11 Yorkville Partners Inc.

Preliminary Geotechnical Assessment
11 Yorkville Avenue
11 to 21 Yorkville Avenue and
16 and 18 Cumberland Street
Toronto, Ontario

Project Number
MRK-00242474-A0

Prepared By:

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Date Submitted
March 8, 2018 (Final)

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1. Introduction

This report presents the findings of a preliminary geotechnical assessment conducted for the proposed residential development, known as 11 Yorkville Avenue, located at 11 to 21 Yorkville Avenue and 16 and 18 Cumberland Street in the City of Toronto, Ontario. The work was authorized by Ms. Kristy Shortall of 11 Yorkville Partners Inc.

Preliminary plans call for a high-rise condominium structure with five (5) levels of underground parking covering the majority of the property. It is understood the existing structures will be demolished.

The purpose of this preliminary geotechnical assessment was to review a preliminary geo-environmental investigation report titled “Preliminary Geo-Environmental Investigation, 19 Yorkville Avenue, Toronto, Ontario”. Reference No. GE4703 dated March 2016, prepared by McClymont & Rak Engineers Inc., and an environmental soil and groundwater investigation report titled “Environmental Soil and Groundwater Investigation, 11 & 17 Yorkville Avenue, Toronto, Ontario”, Reference No. 10001354-220 dated February 2015, prepared by SPL Consultants Limited, and based on an assessment of the available borehole data, to provide an engineering report with geotechnical recommendations pertinent to the design and construction of the proposed development.

Our Terms of Reference for this geotechnical assessment do not include additional field and laboratory testing. As such, the comments and recommendations given in this report are based on the assumption that the information presented in the preliminary geo-environmental investigation report and environmental soil and groundwater investigation report mentioned above are correct and applicable to the current conditions at the project site. Our Terms of Reference also includes a Hydrogeological Study and a Phase II Environmental Site Assessment (ESA). The results of the Hydrogeological Study and Phase II ESA will be reported under separate covers.

The comments and recommendations given in this report are based on the assumption 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 the requirement of additional field or laboratory work to check whether the changes are acceptable from a geotechnical viewpoint.

2. Site Description

The site is located on the south side of Yorkville Avenue, west of Yonge Street in the City of Toronto, Ontario. The municipal address of the site is 11 to 21 Yorkville Avenue and 16 and 18 Cumberland Street, Toronto, Ontario. The site is irregular in shape, covers an area of about 0.31 hectares.

The site is bounded by Yorkville Avenue to the north, Cumberland Street to the south, a commercial building to the west and an alleyway to the east. Currently, the site is occupied by multiple low-rise commercial buildings

3. Subsurface Conditions

A review of the preliminary geo-environmental investigation report by McClymont & Rak Engineers Inc. and the environmental soil and groundwater investigation report by SPL Consultants Limited indicated that the field work for the investigations was conducted in February 2016 and January 2015, respectively. Two relevant boreholes (Borehole 1 and 15-3) were drilled to depths of about 38.2 and 21.9 m below then existing grade, respectively.

Relevant information regarding the approximate locations of the boreholes and the detailed subsoil profiles encountered in each borehole are included in Appendix A.

3.1 Subsoil

In general, the stratigraphy of the site, as revealed in the boreholes, generally comprised surficial concrete or pavement structure underlain by fill overlying native sand/silty sand and silty clay/silty clay till over alternating deposits of silt, sandy silt, sandy silt to silty sand underlain by clayey silt till. The clayey silt till deposit was overlying weathered shale bedrock in Borehole 1.

A brief description of the stratigraphy, in order of depth, follows.

Pavement Structure

Pavement structure, comprising 50 mm asphaltic concrete, was encountered in Borehole 1.

Concrete

Surficial concrete, measuring 100 mm thick, was encountered in Borehole 15-3.

Fill

Fill was encountered in both boreholes, extending to depths of about 1.5 to 2.3 m below then existing grade. The fill material generally comprised silty sand to sand with variable amounts of gravel. Brick, coal, asphalt and concrete fragments were noted within the fill. The fill was generally moist to very moist.

Sand/Silty Sand

Sand/Silty sand was encountered below the fill in both boreholes, and extended to depths of about 3.5 to 4.6 m below then existing grade. The sand/silty sand existed in a loose to compact state of compactness. The sand/silty sand was found to be moist becoming wet at about 3 m below then existing grade.

Lower sand/silty sand layers were encountered at depths of about 12.2 to 25.9 m below then existing grade in Borehole 1. Based on the SPT N values, the lower sand/silty sand existed in a dense to very dense state of compactness. The lower sand/silty ranged unit exist in a moist to wet condition.

