3610 INNES ROAD (FORMER BMR LANDS)

CONCEPTUAL SITE SERVICING AND STORMWATER MANAGEMENT REPORT

Prepared for:

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October 8, 2019
Revised: April 3, 2020

City File: D07-16-19-0027
Novatech File: 118224
Ref: R-2019-174

NOVATECH
Engineers, Planners & Landscape Architects

April 3, 2020

City of Ottawa
Planning and Growth Management Department
Development Review (Urban Services - East) Branch
Infrastructure Approvals Division
110 Laurier Avenue West, 4th Floor
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Attention: **Steve Belan, MCIP, RPP**
Planner II

Sara Mashaie, P.Eng.
Project Manager

Reference: **3610 Innes Road (Former BMR Lands)**
Conceptual Site Servicing and Stormwater Management Report
City File: D07-16-19-0027 / Novatech File No.: 118224

In support of the Draft Plan of Subdivision application for the above-noted site, you will find enclosed the Conceptual Site Servicing and Stormwater Management Report for the 3610 Innes Road (Former BMR Lands) development.

This report addresses the approach to site servicing and stormwater management for the Subject Site, which been developed based on the requirements of the City of Ottawa and Rideau Valley Conservation Authority.

Should you have any questions, or require additional information, please contact me.

Yours truly,

NOVATECH

Bassam Bahia, M.Eng., P. Eng.
Project Manager | Land Development

cc: Eric Lalande, Rideau Valley Conservation Authority
Michael Michaud, Glenview Homes (Innes) Ltd.

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1.0 INTRODUCTION

1.1 Background

This report addresses the approach to site servicing for the 3610 Innes Road development (Subject Site), formerly known as BMR Lands, which is being proposed by Glenview Homes (Innes) Ltd. (Developer).

The Subject Site is located within the north-west quadrant of the East Urban Community (EUC) Phase 3 Area Community Design Plan. More specifically, the site is south of Innes Road, 240m east of its intersection with Lamarche Avenue, as shown on **Figure 1.1** – Key Plan. The site is bound to the south and east by future development lands owned by Richcraft Homes, to the west by the recently constructed residential subdivision known as Orleans Village by Caivan Communities, and to the north by Innes Road, and remnant mixed use parcels.

Historically, the existing land usage was for a commercial plaza that comprised of the BMR sales center/ warehouse and parking lot along Innes Road as shown on **Figure 1.2** – Existing Conditions Plan. Two parts of the existing parcel have since been severed and will be developed under separate planning applications. The existing buildings within the limits of the Subject Site were demolished in 2017. The north side of the subject side is relatively flat and at grade with Innes Road. The south side is undeveloped and slopes gradually downward to the south property line.

The existing residential subdivisions to the west, Orleans Village is currently serviced with public services (i.e. sanitary and storm sewers, and watermain), and drainage is directed towards the EUC Pond 1.

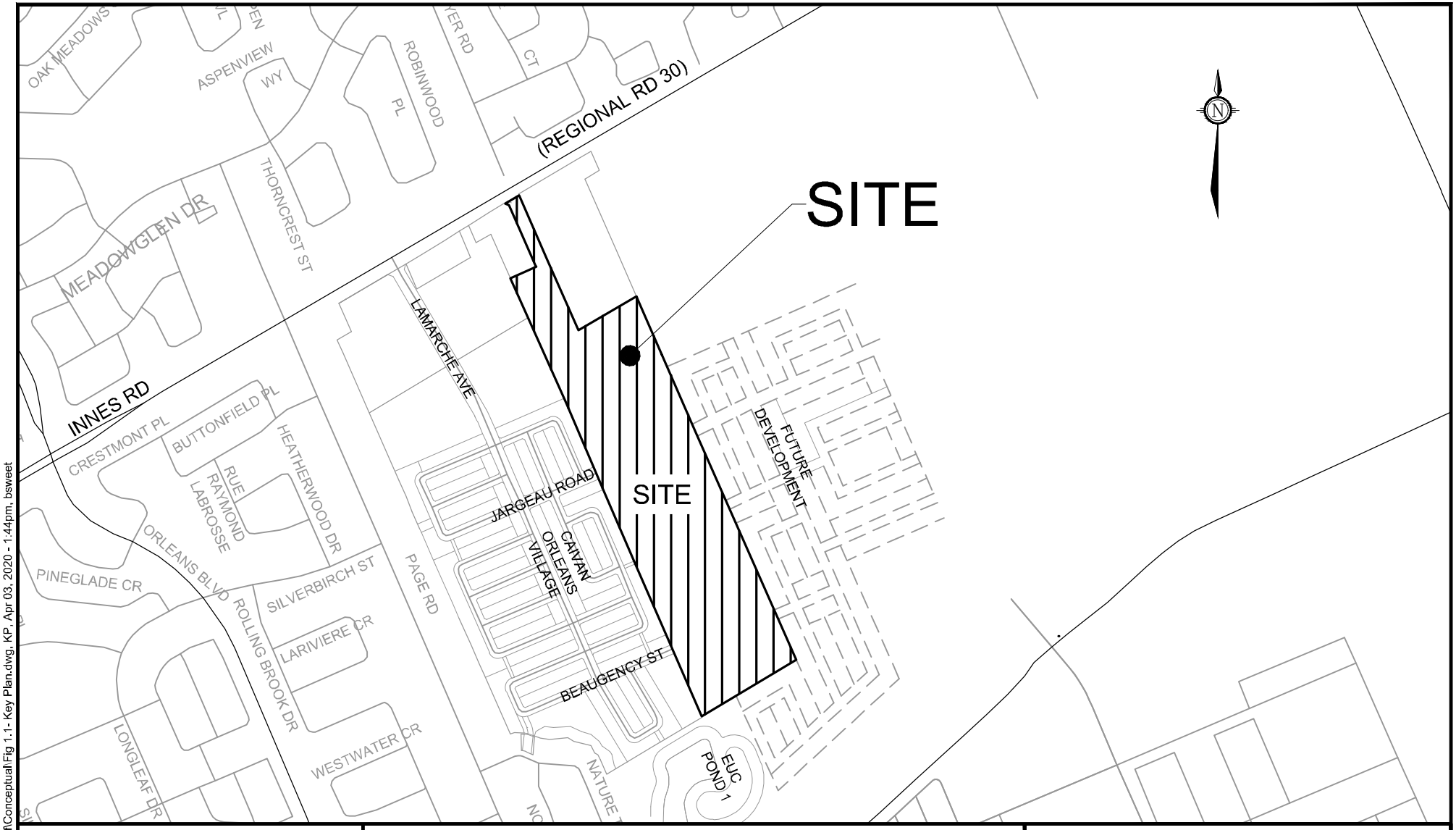
1.2 Development Intent

The Subject Site has an area of 15.71 ha, and the proposed subdivision will comprise of residential housing, public right-of-ways and parkland, as shown in **Table 1.1**. The development will contain City of Ottawa municipal road allowances of 18.0 and 24.0 metres wide. The proposed site development plan is shown on **Figure 1.3** – Site Plan.

Table 1.1: Land Use, Development Potential, and Yield

Unit Type	Number of Units	Area
Singles	179	5.94 ha
Townhouses	109	2.34 ha
Medium Density (2-BR Apartments)	168	2.03 ha
Local Roads / Pathways	-	4.41 ha
Parkland	-	1.00 ha
TOTAL	**456**	**15.72 ha**

The Subject Site is located within the serviced area in the City of Ottawa Official Plan and; therefore, the site has been designed with city water and sanitary sewage collection.



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3610 INNES ROAD (FORMER BMR LANDS)

KEY PLAN

SCALE		
NOT TO SCALE		
DATE: APR 2020	JOB: 118224	FIGURE: 1.1

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3610 INNES ROAD (FORMER BMR LANDS)

EXISTING CONDITIONS

SCALE		
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APR 2020	118224	1.2

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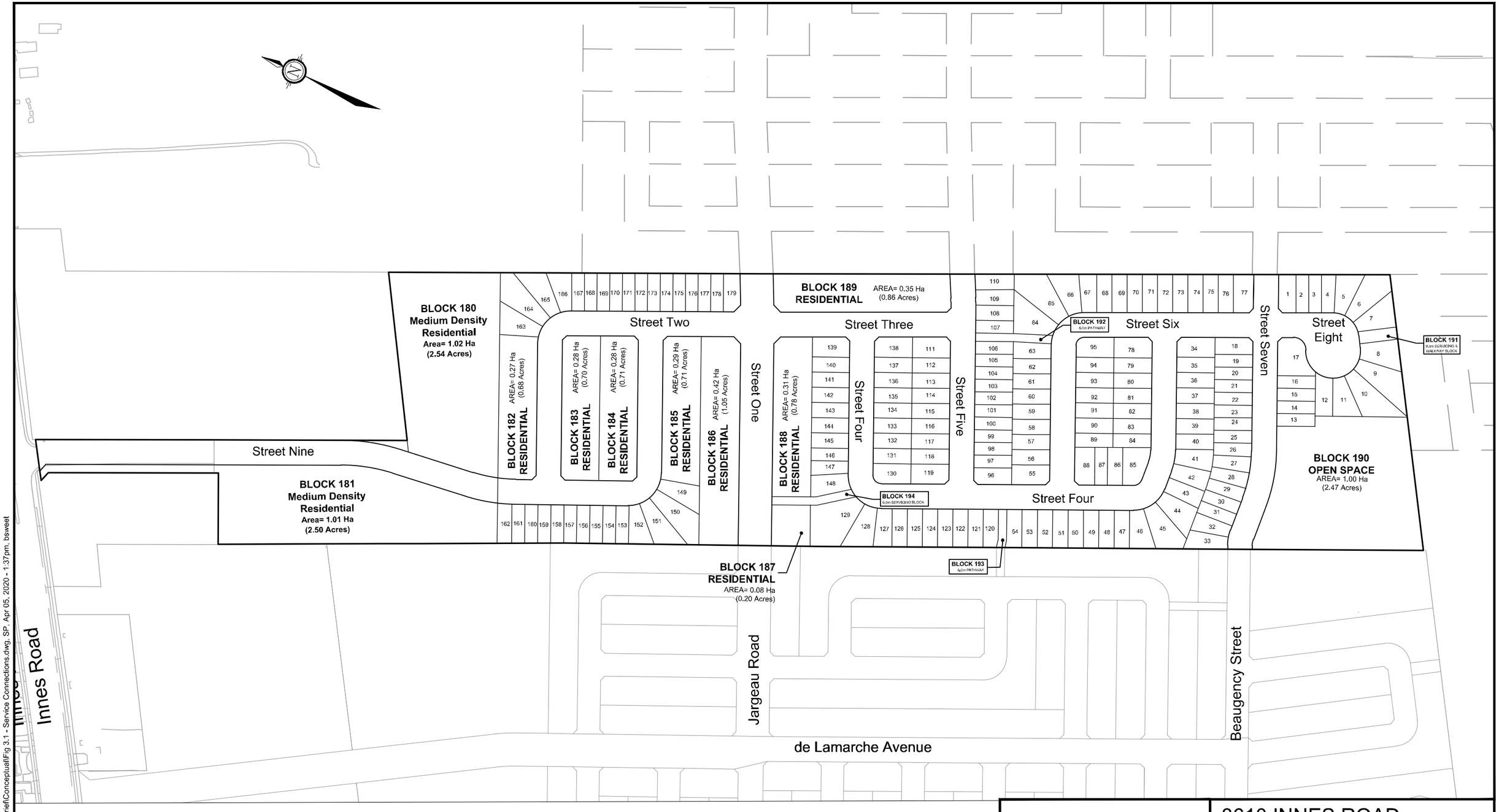

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3610 INNES ROAD (FORMER BMR LANDS)

SITE PLAN

SCALE		
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DATE	JOB	FIGURE
APR 2020	118224	1.3

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1.3 Report Objective

This report assesses the adequacy of existing and proposed services to support the proposed development. This report will be provided to the various agencies for approval and to obtain any applicable permits.

The City of Ottawa Applicant Study and Plan Identification List along with proof of a pre-consultation meeting is provided in **Appendix A**.

The City of Ottawa Servicing Study Guidelines for Development Applications checklist has been completed and is provided in **Appendix B**.

2.0 REFERENCES AND SUPPORTING DOCUMENTS

2.1 Guidelines and Supporting Studies

The following guidelines and supporting documents were utilized in the preparation of this report:

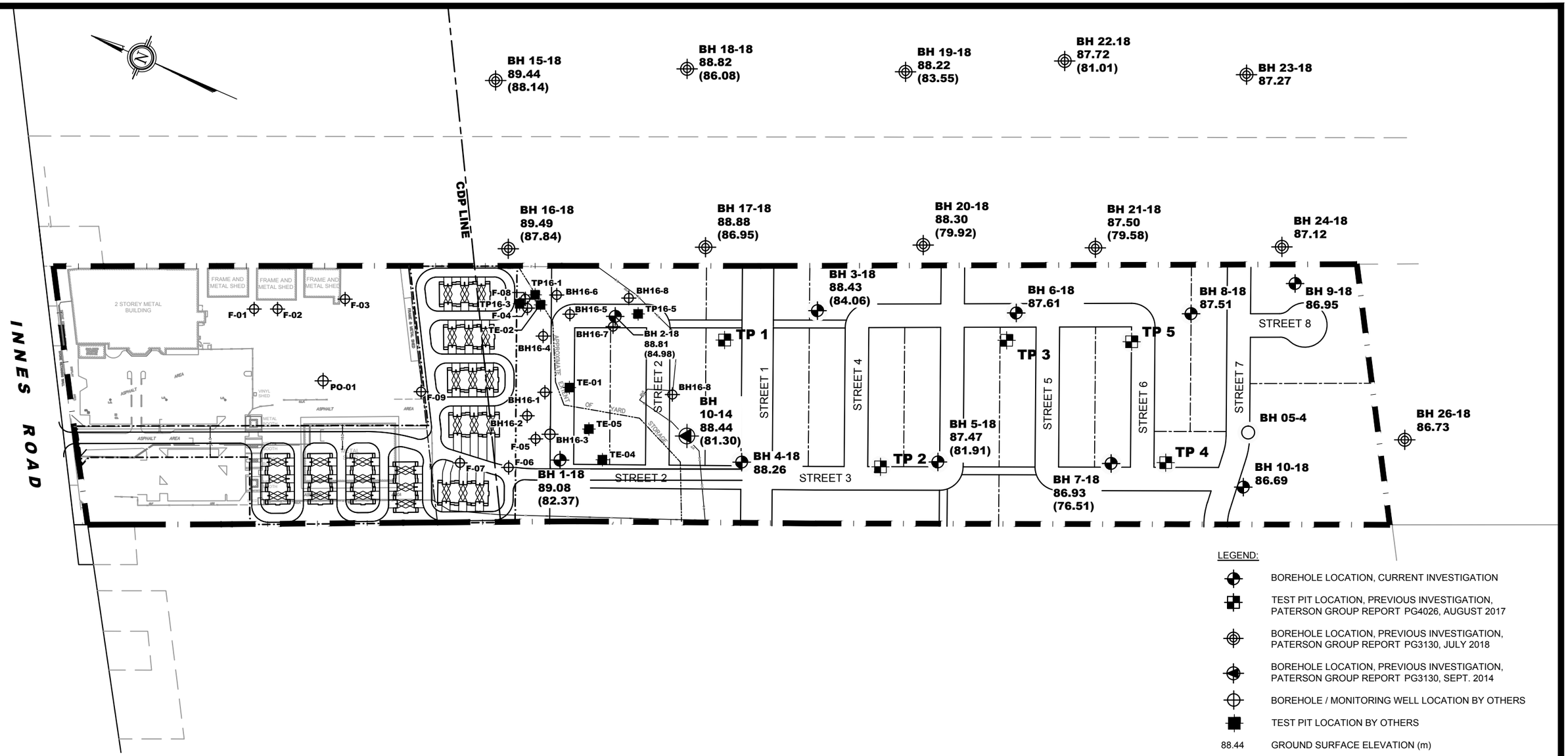
- **City of Ottawa Official Plan** (OP)
  City of Ottawa, adopted by Council 2003.
- **City of Ottawa Infrastructure Master Plan** (IMP)
  City of Ottawa, November 2013.
- **City of Ottawa Water Distribution Guidelines** (OWDG)
  City of Ottawa, October 2012.
- **Revisions to OWDG** (ISTB-2010-01, ISTB-2014-02, ISTB-2018-02, ISTB-2018-04)
  City of Ottawa, December 2010, May 2014, March 2018, and June 2018.
- **City of Ottawa Sewer Design Guidelines** (OSDG)
  City of Ottawa, October 2012.
- **Revisions to OSDG** (ISTB-2016-01, ISTB-2018-01, & ISTB-2018-03)
  City of Ottawa, September 2016 and March 2018.
- **Design Guidelines for Sewage Works and Drinking Water System** (MECP Guidelines)
  Ontario's Ministry of the Environment, 2008.
- **Stormwater Management Planning and Design Manual** (MECP SWM Guidelines)
  Ontario's Ministry of the Environment, 2003.
- **Master Serving Study for East Urban Community Phase 3** (MSS EUC-Phase 3)
  David Schaeffer Engineering, October 2019.

2.2 Geotechnical Investigation

Paterson Group Inc. (Paterson) conducted a geotechnical investigation (**Appendix F**) in support of the proposed residential development:

Geotechnical Investigation – Proposed Residential Development 3604-3646 Innes Road, Ottawa, Ontario; Report No. PG4026-2 (revision 2), Paterson Group Inc., April 2, 2020.

Based on the geotechnical study, it is not anticipated that there will be any significant geotechnical concerns with respect to servicing and developing the site. The borehole locations are provided as **Figure 2.1**. A summary of the geotechnical report findings is provided in **Table 2.1** below.



LEGEND:

- BOREHOLE LOCATION, CURRENT INVESTIGATION
- TEST PIT LOCATION, PREVIOUS INVESTIGATION, PATERSON GROUP REPORT PG4026, AUGUST 2017
- BOREHOLE LOCATION, PREVIOUS INVESTIGATION, PATERSON GROUP REPORT PG3130, JULY 2018
- BOREHOLE LOCATION, PREVIOUS INVESTIGATION, PATERSON GROUP REPORT PG3130, SEPT. 2014
- BOREHOLE / MONITORING WELL LOCATION BY OTHERS
- TEST PIT LOCATION BY OTHERS
- 88.44 GROUND SURFACE ELEVATION (m)
- (81.30) PRACTICAL REFUSAL TO DCPT / AUGERING ELEV. (m)

BASEPLAN PROVIDED BY KORSIAK URBAN PLANNING.

TEST HOLE LOCATIONS AND ELEVATIONS AT TEST HOLES PROVIDED BY J.D. BARNES LIMITED.

SCALE: 1:3000

0 10 20 30 40 50 100 150 200m

FIGURE 2.1- GEOTECHNICAL INVESTIGATION- BOREHOLE LOCATIONS

patersongroup
consulting engineers

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Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL
3	UPDATED CONCEPTUAL PLAN	09/08/2019	RG
2	EXISTING BOREHOLES BY OTHERS ADDED	01/2019	RG
1	NEW BOREHOLES ADDED	11/2018	RG

GLENVIEW HOMES (INNES) LTD.

SUPPLEMENTAL GEOTECHNICAL INVESTIGATION
3604-3646 INNES ROAD

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:3000	Date: 08/2017
Drawn by: RCG	Report No.: PG4026-1
Checked by: NZ	Dwg. No.: PG4026-1
Approved by: DJG	Revision No.: 3

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Table 2.1: Summary of Geotechnical Servicing and Grading Considerations

Parameter	Summary
Sub-Soil Conditions	Silty Clay / Glacier Till / Bedrock
Grade Raise Restriction	2.5m to 2.0m
OHSA Soil Type	Type 2 and 3
Groundwater Considerations	Low to Moderate groundwater flow
Pipe Bedding / Backfill	Pipe Bedding 150 mm to 300mm Granular A Pipe Cover 300 mm Granular A Backfill Native Material
Pavement Structure (Driveways)	50mm Wear Course (SuperPave 12.5) 150mm Base (Granular A) 300mm Subbase (Granular B Type II)
Pavement Structure (Local Roadways)	40mm Wear Course (SuperPave 12.5) 50mm Binder Course (SuperPave 19.0) 150mm Base (Granular A) 400mm Subbase (Granular B Type II)
Pavement Structure (Collector Roads)	40mm Wear Course (SuperPave 12.5) 50mm Upper Binder Course (SuperPave 19.0) 50mm Lower Binder Course (SuperPave 19.0) 150mm Base (Granular A) 550mm Subbase (Granular B Type II)
Landscape Consideration	Large Trees (Minimum setback of the full mature height of the tree) Small to Medium tree species (7.5 m set back)

3.0 SERVICING AND GRADING

3.1 Contemplated MSS EUC-Phase 3 Servicing Connections

Sanitary servicing for the Subject Site will connect to the existing trunk sanitary sewer located within Beaugency Street, west of Street Seven. Storm servicing for the Subject Site will outlet into the EUC Pond 1. Water service for the Subject Site will connect to the existing watermains to the west along Street Seven and Street One, and also a connection to the north along Innes Road.

Refer to the East Urban Community Phase 3 Area Community Design Plan – Key Plan Mark-up included in the enclosed drawing set.

3.2 General Servicing

The Subject Site will be serviced using local storm and sanitary sewers, and watermain. The storm / stormwater management, sanitary, and water servicing strategy is discussed in further detail in the following sections.

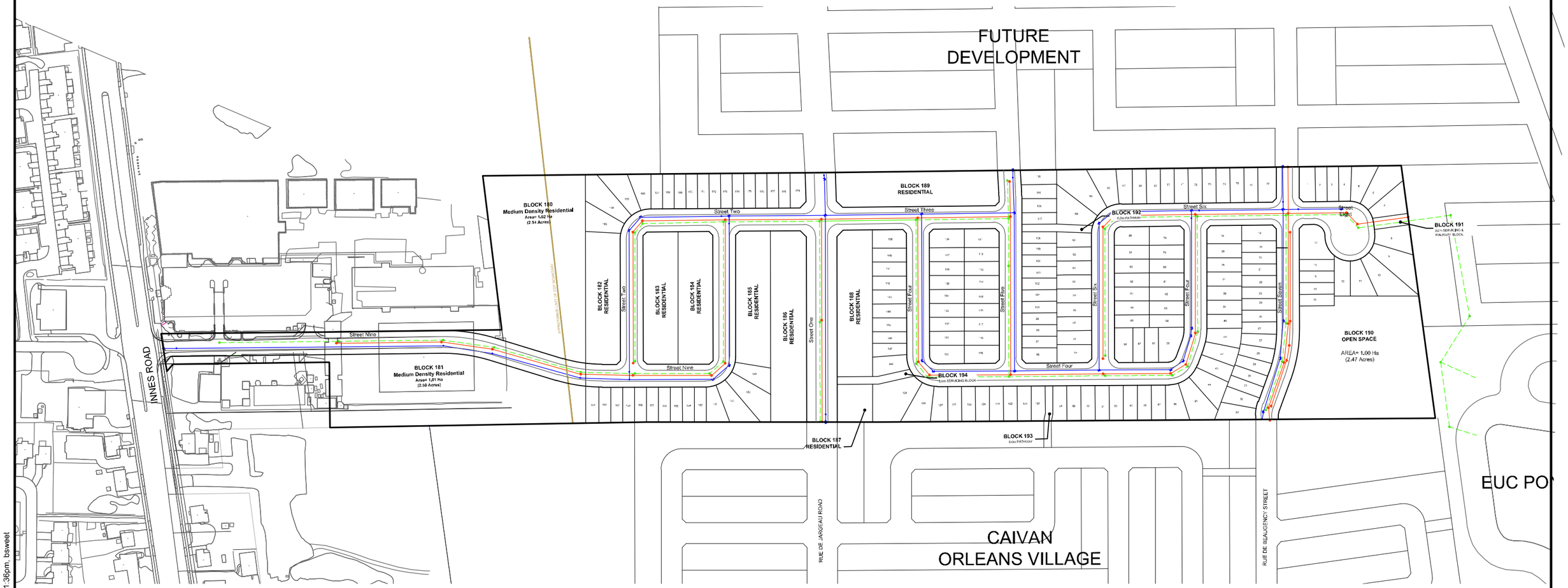
Refer to **Figure 3.1** – Proposed Servicing Layout Plan and the preliminary General Plan of Services (Drawing 118224-GP) included in the enclosed drawing set.

