Bertone Montreal Rd LP

Site Servicing and Stormwater Management Report

1649 Montreal Road & 741 Blair Road

City of Ottawa, Ontario

CIMA+ file number: A001101 (080)
January 28, 2025

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1649 Montreal Road & 741 Blair Road

City of Ottawa, Ontario

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Table of Contents

List of Tables

List of Figures

List of Appendices

1. Introduction

CIMA+ was retained by 10869279 Canada Inc. to prepare a Site Servicing and Stormwater Management Report for the proposed construction of a 26-storey mixed-use (ground floor retail and 252 residential units) building located at 1649 Montreal Road and 741 Blair Road in Ottawa, Ontario.

The purpose of this assessment is to confirm that the proposed development can be adequately serviced by the existing municipal infrastructure (water, sanitary, and storm) surrounding the site. This assessment shall be used in support of the application for Site Plan Control.

1.1 Site Description and Proposed Development

The site is located at the northeast quadrant of the intersection of Blair Road and Montreal Road (refer to **Figure 1** below). 1649 Montreal Road is currently comprised of a garage (vehicle repair shop and sales) with surface parking, while 741 Blair Road comprises of a single-family residential dwelling. The combined site area (1649 Montreal and 741 Blair) measures approximately 0.49 ha.

Generally, the site is bounded by private residential dwellings to the north, a church to the east, Montreal Road to the south, and Blair Road to the west.

Figure 1: Site Location - Plan View.

The proposed development is a 26-storey, mixed use residential and commercial tower with 252 residential units, expected to include approximately 439 residents, and three (3) underground parking levels comprising the entire site area. The commercial floor space on the ground floor measures 691.8 m² and total communal amenity space measures 800 m². Refer to **Figure 2** for a conceptual site plan of the proposed development (prepared by Roderick Lahey Architects Inc.).

Figure 2: Conceptual Site Plan.

1.2 Review of Available Background Documentation

The following design guidelines have been used to estimate the theoretical servicing requirements for the proposed development; while GeoOttawa and the available utility drawings provided by the City of Ottawa Information Centre have been used to determine the existing municipal services fronting the site. Refer to **Appendix A** for available utility plans provided by the City.

- Ottawa Sewer Design Guidelines (October 2012), as amended by all applicable Technical Bulletins.
- Ottawa Design Guidelines – Water Distribution (2010), as amended by all applicable Technical Bulletins.
- Ministry of the Environment Design Guidelines for Sewage Works (2008).
- Ministry of the Environment Stormwater Management Planning and Design Manual (2003).

- Ministry of the Environment Design Guidelines for Drinking-Water Systems (2008).
- Fire Underwriters Survey (FUS) Water Supply for Public Fire Protection (2020).
- Geotechnical Investigation PG5663-1 Rev.1, Proposed Multi-Storey Building, 1649 Montreal Road and 741 Blair Road – Ottawa by Paterson Group Inc. dated August 29, 2022.

Findings from the Geotechnical Investigation Report prepared by Paterson Group Inc. have relevance on the site servicing and stormwater management, including but not limited to groundwater level and blasting. A summary of the applicable findings and recommendations are as follows, while the full Report can be found in **Appendix H**:

- Based on available geological mapping, the bedrock in the area consists of limestone and dolomite interbedded of the Gulf River formation with an overburden drift thickness of 1 to 5 m depth.
- It is expected that line-drilling in conjunction with hoe-ramming, rock grinding and controlled blasting will be required to remove the bedrock for the underground parking levels. In areas of weathered bedrock and where only a small quantity of bedrock is to be removed, bedrock removal may be possible by 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 the proximity of the blasting operations should be carried out 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 or 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 surrounding 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 could be completed with almost vertical side walls.
- The long-term groundwater level is estimated to be located below the bedrock surface, however, it is important to note that groundwater levels are subject to seasonal fluctuations. Therefore, groundwater levels could be encountered at a higher elevation at the time of construction.
- A temporary Ministry of the Environment, Conservation and Parks (MECP) permit to take water (PTTW) Category 3 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. It is understood that the permit application will be initiated by the geotechnical consultant.
- 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.

- A composite foundation drainage system (such as Delta Drain 6000 or equivalent) will be applied to the prepared vertical bedrock surface from the ground surface to the proposed founding elevation.
- It is anticipated that underfloor drainage will be required to control water infiltration. For preliminary design purposes, it is recommended that 150 mm perforated pipes be placed within each bay. The spacing of the underfloor drainage system should be confirmed at the time of completing the excavation when water infiltration can be better assessed.
- It is recommended that 150 mm diameter sleeves at 3 m centres be cast in the footing or at the foundation wall/footing interface to allow the infiltration of water to flow to the interior perimeter drainage pipe. The perimeter drainage pipe and underfloor drainage system should direct water to sump pit(s) within the lower basement area.

1.3 Existing Infrastructure

As identified using GeoOttawa and the available Utility Record Drawings provided by the City of Ottawa Information Centre, the following municipal infrastructure is available within the right-of-way fronting the proposed development site (refer to **Appendix B** for Existing Conditions Plan).

Montreal Road

- 305 mm diameter DI watermain.
- 250 mm diameter Concrete sanitary sewer
- 600 mm diameter Concrete storm sewer.

Blair Road

- 305 mm diameter DI watermain (**preferred primary and secondary water connection points separated by a new isolation valve**).
- 250 mm diameter Concrete sanitary sewer. (**preferred sanitary connection point**).
- 525 mm diameter Concrete storm sewer (**preferred storm connection point**).

1.4 Consultation and Permits

In response to the pre-consultation requirements defined in the City's Development Servicing Study Checklist, the following agencies were consulted in support of the preparation of this report. The Development Servicing Study Checklist as well as all relevant correspondence with the consulted agencies can be found in **Appendix A**.

City of Ottawa

The City of Ottawa Information Centre was contacted to obtain any Reports, Studies, Engineering, and/or Utility Plans including sanitary sewer, storm sewer, watermain, gas, etc. within or adjacent to the site location. The available engineering plans and utility plans were provided. No existing reports or studies were available.

CIMA+ also contacted Sara Mashaie from the City of Ottawa's Planning, Infrastructure and Economic Development Department to obtain any site-specific servicing and stormwater management design criteria for the proposed development. The provided comments and criteria relevant to the Site Servicing and Stormwater Management Report are referenced within the appropriate sections of this report.

Rideau Valley Conservation Authority (RVCA)

The subject site falls under the jurisdiction of the Rideau Valley Conservation Authority (RVCA). CIMA+ contacted Jamie Batchelor from the RVCA to identify any Natural Heritage/Hazards features that may impact the development as well as any Storm Water Management Criteria for the site and required approvals/permits. These criteria are addressed in *Section 4* of this Report.

Ministry of the Environment, Conservation and Parks (MECP)

CIMA+ has determined that the proposed development in question falls within the exemption requirements for an Environmental Compliance Approval (ECA) as per O.Reg. 525/98, section 3(a), and Ontario Water Resources Act section 53.6(c) when considering the following:

1. Currently comprised of two (2) parcels of land that are to be combined into one **(1) parcel**, the existing 0.49-ha site currently consists of a garage (vehicle repair shop and sales) which is zoned Arterial Mainstreet (AM10) and a single-family home which is zoned Residential Third Density (R3K).
2. The proposed sewage works, and stormwater management facility will service a single parcel of land; and
3. The property does not discharge into a combined sewer, and it will not be used for industrial purposes.

Christina Des Rochers of the local MECP district office has confirmed that the project meets the exemption requirement (refer to **Appendix A** for related correspondence).

2. Water Servicing

2.1 Water Supply Design Criteria

The design criteria for determining the water demand requirements for the proposed development follow the parameters outlined in the Ottawa Design Guidelines – Water Distribution (2010) and associated technical bulletins, as well as the MOE Design Guidelines for Drinking-Water Systems (2008). Namely, the following parameters have been used in determining the water demands:

Table 2-1: Water Supply Design Criteria

Design Criterion[1]	Residential Areas	Commercial Areas
Average Day Demand	280 L/capita/day	28,000 L/gross hectare/day
Maximum Daily Demand	3.1 × average daily demand[1]	1.5 × average daily demand
Maximum (Peak) Hour Demand	4.6 × average daily demand[1]	1.8 × maximum daily demand
Populations – 1 Bedroom Apartment	1.4 Persons Per Unit	N/A
Populations – 2 Bedroom Apartment	2.1 Persons Per Unit	N/A
Desired Operating Pressure under Normal Operating Conditions	50 to 70 psi	
Minimum Operating Pressure under Normal Operating Conditions	40 psi	
Maximum Operating Pressure under Normal Operating Conditions	80 psi	
Minimum Operating Pressure under Maximum Daily Demand + Fire Flow	20 psi	

In addition to those design criteria identified in **Table 2-1**, the following comments and criteria identified by the City as part of the pre-consultation must be considered in the water supply servicing strategy:

- The subject site is located within the MONT pressure zone.
- Residential buildings with a basic day demand greater than 50 m³/day (0.57 L/s) are required to be connected to a minimum of two (2) water services separated by an isolation valve to avoid a vulnerable service area. Thus, if the basic day demand for this site exceeds 50 m³/day there shall be a primary and secondary water service to Blair Rd. to provide redundant supply, separation by an isolation valve to avoid a vulnerable service area.
- Fire flow demand requirements shall be based on the Fire Underwriters Survey (FUS) Water Supply for Public Fire Protection 2020, Technical Bulletin ISTB-2018-02 and ISTB-2021-03.

[1] Note that residential peaking factors were selected from **Table 3-3** of the MECP Design Guidelines for Drinking-Water Systems for 0 to 500 persons.

- Exposure separation distances shall be defined on a figure to support the FUS calculation and required fire flow (RFF).
- Hydrant capacity shall be assessed if relying on any public hydrants to provide fire protection, particularly if high design fire flows are being proposed, to demonstrate the Required Fire Flow (RFF) can be achieved. Identification of which hydrants are being considered to meet the RFF on a fire hydrant coverage figure is required as part of the boundary conditions request.

2.2 Proposed Water Supply Servicing and Calculations

Water Demands

The water supply demands for the proposed development are presented in **Table 2-2** below. The demands were developed utilizing the development statistics (i.e., residential units and commercial floor area) provided by Roderick Lahey Architects Inc. and those design criteria identified in *Section 2.1*. Refer to **Appendix D** for detailed calculations.

Table 2-2: Water Demands

Demand Type	Average Daily Demand (L/s)	Maximum Daily Demand (L/s)	Maximum (Peak) Hour Demand (L/s)
Residential	1.37	4.25	6.31
Commercial	0.02	0.03	0.06
Total	**1.39**	**4.28**	**6.37**

Given the basic day demand exceeds 50 m³/day (or 0.57 L/s) a minimum of two (2) water service connections, separated by an isolation valve, are required to provide redundant supply, and avoid a vulnerable service area.

Proposed Water Supply Connection Point(s)

A primary and secondary service connection are proposed on Blair Road. A new isolation valve between the two connection points will be utilized to avoid a vulnerable service area. Refer to **Appendix C** for proposed connection points.

Required Fire Flow (RFF)

The required fire flow for the site was developed using the Fire Underwriters Survey (FUS) Water Supply for Public Fire Protection 2020, Technical Bulletin ISTB-2018-02 and ISTB-2021-03. It was determined that an RFF of **5,000 L/min (83.33 L/s)** would be required to provide adequate protection.

It was assumed that multiple municipal hydrants would be required to meet the fire flow requirements and a fire hydrant coverage figure was prepared in support of the boundary conditions request from the City.

Refer to **Appendix D** for detailed calculations, including supporting figures for exposure distances and hydrant coverage.

Municipal Boundary Conditions

Using the proposed demands, required fire flow and supporting figures the City provided boundary conditions for hydraulic analysis for current conditions, based on computer model simulation. The boundary conditions are as follows:

Table 2-3: Watermain Boundary Conditions

Hydraulic Condition (HGL = Hydraulic Grade Line)	Boundary Condition (Head) (m)
	Blair Rd. 305 mm dia.
Minimum HGL	146.5
Maximum HGL	146.9
Maximum Day + Fire Flow	144.4

Hydraulic Analysis – Water Supply Adequacy

A hydraulic analysis was completed utilizing the boundary condition information provided by the City for the proposed development in order to confirm that there is adequate flow and pressure in the water distribution system to meet the required water demands. The following Table summarizes the available flow and pressure in the system under each demand scenario:

Table 2-4: Water Supply Adequacy - Hydraulic Analysis

Demand Type	Proposed Demand (L/s)	Available Flow/Pressure		Desired Flow/Pressure Objective	Flow/Pressure Objective Achieved?
		Design Operating Pressure (Relative Head) (m)	Design Operating Pressure (psi)		
Average Daily Demand	1.39	48.8	68	50 to 70 psi	Yes
Maximum Day Demand + Fire Flow	87.62	45.5	66	≥ 20 psi	Yes
Maximum (Peak) Hour Demand	6.37	47.6	68	50 to 70 psi	Yes

NOTES:

1. Required fire flow demand was calculated as **5,000 L/min (83.33 L/s)**.
2. The minimum HGL elevation at Connection Point on Blair is **146.5 m** and the maximum HGL elevation is **146.9 m**.
3. Boundary conditions for Connection to Blair Road assumes a ground elevation of 98.9 m.

2.3 Water Supply Summary and Conclusions

The water supply design for the proposed development follows the parameters outlined in the Ottawa Design Guidelines – Water Distribution (2010) and associated technical bulletins, as well as the MOE Design Guidelines for Drinking-Water Systems (2008).

There is adequate flow and pressure in the water distribution system to meet the required water demands for the proposed development.

Water Data Card for service connection is to be completed and submitted once design has been finalized and in preparation for Commence Work Notification and Water Permit Application.

3. Sanitary Servicing

3.1 Sanitary Servicing Design Criteria

The design criteria for determining the sanitary peak flow rates for the proposed development follow the parameters outlined in the City of Ottawa Sewer Design Guidelines, 2012 as amended by all Technical Bulletins. Namely, the following parameters have been used in determining the peak sanitary flow rates:

Table 3-1: Sanitary Peak Flow Determination Design Criteria

Design Criterion	Residential Areas	Commercial Areas
Base Flow	280 L/capita/day	28,000 L/gross hectare/day
Populations – 1 Bedroom Apartment	1.4 Persons Per Unit	N/A
Populations – 2 Bedroom Apartment	2.1 Persons Per Unit	N/A
Peaking Factor	Determined by Harmon Equation $P.F. = 1 + \left[\frac{1}{4 + \left(\frac{P}{1{,}000}\right)^{\frac{1}{2}}}\right] \times 0.8$ (P = population; P.F. = peaking factor) Maximum P.F. = 4.0 Minimum P.F. = 2.0	1.5 if Commercial Contribution > 20% 1.0 if Commercial Contribution < 20%
Dry Weather Infiltration Rate	0.05 L/s/effective gross hectare (for all areas)	
Wet Weather Infiltration	0.28 L/s/effective gross hectare (for all areas)	
Total Infiltration Allowance	0.33 L/s/effective gross hectare (for all areas)	

3.2 Proposed Sanitary Servicing and Calculations

Proposed Sanitary Peak Flows

The estimated peak flows from the proposed development based on the design criteria listed in **Table 3-1** are outlined in the following Table.

Table 3-2: Peak Sanitary Flows

Flow Type	Total Flow Rate (L/s)
Total Estimated Average Dry Weather Flow Rate	1.45
Total Estimate Peak Dry Weather Flow Rate	4.86
Total Estimate Peak Wet Weather Flow Rate	5.02

Refer to **Appendix E** for detailed calculations.

Proposed Sanitary Service Connection Point

The proposed sanitary service will connect to the existing 250 mm diameter Concrete sanitary sewer within the right-of-way of Blair Road. Refer to **Appendix C** for proposed connection points.

Per Ottawa Sewer Design Guidelines (2012), Section 4.4.4.11 a new maintenance hole is required on the mainline when considering the mainline pipe is concrete and the service (200 mm) is greater than 50% of the mainline diameter (250 mm).

3.3 Sanitary Servicing Summary and Conclusions

The sanitary servicing design for the proposed development conforms to the requirements of the City of Ottawa Sewer Design Guidelines, 2012, and Technical Bulletins.

Peak wastewater demands were provided to the City, who confirmed that the sanitary system in the area is currently flooding and could not accept additional sanitary flow.

Due to this outcome, CIMA+, representatives from 10869279 Canada Inc. and representatives from Bertone Development Corporation met with Eric Tousignant and Sara Mashaie of the City of Ottawa to discuss any alternatives. Mr. Tousignant advised that the flooding is due to excess extraneous flows from underground infiltration and in holes in maintenance hole covers. He suggested that these maintenance hole covers should be replaced with solid sealed maintenance hole covers as part of this development project. This option was accepted by all parties involved. This is expected to offset the added sanitary flows from this development.

Therefore, the added wastewater demands to the City sanitary system has been confirmed. Refer to **Appendix E** for all related correspondence with the City.

4. Storm Servicing and Stormwater Management

4.1 Background

As previously mentioned, the subject site of 1649 Montreal Road currently occupies a garage (vehicle repair shop and sales) with surface parking. Based on available recent survey information the site is relatively steep and generally follows the gradient along Blair Road with a steep slope to the north and gentler to the south near Montreal Road.

The gradient is from north to south with an approximate change in gradient of 1 m across the site. The site is approximately 41% impervious with no existing stormwater measures on site (i.e., catch basins, sewers, etc.) and it is thus assumed that there are no current stormwater management controls on site. As such storm runoff generally sheet flows and outlets to Montreal Road to the southwest, near the intersection with Blair. Refer to Pre-development Drainage Area Map in **Appendix F**.

The portion of the site located at 741 Blair Road occupies a single-family dwelling, with asphalt and gravel driveway, stone pathway, shed, and grassed lawn area. Again, it appears that there are no current stormwater management controls on site. Based on the available topographic information the direction of major overland flow is from north to south following Blair with a minimum elevation of 97.93 m at the lot limit with 1649 Montreal Road and a maximum elevation of 103.89 m at the northeast lot limit. Given there are no rear lot drainage features identified on GeoOttawa, it is expected that the outlet for this site area is to Blair Rd. at the driveway location.

Considering there are no current stormwater systems on site and that it is assumed that there are no flow attenuation controls the anticipated peak flows for the existing site are as follows (refer to **Appendix F**):

Table 4-1: Pre-Development Peak Release Flows – Existing Site

Storm Event	Release Flow (L/s)
5-year	66.4
100-year	142.9

Ultimately storm runoff from the site enters the municipal system along Blair Road and Montreal Road, and flows through the storm sewer on Blair south of Montreal. Stormwater ultimately discharges to Green's Creek approximately 3.3 km downstream from the site. Refer to **Appendix F** for sketch demonstrating the flow path to the ultimate outlet.

The site is located in an uncontrolled sewer system area (i.e., no inlet control devices) therefore the 100-year hydraulic grade line (HGL) can reach ground level. This will need to be taken into consideration in designing the underground storage elements.

4.2 Storm Servicing Strategy and Design Criteria

The design of the major and minor storm systems must ensure that the following criteria are upheld under post-development conditions, in keeping with the requirements of the City and the Rideau Valley Conservation Authority (refer to **Appendix A**).

- The allowable release rate for the site shall coincide with the 5-year storm event under pre-development conditions.
- The allowable release rate shall take into consideration any increase in uncontrolled runoff from the boulevard being converted to a hard surface (concrete, interlocking paving stone, etc.).
- The pre-development runoff coefficient (C) shall be a maximum equivalent 'C' of 0.50, or the actual existing site runoff coefficient, whichever is less.
- The pre-development Time of Concentration (Tc) shall be calculated using an appropriate method and must not be less than 10 minutes.
- A Tc of 10 minutes shall be used for all post-development calculations.
- Storm runoff in excess of the allowable 5-year pre-development release rate, up to and including the 100-year storm event, must be detained on site.
- Overland flow will generally be directed to Montreal Road.
- To address concerns about roadway drainage spilling into the underground parking, the entrance to the underground parking is a minimum of 300 mm higher than the spill point at the street.
- The roof drain leaders will be utilizing a pressurized drainpipe type to provide additional protection in the event of surcharge in the municipal system.
- Given the scope of the driveway including turning circle, the RVCA requested onsite water quality control of 80% Total Suspended Solids (TSS) removal. Considering that rainwater from landscaping and rooftop drainage is considered clean for the purpose of protecting water quality and aquatic habitat, the RVCA does not request any additional onsite water quality control measures for these areas specifically save and except best management practices.
- Raingardens and alternative low impact development (LID) are encouraged by the RVCA to meet the best management practice requirement.

4.3 Proposed Storm Servicing and Stormwater Management Design and Calculations

Proposed Storm Service Connection Point

Based on communications with the City, it is understood that the preferred and anticipated stormwater connection from the proposed development will discharge to the existing 525 mm concrete storm sewer on Blair Road. Refer to **Appendix C** for proposed connection points.

Pre-development (Allowable) Release Rates

The pre-development release rates are summarized in the following Table:

Table 4-2: Pre-development (Allowable) Release Rate (5-year event)

Catchment ID	Area (ha)	Runoff Coefficient (C)	Time of Concentration (Tc) (minutes)	Rainfall Intensity (mm/hr)	Release Rate (L/s)
Subject Site	0.488	0.47	10	104.19	**66.4**

The storm runoff under post-development conditions for the site area must be controlled to the allowable 5-year pre-development release rate of **66.4 L/s**, up to and including the 100-year storm event.

Post Development Flow Rates and Stormwater Quantity Control

The anticipated post-development flow rates and required storage when controlled to the allowable pre-development release rate are summarized in the following Table.

Table 4-3: Post-development Flow Rate and Storage Summary

Sub-Area	100-year Release Rate (L/s)	100-year Surface Storage Volume (m^3)
A1: Building Roof + Cistern	51.4 (Release flow of underground retention basin)	47.4 m^3 inside building **Cistern (max 55m^3)**
A2.a: Back East		0.1
A2.b: Back West		33 m^3 (in north raingarden)
A3.a: Front (Entrance)		17.5 m^3 (in south raingarden)
A3.b: Front (POPS)		1.3
A4: Area between Building & Montreal Rd (unattenuated)	15	0.0
Total	66.4	99.4

The total post-development release rate does not account for any area outside the property limits, as no additional area is being converted to hard surfaces (concrete, interlocking paving stone, etc.). Thus, the remaining allowable release rate for the site remains **66.4 L/s**.

As demonstrated in **Table 4-3** an anticipated storage volume of **99.4 m^3** shall be required on-site. Storage will occur via two surface bioswale rain garden (33 m^3 and 17.5 m^3) and an internal underground Cistern 47.4 m^3 (55 m^3 max capacity). The internal Cistern will restrict stormwater

discharge to the allowable release rate of **66.4 L/s**. Refer to **Appendix F** for detailed stormwater storage calculations.

The storm sewer network will be equipped with backflow prevention as well as a pump to meet the SWM design intent and ensure the proposed private storm sewer system will not be overwhelmed in the event the 525 mm diameter storm sewer within Blair Road becomes surcharged. The design of the pump is to be completed by the mechanical engineer.

Below ground storage requirements have been determined using the full flow rate considering a submerged pump will be provided downstream of the underground Cistern to provide a consistent flow rate.

Stormwater Quality Control

Rainwater from landscaping and rooftop drainage is considered to be clean for the purpose of protecting water quality and aquatic habitat. Furthermore, no surface parking is proposed as part of the development, however a driveway including a turning circle is proposed.

After consulting with the Rideau Valley Conservation Authority (RVCA) as shown in Appendix A, it was determined that the surface runoff from the asphalt access needs to have onsite water quality control with a TSS removal rate of 80%.

To meet this requirement, two raingardens equipped with a pre-treatment stone diaphragm will be used. The stormwater from the asphalt area will flow into swales, pass through two clear stone diaphragms, enter a raingarden, percolate through the raingarden medium, and then be collected via perforated subdrains. Finally, it will be directed to the underground retention basin before exiting the site. Bioretention/raingardens that have pretreatment (such as a stone diaphragm and swales, as in our case) are recognized by the Massachusetts Stormwater Handbook and Stormwater Standards as being able to remove 90% TSS. The size of the raingarden areas was calculated using the Minnesota Pollution Control agency formula from 2005, as shown in **Appendix F**. No additional on-site water quality treatment is necessary for the rooftop or landscaped areas.

RVCA also mentioned that, while an underground retention basin may provide some degree of TSS removal if a sufficient detention time is provided, it is unlikely it can achieve the water quality target without being equipped with filter media or splitter in the tank.

4.4 Storm Servicing and Stormwater Management Summary and Conclusions

The storm servicing design for the proposed development conforms to the requirements of the City of Ottawa Sewer Design Guidelines, 2012, and all applicable Technical Bulletins.

An anticipated storage volume of **99.4 m³** shall be required on-site inside building **Cistern** (47.4 m³) and raingardens (17.5 m³ for the south raingarden and 33 m³ for the north raingarden) to restrict stormwater discharge to the allowable release rate of **66.4 L/s**.

The RVCA confirmed that they would require onsite water quality control of 80% TSS removal given the scope of the driveway including a turning circle. This is expected to be achieved via a raingarden equipped with a pre-treatment stone diaphragm.

The raingarden will be utilized to meet best management practices for quality control of surface runoff.

5. Conclusion

The purpose of this assessment is to confirm that the proposed development can be adequately serviced using the existing municipal infrastructure (water, sanitary, and storm) surrounding the site. This assessment shall be used in support of a Site Plan Control Application (SPC) to allow for the construction of one (1) 26-storey mix-residential tower with ground floor commercial space.

The important information and findings as a result of this assessment are as follows:

- The proposed mixed-use commercial and residential building is expected to include 252 apartment units with a population of approximately 439 persons and have a total communal amenity space measure 800 m². The commercial area is approximately 691.8 m². There will be three (3) levels of underground parking spanning the majority of the site area.
- The proposed development falls within the exemption requirements for an Environmental Compliance Approval (ECA) as per O.Reg. 525/98, section 3(a), and Ontario Water Resources Act section 53.6(c).
- The anticipated water demands for the proposed site are **1.39 L/s** (average day), **87.62 L/s** (max day + fire flow), and **6.37 L/s** (peak hour). The boundary conditions received from the City of Ottawa indicate that the existing watermain network can provide the required water demands for the proposed site.
- The estimated sanitary flow for the proposed development is **1.45 L/s** (average dry weather), **4.86 L/s** (peak dry weather), and **5.02 L/s** (peak wet weather). The City of Ottawa has indicated that the existing sanitary sewer network near the proposed site is flooding due to excess extraneous flows form holes in maintenance hole covers and underground infiltration. As a result, the maintenance hole covers will be replaced with solid sealed covers as part of the development project to offset the added sanitary flow, which was satisfactory to the City.
- Storm runoff in excess of the allowable 5-year pre-development release rate, up to and including the 100-year storm event, will be detained on site via an internal cistern prior to being discharged to the municipal storm sewer system.
- The allowable stormwater release rate for the proposed site is **66.4 L/s**. It is expected that this will be achieved by means of underground retention and surface storage. To achieve this release rate, a storage volume of **99.4 m³** is required on-site.
- The existing site is approximately 41% impervious with no existing stormwater measures on site (i.e., catch basins, sewers, etc.) and it is thus assumed that there are no current stormwater management controls on site. Thus, stormwater flows from the redeveloped site are anticipated to be considerably less than the stormwater flows from the existing site.

  The RVCA mentioned that onsite water quality control of 80% TSS removal will be required given the scope of the driveway including a turning area. This is expected to be achieved via a raingarden equipped with a pre-treatment stone diaphragm.
- As a result of the conclusions drawn by the previous points, it is expected that the proposed development can be serviced by the existing municipal services network surrounding the site.

We trust this Site Servicing and Stormwater Management Report is to your satisfaction. If you have any questions regarding this report, please do not hesitate to contact any of the signatories.

A

Appendix A
Pre-consultation Correspondence

Appendix A

PRE-CONSULTATION: UCC DRAWINGS

Jaymeson Adams

From: ISD Information Centre / Centre Information <informationcentre@ottawa.ca>
Sent: April 16, 2021 7:36 AM
To: Jaymeson Adams
Subject: RE: 21-0367 1649 Montreal Rd. and 741 Blair Rd. - Servicing Capacity Assessment - Information Request
Attachments: 21-0367-UCC-Blair-Montreal.dwg; 21-0367.xlsx

EXTERNAL EMAIL

Good morning Jaymeson,

Attached is the UCC information and work order for this request.

The City of Ottawa's Financial Services Branch will send out an invoice at the end of the month. The work orders will no longer be included with the invoice. Please retain the attached work order for your records.

For any additional information regarding this information, please contact the Information Centre.

Thank you and we appreciate your patience,
Nick Havelock
Geospatial Analytics Technology & Solutions, Information Centre:
Phone: 613-580-2424 Ext 44455
Email: informationcentre@ottawa.ca

CAUTION
The City of Ottawa assumes no liability for any of the attached plans or reports.
Such data is provided for reference only and the recipient accepts full responsibility for verifying the accuracy and completeness of the data. Utility locations are established using the best available information but is not guaranteed. All utility locations are to be verified in the field.

From: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Sent: April 09, 2021 1:20 PM
To: ISD Information Centre / Centre Information <informationcentre@ottawa.ca>
Subject: RE: 21-0367 1649 Montreal Rd. and 741 Blair Rd. - Servicing Capacity Assessment - Information Request

Hi Nick,

Truly appreciated. Thank you for escalating.

I hope you enjoy your weekend and the beautiful weather.

Cheers,

JAYMESON ADAMS, EIT
Engineering Trainee / Infrastructure
Ingénieur en formation / Infrastructures

T 613-860-2462 ext. 6659 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

From: ISD Information Centre / Centre Information <informationcentre@ottawa.ca>
Sent: April 9, 2021 1:17 PM
To: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Subject: RE: 21-0367 1649 Montreal Rd. and 741 Blair Rd. - Servicing Capacity Assessment - Information Request

EXTERNAL EMAIL

Hi Jaymeson,

I've sent this to my supervisor, we'll do our best to get you the information as soon as we can.

Thank you,
Nick Havelock
Geospatial Analytics Technology & Solutions, Information Centre:
Phone: 613-580-2424 Ext 44455
Email: informationcentre@ottawa.ca

From: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Sent: April 09, 2021 1:13 PM
To: ISD Information Centre / Centre Information <informationcentre@ottawa.ca>
Cc: Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>; Tim Kennedy <tim.kennedy@cima.ca>
Subject: RE: 21-0367 1649 Montreal Rd. and 741 Blair Rd. - Servicing Capacity Assessment - Information Request

ATTENTION : Ce courriel provient d'un expéditeur externe. Ne cliquez sur aucun lien et n'ouvrez pas de pièce jointe, excepté si vous connaissez l'expéditeur.

Hi Nick,

Thank you for the response, though it wasn't what I was hoping to hear.

The submission is due in three weeks' time so any expediting of the process would be much appreciated.

Thanks,

JAYMESON ADAMS, EIT
Engineering Trainee / Infrastructure
Ingénieur en formation / Infrastructures

T 613-860-2462 ext. 6659 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

From: ISD Information Centre / Centre Information <informationcentre@ottawa.ca>
Sent: April 9, 2021 1:11 PM
To: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Subject: RE: 21-0367 1649 Montreal Rd. and 741 Blair Rd. - Servicing Capacity Assessment - Information Request

EXTERNAL EMAIL

Good afternoon Jaymeson,

A UCC Technician replied with "hopefully by the end of next week". Unfortunately, this has been the longest UCC information queue we've had all year.

Thank you for your understanding,
Nick Havelock
Geospatial Analytics Technology & Solutions, Information Centre:
Phone: 613-580-2424 Ext 44455
Email: informationcentre@ottawa.ca

From: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Sent: April 08, 2021 11:22 AM
To: ISD Information Centre / Centre Information <informationcentre@ottawa.ca>
Cc: Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>; Tim Kennedy <tim.kennedy@cima.ca>
Subject: RE: 21-0367 1649 Montreal Rd. and 741 Blair Rd. - Servicing Capacity Assessment - Information Request

Good morning Nick,

We haven't yet received the UCC information in CAD format yet. When can we expect to receive this?

Thanks,

JAYMESON ADAMS, EIT
Engineering Trainee / Infrastructure
Ingénieur en formation / Infrastructures

T 613-860-2462 ext. 6659 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

From: ISD Information Centre / Centre Information <informationcentre@ottawa.ca>
Sent: March 26, 2021 9:00 AM
To: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Subject: RE: 21-0367 1649 Montreal Rd. and 741 Blair Rd. - Servicing Capacity Assessment - Information Request

Good morning Jaymeson,

Attached are the plan and profile drawings for Blair and Montreal Roads. If there are no major updates to be applied to the UCC information in CAD format, you can expect this information next week.

Thank you,
Nick Havelock
Geospatial Analytics Technology & Solutions, Information Centre:
Phone: 613-580-2424 Ext 44455
Email: informationcentre@ottawa.ca

CAUTION
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Such data is provided for reference only and the recipient accepts full responsibility for verifying the accuracy and completeness of the data. Utility locations are established using the best available information but is not guaranteed. All utility locations are to be verified in the field.

From: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Sent: March 26, 2021 8:15 AM
To: ISD Information Centre / Centre Information <informationcentre@ottawa.ca>
Cc: Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>
Subject: RE: 21-0367 1649 Montreal Rd. and 741 Blair Rd. - Servicing Capacity Assessment - Information Request

Thank you for providing me these options.

Please proceed with Option 1 – UCC and engineering drawings not including the additional reports (using the estimate attached).

Thanks,

JAYMESON ADAMS, EIT
Engineering Trainee / Infrastructure
Ingénieur en formation / Infrastructures

T 613-860-2462 ext. 6659 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

From: ISD Information Centre / Centre Information <informationcentre@ottawa.ca>
Sent: March 25, 2021 1:45 PM
To: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Subject: RE: 21-0367 1649 Montreal Rd. and 741 Blair Rd. - Servicing Capacity Assessment - Information Request

EXTERNAL EMAIL

Hi Jaymeson,

Attached are the cover pages of the reports we have available for this area. Each report will cost an additional $34 while the site plan for 1648 Montreal Road is an additional $16.50. Attached is the revised estimate including the 3 attached reports as well as the site plan.

Please let us know if and how you would like to proceed.

Thank you,
Nick Havelock
Geospatial Analytics Technology & Solutions, Information Centre:
Phone: 613-580-2424 Ext 44455
Email: informationcentre@ottawa.ca

From: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Sent: March 25, 2021 1:15 PM
To: ISD Information Centre / Centre Information <informationcentre@ottawa.ca>
Subject: RE: 21-0367 1649 Montreal Rd. and 741 Blair Rd. - Servicing Capacity Assessment - Information Request

How much would the additional information cost that is not in the estimate?

Thanks,

JAYMESON ADAMS, EIT
Engineering Trainee / Infrastructure
Ingénieur en formation / Infrastructures

T 613-860-2462 ext. 6659 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

From: ISD Information Centre / Centre Information <informationcentre@ottawa.ca>
Sent: March 25, 2021 11:46 AM
To: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Subject: RE: 21-0367 1649 Montreal Rd. and 741 Blair Rd. - Servicing Capacity Assessment - Information Request

EXTERNAL EMAIL

Good morning Jaymeson,

Thank you for your request for infrastructure information,

Attached is the total estimate for this request. If you'd like to proceed, I will send the plan and profile drawings immediately (3 plans showing San, Storm and Watermain along Montreal and Blair as well as UCC information in CAD).

Not included on the estimate but available are: 1648 Montreal Road Development Site Plan, Noise Impact Study (Report), Geotechnical Investigations, and Soil Design Reports.

Thank you,
Nick Havelock
Geospatial Analytics Technology & Solutions, Information Centre:
Phone: 613-580-2424 Ext 44455
Email: informationcentre@ottawa.ca

From: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Sent: March 25, 2021 10:40 AM
To: ISD Information Centre / Centre Information <informationcentre@ottawa.ca>
Cc: Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>
Subject: 21-0367 1649 Montreal Rd. and 741 Blair Rd. - Servicing Capacity Assessment - Information Request

We are working with a client on a servicing capacity assessment for zoning by-law amendment (ZBLA) at 1649 Montreal Rd. and 741 Blair Rd. (see attached key plan).

Our client is considering a service connection for the proposed development to Montreal and/or Blair. Could you please provide any additional background information for the existing services and utilities that may be present at these locations, including but not limited to watermain, storm, and sanitary sewer, gas, hydro, streetlighting, Bell, Rogers, etc. If you could provide a list of any information you have on file and the associated fees for obtaining these it would be much appreciated.

Also CAD of available utility plans would be preferable.

Thanks,

JAYMESON ADAMS, EIT
Engineering Trainee / Infrastructure
Ingénieur en formation / Infrastructures

T 613-860-2462 ext. 6659 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

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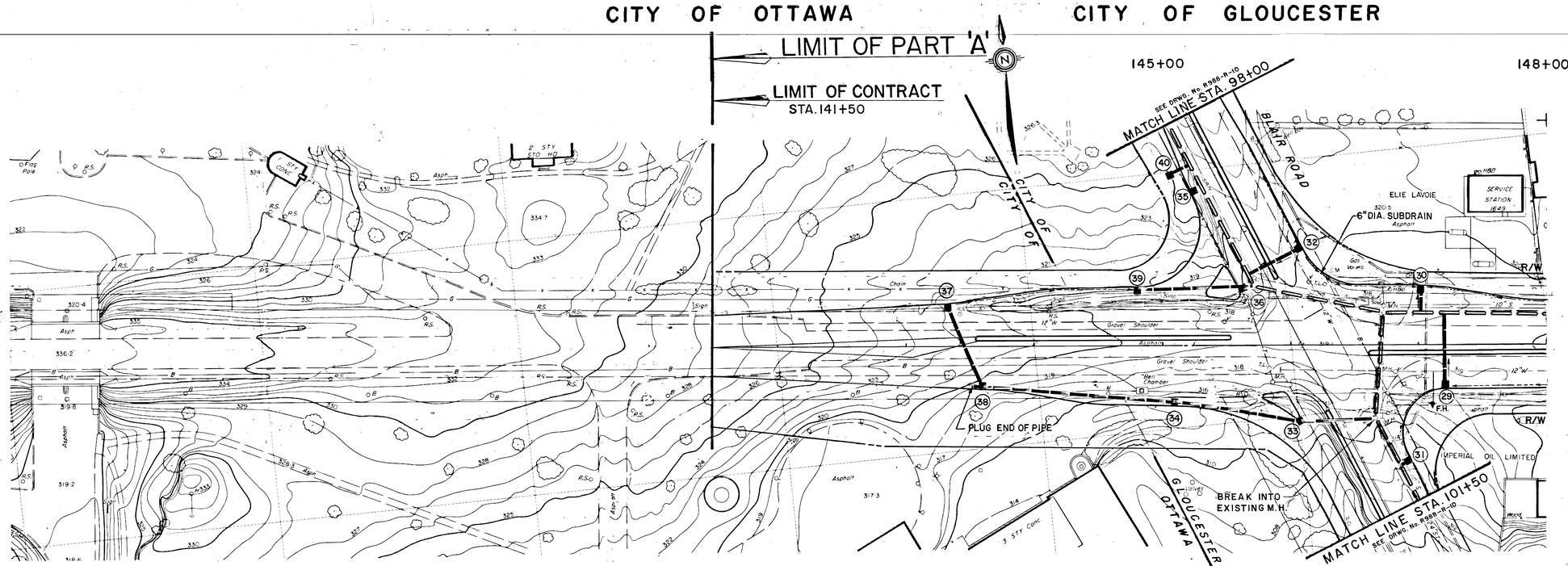
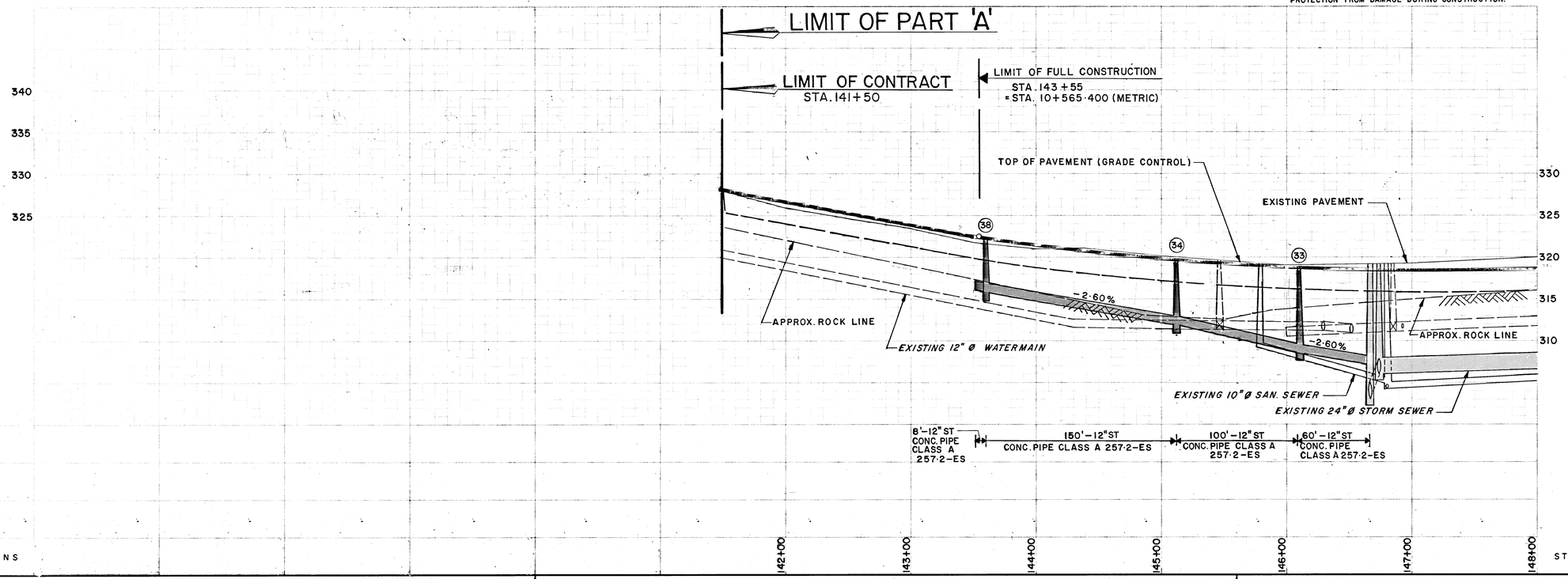
CITY OF OTTAWA

CITY OF GLOUCESTER



NOTE:
THE LOCATION OF UTILITIES IS APPROXIMATE ONLY, AND THE EXACT LOCATION SHOULD BE DETERMINED BY CONSULTING THE MUNICIPAL AUTHORITIES AND UTILITY COMPANIES CONCERNED. THE CONTRACTOR SHALL PROVE THE LOCATION OF UTILITIES AND SHALL BE RESPONSIBLE FOR ADEQUATE PROTECTION FROM DAMAGE DURING CONSTRUCTION.



MANHOLE DATA

No.	Station	Offset (ft.)	Type Cover	Type Structure	Elevations Grade	Elevations Low Invert	Grate to Invert
33	100+50	30·0'RT	S-3.18	J-3.14	318·36	309·22	9·14
34	145+10	45·0'RT	S-3.18	J-3.14	319·34	311·82	7·52
36	99+40	23·0'RT	S-3.18	J-3.14	318·59	313·92	4·67
38	143+60	33·0'RT	S-3.18	J-3.14	320·52	315·72	4·80

SEWER DATA

Structure to Structure	Diameter (in.)	Type	Length (ft.)	Invert Elevations Upstream	Invert Elevations Downstream
CBMH 38 TO MH 34	12"	CONC.	150'	315·72	311·82
MH 34 TO MH 33	12"	CONC.	100'	311·82	309·92
MH 33 TO EXIST. MH	12"	CONC.	60'	309·22	307·66
MH 36 TO EXIST. MH	12"	CONC.	10'	313·92	312·50
STUB TO MH 38	12"	CONC.	8'	315·93	315·72

CATCHBASIN DATA

No.	Station	Offset (ft.)	Type Cover	Type Structure	Elevations Grade	Elevations Low Invert	Grate to Invert
29	147+20	33·0'RT	S-3.18	J-3.9	317·90	313·65	4·25
30	147+00	45·0'LT	S-3.18	J-3.9	317·95	312·70	5·25
31	101+20	33·0'LT	S-3.18	J-3.9	315·10	310·00	5·10
32	99+50	33·0'LT	S-3.18	J-3.9	318·50	313·90	4·60
35	98+50	21·0'RT	S-3.18	J-3.9	320·67	315·67	5·00
37	143+30	32·0'LT	S-3.18	J-3.9	312·19	316·47	5·72
39	144+30	45·0'LT	S-3.18	J-3.9	319·32	314·32	5·00
40	98+35	32·0'RT	S-3.18	J-3.9	317·5±	313·50	4·0±

CATCHBASIN LEAD DATA

Structure to Structure	Diameter (in.)	Type	Length (ft.)	Invert Elevations Upstream	Invert Elevations Downstream
CB 29 TO TRUNK	9"	CONC.	58'	313·65	308·00
CB 30 TO TRUNK	9"	CONC.	20'	312·70	312·30
CB 31 TO TRUNK	9"	CONC.	7'	310·00	306·20
CB 32 TO TRUNK	9"	CONC.	47'	313·90	312·00
CB 35 TO TRUNK	9"	CONC.	9'	315·67	311·05
CB 37 TO MH 38	9"	CONC.	75'	316·47	315·72
CB 39 TO MH 36	9"	CONC.	85'	314·32	313·47
CB 40 TO TRUNK	9"	CONC.	12'	313·50	314·00

NOTES:

1. LATERAL GRADES MAY BE ADJUSTED DUE TO POSSIBLE CONFLICT WITH EXISTING UNDERGROUND UTILITIES.
2. CATCHBASIN OFFSET DISTANCES REFER TO THE CENTRE OF THE GRATE.
3. GRATE ELEVATIONS REFER TO THE TOP OF GRATE AT THE CENTRE OF THE GRATE.
4. RUBBER GASKETS REQUIRED FOR ALL SEWER PIPE JOINTS.
5. MACHINE CUT LATERALS INTO EXISTING TRUNK STORM SEWERS.

