

Table 5.1: Total Available Storage

Structure ID	Number of Chambers	Underground Storage (m^3)	Surface Storage (m^3)	Total Storage (m^3)
		Provided	Provided	Provided
CB01*	6	18.3	3.0	21.3
TOTAL	**6**	**18.3**	**3.0**	**21.3**
CB02*	3	8.5	39.8	48.3
TOTAL	**3**	**8.5**	**39.8**	**48.3**
CB03*	27	65.8	58.7	124.5
TOTAL	**27**	**65.8**	**58.7**	**124.5**
RY04	-	-	17.0	17.0
RY05	-	-	17.0	17.0
RY06	-	-	17.0	17.0
RY07	-	-	17.0	17.0
TOTAL	**-**	**-**	**68.0**	**68.0**
TOTAL OVERALL	**36**	**92.6**	**169.5**	**262.1**

*Structure with ICD.

5.3 Hydrologic & Hydraulic Modeling

The City of Ottawa Sewer Design Guidelines (October 2012) require hydrologic modeling for all dual drainage systems. The performance of the proposed storm drainage system for 1104 Halton Terrace was evaluated using the PCSWMM hydrologic/hydraulic modeling software.

Design Storms

The PCSWMM model includes the following design storms based on the City of Ottawa IDF data presented in the City of Ottawa Sewer Design Guidelines (October 2012):

- 3-hour Chicago Storm Distribution (10-minute time step)
- 12-hour SCS Storm Distribution (30-minute time step)

The 3-hour Chicago storm distribution includes the 2-year, 5-year, 100-year, and 100-year (+20%) return periods while the 12-hour SCS storm distribution includes only the 100-year return period.

The 3-hour Chicago storm distribution was determined to be the critical design storm for the proposed development.

PCSWMM Model Schematics, Output Data and Modeling Files

PCSWMM model schematics and output data for the 100-year 3-hour Chicago storm distribution are provided in **Appendix D**.

Table 5.2 provides a summary of the hydrologic modeling parameters (subcatchments).

Table 5.2: Hydrologic Modeling Parameters (subcatchments)

Area ID	Catchment Area (ha)	Runoff Coefficient (%)	Percent Imperviousness (%)	Zero Imperviousness (%)	Equivalent Width (m)	Average Slope (%)
Controlled Areas						
A-01	0.086	0.77	81.4	0	43	1.5
A-02	0.105	0.52	45.7	0	53	2.5
A-03	0.068	0.82	88.2	0	45	1.5
A-04	0.115	0.53	47.8	0	58	1.5
A-05	0.013	0.20	0	0	26	1.5
A-06	0.014	0.20	0	0	28	1.5
A-07	0.016	0.20	0	0	32	1.5
A-08	0.022	0.20	0	0	44	1.5
A-09	0.017	0.78	82.4	0	11	6.5
A-10	0.220	0.90	100	95	63	1.5
Uncontrolled Areas						
B-01	0.006	0.32	16.7	0	10	6
B-02	0.006	0.20	0	0	12	33.33
B-03	0.026	0.20	0	0	10	2.7
Subdivision	**0.715**	**0.66**	**65.7**	**-**	**-**	**-**

Subcatchment Areas / Runoff Coefficients

- The proposed site has been divided into subcatchments based on the tributary drainage areas to each inlet of the proposed storm sewer system, as shown on the Storm Drainage Area Plan (Drawing 119024-STM).
- Weighted runoff coefficients were assigned based on the percent impervious values used in the PCSWMM model. As per the City of Ottawa Sewer Design Guidelines (October 2012), the runoff coefficient is based on the following equation:

$$C = (\% \text{ Imp.} * 0.7) - 0.2$$

Infiltration

Infiltration losses for all catchment areas were modeled using Horton's infiltration equation, which defines the infiltration capacity of the soil over the duration of a precipitation event using a decay function that ranges from an initial maximum infiltration rate to a minimum rate as the storm progresses. The default values for the Sewer Design Guidelines were used for all catchments.

Horton's Equation:
$f(t) = f_c + (f_o - f_c)e^{-k(t)}$

Initial infiltration rate: $f_o = 76.2$ mm/hr
Final infiltration rate: $f_c = 13.2$ mm/hr
Decay Coefficient: $k = 4.14$/hr

Depression Storage

- The default values for depression storage (1.57 mm impervious / 4.67 mm pervious) have been applied to all catchments.

Subarea Routing

- Subarea routing for all subcatchments has been set to 'direct to outlet'.

Equivalent Width

- The equivalent width parameter for all subcatchments is based on the measured flow length.

Minor System Conduits (Bend / Exit Losses)

- The minor system network was created in Civil3D and imported into PCSWMM.
- The following exit losses have been inputted into the model. They represent the loss coefficient based on the bend angle, as per the Appendix 6-B in the City of Ottawa Sewer Design Guidelines (October 2012).

Bend Angle	Loss Coefficient
0	0.00
15	0.09
30	0.21
45	0.39
60	0.64
75	0.96
90	1.32

Downstream Boundary Condition (Minor System)

- The storm sewer outlets for the proposed development are the existing 375mm and 1500mm diameter storm sewers in Halton Terrace.
- The Master Servicing Study Update for Morgan's Grant Subdivision estimated a 100-year HGL elevation of 82.32m at MH104 (See **Appendix D** for MSS excerpts).

5.3.1 PCSWMM Model Results

Inlet Control Devices (ICDs)

ICDs are provided for catchbasins within the roadway and catchbasin in the landscaped areas. The ICD sizes and design flows are provided in **Table 5.3**. The ICDs have been sized to maximize surface storage, limit the outlet peak flows to the allowable release rate and not have surface ponding during a 2-year storm event.

Table 5.3: Inlet Control Devices and Design Flows

Structure ID	ICD Size & Inlet Rate						
	ICD Type	T/G (m)	Orifice Invert (m)	100-year Head on Orifice (m)	2-year Orifice Peak Flow* (L/s)	5-year Orifice Peak Flow* (L/s)	100-year Orifice Peak Flow* (L/s)
CB01	Tempest MHF (81mm)	83.20	81.50	1.11	7.1	8.6	13.7
CB02	Tempest LMF (Vortex 70)	84.95	83.25	1.99	4.0	5.7	6.0
CB03	Tempest LMF (Vortex 70)	85.05	83.35	2.01	3.6	5.8	6.1
RY03	Tempest LMF (Vortex 74)	83.13	81.54	1.67	0.2	4.3	6.1
RY04	Tempest LMF (Vortex 79)	83.65	82.31	1.50	5.9	6.4	6.7

**From PCSWMM model, 3-hour Chicago storm distribution.*

Both IPEX Tempest LMF (i.e. Vortex ICD's) and MHF ICDs are proposed for the site. Sizing documentation and correspondence is provided in **Appendix D**.

Overland Flow (Major System)

The major system network was evaluated using the PCSWMM model to ensure that the ponding depths conform to the City of Ottawa Sewer Design Guidelines (Oct. 2012). A summary of ponding depths at each inlet for the 2-year, 5-year, 100-year and 100-year (+20%) events are provided in **Appendix D**. The maximum static and dynamic ponding depths are less than 0.35m during all events up to and including the 100-year, thereby meeting the major system criteria. In addition, there is no cascading flow over the highpoints during the 100-year storm event.

Table 5.4: Overland Flow Results

Structure	T/G	Max. Static Ponding		100-yr Event			
	(m)	Elev. (m)	Spill Depth (m)	Elev. (m)	Depth (m)	Cascading Flow?	Cascade Depth (m)
CB01	83.32	83.45	0.13	83.43	0.11	N	0.00
CB02	84.95	85.25	0.30	85.24	0.29	N	0.00
CB03	85.05	85.35	0.30	85.36	0.31	Y	0.01
LC01	83.13	83.28	0.15	83.21	0.08	N	0.00
LC02	83.13	83.43	0.30	83.21	0.08	N	0.00
RY02	83.13	83.28	0.15	83.21	0.08	N	0.00
RY03	83.13	83.30	0.17	83.21	0.08	N	0.00
RY04	83.65	83.95	0.30	83.81	0.16	N	0.00

Structure	T/G (m)	Max. Static Ponding		100-yr Event			
		Elev. (m)	Spill Depth (m)	Elev. (m)	Depth (m)	Cascading Flow?	Cascade Depth (m)
RY05	83.65	83.95	0.30	83.81	0.16	N	0.00
RY06	83.65	83.95	0.30	83.81	0.16	N	0.00
RY07	83.60	83.95	0.35	83.81	0.21	N	0.00

**From PCSWMM model, 3-hour Chicago storm distribution.*

An expanded table of the ponding depths at low points in the roadway (including the stress-test event) is provided in **Appendix D**. Based on these results, the proposed storm drainage system will not experience any adverse flooding even with a 20% increase to the 100-year event.

Hydraulic Grade Line

Table 5.5 provides a summary of the 100-year HGL elevations at each storm manhole. The results of this analysis were used to determine if a minimum freeboard of 0.30m is provided between the 100-year HGL and the designed underside of footing (USF) elevation to ensure a gravity connection from the foundation drain to the storm sewer system is possible.

Table 5.5: 100-year HGL Elevations

Manhole ID	MH Invert Elevation (m)	T/G Elevation (m)	HGL Elevation (100yr) (m)	Design USF (m)
MH02	81.26	84.12	82.34	80.97
MH04	81.38	85.25	82.34	-
MH06	81.42	85.28	82.34	-
MH08	81.69	85.11	82.35	-

**From PCSWMM model, 3-hour Chicago storm distribution.*

As shown above in **Table 5.5**, the USF is at an elevation of 80.97m and is too low to provide a gravity connection for the foundation drain to the proposed storm sewer system. A sump pump is proposed to connect to a 200mm diameter storm service that provides a free-flow outlet from the foundation drain. The invert of the service connection is set at 82.64m and provides a freeboard of 0.30m; meeting the minimum requirement.

A storage tank and pump (by others) will also be required for the underground parking ramp trench drain (TD1). The pump is proposed to discharge flows from the underground parking ramp to surface within the shared outdoor amenity area and captured by RY4.

Comparison of Peak Flows

Table 5.6 provides a comparison of the minor system flows from the proposed development to Klondike Road and major system flows / direct flows to Shirley's Brook.

Table 5.6: Comparison of Peak Flows

Design Event	Allowable Release Rate (L/s)	Controlled Minor System Release Rate (L/s)	Uncontrolled Minor System Release Rate (L/s)	Total Minor System Release Rate (L/s)	Major System Release Rate Off-site (L/s)
2-yr	50.4	19.9	0.5	20.4	0
5-yr		30.5	3.4	33.9	0
100-yr		38.5	11.4	**49.9**	0
100-yr (+20%)	-	39.4	15.7	55.1	70.0

(1) PCSWMM model results for the 3-hour Chicago storm distribution.

The 100-year minor system peak flow to Halton Terrace is controlled to just under the allowable release rate of 50.4 L/s for the proposed site. The total 100-year major system peak flow is contained on-site through a combination of underground and surface storage.

Roof Downspout Outlet

The model has accounted for the building roof drain to discharge to surface within the rear parking area and captured by CB3. The 65.8 m^3 of underground storage (27 SC-740 chambers) at this location ensures the major system flow from the 100-year storm event in contained on site.

6.0 ROADWAYS

6.1 Proposed Road Infrastructure

Paterson has prepared a Geotechnical Investigation report for the Development (May 2019) that provides recommendations for roadway structure, servicing and foundations. The site consists of a private roadway and at-grade parking; the recommended roadway structure is as follows:

Table 6.1: Roadway Structure

Roadway Material Description	Pavement Structure Layer Thickness (mm)
	Private Road
Asphalt Wear Course: Superpave 12.5 (Class B)	40
Asphalt Binder Course: Superpave 19.0 (Class B)	50
Base: Granular A	150
Sub-Base: Granular B – Type II	400
Total	**640**

7.0 EROSION AND SEDIMENT CONTROL

Erosion and sediment control measures will be implemented during construction in accordance with the “Guidelines on Erosion and Sediment Control for Urban Construction Sites” (Government of Ontario, May 1987). An Erosion and Sediment Control Plan will be prepared as part of the detailed design.

Typical erosion and sediment control measures recommended include, but are not limited to, the use of silt fences around perimeter of site (OPSD 219.110), catch basin inserts under catch basin/maintenance hole lids, heavy duty silt fence barrier (OPSD 219.130), straw bale check dams (OPSD 219.180), rock check dams (219.210 or OPSD 219.211), riprap (OPSS 511), mud mats, silt bags for dewatering operations, topsoil and sod to disturbed areas and natural grassed waterways. Dewatering and sediment control techniques will be developed for the individual situations based on the above guidelines and utilizing typical measures to ensure erosion and sediment control is controlled in an acceptable manner and there is no negative impact to adjacent Lands, water bodies or water treatment/conveyance facilities.

It will be the responsibility of the Contractor to submit a detailed construction schedule and appropriate staging, dewatering and erosion and sediment control plans to the Contract Administrator for review and approval prior to the commencement of work.

General Erosion and Sediment Control Measures

- All erosion and sediment control measures are to be installed to the satisfaction of the engineer, the municipality and the conservation authority prior to undertaking any site alterations (filling, grading, removal of vegetation, etc.) and remain present during all phases of site preparation and construction.
- A qualified inspector, provided by the owner, should conduct daily visits during construction to ensure that the contractor is working in accordance with the design drawings and that mitigation measures are being implemented as specified.
    - A light duty silt fence barrier is to be installed in the locations shown on the Erosion and Sediment Control Plan.
    - Rock check dams and/or straw bales are to be installed in drainage ditches.
    - Catch basin inserts are to be placed under the grates of all existing and proposed catchbasins and structures.
    - After complete build-out, all sewers are to be inspected and cleaned and all sediment and construction fencing is to be removed.
- The contractor shall ensure that proper dust control is provided with the application of water (and if required, calcium chloride) during dry periods.
- The contractor shall immediately report to the engineer or inspector any accidental discharges of sediment material into any ditch or sewer system. Appropriate response measures shall be carried out by the contractor without delay.

The contractor acknowledges that failure to implement erosion and sediment control measures may result in penalties imposed by any applicable regulatory agency.

8.0 CONCLUSIONS AND RECOMMENDATIONS

Sanitary Servicing

The analysis of the proposed sanitary servicing confirms the following:

- It is proposed that the development will outlet directly to the 250mm sanitary sewer along Halton Terrace. The proposed outlet is consistent with the approved Morgan's Grant Master Servicing Study (J.L. Richards).
- The proposed development can be serviced with a 200mm sanitary sewer service.
- The underground parking floor drains will require a pump to connect to the 200mm sanitary service.
- The total proposed sanitary flow from the subject lands is 2.0 L/s, which is less than the flows identified in the Master Servicing Study.
- The proposed and existing sanitary sewers have adequate capacity to accommodate the peak sanitary flow.

Watermain

The analysis of the proposed watermain network confirms the following:

- It is proposed to service the site with a 150mm water service.
- The analysis confirms the proposed and existing watermains provide adequate fire protection and domestic service under all operating conditions.

Stormwater Management

The following provides a summary of the storm servicing and stormwater management system:

- Proposed storm sewer system will convey stormwater to the 375mm and 1500mm diameter storm sewers in Halton Terrace.
    - Storm sewers (minor system) have been designed to convey the uncontrolled 2-year peak flow using the Rational Method.
    - Inflows to the minor system will be controlled using inlet control devices (ICDs) to an overall allowable release rate of 50.4 L/s.
    - A sump pump will be required to connect the foundation drain to the proposed 200mm diameter storm service.
    - A storage tank and pump will be required for the underground parking ramp trench drain and flow will be directed to surface within the shared amenity area.
    - Roof drain to discharge to surface within the rear parking area and captured by CB3.
    - A minimum clearance of 0.30m is provided between the 100-year hydraulic grade line (HGL) and the proposed 200mm diameter storm service.
- Surface and underground storage has been maximized to provide stormwater storage during storm events that exceed the allowable minor system inlet rate.
    - The major overland flow outlet for the site is located at the main entrance on Halton Terrace and the existing ditch along the south side of Old Carp Road. No overland

flow occurs up to and including the 100-year storm event, the major overland flow route is provided for emergency purposes only.

- Ponding depths do not exceed 0.35m for all storms up to and including the 100-year event.
- Underground storage will be provided using Stormtech SC-740 (or approved equivalent) arch-type storage chambers.

Erosion and Sediment control

- Erosion and sediment control measures (i.e. filter fabric, silt fences, etc.) will be implemented prior to construction and are to remain in place until vegetation is established.
- The Erosion and Sediment Control Plan will ensure erosion and sediment control is controlled in an acceptable manner and there is no negative impact to adjacent lands, water bodies or water treatment/conveyance facilities.

9.0 CLOSURE

The preceding report is respectfully submitted for review and approval. Please contact the undersigned should you have questions or require additional information.

NOVATECH

Prepared by:

Lucas Wilson, P.Eng.
Project Coordinator

Mark Bissett, P.Eng.
Senior Project Manager

FOR REVIEW

Appendix A
Correspondence

Lucas Wilson

From: Christine McCuaig <christine@q9planning.com>
Sent: Friday, November 20, 2020 8:30 AM
To: Brian Saumure; Mark Bissett; Jennifer Luong
Subject: Fwd: Pre-Consultation Follow-Up: 1104 Halton Terrace
Attachments: AODA Checklist.docx; 1104 Halton Terrace_design_brief_submission requirements.pdf; Plans & Study List (2020).pdf

From: "McCreight, Laurel" <Laurel.McCreight@ottawa.ca>
Date: November 20, 2020 at 7:55:06 AM EST
To: Christine McCuaig <christine@q9planning.com>
Subject: Pre-Consultation Follow-Up: 1104 Halton Terrace

Hi Christine,

Please refer to the below regarding the Pre-Application for 1104 Halton Terrace for a Site Plan Control Application and Zoning By-law Amendment for a residential development. I have also attached the required Plans & Study List for application submission.

An email was sent providing instructions on how to pay the fee for the pre-application consultation.

Below are staff's preliminary comments based on the information available at the time of the pre-consultation meeting:

Planning / Urban Design

- Grading of the site at the intersection of Old Carp Road and Halton Terrace will be an important consideration. Please ensure that the basement level is not exposed at this corner, and the principal entrance to the building is not significantly higher than the existing sidewalk/right of way.
- Will the Old Carp Road frontage be urbanized? If not please consider how this can be designed to work with the proposal.
- Please ensure the setback to the proposed low-rise residential is adequate and considers light and privacy.
- Please ensure that the TIA scoping includes all units, not just the apartment units, but also the detached dwellings.

- Please ensure adequate room for tree planting on-site.
- A design brief is required. Please see the attached terms of reference.
- Cash-in-lieu of Parkland will be required.
- You are encouraged to contact the Ward Councillor, Councillor Jenna Sudds, regarding the proposal.

Engineering

- The Servicing Study Guidelines for Development Applications are available here.
- Servicing and site works shall be in accordance with the following documents:
    - Ottawa Sewer Design Guidelines (October 2012)
    - Ottawa Design Guidelines – Water Distribution (2010)
    - Geotechnical Investigation and Reporting Guidelines for Development Applications in the City of Ottawa (2007)
    - City of Ottawa Slope Stability Guidelines for Development Applications (revised 2012)
    - City of Ottawa Environmental Noise Control Guidelines (January, 2016)
    - City of Ottawa Park and Pathway Development Manual (2012)
    - City of Ottawa Accessibility Design Standards (2012)
    - Ottawa Standard Tender Documents (latest version)
    - Ontario Provincial Standards for Roads & Public Works (2013)
- Record drawings and utility plans are also available for purchase from the City (Contact the City's Information Centre by email at InformationCentre@ottawa.ca or by phone at (613) 580-2424 x.44455).
- The Stormwater Management Criteria for the subject site is to be based on the following:
    - The allowable storm release rate for the subject site is limited to 70 L/s/ha as per the Master Servicing Study Update for Morgan's Grant Subdivision.
    - Onsite storm runoff, in excess of the allowable release rate, must be detained on site.
    - The hydraulic grade line in the storm sewer must remain at least 0.3 m below the underside of adjacent building footings during the 100-year storm event.
    - Quantity control to be provided by the adjacent stormwater management facility and/or as determined by the Mississippi Valley Conservation Authority (MVCA). Please include correspondence from the MVCA in the stormwater management report.
- Additional studies pertaining to discharge to Shirley's Creek sub-watershed will not be required if out letting to existing stormwater management pond to the east. Stormwater charges will not be imposed to connect to the existing stormwater management pond to the east.
- No sanitary sewer capacity constraints were identified on Halton Terrace during the initial review of the concept plan.

- As per Section 4.3.1 of the Water Design Guidelines, two watermain connections will be required to provide a looped connection if the basic day demand is greater than 50 m3/day (approx. 50 homes).
- Water Boundary condition requests must include the location of the service and the expected loads required by the proposed development. Please provide the following information:
  - Location of service
  - Type of development and the amount of fire flow required (as per FUS, 1999).
  - Average daily demand: ___ l/s.
  - Maximum daily demand: ___l/s.
  - Maximum hourly daily demand: ___ l/s.
- An MECP Environmental Compliance Approval in not anticipated to be required for the subject site.
- Phase 1 ESAs and Phase 2 ESAs must conform to clause 4.8.4 of the Official Plan that requires that development applications conform to Ontario Regulation 153/04

Please contact Infrastructure Project Manager Ahmed Elsayed for follow-up questions.

Transportation

- Follow Traffic Impact Assessment Guidelines
  - Traffic Impact Assessment will be required.
  - Start this process asap.
  - Applicant advised that their application will not be deemed complete until the submission of the draft step 1-4, including the functional draft RMA package (if applicable) and/or monitoring report (if applicable).
  - Reduced scope with regards to the study area will be considered.
- To allow for a reduction of the ROW from 26 m, the development proponent should demonstrate that the 24 m ROW can accommodate the road requirements, services, trees and pedestrian and cycling facilities. This can be done by showing the recommended cross section based on the Designing Neighbourhood Collector Guidelines (2019).
- Corner triangles as per OP Annex 1 - Road Classification and Rights-of-Way at the following locations on the final plan will be required:
  - Collector Road to Collector Road: 5 metre x 5 metres
- Noise Impact Studies required for the following:
  - Road
  - Stationary (if there will be any exposed mechanical equipment due to the proximity to neighbouring noise sensitive land uses)
- It is recommended that the access is located only on Halton Terrace to minimize accesses on Old Carp. The realignment of Old Carp is going to add more traffic to this road and the road currently does not have many accesses. The location of the accesses will be further reviewed in the TIA. Sight line analysis for the accesses on Halton Terrace and Carp (if proposed) will be required.
- On site plan:
  - Show all details of the roads abutting the site up to and including the opposite curb; include such items as pavement markings, accesses and/or sidewalks.

    - Turning templates will be required for all accesses showing the largest vehicle to access the site; required for internal movements and at all access (entering and exiting and going in both directions). Show on separate drawings.
    - Show all curb radii measurements; ensure that all curb radii are reduced as much as possible
    - Show lane/aisle widths.
    - Sidewalks are to be continuous across access as per City Specification 7.1.
- It is recommended that the accessibility requirements are implemented (checklist is attached.)

Please contact Transportation Project Manager, Neeti Paudel for follow-up questions.

Forestry

- A Tree Conservation Report (TCR) must be supplied for review along with the suite of other plans/reports required by the City; an approved TCR is a requirement of Site Plan approval.
- Any removal of privately-owned trees 10cm or larger in diameter requires a tree permit issued under the Urban Tree Conservation Bylaw; the permit is based on the approved TCR.
- Any removal of City-owned trees will require the permission of Forestry Services who will also review the submitted TCR.
- The TCR must list all trees on site by species, diameter and health condition.
- The TCR must list all trees on adjacent sites if they have a critical root zone that extends onto the development site.
- If trees are to be removed, the TCR must clearly show where they are, and document the reason they cannot be retained.
- The City encourages the retention of healthy trees; if possible, please seek opportunities for retention of trees that will contribute to the design/function of the site.
- Please ensure newly planted trees have an adequate soil volume for their size at maturity. Here are the recommended soil volumes:

Tree Type/Size	Single Tree Soil Volume (m3)	Multiple Tree Soil Volume (m3/tree)
Ornamental	15	9
Columnar	15	9
Small	20	12
Medium	25	15
Large	30	18
Conifer	25	15

- For more information on the process or help with tree retention options, contact Mark Richardson

Other
Please refer to the links to "Guide to preparing studies and plans" and fees for general information. Additional information is available related to building permits, development charges, and the Accessibility Design Standards. Be aware that other fees and permits may be required, outside of the development review process. You may obtain background drawings by contacting informationcentre@ottawa.ca.

These pre-consultation comments are valid for one year. If you submit a development application(s) after this time, you may be required to meet for another pre-consultation meeting and/or the submission requirements may change. You are as well encouraged to contact us for a follow-up meeting if the plan/concept will be further refined.

Please do not hesitate to contact me if you have any questions.

