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Klondike Road – Block 10

Site Servicing and Stormwater Management Report

MAPLE LEAF HOMES

KLONDIKE ROAD – BLOCK 10

SITE SERVICING AND STORMWATER MANAGEMENT REPORT

Prepared for:

Maple Leaf Homes

Prepared By:

NOVATECH
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario
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Issued: May 17, 2021
Revised: December 22, 2021
Revised: January 20, 2022
Revised: August 4, 2022

Novatech File: 117034-10
Report Ref: R-2021-068

NOVATECH
Engineers, Planners & Landscape Architects

August 4, 2022

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

Attention: **Lisa Stern, Planner**

Reference: **Klondike Road – Block 10**
Site Servicing and Stormwater Management Report
Novatech File No.: 117034-10

Novatech has prepared this Site Servicing and Stormwater Management Report on behalf of Maple Leaf Homes for Klondike Road – Block 10.

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

Lucas Wilson, P.Eng.
Project Coordinator

Suite 200, 240 Michael Cowpland Drive, Ottawa ON K2M 1P6 Tel: 613.254.9643 Fax: 613.254.5867 www.novatech-eng.com

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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 Klondike Road – Block 10 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 Klondike Road and Sandhill Road. The development is approximately 0.60ha and is bounded by Klondike Road to the south, Shirley's Brook to the west, and the future 1055 Klondike Road – Orr Ridge subdivision to the north and east. Refer to **Figure 1** – Site Location and **Figure 2** – Site Plan.

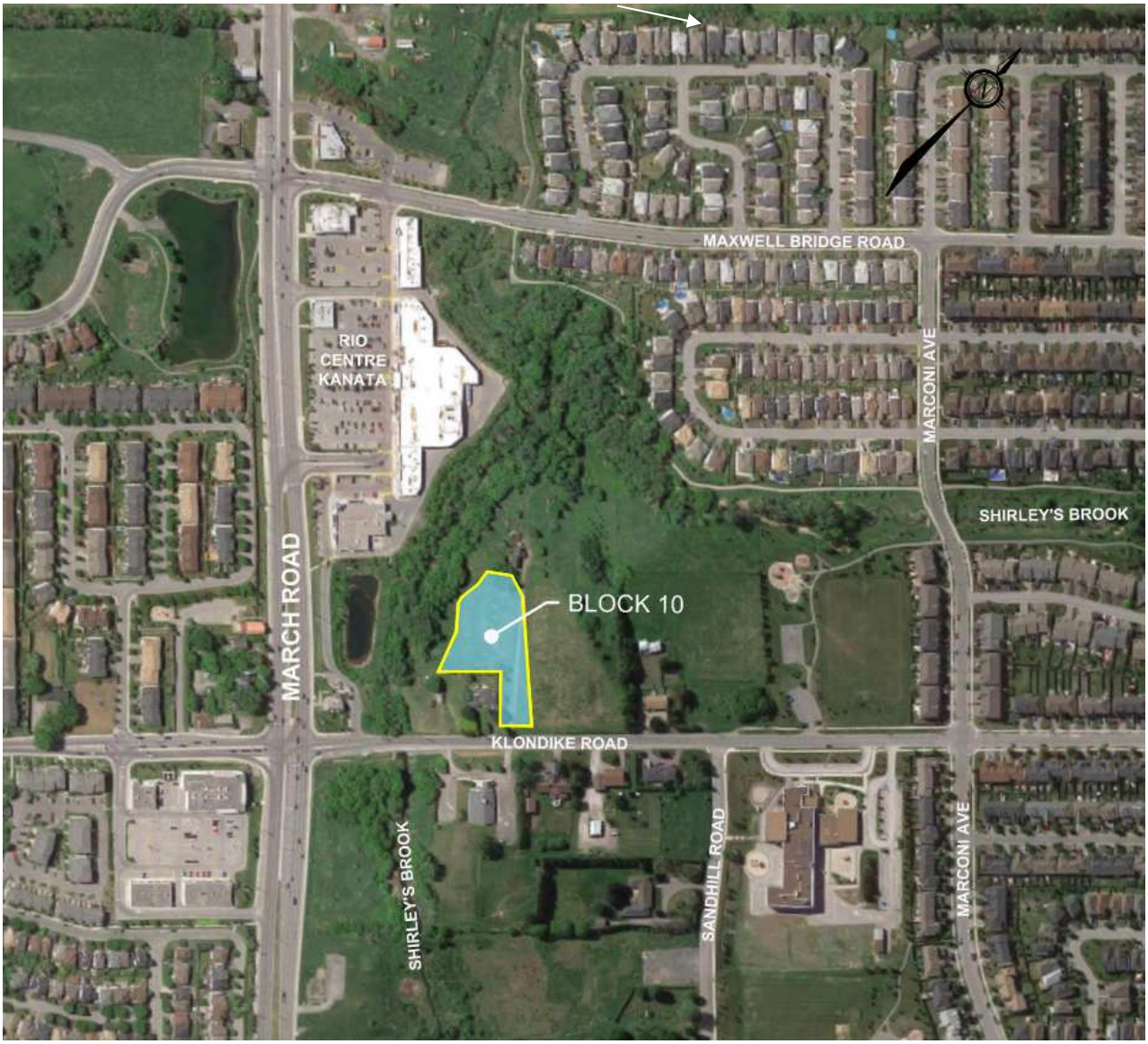


Figure 1 – Site Location: Klondike Rd – Block 10

The proposed development will consist of one 4-storey apartment building with underground parking consisting of 53 units. The proposed site plan is shown in **Figure 2**.

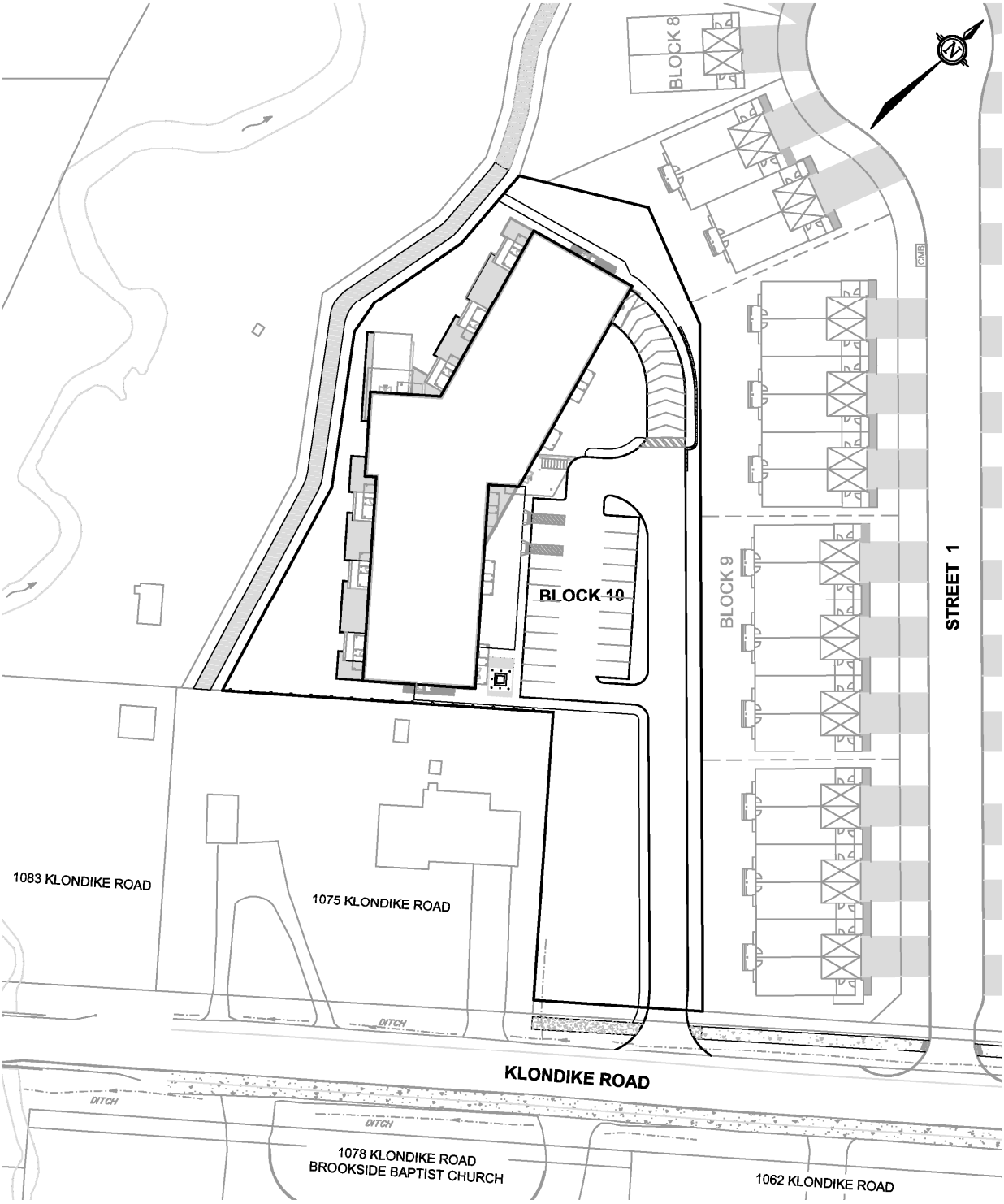


Figure 2 Site Plan

1.2 Existing / Planned Adjacent Land Uses

The following describes the existing and planned land uses adjacent to the subject site:

North / East: The lands north and east of the proposed site is the future 1055 Klondike Road – Klondike Ridge Subdivision consisting of town house and semi-detached units.

South: Klondike Road, a two-lane urban collector road, bounds the Subject Site to the south. The Subject Site is located between March Road and Sandhill Road on the North Side of Klondike Road.

Southeast: To the Southeast of the Subject Site, across Klondike Road, are Brookside Baptist Church and The Greenwoods Academy.

West: The RioCentre Kanata (832-858 March Road) is located to the west of the Subject Site, separated by Shirley's Brook.

1.3 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:

- *Maple Leaf Homes Development, 1055 Klondike Road – Klondike Ridge, Site Servicing and Stormwater Management Report, completed by Novatech, Ref. No.: R-2020-013, dated July 7, 2022.*
- *Brookside Subdivision Infrastructure Servicing Study, completed by Novatech, Ref. No.: R-2006-071 dated November 2006.*
- *Shirley's Brook SWM Facility 'C', Detailed Design Report, completed by Novatech, Ref. No.: R-2006-105 dated November 2006.*

2.0 EXISTING CONDITIONS

2.1 Topography & Drainage

The proposed site is currently undeveloped and consists of grassed table land and a tree-lined municipal watercourse. Access to the site is currently provided off Klondike Road via a private gravel entrance.

The majority of the site gently slopes westerly directly towards Shirley's Brook while a small portion near Klondike Road which slopes south towards the existing north side ditch of Klondike Road. The existing ditch travels west and outlets to Shirley's Brook.

2.2 Subsurface Conditions

Gemtec completed three (3) geotechnical investigations in support of the overall development, consisting of the Subdivision and Block 10. The first geotechnical investigation was conducted to provide a preliminary geotechnical investigation and slope stability assessment of the site:

- *Preliminary Geotechnical Investigation, Proposed Residential Subdivision, 1055 Klondike Road, Ottawa, Ontario, dated April 13, 2017 (Project: 60616.46).*

A second geotechnical investigation was conducted to obtain additional borehole information to provide engineering guidelines and recommendations on the geotechnical design aspects of this project and should be read in conjunction with the preliminary report:

- *Geotechnical Investigation, Proposed Residential Subdivision, 1055 Klondike Road, Ottawa Ontario, dated April 4, 2018 (Project: 64153.85).*

A third geotechnical investigation was conducted to supplement the existing subsurface information providing additional boreholes to obtain more precise grade raise restrictions within the site:

- *Supplemental Geotechnical Investigation, Proposed Residential Development, 1055 Klondike – Ottawa, dated April 10, 2019 (File: 64153.85).*

The principal findings of the geotechnical investigations are as follows:

- The work consisted of advancing eleven (11) boreholes to depths ranging from 4.0m to 10.2 m below ground surface.
- The existing soil profile consists of having a layer of topsoil ranging from 0.10m to 0.31m thick. Deposits of grey brown silty sand were encountered at all boreholes ranging from 0.8 to 2.0m thick. Native deposits of weathered, grey brown silt and clay with trace amounts of sand were encountered underlying the sand and silty sand at all locations ranging from 3.0m to 4.6m thick.
- Bedrock is expected to range from 4m-10m below grade.
- Groundwater is expected to range from 2.2m to 6.7m based on observations.
- Grade fill restrictions of 2.0m would apply to Block 10.

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

3.0 SANITARY SERVICING

3.1 Previous Studies

The Subject Site is located within the Briar Ridge Pump Station catchment area. The 1055 Klondike Road – Klondike Ridge Site Servicing and Stormwater Management Report, prepared by Novatech, dated January 2022, accounted for a sanitary flow of 1.5 L/s from the subject site to outlet to the Klondike Road sanitary sewer.

3.2 Existing Sanitary Sewer System for the Subject Lands

Currently, there is an existing 200mm sanitary sewer along Klondike Road with an existing manhole at Sandhill Road located approximately 117m from the site entrance. Flows from the site will be routed through the Klondike Road sewers to the 450mm trunk sanitary sewer within the pump station access road outletting to the Briar Ridge Pump Station.

Septic systems may be encountered on site, in the event a septic system is discovered, it should be decommissioned in accordance with Schedule 10 Decommissioning Requirements for Out-of-Service Septic Systems from the Ottawa Septic System Office (lands to be used for other purposes after decommissioning).

3.3 Proposed Sanitary Sewer Outlet

A 200mm sanitary sewer will be installed along Klondike Road, as part of the subdivision works, connecting the subject site to the existing manhole located at Klondike Road and Sandhill Road. The proposed outlet is consistent with the approved Brookside Infrastructure Servicing Study (Novatech). The proposed sanitary layout can be seen on **Figure 3** below.

3.4 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
Block 10 Apartment = 2.1 persons per unit
Maximum Residential Peak Factor = 4.0
Harmon Correction Factor = 0.8
Minimum velocity = 0.6m/s
Manning's n = 0.013

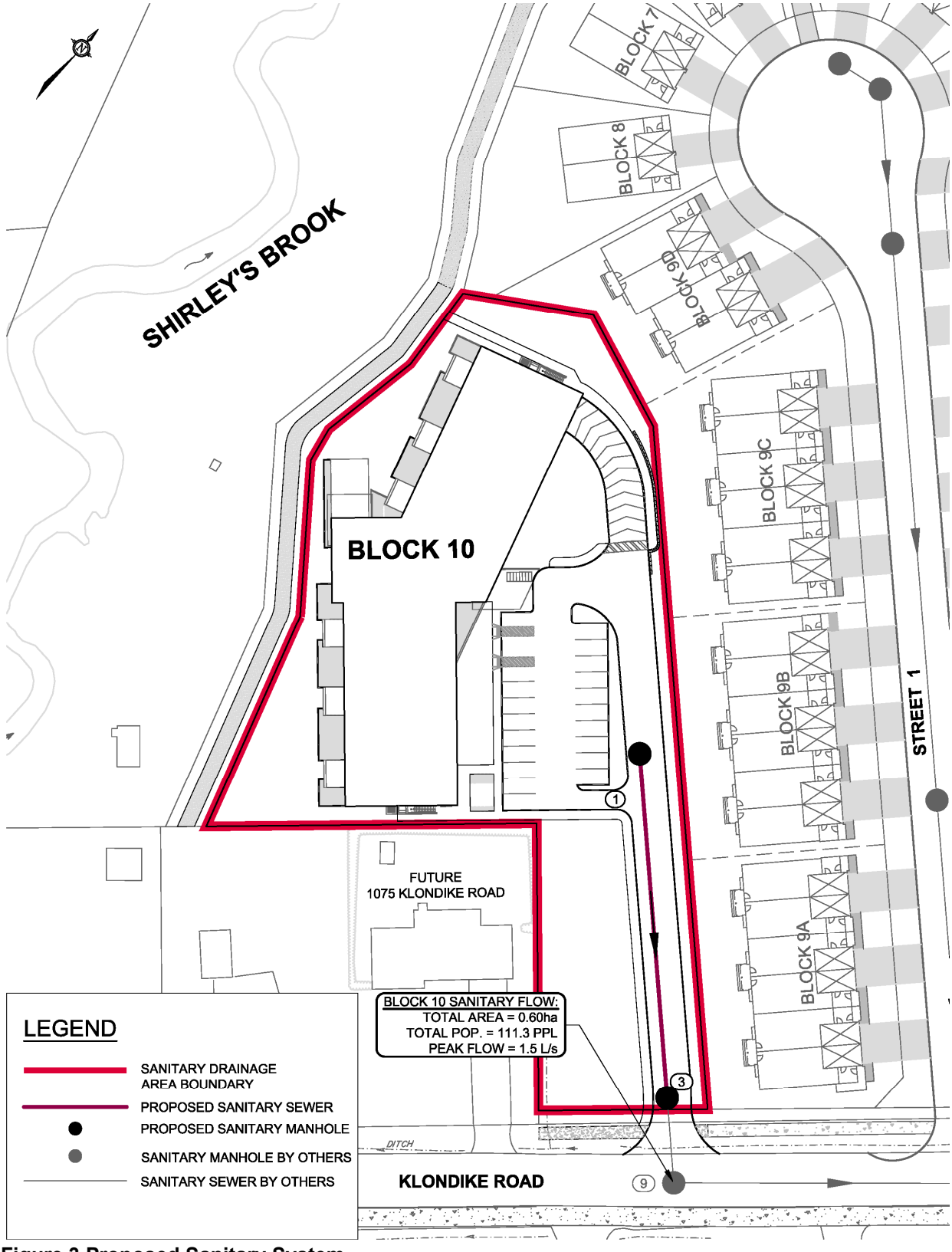


Figure 3 Proposed Sanitary System

3.5 Proposed Sanitary Sewer System

The calculated peak sanitary design flow for the development is 1.5 L/s meeting the flow accounted for in the subdivision servicing report mentioned above. For detailed calculations refer to the Sanitary Sewer Design Sheet located in **Appendix B**.

As previously noted, sanitary flows from the site will be directed to an existing 200mm diameter sanitary sewer on Klondike Road at Sandhill Road.

The downstream sanitary sewers within Klondike Road and the Briar Ridge Pump Station Access Road 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 2W2C Pressure Zone. Existing 400mm watermain stubs are located at the intersections of Klondike Road / Sandhill Road and Klondike Road / March Road.

4.2 Proposed Watermain System

The development will be serviced with a combination of 150mm and 200mm pipes with two connections providing a looped distribution system with redundant supply and improved circulation and water quality. A connection to the proposed 200mm diameter watermain stub at the entrance to the site and a connection to the proposed 200mm diameter watermain stub coming from the subdivision completes the loop. The proposed 200mm diameter stubs will be installed as part of the adjacent subdivision works. **Figure 4** highlights the proposed works and connection points. 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 350 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:

Demands:

- Apartment Density 2.1 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

System Requirements:

- 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)

Friction Factors:

- Watermain Size C-Factor
- 200mm 100
- 250mm 110
- 400mm 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
350 L/s	215.13 kPa (H3)

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

Operating Condition	Maximum Pressure	Minimum Pressure
1.984 L/s through system	474.31 kPa (H1)	450.00 kPa (H3)

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
0.902 L/s through system	521.40 kPa (H1)	518.16 kPa (H3)	2.09 Hours (B1)

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).

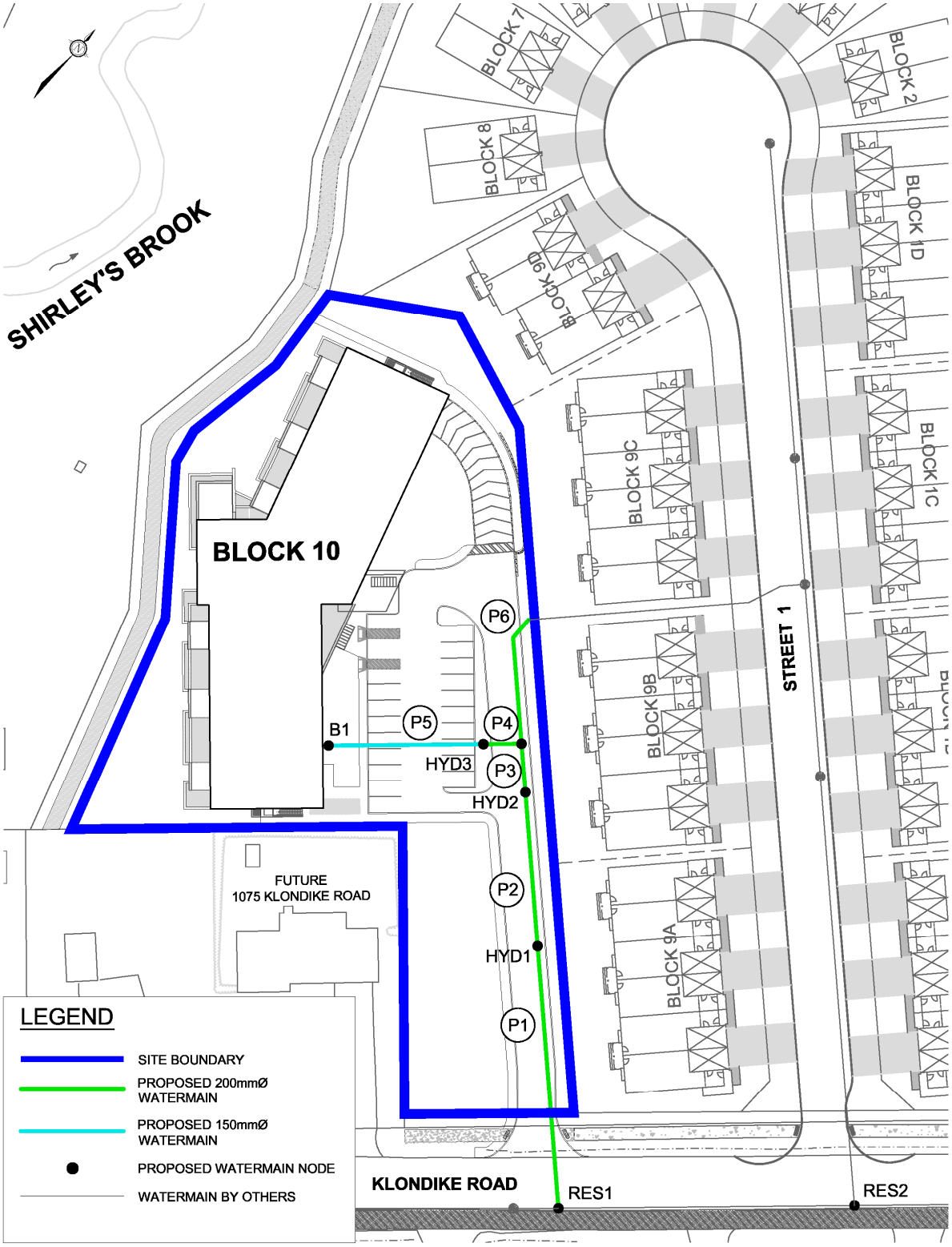


Figure 4 Proposed Watermain Network

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 1055 Klondike Road – Klondike Ridge Site Servicing and Stormwater Management Report (Novatech, July 2022). This report was prepared in accordance with the Brookside Subdivision Infrastructure Servicing Study (Novatech, 2006) and the Shirley's Brook SWM Facility 'C' Detailed Design Report (Novatech, 2006).

- Provide a dual drainage system (i.e. minor and major system flows);
- Maximize the use of surface storage available on site;
- Control the runoff to MH8 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.

For the approval of the 1055 Klondike Road – Klondike Ridge Subdivision, the following assumptions were made for the future development of Block 10 (see **Appendix D** for 1055 Klondike Road – Klondike Ridge report excerpts);

- Restricted minor system flow = 51 L/s;
- 100-year contained on-site (no major system overflow to Shirley's Brook).
- Uncontrolled flow of 6.0 L/s with a volume of 4.0 m^3 is permitted to sheet drain to Shirley's Brook.

5.1.1 Allowable Release Rate

The allowable release rate for Block 10 (0.60 ha) was established based on the restricted minor system flow of 85 L/s/ha (51 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 overland to the main branch of Shirley's Brook along the west side of the site. A small amount of drainage is directed to the north side ditch along Klondike Road.

There is an existing 825mm storm sewer on Klondike Road. The existing storm sewer stops at the intersection of Klondike Road and Sandhill Road (existing MH 159).

Proposed Conditions

As part of the subdivision works, the existing storm sewer on Klondike Road will be extended 163 m west in order to service both the proposed subdivision and Block 10. A future storm sewer to service the Subject Site and adjacent lands was identified in the Novatech (2006) design. Refer to **Figure 5** for the storm servicing layout.

5.2.1 Stormwater Quality Control Criteria

Although at the time it was designed, Shirley's Brook SWM Facility 'C' was required to provide a *Normal* level of water quality control (70% long-term TSS removal) for the contributing drainage area, including the Subject Site, the facility in fact provides an enhanced level of water quality treatment (80% long-term TSS removal). See **Appendix D** for SWM Facility 'C' quality control calculations.

