MILL VALLEY ESTATES DEVELOPMENT FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

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Prepared for:

Houchaimi Holdings Inc.

Prepared by:

Stantec Consulting Ltd.
1331 Clyde Avenue
Ottawa, Ontario
K2C 3G4

Project Number: 160401740

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Revision	Description	Author		Quality Check		Independent Review	
0	Functional Site Servicing and SWM Report	Peter Mott	2022-11-17	Ana Paerez	2022-11-29	Kris Kilborn	2022-12-02

MILL VALLEY ESTATES DEVELOPMENT FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

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Prepared by ____
(signature)
Peter Mott, EIT

Reviewed by ____
(signature)
Kris Kilborn

Approved by ____
(signature)
Ana Paerez, P. Eng.

LICENSED PROFESSIONAL ENGINEER
A.M. PAEREZ FERNANDEZ
100105130
2022-12-07
PROVINCE OF ONTARIO

Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

Stantec Consulting Ltd. has been commissioned by Houchaimi Holdings Inc. to prepare the following Functional Site Servicing and Stormwater Management Report for the Mill Valley Estates Development in support of Draft Plan Circulation with the Municipality of Mississippi Mills. The subject property is located within the Ward of Almonte and is bordered by Appleton Side Road to the northeast, Old Almonte Road to the southwest, vacant land to the northwest bound by Industrial Drive, and vacant land to the southeast.

The development lands will conform to the Official Plan by the municipality of Mississippi Mills, and an Official Plan Amendment (OPA 22, 2021) which outlined the subject property as a viable area for urban boundary expansion. The current zoning designates the ‘Area 2’ lands as Rural Lands. However, based on the OPA, the subject site is zoned for Residential use, and Type I industrial land use.

The proposed overall development comprises approximately 33.4 ha of land consisting of a mixture of townhomes, apartments units, single-family homes, a stormwater management (SWM) block, a block for a sanitary pump station, a community park block, as well as an industrial block (Block 189), intended as a future business park. The property location is indicated in **Figure 1**, and the proposed Draft Plan by Fotenn Planning and Design can be found in **Appendix E**.

Servicing requirements for the Mill Valley Living Retirement Community which will comprise approximately 3.9 ha of land consisting of townhomes, a multi-storey apartment building, and single-family homes were established by McIntosh Perry Consulting Engineers Ltd. in the *Servicing & Stormwater Management Report – Mill Valley Living Community Report (2022)*, which concluded that servicing for the site would be provided through servicing infrastructure within the proposed Mill Valley Estates Development, and as such, the retirement community has been included in this servicing report as an external area.

Figure 1: Mill Valley Estates Development – Draft Plan Area

1.1 OBJECTIVE

This Functional Site Servicing and Stormwater Management (SWM) Report has been prepared to present an internal servicing scheme that is free of conflicts and is in accordance with all applicable design guidelines and recommendations included in the various background studies outlined in **Section 2.0**.

Design objectives for the proposed site include:

- Establish detailed grading with consideration to grading constraints (i.e., high-points, major system relief, sufficient cover, grade raise restrictions), while respecting the natural topography and subsurface soil conditions.
- Define and size the internal water distribution system with connections to the existing water distribution network to service multiple proposed developments within the Mill Valley Estate

Development and including the Mill Valley Living Retirement Community. The overall development will adhere to the criteria provided in the *Master Plan Update Report – Water and Wastewater Infrastructure (2018)* prepared by J. L. Richards and Associates Limited (JLR).

- Define sizing and internal routing of the sanitary collection system in accordance with the *Master Plan Update Report – Water and Wastewater Infrastructure (2018)* prepared by JLR.
- Define major and minor storm conveyance systems in conjunction with the grade control plan including overland flow routes to the proposed stormwater management facility, located within the Mill Valley Estates Development, to provide quality treatment, quantity control and ensure any natural features downstream of the proposed storm outlet will not be negatively impacted.

2.0 REFERENCE DOCUMENTS

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

- Servicing & Stormwater Management Report– Mill Valley Retirement Community (Project No.: CCO-20-0034), McIntosh Perry Consulting Engineers Ltd., February 11, 2022.
- Environmental Impact Assessment – Old Almonte Road and Appleton Side Road, Southeast Almonte, Muncaster Environmental Planning Inc., July 30,2021.
- Geotechnical Investigation – Proposed Residential Development, Riverfront Estates – Future Expansion Lands (Report: PG5576-1), 1218 Old Almonte Road - Almonte, Paterson Group Inc. Consulting Engineers, December 7, 2020.
- Master Plan Update Report – Final, Municipality of Mississippi Mills Almonte Ward - Water and Wastewater Infrastructure (JLR No.: 27456-01), J.L. Richards and Associates Ltd., February 2018.
- City of Ottawa Sewer Design Guidelines, 2nd Edition, City of Ottawa, October 2012 (and all subsequent technical bulletins).
- City of Ottawa Design Guidelines – Water Distribution, 1st Edition, Infrastructure Services Department, City of Ottawa, July 2010.
- Stormwater Management Planning and Design Manual, Ministry of the Environment, Conservation and Parks, Ontario, March 2003.

3.0 POTABLE WATER SERVICING

The Mill Valley Estates Development is proposed for residential and industrial land use comprising a mix of single-family homes (179), townhomes (244), apartments (48), and the Future Houchaimi Business Park Block (Block 189). The future Mill Valley Living Community will be serviced through the proposed site infrastructure and has been included in this analysis.

3.1 BACKGROUND

Servicing requirements for the Mill Valley Living Retirement Community were established by McIntosh Perry Consulting Engineers Ltd. in the *Servicing & Stormwater Management Report – Mill Valley Living Community Report (2022).* Based on the information provided in McIntosh Perry's report, the community will consist of a mix of single-family homes (2), townhomes (42), and apartments (48). Please refer to **Appendix A.3** for excerpts from McIntosh Perry's Mill Valley Living Servicing and SWM Report for reference.

The drinking water supply system within the Almonte Ward consists of five groundwater wells, an elevated potable water storage tank, and a distribution system owned and operated by the Municipality. The proposed Mill Valley Estates Development is within the vicinity of the existing water distribution system on Industrial Drive which is fed by the Town's main groundwater pump station (Well #7 & 8) and the Town's elevated potable water storage tank.

An existing 250 mm diameter watermain is located northwest of the subject site within Industrial Drive, terminating before Appleton Side Road. Additionally, an existing 200 mm diameter watermain is located southwest of the subject site within Paterson/Robert Street, servicing the existing Old Orchard Retirement Site, adjacent to the proposed development lands. **Drawing OSSP-1** in **Appendix F** shows the location of existing watermains and the conceptual watermain network within the proposed development.

3.2 PROPOSED WATERMAIN SIZING AND LAYOUT

3.2.1 Connections to Existing Infrastructure

A network of 200 mm and 250 mm diameter watermains are proposed to follow the alignment of the roads within the subject property and extend to the following connection points:

1) At the existing 250 mm diameter watermain to the northwest of the site within Industrial Drive. A 250 mm watermain extension is required fronting the future Mill Valley Living Community and extending down Gerry Emon Road to Industrial Drive.

2) At the existing 200 mm diameter watermain within the intersection of Paterson Street and Robert Street (southwest of the site) via a proposed watermain extension along an easement.

3.2.2 Domestic Water Demands

The proposed Mill Valley Estates Development will consist of 179 single family homes, 244 townhouse units, 48 apartment units, a one-storey clubhouse providing approximately 218 m^2 of amenity space and parkland area for the community. The future business park (Block 189) planned for light industrial use will be serviced with a watermain extension from the proposed Mill Valley Estates Development through an easement block. The future Mill Valley Living Community designed by McIntosh Perry includes 2 single family homes, 42 townhome units, and 48 senior apartment units. A 15% increase in the total number of units has been considered in the overall domestic water demands for the future Mill Valley Living Community to account for potential density increases within that development area.

Water demands for the development were estimated using the City of Ottawa's Water Distribution Design Guidelines. For residential areas within the proposed Mill Valley Estates Development, the average water demand per capita of 280 L/p/d was used. However, for residential development within the future Mill Valley Living Community, an average water demand per capita of 350 L/p/d was used as per the criteria used in the *Servicing & Stormwater Management Report – Mill Valley Living Community Report (2022)* by McIntosh Perry. For maximum day (MXDY) demand, the average day (AVDY) demand was multiplied by a factor of 2.5 and the peak hour (PKHR) demand was obtained by multiplying the MXDY demand by a factor of 2.2. For the future business park block, light industrial demand rate with an average flow of 35,000 L/ha/d was used. For maximum day (MXDY) demand, AVDY was multiplied by a factor of 1.5 and for peak hour (PKHR) demand, MXDY was multiplied by a factor of 1.8. For the clubhouse and parkland dedicated areas, commercial demand rates with an average flow of 28,000 L/ha/d was used. For maximum day (MXDY) demand, AVDY was multiplied by a factor of 1.5 and for peak hour (PKHR) demand, MXDY was multiplied by a factor of 1.8. The calculated water demands for the entire development are illustrated in **Table 3.1** and the domestic water demand calculations are provided in **Appendix A.1**.

Table 3.1: Water Demands for the Mill Valley Estates Development

Building ID	Area (m^2)	Number of Units[3]	Population	Daily Rate of Demand (L/m^2/day or L/p/day)	Avg. Day Demand (L/s)	Max. Day Demand (L/s)	Peak Hour Demand(L/s)
Mill Valley Estates							
Single Family	-	179	609	280	1.97	2.96	5.33
Townhouse	-	244	659	280	2.14	3.20	5.76
Apartments	-	48	86	280	0.28	0.42	0.76
Parkland Dedication	9,290	-	-	2.8	0.30	0.75	1.66
Industrial Park (Block 189)	73,163	-	-	3.5	2.96	7.41	16.30
Clubhouse	218	-	-	2.8	0.01	0.02	0.04

Building ID	**Area (m^2)**	**Number of Units[3]**	**Population**	**Daily Rate of Demand (L/m^2/day or L/p/day)**	**Avg. Day Demand (L/s)**	**Max. Day Demand (L/s)**	**Peak Hour Demand(L/s)**
Community (Mill Valley Living) [1]							
Single Family	-	2	7	350	0.03	0.04	0.08
Apartment	-	48	110	350	0.45	0.67	1.21
Townhouse	-	42	113	350	0.46	0.69	1.24
15% Future Buildout Contingency [2]	-	14	32	350	0.13	0.19	0.35
Total Site:	**-**	**577**	**1617**	**-**	**8.72**	**16.36**	**32.72**

1. Development statistics and daily rate of demand for the units for Mill Valley Living Community is assumed from the Servicing & Stormwater Management Report - Mill Valley Living Community (February 2022) by McIntosh Perry Consulting Engineers Ltd. to ensure consistency with previous studies.
2. The population estimate for the Mill Valley Living has been increased due to potential future increases in number of units. A 15%-unit contingency has been provided and has been accounted for in the overall demand (assuming 2.3 PPU).

The residential population is estimated using a persons per unit (PPU) density of 3.4 for single family homes, 2.7 for townhomes, 1.8 for average apartments, and 2.3 for the apartments within the future Mill Valley Living Community. The total estimated residential population serviced through the Mill Valley Estates Development upon build-out is estimated to be 1,617 persons with an average day demand of 8.72 L/s, a maximum day demand of 16.36 L/s, and peak hour demand of 32.72 L/s.

3.2.3 Fire flow Requirements

The Fire Underwriters Survey 2020 (FUS) calculations were used to estimate the maximum fire flow requirements for the proposed site as shown in detailed calculations included in **Appendix A.2**. Fire flow requirements for the Mill Valley Living Community were adopted from the *Servicing & Stormwater Management Report – Mill Valley Living Community Report (2022)* by McIntosh Perry.

Fire flow requirement estimates were completed using the FUS (2020) guidelines which meet the requirements of Section 3 of the Ontario Building Code (OBC). FUS calculations were completed for the townhome blocks with the largest number of units (6 units), with the worst-case exposure distances resulting in the governing fire flow requirement. The ground floor area was estimated to be 653 m^2 based on the anticipated building footprint shown on the draft plan. Based on the specified configuration and location of the building footprint, the required fire flow for these blocks was estimated to be 250 L/s (15,000 L/min). In addition, fire flow calculations were performed for the stacked apartments (12 units) and based on the specified configuration and location of the building footprint the required fire flow was estimated to be 217 L/s (13,000 L/min).

For the Mill Valley Living Community, the FUS (1999) method was used by McIntosh Perry to determine the required fire flow which resulted in 183 L/s (11,000 L/min) for the proposed blocks. The results of the fire flow calculations are summarized in **Table 3.2**, below.

Table 3.2: Fire Flow Calculations Using FUS Methodology

Unit Type	Description	Min. Required Fire Flow (L/min)	Min. Required Fire Flow (L/s)
Six-Unit Townhouse Block	Two-storey townhouse block with a 653 m^2 footprint, wood frame construction, worst-case exposure distances	15,000	250
12-Unit Stacked Apartments	Twelve-unit block of stacked units, wood frame construction, worst-case exposure distances	13,000	217
Future Mill Valley Living Community [1]	Blocks within Mill Valley Living Retirement Community	11,000	183

1. Fire Flow Requirements for Mill Valley Living Community as per the Servicing & Stormwater Management Report - Mill Valley Living Community (February 2022) by McIntosh Perry Consulting Engineers Ltd. The largest fire flow requirement will govern design.

3.2.4 Level of Service

The City of Ottawa's Water Distribution Design Guidelines state that the desired range of system pressures under normal demand conditions (i.e., basic day, maximum day and peak hour) should be in the range of 350 kPa to 552 kPa (50 to 80 psi) and no less than 275 kPa (40 psi) at ground elevation. The maximum pressure at any point in the distribution system is to be no higher than 552 kPa (80 psi). As per the Ontario Building Code & Guide for Plumbing, if pressures greater than 552 kPa (80 psi) are anticipated, pressure relief measures (such as pressure reducing valves) are required. Under emergency fire flow conditions, the minimum pressure in the distribution system is allowed to drop to 138 kPa (20 psi).

3.3 BOUNDARY CONDITIONS AND HYDRAULIC MODEL

At the time of submission of this functional servicing report, the hydraulic boundary conditions at the connection points to the existing network have not been received from the Municipality of Mississippi Mills. As a result, the adequacy of the proposed distribution network will be verified in the next submission for draft plan approval. Correspondence with the municipality regarding the boundary conditions request has been provided in **Appendix A.4**.

4.0 WASTEWATER SERVICING

The Mill Valley Estates Development will consist of 179 single family homes, 244 townhome units, 48 apartment units, a community park, a pump station block, a SWM block, and a future business park block (Block 189). The one-storey clubhouse within area R8B provides approximately 218 m^2 of amenity space and has been included in the overall wastewater peak flow calculations for the site. The community park, area I19B, has been included in the overall wastewater peak flow calculations for the site assuming institutional land use for conservatism. In addition, the future business park (Block 189) has been assessed using light industrial sewage generation rates with individual blocks subject to the site plan control process. Please refer to **Drawing OSA-1** for conceptual sanitary sewage network, sanitary drainage areas and pump station location.

Additionally, the proposed wastewater infrastructure has been sized to service the future Mill Valley Living Community which will consist of a mix of single-family homes (~2), townhome units (~42), and apartment units (~48). A 15% increase in the total number of units has been considered for the future Mill Valley Living Community to account for potential density increases within that development area (population density of 2.3 PPU was assumed for additional units).

4.1 BACKGROUND

The *Master Plan Update Report – Water and Wastewater Infrastructure (2018)* (MPUR-WWI) by J.L Richards and Associates Ltd. for the Municipality of Mississippi Mills, Almonte Ward indicates that wastewater peak flows from the proposed development lands are to be pumped to the gravity sewer located northwest of the subject site within Industrial Drive, and ultimately to the Wastewater Treatment Plant (WWTP).

Per the MPUR-WWI, for 'build out' conditions, new and upgraded sanitary sewers are required to convey wastewater flows to the WWTP. Upgrade requirements have been identified for Victoria Street, Menzie Street/Paterson Street, and Houston Drive. Please refer to Error! Reference source not found.**.2** for excerpts from the MPUR-WWI pertaining to the sanitary servicing of the proposed development.

4.2 DESIGN CRITERIA

The following criteria as obtained from either the City of Ottawa's Sewer Design Guidelines (2012) and/or the *Master Plan Update Report – Water and Wastewater Infrastructure (2018)* (MPUR-WWI) by J.L Richards and Associates Ltd., were used to estimate wastewater flow rates and to size the sanitary sewers.

- Minimum Velocity – 0.6 m/s (City of Ottawa)
- Maximum Velocity – 3.0 m/s (City of Ottawa)
- Manning roughness coefficient for all smooth wall pipes – 0.013 (City of Ottawa)

- Minimum size – 200mm dia. for residential areas (City of Ottawa)
- Single Family Persons per unit – 3.4 (City of Ottawa)
- Townhouse Persons per unit – 2.7 (City of Ottawa)
- Average Apartment Persons per unit – 1.8 (City of Ottawa)
- Extraneous Flow Allowance – 0.28 L/s/ha (MPUR-WWI)
- Manhole Spacing – 120 m (City of Ottawa)
- Minimum Cover – 2.5 m (City of Ottawa)
- Average Daily Discharge/Person (Residential) – 350 L/cap/day (MPUR-WWI)
- Commercial Daily Discharge/Area (Clubhouse) – 28,000 L/ha/day (MPUR-WWI)
- Institutional Daily Discharge/Area (Parkland Dedication) – 28,000 L/ha/day (MPUR-WWI)
- Light Industrial Daily Discharge/Area (Future Business Park) – 35,000 L/ha/day (MPUR-WWI)

4.3 PROPOSED CONCEPTUAL SANITARY SERVICING

Wastewater from the proposed Mill Valley Estates Development and the future Mill Valley Living Community will be conveyed to a proposed pump station via a gravity sanitary sewer system (see **Drawing OSA-1**). The proposed pump station will be located adjacent to the SWM facility and will direct sewage flows through a proposed forcemain to the existing 300 mm diameter gravity sanitary sewer within Industrial Drive. Sanitary servicing for the future business park block (Block 189) will be provided through the proposed gravity sanitary sewer network via a sanitary sewer connection along the easement block. As outlined in the *Servicing & Stormwater Management Report – Mill Valley Living Community Report (2022)* by McIntosh Perry, the Mill Valley Living Community will be serviced by a 200 mm diameter sewer.

The conceptual sanitary sewer design sheet and associated drainage area plan (**Drawing OSA-1**) can be found in Error! Reference source not found.**.1** and **Appendix F**, respectively. Based on the proposed unit count, assumed population densities, as well as the design criteria adopted from the MPUR-WWI, the overall anticipated sanitary peak flows from the development are summarized in **Table 4.1**.

Table 4.1: Overall Wastewater Peak Flows to Existing Industrial Drive Sanitary Sewer

Sewer Outlet	Future Mill Valley Living Community (L/s)	Future Houchaimi Business Park – Light Industrial Use (L/s)	Mill Valley Estates Subdivision (L/s)	Total Development Peak Flows (L/s)
Industrial Drive EX. SAN MH	4.8	10.1	24.5	39.4

1. The unit estimate for the Mill Valley Living (Sanitary Drainage Area ID# R19C) has been increased by 15%, which results in a population of 263.

The *Master Plan Update Report – Water and Wastewater Infrastructure (2018)* (MPUR-WWI) by J.L Richards and Associates Ltd. indicates that upgrades to the wastewater collection system are required to support sanitary peak flows from full build-out conditions. As a result, confirmation will be required that the existing wastewater infrastructure downstream of the site has sufficient capacity for the proposed Mill Valley

Estates Development and the future Milla Valley Living Community. Correspondence with the Municipality of Mississippi Mills regarding existing downstream capacity has been provided in **Appendix B.3** and will be confirmed in the next submission.

4.4 PUMP STATION DESIGN

Proposed road elevations for the site are expected to vary from approximately 138.3 m at the northwestern end of the site to a minimum road grade of approximately 133.2 m at the southeast portion of the site near the SWM facility. Due to the large variance in grade and the higher elevation of the gravity sewer within Industrial Drive, a pumping station will be required to adequately service the proposed development. Design of the pump station is to be finalized during the detailed design stage and will be required to meet a peak inflow rate of 38.8 L/s as generated by an anticipated contributing population of 1,617.

The preferred location of the pumping station is shown on **Drawing OSA-1**. The proposed pump station is located adjacent to the SWM facility and is to discharge to an adequately sized force main running northwest to tie into the existing infrastructure on Industrial Drive. The pump station will include a wet well designed to allow sufficient storage to keep the hydraulic grade line (HGL) at acceptable levels during emergency conditions. The wet well and pumping station design calculations will be provided at the detailed design stage.

The proposed sewage peak flows will be discharged from the proposed pump station through a proposed force main (final alignment and size to be determined at the detailed design stage) to the existing 300 mm diameter sanitary sewer within the Industrial Drive ROW as noted on **Drawing OSA-1**.

5.0 STORM DRAINAGE

The following sections describe the conceptual stormwater management (SWM) plan for the Mill Valley Estates Development the context of the governing criteria.

5.1 EXISTING CONDITIONS

The site is currently undeveloped consisting mainly of agricultural lands areas that sheet flow east towards an existing ditch that crosses the site at the eastern corner and ultimately discharges into the Mississippi River. **Figure 2** shows existing site conditions and the location of the existing ditch.

Appleton Side Road has a rural cross section and as such, runoff from external drainage areas upstream of the site is conveyed through a network of grassed swales and road side ditches to an existing 1100 mm diameter CSP that crosses Appleton Side Road and discharges into the exiting ditch crossing the site, which will serve as a storm outlet for the majority of the site.

Figure 2: Existing Site Conditions

A hydrologic analysis of the existing condition drainage patterns across the site and external areas tributary to the proposed storm outlet has been done using PCSWMM to estimate the existing peak flows from the site and external areas to the proposed outlet location. Input parameter calculations and a PCSWMM input file example have been included in **Appendix C.2**. The following summarizes the parameters used and assumptions made in the existing conditions model.

- The SCS Dimensionless Unit Hydrograph method was used to generate a runoff response from the undeveloped site and external areas tributary to the proposed outlet location.
- Existing soils were assumed to be hydrologic soil group C to represent stiff brown silty clay to clayey silt and/or glacial till as per the Geotechnical Investigation (Paterson Group, December 2020).
- A weighted CN of 78 was calculated for the overall catchment based on soil type and land use.
- Flow length and slope were calculated based on available LIDAR and existing drainage patterns.

The PCSWMM model was run using the 24-hour and 12-hour SCS Type II distributions for the 5, and 100-year return periods using City of Ottawa IDF parameters. **Table 5.1** summarizes the existing condition peak flows tributary to the proposed outlet.

Table 5.1: Existing Condition Peak Flows

Existing Condition Peak Flow (L/s)	Storm event			
	5yr - 12hr SCS	100yr - 12hr SCS	5yr - 24hr SCS	100yr - 24hr SCS
Site and External Area Tributary to Storm Outlet	545.7	1,673.8	516.0	1,322.1

5.2 PROPOSED STORM DRAINAGE CONDITIONS

The proposed development encompasses 33.4 ha of land at 53% imperviousness and will consist of a mix of townhomes, single family homes, apartments, a future industrial block (Houchaimi Business Park), a community park block, a pump station, a SWM wet pond, and associated transportation and servicing infrastructure. Storm sewers from the site will outlet to a proposed SWM wet pond that will provide quality control and mitigate post development peak flows to pre-development levels up to the 100-year storm. On-site controls (i.e., on-site storage and quality control) will be required within the future Houchaimi Business Park prior to discharging into the Appleton Side Road side ditch.

The site storm sewer infrastructure and proposed SWM wet pond have been sized to service the future Mill Valley Retirement Community, which encompasses 3.9 ha of land, with an assumed 71% imperviousness.

Inlet control devices at road low points will be used to restrict inflow rates to the sewer to the 5-year runoff. Major system peak flows from the majority of the site, with the exception of the Houchaimi Business Park, will be directed south towards the SWM wet pond a shown on **Drawing OSD-1**.

5.2.1 Proposed Ditch Realignment

The existing ditch that crosses the eastern corner of the site conveys runoff from the southern Appleton Side Road side ditch, as well as runoff from an existing 1100 mm diameter CSP crossing Appleton Side Road. The existing ditch runs in a south-western direction for approximately 1.1 km and ultimately discharges into the Mississippi River.

Figure 3 shows the overall drainage plan which includes proposed site and external areas tributary to the SWM wet pond, the future Houchaimi Business Park block which will provide on-site controls prior to discharging to the Appleton Side Road side ditch, as well as external upstream areas tributary to the proposed ditch realignment.

As part of the proposed development, it is proposed to realign a section of the existing ditch that crosses the site as shown on the conceptual grading plan **Drawing GP-1**.

5.2.2 Future Houchaimi Business Park Block

Stormwater management for the future business park block will be provided on-site to provide ‘Enhanced’ water quality control and to control post development peak flows to pre-development levels up to the 100-year storm prior to discharging into the Appleton Side Road side ditch.

As a result, the industrial block (Area IND-1) has been modeled as an undeveloped catchment, which results in 5-year and 100-year post development target peak outflows of 196 L/s and 638 L/s respectively.

5.3 SWM CRITERIA

The following summarizes the SWM criteria for the proposed development.

- SWM facility to be designed to provide ‘Enhanced’ level of treatment as per MECP recommendations which represents an equivalent 80% TSS removal.
- Post development peak flows up to the 100-year storm event to be restricted to pre-development levels.
- Provide adequate conveyance of emergency flows off site.
- Provide best management practices to prevent disturbances to the receiving environment.
- Size storm sewers for the 5-year event under free flow conditions.

5.4 CONCEPTUAL DESIGN METHODOLOGY

The conceptual design methodology for the SWM component of the development is as follows:

- Provide a conceptual pond configuration that meets Ministry of the Environment, Conservation and Parks (MECP) requirements for quality control for the proposed site and external areas.

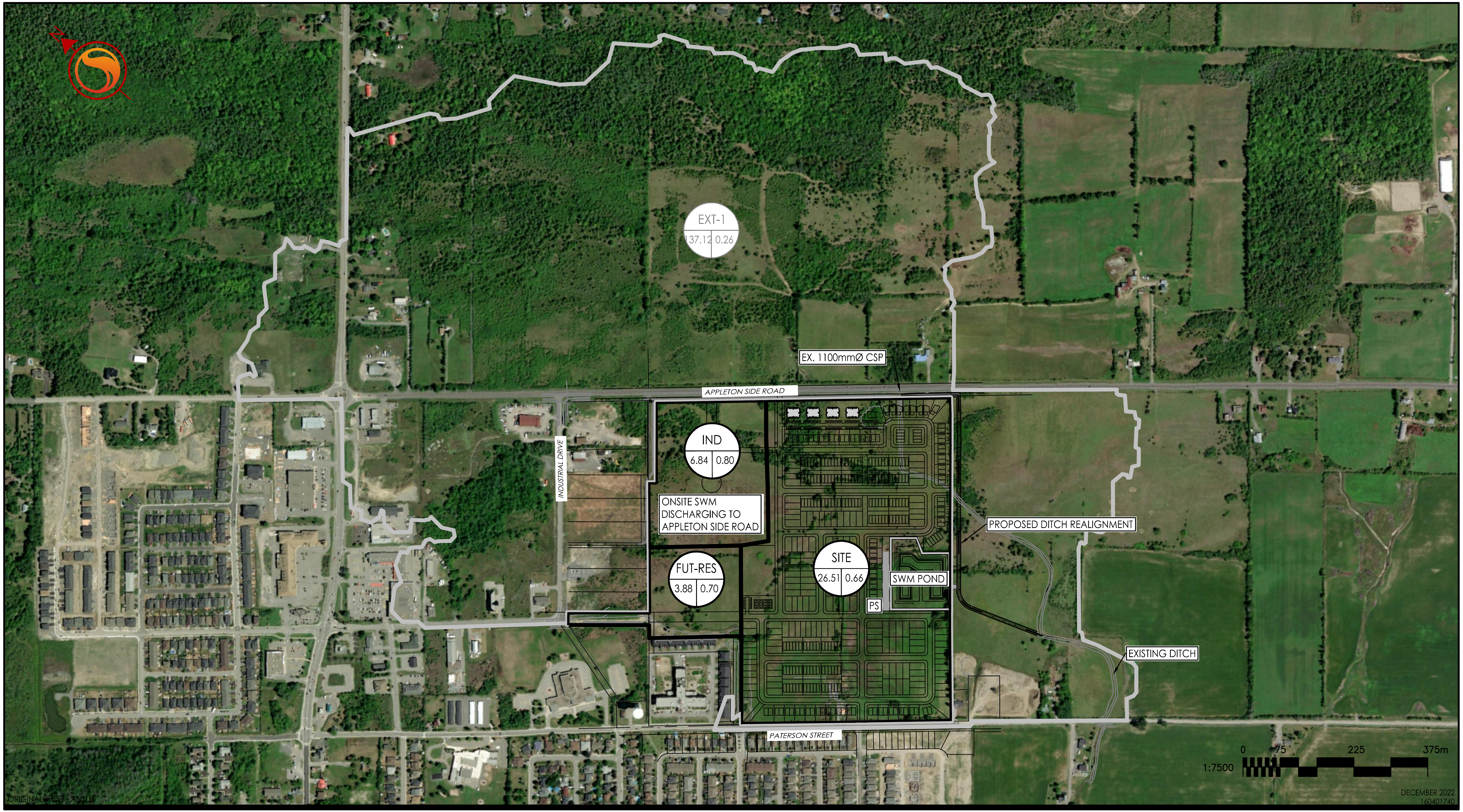
- Restrict inflows to the sewer to the 5-year rate in all areas.

- Produce a preliminary PCSWMM model that generates major and minor system hydrographs and that routes the hydrographs through a hydraulic model.

- Incorporate the conceptual SWM pond and outlet structure into the model and optimize the proposed SWM pond stage-storage-discharge relationship while assessing the effects of the pond water levels on the hydraulic grade line (HGL) across the site.

- Assess the resulting 100-year hydraulic grade line to provide the lowest underside of footing (USF) allowed for the proposed units to be used during detailed design in order to maintain a minimum clearance of 0.3 m between USF and 100-year HGL.

- Estimate external drainage peak flows tributary the existing 1100 CSP and the proposed ditch realignment and assess hydraulic performance of the proposed ditch.



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Stantec
Stantec Consulting Ltd.
400 - 1331 Clyde Avenue
Ottawa ON
Tel. 613.722.4420
www.stantec.com

Legend

1-1	AREA ID
0.60	RUNOFF COEFFICIENT
1.13	STORM DRAINAGE AREA ha.
━━━	STORM DRAINAGE BOUNDARY
▬▬▬	EXISTING STORM DRAINAGE BOUNDARY

Notes

Client/Project
HOUXHIAMI HOLDINGS INC.
MILL VALLEY ESTATES

Figure No.
3.0

Title
OVERALL STORM DRAINAGE PLAN

The site will be designed using the “dual drainage” principle, whereby the minor (pipe) system is designed to convey the peak rate of runoff from the 5-year design storm and runoff from larger events is conveyed by both minor (pipe) and major (overland) channels, such as roadways and walkways, safely off site without impacting proposed or existing downstream properties.

Drawing OSD-1 outlines the conceptual storm sewer alignment, conceptual pond configuration and water levels, and drainage divides and labels.

5.5 MODELLING RATIONALE

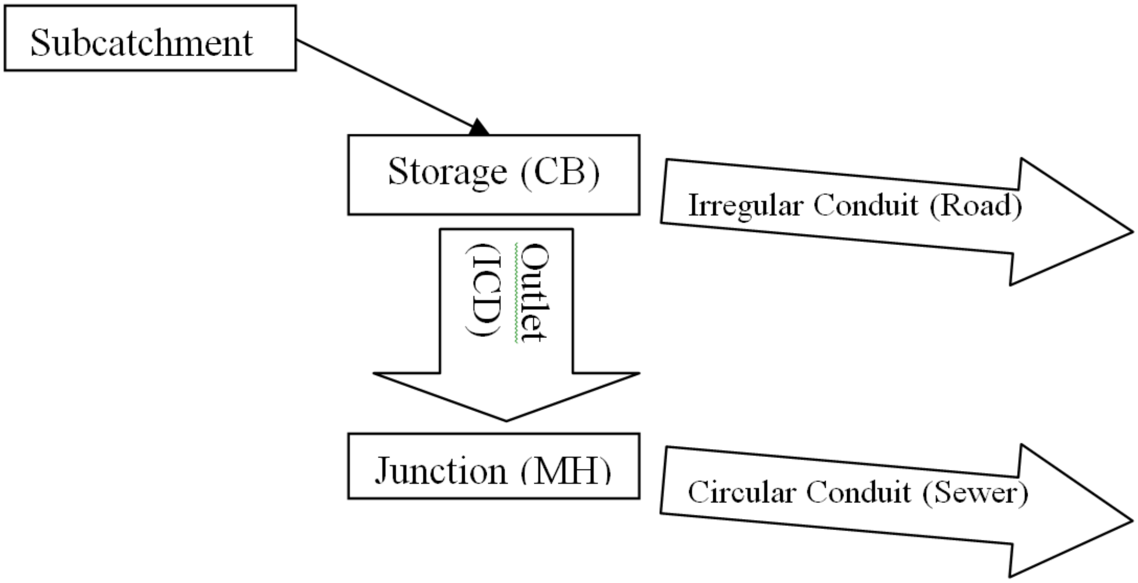
A hydrologic modeling exercise was completed with PCSWMM, accounting for the estimated major and minor systems to evaluate the storm sewer infrastructure, assess the proposed SWM pond hydraulic performance and assess the hydraulic conveyance capacity of the realigned ditch. The use of PCSWMM for modeling of the site hydrology and hydraulics allowed for an analysis of the systems response during various storm events. The following assumptions were applied to the conceptual model:

- Used the 5-year and 100-year, 3-hour Chicago Storm distribution for sewer sizing and HGL analysis, and the 100-year, 12-hour and 24-hour SCS Type II distribution for HGL analysis and pond and ditch realignment hydraulic performance assessment.
- Percent imperviousness estimated based on proposed land use.
- Subcatchment areas are preliminary lumped areas.
- The width parameter was measured as twice the road/rear yard swale for two-sided catchments and equal to the length of the road/rear yard swale for one-sided catchments. The width parameter for urban external drainage areas and future Mill Valley Living block was defined as 225 m/ha as per the City of Ottawa Sewer Design Guidelines.
- Minor system inflow from each subcatchment was restricted with outlet curves as necessary to maintain 5-year inflow target rates at the assumed catchbasin grate elevation and increased by 10% for a total flow depth of 40 cm.
- No surface ponding has been assumed for conservatism. However, in order to account for surface routing, the major system has been created such that the total street length at 0.5% within each subcatchment is represented in the model.
- Major system conduits defined to represent the proposed right of way (ROW) cross-section.

5.5.1 SWMM Dual Drainage Methodology

The proposed development is modeled in one modeling program as a dual conduit system (see **Figure 4**), with: 1) circular conduits representing the sewers & junction nodes representing manholes; 2) irregular conduits using street-shaped cross-sections to represent the approximate overland road network and storage nodes representing catchbasins. The dual drainage systems are connected via outlet link objects from storage node (i.e., CB) to junction (i.e., MH), and restrict the minor system capture rate to the 5-year storm. Subcatchments are linked to the storage node on the surface so that generated hydrographs are directed there firstly.

Figure 4 : Schematic Representing PCSWMM Model Object Roles



Storage nodes are used in the model to represent catchbasins. The invert of the storage node represents the invert of the CB and the rim of the storage node represents the top of the CB plus the allowable flow depth on the segment. For the purpose of this conceptual SWM plan, CB inverts have been assumed to be 2.0 m below the top of the CB and a flow depth of 0.40 m has been assumed to account for 35 cm allowable ponding up tot the 100-year storm and an additional 5 cm to account for flow depth during climate change/stress test events.

5.6 INPUT PARAMETERS

Drawing OSD-1 summarizes the conceptual subcatchments used in the analysis of the proposed development, including external development areas, and outlines the major overland flow path and SWM wet pond location.

Key parameters for the subject area are summarized below; an example input file is provided in **Appendix C.3** for the 100-year, 3hr Chicago storm which indicates all other parameters. For all other input files and results of storm scenarios, please examine the electronic model files included as part of the digital submission. This analysis was performed using PCSWMM, which is a front-end GUI to the EPA-SWMM engine. Model files can be examined in any program which can read EPA-SWMM files version 5.1.015.

5.6.1 Hydrologic Parameters

Table 5.2.2 presents the general subcatchment parameters used for the proposed development (urban catchments):

Table 5.2: General Subcatchment Parameters

Subcatchment Parameter	Value
Infiltration Method	Horton
Max. Infil. Rate (mm/hr)	76.2
Min. Infil. Rate (mm/hr)	13.2
Decay Constant (1/hr)	4.14
N Imperv	0.013
N Perv	0.25
Dstore Imperv (mm)	1.57
Dstore Perv (mm)	4.67

Table 5.3 presents the individual parameters that vary for each of the proposed conceptual subcatchments.

Table 5.3: Conceptual Subcatchment Parameters

Area ID	Area (ha)	Width (m)	Slope (%)	% Impervious	Runoff Coefficient	Subarea Routing	% Routed
C103A	1.32	460.00	2.0	71.4%	0.70	OUTLET	100
C104A	1.16	586.00	2.0	64.3%	0.65	OUTLET	100
C105A	0.81	277.00	2.0	64.3%	0.65	OUTLET	100
C106A	3.47	990.00	2.0	64.3%	0.65	OUTLET	100
C108A	1.24	667.00	2.0	64.3%	0.65	OUTLET	100
C108B	1.22	410.00	2.0	78.6%	0.75	OUTLET	100
C109A	1.66	806.00	2.0	71.4%	0.70	OUTLET	100
C110A	1.79	830.00	2.0	71.4%	0.70	OUTLET	100
C111A	0.57	250.90	2.0	71.4%	0.70	OUTLET	100
C111B	0.48	311.31	2.0	42.9%	0.50	OUTLET	100
C112A	0.19	99.00	2.0	71.4%	0.70	OUTLET	100
C113A	0.46	155.00	2.0	71.4%	0.70	OUTLET	100
C117A	1.91	814.00	2.0	64.3%	0.65	OUTLET	100
C118A	0.87	417.00	2.0	64.3%	0.65	OUTLET	100
C119A	1.99	742.00	2.0	71.4%	0.70	OUTLET	100
C120A	0.07	39.00	2.0	85.7%	0.80	OUTLET	100
C120B	0.93	209.00	4.5	42.9%	0.50	PERVIOUS	100
C120C	3.88	873.00	2.0	71.4%	0.70	OUTLET	100
C121A	1.18	360.00	2.0	64.3%	0.65	OUTLET	100
C122A	1.37	394.00	2.0	64.3%	0.65	OUTLET	100

Area ID	Area (ha)	Width (m)	Slope (%)	% Impervious	Runoff Coefficient	Subarea Routing	% Routed
C123A	1.75	570.00	2.0	71.4%	0.70	OUTLET	100
IND-1	6.84	N/A	2.0	0.0	0.20	N/A	N/A
POND	1.95	439.00	1.0	57.1%	0.60	OUTLET	100
UNC-1	0.11	55.00	2.0	71.4%	0.70	OUTLET	100

1. The future industrial block has been modeled as a rural catchment using the SCS Dimensionless Unit Hydrograph method for runoff generation given that post development runoff from this block will need to be restricted to pre-development levels up to the 100-year storm prior to discharging into the Appleton Side Road side ditch.