Regards,
Laurel

Laurel McCreight MCIP, RPP
Planner
Development Review West
Urbaniste
Examen des demandes d'aménagement ouest

City of Ottawa | Ville d'Ottawa

613.580.2424 ext./poste 16587
ottawa.ca/planning / ottawa.ca/urbanisme

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Appendix B

Sanitary Design Sheets

1104 Halton Terrace: Sanitary Sewer Design Sheet

AREA			RESIDENTIAL								INFILTRATION				PIPE					
			Singles		Apartments		TOTAL													
ID	From	To	Units	Pop.	Units	Pop.	Pop.	Accum. Pop.	Peak Factor	Peak Flow (l/s)	Total Area (ha)	Accum. Area (ha)	Infilt. Flow (l/s)	**Total Flow (l/s)**	Size (mm)	Slope (%)	Length (m)	Capacity (l/s)	Full Flow Vel. (m/s)	Q/Q_{full} (%)
1104 Halton Terrace																				
	MH01	**EXSANMH3**	0	0.0	86	154.8	154.8	154.8	3.5	1.8	0.73	0.73	0.2	2.0	200	1.00	25.3	34.2	1.06	5.9%
Existing Halton Terrace																				
	EXSANMH3	**EXSANMH2**	2	6.8	0.00	0.0	6.8	161.6	3.5	1.9	0.22	0.95	0.3	2.2	250	0.38	31.2	38.2	0.75	5.7%
	EXSANMH2	**EXSANMH1**	6	20.4	0.00	0.0	20.4	182.0	3.5	2.1	0.42	1.37	0.5	2.5	250	0.27	59.9	32.2	0.64	7.9%

Design Parameters:

Avg Flow/Person =	280	l/day
Comm./Inst. Flow =	28000	l/ha/day
Light Industrial Flow =	35000	l/ha/day
Infiltration =	0.33	l/s/ha
Pipe Friction n =	0.013	
Residential Peaking Factor = Harmon Equation (max 4, min 2)		
Peaking Factor Comm./Inst. =	1.5	

Population Density:

	ppl/unit
Apartment	1.8
Single	3.4

Project: 1104 Halton Terrace (119024)
Designed: LRW
Checked: MAB

Date: September 15, 2021

LICENSED PROFESSIONAL ENGINEER
L. R. WILSON
100160065
2021.10.19
PROVINCE OF ONTARIO

NOVATECH
Engineers, Planners & Landscape Architects

J.L. Richards & Associates Limited
Consulting Engineers, Architects & Planners

CITY OF OTTAWA

MINTO DEVELOPMENT INC.
MORGAN'S GRANT SUBDIVISION - PHASE 10A & 10B
JLR NO. 17730

SANITARY SEWER DESIGN SHEET
Revised September 16, 2003

Designed by: J.B.
Checked by: L.J.

DESIGN PARAMETERS

I =	0.280	l/s/ha	q (res) =	350	l/cap/day
Singles =	4.0	pers / unit	q (com) =	50,000	l/ha/day
Townhouses =	4.0	pers / unit	q (inst) =	50,000	l/ha/day

STREET	M.H. #		RESIDENTIAL								NON-RESIDENTIAL				INFIL. FLOW	PEAK FLOW	SEWER DATA						UPSTREAM			DOWNSTREAM		COMMENTS
	FROM	TO	NO. of UNITS	INDIVIDUAL POPUL. people	INDIVIDUAL AREA ha	CUMMULATIVE POPUL. people	CUMMULATIVE AREA ha	Peaking Factor	POPUL. FLOW l/s	AREA ha	CUMM. AREA ha	Peaking Factor	NON-RES. FLOW (l/s)	l/s	l/s	DIA. mm	Slope %	CAPAC. l/s	VEL. m/s	LENGTH m	RESIDUAL CAP. (l/s)	Obvert Drop	Obvert	Invert	Obvert	Invert	
Street No. 1		5	4	16	0.15	1500	26.93	3.68	22.36	0.00	2.93	1.50	2.54	7.54	32.44	250	0.40	39.23	0.77	41.20	6.79	0.078	82.850	82.596	82.685	82.431	Phase 12
	5	Ex. 1	25	100	0.81	1600	27.74	3.66	23.72	0.00	2.93	1.50	2.54	7.77	34.03	250	0.40	39.23	0.77	90.60	5.21	0.063	82.622	82.368	82.260	82.006	Phase 12
STREET No. 1 Phase 12	4	3	2	8	0.21	8	0.21	4.00	0.13	0.00	0.00	1.50	0.00	0.06	0.19	250	0.40	39.23	0.77	24.00	39.04		82.140	81.890	82.044	81.794	PHASE 12
	3	2	3	12	0.33	20	0.54	4.00	0.32	0.00	0.00	1.50	0.00	0.15	0.48	250	0.40	39.23	0.77	24.70	38.76		82.024	81.774	81.925	81.675	PHASE 12
BIDGOOD LANDS	-	2	65	260	2.10	260	2.10	4.00	4.21	0.00	0.00	1.50	0.00	0.59	4.80	250	0.40	39.23	0.77	95.00	34.43						Assumed Future Townhomes
	2	Ex. 1	4	16	0.34	296	2.98	4.00	4.80	0.00	0.00	1.50	0.00	0.83	5.63	250	0.40	39.23	0.77	37.50	33.60		81.905	81.655	81.755	81.505	PHASE 12
FLAMBOROUGH WAY	Ex. 1	Ex. 172A		0	0.17	1896	30.89	3.60	27.68	0.00	2.93	1.50	2.54	8.65	38.87	300	0.18	42.21	0.58	81.10	3.34		81.726	81.426	81.584	81.284	PHASE 6 (as-built info. added)
	Ex. 172A	Ex. 171A		0	0.77	1896	31.66	3.60	27.68	0.00	2.93	1.50	2.54	8.86	39.09	300	0.19	44.07	0.60	104.80	4.98		81.584	81.284	81.384	81.084	PHASE 6 (as-built info. added)
	Ex. 171A	Ex. 170A		0	0.68	1896	32.34	3.60	27.68	0.00	2.93	1.50	2.54	9.06	39.28	300	0.20	44.98	0.62	88.50	5.71		81.344	81.044	81.168	80.868	PHASE 6 (as-built info. added)
	Ex. 170A	Ex. 142B		0	0.41	1896	32.75	3.60	27.68	0.00	2.93	1.50	2.54	9.17	39.39	300	0.18	42.24	0.58	77.00	2.85		81.165	80.865	81.035	80.730	PHASE 6 (as-built info. added)
	Ex. 142B	Ex. 142C		0	0.00	1896	32.75	3.60	27.68	0.00	2.93	1.50	2.54	9.17	39.39	300	0.21	46.28	0.63	17.10	6.89		80.954	80.649	80.918	80.613	PHASE 6 (as-built info. added)
KLONDIKE ROAD	Ex. 142C	142D		0	0.22	1896	32.97	3.60	27.68	0.00	2.93	1.50	2.54	9.23	39.45	300	3.30	183.25	2.51	110.00	143.79	0.04	80.878	80.573	77.248	76.943	
KLONDIKE ROAD	142D	142E	134	536	5.33	2432	38.30	3.52	34.66	0.37	3.30	1.50	2.86	10.72	48.25	300	0.30	55.25	0.76	50.50	7.00	1.07	76.178	75.873	76.026	75.722	Flow from Future Townhouse Complex
COMMERCIAL SITE	142E	142F		0	2.84	2432	41.14	3.52	34.66	2.84	6.14	1.50	5.33	11.52	51.51	300	0.30	55.25	0.76	110.00	3.74		76.026	75.722	75.696	75.392	
	142F	120B		0	0.00	2432	41.14	3.52	34.66	0.00	6.14	1.50	5.33	11.52	51.51	300	0.30	55.25	0.76	36.15	3.74		75.696	75.392	75.588	75.283	Commercial Property
	120B	120A		0	0.00	2432	41.14	3.52	34.66	0.00	6.14	1.50	5.33	11.52	51.51	300	0.30	55.25	0.76	18.69	3.74		75.588	75.283	75.532	75.227	Commercial Property
	120A	Ex. 120		0	0.00	2432	41.14	3.52	34.66	0.00	6.14	1.50	5.33	11.52	51.51	300	0.38	62.18	0.85	15.84	10.67		75.532	75.227	[illegible]	75.167	
Mersey Drive	122	121		24	0.38	24	0.38	4.00	0.39	0.00	0.00	1.50	0.00	0.11	0.50	200	3.78	66.52	2.05	63.5	66.02		80.400	80.200	78.000	77.800	
	121	120		24	0.28	48	0.66	4.00	0.78	0.00	0.00	1.50	0.00	0.18	0.96	200	2.53	54.43	1.68	68.0	53.47		77.900	77.700	76.179	75.979	
Westmoreland Avenue	120	[illegible]		20	0.33	2500	42.13	3.51	35.53	0.00	6.14	1.50	5.33	11.80	52.66	300	0.42	65.32	0.90	70.6	12.66		75.467	75.167	75.171	74.871	Phase IV (as-built info. Added)
Whithorn Avenue	116	119		8	0.14	8	0.14	4.00	0.13	0.00	0.00	1.50	0.00	0.04	0.17	200	2.00	48.38	1.49	8.1	48.22		79.262	79.062	79.100	78.900	
	119	118		24	0.22	32	0.36	4.00	0.52	0.00	0.00	1.50	0.00	0.10	0.62	200	2.69	56.10	1.73	37.2	55.48		79.000	78.800	78.000	77.800	
	118	[illegible]		44	0.50	76	0.86	4.00	1.23	0.00	0.00	1.50	0.00	0.24	1.47	200	2.21	50.86	1.57	81.1	49.39		77.700	77.500	75.908	75.708	
Westmoreland Avenue		[illegible]		24	0.31	2600	43.30	3.49	36.81	0.00	6.14	1.50	5.33	12.12	54.26	300	0.42	65.49	0.90	68.8	11.23		75.160	74.860	74.870	74.570	Phase IV (as-built info. Added)
	111	[illegible]		12	0.33	12	0.33	4.00	0.19	0.00	0.00	1.50	0.00	0.09	0.29	200	1.91	47.28	1.46	46.0	47.00		76.500	76.300	75.620	75.420	
Westmoreland Avenue	[illegible]	109		16	0.30	2628	43.93	3.49	37.16	0.00	6.14	1.50	5.33	12.30	54.79	300	0.36	60.31	0.83	66.3	5.52		74.840	74.540	74.603	74.303	Phase IV (as-built info. Added)
	115	114		20	0.32	20	0.32	4.00	0.32	0.00	0.00	1.50	0.00	0.09	0.41	200	4.49	72.51	2.24	51.2	72.10		81.500	81.300	79.200	79.000	
	116	114		20	0.30	20	0.30	4.00	0.32	0.00	0.00	1.50	0.00	0.08	0.41	200	0.58	26.06	0.80	64.5	25.65		79.374	79.174	79.000	78.800	
	114	113		32	0.40	72	1.02	4.00	1.17	0.00	0.00	1.50	0.00	0.29	1.45	200	0.62	26.94	0.83	72.8	25.49		78.750	78.550	78.300	78.100	
	113	112		16	0.32	88	1.34	4.00	1.43	0.00	0.00	1.50	0.00	0.38	1.80	200	0.50	24.24	0.75	67.7	22.44		78.200	78.000	77.860	77.660	
	112A	112		16	0.35	16	0.35	4.00	0.26	0.00	0.00	1.50	0.00	0.10	0.36	200	1.00	34.21	1.06	48.0	33.86		77.680	77.480	77.200	77.000	
	112	109		16	0.32	120	2.01	4.00	1.94	0.00	0.00	1.50	0.00	0.56	2.51	200	1.71	44.74	1.38	70.0	42.23		77.097	76.897	75.900	75.700	
Mersey Drive	109	[illegible]		24	0.33	2772	46.27	3.47	38.98	0.00	6.14	1.50	5.33	12.96	57.27	300	0.46	68.74	0.94	68.7	11.47		74.580	74.280	74.261	73.961	Phase IV (as-built info. Added)
Mersey Drive	124	123		28	0.44	28	0.44	4.00	0.45	0.00	0.00	1.50	0.00	0.12	0.58	200	0.55	25.38	0.78	96.3	24.80		75.600	75.400	75.070	74.870	Phase IV (as-built info. Added)
	123	103		32	0.42	60	0.86	4.00	0.97	0.00	0.00	1.50	0.00	0.24	1.21	200	0.59	26.27	0.81	109.2	25.06		75.065	74.865	74.421	74.221	Phase IV (as-built info. Added)
Easement	[illegible]	[illegible]		0	0.00	2832	47.13	3.46	39.73	0.00	6.14	1.50	5.33	13.20	58.26	375	0.32	103.88	0.91	12.4	45.62		74.245	73.870	74.205	73.830	Phase IV (as-built info. Added)
	127	126		56	0.78	56	0.78	4.00	0.91	0.00	0.00	1.50	0.00	0.22	1.13	200	1.00	34.21	1.06	100.7	33.09		78.155	77.955	77.148	76.948	
	126	126A		16	0.19	72	0.97	4.00	1.17	0.00	0.00	1.50	0.00	0.27	1.44	200	0.58	26.06	0.80	13.1	24.62		77.118	76.918	77.042	76.842	
	126A	103		0	0.00	72	0.97	4.00	1.17	0.00	0.00	1.50	0.00	0.27	1.44	200	2.83	57.56	1.77	49.8	56.12		77.012	76.812	75.600	75.400	
	107	106		12	0.19	12	0.19	4.00	0.19	0.00	0.00	1.50	0.00	0.05	0.25	200	1.00	34.21	1.06	41.0	33.97		77.470	77.270	77.060	76.860	
	106	105		36	0.36	48	0.55	4.00	0.78	0.00	0.00	1.50	0.00	0.15	0.93	200	0.58	26.06	0.80	69.9	25.12		77.000	76.800	76.595	76.395	
	105	104		32	0.39	80	0.94	4.00	1.30	0.00	0.00	1.50	0.00	0.26	1.56	200	0.58	26.06	0.80	59.2	24.50		75.860	75.660	75.516	75.316	
	104	103		4	0.01	84	0.95	4.00	1.36	0.00	0.00	1.50	0.00	0.27	1.63	200	1.00	34.21	1.06	14.9	32.59		75.049	74.849	74.900	74.700	

1	17/09/03	REVISED PHASE 10 AND 12	L.J.

LICENSED PROFESSIONAL ENGINEER L.J.A. JABLONSKI 16/09/03 PROVINCE OF ONTARIO

SCALE
25m 50m 75m 100m
HORIZONTAL 1:3000

J.L.Richards & Associates Limited
Consulting Engineers, Architect & Planners
OTTAWA, KINGSTON, SUDBURY, CANADA.

DESIGN
CHECKED L.J.
DRAWN M.Z.
CHECKED
APPROVED

Ottawa

minto

MORGAN'S GRANT SUBDIVISION
MASTER DRAINAGE PLAN (SANITARY)

DATED SEPT. 2003
DWG. No. 17730–SA

Appendix C

Watermain Boundary Conditions,
FUS Calculations, &
Modelling Results

Boundary Conditions
1104 Halton Terrace

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	30	0.50
Maximum Daily Demand	75	1.25
Peak Hour	166	2.76
Fire Flow Demand #1	20,000	333.33

Location

Results

Connection 1 – Halton Terr.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	130.0	61.5
Peak Hour	126.3	56.3
Max Day plus Fire 1	115.0	40.2

Ground Elevation = 86.7 m

Connection 2 – Maxwell Bridge Rd.

Demand Scenario	**Head (m)**	**Pressure[1] (psi)**
Maximum HGL	130.0	72.5
Peak Hour	126.3	67.3
Max Day plus Fire 1	116.0	52.7

Ground Elevation = 79.0 m

Disclaimer

The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 119024
Project Name: 1104 Halton Terrace
Date: 7/19/2021
Input By: Designer
Reviewed By: Project Manager

Legend: Input by User; No Information or Input Required

Building Description: 4-Storey Apartment
Wood frame

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction C	Wood frame	Yes	1.5	1.5	
		Ordinary construction		1		
		Non-combustible construction		0.8		
		Modified Fire resistive construction (2 hrs)		0.6		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	2180			
		Number of Floors/Storeys	4			
		Area of structure considered (m^2)			8,720	
	F	**Base fire flow without reductions**	20			31,000
		$F = 220\ C\ (A)^{0.5}$				
b n						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	26,350
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	-10,540
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System		-10%		
				Cumulative Total	**-40%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	> 45.1m		0%	3,953
		East Side	> 45.1m		0%	
		South Side	20.1 - 30 m		10%	
		West Side	30.1- 45 m		5%	
				Cumulative Total	**15%**	
Results						
6	(1) + (2) + (3)	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**20,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**333**
				or	USGPM	5,284
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	4.5
		Required Volume of Fire Flow (m^3)			m^3	5400

1104 Halton Terrace
Water Demand

	Area (ha)	Units	Population	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)
Apartment Unit	N/A	86	155	0.502	1.254	2.759
Total	**0.00**	**86**	**155**	**0.502**	**1.254**	**2.759**

Water Demand Parameters

Apartment Unit	1.8	ppl/unit
Residential Demand	280	L/c/day
Residential Max Day	2.5	x Avg Day
Residential Peak Hour	2.2	x Max Day
Residential Fire Flow	333	L/s

1104 Halton Terrace: Watermain Demand

Node	Apartment Unit	Total Population	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)	Fire Flow (L/s)
B1	86	155	0.502	1.254	2.759	N/A
EXHYD1		0	0.000	0.000	0.000	62
EXHYD2		0	0.000	0.000	0.000	62
HYD1		0	0.000	0.000	0.000	95
HYD2		0	0.000	0.000	0.000	95
HYD3		0	0.000	0.000	0.000	95
T1		0	0.000	0.000	0.000	N/A
Total	**86**	**155**	**0.502**	**1.254**	**2.759**	

Water Demand Parameters

Apartment Unit	1.8	ppl/unit	Residential Max Day	2.5	x Avg Day
Residential Demand	280	L/c/day	Residential Peak Hour	2.2	x Max Day
			Apartment Fire Flow	333	L/s

NOVATECH

Engineers, Planners & Landscape Architects

1104 Halton Terrace: Watermain Analysis

Network Table - Nodes - (Peak Hour)

Node ID	Elevation m	Demand LPS	Head m	Pressure m	Pressure kPa	Pressure psi
Junc B1	85.9	2.76	126.29	40.36	395.93	57.43
Junc EXHYD1	86.75	0	126.3	39.55	387.99	56.27
Junc EXHYD2	80.05	0	126.3	46.25	460.00	66.72
Junc HYD1	84.11	0	126.3	42.19	450.00	65.27
Junc HYD2	82.8	0	126.3	43.5	426.74	61.89
Junc HYD3	82.77	0	126.3	43.53	427.03	61.94
Junc T1	83.29	0	126.3	43.01	421.93	61.20
Resvr RES1	126.3	-1.6	126.3	0	0.00	0.00
Resvr RES2	126.3	-1.15	126.3	0	0.00	0.00

Network Table - Links - (Peak Hour)

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Headloss m/km	Friction Factor
Pipe P1	5	300	120	1.60	0.02	0.00	0.045
Pipe P2	87	300	120	1.60	0.02	0.00	0.041
Pipe P3	25	300	120	1.60	0.02	0.00	0.039
Pipe P4	31	150	100	2.76	0.16	0.40	0.048
Pipe P5	33	300	120	-1.15	0.02	0.00	0.044
Pipe P6	35	300	120	-1.15	0.02	0.00	0.041
Pipe P7	69	300	120	-1.15	0.02	0.00	0.042
Pipe P8	77	300	120	-1.15	0.02	0.00	0.043

1104 Halton Terrace: Watermain Analysis

Network Table - Nodes - (Max Pressure Check)

Node ID	Elevation m	Demand LPS	Head m	Pressure m	Pressure kPa	Pressure psi	Age Hours
Junc B1	85.9	0.5	130	44.07	432.33	62.70	13.16
Junc EXHYD1	86.75	0	130	43.25	424.28	61.54	0.32
Junc EXHYD2	80.05	0	130	49.95	460.00	66.72	7.16
Junc HYD1	84.11	0	130	45.89	450.00	65.27	6.14
Junc HYD2	82.8	0	130	47.2	463.03	67.16	16.84
Junc HYD3	82.77	0	130	47.23	463.33	67.20	13.56
Junc T1	83.29	0	130	46.71	458.23	66.46	12.86
Resvr RES2	130	-0.21	130	0	0.00	0.00	0
Resvr RES1	130	-0.29	130	0	0.00	0.00	0

Network Table - Links - (Max Pressure Check)

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Headloss m/km	Friction Factor
Pipe P1	5	300	120	0.29	0.00	0.00	0.000
Pipe P2	87	300	120	0.29	0.00	0.00	0.037
Pipe P3	25	300	120	0.29	0.00	0.00	0.131
Pipe P4	31	150	100	0.50	0.03	0.02	0.061
Pipe P5	33	300	120	-0.21	0.00	0.00	0.000
Pipe P6	35	300	120	-0.21	0.00	0.00	0.177
Pipe P7	69	300	120	-0.21	0.00	0.00	0.000
Pipe P8	77	300	120	-0.21	0.00	0.00	0.081

1104 Halton Terrace: Watermain Analysis

Network Table - Nodes - (Max Day + FF)

Node ID	Elevation m	Demand LPS	Head m	Pressure m	Pressure kPa	Pressure psi
Junc B1	85.9	1.25	113.69	27.76	272.33	39.50
Junc EXHYD1	86.75	48	114.89	28.14	276.05	40.04
Junc EXHYD2	80.05	0	114.8	34.75	460.00	66.72
Junc HYD1	84.11	95	113.73	29.62	450.00	65.27
Junc HYD2	82.8	95	113.65	30.85	302.64	43.89
Junc HYD3	82.77	95	113.73	30.96	303.72	44.05
Junc T1	83.29	0	113.7	30.41	298.32	43.27
Resvr RES2	116	-149.14	116	0	0.00	0.00
Resvr RES1	115	-185.12	115	0	0.00	0.00

Network Table - Links - (Max Day + FF)

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Headloss m/km	Friction Factor
Pipe P1	5	300	120	185.12	2.62	23.32	0.020
Pipe P2	87	300	120	137.12	1.94	13.37	0.021
Pipe P3	25	300	120	42.12	0.60	1.50	0.025
Pipe P4	31	150	100	1.25	0.07	0.09	0.054
Pipe P5	33	300	120	40.86	0.58	1.42	0.025
Pipe P6	35	300	120	-54.14	0.77	2.39	0.024
Pipe P7	69	300	120	-149.14	2.11	15.62	0.021
Pipe P8	77	300	120	-149.14	2.11	15.62	0.021

Appendix D

STM Design Sheets, SWM Excerpts &
PCSWMM Modelling Info

1104 Halton Terrace (119024)
PCSWMM Model Results (Ponding)

NOVATECH
Engineers, Planners & Landscape Architects

CB / CBMH ID	Invert Elev. (m)	Rim Elev. (m)	Spill Elev. (m)	Ponding Depth (m)	HGL Elev. (m)[1]				Ponding Depth (m)				Spill Depth (m)			
					2-yr	5-yr	100-yr	100-yr (+20%)	2-yr	5-yr	100-yr	100-yr (+20%)	2-yr	5-yr	100-yr	100-yr (+20%)
CB01	82.32	83.32	83.45	0.13	82.65	82.79	83.43	83.48	0.00	0.00	0.11	0.16	0.00	0.00	0.00	0.03
CB02	83.25	84.95	85.25	0.30	84.14	85.02	85.24	85.26	0.00	0.07	0.29	0.31	0.00	0.00	0.00	0.01
CB03	83.35	85.05	85.35	0.30	84.08	85.19	85.36	85.39	0.00	0.14	0.31	0.34	0.00	0.00	0.01	0.04
LC01	82.13	83.13	83.28	0.15	82.14	82.17	83.21	83.30	0.00	0.00	0.08	0.17	0.00	0.00	0.00	0.02
LC02	82.13	83.13	83.43	0.30	82.14	82.16	83.21	83.30	0.00	0.00	0.08	0.17	0.00	0.00	0.00	0.00
RY02	81.92	83.13	83.28	0.15	81.93	82.01	83.21	83.30	0.00	0.00	0.08	0.17	0.00	0.00	0.00	0.02
RY03	81.54	83.13	83.30	0.17	81.56	82.01	83.21	83.30	0.00	0.00	0.08	0.17	0.00	0.00	0.00	0.00
RY04	82.31	83.65	83.95	0.30	83.48	83.69	83.81	83.85	0.00	0.04	0.16	0.20	0.00	0.00	0.00	0.00
RY05	82.40	83.65	83.95	0.30	83.48	83.69	83.81	83.85	0.00	0.04	0.16	0.20	0.00	0.00	0.00	0.00
RY06	82.53	83.65	83.95	0.30	83.48	83.69	83.81	83.85	0.00	0.04	0.16	0.20	0.00	0.00	0.00	0.00
RY07	82.60	83.60	83.95	0.35	83.48	83.70	83.81	83.85	0.00	0.10	0.21	0.25	0.00	0.00	0.00	0.00

[1] *3-hour Chicago Storm.*

Date: 10/18/2021
M:\2019\119024\DATA\Calculations\SWM\119024-Model Results.xlsx

1104 Halton Terrace (119024)
PCSWMM Storage Curves (underground/surface storage)

NOVATECH
Engineers, Planners & Landscape Architects

CB01-Storage		
Depth (m)	Area (m^2)	Volume (m^3)
0.00	0.00	0.00
0.76	48.20	18.32
0.77	0	18.56
1.00	0.36	18.64
1.13	46.00	21.66
1.14	0.00	21.89
2.00	0.00	21.89

CB02-Storage		
Depth (m)	Area (m^2)	Volume (m^3)
0.00	0.00	0.00
0.76	22.40	8.51
0.77	0.36	8.63
1.70	0.36	8.96
2.00	265	48.76
2.01	0.00	50.09
2.70	0.00	50.09

CB03-Storage		
Depth (m)	Area (m^2)	Volume (m^3)
0.00	0.00	0.00
0.76	173.20	65.82
0.77	0.36	66.68
1.70	0.36	67.02
2.00	391	125.72
2.01	0.00	127.68
2.70	0.00	127.68

RY04-Storage		
Depth (m)	Area (m^2)	Volume (m^3)
0.00	0.36	0.00
1.34	0.36	0.48
1.64	113	17.49
1.65	0.00	18.05
2.34	0.00	18.05

RY05-Storage		
Depth (m)	Area (m2)	Volume (m3)
0.00	0.36	0.00
1.25	0.36	0.45
1.55	113	17.45
1.56	0.00	18.02
2.25	0.00	18.02

RY06-Storage		
Depth (m)	Area (m2)	Volume (m3)
0.00	0.36	0.00
1.12	0.36	0.40
1.42	113	17.41
1.43	0.00	17.97
2.12	0.00	17.97

RY07-Storage		
Depth (m)	Area (m2)	Volume (m3)
0.00	0.36	0.00
1.00	0.36	0.36
1.35	97	17.40
1.36	0.00	17.88
2.00	0.00	17.88

Date: 10/18/2021
M:\2019\119024\DATA\Calculations\SWM\119024-Storage Curves.xlsx

1104 Halton Terrace (119024)
Summary of Hydraulic Grade Line (HGL) Elevations

Engineers, Planners & Landscape Architects

MH ID	Obvert Elevation (m)	T/G Elevation (m)	HGL Elevation[1] (m)	Surcharge (m)	Clearance from T/G (m)	HGL in Stress Test[1] (m)
MH02	81.64	84.12	82.34	0.70	1.78	82.34
MH04	81.76	85.25	82.34	0.59	2.91	82.34
MH06	81.81	85.28	82.34	0.53	2.94	82.34
MH08	82.07	85.11	82.35	0.28	2.76	82.35

[1] 3-hour Chicago Storm; Fixed outfall (100yr HGL @ connections to existing = 82.32).