Silty Clay / Silty Clay Till

Silty clay or silty clay till was encountered below the sand/silty sand. The silly clay/silty clay till deposits were grey in colour, contained trace sand and gravel, and were stiff to very stiff in consistency. The silty clay/silty clay till were in a moist condition. The silty clay/silty clay till deposits extended to depths of about 10.4 to 12.2 m below then existing grade.

Alternating Deposits of Silt, Sandy silt, Sandy Silt to Silty Sand

Alternating deposits of silt, sandy silt, and sandy silt to silty sand was encountered below the silty clay or sand/silty sand in both boreholes. The deposits contained variable amounts of clay. Frequent clayey silt seams/layers were noted in the sandy silt to silty sand deposit. The compactness of the deposits ranged from compact to very dense, but was typically dense to very dense. The deposits were generally in a wet condition.

A lower sandy silt layer was encountered at a depth of 21.7 m below then existing grade in Borehole 15-3, and extended to the termination depth of borehole at 21.9 m below then existing grade. The lower sandy silt layer contained trace clay and existed in a dense state of compactness. The lower sandy silt layer existed in a wet condition.

Clayey Silt Till

Clayey silt till was encountered at depths ranging from approximately 19.3 to 33.5 m below existing grade. The clayey silt till contained variable amounts of sand, trace gravel, and was hard in consistency. Shale fragments were noted in the clayey silt till with depth. The clayey silt till was in a moist condition.

Weathered Shale

Weathered shale bedrock was encountered below the clayey silt till deposit in Borehole 1. The contact surface of the bedrock was at about 38.1 m below then existing grade, corresponding to approximately Elevation 78.5 m. No coring was carried out to confirm and to determine the quality of the bedrock for this preliminary investigation. As such, the contact elevations should not be interpreted as exact planes of bedrock since the auger will frequently penetrate some distance into the weathered rock before noticeable resistance is encountered.

Based on our past experience in the area, the bedrock encountered in the borehole belongs to the Georgian Bay formation (Ordovician period) and underlies this site to a significant depth. The upper zone of the bedrock is generally highly weathered to weathered. The distinction between highly weathered shale and the overlying strata, particularly if the latter contains abundant shale fragments, is not always clear and consequently, some of the soils resting on the surface of the bedrock might be very weak or highly weathered rock.

Stress relief features such as folds and faults are common in the Georgian Bay Formation. In these features the rock is heavily fractured and sheared, and contains layers of shale rubble and clay. Due to the fracturing, these features may also be groundwater conduits, which could result in excessive water flow into excavations. Weathering is much deeper than the surrounding rock in these features and often there can be a lateral displacement of the stress relief features resulting in sound unweathered bedrock overlying fractured and weathered bedrock. The stress relief features are usually in the order of 4 to 6 m wide, but in depth can vary from 4 m to in excess of 10 m.

3.2 Groundwater

Monitoring wells were installed in Borehole 1 (M&R) and Borehole 15-3 (SPL) for groundwater measurements.

Groundwater levels of 13.9 and 16.9 m below then existing grade were recorded in Borehole 1 (2016) and Borehole 15-3 (2015), respectively. Groundwater measurements were carried out by exp during the current study (February 15, 2018) and water levels of 20.3 m and 17.4 m were measured in the two wells.

Seasonal fluctuation of the groundwater levels at the site should be anticipated.

Reference should be made to the Hydrogeological Study for details of the groundwater conditions at this site.

4. Engineering Discussion and Recommendations

4.1 General

The project involves the design and construction of the proposed residential development, known as 11 Yorkville Avenue, located at 11 to 21 Yorkville Avenue and 16 and 18 Cumberland Street in the City of Toronto, Ontario. Preliminary plans call for a high-rise condominium structure with five (5) levels of underground parking covering the majority of the property. It is further understood the existing structures will be demolished. It is anticipated all associated structures such as foundations, concrete slab and underground sewers, etc., will be removed as part of the demolition plan.

Based on a review of the boreholes previously put down at the site by others, the following subsections provide preliminary engineering guidelines for the design and construction of the proposed development. When more detailed conceptual design information is available or when the existing buildings on site have been demolished, a more detailed investigation, including additional boreholes, should be carried out to provide geotechnical parameters for final design and construction of the proposed development.