3.3 General Grading

The local roadway within the Subject Site will be graded in a saw-toothed pattern to promote surface storage of stormwater. The grading will direct emergency overland flows from the local roads to the EUC Pond 1.

The lots will be graded from front to back to direct surface drainage to the rearyard areas.

Refer to the preliminary Macro Grading, Erosion and Sediment Control Plan (Drawing 118224-GR) included in the enclosed drawing set.



LEGEND

PROPOSED WATERMAIN AND DIAMETER

MH 101 — PROPOSED SANITARY MH & SEWER

MH 100 — PROPOSED STORM MH & SEWER

PROPOSED ROW LIMIT

PROPERTY BOUNDARY

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3610 INNES ROAD (FORMER BMR LANDS)

PROPOSED SERVICING LAYOUT PLAN

SCALE		
1:3000		
DATE	JOB	FIGURE
APR 2020	118224	3.1

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4.0 STORM SEWER SYSTEM AND STORMWATER MANAGEMENT

The post-development storm sewer and stormwater management system will adhere to the criteria outlined as a part of the MSS EUC-Phase 3. Storm runoff from the Subject Site will outlet to the EUC Pond 1 stormwater management facility at the south end of the site. The following sections outline the preliminary stormwater management design and analysis.

4.1 Stormwater Management Criteria

The Subject Site is located within the Ottawa River East Subwatershed, and are tributary to the Ottawa River, which falls under the jurisdiction of the Rideau Valley Conservation Authority (RVCA). The following stormwater management criteria have been developed based on the criteria in the MSS EUC-Phase 3, and requirements of the RVCA and the OSDG.

Minor System (Storm Sewers)

- Storm sewers are to be designed using the Rational Method as follows:
    - 1:2-year return period for local streets;
    - 1:5-year return period for collector roads;
- Inlet control devices (ICDs) are to be installed in road and rearyard catchbasins to control inflows to the storm sewers;
- Ensure that the 100-year hydraulic grade line in the storm sewer is at least 0.3 m below the underside of footing (USF) elevations for the proposed development.

Major System (Overland Flow)

- Overland flows are to be confined within the right-of-ways and/ or defined drainage easements for all storms up to and including the 1:100-year event;
- Storm runoff that exceeds the capacity of the minor system will be stored within road sags;
    - Runoff that exceeds the capacity of the road sags will be conveyed overland along defined major system flow routes towards the proposed major system outlet to the SWM Facility;
- Major system storage in backyards is not to be included/ accounted for in design computations;
- Maximum depth of flow (static + dynamic) on local and collector streets shall not exceed 0.35 m and shall be confined to the road right-of-way, as well as not touch any part of the building envelope and must remain below the lowest building opening during the stress test event;
- The product of the 100-year flow depth (m) on street and flow velocity (m/s) shall not exceed 0.60.

Water Quality & Quantity Control

- An *Enhanced* (80% TSS removal) level of quality control will be provided by the proposed north main cell expansion and new north forebays at the EUC Pond 1, which outlets to Mud Creek, which ultimately outlets to Green's Creek and then the Ottawa River;
- Implement lot level and conveyance Best Management Practices to promote infiltration and treatment of storm runoff;

- Inflows to the storm sewer are to be controlled by inlet control devices installed in all catchbasins to limit inflows during larger storm events.

4.2 Proposed Storm Drainage System

Storm servicing for the Subject Site will be provided using a dual drainage system: Runoff from frequent events will be conveyed by storm sewers (minor system), while runoff from larger storm events which exceed the capacity of the minor system will be conveyed overland along defined overland flow routes (major system). The EUC Pond 1 is the outlet for both the major and minor systems.

Excerpts of the storm sewer design sheets from the MSS EUC-Phase 3, demonstrating that the Subject Site was accounted for in the EUC Pond 1 revisions/pond expansion, can be found in **Appendix C**. Refer to the MSS EUC-Phase 3 for additional details on the revisions/pond expansion. The East Urban Community Phase 3 Area Community Design Plan – Conceptual Storm Servicing and Proposed SWM Pond Expansion is included in the enclosed drawing set. For reference to the Subject Site's location, refer to the East Urban Community Phase 3 Area Community Design Plan – Key Plan Mark-up.

4.2.1 *Storm Sewer Design (Minor System)*

The minor system has been conceptually designed using the Rational Method. The conceptual storm sewer design sheets are provided in **Appendix C**. Refer to the Storm Drainage Area Plan (Drawing 118224-STM1) for details. The criteria used to size the storm sewers are summarized in **Table 4.1** below.

Table 4.1: Storm Sewer Design Parameters

Parameter	Design Criteria
Local Roads	2-year Return Period
Collector Roads	5-year Return Period
Storm Sewer Design	Rational Method/Modeling
IDF Rainfall Data	OSDG
Initial Time of Concentration (T_c)	10 minutes
Minimum Velocity	0.8 m/s
Maximum Velocity	3.0 m/s
Minimum Diameter	250 mm

Inlet control devices (ICDs) are to be installed in all catchbasins to limit inflows to the minor system during larger storm events. ICDs will be sized during the detailed design stage.

4.2.2 *Overland Flow Path (Major System)*

During the detailed design stage, the site will be graded to provide an engineered overland flow route (major system) for large, infrequent storms or in the event that the storm sewer system becomes obstructed. Flows will be directed to the EUC Pond 1. The major system is to be designed to conform to the design standards outlined in Section 5.5 of the OSDG.

4.2.3 *Best Management Practices and Low Impact Development*

The proposed development will explore the following stormwater best management practices (BMPs) and low impact development (LID) techniques to mitigate the reduction in groundwater infiltration / recharge resulting from the proposed development:

- Perforated pipes, and clear stone pipe trenches in rear yard areas of low density and medium density residential uses will be used to promote infiltration;
- Roof leaders should be directed to grassed rear yard areas.
- Bio-swales, and/ or infiltration trenches in the side-yard areas within the City ROW will be used to promote infiltration, if feasible;

By implementing stormwater management BMPs and LIDs as part of the storm drainage design, the impacts of development on the hydrologic cycle can be reduced. The use and implementation of BMPs and LIDs will be reviewed again during the detailed design process.

4.2.1 *SWM Facility – EUC Pond 1*

Water quantity control and water quality treatment will be provided by an end-of pipe stormwater management pond, 'EUC Pond 1'.

The original EUC Pond 1 was designed and constructed per the *East Urban Community Pond No.1 Design Brief* (Stantec, 2008) for a total drainage area of approximately 326 ha, providing a *Normal* level of water quality protection (70% long-term removal of TSS).

Modifications to the pond have since been made/proposed and include the following:

- South main cell and forebay modifications made to increase the amount of storage provided, and to meet updated MECP and City standards. These modifications increased the pond drainage area to 370 ha and are outlined in the *East Urban Community Stormwater Management Pond 1 for Trails Edge Subdivision* (DSEL/JFSA, March 2014).
- North main cell expansion and new forebays proposed to maintain key operating water levels and peak flow rates per the original design. The opportunity to expand the north main cell and forebays to provide a higher treatment standard has also been explored and implemented in the pond footprint. The proposed expansions will provide an *Enhanced* (80% long-term removal of TSS) level of quality control to the north forebay. This will result in an average blended rate of 76% long-term removal of TSS for the EUC Pond 1. These modifications are outlined in the *East Urban Community / Preliminary Hydraulic Gradeline Analysis and Pond Design* (JFSA, June 2019).

Further details are outlined in the MSS EUC-Phase 3.

4.2.2 *Mud Creek Cumulative Impacts Study*

The City of Ottawa is currently undertaking a cumulative impacts study of Mud Creek to determine design criteria for future developments and City projects, and a retrofit plan for existing development tributary to Mud Creek that will mitigate erosion impacts on the creek. The study also plans to recommend off-site/in-stream works to improve stream resilience and natural riparian/aquatic functions. Portions of the EUC Phase 3 Area CDP tributary to Mud Creek and EUC Pond 1 are within the cumulative impacts study scope. Future coordination is expected to be required for the detailed design of EUC Pond 1 expansion, as the ongoing Mud Creek study may recommend specific changes to the EUC Pond 1 outlet structure.

Further details are outlined in the MSS EUC-Phase 3.

4.3 Hydrologic & Hydraulic Modeling

The OSDG requires hydrologic modeling for all dual drainage systems. The performance of the proposed storm drainage system for the Subject Site was evaluated using the PCSWMM hydrologic/hydraulic model.

Since the design is still in the draft plan stage, the major system has not yet been designed. The major system will be analyzed using PCSWMM during the detailed design stage.

4.3.1 *Design Storms*

The hydrologic analysis was completed using the following synthetic design storms and historical storms. The IDF parameters used to generate the design storms were taken from the OSDG.

3 Hour Chicago Storms:	*12 Hour SCS Type II Storms*:
2-year 3hr Chicago storm	2-year 12hr SCS Type II storm
5-year 3hr Chicago storm	5-year 12hr SCS Type II storm
100-year 3hr Chicago storm	100-year 12hr SCS Type II storm

The 3-hour Chicago distribution generated the highest peak flows, however the 12-hour SCS storm generated higher HGL elevations. Thus, both storm distributions were used for the design of the storm drainage system.

The 100-year 3-hour Chicago storm was also increased by 20% (intensity + total precipitation) to evaluate the impact of an extreme event/ climate change scenario on the performance of the dual drainage system.

Modeling files are provided on the enclosed CD.

4.3.2 *Model Development*

The PCSWMM model has been developed to account for both minor and major system flows from the development and ensure no adverse impacts on the downstream drainage system.

The results of the analysis were used to:

- Determine the required volume of major system storage;
- Determine the storm sewer hydraulic grade line for the 100-year storm event.

The PCSWMM model schematics and 100-year model output data are provided in **Appendix C**. Digital copies of the modeling files and model output for all storm events are provided on the enclosed CD.

Storm Drainage Areas

The Subject Site has been divided into large subcatchments based on the proposed land use, storm sewer, and roadway design. The catchment areas used in the development of the Storm Sewer Design Sheet (refer to Appendix C) are shown on the Storm Drainage Area Plan (Drawing 118224-STM1).

Included in the storm sewer, and roadway design is the external drainage area of 3636 Innes Road, known as the Uhaul Site (City File: TBD). The planning application for the Uhaul Site has been submitted with storm servicing being directed to the proposed sewers along Street Nine. As such, future coordination will be required as part of detailed design.

Excluded in the storm sewer is the external drainage area of 3598 Innes Road, known as the McEwen Site (City File: D07-12-18-0132). The planning application for the McEwen Site has been approved with storm servicing being directed to existing sewers along Innes Road. As such, this drainage area has been excluded from the proposed sewers within the Subject Site.

External drainage areas are shown on the External Storm Drainage Area Plan (Drawing 118224-STM2).

Model Parameters

Since the major system has not yet been designed, the drainage areas have been lumped into larger areas based on the land use and road profiles. The storage to be provided by the major system has been represented in the PCSWMM model as storage nodes, and are connected to the storm sewer system via orifices meant to limit flows into the storm sewer system as follows:

- 2-year flows captured on local streets; and
- 5-year flows captured on collector roads.

The hydrologic parameters for each subcatchment were developed based on the Site Plan (**Figure 1.3**) and the Storm Drainage Area Plan (Drawing 118224-STM1). An overview of the modeling parameters is provided in **Table 4.2**.

Table 4.2: Model Parameters

Area ID	Catchment Area (ha)	Runoff Coefficient (C)	Percent Impervious (%)	No Depression (%)	Equivalent Width (m)	Average Slope (%)
A01-03	0.70	0.70	71%	50%	157.50	0.2%
A04-09	2.99	0.70	71%	50%	672.75	0.2%
A10-17	3.16	0.70	71%	50%	711.00	0.2%
A18-23	2.84	0.70	71%	50%	639.00	0.2%
A24-28	1.72	0.70	71%	50%	387.00	0.2%
B01	1.01	0.80	86%	50%	227.25	0.2%
B02	3.43	0.90	100%	50%	771.75	0.2%
B03	1.02	0.80	86%	50%	229.50	0.2%
B04	1.00	0.25	7%	0%	225.00	0.2%
C01-03	1.30	0.70	71%	50%	292.50	0.2%
TOTAL:	**19.17**					

Depression Storage

The default values for depression storage in the City of Ottawa were used for all catchments.

- Depression Storage (pervious areas): 4.67 mm
- Depression Storage (impervious areas): 1.57 mm

Residential rooftops are assumed to provide no depression storage and all rainfall is converted to runoff.

Equivalent Width

'Equivalent Width' refers to the width of the sub-catchment flow path. This parameter (Table 5.1) is calculated as described in the *Sewer Design Guidelines, October 2012, Section 5.4.5.6*.

Impervious Values

Impervious (TIMP) values for each subcatchment area were calculated based on the concept plan (**Figure 2**). The impervious values correspond to the Runoff Coefficients used in the Rational Method calculations using the equation:

C = 0.90(%IMP) + 0.20(1-%IMP)

Boundary Conditions

To determine the effect of the water level in the existing SWM facility would impact the HLG in the proposed storm sewer system, a boundary condition was applied to each of the outlet nodes. Water levels are from Table 23 of the MSS EUC-Phase 3, and are listed as follows:

- 2-year = 81.75 m (81.92m South Forebay)
- 5-year = 82.13 m
- 100-year = 82.92 m

A note has been included in the PCSWMM model to this effect.

4.3.3 *Results of Hydrologic Analysis*

The PCSWMM hydrologic/hydraulic model was used to evaluate the performance of the proposed storm drainage system for the development. Results from the model are outlined in the following sections.

Storm Sewer Hydraulic Grade Line

The results of the analysis were used to determine preliminary hydraulic grade line (HGL) elevations within the proposed storm sewers. As the design is only at the draft plan stage, underside of footing (USF) elevations have not yet been determined. To analyze whether or not the HGL elevations will pose a risk to the proposed dwellings, the HGL elevations reported from the PCSWMM model were compared against the T/G elevation of the manhole. Generally, HGL elevations are at least 3.0m below the T/G, indicating the storm sewer sizing is sufficient, and there are no anticipated issues with the HGL being within the 0.30m freeboard below the USF elevations. Refer to the HGL table included in **Appendix C**. At the detailed design stage, an HGL analysis will be completed using the proposed USF elevations.

Major System Storage

Potential storage within the major system has been modeled using storage nodes and analyzed on a per-hectare basis. Results of the analysis are outlined in **Table 4.3**.

Table 4.3: Major System Storage Requirements

Drainage Area ID	Area (ha)	Storage Required (m3)	
		Total Volume (m^3)	Per Hectare Volume (m^3/ha)
A01-03	0.70	19	27
A04-08	3.00	322	107
A09-15	3.14	347	110
A16-21	2.84	304	107
A22-24	1.74	192	110
B01+B02	4.44	133	30
C01	1.31	81	62
		AVERAGE =	**79**

As shown in table, the average requirement for major system storage during the 100-year event is approximately 79 m^3/h. This is achievable through a saw-toothed road pattern and maximizing the surface storage to the allowable 0.35m depth within the right-of-way. At the detailed design stage, the major system design will be refined and modeled accordingly.

5.0 SANITARY SEWER SYSTEM

5.1 Existing Sanitary Infrastructure

The sanitary outlet for the Subject Site will consist of an existing 675 mm trunk sanitary sewer located within Beaugency Street, west of Street Seven. Refer to the General Plan of Services and the Sanitary Drainage Area Plan (Drawings 118224-GP and 118224-SAN) for an illustration of the proposed sanitary connection and layout details.

Excerpts of the sanitary sewer design sheets from the MSS EUC-Phase 3, demonstrating that the Subject Site was accounted for in the downstream sewers, can be found in **Appendix D**. The East Urban Community Phase 3 Area Community Design Plan – Conceptual Sanitary Servicing is included in the enclosed drawing set. For reference to the Subject Site's location, refer to the East Urban Community Phase 3 Area Community Design Plan – Key Plan Mark-up.

5.2 Proposed Sanitary Infrastructure

On-site works

The proposed on-site works will require approximately 2,045 m of on-site sanitary sewer to collect wastewater flows and to direct flows to the sanitary outlet. The existing trunk sanitary sewer will be extended within Street Seven of the Subject Site to service the future development to the east. The proposed service laterals on Street Seven will connect to a separate collector sanitary sewer running parallel to the trunk sanitary sewer extension and will outlet into the trunk downstream of Street Seven.

5.3 Sanitary Demand and Design Parameters

The peak design flow parameters in **Table 5.1** have been used in the sewer capacity analysis. Unit and population densities and all other design parameters are specified in the OSDG.

Table 5.1: Sanitary Sewer Design Parameters

Design Component	Design Parameter
Unit Population: Single Detached Home Semis-Detached /Townhomes 2-BR Apartments	 3.4 people/unit 2.7 people/unit 2.1 people/unit
Residential Flow Rate, Average Daily	280 L/cap/day
Residential Peaking Factor	Harmon Equation (min=2.0, max=4.0) Harmon Correction Factor = 0.8
Extraneous Flow Rate	0.33 L/s/ha
Minimum Pipe Size	200mm (Res)
Minimum Velocity[1]	0.6 m/s
Maximum Velocity	3.0 m/s
Minimum Pipe Cover	2.5 m (Unless frost protection provided)

[1]A minimum gradient of 0.65% is required for any initial sewer run with less than 10 residential connections.

The sanitary sewer design sheet, located in **Appendix D**, confirms the combined peaked sanitary flows from the Subject Site to the receiving sanitary trunk sewer will be 17.53 L/s, respectively.

Sanitary Sewer Hydraulic Grade Line

Results from the Page Road trunk sanitary sewer HGL were reviewed, and it is anticipated that the existing and proposed sanitary sewer sizing from the Page Road connection will be sufficient, and there will not be any issues in regard to the HGL. The HGL elevations at the Page Road connection are 4.0m below the T/G, and although the trunk sanitary sewer has been extended 450m within the Orleans Village to the Subject Site, it is anticipated that the HGL will not pose a risk to the proposed dwellings. Refer to the MSS EUC-Phase 3 excerpts included in **Appendix D**. An HGL analysis can be completed at the detailed design stage, if required.

Sanitary Drainage Areas

Excluded in the sanitary sewer design are the external drainage area of the Uhaul and McEwen Sites as the planning applications for both sites show the sanitary servicing being directed to existing sewers along Innes Road. As such, these drainage areas have been excluded from the proposed sewers within the Subject Site

6.0 WATER SUPPLY SYSTEM

6.1 Existing Water Infrastructure

The watermain connection points for the proposed site are an existing 300 mm watermain within Jargeau Road (Connection 1); an existing 250 mm watermain within Beaugency Street (Connection 2); and an existing 400 mm watermain located at the Innes Road and Street Nine intersection (Connection 3).

As per the MSS EUC-Phase 3, it is proposed that the 300 mm watermain within Jargeau Road be extended to the future development to the east. Excerpts from the MSS EUC-Phase 3 showing the proposed EUC Phase 3 site layout, connection points, and water supply system is included in **Appendix E**. The East Urban Community Phase 3 Area Community Design Plan – Watermain Servicing is included in the enclosed drawing set. For reference to the Subject Site's location, refer to the East Urban Community Phase 3 Area Community Design Plan – Key Plan Mark-up.

6.2 Proposed Water Infrastructure

The Subject Site will be serviced with approximately 1,955 m of on-site watermain 200 mm in diameter, 200 m of on-site watermain 250 mm in diameter within Street Seven, and 200 m of a watermain trunk 300 mm in diameter within Street One. The location of hydrants will be confirmed during detailed design. Refer to the General Plan of Services (Drawings 118224-GP) for an illustration of the proposed water supply system.

6.3 Watermain Design Parameters

Boundary conditions were provided by the City of Ottawa, based on the OWDG water demand criteria for the proposed development comprising of approximately 179 single family dwellings, 109 townhouses and 168 medium density units. The boundary conditions are included in **Appendix E**.

The domestic demand design parameters, fire fighting demand design scenarios and system pressure criteria design parameters are outlined in **Table 6.1** below. The system pressure design criteria used to determine the size of the watermains, required within the Subject Site, and are based on a conservative approach that considers three possible scenarios.

Table 6.1: Watermain Design Parameters and Criteria

Domestic Demand Design Parameters	**Design Parameters**
Unit Population: Single Detached Home Semis-Detached /Townhomes 2-BR Apartments	 3.4 people/unit 2.7 people/unit 2.1 people/unit
Basic Day Residential Demand (BSDY)	350 L/c/d
Maximum Day Demand (MXDY)	2.5 x Basic Day
Peak Hour Demand (PKHR)	2.2 x Maximum Day
Fire Demand (FF) Design	**Design Flows**
Conventional single/town units, unless otherwise noted. Medium density residential blocks Hydrant spacing and coding	10,000L/min per FUS / OWDG TB-2014 15,000L/min per FUS 90 to 120m spacing per OWDG
System Pressure Criteria Design Parameters	**Criteria**
Maximum Pressure (BSDY) Condition	< 80 psi occupied areas < 100 psi unoccupied areas
Minimum Pressure (PKHR) Condition	> 40 psi
Minimum Pressure (MXDY+FF) Condition	> 20 psi

The firefighting water demands for the Subject Site have been estimated per OWDG which refers to the Fire Underwriters Survey (CGI, 1999) document, abbreviated as FUS.

In accordance with the FUS and based on the proposed zoning, there is potential for less than 3m of separation between the single family, semi-detached, and row townhome wood-framed buildings, which would require the fire area in the FUS estimate for multiple buildings to be treated as a contiguous block area. This results in a high fire flow demand which is difficult to attain from the existing system; moreover, it would trigger larger diameter watermain size within the Subject Site, creating system vulnerabilities such as water age issues. As per the ISTB-2014-02, fire flows may be capped at 167 L/s (10,000 L/min) for single family, semi-detached, and row townhome, provided certain site criteria are met. The criteria are:

- For singles: a min separation of 10m between the backs of adjacent units.
- Traditional side-by-side semi-detached or row townhomes:
    a. firewalls with a min two-hour rating to separate the block into fire areas of no more than the lesser of 7 dwelling units, or 600 m^2 of building area; and
    b. Min separation of 10 m between the backs of adjacent units.

In general, the proposed layout of the Subject Site in conjunction with the established zoning setbacks ensures that the minimum separation of 10 meters between the backs of adjacent units is achieved.

Areas where the minimum separations are not achieved will require additional analysis. These areas will be highlighted as part of the detailed design process.

Notwithstanding the above, the Subject Site's layout shall meet the foregoing criteria allowing the capped fire flow of 167 L/s to be used for these particular unit types of residential units. Detailed calculations can be found attached in **Appendix E**.

6.4 System Pressure Modeling and Results

System pressures for the Subject Site were estimated using the EPANET engine within PCSWMM.

The PCSWMM model layout is demonstrated in **Figure 6.1** – Proposed Watermain Sizing, Layout and Junction IDs and **Figure 6.2** – Ground Elevations (m).

Domestic Demand

The water demand summary for the complete build out of the Subject Site for the basic daily and peak hour demands has been provided in **Table 6.2** below. For detailed results refer to the tables provided in **Appendix E.** The detailed results are also demonstrated in **Figure 6.3** – Maximum Pressures During BSDY Condition and **Figure 6.4** – Minimum Pressures During PKHR Condition.

