The Hazelton Westboro

Site Servicing and Stormwater Management Report

403 Richmond Road & 389 Roosevelt Avenue

City of Ottawa, Ontario

CIMA+ file number: A001046
January 20, 2023, Rev. 3

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Table of Contents

1. Introduction 1

1.1 Site Description and Proposed Development 1
1.2 Review of Available Background Documentation 2
1.3 Existing Infrastructure 4
1.4 Consultation and Permits 4

2. Water Servicing 5

2.1 Water Supply Design Criteria 5
2.2 Proposed Water Supply Servicing and Calculations 7
2.3 Water Supply Summary and Conclusions 9

3. Sanitary Servicing 9

3.1 Sanitary Servicing Design Criteria 9
3.2 Proposed Sanitary Servicing and Calculations 10
3.3 Sanitary Servicing Summary and Conclusions 11

4. Storm Servicing and Stormwater Management 11

4.1 Background 11
4.2 Storm Servicing Strategy and Design Criteria 12
4.3 Proposed Storm Servicing and Stormwater Management Design and Calculations 13
4.4 Storm Servicing and Stormwater Management Summary and Conclusions 15

5. Conclusion 15

List of Tables

Table 2-1: Water Supply Design Criteria 6
Table 2-2: Water Demands 7
Table 2-3: Watermain Boundary Conditions 8
Table 2-4: Available Hydrant Flows 8
Table 2-5: Water Supply Adequacy - Hydraulic Analysis 9
Table 3-1: Sanitary Peak Flow Determination Design Criteria 10
Table 3-2: Peak Sanitary Flows 10
Table 4-1: Pre-Development Peak Release Flows – Existing Site 12
Table 4-2: Pre-development (Allowable) Release Rate (2-year event) 14
Table 4-3: Post-development Flow Rate and Storage Summary 14

List of Figures

Figure 1: Site Location - Plan View. 1
Figure 2: Conceptual Site Plan. 2

List of Appendices

Appendix A Pre-consultation Correspondence
Appendix B Existing Conditions Plan
Appendix C Site Servicing and Stormwater Management Plan
Appendix D Water Supply Design Calculations
Appendix E Sanitary Servicing Design Calculations
Appendix F Storm Servicing and Stormwater Management Calculations
Appendix G Technical References
Appendix H Geotechnical Report (by Paterson Group Inc.)

1. Introduction

CIMA+ was retained by Starwood Group Inc. to prepare a Site Servicing and Stormwater Management Report for the proposed construction of a nine (9)-storey mixed-use (ground floor retail and 141 residential units) building with an amenity room penthouse, hereafter referred to as The Hazelton Westboro, located at 403 Richmond Road and 389 Roosevelt Avenue 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 Richmond Road and Roosevelt Avenue (refer to **Figure 1** below). 403 Richmond Road is currently comprised of a funeral home with surface parking. The funeral home shares a party wall with the adjacent property to the east (395 Richmond Rd), while 389 Roosevelt Avenue comprises a two-storey private residential building. The combined site area (403 Richmond and 389 Roosevelt) measures approximately 0.26 ha.

Generally, the site is bounded by a private residential dwelling to the north, a commercial building to the east, Richmond Road to the south, and Roosevelt Avenue to the west.

Figure 1: Site Location - Plan View.

The Hazelton Westboro proposed development is a nine (9)-storey, mixed use residential and commercial tower, with 141 residential units, expected to include approximately 237 residents, three (3) underground parking levels comprising nearly the entire site area, and an amenity room penthouse. The commercial floor space on the ground floor measures approximately 422 m² and the common areas, including amenity rooms and party room, measure approximately 409 m². Refer to **Figure 2** for a conceptual site plan of the proposed development (prepared by Roderick Lahey Architects Inc.).

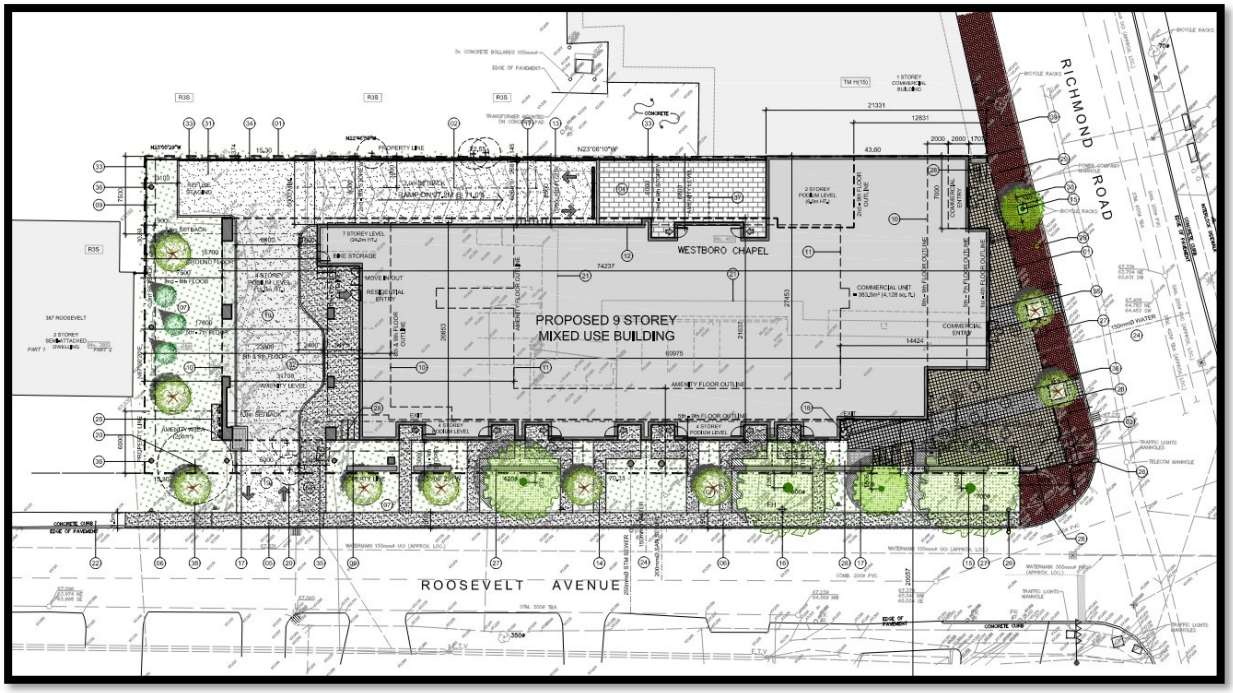

Figure 2: Conceptual Site Plan.

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, a detailed topographic survey prepared by CIMA+ (**Appendix B**), and the available as-built drawings (**Appendix A**) provided by the City of Ottawa Information Centre have been used to determine the existing municipal services location, size, material, and inverts fronting the site.

+ 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, Proposed Multi-Storey Building, 403 Richmond Road – Ottawa by Paterson Group Inc. (revision 2) dated October 7, 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 2 m.
- Bedrock removal can be accomplished by hoe ramming where the bedrock is weathered and/or where only small quantities of the bedrock need to be removed. Sound bedrock may be removed by line drilling in conjunction with controlled blasting and/or hoe ramming.
- Prior to considering blasting operations, the effects on the existing services, buildings and other structures should be addressed. A pre-blast or construction survey located in proximity of the blasting operations should be conducted prior to commencing construction. The extent of the survey should be determined by the blasting consultant and sufficient to respond to any inquiries/claims related to the blasting operations.
- The blasting operations should be planned and conducted under the supervision of a licensed professional engineer who is an experienced blasting consultant.
- Excavation side slopes in sound bedrock can be carried out using almost vertical side walls.
- The long-term groundwater level is expected to be located within the bedrock and range between 3 to 4 m below ground surface.. However, it should be noted that groundwater levels are subject to seasonal fluctuations, therefore, the groundwater levels could vary at the time of construction.
- A temporary Ministry of the Environment, Conservation and Parks (MECP) permit to take water (PTTW) may be required for this project if more than 400,000 L/day of ground and/or surface water is to be pumped during the construction phase. A minimum 4 to 5 months should be allowed for completion of the PTTW application package and issuance of the permit by the MECP. It is understood that the permit application will be initiated by the geotechnical consultant.
- Place a suitable waterproofing membrane (such as Tremco Paraseal or approved equivalent) against the prepared bedrock surface. The membrane liner should extend from finished grade down to footing level. The waterproofing membrane can begin at a depth below the podium level provided that the perimeter drainage board is placed below the vertical portion of the podium deck waterproofing to ensure that surface water drains over the drainage board and does not come in contact with the building's exterior foundation walls.
- Place a composite foundation drainage system, such as Delta Drain 6000 or equivalent, over the membrane (as a secondary system). The composite drainage layer should extend from finished grade to underside of footing level.
- Sub-slab drainage will be required to control water infiltration for the underground parking levels. For preliminary design purposes, it is recommended that 150 mm perforated pipes be placed at approximately 6 m centres underlying the lowest level floor slab. The spacing of the sub-slab 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 the detailed topographic survey, geoOttawa, and the available Utility Record Drawings provided by the City of Ottawa Information Centre, the following municipal infrastructure are available within the right-of-way fronting the proposed development site (refer to **Appendix B** for Existing Conditions Plan).

Richmond Road

+ 305 mm diameter PVC watermain (**preferred primary water connection point**).
+ 300 mm diameter PVC sanitary sewer.
+ 600 mm diameter Concrete storm sewer.

Roosevelt Avenue

+ 305 mm diameter PVC watermain that reduces to a 152 mm diameter Cast Iron (UCI) watermain (**preferred secondary water connection point to 152 mm watermain**).
+ 300 mm diameter Concrete sanitary sewer (**preferred sanitary connection point**).
+ 300 mm diameter Concrete storm sewer that terminates approximately 40 m north of the intersection with Richmond Road (**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 Mark Fraser 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 0.26-ha site currently consists of a funeral home which is zoned traditional main street (TM) and a single-family home which is zoned Residential Third Density (R3S).
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.

Correspondence has been provided to the local district office (refer to **Appendix A**).

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	4.1 × average daily demand[1]	1.5 × average daily demand
Maximum (Peak) Hour Demand	6.2 × average daily demand[1]	1.8 × maximum daily demand
Populations – 1 Bedroom Unit	1.4 Persons Per Unit	N/A
Populations – 2 Bedroom Unit	2.1 Persons Per Unit	N/A
Populations – 3 Bedroom Unit	3.1 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 1W 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. Given the subject site is on a corner lot the City will not support the installation of a new isolation valve on the City watermain to satisfy this requirement. Thus, if the basic day demand for this site exceeds 50m^3/day there shall be a primary water service to Richmond Rd. and a secondary connection to Roosevelt Ave. to provide redundant supply, utilizing the existing isolation valves 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 and Technical Bulletin ISTB-2018-02.
- A primary fire hydrant is required to be within 45 m of the Siamese connection and within 90 m (travel path not radius) of the front door of each building as per OBC and Ottawa Fire Services requirements.

[1] Note that residential peaking factors were selected from **Table 3-3** of the MOE 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	0.77	3.15	4.76
Commercial	0.03	0.04	0.07
Total	**0.79**	**3.19**	**4.83**

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)

In accordance with the City's request to avoid the installation of a new isolation valve on the City watermain given the development's position on a corner lot, a primary water service to Richmond Rd. and a secondary connection to Roosevelt Ave. is proposed. The existing isolation valves between the two connection points will be utilized to avoid a vulnerable service area. Refer to **Appendix C** for proposed connection points.

Primary Hydrant and Siamese Location

The Fire Department (Siamese) Connection is proposed at the southwest corner of the building. The nearest hydrant is located on the east side of Roosevelt Ave., approximately 30 m from the northeast quadrant of the intersection with Richmond Rd. This hydrant is located approximately 10.4 m from the proposed Siamese location and is well within 90 m of the front door. Refer to **Appendix D** (Figure 3 – Hydrant Coverage) for location of existing hydrant.

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 and Technical Bulletin ISTB-2018-02. It was determined that an RFF of **6,000 L/min (100 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 is 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)	
	Richmond Rd. 305 mm dia.	Roosevelt Ave. 152 mm dia.
Minimum HGL	108.5	108.5
Maximum HGL	115.0	115.0

A Multi-Hydrant Analysis was performed by the City utilizing the two nearest available hydrants on Roosevelt Ave. as identified on the Hydrant Coverage Figure prepared by CIMA+ (refer to **Appendix D**). The total available flow from these hydrants is as follows:

Table 2-4: Available Hydrant Flows

Hydrant ID	Available Flow (L/s)
362027H067	85
362028H045	30
Total	115

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 2-5: 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	0.79	47.6	68	50 to 70 psi	Yes
Maximum Day Demand + Fire Flow	103.19	115 L/s @ 20 psi		≥ 20 psi	Yes
Maximum (Peak) Hour Demand	4.83	41.1	58	50 to 70 psi	Yes

NOTES:

1. Required fire flow demand was calculated as **6,000 L/min (100 L/s)**.
2. The minimum HGL elevation at Connection Points 1 and 2 is **108.5 m** and the maximum HGL elevation is **115.0 m**.
3. Boundary conditions for Connection 1 to Richmond Road assumes a ground elevation of 67.40 m.
4. Boundary conditions for Connection 2 to Roosevelt Avenue assumes a ground elevation of 67.40 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 Unit	1.4 Persons Per Unit	N/A
Populations – 2 Bedroom Unit	2.1 Persons Per Unit	N/A
Populations – 3 Bedroom Unit	3.1 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	0.79
Total Estimated Peak Dry Weather Flow Rate	2.71
Total Estimated Peak Wet Weather Flow Rate	2.78

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

Proposed Sanitary Service Connection Point

The proposed sanitary service will connect to the existing 300 mm diameter Concrete sanitary sewer within the right-of-way of Roosevelt Ave. Wastewater flows to the West Nepean Trunk Collector sewer system. Refer to **Appendix C** for proposed connection points.

Per Ottawa Sewer Design Guidelines (2012), Section 6.2.14 a drop structure is required at the proposed sanitary maintenance hole MH-1 in accordance with OPSD 1003.010 to accommodate a drop of greater than 600 mm. This is due to a crossing with the existing municipal watermain within the right-of-way.

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 (300 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, as amended by all applicable Technical Bulletins.

Peak wastewater demands were provided to the City, who confirmed that there is adequate residual capacity in the city system to accommodate the proposed wastewater flow (refer to **Appendix E**).

4. Storm Servicing and Stormwater Management

4.1 Background

As previously mentioned, the subject site of 403 Richmond Road currently occupies a funeral home with surface parking. Based on available recent survey information the site is relatively flat and generally follows the gradient along Roosevelt Avenue sloping gently from south to north with an approximate change in gradient of 350 mm across the site. The site is nearly entirely 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 Roosevelt Avenue at the northwest site entrances. A small portion of unattenuated flow outlets to Richmond Road at the southernmost entrance. Refer to Pre-development Drainage Area Map in **Appendix F**.

The portion of the site located at 389 Roosevelt occupies a single-family dwelling, with asphalt driveway, stone pathway, wooden 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 unclear with a minimum elevation of 67.130 m at the rear lot line and a minimum elevation of 67.190 m at Roosevelt Avenue. Given there are no rear lot drainage features identified on geoOttawa it is expected that the outlet for this site area is also to Roosevelt Ave. 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)
2-year	43.27
5-year	58.70
100-year	122.50

Ultimately storm runoff from the site enters the municipal system along Roosevelt Ave. Stormwater drains to the Dominion Overflow trunk sewer system prior to discharging to the Ottawa River approximately 650 m downstream from the site. Refer to **Appendix F** for sketch demonstrating the flow path to the ultimate outlet.

The site is located in an older sewer system area of the City, which is uncontrolled and is subject to surcharge for events greater than the 2-year storm. The stormwater management solution must account for the impacts of the receiving system's hydraulic grade line when surcharged, specifically where underground storage is proposed.

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 2-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 2-year pre-development release rate, up to and including the 100-year storm event, must be detained on site.
- Where an underground storage tank or cistern is proposed it must be equipped with backflow prevention as well as a submersible pump to ensure a consistent release rate from the building to ensure the on-site stormwater management controls will not be overwhelmed in the event the 300 mm storm sewer main within Roosevelt Ave. becomes surcharged. The design of the pump is to be completed by the mechanical engineer.
- Given the receiving storm sewer is subject to surcharge, the hydraulic grade line under surcharged conditions must be considered in the design of underground retention.
- Overland flow will generally be directed to Roosevelt Avenue.

- The north end landscaped portion will drain to a grass swale, with perforated subdrain, running along the perimeter of the site (refer to **Appendix C**). Stormwater retained in the swale will drain into the perforated subdrain through catch basins and infiltration. The perforated subdrain will outlet into a standard catch basin, which will house a vortex ICD controlling flow and storage in this area.
- 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.
- Foundation drains will be pumped with appropriate back up power, sufficient sized pump, and back flow prevention, thus negating the need for an independent connection to the sewer main.
- The roof drain leaders will be utilizing a pressurized drainpipe type to provide additional protection in the event of surcharge in the municipal system.
- Adjustable flow control roof drains type ES-WD-RD-ACCUTROLADJ-CAN are utilized in roof areas where controlled flow and storage are identified (refer to **Appendix G**).
- Considering no long-term surface parking spots are being proposed and rainwater from landscaping and rooftop drainage is considered to be clean for the purpose of protecting water quality and aquatic habitat, the RVCA would not require any additional onsite water quality control measures save and except best management practices.
- Raingardens and alternative low impact development would be strongly encouraged by RVCA to meet the best management practice requirement.
- RVCA's typical trigger for onsite water quality control via mechanical separation would be six (6) long-term surface parking spaces or greater.

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 300 mm concrete storm sewer on Roosevelt Avenue. Refer to **Appendix C** for proposed connection points.

Per Ottawa Sewer Design Guidelines (2012), Section 6.2.14 a drop structure is required at proposed storm maintenance hole MH-1 in accordance with OPSD 1003.020 to accommodate a drop of greater than 1200 mm. This is due to a crossing with the existing municipal water within the right-of-way.

A new maintenance hole is required on the mainline when considering the mainline pipe is concrete and the service (250 mm) is greater than 50% of the mainline diameter (300 mm).

Pre-development (Allowable) Release Rates

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

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

Catchment ID	Area (ha)	Runoff Coefficient (C)	Time of Concentration (Tc) (minutes)	Rainfall Intensity (mm/hr)	Release Rate (L/s)
Subject Site	0.26	0.50	10	76.81	**27.74**

The storm runoff under post-development conditions for the site area must be controlled to the allowable 2-year pre-development release rate of **27.74 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

Control Area	100-year Release Rate (L/s)	100-year Storage Volume (m^3)
A1 (Controlled Roof Area)	1.90	20.1
A2 (Areas to Swale)	9.59	11.6
A3 (Areas to Underground Tank)	16.25	24.1
NC1 (Uncontrolled Areas)	0.00	-
Total	27.74	55.9

As a result of proposed development, the area of hard surface within the unattenuated area (boulevard) is expected to decrease, further reducing stormwater flows compared to existing conditions.

As demonstrated in **Table 4-3** an anticipated storage volume of **55.9 m^3** shall be required on-site via roof retention, storage in the proposed swale and perforated subdrain at the north and west site areas (refer to **Appendix C**), and underground storage (internal cistern) to restrict stormwater discharge to the allowable release rate of **27.74 L/s**. Refer to **Appendix F** for detailed stormwater storage calculations and **Appendix C** for Stormwater Management Plan.

The storm water tank will be equipped with backflow prevention, appropriate emergency overflow outlet, as well as a submersible pump to meet the SWM design intent and ensure the on-site stormwater management controls will not be overwhelmed in the event the 300 mm storm sewer main within Roosevelt Ave. becomes surcharged.

Below ground storage requirements have been determined using the full flow rate considering a submersible pump will be provided at the outlet of the internal cistern to ensure a consistent release rate. The cistern and pump can be accessed via the parking level P1 and STM MH-2 for maintenance purposes (refer to **Appendix C**).

Stormwater Quality Control

Rainwater from landscaping and rooftop drainage is considered to be clean for the purpose of protecting water quality and aquatic habitat.

Through consultation with the Rideau Valley Conservation Authority (RVCA) (refer to **Appendix A**) it was confirmed that they would not require any additional onsite water quality control measures save and except best management practices.

RVCA also confirmed that a mechanical separator for hydrocarbon removal will not be required as the typical trigger for on-site water quality control via mechanical separation is six (6) surface parking spaces or greater.

Low impact development measures including grassed swale has been provided to meet best management practices for quality control of surface runoff.

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, as amended by all applicable Technical Bulletins.

An anticipated storage volume of **55.9 m³** shall be required on-site via roof retention, storage in the proposed swale with perforated subdrain, and underground storage (internal cistern) to restrict stormwater discharge to the allowable release rate of **27.74 L/s**.

A memorandum shall be provided from the mechanical engineer for the project confirming that the roof will be designed to meet the stormwater management objectives with flow control drains and roof spill scuppers in accordance with requirements of clause 7.4.10.4 of the OBC.

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) nine (9)-storey residential tower with ground floor commercial space and an amenity penthouse.

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 141 apartment units with a population of approximately 237 persons and have a total commercial area of approximately 831 m² (including ground floor commercial areas, amenity rooms, and party room). 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 **0.79 L/s** (average day), **103.19 L/s** (max day + fire flow), and **4.83 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.

- 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.
- The estimated sanitary flow for the proposed development is **0.79 L/s** (average dry weather), **2.71 L/s** (peak dry weather), and **2.78 L/s** (peak wet weather). The City of Ottawa has indicated that the existing sanitary sewer network near the proposed site can accept the peak wet weather sanitary flow of the proposed development.
- Storm runoff in excess of the allowable 2-year pre-development release rate, up to and including the 100-year storm event, will be detained on site via roof retention, swale with perforated subdrain, and an internal cistern prior to being discharged to the municipal storm sewer system.
- The allowable stormwater release rate for the proposed site is **27.74 L/s**. It is expected that this will be achieved by means of roof retention, storage in the proposed swale and perforated subdrain at the north and west site areas, and underground retention (cistern). To achieve this release rate, a storage volume of **55.9 m³** is required on-site.
- The existing site is nearly entirely 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.
- Low Impact Development (LID) measures in the form of a grassed swale are incorporated in the Stormwater Management Plan for the site, which will provide quality control of surface runoff.
- 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

Servicing Study Guidelines for Development Applications

4. Development Servicing Study Checklist

4.1 General Content

	Required Content	Reference Location
☐	Executive Summary (for larger reports only).	N/A
☑	Date and revision number of the report.	Cover Sheet
☑	Location map and plan showing municipal address, boundary, and layout of proposed development.	Report Figures
☑	Plan showing the site and location of all existing services.	Appendix B
☑	Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments	Section 1.1
☑	Summary of Pre-consultation Meetings with City and other approval agencies.	Section 1.4
☑	Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria.	Section 1.2 & 1.4
☑	Statement of objectives and servicing criteria.	Section 1.0, 2.1, 3.1 & 4.2
☑	Identification of existing and proposed infrastructure available in the immediate area.	Section 1.3 & Appendix B
☐	Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).	N/A
☑	Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.	Section 4 and Appendix C
☐	Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.	N/A
☐	Proposed phasing of the development, if applicable.	N/A
☑	Reference to geotechnical studies and recommendations concerning servicing.	Section 1.2 & Appendix H
☐	All preliminary and formal site plan submissions should have the following information: - Metric scale; - North Arrow (including construction North); - Key Plan; - Name and contact information of applicant and property owner; - Property limits including bearings and dimensions; - Existing and proposed structures and parking areas; - Easements, road widening and rights-of-way; - Adjacent street names.	N/A

4.2 Development Servicing Report: Water

	Required Content	Reference Location
☐	Confirm consistency with Master Servicing Study, if available	N/A
☑	Availability of public infrastructure to service proposed development	Section 1.3 & Appendix B
☑	Identification of system constraints	Section 2.1 & 2.2
☑	Identify boundary conditions	Section 2.2
☑	Confirmation of adequate domestic supply and pressure	Section 2.2 & 2.3
☑	Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.	Section 2.2 & 2.3
☑	Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.	Section 2.1 & 2.2
☐	Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design	N/A
☑	Address reliability requirements such as appropriate location of shut-off valves	Section 2.2 & Appendix C
☐	Check on the necessity of a pressure zone boundary modification.	N/A
☑	Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range	Table 2-5
☑	Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.	Section 2.2, Appendix C & Appendix D
☐	Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.	N/A

☑	Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.	Section 2.3
☐	Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.	N/A

4.3 Development Servicing Report: Wastewater

Required Content		Reference Location
☑	Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).	Section 3.1
☐	Confirm consistency with Master Servicing Study and/or justifications for deviations.	N/A
☐	Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.	N/A
☑	Description of existing sanitary sewer available for discharge of wastewater from proposed development	Section 1.3, 3.2 & Appendix B
☑	Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)	Section 3.3
☑	Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.	Section 3.2 & Appendix E
☑	Description of proposed sewer network including sewers, pumping stations, and forcemains.	Section 3.2
☐	Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).	N/A
☐	Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.	N/A
☐	Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.	N/A
☐	Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.	N/A
☐	Special considerations such as contamination, corrosive environment etc.	N/A

4.4 Development Servicing Report: Stormwater Checklist

Required Content		Reference Location
☑	Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)	Section 4.1
☑	Analysis of available capacity in existing public infrastructure.	Section 4.1
☑	A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.	Appendix C & F
☑	Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.	Section 4.2
☑	Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.	Section 4.2
☑	Description of the stormwater management concept with facility locations and descriptions with references and supporting information.	Section 4.3, 4.4 & Appendix C
☐	Set-back from private sewage disposal systems.	N/A
☐	Watercourse and hazard lands setbacks.	N/A
☑	Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.	Appendix A
☐	Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.	N/A
☑	Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).	Section 4.3 & Appendix F
☐	Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.	N/A
☑	Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.	Section 4.1 & 4.3
☐	Any proposed diversion of drainage catchment areas from one outlet to another.	N/A
☑	Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.	Section 4 and Appendix C

☐	If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100 year return period storm event.	N/A
☐	Identification of potential impacts to receiving watercourses	N/A
☐	Identification of municipal drains and related approval requirements.	N/A
☑	Descriptions of how the conveyance and storage capacity will be achieved for the development.	Section 4.3 and 4.4
☑	100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.	Section 4 and Appendix C
☐	Inclusion of hydraulic analysis including hydraulic grade line elevations.	N/A
☐	Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.	N/A
☐	Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.	N/A
☐	Identification of fill constraints related to floodplain and geotechnical investigation.	N/A

4.5 Approval and Permit Requirements: Checklist

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

4.6 Conclusion Checklist

Required Content		Reference Location
☑	Clearly stated conclusions and recommendations	Section 5.0
☑	Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.	Appendix A
☑	All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario	Signature Page

Servicing study guidelines for development applications

4. Development Servicing Study Checklist

The following section describes the checklist of the required content of servicing studies. It is expected that the proponent will address each one of the following items for the study to be deemed complete and ready for review by City of Ottawa Infrastructure Approvals staff.

The level of required detail in the Servicing Study will increase depending on the type of application. For example, for Official Plan amendments and re-zoning applications, the main issues will be to determine the capacity requirements for the proposed change in land use and confirm this against the existing capacity constraint, and to define the solutions, phasing of works and the financing of works to address the capacity constraint. For subdivisions and site plans, the above will be required with additional detailed information supporting the servicing within the development boundary.

4.1 General Content

- ☐ Executive Summary (for larger reports only).
- ☒ Date and revision number of the report.
- ☐ Location map and plan showing municipal address, boundary, and layout of proposed development.
- ☐ Plan showing the site and location of all existing services.
- ☐ Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.
- ☐ Summary of Pre-consultation Meetings with City and other approval agencies.
- ☐ Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria.
- ☐ Statement of objectives and servicing criteria.
- ☐ Identification of existing and proposed infrastructure available in the immediate area.
- ☐ Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).
- ☐ Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.
- ☐ Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.
- ☐ Proposed phasing of the development, if applicable.

- ☐ Reference to geotechnical studies and recommendations concerning servicing.

- ☐ All preliminary and formal site plan submissions should have the following information:
  - Metric scale
  - North arrow (including construction North)
  - Key plan
  - Name and contact information of applicant and property owner
  - Property limits including bearings and dimensions
  - Existing and proposed structures and parking areas
  - Easements, road widening and rights-of-way
  - Adjacent street names

4.2 Development Servicing Report: Water

- ☐ Confirm consistency with Master Servicing Study, if available
- ☐ Availability of public infrastructure to service proposed development
- ☐ Identification of system constraints
- ☐ Identify boundary conditions
- ☐ Confirmation of adequate domestic supply and pressure
- ☐ Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.
- ☐ Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.
- ☐ Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design
- ☐ Address reliability requirements such as appropriate location of shut-off valves
- ☐ Check on the necessity of a pressure zone boundary modification.
- ☐ Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range

- ☐ Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.
- ☐ Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.
- ☐ Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.
- ☐ Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.

4.3 Development Servicing Report: Wastewater

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

4.4 Development Servicing Report: Stormwater Checklist

- ☐ Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)
- ☐ Analysis of available capacity in existing public infrastructure.
- ☐ A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.
- ☐ Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.
- ☐ Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.
- ☐ Description of the stormwater management concept with facility locations and descriptions with references and supporting information.
- ☐ Set-back from private sewage disposal systems.
- ☐ Watercourse and hazard lands setbacks.
- ☐ Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.
- ☐ Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.
- ☐ Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).
- ☐ Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.
- ☐ Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.
- ☐ Any proposed diversion of drainage catchment areas from one outlet to another.
- ☐ Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.
- ☐ If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100 year return period storm event.
- ☐ Identification of potential impacts to receiving watercourses
- ☐ Identification of municipal drains and related approval requirements.
- ☐ Descriptions of how the conveyance and storage capacity will be achieved for the development.
- ☐ 100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.

- ☐ Inclusion of hydraulic analysis including hydraulic grade line elevations.
- ☐ Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.
- ☐ Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.
- ☐ Identification of fill constraints related to floodplain and geotechnical investigation.

4.5 Approval and Permit Requirements: Checklist

The Servicing Study shall provide a list of applicable permits and regulatory approvals necessary for the proposed development as well as the relevant issues affecting each approval. The approval and permitting shall include but not be limited to the following:

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

4.6 Conclusion Checklist

- ☐ Clearly stated conclusions and recommendations
- ☐ Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.
- ☐ All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario

From: Fraser, Mark
To: Tim Kennedy
Cc: Christian Lavoie-Lebel
Subject: RE: 403 Richmond Road - Servicing Requirements and Design Criteria
Date: Monday, June 08, 2020 3:36:38 PM
Attachments: image001.jpg
image002.jpg
PC_403 Richmond Rd. and 389 Roosevelt Ave..msg

Hi Tim,
Please see the attached email for servicing and SWM criteria. An Assessment of Adequacy of Public Services Report with a conceptual servicing and SWM plan will be required in support of an application for OPA and ZBLA at 403 Richmond Rd. and 389 Roosevelt Ave.
If you have any questions or require any clarification on the information provided in the attached email please let me know.
Regards,

Mark Fraser, P. Eng.
Project Manager, Planning Services
Development Review Central Branch
City of Ottawa | Ville d'Ottawa
Planning, Infrastructure and Economic Development Department
110 Laurier Avenue West. 4th Floor, Ottawa ON, K1P 1J1
Tel:613.580.2424 ext. 27791
Fax: 613-580-2576
Mail: Code 01-14
Email: Mark.Fraser@ottawa.ca
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From: Tim Kennedy
Sent: June 08, 2020 6:49 AM
To: Fraser, Mark
Cc: Christian Lavoie-Lebel
Subject: 403 Richmond Road - Servicing Requirements and Design Criteria

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Good morning Mark,
I was given your contact information by my colleague Christian who noted you would be the planner on file for this project. I will be assisting with the civil design and I am hoping you have some availability this week to discuss the servicing requirements and design criteria for the above mentioned development. Also I understand you are looking for a servicing and SWM report for the zoning application and I am wondering what exactly you will require at this stage.
My availability this week is generally between 9:30 and 1:30. Could you let me know which day and time works best on your end?
Looking forward to collaborating on this one.

Regards,

TIM KENNEDY, P.Eng.
Project Manager / Infrastructure

T 613-860-2462 ext. 6620 **M** 613-462-3627 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

Notice to our customers on the COVID-19

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'

From: Fraser, Mark
To: O"Connor, Ann
Subject: PC_403 Richmond Rd. and 389 Roosevelt Ave.
Attachments: image001.png
image002.jpg
2020-05-27 - Concept.pdf
200601_403 Rich_Prelim Servicing.pdf
Servicing Report Template Final Version.docx

Hi Ann,

Please forward the below information to the applicant regarding a development proposal at **403 Richmond Rd. and 389 Roosevelt Ave.** for a 10-storey mixed-use building (ground floor retail and 174 residential units). Note that the information is considered preliminary and the assigned Development Review Project Manager may modify and/or add additional requirements and conditions upon review of an application if deemed necessary.

Comments:

- An application to consolidate the parcels of land will be required otherwise the proposed stormwater works will be servicing more than one parcel of land and thus does not meet the exemption set out in O.Reg. 525/98. This would mean an ECA would be required regardless of who owns the parcels.
- Concerns about roadway drainage spilling into the underground parking garage. Please make sure that the entrance to the underground garage is 0.30m higher than the spill point on the street. Entrance should not be located within a sag (low point) in the road.
- A deep excavation and dewatering operations have the potential to cause damages to the neighboring adjacent buildings/structures. Document that construction activities (excavation, dewatering, vibrations associated with construction, etc.)will not have an impact on any adjacent buildings and infrastructure.
- A **Record of Site Condition (RSC)** in accordance with O.Reg. 153/04 will be required to be filed and acknowledged by the Ministry prior to issuance of a building permit due to a change in property use from commercial to residential. Subsection 11(2) of O. Reg. 153/04 stipulates that the term "change in use" does not include a reference to the zoning of the property under municipal by-law and therefore refers to a change in the actual use of the property.

  Changes of use, s. 168.3.1 (1) (b) of the Act

  14. *A person shall not change the use of property for the purposes of clause 168.3.1 (1) (b) of the Act in any of the following manners:*

  5. *A change from commercial use to more than one type of property use including any or all of the following types of property use:*
     i. *Agricultural or other use*
     ii. *Institutional use*
     iii. *Parkland use*
     iv. ***Residential use***
- Development to be serviced from Roosevelt Ave. (local street). Location and construction of the proposed services shall not impact the existing street trees that have identified to be retained (4.5m setback required). Location of the services will be subject to review.

General:

- It is the sole responsibility of the consultant to investigate the location of existing underground utilities in the proposed servicing area to avoid any conflict with utilities. The location of existing utilities and services shall be documented on an Existing Conditions Plan.

- All underground and above ground building footprints and permanent walls need to be shown on the plans to confirm that any permanent structure does not extend either above or below into the existing property lines and sight triangles and/or future road widening protection limits.
- Please note that the proposed servicing design and site works shall be in accordance with the following documents:
    - Ottawa Sewer Design Guidelines (October 2012)
    - Technical Bulletin PIEDTB-2016-01
    - Technical Bulletins ISTB-2018-01, ISTB-2018-02 and ISTB-2018-03.
    - 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 Accessibility Design Standards (November 2015) (City recommends development be in accordance with these standards on private property)
    - Ottawa Standard Tender Documents (latest version)
    - Ontario Provincial Standards for Roads & Public Works (2013)
    - 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) 580-424 x.44455). **Include copies in the Appendix of the report as supporting documentation.**

Disclaimer:

The City of Ottawa does not guarantee the accuracy or completeness of the data and information contained on the above image(s) and does not assume any responsibility or liability with respect to any damage or loss arising from the use or interpretation of the image(s) provided. This image is for schematic purposes only.