4.2 Foundations

It is anticipated the lowest basement floor will be set at about 16 m below existing grade. Based on the information revealed in the limited boreholes drilled at the site by others, it is anticipated very dense silty sand and silt will be encountered. Two (2) foundation options may be considered for the proposed high-rise structure:

1. Conventional Spread and Strip Footings

2. Raft Foundation

4.2.1 Conventional Spread and Strip Footings

The proposed high-rise structure may be supported on spread and strip footings founded on the very dense silty sand or silt at about 16 to 17 m below existing grade. For preliminary design purposes, a geotechnical resistance of 600 kPa at S.L.S. (Serviceability Limit States) may be used footings founded on the very dense silty sand or silt, subject to effective groundwater control and inspection during construction. The factored geotechnical reaction at U.L.S. (Ultimate Limit States) is 900 kPa. It should be noted that oversized footings will likely be required in view of the anticipated relatively high column loads.

Prior to placement of concrete, all footing bases should be inspected by geotechnical personnel from **exp Services Inc**. to verify the competency of the founding soil.

Provided the footing base excavations are adequately cleaned at the time of concrete placement, footings designed to the geotechnical resistances given are expected to settle less than 25 mm total and 20 mm differential.

4.2.2 Raft Foundation

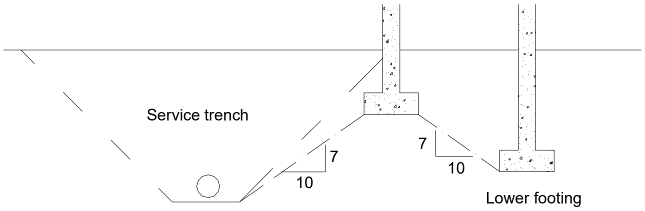
Alternatively, consideration may be given to support the proposed structure on a raft foundation at about 16 to 17 m below existing grade. For preliminary design purposes, a geotechnical resistance of 600 kPa at S.L.S. or 900 kPa at U.L.S may be used for a raft foundation set at a depth of about 17 m below existing grade, subject to effective groundwater control and inspection during construction.

It is recommended that the exposed foundation grade be inspected and approved by a geotechnical engineer prior to placing a mud slab. A 75 mm skim coat of concrete should be placed immediately on the approved subgrade surface in order to protect the subgrade soil.

It should be noted that the recommended geotechnical resistances are for the preliminary design stage only. Additional testing and analyses must be carried out to determine the settlements under the raft once the loading contour under the structure becomes available.

4.2.3 Foundations General

Footings which are to be placed at different elevations should be located such that the higher footing is set below a line drawn up at 10 horizontal to 7 vertical from the near edge of the lower footing, as indicated on the following sketch:



FOOTINGS NEAR SERVICE TRENCHES OR AT DIFFERENT ELEVATIONS

All footings exposed to seasonal freezing conditions should be protected from frost action by at least 1.2 m of soil cover or equivalent insulation, depending on the final design requirements. However, for footings below 3 unheated levels of basement, unmonitored experience in the last few years indicates shallow footing depths of 1.0 m for interior columns and 0.6 m for walls have been successful. Adjacent to air shafts and entrance and exit doors, a footing depth of 1.2 m below floor surface level is required, or alternatively, insulation protection must be provided.

It should be noted the recommended geotechnical resistance value has been calculated by **exp** from the borehole information for the design stage only. The investigation and comments are necessarily ongoing as new information on underground conditions becomes available. For example, it should be appreciated modification to bearing levels may be required if unforeseen subsoil conditions are revealed after the excavation is exposed to full view or if final design decisions differ from those assumed in this report. For this reason, this office should be retained to review final foundation drawings and to provide field inspections during the construction stage.

4.3 Shoring Requirements

Excavation for five (5) levels of underground parking will extend to or near the property boundaries. As such, shoring will be required along the each wall of the excavation to limit the horizontal and vertical movements of adjacent properties. A shoring system consisting of tied-back soldier piles and lagging is expected to provide suitable support in areas where some movements are acceptable and rigid caisson walls in areas where adjacent structures are sensitive to movements.

Based on the configuration of the site, the groundwater table and the extent of excavation, it is likely rigid caisson walls will be required.

The shoring system should be designed in accordance with the 'State-of-the-Art' guidelines provided in the Canadian Foundation Engineering Manual (CFEM). Based on the manual, the following earth-pressure coefficients are recommended:

0.25	Where small movements can be tolerated.
0.35	Where utilities, roads and sidewalks must be protected from significant movement or where vibration from traffic is a factor.
0.45	Where movements are to be minimized such as near adjacent building footings or movement sensitive services (i.e. gas and watermains).

