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Geotechnical Investigation

Proposed Multi-Storey Complex
801 Albert Street
Ottawa, Ontario

Prepared For

Trinity Development Group

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Report PG3272-2 Revision 1

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APPENDICES

1.0 Introduction

Paterson Group (Paterson) was commissioned by Trinity Development Group to conduct a geotechnical investigation for the proposed multi-storey complex to be located at 801 Albert Street in the City of Ottawa, Ontario (refer to Figure 1 - Key Plan in Appendix 2).

The objectives of the current investigation were to:

- ❑ determine the subsurface soil, bedrock and groundwater conditions by means of boreholes.
- ❑ provide geotechnical recommendations for the design of the proposed development including construction considerations which may affect the design.

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

2.0 Proposed Development

It is understood that the proposed complex is to consist of two 30 storey office buildings with a retail complex in the lower levels. Final design and parking requirements have not been finalized prior to issuing this report. It is expected that underground parking will be approximately 2 to 3 levels. The footprint of the parking garage will extend to the property boundaries.

It is also our understanding that consideration may be given to expanding the complex and building over the existing O-Train alignment and provide access to the station.

Due to existing servicing easements within the boundaries of the subject site will either be relocated to accommodate the parking garage or will remain in place and will be included in the design.

3.0 Method of Investigation

3.1 Field Investigation

Field Program

The initial field program for the geotechnical investigation was conducted on June 4, 5, 6 and July 24, 2014. At that time a total of 4 boreholes were advanced to a maximum depth of 33 m below existing ground surface. In addition, a total of 10 test pits were advanced to a maximum depth of 3.7 m below existing ground surface on June 11, 2014.

A supplemental field program was conducted on April 15 and 16, 2015. At that time a total of 8 boreholes were advanced to a maximum depth of 16.4 m below existing ground surface. Along the existing bridge embankment along the north property boundary, a hydraulic shovel was used to create a platform to support a track mounted drill using the excavated material. Once the boreholes were completed the excavated platform was reinstated using the excavated material.

The boreholes for the current investigation were completed with a track mounted drill rig operated by a two-person crew on November 13, 16, 17, 18, 22, 23, 25 and 26, 2015. All fieldwork was conducted under the full-time supervision of Paterson personnel under the direction of a senior engineer from the geotechnical division. The drilling procedure consisted of hollow stem augering to the required depths at select locations, sampling and testing the overburden.

Previous test holes carried out by others were also used to supplement this investigation and the borehole logs are appended to this report.

Sampling and In Situ Testing

Soil samples from the boreholes were recovered from a 50 mm diameter split-spoon, the auger flights or grab samples. The split-spoon and auger samples were classified on site and placed in sealed plastic bags. All samples were transported to our laboratory. The depths at which the split-spoon and auger samples were recovered from the boreholes are presented as SS and AU, respectively, on the Soil Profile and Test Data sheets.

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

Diamond drilling was completed at 22 locations, BH 1, BH 2, BH 3, BH 4, BH 2-15, BH 3-15, BH 4-15, BH 5-15 and BH 6-15, BH 9-15 to BH 22-15 to confirm the bedrock quality. A recovery value and a Rock Quality Designation (RQD) value were calculated for each drilled section of bedrock and are presented as RC on the Soil Profile and Test Data sheets in Appendix 1. The recovery value is the ratio of the bedrock sample length recovered over the drilled section length, in percentage. The RQD value is the total length ratio of intact rock core length more than 100 mm in one drilled section over the length of the drilled section, in percentage. These values are indicative of the quality of the bedrock.

The subsurface conditions observed in the boreholes were recorded in detail in the field. The soil profiles are presented on the Soil Profile and Test Data sheets in Appendix 1.

Groundwater

Piezometers were installed in all boreholes to permit the monitoring of water levels subsequent to the completion of the sampling program.

Sample Storage

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

3.2 Field Survey

The current and supplemental test hole locations were selected by Paterson personnel to provide general coverage of the subject site. The test hole locations and elevations were surveyed in the field by Stantec Geomatics to a geodetic datum. The initial test hole locations were selected and determined in the field by Paterson personnel to provide general coverage of the subject site. The test hole locations and elevations were surveyed in the field by Paterson. A manhole cover was used as a temporary benchmark with an assumed geodetic elevation of 56.03 m.

The location and ground surface elevation at each test hole location is presented on Drawing PG3272-3 - Test Hole Location Plan in Appendix 2.

3.3 Laboratory Testing

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

3.4 Analytical Testing

One soil sample was submitted for analytical testing to assess the potential for exposed ferrous metals and the sulphate potential against subsurface concrete structures. The sample was submitted to determine the concentration of sulphate and chloride, the resistivity and the pH of the soil. The results are provided in Appendix 1, and are discussed further in Subsection 6.7.

4.0 Observations

4.1 Surface Conditions

The subject site is currently vacant. The ground surface is relatively flat and covered with grass, brush and mature trees. A gravel access road runs east-west along the south property boundary, which provides access to the existing fibre optic shelter structure at the southwest corner of the site. The existing railway corridor and multi-use pathway run along the west property boundary of the subject site and Albert Street runs along the north side of the subject site. The alignment of Albert Street adjacent to the subject site is elevated above the subject site due to the bridge embankment for the Albert Street overpass above the existing railway corridor.

4.2 Subsurface Profile

Overburden Conditions

Generally, the subsurface profile at the borehole locations consists of varying fill material overlying a silty clay and/or silty sand and glacial till deposit. The silty clay, where encountered, was noted to be firm to stiff in consistency based on the testing results. The glacial till deposit overlies an interbedded limestone and shale bedrock. The glacial till layer was noted to consist of a fine soil matrix varying between a silty clay to silty sand mixed with sand and gravel, cobbles and boulders.

The fill material varies between a silty clay to a silty sand with organics, debris, railway bed fill, crushed stone, gravel, cobbles and boulders. The fill extended from 2.3 to 8.1 m below the existing grade. Also, remnants of the former rail lines were encountered within the fill areas at several locations.

Bedrock

Bedrock was encountered at all borehole locations, at geodetic elevations between 44.5 to 49.6 m. The bedrock recovered from the borehole locations consisted of an interbedded grey limestone and shale. Based on the RQD values from the cores recovered, the majority of the bedrock appears to be of fair to good quality within the upper 1 m of the bedrock surface. The bedrock quality increases to excellent quality approximately 1 m below the bedrock surface.

Based on available geological mapping, bedrock in the area of the subject site consists of interbedded limestone and shale of the Verulam Formation.

4.3 Groundwater

Groundwater monitoring wells were installed at BH 9-15 to BH 18-15, BH 1, BH 2, BH 3 and BH 4 to measure groundwater levels. The groundwater levels that were measured in the monitoring wells on December 1, 2015 for our current investigation and water levels measured on June 17, 2014 and on July 31, 2014 at the original monitoring well locations are summarized in Table 1. The groundwater level is subject to seasonal fluctuations and therefore, groundwater levels could vary at the time of construction.

Table 1 - Groundwater Level Readings

Borehole Number	Ground Elevation (m)	Depth of Screen (m)	Groundwater Levels		Recording Date
			Depth (m)	Elevation (m)	
BH 1	56.35	13.4 - 16.4	3.12	53.23	June 16, 2014
			3.36	52.99	July 31, 2014
BH 2	55.22	15.1 - 18.1	7.68	47.54	June 16, 2014
			7.01	48.21	July 31, 2014
BH 3	55.62	15.0 - 18.0	1.84	53.78	June 16, 2014
			2.03	53.59	July 31, 2014
BH 4	55.21	30.2 - 33.2	1.91	53.30	July 31, 2014
BH 9-15	57.12	54.1 - 51.1	3.81	53.31	December 1, 2015
BH 10-15	56.29	47.7 - 46.2	3.52	52.77	December 1, 2015
BH 11-15	55.94	48.9 - 45.8	1.92	54.02	December 1, 2015
BH 12-15	55.15	53.55 - 50.55	2.08	53.07	December 1, 2015
BH 13-15	55.02	53.8 - 50.8	1.92	53.10	December 1, 2015
BH 14-15	54.81	52.4 - 50.0	2.09	52.72	December 1, 2015
BH 15-15	55.06	45.0 - 43.7	2.02	53.04	December 1, 2015
BH 16-15	55.01	52.8 - 50.1	2.02	52.99	December 1, 2015
BH 17-15	55.02	52.8 - 50.1	2.02	53.00	December 1, 2015
BH 18-15	60.11	52.5 - 50.7	5.56	54.55	December 1, 2015

5.0 Discussion

5.1 Geotechnical Assessment

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

Bedrock removal will most likely be required to complete a portion of the underground parking levels. Line drilling and controlled blasting where large quantities of bedrock need to be removed is recommended. The blasting operations should be planned and completed under the guidance of a professional engineer with experience in blasting operations. A vibration monitoring program should be implemented and monitored by the geotechnical consultant to confirm that the controlled blasting program does not negatively impact the existing watermain running along the south property boundary of the subject site.

Control and management of the groundwater will be required for the lower parking garage levels. A waterproofing system in combination with a back-up drainage system, consisting of underfloor drainage and perimeter drainage systems, will be required for the portion of the building extending below the long term groundwater table.

It is understood that a temporary shoring system will be in place during the excavation program for the proposed structure. The temporary shoring system will consist of a series of interlocking sheet piles supported by tiebacks anchored into the bedrock along the south property boundary adjacent to the existing 1200 mm diameter watermain. Based on our review of the current design shoring drawings available at the time of issuance of this report, the temporary shoring will provide adequate support of the soils below the existing watermain and limit dewatering of the soils in the immediate area. It is recommended that a periodic survey of selected locations along the adjacent watermain alignment be completed by a legal surveyor to verify that the watermain alignment is not being negatively impacted by the excavation work for the proposed complex.

As part of the proposed development, the relocation of the existing deep services within the boundaries of the subject site is anticipated.

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

5.2 Site Grading and Preparation

Stripping Depth

Due to the anticipated number of underground parking levels and depth of the bedrock at the subject site, it is anticipated that all existing overburden material will be excavated from within the proposed building footprint. Bedrock removal will be required for the construction of the parking garage levels.

Bedrock Removal

Based on the volume of the bedrock encountered in the area, it is expected that line-drilling in conjunction with hoe-ramming and controlled blasting will be required to remove the bedrock. In areas of weathered bedrock and where only a small quantity of bedrock is to be removed, bedrock removal may be possible by hoe-ramming.

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

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

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

Excavation side slopes in sound bedrock can be completed with almost vertical side walls. A minimum of 1 m horizontal bench, should remain between the bottom of the overburden and the top of the bedrock surface to provide an area for potential sloughing or to provide a stable base for the overburden shoring system.

Vibration Considerations

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

The following construction equipments could be the source of vibrations: piling equipment, hoe ram, compactor, dozer, crane, truck traffic, etc. The construction of the shoring system with soldier piles or sheet piling will require the use of these equipments. Vibrations, whether it is caused by blasting operations or by construction operations could be the cause of the source of detrimental vibrations on the adjacent buildings and structures. Therefore, it is recommended that all vibrations be limited.

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

These guidelines are above perceptible human level and, in some cases, could be very disturbing to some people, a pre-construction survey is recommended to minimize the risks of claims during or following the construction of the proposed building.

Rock Stabilization

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

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

Fill Placement

Fill placed for grading beneath the building areas should consist, unless otherwise specified, of clean imported granular fill, such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II. The imported fill material should be tested and approved prior to delivery to the site. The fill should be placed in maximum of 300 mm thick loose lifts and compacted using suitable compaction equipment. Fill placed beneath the buildings should be compacted to a minimum of 98% of the standard Proctor maximum dry density (SPMDD).

Non-specified existing fill along with site-excavated soil could be placed as general landscaping fill where settlement of the ground surface is of minor concern. These materials should be spread in lifts with a maximum thickness of 300 mm and compacted by the tracks of the spreading equipment to minimize voids. Non-specified existing fill and site-excavated soils are not suitable for placement as backfill against foundation walls, unless used in conjunction with a geocomposite drainage membrane, such as Miradrain G100N or Delta Drain 6000.

5.3 Foundation Design

Bearing Resistance Values

For the most part, footings will be founded on the sound bedrock. A factored bearing resistance value at ULS of **4,500 kPa**, incorporating a geotechnical resistance factor of 0.5, and a bearing resistance value at SLS of **3,000 kPa** is available for footings founded on limestone bedrock which is free of seams, fractures and voids within 1.5 m below the founding level. This should be verified by completing and probing 50 mm diameter drill holes to a depth of 1.5 m below the founding level within the all the footing footprints. A minimum of one probe hole should be completed per major footing. The drill hole inspection should be completed by the geotechnical consultant.

Footings for auxiliary structures founded at a higher elevation within the silty clay or glacial till can be designed using a factored bearing resistance value at ultimate limit states (ULS) of **250 kPa**, incorporating a geotechnical resistance factor of 0.5, and a bearing resistance value at serviceability limit states (SLS) of **150 kPa**.

Settlement

Footings bearing on an acceptable bedrock bearing surface and designed using the bearing resistance values provided herein will be subjected to negligible potential post-construction total and differential settlements.

Lateral Support

The bearing medium under footing-supported structures is required to be provided with adequate lateral support with respect to excavations and different foundation levels. Adequate lateral support is provided to a sound bedrock bearing medium when a plane extending down and out from the bottom edge of the footing at a minimum of 1H:6V (or flatter) passes only through sound bedrock or a material of the same or higher capacity as the bedrock, such as concrete.

5.4 Design for Earthquakes

A site specific shear wave velocity test was completed to accurately determine the applicable seismic site classification for foundation design of the proposed building as presented in Table 4.1.8.4.A of the Ontario Building Code 2012. A seismic shear wave velocity test was completed by Paterson at the subject site. Two shear wave velocity profiles are presented in Appendix 2.

Field Program

The shear wave test location is presented in Drawing PG3272-3 - Test Hole Location Plan in Appendix 2. Paterson field personnel installed 24 horizontal geophones in a straight line oriented roughly in a north-south direction along the east site boundary. The 4.5 Hz. horizontal geophones were mounted to the surface by means of two 75 mm ground spikes attached to the geophone land case. The geophones were spaced at 1 m intervals and connected by a geophone spread cable to a Geode 24 Channel seismograph.

The seismograph was connected to a computer and a trigger switch attached to a 12 pound dead blow hammer. The hammer trigger sends a signal to the seismograph to commence recording. The hammer strikes an I-Beam seated into the ground surface, which produces a polarized shear wave. The shots are repeated between four to eight times at each shot location to provide an accurate signal and reduce noise. The shot locations are completed in forward and reverse directions (i.e.- striking both sides of the I-Beam seated parallel to the geophone array). The shot locations were distributed at the centre of the geophone array and 4, 5 and 30 m away from the first and last geophone.

The test method completed by Paterson are guided by the standard test procedures outlined by expert seismologists at Carleton University and Geological Survey of Canada (GSC).

Data Processing and Interpretation

Interpretation for the shear wave velocity results were completed by Paterson. The shear wave velocity measurement was calculated by the reflection/refraction methods. The interpretation is performed by recovering arrival times from direct and refracted waves. The interpretation is repeated at each shot location to provide an average shear wave velocity, V_{s30}, immediately below the proposed buildings foundation of the upper 30 m profile. To compute the bedrock depth at each location, the layer intercept times, velocities from different layers and critical distances are interpreted from the shear wave graphs. The bedrock velocity was interpreted by the main refractor wave velocity, which is considered a conservative estimate of the bedrock velocity due to the increasing quality of the bedrock with depth. As bedrock quality increases, the bedrock shear wave velocity increases.

Based on our analysis, the bedrock seismic shear wave velocity was calculated to be 1,900 m/s. The V_{s30} was calculated using the standard equation for average shear wave velocity from the Ontario Building Code (OBC) 2012, as presented below;

$$V_{s30} = \frac{Depth_{OfInterest}(m)}{\left(\frac{(Depth_{Layer1}(m)}{Vs_{Layer1}(m/s)} + \frac{Depth_{Layer2}(m)}{Vs_{Layer2}(m/s)}\right)}$$

$$V_{s30} = \frac{30m}{\left(\frac{0m}{322m/s} + \frac{30m}{1{,}900m/s}\right)}$$

$$V_{s30} = 1{,}900m/s$$

Based on the seismic results, the average shear wave velocity, V_{s30}, for shallow foundations located at the subject site is 1,900 m/s. Therefore, a **Site Class A** is applicable for design of the proposed building at the subject site, as per Table 4.1.8.4.A of the OBC 2012. The soils underlying the subject site are not susceptible to liquefaction.

5.5 Basement Slab

For the subject site development, all overburden soil should be removed from the subject site and the basement floor slab will be founded on a bedrock medium. OPSS Granular A or Granular B Type II, with a maximum particle size of 50 mm, are recommended for backfilling below the floor slab. For the proposed parking garage slab, 300 mm of OPSS Granular A should be considered to support the vehicle traffic loads.

In consideration of the groundwater conditions encountered at the time of the fieldwork, a subfloor drainage system, consisting of lines of perforated drainage pipe subdrains connected to a positive outlet, should be provided in the clear stone backfill under the lower basement floor.

5.6 Basement Wall

There are several combinations of backfill materials and retained soils that could be applicable for the basement walls of the subject structure. However, the conditions can be well-represented by assuming the retained soil consists of a material with an angle of internal friction of 30 degrees and a bulk (drained) unit weight of 20 kN/m^3. A hydrostatic groundwater pressure should be added for the portion below the groundwater level.

Undrained conditions are anticipated (i.e. below the groundwater level). Therefore, the applicable effective (undrained) unit weight of the retained soil can be taken as 13 kN/m^3, where applicable. A hydrostatic pressure should be added to the total static earth pressure when using the effective unit weight.

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

Static Conditions

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

K_o = at-rest earth pressure coefficient of the applicable retained soil, 0.5
γ = unit weight of fill of the applicable retained soil (kN/m^3)
H = height of the wall (m)

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

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

Seismic Conditions

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

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

a_c = $(1.45-a_{max}/g)a_{max}$
γ = unit weight of fill of the applicable retained soil (kN/m^3)
H = height of the wall (m)
g = gravity, 9.81 m/s^2

The peak ground acceleration, (a_{max}), for the Ottawa area is 0.32g according to OBC 2012. Note that the vertical seismic coefficient is assumed to be zero.

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

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

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

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

5.7 Rock Anchor Design

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

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

The centre to centre spacing between bond lengths should be a minimum of 1.2 m or four times the anchor hole diameter to ensure the group influence effects are minimized. Anchors in close proximity to each other are recommended to be grouted at the same time to ensure any fractures or voids are completely in-filled and grout fluid does not flow from one hole to an adjacent empty one.

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

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

Permanent anchors should be provided with corrosion protection. As a minimum, this requires that the entire drill hole be filled with cementitious grout. The free anchor length is provided by installing a sleeve to act as a bond break, with the sleeve filled with grout. Double corrosion protection can be provided with factory assembled systems, such as those available from Dywidag Systems International or Williams Form Engineering Corp.

Grout to Rock Bond

The unconfined compressive strength of limestone bedrock ranges between 65 and 125 MPa, which is stronger than most routine grouts. A factored tensile grout to rock bond resistance value at ULS of **1.0 MPa**, incorporating a resistance factor of 0.3, should be provided. A minimum grout strength of 40 MPa is recommended.

Rock Cone Uplift

The rock anchor capacity depends on the dimensions of the rock anchors and the anchorage system configuration. Based on existing bedrock information, a **Rock Mass Rating (RMR) of 69** was assigned to the bedrock, and Hoek and Brown parameters (**m and s**) were taken as **0.575 and 0.00293**, respectively.

Recommended Grouted Rock Anchor Lengths

Parameters used to calculate grouted rock anchor lengths are provided in Table 2.

Table 2 - Parameters used in Rock Anchor Review

Grout to Rock Bond Strength - Factored at ULS	1 MPa
Compressive Strength - Grout	40 MPa
Rock Mass Rating (RMR) - Good quality Limestone Hoek and Brown parameters	69 m=0.575 and s=0.00293
Unconfined compressive strength - Limestone	65 MPa
Effective unit weight - Bedrock	15 kN/m^3
Apex angle of failure cone	60^o
Apex of failure cone	mid-point of fixed anchor length

The fixed anchor length will depend on the diameter of the drill holes. Recommended anchor lengths are provided in Table 3. The factored tensile resistance values provided are based on a single anchor with no group influence effects.

Table 3 - Recommended Rock Anchor Lengths - Grouted Rock Anchor

Diameter of Drill Hole (mm)	Anchor Lengths (m)			Factored Tensile Resistance (kN)
	Bonded Length	Unbonded Length	Total Length	
75	1.9	0.8	2.7	500
	2.6	1	3.6	750
	3.2	1.2	4.4	1000
	4.5	2	6.5	1500
125	1.6	0.6	2.2	500
	2	1	3	750
	2.2	1.3	3.5	1000
	3	1.8	4.8	1500

Other considerations

It is recommended that the anchor drill hole diameter be within 1.5 to 2 times the rock anchor tendon diameter. The anchor drill holes should be inspected by geotechnical personnel and should be flushed clean prior to grouting. A tremie pipe is recommended to place grout from the bottom to top of the anchor holes.

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

5.8 Pavement Structure

Asphalt pavement is not anticipated to be required at the subject site. However, should pavement be considered for the project, the recommended pavement structures shown in Tables 4 and 5 would be applicable.

Table 4 - Recommended Pavement Structure - Car Only Parking Areas

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

Table 5 - Recommended Pavement Structure
Access Lanes and Heavy Truck Parking Areas

Thickness (mm)	Material Description
40	**Wear Course -** HL-3 or Superpave 12.5 Asphaltic Concrete
50	**Binder Course -** HL-8 or Superpave 19.0 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
400	**SUBBASE** - OPSS Granular B Type II
	SUBGRADE - In situ soil, or OPSS Granular B Type I or II material placed over in situ soil

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

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

The pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 98% of the SPMDD with suitable vibratory equipment.

5.9 Relocation of Deep Services

Various scenarios are being contemplated for the relocation of the existing deep services. Since the piping is significant and considered relatively aged and in moderate condition, any consideration to leaving the pipes in place will require caution with the excavation, construction and containment of the pipe backfill.

