Proposed Residential Development

CreateTO

Type of Document:
Geotechnical Investigation

Project Location:
1337 Queen Street West, Toronto, Ontario

Project Number:
BRM-21003722-A0

Prepared By:
Raymond Yan, P. Geo.
Geoscientist
Geotechnical Services

Reviewed By:
James Ng, P. Eng.
Geotechnical Manager
Geotechnical Services

Date Submitted:
2022-12-07

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220 Commerce Valley Drive West, Suite 110 | Markham, ON L3T 0A8 | CANADA
t: +1.905.695.3217 | f: +1.905.695.0169 | exp.com

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1. Introduction

This report presents the findings of a geotechnical investigation conducted for the proposed residential building at 1337 Queen Street West in the City of Toronto, Ontario. The work was authorized by Ms. Tracey Smith of CreateTO.

The project involves the design and construction of a three (3) to nine (9) storeys condominium building with one (1) level of basement to be used as community space. It is understood that the existing one (1) storey high commercial building and associated asphalt parking at the site are to be demolished. However, no details about the proposed finished floor and basement elevations were available at the time of preparing this report.

The purpose of the geotechnical investigation was to determine the subsurface soil and groundwater conditions at the site by putting down a limited number of sampled boreholes and, based on an assessment of the factual borehole data, to provide geotechnical engineering guidelines pertaining to the design and construction of the proposed development.

Our Terms of Reference also included a Phase I and II Environmental Site Assessment (ESA), and a hydrogeological study. The results of the Phase I and II ESA and hydrogeological study will be presented under separate cover.

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 changes. 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.

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2. Site Description

The site is located on the south side of Queen Street West, directly south of the intersection of Queen Street West and O'Hara Avenue, and bounded by Dunn Avenue in the west. The municipal address is 1337 Queen Street West, Toronto, Ontario.

The site has an area of approximately 1,984 square meters (m^2) and is developed with one (1) commercial building that is currently occupied by a Dollarama Store. The site is bound by Queen Street West to the north, commercial buildings to the east and west, with residential land use to the south. It is relatively flat with ground surface elevations at the borehole location ranged between 96.2 and 96.4 m.

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3. Fieldwork

The fieldwork was carried out on October 17 to 20, 2022. Prior to drilling, the borehole locations were cleared of underground utilities by Ontario One Call contractors and a private locator. Three (3) boreholes (BH/MW1 - 3) were advanced to depths of about 13.7 to 15.4 m below existing grade at the approximate locations shown on the attached Borehole Location Plan (Drawing No. 1).

Drilling and sampling operations were completed by a combination of auger or mud-rotary and split-spoon techniques using truck mounted drilling equipment owned and operated by a specialist drilling contractor.

In each borehole, soil samples were recovered using conventional 51 mm outer diameter split spoon sampler generally at 0.75 m depth intervals from ground level to 3.1 m below ground surface and at 1.5 m intervals afterwards. The split spoon sampling procedure was carried out in conjunction with the standard penetration test method (ASTM D-1557).

Water levels were observed in the boreholes during the course of the fieldwork and in a monitoring well installed in each of the completed boreholes, to establish the short-term stabilized groundwater level at the site. The monitoring wells were installed in accordance with the Ontario Water Resources Act, R.R.O. 1990, Ontario Regulation (O. Reg.) 903 – Amended to O. Reg. 128/03.

The fieldwork was supervised by EXP geotechnical staff who monitored the drilling operations and logged the borings. All split spoon samples were transported to our laboratory for detailed examination.

The location and ground surface elevation of the boreholes were determined in the field by EXP Services Inc. Ground surface elevations at the borehole locations were determined from Can-Net Elevations with the use of a Trimble TSC3 Controller.

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4. Laboratory Testing

The laboratory testing program comprised the following:

- Moisture content determination on all recovered soil samples, with results presented on the Log of Borehole sheets (Drawing Nos. 2 to 4).
- Grain size analysis were conducted on three (3) selected samples. The results are presented in Appendix A.
- Atterberg Limits testing was conducted on one (1) sample selected from BH/MW3. The results are presented in Appendix A.

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5. Subsurface Conditions

5.1 Soil

The detailed soil profile encountered in each borehole and the results of laboratory moisture content determinations are indicated on the attached borehole logs (Drawing Nos. 2 to 4). It should be noted the soil boundaries indicated on the borehole 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 borehole logs form an integral part of and should be read in conjunction with this report.

The stratigraphy, as revealed in the boreholes, comprised a surficial pavement structure over fill, which was underlain by native deposits of silt, silty clay, and / or silty sand till. A brief description of the stratigraphy in order of depth follows.

Pavement Structure

Surficial pavement structure layer, comprising 100 mm of asphaltic concrete over 100 mm granular base material, was encountered in all three boreholes.

Fill

A fill unit was encountered below the pavement structure in all boreholes, extending to depths of about 0.7 m to 1.5 m below existing grade. The fill was brown to dark brown and grey in colour and composed of sandy silt with some clay and gravel, to clayey silt with some sand and gravel. A trace amount of brick fragments, and wood chips, was observed in BH/MW 2 and 3, respectively. Moisture contents of the moist to very moist fill ranged from 9 to 26%.

Silt

Silt deposit was encountered below the fill in BH/MW 1 and 2, and extended to 6.1 m below existing grade. The silt was brown or grey in colour, depending on weather it was above or below the groundwater table. It contained a trace of sand, some clay, and a trace of gravel. Occasional sand and gravel pockets / or sand seams at various depths were also observed in both boreholes. Standard Penetration Tests carried out in the deposit yielded SPT N-values from 16 to 43 blows per 0.3 m of penetration, indicating compact to dense state of compactness. The moisture contents ranged from 11 to 23, which indicated moist to wet but mostly wet conditions.

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Silty Clay

Silty clay was encountered in BH/MW 3 below the fill, extending to a depth of 6.1 m below existing grade. It was brown in colour and contained a trace of sand. Based on the SPT 'N' values of 19 to 39, the silty clay existed in very stiff to hard consistency. Moisture contents ranged from 17 to 23%, indicating a very moist condition.

Particle size analysis conducted on one (1) select sample of the silty clay revealed that the silty clay contained 0% gravel, 6% sand, 66% silt and 28% clay. Details can be referred to the particle size analysis results in Appendix A.

Atterberg limit testing carried out on one (1) select sample of silty clay revealed that the silty clay has liquid limit of 28%, plastic limit of 16% and plasticity index of 12%. It is a low plasticity clay. Details of the test can be referred to the Atterberg limit testing results in Appendix A.

Silty Sand Till

Sandy silt till was encountered below the fill in Boreholes 1 and 2. It extended to the termination depth in Borehole 1 and to a depth of about 4.9 m below existing grade in Borehole 2. The sandy silt till was brown to grey in colour and contained trace travel. Based on the SPT 'N' values of 34 to over 100 blows per 0.3 m, the sandy silt till existed in dense to very dense states of compactness. Moisture contents of the sandy silt till ranged from 8 to 11%, indicating a moist condition.

Particle size analysis conducted on two (2) select samples of the silty sand till revealed that the silty sand till samples contained 3 to 9% gravel, 53 to 60% sand, 27 to 32% silt and 6 to 10% clay. Details can be referred to the particle size analysis results in Appendix A.

5.2 Groundwater

Groundwater conditions were observed in a monitoring well installed in each of the three (3) boreholes for subsequent readings. Short-term groundwater measurements are recorded in the attached borehole logs.

Upon completion of drilling, the groundwater levels in all three boreholes were not measured due to the use of water mixed with drilling mud during the drilling operations. The groundwater levels observed in the monitoring wells at about 3 weeks after drilling, are presented in Table 1 below.

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Table 1: Short-Term Groundwater Levels in Borehole Locations

Borehole No.	Ground Surface Elevation (m)	Groundwater Depth Upon Completion (m)	Monitoring Screen Bottom Depth / Elevation (m)	Groundwater Depth / Elevation in Monitoring Well on November 1, 2022 (m)
BH/MW 1	96.43	N/A	7.62 / 88.76	5.89 / 90.54
BH/MW 2	96.19	N/A	13.72 / 82.47	4.38 / 91.81
BH/MW 3	96.38	N/A	7.62 / 88.81	6.12 / 90.26

The groundwater elevations reflect conditions at the time of the investigation. Seasonal fluctuation of the groundwater levels at the site should be anticipated.

