Barrhaven Town Centre Stage 2

Functional Servicing Study

Stantec

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Minto Communities Ltd.

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1 Introduction

Minto Communities Inc. has commissioned Stantec Consulting Ltd. to prepare the following Functional Servicing Study for Stage 2 of the Barrhaven Town Centre subdivision development in support of a Draft Plan of Subdivision application. The subject property is located southwest of the intersection of Longfields Drive and Chapman Mills Drive within the Barrhaven Downtown Secondary Plan area and the South Nepean Town Centre Community Design Plan (CDP) area. The property is currently zoned Development Reserve (DR) and is bordered by the Southwest Transitway and future Chapman Mills Drive right-of-way to the north, Jockvale Road to the west, vacant land reserved for development to the south, and Longfields Drive to the east. The proposed residential development is approximately 10 ha in area and will contain a mixture of townhomes, medium density blocks, and a neighbourhood park. Minto's conceptual plan for the development is shown in **Figure 1.1**.

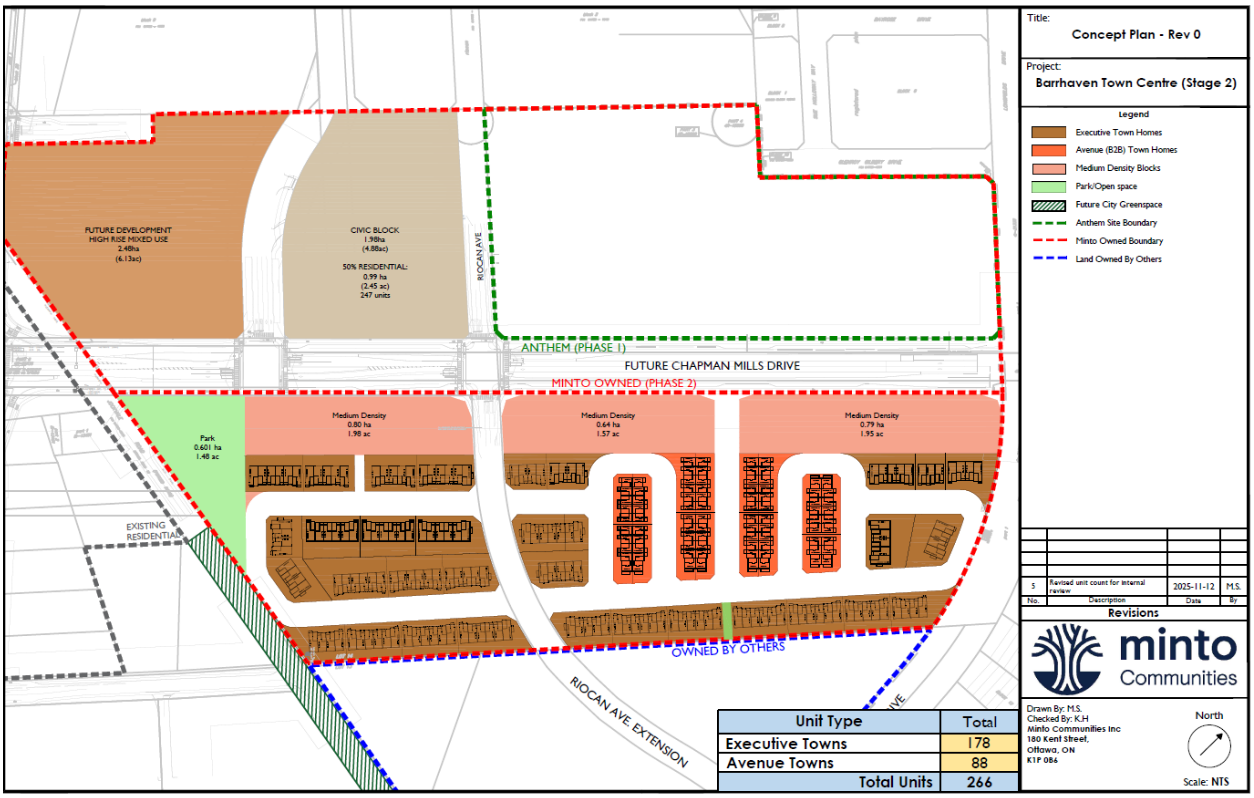


Figure 1.1: Conceptual Development Plan

1.1 Objective

The intent of this report is to build on the servicing principals outlined in the background studies to develop a servicing strategy specific to the subject site. The report will establish criteria for future detailed design of the subdivision in accordance with the associated background studies, City of Ottawa design guidelines, and all other relevant regulations.

2 Background Documents

The following documents were referenced in the preparation of this report:

- Sewer Design Guideline (SDG), Fourth Edition, City of Ottawa, December 2025
- Water Distribution Design Guidelines, Second Edition, City of Ottawa, December 2025
- Design Guidelines for Drinking Water Systems, Ministry of the Environment, Conservation, and Parks (MECP), 2008
- Fire Protection Water Supply Guideline for Part 3 in the Ontario Building Code, Office of the Fire Marshal (OFM), October 2020
- Water Supply for Public Fire Protection, Fire Underwriters Survey (FUS), 2020
- Geotechnical Investigation – Proposed Residential Development, 3265 Jockvale Road, Paterson Group, November 25, 2025
- Water Budget Assessment, 3265 Jockvale Road, Paterson Group, February 4, 2026.
- City of Ottawa South Nepean Collector (SNC) Phase 2 Preliminary Design Report, Novatech, March 2, 2016
- Nepean South Chapman Mills Stormwater Management Servicing Fourth Addendum, IBI Group, February 16, 2018
- Draft Kennedy-Burnett Potable Water Master Servicing Study, Stantec Consulting Ltd., March 25, 2024
- Barrhaven Downtown Secondary Plan, City of Ottawa Official Plan
- Greenbank Road and Southwest Transitway Extension Marketplace Avenue to Barnsdale Road, Chapman Mills preliminary design drawings, Stantec Consulting, Revision 4, November 23, 2024
- Design Brief for Minto Communities- Canada and City of Ottawa, 3311 Greenbank Road, August 2018, DSEL
- Detail Subdivision Stormwater Analysis, Riversbend (3311 Greenbank Road), Nepean South Chapman Mills, IBI Group, August 22, 2018

3 Water Servicing

3.1 Background

The proposed development is currently located within Zone SUC of the City of Ottawa's water distribution system. This zone is fed by the Barrhaven Pump Station and Barrhaven Reservoir Pump Station, with the Moodie elevated storage tank providing balancing storage for peak flows and demands.

The existing municipal watermains surrounding the site include twin 400 mm diameter watermains in Jockvale Road, a 400 mm diameter watermain in Longfields Drive, and a 200 mm diameter watermain in Riocan Avenue north of Chapman Mills Drive.

The Greenbank Road and South West Transitway Extension Project will include the extension of a new 300mm watermain from Greenbank Road to Longfields Drive with connections to the distribution system at Jockvale Road and existing Riocan Avenue. Timing of the watermain extension in Chapman Mills Drive has not yet been confirmed but is expected to be no earlier than 2028.

Development of the Barrhaven Town Centre Stage 2 lands will include connections to the existing municipal water infrastructure to service the subdivision development.

3.2 Preliminary Watermain Sizing and Layout

The preliminary watermain alignment and sizing for this development is shown on **Drawing WTR-1**. The subdivision is expected to be serviced with a network of 200 mm and 300 mm watermains.

A 300 mm watermain will be extended from Chapman Mills to the limit of Riocan Avenue within the subdivision, with a future extension to Longfields Drive when the lands to the south are developed by others. Watermains within the local streets are expected to be 200 mm in diameter.

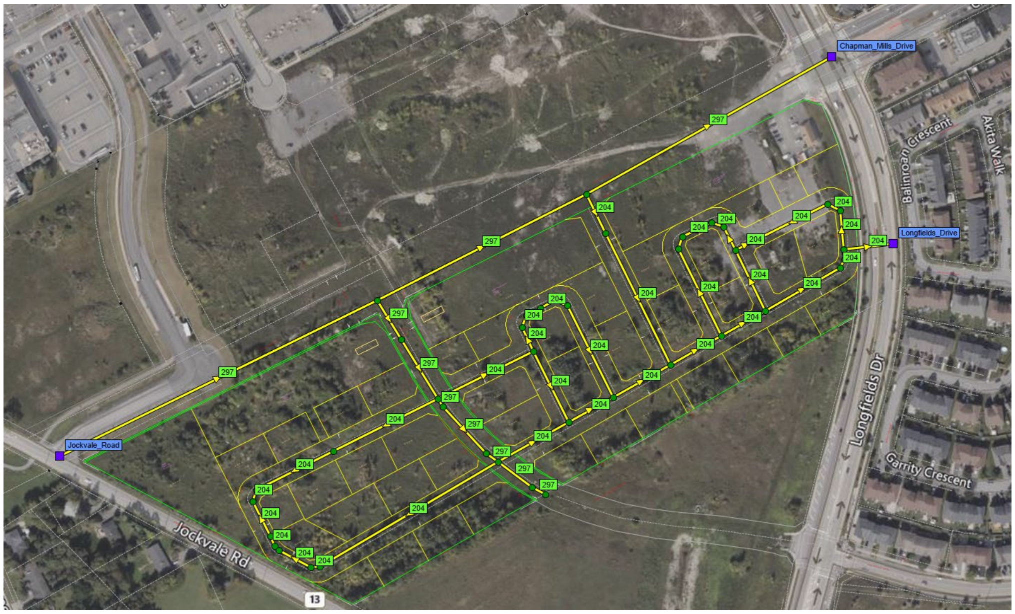
Watermain layout and sizing within the development is preliminary and will be confirmed as part of the future detailed design.

3.2.1 Connections to Existing Infrastructure

The subdivision will be fed by connections to the 300mm watermain in Chapman Mills Drive at each of two proposed roadway intersections. A connection will also be made to the 400 mm watermain in Longfields Drive at the window street to provide a second feed to the eastern portion of the subdivision.

Figure 3.1 shows functional watermain layout with connections to existing watermains.

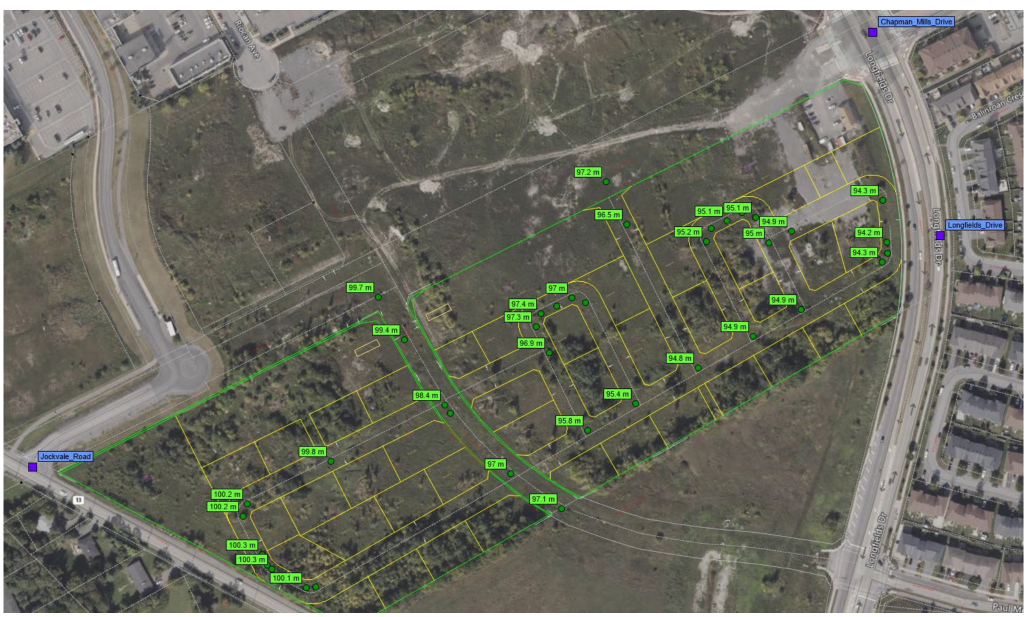
Figure 3.1 Proposed Watermain Layout and Pipe Diameters (mm)



3.2.2 Ground Elevations

Proposed ground elevations throughout the site range from approximately 94m to 100m at nodes in the watermain network. **Figure 3.2** shows the ground elevation at each node in the watermain network.

Figure 3.2 Ground Elevation (m) at Nodes



3.2.3 Servicing Criteria

The current draft plan for the development calls for a total of 43 blocks, of which three (3) are intended for medium density development and the remainder for townhouses. The estimated water demands for the development were estimated based on the population densities, per capita water demands, and peaking factors established by the City of Ottawa's Water Design Guidelines, ISD-2010-02, and ISTB 2021-03 Technical Bulletins, as outlined below.

Residential Population Rate

Medium Density	2.7 persons / unit
Townhouse	2.7 persons / unit

Residential Demand

Average Daily (AVDY)	280 L/cap/day
Maximum Daily (MXDY)	2.5 × AVDY
Peak Hour (PKHR)	2.2 × MXDY

Allowable Water Pressure

MXDY Flow	345 kPa (50 psi) to 552 kPa (80 psi)
PKHR Flow Minimum	276 kPa (40 psi)
MXDY + Fire Flow	140 kPa (20 psi)
Maximum Allowable for Occupied Area	552 kPa (80 psi)

3.3 Potable Water Demand

3.3.1 Domestic Water Demand

The domestic water demand is assessed based on the proposed development conditions established in the draft plan and criteria summarized in **Section 3.2.3**.

The assessed domestic water demand for the study area is summarized in **Table 3.1** and detailed in **Appendix A.1**.

Table 3.1: Domestic Water Demands

Population	**AVDY (L/s)**	MXDY (L/s)	**PKHR (L/s)**
1,242	4.0	10.1	22.1

3.3.2 Fire Flow

Fire flow calculations were completed using the Fire Underwriters Survey (FUS) methodology. Refer to **Appendix A.2** for detailed FUS calculations. The results of the fire flow calculations for the worst-case townhome blocks and apartment buildings are summarized in **Table 3.2.**

Table 3.2 Fire Flow Calculations Using FUS Methodology

Unit Type	Description	Required Fire Flow (L/min)	Required Fire Flow (L/s)
Medium-Density Blocks	Three-storey wood-frame stacked townhouse with a maximum footprint area of 600m2	17,000	283.3
Avenue Townhouse Blocks	Three-storey wood-frame back-to-back avenue townhouse unit with a maximum footprint area of 400m2 (worst-case scenario)	14,000	233.3

3.4 Hydraulic Analysis

A hydraulic model of the proposed watermain network was built in PCSWMM using the following boundary conditions provided by the City of Ottawa staff:

1. Boundary condition before and after the SUC Pressure Zone Reconfiguration on the existing 400 mm watermain at the intersection of Jockvale Drive and the reserved ROW for future Chapman Mills Drive
2. Boundary condition before and after the SUC Pressure Zone Reconfiguration on the existing 400mm watermain along Longfields Drive at the southeastern corner of the proposed site as the second connection point
3. Boundary condition before and after the SUC Pressure Zone Reconfiguration on the existing 300mm watermain stub at the intersection of Longfields Drive and Chapman Mills Drive

The detailed location of the connections and boundary condition obtained from the City of Ottawa staff is attached in the **Appendix A.3** and boundary conditions used for the hydraulic analysis are summarized in **Table 3.3** and **Table 3.4**.

Table 3.3 Boundary Condition for Connection Points Before SUC Pressure Zone Reconfiguration

Location	Before SUC Pressure Zone Reconfiguration			
	Max. HGL (AVDY), Head (m)	**PKHR Head (m)**	**MXDY+FF (233 L/s), Head (m)**	**MXDY+FF (283 L/s), Head (m)**
1 – Jockvale Drive at future Chapman Mills Drive	155.2	142.0	142.0	141.7
2 – Longfields Drive along eastern frontage	155.1	141.6	141.6	140.5
3 – Longfields Drive at future Chapman Mills Drive	155.1	141.6	141.6	140.8

Table 3.4 Boundary Condition for Connection Points After SUC Pressure Zone Reconfiguration

Location	After SUC Pressure Zone Reconfiguration			
	Max. HGL (AVDY), Head (m)	**PKHR, Head (m)**	**MXDY+FF (233 L/s), Head (m)**	**MXDY+FF (283 L/s), Head (m)**
1 – Jockvale Drive at future Chapman Mills Drive	147.2	144.6	143.6	142.9
2 – Longfields Drive along eastern frontage	147.2	144.2	143.4	142.7
3 – Longfields Drive at future Chapman Mills Drive	147.2	144.2	143.6	143.0

3.4.1 Model Development

New watermains were added to the hydraulic model to simulate the proposed distribution system. Hazen-Williams coefficients (“C-Factors”) were applied to the new watermain in accordance with the City of Ottawa’s Water Distribution Design Guidelines (**Table 3.5**).

Table 3.5: C-Factors Applied Based on Watermain Diameter

Nominal Pipe Diameter (mm)	C-Factor
150	100
200 to 250	110
300 to 600	120
Over 600	130

3.4.2 Hydraulic Modeling Results

3.4.2.1 Average Day & Peak Hour

The hydraulic model results show that the maximum pressures (AVDY condition) are anticipated to be approximately 537.7-596.1 kPa (78.0-86.5 psi) prior to the SUC Pressure Zone Reconfiguration and 460.0-518.6 kPa (66.7-75.2 psi) after the SUC Pressure Zone Reconfiguration within the site. Minimum pressures during PKHR conditions are anticipated to be approximately 406.3-463.9 kPa (58.9-67.3 psi) prior to the SUC Pressure Zone Reconfiguration and 431.8-489.4 kPa (62.6-71.0 psi) after the SUC Pressure Zone Reconfiguration for the site.

Minimum pressures are met in all scenarios, however maximum pressures are exceeded prior to the SUC pressure zone reconfiguration. If the subdivision development proceeds before the SUC pressure zone reconfiguration, pressure reducing valves are expected to be required for the majority of the units. This requirement will be confirmed at the detailed design stage.

Figure 3.3, Figure 3.4, Figure 3.5 and **Figure 3.6** identify the minimum (PKHR) and maximum pressure (AVDY) results for the simulation before and after the SUC pressure zone reconfiguration, respectively.

Figure 3.3 Maximum Pressures during AVDY Conditions before SUC Pressure Zone Reconfiguration

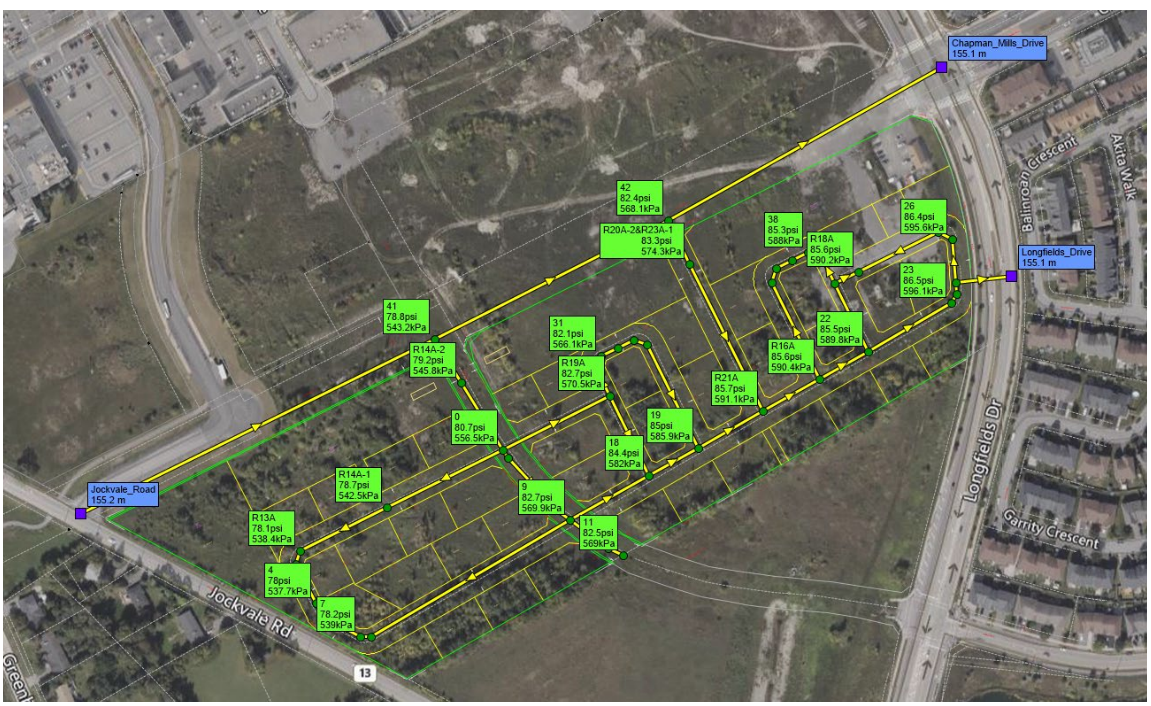


Figure 3.4 Maximum Pressures during AVDY Conditions after SUC Pressure Zone Reconfiguration

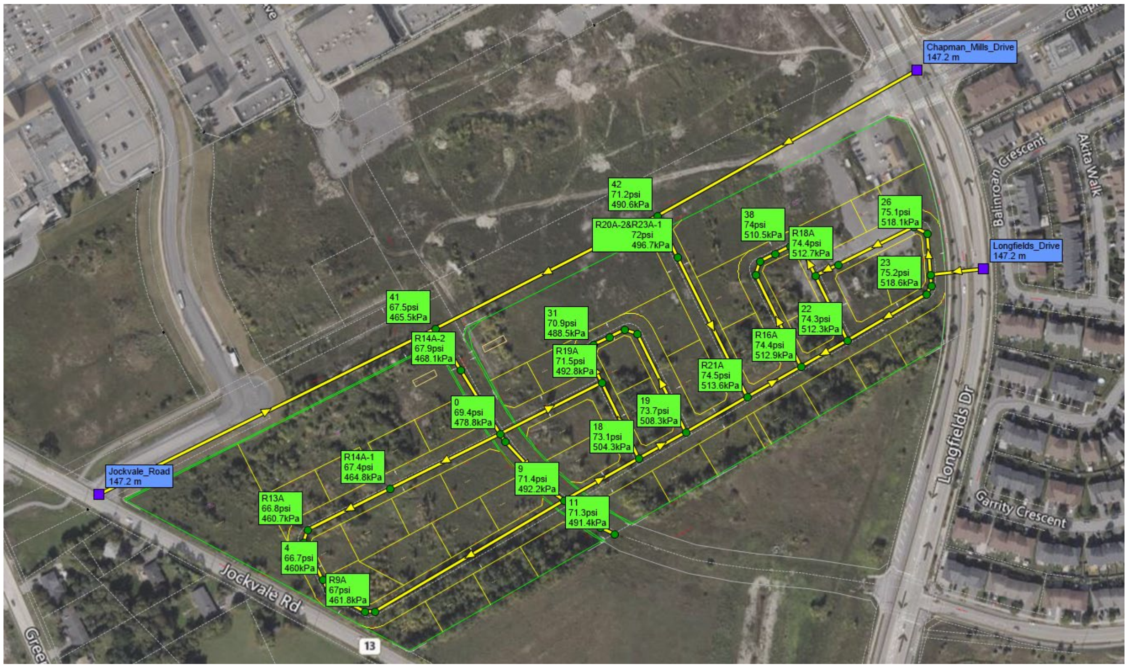


Figure 3.5 Minimum Pressures (psi) During PKHR Conditions before SUC Pressure Reconfiguration

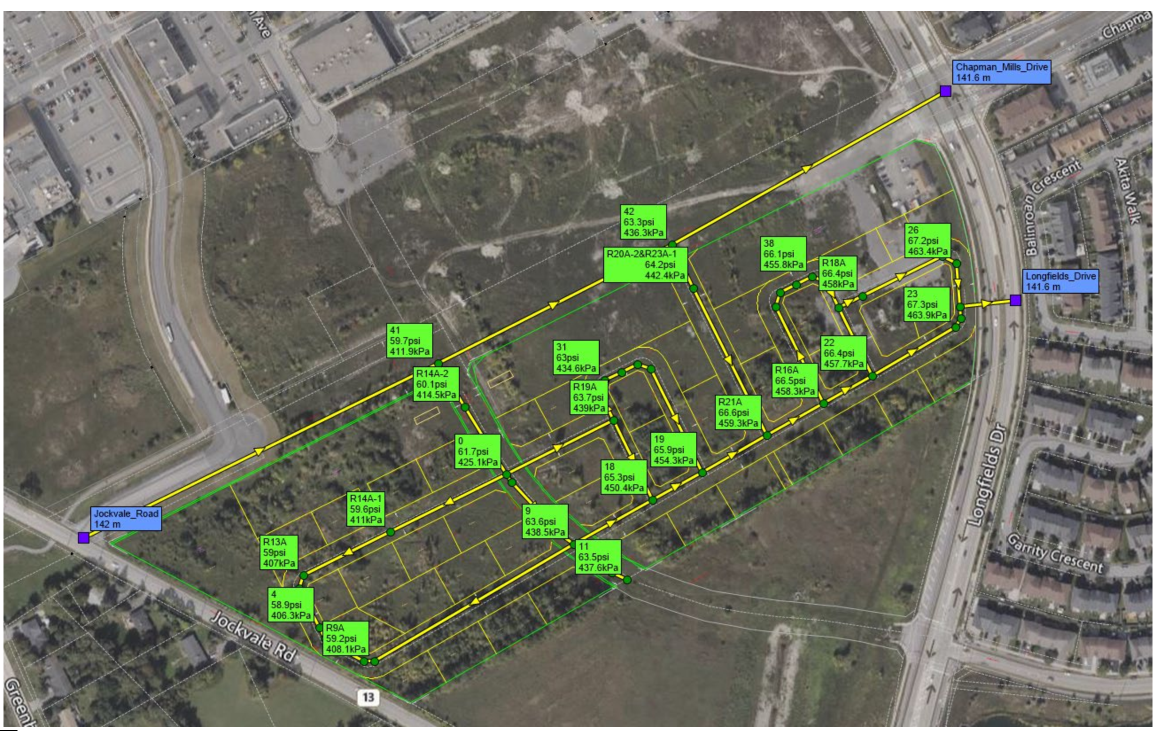
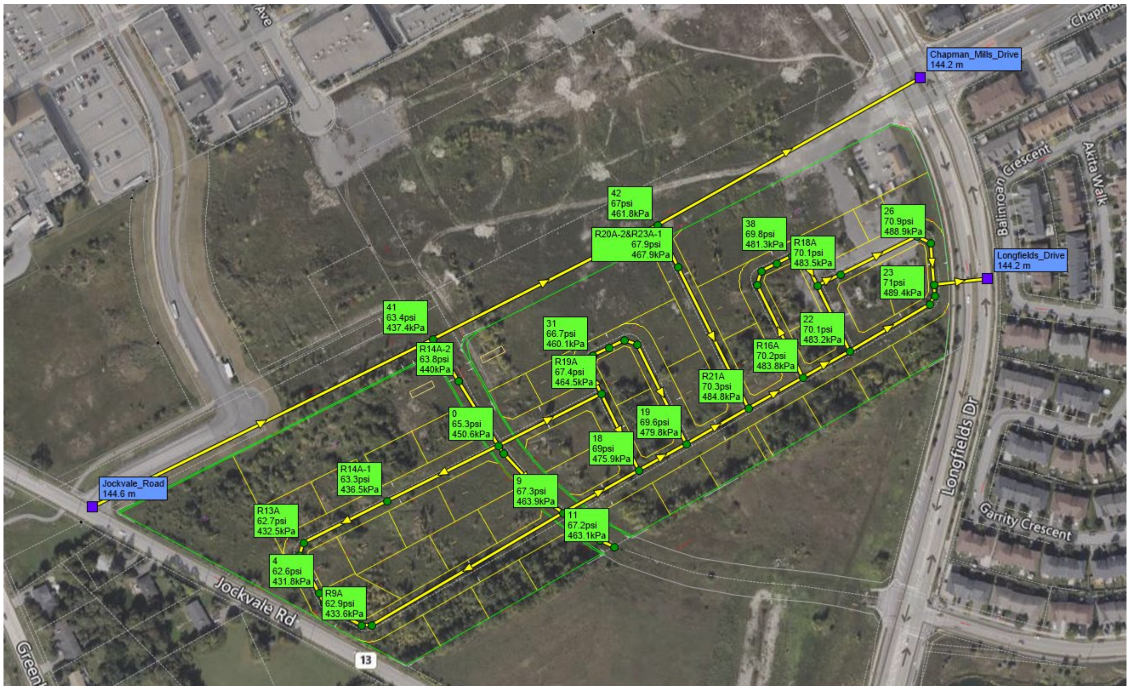