For piping founded directly on bedrock outside the building footprint, relocating the service onto similar bedrock will be acceptable. Building construction will be similar to any conventional shored excavation approach.

Piping remaining along the easements adjacent to the proposed foundation will require adequate stabilization to prevent long term movement especially if founded within the overburden. It is expected that heavy gauge sheet piling will be used to support the excavation sidewalls within the overburden material all the way down to the underlying bedrock. Whalers and tie backs will provide lateral stability to aid in the support of the existing piping. The sheet piling will remain in place especially if the foundation wall is blind poured against the shoring system.

Once the final alternative is selected, Paterson will conduct a further review and will provide more detailed information once the founding depth and proximity to the proposed building foundation is determined.

6.0 Design and Construction Precautions

6.1 Foundation Drainage and Backfill

Foundation Drainage

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

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

- ❑ Temporary shoring along the excavation perimeter or line drill below the bedrock surface along the excavation perimeter.
- ❑ A waterproofing product should be applied to the temporary shoring face to at least 1 m above the long-term groundwater level.
- ❑ Hoe ram and grind any irregularities and prepare bedrock surface. Shotcrete areas to fill in cavities and smooth out angular features at the bedrock surface.
- ❑ Spray the bedrock vertical surfaces using an elastomeric coating (6 mm thick). The coating should extend to the bottom of the excavation. The coating should also extend horizontally a minimum 600 mm below the perimeter footings to create a seal at the juncture of the horizontal and vertical bedrock surfaces.
- ❑ Place a composite drainage layer, such as Delta Drain 6000 or equivalent, over the waterproofing product and elastomeric coating, where required. The composite drainage layer should extend from finished grade to underside of footing level. All joints should be taped with the appropriate adhesive tape based on a reversed shingle effect.
- ❑ Pour foundation wall against the composite drainage system.

It is recommended that 150 mm diameter sleeves at 3 m centres be cast in the footing or at the foundation wall/footing interface to allow the infiltration of any water that breaches the waterproofing and/or elastomeric coating system to flow to an interior perimeter drainage pipe. The perimeter drainage pipe should direct water to a cistern or sump pit(s) within the lower basement area.

Concrete Mud Slab

To lessen the potential groundwater infiltration at the base of the excavation, consideration should be given to pouring a 100 mm thick concrete mud slab using 20 MPa compressive strength concrete directly on the bedrock surface prior to pouring footings. The purpose of the concrete mud slab is to provide a uniform layer to restrict the bulk of the groundwater infiltration. The effectiveness of the concrete mud slab is dependent on pouring a uniform layer on a flat surface avoiding pits and horizontal surfaces from deeper excavations. More details can be provided once the excavation plan is available.

Underfloor Drainage

An underfloor drainage system will be required to control water infiltration. For design purposes, it is recommended that minimum 150 mm diameter perforated pipes be placed at 6 to 8 m centres. The spacing of the underfloor drainage system should be confirmed at the time of completing the excavation when water infiltration can be better assessed.

Foundation Backfill

It is expected that the deep parking garage will be blind poured against the shoring system for the bulk of the building footprint. However, for auxiliary building sections above the bedrock surface, backfill against the exterior sides of the foundation walls should consist of free-draining non frost susceptible granular materials. The greater part of the site excavated materials will be frost susceptible and, as such, are not recommended for re-use as backfill against the foundation walls, unless used in conjunction with a drainage geocomposite, as recommended above, connected to the perimeter foundation drainage system. Imported granular materials, such as clean sand or OPSS Granular B Type I granular material, should otherwise be used for this purpose.

6.2 Protection of Footings Against Frost Action

Perimeter footings of heated structures are recommended to be protected against the deleterious effects of frost action. A minimum of 1.5 m of soil cover alone, or a combination of soil cover and foundation insulation should be provided.

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

It is expected that the parking garage will not require protection against frost action due to the founding depth. Unheated structures such as the access ramp may required to be insulated against the deleterious effect of frost action. A minimum of 2.1 m of soil cover alone, or a minimum of 0.6 m of soil cover, in conjunction with foundation insulation, should be provided.

6.3 Excavation Side Slopes and Temporary Shoring

Side Slopes

The side slopes of the shallow excavations anticipated should either be excavated to acceptable slopes or retained by shoring systems from the beginning of the excavation until the structure is backfilled.

The subsurface soil at this site is considered to be mainly a Type 2 soil according to the Occupational Health and Safety Act and Regulations for Construction Projects. Excavated soil should not be stockpiled directly at the top of excavations and heavy equipment should be kept away from the excavation sides.

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

Temporary Shoring

Temporary shoring will be required to support the overburden soils. The design and implementation of these temporary systems will be the responsibility of the excavation contractor and their design team. Inspections and approval of the temporary system will also be the responsibility of the designer. Geotechnical information provided below is to assist the designer in completing a suitable and safe shoring system.

The designer should take into account the potential for a fully saturated condition following a significant precipitation event allowing for full hydrostatic pressure in the design. Any changes to the approved shoring design system should be reported immediately to the owner's representative prior to implementation.

Temporary shoring will be required for the overburden soil to complete the required excavations where insufficient room is available for open cut methods. The shoring requirements will depend on the depth of the excavation, the proximity of the adjacent buildings and underground structures and the elevation of the adjacent building foundations and underground services.

Within the existing bridge embankment, the upper composition of the embankment at the property line is primarily a sand with gravel and cobbles and should not obstruct the proposed shoring installation. However, once the shoring reaches the underlying former railway beds followed by the glacial till, it is possible that boulders and rail timber ties may be encountered which will require drilled piles to penetrate. Furthermore, since the excavation will penetrate the bedrock, it is expected that the drilled piles will continue within the bedrock to at least below the proposed founding level.

The temporary system could consist of soldier pile and lagging system or interlocking steel sheet piling. Any additional loading due to street traffic, construction equipment, adjacent structures and facilities, etc., should be included to the earth pressures described below. These systems can be cantilevered, anchored or braced. Generally, it is expected that the shoring systems will be provided with tie-back rock anchors to ensure the stability. It is further recommended that the toe of the shoring be adequately supported to resist toe failure, if required, by means of rock bolts or extending the piles into the bedrock through pre-augered holes if a soldier pile and lagging system is the preferred method.

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

Table 6 - Soil Parameters

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

The active earth pressure should be calculated where wall movements are permissible while the at-rest pressure should be calculated if no movement is permissible.

The dry unit weight should be calculated above the groundwater level while the effective unit weight should be calculated below the groundwater level.

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

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

6.4 Pipe Bedding and Backfill

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

Where hard surface areas are considered above the trench backfill, the trench backfill material within the frost zone (about 1.8 m below finished grade) should match the soils exposed at the trench walls to reduce the potential differential frost heaving. The trench backfill should be placed in maximum 300 mm thick loose lifts and compacted to a minimum of 95% of the SPMDD.

6.5 Groundwater Control

Groundwater Control for Building Construction

A local groundwater lowering is anticipated under short-term conditions due to construction of the proposed building. It should be noted that the extent of any significant groundwater lowering will take place within a limited range of the subject site due to the minimal groundwater lowering.

The contractor should be prepared to direct water away from all bearing surfaces and subgrades, regardless of the source, to prevent disturbance to the founding medium. Based on the groundwater level being located within the bedrock, infiltration levels will be low to moderate through the excavation face.

A temporary MOE permit to take water (PTTW) will be required for this project since more than 50,000 L/day will be pumped during the construction phase. A minimum of four to five months should be allocated for completion of the application and issuance of the permit by the MOE.

Long-term Groundwater Control

Our recommendations for the proposed building's long-term groundwater control are presented in Subsection 6.1. Any groundwater encountered along the building's perimeter or sub-slab drainage system will be directed to the proposed building's cistern/sump pit. Provided the proposed groundwater infiltration control system is properly implemented and approved by the geotechnical consultant at the time of construction, it is expected that groundwater flow will be low (i.e. less than 50,000 L/day) with peak periods noted after precipitation events. It is anticipated that the groundwater flow will be controlled using conventional open sumps.

Impacts on Neighbouring Structures

Due to the presence of a groundwater infiltration control system in place against the temporary shoring and bedrock face, long-term groundwater lowering is anticipated to be negligible for the area. Also, the neighbouring structures are located at a significant distance from the subject site and, where encountered, are founded within native glacial till or directly over a bedrock bearing surface based on available soils information within the area. Based on the proposed groundwater control system, soils encountered and proximity to the adjacent structures, it is anticipated that the neighbouring structures will not be negatively impacted by long-term groundwater lowering due to the proposed development.

6.6 Winter Construction

Precautions must be taken if winter construction is considered for this project.

Where excavations are completed in proximity of existing structures which may be adversely affected due to the freezing conditions. In particular, it should be recognized that where a shoring system is constructed, the soil behind the shoring system will be subjected to freezing conditions and could result in heaving of the structure(s) placed within or above frozen soil. Provisions should be made in the contract document to protect the walls of the excavations from freezing, if applicable.

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

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

6.7 Corrosion Potential and Sulphate

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

7.0 Recommendations

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

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

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

8.0 Statement of Limitations

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

A geotechnical investigation 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, Paterson requests notification immediately in order to permit reassessment of the 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 Trinity Development Group, 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.

David J. Gilbert, P.Eng.

Carlos P. Da Silva, P.Eng.

Report Distribution

- ❑ Trinity Development Group (3 copies)
- ❑ Paterson Group (1 copy)

APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

ANALYTICAL RESULTS

BOREHOLE LOGS BY OTHERS

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Prop. Commercial Development - 801 Albert Street
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Limited.

FILE NO. PG3272

REMARKS

HOLE NO. BH 1-15

BORINGS BY CME 75 Power Auger **DATE** April 15, 2015

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	55.80
FILL: Black silty sand/sandy silt with gravel		AU	1				
- rail bedmat at 1.1m depth - some brick pieces at 2.0m depth		SS	2	67	30	1	54.80
2.03		SS	3	38	21	2	53.80
FILL: Brown to black sand, some silt and gravel 2.59		SS	4	67	9		
		SS	5	75	3	3	52.80
Stiff to firm, grey **SILTY CLAY,** some sand		SS	6	100	6	4	51.80
4.72		SS	7	75	7	5	50.80
		SS	8	100	3		
GLACIAL TILL: Grey silty clay with sand, gravel, cobbles and boulders		SS	9	38	4	6	49.80
		SS	10	58	19	7	48.80
		SS	11	67	43	8	47.80
8.53		SS	12	50	50+		
End of Borehole							
Practical refusal to augering at 8.53m depth							
(GWL @ 2.05m-May 1, 2015)							

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

20 40 60 80

Piezometer Construction

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Prop. Commercial Development - 801 Albert Street
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Limited.

FILE NO. PG3272

REMARKS

HOLE NO. BH 2-15

BORINGS BY CME 75 Power Auger **DATE** April 15, 2015

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	60.12
FILL: Brown silty sand, some topsoil, trace clay and gravel		AU	1				
		SS	2	50	4	1	59.12
1.90		SS	3	38	9	2	58.12
		SS	4	58	15		
		SS	5	71	30	3	57.12
FILL: Brown sand, some silt, trace cobbles		SS	6	75	31	4	56.12
- rail bedmat, coal from 6.1 to 6.7m depth		SS	7	58	24	5	55.12
		SS	8	62	12		
		SS	9	71	10	6	54.12
6.90							
FILL: Grey-brown silty clay, trace gravel		SS	10	75	9	7	53.12
8.08		SS	11	100	11	8	52.12
TOPSOIL 8.23							
Dense, grey-brown **SAND,** some silt and gravel 9.14		SS	12	59	50+	9	51.12
		SS	13	100	2		
Grey **SILTY CLAY,** some sand 10.67						10	50.12
		SS	14	88	50+	11	49.12
		SS	15	38	13		
GLACIAL TILL: Grey silty clay with some sand, gravel, cobbles and boulders		SS	16	100	6	12	48.12
		SS	17	67	31	13	47.12
		SS	18	50	25	14	46.12
14.53							
BEDROCK: Grey limestone interbedded with black shale		RC	1	65	54	15	45.12
						16	44.12
						17	43.12

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

20 40 60 80

Piezometer Construction

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Prop. Commercial Development - 801 Albert Street
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Limited.

FILE NO. PG3272

REMARKS

HOLE NO. BH 2-15

BORINGS BY CME 75 Power Auger **DATE** April 15, 2015

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									
BEDROCK: Grey limestone interbedded with black shale		RC	2	73	45	17	43.12		
17.88									
End of Borehole									
(GWL @ 8.5m depth based on field observations)									
(GWL @ 6.09m-May 1, 2015)									

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

Supplemental Geotechnical Investigation
Prop. Commercial Development - 801 Albert Street
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Limited.

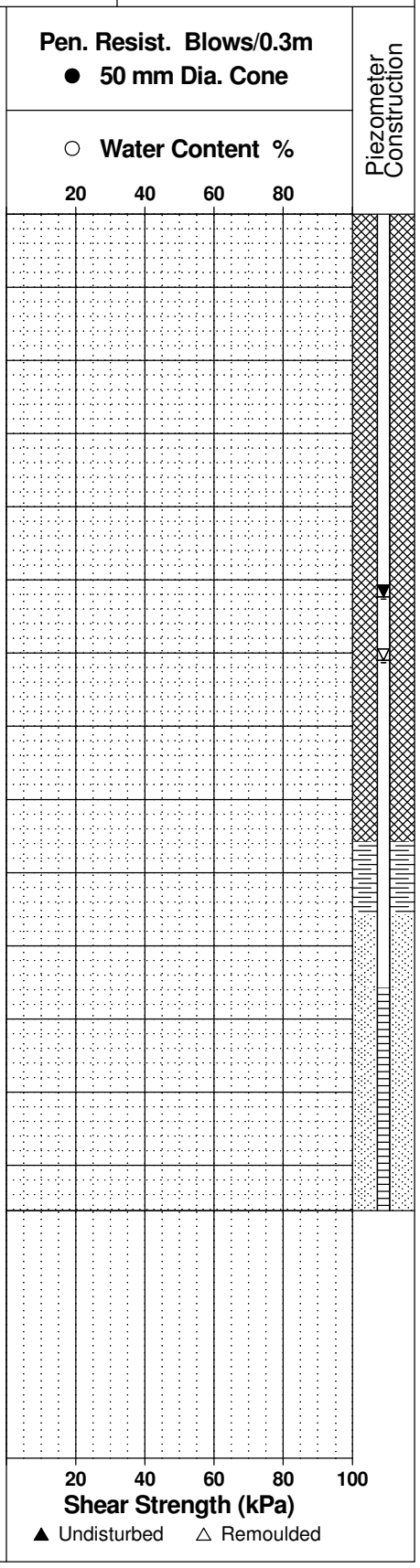
FILE NO. PG3272

REMARKS

HOLE NO. BH 3-15

BORINGS BY CME 75 Power Auger **DATE** April 16, 2015

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	58.41
		AU	1				
		SS	2	17	18	1	57.41
FILL: Brown silty sand, some gravel and cobbles		SS	3	71	362	2	56.41
		SS	4	42	36		
		SS	5	83	38	3	55.41
		SS	6	33	17	4	54.41
4.78							
FILL: Rail bedmat, tar, coal 4.93		SS	7	67	3	5	53.41
FILL: Light brown silty clay, some sand and gravel 5.92		SS	8	100	11		
TOPSOIL 5.94		SS	9	100	50+	6	52.41
		SS	10	100	50+	7	51.41
Very dense, brown **SAND** with gravel and boulders, some silt		SS	11	86	68	8	50.41
		SS	12	83	95		
9.14						9	49.41
GLACIAL TILL: Grey silty clay with sand, gravel and cobbles		SS	13	62	3		
		SS	14	67	10	10	48.41
10.97		SS	15	78	50+		
		RC	1	76	0	11	47.41
BEDROCK: Grey limestone interbedded with shale		RC	2	98	49	12	46.41
- vertical mud seam at 13.5m depth						13	45.41
13.62		RC	3	96	71		
End of Borehole							
(GWL @ 6.1m depth based on field observations)							
(GWL @ 5.23m-May 1, 2015)							



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SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Prop. Commercial Development - 801 Albert Street
Ottawa, Ontario

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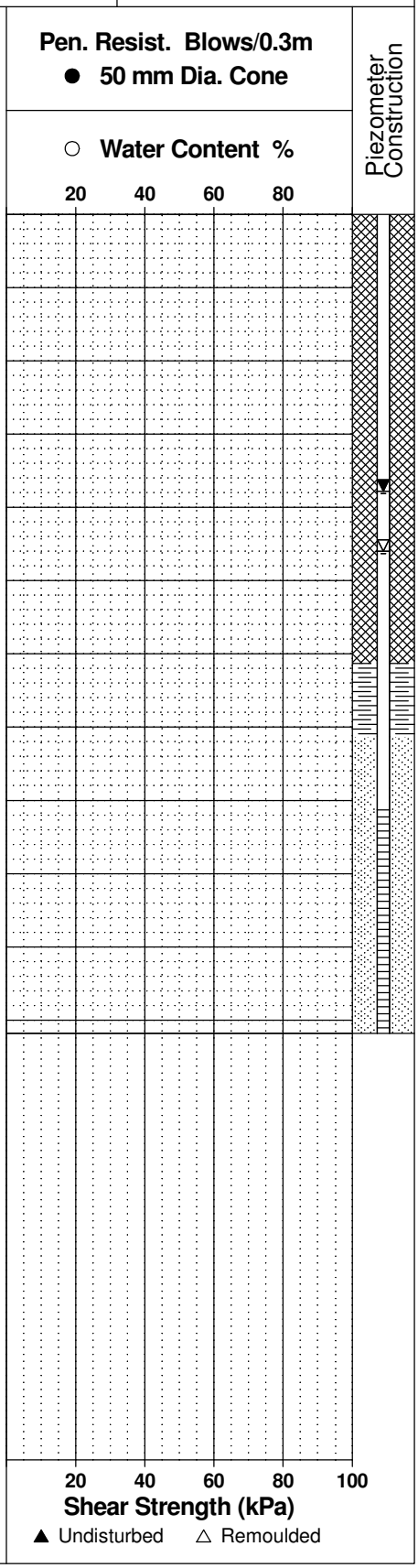
FILE NO. PG3272

REMARKS

HOLE NO. BH 4-15

BORINGS BY CME 75 Power Auger **DATE** April 16, 2015

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	57.06
FILL: Brown silty sand, some gravel, and topsoil		AU	1				
		SS	2	62	10	1	56.06
		SS	3	71	26	2	55.06
2.30							
		SS	4	100	12	3	54.06
FILL: Rail bed, coal, some tar		SS	5	33	7		
3.60							
FILL: Brown silty sand, some clay and gravel		SS	6	25	18	4	53.06
		SS	7	54	35	5	52.06
5.28							
		SS	8	79	79		
Very dense, brown **SAND** with gravel and boulders, trace silt		SS	9	43	50+	6	51.06
		SS	10	50	68	7	50.06
7.62							
GLACIAL TILL: Grey silty clay, some sand, gravel and cobbles		SS	11	65	50+	8	49.06
8.23							
		RC	1	87	57	9	48.06
BEDROCK: Black shale interbedded with grey limestone						10	47.06
		RC	2	100	94		
11.18						11	46.06
End of Borehole							
(GWL @ 4.6m depth based on field observations)							
(GWL @ 3.78m-May 1, 2015)							



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SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Prop. Commercial Development - 801 Albert Street
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FILE NO. PG3272

REMARKS

HOLE NO. BH 5-15

BORINGS BY CME 75 Power Auger **DATE** April 16, 2015

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	55.29
FILL: Brown silty sand with gravel 0.46		AU	1				
FILL: Rail bed and coal 1.42		SS	2	75	13	1	54.29
FILL: Brown sand with gravel, some silt 2.44		SS	3	62	20	2	53.29
TOPSOIL 2.74		SS	4	75	8		
		SS	5	50	28	3	52.29
Compact to very dense, grey **SILTY SAND,** some gravel and cobbles		SS	6	79	79	4	51.29
4.70							
Grey **SILTY CLAY,** trace sand 5.33		SS	7	67	2	5	50.29
		SS	8	75	7		
GLACIAL TILL: Grey silty clay with sand and gravel		SS	9	46	15	6	49.29
7.11		SS	10	0	50+	7	48.29
BEDROCK: Black shale		RC	1	90	61	8	47.29
9.27		RC	2	71	71	9	46.29
End of Borehole							
(GWL @ 1.82m-May 1, 2015)							

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

20 40 60 80

Piezometer Construction

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

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Prop. Commercial Development - 801 Albert Street
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FILE NO. PG3272

REMARKS

HOLE NO. BH 6-15

BORINGS BY CME 75 Power Auger **DATE** April 17, 2015

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	55.38
FILL: Black silty sand with gravel		AU	1				
- brown by 1.1m depth		SS	2	71	16	1	54.38
2.00		SS	3	42	9	2	53.38
FILL: Grey silty clay, some sand and gravel 2.30		SS	4	100	1		
		SS	5	100	2	3	52.38
Grey **SILTY CLAY,** some sand							
4.42		SS	6	100	2	4	51.38
		SS	7	71	7	5	50.38
		SS	8	88	3		
GLACIAL TILL: Grey silty clay with sand and gravel		SS	9	67	8	6	49.38
		SS	10	17	9	7	48.38
		SS	11	50	50+		
8.59						8	47.38
		RC	1	90	40	9	46.38
BEDROCK: Black shale interbedded with grey limestone						10	45.38
		RC	2	93	82	11	44.38
11.63							
End of Borehole							
(GWL @ 4.6m depth based on field observations)							
(GWL @ 1.77-May 1, 2015)							

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

20 40 60 80

Piezometer Construction

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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Supplemental Geotechnical Investigation
Prop. Commercial Development - 801 Albert Street
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FILE NO. PG3272

REMARKS

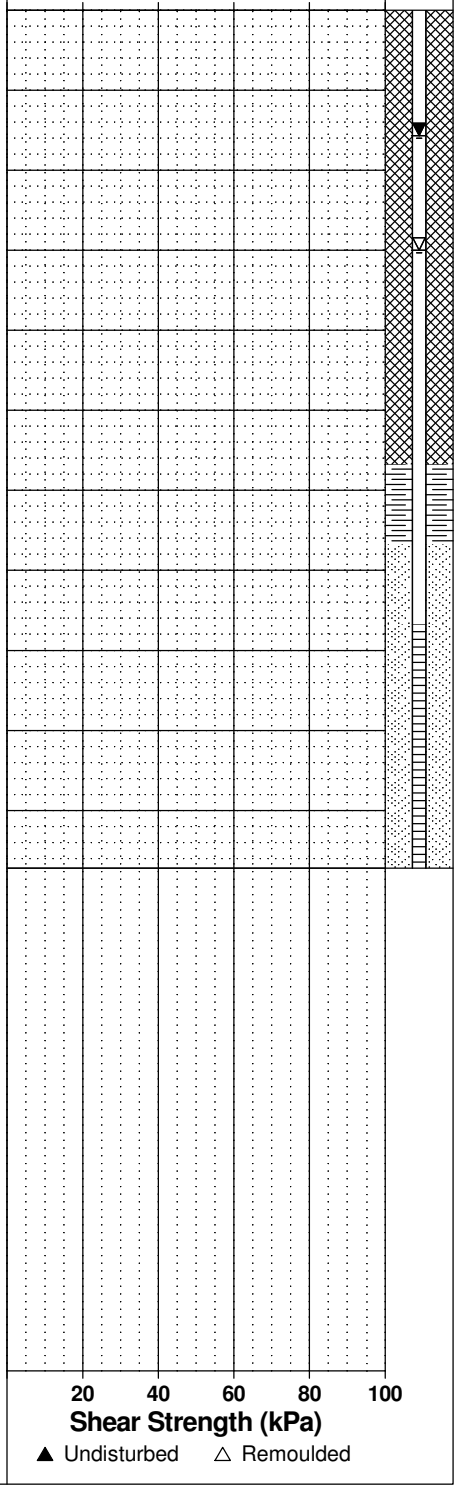
HOLE NO. BH 7-15

BORINGS BY CME 75 Power Auger **DATE** April 17, 2015

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	55.26
FILL: Brown silty sand with gravel, trace cobbles		AU	1				
0.66		SS	2	79	7	1	54.26
FILL: Rail bed, coal and tar		SS	3	29	20		
1.93						2	53.26
FILL: Brown silty clay, some sand and gravel 2.29		SS	4	50	7		
		SS	5	71	50+	3	52.26
Very dense, brown **SILTY SAND,** some gravel		SS	6	60	50+		
4.88		SS	7	4	16	4	51.26
		SS	8	79	4	5	50.26
		SS	9	42	28		
		SS	10	67	6	6	49.26
GLACIAL TILL: Grey silty sand with gravel, some clay and cobbles		SS	11	0	10	7	48.26
		SS	12	54	12		
		SS	13	100	10	8	47.26
		SS	14	62	8	9	46.26
10.72		SS	15	50	50+	10	45.26
End of Borehole							
Practical refusal to augering at 10.72m depth							
(GWL @ 1.57m-May 1, 2015)							

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

Piezometer Construction



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

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Prop. Commercial Development - 801 Albert Street
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Limited.