1104 Halton Terrace
Maple Leaf Homes
Project No.: 119024

STORM SEWER DESIGN SHEET
(Maple Leaf Homes)
FLOW RATES BASED ON RATIONAL METHOD

NOVATECH
Engineers, Planners & Landscape Architects

LOCATION				AREA (ha)			FLOW							TOTAL FLOW	SEWER DATA								
Street	Catchment ID	From Manhole	To Manhole	Area (ha)	C	AC (ha)	Indiv 2.78 AC	Accum 2.78 AC	Time of Concentration	Rainfall Intensity 2 Year (mm/hr)	Rainfall Intensity 5 Year (mm/hr)	Rainfall Intensity 10 Year (mm/hr)	Peak Flow (L/s)	Total Peak Flow, Q (L/s)	Dia. (m) Actual	Dia. (mm)	Type	Slope (%)	Length (m)	Capacity (L/s)	Velocity (m/s)	Flow Time (min)	Ratio Q/Q full
	A-01, A-02, A-03, A-09, A-10	MH08	MH06	0.496	0.78	0.39	1.076	1.076	10.00	76.81			82.6	82.6	0.381	375	PVC	0.40	54.9	115.6	1.01	0.90	71%
						0.00	0.000	0.000	10.00														
						0.00	0.000	0.000	10.00														
		MH06	MH02	0.000	0.00	0.00	0.000	1.076	10.90	73.51			79.1	79.1	0.381	375	PVC	0.40	37.8	115.6	1.01	0.62	68%
						0.00	0.000	0.000	10.90														
						0.00	0.000	0.000	10.90														
	A-04	MH02	EX 1500mm	0.115	0.53	0.06	0.169	1.245	11.52	71.41			88.9	88.9	0.381	375	PVC	0.40	36.9	115.6	1.01	0.61	77%
						0.00	0.000	0.000	11.52														
						0.00	0.000	0.000	11.52														

Q = 2.78 AIC, where
Q = Peak Flow in Litres per Second (L/s)
A = Area in hectares (ha)
I = Rainfall Intensity (mm/hr), 5 year storm
C = Runoff Coefficient

Consultant:	**Novatech**
Date:	October 19, 2021
Design By:	Lucas Wilson
Client: Maple Leaf Homes	**Dwg. Reference:** 119024-STM
	Checked By: MAB

Legend:

*	Indicates 100 Year intensity for storm sewers
10.00	Storm sewers designed to the 2 year event (without ponding) for local roads
10.00	Storm sewers designed to the 5 year event (without ponding) for collector roads
10.00	Storm sewers designed to the 10 year event (without ponding) for arterial roads

TEMPEST Product Submittal Package R2

Date: September 15, 2021

Customer: Novatech

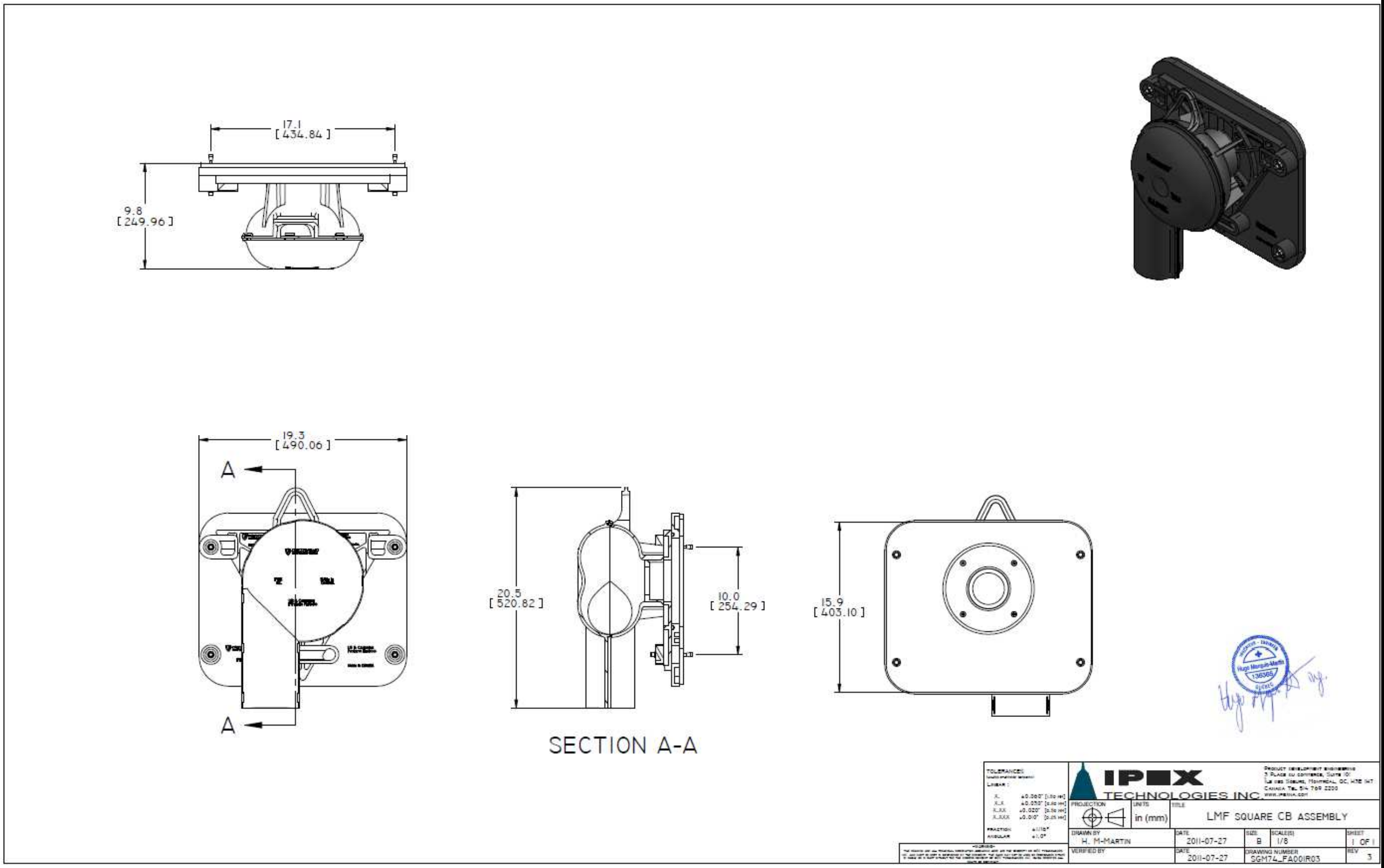
Contact: Lucas Wilson

Location:

