Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Archaeological Services

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Hydrogeological Review

Proposed Multi-Storey Buildings
400 Albert Street
Ottawa, Ontario

Prepared For

Main and Main Developments Inc.

August 5, 2020

Report PG4793-2

Table of Contents

Page

Appendices

1.0 INTRODUCTION

Introduction

Paterson Group (Paterson) was commissioned by Main and Main Developments Inc. to prepare a hydrogeological review for the proposed multi-storey buildings to be located at 400 Albert Street in Ottawa, Ontario (refer to Drawing PG4793-2 - Site Plan within Appendix 1).

Subsurface information was obtained from the field investigations carried out by Paterson and others to determine the subsoil and groundwater conditions at the site by means of test holes.

The following report has been prepared specifically and solely for the aforementioned project which is described herein. It contains the investigation findings and includes hydrogeological assessments pertaining to the proposed program as understood at the time of writing this report.

Proposed Project

It's our understanding that the proposed development will consist of three multi-storey buildings and will share three levels of underground parking that will occupy the majority of the site. It's further understood that the proposed building will be municipally serviced.

In the event that groundwater infiltration is encountered within the excavation at the time of construction, consideration has been given to incorporating a water suppression system that will reduce infiltration volumes and long term groundwater lowering at the post-construction stage. However, based on projects currently under construction in the vicinity of the subject site, no significant water infiltration volumes were encountered at deeper levels. We expect a similar situation at the subject site.

2.0 SITE CONDITIONS

2.1 Surface Conditions

The subject site is currently occupied by an at-grade gravel parking lot. The topography of the site gently slopes down towards the south and is at grade with the surrounding roadways. It is bordered to the north by low-rise residential buildings and Albert Street followed by high-rise residential buildings currently under construction (former at-grade parking lot), to the east by Lyon Street followed by high-rise commercial buildings, to the south by Slater Street followed by an at-grade parking lot as well as a low-rise commercial and high-rise residential building, and to the west by Bay Street followed by a low-rise commercial building.

According to available mapping, the subject site is located in the Limestone Plains physiographic region.

Field Investigations

Field investigations completed by Paterson have been carried out between June 2015 and March 2019. During this time, a total of 15 boreholes have been advanced to a maximum depth of 19.4 m below ground surface (bgs). A previous field investigation completed by others in 2012 has also been included as part of the current hydrogeological review. The previous investigation consisted of 6 boreholes extending to a maximum depth of 7.2 m bgs. The test hole locations were distributed in a manner to provide general coverage of the subject site taking into consideration site features as well as evaluate any environmental concerns. The borehole locations of the field investigations are presented on Drawing PG4793-1, included in Appendix 2.

The subsurface conditions observed in the test holes were recorded in detail in the field. The soil profiles are presented on the Borehole Reports by others and the Soil Profile and Test Data sheets in Appendix 2 of this report.

Surface Water

The subject site is located within the Rideau Canal subwatershed. Surface water feature identified within 500 m of the property include the Ottawa River located approximately 500 m north of the subject site.

Groundwater

Groundwater monitoring wells were installed in select boreholes by Paterson to permit the monitoring of the groundwater levels at the subject site. Groundwater information is discussed in Sections 3 of this report and details are noted on the Soil Profile and Test Data sheets presented in Appendix 2 of this report.

2.2 Subsurface Profile

The subsurface profile at the subject site is generally comprised of fill material followed by a silty clay and/or glacial till deposit extending to bedrock surface. Practical refusal to augering was encountered at depths ranging between 2.8 and 4.9 m bgs, while bedrock was encountered between 2.3 and 4.8 m bgs.

Reference should be made to the soil profile records and test hole locations completed by Paterson and others included in Appendix 2 for the details of the soil profiles encountered at each borehole location.

Based on surficial mapping prepared by the Ontario Geological Survey, the subject site is located in an area where surficial geology consists of a stone-poor, sandy silt to silty sand-textured till deposited on Paleozoic terrain.

Fill Material

A fill layer was encountered at all borehole locations underlying the crushed stone gravel surfacing. The fill material consisted of silty sand with varying amounts of silty clay, gravel, boulders, crushed stone, construction debris and organics. The fill material extended to a maximum depth of 3.3 m bgs.

Silty Clay

Generally, the very stiff silty clay was encountered beneath the fill material in select boreholes and extended to a maximum depth of 3.7 m bgs.

Glacial Till

Generally, the compact to very dense glacial till deposit was noted underlying the silty clay and/or fill material in select boreholes. The glacial till deposit consists of clayey silt to silty sand matrix with varying amounts gravel, cobbles and boulders and it extends to a maximum depth of 4.9 m bgs.

Bedrock

Based on coring results completed by Paterson and others, limestone bedrock was encountered between 2.3 and 4.8 m bgs and was cored to a maximum depth of 19.4 m bgs. The recovery values ranged from 87 to 100%, while the RQD values generally varied between 61 and 100%. Based on these results, the quality of the bedrock ranges from fair to excellent.

Based on available geological mapping, the subject site is located in an area where the bedrock consists of interbedded limestone and shale of the Verulam Formation with an overburden thickness between 2 and 5 m.

3.0 HYDROGEOLOGY

Subsequent to the subsurface investigations completed at the subject site, groundwater levels were measured at the borehole locations by Paterson and others and ranged from 2.2 to 5.4 m bgs. However, it should be noted that the LRT Confederation Line tunnel is located approximately 75 m north of the subject site and drawing the groundwater to a depth greater than the proposed excavation depth at the subject site. Furthermore, minimal groundwater infiltration has been observed at adjacent developments currently under construction and consists of excavations depths greater than the proposed development. Based on the above noted observations, the long-term groundwater table at the subject site can be expected below the excavation depth of the proposed development. Groundwater levels can fluctuate both seasonally and in conjunction with precipitation events. Therefore, the groundwater levels could vary at the time of construction.

For the purpose of this hydrogeological review, the groundwater flow has been conservatively estimated based on measured groundwater levels subsequent to the subsurface investigations.

On a conceptual scale, hydrogeological/hydrologic conditions at the subject site suggest that water may infiltrate the open excavation as surface water infiltration during precipitation events and through groundwater flow within the bedrock at depth.

The excavation footprint related to the proposed underground parking structure at the subject site is expected to encompass an area of approximately 5,200 m^2. Therefore, the potential exists for a moderate amount of surface water to intercept the excavation footprint directly during significant precipitation events.

Based on the measured groundwater levels, the building excavation is expected to intercept bedrock within the saturated depth of excavation. The potential exists for a low to moderate amount of groundwater inflow through the bedrock. The volume of groundwater that infiltrates through the bedrock will depend on the quality of the bedrock across the subject site.

Based on the groundwater levels at the borehole locations, the local groundwater flow direction generally trends in a southeasterly direction. The regional groundwater flow direction is expected to trend north towards the Ottawa River. It should be noted that groundwater levels can fluctuate based on precipitation events and seasonal variations. Therefore, groundwater levels and flow directions may vary at the time of construction.

3.1 Estimated Water Taking Rates

The potential sources of water taking at the subject site has been identified as the excavation footprint of the proposed multi-storey buildings during the construction phase as well as long-term groundwater infiltration at post-construction.

The hydraulic conductivity values were conservatively estimated based upon typical values for limestone bedrock. These values range from 1 x 10^{-6} to 1 x 10^{-10} m/sec and is dependant on the quality of the bedrock.

To determine surface water infiltration into the excavation footprint, an intensity duration frequency (IDF) curve from the Ministry of Transportation - Ontario (MTO) was obtained. The IDF curve is the graphical representation of the probability that a given average rainfall intensity will occur. For the purposes of this project, a 5 year storm event with a one hour duration was chosen as the design storm. This provides a potential rainfall intensity of 2.62 x 10^{-2} m of precipitation into the excavation footprint. Various duration storm events with their associated rainfall intensities are presented in the IDF Curve in Appendix 3.

The infiltration rates provided for the following source was calculated using the Dupuit Forchheimer method:

$$Q = \pi K((h_0^2-h_p^2)/\ln(R/r))$$

- K = hydraulic conductivity (m/sec)
- h_0 = thickness of the aquifer (m)
- h_p = thickness of the aquifer from the base of the excavation to the base of the aquifer (m)
- R = effective drawdown radius for the excavation (m)
- r = equivalent radius of the excavation (m)

A sample groundwater infiltration calculation is provided in Appendix 3 of this report.

Building Excavation Footprint (Construction Dewatering)

The strata at the proposed building location consists of fair to excellent limestone bedrock within the anticipated saturated depth of excavation. The maximum depth of excavation is generally expected to be approximately 10 m bgs. Calculations are based on an excavation sizing of 5,200 m^2 and a saturated depth of excavation of 7.5 m, using a conservative groundwater level measurement of 2.5 m bgs.

Using the above values and a conservative hydraulic conductivity of 1 x 10^{-6} m/sec, the steady state volume of groundwater anticipated is approximately **150,000 L/day**, and does not account for the initial groundwater inflow into the excavation or unforseen circumstances.

A factor of safety should be applied to the calculated infiltration rates to account for variability in the quality of bedrock and any unforseen circumstances that may arise during construction activities.

With respect to the potential for surface water inflow into the excavation footprint, the subject site is adjacent to developed land on all sides. It is therefore expected that the majority of surface water inflow into the excavation footprint will be caused by precipitation directly onto the footprint rather than runoff from other sources. Given an excavation footprint with a sizing of 5,200 m^2 and a precipitation depth of 2.62 x 10^{-2} m, a total volume of approximately 125,000 L of surface water can be expected during a 5 year - 1 hour duration precipitation event. It is expected that the contractor will direct surface water away from open excavations whenever possible.

Based on the anticipated volumes, an Environmental Activity and Sector Registry (EASR) is recommended for temporary construction dewatering of the proposed development.

Post-Construction (Long-Term Dewatering)

If groundwater infiltration is encountered within the excavation and a water suppression system is required, the long-term groundwater infiltration breaching the suppression system at post-construction will be managed by the building sump pit system. Provided the proposed groundwater infiltration control system is properly installed and approved by the geotechnical engineer at the time of construction, a conservative 1 m drawdown in the groundwater table at the subject site could be expected. The steady state volume of groundwater anticipated post-construction is approximately **20,000 to 40,000 L/day**.

3.2 Estimated Radius of Influence

A series of calculations were carried out on theoretical radii of influence for the likely duration of extended pumping during the excavation of the buildings and post-construction. These calculations were completed based on Sichardt (1992) using the equation:

$R = r_e + 3000*\Delta h(k^{0.5})$

- ❑ R = radius of influence (m)
- ❑ r_e = equivalent radius of excavation (m)
- ❑ Δh = thickness of drawdown within the aquifer (m)
- ❑ k = hydraulic conductivity (m/sec)

For the purposes of completing the calculations, the following assumptions were made:

- ❑ r_e = 50 m
- ❑ k = 1 x 10^{-6} m/sec, based upon published values
- ❑ Δh = 7 to 8 m (building excavation); 0.5 to 1.5 (post-construction), to review potential minimum/maximum variable conditions.

Using the above equation and assumptions, a radius of influence of approximately **21 to 24 m** could develop as a steady state condition, extending from the edge of the excavation, during the construction of the proposed underground parking structure.

If a water suppression system is required and adequately installed, it is expected that a radius of influence of approximately **1.5 to 4.5 m** will develop as a steady state condition, extending from the edge of the building, at post-construction.

3.3 Water Discharge

The discharge point for the pumped water from the excavation sump is expected to be to the existing City of Ottawa sewer system via a sewer connection. As such, it will be subject to the City of Ottawa Sewer Use Bylaws and a permit will be required to discharge the water to the sewer system.

It is expected that BMP's as recommended by the City of Ottawa - Sewer Use Program (SUP) document (attached within Appendix 5) or similar will be used to reduce sediment loading within the water prior to discharge to the sewer system. If the pumped water does not meet the SUP criteria, it must be retained on site until test results indicate compliance with the SUP criteria or remove the water through other means such as tanker trucks.

Given the size of the excavation for the proposed development, the volumes of surface water pumped during a 100 year storm event are not expected to exceed the capacity of the nearby City sewer system. Should volumes exceed the available capacity, it's expected that water will be stored on site temporarily and released at an acceptable rate or removed via tanker trucks. The approved SUP permit may provide further discharge restrictions.

Based upon the anticipated water takings being discharged to the City sewer system, it's Paterson's opinion that the water discharged will not cause negative impacts to the natural environment. As the discharged water is not being returned directly to the natural environment, there are no negative effects expected related to the temperature of the discharged water. The location and operation of the appropriate discharge measures are the responsibility of the contractor.

4.0 POTENTIAL IMPACTS

4.1 Adverse Effects on Adjacent Structures

The subsurface profile at the subject site is generally comprised fill material overlain by a silty clay and/or glacial till deposit followed by bedrock. The majority of the expected groundwater infiltration will be encountered within the limestone bedrock. The potential dewatering volumes due to groundwater infiltration into excavation footprint are anticipated to be low to moderate dependant on the quality of bedrock at a given location across the subject site. The buildings in the surrounding area consists of a mixture or residential and commercial buildings. Given the relatively shallow depth to bedrock, the buildings are expected to be founded either on bedrock or the compact to very dense glacial till deposit. As the majority of the groundwater infiltration is expected to occur within the bedrock, adverse effects related to dewatering activities at the subject site are expected to be negligible.

It is not expected mitigation methods will be required related to potential adverse effects on structures or infrastructure adjacent to the excavation due to the lack of compressibility of the bedrock and short term nature of the construction. However, mitigation methods would consist of halting pumping and providing monitoring of the potential settlement to determine if the negative effects are related to the dewatering program. If the dewatering is causing the consolidation/settlement effects, then a revised dewatering program to reduce the taking of water or providing a water recharge system to reduce the consolidation effects would be necessary.

Due to the currently proposed construction activities at the subject site (hoe-ramming, controlled blasting, shoring installations), a pre-construction survey is recommended to be carried out for the structures immediately surrounding the site to document existing conditions. It is additionally recommended in Paterson Report PG4793-1 dated August 23, 2019.

4.2 Adverse Effects on Neighbouring Water Wells

A search of the Ontario Water Well Records database indicates there are a large number of wells within 500 m of the site as depicted in Drawing PG4793-3 included in Appendix 1. However, it is expected that these wells are either no longer in use due to their installation dates and the developed nature of the region or are monitoring well installations. As such, any domestic wells in the area are located well outside the theoretical radius of influence. Therefore, dewatering activities at the site are not expected to cause any interference to the water supply of surrounding properties or other negative impacts.

4.3 Soil, Surface Water and Groundwater

A search of the MECP Brownfields Environmental Site Registry was conducted as part of the assessment of the site, neighbouring properties and the general area. A total of 5 Brownfield sites were located within 500 m of the subject site and have been identified as Registration numbers 22908, 40506, 45110, 215648 and 225846. All Brownfield sites and their respective registration numbers indicated there are no groundwater controls under the Records of Site Condition (RSC), nor were there any groundwater remediations performed during the cleanup process. No concerns were identified in the review of the MECP Brownfields database.

Following the completion of a Phase II Environmental Site Assessment (ESA) by Paterson at the subject site, it was determined that all groundwater samples analysed for VOCs were in compliance with MECP Table 3 standards, with the exception of chloroform. Previous environmental assessments by Paterson others identified mercury and lead concentrations in excess of the MECP Table 3 Standards within the fill material underlying the asphaltic concrete and/or gravel layer. Groundwater results from the previous environmental assessments concluded all analyzed parameters were in compliance with the MECP Table 3 Standards.

The groundwater that is pumped from the site excavation must be managed in an appropriate manner. The contractor will be required to implement a water management program to dispose of the pumped water. It is expected the groundwater will be discharged to the City of Ottawa sewer system in accordance with the City Sewer Use By-Laws. Dependant upon the results of the baseline test to be performed for the discharge permit application, the City of Ottawa will determine the appropriate discharge location (storm versus sanitary sewer), on-site treatment or if off-site disposal is required.

It is anticipated that the material on site will be disposed of as per the MECP policy, *Management of Excess Soil - A Guide for Best Management Practices* dated January, 2014.

With respect to nearby surface water bodies, the Ottawa River is located approximately 500 m north of the property and well outside the theoretical radius of influence for the subject site. As such, adverse effects to surface water features resulting from dewatering activities at the subject site are expected to be negligible.

4.4 Adjacent Permits to Take Water

A search of the MECP Permit to Take Water database provided one active PTTW within 500 m of Cliff CHCP. Permit Number 1003-BCTP6R has been registered to 340 Queen Street Limited Partnership. The PTTW contains one source for construction dewatering with a potential taking of 3,000,000 L/day and is located approximately 20 m north of the subject site. While construction for the above noted development is on-going, it is understood that the foundation for the parking structure will be completed prior to the commencement of any water taking at the subject site. As such, cumulative impacts related to water taking activities between the existing PTTW and the subject site are expected to be negligible.

With regards to the Environmental Activity and Sector Registry (EASR), there are no EASR's within 500 m of the subject site.

5.0 STATEMENT OF LIMITATIONS

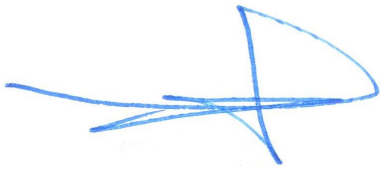
The recommendations provided in this report are in accordance with our present understanding of the project.