FILE NO. PG3272

REMARKS

HOLE NO. BH 8-15

BORINGS BY CME 75 Power Auger **DATE** April 17, 2015

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	54.92
		AU	1				
FILL: Black to brown silty sand with gravel, some cobbles		SS	2	79	6	1	53.92
		SS	3	38	11	2	52.92
2.29							
		SS	4	67	72		
Very dense, brown silty sand with gravel, some cobbles		SS	5	71	50+	3	51.92
		SS	6	33	50+		
4.57						4	50.92
GLACIAL TILL: Grey silty sand with clay, gravel, cobbles		SS	7	52	9	5	49.92
5.31							
End of Borehole							
Practical refusal to augering at 5.31m depth							
(GWL @ 3.0m depth based on field observations)							
(GWL @ 1.72m-May 1, 2015)							

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

○ Water Content %

20 40 60 80

Piezometer Construction

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Prop. Commercial Development - 801 Albert Street
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Limited.

FILE NO. PG3272

REMARKS

HOLE NO. BH 9-15

BORINGS BY CME 75 Power Auger **DATE** November 13, 2015

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	57.12
		AU	1				
FILL: Dark brown silty sand with some cobbles.		SS	2	54	7	1	56.12
		SS	3	33	+50	2	55.12
2.59		SS	4	50	10		
		SS	5	43	+50	3	54.12
FILL: Black sand and gravel		SS	6	63	+50	4	53.12
		SS	7	29	50	5	52.12
5.49		SS	8	83	13		
GLACIAL TILL: Grey silty sand with gravel, cobbles and boulders		SS	9	58	9	6	51.12
7.00						7	50.12
		RC	1	32		8	49.12
BEDROCK: Grey limestone		RC	2	15		9	48.12
		RC	3	83	83	10	47.12
		RC	4	98	82	11	46.12
11.38							
End of Borehole							
(GWL @ 3.81m-Dec. 1, 2015)							

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

Supplemental Geotechnical Investigation
Prop. Commercial Development - 801 Albert Street
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Limited.

FILE NO. PG3272

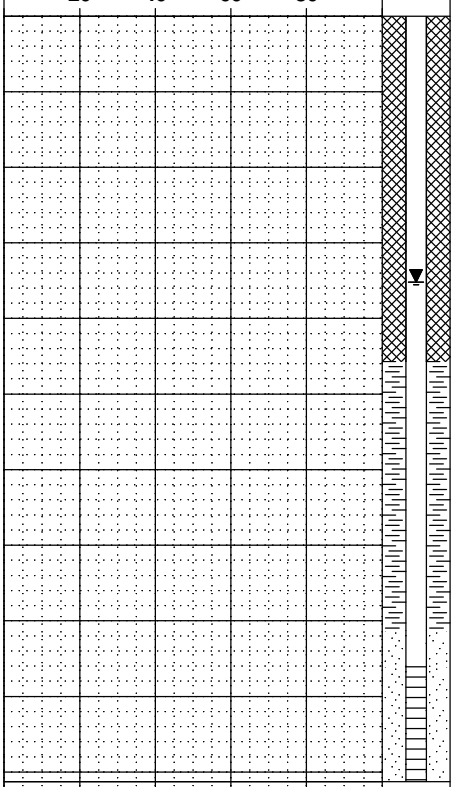
REMARKS

HOLE NO. BH10-15

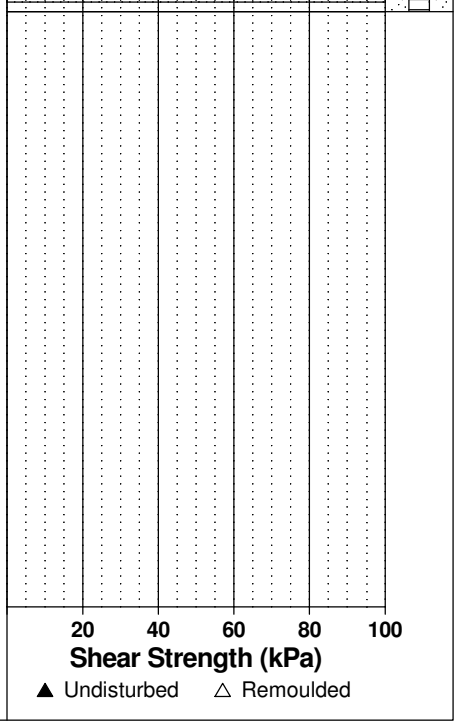
BORINGS BY CME 75 Power Auger **DATE** November 13, 2015

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	56.29
FILL: Dark brown silty sand, some cobbles		AU	1				
		SS	2	25	12	1	55.29
1.65		SS	3	67	22	2	54.29
FILL: Black silty sand and gravel, some ash, spent coal and iron slag		SS	4	58	10		
3.35		SS	5	38	+50	3	53.29
FILL: Brown silty sand and gravel, some cobbles and boulders		SS	6	67	+50	4	52.29
		SS	7	91	+50		
5.18		SS	8	67	7	5	51.29
GLACIAL TILL: Grey silty clay with sand, gravel, cobbles and boulders.		SS	9	100	3	6	50.29
7.49						7	49.29
		RC	1	77	39	8	48.29
BEDROCK: Grey limestone interbedded with shale						9	47.29
		RC	2	100	95		
10.13						10	46.29
End of Borehole							
(GWL @ 3.52m-Dec. 1, 2015)							

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



Monitoring Well Construction



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SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Prop. Commercial Development - 801 Albert Street
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Limited.

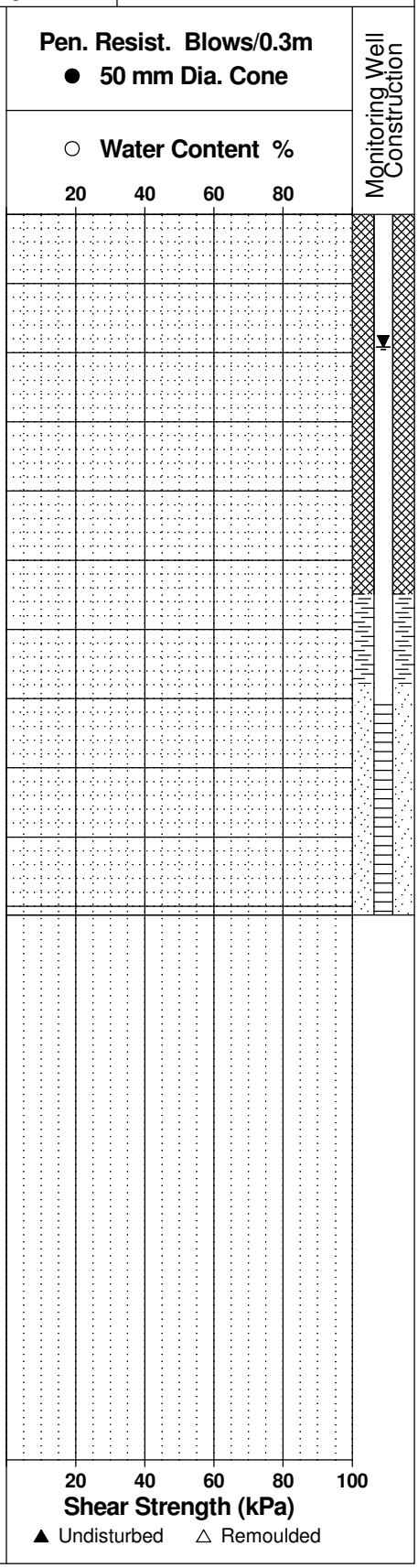
FILE NO. PG3272

REMARKS

HOLE NO. BH11-15

BORINGS BY CME 75 Power Auger **DATE** November 16, 2015

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	55.94
		AU	1				
		SS	2	56	+50	1	54.94
		SS	3	56	+50	2	53.94
FILL: Dark brown silty sand with cobbles and boulders		SS	4	33	+50	3	52.94
		RC	1	89			
		SS	5	54	71	4	51.94
4.88						5	50.94
FILL: Black silty sand and gravel, some ash, spent coal and iron slag 5.74							
		RC	2	100	68	6	49.94
						7	48.94
BEDROCK: Interbedded limestone and shale		RC	3	88	88	8	47.94
						9	46.94
		RC	4	98	98		
10.13						10	45.94
End of Borehole							
(GWL @ 1.92m-Dec. 1, 2015)							



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SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Prop. Commercial Development - 801 Albert Street
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Limited.

FILE NO. PG3272

REMARKS

HOLE NO. BH12-15

BORINGS BY CME 75 Power Auger **DATE** November 16, 2015

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	55.15
FILL: Dark brown silty sand, some gravel, cobbles, organics, burnt wood, ash and coal.		AU	1				
		SS	2	79	25	1	54.15
- 200mm thick layer of decayed wood at 1.8m depth		SS	3	75	16	2	53.15
2.18		SS	4	55	+50		
		SS	5	50	+50	3	52.15
FILL: Grey silty sand with gravel, cobbles and boulders		SS	6	71	+50	4	51.15
		SS	7	88	+50		
		RC	1	50		5	50.15
6.20						6	49.15
		RC	2	100	80		
						7	48.15
BEDROCK: Grey limestone interbedded with black shale		RC	3	100	95	8	47.15
		RC	4	100	92	9	46.15
9.40							
End of Borehole							
(GWL @ 2.08m-Dec. 1, 2015)							

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

Supplemental Geotechnical Investigation
Prop. Commercial Development - 801 Albert Street
Ottawa, Ontario

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FILE NO. PG3272

REMARKS

HOLE NO. BH13-15

BORINGS BY CME 75 Power Auger **DATE** November 17, 2015

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	55.02
FILL: Dark brown silty sand, some gravel, cobbles and organics		AU	1				
		SS	2	25	4	1	54.02
2.13		SS	3	64	52	2	53.02
FILL: Dark grey/black silty sand, some gravel and cobbles, trace organics		SS	4	42	14		
3.05		SS	5	69	+50	3	52.02
		SS	6	60	+50	4	51.02
		SS	7	56	+50		
FILL: Grey silty sand with gravel, cobbles and boulders		RC	1	21		5	50.02
6.58						6	49.02
BEDROCK Interbedded limestone and shale		RC	2	90	0		
		RC	3	50	0	7	48.02
- vertical fracture from 7.5 to 8.4m depth		RC	4	100	70	8	47.02
8.61							
End of Borehole							
(GWL @ 1.92m-Dec. 1, 2015)							

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

20 40 60 80

Monitoring Well Construction

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Prop. Commercial Development - 801 Albert Street
Ottawa, Ontario

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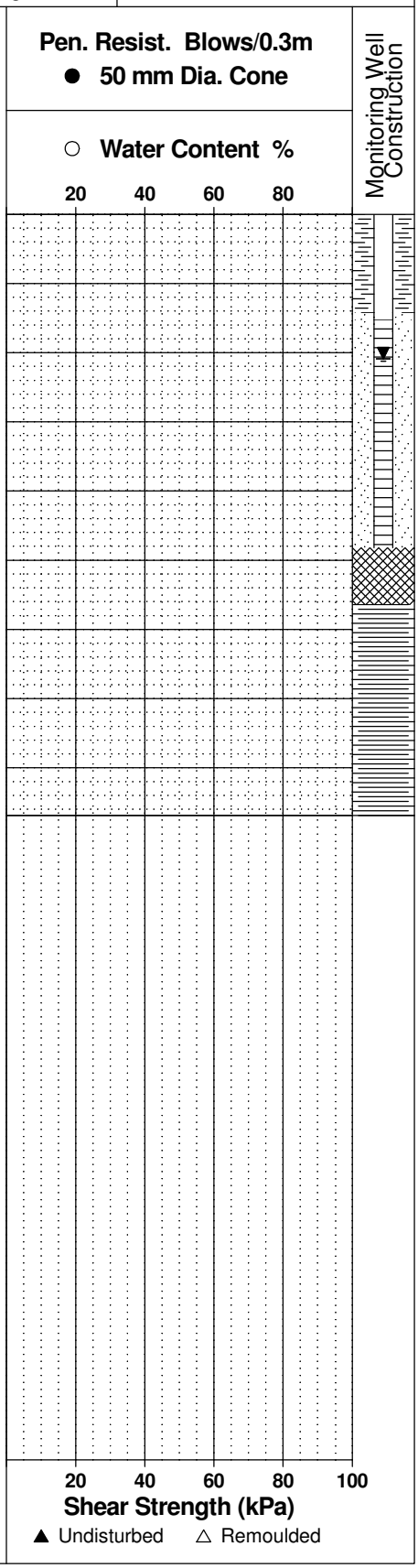
FILE NO. PG3272

REMARKS

HOLE NO. BH14-15

BORINGS BY CME 75 Power Auger **DATE** November 18, 2015

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	54.81
FILL: Dark brown silty sand with gravel, some cobbles, trace boulders		AU	1				
		SS	2	67	13	1	53.81
- dark grey by 2.0m depth		SS	3	67	33	2	52.81
2.08							
		SS	4	67	36		
GLACIAL TILL: Grey silty clay with sand, gravel, cobbles and boulders		SS	5	75	22	3	51.81
		SS	6	100	4	4	50.81
		SS	7	25	3	5	49.81
5.64							
		RC	1	75	72	6	48.81
BEDROCK: Grey limestone						7	47.81
		RC	2	95	95	8	46.81
8.69							
End of Borehole							
(GWL @ 2.09m-Dec. 1, 2015)							



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SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Prop. Commercial Development - 801 Albert Street
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Limited.

FILE NO. PG3272

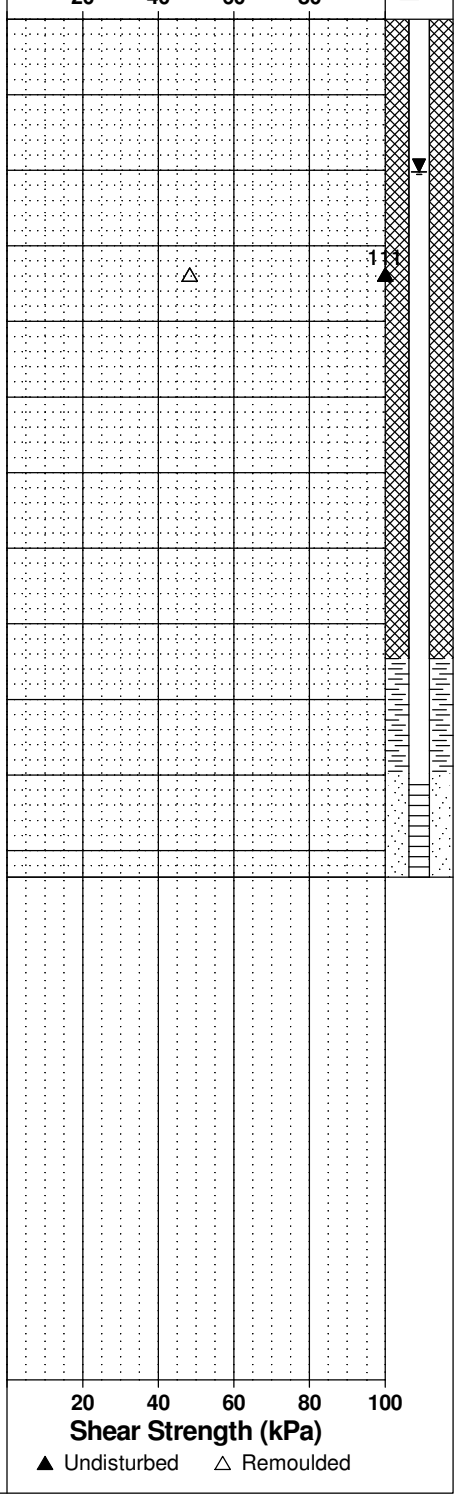
REMARKS

HOLE NO. BH15-15

BORINGS BY CME 75 Power Auger **DATE** November 17, 2015

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	55.06
FILL: Dark brown silty sand, some gravel and organics		AU	1				
		SS	2	33	4	1	54.06
1.73		SS	3	88	3		
Brown **SILTY SAND**, some clay						2	53.06
2.79		SS	4	100	2		
Grey **SILTY CLAY**, trace sand						3	52.06
4.47		SS	5	100	2	4	51.06
GLACIAL TILL: Grey silty clay with sand, some gravel		SS	6	100	2	5	50.06
5.79		SS	7	0	3		
		SS	8	83	6	6	49.06
GLACIAL TILL: Grey silty sand, some gravel, cobbles and boulders		SS	9	79	9	7	48.06
		SS	10	63	40	8	47.06
		SS	11	27	9	9	46.06
9.47							
BEDROCK: Interbedded shale and limestone		RC	1	90	60	10	45.06
		RC	2	100	90	11	44.06
11.35							
End of Borehole							
(GWL @ 2.02m-Dec. 1, 2015)							

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



Monitoring Well Construction

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Prop. Commercial Development - 801 Albert Street
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Limited.

FILE NO. PG3272

REMARKS

HOLE NO. BH16-15

BORINGS BY CME 75 Power Auger **DATE** November 18, 2015

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	55.01
FILL: Dark brown silty sand with gravel, some organics and cobbles		AU	1				
		SS	2	63	8	1	54.01
-metal slag and ash from 0.8 to 2.1m depth		SS	3	13	8	2	53.01
2.24							
FILL: Brown silty sand with gravel, some cobbles, trace boulders		SS	4	58	47		
		SS	5	71	+50	3	52.01
3.51							
Grey **SILTY CLAY**, trace silty sand seams		SS	6	100	2	4	51.01
		SS	7	100	4	5	50.01
5.28							
		SS	8	67	2	6	49.01
		SS	9	75	8		
GLACIAL TILL: Grey silty sand with gravel, cobbles and boulders		SS	10	67	28	7	48.01
		SS	11	63	41	8	47.01
						9	46.01
10.06						10	45.01
BEDROCK: Interbedded shale and limestone		RC	1	98	70	11	44.01
11.58							
End of Borehole							
(GWL @ 2.02m-Dec. 1, 2015)							

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

Supplemental Geotechnical Investigation
Prop. Commercial Development - 801 Albert Street
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Limited.

FILE NO. PG3272

REMARKS

HOLE NO. BH17-15

BORINGS BY CME 75 Power Auger **DATE** November 18, 2015

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	55.02
FILL: Dark brown silty sand, some gravel and organics		AU	1				
		SS	2	79	8	1	54.02
- slag and coal at 0.8m depth		SS	3	40	+50		
1.91		SS	4	0	+50	2	53.02
FILL: Brown silty sand and gravel with cobbles and boulders		SS	5	100	57	3	52.02
		SS	6	25	7	4	51.02
4.88						5	50.02
GLACIAL TILL: Grey silty sand with gravel, cobbles and boulders		SS	7	25	9	6	49.02
7.11						7	48.02
BEDROCK: Interbedded limestone and shale		RC	1	97	80		
		RC	2	100	90	8	47.02
8.66							
End of Borehole							
(GWL @ 2.02m-Dec. 1, 2015)							

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

Supplemental Geotechnical Investigation
Prop. Commercial Development - 801 Albert Street
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Limited.