Table 6.2: System Pressure (EPANET)

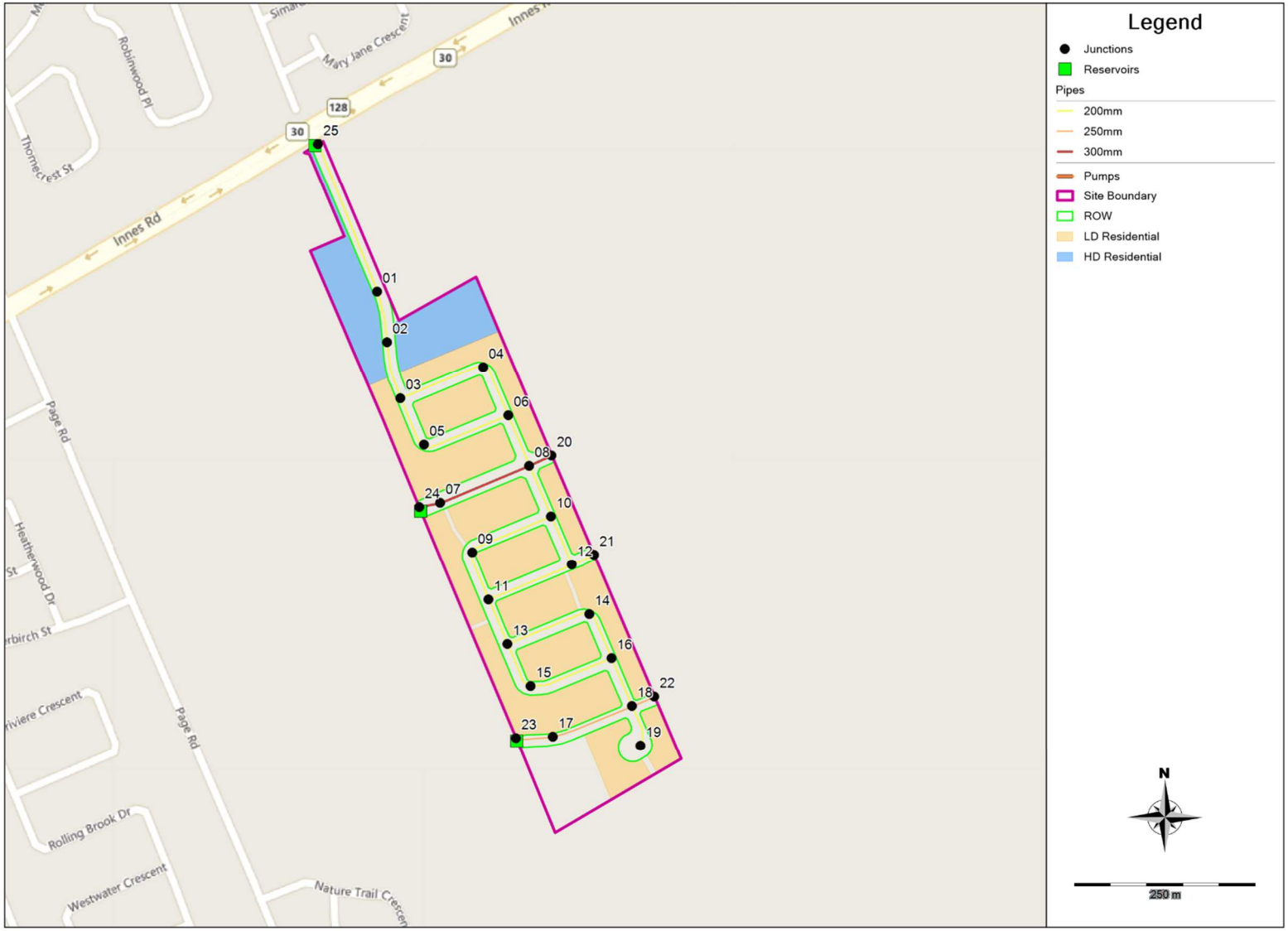
Condition	Demand (L/s)	Allowable Pressure (psi)	Max/Min Pressure (psi)
Basic Daily Demand	5.10	80 (Max)	62
Peak Hour Demand	28.05	40 (Min)	56

Fire Demand

Furthermore, an analysis was carried out to determine the available fire flow under maximum day demand while maintaining a residual pressure of 20psi. This was completed using the EPANET fire flow analysis feature within PCSWMM. For detailed results refer to the tables provided in **Appendix E.** The detailed results are also demonstrated in **Figure 6.5** – Available Flow at 20psi During MXDY+FF Condition.

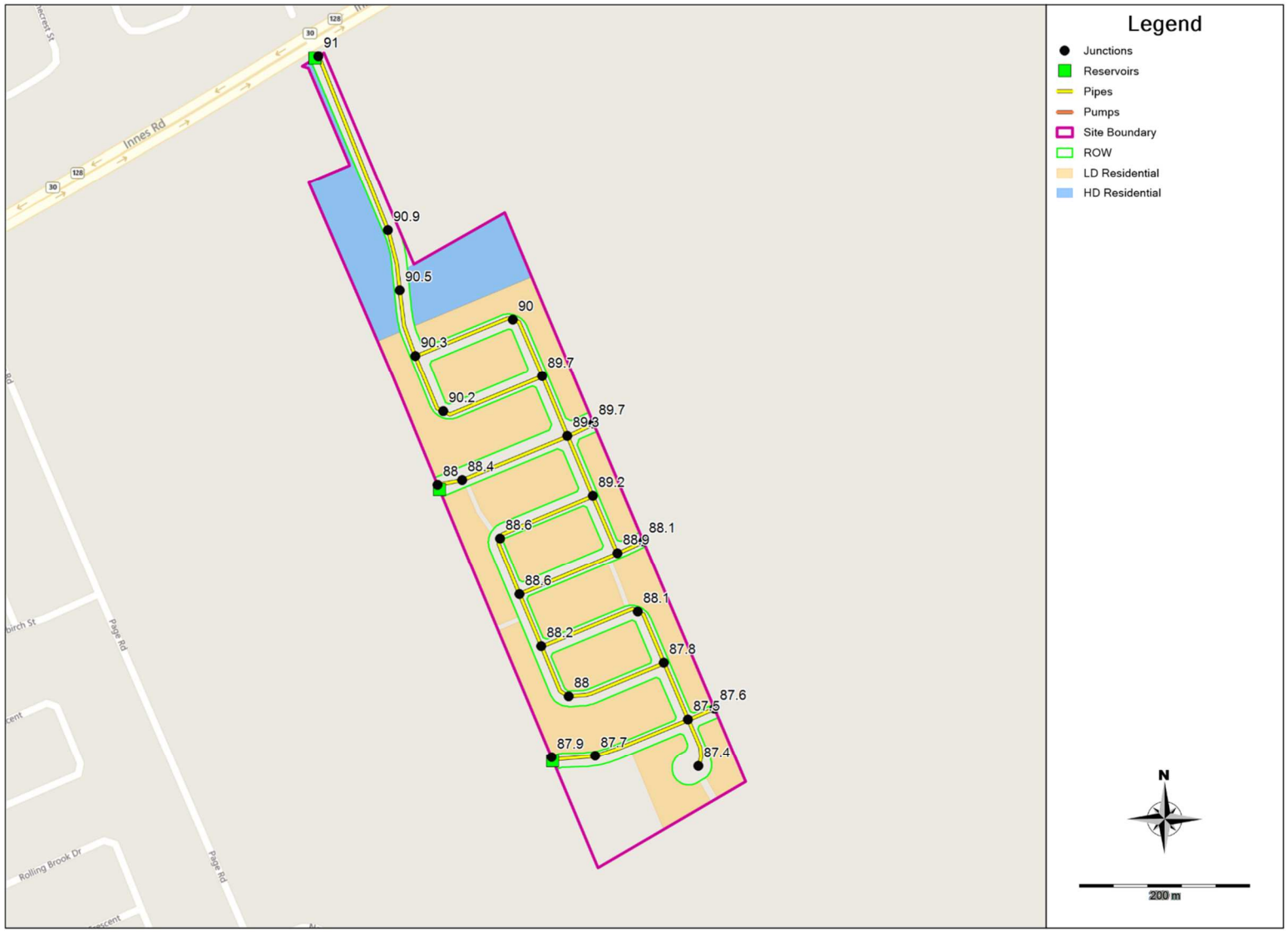
The hydraulic analysis demonstrates that the proposed watermain sizing meets the design criteria.

3610 Innes Road (Former BMR Lands)
Job No. 118224
PCSWMM Model Schematic
Figure 6.1 – Proposed Watermain Sizing, Layout and Junction IDs



Date: 2020/04/03
M:\2018\118224\DATA\Reports\Design Brief\Conceptual Submission 2\Figures\EPANET Model Schematic.docx

3610 Innes Road (Former BMR Lands)
Job No. 118224
PCSWMM Model Schematic
Figure 6.2 – Ground Elevations (m)



Date: 2020/04/03
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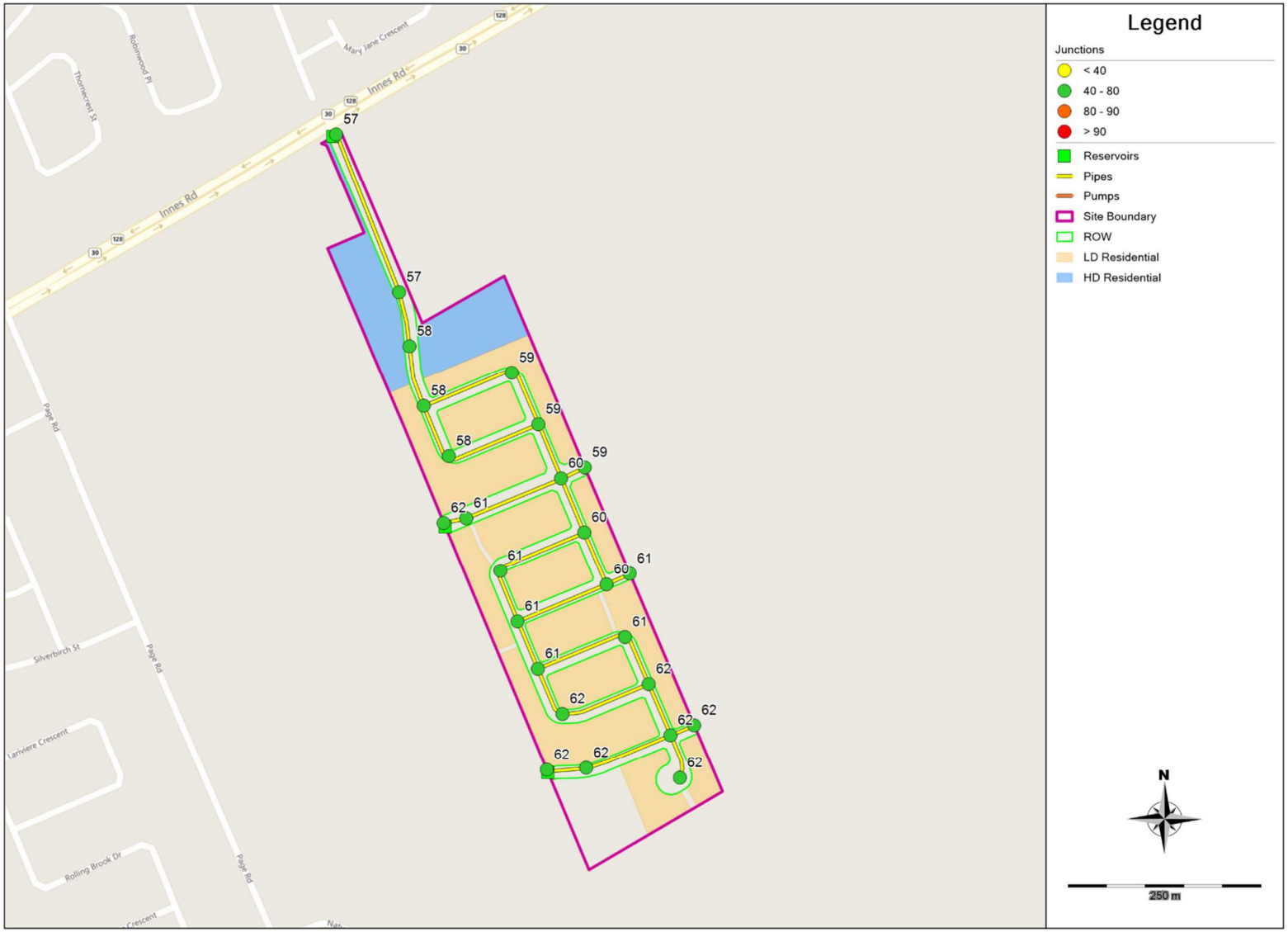
3610 Innes Road (Former BMR Lands)
Job No. 118224
PCSWMM Model Schematic
Figure 6.3 – Maximum Pressures During BSDY Conditions



Date: 2020/04/03
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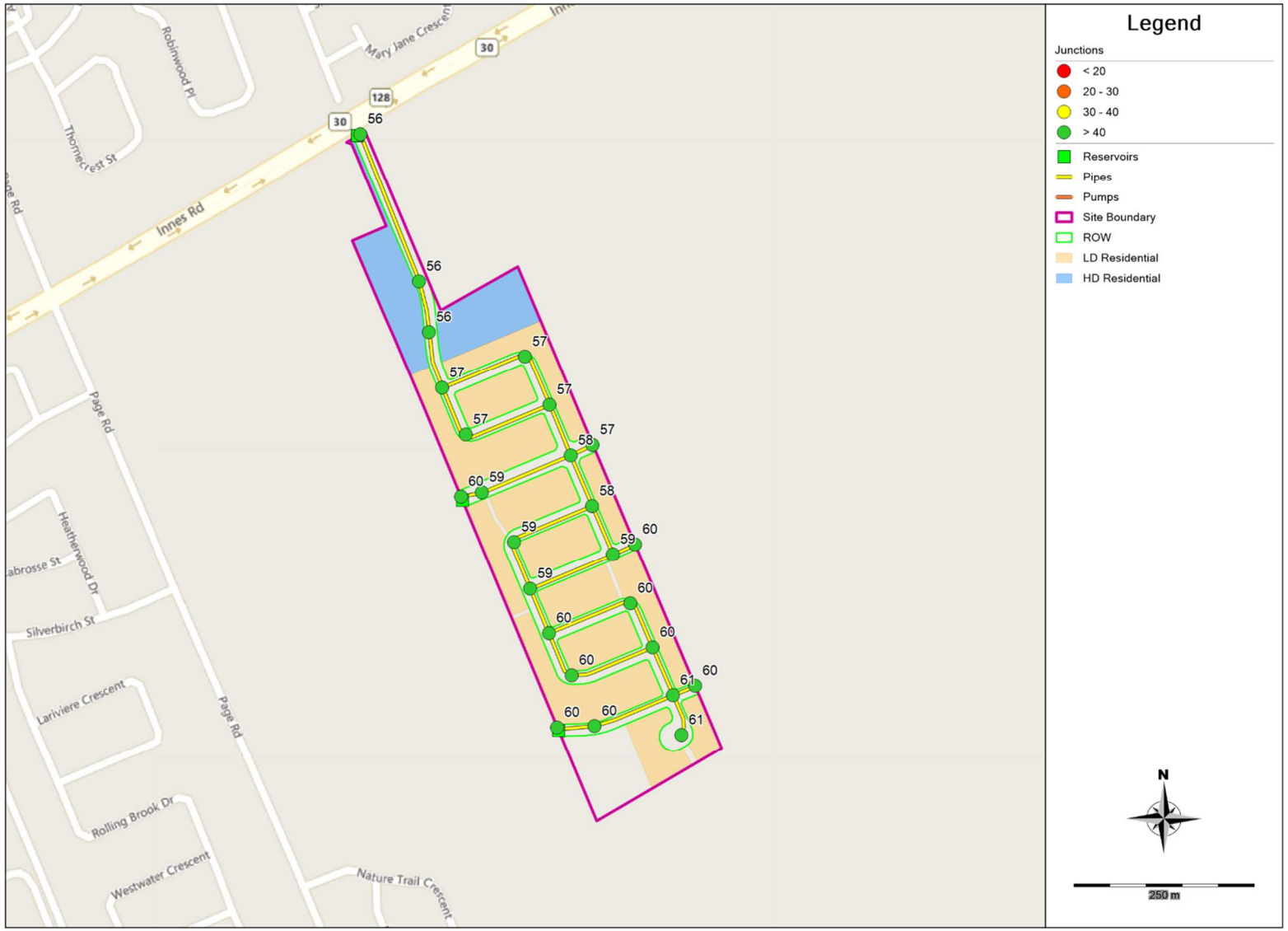
3610 Innes Road (Former BMR Lands)
Job No. 118224
PCSWMM Model Schematic
Figure 6.4 – Minimum Pressures During PKHR Conditions



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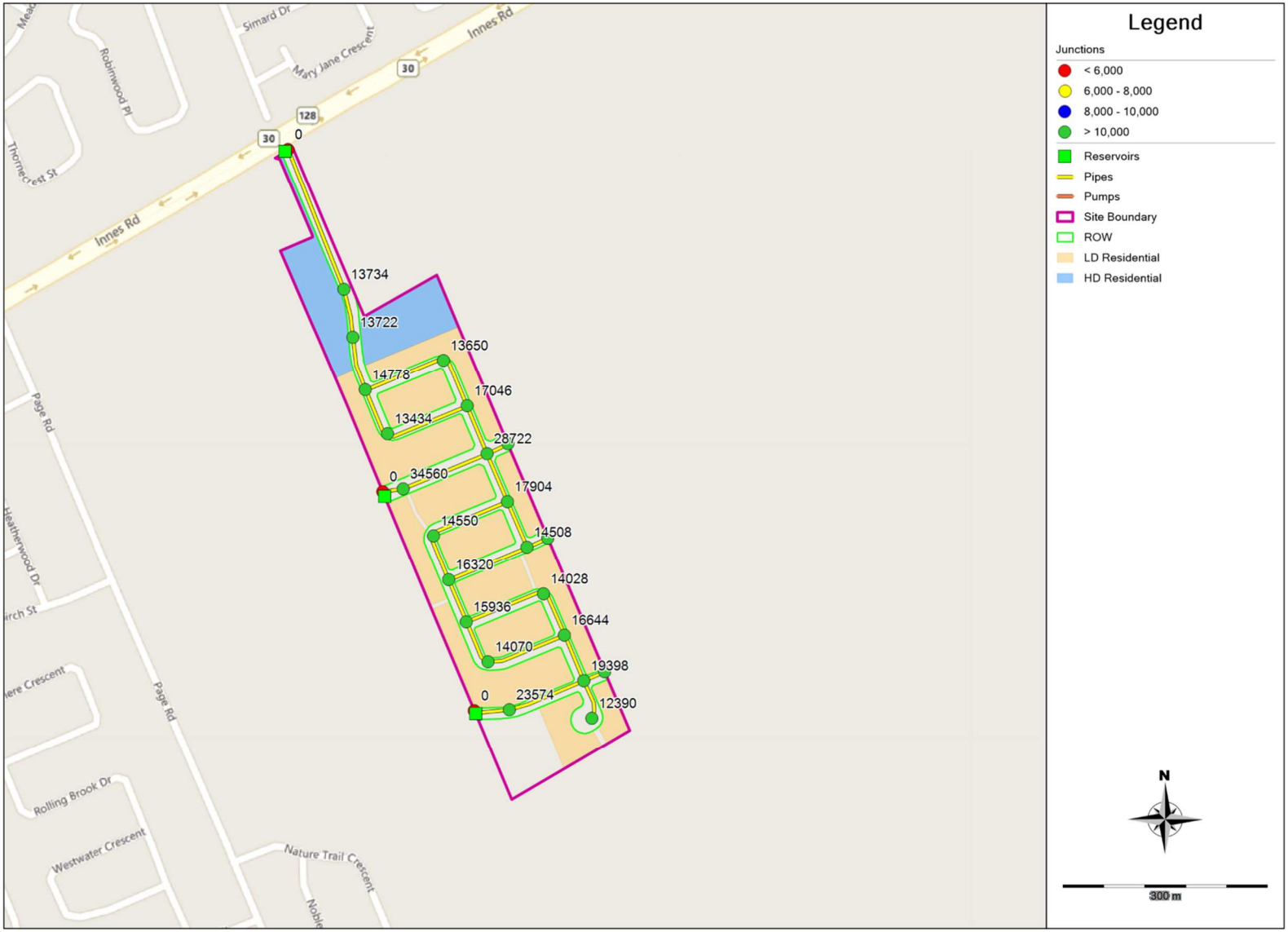
3610 Innes Road (Former BMR Lands)
Job No. 118224
PCSWMM Model Schematic
Figure 6.5 – Available Flow at 20psi During MXDY+FF Conditions



Date: 2020/04/03
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7.0 UTILITIES

The development will be serviced by Hydro Ottawa, Bell Canada, Rogers Communications, and Enbridge Gas Distribution Inc. Furthermore, streetlighting will be provided within the proposed road allowances, and will be designed in accordance with the City's lighting policy (2016). The works will be coordinated with local utility companies during detailed design.

A Composite Utility Plan will be prepared as part of the detailed design process.

The cross section of the utility trench and the connection to the existing services will also be confirmed during the detailed design process. For the preliminary right-of-way cross section refer to the Cross Sections Typical ROW (Drawing 118224-XS), included in the enclosed drawing set.

8.0 EROSION AND SEDIMENT CONTROL AND DEWATERING MEASURES

Temporary 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). Details will be provided on an Erosion and Sediment Control Plan, prepared as part of detailed design. Erosion and sediment control measures may include:

- Placement of filter fabric under all catch basin and maintenance hatches;
- Tree protection fence around the trees to be maintained
- Silt fence around the area under construction placed as per OPSS 577 / OPSD 219.110
- Light duty straw bale check dam per OPSD 219.180

The erosion and sediment control measures will need to be installed to the satisfaction of the engineer, the City, the Ontario Ministry of Environment, Conservation, and Parks (MECP), and the RVCA, prior to construction and will remain in place during construction until vegetation is established. The erosion and sediment control measure will also be subject to regular inspection to ensure that measures are operational.

Refer to the preliminary Macro Grading, Erosion and Sediment Control Plan (Drawing 118224-GR) included in the enclosed drawing set.

9.0 NEXT STEPS, COORDINATION, AND APPROVALS

The proposed municipal infrastructure may be subject, but not limited to the following approvals:

- MECP PTTW. Submitted to: MECP. Proponent: Glenview Homes (Innes) Ltd.
- MECP Environmental Certificate of Approval (ECA) for the proposed EUC Pond 1 expansion through the "Transfer of Review" program. Submitted to: City of Ottawa/ MECP and approved by MECP. Proponent: Glenview Homes (Innes) Ltd.
- MECP ECA for the storm / sanitary sewers through the "Transfer of Review" program. Submitted to: City of Ottawa/ MECP and approved by MECP. Proponent: Glenview Homes (Innes) Ltd.
- MECP Pre-authorized watermain alteration and extension program granted as part of City of Ottawa's Drinking Water Works Permit (F-1 Form). Submitted to: City of Ottawa. Proponent: Glenview Homes (Innes) Ltd.
- Road Cut Permit. Submitted to City of Ottawa. Proponent: Glenview Homes (Innes) Ltd., or its contractor/agent.
- Tree Cutting Permit. Submitted to City of Ottawa. Proponent: Glenview Homes (Innes) Ltd., or its contractor/agent.
- Separate from this report, the Developer may enter into a Cost Sharing Agreement to provide cost sharing principles and recovery mechanisms for development components that benefit external parties.

10.0 SUMMARY AND CONCLUSIONS

This report demonstrates that the proposed development can be adequately serviced with storm and sanitary sewers and watermain. The report is summarized below:

Stormwater Management:

- The Subject Site will be serviced with approximately 2,260 m of on-site storm sewers ranging from 250 mm to 1500 mm in diameter. The on-site storm sewers will outlet to the EUC Pond 1 stormwater management facility to the south of the Subject Site.
- Storm servicing for the Subject Site will be provided using a dual drainage system: Runoff from frequent events will be conveyed by storm sewers (minor system), while runoff from larger storm events which exceed the capacity of the minor system will be conveyed overland along defined overland flow routes (major system). The EUC Pond 1 is the outlet for both the major and minor systems.
- Inlet control devices (ICDs) are to be installed in all catchbasins to limit inflows to the minor system during larger storm events. ICDs will be sized during the detailed design stage.
- Road Right-of-Ways will be used for surface storage (i.e. road sags – saw-toothed grading).