Stormwater Management Criteria (Quantity and Quality Control) and Information:

- This site is located in an older sewer system area of the City.
- The storm sewer system in this area was designed to a **2-year level of service** not a 5-year system.
- **Water Quantity Control:** In the absence of area specific SWM criteria please control post-development runoff, up to and including the 100-year storm event, to a **2-year pre-development level**. The pre-development runoff coefficient will need to be determined **using the smaller of a runoff coefficient of C=0.5 or the actual existing site runoff coefficient**. The time of concentration used to determine the pre-development condition will be the larger of 10min. or the calculated time of concentration. [*Tc should not be less than 10 min. since IDF curves become unrealistic at less than 10 min; T_c of 10 minutes shall be used for all post-development calculations*].
- Any storm events greater than the calculated **2-year allowable release rate**, up to and including the 100-year storm event, shall be detained on-site by appropriate SWM measures to avoid impact on the downstream sewer system.
- Compare pre-development flows to post-developments flows in the SWM report.
- The receiving storm sewer system is uncontrolled therefore subject to surcharge (HGL will be elevated for events greater than the 2-year). The impact from the receiving system HGL will need to be considered if proposing underground storage The SWM solution will need to be designed accordingly.

- If rooftop control and storage is considered as part of the SWM solution sufficient details (Cl. 8.3.8.4) shall be discussed and documented in the report and on the plans. A roof drainage plan and detailed roof drain summary table with supporting drain manufacturer information will be required. The roof drainage plan will need to document roof drain type, flow rates, emergency scupper locations and spill over elevations and ponding areas.
- **Water Quality Control:** Please consult with the local conservation authority (RVCA) regarding water quality criteria and requirements prior to submission of an application. It is consultant's responsibility to check with the RVCA for quality control issues and include this information in the SWM report. Please contact RVCA for further information and provide correspondence in the Appendix of the report.
- Please note that the HGL within the receiving sewer system will need to be assessed if underground storage (cistern) is proposed as part of the stormwater management solution to ensure the system does not become surcharged and thereby ineffective do to a loss in available storage.
- **Underground Storage: Underground storage volumes are to be based on 50% peak flow rates or use dynamic compute model.** The Modified Rational Method for storage computation in the Sewer Design Guidelines was originally intended to be used for above ground storage (i.e. parking lot) where the change in head over the orifice varied from 1.5 m to 1.2 m (assuming a 1.2 m deep CB and a max ponding depth of 0.3 m). This change in head was small and hence the release rate fluctuated little, therefore there was no need to use an average release rate.

  When underground storage is used, the release rate fluctuates from a maximum peak flow based on maximum head down to a release rate of zero. This difference is large and has a significant impact on storage requirements. **We therefore require that an average release rate equal to 50% of the peak allowable rate shall be applied to estimate the required volume. Alternatively, the consultant may choose to use a submersible pump in the design to ensure a constant release rate.**

  In the event that there is a disagreement from the designer regarding the required storage, The City will require that the designer demonstrate their rationale utilizing dynamic modelling, that will then be reviewed by City modellers in the Water Resources Group.

  Note that the above will added to upcoming revised Sewer Design Guidelines to account for underground storage, which is now widely used.
- If a storage tank (internal cistern) is considered as part of the SWM solution sufficient details and system information will need to be provided. A detailed cross-section of such system with sufficient details and information (HWLs, release rate, volume, location, size (dimensions), control device, emergency flow outlet and backflow protection, etc.) will need to be provided. An appropriate emergency overflow location will need to be determined and documented. Backup power supply necessary if pump controlled.
- Please include a Pre-Development Drainage Area Plan to define the pre-development drainage areas/patterns. Existing drainage patterns shall be maintained and discussed as part of the proposed SWM solution. Positive drainage away from the building shall be achieved and exiting grades along the property line are to be maintain. Runoff to any adjacent lands will not be permitted.
- 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.).

Storm Sewer:

- The sewer system in this area is uncontrolled and therefore it can surcharge.

A 300mm dia. Conc. storm sewer is available within Roosevelt Ave. The site shall be serviced from this sewer system (local road). Stormwater drains to the Dominion Overflow trunk sewer system and discharged to the Ottawa River.

- For concrete sewer pipe, maintenance manholes shall be installed when the service is greater than 50% of the diameter of the mainline concrete pipe.
- A storm sewer monitoring maintenance hole is required to be installed at the property line (on the private side of the property) as per City of Ottawa Sewer-Use By-Law 2003-514 (14) *Monitoring Devices* as the site will have a commercial component with the residential development.
- As-built drawings of the existing services within the vicinity of the site are available and to be reviewed in order to determine proper servicing and SWM plan for the subject site(s).
- Foundation drainage system details are to be discussed in the report and document how the system will be integrated into the servicing design. Please note that foundation drain is to be independently connected to sewermain unless being pumped with appropriate back up power, sufficient sized pump and back flow prevention.

Sanitary Sewer:

- A 300mm dia. Conc. sanitary sewer is located within Roosevelt Ave. The site shall be serviced from this sewer system (local road). Wastewater flows to the West Nepean Trunk Collector sewer system.
- For concrete sewer pipe, maintenance manholes shall be installed when the service is greater than 50% of the diameter of the mainline concrete pipe. The sanitary service should be located in an area that will allow for a perpendicular connection to the sewer and have no bends in the pipe. The proposed location of the sanitary service will not allow for a structure to be installed due to the watermain crossing.
- An analysis and demonstration that there is sufficient/adequate residual capacity to accommodate any increase in wastewater flows in the receiving and downstream wastewater system is required to be provided. It is suggested to **calculate the total peak wastewater demand for the proposed development and send it to the City as soon as possible in advance of a submission of an application, as an initial step to determine whether or not there is enough capacity in the city system to accommodate the proposed wastewater flow.** Please note that it takes approx. 10 business days to get a response back from the internal circulation.
- The sanitary sewer criteria shall reflect the new *Technical Bulletin PIEDTB-2018-01.*
- A sanitary sewer monitoring maintenance hole is required to be installed at the property line (on the private side of the property) as per City of Ottawa Sewer-Use By-Law 2003-514 (14) *Monitoring Devices* as the site will have a commercial component with the residential development.
- A backwater valve is required on the sanitary service for protection (mandatory now anyways) as this area has experience flooding in the past due to surcharging of the West Nepean Collector sewer.
- If the groundwater is found to be contaminated and treatment is determined to be required it is a requirement per the Sewer Use By-law that remediated groundwater is to be directed to the sanitary sewer.

Water:

- A 152mm dia. UCI watermain is located within Roosevelt Ave. and a 305mm dia. PVC watermain is located within Richmond Rd.
- **Water Supply Redundancy:** Residential buildings with a basic day demand greater than 50m^3/day (0.57 L/s) are required to be connected to a minimum of two water services separated by an isolation valve to avoid a vulnerable service area as per the *Ottawa Design Guidelines - Water Distribution, WDG001, July 2010 Clause 4.3.1 Configuration. This proposed development will required*

two (2) separate water service connections if the basic day demand for this site exceeds 50m^3/day. There shall be a primary water service (Richmond Rd) and a secondary connection (Roosevelt Ave.). This is a corner lot so we will not support the installation of a new isolation valve on the City watermain to satisfy this requirement.

- Include a **hydrant coverage figure** and **demonstrate there is adequate fire protection** for the building per *Technical Bulletin ISTB-2018-02* . Multiple municipal hydrants will be required for fire protection.
- **Boundary conditions**, HGL, shall be requested and a hydraulic analysis completed to show that there is adequate flow and pressure in the water distribution system to meet the required water demands. **Use Table 3-3 of the MOE Design Guidelines for Drinking-Water System to determine Maximum Day and Maximum Hour peaking factors for 0 to 500 persons.** provide the following information to the City of Ottawa via email to request water distribution network boundary conditions for the subject site. Please note that once this information has been provided to the City of Ottawa it takes approximately 5-10 business days to receive boundary conditions.
    - Type of Development and Units
    - Site Address (Street Number and Name)
    - Location of service(s).
    - A plan showing the proposed water service connection locations.
    - **Average Daily Demand** (L/s)
    - **Maximum Daily Demand** (L/s)
    - **Peak Hour Demand** (L/s)
    - **Required Fire Flow** (L/min) **FUS calculations are to be provided with request for boundary conditions.**
      [*Fire flow demand requirements shall be based on Fire Underwriters Survey (FUS) Water Supply for Public Fire Protection*
      1999 and Technical Bulletin ISTB-2018-02]
      Exposure separation distances shall be defined on a figure to support the FUS calculation and required fore flow (RFF).
      Fire flow demands will be inputted as point loads at each connection separately unless otherwise noted. A multi-hydrant analysis can be requested if necessary.
    - If fire protection is provided by existing municipal hydrants, hydrant capacity shall be assessed to demonstrate the RFF can be achieved. Identify which hydrants are being considered to meet the RFF on a **fire hydrant coverage figure** as part of the boundary conditions request.
- 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 RFF can be achieved. ***Refer to Table 1: Maximum flow to be considered from a given hydrant in Appendix I of Technical Bulletin ISTB-2018-02***.Appropriate fire protection mitigation measures shall be investigated/proposed to lower the RFF for the site to an appropriate level.
- The subject site is located within the 1W Pressure Zone.

Permits and Approvals:

- The consultant shall determine if this project will be subject to an Environmental Compliance Approval (ECA) for Private Sewage Works. It shall be determined if the exemptions set out in Ontario Regulation 525/98: *Approval Exemptions* are satisfied. All regulatory approvals shall be documented and discussed in the report.

Source Protection Policy Screening:

- The address lies within the Mississippi-Rideau Source Protection Region and is subject to the policies of the Mississippi-Rideau Source Protection Plan.
- **The entire property lies within the Surface Water Intake Protection Zone** (IPZ) for the Ottawa River (Lemieux) Intake, IPZ-2 (vulnerability score of 8.1) where significant threat policies apply. Policies are only applicable for significant drinking water threat activities as outlined in the *Clean Water Act*.
    - The *Clean Water Act* Tables of Circumstances identify circumstances under which certain activities would be considered a significant threat to drinking water within certain designated vulnerable area, and the Mississippi-Rideau Source Protection Plan contains policies related to significant drinking water threat activities to protect the drinking water supply.
    - Activities that may be considered a significant drinking water threat within the IPZ-2 (score 8.1) include the following:
        - Untreated stormwater from a stormwater retention pond
            - Note that a stormwater management facility is only considered a significant drinking water threat within this zone if the facility drains more than 100 ha of industrial/commercial land.
        - Sewage treatment plant effluent discharges
        - Combined sewer discharge from a stormwater outlet
        - Sewage treatment plant bypass discharge
        - Industrial effluent discharge
        - Waste disposal site
        - Agricultural activities (application or storage of manure or chemical fertilizers or pesticides, or use of land for livestock grazing)
    - Based on the information provided in your email, **the proposed activity does not meet the circumstances to be considered a significant drinking water threat, thus there are no applicable legally-binding source protection policies**.
- The area is not within a Wellhead Protection Area (WHPA).
- The area is located within a Highly Vulnerable Aquifer (HVA). Note that there are no legally binding policies under the Mississippi-Rideau Source Protection Plan for activities within Highly Vulnerable Aquifers.
- The area is not within a Significant Groundwater Recharge Area.

Capital Woks:

- As per GeoOttawa no capital works are proposed on Roosevelt Ave. or Richmond Rd (at this location).

Sight Triangle and Any Road widening Requirement (By Transportation Project Manager Mike Giampa)

Required Engineering Plans and Studies in Support of OPA and ZBLA applications:

PLANS:

- Conceptual Servicing and SWM Plan
- Legal Survey

REPORTS:

- Assessment of Adequacy of Public Services
- Geotechnical Study
- Noise Feasibility Study
- Phase I ESA (in accordance with Ontario Regulation 153/04)
- Phase II ESA (Depending on recommendations of Phase I ESA)

Wind Study

Required Engineering Plans and Studies in Support of SPC application:

PLANS:

- Existing Conditions and Removals Plan
- Site Servicing Plan
- Grade Control and Drainage Plan
- Erosion and Sediment Control Plan
- Pre-Development Drainage Area Plan
- Post-Development Drainage Area Plan
- Roof Drainage Plan w/ Roof Drain Summary Table (if rooftop SWM storage is being considered)
- Stormwater Storage System Detail (Cistern Details from the Mechanical Engineer if being considered)
- Foundation Drainage System Details
- Legal Survey Plan
- Site Lighting Plan, Photometric Plan and Site Lighting Certification Letter

REPORTS:

- Site Servicing and Stormwater Management Report
- Geotechnical Study/Investigation
- Detailed Noise Study (Transportation Noise Assessment and Stationary Noise Assessment)
- Phase I ESA (in accordance with Ontario Regulation 153/04)
- Phase II ESA (Depending on recommendations of Phase I ESA)
- An Record of Site Condition (RSC) is required (due to more sensitive land use). Phase I and Phase II (if necessary) shall speak to RSC requirement.
- Wind Study (Type 1 Wind Analysis)

Servicing Report Template and Guidelines:

Please find attached the Servicing Report Template & Study Guidelines" and prepare the servicing study accordingly. For capacity issue, please see section 3.2.1 page 3-3 and follow this section. A completed checklist with corresponding references from the servicing study is mandatory for the completeness of the study. Please add a completed checklist in the report. Please ensure you are using current guidelines, by-laws and standards.

Please refer to the **City of Ottawa Guide to Preparing Studies and Plans [Engineering]:** https://ottawa.ca/en/planning-development-and-construction/developing-property/development-application-review-process/development-application-submission/guide-preparing-studies-and-plans

Phase One Environmental Site Assessment (Official Plan Section 4.8.4):

- A Phase I ESA is required to be completed in accordance with Ontario Regulation 153/04 (not per CSA standards) in support of this development proposal to determine the potential for site contamination. Depending on the Phase I recommendations a Phase II ESA may be required in accordance with Ontario Regulation 153/04.
- The Phase I ESA, and if applicable Phase II ESA shall discuss requirement to file a RSC with the Ministry. A **Record of Site Condition (RSC)** in accordance with O.Reg. 153/04 will be required to be filed and acknowledged by the Ministry prior to issuance of a building permit due to a change in property use from commercial (less sensitive) to residential (more sensitive). As per the Official Plan (4.8.4) we do not consider an RSC acknowledged by the Ministry until either its has been confirmed that it will not be audited or it has passed the Ministry audit.
- Please also note that in the event soil and/or groundwater contamination is identified on this site

and the proposal is for a more sensitive land use, the MECP will require approximately 1-1.5 years to review the RSC. PIED will apply appropriate conditions, based on Environmental Protection Act (Section 168.3.1 (1)) and O.Reg. 153/04 (Parts IV and V) regarding requirements for RSC prior to building permit issuance. Dependent on the levels/types of contamination, timelines for building permit issuance may be longer than expected and we recommend applicant speak to Building Code Services, at the earliest convenience, so as to discuss these timelines in more detail, if deemed applicable.

- Environmental Risk Information Services (ERIS) report is required to be included as part of the Phase I ESA.
  https://www.ontario.ca/page/guide-completing-phase-one-environmental-site-assessments-under-ontario-regulation-15304
  https://www.ontario.ca/laws/regulation/040153#BK43

Geotechnical Investigation (Official Plan Section 4.8.3):

- A Geotechnical Study/Investigation shall be prepared in support of this development proposal.
- Discuss and investigate the impact if any on the lowering of the groundwater level has on any adjacent properties as reducing the groundwater level can lead to potential damages to surrounding structures due to excessive differential settlements of the ground.
- Geotechnical Study shall be consistent with the **Geotechnical Investigation and Reporting Guidelines for Development Applications**.
  https://documents.ottawa.ca/sites/default/files/documents/cap137602.pdf

Noise Study:

- A **Transportation Noise Assessment** will be required as the subject development is located within 100m of Richmond Road (arterial road/transit priority corridor identified on Schedule D) and Byron Ave. (collector road), proximity to Sir John A. McDonald Parkway (freeway) and within 300m of the proposed LRT corridor.
- A **Stationary Noise Assessment** is required in order to assess the noise impact of the proposed sources of stationary noise (mechanical HVAC system/equipment) of the development onto the surrounding residential area to ensure the noise levels do not exceed allowable limits specified in the City Environmental Noise Control Guidelines.
- Noise Study shall be consistent with the City's **Environmental Noise Control Guidelines**.
  https://documents.ottawa.ca/sites/default/files/documents/enviro_noise_guide_en.pdf

Wind Study:

- 10-storeys or more or a proposed building is more than twice the height of adjacent existing buildings and is greater than five storeys in height is subject to the submission of a Wind Study.
  https://documents.ottawa.ca/sites/documents/files/torwindanalysis_en.pdf

Exterior Site Lighting:

- Any proposed light fixtures (both pole-mounted and wall mounted) must be part of the approved Site Plan. All external light fixtures must meet the criteria for Full Cut-off Classification as recognized by the Illuminating Engineering Society of North America (IESNA or IES), and must result in minimal light spillage onto adjacent properties (as a guideline, 0.5 fc is normally the maximum allowable spillage). In order to satisfy these criteria, the please provide the City with a **Site Lighting Plan, Photometric Plan and Certification (Statement) Letter** from an acceptable professional engineer stating that the design is compliant.

Please note that these comments are considered preliminary based on the information available to date

and therefore maybe amended as additional details become available and presented to the City. It is the responsibility of the applicant and their representatives/consultants to verify information provided by the City. The applicant may contact me for any follow-up questions related to engineering/infrastructure prior to submission of an application if necessary.

If you have any questions or require any clarification please let me know.

Regards,

Mark Fraser, P. Eng.
Project Manager, Planning Services
Development Review Central Branch
City of Ottawa | Ville d'Ottawa
Planning, Infrastructure and Economic Development Department
110 Laurier Avenue West. 4th Floor, Ottawa ON, K1P 1J1
Tel:613.580.2424 ext. 27791
Fax: 613-580-2576
Mail: Code 01-14
Email: Mark.Fraser@ottawa.ca

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From:	ISD Information Centre / Centre Information
To:	Tim Kennedy
Subject:	RE: 20-0571 - 403 Richmond Rd. and 389 Roosevelt Ave - Servicing Capacity Assessment - Information Request
Date:	Friday, June 12, 2020 4:03:00 PM
Attachments:	2179p&p1.pdf 13695p&p01.pdf L9-1.pdf 20-0571 Richmond & Roosevelt.dwg 20-0571 Work Order.xlsx

Good afternoon Tim,

Attached are the plans and work order for the locations requested.

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.
Nick Havelock

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

From: Tim Kennedy <Tim.Kennedy@cima.ca>
Sent: June 11, 2020 3:16 PM
To: ISD Information Centre / Centre Information <informationcentre@ottawa.ca>
Subject: Re: 20-0571 - 403 Richmond Rd. and 389 Roosevelt Ave - Servicing Capacity Assessment - Information Request

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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,

Thanks for this and yes please proceed.

Tim

Sent from my iPhone

On Jun 11, 2020, at 2:02 PM, ISD Information Centre / Centre Information <informationcentre@ottawa.ca> wrote:

Good afternoon Tim,

Your estimate for the UCC portion of this request is ACAD .dwg – 1 x $143.00.

Your estimate for the drawings showing existing infrastructure: 3 x $16.00.

Please let us know if you would like to proceed or if you have any questions or concerns.

Thank you,
Nick Havelock
GIS & Data Management Branch - Information Centre
Phone: 613-580-2424 x 44455
Email: informationcentre@ottawa.ca

From: Tim Kennedy <Tim.Kennedy@cima.ca>
Sent: June 10, 2020 8:40 AM
To: ISD Information Centre / Centre Information <informationcentre@ottawa.ca>
Cc: Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>; Anne-Julie Cardinal <Anne-Julie.Cardinal@cima.ca>
Subject: 20-0571 - 403 Richmond Rd. and 389 Roosevelt Ave - Servicing Capacity Assessment - Information Request

CAUTION: This email originated from an External Sender. Please do not click links or open attachments unless you recognize the source.

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.

We are working with a client on a servicing capacity assessment for zoning bylaw amendment at 403 Richmond Rd. and 389 Roosevelt Ave (see attached key plan).

Our client is considering a servicing connection for the proposed development to Roosevelt and/or Richmond Road. Could you please provide any available 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, street lighting, 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,

TIM KENNEDY, P.Eng.
Project Manager / Infrastructure

T 613-860-2462 ext. 6620 **M** 613-462-3627 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

Notice to our customers on the COVID-19

<image001.jpg>

<image002.jpg>

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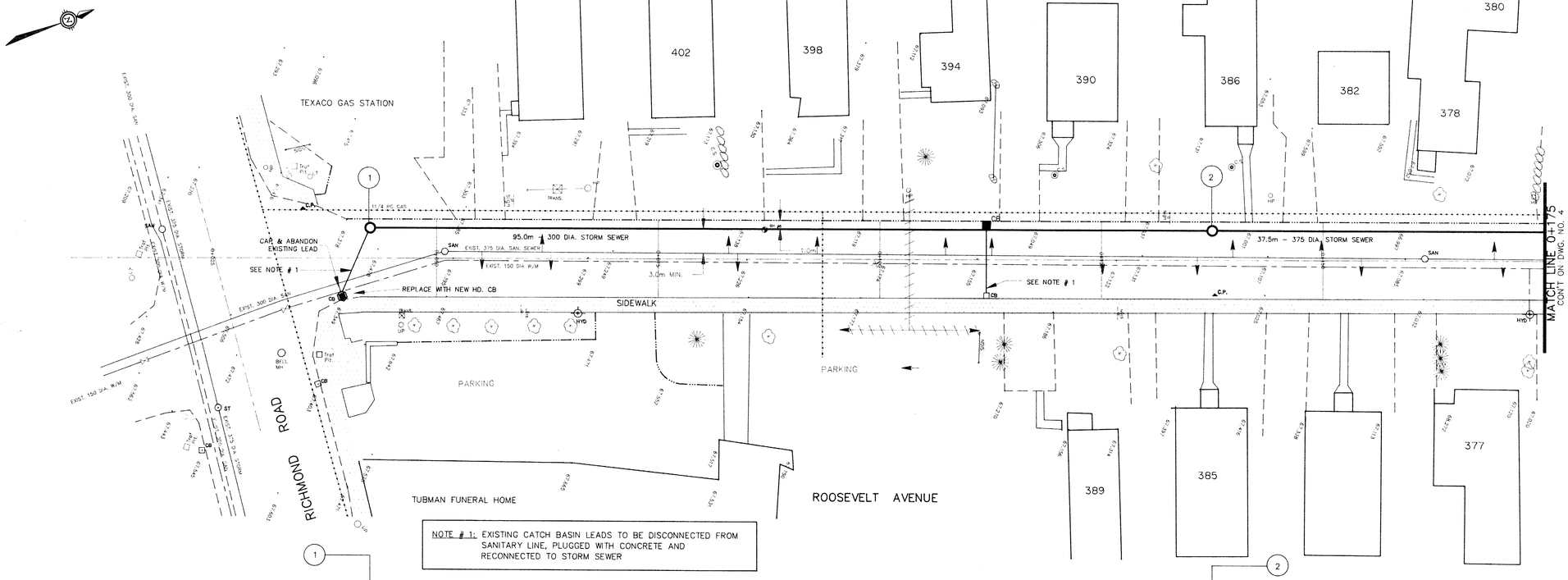
2179 5 OF 11



City Of Ottawa
Department Of Engineering & Works
Engineering And Surveys Branch

Notes:

1. Utilities shown are taken from best available records. Contractor is requested to check with all utility companies before digging.
2. Soil information shown is not guaranteed and contractors are advised to collect additional soils information as deemed necessary.
3. Reference bench mark:
4. Proposed storm and sanitary sewers may be constructed in a common trench provided that a minimum horizontal distance of 460mm is maintained between outside barrels of pipe.
5. All pipes shall conform to the American Society for Testing and Materials (A.S.T.M.) C.76 reinforced concrete sewer pipe with approved rubber gaskets (W.A.R.G.)
6. A minimum of 460mm vertical clearance to be maintained between sewers and watermains where practical
7. Borehole soil descriptions are not based on seive analysis but on visual inspection only, except where otherwise noted.
8. Soil information taken from:
9. Date of television inspection:
10. This plan supercedes (in whole or in part) plan no:
11. Actual rock line recorded during construction of existing sewer.
12. Registered plan no:
13. See additional notes on sheet # 1.

Legend:

	EXISTING	PROPOSED
.STORM SEWER		
.SANITARY SEWER		
.STREET LINE		
.LOT LINE		
.ROADS & DRIVEWYS Curbs Asphalt or Concrete Surface Treated	TYPE	TYPE
.WALKS Concrete or Asphalt Gravel, Cinder or Dirt	TYPE	TYPE
.DEPRESSED ACCESS On Curb On Sidewalk		
.WATERMAIN		
.GASMAIN & VALVE		
.BELL		
.HYDRO		
.TRAFFIC		
.FIRE ALARM		
.CABLEVISION		
.STEAM LINE		
.HYDRANT		
.WATER VALVE		
.STAND PIPE		
.WATER VALVE CHAMBER		
.SEWER, TRAFFIC, HYDRO & BELL MANHOLES(may be labelled for clarification)		
.TRAFFIC HANDHOLE		
.GUARD RAIL		
.RETAINING WALL		
.FENCE		
.HYDRO POLE		
.HYDRO POLE & LIGHT		
.BELL POLE		
TRAFFIC LIGHT		
.LIGHT STANDARD		
.TRAFFIC SIGN		
.STREET SIGN		
.CULVERT & DITCH		
.STANDARD CATCH BASIN & LEAD		
.HEAVY DUTY CATCH BASIN & LEAD		
.CATCH BASIN TO BE REMOVED & REPLACED WITH STANDARD C.B.		
.HEAVY DUTY CATCH BASIN TO BE REMOVED & REPLACED WITH HEAVY DUTY CATCH BASIN		
.HOUSE or CATCH BASIN CONNECTION TAKEN FROM T.V. INSPECTION		
.HOUSE or CATCH BASIN CONNECTION TAKEN FROM RECORDS		
.RELOCATION		
.REMOVAL		
.SQUARE IRON BAR		
.STANDARD IRON BAR		
.ROUND IRON BAR		
.TREE, SHRUB & HEDGE		
.BOREHOLE		
.ROCK		

.IN PLAN SEWERS 600mm & ABOVE ARE SHOWN AS DOUBLE LINE, TO SCALE USING SAME LINE WEIGHT
.UTILITIES X-OUT ARE ABANDONED, BELL PLANT SO MARKED MAY BECOME ACTIVE

Revisions:

No	Date	Description	Drawn By	Appr'd By

Designed By: J.N.SAWARNA	Date	Structural Check By	Date
Survey Detail By	Date	Checked By	Date
Drafting By: T.MARTIN	Date	Checked By	Date

Final Measurements:

Contractor	
Construction Type	Inspector
Work Commenced	Instrumentman
Work Completed	Field Book #
Designer	Date
Drafting Revisions	Checked By

Design And Construction Division

1550 BANK STREET OTTAWA ONTARIO K1H 8K7

Commissioner: C.Sim P.Eng.		Branch Director: W.R. Cole P.Eng.	
Chief Design & Constr. Eng.	Senior Design & Constr. Eng.	Senior Const. Coord.	

STORM SEWER
ROOSEVELT AVENUE
0+025 TO 0+175

Contract No:	Survey Numbers:	Scales:	Plan No:
88-52	OMM 88-6510	HOR. 1:250 VERT. 1:50	2179
			Sheet 5 of 11

LEGEND

- PROPOSED CURB INLET CATCHBASIN
- PROPOSED ROADSIDE CATCHBASIN
- PROPOSED CATCHBASIN/MANHOLE
- PROPOSED DECORATIVE LUMINAIRE
- PROPOSED BELL DUCT
- PROPOSED SANITARY SEWER
- PROPOSED STORM SEWER
- PROPOSED WATERMAIN
- 406 66.17 CIVIC ADDRESS/BASEMENT ELEVATION
- EXISTING SANITARY SERVICE CONNECTION AS PER CCTV INSPECTION
- EXISTING WATER SERVICE CONNECTION

BOREHOLE LEGEND

- ASPHALTIC CONCRETE
- BEDROCK
- CONCRETE
- CRUSHED STONE
- FILL
- SAND
- SILTY SAND
- GLACIAL TILL

BH BR-1 BOREHOLE BY JOHN D. PATERSON & ASSOCIATES LTD. (REPORT No. S8580-1)

NOTE: SERVICE LOCATIONS AT BUILDINGS ARE APPROXIMATE

REGISTERED PROFESSIONAL ENGINEER J.G. RIDDELL PROVINCE OF ONTARIO

REGISTERED PROFESSIONAL ENGINEER R.S. CEBRYK PROVINCE OF ONTARIO

NOVATECH ENGINEERING CONSULTANTS LTD. ENGINEERS & PLANNERS
Suite 200, 240 Michael Cowpland Drive, Kanata, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Email novainfo@novatech-eng.com

NO.	REVISIONS	BY	DATE
1.	ISSUED FOR COMMENTS	ERD	11/25/03
2.	FINAL DESIGN CIRCULATION	DHI	03/05/04
3.	ISSUED FOR TENDER	DHI	03/08/04
4.	ISSUED FOR M.O.E. APPROVAL	DHI	03/08/04
5.	ISSUED FOR CONSTRUCTION	DHI	04/08/04
6.	T/GRADE ELEV. FOR CB21	DHI	05/17/04
7.	AS-BUILT	DHI	03/10/06

NOTE:
The location of the utilities is approximate only, 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

RICHMOND ROAD
REHABILITATION
ROOSEVELT AVENUE TO TWEEDSMUIR AVENUE

GRADING AND DRAINAGE
STATION 1+465 TO STATION 1+575

Ottawa

CONTRACT NO. ISB04-5006
DWG. NO. 045006-08
SHEET 08 OF 38
Date: NOVEMBER 2003
Scale: HORIZONTAL 1:250 (0m 2.5 5 10)
VERTICAL 1:50 (0m 0.5 2)

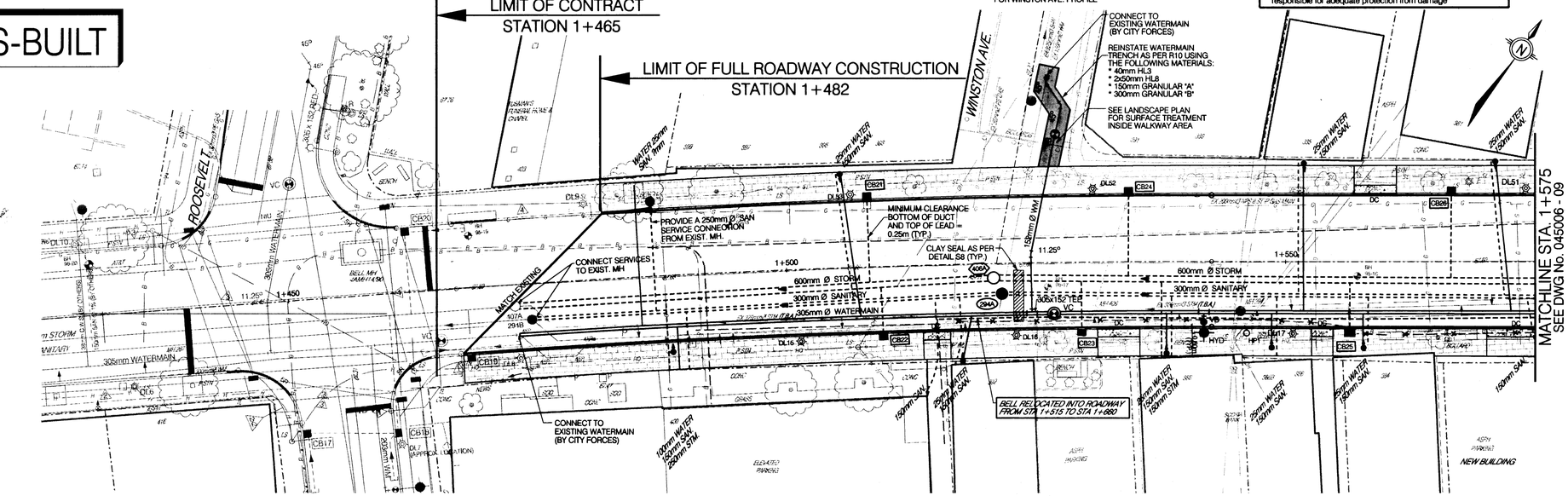
R. G. HEWITT, P.ENG. Director Infrastructure Services		W. NEWELL, P.ENG. Manager Construction Services - West	
Dwn: KLM	Chkd: DHI	Des: DHI	Chkd: RSC

AS-BUILT

SEE DWG. No. 045006 -13 FOR WINSTON AVE. PROFILE

LIMIT OF CONTRACT STATION 1+465

LIMIT OF FULL ROADWAY CONSTRUCTION STATION 1+482



CATCH BASIN DATA

NO.	STATION	OFFSET	TYPE	ELEVATION T/GRATE	ELEVATION LOW/INV.
CB21	1+508.29	6.65 LT	OPSD-705.010	67.378*	65.78
CB22	1+509.47	6.65 RT	OPSD-705.010	67.447*	65.05
CB23	1+529.48	6.65 RT	OPSD-705.010	67.507*	66.11
CB24	1+534.32	6.65 LT	OPSD-705.010	67.450*	65.85
CB25	1+558.40	6.65 RT	OPSD-705.010	67.587*	65.19
CB26	1+568.58	6.65 LT	OPSD-705.010	67.551*	65.96

OFFSETS ARE FROM BASELINE TO FACE OF CURB FOR CATCH BASINS
* CURB INLET ELEV.