Figure 3.6 Minimum Pressures (psi) During PKHR Conditions after SUC Pressure Zone Reconfiguration



3.4.2.2 Maximum Day Plus Fire Flow

An analysis was carried out using the hydraulic model to determine if the proposed development, under maximum day demands, can achieve a fire flow of 14,000 L/min (233.3 L/s) for the Avenue townhouse blocks while maintaining a residual pressure of 138 kPa (20 psi) before and after the SUC pressure zone reconfiguration throughout the network. This was accomplished using a steady-state maximum day demand scenario along with the automated fire flow simulation feature of PCSWMM. The available flows before and after the SUC pressure zone reconfiguration are shown in **Figure 3.7** and **Figure 3.8**:

Figure 3.7 Available Fire Flows (L/s) During MXDY Condition Before SUC Pressure Zone Reconfiguration

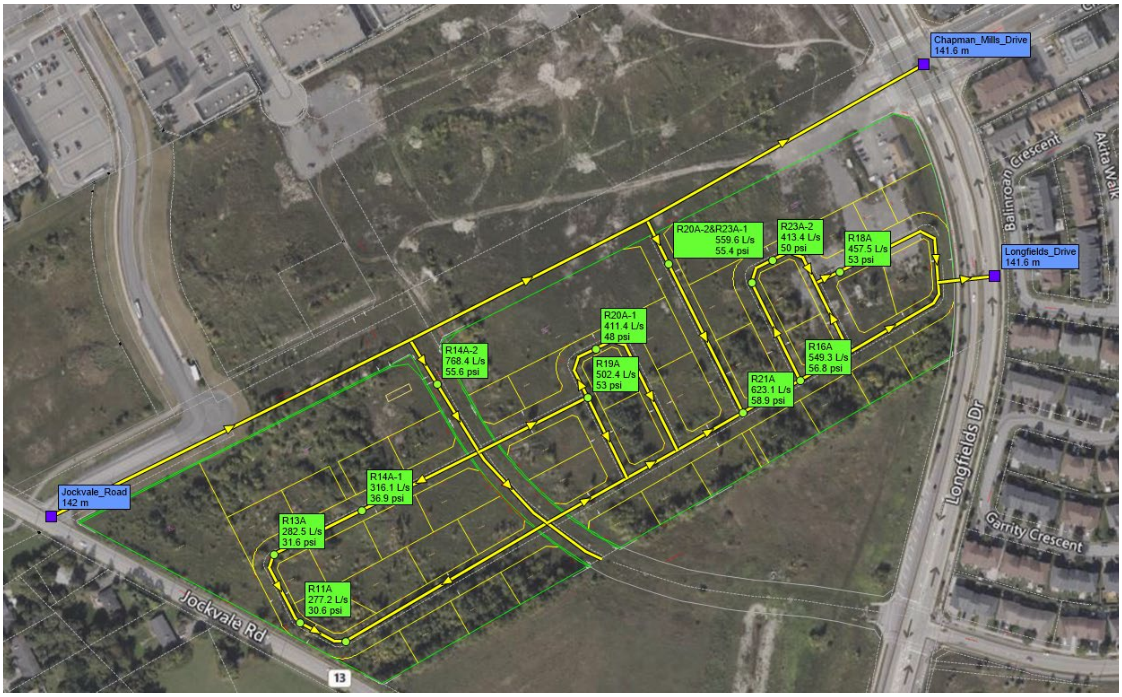
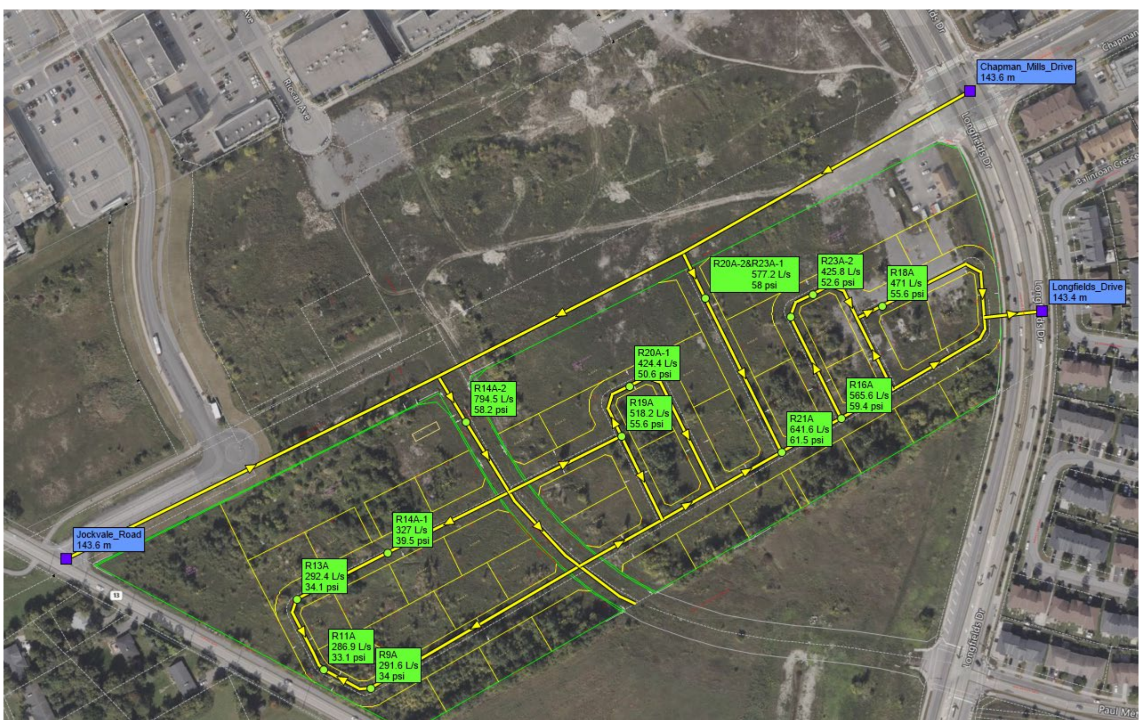


Figure 3.8 Available Fire Flows (L/s) During MXDY Condition After SUC Pressure Zone Reconfiguration



A separate model was conducted under a more conservative condition, with a fire flow requirement of 17,000 L/min (283.3 L/s), for the medium-density blocks (R14A, R20A, and R23A). The model shows that the proposed watermain network can achieve the target fire flow of 17,000 L/min while maintaining the required pressure of 138 kPa (20 psi) under the existing conditions for the medium-density blocks in both pressure zone configurations.

The available flows and residual pressure under the 283.3 L/s fire flow requirement before and after the SUC Pressure Zone reconfiguration are shown below in **Figure 3.9** and **Figure 3.10**. The full preliminary hydraulic analysis results are shown in **Appendix A.4**.

Figure 3.9: Available Fire Flows (L/s) During MXDY Condition Before SUC Pressure Zone Reconfiguration

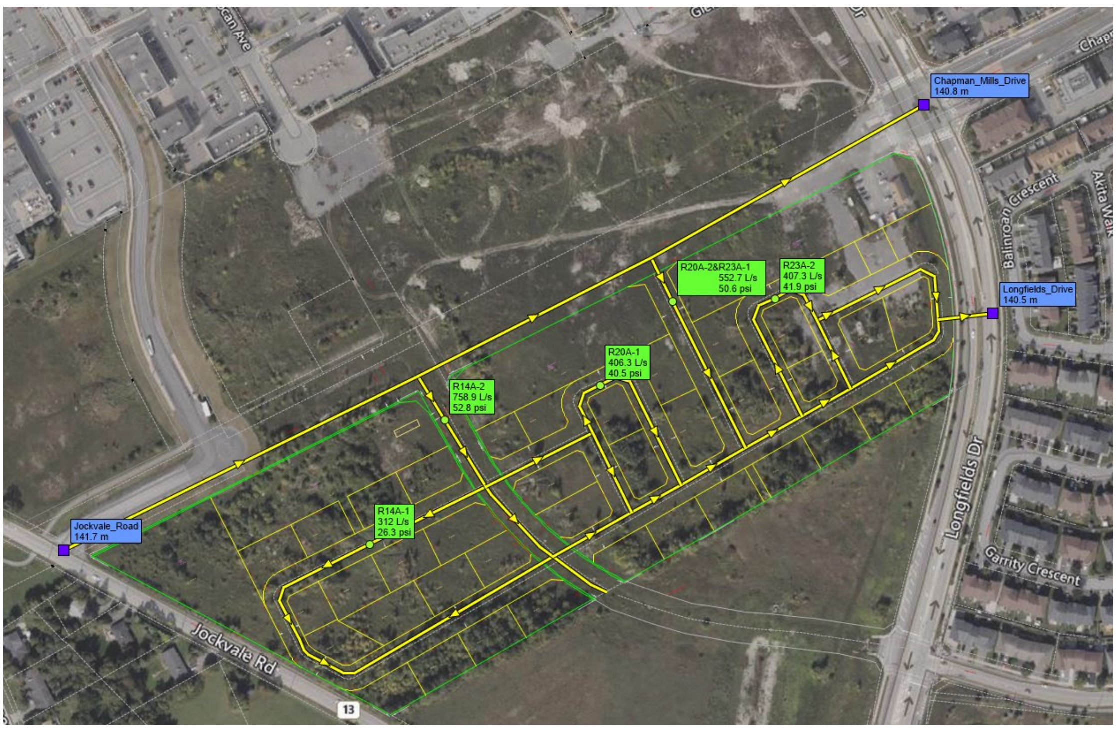
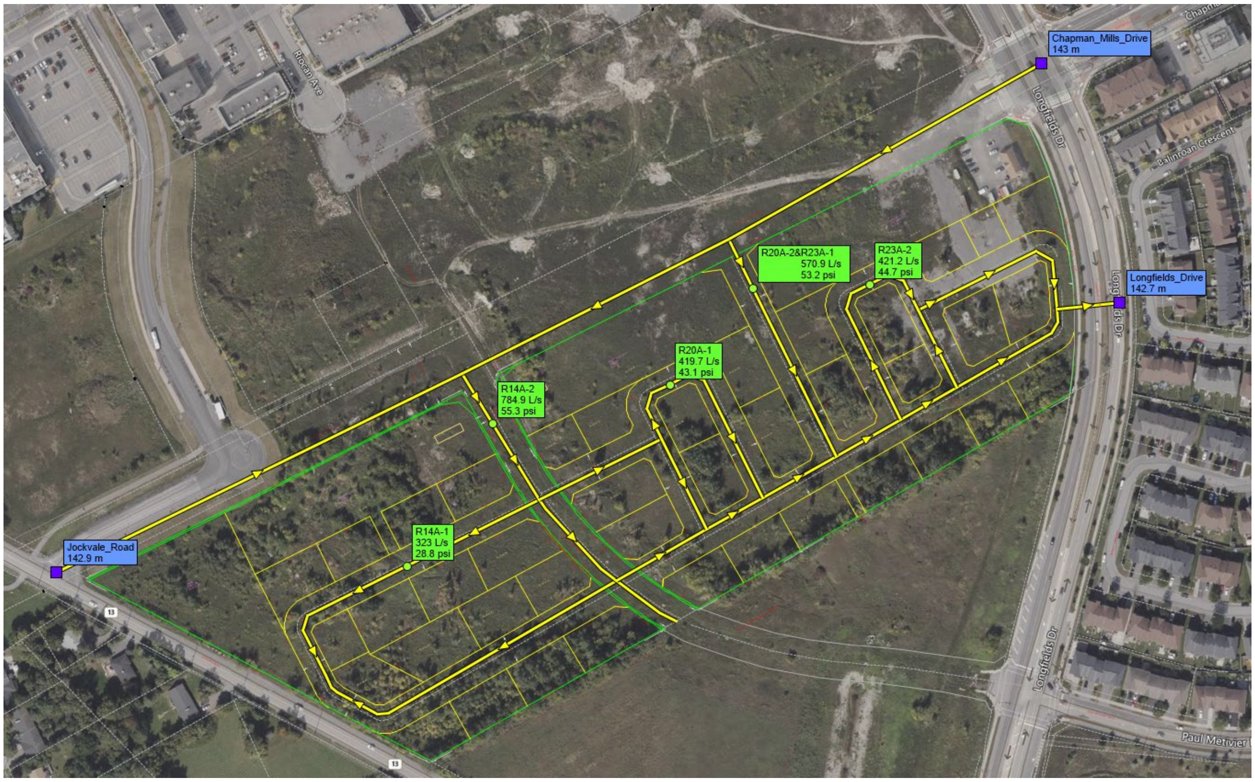


Figure 3.10: Available Fire Flows (L/s) During MXDY Condition after SUC Pressure Zone Reconfiguration



4 Wastewater Servicing

4.1 Background

Existing sanitary sewers within proximity of the study area include 200 mm and 250 mm diameter sanitary sewers within the future Chapman Mills right-of-way, a 250 mm diameter sanitary sewer in Longfields Drive, and a 1050 mm diameter sanitary trunk sewer stub at Longfields Drive at Paul Metivier Drive.

The Barrhaven Town Centre (BTC) Stage 2 subdivision lands fall within the drainage area for the South Nepean Collector Sewer (SNC). The 1050mm diameter sanitary sewer stub was installed at the intersection of Longfields Drive and Paul Metivier Drive to serve as an outlet to for area A8-B as identified in the South Nepean Collector (SNC) Phase 2 Preliminary Design Report, Novatech, March 2, 2026 (SNC design report). A portion of the lands within A8-B have already been developed and provided with a sanitary outlet to Longfields Drive, deviating from the assumptions in the SNC design report due to the phasing of development in the area.

With the diversion of sanitary flow to the Longfields Drive sewer from a portion of the A8-B drainage area, the balance of the area to be serviced by the sanitary stub at Longfields Drive and Paul Metivier Drive is 27.21 ha. The SNC design report assumed a density of 135 persons per hectare for area A8-B. Excerpts from the SNC design report are included in **Appendix B**.

4.2 Design Criteria

Preliminary wastewater servicing has been assessed in accordance with the City of Ottawa Sewer Design Guidelines (2025). The following design parameters were used to calculate estimated wastewater flow rates and to preliminarily size on-site sanitary sewers:

- Minimum Full Flow Velocity – 0.6 m/s
- Maximum Full Flow Velocity – 3.0 m/s
- Manning's roughness coefficient for all smooth walled pipes – 0.013
- Townhouse persons per unit – 2.7
- Apartment persons per unit – 1.8
- Extraneous Flow Allowance – 0.33 L/s/ha
- Residential Average Flows – 280 L/cap/day
- Commercial/Mixed Use Flows – 28,000 L/ha/day
- Harmon Correction Factor – 0.8

- Manhole Spacing – 120 m
- Minimum Cover – 2.5 m
- Density of Future Development Blocks – 135 persons/ha (per City of Ottawa correspondence)

4.3 Preliminary Wastewater Generation

Functional peak wastewater flows for the proposed development were assessed along with the flows from future residential development parcels and roadways (identified as drainage areas R8A, G8A, R8B, G8B, R2A, R2B, G3A, and R4A in the sanitary design sheet and **Drawing SA-1**).

The assessed peak wastewater flow from the subdivision development and external areas that will contribute to the sewer at Longfields Drive and Paul Metivier Drive are summarized in **Table 4.1** with supporting calculations detailed in the sanitary sewer design sheet attached in **Appendix B.1**.

Table 4.1: Conceptual Peak Wastewater Flows

Area	Residential			Infiltration (L/s)	Total Peak Flow (L/s)
	Population	Peak Factor	Peak Flow (L/s)		
BTC Stage 2 West of Riocan	408	3.41	4.5	1.3	5.8
BTC Stage 2 East of Riocan	834	3.28	8.9	1.9	10.8
Areas External to Subdivision	2513	varies	21.7	5.8	27.5
Total	**3755**	**-**	**35.1**	**9.0**	**44.1**

This assessment represents a total drainage area of 27.21 ha with a population of 3,755 persons generating a total peak flow of 44.1 L/s, ultimately contributing to the SNC at Node 70 per the SNC design report.

4.4 Proposed Servicing

A sanitary sewer will be extended from the sanitary trunk sewer stub at Longfields Drive at Paul Metivier Drive to service the drainage area. The sanitary trunk sewer will follow the alignment of the existing trunk storm sewer located within the future extension of Riocan Avenue and will extend through the subdivision lands to Chapman Mills. The trunk sanitary sewer is sized to service the ultimate drainage area per the SNC design report which includes the Minto Barrhaven Town Centre Stage 2 lands, as well as future development lands and roadways external to the subdivision. Local sanitary sewers will follow public roadways within the subdivision and discharge to the trunk sewer within Riocan Avenue. The functional sanitary servicing layout is shown on **Drawing SA-1**.

The density assumed for the subdivision development is based on the conceptual subdivision design prepared by Minto Communities (**Figure 1.1**). The residential density assumed for the majority of lands external to the subdivision is 135 persons per hectare per the SNC design report and as directed by the City of Ottawa (see correspondence in **Appendix B.2**). The density assumed for area R8B is based on a conceptual development plan prepared by Minto communities and has been used for more conservative flow calculations. Overall average density for the drainage area is 138 persons per hectare.

The functional design flows from the subdivision development and external areas respect the flows assumed in the SNC design report from the contributing area,

- The design for the SNC assumed a density of 135 persons per hectare, a design flow of 350 l/p/d and an infiltration rate of 0.28 L/s/ha (equivalent to 0.83 L/s/ha).
- The functional design for the Riocan sewer extension assumes a density of 138 persons per hectare with a design flow of 280 l/p/d and an infiltration rate of 0.33 L/s/ha (equivalent to 0.78 L/s/ha).
- As demonstrated, base sanitary flow rates assumed as part of this functional design are less than those assumed in the SNC design report.

5 Stormwater Management

5.1 Background

Per the *Nepean South Chapman Mills Stormwater Management Servicing Fourth Addendum* (IBI Group, 2018) (NSMCSWM), the study area is within the planned catchment of the Chapman Mills Stormwater Management facility, located east of Longfields Drive and south of Paul Metivier Drive (see **Appendix C**). The study area considers portions of drainage areas ‘A’, ‘C’, ‘C_Road’, ‘D’, ‘E’, and ‘F’ within the IBI study totalling approximately 10.02 ha of land. A 1650 mm diameter storm trunk sewer exists located within the future extension of Riocan Avenue, and is part of the Western Trunk collected by the Western Interceptor to the Chapman Mills SWM facility adjacent to the Jock River. The 1650 mm sewer is identified as the sole minor system drainage outlet for the study area. Additionally, the IBI study considers contribution from upstream areas encompassing Chapman Mills Drive (‘CMD1A’ and ‘1B’), as well as external development areas ‘B’ and ‘CIVIC’ north of Chapman Mills and east of Greenbank Road. Major system flows are identified to ultimately be conveyed southwards through City-owned lands, crossing Jockvale Road, and to the Jock River via previously engineered roadway corridors through Bending Way and Branch Street per the *Design Brief for Minto Communities – Canada and City of Ottawa 3311 Greenbank Road* report (DSEL, 2018).

5.2 SWM Criteria and Constraints

Preliminary stormwater management and storm sewer servicing is assessed based on the stormwater management strategy identified in the IBI Chapman Mills SWM report, various other background documents, the City of Ottawa Sewer Design Guidelines (2025), and through consultation with City of Ottawa staff, and will govern the detailed design of the proposed development. The source of each criterion is indicated in brackets:

General

- Use of the dual drainage principle (City of Ottawa).
- Wherever feasible and practical, site-level measures should be used to reduce and control the volume and rate of runoff. (City of Ottawa).
- Assess impact of 100-year event and climate change event outlined in the City of Ottawa Sewer Design Guidelines on major & minor drainage system (City of Ottawa).

Storm Sewer & Inlet Controls

- Proposed site to discharge the existing storm trunk sewer within the future Riocan Avenue ROW (IBI 2018).
- Boundary conditions for the site outlets per XPSWMM model prepared for the Chapman Mills SWM servicing and Riverbend development (IBI 2018).
- Overall site runoff post-development for all storm events, up to and including the 100-year event, are restricted to 90 L/s/ha (IBI 2018).

Surface Storage & Overland Flow

- Provide adequate emergency overflow conveyance off-site (City of Ottawa).
- Minor flow to be conveyed to the existing Chapman Mills SWM for quality (70% TSS Removal) and quantity control (IBI 2018).
- Major flows to ultimately be conveyed across Jockvale Road to Bending Way, with ultimate discharge to the Jock River (IBI/DSEL 2018).

5.3 Stormwater Management

Based on the draft plan, the drainage areas are defined as illustrated on the storm drainage plan **Drawing SD-1**. Overall, the proposed SWM design intent is to direct storm runoff from the study area to the existing 1650 mm storm trunk sewer in the future Riocan Avenue ROW. Major system flows are routed towards a proposed walkway block and along Riocan Avenue based on grading constraints. The study area does not encompass the ultimate major system flow path towards Jockvale Road, and is additionally obstructed by the minor system drainage outlet for subdivision at Bending Way. As such, both major system outlets from the site are proposed to be stored within a singular interim dry pond within City-owned lands south of the site. The dry ponds are to maintain controlled discharge to the Riocan Avenue trunk sewer, with discharge rates to the Riocan sewer set below existing contributions to the Bending Way outlet channel. Upon development of the City-owned lands to the south, major system flows can be directed overland along internal roadways towards Jockvale Road as envisioned by the NSMCSWM.

Preliminary runoff coefficient values for storm sewer design calculations have been assigned to each drainage area as noted on the provided storm drainage plan for values typical to the associated land use. A summary of drainage areas and runoff coefficients are provided in **Table 5.1**.

Table 5.1: Summary of Post-Development Drainage Areas

Area ID	Area (ha)	C
CT06A	0.40	0.70
CT10A	4.63	0.80
CT10B	1.69	0.80
CT10C	0.45	0.70
C101A	1.10	0.75
C102A	0.29	0.75
C103A	0.61	0.40
C103B	1.11	0.75
C106A	0.70	0.75
C108A	1.19	0.70
C110A	1.50	0.70
C111A	0.82	0.70
C112A	0.64	0.80
C113A	0.49	0.70
C114A	0.40	0.70
C115A	0.79	0.80

The areas ‘CT10A’, ‘CT10B’, and ‘CT10C’ represent the future development lands to the south and the segment of the future Riocan Avenue ROW within the future development lands, and are assumed to contribute to the Riocan Avenue sewer per background studies.

5.3.1 Allowable Release Rate

Based on the NSMCSWM design brief (IBI, 2018), the peak post-development discharge from the development to the minor system was established based on the unit rate of 90 L/s/ha. Note that area ‘C_Road’ of 0.25 ha was originally assumed to discharge to the minor system at a rate of 122 L/s in consideration of 100-year capture of runoff directed towards Longfields Drive. In consideration of this area, the overall site release rate has been effectively set at 1001.3 L/s.

The site is to be designed using the “dual drainage” principle, whereby the minor (pipe) system is designed to convey the peak rate of runoff from the lesser of the 2-year design storm or the unit rate of 90L/s/ha as noted above, and runoff from larger events is conveyed by major (overland) channels, such as roadways and walkways, safely off site without impacting proposed or existing downstream properties.

In keeping with the 2-year inlet restriction criterion (5-year for collector streets, 10-year for arterial roads), inlet control devices (ICDs) or orifice plates will be specified during the detailed design stage for all street and rear yard catchbasins to limit the inflow to the minor system. Restricted inlet rates to the sewer are necessary to prevent the hydraulic grade line from surcharging storm sewers into basements during major storms.

Proposed storm sewers have been preliminarily sized based on required capture rates as described above within the storm sewer design sheet included within **Appendix C.1**.

5.3.2 Quantity Control

A preliminary hydrologic modeling exercise was completed with PCSWMM, accounting for the estimated major and minor systems to evaluate major system conveyance of runoff during the design storm event (100-year storm). The use of PCSWMM for modeling of the site hydrology and hydraulics allowed for a preliminary sizing of the interim dry pond in the future development lands to the south to provide quantity control of the 100-year major system overland flow contribution into the existing 1650 mm diameter storm trunk sewer in the future Riocan Avenue ROW.

The runoff flows in the preliminary storm sewers are detailed in the storm sewer design sheet attached in **Appendix C.1**, while the following assumptions were applied to the preliminary model for the major system overland interim storage sizing:

- Hydrologic parameters as per Ottawa Sewer Design Guidelines, including Manning’s ‘n’, and depression storage values.
- Subcatchment infiltration parameters per Horton Infiltration method per Ottawa Sewer Design Guidelines.
- 3-hour Chicago Storm distribution for the 100-year storm event.

- Runoff coefficients based on typical values for proposed land uses.
- The overall site area was divided based on overland flow tributary areas. Based on grading constraints, approximately 1.07ha at the eastern boundary of the site is expected to maintain an emergency overland flow route to the Longfields Road ROW. It is expected that sufficient road sag storage will be provided within this area to retain major system flows on-site without major system contribution to Longfields Drive per the NSMCSWM report.
- The balance of the site (8.95 ha) was divided up into two lumped subcatchment areas based on overland major system outlets and delineated by the future Riocan Avenue ROW.
- No mitigating road sag storage has been incorporated within the model to reduce major system runoff given anticipated continuous roadway slopes in general from northwest to southeast across the development.
- Subcatchment widths were determined by dividing the subcatchment areas by the length of the overland drainage path from the anticipated site high points to the major system outlets.
- Minor system capture rates have been assigned based on the 90L/s/ha unit rate.
- Major system corridors have been modeled as weirs with cross-sections defined based on expected ROW/walkway configurations.

The preliminary outline of the interim storage pond for the major system overland flow is illustrated on **Drawing SD-1**. In coordination with the functional grading plan as illustrated on **Drawing GP-1**, effective overland conveyance and emergency overland escape routes for stormwater management are available, and the interim dry pond is expected to provide around 1,555 m^3 of storage for the major system discharge during the 100-year storm event. The output from the conceptual model is attached in **Appendix C.2**.

5.3.3 Quality Control

The site is to outlet in its entirety to the existing 1650 mm storm sewer tributary to the existing Chapman Mills SWM facility east of Longfields Road and south of Paul Metivier Drive. As this facility has been sized to provide sufficient end of pipe quality control per the NSCMSWM report, no additional quality control is proposed on site.