Natural Unit Weight = 22.0 kN/m^3 (sand, silty sand, silt, sandy silt, clayey silt till)
= 20.5 kN/m^3 (silty clay)

Bond resistance = 50 kPa (sand, silty sand, silt, sandy silt, clayey silt till)
= 40 kPa (silty clay)
(Higher bond resistance is available if regroutable anchors are used)

It should be noted that the tie-back anchors will encroach into the adjacent properties and permission will be required for temporary limited interest (TLI) from the owners.

The shoring system should be designed by a specialist shoring contractor. All caisson and tieback holes should be temporary cased to minimize the risk of caving. During winter months, the shoring should be covered with thermal blankets to prevent frost penetration behind the shoring system which may result in unacceptable movements.

The recommended design parameters should be confirmed by load testing a number of anchors to 200% design load in accordance with the current edition of the CFEM. As per the CFEN, at least one (1) test per 100 anchors should be carried out. Where multiple levels of anchors are involved, at least two (2) design anchor load tests should be carried out at each level. The design for the production anchors should then be modified based on the test results, where necessary. All remaining anchors must be installed using similar procedures and proof tested to 1.33 times the design load.

Exp should be retained to review the shoring design, to monitor installation and testing of the system, and to monitor the shoring movements during all phases of the excavation. A pre-construction survey of adjacent structures/roads should be carried out prior to the shoring/construction stage. Any potential adverse effects on adjacent structures or roads should be assessed and suitable preventive/remedial measures implemented.

4.4 Excavation and Groundwater Control

Based on the recent groundwater measurement at the site, the groundwater table is observed to be about 17.4 to 20.3 m below existing grade. However, previous groundwater measurements were recorded at about 13.9 to 16.9 m below existing grade. Saturated soils were also encountered above the recently measured groundwater table. As such, positive groundwater control measures may be required. The dewatering system must be designed and installed by a contractor specializing in dewatering.

It should be noted that any temporary construction dewatering that extracts more than 400,000 L per day would be subjected to a Permit to Take Water (PTTW), as regulated by the Ministry of Environment and Climate Change (MOECC). If the estimated rates will be more than 50,000 L per day but less than 400,000 L per day, the water taking can be registered under the Environmental Activity and Sector Registry (EASR) as per MOECC's new regulatory requirements. Refer to our hydrogeological investigation report for the hydrogeological conditions at the project site and the estimated construction dewatering rate.

Once the site has been effectively dewatered and the installation of shoring installation is completed, excavation for basement and foundation construction may proceed. Excavation through the overburden soils should be relatively straightforward using conventional equipment. Excavation must be carried out in accordance with the Occupational Health and Safety Act (OHSA) and local regulations.

4.5 Backfill Considerations

Backfill used to satisfy underfloor slab requirements, in footing and service trenches, etc., should be compactible fill, i.e. inorganic soil with its moisture content close to its optimum value determined in the standard Proctor maximum dry density test. The excavated material will preliminary consist of sand/silty sand, silty clay, silt, sandy silt and clayey silt till. The sand/silty sand, silt, and sandy silt are generally wet and will require drying for proper compaction. The silty clay is highly frost susceptible and could lead to frost adhesion and subsequent damage to foundation walls. The clayey silt till is considered suitable for reuse as backfill.

Any topsoil stained or excessively wet or otherwise deleterious material should not be used for backfilling purposes. Any shortfall of suitable on-site excavated material can be made up with imported granular material such as OPSS Granular 'B'. The granular backfill should be placed in lifts not more than 300 mm thick in the loose state with each lift being compacted to 98% standard Proctor maximum dry density (SPMDD) before subsequent lifts are placed. The degree of compaction achieved in the field should be checked by in-place density tests.

In general, the on-site soils are not free draining and therefore should not be used where this characteristic is required or in confined areas. Imported granular material such as sand and gravel conforming to OPSS Granular 'B' specifications would also be suitable for these purposes.

4.6 Floor Slab Construction and Permanent Drainage

Slab-on-grade construction is feasible at the site on the native soils. Following rough grading, the exposed subgrade surface should be proofrolled with a heavy roller and inspected by a geotechnical technician. Any soft areas identified during the proofrolling operation should be subexcavated and replaced with approved material compacted to 100% SPMDD. A 75 mm skim coat of concrete should be placed immediately on the approved subgrade surface in order to protect the subgrade soil.

