Conseil des écoles catholiques du Centre-Est (CECCE)

Geotechnical Investigation

Type of Document
Final

Project Name
Proposed Addition to New Horizon Jeunesse School
349 Olmstead Street, Ottawa, Ontario

Project Number
OTT-00231875-A0

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Date Submitted
May 18, 2016

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Executive Summary

Exp Services Inc. (**exp**) is pleased to present the results of the geotechnical investigation completed at the site of the existing New Horizon Jeunesse school situated at 349 Olmstead Street in the City of Ottawa, Ontario. Written authorization to proceed with this work was provided by the Conseil des écoles catholiques du Centre-Est in a letter dated February 29, 2015.

Our current understanding of the proposed school re-development is as per Edward J. Cuhaci and Associates Architects Site Plan A003A dated October 2015. Based on this site plan, it is proposed to demolish the two storey portion of the existing school (northern part) and to construct a new two-story addition on the west side of the remaining one storey school building. In addition, construction of a new bus drop loop and a new surface parking facility, extension of the existing surface parking lot, addition of portables and reconfiguration of the playgrounds are also proposed as part of the proposed school re-development. It is understood that the floor slab of the new addition will match the floor slab of the one-storey building of 64.91 m.

The fieldwork for this investigation was carried between March 10 and 18, 2016 and comprised the drilling of ten (10) boreholes and the excavation of eleven (11) test pits throughout the site at locations selected by the design team to depths ranging between 1.5 m and 7.5 m. Four of the test pits were excavated along the west building line in order to establish the depth and configuration of the footings of the existing school building to remain.

The borehole/test pits revealed the subsurface soil conditions to comprise of topsoil/asphalt underlain by fill at localized areas, fine silty sand to sand-silt overlain by silty sand to sandy silt shaley till. The till is loose to dense and underlain by shale bedrock contacted at depths of 3.7 to 4.3 m below the existing ground surface. The groundwater table at the site was established at depths of 3.5 to 4.0 m below the existing ground surface, i.e. Elevation 60.5 to 60.9 m.

Based on available information and proposed floor slab of the addition, it is concluded that the grades at the site will not be raised significantly. The geotechnical conditions at the site are considered suitable to found the proposed single-storey building addition on spread and strip footings set on engineered fill or on the compact to dense glacial as per the recommendation stated in this report. Footings founded on the engineered fill or compact to dense glacial till below any loose layers or seams may be designed for Serviceability Limit State (SLS) bearing pressure of 150 kPa and factored geotechnical resistance at Ultimate Limit State (ULS) of 225 kPa. Special considerations should be taken in areas close to the existing footings as per the recommendations stated in the report. Settlements of the footings designed according to the recommendations of this report and properly constructed are expected to be within the normally tolerated limits of 25 mm total and 19 mm differential movements.

The lowest level floor of the proposed structure may be constructed as a slab-on-grade provided it is set on the natural undisturbed soils or on engineered fill. Treatment of the on-site sand under the floor by re-compaction should be completed as per the recommendations stated in Section 11.0. Perimeter and

underfloor drainage systems will not be required. The finished floor slab should be set at least 150 mm higher than the finished exterior grade.

Excavations for the construction of the building footings are anticipated to extend up to 2.0 m to 3.0 m depth below the existing ground surface and will be above or slightly below the groundwater level. Depth of excavation required for site services is not currently available. The excavation for the footings may be conducted as open cut provided they meet the requirements of the current Ontario Occupational Health and Safety Act 213/91 (OHSA). The on-site soils above the groundwater table are considered to be Type 3 soil and must be cut back at 1H:1V from the bottom of the excavation. In zones of concentrated seepage, the side slopes are expected to slough and will eventually stabilize at a slope of slope of 2H:1V.

The soils to be excavated from the site will comprise of predominantly fill and silty sand. These soils are not considered suitable for backfilling purposes in the interior of the building but may be used as fill in the exterior of the building and foe general grading purposes provided that they are free of debris and their moisture content is maintained within +/- 2 percent of the optimum value. It is anticipated that the majority of the material required for backfilling purposes will need to be imported and should conform to the recommendations of this report.

The site has been classified as Class C for seismic design in accordance with 2012 Ontario Building Code. In addition, the on-site soils are not considered to be liquefiable in a seismic event.

Pavement structures for the proposed paved areas and recreational facilities are provided in Table 5 of the report.

Recommendations for the backfill of the areas of the building that will be demolished are provided in the main body of the report,

The above and other related considerations are discussed in greater detail in the attached report.

Legal Notification

This report was prepared by **exp** Services Inc. for the account of **Conseil des écoles catholiques du Centre-Est.**

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. **Exp** Services Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this project.

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1 Introduction

Exp Services Inc. (**exp**) is pleased to present the results of the geotechnical investigation recently completed for the New Horizon Jeunesse school to be situated at the existing school site located at 349 Olmstead Street in the City of Ottawa, Ontario (Figure 1). Written authorization to proceed with this work was provided by the Conseil des écoles catholiques du Centre-Est in a letter dated February 29, 2016.

Our current understanding of the proposed school re-development is as per Edward J. Cuhaci and Associates Architects Site Plan A003A dated October 2015. Based on the site plan, it is proposed to demolish the two storey portion of the existing school (northern part) and to construct a new two-story slab on grade addition on the west side of the remaining one storey school building. In addition, construction of a new bus drop loop and a new surface parking facility, extension of the existing surface parking lot, addition of portables and reconfiguration of the playgrounds are also proposed as part of the school redevelopment.

Final design grades for the proposed school building and facilities were not available at the time of preparation of this report. However, it is anticipated that the new addition will match the floor slab of the existing school (Elevation 64.91 m) and significant grade changes are not anticipated as part of the proposed construction/redevelopment.

This geotechnical investigation was undertaken to:

(a) Assess the subsurface soil and groundwater conditions at the location of the boreholes and test pits;

(b) Establish the footing depth and founding material of the existing school building portion to remain;

(c) Provide comments and recommendations regarding foundation type, founding depth, bearing pressures and factored geotechnical resistances in limit states design of the founding soils for the proposed school addition and comment on anticipated total and differential settlements of the proposed foundations;

(d) Discuss site grade raise restrictions;

(e) Classify the site for seismic site response in accordance with the 2012 Ontario Building Code and discuss liquefaction potential of subsurface soils;

(f) Comment on slab-on-grade construction and requirement for underfloor and perimeter drainage systems;

(g) Provide pipe bedding requirements for underground services;

(h) Discuss excavation conditions and de-watering requirements during construction;

(i) Comment on backfilling requirements and the suitability of the on-site soils for backfilling purposes;

(j) Provide recommendation for the re-instatement of the area of the site where the existing school building will be demolished;

(k) Recommend pavement structure for the proposed light and heavy duty traffic areas and for the playground; and

(l) Comment on subsurface concrete requirements.

The comments and recommendations given in this report are based on the assumption that the above described design concept will proceed into construction. If changes are made either in the design phase or during construction, this office must be retained to review these modifications. The result of this review may be a modification of our recommendations or it may require additional field or laboratory work to check whether the changes are acceptable from a geotechnical viewpoint.

2 Background Information

2.1 Available Structural Plans

A review of available structural plans dating back to 1965 revealed the existing school is founded on strip/spread footings at a depth of 2.0 m to 2.5 m below the existing ground surface. An addition to a music room in 1968 necessitated underpinning and founding the footings at lower levels to accommodate a basement. It is recommended that the designers review the available structural plans, which indicate that the existing building is founded on a combination of strip and spread footings at variable depths.

2.2 Previous Geotechnical Reports

A preliminary geotechnical report completed by **exp** in May 2015 and presented under Report OTT-00226176-A0 was reviewed. The investigation comprised the drilling of three boreholes numbered as 2015-BH1, 2015 BH2 and 2015 BH3 at the site to depths ranging between 4.4 m and 7.2 m.

A review of the results of the preliminary investigation revealed the site to be underlain by 2.0 m to 2.1 m of fine to medium sand to granular fill. This stratum is underlain by a layer of loose silty sand, which extends to 2.6 m depth. The fill and/or silty sand in all the boreholes is underlain by loose to dense sand and gravel till, which extends to 3.8 m to 4.6 m depth. The till is underlain by very poor to poor shale bedrock of the billings formation. The unit weight and unconfined compressive strength of intact rock cores sample tested varied from 2412 to 2590 kg/m^3 and 53.0 MPa to 66.9 MPa respectively. The groundwater table at the site was measured at a depth of 3.5 m below the existing ground surface.

Logs of relevant boreholes drilled as part of this investigation are included in Appendix A.

3 Site Description

The subject site is the existing Horizon Jeunesse School situated at 349 Olmstead Avenue in the east end of the City of Ottawa, Ontario (Figure 1). The site measures approximately 5.62 hectares (13.9 acres) and is occupied by a two storey slab on grade school building that was initially constructed in 1949 and has undergone several expansions between 1965 and 1975. There are two separate partial basement areas within the school that are used for mechanical systems and storage.

The school site is bounded by Jeanne Mance Street to the north, McArthur Avenue to the south, residential development to the east and by Olmstead Avenue to the west

Surface parking facility, playgrounds and running tracks are situated on the east side of the school building. The bus loop drop-off is currently situated on the west side of the school.

The topography of the site is relatively flat with ground surface elevations at the location of the borehole and test pits ranging between Elevation 64.82 m and 63.21 m.

4 Procedure

The fieldwork for this investigation was carried out between March 15 and March 18, 2016 and comprised the drilling of ten (10) boreholes and the excavation of eleven (11) test pits throughout the site. Four of the test pits were excavated along the west wall of the existing building.

The locations and elevations of the test pits and boreholes were established in the field by a survey crew of **exp** and are presented in Figure 2.

The boreholes were drilled to the specified depths or to refusal to augers ranging between 1.8 m and 4.3 m (Borehole Nos. 1 to 10). In addition, Borehole Nos. 1 and 6 were cased and advanced further beyond the refusal depth into the bedrock using washboring and core drilling techniques to depths of 7.05 m to 7.5 m respectively. The test pits along the building line (Test Pit Nos. 1 to 4) were each excavated to the underside of the existing footings, i.e. 1.5 m to 2.1 m whereas the remaining test pits (Test Pit Nos. 5 to 11) were excavated to depths ranging between 1.25 m to 2.60 m.

The boreholes were undertaken with CME-55 track/truck mounted drill rigs. Standard penetration tests were performed in all the boreholes at 0.75 m and 1.5 m depth intervals, with soil samples retrieved by the split barrel sampler. The bedrock was core drilled using NQ core barrel. Standpipes were installed in Borehole Nos. 2, 3 and 6 for long term monitoring of the groundwater level. All the boreholes were backfilled on completion of the fieldwork.

The test pits were excavated using a rubber-tired backhoe. The test pits were logged. Grab samples were collected from selected depths in some of the test pits. Upon completion of the excavation, all test pits were backfilled and the backfill nominally packed with the backhoe bucket. The test pits excavated in the asphalt area were re-instated by a specialized contractor.

All the soil samples were visually examined in the field, logged, preserved in plastic bags and identified. Similarly, the rock cores were logged and stored in core boxes. On completion of the fieldwork, all the soil and rock samples were transported to the **exp** laboratory in Ottawa where they were examined by a geotechnical engineer. The engineer also assigned the laboratory testing, which consisted of performing the following tests:

Natural Moisture Content (ASTM D2216-10) ..... 63 tests

Unit Weight (ASTM D7263-09)..... 13 tests

Grain-size Analyses (ASTM C1364 and D422)..... 5 tests

pH, Sulphate, Chloride, Resistivity, and Conductivity ..... 2 tests

5 Findings of Test Pits Along Existing School

A detailed description of the findings encountered in each of the four test pits excavated along the west line of the school building is presented in Table 1. Photographs of the test pits and summary of findings are also presented in Appendix B.