Reference should be made to the Hydrogeological Investigation Report for further details of the hydrogeological conditions at this site.

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6. Engineering Discussion and Recommendations

6.1 General

A geotechnical investigation was conducted for the proposed residential building at 1337 Queen Street West in the City of Toronto, Ontario. It is understood that the existing one (1) storey high commercial building and associated asphalt parking at the site are to be demolished. The proposed residential condominium will be three (3) to nine (9) storeys high with one (1) level of basement that extends to a depth of about 4 m below existing grade.

The investigation has generally revealed fill extending to depths of about 0.7 m to 1.5 m below existing grade overlying native deposits of silt or silty clay, which in turn overlied silty sand till. Short-term groundwater levels measured in the three (3) installed monitoring wells ranged between 4.4 to 6.1 m below existing grade.

Based on the results of the limited boreholes drilled at the site, it is considered that the site will be suitable for the construction of the proposed residential building. It is assumed that the existing foundations, floor slabs and buried underground services will be removed as part of the demolishing plan. The following subsections provide geotechnical engineering guidelines pertinent to the design and construction of the proposed structure.

6.2 Foundation Considerations

6.2.1 Footing Foundations

For the proposed structure with one (1) level of basement, it is anticipated the basement floor will extend to depths of about 3 to 4 m below existing grades.

The proposed structure may be supported on conventional spread and strip footings founded on the competent undisturbed native silt or silty clay below all existing pavement structure, fill and loose soils. Footings founded at or below the elevations shown in Table 2 below may be designed for a geotechnical reaction of 300 kPa at Serviceability Limit States (S.L.S.), subject to inspection during construction. The factored geotechnical resistance at Ultimate Limit States (U.L.S.) is 450 kPa.

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Table 2: Highest Founding Elevation at Which 300 kPa Pressure at SLS is Available

Borehole No.	Founding Depth/Elevation (m)*	Founding Soil
BH/MW 1	2.0 / 94.4	Silt
BH/MW 2	1.6 / 94.6	Silt
BH/MW 3	2.2 / 94.2	Silty Clay

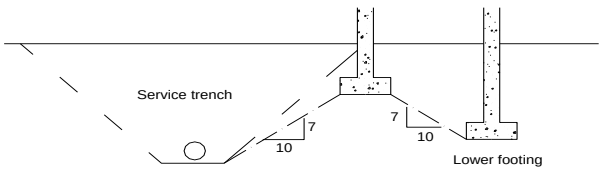
* or below founding elevation of the existing building foundations

If the required structural loads result in a building footprint covered by the conventional footing foundation is greater than 50 percent, consideration may be given to support the structure on a mat foundation. The mat can be designed for a geotechnical reaction of 300 kPa at Serviceability Limit States (S.L.S) and a factored geotechnical resistance at Ultimate Limit States (U.L.S.) of 450 kPa. A modulus of subgrade reaction of 40 MPa/m may be used if a flexible design approach is considered. Once the loading details are available, it is recommended a settlement analysis be carried out to determine the settlement of the raft foundation to verify the settlements are within tolerable limited.

Prior to placement of concrete, all footing/mat bases should be inspected by geotechnical personnel from EXP Services Inc. to verify the competency of the founding material. It should be noted the founding soils are fine grained and will be extremely sensitive to disturbance from construction traffic and weather. It is recommended that following excavation to the footing foundation level, the subgrade should be covered with a 50 mm working mat of lean concrete following approval of the footing bases. If groundwater seepage is encountered in the footing excavations, the water level must be lowered to at least 1 m below base of excavation, to avoid softening of the founding soils (see further discussion in Section 6.3 of this report.)

6.2.2 Foundations General

Footing or mat 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

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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.

The total and differential settlements of well designed and constructed footings placed in accordance with the above recommendations are expected to be less than 25 mm and 20 mm, respectively.

It should be noted the recommended bearing 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 subsurface conditions are encountered 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.

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6.3 Excavation and Groundwater Control

For the proposed dwelling with one (1) level of basement, it is anticipated that the basement and footing excavations will be carried out within the fill, silt and silty clay above the water table. After all existing foundations, basement walls and other associated underground services are removed as part of the demolition plan, excavations within the overburden materials should be relatively straightforward. Unsupported excavations must be carried out in accordance with the Occupational Health and Safety Act (OHSA) and local regulations. The OHSA regulations require that if workmen must enter an excavation deeper than 1.2 m, the excavation must be suitably sloped and/or shored in accordance with OHSA requirements. OHSA specifies maximum slope of the excavation for the soil types encountered at the site as summarized in the following Table 3:

Table 3: Summary of the Soil Types encountered at the Site

Soil	Soil Type	Maximum Slope
Fill	Type 3* above groundwater	1 horizontal to 1 vertical
Native silt and silty clay	Type 3* above groundwater	1 horizontal to 1 vertical

*Note: Where loose soil is encountered or within zones of persistent seepage, it may be necessary to locally flatten the side slopes.

If the above recommended excavation side slopes cannot be maintained due to lack of space or any other reasons, the excavation sides must be supported by a properly designed shoring system, such as soldier pile and lagging with rakers. The shoring systems should be designed in accordance with the latest edition of the Canadian Foundation Engineering Manual (CFEM). Based on the manual, the following earth-pressure coefficients are recommended:

0.25 Where minor movements can be tolerated.

0.35 Where utilities, roads, 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 = 21.0 kN/m^3 (silt, silty clay)

For the anticipated excavation depth of about 4 m, no major groundwater dewatering requirements are expected. However, minor groundwater seepage into the excavation from perched water within the fill and pervious seams/layers within the native soils should be anticipated during construction. It should be possible to control and remove the minor seepage using conventional construction dewatering techniques, i.e. side ditches and pumping from filtered sumps.

If the groundwater level at the time of construction is higher than expected, it may be necessary to employ a more elaborate positive dewatering system to keep the excavations dry, and to prevent softening of the foundation soils. A system of closely spaced properly filtered well points may be needed to lower the groundwater level to 1 m below footing founding elevation.

6.4 Backfill Considerations

Backfill used to satisfy underfloor slab requirements, footings 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 existing fill free of brick fragments, wood chips and otherwise deleterious materials is considered suitable for backfilling purposes. The native silt and silty clay are also considered suitable for reuse as backfill material. However, portions of these material may require moisture adjustments for proper compaction.

Any organic 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, OPSS Granular 'B' or equivalent. The backfill should be placed in lifts not more than 300 mm thick in the loose state with each lift being compacted to at least 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.

The on-site soils are not free draining and therefore should not be used where this characteristic is required or in confined areas where smaller compaction equipment is required. Imported granular material such as OPSS Granular 'B' would also be suitable for these purposes.

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6.5 Floor Slab Construction and Permanent Drainage

The basement floor slab can be constructed as a slab-on-grade on the native material. Prior to slab-on-grade construction, all existing foundations and floor slabs should be removed. Any buried underground services and associated trench backfill should also be removed. Following rough grading, the exposed subgrade surface should be compacted and proof-rolled with a heavy vibratory roller and inspected by geotechnical personnel. Any soft areas identified during the proof-rolling operation should be sub-excavated and replaced with approved material compacted in the manner described in the "Backfill Considerations" subsection of the report.

A moisture barrier, consisting of a 200 mm thick layer of 19 mm clear crushed stone should be placed directly under the floor slab. Within any unheated areas and entrances to the un, 50 mm of Styrofoam insulation should be provided below the floor slab to protect against frost heave.

The foundation walls should be covered with a bituminous spray and a drainage sheet. Permanent perimeter tile drains should also be provided to prevent the build-up of water adjacent to the basement walls. The perimeter drains should consist of 100 mm diameter perforated pipe surrounded by 300 mm of 19 mm clear stone and wrapped with a filter fabric with a filtration size of 60 microns or smaller. The drainage system should be installed around the perimeter of the basement and connected to a frost free outlet from which the water can be removed.

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

Around the perimeter of the proposed building, the ground surface should be sloped on a positive grade away from the structure to promote surface water run-off and to reduce groundwater infiltration adjacent to the foundation.