The site previously consisted of areas A-18, B-03, B-04, B-08, B-09, C-01 and C-02, in the 1055 Klondike Road – Klondike Ridge Design, which had a drainage area of 0.60 ha and runoff coefficient of 0.58 (refer to excerpt provided in **Appendix D**). When comparing the area x runoff coefficient values the proposed site has the same area and runoff coefficient as previously allocated, as shown below:

Parameter	*1055 Klondike Road – Klondike Ridge Design*	*Current Design*
Drainage Area	0.60 ha	0.60 ha
Runoff Coefficient	0.58	0.58
Area x Runoff Coefficient	0.35	0.35

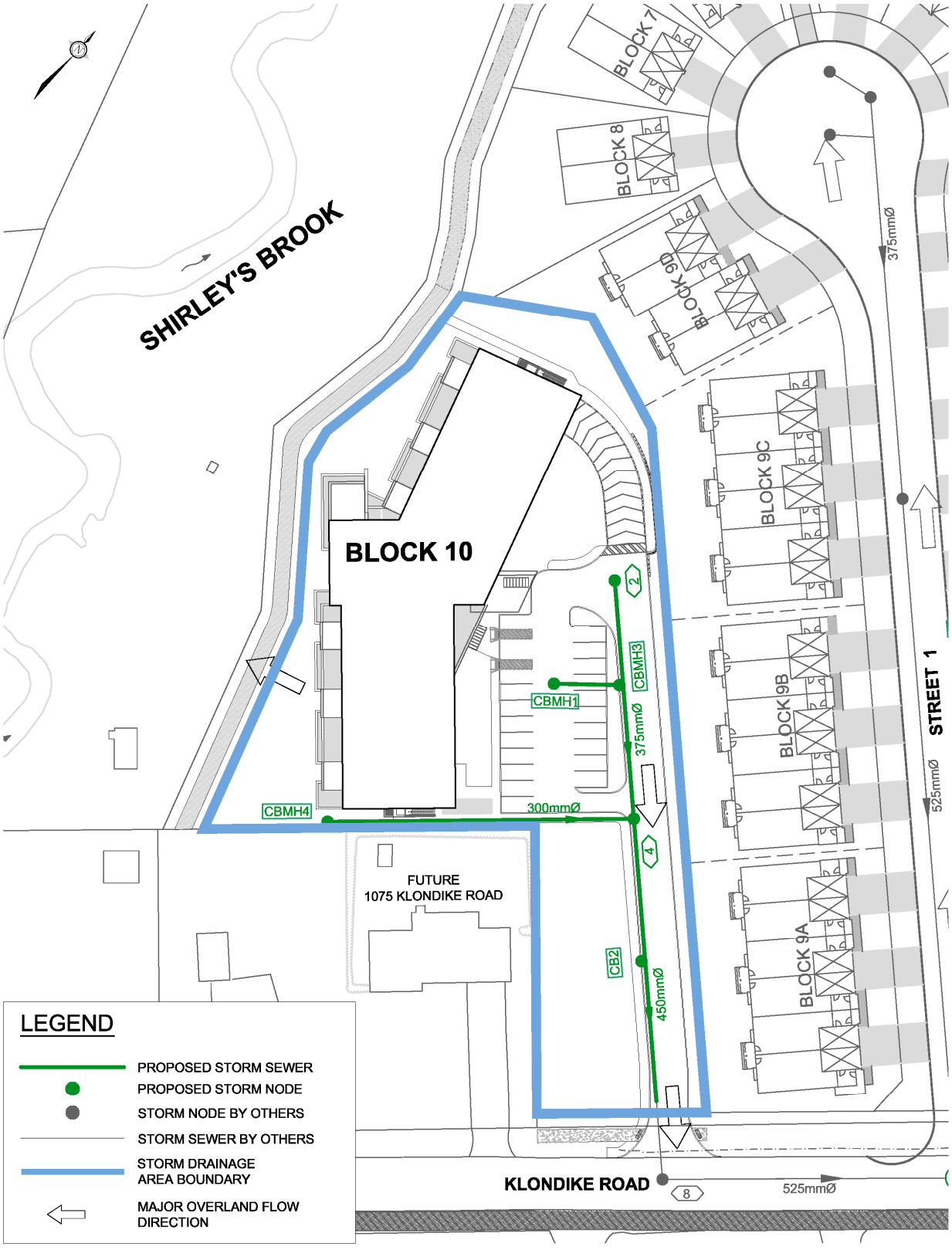


Figure 5 Proposed Storm System

5.2.2 Stormwater Quantity Control Criteria

The 1055 Klondike Road – Klondike Ridge Design established a 100-year release rate to Shirley's Brook of 297.2 L/s. Allocating 6.0 L/s of uncontrolled sheet drainage to Shirley's Brook from areas C-01 and C-02. Block 10 is to contain the 100-year storm event on-site with no major system overflow to Shirley's Brook.

5.2.3 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 storage pipes, 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 upstream of CBMH03 and CBMH04 to ensure no 2-year ponding occurs within the parking area or rear landscaped area. The required underground storage upstream of CBMH03 and CBMH04 is 17.5 m^3 and 6.1m^3 (refer to attached Modified Rational Method calculation in **Appendix D**). A total underground storage value of 17.6 m^3 is provided upstream of CBMH03 using 39.7m of 450mm diameter storm sewers, 10.6 m of 600mm storm sewers, two 1200mm CBMHs and two 610mmx610mm RYCBs. A total underground storage value of 13.0 m^3 is provided upstream of CBMH04 using 61.0 m of 300mm diameter storm sewers, 41.3 m of 250mm diameter storm sewers, two 1200mm CBMHs and three 610mmx610mm RYCB's. The proposed underground storage provided upstream of CBMH03 and CBMH04 will ensure no ponding occurs at the surface during the 2-year storm event. The proposed layout is shown on the General Plan of Services (drawing 117034-10-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 Klondike Road 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.

5.2.4 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 the Klondike Road north side ditch. The landscaped area along Shirley's Brook located on the west side of the building, has been designed to convey runoff that exceed the minor system capacity directly to Shirley's Brook. The site has been graded to ensure the 100-year peak overland flows are confined on-site.

Approximately 0.014 ha of grassed land (C-01 & C-02) sheet drains to Shirley's Brook from the proposed site with a total 100-year peak flow of 6.0 L/s.

Surface Storage

The stage-storage curves for each inlet were calculated based on the proposed Grading Plan (drawing 117034-10-GR). The total storage shown in the stage-storage curves at each inlet is provided in **Appendix D**. Approximately 30.6 m^3 of underground storage and 206.1 m^3 of surface storage is available on-site.

The total storage provided on the surface is as follows:

Table 5.1: Total Available Surface Storage

Structure ID	Surface Storage (m^3) Provided
CBMH03*	29.3
CBMH01	76.2
RY04	6.9
TOTAL	**112.4**
CB02*	31.7
LC02	48.3
TOTAL	**80.0**
RY07	5.1
LC03	1.8
RY03	5.1
RY05	1.7
TOTAL	**13.7**
TOTAL OVERALL	**206.1**

*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 Block 10 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. This is also consistent in the analysis by Novatech (2006), who designed SWM Facility 'C' using the SWMHYMO hydrologic model.

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 (%)
B-01	0.044	0.80	85.7	0	18	1.5
B-02	0.069	0.20	0	0	35	2.5
B-03	0.004	0.20	5	0	13	33.33
B-04	0.006	0.20	5	0	20	33.33
B-05	0.042	0.78	82.9	0	21	1.5
B-06	0.097	0.78	82.5	4	65	1.5
B-07	0.015	0.90	100	0	8	10.5
B-08	0.006	0.20	5	0	20	33.33
B-09	0.006	0.20	5	0	20	33.33
B-10	0.023	0.20	0	0	46	4.5
B-11	0.026	0.45	35.7	0	17	2
B-12	0.060	0.46	37.1	56	40	3
B-13	0.045	0.27	10	0	45	3
B-14	0.003	0.20	0	0	30	5
B-15	0.007	0.20	0	0	14	2.5
B-16	0.060	0.90	100	100	60	1
B-17	0.069	0.90	100	100	69	1
C-01	0.011	0.20	5	0	22	33.33
C-02	0.003	0.20	5	0	30	33.33
Subdivision	**0.60**	**0.58**	**54.3**	**-**	**-**	**-**

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 117034-10-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 = (% 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 outlet for the proposed development is the existing maintenance hole (MH 159) on Klondike Road.
- Novatech (2006) estimated a 100-year Hydraulic Grade Line (HGL) elevation of 69.73 m at MH 159 on Klondike Road at Sandhill Road. This is equivalent to obvert elevation of the outgoing 825mm storm sewer (69.73 m); therefore, it is assumed that this storm sewer does not surcharge during the 100-year storm event. In addition, this HGL elevation is

lower than the invert elevation of the outgoing pipe from MH 08 at the end of the private access (71.80 m). As such, a 'Normal' outfall condition was used for all model simulations.

5.3.1 PCSWMM Model Results

Inlet Control Devices (ICDs)

ICDs are provided for select 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 prevent 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)
CB02	83mm	77.73	76.33	1.51	7.8	12.3	17.7
CBMH03	Tempest MHF 76mm	77.83	75.13	2.93	16.7	19.3	19.8
CBMH04	Tempest LMF Vortex 70	77.80	75.24	2.04	3.1	4.1	6.1

**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, thereby meeting the major system criteria. In addition, there is no cascading flow over the highpoint during the 100-year storm event.

Table 5.4: Overland Flow Results

Structure	T/G (m)	Max. Static Ponding		100-yr Event			
		Elev. (m)	Spill Depth (m)	Elev. (m)	Depth (m)	Cascading Flow?	Cascade Depth (m)
CBMH01	77.83	78.13	0.30	78.06	0.23	N	0.00
CB02	77.73	78.03	0.30	77.84	0.11	N	0.00
CBMH03	77.83	78.13	0.30	78.06	0.23	N	0.00
LC01	77.70	77.75	0.05	76.74	0.00	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)
LC02	77.73	78.03	0.30	77.84	0.11	N	0.00
LC03	77.67	77.80	0.13	77.29	0.00	N	0.00
RY03	77.15	77.30	0.15	77.28	0.13	N	0.00
RY04	78.00	78.22	0.22	78.06	0.06	N	0.00
RY05	77.24	77.35	0.11	77.28	0.04	N	0.00
RY06	78.17	78.20	0.03	78.06	0.00	N	0.00
RY07	77.15	77.35	0.20	77.29	0.14	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 ensure that a minimum freeboard of 0.30m is provided between the 100-year HGL and the designed underside of footing (USF) elevation.

There is no surcharging within the on-site sewers during both the 100-year and 100-year (+20%) storm events.

Table 5.5: 100-year HGL Elevations

Manhole ID	MH Invert Elevation (m)	T/G Elevation (m)	HGL Elevation (100yr) (m)	Design USF (m)	Clearance (100yr) (m)
MH02	72.81	78.15	72.93	-	-
MH04	72.58	78.09	72.75	75.00	1.97
MH08	71.80	77.94	72.02	-	-
TD01	73.88	75.63	73.93	-	-

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

An expanded table showing the results of the stress test (100-year +20% event) and the HGL elevations is provided in **Appendix B**. The stress test indicates that the HGL elevations will be below the USF elevations for this event.

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

Proposed Development	Drainage Area (ha)	Allowable Release Rate[1] (L/s)		100-year Peak Flow (L/s)	
		Minor System (Klondike Rd.)	Uncontrolled Flow (Shirley's Brook)	Minor System (Klondike Rd.)	Major System (Shirley's Brook)
Block 10	0.60	51.0	6.0	50.8	6.0

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

The 100-year minor system peak flow to Klondike Road is controlled to just under the allowable release rate of 51 L/s for the proposed site.

Comparison of Runoff Volumes

There is no major system overflow being directed to Shirley's Brook during the 100-year storm event. A total volume of 4.0 m^3 is being directed to Shirley's Brook because of uncontrolled sheet drainage from areas C-01 and C-02. This volume, included as part of the overall major system allowance, adheres to the criteria specified in **Section 5.1**.

Areas Directed to Subdivision Rear-yard System

A small strip of land along the east property line, approximately 0.02 ha, slopes towards the rear-yards of the subdivision and will be captured by the proposed rear-yard catchbasins with a 100-year peak runoff of 9.5 L/s. This additional flow was included in the subdivision design and does not result in any increase to the subdivision minor or major system peak flows calculated in the 1055 Klondike Road – Klondike Ridge Design Report.

6.0 ROADWAYS

6.1 Proposed Road Infrastructure

Gemtec has prepared a Geotechnical Investigation report for the Development (April 2018) 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)	60
Base: Granular A	150
Sub-Base: Granular B – Type II	450
Total	**700**

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 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 200mm sanitary sewer along Klondike Road. The proposed outlet is consistent with the approved Brookside Subdivision Infrastructure Servicing Study (Novatech).
- The proposed development can be serviced with a 200mm sanitary sewer system.
- The total proposed sanitary flow from the subject lands is 1.5 L/s, which equals the calculated flows in the 1055 Klondike Road – Orr Ridge Servicing Study (1.5 L/s).
- 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 150mm and 200mm pipe with connections to the future 200mm diameter stubs to be located at the site entrance and between Blocks 9B and 9C of the Klondike Ridge subdivision.
- The analysis confirms the proposed watermain provides adequate fire protection and domestic service under all operating conditions.
- Distribution mains have been looped as part of the subdivision works by connecting to the existing 400mm diameter watermain stubs at Klondike Road / Sandhill Road and Klondike Road / March Road providing redundant supply and improved circulation and water quality.

Stormwater Management

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

- Proposed storm sewer system will convey stormwater to MH8 on Klondike Road.
    - 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 51.0 L/s.
    - A minimum clearance of 0.30m is provided between the 100-year hydraulic grade line (HGL) or storm sewer obvert and the designed underside of footing elevation.
- 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 the north side ditch along Klondike Road. No overland flow occurs up to and including the 100-year + 20% 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.

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 Manager

Mark Bissett, P.Eng.
Senior Project Manager

FOR REVIEW

Appendix A

Correspondence

File No.: PC2021-0034
Date: February 23, 2021

1055 Klondike Road
Pre-Consultation Meeting Minutes
Meeting Date: Wednesday February 3, 2021

Attendee	Role	Organization
Lisa Stern	Planner, File Lead	City of Ottawa
Mark Young	Urban Design	
Josiane Gervais	Transportation	
Ahmed Elsayed	Infrastructure PM	
Justyna Garbos	Parks Planner	
Matthew Hayley	Environmental Planner	
Erica Ogden	Planner	MVCA
Christine McCuaig	Planner	Q9 Planning
Anthony Bruni	Architect	Colizza Bruni
Brian Saumure		Maple Leaf Custom Homes
Mark Bissett	Engineer	Novatech

Comments from the Applicant:

1. The subject lands are a part of subdivision rezoning application D07-16-19-0024.
2. Proposal is a 4 storey residential building with underground parking.
3. Access will be taken from Klondike Road.
4. Future Block 12 will be merged with Block 10, but it is the intent that these lands will be developed with 1075 Klondike should it be sold in the future.

Planning Comments:

1. The subject application will be a Complex Site Plan Control Application. The application form, timeline and fees can be found here.
2. There is an on-going subdivision/rezoning process on the subject lands. While the subject site plan application may be reviewed concurrently, no approvals may occur until the zoning is in place and the block is registered.
3. Although it is the intent that block 12 would eventually be merged with 1075 Klondike, there is no assurance that this will occur. Please provide a 'concept plan' for Block 12, a shared private access between Blocks 10 and 12 may be warranted to ensure developability of Block 12.
4. Please provide a pedestrian connection (private sidewalk connection) to Klondike Road.
5. Please ensure that shadow impacts on the public realm and rear yards of surrounding homes are minimized.
6. Please discuss proposed transitions and access to the creek block, and transition to the adjacent low density residential in the planning rationale.
7. Cash-in-lieu of parkland will be taken as a part of the associated subdivision.
8. Please consult with the Ward Councillor prior to submission.

Urban Design Comments:

1. Please consider a re-organization of the parking and ramp locations at grade on the west side of the proposed building as discussed in the meeting.

2. Please review and consider the width of the portion of the parcel connecting to the public right of way. The portion of the parcel that connects to Klondike Road should allow for a private sidewalk and tree planting.
3. Please ensure that the terraces and amenity areas on the east side of the building will allow for accessible connections to the future pathway located along the abutting creek corridor.
4. Please look at the proposed building as it relates to the site located to the south. Efforts to minimize the impact on the abutting property should be reviewed. A high-level review of this building and how it could relate to any future redevelopment of the abutting lands should be considered.
5. Landscaping and screening between the possible ramp location adjacent to low density rear yards should be provided.
6. The applicant is required to provide a Design Brief as part of their planning rationale. Please see the attached terms of reference.

Transportation Comments:

1. As the TIA prepared in support of the 1055 Klondike Rd Subdivision accounts for this apartment building in the Network Impact Component and is currently under review, simply addressing Modules 4.1 to 4.4 is required. This can be incorporated within the greater TIA document, an updated Step 4 report can be submitted (no need to submit Scoping and Forecasting). Alternatively, a separate supplementary technical memorandum can be provided.
2. ROW protection on Klondike between Old Second Line Rd and March Valley Rd is 24m even.
3. Clear throat requirements for <100 apartments on an major collector is 8m.
4. On site plan:
    a. 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.
    b. Turning movement diagrams required for all accesses showing the largest vehicle to access/egress the site.
    c. Turning movement diagrams required for internal movements (loading areas, garbage).
    d. Show all curb radii measurements; ensure that all curb radii are reduced as much as possible
    e. Show lane/aisle widths.
    f. Sidewalk is to be continuous across access as per City Specification 7.1.
    g. Grey out any area that will not be impacted by this application.
5. Provide pedestrian connection between parking area and main access, as well as from Klondike Road to the main access.
6. Underground ramps should be limited to a 12% grade and must contain a subsurface melting device when exceeding 6%. Ramp grades greater than 15% can be psychological barriers to some drivers.
7. The City recommends development on private property be in accordance with the Accessibility Design Standards. AODA legislation applies to areas of the site that will be accessed by the general public (i.e. visitor parking rates, exterior paths of travel, etc.).
8. Noise Impact Studies required for the following:
    a. Road
    b. Stationary, due to the proximity to neighboring exposed mechanical equipment or if there will be any exposed mechanical equipment due to the proximity to neighboring noise sensitive land uses.
9. A by-Law Exemption for section 25 (p) of the Private Approach Bylaw would be required for the site access if it remains in it's current location.

Environmental Comments:

1. No need for a new EIS as the one for the subdivision is sufficient
2. Consider the bird safe design but not required due to the building not being a mid rise
3. Pathway connection – please provide a connection
4. Landscaping should be restricted to native tree species

MVCA Comments:

1. The setbacks from Shirley's Brook for this block has been established through the subdivision. We ask that the setbacks be shown in the site plan submissions as well.
2. Any works within the regulated area of Shirley's Brook will require a permit from the Conservation Authority under Ontario Regulation 153/06.
3. This block was included in the overall stormwater management plan for the subdivision. The detailed design for the site should take the following into account:
    a. Minor system inlet rate of 51 L/s (based on 85 L/s/ha)
    b. Major system storage of 30 m3 (based on 50 m3/ha)
    c. No major system overland flow is allowed to Shirley's Brook for up to and including 1:100-yr storm events.

Forestry:

1. a Tree Conservation Report (TCR) must be supplied for review along with the suite of other plans/reports required by the City
    a. an approved TCR is a requirement of Site Plan approval.
    b. The TCR may be combines with the Landscape Plan
2. As of January 1 2021, any removal of privately or publicly (City) owned trees 10cm or larger in diameter requires a tree permit issued under the Tree Protection Bylaw (Bylaw 2020 – 340); the permit will be based on an approved TCR and made available at or near plan approval.
3. The Planning Forester from Planning and Growth Management as well as foresters from Forestry Services will review the submitted TCR
    a. If tree removal is required, both municipal and privately-owned trees will be addressed in a single permit issued through the Planning Forester
    b. Compensation may be required for city owned trees – if so, it will need to be paid prior to the release of the tree permit
4. the TCR must list all trees on site by species, diameter and health condition
5. the TCR must list all trees on adjacent sites if they have a critical root zone that extends onto the development site
6. Trees should be identified by ownership – Privately owned on-site trees; Privately owned off-site trees; City owned trees; Co-owned trees (growing on a property boundary)
7. If trees are to be removed, the TCR must clearly show where they are, and document the reason they cannot be retained
8. All retained trees must be shown and all retained trees within the area impacted by the development process must be protected as per City guidelines available at Tree Protection Specification or by searching Ottawa.ca
    a. the location of tree protection fencing must be shown on a plan
    b. show the critical root zone of the retained trees
    c. if excavation will occur within the critical root zone, please show the limits of excavation

9. 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.
10. For more information on the process or help with tree retention options, contact Mark Richardson mark.richardson@ottawa.ca or on City of Ottawa

For additional information on the following please contact Adam.Palmer@Ottawa.ca

Minimum Setbacks

- Maintain 1.5m from sidewalk or MUP/cycle track.
- Maintain 2.5m from curb
- Coniferous species require a minimum 4.5m setback from curb, sidewalk or MUP/cycle track/pathway.
- Maintain 7.5m between large growing trees, and 4m between small growing trees. Park or open space planting should consider 10m spacing.
- Adhere to Ottawa Hydro's planting guidelines (species and setbacks) when planting around overhead primary conductors.

Tree specifications

- Minimum stock size: 50mm tree caliper for deciduous, 200cm height for coniferous.
- Maximize the use of large deciduous species wherever possible to maximize future canopy coverage
- Tree planting on city property shall be in accordance with the City of Ottawa's Tree Planting Specification; and include watering and warranty as described in the specification (can be provided by Forestry Services).
- Plant native trees whenever possible
- No root barriers, dead-man anchor systems, or planters are permitted.
- No tree stakes unless necessary (and only 1 on the prevailing winds side of the tree)

Hard surface planting

- Curb style planter is highly recommended
- No grates are to be used and if guards are required, City of Ottawa standard (which can be provided) shall be used.
- Trees are to be planted at grade

Soil Volume

- Please ensure adequate soil volumes are met:

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

Please note that these soil volumes are not applicable in cases with Sensitive Marine Clay.

Sensitive Marine Clay

- Please follow the City's 2017 Tree Planting in Sensitive Marine Clay guidelines

Infrastructure Comments:

Please note the following information regarding the engineering design submission for the above noted site:

1. The Servicing Study Guidelines for Development Applications are available at the following address: https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/guide-preparing-studies-and-plans#servicing-study-guidelines-development-applications
2. 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)
3. 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).
4. The proposed site will require extension of all services (water, sanitary and stormwater).The Stormwater Management Criteria, for the subject site, is to be based on the following:
   i. There is currently no storm sewer on Klondike Road directly in front of the 1055 Klondike Property. There is a storm sewer manhole / system at the intersection of Klondike Road and Sandhill Road conveying flow to a ditch upstream of "Pond C".
   ii. Based on both the Shirley's Brook Floodplain Analysis and SWM Report (Klondike Road Development Lands, prepared by Novatech, May 2006) and the Shirley's Brook SWM Facility "C" Detailed Design Report (prepared by Novatech, 2006), it appears that Pond "C" was sized to service the 1055 Klondike parcel. Please demonstrate that the existing storm sewer and pond have capacity to service this proposed development (quantity and quality control).
   iii. Barring any additional SWM requirements from the MVCA (please see the note below), refer to the SWM design criteria in the Shirley's Brook SWM Facility "C" Detailed Design Report (prepared by Novatech, 2006) for the proposed development area (including rear yards):

- Minor system allowable release rate of 85 L/s/ha;
- Onsite major system storage of 50 m3 / ha (please see the note below);
- ICDs will be installed in the roadway catchbasins to ensure flow into the storm sewer system does not exceed the 5-year runoff rates; and
- HGL for 100-year event must have at least 0.3 m freeboard to the underside of footings.

NOTE: that MVCA is reviewing the SWM design criteria provided in the Shirley's Brook SWM Facility "C" Detailed Design Report (prepared by Novatech, 2006). The MVCA may require further stormwater management requirements be imposed on lands draining to Shirley's Brook (for example, this may include additional onsite major system storage volume, potentially requiring collection and storage of all runoff for storm events up to and including the 100-year return period). Please contact the MVCA to confirm all SWM design criteria (ESC, quality and quantity control).

iv. IDF information derived from the Meteorological Services of Canada rainfall data, taken from the MacDonald Cartier Airport, collected 1966 to 1997.
v. A calculated time of concentration (Cannot be less than 10 minutes).
vi. Flows to the storm sewer in excess of the 5-year storm release rate, must be detained on site (please confirm with MVCA whether the onsite major system storage is 50 m3 / ha, or whether storage volume must be provided to attenuate all runoff up to and including the 100-year event).
vii. SWM calculations using modified rational method is acceptable however, if a combination of surface storage (roof or at-grade / parking lot) is proposed in addition to sub-surface / cistern storage then the consultant is reminded to either:

(a) use a dynamic computer model; or
(b) use modified rational method:

1. assuming an average release rate of 50% peak flow rate for a cistern / sub-surface storage facility.
2. provide calculations for each storage facility /area (roof vs sub-surface storage) with respect to its attributing drainage area; and
3. where storage facilities are inline (or in series), please add the upstream peak release rate to the downstream storage facilities modified rational method calculator.

1. Please note that there is a Special Area Development Charge for the subject site. Please refer to the current Development Charge attached (By-Law No. 2019 – 163). Note that this is the Charge for 2019 and may change over time.
2. Deep Services (Storm, Sanitary & Water Supply)
   i. *Provide existing servicing information and the recommended location for the proposed connections. Services should ideally be grouped in a common trench to minimize the number of road cuts.*
   ii. *Connections to trunk sewers and easement sewers are typically not permitted.*
   iii. *Provide information on the monitoring manhole requirements – should be located in an accessible location on private property near the property line (i.e. Not in a parking area).*
   iv. *Review provision of a high-level sewer.*
   v. *Provide information on the type of connection permitted*

Sewer connections to be made above the springline of the sewermain as per:

a. Std Dwg S11.1 for flexible main sewers – *connections made using approved tee or wye fittings.*
b. Std Dwg S11 (For rigid main sewers) – *lateral must be less that 50% the diameter of the sewermain,*
c. Std Dwg S11.2 (for rigid main sewers using bell end insert method) – *for larger diameter laterals where manufactured inserts are not available; lateral must be less that 50% the diameter of the sewermain,*
d. Connections to manholes permitted when the connection is to rigid main sewers where the lateral exceeds 50% the diameter of the sewermain. – Connect obvert to obvert with the outlet pipe unless pipes are a similar size.
e. *No submerged outlet connections.*

3. As per Section 4.3.1 of the Water Design Guidelines: “Service areas with a basic day demand greater than 50 m^3/day (about 50 homes) shall be connected with a minimum of two feedermains to avoid the creation of a vulnerable service area. Distribution mains shall be looped whenever possible to provide redundant supply and improved circulation and water quality.”

Based on the proposed sub-division the site requires two watermain feeds. Linking the existing watermain stubs on Klondike Road (from March Road) to Sandhill Road.
Note: one connection to the existing watermain stub on Klondike at the intersection of Sandhill will not be accepted.

4. 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:
    i. Location of service
    ii. Type of development and the amount of fire flow required (as per FUS, 1999).
    iii. Average daily demand: ___ l/s.
    iv. Maximum daily demand: ___l/s.
    v. Maximum hourly daily demand: ___ l/s.
5. The applicant will need to confirm with the City whether sufficient capacity is available in the local sanitary sewer on Sandhill or Klondike to accommodate flows generated from the subject site.

Please note that residual capacity at the Briaridge PS is a constraint. A study is currently underway to increase the rated capacity at the station from 55 l/s to 175 l/s. The project to increase capacity is likely a few years away (target date 2021-2022). Note that an EA is not required as part of scope of work for this upgrade.

6. MOECC ECA Requirements

An MOECC Environmental Compliance Approval will be required for the proposed development due to new services and roads. Please contact Ontario Ministry of the Environment and Climate Change, Ottawa District Office to arrange a pre-submission consultation:
For residential applications:
Charlie Primeau
(613) 521-3450, ext. 251
Charlie.Primeau@ontario.ca

Note that the typically the Public Consultation performed as part of the ESA process is submitted as part of the application for the ECA. Please confirm this with the MOECC Ottawa District Office as part of the pre-submission consultation.

7. 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 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-con 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 contact me at Lisa.Stern@ottawa.ca or at 613-580-2424 extension 21108 if you have any questions.