Sanitary and Wastewater Collection System:

- The Subject Site will be serviced with approximately 2,045 m of on-site sanitary sewers ranging from 200 mm to 250 mm in diameter, which will direct flows to an existing 525 mm trunk sanitary sewer (gravity) located within Beaugency Street, west of Street Seven of the Subject Site. The existing trunk sanitary sewer will be extended within Street Seven of the Subject Site to service the future development to the east. The proposed service laterals on Street Seven will connect to a separate collector sanitary sewer running parallel to the trunk sanitary sewer extension and will outlet into the trunk downstream of Street Seven.
- The downstream existing sanitary sewer system have been designed for the flows of the Subject Site and have adequate capacity.

Water Supply System

- The Subject Site will be serviced with approximately 1,955 m of on-site watermain 200 mm in diameter, 200 m of on-site watermain 250 mm in diameter within Street Seven, and 200 m of a watermain trunk 300 mm in diameter within Street One. The watermain connection points for the proposed site are an existing 300 mm watermain within Jargeau Road (Connection 1); an existing 250 mm watermain within Beaugency Street (Connection 2); and the existing 400 mm watermain located at the Innes Road and Street Nine intersection.

Erosion and Sediment Control

- Temporary erosion and sediment control measures will be implemented both prior to commencement and during construction in accordance with the “Guidelines on Erosion and Sediment Control for Urban Construction Sites” (Government of Ontario, May 1987).

Next Steps, Coordination, and Approvals

- MECP PTTW.
- MECP ECA for the proposed EUC Pond 1 expansion through the “Transfer of Review” program.
- MECP ECA for the storm / sanitary sewers through the “Transfer of Review” program.
- MECP Pre-authorized watermain alteration and extension program granted as part of City of Ottawa’s Drinking Water Works Permit (F-1 Form).
- Road Cut Permit.
- Tree Cutting Permit.
- Separate from this report, the developer may enter into a Cost Sharing Agreement to provide cost sharing principles and recovery mechanisms for development components that provide direct benefits to more than one party.

11.0 CLOSURE

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

NOVATECH

Prepared by:

Ben Sweet, P.Eng.
Project Coordinator I Land Development

Kallie Auld, P.Eng.
Project Coordinator | Water Resources

Reviewed by:

Bassam Bahia, M.Eng., P.Eng.
Project Manager | Land Development

Appendix A
Correspondence

MINUTES
Pre-Consultation Meeting

ADDRESS: 3604-3636 Innes Road
DATE: October 5, 2017
TIME: 3:00pm to 4:00pm
LOCATION: 110 Laurier Ave West, Room 4102E
CONTACT: Michael Boughton

City of Ottawa Staff Present:
Michael Boughton (Planner), Nick Stow (Environmental Planner), Diane Emmerson (Parks Planner), Isaac Wong (Engineer), Ellen Potts (Student Planner)

Invitees Present:
Michael Michaud (Glenview Homes)

1.0 Introductions

2.0 Overview of Proposal

- To develop the rear portion of the site for a residential subdivision consisting of single-detached and townhouse dwellings according to the on-going EUC MUC CDP.

3.0 Summary of Preliminary Comments from City Staff Represented Disciplines

- **Michael Boughton and Ellen Potts provided transportation comments (on behalf of Asad Yousfani) and planning comments**
    - A noise study is required and should take into account the area within 100 metres of the right-of-way of arterial and collector roads, both existing and proposed.
    - A transportation study is required.
        - The new TIA guidelines can be accessed at http://documents.ottawa.ca/sites/documents.ottawa.ca/files/tia_guidelines_en.pdf
        - The study will focus on identifying the road modifications required to safely accommodate the site generated traffic.

- **Isaac Wong provided engineering comments**
    - Please see the attached memo.

- **Nick Stow provided environmental comments**
    - No EIS is required, but a tree conservation report is required.

- **Diane Emmerson provided parks comments**
    - Confirmed that the proposed park is a neighbourhood park
    - Explained the new developer-built park process
        - Reviewed the various amenities needed in this park
        - Developer is to provide a Facility-Fit plan prior to Draft Plan approval
    - Main concerns:
        - Park is lacking street frontage; proposed park is only at 25% street frontage (including Caivan's section), but closer to 50% frontage is preferred.

- Michael Michaud pointed out that Caivan has not provided 50% street frontage for their portion of the park and Richcraft is not supplying any.
- Diane Emmerson suggested that Glenview enter into a cost-sharing agreement with Caivan to compensate the lost profit from the removal of housing units for parkland.
    - It is not common practise in cost sharing agreements to compensate a developer for lost revenue from homes that could have been built. Ellen Potts will look into options for compensation.
- Suggested that residential lots bordering the park on Street 7 and Street 8 be eliminated, but of particular concern is the little "divot" on Street 7
- The general location of the park is fine.
- There may be a potential to shift some of the parkland dedication to the north.
- The park budget is $504,865 per hectare.

4.0 Next Steps

- Meet with City staff to have a discussion regarding subdivision layout/design and coordination the CDP.

5.0 List of Required Plans and Studies

Engineering

- Site Servicing Plan (3 copies)
- Site Servicing Study (3 copies)
- Stormwater Management Report (3 copies)
- Geotechnical Study (3 copies)
- Noise Study (3 copies)
- Transportation Impact Study (3 copies)

Planning / Design / Survey

- Draft Plan of Subdivision (15 copies)
- Land-use table (include on Draft Plan of Subdivision)
- Concept Plan showing proposed street configuration, blocks, lots, and dwelling types (colour coordinated, simple) (3 copies)
- Survey Plan (6 copies)
- Planning Rationale (include explanation of how proposal complies with draft EUC MUC CDP) (3 copies)
- Archaeological Resource Assessment (3 copies)

Environmental

- Tree Conservation Report (3 copies)

****Please submit all plans, studies and reports as separate pdf. files on a USB stick or CD (the Draft Plan of Subdivision should also be submitted as a dwg. file)**

ATTACHMENTS

MEMO

Date: October 6, 2017

To / Destinataire	Ellen Potts, Student Planner	
From / Expéditeur	Isaac Wong, Project Manager, Infrastructure Approvals	
Subject / Objet	**Pre-Application Consultation** **3604 Innes Road Ward No. 2** *Develop the rear vacant portion of the site for a residential subdivision consisting of single-detached and townhouse dwellings.*	File No. PC2017-0262

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: http://ottawa.ca/en/development-application-review-process-0/servicing-study-guidelines-development-applications

2. The following Engineering plans and reports are requested for submission:

   a. Site Servicing Plan

   b. Site Servicing Study

   c. Geotechnical Study

   d. Stormwater Management Report

3. 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)

4. 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).

5. The Stormwater Management Criteria, for the subject site, is to be based on the following:

   i. The 5-yr storm event using the IDF information derived from the Meteorological Services of Canada rainfall data, taken from the MacDonald Cartier Airport, collected 1966 to 1997.

   ii. For separated sewer system built pre-1970 the design of the storm sewers are based on a 2 year storm.

   iii. The pre-development runoff coefficient or a maximum equivalent 'C' of 0.5, whichever is less (§ 8.3.7.3).

   iv. A calculated time of concentration (Cannot be less than 10 minutes).

   v. Flows to the storm sewer in excess of the 5-year storm release rate, up to and including the 100-year storm event, must be detained on site.

   vi. For a combined sewer system the maximum C= 0.4 or the pre-development C value, whichever is less. In the absence of other information the allowable release rate shall be based on a 2 year storm event.

   Note: There may be area specific SWM Criteria that may apply. Check for any related SWM &/or Sub-watershed studies that may have been completed.

6. 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 (ie. 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.*

7. 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.

8. MOECC ECA Requirements – The applicant shall consult with the local office of the MOECC to determine which ECA, if any, are required. **NOTE: Site Plan Approval, or Draft Approval, is required before any Ministry of the Environment and Climate Change application is sent to the MOECC.**

For residential applications: Charlie Primeau

(613) 521-3450, ext. 251

Charlie.Primeau@ontario.ca

For I/C/I applications: Emily Diamond

(613) 521-3450, ext. 238

Emily.Diamond@ontario.ca

9. 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.

Should you have any questions or require additional information, please contact me directly at (613) 580-2424, x 24169 or by email at Isaac.Wong@ottawa.ca.

Ben Sweet

Subject: RE: Pre-con Follow-up - 3604 Innes Rd, BMR lands

From: Belan, Steve <Steve.Belan@ottawa.ca>
Sent: Tuesday, July 16, 2019 3:34 PM
To: Michael Michaud <MMichaud@glenview.ca>
Subject: Pre-con Follow-up - 3604 Innes Rd, BMR lands

In attendance: Mike Giampa, Robin van de Lande, Sara Mashaie, Mike Thivierge, Sami Rehman, Steve Belan, Michael Michaud, Jake Shabinsky, Jenifer Wong, James Ireland

Hello,

Please refer to the below regarding the Pre-Application Consultation (pre-con) Meeting held on June 28 for the property at 3604 Innes Road for a rezoning and plan of subdivision application in order to allow the development of a plan of subdivision by Glenview Homes. I have also attached the required Plans & Study List for application submission.

As Heard

- Pre-Application Consultation held in 2017, Plan of Subdivision delayed to delays of the CDP
- Brownfield Clean-up in southern portion of site to be completed, 90% complete, RSC awaiting completion
- Early servicing to begin in 2020, home building 2021
- Park concern addressed with Ingrid (see park comments)
- McEwen and U-Haul have purchased lands up on Innes Road, remainder of the lands outside of the CDP to be incorporated into this subdivision
- The City has asked U-Haul and Gib Patterson for an access (private or public) road (or a protected ROW), running parallel to Innes to allow connectivity between lots/developments
- The lands on the edge of the CDP are medium density (62 unit/ha) and will continue that density over the abutting lands to the north
- Adjacent to Significant woodlands, EIS requirements? (see Sami's comments)
- Engineering, MMS is still underway along with the CDP. LIDs in the MSS: the MSS will not have 10mm accommodation cushion. Glenview will be required to implement the use of LIDs either as soft or other, this is all related to Mud Creek flows.

Below are staff's preliminary comments based on the information available since of pre-con meeting:

Planning

- Draft CDP to be posted
- Road pattern looks acceptable
- Planning wants a ROW (public or private running parallel with Innes Road. To be roughly along the rear of the U-haul property. In a pre-consultation, U-haul was considering providing 40 feet at the rear of their property.
- Maybe both Glenview and U-haul could contribute some land for this ROW and provide landscaping to buffer residential uses from the warehouse space
- We have no issue with including lands outside of the CDP to this application
- A Zoning amendment application will need to be submitted to address the permitted uses and accommodate any provision requests.

Urban Design

- This application will not subject to the Urban Design Review Panel
- Mid to higher density development should be orientated (door should face) to the street.
- There should be accommodations made to provide street trees in front of every house and each corner side yards.

Engineering

- Please consult the Pre-con servicing memo Dated October 6, 2017 From Isaac Wong
- Servicing will be in conformity with the MSS
- Storm water quantity and quality will be controlled
- LIDs either as soft or other need to be implemented and the MSS will not have a 10mm accommodation cushion.

Feel free to contact Infrastructure Project Manager, Sara Mashaie, at sara.mashaie@ottawa.ca or 613.580.2424 ext./poste 27885, for follow-up questions

Transportation

- TIA submission / Road modification agreement requirements

Feel free to contact Transportation Project Manager, Mike Giampa, at mike.giampa@ottawa.ca or 613.580.2424 ext./poste 23657, for follow-up questions

Environmental

- The scoped EIS was reviewed and it was found that it does not sufficiently cover the requirements for an EIS in support of the subdivision. The EIS is required since the site is adjacent to a significant woodlot and Species at Risk have been identified in the vicinity by the CDP study, The EIS should cover potential impacts on these two items and demonstrate how the proposed development will have no negative impacts. Further details of EIS requirements can be found in the OP section 4.7.8 and the EIS guidelines:
  https://documents.ottawa.ca/sites/default/files/documents/eis_guidelines2015_en.pdf
- A RSC will be required for sensitive land uses where Brownfields development occurs.

Feel free to contact Sami Rehman, Environmental Planner, at Sami.Rehman@ottawa.ca or 613.580.2424 ext./poste 13364, for follow-up questions.

Parkland

- The park size proposed is 0.96ha. The CDP and Area Parks Plan requires a 1.82ha park block shown as Park 1 in the APP. Caivan has provided 0.654ha of the required 1.82ha. The remaining parkland is to be conveyed by Glenview. Please have Glenview revise Block 186 to reflect the required 1.166ha park block.
- Once a formal application is submitted, Parks and Facility Planning will review and provide draft conditions as required.

Feel free to contact Mary Ellen Wood, Parks Planner, at MaryEllen.Wood@ottawa.ca or 613.580.2424 ext./poste 16482, for follow-up questions.

Conservation Authority

- Comments related to the Conservation Authority
  - Stormwater runoff quality criteria
  - Area specific stormwater runoff criteria
-

Other

- You are encouraged to contact the Ward Councillor, Councillor Laura Dudas, at Laura.Dudas@ottawa.ca about the proposal.

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

Regards,

Steve Belan, MCIP, RPP

Planner Planning Services, Development Review Services
Planning, Infrastructure and Economic Development
City of Ottawa / Ville d'Ottawa
110 Laurier Avenue West, 4th Floor / 110, avenue Laurier Ouest, 4e étage
Ottawa, ON K1P 1J1
Telephone / tél.: 613-580-2424 ext./poste 27591
E-mail / courriel: Steve.Belan@ottawa.ca

City of Ottawa 2017 TIA Guidelines Screening Form

1. Description of Proposed Development

Municipal Address	
Description of Location	
Land Use Classification	
Development Size (units)	
Development Size (m^2)	
Number of Accesses and Locations	
Phase of Development	
Buildout Year	

If available, please attach a sketch of the development or site plan to this form.

2. Trip Generation Trigger

Considering the Development's Land Use type and Size (as filled out in the previous section), please refer to the Trip Generation Trigger checks below.

Land Use Type	Minimum Development Size
Single-family homes	40 units
Townhomes or apartments	90 units
Office	3,500 m^2
Industrial	5,000 m^2
Fast-food restaurant or coffee shop	100 m^2
Destination retail	1,000 m^2
Gas station or convenience market	75 m^2

** If the development has a land use type other than what is presented in the table above, estimates of person-trip generation may be made based on average trip generation characteristics represented in the current edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual.*

If the proposed development size is greater than the sizes identified above, the Trip Generation Trigger is satisfied.

3. Location Triggers

	Yes	No
Does the development propose a new driveway to a boundary street that is designated as part of the City's Transit Priority, Rapid Transit or Spine Bicycle Networks?		
Is the development in a Design Priority Area (DPA) or Transit-oriented Development (TOD) zone?*		

**DPA and TOD are identified in the City of Ottawa Official Plan (DPA in Section 2.5.1 and Schedules A and B; TOD in Annex 6). See Chapter 4 for a list of City of Ottawa Planning and Engineering documents that support the completion of TIA).*

If any of the above questions were answered with 'Yes,' the Location Trigger is satisfied.

4. Safety Triggers

	Yes	No
Are posted speed limits on a boundary street are 80 km/hr or greater?		
Are there any horizontal/vertical curvatures on a boundary street limits sight lines at a proposed driveway?		
Is the proposed driveway within the area of influence of an adjacent traffic signal or roundabout (i.e. within 300 m of intersection in rural conditions, or within 150 m of intersection in urban/ suburban conditions)?		
Is the proposed driveway within auxiliary lanes of an intersection?		
Does the proposed driveway make use of an existing median break that serves an existing site?		
Is there is a documented history of traffic operations or safety concerns on the boundary streets within 500 m of the development?		
Does the development include a drive-thru facility?		

If any of the above questions were answered with 'Yes,' the Safety Trigger is satisfied.

5. Summary

	Yes	No
Does the development satisfy the Trip Generation Trigger?		
Does the development satisfy the Location Trigger?		
Does the development satisfy the Safety Trigger?		

If none of the triggers are satisfied, the TIA Study is complete. If one or more of the triggers is satisfied, the TIA Study must continue into the next stage (Screening and Scoping).

APPLICANT'S STUDY AND PLAN IDENTIFICATION LIST

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s	3	7. Servicing Options Report	8. Wellhead Protection Study		3
	9	9. Transportation Impact Assessment (TIA)	10.Erosion and Sediment Control Plan / Brief		3
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	PDF only	15.Roadway Modification Functional Design	16.Confederation Line Proximity Study		3

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	3	25.Concept Plan Showing Ultimate Use of Land	26.Cultural Heritage Impact Statement		3
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S/A	Number of copies	ADDITIONAL REQUIREMENTS		S/A	Number of copies
S	1	44. Applicant's Public Consultation Strategy (may be provided as part of the Planning Rationale)	45.		

Meeting Date: June 28, 2019

Application Type: *Zoning By-Law Amendment*

File Lead (Assigned Planner): Steve Belan

Infrastructure Approvals Project Manager: Sara Mashaie

Site Address (Municipal Address):3604 Innes Road

*Preliminary Assessment: 1☐ 2☐ 3☐ 4☐ 5☒

*One (1) indicates that considerable major revisions are required before a planning application is submitted, while five (5) suggests that proposal appears to meet the City's key land use policies and guidelines. **This assessment is purely advisory and does not consider technical aspects of the proposal or in any way guarantee application approval.**

It is important to note that the need for additional studies and plans may result during application review. If following the submission of your application, it is determined that material that is not identified in this checklist is required to achieve complete application status, in accordance with the Planning Act and Official Plan requirements, the* Planning, Infrastructure and Economic Development Department *will notify you of outstanding material required within the required 30 day period. Mandatory pre-application consultation will not shorten the City's standard processing timelines, or guarantee that an application will be approved. It is intended to help educate and inform the applicant about submission requirements as well as municipal processes, policies, and key issues in advance of submitting a formal development application. This list is valid for one year following the meeting date. If the application is not submitted within this timeframe the applicant must again pre-consult with the Planning, Infrastructure and Economic Development Department.

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☐	3	52. Rapport sur les options de viabilisation	53. Plan de protection des têtes de puits	☐	3
☐	9	54. Étude sur les transports communautaires et / ou étude d'impacts sur les transports / résumé	55. Plan de contrôle de l'érosion et des sédiments / résumé	☐	3
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☐	PDF	60. Plan de Modifications aux chaussées	61. Étude relative à la proximité d'un aménagement à la Ligne de la Confédération	☐	3

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☐	15	66. Plan d'implantation	67. Distance de séparation minimale (DSM)	☐	3
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☐		88.	89.	☐	

Date de réunion : Type de demande :

Urbaniste responsable du dossier : Gestionnaire de projet, Approbation des demandes d'infrastructure :

Adresse du site (adresse municipale) : *Évaluation préliminaire : 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

*Le chiffre un (1) indique que des révisions importantes sont nécessaires avant qu'une demande d'aménagement puisse être présentée, et le chiffre cinq (5) suppose que la demande semble conforme aux politiques et aux directives d'utilisation du sol de la Ville. Cette évaluation est purement consultative. Elle ne tient pas compte des aspects techniques de la demande et ne garantit d'aucune manière l'approbation d'une demande.

Il est important de noter que la nécessité de produire d'autres études ou plans peut survenir au cours de l'examen de la demande. Si, après la présentation de votre demande, il s'avère que des documents ne figurant pas dans cette liste de vérification sont requis pour compléter la demande, conformément aux dispositions de la Loi sur l'aménagement du territoire *et du Plan officiel, le* Direction général de la planification, de l'infrastructure et du développement économique *vous informera des documents manquants au cours de la période légale de 30 jours. La consultation obligatoire préalable à la demande ne réduit pas le délai normal de traitement de la demande par la Ville, ni ne garantit qu'une demande sera approuvée. Elle a pour but d'aider à sensibiliser et à informer le requérant au sujet des exigences relatives aux demandes, des procédés, des politiques et des principaux enjeux municipaux, avant qu'il ne présente sa demande officielle. Cette liste est valide une année après la date de la réunion. Si la demande n'est pas présentée pendant cette période, le requérant devra à nouveau procéder à une consultation préalable auprès du Direction général de la planification, de l'infrastructure et du développement économique.*

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Meeting Date: June 28, 2019 — Application Type: *Plan of Subdivision*

File Lead (Assigned Planner): Steve Belan — Infrastructure Approvals Project Manager: Sara Mashaie

Site Address (Municipal Address):3604 Innes Road — *Preliminary Assessment: 1☐ 2☐ 3☐ 4☒ 5☐

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Adresse du site (adresse municipale) : *Évaluation préliminaire : 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

*Le chiffre un (1) indique que des révisions importantes sont nécessaires avant qu'une demande d'aménagement puisse être présentée, et le chiffre cinq (5) suppose que la demande semble conforme aux politiques et aux directives d'utilisation du sol de la Ville. Cette évaluation est purement consultative. Elle ne tient pas compte des aspects techniques de la demande et ne garantit d'aucune manière l'approbation d'une demande.