McCORMICK RANKIN
CONSULTING ENGINEERS

REGISTERED PROFESSIONAL ENGINEER P. TURNER PROVINCE OF ONTARIO

REGISTERED PROFESSIONAL ENGINEER R. A. HUNTON PROVINCE OF ONTARIO

NO.	REVISION	BY	DATE

THE REGIONAL MUNICIPALITY OF OTTAWA—CARLETON
Transportation Department

MONTREAL ROAD

BLAIR ROAD TO BECKENHAM LANE

STORM SEWER

STA. 141+50 TO STA. 148+00

HORIZONTAL 0 10 20 40 60' / 0 3 6 9'
VERTICAL

Des: R.H.	Chkd: P.T.
Dwn: H.R.	Chkd: R.H.
Date: MARCH, 1986	
Scale: Horiz. 1" = 40' Vert. 1" = 8'	

L. G. MORLEY
Director Design & Construction

W.S. BEVERIDGE P.ENG.
Chief Design Engineer

CONTRACT NO. 78-504

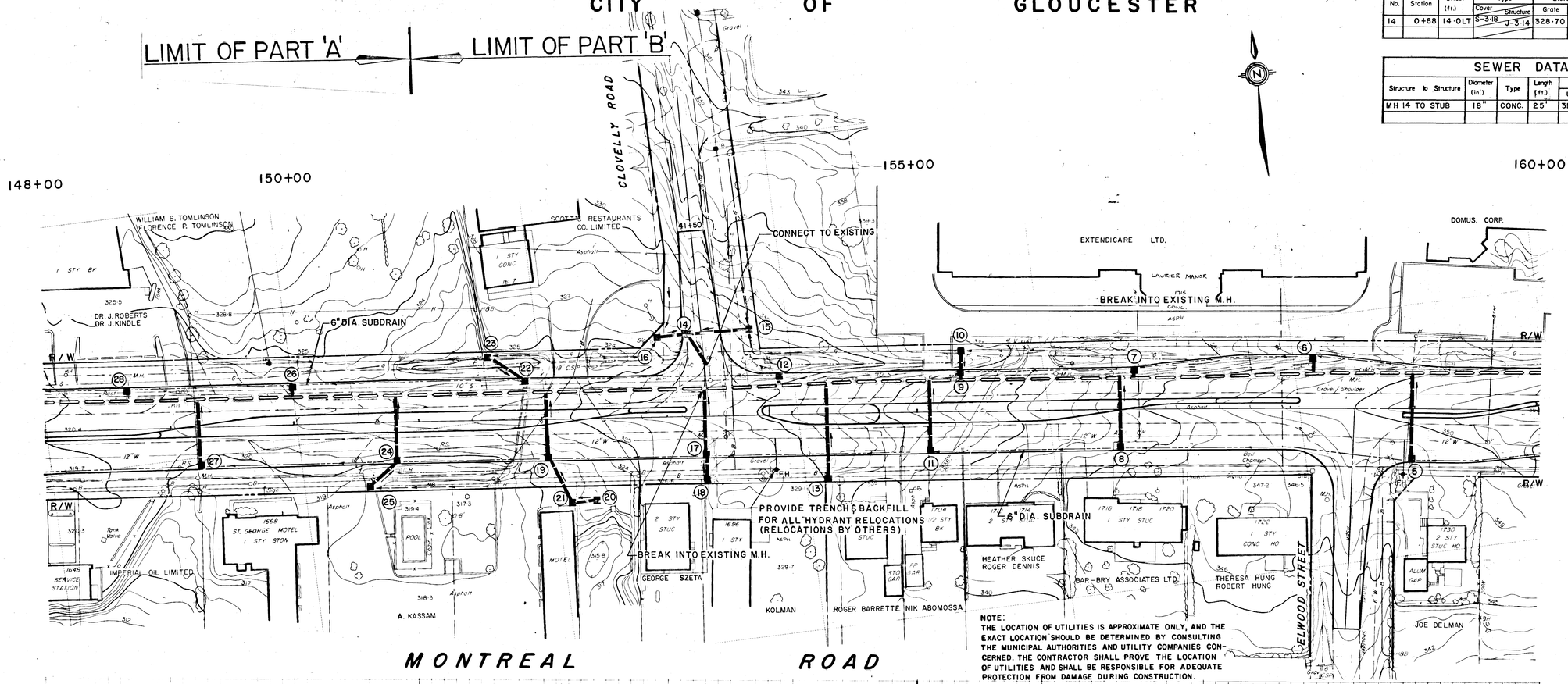
DWG. NO. R988-R-7

SHEET 7 OF 39

10170

R-988-8

CITY OF GLOUCESTER



NOTE:
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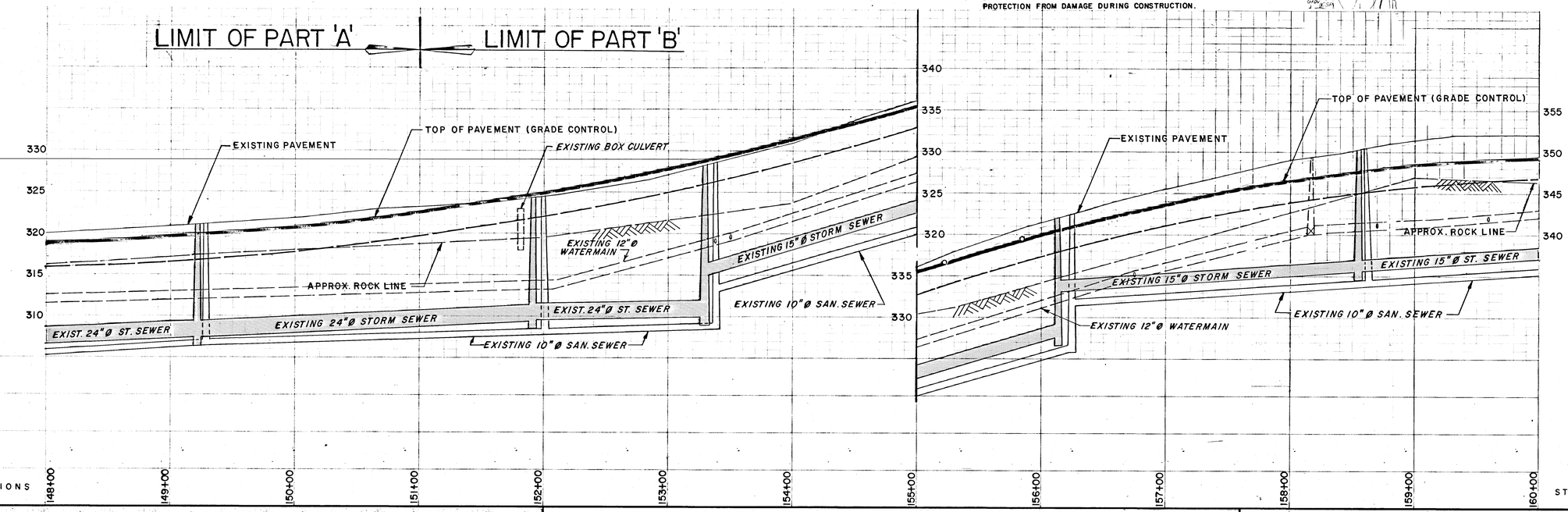


MANHOLE DATA

No.	Station	Offset (ft.)	Type Cover / Structure	Elevations Grade	Elevations Low Invert	Grate to Invert
14	0+68	14·0 LT	S-3.18 / J-3.14	328·70	319·00	9·80

SEWER DATA

Structure to Structure	Diameter (in.)	Type	Length (ft.)	Invert Elevations Upstream	Invert Elevations Downstream
MH 14 TO STUB	18"	CONC.	25'	319·00	318·00

CATCHBASIN DATA

No.	Station	Offset (ft.)	Type Cover / Structure	Elevations Grate	Elevations Low Invert	Grate to Invert
5	158+97	45·0' RT	S-3.18 / J-3.9	347·70	342·70	5·00
6	158+20	45·0' LT	S-3.18 / J-3.9	346·44	339·40	7·04
7	156+75	33·0' LT	S-3.18 / J-3.9	342·30	336·50	5·80
8	156+65	33·0' RT	S-3.18 / J-3.9	341·98	335·21	6·77
9	155+35	33·0' LT	S-3.18 / J-3.9	336·47	328·65	7·82
10	155+35	47·0' LT	S-3.18 / J-3.9	336·8±	329·00	7·8±
11	155+10	33·0' RT	S-3.18 / J-3.9	335·36	326·15	9·31
12	153+90	33·0' LT	S-3.18 / J-3.9	329·82	322·40	8·00
13	154+30	50·0' RT	S-3.15 / S-3.11	328·8±	325·80	3·0±
⚠1 15	40+70	35·0' LT	403·01 / J-3.5	327·5±	322·82	4·6±
⚠2 16	40+55	65·0' LT	403·01 / J-3.5	324·5±	319·95	4·5±
17	153+30	33·0' RT	S-3.18 / J-3.9	328·30	320·10	8·15
18	153+30	50·0' RT	S-3.15 / S-3.11	325·3±	320·50	4·8±
19	152+05	33·0' RT	S-3.18 / J-3.9	324·46	318·43	6·03
22	151+90	33·0' LT	S-3.18 / J-3.9	324·06	317·30	6·65
23	151+60	52·0' LT	403·01 / J-3.5	320·0±	318·00	2·0±
24	150+83	33·0' RT	S-3.18 / J-3.9	321·56	313·60	7·90
25	150+25	52·0' RT	S-3.18 / J-3.9	317·8±	314·00	3·0±
26	150+00	33·0' LT	S-3.18 / J-3.9	320·06	314·80	5·20
27	149+25	33·0' RT	S-3.18 / J-3.9	319·07	314·25	4·75
28	148+68	33·0' LT	S-3.18 / J-3.9	18·50	313·70	4·75
20	152+40	70·0' RT	S-3.15 / S-3.11	324·7±	319·30	5·2±
21	152+20	70·0' RT	S-3.15 / S-3.11	321·0±	319·00	2·0±

CATCHBASIN LEAD DATA

Structure to Structure	Diameter (in.)	Type	Length (ft.)	Invert Elevations Upstream	Invert Elevations Downstream
CB 5 TO TRUNK	9"	CONC.	75'	342·70	336·35
CB 6 TO TRUNK	9"	CONC.	13'	339·40	335·50
CB 7 TO TRUNK	9"	CONC.	10'	336·50	333·45
CB 8 TO TRUNK	9"	CONC.	63'	335·21	333·95
CB 9 TO TRUNK	9"	CONC.	4'	328·65	324·65
CB 10 TO CB 9	9"	CONC.	17'	329·00	328·65
CB 11 TO TRUNK	9"	CONC.	53'	326·15	323·50
CB 12 TO TRUNK	9"	CONC.	9'	322·40	317·90
CB 13 TO TRUNK	12"	CONC.	78'	325·80	320·50
⚠2 CB 15 TO MH 14	12"	CONC.	51'	322·82	322·00
⚠1 CB 16 TO MH 14	12"	CONC.	25'	319·95	319·25
CB 17 TO EXIST.MH	12"	CONC.	55'	321·10	319·00
CB 18 TO CB 17	9"	CONC.	20'	320·50	320·10
CB 19 TO TRUNK	12"	CONC.	57'	318·43	317·86
CB 22 TO EXIST. MH	12"	CONC.	10'	317·30	316·60
DI 23 TO CB 22	12"	CONC.	35'	318·00	317·30
CB 24 TO TRUNK	12"	CONC.	55'	313·60	312·50
DI 25 TO CB 24	12"	CONC.	30'	314·00	313·60
CB 26 TO TRUNK	9"	CONC.	10'	314·80	308·60
CB 27 TO TRUNK	9"	CONC.	55'	314·25	313·70
CB 28 TO TRUNK	9"	CONC.	10'	313·70	306·55
CB 20 TO CB 21	9"	CONC.	20'	319·50	319·25
CB 21 TO CB 19	12"	CONC.	40'	319·00	318·43

McCORMICK RANKIN
CONSULTING ENGINEERS

REGISTERED PROFESSIONAL ENGINEER — P. TURNER — PROVINCE OF ONTARIO
REGISTERED PROFESSIONAL ENGINEER — R.A. HUNTON — PROVINCE OF ONTARIO

NO.	REVISION	BY	DATE
⚠1	CLOVELLY ROAD REALIGNED	RH	MAR 31/86
⚠2	CB ADJUSTMENT	RH	MAR 31/86

THE REGIONAL MUNICIPALITY OF
OTTAWA – CARLETON
Transportation Department

MONTREAL ROAD

BLAIR ROAD TO BECKENHAM LANE

STORM SEWER
STA. 148+00 TO STA. 160+00

HORIZONTAL 0 10 20 40 60'
VERTICAL 0 3 6 9'

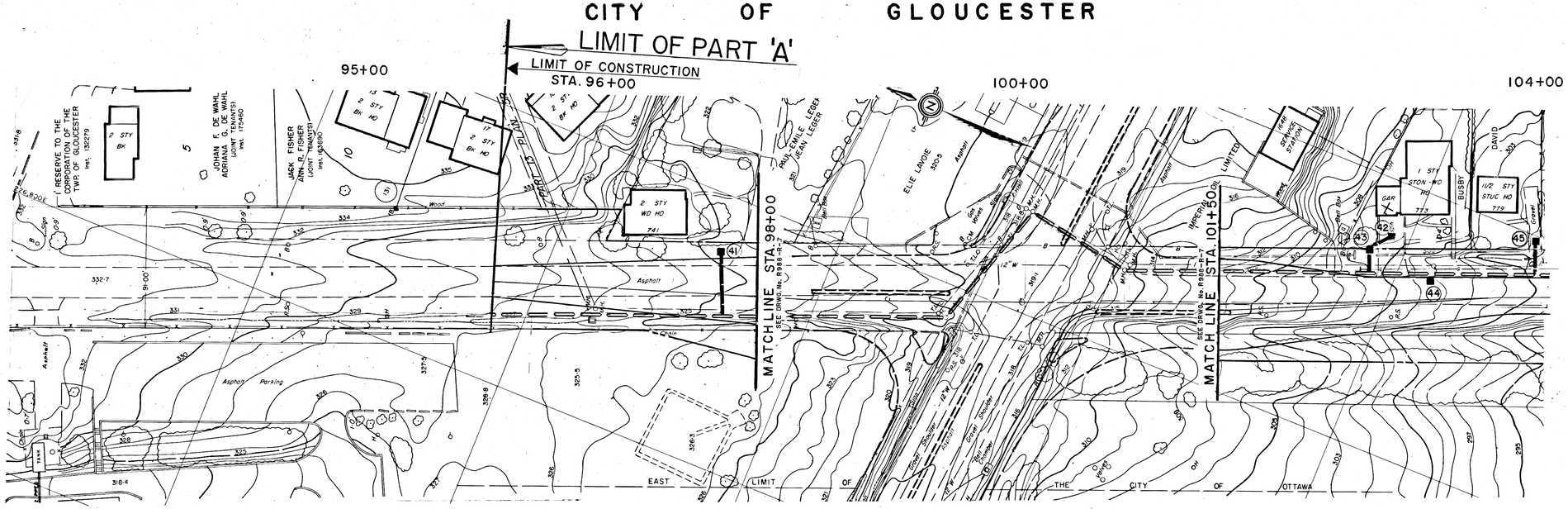
Des: R. H.	Chkd: P.T.
Dwn: H. R.	Chkd: R.H.
Date: MARCH, 1986	
Scale: Horiz. 1"=40' Vert. 1"=6'	
CONTRACT NO. 78-504	

L. G. MORLEY
Director Design & Construction
W.S. BEVERIDGE P.ENG.
Chief Design Engineer
DWG. NO. R988-R-8
SHEET 8 OF 39

10170

R-988-10

CITY OF GLOUCESTER

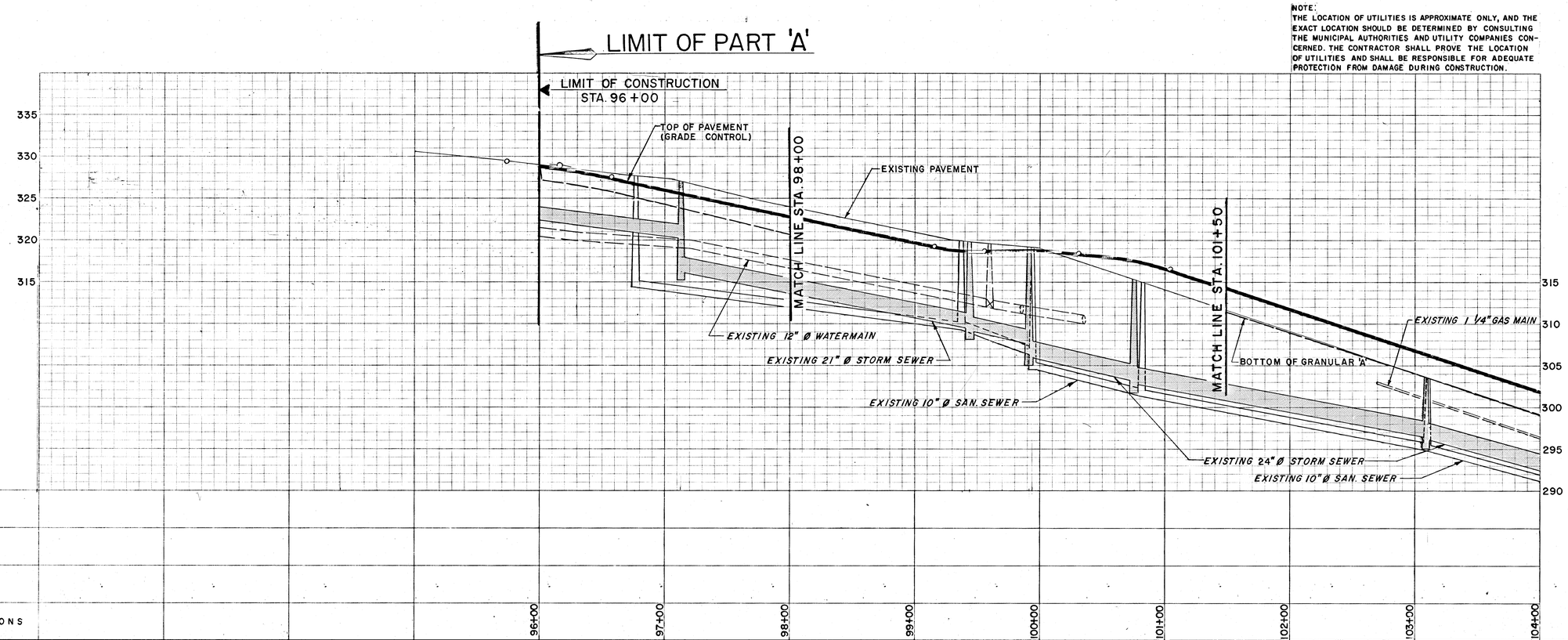


BLAIR ROAD

CATCHBASIN DATA						
No.	Station	Offset (ft.)	Type Cover	Type Structure	Elevations Grate	Elevations Low Invert	Grate to Invert
41	97+75	38.0'LT	S-3.18	J-3.9	321.5±	316.00	5.5±
42	102+80	55.0'LT	S-3.18	J-3.9	306.0±	302.00	4.0±
43	102+65	38.0'LT	S-3.18	J-3.9	306.0±	301.00	5.0±
44	103+10	14.0'LT	S-3.18	J-3.9	305.98	301.50	4.98
45	103+98	50.0'LT	S-3.15	S-3.11	300.5±	296.50	4.0±

CATCHBASIN LEAD DATA					
Structure to Structure	Diameter (in.)	Type	Length (ft.)	Invert Elevations Upstream	Invert Elevations Downstream
CB 41 TO TRUNK	12"	CONC.	50'	316.00	315.00
CB 42 TO CB 43	9"	CONC.	20'	302.00	301.80
CB 43 TO TRUNK	12"	CONC.	19'	301.00	297.65
CB 44 TO TRUNK	9"	CONC.	5'	301.50	298.40
CB 45 TO TRUNK	9"	CONC.	35'	296.50	293.50

NOTE:
THE LOCATION OF UTILITIES IS APPROXIMATE ONLY, AND THE EXACT LOCATION SHOULD BE DETERMINED BY CONSULTING THE MUNICIPAL AUTHORITIES AND UTILITY COMPANIES CONCERNED. THE CONTRACTOR SHALL PROVE THE LOCATION OF UTILITIES AND SHALL BE RESPONSIBLE FOR ADEQUATE PROTECTION FROM DAMAGE DURING CONSTRUCTION.



McCORMICK RANKIN
CONSULTING ENGINEERS

REGISTERED PROFESSIONAL ENGINEER P. TURNER PROVINCE OF ONTARIO

REGISTERED PROFESSIONAL ENGINEER R.A. HUNTON PROVINCE OF ONTARIO

NO.	REVISION	BY	DATE
1	PROFILE ADJUSTMENT STA.96+16	H.R.	APR22/86

THE REGIONAL MUNICIPALITY OF
OTTAWA—CARLETON
Transportation Department

MONTREAL ROAD

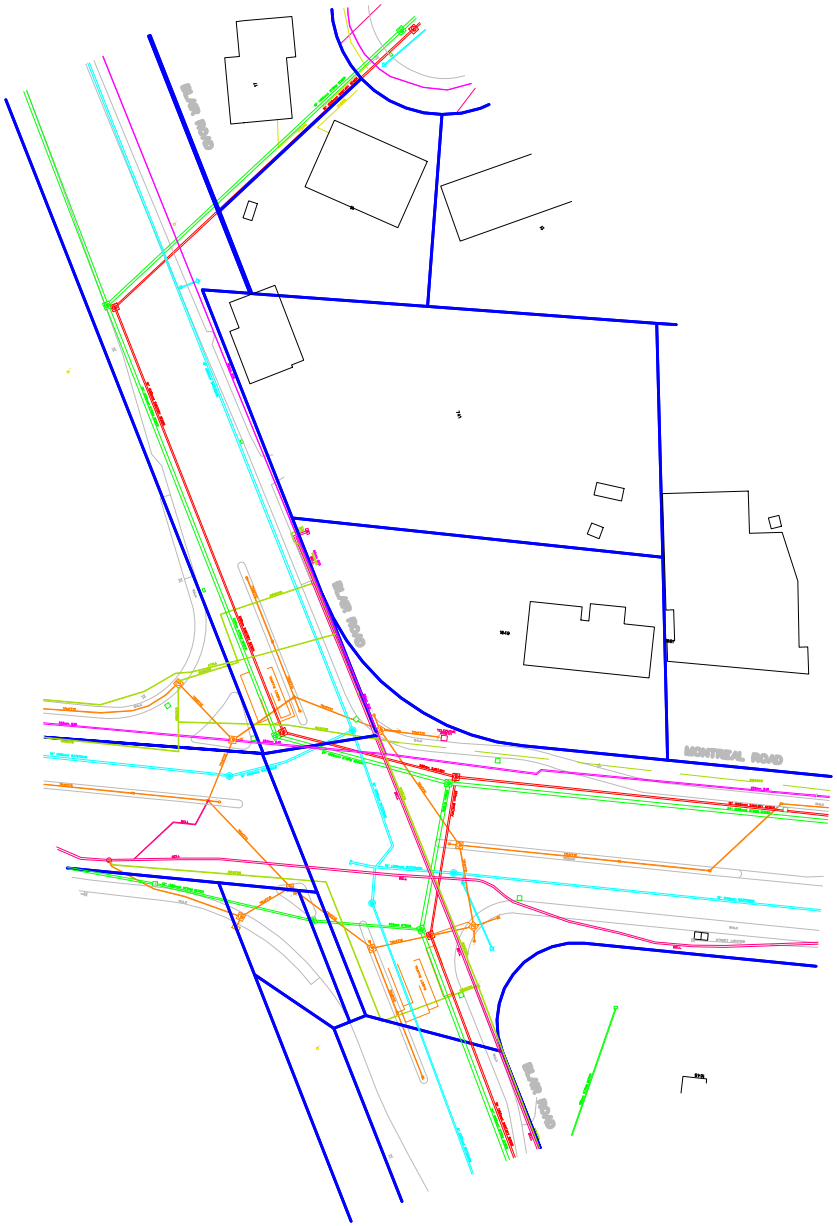
BLAIR ROAD TO BECKENHAM LANE

STORM SEWER
STA. 92+00 TO STA. 104+50

Des: R.H.	Chkd: P.T.
Dwn: H.R.	Chkd: R.H.
Date: MARCH, 1986	
Scale: Horiz. 1" = 40' Vert. 1" = 6'	
CONTRACT NO. 78-504	DWG. NO. R988-R-10
	SHEET 10 OF 39

L. G. MORLEY
Director Design & Construction

W. S. BEVERIDGE, P.ENG.
Chief Design Engineer



CAUTION/ATTENTION

Although utility locations are established using the best available information, they cannot be guaranteed. Property lines were compiled from plans and documents recorded in the Land Registry System and are for indexing purposes only.

Bien que l'emplacement des services publics soient établis en utilisant la meilleure information disponible, ils ne peuvent pas être garantis. Des lignes de propriété ont été compilées en utilisant des plans et des documents enregistrés dans le système de cadastre et sont pour l'indexation seulement.

LEGEND

Water Valve, Valve Chamber, Fire Hydrant

Sewer Manhole, Catch Basin Manhole

Catch Basin / Drainage, Wing Wall, Head Wall

Pole, Pole w/ light, Decorative, Lead Light

Power Supply, Panel, Pedestal, Transformer, Tower, Regulator

Vlvg, Hand Hole, Vault, Gas Valve

DC Transpo: Bus Shelter/Ads Power, Energized, Isolated

Streetscape: Planter Box, Gate Square, Eng. Soil

Traffic Control Box / Disconnect Box, SL Disconnect

R.L Hand Hole, R.L. Camera

Scada: Handhold, Monitoring Panel

Reduce

Pipe, Duct, Conduit, Lateral

Culvert

Abandoned

Capped

Buried Cable

Property Line

Install Year

TELECOM GLOSSARY

A	Allstream	P	Fibrius
AT	Aliant	PIR	Canadian PIR Fiber
B	Bell	R	Rogers
BH	Bell Int	S	Sprint
F	Fibre Net	SL	Street Lighting
G	Globility	T	Telus
GT	Group Telecom	TO	Telecom Ottawa
H	Hydro Ottawa	TU	Tata
HT	Hydro One	V	Videotron
I, I.13	Level 3	Z	Zayo

GLOSSARY - OTHER

DD	Dept. of Defence	PED	Pedestal (owner unknown)
MH	Manhole (owner unknown)	PW	Public Works
OOC	OCTranspo	UP	Utility Pole (owner unknown)
SCD	Scada		

CAUTION/ATTENTION

Although utility locations are established using the best available information, they cannot be guaranteed. Property lines were compiled from plans and documents recorded in the Land Registry System and are for indexing purposes only.

Bien que l'emplacement des services publics soient établis en utilisant la meilleure information disponible, ils ne peuvent pas être garantis. Des lignes de propriété ont été compilées en utilisant des plans et des documents enregistrés dans le système de cadastre et sont pour l'indexation seulement.

Appendix A

PRE-CONSULTATION WITH RVCA

Jaymeson Adams

From: Jamie Batchelor <jamie.batchelor@rvca.ca>
Sent: April 20, 2021 8:42 PM
To: Jaymeson Adams
Cc: Christian Lavoie-Lebel; Tim Kennedy
Subject: RE: 1649 Montreal Rd. and 741 Blair Rd. - Servicing Capacity Assessment - RVCA Pre-consult

EXTERNAL EMAIL

Hi Jaymeson,

There would be no natural heritage features or natural hazards that we have identified on this property which would preclude this application.

a. No additional on-site water quality treatment is required for rooftop or landscaped areas.
b. Given the scope of the drive way including a turning circle, we would require onsite water quality control of 80% TSS removal.
c. The RVCA is open to LID measures for providing water quality treatment.
d. While a water tank may provide some degree of TSS removal if a sufficient detention time is provided, it is unlikely it can achieve the water quality target without being equipped with filter media or splitter in the tank.
e.

Jamie Batchelor, MCIP, RPP
Planner, ext. 1191
Jamie.batchelor@rvca.ca

Rideau Valley Conservation Authority
3889 Rideau Valley Drive
PO Box 599, Manotick ON K4M 1A5
T 613-692-3571 | 1-800-267-3504 F 613-692-0831 | www.rvca.ca

From: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Sent: Thursday, March 25, 2021 1:08 PM
To: Jamie Batchelor <jamie.batchelor@rvca.ca>
Cc: Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>; Tim Kennedy <Tim.Kennedy@cima.ca>
Subject: 1649 Montreal Rd. and 741 Blair Rd. - Servicing Capacity Assessment - RVCA Pre-consult

Hi Jamie,

We are working on a project in the City of Ottawa and I wanted to get your input on Natural Heritage/Hazards features that may impact the development as well as any Stormwater Management Criteria for the site and required approvals/permits.

The proposed development involves the construction of a twenty-six (26) storey mixed use commercial and residential development at 1649 Montreal Rd. and 741 Blair Rd. with underground parking and driveway to the front entrance.

A few specific items for your consideration as follows:

1. The stormwater collected from the site travels approximately 3.3 km to Green's Creek.
2. The development will connect to the existing 525 mm ø storm sewer within Blair Road and will discharge primarily rooftop stormwater as well as stormwater captured in the grassed yard, driveway, and ground-level terrace area.
    a. Will quality control for rooftop areas, yard, driveway, and/or terrace area be required?
    b. Considering parking will be underground, with limited exterior hard surface at the ground level would a mechanical separator still be required for hydrocarbon removal?
    c. Would the use of raingardens or alternative low impact development stormwater measures meet RVCA's requirements for enhanced quality control for this site?
    d. Should an internal/external storage tank be required and provided with detention time for settlement of suspended solids would this meet the requirement for enhanced quality control for this site?

I have attached a key plan with the site location (PDF document) as well as the ultimate flow path for the storm sewer (JPG document).

If you need anything further please let me know. Feel free to call me on the number in my signature box below if you would like to discuss.

Best regards,

JAYMESON ADAMS, EIT
Engineering Trainee / Infrastructure
Ingénieur en formation / Infrastructures

T 613-860-2462 ext. 6659 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

Appendix A

CITY PRE-CONSULTATION: SERVICING MEMO

SERVICING MEMO

Date:	February 10, 2021
To / Destinataire	Shoma Murshid Planner, Development Review East
From / Expéditeur	Sara Mashaie, P.Eng. Project Manager, Infrastructure Approvals, Development Review East
Subject / Objet	**Pre-Application Consultation** **1649 Montreal Rd. & 741 Blair Rd.,** **Ward 11 – Beacon Hill-Cyrville** *Proposed high-rise building consisting of a mix of retail/commercial within the podium and residential units above* File No. PC2020-0344

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

****Note:** Some items may not be required as part of your submission and are for informational purposes.

1. The Servicing Study Guidelines for Development Applications are available at the following address: https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/guide-preparing-studies-and-plans#servicing-study-guidelines-development-applications

2. The following Engineering plans and reports are requested for the **Zoning By-Law Amendment** submission:

    a. Site Servicing Report

    b. Stormwater Management Report (can be combined with the Site Servicing Report)

    c. Geotechnical Report

3. The following Engineering plans and reports are requested for the **Site Plan Control** submission:

    a. Site Servicing Plan

b. Site Servicing Report

c. Stormwater Management Report (can be combined with the Site Servicing Report)

d. Grade Control and Drainage Plan

e. Erosion and Sediment Control Plan (can be combined with the Grade Control and Drainage Plan)

f. Geotechnical Report

4. Plans are to be submitted on standard **A1 size** (594mm x 841mm) sheets, utilizing an appropriate Metric scale (1:200, 1:250, 1:300, 1:400, or 1:500). With all submitted plans and reports, please provide an individual PDF format of the files.

5. Servicing and site works shall be in accordance with the following documents:

⇨ Ottawa Sewer Design Guidelines (October 2012)

⇨ Ottawa Design Guidelines – Water Distribution (2010)

⇨ Geotechnical Investigation and Reporting Guidelines for Development Applications in the City of Ottawa (2007)

⇨ City of Ottawa Slope Stability Guidelines for Development Applications (revised 2012)

⇨ City of Ottawa Environmental Noise Control Guidelines (January, 2016)

⇨ City of Ottawa Park and Pathway Development Manual (2012)

⇨ City of Ottawa Accessibility Design Standards (2012)

⇨ Ottawa Standard Tender Documents (latest version)

⇨ Ontario Provincial Standards for Roads & Public Works (2013)

6. Record drawings and utility plans are also available for purchase from the City (Contact the City's Information Centre by email at InformationCentre@ottawa.ca or by phone at (613) 580-2424 x.44455).

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

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

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

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

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

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

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

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

8. Deep Services (Storm, Sanitary & Water Supply)

   i. Provide existing servicing information and the recommended location for the proposed connections. Services should ideally be grouped in a common trench to minimize the number of road cuts.

   ii. Connections to trunk sewers and easement sewers are typically not permitted.

   iii. Provide information on the monitoring manhole requirements – should be located in an accessible location on private property near the property line (ie. Not in a parking area).

   iv. Review provision of a high-level sewer.

   v. Provide information on the type of connection permitted

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

a. Std Dwg S11.1 for flexible main sewers – *connections made using approved tee or wye fittings.*

b. Std Dwg S11 (For rigid main sewers) – *lateral must be less that 50% the diameter of the sewermain,*

c. Std Dwg S11.2 (for rigid main sewers using bell end insert method) – *for larger diameter laterals where manufactured inserts are not available; lateral must be less that 50% the diameter of the sewermain,*

d. Connections to manholes permitted when the connection is to rigid main sewers where the lateral exceeds 50% the diameter of the sewermain. – Connect obvert to obvert with the outlet pipe unless pipes are a similar size.

e. No submerged outlet connections.

9. Water Boundary condition requests must include the location of the service and the expected loads required by the proposed development. Please provide the following information:

   i. Location of service

   ii. Type of development and the amount of fire flow required (as per FUS, 1999).

   iii. Average daily demand: ___ l/s.

   iv. Maximum daily demand: ___l/s.

   v. Maximum hourly daily demand: ___ l/s.

10. All development application should be considered for an ECA by the MOECC.

    a. Consultant determines if an approval for sewage works under Section 53 of OWRA is required. Consultant determines what type of application is required and the City's project manager confirms. (If the consultant is not clear if an ECA is required, they will work with the City to determine what is required. If the consultant is still

unclear or there is a difference of opinion only then will they approach the MOECC).

b. The project will be either transfer of review (standard), transfer of review (additional), direct submission, or exempt as per O. Reg. 525/98.
c. Pre-consultation is not required if applying for standard works (schedule A of the Agreement) under Transfer Review.
d. Mandatory pre-consultation is required if applying for additional works (schedule A of the Agreement) under Transfer Review.
e. Pre-consultation with local District office of MOECC is recommended for direct submission.
f. Consultant completes an MOECC request form for a pre-consultation. Send request to moeccottawasewage@ontario.ca.

11. Phase 1 ESAs and Phase 2 ESAs must conform to clause 4.8.4 of the Official Plan that requires that development applications conform to Ontario Regulation 153/04.

Should you have any questions or require additional information, please contact me directly at (613) 580-2424, ext. 27885 or by email at sara.mashaie@ottawa.ca.

Appendix A

WATER DEMANDS BOUNDARY CONDITIONS & SANITARY CAPACITY CONFIRMATION

Jaymeson Adams

From: Mashaie, Sara <sara.mashaie@ottawa.ca>
Sent: April 13, 2021 3:56 PM
To: Jaymeson Adams
Cc: Tim Kennedy; Christian Lavoie-Lebel; Murshid, Shoma; Baird, Natasha
Subject: RE: 1649 Montreal Rd. and 741 Blair Rd. - Water Demands - Boundary Condition Request
Attachments: 1649 Montreal Rd & 741 Blair Rd April 2021.pdf

EXTERNAL EMAIL

Hi Jaymeson,

Firstly, I wanted to inform you that the water boundary conditions were received this morning. For your reference, please see below and the attached.

On the wastewater level, I wanted to bring to your attention that our Infrastructure team provided a response with respect to your email dated April 1, 2021 concerning the capacity of the City's system to accommodate the wastewater flow for the proposed development. Based on the modeling review, they have informed us that the existing system is flooding. Should you wish to discuss the existing flooding and capacity in further detail, please contact Eric Tousignant, Senior Engineer (Infrastructure) at eric.tousignant@ottawa.ca.

The following are boundary conditions, HGL, for hydraulic analysis at 1649 Montreal Rd & 741 Blair Rd (zone MONT) assumed to be connected to the 305 mm on Blair Road (see attached PDF for location).

Minimum HGL = 146.5 m

Maximum HGL = 146.9 m

Max Day + Fire Flow (83.3 L/s) = 144.4 m

These are for current conditions and are based on computer model simulation.

Disclaimer: The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation.

Regards,

Sara Mashaie, P.Eng., ing.
Project Manager | Gestionnaire de Projet

Development Review, East Branch | Examen des projets d'aménagement, Secteur est
Planning, Infrastructure and Economic Development Department | Services de la planification, de l'infrastructure et du développement économique
City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West. Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1
613.580.2424 ext./poste 27885, sara.mashaie@ottawa.ca

From: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Sent: April 08, 2021 10:11 AM
To: Mashaie, Sara <sara.mashaie@ottawa.ca>
Cc: Tim Kennedy <tim.kennedy@cima.ca>; Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>
Subject: RE: 1649 Montreal Rd. and 741 Blair Rd. - Water Demands - Boundary Condition Request

Good morning Ms. Mashaie,

Thank you for confirming this. I appreciate the sense of urgency with this file.

Regards,

JAYMESON ADAMS, EIT
Engineering Trainee / Infrastructure
Ingénieur en formation / Infrastructures

T 613-860-2462 ext. 6659 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

From: Mashaie, Sara <sara.mashaie@ottawa.ca>
Sent: April 8, 2021 10:09 AM
To: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Cc: Tim Kennedy <Tim.Kennedy@cima.ca>; Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>
Subject: RE: 1649 Montreal Rd. and 741 Blair Rd. - Water Demands - Boundary Condition Request

EXTERNAL EMAIL

Hi Jaymeson,

Please note that the team will do their best to deliver, and I will provide the results to your attention as soon as received.

Regards,

Sara Mashaie, P.Eng., ing.
Project Manager | Gestionnaire de Projet
Development Review, East Branch | Examen des projets d'aménagement, Secteur est
Planning, Infrastructure and Economic Development Department | Services de la planification, de l'infrastructure et du développement économique
City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West. Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1
613.580.2424 ext./poste 27885, sara.mashaie@ottawa.ca

From: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Sent: April 08, 2021 9:24 AM
To: Mashaie, Sara <sara.mashaie@ottawa.ca>
Cc: Tim Kennedy <tim.kennedy@cima.ca>; Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>
Subject: RE: 1649 Montreal Rd. and 741 Blair Rd. - Water Demands - Boundary Condition Request

I am just following up on the boundary conditions request below. I was wondering if we can still expect the results within the maximum 2 week timeframe.

Thanks,

JAYMESON ADAMS, EIT
Engineering Trainee / Infrastructure
Ingénieur en formation / Infrastructures

T 613-860-2462 ext. 6659 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

From: Mashaie, Sara <sara.mashaie@ottawa.ca>
Sent: April 1, 2021 9:19 AM
To: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Cc: Tim Kennedy <Tim.Kennedy@cima.ca>; Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>
Subject: RE: 1649 Montreal Rd. and 741 Blair Rd. - Water Demands - Boundary Condition Request

EXTERNAL EMAIL

Hi Jaymeson,

Thank you - I have forwarded the request to our water modelling team. Please allow up to 2 weeks for a response.

Regards,

Sara Mashaie, P.Eng., ing.
Project Manager | Gestionnaire de Projet
Development Review, East Branch | Examen des projets d'aménagement, Secteur est
Planning, Infrastructure and Economic Development Department | Services de la planification, de l'infrastructure et du développement économique
City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West. Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1
613.580.2424 ext./poste 27885, sara.mashaie@ottawa.ca

From: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Sent: March 31, 2021 5:36 PM
To: Mashaie, Sara <sara.mashaie@ottawa.ca>
Cc: Tim Kennedy <tim.kennedy@cima.ca>; Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>
Subject: RE: 1649 Montreal Rd. and 741 Blair Rd. - Water Demands - Boundary Condition Request

In addition, can you please confirm receipt of this request for boundary conditions?

The project schedule is very tight so any help in expediting the process would be greatly appreciated.

Thank you,

JAYMESON ADAMS, EIT
Engineering Trainee / Infrastructure
Ingénieur en formation / Infrastructures

T 613-860-2462 ext. 6659 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

From: Jaymeson Adams
Sent: March 31, 2021 5:29 PM
To: sara.mashaie@ottawa.ca
Cc: Tim Kennedy <Tim.Kennedy@cima.ca>; Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>
Subject: 1649 Montreal Rd. and 741 Blair Rd. - Water Demands - Boundary Condition Request

Hello Ms. Mashaie,

My name is Jaymeson Adams and I am the Design EIT working on this project.

We would like to kindly request boundary conditions for the proposed development at **1649 Montreal Road and 741 Blair Road**. Please find the proposed development information below and detailed calculations and associated figures attached including (1) Water Demand Calculations, (2) Fire Flow Calculations, (3) Figure 1 – Proposed Water Service Connection Locations, (4) Figure 2 – Exposure Separation Distances, (5) Figure 3 – Fire Hydrant Coverage, and (6) Architectural Concept Plans (for reference):

1. **Type of Development and Units:** The proposed development involves the construction of one (1) 26-storey mixed use building (residential and ground floor commercial space). There is a total of **243 residential units**. An underground 3-level parking garage extending the majority of the footprint of the site is also proposed (approximate garage footprint is shown on the attached Sketches).
2. **Site Address:** 1649 Montreal Road and 741 Blair Road
3. **Location of Services:** Please see attached Figure 1:
    a. Montreal Road – 305 mm diameter DI watermain.
    b. Blair Road – 305 mm diameter DI watermain.
4. **Average Daily Demand:** 1.87 L/s
5. **Maximum Daily Demand:** 5.56 L/s

6. **Peak Hour Demand:** 8.35 L/s
7. **Required Fire Flow (RFF):** 5,000 L/min

If you have any questions or concerns, please do not hesitate to contact me.

Best regards,

JAYMESON ADAMS, EIT
Engineering Trainee / Infrastructure
Ingénieur en formation / Infrastructures

T 613-860-2462 ext. 6659 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

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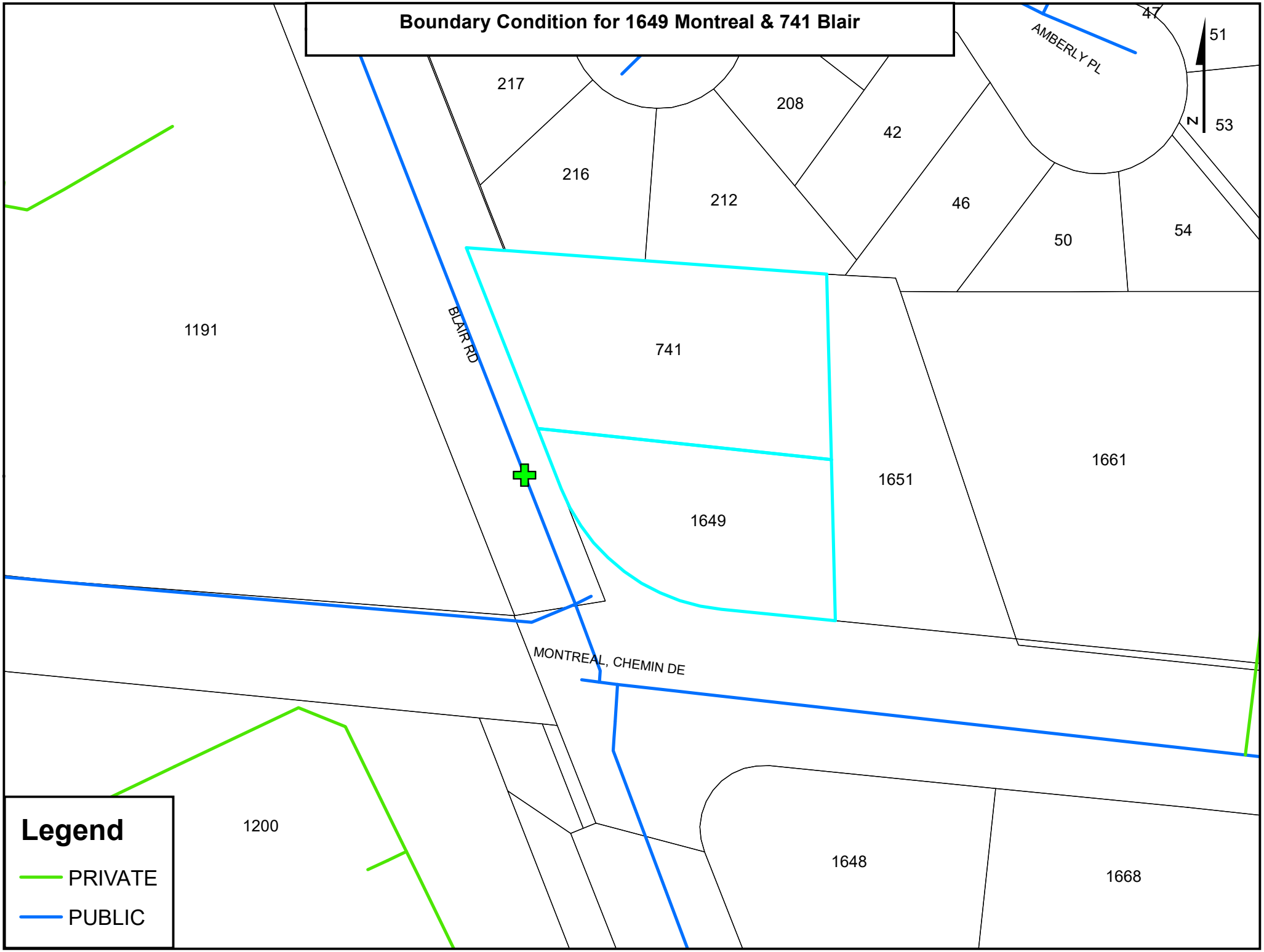

Boundary Condition for 1649 Montreal & 741 Blair
217
208
42
216
212
46
50
54
47
51
53
AMBERLY PL
N
1191
BLAIR RD
741
1649
1651
1661
MONTREAL, CHEMIN DE
1200
1648
1668
Legend
PRIVATE
PUBLIC

Appendix A

SANITARY INFILTRATION SOLUTION

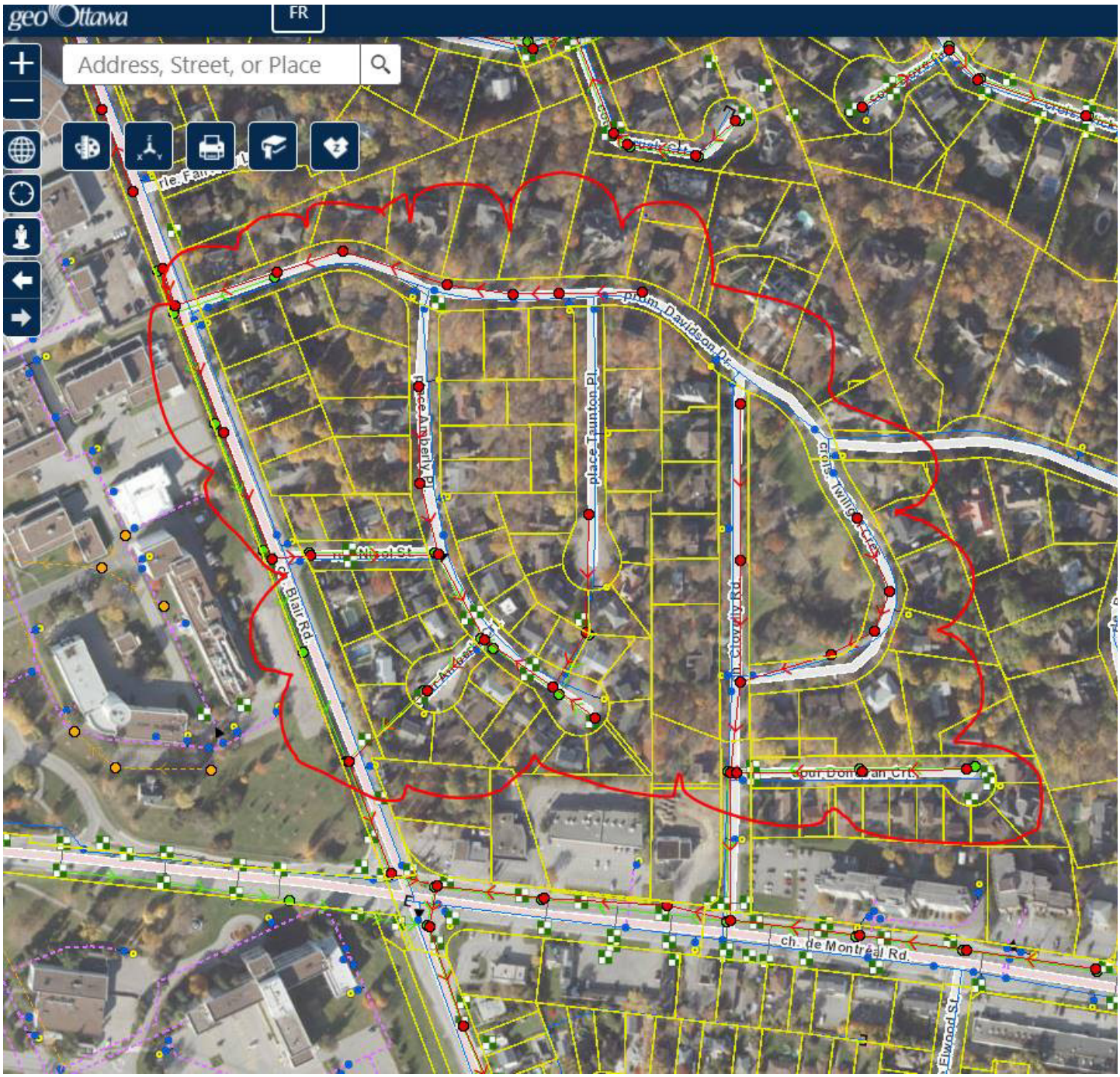
Jaymeson Adams

From: Christian Lavoie-Lebel
Sent: April 19, 2021 9:39 AM
To: Dominic Cleroux Cloutier
Cc: Roderick Lahey; Paul Black; Jaymeson Adams; martin Chénier
Subject: RE: 1649 Montreal Rd. and 741 Blair Rd. - Water Demands - Boundary Condition Request
Attachments: 1649 Montreal Rd & 741 Blair Rd April 2021.pdf

Good Morning,

We held a meeting this morning with the City of Ottawa modelling representative. The problem is caused by very high added flows associated to underground infiltration and surface storm water draining within the sanitary sewer due to multiple storm drainage existing problems.

The City as proposed a storm flow reduction alternative to compensate for the projects added sanitary flows. Replace existing Sanitary Manhole covers with solid sealed manhole covers (approx. 25 units) onto the illustrated area below sanitary networks. This alternative was agreed upon during the meeting and, unless advised otherwise, we will confirm that the client agrees to this within our Adequacy of Servicing report. This alternative will most likely cost around 12,000$.



Regards,

ÇA VA BIEN ALLER

Avis pour nos clients sur la COVID-19

CHRISTIAN LAVOIE-LEBEL, P.Eng, ing.
Partner / Senior Project Manager / Infrastructure

T 613-860-2462 ext. 6621 **M** 819-664-7920 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

420, boul. Maloney Est, bureau 201 Gatineau QC J8P 1E7 CANADA

From: Christian Lavoie-Lebel
Sent: April 14, 2021 11:32 AM
To: Dominic Cleroux Cloutier <dcloutier@bertone.ca>
Cc: Roderick Lahey <rlahey@rlaarchitecture.ca>; Paul Black <black@fotenn.com>; Jaymeson Adams <Jaymeson.Adams@cima.ca>
Subject: FW: 1649 Montreal Rd. and 741 Blair Rd. - Water Demands - Boundary Condition Request

Hi Dominic,

Just a heads-up that we received the following email from the City of Ottawa modelling team with regards to lack of existing sanitary sewer capacities for the connection sewer point of our project.

On the wastewater level, I wanted to bring to your attention that our Infrastructure team provided a response with respect to your email dated April 1, 2021 concerning the capacity of the City's system to accommodate the wastewater flow for the proposed development. Based on the modeling review, they have informed us that the existing system is flooding. Should you wish to discuss the existing flooding and capacity in further detail, please contact Eric Tousignant, Senior Engineer (Infrastructure) at eric.tousignant@ottawa.ca.

We will contact M. Tousignant ASAP and let you know what comes out of that conversation.

Regards,

ÇA VA BIEN ALLER

CHRISTIAN LAVOIE-LEBEL, P.Eng, ing.
Partner / Senior Project Manager / Infrastructure

T 613-860-2462 ext. 6621 **M** 819-664-7920 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA
420, boul. Maloney Est, bureau 201 Gatineau QC J8P 1E7 CANADA

From: Mashaie, Sara <sara.mashaie@ottawa.ca>
Sent: April 13, 2021 3:56 PM
To: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Cc: Tim Kennedy <Tim.Kennedy@cima.ca>; Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>; Murshid, Shoma <Shoma.Murshid@ottawa.ca>; Baird, Natasha <Natasha.Baird@ottawa.ca>
Subject: RE: 1649 Montreal Rd. and 741 Blair Rd. - Water Demands - Boundary Condition Request

EXTERNAL EMAIL

Hi Jaymeson,

Firstly, I wanted to inform you that the water boundary conditions were received this morning. For your reference, please see below and the attached.