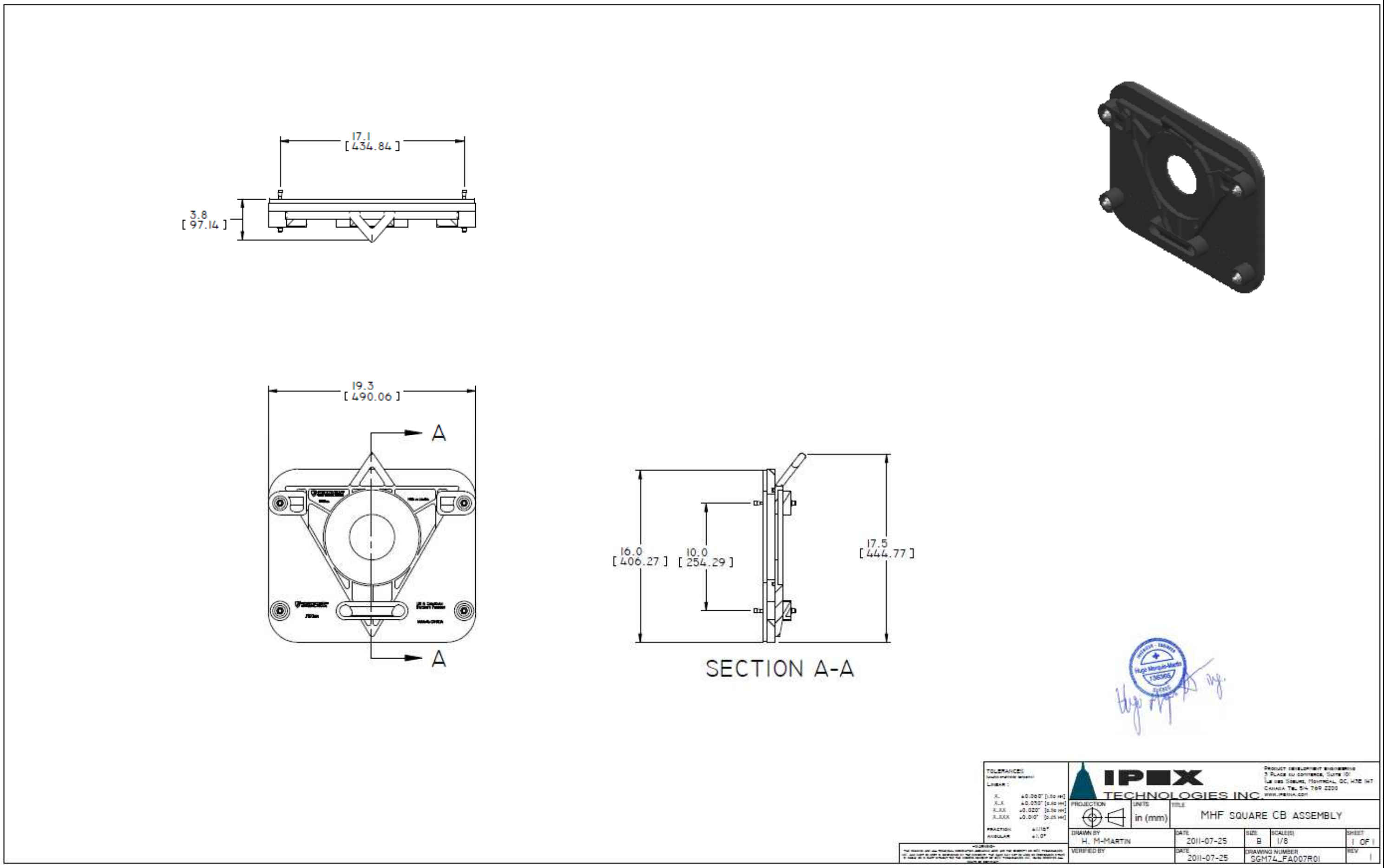
Project Name: 1104 Halton Terrace

IPEX

<u>Tempest LMF ICD Sq</u> Shop Drawing

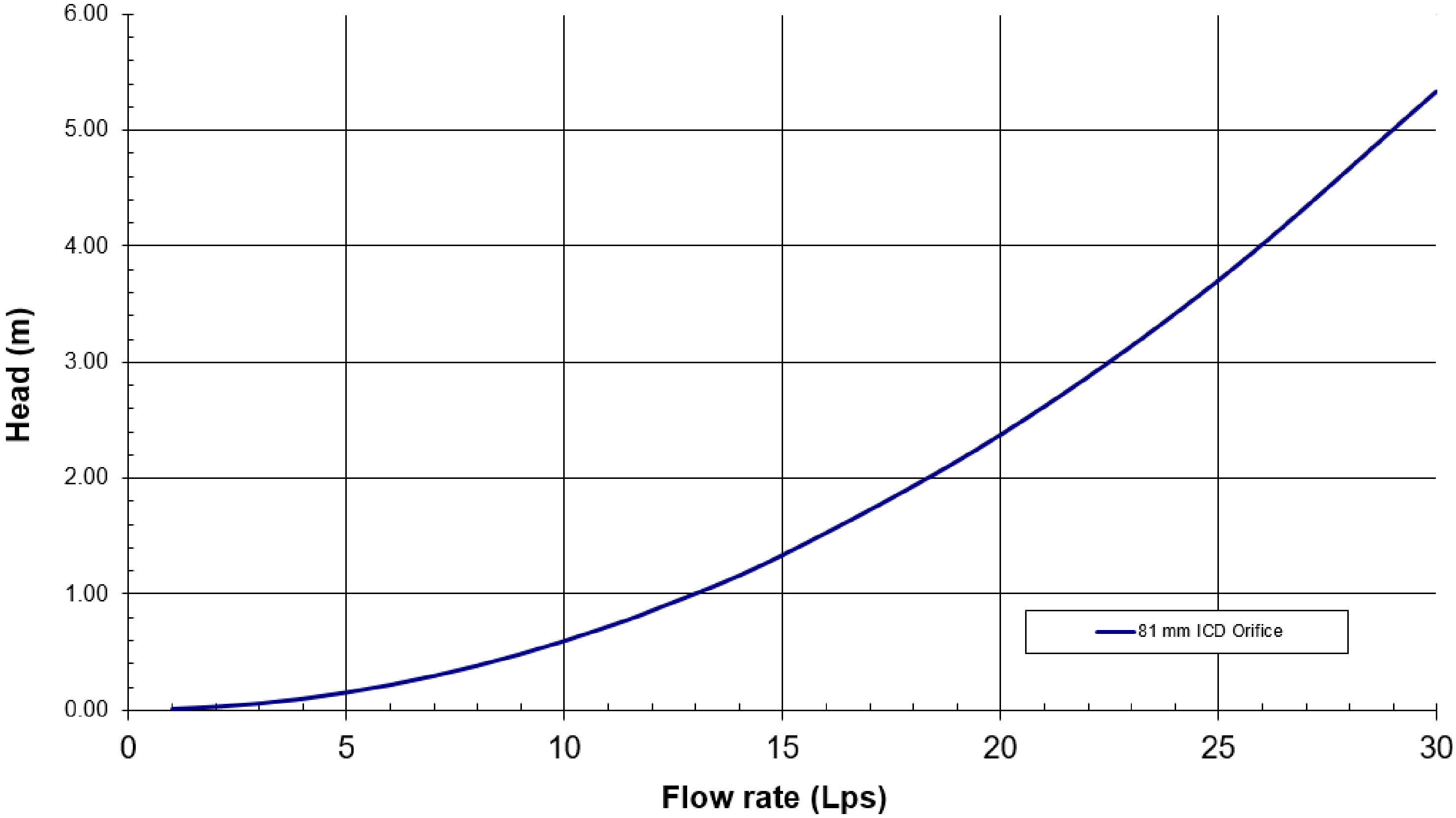


Tempest MHF ICD Sq Shop Drawing



Tempest MHF ICD Flow Curve

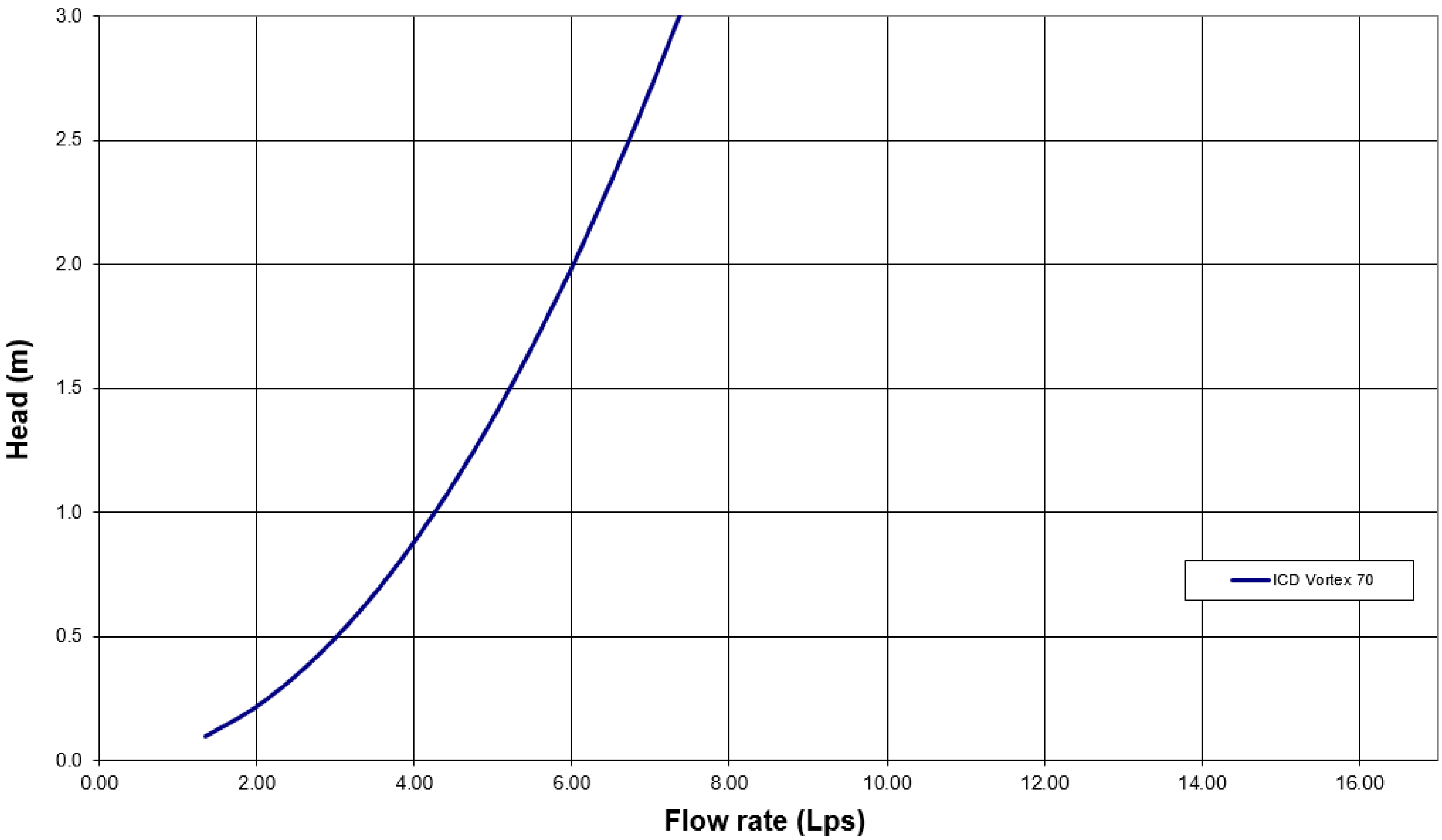
Flow: 13.7 L/s
Head: 1.11 m
CB01



IPEX

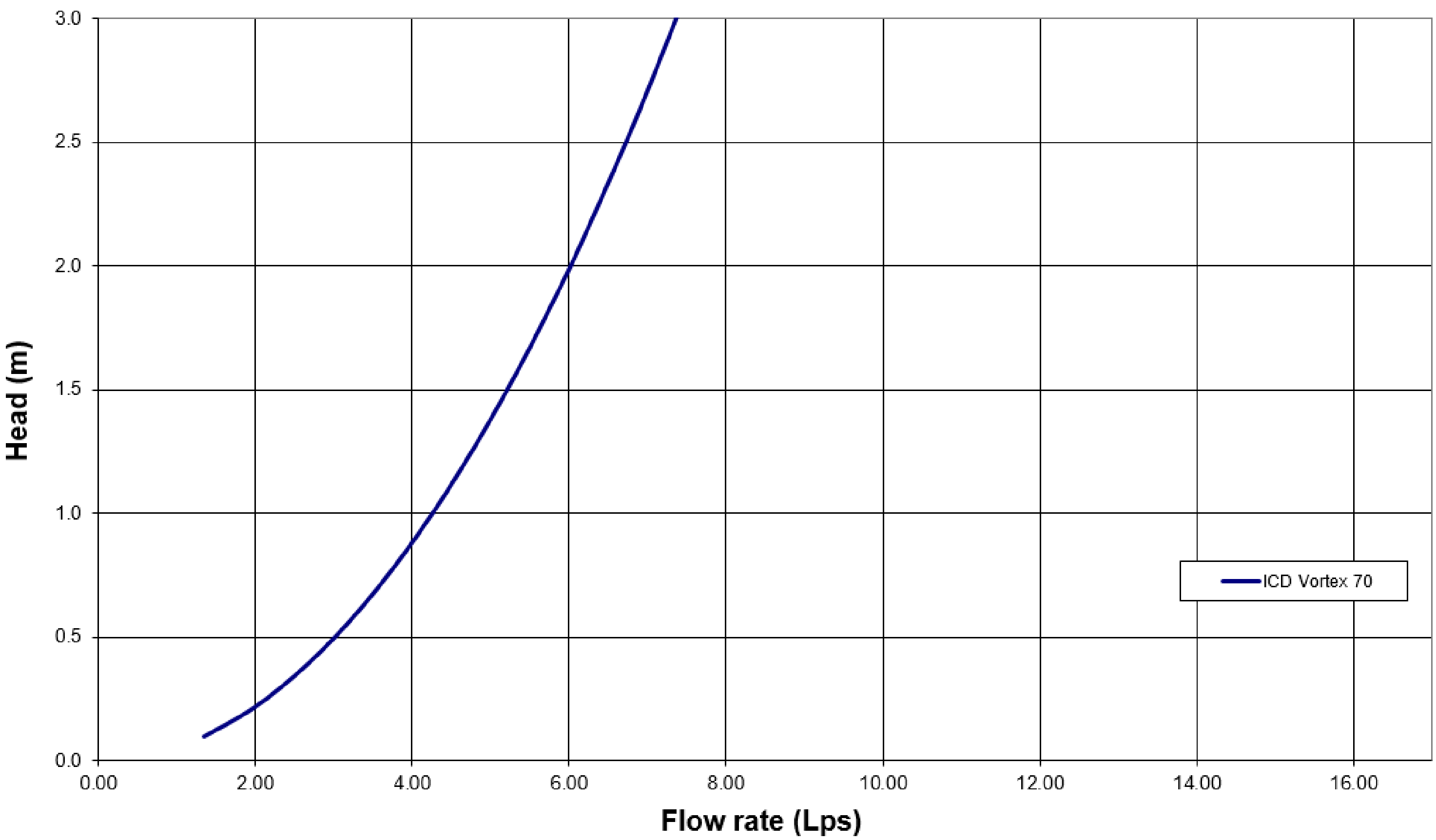
Tempest LMF ICD Flow Curve

Flow: 6.0 L/s
Head: 1.99 m
CB02



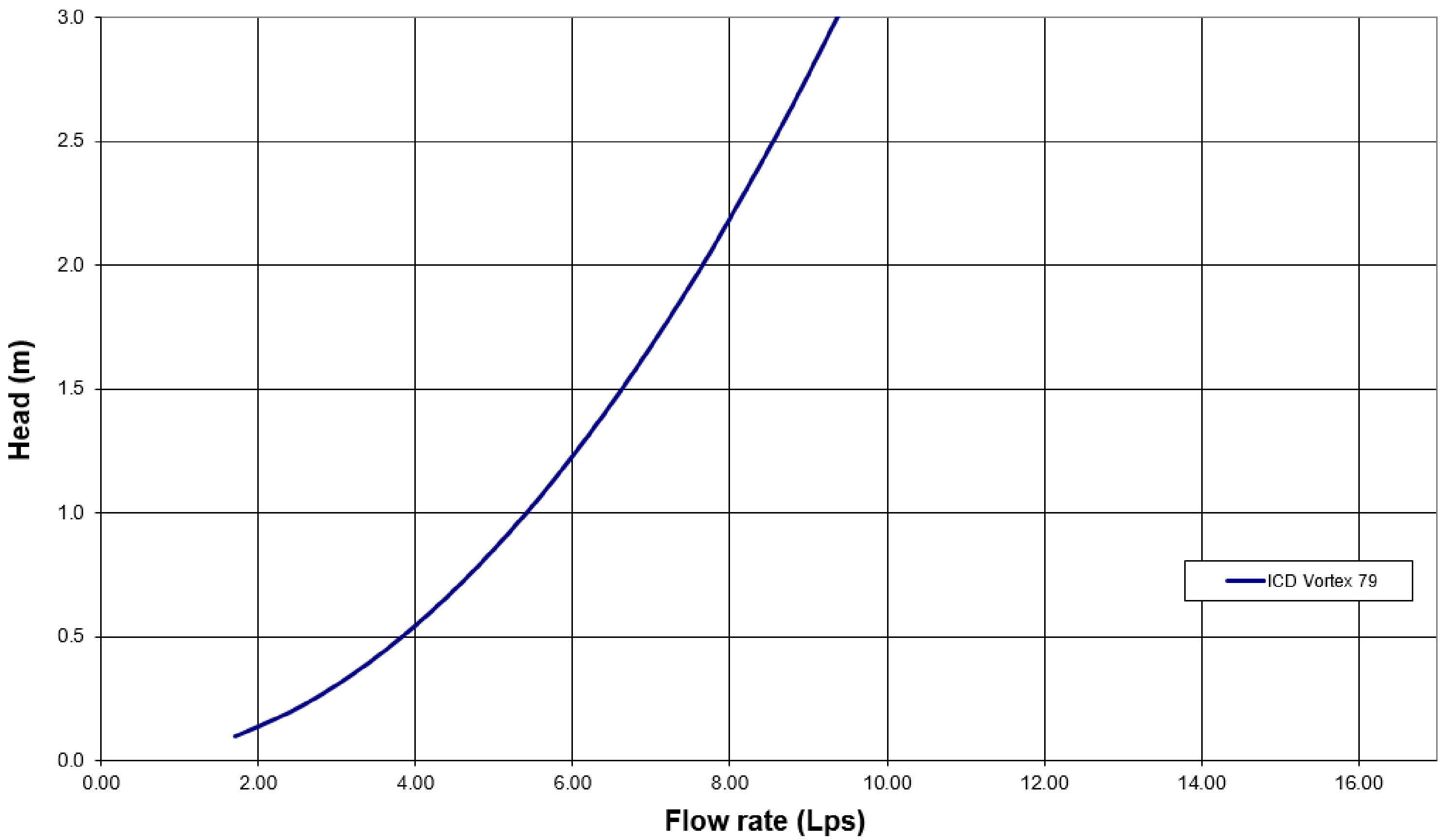
Tempest LMF ICD Flow Curve

Flow: 6.1 L/s
Head: 2.01 m
CB03



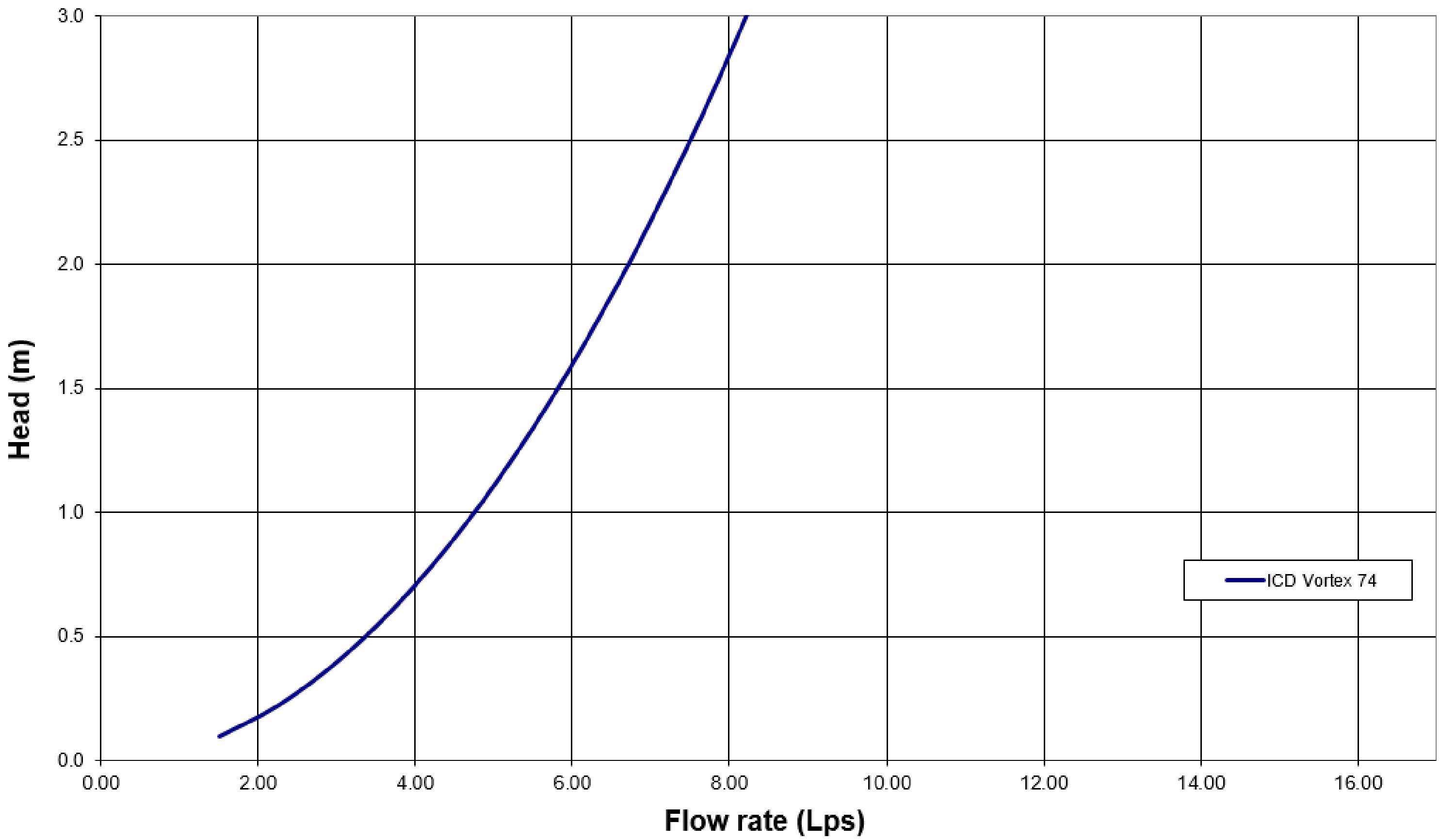
Tempest LMF ICD Flow Curve

Flow: 6.7 L/s
Head: 1.5 m
RY04



Tempest LMF ICD Flow Curve

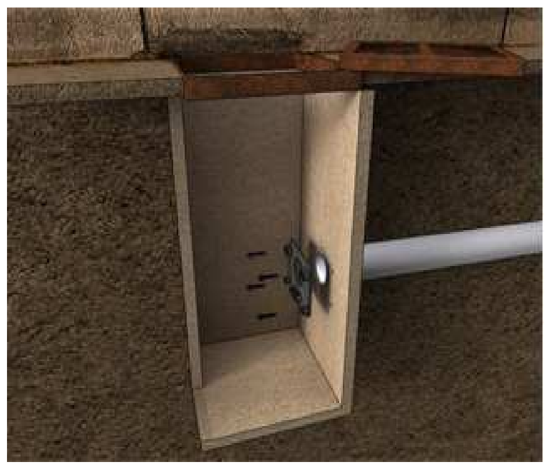
Flow: 6.1 L/s
Head: 1.67 m
RY03

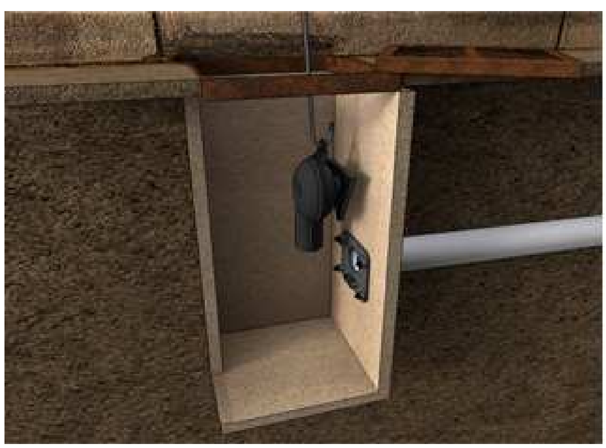


IPEX

Square CB Installation Notes:

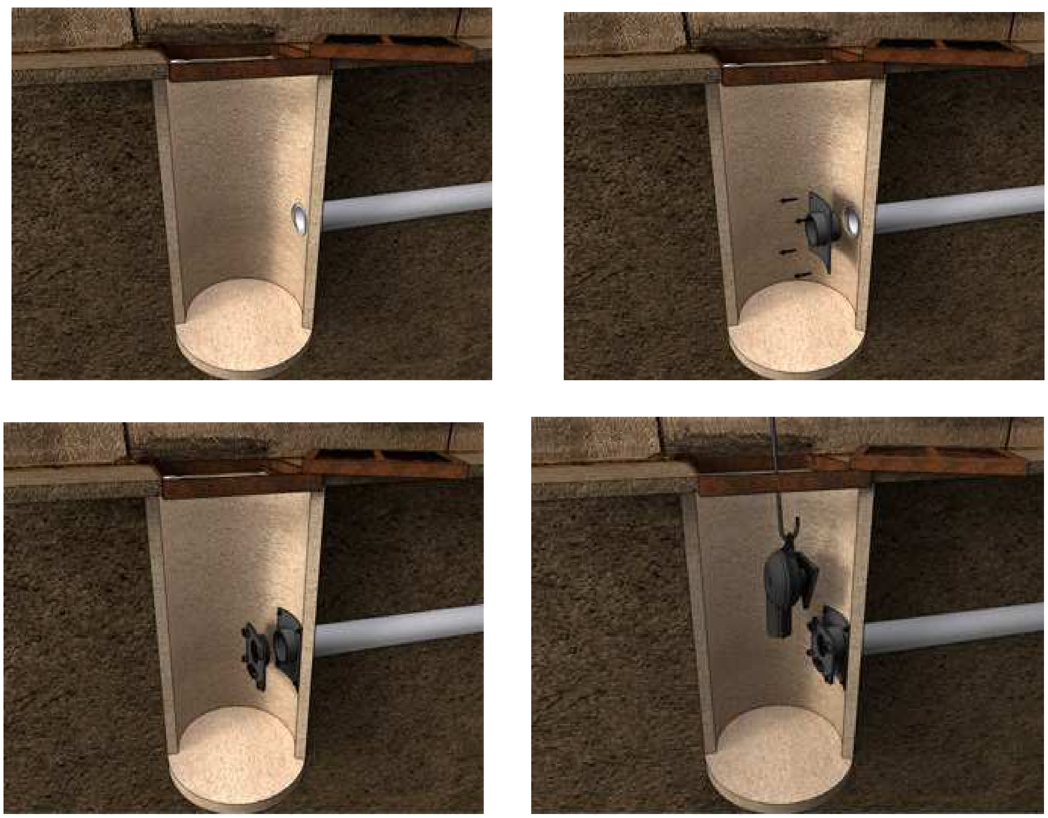
1. Materials and tooling verification:
   - Tooling: impact drill, 3/8'' concrete bit, torque wrench for 9/16''nut, hand hammer, level, and marker.
   - Material: (4) concrete anchor 3/8x3-1/2, (4) washers, (4) nuts
2. Use the mounting wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8'' concrete bit to make the four holes at a minimum of 1-1/2'' depth up to 2-1/2''. Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Put the nuts on the top of the anchors to protect the threads when you will hit the anchors with the hammer. Remove the nuts on the ends of the anchors
5. Install the wall mounting plate on the anchors and screw the nut in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the wall mounting plate and the catch basin wall.
6. From ground above using a reach bar, lower the device by hooking the end of the reach bar to the handle of the LMF device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the wall mounting plate and has created a seal.





Round CB Installation Notes: (Refer to square install notes above for steps 1 , 3, & 4)

2. Use spigot catch basin wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
5. Install the CB spigot wall plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lb-ft). There should be no gap between the CB spigot wall plate and the catch basin wall.
6. Apply solvent cement on the hub of the universal mounting plate and the spigot of the spigot CB wall plate. Slide the hub over the spigot. Make sure the universal mounting plate is at the horizontal and its hub is completely inserted onto the spigot. Normally, the corners of the universal mounting plate hub adapter should touch the catch basin wall.
7. From ground above using a reach bar, lower the ICD device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered into the mounting plate and has created a seal.



CAUTION/WARNING/DISCLAIM:

- Verify that the inlet(s) pipe(s) is not protruding into the catch basin. If it is, cut it back so that the inlet pipe is flush with the catch basin wall.
- Any required cement in the installation must be approved for PVC.
- The solvent cement should not be used below 0°C (32°F) or in a high humidity environment. Please refer to the IPEX solvent cement guide to confirm required curing times or attend the IPEX **Online Solvent Cement Training Course**.
- Call your IPEX representative for more information or if you have any questions about our products.

IPEX TEMPEST Inlet Control Devices Technical Specification

General

Inlet control devices (ICD's) are designed to provide flow control at a specified rate for a given water head level and also provide odour and floatable control where specified. All ICD's will be IPEX Tempest or approved equal.

All devices shall be removable from a universal mounting plate. An operator from street level using only a T-bar with a hook will be able to retrieve the device while leaving the universal mounting plate secured to the catch basin wall face. The removal of the TEMPEST devices listed above must not require any unbolting or special manipulation or any special tools.

High Flow (HF) Sump devices will consist of a removable threaded cap which can be accessible from street level with out entry into the catchbasin (CB). The removal of the threaded cap shall not require any special tools other than the operator's hand.

ICD's must have no moving parts.

Materials

ICD's are to be manufactured from Polyvinyl Chloride (PVC) or Polyurethane material, designed to be durable enough to withstand multiple freeze-thaw cycles and exposure to harsh elements.

The inner ring seal will be manufactured using a Buna or Nitrile material with hardness between Duro 50 and Duro 70.

The wall seal is to be comprised of a 3/8" thick Neoprene Closed Cell Sponge gasket which is attached to the back of the wall plate.

All hardware will be made from 304 stainless steel.

Dimensioning

The Low Medium Flow (LMF), High Flow (HF) and the High Flow (HF) Sump shall allow for a minimum outlet pipe diameter of 200mm with a 600mm deep Catch Basin sump.

Installation

Contractor shall be responsible for securing, supporting and connecting the ICD's to the existing influent pipe and catchbasin/manhole structure as specified and designed by the Engineer.

StormTech SC-740 Chamber

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots thus maximizing land usage for commercial and municipal applications.

StormTech®
Detention • Retention • Recharge
Subsurface Stormwater Management℠

StormTech SC-740 Chamber
(not to scale)

Nominal Chamber Specifications

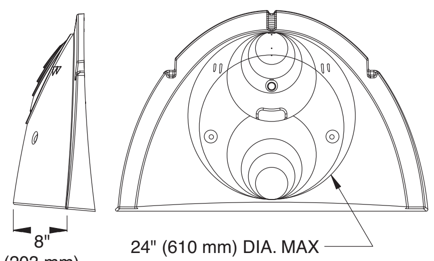
Size (L x W x H)
85.4" x 51.0" x 30.0"
(2170 x 1295 x 762 mm)

Chamber Storage
45.9 ft³ (1.30 m³)

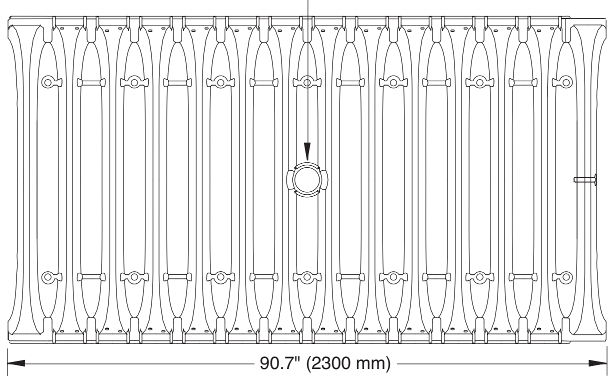
Minimum Installed Storage*
74.9 ft³ (2.12 m³)

Weight
74.0 lbs (33.6 kg)

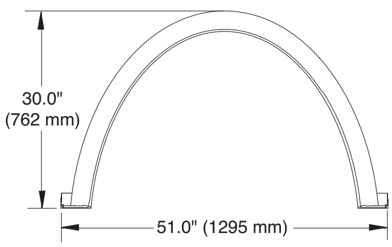
Shipping
30 chambers/pallet
60 end caps/pallet
12 pallets/truck

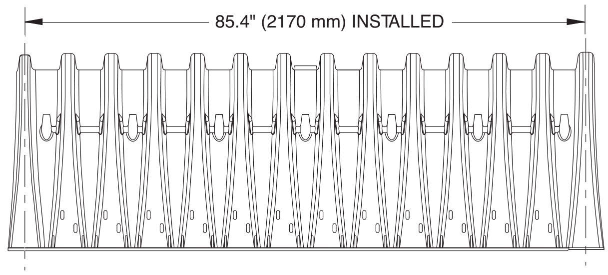


SC-740 End Cap

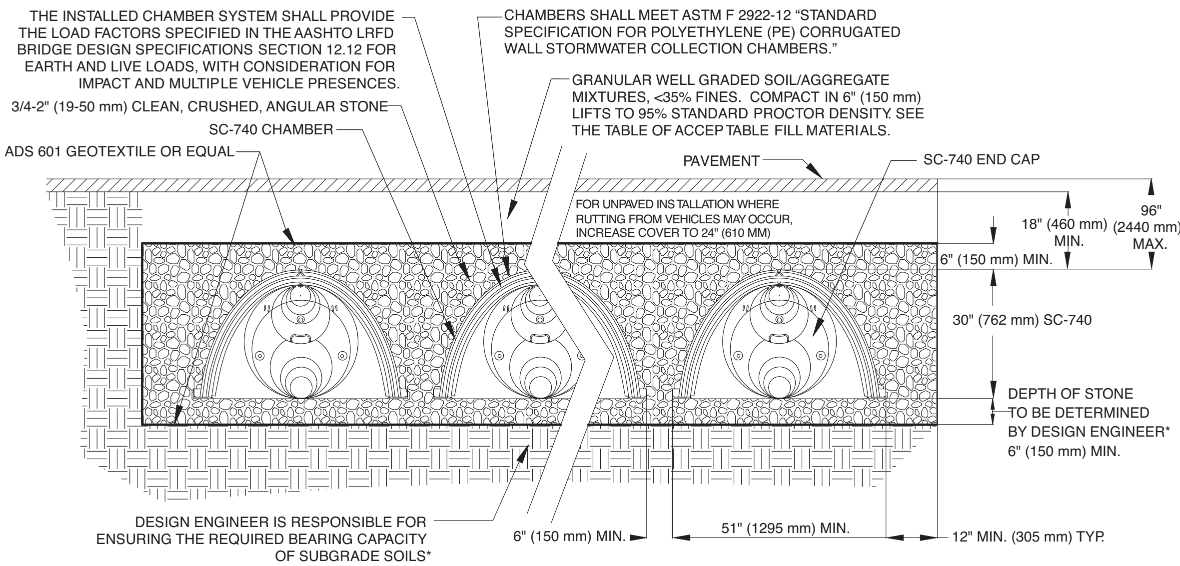


SC-740 Chamber





Typical Cross Section Detail
(not to scale)



THIS CROSS SECTION DETAILS THE REQUIREMENTS NECESSARY TO SATISFY THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS SECTION 12.12 FOR EARTH AND LIVE LOADS USING STORMTECH CHAMBERS

MADE IN THE U.S.A.

SC-740 Cumulative Storage Volumes Per Chamber

Assumes 40% Stone Porosity. Calculations are Based Upon a 6" (152 mm) Stone Base Under the Chambers.

Depth of Water in System Inches (mm)	Cumulative Chamber Storage Ft³ (m³)	Total System Cumulative Storage Ft³ (m³)
42 (1067)	↑ 45.90 (1.300)	74.90 (2.121)
41 (1041)	45.90 (1.300)	73.77 (2.089)
40 (1016)	Stone 45.90 (1.300)	72.64 (2.057)
39 (991)	Cover 45.90 (1.300)	71.52 (2.025)
38 (965)	45.90 (1.300)	70.39 (1.993)
37 (948)	↓ 45.90 (1.300)	69.26 (1.961)
36 (914)	45.90 (1.300)	68.14 (1.929)
35 (889)	45.85 (1.298)	66.98 (1.897)
34 (864)	45.69 (1.294)	65.75 (1.862)
33 (838)	45.41 (1.286)	64.46 (1.825)
32 (813)	44.81 (1.269)	62.97 (1.783)
31 (787)	44.01 (1.246)	61.36 (1.737)
30 (762)	43.06 (1.219)	59.66 (1.689)
29 (737)	41.98 (1.189)	57.89 (1.639)
28 (711)	40.80 (1.155)	56.05 (1.587)
27 (686)	39.54 (1.120)	54.17 (1.534)
26 (660)	38.18 (1.081)	52.23 (1.479)
25 (635)	36.74 (1.040)	50.23 (1.422)
24 (610)	35.22 (0.977)	48.19 (1.365)
23 (584)	33.64 (0.953)	46.11 (1.306)
22 (559)	31.99 (0.906)	44.00 (1.246)
21 (533)	30.29 (0.858)	41.85 (1.185)
20 (508)	28.54 (0.808)	39.67 (1.123)
19 (483)	26.74 (0.757)	37.47 (1.061)
18 (457)	24.89 (0.705)	35.23 (0.997)
17 (432)	23.00 (0.651)	32.96 (0.939)
16 (406)	21.06 (0.596)	30.68 (0.869)
15 (381)	19.09 (0.541)	28.36 (0.803)
14 (356)	17.08 (0.484)	26.03 (0.737)
13 (330)	15.04 (0.426)	23.68 (0.670)
12 (305)	12.97 (0.367)	21.31 (0.608)
11 (279)	10.87 (0.309)	18.92 (0.535)
10 (254)	8.74 (0.247)	16.51 (0.468)
9 (229)	6.58 (0.186)	14.09 (0.399)
8 (203)	4.41 (0.125)	11.66 (0.330)
7 (178)	2.21 (0.063)	9.21 (0.264)
6 (152)	↑ 0	6.76 (0.191)
5 (127)	0	5.63 (0.160)
4 (102)	Stone Foundation 0	4.51 (0.125)
3 (76)	0	3.38 (0.095)
2 (51)	0	2.25 (0.064)
1 (25)	↓ 0	1.13 (0.032)

Note: Add 1.13 cu. ft. (0.032 m³) of storage for each additional inch (25 mm) of stone foundation.

Storage Volume Per Chamber

	Bare Chamber Storage	Chamber and Stone Stone Foundation Depth in. (mm)		
	ft³ (m³)	6 (150)	12 (305)	18 (460)
StormTech SC-740	45.9 (1.3)	74.9 (2.1)	81.7 (2.3)	88.4 (2.5)

Note: Storage volumes are in cubic feet per chamber. Assumes 40% porosity for the stone plus the chamber volume.

Amount of Stone Per Chamber

	Stone Foundation Depth		
ENGLISH TONS (CUBIC YARDS)	**6"**	**12"**	**18"**
StormTech SC-740	3.8 (2.8 yd³)	4.6 (3.3 yd³)	5.5 (3.9 yd³)
METRIC KILOGRAMS (METER³)	**150 mm**	**305 mm**	**460 mm**
StormTech SC-740	3450 (2.1 m³)	4170 (2.5 m³)	4490 (3.0 m³)

Note: Assumes 6" (150 mm) of stone above, and between chambers.

Volume of Excavation Per Chamber

	Stone Foundation Depth		
	6" (150 mm)	**12" (305 mm)**	**18" (460 mm)**
StormTech SC-740	5.5 (4.2)	6.2 (4.7)	6.8 (5.2)

Note: Volumes are in cubic yards (cubic meters) per chamber. Assumes 6" (150 mm) of separation between chamber rows and 18" (460 mm) of cover. The volume of excavation will vary as the depth of the cover increases.

STANDARD LIMITED WARRANTY OF STORMTECH LLC ("STORMTECH"): PRODUCTS

(A) This Limited Warranty applies solely to the StormTech chambers and endplates manufactured by StormTech and sold to the original purchaser (the "Purchaser"). The chambers and endplates are collectively referred to as the "Products."

(B) The structural integrity of the Products, when installed strictly in accordance with StormTech's written installation instructions at the time of installation, are warranted to the Purchaser against defective materials and workmanship for one (1) year from the date of purchase. Should a defect appear in the Limited Warranty period, the Purchaser shall provide StormTech with written notice of the alleged defect at StormTech's corporate headquarters within ten (10) days of the discovery of the defect. The notice shall describe the alleged defect in reasonable detail. StormTech agrees to supply replacements for those Products determined by StormTech to be defective and covered by this Limited Warranty. The supply of replacement products is the sole remedy of the Purchaser for breaches of this Limited Warranty. StormTech's liability specifically excludes the cost of removal and/or installation of the Products.

(C) **THIS LIMITED WARRANTY IS EXCLUSIVE. THERE ARE NO OTHER WARRANTIES WITH RESPECT TO THE PRODUCTS, INCLUDING NO IMPLIED WARRANTIES OF MERCHANT-ABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE.**

(D) This Limited Warranty only applies to the Products when the Products are installed in a single layer. **UNDER NO CIRCUMSTANCES, SHALL THE PRODUCTS BE INSTALLED IN A MULTI-LAYER CONFIGURATION.**

(E) No representative of StormTech has the authority to change this Limited Warranty in any manner or to extend this Limited Warranty. This Limited Warranty does not apply to any person other than to the Purchaser.

(F) Under no circumstances shall StormTech be liable to the Purchaser or to any third party for product liability claims; claims arising from the design, shipment, or installation of the Products, or the cost of other goods or services related to the purchase and installation of the Products. For this Limited Warranty to apply, the Products must be installed in accordance with all site conditions required by state and local codes; all other applicable laws; and StormTech's written installation instructions.

(G) **THE LIMITED WARRANTY DOES NOT EXTEND TO INCIDENTAL, CONSEQUENTIAL, SPECIAL OR INDIRECT DAMAGES. STORMTECH SHALL NOT BE LIABLE FOR PENALTIES OR LIQUIDATED DAMAGES, INCLUDING LOSS OF PRODUCTION AND PROFITS; LABOR AND MATERIALS; OVERHEAD COSTS; OR OTHER LOSS OR EXPENSE INCURRED BY THE PURCHASER OR ANY THIRD PARTY. SPECIFICALLY EXCLUDED FROM LIMITED WARRANTY COVERAGE ARE DAMAGE TO THE PRODUCTS ARISING FROM ORDINARY WEAR AND TEAR; ALTERATION, ACCIDENT, MISUSE, ABUSE OR NEGLECT; THE PRODUCTS BEING SUBJECTED TO VEHICLE TRAFFIC OR OTHER CONDITIONS WHICH ARE NOT PERMITTED BY STORMTECH'S WRITTEN SPECIFICATIONS OR INSTALLATION INSTRUCTIONS; FAILURE TO MAINTAIN THE MINIMUM GROUND COVERS SET FORTH IN THE INSTALLATION INSTRUCTIONS; THE PLACEMENT OF IMPROPER MATERIALS INTO THE PRODUCTS; FAILURE OF THE PRODUCTS DUE TO IMPROPER SITING OR IMPROPER SIZING; OR ANY OTHER EVENT NOT CAUSED BY STORMTECH. THIS LIMITED WARRANTY REPRESENTS STORMTECH'S SOLE LIABILITY TO THE PURCHASER FOR CLAIMS RELATED TO THE PRODUCTS, WHETHER THE CLAIM IS BASED UPON CONTRACT, TORT, OR OTHER LEGAL THEORY.**

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860.529.8188 | 888.892.2694 | fax 866.328.8401 | fax 860-529-8040 | www.stormtech.com

User Inputs

Chamber Model:	SC-740
Outlet Control Structure:	No
Project Name:	1104 Halton Terrace
Engineer:	Lucas Wilson
Project Location:	
Measurement Type:	Metric
Required Storage Volume:	8.50 cubic meters.
Stone Porosity:	40%
Stone Foundation Depth:	152 mm.
Stone Above Chambers:	152 mm.
Average Cover Over Chambers:	457 mm.
Design Constraint Dimensions:	(2.00 m. x 8.00 m.)