STORM MANHOLE DATA

NO.	STATION	OFFSET	TYPE	ELEVATION T/GRATE	ELEVATION LOW/INV.
406A	1+520.8	1.5 RT	OPSD-701.010	67.58	~~65.240~~ 65.040

OFFSETS ARE FROM BASELINE TO CENTRE OF STRUCTURE

STORM SEWER DATA

SEWER	DIA.	TYPE	LENGTH	INVERT ELEVATION UP STR.	INVERT ELEVATION DOWN STR.
406A TO 406A	600	CONC.CL.100D	~~48.0~~ 47.92	~~65.240~~ 65.040	~~65.040~~ 64.840
406A TO 407A	600	CONC.CL.100D	~~48.9~~ 49.03	~~65.340~~ 65.040	~~64.840~~ 64.836

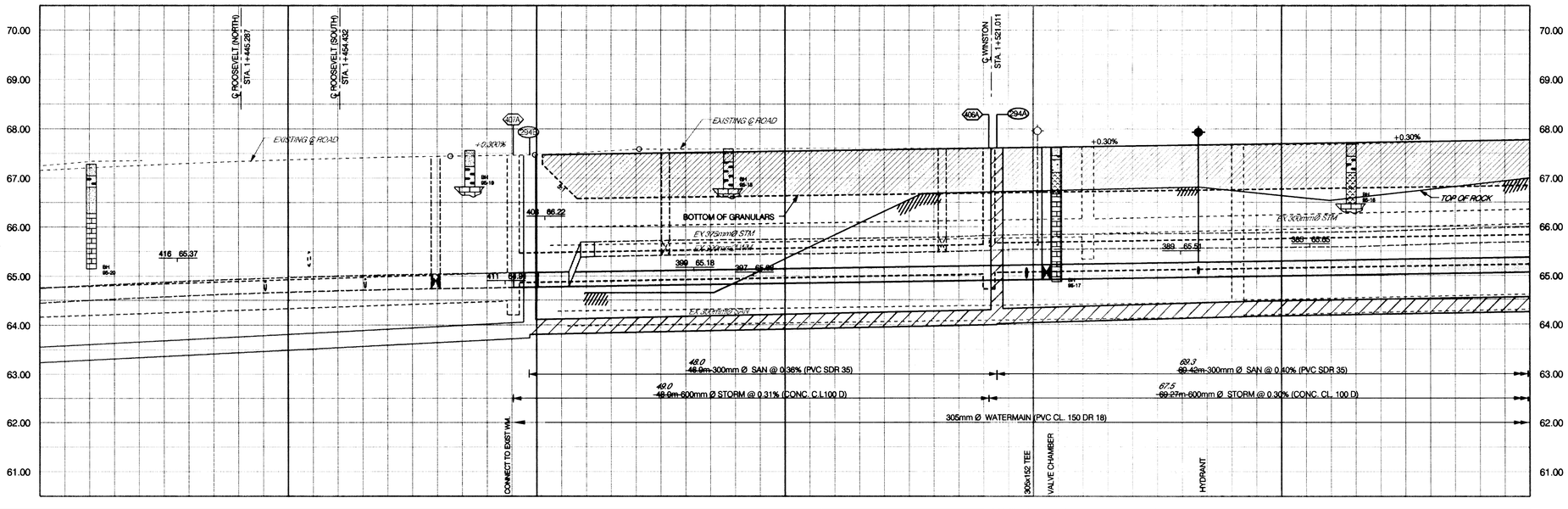
SANITARY MANHOLE DATA

NO.	STATION	OFFSET	TYPE	ELEVATION T/GRATE	ELEVATION LOW/INV.
294A	1+521.6	3.2 RT	OPSD-701.010	67.55	~~65.84~~ 65.64

OFFSETS ARE FROM BASELINE TO CENTRE OF STRUCTURE

SANITARY SEWER DATA

SEWER	DIA.	TYPE	LENGTH	INVERT ELEVATION UP STR.	INVERT ELEVATION DOWN STR.
294B TO 294A	300	PVC SDR 35	~~48.9~~ 48.97	~~65.250~~ 64.030	~~64.030~~ 63.834
294A TO 294B	300	PVC SDR 35	~~48.9~~ 48.97	~~63.884~~ 63.834	~~63.834~~ 63.634



℄ PROFILE	67.154	67.206	67.257	67.301	67.340	67.374	67.403	67.427	67.446	67.461	67.476	67.491	67.521	67.536
TOP OF WATERMAIN										65.06			65.08	
STATION	1+430		1+440			1+450		1+460		1+470	1+471.5	1+475	1+480	1+490

℄ PROFILE	67.551	67.566	67.581	67.596	67.611	67.626	67.641	67.656	67.671	67.686	67.701	67.716	67.731	67.746	67.761	67.776
TOP OF WATERMAIN			65.16		65.10	65.24			65.26				65.31			
STATION	1+500		1+510		1+520	1+524.5	1+525	1+526.5	1+530	1+540	1+541.8	1+550	1+560		1+570	1+575

NOTES:

GENERAL

1. BOREHOLE LOCATIONS ARE APPROXIMATE ONLY. FOR FURTHER INFORMATION, REFER TO GEOTECHNICAL INFORMATION IN THE REPORT PREPARED BY JOHN D. PATERSON & ASSOCIATES LTD. (REPORT No. S6580-1)
2. EXISTING TREES IN THE CONSTRUCTION ZONE AREA TO BE PRESERVED AND PROTECTED DURING THE CONSTRUCTION PERIOD.
3. LIMITS OF GRADING MAY VARY FROM THAT INDICATED, DEPENDING ON FIELD CONDITIONS OR AS DIRECTED BY THE ENGINEER.
4. WHERE AVAILABLE, EXISTING SERVICING INFORMATION TO PRIVATE PROPERTY HAS BEEN SHOWN.
5. SIGNS AND PAVEMENT MARKING TO BE REMOVED AND INSTALLED BY OTHERS.

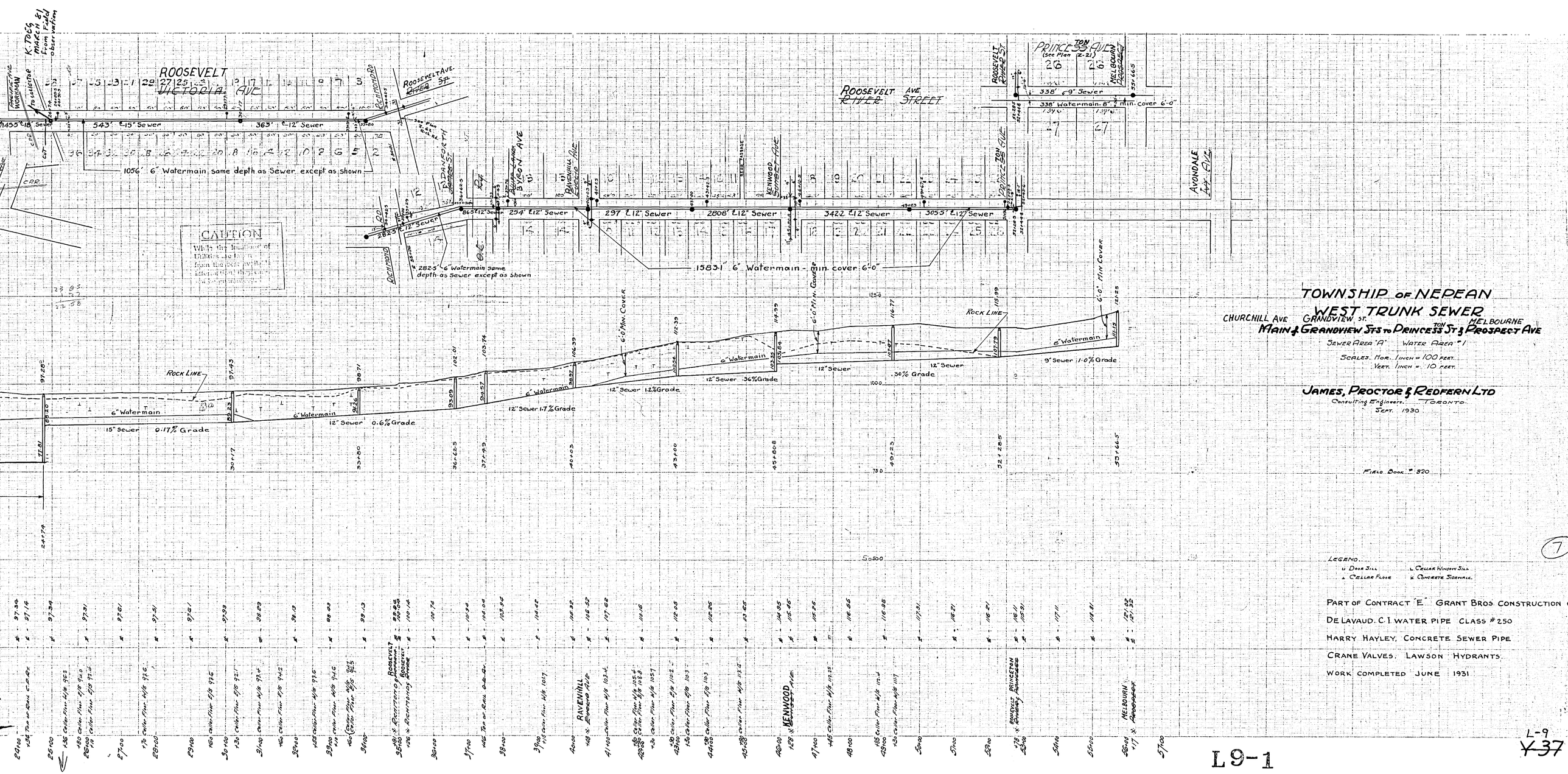
STORM AND SANITARY SEWERS

1. WHERE REQUIRED, EXISTING COMBINED SEWER IS TO BE REMOVED AND REPLACED BY SEPARATE STORM AND SANITARY SEWERS AS SPECIFIED, WITHOUT SERVICE INTERRUPTION.
2. ALL STORM AND SANITARY SERVICES SHALL BE REPLACED TO PROPERTY LINE, OR FURTHER AS REQUIRED. TIE-IN LOCATION BEYOND PROPERTY LINE TO BE APPROVED BY ENGINEER. WHERE NEW STORM LATERALS ARE TO BE PLACED TO PROPERTY LINE, THEY SHALL BE CAPPED WITH A WATER TIGHT SEAL.
3. ALL CATCHBASINS TO HAVE A SUMP OF 0.6m (MIN.), STORM MANHOLES TO HAVE 0.3m SUMP.
4. ALL SEWERS TO HAVE CLASS "B" BEDDING AND APPROVED BACKFILL MATERIAL AS SPECIFIED. SEE TRENCH DETAIL.
5. SUBDRAIN OUTLETS INTO MANHOLES AND CATCHBASINS SHALL BE LOCATED TO SUIT FIELD CONDITIONS.
6. **THE CONTRACTOR WILL BE REQUIRED TO LOCATE AND VERIFY THE STATUS OF EXISTING** SERVICE PIPES. DYE TESTING OR OTHER METHODS (TO THE SATISFACTION OF THE ENGINEER) SHALL BE USED TO DETERMINE THE STATUS (ABANDONED, IN USE, SANITARY, STORM) AND/OR THAT THE EXISTING SERVICES ARE CONNECTED TO BUILDINGS.
7. ACCESS INTO ALL CITY OF OTTAWA MH'S WILL BE AVAILABLE AT ALL TIMES. DURING THE PAVING PROCESS THERE IS TO BE NO CITY OWNED COVERS OF ANY TYPE TO BE PAVED OVER PREVENTING ACCESS.
8. EXISTING MH STRUCTURES THAT ARE TO REMAIN IN USE SHALL BE UPDATED TO CITY STANDARDS. (i.e. REPLACE ACCESS HOLES & COVERS AND LADDER RINGS)

WATERPLANT

1. ALL WATERMAIN MATERIALS AND CONSTRUCTION METHODS SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE CITY STANDARD SPECIFICATIONS AND STANDARD DRAWINGS.
2. ALL CONNECTIONS TO EXIST. SERVICES INCLUDING REINSTATEMENT SHALL BE DONE BY THE CONTRACTOR. ALL CONNECTIONS OF NEW WM TO EXISTING WM AND ALL BLANKINGS SHALL BE PERFORMED BY CITY FORCES.
3. RESTRAINING RINGS AND THRUST BLOCKING SHALL BE UTILIZED ON ALL BENDS, TEES AND PLUGS IN ACCORDANCE WITH THE LATEST EDITION OF THE CITY STANDARD SPECIFICATIONS AND STANDARD DRAWINGS.
4. A MINIMUM 2m SEPARATION IS REQUIRED BETWEEN ALL NEW WATER SERVICES AND CATCHBASINS OR OPEN STRUCTURES AND SHALL BE INSULATED PER CITY SPECIFICATION WSD-23 AS APPLICABLE.
5. A MINIMUM 2m SEPARATION IS REQUIRED BETWEEN ALL NEW HYDRANTS AND CATCHBASINS OR OPEN STRUCTURES AND SHALL BE INSULATED PER CITY SPECIFICATION WSD-23 AS APPLICABLE.
6. THE CONTRACTOR SHALL BE RESPONSIBLE TO DETERMINE VIA EXCAVATION THE EXACT LOCATION AND ELEVATION OF THE EXISTING WATERMAINS AS REQUIRED FOR ALL CONNECTIONS, RELOCATIONS AND BLANKING.

M:\1998\98002\CAD\Design\AS-BUILT\Proseset to Tweedsmuir\045006-08.dgn Updated By: KLM
6/1/2006 2:13:50 PM
045006-08.dgn 6/1/2006 2:13:50 PM



TOWNSHIP OF NEPEAN
WEST TRUNK SEWER

CHURCHILL AVE GRANDVIEW ST. TON MELBOURNE

MAIN & GRANDVIEW STS TO PRINCESS ST & PROSPECT AVE

SEWER AREA "A" WATER AREA "1"

SCALES. HOR. 1 INCH = 100 FEET.
VERT. 1 INCH = 10 FEET.

JAMES, PROCTOR & REDFERN LTD
Consulting Engineers. TORONTO.
SEPT. 1930

FIELD BOOK # 320

LEGEND.
u DOOR SILL
L CELLAR WINDOW SILL
⊥ CELLAR FLOOR
x CONCRETE SIDEWALK.

PART OF CONTRACT "E" GRANT BROS CONSTRUCTION
DE LAVAUD. C.I. WATER PIPE CLASS #250
HARRY HAYLEY, CONCRETE SEWER PIPE
CRANE VALVES. LAWSON HYDRANTS.
WORK COMPLETED JUNE 1931

L9-1

L-9
~~Y37~~

ROOSEVELT AVENUE
RICHMOND ROAD
403
396
364
360
388
BELL
ROGERS
TRAFFIC
WALL
T.D.L.
ROOSEVELT AVENUE

From:	Tim Kennedy
To:	Eastern Ottawa (MECP)
Cc:	Jaymeson Adams; Christian Lavoie-Lebel; MOECCOttawaSewage@ontario.ca
Subject:	RE: 403 Richmond Rd. and 389 Roosevelt Ave - Servicing Capacity Assessment - MECP Pre-consult
Date:	Thursday, July 02, 2020 6:13:00 PM
Attachments:	image001.jpg image002.jpg

Good evening Jéhanne,

To further clarify we are not looking for a formal pre-consult but rather just wanted to inform the MECP of the project and to confirm that it has been determined that the proposed development qualifies for the ECA exemption under Reg. 525/98 of OWRA.

Best Regards,

TIM KENNEDY, P.Eng.
Project Manager / Infrastructure
T 613 860-2462 ext. 6620 **M** 613 462-3627
CIMA+

From: Eastern Ottawa (MECP) <Environment.Ottawa@ontario.ca>
Sent: Tuesday, June 23, 2020 3:17 PM
To: Tim Kennedy <Tim.Kennedy@cima.ca>
Cc: Jaymeson Adams <Jaymeson.Adams@cima.ca>; Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>
Subject: RE: 403 Richmond Rd. and 389 Roosevelt Ave - Servicing Capacity Assessment - MECP Pre-consult

Good afternoon,

Please fill out the Pre-Submission Consultation Form attached and send back to the specified email in the form (MOECCOttawaSewage@ontario.ca).

Once we receive your form we will be able to move forward with your pre-consult.

Thank you,

Jéhanne Hurlbut
Administrative Assistant | Drinking Water & Environmental Compliance Division
Ministry of the Environment, Conservation and Parks
2430 Don Reid Drive, Unit 103, Ottawa ON
jehanne.hurlbut@ontario.ca
(613) 301-4160

From: Tim Kennedy <Tim.Kennedy@cima.ca>

Sent: June 22, 2020 11:48 AM
To: Eastern Ottawa (MECP) <Environment.Ottawa@ontario.ca>
Cc: Jaymeson Adams <Jaymeson.Adams@cima.ca>; Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>
Subject: 403 Richmond Rd. and 389 Roosevelt Ave - Servicing Capacity Assessment - MECP Pre-consult

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

To whom it may concern,

We are currently performing an Adequacy of Public Services Report in support of a zoning by-law amendment application for a proposed development located at 403 Richmond Road and 389 Roosevelt Ave in Ottawa, Ontario (See attached key plan). The proposed development involves the construction of a 10-storey mixed-use residential and commercial building. The subject site is located within the Ottawa River West 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 0.21-ha site currently consists of a funeral home which is zoned traditional mainstreet (TM) and a single family home which is zoned Residential Third Density (R3S);
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 a 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,

TIM KENNEDY, P.Eng.
Project Manager / Infrastructure

T 613-860-2462 ext. 6620 **M** 613-462-3627 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

Notice to our customers on the COVID-19

Do you really need to print this email? Let's protect the environment!

CONFIDENTIALITY WARNING This email is confidential. If you are not the intended recipient, please notify the sender immediately and delete it in its entirety.

From: Jamie Batchelor
To: Tim Kennedy
Cc: Jaymeson Adams; Christian Lavoie-Lebel; Eric Lalande
Subject: RE: 403 Richmond Rd. and 389 Roosevelt Ave - Servicing Capacity Assessment - RVCA Pre-consult
Date: Thursday, July 02, 2020 1:27:33 PM
Attachments: image005.jpg
image006.jpg
image001.jpg

Good Afternoon Tim,

Based on our understanding of the project, no surface parking spots are being proposed. Rainwater from landscaping and rooftop drainage is considered to be clean for the purpose of protecting water quality and aquatic habitat. Therefore, the RVCA would not require any additional onsite water quality control measures save and except best management practices. The raingardens and alternative low impact development would be strongly encouraged to meet the best management practice requirement.

The RVCA's typical trigger for onsite water quality control via mechanical separation would be 6 surface parking spaces or greater.

The RVCA will defer all stormwater issues related to quantity control to the City for comment in this instance as stormwater will be discharging to an existing storm sewer.

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

From: Tim Kennedy <Tim.Kennedy@cima.ca>
Sent: Thursday, July 2, 2020 11:01 AM
To: Jamie Batchelor <jamie.batchelor@rvca.ca>
Cc: Jaymeson Adams <Jaymeson.Adams@cima.ca>; Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>
Subject: RE: 403 Richmond Rd. and 389 Roosevelt Ave - Servicing Capacity Assessment - RVCA Pre-consult

Hi Jamie,

Just following up on my email below. Did you get a chance to look at these items?

We are planning to complete the SWM design first thing next week so we can submit our report to the City by end of next week. If we could get your input by end of this week that would be greatly appreciated.

Thanks,

TIM KENNEDY, P.Eng.
Project Manager / Infrastructure
T 613 860-2462 ext. 6620 **M** 613 462-3627
CIMA+

From: Tim Kennedy
Sent: Monday, June 22, 2020 11:13 AM
To: Jamie Batchelor <jamie.batchelor@rvca.ca>
Cc: Jaymeson Adams <Jaymeson.Adams@cima.ca>; Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>
Subject: 403 Richmond Rd. and 389 Roosevelt Ave - Servicing Capacity Assessment - RVCA Pre-consult

Hello Jamie,

We are currently performing an Adequacy of Public Services Report in support of a zoning by-law amendment application for a proposed

development located at 403 Richmond Road and 389 Roosevelt Ave in Ottawa, Ontario (See attached key plan). The proposed development involves the construction of a 10-storey mixed-use residential and commercial building.

I wanted to get your input on Natural Heritage/Hazards features that may impact the development as well as any Storm Water Management Criteria for the site and required approvals/permits.

A few specific items for your consideration as follows:

1. The stormwater collected from the site travels approximately 650 m to the Ottawa River. The flow path is highlighted in the attached key plan.
2. The development will connect to the existing 300 mm Ø storm sewer within Roosevelt Avenue and will discharge primarily rooftop stormwater.
    a. Will quality control for rooftop areas 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/underground 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?

Please do not hesitate to contact me if you have any questions, want to discuss or need clarification.

Thank you,

TIM KENNEDY, P.Eng.
Project Manager / Infrastructure

T 613-860-2462 ext. 6620 **M** 613-462-3627 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

Notice to our customers on the COVID-19

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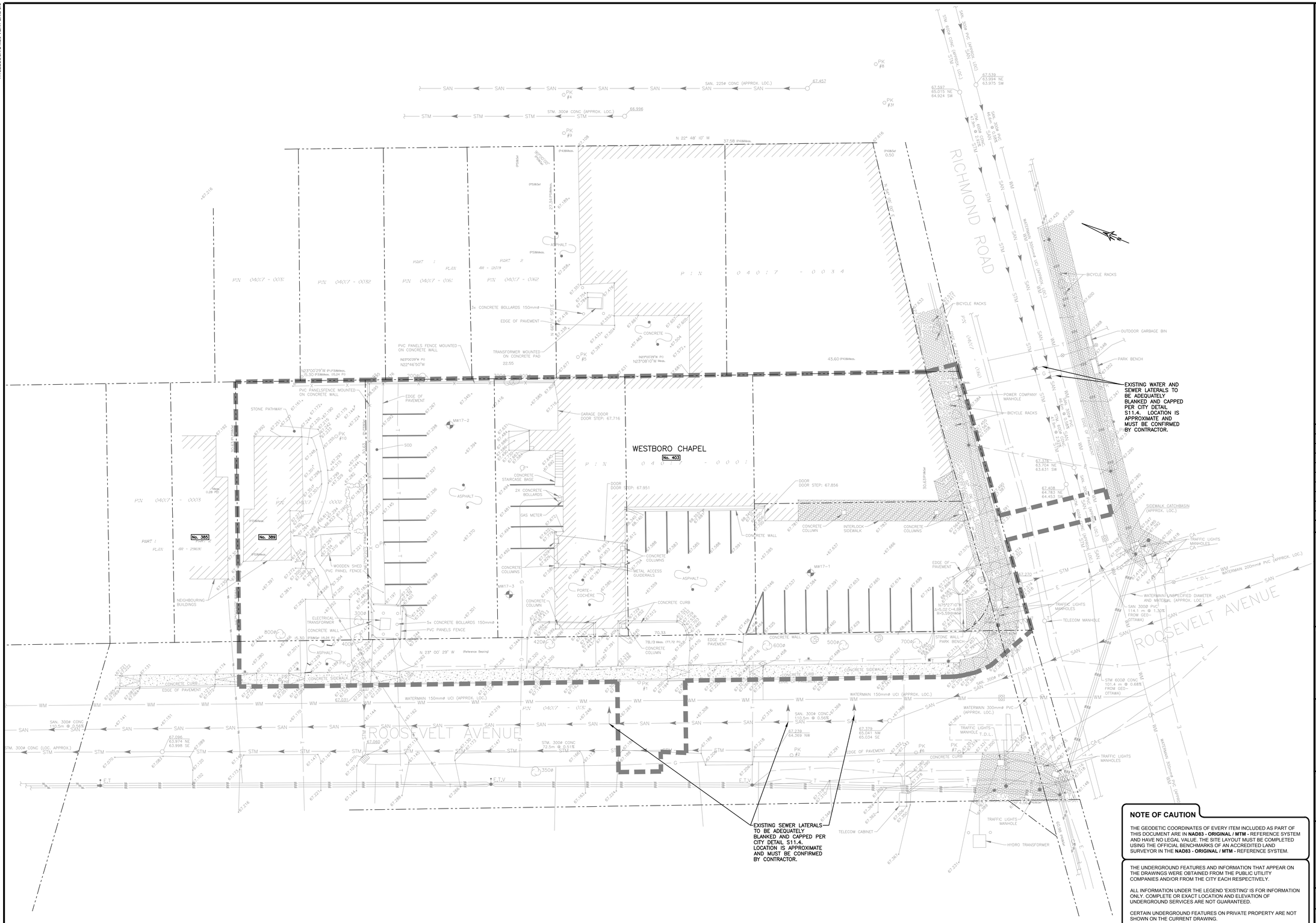
B

Appendix B
Existing Conditions Plan

TITLEBLOCK 24x36 VERT ENG 3.0



EXISTING	PROPOSED
WM	WATERMAIN
SAN	SANITARY SEWER
STM	STORM SEWER
D	DRAIN
G	GAS LINE (APPROX. LOC.)
T	UNDERGROUND TELEPHONE (APPROX. LOC.)
CA	UNDERGROUND TAFFIC CABLE (APPROX. LOC.)
X X	FENCE
E	UNDERGROUND ELECTRICITY (APPROX. LOC.)
	OVERHEAD WIRES
	LOT LINE
	RIGHT-OF-WAY LIMITS
	EASEMENT
	TOP OF SLOPE
	DITCH CENTER
	BOTTOM OF SLOPE
	WOOD AREA
	GRADE CROSSING
	FLAGPOLE
	CATCHBASIN
	MANHOLE/CATCHBASIN
	MANHOLE
	FIRE HYDRANT
	VALVE
	REDUCER
	TEE
	VALVE CHAMBER
	PRIVATE UTILITIES (WATERMAIN)
	EXTERIOR WATER FAUCET
	SLUICEWAY
	NATURAL GAS VALVE
	SIGN
	STOP SIGN
	TRAFFIC LIGHT
	ELECTRICITY POLE
	TELEPHONE POLE
	ELECT.-TEL.-STREET LIGHT POLE
	ELECT.-TEL.-TRANSFORMER POLE
	PRIVATE STREET LIGHT
	ELECTICITY MANHOLE
	TELEPHONE MANHOLE
	SURVEY STATION
	ELEVATION + 99,000
	BOREHOLE (LOC. APPROX.) GROUND ELEVATION (BEDROCK ELEVATION)
	WORK LIMIT

1:200
0 2 4 6 12m

No.	Date	Description	By
4	23/01/20	RE-ISSUED FOR SITE PLAN CONTROL	T.K
3	22/11/07	RE-ISSUED FOR SITE PLAN CONTROL	T.K
2	22/10/14	RE-ISSUED FOR SITE PLAN CONTROL	T.K
1	22/04/07	ISSUED FOR SITE PLAN CONTROL	T.K

STAMPS:

DESIGNED BY | APPROVED BY

ENGINEER: CIMA+

CLIENT: The Hazelton Westboro

PROJECT NAME:
403 RICHMOND ROAD &
389 ROOSEVELT AVENUE

SHEET TITLE:
TOPOGRAPHICAL SURVEY PLAN

DISCIPLINE: CIVIL

DRAFTER: S.C. POGGIOLI	SCALE: 1:200
DESIGNER: T. KENNEDY	DATE: 2022/04/07
APPROVER: T. KENNEDY	APPROVER: T. KENNEDY
PROJECT No: A001046	DRAWING No: C001
SHEET No: 1 of 12	

NOTE OF CAUTION

THE GEODETIC COORDINATES OF EVERY ITEM INCLUDED AS PART OF THIS DOCUMENT ARE IN **NAD83 - ORIGINAL / MTM -** REFERENCE SYSTEM AND HAVE NO LEGAL VALUE. THE SITE LAYOUT MUST BE COMPLETED USING THE OFFICIAL BENCHMARKS OF AN ACCREDITED LAND SURVEYOR IN THE **NAD83 - ORIGINAL / MTM -** REFERENCE SYSTEM.

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.

SURVEY COMPLETED:
CIMA+ JUNE 23rd AND 26th, 2020
SUPPLEMENTED BY CITY UCC PLAN
20-0571 REVISED JULY 21, 2020

PRINT DATE: 2023/01/20 / PAPER SIZE: ISO A4 (210.00 x 297.00 MM)
PATH: Z:\Cima-C10\Dt_Projects\AA001000-A001499\A001046_403 Richmond - Servicing Report\400\460_Civil\C001_Topo.dwg / LAYOUT: C001

D07-12-22-0067

#18861

C

Appendix C
Site Servicing and Stormwater Management Plan

TITLEBLOCK 24x36 VERT ENG 3.0

NOTES:

1. FOUNDATION DRAIN BACKWATER VALVE REQUIRED ON SERVICE LATERAL PER CITY DETAIL S14.
2. SANITARY BACKWATER VALVE REQUIRED ON SERVICE LATERAL PER CITY DETAIL S14.1.
3. ALL FLOOR DRAINS WITHIN THE UNDERGROUND PARKING MUST BE DIRECTED TO THE SANITARY LATERAL.
4. INTERNAL WATER METER TO BE LOCATED IN WATER ENTRY AND FIRE PUMP ROOM ON LEVEL P1.

EXISTING	PROPOSED
WATERMAIN	WM
SANITARY SEWER	SAN
STORM SEWER	STM
DRAIN	D
GAS LINE (APPROX. LOC.)	
UNDERGROUND TELEPHONE (APPROX. LOC.)	
UNDERGROUND TRAFFIC CABLE (APPROX. LOC.)	
FENCE	
UNDERGROUND ELECTRICITY (APPROX. LOC.)	
OVERHEAD WIRES	
LOT LINE	
RIGHT-OF-WAY LIMITS	
EASEMENT	
TOP OF SLOPE	
DITCH CENTER	
BOTTOM OF SLOPE	
WOOD AREA	
GRADE CROSSING	
FLAGPOLE	
CATCHBASIN	
MANHOLE/CATCHBASIN	
MANHOLE	
FIRE HYDRANT	
VALVE	
REDUCER	
TEE	
VALVE CHAMBER	
PRIVATE UTILITIES (WATERMAIN)	
EXTERIOR WATER FAUCET	
SLUICEWAY	
NATURAL GAS VALVE	
SIGN	
STOP SIGN	
TRAFFIC LIGHT	
ELECTRICITY POLE	
TELEPHONE POLE	
ELECT.-TEL.-STREET LIGHT POLE	
ELECT.-TEL.-TRANSFORMER POLE	
PRIVATE STREET LIGHT	
ELECTICITY MANHOLE	
TELEPHONE MANHOLE	
SURVEY STATION	
ELEVATION	
BOREHOLE (LOC. APPROX.)	
SEWER / WATERMAIN INSULATION	
REMOTE WATER METERING READING DEVICE	RM
INTERNAL WATER METER	M
FIRE DEPARTMENT (SIAMESE) CONNECTION	

1:200
0 2 4 6 12m

No.	Date	Description	By
4	23/01/20	RE-ISSUED FOR SITE PLAN CONTROL	T.K
3	22/11/07	RE-ISSUED FOR SITE PLAN CONTROL	T.K
2	22/10/14	RE-ISSUED FOR SITE PLAN CONTROL	T.K
1	22/04/07	ISSUED FOR SITE PLAN CONTROL	T.K

STAMPS:

LICENSED PROFESSIONAL ENGINEER — J. C. ADAMS — 100519478 — 20 January 2023 — PROVINCE OF ONTARIO — DESIGNED BY

LICENSED PROFESSIONAL ENGINEER — T. G. KENNEDY — 100173201 — January 20, 2023 — PROVINCE OF ONTARIO — APPROVED BY

ENGINEER: CIMA+

CLIENT: The Hazelton Westboro

PROJECT NAME:
403 RICHMOND ROAD &
389 ROOSEVELT AVENUE

SHEET TITLE:
SITE SERVICING PLAN

DISCIPLINE: CIVIL

DRAFTER: S.C. POGGIOLI	SCALE: 1:200
DESIGNER: G. JOSEPH	DATE: 2022/04/07
APPROVER: T. KENNEDY	APPROVER: T. KENNEDY
PROJECT No: A001046	DRAWING No: C006
SHEET No: 6 of 12	

NOTE OF CAUTION

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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.

PRINT DATE: 2023/01/20 / PAPER SIZE: ISO A4 (210.00 x 297.00 MM)
PATH: Z:\Cima-C10\01_Projects\A001000-A001499\A001046_403 Richmond - Servicing Report\400\460_Civil\C006-Servicing.dwg / LAYOUT: C006

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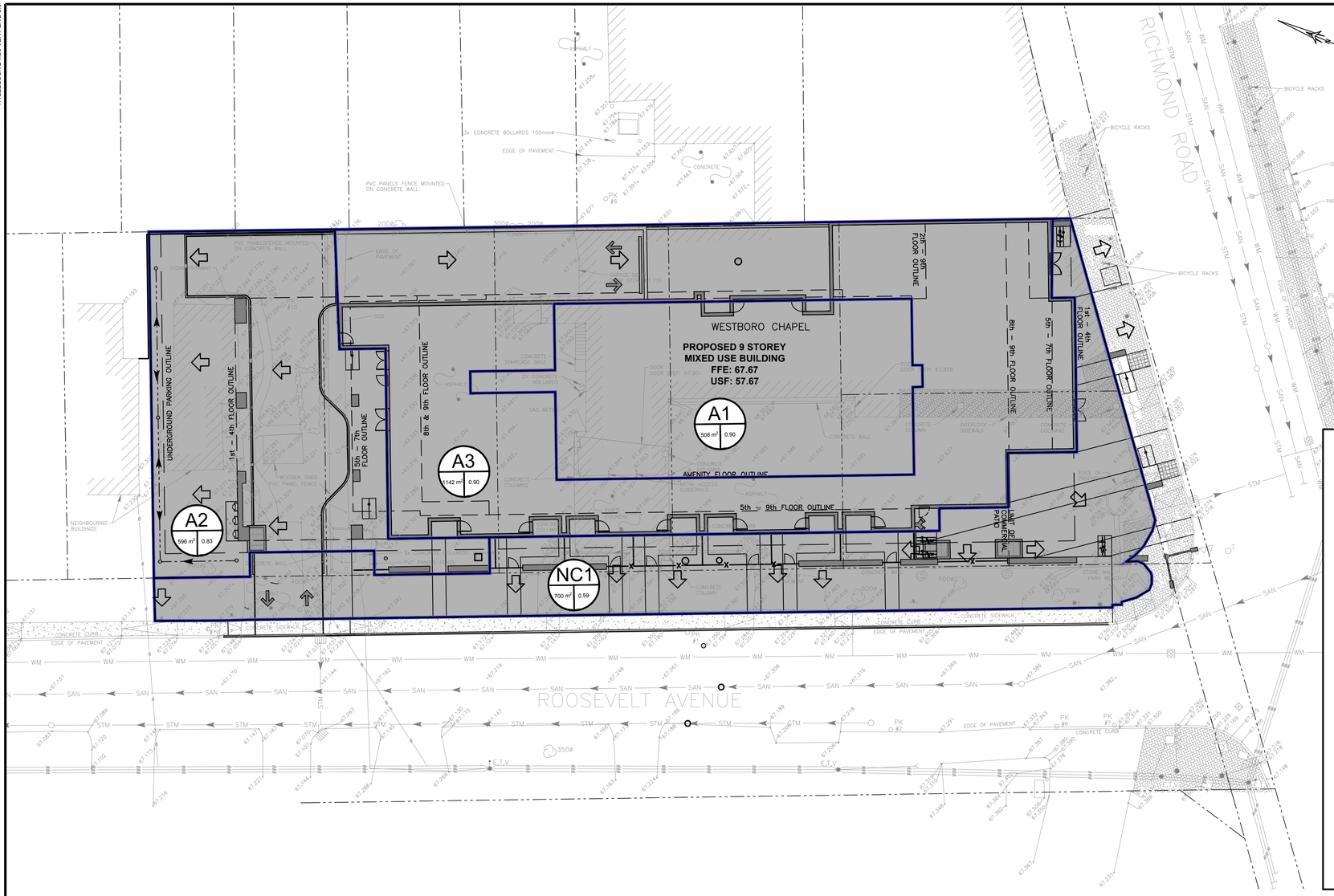


STORM WATER MANAGEMENT LEGEND

STORM DRAINAGE BOUNDARY

AREA ID — A1 (588 m² | 0.90)

AREA IN m2

RUNOFF COEFFICIENT

EXISTING	PROPOSED
WATERMAIN	
SANITARY SEWER	
STORM SEWER	
DRAIN	
GAS LINE (APPROX. LOC.)	
UNDERGROUND TELEPHONE (APPROX. LOC.)	
UNDERGROUND CABLE (APPROX. LOC.)	
FENCE	
UNDERGROUND ELECTRICITY (APPROX. LOC.)	
OVERHEAD WIRES	
LOT LINE	
RIGHT-OF-WAY LIMITS	
EASEMENT	
TOP OF SLOPE	
DITCH CENTER	
BOTTOM OF SLOPE	
WOOD AREA	
GRADE CROSSING	
FLAGPOLE	
CATCHBASIN	
MANHOLE/CATCHBASIN	
MANHOLE	
FIRE HYDRANT	
VALVE	
REDUCER	
TEE	
VALVE CHAMBER	
PRIVATE UTILITIES (WATERMAIN)	
EXTERIOR WATER FAUCET	
SLUICEWAY	
NATURAL GAS VALVE	
SIGN	
STOP SIGN	
TRAFFIC LIGHT	
ELECTRICITY POLE	
TELEPHONE POLE	
ELECT.-TEL.-STREET LIGHT POLE	
ELECT.-TEL.-TRANSFORMER POLE	
PRIVATE STREET LIGHT	
ELECTICITY MANHOLE	
TELEPHONE MANHOLE	
SURVEY STATION	
ELEVATION	
BOREHOLE (LOC. APPROX.)	
OVERLAND FLOW	
WORK LIMIT	

1:200
0 2 4 6 12m

WATTS® Adjustable Accutrol Weir — Tag: _____ | Adjustable Flow Control for Roof Drains

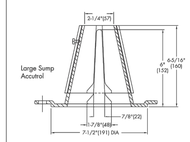
ADJUSTABLE ACCUTROL (for Large Sump Roof Drains only)

For more flexibility in controlling flow with heads deeper than 2", Watts Drainage offers the Adjustable Accutrol. The Adjustable Accutrol Weir is designed with a single parabolic opening that can be covered to restrict flow above 2" of head to less than 5 gpm per inch, up to 6" of head. To adjust the flow rate for depths over 2" of head, set the slot in the adjustable upper cone according to the flow rate required. Refer to Table 1 below.
Note: Flow rates are directly proportional to the amount of weir opening that is exposed.