On the wastewater level, I wanted to bring to your attention that our Infrastructure team provided a response with respect to your email dated April 1, 2021 concerning the capacity of the City's system to accommodate the wastewater flow for the proposed development. Based on the modeling review, they have informed us that the existing system is flooding. Should you wish to discuss the existing flooding and capacity in further detail, please contact Eric Tousignant, Senior Engineer (Infrastructure) at eric.tousignant@ottawa.ca.

The following are boundary conditions, HGL, for hydraulic analysis at 1649 Montreal Rd & 741 Blair Rd (zone MONT) assumed to be connected to the 305 mm on Blair Road (see attached PDF for location).

Minimum HGL = 146.5 m

Maximum HGL = 146.9 m

Max Day + Fire Flow (83.3 L/s) = 144.4 m

These are for current conditions and are based on computer model simulation.

Disclaimer: The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation.

Regards,

Sara Mashaie, P.Eng., ing.
Project Manager | Gestionnaire de Projet
Development Review, East Branch | Examen des projets d'aménagement, Secteur est
Planning, Infrastructure and Economic Development Department | Services de la planification, de l'infrastructure et du développement économique
City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West. Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1
613.580.2424 ext./poste 27885, sara.mashaie@ottawa.ca

From: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Sent: April 08, 2021 10:11 AM
To: Mashaie, Sara <sara.mashaie@ottawa.ca>
Cc: Tim Kennedy <tim.kennedy@cima.ca>; Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>
Subject: RE: 1649 Montreal Rd. and 741 Blair Rd. - Water Demands - Boundary Condition Request

Good morning Ms. Mashaie,

Thank you for confirming this. I appreciate the sense of urgency with this file.

Regards,

JAYMESON ADAMS, EIT
Engineering Trainee / Infrastructure
Ingénieur en formation / Infrastructures

T 613-860-2462 ext. 6659 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

From: Mashaie, Sara <sara.mashaie@ottawa.ca>
Sent: April 8, 2021 10:09 AM
To: Jaymeson Adams <Jaymeson.Adams@cima.ca>

Cc: Tim Kennedy <Tim.Kennedy@cima.ca>; Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>
Subject: RE: 1649 Montreal Rd. and 741 Blair Rd. - Water Demands - Boundary Condition Request

EXTERNAL EMAIL

Hi Jaymeson,

Please note that the team will do their best to deliver, and I will provide the results to your attention as soon as received.

Regards,

Sara Mashaie, P.Eng., ing.
Project Manager | Gestionnaire de Projet
Development Review, East Branch | Examen des projets d'aménagement, Secteur est
Planning, Infrastructure and Economic Development Department | Services de la planification, de l'infrastructure et du développement économique
City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West. Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1
613.580.2424 ext./poste 27885, sara.mashaie@ottawa.ca

From: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Sent: April 08, 2021 9:24 AM
To: Mashaie, Sara <sara.mashaie@ottawa.ca>
Cc: Tim Kennedy <tim.kennedy@cima.ca>; Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>
Subject: RE: 1649 Montreal Rd. and 741 Blair Rd. - Water Demands - Boundary Condition Request

I am just following up on the boundary conditions request below. I was wondering if we can still expect the results within the maximum 2 week timeframe.

Thanks,

JAYMESON ADAMS, EIT
Engineering Trainee / Infrastructure
Ingénieur en formation / Infrastructures

T 613-860-2462 ext. 6659 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

From: Mashaie, Sara <sara.mashaie@ottawa.ca>
Sent: April 1, 2021 9:19 AM
To: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Cc: Tim Kennedy <Tim.Kennedy@cima.ca>; Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>
Subject: RE: 1649 Montreal Rd. and 741 Blair Rd. - Water Demands - Boundary Condition Request

EXTERNAL EMAIL

Hi Jaymeson,

Thank you - I have forwarded the request to our water modelling team. Please allow up to 2 weeks for a response.

Regards,

Sara Mashaie, P.Eng., ing.
Project Manager | Gestionnaire de Projet
Development Review, East Branch | Examen des projets d'aménagement, Secteur est
Planning, Infrastructure and Economic Development Department | Services de la planification, de l'infrastructure et du développement économique
City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West. Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1
613.580.2424 ext./poste 27885, sara.mashaie@ottawa.ca

From: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Sent: March 31, 2021 5:36 PM
To: Mashaie, Sara <sara.mashaie@ottawa.ca>
Cc: Tim Kennedy <tim.kennedy@cima.ca>; Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>
Subject: RE: 1649 Montreal Rd. and 741 Blair Rd. - Water Demands - Boundary Condition Request

In addition, can you please confirm receipt of this request for boundary conditions?

The project schedule is very tight so any help in expediting the process would be greatly appreciated.

Thank you,

JAYMESON ADAMS, EIT
Engineering Trainee / Infrastructure
Ingénieur en formation / Infrastructures

T 613-860-2462 ext. 6659 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

From: Jaymeson Adams
Sent: March 31, 2021 5:29 PM
To: sara.mashaie@ottawa.ca
Cc: Tim Kennedy <Tim.Kennedy@cima.ca>; Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>
Subject: 1649 Montreal Rd. and 741 Blair Rd. - Water Demands - Boundary Condition Request

Hello Ms. Mashaie,

My name is Jaymeson Adams and I am the Design EIT working on this project.

We would like to kindly request boundary conditions for the proposed development at **1649 Montreal Road and 741 Blair Road**. Please find the proposed development information below and detailed calculations and associated figures attached including (1) Water Demand Calculations, (2) Fire Flow Calculations, (3) Figure 1 – Proposed Water Service Connection Locations, (4) Figure 2 – Exposure Separation Distances, (5) Figure 3 – Fire Hydrant Coverage, and (6) Architectural Concept Plans (for reference):

1. **Type of Development and Units:** The proposed development involves the construction of one (1) 26-storey mixed use building (residential and ground floor commercial space). There is a total of **243 residential units**. An underground 3-level parking garage extending the majority of the footprint of the site is also proposed (approximate garage footprint is shown on the attached Sketches).

2. **Site Address:** 1649 Montreal Road and 741 Blair Road
3. **Location of Services:** Please see attached Figure 1:
    a. Montreal Road – 305 mm diameter DI watermain.
    b. Blair Road – 305 mm diameter DI watermain.
4. **Average Daily Demand:** 1.87 L/s
5. **Maximum Daily Demand:** 5.56 L/s
6. **Peak Hour Demand:** 8.35 L/s
7. **Required Fire Flow (RFF):** 5,000 L/min

If you have any questions or concerns, please do not hesitate to contact me.

Best regards,

JAYMESON ADAMS, EIT
Engineering Trainee / Infrastructure
Ingénieur en formation / Infrastructures

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110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

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Appendix A

SWM CRITERIA CONFIRMATION

Jaymeson Adams

From: Jaymeson Adams
Sent: April 21, 2021 11:16 AM
To: Mashaie, Sara
Cc: Christian Lavoie-Lebel
Subject: RE: 1649 Montreal Rd. and 741 Blair Rd. - Stormwater Management Criteria Confirmation

Thank you Ms. Mashaie.

I will confirm Point #3 with Mr. Tousignant.

Regards,

JAYMESON ADAMS, EIT
Engineering Trainee / Infrastructure
Ingénieur en formation / Infrastructures

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110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

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From: Mashaie, Sara <sara.mashaie@ottawa.ca>
Sent: April 21, 2021 10:51 AM
To: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Subject: RE: 1649 Montreal Rd. and 741 Blair Rd. - Stormwater Management Criteria Confirmation

EXTERNAL EMAIL

Hi Jaymeson,

Concerning points #1 and 2 below – confirmed.

Concerning point #3, please check in with Eric Tousignant.

Regards,

Sara Mashaie, P.Eng., ing.
Project Manager | Gestionnaire de Projet
Development Review, East Branch | Examen des projets d'aménagement, Secteur est
Planning, Infrastructure and Economic Development Department | Services de la planification, de l'infrastructure et du développement économique
City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West. Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1
613.580.2424 ext./poste 27885, sara.mashaie@ottawa.ca

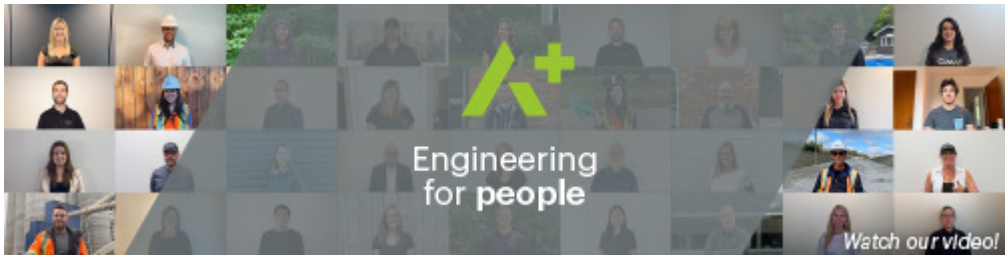
From: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Sent: April 20, 2021 4:12 PM
To: Mashaie, Sara <sara.mashaie@ottawa.ca>
Cc: Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>; Tim Kennedy <tim.kennedy@cima.ca>
Subject: RE: 1649 Montreal Rd. and 741 Blair Rd. - Stormwater Management Criteria Confirmation

shaie,

Just following up on my email below. Are you able to confirm these items?

Thanks,

JAYMESON ADAMS, EIT
Engineering Trainee / Infrastructure
Ingénieur en formation / Infrastructures



T 613-860-2462 ext. 6659 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

From: Jaymeson Adams
Sent: April 14, 2021 8:05 AM
To: Mashaie, Sara <sara.mashaie@ottawa.ca>
Cc: Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>; Tim Kennedy <Tim.Kennedy@cima.ca>
Subject: 1649 Montreal Rd. and 741 Blair Rd. - Stormwater Management Criteria Confirmation

Good morning Ms. Mashaie,

Regarding the servicing memo from the City, dated 10 February 2021, I wanted to touch base and confirm the stormwater management criteria we are using for this site:

1. Per item 7.ii, "For separated sewer system built pre-1970 the design of the storm sewers are based on a 2 year storm." As the as-builts received by the ISD Information Centre are dated in March 1986, we are basing our design on the 5 year storm. Please confirm that you agree with this rationale.
2. Per item 7.v, "Flows to the storm sewer in excess of the 5-year storm release rate, up to and including the 100-year storm event, must be detained on site." We are using this criterion to evaluate storage requirements on the site. Please confirm that this is still correct.
3. Can you please confirm whether there are any surcharge issues in the storm system in the vicinity of our site that could affect our release rate/storage requirements?

We are also in coordination with the RVCA to determine if they have any site-specific criteria.

Thanks,

JAYMESON ADAMS, EIT
Engineering Trainee / Infrastructure
Ingénieur en formation / Infrastructures

T 613-860-2462 ext. 6659 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

and delete it in its entirety.
AVERTISSEMENT CONCERNANT LA CONFIDENTIALITÉ Ce message est confidentiel. S'il ne vous est pas destiné, veuillez en informer l'émetteur immédiatement et le détruire intégralement.

'

'

Appendix A

STORM SURCHAGE SOLUTION CONFIRMATION

Jaymeson Adams

From: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Sent: April 27, 2021 9:30 AM
To: Jaymeson Adams
Cc: Christian Lavoie-Lebel; Tim Kennedy; Mashaie, Sara
Subject: RE: A001101: Blair/Mtl Road - Storm Surcharge Issues Confirmation

EXTERNAL EMAIL

Good Morning Jaymeson

Yes, you can absolutely use that approach.

Eric

Eric Tousignant, P.Eng.
Senior Water Resources Engineer
Infrastructure Services
613-580-2424 ext 25129

From: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Sent: April 27, 2021 9:12 AM
To: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Cc: Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>; Tim Kennedy <tim.kennedy@cima.ca>; Mashaie, Sara <sara.mashaie@ottawa.ca>
Subject: RE: A001101: Blair/Mtl Road - Storm Surcharge Issues Confirmation

Hello Mr. Tousignant,

Thank you for providing the HGL info for the storm.

Because of the fact that the 100 year HGL is at the street level (surcharge condition), we are proposing to use a pump at the exit of the proposed underground tank that will pump stormwater at the allowable release rate. As I understand it this allows us to avoid using the half release rate rule, which lowers the required on-site storage volume.

Please let me know if you are in agreement with this approach. Call me if you want to discuss further.

Thanks,

JAYMESON ADAMS, EIT
Engineering Trainee / Infrastructure
Ingénieur en formation / Infrastructures

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110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

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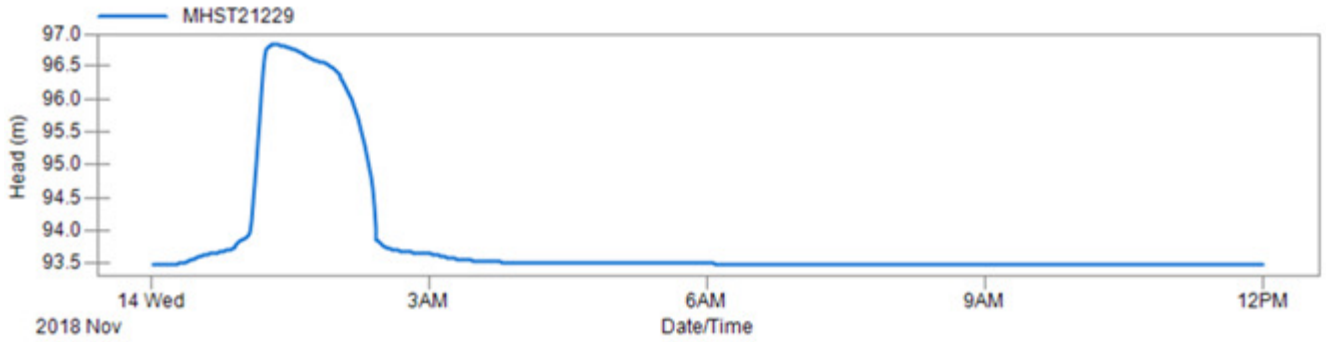
From: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Sent: April 21, 2021 2:50 PM
To: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Cc: Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>
Subject: RE: A001101: Blair/Mtl Road - Storm Surcharge Issues Confirmation

EXTERNAL EMAIL

Hi Jaymeson

This is an uncontrolled storm system (i.e. no inlet control devices) therefore the 100-year HGL can reach ground level. You will need to take this into consideration if you plan to use underground storage.

Below is the time series 100 year HGL at MH MHST21229



Data | Objectives | Error | Storage | Patterns | Edit | Derive | Audit | Events | Scatter | Duration | IDF

Objective functions for Head (m)

From 2018-Nov-13 11:25:03 PM to 2018-Nov-14 12:35:57 PM (13.18 hours)

	MHST21229
Maximum Head (m)	96.826
Minimum Head (m)	93.486
Mean Head (m)	93.823
Duration of Exceedances (h)	11.983
Duration of Deficits (h)	0
Number of Exceedances	1
Number of Deficits	0

Head (m) Exceedance: 0

Head (m) Deficit: 0

From: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Sent: April 21, 2021 11:19 AM
To: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Cc: Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>
Subject: RE: A001101: Blair/Mtl Road - Storm Surcharge Issues Confirmation

Hello Mr. Tousignant,

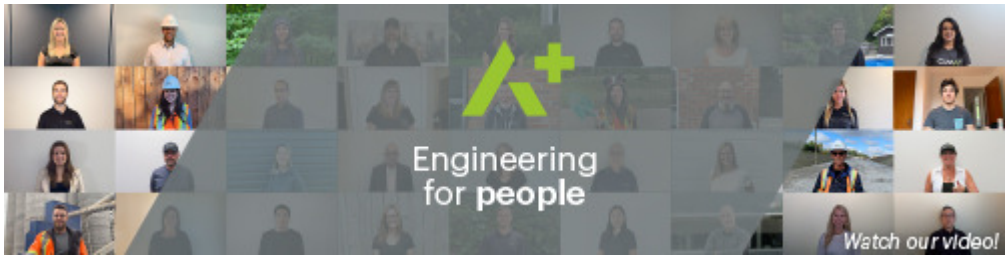
Thank you for meeting with us earlier in the week to discuss the sanitary issue.

I was hoping to have your response to another question pertaining to the storm system:

1. Can you please confirm whether there are any surcharge issues in the storm system in the vicinity of our site that could affect our release rate/storage requirements?

Thanks,

JAYMESON ADAMS, EIT
Engineering Trainee / Infrastructure
Ingénieur en formation / Infrastructures



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110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

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From: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Sent: April 15, 2021 2:08 PM
To: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Subject: RE: A001101: Blair/Mtl Road - Sanitary Flow Issues

COURRIEL EXTERNE

Thank you

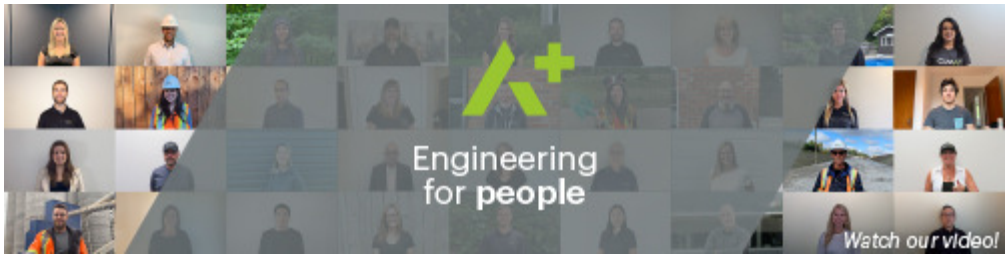
From: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Sent: April 15, 2021 2:08 PM
To: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Subject: RE: A001101: Blair/Mtl Road - Sanitary Flow Issues

Hi Mr. Tousignant,

I updated the meeting start time to 9:00 am.

Regards,

JAYMESON ADAMS, EIT
Engineering Trainee / Infrastructure
Ingénieur en formation / Infrastructures



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-----Original Appointment-----
From: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Sent: April 15, 2021 2:06 PM
To: Jaymeson Adams
Subject: Accepted: A001101: Blair/Mtl Road - Sanitary Flow Issues
When: April 19, 2021 8:30 AM-10:00 AM (UTC-05:00) Eastern Time (US & Canada).
Where: Microsoft Teams Meeting

EXTERNAL EMAIL

Hi Jaymeson

This meeting should not take much time. Can we move it to 9AM instead of 8:30. It can still finish at 10AM.

Thanks
Eric
'

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'

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Appendix A

PRE-CONSULTATION WITH MECP

Jaymeson Adams

From: Des Rochers, Christina (MECP) <Christina.Desrochers@ontario.ca>
Sent: March 26, 2021 9:56 AM
To: Jaymeson Adams; Tim Kennedy; Christian Lavoie-Lebel
Subject: RE: 1649 Montreal Rd. and 741 Blair Rd. - Servicing Capacity Assessment - MECP Pre-consult
Attachments: ODO - Pre-Submission Consultation Request Fill-in Form-May 2017 v4r.docx

EXTERNAL EMAIL

Good morning,

Based on the information provided in your email below, the project appears to meet the exemption requirements of O. Reg. 525.

Going forward, please use the attached form for all pre-submission requests.

Regards.

Christina Des Rochers
Water Inspector | Inspectrice de l'eau
Drinking Water and Environnemental Compliance Division | Division de la conformité en matière d'eau potable et d'environnement
Ministry of the Environment, Conservation and Parks | Ministère de l'Environnement, de la Protection de la nature et des Parcs
Tel. 613-914-4973
Fax. 613-521-5437
Spills Action Centre | Centre d'intervention en cas de déversement 1-800-268-6060
Please consider the environment before printing this email note

---

From: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Sent: March 25, 2021 2:17 PM
To: Eastern Ottawa (MECP) <Environment.Ottawa@ontario.ca>
Cc: Tim Kennedy <Tim.Kennedy@cima.ca>; Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>
Subject: 1649 Montreal Rd. and 741 Blair Rd. - Servicing Capacity Assessment - MECP Pre-consult

To whom it may concern,

We are currently performing an Adequacy of Public Services Report in support of a zoning by-law amendment (ZBLA) application for a proposed development located at 1649 Montreal Road and 741 Blair Road in Ottawa, Ontario (see attached key plan). The proposed development involves the construction of a 26-storey mixed use residential and commercial building. The subject site is located within the Cyrville Drain of the Ottawa River East subwatershed.

We have determined that the proposed development in question falls within the exemption requirements for an Environmental Compliance Approval (ECA) as per O.Reg. 525/98, section 3(a), and Ontario Water Resources Act section 53.6(c) when considering the following:

1. Currently comprised of two (2) parcels of land that are to be combined into one (1) parcel, the existing 0.49-ha site currently consists of a garage (vehicle repair shop and sales) which is zoned Arterial Mainstreet (AM10) and a single family home which is zoned Residential Third Density (R3K).
2. The proposed sewage works and stormwater management facility will service a single parcel of land.
3. The property does not discharge into a combined sewer and it will not be used for industrial purposes.

Would you be able to confirm our assumption that the proposed development is indeed exempt and no further pre-submission consultation is required.

Please feel free to contact me if you have any questions, need to discuss, or require further information.

Best regards,

JAYMESON ADAMS, EIT
Engineering Trainee / Infrastructure
Ingénieur en formation / Infrastructures

T 613-860-2462 ext. 6659 **F** 613-860-1870
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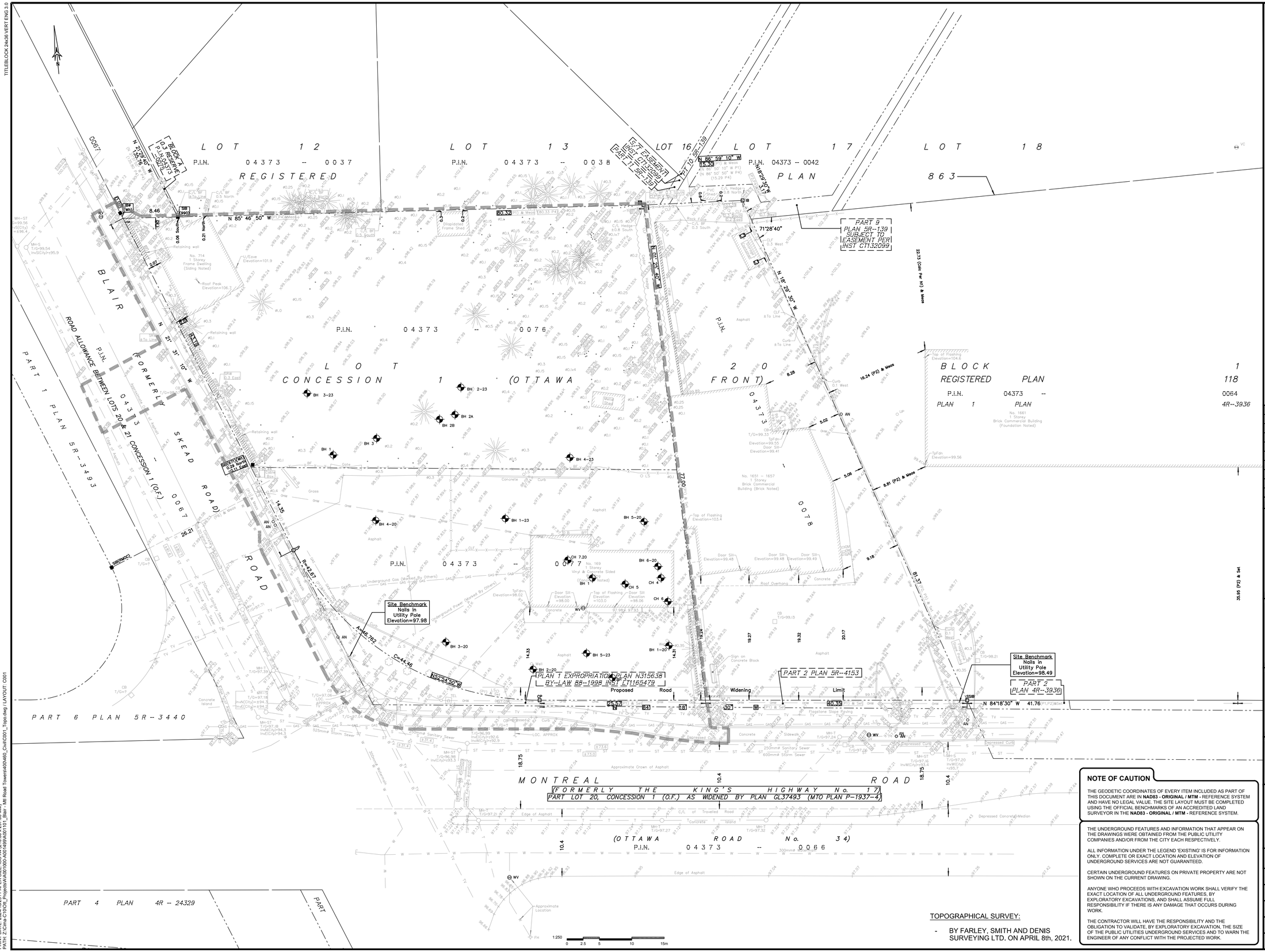
B

Appendix B
Existing Conditions Plan



TOPOGRAPHICAL SURVEY:

- BY FARLEY, SMITH AND DENIS SURVEYING LTD. ON APRIL 8th, 2021.

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THE UNDERGROUND FEATURES AND INFORMATION THAT APPEAR ON THE DRAWINGS WERE OBTAINED FROM THE PUBLIC UTILITY COMPANIES AND/OR FROM THE CITY EACH RESPECTIVELY.

ALL INFORMATION UNDER THE LEGEND 'EXISTING' IS FOR INFORMATION ONLY. COMPLETE OR EXACT LOCATION AND ELEVATION OF UNDERGROUND SERVICES ARE NOT GUARANTEED.

CERTAIN UNDERGROUND FEATURES ON PRIVATE PROPERTY ARE NOT SHOWN ON THE CURRENT DRAWING.

ANYONE WHO PROCEEDS WITH EXCAVATION WORK SHALL VERIFY THE EXACT LOCATION OF ALL UNDERGROUND FEATURES, BY EXPLORATORY EXCAVATIONS, AND SHALL ASSUME FULL RESPONSIBILITY IF THERE IS ANY DAMAGE THAT OCCURS DURING WORK.

THE CONTRACTOR WILL HAVE THE RESPONSIBILITY AND THE OBLIGATION TO VALIDATE, BY EXPLORATORY EXCAVATION, THE SIZE OF THE PUBLIC UTILITIES UNDERGROUND SERVICES AND TO WARN THE ENGINEER OF ANY CONFLICT WITH THE PROJECTED WORK.

EXISTING		PROPOSED
	Survey Monument Planted	
	Survey Monument Found	
SIB	Standard Iron Bar	
SSIB	Short Standard Iron Bar	
IB	Iron Bar	
IBB	Round Iron Bar	
CP	Concrete Pin	
(Wit)	Witness	
Meas	Measured	
(P1)	Plan 5R-4153	
(P2)	Plan by (1287) dated May 26, 1986 (Job No. 236/86)	
(P3)	Plan 5R-2278	
(P4)	Registered Plan 863	
(P5)	Plan 4R-3936	
(P6)	Plan 5R-3440	
(N1)	Notes by (1287) dated August 6, 1986	
(D1)	Inst GL65177	
(D2)	Inst GL63040	
MH-ST	Maintenance Hole (Storm)	
MH-S	Maintenance Hole (Sanitary)	
MH-T	Maintenance Hole (Traffic)	
VC	Valve Chamber (Watermain)	
ST	Underground Storm Sewer	
S	Underground Sanitary Sewer	
W	Underground Water	
P	Underground Power	
GAS	Underground Gas	
B	Underground Bell	
TV	Underground Cable	
OHW	Overhead Wires	
UP	Utility Pole	
AN	Anchor	
LS	Light Standard	
CB	Catch Basin	
FH	Fire Hydrant	
WV	Water Valve	
GV	Gas Valve	
GM	Gas Meter	
TB-B	Bell Terminal Box	
TSP	Traffic Signal Post	
TSL	Traffic Light	
B	Bollard	
S	Sign	
	Gate	
TEL	Telephone Booth	
ø	Diameter	
CLF	Chain Link Fence	
BF	Board Fence	
MF	Metal Fence	
CRW	Concrete Retaining Wall	
SRW	Stone Retaining Wall	
Inv.	Invert	
T/G	Top of Grate	
U/Eave	Underside of Eave	
TpFdn	Top of Foundation	
C/L	Centreline	
+65.00	Location of Elevations	
+65.00	Top of Concrete Curb/Retaining Wall Elevation	
	Property Line	
	Easement	
	Shrub	
	Deciduous Tree	
	Coniferous Tree	
MW17-1	Work Limit	
	Borehole (Loc. Approx.)	

No.	Date	Description	By
5	2024/10/25	ISSUED FOR SITE PLAN CONTROL REV. 4	É.P
4	2023/08/25	ISSUED FOR SITE PLAN CONTROL REV. 3	É.P
3	2023/07/28	ISSUED FOR SITE PLAN CONTROL REV. 2	É.P
2	2023/03/17	ISSUED FOR SITE PLAN CONTROL REV. 1	É.P
1	2022/08/12	ISSUED FOR SITE PLAN CONTROL	É.P

STAMPS:

DESIGNED BY APPROVED BY

ENGINEER:

CLIENT:

PROJECT NAME:

1649 MONTREAL ROAD
MONTREAL AND BLAIR

SHEET TITLE:

TOPOGRAPHICAL PLAN

DISCIPLINE:

CIVIL

DRAFTER: D.VAGHELA	SCALE: 1:250
DESIGNER: É. POTVIN	DATE: 22/08/31
APPROVER: C.L. LEBEL	CITY APPLICATION No: D07-12-22-0132
PROJECT No: A001101	DRAWING No: C001
SHEET No: 1 of 15	

D07-12-22-0132

#18876

C

Appendix C
Detailed Design Civil Plans

D

Appendix D
Water Supply Design Calculations

PROJECT NAME:	1649 Montreal Road & 741 Blair Road Multi-use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001101
CLIENT:	10869279 Canada Inc.
PROJECT STATUS:	Site Servicing and Stormwater Management Report

WATER CONSUMPTION CALCULATIONS

APPLICABLE DESIGN GUIDELINES:

1. Ottawa Design Guidelines - Water Distribution (2010)
2. City of Ottawa Technical Bulletin ISTB-2021-03, ISTB-2018-02, ISDTB-2014-02 and ISD-2010-02
3. MOE Design Guidelines for Drinking-Water Systems

RESIDENTIAL AND COMMERCIAL WATER DEMANDS:

RESIDENTIAL DESIGN CRITERIA:

Residential Average Day Demand:	280	L/c/day
Maximum Day Peaking Factor:	3.1	x Average Daily Demand
Maximum (Peak Hour) Peaking Factor:	4.6	x Average Daily Demand

EQUIVALENT POPULATION :

Unit Type	Number of Units	Persons Per Unit	Population
Studio Unit	1	1.4	1
1-Bedroom Apartments	48	1.4	67
1-Bedroom + Den Apartments	101	1.4	141
2-Bedroom Apartments	43	2.1	90
2-Bedroom + Den Apartments	59	2.1	124
Total	**252**		**423**

Per Unit Populations:

Table 4.1 Per Unit Populations

Unit Type	Persons Per Unit
Single Family	3.4
Semi-detached	2.7
Duplex	2.3
Townhouse (row)	2.7
Apartments:	
Bachelor	1.4
1 Bedroom	1.4
2 Bedroom	2.1
3 Bedroom	3.1
Average Apt.	1.8

COMMERCIAL DESIGN CRITERIA:

Contributing Commercial Area:	0.069	gross ha (including commercial areas and amenity space)
Commercial Average Day Demand:	28 000	L/gross ha/d
Maximum Day Peaking Factor:	1.5	x Average Daily Demand
Maximum (Peak Hour) Peaking Factor:	1.8	x Maximum Daily Demand

WATER DEMANDS:

Demand Type	Average Daily Demand (L/s)	Maximum Daily Demand (L/s)	Maximum (Peak) Hour Demand (L/s)
Residential	1.37	4.25	6.31
Commercial	0.02	0.03	0.06
Total	**1.39**	**4.28**	**6.37**

NOTES:

1. Maximum Day and Maximum Hour residential peaking factors determined using Table 3-3 of the MOE Design Guidelines for Drinking-Water System for 0 to 500 persons.
2. Given basic day demand greater than 50 m³/day (0.57 L/s), two connections, separated by an isolation valve required.

Prepared by: Martin Fréchette, EIT Date: 2024-10-24

Verified by: Éric Potvin, P.Eng. PEO# 100208490 Date: 2024-10-24

PROJECT NAME:	1649 Montreal Road & 741 Blair Road Multi-use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001101
CLIENT:	10869279 Canada Inc.
PROJECT STATUS:	Site Servicing and Stormwater Management Report

FIRE FLOW ASSESSMENT

APPLICABLE DESIGN GUIDELINES:

1. Fire Underwriters Survey (FUS) Water Supply for Public Fire Protection, 2020
2. Ottawa Design Guidelines - Water Distribution (2010) including Appendix H per ISTB-2018-02
3. City of Ottawa Technical Bulletin ISTB-2021-03, ISTB-2018-02
4. MOE Design Guidelines for Drinking-Water Systems

STEP A - DETERMINE THE TYPE OF CONSTRUCTION

Type of Construction	Coefficient (C)	Value Selected (C)
Fire-resistive Construction (> 3 hours)	**0.6**	**0.6**
Non-combustible Construction	0.8	
Ordinary Construction	1.0	
Wood Frame Construction	1.5	

STEP B - DETERMINE THE FLOOR AREA

Floor/Level	Floor Area Per Level (Residential + commom areas) (sq. ft.)	Floor Area Per Level (Residential + commom areas) (m^2)	Fire Resistive Building	Protected Openings (one hour rating)	Area of Structure Considered (m^2)
Gross Floor Area (GFA) Ground Level:	19 041	1 769			1 769
GFA Level 2:	13 133	1 220			305
GFA Level 3:	13 133	1 220			305
GFA Level 4:	13 133	1 220			-
GFA Level 5:	8 541	793			-
GFA Level 6:	8 541	793			-
GFA Level 7:	8 541	793			-
GFA Level 8:	8 541	793			-
GFA Level 9:	8 541	793			-
GFA Level 10:	8 541	793			-
GFA Level 11:	8 541	793			-
GFA Level 12:	8 541	793			-
GFA Level 13:	8 541	793			-
GFA Level 14:	8 541	793	YES	YES	-
GFA Level 15:	8 541	793			-
GFA Level 16:	8 541	793			-
GFA Level 17:	8 541	793			-
GFA Level 18:	8 541	793			-
GFA Level 19:	8 541	793			-
GFA Level 20:	8 541	793			-
GFA Level 21:	8 541	793			-
GFA Level 22:	8 541	793			-
GFA Level 23:	7 423	690			-
GFA Level 24:	7 423	690			-
GFA Level 25:	7 423	690			-
GFA Level 26:	7 423	690			
GFA MP House:	3 995	371			-
TOTAL FLOOR AREA (A):	**245 865**	**22 842**			**2 379**

PROJECT NAME:	1649 Montreal Road & 741 Blair Road Multi-use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001101
CLIENT:	10869279 Canada Inc.
PROJECT STATUS:	Site Servicing and Stormwater Management Report

FIRE FLOW ASSESSMENT

STEP C - DETERMINE THE HEIGHT IN STOREYS

Floor/Level	Number of Storeys	Percent of Floor Area Considered
Ground Level:	1	100%
Level 2:	1	25%
Level 3:	1	25%
Level 4:	1	-
Level 5:	1	-
Level 6:	1	-
Level 7:	1	-
Level 8:	1	-
Level 9:	1	-
Level 10:	1	-
Level 11:	1	-
Level 12:	1	-
Level 13:	1	-
Level 14:	1	-
Level 15:	1	-
Level 16:	1	-
Level 17:	1	-
Level 18:	1	-
Level 19:	1	-
Level 20:	1	-
Level 21:	1	-
Level 22:	1	-
Level 23:	1	-
Level 24:	1	-
Level 25:	1	-
Level 26:	1	-
MP House:	1	-
HEIGHT IN STOREYS:	**27**	

STEP D - DETERMINE BASE FIRE FLOW (ROUND TO NEAREST 1,000 L/min)

$$F = 220C\sqrt{A}$$

Where:

F is the required fire flow in L/min

C is the coefficient related to the type of construction, and;

A is the total floor area of the building in m^2

Coefficient Related to Type of Construction (C) = **0.6**

Floor Area Considered (A) = **2 379 m^2**

REQUIRED (BASE) FIRE FLOW (F) =	**6000**	**L/min** (Rounded to Nearest 1,000 L/min)

STEP E - DETERMINE THE INCREASE OR DECREASE FOR OCCUPANCY AND APPLY TO STEP D (STEP D x STEP E, DO NOT ROUND)

Occupancy Class	Occupancy Factor	Value Selected (C)
Non-combustible	0.75	
Limited combustible	0.85	
Combustible	**1.00**	**1.00**
Free burning	1.15	
Rapid burning	1.25	

REQUIRED (BASE) FIRE FLOW (F) =	**6000**	**L/min** (Not rounded)

PROJECT NAME:	1649 Montreal Road & 741 Blair Road Multi-use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001101
CLIENT:	10869279 Canada Inc.
PROJECT STATUS:	Site Servicing and Stormwater Management Report

FIRE FLOW ASSESSMENT

STEP F - DETERMINE THE DECREASE, IF ANY, FOR AUTOMATIC SPRINKLER PROTECTION AND APPLY TO VALUE IN STEP D ABOVE (DO NOT ROUND)

Sprinkler System Design	Sprinkler Design Charge	Value Selected (C)	Total Charge
Automatic sprinkler system conforming to NFPA standards	-30%	Yes	-30%
Standard water supply	-10%	Yes	-10%
Fully supervised system	-10%	No	0%
TOTAL CHARGE FOR SPRINKLER SYSTEM			**-40%**

DECREASE FOR SPRINKLER PROTECTION =	**-2400**	**L/min** (Not rounded)

STEP G - DETERMINE THE TOTAL INCREASE FOR EXPOSURES AND APPLY TO VALUE IN STEP D ABOVE (DO NOT ROUND)

Façade	Separation Distance (m)	Length-height Factor of Exposed Wall (m-storeys)	Assumed Construction of Exposed Wall of Adjacent Structure	Total Charge
North Façade	>30	-	Wood Frame	0%
East Façade	2.0	30	Fire Resistive or Ordinary with Unprotected Openings	16%
South Façade	>30	-	Fire Resistive or Ordinary with Unprotected Openings	0%
West Façade	>30	-	Wood Frame	0%
TOTAL CHARGE FOR EXPOSURES				**16%**

INCREASE FOR EXPOSURES =	**960**	**L/min** (Not rounded)

STEP H - DETERMINE FIRE FLOW INCLUDING ALL INCREASES AND REDUCTIONS ((STEP E + STEP F + STEP G, ROUND TO NEAREST 1,000 L/min)

TOTAL REQUIRED FIRE FLOW (RFF) =	**5000**	**L/min** (Rounded to Nearest 1,000 L/min)
	83.33	**L/s**
	1321	**USGPM**

PROJECT NAME:	1649 Montreal Road & 741 Blair Road Multi-use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001101
CLIENT:	10869279 Canada Inc.
PROJECT STATUS:	Site Servicing and Stormwater Management Report

FIRE FLOW ASSESSMENT

NOTES/COMMENTS:

STEP A - DETERMINE THE TYPE OF CONSTRUCTION

1. No notes or comments

STEP B - DETERMINE THE FLOOR AREA

1. Assumed vertical openings and exterior vertical communications are properly protected (one hour rating), thus only the area of the largest floor plus 25% of each of the two immediately adjoining floors accounted for per Fire Underwriters Survey (FUS) Water Supply for Public Fire Protection, 1999

STEP C - DETERMINE THE HEIGHT IN STOREYS

1. Three levels of underground parking not considered as they are at least 50% below grade (note F of Fire Underwriters Survey (FUS) Water Supply for Public Fire Protection, 1999)

STEP D - DETERMINE BASE FIRE FLOW (ROUND TO NEAREST 1,000 L/min)

1. No notes or comments.

STEP E - DETERMINE THE INCREASE OR DECREASE FOR OCCUPANCY AND APPLY TO STEP D (STEP D x STEP E, DO NOT ROUND)

1. Occupancy selected assuming commercial establishment will fall under C-3 occupancy type.

STEP F - DETERMINE THE DECREASE, IF ANY, FOR AUTOMATIC SPRINKLER PROTECTION AND APPLY TO VALUE IN STEP D ABOVE (DO NOT ROUND)

1. Assumes sprinkler system will not be fully supervised.

STEP G - DETERMINE THE TOTAL INCREASE FOR EXPOSURES AND APPLY TO VALUE IN STEP D ABOVE (DO NOT ROUND)

1. No notes or comments.

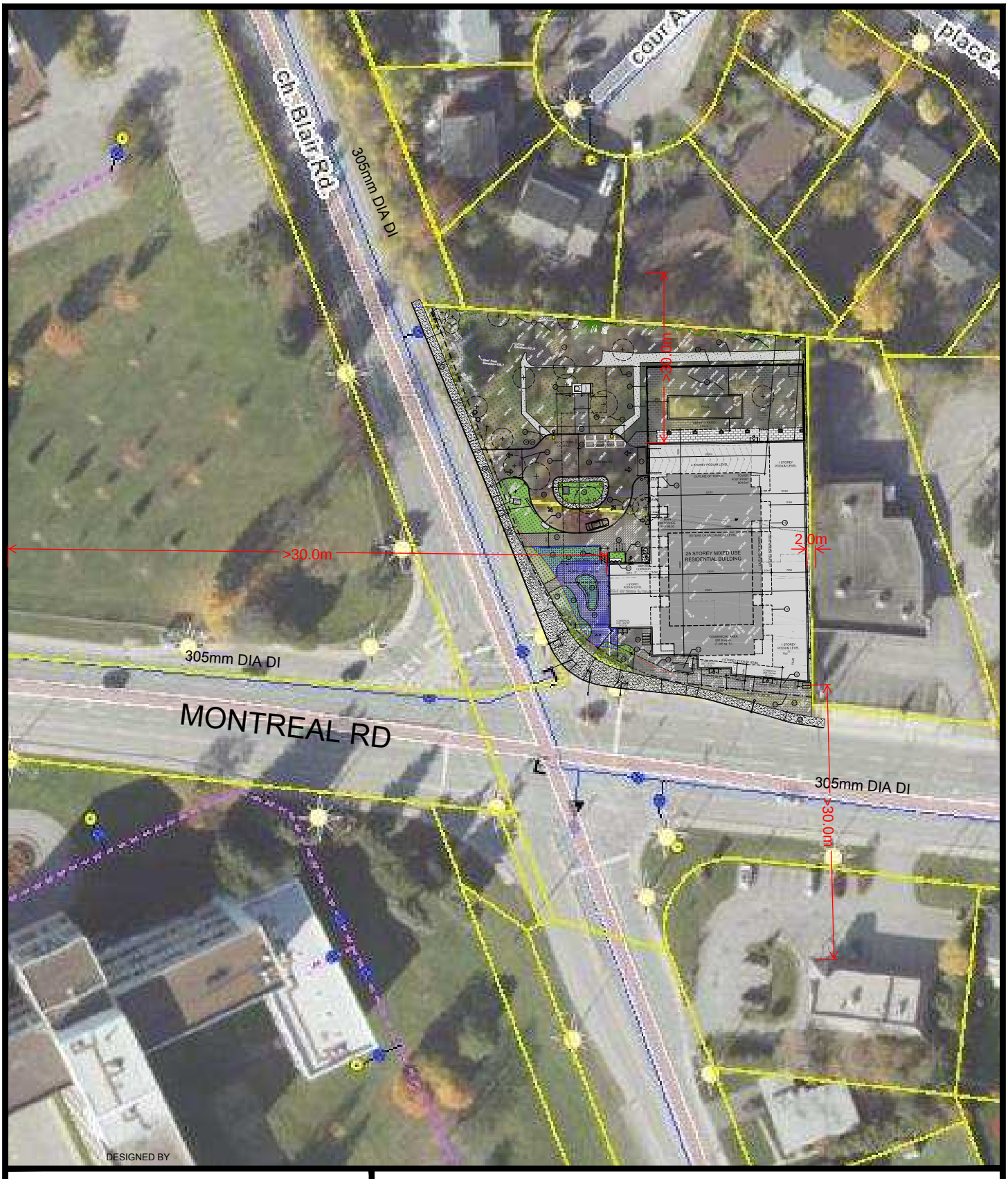
STEP H - DETERMINE FIRE FLOW INCLUDING ALL INCREASES AND REDUCTIONS ((STEP E + STEP F + STEP G, ROUND TO NEAREST 1,000 L/min)

1. No notes or comments.

Prepared by: Martin Fréchette, EIT Date: 2024-10-24

Verified by: Éric Potvin, P.Eng., PEO# 100208490 Date: 2024-10-24

TITLEBLOCK 8.5x11 PO ENG 3.0



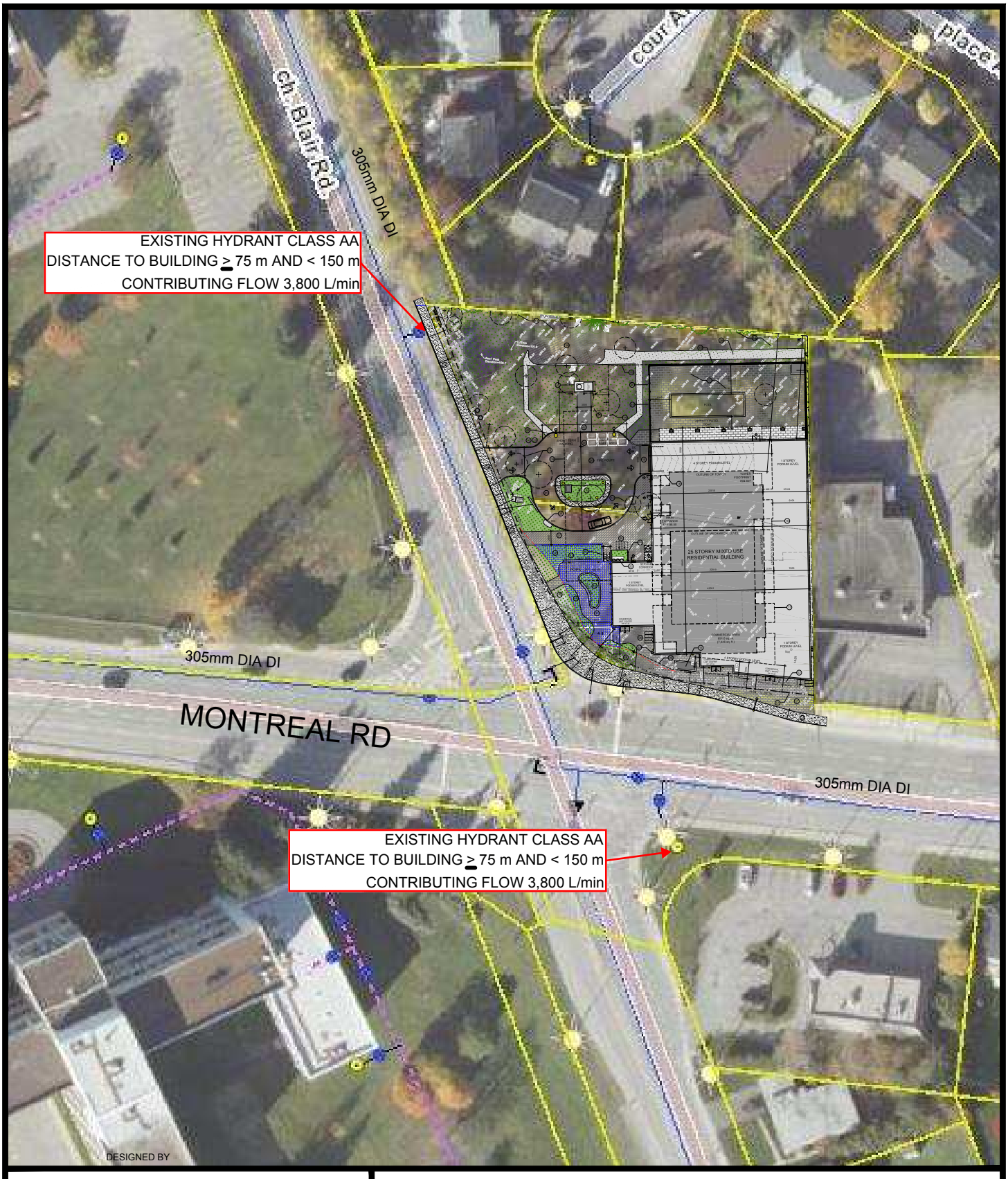
CIMA+

T: 613-580-2482
119-240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

EXPOSURE SEPARATIONS DISTANCES

DRAWN BY:	DESIGNED BY:	APPROVED BY:	SCALE:	DATE:	PROJECT No:	SHEET No:	FIGURE No:
	M.Fréchette	É.Potvin	NTS	2024-10-24	A001101	1 of 2	01

TITLEBLOCK 8.5x11 PO ENG 3.0



T: 613-580-2482
119-240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

FIRE HYDRANT COVERAGE

DRAWN BY:	DESIGNED BY:	APPROVED BY:	SCALE:	DATE:	PROJECT No:	SHEET No:	FIGURE No:
	M.Fréchette	É.Potvin	NTS	2024-10-24	A001101	2 of 2	02

Jaymeson Adams

From: Mashaie, Sara <sara.mashaie@ottawa.ca>
Sent: April 13, 2021 3:56 PM
To: Jaymeson Adams
Cc: Tim Kennedy; Christian Lavoie-Lebel; Murshid, Shoma; Baird, Natasha
Subject: RE: 1649 Montreal Rd. and 741 Blair Rd. - Water Demands - Boundary Condition Request
Attachments: 1649 Montreal Rd & 741 Blair Rd April 2021.pdf

EXTERNAL EMAIL

Hi Jaymeson,

Firstly, I wanted to inform you that the water boundary conditions were received this morning. For your reference, please see below and the attached.