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

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

Paterson Group Inc.

Nicholas Zulinski, P.Geo., géo.

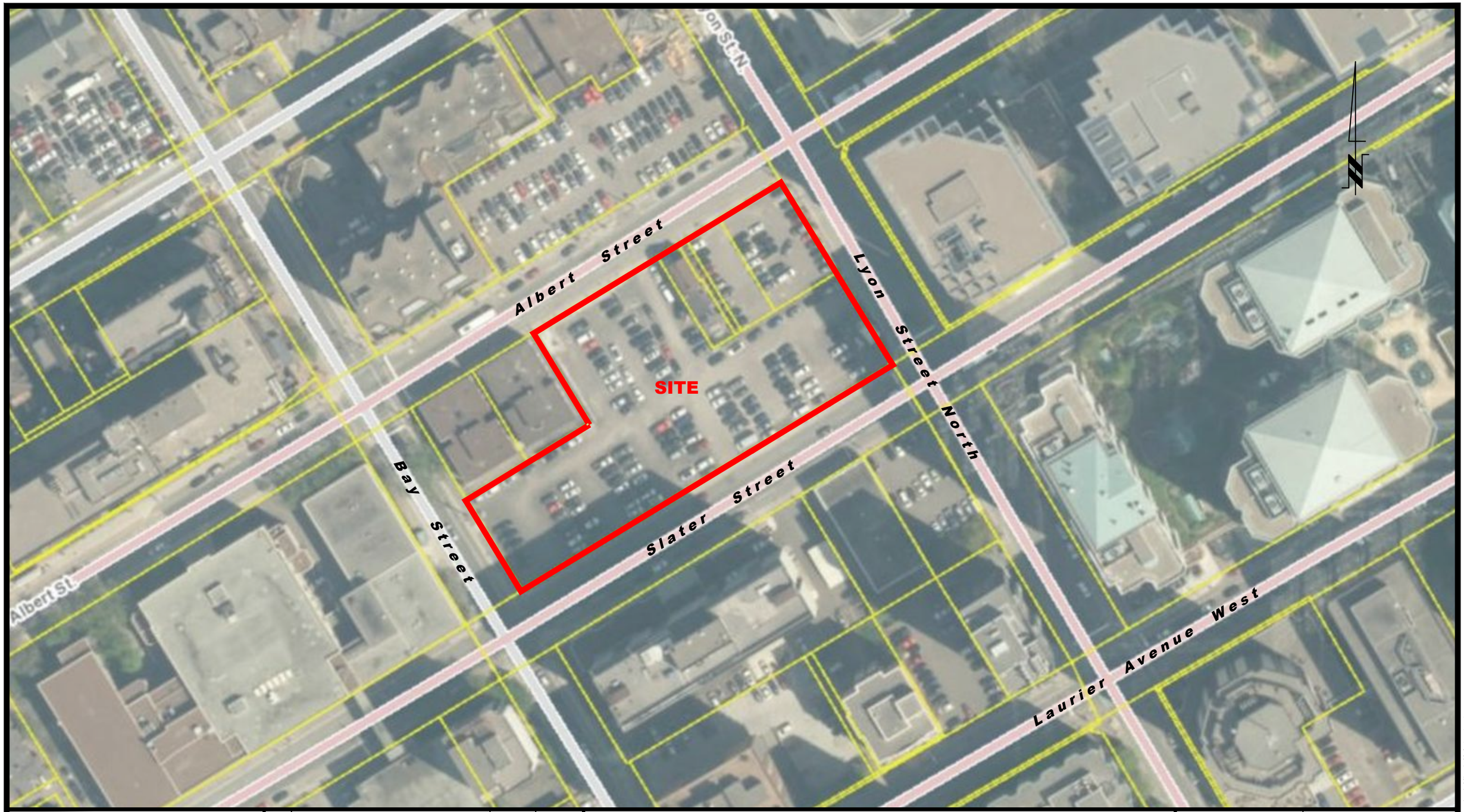


Carlos P. Da Silva, P.Eng., ing., QP_{ESA}

APPENDIX 1

Drawing PG4793 - Site Plan

Drawing PG4793 - MECP Water Well Location Plan



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NO.	REVISIONS	DATE	INITIAL
0			

MAIN AND MAIN DEVELOPMENTS
HYDROGEOLOGICAL REVIEW
PROPOSED MULTI-STOREY BUILDINGS - 400 ALBERT STREET
OTTAWA, ONTARIO

Title:
SITE PLAN

Scale: 1:1000	Date: 08/2020
Drawn by: MPG	Report No.: PG4793-2
Checked by: NZ	Dwg. No.: PG4793-2
Approved by: MK	Revision No.:

11x17

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LEGEND:

⦿ MECP WELL LOCATIONS

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NO.	REVISIONS	DATE	INITIAL
0			

MAIN AND MAIN DEVELOPMENTS

HYDROGEOLOGICAL REVIEW
PROPOSED MULTI-STOREY BUILDINGS - 400 ALBERT STREET

OTTAWA, ONTARIO

Title:

MECP WATER WELL LOCATION PLAN

Scale: 1:7500	Date: 08/2020
Drawn by: MPG	Report No.: PG4793-2
Checked by: NZ	Dwg. No.: PG4793-3
Approved by: MK	Revision No.:

11x17

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APPENDIX 2

PG4793 - Soil Profile and Test Data

PG3914 - Soil Profile and Test Data

PE3774 - Soil Profile and Test Data

PG3543 - Soil Profile and Test Data

Borehole Reports (by Others)

PG4793-1 - Test Hole Location Plan

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
383 Slater St., 400 Albert St. & 156-160 Lyon Street
Ottawa, Ontario

DATUM TBM - Top of manhole cover located along east side of Bay Street, north of Slater Street. Geodetic elevation = 72.77m

FILE NO. PG4793

REMARKS

HOLE NO. BH 1

BORINGS BY CME 55 Power Auger **DATE** March 28, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	73.24
25mm Asphaltic concrete over		AU	1				
0.60 **FILL:** Brown clayey sand with sand and gravel		SS	2	79	12	1	72.24
0.86 Compact, brown **SILTY SAND**		SS	3	4	62	2	71.24
Very stiff, brown **SILTY CLAY,** some gravel 2.44		SS	4	88	10		
GLACIAL TILL: Brown clayey silt with sand and gravel		SS	5	62	10	3	70.24
4.29		SS	6	47	50+	4	69.24
		RC	1	100	0		
		RC	2	98	96	5	68.24
		RC	3	100	84	6	67.24
		RC	4	100	89	7	66.24
		RC	5	100	100	8	65.24
BEDROCK: Fair to excellent quality, grey limestone		RC	6	100	97	9	64.24
		RC	7	100	100	10	63.24
		RC	8	100	97	11	62.24
		RC	9	100	100	12	61.24
		RC	10	100	100	13	60.24
18.01						14	59.24
End of Borehole						15	58.24
(GWL @ 4.37m depth - Apr 9/19)						16	57.24
						17	56.24
						18	55.24

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %
20 40 60 80

Monitoring Well Construction

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

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
383 Slater St., 400 Albert St. & 156-160 Lyon Street
Ottawa, Ontario

DATUM TBM - Top of manhole cover located along east side of Bay Street, north of Slater Street. Geodetic elevation = 72.77m

FILE NO. PG4793

REMARKS

HOLE NO. BH 2

BORINGS BY CME 55 Power Auger **DATE** March 29, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	71.99
Asphaltic concrete 0.06		AU	1				
FILL: Brown silty sand with gravel		SS	2	50	52	1	70.99
2.08		SS	3	46	17	2	69.99
Compact, brown **SILTY SAND** 2.39		SS	4	33	2		
GLACIAL TILL: Brown clayey silt with sand and gravel 2.84		RC	1	100	87	3	68.99
		RC	2	100	93	4	67.99
		RC	3	100	95	5	66.99
		RC	4	100	95	6	65.99
BEDROCK: Good to excellent quality, grey limestone		RC	5	100	100	7	64.99
		RC	6	100	100	8	63.99
		RC	7	100	100	9	62.99
		RC	8	100	100	10	61.99
		RC	9	100	97	11	60.99
		RC	10	100	100	12	59.99
17.88						13	58.99
End of Borehole						14	57.99
(GWL @ 2.20m depth - Apr 9/19)						15	56.99
						16	55.99
						17	54.99

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %
20 40 60 80

Monitoring Well Construction

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

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
383 Slater St., 400 Albert St. & 156-160 Lyon Street
Ottawa, Ontario

DATUM TBM - Top of manhole cover located along east side of Bay Street, north of Slater Street. Geodetic elevation = 72.77m

FILE NO. PG4793

REMARKS

HOLE NO. BH 3

BORINGS BY CME 55 Power Auger **DATE** April 1, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	72.28
		AU	1				
FILL: Grey silty sand with gravel, some clay		SS	2	38	66	1	71.28
		SS	3	46	21	2	70.28
		SS	4	8	11		
3.28		SS	5	44	50+	3	69.28
Concrete with rebar and ties 3.73							
		RC	1	17	0	4	68.28
		RC	2	97	83	5	67.28
		RC	3	100	61	6	66.28
		RC	4	100	82	7	65.28
		RC	5	100	93	8	64.28
		RC	6	100	100	9	63.28
		RC	7	100	100	10	62.28
BEDROCK: Good to excellent quality, grey limestone		RC	8	100	100	11	61.28
		RC	9	100	100	12	60.28
		RC	10	100	95	13	59.28
		RC	11	100	100	14	58.28
		RC	12	100	10	15	57.28
19.38						16	56.28
End of Borehole						17	55.28
(GWL @ 3.50m depth - Apr 9/19)						18	54.28
						19	53.28

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %
20 40 60 80

Monitoring Well Construction

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

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Multi-Storey Redevelopment
383 Slater St. & 400 Albert St., Ottawa, Ontario

DATUM TBM - Top cover of manhole located along east side of Bay Street, just north of Slate Street. A geodetic elevation of 72.77m was provided to the TBM by Annis, O'Sullivan, Vollebekk Ltd.

REMARKS

FILE NO. PG3914

HOLE NO. BH 4-16

BORINGS BY CME 55 Power Auger **DATE** December 9, 2016

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	72.36		
FILL: Brown silty fine sand with crushed stone, some blast rock		AU	1						
0.81									
FILL: Brown sandy silt, some asphalt and concrete, trace brick		SS	2	21	4	1	71.36		
1.52									
FILL: Brown sandy silt, some gravel, cobbles and topsoil		SS	3	17	4				
1.98						2	70.36		
FILL: Crushed concrete		SS	4	33	50+				
2.59									
Concrete slab									
2.74									
FILL: Crushed stone, some sand									
2.90									
Inferred **GLACIAL TILL:** Grey silty sand, some gravel, cobbles and boulders		SS	5	0	50+	3	69.36		
3.45									
End of Borehole									
Practical refusal to augering at 3.45m depth									
(BH dry upon completion)									

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

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Multi-Storey Redevelopment
383 Slater St. & 400 Albert St., Ottawa, Ontario

DATUM TBM - Top cover of manhole located along east side of Bay Street, just north of Slate Street. A geodetic elevation of 72.77m was provided to the TBM by Annis, O'Sullivan, Vollebekk Ltd.

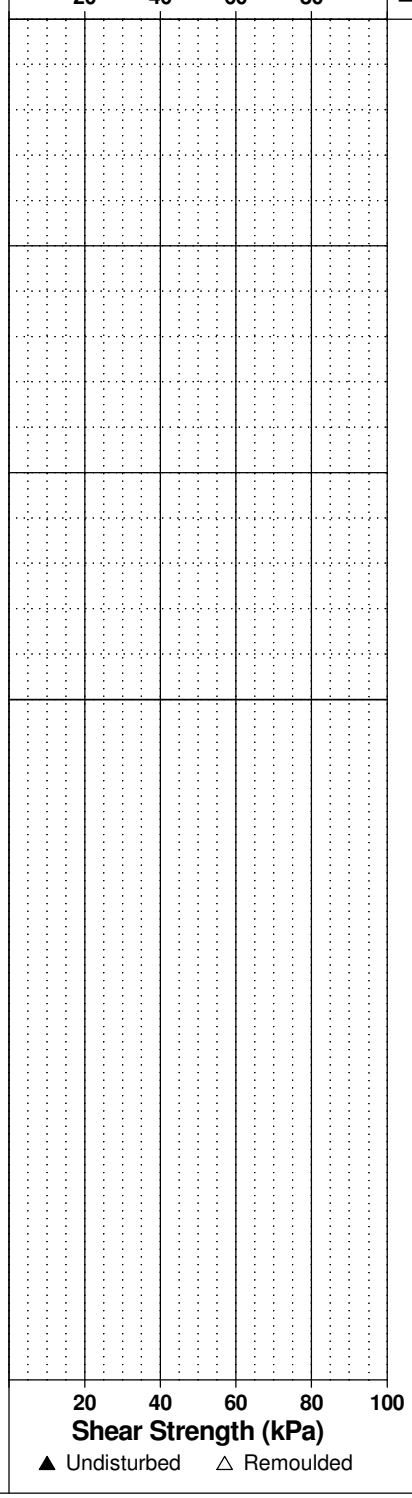
REMARKS

FILE NO. PG3914

HOLE NO. BH 5-16

BORINGS BY CME 55 Power Auger **DATE** December 9, 2016

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	71.91		
FILL: Crushed stone									
0.30		AU	1						
FILL: Brown silty sand, some concrete, brick and mortar, trace crushed stone		SS	2	46	6	1	70.91		
1.42									
FILL: Brown silty fine sand, trace boulders		SS	3	83	7	2	69.91		
2.64		SS	4	75	27				
GLACIAL TILL: Grey silty sand, some gravel, cobbles and boulders									
3.00						3	68.91		
End of Borehole									
Practical refusal to augering at 3.00m depth									
(GWL @ 2.7m depth based on field observations)									



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Multi-Storey Redevelopment
383 Slater St. & 400 Albert St., Ottawa, Ontario

DATUM TBM - Top cover of manhole located along east side of Bay Street, just north of Slate Street. A geodetic elevation of 72.77m was provided to the TBM by Annis, O'Sullivan, Vollebekk Ltd.

REMARKS

FILE NO. PG3914

HOLE NO. BH 6-16

BORINGS BY CME 55 Power Auger **DATE** December 9, 2016

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	72.19		
FILL: Crushed stone									
0.30		AU	1						
FILL: Brown silty sand with crushed stone, some concrete and mortar									
0.60		SS	2	21	5	1	71.19		
FILL: Brown fine to coarse sand, some gravel									
- trace coal by 1.5m depth		SS	3	46	2	2	70.19		▽
		SS	4	33	2				
- trace mortar by 2.7m depth 2.82									
End of Borehole									
Practical refusal to augering at 2.82m depth									
(GWL @ 2.3m depth based on field observations)									

Pen. Resist. Blows/0.3m: 20 40 60 80

Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Multi-Storey Redevelopment
383 Slater St. & 400 Albert St., Ottawa, Ontario

DATUM TBM - Top cover of manhole located along east side of Bay Street, just north of Slate Street. A geodetic elevation of 72.77m was provided to the TBM by Annis, O'Sullivan, Vollebekk Ltd.

REMARKS

FILE NO. PG3914

HOLE NO. BH 7-16

BORINGS BY CME 55 Power Auger **DATE** December 9, 2016

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	72.12		
FILL: Crushed stone									
0.30		AU	1						
FILL: Construction debris (concrete, mortar, tile)		SS	2	36	27	1	71.12		
1.32									
Concrete slab 1.47									
FILL: Brown silty fine to medium sand with crushed stone		SS	3	71	11				
1.98						2	70.12		
Brown **CLAYEY SILT** with sand									
2.21									
GLACIAL TILL: Grey sandy silt, some gravel, cobbles and boulders		SS	4	100	50+				
2.87									
End of Borehole									
Practical refusal to augering at 2.87m depth									
(BH dry upon completion)									

Pen. Resist. Blows/0.3m: 20 40 60 80

Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Multi-Storey Redevelopment
383 Slater St. & 400 Albert St., Ottawa, Ontario

DATUM TBM - Top cover of manhole located along east side of Bay Street, just north of Slate Street. A geodetic elevation of 72.77m was provided to the TBM by Annis, O'Sullivan, Vollebekk Ltd.