EXAMPLE:

For example, if the adjustable upper cone is set to cover 1/2 of the weir opening, flow rates above 2"of head will be restricted to 2-1/2 gpm per inch of head.

Therefore, at 3"of head, the flow rate through the Accutrol Weir that has 1/2 the slot exposed will be:
[5 gpm (per inch of head) x 2 inches of head] + 2-1/2 gpm (for the third inch of head) = 12-1/2 gpm.



1/2 Weir Opening Exposed Shown Above

TABLE 1. Adjustable Accutrol Flow Rate Settings

Weir Opening Exposed	1"	2"	3"	4"	5"	6"
	Flow Rate (gallons per minute)					
Fully Exposed	5	10	15	20	25	30
3/4	5	10	13.75	17.5	21.25	25
1/2	5	10	12.5	15	17.5	20
1/4	5	10	11.25	12.5	13.75	15
Closed	5	5	5	5	5	5

Job Name _____ Contractor _____
Job Location _____ Contractor's P.O. No. _____
Engineer _____ Representative _____

Watts product specifications in U.S. customary units and metric are approximate and are provided for reference only. For precise measurements, please contact Watts Technical Service. Watts reserves the right to change or modify product design, construction, specifications, or materials without prior notice and without incurring any obligation to make such changes and modifications on Watts products previously or subsequently sold.

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STORMWATER MANAGEMENT – PRELIMINARY RETENTION CALCULATIONS – 2 YEAR EVENT

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)	Drawdown Time (min)	Comments
A1	508	508	100.00	100.15	0.15	25.4	5.8	5.8	0.07	100.07	242	1.90	50	Controlled roof area
A2	596	-	-	-	-	22.2	1.4	1.4	-	-	-	9.59	2	Area to swale
A3	1142	-	-	-	-	25.0	4.0	4.0	-	-	-	16.25	4	Areas to Tank
NC1	700	-	-	-	-	-	-	-	-	-	-	0.00	-	Unattenuated Areas
Total	**2946**	**508**				**72.6**	**11.1**	**11.1**				**27.74**		

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.
Drawdown Time = Time required for the total volume of water accumulated within sub-area to subside.

STORMWATER MANAGEMENT – PRELIMINARY RETENTION CALCULATIONS – 100 YEAR EVENT

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)	Drawdown Time (min)	Comments
A1	508	508	100.00	100.15	0.15	25.4	20.1	20.1	0.13	100.13	452	1.90	177	Controlled roof area
A2	596	-	-	-	-	22.2	11.6	11.6	-	-	-	9.59	20	Area to swale
A3	1142	-	-	-	-	25.0	24.1	24.1	-	-	-	16.25	25	Areas to Tank
NC1	700	-	-	-	-	-	-	-	-	-	-	0.00	-	Unattenuated Areas
Total	**2946**	**508**				**72.6**	**55.9**	**55.9**				**27.74**		

DEFINITIONS OF ABBREVIATIONS USED IN CALCULATION TABLE:

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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.
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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.
Drawdown Time = Time required for the total volume of water accumulated within sub-area to subside.

No.	Date	Description	By
4	23/01/20	RE-ISSUED FOR SITE PLAN CONTROL	T.K
3	22/11/07	RE-ISSUED FOR SITE PLAN CONTROL	T.K
2	22/10/14	RE-ISSUED FOR SITE PLAN CONTROL	T.K
1	22/04/07	ISSUED FOR SITE PLAN CONTROL	T.K

STAMPS:

LICENSED PROFESSIONAL ENGINEER — J. C. ADAMS — 100519478 — 20 January 2023 — PROVINCE OF ONTARIO (DESIGNED BY)

LICENSED PROFESSIONAL ENGINEER — T. G. KENNEDY — 100173201 — January 20, 2023 — PROVINCE OF ONTARIO (APPROVED BY)

ENGINEER: CIMA+

CLIENT: The Hazelton Westboro

PROJECT NAME:
403 RICHMOND ROAD &
389 ROOSEVELT AVENUE

SHEET TITLE:
STORM WATER MANAGEMENT PLAN

DISCIPLINE: CIVIL

DRAFTER: S.C. POGGIOLI	SCALE:
DESIGNER: J. ADAMS	DATE: 2022/04/07
APPROVER: T. KENNEDY	APPROVER: T. KENNEDY
PROJECT No: A001046	DRAWING No: C007
SHEET No: 7 of 12	

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D

Appendix D
Water Supply Design Calculations

PROJECT NAME:	403 Richmond Road and 389 Roosevelt Avenue Multi-use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001046
CLIENT:	Starwood Group Inc.
PROJECT STATUS:	Detailed Design (Site Plan Control)

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:	4.1	x Average Daily Demand
Maximum (Peak Hour) Peaking Factor:	6.2	x Average Daily Demand

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

EQUIVALENT POPULATION :

Unit Type	Number of Units	Persons Per Unit	Population
1 Bedroom Unit	21	1.4	29
1 Bedroom + Den Unit	70	1.4	98
2 Bedroom Unit	25	2.1	53
2 Bedroom + Den Unit	20	2.1	42
3 Bedroom Unit	1	3.1	3
3 Bedroom + Den Unit	4	3.1	12
Total	**141**		**237**

COMMERCIAL DESIGN CRITERIA:

Contributing Commercial Area:	0.083	gross ha (including commercial area, amenity rooms, and party room)
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	0.77	3.15	4.76
Commercial	0.03	0.04	0.07
Total	**0.79**	**3.19**	**4.83**

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. Furthermore given location on corner lot, City will not support the addition of an isolation valve on the main line, thus one connection to Richmond Rd and one connection to Roosevelt Ave. required.

Prepared by: Jaymeson Adams, EIT Date: 2022/04/07

Verified by: Tim Kennedy, P.Eng. Date: 2022/08/30
PEO# 100173201

PROJECT NAME:	403 Richmond Road and 389 Roosevelt Avenue Multi-use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001046
CLIENT:	Starwood Group Inc.
PROJECT STATUS:	Detailed Design (Site Plan Control)

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-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	
Wood Frame Construction	1.5	

STEP B - DETERMINE THE FLOOR AREA

Floor/Level	Floor Area Per Level (sq. ft.)	Floor Area Per Level (m2)	Fire Resistive Building	Protected Openings (one hour rating)	Area of Structure Considered (m2)
Gross Floor Area (GFA) Ground Level:	14,649	1,361	YES	YES	-
GFA Level 2:	17,029	1,582			396
GFA Level 3:	17,029	1,582			1,582
GFA Level 4:	17,029	1,582			396
GFA Level 5:	13,277	1,233			-
GFA Level 6:	13,277	1,233			-
GFA Level 7:	13,277	1,233			-
GFA Level 8:	11,124	1,033			-
GFA Level 9:	11,124	1,033			-
Mechanical Penthouse:	5,486	510			-
TOTAL FLOOR AREA (A):	**133,301**	**12,384**			**2,373**

STEP C - DETERMINE THE HEIGHT IN STOREYS

Floor/Level	Number of Storeys	Percent of Floor Area Considered
Ground Level:	1	-
Level 2:	1	25%
Level 3:	1	100%
Level 4:	1	25%
Level 5:	1	-
Level 6:	1	-
Level 7:	1	-
Level 8:	1	-
Level 9:	1	-
Mechanical Penthouse:	1	-
HEIGHT IN STOREYS:	**10**	

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

PROJECT NAME:	403 Richmond Road and 389 Roosevelt Avenue Multi-use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001046
CLIENT:	Starwood Group Inc.
PROJECT STATUS:	Detailed Design (Site Plan Control)

FIRE FLOW ASSESSMENT

Coefficient Related to Type of Construction (C) =	**0.6**
Floor Area Considered (A) =	**2,373 m^2**

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

PROJECT NAME:	403 Richmond Road and 389 Roosevelt Avenue Multi-use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001046
CLIENT:	Starwood Group Inc.
PROJECT STATUS:	Detailed Design (Site Plan Control)

FIRE FLOW ASSESSMENT

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)

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	6	40	Wood Frame	18%
East Façade (fire/party wall)	0	N/A	N/A	10%
South Façade	25	80	Fire Resistive or Ordinary with Unprotected Openings	8%
West Façade	27	18	Wood Frame	8%
TOTAL CHARGE FOR EXPOSURES				**44%**

INCREASE FOR EXPOSURES =	**2640**	**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) =	**6000**	**L/min** (Rounded to Nearest 1,000 L/min)
	100	**L/s**
	1585	**USGPM**

PROJECT NAME:	403 Richmond Road and 389 Roosevelt Avenue Multi-use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001046
CLIENT:	Starwood Group Inc.
PROJECT STATUS:	Detailed Design (Site Plan Control)

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

2. Per the Fire Underwriters Survey (FUS) Water Supply for Public Fire Protection, 1999, Note E: Fire Walls - In determining floor areas, a fire wall that meets or exceeds the requirements of the current edition of the National Building Code of Canada (provided this necessitates a fire resistance rating of 2 or more hours) may be deemed to subdivide the building into more than one area or may, as a party wall, separate the building from an adjoining building. It is assumed that the party wall to the east will have a fire-resistance rating of at least two hours.

STEP C - DETERMINE THE HEIGHT IN STOREYS

1. Two 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. Assumes adjoining wall to east is an unpierced party wall considered to form a boundary when determining floor areas warranting a 10% exposure charge per Note E of the Fire Underwriters Survey (FUS) Water Supply for Public Fire Protection, 1999

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: Jaymeson Adams, EIT Date: 2022/04/07

Verified by: Tim Kennedy, P.Eng. Date: 2022/08/30
PEO# 100173201

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

PROPOSED WATER SERVICE CONNECTION LOCATION(S)

DRAWN BY:	DESIGNED BY:	APPROVED BY:	SCALE:	DATE:	PROJECT No:	SHEET No:	FIGURE No:
T. Kennedy	----	T. Kennedy	NTS	2020/06/23	A001046	1 of 1	1

T: 613-860-2462
110-240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

EXPOSURE SEPARATION DISTANCES

DRAWN BY:	DESIGNED BY:	APPROVED BY:	SCALE:	DATE:	PROJECT No:	SHEET No:	FIGURE No:
T. Kennedy	----	T. Kennedy	NTS	2020/06/23	A001046	1 of 1	2

T: 613-860-2462
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

FIRE HYDRANT COVERAGE

DRAWN BY:	DESIGNED BY:	APPROVED BY:	SCALE:	DATE:	PROJECT No:	SHEET No:	FIGURE No:
T. Kennedy	----	T. Kennedy	NTS	2020/06/23	A001046	1 of 1	3

PROJECT NAME:	403 Richmond Road and 389 Roosevelt Avenue Multi-use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001046
CLIENT:	Starwood Group Inc.
PROJECT STATUS:	Detailed Design (Site Plan Control)

HYDRAULIC ANALYSIS - WATER

APPLICABLE DESIGN GUIDELINES:

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

MUNICIPAL BOUNDARY CONDITIONS

HYDRAULIC BOUNDARY CONDITIONS (PROVIDED BY THE CITY OF OTTAWA):

Hydraulic Condition (HGL = Hydraulic Grade Line)	Boundary Condition (Head) (m)	
	Richmond Rd. 305 mm dia.	Roosevelt Ave. 152 mm dia.
Minimum HGL	108.5	108.5
Maximum HGL	115.0	115.0
Maximum Day + Fire Flow	N/A	N/A

AVAILABLE HYDRANT FLOWS - MULTI-HYDRANT ANALYSIS (PROVIDED BY THE CITY OF OTTAWA):

Hydrant ID	Available Flow (L/s)
362027H067	85
362028H045	30
Total	**115**

HYDRAULIC ANALYSIS - WATER SUPPLY ADEQUACY (FLOW AND PRESSURE)

DESIGN CRITERIA - WATERMAIN PRESSURE AND DEMAND OBJECTIVES:

Demand Type	Minimum Pressure (psi)	Desired Minimum Pressure (psi)	Desired Maximum Pressure (psi)	Maximum Pressure (psi)
Average Daily Demand	40.0	50.0	70.0	80.0
Maximum Daily Demand + Fire Flow	20.0			
Maximum (Peak) Hour Demand	40.0			

WATERMAIN PRESSURE AND DEMAND ANALYSIS SUMMARY - PROPOSED DEVELOPMENT:

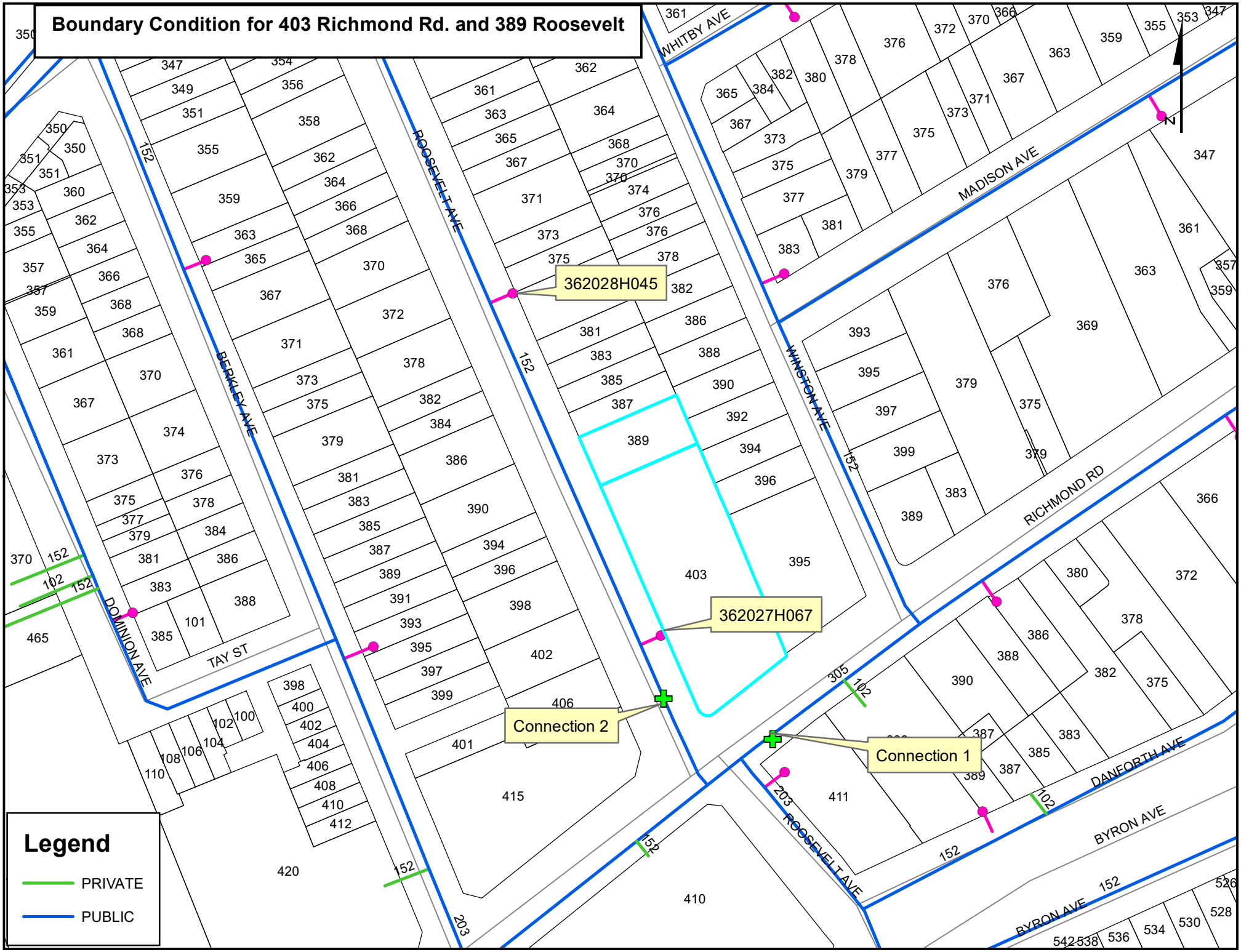
Demand Type	Proposed Demand (L/s)	Available Flow/Pressure		Flow/Pressure Objective Achieved?
		Design Operating Pressure[1] (Relative Head) (m)	Design Operating Pressure (psi)	
Average Daily Demand	0.79	47.6	68	YES
Maximum Daily Demand + Fire Flow	103.19	115 L/s @ 20 psi		YES
Maximum (Peak) Hour Demand	4.83	41.1	58	YES

1. Assumed ground elevation for connections 1 and 2 (m) = 67.4

NOTES:

Prepared by: Jaymeson Adams, EIT Date: 2022/04/07

Verified by: Tim Kennedy, P.Eng. Date: 2022/08/30
PEO# 100173201


Boundary Condition for 403 Richmond Rd. and 389 Roosevelt
362028H045
362027H067
Connection 2
Connection 1
WHITBY AVE
MADISON AVE
ROOSEVELT AVE
WINSTON AVE
RICHMOND RD
BERKLEY AVE
DOMINION AVE
TAY ST
DANFORTH AVE
BYRON AVE
403
415
411
410
420
465
Legend
PRIVATE
PUBLIC

From:	Fraser, Mark
To:	Tim Kennedy
Cc:	Christian Lavoie-Lebel; Jaymeson Adams
Subject:	RE: 403 Richmond Rd. and 389 Roosevelt Ave. - Water Demands - Boundary Condition Request
Date:	Tuesday, June 30, 2020 1:45:52 PM
Attachments:	403 Richmond Rd - 389 Roosevelt June 2020.pdf 1_200625_Water Demands and Fire Flow_R1.pdf 2_200624_Fire Flow.pdf 3_200623_Figure 1 - Connections.pdf 4_200623_Figure 2 - Exposure Separation.pdf 5_200623_Figure 3 - Hydrant Coverage.pdf

---

Hi Tim,

Please find below boundary conditions, HGL, for hydraulic analysis at **403 Richmond Rd. and 389 Roosevelt Ave.** (zone 1W) assumed to be connected to the 305mm dia. watermain on Richmond Rd. and 152mm dia. watermain on Roosevelt Ave. (see attached PDF for location).

Domestic and Fire Flow Demands:
Type of Development: The proposed development involves the construction of one (1) 10-storey mixed-use building (residential and ground floor commercial space). A total of 174 residential units are being proposed.
Average Day Demand = 1.13 L/s
Maximum Day Demand = 4.29 L/s
Peak Hour Demand = 6.41 L/s
Fire Flow Demand = 6,000 L/min

Please include a memorandum from the Architect in the Report as supporting documentation regarding building construction to confirm the parameters and assumptions applied in the FUS method RFF calculation are accurate and confirming the unit type breakdown and commercial area of the building applied to the domestic water demand calculations are accurate.

Minimum HGL = 108.5m
Maximum HGL = 115.0m
A **Multi-Hydrant Analysis** was performed with the two available hydrants identified by the consultant (see attached PDF for the hydrant locations). **The total available flow (115 L/s) from these two fire hydrants exceeds the required fire flow (100 L/s).**

Hydrant	Available Flow
362027H067	85 L/s
362028H045	30 L/s
Total	**115 L/s**

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.

Let us know if you have any questions.

Regards,

Mark Fraser, P. Eng.
Project Manager, Planning Services
Development Review Central Branch
City of Ottawa | Ville d'Ottawa
Planning, Infrastructure and Economic Development Department
110 Laurier Avenue West. 4th Floor, Ottawa ON, K1P 1J1
Tel:613.580.2424 ext. 27791
Fax: 613-580-2576
Mail: Code 01-14
Email: Mark.Fraser@ottawa.ca

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From: Tim Kennedy <Tim.Kennedy@cima.ca>
Sent: June 25, 2020 7:01 AM
To: Fraser, Mark <Mark.Fraser@ottawa.ca>
Cc: Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>; Jaymeson Adams <Jaymeson.Adams@cima.ca>
Subject: RE: 403 Richmond Rd. and 389 Roosevelt Ave. - Water Demands - Boundary Condition Request

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Hi Mark,

Apologies but small correction to the demands below and attached.

Regards.

TIM KENNEDY, P.Eng.
Project Manager / Infrastructure
T 613 860-2462 ext. 6620 **M** 613 462-3627

CIMA+

From: Tim Kennedy
Sent: Thursday, June 25, 2020 6:33 AM
To: Fraser, Mark <Mark.Fraser@ottawa.ca>
Cc: Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>; Jaymeson Adams <Jaymeson.Adams@cima.ca>
Subject: 403 Richmond Rd. and 389 Roosevelt Ave. - Water Demands - Boundary Condition Request

Good morning Mark,

We would like to kindly request boundary conditions for the proposed development at **403 Richmond Road and 389 Roosevelt Ave**. 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) 10-storey mixed-use building (residential and ground floor commercial space). There is a total of **174 residential units**. An underground 2-level parking garage extending the footprint of the site is also proposed.
2. **Site Address:** 403 Richmond Rd. and 389 Roosevelt Ave.
3. **Location of Services:** Please see attached Figure 1.
    a. Richmond Road – 305 mm diameter PVC watermain.
    b. Roosevelt Avenue – 305 mm diameter PVC watermain reducing to 152 mm diameter UCI watermain.
4. **Plan showing Proposed Water Connections:** Please see attached Figure 1.
    a. Primary connection to Richmond Road 305 mm dia. watermain;
    b. Secondary connection to Roosevelt Avenue 152 mm dia. watermain.
5. **Average Daily Demand:** 1.13 L/s
6. **Maximum Daily Demand:** ~~4.84 L/s~~ 4.29 L/s
7. **Peak Hour Demand:** ~~7.27 L/s~~ 6.41 L/s
8. **Required Fire Flow (RFF):** 6,000 L/min

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

Best regards,

TIM KENNEDY, P.Eng.
Project Manager / Infrastructure

T 613-860-2462 ext. 6620 **M** 613-462-3627 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

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E

Appendix E
Sanitary Servicing Design Calculations

CIMA+

PROJECT NAME:	403 Richmond Road and 389 Roosevelt Avenue Multi-use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001046
CLIENT:	Starwood Group Inc.
PROJECT STATUS:	Detailed Design (Site Plan Control)

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)
1 Bedroom Unit	21	1.4	29	0.09
1 Bedroom + Den Unit	70	1.4	98	0.32
2 Bedroom Unit	25	2.1	53	0.17
2 Bedroom + Den Unit	20	2.1	42	0.14
3 Bedroom Unit	1	3.1	3	0.01
3 Bedroom + Den Unit	4	3.1	12	0.04
Total	141		237	**0.77**

PEAK FLOW - DOMESTIC:

Population: (2)	237	persons
Average Dry Weather Flow: (3) = (1) x (2)	0.77	L/s
Peaking Factor (P.F.): (4)	3.50	
Peak Domestic Flow: (5) = (3) x (4)	**2.69**	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)	0.083	gross ha (including commercial area, amenity rooms, and party room)
Average Dry Weather Flow: (8) = (6) x (7)	0.03	L/s

PEAK FLOW - COMMERCIAL:

Percent Commercial Area Contribution:	6%	(GFA/Commercial Floor Area)
Peaking Factor: (9)	1.00	
Peak Commercial Flow: (10) = (8) x (9)	**0.03**	L/s

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)	0.21	ha
Total Infiltration Allowance: (12)	0.33	L/s/effective gross ha (for all areas)
Peak Extraneous Flow: (13) = (11) x (12)	**0.07**	L/s

PROJECT NAME:	403 Richmond Road and 389 Roosevelt Avenue Multi-use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001046
CLIENT:	Starwood Group Inc.
PROJECT STATUS:	Detailed Design (Site Plan Control)

WASTEWATER PEAK FLOW DETERMINATION

Total Estimated Avg. Dry Weather Flow Rate:	**0.79**	**L/s**
Total Estimated Peak Dry Weather Flow Rate:	**2.71**	**L/s**
Total Estimated Peak Wet Weather Flow Rate:	**2.78**	**L/s**

Prepared by: Jaymeson Adams, EIT Date: 2022-04-07

Verified by: Tim Kennedy, P.Eng. Date: 2022-04-07
PEO# 100173201

Z:\Cima-C10\Ott_Projects\A\A001000-A001499\A001046_403 Richmond - Servicing Report\300\360_Civil\220218_Site Plan Control\01_SAN\[220407_Sanitary Flow.xlsx]Sheet1

From:	Fraser, Mark
To:	Tim Kennedy
Cc:	Christian Lavoie-Lebel; Jaymeson Adams
Subject:	RE: 403 Richmond Rd. and 389 Roosevelt Ave. - Peak Wastewater Demand - Capacity Confirmation
Date:	Thursday, June 25, 2020 9:56:53 AM
Attachments:	image001.jpg image002.jpg 200616_Sanitary Flow_revuTK.pdf 2020-05-27 - Concept.pdf

Hi Tim,

The Water Resources Assets Unit has reviewed the proposed peak wastewater flow of 3.13 L/s estimated to be generated from the subject redevelopment proposal and have no issues.

Regards,

Mark Fraser, P. Eng.
Project Manager, Planning Services
Development Review Central Branch
City of Ottawa | Ville d'Ottawa
Planning, Infrastructure and Economic Development Department
110 Laurier Avenue West. 4th Floor, Ottawa ON, K1P 1J1
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From: Tim Kennedy <Tim.Kennedy@cima.ca>
Sent: June 17, 2020 12:40 PM
To: Fraser, Mark <Mark.Fraser@ottawa.ca>
Cc: Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>; Jaymeson Adams <Jaymeson.Adams@cima.ca>
Subject: 403 Richmond Rd. and 389 Roosevelt Ave. - Peak Wastewater Demand - Capacity Confirmation

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We would like to kindly submit the anticipated sanitary demands for the proposed development at **403 Richmond Road and 389 Roosevelt Ave**. Please find the proposed development information below and detailed calculations attached (I have also attached the Architectural Concept Plans for reference):

1. **Type of Development and Units:** The proposed development involves the construction of one (1) 10-storey mixed-use building (residential and commercial space). There is a total of **174 residential units**. An underground 2-level parking garage extending the footprint of the site is also proposed.
2. **Site Address:** 403 Richmond Road and 389 Roosevelt Ave.
3. **Location of Services:** connection to existing 300 mm diameter concrete sanitary sewer on Roosevelt Avenue with new maintenance hole on sewer main anticipated.
4. **Total Estimated Average Dry Weather Flow Rate:** 0.91 L/s
5. **Total Estimated Peak Dry Weather Flow Rate:** 3.06 L/s
6. **Total Estimated Peak Wet Weather Flow Rate:** 3.13 L/s

Could you please confirm if there is enough capacity in the City system to accommodate the proposed wastewater flow. Note that I will be out of the office next week, however you can contact Christian or Jaymeson (cc'd above) if you require anything further while I am away.

Best regards,

TIM KENNEDY, P.Eng.
Project Manager / Infrastructure

T 613-860-2462 ext. 6620 **M** 613-462-3627 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

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'

F

Appendix F
Storm Servicing and Stormwater Management Calculations

CIMA+

JAYMESON ADAMS, EIT
A001046
2020-06-30

PROJECT NAME:	403 Richmond Road and 389 Roosevelt Avenue Multi-use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001046
CLIENT:	Starwood Group Inc.
PROJECT STATUS:	Detailed Design (Site Plan Control)

STORM PRE-DEVELOPMENT FLOW

APPLICABLE DESIGN GUIDELINES:

1. City of Ottawa Sewer Design Guidelines, 2012

PRE-DEVELOPMENT FLOW DETERMINATION:

DESIGN CRITERIA:

Design Storm (year):	2	
IDF Regression Constants: (a)	732.951	
(b)	6.199	
(c)	0.810	
IDF Curve Equation (mm/hr):	$I = a / (\text{Time in min} + b)^c$	
Rational Formula (L/s):	$Q = 2.78C*I*A$	where: Q = Flow (L/s) C = Runoff Coefficient I = Rainfall Intensity (mm/hr) A = Area (hectares)

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
Subject Site	0.26	0.50	10	76.81	**27.74**	**106.67**

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. Calculated runoff coefficient (C) equal to 0.78 for 2-year event. Maximum C of 0.50 used per City Standard.
3. IDF Parameters per City of Ottawa Sewer Design Guidelines, 2012 (Macdonald-Cartier International Airport)

Prepared by: Jaymeson Adams, EIT Date: 2022-04-07

Verified by: Tim Kennedy, P.Eng. Date: 2022-04-07
PEO# 100173201

PROJECT NAME:	403 Richmond Road and 389 Roosevelt Avenue Multi-use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001046
CLIENT:	Starwood Group Inc.
PROJECT STATUS:	Detailed Design (Site Plan Control)

STORM PRE-DEVELOPMENT FLOW - EXISTING SITE FLOWS

APPLICABLE DESIGN GUIDELINES:

1. City of Ottawa Sewer Design Guidelines, 2012

PRE-DEVELOPMENT FLOW DETERMINATION - 2-YEAR EVENT:

DESIGN CRITERIA:

Design Storm (year):	2	
IDF Regression Constants: (a)	732.951	
(b)	6.199	
(c)	0.810	
IDF Curve Equation (mm/hr):	$I = a / (\text{Time in min} + b)^c$	
Rational Formula (L/s):	Q = 2.78C*I*A	where: Q = Flow (L/s) C = Runoff Coefficient I = Rainfall Intensity (mm/hr) A = Area (hectares)

ALLOWABLE RELEASE RATE - SUMMARY:

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
Subject Site	0.26	0.78	10	76.81	**43.27**	**166.41**

PRE-DEVELOPMENT FLOW DETERMINATION - 5-YEAR EVENT:

DESIGN CRITERIA:

Design Storm (year):	5	
IDF Regression Constants: (a)	998.071	
(b)	6.053	
(c)	0.814	

ALLOWABLE RELEASE RATE - SUMMARY:

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
Subject Site	0.26	0.78	10	104.19	**58.70**	**225.75**

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	

ALLOWABLE RELEASE RATE - SUMMARY:

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
Subject Site	0.26	0.95	10	178.56	**122.51**	**471.20**

PROJECT NAME:	403 Richmond Road and 389 Roosevelt Avenue Multi-use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001046
CLIENT:	Starwood Group Inc.
PROJECT STATUS:	Detailed Design (Site Plan Control)

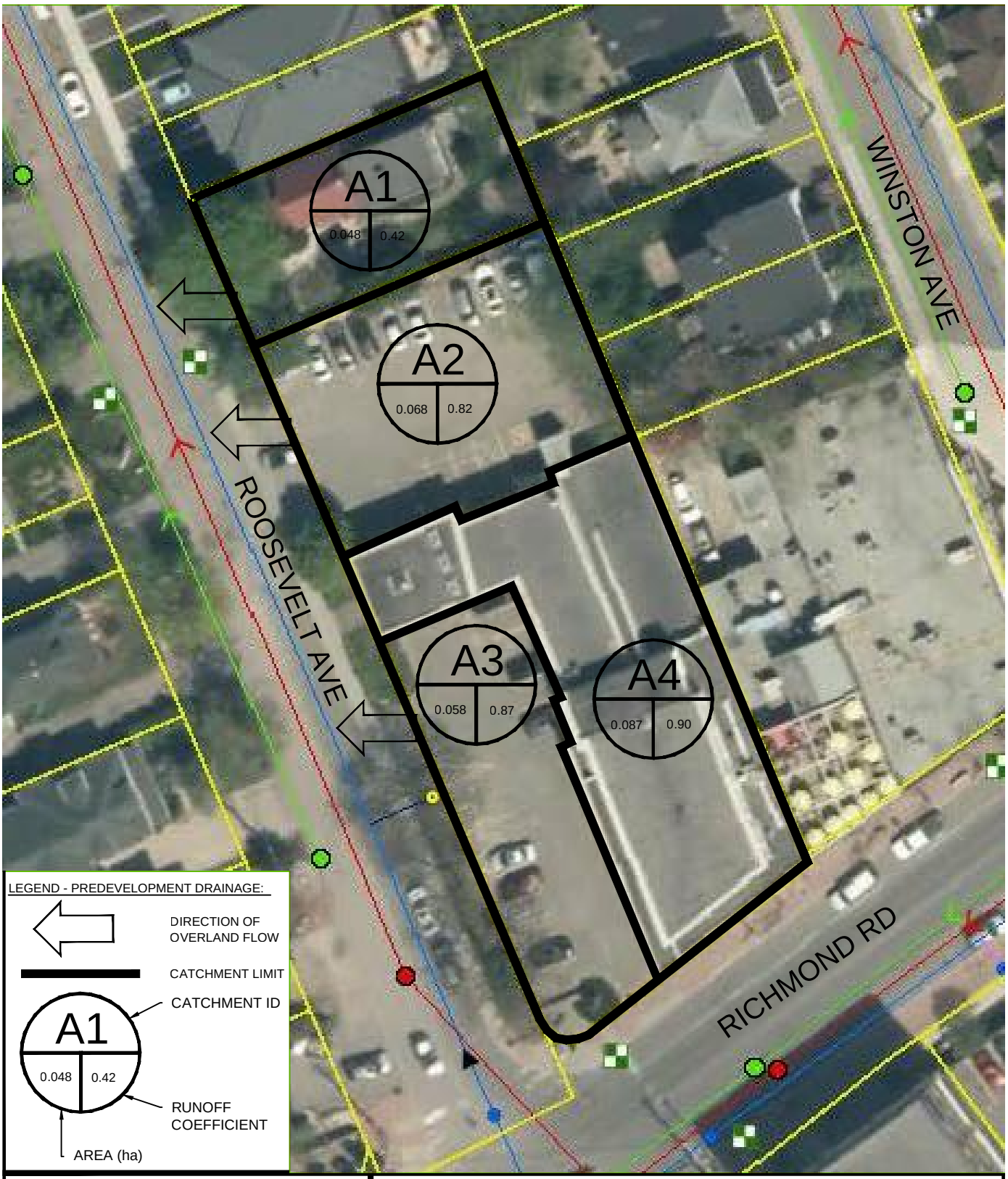
STORM PRE-DEVELOPMENT FLOW - EXISTING SITE FLOWS

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. Calculated runoff coefficient (C) equal to 0.78 for 2-year event and 0.95 for 100-year event.
3. IDF Parameters per City of Ottawa Sewer Design Guidelines, 2012 (Macdonald-Cartier International Airport)

Prepared by: Jaymeson Adams, EIT Date: 2022-04-07

Verified by: Tim Kennedy, P.Eng. Date: 2022-04-07
PEO# 100173201



CIMA+
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:
T. Kennedy	----	T. Kennedy	NTS	2020/07/06	A001046	1 of 1	EXIST - 2

PROJECT NAME:	403 Richmond Road and 389 Roosevelt Avenue Multi-use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001046
CLIENT:	Starwood Group Inc.
PROJECT STATUS:	Detailed Design (Site Plan Control)

STORM PRE- VS POST DEVELOPMENT FLOW - UNATTENUATED AREAS (100-YEAR)

APPLICABLE DESIGN GUIDELINES:

1. City of Ottawa Sewer Design Guidelines, 2012

PRE- vs POST-DEVELOPMENT FLOW DETERMINATION FOR UNATTENUATED AREAS:

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 (hectares)

RELEASE RATE SUMMARY - UNATTENUATED AREAS - PRE- vs POST-DEVELOPMENT (100-year):

Design Event	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
Pre-development	0.07	0.79	10	178.56	**29.0**	**391.84**
Post-development	0.07	0.74	10	178.56	**25.7**	**367.04**
Variance (Post minus Pre)					**-3.3**	

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, P.Eng. Date: 2022-11-04
PEO# 100519478

Verified by: Tim Kennedy, P.Eng. Date: 2022-11-04
PEO# 100173201

PROJECT NAME: 403 Richmond Road and 389 Roosevelt Avenue
Multi-use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER: A001046
CLIENT: Starwood Group Inc.
PROJECT STATUS: Detailed Design (Site Plan Control)

STORMWATER MANAGEMENT – PRELIMINARY RETENTION CALCULATIONS – 2 YEAR EVENT

APPLICABLE DESIGN GUIDELINES:

1. City of Ottawa Sewer Design Guidelines, 2012

STORMWATER MANAGEMENT SUMMARY - STORAGE AND DRAWDOWN:

DESIGN CRITERIA:

Rainfall event	2	years
Roof Flows	1.90	L/s
Ground Area to Swale	9.59	L/s
Areas to Tank	16.25	L/s
Unattenuated Flow (2 year)	0.00	L/s
Allowable Release Rate	27.74	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)	Drawdown Time (min)	Comments
A1	508	508	100.00	100.15	0.15	25.4	5.8	5.8	0.07	100.07	242	1.90	50	Controlled roof area
A2	596	-	-	-	-	22.2	1.4	1.4	-	-	-	9.59	2	Area to swale
A3	1142	-	-	-	-	25.0	4.0	4.0	-	-	-	16.25	4	Areas to Tank
NC1	700	-	-	-	-	-	-	-	-	-	-	0.00	-	Unattenuated Areas
Total	**2946**	**508**				**72.6**	**11.1**	**11.1**				**27.74**		

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.
Drawdown Time = Time required for the total volume of water accumulated within sub-area to subside.