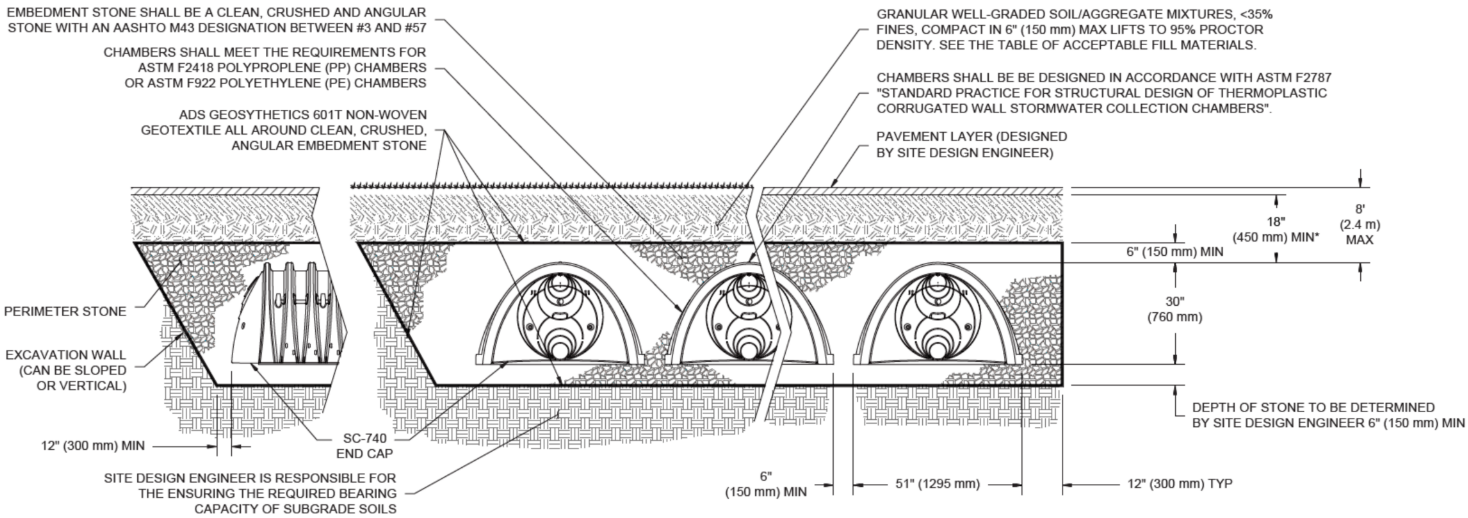
Results

System Volume and Bed Size

Installed Storage Volume:	8.52 cubic meters.
Storage Volume Per Chamber:	1.30 cubic meters.
Number Of Chambers Required:	3
Number Of End Caps Required:	2
Chamber Rows:	1
Maximum Length:	7.60 m.
Maximum Width:	1.91 m.
Approx. Bed Size Required:	14.49 square meters.

System Components

Amount Of Stone Required:	11.56 cubic meters
Volume Of Excavation (Not Including Fill):	15.45 cubic meters
Non-woven Geotextile Required (excluding Isolator Row):	59.12 square meters
Non-woven Geotextile Required (Isolator Row):	20.47 square meters
Total Non-woven Geotextile Required:	79.58 square meters
Woven Geotextile Required (excluding Isolator Row):	0.00 square meters
Woven Geotextile Required (Isolator Row):	12.79 square meters
Total Woven Geotextile Required:	12.79 square meters



*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 24" (600 mm).

User Inputs

Chamber Model:	SC-740
Outlet Control Structure:	No
Project Name:	1104 Halton Terrace
Engineer:	Lucas Wilson
Project Location:	
Measurement Type:	Metric
Required Storage Volume:	18.00 cubic meters.
Stone Porosity:	40%
Stone Foundation Depth:	152 mm.
Stone Above Chambers:	152 mm.
Average Cover Over Chambers:	457 mm.
Design Constraint Dimensions:	(5.00 m. x 7.00 m.)

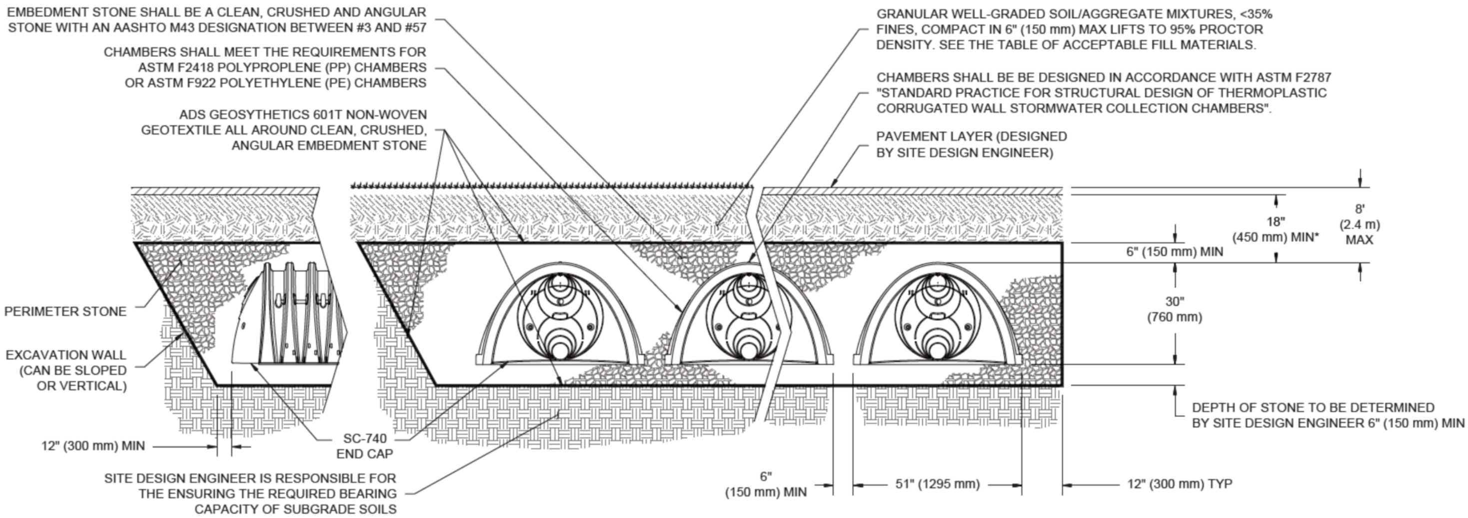
Results

System Volume and Bed Size

Installed Storage Volume:	18.27 cubic meters.
Storage Volume Per Chamber:	1.30 cubic meters.
Number Of Chambers Required:	6
Number Of End Caps Required:	6
Chamber Rows:	3
Maximum Length:	6.63 m.
Maximum Width:	4.80 m.
Approx. Bed Size Required:	31.85 square meters.

System Components

Amount Of Stone Required:	26.17 cubic meters
Volume Of Excavation (Not Including Fill):	33.97 cubic meters
Non-woven Geotextile Required (excluding Isolator Row):	105.71 square meters
Non-woven Geotextile Required (Isolator Row):	14.12 square meters
Total Non-woven Geotextile Required:	119.83 square meters
Woven Geotextile Required (excluding Isolator Row):	13.24 square meters
Woven Geotextile Required (Isolator Row):	8.83 square meters
Total Woven Geotextile Required:	22.06 square meters



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User Inputs

Chamber Model:	SC-740
Outlet Control Structure:	Yes
Project Name:	1104 Halton Terrace
Engineer:	Lucas Wilson
Project Location:	
Measurement Type:	Metric
Required Storage Volume:	65.00 cubic meters.
Stone Porosity:	40%
Stone Foundation Depth:	152 mm.
Stone Above Chambers:	152 mm.
Average Cover Over Chambers:	457 mm.
Design Constraint Dimensions:	(5.00 m. x 22.00 m.)

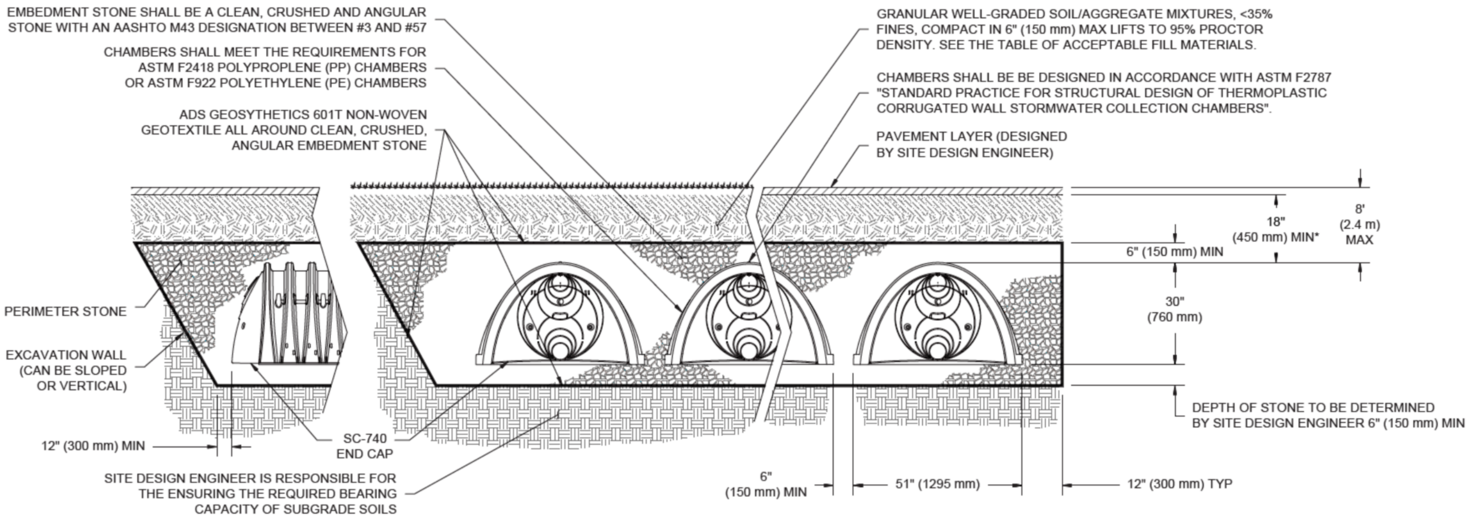
Results

System Volume and Bed Size

Installed Storage Volume:	67.45 cubic meters.
Storage Volume Per Chamber:	1.30 cubic meters.
Number Of Chambers Required:	27
Number Of End Caps Required:	6
Chamber Rows:	3
Maximum Length:	21.82 m.
Maximum Width:	4.98 m.
Approx. Bed Size Required:	108.73 square meters.

System Components

Amount Of Stone Required:	80.90 cubic meters
Volume Of Excavation (Not Including Fill):	115.99 cubic meters
Non-woven Geotextile Required (excluding Isolator Row):	329.57 square meters
Non-woven Geotextile Required (Isolator Row):	58.55 square meters
Total Non-woven Geotextile Required:	388.12 square meters
Woven Geotextile Required (excluding Isolator Row):	13.24 square meters
Woven Geotextile Required (Isolator Row):	36.59 square meters
Total Woven Geotextile Required:	49.83 square meters



*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 24" (600 mm).

1104 Halton Terrace (119024)
PCSWMM Model Output
100yr 3-hour Chicago Storm

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)

****
Element Count
****

Number of rain gages 1
Number of subcatchments ... 13
Number of nodes 34
Number of links 39
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
RG-1	C3h-100yr	INTENSITY	10 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
A-01	0.09	43.00	81.40	1.5000	RG-1	CB02
A-02	0.10	52.50	45.70	2.5000	RG-1	RY04
A-03	0.07	45.33	88.20	1.5000	RG-1	CB03
A-04	0.12	57.50	47.80	1.5000	RG-1	CB01
A-05	0.01	26.00	0.00	1.5000	RG-1	LC02
A-06	0.01	28.00	0.00	1.5000	RG-1	RY03
A-07	0.02	32.00	0.00	1.5000	RG-1	RY02
A-08	0.02	44.00	0.00	1.5000	RG-1	LC01
A-09	0.02	11.33	82.40	6.5000	RG-1	RY04
A-10	0.22	62.86	100.00	1.5000	RG-1	CB03
B-01	0.01	10.00	16.70	6.0000	RG-1	OF1
B-02	0.01	12.00	0.00	33.3300	RG-1	OF2
B-03	0.03	10.40	0.00	2.7000	RG-1	OF3

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
HP01	JUNCTION	83.86	1.00	0.0	
HP02	JUNCTION	83.38	1.00	0.0	
HP-CB02	JUNCTION	85.25	1.00	0.0	
HP-CB03	JUNCTION	85.35	1.00	0.0	
HP-LC02	JUNCTION	83.43	1.00	0.0	
HP-RY03	JUNCTION	83.30	1.00	0.0	
HP-RY04	JUNCTION	83.95	1.00	0.0	
HP-RY05	JUNCTION	83.80	1.00	0.0	
HP-RY06	JUNCTION	83.80	1.00	0.0	
HP-RY07	JUNCTION	83.85	1.00	0.0	
Ex_1500	OUTFALL	80.11	1.37	0.0	
Ex_375	OUTFALL	81.13	0.00	0.0	
HP-CB01	OUTFALL	83.45	1.00	0.0	
HP-LC01	OUTFALL	83.28	1.00	0.0	
HP-RY02	OUTFALL	83.28	1.00	0.0	
OF1	OUTFALL	0.00	0.00	0.0	
OF2	OUTFALL	0.00	0.00	0.0	
OF3	OUTFALL	83.16	1.00	0.0	
CB01	STORAGE	82.32	2.00	0.0	
CB02	STORAGE	83.25	2.70	0.0	
CB03	STORAGE	83.35	2.70	0.0	
LC01	STORAGE	82.13	2.00	0.0	
LC02	STORAGE	82.13	2.00	0.0	
MH02	STORAGE	81.26	2.86	0.0	
MH04	STORAGE	81.38	3.87	0.0	
MH06	STORAGE	81.42	3.86	0.0	
MH08	STORAGE	81.69	3.42	0.0	
RY01	STORAGE	81.98	2.56	0.0	
RY02	STORAGE	81.92	2.21	0.0	
RY03	STORAGE	81.54	2.59	0.0	
RY04	STORAGE	82.31	2.34	0.0	
RY05	STORAGE	82.40	2.25	0.0	
RY06	STORAGE	82.53	2.12	0.0	
RY07	STORAGE	82.60	2.00	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	RY06	HP-RY06	CONDUIT	3.0	-5.0063	0.0350
C2	HP-RY06	RY07	CONDUIT	3.0	6.6815	0.0350
C3	RY05	RY04	CONDUIT	9.4	0.9575	0.0130
C4	RY07	HP-RY07	CONDUIT	3.0	-8.3624	0.0350
C5	HP-RY07	RY04	CONDUIT	3.0	6.6815	0.0350
C6	RY05	HP-RY05	CONDUIT	3.0	-5.0063	0.0350
C7	HP-RY05	RY04	CONDUIT	3.0	5.0063	0.0350
HP1-LC02	HP01	LC02	CONDUIT	19.7	3.7081	0.0350
LC01-RY01	LC01	RY01	CONDUIT	27.6	0.5073	0.0130
LC03-LC02	LC02	RY03	CONDUIT	26.2	0.4962	0.0130
MC02-RY02	RY02	RY03	CONDUIT	16.3	0.4908	0.0130
MH02-Ex_1500	MH02	Ex_1500	CONDUIT	36.9	0.4065	0.0130
MH04-MH02	MH04	MH02	CONDUIT	27.3	0.4029	0.0130
MH06-MH04	MH06	MH04	CONDUIT	10.5	0.3810	0.0130
MH08-MH06	MH08	MH06	CONDUIT	54.9	0.4007	0.0130
MS-CB01	CB01	HP-CB01	CONDUIT	3.0	-4.3374	0.0150
MS-CB02(1)	CB02	HP-CB02	CONDUIT	3.0	-10.0504	0.0150
MS-CB02(2)	HP-CB02	CB01	CONDUIT	3.0	84.0315	0.0150
MS-CB03(1)	CB03	HP-CB03	CONDUIT	3.0	-10.0504	0.0150
MS-CB03(2)	HP-CB03	CB02	CONDUIT	3.0	13.4535	0.0150
MS-HP02	HP02	LC01	CONDUIT	16.6	1.5062	0.0350
MS-LC01	LC01	HP-LC01	CONDUIT	3.0	-5.0063	0.0350
MS-LC02(1)	LC02	HP-LC02	CONDUIT	6.6	-4.5502	0.0350
MS-LC02(2)	HP-LC02	RY03	CONDUIT	20.0	1.5002	0.0350
MS-RY01(1)	RY01	LC01	CONDUIT	27.6	1.4857	0.0350
MS-RY01(2)	RY01	RY02	CONDUIT	10.6	3.8708	0.0350
MS-RY02	RY02	HP-RY02	CONDUIT	3.0	-5.0063	0.0350
MS-RY03(1)	RY03	HP-RY03	CONDUIT	6.6	-2.5766	0.0350
MS-RY03(2)	HP-RY03	RY02	CONDUIT	10.0	1.7002	0.0350
MS-RY04(1)	RY04	HP-RY04	CONDUIT	3.0	-10.0504	0.0350
MS-RY04(2)	HP-RY04	OF3	CONDUIT	28.7	2.7537	0.0350
RY01-RY02	RY01	RY02	CONDUIT	9.9	0.5051	0.0130
RY06-RY05	RY06	RY05	CONDUIT	12.7	1.0237	0.0130
RY07-RY06	RY07	RY06	CONDUIT	6.7	1.0448	0.0130
O-CB01	CB01	MH02	ORIFICE			
O-CB02	CB02	MH08	ORIFICE			
O-CB03	CB03	MH08	ORIFICE			
O-RY03	RY03	Ex_375	ORIFICE			
O-RY04	RY04	MH08	ORIFICE			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	RECT_OPEN	1.00	3.00	0.60	3.00	1	13643.85
C2	RECT_OPEN	1.00	3.00	0.60	3.00	1	15762.25
C3	CIRCULAR	0.25	0.05	0.06	0.25	1	58.19
C4	RECT_OPEN	1.00	3.00	0.60	3.00	1	17633.81
C5	RECT_OPEN	1.00	3.00	0.60	3.00	1	15762.25
C6	RECT_OPEN	1.00	3.00	0.60	3.00	1	13643.85
C7	RECT_OPEN	1.00	3.00	0.60	3.00	1	13643.85
HP1-LC02	TRAPEZOIDAL	1.00	3.15	0.49	6.15	1	10721.28
LC01-RY01	CIRCULAR	0.25	0.05	0.06	0.25	1	42.36
LC03-LC02	CIRCULAR	0.25	0.05	0.06	0.25	1	41.89
MC02-RY02	CIRCULAR	0.25	0.05	0.06	0.25	1	41.66
MH02-Ex_1500	CIRCULAR	0.38	0.11	0.09	0.38	1	111.79
MH04-MH02	CIRCULAR	0.38	0.11	0.09	0.38	1	111.30
MH06-MH04	CIRCULAR	0.38	0.11	0.09	0.38	1	108.22
MH08-MH06	CIRCULAR	0.38	0.11	0.09	0.38	1	111.00
MS-CB01	RECT_OPEN	1.00	3.00	0.60	3.00	1	29632.76
MS-CB02(1)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-CB02(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	130430.14
MS-CB03(1)	RECT_OPEN	1.00	3.00	0.60	3.00	1	45107.44
MS-CB03(2)	RECT_OPEN	1.00	3.00	0.60	3.00	1	52188.39
MS-HP02	TRAPEZOIDAL	1.00	3.15	0.49	6.15	1	6832.97
MS-LC01	TRAPEZOIDAL	1.00	3.15	0.49	6.15	1	12457.35
MS-LC02(1)	TRAPEZOIDAL	1.00	3.15	0.49	6.15	1	11876.33
MS-LC02(2)	TRAPEZOIDAL	1.00	3.15	0.49	6.15	1	6819.29
MS-RY01(1)	TRAPEZOIDAL	1.00	3.15	0.49	6.15	1	6786.26

```
MS-RY01(2)       TRAPEZOIDAL          1.00     3.15     0.49     6.15          1 10953.95
MS-RY02          TRAPEZOIDAL          1.00     3.15     0.49     6.15          1 12457.35
MS-RY03(1)       TRAPEZOIDAL          1.00     3.15     0.49     6.15          1  8937.04
MS-RY03(2)       TRAPEZOIDAL          1.00     3.15     0.49     6.15          1  7259.80
MS-RY04(1)       RECT_OPEN            1.00     3.00     0.60     3.00          1 19331.76
MS-RY04(2)       TRAPEZOIDAL          1.00    16.65     0.50    33.15          1 49703.74
RY01-RY02        CIRCULAR             0.25     0.05     0.06     0.25          1    42.26
RY06-RY05        CIRCULAR             0.25     0.05     0.06     0.25          1    60.17
RY07-RY06        CIRCULAR             0.25     0.05     0.06     0.25          1    60.79
```

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*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... HORTON
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 07/21/2021 00:00:00
Ending Date .............. 07/22/2021 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 4
Head Tolerance ........... 0.001524 m

**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.051        71.667
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.011        15.377
Surface Runoff ...........         0.040        56.581
Final Storage ............         0.000         0.570
Continuity Error (%) .....        -1.201

**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.040         0.404
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.002
External Outflow .........         0.041         0.406
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.002         0.023
Final Stored Volume ......         0.002         0.023
Continuity Error (%) .....        -0.183

*************************
Highest Continuity Errors
*************************
Node CB02 (-1.58%)

***************************
Time-Step Critical Elements
***************************
Link MS-CB03(1) (4.94%)

********************************
Highest Flow Instability Indexes
********************************
Link O-RY04 (34)
Link MS-CB03(2) (3)
Link MS-CB03(1) (3)
Link RY01-RY02 (2)
Link O-RY03 (2)

*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.69 sec
Average Time Step           :     4.81 sec
Maximum Time Step           :     5.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.01
Percent Not Converging      :     0.07
Time Step Frequencies       :
    5.000 -  3.155 sec      :    94.09 %
    3.155 -  1.991 sec      :     0.60 %
    1.991 -  1.256 sec      :     5.29 %
    1.256 -  0.792 sec      :     0.01 %
    0.792 -  0.500 sec      :     0.01 %

***************************
Subcatchment Runoff Summary
***************************
```

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
A-01	71.67	0.00	0.00	8.21	57.25	5.62	62.87	0.05	41.23	0.877
A-02	71.67	0.00	0.00	24.25	32.08	15.53	47.61	0.05	43.53	0.664
A-03	71.67	0.00	0.00	5.18	61.99	3.74	65.72	0.04	33.13	0.917
A-04	71.67	0.00	0.00	23.42	33.57	14.70	48.26	0.06	46.52	0.673
A-05	71.67	0.00	0.00	44.28	0.00	29.64	29.64	0.00	5.09	0.414
A-06	71.67	0.00	0.00	44.28	0.00	29.64	29.64	0.00	5.48	0.414
A-07	71.67	0.00	0.00	44.28	0.00	29.64	29.64	0.00	6.26	0.414
A-08	71.67	0.00	0.00	44.28	0.00	29.64	29.64	0.01	8.61	0.414
A-09	71.67	0.00	0.00	7.72	57.83	5.66	63.49	0.01	8.21	0.886
A-10	71.67	0.00	0.00	0.00	72.05	0.00	72.05	0.16	109.07	1.005
B-01	71.67	0.00	0.00	36.64	11.75	25.85	37.60	0.00	2.58	0.525
B-02	71.67	0.00	0.00	43.81	0.00	32.35	32.35	0.00	2.54	0.451
B-03	71.67	0.00	0.00	45.72	0.00	26.83	26.83	0.01	6.30	0.374