Table 5.4 summarizes the storage node parameters used in the conceptual model. All roadway catch basins have been modeled with an outlet invert of 2.0 m below top of grate and total surface flow depths of 0.40 m.

Table 5.4: Storage Node Parameters

Storage Node	Invert Elevation (m)	Rim Elevation (m)	Total Depth (m)
C103A-S	131.13	133.53	2.40
C104A-S	132.05	134.45	2.40
C105A-S	131.20	133.60	2.40
C106A-S	132.60	135.00	2.40
C108A-S	132.05	134.45	2.40
C108B-S	132.70	135.10	2.40
C109A-S	133.25	135.65	2.40
C110A-S	132.28	134.68	2.40
C111A-S	133.03	135.43	2.40
C111B-S	132.31	134.71	2.40
C112A-S	133.43	135.83	2.40
C113A-S	132.68	135.08	2.40
C117A-S	131.91	134.31	2.40
C118A-S	132.46	134.86	2.40
C119A-S	132.42	134.82	2.40
C120A-S	133.21	135.61	2.40
C120B-S	133.60	136.00	2.40
C120C-S	133.60	136.00	2.40
C121A-S	134.01	136.41	2.40
C122A-S	133.16	135.56	2.40
C123A-S	132.65	135.05	2.40
POND-S	127.50	130.75	3.25

5.6.2 Hydraulic Parameters

As per the Ottawa Sewer Design Guidelines (OSDG 2012), Manning's roughness values of 0.013 were used for sewer modeling and overland flow corridors representing roadways.

Storm sewers were modeled to confirm flow capacities and to assess the 100-year hydraulic grade lines (HGL) in the development with consideration of the pond backwater acting on the sewers. A conceptual storm sewer design sheet is included in **Appendix C.1**.

5.7 CONCEPTUAL MODEL RESULTS AND DISCUSSION

The following section summarizes the key hydrologic and hydraulic conceptual model results. For detailed model results or inputs please refer to the example input file in **Appendix C.3** and the electronic model files included in the digital submission.

5.7.1 Hydrology

Table 5.5 **5.5** summarizes the 100-year, 3hr Chicago storm event minor system capture rates represented in the PCSWMM model through outlet links.

Table 5.5: Conceptual Minor System Capture Rates

Outlet Name	Inlet Node	Outlet Node	Invert Elevation (m)	100-year Flow (L/s)
C103A-IC	C103A-S	103	131.13	312.9
C104A-IC	C104A-S	104	132.05	265.6
C105-IC	C105A-S	105	131.20	179.6
C106A-IC	C106A-S	106	132.60	756.0
C108A-IC	C108A-S	108	132.05	288.0
C108B-IC	C108B-S	108	132.70	313.6
C109A-IC	C109A-S	109	133.25	409.1
C110A-IC	C110A-S	110	132.28	442.6
C111A-IC	C111A-S	111	133.03	137.6
C111B-IC	C111B-S	111	132.31	86.4
C112A-IC	C112A-S	112	133.43	46.6
C113A-IC	C113A-S	113	132.68	109.6
C117A-IC	C117A-S	117	131.91	431.0
C118A-IC	C118A-S	118	132.46	197.3
C119A-IC	C119A-S	119	132.42	477.1
C120A-IC	C120A-S	120	133.21	19.7
C120B-IC	C120B-S	120	133.60	125.9
C120C-IC	C120C-S	120	133.60	899.2
C121A-IC	C121A-S	121	134.01	257.2
C122A-IC	C122A-S	122	133.16	297.7
C123A-IC	C123A-S	123	132.65	420.4

5.7.2 Proposed Development Conceptual Hydraulic Grade Line Analysis

Table 5.6 **5.6** summarizes the HGL results within the development for the 100-year, 3-hour Chicago, and 12-hour and 24-hour SCS Type II storm events. The City of Ottawa requires that during major storm events up to the 100-year event, the maximum hydraulic grade line be kept at least 0.30 m below the underside-of-footing (USF) of any adjacent units connected to the storm sewer during design storm events. As a result, the HGL values below will be used as a starting point during detailed grading of the development. For the purpose of this conceptual hydraulic analysis, it has been assumed that the future USFs will be approximately 2.1 m below the centreline of the street.

Table 5.6: Conceptual Hydraulic Grade Line Results

STM MH	Prop. Road Grade (m)	Approx USF (m)	100-year HGL (m)			Worst-Case 100-year HGL (m)	Approx. USF-HGL Clearance (m)
			3-hr Chicago	24-hr SCS Type II	12-hr SCS Type II		
100B	132.95	130.85	130.15	130.15	130.32	130.32	0.53
101	132.95	130.85	130.15	130.15	130.32	130.32	0.53
102	133.25	131.15	130.15	130.16	130.33	130.33	0.82
103	133.34	131.24	130.34	130.32	130.37	130.37	0.87
104	133.34	131.24	130.62	130.60	130.60	130.62	0.62
105	133.28	131.18	130.78	130.76	130.74	130.78	0.40
106	133.43	131.33	130.95	130.92	130.88	130.95	0.38
107	133.48	131.38	131.01	130.98	130.94	131.01	0.37
108	133.55	131.45	131.11	131.09	131.04	131.11	0.34
109	133.65	131.55	131.18	131.16	131.11	131.18	0.37
110	133.76	131.66	130.82	130.80	130.79	130.82	0.84
111	133.83	131.73	130.99	130.98	130.95	130.99	0.74
112	134.48	132.38	131.31	131.31	131.30	131.31	1.07
113	133.55	131.45	131.16	131.16	131.16	131.16	0.28
115	133.16	131.06	130.44	130.44	130.43	130.44	0.62
117	133.67	131.57	130.91	130.91	130.89	130.91	0.66
118	133.54	131.44	131.29	131.29	131.28	131.29	**0.15**
119	133.78	131.68	130.64	130.61	130.61	130.64	1.04
120	135.30	133.20	130.68	130.68	130.66	130.68	2.52
121	133.85	131.75	131.29	131.29	131.29	131.29	0.46
122	133.56	131.46	131.63	131.63	131.63	131.63	**-0.17**
123	133.46	131.36	130.60	130.59	130.57	130.60	0.76

As can be seen in **Table** 5.6 **5.6**, the minimum USF clearance of 0.30 m has not been met at manholes 118 and 122, based on the USF assumptions listed above. However, it is expected that the minimum HGL to USF clearance will be met during detailed design by incorporating multiple risers in the units within these areas.

5.7.3 Conceptual Pond Hydraulic Modeling Results

The PCSWMM model scenarios were analyzed for the peak pond discharge rate, as well as for peak pond HGL to establish the approximate SWM Pond footprint required to meet the SWM design criteria for the site. Error! Reference source not found. **5.7** below summarizes the pond water levels, peak pond outflow rates, and compares them to the existing condition peak flows from the site at the outlet location for the 5-year, and 100-year 3-hour Chicago, and 12-hour and 24-hour SCS Type II storm events.

Table 5.7: Conceptual Site Discharges, SWM Pond Peak Outflow Rates and Water Levels

Storm Event	Peak Pond Discharge (L/s)	Pond Water Level (m)	Existing Condition Peak Flow (m^3/s)
5yr-12hrSCS	376.5	129.81	545.7
100yr-12hrSCS	1,281.6	130.31	1,673.8
5yr-24hrSCS	322.9	129.78	516.0
100yr-24hrSCS	973.4	130.15	1,322.1
5yr-3hrChicago	308.8	129.77	N/A
100yr-3hrChicago	968.0	130.15	N/A

The above table shows that the proposed SWM pond configuration and footprint provides sufficient storage to restrict post development peak flows to pre-development levels up to the 100-year storm for the proposed Mill Valley Estates Development and the future Milla Valley Living Community.

5.8 CONCEPTUAL WET POND DESIGN

5.8.1 Facility Design Criteria

The proposed SWM wet pond will be designed to achieve an ‘enhanced’ level of treatment of urban runoff according to Ministry of the Environment, Conservation and Parks (MECP) criteria – representing an 80% removal of total suspended solids (TSS).

5.8.2 Conceptual Wet Pond Design Components

The conceptual wet pond has been sized to meet the quality and quantity control requirements outlined above and to achieve all physical design criteria established for wet pond facilities by the MECP. Conceptual pond design calculations have been included in **Appendix C.4**. These physical design criteria are provided in the MECP’s Stormwater Management Design and Planning Manual (March 2003).

The general design approach for the proposed wet pond is as follows:

1. Provide Enhanced water quality treatment, thereby establishing the permanent pool and extended detention volumes
2. Provide post to pre-development quantity control for up to the 100-year storm event
3. Size inlet structure and forebay based on generated inflow and MECP guidelines (to be completed at detailed design)

4. Design a bypass structure to convey peak flows from the 25-mm design storm event into the forebay and bypass higher peak flows directly into the main cell (to be completed at detailed design)
5. Consider environmental and operations and maintenance concerns in orientation and design of all pond components

5.8.2.1 Water Quality Control

The maximum permanent water depth within the facility is 1.5 m. The permanent pool elevation has been set at 129.00 m to provide a gravity outlet to the proposed realigned ditch as seen on **Drawing OSD-1**. This results in a partially submerged inlet pipe. **Table** 5.8 **5.8** shows a comparison of the water quality volume requirements as per MECP guidelines and the volumes provided in the conceptual SWM pond.

Table 5.8: Stormwater Quality Volumetric Requirements

Drainage Area (ha)	Actual % Imp.	MECP Control Level	Water Quality Unit Volume Requirements			Water Quality Volume Requirements		Water Quality Volumes Provided	
			Total Unit Volume (m^3/ha)	Perm. Pool (m^3/ha)	Ext. Detention (m^3/ha)	Perm. Pool (m^3)	Ext. Detention (m^3)	Perm. Pool (m^3)	Ext. Detention (m^3)
30.28	67	Enhanced - 80% TSS Removal	218	178	40	5,390	1,211	6,675	4,246

5.8.2.2 Outlet Design

The outlet will be located opposite the inlet and will discharge to the proposed realigned ditch.

The conceptual design of the outlet structure incorporates a dual control configuration. Firstly, a 220-mm orifice with an invert at the permanent pool elevation (inv=129.00 m) provides an approximate 38-hour extended detention for quality control. The entire extended detention volume is stored between 129.00 m and 129.50 m. Quantity control is provided through a 1m-wide weir opening within the outlet structure at a crest of 129.50 m.

An overflow spillway separate from the outlet control structure is set to 130.45 m and acts as a broad-crested weir, approximately 10.0 m wide. The spillway is design to safely convey runoff to the proposed ditch realignment during storm events higher than the 100-year storm, while maintaining a low water level in the pond.

5.9 CONCEPTUAL DITCH REALIGNMENT

The proposed SWM pond outlet structure and spillway weir will discharge into the proposed ditch realignment as shown on **Drawing SD-1**.

The proposed realigned ditch will convey runoff from upstream drainage areas as shown in **Figure 3.** The proposed realigned ditch will run east along the Appleton Side Road right of way (ROW) with a longitudinal slope of 0.3% and a V-shaped cross section (2.5:1 side slopes). The realigned ditch will then flow south following the site property line with a trapezoidal cross section at 0.8% longitudinal slope (1m-wide bottom, 1.2m-high, 3:1 side slopes) to ultimately discharge into the existing ditch as shown on **Drawing GP-1**. Detailed channel calculations are provided in **Appendix C.5**, which show that the conceptual ditch realignment configuration provides sufficient hydraulic conveyance capacity for external upstream drainage.

6.0 GEOTECHNICAL CONSIDERATIONS AND EIA SUMMARY

6.1 GEOTECHNICAL INVESTIGATION

A geotechnical investigation report for the development was completed by Paterson Group on December 7, 2020. The geotechnical investigation report is included in **Appendix D**.

A geotechnical field investigation was completed by Paterson Group on November 11 and 12, 2020. Forty-two (42) test pits were excavated to a maximum depth of 2.6 m below existing grade throughout the subject site to characterize and delineate the shallow subsurface and groundwater conditions (TP 1-20 to TP 42-20). All test pit locations were used to monitor groundwater infiltration levels at the time of excavation and minor infiltration was observed along the test pit sidewalls within TP 24-20, TP 29-20, TP 30-20, TP 37-20, and TP 39-20. The groundwater levels within these test pits were measured at a depth of 0.5 to 2.1 m below existing ground surface, noting that fluctuations in the groundwater levels due to seasonal variations or in response to precipitation events should be expected. The long-term groundwater table is expected to be near or perched within the bedrock surface based on soil moisture levels and colouring of the recovered samples. For details which are not summarized below, please see Paterson's Geotechnical Investigation Report (2020) in **Appendix D**.

Generally, the subsurface profile encountered at the test hole locations consists of a thin layer of topsoil underlain by stiff brown clay to clayey silt and/or glacial till overlying bedrock. Interbedded dolostone and limestone of the Gull River formation was encountered underlying the overburden soils at all test pit locations with inferred bedrock depths ranging from 0.1 to 2.8 m below existing ground surface. Due to the presence of a silty clay deposit underlying the subject site and undrained shear strength testing results, a permissible grade raise restriction of **2.0 m** is recommended for settlement sensitive structures founded within the clay deposit.

It is anticipated that bedrock removal will be required in areas across the site to complete building construction and service installation. Bedrock removal can be achieved via hoe ramming where small quantities of bedrock removal is required, and line drilling and controlled blasting is recommended where large quantities of bedrock needs to be removed. The blasting operations should be planned and completed under the guidance of a professional engineer with experience in blasting operations.

6.1.1 Groundwater Control

It is anticipated that groundwater infiltration into the excavations should be controllable using open sumps. The contractor should be prepared to direct water away from all bearing surfaces and subgrades, regardless of the source, to prevent disturbance to the founding medium.

A temporary Ministry of the Environment, Conservation, and Parks (MECP) permit to take water (PTTW) may be required for this project if more than 400,000 L/day of ground and/or surface water is to be pumped during the construction phase. A minimum of 4 to 5 months should be allowed for completion of the PTTW application package and issuance of the permit by the MECP.

For typical ground or surface water volumes being pumped during the construction phase, between 50,000 to 400,000 L/day, it is required to register on the Environmental Activity and Sector Registry (EASR). A minimum of two to four weeks should be allotted for completion of the EASR registration and the Water Taking and Discharge Plan to be prepared by a Qualified Person as stipulated under O.Reg. 63/16. If a project qualifies for a PTTW based upon anticipated conditions, an EASR will not be allowed as a temporary dewatering measure while awaiting the MECP review of the PTTW application.

6.1.2 Pavement Structure

The required pavement structure for car only parking areas, and local roadways and collector roadways without bus traffic are outlined in **Table 5.1** and **Table 5.2**, respectively.

Table 6.1: Recommended Pavement Structure for Car Only Parking Areas

Thickness (mm)	Material Description
50	Wear Course – HL-3 or Superpave SP 12.5 Asphaltic Concrete
150	Base - OPSS Granular 'A' Crushed Stone
300	Subbase - OPSS Granular 'B' Type II
	Subgrade – Either fill, in situ soil, or OPSS Granular 'B' Type I or II material placed over in situ soil or fill

Table 6.2: Recommended Pavement Structure for Local and Collector Roadways without Bus Traffic

Thickness (mm)	Material Description
40	Wear Course – HL-3 or Superpave SP 12.5 Asphaltic Concrete
50	Binder Course – HL-8 or Superpave SP 19 Asphaltic Concrete
150	Base - OPSS Granular 'A' Crushed Stone
400	Subbase - OPSS Granular 'B' Type II
	Subgrade – Either fill, in situ soil, or OPSS Granular 'B' Type I or II material placed over in situ soil or fill

Minimum Performance Grade (PG) 58-34 asphalt cement should be used for this project.

6.2 ENVIRONMENTAL IMPACT ASSESSMENT (EIA) SUMMARY

An Environmental Impact Assessment (EIA) was completed by Muncaster Environmental Planning Inc. on July 30th, 2021 in accordance with the Mississippi Mills Community Official Plan. The EIA describes the natural heritage features and functions within the lands and assesses potential Species at Risk within the proposed development area and adjacent to the site.

The drainage channel in the southeast corner and adjacent to the site is considered a potential significant natural heritage feature, however it will be realigned, and the habitat will be maintained and protected in the relocated channel. In addition, the on-site forests do not have the characteristics to be considered significant woodlands and no specimen trees are required to be protected, but tree retention should be maximized as much as possible.

The characteristics of potential Species at Risk, including the eastern meadowlark and bobolink should be discussed with Construction staff and if a Species at Risk is observed, all work that could impact the species is to cease and the Ministry of the Environment, Conservation and Parks and a biological consultant contacted. The EIA notes that the proposed urban residential development and associated infrastructure will not have a significant impact on the local and natural environment. The mitigation measures outlined in the EIA should be properly implemented to ensure the optimal development solution is provided.

7.0 GRADING AND DRAINAGE

The proposed development site measures approximately 33.4 ha, and consists primarily of ploughed fields and pasture land, as well as small forested areas. The topography across the site generally slopes from north to south direction, towards the existing drainage ditch. The existing ground elevations within the development lands varies between 130.11 m to 137.27 m according to the Topographical Plan of Survey provided by Annis, O'Sullivan, Vollebekk Ltd. and slopes downward from the northwest to the southeast.

A detailed grading plan (see **Drawing OGP-1**) has been provided to satisfy the stormwater management requirements, adhere to any geotechnical restrictions (see **Section 6.1**) for the site, and provide for minimum cover requirements for storm and sanitary sewers where possible. Site grading has been established to provide emergency overland flow routes required for stormwater management. The industrial lands (Block 189), intended as a future business park, will have overland flow directed to Appleton Side Road and conveyed to the realigned channel to the south.

The subject site maintains emergency overland flow routes to the proposed SWM wet pond located at the southwest boundary as depicted in **Drawing OGP-1.**

8.0 EROSION CONTROL DURING CONSTRUCTION

Erosion and sediment controls must be in place during construction. The following recommendations to the contractor will be included in contract documents.

1. Implement best management practices to provide appropriate protection of the existing and proposed drainage system and the receiving water course(s).
2. Limit extent of exposed soils at any given time.
3. Re-vegetate exposed areas as soon as possible.
4. Minimize the area to be cleared and grubbed.
5. Protect exposed slopes with plastic or synthetic mulches.
6. Provide sediment traps and basins during dewatering.
7. Install sediment traps (such as SiltSack® by Terrafix) between catch basins and frames.
8. Plan construction at proper time to avoid flooding.

The contractor will, at every rainfall, complete inspections and guarantee proper performance. The inspection is to include:

1. Verification that water is not flowing under silt barriers.
2. Clean and change silt traps at catch basins.

Refer to **Drawing EC-1** for the proposed location of silt fences and other erosion control structures.

9.0 UTILITIES

As the subject site is bound by existing commercial and residential development to the north and west, Hydro, Internet, Gas and Cable servicing for the proposed development should be readily available through existing infrastructure to the northwest of the proposed subdivision. It is anticipated that existing infrastructure will be sufficient to provide the means of distribution for the proposed site. Exact size, location and routing of utilities, along with determination of any off-site works required for redevelopment, will be finalized after design circulation.

10.0 APPROVALS

Ontario Ministry of Environment, Conservation and Parks (MECP) Environmental Compliance Approvals (ECA) will be required for the proposed subdivision works related to stormwater management, inlet control devices, pump station, storm sewers and sanitary sewers.

An MECP Permit to Take Water (PTTW) may be required for the site. The geotechnical consultant shall confirm at the time of application that a PTTW is required.

A permit to alter watercourse will also be required from the Mississippi Valley Conservation Authority (MVCA) to allow for the construction of the wet pond on the southwest boundary and for the realignment of the natural channel to which the SWM facility outlets.

11.0 CONCLUSIONS

11.1 WATER SERVICING

The proposed Mill Valley Estates Development is within the vicinity of existing water distribution system. The proposed site will be serviced through connections to the existing 250 mm diameter watermain within Industrial Drive and the existing 200 mm diameter watermain within Paterson Street/Robert Street. A fire flow of 15,000 L/min (250 L/s) will be required for the proposed development. The proposed watermain network will be assessed in the next submission, once hydraulic boundary conditions are received.

11.2 SANITARY SERVICING

Wastewater peak flows from the proposed site and the future Mill Valley Estates Living Community will be conveyed through a gravity sewer system to a proposed pump station located at the southwest end of the site, adjacent to the SWM facility**.** A forcemain will direct sewage peak flows (approx. 39.4 L/s) from the pump station to the existing 300 mm diameter sanitary sewer within Industrial Drive. The pump station will include a wet well designed to allow sufficient storage to keep the hydraulic grade line (HGL) at acceptable levels during emergency conditions. The wet well and pumping station design calculations will be provided at the detailed design stage.

Verification of downstream wastewater infrastructure capacity will be provided in the next submission.

11.3 STORMWATER SERVICING

The conceptual SWM wet pond has been sized to provide ‘Enhanced’ level of treatment equivalent to 80% TSS removal, and to restrict post development peak flows up to the 100-year storm event to pre-development levels for proposed site areas and the future Mill Valley Estates Living Community. Storm sewers will be sized for the 5-year event under free flow conditions.

Post development runoff from the proposed industrial block (Block 189) will be treated on-site to provide ‘Enhanced’ level of treatment and to restrict post development peak flows up to the 100-year storm event to pre-development levels prior to discharging into the Appleton Side Road side ditch.

11.4 GRADING

A conceptual grading plan has been prepared accounting for required overland flow conveyance, cover over sewers, hydraulic grade line requirements, and recommendations by the geotechnical investigation by Paterson Group. Detailed grading design will be developed at the time of final design.

11.5 UTILITIES

Utility infrastructure exists within the general area of the subject site. It is anticipated that existing infrastructure will be sufficient to provide a means of distribution for the proposed site. Exact size, location and routing of utilities will be finalized at the detailed design stage.

APPENDICES

Appendix A POTABLE WATER SERVICING

A.1 DOMESTIC WATER DEMAND CALCULATIONS

Mill Valley Estates - Domestic Water Demand Estimates
(Draft Plan of Subdivision)

Last updated on 2022-11-25 based on Concept Plan from 2022-10-20 (Rev 6) prepared by Fotenn Planning + Design

Population densities as per City of Ottawa Guidelines:		
Single Family	3.4	ppu
Townhouse/Back-to-Back	2.7	ppu
Average Apartment	1.8	ppu
Average Apartment (Mill Valley Living)	2.3	ppu
Demand conversion factors as per City of Ottawa Guidelines:		
Residential (Mill Valley Retirement) [5]	350	L/p/day
Residential	280	L/p/day
Commercial and Institutional	28000	L/ha/day
Light Industrial	35000	L/ha/day

Building ID	**Area (m^2)**	**Number of Units**[3]	**Population**	**Daily Rate of Demand (L/m^2/day or L/p/day)**	**Avg. Day Demand**		**Max. Day Demand** [1, 2]		**Peak Hour Demand** [1, 2]	
					(L/min)	**(L/s)**	**(L/min)**	**(L/s)**	**(L/min)**	**(L/s)**
Mill Valley Estates										
Single Family	-	179	609	280	118.4	1.97	177.6	2.96	319.7	5.33
Townhouse	-	244	659	280	128.1	2.14	192.2	3.20	345.9	5.76
Apartments	-	48	86	280	16.8	0.28	25.2	0.42	45.4	0.76
Parkland Dedication	9,290	-	-	2.8	18.1	0.30	45.2	0.75	99.4	1.66
Industrial Park (Block 189)	73,163	-	-	3.5	177.8	2.96	444.6	7.41	978.1	16.30
Clubhouse	218	-	-	2.8	0.4	0.01	1.1	0.02	2.3	0.04
Retirement Community (Mill Valley Living) [3]										
Single Family	-	2	7	350	1.7	0.03	2.6	0.04	4.6	0.08
Seniors Apartment	-	48	110	350	26.8	0.45	40.3	0.67	72.5	1.21
Townhouse	-	42	113	350	27.6	0.46	41.3	0.69	74.4	1.24
15% Future Buildout Contingency [4]	-	14	32	350	7.7	0.13	11.6	0.19	20.8	0.35
Total Site :	**-**	**577**	**1617**	**-**	**523.4**	**8.72**	**981.5**	**16.36**	**1963.0**	**32.72**

1 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
  peak hour demand rate = 2.2 x maximum day demand rate

2 Water demand criteria used to estimate peak demand rates for commercial/amenity areas are as follows:
  maximum day demand rate = 1.5 x average day demand rate
  peak hour demand rate = 1.8 x maximum day demand rate

3 Development statistics for Mill Valley Living taken from McIntosh Perry servicing and SWM Report (February 2022)

4 The population estimate for the Mill Valley Living has been increased due to potential future increases in number of units. A 15% unit contingency has been provided and has been accounted for in the overall demand.

5 Daily rate of demand for the units within the Mill Valley Living Retirement Community is adopted from the Servicing & Stormwater Management Report - Mill Valley Retirement Community by McIntosh Perry Consulting Engineers Ltd. to ensure consistency with previous studies.

A.2 FIRE FLOW REQUIREMENTS (2020 FUS METHODOLOGY)

FUS Fire Flow Calculation Sheet - 2020 FUS Guidelines

Stantec Project #: 160401740
Project Name: Mill Valley Estates
Date: 12/1/2022
Fire Flow Calculation #: 1
Description: 6-Unit Townhouse Block (653 m³ Building Footprint)

Notes: 2-Storey Townhouse Row. Building information taken from Draft Plan (Rev. 6) by Fotenn. Block located at the North end of the Draft Plan area surrounded by 6-unit townhouse blocks fornting ROW.

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								-	-
		653	653							1306	-
3	Determine Required Fire Flow	(F = 220 x C x $A^{1/2}$). Round to nearest 1000 L/min								-	12000
4	Determine Occupancy Charge	Limited Combustible								-15%	10200
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	38	2	61-80	Type V		NO	13%	4590
		East	3.1 to 10	17	2	21-49	Type V		NO	16%	
		South	> 30	38	2	61-80	Type V		NO	0%	
		West	3.1 to 10	17	2	21-49	Type V		NO	16%	
7	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min									15000
		Total Required Fire Flow in L/s									250.0
		Required Duration of Fire Flow (hrs)									3.00
		Required Volume of Fire Flow (m^3)									2700

Stantec

FUS Fire Flow Calculation Sheet - 2020 FUS Guidelines

Stantec Project #: 160401740
Project Name: Mill Valley Estates
Date: 12/1/2022
Fire Flow Calculation #: 2
Description: 6-Unit Townhouse Block (653 m³ Building Footprint)

Notes: 2-Storey Townhouse Row. Building information taken from Draft Plan (Rev. 6) by Fotenn. Block located at the Southwest end of the Draft Plan area surrounded by 6-unit and 5-unit townhouse blocks and single family homes fornting ROW.

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								-	-
		653	653							1306	-
3	Determine Required Fire Flow	$(F = 220 \times C \times A^{1/2})$. Round to nearest 1000 L/min								-	12000
4	Determine Occupancy Charge	Limited Combustible								-15%	10200
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	38	2	61-80	Type V		NO	0%	4590
		East	3.1 to 10	17	2	21-49	Type V		NO	16%	
		South	10.1 to 20	38	2	61-80	Type V		NO	13%	
		West	3.1 to 10	17	2	21-49	Type V		NO	16%	
7	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min									15000
		Total Required Fire Flow in L/s									250.0
		Required Duration of Fire Flow (hrs)									3.00
		Required Volume of Fire Flow (m^3)									2700

FUS Fire Flow Calculation Sheet - 2020 FUS Guidelines

Stantec Project #: 160401740
Project Name: Mill Valley Estates
Date: 12/1/2022
Fire Flow Calculation #: 3
Description: 12-Unit Stacked Apartment Block

Notes: Stacked apartment units (12) located at the North end of the Draft Plan area.

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								-	-
		427	427	427						1281	-
3	Determine Required Fire Flow	(F = 220 x C x A$^{1/2}$). Round to nearest 1000 L/min								-	12000
4	Determine Occupancy Charge	Limited Combustible								-15%	10200
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	24	3	61-80	Type V		NO	0%	2448
		East	10.1 to 20	18	3	41-60	Type V		NO	12%	
		South	> 30	24	3	61-80	Type V		NO	0%	
		West	10.1 to 20	18	3	41-60	Type V		NO	12%	
7	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min									13000
		Total Required Fire Flow in L/s									216.7
		Required Duration of Fire Flow (hrs)									2.50
		Required Volume of Fire Flow (m^3)									1950

A.3 BACKGROUND REPORT EXCERPTS – WATER SERVICING

- Updated Modelling: Once all sewage generation parameters were updated, simulations of the wastewater collection system under existing conditions were completed to establish a baseline for comparison with future development scenarios and to ascertain whether there are any existing capacity constraints.

4.0 Potable Water System

The Almonte Ward is the only area in the Municipality that is serviced by a communal water system. The Almonte Ward is generally supplied by five groundwater wells, one elevated potable water storage tank, and approximately 35km of watermains, as illustrated on Figure 6.

4.1 Existing Potable Water System

The communal water system is supplied by five groundwater wells identified as 3, 5, 6, 7, and 8, as shown on Figure 6.

Well 3 is located near Ottawa Street in the northeast end of Municipality. This Well was constructed in 1948 and is a 250mm diameter borehole extending to a depth of 47.5m below the ground surface. The Well is equipped with a vertical turbine pump and enclosed within a vented weather tight masonry block and brick pump house. Well 3 is also equipped with a chlorination system and associated instrumentation.

Well 5 is located in the municipal works yard on the west side of the Mississippi River. This Well was constructed in 1970 and is a 203mm diameter borehole extending to a depth of 38.1m below the ground surface, equipped with a submersible pump and enclosed within a vented weathertight masonry block and aluminum clad pump house. Well 5 is also equipped with a chlorination system and associated instrumentation.

Well 6 is located in Gemmill Park, near Christian Street, on the west side of the Mississippi River. This Well was constructed in 1973 and is a 254mm borehole extending to a depth of 48.8m below the ground surface, with a steel casing to a depth of 10m. It is equipped with a vertical turbine pump and enclosed within a vented weathertight masonry block and wood siding pump house. Well 6 is also equipped with a chlorination system and associated instrumentation.

Wells 7 and 8 are located on Paterson Street on the east edge of Municipality and are approximately 5m apart in the same building. Wells 7 and 8 were constructed in 1990/91, are 254mm boreholes extending to a depth of 79.2m below the ground surface, and have a steel casing to a depth of 13.41m. They are equipped with vertical turbine pumps and enclosed within a vented weathertight masonry block and brick or vinyl siding pump house. The Wells are also equipped with a chlorination system and associated instrumentation.

The water distribution system includes an elevated water storage tank (2,840m^3 nominal capacity) and piping network. The elevated storage tank, constructed in 1992, is located in the northeast quadrant of the Municipality near Wells 7 and 8. The piping network generally consists of polyvinyl chloride, ductile iron and cast iron piping ranging in size from 50mm to 200mm in diameter. It is understood that some of the piping is the original infrastructure dating back to 1930 and earlier.

Table 8: Historic Potable Water Demands (January 2012 to December 2016)

Year	Average Day Demand	Maximum Day Demand
2012	23.4L/s (2,024m^3/d)	43.4L/s (3,754m^3/d)
2013	20.6L/s (1,780m^3/d)	37.8L/s (3,267m^3/d)
2014	19.0L/s (1,641m^3/d)	34.8L/s (3,011m^3/d)
2015	18.4L/s (1,592m^3/d)	37.4L/s (3,228m^3/d)
2016	18.6L/s (1,605m^3/d)	39.1L/s (3,380m^3/d)
Average/Max (2012-2016)	**20.0L/s (1,729m^3/d)**	**43.4L/s (3,754m^3/d)**
Average/Max (2008-2011)	**20.0L/s (1,729m^3/d)**	**38.1L/s (3,893m^3/d)**

Based on the 2016 Almonte Ward design population of 5,039 people and the average day demands, an equivalent per capita average day flow of 343L/c/d is calculated, which is typical for communities of similar size. This is slightly lower than the 352L/c/d calculated in the 2012 Master Plan. Overall, water demands have not changed significantly since the original report.

4.3 Potable Water System Design Criteria

Table 9 provides a summary of the water demand rates used to evaluate the Municipality's water system.

Table 9: Design Criteria - Water Demand Rates

Land Use	Design Criteria	Maximum Day Factor
Existing and Future Residential	350L/cap/day	2.5
Existing and Future Light Industrial	35,000L/ha/day	1.5
Existing and Future Commercial	28,000L/ha/day	1.5

Water pumping stations or wells are rated on their 'firm' pumping capacity. Firm capacity is based on the capacity of the station or system with the largest pump out of service. Pumping stations or well systems are sized based on maximum day flows for areas with sufficient water storage volume, and on peak hour flows for areas without sufficient storage. Storage capacities are based on MOECC Guidelines for Drinking Water Systems (MOECC, 2008). The total storage capacity requirements for a pressure zone are the sum of the equalization storage, fire storage, and emergency storage allowances. These design criteria are summarized in Table 10.

4.8.3 Long-Term (10 to 20 Years): Water Distribution

The long-term water distribution system servicing options identified to address the required fire flow and system pressures include:

- Appleton Side Road Looping: This watermain extension will maintain minimum peak hour pressures in the northeast quadrant. This was envisioned as a long-term need in the 2012 Master Plan.
- Create Pressure Zone 3: This new pressure zone, which was also envisioned as a long-term need in the 2012 Master Plan, will improve pressure management to the island.

It is noted that the 2012 Master Plan also envisioned long-term upgrades on Victoria Street and modifications to PZ-2. The Victoria Street upgrades are currently underway (design ongoing), and now identified in the 0 to 5 year timeframe, and the vision for PZ-2 modifications are now recommended under the 5 to 10 year timeframe.

The opinions of probable costs associated with the long-term water distribution servicing strategies are summarized in Table 19.

Table 19: Opinion of Probable Costs Long-Term Water Distribution

Option	Diameter (mm)	Length (m)	Rate ($/m)[(1)]	Engineering and Contingency (27%)	Rounded Total[(3)]
Appleton Side Road Looping	250	435	$1,100	$129,000	$598,000
Create Pressure Zone 3	$100,000[(2)]			$27,000	$125,000

1. Rates based on City of Ottawa 2015 Unit Rates for watermain, restoration of road (granular, base and wear) and curb, and other past experience.
2. Allowance.
3. Rounded to the nearest $5,000.

4.8.4 Build-Out: Water Distribution System

The build-out water distribution system servicing options identified to address the required fire flow and system pressures are described below. As previously noted, this build-out review offers a broad level overview of potential solutions beyond the 20-year servicing needs.

- Mississippi River Fourth Crossing: This will service build-out Areas 3 and 4.
- County Road 29: This will service build-out Areas 3 and 4.
- Scott Street Looping: This will service build-out Areas 3 and 4.
- Appleton Side Road: This will service build-out Area 1.

- Bridge Street Watermain Extension: This will service build-out Areas 3 and 4, and build-out industrial areas near the Wastewater Treatment Plant.
- Paterson Street Watermain Extension from Tower Street to Ottawa Street: This will service all build-out areas.
- Maude Street to Future Adelaide Street: This will service build-out Area 2.

The opinions of probable costs associated with the build-out water distribution servicing strategies are summarized in Table 20.