Prepared by: Jaymeson Adams, P.Eng. Date: 2022-11-04
PEO# 100519478

Verified by: Tim Kennedy, P.Eng. Date: 2022-11-04
PEO# 100173201

PROJECT NAME:	403 Richmond Road and 389 Roosevelt Avenue Multi-use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001046
CLIENT:	Starwood Group Inc.
PROJECT STATUS:	Detailed Design (Site Plan Control)

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):	37.42 L/s/ha
Area (A):	0.0508 ha
Runoff Coefficient (C):	0.90
Rainfall Event:	2 year
Release Rate (Q):	0.0019 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

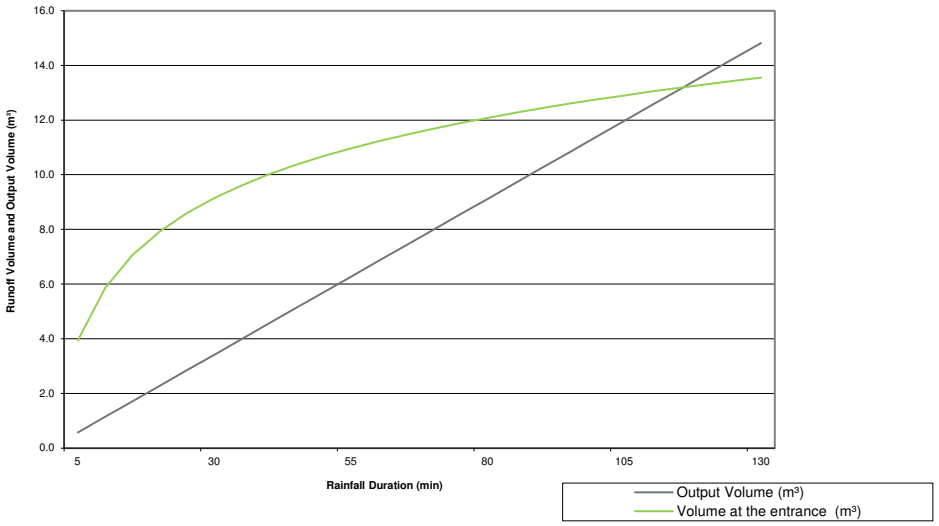
Required Retention Volume: **5.8 m³**

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	103.6	3.9	0.6	3.4
10.0	76.8	5.8	1.1	4.7
15.0	61.8	7.1	1.7	5.3
20.0	52.0	7.9	2.3	5.6
25.0	**45.2**	**8.6**	**2.9**	**5.8**
30.0	40.0	9.1	3.4	5.7
35.0	36.1	9.6	4.0	5.6
40.0	32.9	10.0	4.6	5.5
45.0	30.2	10.4	5.1	5.2
50.0	28.0	10.7	5.7	5.0
55.0	26.2	11.0	6.3	4.7
60.0	24.6	11.2	6.8	4.4
65.0	23.2	11.5	7.4	4.1
70.0	21.9	11.7	8.0	3.7
75.0	20.8	11.9	8.6	3.3
80.0	19.8	12.1	9.1	3.0
85.0	18.9	12.3	9.7	2.6
90.0	18.1	12.4	10.3	2.2
95.0	17.4	12.6	10.8	1.8
100.0	16.7	12.8	11.4	1.4
105.0	16.1	12.9	12.0	0.9
110.0	15.6	13.0	12.5	0.5
115.0	15.0	13.2	13.1	0.1
120.0	14.6	13.3	13.7	-0.4
125.0	14.1	13.4	14.3	-0.8
130.0	13.7	13.6	14.8	-1.3
Design Volume:				**5.8**

Init. JA

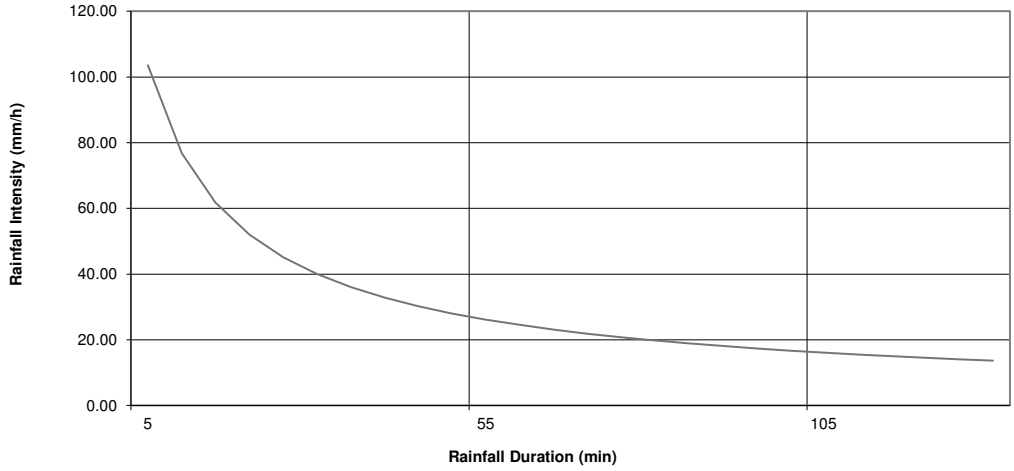
ATTENUATED AREAS

Required Retention Determination Using the Rational Method



I-D-F Rainfall Curve

100 year event



Prepared by: Jaymeson Adams, P.Eng. Date: 2022-11-04
PEO# 100519478

Verified by: Tim Kennedy, P.Eng. Date: 2022-11-04
PEO# 100173201

Init. ja

PROJECT NAME:	403 Richmond Road and 389 Roosevelt Avenue Multi-use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001046
CLIENT:	Starwood Group Inc.
PROJECT STATUS:	Detailed Design (Site Plan Control)

RETENTION CALCULATIONS FOR FOR SUB-CATCHMENT AREA A2

APPLICABLE DESIGN GUIDELINES:

1. City of Ottawa Sewer Design Guidelines, 2012

REQUIRED STORAGE VOLUME DETERMINATION:

DESIGN CRITERIA:

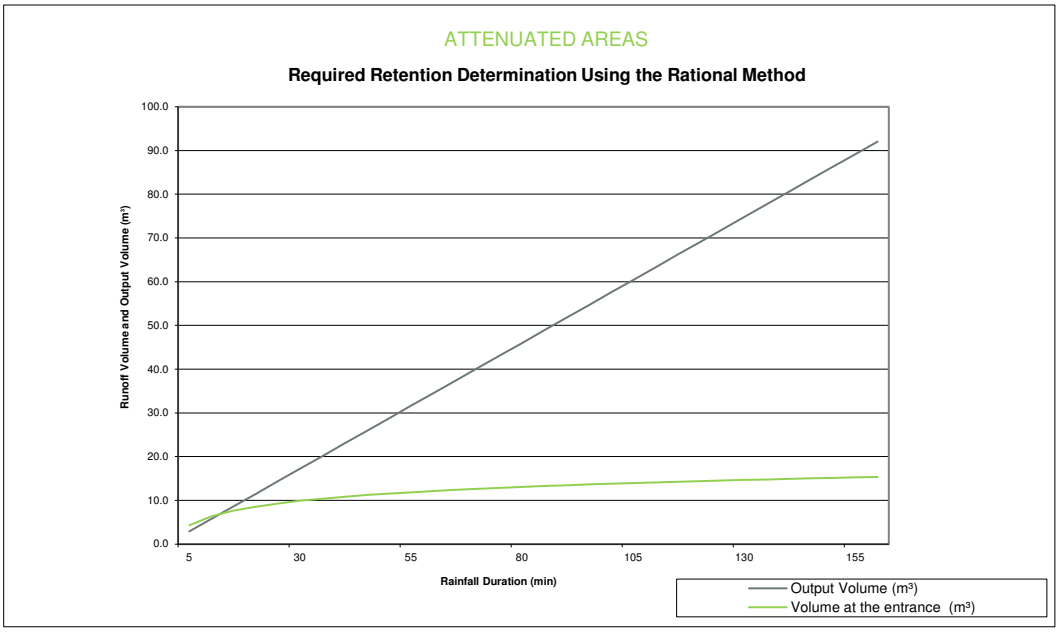
Rainfall Station:	City of Ottawa Sewer Design Guidelines, 2012 (Macdonald-Cartier Airport)
Release Rate Per Unit Area (Q/ha):	160.91 L/s/ha
Area (A):	0.0596 ha
Runoff Coefficient (C):	0.83
Rainfall Event:	2 year
Release Rate (Q):	0.0096 m³/s
Discharge Factor (K):	1

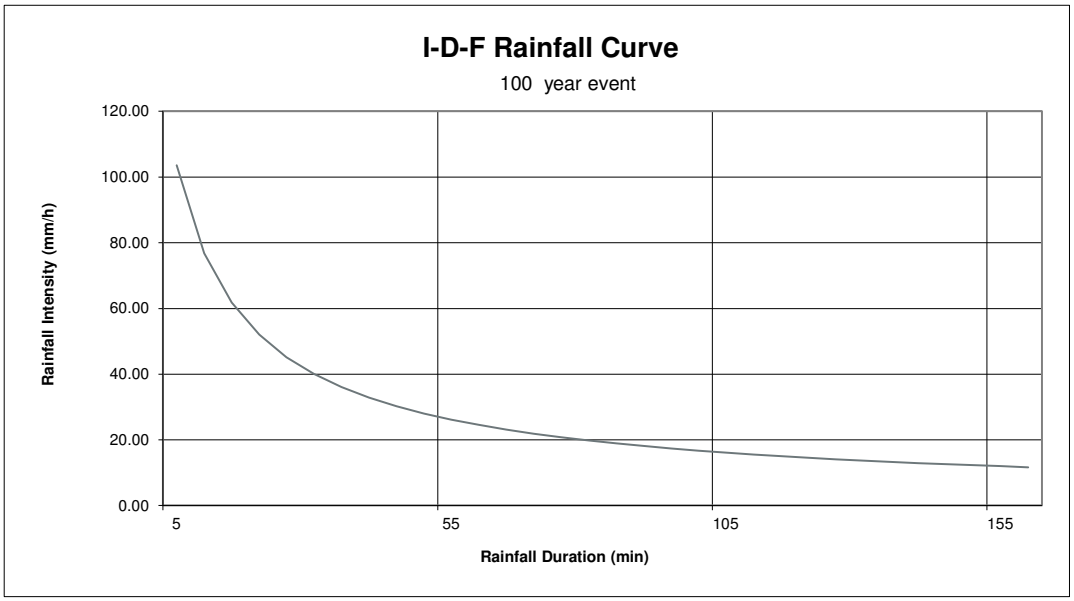
Regression Constants	2 year	5 year	10 year	25 year	50 year	100 year
A	732.951	998.071	1174.184	1402.844	1569.58	1735.688
B	6.199	6.053	6.014	6.018	6.014	6.014
C	0.810	0.814	0.816	0.819	0.82	0.82

Required Retention Volume: **1.4 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	**103.6**	**4.3**	**2.9**	**1.4**
10.0	76.8	6.3	5.8	0.6
15.0	61.8	7.6	8.6	-1.0
20.0	52.0	8.6	11.5	-2.9
25.0	45.2	9.3	14.4	-5.1
30.0	40.0	9.9	17.3	-7.4
35.0	36.1	10.4	20.1	-9.7
40.0	32.9	10.8	23.0	-12.2
45.0	30.2	11.2	25.9	-14.7
50.0	28.0	11.6	28.8	-17.2
55.0	26.2	11.9	31.6	-19.8
60.0	24.6	12.1	34.5	-22.4
65.0	23.2	12.4	37.4	-25.0
70.0	21.9	12.6	40.3	-27.6
75.0	20.8	12.9	43.2	-30.3
80.0	19.8	13.1	46.0	-33.0
85.0	18.9	13.3	48.9	-35.6
90.0	18.1	13.5	51.8	-38.3
95.0	17.4	13.6	54.7	-41.0
100.0	16.7	13.8	57.5	-43.7
105.0	16.1	14.0	60.4	-46.5
110.0	15.6	14.1	63.3	-49.2
115.0	15.0	14.3	66.2	-51.9
120.0	14.6	14.4	69.0	-54.6
125.0	14.1	14.5	71.9	-57.4
130.0	13.7	14.7	74.8	-60.1
135.0	13.3	14.8	77.7	-62.9
140.0	12.9	14.9	80.6	-65.6
145.0	12.6	15.0	83.4	-68.4
150.0	12.3	15.2	86.3	-71.2
155.0	11.9	15.3	89.2	-73.9
160.0	11.7	15.4	92.1	-76.7
Design Volume:				**1.4**

Init. ja





Prepared by: Jaymeson Adams, P.Eng. Date: 2022-11-04
PEO# 100519478

Verified by: Tim Kennedy, P.Eng. Date: 2022-11-04
PEO# 100173201

Init. ja

PROJECT NAME:	403 Richmond Road and 389 Roosevelt Avenue Multi-use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001046
CLIENT:	Starwood Group Inc.
PROJECT STATUS:	Detailed Design (Site Plan Control)

RETENTION CALCULATIONS FOR FOR SUB-CATCHMENT AREA A3

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):	142.28 L/s/ha
Area (A):	0.1142 ha
Runoff Coefficient (C):	0.90
Rainfall Event:	2 year
Release Rate (Q):	0.0163 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

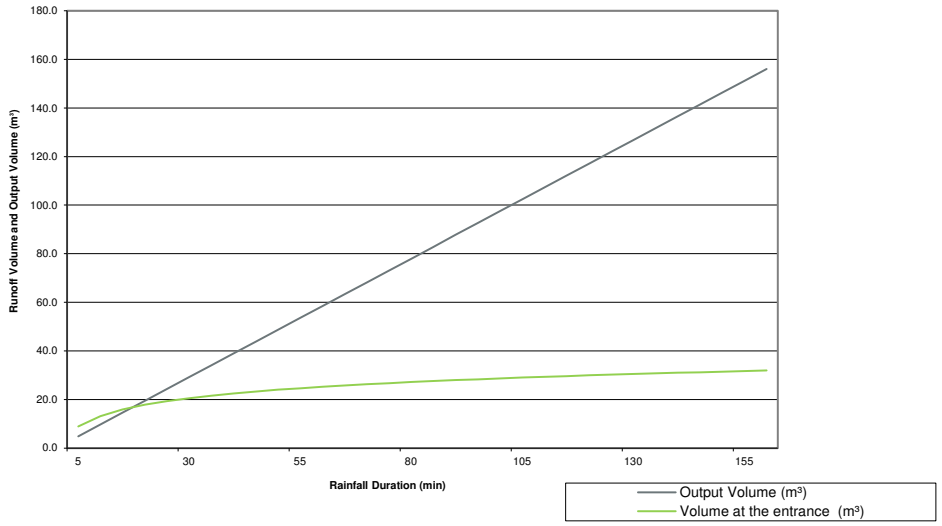
Required Retention Volume: 4.0 m³

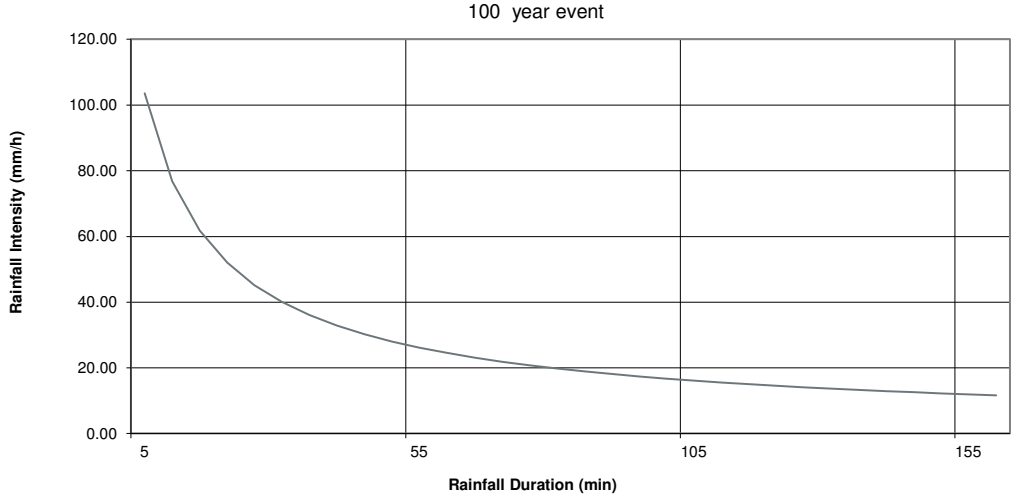
Rainfall Duration (min) *T* (1)	Rainfall Intensity (mm/h) *I* (2)	Runoff Volume (m³) *CIAT* (3)	Output Volume (m³) *kQT* (4)	Retention Volume (m³) *(3)-(4)* (5)
5.0	**103.6**	**8.9**	**4.9**	**4.0**
10.0	76.8	13.2	9.8	3.4
15.0	61.8	15.9	14.6	1.2
20.0	52.0	17.8	19.5	-1.7
25.0	45.2	19.3	24.4	-5.0
30.0	40.0	20.6	29.3	-8.7
35.0	36.1	21.6	34.1	-12.5
40.0	32.9	22.5	39.0	-16.5
45.0	30.2	23.3	43.9	-20.6
50.0	28.0	24.0	48.8	-24.7
55.0	26.2	24.7	53.6	-29.0
60.0	24.6	25.2	58.5	-33.3
65.0	23.2	25.8	63.4	-37.6
70.0	21.9	26.3	68.3	-42.0
75.0	20.8	26.7	73.1	-46.4
80.0	19.8	27.2	78.0	-50.8
85.0	18.9	27.6	82.9	-55.3
90.0	18.1	28.0	87.8	-59.8
95.0	17.4	28.3	92.6	-64.3
100.0	16.7	28.7	97.5	-68.8
105.0	16.1	29.0	102.4	-73.4
110.0	15.6	29.3	107.3	-77.9
115.0	15.0	29.6	112.1	-82.5
120.0	14.6	29.9	117.0	-87.1
125.0	14.1	30.2	121.9	-91.7
130.0	13.7	30.5	126.8	-96.3
135.0	13.3	30.7	131.6	-100.9
140.0	12.9	31.0	136.5	-105.5
145.0	12.6	31.2	141.4	-110.1
150.0	12.3	31.5	146.3	-114.8
155.0	11.9	31.7	151.1	-119.4
160.0	11.7	31.9	156.0	-124.1
Design Volume:				**4.0**

Init. ja

ATTENUATED AREAS

Required Retention Determination Using the Rational Method





Prepared by: Jaymeson Adams, P.Eng. Date: 2022-11-04
PEO# 100519478

Verified by: Tim Kennedy, P.Eng. Date: 2022-11-04
PEO# 100173201

Init. ja

PROJECT NAME: 403 Richmond Road and 389 Roosevelt Avenue
Multi-use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER: A001046
CLIENT: Starwood Group Inc.
PROJECT STATUS: Detailed Design (Site Plan Control)

STORMWATER MANAGEMENT – PRELIMINARY RETENTION CALCULATIONS – 100 YEAR EVENT

APPLICABLE DESIGN GUIDELINES:

1. City of Ottawa Sewer Design Guidelines, 2012

STORMWATER MANAGEMENT SUMMARY - STORAGE AND DRAWDOWN:

DESIGN CRITERIA:

Rainfall event	100	years
Roof Flows	1.90	L/s
Ground Area to Swale	9.59	L/s
Areas to Tank	16.25	L/s
Unattenuated Flow (100 year)	0.00	L/s
Allowable Release Rate	27.74	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)	Drawdown Time (min)	Comments
A1	508	508	100.00	100.15	0.15	25.4	20.1	20.1	0.13	100.13	452	1.90	177	Controlled roof area
A2	596	-	-	-	-	22.2	11.6	11.6	-	-	-	9.59	20	Area to swale
A3	1142	-	-	-	-	25.0	24.1	24.1	-	-	-	16.25	25	Areas to Tank
NC1	700	-	-	-	-	-	-	-	-	-	-	0.00	-	Unattenuated Areas
Total	**2946**	**508**				**72.6**	**55.9**	**55.9**				**27.74**		

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.
Drawdown Time = Time required for the total volume of water accumulated within sub-area to subside.

Prepared by: Jaymeson Adams, P.Eng. Date: 2022-11-04
PEO# 100519478

Verified by: Tim Kennedy, P.Eng. Date: 2022-11-04
PEO# 100173201

PROJECT NAME:	403 Richmond Road and 389 Roosevelt Avenue Multi-use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001046
CLIENT:	Starwood Group Inc.
PROJECT STATUS:	Detailed Design (Site Plan Control)

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:

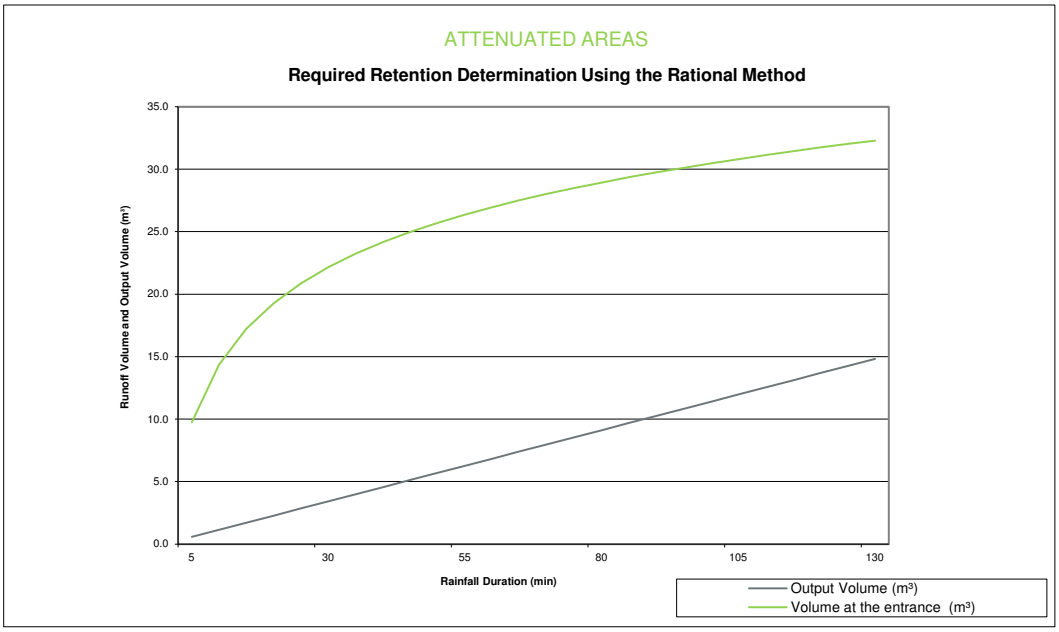
Rainfall Station:	City of Ottawa Sewer Design Guidelines, 2012 (Macdonald-Cartier Airport)
Release Rate Per Unit Area (Q/ha):	37.42 L/s/ha
Area (A):	0.0508 ha
Runoff Coefficient (C):	0.95
Rainfall Event:	100 year
Release Rate (Q):	0.0019 m³/s
Discharge Factor (K):	1

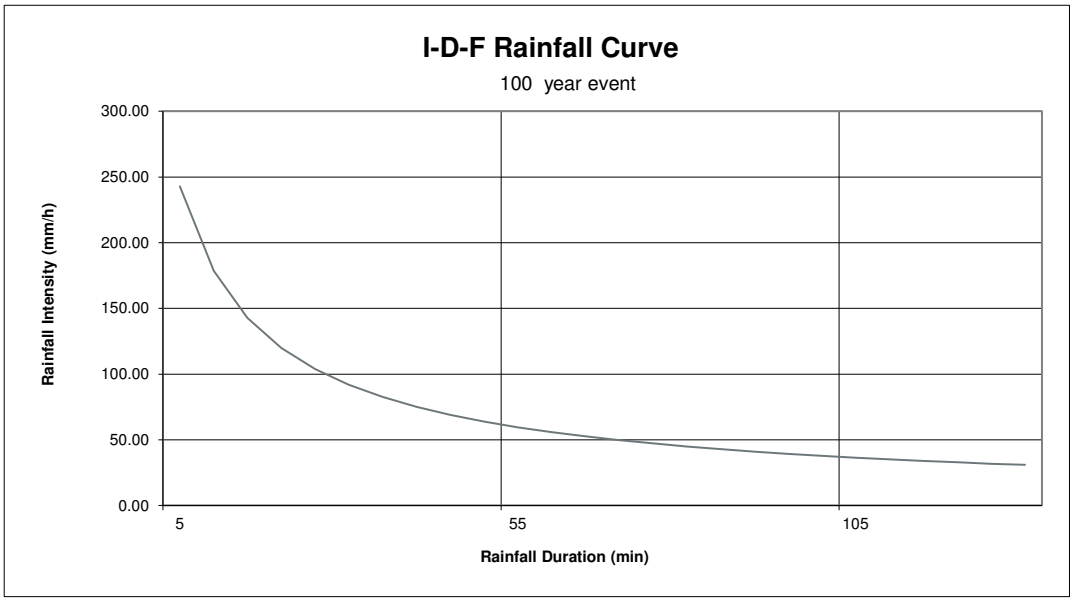
Regression Constants	2 year	5 year	10 year	25 year	50 year	100 year
A	732.951	998.071	1174.184	1402.844	1569.58	1735.688
B	6.199	6.053	6.014	6.018	6.014	6.014
C	0.810	0.814	0.816	0.819	0.82	0.82

Required Retention Volume: 20.1 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	242.7	9.8	0.6	9.2
10.0	178.6	14.4	1.1	13.2
15.0	142.9	17.2	1.7	15.5
20.0	120.0	19.3	2.3	17.0
25.0	103.8	20.9	2.9	18.0
30.0	91.9	22.2	3.4	18.7
35.0	82.6	23.2	4.0	19.2
40.0	75.1	24.2	4.6	19.6
45.0	69.1	25.0	5.1	19.9
50.0	64.0	25.7	5.7	20.0
55.0	59.6	26.4	6.3	20.1
60.0	**55.9**	**27.0**	**6.8**	**20.1**
65.0	52.6	27.5	7.4	20.1
70.0	49.8	28.0	8.0	20.0
75.0	47.3	28.5	8.5	19.9
80.0	45.0	28.9	9.1	19.8
85.0	43.0	29.4	9.7	19.7
90.0	41.1	29.7	10.3	19.5
95.0	39.4	30.1	10.8	19.3
100.0	37.9	30.5	11.4	19.1
105.0	36.5	30.8	12.0	18.8
110.0	35.2	31.1	12.5	18.6
115.0	34.0	31.4	13.1	18.3
120.0	32.9	31.7	13.7	18.1
125.0	31.9	32.0	14.3	17.8
130.0	30.9	32.3	14.8	17.5
Design Volume:				**20.1**

Init.





Prepared by: Jaymeson Adams, P.Eng. Date: 2022-11-04
PEO# 100519478

Verified by: Tim Kennedy, P.Eng. Date: 2022-11-04
PEO# 100173201

Init. ja

PROJECT NAME:	403 Richmond Road and 389 Roosevelt Avenue Multi-use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001046
CLIENT:	Starwood Group Inc.
PROJECT STATUS:	Detailed Design (Site Plan Control)

RETENTION CALCULATIONS FOR FOR SUB-CATCHMENT AREA A2

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):	160.91 L/s/ha
Area (A):	0.0596 ha
Runoff Coefficient (C):	0.95
Rainfall Event:	100 year
Release Rate (Q):	0.0096 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

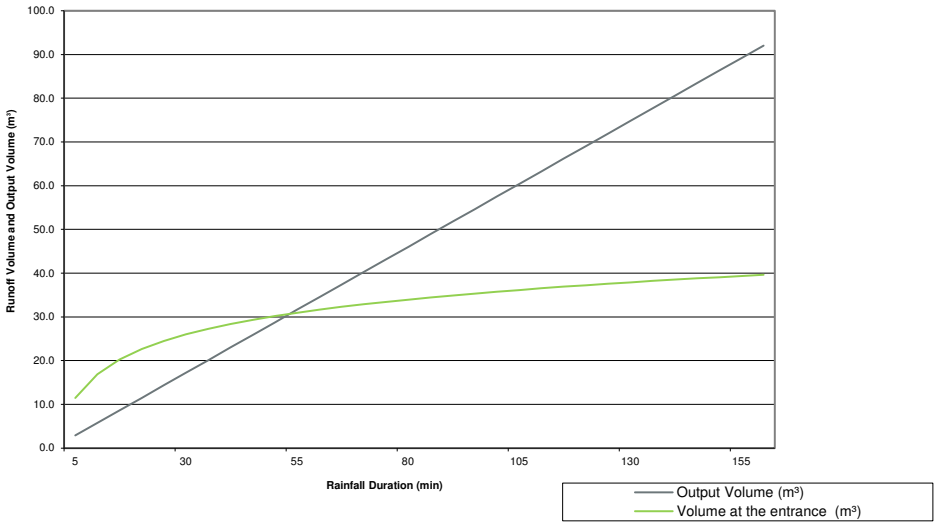
Required Retention Volume: **11.6 m³**

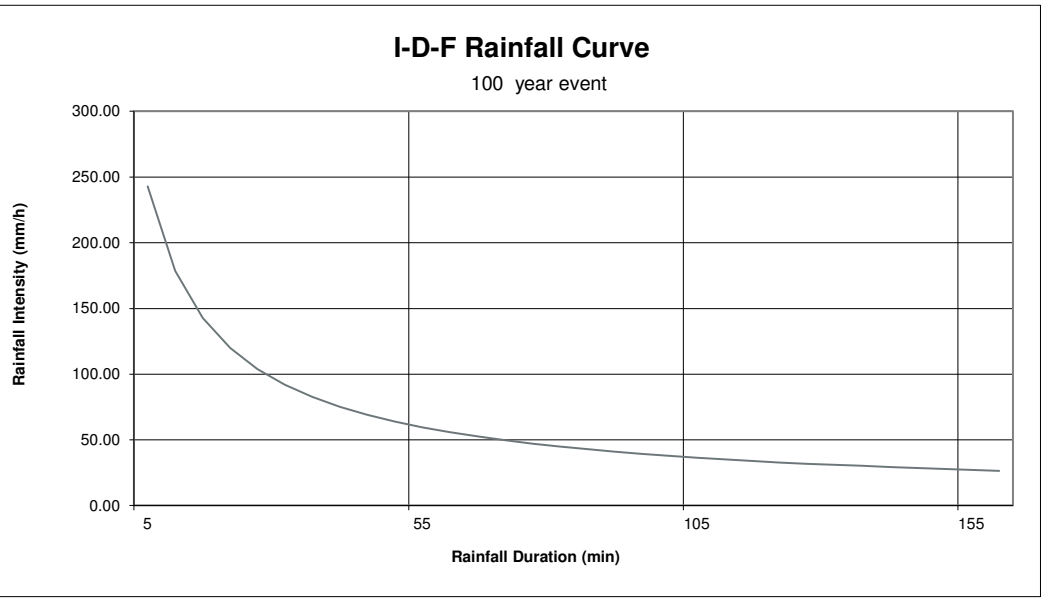
Rainfall Duration (min) *T* (1)	Rainfall Intensity (mm/h) *I* (2)	Runoff Volume (m³) *CIAT* (3)	Output Volume (m³) *kQT* (4)	Retention Volume (m³) *(3)-(4)* (5)
5.0	242.7	11.5	2.9	8.6
10.0	178.6	16.9	5.8	11.1
15.0	**142.9**	**20.2**	**8.6**	**11.6**
20.0	120.0	22.6	11.5	11.1
25.0	103.8	24.5	14.4	10.1
30.0	91.9	26.0	17.3	8.7
35.0	82.6	27.3	20.1	7.1
40.0	75.1	28.4	23.0	5.3
45.0	69.1	29.3	25.9	3.4
50.0	64.0	30.2	28.8	1.4
55.0	59.6	30.9	31.6	-0.7
60.0	55.9	31.6	34.5	-2.9
65.0	52.6	32.3	37.4	-5.1
70.0	49.8	32.9	40.3	-7.4
75.0	47.3	33.4	43.2	-9.7
80.0	45.0	34.0	46.0	-12.1
85.0	43.0	34.5	48.9	-14.5
90.0	41.1	34.9	51.8	-16.9
95.0	39.4	35.4	54.7	-19.3
100.0	37.9	35.8	57.5	-21.8
105.0	36.5	36.2	60.4	-24.3
110.0	35.2	36.5	63.3	-26.8
115.0	34.0	36.9	66.2	-29.3
120.0	32.9	37.3	69.0	-31.8
125.0	31.9	37.6	71.9	-34.3
130.0	30.9	37.9	74.8	-36.9
135.0	30.0	38.2	77.7	-39.5
140.0	29.2	38.5	80.6	-42.0
145.0	28.4	38.8	83.4	-44.6
150.0	27.6	39.1	86.3	-47.2
155.0	26.9	39.4	89.2	-49.8
160.0	26.2	39.6	92.1	-52.4
Design Volume:				**11.6**

Init. JA

ATTENUATED AREAS

Required Retention Determination Using the Rational Method





Prepared by: Jaymeson Adams, P.Eng. Date: 2022-11-04
PEO# 100519478

Verified by: Tim Kennedy, P.Eng. Date: 2022-11-04
PEO# 100173201

Init. ja

PROJECT NAME:	403 Richmond Road and 389 Roosevelt Avenue Multi-use Development (Commercial/Residential)
CIMA+ PROJECT NUMBER:	A001046
CLIENT:	Starwood Group Inc.
PROJECT STATUS:	Detailed Design (Site Plan Control)

RETENTION CALCULATIONS FOR FOR SUB-CATCHMENT AREA A3

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):	142.28 L/s/ha
Area (A):	0.1142 ha
Runoff Coefficient (C):	0.95
Rainfall Event:	100 year
Release Rate (Q):	0.0163 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: 24.1 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	242.7	21.9	4.9	17.1
10.0	178.6	32.3	9.8	22.5
15.0	**142.9**	**38.8**	**14.6**	**24.1**
20.0	120.0	43.4	19.5	23.9
25.0	103.8	46.9	24.4	22.6
30.0	91.9	49.8	29.3	20.6
35.0	82.6	52.3	34.1	18.1
40.0	75.1	54.4	39.0	15.4
45.0	69.1	56.2	43.9	12.3
50.0	64.0	57.8	48.8	9.1
55.0	59.6	59.3	53.6	5.7
60.0	55.9	60.6	58.5	2.1
65.0	52.6	61.9	63.4	-1.5
70.0	49.8	63.0	68.3	-5.2
75.0	47.3	64.1	73.1	-9.0
80.0	45.0	65.1	78.0	-12.9
85.0	43.0	66.0	82.9	-16.9
90.0	41.1	66.9	87.8	-20.8
95.0	39.4	67.7	92.6	-24.9
100.0	37.9	68.5	97.5	-29.0
105.0	36.5	69.3	102.4	-33.1
110.0	35.2	70.0	107.3	-37.2
115.0	34.0	70.7	112.1	-41.4
120.0	32.9	71.4	117.0	-45.6
125.0	31.9	72.0	121.9	-49.9
130.0	30.9	72.6	126.8	-54.1
135.0	30.0	73.2	131.6	-58.4
140.0	29.2	73.8	136.5	-62.7
145.0	28.4	74.4	141.4	-67.0
150.0	27.6	74.9	146.3	-71.4
155.0	26.9	75.4	151.1	-75.7
160.0	26.2	75.9	156.0	-80.1
Design Volume:				**24.1**