On the wastewater level, I wanted to bring to your attention that our Infrastructure team provided a response with respect to your email dated April 1, 2021 concerning the capacity of the City's system to accommodate the wastewater flow for the proposed development. Based on the modeling review, they have informed us that the existing system is flooding. Should you wish to discuss the existing flooding and capacity in further detail, please contact Eric Tousignant, Senior Engineer (Infrastructure) at eric.tousignant@ottawa.ca.

The following are boundary conditions, HGL, for hydraulic analysis at 1649 Montreal Rd & 741 Blair Rd (zone MONT) assumed to be connected to the 305 mm on Blair Road (see attached PDF for location).

Minimum HGL = 146.5 m

Maximum HGL = 146.9 m

Max Day + Fire Flow (83.3 L/s) = 144.4 m

These are for current conditions and are based on computer model simulation.

Disclaimer: The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation.

Regards,

Sara Mashaie, P.Eng., ing.
Project Manager | Gestionnaire de Projet

Development Review, East Branch | Examen des projets d'aménagement, Secteur est
Planning, Infrastructure and Economic Development Department | Services de la planification, de l'infrastructure et du développement économique
City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West. Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1
613.580.2424 ext./poste 27885, sara.mashaie@ottawa.ca

From: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Sent: April 08, 2021 10:11 AM
To: Mashaie, Sara <sara.mashaie@ottawa.ca>
Cc: Tim Kennedy <tim.kennedy@cima.ca>; Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>
Subject: RE: 1649 Montreal Rd. and 741 Blair Rd. - Water Demands - Boundary Condition Request

Good morning Ms. Mashaie,

Thank you for confirming this. I appreciate the sense of urgency with this file.

Regards,

JAYMESON ADAMS, EIT
Engineering Trainee / Infrastructure
Ingénieur en formation / Infrastructures

T 613-860-2462 ext. 6659 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

From: Mashaie, Sara <sara.mashaie@ottawa.ca>
Sent: April 8, 2021 10:09 AM
To: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Cc: Tim Kennedy <Tim.Kennedy@cima.ca>; Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>
Subject: RE: 1649 Montreal Rd. and 741 Blair Rd. - Water Demands - Boundary Condition Request

EXTERNAL EMAIL

Hi Jaymeson,

Please note that the team will do their best to deliver, and I will provide the results to your attention as soon as received.

Regards,

Sara Mashaie, P.Eng., ing.
Project Manager | Gestionnaire de Projet
Development Review, East Branch | Examen des projets d'aménagement, Secteur est
Planning, Infrastructure and Economic Development Department | Services de la planification, de l'infrastructure et du développement économique
City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West. Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1
613.580.2424 ext./poste 27885, sara.mashaie@ottawa.ca

From: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Sent: April 08, 2021 9:24 AM
To: Mashaie, Sara <sara.mashaie@ottawa.ca>
Cc: Tim Kennedy <tim.kennedy@cima.ca>; Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>
Subject: RE: 1649 Montreal Rd. and 741 Blair Rd. - Water Demands - Boundary Condition Request

I am just following up on the boundary conditions request below. I was wondering if we can still expect the results within the maximum 2 week timeframe.

Thanks,

JAYMESON ADAMS, EIT
Engineering Trainee / Infrastructure
Ingénieur en formation / Infrastructures

T 613-860-2462 ext. 6659 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

From: Mashaie, Sara <sara.mashaie@ottawa.ca>
Sent: April 1, 2021 9:19 AM
To: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Cc: Tim Kennedy <Tim.Kennedy@cima.ca>; Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>
Subject: RE: 1649 Montreal Rd. and 741 Blair Rd. - Water Demands - Boundary Condition Request

EXTERNAL EMAIL

Hi Jaymeson,

Thank you - I have forwarded the request to our water modelling team. Please allow up to 2 weeks for a response.

Regards,

Sara Mashaie, P.Eng., ing.
Project Manager | Gestionnaire de Projet
Development Review, East Branch | Examen des projets d'aménagement, Secteur est
Planning, Infrastructure and Economic Development Department | Services de la planification, de l'infrastructure et du développement économique
City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West. Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1
613.580.2424 ext./poste 27885, sara.mashaie@ottawa.ca

From: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Sent: March 31, 2021 5:36 PM
To: Mashaie, Sara <sara.mashaie@ottawa.ca>
Cc: Tim Kennedy <tim.kennedy@cima.ca>; Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>
Subject: RE: 1649 Montreal Rd. and 741 Blair Rd. - Water Demands - Boundary Condition Request

In addition, can you please confirm receipt of this request for boundary conditions?

The project schedule is very tight so any help in expediting the process would be greatly appreciated.

Thank you,

JAYMESON ADAMS, EIT
Engineering Trainee / Infrastructure
Ingénieur en formation / Infrastructures

T 613-860-2462 ext. 6659 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

From: Jaymeson Adams
Sent: March 31, 2021 5:29 PM
To: sara.mashaie@ottawa.ca
Cc: Tim Kennedy <Tim.Kennedy@cima.ca>; Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>
Subject: 1649 Montreal Rd. and 741 Blair Rd. - Water Demands - Boundary Condition Request

Hello Ms. Mashaie,

My name is Jaymeson Adams and I am the Design EIT working on this project.

We would like to kindly request boundary conditions for the proposed development at **1649 Montreal Road and 741 Blair Road**. Please find the proposed development information below and detailed calculations and associated figures attached including (1) Water Demand Calculations, (2) Fire Flow Calculations, (3) Figure 1 – Proposed Water Service Connection Locations, (4) Figure 2 – Exposure Separation Distances, (5) Figure 3 – Fire Hydrant Coverage, and (6) Architectural Concept Plans (for reference):

1. **Type of Development and Units:** The proposed development involves the construction of one (1) 26-storey mixed use building (residential and ground floor commercial space). There is a total of **243 residential units**. An underground 3-level parking garage extending the majority of the footprint of the site is also proposed (approximate garage footprint is shown on the attached Sketches).
2. **Site Address:** 1649 Montreal Road and 741 Blair Road
3. **Location of Services:** Please see attached Figure 1:
    a. Montreal Road – 305 mm diameter DI watermain.
    b. Blair Road – 305 mm diameter DI watermain.
4. **Average Daily Demand:** 1.87 L/s
5. **Maximum Daily Demand:** 5.56 L/s

6. **Peak Hour Demand:** 8.35 L/s
7. **Required Fire Flow (RFF):** 5,000 L/min

If you have any questions or concerns, please do not hesitate to contact me.

Best regards,

JAYMESON ADAMS, EIT
Engineering Trainee / Infrastructure
Ingénieur en formation / Infrastructures

T 613-860-2462 ext. 6659 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

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This e-mail originates from the City of Ottawa e-mail system. Any distribution, use or copying of this e-mail or the information it contains by other than the intended recipient(s) is unauthorized. Thank you.

Jaymeson Adams

From: Rachel Irving-Beer <rirvingbeer@rlaarchitecture.ca>
Sent: March 29, 2021 11:38 AM
To: Christian Lavoie-Lebel
Cc: Tim Kennedy; Roderick Lahey; 'Christopher Gordon'; 'Michelle Lavictoire'; 'Chris Hall'; 'Paul Black'; 'Miguel Tremblay'; 'Timothy Beed'; 'Martin Chenier'; Jaymeson Adams
Subject: RE: 1649 Montreal Rd (Blair & Montreal)

EXTERNAL EMAIL

Hi Christian,

I just spoke with Rod regarding these question. Please see our reply below in red:

- Timeline will be approximately 6 weeks from obtaining final Site Plan, Legal Plan and Topo Survey (CADD) that will be used for Adequacy of Servicing submission. (Please confirm when the
  - Final meaning the building footprint, number of rooms/beds, any commercial or additional building areas will not change. The hard and soft services at the exterior of the building should also remain unchanged; We still need a final survey before we can call our drawings final for this submission. We have made some small changes to the building footprint to accommodate the proposed road widening limit, and I can send out a revised package with these changes this afternoon. The preliminary survey we received on Thursday indicates that our estimated site boundary lines are pretty close to accurate, but we can't confirm anything until we receive the survey.
  - We require these documents to be final as the sewer and water demands will be calculated based on this information and provided to the City for confirmation on capacity. It will take about a week to calculate the demands and then the City requires 10 business days to confirm capacities. If the site plan changes we need to redo these calculations and restart the process with the City (i.e. every site plan change (even small) can set us back three weeks in the process) Understood.
- Determining required fire flow (RFF):
  - Confirm building is of Fire Resistive Construction as follows: any structure that is considered fully protected, having at least 3-hour rated structural members and floors. For example, reinforced concrete or protected steel. Confirmed. Building will be concrete construction.
  - Confirm vertical openings are protected with a one-hour fire rating. Confirmed.
  - Confirm building is sprinklered, but system is not supervised (i.e. continuously monitored). Confirmed.
  - If any of the above are not correct further coordination will be required to confirm RFF. Understood.
  - A letter from the architect will be required as part of the submission confirming the above assumptions are correct as well as a few others such as contributing building areas, however this can be coordinated at a later date once we are into the calculations. Understood.
- Stormwater management storage requirements:
  - Will roof retention be considered? No.
  - If so over what area of the roof will storage be permitted? (i.e. entire area, partial area due to mechanical units, etc.)
  - Also if we know the number of proposed roof drains and locations that would be helpful. This hasn't been determined yet.

Thanks,

Rachel Irving-Beer *M.Arch*
Intern Architect

RLA Architecture
56 Beech Street,
Ottawa, Ontario K1S 3J6
Tel: 613.724.9932 x 225
Toll Free Tel: 1-888-724-9932 x225
rirvingbeer@rlaarchitecture.ca

From: Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>
Sent: March 29, 2021 10:52 AM
To: Rachel Irving-Beer <rirvingbeer@rlaarchitecture.ca>
Cc: Tim Kennedy <Tim.Kennedy@cima.ca>; Roderick Lahey <rlahey@rlaarchitecture.ca>; 'Christopher Gordon' <christopher.gordon@cghtransportation.com>; 'Michelle Lavictoire' <m.lavictoire@bowfinenvironmental.ca>; 'Chris Hall' <cjhall@bellnet.ca>; 'Paul Black' <black@fotenn.com>; 'Miguel Tremblay' <tremblay@fotenn.com>; 'Timothy Beed' <beed@fotenn.com>; 'Martin Chenier' <mchenier@vuzeconstruction.com>; Jaymeson Adams <Jaymeson.Adams@cima.ca>
Subject: RE: 1649 Montreal Rd (Blair & Montreal)

Hi,

Were we able to look at these questions to help us to develop the Adequacy of servicing report?

Thanks,

ÇA VA BIEN ALLER

CHRISTIAN LAVOIE-LEBEL, P.Eng, ing.
Partner / Senior Project Manager / Infrastructure

T 613-860-2462 ext. 6621 **M** 819-664-7920 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA
420, boul. Maloney Est, bureau 201 Gatineau QC J8P 1E7 CANADA

From: Christian Lavoie-Lebel
Sent: March 24, 2021 4:27 PM
To: rirvingbeer@rlaarchitecture.ca
Cc: Tim Kennedy <Tim.Kennedy@cima.ca>; rlahey@rlaarchitecture.ca; Christopher Gordon <christopher.gordon@cghtransportation.com>; Michelle Lavictoire <m.lavictoire@bowfinenvironmental.ca>; Chris Hall <cjhall@bellnet.ca>; Paul Black <black@fotenn.com>; Miguel Tremblay <tremblay@fotenn.com>; Timothy Beed <beed@fotenn.com>; Martin Chenier <mchenier@vuzeconstruction.com>
Subject: RE: 1649 Montreal Rd (Blair & Montreal)

Hi,

Here are the questions that we would like you to go through and answer as much as possible to enable us to complete our adequacy of servicing report as detailed as possible.

If you have any questions

Regards,

ÇA VA BIEN ALLER

CHRISTIAN LAVOIE-LEBEL, P.Eng, ing.
Partner / Senior Project Manager / Infrastructure

T 613-860-2462 ext. 6621 **M** 819-664-7920 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA
420, boul. Maloney Est, bureau 201 Gatineau QC J8P 1E7 CANADA

KINCENTRIC Best Employer CANADA 2019

From: Christian Lavoie-Lebel
Sent: March 17, 2021 7:42 AM
To: Martin Chenier <mchenier@vuzeconstruction.com>; rlahey@rlaarchitecture.ca; Christopher Gordon <christopher.gordon@cghtransportation.com>; Michelle Lavictoire <m.lavictoire@bowfinenvironmental.ca>; Chris Hall <cjhall@bellnet.ca>; Paul Black <black@fotenn.com>; Miguel Tremblay <tremblay@fotenn.com>; Timothy Beed <beed@fotenn.com>
Cc: Tim Kennedy <Tim.Kennedy@cima.ca>
Subject: RE: 1649 Montreal Rd (Blair & Montreal)

Hi Martin,

While we wait for the ACAD version of the Siteplan we have a couple of questions/comments that we would like to raise and have you or Rod answer or take note :

We will want to confirm the following items with you prior to starting design:

- Timeline will be approximately 6 weeks from obtaining final Site Plan, Legal Plan and Topo Survey (CADD) that will be used for Adequacy of Servicing submission. (Please confirm when the
  - Final meaning the building footprint, number of rooms/beds, any commercial or additional building areas will not change. The hard and soft services at the exterior of the building should also remain unchanged;
  - We require these documents to be final as the sewer and water demands will be calculated based on this information and provided to the City for confirmation on capacity. It will take about a week to calculate the demands and then the City requires 10 business days to confirm capacities. If the site plan changes we need to redo these calculations and restart the process with the City (i.e. every site plan change (even small) can set us back three weeks in the process).
- Determining required fire flow (RFF):
  - Confirm building is of Fire Resistive Construction as follows: any structure that is considered fully protected, having at least 3-hour rated structural members and floors. For example, reinforced concrete or protected steel.
  - Confirm vertical openings are protected with a one-hour fire rating.
  - Confirm building is sprinklered, but system is not supervised (i.e. continuously monitored).
  - If any of the above are not correct further coordination will be required to confirm RFF.
  - A letter from the architect will be required as part of the submission confirming the above assumptions are correct as well as a few others such as contributing building areas, however this can be coordinated at a later date once we are into the calculations.
- Stormwater management storage requirements:
  - Will roof retention be considered?
  - If so over what area of the roof will storage be permitted? (i.e. entire area, partial area due to mechanical units, etc.)
  - Also if we know the number of proposed roof drains and locations that would be helpful.

Thanks,

ÇA VA BIEN ALLER

CHRISTIAN LAVOIE-LEBEL, P.Eng, ing.
Partner / Senior Project Manager / Infrastructure

T 613-860-2462 ext. 6621 **M** 819-664-7920 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA
420, boul. Maloney Est, bureau 201 Gatineau QC J8P 1E7 CANADA

From: Martin Chenier <mchenier@vuzeconstruction.com>
Sent: March 12, 2021 7:05 AM
To: Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>; Christopher Gordon <christopher.gordon@cghtransportation.com>; Michelle Lavictoire <m.lavictoire@bowfinenvironmental.ca>; Chris Hall <cjhall@bellnet.ca>; Paul Black <black@fotenn.com>; Miguel Tremblay <tremblay@fotenn.com>; Timothy Beed <beed@fotenn.com>
Subject: Fwd: 1649 Montreal Rd (Blair & Montreal)

EXTERNAL EMAIL

FYI. Layout mostly as well as units count. These will be confirmed shortly with the full package put it's the version we will be elaborating.
Full cad will be available shortly as well.

Thanks.

Begin forwarded message:

> **From:** Ashwani Kumar <akumar@rlaarchitecture.ca>
> **Date:** March 11, 2021 at 5:04:21 PM EST
> **To:** Martin Chenier <mchenier@vuzeconstruction.com>
> **Cc:** chenierm@live.ca, Roderick Lahey <rlahey@rlaarchitecture.ca>
> **Subject: RE: 1649 Montreal Rd (Blair & Montreal)**
>
> Hi Martin,
>
> Please review the attached site plan. The numbers in the Development Summary table are not final yet.
>
> Regards,
> Ashwani Kumar B.Arch, MCP, LEED® Green Associate
> Urban Designer
> RLA Architecture
> Tel: 613.724.9932 x 313
> Toll Free: 888.724.9932
>
> From: Martin Chenier <mchenier@vuzeconstruction.com>
> Sent: March 11, 2021 10:41 AM
> To: Ashwani Kumar <akumar@rlaarchitecture.ca>
> Cc: chenierm@live.ca
> Subject: Re: 1649 Montreal Rd (Blair & Montreal)
>
> [https://s3.amazonaws.com/staticmediafiles/media/sights/iron-icon-color.png]
> IRONSCALES couldn't recognize this email as this is the first time you received an email from this sender mchenier@vuzeconstruction.com<mailto:mchenier@vuzeconstruction.com>
>
> Hi Ashwani

Can you send me the parking levels please.

Thanks.

On Mar 10, 2021, at 5:14 PM, Ashwani Kumar <akumar@rlaarchitecture.ca<mailto:akumar@rlaarchitecture.ca>> wrote:

Hi Martin,

Please take a look at the attached site plan. I have highlighted a one-storey commercial space along Montreal Rd near the ramp. Please let me know if you would like to keep it or remove it.
Also, please share the official client/developer name to put on the site plan.
Thank you.

Regards,
Ashwani Kumar B.Arch, MCP, LEED® Green Associate
Urban Designer

RLA Architecture
56 Beech Street,
Ottawa, Ontario K1S 3J6
Tel: 613.724.9932 x 313
Toll Free: 888.724.9932
akumar@rlaarchitecture.ca<mailto:akumar@rlaarchitecture.ca>

<image001.jpg>

<2037 - SP-1 2021 03 10.pdf>

E

Appendix E
Sanitary Servicing Design Calculations

CIMA+

PROJECT NAME:	1649 Montreal Road and 741 Blair Road Multi-use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001101
CLIENT:	10869279 Canada Inc.
PROJECT STATUS:	Site Servicing and Stormwater Management Report

WASTEWATER PEAK FLOW DETERMINATION

APPLICABLE DESIGN GUIDELINES:

1. City of Ottawa Sewer Design Guidelines, 2012

2. City of Ottawa Technical Bulletin ISTB-2018-01

DOMESTIC CONTRIBUTIONS:

RESIDENTIAL DESIGN CRITERIA:

Residential Average Flow: (1) 280 L/c/day

Residential Peak Factor (P.F.): Harmon Equation (Min 2.0 and Max 4.0)

$$P.F. = 1 + \left(\frac{14}{4 + \left(\frac{P}{1000} \right)^{\frac{1}{2}}} \right) * K$$

where:

P=Population

K=Correction Factor =0.8

Per Unit Populations:

Table 4.2 Per Unit Populations

Unit Type	Persons Per Unit
Single Family	3.4
Semi-detached	2.7
Duplex	2.3
Townhouse (row)	2.7
Apartments:	
Bachelor	1.4
1 Bedroom	1.4
2 Bedroom	2.1
3 Bedroom	3.1
Average Apt.	1.8

AVERAGE FLOW - DOMESTIC:

Unit Type	Number of Units	Persons Per Unit	Population	Average Flow (L/s)
Studio Unit	1	1.4	1	0.003
1-Bedroom Apartments	48	1.4	83	0.27
1-Bedroom + Den Apartments	101	1.4	141	0.46
2-Bedroom Apartments	43	2.1	90	0.29
2-Bedroom + Den Apartments	59	2.1	124	0.40
Total	252		439	**1.42**

PEAK FLOW - DOMESTIC:

Population: (2)	439	persons
Average Dry Weather Flow: (3) = (1) x (2)	1.42	L/s
Peaking Factor (P.F.): (4)	3.40	
Peak Domestic Flow: (5) = (3) x (4)	**4.84**	L/s

COMMERCIAL & INSTITUTIONAL CONTRIBUTIONS:

COMMERCIAL AND INSTITUTIONAL DESIGN CRITERIA:

Commercial Average Flow: (6)	28 000	L/gross ha/d
Commercial Peak Factor:	1.5	if commercial contribution >20%, otherwise use 1.0

AVERAGE FLOW - COMMERCIAL:

Contributing Commercial Area: (7)	0.069	gross ha (including commercial space and amenity areas)
Average Dry Weather Flow: (8) = (6) x (7)	0.02	L/s

PEAK FLOW - COMMERCIAL:

Percent Commercial Area Contribution:	14%	(Commercial Floor Area/GFA)
Peaking Factor: (9)	1.0	
Peak Commercial Flow: (10) = (8) x (9)	**0.02**	L/s

PROJECT NAME:	1649 Montreal Road and 741 Blair Road Multi-use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001101
CLIENT:	10869279 Canada Inc.
PROJECT STATUS:	Site Servicing and Stormwater Management Report

WASTEWATER PEAK FLOW DETERMINATION

EXTRANEOUS FLOW CONTRIBUTION - INFLOW AND INFILTRATION:

EXTRANEOUS DESIGN CRITERIA:

Dry Weather Infiltration:	0.05	L/s/effective gross ha (for all areas)
Wet Weather Infiltration:	0.28	L/s/effective gross ha (for all areas)

PEAK FLOW - EXTRANEOUS:

Effective Gross Area: (11)	0.49	ha
Total Infiltration Allowance: (12)	0.33	L/s/effective gross ha (for all areas)
Peak Extraneous Flow: (13) = (11) x (12)	**0.16**	L/s

Total Estimated Avg. Dry Weather Flow Rate:	**1.45**	**L/s**
Total Estimated Peak Dry Weather Flow Rate:	**4.86**	**L/s**
Total Estimated Peak Wet Weather Flow Rate:	**5.02**	**L/s**

Prepared by: Martin Fréchette, EIT Date: 2024-10-21

Verified by: Éric Potvin, P.Eng. Date: 2024-10-21
PEO# 100208490

F

Appendix F
Storm Servicing and Stormwater Management Calculations

PROJECT NAME:	1649 Montreal Road & 741 Blair Road Multi-use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001101
CLIENT:	10869279 Canada Inc.
PROJECT STATUS:	Site Servicing and Stormwater Management Report

STORM RUNOFF COEFFICIENT DETERMINATION (PRE-DEVELOPMENT)

APPLICABLE DESIGN GUIDELINES:

1. City of Ottawa Sewer Design Guidelines, 2012

PRE-DEVELOPMENT RUNOFF COEFFICIENT DETERMINATION:

Area	Pervious Area m²	Pervious Area Runoff Coefficient	Impervious Area m²	Impervious Area Runoff Coefficient	Total Area m²	Weighted Runoff Coefficient (5-year)	Weighted Runoff Coefficient (100-year)
Unattenuated Areas	2995	0.20	1887	0.90	4882	**0.47**	**0.59**
TOTAL	**2995**	**0.20**	**1887**	**0.90**	**4882**	**0.47**	**0.59**

NOTES:

For 25 year storms add 10% to C value
For 50 year storms add 20% to C value
For 100 year storms add 25% to C value

Prepared by: Martin Frechette, EIT Date: 2024-09-24

Verified by: Éric Potvin Date: 2024-09-24
PEO# 100208490

PROJECT NAME:	1649 Montreal Road & 741 Blair Road Multi-use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001101
CLIENT:	10869279 Canada Inc.
PROJECT STATUS:	Site Servicing and Stormwater Management Report

STORM PRE-DEVELOPMENT FLOW

APPLICABLE DESIGN GUIDELINES:

1. City of Ottawa Sewer Design Guidelines, 2012

PRE-DEVELOPMENT FLOW DETERMINATION:

DESIGN CRITERIA:

Design Storm (year):	5	
IDF Regression Constants: (a)	998.071	
(b)	6.053	
(c)	0.814	
IDF Curve Equation (mm/hr):	$I = a / (Time\ in\ min + b)^c$	
Rational Formula (L/s):	Q = 2.78C*I*A	where: Q = Flow (L/s) C = Runoff Coefficient I = Rainfall Intensity (mm/hr) A = Area

ALLOWABLE RELEASE RATE - SUMMARY:

Catchment ID	Area (A) ha	Runoff Coefficient (C)	Time of Concentration (tc) min	Intensity (I) mm/hr	Allowable Release Rate (Q) L/s	Release Flow Per Unit Area (Q/ha) L/s/ha
A1	0.488	0.47	10	104.19	**66.4**	**136.0**
Total	**0.488**				**66.4**	**136.0**

NOTES:

1. Calculated Time of Concentration (tc) using Bransby Williams (C > 0.4) is 7 min. Minimum Tc of 10 min used per City Standard.
2. IDF Parameters per City of Ottawa Sewer Design Guidelines, 2012 (Macdonald-Cartier International Airport)

Prepared by: Martin Frechette, EIT Date: 2024-09-24

Verified by: Éric Potvin Date: 2024-09-24
PEO# 100208490

Z:\Cima-C10\Ott_Projects\A\A001000-A001499\A001101_Blair - Mtl Road Towers\300\360_Civil\250000_Site_Servicing+SWM_Report_Calc\02_STM\1. Pre-development\[2_240924_ Storm Pre-Development Flow_5yr Allowable.xlsx]Débit Pré-développement

PROJECT NAME:	1649 Montreal Road & 741 Blair Road Multi-use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001101
CLIENT:	10869279 Canada Inc.
PROJECT STATUS:	Site Servicing and Stormwater Management Report

STORM PRE-DEVELOPMENT FLOW - EXISTING SITE FLOWS

APPLICABLE DESIGN GUIDELINES:

1. City of Ottawa Sewer Design Guidelines, 2012

PRE-DEVELOPMENT FLOW DETERMINATION - 100-YEAR EVENT:

DESIGN CRITERIA:

Design Storm (year):	100	
IDF Regression Constants: (a)	1735.688	
(b)	6.014	
(c)	0.820	
IDF Curve Equation (mm/hr):	$I = a / (Time\ in\ min + b)^c$	
Rational Formula (L/s):	Q = 2.78C*I*A	where: Q = Flow (L/s) C = Runoff Coefficient I = Rainfall Intensity (mm/hr) A = Area

ACTUAL RELEASE RATE (100yr):

Catchment ID	Area (A) ha	Runoff Coefficient (C)	Time of Concentration (tc) min	Intensity (I) mm/hr	Release Rate (Q) L/s	Release Flow Per Unit Area (Q/ha) L/s/ha
A1	0.488	0.59	10	178.56	**142.9**	**292.6**
Total	**0.488**				**142.9**	**292.6**

NOTES:

1. Calculated Time of Concentration (tc) using Bransby Williams (C > 0.4) is 7 min. Minimum Tc of 10 min used per City Standard.
2. IDF Parameters per City of Ottawa Sewer Design Guidelines, 2012 (Macdonald-Cartier International Airport)

Prepared by: Jaymeson Adams, EIT Date: 2021-04-07

Verified by: Christian Lavoie-Lebel, P.Eng. Date: 2021-04-27
PEO# 100067842

Z:\Cima-C10\Ott_Projects\A\A001000-A001499\A001101_Blair - Mtl Road Towers\300\360_Civil\250000_Site_Servicing+SWM_Report_Calc\02_STM\1. Pre-development\[3_240924_ Storm Pre-Development Flow_Actual Flows.xlsx]Débit Pré-développement

PROJECT NAME:	1649 Montreal Road & 741 Blair Road Multi-use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001101
CLIENT:	10869279 Canada Inc.
PROJECT STATUS:	Site Servicing and Stormwater Management Report

STORM RUNOFF COEFFICIENT DETERMINATION (POST-DEVELOPMENT)

APPLICABLE DESIGN GUIDELINES:

1. City of Ottawa Sewer Design Guidelines, 2012

POST-DEVELOPMENT RUNOFF COEFFICIENT DETERMINATION:

Area	Pervious Area m²	Pervious Area Runoff Coefficient	Impervious Area m²	Impervious Area Runoff Coefficient	Total Area m²	Weighted Runoff Coefficient (5-year)	Weighted Runoff Coefficient (100-year)
Garage and Roof Area (A1)	0	0.20	2310	0.90	2310	**0.90**	**0.95**
Area to Back East(A2.a)	245	0.20	0	0.90	245	**0.20**	**0.25**
Area to Back West (A2.b)	873	0.20	475	0.90	1348	**0.45**	**0.56**
Area to Front (A3.a)	73	0.20	402	0.90	475	**0.79**	**0.95**
Area to Front (A3.b)	77	0.20	95	0.90	172	**0.59**	**0.73**
Unattenuated Areas (A4)	45	0.20	287	0.90	332	**0.81**	**0.95**
TOTAL	**1313**	**0.20**	**3569**	**0.90**	**4882**	**0.71**	**0.89**

NOTES:

For 25 year storms add 10% to C value
For 50 year storms add 20% to C value
For 100 year storms add 25% to C value

Prepared by: Martin Frechette, EIT Date: 2024-10-21

Verified by: Éric Potvin Date: 2024-10-21
PEO# 100208490

PROJECT NAME:	1649 Montreal Road & 741 Blair Road Multi-Use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001101 (360)
CLIENT:	10869279 Canada Inc.
PROJECT STATUS:	Site Servicing and Stormwater Management Report

RAINGARDEN REQUIRED AREA DETERMINATION

DESIGN EQUATION (Minnesota Pollution Control Agency, 2005):

VOLUME TO BE RETAINED FOR 24h (V) = [25mm ≈ 6-MONTH RAIN ACCUMULATION ≈ 90% OF ALL STORMWATER EVENTS] x [RUNOFF COEFFICIENT (C)] x [AREA DRAINING TO RAINGARDEN (A1)]

$$\text{AREA OF RAINGARDEN (A2)} = \frac{\text{[VOLUME (V)] x [DEPTH OF INFILTRATION BED]}}{\text{[INFILTRATION (I) x (HEIGHT OF WATER OVER INFILTRATION BED + DEPTH OF INFILTRATION BED)] x [TIME OF RELEASE FLOW]}}$$

WHERE,

I = 0.15m/d TO ACCOUNT FOR LONG-TERM CLOGGING OF SUBDRAIN (CLAY & SCHUELER, 1996) = 6.25 mm/h

REQUIRED AREA DETERMINATION:

DESIGN CRITERIA:

Raingarden	6-Month Rainfall Accumulation mm	Runoff Coefficient (C)	Area Draining to Raingarden (A) m²	Subcatchment Area	Volume (V) m³	Depth of Infiltation Bed m	Infiltration (I) mm/h	Height of Water Over Infiltration Bed m	Time of Release Flow h	Min. Required Garden Area [For Treatment] (A) m²
North Raingarden (A2.b)	25.00	0.45	1348.00	A2.b	15.17	0.85	6.25	0.35	24.00	71.61
South Raingarden (A3)	25.00	0.79	475.00	A3.a	9.38	0.85	6.25	0.35	24.00	44.30
TOTAL					24.55					115.91

NOTES:

Prepared by: Martin Frechette, E.I.T. Date: 2024-10-21

Verified by: Éric Potvin Date: 2024-10-21
PEO# 100208490

PROJECT NAME: 1649 Montreal Road & 741 Blair Road
Multi-Use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER: A001101
CLIENT: 10869279 Canada Inc.
PROJECT STATUS: Site Servicing and Stormwater Management Report

STORMWATER MANAGEMENT – RETENTION CALCULATIONS

APPLICABLE DESIGN GUIDELINES:

1. City of Ottawa Sewer Design Guidelines, 2012

STORMWATER MANAGEMENT SUMMARY - STORAGE AND DRAWDOWN:

DESIGN CRITERIA:

Rainfall event	100.0	years
Flows to Cistern	51.4	L/s
Unattenuated Flow (100 year)	15.0	L/s
Allowable Release Rate (66.4 L/s)	66.4	L/s

Sub-Area	Total Area (m^2)	Available Storage Area (m^2)	Catchbasin/ Roof Drain Elevation (m)	Maximum Ponding Elevation (m)	Y_{max} (m)	V_{max} (m^3)	V_{rain} (m^3)	V_{acc} (m^3)	Y_{rain} (m)	$Elev_{rain}$ (m)	A_{rain} (m^2)	Q (L/s)	Cistern Release Rate (L/s)	Drawdown Time (min)	Comments
A1	2310	Refer to note 1	-	-	-	55.0	44.0	47.4	-	-	-	38.3	51.4	-	Building Roof + Cistern
A2.a	245	8.0	98.25	98.30	0.05	0.1	1.6	0.1	-	-	-	4.1		-	Back East
A2.b	1348	Refer to note 2	97.65	98.00	0.35	33.0	33.0	33.0	-	-	-	4.1		-	Back West
A3.a	475	Refer to note 3	97.65	98.00	0.35	17.5	17.5	17.5	-	-	-	2.2		-	Front (Entrance)
A3.b	172	45.0	97.48	97.57	0.09	1.3	3.3	1.3	-	-	-	2.8		-	Front (POPS)
A4	332	0.0	-	-	-	0.0	0.0	0.0	-	-	-	15.0	-	-	Area between Building & Montreal Rd (unattenuated)
Total	**4882**					**107.0**	**99.4**	**99.4**				**66.4**	**51.4**		

NOTES:

1. 47.4 m³ are retained inside building **Cistern (max 55m³)**. No water retained on rooftop.
2. 33 m³ are retained in the **north raingarden.**
3. 17.5 m³ are retained in the **south raingarden.**

DEFINITIONS OF ABBREVIATIONS USED IN CALCULATION TABLE:

NC = Area is not controlled (unattenuated)
Available Area = Area of water accumulated in sub-area at Max. Elev.
Catchbasin Elev. = Elevation of catchbasin inlet (top of grate).
Max. Elev. = Maximum elevation of water that may be accumulated within sub-area.
Y_{max} = Maximum depth of water that may be accumulated within the sub-area.
V_{max} = Maximum volume of water (capacity) that may be accumulated within the sub-area.
V_{rain} = Volume of water generated by rainfall.
V_{acc} = Total volume of water accumulated within the sub-area in the event of a specific rainfall.
Y_{rain} = Depth of water generated by rainfall.
$Elev_{rain}$ = Elevation of water generated by rainfall.
A_{rain} = Area of water generated by rainfall.
Q = Release flow rate.
Tank Release Rate = Release rate from the underground storage tank equal to 1/2 the allowable release rate.
Drawdown Time = Time required for the total volume of water accumulated within sub-area to subside.

Prepared by: Martin Fréchette, E.I.T. Date: 2024-10-22

Verified by: Éric Potvin, P.Eng. Date: 2024-10-22
PEO# 100208490

PROJECT NAME:	1649 Montreal Road & 741 Blair Road Multi-Use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001101
CLIENT:	10869279 Canada Inc.
PROJECT STATUS:	Site Servicing and Stormwater Management Report

RETENTION CALCULATIONS FOR FOR SUB-CATCHMENT AREA A1 (BLOCK 1)

APPLICABLE DESIGN GUIDELINES:

1. City of Ottawa Sewer Design Guidelines, 2012

REQUIRED STORAGE VOLUME DETERMINATION:

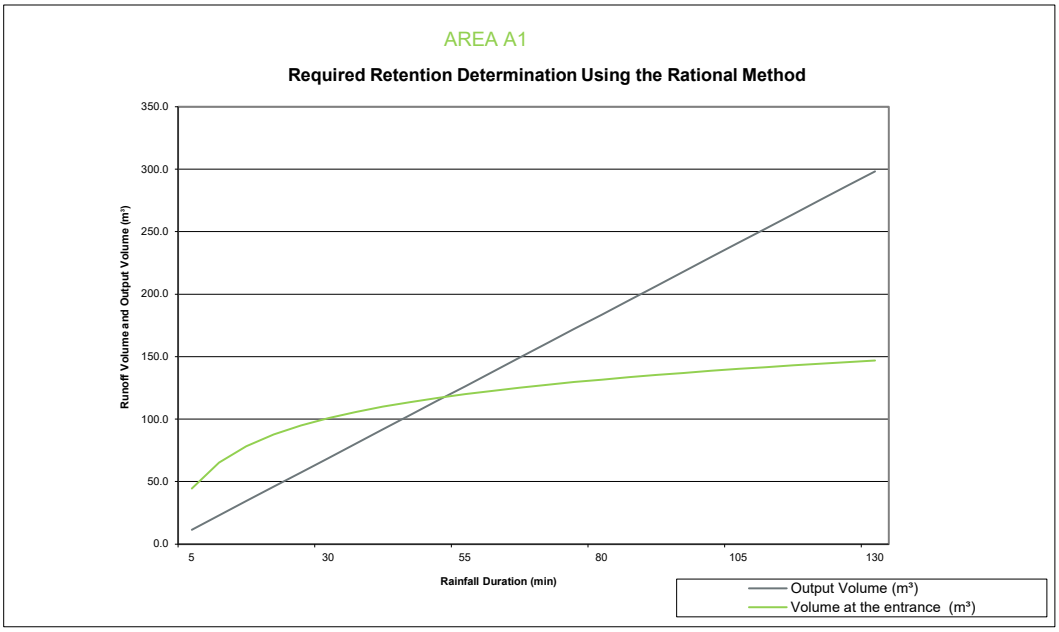
DESIGN CRITERIA:

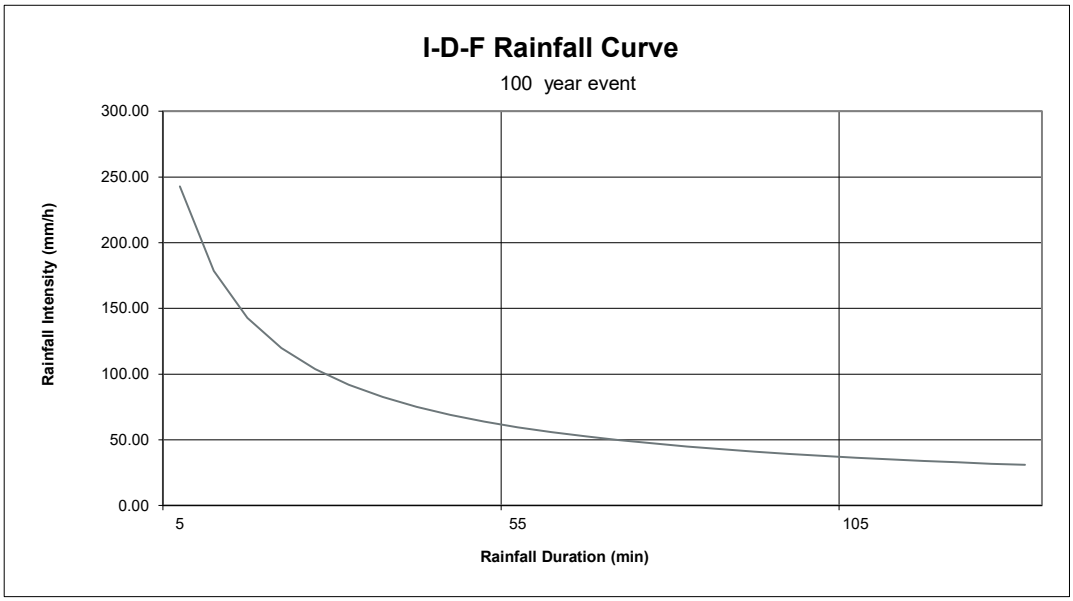
Rainfall Station:	City of Ottawa Sewer Design Guidelines, 2012 (Macdonald-Cartier Airport)	
Release Rate Per Unit Area (Q/ha):	165.63	L/s/ha
Area (A):	0.2310	ha
Runoff Coefficient (C):	0.95	
Rainfall Event:	100	year
Release Rate (Q):	0.0383	m³/s
Discharge Factor (K):	1	

Regression Constants	2 year	5 year	10 year	25 year	50 year	100 year
A	732.951	998.071	1174.184	1402.844	1569.58	1735.688
B	6.199	6.053	6.014	6.018	6.014	6.014
C	0.810	0.814	0.816	0.819	0.82	0.82

Required Retention Volume:	**44.0 m³**

Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m³) *CIAT* (3)	**Output Volume** (m³) *kQT* (4)	**Retention Volume** (m³) *(3)-(4)* (5)
5.0	242.7	44.4	11.5	32.9
10.0	178.6	65.3	23.0	42.4
15.0	**142.9**	**78.4**	**34.4**	**44.0**
20.0	120.0	87.7	45.9	41.8
25.0	103.8	95.0	57.4	37.6
30.0	91.9	100.8	68.9	31.9
35.0	82.6	105.7	80.3	25.4
40.0	75.1	109.9	91.8	18.1
45.0	69.1	113.6	103.3	10.3
50.0	64.0	117.0	114.8	2.2
55.0	59.6	119.9	126.3	-6.3
60.0	55.9	122.7	137.7	-15.1
65.0	52.6	125.2	149.2	-24.1
70.0	49.8	127.5	160.7	-33.2
75.0	47.3	129.6	172.2	-42.5
80.0	45.0	131.6	183.6	-52.0
85.0	43.0	133.5	195.1	-61.6
90.0	41.1	135.3	206.6	-71.3
95.0	39.4	137.0	218.1	-81.1
100.0	37.9	138.6	229.6	-90.9
105.0	36.5	140.2	241.0	-100.9
110.0	35.2	141.6	252.5	-110.9
115.0	34.0	143.0	264.0	-121.0
120.0	32.9	144.4	275.5	-131.1
125.0	31.9	145.7	287.0	-141.3
130.0	30.9	146.9	298.4	-151.5
Design Volume:				**44.0**





Prepared by: Martin Fréchette, E.I.T. Date: 2024-10-22

Verified by: Éric Potvin, P.Eng. Date: 2024-10-22
PEO# 100208490

Init. E.P.

PROJECT NAME:	1649 Montreal Road & 741 Blair Road Multi-Use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001101
CLIENT:	10869279 Canada Inc.
PROJECT STATUS:	Site Servicing and Stormwater Management Report

RETENTION CALCULATIONS FOR FOR SUB-CATCHMENT AREA A2.a

APPLICABLE DESIGN GUIDELINES:

1. City of Ottawa Sewer Design Guidelines, 2012

REQUIRED STORAGE VOLUME DETERMINATION:

DESIGN CRITERIA:

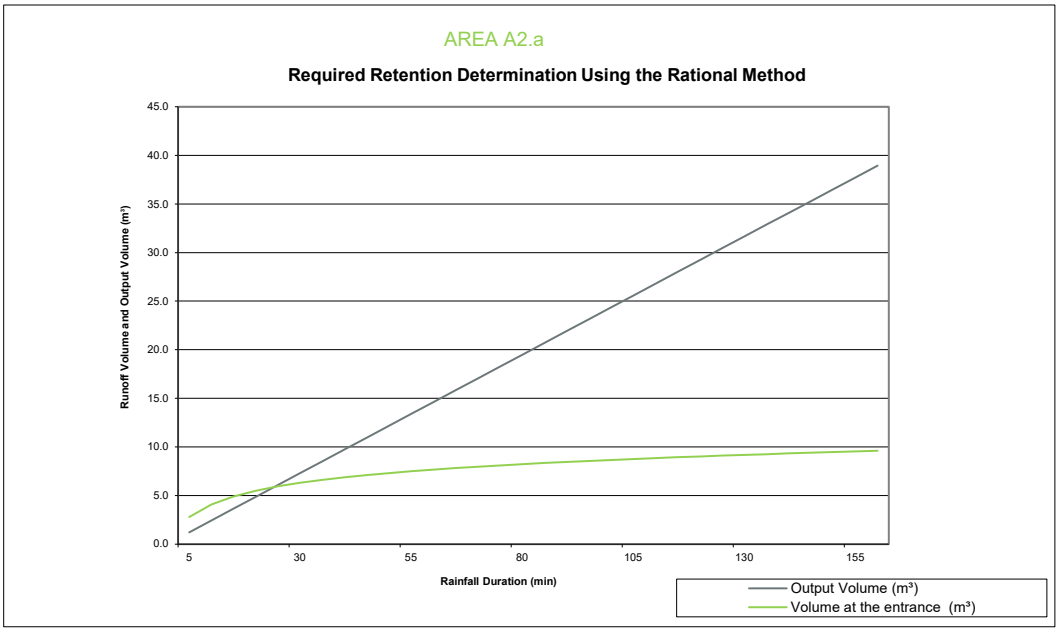
Rainfall Station:	City of Ottawa Sewer Design Guidelines, 2012 (Macdonald-Cartier Airport)	
Release Rate Per Unit Area (Q/ha):	165.63	L/s/ha
Area (A):	0.0245	ha
Runoff Coefficient (C):	0.56	
Rainfall Event:	100	year
Release Rate (Q):	0.0041	m³/s
Discharge Factor (K):	1	

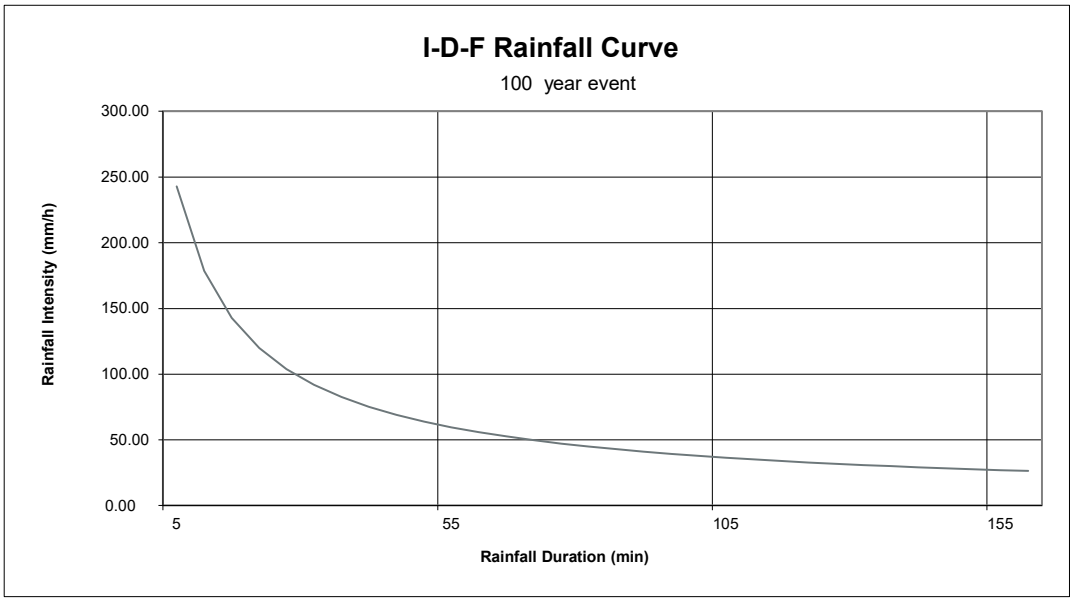
Regression Constants	2 year	5 year	10 year	25 year	50 year	100 year
A	732.951	998.071	1174.184	1402.844	1569.58	1735.688
B	6.199	6.053	6.014	6.018	6.014	6.014
C	0.810	0.814	0.816	0.819	0.82	0.82

Required Retention Volume: 1.6 m³

Rainfall Duration (min) *T* (1)	Rainfall Intensity (mm/h) *I* (2)	Runoff Volume (m³) *CIAT* (3)	Output Volume (m³) *kQT* (4)	Retention Volume (m³) *(3)-(4)* (5)
5.0	242.7	2.8	1.2	1.6
10.0	**178.6**	**4.1**	**2.4**	**1.6**
15.0	142.9	4.9	3.7	1.2
20.0	120.0	5.5	4.9	0.6
25.0	103.8	5.9	6.1	-0.2
30.0	91.9	6.3	7.3	-1.0
35.0	82.6	6.6	8.5	-1.9
40.0	75.1	6.9	9.7	-2.9
45.0	69.1	7.1	11.0	-3.9
50.0	64.0	7.3	12.2	-4.9
55.0	59.6	7.5	13.4	-5.9
60.0	55.9	7.7	14.6	-6.9
65.0	52.6	7.8	15.8	-8.0
70.0	49.8	8.0	17.0	-9.1
75.0	47.3	8.1	18.3	-10.2
80.0	45.0	8.2	19.5	-11.2
85.0	43.0	8.3	20.7	-12.3
90.0	41.1	8.5	21.9	-13.5
95.0	39.4	8.6	23.1	-14.6
100.0	37.9	8.7	24.3	-15.7
105.0	36.5	8.8	25.6	-16.8
110.0	35.2	8.9	26.8	-17.9
115.0	34.0	8.9	28.0	-19.1
120.0	32.9	9.0	29.2	-20.2
125.0	31.9	9.1	30.4	-21.3
130.0	30.9	9.2	31.7	-22.5
135.0	30.0	9.3	32.9	-23.6
140.0	29.2	9.3	34.1	-24.8
145.0	28.4	9.4	35.3	-25.9
150.0	27.6	9.5	36.5	-27.1
155.0	26.9	9.5	37.7	-28.2
160.0	26.2	9.6	39.0	-29.4
Design Volume:				**1.6**

AREA A2.a





Prepared by: Martin Fréchette, E.I.T. Date: 2024-10-22

Verified by: Éric Potvin, P.Eng. Date: 2024-10-22
PEO# 100208490

Init. E.P.