Recently, City of Toronto Water issued guidelines regarding temporary and permanent discharge of groundwater into their sewer system. The City will require the permit applicant to submit a hydrogeological study to determine the short and long term flow rates as well as the quantity of the groundwater for their review and, based on their review, the City will decide on the conditions to issue discharge permits or to disapprove of discharge into the City sewers. If the groundwater collected from perimeter and underfloor drainage system are not allowed to be discharged into the City sewers, the groundwater would have to be colleceted into a separate system and disposed of by different means. Alternatively, the basement walls and slab will have to be tanked and designed to withstand hydrostatic pressures.

If raft foundations will be used, then it will be necessary to place a clear stone layer above the raft to the underside of the lowest basement floor slab to accommodate the installation of underfloor services. It is recommended that underfloor drains be installed below the basement floor slab at regular intervals to intercept water that may be trapped between the raft and basement floor slab.

If conventional spread and strip footings will be used, an under-floor drain system is recommended below the basement floor slab. This should consist of a moisture barrier consisting of 200 mm of 19 mm clear crushed stone, with 100 mm diameter perforated drain pipes installed at the base of the drainage stone, at about 2 to 3 m spacing. The pipes must be wrapped in a non-woven geotextile having a filtering opening size (FOS) of 60 microns. These drain pipes should be connected to the interior sumps. Adequate clean-out ports should be installed for each line of drainage pipes to faciliate future cleaning of the pipes.

Within unheated areas, Styrofoam insulation of minimum 50 mm thick should be provided below the floor slab and below any concrete slabs surrounding the building to protect against frost heave.

Perimeter drainage should be provided to remove any water that may be accumulated at the exterior foundation walls. To prevent build-up of water adjacent to the basement walls, it would be prudent to incorporate an exterior vertical drainage sheet attached to the backside of the basement wall connected to frost free outlets inside the building. The exterior drainage should consist of SITEDRAIN HQ 240 or equivalent covering the entire basement wall in order to reduce the risk of water penetration. The wall drain panels should be outletted through the basement wall into the basement. A solid pipe should be installed to within 1 m of the exterior wall to collect seepage for the wall drains.

The perimeter drainage systems should be independent of any stormwater piping, such as rainwater leaders. Backflow prevention should be provided between the sumps and the drain headers.

4.7 Earth Pressure on Subsurface Walls

The lateral earth pressure acting on basement and retaining walls may be calculated from the following equation:

$$p = k(\gamma h + q)$$

where: p = the pressure in kPa acting against any subsurface wall at depth, h, below the ground surface;

k = the earth pressure coefficient considered to be appropriate for subsurface walls, 0.4;

γ = the bulk unit weight of the retained soil, 21 kN/m^3;

h = the depth in m below the ground surface at which the pressure, p, is to be computed; and

q = the value of any adjacent surcharge in kPa which may be acting close to the wall.

The above expression assumes an effective perimeter drainage system will be incorporated to prevent the build-up of hydrostatic pressure behind the subsurface wall. To minimize infiltration of surface water, the upper 600 mm of backfill should comprise compacted relatively impervious material sloped away from the building.

4.8 Earthquake Considerations

4.8.1 Site Classification for Seismic Site Response

The Ontario Building Code (2012) stipulates the methodology for earthquake design analysis, as set out in Subsection 4.1.8.4. The classification is based on the determination of the average shear wave velocity in the top 30 m of the site stratigraphy, where shear wave velocity (Vs) measurements have been taken. Alternatively, the classification is estimated on the basis of rational analysis of penetration resistance corrected for the energy efficiency of the drilling equipment (N_{60}-values). Since no shear wave velocity measurements were carried out at this site, the site classification is based on the corrected SPT N values.

Based on the result, the site classification for seismic analysis is Class C, as per Table 4.1.8.4A of the Ontario Building Code (2012).

5. General Comments

Exp Services Inc. should be retained for a general review of the final design and specifications to verify the recommendations in this preliminary report address all relevant geotechnical parameters regarding the design and construction of the proposed development. If not accorded the privilege of making this review, **exp Services Inc.** will assume no responsibility for interpretation of the recommendations in the report.

The comments given in this preliminary report are intended only for the guidance of design engineers. The number of boreholes required to determine the localized underground conditions between boreholes affecting construction costs, techniques, sequencing, equipment, scheduling, etc. could be 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 interpretations of the factual borehole results so that they may draw their own conclusions as to how the subsurface conditions may affect them.

More specific information with respect to the conditions between samples or the lateral and vertical extent of materials may become apparent during excavation operations. The interpretation of the borehole information must, therefore, be validated during excavation operations. Consequently, during the future development of the property, conditions not observed during this preliminary investigation may become apparent; should this occur, **exp Services Inc.** should be contacted to assess the situation and additional testing and reporting may be required. **Exp** has qualified personnel to provide assistance in regard to future geotechnical and environmental issues related to this property.