5.3.4 Infiltration

The subject lands do not form part of significant groundwater recharge areas as per current Rideau Valley Conservation Authority mapping data. No requirements for water balance have been identified as requirements during development of the overarching master servicing study for the region.

Given the presence of significant subsurface clay and glacial till deposits, infiltration of runoff for water balance is not anticipated to be feasible. As such, the following low impact development techniques are to be implemented during detailed design solely as best management practices:

- Rear yard swales to be constructed at minimum slopes with subsurface perforated pipes per City standard drawing S29 to promote infiltration where possible.

- Eavestroughs are to be directed to landscaped surfaces, and preferentially to rear lots to further promote infiltration of runoff.
- Topsoil amendments in landscaped areas may be explored at detailed design to provide additional attenuation of runoff for eventual infiltration through surrounding soils.

Excerpts from the water budget hydrogeological investigation are attached in **Appendix D.2**.

5.4 Deviations From Previous Studies

The *Nepean South Chapman Mills Stormwater Management Servicing Fourth Addendum* demonstrates a major system contribution from the entirety of catchment areas ‘E’ and ‘F’ that also include parcels west of the existing Jockvale Road. Based on current topography as well as proposed road profiles for Chapman Mills by others, these lands are significantly lower (in some cases as much as 3 m) than southerly elevations of Jockvale Road to which overland flow would have to pass to meet assumptions of the NSCMSWM. As portions of these lands are also currently occupied by rural homes prior to redevelopment, there is no means of providing overland flow for these lands through the subject site without complete reworking of Jockvale Road grades.

It is expected that the areas within the wedge between Greenbank Road, Jockvale Road, and the future extension of Darjeeling Avenue will be required to contain 100-year major system flows on-site with eventual release to the minor system per requirements of the NSCMSWM report. Similarly, it is likely that the proposed park block at the west of the subject site will also maintain an emergency flow route towards Chapman Mills in order to tie into adjacent existing roadway grades. Despite this, interim major system storage for the proposed draft plan conservatively considers overland flow contribution from the park block to ensure adequate dry pond sizing. Excerpts from the previous studies are attached in **Appendix C.3**.

As described in earlier report sections, a portion of the subject site along the eastern property boundary is anticipated to be too low to contribute to overland flow crossing Jockvale Road given existing grades along the Longfields Drive boundary. These lands will maintain an emergency overland flow route to Longfields Drive, and are anticipated to provide sufficient road sag storage to ensure full storage of the 100-year storm event runoff to ensure no drainage impacts within the existing Longfields ROW.

6 Grading and Drainage

The proposed development area measures approximately 10 ha in area with the majority of the site sheet draining towards the existing storm drainage channel in the future development lands to the south, while the balance of the site in the east drains towards the Longfields Road ROW.

The conceptual grading plan (**Drawing GP-1**) identifies the overall grading strategy, which serves to:

- Match existing grades along adjacent existing property, roadways, and proposed/required development setback boundaries.
- Follow the grade raise restrictions identified in the geotechnical investigation.
- Provide adequate cover conditions for sanitary and storm sewers and watermain servicing.
- Establish effective overland conveyance and emergency overland escape routes for stormwater management and flood protection.

During subsequent stages of the development process, adjustments to grading conditions may be made as required. The associated servicing and stormwater management conditions will be considered and may also be adjusted as needed to maintain consistency with the related design criteria.

7 Riocan Avenue

7.1 Roadway Extension

A 20 m wide City-owned parcel bisects the Minto development lands from future Chapman Mills drive to the southern limit of the subdivision lands. As part of the Minto development, the parcel will be widened to 22 m and will form the future right-of-way (ROW) for an extension of Riocan Avenue. A 22 m ROW is required to accommodate the active transportation infrastructure, municipal servicing, utilities, trees and travel lanes to be constructed as part of the Barrhaven Town Centre Stage 2 subdivision development.

A 1650 mm concrete storm sewer is located within the 20 m City parcel. It will serve as the minor system outlet for the subdivision and must be accommodated in the cross-section for the Riocan Avenue extension.

7.2 Right-of-Way Cross-Section

A 22m right-of-way cross section has been approved and adopted for the segment of Riocan Avenue north of Chapman Mills (see **Figure 7.1** below). This cross-section is proposed to be carried through the Minto Barrhaven Town Centre Stage 2 lands to the extent possible. As noted above, the future Riocan ROW parcel is constrained by the location of the existing 1650mm municipal storm sewer within the corridor.

The proposed section for Riocan Avenue through Stage 2 of the Minto Barrhaven Town Centre lands is included in **Figure 7.2** below. The location of the existing storm sewer within the section varies due to the curvature of the right of way. The sanitary sewer and watermain within the section have been offset from the storm sewer per design guidelines. Although standard catchbasins form part of the section north of Chapman Mills, ditch inlet catchbasins are proposed for the Riocan Avenue south of Chapman Mills per collector road standards and to accommodate the municipal sewer and water within the corridor. All other infrastructure is proposed to match the section approved for Riocan Avenue north of Chapman Mills. The section will be finalised as part of the detailed design of the subdivision.

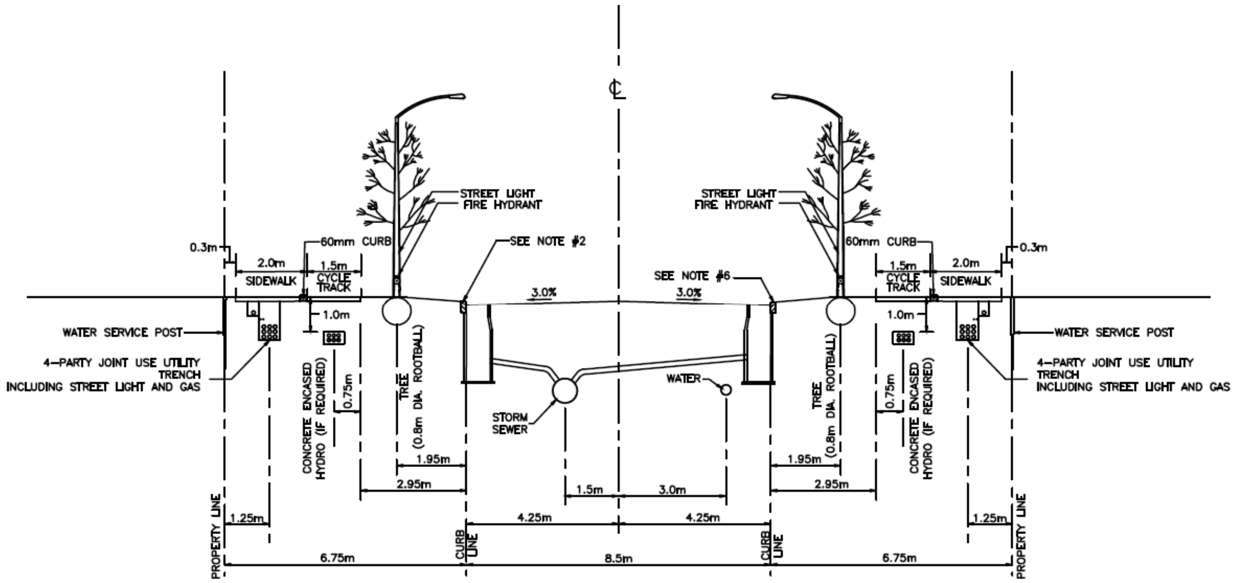


Figure 7.1: Approved Cross-Section Riocan Avenue Minto BTC Stage 1 Subdivision

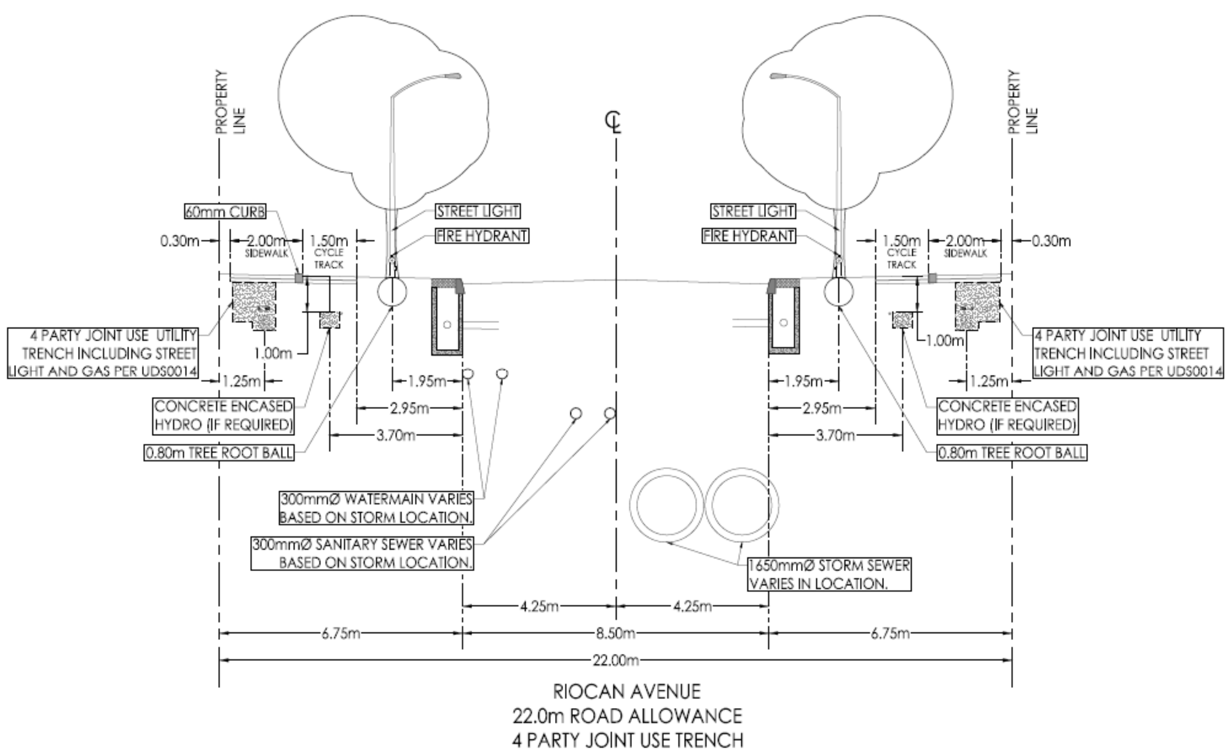


Figure 7.2: Proposed ROW Cross-Section Riocan Avenue Minto BTC Stage 2 Subdivision

8 Approvals

Proposed subdivision works include stormwater management, storm sewers and sanitary sewers, that will require an alteration of the City of Ottawa's municipal Consolidated Linear Infrastructure Environmental Compliance Approval (CLI-ECA), from the Ontario Ministry of Environment, Conservation, and Parks (MECP). These requirements will be confirmed at the detailed design stage.

The Rideau Valley Conservation Authority (RVCA) will be circulated on this submission to confirm any permit requirements given the presence of an existing watercourse on the eastern portion of the site.

An MECP Permit to Take Water (PTTW) or posting on the Environmental Activity and Sector Registry (EASR) may be required for water taking activities. The geotechnical consultant will advise of the applicable requirements.

9 Erosion Control During Construction

To protect downstream water quality and prevent sediment build-up in catch basins and storm sewers, erosion and sediment control measures must be implemented during construction. Erosion and sediment control (ESC) measures are the responsibility of the contractor. Specific recommendations for ESC measures will be identified at the detailed design stage.

10 Geotechnical Investigation

Geotechnical conditions for the site were investigated by Paterson Group with findings presented in the supporting investigation report PG5636-3 dated November 25, 2025. The report summarizes the existing soil conditions within the subject area and construction recommendations. The recommendations from the geotechnical report are intended to be followed as they relate to the proposed servicing strategy for the site. For details which are not summarized below, please see the original Paterson report that was included as part of the application package for Draft Plan of Subdivision.

Subsurface soil conditions within the subject area were determined through field investigations on October 20 and 23, 2025. Subsurface soil conditions within the subject area were determined from 14 boreholes and 12 test pits distributed across the proposed site. In general, soil stratigraphy consisted of a topsoil/organic layer underlain by a silty clay crust and/or silty sand, followed by a glacial till deposit. Bedrock was encountered at borehole BH 1-21 and BH 2-21 to a depth of up to 13.6 m. Based on the geological mapping, the site is in the area where bedrock usually consists of interbedded sandstone and dolomite of the March formation, with an approximate thickness of 5 to 15 m.

Groundwater Levels were estimated to vary in elevation from 0.72 to 6.71m below the original ground surface in the elevation range of 89.4 m to 98.57 m. It is expected that construction will occur below the existing groundwater table and therefore a permit to take water may be required as well as requirements for damp proofing or foundation waterproofing may be required.

A permissible grade raise restriction of 3.0 m has been recommended within the Paterson Group report for the southeastern portion of the property. The grade raise restrictions were accounted for in the conceptual grading design.

The recommended pavement structure for the driveways and roadways is outlined in **Table 10.1**:

Table 10.1 Recommended Pavement Structure

Recommended Pavement Structure for Driveways	Recommended Pavement Structure for Local Residential Roadways	Recommended Pavement Structure for Arterial Roadways with Bus Traffic	Pavement Structure
50 mm	40 mm	40 mm	Superpave 12.5 Asphaltic Concrete or equivalent
-	50 mm	50 mm (Upper Binder) 50 mm (Lower Binder)	Superpave 19.0 Asphaltic Concrete or equivalent
150 mm	150mm	150 mm	OPSS Granular A Crushed Stone
300 mm	450 mm	750 mm	OPSS Granular B Tye II

11 Closing

Based on the preceding information, the following conclusions are summarized below:

11.1 Potable Water

During peak hour conditions, the proposed water distribution system is expected to operate above the minimum pressure objective of 276 kPa (40 psi). The preliminary hydraulic model indicates that the proposed system can provide sufficient fire flow while maintaining a residual pressure of 138 kPa (20 psi) in all areas based on hydraulic analysis done at the draft plan level. A final hydraulic analysis is to be completed at detailed design for plan of subdivision.

The detailed design of the medium density blocks form part of future site plan control applications and redundant feeds will be provided.

11.2 Sanitary Servicing

Stage 2 of the Barrhaven Town Centre development will be serviced by a network of gravity sewers which will direct wastewater flows to a new trunk sanitary sewer in future Riocan Avenue connecting to the existing stub at Longfields Drive and Paul Metivier Drive. Peak flows do not exceed the design flows assumed in the South Nepean Collector sewer design report.

11.3 Stormwater Servicing

The proposed stormwater management plan is in compliance with the goals specified in the background reports and the 2025 City of Ottawa Sewer Guidelines. Inflow to the minor system will be restricted to 90 L/s/ha for all storm events, up to and including the 100-year event.

Minor system peak flows from the proposed site will be captured and directed to the existing 1650mm storm trunk sewers in Riocan Avenue and will ultimately discharge into the outlet channel of the existing Chapman Mills SWM Facility, which has been sized to provide end-of-pipe quality control.

An interim dry pond has been sized will provide storage for the major system flows until such time that the downstream road network is constructed and major system flows are directed to the Jock River via the Riversbend Subdivision. The interim pond will control flow to the existing storm trunk sewer in future Riocan Avenue.

11.4 Grading

A conceptual grading plan has been prepared accounting for required overland flow conveyance, cover over sewers, hydraulic grade line requirements, and grade raise restrictions as identified in the geotechnical investigation. A detailed grading design will be developed at the time of detailed design and will adhere to all requirements as outlined in the City of Ottawa guidelines.

Appendix A Water Servicing

A.1 Domestic Water Demands

<u>Barrhaven Town Center Phase 2 - Domestic Water Demand Estimates</u>
Ultimate

Densities as per City Guidelines:

MD 2.7 ppu

Area ID	Number of Units	Population	Daily Rate of Demand [1]	Avg Day Demand [2]		Max Day Demand [3]		Peak Hour Demand [3]	
				(L/min)	(L/s)	(L/min)	(L/s)	(L/min)	(L/s)
R9A	39	105	280	20.5	0.34	51.2	0.85	112.6	1.88
R11A	8	22	280	4.2	0.07	10.5	0.18	23.1	0.39
R13A	40	108	280	21.0	0.35	52.5	0.88	115.5	1.93
R14A	64	173	280	33.6	0.56	84.0	1.40	184.8	3.08
R16A	50	135	280	26.3	0.44	65.6	1.09	144.4	2.41
R18A	45	122	280	23.6	0.39	59.1	0.98	129.9	2.17
R19A	25	68	280	13.1	0.22	32.8	0.55	72.2	1.20
R20A	64	173	280	33.6	0.56	84.0	1.40	184.8	3.08
R21A	24	65	280	12.6	0.21	31.5	0.53	69.3	1.16
R22A	21	57	280	11.0	0.18	27.6	0.46	60.6	1.01
R23A	80	216	280	42.0	0.70	105.0	1.75	231.0	3.85
Total Site :	**460**	**1242**		**241.5**	**4.0**	**603.8**	**10.1**	**1328.3**	**22.1**

1 Average day water demand for residential areas equal to 280 L/cap/d and 28,000 L/ha/d for the school block
2 City of Ottawa water demand criteria used to estimate peak demand rates for residential areas are as follows:
maximum day demand rate = 2.5 x average day demand rate for residential, 1.5 for Institutional
maximum hour demand rate = 2.2 x maximum day demand rate for residential, 1.8 for institutional
4 Unit counts are based on the Concept Site Plan - Rev 0 for Barrhaven Town Centre by Minto Communities, dated November 12, 2025

A.2 Preliminary Fire Flow Calculations (2020 FUS)

FUS Fire Flow Calculation Sheet - 2020 FUS Guidelines

Stantec Project #: 160402206
Project Name: Barrhaven Town Centre - Phase 2
Date: 2026-02-06
Fire Flow Calculation #: 1
Description: Medium Density Units
Notes: Based on worst-case assumption, 3-storey wood-frame multi-unit building - max. ground floor area of 600m2.(Block 1)

Step	Task	Notes							Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Type V - Wood Frame / Type IV-D - Mass Timber Construction							1.5	-
2	Determine Effective Floor Area	Sum of All Floor Areas							NO	-
		600	600	600					1800	-
3	Determine Required Fire Flow	(F = 220 x C x $A^{1/2}$). Round to nearest 1000 L/min							-	14000
4	Determine Occupancy Charge	Limited Combustible							-15%	11900
5	Determine Sprinkler Reduction	None							0%	0
		Non-Standard Water Supply or N/A							0%	
		Not Fully Supervised or N/A							0%	
		% Coverage of Sprinkler System							0%	
6	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	Firewall / Sprinklered ?	-	-
		North	> 30	20	2	21-49	Type V	NO	0%	4641
		East	10.1 to 20	30	3	81-100	Type V	NO	14%	
		South	10.1 to 20	20	2	21-49	Type V	NO	11%	
		West	10.1 to 20	30	3	81-100	Type V	NO	14%	
7	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min								17000
		Total Required Fire Flow in L/s								283.3
		Required Duration of Fire Flow (hrs)								3.50
		Required Volume of Fire Flow (m^3)								3570

FUS Fire Flow Calculation Sheet - 2020 FUS Guidelines

Stantec

Stantec Project #: 160402206
Project Name: Barrhaven Town Centre - Phase 2
Date: 2026-02-06
Fire Flow Calculation #: 2
Description: Executive Towns
Notes: Based on worst-case assumption, 3-storey wood-frame Back-to-Back townhouse - max. For a ground-floor area of 400 m2, firewall can be required for a larger footprint. Minimum rear yard setback 7.5m per Zoning By-law for Development Reserve Zone (DR)

Step	Task	Notes										Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Type V - Wood Frame / Type IV-D - Mass Timber Construction										1.5	-
2	Determine Effective Floor Area	Sum of All Floor Areas										NO	-
		400	400	400								1200	-
3	Determine Required Fire Flow	(F = 220 x C x $A^{1/2}$). Round to nearest 1000 L/min										-	11000
4	Determine Occupancy Charge	Limited Combustible										-15%	9350
5	Determine Sprinkler Reduction	None										0%	0
		Non-Standard Water Supply or N/A										0%	
		Not Fully Supervised or N/A										0%	
		% Coverage of Sprinkler System										0%	
6	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall		Firewall / Sprinklered ?			-	-
		North	10.1 to 20	30	2	41-60	Type V		NO			12%	4675
		East	3.1 to 10	20	3	41-60	Type V		NO			17%	
		South	20.1 to 30	30	2	41-60	Type V		NO			4%	
		West	3.1 to 10	20	3	41-60	Type V		NO			17%	
7	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min											14000
		Total Required Fire Flow in L/s											233.3
		Required Duration of Fire Flow (hrs)											3.00
		Required Volume of Fire Flow (m^3)											2520

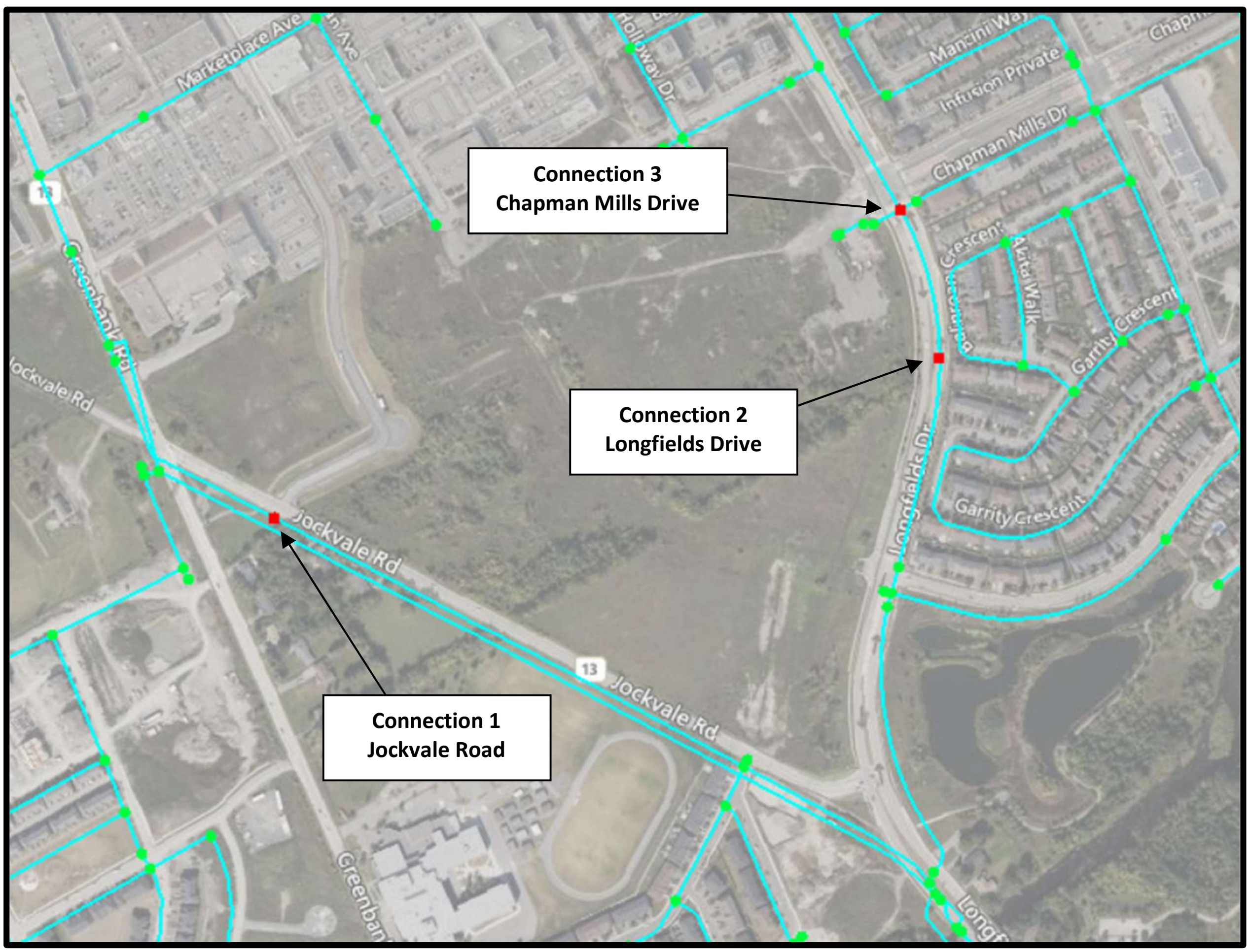
A.3 Hydraulic Boundary Conditions

Boundary Conditions
Barrhaven Town Center – Phase 2s

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	249	4.15
Maximum Daily Demand	622	10.36
Peak Hour	1,369	22.81
Fire Flow Demand #1	10,000	166.67
Fire Flow Demand #2	14,000	233.33
Fire Flow Demand #3	17,000	283.33

Location



Results

Existing Conditions

Connection 1 – Jockvale Road

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	155.2	84.7
Peak Hour	142.0	65.8
Max Day plus Fire Flow #1	142.0	65.8
Max Day plus Fire Flow #2	142.0	65.8
Max Day plus Fire Flow #3	141.7	65.5
[1] Ground Elevation =	95.7	m

Connection 2 – Longfields Drive

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	155.1	87.0
Peak Hour	141.6	67.7
Max Day plus Fire Flow #1	141.6	67.7
Max Day plus Fire Flow #2	141.6	67.7
Max Day plus Fire Flow #3	140.5	66.2
[1] Ground Elevation =	94.0	m

Connection 3 – Chapman Mills Drive

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	155.1	85.9
Peak Hour	141.6	66.6
Max Day plus Fire Flow #1	141.6	66.6
Max Day plus Fire Flow #2	141.6	66.6
Max Day plus Fire Flow #3	140.8	65.5
[1] Ground Elevation =	94.8	m

Future SUC

Connection 1 – Jockvale Road

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	147.2	73.1
Peak Hour	144.6	69.6
Max Day plus Fire Flow #1	144.4	69.2
Max Day plus Fire Flow #2	143.6	68.1
Max Day plus Fire Flow #3	142.9	67.1
[1] Ground Elevation =	95.7	m

Connection 2 – Longfields Drive

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	147.2	75.7
Peak Hour	144.2	71.4
Max Day plus Fire Flow #1	144.2	71.4
Max Day plus Fire Flow #2	143.4	70.3
Max Day plus Fire Flow #3	142.7	69.4
[1] Ground Elevation =	94.0	m

Connection 3 – Chapman Mills Drive

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	147.2	74.6
Peak Hour	144.2	70.3
Max Day plus Fire Flow #1	144.2	70.3
Max Day plus Fire Flow #2	143.6	69.5
Max Day plus Fire Flow #3	143.0	68.6
[1] Ground Elevation =	94.8	m

Notes

1. Any connection to a watermain 400 mm or larger should be approved by DWS as per the *Water Design Guidelines Section 2.4* Review by Drinking Water Services.
2. As per the Ontario Building Code in areas that may be occupied, the static pressure at any fixture shall not exceed 552 kPa (80 psi.) Pressure control measures to be considered are as follows, in order of preference:
   - If possible, systems to be designed to residual pressures of 345 to 552 kPa (50 to 80 psi) in all occupied areas outside of the public right-of-way without special pressure control equipment.
   - Pressure reducing valves to be installed immediately downstream of the isolation valve in the home/ building, located downstream of the meter so it is owner maintained.

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.