Table 1: Summary of Findings in Test Pits along Building Line

Test Pit No. and Location	Ground Surface Elev. (m)	Observations	Width of Exposed Footing (mm)	Thickness of exposed Footing (mm)	Elevation of Underside of Footing (m)
TP-1	64.58	• Building is founded on strip footing at a depth of 1.2 m below the existing ground surface • Existing footing is founded on compact **Silty Sand**	140	300	63.38
TP-2	64.82	• Building is founded on spread footing at a depth of 1.50 m below the ground surface. • Existing footing is founded on compact **Silty Sand.**	125	200	63.32
TP-3	64.73	• Building is founded on strip footing (this portion with basement) at a depth of 2.20 m below the existing ground surface • Existing footing is founded on compact S**ilty Sand glacial till**	140	650	62.53
TP4	64.70	• Building is founded on strip footing at a depth of 1.45 m below the existing ground surface • Existing footing is founded on compact **Silty Sand**.	200	200	63.25

The investigation has revealed that at the location of the test pits, the existing building is founded on strip and spread footings at depths ranging between 1.20 m and 2.20 m below the ground surface, i.e. Elevation 62.53 m to 63.38 m.

The designer should also review the available structural plans which show the existing building to be founded on combination of strip and spread footings at different depths. The test pits excavated along the

west building line revealed that at three of the locations investigated, the building is founded on strip footings set on a compact silty sand. At the fourth location, i.e. vicinity of the basement area, the building was founded on glacial till at a depth of 2.2. m below the ground surface. Based on these findings, the type of footing(s) and founding depth elsewhere along the west wall of the building is not known and should be investigated further prior to tendering.

6 Subsurface Soil and Groundwater Conditions

A detailed description of the subsurface soil and groundwater conditions encountered in the boreholes and test pits is given on the borehole and test pit logs, i.e. Figures 3 to 23. The borehole and test pits logs and related information depict subsurface conditions only at the specific locations and times indicated. Subsurface conditions and water levels at other locations may differ from conditions at the locations where sampling was conducted. The passage of time also may result in changes in the conditions interpreted to exist at the locations where sampling was conducted. Boreholes were drilled and test pits excavated to provide representation of subsurface conditions as part of a geotechnical exploration program and are not intended to provide evidence of potential environmental conditions.

It should be noted that the soil boundaries indicated on the borehole and test pit logs are inferred from non-continuous sampling and observations during drilling. These boundaries are intended to reflect approximate transition zones for the purpose of geotechnical design and should not be interpreted as exact planes of geological change. The “Notes on Sample Descriptions” preceding the logs forms an integral part of this report and should be read in conjunction with this report.

A review of the borehole and test pit logs indicates the following subsurface soil, bedrock and groundwater conditions.

6.1 Topsoil

A surficial topsoil layer ranging in thickness between 150 mm to 300 mm was encountered at all the test hole locations with the exception of Borehole No. 9 and Test Pit Nos. 5, 6, 7 and 11.

6.2 Asphalt

Asphaltic concrete ranging in thickness between 40 and 60 mm was contacted at the surface in Borehole No. 9 and in Test Pit Nos. 5, 6 and 7.

6.3 Granular Fill

Granular fill ranging in thickness between 200 mm to 260 mm was contacted below the asphaltic concrete in Borehole No. 9 and in Test Pit Nos. 5,6 and 7. In Test Pit No. 4, 500 mm of granular fill was encountered below the topsoil.

6.4 Fill

The pavement structure or topsoil in all the test holes with the exception of Borehole Nos. 4 and 5 is underlain by fill which extends to depths ranging between 0.5 m and 2.2 m below existing grade, Elevation 62.5 m to 63.8 m. The fill is heterogeneous in nature and varied from a silty sand to a gravelly sand with traces of clay and brick pieces. It is very loose to compact and has a natural moisture content ranging between 12 and 39 percent. Grain-size analysis completed on a soil sample from Borehole No. 8 and

shown on Figure No. 24 revealed a fill composition of 17 percent silt and clay, 43 percent sand and 40 percent gravel.

6.5 Silty Sand

Silty sand was encountered below the topsoil, fill or granular fill in all the test holes except in Borehole Nos, 6 to 9. The silty sand extends to the maximum depth investigated of 1.5 m to 2.1 in Borehole No. 10 and in Test Pit 1, 2 and 4, i.e. Elevation 62.2 m to 63.1 m and to depths ranging between 0.9 m and 2.4 m below the existing ground surface in the remaining test holes i.e. Elevation 61.6 m to 62.8 m The relative density of this deposit is very loose to compact, with SPT "N" values ranging between 3 and 12 blows for 300 mm penetration of the split spoon sampler. The sand is generally described as being fine grained, silty sand with some clay and trace gravel. This stratum has a moisture content ranging between 10 and 32 percent. Grain-size analysis completed on silty sand samples from Borehole Nos. 1 and 2 are shown on Figure Nos. 25 and 26. A review of these figures indicates a soil composition of 40 to 42 silt and clay, 50 to 60 percent sand and 0 to 8 percent gravel.

6.6 Glacial Till

The silty sand and /or fill is underlain by glacial till, which extends to the auger refusal depths of 3.7 m to 4.3 m, i.e. Elevation 60.0 to 60.8 m in Borehole Nos. 1 to 6 and to the maximum depth investigated of 1.2 m to 2.6 m, i.e. Elevation 61.3 m to 62.5 in the remaining testholes. The relative density of this deposit is compact to very dense, with SPT "N" values between 12 and 57 blows for 300 mm penetration of the split spoon sampler. Loose seams of the till were contacted in the upper levels of Borehole Nos. 2 and 5. The glacial till is generally described as a silty to gravelly sand with some shale fragments and traces of clay, and containing occasional cobbles and boulders. This stratum has a moisture content ranging between 6 and 25 percent. Grain-size analyses completed on glacial till samples retrieved from Borehole Nos. 1 and 3 indicated a soil composition of 22 to 27 percent silt and clay, 33 to 41 percent sand and 32 to 43 percent gravel. The grain-size distribution curves are shown on Figure Nos. 27 and 28.

6.7 Bedrock

Refusal to augers was contacted in Borehole Nos. 1 to 6 at depths ranging between 3.65 m and 4.3 m, i.e. Elevation 60.0 to 60.7 m. Borehole Nos. 1 and 6 were cased and advanced further into the bedrock using washboring and core drilling techniques to termination at depths of 7.50 m and 7.05 m respectively, i.e. Elevation 56.9 m and 57.4 m. Total Core Recovery (TCR) and Rock Quality Designation (RQD) of 100 percent and 13 to 52 percent respectively was obtained when core drilling the bedrock. On this basis, the bedrock quality within the depth investigated may be described as very poor quality (Photographs B5 and B6). The bedrock was also cored in one of the three boreholes (2015-BH-1) drilled by **exp** at the site in 2015 as shown in Appendix A.

Unit weight and unconfined compressive strength tests were performed on two intact rock cores. The tests results are presented on Table 2. Results of lab tests completed on rock samples from the 2015 investigation are also included in Table 2.

Table 2: Unconfined Compressive Strength Tests on Rock Cores			
Borehole No.	**Depth (m)**	**Unit Weight (kg/m^3)**	**Unconfined Compressive Strength (MPa)**
1	4.8 – 4.9	2350	59.1
3	4.4 – 4.5	2351	62.1
2015-1	4.2 – 4.32	2412	54.5
2015 -1	5.74 – 5.87	2532	66.9
2015 -1	6.66 – 6.84	2590	53.0

A review of Table 2 indicates that the unit weight of the bedrock varies from 2350 to 2590 kg/m^3. Its unconfined compressive strength varies from 53.0 MPa to 66.9 MPa.

The bedrock underlying the site is described as highly fractured Shale bedrock of the Billings Formation, horizontally stratified, fissile to very thinly bedded and contains some near vertical joints. The Billings Shale is known to contain disseminated iron sulphide, which can be oxidized by autotrophic bacteria to produce secondary hydrous sulphates of greater volume. This type of oxidation is favoured by warm, drained, humid environment. The shale bedrock also weathers readily when exposed to the environment by parting along weakly bonded fissile bedding planes and disintegrates into debris.

Since the shale bedrock is prone to deterioration when exposed to the elements, it is recommended that in the event that shale bedrock excavation become necessary (not anticipated), a skim coat of concrete should be placed on top of the bedrock surface following excavation cleaning and approval.

6.8 Groundwater Conditions

Water level observations were made in the boreholes during drilling and in standpipes installed in the boreholes subsequent to completion of the drilling.

Table 3: Groundwater Observations			
Borehole No.	**Elapsed Time**	**Depth from Ground Surface (m)**	**Elevation (m)**
BH 2	Completion	Dry	-
	April 6, 2016	4.0	60.5
BH 3	Completion	Dry	-
	April 6, 2016	Blocked	-
BH-6	Completion	Dry	-
	April 6, 2016	3.5	60.9

A review of Table 3 indicates that the groundwater table at the site is at a depth of 3.5 to 4.0 m below the existing ground surface, i.e. Elevation 60.5 m to 60.9 m. It is considered that the groundwater table has not stabilized during the relatively short time interval over which the observations were made.

Water levels were determined in the boreholes at the times and under the conditions stated in the scope of services. Note that fluctuations in the level of groundwater may occur due to a seasonal variation such as precipitation, snowmelt, rainfall activities, and other factors not evident at the time of measurement and therefore may be at a higher level during wet weather periods.

7 Seismic Site Classification and Liquefaction Potential of On Site Soils

The subsurface soil and groundwater conditions at the site were reviewed in relation to Section 4.1.8.4 of the Ontario Building Code, 2012. Based on the geotechnical investigation, the subsurface conditions comprise of fill underlain by very loose to loose silty sand to a depth of 1.6 m to 2.4 m underlain by compact to dense silty to gravelly glacial till extending to auger refusal/bedrock depth of 3.7 m to 4.3 m. The groundwater table was encountered at 3.0 m to 4.0 m depth below the existing ground surface.

The standard penetration values (N) of the silty sand vary between 3 and 9 and those of glacial till vary between 12 and 57. The average shear-wave velocity value of the overburden and bedrock to 30 m below the proposed founding level was computed. For this purpose, the shear-wave velocity value of 360 to 760 m/s is assumed for bedrock. The shear-wave velocity (Vs) of the silty sand and silty to gravelly till can be correlated to the standard penetration values (SPT) using Seed et al. (1983) formula:

$$Vs(m/s) = 56.4\ (N)^{0.5}$$

An average shear-wave velocity to 30 m depth was computed based on the above assumptions as 395 m/s. On this basis, the site has been classified as Class C for seismic site response in accordance with Table 4.1.8.4 A of the Ontario Building Code, 2012. The on-site soils are not expected to be liquefiable during a seismic event.

8 Site Grade Raise Restrictions

The site contains surficial fill, which is underlain by silty sand, glacial till and shale bedrock. Clayey compressible soils were not encountered at the site. Based on the existing site topography and proposed development, significant grade raise is not anticipated at the subject site as part of the proposed development.

However, for design and compliance purposes, a maximum grade raise of 2 m may be used at the subject site.

9 Site Grading

Site grading within the footprint of the proposed building addition should consist of the excavation and removal of all topsoil and fill and unsuitable material as described in Section 10 from within the proposed building envelope. The exposed subgrade should be proofrolled in the presence of a geotechnical engineer. Any soft areas identified should be excavated and replaced with Ontario Provincial Standard Specification (MUNI.OPSS 1010) Granular B Type II compacted to 98 percent standard Proctor maximum dry density (SPMDD).

Following approval of the exposed subgrade, the grades may be raised to the founding level or to the underside of the floor slab, by the placement of engineered fill consisting of OPSS 1010 Granular B II compacted to 98 percent SPMDD.

10 Foundation Considerations

The geotechnical investigation has revealed that the subsurface condition in the area of the proposed addition, comprises of loose fill and silty sand, which extends to 1.6 m to 2.1 m depth, i.e. Elevation 62.8 m to 62.0 m. These soils are underlain by loose to dense till which extends to the surface of the shale bedrock contacted at depths of 3.7 to 4.3, i.e. Elevation 60.7 m to 60.2 m.

The floor slab of the proposed addition is expected to match the existing slab elevation of 64.91 m. The footings of the proposed addition without a basement are expected to be set at Elevation 63.41 m.