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

Yours truly,

Exp Services Inc.

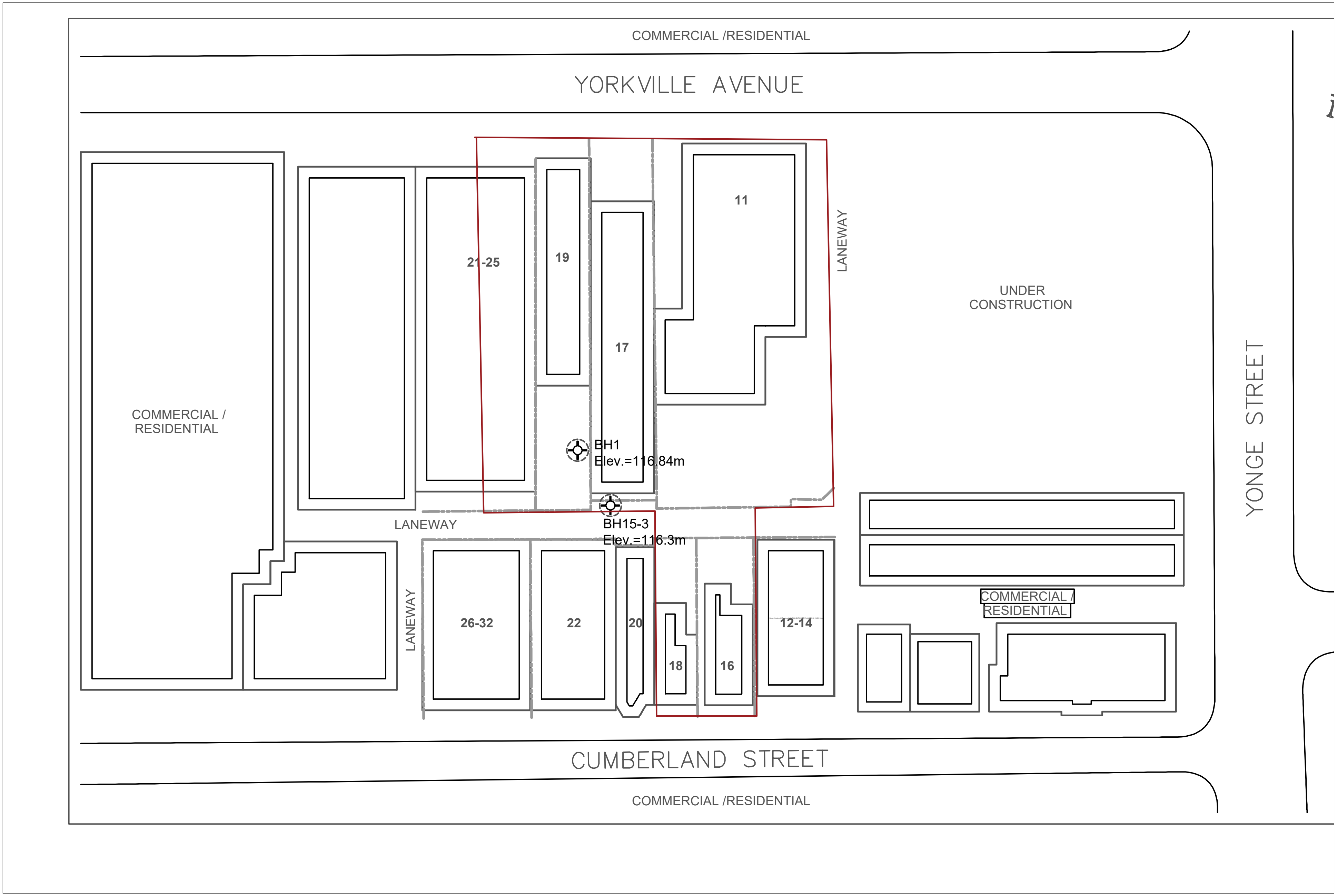
LICENSED PROFESSIONAL ENGINEER
LC
L. C. C. CHUI
100156747
Mar. 8/2018
PROVINCE OF ONTARIO

Leo Chui, P.Eng.
Project Manager

for Peter Chan, P.Eng.
Senior Manager, Geotechnical Division

Appendix A

Borehole Location Plan
Previous Borehole Logs



LEGEND

— PROPERTY BOUNDARY

⊕ APPROXIMATE BOREHOLE LOCATIONS

PRELIMINARY GEOTECHNICAL ASSESSMENT
11 TO 21 YORKVILLE AVENUE AND 16 TO 18 CUMBERLAND STREET,
TORONTO, ONTARIO

BOREHOLE LOCATION PLAN

Scale: 0 2.5 5m (APPROXIMATE)