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6.6 Earth Pressure on Subsurface Walls

The lateral earth pressure acting on subsurface 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 the subsurface walls, for this case, 0.4;

γ = the bulk unit weight of the retained soils, use 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.

6.7 Earthquake Considerations

The recommendations for the geotechnical aspects to determine the earthquake loading are presented below.

6.7.1 Subsoil Conditions

The subsoil information at this site has been examined in relation to Section 4.1.8.4 of OBC 2012.

The subsoil consisted of fill overlying native silt, silty clay and silty sand till. The proposed structure will be supported on conventional footing / mat foundation founded on native silty or silty clay.

There have been no shear wave velocity measurements carried out at this site.

6.7.2 Depth of Boreholes

Table 4.1.8.4.A Site Classification for Seismic Site Response in OBC 2012 indicated that to determine the site classification, the average properties in the top 30 m are to be used. The boreholes were advanced to depths of about 13.7 to 15.4 m below existing grade. No bedrock was encountered within the depths investigated.

6.7.3 Site Classification

Based on the known soil conditions, the Site Class for this site is “D” as per Table 4.1.8.4.A, Site Classification for Seismic Site Response, OBC 2012.

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7. General Comments

A geotechnical engineer should be retained for a general review of the final design and specifications to verify the recommendations in this report address all relevant geotechnical parameters regarding the design and construction of the proposed residential development.

The comments given in this report are intended only for the guidance of design and structural 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 investigation may become apparent; should this occur, a geotechnical engineer 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 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.

Raymond Yan, P. Geo.
Geoscientist
Geotechnical Services

James Ng, P. Eng.
Geotechnical Manager
Geotechnical Services

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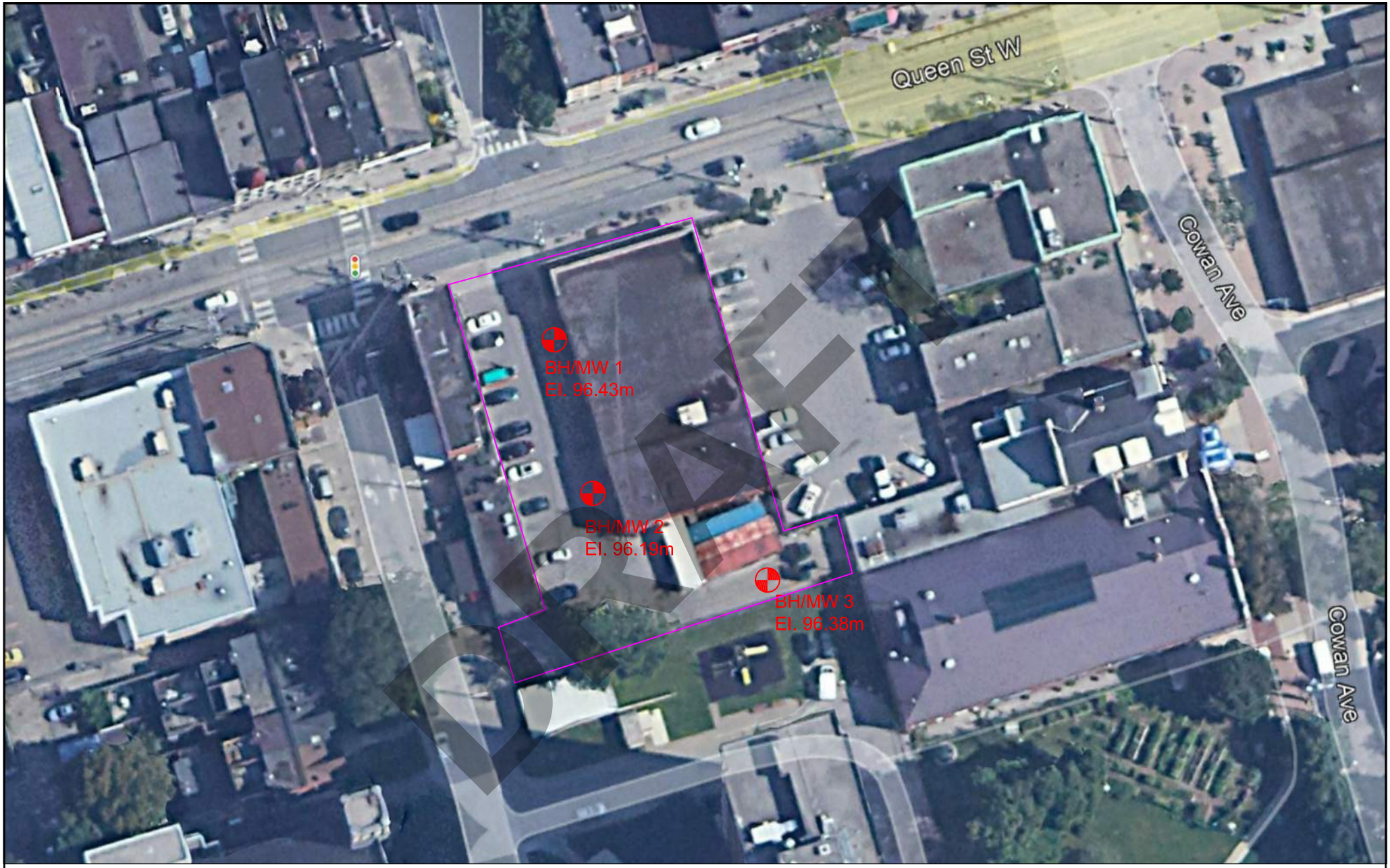
Drawings

Borehole Location Plan
Borehole Logs



NOTES:

1. THE BOUNDARIES AND SOIL TYPES HAVE BEEN ESTABLISHED ONLY AT BOREHOLE LOCATIONS. BETWEEN BOREHOLES THEY ARE ASSUMED AND MAY BE SUBJECT TO CONSIDERABLE ERROR
2. SOIL SAMPLES WILL BE RETAINED IN STORAGE FOR 1 MONTH AND THEN DESTROYED UNLESS CLIENT ADVISES THAT AN EXTENDED TIME PERIOD IS REQUIRED.
3. THIS BACKGROUND IMAGE WAS AN EXTRACT FROM GOOGLE EARTH IMAGE
4. BOREHOLE ELEVATIONS SHOULD NOT BE USED FOR BUILDING GRADES.

LEGEND:

BOREHOLE LOCATIONS

APPROXIMATE SITE BOUNDARY

EXP Services Inc.
t: +1.905.695.3217 | f: +1.905.695.0169
220 COMMERCE VALLEY DR., SUITE 110
MARKHAM, ON L3T 0A8
Canada
www.exp.com

PROJECT TITLE AND LOCATION:
GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
1337 QUEEN STREET WEST,
TORONTO, ONTARIO

DRAWING TITLE:
BOREHOLE LOCATION PLAN

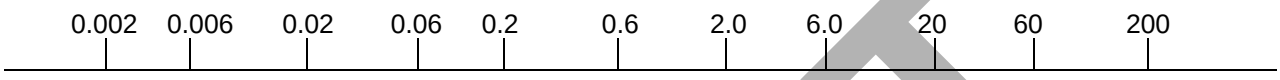
PROJECT#: BRM-21003722-A0	DWN.: RY
SCALE: N.T.S.	CHKD.: JN
DATE: NOVEMBER 2022	DWG. No.: 1

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

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



EQUIVALENT GRAIN DIAMETER IN MILLIMETERS

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.