Appendix B

Sanitary Design Sheets

Klondike Road - Block 10: Sanitary Sewer Design Sheet

AREA			RESIDENTIAL											ICI							INFILTRATION				PIPE					
			Singles		Semi-Detached / Towns				TOTAL																					
ID	From	To	Units	Pop.	Units	Pop.	Future Block 10	Future 1075 Klondike Rd	Pop.	Pop.	Accum. Pop.	Peak Factor	Peak Flow (l/s)	Light Industrial Area (ha)	Accum. Area (ha)	Peak Factor	Commercial Area (ha)	Institutional Area (ha)	Accum. Area (ha)	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} (%)
Block 10																														
A2-1	**MH01**	**MH09**	0	0.0	0	0.0	53		111.3	111.3	111.3	3.6	1.3				0.00	0.00	0.00	0.0	0.60	0.60	0.2	1.5	200	0.50	67.8	24.2	0.75	6.2%
Klondike Road																														
A2-2	**MH09**	**1**	0	0.0	0	0.0	0.00	10	17.6	17.6	128.9	3.6	1.5				0.00	0.00	0.00	0.0	0.28	0.88	0.3	1.8	200	1.40	47.6	40.5	1.25	4.4%
A1-1, A1-2, A1-3	**1**	**266**	0	0.0	58	156.6	0.00		0.0	156.6	285.5	3.5	3.2				0.00	0.00	0.00	0.0	1.85	2.73	0.9	4.1	200	0.65	117.0	27.6	0.85	14.9%
Off-site Drainage Areas (To Briar Ridge Pump Station)																														
A3-3	266	265	0	0.0	57	153.9	0.00		0.0	153.9	439.4	3.4	4.8				0.00	0.00	0.00	0.0	2.47	5.20	1.7	6.6	200	0.32	91.0	19.4	0.60	33.9%
A3-4	265	264	0	0.0	0	0.0	0.00		0.0	0.0	439.4	3.4	4.8				0.00	2.21	2.21	1.1	2.21	7.41	2.4	8.4	200	0.32	120.0	19.4	0.60	43.2%
A3-5	264	206	0	0.0	107	288.9	0.00		0.0	288.9	728.3	3.3	7.8				0.00	0.00	2.21	1.1	3.99	11.40	3.8	12.6	250	0.24	306.3	30.4	0.60	41.6%
A3-1, A3-2, A3-6	206	205	201	683.4	392	1058.4	0.00		0.0	1741.8	2470.1	3.0	24.1				9.02	0.00	11.23	5.5	37.33	48.73	16.1	45.6	450	0.20	52.5	133.0	0.81	34.3%
A3-7, A3-8	205	204	0	0.0	0	0.0	0.00		0.0	0.0	2470.1	3.0	24.1	5.4	5.4	4.7	0.00	0.00	11.23	15.7	5.40	54.13	17.9	57.7	450	0.20	79.7	133.0	0.81	43.4%
	204	203	0	0.0	0	0.0	0.00		0.0	0.0	2470.1	3.0	24.1		5.4	4.7	0.00	0.00	11.23	15.7	0.00	54.13	17.9	57.7	450	0.20	79.7	133.0	0.81	43.4%
	203	202	0	0.0	0	0.0	0.00		0.0	0.0	2470.1	3.0	24.1	7.9	13.3	3.9	0.00	0.00	11.23	26.5	7.90	62.03	20.5	71.0	450	0.26	90.0	151.7	0.92	46.8%
	202	201	0	0.0	0	0.0	0.00		0.0	0.0	2470.1	3.0	24.1		13.3	3.9	0.00	0.00	11.23	26.5	0.00	62.03	20.5	71.0	450	0.25	270.0	148.7	0.91	47.8%
	201	PS	0	0.0	0	0.0	0.00		0.0	0.0	2470.1	3.0	24.1		13.3	3.9	0.00	0.00	11.23	26.5	0.00	62.03	20.5	71.0	450	0.15	21.6	115.2	0.70	61.7%

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	units/ha
Block 10 Apartment Unit	2.1	
Future 1075 Klondike Road	1.8	35
Single	3.4	
Semi / Town	2.7	

Project: 1055 Klondike Road - Block 10 (117034-10)

Designed: LRW

Checked: MAB

Date: May 17, 2021

NOVATECH
Engineers, Planners & Landscape Architects

Appendix C

Watermain Boundary Conditions,
FUS Calculations, &
Modelling Results

Boundary Conditions
1055 Klondike Road

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	50	0.83
Maximum Daily Demand	125	2.09
Peak Hour	275	4.59
Fire Flow Demand #1	15,000	250.00
Fire Flow Demand #2	21,000	350.00

Location

Results

Connection 1 – Klondike Rd.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	131.0	78.6
Peak Hour	126.2	71.7
Max Day plus Fire 1	121.2	64.7
Max Day plus Fire 2	116.7	58.2

Ground Elevation = 75.7 m

Connection 2 – Klondike Rd.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	131.0	78.9
Peak Hour	126.2	72.0
Max Day plus Fire 1	121.2	65.0
Max Day plus Fire 2	116.6	58.5

Ground Elevation = 75.5 m

Notes

1. A 400mm watermain on Klondike Rd. was added for modelling purposes between March Rd. and Sandhill Rd.

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 #: 117034-10
Project Name: 1055 Klondike Block 10
Date: 5/10/2021
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)	1462			
		Number of Floors/Storeys	4			
		Area of structure considered (m^2)			**5,848**	
	F	**Base fire flow without reductions**	20			**25,000**
		F = 220 C $(A)^{0.5}$				
b n						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	**21,250**
		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%	**-8,500**
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System		-10%		
				Cumulative Total	**-40%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	10.1 - 20 m		15%	**8,500**
		East Side	20.1 - 30 m		10%	
		South Side	10.1 - 20 m		15%	
		West Side	> 45.1m		0%	
				Cumulative Total	**40%**	
Results						
6	(1) + (2) + (3)	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**21,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**350**
				or	USGPM	5,548
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	4.5
		Required Volume of Fire Flow (m^3)			m^3	5670

KLONDIKE ROAD - BLOCK 10
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	53	111	0.361	0.902	1.984
Total	**0.00**	**53**	**111**	**0.361**	**0.902**	**1.984**

Water Demand Parameters

Apartment Unit	2.1	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	350	L/s

Klondike Road - Block 10: Watermain Demand

Node	Semi-Detached	Towns	Block 10 Apartment Unit	Total Population	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)	Fire Flow (L/s)
B1			53	111	0.361	0.902	1.984	N/A
H1				0	0.000	0.000	0.000	117
H2				0	0.000	0.000	0.000	117
H3				0	0.000	0.000	0.000	117
T1				0	0.000	0.000	0.000	N/A
Total	**0**	**0**	**53**	**111**	**0.361**	**0.902**	**1.984**	

Water Demand Parameters

Semi-Detached	2.7	ppl/unit	Residential Max Day	2.5	x Avg Day
Towns	2.7	ppl/unit	Residential Peak Hour	2.2	x Max Day
Block 10 Apartment Unit	2.1	ppl/unit	Apartment Fire Flow	350	L/s
Residential Demand	280	L/c/day			

Klondike Road - Block 10: Watermain Analysis

Network Table - Nodes - (Peak Hour)

Node ID	Elevation m	Demand LPS	Head m	Pressure m	Pressure kPa	Pressure psi
Junc B1	78.0	1.98	126.19	48.19	472.74	68.57
Junc H1	77.85	0	126.2	48.35	474.31	68.79
Junc H2	78.1	0	126.2	48.1	460.00	66.72
Junc H3	78.18	0	126.19	48.01	450.00	65.27
Junc T1	78.04	0	126.19	48.15	472.35	68.51
Resvr RES2	126.2	-2.38	126.2	0	0.00	0.00
Resvr RES1	126.2	-2.39	126.2	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	43	204	100	2.39	0.07	0.07	0.051
Pipe P2	25	204	100	2.39	0.07	0.07	0.051
Pipe P3	8	204	100	2.39	0.07	0.07	0.051
Pipe P4	6	204	100	1.98	0.06	0.05	0.052
Pipe P5	25	155	100	1.98	0.11	0.18	0.05
Pipe P6	66.4	204	100	1.06	0.03	0.01	0.057

Klondike Road - Block 10: 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	78	0.36	131	53	519.93	75.41	2.09
Junc H1	77.85	0	131	53.15	521.40	75.62	0.89
Junc H2	78.1	0	131	52.9	518.95	75.27	1.41
Junc H3	78.18	0	131	52.82	518.16	75.15	1.73
Junc T1	78.04	0	131	52.96	519.54	75.35	1.57
Resvr RES1	131	-0.44	131	0	0.00	0.00	0
Resvr RES2	131	-0.43	131	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	43	204	100	0.44	0.01	0.00	0.069
Pipe P2	25	204	100	0.44	0.01	0.00	0.059
Pipe P3	8	204	100	0.44	0.01	0.00	0.080
Pipe P4	6	204	100	0.36	0.01	0.00	0.049
Pipe P5	25	155	100	0.36	0.02	0.01	0.065
Pipe P6	66	204	100	0.07	0.00	0.00	0.107

Klondike Road - Block 10: Watermain Analysis

Network Table - Nodes (Max Day + FF)

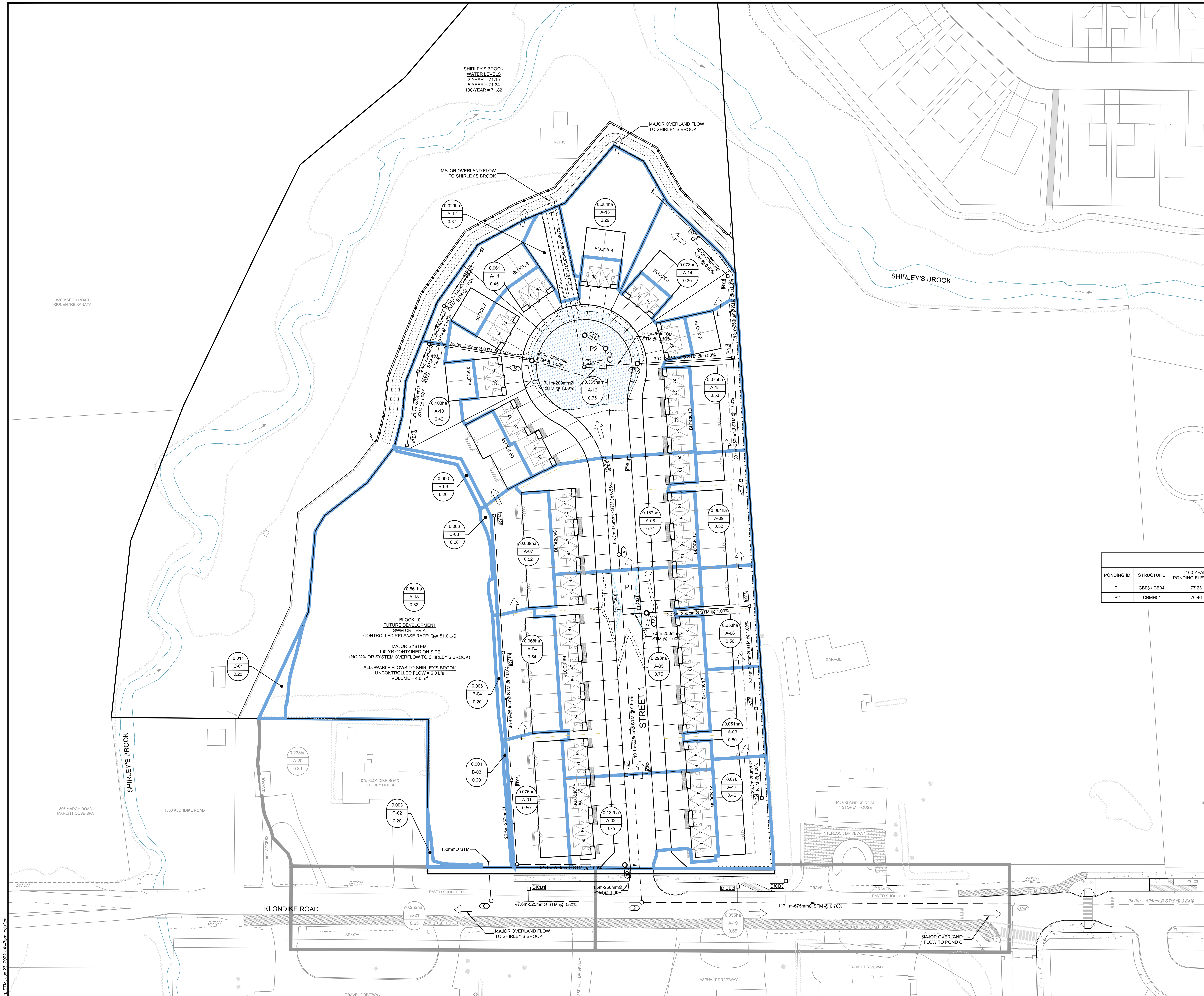
Node ID	Elevation m	Demand LPS	Head m	Pressure m	Pressure kPa	Pressure psi
Junc B1	78	0.9	100.11	22.11	216.90	31.46
Junc H1	77.85	116.7	102.9	25.05	245.74	35.64
Junc H2	78.1	116.7	100.68	22.58	221.51	32.13
Junc H3	78.18	116.6	100.11	21.93	215.13	31.20
Junc T1	78.04	0	100.68	22.64	222.10	32.21
Resvr RES1	116.7	-231.93	116.7	0	0.00	0.00
Resvr RES2	116.6	-120.24	116.6	0	0.00	0.00

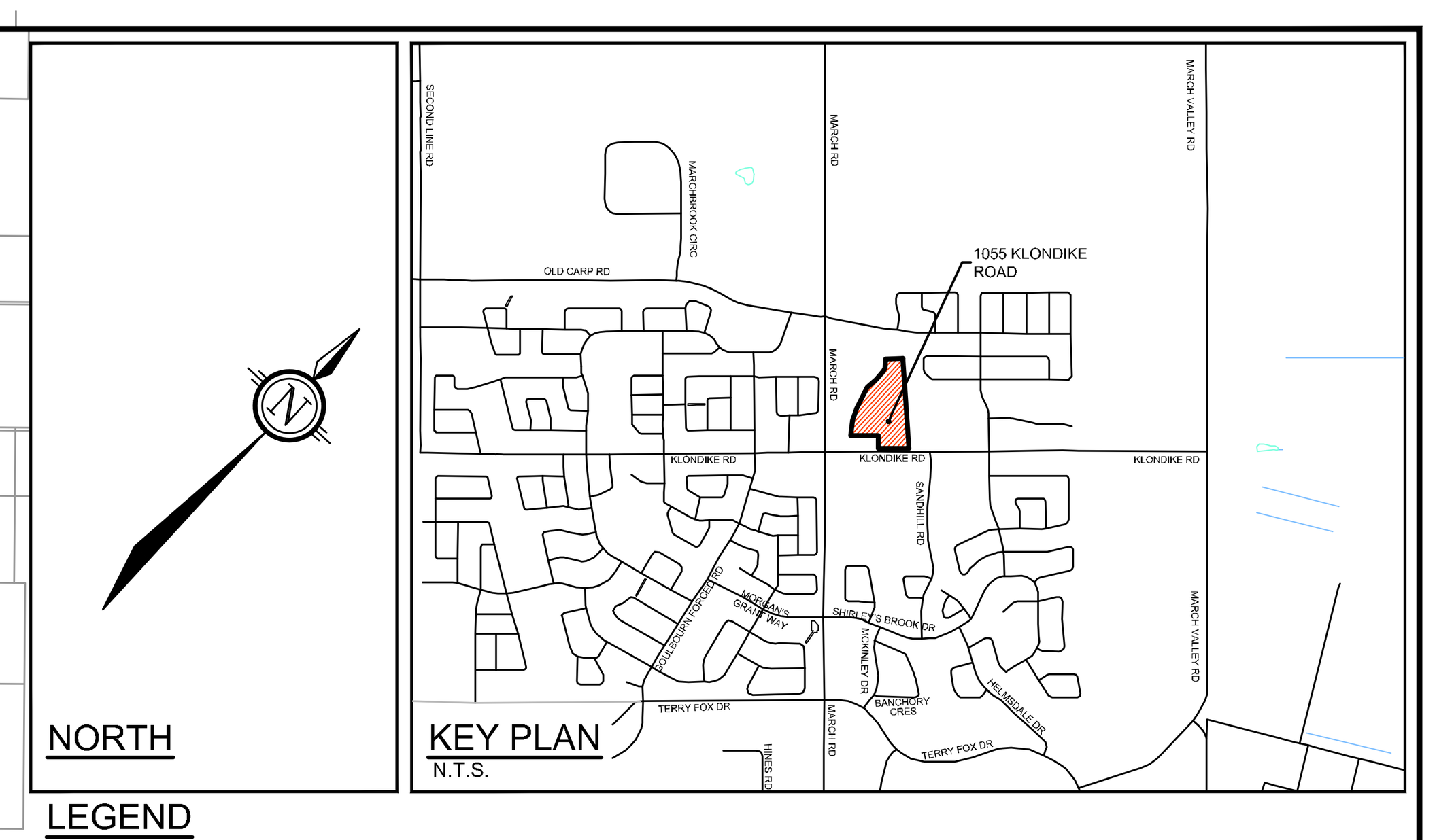
Network Table - Links (Max Day + FF)

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Headloss m/km	Friction Factor
Pipe P1	43	204	100	231.93	7.10	324.70	0.026
Pipe P2	25	204	100	115.23	3.53	88.89	0.029
Pipe P3	8	204	100	-1.47	0.04	0.03	0.054
Pipe P4	6	204	100	117.50	3.59	92.16	0.029
Pipe P5	25	155	100	0.90	0.05	0.04	0.056
Pipe P6	66	204	100	-118.97	3.64	94.30	0.029

Appendix D

STM Design Sheets, SWM Excerpts &
PCSWMM Modelling Info





LEGEND

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

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	CB03 / CB04	77.23	0.21	77.25	0.23	77.09	0.07
P2	CBMH01	76.46	0.32	76.51	0.37	76.46	0.32

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
7.	CITY SUBMISSION	JUL 7/22	MAB
6.	ISSUED FOR ECA	MAR 16/22	MAB
5.	CITY SUBMISSION	JAN 20/22	MAB
4.	CITY SUBMISSION	OCT 12/21	MAB
3.	CITY SUBMISSION	JUN 22/21	MAB
2.	ISSUED FOR APPROVAL	MAR 12/21	MAB
1.	ISSUED FOR APPROVAL	SEPT 3/20	MAB

SCALE 1:500

DESIGN LRW
CHECKED MAB
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 2022.07.07 PROVINCE OF ONTARIO

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CITY OF OTTAWA
1055 KLONDIKE ROAD - KLONDIKE RIDGE

POST-DEVELOPMENT STORM DRAINAGE AREA PLAN

PROJECT No. 117034-0
REV # 7
DRAWING No. 117034-STM2

D07-16-19-0024 PLAN #18750

1055 Klondike Road - Block 10 (117034-10)
PCSWMM Storage Curves (surface/underground storage)

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CBMH01-Storage		
Depth (m)	Area (m^2)	Volume (m^3)
0.00	1.13	0.00
2.59	1.13	2.93
2.64	26.00	3.60
2.69	104.30	6.86
2.74	234.70	15.34
2.79	382.10	30.76
2.84	464.30	51.92
2.89	521.60	76.56
2.90	0.00	79.17
3.59	0.00	79.17

CB02-Storage		
Depth (m)	Area (m^2)	Volume (m^3)
0.00	0.36	0.00
1.40	0.36	0.50
1.45	10.00	0.76
1.50	40.00	2.01
1.55	86.00	5.16
1.60	141.00	10.84
1.65	200.00	19.36
1.70	262.00	30.91
1.71	0.00	32.22
2.40	0.00	32.22

CBMH03-Storage		
Depth (m)	Area (m^2)	Volume (m^3)
0.00	1.13	0.00
2.70	1.13	3.05
2.75	8.40	3.29
2.80	33.70	4.34
2.85	75.90	7.08
2.90	126.90	12.15
2.95	184.80	19.94
3.00	260.60	31.08
3.01	0.00	32.38
3.70	0.00	32.38

RY04-Storage		
Depth (m)	Area (m^2)	Volume (m^3)
0.00	0.36	0.00
2.35	0.36	0.85
2.40	5.00	0.98
2.45	20.00	1.61
2.50	44.90	3.23
2.55	79.80	6.34
2.56	96.60	7.23
2.57	0.00	7.71
3.35	0.00	7.71

LC02-Storage		
Depth (m)	Area (m^2)	Volume (m^3)
0.00	0.36	0.00
1.31	0.36	0.47
1.36	12.30	0.79
1.41	49.30	2.33
1.46	111.00	6.34
1.51	197.30	14.04
1.56	308.20	26.68
1.61	478.70	46.35
1.62	0.00	48.75
2.31	0.00	48.75

LC03-Storage		
Depth (m)	Area (m^2)	Volume (m^3)
0.00	0.36	0.00
1.00	0.36	0.36
1.05	5.00	0.49
1.10	20.00	1.12
1.13	35.00	1.94
1.14	0.00	2.12
2.00	0.00	2.12

RY07-Storage		
Depth (m)	Area (m^2)	Volume (m^3)
0.00	0.36	0.00
1.00	0.36	0.36
1.05	5.20	0.50
1.10	17.00	1.05
1.15	35.30	2.36
1.20	72.70	5.06
1.21	0.00	5.43
2.00	0.00	5.43

RY03-Storage		
Depth (m)	Area (m2)	Volume (m3)
0.00	0.36	0.00
1.70	0.36	0.61
1.75	9.50	0.86
1.80	40.00	2.10
1.85	86.00	5.25
1.86	0.00	5.68
2.70	0.00	5.68

RY05-Storage		
Depth (m)	Area (m2)	Volume (m3)
0.00	0.36	0.00
1.52	0.36	0.55
1.57	8.00	0.76
1.62	31.60	1.75
1.63	37.40	2.09
1.64	0.00	2.28
2.52	0.00	2.28

1055 Klondike Road - Block 10 (117034-10)
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%)
CBMH01	75.24	77.83	78.13	0.30	77.23	77.93	78.06	78.11	0.00	0.10	0.23	0.28	0.00	0.00	0.00	0.00
CB02	76.33	77.73	78.03	0.30	76.66	77.08	77.84	77.88	0.00	0.00	0.11	0.15	0.00	0.00	0.00	0.00
CBMH03	75.13	77.83	78.13	0.30	77.23	77.93	78.06	78.11	0.00	0.10	0.23	0.28	0.00	0.00	0.00	0.00
LC01	76.70	77.70	77.75	0.05	76.71	76.72	76.74	76.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LC02	76.42	77.73	78.03	0.30	76.66	77.08	77.84	77.89	0.00	0.00	0.11	0.16	0.00	0.00	0.00	0.00
LC03	76.67	77.67	77.80	0.13	76.70	76.71	77.29	77.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RY03	75.45	77.15	77.30	0.15	75.80	76.21	77.28	77.31	0.00	0.00	0.13	0.16	0.00	0.00	0.00	0.01
RY04	75.65	78.00	78.22	0.22	77.24	77.94	78.06	78.11	0.00	0.00	0.06	0.11	0.00	0.00	0.00	0.00
RY05	75.72	77.24	77.35	0.11	75.80	76.21	77.28	77.32	0.00	0.00	0.04	0.08	0.00	0.00	0.00	0.00
RY06	75.66	78.17	78.20	0.03	77.23	77.93	78.06	78.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RY07	76.15	77.15	77.35	0.20	76.20	76.23	77.29	77.33	0.00	0.00	0.14	0.18	0.00	0.00	0.00	0.00

[1] *3-hour Chicago Storm.*

1055 Klondike Road - Block 10 (117034-10)
Summary of Hydraulic Grade Line (HGL) Elevations

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	73.19	78.15	72.93	0.00	5.22	72.93
MH04	73.03	78.09	72.75	0.00	5.34	72.75
MH08	72.33	77.94	72.02	0.00	5.92	72.02
TD01	74.13	75.63	73.93	0.00	1.70	73.94

[1] *3-hour Chicago Storm*

Klondike Road - Block 10
Maple Leaf Homes
Project No.: 117034-10

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

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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
	B-05, B-06, B-07, B-10, B-16, B-17	MH2	MH4	0.306	0.79	0.24	0.672	0.672	10.00	76.81			51.6	51.6	0.381	375	PVC	0.50	38.8	129.2	1.13	0.57	40%
						0.00	0.000	0.000	10.00														
						0.00	0.000	0.000	10.00														
	B-11, B-12, B-13, B-14, B-15	CBMH4	MH4	0.141	0.39	0.05	0.153	0.153	10.00	76.81			11.7	11.7	0.305	300	PVC	1.00	49.5	100.8	1.38	0.60	12%
						0.00	0.000	0.000	10.00														
						0.00	0.000	0.000	10.00														
	B-01, B-02	MH4	MH8	0.113	0.43	0.05	0.135	0.960	10.60	74.59			71.6	71.6	0.457	450	Conc	0.50	58.4	210.2	1.28	0.76	34%
						0.00	0.000	0.000	10.60														
						0.00	0.000	0.000	10.60														

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:	August 3, 2022
Design By:	Lucas Wilson
Client:	**Dwg. Reference:** / **Checked By:**
Maple Leaf Homes	117034-10-STM / 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