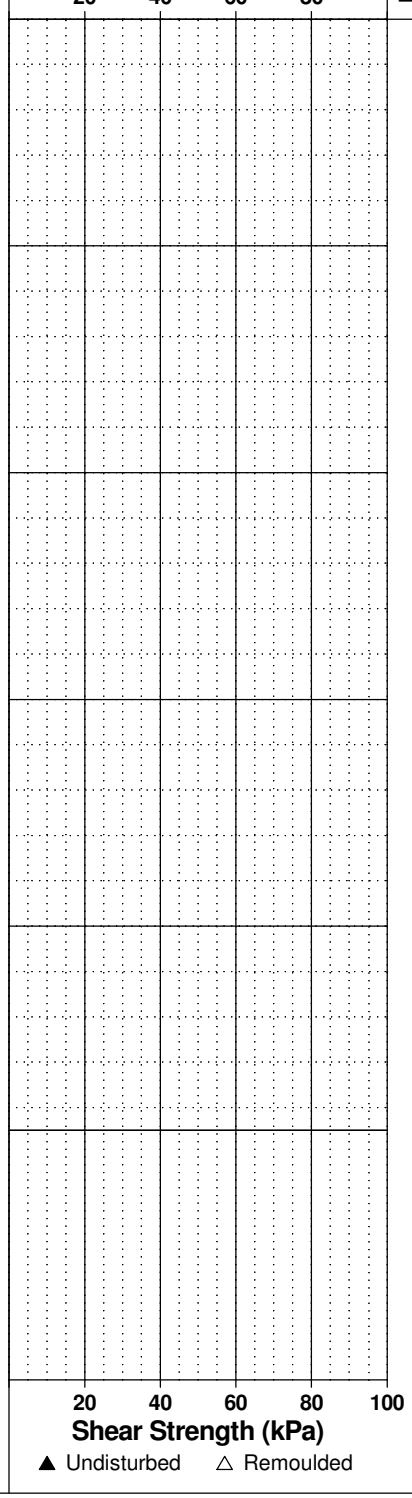
REMARKS

FILE NO. PG3914

HOLE NO. BH 8-16

BORINGS BY CME 55 Power Auger **DATE** December 9, 2016

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	72.08		
FILL: Crushed stone, trace brick									
0.25		AU	1						
FILL: Brown sandy silt with topsoil, some brick, mortar, trace wood and gravel		SS	2	79	11	1	71.08		
1.62		SS	3	88	13				
FILL: Brown clayey silt with sand, trace gravel and organics		SS	4	79	8	2	70.08		
2.97									
Brown **CLAYEY SILT,** trace sand						3	69.08		▽
3.35		SS	5	50	10				
GLACIAL TILL: Grey silty sand with gravel, cobbles and boulders		SS	6	71	15	4	68.08		
		SS	7	85	50+				
4.90									
End of Borehole									
Practical refusal to augering at 4.90m depth									
(GWL @ 4.8m depth based on field observations)									



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
383 Slater Street
Ottawa, Ontario

DATUM Benchmark (BM) - Top cover of manhole located along east side of Bay Street, just north of Slater Street. Geodetic elevation = 72.77m.

FILE NO. PE3774

REMARKS

HOLE NO. BH 9

BORINGS BY CME 55 Power Auger **DATE** April 18, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	72.06
Asphaltic concrete 0.10							
FILL: Crushed stone 0.25		SS	1	75	12		
FILL: Brown silty clay, some sand 0.71						1	71.06
FILL: Brown silty sand, some clay 1.37		SS	2	67	5		
		SS	3	92	5	2	70.06
Very stiff, brown **SILTY CLAY,** some sand 2.90		SS	4	100	8		
		RC	1	100	77	3	69.06
						4	68.06
BEDROCK: Good to excellent quality, grey limestone		RC	2	100	97	5	67.06
						6	66.06
		RC	3	100	97		
7.14						7	65.06
End of Borehole							
(GWL @ 3.30m - April 27, 2017)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
383 Slater Street
Ottawa, Ontario

DATUM Benchmark (BM) - Top cover of manhole located along east side of Bay Street, just north of Slater Street. Geodetic elevation = 72.77m.

FILE NO. PE3774

REMARKS

HOLE NO. BH10

BORINGS BY CME 55 Power Auger **DATE** April 18, 2017

SOIL DESCRIPTION	Depth (m)	Elev. (m)	Strata Plot	Sample Type	Sample Number	% Recovery	N Value or RQD
GROUND SURFACE	0	71.90					
Asphaltic concrete	0.10						
FILL: Crushed stone	0.30			SS	1	58	7
FILL: Brown silty sand, trace clay				SS	2	83	5
	1.37	70.90					
FILL: Brown sand, trace silt				SS	3	75	6
	2.13	69.90					
Compact, brown **SILTY SAND,** some clay				SS	4	83	10
	2.90						
Very stiff, grey-brown **CLAYEY SILT**	3.20	68.90		SS	5	100	50+
				RC	1	89	66
BEDROCK: Fair to excellent quality, grey limestone		67.90					
		66.90		RC	2	100	98
		65.90					
				RC	3	100	100
	7.19	64.90					
End of Borehole							
(GWL @ 3.76m - April 27, 2017)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
383 Slater Street
Ottawa, Ontario

DATUM Benchmark (BM) - Top cover of manhole located along east side of Bay Street, just north of Slater Street. Geodetic elevation = 72.77m.

FILE NO. PE3774

REMARKS

HOLE NO. BH11

BORINGS BY CME 55 Power Auger **DATE** April 18, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	72.60
Asphaltic concrete 0.10							
FILL: Crushed stone 0.25							
FILL: Brown clayey sand, some silt		SS	1	58	4		
0.90						1	71.60
		SS	2	83	4		
Very stiff, brown **SILTY CLAY**		SS	3	100	12	2	70.60
		SS	4	100	6		
- some sand by 2.7m depth						3	69.60
		SS	5	83	7		
3.66							
Very dense, brown **SILTY SAND,** some clay		SS	6	62	50+	4	68.60
4.27							
BEDROCK: Excellent quality, grey limestone		RC	1	98	93	5	67.60
						6	66.60
		RC	2	100	98		
6.81							
End of Borehole							
(GWL @ 4.59m - April 27, 2017)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
383 Slater Street
Ottawa, Ontario

DATUM Benchmark (BM) - Top cover of manhole located along east side of Bay Street, just north of Slater Street. Geodetic elevation = 72.77m.

FILE NO. PE3774

REMARKS

HOLE NO. BH12

BORINGS BY CME 55 Power Auger **DATE** April 18, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE									
Asphaltic concrete 0.10						0	72.30		
FILL: Crushed stone 0.30									
FILL: Brown silty sand 0.76		SS	1	58	11				
Very stiff, brown **SILTY CLAY**		SS	2	100	11	1	71.30		
- some sand by 2.1m depth		SS	3	100	7	2	70.30		
2.90		SS	4	100	3				
Dense, brown **SILTY SAND,** some clay 3.20		SS	5	67	50+	3	69.30		
End of Borehole									
Practical refusal to augering at 3.20m depth									

Photo Ionization Detector: ○ Lower Explosive Limit % — 20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Groundwater Quality Assessment
Proposed Development - 383 Slater St. & 400 Albert St.
Ottawa, Ontario

DATUM TBM - Top of manhole located on the east side of Bay Street, just north of Slater Street. A geodetic elevation of 72.77m was provided by Annis, O'Sullivan, Vollebekk Ltd. for the TBM.

REMARKS

FILE NO. PG3543

HOLE NO. BH 1

BORINGS BY CME 55 Power Auger **DATE** June 5, 2015

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	72.74
Asphaltic concrete 0.10		AU	1				
FILL: Brown silty sand, some gravel and cobbles		SS	2	62	3	1	71.74
- some brick and concrete by 0.4m depth 2.29		SS	3	25	16	2	70.74
		RC	1	94	61	3	69.74
		RC	2	100	86	4	68.74
		RC	3	97	92	5	67.74
		RC	4	98	95	6	66.74
BEDROCK: Grey limestone with shale lenses		RC	5	98	77	7	65.74
		RC	6	97	97	8	64.74
- calcite noted from 10.5m to 11.9m depth		RC	7	100	97	9	63.74
		RC	8	98	98	10	62.74
		RC	9	100	100	11	61.74
15.16						12	60.74
End of Borehole						13	59.74
(GWL @ 4.61m-August 17, 2015)						14	58.74
						15	57.74

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Groundwater Quality Assessment
Proposed Development - 383 Slater St. & 400 Albert St.
Ottawa, Ontario

DATUM TBM - Top of manhole located on the east side of Bay Street, just north of Slater Street. A geodetic elevation of 72.77m was provided by Annis, O'Sullivan, Vollebekk Ltd. for the TBM.

REMARKS

FILE NO. PG3543

HOLE NO. BH 2

BORINGS BY CME 55 Power Auger **DATE** June 5, 2015

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	73.72
Asphaltic concrete 0.05		AU	1				
FILL: Crushed stone with sand 0.25							
FILL: Brown silty sand with crushed stone, trace brick 1.52		SS	2	50	19	1	72.72
FILL: Gravel and boulders, some silt and sand 2.44		SS	3	67	45	2	71.72
Grey **SILTY CLAY,** trace sand 2.87		SS	4	70	10	3	70.72
GLACIAL TILL: Grey-brown silty sand with gravel and cobbles		SS	5	42	12		
4.27		SS	6	72	14	4	69.72
		RC	1	100	97	5	68.72
		RC	2	98	98	6	67.72
		RC	3	98	88	7	66.72
BEDROCK: Grey limestone with shale lenses		RC	4	95	95	8	65.72
		RC	5	100	100	9	64.72
		RC	6	98	98	10	63.72
		RC	7	97	97	11	62.72
15.22		RC	8	100	100	12	61.72
End of Borehole						13	60.72
(GWL @ 5.41m-August 17, 2015)						14	59.72
						15	58.72

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Groundwater Quality Assessment
Proposed Development - 383 Slater St. & 400 Albert St.
Ottawa, Ontario

DATUM TBM - Top of manhole located on the east side of Bay Street, just north of Slater Street. A geodetic elevation of 72.77m was provided by Annis, O'Sullivan, Vollebekk Ltd. for the TBM.

REMARKS

FILE NO. PG3543

HOLE NO. BH3

BORINGS BY CME 55 Power Auger **DATE** June 8, 2015

SOIL DESCRIPTION	Depth (m)	Elev. (m)	Strata Plot	Sample Type	Sample Number	% Recovery	N Value or RQD
GROUND SURFACE	0	72.12					
Asphaltic concrete	0.10			AU	1		
FILL: Crushed stone with silty sand	0.76						
FILL: Brown silty sand	1.55			SS	2	67	4
				SS	3	96	9
GLACIAL TILL: Grey silty sand, some gravel, cobbles and boulders				SS	4	71	50+
				RC	1		
	3.68			RC	2		
BEDROCK: Grey limestone with shale lenses				RC	3	97	90
				RC	4	100	100
				RC	5	97	85
				RC	6	100	100
				RC	7	100	90
				RC	8	100	100
				RC	9	100	100
	15.24						
End of Borehole							
(GWL @ 4.50m-August 17, 2015)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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

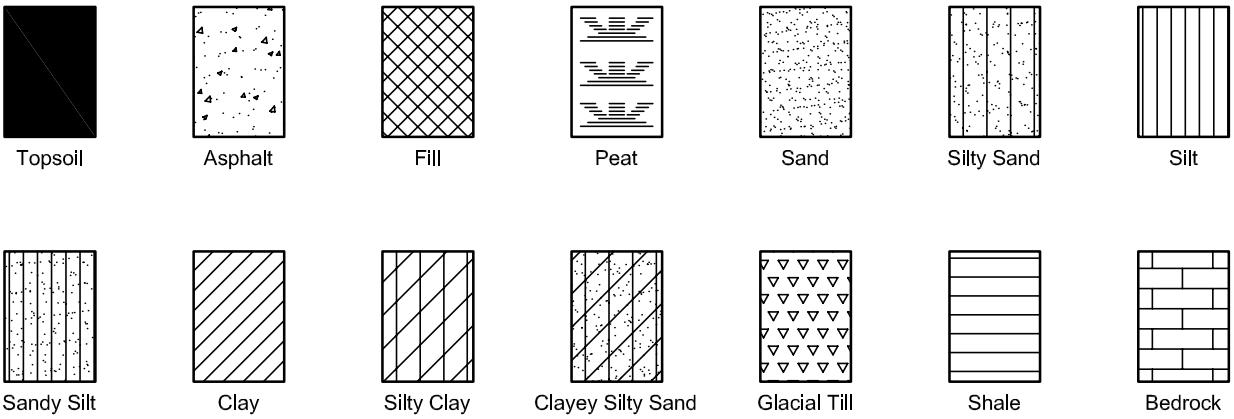
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

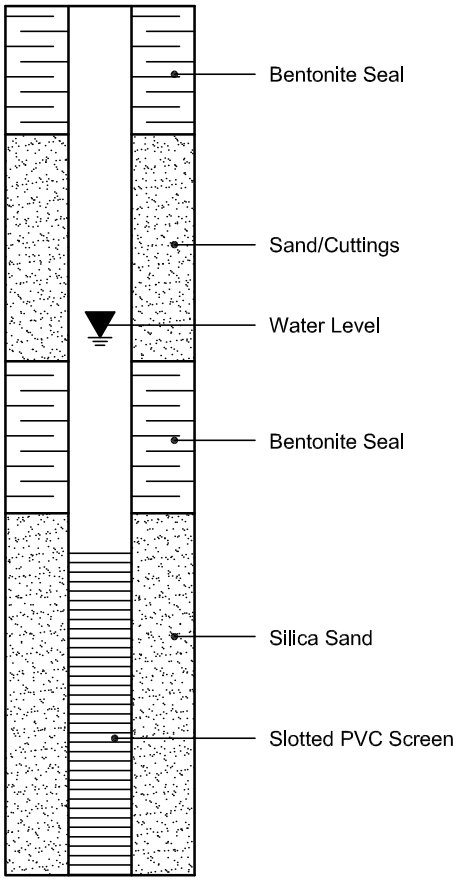
SYMBOLS AND TERMS (continued)

STRATA PLOT

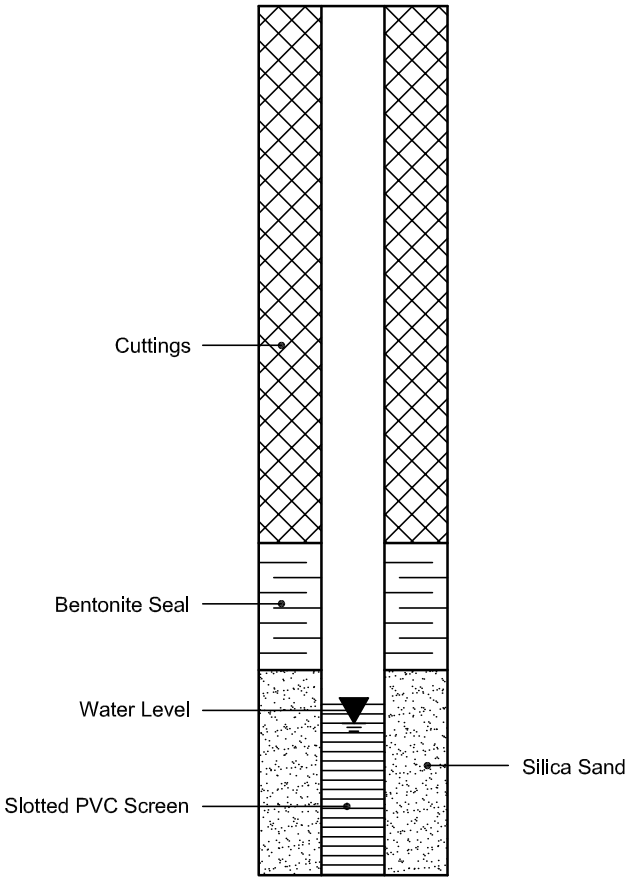


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



Client : **BROCCOLINI CONSTRUCTION inc.**

BOREHOLE REPORT

File n°: **B-0001436-1**
Borehole n°: **BH-01-12**
Date: **2012-06-12**

Project: **Phase II Environmental Site Investigation and Geotechnical Investigation**

Location: **400 Albert street, Ottawa, ON**

Coordinates (m): North 4983184,0 (Y); East 444442,0 (X); Elevation **98,90 (Z)**
Bedrock: 4,27 m End depth: 7,24 m

Sample condition: Intact; Remoulded; Lost; Core

Organoleptic soil examination:
Visual aspect: Non-existent(N); Disseminated(D); Soaked(S)
Odor: Non-existent(N); Light(L); Medium(M); Persistent(P)

Sample type

SS	Split Spoon
TM	Thin wall Tube
PS	Piston Tube
RC	Rock core
AS	Auger
MA	Bulk sample
TU	Transparent tube
PW	LVM Mega-Sampler
FG	Frozen ground

Tests

L	Consistency Limits	O.M.	Organic Matter (%)		Water Level
W_L	Liquid Limit (%)	K	Permeability (cm/s)	N	Std Penetration test (blows/300mm)
W_P	Plastic Limit (%)	UW	Unit Weight (kN/m³)	N_C	Dyn. Penetration test (blows/300mm) ●
I_P	Plasticity Index (%)	A	Absorption (l/min. m)	σ'_P	Preconsolidation Pressure (kPa)
I_L	Liquidity Index	U	Uniaxial Compressive strength (MPa)	SCI	Soil Corrosivity Index
W	Natural Water Content (%)	RQD	Rock Quality Designation (%)		
GS	Grain Size Analysis	CA	Chemical Analysis		**Undrained shear strength** (Field ▲ / Laboratory ■)
S	Hydrometer analysis	P_L	Limit Pressure (kPa)	C_U	Undisturbed (kPa) ▲ ■
R	Refusal	E_M	Pressuremeter Modulus (MPa)	C_{UR}	Remoulded (kPa) △ □
VBS	Methylene Blue Value	E_r	Modulus of subgrade reaction (MPa)		
WR	Weight of Rods	SP_O	Segregation Potential (mm²/H °C)		