A.4 Preliminary Hydraulic Model Results

Pre-SUC Reconfiguration PCSWMM Watermain Hydraulic Analysis Result
Junction Results - Basic Day

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (m)	Pressure (psi)2	Pressure (kPa)
0.00	0.00	98.36	155.12	56.76	80.71	556.49
11.00	0.00	97.08	155.12	58.04	82.53	569.03
12.00	0.00	97.05	155.12	58.07	82.57	569.30
13.00	0.00	97.24	155.12	57.87	82.30	567.40
14.00	0.00	98.24	155.12	56.88	80.88	557.67
18.00	0.00	95.76	155.11	59.36	84.41	581.96
19.00	0.00	95.35	155.11	59.76	84.98	585.90
22.00	0.00	94.94	155.10	60.16	85.55	589.85
23.00	0.00	94.30	155.10	60.80	86.46	596.11
24.00	0.00	94.23	155.10	60.87	86.56	596.81
25.00	0.00	94.19	155.10	60.91	86.61	597.17
26.00	0.00	94.35	155.10	60.75	86.39	595.62
27.00	0.00	94.43	155.10	60.67	86.27	594.78
29.00	0.00	95.03	155.10	60.07	85.42	588.93
3.00	0.00	100.19	155.12	54.92	78.10	538.47
30.00	0.00	97.31	155.11	57.80	82.19	566.68
31.00	0.00	97.37	155.11	57.75	82.11	566.15
33.00	0.00	97.03	155.11	58.08	82.59	569.43
34.00	0.00	96.79	155.11	58.32	82.93	571.77
37.00	0.00	95.11	155.10	59.99	85.31	588.19
38.00	0.00	95.13	155.10	59.98	85.28	588.00
4.00	0.00	100.27	155.12	54.84	77.99	537.69
40.00	0.00	95.20	155.10	59.90	85.17	587.25
41.00	0.00	99.72	155.12	55.40	78.78	543.19
42.00	0.00	97.16	155.11	57.95	82.40	568.14
5.00	0.00	100.27	155.12	54.84	77.98	537.68
7.00	0.00	100.14	155.12	54.98	78.18	539.03
9.00	0.00	96.99	155.12	58.13	82.65	569.88
R11A	0.18	100.27	155.12	54.85	77.99	537.72
R13A	0.88	100.20	155.12	54.92	78.09	538.42
R14A-1	0.70	99.79	155.12	55.33	78.68	542.45
R14A-2	0.70	99.45	155.12	55.68	79.17	545.85
R16A	1.09	94.88	155.10	60.22	85.64	590.43
R18A	0.98	94.90	155.10	60.20	85.61	590.23
R19A	0.55	96.93	155.11	58.19	82.74	570.49
R20A-1	0.70	97.22	155.11	57.89	82.32	567.59
0A-2&R23A	1.58	96.53	155.11	58.58	83.29	574.29
R21A	0.53	94.81	155.11	60.29	85.74	591.13
R22A	0.46	95.21	155.10	59.89	85.16	587.13
R23A-2	0.88	95.12	155.10	59.98	85.29	588.06
R9A	0.85	100.09	155.12	55.03	78.25	539.51

Link Results - Basic Day

ID	FROM	TO	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)
1000	R14A-1	0	91	204	110	-1.570	0.048
1001	R13A	R14A-1	67	204	110	-0.870	0.027
1002	3	R13A	10	204	110	0.010	0.000
1003	4	3	31	204	110	0.010	0.000
1004	5	4	8	204	110	0.010	0.000
1005	R11A	5	4	204	110	0.010	0.000
1006	7	R11A	28	204	110	0.190	0.006
1007	R9A	7	7	204	110	0.190	0.006
1008	9	R9A	161	204	110	1.040	0.032
1010	12	11	12	297	120	0.000	0.000
1011	9	12	33	297	120	0.000	0.000
1012	13	9	12	297	120	3.339	0.048
1013	14	13	49	297	120	3.339	0.048
1014	0	14	7	297	120	3.339	0.048
1015	R14A-2	0	55	297	120	7.182	0.104
1016	41	R14A-2	35	297	120	7.882	0.114
1017	R19A	0	83	204	110	-2.274	0.070
1018	18	9	63	204	110	-2.299	0.070
1019	19	18	40	204	110	-2.386	0.073
1020	R21A	19	52	204	110	-3.322	0.102
1021	R16A	R21A	46	204	110	-3.549	0.109
1022	22	R16A	40	204	110	-1.331	0.041
1023	23	22	67	204	110	-0.526	0.016
1024	24	23	7	204	110	-0.526	0.016
1025	25	24	8	204	110	-0.526	0.016
1026	26	25	30	204	110	-0.381	0.012
1027	27	26	11	204	110	-0.381	0.012
1028	R18A	27	62	204	110	-0.381	0.012
1029	29	R18A	19	204	110	0.599	0.018
1030	R19A	18	62	204	110	0.088	0.003
1031	30	R19A	20	204	110	-1.636	0.050
1032	31	30	10	204	110	-1.636	0.050
1033	R20A-1	31	13	204	110	-1.636	0.050
1034	33	R20A-1	13	204	110	-0.936	0.029
1035	34	33	10	204	110	-0.936	0.029
1036	19	34	80	204	110	-0.936	0.029
1037	R20A-2&R23A-1	42	34	204	110	-2.332	0.071
1038	R21A	R20A-2&R23A-1	115	204	110	-0.757	0.023
1039	29	22	53	204	110	-0.806	0.025
1040	37	29	20	204	110	-0.207	0.006
1041	38	37	10	204	110	-0.207	0.006
1042	R23A-2	38	13	204	110	-0.207	0.006
1043	40	R23A-2	13	204	110	0.668	0.020
1044	R22A	40	10	204	110	0.668	0.020
1045	R16A	R22A	75	204	110	1.128	0.035
1046	25	Longfields_Drive	39	204	110	0.144	0.004
C1	Jockvale_Road	41	274	297	120	16.459	0.238
C2	41	42	183	297	120	8.577	0.124
C3	42	hapman_Mills_Driv	197	297	120	6.245	0.090

Pre-SUC Reconfiguration PCSWMM Watermain Hydraulic Analysis Result
Junction Results - Peak Hour

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (m)	Pressure (psi)2	Pressure (kPa)
0.00	0.00	98.36	141.71	43.36	61.65	425.08
11.00	0.00	97.08	141.71	44.64	63.47	437.61
12.00	0.00	97.05	141.71	44.66	63.51	437.87
13.00	0.00	97.24	141.71	44.47	63.23	435.97
14.00	0.00	98.24	141.71	43.48	61.82	426.25
18.00	0.00	95.76	141.70	45.94	65.33	450.43
19.00	0.00	95.35	141.69	46.33	65.89	454.27
22.00	0.00	94.94	141.62	46.68	66.38	457.67
23.00	0.00	94.30	141.61	47.31	67.28	463.87
24.00	0.00	94.23	141.61	47.38	67.38	464.56
25.00	0.00	94.19	141.61	47.42	67.43	464.91
26.00	0.00	94.35	141.61	47.26	67.21	463.38
27.00	0.00	94.43	141.61	47.18	67.09	462.54
29.00	0.00	95.03	141.62	46.59	66.25	456.75
3.00	0.00	100.19	141.71	41.52	59.04	407.06
30.00	0.00	97.31	141.70	44.38	63.11	435.13
31.00	0.00	97.37	141.70	44.33	63.03	434.60
33.00	0.00	97.03	141.69	44.66	63.51	437.85
34.00	0.00	96.79	141.69	44.90	63.84	440.19
37.00	0.00	95.11	141.62	46.51	66.14	456.01
38.00	0.00	95.13	141.62	46.49	66.11	455.82
4.00	0.00	100.27	141.71	41.44	58.92	406.26
40.00	0.00	95.20	141.62	46.42	66.00	455.08
41.00	0.00	99.72	141.73	42.01	59.74	411.87
42.00	0.00	97.16	141.66	44.50	63.28	436.27
5.00	0.00	100.27	141.71	41.44	58.92	406.25
7.00	0.00	100.14	141.71	41.58	59.12	407.61
9.00	0.00	96.99	141.71	44.72	63.59	438.45
R11A	0.18	100.27	141.71	41.44	58.93	406.29
R13A	0.88	100.20	141.71	41.51	59.03	407.01
R14A-1	0.70	99.79	141.71	41.92	59.61	411.03
R14A-2	0.70	99.45	141.72	42.28	60.12	414.48
R16A	1.09	94.88	141.63	46.75	66.47	458.32
R18A	0.98	94.90	141.62	46.72	66.43	458.02
R19A	0.55	96.93	141.70	44.77	63.67	438.96
R20A-1	0.70	97.22	141.69	44.47	63.24	436.02
0A-2&R23/	1.58	96.53	141.66	45.13	64.17	442.42
R21A	0.53	94.81	141.66	46.84	66.61	459.27
R22A	0.46	95.21	141.62	46.41	65.99	454.97
R23A-2	0.88	95.12	141.62	46.50	66.12	455.88
R9A	0.85	100.09	141.71	41.62	59.19	408.09

Link Results - Basic Day

ID	FROM	TO	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)
1000	R14A-1	0	91	204	110	-1.797	0.055
1001	R13A	R14A-1	67	204	110	-1.097	0.034
1002	3	R13A	10	204	110	-0.217	0.007
1003	4	3	31	204	110	-0.217	0.007
1004	5	4	8	204	110	-0.217	0.007
1005	R11A	5	4	204	110	-0.217	0.007
1006	7	R11A	28	204	110	-0.037	0.001
1007	R9A	7	7	204	110	-0.037	0.001
1008	9	R9A	161	204	110	0.813	0.025
1010	12	11	12	297	120	0.000	0.000
1011	9	12	33	297	120	0.000	0.000
1012	13	9	12	297	120	5.819	0.084
1013	14	13	49	297	120	5.819	0.084
1014	0	14	7	297	120	5.819	0.084
1015	R14A-2	0	55	297	120	12.301	0.178
1016	41	R14A-2	35	297	120	13.001	0.188
1017	R19A	0	83	204	110	-4.685	0.143
1018	18	9	63	204	110	-5.007	0.153
1019	19	18	40	204	110	-5.763	0.176
1020	R21A	19	52	204	110	-8.441	0.258
1021	R16A	R21A	46	204	110	-8.853	0.271
1022	22	R16A	40	204	110	-4.749	0.145
1023	23	22	67	204	110	-3.232	0.099
1024	24	23	7	204	110	-3.232	0.099
1025	25	24	8	204	110	-3.232	0.099
1026	26	25	30	204	110	2.216	0.068
1027	27	26	11	204	110	2.216	0.068
1028	R18A	27	62	204	110	2.216	0.068
1029	29	R18A	19	204	110	3.196	0.098
1030	R19A	18	62	204	110	0.756	0.023
1031	30	R19A	20	204	110	-3.378	0.103
1032	31	30	10	204	110	-3.378	0.103
1033	R20A-1	31	13	204	110	-3.378	0.103
1034	33	R20A-1	13	204	110	-2.678	0.082
1035	34	33	10	204	110	-2.678	0.082
1036	19	34	80	204	110	-2.678	0.082
1037	R20A-2&R23A-1	42	34	204	110	-2.517	0.077
1038	R21A	R20A-2&R23A-1	115	204	110	-0.942	0.029
1039	29	22	53	204	110	-1.517	0.046
1040	37	29	20	204	110	1.679	0.051
1041	38	37	10	204	110	1.679	0.051
1042	R23A-2	38	13	204	110	1.679	0.051
1043	40	R23A-2	13	204	110	2.554	0.078
1044	R22A	40	10	204	110	2.554	0.078
1045	R16A	R22A	75	204	110	3.014	0.092
1046	25	Longfields_Drive	39	204	110	5.448	0.167
C1	Jockvale_Road	41	274	297	120	32.703	0.472
C2	41	42	183	297	120	19.702	0.284
C3	42	hapman_Mills_Driv	197	297	120	17.185	0.248

Pre-SUC Reconfiguration PCSWMM Watermain Hydraulic Analysis Result
Fire Flow Results - Max Day + 233 L/s

ID	Static Demand (L/s)	Static Pressure (m)	Static Pressure (psi)	Static Pressure (kPa)	Static Head (m)	Fire Flow Demand (L/s)	Residual Pressure (m)	Residual Pressure (psi)	Available Flow (L/s)	Available Pressure (psi)
0	0.00	43.36	61.66	425.11	141.71	233.33	39.28	55.86	683.84	20
11	0.00	44.63	63.46	437.56	141.71	233.33	37.78	53.73	526.20	20
12	0.00	44.66	63.51	437.85	141.71	233.33	38.25	54.39	545.88	20
13	0.00	44.47	63.24	435.99	141.71	233.33	39.43	56.07	621.37	20
14	0.00	43.48	61.83	426.28	141.71	233.33	39.24	55.79	670.58	20
18	0.00	45.94	65.33	450.40	141.70	233.33	39.46	56.11	554.69	20
19	0.00	46.33	65.88	454.23	141.69	233.33	39.89	56.72	560.29	20
22	0.00	46.68	66.38	457.66	141.62	233.33	39.57	56.27	534.17	20
23	0.00	47.31	67.27	463.83	141.61	233.33	40.46	57.54	549.82	20
24	0.00	47.38	67.37	464.52	141.61	233.33	41.25	58.66	584.53	20
25	0.00	47.42	67.43	464.91	141.61	233.33	42.35	60.22	648.67	20
26	0.00	47.26	67.20	463.34	141.61	233.33	38.71	55.04	486.82	20
27	0.00	47.18	67.09	462.56	141.61	233.33	37.91	53.91	465.57	20
29	0.00	46.59	66.25	456.77	141.62	233.33	38.21	54.34	488.06	20
3	0.00	41.52	59.04	407.07	141.71	233.33	21.96	31.22	280.62	20
30	0.00	44.38	63.11	435.11	141.70	233.33	34.93	49.66	439.42	20
31	0.00	44.33	63.04	434.62	141.70	233.33	34.20	48.63	422.94	20
33	0.00	44.66	63.51	437.85	141.69	233.33	33.62	47.80	405.80	20
34	0.00	44.90	63.85	440.21	141.69	233.33	33.74	47.98	405.20	20
37	0.00	46.51	66.14	455.99	141.62	233.33	36.32	51.64	437.90	20
38	0.00	46.49	66.11	455.79	141.62	233.33	35.69	50.75	424.06	20
4	0.00	41.44	58.93	406.28	141.71	233.33	21.49	30.55	277.18	20
40	0.00	46.42	66.01	455.11	141.62	233.33	34.82	49.51	407.53	20
41	0.00	0.00	0.00	0.00	0.00	233.33	39.57	56.26	878.80	20
42	0.00	0.00	0.00	0.00	0.00	233.33	42.27	60.10	958.92	20
5	0.00	41.44	58.93	406.28	141.71	233.33	21.47	30.53	277.07	20
7	0.00	41.58	59.13	407.66	141.71	233.33	21.93	31.19	280.29	20
9	0.00	44.72	63.59	438.44	141.71	233.33	39.55	56.24	615.27	20
R11A	0.18	41.44	58.93	406.28	141.71	233.33	21.49	30.55	277.15	20
R13A	0.88	41.51	59.03	406.97	141.71	233.33	22.19	31.55	282.47	20
R14A-1	0.70	41.92	59.61	410.99	141.71	233.33	25.97	36.93	316.05	20
R14A-2	0.70	42.28	60.12	414.52	141.72	233.33	39.11	55.61	768.35	20
R16A	1.09	46.75	66.48	458.34	141.63	233.33	39.97	56.83	549.25	20
R18A	0.98	46.72	66.43	458.05	141.62	233.33	37.26	52.98	457.47	20
R19A	0.55	44.77	63.66	438.93	141.70	233.33	37.28	53.01	502.43	20
R20A-1	0.70	44.47	63.24	435.99	141.69	233.33	33.77	48.02	411.38	20
R20A-2&R23A-1	1.58	45.13	64.17	442.46	141.66	233.33	38.94	55.37	559.57	20
R21A	0.53	46.84	66.61	459.23	141.66	233.33	41.45	58.94	623.11	20
R22A	0.46	46.41	65.99	455.01	141.62	233.33	34.75	49.42	406.39	20
R23A-2	0.88	46.50	66.12	455.89	141.62	233.33	35.17	50.01	413.43	20
R9A	0.85	41.62	59.18	408.05	141.71	233.33	22.13	31.47	281.76	20

Pre-SUC Reconfiguration PCSWMM Watermain Hydraulic Analysis Result
Fire Flow Results - Max Day + 283 L/s

ID	Static Demand (L/s)	Static Pressure (m)	Static Pressure (psi)	Static Pressure (kPa)	Static Head (m)	Fire Flow Demand (L/s)	Residual Pressure (m)	Residual Pressure (psi)	Available Flow (L/s)	Available Pressure (psi)
0	0.00	42.68	60.69	418.44	141.04	283.33	36.88	52.45	675.55	20
11	0.00	43.95	62.50	430.89	141.03	283.33	34.18	48.61	520.03	20
12	0.00	43.98	62.54	431.19	141.03	283.33	34.84	49.54	539.49	20
13	0.00	43.79	62.27	429.32	141.03	283.33	36.62	52.07	614.05	20
14	0.00	42.80	60.86	419.62	141.04	283.33	36.77	52.28	662.47	20
18	0.00	45.23	64.32	443.44	140.99	283.33	35.99	51.17	548.21	20
19	0.00	45.60	64.84	447.07	140.95	283.33	36.41	51.78	553.62	20
22	0.00	45.72	65.01	448.25	140.66	283.33	35.64	50.68	526.34	20
23	0.00	46.31	65.85	454.03	140.60	283.33	36.59	52.03	541.57	20
24	0.00	46.37	65.94	454.62	140.60	283.33	37.68	53.58	575.73	20
25	0.00	46.40	65.98	454.91	140.59	283.33	39.23	55.78	638.84	20
26	0.00	46.26	65.78	453.54	140.61	283.33	34.10	48.49	479.51	20
27	0.00	46.18	65.67	452.76	140.61	283.33	33.00	46.93	458.58	20
29	0.00	45.62	64.87	447.26	140.65	283.33	33.73	47.97	480.83	20
3	0.00	40.84	58.07	400.40	141.03	283.33	12.91	18.36	276.91	20
30	0.00	43.67	62.10	428.15	140.99	283.33	30.18	42.91	434.01	20
31	0.00	43.61	62.01	427.56	140.98	283.33	29.16	41.47	417.71	20
33	0.00	43.94	62.48	430.79	140.98	283.33	28.18	40.07	400.82	20
34	0.00	44.18	62.82	433.15	140.97	283.33	28.25	40.17	400.25	20
37	0.00	45.55	64.77	446.58	140.66	283.33	31.06	44.17	431.43	20
38	0.00	45.54	64.76	446.48	140.66	283.33	30.17	42.90	417.80	20
4	0.00	40.76	57.96	399.62	141.03	283.33	12.28	17.45	273.50	20
40	0.00	45.47	64.66	445.79	140.67	283.33	28.97	41.19	401.53	20
41	0.00	41.35	58.80	405.40	141.07	283.33	37.88	53.87	868.08	20
42	0.00	43.75	62.21	428.93	140.91	283.33	40.59	57.71	947.08	20
5	0.00	40.76	57.96	399.62	141.03	283.33	12.25	17.42	273.39	20
7	0.00	40.89	58.14	400.89	141.03	283.33	12.85	18.28	276.59	20
9	0.00	44.04	62.62	431.77	141.03	283.33	36.68	52.15	608.09	20
R11A	0.18	40.76	57.96	399.62	141.03	283.33	12.27	17.45	273.47	20
R13A	0.88	40.83	58.06	400.30	141.03	283.33	13.25	18.84	278.73	20
R14A-1	0.70	41.24	58.64	404.32	141.03	283.33	18.47	26.27	311.96	20
R14A-2	0.70	41.61	59.17	407.95	141.06	283.33	37.11	52.77	758.89	20
R16A	1.09	45.83	65.17	449.32	140.71	283.33	36.21	51.49	541.50	20
R18A	0.98	45.74	65.04	448.44	140.64	283.33	32.30	45.92	450.64	20
R19A	0.55	44.07	62.67	432.07	140.99	283.33	33.38	47.47	496.37	20
R20A-1	0.70	43.76	62.23	429.03	140.98	283.33	28.48	40.49	406.31	20
R20A-2&R23A-1	1.58	44.36	63.08	434.91	140.89	283.33	35.56	50.57	552.70	20
R21A	0.53	46.04	65.47	451.38	140.86	283.33	38.37	54.57	615.21	20
R22A	0.46	45.46	64.64	445.70	140.68	283.33	28.88	41.06	400.41	20
R23A-2	0.88	45.55	64.77	446.58	140.67	283.33	29.44	41.86	407.35	20
R9A	0.85	40.94	58.22	401.38	141.03	283.33	13.12	18.65	278.04	20

Post-SUC Reconfiguration PCSWMM Watermain Hydraulic Analysis Result
Junction Results - Basic Day

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (m)	Pressure (psi)2	Pressure (kPa)
0.00	0.00	98.36	147.19	48.84	69.44	478.80
11.00	0.00	97.08	147.19	50.12	71.26	491.35
12.00	0.00	97.05	147.19	50.14	71.30	491.62
13.00	0.00	97.24	147.19	49.95	71.03	489.72
14.00	0.00	98.24	147.19	48.96	69.62	479.98
18.00	0.00	95.76	147.19	51.44	73.14	504.32
19.00	0.00	95.35	147.19	51.84	73.72	508.27
22.00	0.00	94.94	147.19	52.26	74.31	512.33
23.00	0.00	94.30	147.20	52.90	75.22	518.62
24.00	0.00	94.23	147.20	52.97	75.32	519.32
25.00	0.00	94.19	147.20	53.01	75.37	519.68
26.00	0.00	94.35	147.20	52.85	75.15	518.13
27.00	0.00	94.43	147.20	52.76	75.02	517.28
29.00	0.00	95.03	147.19	52.16	74.18	511.42
3.00	0.00	100.19	147.19	47.00	66.83	460.79
30.00	0.00	97.31	147.19	49.88	70.93	489.03
31.00	0.00	97.37	147.19	49.83	70.85	488.51
33.00	0.00	97.03	147.19	50.16	71.33	491.80
34.00	0.00	96.79	147.19	50.40	71.67	494.13
37.00	0.00	95.11	147.19	52.09	74.07	510.68
38.00	0.00	95.13	147.19	52.07	74.04	510.49
4.00	0.00	100.27	147.19	46.92	66.72	460.01
40.00	0.00	95.20	147.19	51.99	73.93	509.74
41.00	0.00	99.72	147.20	47.48	67.51	465.46
42.00	0.00	97.16	147.20	50.04	71.15	490.57
5.00	0.00	100.27	147.19	46.92	66.72	460.00
7.00	0.00	100.14	147.19	47.06	66.91	461.35
9.00	0.00	96.99	147.19	50.20	71.39	492.20
R11A	0.18	100.27	147.19	46.92	66.72	460.04
R13A	0.88	100.20	147.19	47.00	66.83	460.75
R14A-1	0.70	99.79	147.19	47.41	67.41	464.77
R14A-2	0.70	99.45	147.20	47.75	67.90	468.13
R16A	1.09	94.88	147.19	52.32	74.39	512.91
R18A	0.98	94.90	147.19	52.30	74.36	512.72
R19A	0.55	96.93	147.19	50.27	71.48	492.84
R20A-1	0.70	97.22	147.19	49.97	71.06	489.95
0A-2&R23/	1.58	96.53	147.20	50.66	72.04	496.72
R21A	0.53	94.81	147.19	52.38	74.49	513.56
R22A	0.46	95.21	147.19	51.98	73.91	509.62
R23A-2	0.88	95.12	147.19	52.08	74.05	510.55
R9A	0.85	100.09	147.19	47.11	66.98	461.83

Link Results - Basic Day

ID	FROM	TO	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)
1000	R14A-1	0	91	204	110	-1.479	0.045
1001	R13A	R14A-1	67	204	110	-0.779	0.024
1002	3	R13A	10	204	110	0.101	0.003
1003	4	3	31	204	110	0.101	0.003
1004	5	4	8	204	110	0.101	0.003
1005	R11A	5	4	204	110	0.101	0.003
1006	7	R11A	28	204	110	0.281	0.009
1007	R9A	7	7	204	110	0.281	0.009
1008	9	R9A	161	204	110	1.131	0.035
1010	12	11	12	297	120	0.000	0.000
1011	9	12	33	297	120	0.000	0.000
1012	13	9	12	297	120	1.651	0.024
1013	14	13	49	297	120	1.651	0.024
1014	0	14	7	297	120	1.651	0.024
1015	R14A-2	0	55	297	120	3.862	0.056
1016	41	R14A-2	35	297	120	4.562	0.066
1017	R19A	0	83	204	110	-0.732	0.022
1018	18	9	63	204	110	-0.519	0.016
1019	19	18	40	204	110	-0.278	0.009
1020	R21A	19	52	204	110	-0.002	0.000
1021	R16A	R21A	46	204	110	-0.317	0.010
1022	22	R16A	40	204	110	1.111	0.034
1023	23	22	67	204	110	1.617	0.049
1024	24	23	7	204	110	1.617	0.049
1025	25	24	8	204	110	1.617	0.049
1026	26	25	30	204	110	-1.471	0.045
1027	27	26	11	204	110	-1.471	0.045
1028	R18A	27	62	204	110	-1.471	0.045
1029	29	R18A	19	204	110	-0.491	0.015
1030	R19A	18	62	204	110	-0.241	0.007
1031	30	R19A	20	204	110	-0.424	0.013
1032	31	30	10	204	110	-0.424	0.013
1033	R20A-1	31	13	204	110	-0.424	0.013
1034	33	R20A-1	13	204	110	0.276	0.008
1035	34	33	10	204	110	0.276	0.008
1036	19	34	80	204	110	0.276	0.008
1037	R20A-2&R23A-1	42	34	204	110	-2.420	0.074
1038	R21A	R20A-2&R23A-1	115	204	110	-0.845	0.026
1039	29	22	53	204	110	-0.506	0.015
1040	37	29	20	204	110	-0.997	0.030
1041	38	37	10	204	110	-0.997	0.030
1042	R23A-2	38	13	204	110	-0.997	0.030
1043	40	R23A-2	13	204	110	-0.122	0.004
1044	R22A	40	10	204	110	-0.122	0.004
1045	R16A	R22A	75	204	110	0.338	0.010
1046	25	Longfields_Drive	39	204	110	-3.088	0.094
C1	Jockvale_Road	41	274	297	120	3.294	0.048
C2	41	42	183	297	120	-1.268	0.018
C3	42	hapman_Mills_Driv	197	297	120	-3.689	0.053

Post-SUC Reconfiguration PCSWMM Watermain Hydraulic Analysis Result
Junction Results - Peak Hour