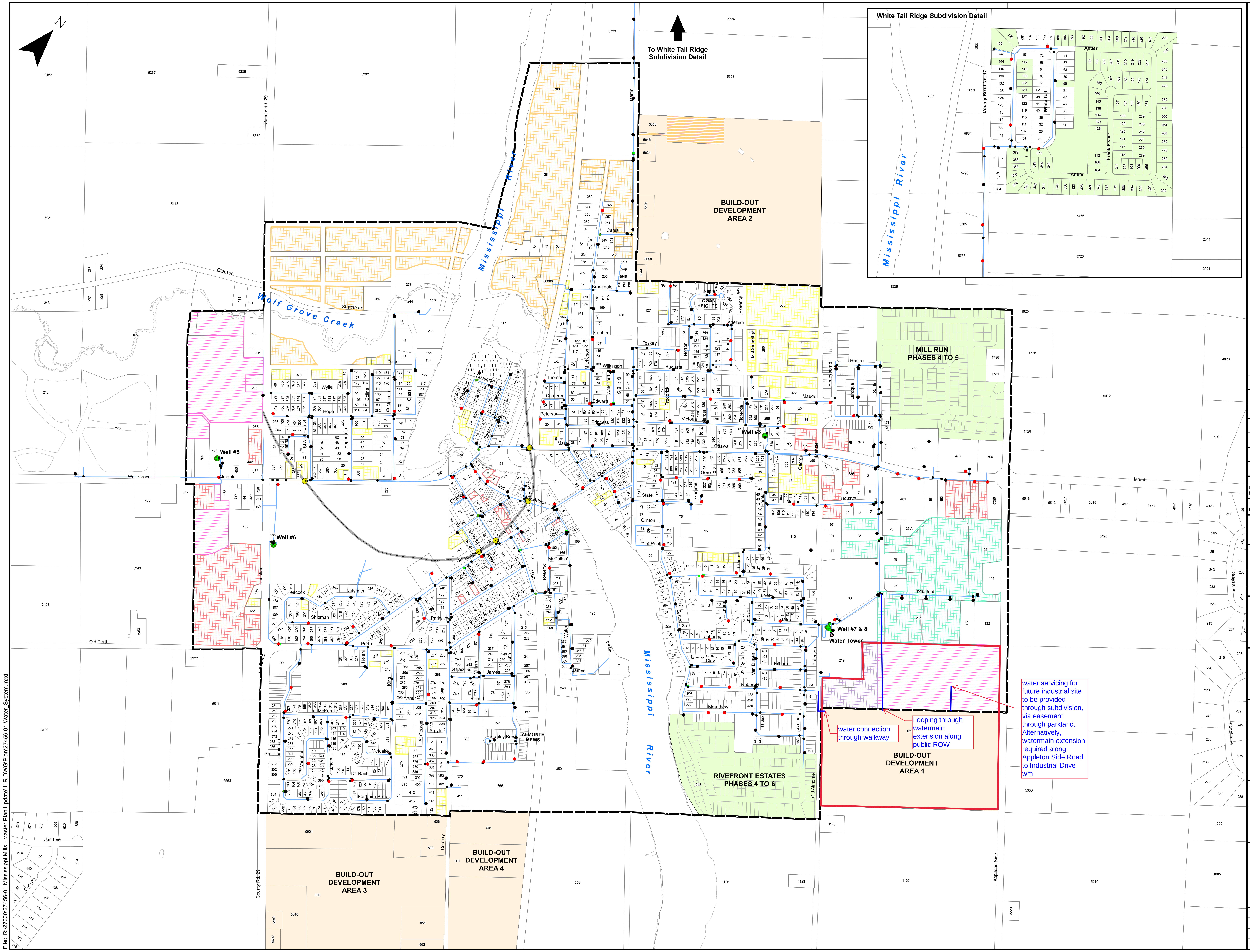
Table 20: Opinion of Probable Costs Build-Out Water Distribution

Option	Diameter (mm)	Length (m)	Rate ($/m)(1)	Engineering and Contingency (27%)	Rounded Total(3)
Mississippi River Fourth Crossing – Riverfront Estates to West Side of River	300	500	$10,000(2)	$1,350,000	$6,350,000
Mississippi River Fourth Crossing – West Side of River to Country Street	300	476	$1,090	$140,000	$660,000
County Road 29	250	711	$1,100	$211,000	$995,000
Scott Street Looping	200	80	$1,030	$22,000	$105,000
Appleton Side Road	250	490	$1,100	$146,000	$685,000
Bridge Street Watermain Extension	300	140	$1,090	$41,000	$195,000
Paterson Street Watermain Extension	300	633	$1,090	$186,000	$875,000
Maude Street to Future Adelaide Street	300	261	$1,090	$77,000	$360,000

1. Rates based on City of Ottawa 2015 Unit Rates for watermain, restoration of road (granulars, base and wear) and curb, and other past experience.
2. High level estimate for rock boring below Mississippi River.
3. Rounded to the nearest $5,000.

4.9 Summary of Potable Water Servicing Strategies

A summary of the water supply and treatment, storage and distribution servicing strategies and opinion of probable costs are presented in Table 21 and Figure 17.



water servicing for future industrial site to be provided through subdivision, via easement through parkland. Alternatively, watermain extension required along Appleton Side Road to Industrial Drive wm

water connection through walkway

Looping through watermain extension along public ROW

Infrastructure

- 🔴 Fire Hydrant
- 🟩 Valve Chamber
- ● Valve Box
- ⊠ Pressure Reducing Valve
- ⊕ Well
- ○ Water Tower
- — Watermain
- - - Pressure Zone

Land Use

- ▬ Almonte Ward Limits
- ☐ Existing Lots
- ☐ Future Lots
- ▨ Closed Waste Disposal Site
- 🟩 Registered Subdivision
- 🟧 Build Out
- ▨ Business Park (17.0 ha)
- ▨ Community Facility (3.1 ha)
- ▨ Commercial (15.6 ha)
- ▨ Industrial (24.1 ha)
- ▨ Residential - Geenfield (34.2 ha)
- ▨ Residential - Infill (16.0 ha)

No.	ISSUE / REVISION	DD/MM/YY

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PROJECT:

**MUNICIPALITY OF MISSISSIPPI MILLS
ALMONTE WARD WATER AND
WASTEWATER INFRASTRUCTURE
MASTER PLAN UPDATE**

MISSISSIPPI MILLS, ONTARIO

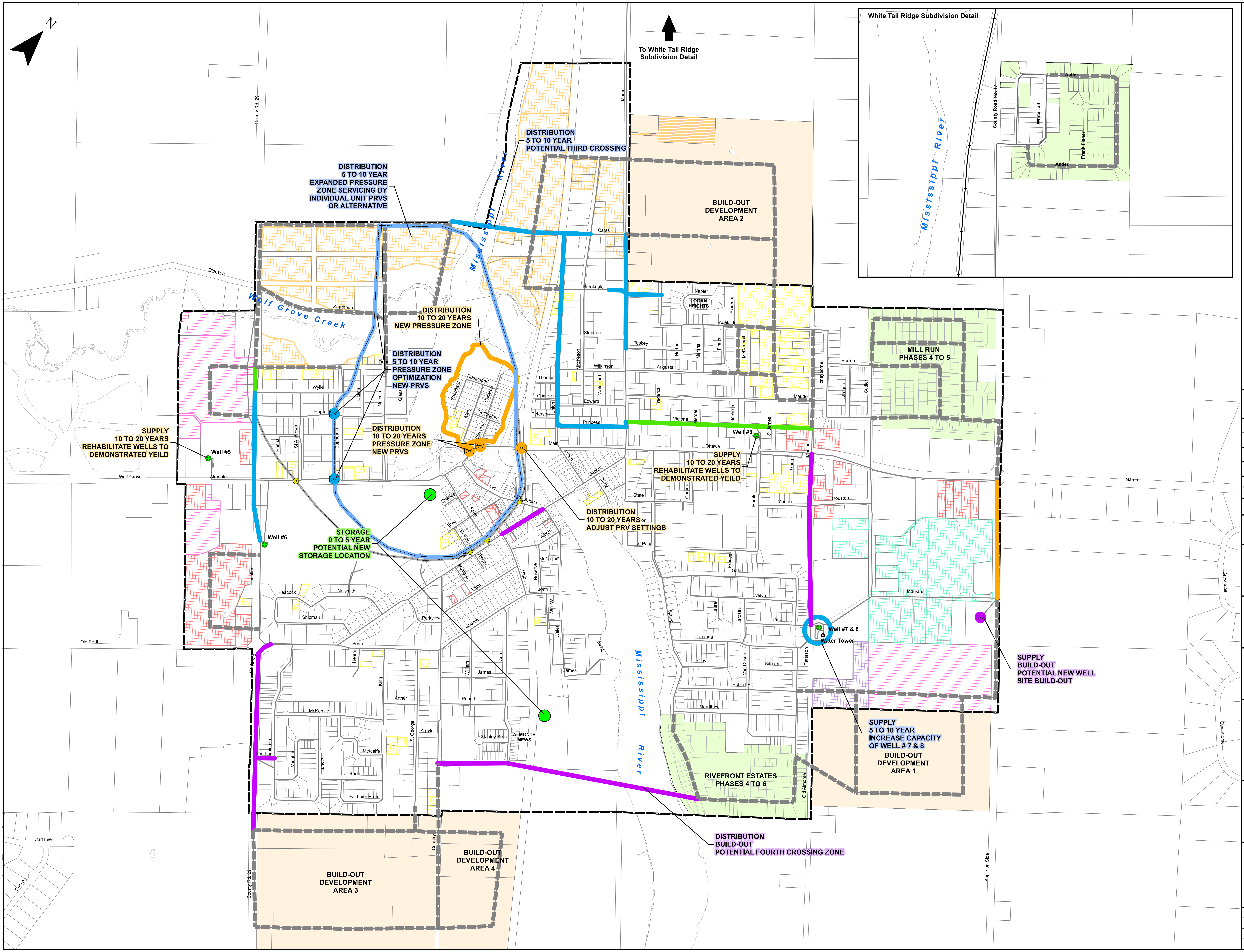
DRAWING:

**ALMONTE WARD
WATER SYSTEM**

DESIGN: **MB**
DRAWN: **KTK**
CHECKED: **SG**
JLR #: **27456-01**
DRAWING #: **FIGURE 6**

PLOT DATE: January 5, 2018 8:27:07 AM

File: R:\27000\27456-01 Mississippi Mills - Master Plan Update\JLR DWG\Plan\27456-01 Water_System.mxd



Watermain Upgrades

- ▬ Future Pressure Zone
- ▬ 0 to 5 Years
- ▬ 5 to 10 Years
- ▬ 10 to 20 Years
- ▬ Future Watermain
- ▬ Simulated Watermain Routing (conceptual) to be finalized during development stage

Infrastructure

- ⊗ Pressure Reducing Valve
- ⊕ Well
- ○ Water Tower
- ▬ Existing Pressure Zone
- ▬ Watermain

Land Use

- ▬ Almonte Ward Limits
- ☐ Existing Lots
- ☐ Future Lots
- ▨ Closed Waste Disposal Site
- ▨ Registered Subdivision
- ▨ Build Out
- ▨ Business Park (17.0 ha)
- ▨ Community Facility (3.1 ha)
- ▨ Commercial (15.6 ha)
- ▨ Industrial (24.1 ha)
- ▨ Residential - Geenfield (34.2 ha)
- ▨ Residential - Infill (16.0 ha)

No.	ISSUE / REVISION	DD/MM/YY

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PROJECT:
MUNICIPALITY OF MISSISSIPPI MILLS ALMONTE WARD WATER AND WASTEWATER INFRASTRUCTURE MASTER PLAN UPDATE
MISSISSIPPI MILLS, ONTARIO

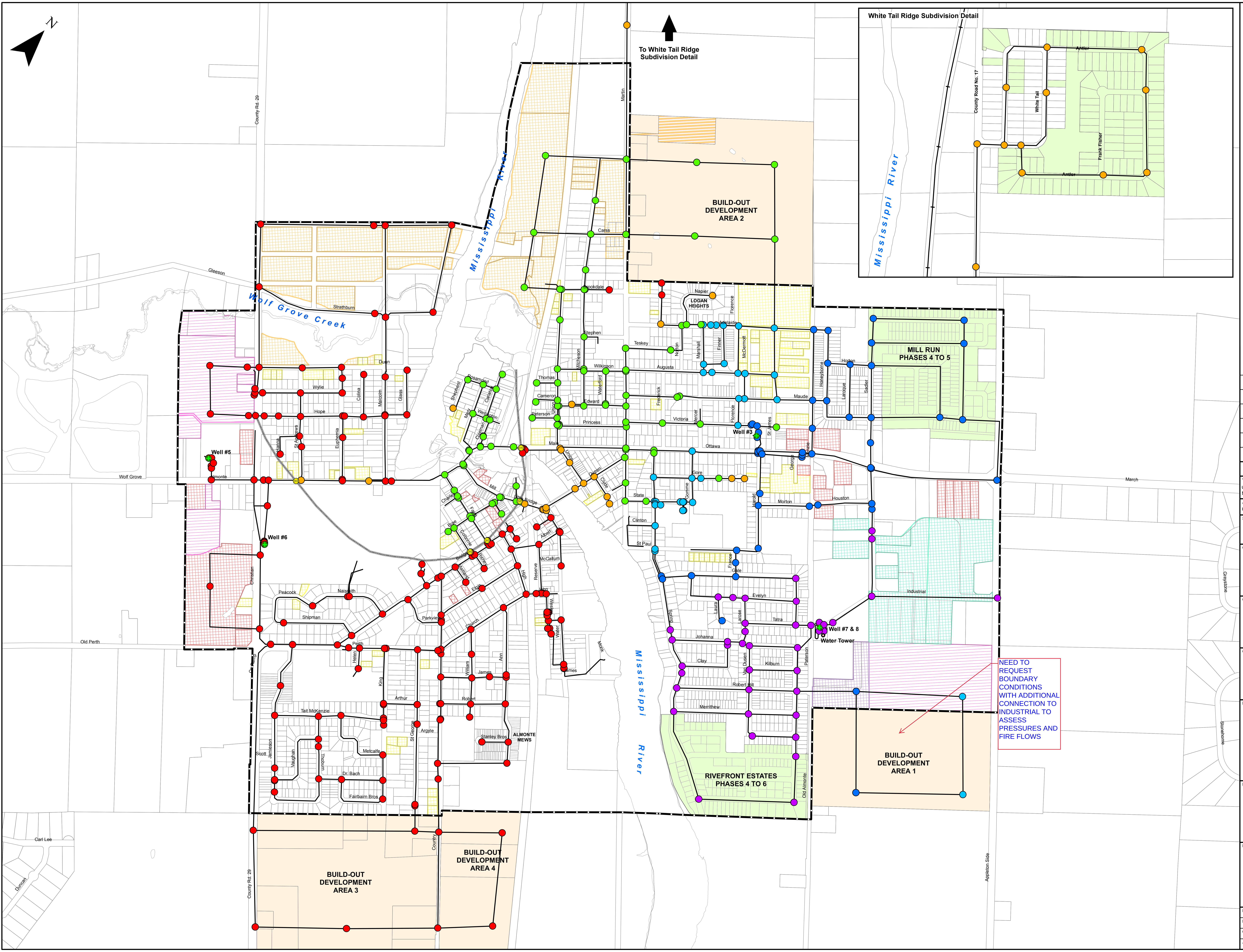
DRAWING:
ALMONTE WARD WATER SYSTEM SERVICING STRATEGIES SUPPLY STORAGE DISTRIBUTION

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #:
FIGURE 17

PLOT DATE: January 26, 2018 11:13:39 AM

File: R:\27000\27456-01 Mississippi Mills - Master Plan Update\JLR DWG\Plan\17_27456-01 AlmonteGrowth BuildOut_WaterUpgrades.mxd



NEED TO REQUEST BOUNDARY CONDITIONS WITH ADDITIONAL CONNECTION TO INDUSTRIAL TO ASSESS PRESSURES AND FIRE FLOWS

Max Day + Fire Flow

- ● < 32 L/s
- ● 33 to 50 L/s
- ● 51 to 67 L/s
- ● 68 to 75 L/s
- ● 76 to 100 L/s
- ● 100 to 300 L/s

Infrastructure

- ⊗ Pressure Reducing Valve
- ⊕ Well
- ○ Water Tower
- ┅ Pressure Zone
- ─ Watermain

Land Use

- ━ Almonte Ward Limits
- ☐ Existing Lots
- ☐ Future Lots
- ▨ Closed Waste Disposal Site
- 🟩 Registered Subdivision
- ▭ Build Out
- ▨ Business Park (17.0 ha)
- ▨ Community Facility (3.1 ha)
- ▨ Commercial (15.6 ha)
- ▨ Industrial (24.1 ha)
- ▨ Residential - Geenfield (34.2 ha)
- ▨ Residential - Infill (16.0 ha)

No.	ISSUE / REVISION	DD/MM/YY

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PROJECT:

MUNICIPALITY OF MISSISSIPPI MILLS
ALMONTE WARD WATER AND
WASTEWATER INFRASTRUCTURE
MASTER PLAN UPDATE

MISSISSIPPI MILLS, ONTARIO

DRAWING:

ALMONTE WARD WATER SYSTEM
BUILD-OUT (2037+)
MAX DAY DEMAND / FIRE FLOW

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #:

FIGURE 15

PLOT DATE: January 5, 2018 2:34:35 PM

File: R:\27000\27456-01 Mississippi Mills - Master Plan Update\JLR DWG\Plan\27456-01 AlmonteGrowth BuildOut_WaterPeakFF.mxd

2.0 BACKROUND STUDIES

Background studies that have been completed for the proposed site include Mississippi Mills as-built drawings, a topographical survey and a geotechnical report.

As-built drawings of existing services within the vicinity of the proposed site were reviewed in order to determine accurate servicing and stormwater management schemes for the site.

A topographic survey of the site was completed by Annis, O'Sullivan Vollebekk.

3.0 WATERMAIN

3.1 Existing Watermain

There is an existing 250mm diameter PVC watermain within Industrial Drive. The watermain services the adjacent properties as well as the fire hydrants along Industrial Drive. Industrial Drive is immediately downstream of the Town's main groundwater pump station and elevated water storage tank.

3.2 Proposed Watermain

A new 250mm diameter PVC watermain is proposed to be extended from Industrial Drive down the Gerry Emon Road right-of-way to service the site. The watermain will also extend to the end of the right-of-way to service future development land. The watermain will loop within the private site with sizes ranging from 150 mm to 200 mm. Four hydrants have been proposed within the ROW. There are also two private hydrants proposed on the site. The watermain is designed to have a minimum of 2.4m cover.

The Fire Underwriters Survey 1999 (FUS) method was utilized to determine the required fire flow for the site. The results of the calculations yielded a total required fire flow of 16,000 L/min. The detailed calculations for the FUS can be found in Appendix 'B'.

The water demands for the proposed development have been calculated to adhere to the Ottawa Design Guidelines – Water Distribution manual and can be found in Appendix 'B'. The results have been summarized below:

Table 1: Water Demands

	Main Building	Blocks
Population	68	130
Residential	350 L/c/day	350 L/c/day
Average Day Demand (L/s)	0.28	0.53
Maximum Daily Demand (L/s)	0.69	1.32

Peak Hourly Demand (L/s)	1.52	2.90
FUS Fire Flow Requirement (L/min)	5,000	11,000

Boundary Conditions have been requested however were not available at the time of submission. Once boundary conditions are obtained, the subject property will be hydraulically modelled using WaterCAD to confirm the system has adequate capacity for the proposed development and the required fire flows can be met.

To confirm the adequacy of fire flow to protect the proposed development, public and private fire hydrants within 150 m of the proposed building were analysed per City of Ottawa ISTB 2018-02 Appendix I Table 1. The results are demonstrated below.

Table 2: Fire Protection Confirmation

Building	Fire Flow Demand (L/min.)	Fire Hydrant(s) within 75m	Fire Hydrant(s) within 150m	Combined Fire Flow (L/min.)
Proposed Site	16,000	3	2	24,700

A.4 BOUNDARY CONDITIONS REQUEST – CORRESPONDENCE WITH THE MUNICIPALITY OF MISSISSIPPI MILLS

From: David Shen
To: Mott, Peter; Paerez, Ana
Cc: Cory Smith
Subject: RE: Mill Valley Estates (Houchimi) - Boundary Conditions Request
Date: Monday, November 28, 2022 7:34:11 AM

Good Morning Peter,

Can you do me a favor to forward the attachments with your Nov. 10 email? I will need conduct a quick review.

Assuming you already knew our regular practice, I may repeat here if you don't mind. Once I review/approve the calculations, you can do the second step. The second step is using the approved calculation results as inputs to check the system capacity and performance in the Municipal water/wastewater models. Since J.L.Richards helps the Municipality keep/maintain/update the models, you will pay J.L.Richards to do this step.

Thanks!
David Shen, P.Eng.
Director, Development Services and Engineering
Municipality of Mississippi Mills
dshen@mississippimills.ca
613-880-5996
Website: www.mississippimills.ca

Mississippi
Mills

From: Cory Smith <csmith@mississippimills.ca>
Sent: November 23, 2022 10:38 AM
To: Mott, Peter <Peter.Mott@stantec.com>; David Shen <dshen@mississippimills.ca>
Cc: Paerez, Ana <Ana.Paerez@stantec.com>
Subject: RE: Mill Valley Estates (Houchimi) - Boundary Conditions Request

Peter,

I have been out of the office for extended time.
Please send these requests to David Shen, Director of Development Services.

Cory Smith, C.Tech.
Director of Roads and Public Works
Municipality of Mississippi Mills
3131 Old Perth Rd.
P.O. Box 400
Almonte, ON
K0A 1A0
csmith@mississippimills.ca
(613)256-2064 x401

From: Mott, Peter <Peter.Mott@stantec.com>
Sent: November 22, 2022 12:46 PM
To: Cory Smith <csmith@mississippimills.ca>
Cc: Paerez, Ana <Ana.Paerez@stantec.com>
Subject: RE: Mill Valley Estates (Houchimi) - Boundary Conditions Request

Hi Corey – Just wanted to follow up with regards to the below BC request and the email sent regarding sanitary sewer capacity of the receiving sewers based on the provided sewage generation from the development. Let me know if you need any additional information from our end.

Best regards,

Peter Mott EIT
Engineering Intern, Community Development

Mobile: +1 (343) 999-8172
Peter.Mott@stantec.com
Stantec
400 - 1331 Clyde Avenue
Ottawa ON K2C 3G4

From: Mott, Peter
Sent: Thursday, November 10, 2022 3:37 PM
To: csmith@mississippimills.ca
Cc: Paerez, Ana <Ana.Paerez@stantec.com>; Kilborn, Kris <kris.kilborn@stantec.com>
Subject: Mill Valley Estates (Houchimi) - Boundary Conditions Request

Hello Corey,

I would like to request the hydraulic boundary conditions for the Mill Valley Estates Development, including demand estimates from the adjacent Mill Valley Living Senior’s Residence. Please find attached the draft plan, the key map showing the location of the proposed development and connection locations, domestic water demand calculations, and fire flow calculations.

A summary of the proposed site is provided below:

We anticipate a minimum of two (2) connections: one to the existing watermain on Industrial Drive and one (1) within Old Almonte Road at Robert Hill Street. The following connections are expected for servicing:

➢Connection to the existing watermain on Industrial Drive.
➢Connection to the existing watermain stub on Old Almonte Road at Robert Hill Street.

For the purpose of the boundary conditions request, may you please provide us with the boundary conditions for the following servicing options:

i. Watermain connections to the above listed connections; assuming a fire flow requirement of **11,000 L/min (183 L/s)** for the site in addition to the domestic water demands provided below. (Includes the governing Townhouse Blocks with fire separation and the adjacent Retirement Community)
ii. Watermain connections to the above listed connections; assuming a fire flow requirement of **15,000 L/min (250 L/s)** for the site in addition to the domestic water demands provided below.

- The intended land use is a combination of residential, institutional, commercial/mixed use, and park land dedication per the summary provided in the Domestic Demands spreadsheet. (See attached Draft Plan)
- Estimated fire flow demand per the FUS methodology: 15,000 L/min (250 L/s) for the worst-case scenario (12-Unit Stacked Apartments)
- Domestic water demands for the entire development:
  - **Average day: 509.3 L/min (8.5 L/s)**
  - **Maximum day: 960.3 L/min (16.0 L/s)**
  - **Peak hour: 1924.8 L/min (32.1 L/s)**

Thank you for your time and please contact me at your earliest convenience if any additional information or clarification is required.

Best regards,

Peter Mott EIT
Engineering Intern, Community Development

Mobile: +1 (343) 999-8172
Peter.Mott@stantec.com
Stantec
400 - 1331 Clyde Avenue
Ottawa ON K2C 3G4

Appendix B WASTEWATER SERVICING

B.1 SANITARY SEWER DESIGN SHEET

Stantec

SUBDIVISION:

Mill Valley Estates

DATE: 12/1/2022
REVISION: 1
DESIGNED BY: WAJ
CHECKED BY: PM

SANITARY SEWER DESIGN SHEET
(City of Ottawa)

FILE NUMBER: 160401740

DESIGN PARAMETERS

MAX PEAK FACTOR (RES.)=	4.0	AVG. DAILY FLOW / PERSON	350 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):	2.7	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	0.28 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)	SINGLE	UNITS TOWN	APT	POP.	CUMULATIVE AREA (ha)	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)	VEL. (ACT.) (m/s)
R21A	21	20	1.64	0	35	0	95	1.64	95	3.60	1.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	1.64	1.64	0.5	1.8	192.0	200	PVC	SDR 35	0.32	18.9	**9.71%**	0.60	0.31
R20A	20	18	1.41	23	0	0	78	3.05	173	3.54	2.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	1.41	3.05	0.9	3.3	170.0	200	PVC	SDR 35	0.32	18.9	**17.60%**	0.60	0.37
R19A, I19B, R19C	19	18	3.95	0	0	0	263	3.95	263	3.48	3.7	0.00	0.00	0.00	0.00	0.00	0.00	0.93	0.93	0.00	0.00	0.3	4.88	4.88	1.4	5.4	40.7	200	PVC	SDR 35	0.32	18.9	**28.44%**	0.60	0.43
R18A	18	14	1.23	20	0	0	68	8.24	504	3.38	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.93	0.00	0.00	0.3	1.23	9.17	2.6	9.8	203.5	200	PVC	SDR 35	0.32	18.9	**51.60%**	0.60	0.51
R17A	17	16	1.00	4	12	0	46	1.00	46	3.66	0.7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	1.00	1.00	0.3	1.0	127.4	200	PVC	SDR 35	0.32	18.9	**5.09%**	0.60	0.26
R16A	16	15	1.91	31	0	0	105	2.92	151	3.55	2.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	1.91	2.92	0.8	3.0	170.0	200	PVC	SDR 35	0.32	18.9	**15.84%**	0.60	0.36
R15A	15	14	0.50	4	0	0	14	3.42	165	3.54	2.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.50	3.42	1.0	3.3	138.0	200	PVC	SDR 35	0.32	18.9	**17.58%**	0.60	0.37
R22A	22	14	2.28	20	34	0	160	2.28	160	3.55	2.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	2.28	2.28	0.6	2.9	129.0	200	PVC	SDR 35	0.32	18.9	**15.51%**	0.60	0.36
	14	2	0.00	0	0	0	0	13.94	829	3.28	11.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.93	0.00	0.00	0.3	0.00	14.87	4.2	15.5	23.6	250	PVC	SDR 35	0.32	34.3	**45.12%**	0.69	0.57
R8A, R8B	8	7	2.59	9	13	48	152	2.59	152	3.55	2.2	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	2.61	2.61	0.7	2.9	74.0	200	PVC	SDR 35	0.32	18.9	**15.47%**	0.60	0.36
	7	6	0.00	0	0	0	0	2.59	152	3.55	2.2	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	2.61	0.7	2.9	55.5	200	PVC	SDR 35	0.32	18.9	**15.47%**	0.60	0.36
R9A	9	6	1.92	0	48	0	130	1.92	130	3.57	1.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	1.92	1.92	0.5	2.4	263.4	200	PVC	SDR 35	0.32	18.9	**12.74%**	0.60	0.34
R6A	6	5	3.42	10	78	0	245	7.92	526	3.37	7.2	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	3.42	7.94	2.2	9.4	156.0	200	PVC	SDR 35	0.32	18.9	**49.78%**	0.60	0.51
R4A	5	3	0.54	0	12	0	32	8.46	559	3.36	7.6	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.54	8.48	2.4	10.0	137.9	200	PVC	SDR 35	0.32	18.9	**52.79%**	0.60	0.52
R12A	12	11	0.20	0	0	0	0	0.20	0	3.80	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.20	0.20	0.1	0.1	55.4	200	PVC	SDR 35	0.32	18.9	**0.29%**	0.60	0.11
R11A, L11A	11	10	0.79	10	0	0	34	0.99	34	3.68	0.5	0.00	0.00	7.32	7.32	0.00	0.00	0.00	0.00	0.00	0.00	8.0	8.11	8.31	2.3	10.8	166.0	200	PVC	SDR 35	0.32	18.9	**57.28%**	0.60	0.53
R13A	13	10	0.59	7	0	0	24	0.59	24	3.70	0.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.59	0.59	0.2	0.5	134.0	200	PVC	SDR 35	0.32	18.9	**2.76%**	0.60	0.22
R10A	10	3	1.97	34	0	0	116	3.55	173	3.54	2.5	0.00	0.00	0.00	7.32	0.00	0.00	0.00	0.00	0.00	0.00	8.0	1.97	10.87	3.0	13.5	165.6	200	PVC	SDR 35	0.32	18.9	**71.53%**	0.60	0.57
R3A	3	2	1.07	7	12	0	56	13.08	788	3.29	10.5	0.00	0.02	0.00	7.32	0.00	0.00	0.00	0.00	0.00	0.00	8.0	1.07	20.42	5.7	24.2	148.2	300	PVC	SDR 35	0.24	47.0	**51.54%**	0.67	0.58
POND	2	1	0.00	0	0	0	0	27.02	1617	3.12	20.5	0.00	0.02	0.00	7.32	0.00	0.00	0.00	0.93	0.00	0.00	8.5	1.95	37.24	10.4	39.4	14.4	375	PVC	SDR 35	0.20	72.6	**54.22%**	0.69	0.60
			27.02	179	244	48	1617																					375							

1. The population estimate for the Mill Valley Living (Sanitary Drainage Area ID# R19C) has been increased due to potential future increases in number of units. A 15% unit contingency has been provided and has been accounted for in the overall demand.
2. Clubhouse (Sanitary Drainage Area ID # R8B) is assigned the commercial sewage generation rate of 28,000 L/ha/day for the building footprint area .

B.2 BACKGROUND REPORT EXCERPTS – WASTEWATER SERVICING

Table 24: Raw Sewage Bypasses at Gemmill's Bay SPS (2012 to Present)

Year	Number of Events	Total Duration (h)
2012	2	7.8
2013	1	3.0
2014	2	23.1
2015	1	1.5
2016	0	0.0
2017 (to Oct. 30)	8	155.3

It is also noted for reference that tertiary filtration bypasses have recently occurred at the WWTP in 2016 and 2017 (since its construction in 2012). The majority of these events were generally noted as being due to heavy precipitation events, mostly during 2017, a particularly wet year.

5.3 Wastewater System Design Criteria

Table 25 provides a summary of the residential wastewater generation rates to be used to assess and size the Municipality’s wastewater system. It is noted that the existing residential wastewater flow generation values were determined by a flow monitoring program conducted by the Municipality in the spring of 2011 at seven various locations throughout the wastewater system.

Table 25: Design Criteria - Wastewater Flow Generation

Parameter	Average Day Dry Weather Flow	Dry Weather Peaking Factor	Baseline Infiltration	Wet Weather Extraneous Flow	Wet Weather Peaking Factor
Existing Residential	200L/cap/day	1.5	0.1L/s/ha	0.15L/s/ha	4
Parameter	**Average Day Flow**	**Extraneous Flow**	**Peaking Factor**		
Future Residential	350L/cap/day	0.28L/s/ha	Varies based on Harmon Peaking Factor		
Existing and Future Industrial	35,000L/ha/day	0.28L/s/ha	2.7		
Existing and Future Institutional and Commercial	28,000L/ha/day	0.28L/s/ha	1.5		

The wet weather peaking factor was increased from a factor 3 used in the 2012 Master Plan to a factor of 4 in the Master Plan update, based on the April 2014 wet weather event. Bypass flow was observed at the Gemmill’s Bay SPS during the April 2014 event, but no data is available on peak bypass flow rate or volume. The unaccounted for bypass flow could result in a further increase to the wet weather peaking factor. However, any estimated bypass flow rate uniformly attributed to the entire wastewater collection system could generate unrealistic peak flow conditions requiring extensive and potentially unwarranted capacity upgrades. Based on

Table 34: Opinion of Probable Costs Long-Term Wastewater Collection

Option	Diameter (mm)	Length (m)	Rate ($/m)(1)	Engineering and Contingency (27%)	Rounded Total(2)
Union Street (from 225mm to 300mm to match existing)	300	145	$1,060	$41,000	$195,000

1. Rates based on City of Ottawa 2015 Unit Rates for sewers, restoration of road (granulars, base and wear) and curb, and other past experience.
2. Rounded to the nearest $5,000.

5.8.4 Build-Out: Wastewater Collection

Based on a review of development impacts on the wastewater collection system, the following build-out upgrades were identified:

- Martin Street South, from Ottawa Street to Queen Street: This upgrade will service build-out areas 1 and 2.
- Martin Street North, from Victoria Street to Ottawa Street: This upgrade will service build-out areas 1 and 2.

The opinion of probable costs associated with the build-out wastewater collection servicing strategy is summarized in Table 35.

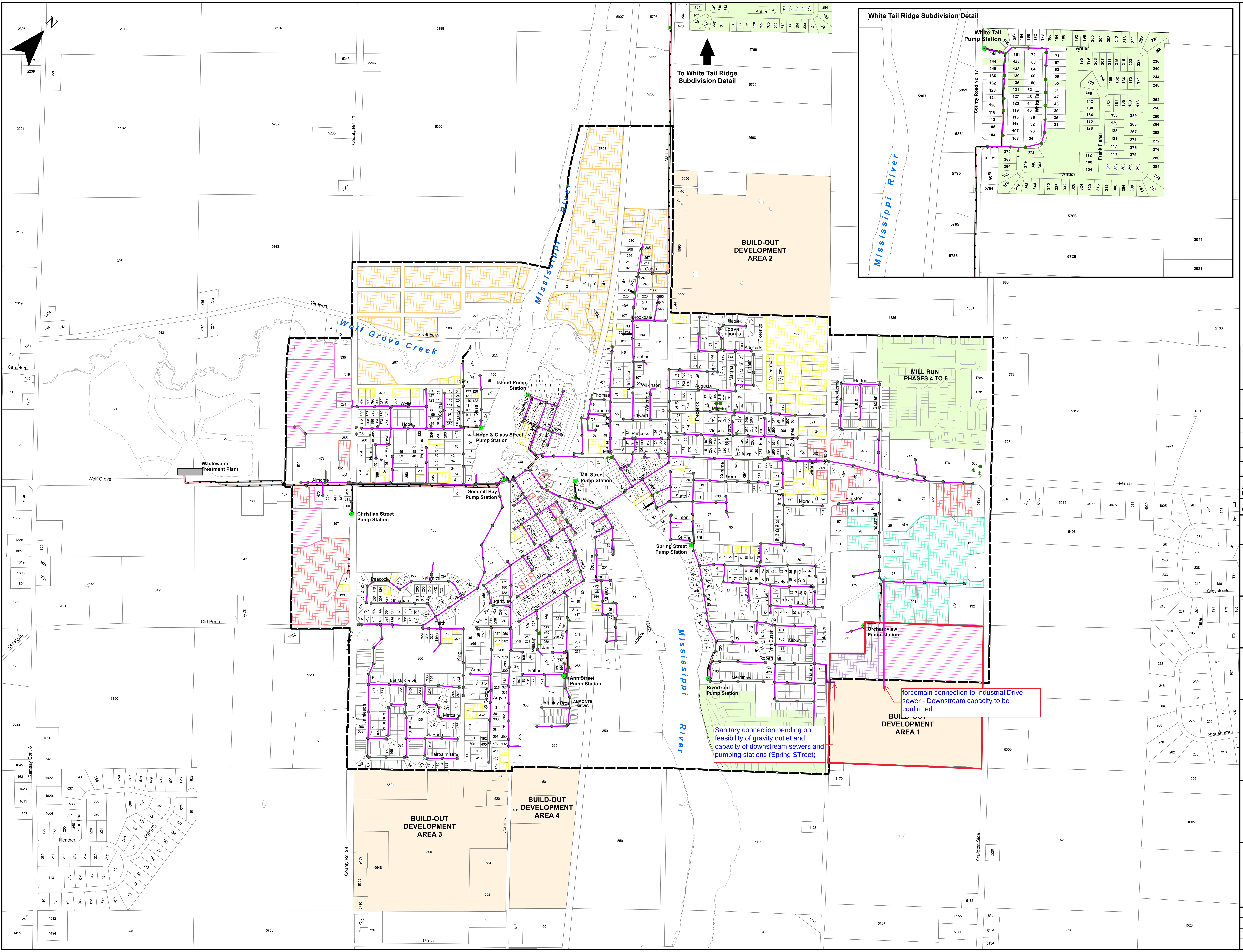
Table 35: Opinion of Probable Costs Build-Out Wastewater Collection

Option	Diameter (mm)	Length (m)	Rate ($/m)(1)	Engineering and Contingency (27%)	Rounded Total(2)
Martin Street South, from Ottawa Street to Queen Street	525	27	$1,660	$12,000	$55,000
Martin Street North, from Victoria Street to Ottawa Street	450	85	$1,630	$37,000	$175,000

1. Rates based on City of Ottawa 2015 Unit Rates for sewers, restoration of road (granulars, base and wear) and curb, estimated traffic control for Ottawa Street and Queen Street detours and other past experience.
2. Rounded to the nearest $5,000.