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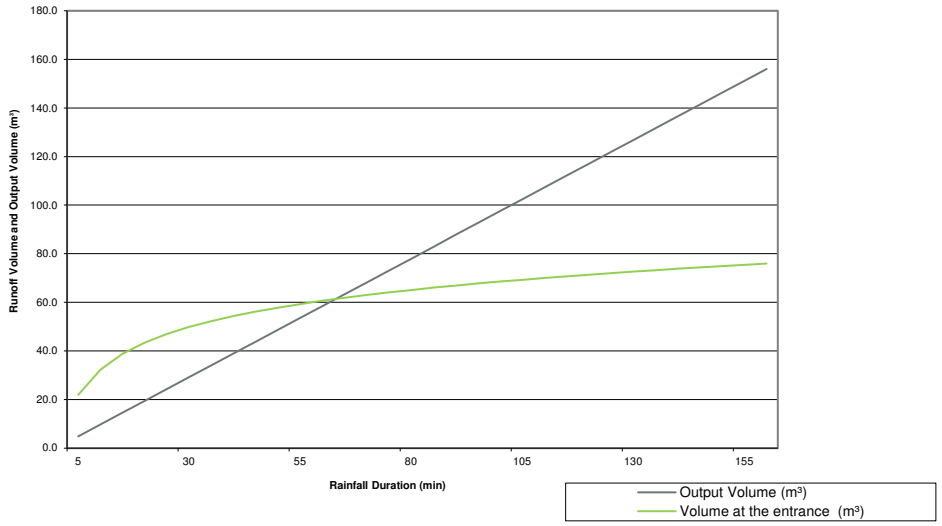
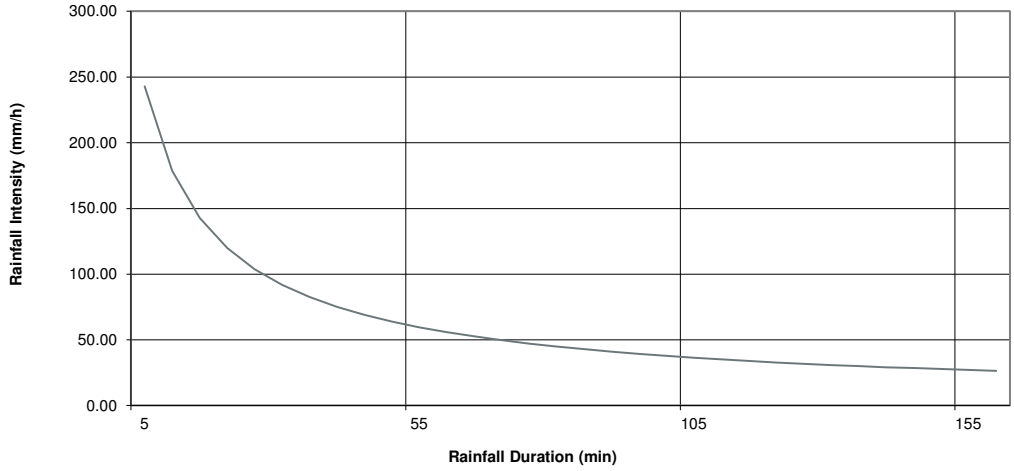
ATTENUATED AREAS

Required Retention Determination Using the Rational Method



I-D-F Rainfall Curve

100 year event



Prepared by: Jaymeson Adams, P.Eng. Date: 2022-11-04
PEO# 100519478

Verified by: Tim Kennedy, P.Eng. Date: 2022-11-04
PEO# 100173201

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Appendix G
Technical References

CIMA+

WATTS®	Adjustable Accutrol Weir Tag: _____	Adjustable Flow Control for Roof Drains

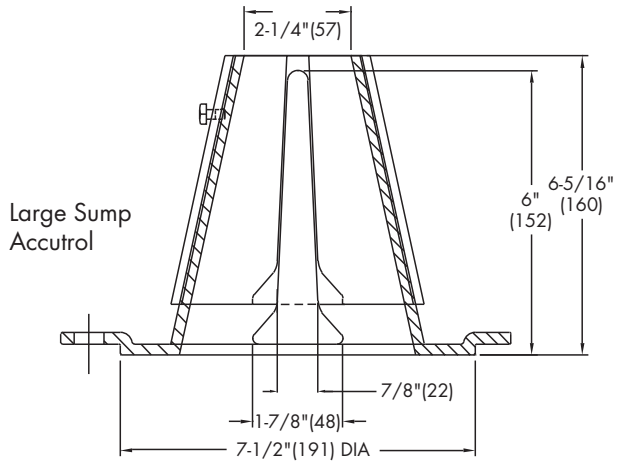
ADJUSTABLE ACCUTROL (for Large Sump Roof Drains only)

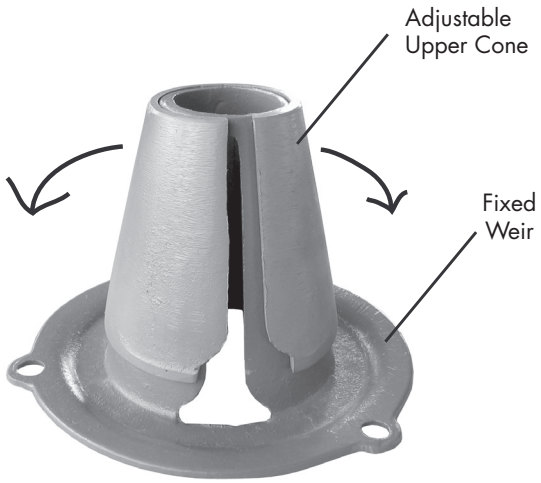
For more flexibility in controlling flow with heads deeper than 2", Watts Drainage offers the Adjustable Accutrol. The Adjustable Accutrol Weir is designed with a single parabolic opening that can be covered to restrict flow above 2" of head to less than 5 gpm per inch, up to 6" of head. To adjust the flow rate for depths over 2" of head, set the slot in the adjustable upper cone according to the flow rate required. Refer to Table 1 below.
Note: Flow rates are directly proportional to the amount of weir opening that is exposed.

EXAMPLE:

For example, if the adjustable upper cone is set to cover 1/2 of the weir opening, flow rates above 2"of head will be restricted to 2-1/2 gpm per inch of head.

Therefore, at 3"of head, the flow rate through the Accutrol Weir that has 1/2 the slot exposed will be:
[5 gpm (per inch of head) x 2 inches of head] + 2-1/2 gpm (for the third inch of head) = 12-1/2 gpm.





1/2 Weir Opening Exposed Shown Above

TABLE 1. Adjustable Accutrol Flow Rate Settings

Weir Opening Exposed	1"	2"	3"	4"	5"	6"
	Flow Rate (gallons per minute)					
Fully Exposed	5	10	15	20	25	30
3/4	5	10	13.75	17.5	21.25	25
1/2	5	10	12.5	15	17.5	20
1/4	5	10	11.25	12.5	13.75	15
Closed	5	5	5	5	5	5

Job Name _____ Contractor _____

Job Location _____ Contractor's P.O. No. _____

Engineer _____ Representative _____

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H

Appendix H
Geotechnical Report (by Paterson Group Inc.)

PATERSON GROUP

Geotechnical Investigation

Proposed Multi-Storey Building

403 Richmond Road and 389 Roosevelt Avenue
Ottawa, Ontario

Prepared for Westboro Inc.

Report PG5101-1 Revision 2, dated October 7, 2022

Table of Contents

PAGE

1.0 Introduction 1
2.0 Proposed Development 1
3.0 Method of Investigation 2
3.1 Field Investigation 2
3.2 Field Survey 4
4.0 Observations 5
4.1 Surface Conditions 5
4.2 Subsurface Profile 5
4.3 Groundwater 6
4.4 Hydrogeologic Conditions 6
5.0 Discussion 8
5.1 Geotechnical Assessment 8
5.2 Site Grading and Preparation 8
5.3 Foundation Design 10
5.4 Design for Earthquakes 11
5.5 Basement Floor Slab 12
5.6 Basement Wall 13
5.7 Rock Anchor Design 14
5.8 Pavement Design 17
6.0 Design and Construction Precautions 20
6.1 Foundation Drainage and Backfill 20
6.2 Protection of Footings Against Frost Action 24
6.3 Excavation Side Slopes 24
6.4 Pipe Bedding and Backfill 26
6.5 Groundwater Control 27
6.6 Winter Construction 28
7.0 Recommendations 29
8.0 Statement of Limitations 30

Appendices

Appendix 1 Soil Profile and Test Data Sheets
Symbols and Terms
Monitoring Well Logs by Others
Hydraulic Conductivity Testing Results

Appendix 2 Figure 1 - Key Plan
Figures 2 & 3 – Seismic Shear Wave Velocity Profiles
Figure 4 – Podium Deck to Foundation Wall Drainage System Tie-In Detail
Figure 5 – Waterproofing System for Elevator
Drawing PG5101-1 - Test Hole Location Plan

1.0 Introduction

Paterson Group (Paterson) was commissioned by Westboro Inc. to prepare a geotechnical report for the proposed multi-storey building to be located at 403 Richmond Road and 389 Roosevelt Avenue in the City of Ottawa, Ontario (refer to Figure 1 - Key Plan in Appendix 2 of this report).

The objectives of the geotechnical investigation were to:

- Determine the subsoil and groundwater conditions at this site by means of borehole.
- Provide geotechnical recommendations pertaining to 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. It contains our findings and includes geotechnical recommendations pertaining to the design and construction of the proposed development as they are understood at the time of writing this report.

Investigating the presence or potential presence of contamination on the subject property was not part of the scope of work of the present investigation. Therefore, the present report does not address the environmental issues.

2.0 Proposed Development

Based on available drawings, it is understood that the proposed development will consist of a multi-storey building with 3 levels of underground parking. Asphalt-paved access lanes, walkways and landscaped areas are also anticipated at finished grades surrounding the proposed building.

Construction of the proposed development is expected to require demolition of the existing residential dwelling and commercial building presently located at the site.

3.0 Method of Investigation

3.1 Field Investigation

Field Program

The field program for the current geotechnical investigation was carried out on September 1, 2022 and consisted of advancing a total of 3 boreholes to a maximum depth of 10.6 m below the existing ground surface. The borehole locations were distributed in a manner to provide general coverage of the subject site, taking into consideration underground utilities and site features.

The boreholes were advanced using an auger drill rig. The drilling procedure consisted of augering and bedrock coring to the required depths at the selected locations and sampling the overburden.

A previous geotechnical investigation was completed by others at the subject site on February 7, 2017, and consisted of advancing a total of 3 boreholes to a maximum depth of 4.4 m.

The locations of the boreholes are shown on Drawing PG5101-1 - Test Hole Location Plan in Appendix 2.

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. Rock cores (RC) were obtained using 47.6 mm inside diameter coring equipment. 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 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.

A Standard Penetration Test (SPT) was 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.

Bedrock samples were recovered from all boreholes using a core barrel and diamond drilling techniques. A recovery value and a Rock Quality Designation (RQD) value were calculated for each drilled section (core run) of bedrock and are shown on the borehole logs. The recovery value is the ratio, in percentage, of the length of the bedrock sample recovered over the length of the drilled section (core run). The RQD value is the ratio, in percentage, of the total length of intact rock pieces longer than 100 mm in one core run over the length of the core run. These values are indicative of the bedrock quality.

The subsurface conditions observed in the boreholes were recorded in detail in the field. The soil profiles are logged on the Soil Profile and Test Data Sheets in Appendix 1 of this report.

Groundwater

Groundwater monitoring wells were installed in boreholes BH 1-22 and BH 2-22 and a piezometer was installed in all borehole BH 3-22 to permit monitoring of the groundwater levels subsequent to the completion of the sampling program. The groundwater observations are discussed in Section 4.3 and are presented in the Soil Profile and Test Data Sheets in Appendix 1.

All monitoring wells should be decommissioned in accordance with Ontario Regulations O.Reg 903 by a qualified licensed well technician and prior to construction.

Hydraulic Conductivity (slug) Testing

Hydraulic conductivity (slug) testing was conducted at each monitoring well location to assist in confirming anticipated groundwater flow rates within the subsoils at the subject site. The test data was analyzed as per the method set out by Hvorslev (1951). Assumptions inherent in the Hvorslev method include a homogeneous and istropic aquifer of infinite extent with zero-storage assumption, and a screen length significantly greater than the monitoring well diameter.

The assumption regarding aquifer storage is considered to be appropriate for groundwater inflow through the overburden and/or bedrock aquifer. The assumption regarding screen length and well diameter is considered to be met based on a screen length of 3.0 m and a diameter of 0.03 m. While the idealized assumptions regarding aquifer extent, homogeneity, and isotropy are not strictly met in this case (or in any real-world situation), it has been our experience that the Hvorslev method produces effective point estimates of hydraulic conductivity in conditions similar to those encountered at the subject site.

The Horslev analysis is based on the line of best fit through the field data (hydraulic head recovery vs. time), plotted on a semi-logarithmic scale. In cases where the initial hydraulic head displacement is known with relative certainty, such as in this case where a physical slug has been introduced, the line of best fit is considered to pass through the origin. The semi-log drawdown vs. time plots for rising and falling head at each borehole locations are presented in Appendix 1.

The results of testing and hydrogeological recommendations are further discussed in Subsections 4.4.

Sample Storage

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

3.2 Field Survey

The borehole locations were selected by Paterson to provide general coverage of the proposed development, taking into consideration the location of previously drilled boreholes, existing site features and underground utilities. The borehole locations, and the ground surface elevation at each borehole location, were surveyed by Paterson using a GPS unit with respect to a geodetic datum. The ground surface elevation at the boreholes by others are understood to be referenced to a temporary benchmark which was assigned an arbitrary elevation of 100.0 m. The locations of the boreholes and ground surface elevation at each borehole location are presented on Drawing PG5101-1 - Test Hole Location Plan in Appendix 2.

4.0 Observations

4.1 Surface Conditions

The subject site consists of 2 contiguous properties: 403 Richmond Road and 389 Roosevelt Avenue. The property at 403 Richmond is occupied by an existing commercial development and associated asphalt-paved access lanes and parking areas.

The majority of the property at 389 Roosevelt Avenue is occupied by a residential dwelling located within the northern portion of the property as well as landscaped areas. An asphalt-paved driveway is located within the southwest corner of the property, fronting onto Roosevelt Avenue.

The subject site is bordered to the north and northeast by residential dwellings, to the southeast by a commercial development, to the south by Richmond Road and to the west by Roosevelt Avenue. The ground surface across the subject site is relatively flat and at-grade with the surrounding roadways.

4.2 Subsurface Profile

Overburden

Generally, the subsurface profile encountered at the test hole locations consists of asphaltic concrete underlain by an approximate 1.0 to 1.5 m thickness of fill which is further underlain by bedrock. The fill material was generally observed to consist of brown silty sand to sandy silt with varying amounts of crushed stone, gravel and clay

Bedrock

Practical refusal to augering was encountered on the bedrock surface at approximate depths ranging from 1.0 to 1.5 m. The bedrock was cored at all boreholes and, based on the recovered rock core, was observed to consist of interbedded grey limestone and shale. Based on the RQDs of the recovered rock core, the quality of the upper 0.5 to 3.5 m generally varies from very poor to fair in quality, becoming excellent by depths of 3.2 to 4.6. m The bedrock was cored to a maximum depth of 10.6 m below the existing ground surface.

Based on available geological mapping, bedrock in the area of the subject site consists of interbedded limestone and dolomite of the Gull River Formation with an overburden thickness ranging from approximately 1 to 2 m.

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

4.3 Groundwater

Groundwater level readings were measured in the monitoring wells and piezometers on September 7, 2022. Groundwater level readings were measured in the monitoring wells by others on February 17, 2017. The measured groundwater level (GWL) readings are presented in Table 1 below.

Table 1 - Summary of Groundwater Level Readings by Paterson

Borehole Number	Ground Surface Elevation (m)	Groundwater Levels (m)	Groundwater Elevation (m)	Recording Date
BH 1-22 *	67.66	3.88	63.78	September 7, 2022
BH 2-22 *	67.57	6.10	61.47	
BH 3-22	67.22	N/A	N/A	
MW1-17	99.53	3.48	96.05	February 17, 2017
MW2-17	99.26	3.70	95.56	
MW3-17	99.27	3.16	96.11	

Notes: * indicates boreholes by Paterson with monitoring well installed

Ground surface elevations at boreholes by others were surveyed by others and are referenced to a local benchmark with an assumed elevation of 100.00 m.

The long-term groundwater level can also be estimated based on the observed colour, moisture content and consistency of the recovered samples. Based on these observations, the long-term groundwater level is expected to be located within the bedrock and range between approximately 3 to 4 m below ground surface.

However, it should be noted that groundwater levels are subject to seasonal fluctuations, therefore, the groundwater levels could vary at the time of construction.

4.4 Hydrogeologic Conditions

A total of 4 hydraulic conductivity tests were conducted at 2 locations to provide the general coverage of the subject site as shown in Table 2 on the following page.

Table 2 – Summary of hydraulic conductivity values.

Test Hole Number	Ground Surface Elevation (m)	Screen Interval (m)	K (m/sec)	Test Type	Soil Type
BH 1-22	67.66	7.5 to10.5	$2.26x10^{-7}$	Falling Head	Interbedded Limestone and shale
			$2.20x10^{-7}$	Rising Head	
BH 2-22	67.57	9.1 to 10.6	$3.71x10^{-7}$	Falling Head	Interbedded Limestone and shale
			$6.00x10^{-7}$	Rising Head	

The hydraulic conductivity (K) values measured at the monitoring wells screen are consistent with similar materials Paterson has encountered on other sites and typical published values for limestone bedrock which typically range from $1x10^{-6}$ to $1x10^{-9}$ m/sec. The range in testing results can be attributed to the variability in composition/consistency of the layer encountered and presence of shale within the bedrock.

5.0 Discussion

5.1 Geotechnical Assessment

From a geotechnical perspective, the subject site is considered suitable for the proposed multi-storey building. The proposed multi-storey building is expected to be founded on conventional spread footings placed on clean surface sounded bedrock.

Bedrock removal will be required to complete the underground parking levels. Hoe ramming is an option where the bedrock is weathered and/or where only small quantities of bedrock need to be removed. Line drilling and controlled blasting will be required where large quantities of bedrock need to be removed. The blasting operations should be planned and completed under the guidance of a professional engineer with experience in blasting operations.

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

5.2 Site Grading and Preparation

Stripping Depth

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

Existing foundation walls and other construction debris should be entirely removed from within the building perimeter. Under paved areas, existing construction remnants, such as foundation walls, should be excavated to a minimum of 1 m below final grade.

Due to the relatively shallow depth of the bedrock surface and the anticipated founding level for the proposed building, all existing overburden material should be excavated from within the proposed building footprint.

Bedrock Removal

Bedrock removal can be accomplished by hoe ramming where the bedrock is weathered and/or where only small quantities of the bedrock need to be removed. Sound bedrock may be removed by line drilling in conjunction with controlled blasting and/or hoe ramming.

Prior to considering blasting operations, the blasting effects on the existing services, buildings and other structures should be addressed. A pre-blast or pre-construction survey of the existing structures located in proximity of the blasting operations should be completed prior to commencing site activities. The extent of the survey should be determined by the blasting consultant and should be sufficient to respond to any inquiries/claims related to the blasting operations.

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

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

Vibration Considerations

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

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

Two parameters are used to determine the permissible vibrations, namely, the maximum peak particle velocity and the frequency. For low frequency vibrations, the maximum allowable peak particle velocity is less than that for high frequency vibrations. As a guideline, the peak particle velocity should be less than 15 mm/s between frequencies of 4 to 12 Hz, and 50 mm/s above a frequency of 40 Hz (interpolate between 12 and 40 Hz).

It should be noted that these guidelines are for today's construction standards. Considering that these guidelines are above perceptible human level and, in some cases, could be very disturbing to some people, a pre-construction survey is recommended be completed to minimize the risks of claims during or following the construction of the proposed building.

Fill Placement

Fill used for grading beneath the proposed building should consist of clean imported granular fill, such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II or suitably sized blast rock material approved by Paterson personnel. This material should be tested and approved prior to delivery to the site. The fill should be placed in maximum 300 mm thick loose lifts and compacted by suitable compaction equipment. Fill placed beneath the building and paved areas should be compacted to a minimum of 98% of the standard Proctor maximum dry density (SPMDD).

Non-specified existing fill along with site-excavated soil can be used as general landscaping fill where settlement of the ground surface is of minor concern. This material should be spread in lifts and at least compacted by the tracks of the spreading equipment to minimize voids. If this material is to be used to build up the subgrade level for areas to be paved, it should be compacted in thin lifts to at least 95% of the material's SPMDD.

Non-specified existing fill and site-excavated soils are not suitable for use as backfill against foundation walls, unless used in conjunction with a geocomposite drainage membrane.

5.3 Foundation Design

Bearing Resistance Values

Footings placed on clean, surface sounded limestone bedrock can be designed using a factored bearing resistance value at ultimate limit states (ULS) of **5,000 kPa**, 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.

Footings placed on clean, surface-sounded bedrock will be subjected to negligible post-construction total and differential settlements.

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 shallower) passes only through sound bedrock or a material of the same or higher capacity as the bedrock, such as concrete.

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 (OBC 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 in Appendix 2 of the present report.

Field Program

The seismic array testing location was placed as presented in Drawing PG5101-1 - 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 1, 1.5 and 15 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 our testing results, the bedrock shear wave velocity is **2,104 m/s**. It is understood that the overburden will be completely removed as part of the proposed building and footings will be placed on the bedrock surface. The V_{s30} was calculated using the standard equation for average shear wave velocity provided in the OBC 2012, and as presented below.

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

$$V_{s30=} \frac{30\ m}{\left(\frac{30\ m}{2{,}104\ m/s}\right)}$$

$$V_{s30=}\ \ 2{,}104\ m/s$$

Based on the results of the shear wave velocity testing, the average shear wave velocity V_{s30} is **2,104 m/s**. Therefore, a **Site Class A** is applicable for the design of the proposed buildings in this case, as per Table 4.1.8.4.A of the OBC 2012.

Soils underlying the subject site are not susceptible to liquefaction. Reference should be made to the latest revision of the Ontario Building Code 2012 for a full discussion of the earthquake design requirements.

5.5 Basement Floor Slab

For the proposed development, all overburden soil will be removed from the building footprint, leaving the bedrock as the subgrade medium for the basement floor slab. It is anticipated that the basement area for the proposed building will be mostly parking and the recommended pavement structures noted in Subsection 5.8 will be applicable. However, if storage or other uses of the lower level will involve the construction of a concrete floor slab, the upper 200 mm of sub-slab fill is recommended to consist of 19 mm clear crushed stone, which can be placed over approved granular fill as noted in Subsection 5.2.

Any soft areas in the basement slab subgrade should be removed and backfilled with appropriate backfill material prior to placing fill. OPSS Granular A or Granular B Type II, with a maximum particle size of 50 mm, are recommended for backfilling below the floor slab. All backfill material within the footprint of the proposed building should be placed in maximum 300 mm thick loose layers and compacted to a minimum of 98% of the SPMDD.

In consideration of the groundwater conditions at the site, a sub-slab drainage system, consisting of lines of perforated drainage pipe subdrains connected to a positive outlet, should be provided in the subfloor fill under the lower basement floor. This is discussed further in Subsection 6.1.

5.6 Basement Wall

There are several combinations of backfill materials and retained soils that could be applicable for the basement walls of the subject structure. However, 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.

Where undrained conditions are anticipated (i.e below the groundwater level), 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 calculating the effective unit weight.

Lateral Earth Pressures

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 Earth Pressures

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 area is 0.32 g according to OBC 2012. 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

Overview of Anchor Features

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 a 60 to 90 degree pullout of rock cone with the apex of the cone near the middle of the bonded length of the anchor. 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 individual anchor.

A third failure mode of shear failure along the grout/steel interface should be reviewed by the structural engineer to ensure all typical failure modes have been reviewed.

The centre to centre spacing between bond lengths should at least four (4) times the diameter of the anchor holes and greater than one fifth (1/5) of the total anchor length or a minimum of 1.2 m to decrease the group influence effects. Anchors in close proximity to each other are recommended to be grouted at the same time to ensure any fractures or voids are completely in0filled and grout fluid does not flow from one hole to an adjacent empty one.

The anchor should be provided with a bonded length (fixed length) at the base of the anchor which will provide the anchor capacity, as well an unbonded length (free length) between the rock surface and the top of the bonded length.

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

Double corrosion protection can be provided with factory assembled systems, such as those available from Dywidag Systems or Williams Form Engineering Corp. Recognizing the importance of the anchors for the long-term performance of the foundation of the proposed building, the rock anchors for this project are recommended to be provided with double corrosion protection.

Grout to Rock Bond

The Canadian Foundation Engineering Manual recommends a maximum allowable grout to rock bond stress (for sound rock) of 1/30 of the unconfined compressive strength (UCS) of either the grout or rock (but less than 1.3 MPa) for an anchor of minimum length (depth) of 3 m. Generally, the UCS of limestone interbedded with shale ranges between about 50 and 80 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 calculated. 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 bedrock 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

Parameters used to calculate rock anchor lengths are provided in Table 3 on the following page:

Table 3 - 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	50 MPa
Unit weight - Submerged Bedrock	15.5 kN/m^3
Apex angle of failure cone	60°
Apex of failure cone	mid-point of fixed anchor length

The fixed anchor length will depend on the diameter of the drill holes. Recommended anchor lengths for a 75 mm and 125 mm diameter hole are provided in Table 4 below. The factored tensile resistance values given in Table 4 are based on a single anchor with no group influence effects. A detailed analysis of the anchorage system, including potential group influence effects, could be provided once the details of the loading for the proposed building are determined.

Table 4 - 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	0.8	0.7	1.5	200
	1.8	0.7	2.5	400
	2.0	1.0	3.0	500
	3.0	1.0	4.0	850
125	1.5	0.5	2.0	350
	2.0	1.0	3.0	700
	2.8	1.2	4.0	1100
	3.3	1.2	4.5	1300

Other considerations

The anchor drill holes should be within 1.5 to 2 times the rock anchor tendon diameter, inspected by geotechnical personnel and should be flushed clean prior to grouting. A tremie tube is recommended to place grout from the bottom of the anchor holes. Compressive strength testing is recommended to be completed for the rock anchor grout. A set of grout cubes should be tested for each day that grout is prepared.

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.

5.8 Pavement Design

Podium Deck Area

It is anticipated that the podium deck structure will be provided car only parking areas, access lanes, fire truck lanes and loading areas. Based on the concrete slab subgrade, the pavement structure indicated in the following Table 5 and 6 may be considered for design purposes:

Table 5 - Recommended Pavement Structure - Car-Only Parking Areas (Podium Deck)

Thickness (mm)	Material Description
50	**Wear Course** - HL-3 or Superpave 12.5 Asphaltic Concrete
200	**Base** - OPSS Granular A Crushed Stone
See Below*	**Thermal Break*** - Rigid insulation (See Paragraph Below)
n/a	**Waterproofing Membrane and IKO Protection Board**
SUBGRADE – Reinforced Concrete Podium Deck *If specified by others, not required from a geotechnical perspective	

Table 6 - Recommended Pavement Structure – Access Lane, Fire Truck Lane, Ramp and Heavy Truck Parking Areas (Podium Deck)

Thickness (mm)	Material Description
40	**Wear Course** - HL-3 or Superpave 12.5 Asphaltic Concrete
50	**Wear Course** - HL-8 or Superpave 19.0 Asphaltic Concrete
300	**Base** - OPSS Granular A Crushed Stone
See Below*	**Thermal Break*** - Rigid insulation (See Paragraph Below)
n/a	**Waterproofing Membrane and IKO Protection Board**
SUBGRADE – Reinforced Concrete Podium Deck *If specified by others, not required from a geotechnical perspective	

The transition between the pavement structure over the podium deck subgrade and soil subgrade beyond the footprint of the podium deck is recommended to be transitioned to match the pavement structures provided in the following section. For this transition, a 5H:1V is recommended between the two subgrade surfaces. Further, the base layer thickness should be increased to a minimum thickness of 500 mm below the top of the podium slab a minimum of 1.5 m from the face of the foundation wall prior to providing the recommended taper.

Should the proposed podium deck be specified to be provided a thermal break by the use of a layer of rigid insulation below the pavement structure, its placement within the pavement structure is recommended to be as per the above-noted tables. The layer of rigid insulation is recommended to consist of a DOW Chemical High-Load 100 (HI-100), High-Load 60 (HI-60). The higher grades of insulation have more resistance to deformation under wheel-loading and require less granular cover to avoid being crushing by vehicular loading. It should be noted that SM (Styrofoam) rigid insulation is not considered suitable for this application.

Pavement Structure Beyond Podium Deck

Beyond the podium deck, the following pavement structures may be considered for car only parking and heavy traffic areas. The subgrade material will consist of fill over glacial till throughout the exterior of the subject site. The proposed pavement structures are shown in Tables 7 and 8.

Table 7 - Recommended Pavement Structure – Car Only Parking Areas

Thickness (mm)	Material Description
50	**Wear Course** - HL-3 or Superpave 12.5 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
300	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either in situ soils, bedrock or OPSS Granular B Type I or II material placed over in situ soil or bedrock	

Table 8 - Recommended Pavement Structure – Heavy Truck Traffic and Loading Areas	
Thickness (mm)	**Material Description**
40	**Wear Course** - HL-3 or Superpave 12.5 Asphaltic Concrete
50	**Binder Course** - HL-8 or Superpave 19.0 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
450	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either in situ soils, bedrock or OPSS Granular B Type I or II material placed over in situ soil or bedrock	

Minimum Performance Graded (PG) 58-34 asphalt cement should be used for this project. If soft spots develop in the subgrade during compaction or due to construction traffic, the affected areas should be excavated and replaced with OPSS Granular B Type II material.

The pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 100% of the material's SPMDD using suitable compaction equipment

6.0 Design and Construction Precautions

6.1 Foundation Drainage and Backfill

Foundation Drainage

It is anticipated that the portion of the proposed building foundation walls located below the long-term groundwater table will be blind poured and placed against a groundwater infiltration control system. Also, a perimeter foundation drainage system will be required as a secondary system to account for any groundwater which comes in contact with the proposed building's foundation walls.

For the groundwater infiltration control system for the foundation walls, the following is recommended:

- ❑ Line drill the excavation perimeter (usually at 150 to 200 mm spacing).
- ❑ Mechanical bedrock removal along the foundation walls can be undertaken up to 150 mm from the finished vertical excavation face.
- ❑ Grind the bedrock surface up to the outer face of the line drill holes to ensure a satisfactory surface for the below grade foundation drainage system.
- ❑ If bedrock overbreaks occur, shotcrete these areas to fill in cavities and to smooth out angular features at the bedrock surface, as required based on site inspection by Paterson.
- ❑ Place a suitable waterproofing membrane (such as Tremco Paraseal or approved equivalent) against the prepared bedrock surface. The membrane liner should extend from finished grade down to footing level. The waterproofing membrane can begin at a depth below the podium level provided that the perimeter drainage board is placed below the vertical portion of the podium deck waterproofing to ensure that surface water drains over the drainage board and does not come in contact with the building's exterior foundation walls.
- ❑ Place a composite drainage layer, such as Delta Drain 6000 or equivalent, over the membrane (as a secondary system). The composite drainage layer should extend from finished grade to underside of footing level.
- ❑ Pour foundation wall against the composite drainage system.

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 any water to flow to an interior perimeter drainage pipe. The perimeter drainage pipe should direct water to sump pit(s) within the lower basement area.

Transition from Foundation Wall to Podium Deck

It is anticipated that a 2-ply modified bitumen membrane or similar hot-applied waterproofing membrane product will be placed across the exterior surface of the concrete deck. It is recommended to extend this membrane vertically down the foundation wall and a minimum of 300 mm below the construction joint between the foundation wall and podium deck slab.

- Where a double-sided pour is considered for the top segment of the foundation wall, it is recommended to extend the podium deck waterproofing membrane vertically down the foundation wall and a minimum of 300 mm below the construction joint between the foundation wall and podium deck slab. Further, the bottom-most endlap of the waterproofing membrane extending over the drainage board should be installed loosely against the drainage board layer to mitigate heat associated with welding the rubber membrane from damaging the drainage layer. The loosely installed layer of membrane should overlap the top of the drainage board layer by a minimum of 300 mm.

- Should the top segment of the foundation wall be blind-cast against a shoring system or bedrock, the waterproofing membrane should be vertically installed and extended over the temporary shoring face or bedrock prior to the placement of the P1 foundation wall and podium deck slab. Following installation of the podium deck slab, the waterproofing membrane can be overlapped onto the podium deck surface and installed accordingly to manufacturer's specifications.

- Where a podium deck will not be provided with a horizontal application as described above, the top edge of the drainage board should be sealed by a liquid membrane to mitigate the migration of water between the foundation wall and drainage board layer.

Reference should be made to Figure 4 – Podium Deck to Foundation Wall Drainage System Tie-In Detail in Appendix 2.

Sub-slab Drainage System

Sub-slab drainage will be required to control water infiltration for the underground parking levels. For preliminary design purposes, we recommend that 150 mm perforated pipes be placed at approximate 6 m centres underlying the lowest level floor slab. The spacing of the sub-slab drainage system should be confirmed at the time of completing the excavation when water infiltration can be better assessed.

Foundation Backfill

Above the bedrock surface, backfill against the exterior sides of the foundation walls should consist of free-draining, non-frost susceptible granular materials such as OPSS Granular B Type I (pit run) material.

Elevator Pit Waterproofing System

To accommodate the elevator shaft within the lower level of the proposed structure, it is expected that the associated concrete base slabs will be extended below the basement floor slab. It is therefore expected that additional bedrock removal below the building's perimeter strip footings will be required to accommodate the elevator shaft. In addition, it is expected that the elevator shaft may extend below the invert level of the underfloor drainage system and will thus be designed under submerged conditions.

- ❒ It is recommended to cast the elevator shaft base slab tight against the bedrock excavation sidewalls and use the bedrock surface as the formwork. This would create a watertight boundary between the bedrock surface and the top of the concrete slab. If consideration is given to forming the perimeter of the slab, Paterson should be notified prior to preparing the bedrock excavation for the placement of rebar and formwork as the bedrock surface would be required to be covered with an additional waterproofing membrane.

- ❒ A continuous PVC waterstop such as Southern waterstop 14RCB or equivalent should be installed within the interface between the concrete base slab below the elevator shaft foundation walls and the elevator shaft walls.

- ❒ Once the concrete slab and elevator pit sidewalls are poured in place, it is recommended that a waterproofing membrane, such as Colphene Torch'n Stick (or approved other) be applied to the exterior of the elevator pit sidewalls and horizontally over the exterior side of the elevator slab in accordance with the manufacturer's specifications. It is recommended to extend the membrane a minimum of 600 mm horizontally beyond the exterior face of the elevator shaft.

- ❒ A protection board should be placed over the waterproofing membrane to protect the waterproofing membrane from damage during backfilling operations. The area between the elevator pit and bedrock excavation face should be in-filled with lean concrete or compacted layers of approved blast rock fill, OPSS Granular B Type II or OPSS Granular A crushed stone.