The existing fill and loose silty sand are not considered capable of supporting significant structural loads. In addition, the upper levels of the glacial till in some areas of the site is loose and also not considered suitable founding purposes. It is therefore considered that it would be necessary to remove all the loose soils identified from the underside of the proposed footings and to replace them with engineered fill as described below. The approximate depth and elevations of the required sub-excavation at each borehole location drilled within the proposed building addition is presented in Table 4 below:

Table 4: Summary of Sub-Excavation Required for Addition

Borehole No.	Anticipated Sub-Excavation Depth (m)	Anticipated Sub-Excavation Elevation (m)	Depth of Engineered Fill Required under Footings (m)
1	2.4	62.0	0.7
2	2.5	62.0	0.7
3	2.5	61.9	0.80
4	2.0	62.2	0.50
5	2.5	61.9	0.80
6	2.0	62.5	0.20

As indicated above, it is feasible to found the proposed building addition on spread and strip footings set on engineered fill, provided all the existing fill, silty sand and loose seams of glacial till are sub-excavated and replaced with engineered fill. The option would require undertaking excavation to a depth of 2.0 m to 2.5 m below the existing ground surface, compaction of the exposed subgrade and placement and compaction of the engineered fill to the founding level. The engineered fill should extend to a distance of 1.0 m beyond the edge of the footings and thereafter should be sloped at a gradient of 1H to 1V. The engineered fill should conform to OPSS 1010 for Granular B, Type II. It should be placed in maximum of 300 mm lift thicknesses and each lift compacted to 100 percent standard Proctor maximum dry density in accordance with AASTM 698-12e2 (SPMDD). The placement and compaction of the engineered fill can in this way be undertaken to the founding level and footings constructed. Confirmation of the degree of compaction of the engineered fill would be required by performing in-situ density tests on each lift. A

serviceability limit state (SLS) bearing pressure of 150 kPa is expected to be available when founding on engineered fill.

Close to the existing building, sub-excavation for removal of the loose material and replacement with engineered fill may not be feasible due to risk of damaging and/or undermining the existing footings. Therefore, close to the existing footings, the excavation should only extend to the underside of the existing footings; construction of the new footings may proceed as follows:

- In areas of shallow footings founded on the silty sand (strip footings), the footings of the proposed addition should be set at the same elevation as the existing footings for a distance of 2 to 3 m and designed for a lower SLS/ULS bearing pressure of 50 kPa to 75 kPa respectively. Beyond 3 m, excavation may be undertaken to remove the loose soils and to found on engineered fill, which is prepared and designed as per the recommendation stated above. Alternatively, the footings may be designed as cantilever along this section.

- In areas of deep footing set on the glacial till, the footings of the proposed addition should be set at the same elevation as the existing footings and designed for a lower SLS/ULS bearing pressure of 100 kPa respectively for a distance of 3 m beyond, which the footing may be placed on engineered fill which is prepared and designed as per the recommendation stated above.

- Review of the above recommendations should be completed once the structural designs are completed and the underside of the proposed footings are set.

Settlements of the footings constructed as above are expected to be within the normally tolerated limits of 25 mm total and 19 mm differential movements.

A minimum of 1.5 m of earth cover should be provided to the footings of a heated structure to protect them from damage due to frost penetration. The frost cover should be increased to 2.1 m for unheated structures if snow will not be removed from their vicinity. If snow will be removed from the vicinity of the unheated structures, the frost cover should be increased to 2.4 m.

All the footing beds should be examined by a geotechnical engineer to ensure that the founding surfaces are capable of supporting the design bearing pressure and that the footing beds have been properly prepared. Depending on the prevailing weather conditions at the time of construction, it may be necessary to protect the surface of the till following excavation by the placement of a concrete mud slab for footings set on the glacial till.

Settlements of the footings designed for the SLS bearing pressures recommended above and properly constructed are expected to be within the normally tolerated limits of 25 mm total and 19 mm differential settlements.

The recommended bearing pressures have been calculated by **exp** from the borehole information for the design stage only. The investigation and comments are necessarily on-going as new information of underground conditions becomes available. For example, more specific information is available with

respect to conditions between boreholes, when foundation construction is underway. The interpretation between boreholes and the recommendations of this report must therefore be checked through field monitoring provided by an experienced geotechnical engineer to validate the information for use during the construction stage.

A second option would be to found the proposed addition on pile foundations. **Exp** can provide recommendations regarding the design of piles if this option is to be considered.

11 Floor Slab Construction

The floor slab of the proposed addition may be set on a 200 mm thick bed of well compacted 19 mm clear stone placed on the engineered fill pad at least 300 mm thick constructed as recommended below and in Section 10 of the report. The clear stone would prevent the capillary rise of moisture from the sub-soil to the floor slab. A polyethylene vapour barrier should be placed over the clear stone pad, if a moisture sensitive finish is to be placed on the floor. Adequate saw cuts should be provided in the floor slab to control cracking.

The investigation has revealed that the site contains fill, loose silty sand and till, which extends to a depth of 2.0 m to 2.5 m below the existing ground surface. Therefore, if only localized trenches are excavated for construction of the new footings instead of a mass excavation, the floor slab may be constructed as slab on grade provided that the following recommendations are implemented:

1. All organic soil and fill should be removed from the building envelope as described in Section 10.

2. The exposed silty sand surface should be compacted with a heavy vibratory roller. Any soft areas detected should be sub-excavated and replaced with engineered fill comprising of OPSS Granular B Type II placed in 300 mm lifts and each lift compacted to 98 percent of the SPMDD.

3. The grades should be raised to underside of the clear stone using OPSS 1010 Granular B Type II which should be placed in 300 mm lifts and each lift compacted to 98 percent of the SPMDD.

Perimeter and underfloor drainage will not be required for the proposed addition without a basement provided the floor slab is at least 150 mm higher than the surrounding finished exterior grade. The final grades should be sloped to promote drainage of surface water away from the building addition.

12 Pipe Bedding Requirements

It is recommended that the bedding for the underground services including material specifications, thickness of cover material and compaction requirements conform to the local requirements of the municipality and/or Ontario Provincial Standard Specification and Drawings (OPSS and OPSD).

For guidance, the pipe bedding may consist of 300 mm of well graded, crushed stone, such as MUNI.OPSS 1010 Granular A. The bedding material should be placed along the sides and on top of the pipe to provide a minimum cover of 300 mm. The bedding should be compacted to at least 95 percent SPMDD.

13 Excavations and De-Watering Requirements

Excavations for the building addition are expected to extend to a depth of up to 2.5 m below the existing ground surface and is expected to be above the prevailing groundwater table. These excavations will extend through the fill and into the silty sand and the upper levels of the glacial till.

Excavations may be undertaken as open cut provided they meet the requirements of the current Ontario Occupational Health and Safety Act (OHSA), i.e. they are cut back at 1H:1V from the bottom of the excavation above the groundwater table. Any excavation that extends below the groundwater table should be cut back at a slope of 3H:1V.

It is anticipated that excavations for the construction of the footings at the site will not penetrate the granular soils below the groundwater table. However, if this condition is encountered at any location, this office should be contacted to provide additional recommendations. Dewatering of the groundwater sites would require lowering of the groundwater table to below the final excavation level prior to proceeding with the excavation.

Many geologic materials deteriorate rapidly upon exposure to meteorological elements. Unless otherwise specifically indicated in this report, walls and floors of excavations must be protected from moisture, desiccation, and frost action throughout the course of construction.

Although this investigation has estimated the groundwater levels at the time of the field work, and commented on de-watering and general construction problems, conditions may be present that are difficult to establish from standard boring and excavating techniques. These conditions may affect the type and nature of de-watering procedures used by the contractor. These conditions include local and seasonal fluctuations in the groundwater table, erratic changes in the soil profile, thin layers of soil with large or small permeabilities compared with the soil mass, etc. Only carefully controlled tests using pumped wells and observation wells will yield the quantitative data on groundwater volumes and pressures that are necessary to adequately engineer construction de-watering systems.

14 Backfilling Requirements and Suitability of On-Site Soils for Backfilling Purposes

The soils to be excavated from the site will comprise of topsoil, fill, loose silty sand and glacial till. The fill contains construction debris and therefore not considered suitable for backfilling in the interior of the building. It may be used outside the building and for general grading purposes. The silty sand may be also used exterior to the building as backfill provided its moisture content is maintained at all times within +/-2 percent of the optimum value as per ASTM D-698-12e2 (Natural moisture content is between 10 and 32 percent).

It is anticipated that the majority of the material required for backfilling purposes will need to be imported and should preferably conform to the following specifications:

- Engineered fill under footings and underfloor fill including backfilling in service trenches inside the building – OPSS 1010 (November 2013) for Granular B Type II placed in 300 mm thick lifts with each lift compacted to 98 percent SPMDD beneath the floor slab and 100 percent SPMDD beneath footings;

- Backfill against exterior subsurface walls – OPSS 1010 Granular B Type II placed in 300 mm thick lifts and compacted to 95 percent SPMDD; and

- Trench backfill outside building area, and fill placement to subgrade level for pavement and playgrounds – OPSS 1010 Select Subgrade Material (SSM), free of organics, debris and with a natural moisture content within 2 percent of the optimum moisture content. It should be placed in 300 mm thick lifts compacted to minimum 95 percent SPMDD.

15 Backfilling Requirements Following the demolition of the School Building

As part of the redevelopment of the school property, it is understood that portion of the existing school structure will be demolished and the area backfilled. The following recommendations are provided for the re-instatement of these areas following the demolition process;

1. All structural elements, i.e. slabs, walls, footing, plumbing system, underground services, etc. should be demolished, removed and disposed of site.

2. The excavation should extend to the underside of the existing footings. The exposed surface should be examined by a geotechnician and any unsuitable material identified sub-excavated;

3. Following approval of the subgrade, any areas proposed for structural elements, such as footings, slabs, etc. should be backfilled with OPSS 1010 Granular B Type II material which should be placed in 300 mm lifts and each lift compacted to 100 percent of the SPMDD under footings and to 98 percent of the SPMDD under floor slabs.

4. In areas proposed to be constructed as parking lots, walkway, roadways, landscaped areas and following approval of the subgrade, OPSS 1010 Select Subgrade material should be used and should be placed in 300 mm lifts and each lift compacted to 95 percent of the SPMDD to sub grade level.

16 Pavement Structure

The recommended pavement structure for playground, parking areas and access roadways/bus loop are given on Table 5. The structures are based upon the assumption that the subgrade will be properly prepared and assuming a functional design life of eight to ten years. The proposed functional design life represents the number of years to the first rehabilitation, assuming regular maintenance is carried out.

Table 5: Recommended Pavement Structure Thicknesses for Playground, Light & Heavy Duty Pavement

Pavement Layer	Compaction Requirements	Computed Pavement Structure		
		Playground (No Vehicle Traffic)	Light Duty (Cars Only)	Heavy Duty (Bus and Truck Routes)
Asphaltic Concrete (PG 58-34)	92-96% MRD	50 mm SC	65 mm SC	40 mm SC 50 mm BC
OPSS 1010 Granular 'A' Base (crushed limestone)	100% SPMDD*	150 mm	150 mm	150 mm
OPSS 1010 Granular 'B' II Sub-base	100% SPMDD*	200 mm	400 mm	500 mm
Subgrade	Engineered Fill/approved Fill as per specifications			

Notes:
SPMDD denotes standard Proctor maximum dry density, ASTM, D-698-12e2
MRD denotes Maximum Relative Density, ASTM D2041.
The upper 300 mm of the subgrade fill must be compacted to 98% SPMDD.
SC Denotes Surface course asphalt and may comprise of Marshall HL3 Mix or SP 12.5 mm (Cat B) Superpave Mix.
BC Denotes Base course asphalt and may comprise of Marshall HL8 Mix or SP 19 mm (Cat B) Superpave Mix.

16.1 Additional Comments

The foregoing designs assume that construction is carried out during dry periods and that the subgrade is stable under the load of construction equipment. If construction is carried out during wet weather, and heaving or rolling of the subgrade is experienced, additional thickness of granular material and/or geotextile may be required.

Additional comments on the construction of areas to be paved are as follows:

1. As part of the subgrade preparation, the new pavement areas should be stripped of all unsuitable topsoil and organic stained soils. Fill required to raise the grades to design elevations should be organic-free and at a moisture content that will permit compaction to the densities indicated. After

all the underground services have been installed, the subgrade should be properly shaped, crowned and proofrolled with a heavy roller in the full-time presence of a representative of this office. Any soft or spongy subgrade areas detected should be sub-excavated and properly replaced with suitable approved backfill compacted to 95 percent SPMDD. Wet soils should not be used to backfill the service trenches or as subgrade fill.