Checked by: RF

Drawn by: RKZ

Date: February 2018

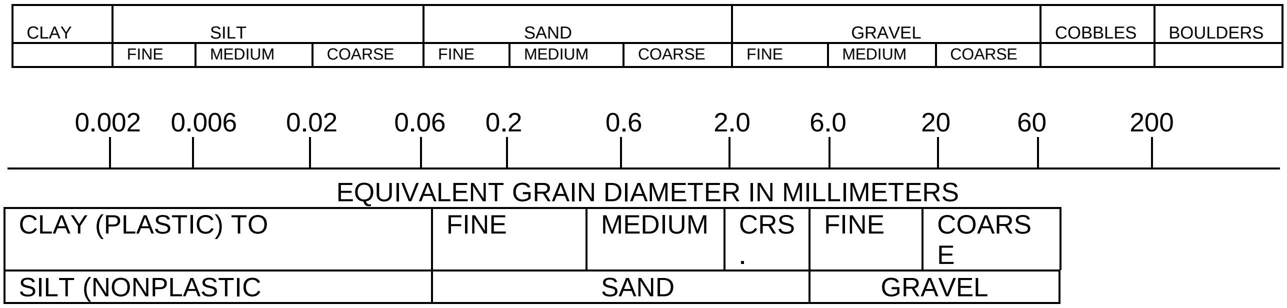
Project No.: MRK-00242474-A0

FIGURE NO.: 1

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 Society for Soil Mechanics and Foundation Engineering. Laboratory grain size analyses provided by exp 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



EQUIVALENT GRAIN DIAMETER IN MILLIMETERS

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.

RECORD OF BOREHOLE 1

PROJECT : E4703
LOCATION : 19 Yorkville Avenue, Toronto, Ontario
STARTED : February 22, 2016
COMPLETED : February 24, 2016

MC CLYMONT & RAK ENGINEERS, INC.

SHEET 1 OF 1
DATUM Geodetic

BORING METHOD: POWER BORING, ROTARY MUD DRILLING

SOIL PROFILE

DESCRIPTION	ELEV. DEPTH (m)
GROUND SURFACE	116.64
50 mm ASPHALT	116.59 0.05
FILL: sand and gravel, trace of brick, coal, asphalt and concrete pieces, brown, moist, compact.	115.12 1.52
SILTY SAND: brown, moist, loose to compact. -wet below 3.05 m depth.	112.07 4.57
SILTY CLAY: grey, moist, stiff to very stiff.	105.97 10.67
SILTY CLAY TILL: trace of sand and gravel, grey moist, very stiff.	104.45 12.19
SILTY SAND: grey, wet, dense.	102.92 13.72
SANDY SILT: grey, moist, very dense.	101.40 15.24
SILTY SAND: grey, moist to wet, dense to very dense. -wet at 16.8 m depth.	96.83 19.81
CLAYEY SILT TILL: trace of sand and gravel, grey, moist, hard. -some sand below 21.3 m depth.	93.78 22.86
SILTY SAND: grey, wet, very dense.	92.26 24.38
SANDY SILT: grey, wet, very dense.	90.73 25.91
SILTY SAND: grey, wet, very dense.	86.16 30.48
SAND: grey, wet, very dense.	83.11 33.53
CLAYEY SILT TILL: trace of sand, gravel and shale fragments, grey, moist, hard. -tricone bit grinding below 36.9 m depth (possible shale bedrock).	78.54
WEATHERED SHALE: grey, moist.	78.49 38.10
End of Borehole.	38.15

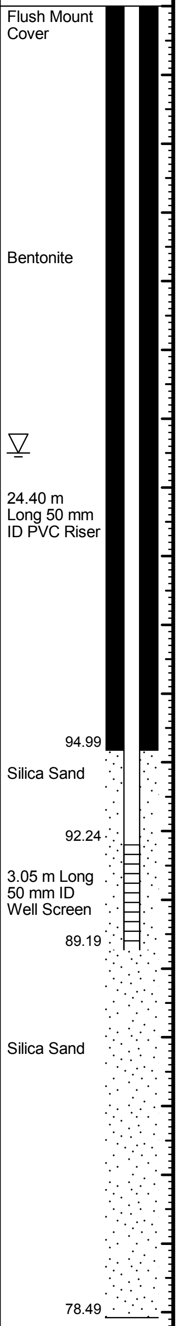
Note:
1) Water level was not measured on completion of drilling due to use of mud.
2) Water level was measured at 13.0 m bgs on February 25, 2016.