5.9 Summary of Wastewater Servicing Strategies

A summary of the wastewater treatment, pumping and collection servicing strategies, and opinion of probable costs are presented in Table 36 and Figure 24. Figure 25 was also developed to assist the Municipality in understanding demand allocations for the future servicing strategies and illustrated whether the wastewater flows were modelled under a pumped or gravity scenario.



forcemain connection to Industrial Drive sewer - Downstream capacity to be confirmed

Sanitary connection pending on feasibility of gravity outlet and capacity of downstream sewers and pumping stations (Spring STreet)

Infrastructure

4-102	Manhole ID
●	Pumping Station
✱	Cleanout
●	Sanitary Manhole
—	Saniatry Sewer
—	Private Forecmain
—	Forcemain

Land Use

▭	Almonte Ward Limits
☐	Existing Lots
☐	Future Lots
🟩	Registered Subdivision
☐	Build Out
▨	Business Park (17.0 ha)
▨	Community Facility (3.1 ha)
▨	Commercial (15.6 ha)
▨	Industrial (24.1 ha)
▨	Residential - Geenfield (34.2 ha)
▨	Residential - Infill (16.0 ha)

No.	ISSUE / REVISION	DD/MM/YY

VERIFY SHEET SIZE AND SCALES. BAR TO THE RIGHT IS 25mm IF THIS IS A FULL SIZE DRAWING. 0 25mm

SCALE:

0 50 100 200 300 400 Meters

CLIENT:

CONSULTANT:

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS
www.jlrichards.ca

CONSULTANT:

PROFESSIONAL STAMP

PROFESSIONAL STAMP

PROJECT:

MUNICIPALITY OF MISSISSIPPI MILLS ALMONTE WARD WATER AND WASTEWATER INFRASTRUCTURE MASTER PLAN UPDATE

MISSISSIPPI MILLS, ONTARIO

DRAWING:

WASTEWATER SYSTEM

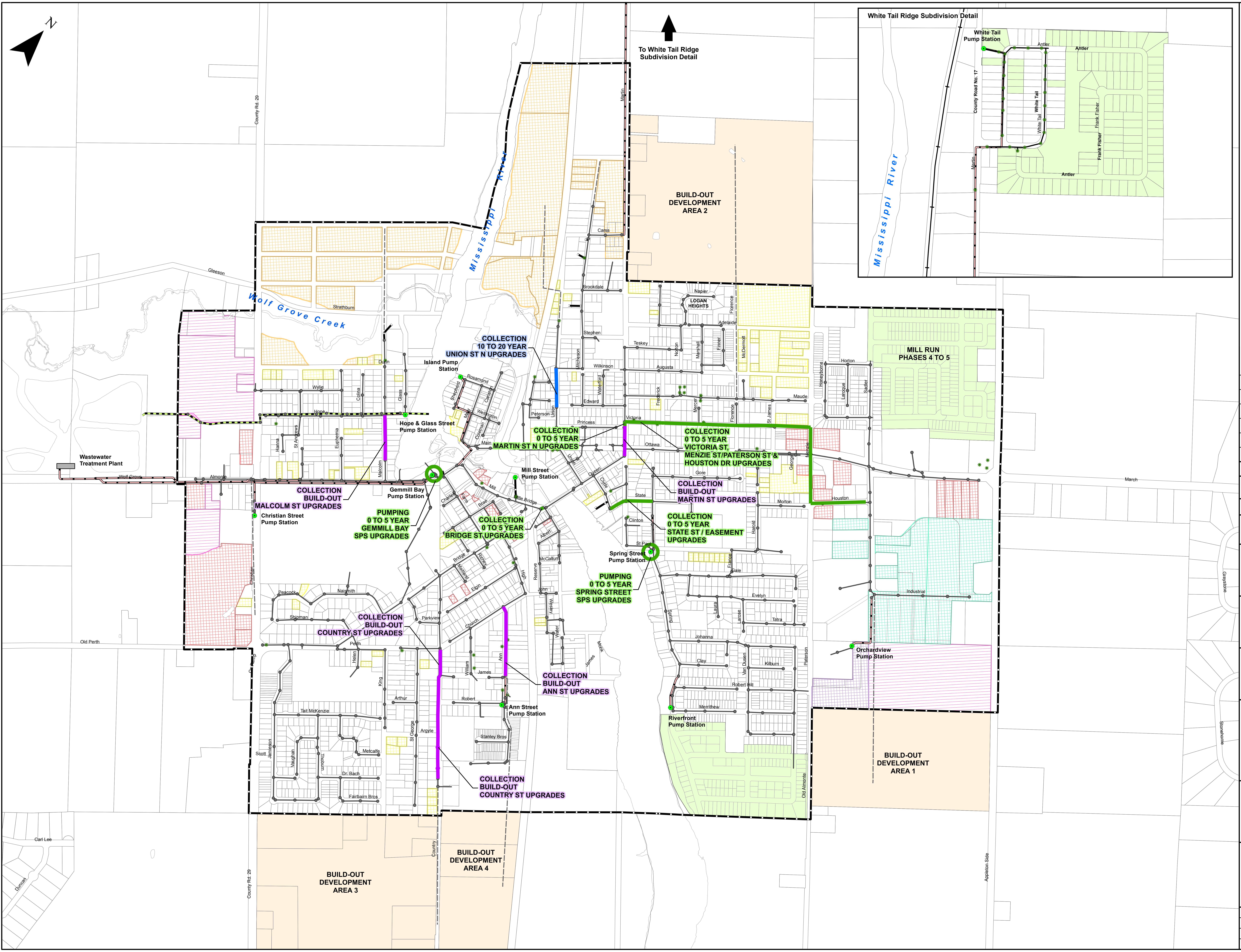
DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #:

FIGURE 18

PLOT DATE: January 5, 2018 10:04:36 AM

File: R:\27000\27456-01 Mississippi Mills - Master Plan Update\JLR DWG\Plan\27456-01 WW_System.mxd



Sanitary Sewer Upgrades

- 🟩 0 to 5 Years
- 🟦 10 to 20 Years
- 🟪 Build-out
- – – – Future Servicing

Infrastructure

- ● Pumping Station
- ✱ Cleanout
- ● Sanitary Manhole
- ▬ Lagoon Outfall
- ― Saniatry Sewer
- ▬ Private Forecmain
- ▬ Forcemain

Land Use

- ▬ Almonte Ward Limits
- ☐ Existing Lots
- ☐ Future Lots
- 🟩 Registered Subdivision
- ☐ Build Out
- ▨ Business Park (17.0 ha)
- ▨ Community Facility (3.1 ha)
- ▨ Commercial (15.6 ha)
- ▨ Industrial (24.1 ha)
- ▨ Residential - Geenfield (34.2 ha)
- ▨ Residential - Infill (16.0 ha)

No.	ISSUE / REVISION	DD/MM/YY

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0 25mm

SCALE:

0 50 100 200 300 400 Meters

CLIENT:

PERGAMUS UNA

CONSULTANT:

J.L.Richards
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CONSULTANT:

PROFESSIONAL STAMP

PROFESSIONAL STAMP

PROJECT:

MUNICIPALITY OF MISSISSIPPI MILLS ALMONTE WARD WATER AND WASTEWATER INFRASTRUCTURE MASTER PLAN UPDATE

MISSISSIPPI MILLS, ONTARIO

DRAWING:

ALMONTE WARD WASTEWATER SERVICING STRATEGIES

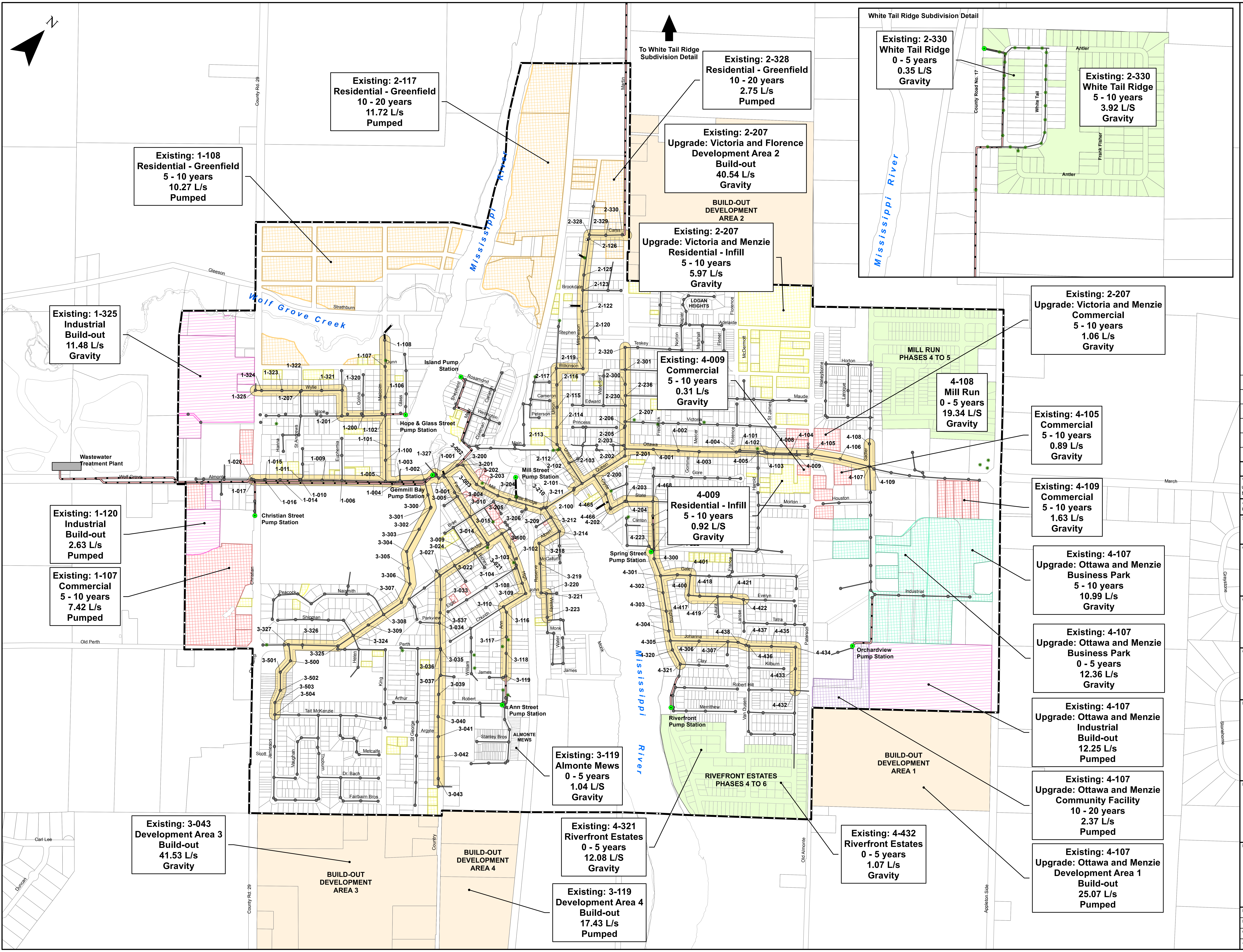
DESIGN: **MB**
DRAWN: **KTK**
CHECKED: **SG**
JLR #: **27456-01**

DRAWING #:

FIGURE 24

PLOT DATE: January 5, 2018 10:29:59 AM

File: R:\27000\27456-01 Mississippi Mills - Master Plan Update\JLR DWG\Plan\27456-01 AlmonteGrowth_Sanitary_Upgrade.mxd



Infrastructure

- **4-102** Manhole ID
- ● Pumping Station
- ✱ Cleanout
- ● Sanitary Manhole
- Saniatry Sewer
- Private Forecmain
- Forcemain
- Sanitary Trunk Sewers

Land Use

- Almonte Ward Limits
- Existing Lots
- Future Lots
- Registered Subdivision
- Build Out
- Business Park (17.0 ha)
- Community Facility (3.1 ha)
- Commercial (15.6 ha)
- Industrial (24.1 ha)
- Residential - Geenfield (34.2 ha)
- Residential - Infill (16.0 ha)

Existing: 4-109	- Manhole ID
Upgrade : Ottawa and Menzie	- Intersection
Commercial	- Development Name or Type
5 - 10 years	- Development Timeline
1.63 L/s	- Estimated Park Flow
Gravity	- Anticipated Future Trunk Servicing

No.	ISSUE / REVISION	DD/MM/YY

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SCALE: 0 50 100 200 300 400 Meters

CLIENT:

CONSULTANT:

J.L.Richards
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CONSULTANT:

PROFESSIONAL STAMP

PROFESSIONAL STAMP

PROJECT:

MUNICIPALITY OF MISSISSIPPI MILLS ALMONTE WARD WATER AND WASTEWATER INFRASTRUCTURE MASTER PLAN UPDATE

MISSISSIPPI MILLS, ONTARIO

DRAWING:

WASTEWATER HYDRAULIC MODEL DEMAND ALLOCATION

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #:

FIGURE 25

PLOT DATE: January 5, 2018 10:32:24 AM

File: R:\27000\27456-01 Mississippi Mills - Master Plan Update\JLR DWG\Plan\27456-01 SimplifiedModel.mxd

Peak Hourly Demand (L/s)	1.52	2.90
FUS Fire Flow Requirement (L/min)	5,000	11,000

Boundary Conditions have been requested however were not available at the time of submission. Once boundary conditions are obtained, the subject property will be hydraulically modelled using WaterCAD to confirm the system has adequate capacity for the proposed development and the required fire flows can be met.

To confirm the adequacy of fire flow to protect the proposed development, public and private fire hydrants within 150 m of the proposed building were analysed per City of Ottawa ISTB 2018-02 Appendix I Table 1. The results are demonstrated below.

Table 2: Fire Protection Confirmation

Building	Fire Flow Demand (L/min.)	Fire Hydrant(s) within 75m	Fire Hydrant(s) within 150m	Combined Fire Flow (L/min.)
Proposed Site	16,000	3	2	24,700

4.0 SANITARY DESIGN

4.1 Existing Sanitary Sewer

There is an existing 300mm diameter PVC sanitary main within Industrial Drive. The 26.0m wide right-of-way section of Gerry Emon Road has an existing 50mm diameter sanitary forcemain within. The forcemain services the existing Orchard View by the Mississippi retirement community.

4.2 Proposed Sanitary Sewer

A new 300 mm diameter gravity sanitary sewer will be connected to the existing 300 mm diameter sanitary sewer within Industrial Drive and will be extended along Gerry Emon Road.

The private road will be serviced by a 200mm diameter sewer, while the proposed apartment building will be services by a 150mm diameter service designed with a minimum full flow target velocity (cleansing velocity) of 0.6 m/s and a full flow velocity of not more than 3.0 m/s. This may not be feasible on every length of pipe, as the capture area for the uppermost mains in the system is relatively small. This issue has been dealt with by increasing the slopes of the sanitary sewers on the uppermost mains. Design parameters for the site include an infiltration rate of 0.33 L/s/Ha.

See the Sanitary Sewer Design Sheet and Sanitary Drainage Area Plan in Appendix ‘C’ of this report for more details.

SANITARY SEWER DESIGN SHEET

PROJECT: Mill Valley Retirement Community
LOCATION: Almonte, ON
CLIENT: Houchaimi Holdings Inc.

MCINTOSH PERRY

LOCATION				RESIDENTIAL									ICI AREAS							INFILTRATION ALLOWANCE			FLOW	SEWER DATA								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	30	31
STREET	AREA ID	FROM MH	TO MH	UNIT TYPES				AREA (ha)	POPULATION		PEAK FACTOR	PEAK FLOW (L/s)	AREA (ha)						PEAK FLOW (L/s)	AREA (ha)		FLOW (L/s)	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	DIA (mm)	SLOPE (%)	VELOCITY (full) (m/s)	FLOW DEPTH (mm)	VELOCITY (actual) (m/s)	AVAILABLE CAPACITY	
				SF	SD	TH	APT		IND	CUM			INSTITUTIONAL		COMMERCIAL		INDUSTRIAL			IND	CUM										L/s	(%)
													IND	CUM	IND	CUM	IND	CUM														
GERRY EMON RD.	FUTURE SUBDIVISION		17A						0.0	0.0	4.00	0.00		0.00		0.00		0.00	0.00	0.00	0.00	0.00	0.00									
	17	17A	16A		2	1		0.19	8.1	8.1	4.00	0.11		0.00		0.00		0.00	0.00	0.19	0.19	0.06	0.17	45.12	41.00	300	0.20	0.618	14.3	0.148	44.95	99.63
BLOCK 1	23a	23A	24A			4		0.25	10.8	10.8	4.00	0.14		0.00		0.00		0.00	0.00	0.25	0.25	0.08	0.22	27.59	12.30	200	0.65	0.851	13.7	0.258	27.36	99.19
	24	24A	16A			8		0.37	21.6	32.4	4.00	0.42		0.00		0.00		0.00	0.00	0.37	0.62	0.20	0.62	27.59	95.60	200	0.65	0.851	22.3	0.353	26.96	97.74
GERRY EMON RD.	16	16A	15A			9		0.43	24.3	64.8	4.00	0.84		0.00		0.00		0.00	0.00	0.43	1.05	0.35	1.19	45.12	82.20	300	0.20	0.618	35.9	0.269	43.93	97.37
	BLD	BUILDING	15A				48	1.26	110.4	110.4	4.00	1.43		0.00		0.00		0.00	0.00	1.26	1.26	0.42	1.85	15.89	44.66	150	1.00	0.871	36.1	0.589	14.04	88.38
	15	15A	14A			6		0.30	16.2	191.4	4.00	2.48		0.00		0.00		0.00	0.00	0.30	2.61	0.86	3.34	45.12	57.70	300	0.20	0.618	58.3	0.367	41.77	92.59
BLOCK 1	23b	23A	22A			10		0.40	27.0	27.0	4.00	0.35		0.00		0.00		0.00	0.00	0.40	0.40	0.13	0.48	27.59	88.45	200	0.65	0.851	19.8	0.326	27.10	98.25
	22	22A	21A			4		0.21	10.8	37.8	4.00	0.49		0.00		0.00		0.00	0.00	0.21	0.61	0.20	0.69	20.24	42.75	200	0.35	0.624	27.1	0.294	19.55	96.58
		21A	14A						0.0	37.8	4.00	0.49		0.00		0.00		0.00	0.00	0.00	0.61	0.20	0.69	20.24	102.40	200	0.35	0.624	27.1	0.294	19.55	96.58
GERRY EMON RD.	14	14A	13A					0.00	0.0	229.2	4.00	2.97		0.00		0.00		0.00	0.00	0.30	3.52	1.16	4.13	45.12	39.90	300	0.20	0.618	64.4	0.390	40.98	90.84
	13	13A	12A					0.00	0.0	229.2	4.00	2.97		0.00		0.00		0.00	0.00	0.17	3.69	1.22	4.19	45.12	66.00	300	0.20	0.618	64.8	0.392	40.93	90.72
	12	12A	11A					0.00	0.0	229.2	4.00	2.97		0.00		0.00		0.00	0.00	0.17	3.86	1.27	4.24	45.12	66.00	300	0.20	0.618	65.2	0.393	40.87	90.59
	11	11A	10A					0.00	0.0	229.2	4.00	2.97		0.00		0.00		0.00	0.00	0.03	3.89	1.28	4.25	45.12	16.70	300	0.20	0.618	65.3	0.394	40.86	90.57

Design Parameters:

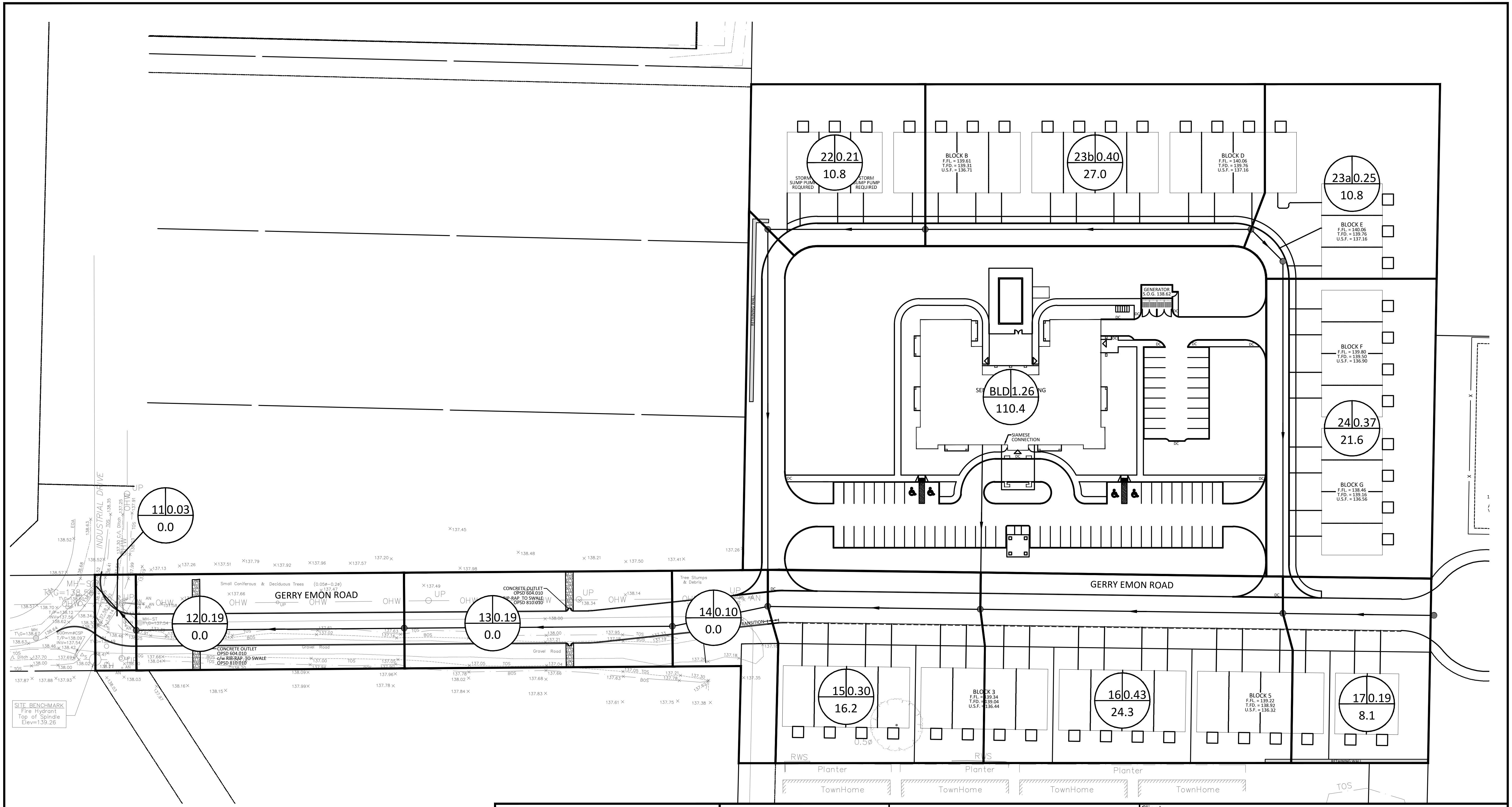
Residential			ICI Areas			Peak Factor
SF	3.4	p/p/u				
TH/SD	2.7	p/p/u	INST	28,000	L/Ha/day	1.5
APT	2.3	p/p/u	COM	28,000	L/Ha/day	1.5
Other	60	p/p/Ha	IND	35,000	L/Ha/day	MOE Chart

Notes:
1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 280 L/day
3. Infiltration allowance: 0.33 L/s/Ha
4. Residential Peaking Factor:
Harmon Formula = 1+(14/(4+P^0.5)*0.8)
where P = population in thousands

Designed: P.G.K.
Checked: R.P.K.
Project No.: CCO-20-0034

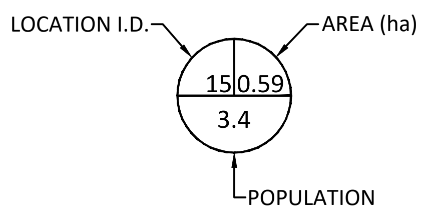
No.	Revision	Date
1.	ISSUED FOR MUNICIPAL REVIEW	JUL. 28, 2021
2.	REVISED PER MUNICIPAL COMMENTS	DEC. 10, 2021
3.	REVISED PER MUNICIPAL COMMENTS	FEB. 11, 2022

Sheet No:
1 of 1



SCALE 1 : 1000

0 25 50 75 100 Metres



McINTOSH PERRY

115 Walgreen Road, RR3, Carp, ON K0A 1L0
Tel: 613-836-2184 Fax: 613-836-3742
www.mcintoshperry.com

Client:

HOUCHAIMI HOLDINGS INC.
21 HAMPEL CRES. STITTSVILLEM ON K2S 1E4

Project:

MILL VALLEY RETIREMENT COMMUNITY
GERRY EMON ROAD

Drawing Title:

SANITARY DRAINAGE AREA PLAN

Drawn by:	Checked By:
P.G.K.	R.P.K.
Scale:	Project Number:
1:1000	CCO-20-0034

No.	Revisions	Date

Drawing Number:

SAN

FILENAME: U:\Ottawa\01 Project - Proposals\2020 Jobs\CCO\CCO-20-0034 Houchaimi Holdings - Seniors' Residence\Drawings\CCO-20-0034_Presentation.dwg
LAST SAVED: Thursday, December 09, 2021 LAST SAVED BY: p.kirkimtzis
LAST PLOTTED: Friday, December 10, 2021 CTB FILE USED: ----

B.3 RESIDUAL SANITARY SEWER CAPACITY – CORRESPONDENCE WITH THE MUNICIPALITY OF MISSISSIPPI OF MILLS

From: Mott, Peter
To: dshen@mississippimills.ca
Cc: Paerez, Ana; Kilborn, Kris
Subject: RE: Mill Valley Estates (Houchimi) - Sanitary Sewer Capacity
Date: Wednesday, November 23, 2022 11:14:00 AM
Attachments: san 2022-11-16 waj.pdf
5 160401740-SA - OSA-1.pdf

Hello David – Per Corey's request, could you please review the below request and provide comment. If you have any questions regarding the request, please feel free to reach out.

Best,

Peter Mott EIT
Engineering Intern, Community Development

Mobile: +1 (613) 897-0445
Teams: +1 (613) 724-4370
Peter.Mott@stantec.com
Stantec
300 - 1331 Clyde Avenue
Ottawa ON K2C 3G4

From: Mott, Peter
Sent: Friday, November 11, 2022 1:19 PM
To: csmith@mississippimills.ca
Cc: Paerez, Ana <Ana.Paerez@stantec.com>; Kilborn, Kris <kris.kilborn@stantec.com>
Subject: Mill Valley Estates (Houchimi) - Sanitary Sewer Capacity

Hello Corey,

For the servicing of the Mill Valley Estates development, Stantec is proposing a sanitary forcemain connection to the existing 300 mm diameter sanitary sewer within Industrial Drive. Could you please advise on the capacity of the accepting sanitary sewer?

The estimated population for the site, accounting for the Mill Valley Living population in our sewage generation estimates, is expected to generate peak flows of approximately 39.7 L/s. I have attached our conceptual sewer design sheet and conceptual sanitary drainage plan for reference.

Please let us know of any capacity constraints based on the proposed concept and if you have any questions let us know.

Peter Mott EIT
Engineering Intern, Community Development

Mobile: +1 (343) 999-8172
Peter.Mott@stantec.com
Stantec
400 - 1331 Clyde Avenue

Ottawa ON K2C 3G4

Appendix C STORMWATER MANAGEMENT

C.1 STORM SEWER DESIGN SHEET

Stantec

Mill Valley Estates

DATE: 2022-11-28
REVISION: 1
DESIGNED BY: WAJ
CHECKED BY: AMP

STORM SEWER
DESIGN SHEET
(City of Ottawa)

FILE NUMBER: 160401740

DESIGN PARAMETERS

$I = a / (t+b)^c$ (As per City of Ottawa Guidelines, 2012)

	1:2 yr	1:5 yr	1:10 yr	1:100 yr
a =	732.951	998.071	1174.184	1735.688
b =	6.199	6.053	6.014	6.014
c =	0.810	0.814	0.816	0.820

MANNING'S n = 0.013
BEDDING CLASS = B
MINIMUM COVER: 2.00 m
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)	$I_{2\text{-YEAR}}$ (mm/h)	$I_{5\text{-YEAR}}$ (mm/h)	$I_{10\text{-YEAR}}$ (mm/h)	$I_{100\text{-YEAR}}$ (mm/h)	$Q_{CONTROL}$ (L/s)	ACCUM. $Q_{CONTROL}$ (L/s)	Q_{ACT} (CIA/360) (L/s)	LENGTH (m)	PIPE WIDTH OR DIAMETEI (mm)	PIPE HEIGHT (mm)	PIPE SHAPE (-)	MATERIAL (-)	CLASS (-)	SLOPE %	Q_{CAP} (FULL) (L/s)	% FULL (-)	VEL. (FULL) (m/s)	VEL. (ACT) (m/s)	TIME OF FLOW (min)
Bypass Inlet	101	100B	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	19.015	0.000	0.000	0.000	0.000	23.52	46.98	63.36	74.12	108.09	0.0	0.0	3346.7	22.8	1950	1950	CIRCULAR	CONCRETE	-	0.10	4694.4	**71.29%**	1.52	1.45	0.26
	100B	100A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	19.015	0.000	0.000	0.000	0.000	23.79	46.64	62.91	73.58	107.30	0.0	0.0	3322.7	39.6	1950	1950	CIRCULAR	CONCRETE	-	0.10	4694.4	**70.78%**	1.52	1.45	0.46
																				24.24									1950	1950									
C108A, C108B	108	107	0.00	2.46	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.000	0.000	1.723	1.723	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	498.7	78.2	900	900	CIRCULAR	CONCRETE	-	0.10	597.2	**83.51%**	0.91	0.91	1.44
	107	106	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	1.723	0.000	0.000	0.000	0.000	11.44	71.69	97.16	113.86	166.39	0.0	0.0	465.1	55.5	900	900	CIRCULAR	CONCRETE	-	0.10	597.3	**77.86%**	0.91	0.89	1.04
																				12.48																			
C109A	109	106	0.00	1.66	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.000	0.000	1.164	1.164	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	336.9	266.0	825	825	CIRCULAR	CONCRETE	-	0.10	473.5	**71.14%**	0.86	0.81	5.44
																				15.44																			
C106A	106	105	0.00	3.47	0.00	0.00	0.00	0.00	0.65	0.00	0.00	0.000	0.000	2.255	5.142	0.000	0.000	0.000	0.000	15.44	60.74	82.16	96.20	140.47	0.0	0.0	1173.4	172.0	1350	1350	CIRCULAR	CONCRETE	-	0.10	1760.8	**66.64%**	1.19	1.11	2.59
C105A	105	104	0.00	0.81	0.00	0.00	0.00	0.00	0.65	0.00	0.00	0.000	0.000	0.528	5.670	0.000	0.000	0.000	0.000	18.03	55.43	74.89	87.67	127.95	0.0	0.0	1179.6	144.0	1350	1350	CIRCULAR	CONCRETE	-	0.10	1760.8	**66.99%**	1.19	1.12	2.15
																				20.18																			
C112A	112	111	0.00	0.19	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.000	0.000	0.134	0.134	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	38.9	49.8	300	300	CIRCULAR	CONCRETE	-	0.40	60.8	**63.94%**	0.86	0.80	1.04
C111A, C111B	111	110	0.00	1.05	0.00	0.00	0.00	0.00	0.61	0.00	0.00	0.000	0.000	0.639	0.773	0.000	0.000	0.000	0.000	11.04	73.02	98.99	116.02	169.56	0.0	0.0	212.6	172.0	675	675	CIRCULAR	CONCRETE	-	0.10	277.3	**76.66%**	0.75	0.73	3.92
																				14.96																			
C113A	113	110	0.00	0.46	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.000	0.000	0.320	0.320	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	92.6	130.3	450	450	CIRCULAR	CONCRETE	-	0.20	133.0	**69.64%**	0.81	0.76	2.84
																				12.84																			
C110A	110	104	0.00	1.79	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.000	0.000	1.256	2.349	0.000	0.000	0.000	0.000	14.96	61.85	83.68	97.99	143.10	0.0	0.0	546.1	165.6	975	975	CIRCULAR	CONCRETE	-	0.10	739.3	**73.86%**	0.96	0.92	2.99
																				17.95																			
C104A	104	103	0.00	1.16	0.00	0.00	0.00	0.00	0.65	0.00	0.00	0.000	0.000	0.756	8.775	0.000	0.000	0.000	0.000	20.18	51.74	69.86	81.75	119.27	0.0	0.0	1702.8	165.8	1500	1500	CIRCULAR	CONCRETE	-	0.10	2331.9	**73.02%**	1.28	1.22	2.26
																				22.44																			
C122A	122	121	0.00	1.37	0.00	0.00	0.00	0.00	0.65	0.00	0.00	0.000	0.000	0.893	0.893	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	258.4	190.6	750	750	CIRCULAR	CONCRETE	-	0.10	367.3	**70.36%**	0.81	0.76	4.16
C121A	121	119	0.00	1.18	0.00	0.00	0.00	0.00	0.65	0.00	0.00	0.000	0.000	0.769	1.662	0.000	0.000	0.000	0.000	14.16	63.83	86.39	101.18	147.78	0.0	0.0	398.8	176.0	825	825	CIRCULAR	CONCRETE	-	0.10	473.5	**84.22%**	0.86	0.86	3.41
																				17.57																			
C120A, C120B, C120C	120	119	0.00	4.88	0.00	0.00	0.00	0.00	0.66	0.00	0.00	0.000	0.000	3.234	3.234	0.000	0.000	0.000	0.000	17.24	56.94	76.96	90.09	131.51	0.0	0.0	691.3	37.0	1050	1050	CIRCULAR	CONCRETE	-	0.10	901.0	**76.73%**	1.01	0.98	0.63
																				17.87																			
C119A	119	103	0.00	1.99	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.000	0.000	1.392	6.288	0.000	0.000	0.000	0.000	17.87	55.73	75.31	88.15	128.66	0.0	0.0	1315.3	203.5	1350	1350	CIRCULAR	CONCRETE	-	0.10	1760.9	**74.70%**	1.19	1.15	2.94
																				20.81																			
C123A	123	103	0.00	1.75	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.000	0.000	1.226	1.226	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	354.9	129.5	825	825	CIRCULAR	CONCRETE	-	0.10	473.6	**74.94%**	0.86	0.83	2.60
																				12.60																			
C103A	103	102	0.00	1.32	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.000	0.000	0.922	17.211	0.000	0.000	0.000	0.000	22.44	48.41	65.31	76.40	111.44	0.0	0.0	3122.2	91.4	1800	1800	CIRCULAR	CONCRETE	-	0.10	3701.7	**84.35%**	1.41	1.41	1.08
																				23.52																			
C118A	118	117	0.00	0.87	0.00	0.00	0.00	0.00	0.65	0.00	0.00	0.000	0.000	0.565	0.565	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	163.5	129.2	525	525	CIRCULAR	CONCRETE	-	0.20	200.6	**81.50%**	0.90	0.89	2.42
C117A	117	115	0.00	1.91	0.00	0.00	0.00	0.00	0.65	0.00	0.00	0.000	0.000	1.239	1.804	0.000	0.000	0.000	0.000	12.42	68.61	92.94	108.89	159.10	0.0	0.0	465.8	176.0	900	900	CIRCULAR	CONCRETE	-	0.10	597.2	**77.99%**	0.91	0.89	3.29
	115	102	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	1.804	0.000	0.000	0.000	0.000	15.71	60.13	81.32	95.22	139.04	0.0	0.0	407.6	52.6	900	900	CIRCULAR	CONCRETE	-	0.10	597.2	**68.24%**	0.91	0.85	1.03
																				16.74																			
Forebay Inlet	102	101	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	19.015	0.000	0.000	0.000	0.000	23.52	46.98	63.36	74.12	108.09	0.0	0.0	3346.7	10.3	1950	1950	CIRCULAR	CONCRETE	-	0.10	4788.4	**69.89%**	1.55	1.47	0.12
																				23.91									1950	1950									
SWM Pond Outlet	200	200A	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	1673.8	1673.8	1673.8	33.5	1050	1050	CIRCULAR	CONCRETE	-	0.62	2243.1	**74.62%**	2.51	2.43	0.23
																				10.23									1050	1050									

C.2 PRE-DEVELOPMENT: INPUT PARAMETER CALCULATIONS/ PCSWMM INPUT FILES

Pre-Development Site Conditions - CN Calculation

INPUT	OUTPUT

Land Use (%)									
Woodlots and Forest (ha)	Impervious Areas, Non-Paved and Improved Land (ha)	Pasture & Unimproved Land (ha)	Fallow (ha)	Bare Bedrock (ha)	Lakes and Wetlands (ha)	Total Area (Drainage) (ha)	**Weighted CN**	**Total Area (Drainage) (km^2)**	**Impervious (%)**
7.09	0.32	16.61	6.01	0	0.25	30.28	**78**	**0.3028**	**1.05680317**

Note: Areas were obtained from associated Google Earth file.

CN for Hydrologic Soil Type C						
Land Use	Woodlots and Forest	Impervious Areas (Non-Paved and Improved Land)	Pasture	Fallow	Bare Bedrock	Lakes and Wetlands
CN	71	82	76	91	70	50

Note: Values were obtained from MTO Drainage Management Manual Part 4, Chart 1.08 & 1.09.