2. The long term performance of the pavement structure is highly dependent upon the subgrade support conditions. Stringent construction control procedures should be maintained to ensure that uniform subgrade moisture and density conditions are achieved. The need for adequate drainage cannot be over-emphasized. Due to the fine grained and frost susceptible nature of the subgrade soil, the pavement structure should be equipped with sub-drains. For guidance, subdrains should be installed at low points in the parking areas and on both sides of the fire route and should be continuous between catch basins to intercept excess surface and subsurface moisture and to prevent subgrade softening. This will ensure no water collects in the granular course, which could result in pavement failure during the spring thaw. The location and extent of subdrainage required within the paved areas should be reviewed by this office in conjunction with the proposed site grading.

3. To minimize the problems of differential movement between the pavement and catchbasins/manhole due to frost action, the backfill around the structures should consist of free-draining granular material preferably conforming to OPSS Granular B Type II material. Weep holes should be provided in the catchbasins and manholes to facilitate drainage of the granular fill.

4. The finished pavement surface should be free of depressions and should be sloped (preferably at a minimum cross fall of 2 percent) to provide effective surface drainage towards catch basins. Surface water should not be allowed to pond adjacent to the outside edges of paved areas.

5. The granular materials used for pavement construction should conform to OPSS 1010 for Granular A and Granular B Type II and should be compacted to 100 percent SPMDD. The asphaltic concrete used and its placement should meet OPSS 313 and 1150/1151 requirements.

It is recommended that **exp** be retained to review the final pavement structure design and drainage plans prior to construction to ensure that they are consistent with the recommendations of this report.

17 Subsurface Concrete Requirement

Selected soil samples were submitted for pH, chloride, sulphate and electrical resistivity laboratory analysis. A summary of the laboratory test results is summarized in Table 6.

Table 6: Results of pH, Chloride, Sulphate and Electrical Resistivity Tests on Soil Samples

Borehole No. Sample	Depth (m)	Soil Type	Moisture Content (%)	pH	Sulphate (%)	Chloride (%)	Electrical Resistivity Ohm.cm
Threshold Values				<5	>0.1	>0.04	<1500
2 -SS4	2.3 – 2.9	Till	15	7.7	0.0052	0.0102	2980
5 –SS4	3.0 – 3.7	Till	14	7.8	0.012	0.0012	5380

The results indicate an alkaline soil with a sulphate and chloride content of less than 0.1 and 0.04 percent respectively. These concentrations of sulphate and chloride in the soil would have a negligible potential of sulphate and chloride attack on subsurface concrete. The concrete should be designed in accordance with Table Nos. 3 and 6 of CSA A.23.1-14. However, the concrete should be dense, well compacted and cured.

The results also indicate the electrical resistivity of the soil to vary from 2980 ohm.cm and 5380 ohm.cm, which is indicative of moderately to strong potential corrosion attack on buried steel. Therefore, a corrosion specialist should be consulted for any additional recommendation regarding protection of any buried steel structures.

Certificate of the laboratory test results is attached in Appendix C.

18 General Closure

The comments given in this report are intended only for the guidance of the design engineers. The number of boreholes and testholes required to determine the localized underground conditions between boreholes and testholes affecting construction costs, techniques, sequencing, equipment, scheduling, etc., would be much greater than has been carried out for design purposes. Contractors bidding on or undertaking the works should in this light, decide on their own investigations, as well as their own interpretation of the factual borehole and testhole results to draw their own conclusions as to how the subsurface conditions may affect them.

The information contained in this report is not intended to reflect on environmental aspects of the soils. Should specific information be required, including for example, the presence of pollutants, contaminants or other hazards in the soil, additional testing may be required.

We trust this report is satisfactory for your purposes. Should you have any questions, please do not hesitate to contact this office.

Figures

0 200m 400m 800m

HORIZONTAL 1:20,000

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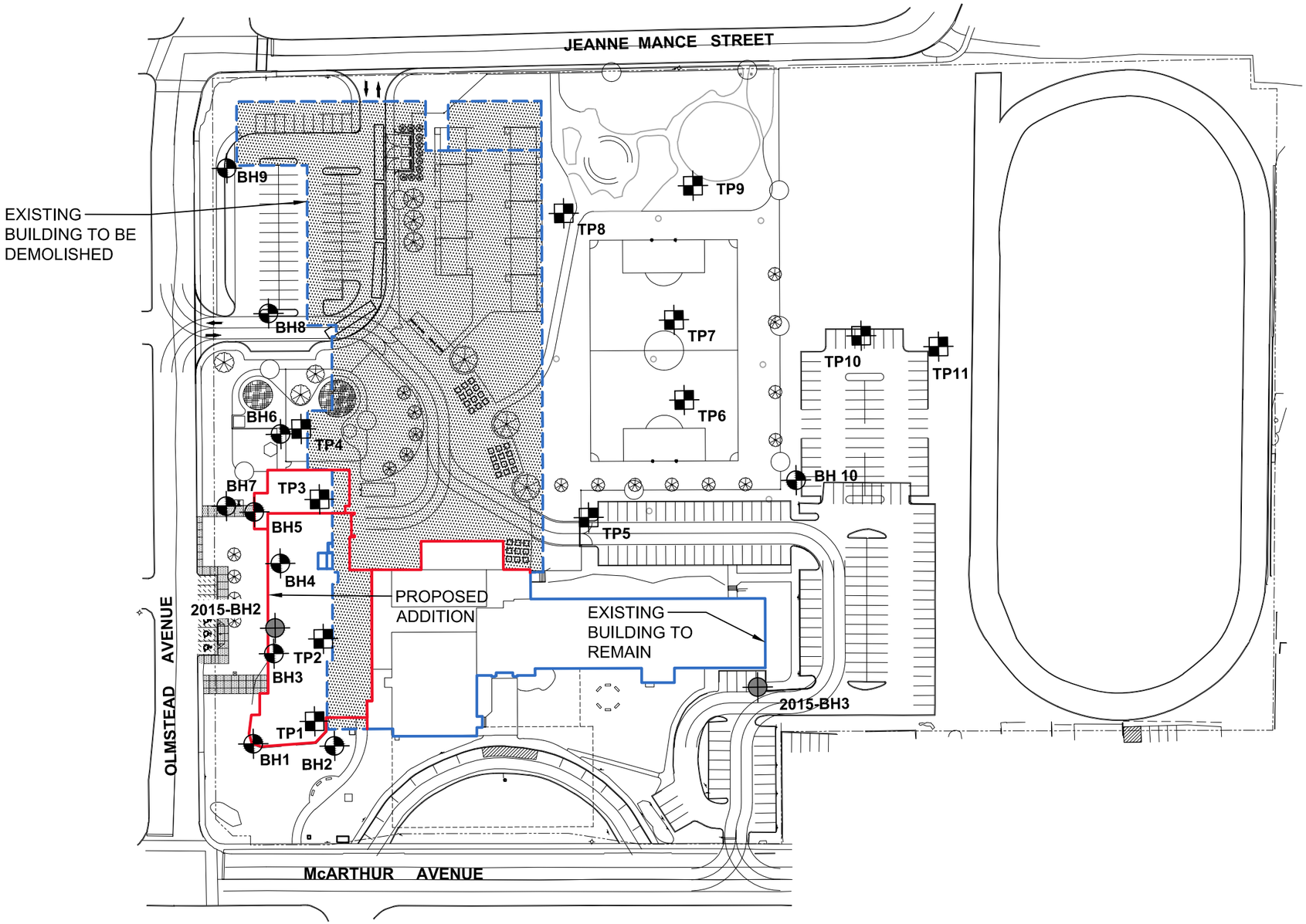
scale 1:20,000	CLIENT: CONSEIL DES ÉCOLES CATHOLIQUES DU CENTRE-EST		project no. OTT-00231875-A0
date APRIL 2016			
drawn by M.N.	TITLE: SITE LOCATION PLAN ÉCOLES ÉLÉMENTAIRE HORIZON-JEUNESSE, 349 RUE OLMSTEAD, OTTAWA, ON		FIG 1

Filename: r:\230000\231000\231875-a0 ecole elem. horizon jeunesse\231875-a0 fig 1 loc plan.dwg
Last Saved: 4/4/2016 11:38:34 AM
Last Plotted: 4/4/2016 2:17:04 PM Plotted by: nugentm Pen Table:: trow standard, july 01, 2004.ctb



0 10m 25m 50m

HORIZONTAL 1:1250

NOTES :

1. THE BOUNDARIES AND SOIL TYPES HAVE BEEN ESTABLISHED ONLY AT TEST PIT AND BOREHOLE LOCATIONS. BETWEEN TEST PITS AND BOREHOLES THEY ARE ASSUMED AND MAY BE SUBJECT TO CONSIDERABLE ERROR.
2. SOIL SAMPLES AND ROCK WILL BE RETAINED IN STORAGE FOR THREE MONTHS AND THEN DESTROYED UNLESS THE CLIENT ADVISES THAT AN EXTENDED TIME PERIOD IS REQUIRED.
3. TOPSOIL QUANTITIES SHOULD NOT BE ESTABLISHED FROM THE INFORMATION PROVIDED AT THE TEST PIT AND BOREHOLE LOCATIONS.
4. TEST PIT AND BOREHOLE ELEVATIONS SHOULD NOT BE USED TO DESIGN BUILDING(S) OR FLOOR SLABS OR PARKING LOT(S) GRADES.
5. THIS DRAWING FORMS PART OF THE REPORT PROJECT NUMBER AS REFERENCED AND SHOULD BE USED ONLY IN CONJUNCTION WITH THIS REPORT.
6. BASE PLANS OBTAINED FROM CECCE - STANTEC GEOMATICS LTD., TOPOGRAPHIC PLAN OF PART OF LOTS D, E, F, G, H & I, REGISTERED PLAN 381, CITY OF OTTAWA, DATED OCT. 9, 2015 AND SITE PLAN BY EDWARDJ. CUHACI AND ASSOCIATES ARCHITECTS INC., DRAWING A003, DATED OCT. 28, 2015.

LEGEND

BH1 BOREHOLE LOCATION AND NUMBER

TP1 TEST PIT LOCATION AND NUMBER

2015-BH2 EXISTING BOREHOLE LOCATION AND NUMBER BY exp SERVICES INC. PROJECT NO. OTT-00226176-A0

exp Services Inc.
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scale 1:1250	CLIENT: CONSEIL DES ÉCOLES CATHOLIQUES DU CENTRE-EST	project no. OTT-00231875-A0
date APRIL 2016	TITLE: BOREHOLE LOCATION PLAN	FIG 2
drawn by M.N.	ÉCOLE ÉLÉMENTAIRE HORIZON-JEUNESSE, 349 OLMSTEAD ST. OTTAWA	

Filename: c:\autocad backup\231875-a0 fig 2 bh plan.dwg
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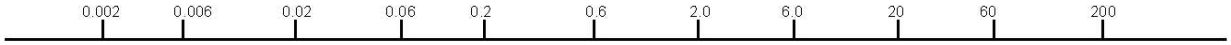
Notes On Sample Descriptions

1. All sample descriptions included in this report follow the Canadian Foundations Engineering Manual soil classification system. This system follows the standard proposed by the International Societv for Soil Mechanics and Foundation Engineering. Laboratory grain size analyses provided by **exp** Services Inc. also follow the same system. Different classification systems may be used by others; one such system is the Unified Soil Classification. Please note that, with the exception of those samples where a grain size analysis has been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.

ISSMFE SOIL CLASSIFICATION

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE		



EQUIVALENT GRAIN DIAMETER IN MILLIMETRES

CLAY (PLASTIC) TO	FINE	MEDIUM	CRS.	FINE	COARSE
SILT (NONPLASTIC)	SAND			GRAVEL	

UNIFIED SOIL CLASSIFICATION

2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional geotechnical site investigation.

3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

Log of Borehole BH 1

Project No: OTT-00231875-A0

Project: Geotechnical Investigation. New Ecole Elementaire Horizon-Jeunesse

Location: 349 Olmstead Avenue, City of Ottawa, Ontario

Figure No. 3

Page. 1 of 1

Date Drilled: 3/15/16

Drill Type: CME 75 - truck mount

Datum: Geodetic

Logged by: A.N. Checked by: I.T.