- ❒ The foundation wall of the elevator shaft should host a PVC sleeve to allow any water trapped within the interior side of the structures to be discharged to the associated sump pump. The opening should be properly sealed with suitable membrane and mastic products to prevent water from entering the subject structure.

- ❒ It should be noted that a waterproofed concrete (with Xypex Additive, or equivalent) is recommended to be incorporated in the concrete mix design for the elevator base slab and shaft walls. **However, this is considered optional and is not considered a substitute for the above-noted waterproofing products.**

Reference should be made to Figure 5 – Elevator Waterproofing Detail in Appendix 2 for specific details of the waterproofing recommendations pertaining to the elevator shaft as described herein.

Sidewalks and Walkways

Backfill material below sidewalk and walkway subgrade areas or other settlement sensitive structures which are not adjacent to the buildings should consist of free-draining, non-frost susceptible material.

This material should be placed in maximum 300 mm thick loose lifts and compacted to at least 98% of its SPMDD under dry and above freezing conditions.

6.2 Protection of Footings Against Frost Action

Perimeter footings of heated structures are recommended to be insulated against the deleterious effects of frost action. A minimum 1.5 m thick soil cover, or an equivalent combination of soil cover and foundation insulation, should be provided in this regard.

Exterior unheated footings, such as isolated 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 an equivalent combination of soil cover and foundation insulation.

However, the footings are generally not expected to require protection against frost action due to the founding depth. Unheated structures such as the access ramp may require insulation for protection against the deleterious effects of frost action.

6.3 Excavation Side Slopes

The side slopes of excavations in the soil and fill overburden materials should either be cut back at acceptable slopes or should be retained by shoring systems from the start of the excavation until the structure is backfilled.

Unsupported Excavations

The excavation side slopes in the overburden and 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.

It is recommended that a trench box be used at all times to protect personnel working in trenches with steep or vertical sides. It is expected that services will be installed by “cut and cover” methods and excavations will not be left open for extended periods of time.

Bedrock Stabilization

Excavation side slopes in sound bedrock can be carried out using almost vertical side walls. 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 or to provide a stable base for the overburden shoring system.

Horizontal rock anchors may be required at specific locations to prevent pop-outs of the bedrock, especially in areas where bedrock fractures are conducive to the failure of the bedrock surface.

The requirement for horizontal rock anchors should be evaluated during the excavation operations and should be discussed with the structural engineer during the design stage.

Temporary Shoring

Due to the expected depth of excavation to accommodate the underground parking and the proximity of the proposed multi-storey building to surrounding boundaries, temporary shoring may be required to support the overburden soils. The design and approval of the shoring system will be the responsibility of the shoring contractor and the shoring designer who is a licensed professional engineer and is hired by the shoring contractor. It is the responsibility of the shoring contractor to ensure that the temporary shoring is in compliance with safety requirements, designed to avoid any damage to adjacent structures and include dewatering control measures.

In the event that subsurface conditions differ from the approved design during the actual installation, it is the responsibility of the shoring contractor to commission the required experts to re-assess the design and implement the required changes.

The designer should also take into account the impact of a significant precipitation event and designate design measures to ensure that a precipitation 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 representative prior to implementation.

The temporary shoring system may consist of a soldier pile and lagging system or steel sheet piles which could be cantilevered, anchored or braced. The shoring system is recommended to be adequately supported to resist toe failure. Any additional loading due to street traffic, construction equipment, adjacent structures and facilities, etc., should be added to the earth pressures described below.

The earth pressures acting on the temporary shoring system may be calculated using the parameters outlined in Table 9 below.

Table 9 - Soil Parameters for Calculating Earth Pressures Acting on Shoring System

Parameter	Value
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	21
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 used above the groundwater level while the effective unit weight should be used below the groundwater level.

The hydrostatic groundwater pressure should be added to the earth pressure distribution wherever the effective unit weights are used for earth pressure calculations. If the groundwater level is lowered, the dry unit weight for the soil should be used 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

Bedding and backfill materials should be in accordance with the most recent Material Specifications and Standard Detail Drawings from the Department of Public Works and Services, Infrastructure Services Branch of the City of Ottawa.

A minimum of 150 mm of OPSS Granular A should be placed for bedding for sewer or water pipes when placed on soil subgrade. The bedding should extend to the spring line of the pipe. Cover material, from the spring line to a minimum of 300 mm above the obvert of the pipe should consist of OPSS Granular A (concrete or PSM PVC pipes) or sand (concrete pipe). The bedding and cover materials should be placed in maximum 225 mm thick lifts and compacted to 95% of the SPMDD.

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) and above the cover material should match the soils exposed at the trench walls to minimize differential frost heaving. The trench backfill should be placed in maximum 225 mm thick loose lifts and compacted to a minimum of 95% of the material's SPMDD.

6.5 Groundwater Control

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

Groundwater Control for Building Construction

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

For typical ground or surface water volumes being pumped during the construction phase, typically 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 foundation drainage system are presented in Subsection 6.1. Based on our review, the proposed building will be founded within excellent quality limestone bedrock and below the long-term groundwater table. It is therefore expected that infiltration will be low to moderate with peak periods noted after rain and snow-melt events. A more accurate estimate can be provided at the time of construction, once groundwater infiltration levels are observed.

Impacts on Neighbouring Properties

Based on the geotechnical investigation by Paterson and others, it is anticipated that the existing buildings in proximity to the subject site are founded on bedrock. Therefore, dewatering impacting neighbouring properties is not a concern for the proposed development.

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 into the subgrade or in the excavation walls and bottoms. Precautions should be taken if such activities are to be carried out during freezing conditions.

7.0 Recommendations

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

- ❑ Review of the geotechnical aspects of the excavation contractor's temporary shoring design, if required, prior to construction
- ❑ Review of the proposed groundwater infiltration control system and requirements
- ❑ Review of the bedrock stabilization and excavation requirements
- ❑ Observation of all bearing surfaces prior to the placement of concrete.
- ❑ Sampling and testing of the concrete and fill materials.
- ❑ Observation of all subgrades prior to backfilling.
- ❑ Field density tests to determine the level of compaction achieved.
- ❑ Sampling and testing of the bituminous concrete including mix design reviews.

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

All excess soils, with the exception of engineered crushed stone fill, generated by construction activities that will be transported on-site or off-site should be handled as per *Ontario Regulation 406/19: On-Site and Excess Soil Management.*

8.0 Statement of Limitations

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

A soils investigation is a limited sampling of a site. Should any conditions at the site be encountered which differ from those at the test locations, Paterson requests immediate notification to permit reassessment of our recommendations.

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

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

Paterson Group Inc.

Oct. 7, 2022

Kevin A. Pickard, EIT

David J. Gilbert, P.Eng.

Report Distribution:

- ❑ Westboro Inc. (Digital copy)
- ❑ Paterson Group (1 copy)

APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

MONITORING WELL LOGS BY OTHERS

HYDRAULIC CONDUCTIVITY TESTING RESULTS

patersongroup Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Multi-Storey Building - 403 Richmond Road, 389 Roosevelt Avenue, Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY CME-55 Low Clearance Drill **DATE** September 1, 2022

FILE NO. PG5101

HOLE NO. BH 1-22

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	67.66		
Asphaltic concrete 0.08									
FILL: Brown silty clay with gravel and crushed stone 0.69		AU	1						
FILL: Brown silty sand to sandy silt with gravel and crushed stone, trace clay 1.47		SS	2	50	38	1	66.66		
		RC	1	100	61	2	65.66		
BEDROCK: Fair to good quality, grey limestone interbedded with dark grey shale		RC	2	100	75	3	64.66		
- excellent quality by 4.5m depth						4	63.66		
- dolostone layer from 6.1 to 7.7m depth		RC	3	100	100	5	62.66		
		RC	4	100	100	6	61.66		
		RC	5	100	97	7	60.66		
		RC	6	100	100	8	59.66		
10.54						9	58.66		
End of Borehole						10	57.66		
(GWL @ 3.88m - Sep. 7, 2022)									

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Multi-Storey Building - 403 Richmond Road, 389 Roosevelt Avenue, Ottawa, Ontario

DATUM Geodetic

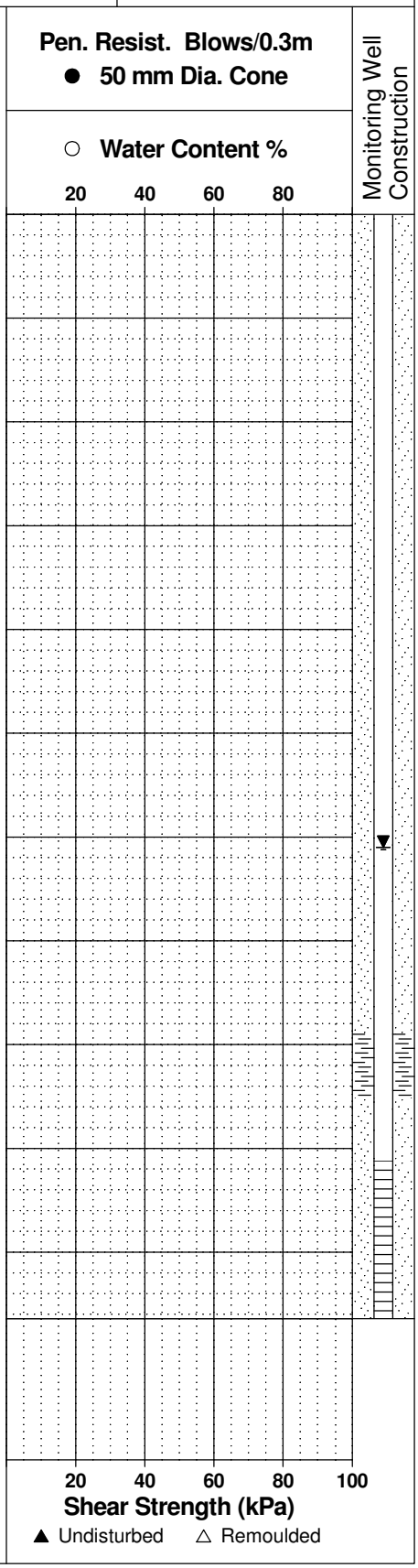
REMARKS

BORINGS BY CME-55 Low Clearance Drill **DATE** September 1, 2022

FILE NO. PG5101

HOLE NO. BH 2-22

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	67.57
Asphaltic concrete 0.08							
FILL: Brown silty sand to sandy silt with crushed stone and gravel 0.69		AU	1				
FILL: Brown silty clay with crushed stone and gravel 1.17		SS	2	45	50+	1	66.57
		RC	1	100	0		
		RC	2	100	66	2	65.57
BEDROCK: Very poor to fair quality, grey limestone interbedded with dark grey shale						3	64.57
		RC	3	100	71	4	63.57
- dolostone layer from 1.6 to 2.2m depth and 7.0 to 8.0m depth							
- excellent quality by 4.6m depth						5	62.57
		RC	4	100	100	6	61.57
		RC	5	100	100	7	60.57
		RC	6	100	97	8	59.57
						9	58.57
		RC	7	10	100	10	57.57
10.64							
End of Borehole							
(GWL @ 6.10m - Sep. 7, 2022)							



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9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Multi-Storey Building - 403 Richmond Road, 389 Roosevelt Avenue, Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY CME-55 Low Clearance Drill **DATE** September 1, 2022

FILE NO. PG5101

HOLE NO. BH 3-22

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	67.22
Asphaltic concrete 0.05							
FILL: Brown silty sand to sandy silt with crushed stone and gravel, occasional cobbles		AU	1				
		SS	2	75	50+	1	66.22
1.27							
		RC	1	100	0		
BEDROCK: Very poor to good quality, grey limestone interbedded with dark grey shale		RC	2	100	83	2	65.22
- dolostone layer from 1.6 to 2.2m and 6.6 to 7.7m depths						3	64.22
		RC	3	100	90	4	63.22
- excellent quality by 3.2m depth						5	62.22
		RC	4	100	97	6	61.22
		RC	5	100	95	7	60.22
		RC	6	100	100	8	59.22
						9	58.22
		RC	7	100	100	10	57.22
10.64							
End of Borehole							
(Piezometer blocked - Sep. 7, 2022)							

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

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

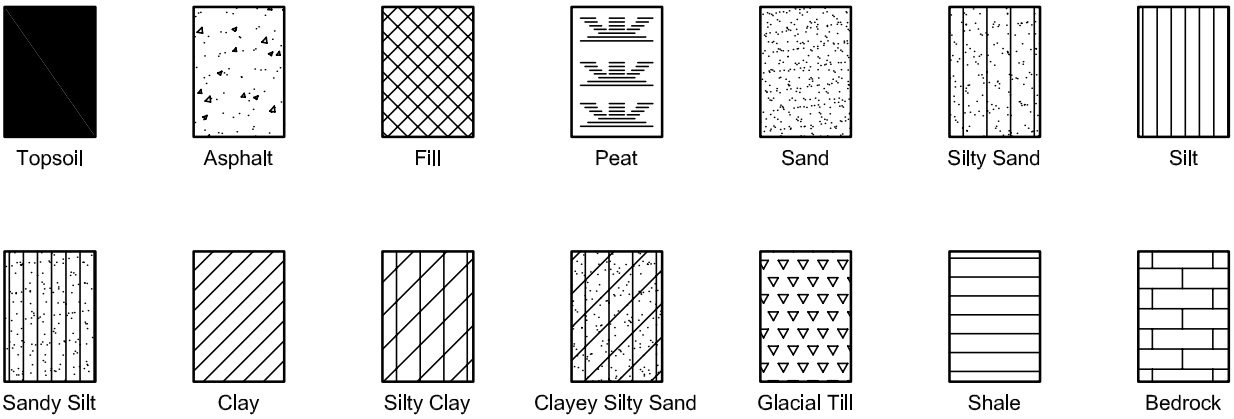
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void 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.

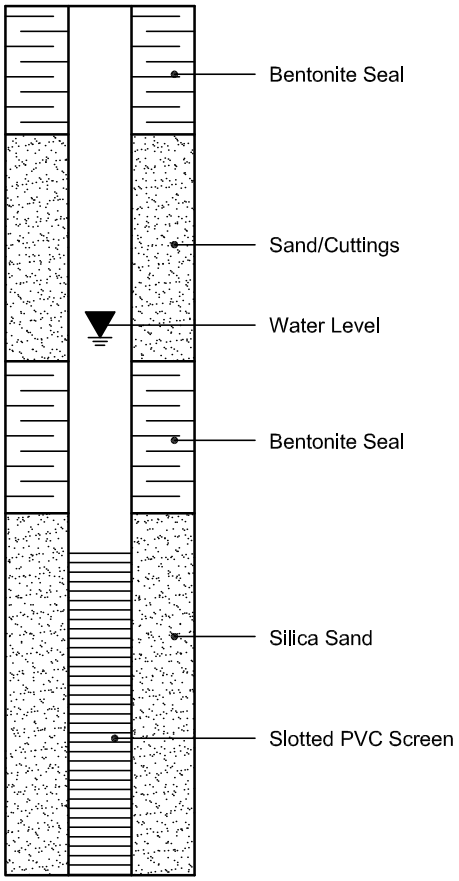
SYMBOLS AND TERMS (continued)

STRATA PLOT

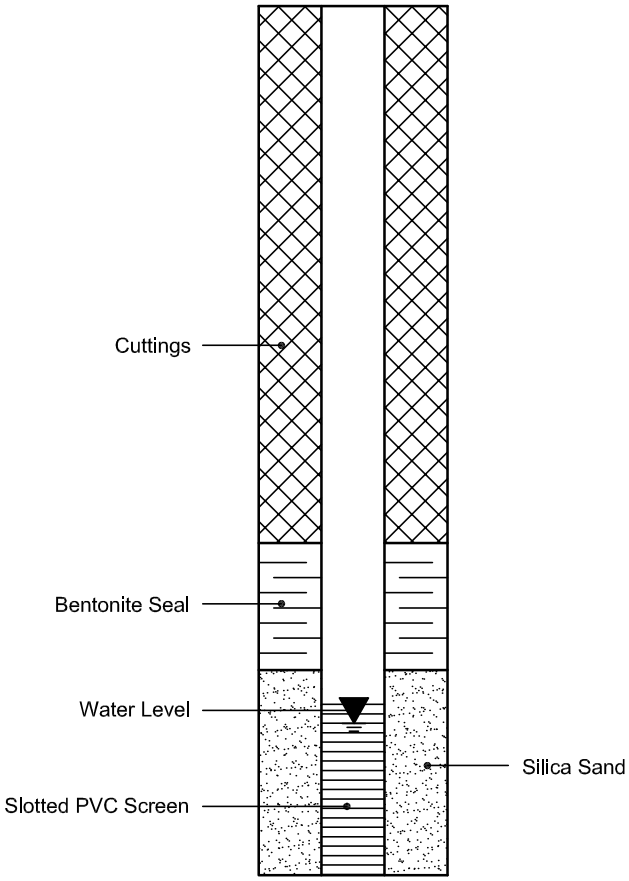


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



Monitoring Well: MW17-1

Project:	Phase II ESA and Geotechnical Assessment	**Drilling method:**	Solid Stem Auger / HQ Core
Client:	A. L. Tubman Ltd.	**Date started/completed:**	09-Feb-2017
Location:	403 Richmond Road, Ottawa, ON	**Ground surface elevation:**	99.53 m RTD
Number:	122170005.200	**Top of casing elevation:**	99.39 m RTD
Field investigator:	R. Lee	**Easting:**	440745
Contractor:	George Downing Estate Drilling Ltd.	**Northing:**	5026659

SUBSURFACE PROFILE				SAMPLE DETAILS								INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m RTD) Depth (m BGS)	Sample Number	Sample Type	Recovery	RQD	Fractures per 1.52m	N Value	Lab Analyses	%LEL Comb. 20 40 60 80 / ppm OTOV / Comb. 200 400 600 800	Diagram	Description
			Ground Surface	99.53										
			100 mm ASPHALT	0.00 99.43										Flushmount protective cover with concrete seal
			FILL: light to dark brown, silty sand, some gravel	0.10 99.23										
			Light to dark brown, SILTY SAND (possible fill)	0.30	1	GS	n/a	n/a	n/a	n/a	Metals, PAH, pH, PHC F1-F4, VOC	<5		Backfilled with bentonite
2					2	SS	50%	n/a	n/a	60		<5		50 mm ID schedule 40 PVC pipe
	1		Fair quality, light grey LIMESTONE	98.56 0.97										
4			- Iron oxidation in fractures											
				97.70	B1	CORE	100%	34" 59%	2.5	n/a				
6			Fair quality, interlayered grey LIMESTONE and dark grey SHALE	1.83										
	2													
8														Backfilled with silica sand
10	3													50 mm ID slotted schedule 40 PVC pipe
				96.18										
			Fair quality, light grey LIMESTONE to SHALEY LIMESTONE	3.35	B2	CORE	100%	40.5" 52%	2.5	n/a				Groundwater Level: 3.48 m BGS 17-Feb-17
12														
	4													
14				95.11										
			End of Borehole	4.42										
16	5													

Screen Interval: 1.37 - 4.42 m BGS
Sand Pack Interval: 0.61 - 4.42 m BGS
Well Seal Interval: 0.23 - 0.61 m BGS

Notes:
m BGS - metres below ground surface
SS - split-spoon sample
GS - grab sample
ppm - parts per million by volume
n/a - not available

CORE - HQ core size
PAH - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOC - volatile organic compounds

Easting and Northing coordinates based on UTM 17T projection

Stantec

Drawn By/Checked By: M. Ford / R. Lee

STANTEC BOREHOLE AND WELL V2 122170005_200_BHLOGS.GPJ STANTEC - DATA TEMPLATE.GDT 3/9/17 MIFORD

Monitoring Well: MW17-2

Project:	Phase II ESA and Geotechnical Assessment	**Drilling method:**	Solid Stem Auger / HQ Core
Client:	A. L. Tubman Ltd.	**Date started/completed:**	09-Feb-2017
Location:	403 Richmond Road, Ottawa, ON	**Ground surface elevation:**	99.26 m RTD
Number:	122170005.200	**Top of casing elevation:**	99.16 m RTD
Field investigator:	R. Lee	**Easting:**	440744
Contractor:	George Downing Estate Drilling Ltd.	**Northing:**	5026703

SUBSURFACE PROFILE				SAMPLE DETAILS								INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m RTD) Depth (m BGS)	Sample Number	Sample Type	Recovery	RQD	Fractures per 1.52m	N Value	Lab Analyses	%LEL Comb▲ 20 40 60 80 / ppm OTOV / Comb 200 400 600 800	Diagram	Description
			Ground Surface	99.26										
			ASPHALT	0.00 / 99.16										Flushmount protective cover with concrete seal
			FILL: dark brown, clayey sand to sandy clay, with gravel	0.10 / 98.95										
			Dark brown, SILTY SAND, with some clay (possible fill)	0.30	1	GS	n/a	n/a	n/a	n/a	Metals, PAH, PHC F1-F4, VOC	1%		Backfilled with bentonite
2					2	SS	50%	n/a	n/a	60		1%		50 mm ID schedule 40 PVC pipe
	1			98.19										
4			Good quality, light grey LIMESTONE with SHALE laminations	1.07										
			- Iron oxidation in fractures		B1	CORE	100%	46.5" 78%	2.5	n/a				
6	2													
8				96.51										Backfilled with silica sand
			Poor quality, dark grey interlayered SHALE and LIMESTONE	2.74										50 mm ID slotted schedule 40 PVC pipe
10	3				B2	CORE	100%	43.5" 63%	2.5	n/a				
12				95.55										Groundwater Level: 3.70 m BGS 17-Feb-17
	4		Fair quality, grey LIMESTONE to SHALEY LIMESTONE	3.70										
14				94.84										
			End of Borehole	4.42										
16	5													

Screen Interval: 1.37 - 4.42 m BGS
Sand Pack Interval: 0.61 - 4.42 m BGS
Well Seal Interval: 0.23 - 0.61 m BGS

Notes:
m BGS - metres below ground surface
SS - split-spoon sample
GS - grab sample
ppm - parts per million by volume
n/a - not available

CORE - HQ core size
PAH - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOC - volatile organic compounds

Easting and Northing coordinates based on UTM 17T projection

Stantec

Drawn By/Checked By: M. Ford / R. Lee

Sheet 1 of 1

STANTEC BOREHOLE AND WELL V2 122170005_200_BHLOGS.GPJ STANTEC - DATA TEMPLATE.GDT 3/9/17 MIFORD

Monitoring Well: MW17-3

Project:	Phase II ESA and Geotechnical Assessment	**Drilling method:**	Solid Stem Auger / HQ Core
Client:	A. L. Tubman Ltd.	**Date started/completed:**	09-Feb-2017
Location:	403 Richmond Road, Ottawa, ON	**Ground surface elevation:**	99.27 m RTD
Number:	122170005.200	**Top of casing elevation:**	99.19 m RTD
Field investigator:	R. Lee	**Easting:**	440729
Contractor:	George Downing Estate Drilling Ltd.	**Northing:**	5026693

SUBSURFACE PROFILE				SAMPLE DETAILS								INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m RTD) Depth (m BGS)	Sample Number	Sample Type	Recovery	RQD	Fractures per 1.52m	N Value	Lab Analyses	%LEL Comb▲ 20 40 60 80 / ppm OTOV ● Comb 200 400 600 800	Diagram	Description
			Ground Surface	99.27										
			100 mm ASPHALT	0.00 / 99.17										
			FILL: dark brown, clayey sand, with gravel	0.10 / 98.97										
			Dark brown, SILTY SAND, with some clay (possible fill)	0.30	1	GS	n/a	n/a	n/a	n/a	Metals, PAH, PHC F1-F4, VOC	<5		Flushmount protective cover with concrete seal
2					2	SS	50%	n/a	n/a	50 / 0.1 m		<5		Backfilled with bentonite
	1			98.21										50 mm ID schedule 40 PVC pipe
4			Poor quality, light grey LIMESTONE	1.07										
			- Highly fractured and highly weathered zone between 1.4 to 1.6 mBGS		B1	CORE	100%	10" 20%	10	n/a				
6	2		- Highly fractured and highly weathered zone between 2.1 to 2.3 m BGS	96.99 / 2.29										
8			Good quality, dark grey interlayered LIMESTONE and SHALE		B2	CORE	100%	18" 75%	5	n/a				Backfilled with silica sand
10	3			95.92										50 mm ID slotted schedule 40 PVC pipe
			Good quality, light grey SHALEY LIMETONE to LIMESTONE	3.35										Groundwater Level: 3.16 m BGS 17-Feb-17
12					B3	CORE	100%	46" 80%	5	n/a				
14	4			94.85										
			End of Borehole	4.42										
16	5													

Screen Interval: 1.37 - 4.42 m BGS
Sand Pack Interval: 0.61 - 4.42 m BGS
Well Seal Interval: 0.23 - 0.61 m BGS

Notes:
m BGS - metres below ground surface
SS - split-spoon sample
GS - grab sample
ppm - parts per million by volume
n/a - not available

CORE - HQ core size
PAH - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOC - volatile organic compounds

Easting and Northing coordinates based on UTM 17T projection

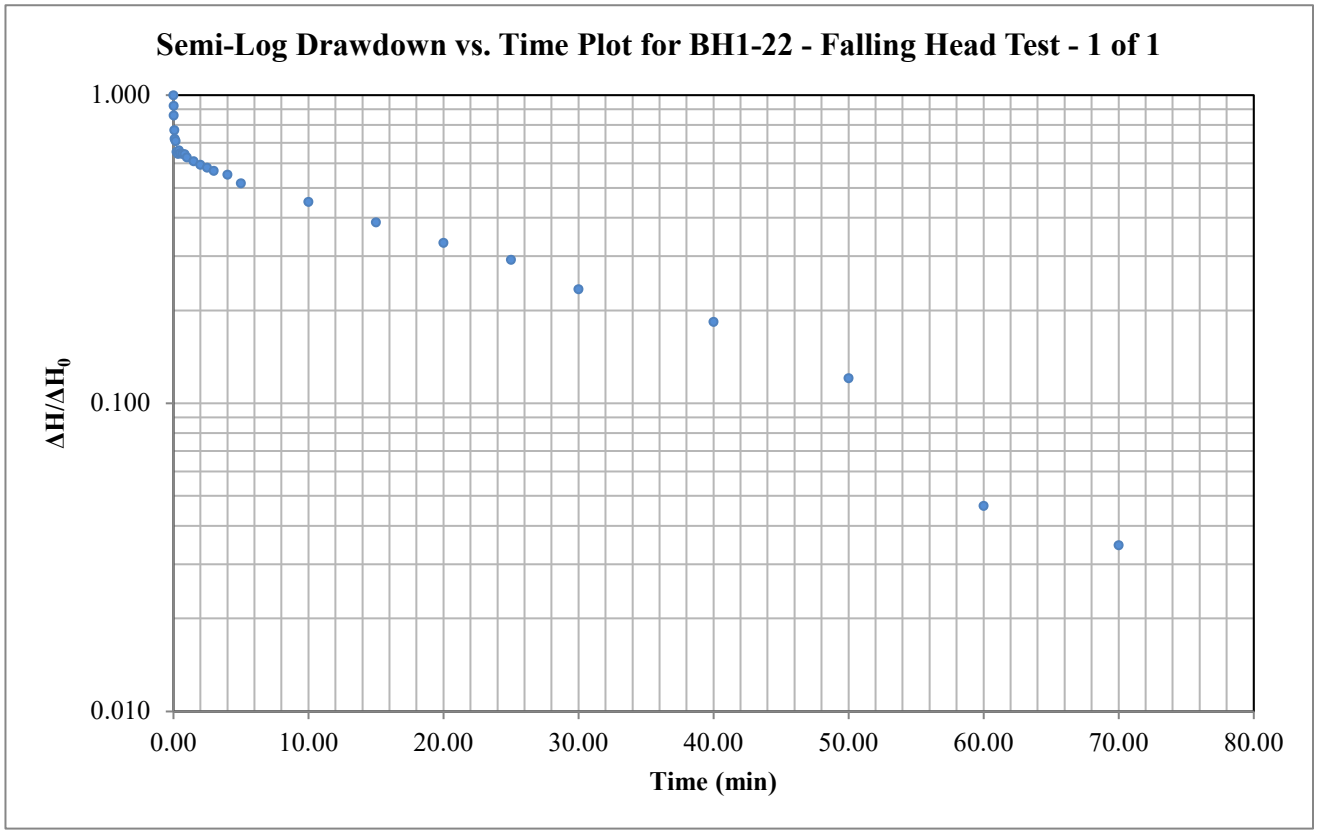
Stantec

Drawn By/Checked By: M. Ford / R. Lee

STANTEC BOREHOLE AND WELL V2 122170005_200_BHLOGS.GPJ STANTEC - DATA TEMPLATE.GDT 3/9/17 MIFORD

Hvorslev Hydraulic Conductivity Analysis

Project: Westboro Inc. - 403 Richmond Road and 389 Roosevelt Avenue
Test Location: BH1-22
Test: Falling Head - 1 of 1
Date: September 7, 2022



Hvorslev Horizontal Hydraulic Conductivity

$$K = \frac{\pi r_c^2}{F}\frac{1}{t^*}\ln\left(\frac{\Delta H^*}{\Delta H_0}\right)$$

Hvorslev Shape Factor

$$F = \frac{2\pi L}{\ln\left(\frac{2L}{D}\right)}$$

Valid for L>>D

Hvorslev Shape Factor F: 3.59613

Well Parameters:

L	3	m	Saturated length of screen or open hole
D	0.03175	m	Diameter of well
r_c	0.01588	m	Radius of well

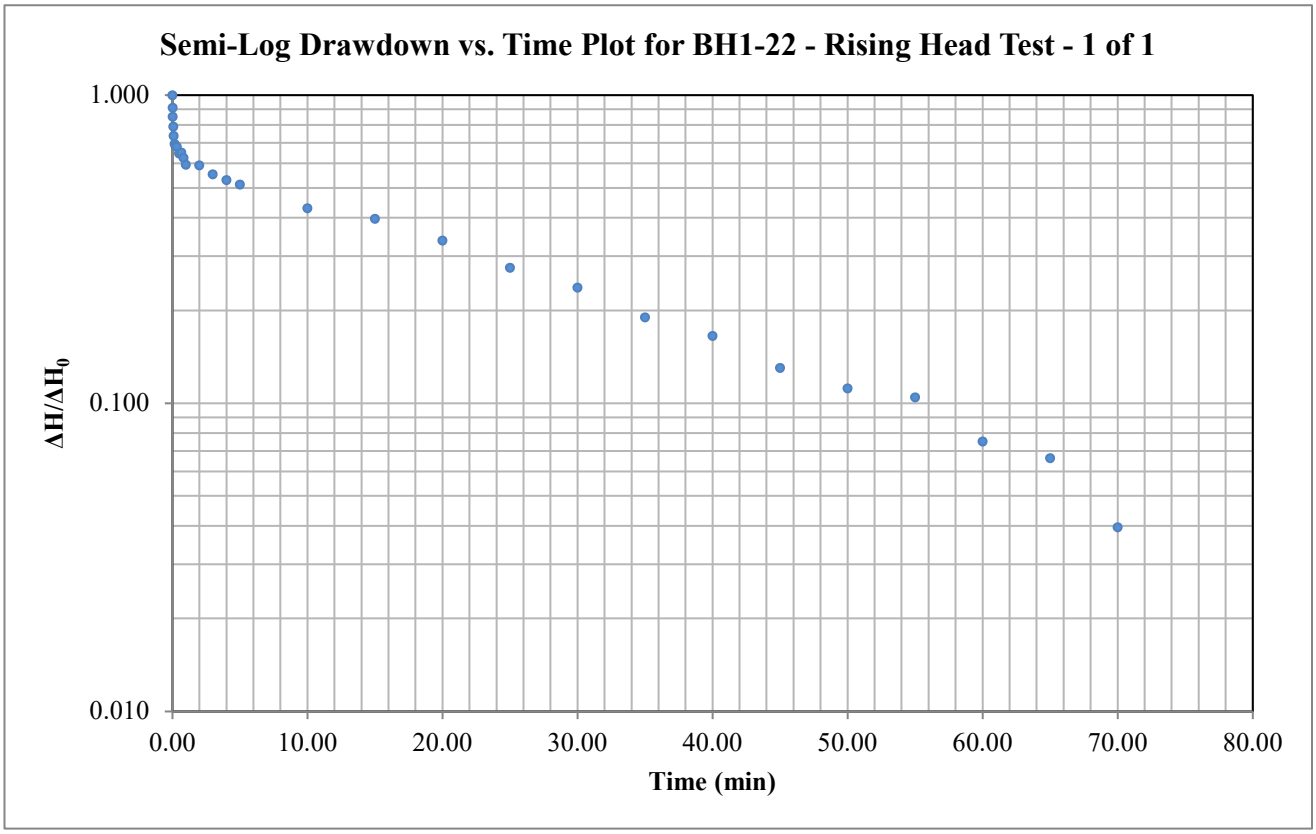
Data Points (from plot):

t*: 16.139 minutes $\Delta H^*/\Delta H_0$: 0.37

Horizontal Hydraulic Conductivity
K = 2.26E-07 m/sec

Hvorslev Hydraulic Conductivity Analysis

Project: Westboro Inc. - 403 Richmond Road and 389 Roosevelt Avenue
Test Location: BH1-22
Test: Rising Head - 1 of 1
Date: September 7, 2022



Hvorslev Horizontal Hydraulic Conductivity

$$K = \frac{\pi r_c^2}{F}\frac{1}{t^*}\ln\left(\frac{\Delta H^*}{\Delta H_0}\right)$$

Hvorslev Shape Factor

$$F = \frac{2\pi L}{\ln\left(\frac{2L}{D}\right)}$$

Valid for L>>D

Hvorslev Shape Factor F: 3.59613

Well Parameters:

L	3	m	Saturated length of screen or open hole
D	0.03175	m	Diameter of well
r_c	0.01588	m	Radius of well