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Log of BH/MW1

Project No. BRM-21003722-A0 Drawing No. 2

Project: Geotechnical Investigation Sheet No. 1 of 2

Location: 1337 Queen Street West, Toronto, Ontario

Date Drilled: October 17, 2022

Drill Type: CME55 Truck Mount

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test S

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m
		~ 100 mm asphaltic concrete on ~ 100 mm sand & gravel, brown, moist	96.43
		FILL - sandy silt, some gravel, some clay; brown, moist, slight odour	96.3 96.2 95.7
		SILT - trace to some clay, trace sand, trace sand pockets; brown, moist, compact, no odour or staining	
		- trace sand and gravel pockets / seams and becoming wet	
		- becoming some sand and dense	
		- becoming moist	
		- becoming grey, trace wet sand seams	
			90.3
		SILTY SAND TILL - trace clay and gravel, trace sand seams; brown, wet, dense, no odour or staining	

DEPTH | N Value: 20 40 60 80 | Shear Strength: 0.1 0.2 MPa | Combustible Vapour Reading (ppm): 250 500 750 | Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30 | SAMPLES | Natural Unit Weight kN/m³

DEPTH	N Value	Natural Moisture Content %
0	9	10
1	16	10
2	22	10
2	41	10
3	40	15
5	36	20
6	46	50
8	42	10
9	43	45

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Continued Next Page

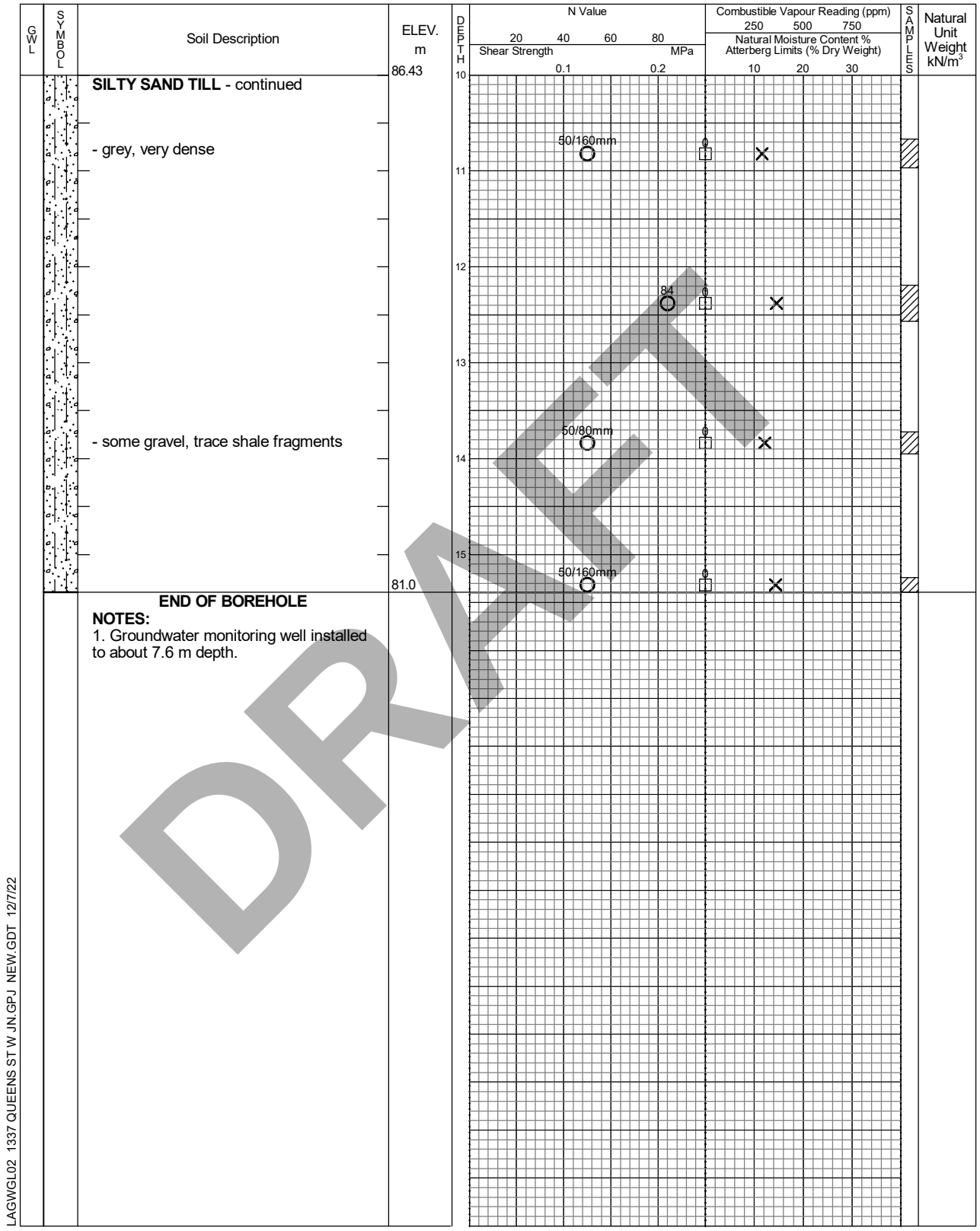
LAGWGL02 1337 QUEENS ST W JN.GPJ NEW.GDT 12/7/22

Time	Water Level (m)	Depth to Cave (m)
On completion	N/A	
November 1, 2022	5.89	

Log of BH/MW1

Project No. BRM-21003722-A0 Drawing No. 2

Project: Geotechnical Investigation Sheet No. 2 of 2



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LAGWGL02 1337 QUEENS ST W JN.GPJ NEW.GDT 12/7/22

Time	Water Level (m)	Depth to Cave (m)
On completion	N/A	
November 1, 2022	5.89	

Log of BH/MW2

Project No. BRM-21003722-A0 Drawing No. 3

Project: Geotechnical Investigation Sheet No. 1 of 2

Location: 1337 Queen Street West, Toronto, Ontario

Date Drilled: October 19, 2022

Drill Type: CME55 Truck Mount

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH
		~ 100 mm asphaltic concrete on ~100 mm sand and gravel, brown, moist	96.19	0
		FILL - clayey silt, some sand, some gravel, trace brick fragments; brown to grey, very moist, no odour or staining	96.1 96.0	
		SILT - trace sand, trace gravel; brown, very moist to wet, dense, no odour or staining	94.7	2
		- becoming grey with trace clay		
		- trace wet sand seams, compact		3
		- becoming sandy silt, trace wet sand seams, dense		5
		SILTY SAND TILL - trace clay and gravel; grey, wet, dense, no odour or staining	90.1	6
		- very dense		9

N Value: 20 40 60 80
Shear Strength: 0.1 0.2 MPa
Combustible Vapour Reading (ppm): 250 500 750
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30
SAMPLES
Natural Unit Weight kN/m³

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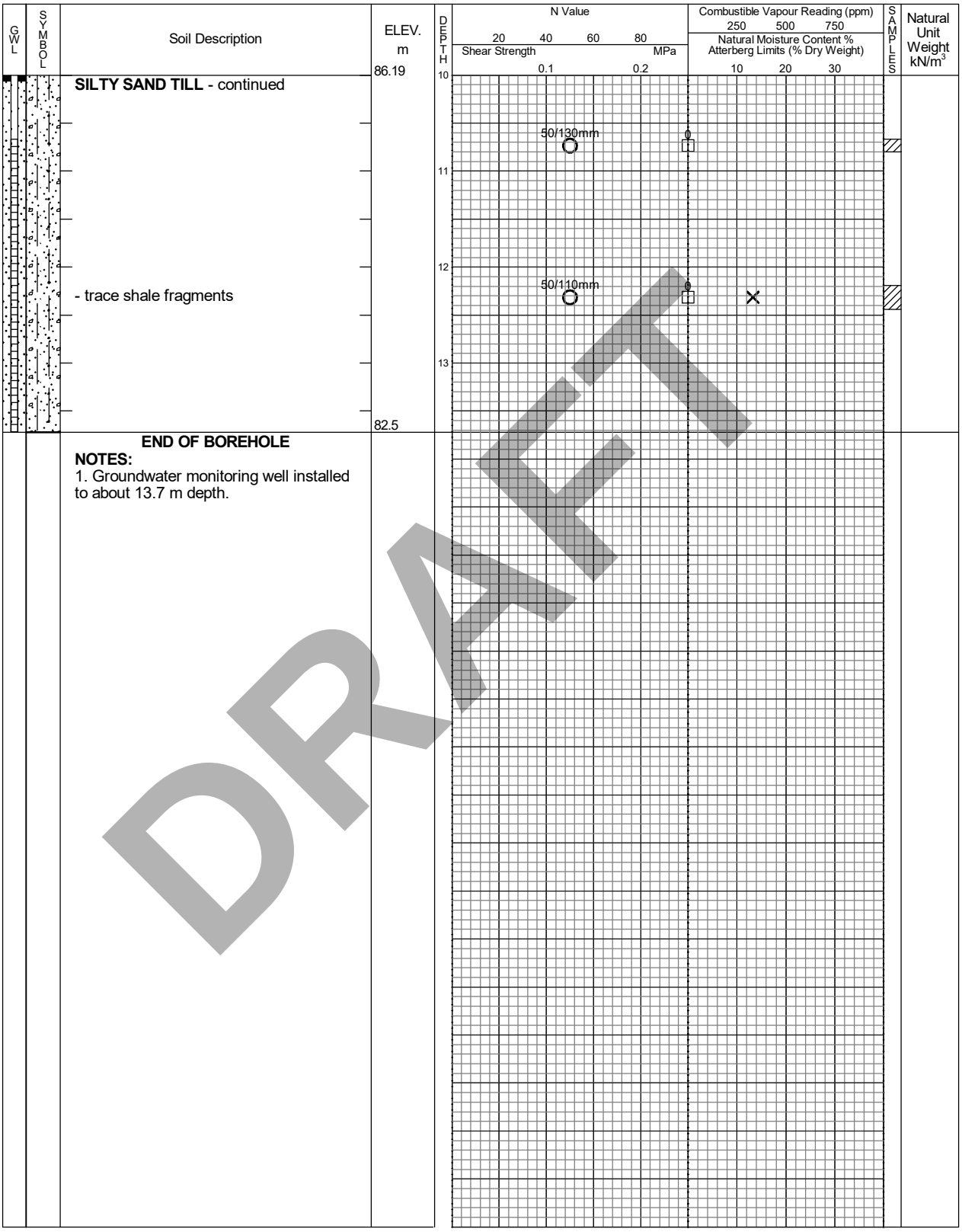
Continued Next Page