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	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
		TOPSOIL ~300mm	64.4	0				
		FILL Silty sand to sand, trace gravel, some brick/concrete pieces in upper portion, brown, moist, (very loose to loose)	64.1		3			
				1	7			
		SILTY SAND Fine grained, trace clay, oxidized stains, brown, moist, (loose)	62.9		8			
				2				
		GLACIAL TILL Silty to gravelly sand with some shale fragments, trace clay, dark brown, moist, (compact)	62.0		15			
				3	14			
		SHALE BEDROCK Horizontally bedded, horizontal and vertical seams, some silty sand seams (Very poor quality)	60.7	4				Run 1
				5				Run 2
				6				
				7				Run 3
			56.9					
		Borehole Terminated at 7.50 m Depth						

LOG OF BOREHOLE BH LOGS - 231875 - NOUVELLE HORIZON SCHOOL.GPJ TROW OTTAWA.GDT 4/6/16

NOTES:
1. Borehole data requires interpretation by exp. before use by others
2. Borehole backfilled with cuttings upon completion
3. Field work supervised by an **exp** representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-00231875-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	Core Water	7.5

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	3.66 - 4.62	90	28
2	4.62 - 6.15	100	40
3	6.15 - 7.5	100	13

Log of Borehole BH 2

Project No: OTT-00231875-A0

Project: Geotechnical Investigation. New Ecole Elementaire Horizon-Jeunesse

Location: 349 Olmstead Avenue, City of Ottawa, Ontario

Figure No. 4

Page. 1 of 1

Date Drilled: 3/15/16

Drill Type: CME 75 - truck mount

Datum: Geodetic

Logged by: A.N. Checked by: I.T.

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	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
		TOPSOIL ~150mm	64.5	0				
		FILL Silty sand with some gravel, trace clay, scattered brick pieces, moist, brown, (loose)	64.4		4	×		
			63.8	1	6	×		20.2
		SILTY SAND Fine grained, silty, trace to some clay, trace gravel, oxidized stains, brown, moist to wet, (loose)			5	×		20.6
			62.6	2				
		GLACIAL TILL Silty to gravelly sand with some shale fragments, trace clay, dark brown, moist, (compact to dense)			18	×		
				3	30	×		
			60.5	4	50 for 50mm	×		
			60.2					
		Borehole Terminated at 4.30 m Depth Upon Auger Refusal						

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

NOTES:
1. Borehole data requires interpretation by exp. before use by others
2. Piezometer installed upon completion
3. Field work supervised by an **exp** representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-00231875-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	dry	4.1
April 4, 2016	4.0	
April 6, 2016	4.0	

CORE DRILLING RECORD

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

LOG OF BOREHOLE BH LOGS - 231875 - NOUVELLE HORIZON SCHOOL.GPJ TROW OTTAWA.GDT 4/6/16

Log of Borehole BH 3

Project No: OTT-00231875-A0

Project: Geotechnical Investigation. New Ecole Elementaire Horizon-Jeunesse

Location: 349 Olmstead Avenue, City of Ottawa, Ontario

Figure No. 5

Page. 1 of 1

Date Drilled: 3/16/16

Drill Type: CME 75 - truck mount

Datum: Geodetic

Logged by: A.N. Checked by: I.T.

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	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 ~150mm	64.4	0	4	×		
		FILL Silty sand with some gravel, trace clay, moist, brown, (loose to very loose)	64.3					
		SILTY SAND Fine grained, trace clay, oxidized stains, brown, moist, (loose)	63.4	1	3	×		19.8
				2	8	×		20.4
		GLACIAL TILL Silty to gravelly sand with some shale fragments, trace clay, dark brown, moist, (compact)	62.2	3	12	×		
					19	×		
			60.3	4	50 for 125mm			
		Borehole Terminated at 4.10 m Depth Upon Auger Refusal						

LOG OF BOREHOLE BH LOGS - 231875 - NOUVELLE HORIZON SCHOOL.GPJ TROW OTTAWA.GDT 4/6/16

NOTES:
1. Borehole data requires interpretation by exp. before use by others
2. Piezometer installed upon completion
3. Field work supervised by an **exp** representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-00231875-A0

WATER LEVEL RECORDS		
Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	dry	4.1
April 6, 2016	Blocked	

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %

Log of Borehole BH 4

Project No: OTT-00231875-A0

Project: Geotechnical Investigation. New Ecole Elementaire Horizon-Jeunesse

Location: 349 Olmstead Avenue, City of Ottawa, Ontario

Figure No. 6

Page. 1 of 1

Date Drilled: 3/15/16

Drill Type: CME 75 - truck mount

Datum: Geodetic

Logged by: A.N. Checked by: I.T.

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	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
		TOPSOIL ~200mm	64.2	0				
		SILTY SAND Fine grained, trace clay and gravel, oxidized stains, brown, moist, (loose)	64.0		4	×		
				1	9	×		20.5
					5	×		
			62.4		75			
		GLACIAL TILL Silty to gravelly sand with some shale fragments, trace clay, some silt and shale, dark brown, moist, (dense) -presence of cobbles and boulders		2	31	×		
				3	39	×		
				4	50 for 75mm	×		
			60.0					
		Borehole Terminated at 4.25 m Depth Upon Auger Refusal						

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

LOG OF BOREHOLE BH LOGS - 231875 - NOUVELLE HORIZON SCHOOL.GPJ TROW OTTAWA.GDT 4/6/16

NOTES:
1. Borehole data requires interpretation by exp. before use by others
2. Borehole backfilled with cuttings upon completion
3. Field work supervised by an **exp** representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-00231875-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	dry	4.3

CORE DRILLING RECORD

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

Log of Borehole BH 5

Project No: OTT-00231875-A0

Project: Geotechnical Investigation. New Ecole Elementaire Horizon-Jeunesse

Location: 349 Olmstead Avenue, City of Ottawa, Ontario

Figure No. 7

Page. 1 of 1

Date Drilled: 3/16/16

Drill Type: CME 75 - truck mount

Datum: Geodetic

Logged by: A.N. Checked by: I.T.

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	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
		TOPSOIL ~200mm	64.4	0	3			
		SILTY SAND	64.2					
		Fine to coarse grained, some silt, trace gravel, oxidized stains, brown, moist, (very loose to loose)		1	4			19.3
			62.8					
		GLACIAL TILL		2	5			
		Silty to gravelly sand with some shale fragments, trace clay, dark brown, moist, (loose to very dense)			10			
		-presence of cobbles and boulders		3	56			22.2
			60.8					
		Borehole Terminated at 4.25 m Depth Upon Auger Refusal						

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

NOTES:
1. Borehole data requires interpretation by exp. before use by others
2. Borehole backfilled with cuttings upon completion
3. Field work supervised by an **exp** representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-00231875-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	dry	3.7

CORE DRILLING RECORD

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

LOG OF BOREHOLE BH LOGS - 231875 - NOUVELLE HORIZON SCHOOL.GPJ TROW OTTAWA.GDT 4/6/16

Log of Borehole BH 6

Project No: OTT-00231875-A0

Project: Geotechnical Investigation. New Ecole Elementaire Horizon-Jeunesse

Location: 349 Olmstead Avenue, City of Ottawa, Ontario

Figure No. 8

Page. 1 of 1

Date Drilled: 3/16/16

Drill Type: CME 75 - truck mount

Datum: Geodetic

Logged by: A.N. Checked by: I.T.

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	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
		TOPSOIL ~125mm	64.4	0	7			
		FILL Fine to coarse grained silty sand, some gravel, trace silt, moist, brown, (loose)	64.3	1	6			
					14			
		GLACIAL TILL Silty to gravelly sand with some shale fragments, trace clay, dark brown, moist, (compact to very dense)	62.5	2	22			
		-occasional cobbles and boulders		3	57			
			60.9					
				4	50 for 75mm			21.7
		SHALE BEDROCK Horizontally bedded, horizontal and vertical seams, some silty sand seams (Very poor quality)	60.2	5				Run 1
				6				Run 2
			57.4	7				Run 3
		Borehole Terminated at 7.05 m Depth						

LOG OF BOREHOLE BH LOGS - 231875 - NOUVELLE HORIZON SCHOOL.GPJ TROW OTTAWA.GDT 4/6/16

NOTES:
1. Borehole data requires interpretation by exp. before use by others
2. Piezometer installed upon completion
3. Field work supervised by an **exp** representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-00231875-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	Core Water	7.1
April 4, 2016	3.5	
April 6, 2016	3.5	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	4.2 - 5.08	81	29
2	5.08 - 6.61	73	50
3	6.61 - 7.05	100	52

Log of Borehole BH 7

Project No: OTT-00231875-A0

Project: Geotechnical Investigation. New Ecole Elementaire Horizon-Jeunesse

Location: 349 Olmstead Avenue, City of Ottawa, Ontario

Figure No. 9

Page. 1 of 1

Date Drilled: 3/16/16

Drill Type: CME 75 - truck mount

Datum: Geodetic

Logged by: A.N. Checked by: I.T.

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
		TOPSOIL ~300mm	64.3	0
		FILL Silty sand, trace gravel, oxidized stains, brown, moist, (loose)	64.0	
		GLACIAL TILL Silty to gravelly sand with some shale fragments, trace clay, dark brown, moist, (dense)	62.8	1
		Borehole Terminated at 1.80 m Depth	62.5	

Standard Penetration Test N Value: 5, 6, 43

Shear Strength kPa: 20 40 60 80 / 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

NOTES:
1. Borehole data requires interpretation by exp. before use by others
2. Borehole backfilled with cuttings upon completion
3. Field work supervised by an **exp** representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-00231875-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	dry	1.8

CORE DRILLING RECORD

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

LOG OF BOREHOLE BH LOGS - 231875 - NOUVELLE HORIZON SCHOOL.GPJ TROW OTTAWA.GDT 4/6/16

Log of Borehole BH 8

Project No: OTT-00231875-A0

Project: Geotechnical Investigation. New Ecole Elementaire Horizon-Jeunesse

Location: 349 Olmstead Avenue, City of Ottawa, Ontario

Figure No. 10

Page. 1 of 1

Date Drilled: 3/16/16

Drill Type: CME 75 - truck mount

Datum: Geodetic

Logged by: A.N. Checked by: I.T.

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	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
		TOPSOIL ~150mm	64.2	0				
		FILL Fine grained gravelly sand, oxidized stains, brown, moist, (loose) -upper 0.6m frozen	64.1		31			
				1	7			
			62.8		14			
		GLACIAL TILL Silty to gravelly sand with some shale fragments, trace clay, dark brown, moist, (compact)	62.4					
		Borehole Terminated at 1.80 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

LOG OF BOREHOLE BH LOGS - 231875 - NOUVELLE HORIZON SCHOOL.GPJ TROW OTTAWA.GDT 4/6/16

NOTES:
1. Borehole data requires interpretation by exp. before use by others
2. Borehole backfilled with cuttings upon completion
3. Field work supervised by an **exp** representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-00231875-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	dry	1.8

CORE DRILLING RECORD

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

Log of Borehole BH 9

Project No: OTT-00231875-A0

Project: Geotechnical Investigation. New Ecole Elementaire Horizon-Jeunesse

Location: 349 Olmstead Avenue, City of Ottawa, Ontario

Figure No. 11

Page. 1 of 1

Date Drilled: 3/16/16

Drill Type: CME 75 - truck mount

Datum: Geodetic

Logged by: A.N. Checked by: I.T.

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
			64.3	0
		PAVEMENT STRUCTURE 40mm of Asphalt over 260mm of Granular Fill	64.0	
		FILL Gravelly sand, dark brown, moist, (compact)		1
			62.8	
		GLACIAL TILL Silty to gravelly sand with some shale fragments, trace clay, dark brown, moist, (compact)	62.5	
		Borehole Terminated at 1.80 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
21.9
22.6

LOG OF BOREHOLE BH LOGS - 231875 - NOUVELLE HORIZON SCHOOL.GPJ TROW OTTAWA.GDT 4/6/16

NOTES:
1. Borehole data requires interpretation by exp. before use by others
2. Borehole backfilled with cuttings upon completion
3. Field work supervised by an **exp** representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-00231875-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	dry	1.8

CORE DRILLING RECORD

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

Log of Borehole BH 10

Project No: OTT-00231875-A0

Project: Geotechnical Investigation. New Ecole Elementaire Horizon-Jeunesse

Location: 349 Olmstead Avenue, City of Ottawa, Ontario

Figure No. 12

Page. 1 of 1

Date Drilled: 3/16/16

Drill Type: CME 75 - truck mount

Datum: Geodetic

Logged by: A.N. Checked by: I.T.