FILE NO. PG3272

REMARKS

HOLE NO. BH18-15

BORINGS BY CME 850 Power Auger **DATE** November 23, 2015

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
TOPSOIL 0.20		AU	1			0	60.11
FILL: Brown silty sand with gravel, cobble sand boulders		SS	2	67	23	1	59.11
-black @ 0.8m depth		SS	3	17	17	2	58.11
-brown @ 1.4m depth		SS	4	17	27	3	57.11
-black @ 3.8m depth		SS	5	50	57		
4.42		SS	6	50	31	4	56.11
		SS	7	50	45	5	55.11
GLACIAL TILL: Grey silty clay with sand, gravel, cobbles and boulders		SS	8	75	12	6	54.11
		SS	9	75	12		
		SS	10	83	10	7	53.11
8.20		SS	11	75	23	8	52.11
		SS	12	17	32		
		SS	13	67	42	9	51.11
GLACIAL TILL: Grey silty sand with clay, gravel, cobbles and boulders						10	50.11
		SS	14	75	47	11	49.11
		SS	15	42	3	12	48.11
						13	47.11
		SS	16	100	15	14	46.11
14.73						15	45.11
BEDROCK: Grey limestone		RC	1	96	86		
16.15						16	44.11
End of Borehole							
(GWL @ 8m depth based on field observations)							
(GWL @ 5.56m-Dec. 1, 2015)							

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

20 40 60 80

Monitoring Well Construction

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

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SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Prop. Commercial Development - 801 Albert Street
Ottawa, Ontario

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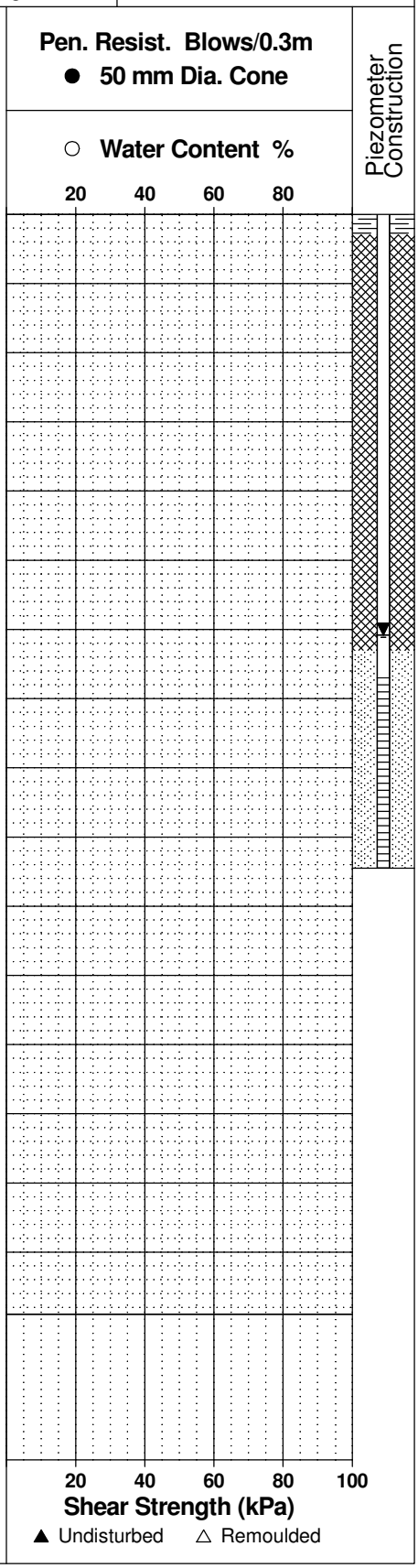
FILE NO. PG3272

REMARKS

HOLE NO. BH19-15

BORINGS BY CME 75 Power Auger **DATE** November 25, 2015

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	59.68
TOPSOIL 0.20		AU	1				
FILL: Brown silty sand with gravel		SS	2	75	29	1	58.68
- black @ 0.8m depth		SS	3	58	5	2	57.68
- brown @ 1.4m depth		SS	4	83	6		
- brick piece at 2.1m depth		SS	5	25	13	3	56.68
- some clay from 2.5 to 2.7m depth		SS	6	38	10	4	55.68
5.11		SS	7	54	33	5	54.68
GLACIAL TILL: Grey silty clay with sand and gravel, trace cobbles		SS	8	38	11	6	53.68
		SS	9	58	6		
7.62		SS	10	50	31	7	52.68
		SS	11	67	28	8	51.68
		SS	12	62	33		
		SS	13	83	62	9	50.68
						10	49.68
GLACIAL TILL: Dense to very dense, grey silty sand with gravel, cobbles, boulders		SS	14	50	50+	11	48.68
		SS	15	67	31	12	47.68
						13	46.68
14.38		SS	16	91	50+	14	45.68
BEDROCK: Grey limestone		RC	1	100	60	15	44.68
15.90							
End of Borehole							
(GWL @ 8.0m depth based on field observations)							
(GWL @ 6.08m-Dec. 1, 2015)							



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SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Prop. Commercial Development - 801 Albert Street
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Limited.

FILE NO. PG3272

REMARKS

HOLE NO. BH20-15

BORINGS BY CME 75 Power Auger **DATE** November 22, 2015

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	55.68
TOPSOIL 0.23		AU	1				
FILL: Black silty sand with gravel and brick pieces		SS	2	50	7	1	54.68
		SS	3	38	7	2	53.68
- concrete piece at 1.9m depth							
2.74		SS	4	25	5	3	52.68
		SS	5	50	8		
		SS	6	62	7	4	51.68
		SS	7	8	8	5	50.68
GLACIAL TILL: Grey silty sand with gravel and cobbles		SS	8	83	30	6	49.68
		SS	9	88	64		
		SS	10	100	60	7	48.68
		SS	11	100	11	8	47.68
		SS	12	100	12		
9.42						9	46.68
		RC	1	100	61	10	45.68
		RC	2	100	47		
BEDROCK: Grey limestone		RC	3	100	100	11	44.68
						12	43.68
		RC	4	100	95	13	42.68
13.49							
End of Borehole							
(GWL @ 5.0m depth based on field observations)							

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

20 40 60 80

Piezometer Construction

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

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Prop. Commercial Development - 801 Albert Street
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Limited.

FILE NO. PG3272

REMARKS

HOLE NO. BH21-15

BORINGS BY CME 75 Power Auger **DATE** November 23, 2015

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	55.88
FILL: Brown to black clayey sand, some gravel		AU	1				
		SS	2	92	12	1	54.88
		SS	3	100	8	2	53.88
2.40							
		SS	4	83	8	3	52.88
		SS	5	50	5		
		SS	6	50	3	4	51.88
		SS	7	75	17	5	50.88
GLACIAL TILL: Grey clayey silt with sand, gravel, cobbles and boulders		SS	8	50	13		
		SS	9	50	30	6	49.88
		SS	10	75	18	7	48.88
		SS	11	92	50+		
		RC	1	29		8	47.88
		RC	2	39		9	46.88
10.80						10	45.88
BEDROCK: Grey limestone		RC	3	91	84	11	44.88
12.22						12	43.88
End of Borehole							
(GWL @ 4.0m depth based on field observations)							
(GWL @ 1.84m-Dec. 1, 2015)							

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

Supplemental Geotechnical Investigation
Prop. Commercial Development - 801 Albert Street
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Limited.

FILE NO. PG3272

REMARKS

HOLE NO. BH22-15

BORINGS BY CME 75 Power Auger **DATE** November 26, 2015

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	55.58
TOPSOIL 0.08		AU	1				
FILL: Dark brown silty sand, some gravel		SS	2	12	20	1	54.58
-black @ 0.8m depth		SS	3	62	11	2	53.58
-brown @ 1.4m depth		SS	4	54	22		
3.30		SS	5	36	50+	3	52.58
		SS	6	62	4	4	51.58
		SS	7	83	7	5	50.58
GLACIAL TILL: Brown silty sand with gravel, clay, cobbles and boulders		SS	8	54	10	6	49.58
		SS	9	83	10		
		SS	10	50	48	7	48.58
		SS	11	17	1	8	47.58
		SS	12	67	34	9	46.58
		SS	13	58	37		
10.52		SS	14	67	50+	10	45.58
BEDROCK: Grey limestone		RC	1	100	82	11	44.58
12.04						12	43.58
End of Borehole							
(GWL @ 3.0m depth based on field observations)							
(GWL @ 2.84m-Dec. 1, 2015)							

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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Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Development - 801 Albert Street
Ottawa, Ontario

DATUM TBM - Top of manhole cover located near the northwest corner of subject site. Geodetic elevation = 56.03m.

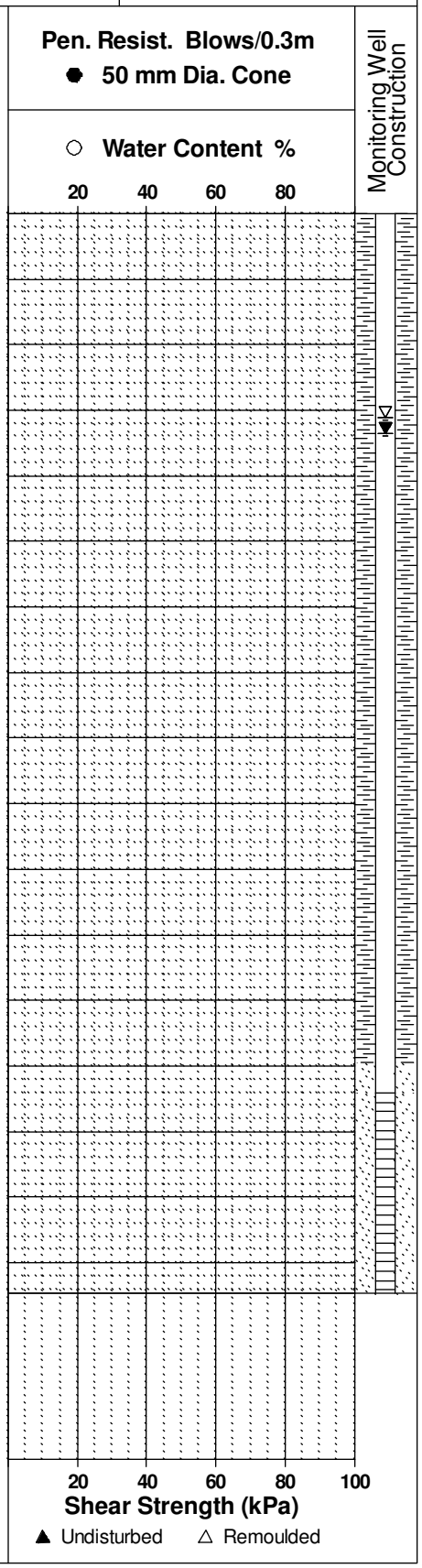
FILE NO. PG3272

REMARKS

HOLE NO. BH 1

BORINGS BY CME 55 Power Auger **DATE** June 4, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	56.35
		AU	1				
		SS	2	33	26	1	55.35
FILL: Brown silty sand with organics, some gravel and crushed stone		SS	3	0	12	2	54.35
		SS	4	43	17		
- black with trace asphalt by 2.7m depth		SS	5	55	60	3	53.35
		SS	6	80	50+	4	52.35
		SS	7	92	68	5	51.35
		SS	8	67	50+		
6.10						6	50.35
GLACIAL TILL: Grey silty clay with sand, gravel, some cobbles, trace boulders 6.68		SS	9	100	50+		
		RC	1	100	16	7	49.35
		RC	2	100	53	8	48.35
		RC	3	100	95	9	47.35
						10	46.35
BEDROCK: Grey limestone interbedded with black shale		RC	4	100	98	11	45.35
						12	44.35
		RC	5	98	95	13	43.35
		RC	6	100	98	14	42.35
						15	41.35
		RC	7	95	35	16	40.35
16.46							
End of Borehole							
(GWL @ 3.12m-June 16, 2014)							
(GWL @ 3.36m-July 31, 2014)							



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Development - 801 Albert Street
Ottawa, Ontario

DATUM TBM - Top of manhole cover located near the northwest corner of subject site. Geodetic elevation = 56.03m.

FILE NO. PG3272

REMARKS

HOLE NO. BH 2

BORINGS BY CME 55 Power Auger **DATE** June 5, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	55.22
FILL: Brown silty sand with gravel and crushed stone, trace brick		AU	1				
		SS	3	25	13	1	54.22
		SS	2	58	16		
2.44						2	53.22
		SS	4	33	8		
		SS	5	83	3	3	52.22
Stiff, brown **SILTY CLAY**		SS	6	100	W	4	51.22
- grey by 4.6m depth						5	50.22
6.10						6	49.22
GLACIAL TILL: Grey silty clay/clayey silt with sand, gravel, trace cobbles and boulders		SS	7	25	7		
		SS	8	17	28	7	48.22
		SS	9	17	50+	8	47.22
8.53		SS	10	38	50+		
		RC	1	100	87	9	46.22
		RC	2	100	92	10	45.22
		RC	3	100	92	11	44.22
		RC	4	100	100	12	43.22
BEDROCK: Grey limestone interbedded with black shale						13	42.22
		RC	5	98	88	14	41.22
						15	40.22
		RC	6	100	100	16	39.22
(GWL @ 7.68m-June 16, 2014)						17	38.22
(GWL @ 7.01m-July 31, 2014)		RC	7	100	100		
18.06						18	37.22
End of Borehole							

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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Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Development - 801 Albert Street
Ottawa, Ontario

DATUM TBM - Top of manhole cover located near the northwest corner of subject site. Geodetic elevation = 56.03m.

FILE NO. PG3272

REMARKS

HOLE NO. BH 3

BORINGS BY CME 55 Power Auger **DATE** June 6, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	55.62
		AU	1				
		SS	2	42	12	1	54.62
FILL: Dark brown silty sand with organics, some gravel and crushed stone, trace asphalt and coal		SS	3	25	8	2	53.62
		SS	4	58	2		
		SS	5	42	68	3	52.62
		SS	6	60	50+		
- trace blast rock by 4.0m depth						4	51.62
5.03		SS	7	17	36	5	50.62
		SS	8	0	3		
		SS	9	42	5	6	49.62
GLACIAL TILL: Grey silty clay/clayey silt with sand, gravel, some cobbles and boulders		SS	10	33	21	7	48.62
		SS	11	33	9	8	47.62
		SS	12	8	14		
		SS	13	42	19	9	46.62
		SS	14	26	36	10	45.62
10.70						11	44.62
		RC	1	100	82		
						12	43.62
		RC	2	100	58		
BEDROCK: Grey limestone interbedded with black shale						13	42.62
		RC	3	100	90	14	41.62
						15	40.62
		RC	4	98	87	16	39.62
(GWL @ 1.84m-June 16, 2014)							
(GWL @ 2.03m-July 31, 2014)		RC	5	100	95	17	38.62
18.04						18	37.62
End of Borehole							

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
Prop. Commercial Development - 801 Albert Street
Ottawa, Ontario

DATUM TBM - Top of manhole cover located near the northwest corner of subject site. Geodetic elevation = 56.03m.

FILE NO. PG3272

REMARKS

HOLE NO. BH 4

BORINGS BY CME 55 Power Auger **DATE** July 24, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	55.21
FILL: Black silty sand, some gravel		AU	1				
0.71							
FILL: Crushed stone with sand, blat rock, cobbles, boulders		SS	2	26	46	1	54.21
1.45							
		SS	3	67	57	2	53.21
FILL: Brown silty sand with crushed stone, blast rock, cobbles, boulders		SS	4	61	46		
		SS	5	8	11	3	52.21
3.76							
Stiff, brown **SILTY CLAY,** trace sand		SS	6	100	2	4	51.21
- grey by 4.5m depth		SS	7	100	2	5	50.21
6.04							
Loose, grey **SANDY SILT,** trace clay and gravel		SS	8	42	4	6	49.21
6.86							
GLACIAL TILL: Dark grey silty clay with gravel, cobbles, boulders, trace shale		SS	9	42	29	7	48.21
7.47							
		RC	1			8	47.21
						9	46.21
		RC	2	100	80	10	45.21
		RC	3	100	100	11	44.21
						12	43.21
		RC	4	100	88	13	42.21
BEDROCK: Grey limestone interbedded with shale		RC	5	98	75	14	41.21
						15	40.21
		RC	6	100	88	16	39.21
		RC	7	100	100	17	38.21
						18	37.21
		RC	8	98	98	19	36.21

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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Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Development - 801 Albert Street
Ottawa, Ontario

DATUM TBM - Top of manhole cover located near the northwest corner of subject site. Geodetic elevation = 56.03m.

FILE NO. PG3272

REMARKS

HOLE NO. BH 4

BORINGS BY CME 55 Power Auger **DATE** July 24, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Monitoring Well Construction
GROUND SURFACE									
		RC	9	100	100	19	36.21		
						20	35.21		
		RC	10	98	98	21	34.21		
						22	33.21		
		RC	11	100	100	23	32.21		
						24	31.21		
		RC	12	100	100	25	30.21		
BEDROCK: Grey limestone interbedded with shale		RC	13	100	100	26	29.21		
						27	28.21		
		RC	14	100	100	28	27.21		
		RC	15	98	98	29	26.21		
						30	25.21		
		RC	16	98	98	31	24.21		
		RC	17	100	100	32	23.21		
33.17		RC	18	100	100	33	22.21		
End of Borehole									
(GWL @ 1.91m-July 31, 2014)									

20 40 60 80

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
801 Albert Street
Ottawa, Ontario

DATUM TBM - Top of manhole cover located near the northwest corner of subject site. Geodetic elevation = 56.03m.

FILE NO. PG3272

REMARKS

HOLE NO. TP 1

BORINGS BY Backhoe **DATE** June 11, 2014

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	57.47		
FILL: Dark brown silty sand with gravel, cobbles, trace concrete		G	1						
- trace metal, brick and asphalt by 0.6m depth		G	2			1	56.47		
		G	3			2	55.47		
2.80									
End of Test Pit									
(TP dry upon completion)									

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

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
801 Albert Street
Ottawa, Ontario

DATUM TBM - Top of manhole cover located near the northwest corner of subject site. Geodetic elevation = 56.03m.

FILE NO. PG3272

REMARKS

HOLE NO. TP 2

BORINGS BY Backhoe **DATE** June 11, 2014

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	56.78		
		G	1						
		G	2			1	55.78		
FILL: Brown silty sand with gravel, cobbles, trace brick									
- some asphalt, brick and rebar by 0.3m depth		G	3						
- with some coal by 1.5m depth						2	54.78		
		G	4						
- with wood pieces by 2.7m depth		G	5						
						3	53.78		
3.66									
End of Test Pit									

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
801 Albert Street
Ottawa, Ontario

DATUM TBM - Top of manhole cover located near the northwest corner of subject site. Geodetic elevation = 56.03m.

FILE NO. PG3272

REMARKS

HOLE NO. TP 3

BORINGS BY Backhoe **DATE** June 11, 2014

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	56.34		
FILL: Brown silty sand with gravel, cobbles, rebar and rock fragments		G	1			1	55.34		
- with brick and pvc by 1.4m depth		G	2			2	54.34		
3.05						3	53.34		▽
End of Test Pit (GWL @ 3.0m 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
801 Albert Street
Ottawa, Ontario

DATUM TBM - Top of manhole cover located near the northwest corner of subject site. Geodetic elevation = 56.03m.

FILE NO. PG3272

REMARKS

HOLE NO. TP 4

BORINGS BY Backhoe **DATE** June 11, 2014

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	55.90		
FILL: Brown silty sand with gravel, cobbles, rock fragments and asphalt - dark brown to black by 1.5m depth		G	1			1	54.90		
2.08						2	53.90		
FILL: Brown silty sand with gravel, cobbles, trace boulders		G	2						
2.69									
End of Test Pit (TP dry upon completion)									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %; scale 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
801 Albert Street
Ottawa, Ontario

DATUM TBM - Top of manhole cover located near the northwest corner of subject site. Geodetic elevation = 56.03m.

FILE NO. PG3272

REMARKS

HOLE NO. TP 5

BORINGS BY Backhoe **DATE** June 11, 2014

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	54.76		
FILL: Brown silty sand with gravel, cobbles, boulders, trace brick		G	1			1	53.76		
		G	2			2	52.76		▽
2.46									
End of Test Pit (GWL @ 2.0m 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
801 Albert Street
Ottawa, Ontario

DATUM TBM - Top of manhole cover located near the northwest corner of subject site. Geodetic elevation = 56.03m.

FILE NO. PG3272

REMARKS

HOLE NO. TP 6

BORINGS BY Backhoe **DATE** June 11, 2014

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	54.83		
FILL: Brown silty sand with gravel, cobbles, boulders, trace asphalt		G	1			1	53.83		
		G	2			2	52.83		
2.59									
End of Borehole									
(GWL @ 1.8m depth based on field observations)									

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

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
801 Albert Street
Ottawa, Ontario

DATUM TBM - Top of manhole cover located near the northwest corner of subject site. Geodetic elevation = 56.03m.