Time	Water Level (m)	Depth to Cave (m)
On completion	N/A	
November 1, 2022	4.38	

Log of BH/MW2

Project No. BRM-21003722-A0 Drawing No. 3

Project: Geotechnical Investigation Sheet No. 2 of 2



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LAGWGL02 1337 QUEENS ST W JN.GPJ NEW.GDT 12/7/22

Time	Water Level (m)	Depth to Cave (m)
On completion	N/A	
November 1, 2022	4.38	

Log of BH/MW3

Project No. BRM-21003722-A0 | Drawing No. 4

Project: Geotechnical Investigation | Sheet No. 1 of 2

Location: 1337 Queen Street West, Toronto, Ontario

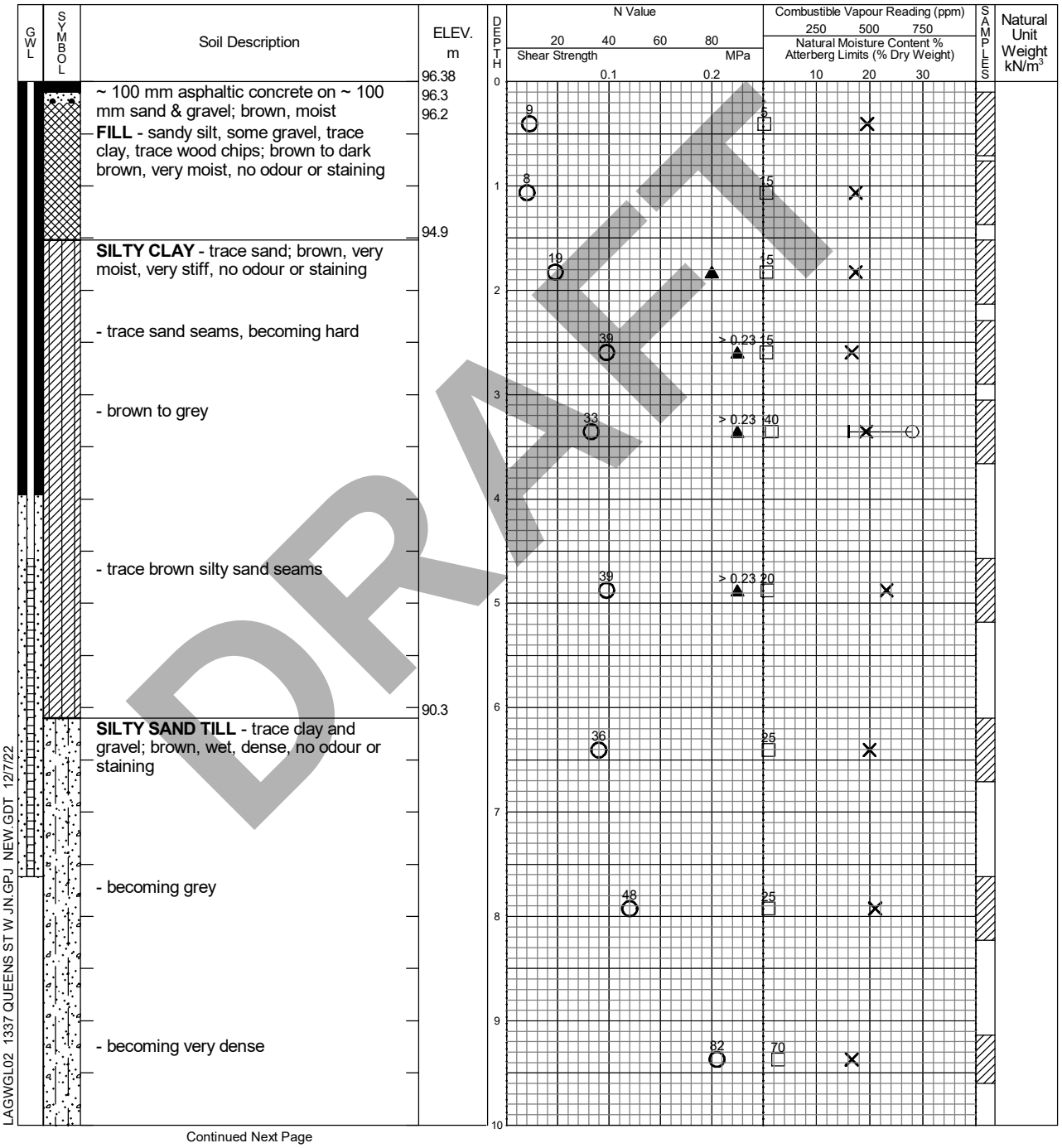
Date Drilled: October 20, 2022

Drill Type: CME55 Truck Mount

Datum: Geodetic

Auger Sample | SPT (N) Value | Dynamic Cone Test | Shelby Tube | Field Vane Test (S)

Combustible Vapour Reading | Natural Moisture | Plastic and Liquid Limit | Undrained Triaxial at % Strain at Failure | Penetrometer