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	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
		TOPSOIL ~250mm	64	0				
		FILL Gravelly sand, dark brown, moist, (compact)	63.8		12	×		
					10	×		20.7
		SILTY SAND Fine grained, brown, oxidized stains, moist, (compact)	63.0	1				
					12	×		20.3
		Borehole Terminated at 1.80 m Depth	62.2					

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

LOG OF BOREHOLE BH LOGS - 231875 - NOUVELLE HORIZON SCHOOL.GPJ TROW OTTAWA.GDT 4/6/16

NOTES:
1. Borehole data requires interpretation by exp. before use by others
2. Borehole backfilled with cuttings upon completion
3. Field work supervised by an **exp** representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-00231875-A0

WATER LEVEL RECORDS		
Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	dry	1.8

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %

Log of Borehole TP 01

Project No: OTT-00231875-A0

Project: Geotechnical Investigation, New Horizon-Jeunesse Elementary School

Location: 349 Olmstead Avenue, City of Ottawa, Ontario

Figure No. 13

Page. 1 of 1

Date Drilled: 'March 18, 2016

Drill Type: Backhoe

Datum: Geodetic

Logged by: A.N. Checked by: I.T.

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
		TOPSOIL ~150mm	64.6	0
			64.5	
		FILL Silty sand, trace gravel, some asphalt pieces, brown, moist		
		-Underside of Footing at 1.2m depth (Elev. 63.38)		1
			63.4	
		SILTY SAND Fine grained, oxidized staining, brown, moist		
			63.1	
		Test Pit Terminated at 1.50 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

LOG OF BOREHOLE TP LOGS - 231875 - NOUVELLE HORIZON SCHOOL.GPJ TROW OTTAWA.GDT 4/6/16

NOTES:
1. Borehole data requires interpretation by exp. before use by others
2. Test Pit backfilled and compacted upon completion
3. Field work supervised by an **exp** representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-00231875-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	dry	1.5

CORE DRILLING RECORD

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

Log of Borehole TP 02

Project No: OTT-00231875-A0

Project: Geotechnical Investigation, New Horizon-Jeunesse Elementary School

Location: 349 Olmstead Avenue, City of Ottawa, Ontario

Figure No. 14

Page. 1 of 1

Date Drilled: 'March 18, 2016

Drill Type: Backhoe

Datum: Geodetic

Logged by: A.N. Checked by: I.T.

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	Standard Penetration Test N Value / Shear Strength kPa (20 40 60 80 / 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 ~150mm	64.8	0				
			64.7					
		FILL Silty sand, some gravel, occasional boulders, brown, moist				×		
		-Underside of Footing at 1.5m depth (Elev. 63.32)		1				
			63.3					
		SILTY SAND Fine grained, oxidized staining, brown, moist - Water Infiltration into the test pit at 2.0 m depth				×		19.0
			62.7	2				
		Test Pit Terminated at 2.10 m Depth						

NOTES:
1. Borehole data requires interpretation by exp. before use by others
2. Test Pit backfilled and compacted upon completion
3. Field work supervised by an **exp** representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-00231875-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	dry	2.1

CORE DRILLING RECORD

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

LOG OF BOREHOLE TP LOGS - 231875 - NOUVELLE HORIZON SCHOOL.GPJ TROW OTTAWA.GDT 4/6/16

Log of Borehole TP 03

Project No: OTT-00231875-A0

Project: Geotechnical Investigation, New Horizon-Jeunesse Elementary School

Location: 349 Olmstead Avenue, City of Ottawa, Ontario

Figure No. 15

Page. 1 of 1

Date Drilled: 'March 18, 2016

Drill Type: Backhoe

Datum: Geodetic

Logged by: A.N. Checked by: I.T.

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	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
		TOPSOIL ~150mm	64.7	0	20 40 60 80 / 50 100 150 200 kPa	250 500 750 / 20 40 60		
			64.6					
		FILL Sand, some silt and gravel, occasional pieces of concrete, occasional boulders, brown, moist				×		
				1				
		-Underside of Footing at 2.2m depth (Elev. 62.53)		2				
			62.5					
		GLACIAL TILL Silty to gravelly sand with some shale fragments, trace clay, dark brown, moist				×		21.1
			62.1					
		Test Pit Terminated at 2.10 m Depth						

LOG OF BOREHOLE TP LOGS - 231875 - NOUVELLE HORIZON SCHOOL.GPJ TROW OTTAWA.GDT 4/6/16

NOTES:
1. Borehole data requires interpretation by exp. before use by others
2. Test Pit backfilled and compacted upon completion
3. Field work supervised by an **exp** representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-00231875-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	dry	2.6

CORE DRILLING RECORD

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

Log of Borehole TP 04

Project No: OTT-00231875-A0

Project: Geotechnical Investigation, New Horizon-Jeunesse Elementary School

Location: 349 Olmstead Avenue, City of Ottawa, Ontario

Figure No. 16

Page. 1 of 1

Date Drilled: 'March 18, 2016

Drill Type: Backhoe

Datum: Geodetic

Logged by: A.N. Checked by: I.T.

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
		TOPSOIL ~100mm	64.7	0
		FILL Crusher-run, some brick pieces, brown	64.6	
			64.1	
		FILL Silty sand, trace gravel, some wood pieces, brown, moist		1
		-Underside of Footing at 1.45m depth (Elev. 62.53)	63.3	
		SILTY SAND Fine grained, oxidized staining, brown, moist	63.1	
		Test Pit Terminated at 1.60 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

NOTES:
1. Borehole data requires interpretation by exp. before use by others
2. Test Pit backfilled and compacted upon completion
3. Field work supervised by an **exp** representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-00231875-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	dry	1.6

CORE DRILLING RECORD

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

LOG OF BOREHOLE TP LOGS - 231875 - NOUVELLE HORIZON SCHOOL.GPJ TROW OTTAWA.GDT 4/6/16

Log of Borehole TP 05

Project No: OTT-00231875-A0

Project: Geotechnical Investigation, New Horizon-Jeunesse Elementary School

Location: 349 Olmstead Avenue, City of Ottawa, Ontario

Figure No. 17

Page. 1 of 1

Date Drilled: 'March 18, 2016

Drill Type: Backhoe

Datum: Geodetic

Logged by: A.N. Checked by: I.T.

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
		PAVEMENT STRUCTURE 50mm of asphalt over 200mm of granular fill	63.4	0
		FILL Sand and gravel, brown, moist	63.2	
		SILTY SAND Fine grained, oxidized staining, brown, moist	62.8	
		GLACIAL TILL Silty to gravelly sand with some shale fragments, trace clay, dark brown, moist	62.5	1
		Test Pit Terminated at 1.25 m Depth	62.2	

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

NOTES:
1. Borehole data requires interpretation by exp. before use by others
2. Test Pit backfilled and compacted upon completion
3. Field work supervised by an **exp** representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-00231875-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	dry	1.3

CORE DRILLING RECORD

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

LOG OF BOREHOLE TP LOGS - 231875 - NOUVELLE HORIZON SCHOOL.GPJ TROW OTTAWA.GDT 4/6/16

Log of Borehole TP 06

Project No: OTT-00231875-A0

Project: Geotechnical Investigation, New Horizon-Jeunesse Elementary School

Location: 349 Olmstead Avenue, City of Ottawa, Ontario

Figure No. 18

Page. 1 of 1

Date Drilled: 'March 18, 2016

Drill Type: Backhoe

Datum: Geodetic

Logged by: A.N. Checked by: I.T.

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
		PAVEMENT STRUCTURE 40mm of asphalt over 250mm of granular fill	63.4	0
		FILL Gravelly sand, brown, moist	63.1	
		SILTY SAND Fine grained, oxidized staining, brown, moist	62.8	
		GLACIAL TILL Silty to gravelly sand with some shale fragments, trace clay, dark brown, moist	62.5	1
		Test Pit Terminated at 1.35 m Depth	62.1	

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

NOTES:
1. Borehole data requires interpretation by exp. before use by others
2. Test Pit backfilled and compacted upon completion
3. Field work supervised by an **exp** representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-00231875-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	dry	1.4

CORE DRILLING RECORD

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

LOG OF BOREHOLE TP LOGS - 231875 - NOUVELLE HORIZON SCHOOL.GPJ TROW OTTAWA.GDT 4/6/16

Log of Borehole TP 07

Project No: OTT-00231875-A0

Project: Geotechnical Investigation, New Horizon-Jeunesse Elementary School

Location: 349 Olmstead Avenue, City of Ottawa, Ontario

Figure No. 19

Page. 1 of 1

Date Drilled: 'March 18, 2016

Drill Type: Backhoe

Datum: Geodetic

Logged by: A.N. Checked by: I.T.

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
		PAVEMENT STRUCTURE 60mm of asphalt over 200mm of granular fill	63.2	0
		FILL Gravelly sand, brown, moist	63.0	
		SILTY SAND Fine grained, oxidized staining, brown, moist	62.7	1
		GLACIAL TILL Silty to gravelly sand with some shale fragments, trace clay, occasional cobbles and boulders, dark brown, moist	62.0	
		Test Pit Terminated at 1.80 m Depth	61.4	

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

NOTES:
1. Borehole data requires interpretation by exp. before use by others
2. Test Pit backfilled and compacted upon completion
3. Field work supervised by an **exp** representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-00231875-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	dry	1.8

CORE DRILLING RECORD

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

LOG OF BOREHOLE TP LOGS - 231875 - NOUVELLE HORIZON SCHOOL.GPJ TROW OTTAWA.GDT 4/6/16

Log of Borehole TP 08

Project No: OTT-00231875-A0

Project: Geotechnical Investigation, New Horizon-Jeunesse Elementary School

Location: 349 Olmstead Avenue, City of Ottawa, Ontario

Figure No. 20

Page. 1 of 1

Date Drilled: 'March 18, 2016

Drill Type: Backhoe

Datum: Geodetic

Logged by: A.N. Checked by: I.T.

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
		TOPSOIL ~150mm	63.6	0
			63.5	
		FILL Gravelly sand, brown, moist		
			62.6	1
		SILTY SAND Fine grained, oxidized staining, brown, moist		
			62.0	
		GLACIAL TILL Silty to gravelly sand with some shale fragments, trace clay, dark brown, moist	61.6	2
		Test Pit Terminated at 2.0 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

NOTES:
1. Borehole data requires interpretation by exp. before use by others
2. Test Pit backfilled and compacted upon completion
3. Field work supervised by an **exp** representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-00231875-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	dry	2.0

CORE DRILLING RECORD

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

LOG OF BOREHOLE TP LOGS - 231875 - NOUVELLE HORIZON SCHOOL.GPJ TROW OTTAWA.GDT 4/6/16

Log of Borehole TP 09

Project No: OTT-00231875-A0

Project: Geotechnical Investigation, New Horizon-Jeunesse Elementary School

Location: 349 Olmstead Avenue, City of Ottawa, Ontario

Figure No. 21

Page. 1 of 1

Date Drilled: 'March 18, 2016

Drill Type: Backhoe

Datum: Geodetic

Logged by: A.N. Checked by: I.T.

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
		TOPSOIL ~100mm	63.2	0
		FILL Granular fill	63.1	
		FILL Medium to coarse grained sand, brown, moist -filter cloth at 0.7m depth	63.0	
		SILTY SAND Fine grained, oxidized staining, brown, moist	62.5	1
		GLACIAL TILL Silty to gravelly sand with some shale fragments, trace clay, occasional cobbles, dark brown, moist	61.9	
		Test Pit Terminated at 1.65 m Depth	61.6	

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

NOTES:
1. Borehole data requires interpretation by exp. before use by others
2. Test Pit backfilled and compacted upon completion
3. Field work supervised by an **exp** representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-00231875-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	dry	1.7

CORE DRILLING RECORD

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

LOG OF BOREHOLE TP LOGS - 231875 - NOUVELLE HORIZON SCHOOL.GPJ TROW OTTAWA.GDT 4/6/16

Log of Borehole TP 10

Project No: OTT-00231875-A0

Project: Geotechnical Investigation, New Horizon-Jeunesse Elementary School

Location: 349 Olmstead Avenue, City of Ottawa, Ontario

Figure No. 22

Page. 1 of 1

Date Drilled: 'March 18, 2016

Drill Type: Backhoe

Datum: Geodetic

Logged by: A.N. Checked by: I.T.