```
******************
Node Depth Summary
******************

---------------------------------------------------------------------------------
                                 Average  Maximum  Maximum  Time of Max    Reported
                                   Depth    Depth      HGL   Occurrence   Max Depth
Node                     Type     Meters   Meters   Meters  days hr:min      Meters
---------------------------------------------------------------------------------
```

HP01	JUNCTION	0.00	0.00	83.86	0	00:00	0.00
HP02	JUNCTION	0.00	0.00	83.38	0	00:00	0.00
HP-CB02	JUNCTION	0.00	0.00	85.25	0	00:00	0.00
HP-CB03	JUNCTION	0.00	0.01	85.36	0	01:22	0.01
HP-LC02	JUNCTION	0.00	0.00	83.43	0	00:00	0.00
HP-RY03	JUNCTION	0.00	0.00	83.30	0	00:00	0.00
HP-RY04	JUNCTION	0.00	0.00	83.95	0	00:00	0.00
HP-RY05	JUNCTION	0.00	0.01	83.81	0	01:31	0.01
HP-RY06	JUNCTION	0.00	0.01	83.81	0	01:30	0.01
HP-RY07	JUNCTION	0.00	0.00	83.85	0	00:00	0.00
Ex_1500	OUTFALL	2.21	2.21	82.32	0	00:00	2.21
Ex_375	OUTFALL	1.19	1.19	82.32	0	00:00	1.19
HP-CB01	OUTFALL	0.00	0.00	83.45	0	00:00	0.00
HP-LC01	OUTFALL	0.00	0.00	83.28	0	00:00	0.00
HP-RY02	OUTFALL	0.00	0.00	83.28	0	00:00	0.00
OF1	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
OF2	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
OF3	OUTFALL	0.00	0.00	83.16	0	00:00	0.00
CB01	STORAGE	0.07	1.11	83.43	0	01:21	1.11
CB02	STORAGE	0.34	1.99	85.24	0	01:55	1.99
CB03	STORAGE	0.58	2.01	85.36	0	01:22	2.01
LC01	STORAGE	0.24	1.08	83.21	0	01:21	1.08
LC02	STORAGE	0.24	1.08	83.21	0	01:21	1.08
MH02	STORAGE	1.06	1.08	82.34	0	01:14	1.08
MH04	STORAGE	0.94	0.96	82.34	0	01:14	0.96
MH06	STORAGE	0.90	0.92	82.34	0	01:14	0.92
MH08	STORAGE	0.63	0.66	82.35	0	01:13	0.66
RY01	STORAGE	0.39	1.23	83.21	0	01:20	1.23
RY02	STORAGE	0.45	1.29	83.21	0	01:20	1.29
RY03	STORAGE	0.83	1.67	83.21	0	01:21	1.67
RY04	STORAGE	0.20	1.50	83.81	0	01:31	1.50
RY05	STORAGE	0.18	1.41	83.81	0	01:32	1.41
RY06	STORAGE	0.16	1.28	83.81	0	01:30	1.28
RY07	STORAGE	0.15	1.21	83.81	0	01:31	1.21

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days	hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
HP01	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP02	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-CB02	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-CB03	JUNCTION	0.00	29.79	0	01:22	0	0.025	-3.099
HP-LC02	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-RY03	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-RY04	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-RY05	JUNCTION	0.00	2.91	0	01:21	0	0.00249	-0.028
HP-RY06	JUNCTION	0.00	1.20	0	01:21	0	0.000991	0.055
HP-RY07	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
Ex_1500	OUTFALL	0.00	32.39	0	01:14	0	0.376	0.000
Ex_375	OUTFALL	0.00	6.06	0	01:21	0	0.0204	0.000
HP-CB01	OUTFALL	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-LC01	OUTFALL	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-RY02	OUTFALL	0.00	0.00	0	00:00	0	0	0.000 ltr
OF1	OUTFALL	2.58	2.58	0	01:10	0.00225	0.00225	0.000
OF2	OUTFALL	2.54	2.54	0	01:10	0.00194	0.00194	0.000
OF3	OUTFALL	6.30	6.30	0	01:10	0.00697	0.00697	0.000
CB01	STORAGE	46.52	46.52	0	01:10	0.0555	0.0555	-0.521
CB02	STORAGE	41.23	41.23	0	01:10	0.054	0.0798	-1.554
CB03	STORAGE	142.20	142.20	0	01:10	0.203	0.203	0.680
LC01	STORAGE	8.61	8.61	0	01:10	0.00651	0.00703	0.062
LC02	STORAGE	5.09	5.09	0	01:10	0.00385	0.00435	0.082
MH02	STORAGE	0.00	32.34	0	01:14	0	0.377	0.000
MH04	STORAGE	0.00	19.30	0	01:33	0	0.321	0.000
MH06	STORAGE	0.00	19.11	0	01:33	0	0.321	-0.000
MH08	STORAGE	0.00	18.73	0	01:43	0	0.32	0.019
RY01	STORAGE	0.00	5.03	0	01:10	0	0.00768	0.010
RY02	STORAGE	6.26	7.32	0	01:11	0.00474	0.0126	0.047
RY03	STORAGE	5.48	10.23	0	01:10	0.00415	0.0212	-0.008
RY04	STORAGE	51.74	51.74	0	01:10	0.0607	0.0861	-0.037
RY05	STORAGE	0.00	27.69	0	01:10	0	0.0418	0.067
RY06	STORAGE	0.00	17.66	0	01:11	0	0.0265	0.019
RY07	STORAGE	0.00	16.50	0	01:04	0	0.00959	0.581

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days	hr:min	Maximum Outflow LPS
CB01	0.001	6	0	0	0.021	95	0	01:21	13.69
CB02	0.006	11	0	0	0.046	91	0	01:55	6.03
CB03	0.034	26	0	0	0.128	100	0	01:21	35.85
LC01	0.000	12	0	0	0.000	54	0	01:21	5.03
LC02	0.000	12	0	0	0.000	54	0	01:21	2.05
MH02	0.001	37	0	0	0.001	38	0	01:14	32.39
MH04	0.001	24	0	0	0.001	25	0	01:14	19.47
MH06	0.001	23	0	0	0.001	24	0	01:14	19.30
MH08	0.001	19	0	0	0.001	19	0	01:13	19.11
RY01	0.000	15	0	0	0.000	48	0	01:20	2.63
RY02	0.000	20	0	0	0.000	58	0	01:20	4.22
RY03	0.000	32	0	0	0.001	64	0	01:21	6.06
RY04	0.000	3	0	0	0.005	30	0	01:31	34.32
RY05	0.000	2	0	0	0.005	29	0	01:32	17.66
RY06	0.000	2	0	0	0.005	29	0	01:30	16.50
RY07	0.001	3	0	0	0.007	36	0	01:31	5.83

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
Ex_1500	88.34	6.02	32.39	0.376
Ex_375	17.69	2.33	6.06	0.020
HP-CB01	0.00	0.00	0.00	0.000
HP-LC01	0.00	0.00	0.00	0.000
HP-RY02	0.00	0.00	0.00	0.000
OF1	9.23	0.34	2.58	0.002
OF2	5.74	0.46	2.54	0.002
OF3	8.50	1.48	6.30	0.007
System	16.19	10.62	45.46	0.408

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	1.20	0	01:21	0.01	0.00	0.08
C2	CONDUIT	0.97	0	01:46	0.00	0.00	0.11
C3	CONDUIT	27.69	0	01:10	0.56	0.48	1.00
C4	CONDUIT	0.00	0	00:00	0.00	0.00	0.10
C5	CONDUIT	0.00	0	00:00	0.00	0.00	0.08
C6	CONDUIT	2.73	0	01:21	0.01	0.00	0.08
C7	CONDUIT	2.91	0	01:21	0.01	0.00	0.08
HP1-LC02	CONDUIT	0.00	0	00:00	0.00	0.00	0.04
LC01-RY01	CONDUIT	5.03	0	01:10	0.10	0.12	1.00
LC03-LC02	CONDUIT	2.05	0	01:13	0.04	0.05	1.00
MC02-RY02	CONDUIT	4.22	0	01:12	0.09	0.10	1.00

MH02-Ex_1500	CONDUIT	32.39	0	01:14	0.29	0.29	1.00
MH04-MH02	CONDUIT	19.47	0	01:32	0.18	0.17	1.00
MH06-MH04	CONDUIT	19.30	0	01:33	0.17	0.18	1.00
MH08-MH06	CONDUIT	19.11	0	01:33	0.17	0.17	1.00
MS-CB01	CONDUIT	0.00	0	00:00	0.00	0.00	0.05
MS-CB02(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.14
MS-CB02(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.05
MS-CB03(1)	CONDUIT	29.79	0	01:22	0.06	0.00	0.16
MS-CB03(2)	CONDUIT	29.94	0	01:22	0.09	0.00	0.15
MS-HP02	CONDUIT	0.00	0	00:00	0.00	0.00	0.04
MS-LC01	CONDUIT	0.00	0	00:00	0.00	0.00	0.04
MS-LC02(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.04
MS-LC02(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.04
MS-RY01(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.04
MS-RY01(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.04
MS-RY02	CONDUIT	0.00	0	00:00	0.00	0.00	0.04
MS-RY03(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.04
MS-RY03(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.04
MS-RY04(1)	CONDUIT	0.00	0	00:00	0.00	0.00	0.08
MS-RY04(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
RY01-RY02	CONDUIT	2.63	0	01:35	0.05	0.06	1.00
RY06-RY05	CONDUIT	17.66	0	01:11	0.36	0.29	1.00
RY07-RY06	CONDUIT	16.50	0	01:04	0.34	0.27	1.00
O-CB01	ORIFICE	13.69	0	01:21			1.00
O-CB02	ORIFICE	6.03	0	01:55			1.00
O-CB03	ORIFICE	6.06	0	01:22			1.00
O-RY03	ORIFICE	6.06	0	01:21			1.00
O-RY04	ORIFICE	6.68	0	01:33			1.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.88	0.06	0.00	0.06	0.00	0.00	0.00	0.93	0.00
C2	1.00	0.88	0.06	0.00	0.06	0.00	0.00	0.00	0.92	0.00
C3	1.00	0.00	0.80	0.00	0.20	0.00	0.00	0.00	0.85	0.00
C4	1.00	0.88	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C5	1.00	0.88	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C6	1.00	0.88	0.05	0.00	0.06	0.00	0.00	0.00	0.93	0.00
C7	1.00	0.88	0.05	0.00	0.06	0.00	0.00	0.00	0.93	0.00
HP1-LC02	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LC01-RY01	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
LC03-LC02	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
MC02-RY02	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
MH02-Ex_1500	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
MH04-MH02	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
MH06-MH04	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
MH08-MH06	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
MS-CB01	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CB02(1)	1.00	0.84	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CB02(2)	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CB03(1)	1.00	0.77	0.15	0.00	0.08	0.00	0.00	0.00	0.90	0.00
MS-CB03(2)	1.00	0.84	0.08	0.00	0.08	0.00	0.00	0.00	0.95	0.00
MS-HP02	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-LC01	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-LC02(1)	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-LC02(2)	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RY01(1)	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RY01(2)	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RY02	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RY03(1)	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RY03(2)	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RY04(1)	1.00	0.88	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-RY04(2)	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RY01-RY02	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
RY06-RY05	1.00	0.02	0.01	0.00	0.97	0.00	0.00	0.00	0.85	0.00
RY07-RY06	1.00	0.03	0.00	0.00	0.96	0.00	0.00	0.00	0.86	0.00

****
Conduit Surcharge Summary
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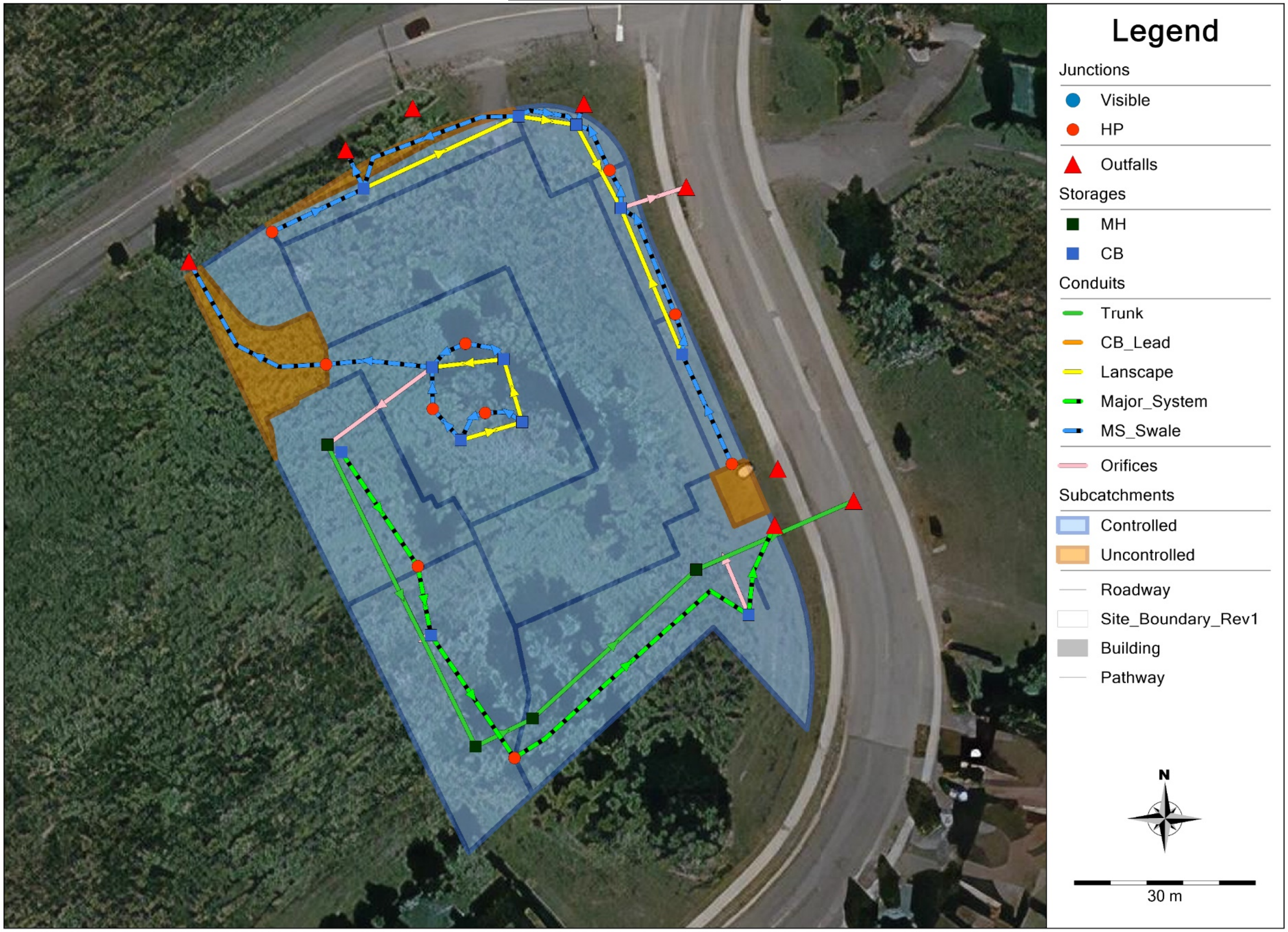
Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C3	2.52	2.52	2.63	0.01	0.01
LC01-RY01	1.13	1.13	24.00	0.01	0.01
LC03-LC02	1.13	1.13	24.00	0.01	0.01
MC02-RY02	24.00	24.00	24.00	0.01	0.01
MH02-Ex_1500	24.00	24.00	24.00	0.01	0.01
MH04-MH02	24.00	24.00	24.00	0.01	0.01
MH06-MH04	24.00	24.00	24.00	0.01	0.01
MH08-MH06	24.00	24.00	24.00	0.01	0.01
RY01-RY02	24.00	24.00	24.00	0.01	0.01
RY06-RY05	2.39	2.39	2.52	0.01	0.01
RY07-RY06	2.34	2.34	2.39	0.01	0.01

Analysis begun on: Mon Oct 18 11:48:35 2021
Analysis ended on: Mon Oct 18 11:48:36 2021
Total elapsed time: 00:00:01

1104 Halton Terrace – Maple Leaf Homes (119024)
PCSWMM Model Schematic

<u>Overall Model Schematic</u>



Date: 2021-10-19
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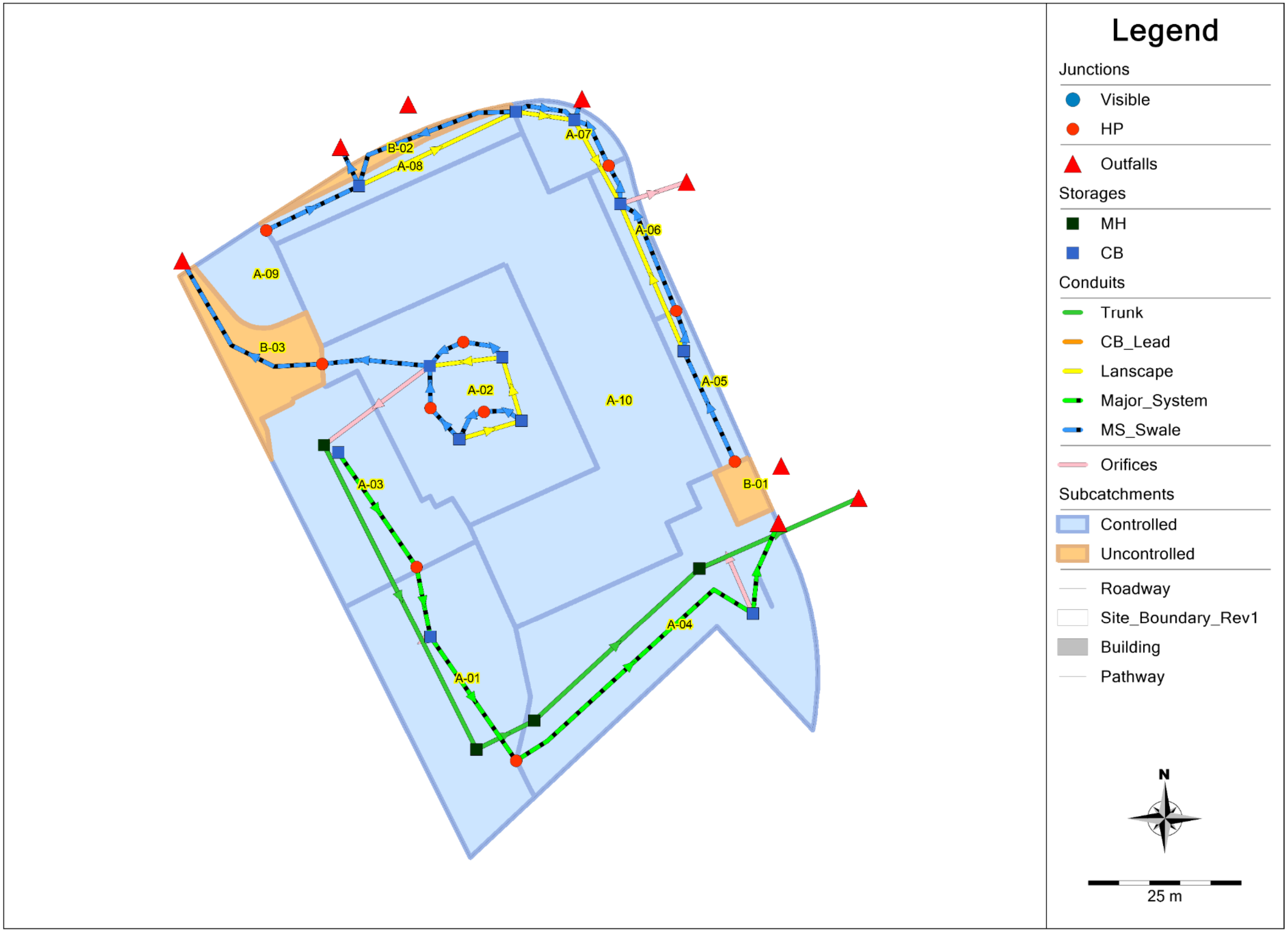