LAGWGL02 1337 QUEENS ST W JN.GPJ NEW.GDT 12/7/22

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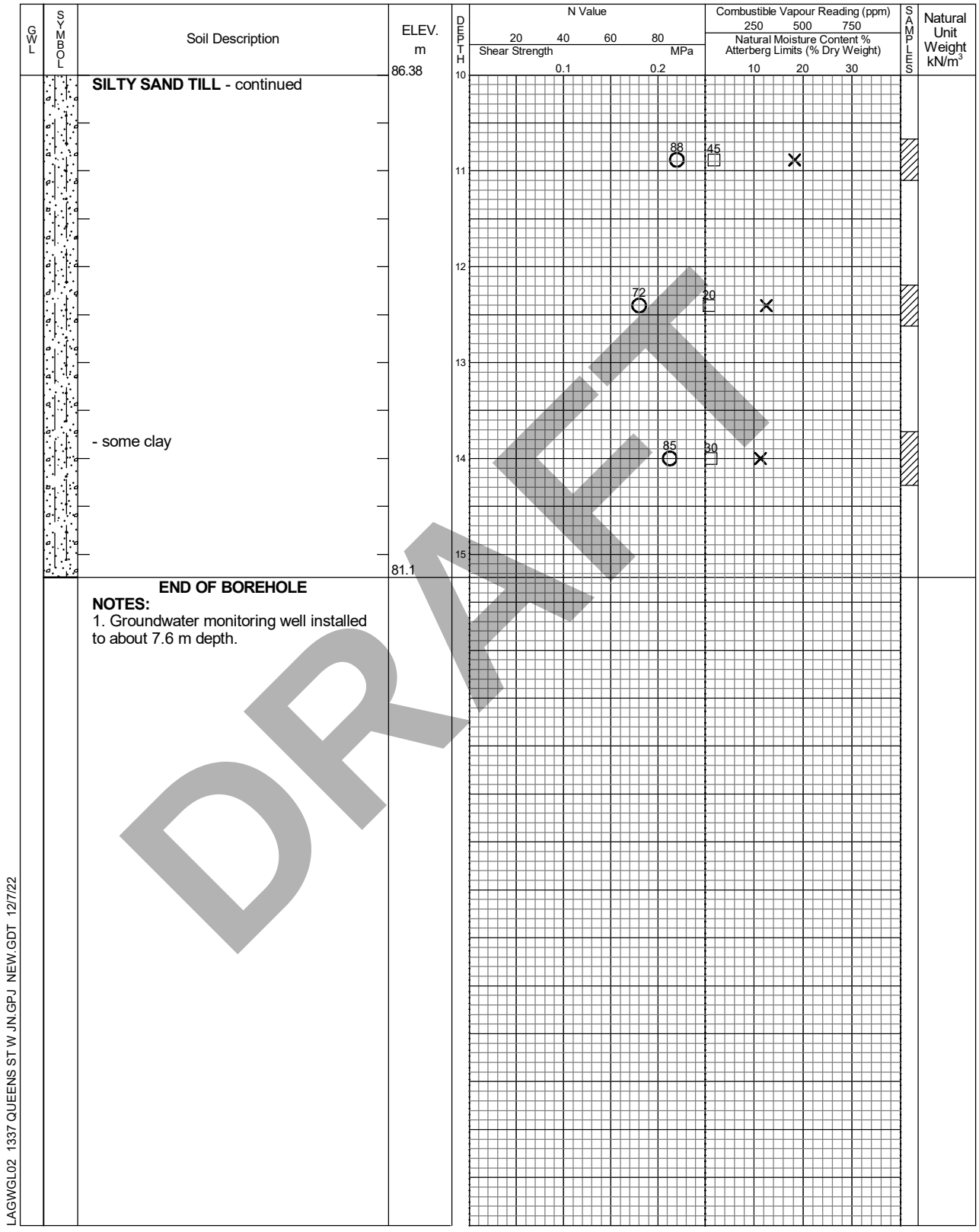
Time	Water Level (m)	Depth to Cave (m)
On completion	N/A	
November 1, 2022	6.12	

Log of BH/MW3

Project No. BRM-21003722-A0 Drawing No. 4

Project: Geotechnical Investigation Sheet No. 2 of 2



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LAGWGL02 1337 QUEENS ST W JN.GPJ NEW.GDT 12/7/22

Time	Water Level (m)	Depth to Cave (m)
On completion	N/A	
November 1, 2022	6.12	

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Appendix A

Particle Size Analysis / Atterberg Limit Testing Results

exp Services Inc.
1595 Clark Boulevard, Brampton
Ontario, Canada, L6T 4V1
Telephone: (905) 793-9800
Fax: (905) 793-0641

Grain Size Analysis & Hydrometer Test Report

ST08

Sample Test No.: 408981-1 **Report No.:** 1 **Date Reported:** 04-Nov-22

Project No.: brm-21003722-a0 b103
Project Name: 1337 Queen Street West, Toronto, Ontario

Grain Size Proportion (%)

Gravel (> 4.75mm):	**9.0**
Sand (> 75µm, < 4.75mm):	**52.8**
Silt (> 2µm), < 75µm):	**32.0**
Clay (< 2µm):	**6.2**
Total:	**100.0**

Sample Information

Location: BH 1
Sample Method: SS
Sample No.: 11
Depth: 12.2 - 12.8 m
Sample Description: Silty Sand, trace Gravel and Clay; Grey
Sampled By: exp Markham
Sampling Date: 10/28/2022
Date Received: 10/31/2022
Client Sample ID:
Comments:

Grain Size (mm)	% Passing	Grain Size (mm)	% Passing
26.5	100.0	**0.0490**	25.3
22.4	100.0	**0.0353**	19.8
19	100.0	**0.0226**	16.0
16	100.0	**0.0132**	12.9
13.2	100.0	**0.0094**	11.5
12.5	97.7	**0.0066**	10.4
9.5	94.1	**0.0033**	8.1
6.7	93.1	**0.0014**	5.3
4.75	91.0		
2	88.2		
0.85	84.5		
0.425	79.9		
0.25	72.4		
0.18	66.1		
0.15	60.5		
0.075	38.2		
0.053	28.3		

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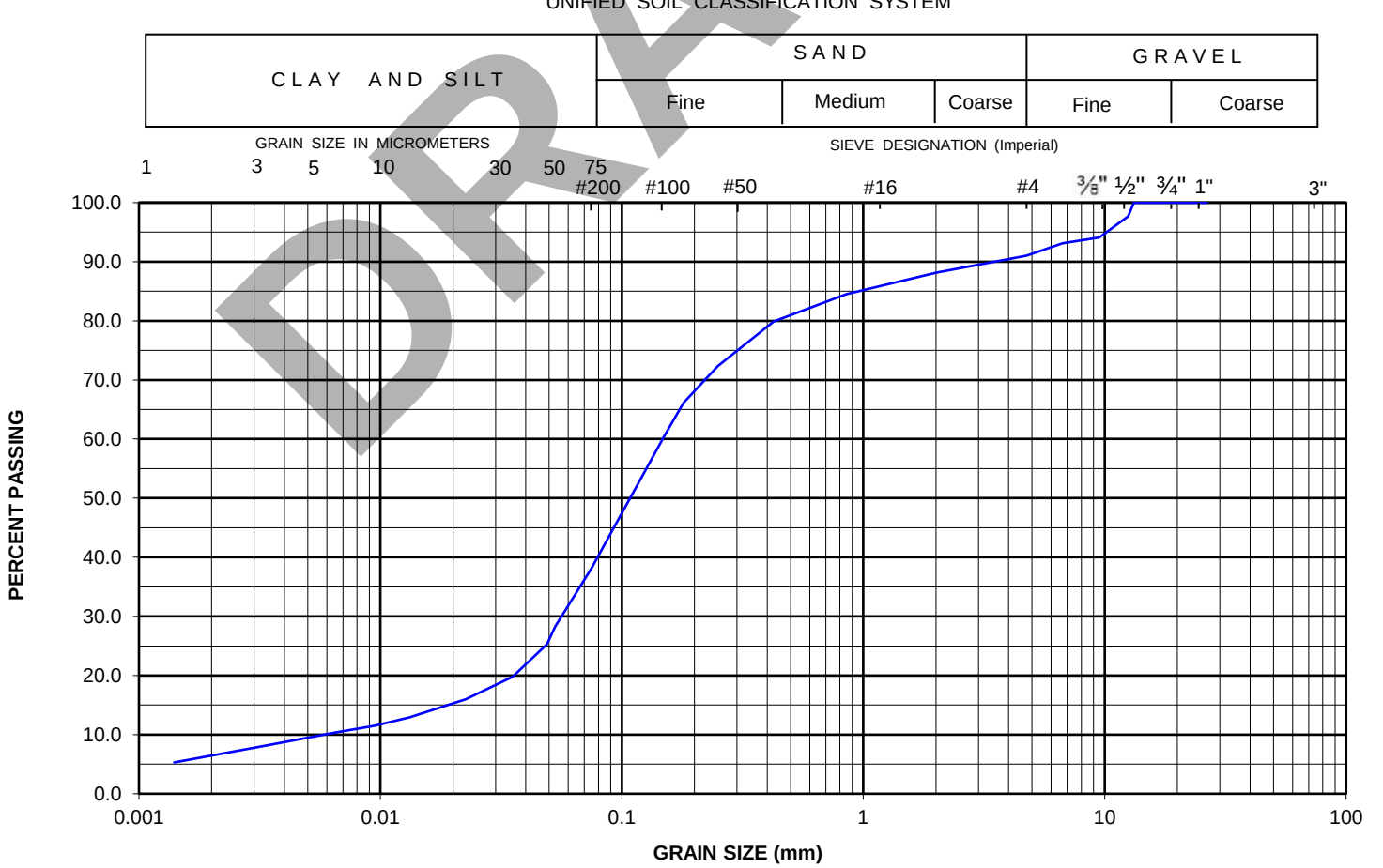