1055 Klondike – Maple Leaf Homes (117034)
PCSWMM Model Schematic

NOVATECH
Engineers, Planners & Landscape Architects

Overall Model Schematic

Date: 2022-08-03
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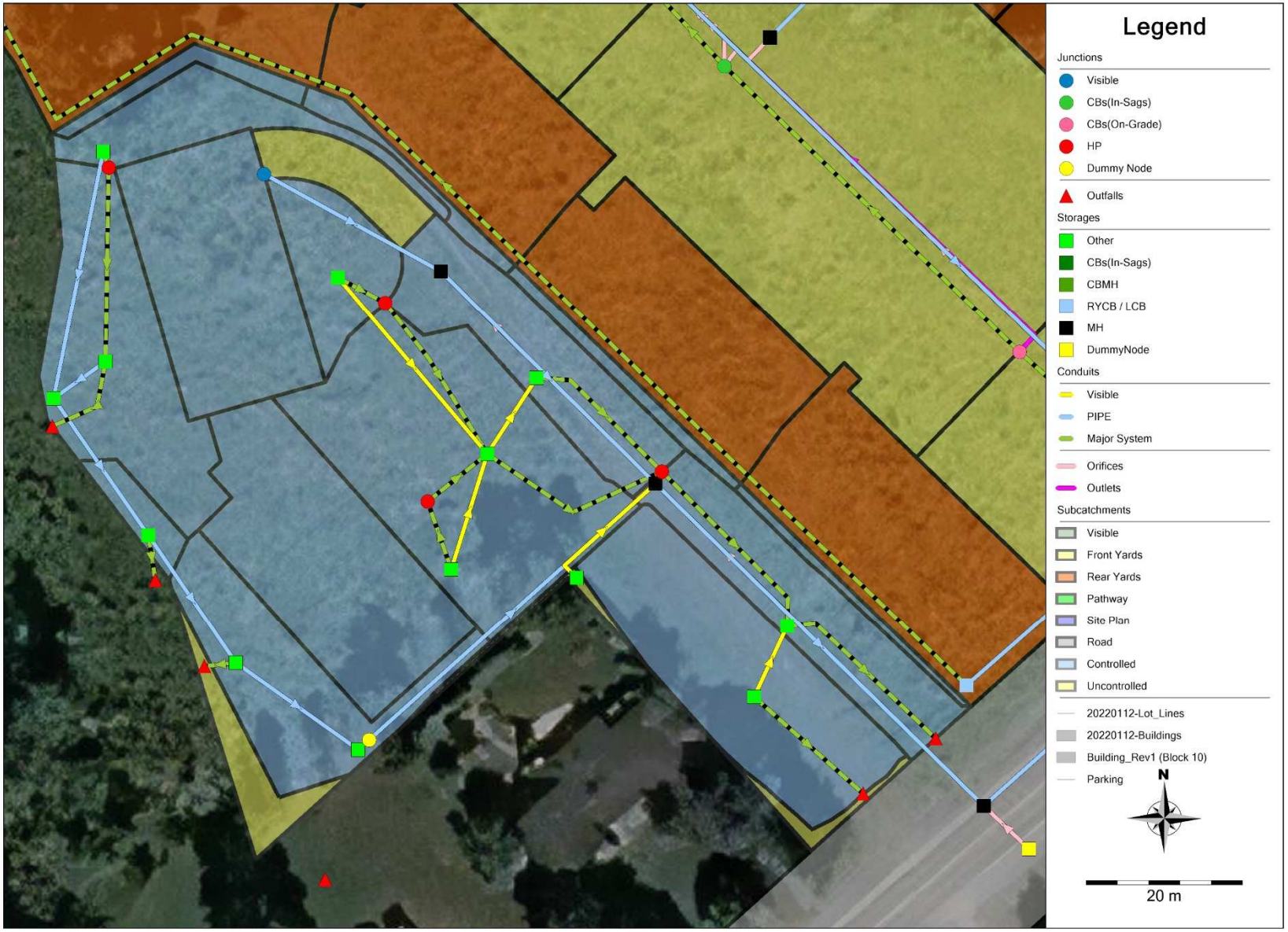
1055 Klondike – Maple Leaf Homes (117034)
PCSWMM Model Schematic

NOVATECH
Engineers, Planners & Landscape Architects

Overall (Block 10)



Date: 2022-08-03
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1055 Klondike – Maple Leaf Homes (117034)
PCSWMM Model Schematic

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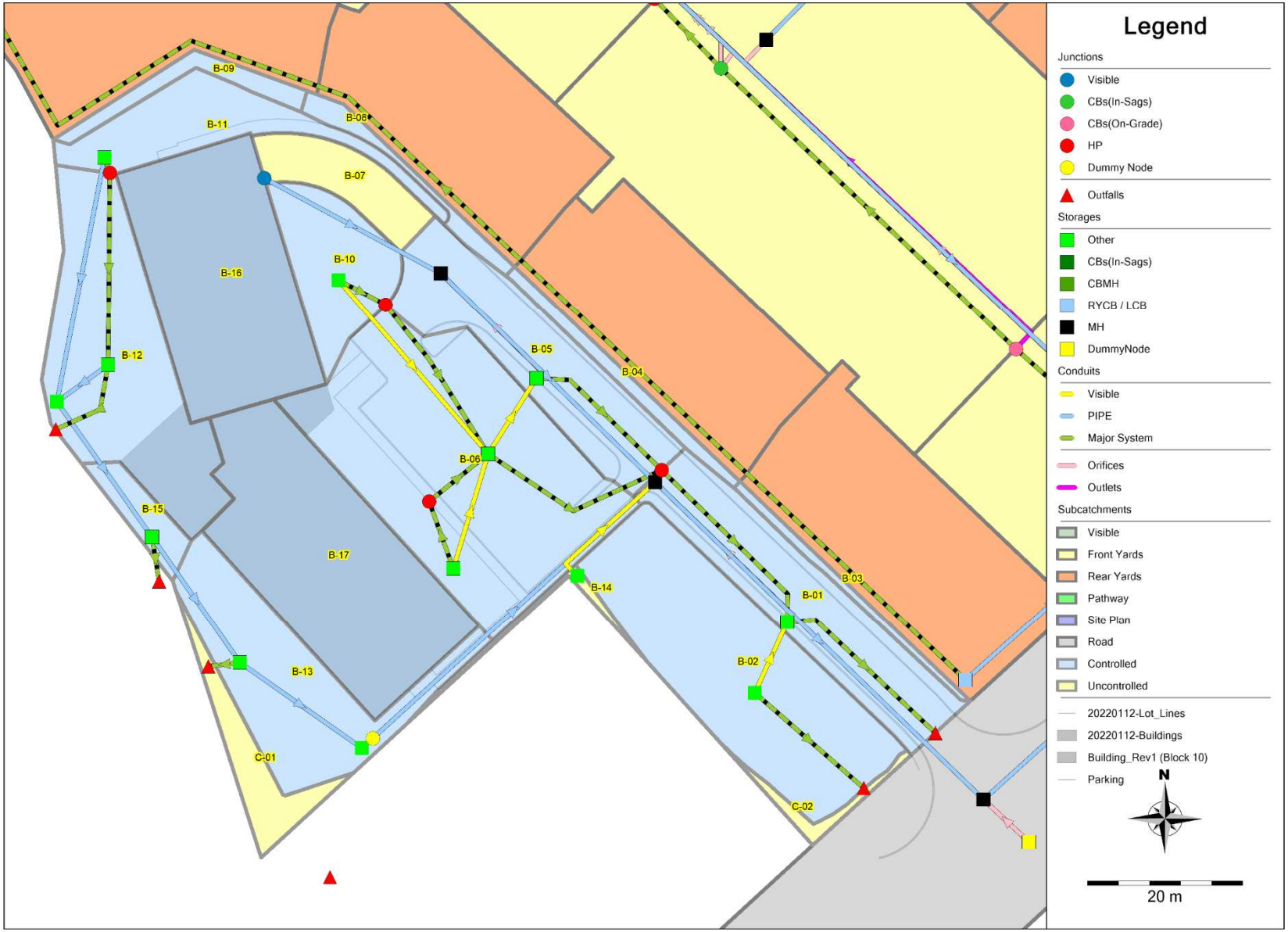
Subcatchments (ID's)



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1055 Klondike – Maple Leaf Homes (117034)
PCSWMM Model Schematic

NOVATECH
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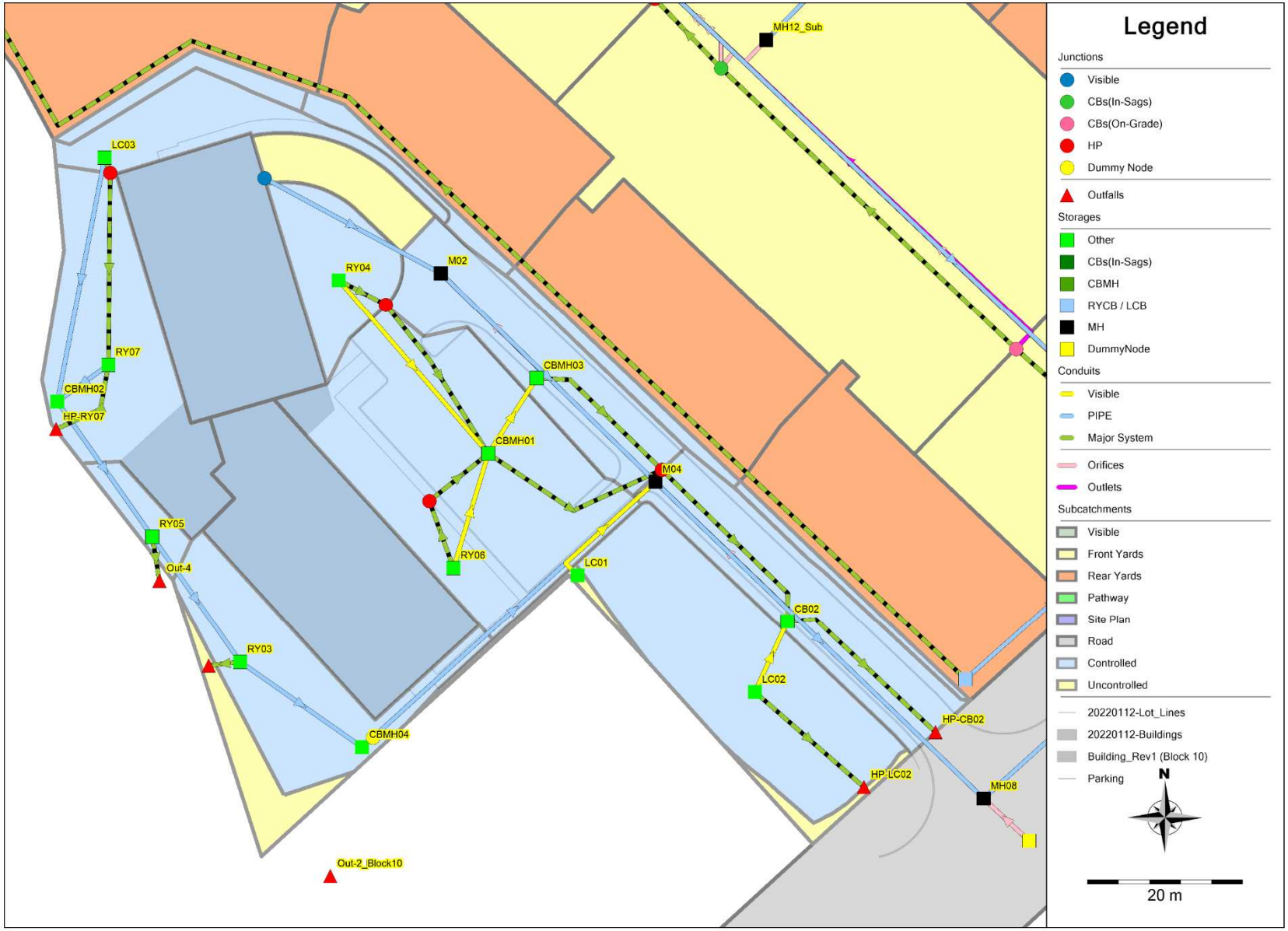
Nodes ID's



Date: 2022-08-03
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MAPLE LEAF HOMES

1055 KLONDIKE ROAD – KLONDIKE RIDGE

SITE SERVICING AND STORMWATER MANAGEMENT REPORT

Prepared for:

Maple Leaf Homes

Prepared By:

NOVATECH
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario
K2M 1P6

Issued: September 3, 2020
Revised: March 12, 2021
Revised: June 22, 2021
Revised: October 12, 2021
Revised: January 20, 2022
Revised: March 16, 2022
Revised: July 7, 2022

Novatech File: 117034
Report Ref: R-2020-013

Table 5.8: Comparison of Peak Flows

Proposed Development	Drainage Area (ha)	Allowable Release Rate[1] (L/s)		100-year Peak Flow[2] (L/s)		
		Minor System (Klondike Rd.)	Major System/Uncontrolled Flow (Shirley's Brook)	Minor System (Klondike Rd.)	Major System (Shirley's Brook)	TOTAL
Subdivision	1.84	179.4	297.2	179.1	287.3	466.4
Site Plan Block	0.60	51.0		51.0	6.0	57.0
Subject Site	**2.44**	**230.4**	**297.2**	**230.1**	**293.3**	**523.4**

(1) Allowable release rate is based on drainage area (2006 Brookside South SWMF Report) x 85 L/s/ha (Klondike Rd.).
(2) PCSWMM model results for the 3-hour Chicago storm distribution.

The 100-year minor system peak flow to Klondike Road is controlled to just below the allowable release rate of 230.4 L/s for the proposed subdivision and future Site Plan. The 100-year major system peak flow (Including both major system flow and uncontrolled sheet drainage) to Shirley's Brook is also less than the 100-year major system flow specified in **Section 5.3.2**. The subdivision provides a total of 188.6 m^3 of major system storage (51.6 m^3 underground at CBMH01 and 137 m^3 of surface storage) exceeding the total required major system storage of 135.5 m^3.

The 2-year and 5-year major system / uncontrolled flows directed to Shirley's Brook from the subdivision and Site Plan block are 4.7 L/s and 79.0 L/s respectively and are below the pre-development peak flows calculated in **Section 5.3.2**.

Comparison of Runoff Volumes

Table 5.9 provides a summary of the 100-year major system volumes to Shirley's Brook. The 100-year major system volumes from the proposed subdivision adhere to the criteria specified in **Section 5.3.2** for the Subject Site. The Site Plan Block is to be designed to include no 100-year major system overflow to Shirley's Brook. The Site Plan Block does include 0.014 ha of uncontrolled grassed area sheet draining to Shirley's Brook and is included in the overall major system volumes.

Table 5.9: Comparison of Runoff Volumes

Proposed Development	Drainage Area (ha)	Allowable Runoff (100yr) (m^3)	Runoff Volume to Shirley's Brook (m^3)		
			2-year	5-year	100-year
Subdivision	1.84	197.4	6	19	162
Site Plan Block	0.60		0	1	4
Subject Site	**2.44**	**197.4**	**6**	**20**	**166**

5.4.3 Stormwater Management Requirements for Site Plan Block

The Site Plan Block (0.60 ha) is to adhere to the following stormwater management criteria:

- Minor system inlet rate = 51 L/s
- 100-year contained on-site (no major system overflow to Shirley's Brook)
- Uncontrolled flow of 6.0 L/s with a volume of 4 m^3 is permitted to sheet drain to Shirley's Brook

1055 Klondike Road – Orr Ridge (117034)
PCSWMM Model Output
100yr 3-hour Chicago Storm

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

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  *************
  Element Count
  *************
  Number of rain gages ...... 1
  Number of subcatchments ... 38
  Number of nodes ........... 54
  Number of links ........... 62
  Number of pollutants ...... 0
  Number of land uses ....... 0


  ****************
  Raingage Summary
  ****************
                                                  Data       Recording
  Name                 Data Source                Type       Interval
  ------------------------------------------------------------------
  Raingage             C3hr-100yr                 INTENSITY  10 min.


  *********************
  Subcatchment Summary
  *********************
  Name                       Area     Width   %Imperv    %Slope Rain Gage            Outlet
  ------------------------------------------------------------------------------------------
---
  A-01                       0.08     38.00     42.90    3.5000 Raingage             RY04_Sub
  A-02                       0.13     52.80     78.80    4.0000 Raingage             CB01/02_Sub
  A-03                       0.05     25.50     43.10    5.0000 Raingage             RY03_Sub
  A-04                       0.07     34.00     48.50    4.0000 Raingage             RY04_Sub
  A-05                       0.30    119.20     79.90    4.0000 Raingage             CB03/04_Sub
  A-06                       0.06     29.00     43.10    5.0000 Raingage             RY03_Sub
  A-07                       0.07     34.50     46.40    3.0000 Raingage             RY04_Sub
  A-08                       0.17     66.80     72.50    4.0000 Raingage             CB05/06_Sub
  A-09                       0.06     32.00     45.30    5.0000 Raingage             RY02_Sub
  A-10                       0.10     41.20     32.00    2.5000 Raingage             RY06_Sub
  A-11                       0.06     40.67     36.10    5.0000 Raingage             RY06_Sub
  A-12                       0.03     10.00     24.10    3.3000 Raingage             Out-2_Sub
  A-13                       0.08     24.00     13.10    3.5000 Raingage             Out-3_Sub
  A-14                       0.07     29.20     14.70    4.0000 Raingage             RY02_Sub
  A-15                       0.07     37.50     47.30    5.5000 Raingage             RY02_Sub
  A-16                       0.36     91.25     78.60    3.0000 Raingage             CBMH01_Sub
  A-17                       0.07     35.00     37.10    5.0000 Raingage             RY03_Sub
  A-19                       0.35    236.67     64.30    2.0000 Raingage             K-02
  A-21                       0.25    168.00     64.30    2.0000 Raingage             K-01
  B-01                       0.04     17.60     85.70    1.5000 Raingage             CB02
  B-02                       0.07     34.50      0.00    2.5000 Raingage             LC02
  B-03                       0.00     13.33      5.00   33.3300 Raingage             RY04_Sub
  B-04                       0.01     20.00      5.00   33.3300 Raingage             RY04_Sub
  B-05                       0.04     21.00     82.90    1.5000 Raingage             CBMH03
  B-06                       0.10     64.67     82.50    1.5000 Raingage             CBMH01
  B-07                       0.01      7.50     82.90   10.5000 Raingage             TD01
  B-08                       0.01     20.00      5.00   33.3300 Raingage             RY04_Sub
  B-09                       0.01     20.00      5.00   33.3300 Raingage             RY06_Sub
  B-10                       0.02     46.00      0.00    4.5000 Raingage             RY04
  B-11                       0.03     17.33     35.70    2.0000 Raingage             LC03
  B-12                       0.06     40.00     37.10    3.0000 Raingage             RY07
  B-13                       0.04     45.00     10.00    3.0000 Raingage             RY03
  B-14                       0.00     30.00      0.00    5.0000 Raingage             LC01
  B-15                       0.01     14.00      0.00    2.5000 Raingage             RY05
  B-16                       0.06     60.00    100.00    1.0000 Raingage             RY04
  B-17                       0.07     69.00    100.00    1.0000 Raingage             RY06
  C-01                       0.01     22.00      5.00   33.3300 Raingage             Out-2_Block10
  C-02                       0.00     30.00      5.00   33.3300 Raingage             Out-2_Block10


  ************
  Node Summary
  ************
                                          Invert      Max.    Ponded    External
  Name                 Type                Elev.     Depth      Area    Inflow
  ------------------------------------------------------------------------
  CB01/02_Sub          JUNCTION           77.52      1.00       0.0
  CB03/04_Sub          JUNCTION           75.62      2.40       0.0
  CB05/06_Sub          JUNCTION           76.73      1.00       0.0
  CBMH04-Dummy         JUNCTION           75.24      2.72       0.0
  HP01_Sub             JUNCTION           77.79      1.00       0.0
  HP02_Sub             JUNCTION           77.09      1.00       0.0
  HP-03_Sub            JUNCTION           76.46      1.00       0.0
  HP-CBMH01-CBMH03     JUNCTION           78.13      1.00       0.0
  HP-LC03              JUNCTION           77.80      1.00       0.0
  HP-RY04              JUNCTION           78.22      1.00       0.0
  HP-RY06              JUNCTION           78.20      1.00       0.0
  TD01                 JUNCTION           73.88      1.75       0.0
  EX-MH159             OUTFALL            70.14      0.68       0.0
  HP-CB02              OUTFALL            78.03      1.00       0.0
  HP-LC02              OUTFALL            78.03      1.00       0.0
  HP-RY03              OUTFALL            77.30      1.00       0.0
  HP-RY07              OUTFALL            77.35      1.00       0.0
  HP-RY11_Sub          OUTFALL            73.92      1.00       0.0
  Out-1_Sub            OUTFALL            76.56      1.00       0.0
  Out-2_Block10        OUTFALL             0.00      0.00       0.0
  Out-2_Sub            OUTFALL            75.50      1.00       0.0
  Out-3_Sub            OUTFALL            73.47      0.00       0.0
  Out-4                OUTFALL            77.35      1.00       0.0
  CB02                 STORAGE            76.33      2.40       0.0
  CBMH01               STORAGE            75.24      3.59       0.0
  CBMH01_Sub           STORAGE            72.30      4.84       0.0
  CBMH02               STORAGE            75.91      1.47       0.0
  CBMH03               STORAGE            75.13      3.70       0.0
  CBMH04               STORAGE            75.24      2.56       0.0
  K-01                 STORAGE            76.14      2.40       0.0
  K-02                 STORAGE            76.42      2.20       0.0
  LC01                 STORAGE            76.70      1.00       0.0
  LC02                 STORAGE            76.42      2.31       0.0
  LC03                 STORAGE            76.67      2.00       0.0
  M02                  STORAGE            72.81      5.34       0.0
  M04                  STORAGE            72.58      5.51       0.0
  MH02                 STORAGE            70.96      7.03       0.0
  MH04_Sub             STORAGE            71.71      5.42       0.0
  MH06_Sub             STORAGE            72.22      4.03       0.0
  MH08                 STORAGE            71.80      6.14       0.0
  MH10_Sub             STORAGE            72.30      5.76       0.0
  MH12_Sub             STORAGE            72.05      5.13       0.0
  MH14_Sub             STORAGE            74.02      3.43       0.0
  MH16_Sub             STORAGE            72.29      4.16       0.0
  MH18_Sub             STORAGE            72.39      3.86       0.0
  RY02_Sub             STORAGE            72.44      2.38       0.0
  RY03                 STORAGE            75.45      2.70       0.0
  RY03_Sub             STORAGE            73.43      2.07       0.0
  RY04                 STORAGE            75.65      3.35       0.0
  RY04_Sub             STORAGE            74.73      3.34       0.0
  RY05                 STORAGE            75.72      2.52       0.0
  RY06                 STORAGE            75.66      3.51       0.0
  RY06_Sub             STORAGE            74.36      3.34       0.0
  RY07                 STORAGE            76.15      2.00       0.0