1104 Halton Terrace – Maple Leaf Homes (119024)
PCSWMM Model Schematic

<u>**Subcatchments (ID's)**</u>



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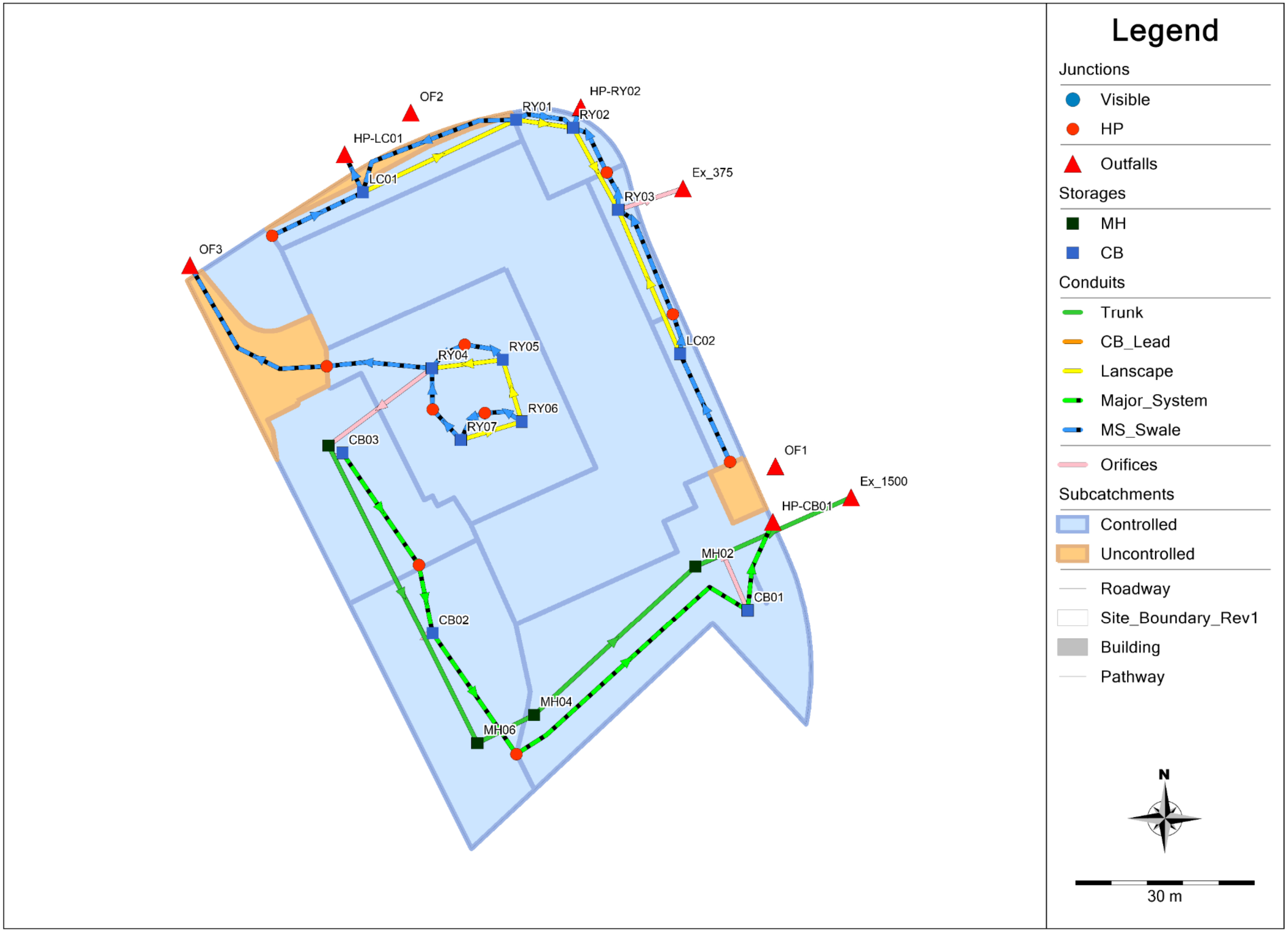
1104 Halton Terrace – Maple Leaf Homes (119024)
PCSWMM Model Schematic

<u>Nodes ID's</u>



Date: 2021-10-19
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MASTER SERVICING STUDY UPDATE FOR MORGAN'S GRANT SUBDIVISION

CITY OF OTTAWA

September 2003

Prepared for:

MINTO DEVELOPMENTS INC.
427 Laurier Avenue West, Suite 300
Ottawa, Ontario
K1R 7Y2

Prepared by:

J.L. RICHARDS & ASSOCIATES LIMITED
Consulting Engineers, Architects & Planners
864 Lady Ellen Place
Ottawa, Ontario
K1Z 5M2

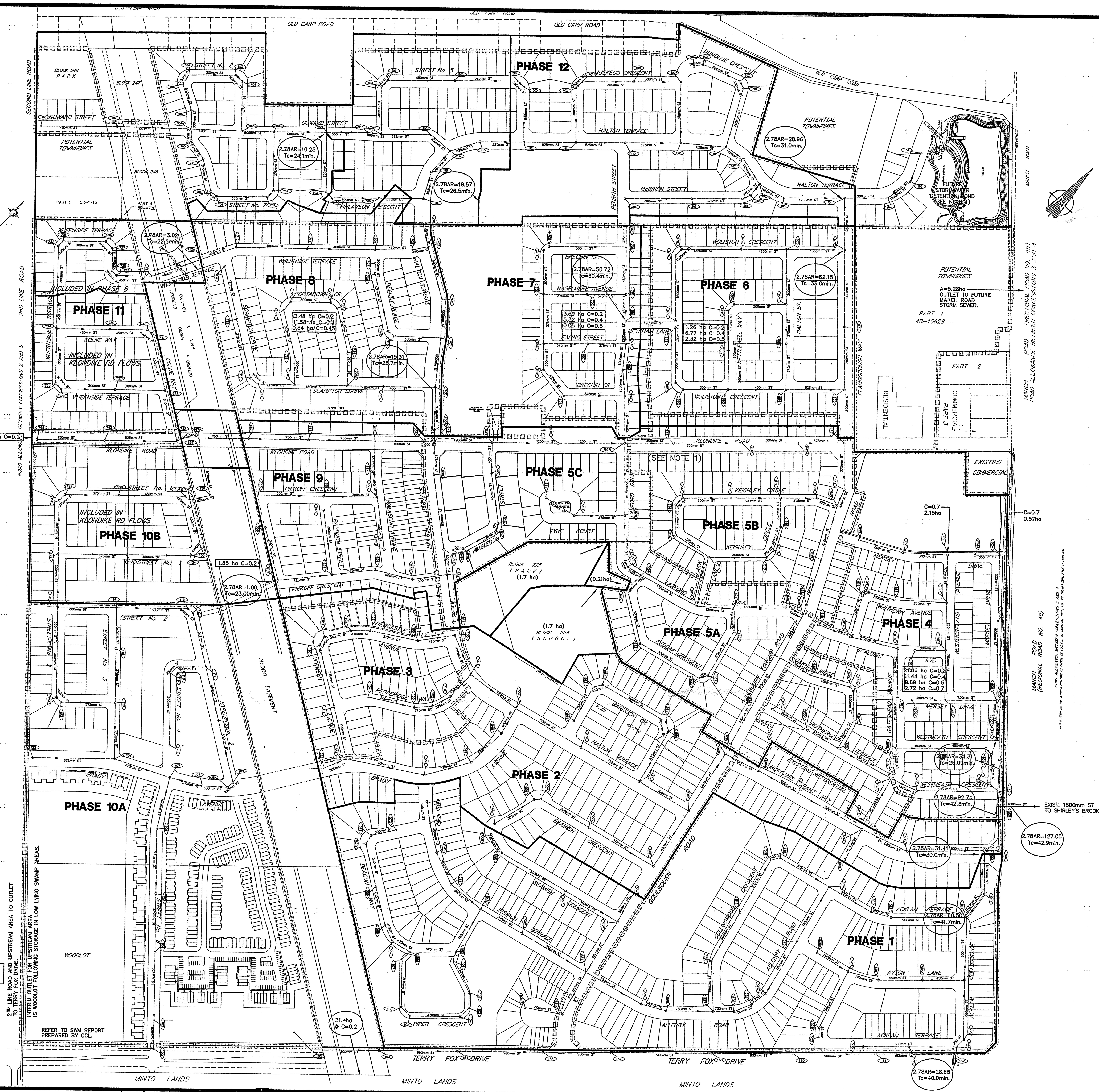
JLR 17730

Table 5 - Results of HGL Analysis (2003)

Manhole Junction Number	1:100 Year HGL Elevation (m)	HGL-Centreline Road Elev. (M)
101	83.927	3.073
102	83.392	1.908
103	83.017	1.733
104	82.322	1.068
Chamber	82.000	1.200

2.5 On-Site Storage Requirements

To minimize land requirements for stormwater management facilities, ICDs, combined with on-site storage, have been utilized in all recent Phases of the Subdivision. As such, local storm sewers are to be designed to limit the capture rate to 70 L/s/ha, approximately equivalent to a 1:5 year storm event. Storm runoff in excess of the 1:5 year recurrence is to be detained, tentatively, on site by means of road-sag storage, park storage, hydro easement storage or, ultimately, by the stormwater management facility. To maintain the integrity of the design of the stormwater management facilities (existing and future), specific on-site storage requirements have been calculated and are presented in Table 6.



NOTE :

1. UPON COMPLETION OF THE STORMWATER DETENTION POND NORTH EAST OF PHASE 6 AND FOLLOWING CONSTRUCTION OF STORM SEWERS IN PHASE 6 AND 7 ALL STORM WATER WEST OF MH 645 WILL BE REROUTED THROUGH PHASES 7 AND 6 TO THE NEW STORMWATER DETENTION POND.
2. MAJOR OVERLAND FLOW FOR THESE AREAS WILL ALSO BE DIRECTED TO THE DETENTION POND WITH PROVISIONS FOR SURFACE STORAGE WHEREVER POSSIBLE (i.e. ROAD SAGS, PARKS, etc....)

1	17/09/03	REVISED PHASE 10 AND 12	L.J.

LICENSED PROFESSIONAL ENGINEER L.A. JABLONSKI 16/09/03 PROVINCE OF ONTARIO

SCALE

0 25m 50m 75m 100m

HORIZONTAL 1:3000

J.L.Richards & Associates Limited
Consulting Engineers, Architect & Planners
OTTAWA, KINGSTON, SUDBURY, CANADA.

DESIGN	
CHECKED	L.J.
DRAWN	M.Z.
CHECKED	
APPROVED	

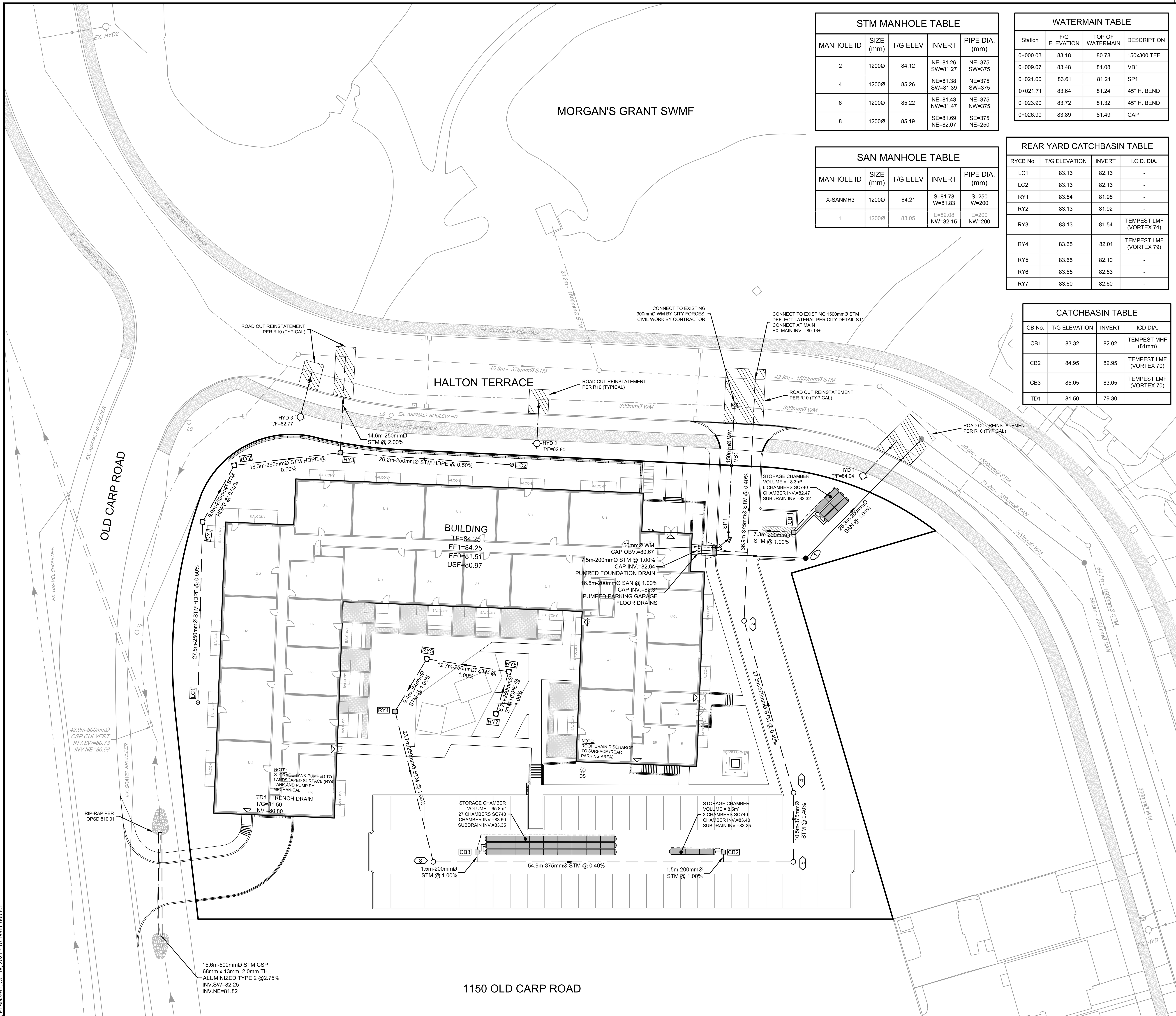
Ottawa

minto

MORGAN'S GRANT SUBDIVISION

MASTER DRAINAGE PLAN (STORM)

DATED	SEPT. 2003
DWG. No.	17730-ST



STM MANHOLE TABLE

MANHOLE ID	SIZE (mm)	T/G ELEV	INVERT	PIPE DIA. (mm)
2	1200Ø	84.12	NE=81.26 SW=81.27	NE=375 SW=375
4	1200Ø	85.26	NE=81.38 SW=81.39	NE=375 SW=375
6	1200Ø	85.22	NE=81.43 NW=81.47	NE=375 NW=375
8	1200Ø	85.19	SE=81.69 NE=82.07	SE=375 NE=250

SAN MANHOLE TABLE

MANHOLE ID	SIZE (mm)	T/G ELEV	INVERT	PIPE DIA. (mm)
X-SANMH3	1200Ø	84.21	S=81.78 W=81.83	S=250 W=200
1	1200Ø	83.05	E=82.08 NW=82.15	E=200 NW=200

WATERMAIN TABLE

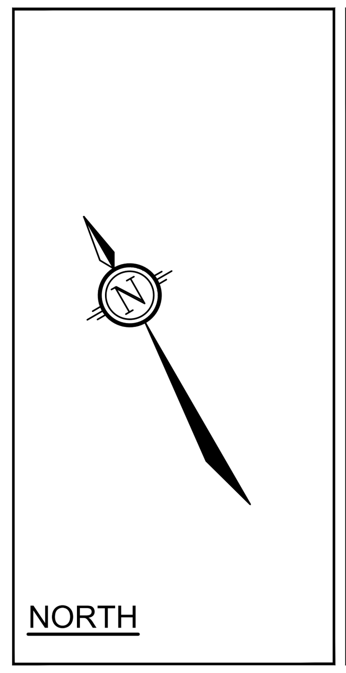
Station	F/G ELEVATION	TOP OF WATERMAIN	DESCRIPTION
0+000.03	83.18	80.78	150x300 TEE
0+009.07	83.48	81.08	VB1
0+021.00	83.61	81.21	SP1
0+021.71	83.64	81.24	45° H. BEND
0+023.90	83.72	81.32	45° H. BEND
0+026.99	83.89	81.49	CAP

REAR YARD CATCHBASIN TABLE

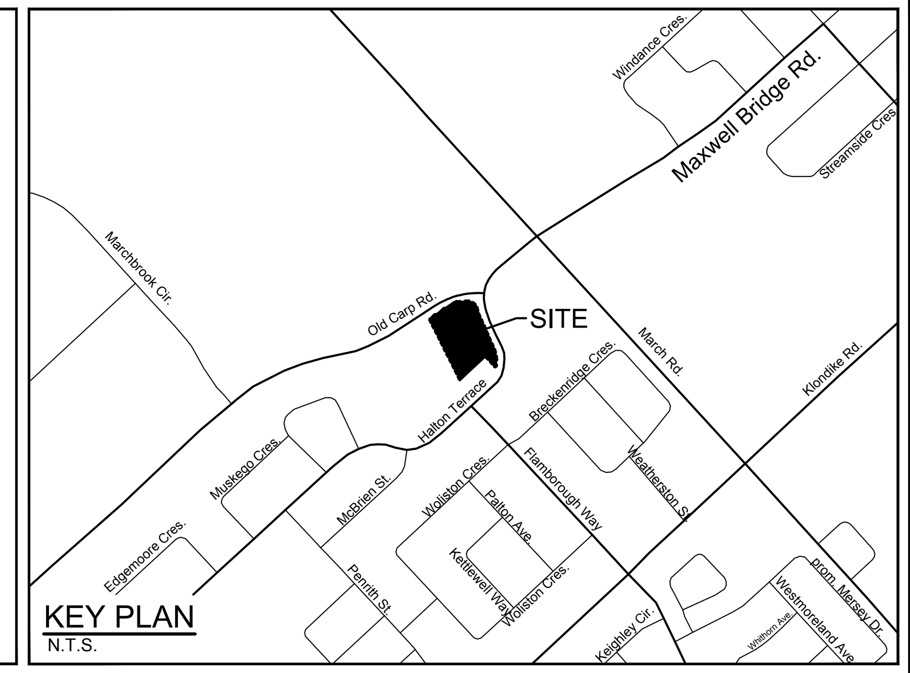
RYCB No.	T/G ELEVATION	INVERT	I.C.D. DIA.
LC1	83.13	82.13	-
LC2	83.13	82.13	-
RY1	83.54	81.98	-
RY2	83.13	81.92	-
RY3	83.13	81.54	TEMPEST LMF (VORTEX 74)
RY4	83.65	82.01	TEMPEST LMF (VORTEX 79)
RY5	83.65	82.10	-
RY6	83.65	82.53	-
RY7	83.60	82.60	-

CATCHBASIN TABLE

CB No.	T/G ELEVATION	INVERT	ICD DIA.
CB1	83.32	82.02	TEMPEST MHF (81mm)
CB2	84.95	82.95	TEMPEST LMF (VORTEX 70)
CB3	85.05	83.05	TEMPEST LMF (VORTEX 70)
TD1	81.50	79.30	-



NORTH



KEY PLAN
N.T.S.

LEGEND

SANITARY MANHOLE, SEWER & DIRECTION OF FLOW	CB1	ROAD CATCHBASIN
STORM MANHOLE, SEWER & DIRECTION OF FLOW	CB1	ROAD CATCHBASIN WITH ICD
300mmØ	WATERMAIN AND DIAMETER	LC1	LANDSCAPE TYPE CATCHBASIN
VB	VALVE & VALVE BOX	RY1	REAR YARD CATCH BASIN
	BEND AND THRUST BLOCK		UNDERGROUND STORAGE CHAMBERS WITH SUBDRAIN
HYD	HYDRANT C/W VALVE & LEAD	DS	ROOFTOP DOWNSPOUT LOCATION
	CAP		

GENERAL NOTES:

1. DIMENSIONS AND LAYOUT INFORMATION SHALL BE CONFIRMED PRIOR TO COMMENCEMENT OF CONSTRUCTION.
2. THE ORIGINAL TOPOGRAPHY AND GROUND ELEVATIONS, SERVICING AND SURVEY INFORMATION SHOWN ON THIS PLAN ARE SUPPLIED FOR INFORMATION PURPOSES ONLY. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE ACCURACY OF ALL INFORMATION OBTAINED FROM THIS PLAN.
3. CO-ORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
4. BEFORE COMMENCING CONSTRUCTION, PROVIDE PROOF OF COMPREHENSIVE ALL RISK AND OPERATIONAL LIABILITY INSURANCE INCLUDING BLASTING. INSURANCE POLICY TO NAME THE OWNER, ENGINEER AND THE CITY AS CO-INSURED.
5. CONNECT TO EXISTING SYSTEMS AS DETAILED, INCLUDING ALL RESTORATION WORK NECESSARY TO REINSTATE SURFACES TO EXISTING CONDITIONS OR BETTER.
6. DETERMINE THE EXACT LOCATION, SIZE, MATERIAL AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO COMMENCING CONSTRUCTION. PROTECT AND ASSUME RESPONSIBILITY FOR ALL EXISTING UTILITIES WHETHER OR NOT SHOWN ON THESE DRAWINGS.
7. OBTAIN AND PAY FOR ALL NECESSARY PERMITS AND APPROVALS BEFORE COMMENCING CONSTRUCTION.
8. RESTORE ALL TRENCHES AND SURFACE FEATURES TO EXISTING CONDITIONS OR BETTER AND TO THE SATISFACTION OF MUNICIPAL AUTHORITIES.
9. REMOVE FROM SITE ALL DEBRIS AND EXCESS EXCAVATED MATERIAL UNLESS OTHERWISE INSTRUCTED BY THE ENGINEER.
10. ALL ELEVATIONS ARE GEODETIC AND UTILIZE METRIC UNITS.
11. REFER TO GEOTECHNICAL INVESTIGATION PG4872-1 (DATED MAY 3, 2019), PREPARED BY PATERSON GROUP INC. FOR SUBSURFACE CONDITIONS AND CONSTRUCTION RECOMMENDATIONS.
12. PERFORATED PIPE SUB-DRAINS TO BE PROVIDED AT SUBGRADE LEVEL EXTENDING FROM THE ROADSIDE CATCHBASIN FOR A DISTANCE OF 3.0m, PARALLEL TO THE CURB IN TWO DIRECTIONS.

SEWER NOTES:

1. SPECIFICATIONS:

ITEM	SPEC. No.	REFERENCE
CATCHBASIN (600x600mm)	705.010	OPSD
STORM / SANITARY MANHOLE (1200Ø)	701.010	OPSD
ROADSIDE CB, FRAME & COVER	S2 & S19	CITY of OTTAWA
STORM / SANITARY MH FRAME & COVER	S24.1 / S24 & S25	CITY of OTTAWA
STORM SEWER	PVC DR 35 OR CONC.	(CLASS SPECIFIED ON PROFILE DRAWINGS)
SANITARY SEWER	PVC DR 35	
CATCHBASIN LEAD	PVC DR 35	

2. INSULATE ALL PIPES (SAN/STM) THAT HAVE LESS THAN 1.5m COVER WITH 50mmX1200mm HI-40 INSULATION. PROVIDE 150mm CLEARANCE BETWEEN PIPE AND INSULATION.
3. SERVICES ARE TO BE CONSTRUCTED TO PROPERTY LINE AT MINIMUM SLOPE OF 1.0% (2.0% IS PREFERRED).
4. PIPE BEDDING, COVER AND BACKFILL ARE TO BE COMPACTED TO AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY. THE USE OF CLEAR CRUSHED STONE AS A BEDDING LAYER SHALL NOT BE PERMITTED.
5. SEWER SERVICE CONNECTIONS PER CITY OF OTTAWA DETAILS S11 AND S11.1.
6. THE SITE SERVICING CONTRACTOR SHALL PERFORM FIELD TESTS FOR QUALITY CONTROL OF ALL SANITARY SEWERS. LEAKAGE TESTING SHALL BE COMPLETED IN ACCORDANCE WITH OPSS 410.07.16 AND 407.07.24. DYE TESTING IS TO BE COMPLETED ON ALL SANITARY SERVICES TO CONFIRM PROPER CONNECTION TO THE SANITARY SEWER MAIN. THE FIELD TESTS SHALL BE PERFORMED IN THE PRESENCE OF THE ENGINEER.
7. STORM MANHOLES AND CBMHS SHALL HAVE 300mm SUMPS UNLESS OTHERWISE INDICATED.
8. CONTRACTOR TO TELEVISE (CCTV) ALL PROPOSED SEWERS, 200mmØ OR GREATER PRIOR TO BASE COURSE ASPHALT. UPON COMPLETION OF CONTRACT, THE CONTRACTOR IS RESPONSIBLE TO FLUSH AND CLEAN ALL SEWERS & APPURTENANCES.

WATERMAIN NOTES:

1. GENERAL:

ITEM	DETAIL. No.	REFERENCE
WATERMAIN TRENCHING	W17	CITY OF OTTAWA
THERMAL INSULATION IN SHALLOW TRENCHES	W22	CITY OF OTTAWA
WATERMAIN CROSSING BELOW SEWER / OVER SEWER	W25 / W25.2	CITY OF OTTAWA

2. THE WATERMAIN SHALL BE PVC DR 18 IN ACCORDANCE WITH MATERIAL SPECIFICATION MW-18.1, UNLESS OTHERWISE INDICATED.
3. SUPPLY AND CONSTRUCT ALL WATERMAINS AND APPURTENANCES IN ACCORDANCE WITH THE CITY OF OTTAWA STANDARDS AND SPECIFICATIONS. EXCAVATION, INSTALLATION, BACKFILL AND RESTORATION OF ALL WATERMAINS BY THE CONTRACTOR. CONNECTIONS AND SHUT-OFFS AT THE MAIN AND CHLORINATION OF THE WATER SYSTEM SHALL BE PERFORMED BY CITY OFFICIALS.
4. WATERMAIN SHALL BE MINIMUM 2.4m DEPTH BELOW GRADE UNLESS OTHERWISE INDICATED.
5. PROVIDE MINIMUM 0.50m CLEARANCE BETWEEN OUTSIDE OF PIPES AT ALL CROSSINGS.

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

No.	REVISION	DATE	BY
1.	CITY SUBMISSION	OCT 19/21	MAB

SCALE 1:300

DESIGN DTD
CHECKED LWR
DRAWN DTD
CHECKED MAB
APPROVED JGR

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER
L. R. WILSON
100160065
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
M.A. BISSETT
2021.10.19
PROVINCE OF ONTARIO

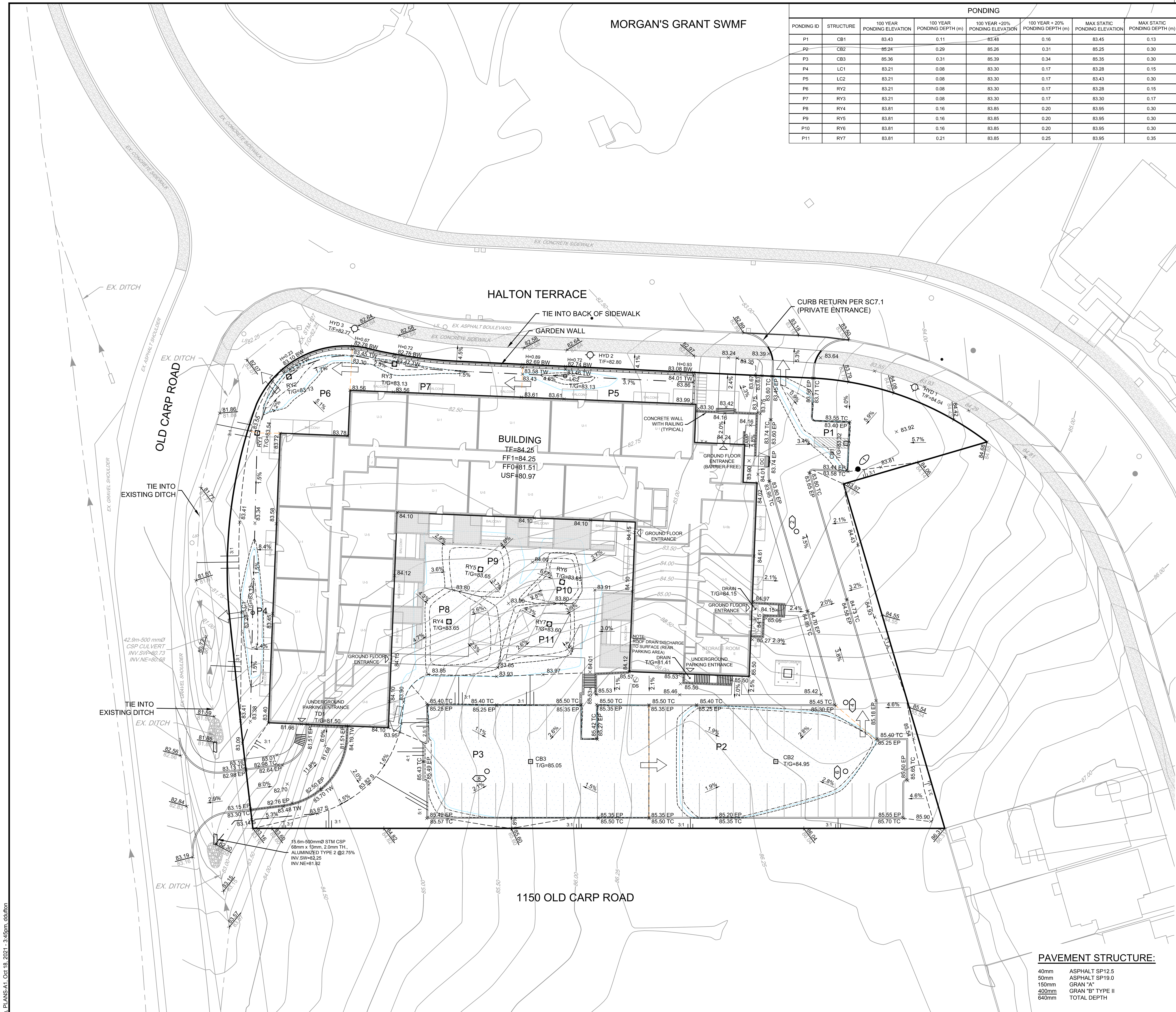
NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

CITY OF OTTAWA
1104 HALTON TERRACE

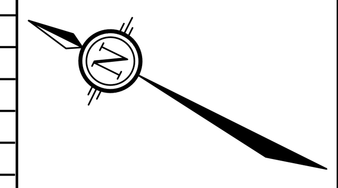
GENERAL PLAN OF SERVICES

PROJECT No. 119024
REV REV # 1
DRAWING No. 119024-GP

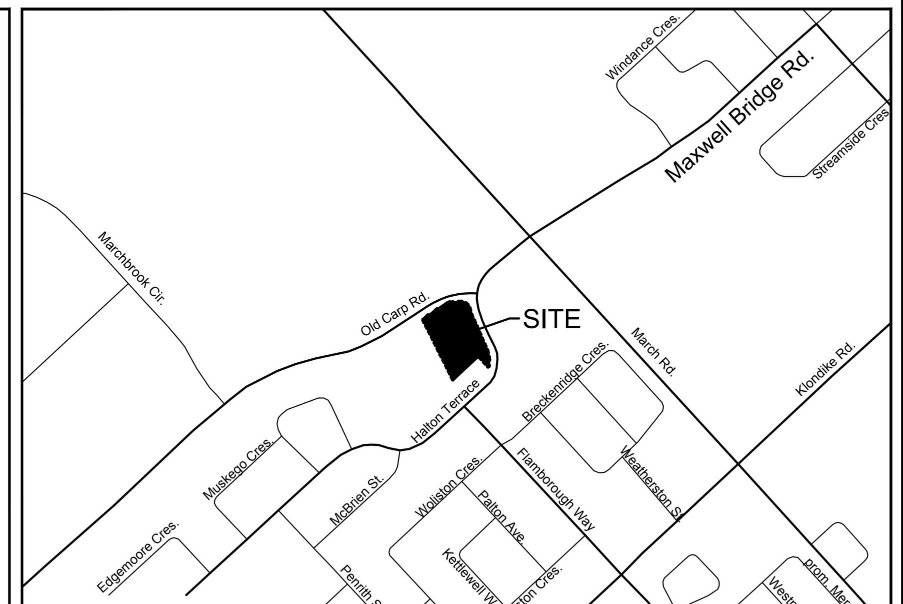
M:\2019\119024\CAD\Design\119024-GP.dwg, PLANS-A1, Oct 19, 2021 - 10:19am, dduffon



PONDING							
PONDING ID	STRUCTURE	100 YEAR PONDING ELEVATION	100 YEAR PONDING DEPTH (m)	100 YEAR +20% PONDING ELEVATION	100 YEAR + 20% PONDING DEPTH (m)	MAX STATIC PONDING ELEVATION	MAX STATIC PONDING DEPTH (m)
P1	CB1	83.43	0.11	83.48	0.16	83.45	0.13
P2	CB2	85.24	0.29	85.26	0.31	85.25	0.30
P3	CB3	85.36	0.31	85.39	0.34	85.35	0.30
P4	LC1	83.21	0.08	83.30	0.17	83.28	0.15
P5	LC2	83.21	0.08	83.30	0.17	83.43	0.30
P6	RY2	83.21	0.08	83.30	0.17	83.28	0.15
P7	RY3	83.21	0.08	83.30	0.17	83.30	0.17
P8	RY4	83.81	0.16	83.85	0.20	83.95	0.30
P9	RY5	83.81	0.16	83.85	0.20	83.95	0.30
P10	RY6	83.81	0.16	83.85	0.20	83.95	0.30
P11	RY7	83.81	0.21	83.85	0.25	83.95	0.35



NORTH



KEY PLAN
N.T.S.

LEGEND

PROPOSED GRADE AND DIRECTION OF FLOW	HYDRANT WITH TOP OF FLANGE ELEVATION
PROPOSED ELEVATION	SANITARY MANHOLE
PROPOSED ELEVATION / EXISTING ELEVATION	STORM MANHOLE