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (m)	Pressure (psi)2	Pressure (kPa)
0.00	0.00	98.36	144.31	45.96	65.35	450.57
11.00	0.00	97.08	144.31	47.24	67.17	463.10
12.00	0.00	97.05	144.31	47.26	67.21	463.36
13.00	0.00	97.24	144.31	47.07	66.93	461.46
14.00	0.00	98.24	144.31	46.08	65.52	451.75
18.00	0.00	95.76	144.30	48.54	69.03	475.92
19.00	0.00	95.35	144.29	48.93	69.58	479.76
22.00	0.00	94.94	144.22	49.28	70.08	483.16
23.00	0.00	94.30	144.21	49.91	70.98	489.36
24.00	0.00	94.23	144.21	49.98	71.08	490.05
25.00	0.00	94.19	144.21	50.02	71.13	490.40
26.00	0.00	94.35	144.21	49.86	70.91	488.87
27.00	0.00	94.43	144.21	49.78	70.78	488.03
29.00	0.00	95.03	144.22	49.19	69.94	482.24
3.00	0.00	100.19	144.31	44.12	62.74	432.55
30.00	0.00	97.31	144.30	46.98	66.81	460.62
31.00	0.00	97.37	144.30	46.93	66.73	460.09
33.00	0.00	97.03	144.29	47.26	67.20	463.34
34.00	0.00	96.79	144.29	47.50	67.54	465.68
37.00	0.00	95.11	144.22	49.11	69.84	481.50
38.00	0.00	95.13	144.22	49.09	69.81	481.31
4.00	0.00	100.27	144.31	44.04	62.62	431.75
40.00	0.00	95.20	144.22	49.02	69.70	480.57
41.00	0.00	99.72	144.33	44.61	63.43	437.36
42.00	0.00	97.16	144.26	47.10	66.97	461.77
5.00	0.00	100.27	144.31	44.04	62.62	431.74
7.00	0.00	100.14	144.31	44.18	62.82	433.10
9.00	0.00	96.99	144.31	47.32	67.29	463.94
R11A	0.18	100.27	144.31	44.04	62.62	431.78
R13A	0.88	100.20	144.31	44.11	62.73	432.50
R14A-1	0.70	99.79	144.31	44.52	63.31	436.52
R14A-2	0.70	99.45	144.32	44.88	63.81	439.97
R16A	1.09	94.88	144.23	49.35	70.17	483.81
R18A	0.98	94.90	144.22	49.32	70.13	483.51
R19A	0.55	96.93	144.30	47.37	67.36	464.45
R20A-1	0.70	97.22	144.29	47.07	66.94	461.51
0A-2&R23/	1.58	96.53	144.26	47.73	67.86	467.91
R21A	0.53	94.81	144.26	49.44	70.31	484.76
R22A	0.46	95.21	144.22	49.01	69.69	480.46
R23A-2	0.88	95.12	144.22	49.10	69.82	481.37
R9A	0.85	100.09	144.31	44.22	62.89	433.58

Link Results - Basic Day

ID	FROM	TO	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)
1000	R14A-1	0	91	204	110	-1.797	0.055
1001	R13A	R14A-1	67	204	110	-1.097	0.034
1002	3	R13A	10	204	110	-0.217	0.007
1003	4	3	31	204	110	-0.217	0.007
1004	5	4	8	204	110	-0.217	0.007
1005	R11A	5	4	204	110	-0.217	0.007
1006	7	R11A	28	204	110	-0.037	0.001
1007	R9A	7	7	204	110	-0.037	0.001
1008	9	R9A	161	204	110	0.813	0.025
1010	12	11	12	297	120	0.000	0.000
1011	9	12	33	297	120	0.000	0.000
1012	13	9	12	297	120	5.819	0.084
1013	14	13	49	297	120	5.819	0.084
1014	0	14	7	297	120	5.819	0.084
1015	R14A-2	0	55	297	120	12.301	0.178
1016	41	R14A-2	35	297	120	13.001	0.188
1017	R19A	0	83	204	110	-4.685	0.143
1018	18	9	63	204	110	-5.007	0.153
1019	19	18	40	204	110	-5.763	0.176
1020	R21A	19	52	204	110	-8.441	0.258
1021	R16A	R21A	46	204	110	-8.853	0.271
1022	22	R16A	40	204	110	-4.749	0.145
1023	23	22	67	204	110	-3.232	0.099
1024	24	23	7	204	110	-3.232	0.099
1025	25	24	8	204	110	-3.232	0.099
1026	26	25	30	204	110	2.216	0.068
1027	27	26	11	204	110	2.216	0.068
1028	R18A	27	62	204	110	2.216	0.068
1029	29	R18A	19	204	110	3.196	0.098
1030	R19A	18	62	204	110	0.756	0.023
1031	30	R19A	20	204	110	-3.378	0.103
1032	31	30	10	204	110	-3.378	0.103
1033	R20A-1	31	13	204	110	-3.378	0.103
1034	33	R20A-1	13	204	110	-2.678	0.082
1035	34	33	10	204	110	-2.678	0.082
1036	19	34	80	204	110	-2.678	0.082
1037	R20A-2&R23A-1	42	34	204	110	-2.517	0.077
1038	R21A	R20A-2&R23A-1	115	204	110	-0.942	0.029
1039	29	22	53	204	110	-1.517	0.046
1040	37	29	20	204	110	1.679	0.051
1041	38	37	10	204	110	1.679	0.051
1042	R23A-2	38	13	204	110	1.679	0.051
1043	40	R23A-2	13	204	110	2.554	0.078
1044	R22A	40	10	204	110	2.554	0.078
1045	R16A	R22A	75	204	110	3.014	0.092
1046	25	Longfields_Drive	39	204	110	5.448	0.167
C1	Jockvale_Road	41	274	297	120	32.703	0.472
C2	41	42	183	297	120	19.702	0.284
C3	42	hapman_Mills_Driv	197	297	120	17.185	0.248

Post-SUC Reconfiguration PCSWMM Watermain Hydraulic Analysis Result
Fire Flow Results - Max Day + 233 L/s

ID	Static Demand (L/s)	Static Pressure (m)	Static Pressure (psi)	Static Pressure (kPa)	Static Head (m)	Fire Flow Demand (L/s)	Residual Pressure (m)	Residual Pressure (psi)	Available Flow (L/s)	Available Pressure (psi)
0	0.00	45.21	64.29	443.25	143.56	233.33	41.08	58.41	706.30	20
11	0.00	46.48	66.09	455.70	143.56	233.33	39.58	56.28	542.76	20
12	0.00	46.51	66.14	455.99	143.56	233.33	40.05	56.95	563.05	20
13	0.00	46.32	65.87	454.13	143.56	233.33	41.23	58.63	641.04	20
14	0.00	45.33	64.46	444.42	143.56	233.33	41.03	58.35	692.51	20
18	0.00	47.80	67.97	468.64	143.55	233.33	41.26	58.67	571.48	20
19	0.00	48.19	68.52	472.46	143.54	233.33	41.70	59.29	577.09	20
22	0.00	48.51	68.98	475.60	143.45	233.33	41.39	58.85	550.04	20
23	0.00	49.13	69.86	481.68	143.43	233.33	42.28	60.12	565.82	20
24	0.00	49.20	69.96	482.36	143.43	233.33	43.06	61.23	601.50	20
25	0.00	49.24	70.02	482.76	143.43	233.33	44.16	62.80	667.48	20
26	0.00	49.08	69.79	481.19	143.43	233.33	40.52	57.62	501.01	20
27	0.00	49.00	69.68	480.40	143.43	233.33	39.72	56.49	479.18	20
29	0.00	48.42	68.85	474.72	143.45	233.33	40.03	56.92	502.61	20
3	0.00	43.37	61.67	425.21	143.56	233.33	23.75	33.78	290.47	20
30	0.00	46.24	65.75	453.34	143.55	233.33	36.73	52.23	453.40	20
31	0.00	46.18	65.67	452.76	143.55	233.33	36.01	51.20	436.42	20
33	0.00	46.52	66.15	456.09	143.55	233.33	35.42	50.37	418.60	20
34	0.00	46.75	66.48	458.34	143.55	233.33	35.55	50.55	417.88	20
37	0.00	48.34	68.74	473.93	143.45	233.33	38.13	54.22	450.99	20
38	0.00	48.32	68.71	473.74	143.45	233.33	37.50	53.32	436.74	20
4	0.00	43.29	61.56	424.42	143.56	233.33	23.29	33.11	286.93	20
40	0.00	48.25	68.61	473.05	143.45	233.33	36.63	52.09	419.75	20
41	0.00	43.86	62.37	430.01	143.58	233.33	41.36	58.81	908.87	20
42	0.00	46.42	66.01	455.11	143.58	233.33	44.11	62.72	989.92	20
5	0.00	43.29	61.56	424.42	143.56	233.33	23.27	33.09	286.82	20
7	0.00	43.42	61.74	425.70	143.56	233.33	23.73	33.74	290.11	20
9	0.00	46.57	66.22	456.58	143.56	233.33	41.35	58.80	634.60	20
R11A	0.18	43.29	61.56	424.42	143.56	233.33	23.28	33.11	286.90	20
R13A	0.88	43.36	61.66	425.11	143.56	233.33	23.99	34.11	292.38	20
R14A-1	0.70	43.77	62.24	429.13	143.56	233.33	27.77	39.48	326.98	20
R14A-2	0.70	44.12	62.74	432.56	143.57	233.33	40.90	58.16	794.47	20
R16A	1.09	48.59	69.09	476.38	143.47	233.33	41.78	59.41	565.56	20
R18A	0.98	48.54	69.02	475.89	143.44	233.33	39.07	55.55	471.05	20
R19A	0.55	46.63	66.31	457.17	143.55	233.33	39.08	55.57	518.21	20
R20A-1	0.70	46.33	65.88	454.23	143.55	233.33	35.57	50.58	424.44	20
R20A-2&R23A-1	1.58	47.03	66.88	461.09	143.56	233.33	40.77	57.97	577.15	20
R21A	0.53	48.71	69.26	477.56	143.52	233.33	43.27	61.53	641.58	20
R22A	0.46	48.24	68.60	472.95	143.45	233.33	36.57	52.00	418.57	20
R23A-2	0.88	48.33	68.72	473.83	143.45	233.33	36.99	52.59	425.80	20
R9A	0.85	43.47	61.81	426.19	143.56	233.33	23.93	34.03	291.60	20

Post-SUC Reconfiguration PCSWMM Watermain Hydraulic Analysis Result
Fire Flow Results - Max Day + 233 L/s

ID	Static Demand (L/s)	Static Pressure (m)	Static Pressure (psi)	Static Pressure (kPa)	Static Head (m)	Fire Flow Demand (L/s)	Residual Pressure (m)	Residual Pressure (psi)	Available Flow (L/s)	Available Pressure (psi)
0	0.00	44.53	63.32	436.58	142.89	283.33	38.68	55.00	698.09	20
11	0.00	45.81	65.14	449.13	142.89	283.33	35.99	51.17	536.72	20
12	0.00	45.84	65.18	449.42	142.89	283.33	36.64	52.10	556.78	20
13	0.00	45.64	64.90	447.46	142.89	283.33	38.42	54.63	633.86	20
14	0.00	44.65	63.49	437.75	142.89	283.33	38.56	54.83	684.50	20
18	0.00	47.12	67.00	461.97	142.88	283.33	37.82	53.78	565.36	20
19	0.00	47.52	67.57	465.89	142.87	283.33	38.27	54.42	570.97	20
22	0.00	47.82	68.00	468.83	142.76	283.33	37.66	53.56	544.15	20
23	0.00	48.44	68.88	474.91	142.74	283.33	38.65	54.96	559.84	20
24	0.00	48.51	68.98	475.60	142.74	283.33	39.74	56.51	595.15	20
25	0.00	48.54	69.02	475.89	142.73	283.33	41.30	58.73	660.43	20
26	0.00	48.39	68.81	474.42	142.74	283.33	36.16	51.42	495.71	20
27	0.00	48.31	68.70	473.64	142.74	283.33	35.06	49.85	474.10	20
29	0.00	47.73	67.87	467.95	142.76	283.33	35.76	50.85	497.21	20
3	0.00	42.69	60.70	418.54	142.88	283.33	14.71	20.92	286.87	20
30	0.00	45.56	64.78	446.68	142.87	283.33	32.01	45.51	448.31	20
31	0.00	45.51	64.71	446.19	142.87	283.33	31.00	44.08	431.51	20
33	0.00	45.84	65.18	449.42	142.87	283.33	30.02	42.68	413.94	20
34	0.00	46.08	65.52	451.77	142.87	283.33	30.09	42.79	413.26	20
37	0.00	47.65	67.76	467.17	142.76	283.33	33.09	47.05	446.13	20
38	0.00	47.64	67.74	467.07	142.76	283.33	32.19	45.77	432.04	20
4	0.00	42.61	60.59	417.75	142.88	283.33	14.07	20.01	283.37	20
40	0.00	47.56	67.63	466.28	142.76	283.33	30.98	44.06	415.22	20
41	0.00	43.18	61.40	423.34	142.90	283.33	39.65	56.38	897.83	20
42	0.00	45.76	65.07	448.64	142.92	283.33	42.49	60.42	979.10	20
5	0.00	42.61	60.59	417.75	142.88	283.33	14.05	19.98	283.26	20
7	0.00	42.75	60.79	419.13	142.88	283.33	14.65	20.83	286.53	20
9	0.00	45.89	65.25	449.91	142.89	283.33	38.48	54.72	627.54	20
R11A	0.18	42.62	60.60	417.85	142.88	283.33	14.07	20.00	283.35	20
R13A	0.88	42.69	60.70	418.54	142.88	283.33	15.05	21.39	288.76	20
R14A-1	0.70	43.10	61.29	422.56	142.89	283.33	20.27	28.82	322.99	20
R14A-2	0.70	43.45	61.78	425.99	142.90	283.33	38.89	55.30	784.91	20
R16A	1.09	47.90	68.11	469.62	142.78	283.33	38.21	54.33	559.54	20
R18A	0.98	47.85	68.04	469.13	142.75	283.33	34.33	48.82	466.00	20
R19A	0.55	45.95	65.34	450.50	142.88	283.33	35.21	50.06	512.46	20
R20A-1	0.70	45.65	64.91	447.56	142.87	283.33	30.31	43.10	419.68	20
R20A-2&R23A-1	1.58	46.37	65.94	454.62	142.90	283.33	37.44	53.24	570.90	20
R21A	0.53	48.04	68.31	470.99	142.85	283.33	40.30	57.30	634.85	20
R22A	0.46	47.55	67.61	466.19	142.77	283.33	30.89	43.93	414.06	20
R23A-2	0.88	47.64	67.74	467.07	142.76	283.33	31.45	44.73	421.22	20
R9A	0.85	42.80	60.86	419.62	142.88	283.33	14.92	21.21	288.01	20

Appendix B Wastewater Servicing

B.1 Conceptual Sanitary Sewer Design Sheet

Stantec

SUBDIVISION: **Barrhaven Town Centre**

DATE: 2026-01-26
REVISION: 1
DESIGNED BY: MJS
CHECKED BY: MW

SANITARY SEWER DESIGN SHEET
(City of Ottawa)

FILE NUMBER: 160402206

DESIGN PARAMETERS

MAX PEAK FACTOR (RES.)=	4.0	AVG. DAILY FLOW / PERSON	280 l/p/day	MINIMUM VELOCITY	0.60 m/s
MIN PEAK FACTOR (RES.)=	2.0	COMMERCIAL	28,000 l/ha/day	MAXIMUM VELOCITY	3.00 m/s
PEAKING FACTOR (INDUSTRIAL):	2.4	INDUSTRIAL (HEAVY)	55,000 l/ha/day	MANNINGS n	0.013
PEAKING FACTOR (ICI >20%):	1.5	INDUSTRIAL (LIGHT)	35,000 l/ha/day	BEDDING CLASS	B
PERSONS / SINGLE	3.4	INSTITUTIONAL	28,000 l/ha/day	MINIMUM COVER	2.50 m
PERSONS / TOWNHOME	2.7	INFILTRATION	0.33 l/s/Ha	HARMON CORRECTION FACTOR	0.8
PERSONS / APARTMENT	1.8				

LOCATION			RESIDENTIAL AREA AND POPULATION									COMMERCIAL		INDUSTRIAL (L)		INDUSTRIAL (H)		INSTITUTIONAL		GREEN / UNUSED		C+I+I	INFILTRATION			TOTAL	PIPE							
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA (ha)	UNITS SINGLE	UNITS TOWN	UNITS APT	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)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	FLOW (l/s)	LENGTH (m)	DIA (mm)	MATERIAL	CLASS	SLOPE (%)	CAP. (FULL) (l/s)	CAP. V PEAK FLOW (%)	VEL. (FULL) (m/s)
R8B, G8B, R8A, G8A	8	7	4.41	0	0	644	1159	4.41	1159	3.21	12.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.72	2.72	0.0	7.13	7.13	2.4	14.4	96.9	300	PVC	SDR 35	0.40	60.7	**23.71%**	0.86
	7	6	0.00	0	0	0	0	4.41	1159	3.21	12.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.72	0.0	0.00	7.13	2.4	14.4	48.8	300	PVC	SDR 35	2.40	148.7	**9.68%**	2.11
	6	5	0.00	0	0	0	0	4.41	1159	3.21	12.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.72	0.0	0.00	7.13	2.4	14.4	16.1	300	PVC	SDR 35	2.40	148.7	**9.68%**	2.11
R14A	14	13	0.70	0	64	0	173	0.70	173	3.54	2.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.70	0.70	0.2	2.2	34.0	200	PVC	SDR 35	0.50	23.6	**9.35%**	0.74
R13A	13	12	1.11	0	40	0	108	1.81	281	3.47	3.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	1.11	1.81	0.6	3.8	65.7	200	PVC	SDR 35	0.50	23.6	**15.89%**	0.74
	12	11	0.00	0	0	0	0	1.81	281	3.47	3.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	1.81	0.6	3.8	12.2	200	PVC	SDR 35	0.50	23.6	**15.89%**	0.74
R11A, G11A	11	10	0.29	0	8	0	22	2.10	302	3.46	3.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.61	0.61	0.0	0.90	2.71	0.9	4.3	43.1	200	PVC	SDR 35	0.50	23.6	**18.13%**	0.74
	10	9	0.00	0	0	0	0	2.10	302	3.46	3.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.61	0.0	0.00	2.71	0.9	4.3	37.0	200	PVC	SDR 35	0.50	23.6	**18.13%**	0.74
R9A	9	5	1.10	0	39	0	105	3.20	408	3.41	4.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.61	0.0	1.10	3.81	1.3	5.8	171.8	200	PVC	SDR 35	0.50	23.6	**24.39%**	0.74
R18A	18	17	1.49	0	45	0	122	1.49	122	3.58	1.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	1.49	1.49	0.5	1.9	110.6	200	PVC	SDR 35	0.40	21.1	**8.99%**	0.67
R23A	23	22	0.79	0	80	0	216	0.79	216	3.51	2.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.79	0.79	0.3	2.7	31.8	200	PVC	SDR 35	0.50	23.6	**11.49%**	0.74
R22A	22	17	0.40	0	21	0	57	1.19	273	3.48	3.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.40	1.19	0.4	3.5	79.7	200	PVC	SDR 35	0.50	23.6	**14.65%**	0.74
	17	16	0.00	0	0	0	0	2.68	394	3.42	4.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	2.68	0.9	5.3	45.6	200	PVC	SDR 35	0.40	21.1	**24.84%**	0.67
R21A	21	16	0.49	0	24	0	65	0.49	65	3.63	0.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.49	0.49	0.2	0.9	98.1	200	PVC	SDR 35	1.00	33.4	**2.76%**	1.05
R16A	16	15	1.31	0	50	0	135	4.47	594	3.35	6.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	1.31	4.47	1.5	7.9	91.1	200	PVC	SDR 35	0.40	21.1	**37.45%**	0.67
R20A	20	19	0.64	0	64	0	173	0.64	173	3.54	2.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.64	0.64	0.2	2.2	39.3	200	PVC	SDR 35	0.50	23.6	**9.26%**	0.74
R19A	19	15	0.70	0	25	0	68	1.34	240	3.49	2.7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.70	1.34	0.4	3.2	87.5	200	PVC	SDR 35	1.00	33.4	**9.46%**	1.05
	15	5	0.00	0	0	0	0	5.81	834	3.28	8.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	5.81	1.9	10.8	55.5	200	PVC	SDR 35	1.70	43.6	**24.74%**	1.37
	5	4	0.00	0	0	0	0	13.41	2401	3.02	23.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.33	0.0	0.00	16.75	5.5	29.0	28.2	300	PVC	SDR 35	0.50	67.9	**42.73%**	0.96
R4A	4	3	3.71	0	0	0	501	17.12	2902	2.96	27.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.33	0.0	3.71	20.45	6.7	34.6	44.5	300	PVC	SDR 35	0.50	67.9	**51.00%**	0.96
G3A	3	2	0.00	0	0	0	0	17.12	2902	2.96	27.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.45	3.78	0.0	0.45	20.90	6.9	34.8	45.1	300	PVC	SDR 35	0.50	67.9	**51.21%**	0.96
R2B, R2A	2	1	6.32	0	0	0	853	23.44	3755	2.89	35.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.78	0.0	6.32	27.21	9.0	44.1	114.6	300	PVC	SDR 35	0.50	67.9	**64.96%**	0.96
	1	EX-1	0.00	0	0	0	0	23.44	3755	2.89	35.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.78	0.0	0.00	27.21	9.0	44.1	33.0	1050	PVC	SDR 35	0.24	1417.6	**3.11%**	1.59
																												1050						

B.2 Background Report Excerpts and Correspondence

NOVATECH

Engineers, Planners & Landscape Architects

Engineering

- Land / Site Development
- Municipal Infrastructure
- Environmental / Water Resources
- Traffic/ Transportation
- Structural
- Recreational

Planning

- Land/Site Development
- Planning Application Management
- Municipal
- Planning Documents & Studies
- Expert Witness (OMB)
- Wireless Industry

Landscape Architecture

- Urban Design & Streetscapes
- Recreation & Parks Planning
- Environmental Restoration
- Sustainable Design

32 Years

City of Ottawa

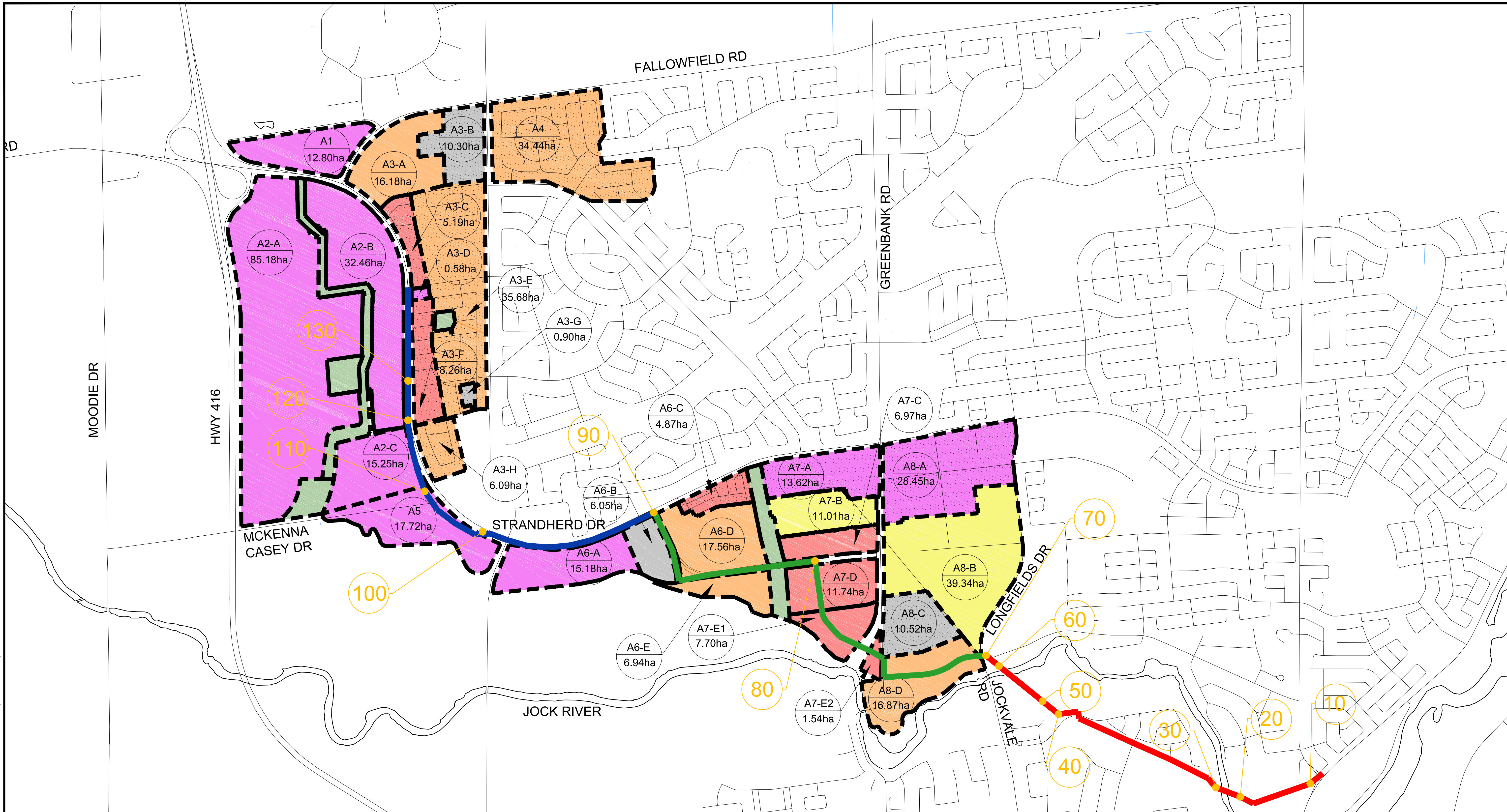
South Nepean Collector (SNC) Phase 2

Preliminary Design, Detailed Design, Tender, Contract Administration and Inspection Services

Preliminary Design Report

Novatech Project No. 115075
Submitted to the City of Ottawa
March 2, 2016

Engineering excellence. Planning precision. Inspired landscapes.