  ************
  Link Summary
  ************
  Name                 From Node          To Node            Type          Length    %Slope Roughness
  ---------------------------------------------------------------------------------------------------
  CB02-HP              CB02               HP-CB02            CONDUIT          3.0  -10.0504    0.0150
  CBMH01-CBMH03        CBMH01             CBMH03             CONDUIT         10.6    1.0378    0.0130
  CBMH01-HP            CBMH01             HP-CBMH01-CBMH03   CONDUIT          3.0  -10.0504    0.0150
  CBMH02-RY05          CBMH02             RY05               CONDUIT         19.2    0.9896    0.0130
  CBMH03-HP            CBMH03             HP-CBMH01-CBMH03   CONDUIT          3.0  -10.0504    0.0150
  CBMH04-MH04          CBMH04-Dummy       M04                CONDUIT         49.5    1.0102    0.0130
  HP-CB02              HP-CBMH01-CBMH03   CB02               CONDUIT          3.0   13.4535    0.0150
  HP-LC03-RY07         HP-LC03            RY07               CONDUIT          3.0   20.4124    0.0350
  HP-RY04-CBMH01       HP-RY04            CBMH01             CONDUIT          3.0   13.1113    0.0150
  HP-RY06-CBMH01       HP-RY06            CBMH01             CONDUIT          3.0   12.4282    0.0150
  LC01-M04             LC01               M04                CONDUIT          2.5    0.4000    0.0130
  LC02-CB02            LC02               CB02               CONDUIT          9.3    0.9678    0.0130
  LC02-HP              LC02               HP-LC02            CONDUIT          3.0  -10.0504    0.0350
  LC03-CBMH02          LC03               CBMH02             CONDUIT         32.7    2.1718    0.0130
  LC03-HP              LC03               HP-LC03            CONDUIT          3.0   -4.3374    0.0350
  M02-M04              M02                M04                CONDUIT         38.8    0.4897    0.0130
  M04-MH08             M04                MH08               CONDUIT         58.4    0.4795    0.0130
  MH02-MH159           MH02               EX-MH159           CONDUIT        117.1    0.7003    0.0130
  MH04-MH02_Sub        MH04_Sub           MH02               CONDUIT        110.1    0.5541    0.0130
  MH06-MH04_Sub        MH06_Sub           MH04_Sub           CONDUIT         65.3    0.5513    0.0130
  MH08-MH02            MH08               MH02               CONDUIT         47.6    0.5042    0.0130
  MH18-MH06_Sub        MH18_Sub           MH06_Sub           CONDUIT          7.8    0.5128    0.0130
  MS-CB01/02(1)_Sub HP01_Sub           CB01/02_Sub        CONDUIT         29.5    0.9153    0.2500
  MS-CB01/02(2)_Sub CB01/02_Sub        CB03/04_Sub        CONDUIT         52.4    0.9542    0.2500
  MS-CB03/04(1)_Sub CB03/04_Sub        HP02_Sub           CONDUIT         12.4   -0.5645    0.2500
```

MS-CB03/04(2)_Sub	HP02_Sub	CB05/06_Sub	CONDUIT	35.3	1.0199	0.2500
MS-CB05/06_Sub	CB05/06_Sub	CBMH01_Sub	CONDUIT	3.0	20.0584	0.2500
MS-CBMH01(1)_Sub	CBMH01_Sub	HP-03_Sub	CONDUIT	3.0	-10.7279	0.0150
MS-CBMH01(2)_Sub	HP-03_Sub	Out-2_Sub	CONDUIT	31.0	3.0983	0.0350
MS-RYCB02_Sub	RY02_Sub	HP-RY11_Sub	CONDUIT	1.0	-10.0504	0.0350
MS-RYCB03_Sub	RY03_Sub	RY02_Sub	CONDUIT	1.0	185.2734	0.0350
MS-RYCB04_Sub	RY04_Sub	RY06_Sub	CONDUIT	1.0	34.9583	0.0350
MS-RYCB06_Sub	RY06_Sub	Out-1_Sub	CONDUIT	1.0	14.1393	0.0350
RY02-MH16_Sub	RY02_Sub	MH16_Sub	CONDUIT	1.0	15.1717	0.0130
RY03-CBMH04	RY03	CBMH04	CONDUIT	18.1	0.9945	0.0130
RY03-HP	RY03	HP-RY03	CONDUIT	3.0	-5.0063	0.0350
RY03-MH12	RY03_Sub	MH12_Sub	CONDUIT	1.0	34.9583	0.0130
RY04-CBMH01	RY04	CBMH01	CONDUIT	26.2	0.9924	0.0130
RY04-HP	RY04	HP-RY04	CONDUIT	3.0	-7.3531	0.0150
RY04-MH10	RY04_Sub	MH10_Sub	CONDUIT	1.0	39.8264	0.0130
RY05-HP	RY05	Out-4	CONDUIT	3.0	-3.6691	0.0350
RY05-RY03	RY05	RY03	CONDUIT	23.7	1.0127	0.0130
RY06-CBMH01	RY06	CBMH01	CONDUIT	13.5	2.0004	0.0130
RY06-HP	RY06	HP-RY06	CONDUIT	3.0	-1.0001	0.0150
RY06-MH14_Sub	RY06_Sub	MH14_Sub	CONDUIT	1.0	34.9583	0.0150
RY07-CBMH02	RY07	CBMH02	CONDUIT	8.6	1.0466	0.0130
RY07-HP	RY07	HP-RY07	CONDUIT	3.0	-6.6815	0.0350
TD01-M02	TD01	M02	CONDUIT	23.7	1.9835	0.0130
CB02-O	CB02	M04	ORIFICE			
CB3-O_Sub	CB03/04_Sub	MH04_Sub	ORIFICE			
CB4-O_Sub	CB03/04_Sub	MH04_Sub	ORIFICE			
CBMH03-O	CBMH03	M02	ORIFICE			
CBMH04-O	CBMH04	CBMH04-Dummy	ORIFICE			
CBMH1-O(1)_Sub	CBMH01_Sub	MH06_Sub	ORIFICE			
K-01-O	K-01	MH08	ORIFICE			
K-02-O	K-02	MH02	ORIFICE			
MH10-O_Sub	MH10_Sub	MH04_Sub	ORIFICE			
MH12-O_Sub	MH12_Sub	MH04_Sub	ORIFICE			
MH14-O_Sub	MH14_Sub	MH06_Sub	ORIFICE			
MH16-O_Sub	MH16_Sub	MH06_Sub	ORIFICE			
CB01/02-O_Sub	CB01/02_Sub	MH04_Sub	OUTLET			
CB05/06-O_Sub	CB05/06_Sub	MH06_Sub	OUTLET			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
CB02-HP	RECT_OPEN	1.00	3.00	0.75	3.00	1	52342.55
CBMH01-CBMH03	CIRCULAR	0.60	0.28	0.15	0.60	1	625.54
CBMH01-HP	RECT_OPEN	1.00	3.00	0.75	3.00	1	52342.55
CBMH02-RY05	CIRCULAR	0.30	0.07	0.07	0.30	1	96.20
CBMH03-HP	RECT_OPEN	1.00	3.00	0.75	3.00	1	52342.55
CBMH04-MH04	CIRCULAR	0.30	0.07	0.07	0.30	1	97.20
HP-CB02	RECT_OPEN	1.00	3.00	0.75	3.00	1	60559.26
HP-LC03-RY07	RECT_OPEN	1.00	3.00	0.75	3.00	1	31969.37
HP-RY04-CBMH01	RECT_OPEN	1.00	3.00	0.75	3.00	1	59784.13
HP-RY06-CBMH01	RECT_OPEN	1.00	3.00	0.75	3.00	1	58206.05
LC01-M04	CIRCULAR	0.25	0.05	0.06	0.25	1	37.61
LC02-CB02	CIRCULAR	0.25	0.05	0.06	0.25	1	58.51
LC02-HP	RECT_OPEN	1.00	3.00	0.75	3.00	1	22432.52
LC03-CBMH02	CIRCULAR	0.25	0.05	0.06	0.25	1	87.64
LC03-HP	RECT_OPEN	1.00	3.00	0.75	3.00	1	14736.76
M02-M04	CIRCULAR	0.38	0.11	0.09	0.38	1	122.70
M04-MH08	CIRCULAR	0.45	0.16	0.11	0.45	1	197.43
MH02-MH159	CIRCULAR	0.68	0.36	0.17	0.68	1	703.47
MH04-MH02_Sub	CIRCULAR	0.53	0.22	0.13	0.53	1	320.13
MH06-MH04_Sub	CIRCULAR	0.38	0.11	0.09	0.38	1	130.19
MH08-MH02	CIRCULAR	0.53	0.22	0.13	0.53	1	305.40
MH18-MH06_Sub	CIRCULAR	0.25	0.05	0.06	0.25	1	42.59
MS-CB01/02(1)_Sub	18mROW	1.00	15.42	7.47	18.00	1	22542.02
MS-CB01/02(2)_Sub	18mROW	1.00	15.42	7.47	18.00	1	23016.65
MS-CB03/04(1)_Sub	18mROW	1.00	15.42	7.47	18.00	1	17703.31
MS-CB03/04(2)_Sub	18mROW	1.00	15.42	7.47	18.00	1	23795.13
MS-CB05/06_Sub	18mROW	1.00	15.42	7.47	18.00	1	105526.37
MS-CBMH01(1)_Sub	RECT_OPEN	1.00	3.00	0.60	3.00	1	46602.99
MS-CBMH01(2)_Sub	RECT_OPEN	1.00	3.00	0.75	3.00	1	12455.06
MS-RYCB02_Sub	TRAPEZOIDAL	1.00	3.00	0.47	6.00	1	16528.42
MS-RYCB03_Sub	TRAPEZOIDAL	1.00	3.00	0.47	6.00	1	70965.42
MS-RYCB04_Sub	TRAPEZOIDAL	1.00	3.00	0.47	6.00	1	30825.89
MS-RYCB06_Sub	TRAPEZOIDAL	1.00	3.00	0.47	6.00	1	19604.39
RY02-MH16_Sub	CIRCULAR	0.25	0.05	0.06	0.25	1	231.64
RY03-CBMH04	CIRCULAR	0.30	0.07	0.07	0.30	1	96.44
RY03-HP	RECT_OPEN	1.00	3.00	0.75	3.00	1	15832.29
RY03-MH12	CIRCULAR	0.25	0.05	0.06	0.25	1	351.63
RY04-CBMH01	CIRCULAR	0.45	0.16	0.11	0.45	1	284.04
RY04-HP	RECT_OPEN	1.00	3.00	0.75	3.00	1	44771.31
RY04-MH10	CIRCULAR	0.25	0.05	0.06	0.25	1	375.31
RY05-HP	RECT_OPEN	1.00	3.00	0.75	3.00	1	13554.04
RY05-RY03	CIRCULAR	0.30	0.07	0.07	0.30	1	97.32
RY06-CBMH01	CIRCULAR	0.45	0.16	0.11	0.45	1	403.27
RY06-HP	RECT_OPEN	1.00	3.00	0.75	3.00	1	16511.04
RY06-MH14_Sub	CIRCULAR	0.25	0.05	0.06	0.25	1	304.74
RY07-CBMH02	CIRCULAR	0.25	0.05	0.06	0.25	1	60.84
RY07-HP	RECT_OPEN	1.00	3.00	0.75	3.00	1	18290.47
TD01-M02	CIRCULAR	0.25	0.05	0.06	0.25	1	83.76

****
Transect Summary
****

Transect 18mROW
Area:

0.0008	0.0034	0.0076	0.0136	0.0219
0.0328	0.0461	0.0605	0.0758	0.0919
0.1090	0.1269	0.1458	0.1655	0.1862
0.2077	0.2301	0.2533	0.2767	0.3000
0.3233	0.3466	0.3699	0.3933	0.4166
0.4399	0.4632	0.4866	0.5099	0.5332
0.5566	0.5799	0.6032	0.6266	0.6499
0.6732	0.6966	0.7199	0.7432	0.7666
0.7899	0.8133	0.8366	0.8599	0.8833
0.9066	0.9300	0.9533	0.9767	1.0000

Hrad:

0.0013	0.0026	0.0039	0.0051	0.0072
0.0108	0.0163	0.0239	0.0327	0.0427
0.0539	0.0662	0.0795	0.0938	0.1091
0.1252	0.1421	0.1639	0.1905	0.2174
0.2445	0.2718	0.2991	0.3265	0.3538
0.3812	0.4084	0.4356	0.4627	0.4896
0.5165	0.5432	0.5698	0.5963	0.6226
0.6488	0.6749	0.7008	0.7265	0.7521
0.7776	0.8029	0.8281	0.8531	0.8779
0.9026	0.9272	0.9516	0.9759	1.0000

Width:

0.0728	0.1455	0.2183	0.3006	0.4114
0.5222	0.5967	0.6350	0.6733	0.7116
0.7499	0.7882	0.8265	0.8648	0.9031
0.9414	0.9797	0.9989	0.9989	0.9990
0.9990	0.9990	0.9991	0.9991	0.9991
0.9992	0.9992	0.9992	0.9993	0.9993
0.9994	0.9994	0.9994	0.9995	0.9995
0.9995	0.9996	0.9996	0.9996	0.9997
0.9997	0.9997	0.9998	0.9998	0.9998
0.9999	0.9999	0.9999	1.0000	1.0000

****
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 ..... YES
  Water Quality ..... NO
Infiltration Method ..... HORTON
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date 07/22/2019 00:00:00
Ending Date 07/23/2019 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:01:00
Dry Time Step 00:05:00
Routing Time Step ..... 2.00 sec

```
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 4
Head Tolerance ........... 0.001500 m


**********
Control Actions Taken
**********


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.218        71.667
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.056        18.351
Surface Runoff ...........         0.161        52.855
Final Storage ............         0.002         0.549
Continuity Error (%) .....        -0.124


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------      ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.161         1.610
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.161         1.610
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....         0.010


**************************
Highest Continuity Errors
**************************
Node CB01/02_Sub (-3.35%)
Node CB05/06_Sub (-2.07%)


***************************
Time-Step Critical Elements
***************************
Link RY04-MH10 (33.98%)
Link MS-RYCB06_Sub (4.17%)
Link RY03-MH12 (1.80%)


*******************************
Highest Flow Instability Indexes
*******************************
Link CBMH04-O (1)


************************
Routing Time Step Summary
************************
Minimum Time Step           :     0.50 sec
Average Time Step           :     1.43 sec
Maximum Time Step           :     2.00 sec
Percent in Steady State     :    -0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00
Time Step Frequencies       :
    2.000 -  1.516 sec      :    59.44 %
    1.516 -  1.149 sec      :     3.95 %
    1.149 -  0.871 sec      :     1.48 %
    0.871 -  0.660 sec      :     1.09 %
    0.660 -  0.500 sec      :    34.04 %


***************************
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	25.43	30.76	15.52	46.29	0.04	31.79	0.646
A-02	71.67	0.00	0.00	9.34	55.81	5.87	61.68	0.08	63.17	0.861
A-03	71.67	0.00	0.00	25.26	30.90	15.55	46.46	0.02	21.84	0.648
A-04	71.67	0.00	0.00	22.87	34.78	14.07	48.85	0.03	29.52	0.682
A-05	71.67	0.00	0.00	8.85	56.59	5.57	62.16	0.19	142.98	0.867
A-06	71.67	0.00	0.00	25.26	30.90	15.55	46.46	0.03	24.84	0.648
A-07	71.67	0.00	0.00	23.88	33.27	14.57	47.84	0.03	29.14	0.667
A-08	71.67	0.00	0.00	12.15	51.35	7.58	58.94	0.10	78.58	0.822
A-09	71.67	0.00	0.00	24.27	32.48	14.97	47.45	0.03	27.69	0.662
A-10	71.67	0.00	0.00	30.70	22.95	18.06	41.00	0.04	36.76	0.572
A-11	71.67	0.00	0.00	28.30	25.88	17.54	43.42	0.03	26.13	0.606
A-12	71.67	0.00	0.00	34.40	16.92	20.02	36.94	0.01	9.52	0.515
A-13	71.67	0.00	0.00	39.83	9.39	22.48	31.87	0.03	22.53	0.445
A-14	71.67	0.00	0.00	38.50	10.54	22.66	33.20	0.02	23.54	0.463
A-15	71.67	0.00	0.00	23.36	33.92	14.45	48.37	0.04	32.88	0.675
A-16	71.67	0.00	0.00	9.50	55.59	5.85	61.45	0.22	171.92	0.857
A-17	71.67	0.00	0.00	27.97	26.60	17.14	43.74	0.03	29.08	0.610
A-19	71.67	0.00	0.00	15.79	45.15	9.83	54.97	0.20	163.67	0.767
A-21	71.67	0.00	0.00	15.79	45.15	9.83	54.97	0.14	116.18	0.767
B-01	71.67	0.00	0.00	6.31	60.14	3.96	64.10	0.03	21.29	0.894
B-02	71.67	0.00	0.00	45.39	0.00	26.31	26.31	0.02	18.56	0.367
B-03	71.67	0.00	0.00	41.55	3.51	26.73	30.24	0.00	1.72	0.422
B-04	71.67	0.00	0.00	41.55	3.51	26.73	30.24	0.00	2.58	0.422
B-05	71.67	0.00	0.00	7.54	58.19	4.73	62.92	0.03	20.23	0.878
B-06	71.67	0.00	0.00	7.70	57.97	4.86	62.83	0.06	46.81	0.877
B-07	71.67	0.00	0.00	7.49	58.21	4.79	63.00	0.01	7.26	0.879
B-08	71.67	0.00	0.00	41.55	3.51	26.73	30.24	0.00	2.58	0.422
B-09	71.67	0.00	0.00	41.55	3.51	26.73	30.24	0.00	2.58	0.422
B-10	71.67	0.00	0.00	44.02	0.00	27.75	27.75	0.01	9.59	0.387
B-11	71.67	0.00	0.00	28.70	25.07	17.42	42.48	0.01	10.43	0.593
B-12	71.67	0.00	0.00	27.96	26.37	17.16	43.53	0.03	25.04	0.607
B-13	71.67	0.00	0.00	39.97	7.01	24.58	31.60	0.01	17.42	0.441
B-14	71.67	0.00	0.00	43.73	0.00	28.15	28.15	0.00	1.28	0.393
B-15	71.67	0.00	0.00	44.13	0.00	27.62	27.62	0.00	2.85	0.385
B-16	71.67	0.00	0.00	0.00	71.77	0.00	71.77	0.04	29.76	1.001
B-17	71.67	0.00	0.00	0.00	71.77	0.00	71.77	0.05	34.22	1.001

C-01			71.67	0.00	0.00	41.59	3.51	26.65	30.16
0.00	4.73	0.421							
C-02			71.67	0.00	0.00	41.49	3.52	26.83	30.35
0.00	1.29	0.423							

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
CB01/02_Sub	JUNCTION	0.01	0.10	77.62	0 01:10	0.10
CB03/04_Sub	JUNCTION	0.12	1.61	77.23	0 01:10	1.61
CB05/06_Sub	JUNCTION	0.01	0.09	76.82	0 01:04	0.09
CBMH04-Dummy	JUNCTION	0.02	0.05	75.29	0 01:32	0.05
HP01_Sub	JUNCTION	0.00	0.00	77.79	0 00:00	0.00
HP02_Sub	JUNCTION	0.01	0.12	77.21	0 01:15	0.12
HP-03_Sub	JUNCTION	0.00	0.00	76.46	0 01:52	0.00
HP-CBMH01-CBMH03	JUNCTION	0.00	0.00	78.13	0 00:00	0.00
HP-LC03	JUNCTION	0.00	0.00	77.80	0 00:00	0.00
HP-RY04	JUNCTION	0.00	0.00	78.22	0 00:00	0.00
HP-RY06	JUNCTION	0.00	0.00	78.20	0 00:00	0.00
TD01	JUNCTION	0.01	0.05	73.93	0 01:10	0.05
EX-MH159	OUTFALL	0.07	0.35	70.49	0 01:11	0.35
HP-CB02	OUTFALL	0.00	0.00	78.03	0 00:00	0.00
HP-LC02	OUTFALL	0.00	0.00	78.03	0 00:00	0.00
HP-RY03	OUTFALL	0.00	0.00	77.30	0 00:00	0.00
HP-RY07	OUTFALL	0.00	0.00	77.35	0 00:00	0.00
HP-RY11_Sub	OUTFALL	0.00	0.16	74.08	0 01:10	0.16
Out-1_Sub	OUTFALL	0.00	0.15	76.71	0 01:10	0.15
Out-2_Block10	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
Out-2_Sub	OUTFALL	0.00	0.00	75.50	0 01:52	0.00
Out-3_Sub	OUTFALL	0.00	0.00	73.47	0 00:00	0.00
Out-4	OUTFALL	0.00	0.00	77.35	0 00:00	0.00
CB02	STORAGE	0.09	1.51	77.84	0 01:15	1.51
CBMH01	STORAGE	0.69	2.82	78.06	0 01:30	2.82
CBMH01_Sub	STORAGE	1.78	4.16	76.46	0 01:52	4.16
CBMH02	STORAGE	0.24	1.38	77.29	0 01:30	1.38
CBMH03	STORAGE	0.73	2.93	78.06	0 01:29	2.93
CBMH04	STORAGE	0.43	2.04	77.28	0 01:31	2.04
K-01	STORAGE	0.09	1.52	77.66	0 01:11	1.52
K-02	STORAGE	0.09	1.54	77.96	0 01:11	1.54
LC01	STORAGE	0.00	0.04	76.74	0 01:10	0.04
LC02	STORAGE	0.07	1.42	77.84	0 01:15	1.42
LC03	STORAGE	0.08	0.62	77.29	0 01:30	0.62
M02	STORAGE	0.03	0.12	72.93	0 01:10	0.12
M04	STORAGE	0.04	0.17	72.75	0 01:10	0.17
MH02	STORAGE	0.07	0.35	71.31	0 01:11	0.35
MH04_Sub	STORAGE	0.06	0.31	72.02	0 01:11	0.31
MH06_Sub	STORAGE	0.05	0.19	72.41	0 01:10	0.19
MH08	STORAGE	0.04	0.22	72.02	0 01:10	0.22
MH10_Sub	STORAGE	0.32	4.83	77.13	0 01:10	4.83
MH12_Sub	STORAGE	0.18	2.72	74.77	0 01:10	2.72
MH14_Sub	STORAGE	0.21	2.83	76.85	0 01:10	2.83
MH16_Sub	STORAGE	0.11	1.85	74.14	0 01:10	1.85
MH18_Sub	STORAGE	0.00	0.02	72.41	0 01:10	0.02
RY02_Sub	STORAGE	0.09	1.70	74.14	0 01:10	1.70
RY03	STORAGE	0.37	1.83	77.28	0 01:31	1.83
RY03_Sub	STORAGE	0.06	1.34	74.77	0 01:10	1.34
RY04	STORAGE	0.56	2.41	78.06	0 01:30	2.41
RY04_Sub	STORAGE	0.14	2.41	77.14	0 01:10	2.41
RY05	STORAGE	0.29	1.56	77.28	0 01:30	1.56
RY06	STORAGE	0.56	2.40	78.06	0 01:25	2.40
RY06_Sub	STORAGE	0.16	2.49	76.85	0 01:10	2.49
RY07	STORAGE	0.18	1.14	77.29	0 01:30	1.14

****
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
CB01/02_Sub	JUNCTION	63.17	63.17	0 01:10	0.0814	0.0814	-3.240
CB03/04_Sub	JUNCTION	142.98	163.23	0 01:10	0.185	0.206	0.861
CB05/06_Sub	JUNCTION	78.58	83.21	0 01:10	0.0984	0.111	-2.032
CBMH04-Dummy	JUNCTION	0.00	6.07	0 01:31	0	0.0534	-0.013
HP01_Sub	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP02_Sub	JUNCTION	0.00	52.07	0 01:11	0	0.0206	17.583
HP-03_Sub	JUNCTION	0.00	1.36	0 01:50	0	0.00169	0.006
HP-CBMH01-CBMH03	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP-LC03	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-RY06	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
TD01	JUNCTION	7.26	7.26	0 01:10	0.00945	0.00945	0.003
EX-MH159	OUTFALL	0.00	370.27	0 01:11	0	1.44	0.000
HP-CB02	OUTFALL	0.00	0.00	0 00:00	0	0	0.000 ltr
HP-LC02	OUTFALL	0.00	0.00	0 00:00	0	0	0.000 ltr
HP-RY03	OUTFALL	0.00	0.00	0 00:00	0	0	0.000 ltr
HP-RY07	OUTFALL	0.00	0.00	0 00:00	0	0	0.000 ltr
HP-RY11_Sub	OUTFALL	0.00	124.38	0 01:10	0	0.06	0.000
Out-1_Sub	OUTFALL	0.00	130.86	0 01:10	0	0.0628	0.000
Out-2_Block10	OUTFALL	6.02	6.02	0 01:10	0.00422	0.00422	0.000
Out-2_Sub	OUTFALL	9.52	9.52	0 01:10	0.0107	0.0124	0.000
Out-3_Sub	OUTFALL	22.53	22.53	0 01:10	0.0268	0.0268	0.000
Out-4	OUTFALL	0.00	0.00	0 00:00	0	0	0.000 ltr
CB02	STORAGE	21.29	28.25	0 01:10	0.0282	0.0471	-0.010
CBMH01	STORAGE	46.81	123.53	0 01:05	0.0609	0.165	-0.004
CBMH01_Sub	STORAGE	171.92	226.51	0 01:10	0.224	0.262	0.115
CBMH02	STORAGE	0.00	30.50	0 01:09	0	0.0374	-0.565
CBMH03	STORAGE	20.23	54.32	0 01:05	0.0264	0.191	0.007
CBMH04	STORAGE	0.00	16.41	0 01:11	0	0.0534	0.008
K-01	STORAGE	116.18	116.18	0 01:10	0.139	0.139	0.028
K-02	STORAGE	163.67	163.67	0 01:10	0.195	0.195	0.030
LC01	STORAGE	1.28	1.28	0 01:10	0.000844	0.000844	0.056
LC02	STORAGE	18.56	18.56	0 01:10	0.0182	0.0189	0.003
LC03	STORAGE	10.43	19.36	0 01:10	0.011	0.0113	0.487
M02	STORAGE	0.00	26.91	0 01:10	0	0.196	0.047
M04	STORAGE	0.00	50.96	0 01:10	0	0.296	-0.033
MH02	STORAGE	0.00	370.25	0 01:11	0	1.44	0.002
MH04_Sub	STORAGE	0.00	178.85	0 01:10	0	0.814	-0.002
MH06_Sub	STORAGE	0.00	66.18	0 01:10	0	0.439	0.001
MH08	STORAGE	0.00	108.72	0 01:10	0	0.435	-0.003
MH10_Sub	STORAGE	0.00	46.66	0 01:01	0	0.0703	-0.009
MH12_Sub	STORAGE	0.00	57.88	0 01:01	0	0.0524	-0.014
MH14_Sub	STORAGE	0.00	48.34	0 01:03	0	0.0457	-0.064
MH16_Sub	STORAGE	0.00	46.81	0 00:57	0	0.0638	-0.101
MH18_Sub	STORAGE	0.00	0.30	0 01:03	0	4.03e-05	1.914
RY02_Sub	STORAGE	84.11	144.21	0 01:10	0.0909	0.124	0.051
RY03	STORAGE	17.42	27.41	0 01:10	0.0142	0.0537	-0.053
RY03_Sub	STORAGE	75.76	75.76	0 01:10	0.0813	0.0813	0.004
RY04	STORAGE	39.35	39.35	0 01:10	0.0494	0.0498	-0.006
RY04_Sub	STORAGE	97.34	97.34	0 01:10	0.106	0.106	0.032
RY05	STORAGE	2.85	23.83	0 01:04	0.00193	0.0396	0.161
RY06	STORAGE	34.22	34.22	0 01:10	0.0495	0.0495	-0.009
RY06_Sub	STORAGE	65.47	142.49	0 01:10	0.0705	0.109	0.028
RY07	STORAGE	25.04	25.04	0 01:10	0.0261	0.0261	0.317

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Node Surcharge Summary
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No nodes were surcharged.

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Node Flooding Summary
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No nodes were flooded.

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Storage Volume Summary
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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
CB02	0.000	0	0	0	0.002	8	0 01:15	17.72
CBMH01	0.006	7	0	0	0.045	56	0 01:30	40.33
CBMH01_Sub	0.063	33	0	0	0.191	99	0 01:52	10.49
CBMH02	0.000	16	0	0	0.002	94	0 01:30	22.24

CBMH03	0.002	7	0	0	0.017	53	0	01:29	34.08
CBMH04	0.000	17	0	0	0.002	80	0	01:31	6.07
K-01	0.001	0	0	0	0.024	15	0	01:11	58.16
K-02	0.001	1	0	0	0.033	22	0	01:11	82.86
LC01	0.000	0	0	0	0.000	4	0	01:10	1.28
LC02	0.000	0	0	0	0.003	6	0	01:15	11.62
LC03	0.000	1	0	0	0.000	10	0	01:30	10.16
M02	0.000	1	0	0	0.000	2	0	01:10	26.90
M04	0.000	1	0	0	0.000	3	0	01:10	50.58
MH02	0.000	1	0	0	0.000	5	0	01:11	370.27
MH04_Sub	0.000	1	0	0	0.000	6	0	01:11	178.72
MH06_Sub	0.000	1	0	0	0.000	5	0	01:10	66.16
MH08	0.000	1	0	0	0.000	4	0	01:10	108.67
MH10_Sub	0.000	7	0	0	0.005	99	0	01:10	25.74
MH12_Sub	0.000	3	0	0	0.003	53	0	01:10	25.76
MH14_Sub	0.000	8	0	0	0.003	100	0	01:03	34.93
MH16_Sub	0.000	3	0	0	0.002	44	0	01:10	40.19
MH18_Sub	0.000	0	0	0	0.000	1	0	01:10	0.20
RY02_Sub	0.000	4	0	0	0.000	71	0	01:10	144.13
RY03	0.000	5	0	0	0.004	71	0	01:31	16.41
RY03_Sub	0.000	3	0	0	0.000	65	0	01:10	75.73
RY04	0.000	3	0	0	0.001	14	0	01:30	44.46
RY04_Sub	0.000	4	0	0	0.000	72	0	01:10	97.30
RY05	0.000	5	0	0	0.001	32	0	01:30	16.95
RY06	0.000	16	0	0	0.001	68	0	01:25	40.45
RY06_Sub	0.000	5	0	0	0.000	75	0	01:10	142.46
RY07	0.000	3	0	0	0.002	35	0	01:30	22.53

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Outfall Loading Summary
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Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
EX-MH159	61.95	62.05	370.27	1.443
HP-CB02	0.00	0.00	0.00	0.000
HP-LC02	0.00	0.00	0.00	0.000
HP-RY03	0.00	0.00	0.00	0.000
HP-RY07	0.00	0.00	0.00	0.000
HP-RY11_Sub	3.89	50.81	124.38	0.060
Out-1_Sub	4.18	49.71	130.86	0.063
Out-2_Block10	12.28	1.04	6.02	0.004
Out-2_Sub	31.63	1.18	9.52	0.012
Out-3_Sub	34.58	2.29	22.53	0.027
Out-4	0.00	0.00	0.00	0.000
System	13.50	167.08	661.94	1.610