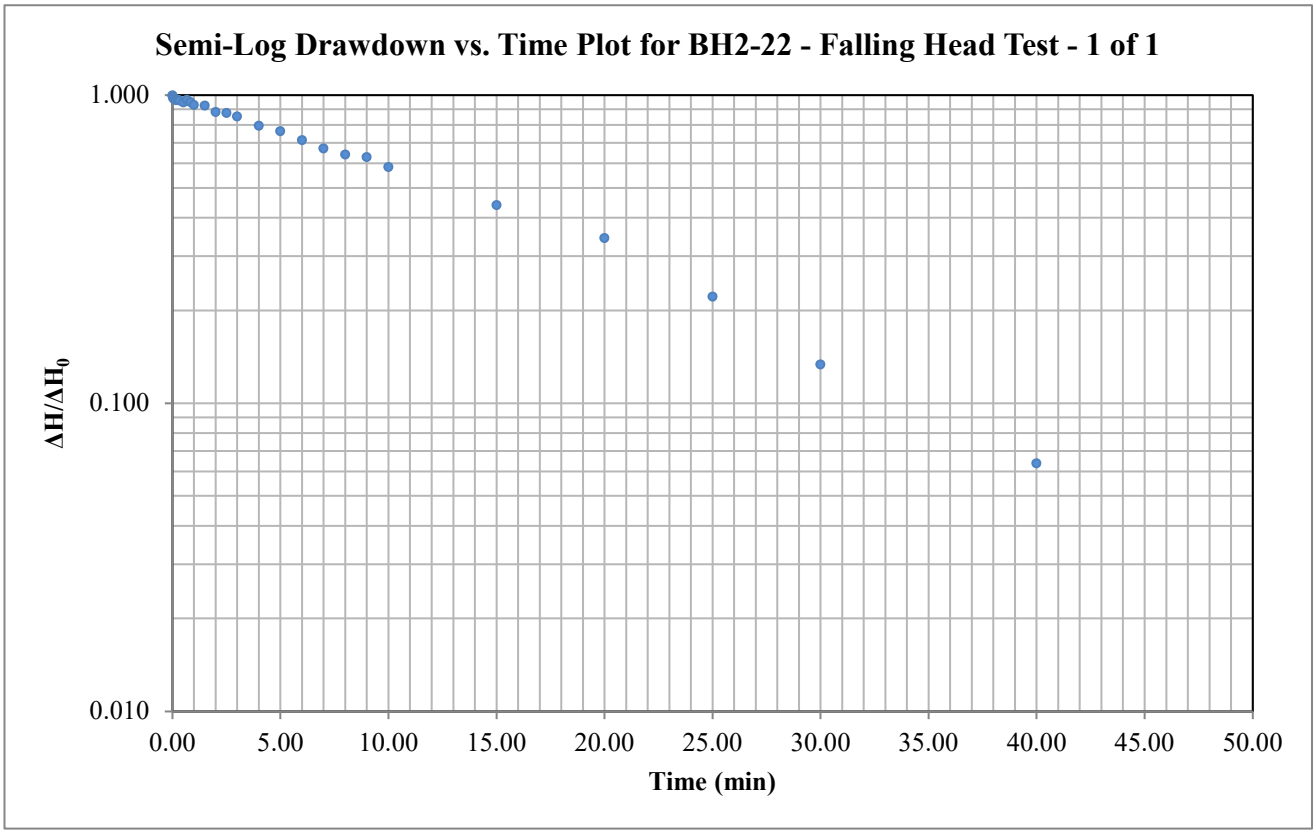
Data Points (from plot):

t*: 16.607 minutes $\Delta H^*/\Delta H_0$: 0.37

Horizontal Hydraulic Conductivity
K = 2.20E-07 m/sec

Hvorslev Hydraulic Conductivity Analysis

Project: Westboro Inc. - 403 Richmond Road and 389 Roosevelt Avenue
Test Location: BH2-22
Test: Falling Head - 1 of 1
Date: September 7, 2022



Hvorslev Horizontal Hydraulic Conductivity

$$K = \frac{\pi r_c^2}{F}\frac{1}{t^*}\ln\left(\frac{\Delta H^*}{\Delta H_0}\right)$$

Hvorslev Shape Factor

$$F = \frac{2\pi L}{\ln\left(\frac{2L}{D}\right)}$$

Valid for L>>D

Hvorslev Shape Factor F: 2.09791

Well Parameters:

L	1.524	m	Saturated length of screen or open hole
D	0.03175	m	Diameter of well
r_c	0.01588	m	Radius of well

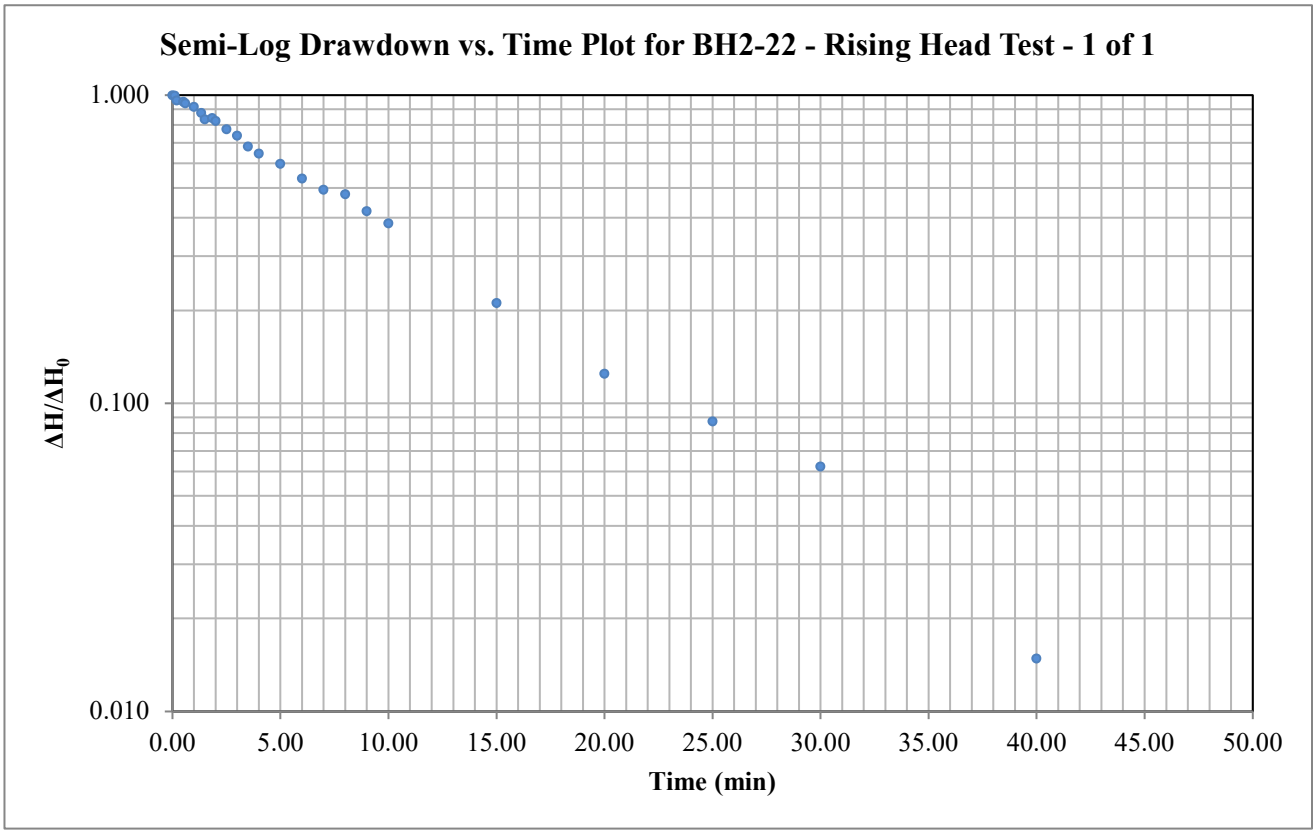
Data Points (from plot):

t*: 16.852 minutes $\Delta H^*/\Delta H_0$: 0.37

Horizontal Hydraulic Conductivity
K = 3.71E-07 m/sec

Hvorslev Hydraulic Conductivity Analysis

Project: Westboro Inc. - 403 Richmond Road and 389 Roosevelt Avenue
Test Location: BH2-22
Test: Rising Head - 1 of 1
Date: September 7, 2022



Hvorslev Horizontal Hydraulic Conductivity

$$K = \frac{\pi r_c^2}{F}\frac{1}{t^*}\ln\left(\frac{\Delta H^*}{\Delta H_0}\right)$$

Hvorslev Shape Factor

$$F = \frac{2\pi L}{\ln\left(\frac{2L}{D}\right)}$$

Valid for L>>D

Hvorslev Shape Factor F: 2.09791

Well Parameters:

L	1.524	m	Saturated length of screen or open hole
D	0.03175	m	Diameter of well
r_c	0.01588	m	Radius of well

Data Points (from plot):

t*: 10.423 minutes $\Delta H^*/\Delta H_0$: 0.37

Horizontal Hydraulic Conductivity
K = 6.00E-07 m/sec

APPENDIX 2

FIGURE 1 - KEY PLAN

FIGURES 2 & 3 – SEISMIC SHEAR WAVE VELOCITY PROFILES

FIGURE 4 – PODIUM DECK TO FOUNDATION WALL DRAINAGE SYSTEM TIE-IN DETAIL

FIGURE 5 – WATERPROOFING SYSTEM FOR ELEVATOR

DRAWING PG5101-1 - TEST HOLE LOCATION PLAN

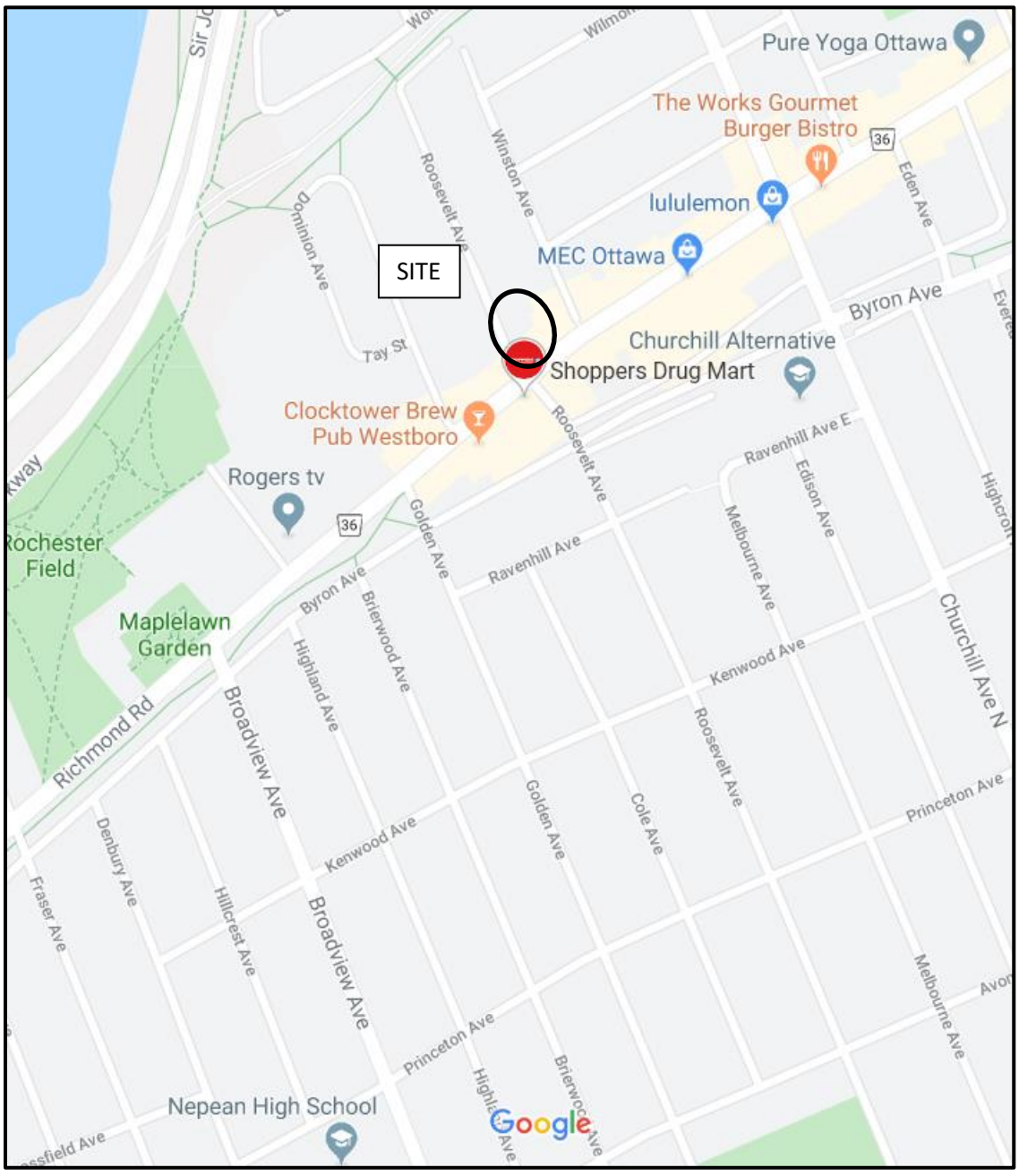


FIGURE 1

KEY PLAN

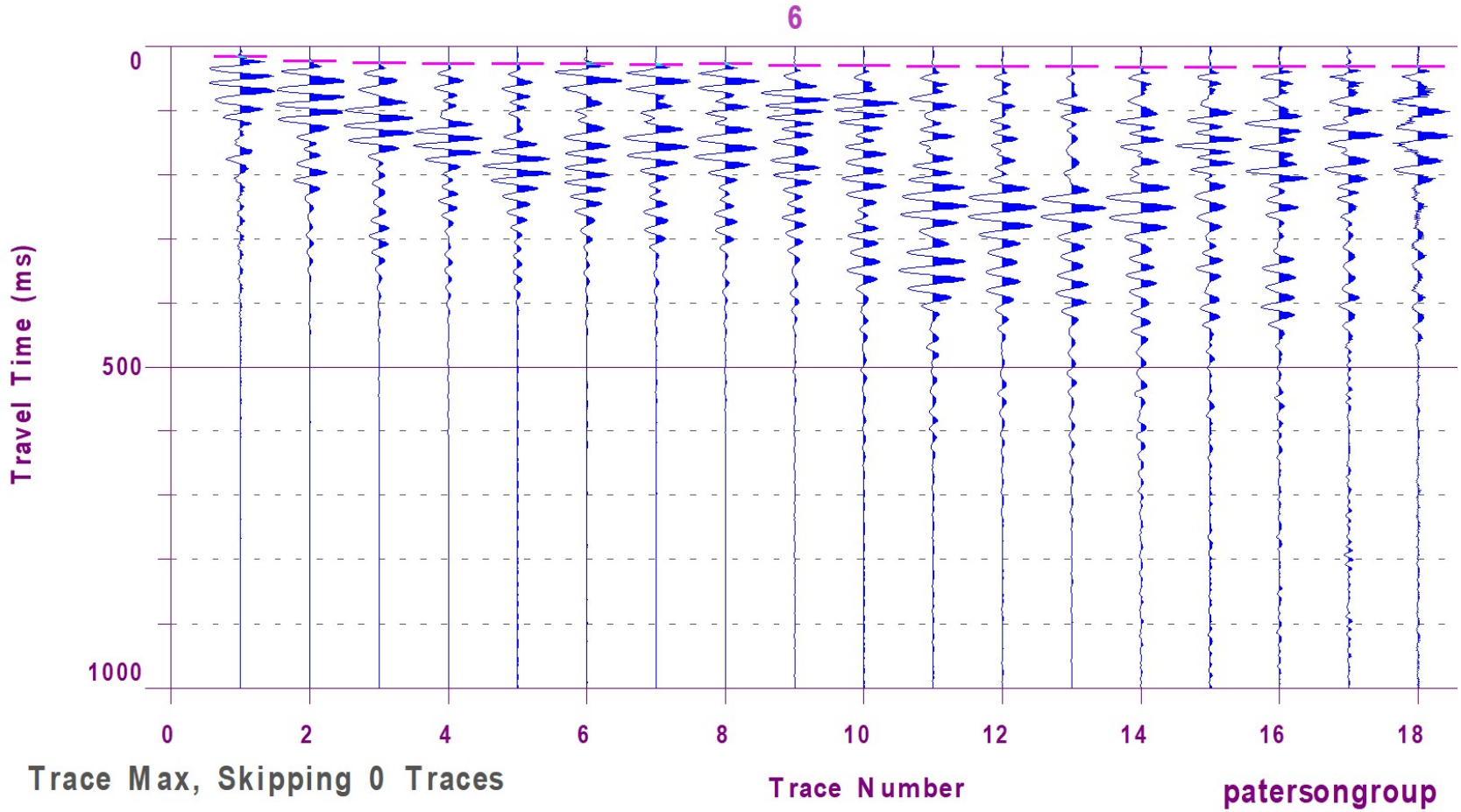


Figure 2 – Shear Wave Velocity Profile at Shot Location -1.5 m

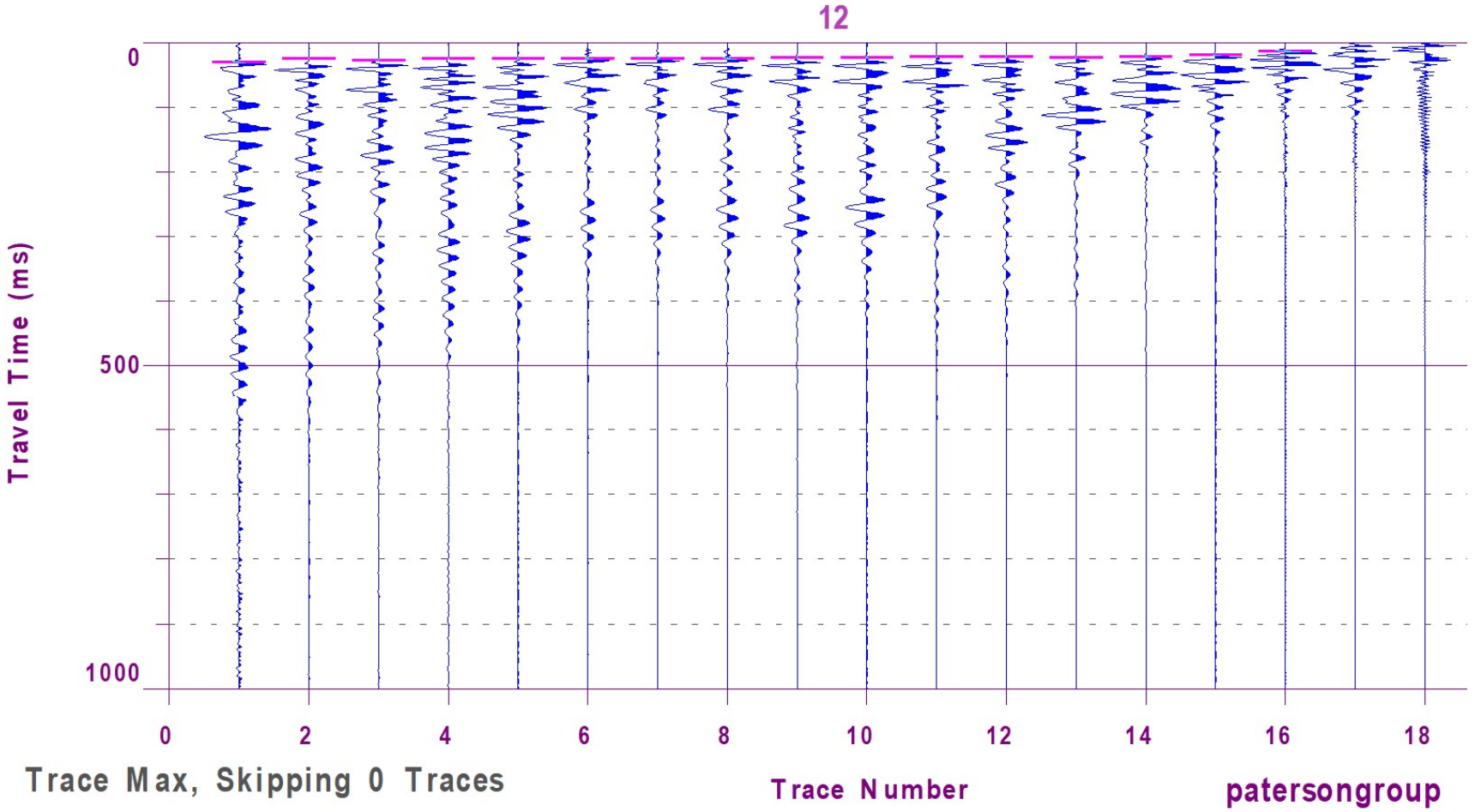
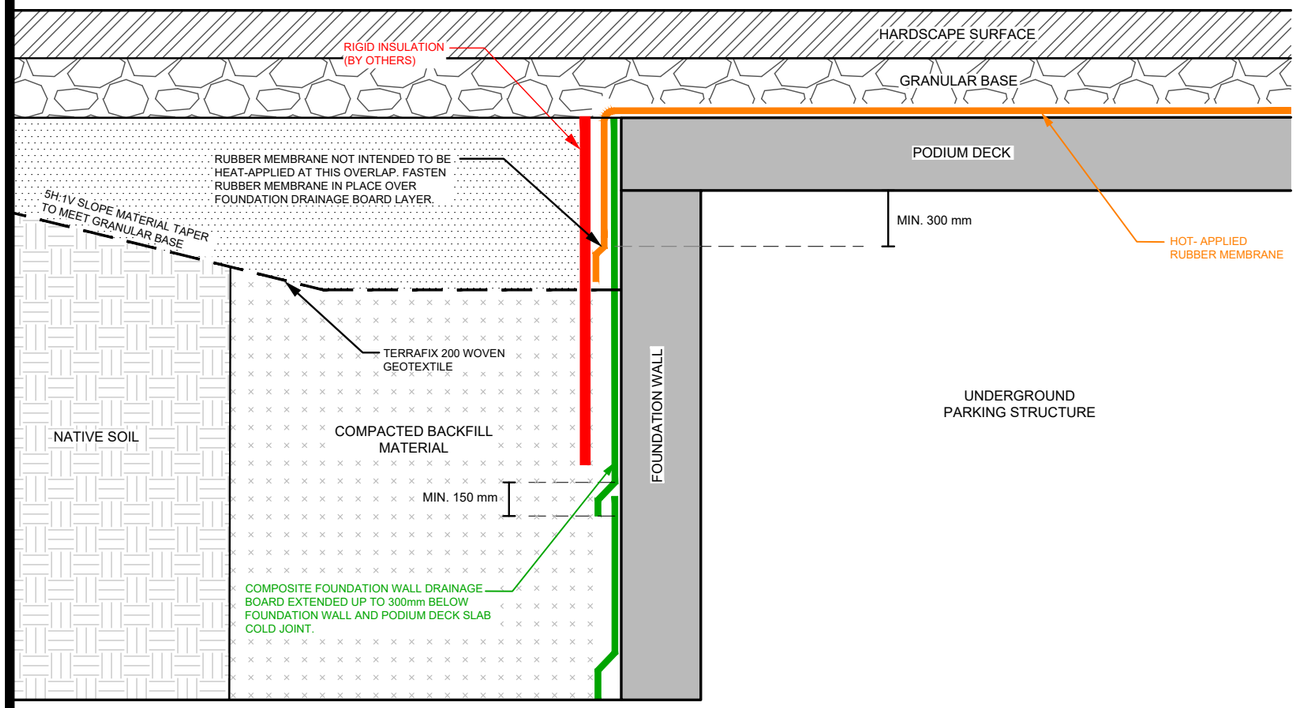
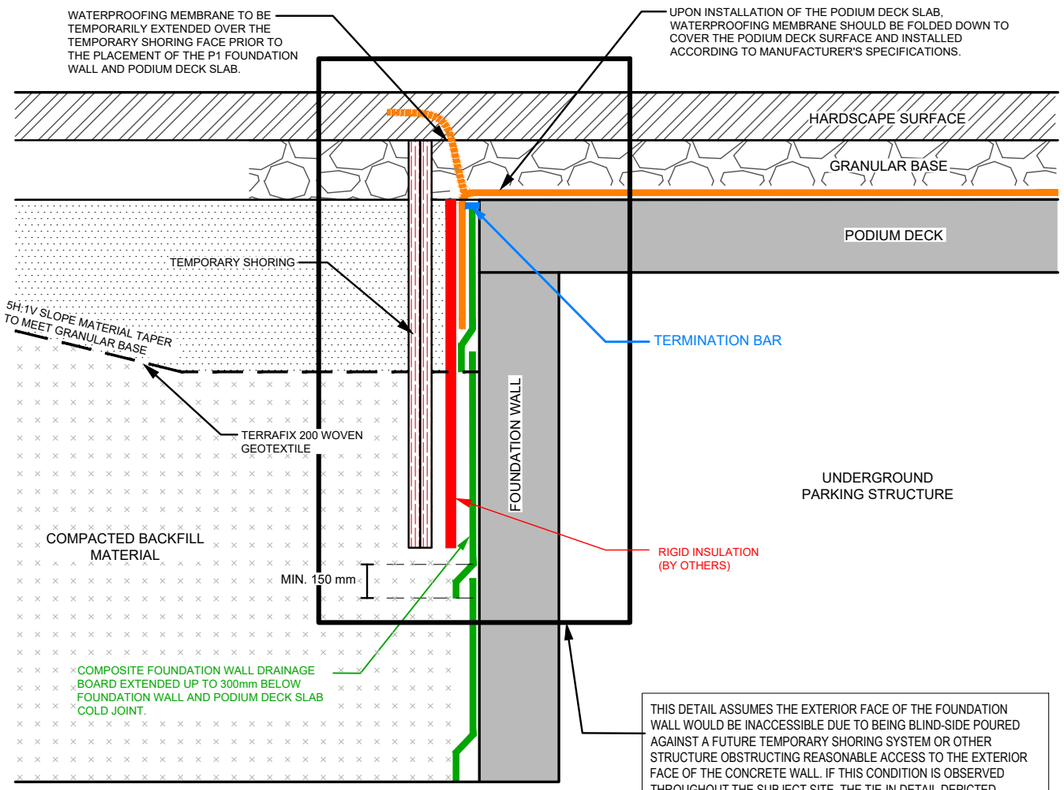


Figure 3 – Shear Wave Velocity Profile at Shot Location 18 m

OPTION A - DOUBLE-SIDE POURED TOP OF FOUNDATION WALL



OPTION B - BLIND-SIDE POURED TOP OF FOUNDATION WALL



NOTES:

THE ABOVE DETAIL FOR HOT RUBBER AND DRAINAGE BOARD OVERLAP IS APPLICABLE TO ALL EDGE-PORTIONS OF THE PODIUM DECK AND/OR SUSPENDED GROUND FLOOR SLAB STRUCTURE.

APPLICABILITY THICKNESS AND EXTENSIONS OF RIGID INSULATION ARE SPECIFIED BY OTHERS

WHERE THE GRADING SURFACE TERMINATES AGAINST THE BUILDING FACE AND PAVEMENT STRUCTURE IS NOT LOCATED ABOVE THE EDGE OF THE FOUNDATION WALL AND PODIUM DECK SLAB AS DEPICTED HEREIN, IT IS RECOMMENDED TO PROVIDE A SUITABLE TERMINATION BAR TO SEAL THE TOP ENDLAP OF THE HOT-APPLIED RUBBER MEMBRANE LAYER TO THE VERTICAL FACE OF THE STRUCTURE. THIS WOULD BE REQUIRED TO MITIGATE THE POTENTIAL FOR THE MIGRATION OF WATER BEHIND THE RUBBER MEMBRANE.

ALL PORTIONS OF THE ABOVE-NOTED DETAIL (INSULATION OF FOUNDATION DRAINAGE BOARD, TERMINATION BAR, HOT-RUBBER MEMBRANE OVER SLAB, FOUNDATION WALL CONSTRUCTION JOINT AND OVERLAPPING/SHINGLING OF DRAINAGE BOARD) SHOULD BE REVIEWED AT THE TIME OF CONSTRUCTION BY PATERSON PERSONNEL.

PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7S9
TEL: (613) 226-7381

NO.	REVISIONS	DATE	INITIAL

WESTBORO INC.

PROPOSED MULTI-STOREY BUILDING

403 RICHMOND ROAD AND 389 ROOSEVELT AVENUE

OTTAWA, ONTARIO

Title:

PODIUM DECK TO FOUNDATION WALL DRAINAGE SYSTEM TIE-IN DETAIL

Scale: N.T.S	**Date:** 09/2022
Drawn by: RCG	**Report No.:** PG5101-1 REVISION 1
Checked by: KP	**Dwg. No.:** FIGURE 4
Approved by: DJG	**Revision No.:**

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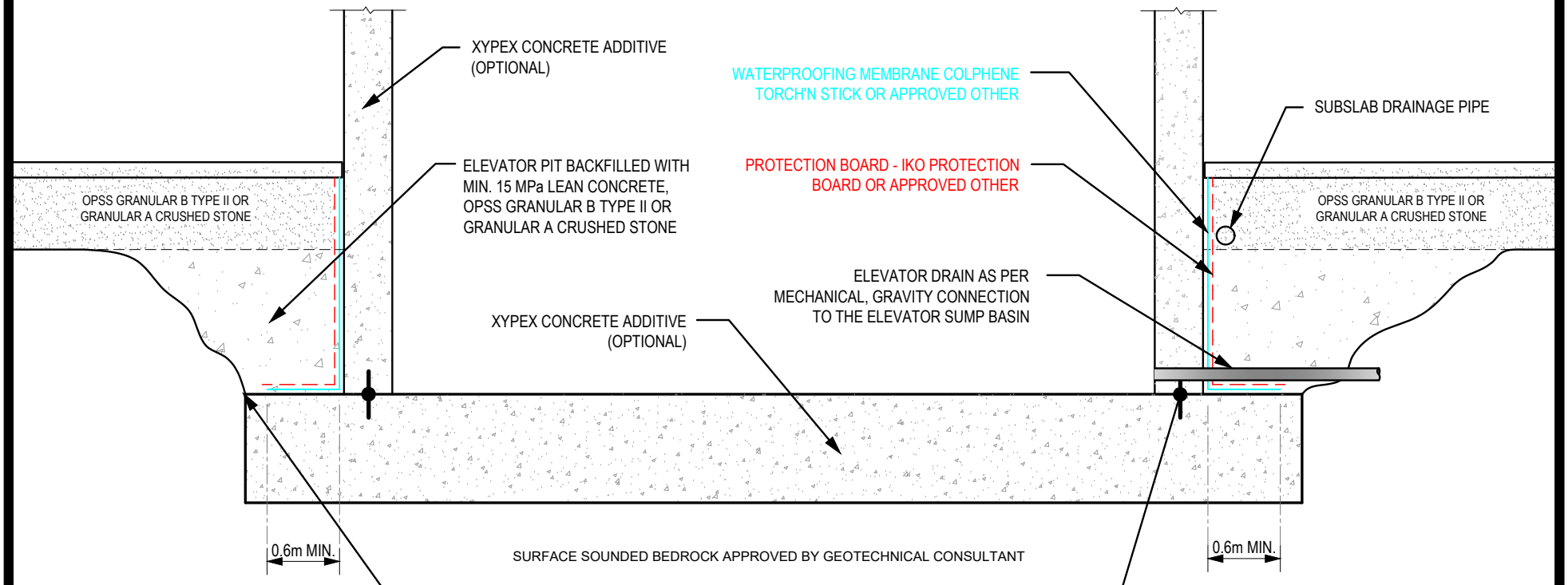

NOTES:

1. IT IS RECOMMENDED THAT PERIODIC INSPECTIONS BE COMPLETED BY THE GEOTECHNICAL CONSULTANT AT THE TIME OF CONSTRUCTION DURING THE INSTALLATION OF THE ELEVATOR WATERPROOFING MEMBRANE(S).

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WESTBORO INC.

PROPOSED MULTI-STOREY BUILDING

403 RICHMOND ROAD AND 389 ROOSEVELT AVENUE

OTTAWA, ONTARIO

Title:

WATERPROOFING SYSTEM FOR ELEVATOR

Scale: N.T.S.	**Date:** 09/2022
Drawn by: RCG	**Report No.:** PG5101-1 REVISION 1
Checked by: KP	**Drawing No.:** FIGURE 5
Approved by: DJG	**Revision No.:**

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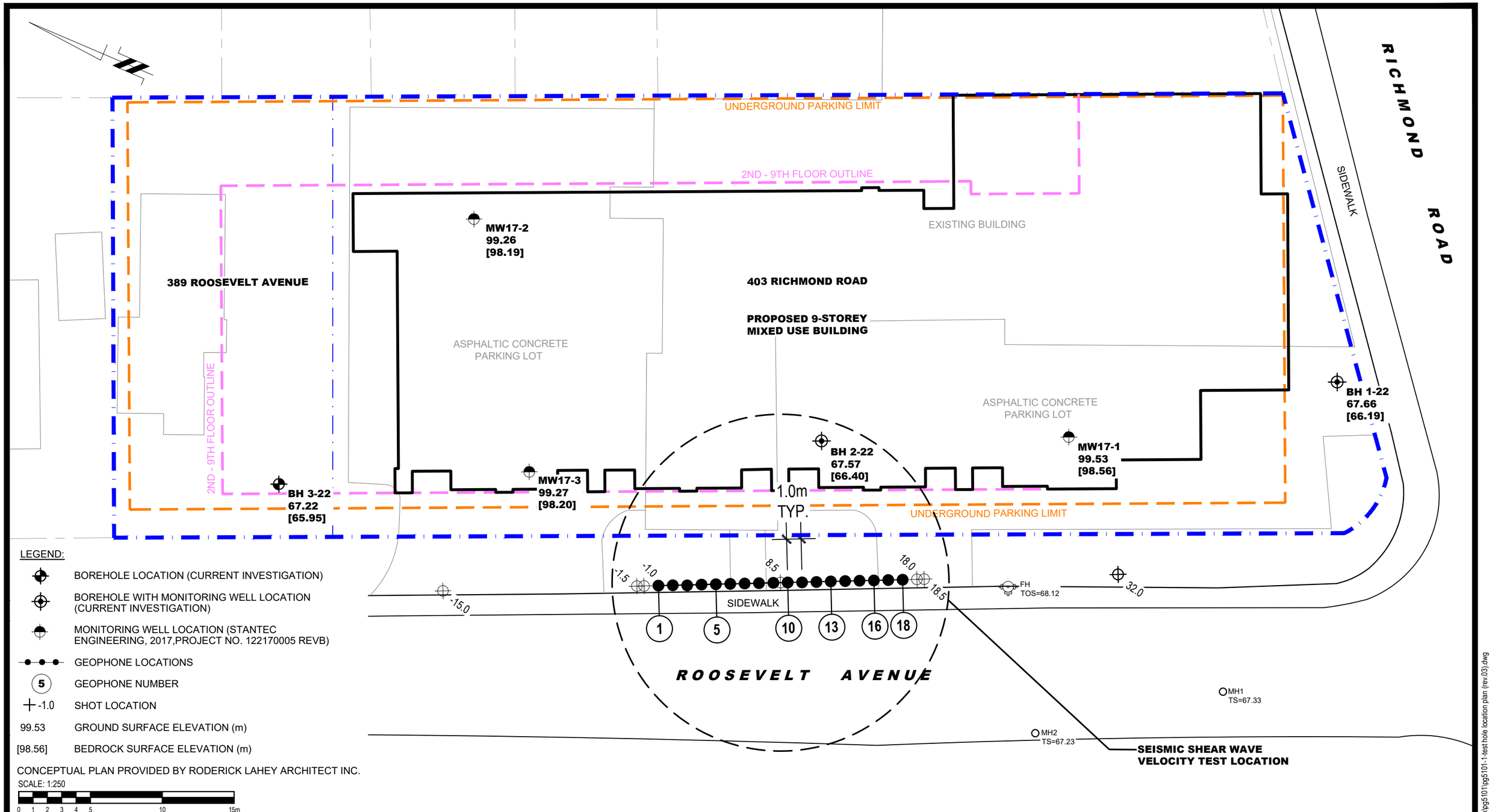

LEGEND:

- BOREHOLE LOCATION (CURRENT INVESTIGATION)
- BOREHOLE WITH MONITORING WELL LOCATION (CURRENT INVESTIGATION)
- MONITORING WELL LOCATION (STANTEC ENGINEERING, 2017,PROJECT NO. 122170005 REVB)
- GEOPHONE LOCATIONS
- 5 — GEOPHONE NUMBER
- -1.0 — SHOT LOCATION
- 99.53 — GROUND SURFACE ELEVATION (m)
- [98.56] — BEDROCK SURFACE ELEVATION (m)

CONCEPTUAL PLAN PROVIDED BY RODERICK LAHEY ARCHITECT INC.

SCALE: 1:250

0 1 2 3 4 5 10 15m

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NO.	REVISIONS	DATE	INITIAL
3	SUPPLEMENTAL BOREHOLES ADDED TO PLAN	07/09/2022	KP
2	SHEAR WAVE VELOCITY TEST ADDED TO PLAN	29/04/2022	FC
1	UPDATED CONCEPTUAL PLAN TO DRAWING	07/04/2022	KP

STARWOOD GROUP INC.

GEOTECHNICAL INVESTIGATION
PROPOSED MIXED USE BUILDING
403 RICHMOND ROAD & 389 ROOSEVELT AVENUE

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:250	Date: 10/2019
Drawn by: YA	Report No.: PG5101-1 REVISION 2
Checked by: NG	Dwg. No.: PG5101-1
Approved by: DJG	Revision No.: 3

11x17

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