LEGEND

- EXISTING / PROPOSED HIGH DENSITY RESIDENTIAL
- EXISTING / PROPOSED MEDIUM DENSITY RESIDENTIAL
- EXISTING / PROPOSED LOW DENSITY RESIDENTIAL
- EXISTING / PROPOSED COMMERCIAL
- EXISTING / PROPOSED INSTITUTIONAL
- OTHER LANDS (OPEN SPACE, PARKS, AND SWMFS)
- SOUTH NEPEAN COLLECTOR PHASE 1
- SOUTH NEPEAN COLLECTOR PHASE 2
- SOUTH NEPEAN COLLECTOR PHASE 3
- 80 SOUTH NEPEAN COLLECTOR NODE ID

NOVATECH

Engineers, Planners & Landscape Architects

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

Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

SOUTH NEPEAN COLLECTOR SEWER

SANITARY DRAINAGE AREAS AND LAND USE

SCALE	1:20 000
DATE	AUG 2015
JOB	115075
FIGURE	FIG. 1

M:\2015\115075\CAD\Design\Figures\DSK\DSK08_SANArea\DSK08_SANArea.dwg, DSK08, Aug 20, 2015 - 1:32pm, nsmit

PROJECT #: 115075
DESIGNED BY: CMS
CHECKED BY: MJP
DATE: August 20, 2015

SANITARY SEWER DESIGN SHEET

South Nepean Collector - Phase 2 & 3

Theoretical Future Full Service Peak Wastewater Flow

NOVATECH
Engineers, Planners & Landscape Architects

Location			Areas				Population				Individual Design Flows			Cumulative Design Flows				
Area I.D.	Existing / Proposed Land Use	Upstream Node	Gross Commercial Area (ha)	Gross Institutional Area (ha)	Gross Residential Area (ha)	Total Gross Area (ha)	Residential Popultation Density (people / ha)	Individual Residential Population	Cumulative Residential Population	Residential Peaking Factor (Harmon Eqn[1])	Commercial Peak Flow Rate[2] (50,000 L/ha/d) (L/s)	Institutional Peak Flow Rate[2] (50,000 L/ha/d) (L/s)	Infiltration / Inflow Rate (0.28 L/s/ha) (L/s)	Commercial (L/s)	Institutional (L/s)	Infiltration / Inflow (L/s)	Residential Peak Flow Rate (350 L/cap/d) (L/s)	Cumulative Peak Design Flow (L/s)
A1	Commercial	130	12.80			12.80					11.1	0.0	3.6	11.1	0.0	3.6	0.0	14.7
A2-A	Commercial	130	85.18			85.18					73.9	0.0	23.9	85.1	0.0	27.4	0.0	112.5
A2-B	Commercial	130	32.46			32.46					28.2	0.0	9.1	113.2	0.0	36.5	0.0	149.8
A3-A	Low Density Residential	130			16.18	16.18	95.2	1540	1540	3.67	0.0	0.0	4.5	113.2	0.0	41.1	22.9	177.2
A3-B	Institutional	130		10.30		10.30			1540	3.67	0.0	8.9	2.9	113.2	8.9	43.9	22.9	189.0
A3-C	Medium Density Residential	130			5.19	5.19	162.0	841	2381	3.53	0.0	0.0	1.5	113.2	8.9	45.4	34.0	201.6
A3-D	Commercial	130	0.58			0.58			2381	3.53	0.5	0.0	0.2	113.7	8.9	45.6	34.0	202.2
A3-E	Low Density Residential	130			35.68	35.68	95.2	3397	5778	3.19	0.0	0.0	10.0	113.7	8.9	55.5	74.6	252.8
A3-F	Medium Density Residential	130			8.26	8.26	162	1338	7116	3.10	0.0	0.0	2.3	113.7	8.9	57.9	89.4	269.9
A3-G	Institutional	130		0.90		0.90			7116	3.10	0.0	0.8	0.3	113.7	9.7	58.1	89.4	270.9
A4	Low Density Residential	130			34.44	34.44	95.2	3279	10395	2.94	0.0	0.0	9.6	113.7	9.7	67.8	123.7	314.9
A2-C	Commercial (ex. snow dump)	120	15.25			15.25			10395	2.94	13.2	0.0	4.3	127.0	9.7	72.0	123.7	332.4
A3-H	Low Density Residential	120			6.09	6.09	95.2	580	10974	2.91	0.0	0.0	1.7	127.0	9.7	73.7	129.6	340.0
A5	Commercial	110	17.72			17.72			10974	2.91	15.4	0.0	5.0	142.4	9.7	78.7	129.6	360.3
A6-A	Commercial	100	15.18			15.18			10974	2.91	13.2	0.0	4.3	155.5	9.7	82.9	129.6	377.8
A6-B	Institutional	100		6.05		6.05			10974	2.91	0.0	5.3	1.7	155.5	15.0	84.6	129.6	384.7
A6-C	Medium Density Residential	90			4.87	4.87	162.0	789	11763	2.88	0.0	0.0	1.4	155.5	15.0	86.0	137.4	393.9
A6-D	Low Density Residential	90			17.56	17.56	95.2	1672	13435	2.83	0.0	0.0	4.9	155.5	15.0	90.9	153.8	415.2
A6-E	Low Density Residential	90			6.94	6.94	95.2	661	14096	2.81	0.0	0.0	1.9	155.5	15.0	92.9	160.2	423.6
A7-A	Commercial	90	13.62			13.62			14096	2.81	11.8	0.0	3.8	167.4	15.0	96.7	160.2	439.2
A7-B	High Density Residential	90			11.01	11.01	135.0	1486	15582	2.76	0.0	0.0	3.1	167.4	15.0	99.8	174.3	456.4
A7-C	Medium Density Residential	90			6.97	6.97	162.0	1129	16711	2.73	0.0	0.0	2.0	167.4	15.0	101.7	184.9	468.9
A7-D	Medium Density Residential	90			11.74	11.74	162.0	1902	18613	2.68	0.0	0.0	3.3	167.4	15.0	105.0	202.4	489.7
A7-E1/E2	Medium Density Residential	90			9.24	9.24	162.0	1497	20110	2.65	0.0	0.0	2.6	167.4	15.0	107.6	215.9	505.8
A8-A	Commercial	80	28.45			28.45			20110	2.65	24.7	0.0	8.0	192.0	15.0	115.5	215.9	538.5
A8-B	High Density Residential	80			39.34	39.34	135.0	5311	25421	2.55	0.0	0.0	11.0	192.0	15.0	126.6	262.4	596.0
A8-C	Institutional	80		10.52		10.52			25421	2.55	0.0	9.1	2.9	192.0	24.1	129.5	262.4	608.1
A8-D	Low Density Residential	80			16.87	16.87	120.9	2040	27461	2.52	0.0	0.0	4.7	192.0	24.1	134.2	279.8	630.2
ROW Along SNC Sewer Alignment	-	80				14.34			27461	2.52	0.0	0.0	4.0	192.0	24.1	138.2	279.8	634.2
TOTAL		***80***	***221.24***	***27.77***	***230.38***	***493.73***	***-***	***27461***	***27461***	***2.52***	***192.0***	***24.1***	***134.2***	***192.0***	***24.1***	***138.2***	***279.8***	***634.2***

Residential Land Use	Population Density (Units / ha)	Persons per Unit	Persons per ha
Low Density (singles and semis)	26 – 28 (28 used)	2.7 – 3.4 (3.4 used)	95.2
Medium Density (row/townhouse)	50 – 60 (60 used)	2.7	162.0
High Density (apartments)	60 – 75 (75 used)	1.8	135.0

Notes:

1. Harmon Equation = $1 + [14 / (4+(P/1000)^{1/2})] \times K$

Where: P = population; K = correction factor = 1.0

2. Instituional / Commercial Peaking Factor = 1.5

Reported Design Flows / Assumptions:

1. Area A4: Existing single family units currently serviced by Jockvale pump station to be redirected to SNC

2. Area A8-D: proposed 600 medium density residential units

Wu, Michael

From: Smadella, Karin
Sent: January 16, 2026 16:25
To: 'Cassidy, Tyler'; Shillington, Jeffrey
Cc: Kevin A. Harper; Thiffault, Dustin
Subject: RE: Barrhaven Town Centre Phase 2

Hi Tyler

Thank you for this information.

We will assume a density of 135 persons/ha lands external to the subdivision as directed below. Given the extent of lands diverted from the Riocan trunk through the Minto subdivision, flows contributing at Node 70 will be less than assumed as part of the South Nepeam Collector (SNC) sewer design. How the functional design flows compare with the flows assumed as part of the SNC design will be addressed as part of the functional design report for the plan of subdivision.

Have a good weekend.

Karin

Karin Smadella, P.Eng.
Principal, Operations Leader

Stantec

From: Cassidy, Tyler <tyler.cassidy@ottawa.ca>
Sent: Tuesday, January 13, 2026 4:39 PM
To: Smadella, Karin <Karin.Smadella@stantec.com>; Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Cc: Kevin A. Harper <KHarper@minto.com>; Thiffault, Dustin <Dustin.Thiffault@stantec.com>
Subject: RE: Barrhaven Town Centre Phase 2

Hi Karin,

I have provided the answers I could to your inquiry below. The information we have in the South Nepean Collector : Phase 2 Hydraulics Review/Assessment is the best we have to go off.

- What use/density is to be considered for lands that do not form part of the BTC Ph 2 subdivision?
  The density identified in the SNC study (high-density residential).
- Should the portions of A8-A and B that have been diverted to Longfields be considered in the Riocan sewer sizing? Note that there was no sanitary sewer considered in the upstream segments of Riocan.
  Any portion of A8-A and A8-B that have been permanently diverted to Longfields sanitary system do not need to be considered in the Riocan sanitary sewer study.

I've met with our IWSD and Trunk Sewer Planning departments to discuss this portion of the South Nepean Collector. Both groups would like more information on your proposal before signing off on the design concept. If you could please provide a memo that addresses the following items for their review:

- Are any flows to the SNC from this application greater than what is identified in the SNC study?
- An updated design sheet for the SNC which incorporates the flows from this application and any other known future development (acknowledging Minto owns the majority of this area). The density provided in the SNC study can be used for any areas where the information may be missing.
- Sanitary drainage map that identifies the contributing flows from this area (A8-B) and how it meets or deviates from the SNC study.

If you would like to have a discussion regarding the above, I'm happy to set up a meeting. Please let me know and I can coordinate.

Thank you,

Tyler Cassidy, P.Eng
Infrastructure Project Manager,
Planning, Development and Building Services department (PDBS)/ Direction générale des services de la planification, de l'aménagement et du bâtiment (DGSPAB) - South Branch
City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1
613.580.2424 ext./poste 12977, Tyler.Cassidy@ottawa.ca

From: Smadella, Karin <Karin.Smadella@stantec.com>
Sent: January 07, 2026 11:07 AM
To: Cassidy, Tyler <tyler.cassidy@ottawa.ca>; Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Cc: Kevin A. Harper <KHarper@minto.com>; Thiffault, Dustin <dustin.thiffault@stantec.com>; Bougadis, John <John.Bougadis@ottawa.ca>
Subject: RE: Barrhaven Town Centre Phase 2

Hi all – Hope everyone had a nice time over the holidays.

I am following up on this item. Would it be helpful if I set up a short mtg to discuss?

Thanks,

Karin

Karin Smadella, P.Eng.
Principal, Operations Leader

Stantec

From: Smadella, Karin
Sent: Wednesday, December 17, 2025 2:31 PM
To: Cassidy, Tyler <tyler.cassidy@ottawa.ca>; Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Cc: Kevin A. Harper <KHarper@minto.com>; Thiffault, Dustin <Dustin.Thiffault@stantec.com>; Bougadis, John <john.bougadis@ottawa.ca>
Subject: Barrhaven Town Centre Phase 2

Hi Tyler/Jeff

At the September 25th preconsultation meeting for Minto's Barrhaven Town Centre (BTC) Phase 2 development, we requested confirmation of the drainage area to be considered for the design of the sanitary sewer in Riocan to connect to the stub at Longfields opposite Paul Metivier. The following comment was included with the preconsulation notes provided by the file lead.

c. Sanitary: Connect to the existing 1050mm dia. Stub at the intersection of Riocan and Paul Metivier Drive. Note that the 250 mm dia. sewer on Longfields Drive does not have the capacity to support this application. At this time we have not located a sanitary drainage area plan or design sheet to confirm flows on the proposed sanitary sewer on Riocan. If and when we are able to locate any information on the Riocan sanitary sewer we will provide this information to the applicant and their consultant.

Can you please advise if you now have the requested information?

I have attached the drainage area plan and design assumptions for the South Nepean Collector Sewer (March 2016 Report). As noted, areas A8-A and A8-B would have potentially contributed to the sanitary stub at Longfields and Paul Metivier. A8-A (Commercial) is currently developed and is directed to Longfields upstream. A portion of A8-B has also been developed and is also directed to Longfields upstream. That leaves an area of approximately 33 ha undeveloped/to be redeveloped which will be accounted for as part of Minto's BTC Phase 2 development and design of the sanitary sewer outlet.

Can you please confirm:

- Is this the entire drainage area to be considered?
- What use/density is to be considered for lands that do not form part of the BTC Ph 2 subdivision?
- Should the portions of A8-A and B that have been diverted to Longfields be considered in the Riocan sewer sizing? Note that there was no sanitary sewer considered in the upstream segments of Riocan.

I have copied John Bougadis as he may be able to help with clarifying the design requirements. We are hoping to have this item resolved as soon as possible to be able to proceed further with the functional design.

Happy to have a quick meeting to discuss.

Thank you,

Karin

Karin Smadella, P.Eng.
Principal, Operations Leader

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Mobile: 613-698-8088
karin.smadella@stantec.com

Stantec

Appendix C Stormwater Management

C.1 Storm Sewer Design Sheet

Stantec	Barrhaven Town Centre Phase 2	STORM SEWER DESIGN SHEET (City of Ottawa)	DESIGN PARAMETERS
	DATE: 2026-01-23		I = a / (t+b)^{c} (As per City of Ottawa Guidelines, 2012)
	REVISION: 1		
	DESIGNED BY: MJS	FILE NUMBER: 160402206	
	CHECKED BY: MW		

	1:2 yr	1:5 yr	1:10 yr	1:100 yr				
a =	732.951	998.071	1174.184	1735.688	MANNING'S n =	0.013	BEDDING CLASS =	B
b =	6.199	6.053	6.014	6.014	MINIMUM COVER:	2.00	m	
c =	0.810	0.814	0.816	0.820	TIME OF ENTRY	10	min	

LOCATION			DRAINAGE AREA																									PIPE SELECTION									
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA (2-YEAR) (ha)	AREA (5-YEAR) (ha)	AREA (10-YEAR) (ha)	AREA (100-YEAR) (ha)	AREA (ROOF) (ha)	C (2-YEAR) (-)	C (5-YEAR) (-)	C (10-YEAR) (-)	C (100-YEAR) (-)	A x C (2-YEAR) (ha)	ACCUM AxC (2YR) (ha)	A x C (5-YEAR) (ha)	ACCUM. AxC (5YR) (ha)	A x C (10-YEAR) (ha)	ACCUM. AxC (10YR) (ha)	A x C (100-YEAR) (ha)	ACCUM. AxC (100YR) (ha)	T of C (min)	I_{2-YEAR} (mm/h)	I_{5-YEAR} (mm/h)	$I_{10-YEAR}$ (mm/h)	$I_{100-YEAR}$ (mm/h)	$Q_{CONTROL}$ (L/s)	ACCUM. $Q_{CONTROL}$ (L/s)	Q_{ACT} (CIA/360) (L/s)	LENGTH (m)	PIPE WIDTH OR DIAMETER (mm)	PIPE HEIGHT (mm)	PIPE SHAPE (-)	MATERIAL (-)	CLASS (-)	SLOPE %	Q_{CAP} (FULL) (L/s)	% FULL (-)	VEL. (FULL) (m/s)
C106A	106	105	0.00	0.70	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.000	0.000	0.524	0.524	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	151.6	32.5	525	525	CIRCULAR	CONCRETE	-	0.50	317.2	**47.79%**	1.42
	105	104	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.524	0.000	0.000	0.000	0.000	10.45	75.12	101.87	119.41	174.54	0.0	0.0	148.2	64.8	525	525	CIRCULAR	CONCRETE	-	0.50	317.2	**46.73%**	1.42
	104	103	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.524	0.000	0.000	0.000	0.000	11.36	71.96	97.53	114.30	167.03	0.0	0.0	141.9	13.5	525	525	CIRCULAR	CONCRETE	-	0.50	317.2	**44.74%**	1.42
C103A, C103B	103	102	0.00	1.72	0.00	0.00	0.00	0.00	0.63	0.00	0.00	0.000	0.000	1.077	1.601	0.000	0.000	0.000	0.000	11.55	71.33	96.67	113.28	165.55	0.0	0.0	430.0	44.2	675	675	CIRCULAR	CONCRETE	-	0.50	620.1	**69.34%**	1.68
C102A	102	101	0.00	0.29	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.000	0.000	0.215	1.817	0.000	0.000	0.000	0.000	12.01	69.85	94.64	110.89	162.03	0.0	0.0	477.6	38.3	750	750	CIRCULAR	CONCRETE	-	0.50	821.2	**58.15%**	1.80
C101A	101	100	0.00	1.10	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.000	0.000	0.824	2.641	0.000	0.000	0.000	0.000	12.41	68.64	92.98	108.94	159.16	0.0	0.0	682.1	177.0	825	825	CIRCULAR	CONCRETE	-	0.50	1058.9	**64.42%**	1.92
																				14.08																	
C110A	110	109	0.00	1.50	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.000	0.000	1.049	1.049	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	303.7	112.2	750	750	CIRCULAR	CONCRETE	-	0.15	449.8	**67.51%**	0.99
																				12.03																	
C115A	115	114	0.00	0.79	0.00	0.00	0.00	0.00	0.80	0.00	0.00	0.000	0.000	0.632	0.632	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	183.0	26.5	525	525	CIRCULAR	CONCRETE	-	0.50	317.2	**57.69%**	1.42
C114A	114	109	0.00	0.40	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.000	0.000	0.277	0.909	0.000	0.000	0.000	0.000	10.35	75.49	102.39	120.02	175.44	0.0	0.0	258.7	81.9	600	600	CIRCULAR	CONCRETE	-	0.50	452.9	**57.11%**	1.55
																				11.33																	
	109	108	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	1.959	0.000	0.000	0.000	0.000	12.03	69.81	94.59	110.83	161.95	0.0	0.0	514.6	45.6	900	900	CIRCULAR	CONCRETE	-	0.15	731.4	**70.36%**	1.11
																				12.74																	
C113A	113	108	0.00	0.49	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.000	0.000	0.341	0.341	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	98.7	137.1	375	375	CIRCULAR	PVC	-	1.00	164.8	**59.89%**	1.56
																				11.62																	
C108A	108	107	0.00	1.19	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.000	0.000	0.830	3.130	0.000	0.000	0.000	0.000	12.74	67.66	91.63	107.35	156.84	0.0	0.0	796.6	91.1	1050	1050	CIRCULAR	CONCRETE	-	0.15	1103.3	**72.20%**	1.23
																				14.03																	
C112A	112	111	0.00	0.64	0.00	0.00	0.00	0.00	0.80	0.00	0.00	0.000	0.000	0.509	0.509	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	147.4	34.7	450	450	CIRCULAR	CONCRETE	-	0.50	210.3	**70.07%**	1.28
C111A	111	107	0.00	0.82	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.000	0.000	0.571	1.081	0.000	0.000	0.000	0.000	10.48	75.02	101.74	119.26	174.32	0.0	0.0	305.4	89.1	600	600	CIRCULAR	CONCRETE	-	0.50	452.9	**67.42%**	1.55
																				11.50																	
	107	100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	4.210	0.000	0.000	0.000	0.000	14.03	64.15	86.82	101.69	148.53	0.0	0.0	1015.4	49.5	1200	1200	CIRCULAR	CONCRETE	-	0.15	1575.3	**64.46%**	1.35
																				14.69																	
CT06A	T06	100	0.00	0.40	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.000	0.000	0.282	0.282	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	81.8	20.4	1650	1650	CIRCULAR	CONCRETE	-	0.20	4252.3	**1.92%**	1.93
																				10.54																	
	100	T07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	7.134	0.000	0.000	0.000	0.000	14.69	62.50	84.56	99.03	144.62	0.0	0.0	1675.6	22.4	1650	1650	CIRCULAR	CONCRETE	-	0.20	4252.3	**39.40%**	1.93
	T07	T08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	7.134	0.000	0.000	0.000	0.000	14.94	61.92	83.76	98.09	143.24	0.0	0.0	1659.8	44.6	1650	1650	CIRCULAR	CONCRETE	-	0.32	5403.4	**30.72%**	2.45
	T08	T09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	7.134	0.000	0.000	0.000	0.000	15.35	60.96	82.45	96.55	140.98	0.0	0.0	1633.8	45.4	1650	1650	CIRCULAR	CONCRETE	-	0.44	6308.0	**25.90%**	2.86
	T09	T10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	7.134	0.000	0.000	0.000	0.000	15.73	60.11	81.28	95.18	138.97	0.0	0.0	1610.7	41.3	1650	1650	CIRCULAR	CONCRETE	-	0.47	6550.1	**24.59%**	2.97
																				16.06																	
	EX. HEADW/	T10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	0.0	11.4	1500	1500	CIRCULAR	CONCRETE	-	0.10	2332.0	**0.00%**	1.28
																				10.00																	
CT10A, CT10C, CT10B	T10	T11	0.00	6.77	0.00	0.00	0.00	0.00	0.79	0.00	0.00	0.000	0.000	5.368	12.502	0.000	0.000	0.000	0.000	16.06	59.37	80.28	93.99	137.23	0.0	0.0	2787.8	72.1	1950	1950	CIRCULAR	CONCRETE	-	0.32	8383.1	**33.25%**	2.72

C.2 Conceptual PCSWMM Model Outputs

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)

****
Element Count
****
Number of rain gages 4
Number of subcatchments ... 2
Number of nodes 6
Number of links 6
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
CHI_002	CHI_002	INTENSITY	10 min.
CHI_005	CHI_005	INTENSITY	10 min.
CHI_100	CHI_100	INTENSITY	10 min.
CHI_120	CHI_120	INTENSITY	10 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
C100A_1	4.74	179.39	72.86	1.5000	CHI_100	SU1
C100A_2	4.21	169.12	72.86	1.5000	CHI_100	SU3

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
T07	JUNCTION	88.89	8.71	0.0	
OF1	OUTFALL	89.18	0.00	0.0	

```
  TO8                  OUTFALL              88.75      1.65       0.0
  SU1                  STORAGE              93.42      1.73       0.0
  SU2                  STORAGE              92.00      2.38       0.0
  SU3                  STORAGE              94.49      1.68       0.0


  ************
  Link Summary
  ************
  Name             From Node        To Node          Type            Length
%Slope Roughness

------------------------------------------------------------------------------------
----------
  C1               T07              TO8              CONDUIT           44.6
0.3139    0.0130
  OR1              SU2              OF1              ORIFICE
  W1               SU1              SU2              WEIR
  W2               SU3              SU2              WEIR
  OL1              SU1              T07              OUTLET
  OL2              SU3              T07              OUTLET


  *********************
  Cross Section Summary
  *********************
                                        Full     Full     Hyd.     Max.   No. of
 Full
  Conduit          Shape               Depth     Area     Rad.    Width  Barrels
 Flow

------------------------------------------------------------------------------------
----
  C1               CIRCULAR             1.65     2.14     0.41     1.65        1
5106.86


  ****************
  Analysis Options
  ****************
  Flow Units ............... LPS
  Process Models:
    Rainfall/Runoff ........ YES
    RDII ................... NO
    Snowmelt ............... NO
    Groundwater ............ NO
    Flow Routing ........... YES
    Ponding Allowed ........ YES
    Water Quality .......... NO
  Infiltration Method ...... HORTON
```

```
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 01/23/2026 00:00:00
Ending Date .............. 01/23/2026 03:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:01:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 1.00 sec
Variable Time Step ....... NO
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.634        70.853
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.109        12.205
Surface Runoff ...........         0.480        53.606
Final Storage ............         0.046         5.104
Continuity Error (%) .....        -0.087


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.480         4.796
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.457         4.575
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.063         0.634
Continuity Error (%) .....        -8.602


*************************
Highest Continuity Errors
*************************
Node SU2 (-6.12%)


********************************
```

Highest Flow Instability Indexes
****
Link OL2 (42)
Link OL1 (40)
Link W2 (17)
Link C1 (14)
Link W1 (5)

****
Most Frequent Nonconverging Nodes
****
Node OF1 (18.12%)
Node TO8 (18.12%)
Node SU1 (14.09%)
Node SU3 (12.34%)
Node T07 (1.12%)

****
Routing Time Step Summary
****

Minimum Time Step	:	1.00 sec
Average Time Step	:	1.00 sec
Maximum Time Step	:	1.00 sec
% of Time in Steady State	:	0.00
Average Iterations per Step	:	3.81
% of Steps Not Converging	:	18.12

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
C100A_1	70.85	0.00	0.00	12.21	46.80	6.74	53.54	2.54	1748.95	0.756
C100A_2	70.85	0.00	0.00	12.21	46.86	6.82	53.67	2.26	1569.60	0.758

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
T07	JUNCTION	0.23	0.47	89.36	0 01:00	0.46
OF1	OUTFALL	0.00	0.00	89.18	0 00:00	0.00
TO8	OUTFALL	0.23	0.45	89.20	0 01:01	0.45
SU1	STORAGE	0.26	1.73	95.15	0 01:10	1.73
SU2	STORAGE	1.25	2.13	94.13	0 01:24	2.13
SU3	STORAGE	0.24	1.57	96.06	0 01:09	1.57

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
T07	JUNCTION	0.00	805.50	0 01:00	0	3.4	0.146
OF1	OUTFALL	0.00	176.31	0 01:24	0	1.18	0.000
TO8	OUTFALL	0.00	852.23	0 01:01	0	3.39	0.000
SU1	STORAGE	1748.95	1748.95	0 01:10	2.54	2.54	-5.775
SU2	STORAGE	0.00	2554.31	0 01:10	0	1.7	-5.763
SU3	STORAGE	1569.60	1569.60	0 01:10	2.26	2.26	-6.239

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
SU1	0.000	14.8	0.0	0.0	0.002	99.8	0 01:10	1760.46
SU2	0.709	34.4	0.0	0.0	1.555	75.4	0 01:24	176.31
SU3	0.000	14.4	0.0	0.0	0.002	93.3	0 01:09	1599.35

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
OF1	66.06	165.46	176.31	1.180
TO8	76.63	410.12	852.23	3.394

System	71.35	575.58	981.81	4.575

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	852.23	0 01:01	1.78	0.17	0.28
OR1	ORIFICE	176.31	0 01:24			1.00
W1	WEIR	1333.86	0 01:10			0.99
W2	WEIR	1220.45	0 01:10			0.63
OL1	DUMMY	426.60	0 00:59			
OL2	DUMMY	378.90	0 00:59			

****
Flow Classification Summary
****

	Adjusted	---------- Fraction of Time in Flow Class ----------								
	/Actual		Up	Down	Sub	Sup	Up	Down	Norm	Inlet
Conduit	Length	Dry	Dry	Dry	Crit	Crit	Crit	Crit	Ltd	Ctrl
C1	1.00	0.23	0.00	0.00	0.73	0.04	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Thu Jan 29 10:38:28 2026
Analysis ended on: Thu Jan 29 10:38:28 2026

Total elapsed time: < 1 sec

C.3 Background Report Excerpts

Report

Nepean South Chapman Mills Stormwater Management Servicing Fourth Addendum

Prepared for Minto Communities – Canada
by IBI Group
February 16, 2018

		HGL (M)		
TRUNK	MH	100 YEAR 24 HOUR SCS TYPE II STORM		100 YEAR 3 HOUR CHICAGO STORM
		2012	UPDATED	
	252A	88.61	88.64	88.42
Western (Longfields)	9074	N/A	N/A	90.58
	9054	N/A	N/A	90.07
	9053	89.77	89.65	89.77
	TO11/9076	90.04	89.90	90.02
	1	89.08	88.92	88.96
	Western Interceptor MH 9077	N/A	N/A	N/A
	9078	N/A	N/A	N/A
	9079	N/A	N/A	N/A
	9080	N/A	N/A	N/A
	9081	N/A	N/A	N/A
	9082	N/A	N/A	N/A
	9083	N/A	N/A	N/A
	Western Overflow	N/A	N/A	N/A
SWM Facility		88.53	88.47	88.22

Note: N/A indicates free flow conditions

The HGL was established in the 2006 Servicing Report and has been evaluated at critical locations to reflect subsequent changes in design. Previous to the preparation of this addendum, the most recent HGL evaluation had been submitted to the City as part of the 2012 Addendum. At the time, the HGL was reviewed by the engineer consultants conducting the detailed design. Overall, it was confirmed that the 0.3 m clearance between the HGL and underside of footings is maintained along the trunk sewers at relevant locations. The exception was at MH 9053, located on Longfields Drive at Paul Métivier Drive. The HGL at this location was 89.77 m, resulting in a 0.27 m clearance between HGL and USF at one townhouse unit on Paul Métivier Drive. It is IBI's understanding that the 2012 HGL values were acceptable. The aim of the present analysis was to not exceed those values.