Results from PCSWMM Model "160401740_pre_func-2022-11-17_amp"				
Rain Gage	CN	Impervious %	Peak Runoff (L/s)	Design Storm
12-hr SCS	78	1.05680317	**1673.768**	100-yr
24-hr SCS	78	1.05680317	1322.124	100-yr
12-hr SCS	78	1.05680317	545.662	5-yr
24-hr SCS	78	1.05680317	516.021	5-yr

```
  ALTERNATIVE RUNOFF METHOD (ARM) - PCSWMM VERSION 7.4.3240
  ---------------------------------------------------------

  This is a new version of ARM - your feedback and suggestions are solicited.
  Create a ticket, post on the PCSWMM feature request forum, or email us directly!

  Simulation start time:                  08/11/2022 00:00:00
  Simulation end time:                    08/13/2022 00:00:00
  Runoff wet weather time steps:          300 seconds
  Report time steps:                      60 seconds
  Number of data points:                  2881


  ******************************
  Unit Hydrographs Runoff Method
  ******************************


------------------------------------------------------------------------------------
-------------------------------------------------------------------------
                                                                      Area   Time of
Concentration  Time to Peak    Time after Peak    Peak UH Flow    UH Depth
  Subcatchment         Runoff Method             Raingage             (ha)   (min)
               (min)          (min)              (m³/s/mm)       (mm)

------------------------------------------------------------------------------------
-------------------------------------------------------------------------
  Pre-dev              Dimensionless UH (483.4)  100yr12hrSCS         30.28  83.93
               52.86          223.75             0.07152         1.001


  ******************
  ARM Runoff Summary
  ******************


------------------------------------------------------------------------------------
-------
                       Total       Total       Total       Total       Peak
Runoff
                       Precip      Losses      Runoff      Runoff      Runoff
Coeff
  Subcatchment         (mm)        (mm)        (mm)        10^6 ltr    LPS
(fraction)

------------------------------------------------------------------------------------
-------
  Pre-dev              96          51.937      44.055      13.34       1673.768
0.459
```

C.3 POST-DEVELOPMENT: INPUT PARAMETER CALCULATIONS/ PCSWMM INPUT FILES

Summary of Subcatchment Parameters - Proposed/Future Development Areas

Area ID	Area (ha)	Width (m)	Slope (%)	%IMP	Runoff Coefficient	Subarea Routing	% Routed		Minor System Capture (L/s)
C103A	1.32	460.00	2.0	71.4%	0.70	OUTLET	100	Residential	307.5
C104A	1.16	586.00	2.0	64.3%	0.65	OUTLET	100	Residential	258.9
C105A	0.81	277.00	2.0	64.3%	0.65	OUTLET	100	Residential	174.2
C106A	3.47	990.00	2.0	64.3%	0.65	OUTLET	100	Residential	731.5
C108A	1.24	667.00	2.0	64.3%	0.65	OUTLET	100	Residential	278.5
C108B	1.22	410.00	2.0	78.6%	0.75	OUTLET	100	Residential	306.1
C109A	1.66	806.00	2.0	71.4%	0.70	OUTLET	100	Residential	398.0
C110A	1.79	830.00	2.0	71.4%	0.70	OUTLET	100	Residential	428.0
C111A	0.57	250.90	2.0	71.4%	0.70	OUTLET	100	Residential	135.0
C111B	0.48	311.31	2.0	42.9%	0.50	OUTLET	100	Residential	84.4
C112A	0.19	99.00	2.0	71.4%	0.70	OUTLET	100	Residential	46.2
C113A	0.46	155.00	2.0	71.4%	0.70	OUTLET	100	Residential	106.5
C117A	1.91	814.00	2.0	64.3%	0.65	OUTLET	100	Residential	417.5
C118A	0.87	417.00	2.0	64.3%	0.65	OUTLET	100	Residential	192.6
C119A	1.99	742.00	2.0	71.4%	0.70	OUTLET	100	Residential	466.6
C120A	0.07	39.00	2.0	85.7%	0.80	OUTLET	100	Residential	19.3
C120B	0.93	209.00	4.5	42.9%	0.50	PERVIOUS	100	Park	119.5
C120C	3.88	873.00	2.0	71.4%	0.70	OUTLET	100	Fut-Retirement	877.2
C121A	1.18	360.00	2.0	64.3%	0.65	OUTLET	100	Residential	251.0
C122A	1.37	394.00	2.0	64.3%	0.65	OUTLET	100	Residential	289.8
C123A	1.75	570.00	2.0	71.4%	0.70	OUTLET	100	Residential	406.9
IND-1	6.84	N/A	0.0	0.0	0.20	N/A	N/A	Fut-Industrial	-
POND	1.95	439.00	1.0	57.1%	0.60	OUTLET	100	SWM-POND	353.1
UNC-1	0.11	55.00	2.0	71.4%	0.70	OUTLET	100	Residential	26.8
	37.23			**54.4%**	0.58				**6674.8**

30.28	ha - SWM Pond DA	**66.7%**	0.67
28.33	ha - Storm Sewer Area		
26.51	ha - Site	66.0%	0.66
136.92	ha - External Drainage	5.3%	0.24

```
[TITLE]
;;Project Title/Notes

[OPTIONS]
;;Option             Value
FLOW_UNITS           LPS
INFILTRATION         HORTON
FLOW_ROUTING         DYNWAVE
LINK_OFFSETS         ELEVATION
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           11/04/2022
START_TIME           00:00:00
REPORT_START_DATE    11/04/2022
REPORT_START_TIME    00:00:00
END_DATE             11/05/2022
END_TIME             00:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:01:00
WET_STEP             00:05:00
DRY_STEP             00:05:00
ROUTING_STEP         5
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0
LENGTHENING_STEP     0
MIN_SURFAREA         0
MAX_TRIALS           8
HEAD_TOLERANCE       0.0015
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              2

[FILES]
;;Interfacing Files
USE INFLOWS "C:\Users\apaerez\Documents\ana's\1604\Mill
Valley\PCSWMM\prelim\prop_site-base_100yr-3hrCHI_2022-11-24_amp.arm.txt"

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
CONSTANT         0.0
DRY_ONLY         NO
```

```
[RAINGAGES]
;;Name           Format    Interval SCF      Source    
;;-------------- --------- -------- -------- ----------
RG1              INTENSITY 0:10     1.0      TIMESERIES 100yr3hrChicago

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope
  CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- --------
-------- -------- ----------------
;0.70
C103A            RG1              C103A-S          1.316801 71.429   460      2
  0
;0.80
C104A            RG1              C104A-S          1.162557 64.286   586      2
  0
C105A            RG1              C105A-S          0.8126   64.286   277      2
  0
;0.65
C106A            RG1              C106A-S          3.468887 64.286   990      2
  0
;0.80
C108A            RG1              C108A-S          1.242566 64.286   667      2
  0
;0.80
C108B            RG1              C108B-S          1.220675 78.571   410      2
  0
;0.80
C109A            RG1              C109A-S          1.662717 71.429   806      2
  0
;0.80
C110A            RG1              C110A-S          1.794657 71.429   830      2
  0
;0.80
C111A            RG1              C111A-S          0.56791  71.429   250.9    2
  0
;0.80
C111B            RG1              C111B-S          0.482529 42.857   311.309  2
  0
;0.80
C112A            RG1              C112A-S          0.191915 71.429   99       2
  0
;0.80
C113A            RG1              C113A-S          0.457219 71.429   155      2
  0
;0.80
C117A            RG1              C117A-S          1.906343 64.286   814      2
  0
;0.80
C118A            RG1              C118A-S          0.869252 64.286   417      2
```

```
  0
;0.80
C119A            RG1              C119A-S          1.988317 71.429   742      2
  0
;0.80
C120A            RG1              C120A-S          0.071098 85.714   39       2
  0
;0.80
C120B            RG1              C120B-S          0.927937 42.857   209      4.5
  0
;0.70
C120C            RG1              C120C-S          3.875998 71.429   873      2
  0
;0.80
C121A            RG1              C121A-S          1.183475 64.286   360      2
  0
;0.80
C122A            RG1              C122A-S          1.37355  64.286   394      2
  0
;0.80
C123A            RG1              C123A-S          1.751765 71.429   570      2
  0
EXT_S1           RG1              J10              4.2583   40       958      0.6
  0
EXT_S10          RG1              J23              13.4877  7        3034.8   0.96
  0
EXT_S12          RG1              J13              2.0123   11       452      0.71
  0
EXT_S13          RG1              J26              4.9346   6        1109     0.75
  0
EXT_S17          RG1              J25              0.889    0        200      0.71
  0
EXT_S24          RG1              J50              4.0965   1        920      1.3
  0
EXT_S25          RG1              J50              2.5562   0        574      1.9
  0
EXT_S28          RG1              J4               0.3185   30       218      3
  0
EXT_S3_1         RG1              J2               3.816346 45       857      0.5
  0
EXT_S3_2         RG1              J10              6.967    25       112.371  0.5
  0
EXT_S4           RG1              J18              0.5587   30       374      3
  0
;0.60
POND             RG1              POND-S           1.948423 57.143   439      1
  0
;0.80
UNC-1            RG1              UNC-1-S          0.111763 71.429   55       2
  0
```

```
[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo
PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ----------
----------
C103A            0.013      0.25       1.57       4.67       0          OUTLET
C104A            0.013      0.25       1.57       4.67       0          OUTLET
C105A            0.013      0.25       1.57       4.67       0          OUTLET
C106A            0.013      0.25       1.57       4.67       0          OUTLET
C108A            0.013      0.25       1.57       4.67       0          OUTLET
C108B            0.013      0.25       1.57       4.67       0          OUTLET
C109A            0.013      0.25       1.57       4.67       0          OUTLET
C110A            0.013      0.25       1.57       4.67       0          OUTLET
C111A            0.013      0.25       1.57       4.67       0          OUTLET
C111B            0.013      0.25       1.57       4.67       0          OUTLET
C112A            0.013      0.25       1.57       4.67       0          OUTLET
C113A            0.013      0.25       1.57       4.67       0          OUTLET
C117A            0.013      0.25       1.57       4.67       0          OUTLET
C118A            0.013      0.25       1.57       4.67       0          OUTLET
C119A            0.013      0.25       1.57       4.67       0          OUTLET
C120A            0.013      0.25       1.57       4.67       0          OUTLET
C120B            0.013      0.25       1.57       4.67       0          PERVIOUS
100
C120C            0.013      0.25       1.57       4.67       0          OUTLET
C121A            0.013      0.25       1.57       4.67       0          OUTLET
C122A            0.013      0.25       1.57       4.67       0          OUTLET
C123A            0.013      0.25       1.57       4.67       0          OUTLET
EXT_S1           0.013      0.25       1.57       4.67       0          PERVIOUS
100
EXT_S10          0.013      0.25       1.57       4.67       0          PERVIOUS
100
EXT_S12          0.013      0.25       1.57       4.67       0          PERVIOUS
100
EXT_S13          0.013      0.25       1.57       4.67       0          PERVIOUS
100
EXT_S17          0.013      0.25       1.57       4.67       0          PERVIOUS
100
EXT_S24          0.013      0.25       1.57       4.67       0          PERVIOUS
100
EXT_S25          0.013      0.25       1.57       4.67       0          PERVIOUS
100
EXT_S28          0.013      0.25       1.57       4.67       0          PERVIOUS
100
EXT_S3_1         0.013      0.25       1.57       4.67       0          PERVIOUS
100
EXT_S3_2         0.013      0.25       1.57       4.67       0          PERVIOUS
100
EXT_S4           0.013      0.25       1.57       4.67       0          PERVIOUS
100
POND             0.013      0.25       1.57       4.67       0          OUTLET
UNC-1            0.013      0.25       1.57       4.67       0          OUTLET
```

```
[INFILTRATION]
;;Subcatchment   Param1     Param2     Param3     Param4     Param5
;;-------------- ---------- ---------- ---------- ---------- ----------
C103A            76.2       13.2       4.14       7          0
C104A            76.2       13.2       4.14       7          0
C105A            76.2       13.2       4.14       7          0
C106A            76.2       13.2       4.14       7          0
C108A            76.2       13.2       4.14       7          0
C108B            76.2       13.2       4.14       7          0
C109A            76.2       13.2       4.14       7          0
C110A            76.2       13.2       4.14       7          0
C111A            76.2       13.2       4.14       7          0
C111B            76.2       13.2       4.14       7          0
C112A            76.2       13.2       4.14       7          0
C113A            76.2       13.2       4.14       7          0
C117A            76.2       13.2       4.14       7          0
C118A            76.2       13.2       4.14       7          0
C119A            76.2       13.2       4.14       7          0
C120A            76.2       13.2       4.14       7          0
C120B            76.2       13.2       4.14       7          0
C120C            76.2       13.2       4.14       7          0
C121A            76.2       13.2       4.14       7          0
C122A            76.2       13.2       4.14       7          0
C123A            76.2       13.2       4.14       7          0
EXT_S1           76.2       13.2       4.14       7          0
EXT_S10          76.2       13.2       4.14       7          0
EXT_S12          76.2       13.2       4.14       7          0
EXT_S13          76.2       13.2       4.14       7          0
EXT_S17          76.2       13.2       4.14       7          0
EXT_S24          76.2       13.2       4.14       7          0
EXT_S25          76.2       13.2       4.14       7          0
EXT_S28          76.2       13.2       4.14       7          0
EXT_S3_1         76.2       13.2       4.14       7          0
EXT_S3_2         76.2       13.2       4.14       7          0
EXT_S4           76.2       13.2       4.14       7          0
POND             76.2       13.2       4.14       7          0
UNC-1            76.2       13.2       4.14       7          0

[JUNCTIONS]
;;Name           Elevation  MaxDepth   InitDepth  SurDepth   Aponded
;;-------------- ---------- ---------- ---------- ---------- ----------
100B             128.243    4.707      0          0          0
101              128.53     4.42       0          0          0
102              128.541    4.709      0          0          0
103              129        4.344      0          0          0
104              128.99     4.354      0          0          0
105              129.32     3.958      0          0          0
106              129.51     3.921      0          0          0
107              129.94     3.542      0          0          0
108              130.08     3.473      0          0          0
```

```
109              130.23     3.417      0          0          0
110              130.03     3.731      0          0          0
111              130.51     3.318      0          0          0
112              131.15     3.329      0          0          0
113              130.89     2.655      0          0          0
115              130.05     3.112      0          0          0
117              130.28     3.391      0          0          0
118              130.99     2.55       0          0          0
119              129.507    4.273      0          0          0
120              130.14     5.158      0          0          0
121              130.86     2.988      0          0          0
122              131.2      2.364      0          0          0
123              130.183    3.281      0          0          0
200              129        2.386      0          0          0
200A             127.62     1.2        0          0          0
J13              136.8      1.1        0          0          0
J17              137.1      1.55       0          0          0
J18              135.778    1          0          0          0
J19              142.025    1          0          0          0
J2               137.6      1.05       0          0          0
J21              143.605    1          0          0          0
J22              134.865    1          0          0          0
J23              139.038    1          0          0          0
J25              136.13     1          0          0          0
J26              136.052    1          0          0          0
J27              136.006    1          0          0          0
J31              142.006    1          0          0          0
J4               131.25     2          0          0          0
J46              127.668    1          0          0          0
J48              126.97     1.2        0          0          0
J5               130.89     0.85       0          0          0
J50              123.805    1          0          0          0
J57              125.77     1          0          0          0
J7               128.02     1.2        0          0          0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
J1               123.62     NORMAL                      NO
UNC-1-S          0          FREE                        NO

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape      Curve Name/Params
   N/A      Fevap    Psi      Ksat     IMD
;;-------------- -------- ---------- ---------- ----------
---------------------------- -------- --------          -------- --------
C103A-S          131.13   2.4        0          FUNCTIONAL 0          0          0
   0        0
C104A-S          132.05   2.4        0          FUNCTIONAL 0          0          0
   0        0
C104A-S1         131.8    2.4        0          FUNCTIONAL 0          0          0
```

```
   0        0
C105A-S          131.2    2.4        0          FUNCTIONAL 0         0         0
   0        0
C106A-S          132.6    2.4        0          FUNCTIONAL 0         0         0
   0        0
C108A-S          132.05   2.4        0          FUNCTIONAL 0         0         0
   0        0
C108B-S          132.7    2.4        0          FUNCTIONAL 0         0         0
   0        0
C109A-S          133.25   2.4        0          FUNCTIONAL 0         0         0
   0        0
C110A-S          132.28   2.4        0          FUNCTIONAL 0         0         0
   0        0
C111A-S          133.03   2.4        0          FUNCTIONAL 0         0         0
   0        0
C111B-S          132.31   2.4        0          FUNCTIONAL 0         0         0
   0        0
C112A-S          133.43   2.4        0          FUNCTIONAL 0         0         0
   0        0
C113A-S          132.68   2.4        0          FUNCTIONAL 0         0         0
   0        0
C117A-S          131.91   2.4        0          FUNCTIONAL 0         0         0
   0        0
C118A-S          132.46   2.4        0          FUNCTIONAL 0         0         0
   0        0
C119A-S          132.42   2.4        0          FUNCTIONAL 0         0         0
   0        0
C120A-S          133.21   2.4        0          FUNCTIONAL 0         0         0
   0        0
C120B-S          133.6    2.4        0          FUNCTIONAL 0         0         0
   0        0
C120C-S          133.6    2.4        0          FUNCTIONAL 0         0         0
   0        0
C121A-S          134.01   2.4        0          FUNCTIONAL 0         0         0
   0        0
C122A-S          133.16   2.4        0          FUNCTIONAL 0         0         0
   0        0
C123A-S          132.65   2.4        0          FUNCTIONAL 0         0         0
   0        0
J10              136.9    1.05       0          FUNCTIONAL 1000      0         0
   0        0
J3               131.54   1.71       0          FUNCTIONAL 0         0         6000
   0        0
J55              132.51   1          0          FUNCTIONAL 0         0         10000
   0        0
POND-S           127.5    3.25       1.5        TABULAR    Pond
 0        0

[CONDUITS]
;;Name           From Node        To Node          Length     Roughness  InOffset
OutOffset  InitFlow   MaxFlow
```

```
;;-------------- ---------------- ---------------- ---------- ---------- ----------
---------- ---------- ----------
102-101          102              101              10.281     0.013      128.54
128.53     0          0
103-102          103              102              91.371     0.013      128.78
128.69     0          0
105-104          105              104              143.95     0.013      129.54
129.39     0          0
106-105          106              105              172        0.013      129.77
129.6      0          0
107-106          107              106              55.5       0.013      130.27
130.22     0          0
108-107          108              107              78.243     0.013      130.41
130.33     0          0
109-106          109              106              265.986    0.013      130.56
130.29     0          0
110-104          110              104              165.6      0.013      129.93
129.77     0          0
111-110          111              110              172        0.013      130.41
130.23     0          0
112-111          112              111              49.844     0.013      130.98
130.78     0          0
113-110          113              110              130.335    0.013      130.72
130.46     0          0
115-102          115              102              52.579     0.013      129.64
129.59     0          0
117-115          117              115              176        0.013      129.88
129.7      0          0
118-117          118              117              129.181    0.013      130.51
0          0          0
119-103          119              103              203.45     0.013      129.43
129.23     0          0
120-119          120              119              37.024     0.013      129.84
129.81     0          0
121-119          121              119              176        0.013      130.13
129.96     0          0
122-121          122              121              190.64     0.013      130.4
130.21     0          0
123-103          123              103              129.526    0.013      129.88
129.75     0          0
200-200A         200              200A             33.405     0.013      129
128.79     0          0
C1               C120C-S          C120A-S          5          0.013      135.6
135.21     0          0
C10              100B             POND-S           39.6       0.013      128.54
128.5      0          0
C11              J48              J57              95.752     0.035      126.97
125.77     0          0
C12              C123A-S          C104A-S1         170        0.013      134.65
133.8      0          0
C13              101              POND-S           23.7       0.013      128.53
```

```
128.5      0          0
C14              104              103              165.85     0.013      129.24
129.08     0          0
C15              C122A-S          C123A-S          102        0.013      135.16
134.65     0          0
C16              J7               200A             49.839     0.035      128.02
127.62     0          0
C17              J31              J55              456.331    0.035      142.006
132.51     0          0
C18              200A             J48              81.314     0.035      127.62
126.97     0          0
C19              C104A-S          C104A-S1         50         0.013      134.05
133.8      0          0
C2               J4               J5               106.625    0.035      131.25
130.89     0          0
C20              C119A-S          C104A-S1         84         0.013      134.42
131.8      0          0
C21              J19              J22              336.61     0.035      142.025
134.865    0          0
C22              J21              J19              60.97      0.035      143.605
142.025    0          0
C25              J13              J25              150.821    0.035      136.8
136.13     0          0
C26              J17              J18              181.019    0.035      137.1
135.778    0          0
C27              J18              J4               500.106    0.035      135.778
131.25     0          0
C28              J23              J22              393.336    0.035      139.038
134.865    0          0
C29              C104A-S1         C103A-S          135        0.013      133.8
133.13     0          0
C3               J5               J7               358.496    0.035      130.89
128.02     0          0
C30              J25              J26              126.258    0.035      136.13
136.052    0          0
C31              J27              J18              149.093    0.035      136.006
135.778    0          0
C32              J26              J27              21.553     0.035      136.052
136.006    0          0
C33              J22              J55              235.66     0.035      134.865
132.51     0          0
C34              J55              J3               127.624    0.035      132.51
131.54     0          0
C35              C103A-S          POND-S           5          0.035      133.13
126.85     0          0
C36              C117A-S          C103A-S          155        0.013      133.91
133.13     0          0
C37              C118A-S          C117A-S          110        0.013      134.46
133.91     0          0
C38              C105A-S          POND-S           10         0.035      133.2
126.85     0          0
```

```
C39              C110A-S          C105A-S          215        0.013      134.28
133.2      0          0
C4               C120B-S          C113A-S          20         0.025      135.6
134.68     0          0
C40              C113A-S          C110A-S          80         0.013      134.68
134.28     0          0
C41              C111A-S          C110A-S          150        0.013      135.03
134.28     0          0
C42              C111B-S          C110A-S          5          0.013      134.31
134.28     0          0
C43              C106A-S          C105A-S          280        0.013      134.6
133.2      0          0
C44              C108A-S          C105A-S          169        0.013      134.05
133.2      0          0
C45              C109A-S          C108A-S          240        0.013      135.25
134.05     0          0
C46              C108B-S          C108A-S          130        0.013      134.7
134.05     0          0
C47              C112A-S          C111A-S          80         0.013      135.43
135.03     0          0
C5               C121A-S          C120A-S          160        0.013      136.01
135.21     0          0
C6               C120A-S          C104A-S1         202        0.013      135.21
133.8      0          0
C6_1             J50              J1               54.795     0.035      123.805
123.62     0          0
C7               J57              J50              215.319    0.035      125.77
123.805    0          0
C8               J46              J57              154.465    0.035      127.668
125.77     0          0
C9               101              100B             22.807     0.013      128.6
128.57     0          0
clvt-appleton    J3               J4               22.849     0.025      131.54
131.25     0          0
Clvt-Indust1     J10              J13              12.357     0.024      136.9
136.8      0          0
Clvt-Indust2     J2               J17              15.666     0.024      137.6
137.1      0          0

[ORIFICES]
;;Name           From Node        To Node          Type         Offset     Qcoeff
 Gated    CloseTime
;;-------------- ---------------- ---------------- ------------ ----------
---------- -------- ----------
Qual-Orf         POND-S           200              SIDE         129        0.61
 NO       0

[WEIRS]
;;Name           From Node        To Node          Type         CrestHt    Qcoeff
 Gated    EndCon   EndCoeff   Surcharge  RoadWidth  RoadSurf   Coeff. Curve
;;-------------- ---------------- ---------------- ------------ ----------
```

```
---------- -------- -------- ---------- ---------- ---------- ----------
----------------
Quant-W          POND-S           200              TRANSVERSE   129.5      1.7
 NO       0        0          YES
Spillway         POND-S           200              TRANSVERSE   130.45     1.74
 NO       0        0          YES
weir-Apple       J3               J4               TRANSVERSE   133        1.74
 NO       0        0          YES
weir-ind1        J10              J13              TRANSVERSE   137.8      1.74
 NO       0        0          YES
weir-ind2        J2               J17              TRANSVERSE   138.5      1.74
 NO       0        0          YES

[OUTLETS]
;;Name           From Node        To Node          Offset     Type
QTable/Qcoeff    Qexpon     Gated
;;-------------- ---------------- ---------------- ---------- ----------------
---------------- ---------- --------
C103A-IC         C103A-S          103              131.13     TABULAR/HEAD
103A-IC                     NO
C104A-IC         C104A-S          104              132.05     TABULAR/HEAD
104A-IC                     NO
C105-IC          C105A-S          105              131.2      TABULAR/HEAD
105A-IC                     NO
C106A-IC         C106A-S          106              132.6      TABULAR/HEAD
106A-IC                     NO
C108A-IC         C108A-S          108              132.05     TABULAR/HEAD
108A-IC                     NO
C108B-IC         C108B-S          108              132.7      TABULAR/HEAD
108B-IC                     NO
C109A-IC         C109A-S          109              133.25     TABULAR/HEAD
109A-IC                     NO
C110A-IC         C110A-S          110              132.28     TABULAR/HEAD
110A-IC                     NO
C111A-IC         C111A-S          111              133.03     TABULAR/HEAD
111A-IC                     NO
C111B-IC         C111B-S          111              132.31     TABULAR/HEAD
111B-IC                     NO
C112A-IC         C112A-S          112              133.43     TABULAR/HEAD
112A-IC                     NO
C113A-IC         C113A-S          113              132.68     TABULAR/HEAD
113A-IC                     NO
C117A-IC         C117A-S          117              131.91     TABULAR/HEAD
117A-IC                     NO
C118A-IC         C118A-S          118              132.46     TABULAR/HEAD
118A-IC                     NO
C119A-IC         C119A-S          119              132.42     TABULAR/HEAD
119A-IC                     NO
C120A-IC         C120A-S          120              133.21     TABULAR/HEAD
120A-IC                     NO
C120B-IC         C120B-S          120              133.6      TABULAR/HEAD
```

```
120B-IC                     NO
C120C-IC         C120C-S          120              133.6      TABULAR/HEAD
120C-IC                     NO
C121A-IC         C121A-S          121              134.01     TABULAR/HEAD
121A-IC                     NO
C122A-IC         C122A-S          122              133.16     TABULAR/HEAD
122A-IC                     NO
C123A-IC         C123A-S          123              132.65     TABULAR/HEAD
123A-IC                     NO

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4
Barrels    Culvert
;;-------------- ------------ ---------------- ---------- ---------- ----------
---------- ----------
102-101          CIRCULAR     1.95             0          0          0          1

103-102          CIRCULAR     1.8              0          0          0          1

105-104          CIRCULAR     1.35             0          0          0          1

106-105          CIRCULAR     1.35             0          0          0          1

107-106          CIRCULAR     0.9              0          0          0          1

108-107          CIRCULAR     0.9              0          0          0          1

109-106          CIRCULAR     0.825            0          0          0          1

110-104          CIRCULAR     0.975            0          0          0          1

111-110          CIRCULAR     0.675            0          0          0          1

112-111          CIRCULAR     0.3              0          0          0          1

113-110          CIRCULAR     0.45             0          0          0          1

115-102          CIRCULAR     0.9              0          0          0          1

117-115          CIRCULAR     0.9              0          0          0          1

118-117          CIRCULAR     0.525            0          0          0          1

119-103          CIRCULAR     1.35             0          0          0          1

120-119          CIRCULAR     0.975            0          0          0          1

121-119          CIRCULAR     0.825            0          0          0          1

122-121          CIRCULAR     0.75             0          0          0          1
```

123-103	CIRCULAR	0.825	0	0	0	1
200-200A	CIRCULAR	0.6	0	0	0	2
C1	IRREGULAR	ROW	0	0	0	1
C10	CIRCULAR	1.95	0	0	0	1
C11	TRAPEZOIDAL	1	1	3	3	1
C12	IRREGULAR	ROW	0	0	0	1
C13	CIRCULAR	1.05	0	0	0	1
C14	CIRCULAR	1.5	0	0	0	1
C15	IRREGULAR	ROW	0	0	0	1
C16	TRAPEZOIDAL	1.2	1	3	3	1
C17	TRAPEZOIDAL	1	1	3	3	1
C18	TRAPEZOIDAL	1.2	1	3	3	1
C19	IRREGULAR	ROW	0	0	0	1
C2	TRIANGULAR	0.85	3.4	0	0	1
C20	IRREGULAR	ROW	0	0	0	1
C21	TRAPEZOIDAL	1	1	3	3	1
C22	TRAPEZOIDAL	1	1	3	3	1
C25	TRAPEZOIDAL	1	0.5	3	3	1
C26	TRAPEZOIDAL	1	0.5	3	3	1
C27	TRAPEZOIDAL	1	0.5	3	3	1
C28	TRAPEZOIDAL	1	1	3	3	1
C29	IRREGULAR	ROW	0	0	0	1
C3	TRAPEZOIDAL	1.2	1	3	3	1
C30	TRAPEZOIDAL	1	0.5	3	3	1
C31	TRAPEZOIDAL	1	0.5	3	3	1
C32	TRAPEZOIDAL	1	0.5	3	3	1

C33	TRAPEZOIDAL	1.1	1	3	3	1
C34	TRAPEZOIDAL	1.1	1	3	3	1
C35	TRAPEZOIDAL	0.6	2	5	5	1
C36	IRREGULAR	ROW	0	0	0	1
C37	IRREGULAR	ROW	0	0	0	1
C38	TRAPEZOIDAL	0.6	2	5	5	1
C39	IRREGULAR	ROW	0	0	0	1
C4	TRIANGULAR	0.6	3.6	0	0	1
C40	IRREGULAR	ROW	0	0	0	1
C41	IRREGULAR	ROW	0	0	0	1
C42	IRREGULAR	ROW	0	0	0	1
C43	IRREGULAR	ROW	0	0	0	1
C44	IRREGULAR	ROW	0	0	0	1
C45	IRREGULAR	ROW	0	0	0	1
C46	IRREGULAR	ROW	0	0	0	1
C47	IRREGULAR	ROW	0	0	0	1
C5	IRREGULAR	ROW	0	0	0	1
C6	IRREGULAR	ROW	0	0	0	1
C6_1	TRAPEZOIDAL	1.1	1	3	3	1
C7	TRAPEZOIDAL	1.1	1	3	3	1
C8	TRAPEZOIDAL	1	1	3	3	1
C9	CIRCULAR	1.95	0	0	0	1
clvt-appleton 6	CIRCULAR	1.1	0	0	0	1
Clvt-Indust1 6	CIRCULAR	0.6	0	0	0	1
Clvt-Indust2 6	CIRCULAR	0.6	0	0	0	1

```
Qual-Orf         CIRCULAR     0.22             0          0          0
Quant-W          RECT_OPEN    0.9              1          0          0
Spillway         RECT_OPEN    0.2              10         0          0
weir-Apple       RECT_OPEN    0.25             10         0          0
weir-ind1        RECT_OPEN    0.15             3          0          0
weir-ind2        RECT_OPEN    0.15             6          0          0

[TRANSECTS]
;;Transect Data in HEC-2 format
;
;8.5m asphalt
;2m sidewalk on each side
NC 0.025    0.025    0.013
X1 ROW               10       7.08     19.58    0.0      0.0      0.0      0.0
0.0
GR 0.35     0        0.3      3.33     0.19     7.08     0.15     9.08     0
9.08
GR 0.128    13.33    0        17.58    0.15     17.58    0.19     19.58    0.35
23.33

[LOSSES]
;;Link           Kentry     Kexit      Kavg       Flap Gate  Seepage
;;-------------- ---------- ---------- ---------- ---------- ----------

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
103A-IC          Rating     0          0
103A-IC                     2          308
103A-IC                     2.4        338

104A-IC          Rating     0          0
104A-IC                     2          259
104A-IC                     2.4        285

105A-IC          Rating     0          0
105A-IC                     2          174
105A-IC                     2.4        192

106A-IC          Rating     0          0
106A-IC                     2          732
106A-IC                     2.4        805

108A-IC          Rating     0          0
108A-IC                     2          279
108A-IC                     2.4        306

108B-IC          Rating     0          0
108B-IC                     2          306
108B-IC                     2.4        336
```

109A-IC	Rating	0	0
109A-IC		2	398
109A-IC		2.4	438
110A-IC	Rating	0	0
110A-IC		2	428
110A-IC		2.4	471
111A-IC	Rating	0	0
111A-IC		2	135
111A-IC		2.4	148
111B-IC	Rating	0	0
111B-IC		2	84
111B-IC		2.4	93
112A-IC	Rating	0	0
112A-IC		2	46
112A-IC		2.4	51
113A-IC	Rating	0	0
113A-IC		2	107
113A-IC		2.4	117
117A-IC	Rating	0	0
117A-IC		2	418
117A-IC		2.4	459
118A-IC	Rating	0	0
118A-IC		2	193
118A-IC		2.4	212
119A-IC	Rating	0	0
119A-IC		2	467
119A-IC		2.4	513
120A-IC	Rating	0	0
120A-IC		2	19
120A-IC		2.4	21
120B-IC	Rating	0	0
120B-IC		2	120
120B-IC		2.4	132
120C-IC	Rating	0	0
120C-IC		2	878
120C-IC		2.4	966
121A-IC	Rating	0	0
121A-IC		2	251
121A-IC		2.4	276

```
122A-IC          Rating     0          0
122A-IC                     2          290
122A-IC                     2.4        319

123A-IC          Rating     0          0
123A-IC                     2          407
123A-IC                     2.4        448

IND-1-IC         Rating     0          0
IND-1-IC                    2          700
IND-1-IC                    2.4        1014

clvt-up          Storage    0          0
clvt-up                     1.46       4000
clvt-up                     1.61       4000

ind-s            Storage    0          0
ind-s                       2          0
ind-s                       2.4        3000

;November 17, 2022 (Conceptual)
Pond             Storage    0          2895
Pond                        0.5        3966
Pond                        1          5037
Pond                        1.2        5848
Pond                        1.5        7150
Pond                        2          9833
Pond                        2.3        10522
Pond                        2.5        10981
Pond                        2.7        11440
Pond                        2.8        11670
Pond                        2.95       12014
Pond                        3.25       12527

store-1          Storage    0          0
store-1                     1          1124

[REPORT]
;;Reporting Options
INPUT      YES
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]
Subcatch   C103A            Residential
Subcatch   C104A            Residential
Subcatch   C105A            Residential
Subcatch   C106A            Residential
```

```
Subcatch   C108A            Residential
Subcatch   C108B            Residential
Subcatch   C109A            Residential
Subcatch   C110A            Residential
Subcatch   C111A            Residential
Subcatch   C111B            Residential
Subcatch   C112A            Residential
Subcatch   C113A            Residential
Subcatch   C117A            Residential
Subcatch   C118A            Residential
Subcatch   C119A            Residential
Subcatch   C120A            Residential
Subcatch   C120B            Park
Subcatch   C120C            Fut-Retirement
Subcatch   C121A            Residential
Subcatch   C122A            Residential
Subcatch   C123A            Residential
Subcatch   EXT_S1           EXTERNAL
Subcatch   EXT_S10          EXTERNAL
Subcatch   EXT_S12          EXTERNAL
Subcatch   EXT_S13          EXTERNAL
Subcatch   EXT_S17          EXTERNAL
Subcatch   EXT_S24          EXTERNAL
Subcatch   EXT_S25          EXTERNAL
Subcatch   EXT_S28          EXTERNAL
Subcatch   EXT_S3_1         EXTERNAL
Subcatch   EXT_S3_2         EXTERNAL
Subcatch   EXT_S4           EXTERNAL
Subcatch   POND             SWM-POND
Subcatch   UNC-1            Residential
Node       100B             MH
Node       101              MH
Node       102              MH
Node       103              MH
Node       104              MH
Node       105              MH
Node       106              MH
Node       107              MH
Node       108              MH
Node       109              MH
Node       110              MH
Node       111              MH
Node       112              MH
Node       113              MH
Node       115              MH
Node       117              MH
Node       118              MH
Node       119              MH
Node       120              MH
Node       121              MH
Node       122              MH
```

Node	123	MH
Node	200	MH
Node	200A	Prop.Ditch
Node	J13	EX_DITCH
Node	J17	EX_DITCH
Node	J18	EX_DITCH
Node	J19	WDT
Node	J21	WDT
Node	J22	EX_DITCH
Node	J23	EX_DITCH
Node	J25	EX_DITCH
Node	J26	EX_DITCH
Node	J27	EX_DITCH
Node	J31	WDT
Node	J4	Prop.Ditch
Node	J46	Ex.Ditch
Node	J48	Prop.Ditch
Node	J5	Prop.Ditch
Node	J50	Ex.Ditch
Node	J57	Ex.Ditch
Node	J7	Prop.Ditch
Node	J55	EX_DITCH
Node	POND-S	2022-11-03
Link	102-101	Nov16-2023
Link	103-102	Nov16-2023
Link	105-104	Nov16-2023
Link	106-105	Nov16-2023
Link	107-106	Nov16-2023
Link	108-107	Nov16-2023
Link	109-106	Nov16-2023
Link	110-104	Nov16-2023
Link	111-110	Nov16-2023
Link	112-111	Nov16-2023
Link	113-110	Nov16-2023
Link	115-102	Nov16-2023
Link	117-115	Nov16-2023
Link	118-117	Nov16-2023
Link	119-103	Nov16-2023
Link	120-119	Nov16-2023
Link	121-119	Nov16-2023
Link	122-121	Nov16-2023
Link	123-103	Nov16-2023
Link	C1	MJ
Link	C11	Prop-Ditch
Link	C12	MJ
Link	C15	MJ
Link	C16	Prop-Ditch
Link	C17	WDT
Link	C18	Prop-Ditch
Link	C19	MJ
Link	C2	Prop-Ditch

```
Link        C20             MJ
Link        C21             WDT
Link        C22             WDT
Link        C25             EX_DITCH
Link        C26             EX_DITCH
Link        C27             EX_DITCH
Link        C28             EX_DITCH
Link        C29             MJ
Link        C3              Prop-Ditch
Link        C30             EX_DITCH
Link        C31             EX_DITCH
Link        C32             EX_DITCH
Link        C33             EX_DITCH
Link        C34             EX_DITCH
Link        C35             MJ
Link        C36             MJ
Link        C37             MJ
Link        C38             MJ
Link        C39             MJ
Link        C4              MJ
Link        C40             MJ
Link        C41             MJ
Link        C42             MJ
Link        C43             MJ
Link        C44             MJ
Link        C45             MJ
Link        C46             MJ
Link        C47             MJ
Link        C5              MJ
Link        C6              MJ
Link        C6_1            EX_DITCH
Link        C7              EX_DITCH
Link        C8              EX_DITCH

[MAP]
DIMENSIONS       329663.5041      5009128.17       330979.8059      5011249.476
UNITS            Meters
```

```
  ALTERNATIVE RUNOFF METHOD (ARM) - PCSWMM VERSION 7.4.3240
  ---------------------------------------------------------

  This is a new version of ARM - your feedback and suggestions are solicited.
  Create a ticket, post on the PCSWMM feature request forum, or email us directly!

  Simulation start time:                  11/04/2022 00:00:00
  Simulation end time:                    11/05/2022 00:00:00
  Runoff wet weather time steps:          300 seconds
  Report time steps:                      60 seconds
  Number of data points:                  1441


  ******************************
  Unit Hydrographs Runoff Method
  ******************************


------------------------------------------------------------------------------------
-------------------------------------------------------------------------
                                                                      Area   Time of
Concentration  Time to Peak    Time after Peak    Peak UH Flow    UH Depth
  Subcatchment         Runoff Method             Raingage             (ha)   (min)
               (min)           (min)              (m³/s/mm)       (mm)

------------------------------------------------------------------------------------
-------------------------------------------------------------------------
  IND-1                Dimensionless UH (483.4)  RG1                  6.837  27.74
               19.15           73.97              0.04458         0.993
  EXT_S2               Dimensionless UH (483.4)  RG1                  2.513  19.17
               14              51.11              0.0224          0.991
  EXT_S9               Dimensionless UH (483.4)  RG1                  10.83  57.28
               36.87           152.7              0.03667         0.995
  EXT_S11              Dimensionless UH (483.4)  RG1                  0.463  19.05
               13.93           50.79              0.00415         0.99
  EXT_S6               Dimensionless UH (483.4)  RG1                  8.335  57.22
               36.83           152.56             0.02825         0.996
  EXT_S8               Dimensionless UH (483.4)  RG1                  11.551 46.67
               30.5            124.42             0.04728         0.993
  EXT_S7               Dimensionless UH (483.4)  RG1                  9.668  34.8
               23.38           92.77              0.05163         0.991
  EXT_S5               Dimensionless UH (483.4)  RG1                  0.286  8.24
               7.44            21.96              0.0048          0.986
  EXT_S15              Dimensionless UH (483.4)  RG1                  7.42   55.29
               35.67           147.39             0.02597         0.996
  EXT_S16              Dimensionless UH (483.4)  RG1                  9.609  55.58
               35.85           148.18             0.03346         0.996
  EXT_S27              Dimensionless UH (483.4)  RG1                  6.18   29.83
               20.4            79.52              0.03783         0.993
  EXT_S26              Dimensionless UH (483.4)  RG1                  5.36   31.11
```

```
               21.16          82.93              0.03162         0.992
  EXT_S14              Dimensionless UH (483.4)  RG1                 4.987  24.51
               17.21          65.36              0.03618         0.993
  EXT_S20              Dimensionless UH (483.4)  RG1                 1.112  45.41
               29.74          121.05             0.00467         0.993
  EXT_S21              Dimensionless UH (483.4)  RG1                 5.168  46.29
               30.28          123.41             0.02131         0.993
  EXT_S22              Dimensionless UH (483.4)  RG1                 5.268  44.52
               29.21          118.69             0.02251         0.992
  EXT_S29              Dimensionless UH (483.4)  RG1                 1.869  19.57
               14.24          52.17              0.01639         0.99
  EXT_S23              Dimensionless UH (483.4)  RG1                 1.597  15.64
               11.88          41.69              0.01678         0.989
  EXT_S30              Dimensionless UH (483.4)  RG1                 0.807  13.48
               10.59          35.93              0.00952         0.991


  ******************
  ARM Runoff Summary
  ******************


------------------------------------------------------------------------------------
-------
                       Total       Total       Total       Total       Peak
Runoff
                       Precip      Losses      Runoff      Runoff      Runoff
Coeff
  Subcatchment         (mm)        (mm)        (mm)        10^6 ltr    LPS
(fraction)

------------------------------------------------------------------------------------
-------
  IND-1                71.665      47.555      24.104      1.648       498.053
0.336
  EXT_S2               71.665      47.555      24.182      0.608       212.696
0.337
  EXT_S9               71.665      52.622      19.058      2.064       402.245
0.266
  EXT_S11              71.665      52.622      19.102      0.088       29.494
0.267
  EXT_S6               71.665      54.903      16.773      1.398       267.39
0.234
  EXT_S8               71.665      45.252      26.413      3.051       704.654
0.369
  EXT_S7               71.665      50.176      21.494      2.078       545.897
0.3
  EXT_S5               71.665      47.555      24.423      0.07        32.924
0.341
  EXT_S15              71.665      54.903      16.779      1.245       242.234
0.234
```

```
  EXT_S16                 71.665      52.622      19.065      1.832       361.918
0.266
  EXT_S27                 71.665      50.176      21.456      1.326       375.31
0.299
  EXT_S26                 71.665      50.176      21.493      1.152       316.868
0.3
  EXT_S14                 71.665      42.841      28.855      1.439       483.301
0.403
  EXT_S20                 71.665      47.555      24.101      0.268       61.991
0.336
  EXT_S21                 71.665      48.888      22.775      1.177       267.463
0.318
  EXT_S22                 71.665      47.555      24.108      1.27        297.43
0.336
  EXT_S29                 71.665      46.176      25.559      0.478       168.622
0.357
  EXT_S23                 71.665      46.176      25.266      0.404       158.798
0.353
  EXT_S30                 71.665      47.555      23.99       0.194       77.397
0.335


  WARNING ARM01: Computed UH depth for ARM subcatchment EXT_S5 is not unity.
Consider reducing wet weather time step.
  WARNING ARM01: Computed UH depth for ARM subcatchment EXT_S23 is not unity.
Consider reducing wet weather time step.
```