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam: Odor	Organo. Exam: Visual	RESULTS
		98,90													
1		0,00	Asphalt												
2		98,88 / 0,03	***Fill:*** Gravelly sand, grey, with lump of clay			SS-1				43	1-5 5-3	10			
3	1	98,14 / 0,76	Clayey and gravelly sand with clay lump and concrete fragments			SS-2				67	2-2 3-4	5			
4		97,53 / 1,37	Clayey and gravelly sand with clay lump and concrete fragments, moist			SS-3				48	1-3 5-50 /8 cm	8			
5						SS-4				58	2-1 2-3	3			GS
6	2				el. 95,15 m 2012-06-28										
7						SS-5				42	1-3 7-5	10			
8		95,86 / 3,05	Silt and fine sand, brown												
9															
10	3														
11															
12															
13	4	94,64 / 4,27	***Rock :*** Limestone, black, fine-grained, with clay horizon			RC-6				96		75			U = 100 MPa
14															
15															
16															
17	5														
18															
19															
20	6														
21						RC-7				95		88			
22															
23	7	91,66													
24		7,24	End of borehole												
25															
26	8														
27															
28															
29															

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120

UNDRAINED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Vertical Scale = 1 : 75

Remarks:

Borehole type: **Diamond**

Boring equipment: **CME-75**

Prepared by: **S. Séguin, tech.**

Approved by: **T. Lampron**

2012-07-11

Page: 1 of 1

Client : **BROCCOLINI CONSTRUCTION inc.**

BOREHOLE REPORT

File n°: **B-0001436-1**
Borehole n°: **BH-03-12**
Date: **2012-06-12**

Project: **Phase II Environmental Site Investigation and Geotechnical Investigation**

Location: **400 Albert street, Ottawa, ON**

Coordinates (m): North 4983146,0 (Y); East 444465,0 (X); Elevation **99,13 (Z)**
Bedrock: 3,05 m End depth: 6,33 m

Sample condition: Intact; Remoulded; Lost; Core

Organoleptic soil examination:
Visual aspect: Non-existent(N); Disseminated(D); Soaked(S)
Odor: Non-existent(N); Light(L); Medium(M); Persistent(P)

Sample type

SS	Split Spoon
TM	Thin wall Tube
PS	Piston Tube
RC	Rock core
AS	Auger
MA	Bulk sample
TU	Transparent tube
PW	LVM Mega-Sampler
FG	Frozen ground

Tests

L	Consistency Limits	O.M.	Organic Matter (%)		Water Level
W_L	Liquid Limit (%)	K	Permeability (cm/s)	N	Std Penetration test (blows/300mm)
W_P	Plastic Limit (%)	UW	Unit Weight (kN/m³)	N_C	Dyn. Penetration test (blows/300mm) ●
I_P	Plasticity Index (%)	A	Absorption (l/min. m)	σ'_P	Preconsolidation Pressure (kPa)
I_L	Liquidity Index	U	Uniaxial Compressive strength (MPa)	SCI	Soil Corrosivity Index
W	Natural Water Content (%)	RQD	Rock Quality Designation (%)		
GS	Grain Size Analysis	CA	Chemical Analysis		Undrained shear strength (Field ▲ / Laboratory ■)
S	Hydrometer analysis	P_L	Limit Pressure (kPa)	C_U	Undisturbed (kPa)
R	Refusal	E_M	Pressuremeter Modulus (MPa)	C_{UR}	Remoulded (kPa) △ □
VBS	Methylene Blue Value	E_r	Modulus of subgrade reaction (MPa)		
WR	Weight of Rods	SP_O	Segregation Potential (mm²/H °C)		

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam: Odor	Organo. Exam: Visual	RESULTS
		99,13													
1		0,00 / 99,08	Asphalt												
2		0,05 / 98,37	***Fill:*** Sandy gravel with some silt, grey-black, moist			SS-1				33	2-3 7-2	10			
3	1	0,76	Fine sand with some silt, beige, dry			SS-2				62	3-2 3-4	5			GS
4															
5						SS-3				67	2-2 4-3	6			
6	2														
7		96,84													
8		2,29	Sandy silt with traces of gravel, grey, saturated, with trace of oxydation			SS-4				58	4-6 4-50 /3 cm	10			
9															
10	3	96,08 / 3,05	***Rock :*** Limestone, black, fine-grained, with clay horizon			SS-5				0	50	R			
11															
12						CR-6				100		89			
13	4														
14															
15															
16						CR-7				98		83			
17	5														
18															
19															
20	6					CR-8				100		100			
21		92,80 / 6,33	End of borehole												
22															
23	7														
24															
25															
26	8														
27															
28															
29															

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120
UNDRAINED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Vertical Scale = 1 : 75

Remarks:

Borehole type: **Diamond**

Boring equipment: **CME-75**

Prepared by: **S. Séguin, tech.** | Approved by: **T. Lampron** | 2012-07-11 | Page: 1 of 1

Client : **BROCCOLINI CONSTRUCTION inc.**

BOREHOLE REPORT

File n°: **B-0001436-1**
Borehole n°: **BH-04-12**
Date: **2012-06-12**

Project: **Phase II Environmental Site Investigation and Geotechnical Investigation**

Location: **400 Albert street, Ottawa, ON**

Coordinates (m): North 4983177,0 (Y); East 444497,0 (X); Elevation **99,61 (Z)**
Bedrock: 4,85 m End depth: 8,86 m

Sample condition: Intact; Remoulded; Lost; Core

Organoleptic soil examination: Visual aspect: Non-existent(N); Disseminated(D); Soaked(S). Odor: Non-existent(N); Light(L); Medium(M); Persistent(P)

Sample type

SS	Split Spoon
TM	Thin wall Tube
PS	Piston Tube
RC	Rock core
AS	Auger
MA	Bulk sample
TU	Transparent tube
PW	LVM Mega-Sampler
FG	Frozen ground

Tests

L	Consistency Limits	O.M.	Organic Matter (%)
W_L	Liquid Limit (%)	K	Permeability (cm/s)
W_P	Plastic Limit (%)	UW	Unit Weight (kN/m³)
I_P	Plasticity Index (%)	A	Absorption (l/min. m)
I_L	Liquidity Index	U	Uniaxial Compressive strength (MPa)
W	Natural Water Content (%)	RQD	Rock Quality Designation (%)
GS	Grain Size Analysis	CA	Chemical Analysis
S	Hydrometer analysis	P_L	Limit Pressure (kPa)
R	Refusal	E_M	Pressuremeter Modulus (MPa)
VBS	Methylene Blue Value	E_r	Modulus of subgrade reaction (MPa)
WR	Weight of Rods	SP_O	Segregation Potential (mm²/H °C)

▼	Water Level
N	Std Penetration test (blows/300mm)
N_C	Dyn. Penetration test (blows/300mm) ●
σ'_P	Preconsolidation Pressure (kPa)
SCI	Soil Corrosivity Index

Undrained shear strength

	Field	Laboratory
C_U Undisturbed (kPa)	▲	■
C_{UR} Remoulded (kPa)	△	□

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam: Odor	Organo. Exam: Visual	RESULTS
		99,61													
1-		0,00 / 99,56	Topsoil												
2-		0,05 / 98,85	***Fill:*** Sandy silt with some gravel, grey-black			SS-1				87	4-7 5-4	12			
3-	1	0,76 / 98,09	Silty fine sand, brown, with clay lump and roots			SS-2				79	4-4 4-4	8			
4-		1,52 / 97,33	Silty fine sand, beige, with clay lump			SS-3				83	4-3 3-3	6			
5-	2	2,29 / 96,56	Clay, grey, with roots, moist			SS-4				46	2-2 2-3	4			
6-		3,05 / 95,04	Clay with trace of coarse gravel, grey, with roots, moist		el. 94,95 m 2012-06-28	SS-5				42	2-3 8-12	11			
7-	3	4,57 / 94,76	Sandy and silty gravel, grey-black			SS-6				60	25-50	R			
8-		4,85	***Rock:*** Limestone, black, fine-grained, with clay horizon			RC-7				87		66			
9-	4														
10-															
11-	5					RC-8				100		83			
12-															
13-	6														
14-															
15-						RC-9				98		90			U = 107 MPa
16-	7														
17-															
18-															
19-	8														
20-															
21-															
22-															
23-															
24-															
25-															
26-															
27-															
28-															
29-		90,75													

NATURAL WATER CONTENT AND LIMITS (%) Wp W WL — 20 40 60 80 100 120

UNDRAINED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Vertical Scale = 1 : 75

Remarks:

Borehole type: **Diamond**

Boring equipment: **CME-75**

Prepared by: **S. Séguin, tech.**

Approved by: **T. Lampron**

2012-07-11

Page: 1 of 1

Client : **BROCCOLINI CONSTRUCTION inc.**

BOREHOLE REPORT

File n°: **B-0001436-1**
Borehole n°: **BH-05-12**
Date: **2012-06-13**

Project: **Phase II Environmental Site Investigation and Geotechnical Investigation**

Location: **400 Albert street, Ottawa, ON**

Coordinates (m): North 4983153,0 (Y); East 444477,0 (X); Elevation **99,15 (Z)**
Bedrock: m End depth: 3,43 m

Sample condition: Intact; Remoulded; Lost; Core

Organoleptic soil examination:
Visual aspect: Non-existent(N); Disseminated(D); Soaked(S)
Odor: Non-existent(N); Light(L); Medium(M); Persistent(P)

Sample type

SS	Split Spoon
TM	Thin wall Tube
PS	Piston Tube
RC	Rock core
AS	Auger
MA	Bulk sample
TU	Transparent tube
PW	LVM Mega-Sampler
FG	Frozen ground

Tests

L	Consistency Limits	O.M.	Organic Matter (%)
W_L	Liquid Limit (%)	K	Permeability (cm/s)
W_P	Plastic Limit (%)	UW	Unit Weight (kN/m³)
I_P	Plasticity Index (%)	A	Absorption (l/min. m)
I_L	Liquidity Index	U	Uniaxial Compressive strength (MPa)
W	Natural Water Content (%)	RQD	Rock Quality Designation (%)
GS	Grain Size Analysis	CA	Chemical Analysis
S	Hydrometer analysis	P_L	Limit Pressure (kPa)
R	Refusal	E_M	Pressuremeter Modulus (MPa)
VBS	Methylene Blue Value	E_r	Modulus of subgrade reaction (MPa)
WR	Weight of Rods	SP_O	Segregation Potential (mm²/H °C)

▼	Water Level
N	Std Penetration test (blows/300mm)
N_C	Dyn. Penetration test (blows/300mm) ●
σ'_P	Preconsolidation Pressure (kPa)
SCI	Soil Corrosivity Index

Undrained shear strength (Field ▲ / Laboratory ■)
C_U Undisturbed (kPa)
C_{UR} Remoulded (kPa) (△ / □)

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam: Odor	Organo. Exam: Visual	RESULTS
		99,15													
		0,00 / 99,06	Asphalt												
		0,09 / 98,54	***Fill:*** Sandy silt with some gravel, grey-black			SS-1				49	1-7 9-11	16			
	1	0,61 / 97,93	Gravelly sand with some silt, grey, with trace of oxydation			SS-2				58	6-13 6-7	19			
		1,22 / 97,32	Sand with some silt and trace of gravel, grey-beige, with zone of black sand, moist			SS-3				75	6-12 9-9	21			VOC: 70ppm
	2	1,83 / 96,71	Sand with some silt and trace of gravel, grey, moist			SS-4				71	3-4 5-5	9			VOC: 0ppm
		2,44	Silty sand with trace of gravel, grey, very moist			SS-5				58	2-3 4-4	7			VOC: 0ppm
	3	95,72				SS-6				40	2-8 50 /8 cm	R			
		3,43	End of borehole												
	4														
	5														
	6														
	7														
	8														

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120
UNDRAINED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Vertical Scale = 1 : 75

Remarks:

Borehole type: **Auger**

Boring equipment: **CME-75**

Prepared by: **S. Séguin, tech.**

Approved by: **T. Lampron**

2012-07-11

Page: 1 of 1

Client : **BROCCOLINI CONSTRUCTION inc.**

BOREHOLE REPORT

File n°: **B-0001436-1**
Borehole n°: **BH-06-12**
Date: **2012-06-13**

Project: **Phase II Environmental Site Investigation and Geotechnical Investigation**

Location: **400 Albert street, Ottawa, ON**

Coordinates (m): North 4983159,0 (Y); East 444468,0 (X); Elevation **99,26 (Z)**
Bedrock: m End depth: 3,12 m

Sample condition: Intact; Remoulded; Lost; Core

Organoleptic soil examination:
Visual aspect: Non-existent(N); Disseminated(D); Soaked(S)
Odor: Non-existent(N); Light(L); Medium(M); Persistent(P)

Sample type

SS	Split Spoon
TM	Thin wall Tube
PS	Piston Tube
RC	Rock core
AS	Auger
MA	Bulk sample
TU	Transparent tube
PW	LVM Mega-Sampler
FG	Frozen ground

Tests

L	Consistency Limits	O.M.	Organic Matter (%)		Water Level
W_L	Liquid Limit (%)	K	Permeability (cm/s)	N	Std Penetration test (blows/300mm)
W_P	Plastic Limit (%)	UW	Unit Weight (kN/m³)	N_C	Dyn. Penetration test (blows/300mm) ●
I_P	Plasticity Index (%)	A	Absorption (l/min. m)	σ'_P	Preconsolidation Pressure (kPa)
I_L	Liquidity Index	U	Uniaxial Compressive strength (MPa)	SCI	Soil Corrosivity Index
W	Natural Water Content (%)	RQD	Rock Quality Designation (%)		
GS	Grain Size Analysis	CA	Chemical Analysis		Undrained shear strength (Field ▲ / Laboratory ■)
S	Hydrometer analysis	P_L	Limit Pressure (kPa)	C_U	Undisturbed (kPa)
R	Refusal	E_M	Pressuremeter Modulus (MPa)	C_{UR}	Remoulded (kPa) △ □
VBS	Methylene Blue Value	E_r	Modulus of subgrade reaction (MPa)		
WR	Weight of Rods	SP_O	Segregation Potential (mm²/H °C)		

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam: Odor	Organo. Exam: Visual	RESULTS
		99,26													
1		0,00 / 99,20	Asphalt												
2		0,05 / 98,65	***Fill:*** Gravelly sand with some silt, grey			SS-1				46	1-7 / 3-2	10			VOC: 0ppm
3	1	0,61	Clayey silt, grey			SS-2				83	2-3 / 4-7	7			VOC: 0ppm
4						SS-3				87	3-3 / 4-4	7			VOC: 0ppm
5		97,43 / 1,83	Silty sand with trace of gravel and clay, grey, with trace of oxydation, very moist			SS-4				46	4-2 / 3-3	5			
6	2	96,82 / 2,44	Silty sand with some gravel, grey, very moist			SS-5				71	2-1 / 4-8	5			VOC: 30ppm
7		96,21 / 3,05	Sand with some silt and rock fragment, grey			SS-6				100	50 /8 cm	R			
8	3	96,13 / 3,12	End of borehole												
9															
10															
11	4														
12															
13															
14															
15	5														
16															
17															
18															
19	6														
20															
21															
22															
23	7														
24															
25															
26	8														
27															
28															
29															

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120

UNDRAINED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Vertical Scale = 1 : 75

Remarks:

Borehole type: **Auger**

Boring equipment: **CME-75**

Prepared by: **S. Séguin, tech.**

Approved by: **T. Lampron**

2012-07-11

Page: 1 of 1

Client : **BROCCOLINI CONSTRUCTION inc.**

BOREHOLE REPORT

File n°: **B-0001436-1**
Borehole n°: **BH-07-12**
Date: **2012-06-13**

Project: **Phase II Environmental Site Investigation and Geotechnical Investigation**

Location: **400 Albert street, Ottawa, ON**

Coordinates (m): North 4983169,0 (Y); East 444460,0 (X); Elevation **99,59 (Z)**
Bedrock: m End depth: 2,97 m

Sample condition: Intact; Remoulded; Lost; Core

Organoleptic soil examination: Visual aspect: Non-existent(N); Disseminated(D); Soaked(S). Odor: Non-existent(N); Light(L); Medium(M); Persistent(P)

Sample type

SS	Split Spoon
TM	Thin wall Tube
PS	Piston Tube
RC	Rock core
AS	Auger
MA	Bulk sample
TU	Transparent tube
PW	LVM Mega-Sampler
FG	Frozen ground

Tests

L	Consistency Limits	O.M.	Organic Matter (%)		Water Level
W_L	Liquid Limit (%)	K	Permeability (cm/s)	N	Std Penetration test (blows/300mm)
W_P	Plastic Limit (%)	UW	Unit Weight (kN/m³)	N_C	Dyn. Penetration test (blows/300mm) ●
I_P	Plasticity Index (%)	A	Absorption (l/min. m)	σ'_P	Preconsolidation Pressure (kPa)
I_L	Liquidity Index	U	Uniaxial Compressive strength (MPa)	SCI	Soil Corrosivity Index
W	Natural Water Content (%)	RQD	Rock Quality Designation (%)		
GS	Grain Size Analysis	CA	Chemical Analysis		Undrained shear strength (Field ▲ / Laboratory ■)
S	Hydrometer analysis	P_L	Limit Pressure (kPa)	C_U	Undisturbed (kPa) ▲ ■
R	Refusal	E_M	Pressuremeter Modulus (MPa)	C_{UR}	Remoulded (kPa) △ □
VBS	Methylene Blue Value	E_r	Modulus of subgrade reaction (MPa)		
WR	Weight of Rods	SP_O	Segregation Potential (mm²/H °C)		

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam: Odor	Organo. Exam: Visual	RESULTS
		99,59													
1-		0,00 / 99,51	Asphalt												
2-		0,08 / 98,98	***Fill:*** Clayey silt with some sand and trace of gravel, grey			SS-1				48	2-5 4-3	9			
3-	1	0,61	Clayey silt, grey			SS-2				83	3-4 5-4	9			VOC: 10ppm
4-															
5-						SS-3				87	2-3 5-5	8			VOC: 0ppm
6-		97,76 / 1,83	Clayey silt with some sand and trace of gravel, grey												
7-	2					SS-4				67	4-5 6-6	11			
8-		97,15 / 2,44	Silty sand with some gravel et trace of rock fragment, grey			SS-5				76	1-50 /30 cm	R			VOC: 0ppm
9-		96,62 / 2,97	End of borehole												
10-	3														
11-															
12-															
13-	4														
14-															
15-															
16-	5														
17-															
18-															
19-															
20-	6														
21-															
22-															
23-	7														
24-															
25-															
26-	8														
27-															
28-															
29-															

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120

UNDRAINED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Vertical Scale = 1 : 75

Remarks:

Borehole type: **Auger**

Boring equipment: **CME-75**

Prepared by: **S. Séguin, tech.** | Approved by: **T. Lampron** | 2012-07-11 | Page: 1 of 1

EXPLANATION NOTE ON SOUNDING LOGS

The following sounding logs summarize soils and rock geotechnical properties as well as ground water conditions, as collected during field work and/or obtained from laboratory tests. This note explains the different symbols and abbreviations used in these logs.