Project Manager: Jennifer Hayman **Approved By:** *Original Signed By*
Arcadio Petrola; C.E.T. **Date Approved:** 04-Nov-22

exp Services Inc.
1595 Clark Boulevard, Brampton
Ontario, Canada, L6T 4V1
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Fax: (905) 793-0641

Grain Size Analysis & Hydrometer Test Report

ST08

Sample Test No.: 408983-1 **Report No.:** 2 **Date Reported:** 04-Nov-22

Project No.: brm-21003722-a0 b103
Project Name: 1337 Queen Street West, Toronto, Ontario

Grain Size Proportion (%)

Gravel (> 4.75mm):	**2.6**
Sand (> 75µm, < 4.75mm):	**60.3**
Silt (> 2µm), < 75µm):	**27.3**
Clay (< 2µm):	**9.8**
Total:	**100.0**

Sample Information

Location: BH 2
Sample Method: SS
Sample No.: 8
Depth: 7.6 - 8.2 m
Sample Description: Silty Sand, trace Clay and Gravel; Grey
Sampled By: exp Markham
Sampling Date: 10/28/2022
Date Received: 10/31/2022
Client Sample ID:
Comments:

Grain Size (mm)	% Passing	Grain Size (mm)	% Passing
26.5	100.0	**0.0482**	31.7
22.4	100.0	**0.0344**	28.8
19	100.0	**0.0220**	25.8
16	100.0	**0.0128**	21.6
13.2	100.0	**0.0092**	19.0
12.5	100.0	**0.0065**	16.6
9.5	100.0	**0.0032**	12.2
6.7	99.0	**0.0014**	8.6
4.75	97.4		
2	93.4		
0.85	89.7		
0.425	87.3		
0.25	82.4		
0.18	71.9		
0.15	61.7		
0.075	37.1		
0.053	32.5		

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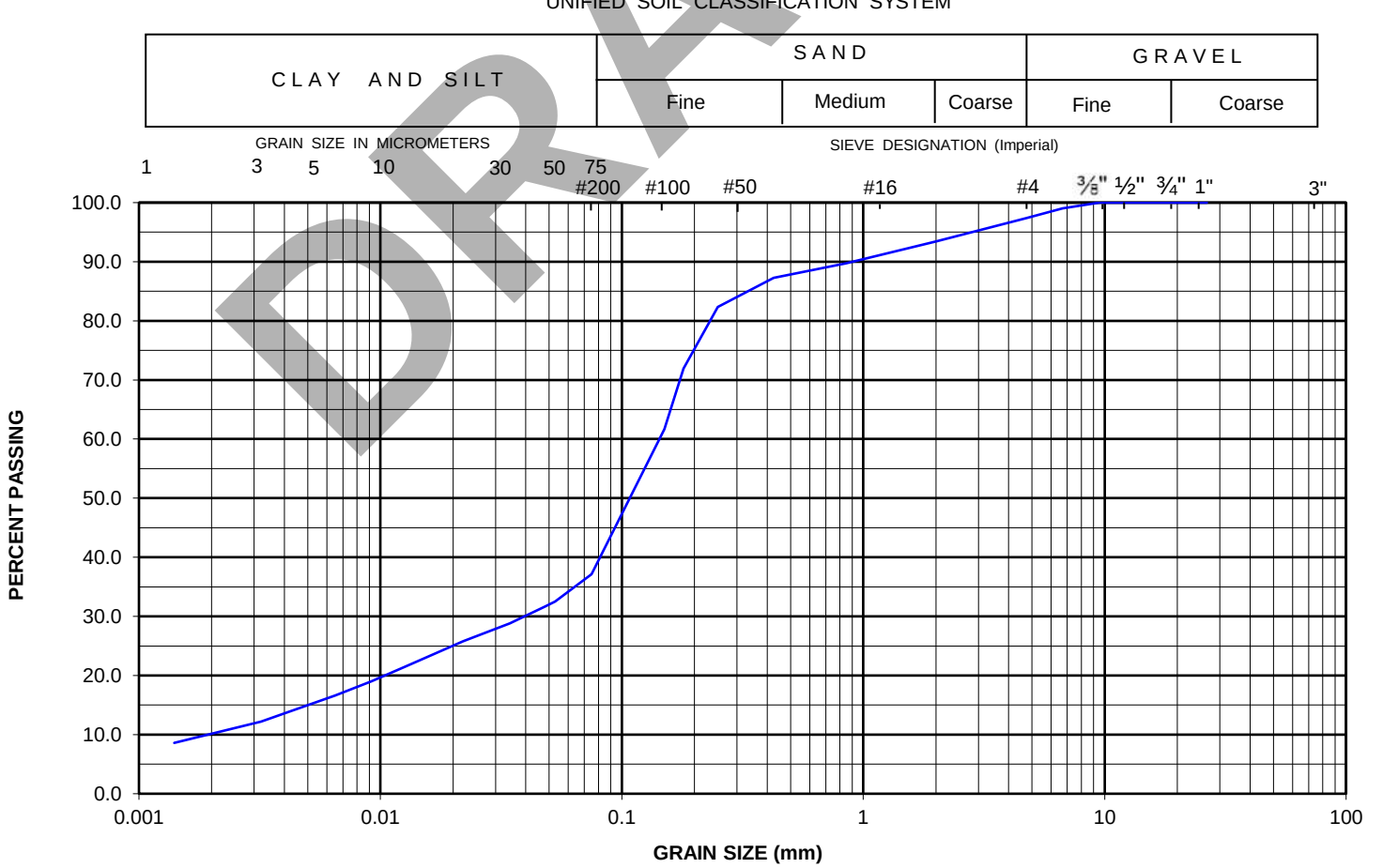


Project Manager: Jennifer Hayman **Approved By:** *Original Signed By* **Date Approved:** 04-Nov-22
Arcadio Petrola; C.E.T.

exp Services Inc.
1595 Clark Boulevard, Brampton
Ontario, Canada, L6T 4V1
Telephone: (905) 793-9800
Fax: (905) 793-0641

Grain Size Analysis & Hydrometer Test Report

ST08

Sample Test No.: 408984-1 **Report No.:** 3 **Date Reported:** 04-Nov-22

Project No.: brm-21003722-a0 b103
Project Name: 1337 Queen Street West, Toronto, Ontario

Grain Size Proportion (%)