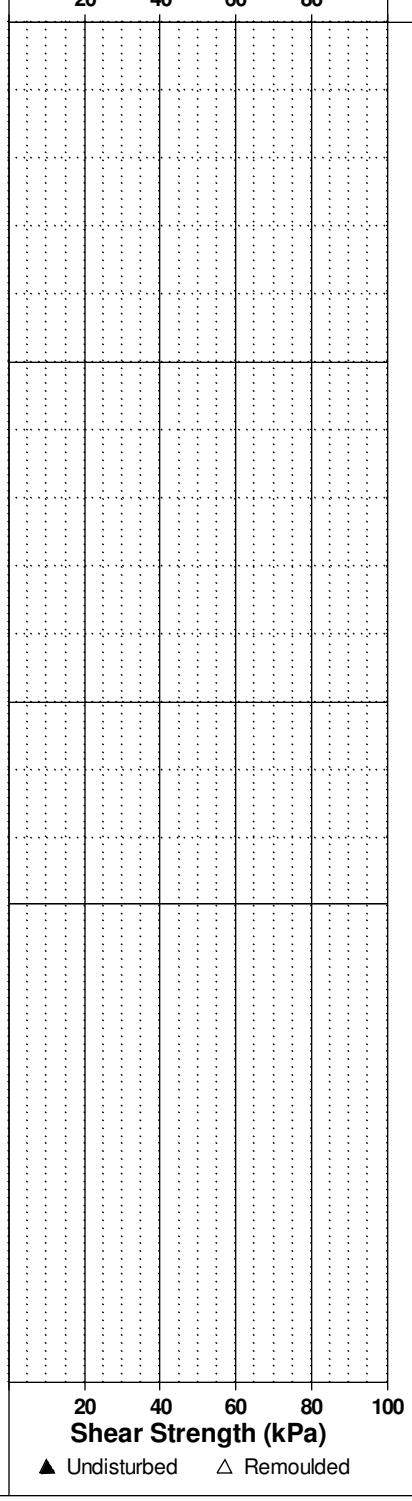
FILE NO. PG3272

REMARKS

HOLE NO. TP 7

BORINGS BY Backhoe **DATE** June 11, 2014

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	55.62		
FILL: Brown silty sand with gravel, cobbles, trace boulders									
0.94									
FILL: Black silty sand						1	54.62		
1.09									
FILL: Brown silty sand with gravel, cobbles						2	53.62		
2.59									
End of Test Pit									
(TP dry upon completion)									



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
801 Albert Street
Ottawa, Ontario

DATUM TBM - Top of manhole cover located near the northwest corner of subject site. Geodetic elevation = 56.03m.

FILE NO. PG3272

REMARKS

HOLE NO. TP 8

BORINGS BY Backhoe **DATE** June 11, 2014

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	55.59		
FILL: Brown silty sand with gravel, cobbles and boulders - black from 0.6 to 1.0m depth		G	1						
		G	2			1	54.59		
		G	3						
2.13						2	53.59		▽
FILL: Grey silty clay to clayey silt, trace sand		G	4						
3.00						3	52.59		
End of Test Pit (GWL @ 2.1m depth based on field observations)									

20 40 60 80

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
801 Albert Street
Ottawa, Ontario

DATUM TBM - Top of manhole cover located near the northwest corner of subject site. Geodetic elevation = 56.03m.

FILE NO. PG3272

REMARKS

HOLE NO. TP 9

BORINGS BY Backhoe **DATE** June 11, 2014

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	55.27		
FILL: Brown silty sand with gravel, trace bricks, organics									
0.63									
FILL: Black silty sand		G	1						
1.04						1	54.27		
FILL: Light brown clayey silt, trace sand		G	2						
1.68									
FILL: Brown-orange silty sand with gravel, cobbles and boulders		G	3			2	53.27		
2.44									
End of Test Pit TP terminated on bedrock surface at 2.44m depth									

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

Shear Strength (kPa): 20, 40, 60, 80, 100

▲ Undisturbed △ Remoulded

patersongroup

Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
801 Albert Street
Ottawa, Ontario

DATUM TBM - Top of manhole cover located near the northwest corner of subject site. Geodetic elevation = 56.03m.

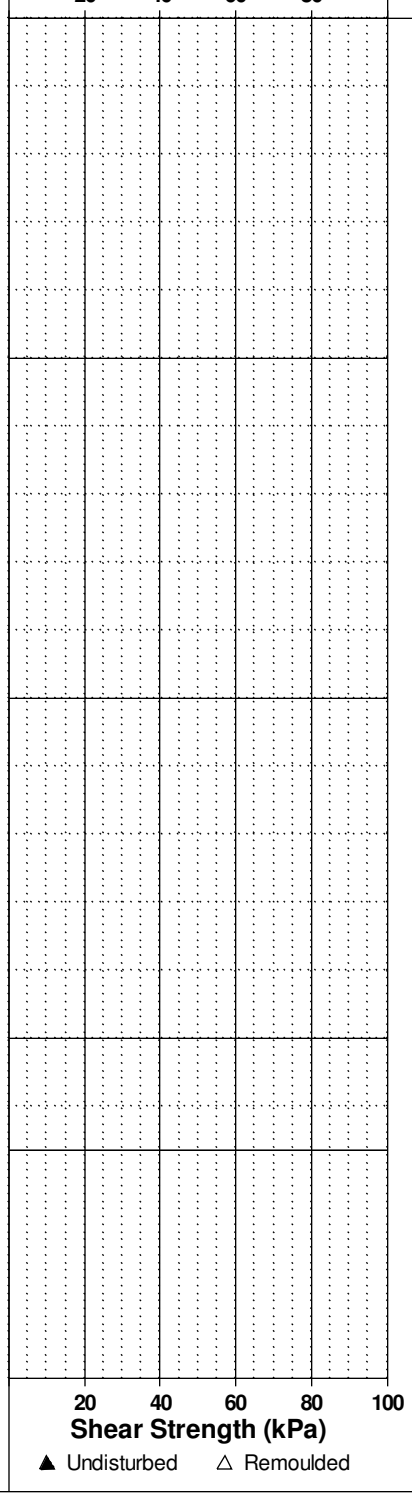
FILE NO. PG3272

REMARKS

HOLE NO. TP10

BORINGS BY Backhoe **DATE** June 11, 2014

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	55.90		
FILL: Brown silty sand with gravel, cobbles, boulders, trace brick		G	1			1	54.90		
		G	2			2	53.90		
		G	3			3	52.90		▽
3.33 End of Test Pit (GWL @ 3.0m depth based on field observations)									



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

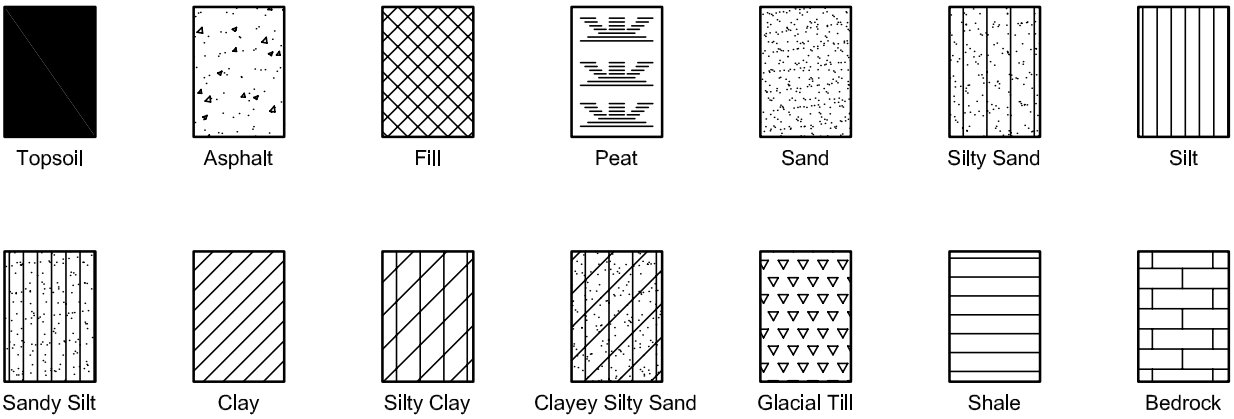
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

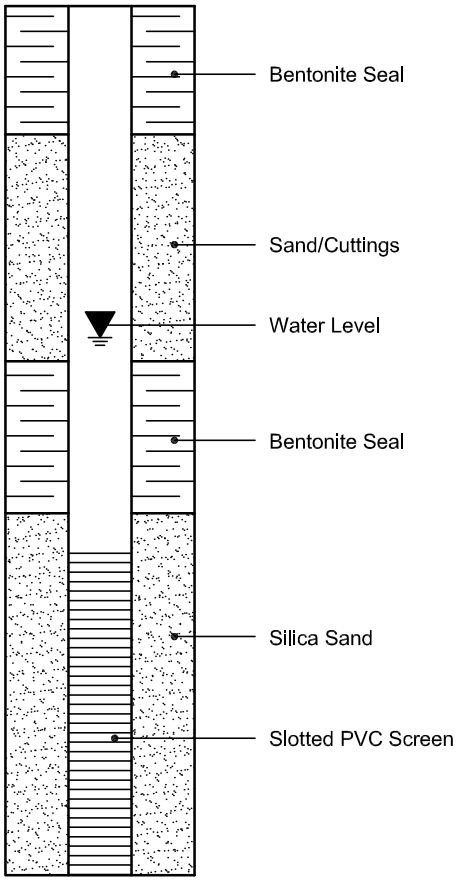
SYMBOLS AND TERMS (continued)

STRATA PLOT

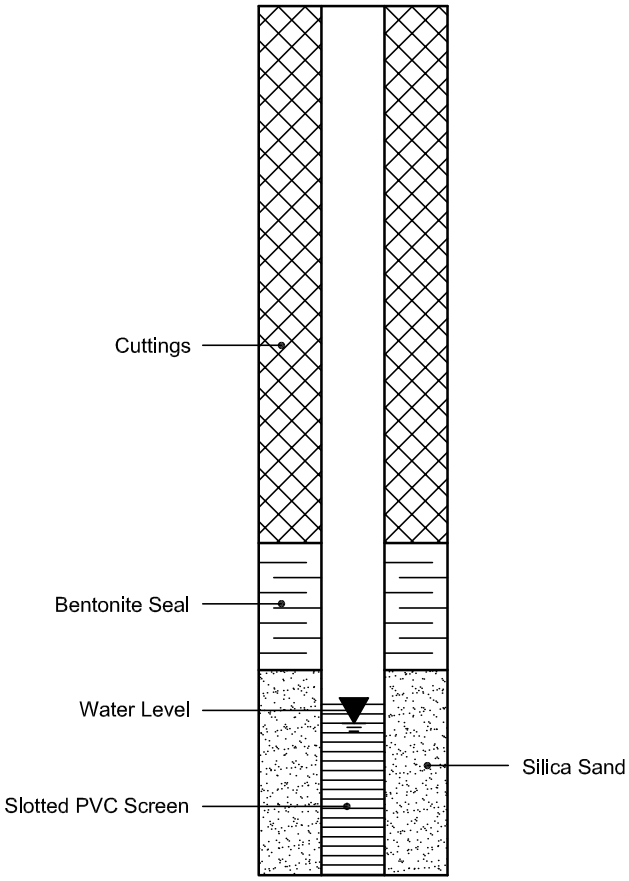


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



Certificate of Analysis

Report Date: 25-Jun-2014
Order Date:20-Jun-2014

Client: **Paterson Group Consulting Engineers**
Client PO: 16047

Project Description: PG3272

	Client ID:	BH3 SS13	-	-	-
	Sample Date:	06-Jun-14	-	-	-
	Sample ID:	1425330-01	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	91.9	-	-	-
General Inorganics					
pH	0.05 pH Units	8.15	-	-	-
Resistivity	0.10 Ohm.m	50.5	-	-	-
Anions					
Chloride	5 ug/g dry	40	-	-	-
Sulphate	5 ug/g dry	65	-	-	-

Log of Borehole 1

Trow

Project No: OTGE00017721A

Project: Geotechnical Investigation - Proposed Development

Location: Albert and City Centre Street, Ottawa, ON

Figure No. 3

Page. 1 of 2

Date Drilled: December 14th, 2004

Drill Type:

Datum: Depth below grade

Logged by: _____ Checked by: _____

Split Spoon Sample	⊠	Combustible Vapour Reading	□
Auger Sample	▯	Natural Moisture Content	×
SPT (N) Value	o	Atterberg Limits	⊢—⊙
Dynamic Cone Test	———	Undrained Triaxial at % Strain at Failure	⊕
Shelby Tube	▯	Shear Strength by Penetrometer Test	▲
Shear Strength by Vane Test	+ S		

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth m
		TOPSOIL ~ 300 mm.	55.6	0
		FILL Sandy silt to silty sand, some roots, organics, brick and asphalt pieces, dark grey, moist (loose).	55.3	
		SILTY CLAY Fissured material, grey and brown, moist (soft).	53.3	2
		SAND AND GRAVEL TILL Fine to coarse grained, some silt, brown, to grey, wet (compact to dense).	53.2 / 52.8	3
		Frequent cobbles and boulders below 4.0 m depth		4
		LIMESTONE BEDROCK Some shale partings, grey/black (poor to fair quality).	45.8	10

Standard Penetration Test N Value: 20 40 60 80

Shear Strength kPa: 50 100 150 200

Combustible Vapour Reading (ppm): 250 500 750

Natural Moisture Content % Atterberg Limits (% Dry Weight): 20 40 80

SAMPLES

Natural Unit Wt. kN/m³

Continued Next Page

NOTES:
1. Borehole/Test Pit data requires interpretation by Trow before use by others
2. Piezometer installed upon completion.
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00017721A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	2.3	NA
44 Days	2.4	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	4.3 - 5	15	
2	5 - 8.9	18	
3	8.9 - 9.6	43	
4	9.6 - 9.8	100	
5	9.8 - 11.9	42	32
6	11.9 - 12.5	100	73

LOG OF BOREHOLE CHAMPAGNESLOPEBH1-7.GPJ TROW OTTAWA.GDT 5/28/09

Log of Borehole 1

Trow

Project No: OTGE00017721A

Project: Geotechnical Investigation - Proposed Development

Figure No. 3

Page. 2 of 2

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth m	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	PIEZO	Natural Unit Wt. kN/m³
		LIMESTONE BEDROCK Some shale partings, grey/black (poor to fair quality). *(continued)*	43.6	12	20 40 60 80 / 50 100 150 200	250 500 750 / 20 40 60		
			43.1					

NOTES:
1. Borehole/Test Pit data requires interpretation by Trow before use by others
2. Piezometer installed upon completion
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00017721A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	2.3	NA
44 Days	2.4	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	4.3 - 5	15	
2	5 - 8.9	18	
3	8.9 - 9.6	43	
4	9.6 - 9.8	100	
5	9.8 - 11.9	42	32
6	11.9 - 12.5	100	73

LOG OF BOREHOLE CHAMPAGNESLOPEBH1-7.GPJ TROW OTTAWA.GDT 5/28/09

Log of Borehole 2

Trow

Project No: OTGE00017721A

Project: Geotechnical Investigation - Proposed Development

Location: Albert and City Centre Street, Ottawa, ON

Figure No. 4

Page. 1 of 1

Date Drilled: December 13th, 2004

Drill Type:

Datum: Depth below grade

Logged by: _____ Checked by: _____

Split Spoon Sample	⊠	Combustible Vapour Reading	□
Auger Sample	▯	Natural Moisture Content	×
SPT (N) Value	○	Atterberg Limits	⊢—○
Dynamic Cone Test	———	Undrained Triaxial at % Strain at Failure	⊕
Shelby Tube	■	Shear Strength by Penetrometer Test	▲
Shear Strength by Vane Test	+ S		

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	DEPTH m
		TOPSOIL ~ 400 mm.	55.7	
			55.3	
		FILL Mixture of topsoil and sand, brown and black, moist.	54.8	
		SILTY SAND AND GRAVEL Fine to coarse grained sand and fine to medium gravel, mottled, grey and brown, moist (compact).	53.9	1
▼		SILTY CLAY Sandy seams, slightly organic, some shells, grey, very moist (stiff).	53.3	2
			52.7	3
		CLAYEY SILT TILL Fine to medium gravel, sandy, grey, very moist to wet (very soft to stiff).		4
				5
				6
				7
		WEATHERED LIMESTONE Black, wet.	48.2	8
		Borehole terminated at 8.5 m depth	47.2	

Standard Penetration Test N Value: 20 40 60 80

Shear Strength: 50 100 150 200 kPa

>100 kPa

spoon refusal

Combustible Vapour Reading (ppm): 250 500 750

Natural Moisture Content % Atterberg Limits (% Dry Weight): 20 40 60

SAMPLES

Natural Unit Wt. kN/m³

NOTES:
1. Borehole/Test Pit data requires interpretation by Trow before use by others
2. Borehole backfilled upon completion.
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00017721A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	2.4	NA
44 Days		

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE CHAMPAGNESLOPEBH1-7.GPJ TROW OTTAWA.GDT 5/28/09

Log of Borehole 3

Trow

Project No: OTGE00017721A

Project: Geotechnical Investigation - Proposed Development

Location: Albert and City Centre Street, Ottawa, ON

Figure No. 5

Page 1 of 1

Date Drilled: December 13th, 2004

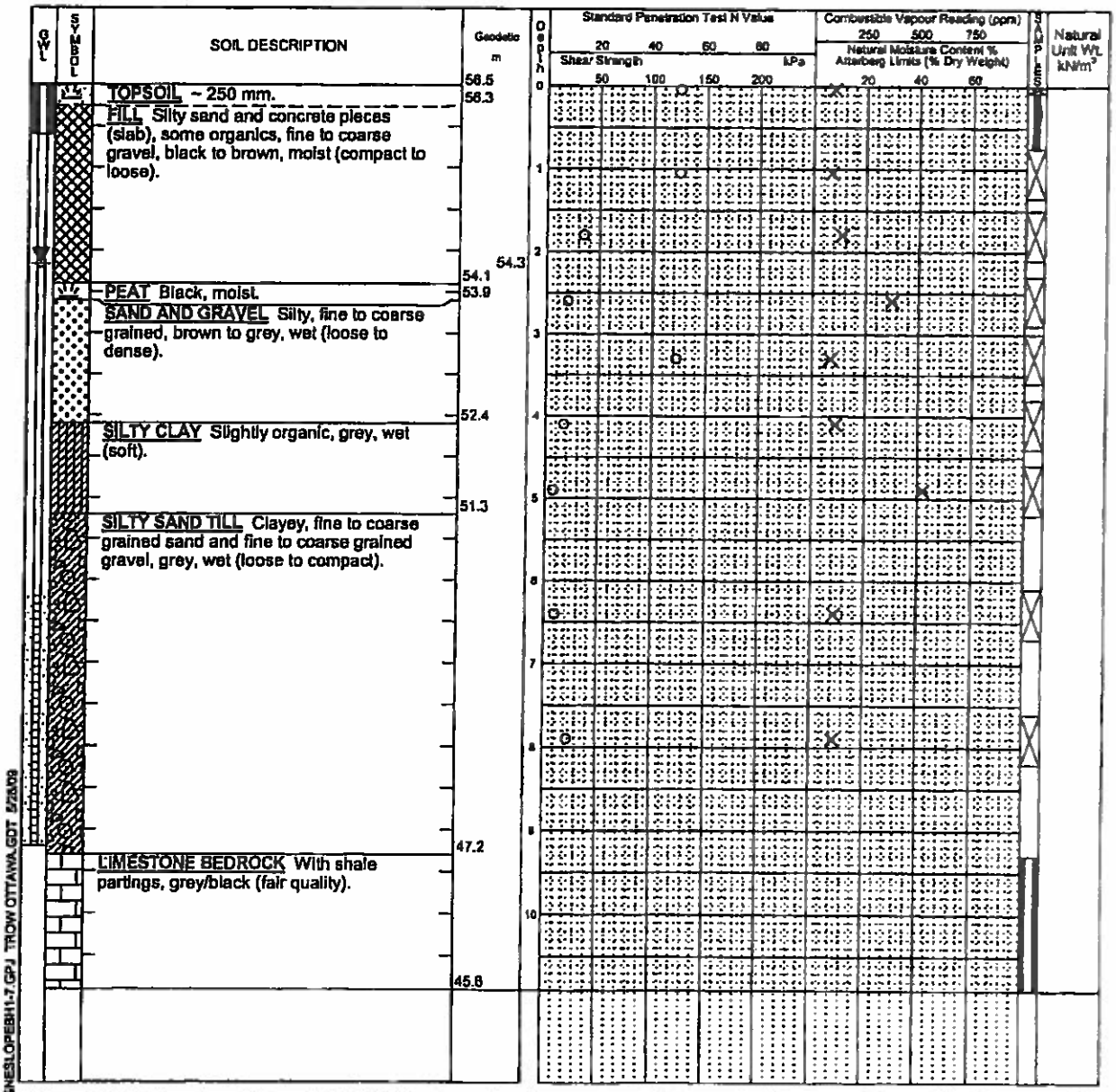
Drill Type:

Datum: Depth below grade

Logged by: _____ Checked by: _____

Split Spoon Sample ⊠ | Auger Sample ▯▯ | SPT (N) Value ○ | Dynamic Cone Test ——— | Shelby Tube ▩ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits ⊢—○—⊣ | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲



NOTES:
1. Borehole/Test Pit data requires interpretation by Trow before use by others
2. Piezometer installed upon completion.
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00017721A

WATER LEVEL RECORDS		
Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	dry	NA
44 Days	2.2	

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %
1	9.3 - 10.9	100	72

LOG OF BOREHOLE CHAMPAGNESLOPEBH1-7.GPJ TROW OTTAWA.GDT 2/26/09

Log of Borehole 4

Trow

Project No: OTGE00017721A

Project: Geotechnical Investigation - Proposed Development

Location: Albert and City Centre Street, Ottawa, ON

Figure No. 6

Page. 1 of 1

Date Drilled: December 14th, 2004

Drill Type:

Datum: Depth below grade

Logged by: _____ Checked by: _____

Split Spoon Sample ⊠ | Combustible Vapour Reading □
Auger Sample ▥ | Natural Moisture Content ×
SPT (N) Value ○ | Atterberg Limits ⊢—○
Dynamic Cone Test ——— | Undrained Triaxial at % Strain at Failure ⊕
Shelby Tube ■ | Shear Strength by Penetrometer Test ▲
Shear Strength by Vane Test +S

GWT	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth m	Standard Penetration Test N Value (20 40 60 80) / Shear Strength kPa (50 100 150 200)	Combustible Vapour Reading (ppm) 250 500 750 / Natural Moisture Content % Atterberg Limits (% Dry Weight) 20 40 60	SAMPLES	Natural Unit Wt kN/m³
		TOPSOIL ~ 150 mm.	55.5	0				
		FILL Sandy silt to silty sand with peat pockets, asphalt pieces, organics, grey-brown to black, moist (compact).	55.4					
		SANDY SILT Black peat layers or pockets, yellow-brown, moist (compact to very loose).	54.0	1				
			53.2	2				
		SAND AND GRAVEL TILL Fine to coarse grained sand with fine to coarse grained gravel, frequent cobbles and boulders, grey, moist.	52.6	3				
				4				
				5				
				6				
				7				
		LIMESTONE BEDROCK With shale partings, grey/black (excellent quality).	47.7	8				
			46.2	9				