C.4 CONCEPTUAL POND DESIGN

160401740 Mill Valley Development - Conceptual SWM Pond Design

Stormwater Quality Volumetric Requirements

Pond	Drainage Area (ha)	Actual % Imp.	MOE Control Level	Water Quality Unit Volume Requirments			Water Quality Volume Requirements			Water Quality Volumes Provided			
				Total Unit Volume (m^3/ha)	Permanent Pool (m^3/ha)	Extended Detention (m^3/ha)	Permanent Pool (m^3)	Extended Detention (m^3)	Total MECP Volume	Permanent Pool (m^3)	Extended Detention (m^3)	Total MECP Volume	Actual Provided Unit Volume (m^3/ha)
Mill Valley SWM Pond	30.28	67	Enhanced - 80% TSS Removal	218	178.0	40	5,390	1,211	6,601	6,675	4,246	10,920	361

*Enhanced Water Level protection as specified by Fernbank Community Master Servicing Study

For use in Interpolation of above formulae

	Wetpond					Wetland			
%	0	35	55	70	85	35	55	70	85
Enhanced - 80% TSS Removal	0	140	190	225	250	80	105	120	140
Normal - 70% TSS Removal	0	90	110	130	150	60	70	80	90
Basic - 60% TSS Removal	0	60	75	85	95	60	60	60	60

160401740 Mill Valley Development - Conceptual SWM Pond Design
Stage-Storage-Discharge Summary

Stage	Discharge	Storage		Depth	Forebay			Main Cell			
		Active	Total*		Area	Incremental Volume	Accumulated Volume	Area	Incremental Volume	Accumulated Volume	
(m)	(m^3/s)	(m^3)	(m^3)	(m)	(m^2)	(m^3)	(m^3)	(m^2)	(m^3)	(m^3)	
127.50		0	0	0.00	530	0	0	2,365	0	0	
128.00		0	1,386	0.50	789	330	330	3,177	1,386	1,386	
128.50		0	3,636	1.00	1,048	459	789	3,989	1,791	3,177	
128.70		0	4,725	1.20	1,260	231	1,020	4,588	858	4,035	
129.00		0	6,675	1.50	2,145	511	1,531	5,005	1,439	5,474	Permanent Pool
129.00		0	6,675	1.50	0	0	1,531	7,150	0	5,474	Permanent Pool
129.50		4,246	10,920	0.50	0	0	1,531	9,833	4,246	9,719	
129.80		7,299	13,973	0.80	0	0	1,531	10,522	3,053	12,772	
130.00		9,449	16,124	1.00	0	0	1,531	10,981	2,150	14,923	
130.20		11,691	18,366	1.20	0	0	1,531	11,440	2,242	17,165	
130.30		12,847	19,521	1.30	0	0	1,531	11,670	1,156	18,320	
130.45		14,623	21,298	1.45	0	0	1,531	12,014	1,776	20,097	
130.75		18,304	24,979	1.75	0	0	1,531	12,527	3,681	23,778	

* Total pond including forebay, excluding sediment storage (assume 0.5m depth in forebay for sediment storage)

160401740 Mill Valley Development - Conceptual SWM Pond Design

Conceptual Outlet Structure Discharge Calculations

Elevation	Discharge (m^3/s)								
	Overflow Outlet			Piped Outlet					Total
(m)		Spillway	Total	Orifice 1	Orifice 2		Control	Weir 1	Discharge
127.50									0.000
128.50									0.000
128.70									0.000
129.00									0.000
129.00		0.000	0.000	0.000	0.000		0.000	0.000	0.000
129.50		0.000	0.000	0.071	0.000		0.000	0.000	**0.071**
129.80		0.000	0.000	0.090	0.000		0.000	0.279	**0.370**
130.00		0.000	0.000	0.101	0.000		0.000	0.601	**0.702**
130.20		0.000	0.000	0.111	0.000		0.000	0.996	**1.106**
130.30		0.000	0.000	0.115	0.000		0.000	1.216	**1.332**
130.45		0.000	0.000	0.122	0.000		0.000	1.574	**1.696**
130.75		2.859	2.859	0.134	0.000		0.000	2.376	**5.369**

1. Outlet structure consists of reverse-sloped lowflow pipe connected to orifice #1 (created by equivalent sluice gate orientation)
2. Secondary outlet is Weir#1 in weir wall inside structure

Parameters		
	Orifice 1	
	Orifice Centre	Perimeter
	129.11 m	0.691 m
	Orifice Invert	Area
	129.00 m	0.0380 m^2
	Orifice Diameter	Orifice Coeff.
	220 mm	0.61
	Orientation	Permanent Pool
Spillway Weir	Vertical	129.00 m
Crest Elevation	**Orifice 2**	
130.45 m	Orifice Centre	Perimeter
Crest Width	200.23 m	1.445 m
10 m*	Orifice Invert	Area
	200.00 m	0.1662 m^2
Weir Coeff. 1.740	Orifice Diameter	Orifice Coeff.
	460 mm	0.61
	Orientation	
	Vertical	
	Weir 1	
	Top of Weir Structure	Max Perimeter
	130.40 m	1.000 m
	Weir Crest Invert	Max Open Area
	129.50 m	0.900 m^2
	Weir Dimensions (Height x Length)	
	0.90 m Height	1.00 m Len
	Side Walls	Weir Coeff.
	Vertical	1.700

1 m long weir at inv. = 129.5
220 mm lowflow outlet at inv. = 129 m
460 mm outlet at inv. = 200 m

Water Quality Extended Detention Summary

Required Extended Detention Time	24-48	hrs for water quality drawdown		
Actual Extended Detention Time	38	hrs	Q_{peak}	0.071 m^3/s
Extended Detention Elevation	129.50	m	Q_{avg}	0.036 m^3/s

Watershed Area (ha)	30.28
Percent Impervious	67.0%
Water Quality Criteria	Enhanced - 80% TSS Removal
Req'd Ext. Det. Volume (m^3/ha)	40
Req'd Ext. Det. Volume (m^3)	1,211
Provided Ext. Det. (m^3)	4,246
Req'd Perm. Pool Volume (m^3/ha)	178.0
Req'd Perm. Pool Volume (m^3)	5,390
Provided Perm. Pool Volume (m^3)	6,675

$$Q = CA\sqrt{2g\left(h_2 - h_1 + \frac{D}{2000}\right)}$$

$$Q = CL\,(h_2 - h_1)^{1.5}$$

Where,

h2 = elevation at stage 2 (m)
h1 = elevation at stage 1 (m)
D = orifice diameter (mm)
C = orifice coefficient
A = orifice open area (m^2)

h2 = elevation at stage 2 (m)
h1 = elevation at stage 1 (m)
L = weir crest length (m)
C = weir coefficient

Weir flow calculation for orifice below centreline:

$$\theta = 2\cos^{-}(1 - \frac{2h}{D}) = 2\,\mathrm{acos}\,(1 - \frac{2h}{D})$$

$$P_W = \frac{D\theta}{2}$$

h = water level stage (m)
D = orifice diameter (m)
θ = angle based on water level (radians)
P_W = Wetted Perimeter = Crest Length (m)

160401740 Mill Valley Development - Conceptual SWM Pond Design

Flow Augmentation Calculation

Falling Head Orifice Equation (used for approximating detention time).
(as per Equation 4.10 in MOE SWMPDM)

a) $$t= \frac{2*A_p}{CA_0(2g)^{0.5}}(h_1^{0.5} - h_2^{0.5})$$

where:

t= drawdown time (seconds)
A_p= pond surface area (sq.m),
C= discharge coefficient
A_0= area of orifice (sq.m)
h_1= starting water elevation above orifice (m)
h_2= ending water elevation above orifice (m)

Check for Detention Time

Ap	9832.9	m^2	Approximate pond area
C	0.61		
orifice dia.	0.22	m	
h1	0.50	m	
h2	0.00	m	
Ao =	0.03801	sq.m	
t =	135388.0316	s	
	1.6	days	
	37.6	**hours**	

Equation 4.11

b) $$t= \frac{0.66C_2h^{1.5}+2C_3h^{0.5}}{2.75A_0}$$

Where:

t= drawdown time (seconds)
A_0= cross sectional area of orifice (sq.m)
h= maximum water elevation above the orifice (m)
C_2= slope coefficient from the area-depth linear regression
C_3= intercept form the area-depth linear regression

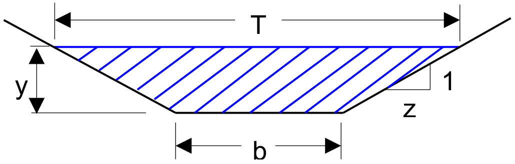
A_0	0.0380	sq.m
h	0.50	m
C_2	2296	
C_3	9832.9	
t=	138149	s
	1.6	days
	38.4	**hours**

C.5 CHANNEL REALIGNMENT CALCULATIONS

Job # 160401740 Mill Valley Estates

Date: 22-Nov-22

Conceptual Ditch Realignment along Appleton Side Road ROW



$$A = (b + z \cdot y)y$$

$$P = b + 2 \cdot y \cdot \sqrt{1 + z^2}$$

$$R = \frac{A}{P}$$

$$T = b + 2zy$$

$$Q = \frac{A}{n} R^{2/3} \sqrt{S}$$

$$V = \frac{Q}{A}$$

$$Fr = \sqrt{\frac{Q^2 T}{g A^3}}$$

	Expected Flow Depth		w Freeboard	
n=	0.035		0.035	
z=	2.5		2.5	
b=	0		0	
y=	1.00		1.10	
A=	2.5		3.025	
P=	5.385165		5.923681	
R=	0.464238		0.510662	
S=	0.003		0.003	
T=	5		5.5	
Q=	**2.346**	m^3/s	3.024	m^3/s
V=	0.94	m/s	1.00	m/s
Fr # =	0.423643		0.430427	

100 Year Flow Generated = 2.295 m^3/s

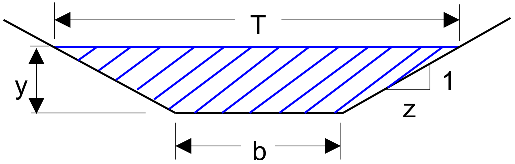
Full Flow Channel Capacity = 3.024 m^3/s

Channel OK

Job # 160401740 Mill Valley Estates

Date: 22-Nov-22

Conceptual Ditch Realignment along Southern Property Line



$$\boxed{A=(b+z\cdot y)y}$$

$$\boxed{P=b+2\cdot y\cdot\sqrt{1+z^2}}$$

$$\boxed{R=\frac{A}{P}}\quad\boxed{T=b+2zy}$$

$$\boxed{Q=\frac{A}{n}R^{2/3}\sqrt{S}}\quad\boxed{V=\frac{Q}{A}}$$

$$\boxed{Fr=\sqrt{\frac{Q^2T}{gA^3}}}$$

	Expected Flow Depth		w Freeboard	
n=	0.035		0.035	
z=	3		3	
b=	1		1	
y=	1.00		1.20	
A=	4		5.52	
P=	7.324555		8.589466	
R=	0.546108		0.642648	
S=	0.008		0.008	
T=	7		8.2	
Q=	**6.830**	m^3/s	10.505	m^3/s
V=	1.71	m/s	1.90	m/s
Fr # =	0.721131		0.740563	

100 Year Flow Generated =	2.320	m^3/s
Full Flow Channel Capacity =	10.505	m^3/s

Channel OK

C.6 SWM DESIGN – MVCA CORRESPONDENCE

From:	Mott, Peter
Sent:	Tuesday, November 22, 2022 11:15 AM
To:	Diane Reid
Cc:	Paerez, Ana
Subject:	Mill Valley Estates (Almonte, ON) - SWM Criteria
Attachments:	4 160401740-SD - OSD-1.pdf; 1 160401740-DB - OSSP-1.pdf

Hello Diane,

Stantec has been retained to provide the site servicing for the Mill Valley Estates subdivision located in the town of Mississippi Mills. The proposed development is to consist of 179 single family homes, 244 townhome units, 48 apartments, a clubhouse, a SWM pond, and a block zoned for industrial use. In addition, the sewer sizing will include contributions from the Mill Valley Living retirement community, adjacent to the subdivision, which consists of 7 single family homes, 48 seniors apartments, 42 townhome units, and a 15% population contingency for potential future buildout. The overall development is estimated to have a total population of 1617 persons as shown in the attached SD-1 drawing.

We are looking to confirm what quantity and quality control measures are required on-site, and the SWM criteria to be used for the proposed development. As mentioned above, the development will contain a SWM pond to attenuate peak flows and provide water quality treatment (TSS removal). Please review the site servicing plan attached and if you can confirm the requirements for the site, that would be much appreciated. If you need any other information, please feel free to reach out.

Thank you,

Peter Mott EIT
Engineering Intern, Community Development

Mobile: +1 (343) 999-8172
Peter.Mott@stantec.com
Stantec
400 - 1331 Clyde Avenue
Ottawa ON K2C 3G4

Stantec

Ontario Regulation 153/06

Mill Valley Estates

Legend

Parcels - Assessment

— MVCA Streams

— Ottawa_Streams

— Municipal Drains

■ Waterbodies

0 100 200

m

1:5,000

N W E S

Projection: UTM Zone 18- NAD 83 Datum

This map is produced in part with data provided by the Ontario Geographic Data Exchange under License with the Ontario Ministry of Natural Resources and the Queen's Printer for Ontario, 2019

Imagery @ Fugro Geospatial, May 2014

Date: 8/25/2022

From: Diane Reid <dreid@mvc.on.ca>
Sent: Thursday, December 1, 2022 2:53 PM
To: Mott, Peter <Peter.Mott@stantec.com>
Cc: Jacob Perkins <jperkins@mvc.on.ca>
Subject: RE: Mill Valley Estates (Almonte, ON) - SWM Criteria

Hi Peter, Thank-you. The extent of the property shown on the MVCA mapping is different than the key map on the Conceptual SWMP you provided. Can you clarify? Also, I am confused with Mill Valley Living, Mill Valley Retirement, and Mill Valley Estates. For Mill Valley Living Subdivision (09-T-21005)/Mill Valley Retirement, we have already reviewed the conceptual SWMP and draft plan conditions are prepared.

Generally speaking, the following is required and/or recommended with respect to SWM, on the subject site:

- An enhanced level of quality control (80% TSS removal)
- Quantity control
- Low Impact Development (LID) measures (e.g. infiltration trenches, filter strips. etc.) to the treatment approach (possibly as pre-treatment practices if the WQ treatment is vegetated or enhanced swales).
- Details of the proposed watercourse realignment (location, filling, grading, etc.).
- An MVCA permit for shoreline alteration and watercourse realignment.

Additional details will be provided upon receipt of a conceptual plan. Hope that helps.
Diane Reid

From: Mott, Peter Peter.Mott@stantec.com>
Sent: Thursday, December 1, 2022 2:05 PM
To: Diane Reid <dreid@mvc.on.ca>
Cc: Paerez, Ana Ana.Paerez@stantec.com>; Kilborn, Kris <kris.kilborn@stantec.com>
Subject: RE: Mill Valley Estates (Almonte, ON) - SWM Criteria

Hi Diane – I am not sure if that is the correct file number, to be honest. Bill Houchaimi is the developer and I've attached the MVCA Mapping for your reference with the property fronting Appleton Side Road.

Thanks,

Peter Mott EIT
Engineering Intern, Community Development

Mobile: +1 (613) 897-0445
Teams: +1 (613) 724-4370
Peter.Mott@stantec.com
Stantec
300 - 1331 Clyde Avenue
Ottawa ON K2C 3G4

From: Mott, Peter Peter.Mott@stantec.com>
Sent: Tuesday, November 22, 2022 11:15 AM

To: Diane Reid <dreid@mvc.on.ca>
Cc: Paerez, Ana Ana.Paerez@stantec.com>
Subject: Mill Valley Estates (Almonte, ON) - SWM Criteria

Hello Diane,

Stantec has been retained to provide the site servicing for the Mill Valley Estates subdivision located in the town of Mississippi Mills. The proposed development is to consist of 179 single family homes, 244 townhome units, 48 apartments, a clubhouse, a SWM pond, and a block zoned for industrial use. In addition, the sewer sizing will include contributions from the Mill Valley Living retirement community, adjacent to the subdivision, which consists of 7 single family homes, 48 seniors apartments, 42 townhome units, and a 15% population contingency for potential future buildout. The overall development is estimated to have a total population of 1617 persons as shown in the attached SD-1 drawing.

We are looking to confirm what quantity and quality control measures are required on-site, and the SWM criteria to be used for the proposed development. As mentioned above, the development will contain a SWM pond to attenuate peak flows and provide water quality treatment (TSS removal). Please review the site servicing plan attached and if you can confirm the requirements for the site, that would be much appreciated. If you need any other information, please feel free to reach out.

Thank you,

Peter Mott EIT
Engineering Intern, Community Development

Mobile: +1 (343) 999-8172
Peter.Mott@stantec.com
Stantec
400 - 1331 Clyde Avenue
Ottawa ON K2C 3G4

Appendix D EXTERNAL PLANS AND REPORTS

D.1 GEOTECHNICAL INVESTIGATION (PATERSON GROUP, 2020)

patersongroup

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Archaeological Services

Geotechnical Investigation
Proposed Residential Development
Riverfront Estates - Future Expansion Lands
1218 Old Almonte Road - Almonte

Prepared For

Houchaimi Holdings Inc.

December 7, 2020

Report PG5576-1

Paterson Group Inc.
Consulting Engineers
154 Colonnade Road South
Ottawa (Nepean), Ontario
Canada K2E 7J5

Tel: (613) 226-7381
Fax: (613) 226-6344
www.patersongroup.ca

Table of Contents

Appendices

Appendix 1	Soil Profile and Test Data Sheets Symbols and Terms Analytical Testing Results
Appendix 2	Figure 1 - Key Plan Drawing PG5576-1 - Test Hole Location Plan

1.0 Introduction

Paterson Group (Paterson) was commissioned by Houchaimi Holdings Inc. to conduct a geotechnical investigation for the proposed Future Expansion Lands as part of the Riverfront Estates residential development located along Old Almonte Road in the Village of Almonte, Ontario (refer to Figure 1 - Key Plan in Appendix 2).

The objectives of the current investigation were to:

- ☐ Determine the subsoil and groundwater conditions at this site by means of test holes.

- ☐ Provide geotechnical recommendations for the design of the proposed development including construction considerations pertaining to the design which may affect its design.

The following report has been prepared specifically and solely for the aforementioned project. This report contains geotechnical findings and includes recommendations pertaining to the design and construction of the proposed development as understood at the time of writing this report.

2.0 Proposed Development

It is anticipated that the proposed development will consist of single and townhouse style residential dwellings with associated paved parking areas and local roadways. It is further anticipated that the site will be municipally serviced.

3.0 Method of Investigation

3.1 Field Investigation

Field Program

The field program for the investigation was carried out on November 11 and 12, 2020. At that time, a total of forty-two (42) test pits were excavated to a maximum depth of 2.6 m below existing grade using a hydraulic excavator. All fieldwork was conducted under the full-time supervision of Paterson personnel under the direction of a senior engineer. The test pitting procedure consisted of excavating to the required depths at the selected locations and sampling the overburden. The test holes were distributed in a manner to provide general coverage of the subject site taking into consideration site features. The approximate locations of the test holes are shown on Drawing PG5576-1 - Test Hole Location Plan included in Appendix 2.

Sampling and In Situ Testing

Soil samples from the test pits from the current investigation were recovered from the side walls of the open excavation and all soil samples were initially classified on site. All samples were placed in sealed plastic bags and transported to our laboratory for further examination and classification. The depths at which the grab samples were recovered from the test pits are shown as “G” on the Soil Profile and Test Data sheets in Appendix 1.

Undrained shear strength testing was carried out at regular depth intervals in cohesive soils. Undrained shear strength testing in test pits was completed using a handheld, portable vane apparatus (field inspection vane tester Roctest Model H-60).

Subsurface conditions observed in the test holes were recorded in detail in the field. Reference should be made to the Soil Profile and Test Data sheets presented in Appendix 1 for specific details of the soil profile encountered at the test hole location.

Groundwater

Open hole groundwater infiltration levels were observed at the time of excavation at two test pit locations. Our observations are presented in the Soil Profile and Test Data sheets in Appendix 1.

Sample Storage

All samples will be stored in the laboratory for a period of one month after issuance of this report. They will then be discarded unless we are otherwise directed.

3.2 Field Survey

The locations and ground surface elevations at each test hole location were surveyed by Paterson personnel and referenced to a geodetic datum using a Trimble GPS unit. The test hole locations and ground surface elevations at the test hole locations are presented on Drawing PG5576 -1 - Test Hole Location Plan in Appendix 2.

3.3 Laboratory Testing

Soil samples recovered from the subject site were visually examined in our laboratory to review the field logs.

3.4 Analytical Testing

One (1) soil sample was submitted for analytical testing to assess the corrosion potential for exposed ferrous metals and the sulphate potential against subsurface concrete structures. The results are discussed further in Subsection 6.7.

4.0 Observations

4.1 Surface Conditions

The subject site is currently undeveloped agricultural land which is relatively flat and approximately at grade with the surrounding area and Old Almonte Road. Appleton Side Road, to the southeast, by agricultural lands, to the southwest by Old Almonte Road and residential areas, and to the northwest by agricultural lands and Orchard View Long Term Care Home and agricultural land The ground surface across the site is relatively flat and approximately at grade with Old Almonte Road.

4.2 Subsurface Profile

Overburden

Generally, the subsurface profile at the test hole locations completed within the Future Expansion Lands residential development consisted of a thin layer of top soil overlying a stiff brown silty clay to clayey silt and/or glacial till overlying inferred. Practical refusal to excavation on inferred bedrock was encountered at all test pits at depths ranging from 0.1 to 2.8 m below the existing ground surface.

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 test hole location.

Bedrock

Based on available geological mapping, the subject site consists of interbedded dolostone and limestone of the Gull River formation with an anticipated drift thickness between 1 to 2 m.

4.3 Groundwater

All test holes were generally observed to be dry upon completion of the sampling program with the exception of minor infiltration noted along the test pit sidewalls these included; TP24-20, TP29-20 , TP30-20, TP37-20, and TP39-20 where the groundwater was measured at a depth of 0.5 to 2.1 m. The measured groundwater level (GWL) readings are presented the Soil Profile and Test Data sheets in Appendix 1. It should be noted that groundwater levels are subject to seasonal fluctuations, therefore, the groundwater level could vary at the time of construction.

Based on the moisture levels and coloring of the recovered soil samples, and our experience with the local area, the long-term groundwater table is expected to be near or perched within the bedrock surface. The recorded groundwater levels are noted on the applicable Soil Profile and Test Data sheet presented in Appendix 1.

5.0 Discussion

5.1 Geotechnical Assessment

From a geotechnical perspective, the subject site is considered satisfactory for the proposed development. It is expected that the proposed residential buildings will be founded on conventional style footing placed on a stiff silty clay, clayey silt, glacial till, and/or bedrock bearing surface.

It is anticipated that some bedrock removal will be required in areas across the site for building construction and service installation. All contractors should be prepared for bedrock removal within the subject site. Additionally, due to the presence of a silty clay deposit underlying the subject site, a permissible grade raise restriction will be required for settlement sensitive structures founded within the clay deposit.

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

5.2 Site Grading and Preparation

Stripping Depth

Topsoil and deleterious fill, such as those containing organic materials, should be stripped from under any buildings, paved areas, pipe bedding, and other settlement sensitive structures.

Bedrock Removal

Bedrock removal can be accomplished by hoe ramming where only small quantity of the bedrock needs to be removed. Sound bedrock may be removed by line drilling and controlled blasting and/or hoe ramming.

Prior to considering blasting operations, the blasting effects on the existing services, buildings and other structures should be addressed. A pre-blast or pre-construction survey of the existing structures located in proximity of the blasting operations should be completed prior to commencing site activities.

The extent of the survey should be determined by the blasting consultant and should be sufficient to respond to any inquiries/claims related to the blasting operations.

As a general guideline, peak particle velocities (measured at the structures) should not exceed 25 mm/s during the blasting program to reduce the risks of damage to the existing structures.

The blasting operations should be planned and conducted under the supervision of a licensed professional engineer who is also an experienced blasting consultant.

Excavation side slopes in sound bedrock can be excavated using almost vertical side walls. A minimum 1 m horizontal ledge, should remain between the overburden excavation and the bedrock surface to provide an area to allow for potential sloughing. The ledge will provide an area to allow for potential sloughing or a stable base for the overburden shoring system.

Vibration Considerations

Construction operations are the cause of vibrations, and possibly, sources of nuisance to the community. Therefore, means to reduce the vibration levels as much as possible should be incorporated in the construction operations to maintain, as much as possible, a cooperative environment with the residents.

The following construction equipments could be the source of vibrations: hoe ram, compactor, dozer, crane, truck traffic, etc. Vibrations, whether caused by blasting operations or by construction operations, could be the source of detrimental vibrations on the nearby buildings and structures. Therefore, all vibrations are recommended to be limited.

Two parameters are used to determine the permissible vibrations, namely, the maximum peak particle velocity and the frequency. For low frequency vibrations, the maximum allowable peak particle velocity is less than that for high frequency vibrations. As a guideline, the peak particle velocity should be less than 15 mm/s between frequencies of 4 to 12 Hz, and 50 mm/s above a frequency of 40 Hz (interpolate between 12 and 40 Hz). The guidelines are for current construction standards. Considering that these guidelines are above perceptible human level and, in some cases, could be very disturbing to some people, a pre-construction survey is recommended be completed to minimize the risks of claims during or following the construction of the proposed buildings.

Fill Placement

Fill placed for grading beneath the proposed structure(s) or other settlement sensitive areas should consist of clean imported granular fill unless otherwise specified, such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II. This material should be tested and approved prior to delivery to the site. The engineered fill should be placed in maximum 300 mm thick lifts and compacted using suitable compaction equipment for the specified lift thickness. Fill placed beneath the building areas should be compacted to at least 98% of the material’s standard Proctor maximum dry density (SPMDD).

To in-fill existing channels/ditches below building areas, roadways or other settlement sensitive structures, it is recommended to place Granular A, Granular B Type I or II, well graded blast rock (maximum 200 mm diameter) or select subgrade material). The backfill material should be placed under dry conditions, in above freezing temperatures and approved by the geotechnical consultant. The backfill should be placed in maximum 300 mm loose lifts and compacted to 98% of its SPMDD.

Non-specified existing fill along with site-excavated soil can be placed as general landscaping fill where surface settlement is a minor concern. The backfill materials should be spread in thin lifts and at a minimum compacted by the tracks of the spreading equipment to minimize voids. If the non-specified backfill is to be placed to increase the subgrade level for areas to be paved, the fill should be compacted in maximum 300 mm lifts and compacted to 98% of the material's SPMDD. Non-specified existing fill and site-excavated soils are not suitable for placement as backfill against foundation walls unless a composite drainage blanket connected to a perimeter drainage system is provided.

If excavated rock is to be used as fill, it should be suitably fragmented to produce a well-graded material with a maximum particle size of 300 mm. This material should be used structurally only to build up the subgrade for roads and paved areas. Where the fill is open-graded, a blinding layer of finer granular fill or a woven geotextile, such as Terratrack 200 or equivalent, may be required to prevent adjacent finer materials from migrating into the voids, with associated loss of ground and settlements. This can be determined at the time of construction

5.3 Foundation Design

Bearing resistance values are provided in Table 1 for footings placed on an undisturbed silty clay, sandy silt, glacial till or clean bedrock bearing surface. Footings designed using the bearing resistance values at SLS provided in Table 1 will be subjected to potential post construction total and differential settlements of 25 and 20 mm, respectively. Footings placed on clean, surface sounded bedrock will be subjected to negligible settlements.

An undisturbed soil bearing surface consists of a surface from which all organic materials and deleterious materials, such as loose, frozen or disturbed soil, whether in situ or not, have been removed, in the dry, prior to the placement of concrete for footings. A clean, surface-sounded bedrock bearing surface should be free of loose materials, and have no near surface seams, voids, fissures or open joints which can be detected from surface sounding with a rock hammer.

Table 1 - Bearing Resistance Values

Bearing Surface	Factored Bearing Resistance Values at ULS (kPa)	Bearing Resistance Values at SLS or Allowable Bearing Pressure (kPa)
Stiff Sandy Silt	200	100
Stiff Silty Clay	250	150
Glacial Till	250	150
Engineered fill (Granular A or Granular B Type II)	250	150
Clean Surface Sounded Bedrock	1000	-

Notes:
❏ A geotechnical resistance factor of 0.5 was applied to the provided bearing resistance values at ULS

Where a building is founded partly on bedrock and partly on soil, it is recommended to decrease the soil bearing resistance value by 25% for the footings placed on soil bearing media to reduce the potential long term total and differential settlements. Also, at the soil/bedrock and bedrock/soil transitions, it is recommended that the upper 0.5 m of the bedrock be removed for a minimum length of 2 m (on the bedrock side) and replaced with nominally compacted OPSS Granular A or Granular B Type II material. The width of the subexcavation should be at least the proposed footing width plus 0.5 m. Steel reinforcement, extending at least 3 m on both sides of the 2 m long transition, should be placed in the top part of the footings and foundation walls.

Lateral Support

The bearing medium under footing-supported structures is required to be provided with adequate lateral support with respect to excavations and different foundation levels. Adequate lateral support is provided to a stiff silty clay above the groundwater table when a plane extending down and out from the bottom edge of the footing at a minimum of 1.5H:1V passes only through in situ soil of the same or higher capacity as the bearing medium soil. A bedrock bearing medium will require a lateral support zone of 1H:6V.

Bedrock/Soil Transition

Where a building is founded partly on bedrock and partly on soil, it is recommended to decrease the soil bearing resistance value by 25% for the footings placed on soil bearing media to reduce the potential long term total and differential settlements. Also, at the soil/bedrock and bedrock/soil transitions, it is recommended that the upper 0.5 m of the bedrock be removed for a minimum length of 2 m (on the bedrock side) and replaced with nominally compacted OPSS Granular A or Granular B Type II material. The width of the sub-excavation should be at least the proposed footing width plus 0.5 m. Steel reinforcement, extending at least 3 m on both sides of the 2 m long transition, should be placed in the top part of the footings and foundation walls.

Permissible Grade Raise

Based on the undrained shear strength testing results and experience with the local silty clay deposit, a permissible grade raise restriction of **2.0 m** is recommended for settlement sensitive structures founded within the clay deposit.

5.4 Design for Earthquakes

The subject site can be taken as seismic site response **Class C** as defined in Table 4.1.8.4.A of the Ontario Building Code (OBC) 2012 for foundations considered at this site. A higher seismic class may be applicable, such as Class A or B, provided the footings are within 3 m of the bedrock surface. However, this would need to be confirmed by performing a seismic shear wave velocity test at the subject site. The soils underlying the site are not susceptible to liquefaction. Reference should be made to the latest revision of the Ontario Building Code for a full discussion of the earthquake design requirements.

5.5 Basement Slab

With the removal of all topsoil and deleterious fill, such as those containing organic materials, within the footprint of the proposed buildings, the native soil surface will be considered to be an acceptable subgrade on which to commence backfilling for floor slab construction. Provision should be made for proof rolling the soil subgrade using heavy vibratory compaction equipment prior to placing any fill. Any soft areas should be removed and backfilled with appropriate backfill material prior to placing any fill. OPSS Granular A or Granular B Type II, with a maximum particle size of 50 mm, are recommended for backfilling below the floor slab. All backfill material within the footprint of the proposed building(s) should be placed in maximum 300 mm thick loose layers and compacted to a minimum of 98% of the SPMDD.

5.6 Pavement Structure

The subgrade materials for the pavement structure are anticipated to be stiff silty clay, glacial till or compacted engineered fill. Car only parking, local and collector roadways are anticipated at this site. The proposed pavement structures are shown in Tables 2 and 3.

Table 2 - Recommended Pavement Structure - Car Only Parking Areas

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
	SUBGRADE - Either fill, in situ soil, or OPSS Granular B Type I or II material placed over in situ soil or fill

Table 4 - Recommended Pavement Structure - Local Roadways and Collector Roadways without Bus Traffic

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
400	**SUBBASE** - OPSS Granular B Type II
	SUBGRADE - Either fill, in situ soil, or OPSS Granular B Type I or II material placed over in situ soil or fill

Minimum Performance Graded (PG) 58-34 asphalt cement should be used for this project.

For residential driveways and car only parking areas, an Ontario Traffic Category A will be used. For local and collector roadways, an Ontario Traffic Category B should be used for design purposes.

If soft spots develop in the subgrade during compaction or due to construction traffic, the affected areas should be excavated and replaced with OPSS Granular B Type I or Type II material.

The pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 99% of the material's SPMDD using suitable compaction equipment.

Pavement Structure Drainage

Satisfactory performance of the pavement structure is largely dependent on keeping the contact zone between the subgrade material and the base stone in a dry condition. Failure to provide adequate drainage under conditions of heavy wheel loading can result in the fine subgrade soil being pumped into the voids in the stone subbase, thereby reducing its load carrying capacity.

Due to the impervious nature of the subgrade materials consideration should be given to installing subdrains during the pavement construction. These drains should extend in four orthogonal directions or longitudinally when placed along a curb. The clear crushed stone surrounding the drainage lines or the pipe, should be wrapped with suitable filter cloth. The subdrain inverts should be approximately 300 mm below subgrade level. The subgrade surface should be shaped to promote water flow to the drainage lines. All subdrains should be provided with a positive outlet to the storm sewer.

6.0 Design and Construction Precautions

6.1 Foundation Drainage and Backfill

Foundation Drainage

A perimeter foundation drainage system is recommended to be provided for the proposed structure. The system should consist of a 100 to 150 mm diameter perforated corrugated plastic pipe, surrounded on all sides by 150 mm of 10 mm clear crushed stone, placed at the footing level around the exterior perimeter of the structure. The pipe should have a positive outlet, such as a gravity connection to the storm sewer.

Foundation Backfill

Backfill against the exterior sides of the foundation walls should consist of free-draining, non frost susceptible granular materials. Imported granular materials, such as clean sand or OPSS Granular B Type I granular material, should be used for this purpose. The greater part of the site excavated materials will be frost susceptible and, as such, are not recommended for re-use as backfill against the foundation walls, unless used in conjunction with a composite drainage blanket, such as Miradrain G100N or Delta Drain 6000.

6.2 Protection of Footings Against Frost Action

Perimeter footings of heated structures are required to be insulated against the deleterious effect of frost action. A minimum of 1.5 m thick soil cover (or equivalent) should be provided in this regard.

Exterior unheated footings, such as those for isolated exterior piers, are more prone to deleterious movement associated with frost action than the exterior walls of the structure proper and require additional protection, such as soil cover of 2.1 m or a combination of soil cover and foundation insulation.

Frost Susceptibility of Bedrock

When bedrock is encountered above the proposed founding depth and soil frost cover is less than 1.5 m, the frost susceptibility of the bedrock should be determined. This can be accomplished as follows:

☐ Drill probeholes within the bedrock and assess its frost susceptibility.
☐ Examine service trench profiles extending in bedrock in the vicinity of the foundation to determine if weathering is extensive.

If the bedrock is considered to be **non-frost susceptible**, the footings can be poured directly on the bedrock without any further frost protective measures.
If the bedrock is considered to be **frost susceptible**, the following measures should be implemented for frost protection:

- ☐ Option A - Sub-excavate the weathered bedrock to sound bedrock or to the required frost cover depth. Pour footings at the lower level.

- ☐ Option B - Use insulation to protect footings. It is preferable to pour footings on the insulation overlying weathered bedrock. However, due to potential undulating bedrock surface, consideration may have to be given to adopting an insulation detail that allows the footing to be poured directly on the weathered bedrock.

6.3 Excavation Side Slopes

Temporary Side Slopes

The temporary excavation side slopes should be excavated to acceptable slopes from the beginning of the excavation until the structure is backfilled. It is assumed that sufficient room will be available for the greater part of the excavation to be undertaken by open-cut methods (i.e. unsupported excavations). In bedrock, almost vertical side slopes can be used provided that all loose rock and blocks with unfavourable weak planes are removed or stabilized.

The excavation side slopes above the groundwater level extending to a maximum depth of 3 m should be excavated at 1H:1V or shallower. The shallower slope is required for excavation below groundwater level. The subsurface soil is considered to be mainly Type 2 and 3 soil according to the Occupational Health and Safety Act and Regulations for Construction Projects.

Excavated soil should not be stockpiled directly at the top of excavations and heavy equipment should maintain safe working distance from the excavation sides.

Slopes in excess of 3 m in height should be periodically inspected by the geotechnical consultant in order to detect if the slopes are exhibiting signs of distress.