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
		TOPSOIL ~150mm	63.9	0
			63.8	
		FILL Silty sand, some gravel, brown, moist		
			62.7	1
		SILTY SAND Fine grained, oxidized staining, brown, moist		
			61.6	2
		GLACIAL TILL Silty to gravelly sand with some shale fragments, trace clay, dark brown, wet	61.3	
		Test Pit Terminated at 2.60 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: 17.0

NOTES:
1. Borehole data requires interpretation by exp. before use by others
2. Test Pit backfilled and compacted upon completion
3. Field work supervised by an **exp** representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-00231875-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	dry	2.6

CORE DRILLING RECORD

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

LOG OF BOREHOLE TP LOGS - 231875 - NOUVELLE HORIZON SCHOOL.GPJ TROW OTTAWA.GDT 4/6/16

Log of Borehole TP 11

Project No: OTT-00231875-A0

Project: Geotechnical Investigation, New Horizon-Jeunesse Elementary School

Location: 349 Olmstead Avenue, City of Ottawa, Ontario

Figure No. 23

Page. 1 of 1

Date Drilled: 'March 18, 2016

Drill Type: Backhoe

Datum: Geodetic

Logged by: A.N. Checked by: I.T.

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	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
		FILL Silty sand to sand and gravel, brown, moist	63.8	0	20 40 60 80 / 50 100 150 200 kPa	250 500 750 / 20 40 60		
		SILTY SAND Fine grained, oxidized staining, brown, moist	62.8	1		×		20.7
		GLACIAL TILL Silty to gravelly sand with some shale fragments, trace clay, dark brown, wet	62.1	2		×		
		Test Pit Terminated at 2.40 m Depth	61.4					

NOTES:
1. Borehole data requires interpretation by exp. before use by others
2. Test Pit backfilled and compacted upon completion
3. Field work supervised by an **exp** representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-00231875-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	dry	2.4

CORE DRILLING RECORD

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

LOG OF BOREHOLE TP LOGS - 231875 - NOUVELLE HORIZON SCHOOL.GPJ TROW OTTAWA.GDT 4/6/16

exp Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Grain-Size Distribution Curve

Method of Test for Sieve Analysis of Aggregate

ASTM C-136 (LS-602)

Modified M.I.T. Classification

CLAY	SILT			SAND			GRAVEL		
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse

Exp Project No.:	**OTT-00231875-AO**	**Project Name :**	**Geotechnical Investigation . New Horizon-Jeunesse Elementary School**			
Client :	**CECCE**	**Project Location :**	**349 Olmstead Avenue, Ottawa, ON**			
Date Sampled :	**March 16, 2016**	**Borehole:**	**8**	**Sample:**	**SS1**	**Depth (m) :** **0-0.6**
Sample Description :		**Sand and Gravel, Some Silt**				**Figure :** **24**

exp Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Grain-Size Distribution Curve

Method of Test for Sieve Analysis of Aggregate

ASTM C-136 (LS-602)

Modified M.I.T. Classification

CLAY	SILT			SAND			GRAVEL		
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse

Exp Project No.:	**OTT-00231875-AO**	**Project Name :**	**Geotechnical Investigation . New Horizon-Jeunsse Elementary School**				
Client :	**CECCE**	**Project Location :**	**349 Olmstead Avenue, Ottawa, ON**				
Date Sampled :	**March 16, 2016**	**Borehole:**	**1**	**Sample:**	**SS3**	**Depth (m) :**	**1.5-2.1**
Sample Description :		**Silty Sand, Trace Clay**				**Figure :**	**25**

exp Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

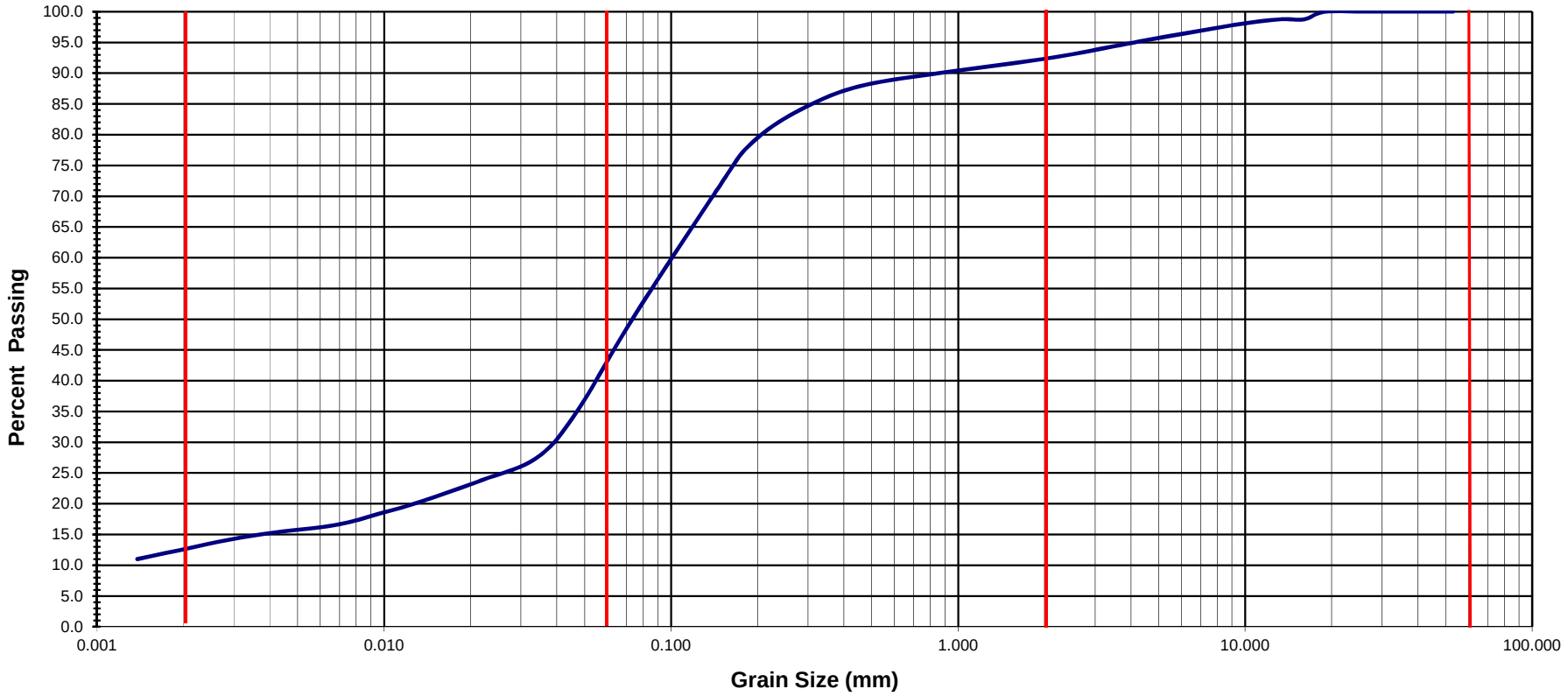
Grain-Size Distribution Curve

Method of Test for Particle Size Analysis of Soil

MTO Test Method LS - 702, Rev. No. 19

Modified M.I.T. Classification

CLAY	SILT			SAND			GRAVEL			
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	



Exp Project No.:	**OTT-00231875-A0**	**Project Name :**	**Geotechnical Investigation . New Horizon-Jeunesse Elementary School**		
Client :	**CECCE**	**Project Location :**	**349 Olmstead Avenue, Ottawa, ON**		
Date Sampled :	**March 15, 2016**	**Bore Hole/Test Pit No.:**	**2**	**Sample No.:** **SS3**	**Depth (m) :** **1.5-2.1**
Sample Description :	**Silty Sand, Some Clay, Trace Gravel**				**Figure :** **26**

exp Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Grain-Size Distribution Curve

Method of Test for Sieve Analysis of Aggregate

ASTM C-136 (LS-602)

Modified M.I.T. Classification

CLAY	SILT			SAND			GRAVEL		
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse

Exp Project No.:	**OTT-00231875-AO**	**Project Name :**	**Geotechnical Investigation . New Horizon-Jeunesse Elementary School**			
Client :	**CECCE**	**Project Location :**	**349 Olmstead Avenue, Ottawa, ON**			
Date Sampled :	**March 16, 2016**	**Borehole:**	**1**	**Sample:**	**SS5**	**Depth (m) :** **3.0-3.6**
Sample Description :		**Silty Sand and Gravel TILL**				**Figure :** **27**

exp Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

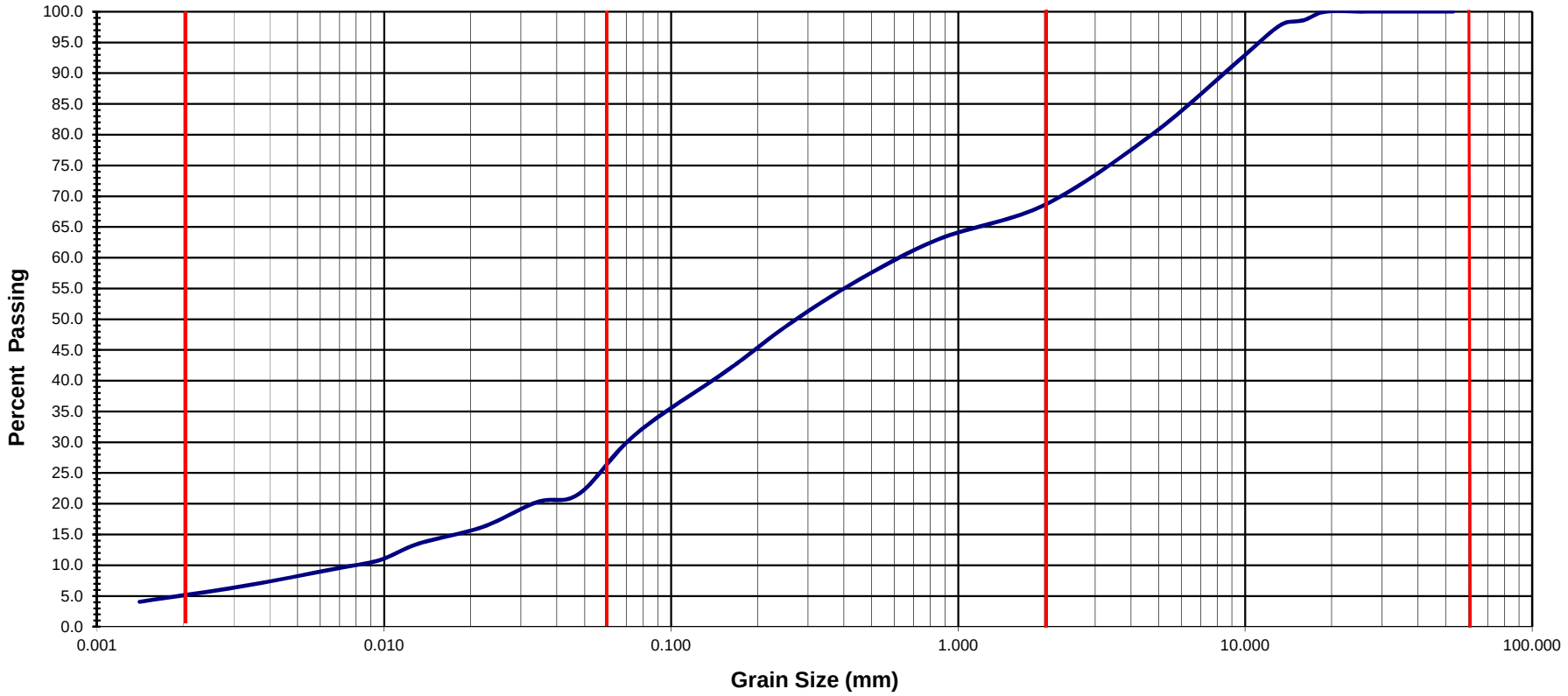
Grain-Size Distribution Curve

Method of Test for Particle Size Analysis of Soil

MTO Test Method LS - 702, Rev. No. 19

Modified M.I.T. Classification

CLAY	SILT			SAND			GRAVEL			
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	



Exp Project No.:	**OTT-00231875-A0**	**Project Name :**	**Geotechnical Investigation . New Horizon-Jeunsse Elementary School**		
Client :	**CECCE**	**Project Location :**	**349 Olmstead Avenue, Ottawa, ON**		
Date Sampled :	**March 16, 2016**	**Bore Hole/Test Pit No.:**	**3**	**Sample No.:**	**SS5**
Sample Description :	**Silty Gravelly Sand Till, Trace Clay**			**Depth (m) :**	**3.0-3.6**
				Figure :	**28**