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Link Flow Summary
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Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
CB02-HP	CONDUIT	0.00	0	00:00	0.00	0.00	0.06
CBMH01-CBMH03	CONDUIT	39.88	0	00:53	0.39	0.06	1.00
CBMH01-HP	CONDUIT	0.00	0	00:00	0.00	0.00	0.12
CBMH02-RY05	CONDUIT	22.24	0	01:04	1.03	0.23	1.00
CBMH03-HP	CONDUIT	0.00	0	00:00	0.00	0.00	0.12
CBMH04-MH04	CONDUIT	6.07	0	01:32	0.75	0.06	0.17
HP-CB02	CONDUIT	0.00	0	00:00	0.00	0.00	0.06
HP-LC03-RY07	CONDUIT	0.00	0	00:00	0.00	0.00	0.04
HP-RY04-CBMH01	CONDUIT	0.00	0	00:00	0.00	0.00	0.12
HP-RY06-CBMH01	CONDUIT	0.00	0	00:00	0.00	0.00	0.12
LC01-M04	CONDUIT	1.28	0	01:10	0.35	0.03	0.13
LC02-CB02	CONDUIT	11.62	0	01:12	0.24	0.20	1.00
LC02-HP	CONDUIT	0.00	0	00:00	0.00	0.00	0.06
LC03-CBMH02	CONDUIT	10.16	0	01:10	1.02	0.12	1.00
LC03-HP	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
M02-M04	CONDUIT	26.90	0	01:10	0.89	0.22	0.33
M04-MH08	CONDUIT	50.58	0	01:10	0.99	0.26	0.36
MH02-MH159	CONDUIT	370.27	0	01:11	1.99	0.53	0.52
MH04-MH02_Sub	CONDUIT	178.72	0	01:11	1.44	0.56	0.56
MH06-MH04_Sub	CONDUIT	66.14	0	01:10	1.19	0.51	0.50
MH08-MH02	CONDUIT	108.67	0	01:11	1.29	0.36	0.41
MH18-MH06_Sub	CONDUIT	0.30	0	01:03	0.09	0.01	0.16
MS-CB01/02(1)_Sub	CHANNEL	0.00	0	00:00	0.00	0.00	0.05
MS-CB01/02(2)_Sub	CHANNEL	21.33	0	01:10	0.02	0.00	0.15
MS-CB03/04(1)_Sub	CHANNEL	52.07	0	01:11	0.07	0.00	0.15
MS-CB03/04(2)_Sub	CHANNEL	13.70	0	01:14	0.05	0.00	0.09
MS-CB05/06_Sub	CHANNEL	62.96	0	01:05	0.23	0.00	0.17
MS-CBMH01(1)_Sub	CONDUIT	1.36	0	01:50	0.00	0.00	0.16
MS-CBMH01(2)_Sub	CONDUIT	1.30	0	01:52	0.13	0.00	0.00
MS-RYCB02_Sub	CONDUIT	124.38	0	01:10	0.72	0.01	0.24
MS-RYCB03_Sub	CONDUIT	60.09	0	01:10	0.53	0.00	0.19
MS-RYCB04_Sub	CONDUIT	77.02	0	01:10	2.00	0.00	0.13
MS-RYCB06_Sub	CONDUIT	130.86	0	01:10	1.87	0.01	0.15
RY02-MH16_Sub	CONDUIT	46.81	0	00:57	1.09	0.20	1.00
RY03-CBMH04	CONDUIT	16.41	0	01:11	0.41	0.17	1.00
RY03-HP	CONDUIT	0.00	0	00:00	0.00	0.00	0.07
RY03-MH12	CONDUIT	57.88	0	01:01	4.19	0.16	1.00
RY04-CBMH01	CONDUIT	44.46	0	01:04	0.53	0.16	1.00
RY04-HP	CONDUIT	0.00	0	00:00	0.00	0.00	0.03
RY04-MH10	CONDUIT	46.66	0	01:01	5.02	0.12	1.00
RY05-HP	CONDUIT	0.00	0	00:00	0.00	0.00	0.02
RY05-RY03	CONDUIT	16.95	0	01:03	0.65	0.17	1.00
RY06-CBMH01	CONDUIT	40.45	0	01:04	0.71	0.10	1.00
RY06-HP	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
RY06-MH14_Sub	CONDUIT	48.34	0	01:03	1.12	0.16	1.00
RY07-CBMH02	CONDUIT	22.53	0	01:09	0.95	0.37	1.00
RY07-HP	CONDUIT	0.00	0	00:00	0.00	0.00	0.07
TD01-M02	CONDUIT	7.26	0	01:10	1.04	0.09	0.20
CB02-O	ORIFICE	17.72	0	01:15			1.00
CB3-O_Sub	ORIFICE	27.54	0	01:10			1.00
CB4-O_Sub	ORIFICE	27.54	0	01:10			1.00
CBMH03-O	ORIFICE	19.78	0	01:29			1.00
CBMH04-O	ORIFICE	6.07	0	01:31			1.00
CBMH1-O(1)_Sub	ORIFICE	9.14	0	01:54			1.00
K-01-O	ORIFICE	58.16	0	01:11			1.00
K-02-O	ORIFICE	82.86	0	01:11			1.00
MH10-O_Sub	ORIFICE	20.26	0	01:10			1.00
MH12-O_Sub	ORIFICE	15.62	0	01:10			1.00
MH14-O_Sub	ORIFICE	11.55	0	01:10			1.00
MH16-O_Sub	ORIFICE	19.69	0	01:10			1.00
CB01/02-O_Sub	DUMMY	21.80	0	01:01			
CB05/06-O_Sub	DUMMY	26.00	0	01:01			

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Flow Classification Summary
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Conduit	Adjusted /Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
CB02-HP	1.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CBMH01-CBMH03	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.35	0.00
CBMH01-HP	1.00	0.80	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CBMH02-RY05	1.00	0.01	0.00	0.00	0.89	0.10	0.00	0.00	0.86	0.00
CBMH03-HP	1.00	0.80	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CBMH04-MH04	1.00	0.02	0.00	0.00	0.00	0.00	0.00	0.98	0.00	0.00
HP-CB02	1.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HP-LC03-RY07	1.00	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HP-RY04-CBMH01	1.00	0.80	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HP-RY06-CBMH01	1.00	0.80	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LC01-M04	1.00	0.11	0.00	0.00	0.00	0.00	0.00	0.89	0.00	0.00
LC02-CB02	1.00	0.22	0.54	0.00	0.24	0.00	0.00	0.00	0.93	0.00
LC02-HP	1.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LC03-CBMH02	1.00	0.03	0.00	0.00	0.26	0.00	0.00	0.71	0.04	0.00
LC03-HP	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
M02-M04	1.00	0.01	0.00	0.00	0.05	0.00	0.00	0.95	0.02	0.00
M04-MH08	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
MH02-MH159	1.00	0.01	0.00	0.00	0.43	0.57	0.00	0.00	0.73	0.00
MH04-MH02_Sub	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
MH06-MH04_Sub	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
MH08-MH02	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
MH18-MH06_Sub	1.00	0.10	0.00	0.00	0.06	0.00	0.00	0.83	0.01	0.00
MS-CB01/02(1)_Sub	1.00	0.55	0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS-CB01/02(2)_Sub	1.00	0.55	0.00	0.00	0.06	0.00	0.00	0.39	0.03	0.00
MS-CB03/04(1)_Sub	1.00	0.10	0.00	0.00	0.06	0.00	0.00	0.84	0.00	0.00
MS-CB03/04(2)_Sub	1.00	0.01	0.10	0.00	0.89	0.00	0.00	0.00	0.01	0.00
MS-CB05/06_Sub	1.00	0.33	0.03	0.00	0.36	0.00	0.00	0.28	0.95	0.00
MS-CBMH01(1)_Sub	1.00	0.61	0.28	0.00	0.11	0.00	0.00	0.00	0.90	0.00
MS-CBMH01(2)_Sub	1.00	0.89	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.00

MS-RYCB02_Sub	1.00	0.96	0.00	0.00	0.04	0.00	0.00	0.00	0.94	0.00
MS-RYCB03_Sub	1.00	0.96	0.00	0.00	0.04	0.00	0.00	0.00	0.96	0.00
MS-RYCB04_Sub	1.00	0.96	0.01	0.00	0.00	0.03	0.00	0.00	0.96	0.00
MS-RYCB06_Sub	1.00	0.96	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00
RY02-MH16_Sub	1.00	0.01	0.00	0.00	0.94	0.06	0.00	0.00	0.18	0.00
RY03-CBMH04	1.00	0.01	0.00	0.00	0.35	0.00	0.00	0.64	0.02	0.00
RY03-HP	1.00	0.90	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RY03-MH12	1.00	0.01	0.00	0.00	0.05	0.00	0.00	0.94	0.00	0.00
RY04-CBMH01	1.00	0.01	0.00	0.00	0.32	0.00	0.00	0.68	0.02	0.00
RY04-HP	1.00	0.87	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RY04-MH10	1.00	0.01	0.00	0.00	0.06	0.00	0.00	0.93	0.00	0.00
RY05-HP	1.00	0.93	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RY05-RY03	1.00	0.01	0.00	0.00	0.29	0.00	0.00	0.70	0.01	0.00
RY06-CBMH01	1.00	0.01	0.00	0.00	0.32	0.00	0.00	0.68	0.02	0.00
RY06-HP	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RY06-MH14_Sub	1.00	0.01	0.00	0.00	0.32	0.03	0.00	0.65	0.08	0.00
RY07-CBMH02	1.00	0.01	0.00	0.00	0.25	0.00	0.00	0.75	0.01	0.00
RY07-HP	1.00	0.90	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TD01-M02	1.00	0.03	0.00	0.00	0.00	0.00	0.00	0.97	0.00	0.00

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Conduit Surcharge Summary
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Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
CBMH01-CBMH03	2.55	2.55	2.66	0.01	0.01
CBMH02-RY05	2.01	2.01	2.26	0.01	0.01
LC02-CB02	0.59	0.59	0.62	0.01	0.01
LC03-CBMH02	1.21	1.21	2.01	0.01	0.01
RY02-MH16_Sub	0.64	0.64	0.83	0.01	0.01
RY03-CBMH04	2.59	2.59	2.80	0.01	0.01
RY03-MH12	0.53	0.53	0.58	0.01	0.01
RY04-CBMH01	2.36	2.36	2.55	0.01	0.01
RY04-MH10	0.58	0.58	0.61	0.01	0.01
RY05-RY03	2.26	2.26	2.56	0.01	0.01
RY06-CBMH01	2.35	2.35	2.55	0.01	0.01
RY06-MH14_Sub	0.91	0.91	1.12	0.01	0.01
RY07-CBMH02	1.78	1.78	1.88	0.01	0.01

Analysis begun on: Tue Aug 2 15:33:10 2022
Analysis ended on: Tue Aug 2 15:33:12 2022
Total elapsed time: 00:00:02

STORM SEWER: HYDRAULIC GRADE LINE ANALYSIS (100-YEAR EVENT - ULTIMATE CONDITION)

This spreadsheet uses the Darcy-Weisbach equation to calculate hydraulic losses through a pipe network with a specified flow rate. Minor losses are accounted for including both pipe bend losses and structure losses.
The spreadsheet returns the upstream hydraulic grade line if surcharged, or the pipe obvert if free flow conditions exist. The slope of the HGL is calculated and the minimum USF elevations can be established +0.30m above the HGL.
The theoretical 100-year event storm sewer peak flows will be controlled to the actual 5-year flow rates using various roadway inlet controls within CBs. Additional flows will be directed using overland flow routes.
The Ultimate Condition accounts for the entire drainage areas flowing through the completed storm sewer network.

LOCATION	MANHOLE		INVERT ELEVATION		GROUND ELEVATION	COVER	PIPE PARAMETERS			TOTAL FLOW	Q_{cap}	Q_{in}/Q_{cap}	COMPUTATIONAL COLUMNS					HEAD LOSS	SURCHARGE	HGL			PIPE SLOPE	MIN. USF ELEVATION
	Upstream	Downstream	U/S (m)	D/S (m)	Upstream (m)	Upstream (m)	Dia (mm)	Length (m)	'n'	(m^3/s)	(m^3/s)		Pipe Area (m^2)	L/D	Friction Factor (f)	Velocity V (m/s)	$V^2/2g$	HL (m)	Upstream (m)	U/S (m)	D/S (m)	SLOPE (%)	(%)	Upstream (m)
KLONDIKE ROAD																				67.57	<- OUTLET TO POND			
	FUT.MH C	OUTLET	65.93	65.90	67.95	0.670	1350	13.80	0.013	1.714	2.596	0.66	1.478	10	0.01905	1.16	0.07	0.05	0.34	67.62	67.57	0.35	0.14	67.92
	FUT.MH B	FUT.MH C	66.02	65.93	68.55	1.180	1350	51.00	0.013	1.738	2.339	0.74	1.478	38	0.01905	1.18	0.07	0.09	0.34	67.71	67.62	0.17	0.13	68.01
	FUT.MH A	FUT.MH B	66.24	66.05	68.87	1.280	1350	117.00	0.013	1.797	2.244	0.80	1.478	87	0.01905	1.22	0.08	0.14	0.26	67.85	67.71	0.12	0.13	68.15
	MH 153	FUT.MH A	66.40	66.24	70.01	2.260	1350	108.50	0.013	1.447	2.138	0.68	1.478	80	0.01905	0.98	0.05	0.09	0.19	67.94	67.85	0.08	0.13	68.24
	MH 154	MH 153	66.63	66.55	70.18	2.350	1200	39.90	0.013	1.441	1.821	0.79	1.167	33	0.01981	1.23	0.08	0.07	0.17	68.00	67.94	0.17	0.20	68.30
PHASE2																								
	MH 163	MH 154	66.97	66.90	70.25	2.380	900	65.0	0.013	0.180	0.620	0.29	0.657	72	0.02181	0.27	0.00	0.01	0.14	68.01	68.00	0.01	0.11	68.31
	MH 164	MH 163	67.33	67.27	69.82	1.890	600	41.5	0.013	0.159	0.244	0.65	0.292	69	0.02496	0.54	0.02	0.04	0.12	68.05	68.01	0.09	0.14	68.35
	MH 165	MH 164	67.59	67.41	70.15	2.035	525	110.0	0.013	0.161	0.181	0.89	0.223	210	0.02610	0.72	0.03	0.15	0.09	68.20	68.05	0.14	0.16	68.50
	MH 166	MH 165	67.87	67.67	70.50	2.180	450	90.3	0.013	0.126	0.140	0.90	0.164	201	0.02747	0.77	0.03	0.19	0.08	68.40	68.20	0.21	0.22	68.70
	MH 167	MH 166	68.25	68.02	70.50	1.950	300	66.4	0.013	0.045	0.059	0.75	0.073	221	0.03145	0.61	0.02	0.13	0.00	68.55	68.40	0.23	0.35	68.85
KLONDIKE ROAD																								
	MH 155	MH 154	66.78	66.63	70.12	2.140	1200	117.00	0.013	1.335	1.456	0.92	1.167	98	0.01981	1.14	0.07	0.14	0.17	68.15	68.00	0.11	0.13	68.45
	MH 156	MH 155	66.90	66.78	70.39	2.290	1200	91.30	0.013	1.279	1.475	0.87	1.167	76	0.01981	1.10	0.06	0.10	0.15	68.25	68.15	0.11	0.13	68.55
	MH 157	MH 156	67.03	66.90	70.29	2.060	1200	97.00	0.013	1.214	1.489	0.82	1.167	81	0.01981	1.04	0.06	0.10	0.12	68.35	68.25	0.10	0.13	68.65
MARCONI AVENUE																								
	MH 160	MH 157	68.08	67.78	70.64	2.110	450	120.00	0.013	0.129	0.149	0.87	0.164	267	0.02747	0.79	0.03	0.28	0.10	68.63	68.35	0.23	0.25	68.93
	MH 161	MH 160	68.35	68.23	70.87	2.220	300	23.90	0.013	0.023	0.071	0.32	0.073	80	0.03145	0.32	0.01	0.01	0.00	68.65	68.63	0.10	0.50	68.95
	MH 162	MH 161	68.50	68.38	71.50	2.700	300	24.60	0.013	0.000	0.070	0.00	0.073	82	0.03145	0.00	0.00	0.00	0.00	68.80	68.68	0.49	0.49	69.10
KLONDIKE ROAD																								
	MH 158	MH 157	68.30	67.40	71.78	2.655	825	120.00	0.013	1.064	1.297	0.82	0.552	145	0.02245	1.93	0.19	0.66	0.00	69.13	68.35	0.65	0.75	69.43
	MH 159	MH 158	68.90	68.30	74.79	5.065	825	94.00	0.013	0.932	1.196	0.78	0.552	114	0.02245	1.69	0.15	0.40	0.00	69.73	69.13	0.64	0.64	70.03
TER LEVEL at Outlet = 67.57m																								

TEMPEST Product Submittal Package R1

Date: December 13, 2021

Customer: Novatech

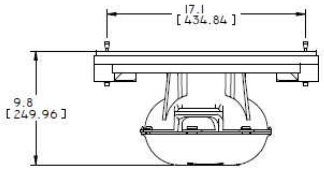
Contact: Lucas Wilson

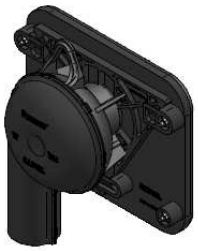
Location:

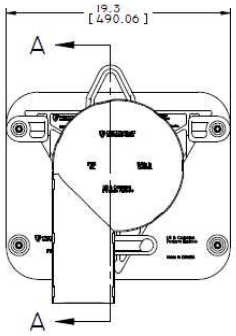
Project Name: Klondike Road

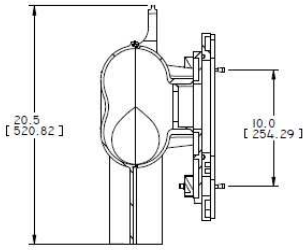
IPEX

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

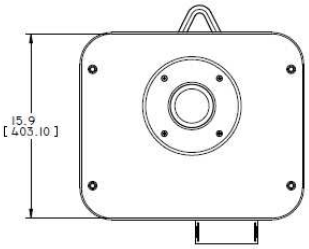








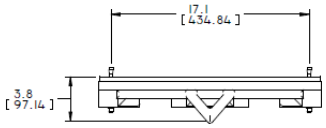
SECTION A-A

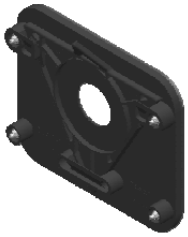


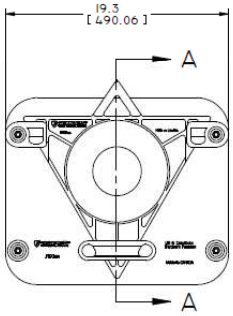
TOLERANCES	IPEX TECHNOLOGIES INC.			
PROJECTION	UNITS: in (mm)	TITLE: LMF SQUARE CB ASSEMBLY		
DRAWN BY: H. M-MARTIN	DATE: 2011-07-27	SIZE: B	SCALE(S): 1/8	SHEET: 1 OF 1
VERIFIED BY	DATE: 2011-07-27	DRAWING NUMBER: SGM74_FA00IR03		REV: 3

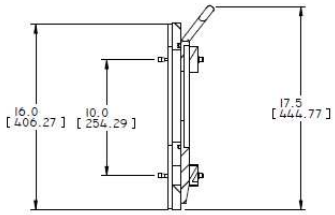
IPEX

Tempest MHF ICD Sq Shop Drawing







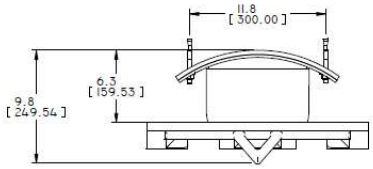


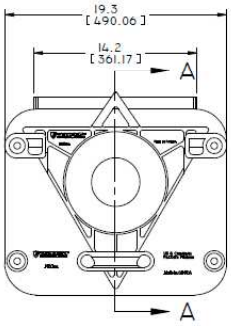
SECTION A-A

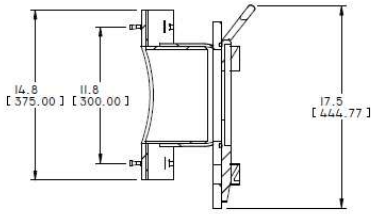
TOLERANCES:	IPEX TECHNOLOGIES INC.				
	PROJECTION	UNITS: in (mm)	TITLE: MHF SQUARE CB ASSEMBLY		
	DRAWN BY: H. M-MARTIN	DATE: 2011-07-25	SIZE: B	SCALE(S): 1/8	SHEET: 1 OF 1
	VERIFIED BY:	DATE: 2011-07-25	DRAWING NUMBER: SGM74_FA007R01		REV: 1

IPEX

Tempest MHF ICD Rd Shop Drawing







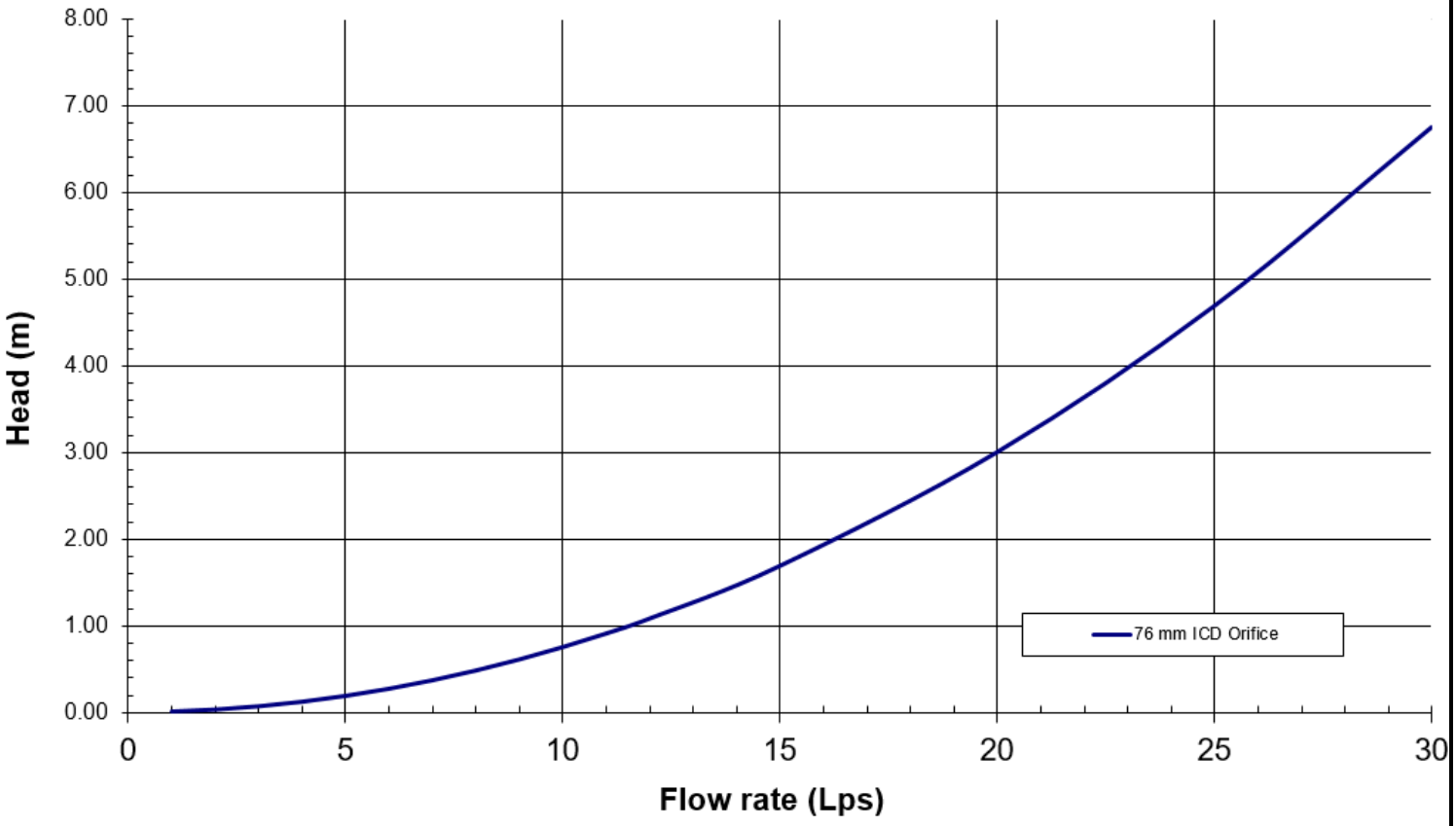
SECTION A-A

TOLERANCES: LINEAR: X ±0.060" [±1.50 mm]; X.X ±0.030" [±0.80 mm]; X.XX ±0.020" [±0.50 mm]; X.XXX ±0.010" [±0.25 mm]; FRACTION ±1/64"; ANGULAR ±1.0°	IPEX TECHNOLOGIES INC.			
	PROJECTION	UNITS: in (mm)	TITLE: MHF ROUND CB ASSEMBLY	
	DRAWN BY: H. McMARTIN	DATE: 2011-07-25	SIZE: B	SCALE(S): 1/8
	VERIFIED BY:	DATE: 2011-07-25	DRAWING NUMBER: SGM74_FA008R01	REV: 1

IPEX

Tempest MHF ICD Flow Curve

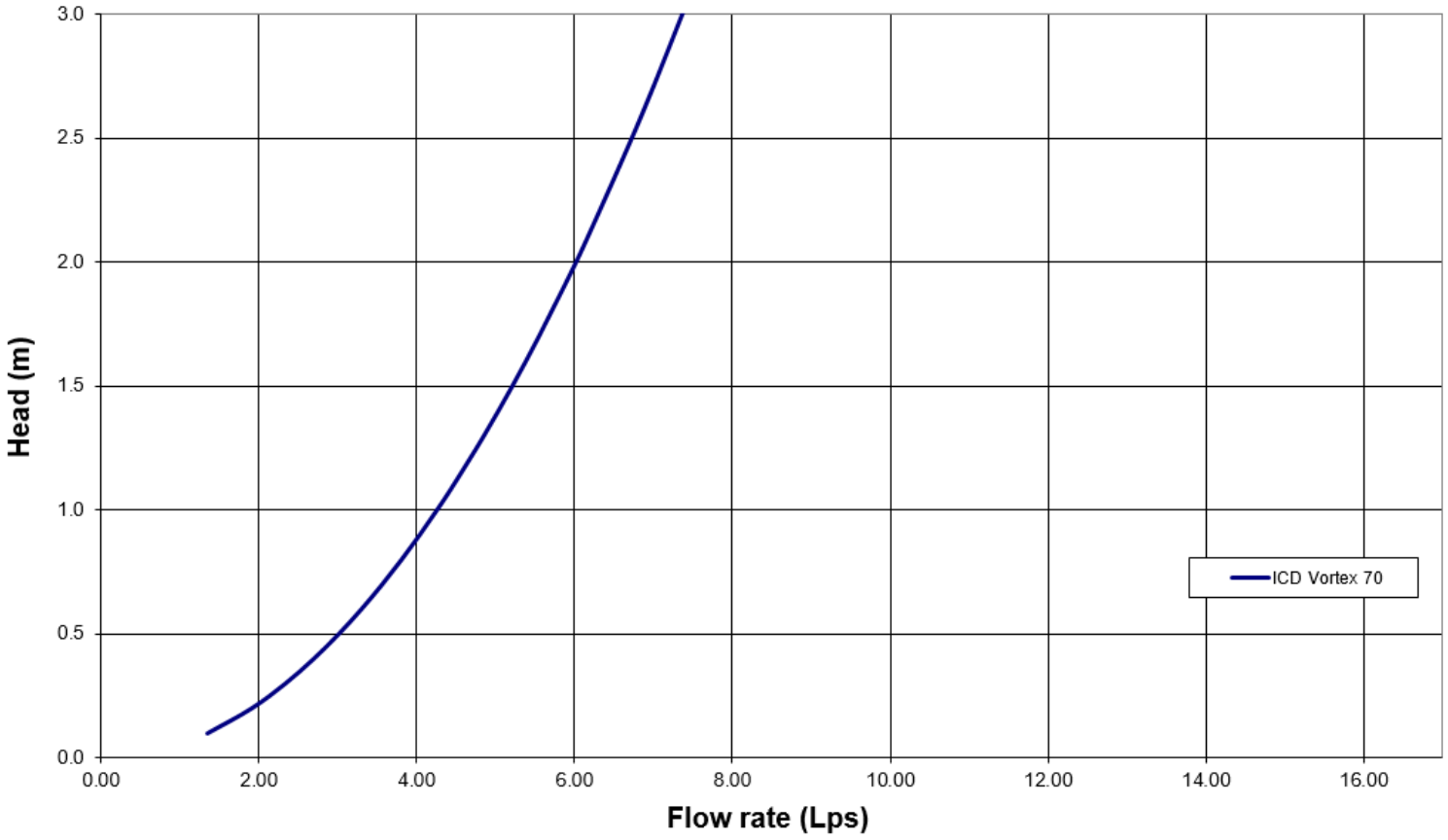
Flow: 19.8 L/s
Head: 2.93 m
CBMH03



IPEX

Tempest LMF ICD Flow Curve

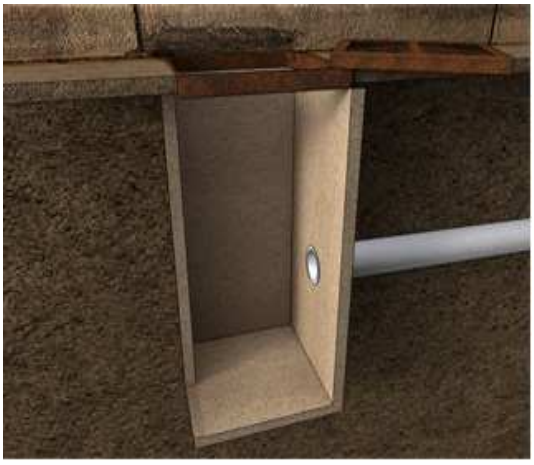
Flow: 6.1 L/s
Head: 2.05 m
CBMH04

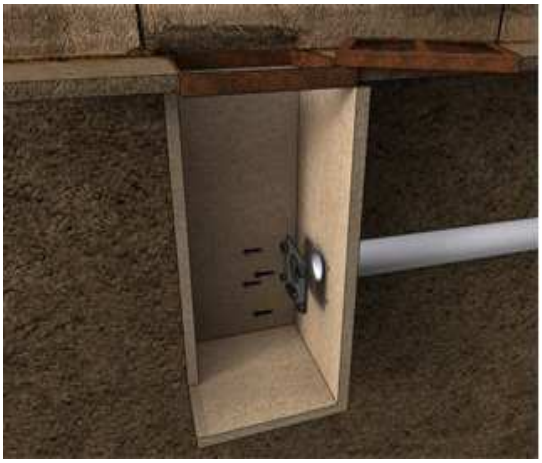


IPEX

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.