A trench box is recommended to be installed at all times to protect personnel working in trenches with steep or vertical sides. Services are expected to be installed by “cut and cover” methods and excavations should not be remain exposed for extended periods of time.

6.4 Pipe Bedding and Backfill

The pipe bedding for sewer and water pipes should consist of at least 150 mm of OPSS Granular A material for areas over a soil subgrade. However, the bedding thickness should be increased to 300 mm for areas over a bedrock subgrade, if encountered. The material should be placed in maximum 300 mm thick lifts and compacted to a minimum of 99% of its SPMDD. The bedding material should extend at a minimum to the spring line of the pipe.

The cover material, which should consist of OPSS Granular A crushed stone, should extend from the spring line of the pipe to a minimum of 300 mm above the obvert of the pipe. The material should be placed in maximum 300 mm thick lifts and compacted to a minimum of 99% of its SPMDD.

Generally, it should be possible to re-use the moist (not wet) silty sand and glacial till above the cover material if the excavation and filling operations are carried out in dry weather conditions. Wet sub-excavated soil should be given a sufficient drying period to decrease its moisture content to an acceptable level to make compaction possible prior to being re-used. All stones greater than 300 mm in their greatest dimension should be removed prior to reuse of site-generated glacial till.

Where hard surface areas are considered above the trench backfill, the trench backfill material within the frost zone (about 1.8 m below finished grade) should consist of the soils exposed at the trench walls to minimize differential frost heaving. The trench backfill should be placed in maximum 300 mm thick loose lifts and compacted to a minimum of 98% of the SPMDD.

Typically, clay seals are recommended to be placed within service trenches where silty clay is present at invert level. Paterson has reviewed the available service profile drawings for the current phase. Based on our review and existing subsoils information, the silty clay deposit where encountered along proposed service alignment is located above the lowest service pipe invert level. Therefore, clay seals are not required. However, if silty clay is encountered at the lowest service invert level, it is recommended that, clay seals be provided in the service trenches at no more than 60 m intervals in the service trenches.

The seals should be at least 1.5 m long (in the trench direction) and should extend from trench wall to trench wall. The seals should extend from the frost line and fully penetrate the bedding, subbedding and cover material. The barriers should consist of relatively dry and compactable brown silty clay placed in maximum 225 mm thick loose layers and compacted to a minimum of 95% of the SPMDD.

6.5 Groundwater Control

It is anticipated that groundwater infiltration into the excavations should be low and controllable using open sumps. Pumping from open sumps should be sufficient to control the groundwater influx through the sides of shallow excavations. The contractor should be prepared to direct water away from all bearing surfaces and subgrades, regardless of the source, to prevent disturbance to the founding medium.

A temporary Ministry of the Environment, Conservation and Parks (MECP) permit to take water (PTTW) may be required for this project if more than 400,000 L/day of ground and/or surface water is to be pumped during the construction phase. A minimum 4 to 5 months should be allowed for completion of the PTTW application package and issuance of the permit by the MECP.

For typical ground or surface water volumes, being pumped during the construction phase, between 50,000 to 400,000 L/day, it is required to register on the Environmental Activity and Sector Registry (EASR). A minimum of two to four weeks should be allotted for completion of the EASR registration and the Water Taking and Discharge Plan to be prepared by a Qualified Person as stipulated under O.Reg. 63/16.

If a project qualifies for a PTTW based upon anticipated conditions, an EASR will not be allowed as a temporary dewatering measure while awaiting the MECP review of the PTTW application.

6.6 Winter Construction

Precautions must be taken if winter construction is considered for this project. The subsoil conditions at this site consist of frost susceptible materials. In the presence of water and freezing conditions, ice could form within the soil mass. Heaving and settlement upon thawing could occur. Provisions in the contract documents should be provided to protect the excavation walls from freezing, if applicable.

In the event of construction during below zero temperatures, the founding stratum should be protected from freezing temperatures by the installation of straw, propane heaters and tarpaulins or other suitable means. The excavation base should be insulated from sub-zero temperatures immediately upon exposure and until such time as heat is adequately supplied to the building and the footings are protected with sufficient soil cover to prevent freezing at founding level.

Trench excavations and pavement construction are difficult activities to complete during freezing conditions without introducing frost in the subgrade or in the excavation walls and bottoms. Precautions should be considered if such activities are to be completed during freezing conditions. Additional information could be provided, if required.

6.7 Corrosion Potential and Sulphate

The results on analytical testing show that the sulphate content is less than 0.1%. The results are indicative that Type 10 Portland Cement (Type GU) would be appropriate for this site. The chloride content and the pH of the sample indicate that they are not significant factors in creating a corrosive environment for exposed ferrous metals at this site, whereas the resistivity in indicative of a aggressive to very aggressive corrosive environment.

6.8 Landscaping Considerations

Tree Planting Restrictions

The proposed residential dwellings founded over a silty clay deposit are located in a low to moderate sensitivity area with respect to tree planting. It is recommended that trees placed within 5 m of the foundation wall should consist of low water demanding trees with shallow roots systems that extend less than 1.5 m below ground surface for buildings where footings are founded over a silty clay deposit. Trees placed greater than 5 m from the foundation wall may consist of typical street trees, which are typically moderate water demand species with roots extending to a maximum depth of 2 m below ground surface.

It is well documented in the literature, and is our experience, that fast-growing trees located near buildings founded on cohesive soils that shrink on drying can result in long-term differential settlements of the structures. Tree varieties that have the most pronounced effect on foundations are seen to consist of poplars, willows and some maples (i.e. Manitoba Maples) and, as such, they should not be considered in the landscaping design.

7.0 Recommendations

A materials testing and observation services program is a requirement for the provided foundation design data to be applicable. The following aspects of the program should be performed by the geotechnical consultant:

☐ Review detailed grading plan(s) from a geotechnical perspective.

☐ Review of architectural and structural drawings to ensure adequate frost protection is provided to the subsoil.

☐ Observation of all bearing surfaces prior to the placement of concrete.

☐ Sampling and testing of the concrete and fill materials used.

☐ 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.

☐ 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 the geotechnical consultant

8.0 Statement of Limitations

The recommendations provided in the report are in accordance with Paterson's present understanding of the project. Paterson request permission to review the recommendations when the drawings and specifications are completed.

A geotechnical investigation is a limited sampling of a site. Should any conditions encountered during construction differ from the test pit locations, Paterson requests immediate notification to permit reassessment of the recommendations provided herein.

The recommendations provided should only be used by the design professionals associated with this project. The recommendations are not intended for contractors bidding on or constructing the project. The latter should evaluate the factual information provided in the report. The contractor should also determine the suitability and completeness for the intended construction schedule and methods. Additional testing may be required for the contractors purpose.

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 Houchaimi Holdings Inc. or their agent(s) is not authorized without review by Paterson for the applicability of our recommendations to the altered use of the report.

Paterson Group Inc.

LICENSED PROFESSIONAL ENGINEER
December 7 2020
D. J. GILBERT
100116130
PROVINCE OF ONTARIO

Otillia McLaughlin B.Eng.

David J Gilbert P.Eng.

Report Distribution:

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APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

ANALYTICAL TESTING RESULTS

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Backhoe

DATE November 11, 2020

FILE NO. PG5576

HOLE NO. TP 1-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
GROUND SURFACE						0	131.14		
TOPSOIL 0.30	■	G	1						
Brown **CLAYEY SILT**	▨	G	2						
0.92	▨	G	3						
End of Test Pit TP terminated on inferred bedrock surface at 0.92m depth (TP dry upon completion)									

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

REMARKS

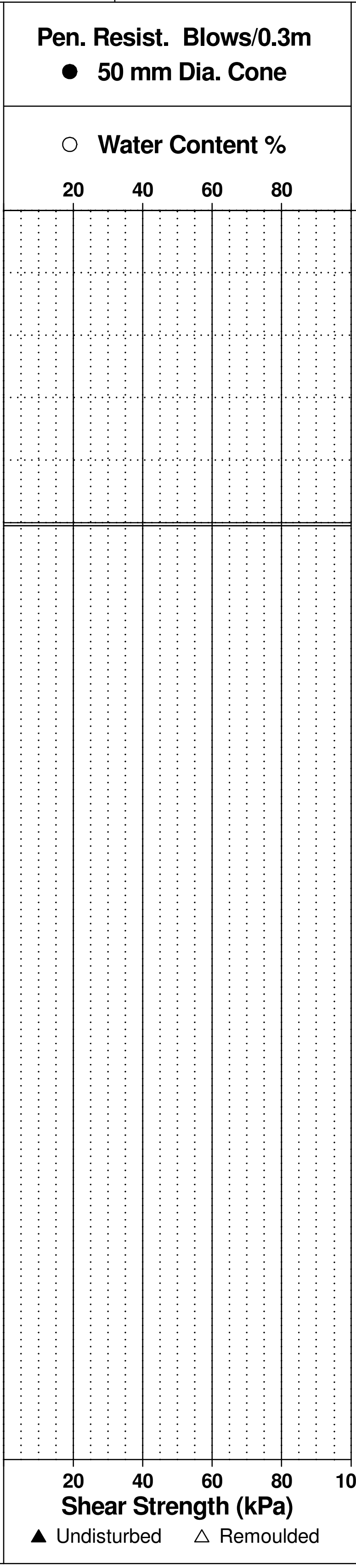
BORINGS BY Backhoe

DATE November 11, 2020

FILE NO. PG5576

HOLE NO. TP 2-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	130.41
TOPSOIL 0.37	■						
Brow **SILTY CLAY,** trace gravel 0.63	▨	G	1				
GLACIAL TILL: Brown silty clay, some sand, gravel and cobbles 1.01	^	G	2			1	129.41
End of Test Pit TP terminated on inferred bedrock surface at 1.01m depth (TP dry upon completion)							



Piezometer Construction

patersongroup Consulting Engineers
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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

FILE NO. PG5576

REMARKS

HOLE NO. TP 3-20

BORINGS BY Backhoe

DATE November 11, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
GROUND SURFACE						0	130.42		
TOPSOIL 0.33	■	G	1						
Brown **CLAYEY SILT**	▨	G	2						
	▨	G	3			1	129.42		
1.23	▨								

End of Test Pit

TP terminated on inferred bedrock surface at 1.23m depth

(TP dry upon completion)

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

FILE NO. PG5576

REMARKS

HOLE NO. TP 4-20

BORINGS BY Backhoe

DATE November 11, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
GROUND SURFACE						0	131.00		
TOPSOIL 0.37		G	1						
Brown **SILTY CLAY** 0.53		G	2						
GLACIAL TILL: Brown silty clay, some sand, gravel, cobbles and boulders 0.81		G	3						
End of Test Pit TP terminated on inferred bedrock surface at 0.81m depth (TP dry upon completion)									

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Backhoe

DATE November 11, 2020

FILE NO. PG5576

HOLE NO. TP 5-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD				
GROUND SURFACE						0	131.44		
TOPSOIL 0.39	■	G	1						
Brown **SILTY CLAY** 0.57	▨	G	2						
End of Test Pit TP terminated on inferred bedrock surface at 0.57m depth (TP dry upon completion)									

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

FILE NO. PG5576

REMARKS

HOLE NO. TP 6-20

BORINGS BY Backhoe

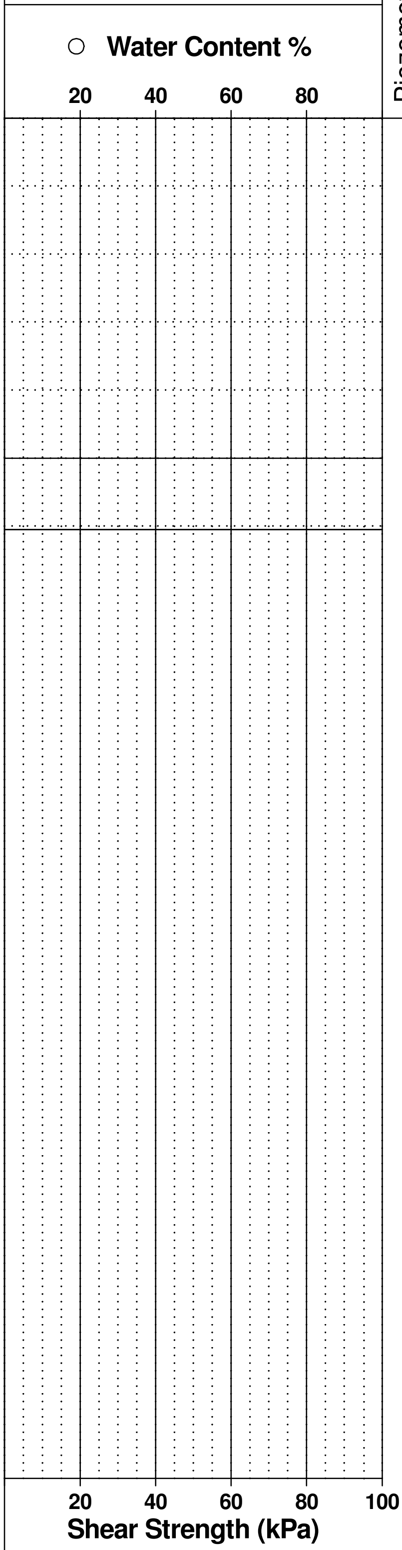
DATE November 11, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE		TYPE	NUMBER	% RECOVERY	N VALUE or RQD				
TOPSOIL 0.23	■	G	1			0	131.94		
Brown **SILTY CLAY to CLAYEY SILT** 0.52	▨	G	2						
GLACIAL TILL: Brow nsilty clay, some sand, gravel, cobbles and boulders 1.21	^^^	G	3			1	130.94		

End of Test Pit

TP terminated on inferred bedrock surface at 1.21m depth

(TP dry upon completion)



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Backhoe

DATE November 11, 2020

FILE NO. PG5576

HOLE NO. TP 7-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD				
GROUND SURFACE						0	131.52		
TOPSOIL 0.21	■								
Brown **SILTY CLAY,** trace sand and gravel 0.51	▨	G	1						
End of Test Pit TP terminated on inferred bedrock surface at 0.51m depth (TP dry upon completion)									

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Backhoe

DATE November 11, 2020

FILE NO. PG5576

HOLE NO. TP 8-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
GROUND SURFACE						0	132.47		
TOPSOIL 0.11									
GLACIAL TILL: Brown silty clay with weathered bedrock, trace sand and gravel 0.47		G	1						
End of Test Pit TP terminated on inferred bedrock surface at 0.47m depth (TP dry upon completion)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

FILE NO. PG5576

REMARKS

HOLE NO. TP 9-20

BORINGS BY Backhoe

DATE November 11, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
GROUND SURFACE						0	133.52		
TOPSOIL 0.19		G	1						
GLACIAL TILL: Brown silty clay with weathered bedrock 0.42		G	2						
End of Test Pit TP terminated on inferred bedrock surface at 0.42m depth (TP dry upon completion)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Backhoe

DATE November 11, 2020

FILE NO. PG5576

HOLE NO. TP10-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
GROUND SURFACE		TYPE	NUMBER	% RECOVERY	N VALUE or RQD				
						0	131.97		
TOPSOIL 0.38	■	G	1						
End of Test Pit TP terminated on inferred bedrock surface at 0.38m depth (TP dry upon completion)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

FILE NO. PG5576

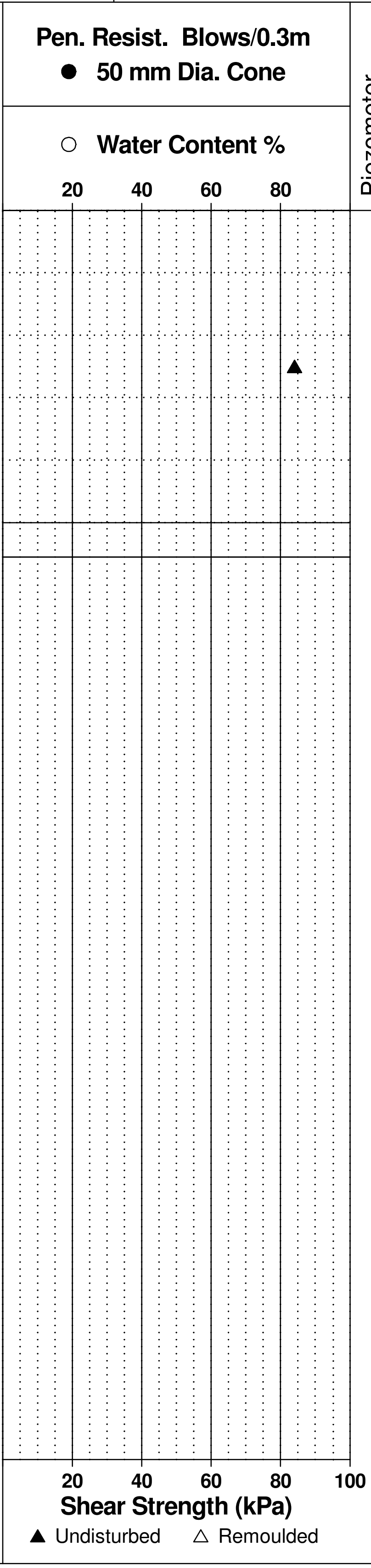
REMARKS

HOLE NO. TP11-20

BORINGS BY Backhoe

DATE November 11, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	132.09
TOPSOIL 0.31							
Stiff, brown **SILTY CLAY** 0.62		G	1				
GLACIAL TILL: Brown silty clay, some sand and gravel 1.11		G	2			1	131.09
End of Test Pit TP terminated on inferred bedrock surface at 1.11m depth (TP dry upon completion)							



Piezometer Construction

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Backhoe

DATE November 11, 2020

FILE NO. PG5576

HOLE NO. TP12-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD				
GROUND SURFACE						0	131.87		
TOPSOIL 0.32	■	G	1						
End of Test Pit TP terminated on inferred bedrock surface at 0.32m depth (TP dry upon completion)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Backhoe

DATE November 11, 2020

FILE NO. PG5576

HOLE NO. TP13-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
GROUND SURFACE						0	133.74		
TOPSOIL 0.34	■	G	1						
GLACIAL TILL: Brown silty clay, some gravel and weathered bedrock 0.53	^^^	G	2						
End of Test Pit TP terminated on inferred bedrock surface at 0.53m depth (TP dry upon completion)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Backhoe

DATE November 11, 2020

FILE NO. PG5576

HOLE NO. TP14-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	133.27		
TOPSOIL 0.25		G	1						
GLACIAL TILL: Brown silty clay with weathered bedrock 0.37									
End of Test Pit TP terminated on inferred bedrock surface at 0.37m depth (TP dry upon completion)									

Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Backhoe

DATE November 11, 2020

FILE NO. PG5576

HOLE NO. TP15-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
GROUND SURFACE						0	135.24		
TOPSOIL	█	G	1						
0.39									
End of Test Pit TP terminated on inferred bedrock surface at 0.39m depth (TP dry upon completion)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

REMARKS

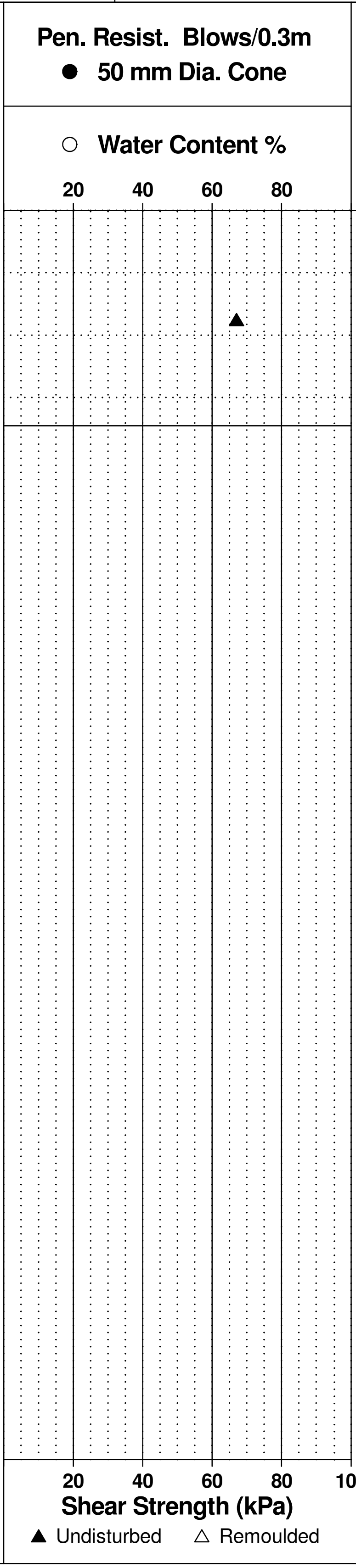
BORINGS BY Backhoe

DATE November 11, 2020

FILE NO. PG5576

HOLE NO. TP16-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	133.74
0.19	■	G	1				
Stiff, brown **SILTY CLAY** **TOPSOIL** 0.47	▨	G	2				
GLACIAL TILL: Brown silty clay, some sand and gravel 0.69	⁖	G	3				
End of Test Pit TP terminated on inferred bedrock surface at 0.69m depth (TP dry upon completion)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

FILE NO. PG5576

REMARKS

HOLE NO. TP17-20

BORINGS BY Backhoe

DATE November 11, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD				
GROUND SURFACE						0	133.57		
TOPSOIL 0.32	■	G	1						
End of Test Pit TP terminated on inferred bedrock surface at 0.32m depth (TP dry upon completion)									

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Backhoe

DATE November 11, 2020

FILE NO. PG5576

HOLE NO. TP18-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
GROUND SURFACE						0	133.37		
TOPSOIL		G	1						
0.35									
GLACIAL TILL: Brown silty clay, some sand and gravel		G	2						
		G	3			1	132.37		
1.32									
End of Test Pit TP terminated on inferred bedrock surface at 1.32m depth (TP dry upon completion)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Backhoe

DATE November 11, 2020

FILE NO. PG5576

HOLE NO. TP19-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD				
GROUND SURFACE						0	133.36		
TOPSOIL 0.41	■	G	1						
End of Test Pit TP terminated on inferred bedrock surface at 0.41m depth (TP dry upon completion)									

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Backhoe

DATE November 11, 2020

FILE NO. PG5576

HOLE NO. TP20-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content % (20 40 60 80)	Piezometer Construction
GROUND SURFACE						0	132.78		
TOPSOIL 0.31	■	G	1						
Stiff, brown **SILTY CLAY** 0.83	▨	G	2						
End of Test Pit TP terminated on inferred bedrock surface at 0.83m depth (TP dry upon completion)									

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Backhoe

DATE November 11, 2020

FILE NO. PG5576

HOLE NO. TP21-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
GROUND SURFACE						0	133.81		
TOPSOIL 0.32		G	1						
GLACIAL TILL: Brown silty clay with weathered bedrock 0.99		G	2						
End of Test Pit TP terminated on inferred bedrock surface at 0.99m depth (TP dry upon completion)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Backhoe

DATE November 11, 2020

FILE NO. PG5576

HOLE NO. TP22-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
GROUND SURFACE		TYPE	NUMBER	% RECOVERY	N VALUE or RQD				
TOPSOIL 0.35	■	G	1			0	135.28		
End of Test Pit TP terminated on inferred bedrock surface at 0.35m depth (TP dry upon completion)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Backhoe

DATE November 11, 2020

FILE NO. PG5576

HOLE NO. TP23-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
GROUND SURFACE		TYPE	NUMBER	% RECOVERY	N VALUE or RQD				
TOPSOIL 0.17	■	G	1			0	135.23		
End of Test Pit TP terminated on inferred bedrock surface at 0.17m depth (TP dry upon completion)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

FILE NO. PG5576

REMARKS

HOLE NO. TP24-20

BORINGS BY Backhoe

DATE November 11, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content % (20 40 60 80)	Piezometer Construction
GROUND SURFACE						0	133.89		
TOPSOIL 0.29	■	G	1						
Stiff, brown **SILTY CLAY,** trace sand and gravel 0.52	▨								
End of Test Pit TP terminated on inferred bedrock surface at 0.52m depth (Groundwater infiltration at 0.5m depth)									

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

FILE NO. **PG5576**

REMARKS

HOLE NO. **TP25-20**

BORINGS BY Backhoe

DATE November 12, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	134.61		
TOPSOIL 0.24	■	G	1						
Stiff, brown **CLAYEY SILT** 0.53	▨	G	2						
End of Test Pit TP terminated on inferred bedrock surface at 0.53m depth (TP dry upon completion)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Backhoe

DATE November 12, 2020

FILE NO. PG5576

HOLE NO. TP26-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD				
GROUND SURFACE						0	132.81		
TOPSOIL 0.25	■	G	1						
GLACIAL TILL: Brown silty clay, some sand and gravel 0.75	^^^	G	2						
End of Test Pit TP terminated on inferred bedrock surface at 0.75m depth (TP dry upon completion)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Backhoe

DATE November 12, 2020

FILE NO. PG5576

HOLE NO. TP27-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
GROUND SURFACE		TYPE	NUMBER	% RECOVERY	N VALUE or RQD				
TOPSOIL 0.13	■	G	1			0	134.72		
End of Test Pit TP terminated on inferred bedrock surface at 0.13m depth (TP dry upon completion)									

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Backhoe

DATE November 12, 2020

FILE NO. PG5576

HOLE NO. TP28-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD				
GROUND SURFACE						0	135.27		
TOPSOIL 0.11	■	G	1						
End of Test Pit TP terminated on inferred bedrock surface at 0.11m depth (TP dry upon completion)									

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Backhoe

DATE November 12, 2020

FILE NO. PG5576

HOLE NO. TP29-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
GROUND SURFACE						0	132.76		
TOPSOIL — 0.19		G	1						
GLACIAL TILL: Brown silty clay, some sand and gravel — 0.98		G	2						∇
End of Test Pit TP terminated on inferred bedrock surface at 0.92m depth (Groundwater infiltration at 0.9m depth)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

REMARKS

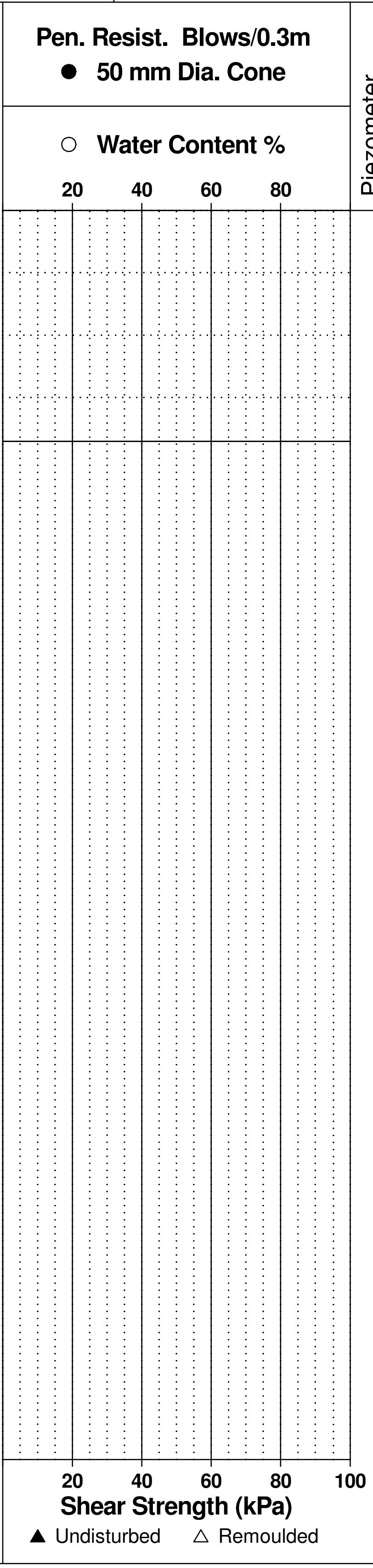
BORINGS BY Backhoe

DATE November 12, 2020

FILE NO. PG5576

HOLE NO. TP30-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Piezometer Construction
GROUND SURFACE						0	132.81	
TOPSOIL 0.26		G	1					
GLACIAL TILL: Brown silty clay, some sand and gravel 0.74		G	2					▽
End of Test Pit TP terminated on inferred bedrock surface at 0.74m depth (Groundwater infiltration at 0.6m depth)								



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

FILE NO. PG5576

REMARKS

HOLE NO. TP31-20

BORINGS BY Backhoe

DATE November 12, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD				
GROUND SURFACE						0	132.73		
TOPSOIL 0.21	■	G	1						
GLACIAL TILL: Brown silty clay with sand, gravel and cobbles 0.52	^	G	2						
End of Test Pit TP terminated on inferred bedrock surface at 0.52m depth (TP dry upon completion)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

FILE NO. **PG5576**

REMARKS

HOLE NO. **TP32-20**

BORINGS BY Backhoe

DATE November 12, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
GROUND SURFACE						0	131.56		
TOPSOIL 0.31		G	1						
GLACIAL TILL: Brown silty clay with sand, gravel and cobbles 0.82		G	2						

End of Test Pit

TP terminated on inferred bedrock surface at 0.82m depth

(TP dry upon completion)

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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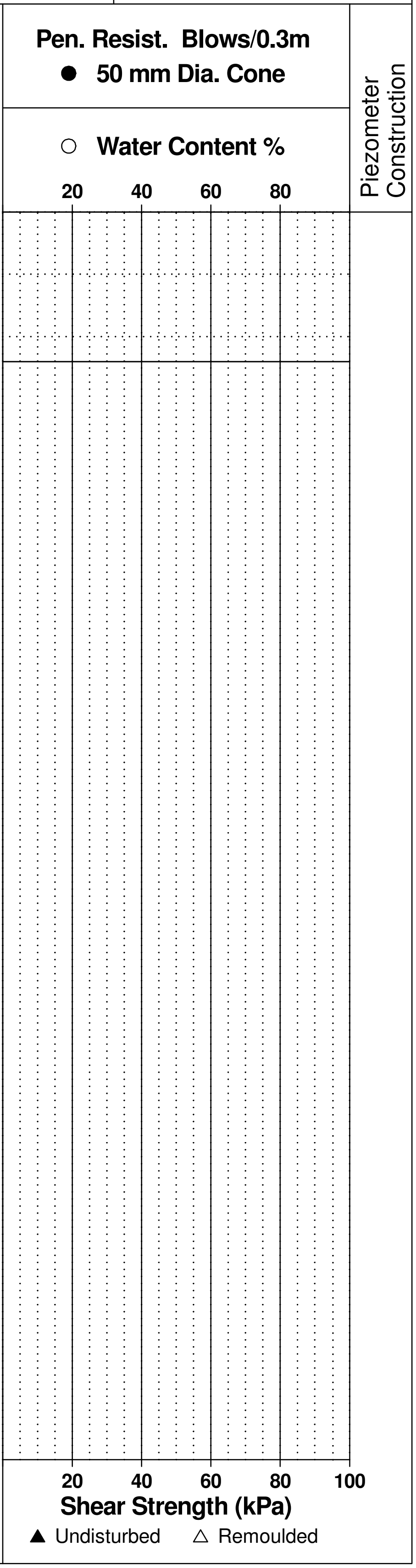
SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic
FILE NO. PG5576
REMARKS
HOLE NO. TP33-20
BORINGS BY Backhoe
DATE November 12, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	132.75
TOPSOIL		G	1				
0.39							
GLACIAL TILL: Brown silty clay, some sand and gravel	^^^^	G	2				
0.48							
End of Test Pit TP terminated on inferred bedrock surface at 0.48m depth (TP dry upon completion)							



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

FILE NO. PG5576

REMARKS

HOLE NO. TP34-20

BORINGS BY Backhoe

DATE November 12, 2020

SOIL DESCRIPTION GROUND SURFACE	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
TOSPOIL 0.12	■	G	1			0	132.19		
Stiff, brown **CLAYEY SILT,** trace gravel 0.46	▨	G	2						
End of Test Pit TP terminated on inferred bedrock surface at 0.46m depth (TP dry upon completion)									

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Backhoe

DATE November 12, 2020

FILE NO. PG5576

HOLE NO. TP35-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
GROUND SURFACE						0	131.42		
TOPSOIL 0.13	■								
GLACIAL TILL: Brown silty clay with sand, gravel and cobbles 0.39	▨	G	1						
End of Test Pit TP terminated on inferred bedrock surface at 0.39m depth (TP dry upon completion)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

FILE NO. **PG5576**

REMARKS

HOLE NO. **TP36-20**

BORINGS BY Backhoe

DATE November 12, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD				
GROUND SURFACE						0	131.14		
TOPSOIL 0.23									
GLACIAL TILL: Brown silt clay, trace sand, gravel, cobbles, boulders 0.66		G	1						
		G	2						
End of Test Pit TP terminated on inferred bedrock surface at 0.66m depth (TP dry upon completion)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Backhoe

DATE November 12, 2020

FILE NO. PG5576

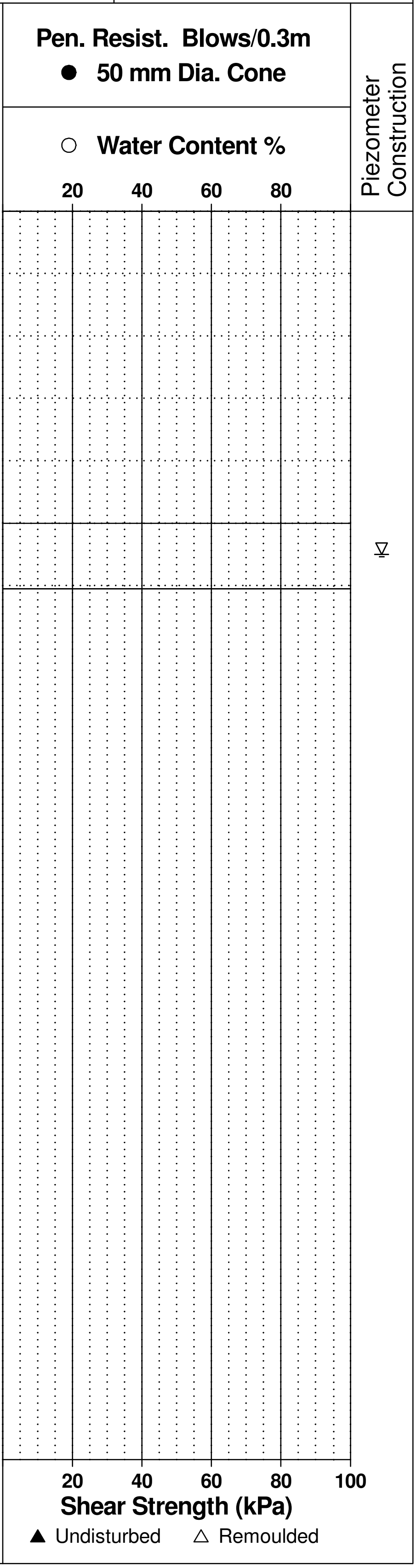
HOLE NO. TP37-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	131.23
TOPSOIL 0.39							
GLACIAL TILL: Brown silty clay, some sand, gravel, cobbles and boulders 1.21		G	1			1	130.23

End of Test Pit

TP terminated on inferred bedrock surface at 1.21m depth

(Groundwater infiltration at 1.1m depth)



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Backhoe

DATE November 12, 2020

FILE NO. PG5576

HOLE NO. TP38-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
GROUND SURFACE						0	131.06		
TOPSOIL 0.29	■								
Stiff, brown **SILTY CLAY** 1.01	▨	G	1			1	130.06		
End of Test Pit TP terminated on inferred bedrock surface at 1.01m depth (TP dry upon completion)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

FILE NO. **PG5576**

REMARKS

HOLE NO. **TP39-20**

BORINGS BY Backhoe

DATE November 12, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
GROUND SURFACE						0	131.64		
TOPSOIL 0.23	■								
Stiff, brown **SILTY CLAY,** trace sand 0.54	▨	G	1						
GLACIAL TILL: Brown silty clay, some sand, gravel, cobbles, boulders	^^^	G	2						
	^^^					1	130.64		
	^^^					2	129.64		
	^^^	G	3						∇
2.83	^^^								
End of Test Pit TP terminated on inferred bedrock surface at 2.83m depth (Groundwater infiltration at 2.1m depth)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

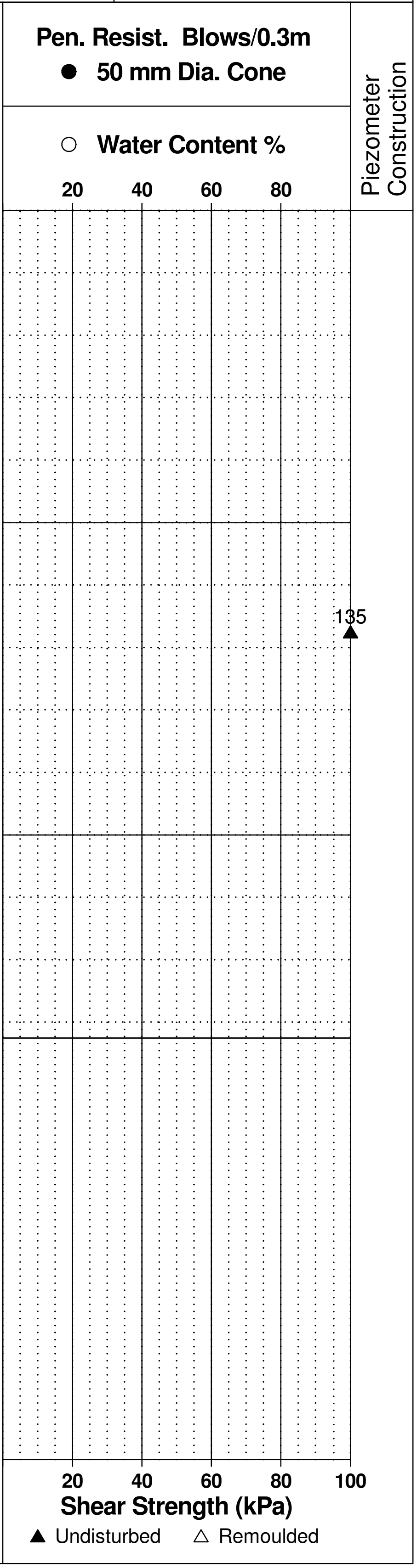
DATUM Geodetic
REMARKS
BORINGS BY Backhoe
DATE November 12, 2020
FILE NO. PG5576
HOLE NO. TP40-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	131.66
TOPSOIL 0.31							
Stiff, brown **CLAYEY SILT** with organics 0.72		G	1				
		G	2				
						1	130.66
GLACIAL TILL: Brown silty clay with sand, gravel, cobbles, boulders		G	3				
						2	129.66
2.65							

End of Test Pit

TP terminated on inferred bedrock surface at 2.65m depth

(TP dry upon completion)



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

FILE NO. PG5576

REMARKS

HOLE NO. TP41-20

BORINGS BY Backhoe

DATE November 12, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
GROUND SURFACE						0	131.91		
TOPSOIL 0.39									
GLACIAL TILL: Brown silty clay with sand, gravel, cobbles 0.81		G	1						
End of Test Pit TP terminated on inferred bedrock surface at 0.81m depth (TP dry upon completion)									

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Subdivision - Future Expansion Lands
Riverfront Estates, Mississippi Mills, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Backhoe

DATE November 12, 2020

FILE NO. PG5576

HOLE NO. TP42-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD				
GROUND SURFACE						0	131.21		
TOPSOIL 0.26	■								
GLACIAL TILL; Brown silty clay with sand, gravel, cobbles 0.72	^^^	G	1						
End of Test Pit TP terminated on inferred bedrock surface at 0.72m depth (TP dry upon completion)									

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

SYMBOLS AND TERMS

SOIL DESCRIPTION

Behavioural properties, such as structure and strength, take precedence over particle gradation in describing soils. Terminology describing soil structure are as follows:

Desiccated	-	having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
Fissured	-	having cracks, and hence a blocky structure.
Varved	-	composed of regular alternating layers of silt and clay.
Stratified	-	composed of alternating layers of different soil types, e.g. silt and sand or silt and clay.
Well-Graded	-	Having wide range in grain sizes and substantial amounts of all intermediate particle sizes (see Grain Size Distribution).
Uniformly-Graded	-	Predominantly of one grain size (see Grain Size Distribution).