Il est important de noter que la nécessité de produire d'autres études ou plans peut survenir au cours de l'examen de la demande. Si, après la présentation de votre demande, il s'avère que des documents ne figurant pas dans cette liste de vérification sont requis pour compléter la demande, conformément aux dispositions de la Loi sur l'aménagement du territoire *et du Plan officiel, le* Direction général de la planification, de l'infrastructure et du développement économique *vous informera des documents manquants au cours de la période légale de 30 jours. La consultation obligatoire préalable à la demande ne réduit pas le délai normal de traitement de la demande par la Ville, ni ne garantit qu'une demande sera approuvée. Elle a pour but d'aider à sensibiliser et à informer le requérant au sujet des exigences relatives aux demandes, des procédés, des politiques et des principaux enjeux municipaux, avant qu'il ne présente sa demande officielle. Cette liste est valide une année après la date de la réunion. Si la demande n'est pas présentée pendant cette période, le requérant devra à nouveau procéder à une consultation préalable auprès du Direction général de la planification, de l'infrastructure et du développement économique.*

Appendix B
Servicing Report Checklist

Development Servicing Study Checklist

Project Name: 3610 Innes Road (Former BMR Lands)
Project Number:118224
Date: April 3, 2020

4.1 General Content	**Addressed (Y/N/NA)**	**Section**	**Comments**
Executive Summary (for larger reports only).	NA		
Date and revision number of the report.	Y	Cover	
Location map and plan showing municipal address, boundary, and layout of proposed development.	Y	Fig 1.1, 1.2, 1.3	
Plan showing the site and location of all existing services.	Y	Fig 1.2	
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.	NA		
Summary of Pre-consultation Meetings with City and other approval agencies.	Y	1	
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	2	
Statement of objectives and servicing criteria.	Y	1	
Identification of existing and proposed infrastructure available in the immediate area.	Y	4,5,6	
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).	NA		
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	GR	

4.1 General Content	**Addressed (Y/N/NA)**	**Section**	**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.	NA		
Proposed phasing of the development, if applicable.	NA		
Reference to geotechnical studies and recommendations concerning servicing.	Y	2.2	
All preliminary and formal site plan submissions should have the following information:			
Metric scale	NA		
North arrow (including construction North)	NA		
Key plan	NA		
Name and contact information of applicant and property owner	NA		
Property limits including bearings and dimensions	NA		
Existing and proposed structures and parking areas	NA		
Easements, road widening and rights-of-way	NA		
Adjacent street names	NA		

4.2 Water	Addressed (Y/N/NA)	Section	Comments
Confirm consistency with Master Servicing Study, if available.	Y	6	
Availability of public infrastructure to service proposed development.	Y	6	
Identification of system constraints.	Y	6	
Identify boundary conditions.	Y	6	
Confirmation of adequate domestic supply and pressure.	Y	6	
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	6	
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	6	
Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design.	N		TBD as part of detailed design
Address reliability requirements such as appropriate location of shut-off valves.	N		TBD as part of detailed design
Check on the necessity of a pressure zone boundary modification.	NA		
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	6	
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	6, GP	
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.	NA		
Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.	Y	6	
Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.	Y	Fig 6.1	

4.3 Wastewater	Addressed (Y/N/NA)	Section	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	5	
Confirm consistency with Master Servicing Study and/or justifications for deviations.	Y	5	
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.	NA		
Description of existing sanitary sewer available for discharge of wastewater from proposed development.	Y	5	
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	5	
Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.	NA		
Description of proposed sewer network including sewers, pumping stations, and forcemains.	Y	5	
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).	NA		
Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.	NA		
Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.	NA		
Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.	NA		
Special considerations such as contamination, corrosive environment etc.	NA		

4.4 Stormwater	Addressed (Y/N/NA)	Section	Comments
Description of drainage outlets and downstream constraints including legality of outlet (i.e. municipal drain, right-of-way, watercourse, or private property).	Y	4	
Analysis of the available capacity in existing public infrastructure.	NA		
A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns and proposed drainage patterns.	Y	AppC	
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	4	
Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.	Y	4	
Description of stormwater management concept with facility locations and descriptions with references and supporting information.	Y	4	
Set-back from private sewage disposal systems.	NA		
Watercourse and hazard lands setbacks.	NA		
Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.	NA		
Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.	Y	4	
Storage requirements (complete with calcs) and conveyance capacity for 5 yr and 100 yr events.	Y	4	
Identification of watercourse within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.	Y	4	
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	4	
Any proposed diversion of drainage catchment areas from one outlet to another.	NA		
Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and SWM facilities.	Y	4	
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.	NA		

4.4 Stormwater	Addressed (Y/N/NA)	Section	Comments
Identification of municipal drains and related approval requirements.	NA		
Description of how the conveyance and storage capacity will be achieved for the development.	Y	4	
100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.	Y	4	
Inclusion of hydraulic analysis including HGL elevations.	Y	4	
Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.	Y	8	
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.	Y	4	
Identification of fill constrains related to floodplain and geotechnical investigation.	NA		

4.5 Approval and Permit Requirements	Addressed (Y/N/NA)	Section	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.	Y	9	
Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.	Y	9	
Changes to Municipal Drains.	NA		
Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)	Y	9	

4.6 Conclusion	Addressed (Y/N/NA)	Section	Comments
Clearly stated conclusions and recommendations.	Y	10	
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.	NA		
All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario.	Y	11	

Appendix C
Storm Sewer Design Sheets and Stormwater Management Calculations

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Arterial Roads Return Frequency = 10 years

Manning 0.013

	LOCATION		AREA (Ha) 2 YEAR				AREA (Ha) 5 YEAR				AREA (Ha) 10 YEAR				AREA (Ha) 100 YEAR				FLOW						SEWER DATA							
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Time of Conc.	Intensity 2 Year	Intensity 5 Year	Intensity 10 Year	Intensity 100 Year	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min	Q/Q full
	2136	2138	0.37	0.70	0.72	93.83			0.00	69.94			0.00	5.35			0.00	14.86	27.52	42.41	57.14	66.82	97.40	9781	2700	2700	CONC	0.15	90.5	13126	2.29	0.66	0.75
			1.29	0.70	2.51	96.34			0.00	69.94			0.00	5.35			0.00	14.86															
			1.30	0.70	2.53	98.87			0.00	69.94			0.00	5.35			0.00	14.86															
			0.50	0.70	0.97	99.85			0.00	69.94			0.00	5.35			0.00	14.86															
	2138	2139	0.38	0.70	0.74	100.59			0.00	69.94			0.00	5.35			0.00	14.86	21.02	50.44	68.08	79.66	116.22	11988	2700	2700	CONC	0.16	77.0	13556	2.37	0.54	0.88
	2139	2140	0.38	0.70	0.74	101.33			0.00	69.94			0.00	5.35			0.00	14.86	21.56	49.64	66.99	78.38	114.34	11834	2700	2700	CONC	0.15	73.5	13126	2.29	0.53	0.90
	2140	HW	0.11	0.70	0.21	101.54			0.00	69.94			0.00	5.35			0.00	14.86	21.56	49.64	66.99	78.38	114.34	11844	2700	2700	CONC	0.15	47.0	13126	2.29	0.34	0.90
TO POND 1																																	
TRUNK 3																																	
					0.00	0.00	0.98	0.80	2.18	2.18			0.00	0.00			0.00	0.00	21.15														
			2.86	0.70	5.57	5.57	5.61	0.90	14.04	16.22			0.00	0.00			0.00	0.00															
					0.00	5.57	0.95	0.80	2.11	18.33			0.00	0.00			0.00	0.00															
	2025	2026	7.33	0.70	14.26	19.83	0.49	0.90	1.23	19.55			0.00	0.00			0.00	0.00	21.15	50.25	67.82	79.36	115.77	148	1650	1650	CONC	0.14	32.0	3410	1.59	0.33	0.04
	2026	2119	0.39	0.70	0.76	20.59	1.16	0.40	1.29	20.84			0.00	0.00			0.00	0.00	21.48	49.76	67.15	78.57	114.61	1366	1650	1650	CONC	0.16	92.5	3646	1.71	0.90	0.37
	2119	2120	0.66	0.70	1.28	21.87			0.00	20.84			0.00	0.00			0.00	0.00	22.39	48.48	65.41	76.52	111.61	1469	1650	1650	CONC	0.10	47.0	2882	1.35	0.58	0.51
	2120	2121	0.43	0.70	0.84	22.71			0.00	20.84			0.00	0.00			0.00	0.00	22.97	47.70	64.34	75.27	109.78	2204	1650	1650	CONC	0.10	84.5	2882	1.35	1.04	0.76
	2121	2142	1.13	0.70	2.20	24.91			0.00	20.84			0.00	0.00			0.00	0.00	24.01	46.36	62.52	73.13	106.63	2258	1650	1650	CONC	0.10	76.0	2882	1.35	0.94	0.78
	2142	2143	0.37	0.70	0.72	25.63			0.00	20.84			0.00	0.00			0.00	0.00	22.97	47.70	64.34	75.27	109.78	2204	1650	1650	CONC	0.10	43.0	2882	1.35	0.53	0.76
	2143	2144			0.00	25.63			0.00	20.84			0.00	0.00			0.00	0.00	24.01	46.36	62.52	73.13	106.63	2258	1800	1800	CONC	0.10	51.1	3635	1.43	0.60	0.62
	2144	HW			0.00	25.63			0.00	20.84			0.00	0.00			0.00	0.00	24.95	45.22	60.97	71.31	103.97	2260	1800	1800	CONC	0.10	22.5	3635	1.43	0.26	0.62
TO POND 1																																	

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

LICENSED PROFESSIONAL ENGINEER
K. MITIC
100122349
OCT 18, 2019
PROVINCE OF ONTARIO

Designed: R.B.	PROJECT: Orleans EUC MUC		
Checked: K.M.	LOCATION: City of Ottawa		
Dwg. Reference:	File Ref: 14-733	Date: October 2019	Sheet No. 2

STORM SEWER DESIGN SHEET (PRELIMINARY)

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 118224
Project Name: 3610 Innes Road (Former BMR Lands)
Date Prepared: 10/4/2019
Date Revised: 3/4/2020
Input By: Ben Sweet
Reviewed By: Sam Bahia
Drawing Reference: 118224-GP AND 118224-STM

Legend:
- PROJECT SPECIFIC INFO
- USER DESIGN INPUT
- CUMILATIVE CELL
- CALCULATED DESIGN CELL OUTPUT
- USER AS-BUILT INPUT

LOCATION			DEMAND																	CAPACITY						
			AREA									FLOW								PROPOSED SEWER PIPE SIZING / DESIGN						
															RAIN INTENSITY (mm/hr)					PIPE PROPERTIES							
STREET	FROM MH	TO MH	AREA ID	COMMERCIAL	HIGH DENSITY	ROAD 1	REAR YARD 1 (TOWN)	REAR YARD 2 (SINGLE/SEMI)	PARK	TOTAL AREA	WEIGHTED RUNOFF COEFFICIENT	INDIVI 2.78 AR	ACCUM 2.78 AR	TIME OF CONC	2yr	5yr	100yr	PEAK FLOW	TOTAL UNCONTROLLED PEAK FLOW (QDesign)	TOTAL RESTRICTED PEAK FLOW (Q)	LENGTH	SIZE / MATERIAL	ID ACTUAL	ROUGHNESS	DESIGN GRADE	CAPACITY	FULL FLOW VELOCITY	TIME OF FLOW	QPEAK DESIGN / QFULL
				0.90	0.80	0.70	0.50	0.45	0.25	(ha)				(min.)				(L/s)	(L/s)	(L/s)	(m)	(mm / type)	(m)		(%)	(L/s)	(m/s)	(min.)	(%)
Street 9	149	150	A1			0.32				0.32	0.70	0.62	0.62	10.00	76.81			47.83										
										0.00		0.00	0.00	10.00				0.00	**47.8**		93.9	375 PVC	0.381	0.013	0.32	103.5	0.91	1.72	46.2%
										0.00		0.00	0.00	10.00				0.00										
	150	151	A2, B1			0.24				0.24	0.70	0.47	1.09	11.72	70.76			77.11										
					1.01					1.01	0.80	2.25	2.25	11.72		95.89		215.39	**292.5**		82.8	600 CONC	0.6096	0.013	0.32	362.4	1.24	1.11	80.7%
										0.00		0.00	0.00	11.72				0.00										
	151	152	B2	3.43						0.00		0.00	1.09	12.84	67.40			73.45										
										3.43	0.90	8.58	10.83	12.84		91.27		988.28	**1061.7**		40.6	975 CONC	0.9906	0.013	0.32	1322.5	1.72	0.39	80.3%
										0.00		0.00	0.00	12.84				0.00										
	152	153	A3, B3			0.14				0.14	0.70	0.27	1.36	13.23	66.29			90.30										
					1.02					1.02	0.80	2.27	13.10	13.23		89.75		1175.39	**1265.7**		71.0	1050 CONC	1.0668	0.013	0.32	1611.5	1.80	0.66	78.5%
										0.00		0.00	0.00	13.23				0.00										
	153	99	A4			0.44				0.44	0.70	0.86	2.22	13.89	64.53			143.15										
										0.00		0.00	13.10	13.89		87.34		1143.80	**1286.9**		42.7	1050 CONC	1.0668	0.013	0.32	1611.5	1.80	0.39	79.9%
										0.00		0.00	0.00	13.89				0.00										
	99	100	-							0.00		0.00	2.22	14.28	63.52			140.91										
										0.00		0.00	13.10	14.28		85.95		1125.69	**1266.6**		59.1	1050 CONC	1.0668	0.013	0.32	1611.5	1.80	0.55	78.6%
										0.00		0.00	0.00	14.28				0.00										
	100	101	A5			0.23				0.23	0.70	0.45	2.67	14.83	62.18			165.77										
										0.00		0.00	13.10	14.83		84.12		1101.66	**1267.4**		14.4	1050 CONC	1.0668	0.013	0.32	1611.5	1.80	0.13	78.6%
										0.00		0.00	0.00	14.83				0.00										
	101	75	A6			0.77				0.77	0.70	1.50	4.16	14.96	61.86			257.61										
										0.00		0.00	13.10	14.96		83.68		1095.98	**1353.6**		110.2	1050 CONC	1.0668	0.013	0.32	1611.5	1.80	1.02	84.0%
										0.00		0.00	0.00	14.96				0.00										
Street 2	72	73	A7			0.89				0.89	0.70	1.73	1.73	10.00	76.81			133.02										
										0.00		0.00	0.00	10.00				0.00	**133.0**		101.4	525 CONC	0.5334	0.013	0.32	253.8	1.14	1.49	52.4%
										0.00		0.00	0.00	10.00				0.00										
	73	74	-							0.00		0.00	1.73	11.49	71.53			123.88										
										0.00		0.00	0.00	11.49				0.00	**123.9**		9.5	525 CONC	0.5334	0.013	0.32	253.8	1.14	0.14	48.8%
										0.00		0.00	0.00	11.49				0.00										
	74	75	A8			0.35				0.35	0.70	0.68	2.41	11.63	71.07			171.51										
										0.00		0.00	0.00	11.63				0.00	**171.5**		63.8	525 CONC	0.5334	0.013	0.32	253.8	1.14	0.94	67.6%
										0.00		0.00	0.00	11.63				0.00										
Street 2	75	76	A9			0.31				0.31	0.70	0.60	7.18	15.98	59.55			427.60										
										0.00		0.00	13.10	15.98		80.52		1054.55	**1482.1**		76.0	1200 CONC	1.2192	0.013	0.24	1992.6	1.71	0.74	74.4%
										0.00		0.00	0.00	15.98				0.00										
Street 1	97	98	C1							0.00		0.00	0.00	10.00				0.00										
						0.62				0.62	0.70	1.21	1.21	10.00		104.19		125.71	**125.7**		78.5	450 PVC	0.4572	0.013	0.32	168.3	1.02	1.28	74.7%
										0.00		0.00	0.00	10.00				0.00										
	98	76	C2							0.00		0.00	0.00	11.28				0.00										
						0.61				0.61	0.70	1.19	2.39	11.28		97.90		234.33	**234.3**		79.7	600 CONC	0.6096	0.013	0.32	362.4	1.24	1.07	64.7%
										0.00		0.00	0.00	11.28				0.00										
Street 3	76	77	C3, A10			0.30				0.30	0.70	0.58	7.76	16.72	57.98			450.20										
						0.07				0.07	0.70	0.14	15.63	16.72		78.38		1224.77	**1675.0**		76.1	1200 CONC	1.2192	0.013	0.24	1992.6	1.71	0.74	84.1%
										0.00		0.00	0.00	16.72				0.00										
Street 4	77	95	A11			0.83				0.83	0.70	1.62	9.38	17.46	56.50			529.98										
										0.00		0.00	15.63	17.46		76.36		1193.17	**1723.2**		113.6	1200 CONC	1.2192	0.013	0.24	1992.6	1.71	1.11	86.5%
										0.00		0.00	0.00	17.46				0.00										
	95	96	-							0.00		0.00	9.38	18.57	54.44			510.67										
										0.00		0.00	15.63	18.57		73.54		1149.24	**1659.9**		13.7	1350 CONC	1.3716	0.013	0.20	2490.2	1.69	0.13	66.7%
										0.00		0.00	0.00	18.57				0.00										
	96	79	A12			0.42				0.42	0.70	0.82	10.20	18.71	54.21			552.73										
										0.00		0.00	15.63	18.71		73.22		1144.14	**1696.9**		64.1	1350 CONC	1.3716	0.013	0.20	2490.2	1.69	0.63	68.1%
										0.00		0.00	0.00	18.71				0.00										
Street 3	77	78	A13			0.30				0.30	0.70	0.58	0.58	10.00	76.81			44.84										
										0.00		0.00	0.00	10.00				0.00	**44.8**		73.1	250 PVC	0.254	0.013	0.65	50.0	0.99	1.23	89.6%
										0.00		0.00	0.00	10.00				0.00										
Street 5	43	78	A14			0.18				0.18	0.70	0.35	0.35	10.00	76.81			26.90										
										0.00		0.00	0.00	10.00				0.00	**26.9**		30.0	250 PVC	0.254	0.013	0.65	50.0	0.99	0.51	53.8%
										0.00		0.00	0.00	10.00				0.00										
	78	45	A15			0.23				0.23	0.70	0.45	1.38	10.51	74.91			103.50										
										0.00		0.00	0.00	10.51				0.00	**103.5**		37.4	600 CONC	0.6096	0.013	0.32	362.4	1.24	0.50	28.6%
										0.00		0.00	0.00	10.51				0.00										
	45	79	A16			0.58				0.58	0.70	1.13	2.51	11.01	73.14			183.60										
										0.00		0.00	0.00	11.01				0.00	**183.6**		87.4	600 CONC	0.6096	0.013	0.32	362.4	1.24	1.17	50.7%
										0.00		0.00	0.00	11.01				0.00										

STORM SEWER DESIGN SHEET (PRELIMINARY)

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LOCATION			DEMAND																CAPACITY							
			AREA									FLOW								PROPOSED SEWER PIPE SIZING / DESIGN							
STREET	FROM MH	TO MH	AREA ID	COMMERCIAL	HIGH DENSITY	ROAD 1	REAR YARD 1 (TOWN)	REAR YARD 2 (SINGLE/SEMI)	PARK	TOTAL AREA	WEIGHTED RUNOFF COEFFICIENT	INDIVI 2.78 AR	ACCUM 2.78 AR	TIME OF CONC	RAIN INTENSITY (mm/hr)			PEAK FLOW	TOTAL UNCONTROLLED PEAK FLOW (QDesign)	TOTAL RESTRICTED PEAK FLOW (Q)	PIPE PROPERTIES					CAPACITY	FULL FLOW VELOCITY	TIME OF FLOW	QPEAK DESIGN / QFULL
															2yr	5yr	100yr				LENGTH	SIZE / MATERIAL	ID ACTUAL	ROUGHNESS	DESIGN GRADE				
				0.90	0.80	0.70	0.50	0.45	0.25	(ha)				(min.)				(L/s)	(L/s)	(L/s)	(m)	(mm / type)	(m)		(%)	(L/s)	(m/s)	(min.)	(%)
Street 4	79	80	A17			0.32				0.32	0.70	0.62	13.33	19.34	53.11			708.00	1828.8		76.0	1350 CONC	1.3716	0.013	0.20	2490.2	1.69	0.75	73.4%
										0.00		0.00	15.63	19.34		71.73		1120.84										
										0.00		0.00	0.00	19.34				0.00										
	80	81	A18			0.57				0.57	0.70	1.11	14.44	20.09	51.88			749.11	1843.7		53.2	1350 CONC	1.3716	0.013	0.20	2490.2	1.69	0.53	74.0%
										0.00		0.00	15.63	20.09		70.04		1094.54										
										0.00		0.00	0.00	20.09				0.00										
	81	82	-							0.00		0.00	14.44	20.62	51.05			737.18	1814.1		13.9	1350 CONC	1.3716	0.013	0.20	2490.2	1.69	0.14	72.9%
										0.00		0.00	15.63	20.62		68.92		1076.94										
										0.00		0.00	0.00	20.62				0.00										
	82	83	A19			0.16				0.16	0.70	0.31	14.75	20.76	50.84			749.97	1822.4		28.4	1350 CONC	1.3716	0.013	0.20	2490.2	1.69	0.28	73.2%
										0.00		0.00	15.63	20.76		68.63		1072.44										
										0.00		0.00	0.00	20.76				0.00										
	83	84	A20			0.60				0.60	0.70	1.17	15.92	21.04	50.42			802.57	1865.9		91.1	1350 CONC	1.3716	0.013	0.20	2490.2	1.69	0.90	74.9%
										0.00		0.00	15.63	21.04		68.05		1063.38										
										0.00		0.00	0.00	21.04				0.00										
Street 6	89	90	A21			0.79				0.79	0.70	1.54	1.54	10.00	76.81			118.08	118.1		100.0	450 PVC	0.4572	0.013	0.32	168.3	1.02	1.63	70.2%
										0.00		0.00	0.00	10.00				0.00										
										0.00		0.00	0.00	10.00				0.00										
	90	91	-							0.00		0.00	1.54	11.63	71.08			109.27	109.3		12.6	450 PVC	0.4572	0.013	0.32	168.3	1.02	0.20	64.9%
										0.00		0.00	0.00	11.63				0.00										
										0.00		0.00	0.00	11.63				0.00										
	91	84	A22			0.41				0.41	0.70	0.80	2.34	11.83	70.43			164.46	164.5		64.2	525 CONC	0.5334	0.013	0.32	253.8	1.14	0.94	64.8%
										0.00		0.00	0.00	11.83				0.00										
										0.00		0.00	0.00	11.83				0.00										
Street 6	84	85	A23			0.31				0.31	0.70	0.60	18.86	21.94	49.11			925.99	1961.4		70.0	1350 CONC	1.3716	0.013	0.32	3149.8	2.13	0.55	62.3%
										0.00		0.00	15.63	21.94		66.26		1035.44										
										0.00		0.00	0.00	21.94				0.00										
Street 7	65	94	A24			0.23				0.23	0.70	0.45	0.45	10.00	76.81			34.38	34.4		40.4	250 PVC	0.254	0.013	0.65	50.0	0.99	0.68	68.7%
										0.00		0.00	0.00	10.00				0.00										
										0.00		0.00	0.00	10.00				0.00										
	94	136	A25, B4			0.14			1.00	1.14	0.31	0.97	1.42	10.68	74.28			105.11	105.1		30.5	450 PVC	0.4572	0.013	0.20	133.0	0.81	0.63	79.0%
										0.00		0.00	0.00	10.68				0.00										
										0.00		0.00	0.00	10.68				0.00										
	136	85	A26			0.52				0.52	0.70	1.01	2.43	11.31	72.12			175.03	175.0		85.2	525 CONC	0.5334	0.013	0.20	200.6	0.90	1.58	87.2%
										0.00		0.00	0.00	11.31				0.00										
										0.00		0.00	0.00	11.31				0.00										
Street 8	85	86	A23, A27			0.83				0.83	0.70	1.62	22.90	22.49	48.35			1107.07	2126.3		47.1	1650 CONC	1.651	0.013	0.10	2886.9	1.35	0.58	73.7%
										0.00		0.00	15.63	22.49		65.23		1019.25										
										0.00		0.00	0.00	22.49				0.00										
	86	87	-							0.00		0.00	22.90	23.07	47.57			1089.20	2091.8		14.5	1650 CONC	1.651	0.013	0.10	2886.9	1.35	0.18	72.5%
										0.00		0.00	15.63	23.07		64.16		1002.63										
										0.00		0.00	0.00	23.07				0.00										
	87	2121	-							0.00		0.00	22.90	23.25	47.33			1083.83	2081.5		73.5	1650 CONC	1.651	0.013	0.10	2886.9	1.35	0.91	72.1%
										0.00		0.00	15.63	23.25		63.84		997.64										
										0.00		0.00	0.00	23.25				0.00										
TO TRUNK STORM SEWER																												

DEMAND EQUATION

Q = 2.78 AIR Where : **Q = Peak flow in litres per second (L/s)**
A = Area in hectares (ha)
R = Weighted runoff coefficient (increased by 25% for 100-year)
I = Rainfall intensity in millimeters per hour (mm/hr)
Rainfall Intensity (I) is based on City of Ottawa IDF data presented in the City of Ottawa Sewer Design Guidelines (Oct. 2012)

CAPACITY EQUATION

Q full= (1/n) A R^(2/3)So^(1/2) Where : **Q full = Capacity (L/s)**
n = Manning coefficient of roughness (0.013)
A = Flow area (m²)
R = Wetter perimenter (m)
So = Pipe Slope/gradient

BMR Lands - Innes
Overall Model Schematic

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Legend

- Junctions
  - Visible
  - Manholes
  - Outfalls
- Storages
  - Visible
  - Surface Storage
- Conduits
  - Visible
  - Storm Sewers
  - Major System
  - Orifices
- Subcatchments
  - Visible
  - Park
  - Residential - 2-year Control
  - Residential - 5-year Control
  - External Area
  - Background