STRATIGRAPHIC UNITS

Elevation/Depth: Reference to the geodesic elevation of the soil or to a bench mark of arbitrary elevation, at the location of the sounding. Depth of the different geological boundaries as measured from ground surface. On the left, the scale is in meters while on the right, it is in feet.

Description of the stratigraphic units: Every geological formation is detailed.

The proportion of the different elements of the soil, defined according to the size of the particles, is given following the classification hereafter. The relative compactness of cohesionless soils is defined by the "N" index of the Standard Penetration Test. The consistency of cohesive soils is defined by their shear resistance.

Classification	Particle size (mm)
Clay	< 0.002
Clay and silt (undifferentiated)	< 0.08
Sand	0.08 to 5
Gravel	5 to 80
Cobble	80 to 300
Boulder	> 300

Descriptive terminology	Proportion (%)
"Traces" (tr.)	1 to 10
"Some" (s.)	10 to 20
Adjective (ex.: sandy, silty)	20 to 35
"And" (ex.: sand and gravel)	35 to 50

Compactness of cohesionless soils	Standard Penetration Test index ("N" value), ASTM D-1586 (blows for a 300mm penetration)
Very loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very dense	> 50

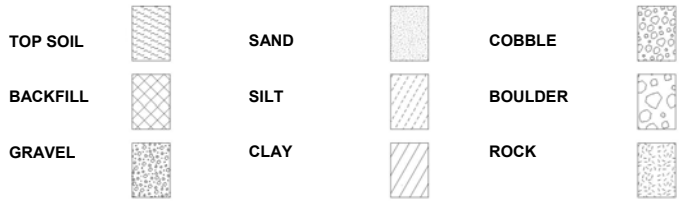
Consistency of cohesive soils	Undrained shear strength (kPa)
Very soft	< 12
Soft	12 to 25
Firm	25 to 50
Stiff	50 to 100
Very stiff	100 to 200
Hard	> 200

Plasticity of cohesive soils	Liquid limit (%)
Low	< 30
Medium	30 to 50
High	> 50

Sensitivity of cohesive soils	$S_t = (C_u/C_{ur})$
Low	$S_t < 2$
Medium	$2 < S_t < 4$
High	$4 < S_t < 8$
Extra-sensitive	$8 < S_t < 16$
Quick (sensitive) clay	$S_t > 16$

Classification of rock	RQD (%)
Very poor quality	< 25
Poor quality	25 to 50
Fair quality	50 to 75
Good quality	75 to 90
Excellent quality	90 to 100

SYMBOLS



WATER LEVEL

This column shows the ground water level, as measured at a given time during the geotechnical investigation. The details of the installation (type and depth) are also illustrated in this column.

SAMPLES

Type and number: Each sample is labelled in accordance with the number of this column and the given notation refers to samples types.

Sub-sample: When a sample contains two or more different stratigraphic units, it is sometimes necessary to separate it and create sub-samples. This column allows for the identification of the latter and the association to *in situ* or laboratory measurements to these sub-samples.

Condition: The position, length and condition of each sample are shown in this column. The symbol shows the condition of the sample, following the legend given on the sounding log.

Size: This column indicates the split spoon sampler size.

"N" index The standard penetration index shown in this column is expressed with the letter "N". This index is obtained with the Standard Penetration Test. It corresponds to the number of blows required to drive the last 300mm of the split spoon, using a 622 Newton hammer falling freely from a height of 762mm (ASTM D-1586). For a 610mm long split spoon, the "N" index is obtained by adding the number of blows required for the driving of the 2nd and 3rd 150mm of the split spoon. Refusal (R) indicates a number of blows greater than 100. A set of numbers such as 28-30-50/60mm indicates that the number of blows required to drive the 1st and 2nd 150mm of the split spoon are respectively 28 and 30. Moreover, it indicates that 50 blows were necessary to get a penetration of 60mm, whereupon the test was suspended.

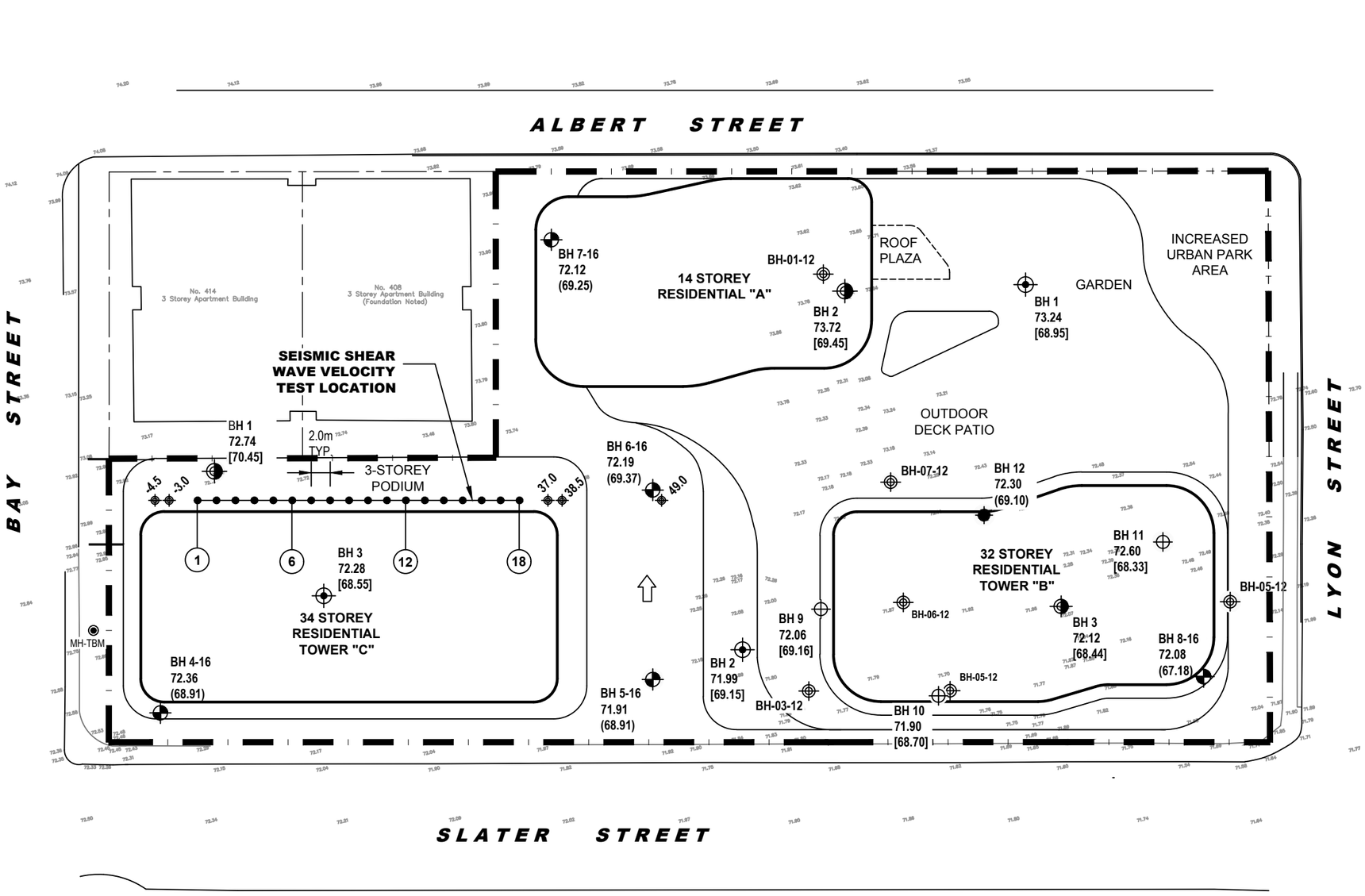
RQD index: Rock Quality Designation index: This index is defined as the ratio between the total length of all rock cores of 100mm and more in length over the total length of the core run. The RQD index is an indirect measurement of the number of "natural" fractures and of the amount of the alteration in a rock mass.

TESTS

Results: This column shows, for the corresponding depth, the results of tests carried out in the field or in the laboratory (shear strength, dynamic penetration, Atterberg limits with the cone, etc.). For more information, please refer to the legend in the upper part of the sounding log. However, an abbreviation indicating the type of analysis performed is shown next to the sample tested.

Graph: This graph shows the undrained shear strength resistance of cohesive soils, as measured *in situ* or in the laboratory (NQ 2501-200). It is also used to present the Dynamic Cone Penetration Test (NQ 2501-145) results.

Moreover, this graph is used for the representation of the water content and Atterberg limits test results.



LEGEND:

- BOREHOLE WITH MONITORING WELL LOCATION, CURRENT INVESTIGATION
- BOREHOLE LOCATION, PATERSON GROUP REPORT PG3914
- BOREHOLE WITH MONITORING WELL LOCATION, PATERSON GROUP REPORT NO. PE3774
- BOREHOLE LOCATION, PATERSON GROUP REPORT NO. PE3774
- BOREHOLE WITH MONITORING WELL LOCATION, PATERSON GROUP REPORT PG3543-08, 2015
- APPROXIMATE BOREHOLE LOCATION BY OTHERS

72.74 GROUND SURFACE ELEVATION (m)

[70.45] BEDROCK SURFACE ELEVATION (m)

(68.91) PRACTICAL REFUSAL TO AUGERING ELEV. (m)

GEOPHONE LOCATION

18 GEOPHONE NUMBER

-3.0 SHOT LOCATION

TBM - TOP COVER OF MANHOLE LOCATED ALONG EAST SIDE OF BAY STREET, JUST NORTH OF SLATER STREET. A GEODETIC ELEVATION OF 72.77m WAS PROVIDED FOR THE TBM BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD.

BASE PLAN PROVIDED BY WOODMAN ARCHITECT & ASSOCIATES LTD.

SCALE: 1:500

0 5 10 15 20 25 30m

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

NO.	REVISIONS	DATE	INITIAL

MAIN AND MAIN DEVELOPMENTS

GEOTECHNICAL INVESTIGATION
MULTI-STOREY REDEVELOPMENT - 383 SLATER ST. & 400 ALBERT ST.

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:500	Date: 04/2019
Drawn by: RCG	Report No.: PG4793-1
Checked by: NC	Dwg. No.: PG4793-1
Approved by: DJG	Revision No.: 0

p:\autocad drawings\geotechnical\pg47xx\pg4793-1(rev) thlp.dwg

APPENDIX 3

MTO IDF Curves

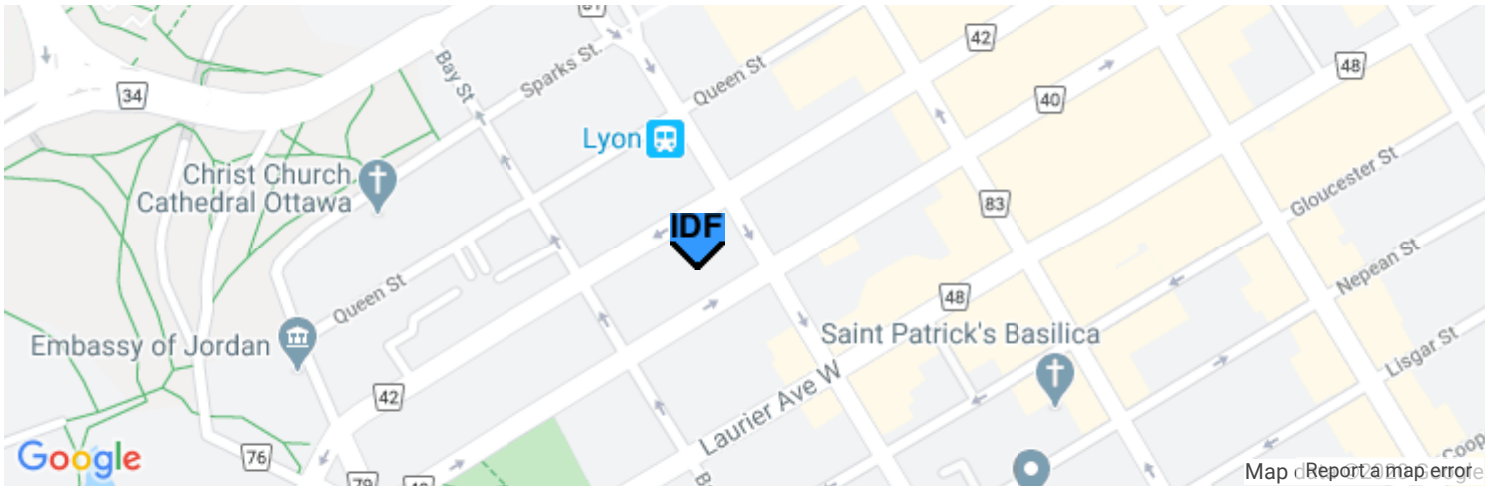
Sample Calculations - Dupuit Forchheimer

Ontario IDF CURVE LOOKUP

Active coordinate

45° 25' 15" N, 75° 42' 14" W (45.420833,-75.704167)

Retrieved: Thu, 23 Jul 2020 20:36:56 GMT



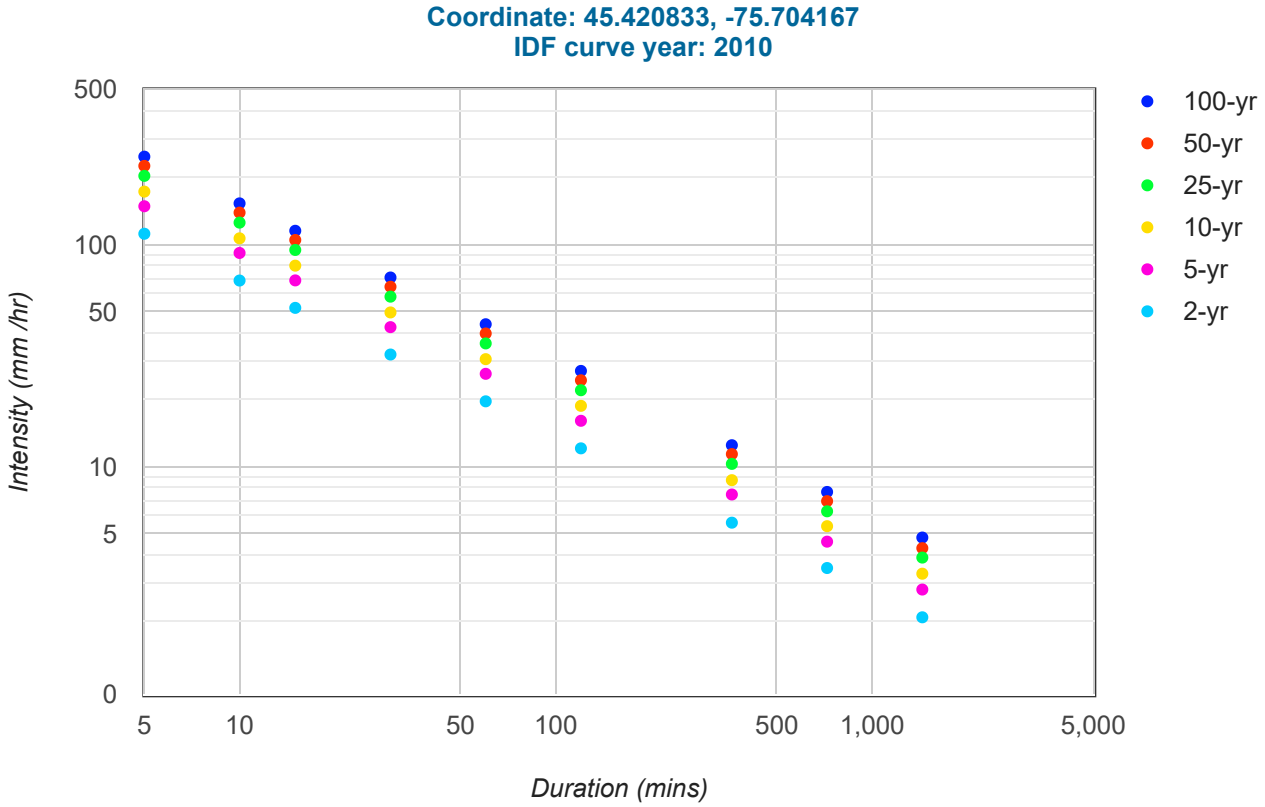
Location summary

These are the locations in the selection.