PROJECT NAME:	1649 Montreal Road & 741 Blair Road Multi-Use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001101
CLIENT:	10869279 Canada Inc.
PROJECT STATUS:	Site Servicing and Stormwater Management Report

RETENTION CALCULATIONS FOR FOR SUB-CATCHMENT AREA A2.b

APPLICABLE DESIGN GUIDELINES:

1. City of Ottawa Sewer Design Guidelines, 2012

REQUIRED STORAGE VOLUME DETERMINATION:

DESIGN CRITERIA:

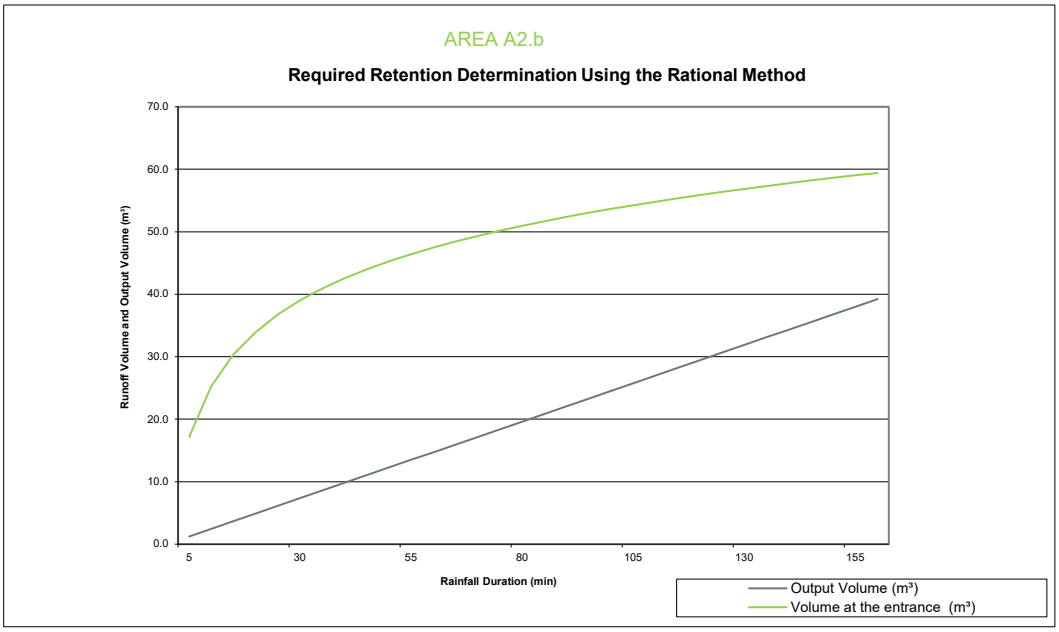
Rainfall Station:	City of Ottawa Sewer Design Guidelines, 2012 (Macdonald-Cartier Airport)
Release Rate Per Unit Area (Q/ha):	30.32 L/s/ha
Area (A):	0.1348 ha
Runoff Coefficient (C):	0.63
Rainfall Event:	100 year
Release Rate (Q):	0.0041 m³/s
Discharge Factor (K):	1

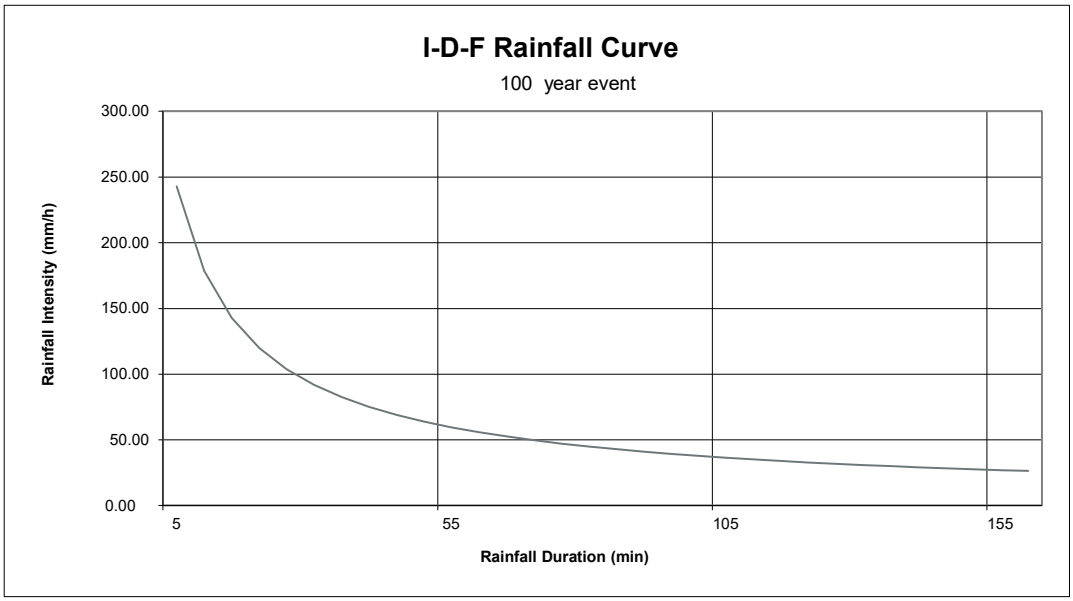
Regression Constants	2 year	5 year	10 year	25 year	50 year	100 year
A	732.951	998.071	1174.184	1402.844	1569.58	1735.688
B	6.199	6.053	6.014	6.018	6.014	6.014
C	0.810	0.814	0.816	0.819	0.82	0.82

Required Retention Volume: 33.0 m³

Note: 33m³ volume is retained in the north raingarden before rainwater is evacuated trough the overflow 350mm above ground.

Rainfall Duration (min) *T* (1)	Rainfall Intensity (mm/h) *I* (2)	Runoff Volume (m³) *CIAT* (3)	Output Volume (m³) *kQT* (4)	Retention Volume (m³) *(3)-(4)* (5)
5.0	242.7	17.2	1.2	16.0
10.0	178.6	25.3	2.5	22.8
15.0	142.9	30.3	3.7	26.7
20.0	120.0	34.0	4.9	29.1
25.0	103.8	36.7	6.1	30.6
30.0	91.9	39.0	7.4	31.7
35.0	82.6	40.9	8.6	32.3
40.0	75.1	42.5	9.8	32.7
45.0	69.1	44.0	11.0	32.9
50.0	**64.0**	**45.3**	**12.3**	**33.0**
55.0	59.6	46.4	13.5	32.9
60.0	55.9	47.5	14.7	32.8
65.0	52.6	48.4	15.9	32.5
70.0	49.8	49.3	17.2	32.2
75.0	47.3	50.2	18.4	31.8
80.0	45.0	50.9	19.6	31.3
85.0	43.0	51.7	20.8	30.8
90.0	41.1	52.4	22.1	30.3
95.0	39.4	53.0	23.3	29.7
100.0	37.9	53.6	24.5	29.1
105.0	36.5	54.2	25.7	28.5
110.0	35.2	54.8	27.0	27.8
115.0	34.0	55.4	28.2	27.2
120.0	32.9	55.9	29.4	26.4
125.0	31.9	56.4	30.7	25.7
130.0	30.9	56.9	31.9	25.0
135.0	30.0	57.3	33.1	24.2
140.0	29.2	57.8	34.3	23.4
145.0	28.4	58.2	35.6	22.6
150.0	27.6	58.6	36.8	21.8
155.0	26.9	59.0	38.0	21.0
160.0	26.2	59.4	39.2	20.2
Design Volume:				**33.0**





Prepared by: Martin Fréchette, E.I.T. Date: 2024-10-22

Verified by: Éric Potvin, P.Eng. Date: 2024-10-22
PEO# 100208490

Init. E.P.

PROJECT NAME:	1649 Montreal Road & 741 Blair Road Multi-Use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001101
CLIENT:	10869279 Canada Inc.
PROJECT STATUS:	Site Servicing and Stormwater Management Report

RETENTION CALCULATIONS FOR FOR SUB-CATCHMENT AREA A3.a

APPLICABLE DESIGN GUIDELINES:

1. City of Ottawa Sewer Design Guidelines, 2012

REQUIRED STORAGE VOLUME DETERMINATION:

DESIGN CRITERIA:

Rainfall Station:	City of Ottawa Sewer Design Guidelines, 2012 (Macdonald-Cartier Airport)
Release Rate Per Unit Area (Q/ha):	45.96 L/s/ha
Area (A):	0.0475 ha
Runoff Coefficient (C):	0.95
Rainfall Event:	100 year
Release Rate (Q):	0.0022 m³/s
Discharge Factor (K):	1

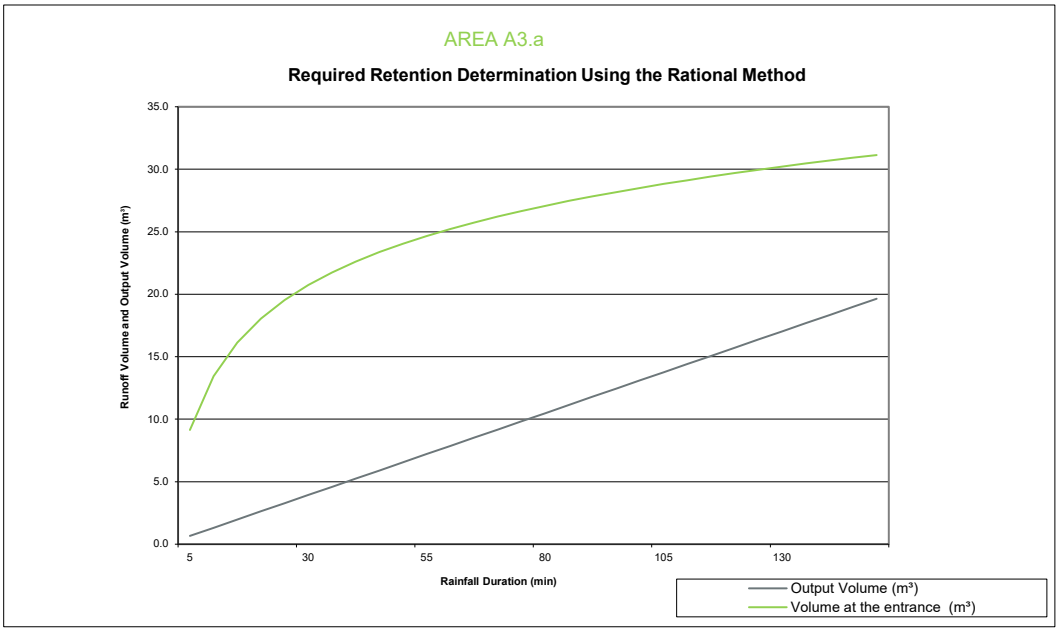
Regression Constants	2 year	5 year	10 year	25 year	50 year	100 year
A	732.951	998.071	1174.184	1402.844	1569.58	1735.688
B	6.199	6.053	6.014	6.018	6.014	6.014
C	0.810	0.814	0.816	0.819	0.82	0.82

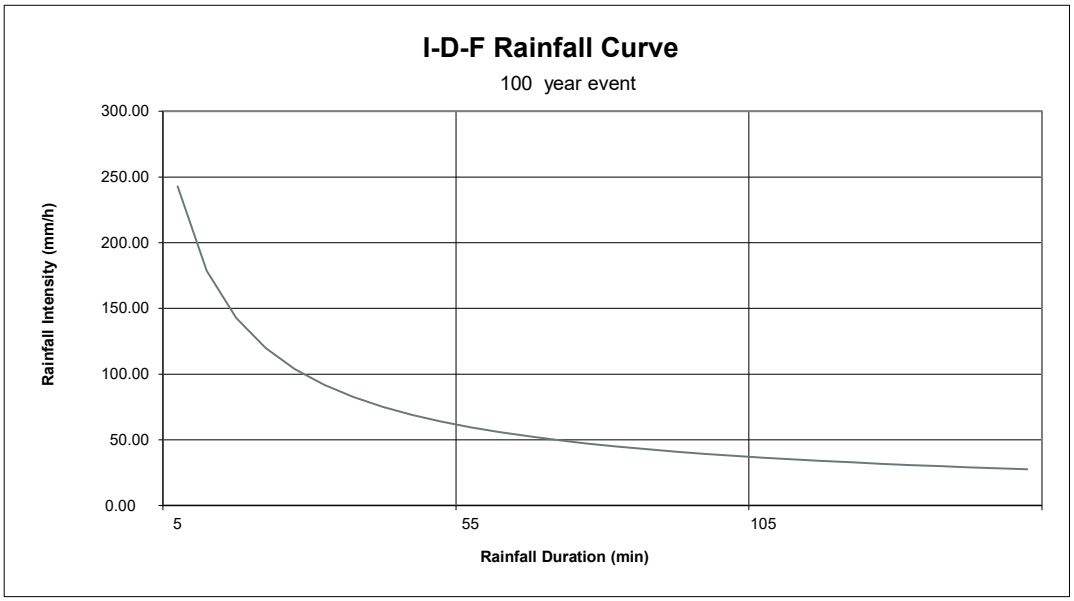
Required Retention Volume: 17.5 m³

Note: 17.5m³ volume is retained in the south raingarden before rainwater is evacuated trough the overflow 350mm above ground.

Rainfall Duration (min) *T* (1)	Rainfall Intensity (mm/h) *I* (2)	Runoff Volume (m³) *CIAT* (3)	Output Volume (m³) *kQT* (4)	Retention Volume (m³) *(3)-(4)* (5)
5.0	242.7	9.1	0.7	8.5
10.0	178.6	13.4	1.3	12.1
15.0	142.9	16.1	2.0	14.2
20.0	120.0	18.0	2.6	15.4
25.0	103.8	19.5	3.3	16.3
30.0	91.9	20.7	3.9	16.8
35.0	82.6	21.7	4.6	17.2
40.0	75.1	22.6	5.2	17.4
45.0	69.1	23.4	5.9	17.5
50.0	**64.0**	**24.0**	**6.5**	**17.5**
55.0	59.6	24.7	7.2	17.5
60.0	55.9	25.2	7.9	17.4
65.0	52.6	25.7	8.5	17.2
70.0	49.8	26.2	9.2	17.0
75.0	47.3	26.7	9.8	16.8
80.0	45.0	27.1	10.5	16.6
85.0	43.0	27.5	11.1	16.3
90.0	41.1	27.8	11.8	16.0
95.0	39.4	28.2	12.4	15.7
100.0	37.9	28.5	13.1	15.4
105.0	36.5	28.8	13.8	15.1
110.0	35.2	29.1	14.4	14.7
115.0	34.0	29.4	15.1	14.3
120.0	32.9	29.7	15.7	14.0
125.0	31.9	30.0	16.4	13.6
130.0	30.9	30.2	17.0	13.2
135.0	30.0	30.5	17.7	12.8
140.0	29.2	30.7	18.3	12.4
145.0	28.4	30.9	19.0	11.9
150.0	27.6	31.1	19.6	11.5
Design Volume:				**17.5**

AREA A3.a





Prepared by: Martin Fréchette, E.I.T. Date: 2024-10-22

Verified by: Éric Potvin, P.Eng. Date: 2024-10-22
PEO# 100208490

Init. E.P.

PROJECT NAME:	1649 Montreal Road & 741 Blair Road Multi-Use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001101
CLIENT:	10869279 Canada Inc.
PROJECT STATUS:	Site Servicing and Stormwater Management Report

RETENTION CALCULATIONS FOR FOR SUB-CATCHMENT AREA A3.b

APPLICABLE DESIGN GUIDELINES:

1. City of Ottawa Sewer Design Guidelines, 2012

REQUIRED STORAGE VOLUME DETERMINATION:

DESIGN CRITERIA:

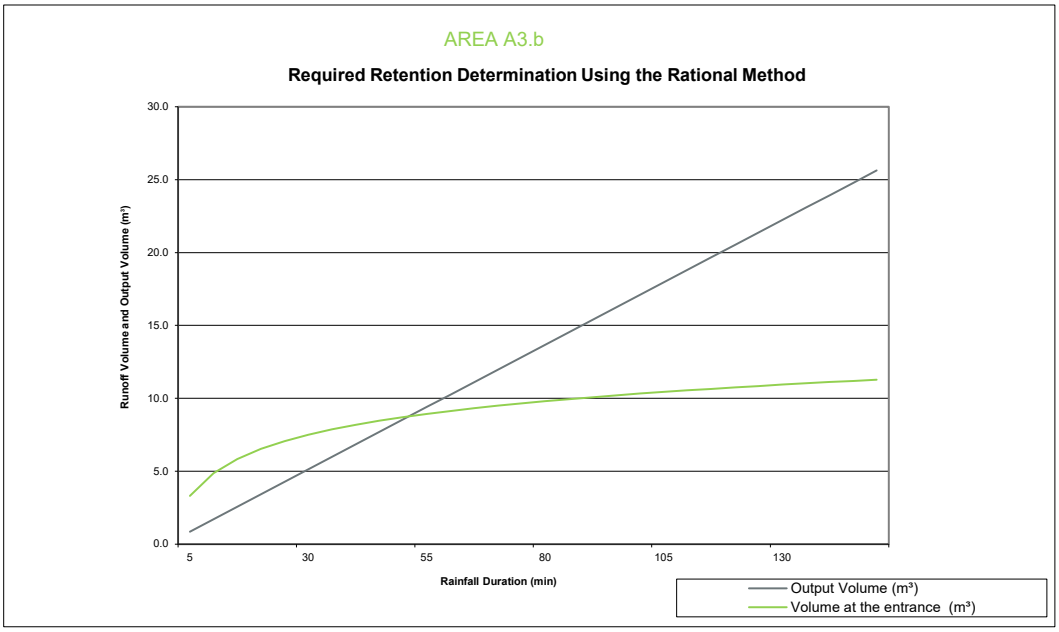
Rainfall Station:	City of Ottawa Sewer Design Guidelines, 2012 (Macdonald-Cartier Airport)	
Release Rate Per Unit Area (Q/ha):	165.63	L/s/ha
Area (A):	0.0172	ha
Runoff Coefficient (C):	0.95	
Rainfall Event:	100	year
Release Rate (Q):	0.0028	m³/s
Discharge Factor (K):	1	

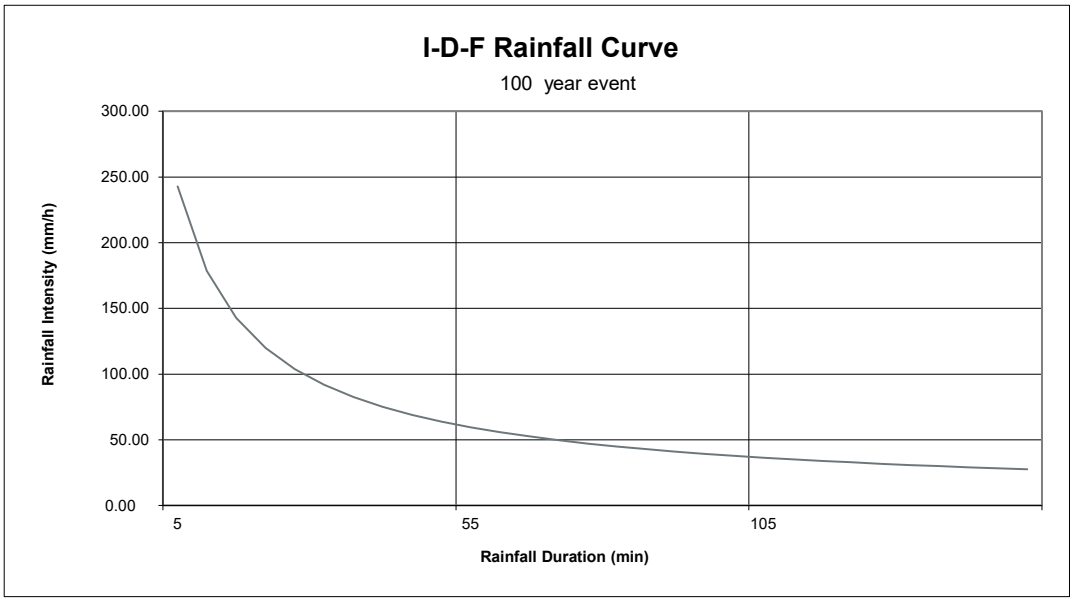
Regression Constants	2 year	5 year	10 year	25 year	50 year	100 year
A	732.951	998.071	1174.184	1402.844	1569.58	1735.688
B	6.199	6.053	6.014	6.018	6.014	6.014
C	0.810	0.814	0.816	0.819	0.82	0.82

Required Retention Volume: 3.3 m³

Rainfall Duration (min) *T* (1)	Rainfall Intensity (mm/h) *I* (2)	Runoff Volume (m³) *CIAT* (3)	Output Volume (m³) *kQT* (4)	Retention Volume (m³) *(3)-(4)* (5)
5.0	242.7	3.3	0.9	2.5
10.0	178.6	4.9	1.7	3.2
15.0	**142.9**	**5.8**	**2.6**	**3.3**
20.0	120.0	6.5	3.4	3.1
25.0	103.8	7.1	4.3	2.8
30.0	91.9	7.5	5.1	2.4
35.0	82.6	7.9	6.0	1.9
40.0	75.1	8.2	6.8	1.3
45.0	69.1	8.5	7.7	0.8
50.0	64.0	8.7	8.5	0.2
55.0	59.6	8.9	9.4	-0.5
60.0	55.9	9.1	10.3	-1.1
65.0	52.6	9.3	11.1	-1.8
70.0	49.8	9.5	12.0	-2.5
75.0	47.3	9.7	12.8	-3.2
80.0	45.0	9.8	13.7	-3.9
85.0	43.0	9.9	14.5	-4.6
90.0	41.1	10.1	15.4	-5.3
95.0	39.4	10.2	16.2	-6.0
100.0	37.9	10.3	17.1	-6.8
105.0	36.5	10.4	17.9	-7.5
110.0	35.2	10.5	18.8	-8.3
115.0	34.0	10.6	19.7	-9.0
120.0	32.9	10.8	20.5	-9.8
125.0	31.9	10.8	21.4	-10.5
130.0	30.9	10.9	22.2	-11.3
135.0	30.0	11.0	23.1	-12.0
140.0	29.2	11.1	23.9	-12.8
145.0	28.4	11.2	24.8	-13.6
150.0	27.6	11.3	25.6	-14.4
Design Volume:				**3.3**

AREA A3.b





Prepared by: Martin Fréchette, E.I.T. Date: 2024-10-22

Verified by: Éric Potvin, P.Eng. Date: 2024-10-22
PEO# 100208490

Init. E.P.

PROJECT NAME:	1649 Montreal Road & 741 Blair Road Multi-Use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001101
CLIENT:	10869279 Canada Inc.
PROJECT STATUS:	Site Servicing and Stormwater Management Report

RETENTION CALCULATIONS FOR FOR SUB-CATCHMENT AREA A4

APPLICABLE DESIGN GUIDELINES:

1. City of Ottawa Sewer Design Guidelines, 2012

REQUIRED STORAGE VOLUME DETERMINATION:

DESIGN CRITERIA:

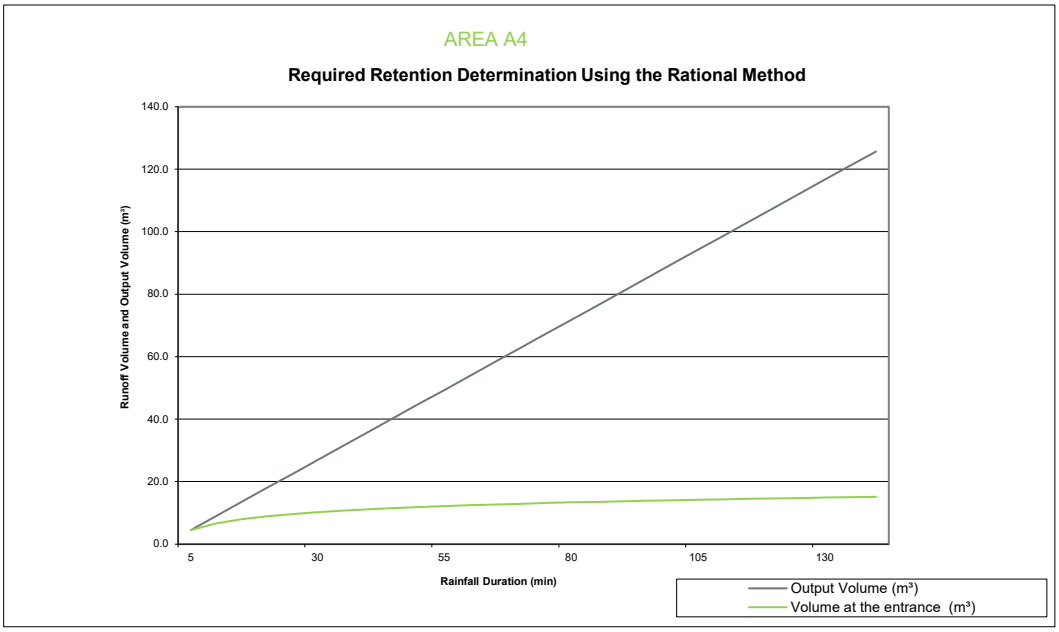
Rainfall Station:	City of Ottawa Sewer Design Guidelines, 2012 (Macdonald-Cartier Airport)
Release Rate Per Unit Area (Q/ha):	450.69 L/s/ha
Area (A):	0.0332 ha
Runoff Coefficient (C):	0.67
Rainfall Event:	100 year
Release Rate (Q):	0.0150 m³/s
Discharge Factor (K):	1

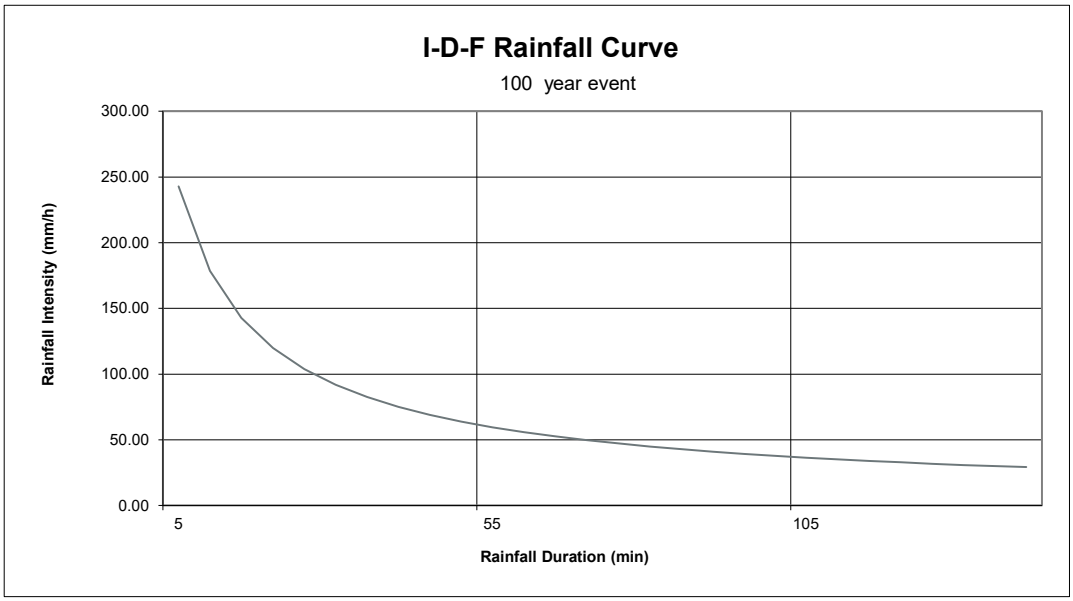
Regression Constants	2 year	5 year	10 year	25 year	50 year	100 year
A	732.951	998.071	1174.184	1402.844	1569.58	1735.688
B	6.199	6.053	6.014	6.018	6.014	6.014
C	0.810	0.814	0.816	0.819	0.82	0.82

Required Retention Volume: 0.01 m³

Rainfall Duration (min) *T* (1)	Rainfall Intensity (mm/h) *I* (2)	Runoff Volume (m³) *CIAT* (3)	Output Volume (m³) *kQT* (4)	Retention Volume (m³) *(3)-(4)* (5)
5.0	**242.7**	**4.5**	**4.5**	**0.0**
10.0	178.6	6.6	9.0	-2.4
15.0	142.9	7.9	13.5	-5.5
20.0	120.0	8.9	18.0	-9.1
25.0	103.8	9.6	22.4	-12.8
30.0	91.9	10.2	26.9	-16.7
35.0	82.6	10.7	31.4	-20.7
40.0	75.1	11.1	35.9	-24.8
45.0	69.1	11.5	40.4	-28.9
50.0	64.0	11.9	44.9	-33.0
55.0	59.6	12.2	49.4	-37.2
60.0	55.9	12.4	53.9	-41.4
65.0	52.6	12.7	58.4	-45.7
70.0	49.8	12.9	62.8	-49.9
75.0	47.3	13.1	67.3	-54.2
80.0	45.0	13.3	71.8	-58.5
85.0	43.0	13.5	76.3	-62.8
90.0	41.1	13.7	80.8	-67.1
95.0	39.4	13.9	85.3	-71.4
100.0	37.9	14.1	89.8	-75.7
105.0	36.5	14.2	94.3	-80.1
110.0	35.2	14.4	98.8	-84.4
115.0	34.0	14.5	103.2	-88.7
120.0	32.9	14.6	107.7	-93.1
125.0	31.9	14.8	112.2	-97.5
130.0	30.9	14.9	116.7	-101.8
135.0	30.0	15.0	121.2	-106.2
140.0	29.2	15.1	125.7	-110.6
Design Volume:				**0.0**

AREA A4





Prepared by: Martin Fréchette, E.I.T. Date: 2024-10-22

Verified by: Éric Potvin, P.Eng. Date: 2024-10-22
PEO# 100208490

Init. E.P.

PROJECT NAME: 1649 Montreal Road & 741 Blair Road
Multi-Use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER: A001101
CLIENT: 10869279 Canada Inc.
PROJECT STATUS: Site Servicing and Stormwater Management Report

STORMWATER MANAGEMENT – RETENTION CALCULATIONS

APPLICABLE DESIGN GUIDELINES:

1. City of Ottawa Sewer Design Guidelines, 2012

STORMWATER MANAGEMENT SUMMARY - STORAGE AND DRAWDOWN:

DESIGN CRITERIA:

Rainfall event	5	years
Flows to Cistern	51.4	L/s
Unattenuated Flow (100 year)	8.7	L/s
Allowable Release Rate (66.4 L/s)	60.1	L/s

Sub-Area	Total Area (m^2)	Available Storage Area (m^2)	Catchbasin/ Roof Drain Elevation (m)	Maximum Ponding Elevation (m)	Y_{max} (m)	V_{max} (m^3)	V_{rain} (m^3)	V_{acc} (m^3)	Y_{rain} (m)	$Elev_{rain}$ (m)	A_{rain} (m^2)	Q (L/s)	Cistern Release Rate (L/s)	Drawdown Time (min)	Comments
A1	2310	Refer to note 1	-	-	-	55.0	12.7	12.9	-	-	-	43.9	51.4	-	Building Roof + Cistern
A2.a	245	8.0	98.25	98.30	0.05	0.1	0.4	0.1	-	-	-	4.1		-	Back East
A2.b	1348	Refer to note 2	97.65	98.00	0.35	33.0	33.0	33.0	-	-	-	0.4		-	Back West
A3.a	475	Refer to note 3	97.65	98.00	0.35	17.5	17.5	17.5	-	-	-	0.2		-	Front (Entrance)
A3.b	172	45.0	97.48	97.57	0.09	1.3	1.1	1.1	-	-	-	2.8		-	Front (POPS)
A4	332	0.0	-	-	-	0.0	0.0	0.0	-	-	-	8.7	-	-	Area between Building & Montreal Rd (unattenuated)
Total	**4882**					**107.0**	**64.7**	**64.7**				**60.1**	**51.4**		

NOTES:

1. 12.9 m³ are retained inside building **Cistern (max 55m³)**. No water retained on rooftop.
2. 33 m³ are retained in the **north raingarden.**
3. 17.5 m³ are retained in the **south raingarden.**

DEFINITIONS OF ABBREVIATIONS USED IN CALCULATION TABLE:

NC = Area is not controlled (unattenuated)
Available Area = Area of water accumulated in sub-area at Max. Elev.
Catchbasin Elev. = Elevation of catchbasin inlet (top of grate).
Max. Elev. = Maximum elevation of water that may be accumulated within sub-area.
Y_{max} = Maximum depth of water that may be accumulated within the sub-area.
V_{max} = Maximum volume of water (capacity) that may be accumulated within the sub-area.
V_{rain} = Volume of water generated by rainfall.
V_{acc} = Total volume of water accumulated within the sub-area in the event of a specific rainfall.
Y_{rain} = Depth of water generated by rainfall.
$Elev_{rain}$ = Elevation of water generated by rainfall.
A_{rain} = Area of water generated by rainfall.
Q = Release flow rate.
Tank Release Rate = Release rate from the underground storage tank equal to 1/2 the allowable release rate.
Drawdown Time = Time required for the total volume of water accumulated within sub-area to subside.

Prepared by: Martin Fréchette, E.I.T. Date: 2024-10-22

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CIMA+ PROJECT NUMBER:	A001101
CLIENT:	10869279 Canada Inc.
PROJECT STATUS:	Site Servicing and Stormwater Management Report

RETENTION CALCULATIONS FOR FOR SUB-CATCHMENT AREA A1

APPLICABLE DESIGN GUIDELINES:

1. City of Ottawa Sewer Design Guidelines, 2012

REQUIRED STORAGE VOLUME DETERMINATION:

DESIGN CRITERIA:

Rainfall Station:	City of Ottawa Sewer Design Guidelines, 2012 (Macdonald-Cartier Airport)	
Release Rate Per Unit Area (Q/ha):	189.95	L/s/ha
Area (A):	0.2310	ha
Runoff Coefficient (C):	0.95	
Rainfall Event:	5	year
Release Rate (Q):	0.0439	m³/s
Discharge Factor (K):	1	

Regression Constants	2 year	5 year	10 year	25 year	50 year	100 year
A	732.951	998.071	1174.184	1402.844	1569.58	1735.688
B	6.199	6.053	6.014	6.018	6.014	6.014
C	0.810	0.814	0.816	0.819	0.82	0.82

Required Retention Volume: **12.7 m³**

Rainfall Duration (min) *T* (1)	Rainfall Intensity (mm/h) *I* (2)	Runoff Volume (m³) *CIAT* (3)	Output Volume (m³) *kQT* (4)	Retention Volume (m³) *(3)-(4)* (5)
5.0	**141.2**	**25.8**	**13.2**	**12.7**
10.0	104.2	38.1	26.3	11.8
15.0	83.6	45.8	39.5	6.4
20.0	70.3	51.4	52.7	-1.3
25.0	60.9	55.7	65.8	-10.1
30.0	53.9	59.2	79.0	-19.8
35.0	48.5	62.1	92.1	-30.0
40.0	44.2	64.6	105.3	-40.7
45.0	40.6	66.9	118.5	-51.6
50.0	37.7	68.9	131.6	-62.8
55.0	35.1	70.7	144.8	-74.1
60.0	32.9	72.3	158.0	-85.7
65.0	31.0	73.8	171.1	-97.3
70.0	29.4	75.2	184.3	-109.1
75.0	27.9	76.5	197.4	-120.9
80.0	26.6	77.7	210.6	-132.9
85.0	25.4	78.9	223.8	-144.9
90.0	24.3	80.0	236.9	-157.0
95.0	23.3	81.0	250.1	-169.1
100.0	22.4	82.0	263.3	-181.3
105.0	21.6	82.9	276.4	-193.5
110.0	20.8	83.8	289.6	-205.8
115.0	20.1	84.6	302.8	-218.1
120.0	19.5	85.4	315.9	-230.5
125.0	18.9	86.2	329.1	-242.9
130.0	18.3	87.0	342.2	-255.3
Design Volume:				**12.7**

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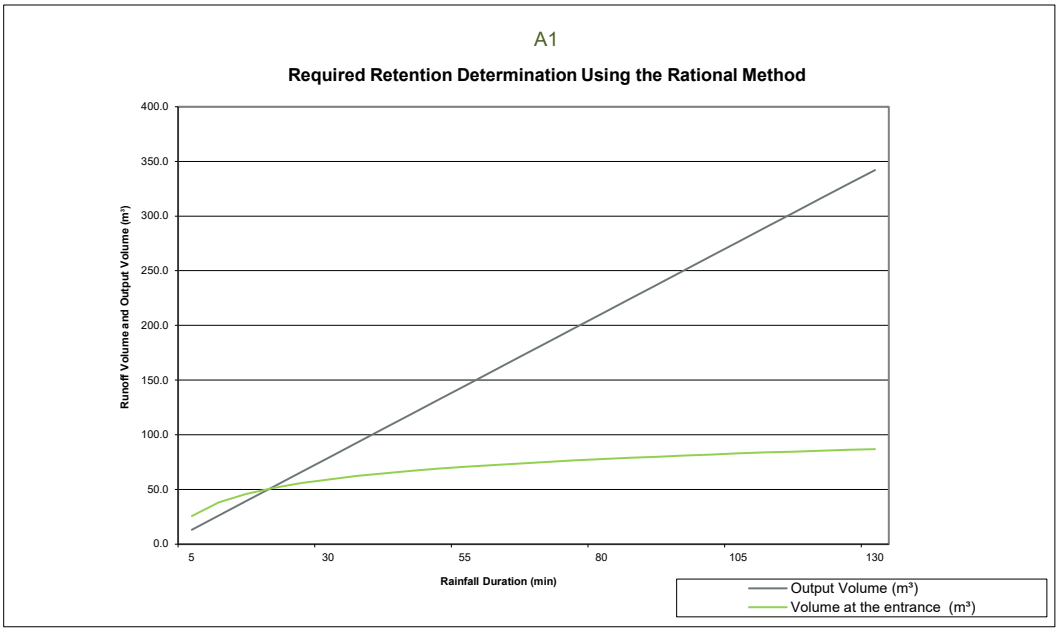
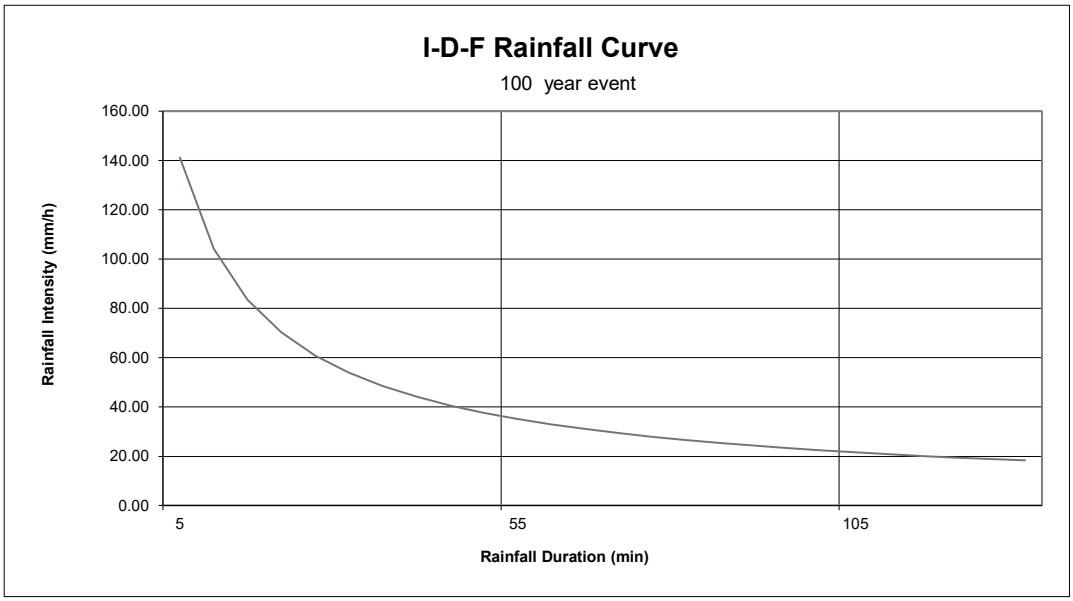




Prepared by: Martin Fréchette, E.I.T. Date: 2024-10-22

Verified by: Éric Potvin, P.Eng. Date: 2024-12-11
PEO# 100208490

Init._____

PROJECT NAME:	1649 Montreal Road & 741 Blair Road Multi-Use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001101
CLIENT:	10869279 Canada Inc.
PROJECT STATUS:	Site Servicing and Stormwater Management Report

RETENTION CALCULATIONS FOR FOR SUB-CATCHMENT AREA A2.a

APPLICABLE DESIGN GUIDELINES:

1. City of Ottawa Sewer Design Guidelines, 2012

REQUIRED STORAGE VOLUME DETERMINATION:

DESIGN CRITERIA:

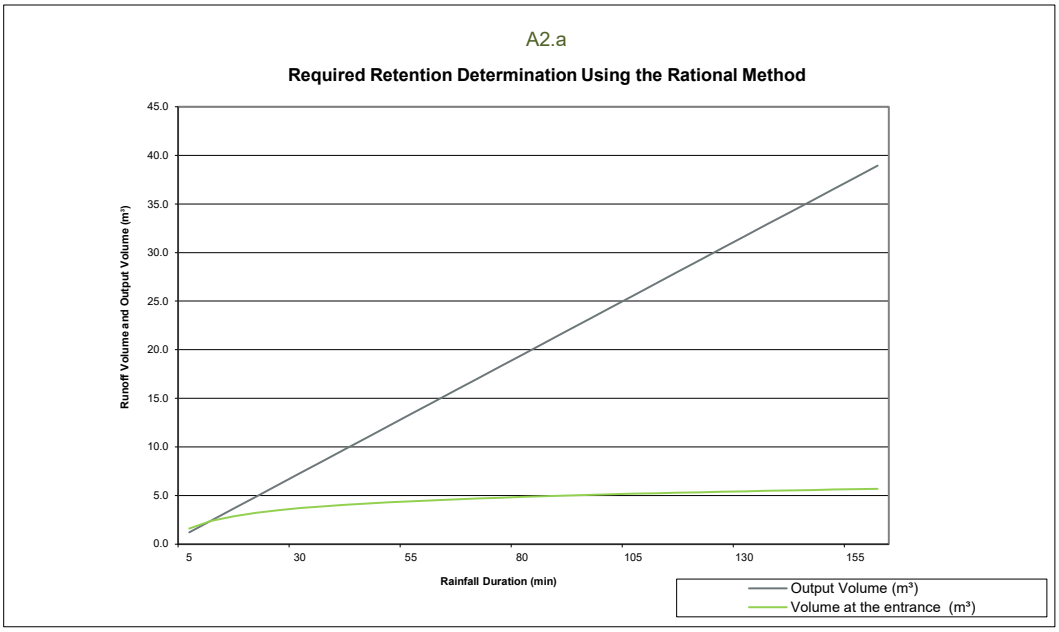
Rainfall Station:	City of Ottawa Sewer Design Guidelines, 2012 (Macdonald-Cartier Airport)	
Release Rate Per Unit Area (Q/ha):	165.63	L/s/ha
Area (A):	0.0245	ha
Runoff Coefficient (C):	0.56	
Rainfall Event:	5	year
Release Rate (Q):	0.0041	m³/s
Discharge Factor (K):	1	

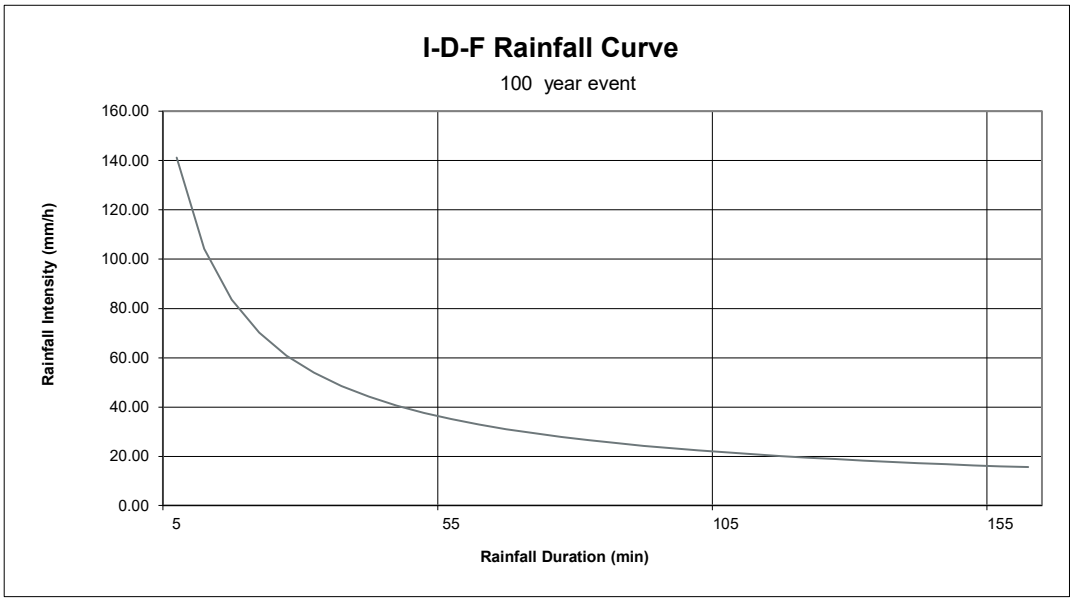
Regression Constants	2 year	5 year	10 year	25 year	50 year	100 year
A	732.951	998.071	1174.184	1402.844	1569.58	1735.688
B	6.199	6.053	6.014	6.018	6.014	6.014
C	0.810	0.814	0.816	0.819	0.82	0.82

Required Retention Volume: **0.4 m³**

Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m³) *CIAT* (3)	**Output Volume** (m³) *kQT* (4)	**Retention Volume** (m³) *(3)-(4)* (5)
5.0	**141.2**	**1.6**	**1.2**	**0.4**
10.0	104.2	2.4	2.4	-0.1
15.0	83.6	2.9	3.7	-0.8
20.0	70.3	3.2	4.9	-1.7
25.0	60.9	3.5	6.1	-2.6
30.0	53.9	3.7	7.3	-3.6
35.0	48.5	3.9	8.5	-4.6
40.0	44.2	4.0	9.7	-5.7
45.0	40.6	4.2	11.0	-6.8
50.0	37.7	4.3	12.2	-7.9
55.0	35.1	4.4	13.4	-9.0
60.0	32.9	4.5	14.6	-10.1
65.0	31.0	4.6	15.8	-11.2
70.0	29.4	4.7	17.0	-12.3
75.0	27.9	4.8	18.3	-13.5
80.0	26.6	4.9	19.5	-14.6
85.0	25.4	4.9	20.7	-15.8
90.0	24.3	5.0	21.9	-16.9
95.0	23.3	5.1	23.1	-18.1
100.0	22.4	5.1	24.3	-19.2
105.0	21.6	5.2	25.6	-20.4
110.0	20.8	5.2	26.8	-21.5
115.0	20.1	5.3	28.0	-22.7
120.0	19.5	5.3	29.2	-23.9
125.0	18.9	5.4	30.4	-25.0
130.0	18.3	5.4	31.7	-26.2
135.0	17.8	5.5	32.9	-27.4
140.0	17.3	5.5	34.1	-28.6
145.0	16.8	5.6	35.3	-29.7
150.0	16.4	5.6	36.5	-30.9
155.0	15.9	5.7	37.7	-32.1
160.0	15.6	5.7	39.0	-33.3
Design Volume:				**0.4**

A2.a





Prepared by: Martin Fréchette, E.I.T. Date: 2024-10-22

Verified by: Éric Potvin, P.Eng. Date: 2024-12-11
PEO# 100208490

Init._____

PROJECT NAME:	1649 Montreal Road & 741 Blair Road Multi-Use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001101
CLIENT:	10869279 Canada Inc.
PROJECT STATUS:	Site Servicing and Stormwater Management Report

RETENTION CALCULATIONS FOR FOR SUB-CATCHMENT AREA A2.b

APPLICABLE DESIGN GUIDELINES:

1. City of Ottawa Sewer Design Guidelines, 2012

REQUIRED STORAGE VOLUME DETERMINATION:

DESIGN CRITERIA:

Rainfall Station:	City of Ottawa Sewer Design Guidelines, 2012 (Macdonald-Cartier Airport)
Release Rate Per Unit Area (Q/ha):	2.97 L/s/ha
Area (A):	0.1348 ha
Runoff Coefficient (C):	0.63
Rainfall Event:	5 year
Release Rate (Q):	0.0004 m³/s
Discharge Factor (K):	1

Regression Constants	2 year	5 year	10 year	25 year	50 year	100 year
A	732.951	998.071	1174.184	1402.844	1569.58	1735.688
B	6.199	6.053	6.014	6.018	6.014	6.014
C	0.810	0.814	0.816	0.819	0.82	0.82

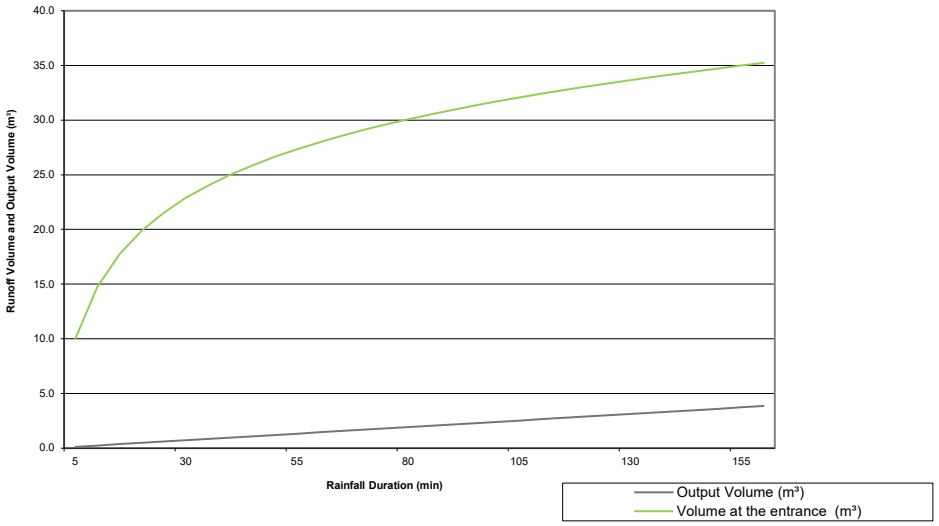
Required Retention Volume: 33.0 m³

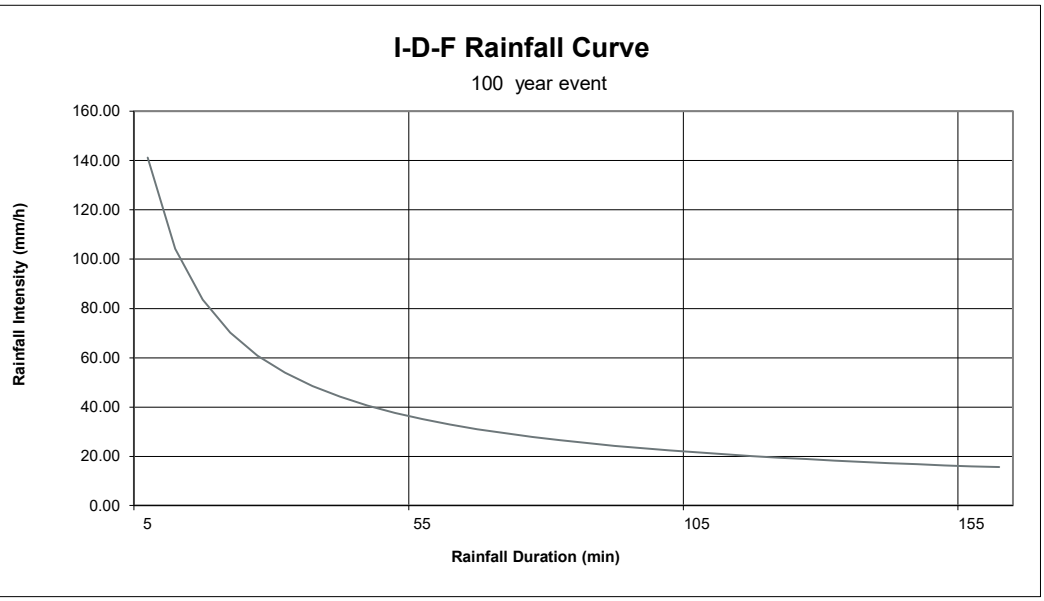
Note: 33m³ volume is retained in the north raingarden before rainwater is evacuated trough the overflow 350mm above ground.