The current updates to the modeling are tributary to the western trunk storm sewer. HGL values are generally consistent with those of 2012 with slight increases in the sewers east of Longfields Drive in the order of 1 and 2 cm. The critical HGL location in the western trunk remains MH 9053. The resulting HGL at this location during the more critical of the 100 year events (at this location the 100 year 3 hour Chicago storm) is 89.77 m, consistent with the June 2012 submission. There are free flow conditions at all other locations along the Longfields Drive trunk storm sewer.

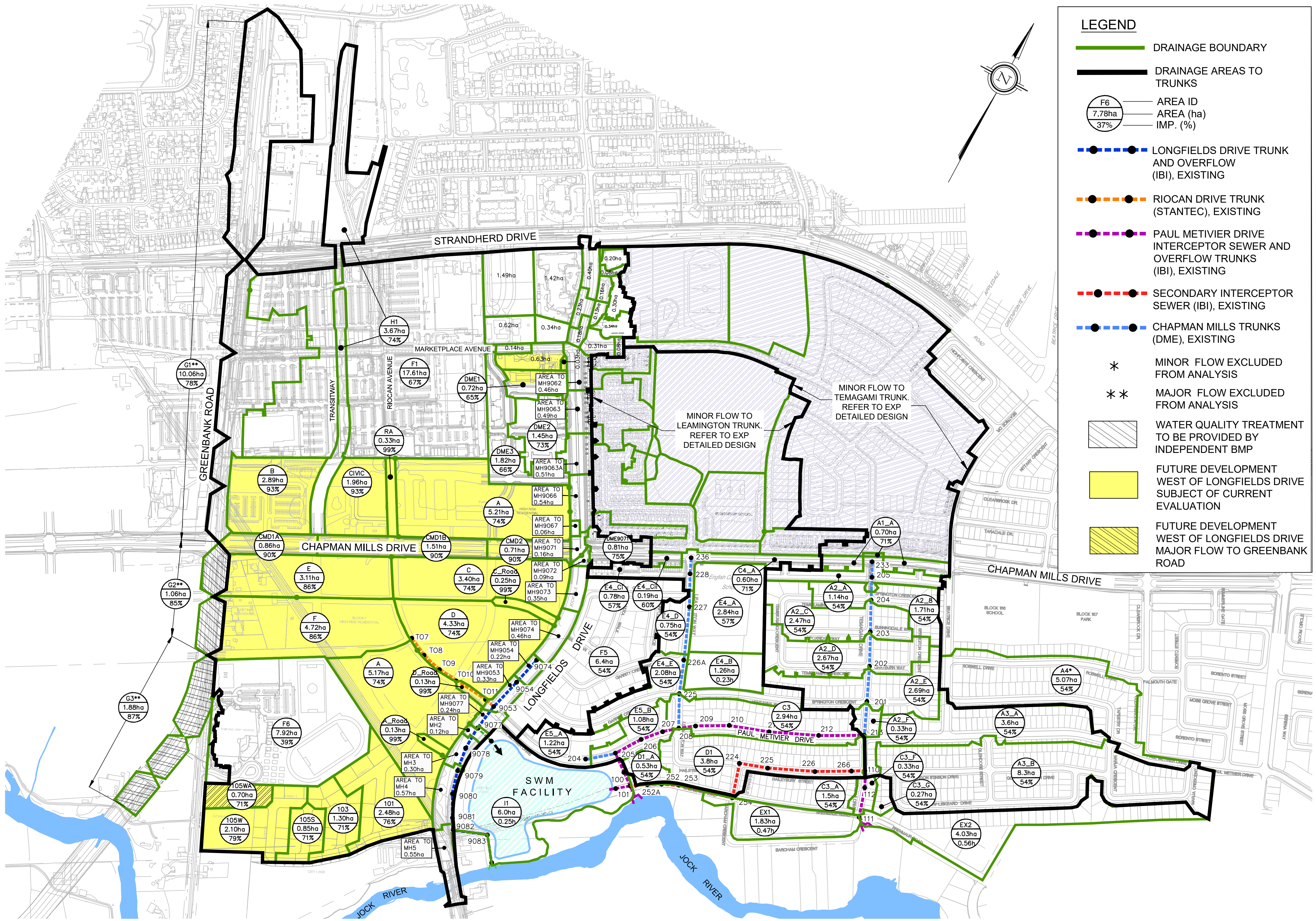
As-built information for the Riocan Avenue sewer was received and the model was updated. Based on the 100 year events, there are free flow conditions at the two upstream manholes of the modeled Riocan Avenue sewer. The remainder of the sewer is surcharged to where it joins the Longfield Drive trunk storm sewer. It is concluded that the hydraulic grade line is maintained at acceptable levels during the 100 year storm event.

For local sewers at a conceptual level of design, the design engineers must confirm the grading versus HGL to ensure the 0.3 m clearance is maintained.

Table 2.9 Revised drainage areas

2006					UPDATED				
DRAINAGE AREA ID	AREA (HA)	TIMP (%)	SURFACE STORAGE (CU-M)	MINOR SYSTEM CAPTURE (L/S)	DRAINAGE AREA ID	AREA (HA)	TIMP (%)	SURFACE STORAGE (CU-M)	MINOR SYSTEM CAPTURE (L/S)
F2	14.4	85	3012[1]	1575	DME-9063A (DME3)	1.82	66	252	435[2]
F3	9.4	85	2057[1]	956	Block A	5.21	74[3]	750	784[4][5][6]
					R-9066	0.54	71	0	211
					Riocan Avenue	0.33	99	0	28[7]
					CMD1B	1.50	90[3]	0	752[4][7]
					CMD2	0.71	90[3]	0	457[4][5]
					Block B	2.89	93[3]	0	1331[4]
					Block H Civic	1.96	93[3]	0	900[4]
					CMD1A	0.86	90[3]	0	383[4]
F4	31.6	85	5814[1]	3750	E	3.11[9]	86	0	280[10]
					F	4.72[9]	86	0	425[10]
					C	3.40	74[13]	0	306[10]
					C_ROAD	0.25	99	0	122[4]
					D	4.33	74[13]	0	389[10]
					D_ROAD	0.13	99	0	66[4]
					Parcel A	5.17	74[13]	0	465[10]
					A_ROAD	0.13	99	0	65[4]
					105W	2.10	79[3]	0	189[10]
					105WA[16]	0.70	71[15]	0	63[10]
					105S	0.85	71[3]	0	77[10]
					103	1.30	71[3]	0	117[10]
					101	2.48	76[3]	0	223[10]
F6	7.37	37	863[1]	627	F6[14]	7.84	39	680	831[4]
H1	3.2	80	392	530	H1	3.67	74	1056	556
G1	10.40	78	0	1544	G1	10.06	78	0	1869[8]
G2	1.08	85	0	268	G2[11]	1.06	85	0	268[12]
G3	1.88	87	0	478	G3[11]	1.88	87	0	478[12]

(1) 100 year on-site storage
(2) Based on rational method for Ampersand Stage I
(3) Weighted c value (from which imperviousness was calculated) established by engineering consultant completing conceptual design
(4) 100 year flow capture (based on 100 year 3 hour Chicago storm)
(5) 100 year flow from a 0.358 ha portion of Block A flow cascades to Chapman Mills Drive (CMD2)
(6) Minor flow from a 0.915 ha portion of Block A drains via the storm sewer on Glenroy Gilbert Drive (via Ampersand Stage I); minor flow from a 3.936 ha portion and 100 year flow from a 0.358 ha portion drains via the storm sewer on Chapman Mills Drive
(7) Major flow from Riocan Avenue cascades to Chapman Mills Drive (CMD1B)
(8) Minor system capture per Stantec/AECOM July 2009
(9) Drainage area extended west to Greenbank Road
(10) Minor system capture increased to 90 l/s/ha from 85 l/s/ha
(11) Water quality treatment for areas G2, G3 to be provided by an independent BMP
(12) Minor system capture per TSH May 2006
(13) Imperviousness consistent with that of Block A
(14) Per detailed design of site
(15) Per email from DSEL November 6, 2017
(16) Major flow conveyed toward Greenbank Road



Scale	Project Title	Drawing Title	Sheet No.
N.T.S.	NEPEAN SOUTH-CHAPMAN MILLS SWM SERVICING ADDENDUM	DRAINAGE AREA PLAN	FIGURE 1A

J:\IBI Engineering\CCL\0-CAD\cad\Water\3771 Nepean South\5.0\5.9\5.9.1\Design files\CH-MILLS SWM Addendum-2017\Figure 1A.dwg Layout Name: Figure 1A Plot Style: ---- Plot Scale: 1:2.5849 Plotted At: 2/15/2018 11:56 AM Last Saved By: svukic Last Saved At: Dec. 20, 17

Appendix D Geotechnical and Hydrogeology

D.1 Geotechnical Investigations Excerpts

Geotechnical Investigation

Proposed Residential Development

3265 Jockvale Road
Barrhaven Town Center Stage 2
Ottawa, Ontario

Prepared for Minto Communities

Report PG5636-3 dated November 25, 2025

4.0 Observations

4.1 Surface Conditions

The subject site consists of undeveloped, primarily vacant land with scattered forested areas. An access road traverses the central portion of the property. The site is bordered by Longfields Drive to the east, Jockvale Road to the west, vacant lands and construction sites to the north, and vacant lands to the south. In addition, a temporary office building and a gravel-surfaced parking area were observed in the northeast corner of the subject site.

The ground surface elevation across the subject site is relatively flat, and slightly sloped upward from east to west, ranging between an approximate geodetic elevation of 92.4 m to 101.0 m. The subject site is relatively at grade with surrounding roadways and properties.

Reference should be made to Drawing PG5636-15 – Test Hole Location Plan included in Appendix 2.

4.2 Subsurface Profile

Overburden

Generally, the subsurface profile encountered at the test hole locations consists of either fill or topsoil underlain by a silty clay crust and/or silty sand and/or a glacial till deposit. Where encountered, the existing fill layer was observed to range between 0.4 to 2.2 m in depth.

The surficial layer of topsoil and/or fill was observed to be underlain by an undisturbed, hard to stiff and weathered crust layer of silty clay at BH 1-25, BH 3-25, BH4-25, BH 5-25 of the current investigation and BH 1-21, BH 6-21, BH 7-21 of the 2021 investigation. This crust layer was observed to range between 0.5 and 3.3 m in thickness. The crust layer was observed to be underlain by a layer of unweathered grey silty clay extending up to a depth of 6.5 m below the existing ground surface at BH 7-21.

Glacial till was observed underlying the above-noted deposits at all test hole locations. The glacial till generally consisted of silty sand and/or silty clay with varying amounts of clay. A significant amount of cobbles and boulders is also present throughout the glacial till deposit encountered throughout the subject site.

Practical refusal to augering was encountered at all borehole locations except BH 7-25, BH 8-25, BH 9-25, and BH 12A-25 at approximate depths ranging from 0.6 m to 6.7 m below existing grade, respectively, in the current investigation.

Reference should be made to the Soil Profile and Test Data sheets in Appendix 1 for specific details of the soil profiles encountered at each borehole location.

Bedrock

Bedrock was cored at BH 1-21 and BH 2-21 to depths of up to 13.6 m and was observed to consist of limestone with interbedded shale in the 2021 investigation. Based on the RQD values, the bedrock core was noted to be in good to excellent condition.

Based on available geological mapping, the subject site is located in an area where the bedrock consists of interbedded sandstone and dolomite of the March formation with a drift thickness between 5 to 15 m.

Grain Size Distribution Testing

The results of the soil samples submitted for grain size analysis from the test holes from the current investigation are summarized in Table 1, on the next page, and are also presented on the grain size distribution testing results sheets in Appendix 1.

Table 1 – Summary of Grain Size Distribution Analysis

Test Hole	Sample Depth	Gravel (%)	Sand (%)	Silt and Clay (%)
BH 3-25	SS6	22.3	50.9	26.8
BH 4-25	SS8	19.5	52.3	28.2
BH 11-25	SS7	22.4	46.5	31.1
BH 12A-25	SS3	41.4	39.9	18.7

Atterberg Limits Testing

Atterberg limits testing, as well as associated moisture content testing, was completed on the recovered silty clay samples at selected locations throughout the subject site. The results are summarized in Table 2 and presented on the Atterberg limits tests sheet in Appendix 1.

Table 2 – Summary of Atterberg Limits Tests

Sample	Depth (m)	Liquid Limit %	Plastic Limit %	Plasticity Index %	Classification
BH 1-25	1.83	70	34	36	MH
BH 4-25	1.83	45	22	23	CL
BH 6-21	2.59	51	29	22	MH
BH 7-21	2.59	72	35	37	MH

Notes: MH: Inorganic Silt of High Plasticity, CL: Inorganic Clay of Low Plasticity

Shrinkage Testing

The shrinkage limit and ratio of the tested soil sample (BH 3-25-SS2) are 20.67 percent and 1.755, respectively. The results are presented on the shrinkage testing sheet in Appendix 1.

4.3 Groundwater

Groundwater levels were measured in the installed piezometers and monitoring well on November 3, 2025, and January 8, 11, and 20, 2021.

The manual groundwater level (GWL) readings are presented in Table 3, in the following, and are shown on the Soil Profile and Test Data sheets in Appendix 1.

The long term groundwater level can also be estimated based on the recovered soil samples, moisture levels, and consistency. It is important to note that groundwater readings at piezometers can be influenced by surface water perched within the borehole backfill material.

It should be noted that groundwater levels are subject to seasonal fluctuations. Therefore, the groundwater level could vary at the time of construction.

5.0 Discussion

5.1 Geotechnical Assessment

From a geotechnical perspective, the subject site is considered suitable for the proposed development. It is expected that the proposed residential dwellings will be founded on conventional spread footings placed on an undisturbed, hard to stiff silty clay, and/or undisturbed, compact silty sand, and/or undisturbed, compact to very dense glacial till deposit.

Furthermore, it is anticipated that cobbles and boulders will be encountered frequently throughout servicing trenches and building excavations. All contractors should be prepared for boulder, including oversized boulders, removal throughout the subject site.

Due to the presence of a silty clay deposit within a portion of the subject site, recommendations have been provided for permissible grade raise restrictions and tree planting setbacks in this area in Sections 5.3 and 6.8, respectively.

The above and other considerations are further discussed in the following sections.

5.2 Site Grading and Preparation

Stripping Depth

Topsoil, and any deleterious fill, such as those containing organic materials, should be stripped from under any buildings and other settlement sensitive structures. Care should be taken not to disturb adequate bearing soils below the founding level during site preparation activities. Disturbance of the subgrade may result in having to sub- excavate the disturbed material and the placement of additional suitable fill material.

The existing fill, where free of organics and deleterious materials, can be left in place below the proposed floor slab and beyond the lateral support zones for footings. If considered to be left in place as subgrade, it is recommended that the existing fill be proof-rolled under dry conditions and above freezing temperatures by an adequately sized vibratory roller, making several passes to achieve optimum compaction levels. The compaction program should be reviewed and approved by Paterson personnel at the time of construction. In poor performing areas, be removed and reinstated with an approved engineered fill, such as OPSS Granular B Type II.

5.7 Pavement Design

For design purposes, the pavement structure presented in the following tables could be used for the design of driveways, local residential streets, and roadways with bus traffic. It should be noted that for residential driveways and car only parking areas, Ontario Traffic Category A is applicable. For local roadways, Ontario Traffic Category B should be used for design purposes.

Table 4 – Recommended Pavement Structure - Driveways

Thickness (mm)	Material Description
50	**Wear Course** – HL-3 or Superpave 12.5 Asphaltic Concrete
150	**BASE** – OPSS Granular A Crushed Stone
300	**SUBBASE** – OPSS Granular B Type II

Notes:
1 - SUBGRADE - Either in situ soils or OPSS Granular B Type I or II material placed over in situ soil
2 - Minimum Performance Graded (PG) 58-34 asphalt cement should be used for this Pavement Structure.

Table 5 – Recommended Pavement Structure – Local Residential Roadways

Thickness (mm)	Material Description
40	**Wear Course** – HL-3 or Superpave 12.5 Asphaltic Concrete
50	**Binder Course** – HL-8 or Superpave 19.0 Asphaltic Concrete
150	**BASE** – OPSS Granular A Crushed Stone
450	**SUBBASE** – OPSS Granular B Type II

Notes:
1 - SUBGRADE - Either in situ soils or OPSS Granular B Type I or II material placed over in situ soil
2 - Minimum Performance Graded (PG) 58-34 asphalt cement should be used for this Pavement Structure.

Table 6 – Recommended Pavement Structure – Arterial Roadways with Bus Traffic

Thickness (mm)	Material Description
40	**Wear Course** - Superpave 12.5 Asphaltic Concrete
50	**Upper Binder Course** - Superpave 19.0 Asphaltic Concrete
50	**Lower Binder Course** - Superpave 19.0 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
600	**SUBBASE** - OPSS Granular B Type II

Notes:
1 - SUBGRADE - Either in situ soils or OPSS Granular B Type I or II material placed over in situ soil
2 - Minimum Performance Graded (PG) 64-34 asphalt cement should be used for this Pavement Structure.

7.0 Recommendations

It is recommended that the following be carried out by Paterson once design details of the proposed development have been prepared:

- ❑ Review preliminary and detailed grading, servicing plan(s) from a geotechnical perspective.

It is a requirement for the foundation design data provided herein to be applicable that a material testing and observation program be performed by the geotechnical consultant. The following aspects of the program should be performed by Paterson:

- ❑ Review and inspection of the installation of the foundation drainage systems.
- ❑ Observation of all bearing surfaces prior to the placement of concrete.
- ❑ Sampling and testing of the concrete and fill materials.
- ❑ Periodic observation of the condition of unsupported excavation side slopes in excess of 3 m in height, if applicable.
- ❑ Observation of all subgrades prior to backfilling and follow-up field density tests to determine the level of compaction achieved.
- ❑ Field density tests to determine the level of compaction achieved.
- ❑ Sampling and testing of the bituminous concrete including mix design reviews.

A report confirming that these works have been conducted in general accordance with our recommendations could be issued upon the completion of a satisfactory inspection program by Paterson.

All excess soil must be handled as per *Ontario Regulation 406/19: On-Site and Excess Soil Management*.

8.0 Statement of Limitations

The recommendations provided in this report are in accordance with our present understanding of the project. We request permission to review our recommendations when the drawings and specifications are completed.

A geotechnical investigation of this nature is a limited sampling of a site. Should any conditions at the site be encountered which differ from those at the test locations, we request immediate notification to permit reassessment of our recommendations.

The recommendations provided herein should only be used by the design professionals associated with this project. They are not intended for contractors bidding on or undertaking the work. The latter should evaluate the factual information provided in this report and determine its suitability and completeness for their intended construction schedule and methods. Additional testing may be required for their purposes.

The present report applies only to the project described in this document. Use of this report for purposes other than those described herein or by person(s) other than Minto Communities or their agents is not authorized without review by Paterson Group for the applicability of our recommendations to the altered use of the report.

Paterson Group Inc.

LICENSED PROFESSIONAL ENGINEER
Nov. 25, 2025
D. J. PETAHTEGOOSE
100568013
PROVINCE OF ONTARIO

Yashar Ziaeimehr, M.A.Sc., P.Eng. Drew Petahtegoose, P.Eng.

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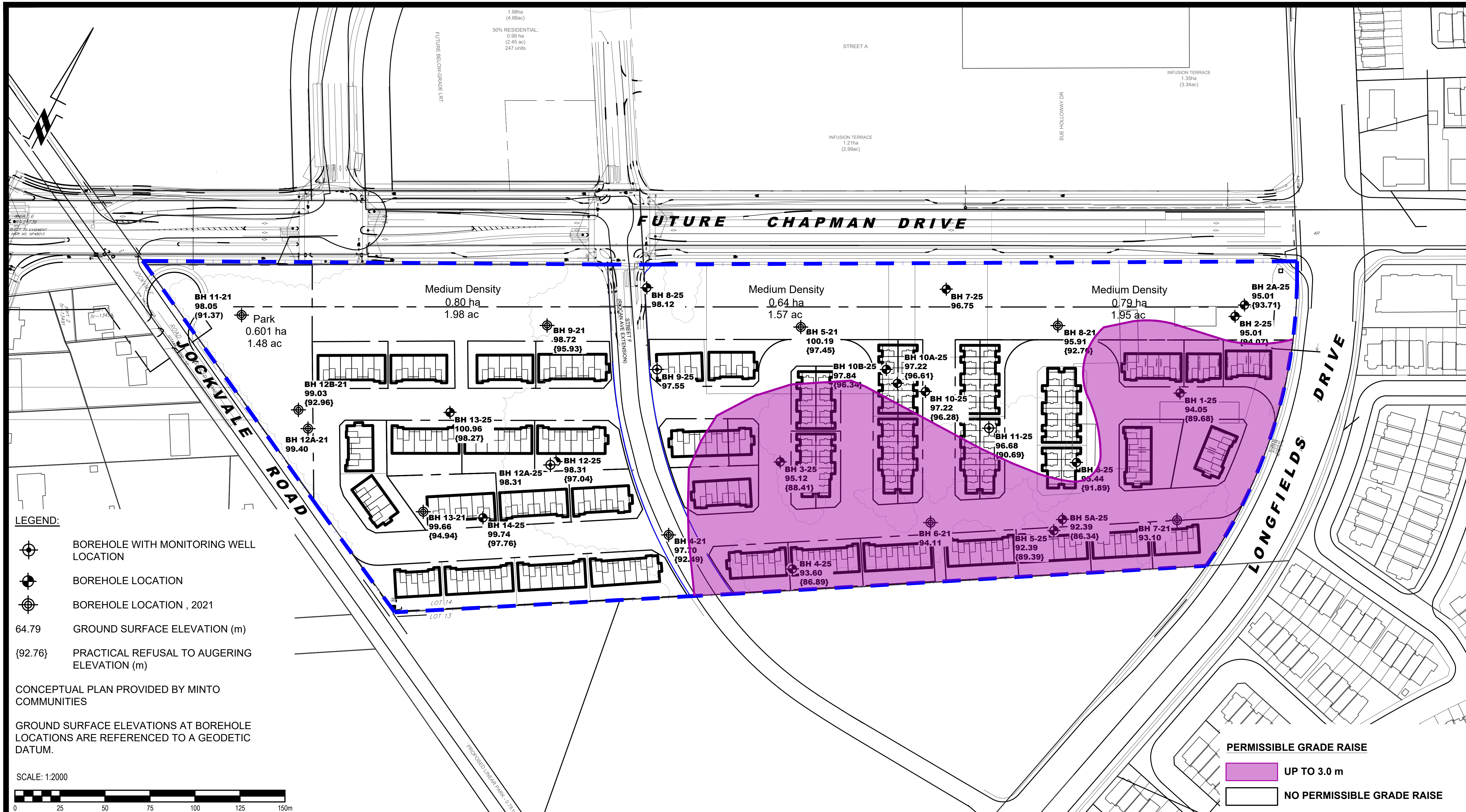

PATERSON GROUP
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NO.	REVISIONS	DATE	INITIAL

MINTO COMMUNITIES
GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
OTTAWA, 3265 JOCKVALE ROAD - BARRHAVEN TOWN CENTRE STAGE 2 ONTARIO

Title:

PERMISSIBLE GRADE RAISE PLAN

Scale: 1:2000	Date: 11/2025
Drawn by: GK	Report No.: PG5636-3
Checked by: YZ	Dwg. No.: PG5636-16
Approved by: DP	Revision No.:

p:\autocad drawings\geotechnical\pg56xx\pg5636\pg5636-15 test hole location plan.dwg

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D.2 Hydrogeology Memo Excerpts

February 4, 2026

PH5176-LET.01

Minto Communities
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Building Science
Rural Development Design
Temporary Shoring Design
Retaining Wall Design
Noise and Vibration Studies
Energy and Sustainability
Temporary Shoring Design
Pile Dynamic Analysis and Testing

patersongroup.ca

Attention: **Kevin Harper**

Subject: **Water Budget Assessment**
Proposed Residential Development
3265 Jockvale Road, Ottawa, Ontario

INTRODUCTION

Further to your request, Paterson Group (Paterson) has completed a Water Budget Assessment in support of the stormwater management strategy for the proposed residential development located at 3265 Jockvale Road, in the City of Ottawa, Ontario (hereinafter referred to as the "subject site"). Please refer to Drawing PH5176-1 - Site Plan for the approximate site location.

The area that was considered for the water budget assessment has a footprint of approximately 101,239 m^2. The majority of the subject site is currently vacant and covered with shrubs or mature trees. The northeast corner of the subject site consists of an industrial building with paved/gravel parking areas. A paved/gravel road runs through the center of the subject site.

The shallow subsoils within the western and northern portions of the subject site generally consisted of topsoil overlying a glacial till deposit with a silty sand matrix. The shallow subsoils within the southeastern portion of the subject site generally consisted of a hard to very stiff silty clay.

During the most recent field investigation completed at the subject site by Paterson, groundwater levels were measured between 0.72 and 6.71 m below ground surface (bgs).

A detailed description of the subject site can be found in the most recent PG5636-3 Paterson Group Report which should be read in conjunction with this report.

WATER BUDGET ASSESMENT

The Thornthwaite and Mather (1957) method was used to assess pre and post-development site conditions based on Table 3.1 of the Ministry of the Environment's (MOE) 2003 Stormwater Management Planning and Design Manual and hydrologic/climatic data provided by Environment Canada's Engineering Climate Services Unit (EC-ECS).

Shallow unsaturated soils within the study area generally consisted of topsoil overlying a glacial till deposit with a silty sand matrix or a hard to very stiff silty clay, dependent on the location across the subject site. The above noted calculations were carried out for a fine sandy loam, clay loam or silt loam soil, dependent on the location across the subject site and pre or post development conditions.

Given that the location of the subject site is within the City of Ottawa, climatic data was obtained from the climate station located at the McDonald-Cartier International Airport covering the period of January 1939 to December 2022. The information was provided by EC-ECS and is attached to this report.

Table 1, below, displays the soil types present within the study area and their associated water holding capacities (WHC) as well as the actual evapotranspiration (AE) and surplus data. The EC-ECS monthly/annual water budget data used in this assessment is attached to this report.

Table 1 - Site Specific Water Surplus Information

Land Use Unit	Water Holding Capacity (mm)	Actual Evapotranspiration (mm/year)	Surplus Water (mm/year)
Impervious Surfaces	N/A	*144	759
Urban Lawns / Shallow Rooted Crops (Fine Sandy Loam)	75	525	378
Urban Lawns / Shallow Rooted Crops (Silt Loam)	125	562	341
Pasture and Shrubs (Fine Sandy Loam)	150	574	329
Pasture and Shrubs (Clay Loam)	250	600	304
Mature Forests (Fine Sandy Loam)	300	605	298
Mature Forests (Clay Loam)	400	609	292

Table reproduced using WHC values from the MOE 2003 Stormwater Management Planning and Design Manual and modelling data from Environment Canada's Engineering Climate Services Unit.
*Value based on evaporation information for urban areas (16% of precipitation) included in the Eastern Ontario Water Resources Management Study prepared by CH2M HILL Canada Limited (March 30, 2001).

Infiltration Factors

In order to partition the surplus water values for the various materials into infiltration and runoff, various factors must be considered. The MOE 2003 Stormwater Management Planning and Design Manual lists three main factors that contribute to surface water infiltration rates.