IDF Curve: 45° 25' 15" N, 75° 42' 14" W (45.420833,-75.704167)

Results

An IDF curve was found.



Coefficient summary

IDF Curve: 45° 25' 15" N, 75° 42' 14" W (45.420833,-75.704167)

Retrieved: Thu, 23 Jul 2020 20:36:56 GMT

Data year: 2010
IDF curve year: 2010

Return period	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
A	19.7	26.2	30.5	35.9	39.8	43.8
B	-0.699	-0.699	-0.699	-0.699	-0.699	-0.699

Statistics

Rainfall intensity (mm hr^{-1})

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	111.9	68.9	51.9	32.0	19.7	12.1	5.6	3.5	2.1
5-yr	148.8	91.7	69.0	42.5	26.2	16.1	7.5	4.6	2.8
10-yr	173.2	106.7	80.4	49.5	30.5	18.8	8.7	5.4	3.3
25-yr	203.9	125.6	94.6	58.3	35.9	22.1	10.3	6.3	3.9
50-yr	226.1	139.3	104.9	64.6	39.8	24.5	11.4	7.0	4.3
100-yr	248.8	153.3	115.4	71.1	43.8	27.0	12.5	7.7	4.8

Rainfall depth (mm)

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	9.3	11.5	13.0	16.0	19.7	24.3	33.8	41.6	51.3
5-yr	12.4	15.3	17.3	21.3	26.2	32.3	44.9	55.4	68.2
10-yr	14.4	17.8	20.1	24.8	30.5	37.6	52.3	64.4	79.4
25-yr	17.0	20.9	23.7	29.1	35.9	44.2	61.6	75.8	93.4
50-yr	18.8	23.2	26.2	32.3	39.8	49.0	68.3	84.1	103.6
100-yr	20.7	25.5	28.9	35.6	43.8	54.0	75.1	92.5	114.0

Terms of Use

Estimated Groundwater Inflow

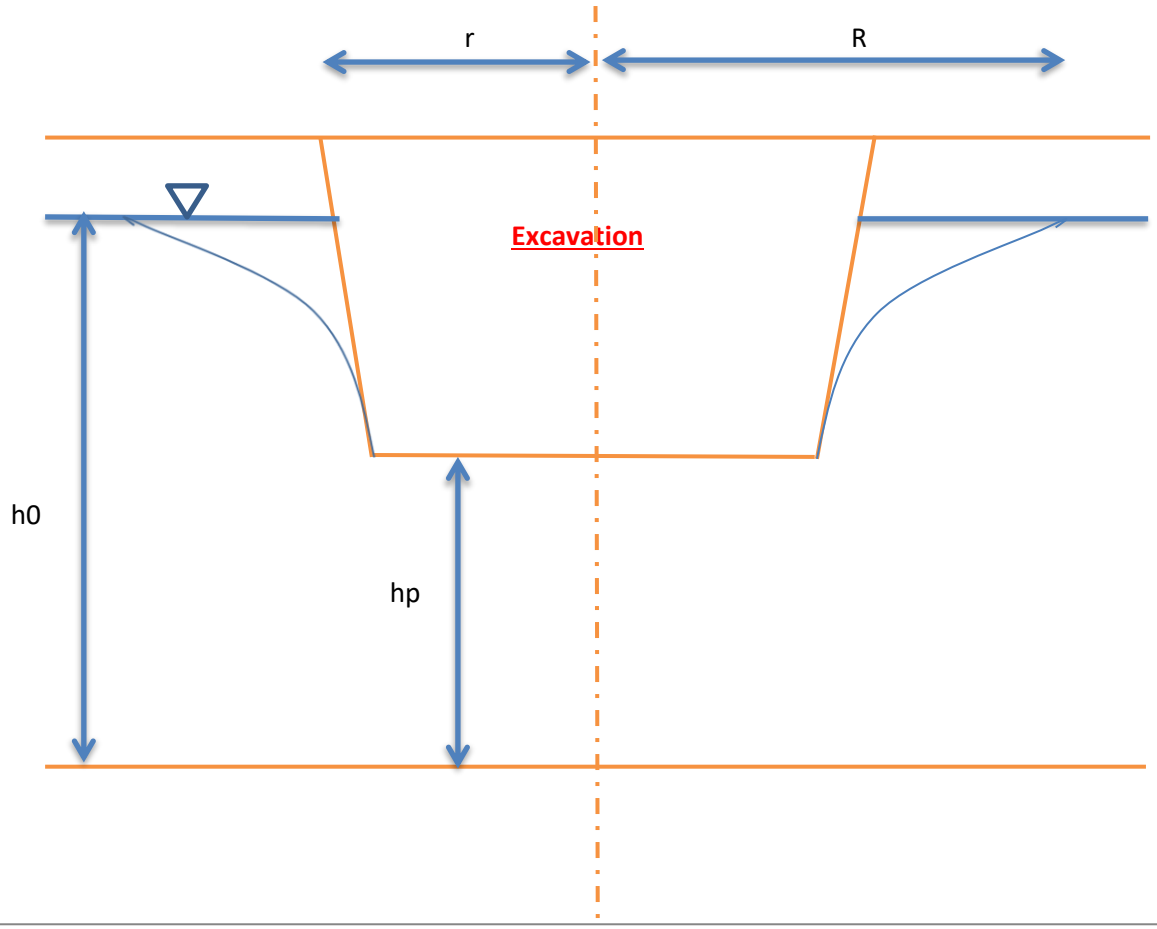
Main and Main Developments - 400 Albert Street - Building Excavation Footprint

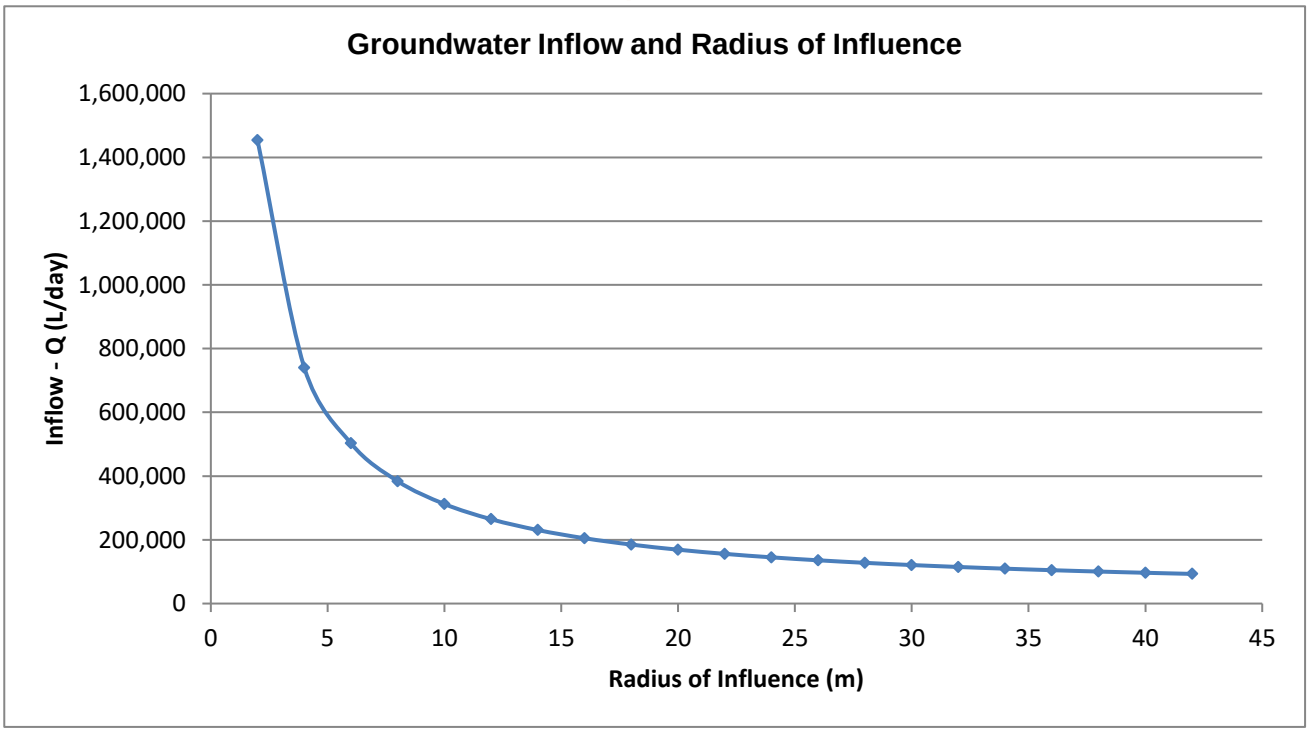
Dupuit-Forchheimer Equation $Q = \pi K((h_0^2 - h_p^2)/\ln(R/r))$

Equivalent Radius of Excavation = A+B=Pi*r

K (m/sec) =	1.00E-06		
h0 (m) =	17.5	Excavation Width (A) =	115 m
hp (m) =	10	Excavation Length (B) =	45 m
r (m) =	50.93	Perimeter Length =	320 m
		Equivalent Radius (r) =	50.93 m

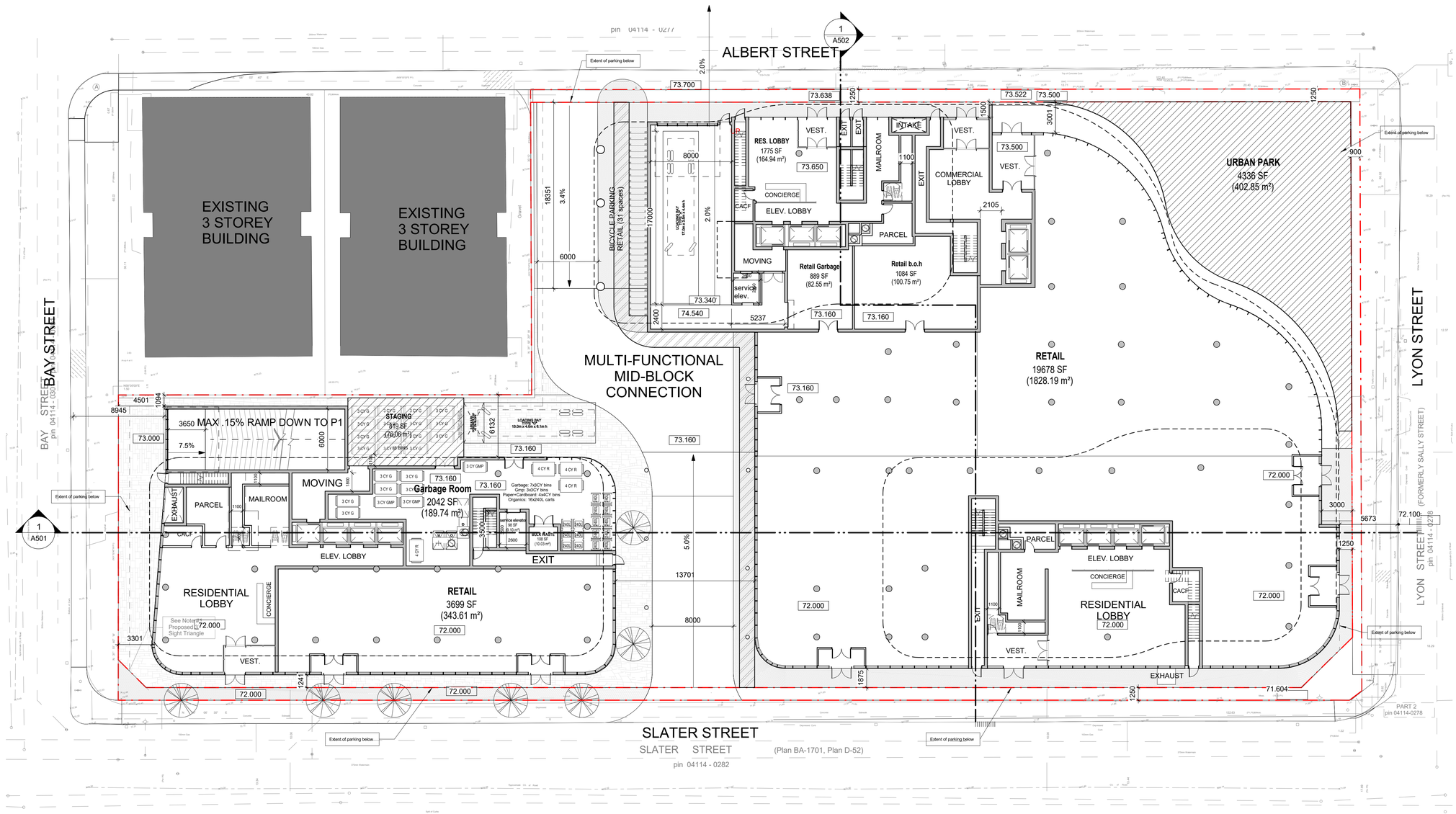
R	Distance to edge of excavation	Q (m^3/s)	Q (m^3/day)	Q (L/day)
52.93	2.00	0.0168	1,453	1,453,412
54.93	4.00	0.0086	740	740,439
56.93	6.00	0.0058	503	502,672
58.93	8.00	0.0044	384	383,711
60.93	10.00	0.0036	312	312,276
62.93	12.00	0.0031	265	264,605
64.93	14.00	0.0027	231	230,517
66.93	16.00	0.0024	205	204,919
68.93	18.00	0.0021	185	184,982
70.93	20.00	0.0020	169	169,009
72.93	**22.00**	**0.0018**	**156**	**155,920**
74.93	24.00	0.0017	145	144,995
76.93	26.00	0.0016	136	135,734
78.93	28.00	0.0015	128	127,783
80.93	30.00	0.0014	121	120,879
82.93	32.00	0.0013	115	114,826
84.93	34.00	0.0013	109	109,475
86.93	36.00	0.0012	105	104,709
88.93	38.00	0.0012	100	100,436
90.93	40.00	0.0011	97	96,582
92.93	42.00	0.0011	93	93,088


r
R
Excavation
h0
hp


Groundwater Inflow and Radius of Influence
Inflow - Q (L/day)
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
0
5
10
15
20
25
30
35
40
45
Radius of Influence (m)

APPENDIX 4

IBI Group - Plan/Profile Drawings



CLIENT

5015218 Ontario Inc. and Albert & Main Developments Inc.

109 Atlantic Avenue, Toronto, ON, M6K 1X4

ISSUES

01	ISSUED FOR REZONING	2019-08-29
02	ISSUED FOR REZONING	2020-05-04

SEAL

PRIME CONSULTANT
IBI GROUP
55 St. Clair Avenue West, 7th Floor,
Toronto, ON M4V 2Y7, Canada
tel 416 596 1930 fax 416 596 0644
ibigroup.com