N

300 m

4/3/2020
PREPARED BY: NOVATECH

BMR Lands - Innes
HGL Elevations

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Manhole ID	MH Invert Elevation (m)	T/G Elevation (m)	HGL Elevation - 100yr4hr (m)	HGL Elevation - 100yr4hr+20% (m)	Min USF (m)	Clearance below T/G (100yr) (m)	Clearance below T/G (100yr+20%) (m)
MH043	85.30	88.41	85.30	85.30	85.60	3.11	3.11
MH045	84.62	88.72	85.11	85.17	85.41	3.61	3.55
MH065	83.77	87.88	83.77	83.77	84.07	4.11	4.11
MH072	86.30	90.08	86.30	86.37	86.60	3.78	3.71
MH073	85.97	90.04	86.22	86.36	86.52	3.82	3.68
MH074	85.93	89.98	86.22	86.36	86.52	3.76	3.62
MH075	84.61	89.76	86.21	86.36	86.51	3.55	3.40
MH076	84.42	89.31	85.98	86.11	86.28	3.33	3.20
MH077	84.18	89.32	85.69	85.78	85.99	3.63	3.54
MH078	84.75	88.99	85.12	85.18	85.42	3.87	3.81
MH079	83.83	88.61	85.11	85.17	85.41	3.50	3.44
MH080	83.37	88.37	84.88	84.93	85.18	3.49	3.44
MH081	83.24	88.09	84.71	84.76	85.01	3.38	3.33
MH082	83.22	88.01	84.66	84.70	84.96	3.35	3.31
MH083	83.13	87.89	84.56	84.60	84.86	3.33	3.29
MH084	82.79	87.85	84.21	84.24	84.51	3.64	3.61
MH085	82.12	87.54	83.45	83.48	83.75	4.09	4.06
MH086	81.76	87.43	83.36	83.39	83.66	4.07	4.04
MH087	81.71	87.58	83.34	83.36	83.64	4.24	4.22
MH089	84.28	88.21	84.28	84.28	84.58	3.93	3.93
MH090	83.93	88.07	83.93	84.03	84.23	4.14	4.04
MH091	83.81	88.08	84.21	84.24	84.51	3.87	3.84
MH094	83.61	87.79	83.61	83.61	83.91	4.18	4.18
MH095	83.73	88.60	85.25	85.33	85.55	3.35	3.27
MH096	83.67	88.57	85.23	85.30	85.53	3.34	3.27
MH097	85.75	89.18	86.11	86.30	86.41	3.07	2.88
MH098	85.34	86.33	86.11	86.30	86.41	0.22	0.03
MH099	85.47	90.11	86.91	87.12	87.21	3.20	2.99
MH100	85.25	89.98	86.69	86.88	86.99	3.29	3.10
MH101	85.47	89.91	86.63	86.82	86.93	3.28	3.09
MH136	83.48	87.72	83.48	83.48	83.78	4.24	4.24

BMR Lands - Innes
HGL Elevations

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Manhole ID	MH Invert Elevation (m)	T/G Elevation (m)	HGL Elevation - 100yr4hr (m)	HGL Elevation - 100yr4hr+20% (m)	Min USF (m)	Clearance below T/G (100yr) (m)	Clearance below T/G (100yr+20%) (m)
MH149	87.30	90.94	87.30	87.67	87.60	3.64	3.27
MH150	86.78	90.38	87.41	87.66	87.71	2.97	2.72
MH151	86.10	90.05	87.41	87.65	87.71	2.64	2.40
MH152	85.88	90.14	87.32	87.56	87.62	2.82	2.58
MH153	85.62	90.08	87.08	87.30	87.38	3.00	2.78
MH2121	79.91	86.74	83.15	83.17	83.45	3.59	3.57
MH2142	79.80	86.96	83.01	83.02	83.31	3.95	3.94
MH2143	79.54	86.89	82.94	82.94	83.24	3.95	3.95
MH2144	79.46	86.79	82.92	82.92	83.22	3.87	3.87

BMR Lands - Innes
Design Storm Time Series Data
3-hour Chicago Design Storms

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C25mm-3.stm		C2-3.stm		C5-3.stm	
Duration	Intensity	Duration	Intensity	Duration	Intensity
min	mm/hr	min	mm/hr	min	mm/hr
0:00	0	0:00	0	0:00	0
0:10	2.21	0:10	2.81	0:10	3.68
0:20	2.75	0:20	3.5	0:20	4.58
0:30	3.68	0:30	4.69	0:30	6.15
0:40	5.73	0:40	7.3	0:40	9.61
0:50	14.29	0:50	18.21	0:50	24.17
1:00	60.28	1:00	76.81	1:00	104.19
1:10	18.9	1:10	24.08	1:10	32.04
1:20	9.7	1:20	12.36	1:20	16.34
1:30	6.53	1:30	8.32	1:30	10.96
1:40	4.94	1:40	6.3	1:40	8.29
1:50	3.99	1:50	5.09	1:50	6.69
2:00	3.37	2:00	4.29	2:00	5.63
2:10	2.92	2:10	3.72	2:10	4.87
2:20	2.58	2:20	3.29	2:20	4.3
2:30	2.32	2:30	2.95	2:30	3.86
2:40	2.1	2:40	2.68	2:40	3.51
2:50	1.93	2:50	2.46	2:50	3.22
3:00	1.79	3:00	2.28	3:00	2.98

BMR Lands - Innes
Design Storm Time Series Data
3-hour Chicago Design Storms

C100-3.stm		C100-3+20%.stm	
Duration	Intensity	Duration	Intensity
min	mm/hr	min	mm/hr
0:00	0	0:00	0
0:10	6.05	0:10	6:14
0:20	7.54	0:20	9.05
0:30	10.16	0:30	12.19
0:40	15.97	0:40	19.16
0:50	40.65	0:50	48.78
1:00	178.56	1:00	214.27
1:10	54.05	1:10	64.86
1:20	27.32	1:20	32.78
1:30	18.24	1:30	21.89
1:40	13.74	1:40	16.49
1:50	11.06	1:50	13.27
2:00	9.29	2:00	11.15
2:10	8.02	2:10	9.62
2:20	7.08	2:20	8.5
2:30	6.35	2:30	7.62
2:40	5.76	2:40	6.91
2:50	5.28	2:50	6.34
3:00	4.88	3:00	5.86

BMR Lands - Innes
Design Storm Time Series Data
SCS Design Storms

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S2-12.stm		S5-12.stm		S100-12.stm	
Duration	Intensity	Duration	Intensity	Duration	Intensity
min	mm/hr	min	mm/hr	min	mm/hr
0:00	0.00	0:00	0	0:00	0
0:30	1.27	0:30	1.69	0:30	2.82
1:00	0.59	1:00	0.79	1:00	1.31
1:30	1.10	1:30	1.46	1:30	2.44
2:00	1.10	2:00	1.46	2:00	2.44
2:30	1.44	2:30	1.91	2:30	3.19
3:00	1.27	3:00	1.69	3:00	2.82
3:30	1.69	3:30	2.25	3:30	3.76
4:00	1.69	4:00	2.25	4:00	3.76
4:30	2.29	4:30	3.03	4:30	5.07
5:00	2.88	5:00	3.82	5:00	6.39
5:30	4.57	5:30	6.07	5:30	10.14
6:00	36.24	6:00	48.08	6:00	80.38
6:30	9.23	6:30	12.25	6:30	20.47
7:00	4.06	7:00	5.39	7:00	9.01
7:30	2.71	7:30	3.59	7:30	6.01
8:00	2.37	8:00	3.15	8:00	5.26
8:30	1.86	8:30	2.47	8:30	4.13
9:00	1.95	9:00	2.58	9:00	4.32
9:30	1.27	9:30	1.69	9:30	2.82
10:00	1.02	10:00	1.35	10:00	2.25
10:30	1.44	10:30	1.91	10:30	3.19
11:00	0.93	11:00	1.24	11:00	2.07
11:30	0.85	11:30	1.12	11:30	1.88
12:00	0.85	12:00	1.12	12:00	1.88

BMR Lands - Innes
Design Storm Time Series Data
SCS Design Storms

NOVATECH
Engineers, Planners & Landscape Architects

S2-24.stm		S5-24.stm		S100-24.stm	
Duration	Intensity	Duration	Intensity	Duration	Intensity
min	mm/hr	min	mm/hr	min	mm/hr
0:00	0.00	0:00	0	0:00	0
1:00	0.72	1:00	0.44	1:00	0.6
2:00	0.34	2:00	0.44	2:00	0.75
3:00	0.63	3:00	0.81	3:00	1.39
4:00	0.63	4:00	0.81	4:00	1.39
5:00	0.81	5:00	1.06	5:00	1.81
6:00	0.72	6:00	0.94	6:00	1.6
7:00	0.96	7:00	1.25	7:00	2.13
8:00	0.96	8:00	1.25	8:00	2.13
9:00	1.30	9:00	1.68	9:00	2.88
10:00	1.63	10:00	2.12	10:00	3.63
11:00	2.59	11:00	3.37	11:00	5.76
12:00	20.55	12:00	26.71	12:00	45.69
13:00	5.23	13:00	6.8	13:00	11.64
14:00	2.30	14:00	2.99	14:00	5.12
15:00	1.54	15:00	2	15:00	3.42
16:00	1.34	16:00	1.75	16:00	2.99
17:00	1.06	17:00	1.37	17:00	2.35
18:00	1.11	18:00	1.44	18:00	2.46
19:00	0.72	19:00	0.94	19:00	1.6
20:00	0.58	20:00	0.75	20:00	1.28
21:00	0.81	21:00	1.06	21:00	1.81
22:00	0.53	22:00	0.68	22:00	1.17
23:00	0.48	23:00	0.63	23:00	1.07
0:00	0.48	0:00	0.63	0:00	1.07

Appendix D
Sanitary Sewer Design Sheets and Sanitary Calculations

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION						COMM		INSTIT		PARK		C+I+I	INFILTRATION				PIPE					
STREET	FROM M.H.	TO M.H.	AREA (ha)	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL (FULL) (m/s)	VEL (ACT.) (m/s)
North West Sanitary Trunk																									
Trunk 1	1007A	1008A			0.00	0			2.58	2.58					1.57	2.58	2.58	0.85	2.42	58.00	200.00	0.65	26.44	0.09	0.84	0.52
COMMERCIAL	1008A	1009A			0.00	0				2.58					1.57	0.00	2.58	0.85	2.42	86.50	250.00	0.25	29.73	0.08	0.61	0.37
COMMERCIAL	1009A	1010A			0.00	0			1.29	3.87					2.35	1.29	3.87	1.28	3.63	86.50	250.00	0.25	29.73	0.12	0.61	0.41
COMMERCIAL					0.00	0			0.22	4.09						0.22	4.09								
COMMERCIAL	1010A	1011A			0.00	0			1.63	5.72					3.48	1.63	5.72	1.89	5.37	39.50	300.00	0.20	43.25	0.12	0.61	0.00
COMMERCIAL	1011A	1012A			0.00	0			0.99	6.71					4.08	0.99	6.71	2.21	6.29	99.50	375.00	0.15	67.91	0.09	0.61	0.38
COMMERCIAL	1012A	1013A			0.00	0			1.41	8.12					4.93	1.41	8.12	2.68	7.61	117.00	375.00	0.15	67.91	0.11	0.61	0.40
COMMERCIAL	1013A	1014A			0.00	0			1.41	9.53					5.79	1.41	9.53	3.14	8.93	112.00	375.00	0.15	67.91	0.13	0.61	0.41
COMMERCIAL	1014A	1022A			0.00	0			1.54	11.07					6.73	1.54	11.07	3.65	10.38	83.50	375.00	0.15	67.91	0.15	0.61	0.44
COMMERCIAL	1022A	1023A			0.00	0			7.02	18.09					10.99	7.02	18.09	5.97	16.96	96.50	375.00	0.15	67.91	0.25	0.61	0.51
	1023A	1024A	0.65	66	0.65	66	3.63	0.78		18.09					10.99	0.65	18.74	6.18	17.95	81.00	450.00	0.12	98.76	0.18	0.62	0.47
	1024A	1025A	0.20	21	0.85	87	3.61	1.02		18.09					10.99	0.20	18.94	6.25	18.26	79.00	450.00	0.12	98.76	0.18	0.62	0.47
	1025A	1026A	0.13	14	0.98	101	3.59	1.18		18.09					10.99	0.13	19.07	6.29	18.46	51.00	450.00	0.12	98.76	0.19	0.62	0.48
	1026A	1027A	0.20	21	1.18	122	3.58	1.42		18.09					10.99	0.20	19.27	6.36	18.77	74.00	450.00	0.12	98.76	0.19	0.62	0.48
	1027A	1028A			1.18	122				18.09					10.99	0.00	19.27	6.36	17.35	11.00	450.00	0.12	98.76	0.18	0.62	0.47
	1028A	1029A	0.40	41	1.58	163	3.54	1.87		18.09					10.99	0.40	19.67	6.49	19.35	100.00	450.00	0.12	98.76	0.20	0.62	0.48
	1029A	1037A	0.60	61	2.18	224	3.50	2.54		18.09					10.99	0.60	20.27	6.69	20.22	94.00	450.00	0.12	98.76	0.20	0.62	0.48
	1037A	1040A	3.30	334	5.48	558	3.36	6.08		18.09					10.99	3.30	23.57	7.78	24.85	79.00	450.00	0.12	98.76	0.25	0.62	0.51
	1040A	1049A	1.45	147	6.93	705	3.31	7.56		18.09					10.99	1.45	25.02	8.26	26.81	79.00	450.00	0.12	98.76	0.27	0.62	0.52
	1049A	1058A	4.50	455	11.43	1160	3.21	12.07		18.09					10.99	4.50	29.52	9.74	32.80	81.50	450.00	0.12	98.76	0.33	0.62	0.56
PARK	1058A	1059A	5.80	586	17.23	1746	3.10	17.54		18.09			1.27	1.27	11.20	7.07	36.59	12.07	40.81	120.50	450.00	0.12	98.76	0.41	0.62	0.59
	1059A	1090A	0.70	71	17.93	1817	3.09	18.20		18.09				1.27	11.20	0.70	37.29	12.31	41.71	123.00	450.00	0.12	98.76	0.42	0.62	0.59
PARK, EXT FUT			4.30	620	22.23	2437			5.27	23.36			0.56	1.83		10.13	47.42									
	1090A	1095A	12.65	1278	34.88	3715	2.89	34.79		23.36				1.83	14.49	12.65	60.07	19.82	69.10	75.00	450.00	0.15	110.42	0.63	0.69	0.73
Contribution from Trunk 2, MH 1094A-1095A					10.74	1478				0.00				4.64			15.38									
	1095A	1096A	0.50	51	46.12	5244	2.78	47.24		23.36				6.47	15.24	0.50	75.95	25.06	87.54	79.00	525.00	0.12	148.98	0.59	0.69	0.72
	1096A	1107A	2.26	229	48.38	5473	2.77	49.13		23.36				6.47	15.24	2.26	78.21	25.81	90.18	86.50	525.00	0.10	136.00	0.66	0.63	0.67
	1107A	1108A	4.24	429	52.62	5902	2.74	52.41		23.36				6.47	15.24	4.24	82.45	27.21	94.86	87.00	525.00	0.42	278.71	0.34	1.29	1.16
PARK	1108A	1132A	0.06	8	52.68	5910	2.74	52.48		23.36			1.16	7.63	15.43	1.22	83.67	27.61	95.52	31.50	525.00	0.10	136.00	0.70	0.63	0.68
CONTRIBUTION FROM EXTERNAL			0.96	144	53.64	6054	2.73	53.56	4.42	27.78				7.63		5.38	89.05									
			0.95	137	54.59	6191				27.78				7.63		0.95	90.00									
	1132A	1133A	9.80	990	64.39	7181	2.68	62.37		27.78				7.63	18.11	9.80	99.80	32.93	113.41	15.50	600.00	0.10	194.17	0.58	0.69	0.72
	1133A	1A (B.O.)			64.39	7181	2.68	62.37		27.78				7.63	18.11	0.00	99.80	32.93	113.41	15.50	600.00	0.10	194.17	0.58	0.69	0.72
To MH 1A By Others																										
Trunk 2																										
PARK	1203A	1204A	0.40	58	0.40	58				0.00			4.64	4.64	0.75	5.04	5.04	1.66	2.41	81.00	300.00	0.65	77.96	0.03	1.10	0.48
	1204A	1205A	0.89	129	1.29	187	3.53	2.14		0.00				4.64	0.75	0.89	5.93	1.96	4.85	111.00	300.00	0.20	43.25	0.11	0.61	0.40
	1205A	1206A	0.83	120	2.12	307	3.46	3.44		0.00				4.64	0.75	0.83	6.76	2.23	6.42	74.00	300.00	0.20	43.25	0.15	0.61	0.44
	1206A	1207A	1.03	149	3.15	456	3.40	5.02		0.00				4.64	0.75	1.03	7.79	2.57	8.34	75.00	300.00	0.20	43.25	0.19	0.61	0.47
	1207A	1208A			3.15	456				0.00				4.64	0.75	0.00	7.79	2.57	3.32	100.50	300.00	0.20	43.25	0.08	0.61	0.37

LICENSED PROFESSIONAL ENGINEER
K. MITIC
100122349
OCT. 18, 2019
PROVINCE OF ONTARIO

DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.108	Harmon Correction Factor =	0.800		
Average Daily Flow =	280	l/p/day		Industrial Peak Factor = as per MOE Graph			
Comm/Inst Flow =	35000	L/ha/da	0.405	Extraneous Flow =	0.330	L/s/ha	
Industrial Flow =	35000	L/ha/da	0.405	Minimum Velocity =	0.600	m/s	
Max Res. Peak Factor =	4.00			Manning's n = (Conc)	0.013	(Pvc)	0.013
Commercial/Inst./Park Peak Factor =	1.50	if ICI >20%	1.00	if ICI <20%			
Mixed Use	35000.00	L/ha/da					
Institutional =	0.405	l/s/Ha					

Designed: R.B	PROJECT: Orleans EUC MUC		
Checked: K.M	LOCATION: City of Ottawa		
Dwg. Reference:	File Ref: 14-733	Date: October, 2019	Sheet No. 1 of 2

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D1

SANITARY SEWER DESIGN SHEET (PRELIMINARY)

Novatech Project #: 118224
Project Name: 3610 Innes Road (Former BMR Lands)
Date Prepared: 10/4/2019
Date Revised: 3/4/2020
Input By: Ben Sweet
Reviewed By: Sam Bahia
Drawing Reference: 118224-GP AND 118224-SAN

Legend:
- PROJECT SPECIFIC INFO
- USER DESIGN INPUT
- CUMILATIVE CELL
- CALCULATED DESIGN CELL OUTPUT
- CALCULATED ANNUAL CELL OUTPUT
- CALCULATED RARE CELL OUTPUT
- USER AS-BUILT INPUT

NOVATECH
Engineers, Planners & Landscape Architects

LOCATION				DEMAND												DESIGN CAPACITY							
				RESIDENTIAL FLOW										EXTRANOUS FLOW AREA METHOD		TOTAL DESIGN FLOW	PROPOSED SEWER PIPE SIZING / DESIGN							
STREET	AREA	FROM MH	TO MH	SINGLES	SEMIS/ TOWNS	APARTS	PARK AREA (ha)	POPULATION (in 1000's)	CUMULATIVE POPULATION (in 1000's)	PEAK FACTOR M	AVG POPULATION FLOW Q(q) (L/s)	PEAKED DESIGN POP FLOW Q(p) (L/s)	RESIDENTIAL DRAINAGE AREA (ha.)	CUMULATIVE RES DRAINAGE AREA (ha.)	CUMULATIVE EXTRANOUS DRAINAGE AREA (ha.)	DESIGN EXTRAN. FLOW Q(e) (L/s)	TOTAL DESIGN FLOW Q(D) (L/s)	LENGTH (m)	PIPE SIZE (mm) AND MATERIAL	PIPE ID ACTUAL (m)	ROUGH. (n)	DESIGN GRADE (%)	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	Qpeak Design / Qcap
	A1, A2	143	144			42		0.088	0.088	4.00	0.29	0.91	0.980	0.980	0.980	0.32	1.24	82.8	200 PVC	0.203	0.013	0.32	19.4	0.60	6.4%
	A3	144	146			42		0.088	0.176	4.00	0.57	1.83	0.590	1.570	1.570	0.52	2.35	40.6	200 PVC	0.203	0.013	0.32	19.4	0.60	12.1%
Street 9	A4	146	141			84		0.176	0.353	4.00	1.14	3.66	1.160	2.730	2.730	0.90	4.56	72.5	200 PVC	0.203	0.013	0.32	19.4	0.60	23.6%
	A5	141	15	4				0.014	0.366	4.00	1.19	3.80	0.180	2.910	2.910	0.96	4.76	41.2	200 PVC	0.203	0.013	0.32	19.4	0.60	24.6%
	A6	15	52	7				0.024	0.390	4.00	1.26	4.05	0.310	3.220	3.220	1.06	5.11	62.1	200 PVC	0.203	0.013	0.32	19.4	0.60	26.4%
	A7	52	54	3				0.010	0.400	4.00	1.30	4.15	0.190	3.410	3.410	1.13	5.28	14.4	200 PVC	0.203	0.013	0.32	19.4	0.60	27.3%
	A8	54	22		27			0.073	0.473	3.99	1.53	4.89	0.780	4.190	4.190	1.38	6.27	113.2	200 PVC	0.203	0.013	0.32	19.4	0.60	32.4%
	A9	16	18		26			0.070	0.070	4.00	0.23	0.73	0.760	0.760	0.760	0.25	0.98	103.4	200 PVC	0.203	0.013	0.32	19.4	0.60	5.1%
Street 2	A10	18	20	3				0.010	0.080	4.00	0.26	0.83	0.190	0.950	0.950	0.31	1.15	11.5	200 PVC	0.203	0.013	0.32	19.4	0.60	5.9%
	A11	20	22	7				0.024	0.104	4.00	0.34	1.08	0.300	1.250	1.250	0.41	1.49	65.4	200 PVC	0.203	0.013	0.32	19.4	0.60	7.7%
Street 2	A12	22	24	7				0.024	0.601	3.93	1.95	6.13	0.340	5.780	5.780	1.91	8.04	76.0	200 PVC	0.203	0.013	0.32	19.4	0.60	41.5%
Street 1	A13	48	49		18			0.049	0.049	4.00	0.16	0.50	0.650	0.650	0.650	0.21	0.72	80.1	200 PVC	0.203	0.013	0.32	19.4	0.60	3.7%
	A14	49	24		21			0.057	0.105	4.00	0.34	1.09	0.580	1.230	1.230	0.41	1.50	79.7	200 PVC	0.203	0.013	0.32	19.4	0.60	7.7%
Street 3	A15	24	26		8			0.022	0.728	3.88	2.36	7.33	0.330	7.340	7.340	2.42	9.76	76.0	200 PVC	0.203	0.013	0.32	19.4	0.60	50.4%
	A19	26	57	19				0.065	0.793	3.86	2.57	7.94	0.800	8.140	8.140	2.69	10.63	113.6	250 PVC	0.254	0.013	0.24	30.4	0.60	35.0%
Street 4	A20	57	59	2				0.007	0.800	3.86	2.59	8.00	0.190	8.330	8.330	2.75	10.75	13.6	250 PVC	0.254	0.013	0.24	30.4	0.60	35.4%
	A21	59	30	5				0.017	0.817	3.86	2.65	8.16	0.260	8.590	8.590	2.83	11.00	64.1	250 PVC	0.254	0.013	0.24	30.4	0.60	36.2%
Street 3	A16	26	28		9			0.024	0.024	4.00	0.08	0.25	0.290	0.290	0.290	0.10	0.35	73.1	200 PVC	0.203	0.013	0.65	27.6	0.85	1.3%
Street 5	A17	140	28	3				0.010	0.010	4.00	0.03	0.11	0.150	0.150	0.150	0.05	0.16	27.7	200 PVC	0.203	0.013	0.65	27.6	0.85	0.6%
Street 5	A18	28	30	21				0.071	0.106	4.00	0.34	1.10	0.840	1.280	1.280	0.42	1.52	124.7	200 PVC	0.203	0.013	0.32	19.4	0.60	7.9%
	A22	30	135	6				0.020	0.943	3.82	3.06	9.33	0.330	10.200	10.200	3.37	12.70	73.0	250 PVC	0.254	0.013	0.24	30.4	0.60	41.8%
	A23	135	32	9				0.031	0.974	3.81	3.15	9.61	0.400	10.600	10.600	3.50	13.11	53.2	250 PVC	0.254	0.013	0.24	30.4	0.60	43.1%
Street 4	A24	32	34	3				0.010	0.984	3.80	3.19	9.70	0.180	10.780	10.780	3.56	13.26	14.0	250 PVC	0.254	0.013	0.24	30.4	0.60	43.6%
	A25	34	36	3				0.010	0.994	3.80	3.22	9.80	0.150	10.930	10.930	3.61	13.40	25.9	250 PVC	0.254	0.013	0.24	30.4	0.60	44.1%
	A26	36	38	14				0.048	1.042	3.79	3.38	10.23	0.600	11.530	11.530	3.80	14.03	93.7	250 PVC	0.254	0.013	0.24	30.4	0.60	46.2%
	A27	62	63	16				0.054	0.054	4.00	0.18	0.56	0.710	0.710	0.710	0.23	0.80	103.8	200 PVC	0.203	0.013	0.32	19.4	0.60	4.1%
Street 6	A28	63	65	2				0.007	0.061	4.00	0.20	0.63	0.160	0.870	0.870	0.29	0.92	12.6	200 PVC	0.203	0.013	0.32	19.4	0.60	4.8%
	A29	65	38	6				0.020	0.082	4.00	0.26	0.85	0.310	1.180	1.180	0.39	1.24	64.2	200 PVC	0.203	0.013	0.32	19.4	0.60	6.4%
Street 6	A30	38	1107A	6				0.020	1.144	3.76	3.71	11.15	0.310	13.020	13.020	4.30	15.45	73.2	250 PVC	0.254	0.013	0.32	35.1	0.69	44.0%
TO TRUNK SANITARY SEWER																									
	EXT	CAP2	70	113				0.384	0.384	4.00	1.25	3.98	3.470	3.470	3.470	1.15	5.13	40.4	200 PVC	0.203	0.013	0.32	19.4	0.60	26.5%
Street 8	A31	70	68	8				0.027	0.411	4.00	1.33	4.27	0.500	3.970	3.970	1.31	5.58	12.5	200 PVC	0.203	0.013	0.32	19.4	0.60	28.8%
	A32	68	1107A	5				0.017	0.428	4.00	1.39	4.44	0.270	4.240	4.240	1.40	5.84	46.0	200 PVC	0.203	0.013	0.32	19.4	0.60	30.2%
TO TRUNK SANITARY SEWER																									
	A34	201	203	12				0.041	0.041	4.00	0.13	0.42	0.520	0.520	0.520	0.17	0.59	87.0	200 PVC	0.203	0.013	0.32	19.4	0.60	3.1%
	A35	203	205	3				0.010	0.051	4.00	0.17	0.53	0.140	0.660	0.660	0.22	0.75	19.1	200 PVC	0.203	0.013	0.32	19.4	0.60	3.9%
Street 7	A36	205	207				1.000	0.003	0.054	4.00	0.18	0.56	1.000	1.660	1.660	0.55	1.11	12.0	200 PVC	0.203	0.013	0.32	19.4	0.60	5.7%
	A37	207	209	5				0.017	0.071	4.00	0.23	0.74	0.230	1.890	1.890	0.62	1.36	38.1	200 PVC	0.203	0.013	0.32	19.4	0.60	7.0%
	-	209	1133A					0.000	0.071	4.00	0.23	0.74	0.000	1.890	1.890	0.62	1.36	2.8	200 PVC	0.203	0.013	0.32	19.4	0.60	7.0%
TO TRUNK SANITARY SEWER																									
TOTALS				292	109	168	1.000		1.644																