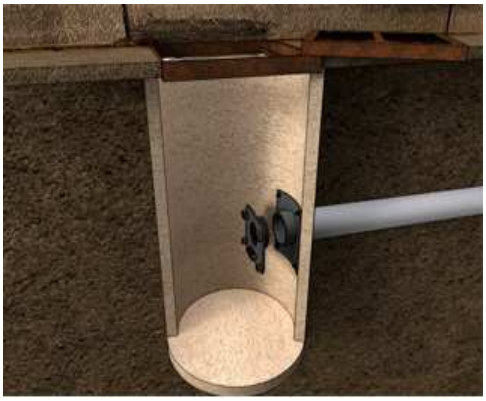


IPEX

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

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.

Klondike Road - Block 10
Maple Leaf Homes
Project No.: 117034-10

REQUIRED STORAGE - 2-YEAR EVENT
(B-05, B-06, B-10, B-16 & B-17)

OTTAWA IDF CURVE

Area =	**0.290**	**ha**	**Qallow =**	**19.8**
C =	**0.79**		**Vol(max) =**	**17.45**

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	103.6	65.7	45.9	13.8
10	76.8	48.7	28.9	17.4
15	61.8	39.2	19.4	17.5
20	52.0	33.0	13.2	15.9
25	45.2	28.7	8.9	13.3
30	40.0	25.4	5.6	10.1
35	36.1	22.9	3.1	6.5
40	32.9	20.9	1.1	2.5
45	30.2	19.2	-0.6	-1.7
50	28.0	17.8	-2.0	-6.0
55	26.2	16.6	-3.2	-10.5
60	24.6	15.6	-4.2	-15.2
65	23.2	14.7	-5.1	-19.9
70	21.9	13.9	-5.9	-24.8
75	20.8	13.2	-6.6	-29.7
80	19.8	12.6	-7.2	-34.6
85	18.9	12.0	-7.8	-39.7
90	18.1	11.5	-8.3	-44.8

Notes: Q = 2.78*C*i*A
Vol = Qnet x time
Qnet = Q - Qallow

Klondike Road - Block 10
Maple Leaf Homes
Project No.: 117034-10

REQUIRED STORAGE - 2-YEAR EVENT
(B-11, B-12, B-13 & B-15)

OTTAWA IDF CURVE

Area =	**0.138**	**ha**	**Qallow =**	**3.1**
C =	**0.41**		**Vol(max) =**	**6.10**

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m^3)
5	103.6	16.3	13.2	4.0
10	76.8	12.1	9.0	5.4
15	61.8	9.7	6.6	6.0
20	52.0	8.2	5.1	6.1
25	45.2	7.1	4.0	6.0
30	40.0	6.3	3.2	5.8
35	36.1	5.7	2.6	5.4
40	32.9	5.2	2.1	5.0
45	30.2	4.8	1.7	4.5
50	28.0	4.4	1.3	3.9
55	26.2	4.1	1.0	3.4
60	24.6	3.9	0.8	2.7
65	23.2	3.6	0.5	2.1
70	21.9	3.4	0.3	1.5
75	20.8	3.3	0.2	0.8
80	19.8	3.1	0.0	0.1
85	18.9	3.0	-0.1	-0.6
90	18.1	2.9	-0.2	-1.3

Notes: Q = 2.78*C*i*A
Vol = Qnet x time
Qnet = Q - Qallow

SWM Facility 'C'
Design Calculations

SWMF 'C' - Required Forebay Length

Parameters:

Length to width ratio of forebay, r =	3.0:1
Peak outflow rate during 25 mm storm, Q_p =	0.240 m^3/s (24hr ext. det)
Target particle size =	150 mm
Settling velocity, V_s =	0.0003 m/s

Forebay Settling Length, Dist

$$Dist = \sqrt{\frac{rQ_p}{V_s}}$$

= 49 m

Check Dispersion Length, $Dist_2$

Desired velocity in forebay, V_f =	0.2 m/s
Inlet flowrate , Q =	1.900 m^3/s
Depth in forebay, d =	1.1 m

$$Dist_2 = \frac{8Q}{dV_f}$$

= 72 m

Therefore, the dispersion length of 72 m governs the design.

Provided Length:	**72 m**

SWMF 'C' - Sediment Loading Estimate

Table 6.3 - MOE SWM Planning & Design Manual

Catchment Imperviousness	Annual Loading (kg/ha)	Wet Density (kg/m^3)	Annual Loading (m^3/ha)
35%	770	1,230	0.6
55%	2,300	1,230	1.9
70%	3,495	1,230	2.8
85%	4,680	1,230	3.8

Catchment Area:	26.2	ha
% Impervious:	52%	
Annual Sediment Loading:	2,071	kg/ha/yr
	1.68	m^3/ha/yr
	44.1	m^3/yr
Sediment Removal Efficiency:	80%	
	35.3	m^3/yr

Sediment Accumulation:

10yrs	353 m^3

Volume Provided in Forebay:	530 m^3

Catchment Area: 26.2 ha
% Impervious: 55%
Annual Sediment Loading: 2,300 kg/ha/yr
1.9 m^3/ha/yr

49.8 m^3/yr

Sediment Removal Efficiency: 80%
39.8 m^3/yr

Sediment Accumulation: 10yrs 398 m^3

Volume Provided in Forebay: 530 m^3

SWMF C

Drainage Area:	26.2 ha
Runoff Coefficient:	0.6
Estimate Influent TSS Level (max):	250 mg/L
(Long-term average):	150 mg/L
Sediment Density:	1,230 kg/m^3
Total Annual Precipitation:	907 mm
Total Annual Rain (Ice Free Period):	686 mm
Total Annual Runoff:	142,580 m^3
Runoff during Ice-free period:	107,839 m^3
Max Annual TSS Loading:	35,645 kg
(total precipitation)	29.0 m^3/yr
Max Annual TSS Loading:	26,960 kg
(precipitation during ice-free period)	21.9 m^3/yr
Average Annual TSS Loading:	21,387 kg
(total precipitation)	17.4 m^3/yr
Average Annual TSS Loading:	16,176 kg
(precipitation during Ice-free period)	13.2 m^3/yr

Target 80% TSS Removal:	
Max:	23.2 m^3/yr
Min:	10.5 m^3/yr

Appendix E

DSS Checklist

1055 KLONDIKE - BLOCK 10, OTTAWA
DEVELOPMENT SERVICING STUDY CHECKLIST

4.1 General Content	Addressed (Y/N/NA)	Comments
Executive Summary (for larger reports only).	N/A	
Date and revision number of the report.	Y	
Location map and plan showing municipal address, boundary, and layout of proposed development.	Y	Refer to Report Figures
Plan showing the site and location of all existing	Y	Refer to Grading and Servicing Plans
Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.	Y	Refer to Site Plan
Summary of Pre-consultation Meetings with City and other approval agencies.	Y	
Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria.	Y	
Statement of objectives and servicing criteria.	Y	Refer to Sections: 3.0 Sanitary Servicing, 4.0 Watermain, 5.0 Storm Sewer System and Stormwater Management
Identification of existing and proposed infrastructure available in the immediate area.	Y	
Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).	N/A	
Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighboring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.	Y	Refer to Grading Plan and Stormwater Drainage Area Plan

4.1 General Content	Addressed (Y/N/NA)	Comments
Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.	N/A	
Proposed phasing of the development, if applicable.	N/A	
Reference to geotechnical studies and recommendations concerning servicing.	Y	Refer to Section 3.0 Grading
All preliminary and formal site plan submissions should have the following information:		
Metric scale	Y	
North arrow (including construction North)	Y	
Key plan	Y	
Name and contact information of applicant and property owner	Y	
Property limits including bearings and dimensions	Y	
Existing and proposed structures and parking areas	Y	
Easements, road widening and rights-of-way	Y	
Adjacent street names	Y	

4.2 Water	**Addressed (Y/N/NA)**	**Comments**
Confirm consistency with Master Servicing Study, if available.	Y	
Availability of public infrastructure to service proposed development.	Y	Refer to Sections: 3.0 Sanitary Servicing, 4.0 Watermain, 5.0 Storm Sewer System and Stormwater Management
Identification of system constraints.	N/A	
Identify boundary conditions.	Y	Provided by City of Ottawa
Confirmation of adequate domestic supply and pressure.	Y	Refer to Appendix C
Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.	Y	Refer to Appendix C
Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.	Y	Refer to Appendix C
Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design.	N/A	
Address reliability requirements such as appropriate location of shut-off valves.	Y	
Check on the necessity of a pressure zone boundary modification.	N/A	
Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range.	Y	Refer to Section 4.0 Watermain
Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.	Y	Refer to Section 4.0 Watermain
Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.	N/A	
Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.	Y	Refer to Section 4.0 Watermain
Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.	N/A	

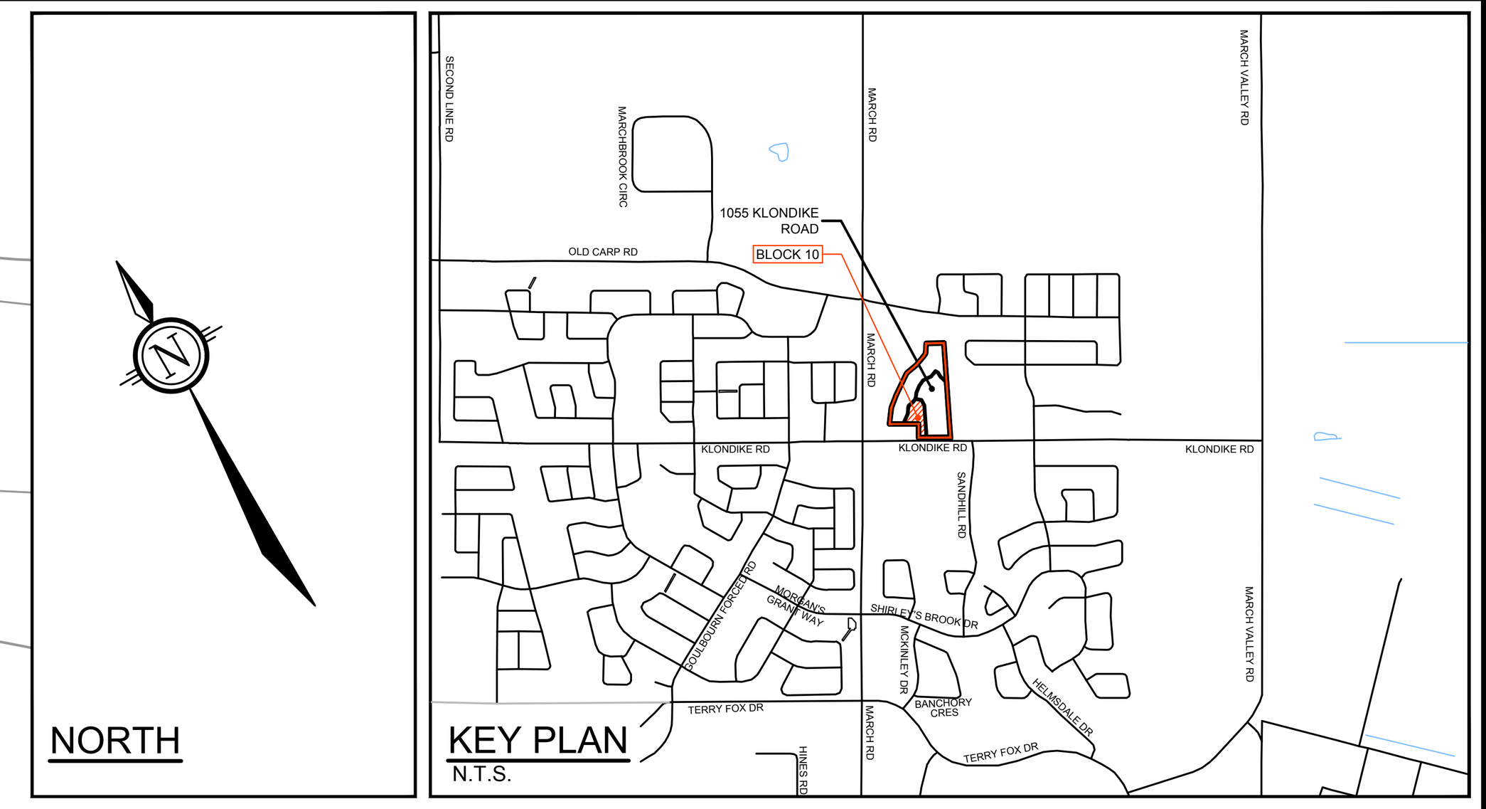
4.3 Wastewater	Addressed (Y/N/NA)	**Comments**
Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).	Y	Refer to Section 3.0 Sanitary Servicing
Confirm consistency with Master Servicing Study and/or justifications for deviations.	N/A	
Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.	N/A	
Description of existing sanitary sewer available for discharge of wastewater from proposed development.	Y	Refer to Section 3.0 Sanitary Servicing
Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)	y	Refer to Appendix B
Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.	N/A	
Description of proposed sewer network including sewers, pumping stations, and forcemains.	Y	Refer to Section 3.0 Sanitary Servicing
Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).	N/A	
Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.	N/A	
Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.	N/A	
Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.	N/A	
Special considerations such as contamination, corrosive environment etc.	N/A	

4.4 Stormwater	**Addressed (Y/N/NA)**	**Comments**
Description of drainage outlets and downstream constraints including legality of outlet (i.e. municipal drain, right-of-way, watercourse, or private property).	Y	Refer to Section 5.0 Storm Sewer System and Stormwater Management
Analysis of the available capacity in existing public infrastructure.	Y	Refer to Appendix D
A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns and proposed drainage patterns.	Y	Refer to Storm Drainage Area Plan (117034-10-STM)
Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.	Y	Refer to Section 5.0 Storm Sewer System and Stormwater Management
Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.	Y	Refer to Section 5.0 Storm Sewer System and Stormwater Management
Description of stormwater management concept with facility locations and descriptions with references and supporting information.	Y	Refer to Section 5.0 Storm Sewer System and Stormwater Management
Set-back from private sewage disposal systems.	N/A	
Watercourse and hazard lands setbacks.	N/A	
Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.	N/A	
Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.	Y	
Storage requirements (complete with calcs) and conveyance capacity for 5 yr and 100 yr events.	Y	Refer to Appendix D
Identification of watercourse within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.	N/A	
Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.	Y	Refer to Appendix D
Any proposed diversion of drainage catchment areas from one outlet to another.	N/A	
Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and SWM	N/A	
If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event.	N/A	

4.4 Stormwater	Addressed (Y/N/NA)	Comments
Identification of potential impacts to receiving watercourses.	N/A	
Identification of municipal drains and related approval requirements.	N/A	
Description of how the conveyance and storage capacity will be achieved for the development.	Y	Refer to Section 5.0 Storm Sewer System and Stormwater Management
100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.	Y	Refer to Grading Plan and Storm Drainage Area Plan
Inclusion of hydraulic analysis including HGL elevations.	Y	
Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.	Y	Refer to Section 7.0 Erosion Sediment Control
Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.	N/A	
Identification of fill constrains related to floodplain and geotechnical investigation.	N/A	

4.5 Approval and Permit Requirements	Addressed (Y/N/NA)	Comments
Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act.	N/A	
Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.	N/A	
Changes to Municipal Drains.	N/A	
Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)	N/A	

4.6 Conclusion	Addressed (Y/N/NA)	Comments
Clearly stated conclusions and recommendations.	Y	Refer to Section 8.0 Conclusions and Recommendations
Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.	Y	
All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario.	Y	



LEGEND

2.5%	PROPOSED GRADE AND DIRECTION OF FLOW	TF	TOP OF FOUNDATION
76.90	PROPOSED ELEVATION	FF1	FINISHED FLOOR ELEVATION - 1st FLOOR
105.53 / 105.53	PROPOSED ELEVATION / EXISTING ELEVATION	FF0	FINISHED FLOOR ELEVATION - BASEMENT
105.53 TW / 105.53 BW	PROPOSED TOP OF WALL ELEVATION / PROPOSED BOTTOM OF WALL ELEVATION	EP	EDGE OF PAVEMENT
77.50	EXISTING ELEVATION	TC	TOP OF CURB
3:1	TERRACING (3:1 MAX)	BS	BACK OF SIDEWALK
	PROPOSED RETAINING WALL	TS	TOP OF SLOPE
	MAJOR OVERLAND FLOW DIRECTION	DC	DEPRESSED CURB
101.00	EXISTING CONTOUR AND ELEVATION		MAX STATIC PONDING LIMITS
RDO	ROOF DRAIN OUTLET		100-YR PONDING LIMITS
			100-YR +20% PONDING LIMITS

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. ASPHALT WALKWAY TO BE CONSTRUCTED PER CITY STANDARD SC.20
12. REFER TO GEOTECHNICAL INVESTIGATION (DATED APRIL 4, 2018), PREPARED BY GEMTEC FOR SUBSURFACE CONDITIONS AND CONSTRUCTION RECOMMENDATIONS.
13. 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.
14. DECOMMISSIONING OF ALL MONITORING WELLS AND DRINKING WATER WELLS SHALL BE CARRIED OUT AND IN ACCORDANCE WITH O.REG. 903. ANY SEPTIC SYSTEM OR AGRICULTURAL TILES DRAINS SHALL BE DECOMMISSIONED PRIOR TO ISSUANCE OF COMMENCE WORK NOTIFICATION.

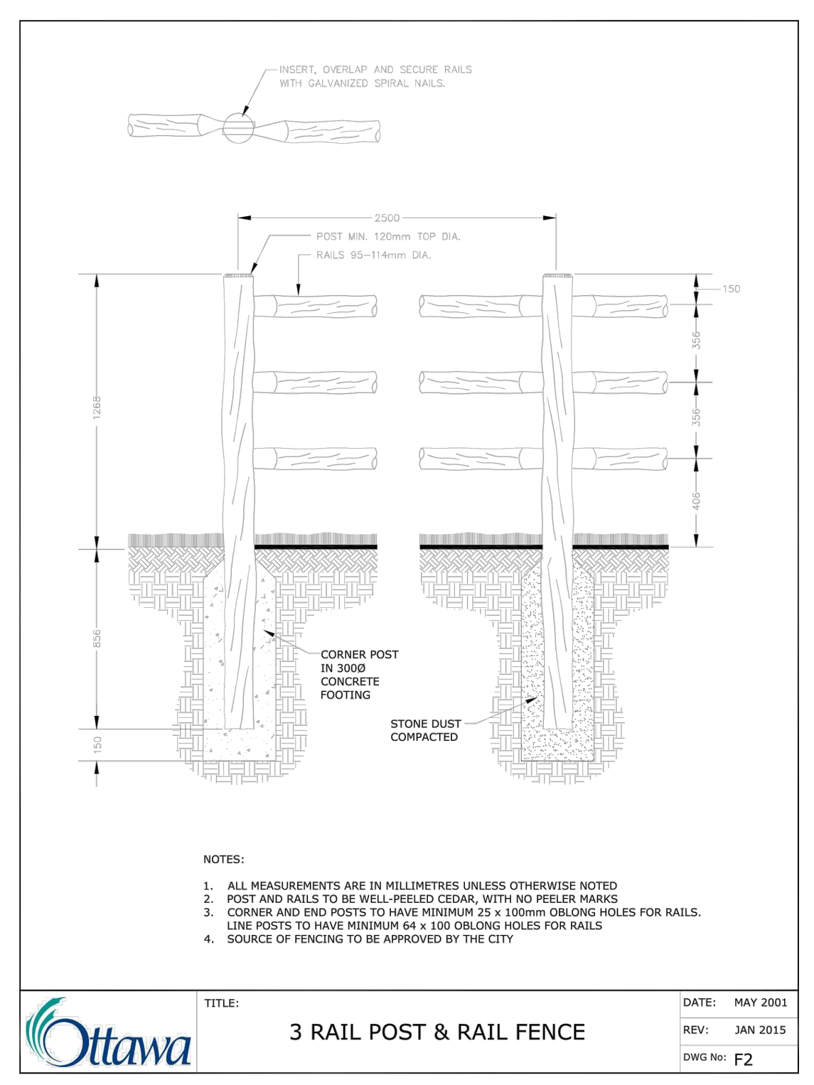
GRADING AND PAVEMENT NOTES:

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 98% 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:

PRIVATE ACCESS
AND PARKING AREAS

40mm	ASPHALT SP12.5
60mm	ASPHALT SP19.0
150mm	GRAN "A"
450mm	GRAN "B" TYPE II
700mm	TOTAL DEPTH



TURTLE FENCE DETAIL

DETAIL F2 C/W 12-GAUGE GREEN PVC COATED WELDED WIRE MESH (3" X 2" OPENINGS) ATTACHED TO THE MIDDLE RAIL AND BURIED (MIN. 100mm). MESH TO BE INSTALLED ON SIDE AWAY FROM PEDESTRIAN PATH.

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	CBMH1	78.06	0.23	78.11	0.28	78.13	0.30
P2	CB2	77.84	0.11	77.88	0.15	78.03	0.30
P3	CBMH3	78.06	0.23	78.11	0.28	78.13	0.30
P4	LC3	77.29	0.00	77.33	0.00	77.80	0.13
P5	RY7	77.29	0.14	77.33	0.18	77.35	0.20
P6	RY4	78.06	0.06	78.11	0.11	78.22	0.22
P7	LC2	77.84	0.11	77.89	0.16	78.03	0.30
P8	RY3	77.28	0.13	77.31	0.16	77.30	0.15
P9	LC1	76.74	0.00	76.74	0.00	77.75	0.05
P10	RY5	77.28	0.04	77.32	0.08	77.35	0.11
P11	RY6	78.06	0.00	78.11	0.00	78.20	0.03

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.