NOTES:
1. Borehole/Test Pit data requires interpretation by Trow before use by others
2. Piezometer installed upon completion.
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00017721A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	2.3	NA
44 Days	2.3	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	3.8 - 4.2	100	
2	4.2 - 4.8	58	
3	4.8 - 7.3	16	
4	7.8 - 9.3	100	98

LOG OF BOREHOLE CHAMPAGNESLOPEBH1-7.GPJ TROW OTTAWA.GDT 5/28/09

Log of Borehole 5

Trow

Project No: OTGE00017721A

Project: Geotechnical Investigation - Proposed Development

Location: Albert and City Centre Street, Ottawa, ON

Figure No. 7

Page 1 of 1

Date Drilled: December 14th, 2004

Drill Type:

Datum: Depth below grade

Logged by: _____ Checked by: _____

Split Spoon Sample ⊠ | Auger Sample ▯ | SPT (N) Value ○ | Dynamic Cone Test ——— | Shelby Tube ▩ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits |—○ | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SWPOL	SOIL DESCRIPTION	Geodetic m	Depth m
		TOPSOIL ~100 mm.	55.4	0
		FILL Sandy silt with organics, asphalt pieces, dark grey to black, moist (loose).	55.3	
		SAND AND GRAVEL TILL Fine to coarse grained sand and fine to medium gravel, some shells, grey, moist (compact to dense).	53.9	
		Frequent cobbles and boulders below 3.0 m depth	53.3	2
		LIMESTONE BEDROCK With shale partings, grey/black (poor to good quality).	49.9	5
			47.9	7

Standard Penetration Test N Value: 20 40 60 80

Shear Strength: 50 LPa 200 — spoon refusal

Combustible Vapour Reading (ppm): 250 500 750

Natural Moisture Content % / Atterberg Limits (% Dry Weight): 20 40 60

SPT Sample

Natural Unit Wt. kN/m³

NOTES:
1. Borehole/Test Pit data requires interpretation by Trow before use by others
2. Piezometer installed upon completion.
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00017721A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	2.4	NA
44 Days	2.1	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	3.1 - 4	40	
2	4 - 5.2	27	
3	5.2 - 5.5	100	
4	5.5 - 5.9	100	32
5	5.9 - 7.5	100	88

LOG OF BOREHOLE CHAMPAGNESLOPEBH1-7.GPJ TROW OTTAWA.GDT 5/28/09

Log of Borehole 6

Trow

Project No: OTGE00017721A

Project: Geotechnical Investigation - Proposed Development

Location: Albert and City Centre Street, Ottawa, ON

Figure No. 8

Page 1 of 1

Date Drilled: December 14th, 2004

Drill Type:

Datum: Depth below grade

Logged by: _____ Checked by: _____

Split Spoon Sample ⊠
Auger Sample ▥
SPT (N) Value ○
Dynamic Cone Test ——
Shelby Tube ■
Shear Strength by Vane Test +
S

Combustible Vapour Reading □
Natural Moisture Content ×
Atterberg Limits |—○
Undrained Triaxial at % Strain at Failure ⊕
Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth m
		TOPSOIL ~ 175 mm.	55.4	
		FILL: Sandy silt with organics, asphalt pieces, dark grey to black, moist (loose).	55.2	
		CLAYEY SILT: Olive grey, moist.	53.1	53.2
		PEAT: Partially decayed, black, wet (loose).	52.8	
		SAND AND GRAVEL TILL: Fine to coarse grained sand with fine to medium gravel, frequent cobbles and boulders, grey moist (very dense).	52.5	
		LIMESTONE BEDROCK: With shale partings, grey/black (fair quality).	49.2	
			47.5	

Standard Penetration Test N Value: 20 40 60 80
Shear Strength kPa: 50 100 150 200
Combustible Vapour Reading (ppm): 250 500 750
Natural Moisture Content % Atterberg Limits (% Dry Weight): 20 40 60
SAMPLES
Natural Unit Wt. kN/m³

Depth m: 0 1 2 3 4 5 6 7

spoon refusal
spoon refusal

NOTES:
1. Borehole/Test Pit data requires interpretation by Trow before use by others
2. Piezometer installed upon completion.
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00017721A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	2.7	NA
44 Days	2.2	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	2.9 - 4.7	47	
2	4.7 - 6.2	40	
3	6.2 - 7.9	91	65

LOG OF BOREHOLE CHAMPAGNESLOPEBH1-7.GPJ TROW OTTAWA.GDT 3/25/09

Log of Borehole 7

Trow

Project No: OTGE00017721A

Project: Geotechnical Investigation - Proposed Development

Location: Albert and City Centre Street, Ottawa, ON

Figure No. 9

Page 1 of 2

Date Drilled: January 14th, 2005

Drill Type:

Datum: Depth below grade

Logged by: _____ Checked by: _____

Split Spoon Sample	⊠	Combustible Vapour Reading	□
Auger Sample	▥	Natural Moisture Content	×
SPT (N) Value	○	Atterberg Limits	⊢—○
Dynamic Cone Test	——	Undrained Triaxial at % Strain at Failure	⊕
Shelby Tube	▩	Shear Strength by Penetrometer Test	▲
Shear Strength by Vane Test	+ S		

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	DEPTH m	Standard Penetration Test N Value (20 40 60 80) / Shear Strength (50 100 150 200 kPa)	Combustible Vapour Reading (ppm) (250 500 750) / Natural Moisture Content % Atterberg Limits (% Dry Weight) (20 40 60)	SAMPLES	Natural Unit Wt. kN/m³
		PILL Sand to silty sand with occasional gravel layers and rock fragments, brown, moist (compact to dense).	64.3	0				
		Some wood fragments, black staining and organics present from 9.1 m depth.	53.2	11				

Continued Next Page

NOTES:
1. Borehole/Test Pit data requires interpretation by Trow before use by others
2. Piezometer installed upon completion.
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00017721A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	dry	14.3 m
14 Days	11.1	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	13.5 - 14.4	67	0
2	14.4 - 15.2	0	0

LOG OF BOREHOLE CHAMPAGNESLOPEBH1-7.GPJ TROW OTTAWA.GDT 5/28/09

Log of Borehole 7

Trow

Project No: OTGE00017721A

Project: Geotechnical Investigation - Proposed Development

Figure No. 9

Page. 2 of 2

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth
		FILL: Sand to silty sand with occasional gravel layers and rock fragments, brown, moist (compact to dense). *(continued)*	52.3	12
		SAND AND GRAVEL TILL: Frequent cobbles and boulders, fine to coarse sand and fine to coarse gravel, grey.	50.8	13
		Borehole terminated at 15.2 m depth	49.1	15

Standard Penetration Test N Value: 20 40 60 80

Shear Strength: 50 100 150 200 kPa

Combustible Vapour Reading (ppm): 250 500 750

Natural Moisture Content % Atterberg Limits (% Dry Weight): 20 40 60

SPT 'N' Value

Natural Unit Wt. kN/m³

NOTES:
1. Borehole/Test Pit data requires interpretation by Trow before use by others
2. Piezometer installed upon completion.
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00017721A

WATER LEVEL RECORDS		
Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	dry	14.3 m
14 Days	11.1	

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %
1	13.5 - 14.4	67	0
2	14.4 - 15.2	0	0

LOG OF BOREHOLE CHAMPAGNESLOPEBH1-7.GPJ TROW OTTAWA.GDT 5/28/09

Log of Borehole 8

Trow

Project No: OTT-00020493-A0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 801 Albert Street, City of Ottawa, Ontario

Figure No. 10

Page 1 of 2

Date Drilled: July 20, 2010

Drill Type:

Datum: Geodetic

Logged by: Checked by:

Split Spoon Sample | Combustible Vapour Reading
Auger Sample | Natural Moisture Content
SPT (N) Value | Atterberg Limits
Dynamic Cone Test | Undrained Triaxial at % Strain at Failure
Shelby Tube | Shear Strength by Penetrometer Test
Shear Strength by Vane Test

SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Sample	Natural Unit Wt. kN/m³
TOPSOIL ~ 230 mm	54.96	0				
FILL Sand and gravel with asphalt grinders, frequent cobbles and boulders, brown and black, moist	54.8		21			
		1	23			
	53.01	2	15			
Basement floor	49.8	5	6			
CLAYEY SILT TILL Some sand, fine to medium gravel, grey, wet		6	9			
SILTY SAND TILL Fine to coarse gravel, some cobbles and boulders, grey, very moist	48.6	7	15			

Continued Next Page

NOTES:
1. Borehole/Test Pit data requires interpretation by Trow before use by others
2. A 19 mm slotted standpipe was installed in the borehole
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTT-00020493-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
14 days	2.0	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	8.9 - 10.9	100	100
2	10.9 - 11.9	100	94

LOG OF BOREHOLE LOG BH 8 TO 13.GPJ TROW OTTAWA.GDT 8/5/10

Log of Borehole 8

Trow

Project No: OTT-00020493-A0

Project: Geotechnical Investigation - Proposed Residential Development

Figure No. 10

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth
		SILTY SAND TILL Fine to coarse gravel, some cobbles and boulders, grey, very moist *(continued)*	47.96	7
				8
			46.1	9
		LIMESTONE BEDROCK Shaley partings, horizontally bedded thingly to medium bedded, vertical joint planes, grey (excellent quality)		10
				11
			43.1	
		Borehole Terminated @ 11.9 m depth		

Standard Penetration Test N Value: 20 40 60 80

Shear Strength kPa: 50 100 150 200

Combustible Vapour Reading (ppm): 250 500 750

Natural Moisture Content % / Atterberg Limits (% Dry Weight): 20 40 60

SAMPLES

Natural Unit Wt. kN/m³

Run 1

Run 2

LOG OF BOREHOLE LOG B# 8 TO 13.GPJ TROW OTTAWA.GDT 8/5/10

NOTES:
1. Borehole/Test Pit data requires interpretation by Trow before use by others
2. A 19 mm slotted standpipe was installed in the borehole
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTT-00020493-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
14 days	2.0	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	8.9 - 10.9	100	100
2	10.9 - 11.9	100	94

Log of Borehole 9

Trow

Project No: OTT-00020493-A0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 801 Albert Street, City of Ottawa, Ontario

Figure No. 11

Page 1 of 2

Date Drilled: July 20, 2010

Drill Type:

Datum: Geodetic

Logged by: _____ Checked by: _____

Split Spoon Sample	⊠	Combustible Vapour Reading	□
Auger Sample	▯	Natural Moisture Content	×
SPT (N) Value	○	Atterberg Limits	⊢○
Dynamic Cone Test	———	Undrained Triaxial at % Strain at Failure	⊕
Shelby Tube	▩	Shear Strength by Penetrometer Test	▲
Shear Strength by Vane Test	+ S		

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	DEPTH	Standard Penetration Test N Value (20 40 60 80) / Shear Strength (50 100 150 200 kPa)	Combustible Vapour Reading (ppm) (250 500 750) / Natural Moisture Content % Atterberg Limits (% Dry Weight) (20 40 60)	SAMPLES	Natural Unit Wt. kN/m³
		TOPSOIL ~ 40 mm	54.82					
		FILL: Silty sand with asphalt grindings, some silty clay and topsoil, frequent gravel, cobbles boulders, brown and black, moist to wet	54.6		28			
				1	17			
			52.93	2	21			
		Basement floor		3	85/230mm			
				4	75			
				5				
		SILTY SAND TILL: Clayey, frequent gravel, grey, wet	48.7	6	19			
			47.9	7				

Continued Next Page

NOTES:
1. Borehole/Test Pit data requires interpretation by Trow before use by others
2. A 19 mm slotted standpipe was installed in the borehole
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTT-00020493-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
14 days	1.9	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	6.9 - 7.8	100	100
2	7.8 - 9.3	98	85
3	9.3 - 10.8	98	95

LOG OF BOREHOLE LOG BH 8 TO 13.GPJ TROW OTTAWA.GDT 8/5/10

Log of Borehole 9

Trow

Project No: OTT-00020493-A0

Project: Geotechnical Investigation - Proposed Residential Development

Figure No. 11

SOIL DESCRIPTION	Geodetic Elevation m	Depth m	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Natural Unit Wt. kN/m³
LIMESTONE BEDROCK Shaley partings, horizontally bedded, thingly to medium bedded, vertical joint planes, grey (very good to excellent quality) *(continued)*	47.82	7	20 40 60 80 50 100 150 200	250 500 750 20 40 60	Run 1
		8			Run 2
		9			
		10			Run 3
Borehole Terminated @ 10.8 m depth	44.0				

NOTES:
1. Borehole/Test Pit data requires interpretation by Trow before use by others
2. A 19 mm slotted standpipe was installed in the borehole
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTT-00020493-A0

WATER LEVEL RECORDS		
Elapsed Time	Water Level (m)	Hole Open To (m)
14 days	1.9	

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %
1	6.9 - 7.8	100	100
2	7.8 - 9.3	98	85
3	9.3 - 10.8	98	95

LOG OF BOREHOLE LOG BH 8 TO 13.GPJ TROW OTTAWA.GDT 8/5/10

Log of Borehole 10

Trow

Project No: OTT-00020493-A0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 801 Albert Street, City of Ottawa, Ontario

Figure No. 12

Page. 1 of 2

Date Drilled: July 21, 2010

Drill Type:

Datum: Geodetic

Logged by: _____ Checked by: _____

Split Spoon Sample ⊠ | Auger Sample ▯ | SPT (N) Value ○ | Dynamic Cone Test ——— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits ⊢—○ | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Depth Below Grade m	Elev.
			54.94	
		TOPSOIL ~ 100 mm	54.8	
		FILL Silty sand and gravel with asphalt pices, some topsoil and organics, brown and black, moist		
				53
			51.9	
		SILTY CLAY Some sand seams or pockets, grey, moist to very moist		
		Basement floor		
			48.9	
		SILTY SAND TILL Clayey, some gravel, cobbles and boulders, grey, wet		

Standard Penetration Test N Value: 20 40 60 80

Shear Strength kPa: 50 100 150 200

Combustible Vapour Reading (ppm): 250 500 750

Natural Moisture Content % / Atterberg Limits (% Dry Weight): 20 40 60

Depth: 0 1 2 3 4 5 6 7

SAMPLES

Natural Unit Wt. kN/m³

20 | 9 | 50/280 mm | 118 si=24 | 8 | 16 | 12

Continued Next Page

NOTES:
1. Borehole/Test Pit data requires interpretation by Trow before use by others
2. A 19 mm slotted standpipe was installed in the borehole
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTT-00020493-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
13 days	7.8	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	9.5 - 10.5	100	89
2	10.5 - 12	99	94
3	12 - 13.4	100	100

LOG OF BOREHOLE LOG BH 8 TO 13.GPJ TROW OTTAWA.GDT 1/17/11

Log of Borehole 10

Trow

Project No: OTT-00020493-A0

Project: Geotechnical Investigation - Proposed Residential Development

Figure No. 12

Page. 2 of 2

GWL	SYMBOL	SOIL DESCRIPTION	Depth Below Grade m	Depth
		SILTY SAND TILL Clayey, some gravel, cobbles and boulders, grey, wet *(continued)*	47.94	7
				8
				9
		LIMESTONE BEDROCK Shaley partings, horizontally thingly to medium bedded, vertical joint planes, grey (very good to excellent quality)	45.4	10
				11
				12
				13
		Borehole Terminated @ 13.4 m depth	41.5	

Standard Penetration Test N Value: 20 40 60 80

Shear Strength kPa: 50 100 150 200

Combustible Vapour Reading (ppm): 250 500 750

Natural Moisture Content % / Atterberg Limits (% Dry Weight): 20 40 60

SAMPLES

Natural Unit Wt. kN/m³

Run1

Run 2

Run 3

LOG OF BOREHOLE LOG BH 8 TO 13.GPJ TROW OTTAWA.GDT 1/17/11

NOTES:
1. Borehole/Test Pit data requires interpretation by Trow before use by others
2. A 19 mm slotted standpipe was installed in the borehole
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTT-00020493-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
13 days	7.8	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	9.5 - 10.5	100	89
2	10.5 - 12	99	94
3	12 - 13.4	100	100

Log of Borehole 11

Trow

Project No: OTT-00020493-A0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 801 Albert Street, City of Ottawa, Ontario

Figure No. 13

Page. 1 of 2

Date Drilled: July 19, 2010

Drill Type:

Datum: Geodetic

Logged by: _____ Checked by: _____

Split Spoon Sample | Auger Sample | SPT (N) Value | Dynamic Cone Test | Shelby Tube | Shear Strength by Vane Test (S)

Combustible Vapour Reading | Natural Moisture Content | Atterberg Limits | Undrained Triaxial at % Strain at Failure | Shear Strength by Penetrometer Test

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value (20 40 60 80) / Shear Strength kPa (50 100 150 200)	Combustible Vapour Reading ppm (250 500 750) / Natural Moisture Content % Atterberg Limits (% Dry Weight) (20 40 60)	SAMPLES	Natural Unit Wt. kN/m³
		TOPSOIL ~ 100 mm	54.82	0				
		FILL: Silty sand and gravel with asphalt grandings, wood pieces, some organics, brown and black, moist to wet	54.7		12			
				1	76			
			53.21					
				2	41			
		SILTY SAND TILL: Slightly cohesive, frequent gravel, cobbles and boulders, brown to grey, moist to wet	52.7					
		Basement floor		3				
				4				
				5	45			
			48.9					
		LIMESTONE BEDROCK: Shaley partings, horizontally bedded with thin to medium bedded, vertical joints, grey (excellent quality)		6				Run1
				7				Run 2

Continued Next Page

NOTES:
1. Borehole/Test Pit data requires interpretation by Trow before use by others
2. A 19 mm slotted standpipe was installed in the borehole
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTT-00020493-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
15 days	1.6	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	5.9 - 6	97	97
2	6 - 7.5	100	100
3	7.5 - 9	97	97

LOG OF BOREHOLE LOG BH 8 TO 13.GPJ TROW OTTAWA.GDT 8/9/10

Log of Borehole 11

Trow

Project No: OTT-00020493-A0

Project: Geotechnical Investigation - Proposed Residential Development

Figure No. 13

Page. 2 of 2

SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SCR %	Natural Unit Wt. kN/m³
LIMESTONE BEDROCK Shaley partings, horizontally bedded with thin to medium bedded, vertical joints, grey (excellent quality) *(continued)*	47.82	7	20 40 60 80 50 100 150 200	250 500 750 20 40 60		Run 3
		8				
Borehole Terminated @ 9.0 m depth	45.8	9				

NOTES:
1. Borehole/Test Pit data requires interpretation by Trow before use by others
2. A 19 mm slotted standpipe was installed in the borehole
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTT-00020493-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
15 days	1.6	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	5.9 - 6	97	97
2	6 - 7.5	100	100
3	7.5 - 9	97	97

LOG OF BOREHOLE LOG BH 8 TO 13.GPJ TROW OTTAWA.GDT 8/5/10

Log of Borehole 12

Trow

Project No: OTT-00020493-A0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 801 Albert Street, City of Ottawa, Ontario

Figure No. 14

Page 1 of 2

Date Drilled: July 19, 2010

Drill Type:

Datum: Geodetic

Logged by: _____ Checked by: _____

Split Spoon Sample | Auger Sample | SPT (N) Value | Dynamic Cone Test | Shelby Tube | Shear Strength by Vane Test (S)

Combustible Vapour Reading | Natural Moisture Content | Atterberg Limits | Undrained Triaxial at % Strain at Failure | Shear Strength by Penetrometer Test

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth m	Standard Penetration Test N Value (20 40 60 80) / Shear Strength kPa (50 100 150 200)	Combustible Vapour Reading ppm (250 500 750) / Natural Moisture Content % / Atterberg Limits (% Dry Weight) (20 40 60)	SAMPLES	Natural Unit Wt. kN/m³
		TOPSOIL ~ 80 mm	55.29	0				
		FILL Silty sand and gravel with asphalt grandings, wood pieces, some organics, brown and black, moist to wet	55.2		68/230 mm			
				1	21			
				2	8			
			53.11					
		Frequent cobbles and boulders			45			
				3	50/50 mm			
				4				
			50.7					
		SILTY SAND TILL Slightly cohesive, scattered gravel, cobbles and boulders, grey, wet		5	80/150 mm			
		Basement floor						
				6				
				7				

Continued Next Page

NOTES:
1. Borehole/Test Pit data requires interpretation by Trow before use by others
2. A 19 mm slotted standpipe was installed in the borehole
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTT-00020493-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
15 days	2.2	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	7.8 - 9.1	100	100
2	9.1 - 10.6	99	98

LOG OF BOREHOLE LOG BH 8 TO 13.GPJ TROW OTTAWA.GDT 8/5/10

Log of Borehole 12

Trow

Project No: OTT-00020493-A0

Project: Geotechnical Investigation - Proposed Residential Development

Figure No. 14

Page. 2 of 2

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	DEPTH m	Standard Penetration Test N Value (20 40 60 80) / Shear Strength kPa (50 100 150 200)	Combustible Vapour Reading (ppm) (250 500 750) / Natural Moisture Content % Atterberg Limits (% Dry Weight) (20 40 60)	SAMPLES	Natural Unit Wt. kN/m³
		SILTY SAND TILL Slightly cohesive, scattered gravel, cobbles and boulders, grey, wet *(continued)*	48.29	7	50/150 mm	X		
		LIMESTONE BEDROCK Shaley partings, horizontally bedded, thin to medium beds, vertical joints, grey (excellent quality)	47.5	8				Run1
		Borehole Terminated @ 10.6 m depth	44.7	9				Run 2
				10				

NOTES:
1. Borehole/Test Pit data requires interpretation by Trow before use by others
2. A 19 mm slotted standpipe was installed in the borehole
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTT-00020493-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
15 days	2.2	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	7.8 - 9.1	100	100
2	9.1 - 10.6	99	99

LOG OF BOREHOLE LOG BH 8 TO 13.GPJ TROW OTTAWA.GDT 8/5/10

Log of Borehole 13

Trow

Project No: OTT-00020493-A0

Project: Geotechnical Investigation - Proposed Residential Development

Location: 801 Albert Street, City of Ottawa, Ontario

Figure No. 15

Page 1 of 2

Date Drilled: July 16, 2010

Drill Type:

Datum: Geodetic

Logged by: _____ Checked by: _____

Split Spoon Sample ⊠
Auger Sample ◫
SPT (N) Value ○
Dynamic Cone Test ——
Shelby Tube ■
Shear Strength by Vane Test +/S

Combustible Vapour Reading □
Natural Moisture Content ×
Atterberg Limits |—○
Undrained Triaxial at % Strain at Failure ⊕
Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth
		TOPSOIL ~ 100 mm	58.05	0
		FILL	58.0	
		Silty sand and gravel with asphalt grandings, topsoil, some organics, brown and black, moist		
		150 mm Peat Layers	54.3	
		SILTY SAND TILL		
		Fine to coarse, slightly cohesive, frequent gravel, cobbles and boulders, grey, wet		
			53.22	5

Standard Penetration Test N Value: 20 40 60 80
Shear Strength: 50 100 150 200 kPa
Combustible Vapour Reading (ppm): 250 500 750
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 20 40 60
SAMPLES
Natural Unit Wt. kN/m³

50
43
15
28
8
96/360 mm
93/280 mm

Continued Next Page

NOTES:
1. Borehole/Test Pit data requires interpretation by Trow before use by others
2. A 19 mm slotted standpipe was installed in the borehole
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTT-00020493-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
18 days	4.8	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	7.1 - 7.6	83	70
2	7.6 - 8.9	100	85
3	8.9 - 10.4	100	98

LOG OF BOREHOLE LOG BH 1 TO 13.GPJ TROW OTTAWA.GDT 8/5/10

Log of Borehole 13

Trow

Project No: OTT-00020493-A0

Project: Geotechnical Investigation - Proposed Residential Development

Figure No. 15

Page. 2 of 2

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value (20 40 60 80) / Shear Strength kPa (50 100 150 200)	Combustible Vapour Reading (ppm) (250 500 750) / Natural Moisture Content % Atterberg Limits (% Dry Weight) (20 40 60)	SAMPLES	Natural Unit Wt kN/m³
			51.05	7				
		LIMESTONE BEDROCK Shaley partings, horizontally thingly to medium bedded, vertical joint, grey (good to excellent quality)	51.0					Run1
		Basement floor		8				Run 2
		Borehole Terminated @ 10.6 m depth		9				
				10				Run 3
			47.7					

NOTES:
1. Borehole/Test Pit data requires interpretation by Trow before use by others
2. A 19 mm slotted standpipe was installed in the borehole
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTT-00020493-A0

WATER LEVEL RECORDS		
Elapsed Time	Water Level (m)	Hole Open To (m)
18 days	4.8	

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %
1	7.1 - 7.6	83	70
2	7.6 - 8.9	100	65
3	8.9 - 10.4	100	58

LOG OF BOREHOLE LOG BH 8 TO 13.GPJ TROW OTTAWA.GDT 8/5/10

Log of Borehole 1A

Trow

Project No: OTGE00018054A

Project: Additional Geotechnical Investigation, Proposed Development

Location: Scott Street and City Centre Street, Ottawa, Ontario

Figure No. 16

Page 1 of 2

Date Drilled: 7/25/05

Drill Type:

Datum: Geodetic

Logged by: _____ Checked by: _____

Split Spoon Sample ☒ | Auger Sample ▥ | SPT (N) Value ○ | Dynamic Cone Test ——— | Shelby Tube ▩ | Shear Strength by Vane Test + 5

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits ⊢—○ | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth m
		FILL: Clayey silt and gravel, occasional roots, numerous cobbles and boulders throughout the fill matrix, brown, moist	57	0
▽			52.9	4
		SILTY CLAY Grey, wet, (soft).	51.0	6
		CLAYEY SILT TILL Some gravel, moist (stiff).	50.0	7
		SILTY SAND TILL Some cobbles and boulders, grey, wet (compact to very dense)	47.9	9

Standard Penetration Test N Value: 20 40 60 80

Shear Strength kPa: 50 100 150 200

Combustible Vapour Reading (ppm): 250 500 750

Natural Moisture Content % Atterberg Limits (% Dry Weight): 20 40 60

Tor 260 mm

SAMPLES: Run 1, Run 2

Natural Unit Wt. kN/m³

Continued Next Page

NOTES:
1. Borehole/Test Pit data requires interpretation by Trow before use by others
2. A 13mm slotted standpipe was installed in the borehole
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00018054A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	cave water	n/a
17 Days	4.1	n/a

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	2.98 - 4.12	22	0
2	4.12 - 4.75	25	0
3	10.82 - 11.13	67	0
4	11.13 - 11.46	100	92
5	11.46 - 12.98	100	100

LOG OF BOREHOLE 8H ATOBA.GPJ TROW OTTAWA.GDT 9/28/05

Log of Borehole 1A

Trow

Project No: OTGE00018054A

Project: Additional Geotechnical Investigation. Proposed Development

Figure No. 16

Page. 2 of 2

GWP	Recovery	SOIL DESCRIPTION	Geodetic m	Depth	Standard Penetration Test N Value (20 40 60 80) / Shear Strength kPa (50 100 150 200)	Combustible Vapour Reading (ppm) (250 500 750) / Natural Moisture Content % / Atterberg Limits (% Dry Weight) (20 40 60)	Standpipe	Natural Unit Wt. kN/m³
		SILTY SAND TILL Some cobbles and boulders, grey, wet (compact to very dense) *(continued)*	47					
		LIMESTONE/DOLOMITE BEDROCK Horizontal joints, some calcite veins, black (Excellent Quality)	46.2	11	for 150 mm			Run 3 Run 4 Run 5
		Borehole terminated @ 13.0 m depth	44.0	13				

NOTES:
1. Borehole/Test Pit data requires interpretation by Trow before use by others
2. A 13mm slotted standpipe was installed in the borehole
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00018054A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	core water	n/a
17 Days	4.1	n/a

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	2.98 - 4.12	22	0
2	4.12 - 4.75	25	0
3	10.82 - 11.13	67	0
4	11.13 - 11.46	100	92
5	11.46 - 12.98	100	100

LOG OF BOREHOLE BH1ATOMA.GPJ TROW OTTAWA.GDT 5/28/09

Log of Borehole 2A

Trow

Project No: OTGE00018054A

Project: Additional Geotechnical Investigation, Proposed Development

Location: Scott Street and City Centre Street, Ottawa, Ontario

Figure No. 17

Page 1 of 1

Date Drilled: 7/25/05

Drill Type:

Datum: Geodetic

Logged by: _____ Checked by: _____

Split Spoon Sample ⊠ | Combustible Vapour Reading □
Auger Sample ▥ | Natural Moisture Content ×
SPT (N) Value ○ | Atterberg Limits ⊢—○
Dynamic Cone Test —— | Undrained Triaxial at % Strain at Failure ⊕
Shelby Tube ▥ | Shear Strength by Penetrometer Test ▲
Shear Strength by Vane Test +S

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth m	Standard Penetration Test N Value (20 40 60 80) / Shear Strength kPa (50 100 150 200)	Combustible Vapour Reading (ppm) (250 500 750) / Natural Moisture Content % Atterberg Limits (% Dry Weight) (20 40 80)	SOIL SAMPLES	Natural Unit Wt kN/m³
		FILL Silty sand and gravel with numerous cobbles and boulders, brown, moist (loose to compact)	56.4	0				
		SANDY SILT TILL Fine to medium gravel, limestone fragments, grey, moist (very dense)	50.4	6	for 270 mm			
		LIMESTONE/DOLOMITE BEDROCK Some calcite veins, black (Fair to Excellent Quality)	49.9	7			Run 1 Run 2 Run 3 Run 4	
		Borehole terminated @ 9.0 m depth	47.9	8				

for 200 mm

LOG OF BOREHOLE BH1ATOWA.GPJ TROW OTTAWA.GDT 5/28/09

NOTES:
1. Borehole/Test Pit data requires interpretation by Trow before use by others
2. Borehole backfilled upon completion of drilling
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00018054A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	core water	n/a

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	4.06 - 4.75	52	14
2	4.75 - 5.44	31	0
3	6.33 - 7.06	93	79
4	7.06 - 8.51	100	100

Log of Borehole 3A

Trow

Project No: OTGE00018054A

Project: Additional Geotechnical Investigation. Proposed Development

Location: Scott Street and City Centre Street, Ottawa, Ontario

Figure No. 18

Page 1 of 2

Date Drilled: 7/26/05

Drill Type:

Datum: Geodetic

Logged by: _____ Checked by: _____

Split Spoon Sample ⊠ | Combustible Vapour Reading □
Auger Sample ⊠ | Natural Moisture Content ×
SPT (N) Value ○ | Atterberg Limits ⊢○
Dynamic Cone Test ——— | Undrained Triaxial at % Strain at Failure ⊕
Shelby Tube ■ | Shear Strength by Penetrometer Test ▲
Shear Strength by Vane Test +S

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	DEPTH	Standard Penetration Test N Value (20 40 60 80) / Shear Strength (50 100 150 200 kPa)	Combustible Vapour Reading (ppm) (250 500 750) / Natural Moisture Content % Atterberg Limits (% Dry Weight) (20 40 60)	SOIL SAMPLES	Natural Unit Wt. kN/m³
		FILL Sandy silt to sandy silt, numerous cobbles and boulders,some fine to medium gravel, light grey to brown, very moist (compact to dense)	55.7	0				
			53.3	2				
		CLAY Grey, moist to very moist (very stiff)	52.2	3				
				4	1.8			
				5	>120			
		CLAYEY SILT TILL Fine to medium gravel, grey, moist (very soft)	49.7	6				
		SILTY SAND TILL Occasional rock fragments, grey, wet (compact)	48.4	7				
		LIMESTONE/DOLOMITE BEDROCK Some black limestone inclusions, calcite veins, (Good to Excellent Quality)	47.3	8				Run 1
				9				Run 2
				10				

Continued Next Page

NOTES:
1. Borehole/Test Pit data requires interpretation by Trow before use by others
2. A 13mm slotted standpipe was installed in the borehole
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00018054A

WATER LEVEL RECORDS		
Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	core water	n/a
16 Days	2.4	n/a

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %
1	7.8 - 8.44	40	0
2	8.44 - 10	100	95
3	10 - 10.77	93	82

LOG OF BOREHOLE BH1ATO9A.GPJ TROW OTTAWA.GDT 5/28/09

Log of Borehole 3A

Trow

Project No: OTGE00018054A

Project: Additional Geotechnical Investigation, Proposed Development

Figure No. 18

Page. 2 of 2

GWL	Sample	SOIL DESCRIPTION	Geodetic m	Depth m	Standard Penetration Test N Value (20, 40, 60, 80) / Shear Strength kPa (50, 100, 150, 200)	Combustible Vapour Reading (ppm) (250, 500, 750) / Natural Moisture Content % Atterberg Limits (% Dry Weight) (20, 40, 60)	RQD %	Natural Unit Wt. kN/m³
		LIMESTONE/DOLOMITE BEDROCK Some black limestone inclusions, calcite veins, (Good to Excellent Quality) *(continued)*	45.7 44.9					Run 3
		Borehole terminated @ 10.8 m depth						

LOG OF BOREHOLE BH1ATOMA.GPJ TROW OTTAWA.GDT 5/28/09

NOTES:
1. Borehole/Test Pit data requires interpretation by Trow before use by others
2. A 13mm slotted standpipe was installed in the borehole
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00018054A

WATER LEVEL RECORDS		
Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	core water	n/a
16 Days	2.4	n/a

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %
1	7.8 - 8.44	40	0
2	8.44 - 10	100	95
3	10 - 10.77	93	82

Log of Borehole 4A

Trow

Project No: OTGE00018054A

Project: Additional Geotechnical Investigation. Proposed Development

Location: Scott Street and City Centre Street, Ottawa, Ontario

Figure No. 19

Page. 1 of 1

Date Drilled: 7/26/05

Drill Type:

Datum: Geodetic

Logged by: _____ Checked by: _____

Split Spoon Sample	⊠	Combustible Vapour Reading	□
Auger Sample	▥	Natural Moisture Content	×
SPT (N) Value	○	Atterberg Limits	⊢—⊖
Dynamic Cone Test	——	Undrained Triaxial at % Strain at Failure	⊕
Shelby Tube	▩	Shear Strength by Penetrometer Test	▲
Shear Strength by Vane Test	+ S		

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	DEPTH
		FILL Sandy silt to silty sand with gravel, cobbles, occasional boulders, some peat pockets or layers, wood pieces, grey brown, wet (very loose)	55	0
			52.9	2
		CLAYEY SILT TILL Sandy, some fine gravel (very soft)	49.0	6
		LIMESTONE/DOLOMITE BEDROCK Horizontal to slighlty dipping joints, calcite seams, (poor to good quality)	47.1	8
		Borehole terminated @ 9.6 m depth	45.4	

Standard Penetration Test N Value: 20 40 60 80

Shear Strength: 50 100 150 200 kPa

Combustible Vapour Reading (ppm): 250 500 750

Natural Moisture Content % Atterberg Limits (% Dry Weight): 20 40 60

SAMPLES

Natural Unit Wt. kN/m³

Run 1

Run 2

LOG OF BOREHOLE BH1ATOWA.GPJ TROW OTTAWA.GDT 5/28/09

NOTES:
1. Borehole/Test Pit data requires interpretation by Trow before use by others
2. A 13mm slotted standpipe was installed in the borehole
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00018054A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	core water	n/a
16 Days	2.1	n/a

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	7.75 - 8.08	54	31
2	8.08 - 9.63	98	88

Log of Borehole 5A

Trow

Project No: OTGE00018054A

Project: Additional Geotechnical Investigation, Proposed Development

Location: Scott Street and City Centre Street, Ottawa, Ontario

Figure No. 20

Page. 1 of 2

Date Drilled: 7/27/05

Drill Type:

Datum: Geodetic

Logged by: _____ Checked by: _____

Split Spoon Sample ☒ | Auger Sample ▥ | SPT (N) Value o | Dynamic Cone Test ——— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits ⊢—○ | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Depth Below Grade m	Elev. m
		FILL Sandy silt to silty sand with gravel, cobbles, occasional boulders, grey brown, wet (loose)		55.2
				53.2
		CLAY Horizontal layered, some silt partings, grey brown, moist (stiff)		52.2
				49.7
		SILTY SAND TILL Fine to medium gravel, occasional cobbles and boulders, grey, very moist (compact)		
				45.7
		LIMESTONE BEDROCK		

Standard Penetration Test N Value: 20 40 60 80

Shear Strength: 50 100 150 200 kPa

Combustible Vapour Reading (ppm): 250 500 750

Natural Moisture Content % Atterberg Limits (% Dry Weight): 20 40 60

Depth: 0 1 2 3 4 5 6 7 8 9 10

SAMPLERS: Run 1

Natural Unit Wt. kN/m³

Continued Next Page

NOTES:
1. Borehole/Test Pit data requires interpretation by Trow before use by others
2. A 13mm slotted standpipe was installed in the borehole
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00018054A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	core water	n/a
15 Days	2.0	n/a

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	9.55 - 9.83	100	68
2	9.83 - 11.36	100	66
3	11.36 - 12.88	99	99

LOG OF BOREHOLE BH1ATOE4.GPJ TROW OTTAWA.GDT 1/17/11

Log of Borehole 5A

Trow

Project No: OTGE00018054A

Project: Additional Geotechnical Investigation, Proposed Development

Figure No. 20

Page 2 of 2

Depth (m)	Soil Description	Depth Below Grade (m)	Standard Penetration Test N Value / Shear Strength (kPa)	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Natural Unit Wt. kN/m³
10	**LIMESTONE BEDROCK** Horizontal to slightly dipping joints, calcite seams, (Fair to Excellent Quality) *(continued)*	45.2			Run 2
11					
12					Run 3
	Borehole terminated @ 12.88 m depth	42.3			

NOTES:
1. Borehole/Test Pit data requires interpretation by Trow before use by others
2. A 13mm slotted standpipe was installed in the borehole
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00018054A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	core water	n/a
15 Days	2.0	n/a

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	9.55 - 9.83	100	68
2	9.83 - 11.36	100	66
3	11.36 - 12.88	99	99

LOG OF BOREHOLE BH1ATOBA.GPJ TROW OTTAWA.GDT 1/17/11

Log of Borehole 6A

Trow

Project No: OTGE00018054A

Project: Additional Geotechnical Investigation, Proposed Development

Location: Scott Street and City Centre Street, Ottawa, Ontario

Figure No. 21

Page 1 of 2

Date Drilled: 7/27/05

Drill Type:

Datum: Geodetic

Logged by: _____ Checked by: _____

Split Spoon Sample ⊠
Auger Sample ▥
SPT (N) Value ○
Dynamic Cone Test ——
Shelby Tube ▩
Shear Strength by Vane Test +
Combustible Vapour Reading □
Natural Moisture Content ×
Atterberg Limits |—○
Undrained Triaxial at % Strain at Failure ⊕
Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	DEPTH	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
			55.7	0	20 40 60 80 / 50 100 150 200	250 500 750 / 20 40 60		
		TOPSOIL –150mm	55.7					
		FILL						
		Clayey silt to silty clay with organics, roots and organics, brown, moist (loose to very loose)		1				
				2				
			53.3					
				3				
				4				
		CLAYEY SILT TILL	51.1					
		Occasional sand seams or layers, fine to medium gravel, moist to very moist (very soft to stiff)		5				
				6				
			49.2					
		SILTY SAND TILL						
		Fine to medium gravel, occasional cobbles and boulders, grey, very moist (compact)		7				
				8				
			48.7					
		WEATHERED LIMESTONE BEDROCK		9				Run 1
				10				

Continued Next Page

NOTES:
1. Borehole/Test Pit data requires interpretation by Trow before use by others
2. A 13mm slotted standpipe was installed in the borehole
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00018054A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	core water	n/a
15 Days	2.4	n/a

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	8.97 - 9.76	72	45
2	9.76 - 11.36	58	53
3	11.36 - 12.85	95	93
4	12.85 - 13.59	100	100

LOG OF BOREHOLE BH1ATOMA.GPJ TROW OTTAWA.GDT 5/28/09

Log of Borehole 6A

Trow

Project No: OTGE00018054A

Project: Additional Geotechnical Investigation. Proposed Development

Figure No. 21

Page. 2 of 2

SOIL DESCRIPTION	Geodetic m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Natural Unit Wt. kN/m³
WEATHERED LIMESTONE BEDROCK *(continued)*	45.7	10	20 40 60 80 / 50 100 150 200	250 500 750 / 20 40 60	Run 2
	44.3	11			
LIMESTONE/DOLOMITE BEDROCK Horizontal to slightly dipping joints, calcite seams, (excellent quality)		12			Run 3
		13			Run 4
	42.1				
Borehole terminated @ 13.6 m depth					

NOTES:
1. Borehole/Test Pit data requires interpretation by Trow before use by others
2. A 13mm slotted standpipe was installed in the borehole
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00018054A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	core water	n/a
15 Days	2.4	n/a

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	8.97 - 9.76	72	45
2	9.76 - 11.35	58	53
3	11.30 - 12.85	95	93
4	12.85 - 13.59	100	100

LOG OF BOREHOLE BH1ATOBA.GPJ TROW OTTAWA.GDT 5/28/09

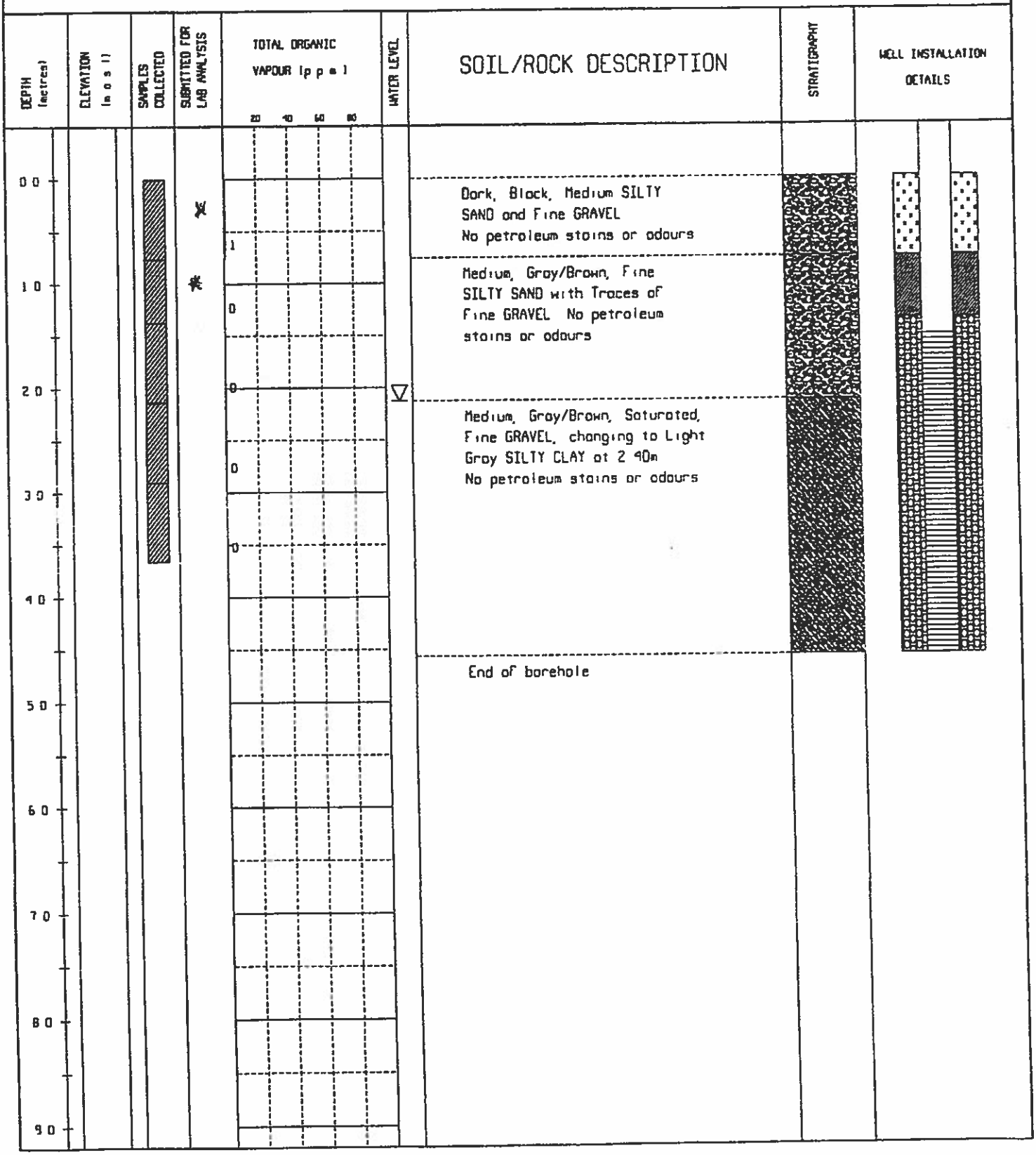
BOREHOLE NUMBER MW-1

PROJECT NUMBER	MC-12302A	DATE BEGUN	Febuary 17, 1998
PROJECT NAME	Champagne and Scott Property	DATE COMPLETED	Febuary 17, 1998
CLIENT NAME	NCC	DRILLING METHOD	Hollow Stem Auger