The first factor is topography, which is broken down further into three sections: flat and average slope, rolling land and hilly land. Flat and average slope provides the greatest potential for infiltration and has the largest infiltration factor applied to it (0.3), while the other two have progressively lower infiltration factors (rolling land is 0.2 and hilly land is 0.1).

The second factor is soil, which is also broken down further into three sections: tight impervious clay, medium combinations of clay and loam and open sandy loam. Open sandy loam provides the greatest potential for infiltration (infiltration factor of 0.4) while the other two have progressively lower potential for infiltration to occur (infiltration factor for medium combinations of clay and loam is 0.2 and for tight impervious clay is 0.1).

The final factor the MOE manual uses to partition infiltration from runoff is land cover. It is broken down into two sections: open fields/cultivated lands and woodlands. Woodlands have greater infiltration potential and an infiltration factor of 0.2. Open fields and cultivated lands have lower potential with an infiltration factor of 0.1. A summary of the MOE manual's descriptors and their associated infiltration factors is shown below in Table 2.

Table 2 - MOE (2003) Infiltration Factors

Description of Area/Development Site	Value of Infiltration Factor
Topography	
Flat and average slope (<0.6 m/km)	0.30
Rolling land (slope of 2.8-3.8 m/km)	0.20
Hilly land (slope of 28-47 m/km)	0.10
Soil	
Tight impervious clay	0.10
Medium combinations of clay and loam	0.20
Open sandy loam	0.40
Cover	
Open fields/cultivated lands	0.10
Woodlands	0.20

Table reproduced from MOE (2003) - Stormwater Management Planning and Design Manual.

The topography of the subject site was classified as being between hilly land and rolling land and was assigned a pre-development topography infiltration factor of 0.15 for the fine sandy loam and clay loam soils. Under post-development conditions without mitigation, the topography infiltration factor of 0.15 was assigned to the Urban Lawns (Silt Loam). Under post-development conditions with mitigation, the slope of the site is anticipated to be reduced to promote additional infiltration. Therefore, a post-development topography infiltration factor of 0.2 was assigned. An infiltration factor of 0 was assigned to the impervious surfaces due to its negligible infiltration capacity.

The soils within the study area generally consisted of topsoil overlying a glacial till deposit with a silty sand matrix or a hard to very stiff silty clay. Therefore, a pre-development soil infiltration factor of 0.3 and 0.15 was given for the fine sandy loam and clay loam materials analysed on the property, respectively. Under post-development conditions without mitigation, a soil infiltration factor of 0.25 was given for Urban Lawns (Silt Loam). Under post-development conditions with mitigation, soils with higher infiltration potential are anticipated to be used and were assigned a soil Infiltration factor of 0.3 for the Urban Lawns (Fine Sandy Loam). An infiltration factor of 0 was assigned to the impervious surfaces due to its negligible infiltration capacity.

The vegetation cover at the subject site generally consisted of pasture and shrubs or mature trees. Under post-development conditions (with and without mitigation), the land cover will largely change to landscaped areas (Urban Lawns) or impervious surfaces. A vegetation infiltration factor of 0.1 was assigned to all pre- and post-development materials and 0 for the impervious surfaces, with the exception of the pre-development tree covered areas which were assigned a vegetation infiltration factor of 0.2.

It is important to note that the water budget analysis for the subject site does not consider any potential infiltration of impervious surfaces (100% runoff was taken as a conservative approach). In reality, some portion of surface water that lands on impervious surfaces infiltrates (asphalt is not 100% impervious) or is diverted to grassed areas where additional infiltration may occur. As such, the impervious surface runoff volumes should be considered a conservative estimate and not expected to definitively represent existing conditions.

The infiltration factors noted above are displayed within the water budget calculations in Tables 3-5 attached to this report.

Pre-Development Water Budget

The pre-development water budget analysis conducted for the study area determined that an estimated 15,186,064 L/year of surplus water currently infiltrates the surface soils. The remaining estimated 21,511,585 L/year of surplus leaves the site as runoff.

Details of the pre-development water budget analyses are presented in Table 3 attached to this report.

Post-Development Water Budget Assessment - No Mitigation

The post-development water budget analysis without mitigation determined that an estimated 5,389,658 L/year of surplus water will infiltrate the surface soils and approximately 58,237,390 L/year will leave the site as runoff. These values equate to an approximate 65% decrease in infiltration and 171% increase in runoff when compared to the pre-development water budget.

Post-Development Water Budget Assessment - Mitigation

The post-development water budget analysis with mitigation determined that an estimated 8,983,751 L/year of surplus water will infiltrate the surface soils and approximately 52,764,899 L/year will leave the site as runoff. These values equate to an approximate 41% decrease in infiltration and 145% increase in runoff when compared to the pre-development water budget.

Below are the assumptions used in the assessment based on discussions with the design team.

- The medium density blocks were considered to be 15% pervious areas classified as Urban Lawns / Shallow Rooted Crops (Silt Loam or Fine Sandy Loam) and 85% impervious areas.
- The residential housing blocks were considered to be 30% pervious areas classified as Urban Lawns / Shallow Rooted Crops (Silt Loam or Fine Sandy Loam) and 70% impervious areas.
- An estimated 8,000 m^2 of roofs for the non-back-to-back townhouses will be directed to rear yards. This area (8,000 m^2) is subtracted from the Impervious Surfaces footprint and added to the Urban Lawns footprint for the mitigation calculations.
- The soil infiltration factor increased from 0.25 (Silt Loam) to 0.3 (Fine Sandy Loam) for Urban Lawns as the result of using topsoil with higher infiltration potential for the mitigation calculations.
- Topography Infiltration factor increased from 0.15 to 0.2 for Urban Lawns as the result of reduced grading for the mitigation calculations.

Details of the post-development water budget analyses are presented in Tables 4 and 5 attached to this report.

CONCLUSIONS

As previously discussed, surficial soils at the subject site generally consisted of topsoil overlying a glacial till deposit with a silty sand matrix or a hard to very stiff silty clay.

As noted above, the results of the water budget analyses completed at the subject site indicated that an estimated 15,186,064 L/year of infiltration and 21,511,585 L/year of surface runoff are occurring under pre-development conditions. Under post-development conditions, it is expected that there will be an approximate 65% infiltration deficit and a 171% increase in runoff prior to implementing mitigation measures.

As discussed above, the stormwater management design team is anticipated to implement mitigation measures to address post-development changes to the site's water budget. These mitigation measures include reduced lot grading, using topsoil with higher infiltration potential and connecting roof leads to lawns. By implementing these measures, the post development infiltration deficit and runoff increase will be reduced from 65 to 41% and 171 to 145%, respectively.

The information presented in this report is intended to support the stormwater management strategy while aligning with the Consolidated Linear Infrastructure Environmental Compliance Approval (CLI ECA) framework and City of Ottawa Technical Bulletin IWSTB-2024-04. Based on discussions with the design team, it is Paterson's understanding that the City's standard right-of-way (ROW) cross sections for local roads do not accommodate infiltration/exfiltration Low Impact Development (LID) systems and that the proposed 22 m collector road cannot accommodate LIDs in addition to the other infrastructure requirements. Therefore, based on the current concept plans available at the time of report preparation, it is anticipated that stormwater will be managed by implementing the mitigation measures noted above while tying into the existing stormwater management infrastructure for the surrounding area.

STATEMENT OF LIMITATIONS

The client should be aware that any information pertaining to soils and all test hole logs are furnished as a matter of general information only, and test hole descriptions or logs are not to be interpreted as descriptive of conditions at locations other than those of the test holes.

A review of this nature is a limited sampling of a site. The recommendations are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around the test locations. Should any conditions at the site be encountered which differ from those at the test locations, we request notification immediately in order to permit reassessment of our recommendations.

The present report applies only to the project described in this document. Use of this report for purposes other than those described herein or by person(s) other than Minto Communities or their agent(s) is not authorized without review by Paterson Group for the applicability of our recommendations to the altered use of the report.

We trust that the current submission satisfies your immediate requirements.

Best Regards,

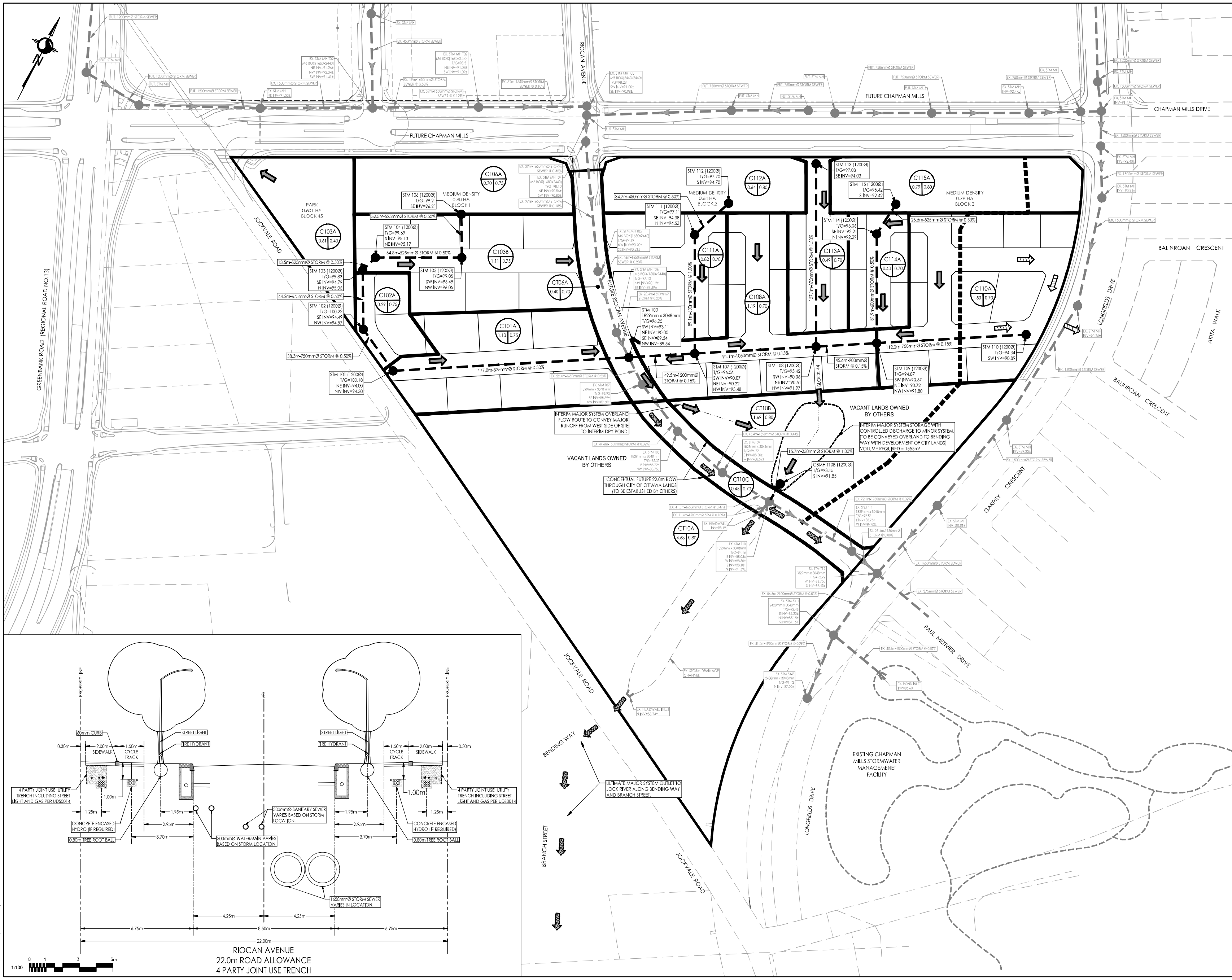
Paterson Group Inc.

Oliver Blume, P.Geo.

Attachments:

- ❑ Drawing PH5176 - Site Plan
- ❑ Drawing PH5176 - Pre-Development Terrain Composition Plan
- ❑ Drawing PH5176 - Post-Development Terrain Composition Plan
- ❑ Table 3 - Pre-Development Annual Water Budget Calculations
- ❑ Table 4 - Post-Development Annual Water Budget Calculations
- ❑ Table 5 - Post-Development Annual Water Budget Calculations with Mitigation
- ❑ Environment Canada's Engineering Climate Services Water Budget Data
- ❑ Soil Profile and Test Data Sheets
- ❑ Drawing PG5636-15 Test Hole Location Plan

Appendix E Drawings



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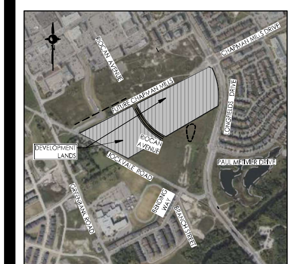
Legend

- PROPOSED STORM SEWER
- EXISTING STORM SEWER
- FUTURE STORM SEWER (BY OTHERS)
- MAJOR OVERLAND FLOW ROUTE
- EMERGENCY OVERLAND FLOW ROUTE
- ULTIMATE MAJOR OVERLAND FLOW ROUTE
- ST101 — DRAINAGE AREA ID; 1.00 — STORM DRAINAGE AREA (ha); 0.80 — RUNOFF COEFFICIENT
- STORM DRAINAGE BOUNDARY
- MAJOR SYSTEM DIVIDE

Notes



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0	ISSUED FOR COMMENT	MJS	KS	26.02.05

File Name: 160402206 DB.dwg	Dwn.	Chkd.	Dsgn.	YY.MM.DD
	MJS	DT	MJS	26.01.19

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LICENSED PROFESSIONAL ENGINEER
K.L. SMADELLA
2026-02-23
PROVINCE OF ONTARIO

Client/Project

MINTO

BARRHAVEN TOWN CENTRE
PHASE 2
OTTAWA, ON, CANADA

Title

CONCEPTUAL STORM SEWER NETWORK

Project No. 160402206

Scale 1:1250 (0, 12.5, 37.5, 62.5m)

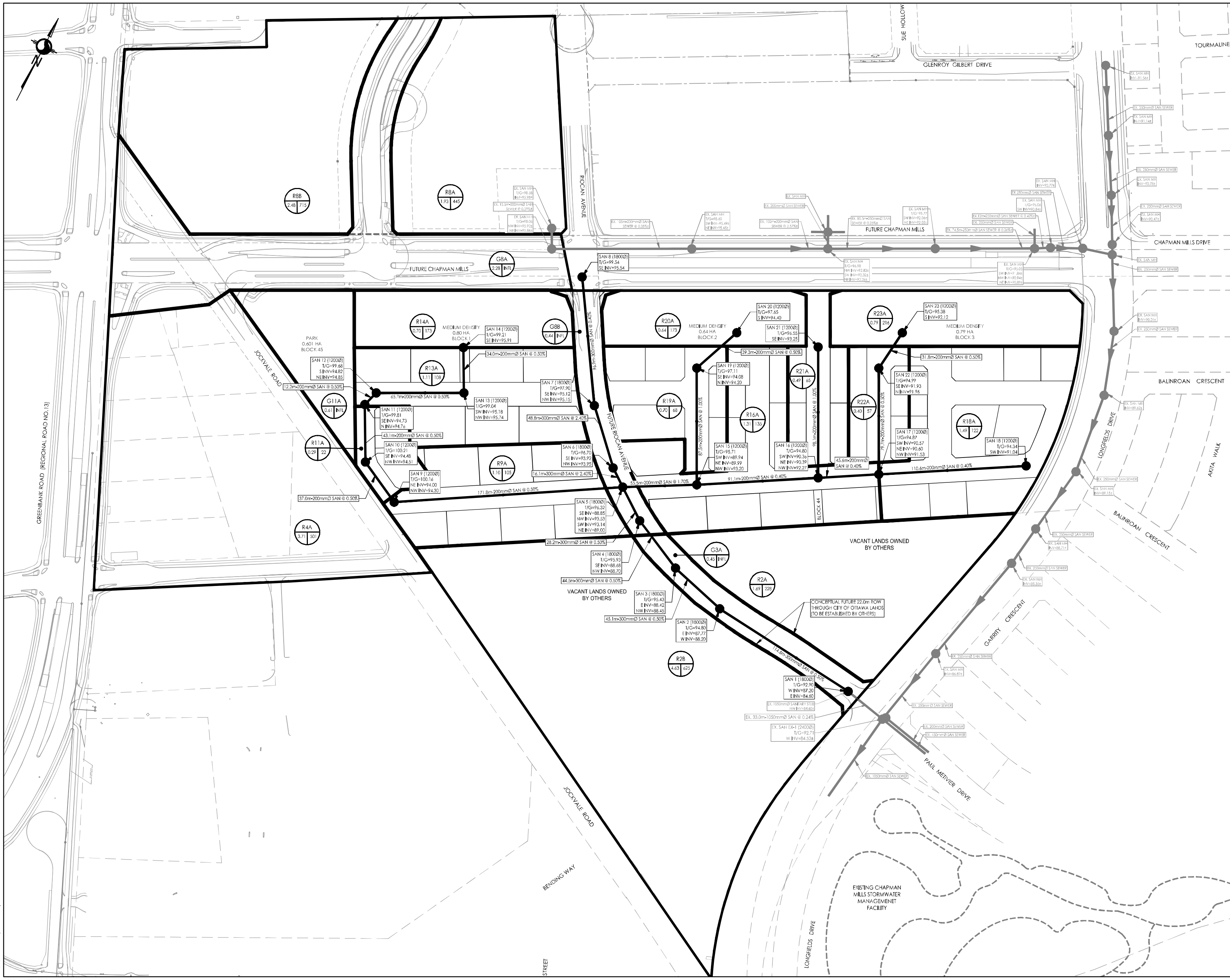
Drawing No. SD-1

Sheet 1 of 4

Revision 1

PLAN # XXXXX

D07-12-XX-XXXX



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Legend

- PROPOSED SANITARY SEWER
- EXISTING SANITARY SEWER
- SANITARY DRAINAGE BOUNDARY
- R1A — SANITARY DRAINAGE AREA ID#
- 100 — POPULATION COUNTS
- 10.04 — SANITARY DRAINAGE AREA ha.
- G1A — SANITARY DRAINAGE AREA ID#
- INF — INFILTRATION RATES
- 10.04 — SANITARY DRAINAGE AREA ha.

Notes

KEY PLAN
1:10000

1	REVISED DRAFT PLAN	KV	KS	26.02.20
0	ISSUED FOR COMMENT	MJS	KS	26.02.05
Revision		By	Appd.	YY.MM.DD

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	Dwn.	Chkd.	Dsgn.	YY.MM.DD

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LICENSED PROFESSIONAL ENGINEER
K.L. SMADELLA
2026-02-23
PROVINCE OF ONTARIO

Client/Project

MINTO

BARRHAVEN TOWN CENTRE
PHASE 2
OTTAWA, ON, CANADA

Title

CONCEPTUAL SANITARY SEWER NETWORK

Project No.	Scale	
160402206	1:1250	
Drawing No.	Sheet	Revision
SA-1	2 of 4	1

PLAN # XXXXX

D07-12-XX-XXXX

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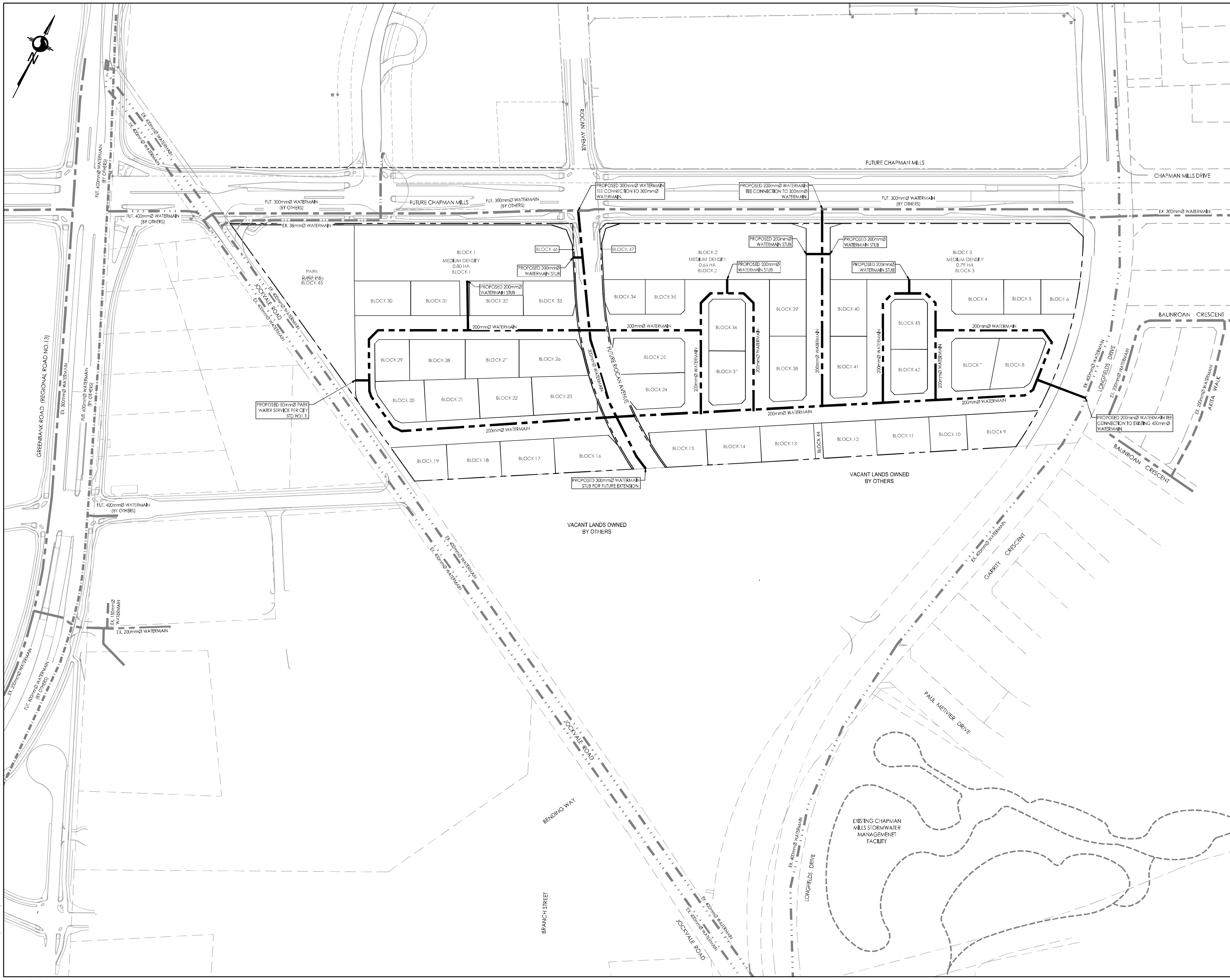

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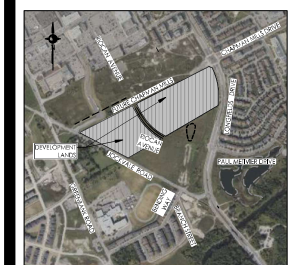
Legend

- 600mmØ WATERMAIN
- 400mmØ WATERMAIN
- 300mmØ WATERMAIN
- 250mmØ WATERMAIN
- 200mmØ WATERMAIN
- 150mmØ WATERMAIN
- 25mm TO 100mmØ WATERMAIN
- EX. 600mmØ WATERMAIN
- EX/FUT. 400mmØ WATERMAIN (BY OTHERS)
- EX/FUT. 300mmØ WATERMAIN (BY OTHERS)
- EX. 250mmØ WATERMAIN
- EX. 200mmØ WATERMAIN
- EX. 150mmØ WATERMAIN
- EX. 25mm TO 100mmØ WATERMAIN

Notes



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0	ISSUED FOR COMMENT	MJS	KS	26.02.05
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K.L. SMADELLA
2026-02-23
PROVINCE OF ONTARIO

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BARRHAVEN TOWN CENTRE
PHASE 2
OTTAWA, ON, CANADA

Title
CONCEPTUAL WATER LAYOUT PLAN

Project No. 160402206
Scale 1:1250

Drawing No. WTR-1
Sheet 3 of 4
Revision 1

PLAN # XXXXX

D07-12-XX-XXXX

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Legend

- × 87.65 — EXISTING ELEVATION
- 89.40 × — PROPOSED ELEVATION
- MAJOR OVERLAND FLOW ROUTE
- EMERGENCY OVERLAND FLOW ROUTE
- ULTIMATE MAJOR OVERLAND FLOW ROUTE
- MAJOR SYSTEM DIVIDE

PROPOSED GRADE RAISE PROVIDED BY PATERSON GROUP, REPORT TITLED GEOTECHNICAL INVESTIGATION - PROPOSED RESIDENTIAL DEVELOPMENT - 3265 JOCKVALE ROAD, BARRHAVEN TOWN CENTER STAGE 2, OTTAWA, ON. REPORT DATED NOVEMBER 25, 2025, REPORT No. PG5636-3.

- AREAS WHERE NO GRADE RAISE RESTRICTIONS
- AREAS WHERE GRADE RAISES UP TO 3.0m ARE PERMITTED.

Notes

1. CHAPMAN MILLS CENTERLINE GRADES FROM GREENBANK ROAD AND SOUTH WEST TRANSIT WAY EXTENSION MARKETPLACE AVENUE TO BARNSDALE ROAD, STANTEC CONSULTING FOR CITY OF OTTAWA, REVISION 4 ISSUED FOR PRELIMINARY DESIGN.
2. TOPOGRAPHIC SURVEY PREPARED BY STANTEC CONSULTING. PART OF LOTS 13 & 14, CONCESSION 2 (RIDEAU FRONT) GEOGRAPHIC TOWNSHIP OF NEPEAN, CITY OF OTTAWA.

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

HORIZONTAL DATUM NOTE
PROJECTION: UNIVERSAL TRANSVERSE MERCATOR (MTM. ZONE 9, CM76°30'W)
DATUM: NAD 83 (ORIGINAL)

DISTANCES ON THIS PLAN MAY BE CONVERTED TO GROUND DISTANCES BY DIVIDING BY A COMBINED SCALE FACTOR OF 0.999930.

VERTICAL DATUM NOTE
ELEVATIONS ARE REFERRED TO THE CANADIAN GEODETIC VERTICAL DATUM (CGVD-1928:1978) AND ARE DERIVED FROM BENCHMARK MONUMENT No. 196530071*, HAVING A PUBLISHED ELEVATION OF 99.742 METRES.

1	REVISED DRAFT PLAN	KV	KS	26.02.20
0	ISSUED FOR COMMENT	MJS	KS	26.02.05
Revision		By	Appd.	YY.MM.DD

File Name: 160402206 DB.dwg	MJS	DT	MJS	26.01.19
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

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LICENSED PROFESSIONAL ENGINEER K.L. SMADELLA 2026-02-23 PROVINCE OF ONTARIO

Client/Project
MINTO

BARRHAVEN TOWN CENTRE
PHASE 2
OTTAWA, ON, CANADA

Title
CONCEPTUAL GRADING PLAN

Project No. 160402206
Scale 1:1250 (0 12.5 37.5 62.5m)

Drawing No. GP-1
Sheet 4 of 4
Revision 1
PLAN # XXXXX

D07-12-XX-XXXX

With every community, we redefine what's possible.

Stantec is a global leader in sustainable engineering, architecture, and environmental consulting. The diverse perspectives of our partners and interested parties drive us to think beyond what's previously been done on critical issues like climate change, digital transformation, and future-proofing our cities and infrastructure. We innovate at the intersection of community, creativity, and client relationships to advance communities everywhere, so that together we can redefine what's possible.

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