Rainfall Duration (min) *T* (1)	Rainfall Intensity (mm/h) *I* (2)	Runoff Volume (m³) *CIAT* (3)	Output Volume (m³) *kQT* (4)	Retention Volume (m³) *(3)-(4)* (5)
5.0	141.2	10.0	0.1	9.9
10.0	104.2	14.7	0.2	14.5
15.0	83.6	17.7	0.4	17.4
20.0	70.3	19.9	0.5	19.4
25.0	60.9	21.5	0.6	20.9
30.0	53.9	22.9	0.7	22.2
35.0	48.5	24.0	0.8	23.2
40.0	44.2	25.0	1.0	24.1
45.0	40.6	25.9	1.1	24.8
50.0	37.7	26.6	1.2	25.4
55.0	35.1	27.3	1.3	26.0
60.0	32.9	28.0	1.4	26.5
65.0	31.0	28.6	1.6	27.0
70.0	29.4	29.1	1.7	27.4
75.0	27.9	29.6	1.8	27.8
80.0	26.6	30.1	1.9	28.2
85.0	25.4	30.5	2.0	28.5
90.0	24.3	30.9	2.2	28.8
95.0	23.3	31.3	2.3	29.1
100.0	22.4	31.7	2.4	29.3
105.0	21.6	32.1	2.5	29.5
110.0	20.8	32.4	2.6	29.8
115.0	20.1	32.7	2.8	30.0
120.0	19.5	33.1	2.9	30.2
125.0	18.9	33.4	3.0	30.4
130.0	18.3	33.7	3.1	30.5
135.0	17.8	33.9	3.2	30.7
140.0	17.3	34.2	3.4	30.9
145.0	16.8	34.5	3.5	31.0
150.0	16.4	34.7	3.6	31.1
155.0	15.9	35.0	3.7	31.3
160.0	15.6	35.2	3.8	31.4
Design Volume:				**33.0**

A2.b

Required Retention Determination Using the Rational Method





Prepared by: Martin Fréchette, E.I.T. Date: 2024-10-22

Verified by: Éric Potvin, P.Eng. Date: 2024-12-11
PEO# 100208490

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PROJECT NAME:	1649 Montreal Road & 741 Blair Road Multi-Use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001101
CLIENT:	10869279 Canada Inc.
PROJECT STATUS:	Site Servicing and Stormwater Management Report

RETENTION CALCULATIONS FOR FOR SUB-CATCHMENT AREA A3.a

APPLICABLE DESIGN GUIDELINES:

1. City of Ottawa Sewer Design Guidelines, 2012

REQUIRED STORAGE VOLUME DETERMINATION:

DESIGN CRITERIA:

Rainfall Station:	City of Ottawa Sewer Design Guidelines, 2012 (Macdonald-Cartier Airport)
Release Rate Per Unit Area (Q/ha):	4.52 L/s/ha
Area (A):	0.0475 ha
Runoff Coefficient (C):	0.95
Rainfall Event:	5 year
Release Rate (Q):	0.0002 m³/s
Discharge Factor (K):	1

Regression Constants	2 year	5 year	10 year	25 year	50 year	100 year
A	732.951	998.071	1174.184	1402.844	1569.58	1735.688
B	6.199	6.053	6.014	6.018	6.014	6.014
C	0.810	0.814	0.816	0.819	0.82	0.82

Required Retention Volume: 17.5 m³

Note: 17.5m³ volume is retained in the south raingarden before rainwater is evacuated trough the overflow 350mm above ground.

Rainfall Duration (min) *T* (1)	Rainfall Intensity (mm/h) *I* (2)	Runoff Volume (m³) *CIAT* (3)	Output Volume (m³) *kQT* (4)	Retention Volume (m³) *(3)-(4)* (5)
5.0	141.2	5.3	0.1	5.2
10.0	104.2	7.8	0.1	7.7
15.0	83.6	9.4	0.2	9.2
20.0	70.3	10.6	0.3	10.3
25.0	60.9	11.4	0.3	11.1
30.0	53.9	12.2	0.4	11.8
35.0	48.5	12.8	0.5	12.3
40.0	44.2	13.3	0.5	12.8
45.0	40.6	13.8	0.6	13.2
50.0	37.7	14.2	0.6	13.5
55.0	35.1	14.5	0.7	13.8
60.0	32.9	14.9	0.8	14.1
65.0	31.0	15.2	0.8	14.3
70.0	29.4	15.5	0.9	14.6
75.0	27.9	15.7	1.0	14.8
80.0	26.6	16.0	1.0	15.0
85.0	25.4	16.2	1.1	15.1
90.0	24.3	16.4	1.2	15.3
95.0	23.3	16.7	1.2	15.4
100.0	22.4	16.9	1.3	15.6
105.0	21.6	17.0	1.4	15.7
110.0	20.8	17.2	1.4	15.8
115.0	20.1	17.4	1.5	15.9
120.0	19.5	17.6	1.5	16.0
125.0	18.9	17.7	1.6	16.1
130.0	18.3	17.9	1.7	16.2
135.0	17.8	18.0	1.7	16.3
140.0	17.3	18.2	1.8	16.4
145.0	16.8	18.3	1.9	16.5
150.0	16.4	18.5	1.9	16.5
Design Volume:				**17.5**

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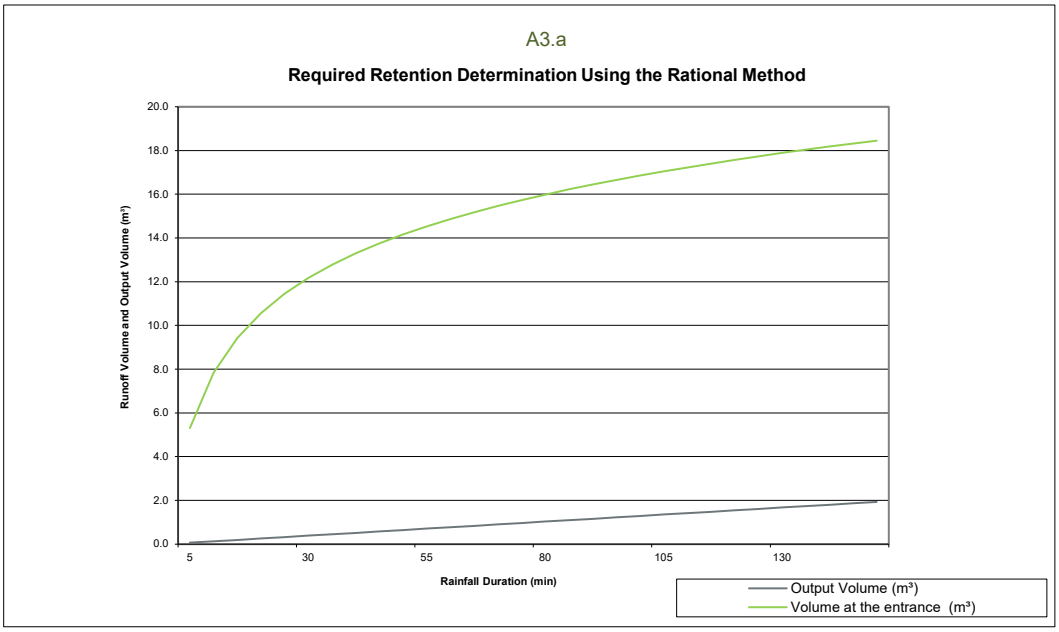
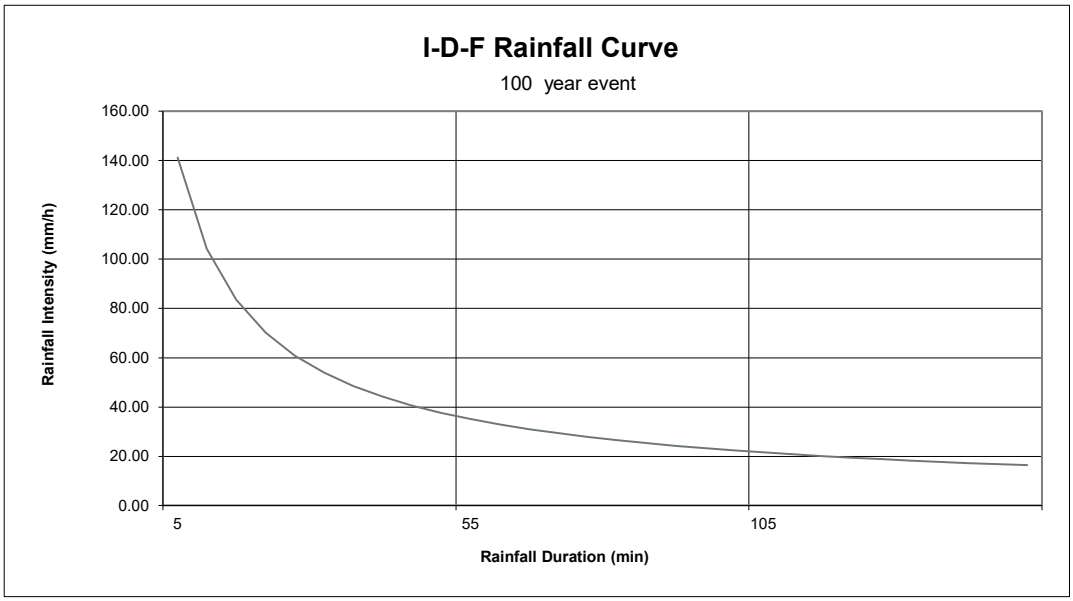
A3.a





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CIMA+ PROJECT NUMBER:	A001101
CLIENT:	10869279 Canada Inc.
PROJECT STATUS:	Site Servicing and Stormwater Management Report

RETENTION CALCULATIONS FOR FOR SUB-CATCHMENT AREA A3.b

APPLICABLE DESIGN GUIDELINES:

1. City of Ottawa Sewer Design Guidelines, 2012

REQUIRED STORAGE VOLUME DETERMINATION:

DESIGN CRITERIA:

Rainfall Station:	City of Ottawa Sewer Design Guidelines, 2012 (Macdonald-Cartier Airport)
Release Rate Per Unit Area (Q/ha):	165.63 L/s/ha
Area (A):	0.0172 ha
Runoff Coefficient (C):	0.95
Rainfall Event:	5 year
Release Rate (Q):	0.0028 m³/s
Discharge Factor (K):	1

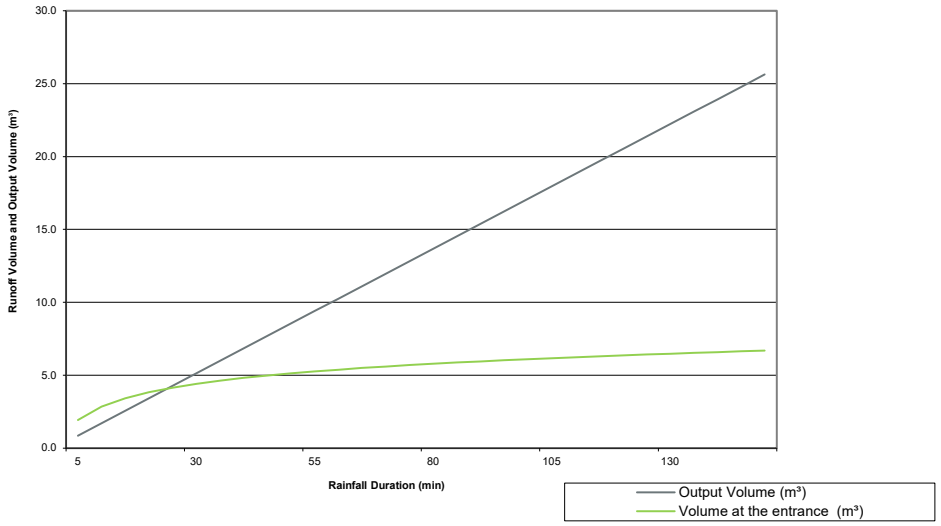
Regression Constants	2 year	5 year	10 year	25 year	50 year	100 year
A	732.951	998.071	1174.184	1402.844	1569.58	1735.688
B	6.199	6.053	6.014	6.018	6.014	6.014
C	0.810	0.814	0.816	0.819	0.82	0.82

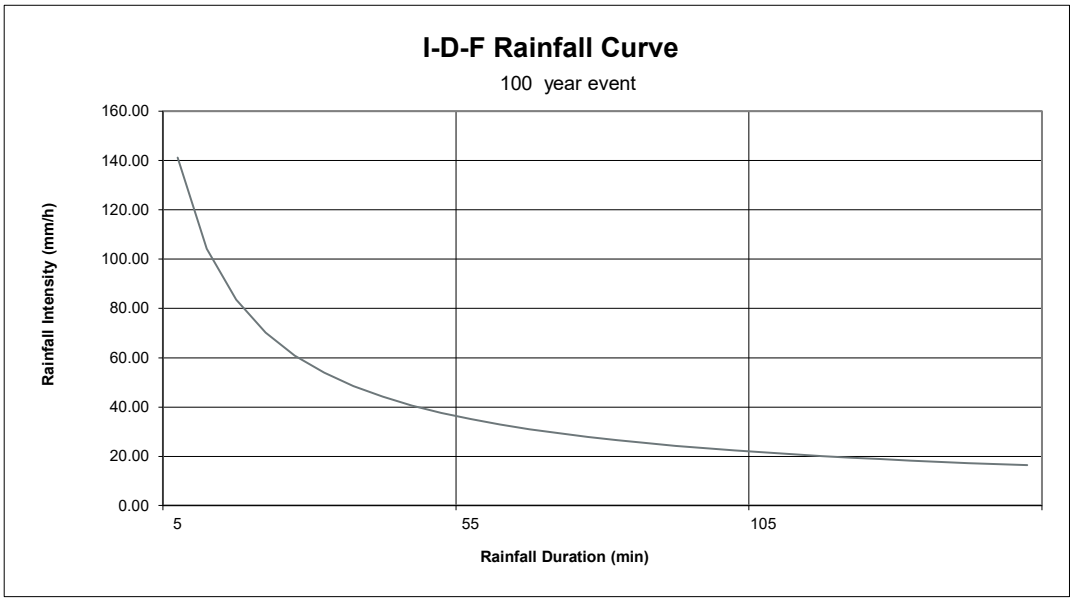
Required Retention Volume: 1.1 m³

Rainfall Duration (min) *T* (1)	Rainfall Intensity (mm/h) *I* (2)	Runoff Volume (m³) *CIAT* (3)	Output Volume (m³) *kQT* (4)	Retention Volume (m³) *(3)-(4)* (5)
5.0	141.2	1.9	0.9	1.1
10.0	**104.2**	**2.8**	**1.7**	**1.1**
15.0	83.6	3.4	2.6	0.8
20.0	70.3	3.8	3.4	0.4
25.0	60.9	4.1	4.3	-0.1
30.0	53.9	4.4	5.1	-0.7
35.0	48.5	4.6	6.0	-1.4
40.0	44.2	4.8	6.8	-2.0
45.0	40.6	5.0	7.7	-2.7
50.0	37.7	5.1	8.5	-3.4
55.0	35.1	5.3	9.4	-4.1
60.0	32.9	5.4	10.3	-4.9
65.0	31.0	5.5	11.1	-5.6
70.0	29.4	5.6	12.0	-6.4
75.0	27.9	5.7	12.8	-7.1
80.0	26.6	5.8	13.7	-7.9
85.0	25.4	5.9	14.5	-8.7
90.0	24.3	6.0	15.4	-9.4
95.0	23.3	6.0	16.2	-10.2
100.0	22.4	6.1	17.1	-11.0
105.0	21.6	6.2	17.9	-11.8
110.0	20.8	6.2	18.8	-12.6
115.0	20.1	6.3	19.7	-13.4
120.0	19.5	6.4	20.5	-14.1
125.0	18.9	6.4	21.4	-14.9
130.0	18.3	6.5	22.2	-15.7
135.0	17.8	6.5	23.1	-16.5
140.0	17.3	6.6	23.9	-17.3
145.0	16.8	6.6	24.8	-18.2
150.0	16.4	6.7	25.6	-19.0
Design Volume:				**1.1**

A3.b

Required Retention Determination Using the Rational Method





Prepared by: Martin Fréchette, E.I.T. Date: 2024-10-22

Verified by: Éric Potvin, P.Eng. Date: 2024-12-11
PEO# 100208490

Init._____

PROJECT NAME:	1649 Montreal Road & 741 Blair Road Multi-Use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001101
CLIENT:	10869279 Canada Inc.
PROJECT STATUS:	Site Servicing and Stormwater Management Report

RETENTION CALCULATIONS FOR FOR SUB-CATCHMENT AREA A4

APPLICABLE DESIGN GUIDELINES:

1. City of Ottawa Sewer Design Guidelines, 2012

REQUIRED STORAGE VOLUME DETERMINATION:

DESIGN CRITERIA:

Rainfall Station:	City of Ottawa Sewer Design Guidelines, 2012 (Macdonald-Cartier Airport)
Release Rate Per Unit Area (Q/ha):	261.74 L/s/ha
Area (A):	0.0332 ha
Runoff Coefficient (C):	0.67
Rainfall Event:	5 year
Release Rate (Q):	0.0087 m³/s
Discharge Factor (K):	1

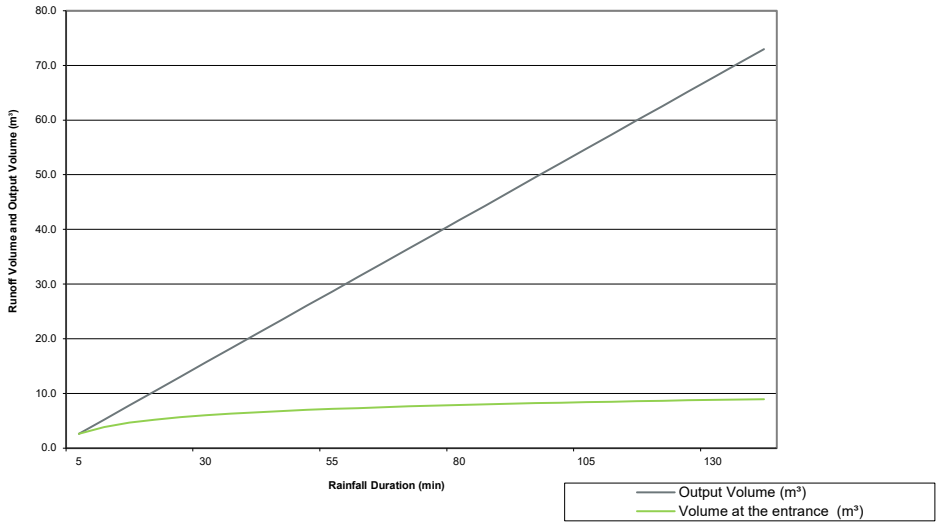
Regression Constants	2 year	5 year	10 year	25 year	50 year	100 year
A	732.951	998.071	1174.184	1402.844	1569.58	1735.688
B	6.199	6.053	6.014	6.018	6.014	6.014
C	0.810	0.814	0.816	0.819	0.82	0.82

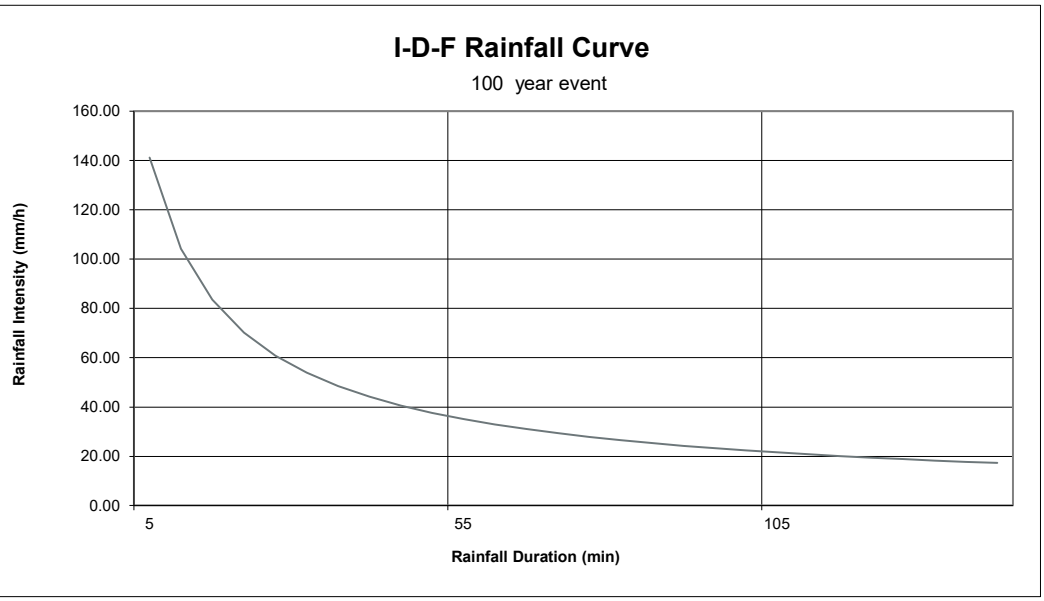
Required Retention Volume: 0.01 m³

Rainfall Duration (min) *T* (1)	Rainfall Intensity (mm/h) *I* (2)	Runoff Volume (m³) *CIAT* (3)	Output Volume (m³) *kQT* (4)	Retention Volume (m³) *(3)-(4)* (5)
5.0	**141.2**	**2.6**	**2.6**	**0.0**
10.0	104.2	3.9	5.2	-1.4
15.0	83.6	4.6	7.8	-3.2
20.0	70.3	5.2	10.4	-5.2
25.0	60.9	5.6	13.0	-7.4
30.0	53.9	6.0	15.6	-9.6
35.0	48.5	6.3	18.2	-12.0
40.0	44.2	6.6	20.9	-14.3
45.0	40.6	6.8	23.5	-16.7
50.0	37.7	7.0	26.1	-19.1
55.0	35.1	7.2	28.7	-21.5
60.0	32.9	7.3	31.3	-24.0
65.0	31.0	7.5	33.9	-26.4
70.0	29.4	7.6	36.5	-28.9
75.0	27.9	7.8	39.1	-31.4
80.0	26.6	7.9	41.7	-33.8
85.0	25.4	8.0	44.3	-36.3
90.0	24.3	8.1	46.9	-38.8
95.0	23.3	8.2	49.5	-41.3
100.0	22.4	8.3	52.1	-43.8
105.0	21.6	8.4	54.7	-46.3
110.0	20.8	8.5	57.4	-48.9
115.0	20.1	8.6	60.0	-51.4
120.0	19.5	8.7	62.6	-53.9
125.0	18.9	8.7	65.2	-56.4
130.0	18.3	8.8	67.8	-59.0
135.0	17.8	8.9	70.4	-61.5
140.0	17.3	9.0	73.0	-64.0
Design Volume:				**0.0**

A4

Required Retention Determination Using the Rational Method





Prepared by: Martin Fréchette, E.I.T. Date: 2024-10-22

Verified by: Éric Potvin, P.Eng. Date: 2024-12-11
PEO# 100208490

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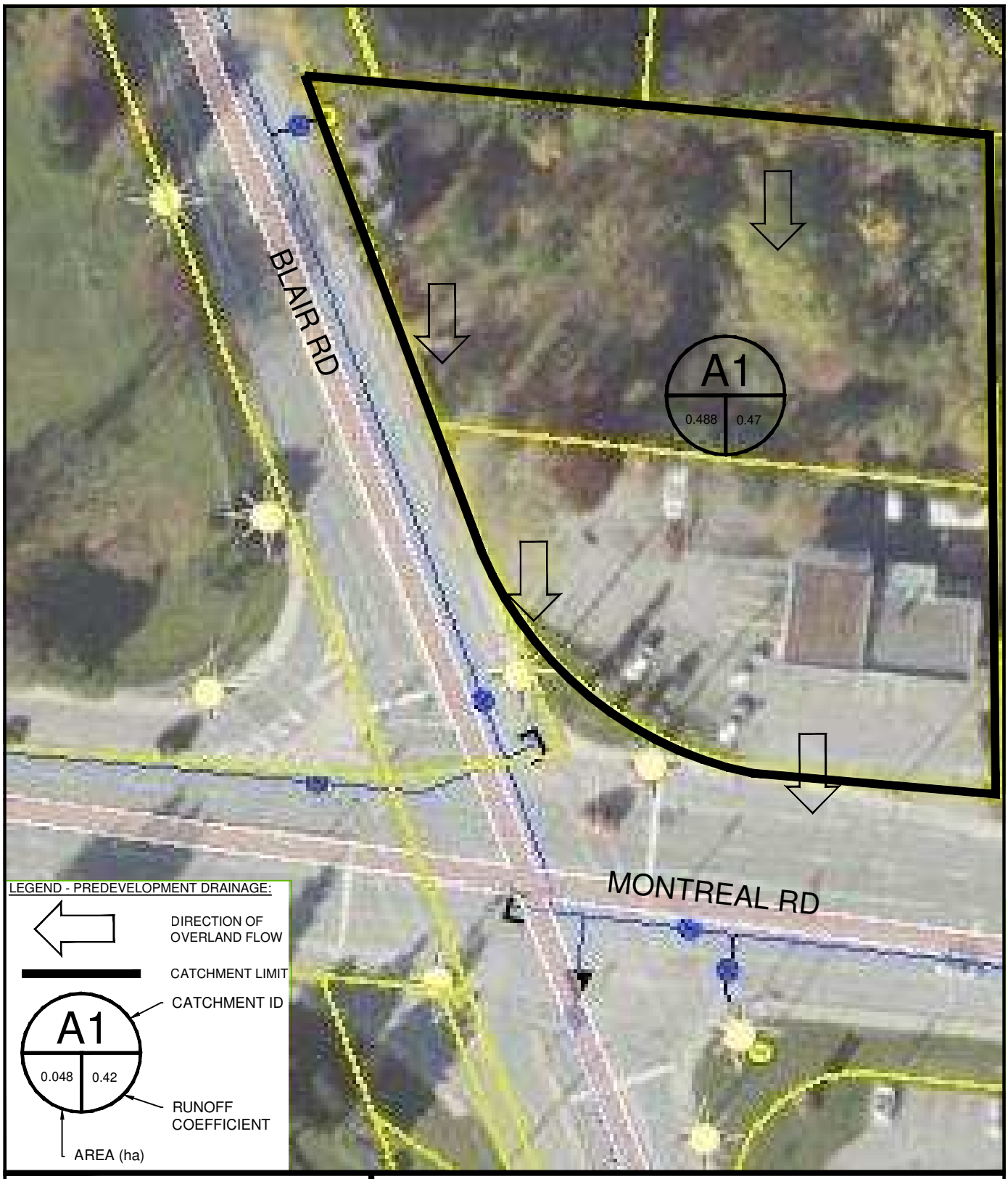


T: 613-580-2424
110-240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

PRE-DEVELOPMENT DRAINAGE AREAS

DRAWN BY:	DESIGNED BY:	APPROVED BY:	SCALE:	DATE:	PROJECT No:	SHEET No:	FIGURE No:
J. Adams	----	C. Lavoie-Lebel	NTS	2021/04/06	A001101	1 of 1	EXIST - 2

G

Appendix G
Geotechnical Report (by Paterson Group Inc.)

PATERSON GROUP

Geotechnical Investigation

Proposed Multi-Storey Building

1649 Montreal Road and 741 Blair Road
Ottawa, Ontario

Prepared for 10869279 Canada Inc.

Report PG5663-1 Revision 2 dated May 17, 2023

Table of Contents

PAGE

Appendices

1.0 Introduction

Paterson Group (Paterson) was commissioned by 10869279 Canada Inc. to conduct a geotechnical investigation for the proposed high-rise building to be located at 1649 Montreal Road and 741 Blair Road, in the City of Ottawa (refer to Figure 1 - Key Plan presented in Appendix 2).

The objective of the investigation was 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 which may affect the design.

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

Investigating the presence or potential presence of contamination on the proposed development was not part of the scope of work.

2.0 Proposed Development

It is understood based on available information that the proposed development will consist of a twenty-six storey building constructed over an underground parking structure with up to 5 levels, occupying the majority of the subject site. Associated access lanes and landscaped areas are also anticipated for the proposed development. It is further understood that the proposed development will be municipally serviced.

3.0 Method of Investigation

3.1 Field Investigation

Field Program

The field program for the current geotechnical investigation was conducted from April 11 to 20, 2023, and consisted of five (5) boreholes advanced to a maximum depth of 21.2 m below the existing ground surface. Furthermore, a previous investigation was carried out on October 15 and 16, 2020. At that time, seven (7) boreholes were completed across the subject site extending to a maximum depth of 6.5 m below the ground surface. The test hole locations were placed in a manner to provide general coverage of the subject site. The test hole locations are illustrated on Drawing PG5663-1 - Test Hole Location Plan presented in Appendix 2.

The boreholes were completed using a low-clearance auger drill rig operated by a two-person crew. All fieldwork was conducted under the full-time supervision of Paterson personnel under the direction of a senior engineer from the geotechnical division. The testing procedure consisted of augering to the required depths at the selected locations and sampling the overburden.

Sampling and In Situ Testing

Soil samples were collected from the boreholes using two different techniques, namely, sampled directly from the auger flights (AU) or collected using a 50 mm diameter split spoon (SS) sampler. The bedrock was cored to assess the bedrock quality. All samples were visually inspected and initially classified on site. The auger and split-spoon samples were placed in sealed plastic bags, and rock cores (RC) were placed in cardboard boxes. All samples were transported to our laboratory for further examination and classification. The depths at which the auger, split spoon and rock core samples were recovered from the boreholes are shown as AU, SS and RC, respectively, on the Soil Profile and Test Data sheets presented in Appendix 1. Photographs of the rock core are presented in Appendix 1.

The Standard Penetration Tests (SPT) were conducted in conjunction with the recovery of the split-spoon samples. The SPT results are recorded as “N” values on the Soil Profile and Test Data sheets. The “N” value is the number of blows required to drive the split-spoon sampler 300 mm into the soil after a 150 mm initial penetration using a 63.5 kg hammer falling from a height of 760 mm.

The subsurface conditions observed at the test hole locations were recorded in detail in the field. The soil profiles are presented on the Soil Profile and Test Data sheets in Appendix 1 of this report.

Groundwater

Monitoring wells were installed at eight (8) borehole locations during the 2020 and 2023 investigations to permit monitoring of the groundwater levels subsequent to the completion of the sampling programs. The groundwater level readings were obtained after suitable stabilization periods subsequent to the completion of the field investigations.

Monitoring Well Installation

Typical monitoring well construction details are described below:

- ❑ 3.0 m of slotted 51 mm diameter PVC screen at base the base of the boreholes.
- ❑ 51 mm diameter PVC riser pipe from the top of the screen to the ground surface.
- ❑ No.3 silica sand backfill within annular space around screen.
- ❑ 300 mm thick bentonite hole plug directly above PVC slotted screen.
- ❑ Clean backfill from top of bentonite plug to the ground surface.

Refer to the Soil Profile and Test Data sheets in Appendix 1 for specific well construction details.

3.2 Field Survey

The test holes were located in the field by Paterson personnel using a GPS unit, and the ground surface elevation at the test hole locations from the current investigation were referenced to a geodetic datum. The ground surface elevation and location of the test holes are presented on Drawing PG5663-1 - Test Hole Location Plan in Appendix 2.

3.3 Laboratory Testing

The soil samples recovered from the field investigation were examined in our laboratory to review field notes and soil samples. All samples will be stored in the laboratory for a period of one month after issuance of the report. They will then be discarded unless we are otherwise directed.

4.0 Observations

4.1 Surface Conditions

At the present time, an automotive repair shop and an associated parking lot occupy the south portion of the subject site. An abandoned residential dwelling is present on the north-west portion of the site with an associated driveway and landscaped area. The north-east portion of the subject site is occupied by mature trees. The majority of the ground surface across the subject site is relatively flat at an approximate geodetic elevation of 98 m. The site is at grade with surrounding roadways and developments.

A section of outcropping bedrock is present on the north-east corner of the site which slopes up towards the north-east to an approximate elevation of 104 m.

The site is bound by residential dwellings and landscaped areas to the north, a one-storey church to the east, Montreal Road to the south, and Blair Road to the west.

4.2 Subsurface Profile

Overburden

Generally, the soil conditions encountered at the majority of the test hole locations consisted of a concrete slab/asphaltic concrete layer followed by fill overlying a compact glacial till layer. The fill material consisted of brown silty sand with crushed stone and/or silty clay. Silty clay, sandy silt, or silty sand were occasionally encountered below the fill. At the north-west corner of the site silty clay was encountered directly below a thin topsoil layer.

Bedrock

Bedrock was encountered at cored borehole locations at depths ranging from 0.7 to 5.7 m below the existing ground surface. Generally, the bedrock throughout the majority of the subject site was generally observed to consist of a very poor to fair quality limestone with shale interbeds at some locations. The bedrock quality overall improved to a poor to good or excellent quality near the north-east portion of the site.

Based on available geological mapping, the bedrock in this area mostly consists of interbedded limestone and dolomite of the Gull River formation with an overburden drift thickness of 1 to 5 m depth.

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.

4.3 Groundwater

Groundwater levels (GWL) were measured in the piezometers and monitoring wells, and the results are presented in Table 1. It should be noted that surface water can become perched within a backfilled borehole, which can lead to higher than normal groundwater level readings. The long-term groundwater level can also be estimated based on moisture levels and colour of the recovered soil samples. Based on these observations, the long-term groundwater table is expected to be located below the bedrock surface. It should be noted that groundwater levels are subject to seasonal fluctuations. Therefore, the groundwater levels could vary at the time of construction.

Table 1 - Summary of Groundwater Level Readings

Borehole Number	Ground Surface Elevation (m)	Groundwater Level (m)	Groundwater Elevation (m)	Recording Date
BH 1-23	97.78	1.43	96.35	May 2, 2023
BH 2-23	98.04	0.66	97.38	
BH 3-23	98.32	1.17	97.15	
BH 4-23	98.16	1.43	96.73	
BH 5-23	97.68	17.76	79.92	
BH 1	97.76	2.42	95.34	October 19, 2020
BH 2	97.48	2.59	94.89	
BH 3	97.66	2.31	95.35	
BH 6	97.92	1.35	96.57	
BH 7	97.98	1.81	96.17	October 21, 2020

5.0 Discussion

5.1 Geotechnical Assessment

The subject site is considered satisfactory, from a geotechnical perspective, for the proposed development. Due to the varying quality of the bedrock encountered throughout the subject site at the anticipated underside of footing level, the bedrock quality at the site has been separated into two zones, Zone 1 – Very Poor to Fair Quality Bedrock, and Zone 2 – Good or Excellent Quality Bedrock. Reference should be made to Drawing PG5663-2 – Bedrock Quality Zone Plan in Appendix 2. Paterson recommends a sub-excavation below design footing level within Zone 1 due to the presence of poor quality bedrock at footing level. A minimum 300 mm concrete slab should be placed over the fractured bedrock up to design footing level. It is anticipated that the north-east portion of the proposed high-rise building will be founded on shallow footings placed on a clean, surface sounded bedrock at the location of Zone 2.

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

5.2 Site Grading and Preparation

Stripping Depth

Due to the depth of the bedrock at the subject site and the anticipated founding level for the proposed high-rise building, it is anticipated that all existing overburden material will be excavated from within the footprint of the proposed multi-storey building.

Bedrock Removal

It is expected that line-drilling in conjunction with hoe-ramming, rock grinding and controlled blasting will be required to remove the bedrock for the underground parking levels. In areas of weathered bedrock and where only a small quantity of bedrock is to be removed, bedrock removal may be possible by 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 the proximity of the blasting operations should be carried out 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 or claims related to the blasting operations.

As a general guideline, peak particle velocities (measured at the structures) should not exceed the below noted vibration limits during the blasting program to reduce the risks of damage to the existing surrounding 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 carried out using near vertical sidewalls. A minimum 1 m horizontal ledge should be left between the bottom of the overburden excavation and the top of the bedrock surface to provide an area to allow for potential sloughing. The 1 m horizontal ledge set back can be eliminated with a shoring program which has drilled piles extending below the proposed founding elevation.

Fill Placement

Excavated limestone bedrock could be used as select subgrade material around the proposed building footings, provided the excavated bedrock is suitably crushed to 50 mm in its longest dimension and approved by the geotechnical consultant at the time of placement. Alternatively, an engineered fill such as an OPSS Granular A or Granular B Type II compacted to 98% of its SPMDD could be placed around the proposed footings.

Bedrock Excavation Face Reinforcement

Due to the bedrock quality encountered at the site, horizontal rock anchors and chain link fencing connected to the excavation face will be required at specific locations to prevent bedrock pop-outs, especially in areas where bedrock fractures are conducive to the failure of the bedrock surface. It is expected that Zone 1, as indicated on Drawing PG5663-2 in Appendix 2 will require a large number of rock anchors to be installed for bedrock stabilization purposes due to the poor quality of bedrock encountered. The requirements for bedrock stabilization measures will be evaluated during the excavation operations.

Vibration Considerations

Construction operations could cause 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 a cooperative environment with the residents.

Two parameters determine the recommended vibration limit, 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 recommended by the regulations, the peak particle velocity should be less than 20 mm/s below 40 Hz, and 50 mm/s above a frequency of 40 Hz. These regulations are for both infrastructure (pipelines) as in addition to buildings. A pre-construction survey is recommended to minimize the risks of claims during or following the construction of the proposed building.

5.2.1 Vibration Monitoring and Control Plan

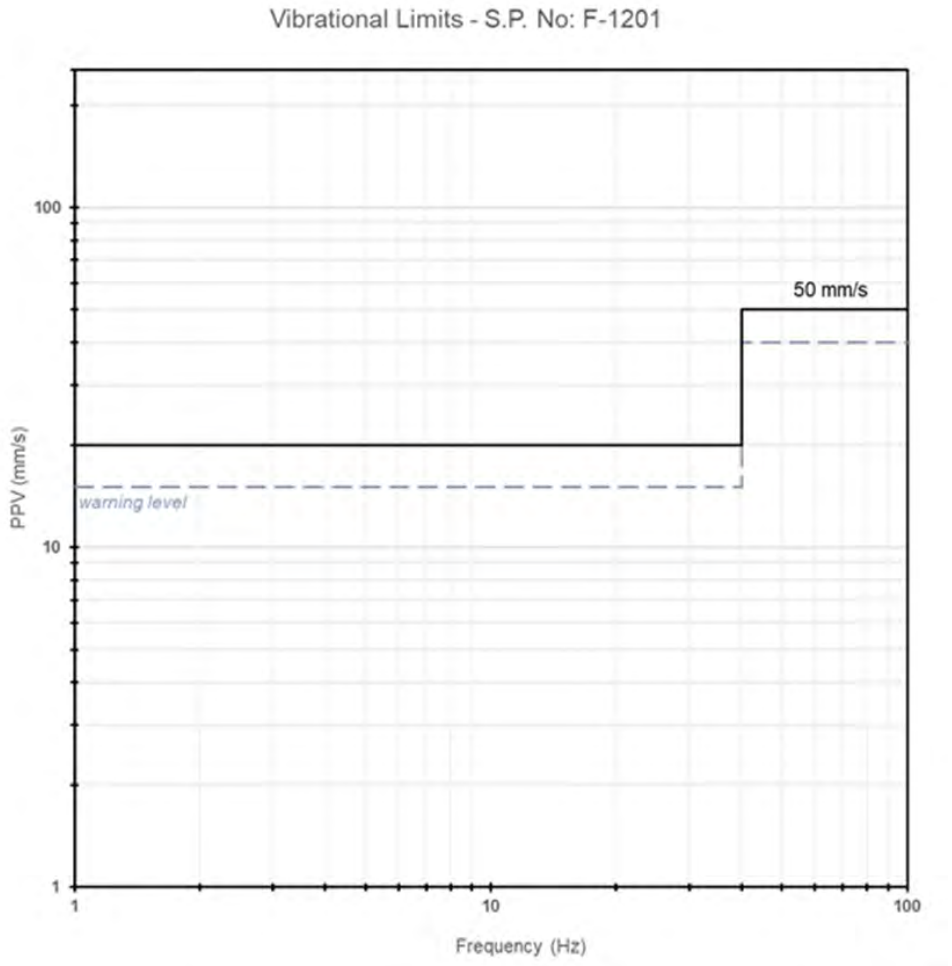
A monitoring instrumentation remote exchange network (MIREN) set up by Paterson, will provide real-time results of vibrations to the blasting consultant, construction team and Paterson for immediate review. Following each recorded event, an email will be sent out containing the following:

- ❑ A breakdown of the vibration event including the PPV, dominant frequency, and zero cross frequency in each direction (transverse, vertical, longitudinal).
- ❑ The monitor serial, calibration date, and the location of the monitor recording the event.
- ❑ A statement indicating if the vibration is either within the agreed upon limits or in exceedance.
- ❑ A PDF attachment containing the full waveforms and FFT report.

For warning or exceedance level events, the procedures described below will be followed.

Proposed Vibration Limits

The excavation operations should be planned and conducted under the supervision of a licensed professional engineer. The vibration limits for the associated infrastructure, outlined in the figure below, are 20 mm/s for frequencies below 40 Hz, and 50 mm/s for frequencies 40 Hz and higher. The warning level limits are 10 mm/s for frequencies below 40 Hz, and 40 mm/s for frequencies 40 Hz and higher.



Monitoring Data

The monitoring protocol should include the following information:

Warning Level Event

- ❑ Review the waveforms of the event to determine the cause of the event and confirm monitor function.
- ❑ Paterson will notify the contractor if any vibrations occur due to construction activities and are close to exceedance level.
- ❑ A site visit may be required to confirm the monitor placement, source of exceedance, provide mitigation recommendations and/or to review the field conditions.

Exceedance Level Event

- ❑ Review the waveforms of the event to determine the cause of the event and confirm monitor function.
- ❑ Paterson will notify the blasting contractor of the exceedance.

- ❑ A site visit may be required to confirm the monitor placement, source of exceedance, provide mitigation recommendations and/or to review the field conditions.
- ❑ An exceedance report will be created and issued.

Incident/Exceedance Reporting

In case an incident/exceedance occurs from construction activities, the Senior Project Management and any relevant personnel should be notified immediately. A report should be completed which contains the following:

- ❑ Identify the location of the vibration exceedance,
- ❑ The date, time and nature of the exceedance/incident,
- ❑ Purpose of the exceeded monitor and current vibration criteria,
- ❑ Identify the likely cause of the exceedance/incident,
- ❑ Describe the initial response action that has been completed to date,
- ❑ Describe the proposed measures to address the exceedance/incident and provide an immediate action plan and prevention measures to eliminate the cause of the exceeded vibrations(s) during future work.

5.3 Foundation Design

Bearing Resistance Values

Due to the varying quality of the bedrock encountered throughout the subject site at the anticipated underside of footing elevation, the bedrock quality at the site has been separated into two zones, Zone 1 – Very Poor to Fair Quality Bedrock, and Zone 2 – Good or Excellent Quality Bedrock. Reference should be made to drawing PG5663-2 – Bedrock Quality Zone Plan in Appendix 2. The following outlines recommendations for each bedrock quality zone.

Zone 1 – Very Poor to Fair Quality Bedrock

Due to the highly fractured bedrock encountered at Zone 1 of the site, it is recommended that a minimum 300 mm thick minimum 25 MPa (28-day compressive strength) concrete slab extending at least 1 m horizontally beyond the footing face be placed over the fractured bedrock surface prior to the placement of the footings. The bedrock surface should be cleaned of any loose fragments prior to the placement of the concrete raft slab. The concrete raft slab should be continuous across the entirety of Zone 1 and effort should be made at the time of placement of the raft slab to infill any surficial fractures and/or voids with concrete.

Therefore, the bedrock must be sub-excavated a minimum depth of 300 mm below the proposed underside of footing elevation to allow space for the placement of the raft slab at Zone 1.

Footings placed on a concrete raft slab placed over a clean, fractured bedrock surface at the proposed founding elevation can be designed using a factored bearing resistance value at ultimate limit states (ULS) of **3,000 kPa** incorporating a geotechnical resistance factor of 0.5 was applied to the bearing resistance value at ULS. The modulus of subgrade reaction was calculated to be **500 MPa/m** for a contact pressure of **3,000 kPa**.

For a foundation placed on a concrete raft slab placed on fractured bedrock, the total and differential settlement are expected to be negligible.

Zone 2 –Good or Excellent Quality Bedrock

At the location of Zone 2, footings may be placed directly over a clean, surface sounded bedrock bearing surface, provided that the bedrock is free of seams, fractures, and voids within 1.5 m below the founding level. This could be verified by completing and probing 50 mm diameter drill holes to a depth of 1.5 m below the founding level within the footing footprint(s) or assessing the bedrock profile at depth.

Footings placed on a clean, surface sounded bedrock surface free of any seams, fractures or voids within 1.5 m of the founding level may be designed using a factored bearing resistance value of **3,000 kPa (ULS)** incorporating a geotechnical resistance factor of 0.5.

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.

For a foundation placed on a bedrock bearing surface, the total and differential settlement are expected to be negligible.

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 sound bedrock bearing medium when a plane extending down and out from the bottom edge of the footing at a minimum of 1H:6V (or flatter) passes only through sound bedrock or a material of the same or higher capacity as the bedrock, such as concrete. A weathered or highly fractured bedrock bearing medium will require a lateral support zone of 1H:1V (or flatter).

5.4 Design for Earthquakes

Seismic shear wave velocity testing was completed for the subject site to accurately determine the applicable seismic site classification for the proposed building in accordance with Table 4.1.8.4.A of the Ontario Building Code 2012. The shear wave velocity testing was completed by Paterson personnel. The results of the shear wave velocity test are provided in Figures 2 and 3, which are presented in Appendix 2 of this report.

Field Program

The seismic array testing location was placed as presented in Drawing PG5663-1 - Test Hole Location Plan, attached to the present report. Paterson field personnel placed 18 horizontal 2.4 Hz. geophones mounted to the surface by means of two 75 mm ground spikes attached to the geophone land case. The geophones were spaced at 1 m intervals and connected by a geophone spread cable to a Geode 24 Channel seismograph.

The seismograph was also connected to a computer laptop and a hammer trigger switch attached to a 12-pound dead blow hammer. The hammer trigger switch sends a start signal to the seismograph. The hammer is used to strike an I-Beam seated into the ground surface, which creates a polarized shear wave. The hammer shots are repeated between four (4) to eight (8) times at each shot location to improve signal to noise ratio. The shot locations were 15, 1.5 and 1.0 m away from the first and last geophone and at the centre of the seismic array.

Data Processing and Interpretation

Interpretation for the shear wave velocity results were completed by Paterson personnel. Shear wave velocity measurement was made using reflection/refraction methods. The interpretation is performed by recovering arrival times from direct and refracted waves.

The interpretation is repeated at each shot location to provide an average shear wave velocity, V_{s30}, of the upper 30 m profile, immediately below the foundation of the building. The layer intercept times, velocities from different layers and critical distances are interpreted from the shear wave records to compute the bedrock depth at each location.

The bedrock velocity was interpreted using the main refractor wave velocity, which is considered a conservative estimate of the bedrock velocity due to the increasing quality of the bedrock with depth. It should be noted that as bedrock quality increases, the bedrock shear wave velocity also increases.

Based on the results of the shear wave velocity testing, the average shear wave velocity, V_{s30}, for the proposed building is **2,033 m/s** provided the footings are placed directly on bedrock. The V_{s30} was calculated using the standard equation for average shear wave velocity provided in the OBC 2012 and as presented below:

$$V_{s30} = \frac{Depth_{of\ interest}(m)}{\left(\frac{Depth_{Layer1}(m)}{V_{S_{Layer1}}(m/s)} + \frac{Depth_{Layer2}(m)}{V_{S_{Layer2}}(m/s)}\right)}$$

$$V_{s30=} \frac{30\ m}{\left(\frac{30\ m}{2{,}033\ m/s}\right)}$$

$$V_{s30=} 2{,}033\ m/s$$

Based on the results of the shear wave velocity testing, the average shear wave velocity V_{s30}, is 2,033 m/s. Therefore, a **Site Class A** is applicable for the design of proposed building bearing on bedrock, as per Table 4.1.8.4.A of the OBC 2012. The soils underlying the subject site are not susceptible to liquefaction.

5.5 Basement Slab

The basement floor slab at the final underground level will be placed over a minimum 200 mm thick layer OPSS Granular A crushed stone followed by Granular B Type II to the top of the bedrock subgrade. The sub-floor granular material within the footprint of the building will be placed in maximum 300 mm thick lifts and compacted to at least 98% of the material's SPMDD.