DEMAND EQUATION

Design Parameters:

1. Q(D), Q(A), Q(R) = Q(p) + Q(fd) + Q(ici) + Q(e)
2. Q(p) = (P x q x M x K / 86,400)
3. q Avg capita flow (L/per/day)= 280 L/per/day (design); 200 L/per/day (annual and rare)
4. M = Harmon Formula (maximum of 4.0)
5. K = 0.8 (design); 0.6 (annual and rare)
6. Park flow is considered equivalent to a single unit / ha
   Park Demand = 1 Single Unit Equivalent / Park ha
7. Foundation Drains 0.45 L/s/unit
8. Q(ici) = ICI Area x ICI Flow x ICI Peak
9. Q(e) = 0.33 L/sec/ha (design); 0.30 L/sec/ha (annual); 0.55 L/sec/ha (rare)

Definitions:

Q(D) = Peak Design Flow (L/sec) Q(A) = Peak Annual Flow (L/sec) Q(R) = Peak Rare Flow (L/sec)
Q(e) = Extraneous Flow (L/sec)
Q(p) = Population Flow (L/sec)

	Singles	Semis/Towns	Apts (2-BR)
K = Harmon Correction Factor			
P = Residential Population	3.4	2.7	2.1
Typ Service Diameter (mm)		135	
Typ Service Length (m)	15	15	
I/I Pipe Rate (L/mm dia/m/hr) =	0.007		

Q(fd) = Foundation Flow (L/sec)
Q(ici) = Industrial / Commercial / Institutional Flow (L/sec)

Institutional / Commercial / Industrial			Industrial	Commercial / Institutional	
	Design =		35000	28000	L/gHa/d
	Annual / Rare =		10000	17000	L/gHa/d
ICI Peak *	Design =	Std ICI -->	1.0	1.5	* ICI Peak = 1.0 Default, 1.5 if ICI in contributing area is >20% (design only)
	Annual / Rare =		1.0		

CAPACITY EQUATION

Q full= (1/n) A R^(2/3)So^(1/2)
Where : Q full = Capacity (L/s)
n = Manning coefficient of roughness (0.013)
A = Flow area (m^2)
R = Wetter perimenter (m)
So = Pipe Slope/gradient

NOTES

External Flows to be determined as part of detailed design process. Futher coordination with DSEL required.

FOREST VALLEY TRUNK AND ORLEANS CUMBERLAND COLLECTOR CAPACITY ANALYSIS

634-00465

Prepared by:

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Prepared for:

City of Ottawa
111 Lisgar Street
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Ottawa, ON K1P 1J1

October 2003

Stantec

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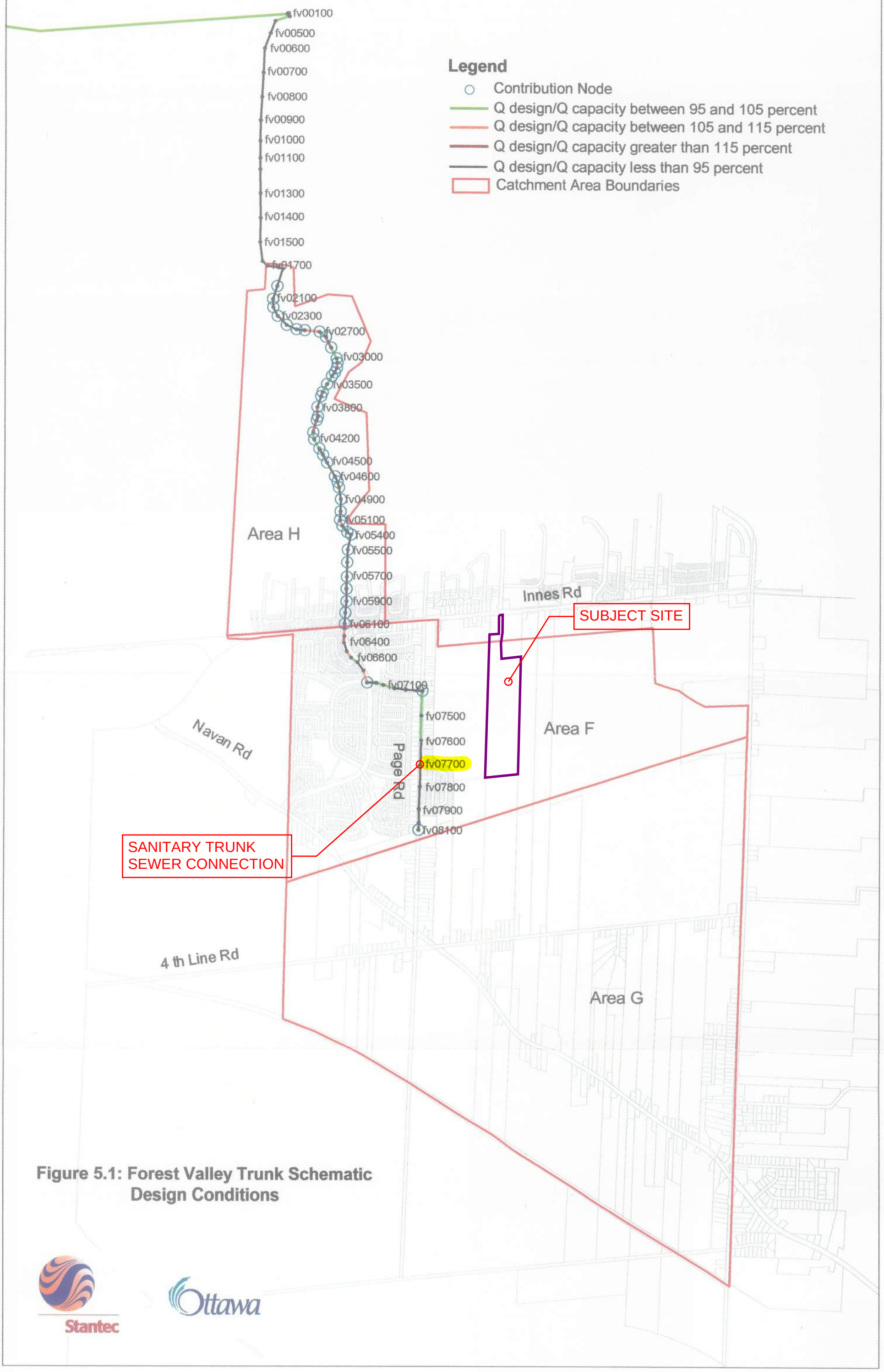


Figure 5.1: Forest Valley Trunk Schematic Design Conditions

Stantec

Ottawa

david schaeffer engineering ltd

120 Iber Road, Suite 103
Ottawa, Ontario K2S 1E9
Tel. (613)836-0856
Fax (613) 836-7183
www.DSEL.ca

DESIGN BRIEF

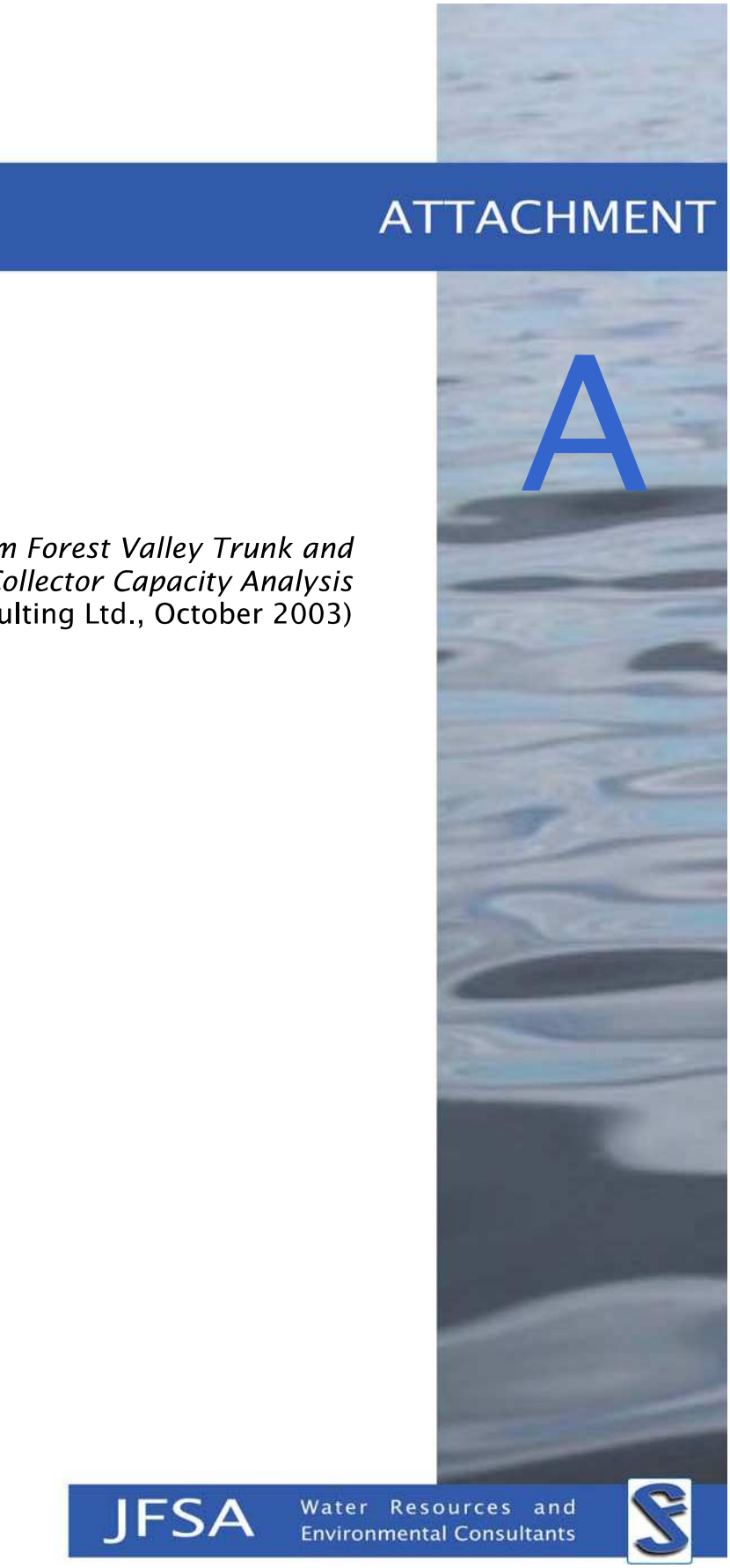
FOR

CAIVAN (ORLEANS VILLAGE) LIMITED
3490 INNES ROAD

CITY OF OTTAWA

PROJECT NO.: 15-881

MAY 2018 – VER 2



ATTACHMENT

A

Excerpts from Forest Valley Trunk and Orleans Cumberland Collector Capacity Analysis
(Stantec Consulting Ltd., October 2003)

JFSA Water Resources and Environmental Consultants

TABLE 5-1
Summary of FVT Wasterwater Flows and HGL

LEGEND
- Catchment Node
- Q/Qcap between 95% and105%
- Q/Qcap between 105% and115%
- Q/Qcap greater than 115%
- Q/Qcap greater than 95% and HGL is above basement elevation (OG-3.3m)

USMH	DSMH	LENGTH	USINV	USOBV	GROUND	USF Elev. (3.3m below OG)	Qcap Manning's (L/s)	Design				Monitored (300Lpcd, 0.50L/s/ha, K=0.60)				Monitored & Design			
								HGL (m)	Surcharge (m)	Q (L/s)	Q/Qc (%)	HGL (m)	Surcharge (m)	Q (L/s)	Q/Qc (%)	HGL (m)	Surcharge (m)	Q (L/s)	Q/Qc (%)
fv05100	fv05000	3,608	78.8	79.7	84.0	80.7	924	79.7	0.00	793	86%	79.7	0.00	661	71%	79.7	0.00	820	89%
fv05200	fv05100	3,646	78.9	79.8	84.3	81.0	731	79.8	0.01	793	109%	79.8	0.00	660	90%	79.8	0.02	819	112%
fv05300	fv05200	3,698	79.1	80.0	84.7	81.4	924	80.0	0.00	793	86%	80.0	0.00	660	71%	80.0	0.00	819	89%
fv05400	fv05300	3,724	79.1	80.0	85.5	82.2	822	80.0	0.00	792	96%	80.0	0.00	659	80%	80.0	0.00	819	100%
fv05500	fv05400	3,821	79.4	80.3	86.9	83.6	924	80.3	0.00	783	85%	80.3	0.00	649	70%	80.3	0.00	807	87%
fv05600	fv05500	3,898	79.6	80.5	87.9	84.6	844	80.5	0.00	783	93%	80.5	0.00	648	77%	80.5	0.00	807	96%
fv05700	fv05600	3,989	79.8	80.7	89.1	85.8	962	80.7	0.00	783	81%	80.7	0.00	648	67%	80.7	0.00	806	84%
fv05800	fv05700	4,063	80.0	80.9	89.0	85.7	864	80.9	0.00	773	89%	80.9	0.00	636	74%	80.9	0.00	794	92%
fv05900	fv05800	4,140	80.2	81.1	88.6	85.3	885	81.1	0.00	773	87%	81.1	0.00	636	72%	81.1	0.00	794	90%
fv06000	fv05900	4,210	80.3	81.2	88.6	85.3	885	81.2	0.00	773	87%	81.2	0.00	636	72%	81.2	0.00	793	90%
fv06100	fv06000	4,280	80.5	81.4	88.9	85.6	822	81.4	0.00	772	94%	81.4	0.00	636	77%	81.4	0.00	793	96%
fv06200	fv06100	4,306	80.5	81.4	88.8	85.5	864	81.4	0.00	772	89%	81.4	0.00	635	74%	81.4	0.00	793	92%
fv06300	fv06200	4,354	80.6	81.5	88.6	85.3	731	81.5	0.01	772	106%	81.5	0.00	635	87%	81.5	0.01	793	109%
fv06400	fv06300	4,397	80.6	81.5	88.5	85.2	653	81.6	0.02	772	118%	81.5	0.00	635	97%	81.6	0.02	793	121%
fv06500	fv06400	4,448	80.8	81.7	88.2	84.9	1016	81.7	0.00	772	76%	81.7	0.00	635	63%	81.7	0.00	793	78%
fv06600	fv06500	4,495	80.8	81.8	88.1	84.8	731	81.8	0.01	772	106%	81.8	0.00	635	87%	81.8	0.01	793	109%
fv06700	fv06600	4,544	80.9	81.8	87.8	84.5	778	81.8	0.00	772	99%	81.8	0.00	635	82%	81.9	0.02	793	102%
fv06800	fv06700	4,609	81.1	82.0	87.7	84.4	885	82.0	0.00	772	87%	82.0	0.00	635	72%	82.0	0.00	793	90%
fv06900	fv06800	4,688	81.2	82.1	87.0	83.7	706	82.1	0.02	772	109%	82.1	0.00	635	90%	82.2	0.03	793	112%
fv07000	fv06900	4,744	81.3	82.3	87.3	84.0	800	82.3	0.00	714	89%	82.3	0.00	561	70%	82.3	0.00	714	89%
fv07100	fv07000	4,791	81.4	82.4	87.6	84.3	680	82.4	0.01	714	105%	82.4	0.00	561	83%	82.4	0.01	714	105%
fv07200	fv07100	4,863	81.6	82.5	87.5	84.2	731	82.5	0.00	714	98%	82.5	0.00	561	77%	82.5	0.00	714	98%
fv07300	fv07200	4,934	81.8	82.7	87.8	84.5	1016	82.7	0.00	714	70%	82.7	0.00	561	55%	82.7	0.00	714	70%
fv07400	fv07300	5,037	81.9	82.9	88.0	84.7	1790	82.9	0.00	714	40%	82.9	0.00	561	31%	82.9	0.00	714	40%
fv07500	fv07400	5,189	82.224	83.138	87.8	84.5	706	83.1	0.00	533	76%	83.1	0.00	458	65%	83.1	0.00	533	76%
fv07600	fv07500	5,342	82.450	83.364	87.7	84.4	731	83.4	0.00	533	73%	83.4	0.00	458	63%	83.4	0.00	533	73%
fv07700	fv07600	5,495	82.608	83.522	87.8	84.5	597	83.5	0.00	533	89%	83.5	0.00	458	77%	83.5	0.00	533	89%
fv07800	fv07700	5,627	82.751	83.665	87.6	84.3	626	83.7	0.00	533	85%	83.7	0.00	458	73%	83.7	0.00	533	85%
fv07900	fv07800	5,766	82.877	83.791	87.1	83.8	1790	83.8	0.00	533	30%	83.8	0.00	458	26%	83.8	0.00	533	30%
fv08000	fv07900	5,852	82.965	83.879	86.4	83.1	1790	83.9	0.00	533	30%	83.9	0.00	458	26%	83.9	0.00	533	30%
fv08100	fv08000	5,897	83.011	83.925	86.0	82.7	597	83.9	0.00	533	89%	83.9	0.00	458	77%	83.9	0.00	533	89%

ATTACHMENT

B

XPSWMM Model Schematic

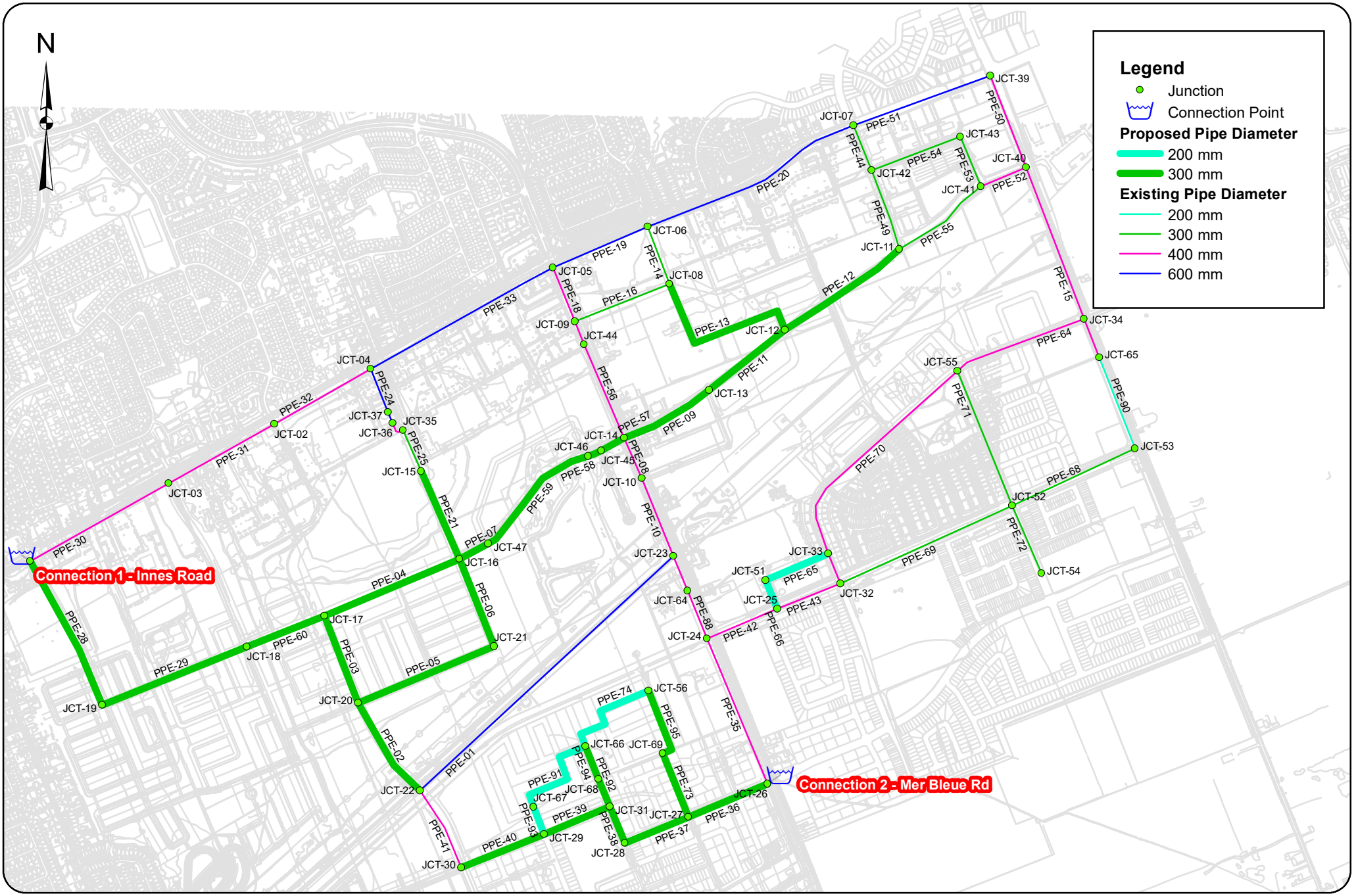
Pipe Data and Hydraulic Simulation Results

JFSA Water Resources and Environmental Consultants

Table B-2: Pipe Data and Hydraulic Simulation Results for the Sanitary Trunk Sewer (Monitored & Design Scenario, 165.2 L/s Redirected from fv07400 to fv07700)