SAMPLES

NUMBER	TYPE	BLOWS/0.3m	ORGANIC VAPOUR READINGS (ppm)
1	SS	36	0
2	AS		0
3	SS	9	0
4	SS	19	0
5	SS	20	0
6	SS	13	0
7	SS	29	0
8	SS	24	0
9	SS	14	0
10	SS	17	0
11	SS	31	0
12	SS	>100	0
13	SS	39	0
14	SS	>100	0
15	SS	83	0
16	SS	60	0
17	SS	78	0
18	SS	54	0
19	SS	61	0
20	SS	64	0
21	SS	74	0
22	SS	61	0
23	SS	66	0
24	SS	>100	0
25	SS	>100	0
26	SS	>100	0
27	SS	>100	0
28	SS	>100	0

ORGANIC VAPOUR READINGS (ppm) ⊗ 100 200 300 400
% LEL (hexane) ☐ 20 40 60 80
SHEAR STRENGTH: Cu, KPa nat V - ✚ Q - ✖ rem V - ● U - ▲ 20 40 60 80
WATER CONTENT, PERCENT wp ⊢—○w—⊣ wl 10 20 30 40
ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION



GROUNDWATER ELEVATIONS

▽ SHALLOW/SINGLE INSTALLATION WATER LEVEL (date)

▼ DEEP/DUAL INSTALLATION WATER LEVEL (date)

LOGGED : VSL
CHECKED : JB

LOG OF BOREHOLE BH15-3

PROJECT: Environmental Soil & Groundwater Investigation
CLIENT: Bazis Inc.
PROJECT LOCATION: 11-17 Yorkville Avenue, Toronto, Ontario
DATUM: Geodetic
BH LOCATION: See Borehole Location Plan

DRILLING DATA
Method: Hollow Stem Augers
Diameter: 203mm
Date: Jan/24/2015

REF. NO.: 10001354-100
ENCL NO.: 2

SOIL PROFILE

(m) ELEV / DEPTH	DESCRIPTION
116.3	
116.2 / 0.1	**CONCRETE:** 100mm
	FILL: silty sand to sand, trace clay, trace brick fragments, brownish grey to brown, moist to very moist, very loose to compact
114.0 / 2.3	**FINE SAND:** trace silt, brown to grey, moist, compact wet below 3.1m
112.8 / 3.5	**SILTY CLAY** trace sand, occasional seams of fine sand and silt, grey, moist, stiff to very stiff
105.9 / 10.4	**SILT:** trace sand, trace clay, grey, wet, compact some clay, moist below 12.2m
101.5 / 14.8	**SANDY SILT:** trace clay, grey, wet, dense
99.8 / 16.5	**SILT:** trace clay, grey, wet, very dense
98.3 / 18.0	**SANDY SILT TO SILTY SAND:** frequent clayey silt seams/layers, grey, wet, very dense
97.0 / 19.3	**CLAYEY SILT TILL:** some sand to sandy, trace gravel, grey, moist, hard
94.7	
94.6	**SANDY SILT:** trace clay, grey, wet, dense
94.4 / 21.9	**END OF BOREHOLE**

Notes:
1) 50mm dia. monitoring well installed in the borehole upon completion.

SAMPLES

NUMBER	TYPE	"N" BLOWS / 0.3 m
1	SS	19
2	SS	3
3	SS	5
4	SS	12
5	SS	10
6	SS	10
7	SS	15
8	SS	14
9	SS	12
10	SS	23
11	SS	59
12	SS	72
13	SS	58
14	SS	66
15	SS	64
16	SS	46
17	SS	43

STRATA PLOT | GROUND WATER CONDITIONS | ELEVATION: 116, 114, 112, 110, 108, 106, 104, 102, 100, 98, 96

W. L. 99.4 m
Jan 28, 2015

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

PLASTIC LIMIT W_P | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W_L
WATER CONTENT (%): 10 20 30

POCKET PEN. (Cu) (kPa) | NATURAL UNIT WT (Mg/m^3) | REMARKS AND GRAIN SIZE DISTRIBUTION (%): GR SA SI CL

GROUNDWATER ELEVATIONS
Shallow/ Single Installation ▽ ▼ Deep/Dual Installation ▽ ▼

GRAPH NOTES: $+^3, \times^3$: Numbers refer to Sensitivity
○ ε=3% Strain at Failure