An underfloor drainage system is required between the finished floor and the underlying bedrock subgrade to direct water infiltration to the building sump pit.

5.6 Basement Wall

It is understood that the basement walls are to be poured against a composite drainage system, which will be placed against the exposed bedrock face. A nominal coefficient for at-rest earth pressure of 0.05 is recommended in conjunction with a bulk unit weight of 24.5 kN/m^3 (effective 15.5 kN/m^3). A seismic earth pressure component will not be applicable for the foundation wall, which is to be poured against the bedrock face.

Where soil is to be retained, the conditions can be well-represented by assuming the retained soil consists of a material with an angle of internal friction of 30 degrees and a bulk (drained) unit weight of 20 kN/m^3. Undrained conditions are anticipated (i.e. below the groundwater level). Therefore, the applicable effective (undrained) unit weight of the retained soil can be taken as 13 kN/m^3, where applicable. A hydrostatic pressure should be added to the total static earth pressure when using the effective unit weight.

Two (2) distinct conditions, static and seismic, must be reviewed for design calculations. The parameters for design calculations for the two (2) conditions are presented below.

Static Conditions

The static horizontal earth pressure (P_o) can be calculated using a triangular earth pressure distribution equal to $K_o \cdot \gamma \cdot H$ where:

K_o = at-rest earth pressure coefficient of the applicable retained soil, 0.5

γ = unit weight of fill of the applicable retained soil (kN/m^3)

H = height of the wall (m)

An additional pressure having a magnitude equal to $K_o \cdot q$ and acting on the entire height of the wall should be added to the above diagram for any surcharge loading, q (kPa), that may be placed at ground surface adjacent to the wall. The surcharge pressure will only be applicable for static analyses and should not be used in conjunction with the seismic loading case.

Actual earth pressures could be higher than the “at-rest” case if care is not exercised during the compaction of the backfill materials to maintain a minimum separation of 0.3 m from the walls with the compaction equipment.

Seismic Conditions

The total seismic force (P_{AE}) includes both the earth force component (P_o) and the seismic component (ΔP_{AE}).

The seismic earth force (ΔP_{AE}) can be calculated using $0.375 \cdot a_c \cdot \gamma \cdot H^2/g$ where:

a_c = $(1.45-a_{max}/g)a_{max}$

γ = unit weight of fill of the applicable retained soil (kN/m^3)

H = height of the wall (m)

g = gravity, 9.81 m/s^2

The peak ground acceleration, (a_{max}), for the Ottawa (City Hall) area is 0.281 g according to OBC 2012 (R2019). Note that the vertical seismic coefficient is assumed to be zero.

The earth force component (P_o) under seismic conditions can be calculated using $P_o = 0.5\ K_o\ \gamma\ H^2$, where $K_o = 0.5$ for the soil conditions noted above.

The total earth force (P_{AE}) is considered to act at a height, h (m), from the base of the wall, where:

$h = \{P_o \cdot (H/3) + \Delta P_{AE} \cdot (0.6 \cdot H)\}/P_{AE}$

The earth forces calculated are unfactored. For the ULS case, the earth loads should be factored as live loads, as per OBC 2012.

5.7 Rock Anchor Design

The geotechnical design of grouted rock anchors in sedimentary bedrock is based upon two possible failure modes. The anchor can fail either by shear failure along the grout/rock interface or by pullout of a 60 to 90 degree cone of rock with the apex of the cone near the middle of the bonded length of the anchor. It should be noted that interaction may develop between the failure cones of anchors that are relatively close to one another resulting in a total group capacity smaller than the sum of the load capacity of each anchor taken individually.

A third failure mode of shear failure along the grout/steel interface should also be reviewed by a qualified structural engineer to ensure all typical failure modes have been reviewed. Typical rock anchor suppliers, such as Dywidag Systems International (DSI Canada), have qualified personnel on staff to recommend appropriate rock anchor size and materials.

It should be further noted that centre to centre spacing between bond lengths be at least four (4) times the anchor hole diameter and greater than 1.2 m to lower the group influence effects. It is also recommended that anchors in close proximity to each other be grouted at the same time to ensure any fractures or voids are completely in-filled and that fluid grout does not flow from one hole to an adjacent empty one.

Anchors can be of the “passive” or the “post-tensioned” type, depending on whether the anchor tendon is provided with post-tensioned load or not prior to being put into service.

Regardless of whether an anchor is of the passive or the post tensioned type, it is recommended that the anchor be provided with a bonded length, or fixed anchor length, at the base of the anchor, which will provide the anchor capacity, as well an unbonded length, or free anchor length, between the rock surface and the start of the bonded length. As the depth at which the apex of the shear failure cone develops is midway along the bonded length, a fully bonded anchor would tend to have a much shallower cone, and therefore less geotechnical resistance, than one where the bonded length is limited to the bottom part of the overall anchor.

Permanent anchors should be provided with corrosion protection. As a minimum, this requires that the entire drill hole be filled with cementitious grout. The free anchor length is provided by installing a plastic sleeve to act as a bond break.

Grout to Rock Bond

Generally, the unconfined compressive strength of limestone ranges between 60 and 120 MPa, which is stronger than most routine grouts. A factored tensile grout to rock bond resistance value at ULS of **1.0 MPa**, incorporating a resistance factor of 0.3, can be used. A minimum grout strength of 40 MPa is recommended.

Rock Cone Uplift

As discussed previously, the geotechnical capacity of the rock anchors depends on the dimensions of the rock anchors and the configuration of the anchorage system. Based on existing subsoils information, a **Rock Mass Rating (RMR) of 65** was assigned to the bedrock, and Hoek and Brown parameters (**m and s**) were taken as **0.575 and 0.00293**, respectively.

Recommended Rock Anchor Lengths

Rock anchor lengths can be designed based on the required loads. Rock anchor lengths for some typical loads have been calculated and are presented in Table 2. Load specified rock anchor lengths can be provided, if required.

For our calculations the following parameters were used.

Table 2 - Parameters used in Rock Anchor Review	
Grout to Rock Bond Strength - Factored at ULS	1.0 MPa
Compressive Strength - Grout	40 MPa
Rock Mass Rating (RMR) - Good quality Limestone Hoek and Brown parameters	65 m=0.575 and s=0.00293
Unconfined compressive strength - Limestone bedrock	60 MPa
Unit weight - Submerged Bedrock	15 kN/m^3
Apex angle of failure cone	60^o
Apex of failure cone	mid-point of fixed anchor length

From a geotechnical perspective, the fixed anchor length will depend on the diameter of the drill holes. Recommended anchor lengths for a 75 and 125 mm diameter hole are provided in Table 3.

Table 3 - Recommended Rock Anchor Lengths - Grouted Rock Anchor

Diameter of Drill Hole (mm)	Anchor Lengths (m)			Factored Tensile Resistance (kN)
	Bonded Length	Unbonded Length	Total Length	
75	1.2	0.6	1.8	250
	1.9	1.0	2.9	500
	3	1.5	4.5	1000
125	1.1	0.5	1.6	250
	1.5	0.9	2.4	500
	2.6	1.0	3.6	1000

It is recommended that the anchor drill hole diameter be within 1.5 to 2 times the rock anchor tendon diameter and the anchor drill holes be inspected by geotechnical personnel and should be flushed clean prior to grouting. The use of a grout tube to place grout from the bottom up in the anchor holes is further recommended.

The geotechnical capacity of each rock anchor should be proof tested at the time of construction. More information on testing can be provided upon request. Compressive strength testing is recommended to be completed for the rock anchor grout. A set of grout cubes should be tested for each day grout is prepared.

6.0 Design and Construction Precautions

6.1 Foundation Drainage and Backfill

Foundation Drainage and Waterproofing

It is anticipated that the building foundation walls will be placed in close proximity to the site boundaries. It is expected that the foundation wall will be blind side poured against a foundation drainage and waterproofing system fastened against the temporary shoring system and bedrock face.

A waterproofing membrane, such as a granular bentonite sheeting, will be required to lessen the effect of water infiltration. The waterproofing membrane can be placed and fastened to the shoring system and should extend from 3 m below finished grade to the bottom of the excavation at the founding level of the perimeter footings. The waterproofing should be extended a minimum of 600 mm below the underside of the perimeter footings.

It is recommended that a composite drainage blanket, such as Delta Drain 6000 or equivalent, extend from the exterior finished grade to the founding elevation. The purpose of the composite drainage system is to direct any water infiltration resulting from a breach of the waterproofing membrane to the building sump pit(s). It is recommended that 150 mm diameter sleeves at 3 m centres be cast in the foundation wall at the perimeter footing interface to allow water infiltration into to an interior perimeter and underfloor drainage system. The perimeter and underfloor drainage system should direct water to sump pit(s) within the lower basement area.

It should be noted that due to the poor-quality bedrock and bedrock seams and voids encountered throughout the subject site, preparation of the bedrock substrate surface prior to application of the waterproofing membrane will be required. This may include the application of shotcrete, infilling of voids with concrete, and bedrock griding. Recommendations will be made at the time of excavation when the bedrock is exposed and can be better assessed.

Underfloor Drainage

Underfloor drainage will be required to control water infiltration below the lowest level floor slab. For design purposes, it is recommended that 150 mm diameter perforated, corrugated pipes be placed along the interior perimeter of the foundation wall and one drainage line within each bay. The spacing of the underfloor drainage system should be confirmed at the time of construction when water infiltration can be better assessed.

Foundation Backfill

Where space is available for conventional wall construction, 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, should be used for this purpose.

6.2 Protection Against Frost Action

Perimeter footings of heated structures are required to be insulated against the deleterious effect of frost action. A minimum 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.

6.3 Excavation Side Slopes

Unsupported Side Slopes

The side slopes of excavations in the soil and fill overburden materials should either be excavated at acceptable slopes or should be retained by shoring systems from the beginning of the excavation until the structure is backfilled. Insufficient room is expected for the majority of the excavation to be constructed by open-cut methods (i.e. unsupported excavations).

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 soils are considered to be a 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 be kept away 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 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 remain open for extended periods of time.

Temporary Shoring

It is anticipated that temporary shoring is required to complete the required excavation where insufficient room is available for open cut methods. The shoring requirements designed by a structural engineer specializing in those works will depend on the depth of the excavation, the proximity of the adjacent structures and the elevation of the adjacent building foundations and underground services. The design and implementation of these temporary systems will be the responsibility of the excavation contractor and their design team. Inspections and approval of the temporary system will also be the responsibility of the designer. Geotechnical information provided below is to assist the designer in completing a suitable and safe shoring system. The designer should take into account the impact of a significant precipitation event and designate design measures to ensure that a precipitation event will not negatively impact the shoring system or soils supported by the system. Any changes to the approved shoring design system should be reported immediately to the owner's structural designer prior to implementation.

The temporary system could consist of soldier pile and lagging system or interlocking steel sheet piling. Any additional loading due to street traffic, construction equipment, adjacent structures and facilities, etc., should be included to the earth pressures described below. These systems could be cantilevered, anchored or braced. Generally, it is expected that the shoring systems will be provided with tie-back rock anchors to ensure their stability. The shoring system is recommended to be adequately supported to resist toe failure and inspected to ensure that the sheet piles extend well below the excavation base. It should be noted if consideration is being given to utilizing a raker style support for the shoring system that lateral movements can occur and the structural engineer should ensure that the design selected minimizes these movements to tolerable levels.

The earth pressures acting on the temporary shoring system may be calculated with the following parameters.

Table 4 - Soil Parameters for Shoring System Design

Parameters	Values
Active Earth Pressure Coefficient (K_a)	0.33
Passive Earth Pressure Coefficient (K_p)	3
At-Rest Earth Pressure Coefficient (K_o)	0.5
Unit Weight (γ), kN/m^3	20
Submerged Unit Weight (γ), kN/m^3	13

The active earth pressure should be calculated where wall movements are permissible while the at-rest pressure should be calculated if no movement is permissible. The dry unit weight should be calculated above the groundwater level while the effective unit weight should be calculated below the groundwater level.

The hydrostatic groundwater pressure should be included to the earth pressure distribution wherever the effective unit weight are calculated for earth pressures. If the groundwater level is lowered, the dry unit weight for the soil/bedrock should be calculated full weight, with no hydrostatic groundwater pressure component.

For design purposes, the minimum factor of safety of 1.5 should be calculated.

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. The material should be placed in maximum 300 mm thick lifts and compacted to a minimum of 99% of the SPMDD. The bedding material should extend at least 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 at least 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 the SPMDD.

Generally, it should be possible to re-use the site material above the cover material if the excavation and backfilling operations are completed in dry weather conditions.

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 match 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 95% of the SPMDD.

6.5 Groundwater Control

Groundwater Control for Building Construction

Due to the highly fractured bedrock encountered at the site, it is anticipated that groundwater infiltration into the excavation may be higher than expected. Pumps should be appropriately sized to handle the expected groundwater influx.

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) Category 3 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.

Long-term Groundwater Control

Our recommendations for the proposed building's long-term groundwater control are presented in Subsection 6.1. Any groundwater which breaches the building's perimeter groundwater infiltration control system will be directed to the proposed building's sump pit. Provided the proposed groundwater infiltration control system is properly implemented and approved by the geotechnical consultant at the time of construction, it is expected that groundwater flow will be low to negligible (less than 20,000 L/day).

Impacts on Neighboring Structures

It is understood that at up to five levels of underground parking are planned for the proposed building. Based on the existing groundwater level and considering that the proposed building will be surrounded by a waterproofing membrane, long-term groundwater lowering will be minimal and will take place within a limited range of the proposed building. Based on the proximity of neighboring buildings and the minimal zone impacted by the groundwater lowering, the proposed development will not negatively impact the neighbouring structures. It should be noted that no issues are expected with respect to groundwater lowering that would cause long term damage to adjacent structures surrounding the proposed building.

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. In the event of construction during below zero temperatures, the founding stratum should be protected from freezing temperatures by the use of straw, propane heaters and tarpaulins or other suitable means. In this regard, the base of the excavations 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 also difficult activities to complete during freezing conditions without introducing frost in the subgrade or in the excavation walls and bottoms. Precautions should be taken if such activities are to be carried out during freezing conditions. Additional information could be provided, if required.

Shotcrete Application in Winter Conditions

It is recommended that the application of shotcrete to the excavated bedrock sidewalls as a bedrock stabilization and/or substrate surface preparation measure be avoided during winter conditions. The application of shotcrete during winter conditions can result in ice formation on the bedrock excavation sidewalls, resulting in delamination of the shotcrete which could present a safety hazard. If winter construction is considered, alternate recommendations for bedrock stabilization and substrate surface preparation can be made at the time of construction.

7.0 Recommendations

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

- ❑ Observation of all bearing surfaces prior to the placement of concrete.
- ❑ Inspection of the foundation waterproofing and all foundation drainage systems.
- ❑ Sampling and testing of the concrete and fill materials placed.
- ❑ 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.

A report confirming that these works have been conducted in general accordance with Paterson's recommendations could be issued upon request, following the completion of a satisfactory material testing and observation program by the geotechnical consultant.

8.0 Statement of Limitations

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

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

The present report applies only to the project described in this document. Use of this report for purposes other than those described herein or by person(s) other than 10869279 Canada Inc. or their agent(s) is not authorized without review by Paterson Group for the applicability of our recommendations to the altered use of the report.

Paterson Group Inc.

Nicole R.L. Patey, B.Eng.

David J. Gilbert, P.Eng.

APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

PHOTOGRAPHS OF ROCK CORE

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9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
1649 Montreal Road and 741 Blair Road
Ottawa, Ontario

DATUM Geodetic

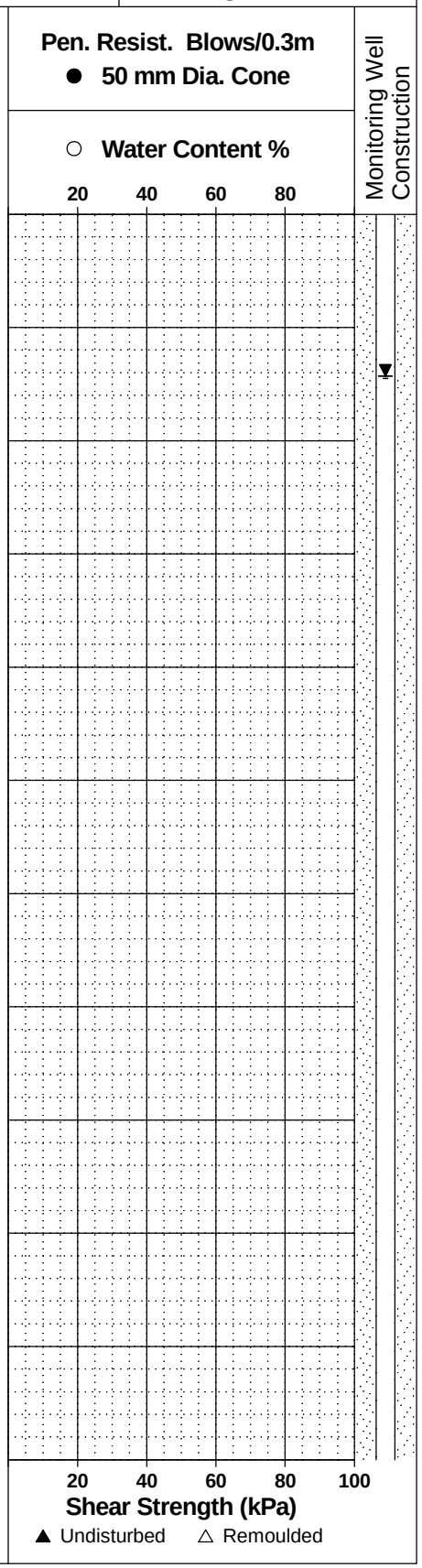
REMARKS

BORINGS BY CME-55 Low Clearance Drill **DATE** April 11, 2023

FILE NO. PG5663

HOLE NO. BH 1-23

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	97.78
Asphaltic concrete 0.15							
FILL: Crushed stone 0.46		AU	1				
FILL: Brown silty sand, some organics, trace gravel 1.21		SS	2	50	6	1	96.78
Compact to dense, brown **SILTY SAND,** trace clay and gravel 2.26		SS	3	67	50+	2	95.78
		RC	1	100	82	3	94.78
BEDROCK: Very poor to fair quality, grey limestone							
- crystallized calcite at 3.3, 3.9, 6.15, 7.4, 7.6, 9.3, 9.6, 9.75, 10.7, 11.2, 11.5, 12.4, 12.8 and 16.4m depths		RC	2	100	72	4	93.78
		RC	3	100	47	5	92.78
		RC	4	100	59	6	91.78
		RC	5	93	46	7	90.78
		RC	6	89	68	8	89.78
						9	88.78
						10	87.78
						11	86.78



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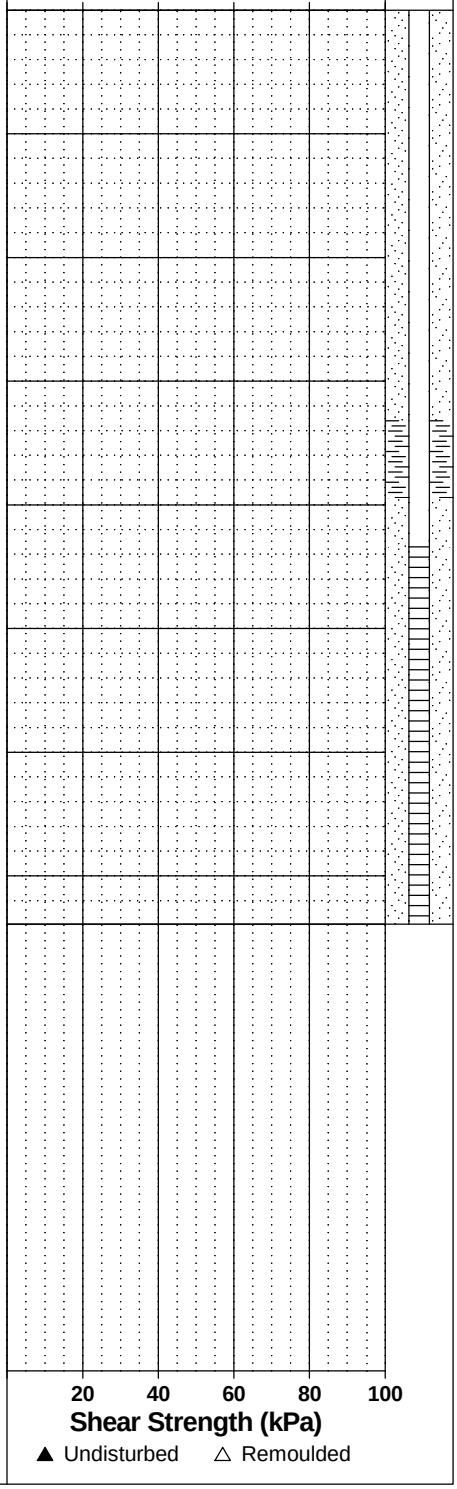
HOLE NO. BH 1-23

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 %	Monitoring Well Construction
GROUND SURFACE									
		RC	7	100	56	11	86.78		
						12	85.78		
		RC	8	93	56	13	84.78		
						14	83.78		
BEDROCK: Poor to fair quality, grey limestone		RC	9	100	14	15	82.78		
		RC	10	100	59	16	81.78		
						17	80.78		
		RC	11	100	53	18	79.78		
18.39									
End of Borehole									
(GWL @ 1.43m - May 2, 2023)									



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FILE NO. PG5663

HOLE NO. BH 2-23

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
Ground Surface						0	98.04
TOPSOIL 0.15		AU	1				
Hard, brown **SILTY CLAY,** some sand		SS	2	67	8	1	97.04
- trace gravel by 1.8m depth		SS	3	75	17	2	96.04
2.51		SS	4	83	50+		
		RC	1	100	62	3	95.04
		RC	2	100	76	4	94.04
		RC	3	100	73	5	93.04
BEDROCK: Poor to good quality, grey limestone						6	92.04
- crystallized calcite at 8.3m depth							
- vertical black shale fracture from 8.3 to 9.9m depth		RC	4	100	71	7	91.04
- 40mm thick mud seam at 12.7m depth						8	90.04
- vertical fracture from 15.2 to 15.4m depth		RC	5	100	59	9	89.04
		RC	6	100	42	10	88.04
						11	87.04

Pen. Resist. Blows/0.3m
● **50 mm Dia. Cone**
○ **Water Content %**

20 40 60 80

Piezometer Construction

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

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FILE NO. PG5663

HOLE NO. BH 2-23

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
Ground Surface							
		RC	7	100	93	11	87.04
						12	86.04
		RC	8	100	85	13	85.04
BEDROCK: Poor to good quality, grey limestone		RC	9	85	47	14	84.04
						15	83.04
		RC	10	80	37	16	82.04
						17	81.04
		RC	11	98	41	18	80.04
18.16							
End of Borehole							
(GWL @ 0.66m - May 2, 2023)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Water Content %

20 40 60 80

Piezometer Construction

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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REMARKS

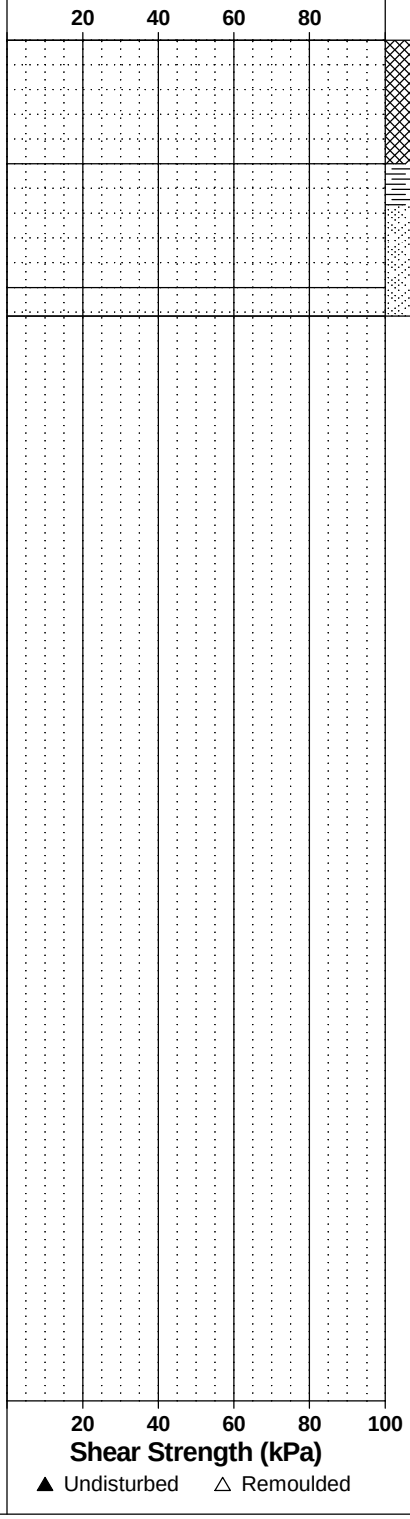
BORINGS BY CME-55 Low Clearance Drill **DATE** April 12, 2023

FILE NO. PG5663

HOLE NO. BH 3-23

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
Ground Surface						0	98.32
FILL: Brown silty sand with crushed stone and gravel, occasional cobbles		AU	1				
0.23							
FILL; Brown silty sand, trace clay, occasional cobbles		SS	2	71	3	1	97.32
1.45							
GLACIAL TILL: Dense, brown silty sand to sandy silt with gravel, cobbles and boulders		SS	3	79	34	2	96.32
2.23							
End of Borehole							
Practical refusal to augering at 2.23m depth							
(GWL @ 1.17m - May 2, 2023)							

Pen. Resist. Blows/0.3m
● **50 mm Dia. Cone**
○ **Water Content %**



Piezometer Construction

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SOIL PROFILE AND TEST DATA

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DATUM Geodetic

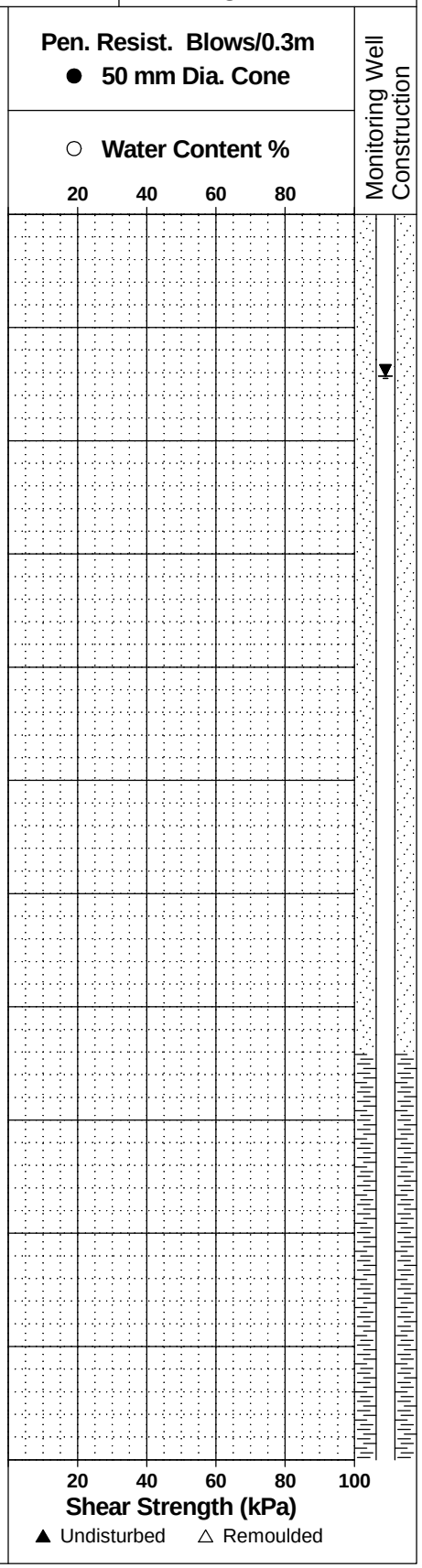
REMARKS

BORINGS BY CME-55 Low Clearance Drill **DATE** April 13, 2023

FILE NO. PG5663

HOLE NO. BH 4-23

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	98.16
TOPSOIL 0.30		AU	1				
Loose to compact, brown **SILTY SAND,** trace gravel 0.66						1	97.16
		RC	1	100	26		
BEDROCK: Poor to excellent quality, grey limestone						2	96.16
		RC	2	100	59		
- crystallized calcite at 2.4m depth						3	95.16
- vertical fracture from 9.9 to 10.4m depth.		RC	3	100	73	4	94.16
- vertical fracture with crystallized calcite from 13.6 to 13.8m depth						5	93.16
- 25mm thick mud seam at 15.4m depth		RC	4	100	64	6	92.16
		RC	5	100	90	7	91.16
		RC	6	100	97	8	90.16
		RC	7	100	85	9	89.16
						10	88.16
						11	87.16



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FILE NO. PG5663

HOLE NO. BH 4-23

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 %	Monitoring Well Construction
GROUND SURFACE								20 40 60 80	
		RC	8	100	86	11	87.16		
						12	86.16		
		RC	9	100	88	13	85.16		
BEDROCK: Good to excellent quality, grey limestone						14	84.16		
		RC	10	100	100	15	83.16		
		RC	11	100	83	16	82.16		
16.64									
End of Borehole									
(GWL @ 1.43m - May 2, 2023)									

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

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
1649 Montreal Road and 741 Blair Road
Ottawa, Ontario

DATUM Geodetic

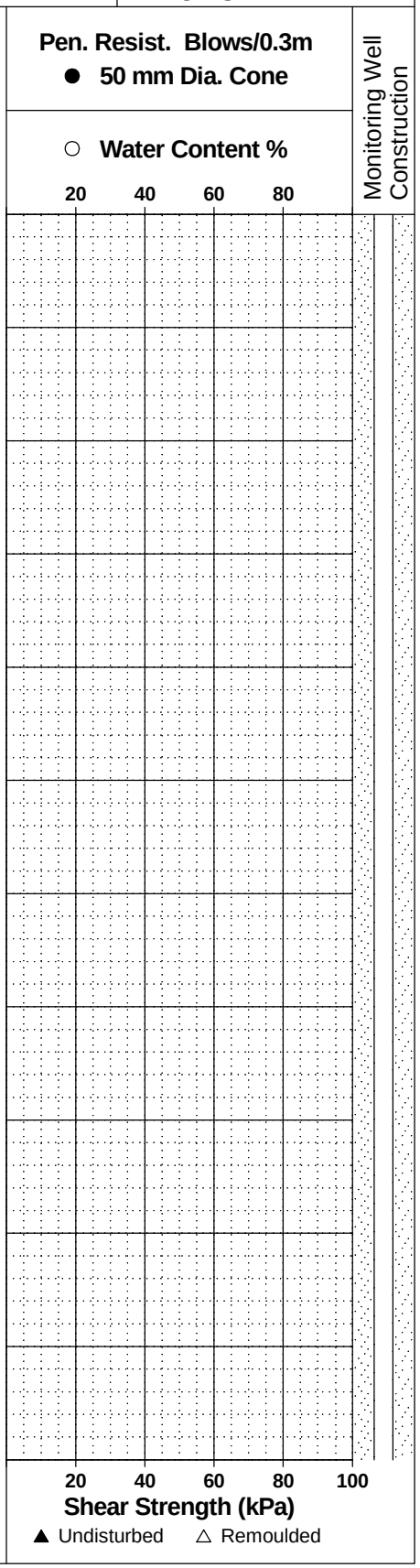
REMARKS

BORINGS BY Truck-Mount Power Auger **DATE** April 20, 2023

FILE NO. PG5663

HOLE NO. BH 5-23

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	97.68
Asphaltic concrete 0.03		AU	1				
FILL: Brown silty sand with crushed stone and gravel 0.30							
FILL: Brown silty sand with clay, some crushed stone, organics and asphalt fragments		SS	2	50	8	1	96.68
		SS	3	67	5	2	95.68
		SS	4	67	14		
2.97						3	94.68
		SS	5	67	8		
GLACIAL TILL: Loose to dense, brown silty sand with gravel, cobbles and boulders		SS	6	75	22	4	93.68
		SS	7	75	13		
- trace clay by 4.6m depth						5	92.68
		SS	8	89	50+		
5.72							
		RC	1	100	0	6	91.68
		RC	2	100	60		
BEDROCK: Very poor to fair quality, grey limestone						7	90.68
		RC	3	100	49		
- some fractures between 14.4 and 16.6m depth						8	89.68
- mud seams at 12.5, 14.3, 14.5, 16.9 and 17.8m depths						9	88.68
		RC	4	100	63		
- crystallized calcite at 20.6m depth						10	87.68
		RC	5	100	32	11	86.68



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
1649 Montreal Road and 741 Blair Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Truck-Mount Power Auger **DATE** April 20, 2023

FILE NO. PG5663

HOLE NO. BH 5-23

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
BEDROCK: Very poor to fair quality, grey limestone		RC	6	98	69	11	86.68
						12	85.68
		RC	7	100	75	13	84.68
						14	83.68
		RC	8	50	5	15	82.68
						16	81.68
		RC	9	100	57	17	80.68
						18	79.68
		RC	10	100	50	19	78.68
						20	77.68
		RC	11	100	52	21	76.68
21.18							
End of Borehole							
(GWL @ 17.76m - May 3, 2023)							

Pen. Resist. Blows/0.3m
● **50 mm Dia. Cone**
○ **Water Content %**

20 40 60 80

Monitoring Well Construction

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

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
1649 Montreal Road and 741 Blair Road
Ottawa, Ontario

DATUM Geodetic

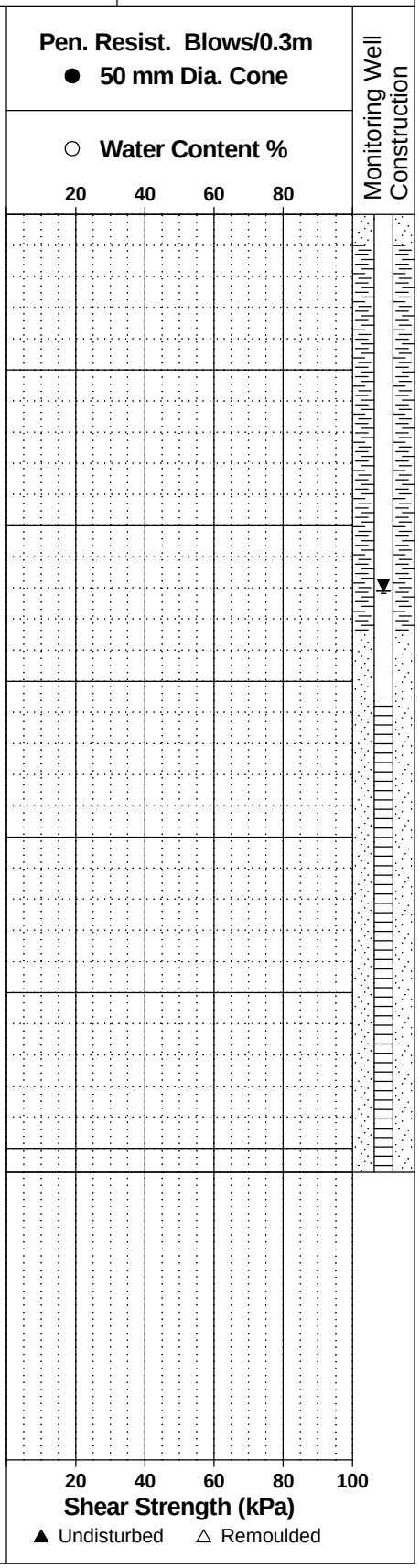
FILE NO. PG5663

REMARKS

HOLE NO. BH 1-20

BORINGS BY CME-55 Low Clearance Drill **DATE** October 15, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	97.76
Asphaltic concrete 0.08							
FILL: Brown silty sand with crushed stone 0.66		AU	1				
FILL: Brown silty sand with clay 1.37		SS	2	29	7	1	96.76
		SS	3	33	7	2	95.76
FILL: Brown silty sand		SS	4	58	2		
		SS	5	17	W	3	94.76
3.81							
		SS	6	75	5	4	93.76
GLACIAL TILL: Loose to very dense, grey silty sand with gravel		SS	7	25	14	5	92.76
5.60		SS	8	91	50+		
Weathered **BEDROCK**						6	91.76
6.15		SS	9	50	50+		
End of Borehole							
Practical refusal to augering at 6.15m depth							
(GWL @ 2.42m - Oct. 19, 2020)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
1649 Montreal Road and 741 Blair Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5663

REMARKS

HOLE NO. BH 2-20

BORINGS BY CME-55 Low Clearance Drill **DATE** October 15, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	97.48
Asphaltic concrete 0.08							
FILL: Brown silty sand, trace crushed stone 0.56		AU	1				
FILL: Grey/black silty sand with gravel and crushed stone		SS	2	54	10	1	96.48
1.83		SS	3	33	7		
Grey **SILTY CLAY,** some sand 2.13						2	95.48
GLACIAL TILL: Compact to dense, brown silty sand with clay and gravel		SS	4	50	14		
		SS	5	25	50+	3	94.48
3.61							
BEDROCK: Poor to fair quality, grey limestone		RC	1	100	45	4	93.48
		RC	2	100	58	5	92.48
5.92							
End of Borehole							
(GWL @ 2.59m - Oct. 19, 2020)							

Pen. Resist. Blows/0.3m
● **50 mm Dia. Cone**
○ **Water Content %**

20 40 60 80

Monitoring Well Construction

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

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
1649 Montreal Road and 741 Blair Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5663

REMARKS

HOLE NO. BH 3-20

BORINGS BY CME-55 Low Clearance Drill **DATE** October 15, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	97.66
Asphaltic concrete 0.08		AU	1				
FILL: Brown silty sand with crushed stone		SS	2	62	27	1	96.66
		SS	3	54	32	2	95.66
		SS	4	46	18		
3.05						3	94.66
GLACIAL TILL: Brown silty sand with gravel		SS	5	17	3		
3.83		SS	6	0	50+	4	93.66
		RC	1	57	45		
BEDROCK: Poor quality, grey limestone						5	92.66
		RC	2	100	48		
6.48						6	91.66
End of Borehole							
(GWL @ 2.31m - Oct. 19, 2020)							

Pen. Resist. Blows/0.3m
● **50 mm Dia. Cone**
○ **Water Content %**

20 40 60 80

Monitoring Well Construction

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
1649 Montreal Road and 741 Blair Road
Ottawa, Ontario

DATUM Geodetic

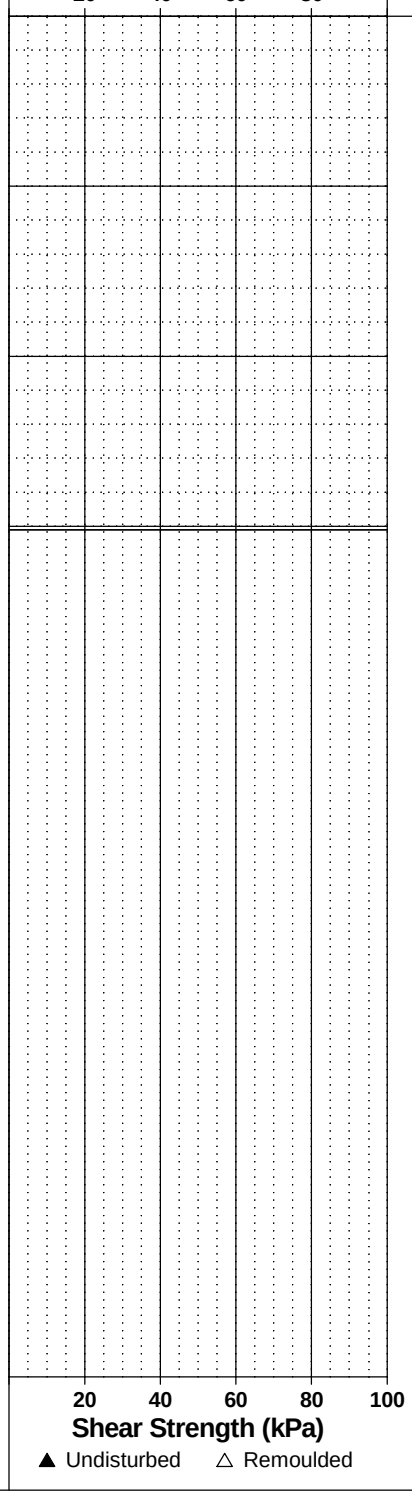
REMARKS

BORINGS BY CME-55 Low Clearance Drill **DATE** October 15, 2020

FILE NO. PG5663

HOLE NO. BH 4-20

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 %	Monitoring Well Construction
GROUND SURFACE						0	97.77		
Asphaltic concrete 0.08									
FILL: Brown silty sand, some crushed stone 0.51		AU	1						
		SS	2	71	16	1	96.77		
Compact, brown **SILTY SAND** with gravel		SS	3	62	26	2	95.77		
2.29									
GLACIAL TILL: Compact, brown silty sand with gravel, cobbles and boulders		SS		46	15	3	94.77		
3.02									
End of Borehole									
Practical refusal to augering at 3.02m depth.									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
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Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5663

REMARKS

HOLE NO. BH 5-20

BORINGS BY CME-55 Low Clearance Drill **DATE** October 15, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	97.93
Asphaltic concrete 0.08							
FILL: Brown silty sand with crushed stone 0.60		AU	1				
FILL: Brown silty sand with gravel		SS	2	33	7	1	96.93
1.52							
Brown **SILT,** some sand and gravel		SS	3	59	50+		
1.96							
End of Borehole							
Practical refusal to augering at 1.96m depth							

Pen. Resist. Blows/0.3m
● **50 mm Dia. Cone**
○ **Water Content %**

20 40 60 80

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

Monitoring Well Construction

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
1649 Montreal Road and 741 Blair Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

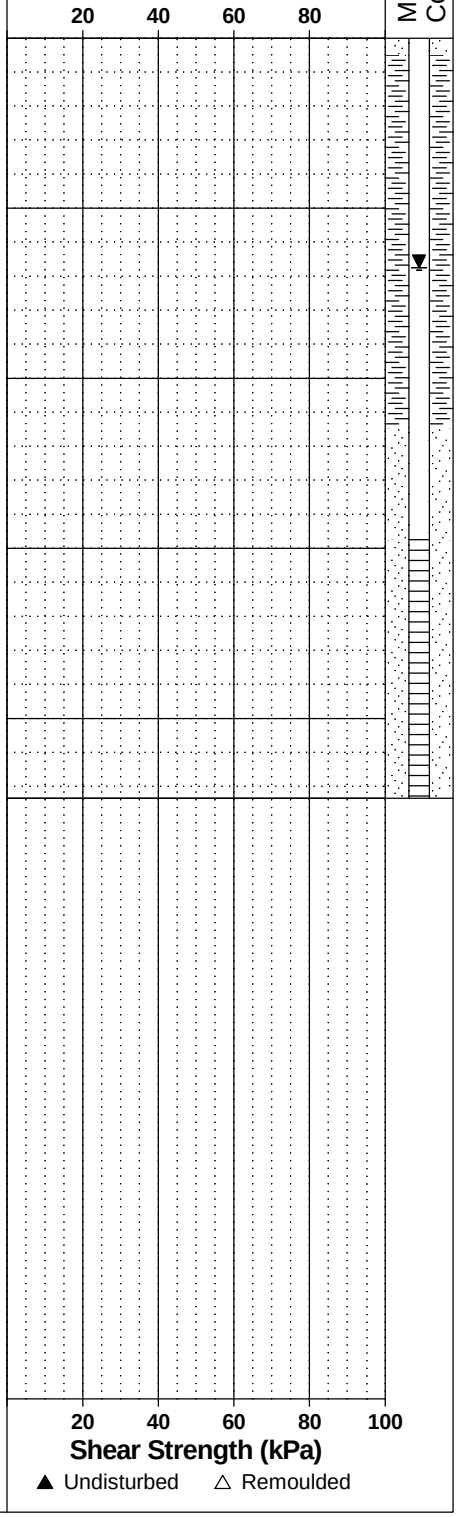
BORINGS BY Portable Drill **DATE** October 16, 2020

FILE NO. PG5663

HOLE NO. BH 6-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	97.92
Concrete slab 0.16							
FILL: Brown silty sand		SS	1	83			
		SS	2	67		1	96.92
1.75		SS	3	60			
		RC	1	100	42	2	95.92
		RC	2	100	36		
		RC	3	100	47		
BEDROCK: Poor to fair quality, grey limestone interbedded with shale		RC	4	100	0	3	94.92
		RC	5	100	0		
		RC	6	69	0		
		RC	7	100	55	4	93.92
4.47							
End of Borehole							
(GWL @ 1.35m - Oct. 19, 2020)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %



Monitoring Well Construction

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
1649 Montreal Road and 741 Blair Road
Ottawa, Ontario

DATUM Geodetic

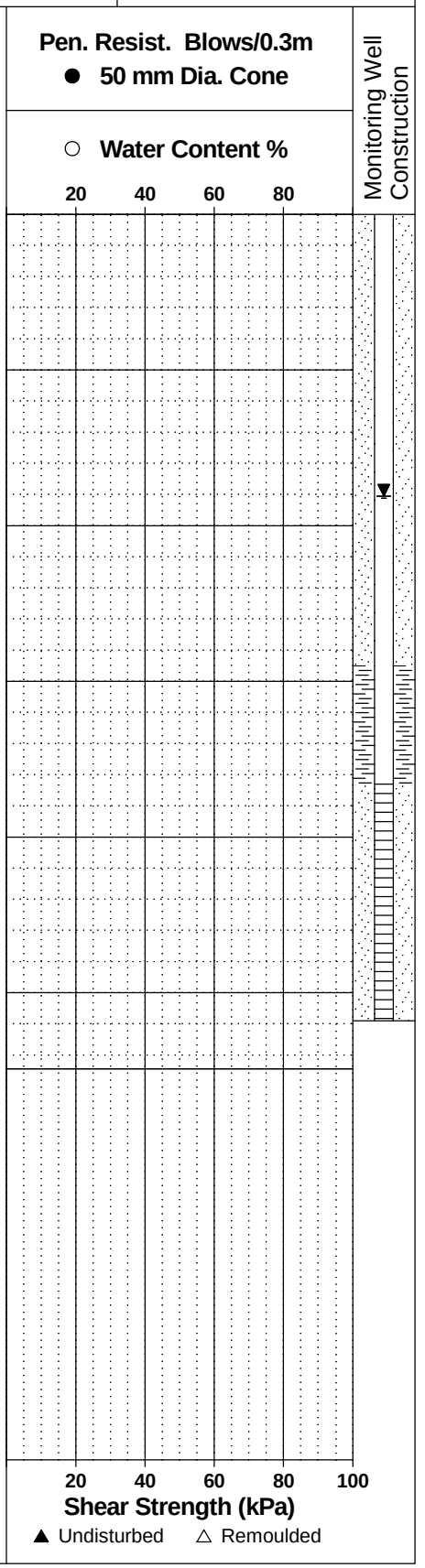
FILE NO. PG5663

REMARKS

HOLE NO. BH 7-20

BORINGS BY Portable Drill **DATE** October 16, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	97.98
Concrete slab 0.13							
FILL: Brown silty sand with crushed stone 0.56		SS	1	83			
FILL: Brown silty sand, trace gravel, clay and crushed stone		SS	2	67		1	96.98
1.80		SS	3	42			
Compact, brown **SILT,** some sand, occasional gravel		SS	4	58		2	95.98
2.74		SS	5	58			
		RC	1	100	70	3	94.98
		RC	2	100	0		
		RC	3	100	50		
BEDROCK: Poor to fair quality, grey limestone interbedded with shale		RC	4	100	42	4	93.98
		RC	5	100	31		
		RC	6	100	30		
		RC	7	100	42		
		RC	8	100	33	5	92.98
		RC	98	100	50		
5.49							
End of Borehole							
(GWL @ 1.81m - Oct. 21, 2020)							



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28 Concourse Gate, Unit 1, Nepean, Ont. K2E 7T7

SOIL PROFILE & TEST DATA

Phase II Environmental Site Assessment
1649 Montreal Road
Gloucester, Ontario

DATUM

REMARKS

BORINGS BY CME 55 Power Auger **DATE** 6 DEC 00

FILE NO. **E2071**

HOLE NO. **BH 1**

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 / ○ Lower Explosive Limit %	MONITORING WELL CONSTRUCTION
GROUND SURFACE									
Asphaltic concrete 0.05						0			
FILL: Light brown to brown sand		AU	1						
		SS	2	50	2	1			
1.83		SS	3	75	4				
Firm, grey **SILTY CLAY**, trace sand 2.13						2			
Compact, grey to brown **SILTY SAND**, some gravel		SS	4	67	21				
		SS	5	33	8	3			
3.50									
End of Borehole									
Spoon refusal @ 3.50m depth									
(Open hole WL @ 0.8m depth)									