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No.	REVISION	DATE	BY
4.	CITY SUBMISSION	AUG 4/22	MAB
3.	CITY COMMENTS	JAN 20/22	MAB
2.	REVISED PER CITY COMMENTS	DEC 22/21	MAB
1.	ISSUED FOR APPROVAL	MAY 17/21	MAB

SCALE 1:250

DESIGN	DTD
CHECKED	LRW
DRAWN	DTD
CHECKED	LRW
APPROVED	MAB

FOR REVIEW ONLY

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

LICENSED PROFESSIONAL ENGINEER — M.A. BISSETT — 2022.08.04 — 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

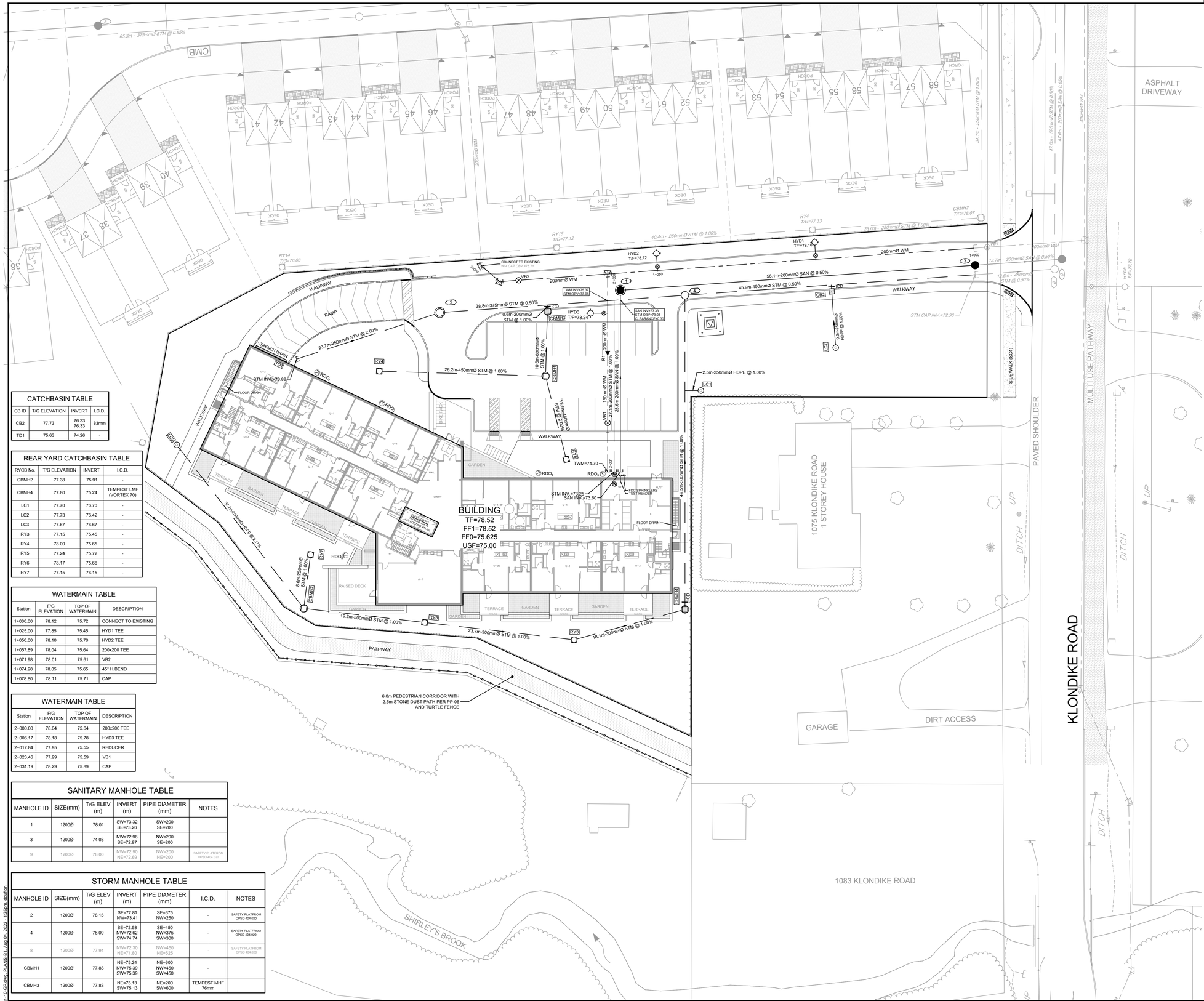
CITY OF OTTAWA
KLONDIKE RIDGE - BLOCK 10

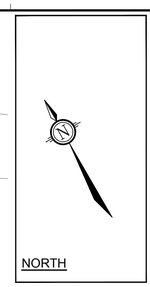
GRADING PLAN

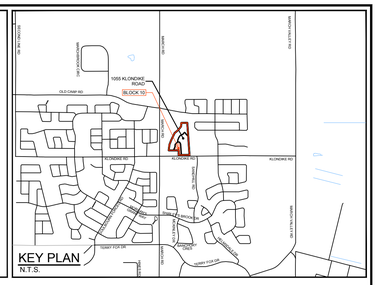
PROJECT No. 117034-10
REV REV #4
DRAWING No. 117034-10-GR

PLAN #18577 D07-12-21-0109

PLANB1.DWG - 1000mmx707mm







LEGEND

- SANITARY MANHOLE, SEWER & DIRECTION OF FLOW
- SANITARY MANHOLE WITH COMPRESSION ASSEMBLY TOP
- STORM MANHOLE, SEWER & DIRECTION OF FLOW
- STORM MANHOLE WITH COMPRESSION ASSEMBLY TOP
- 300mmØ WATERMAIN AND DIAMETER
- VB VALVE & VALVE BOX
- VC VALVE & VALVE CHAMBER
- HYD BEND AND THRUST BLOCK
- HYDRANT C/W VALVE & LEAD
- CAP
- REDUCER
- ROAD CATCH BASIN
- ROAD CATCH BASIN WITH ICD
- LCB LANDSCAPE CATCH BASIN
- RY1 REAR YARD CATCH BASIN
- RY2 REAR YARD CATCH BASIN WITH ICD
- WATER METER
- REMOTE METER
- FDC FIRE DEPARTMENT CONNECTION (SPRINKLERS)
- TEST HEADER

GENERAL NOTES:

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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 EXCESS EXCAVATED MATERIAL UNLESS OTHERWISE INSTRUCTED BY THE ENGINEER.
10. ALL ELEVATIONS ARE GEODETIC AND UTILIZE METRIC UNITS.
11. REFER TO GEOTECHNICAL INVESTIGATION PROJECT: 64153.85 (DATED APRIL 4, 2018), PREPARED BY GEMTEC FOR SUBSURFACE CONDITIONS AND CONSTRUCTION RECOMMENDATIONS.
12. PERFORATED PIPE SUB-DRAINS TO BE PROVIDED AT SUBGRADE LEVEL EXTENDING FROM THE ROADSIDE CATCH BASIN 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
CATCHBASIN MANHOLE (1200Ø)	701.010	OPSD
STORM / SANITARY MANHOLE (1200Ø)	701.010	OPSD
ROADSIDE CB, FRAME & COVER	S2 & S19	CITY OF OTTAWA
CURB INLET CB, FRAME & COVER	S3, S22 & S23	CITY OF OTTAWA
CBMH FRAME & COVER	S25 & S24.1	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	
CURB INLET CATCH BASIN MANHOLE	S28	CITY OF OTTAWA

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. 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.
4. SEWER SERVICE CONNECTIONS PER CITY OF OTTAWA DETAILS S11 AND S11.1.
5. 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.
6. STORM MANHOLES AND CBMHS SHALL HAVE 300mm SUMPS UNLESS OTHERWISE INDICATED.
7. 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
HYDRANT INSTALLATION	W19	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.

CATCHBASIN TABLE

CB ID	T/G ELEVATION	INVERT	I.C.D.
CB2	77.73	76.33 76.33	83mm
TD1	75.63	74.26	-

REAR YARD CATCHBASIN TABLE

RYCB No.	T/G ELEVATION	INVERT	I.C.D.
CBMH2	77.38	75.91	-
CBMH4	77.80	75.24	TEMPEST LMF (VORTEX 70)
LC1	77.70	76.70	-
LC2	77.73	76.42	-
LC3	77.67	76.67	-
RY3	77.15	75.45	-
RY4	78.00	75.65	-
RY5	77.24	75.72	-
RY6	78.17	75.66	-
RY7	77.15	76.15	-

WATERMAIN TABLE

Station	F/G ELEVATION	TOP OF WATERMAIN	DESCRIPTION
1+000.00	78.12	75.72	CONNECT TO EXISTING
1+025.00	77.85	75.45	HYD1 TEE
1+050.00	78.10	75.70	HYD2 TEE
1+057.89	78.04	75.64	200x200 TEE
1+071.98	78.01	75.61	VB2
1+074.98	78.05	75.65	45° H.BEND
1+078.80	78.11	75.71	CAP

WATERMAIN TABLE

Station	F/G ELEVATION	TOP OF WATERMAIN	DESCRIPTION
2+000.00	78.04	75.64	200x200 TEE
2+006.17	78.18	75.78	HYD3 TEE
2+012.84	77.95	75.55	REDUCER
2+023.46	77.99	75.59	VB1
2+031.19	78.29	75.89	CAP

SANITARY MANHOLE TABLE

MANHOLE ID	SIZE(mm)	T/G ELEV (m)	INVERT (m)	PIPE DIAMETER (mm)	NOTES
1	1200Ø	78.01	SW=73.32 SE=73.26	SW=200 SE=200	
3	1200Ø	74.03	NW=72.98 SE=72.97	NW=200 SE=200	
9	1200Ø	78.00	NW=72.90 NE=72.69	NW=200 NE=200	SAFETY PLATFROM OPSD 404.020

STORM MANHOLE TABLE

MANHOLE ID	SIZE(mm)	T/G ELEV (m)	INVERT (m)	PIPE DIAMETER (mm)	I.C.D.	NOTES
2	1200Ø	78.15	SE=72.81 NW=73.41	SE=375 NW=250	-	SAFETY PLATFROM OPSD 404.020
4	1200Ø	78.09	SE=72.58 NW=72.62 SW=74.74	SE=450 NW=375 SW=300	-	SAFETY PLATFROM OPSD 404.020
8	1200Ø	77.94	NW=72.30 NE=71.80	NW=450 NE=525	-	SAFETY PLATFROM OPSD 404.020
CBMH1	1200Ø	77.83	NE=75.24 NW=75.39 SW=75.39	NE=600 NW=450 SW=450	-	
CBMH3	1200Ø	77.83	NE=75.13 SW=75.13	NE=200 SW=600	TEMPEST MHF 76mm	

NOTE:
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No.	REVISION	DATE	BY
5.	CITY SUBMISSION	AUG 4/22	MAB
4.	ARCHITECTURAL COORDINATION	APR 28/22	MAB
3.	CITY COMMENTS	JAN 20/22	MAB
2.	REVISED PER CITY COMMENTS	DEC 22/21	MAB
1.	ISSUED FOR APPROVAL	MAY 17/21	MAB

SCALE: 1:250 (1:250, 0 2 4 6 8 10)

DESIGN DTD | CHECKED LRW | DRAWN DTD | CHECKED LRW | APPROVED MAB

FOR REVIEW ONLY

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

LICENSED PROFESSIONAL ENGINEER — M.A. BISSETT — 2022.08.04 — PROVINCE OF ONTARIO

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Website www.novatech-eng.com

CITY OF OTTAWA
KLONDIKE RIDGE - BLOCK 10

SERVICING PLAN

PROJECT No. 117034-10
REV REV # 5
DRAWING No. 117034-10-GP

PLAN #18577 D07-12-21-0109

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	CBMH1	78.06	0.23	78.11	0.28	78.13	0.30
P2	CB2	77.84	0.11	77.88	0.15	78.03	0.30
P3	CBMH3	78.06	0.23	78.11	0.28	78.13	0.30
P4	LC3	77.29	0.00	77.33	0.00	77.80	0.13
P5	RY7	77.29	0.14	77.33	0.18	77.35	0.20
P6	RY4	78.06	0.06	78.11	0.11	78.22	0.22
P7	LC2	77.84	0.11	77.89	0.16	78.03	0.30
P8	RY3	77.28	0.13	77.31	0.16	77.30	0.15
P9	LC1	76.74	0.00	76.74	0.00	77.75	0.05
P10	RY5	77.28	0.04	77.32	0.08	77.35	0.11
P11	RY6	78.06	0.00	78.11	0.00	78.20	0.03

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M:\2017\117034\Block 10\CAD\Design\117034-10-STM.dwg, PLANS-B1, Aug 04, 2022 - 2:26pm, ddufton

CATCHBASIN TABLE			
CB ID	T/G ELEVATION	INVERT	I.C.D.
CB2	77.73	76.33 76.33	83mm
CBMH1	77.83	75.24 75.39 75.39	-
CBMH3	77.83	75.13 75.13	TEMPEST MHF 76mm
TD1	75.62	74.26	-

REAR YARD CATCHBASIN TABLE			
RYCB No.	T/G ELEVATION	INVERT	I.C.D.
CBMH2	77.38	75.91	-
CBMH4	77.80	75.24	TEMPEST LMF (VORTEX 70)
LC2	77.73	76.42	-
LC3	77.67	76.67	-
RY3	77.15	75.45	-
RY4	78.00	75.65	-
RY7	77.15	76.15	-

STORM MANHOLE TABLE					
MANHOLE ID	SIZE(mm)	T/G ELEV (m)	INVERT (m)	PIPE DIAMETER (mm)	I.C.D.
2	1200Ø	78.15	SE=72.81 NW=73.41	SE=375 NW=250	-
4	1200Ø	78.09	SE=72.58 NW=72.62 SW=74.74	SE=450 NW=375 SW=300	-
8	1200Ø	77.94	NW=72.30 NE=71.80	NW=450 NE=525	-

No.	REVISION	DATE	BY
4.	CITY SUBMISSION	AUG 4/22	MAB
3.	CITY COMMENTS	JAN 20/22	MAB
2.	REVISED PER CITY COMMENTS	DEC 22/21	MAB
1.	ISSUED FOR APPROVAL	MAY 17/21	MAB

SCALE
1:250

1:250
0 2 4 6 8 10

DESIGN DTD
CHECKED LRW
DRAWN DTD
CHECKED LRW
APPROVED MAB

FOR REVIEW ONLY

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

LICENSED PROFESSIONAL ENGINEER
M.A. BISSETT
2022.08.04
PROVINCE OF ONTARIO

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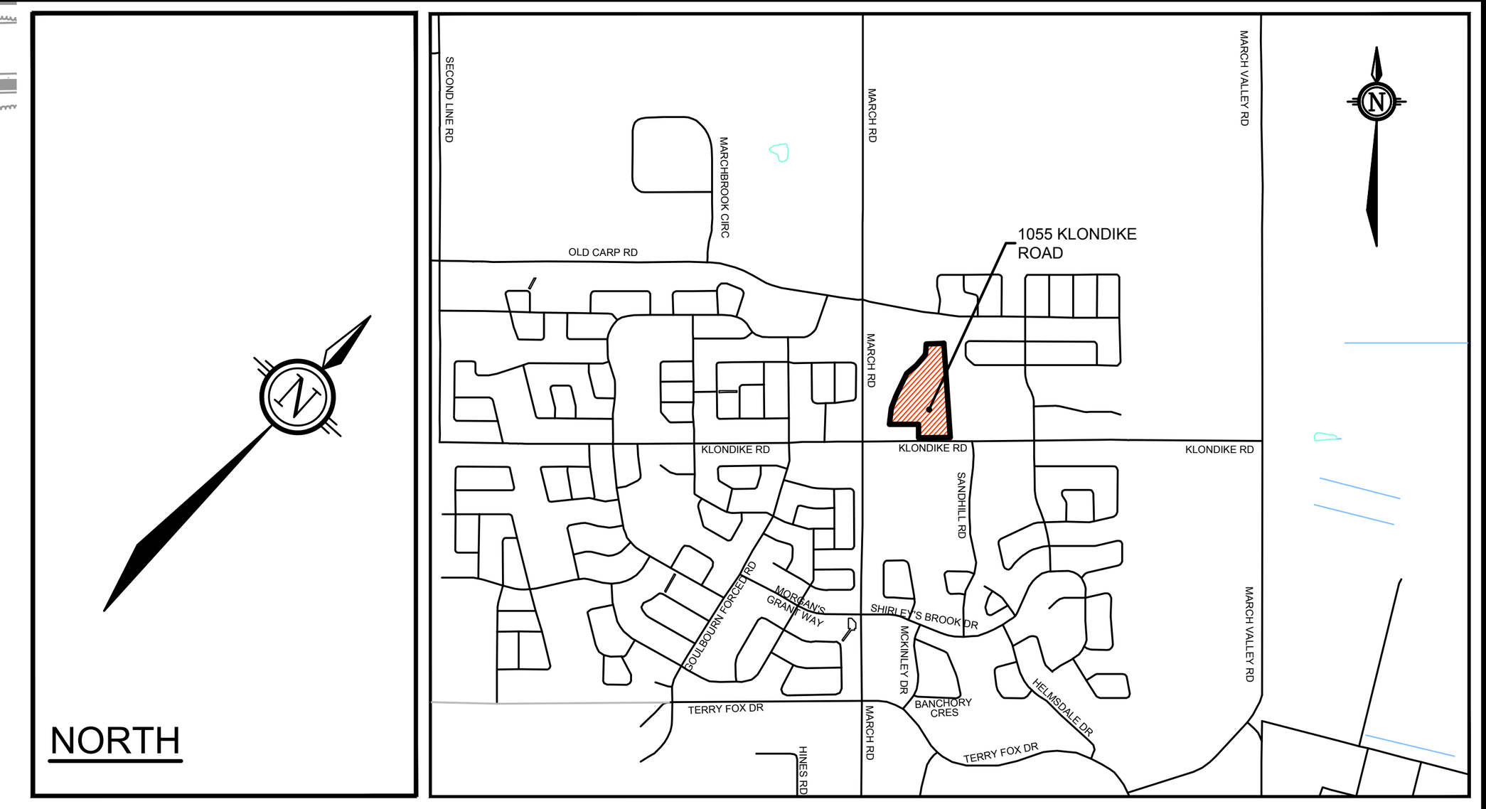
CITY OF OTTAWA
KLONDIKE RIDGE - BLOCK 10

STORM DRAINAGE AREA PLAN

PROJECT No. 117034-10
REV REV # 4
DRAWING No. 117034-10-STM

D07-12-21-0109
PLAN #18577

PLANB1.DWG - 1000mmx707mm



LEGEND

- A1-1 — AREA ID
- 7-5 — MANHOLE TO MANHOLE
- 0.60 | 37.8 — POPULATION EQUIVALENT / AREA IN HECTARES
- A2-1 — FUTURE AREA ID
- 9-1 — FUTURE MANHOLE TO MANHOLE
- 0.60 | 100.8 — FUTURE POPULATION EQUIVALENT / FUTURE AREA IN HECTARES
- A3-6 — OVERALL AREA ID
- 207-206 — OVERALL MANHOLE TO MANHOLE
- 2.91 | 118.8 — OVERALL POPULATION EQUIVALENT / OVERALL AREA IN HECTARES
- SANITARY DRAINAGE AREA BOUNDARY
- FUTURE SANITARY DRAINAGE AREA BOUNDARY
- OVERALL SANITARY DRAINAGE AREA BOUNDARY
- EXISTING DIRECTION OF FLOW
- DIRECTION OF FLOW
- 636 — EXISTING SANITARY SEWER AND MANHOLE
- 482 — PROPOSED SANITARY SEWER AND MANHOLE

NOTE:
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3.	CITY SUBMISSION	AUG 4/22	MAB
2.	CITY COMMENTS	JAN 20/22	MAB
1.	REVISED PER CITY COMMENTS	DEC 22/21	MAB

SCALE 1:1500

1:1500
0 15 30 45 60

DESIGN	LRW
CHECKED	MAB
DRAWN	DTD
CHECKED	MAB
APPROVED	JGR

FOR CONSTRUCTION

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

LICENSED PROFESSIONAL ENGINEER
M.A. BISSETT
2022.08.04
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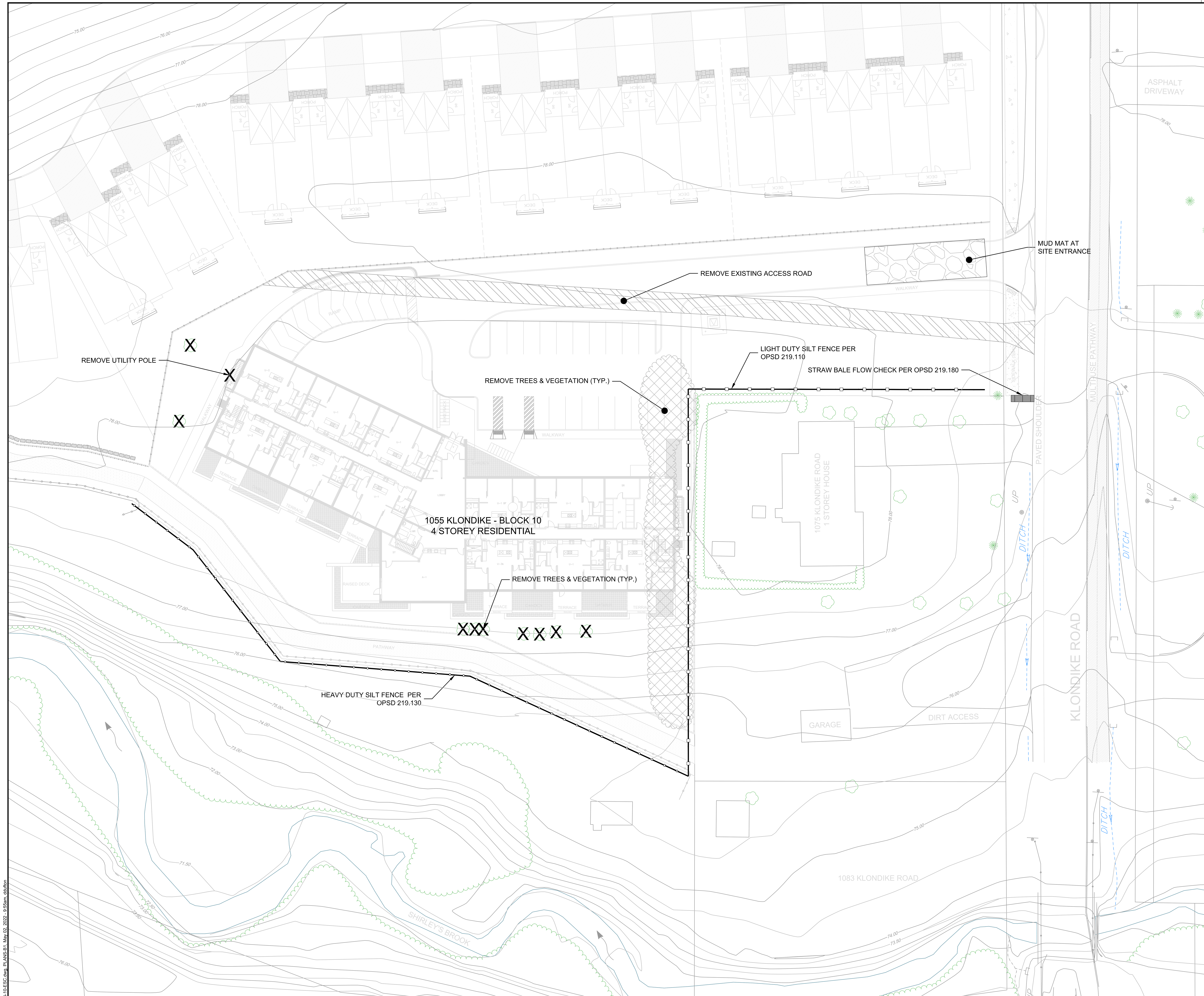
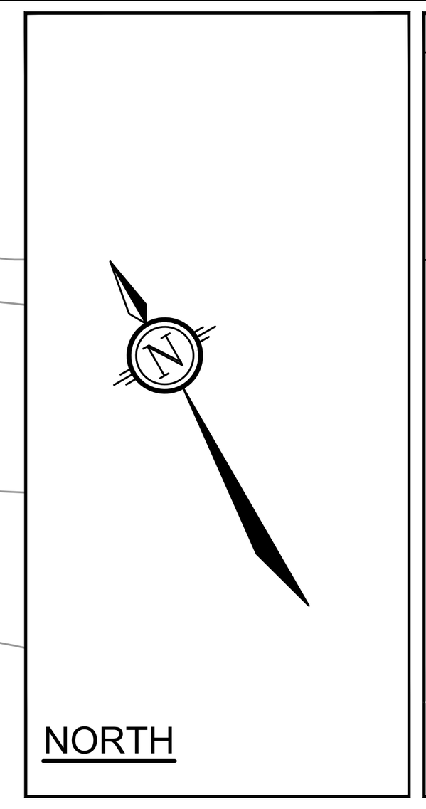
CITY OF OTTAWA
1055 KLONDIKE ROAD - KLONDIKE RIDGE

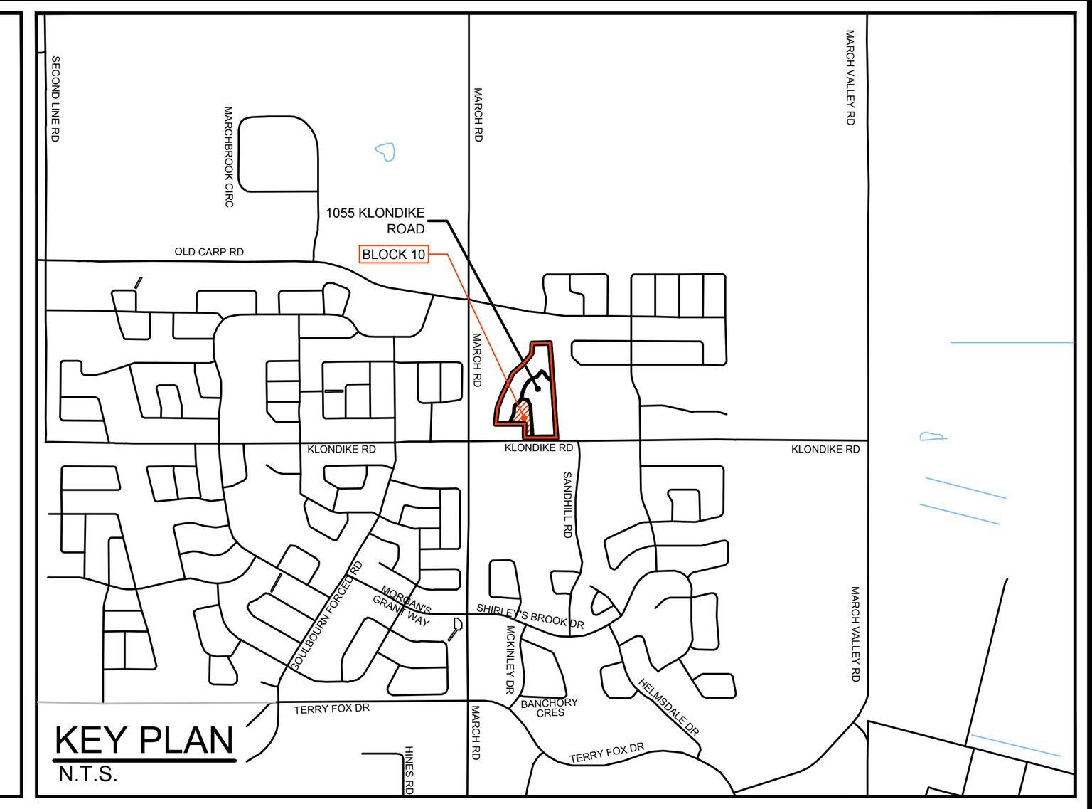
SANITARY DRAINAGE AREA PLAN

PROJECT No. 117034-10
REV REV # 3
DRAWING No. 117034-10-SAN

PLAN #18577 D07-12-21-0109







LEGEND

- GRAVEL SHOULDER & DRIVEWAY REMOVAL
- CLEARING, GRUBBING & TOPSOIL STRIPPING
- MUD MATS (100mm GRANULAR B. TYPE II)
- X — REMOVALS
- SILT FENCE PER OPSD 219.110
- STRAW BALE FLOW CHECK PER OPSD 219.180
- 101.00 — EXISTING CONTOUR AND ELEVATION

EROSION AND SEDIMENT CONTROL NOTES :

1. ALL EROSION AND SEDIMENT CONTROLS SHALL BE INSTALLED TO THE SATISFACTION OF THE ENGINEER, THE MUNICIPALITY AND THE CONSERVATION AUTHORITY. THEY SHALL 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 SHALL 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, A LIGHT DUTY SILT FENCE BARRIER WILL ALSO BE INSTALLED IN SELECTED LOCATIONS SHOWN ON THIS PLAN. TERRAFIX SILT SOXX ARE TO BE INSTALLED ON ALL PROPOSED CATCHBASINS. 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 PROVIDE DUST CONTROL WITH THE APPLICATION OF WATER AND/OR CALCIUM CHLORIDE AS REQUIRED.
7. THE CONTRACTOR SHALL PROTECT ALL SURVEY MONUMENTS.

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SCALE 1:250

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CHECKED LRW
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LICENSED PROFESSIONAL ENGINEER M.A. BISSETT 2022.08.04 PROVINCE OF ONTARIO

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CITY OF OTTAWA
KLONDIKE RIDGE - BLOCK 10

REMOVALS, EROSION AND SEDIMENT CONTROL PLAN

PROJECT No. 117034-10
REV REV # 4
DRAWING No. 117034-10-ESC