EXISTING SPOT ELEVATION	CB6 T/G=56.48 — CATCHBASIN WITH TOP OF GRATE ELEVATION CB WITH ICD
EXISTING ELEVATION AT BACK OF SIDEWALK	LC1 T/G=56.48 — LANDSCAPE TYPE CATCHBASIN WITH TOP OF GRATE ELEVATION
EXISTING CONTOUR ELEVATION	VB — VALVE & VALVE BOX LOCATION
MAJOR OVERLAND FLOW DIRECTION	FF= FINISHED FLOOR
TERRACE GRADE (3:1 MAX)	TF= TOP OF FOUNDATION
SWALE AND TERRACE	USF= UNDERSIDE OF FOOTING
MAX STATIC PONDING LIMITS	EP EDGE OF PAVEMENT
100-YR PONDING LIMITS	TC TOP OF CURB
100-YR +20% PONDING LIMITS	DS ROOFTOP DOWNSPOUT LOCATION

GENERAL NOTES:

1. DIMENSIONS AND LAYOUT INFORMATION SHALL BE CONFIRMED PRIOR TO COMMENCEMENT OF CONSTRUCTION.
2. THE ORIGINAL TOPOGRAPHY AND GROUND ELEVATIONS, SERVICING AND SURVEY INFORMATION SHOWN ON THIS PLAN ARE SUPPLIED FOR INFORMATION PURPOSES ONLY. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE ACCURACY OF ALL INFORMATION OBTAINED FROM THIS PLAN.
3. CO-ORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
4. BEFORE COMMENCING CONSTRUCTION, PROVIDE PROOF OF COMPREHENSIVE ALL RISK AND OPERATIONAL LIABILITY INSURANCE INCLUDING BLASTING. INSURANCE POLICY TO NAME THE OWNER, ENGINEER AND THE CITY AS CO-INSURED. AMOUNT OF INSURANCE TO BE SPECIFIED BY OWNER'S AGENT.
5. CONNECT TO EXISTING SYSTEMS AS DETAILED, INCLUDING ALL RESTORATION WORK NECESSARY TO REINSTATE SURFACES TO EXISTING CONDITIONS OR BETTER.
6. DETERMINE THE EXACT LOCATION, SIZE, MATERIAL AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO COMMENCING CONSTRUCTION. PROTECT AND ASSUME ALL RESPONSIBILITY FOR ALL EXISTING UTILITIES WHETHER OR NOT SHOWN ON THESE DRAWINGS.
7. OBTAIN AND PAY FOR ALL NECESSARY PERMITS AND APPROVALS BEFORE COMMENCING CONSTRUCTION.
8. RESTORE ALL TRENCHES AND SURFACE FEATURES TO EXISTING CONDITIONS OR BETTER AND TO THE SATISFACTION OF CITY OF OTTAWA AUTHORITIES.
   - ASPHALT RESTORATION SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA DETAIL R-10.
   - THICKNESS OF GRANULAR MATERIAL AND ASPHALT LAYERS TO MATCH EXISTING.
   - BOULEVARDS SHALL BE REINSTATED WITH 100mm OF TOPSOIL, SEED AND MULCH.
9. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL UNLESS OTHERWISE INSTRUCTED BY ENGINEER.
10. ALL ELEVATIONS ARE GEODETIC AND UTILIZE METRIC UNITS.
11. REFER TO GEOTECHNICAL INVESTIGATION PG4872-1 (DATED MAY 3, 2019), PREPARED BY PATERSON GROUP FOR SUBSURFACE CONDITIONS AND CONSTRUCTION RECOMMENDATIONS.
12. PERFORATED PIPE SUB-DRAINS TO BE PROVIDED AT SUBGRADE LEVEL EXTENDING FROM THE ROADSIDE CATCHBASIN FOR A DISTANCE OF 3.0m, PARALLEL TO THE CURB IN TWO DIRECTIONS.

GRADING AND PAVEMENT NOTES:

1. ALL TOPSOIL, ORGANIC OR DELETERIOUS MATERIAL MUST BE ENTIRELY REMOVED FROM BENEATH THE PROPOSED HARD SURFACE (ie. PAVEMENT, CURB, SIDEWALK, ETC.) AREAS AS DIRECTED BY THE SITE ENGINEER OR GEOTECHNICAL ENGINEER.
2. EXPOSED SUBGRADES IN PROPOSED PAVED AREAS SHOULD BE HEAVILY PROOF ROLLED WITH A LARGE (10 TON) VIBRATORY STEEL DRUM ROLLER UNDER DRY CONDITIONS AND INSPECTED BY THE GEOTECHNICAL ENGINEER PRIOR TO THE PLACEMENT OF GRANULARS.
3. ANY SOFT AREAS EVIDENT FROM THE PROOF ROLLING SHOULD BE SUB-EXCAVATED AND REPLACED WITH SUITABLE MATERIAL THAT IS FROST COMPATIBLE WITH THE EXISTING SOILS AS RECOMMENDED BY THE GEOTECHNICAL ENGINEER.
4. THE GRANULAR BASE SHOULD BE PLACED IN MAXIMUM 300mm LIFTS AND COMPACTED TO AT LEAST 100% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY VALUE. ANY ADDITIONAL GRANULAR FILL USED BELOW THE PROPOSED PAVEMENT SHOULD BE PLACED IN MAXIMUM 300mm LIFTS AND COMPACTED TO AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY VALUE.
5. ROADWAY SUBGRADE TO BE INSPECTED BY THE GEOTECHNICAL ENGINEER AT THE TIME OF CONSTRUCTION TO REVIEW IF A WOVEN GEOTEXTILE IS REQUIRED BELOW THE GRANULAR MATERIALS; AND TO CONFIRM THE DEPTH AND COMPACTION OF GRANULAR 'B'
6. PRIOR TO PLACEMENT OF TOPLIFT, THE CONTRACTOR SHALL ADJUST ALL STRUCTURES TO FINAL GRADE PER CITY OF OTTAWA STANDARDS.
7. MINIMUM OF 2% GRADE FOR ALL GRASS AREAS UNLESS OTHERWISE NOTED.
8. MAXIMUM TERRACING GRADE TO BE 3:1 UNLESS OTHERWISE NOTED.
9. ALL GRADES BY CURBS ARE EDGE OF PAVEMENT GRADES UNLESS OTHERWISE INDICATED.
10. ALL CURBS SHALL BE BARRIER CURB UNLESS OTHERWISE NOTED AND CONSTRUCTED PER CITY OF OTTAWA STANDARD (SC1.1).
11. REFER TO LANDSCAPE PLAN FOR PLANTING AND OTHER LANDSCAPE FEATURE DETAILS.

PAVEMENT STRUCTURE:

40mm	ASPHALT SP12.5
50mm	ASPHALT SP19.0
150mm	GRAN "A"
400mm	GRAN "B" TYPE II
640mm	TOTAL DEPTH

NOTE:
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No.	REVISION	DATE	BY
1.	CITY SUBMISSION	OCT 19/21	MAB

SCALE 1:300

DESIGN	DTD
CHECKED	LWR
DRAWN	DTD
CHECKED	MAB
APPROVED	JGR

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER — L. R. WILSON 100160065 — PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER — M.A. BISSETT — 2021.10.19 — PROVINCE OF ONTARIO

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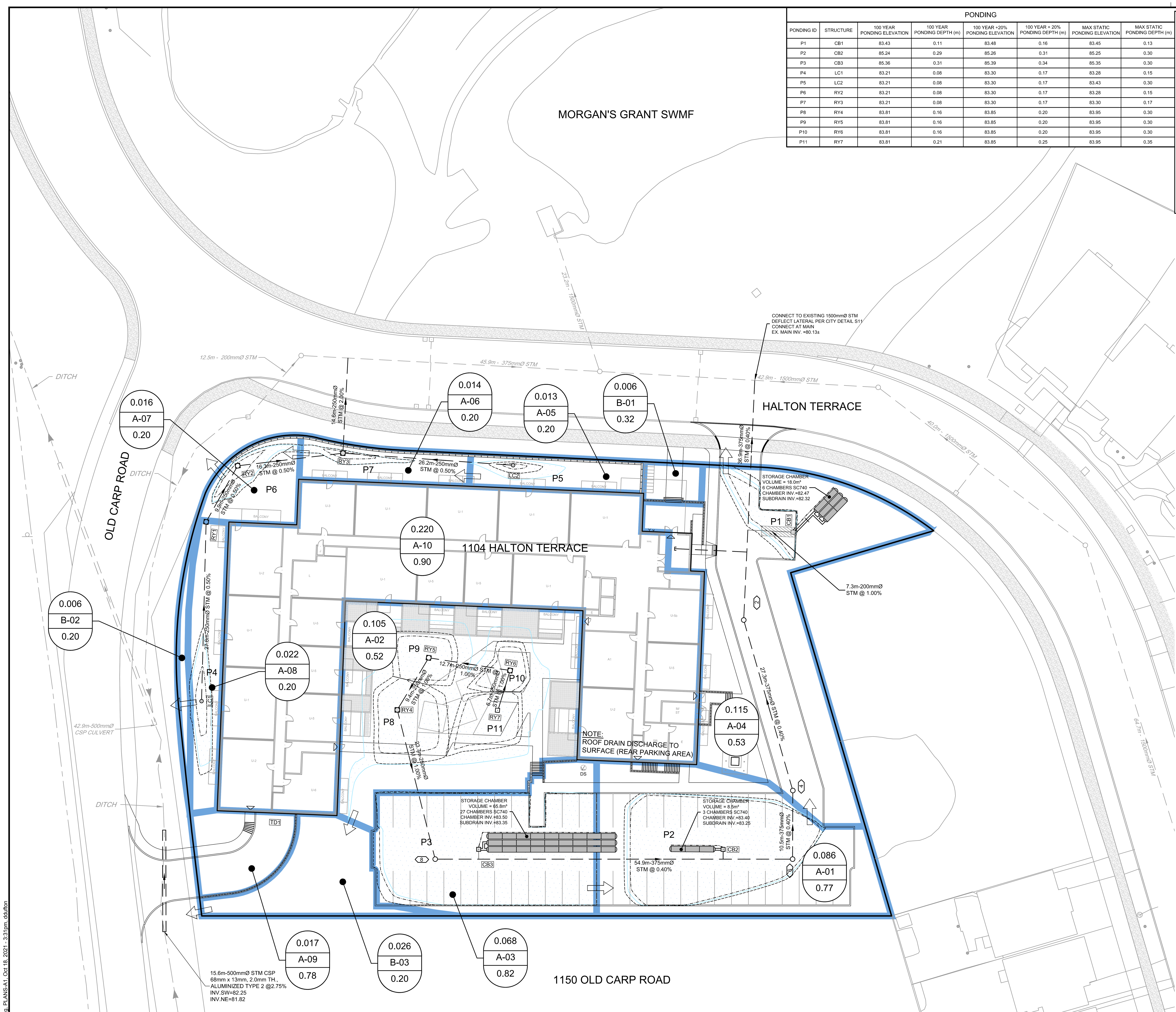
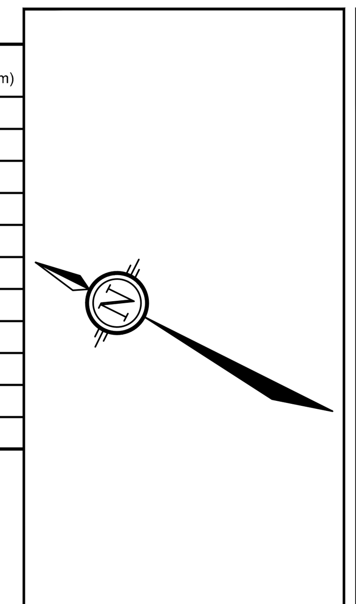
CITY OF OTTAWA
1104 HALTON TERRACE

GRADING PLAN

PROJECT No. 119024
REV — REV # 1
DRAWING No. 119024-GR



PONDING							
PONDING ID	STRUCTURE	100 YEAR PONDING ELEVATION	100 YEAR PONDING DEPTH (m)	100 YEAR +20% PONDING ELEVATION	100 YEAR + 20% PONDING DEPTH (m)	MAX STATIC PONDING ELEVATION	MAX STATIC PONDING DEPTH (m)
P1	CB1	83.43	0.11	83.48	0.16	83.45	0.13
P2	CB2	85.24	0.29	85.26	0.31	85.25	0.30
P3	CB3	85.36	0.31	85.39	0.34	85.35	0.30
P4	LC1	83.21	0.08	83.30	0.17	83.28	0.15
P5	LC2	83.21	0.08	83.30	0.17	83.43	0.30
P6	RY2	83.21	0.08	83.30	0.17	83.28	0.15
P7	RY3	83.21	0.08	83.30	0.17	83.30	0.17
P8	RY4	83.81	0.16	83.85	0.20	83.95	0.30
P9	RY5	83.81	0.16	83.85	0.20	83.95	0.30
P10	RY6	83.81	0.16	83.85	0.20	83.95	0.30
P11	RY7	83.81	0.21	83.85	0.25	83.95	0.35



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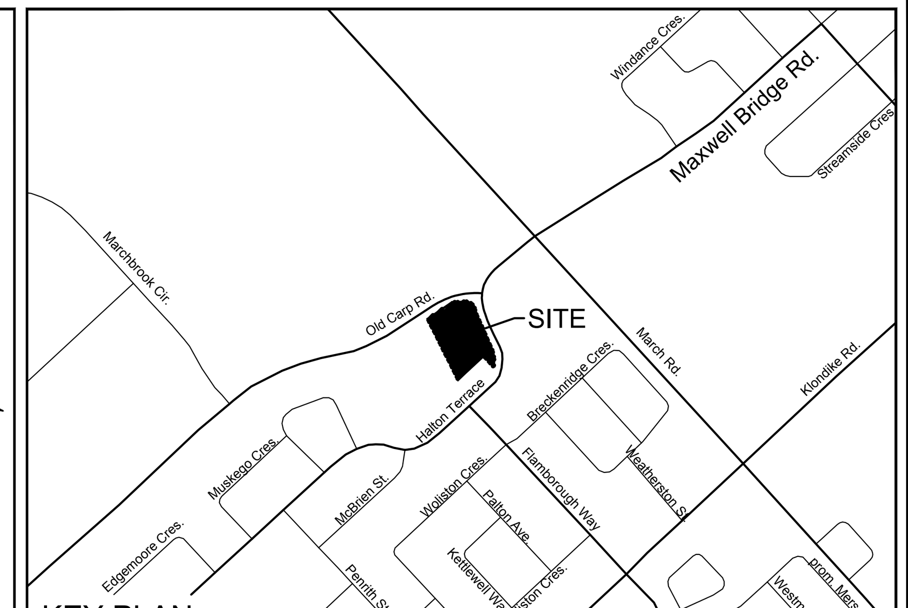

KEY PLAN
N.T.S.

LEGEND

- 0.24 ha — AREA (hectares)
- A-01 — AREA ID
- 0.65 — RUN-OFF COEFFICIENT
- PROPOSED STORM DRAINAGE AREA BOUNDARY
- 100 — PROPOSED STORM MANHOLE / SEWER AND FLOW DIRECTION
- 95 — PROPOSED ROAD CATCHBASIN
- LC1 — LANDSCAPE CATCH BASIN
- RY1 — REAR YARD CATCH BASIN
- MAJOR SYSTEM FLOW ROUTE
- MAX STATIC PONDING LIMITS
- 100-YR PONDING LIMITS
- 100-YR +20% PONDING LIMITS
- DS — ROOFTOP DOWNSPOUT LOCATION

NOTE:
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CITY OF OTTAWA
1104 HALTON TERRACE

STORM DRAINAGE AREA PLAN

PROJECT No. 119024
REV: REV # 1
DRAWING No. 119024-STM

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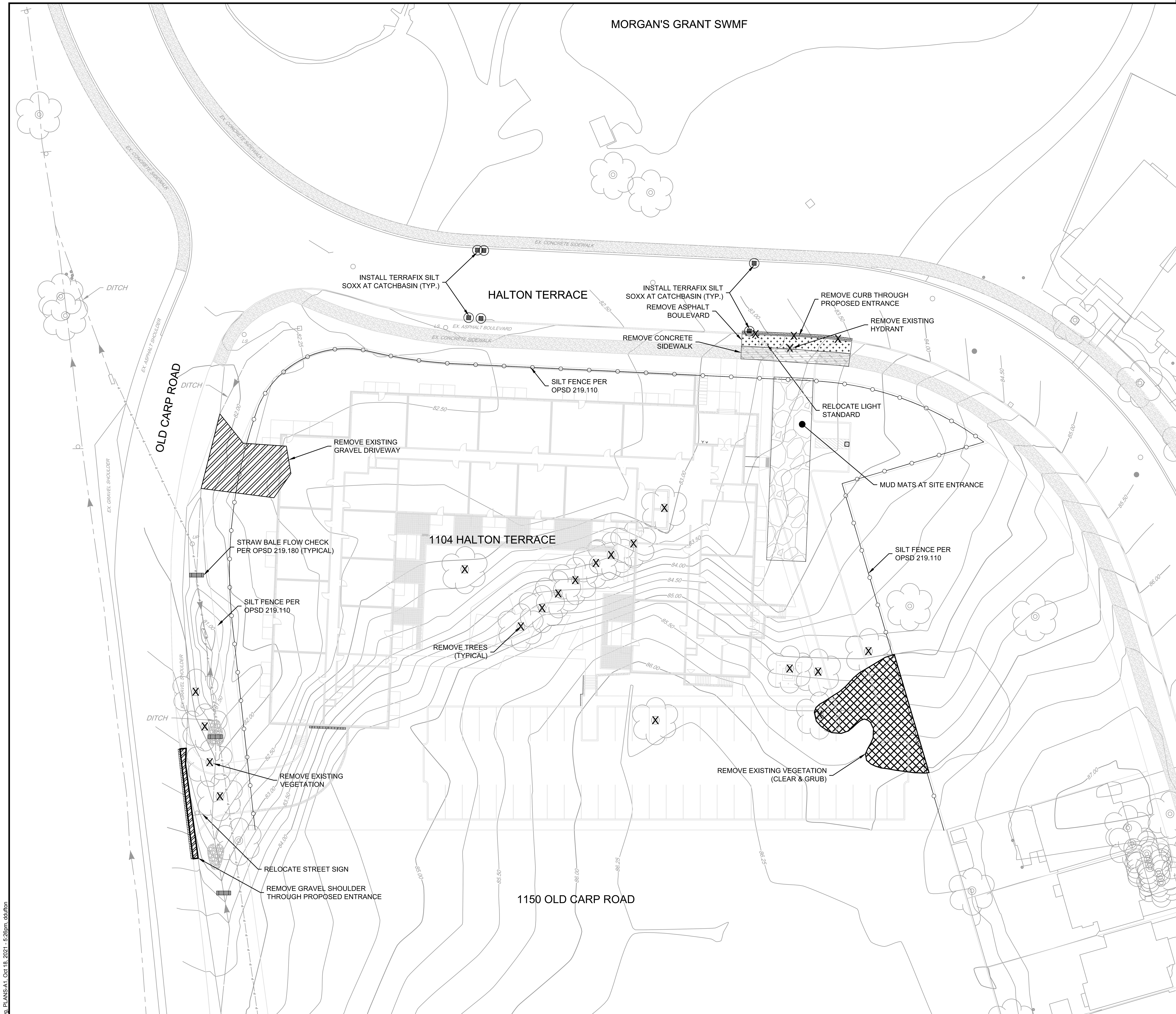

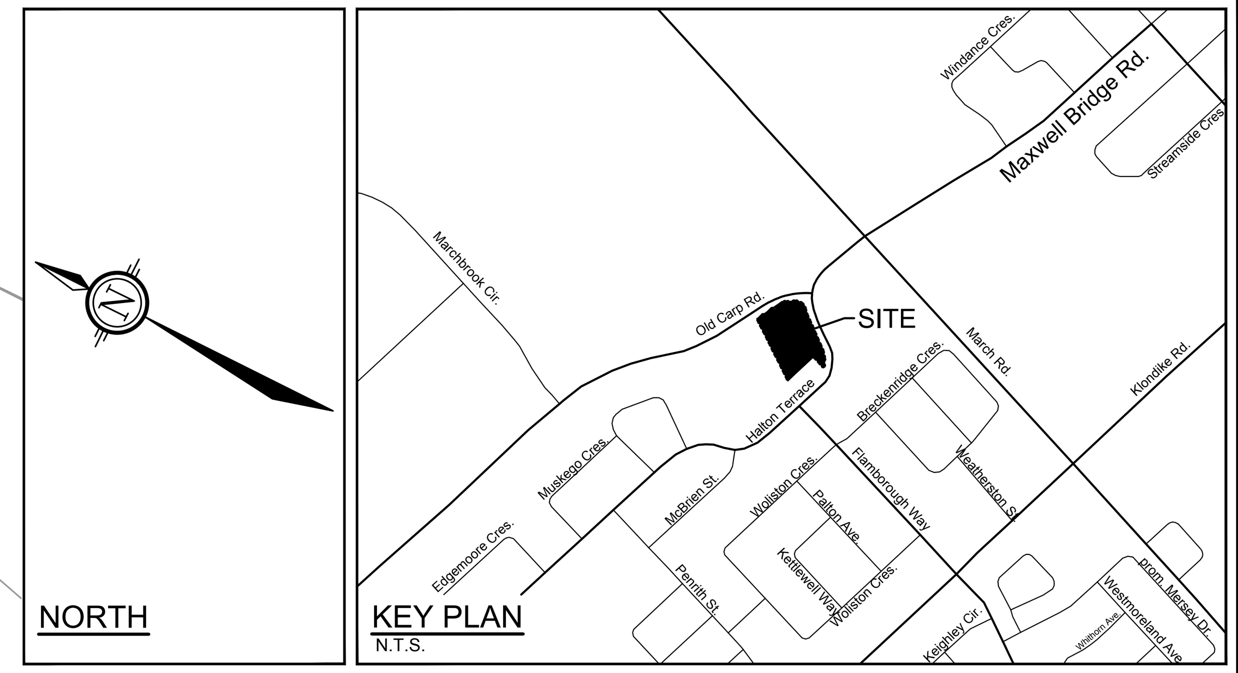

LEGEND

- CLEARING AND GRUBBING
- GRAVEL SHOULDER & DRIVEWAY REMOVAL
- REMOVE ASPHALT
- X REMOVALS
- SILT FENCE PER OSPD 219.110
- STRAW BALE FLOW CHECK PER OPSD 219.180
- DRY GRIND EXISTING ASPHALT. AVERAGE DEPTH 50mm AND 0.3m FROM BACK OF FULL DEPTH ASPHALT
- REMOVE CONCRETE
- 101.00 EXISTING CONTOUR AND ELEVATION
- MUD MATS (50mm - 100mm GRANULAR B. TYPE II)

EROSION AND SEDIMENT CONTROL NOTES :

1. ALL EROSION AND SEDIMENT CONTROLS ARE TO BE INSTALLED TO THE SATISFACTION OF THE ENGINEER, THE MUNICIPALITY AND THE CONSERVATION AUTHORITY. THEY ARE TO BE APPROPRIATE TO THE SITE CONDITIONS, PRIOR TO UNDERTAKING ANY SITE ALTERATIONS (FILLING, GRADING, REMOVAL OF VEGETATION, ETC.) AND DURING ALL PHASES OF SITE PREPARATION AND CONSTRUCTION. THESE PRACTICES ARE TO BE IMPLEMENTED IN ACCORDANCE WITH THE CURRENT BEST MANAGEMENT PRACTICES FOR EROSION AND SEDIMENT CONTROL AND SHOULD INCLUDE AS A MINIMUM THOSE MEASURES INDICATED ON THE PLAN.
2. TO PREVENT SURFACE EROSION FROM ENTERING THE DITCH OR STORM SYSTEM DURING CONSTRUCTION, FILTER SOCKS WILL BE PLACED UNDER GRATES OF ALL PROPOSED AND EXISTING CATCHBASINS AND STRUCTURES. A LIGHT DUTY SILT FENCE BARRIER WILL ALSO BE INSTALLED IN SELECTED LOCATIONS SHOWN ON THIS PLAN, AND STRAW BALE BARRIERS WILL BE INSTALLED WITHIN THE OUTLET DITCHES. THESE CONTROL MEASURES WILL REMAIN IN PLACE UNTIL VEGETATION HAS BEEN ESTABLISHED AND CONSTRUCTION COMPLETE.
3. THE SEDIMENT CONTROL MEASURES SHALL ONLY BE REMOVED WHEN, IN THE OPINION OF THE ENGINEER, THE MEASURES ARE NO LONGER REQUIRED. NO CONTROL MEASURES MAY BE PERMANENTLY REMOVED WITHOUT PRIOR AUTHORIZATION FROM THE ENGINEER.
4. THE CONTRACTOR SHALL IMMEDIATELY REPORT TO THE ENGINEER ANY ACCIDENTAL DISCHARGES OF SEDIMENT MATERIAL INTO ANY DITCH OR STORM SEWER SYSTEM. APPROPRIATE RESPONSE MEASURES, INCLUDING ANY REPAIRS TO EXISTING CONTROL MEASURES OR THE IMPLEMENTATION OF ADDITIONAL CONTROL MEASURES, SHALL BE CARRIED OUT BY THE CONTRACTOR WITHOUT DELAY.
5. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.
6. THE CONTRACTOR SHALL ENSURE PROPER DUST CONTROL IS PROVIDED WITH THE APPLICATION OF WATER (AND IF REQUIRED, CALCIUM CHLORIDE) DURING DRY PERIODS.

REMOVALS NOTES :

1. ALL HYDRANTS, VALVES AND OTHER APPURTENANCES TO BE REMOVED SHALL BE SALVAGED AND DELIVERED TO CITY OF OTTAWA MAINTENANCE YARD AT CLYDE AVENUE.
2. THE CONTRACTOR SHALL PROTECT ALL SURVEY MONUMENTS.
3. REMOVAL OF ALL ABOVE GROUND TRAFFIC PLANT AND STREETLIGHTING TO BE DONE BY OTHERS. CONTRACTOR SHALL PROTECT AND MAINTAIN EXISTING STREETLIGHTING, HYDRO POLES AND OVERHEAD LINES DURING CONSTRUCTION.
4. ALL BELL AND HYDRO OTTAWA MAINTENANACE HOLE ADJUSTMENTS SHALL BE PERFORMED BY AN APPROVED CONTRACTOR ONLY.
5. ALL TOPSOIL AND ANY SOFT, WET OR DELETERIOUS MATERIAL SHALL BE REMOVED FROM IMPROVED AREAS UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
6. FORESTRY TO BE CONTACTED PRIOR TO ANY SELECTIVE PRUNING OR REMOVALS WITHIN THE AREAS OF TRESS SURROUNDING THE TRANS CANADA TRAIL AND TREES THAT ARE TO REMAIN ARE TO HAVE PROPER TREE PROTECTION FENCING.

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APPROVED	JGR

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CITY OF OTTAWA
1104 HALTON TERRACE

SITE REMOVALS, EROSION AND SEDIMENT CONTROL PLAN

PROJECT No. 119024
REV: REV # 1
DRAWING No. 119024-ESC

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