PROJECT

400 Albert Street

383 Slater Street/400 Albert Street
Ottawa, Ontario

PROJECT NO: 120068

SCALE:	DATE
1 : 200	07/02/20

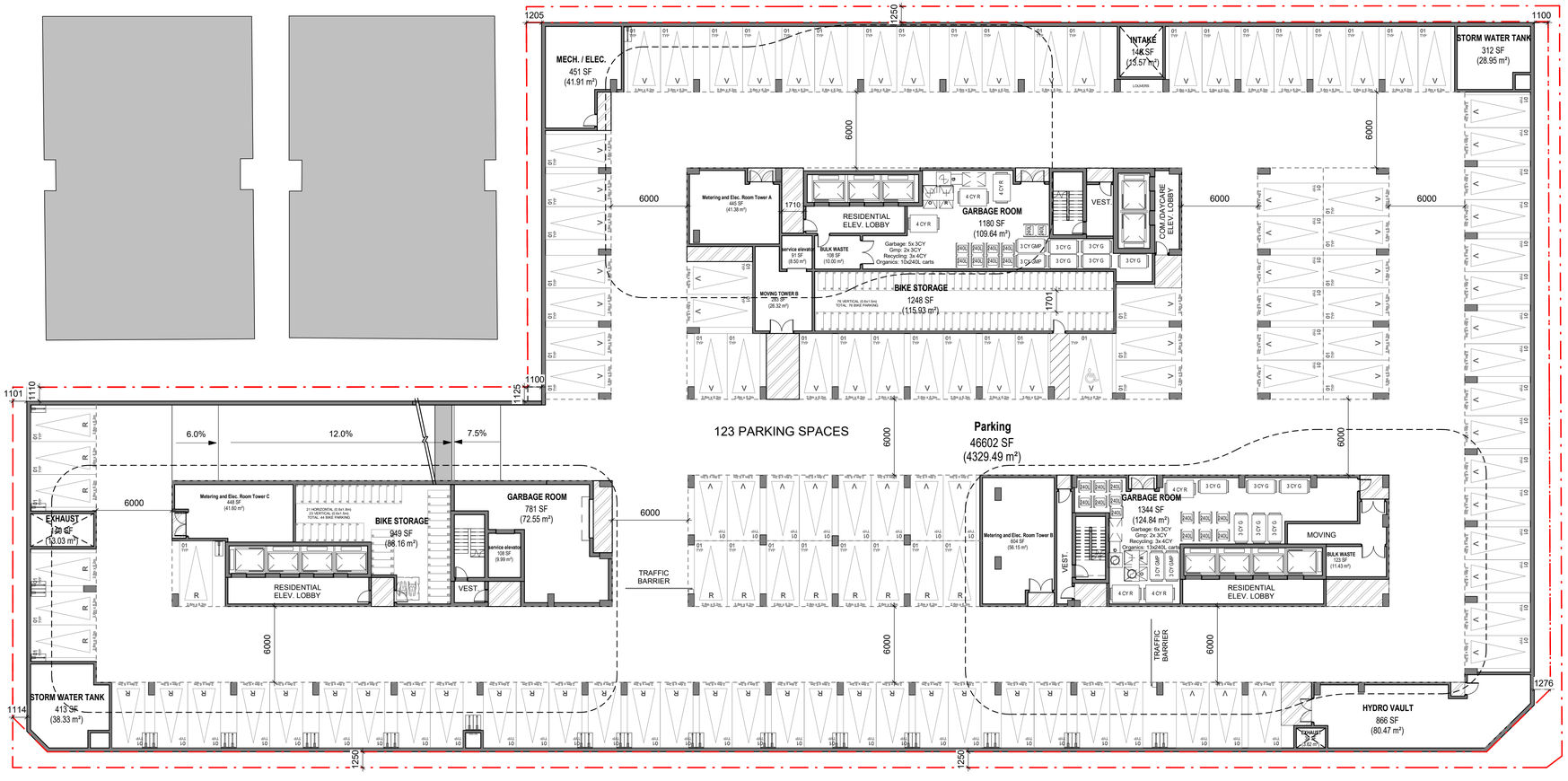
SHEET TITLE

GROUND FLOOR PLAN

SHEET NUMBER

A201

PLOTTED: 2020-07-22



GARBAGE BIN CALC.
RESIDENTIAL WASTE COLLECTION:
Tower A - 229 Units Garbage: 5-3CY bins Gmp: 2-3CY bins Fiber: 3-4CYbins Organics: 10-240L carts
Tower B - 306 Units Garbage: 6-3CY bins Gmp: 2-3CY bins Fiber: 3-4CY bins Organics: 13-240L carts

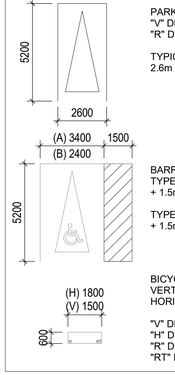
STATISTICS LEVEL P1	PER LEVEL
GCA = 5,658 m² (60,902 ft²) GFA = 0 m² (0 ft²)	

PARKING P1		PER LEVEL
(RESIDENTIAL)	42 SPACES	*TYP. (2.6 x 5.2m)*
(VISITOR)	81 SPACES	*TYP. (2.6 x 5.2m)*
(VISITOR)	1 SPACES	*B.F. TYPE-A (3.4 x 5.2m)*
	0 SPACES	*B.F. TYPE-B (2.4 x 5.2m)*
	0 SPACES	*CAR SHARE (2.6 x 5.2m)*
	0 SPACES	*OBSTRUCTED*
TOTAL PARKING =	123 SPACES	

BICYCLE PARKING P1		PER LEVEL
RES. BIKE PARKING =		
(HORIZONTAL)	21 SPACES	*HORIZ. (0.6 x 1.8m)*
(VERTICAL)	99 SPACES	*VERT. (0.6 x 1.5m)*
(VERTICAL)	34 SPACES	*VERT. (0.6 x 1.2m) (In parking stalls)*
TOTAL BIKE PARKING=	154 SPACES	

LOCKERS P1	PER LEVEL
TOTAL RES. LOCKERS @ P1 = 0	

LEGEND



PARKING
"V" DENOTES VISITOR PARKING
"R" DENOTES RESIDENTIAL PARKING

TYPICAL PARKING SIZE:
2.6m (W) x 5.2m (D)

BARRIER-FREE PARKING SIZE:
TYPE A: 3.4m (W) x 5.2m (D)
+ 1.5m (W) ACCESS AISLE

TYPE B: 2.4m (W) x 5.2m (D)
+ 1.5m (W) ACCESS AISLE

BICYCLE PARKING
VERTICAL: 0.60m (W) x 1.5m (D)
HORIZONTAL: 0.60m (W) x 1.8m (D)

"V" DENOTES VERTICAL
"H" DENOTES HORIZONTAL
"R" DENOTES RESIDENTIAL
"RT" DENOTES RETAIL

CLIENT
5015218 Ontario Inc. and Albert & Main Developments Inc.

109 Atlantic Avenue, Toronto, ON, M6K 1X4

ISSUES

01	ISSUED FOR REZONING	2019-08-29
02	ISSUED FOR REZONING	2020-05-04

SEAL

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PROJECT
400 Albert Street
383 Slater Street/400 Albert Street
Ottawa, Ontario

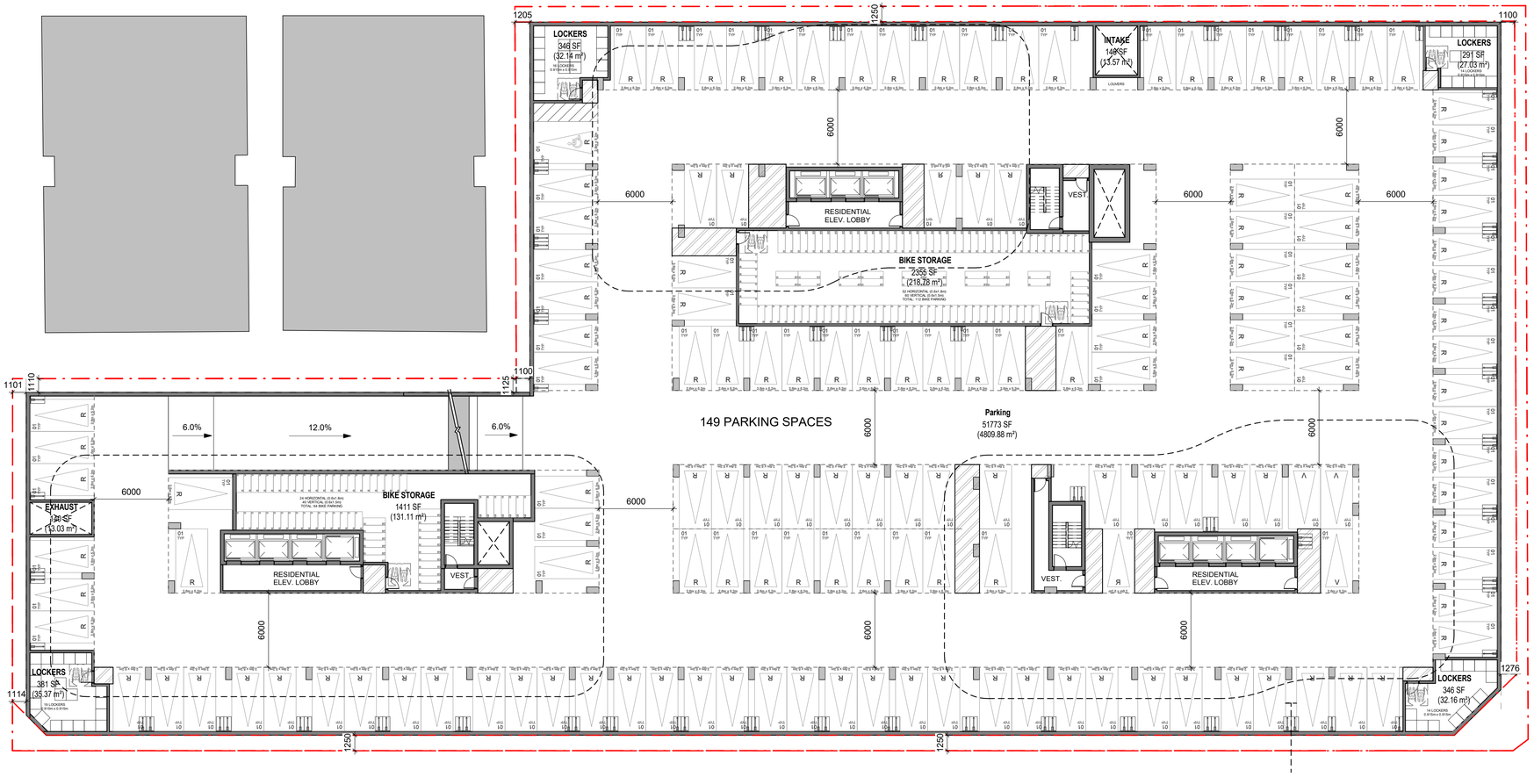
PROJECT NO:
120068

SCALE:	DATE
As indicated	**05/04/20**

SHEET TITLE
PARKING LEVEL 1

SHEET NUMBER
A212

PLOTTED: 2020-07-22



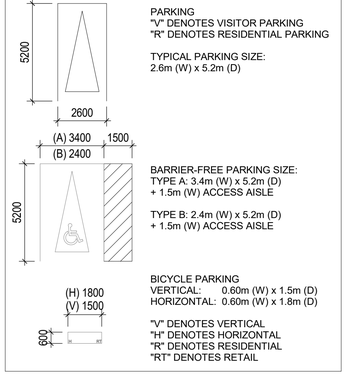
PARKING P2		PER LEVEL
(RESIDENTIAL)	148 SPACES	*TYP. (2.6 x 5.2m)*
	1 SPACES	*B.F. TYPE-A (3.4 x 5.2m)*
	0 SPACES	*B.F. TYPE-B (2.4 x 5.2m)*
	0 SPACES	*CAR SHARE (2.6 x 5.2m)*
	0 SPACES	*OBSTRUCTED*
TOTAL PARKING =	149 SPACES	

BICYCLE PARKING P2		PER LEVEL
RES. BIKE PARKING =		
(HORIZONTAL)	76 SPACES	*HORIZ. (0.6 x 1.8m)*
(VERTICAL)	100 SPACES	*VERT. (0.6 x 1.5m)*
(VERTICAL)	95 SPACES	*VERT. (0.6 x 1.2m) (In parking stalls)*
TOTAL BIKE PARKING=	271 SPACES	

STATISTICS LEVEL P2	PER LEVEL
GCA = 5,658 m² (60,902 ft²)	
GFA = 0 m² (0 ft²)	

LOCKERS P2		PER LEVEL
TOTAL RES. LOCKERS @ P2 = 63	*(0.915 x 0.915m)*	

LEGEND



PARKING
"V" DENOTES VISITOR PARKING
"R" DENOTES RESIDENTIAL PARKING

TYPICAL PARKING SIZE:
2.6m (W) x 5.2m (D)

BARRIER-FREE PARKING SIZE:
TYPE A: 3.4m (W) x 5.2m (D)
+ 1.5m (W) ACCESS AISLE

TYPE B: 2.4m (W) x 5.2m (D)
+ 1.5m (W) ACCESS AISLE

BICYCLE PARKING
VERTICAL: 0.60m (W) x 1.5m (D)
HORIZONTAL: 0.60m (W) x 1.8m (D)

"V" DENOTES VERTICAL
"H" DENOTES HORIZONTAL
"R" DENOTES RESIDENTIAL
"RT" DENOTES RETAIL

CLIENT
5015218 Ontario Inc. and Albert & Main Developments Inc.

109 Atlantic Avenue, Toronto, ON, M6K 1X4

ISSUES

01	ISSUED FOR REZONING	2019-08-29
02	ISSUED FOR REZONING	2020-05-04

SEAL

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55 St. Clair Avenue West, 7th Floor,
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tel 416 596 1930 fax 416 596 0644
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PROJECT
400 Albert Street
383 Slater Street/400 Albert Street
Ottawa, Ontario

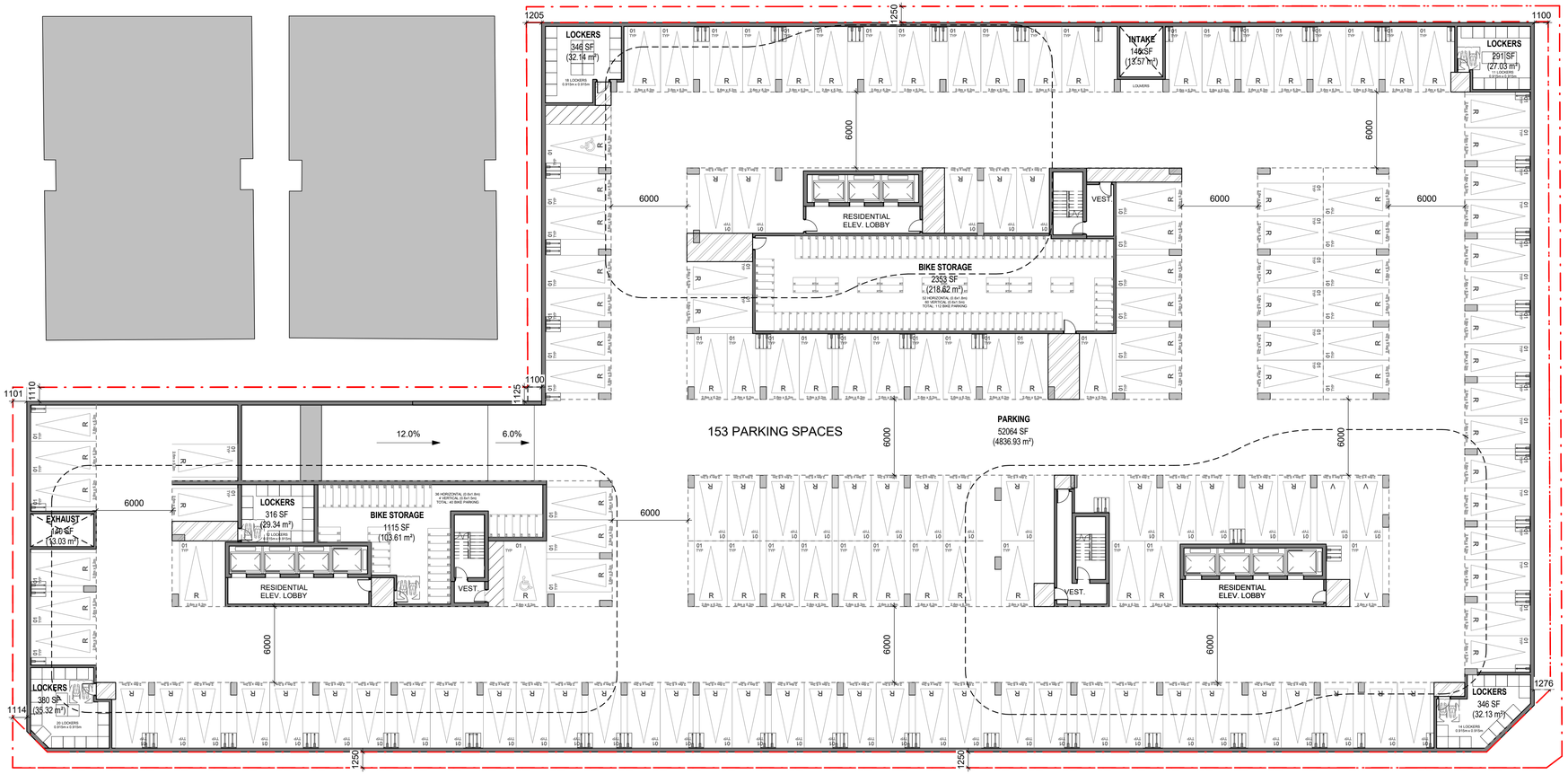
PROJECT NO:
120068

SCALE:	DATE
As indicated	**05/04/20**

SHEET TITLE
PARKING LEVEL 2

SHEET NUMBER
A213

PLOTTED: 2020-07-21



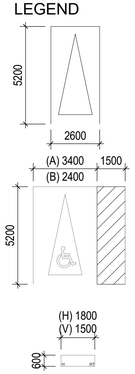
PARKING P3		PER LEVEL
(RESIDENTIAL)	152 SPACES	*TYP. (2.6 x 5.2m)*
	2 SPACES	*B.F. TYPE-A (3.4 x 5.2m)*
	0 SPACES	*B.F. TYPE-B (2.4 x 5.2m)*
	0 SPACES	*CAR SHARE (2.6 x 5.2m)*
	0 SPACES	*OBSTRUCTED*
TOTAL PARKING =	154 SPACES	

BICYCLE PARKING P3		PER LEVEL
RES. BIKE PARKING =		
(HORIZONTAL)	88 SPACES	*HORIZ. (0.6 x 1.8m)*
(VERTICAL)	64 SPACES	*VERT. (0.6 x 1.5m)*
(VERTICAL)	95 SPACES	*VERT. (0.6 x 1.2m) (In parking stalls)*
TOTAL BIKE PARKING=	152 SPACES	

STATISTICS LEVEL P3	PER LEVEL
GCA = 5,658 m² (60,902 ft²)	
GFA = 0 m² (0 ft²)	

LOCKERS P3		PER LEVEL
TOTAL RES. LOCKERS @ P3 = 75		*(0.915 x 0.915m)*

LEGEND



PARKING
"V" DENOTES VISITOR PARKING
"R" DENOTES RESIDENTIAL PARKING

TYPICAL PARKING SIZE:
2.6m (W) x 5.2m (D)

BARRIER-FREE PARKING SIZE:
TYPE A: 3.4m (W) x 5.2m (D)
+ 1.5m (W) ACCESS AISLE

TYPE B: 2.4m (W) x 5.2m (D)
+ 1.5m (W) ACCESS AISLE

BICYCLE PARKING
VERTICAL: 0.60m (W) x 1.5m (D)
HORIZONTAL: 0.60m (W) x 1.8m (D)

"V" DENOTES VERTICAL
"H" DENOTES HORIZONTAL
"R" DENOTES RESIDENTIAL
"RT" DENOTES RETAIL

CLIENT
5015218 Ontario Inc. and Albert & Main Developments Inc.