DEPTH (metres)	ELEVATION (asl)	SAMPLES COLLECTED	SUBMITTED FOR LAB ANALYSIS	TOTAL ORGANIC VAPOUR (ppm)	WATER LEVEL	SOIL/ROCK DESCRIPTION	STRATIGRAPHY	WELL INSTALLATION DETAILS
0.0						Dark, Brown, Medium SILTY SAND, changing to Light Brown Medium SAND and Fine GRAVEL No petroleum stains or odours		
1.0			*	1		Medium, Red/Brown, Coarse SAND with some Fine GRAVEL No petroleum stains or odours		
2.0				0	▽	Light, Yellow/Brown, Medium to Coarse SAND, with traces of Fine GRAVEL, moist at 2.0m No petroleum stains or odours		
3.0						Auger Refusal, End of borehole		
4.0								
5.0								
6.0								
7.0								
8.0								
9.0								

BOREHOLE NUMBER MW-2

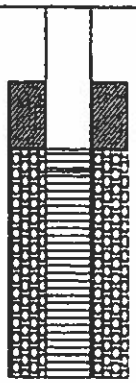
PROJECT NUMBER	MC-12302A	DATE BEGUN	Febuary 17, 1998
PROJECT NAME	Champagne and Scott Property	DATE COMPLETED	Febuary 17, 1998
CLIENT NAME	NCC	DRILLING METHOD	Hollow Stem Auger



BOREHOLE NUMBER MW-3

PROJECT NUMBER	MC-123D2A	DATE BEGUN	Febuary 17, 1998
PROJECT NAME	Champagne and Scott Property	DATE COMPLETED	Febuary 17, 1998
CLIENT NAME	NCC	DRILLING METHOD	Hollow Stem Auger

DEPTH (metres)	ELEVATION (masl)	SAMPLES COLLECTED	SUBMITTED FOR LAB ANALYSIS	TOTAL ORGANIC VAPOUR (ppm) 20 40 60 80	WATER LEVEL	SOIL/ROCK DESCRIPTION	STRATIGRAPHY	WELL INSTALLATION DETAILS
0.0								
						Medium Gray/Brown, Medium SILTY SAND and Fine GRAVEL No petroleum stains or odours		
1.0								
				1				
2.0						Auger Refusal, End of borehole		
3.0								
4.0								
5.0								
6.0								
7.0								
8.0								
9.0								



BOREHOLE NUMBER BH-3

PROJECT NUMBER	MC-12302A	DATE BEGUN	Febuory 17, 1998
PROJECT NAME	Champagne and Scott Property	DATE COMPLETED	Febuory 17, 1998
CLIENT NAME	NCC	DRILLING METHOD	Hollow Stem Auger

DEPTH (metres)	ELEVATION (a s l)	SAMPLES COLLECTED	SUBMITTED FOR LAB ANALYSIS	TOTAL ORGANIC VAPOUR (p p m)	WATER LEVEL	SOIL/ROCK DESCRIPTION	STRATIGRAPHY	WELL INSTALLATION DETAILS
0 0				20 40 60 80				
						Dark, BLACK, Medium SILTY SAND, and Fine GRAVEL No petroleum stains or odours		
1 0				1		Dark, Black, Coarse SAND with some Fine GRAVEL mixed with Black "coal-like" FILL		
				1				
2 0			*	1				
				1		Medium, Yellow/Brown, Medium to Coarse SAND, with traces of Fine GRAVEL No petroleum stains or odours		
3 0						Auger Refusal, End of borehole		
4 0								
5 0								
6 0								
7 0								
8 0								
9 0								

BOREHOLE NUMBER BH-4

PROJECT NUMBER	MC-12302A	DATE BEGUN	Febuary 17, 1998
PROJECT NAME	Champagne and Scott Property	DATE COMPLETED	Febuary 17, 1998
CLIENT NAME	NCC	DRILLING METHOD	Hollow Stem Auger

DEPTH (metres)	ELEVATION (masl)	SAMPLES COLLECTED	SUBMITTED FOR LAB ANALYSIS	TOTAL ORGANIC VAPOUR (ppm)	WATER LEVEL	SOIL/ROCK DESCRIPTION	STRATIGRAPHY	WELL INSTALLATION DETAILS
0.0						Dark, BLACK, Medium SILTY SAND, and Fine GRAVEL No petroleum stains or odours		
1.0				0		Medium, Brown, Coarse SAND with some Fine GRAVEL changing to Yellow/Brown Fine SILTY SAND at 1.0m No petroleum stains or odours		
2.0				0		Medium, Yellow/Brown, Fine to Medium SILTY SAND No petroleum stains or odours		
3.0				0		Auger Refusal, End of borehole		
4.0								
5.0								
6.0								
7.0								
8.0								
9.0								

APPENDIX 2

FIGURE 1 - KEY PLAN

FIGURES 2 AND 3 - SEISMIC SHEAR WAVE VELOCITY PROFILES

DRAWING PG3272-3 - TEST HOLE LOCATION PLAN

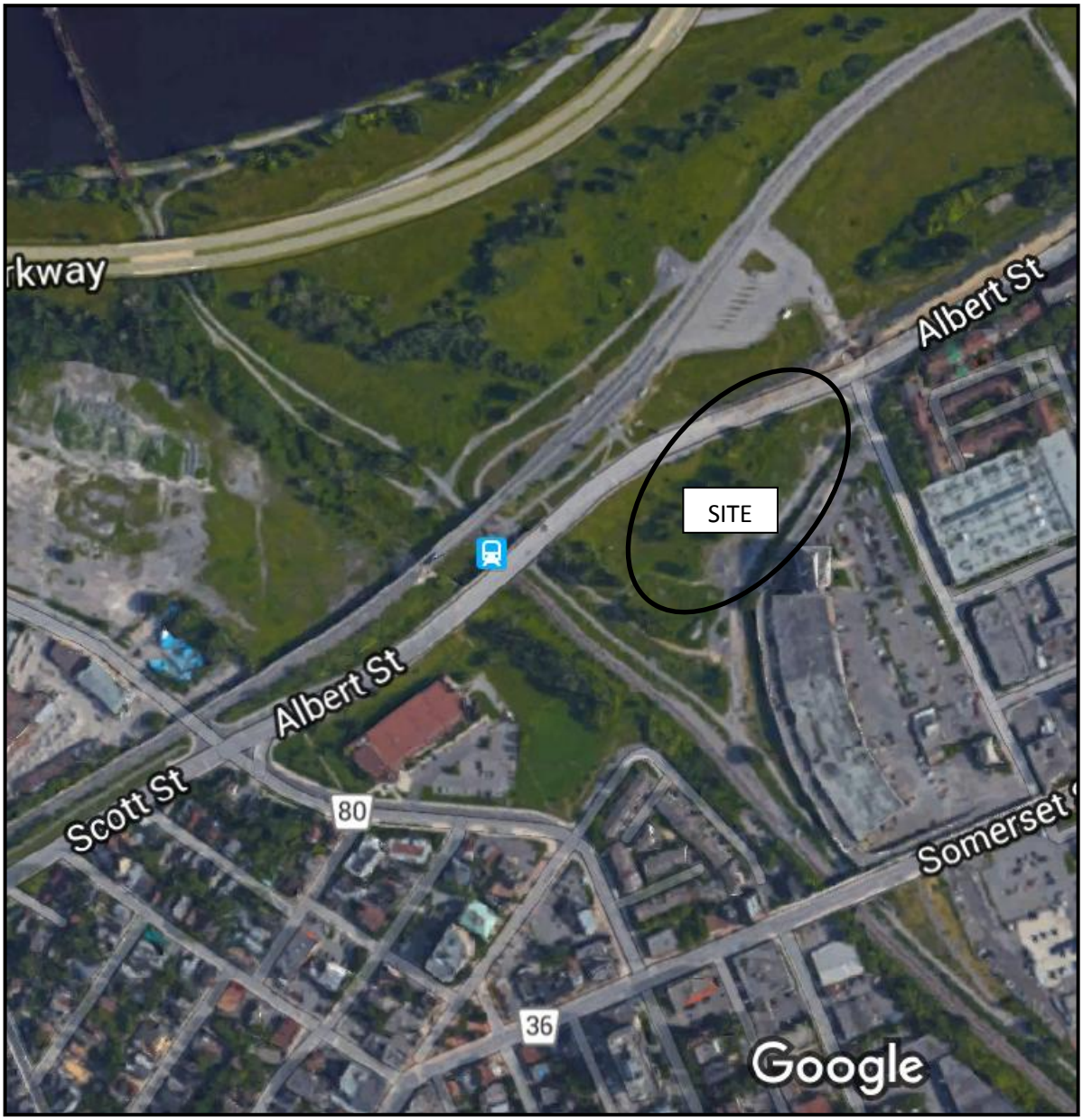


FIGURE 1

KEY PLAN

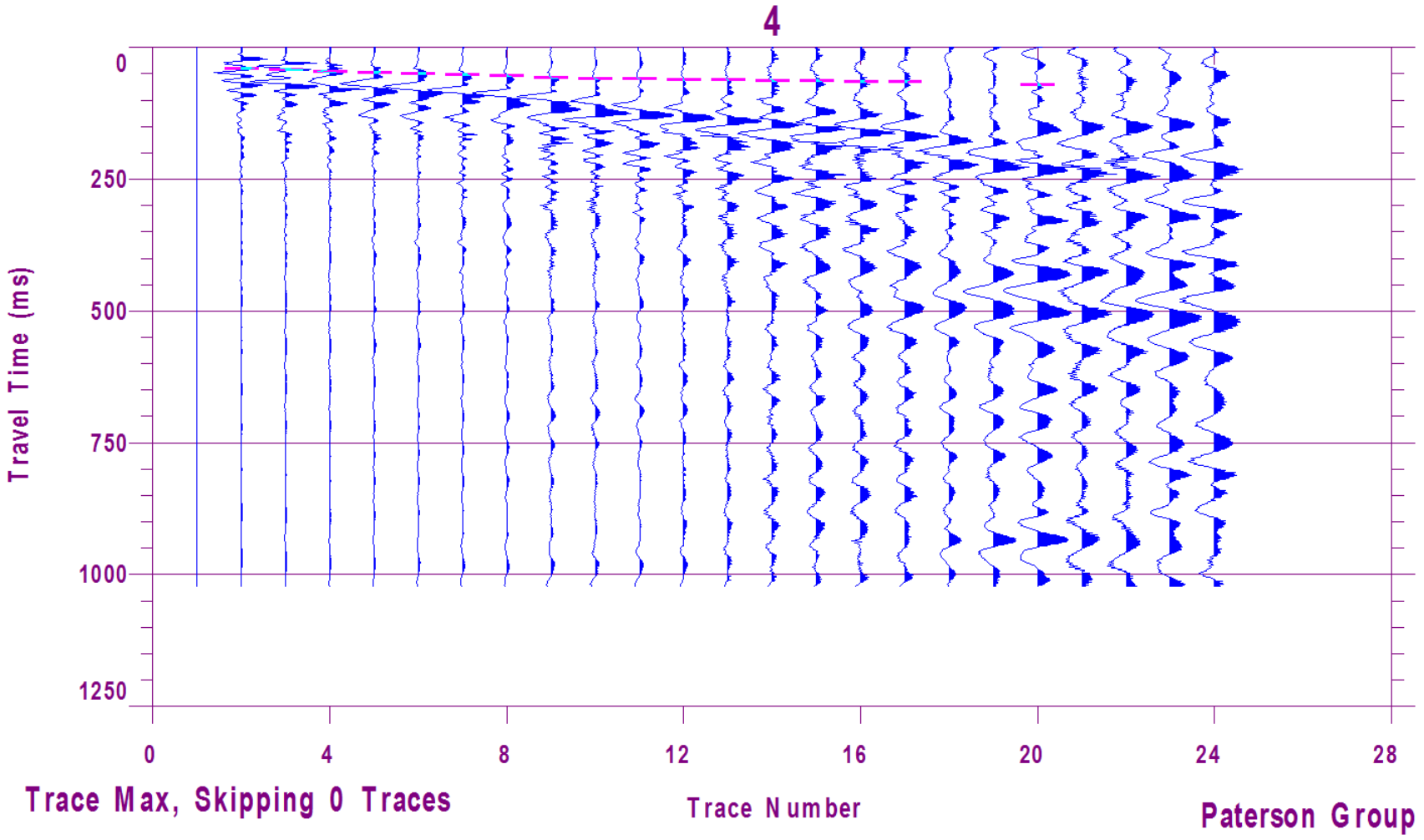


Figure 2 – Shear Wave Velocity Profile at Shot Location – 4.5 m

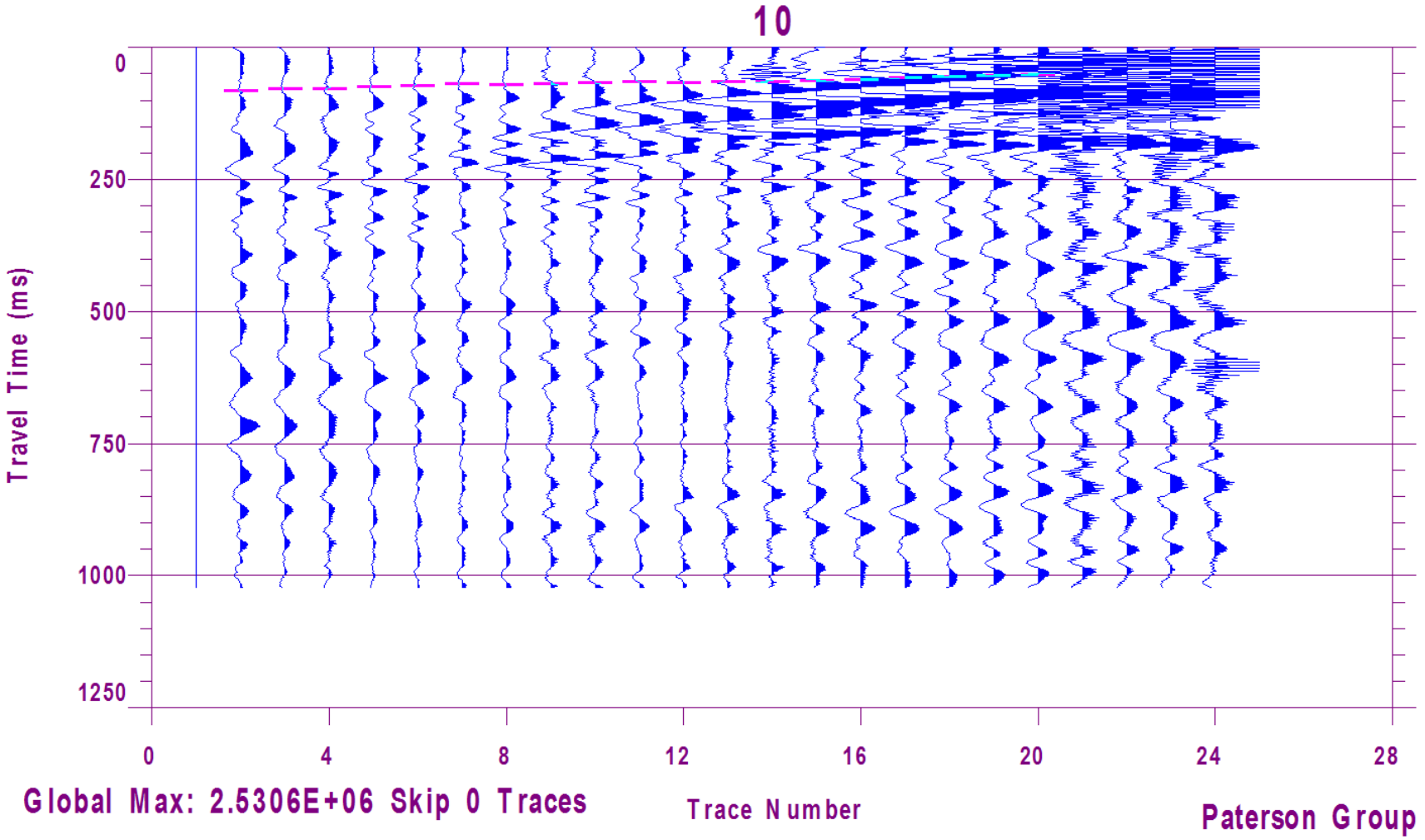
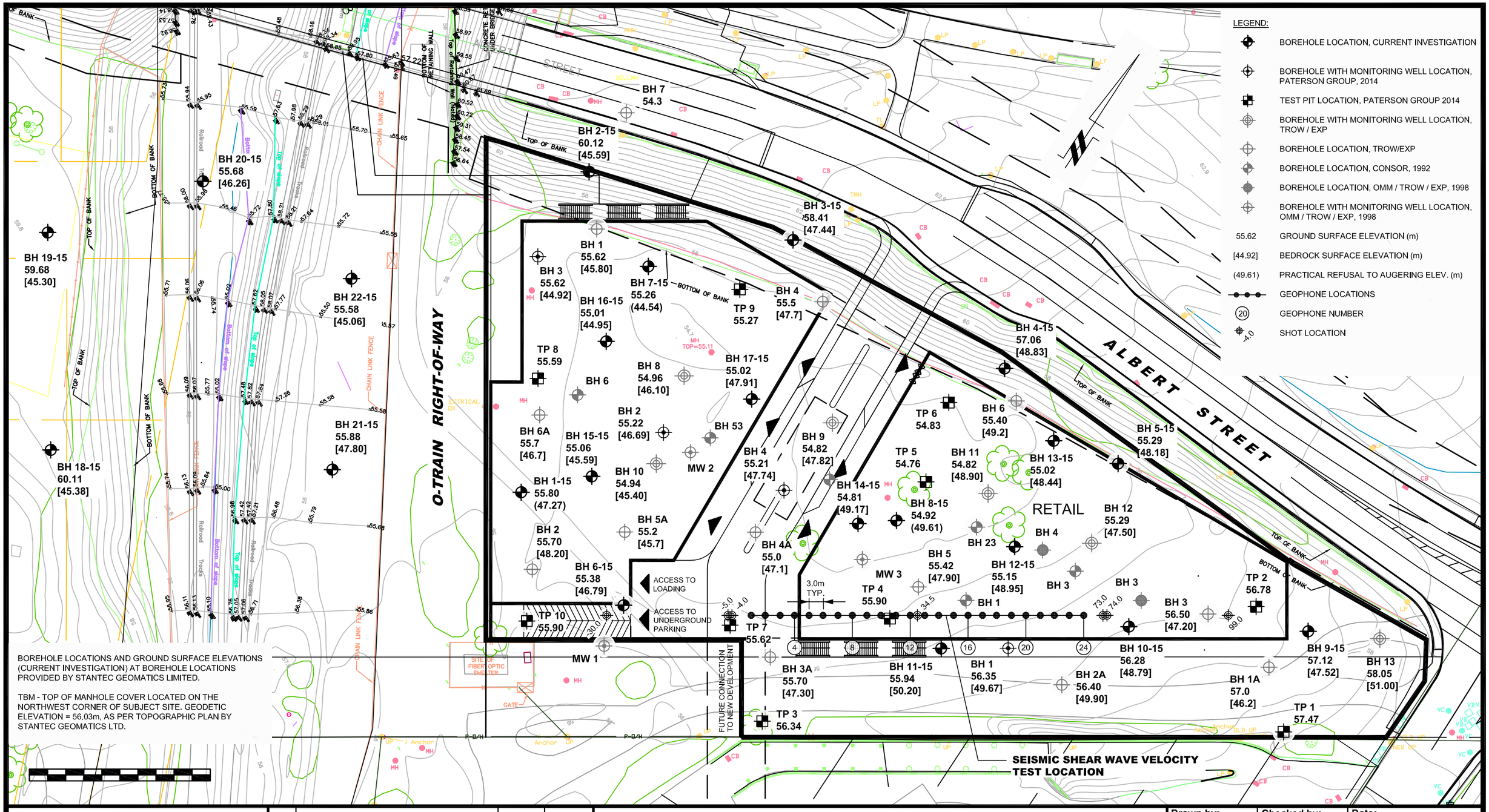


Figure 3 – Shear Wave Velocity Profile at Shot Location 72.0 m



BOREHOLE LOCATIONS AND GROUND SURFACE ELEVATIONS (CURRENT INVESTIGATION) AT BOREHOLE LOCATIONS PROVIDED BY STANTEC GEOMATICS LIMITED.

TBM - TOP OF MANHOLE COVER LOCATED ON THE NORTHWEST CORNER OF SUBJECT SITE. GEODETIC ELEVATION = 56.03m, AS PER TOPOGRAPHIC PLAN BY STANTEC GEOMATICS LTD.

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL
1	SEISMIC SURVEY LOCATION ADDED	28/01/2016	DJG

TRINITY DEVELOPMENT GROUP

GEOTECHNICAL INVESTIGATION
PROP. COMMERCIAL DEVELOPMENT - 801 ALBERT STREET

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Drawn by:	Checked by:	Date:
MPG	DJG	11/2015
Scale: 1:750		Drawing No.: PG3272-3
Report No.: PG3272-2		

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