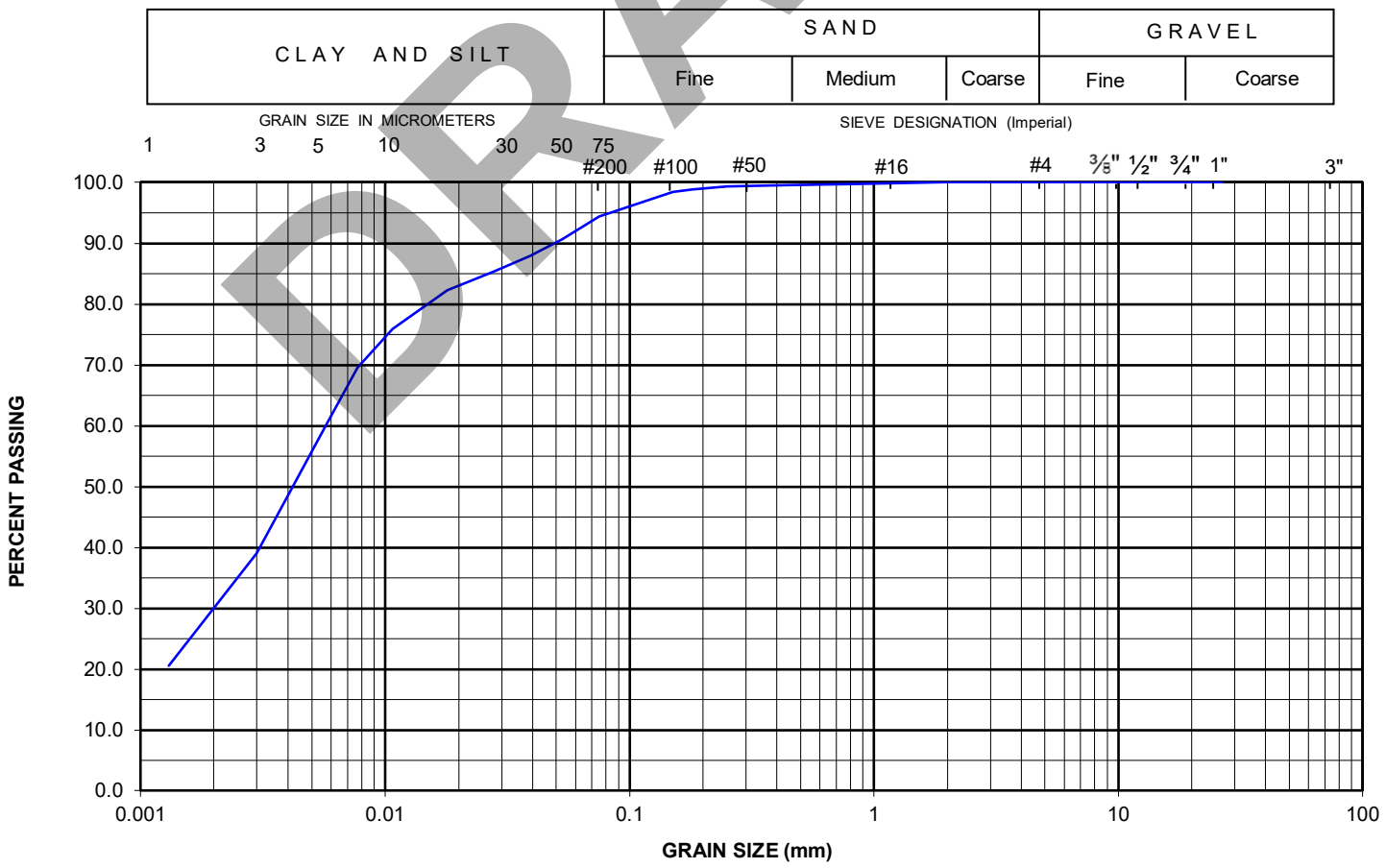
Gravel (> 4.75mm):	
Sand (> 75µm, < 4.75mm):	**5.6**
Silt (> 2µm), < 75µm):	**66.2**
Clay (< 2µm):	**28.2**
Total:	**100.0**

Sample Information

Location: BH 3
Sample Method: SS
Sample No.: 5
Depth: 3.0 - 3.7 m
Sample Description: Clayey Silt, trace Sand; Grey
Sampled By: exp Markham
Sampling Date: 10/28/2022
Date Received: 10/31/2022
Client Sample ID:
Comments:

Grain Size (mm)	% Passing	Grain Size (mm)	% Passing
26.5	100.0	**0.0392**	88.0
22.4	100.0	**0.0280**	85.4
19	100.0	**0.0179**	82.3
16	100.0	**0.0107**	75.9
13.2	100.0	**0.0077**	69.6
12.5	100.0	**0.0057**	60.0
9.5	100.0	**0.0030**	39.1
6.7	100.0	**0.0013**	20.6
4.75	100.0		
2	100.0		
0.85	99.8		
0.425	99.6		
0.25	99.4		
0.18	98.9		
0.15	98.5		
0.075	94.4		
0.053	90.7		

UNIFIED SOIL CLASSIFICATION SYSTEM



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Project Manager: Jennifer Hayman **Approved By:** *Original Signed By*
Arcadio Petrola; C.E.T. **Date Approved:** 04-Nov-22

exp Services Inc.
1595 Clark Boulevard, Brampton
Ontario, Canada, L6T 4V1
Telephone: (905) 793-9800
Fax: (905) 793-0641

Plasticity Index Test Report

ST03

Project No.: Brm-21003722-A0
Sample Number: 408984-2
Date Sampled: October 28, 2022
Date Received: October 31, 2022

Date Reported: November 15, 2022
Borehole No: BH3 / SS5
Sample Depth:

Liquid Limit

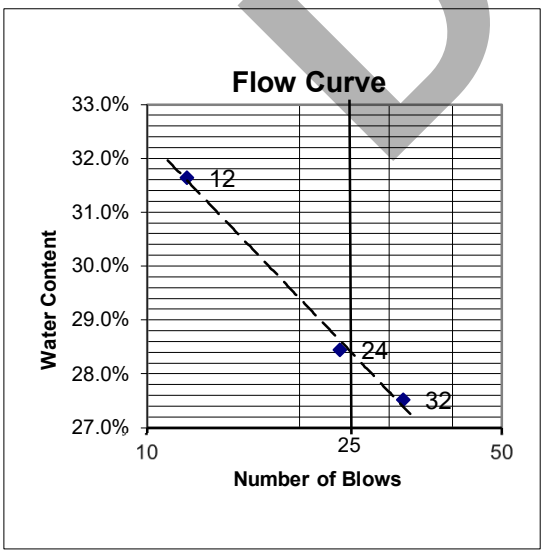
Trial Number	1	2	3	4	5
Number of Blows	32	24	12		
Moisture Tin No.	2	3	13		
Mass of Soil and Tin, g	29.518	31.575	29.711		
Mass of Dry Soil and Tin, g	26.779	28.287	26.577		
Mass of Tin, g	16.826	16.728	16.672		
Mass of Water, g	2.739	3.288	3.134		
Mass of Dry Soil, g	9.953	11.559	9.905		
Water Content	27.5%	28.4%	31.6%		

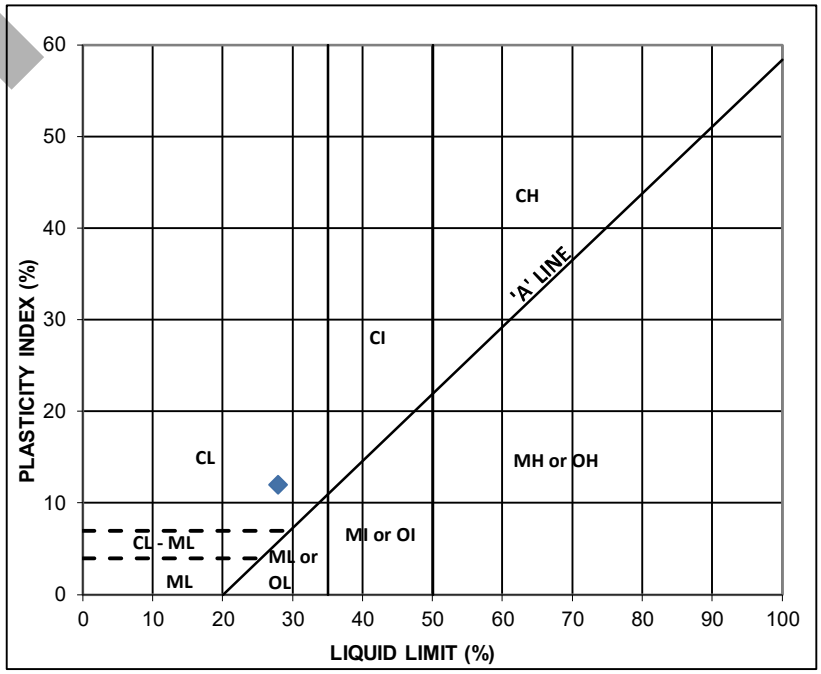
Plastic Limit

Trial Number	1	2	3
Moisture Tin No.	17	18	19
Mass of Soil and Tin, g	29.000	28.680	26.852
Mass of Dry Soil and Tin, g	27.290	26.973	25.329
Mass of Tin, g	16.699	16.496	15.629
Mass of Water, g	1.710	1.707	1.523
Mass of Dry Soil, g	10.591	10.477	9.7
Water Content	16.1%	16.3%	15.7%

Summary of Results

Liquid Limit *(LL)*: 28
Plastic Limit *(PL)*: 16
Plasticity Index *(PI)*: 12
Classification: CL





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Tested By:

Checked By: **Arcadio Petrola, CET**
Senior Lab. Technician