U/S MH	D/S MH	U/S Invert (m)	D/S Invert (m)	Pipe Dia. / Height (mm)	Pipe Length (m)	Pipe Slope (%)	n	U/S MH Cover Elev. (m)	D/S MH Cover Elev. (m)	Design Vel. (m/s)	Design Flow (m^3/s)	Peak Pipe Flow (m^3/s)	Peak / Design Flow	Surcharge U/S [1] (m)	Max. U/S HGL (m)	Max. D/S HGL (m)	Freeboard U/S HGL and MH Cover [2] (m)	Compare to 2003 HGL Results (m)	
																		U/S HGL [3] (m)	Difference (m)
fv08100	fv08000	83.011	82.965	900	45.0	0.1	0.013	86.000	86.400	0.900	0.572	0.533	0.9	-0.166	83.745	83.705	2.255	83.9	-0.155
fv08000	fv07900	82.965	82.877	900	86.0	0.1	0.013	86.400	87.100	0.900	0.572	0.533	0.9	-0.160	83.705	83.631	2.695	83.9	-0.195
fv07900	fv07800	82.877	82.751	900	139.0	0.1	0.013	87.100	87.600	0.854	0.543	0.533	1.0	-0.146	83.631	83.515	3.469	83.8	-0.169
fv07800	fv07700	82.751	82.608	900	132.0	0.1	0.013	87.600	87.800	0.944	0.600	0.533	0.9	-0.136	83.515	83.410	4.085	83.7	-0.185
fv07700	fv07600	82.608	82.450	900	153.0	0.1	0.013	87.800	87.700	0.900	0.572	0.698	1.2	-0.098	83.410	83.194	4.390	83.5	-0.090
fv07600	fv07500	82.450	82.224	900	153.0	0.2	0.013	87.700	87.800	1.102	0.701	0.698	1.0	-0.156	83.194	82.968	4.506	83.4	-0.206
fv07500	fv07400	82.224	81.900	900	152.0	0.2	0.013	87.800	88.000	1.304	0.830	0.698	0.8	-0.156	82.968	82.637	4.832	83.1	-0.132
fv07400	fv07300	81.900	81.800	900	103.0	0.1	0.013	88.000	87.800	0.900	0.572	0.714	1.2	-0.163	82.637	82.442	5.363	82.9	-0.263
fv07300	fv07200	81.800	81.600	900	71.0	0.3	0.013	87.800	87.500	1.506	0.958	0.714	0.7	-0.258	82.442	82.306	5.358	82.7	-0.258
fv07200	fv07100	81.600	81.400	900	72.0	0.3	0.013	87.500	87.600	1.506	0.958	0.714	0.7	-0.194	82.306	82.201	5.194	82.5	-0.194
fv07100	fv07000	81.400	81.300	900	47.0	0.2	0.013	87.600	87.300	1.304	0.830	0.714	0.9	-0.099	82.201	82.133	5.399	82.4	-0.199
fv07000	fv06900	81.300	81.200	900	56.0	0.2	0.013	87.300	87.000	1.207	0.768	0.714	0.9	-0.067	82.133	81.994	5.167	82.3	-0.167
fv06900	fv06800	81.200	81.100	900	79.0	0.1	0.013	87.000	87.700	0.986	0.627	0.793	1.3	-0.106	81.994	81.834	5.006	82.2	-0.206
fv06800	fv06700	81.100	80.900	900	65.0	0.3	0.013	87.700	87.800	1.584	1.008	0.793	0.8	-0.166	81.834	81.713	5.866	82.0	-0.166
fv06700	fv06600	80.900	80.800	900	49.0	0.2	0.013	87.800	88.100	1.273	0.810	0.793	1.0	-0.087	81.713	81.621	6.087	81.9	-0.187
fv06600	fv06500	80.800	80.800	900	47.0	0.0	0.013	88.100	88.200	0.090	0.060	0.793	13.2	-0.079	81.621	81.515	6.479	81.8	-0.179
fv06500	fv06400	80.800	80.600	900	51.0	0.4	0.013	88.200	88.500	1.777	1.131	0.793	0.7	-0.185	81.515	81.422	6.685	81.7	-0.185
fv06400	fv06300	80.600	80.600	900	43.0	0.0	0.013	88.500	88.600	0.090	0.060	0.793	13.2	-0.078	81.422	81.335	7.078	81.6	-0.178
fv06300	fv06200	80.600	80.500	900	48.0	0.2	0.013	88.600	88.800	1.304	0.830	0.793	1.0	-0.165	81.335	81.241	7.265	81.5	-0.165
fv06200	fv06100	80.500	80.500	900	26.0	0.0	0.013	88.800	88.900	0.090	0.060	0.793	13.2	-0.159	81.241	81.174	7.559	81.4	-0.159
fv06100	fv06000	80.500	80.300	900	70.0	0.3	0.013	88.900	88.600	1.520	0.970	0.793	0.8	-0.226	81.174	81.023	7.726	81.4	-0.226
fv06000	fv05900	80.300	80.200	900	70.0	0.1	0.013	88.600	88.600	1.080	0.680	0.793	1.2	-0.177	81.023	80.858	7.577	81.2	-0.177
fv05900	fv05800	80.200	80.000	900	77.0	0.3	0.013	88.600	89.000	1.450	0.920	0.794	0.9	-0.242	80.858	80.669	7.742	81.1	-0.242
fv05800	fv05700	80.000	79.800	900	74.0	0.3	0.013	89.000	89.100	1.480	0.940	0.794	0.8	-0.231	80.669	80.500	8.331	80.9	-0.231
fv05700	fv05600	79.800	79.600	900	91.0	0.2	0.013	89.100	87.900	1.330	0.850	0.806	0.9	-0.200	80.500	80.296	8.600	80.7	-0.200
fv05600	fv05500	79.600	79.400	900	77.0	0.3	0.013	87.900	86.900	1.450	0.920	0.807	0.9	-0.204	80.296	80.126	7.604	80.5	-0.204
fv05500	fv05400	79.400	79.100	900	97.0	0.3	0.013	86.900	85.500	1.580	1.010	0.807	0.8	-0.174	80.126	79.840	6.774	80.3	-0.174
fv05400	fv05300	79.100	79.100	900	26.0	0.0	0.013	85.500	84.700	0.090	0.060	0.819	13.7	-0.160	79.840	79.744	5.660	80.0	-0.160
fv05300	fv05200	79.100	78.900	900	52.0	0.4	0.013	84.700	84.300	1.760	1.120	0.819	0.7	-0.256	79.744	79.615	4.956	80.0	-0.256
fv05200	fv05100	78.900	78.800	900	38.0	0.3	0.013	84.300	84.000	1.460	0.930	0.819	0.9	-0.185	79.615	79.513	4.685	79.8	-0.185
fv05100	fv05000	78.800	78.700	900	53.0	0.2	0.013	84.000	84.400	1.240	0.790	0.820	1.0	-0.187	79.513	79.383	4.487	79.7	-0.187
fv05000	fv04900	78.700	78.500	900	76.0	0.3	0.013	84.400	84.800	1.460	0.930	0.820	0.9	-0.217	79.383	79.198	5.017	79.6	-0.217
fv04900	fv04800	78.500	78.300	900	74.0	0.3	0.013	84.800	84.300	1.480	0.940	0.822	0.9	-0.202	79.198	79.033	5.602	79.4	-0.202
fv04800	fv04700	78.300	78.200	900	36.0	0.3	0.013	84.300	84.300	1.500	0.950	0.822	0.9	-0.167	79.033	78.956	5.267	79.2	-0.167
fv04700	fv04600	78.200	78.100	900	38.0	0.3	0.013	84.300	84.400	1.460	0.930	0.822	0.9	-0.144	78.956	78.882	5.344	79.1	-0.144
fv04600	fv04500	78.100	77.900	900	81.0	0.3	0.013	84.400	84.800	1.410	0.900	0.823	0.9	-0.118	78.882	78.735	5.518	79.0	-0.118
fv04500	fv04400	77.900	77.800	900	48.0	0.2	0.013	84.800	84.400	1.300	0.830	0.823	1.0	-0.065	78.735	78.648	6.065	78.8	-0.065
fv04400	fv04300	77.800	77.700	900	41.0	0.2	0.013	84.400	84.000	1.410	0.890	0.828	0.9	-0.052	78.648	78.572	5.752	78.7	-0.052
fv04300	fv04200	77.700	77.500	900	55.0	0.4	0.013	84.000	84.500	1.720	1.090	0.883	0.8	-0.028	78.572	78.443	5.428	78.6	-0.028
fv04200	fv04100	77.500	77.400	900	43.0	0.2	0.013	84.500	84.600	1.370	0.870	0.883	1.0	0.043	78.443	78.329	6.057	78.4	0.043
fv04100	fv04000	77.400	77.300	900	79.0	0.1	0.013	84.600	84.100	1.010	0.640	0.884	1.4	0.029	78.329	78.140	6.271	78.4	-0.071
fv04000	fv03900	77.300	77.200	900	21.0	0.5	0.013	84.100	83.900	1.960	1.250	0.889	0.7	-0.060	78.140	78.088	5.960	78.2	-0.060
fv03900	fv03800	77.200	77.100	900	61.0	0.2	0.013	83.900	83.600	1.150	0.730	0.889	1.2	-0.012	78.088	77.934	5.812	78.2	-0.112
fv03800	fv03700	77.100	76.900	900	71.0	0.3	0.013	83.600	83.600	1.510	0.960	0.891	0.9	-0.066	77.934	77.781	5.666	78.0	-0.066
fv03700	fv03600	76.900	76.900	900	27.0	0.0	0.013	83.600	83.700	0.090	0.060	0.892	14.9	-0.019	77.781	77.709	5.819	77.9	-0.119
fv03600	fv03500	76.900	76.800	900	55.0	0.2	0.013	83.700	84.000	1.210	0.770	0.893	1.2	-0.091	77.709	77.583	5.991	77.9	-0.191
fv03500	fv03400	76.800	76.600	900	59.0	0.3	0.013	84.000	83.800	1.660	1.050	0.895	0.9	-0.117	77.583	77.458	6.417	77.7	-0.117

Appendix E
Water Demand Calculations and Hydraulic Modeling



GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis East Urban Community Mixed-Use Centre Development**
Client: **David Schaeffer Engineering Ltd.**
Date: **July 2018**
Created by: **AM**
Reviewed by: **WdS**

0 400 800
Meters

Site Layout and Connection Points

Figure 1.1
B5

Boundary Conditions for BMR Lands

Date Provided September-19

Scenario	Demand	
	L/min	L/s
Average Daily Demand	306.06	5.101
Maximum Daily Demand	765.06	12.751
Peak Hour	1683.18	28.053
Fire Flow Demand #1	10020	167
Fire Flow Demand #2	13020	217
Fire Flow Demand #3	15000	250

# of connections 2

Location:

Results:

Connection 1 - Jargeau Road

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	130.9	61.0
Peak Hour	127.0	55.4
Max Day plus Fire 1	122.5	49.1
Max Day plus Fire 3	116.5	40.5

[1] Ground Elevation = 88.0 m

Max Day Plus Fire 2 = 118.9, 43.9

Connection 2 - Beaugency Street

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	130.9	61.0
Peak Hour	127.0	55.4
Max Day plus Fire 1	120.9	46.8
Max Day plus Fire 3	113.2	35.9

[1] Ground Elevation = 88.0 m

Max Day Plus Fire 2 = 116.3, 40.2

Connection 3 - Innes Rd (Optional)

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	130.9	56.4
Peak Hour	127.0	50.9
Max Day plus Fire 1	127.1	51.0
Max Day plus Fire 3	126.0	49.5

[1] Ground Elevation = 91.2 m

Max Day Plus Fire 2 = 126.4, 50.1

Notes:

1. Please interpolate to estimate HGL elevations at fire flow demand 2.

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 #: 118224
Project Name: 3610 Innes Road (Former BMR Lands)
Date: 3/4/2020
Input By: BCS
Reviewed By: BHB

Legend

Building Description: Lots 35 to 55 - Single Family
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)	3297			
		Number of Floors/Storeys	2			
		Area of structure considered (m^2)			**6,594**	
	F	**Base fire flow without reductions**				**27,000**
		F = 220 C (A)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	**22,950**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	No	-30%		**0**
		Standard Water Supply	No	-10%		
		Fully Supervised System	No	-10%		
				Cumulative Total	**0%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	3.1 - 10 m		20%	**13,770**
		East Side	20.1 - 30 m		10%	
		South Side	10.1 - 20 m		15%	
		West Side	10.1 - 20 m		15%	
				Cumulative Total	**60%**	
Results						
6	**(1) + (2) + (3)**	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**37,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**617**
				or	USGPM	9,775
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	8.5
		Required Volume of Fire Flow (m^3)			m^3	18870

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 118224
Project Name: 3610 Innes Road (Former BMR Lands)
Date: 3/4/2020
Input By: BCS
Reviewed By: BHB

Legend

Building Description: Lots 164 to 180 - Single Family, Block 183 - 15 Townhouses
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)	4544			
		Number of Floors/Storeys	2			
		Area of structure considered (m^2)			**9,088**	
	F	**Base fire flow without reductions**				**31,000**
		F = 220 **C** (**A**)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	**26,350**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	No	-30%		**0**
		Standard Water Supply	No	-10%		
		Fully Supervised System	No	-10%		
				Cumulative Total	**0%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	3.1 - 10 m		20%	**14,493**
		East Side	10.1 - 20 m		15%	
		South Side	20.1 - 30 m		10%	
		West Side	20.1 - 30 m		10%	
				Cumulative Total	**55%**	
Results						
6	**(1) + (2) + (3)**	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**41,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**683**
				or	USGPM	10,832
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	9.5
		Required Volume of Fire Flow (m^3)			m^3	23370

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 118224
Project Name: 3610 Innes Road (Former BMR Lands)
Date: 3/4/2020
Input By: BCS
Reviewed By: BHB

Legend

Building Description: Lots 79 to 96 - Single Family
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)	1099			
		Number of Floors/Storeys	2			
		Area of structure considered (m^2)			**2,198**	
	F	**Base fire flow without reductions**				**15,000**
		F = 220 C (A)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	**12,750**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	No	-30%		**0**
		Standard Water Supply	No	-10%		
		Fully Supervised System	No	-10%		
				Cumulative Total	**0%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	20.1 - 30 m		10%	**7,013**
		East Side	20.1 - 30 m		10%	
		South Side	10.1 - 20 m		15%	
		West Side	3.1 - 10 m		20%	
				Cumulative Total	**55%**	
Results						
6	**(1) + (2) + (3)**	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**20,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**333**
				or	USGPM	5,284
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	4.5
		Required Volume of Fire Flow (m^3)			m^3	5400

Novatech Project #: 118224
Project Name: 3610 Innes Road (Former BMR Lands)
Date: 10/04/2019
Date Revised: 3/4/2020

Engineers, Planners & Landscape Architects

OVERALL WATER DEMAND

RESIDENTIAL					BASIC DAY DEMAND	MAX. DAY DEMAND	PEAK HOUR DEMAND
NUMBER OF UNITS				POP'N			
SINGLE DWELLING	ROW TOWNHOME	MULTI-RESIDENTIAL	PARK	(pers)	(L/s) RES.	(L/s) RES.	(L/s) RES.
179	109	168	1	1259	5.10	12.75	28.05

ASSUMPTIONS:

RESIDENTIAL POPULATION	- Single Dwelling	3.4	people/unit
	- Semi-Detached	2.7	people/unit
	- Row Townhome	2.7	people/unit
	- Multi-Residential	2.1	people/unit
	- Park demands, equivalent to Single Dwelling		
BASIC DAY DEMAND:	- Residential	350	L / c / d
MAXIMUM DAY DEMAND:	- Residential	2.50	* basic day
PEAK HOUR DEMAND:	- Residential	2.20	* maximum day

FIRE FLOW DEMAND:	- Low Density Residential	10,000	L/min. =	167	L/s
	- Typ. Row Town Blocks	13,000	L/min. =	217	L/s
	- Stacked Row Town Blocks	15,000	L/min. =	250	L/s

Novatech Project #: 118224
Project Name: 3610 Innes Road (Former BMR Lands)
Date: 10/04/2019
Date Revised: 3/4/2020

NOVATECH
Engineers, Planners & Landscape Architects

JUNCTION DEMAND

JUNCTION ID	RESIDENTIAL					BASIC DAY DEMAND	MAX. DAY DEMAND	PEAK HOUR DEMAND	FIRE FLOW DEMAND
	NUMBER OF UNITS				POP'N				
	SINGLE DWELLING	ROW TOWNHOME	MULTI-RESIDENTIAL	PARK	(pers)	(L/s)	(L/s)	(L/s)	(L/s)
1			84		176	0.71	1.79	3.93	167
2			84		176	0.71	1.79	3.93	167
3	8	12			60	0.24	0.60	1.33	167
4	6	14			58	0.24	0.59	1.30	167
5	6	13			56	0.22	0.56	1.24	167
6	8	14			65	0.26	0.66	1.45	167
7		25			68	0.27	0.68	1.50	167
8	3	17			56	0.23	0.57	1.25	167
9	13				44	0.18	0.45	0.98	167
10	10	10			61	0.25	0.62	1.36	167
11	15				51	0.21	0.52	1.14	167
12	15	4			62	0.25	0.63	1.38	167
13	14				48	0.19	0.48	1.06	167
14	15				51	0.21	0.52	1.14	167
15	14				48	0.19	0.48	1.06	167
16	17				58	0.23	0.59	1.29	167
17	10			1	37	0.15	0.38	0.83	167
18	13				44	0.18	0.45	0.98	167
19	12				41	0.17	0.41	0.91	167
20					0	0.00	0.00	0.00	167
21					0	0.00	0.00	0.00	167
22					0	0.00	0.00	0.00	167
23					0	0.00	0.00	0.00	167
24					0	0.00	0.00	0.00	167
25					0	0.00	0.00	0.00	167
TOTAL	**179**	**109**	**168**	**1**	**1,259**	**5.10**	**12.75**	**28.05**	

ASSUMPTIONS:

RESIDENTIAL POPULATION DENSITY:
- Single Dwelling — 3.4 people/unit
- Semi-Detached — 2.7 people/unit
- Row Townhome — 2.7 people/unit
- Multi-Residential — 2.1 people/unit
- Park demands, equivalent to Single Dwelling

BASIC DAY DEMAND:
- Residential — 350 L / c / d

MAXIMUM DAY DEMAND:
- Residential — 2.50 * basic day

PEAK HOUR DEMAND:
- Residential — 2.20 * maximum day

FIRE FLOW DEMAND:
- Low Density Residential — 10,000 L/min. = 167 L/s
- Typ. Row Town Blocks — 13,000 L/min. = 217 L/s
- Stacked Row Town Blocks — 15,000 L/min. = 250 L/s

Novatech Project #: 118224
Project Name: 3610 Innes Road (Former BMR Lands)
Date: 10/04/2019
Date Revised: 3/4/2020

NOVATECH
Engineers, Planners & Landscape Architects

MAX PRESSURES DURING BSDY CONDITIONS

JUNCTION ID	ELEVATION (m)	STATIC DEMAND (L/s)	STATIC HEAD (m)	STATIC PRESSURE (m)	STATIC PRESSURE (psi)
1	90.90	0.71	131.30	40.40	57
2	90.50	0.71	131.30	40.79	58
3	90.30	0.24	131.30	40.99	58
4	90.00	0.24	131.30	41.29	59
5	90.20	0.22	131.30	41.09	58
6	89.70	0.26	131.30	41.59	59
7	88.40	0.27	131.30	42.90	61
8	89.30	0.23	131.30	42.00	60
9	88.60	0.18	131.30	42.69	61
10	89.20	0.25	131.30	42.09	60
11	88.60	0.21	131.30	42.69	61
12	88.90	0.25	131.30	42.39	60
13	88.20	0.19	131.30	43.10	61
14	88.10	0.21	131.30	43.20	61
15	88.00	0.19	131.30	43.30	62
16	87.80	0.23	131.30	43.50	62
17	87.70	0.15	131.30	43.60	62
18	87.50	0.18	131.30	43.80	62
19	87.40	0.17	131.30	43.90	62
20	89.70	0.00	131.30	41.60	59
21	88.10	0.00	131.30	43.19	61
22	87.60	0.00	131.30	43.70	62
23	87.90	0.00	131.30	43.40	62
24	88.00	0.00	131.30	43.30	62
25	91.00	0.00	131.30	40.30	57

Novatech Project #: 118224
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NOVATECH
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MIN PRESSURES DURING PKHR CONDITIONS

JUNCTION ID	ELEVATION (m)	STATIC DEMAND (L/s)	STATIC HEAD (m)	STATIC PRESSURE (m)	STATIC PRESSURE (psi)
1	90.90	3.91	130.08	39.18	56
2	90.50	3.91	130.06	39.56	56
3	90.30	1.32	130.06	39.76	57
4	90.00	1.32	130.06	40.06	57
5	90.20	1.21	130.06	39.86	57
6	89.70	1.43	130.06	40.36	57
7	88.40	1.49	130.08	41.68	59
8	89.30	1.27	130.07	40.77	58
9	88.60	0.99	130.06	41.46	59
10	89.20	1.38	130.06	40.86	58
11	88.60	1.16	130.06	41.46	59
12	88.90	1.38	130.06	41.16	59
13	88.20	1.05	130.07	41.87	60
14	88.10	1.16	130.07	41.97	60
15	88.00	1.05	130.07	42.07	60
16	87.80	1.27	130.08	42.28	60
17	87.70	0.83	130.18	42.48	60
18	87.50	0.98	130.10	42.60	61
19	87.40	0.94	130.10	42.70	61
20	89.70	0.00	130.07	40.37	57
21	88.10	0.00	130.06	41.96	60
22	87.60	0.00	130.10	42.50	60
23	87.90	0.00	130.22	42.32	60
24	88.00	0.00	130.09	42.09	60
25	91.00	0.00	130.24	39.24	56

Novatech Project #: 118224
Project Name: 3610 Innes Road (Former BMR Lands)
Date: 10/04/2019
Date Revised: 3/4/2020

NOVATECH
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AVAILABLE FLOW AT 20psi DURING MXDY+FF CONDITIONS

JUNCTION ID	ELEVATION (m)	STATIC DEMAND (L/s)	STATIC HEAD (m)	STATIC PRESSURE (m)	STATIC PRESSURE (psi)	FIRE FLOW DEMAND (L/s)	FIRE FLOW DEMAND (L/min)	AVAILABLE FLOW (L/min)
1	90.90	1.78	130.98	40.08	57	167	10,000	13,734
2	90.50	1.78	130.97	40.48	58	167	10,000	13,722
3	90.30	0.60	130.97	40.68	58	167	10,000	14,778
4	90.00	0.60	130.97	40.98	58	167	10,000	13,650
5	90.20	0.55	130.97	40.78	58	167	10,000	13,434
6	89.70	0.65	130.97	41.28	59	167	10,000	17,046
7	88.40	0.68	130.98	42.58	61	167	10,000	34,560
8	89.30	0.58	130.98	41.68	59	167	10,000	28,722
9	88.60	0.45	130.97	42.38	60	167	10,000	14,550
10	89.20	0.63	130.97	41.78	59	167	10,000	17,904
11	88.60	0.53	130.97	42.38	60	167	10,000	16,320
12	88.90	0.63	130.97	42.08	60	167	10,000	14,508
13	88.20	0.48	130.97	42.78	61	167	10,000	15,936
14	88.10	0.53	130.97	42.88	61	167	10,000	14,028
15	88.00	0.48	130.97	42.98	61	167	10,000	14,070
16	87.80	0.58	130.98	43.18	61	167	10,000	16,644
17	87.70	0.38	131.00	43.30	62	167	10,000	23,574
18	87.50	0.45	130.98	43.49	62	167	10,000	19,398
19	87.40	0.43	130.98	43.59	62	167	10,000	12,390
20	89.70	0.00	130.98	41.28	59	167	10,000	25,728
21	88.10	0.00	130.97	42.88	61	167	10,000	12,012
22	87.60	0.00	130.98	43.39	62	167	10,000	17,238

Appendix F
Geotechnical Investigation (soft copy)