Appendix A:

Logs of Preliminary Geotechnical Investigation Completed by Exp - 2015

Log of Borehole 1

Project No: OTT-00226176-A0

Project: Preliminary Geotechnical Investigation. Horizon-Jeunesse School Re-Construction

Location: 349 Olmstead Street, Ottawa, Ontario

Figure No. 3

Page. 1 of 1

Date Drilled: 'May 19th, 2015

Drill Type: CME-55 (truck mount)

Datum: Depth Below Grade

Logged by: ML Checked by: SA

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	Depth
		TOPSOIL ~ 50 mm	0	0
		FILL Medium sand to sand and gravel, some shale pieces, trace silt, brown (loose to compact).	-0.1	
		SAND & GRAVEL TILL Trace to some clay and silt, black shale fragments, scattered gravel, brown, moist, (compact to very dense).	-2.0	2
		SHALE BEDROCK Billing's Formation, Horizontally stratified, fissile to very thinly bedded, nearly vertical joints, expansive, black, (very poor to poor quality).	-3.3	3
			-3.5	
		Borehole Terminated at 7.2 m Depth	-7.2	7

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
21.5
21.0
Run 1
Run 2
Run 3

NOTES:
1. Borehole data requires interpretation by exp. before use by others
2. A 19 mm slotted standpipe was installed in the borehole upon completion.
3. Field work supervised by an exp representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-00226176-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'May 21, 2015	3.5	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	3.81 - 4.11	50	0
2	4.11 - 5.67	100	17
3	5.67 - 7.2	100	51

LOG OF BOREHOLE LOGS OF BOREHOLES - 226176A0.GPJ TROW OTTAWA.GDT 5/28/15

Log of Borehole 2

Project No: OTT-00226176-A0

Project: Preliminary Geotechnical Investigation. Horizon-Jeunesse School Re-Construction

Location: 349 Olmstead Street, Ottawa, Ontario

Figure No. 4

Page. 1 of 1

Date Drilled: 'May 19th, 2015

Drill Type: CME-55 (truck mount)

Datum: Depth Below Grade

Logged by: ML Checked by: SA

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	Depth
		TOPSOIL ~ 200 mm	0	0
		-0.2		
		POSSIBLE FILL Medium sand, brown to dark brown, moist to wet (very loose to loose).		1
		-2.1		2
		SAND & GRAVEL TILL Trace to some clay and silt, black shale fragments, scattered gravel, brown, moist, (loose to compact).		3
		-3.8		
		SHALE BEDROCK Sandy, black, weathered.		4
		-4.4		
		Borehole Terminated at auger refusal depth of 4.4 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

SPT values: 4, 5, 10, 9, 19, 64/165 mm

SAMPLES

Natural Unit Wt. kN/m³: 21.5, 22.9

NOTES:
1. Borehole data requires interpretation by exp. before use by others
2. A 19 mm slotted standpipe was installed in the borehole upon completion.
3. Field work supervised by an exp representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-00226176-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'May 21, 2015	Dry	

CORE DRILLING RECORD

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

LOG OF BOREHOLE LOGS OF BOREHOLES - 226176A0.GPJ TROW OTTAWA.GDT 5/28/15

Log of Borehole 3

Project No: OTT-00226176-A0

Project: Preliminary Geotechnical Investigation. Horizon-Jeunesse School Re-Construction

Location: 349 Olmstead Street, Ottawa, Ontario

Figure No. 5

Page. 1 of 1

Date Drilled: 'May 19th, 2015

Drill Type: CME-55 (truck mount)

Datum: Depth Below Grade

Logged by: ML Checked by: SA

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	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
		ASPHALT ~ 50 mm	0	0				
		GRANULAR A ~ 150 mm	-0.1					
		GRANULAR A ~ 200 mm Crushed limestone	-0.4					
		SAND & GRAVEL FILL (Possible Fill) some silt, light grey, moist. Brown silty sand with some gravel below 0.8 m depth (compact to loose).		1	16, 12			21.5
			-2.1	2	7			21.0
		SILTY SAND Fine to Medium, light brown, moist (loose).	-2.6		8			
		SAND & GRAVEL Trace to some clay and silt, black shale fragments, scattered gravel, brown, moist, (compact to very dense).		3	14			
				4	34			
			-4.6					
		Borehole Terminated at auger refusal depth of 4.6 m						

NOTES:
1. Borehole data requires interpretation by exp. before use by others
2. A 19 mm slotted standpipe was installed in the borehole upon completion.
3. Field work supervised by an exp representative.
4. See Notes on Sample Descriptions
5. This Figure is to read with exp. Services Inc. report OTT-00226176-A0

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
'May 21, 2015	Dry	

CORE DRILLING RECORD

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

LOG OF BOREHOLE LOGS OF BOREHOLES - 226176A0.GPJ TROW OTTAWA.GDT 5/28/15

Appendix B:

Photographs: Test Pits and Cores

Photo B1: Strip Footing at Test Pit 1 – USF at 1.2 m below Grade – Elevation:
Founding Material: Silty Sand

Photo B2: Strip Footing at Test Pit 2 – USF at 1.5 m below Grade – Elevation:
Founding Material: Silty Sand

Photo No. B3: Test Pit No. 3- Spread Footing at a depth 2.2 m, i.e. Elevation: xx m (Partial length of Footing was exposed as shown)- **Founding Material: Glacial Till**

Photo No. B4: Test Pit No. 4- Strip Footing at a depth 1.5 m, Elevation:
Founding Material: Silty Sand

Photo No. B5: Bedrock Cores from Borehole No. 1 –Run 1, Run 2 and Run 3

Photo No. B6: Bedrock Cores from Borehole No. 6 – Run 1 to 3

Appendix C:

AGAT Laboratory Certificate

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: EXP SERVICES INC
2650 QUEENSVIEW DRIVE, UNIT 100
OTTAWA, ON K2B8H6
(613) 688-1899

ATTENTION TO: Ismail M. Taki

PROJECT: OTT-231875

AGAT WORK ORDER: 16Z079086

SOIL ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Coordinator

DATE REPORTED: Mar 29, 2016

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 16Z079086

PROJECT: OTT-231875

CLIENT NAME: EXP SERVICES INC

ATTENTION TO: Ismail M. Taki

SAMPLING SITE:349 Olmstead

SAMPLED BY:A.N.

Inorganic Chemistry (Soil)

DATE RECEIVED: 2016-03-22

DATE REPORTED: 2016-03-29

		SAMPLE DESCRIPTION:		BH2 SS4	BH5 SS4
		SAMPLE TYPE:		Soil	Soil
		DATE SAMPLED:		3/15/2016	3/15/2016
Parameter	Unit	G / S	RDL	7455384	7455385
pH, 2:1 CaCl2 Extraction	pH Units			7.72	7.75
Chloride (2:1)	µg/g		2	2	8
Sulphate (2:1)	µg/g		2	102	12
Electrical Conductivity (2:1)	mS/cm		0.005	0.336	0.186
Resistivity (2:1)	ohm.cm		1	2980	5380

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

7455384-7455385 EC/Resistivity,Chloride and Sulphate were determined on the extract obtained from the 2:1 leaching procedure (2 parts DI water: 1 part soil).pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio.

Certified By: Amanjot Bhela

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: EXP SERVICES INC

AGAT WORK ORDER: 16Z079086

PROJECT: OTT-231875

ATTENTION TO: Ismail M. Taki

SAMPLING SITE:349 Olmstead

SAMPLED BY:A.N.

Soil Analysis

RPT Date: Mar 29, 2016			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Inorganic Chemistry (Soil)															
pH, 2:1 CaCl2 Extraction	7455384	7455384	7.72	7.74	0.3%	NA	101%	80%	120%	NA			NA		
Chloride (2:1)	7457098		194	188	3.1%	< 2	96%	70%	130%	106%	70%	130%	99%	70%	130%
Sulphate (2:1)	7457098		57	56	1.8%	< 2	103%	70%	130%	103%	70%	130%	99%	70%	130%
Electrical Conductivity (2:1)	7457098		0.581	0.579	0.3%	< 0.005	95%	90%	110%	NA			NA		

Comments: NA signifies Not Applicable.

Certified By: Amanjot Bhela

AGAT Laboratories

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Method Summary

CLIENT NAME: EXP SERVICES INC

AGAT WORK ORDER: 16Z079086

PROJECT: OTT-231875

ATTENTION TO: Ismail M. Taki

SAMPLING SITE:349 Olmstead

SAMPLED BY:A.N.

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER
Chloride (2:1)	INOR-93-6004	McKeague 4.12 & SM 4110 B	ION CHROMATOGRAPH
Sulphate (2:1)	INOR-93-6004	McKeague 4.12 & SM 4110 B	ION CHROMATOGRAPH
Electrical Conductivity (2:1)	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Resistivity (2:1)	INOR-93-6036	McKeague 4.12, SM 2510 B,SSA #5 Part 3	EC METER

AGAT Laboratories

Sim Rec

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
www.agatlabs.com webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water intended for human consumption)

Laboratory Use Only
Work Order #: 1670790 86
Cooler Quantity: 1
Arrival Temperatures: 22.0 | 21.8 | 22.3
Custody Seal Intact: ☐ Yes ☐ No ☐ N/A
Notes:

Report Information:
Company: Exp Services Inc
Contact: Ismail Taki
Address: 100-2650 Queensview Drive
Ottawa Ont K2B 8H6
Phone: 613-688-1899 Fax:
Reports to be sent to:
1. Email: Ismail.Taki@exp.com
2. Email:

Regulatory Requirements: ☐ No Regulatory Requirement
(Please check all applicable boxes)

☐ Regulation 153/04 — Table ___ (Indicate One) ☐ Ind/Com ☐ Res/Park ☐ Agriculture
Soil Texture (Check One) ☐ Coarse ☐ Fine
☐ Sewer Use ☐ Sanitary ☐ Storm — Region ___ (Indicate One)
☐ Regulation 558 ☐ CCME ☐ Prov. Water Quality Objectives (PWQO) ☐ Other ___ (Indicate One)

Is this submission for a Record of Site Condition? ☐ Yes ☐ No
Report Guideline on Certificate of Analysis ☐ Yes ☐ No

Turnaround Time (TAT) Required:
Regular TAT ☑ 5 to 7 Business Days
Rush TAT (Rush Surcharges Apply)
☐ 3 Business Days ☐ 2 Business Days ☐ 1 Business Day
OR Date Required (Rush Surcharges May Apply):
Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

Project Information:
Project: OTT-231875
Site Location: 349 Olmstead
Sampled By: A.N
AGAT Quote #: PO:
Please note: If quotation number is not provided, client will be billed full price for analysis

Invoice Information:
Bill To Same: Yes ☑ No ☐
Company:
Contact:
Address:
Email:

Sample Matrix Legend
B Biota
GW Ground Water
O Oil
P Paint
S Soil
SD Sediment
SW Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Metals and Inorganics	Metal Scan	Hydride Forming Metals	Client Custom Metals	(Check Applicable) ORPs: ☐ B-HWS ☐ Cl ☐ CN ☐ Cr^{6+} ☐ EC ☐ FOC ☐ NO_2/NO_3 ☐ Total N ☐ Hg ☐ pH ☐ SAR Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_2/NO_3 Volatiles: ☐ VOC ☐ BTEX ☐ THM	CCME Fractions 1 to 4	ABNs	PAHs	Chlorophenols	PCBs	Organochlorine Pesticides	TCLP Metals/Inorganics	Sewer Use	pH	Sulphate	Chloride	Electro Conductivity
BH 2 SS4	15/3/16	NA	1Bag	Soil	2.3-2.7														✓	✓	✓	✓
BH 5 SS4	15/3/16	NA	1Bag	Soil	2.3-2.7														✓	✓	✓	✓

Samples Relinquished By (Print Name and Sign): Ryan DiGiuseppe — Date: Mar 22/16 — Time: 2:42
Samples Received By (Print Name and Sign): Berthelet — Date: 22 Mar 16 — Time: 14h42
Samples Relinquished By (Print Name and Sign): Berthelet to Runlator — Date: 23 Mar 16 — Time: 16h30
Samples Received By (Print Name and Sign): — Date: 16/25/3 — Time: 8 45

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List of Distribution

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