109 Atlantic Avenue, Toronto, ON, M6K 1X4

ISSUES

01	ISSUED FOR REZONING	2019-08-29
02	ISSUED FOR REZONING	2020-05-04

SEAL

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IBI GROUP
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tel 416 596 1930 fax 416 596 0644
ibigroup.com

PROJECT
400 Albert Street
383 Slater Street/400 Albert Street
Ottawa, Ontario

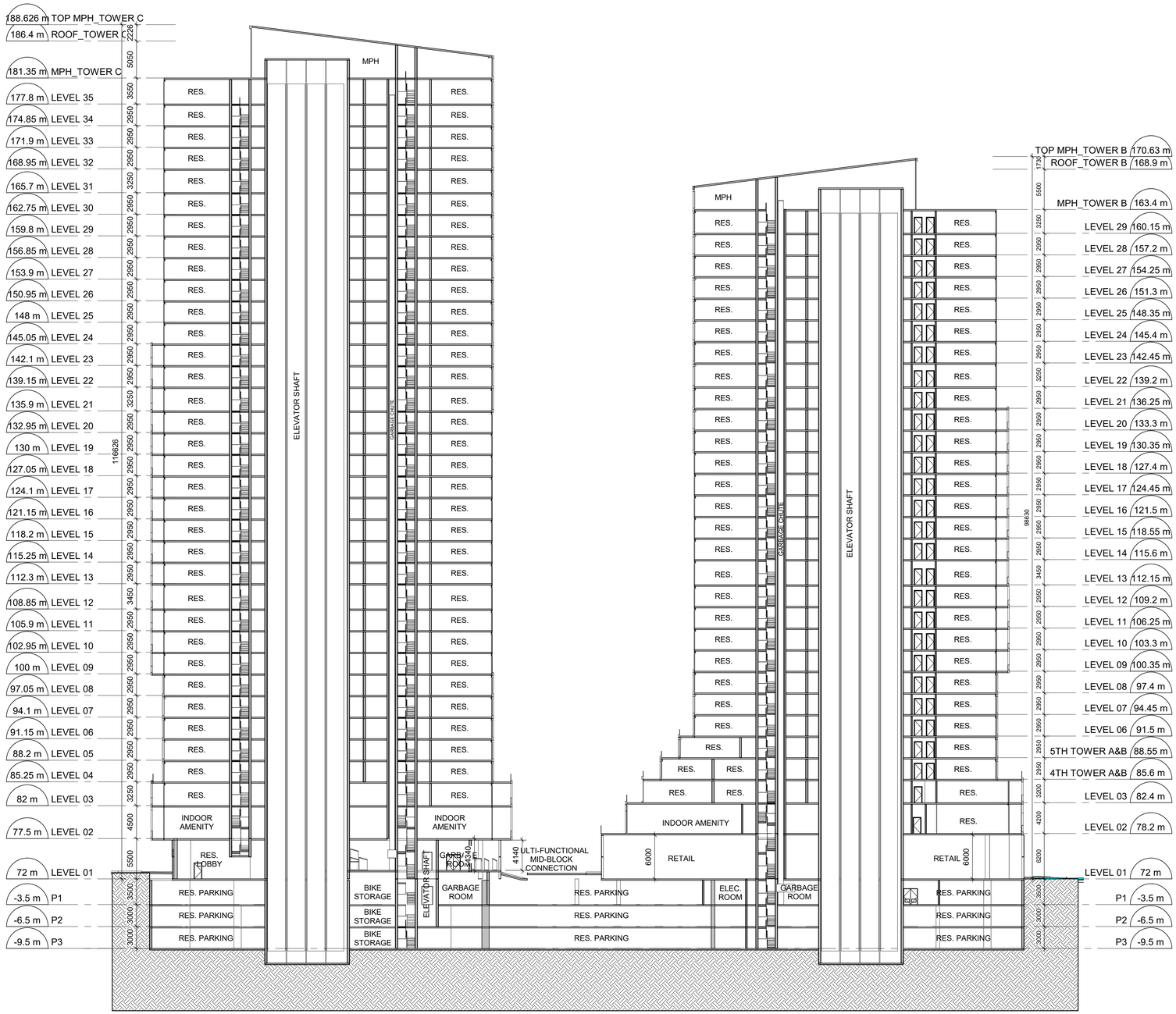
PROJECT NO:
120068

SCALE:	DATE
As indicated	**05/04/20**

SHEET TITLE
PARKING LEVEL 3

SHEET NUMBER
A214

PLOTTED: 2020-07-21



CLIENT

5015218 Ontario Inc. and Albert & Main Developments Inc.

109 Atlantic Avenue, Toronto, ON, M6K 1X4

ISSUES

SEAL

PRIME CONSULTANT

IBI GROUP
55 St. Clair Avenue West, 7th Floor,
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tel 416 596 1930 fax 416 596 0644
ibigroup.com

PROJECT

400 Albert Street

383 Slater Street/400 Albert Street
Ottawa, Ontario

PROJECT NO: 120068

SCALE: 1 : 300

DATE 06/10/20

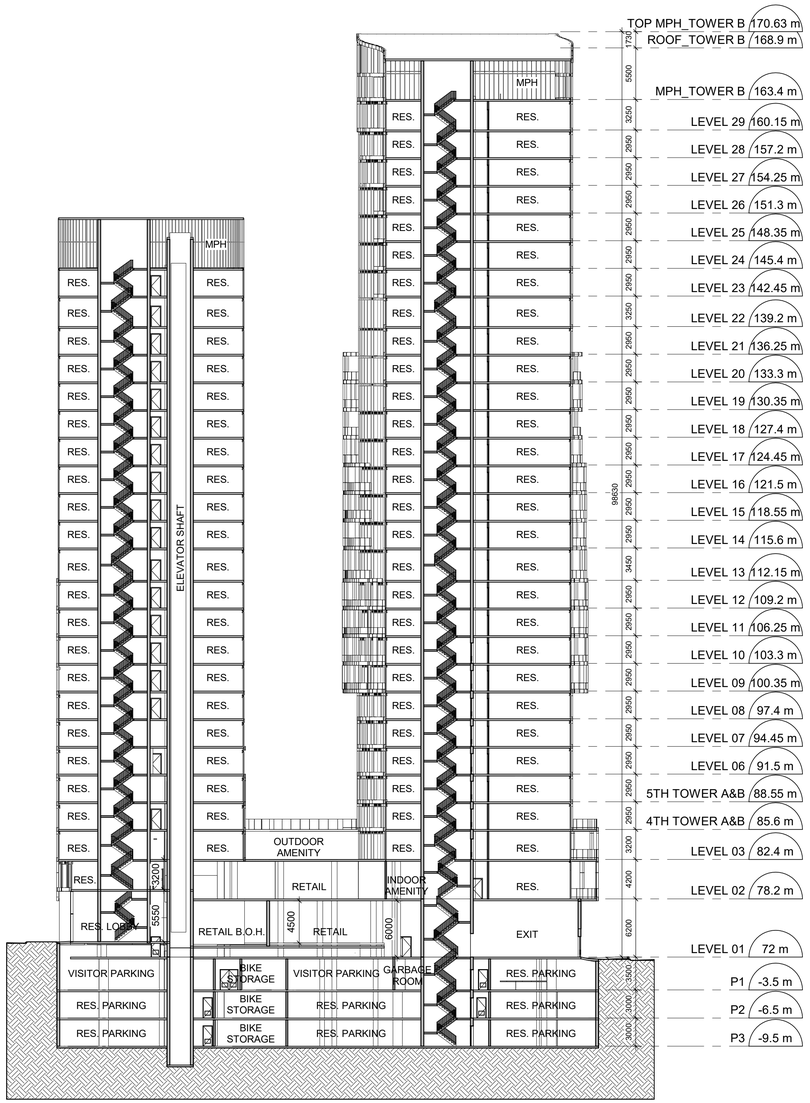
SHEET TITLE

BUILDING CROSS SECTION

SHEET NUMBER

A501

PLOTTED: 2020-07-20



CLIENT

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ISSUES

SEAL

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PROJECT

400 Albert Street

383 Slater Street/400 Albert Street
Ottawa, Ontario

PROJECT NO: 120068

SCALE:	DATE
1 : 300	06/10/20

SHEET TITLE

BUILDING CROSS SECTION

SHEET NUMBER

A502

PLOTTED: 2020-07-20

APPENDIX 5

City of Ottawa - Sewer Use Program - Best Management Practices

DEWATERING UNCONTAMINATED WATER FROM CONSTRUCTION ACTIVITIES TO THE STORM SEWER

For information and assistant please direct all correspondence to Compliance Officer, Sewer Use Program 800 Green Creek Drive Ottawa ON K1J 1A6; or faxed to 613-745-9197; or scanned and emailed to SUP-PUE@ottawa.ca. Should you have any questions, please call the Sewer Use Program Duty Officer at 613-580-2424 extension 23326.

HOW TO KEEP SEDIMENTS AND POLLUTANTS OUT OF THE STORM DRAINS AND SANITARY SEWERS, AND PROTECT FISH HABITAT

Dewatering activities can occur at construction sites, during in-ground utilities maintenance, and site investigations/ assessments and cleanup. Depending on soil types and site history, stormwater and groundwater pumped from these sites may be contaminated with toxics (such as oil or solvents) and /or laden with sediments.

Discharging any water containing sediments or contaminants into a street, gutter, storm drain, or creek can pollute water, contaminate sediments and harm fish habitat. Some pollutants can also interfere with the operation of the Robert O. Pickard Environmental Centre- the City of Ottawa's wastewater treatment plant.

If sediments or contaminants from your job site enter a catch basin or storm drain system, you have violated the City of Ottawa's Sewer Use By-law (2003-514), as well as provincial and federal regulations. Offenders could be subject to fines and cleanup costs.

However, provided certain conditions are met, sites may dewater certain projects to the storm sewer under certain conditions.

TYPICAL PROJECTS THAT REQUIRE DEWATERING:

- Site Investigation/Assessment
- Construction, both large and small sites
- Foundation work
- Utilities infrastructure installation and repair
  - ✓ Electrical conduits
  - ✓ Vaults
  - ✓ Sewer line and storm drain maintenance
  - ✓ Phone lines and cable TV installation / repair
  - ✓ Tank removal

NOTE: Contaminated or impacted sites that involve Groundwater Remediation are not considered to be "dewatering" projects. The discharge of Remediated Groundwater to the storm sewer system is prohibited by the Sewer Use by-law. For more information on how to discharge remediated groundwater to the City's sewage works, contact the Sewer Use Program Duty Officer.

WHAT TO DO IF GROUNDWATER OR IMPOUNDED STORMWATER HAS SEDIMENTS BUT NO TOXICS ARE PRESENT

HOW DO YOU DEWATER A SITE WHERE NO CONTAMINATION IS PRESENT IN THE GROUNDWATER OR IMPOUNDED STORMWATER?

ASK YOURSELF THIS QUESTION:

Is the water clear?

YES

If yes, you may be able to pump to the ground, street or storm drain. Check with the Sewer Use Program to see if you will need authorization.

NO

You may be allowed to discharge on the ground, providing no runoff occurs.

NO

For discharge to a storm or sanitary sewer, the solids in the water must be filtered or settled out. Some combination of the options shown on the next two pages may solve the problem.

Depending on the quality of the water after filtering or settling, you may be allowed to pump to the storm or sanitary sewer. The Sewer Use Program will work with you to determine which option is most appropriate.

Solids Disposal

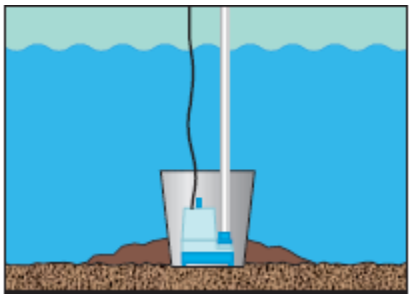
Return settled or filtered solids to the ground, or dry the solids and dispose of them as fill or solid waste.

REMOVING SEDIMENTS FROM GROUNDWATER OR IMPOUNDED STORMWATER

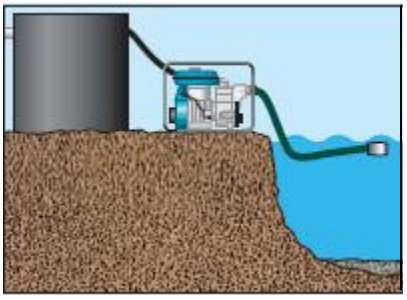
In general, you will need to follow two steps – 1) source control; **2)** filtration – to remove sediments from groundwater or impounded stormwater before you pump it off your site. Source control measures should be used before filtration. Use a combination of approaches described below for the best results. These are just some of the Best Management Practices available.

Remember to check sediment removal devices frequently to make sure they are unclogged and operating correctly. You may need to make adjustments depending on the amount of sediment in the water you're pumping.

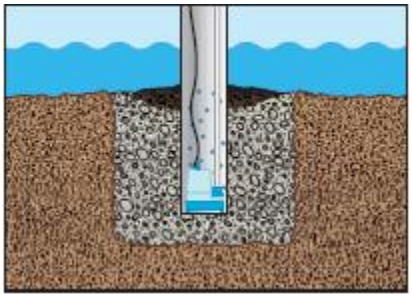
Step 1: Control sediment loading before pumping



Using a submersible pump, pump from a bucket placed below the water level.



Place the end of the suction pipe on a float or similar device to draw off the top. Pump to a tank with sampling port(s).



Dig a small pit and fill with fine gravel. Pump through a perforated pipe sunk partway into the gravel.

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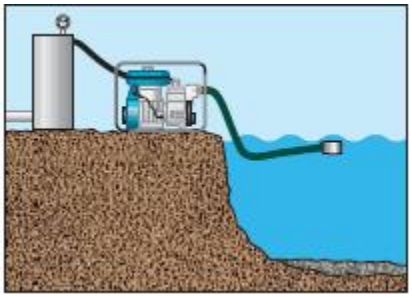
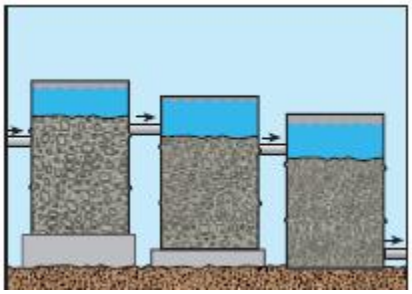
Step 2: (if necessary) Filter before final discharge

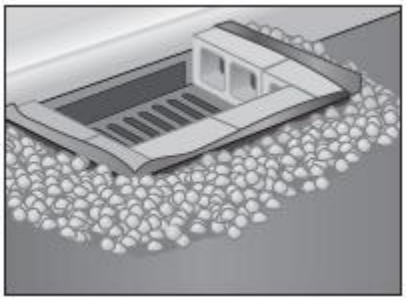
Options:



Pump through a filtering device such as a swimming pool filter with the end of the suction pipe on a float or similar device.

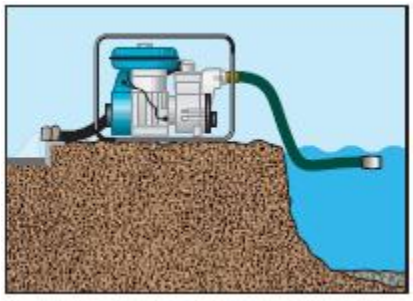


Direct water through a series of drums filled with successively finer gravel and sand.



Although not a preferred option, place filter fabric around the storm drain and anchor in place under the grate.

Surround the storm drain with concrete blocks and wrap the fabric around the outside of the blocks. Hold the fabric in place with crushed rock to complete the filtering dam.
This method is best used in conjunction with other options.



Wrap the end of the suction pipe with filter fabric and use a float or similar device to draw off the surface.

Another way to remove low levels of sediment is to discharge stormwater to a properly designed stormwater treatment facility for the type of discharge. This can include vegetated swales and/or structural devices.