Lower Explosive Limit % scale: 20 40 60 80

Gastech 1314 Rdg. (ppm): 100 200 300 400 500

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE & TEST DATA

Phase II Environmental Site Assessment
1649 Montreal Road
Gloucester, Ontario

DATUM

REMARKS

BORINGS BY CME 55 Power Auger **DATE** 7 DEC 00

FILE NO. **E2071**

HOLE NO. **BH 2**

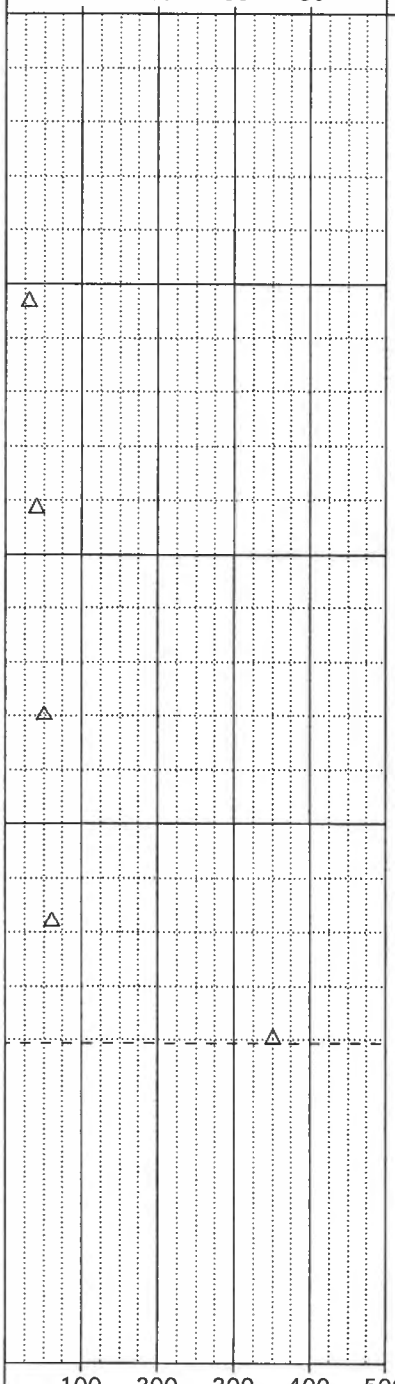
SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	
Dark brown sandy TOPSOIL 0.25							
FILL: Brown sand, some gravel, trace silt		SS	6	50	10	1	
		SS	7	50	11	2	
		SS	8	58	17		
		SS	9	33	2	3	
3.81		SS	10	100			
End of Borehole							
Spoon refusal @ 3.81m depth							
(Open hole WL @ 2.0m depth)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Lower Explosive Limit %

20 40 60 80

MONITORING WELL CONSTRUCTION



100 200 300 400 500

Gastech 1314 Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE & TEST DATA

Phase II Environmental Site Assessment
1649 Montreal Road
Gloucester, Ontario

DATUM

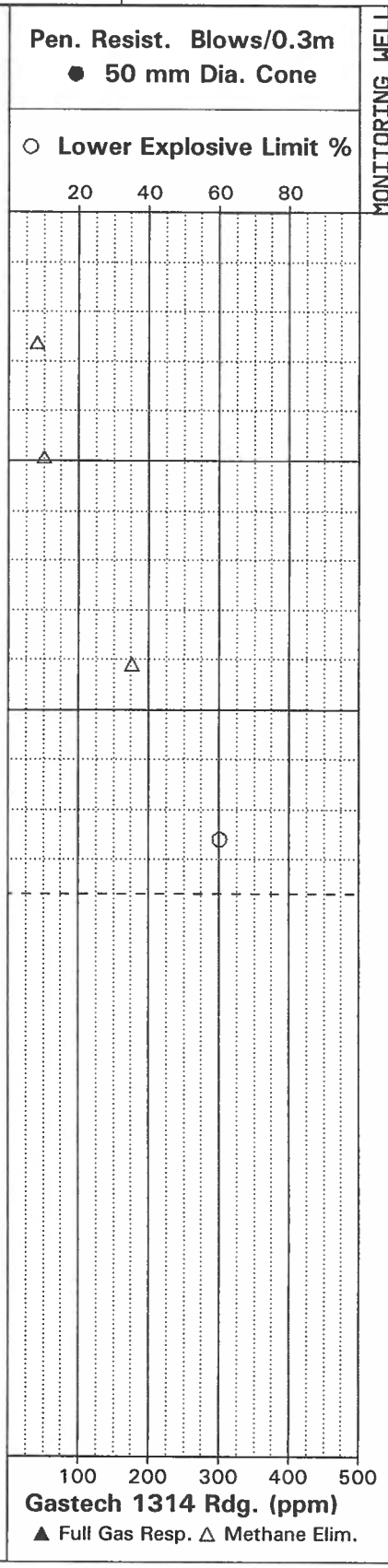
REMARKS

BORINGS BY CME 55 Power Auger DATE 6 DEC 00

FILE NO. **E2071**

HOLE NO. **BH 3**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
Asphaltic concrete 0.05						0	
FILL: Light brown sand to sand, clay and gravel mixture		AU	11				
		SS	12	44	12	1	
1.37							
Stiff, dark brown SILTY **CLAY** 1.68		SS	13	67	13	2	
Compact, dark grey SILTY **SAND-GRAVEL**		SS	14		4		
2.74							
End of Borehole							
Spoon refusal @ 2.74m depth							
(Open hole WL @ 1.8m depth)							



MONITORING WELL CONSTRUCTION

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SOIL PROFILE & TEST DATA

Phase II Environmental Site Assessment
1649 Montreal Road
Gloucester, Ontario

DATUM

REMARKS

BORINGS BY Portable Drill **DATE** 7 DEC 00

FILE NO. **E2071**

HOLE NO. **CH 4**

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 ○ Lower Explosive Limit %	MONITORING WELL CONSTRUCTION
GROUND SURFACE									
Concrete slab 0.18						0			
FILL: Light brown to brown sand, trace to some gravel		SS	1		20				
		SS	2		10	1			
		SS	3		22				
1.88 End of Corehole		SS	4						
Spoon refusal @ 1.88m depth									

20 40 60 80

100 200 300 400 500

Gastech 1314 Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE & TEST DATA

Phase II Environmental Site Assessment
1649 Montreal Road
Gloucester, Ontario

DATUM

REMARKS

BORINGS BY Portable Drill **DATE** 7 DEC 00

FILE NO. **E2071**

HOLE NO. **CH 5**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	
Concrete slab 0.10							
		SS	5		3		
FILL: Reddish brown to brown sand		SS	6		2	1	
1.96		SS	7				
End of Corehole							
Spoon refusal @ 1.96m depth							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Lower Explosive Limit %

20 40 60 80

△ △ △

MONITORING WELL CONSTRUCTION

100 200 300 400 500

Gastech 1314 Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE & TEST DATA

Phase II Environmental Site Assessment
1649 Montreal Road
Gloucester, Ontario

DATUM

REMARKS

BORINGS BY Portable Drill **DATE** 7 DEC 00

FILE NO. **E2071**

HOLE NO. **CH 6**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
Concrete slab 0.13						0	
FILL: Light brown to brown sand		SS	8		15		
		SS	9		8	1	
		SS	10				
1.96 End of Corehole							
Spoon refusal @ 1.96m depth							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Lower Explosive Limit %

20 40 60 80

100 200 300 400 500

Gastech 1314 Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

MONITORING WELL CONSTRUCTION

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SOIL PROFILE & TEST DATA

Phase II-Environmental Site Assessment
1651 Montreal Road and 741 Blair Road
Ottawa (Gloucester), Ontario

DATUM

REMARKS

FILE NO. **E2662**

HOLE NO. **BH 1**

BORINGS BY CME 55 Power Auger **DATE** 17 JUN 03

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	
TOPSOIL 0.18							
FILL: Brown silty fine to medium sand with crushed gravel 0.70		AU	1				
		SS	2	33	72	1	
Very dense, brown SILTY **SAND-GRAVEL** with cobbles		SS	3	50	68	2	
		SS	4	38	69		
2.92 End of Borehole							
Practical refusal to augering @ 2.92m depth							
(Open hole WL @ 2.5m depth)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Lower Explosive Limit %

20 40 60 80

Monitoring Well Construction

100 200 300 400 500

Gastech 1314 Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE & TEST DATA

Phase II-Environmental Site Assessment
1651 Montreal Road and 741 Blair Road
Ottawa (Gloucester), Ontario

DATUM

REMARKS

FILE NO. **E2662**

HOLE NO. **BH 2A**

BORINGS BY CME 55 Power Auger DATE 17 JUN 03

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 / ○ Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
TOPSOIL 0.23									
FILL: Dark brown silty fine to medium sand with organic matter		AU	5						
		SS	6	27	50+	1			▽
1.37 End of Borehole									
Practical refusal to augering @ 1.37m depth									
(Open hole WL @ 1.0m depth)									

Lower Explosive Limit % scale: 20 40 60 80

Gastech 1314 Rdg. (ppm): 100 200 300 400 500

▲ Full Gas Resp. △ Methane Elim.

JOHN D. PATERSON & ASSOCIATES LTD.
Consulting Engineers
28 Concourse Gate, Unit 1, Nepean, Ont. K2E 7T7

SOIL PROFILE & TEST DATA

Phase II-Environmental Site Assessment
1651 Montreal Road and 741 Blair Road
Ottawa (Gloucester), Ontario

DATUM

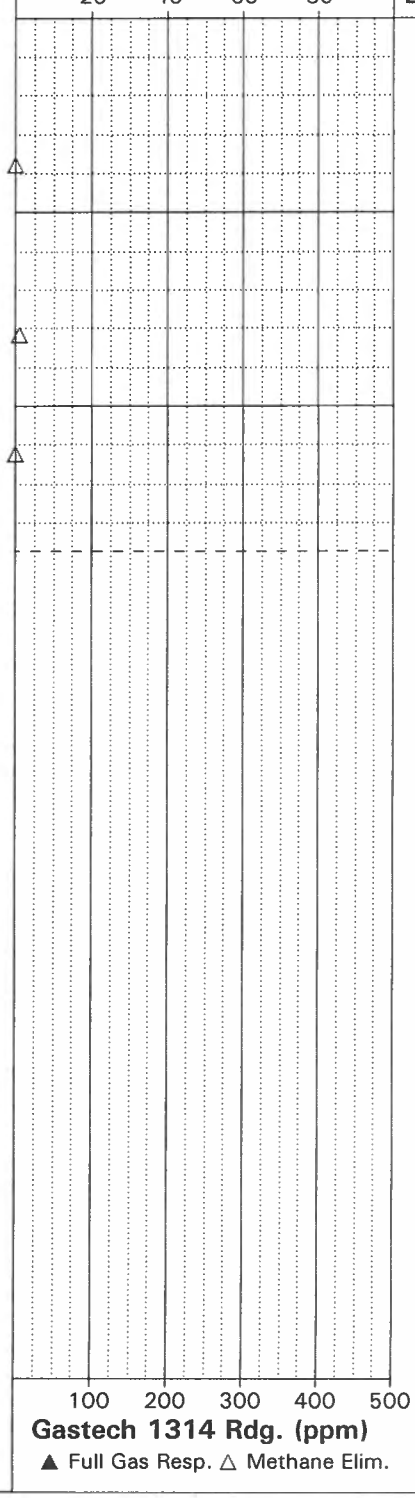
REMARKS

BORINGS BY CME 55 Power Auger DATE 17 JUN 03

FILE NO. **E2662**

HOLE NO. **BH 2B**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	
TOPSOIL 0.10							
FILL: Brown silty fine to medium sand, some gravel		AU	7			1	
1.30							
Very dense, brown SILTY SAND-GRAVEL with cobbles		SS	8	56	50+	2	
		AU	8A				
2.74							
End of Borehole							
Practical refusal to augering @ 2.74m depth							
(Open hole WL @ 0.6m depth)							



Monitoring Well Construction

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SOIL PROFILE & TEST DATA

Phase II-Environmental Site Assessment
1651 Montreal Road and 741 Blair Road
Ottawa (Gloucester), Ontario

DATUM

REMARKS

BORINGS BY CME 55 Power Auger DATE 17 JUN 03

FILE NO. **E2662**

HOLE NO. **BH 3**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	
FILL: Dark brown silty fine to medium sand with organic matter and rock fragments		AU	9				
0.66							
FILL: Brown sandy silty clay, trace gravel		SS	10	83	11	1	
0.86							
Very stiff, brown **SILTY CLAY**							
1.65		SS	11	79	27	2	
Loose to very dense, brown to greyish brown **SILTY** fine **SAND**, occasional cobbles		SS	12	62	34		
		SS	13	58	52	3	
		SS	14	29	3	4	
4.42							
End of Borehole							
(Open hole WL @ 1.3m depth)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Lower Explosive Limit %

20 40 60 80

100 200 300 400 500

Gastech 1314 Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

JOHN D. PATERSON & ASSOCIATES LTD.
Consulting Engineers
28 Concourse Gate, Unit 1, Nepean, Ont. K2E 7T7

SOIL PROFILE & TEST DATA

Phase II-Environmental Site Assessment
1651 Montreal Road and 741 Blair Road
Ottawa (Gloucester), Ontario

DATUM

REMARKS

BORINGS BY CME 55 Power Auger DATE 17 JUN 03

FILE NO. **E2662**

HOLE NO. **BH 4**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	
Asphaltic concrete 0.05		AU	15				
FILL: Dark brown clayey silty sand, trace gravel		SS	16	17	22	1	
		SS	17	17	18	2	
2.54		SS	18	58	16		
Very stiff, brown **SILTY CLAY**, occasional sand seams		SS	19	0	18	3	
		SS	20	92	14	4	
4.60		SS	21	50	16	5	
Compact, brown SANDY **SILT**							
5.36							
End of Borehole							
Practical refusal to augering @ 5.36m depth							
(GWL @ 3.50m-June 17/03)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Lower Explosive Limit %
20 40 60 80

Monitoring Well Construction

100 200 300 400 500
Gastech 1314 Rdg. (ppm)
▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE & TEST DATA

Phase II-Environmental Site Assessment
1651 Montreal Road and 741 Blair Road
Ottawa (Gloucester), Ontario

DATUM

REMARKS

BORINGS BY CME 55 Power Auger DATE 17 JUN 03

FILE NO. **E2662**

HOLE NO. **BH 5**

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 / ○ Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
FILL: Brown silty fine to medium sand with crushed gravel, cobbles and asphalt pieces		AU	22						
1.17		SS	23	33	29	1			
FILL: Crushed rock, some silty sand		SS	24	21	65+				
2.18						2			
End of Borehole									
Practical refusal to augering @ 2.18m depth.									

Lower Explosive Limit % scale: 20 40 60 80

Gastech 1314 Rdg. (ppm): 100 200 300 400 500

▲ Full Gas Resp. △ Methane Elim.

JOHN D. PATERSON & ASSOCIATES LTD.
Consulting Engineers
28 Concourse Gate, Unit 1, Nepean, Ont. K2E 7T7

SOIL PROFILE & TEST DATA

Phase II-Environmental Site Assessment
1651 Montreal Road and 741 Blair Road
Ottawa (Gloucester), Ontario

DATUM

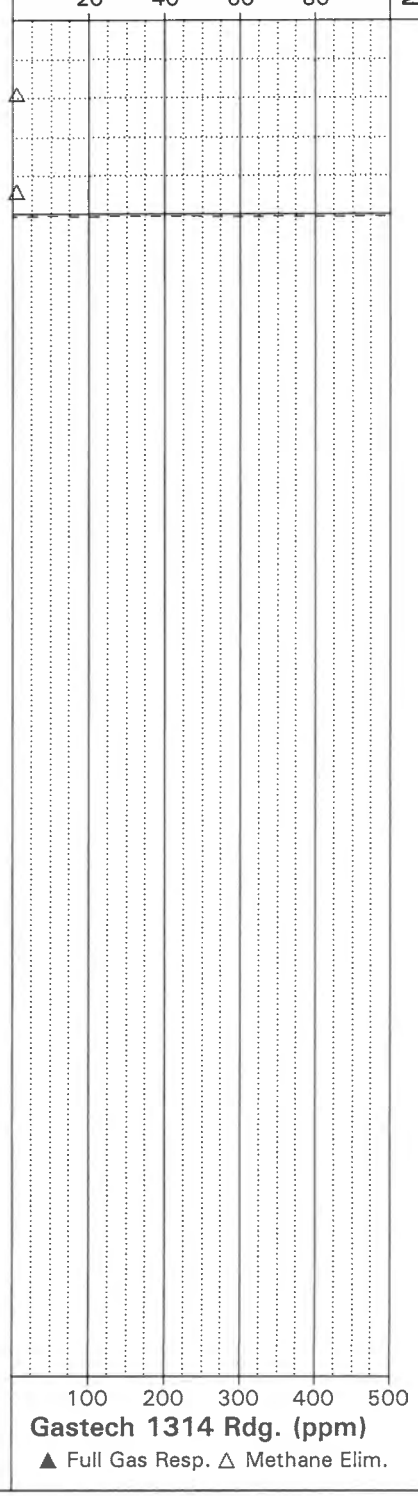
REMARKS

BORINGS BY CME 55 Power Auger DATE 17 JUN 03

FILE NO. **E2662**

HOLE NO. **BH 6**

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 / ○ Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE									
Asphaltic concrete 0.05						0			
FILL: Brown sand with crushed gravel		AU	25						
1.01		AU	26			1			
End of Borehole									
Practical refusal to augering @ 1.01m depth									



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 strength of cohesionless soils is the relative density, 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.

Relative Density	'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 vane tests, penetrometer tests, unconfined compression tests, or occasionally by Standard Penetration Tests.

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 is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil.

Terminology used for describing soil strata based upon texture, or the proportion of individual particle sizes present is provided on the Textural Soil Classification Chart at the end of this information package.

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 NXL size core. However, it can be used on smaller core sizes, such as BX, 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
PS	-	Piston sample
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size AXT, BXL, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

MC%	-	Natural moisture 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 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

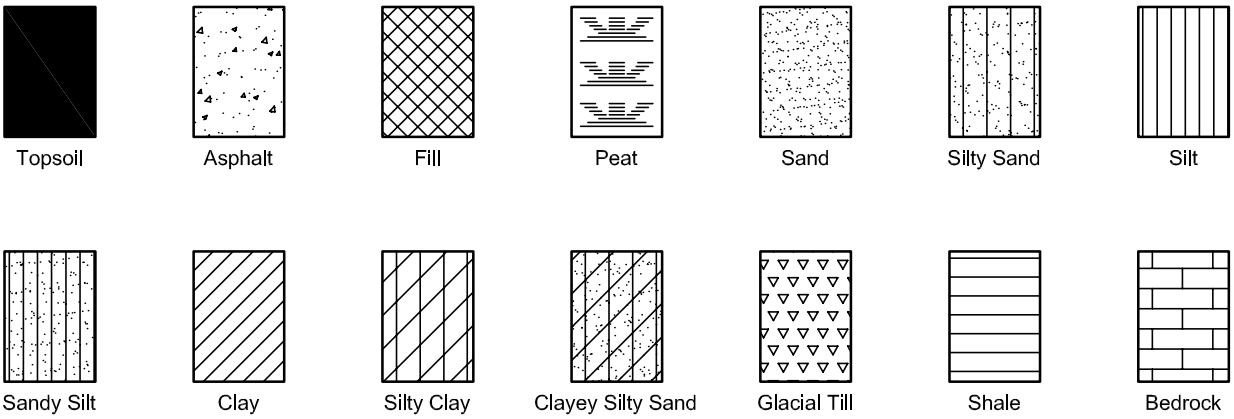
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void 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.

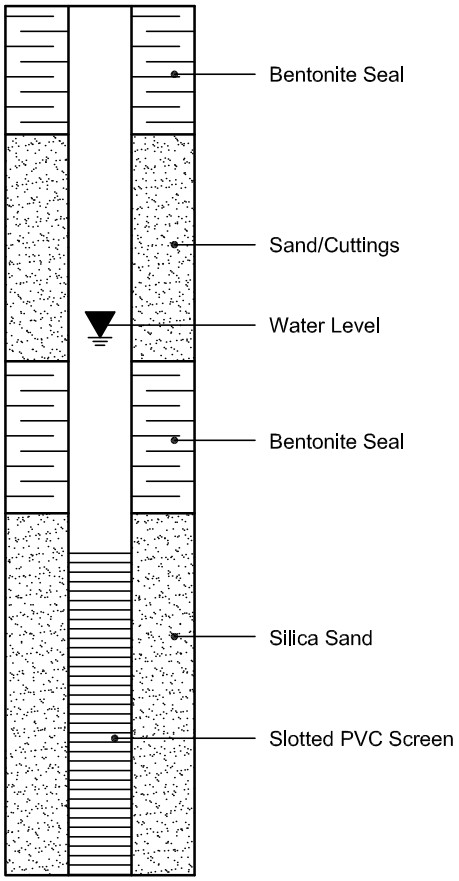
SYMBOLS AND TERMS (continued)

STRATA PLOT



MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION

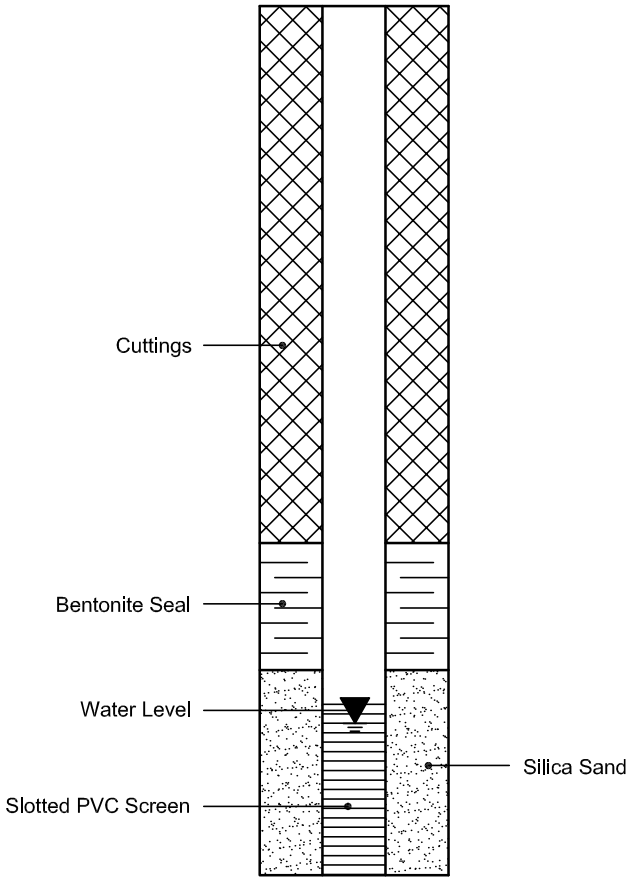


Photo 1: Photograph of RC 1 from BH 1-23 – Depth from 2.34 to 3.18 m – RQD = 82 % and REC = 100 %

Photo 2: Photograph of RC 2 from BH 1-23 – Depth from 3.18 to 4.65 m – RQD = 72 % and REC = 100 %

Photo 3: Photograph of RC 3 from BH 1-23 – Depth from 4.65 to 6.15 m – RQD = 47 % and REC = 100 %

Photo 4: Photograph of RC 4 from BH 1-23 – Depth from 6.15 to 7.65 m – RQD = 59 % and REC = 100 %

Photo 5: Photograph of RC 5 from BH 1-23 – Depth from 7.65 to 9.14 m – RQD = 46 % and REC = 93 %

Photo 6: Photograph of RC 6 from BH 1-23 – Depth from 9.14 to 10.64 m – RQD = 68 % and REC = 89 %

Photo 7: Photograph of RC 7 from BH 1-23 – Depth from 10.64 to 12.14 m – RQD = 56 % and REC = 100 %

Photo 8: Photograph of RC 8 from BH 1-23 – Depth from 12.14 to 13.64 m – RQD = 56 % and REC = 93 %

Photo 9: Photograph of RC 9 from BH 1-23 – Depth from 13.64 to 15.14 m – RQD = 14 % and REC = 100 %

Photo 10: Photograph of RC 10 from BH 1-23 – Depth from 15.14 to 16.51 m – RQD = 59 % and REC = 100 %

Photo 11: Photograph of RC 11 from BH 1-23 – Depth from 16.51 to 18.39 m – RQD = 53 % and REC = 100 %

Photo 12: Photograph of RC 1 from BH 2-23 – Depth from 2.51 to 3.18 m – RQD = 62 % and REC = 100 %

Photo 13: Photograph of RC 2 from BH 2-23 – Depth from 3.18 to 4.67 m – RQD = 76 % and REC = 100 %

Photo 14: Photograph of RC 3 from BH 2-23 – Depth from 4.67 to 6.17 m – RQD = 73 % and REC = 100 %

Photo 15: Photograph of RC 4 from BH 2-23 – Depth from 6.17 to 7.67 m – RQD = 71 % and REC = 100 %

Photo 16: Photograph of RC 5 from BH 2-23 – Depth from 7.67 to 9.17 m – RQD = 59 % and REC = 100 %

Photo 17: Photograph of RC 6 from BH 2-23 – Depth from 9.17 to 10.67 m – RQD = 42 % and REC = 100 %

Photo 18: Photograph of RC 7 from BH 2-23 – Depth from 10.67 to 12.17 m – RQD = 93 % and REC = 100 %

Photo 19: Photograph of RC 8 from BH 2-23 – Depth from 12.17 to 13.67 m – RQD = 85 % and REC = 100 %

Photo 20: Photograph of RC 9 from BH 2-23 – Depth from 13.67 to 15.16 m – RQD= 47 % and REC = 85 %

Photo 21: Photograph of RC 10 from BH 2-23 – Depth from 15.16 to 16.69 m – RQD = 37 % and REC = 80 %

Photo 22: Photograph of RC 11 from BH 2-23 – Depth from 16.69 to 18.16 m – RQD = 41 % and REC = 98 %

Photo 23: Photograph of RC 1 from BH 4-23 – Depth from 0.66 to 1.63 m – RQD = 26 % and REC = 100 %

Photo 24: Photograph of RC 2 from BH 4-23 – Depth from 1.63 to 3.12 m – RQD = 59 % and REC = 100 %

Photo 25: Photograph of RC 3 from BH 4-23 – Depth from 3.12 to 4.62 m – RQD = 73 % and REC = 100 %

Photo 26: Photograph of RC 4 from BH 4-23 – Depth from 4.62 to 6.12 m – RQD = 64 % and REC = 100 %

Photo 27: Photograph of RC 5 from BH 4-23 – Depth from 6.12 to 7.62 m – RQD = 90 % and REC = 100 %

Photo 28: Photograph of RC 6 from BH 4-23 – Depth from 7.62 to 9.12 m – RQD = 97 % and REC = 100 %

Photo 29: Photograph of RC 7 from BH 4-23 – Depth from 9.12 to 10.62 m – RQD = 85 % and REC = 100 %

Photo 30: Photograph of RC 8 from BH 4-23 – Depth from 10.62 to 12.12 m – RQD = 86 % and REC = 100 %

Photo 31: Photograph of RC 9 from BH 4-23 – Depth from 12.12 to 13.61 m – RQD = 88 % and REC = 100 %

Photo 32: Photograph of RC 10 from BH 4-23 – Depth from 13.61 to 15.11 m – RQD = 100 % and REC = 100 %

Photo 33: Photograph of RC 11 from BH 4-23 – Depth from 15.11 to 16.64 m – RQD = 83 % and REC = 100 %

Photo 34: Photograph of RC 1 from BH 5-23 – Depth from 5.72 to 6.32 m – RQD = 0 % and REC = 100 %

Photo 35: Photograph of RC 2 from BH 5-23 – Depth from 6.32 to 7.04 m – RQD = 60 % and REC = 100 %

Photo 36: Photograph of RC 3 from BH 5-23 – Depth from 7.04 to 8.69 m – RQD = 49 % and REC = 100 %

Photo 37: Photograph of RC 4 from BH 5-23 – Depth from 8.69 to 10.13 m – RQD = 63 % and REC = 100 %

Photo 38: Photograph of RC 5 from BH 5-23 – Depth from 10.13 to 11.63 m – RQD = 32 % and REC = 100 %

Photo 39: Photograph of RC 6 from BH 5-23 – Depth from 11.63 to 13.00 m – RQD = 69 % and REC = 98 %

Photo 40: Photograph of RC 7 from BH 5-23 – Depth from 13.00 to 14.40 m – RQD = 75 % and REC = 100 %

Photo 41: Photograph of RC 8 from BH 5-23 – Depth from 14.40 to 16.59 m – RQD = 5 % and REC = 50 %

Photo 42: Photograph of RC 9 from BH 5-23 – Depth from 16.59 to 18.11 m – RQD = 57 % and REC = 100 %

Photo 43: Photograph of RC 10 from BH 5-23 – Depth from 18.11 to 19.58 m – RQD = 50 % and REC = 100 %

Photo 44: Photograph of RC 11 from BH 5-23 – Depth from 19.58 to 21.18 m – RQD = 52 % and REC = 100 %

APPENDIX 2

FIGURE 1 - KEY PLAN

FIGURES 2 & 3 – SEISMIC SHEAR WAVE VELOCITY PROFILES

DRAWING PG5663-1 - TEST HOLE LOCATION PLAN

DRAWING PG5663-2 – BEDROCK QUALITY ZONE PLAN

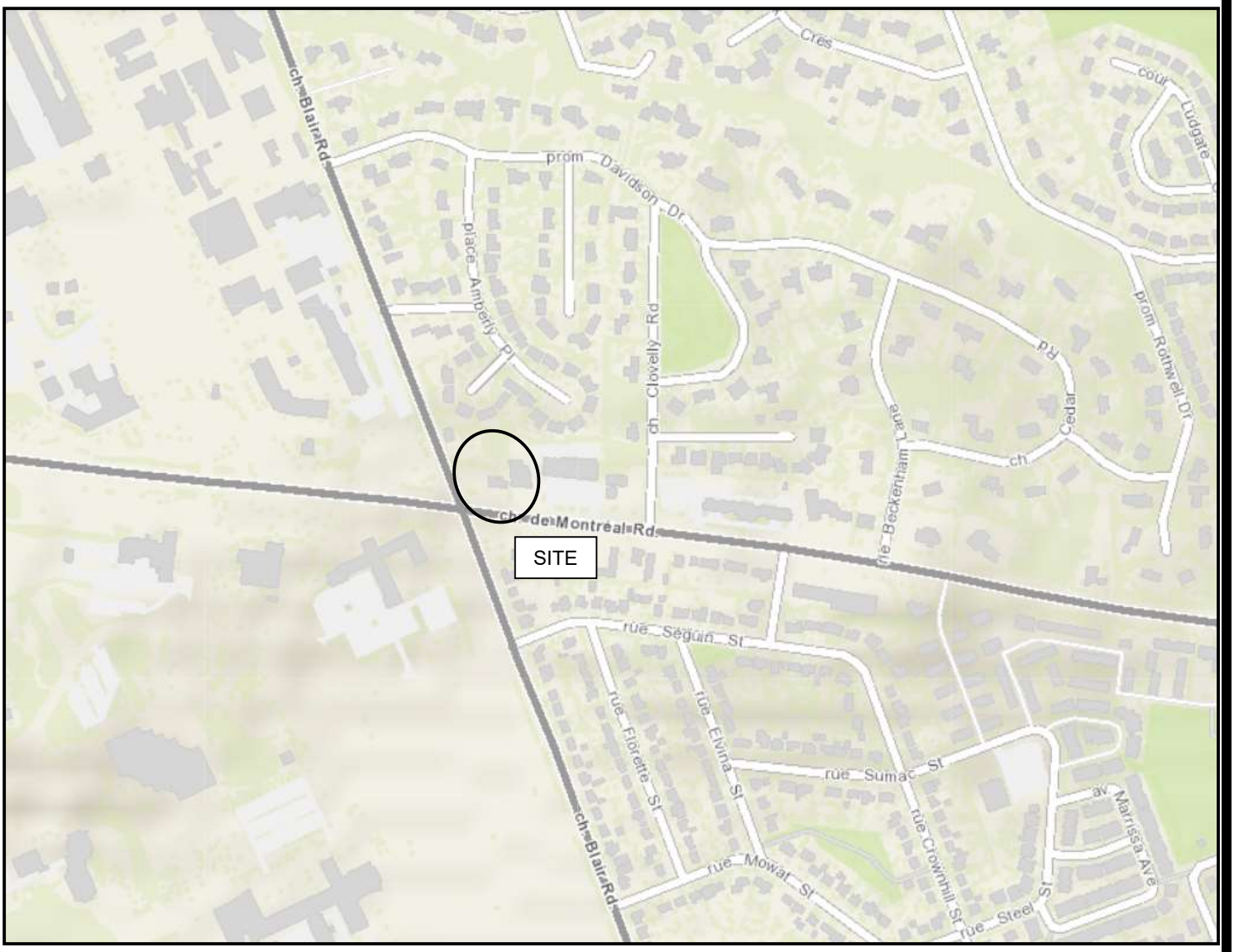


FIGURE 1

KEY PLAN

PATERSON GROUP

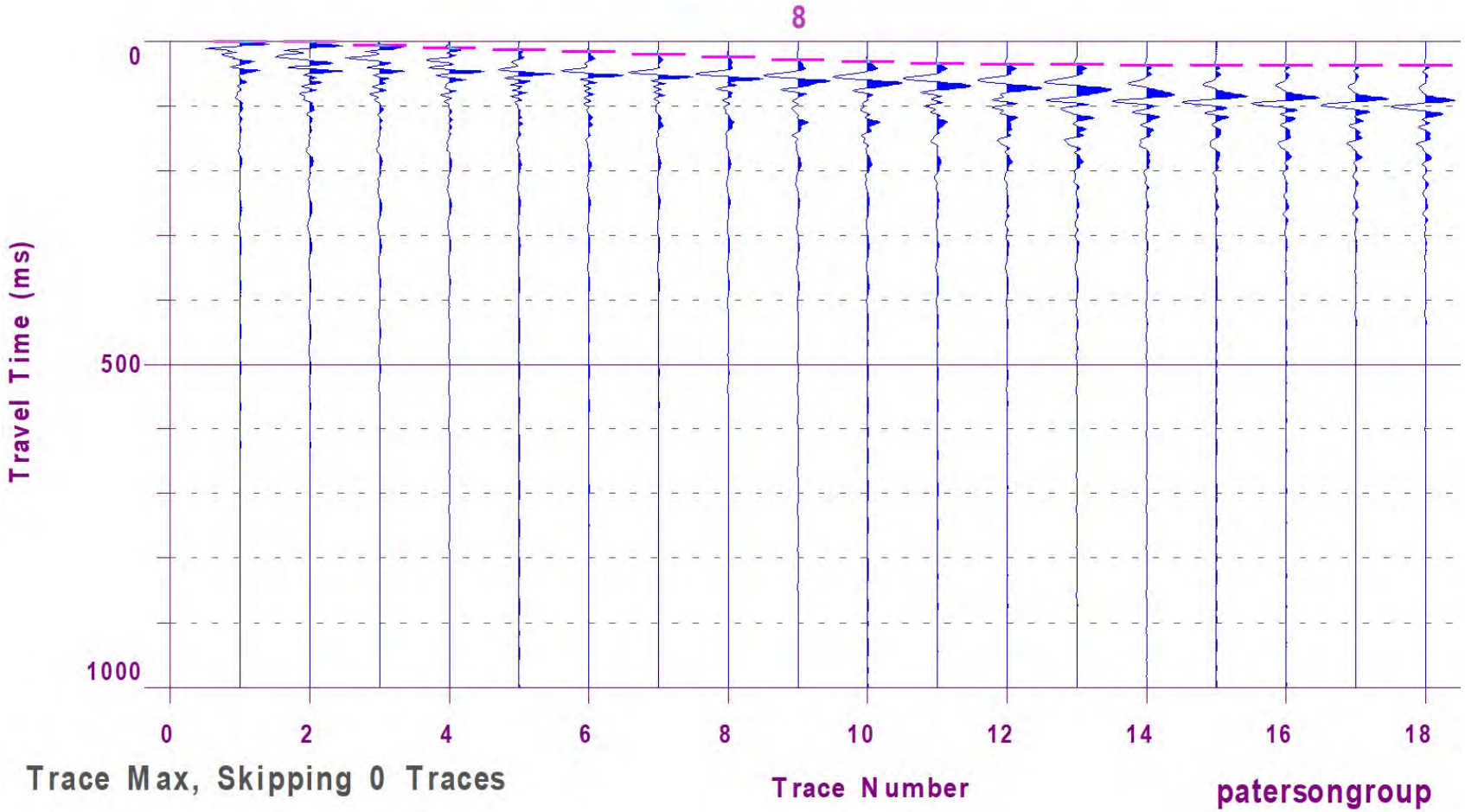


Figure 2 – Shear Wave Velocity Profile at Shot Location -1.5 m

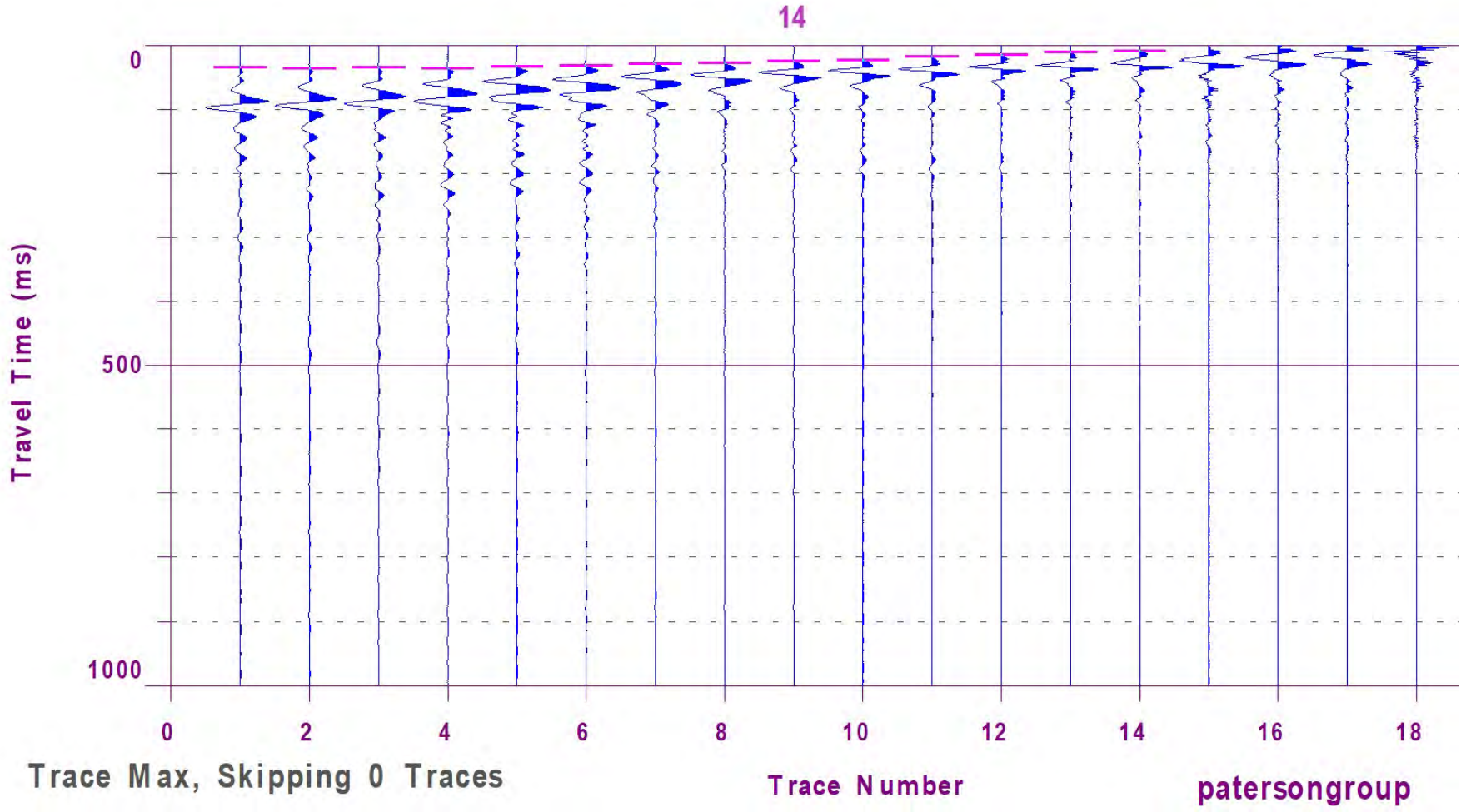
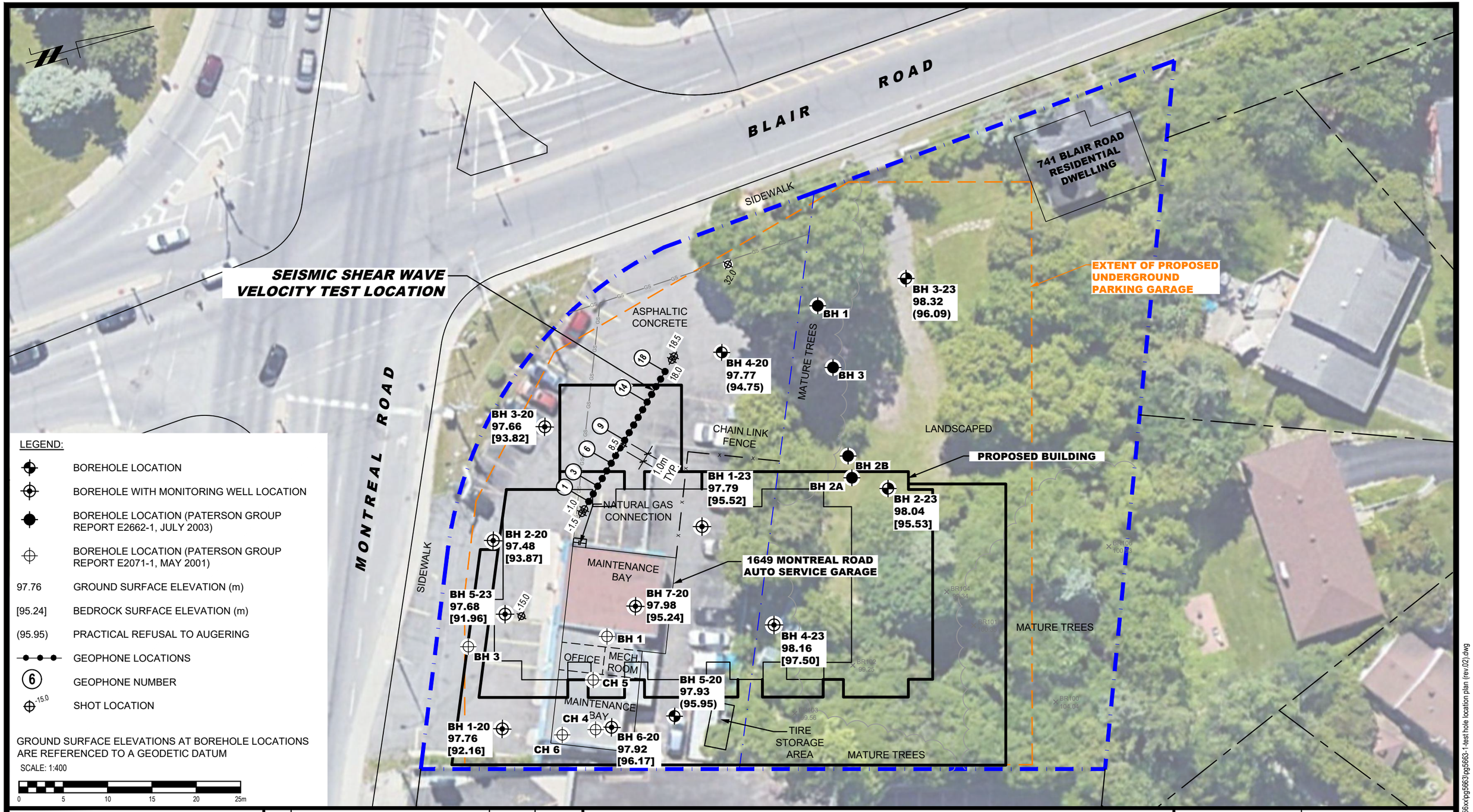


Figure 3 – Shear Wave Velocity Profile at Shot Location 18 m



LEGEND:

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- BOREHOLE LOCATION (PATERSON GROUP REPORT E2662-1, JULY 2003)
- BOREHOLE LOCATION (PATERSON GROUP REPORT E2071-1, MAY 2001)
- 97.76 GROUND SURFACE ELEVATION (m)
- [95.24] BEDROCK SURFACE ELEVATION (m)
- (95.95) PRACTICAL REFUSAL TO AUGERING
- GEOPHONE LOCATIONS
- 6 GEOPHONE NUMBER
- -15.0 SHOT LOCATION

GROUND SURFACE ELEVATIONS AT BOREHOLE LOCATIONS ARE REFERENCED TO A GEODETIC DATUM

SCALE: 1:400

0 5 10 15 20 25m

PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7S9
TEL: (613) 226-7381

NO.	REVISIONS	DATE	INITIAL
2	ADDED 2023 BOREHOLE LOCATIONS TO PLAN	27/04/2023	YZ
1	ADDED SEISMIC SHEAR WAVE VELOCITY TEST LOCATION	08/08/2022	FC

10869279 CANADA INC.

GEOTECHNICAL INVESTIGATION
PROPOSED HIGH-RISE BUILDING
1649 MONTREAL ROAD AND 741 BLAIR ROAD
OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:400	Date: 01/2021
Drawn by: YA	Report No.: PG5663-1
Checked by: NP	Dwg. No.: PG5663-1
Approved by: DJG	Revision No.: 2

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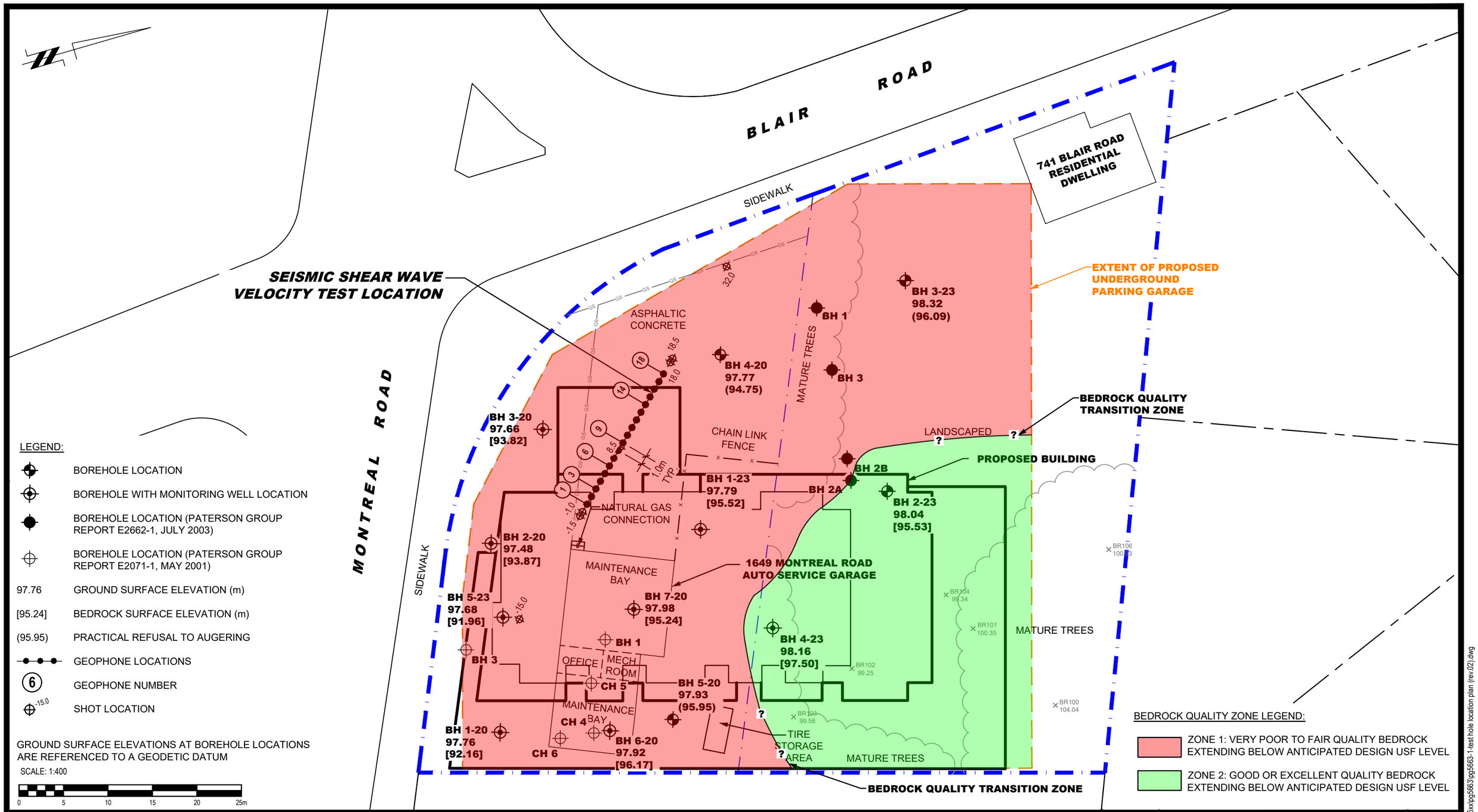

LEGEND:

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- BOREHOLE LOCATION (PATERSON GROUP REPORT E2662-1, JULY 2003)
- BOREHOLE LOCATION (PATERSON GROUP REPORT E2071-1, MAY 2001)
- 97.76 GROUND SURFACE ELEVATION (m)
- [95.24] BEDROCK SURFACE ELEVATION (m)
- (95.95) PRACTICAL REFUSAL TO AUGERING
- GEOPHONE LOCATIONS
- 6 GEOPHONE NUMBER
- -15.0 SHOT LOCATION

GROUND SURFACE ELEVATIONS AT BOREHOLE LOCATIONS ARE REFERENCED TO A GEODETIC DATUM

SCALE: 1:400

0 5 10 15 20 25m

BEDROCK QUALITY ZONE LEGEND:

- ZONE 1: VERY POOR TO FAIR QUALITY BEDROCK EXTENDING BELOW ANTICIPATED DESIGN USF LEVEL
- ZONE 2: GOOD OR EXCELLENT QUALITY BEDROCK EXTENDING BELOW ANTICIPATED DESIGN USF LEVEL

PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7S9
TEL: (613) 226-7381

NO.	REVISIONS	DATE	INITIAL

10869279 CANADA INC.

GEOTECHNICAL INVESTIGATION
PROPOSED HIGH-RISE BUILDING
1649 MONTREAL ROAD AND 741 BLAIR ROAD

OTTAWA, ONTARIO

Title:

BEDROCK QUALITY ZONE PLAN

Scale: 1:400	Date: 05/2023
Drawn by: NFRV	Report No.: PG5663-1
Checked by: NP	Dwg. No.: PG5663-2
Approved by: DJG	Revision No.:

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