The standard terminology to describe the relative strength of cohesionless soils is the compactness condition, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm. An SPT N value of "P" denotes that the split-spoon sampler was pushed 300 mm into the soil without the use of a falling hammer.

Compactness Condition	'N' Value	Relative Density %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory shear vane tests, unconfined compression tests, or occasionally by the Standard Penetration Test (SPT). Note that the typical correlations of undrained shear strength to SPT N value (tabulated below) tend to underestimate the consistency for sensitive silty clays, so Paterson reviews the applicable split spoon samples in the laboratory to provide a more representative consistency value based on tactile examination.

Consistency	Undrained Shear Strength (kPa)	'N' Value
Very Soft	<12	<2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very Stiff	100-200	15-30
Hard	>200	>30

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their “sensitivity”. The sensitivity, S_t, is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil. The classes of sensitivity may be defined as follows:

Low Sensitivity: $S_t < 2$
Medium Sensitivity: $2 < S_t < 4$
Sensitive: $4 < S_t < 8$
Extra Sensitive: $8 < S_t < 16$
Quick Clay: $S_t > 16$

ROCK DESCRIPTION

The structural description of the bedrock mass is based on the Rock Quality Designation (RQD).

The RQD classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be a result of closely-spaced discontinuities (resulting from shearing, jointing, faulting, or weathering) in the rock mass and are not counted. RQD is ideally determined from NQ or larger size core. However, it can be used on smaller core sizes, such as BQ, if the bulk of the fractures caused by drilling stresses (called “mechanical breaks”) are easily distinguishable from the normal in situ fractures.

RQD %	**ROCK QUALITY**
90-100	Excellent, intact, very sound
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

SAMPLE TYPES

SS - Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW - Thin wall tube or Shelby tube, generally recovered using a piston sampler
G - "Grab" sample from test pit or surface materials
AU - Auger sample or bulk sample
WS - Wash sample
RC - Rock core sample (Core bit size BQ, NQ, HQ, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

PLASTICITY LIMITS AND GRAIN SIZE DISTRIBUTION

WC% - Natural water content or water content of sample, %
LL - Liquid Limit, % (water content above which soil behaves as a liquid)
PL - Plastic Limit, % (water content above which soil behaves plastically)
PI - Plasticity Index, % (difference between LL and PL)

Dxx - Grain size at which xx% of the soil, by weight, is of finer grain sizes
These grain size descriptions are not used below 0.075 mm grain size
D10 - Grain size at which 10% of the soil is finer (effective grain size)
D60 - Grain size at which 60% of the soil is finer

Cc - Concavity coefficient = $(D30)^2$ / (D10 x D60)
Cu - Uniformity coefficient = D60 / D10

Cc and Cu are used to assess the grading of sands and gravels:
Well-graded gravels have: $1 < Cc < 3$ and $Cu > 4$
Well-graded sands have: $1 < Cc < 3$ and $Cu > 6$
Sands and gravels not meeting the above requirements are poorly-graded or uniformly-graded.
Cc and Cu are not applicable for the description of soils with more than 10% silt and clay
(more than 10% finer than 0.075 mm or the #200 sieve)

CONSOLIDATION TEST

p'_o - Present effective overburden pressure at sample depth
p'_c - Preconsolidation pressure of (maximum past pressure on) sample
Ccr - Recompression index (in effect at pressures below p'_c)
Cc - Compression index (in effect at pressures above p'_c)

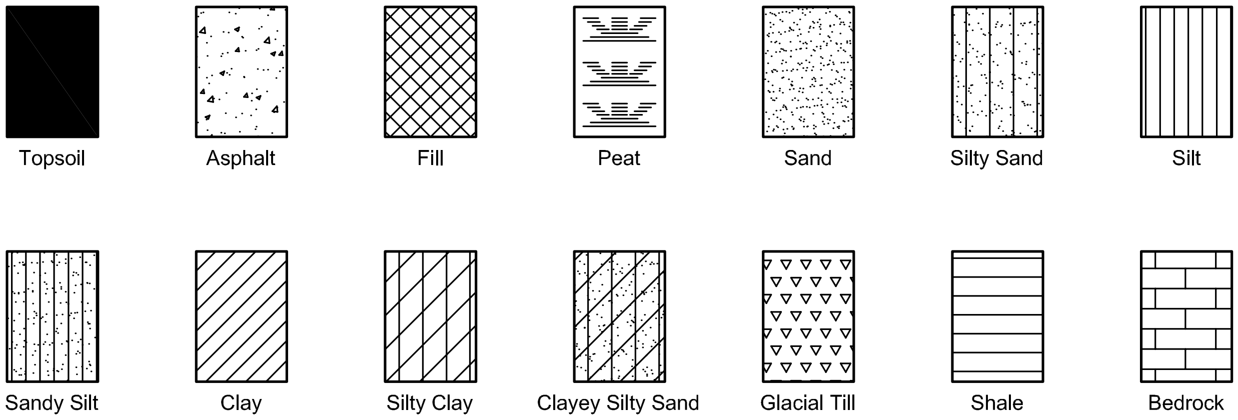
OC Ratio Overconsolidaton ratio = p'_c / p'_o
Void Ratio Initial sample void ratio = volume of voids / volume of solids
Wo - Initial water content (at start of consolidation test)

PERMEABILITY TEST

k - Coefficient of permeability or hydraulic conductivity is a measure of the ability of water to flow through the sample. The value of k is measured at a specified unit weight for (remoulded) cohesionless soil samples, because its value will vary with the unit weight or density of the sample during the test.

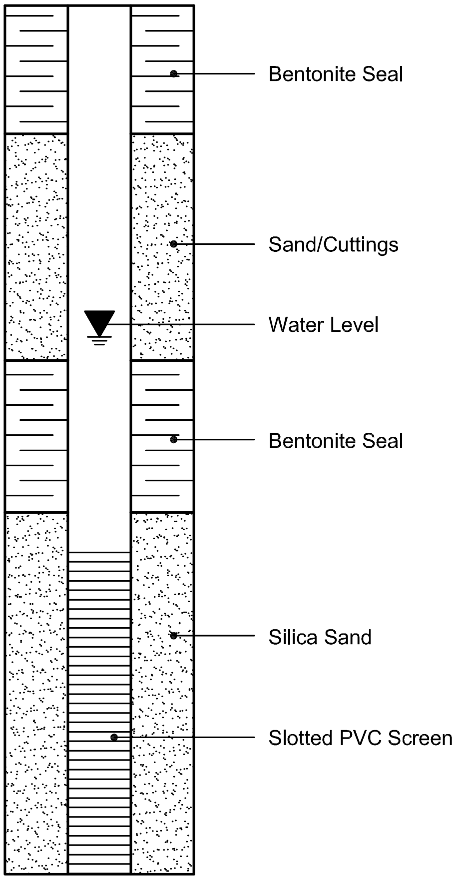
SYMBOLS AND TERMS (continued)

STRATA PLOT

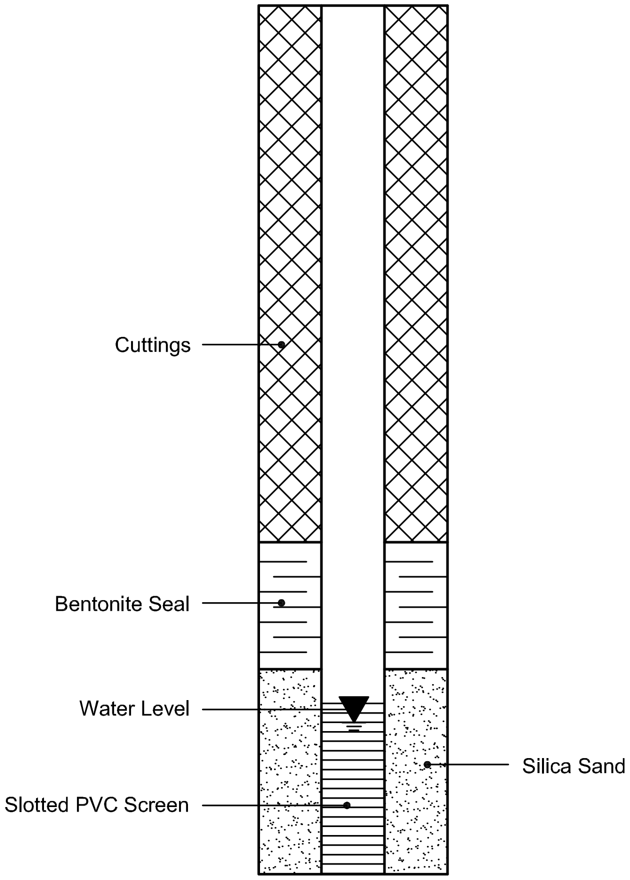


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 31279

Report Date: 26-Nov-2020

Order Date: 23-Nov-2020

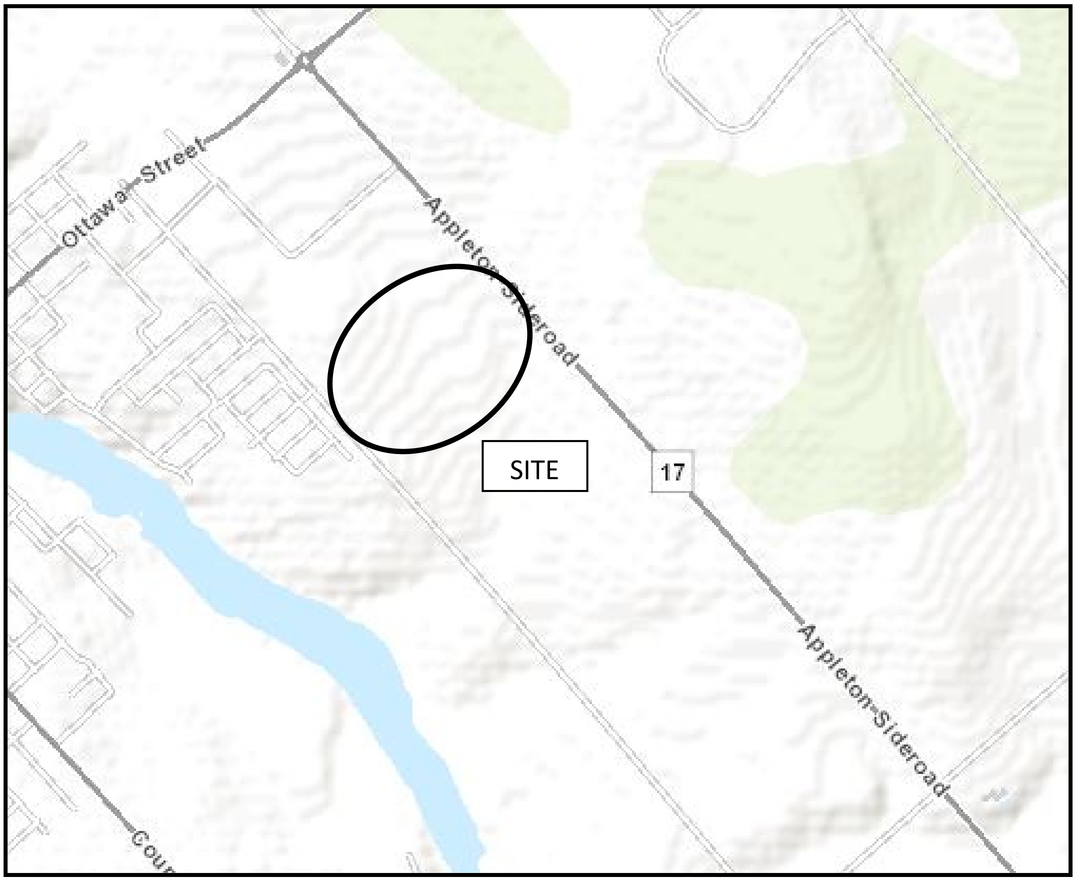
Project Description: PG5576

	Client ID:	TP40-20	-	-	-
	Sample Date:	12-Nov-20 13:00	-	-	-
	Sample ID:	2048113-01	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	71.8	-	-	-
General Inorganics					
pH	0.05 pH Units	7.46	-	-	-
Resistivity	0.10 Ohm.m	57.6	-	-	-
Anions					
Chloride	5 ug/g dry	13	-	-	-
Sulphate	5 ug/g dry	27	-	-	-

APPENDIX 2

FIGURE 1 - KEY PLAN

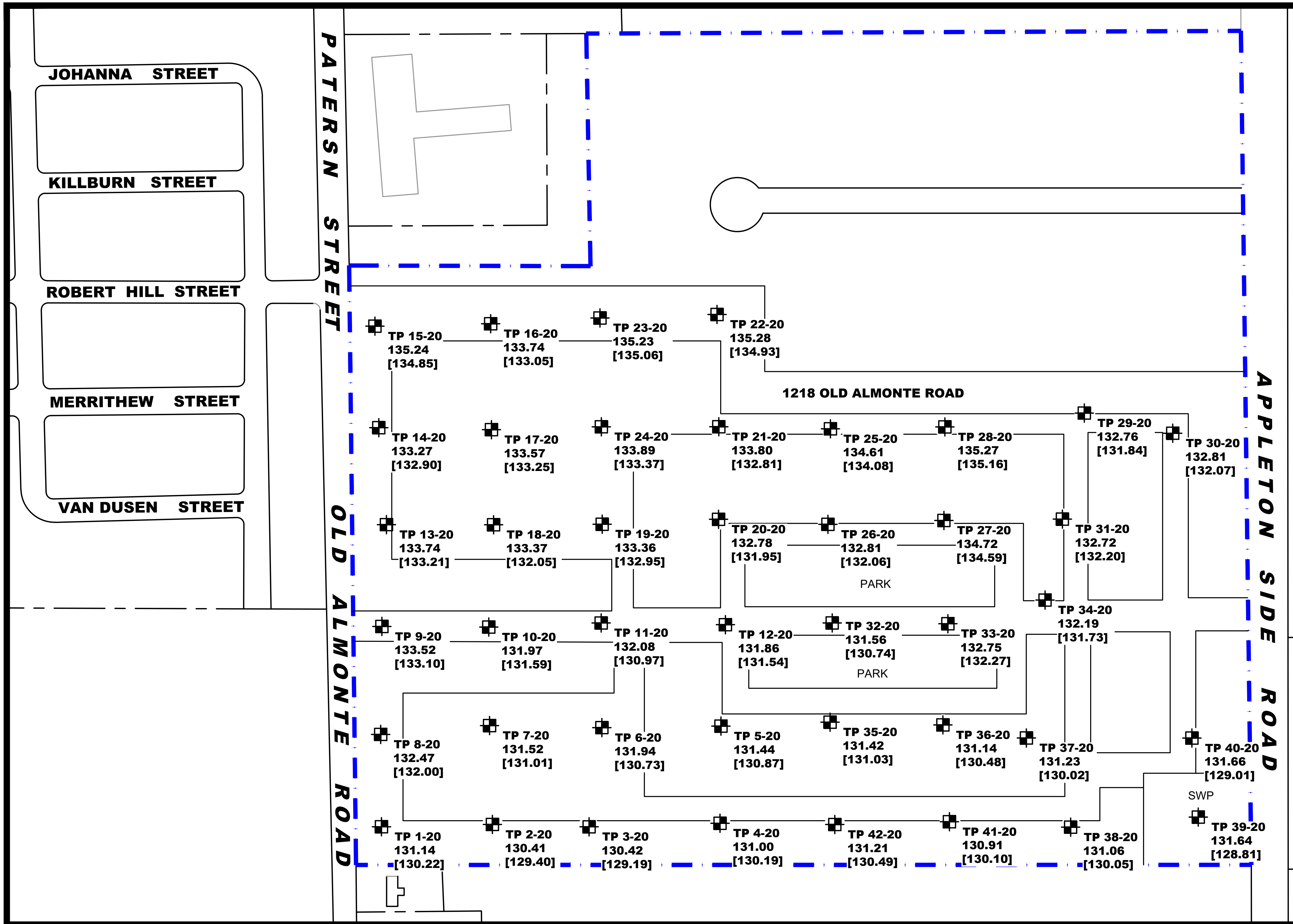
DRAWING PG5576-1 - TEST HOLE LOCATION PLAN

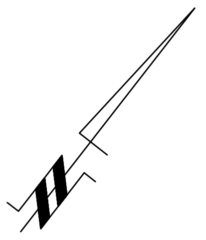


Source: GeoOttawa

FIGURE 1

KEY PLAN





LEGEND:

⊞	TEST PIT LOCATION
131.00	GROUND SURFACE ELEVATION (m)
[130.19]	INFERRED BEDROCK SURFACE ELEVATION (m)

CONCEPTUAL PLAN PROVIDED BY MCINTOSH PERRY

GROUND SURFACE ELEVATIONS AT TEST PIT LOCATIONS
ARE REFERENCED TO A GEODETIC DATUM

SCALE: 1:3000

0 25 50 75 100 125 150 200m

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL

HOUCHAIMI HOLDINGS
GEOTECHNICAL INVESTIGATION
RIVERFRONT ESTATES FUTURE DEVELOPMENT
1218 OLD ALMONTE ROAD
ALMONTE, ONTARIO

Title:
TEST HOLE LOCATION PLAN

Scale: 1:3000
Date: 11/2020
Drawn by: YA
Report No.: PG5576-1
Checked by: OC
Dwg. No.: PG5576-1
Approved by: DJG
Revision No.:

p:\autocad drawings\geotechnical\pg55xx\pg5576\pg5576-1-test hole location plan.dwg

D.2 OFFICIAL PLAN AMENDMENT NO. 22 – BACKGROUND EXCERPTS

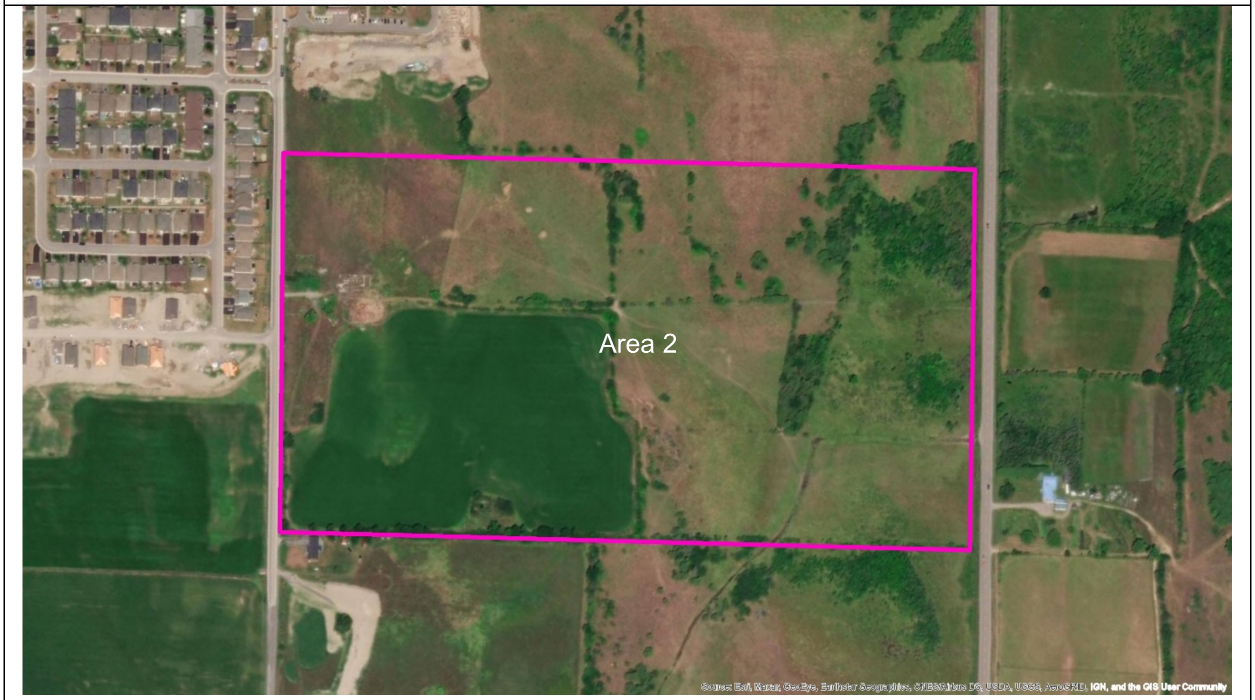
SITE EVALUATION CRITERIA

PROFILE SUMMARY

Almonte Potential Expansion Area 2

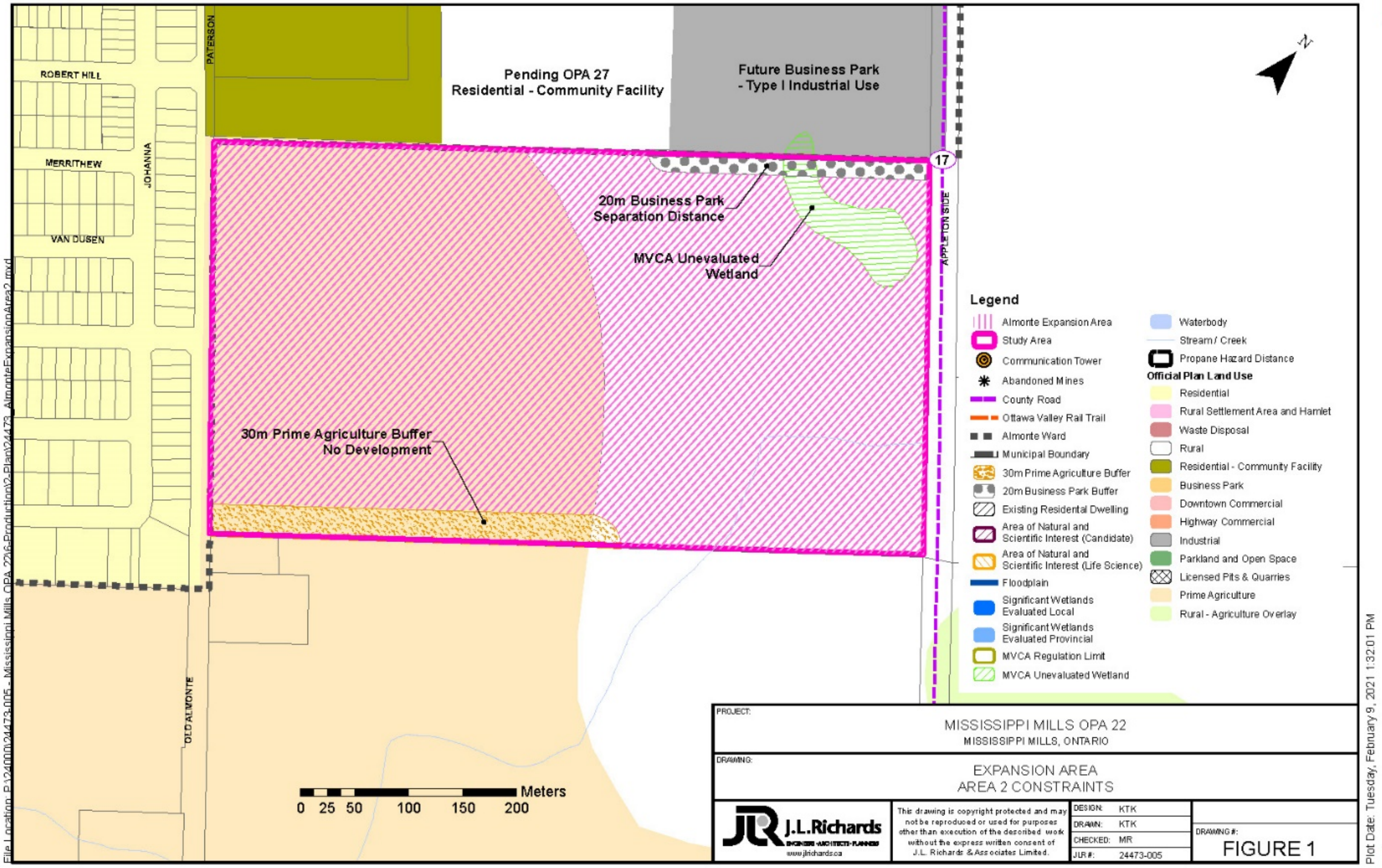
Location Map

Topographical Map



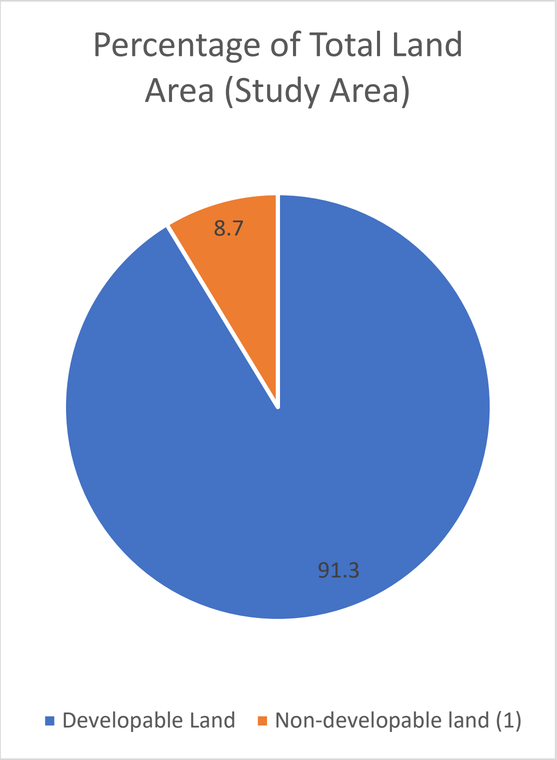
SITE EVALUATION CRITERIA

Constraints Map



SITE EVALUATION CRITERIA

Land Area Total



Legend

- ┃┃┃ Almonte Expansion Area
- ▭ Study Area
- ◎ Communication Tower
- ✱ Abandoned Mines
- ━ ━ County Road
- ━ ━ Ottawa Valley Rail Trail
- ■ ■ Almonte Ward
- ▭ Municipal Boundary
- ▨ 30m Prime Agriculture Buffer
- ▨ 20m Business Park Buffer
- ▨ Existing Residental Dwelling
- ▨ Area of Natural and Scientific Interest (Candidate)
- ▨ Area of Natural and Scientific Interest (Life Science)
- ━ Floodplain
- ■ Significant Wetlands Evaluated Local
- ■ Significant Wetlands Evaluated Provincial
- ▭ MVCA Regulation Limit
- ▨ MVCA Unevaluated Wetland
- ■ Waterbody
- ─ Stream / Creek
- ▭ Propane Hazard Distance

Official Plan Land Use

- ■ Residential
- ■ Rural Settlement Area and Hamlet
- ■ Waste Disposal
- ☐ Rural
- ■ Residential - Community Facility
- ■ Business Park
- ■ Downtown Commercial
- ■ Highway Commercial
- ■ Industrial
- ■ Parkland and Open Space
- ▨ Licensed Pits & Quarries
- ■ Prime Agriculture
- ■ Rural - Agriculture Overlay

(1) Includes Land Use Constraints and Natural Heritage Features discussed below

Site Location

- Located along the southeastern edge of the settlement area of Almonte, southeast of the Orchard View Retirement Home Phase I and Phase II (pending OPA 27), the Almonte Business Park / Industrial Park and east of an existing residential subdivision.
- The study area consists of 24.01 hectares (ha) of land, including 21.9 ha of developable land and 2.09 ha of undevelopable land, which is constrained by land use constraints and natural heritage features discussed below.
- Land Stakeholders: Area is known as the “Houchaimi Lands”.

Servicing

- Included in Master Plan build-out future development areas.
- Water servicing- additional watermain extension along Appleton Side Road.
- Wastewater pumping station and force main required to connect proposed development to gravity sewer system near Patterson and Houston Street. Requires industrial park sewer be routed along Houston Street, under Ottawa Street to the new Victoria Street trunk sewer. These sewer upgrades are required to prevent future sewer surcharging of the existing Ottawa Street sanitary sewer.
- Stormwater: Unknown but anticipate that local water quality and quantity can be managed on site. Outlet location and depth remain unknown and could impact development potential.

Transportation and Road

- Limited ROW opportunities and nearby road connections.
- Logical sidewalk extensions and planned cycling infrastructure.
- Adjacent to County Road 17 and other major regional roads (County Road 49). Connection to Old Almonte Road and Appleton Side Road possible but will require a Transportation Impact Assessment.

SITE EVALUATION CRITERIA

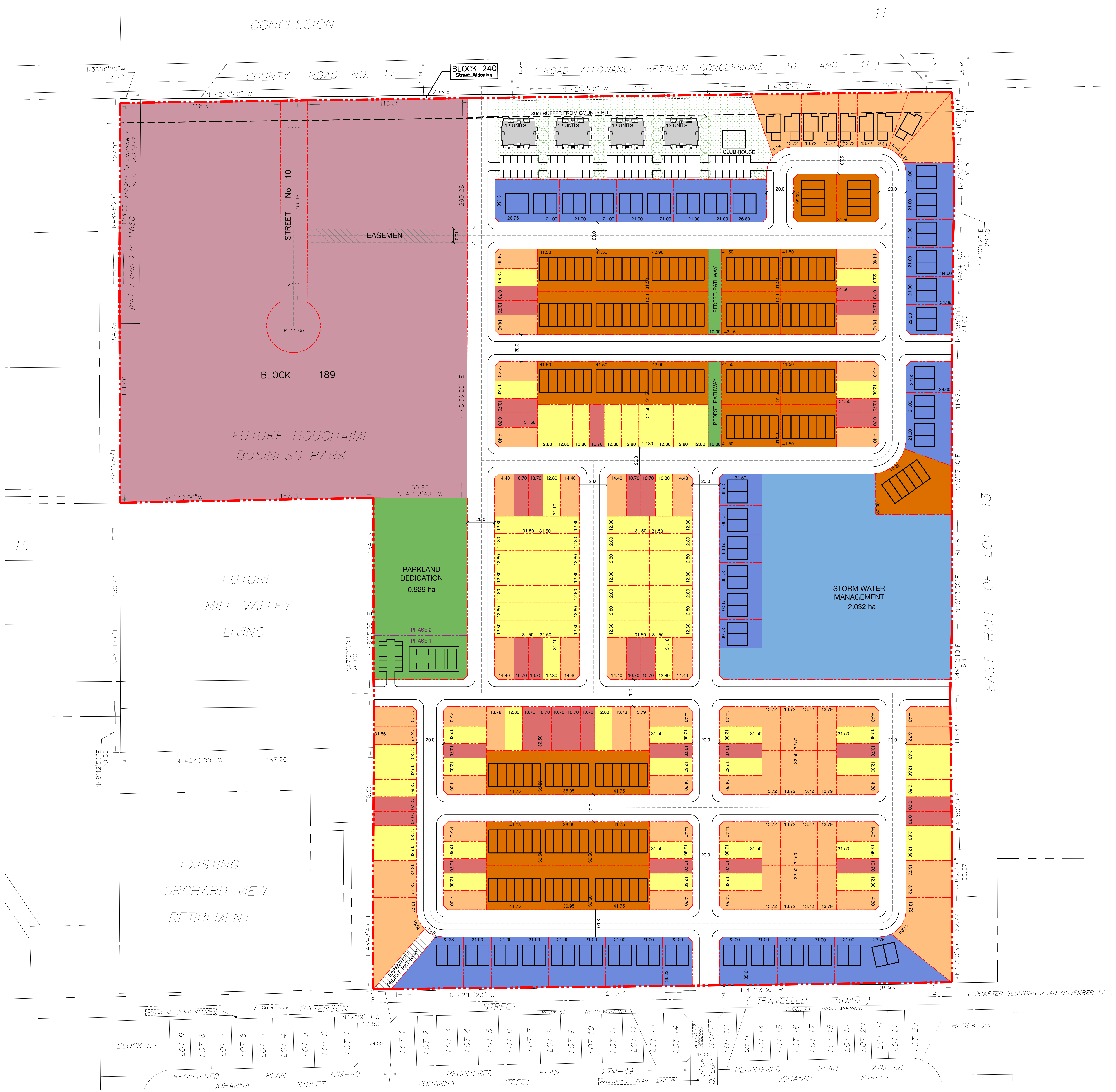
Land Use Constraints

- 11.4 ha of land currently designated Rural lands.
- 12.6 ha of land currently designated Prime Agricultural Land.
- 1.12 ha of land is within the 30m Prime Agricultural Buffer. Section 3.6.16 of the Mississippi Mills Community Official Plan (COP) prescribes that residential dwellings be set back 30m when located in a settlement area and abutting agricultural lands.
- 0.51 ha of land will be subject to the Ministry of Environment and Climate Change (MOECC) Guideline D-2, D-4 separation distance requirement from Type I industrial land uses which is 20m from the Future Business Park on the lands to the north. Note – might require a greater separation distance should a Type II industrial use be proposed within the Industrial lands.
- The Provincial Policy Statement (PPS) 2020, Lanark County Sustainable Communities Official Plan (SCOP) and the Municipality of Mississippi Mills COP all provide policies that limit the range of development opportunities for rural lands and the protection of Prime Agricultural Land, including mitigating the potential loss of agricultural land, potential land use compatibility issues, minimum distance separation formulae requirements, servicing restrictions, etc. The PPS strongly discourages the conversion of prime agricultural land for other land uses.

Natural Heritage Constraints

- 0.63 ha of Rural Land is located within the MVCA Unevaluated Wetland. The MVCA has jurisdiction over these lands and restricts development within wetlands and other natural hazards. A small portion of the site consists of this natural heritage constraint, which will restrict development and include a range of assessments and studies to be completed in advance.
- Topography slopes north to south (relatively flat).
- Watercourse observed.
- There are vacant parcels and lands cleared for agricultural purposes (prime agricultural lands).
- Some municipal ditches, scarcely vegetated.
- The Provincial Policy Statement (PPS) 2020, Lanark County Sustainable Communities Official Plan (SCOP) and the Municipality of Mississippi Mills Community Official Plan (COP) all provide policies that aim to protect the natural heritage and mitigate potential impacts on wildlife, habitat, species at risk (SAR) and avoid conflicts with natural features, including watercourses. These are all considered potential Natural Heritage Constraints due to the presence of the wetland and watercourse.

Appendix E PROPOSED DRAFT PLAN OF SUBDIVISION



SITE INFORMATION

ZONING	Development (D)*

*to be rezoned as per planing rationale.

SITE AREA	
Total Site Area:	33.599ha
Net Site Area:	15.936ha

DENSITY	
Maximum:	25units/ha
Low Density Target:	60%
Medium Density Target:	40%

DEVELOPMENT STATISTICS

Single Detached (35ft):	34
Single Detached (42ft):	73
Single Detached (45ft):	72
Semi Detached:	78
Townhouses:	166
Apartments:	48

SUMMARY OF UNITS

Houses: 423

Apartments: 48

Total: 471

DENSITIES	
Maximum:	25 units/net ha
Provided:	29.5 units/net ha
Low Density (singles + semi-detached):	257 units (55%)
Medium Density (townhouses + apart.):	214 units (45%)

PARKLAND DEDICATION	
Required:	
75,629m^2 x 2% + 260,358m^2 x 5%:	14,350m^2
Provided:	929m^2

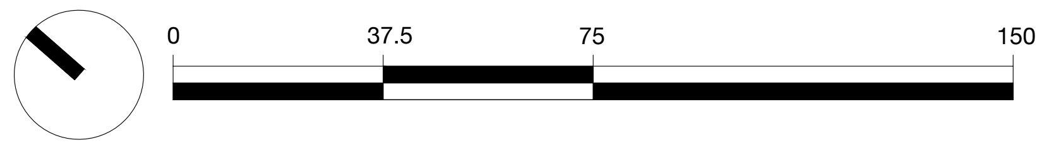
STREETS' TOTAL LENGTH	
Total length (center line):	~3,750m

MILL VALLEY ESTATES

Subdivision Plan

LEGEND

🟥	SINGLE DETACHED (35FT / 10.65M)
🟨	SINGLE DETACHED HOUSES (42FT / 12.8M)
🟧	SINGLE DETACHED HOUSES (45FT / 13.72M)
🟦	SEMI DETACHED HOUSES
🟫	TOWNHOUSES
⬜	APARTMENT BUILDING
🟪	BUSINESS PARK
🟩	PARKLAND DEDICATION
⬚	AMENITY SPACE
▨	RESIDENTIAL - COMMUNITY FACILITY ZONE (OP)
-·-·-	PROPERTY BOUNDARY
- - -	SETBACKS



No.	REVISION	DATE	BY
7	REVISIONS	2022.11.10	TS
6	REVISIONS	2022.10.20	TS
5	REVISIONS	2022.10.18	TS
4	REVISIONS	2021.10.07	RJ
2	REVISIONS	2021.09.28	TS
2	REVISIONS	2021.06.21	TS
1	SUBDIVISION PLAN	2021.06.13	TS
0	BASE PLAN	2022.06.06	RP

CLIENT

MILL VALLEY
ESTATES

FOTENN
Planning + Design

396 Cooper Street, Suite 300, Ottawa ON K2P 2H7
613.730.5709 www.fotenn.com

DESIGNED	TS
REVIEWED	RP
DATE	2022.06.06

P1

Appendix F DRAWINGS