Englobe
Soils Materials Environment

Metrolinx

Port Credit GO Station
30 Queen Street East, Mississauga, Ontario

Final Geotechnical Investigation Report

Date: February 25, 2016
Ref. N°: 124-P-0004553-0-027-GE-R-001-01

Metrolinx

Port Credit GO Station
30 Queen Street East, Mississauga, Ontario

Final Geotechnical Investigation Report | P-0004553-0-01-027-GE-R-001-01

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Property and Confidentiality

REVISION AND PUBLICATION REGISTER		
Revision N°	Date	Modification And/Or Publication Details
0A	2016-02-09	Submission of Draft Geotechnical Investigation Report
00	2016-02-11	Submission of Final Geotechnical Investigation Report
01	2016-02-25	Submission of Final Geotechnical Investigation Report – The first paragraph under Property and Confidentiality on page ii is revised.

INTRODUCTION

Englobe Corp. has completed a geotechnical investigation for the proposed development of high-rise buildings at the existing surface parking area located at the northeast corner of Hurontario Street and Park Street East in the City of Mississauga. This project was carried out at the request of Laura Filice, Environmental Programs and Assessments of GO, a division of Metrolinx.

Englobe carried out a supplementary geotechnical investigation at the existing parking area in conjunction with LVM (a division of EnGlobe Corp.) Geotechnical Report 124-P-0004553-0-01-007-GE-001-0A (dated November 04, 2014). The purpose of this investigation was to determine the subsoil/rock conditions in order to provide recommendations for design of the foundation for the proposed two (2) twenty two (22) storey buildings including four (4) levels of below grade parking levels which assumed a maximum up to five (5) m depth per level.

The subsoil/rock types and groundwater conditions within the project limits were documented in order to provide recommendations for the geotechnical design aspect of the proposed high-rise buildings including four basement levels. The results of the geotechnical investigation have been summarized and geotechnical recommendations developed for the proposed developments.

1 PROJECT METHODOLOGY

The geotechnical investigation for this project consisted of the following components.

Subsequent to obtaining service clearances at each borehole location, six boreholes (BH-1-16 to BH-6-16) were advanced to 26 m below ground surface within the limits of the project. The locations of the boreholes are indicated on the attached Borehole Location Drawing (Appendix 1, Drawing 1) with the Borehole Logs provided in Appendix 2. The boreholes were completed using continuous flight hollow stem auger equipment supplied by Determination Drilling and Drilltech Drilling Ltd. under the continuous supervision of an Englobe field technician.

Subsoil samples were recovered at regular intervals of depth using a 50 mm O.D. split-barrel sampler driven into the subsoil in accordance with the Standard Penetration Test (SPT) procedure (ASTM D1586). Cores of the bedrock were recovered in 1.5 m runs to achieve the specified drilling depth of 26 m below ground surface (mbgs). The recovered subsoil and rock core samples were visually examined in the field and then preserved and transported to the Englobe Toronto laboratory for examination and testing. Ground water observations were carried out in the open boreholes upon completion of the field work. The boreholes were then promptly backfilled upon completion in accordance with Ontario Regulation 468/10. Water levels were measured upon completion of drilling.

In the laboratory, each soil sample was examined as to its visual and textural characteristics by the Project Engineer. Moisture content determinations were carried out on all granular base/subbase and subgrade soil samples. In addition, grain size analysis and hydrometer testing were completed on six representative soil samples. The rock core samples were examined to determine the Rock Quality Designation (RQD), and four (4) representative rock samples were selected for Unconfined Compressive Strength testing.

Two (2) representative subsoil samples were tested for Corrosivity (sulphate, chloride ion, electrical conductivity, PH and Redox potential) tests. In addition, one representative soil sample was selected by Englobe and submitted to Maxxam for environmental analysis in accordance with Ontario Regulation 347 (as amended by O.Reg.558/00) for disposal of soil cuttings generated from the boreholes.

A site MASW (Multi-Channel Analysis of Surface Waves) survey was completed by Geophysics GPR International Inc. as a sub-consultant to Englobe, in order to measure the shear wave velocities in the soils for the determination of the V_{S30} value for seismic site classification in conformance with the current Ontario Building Code requirements. The full MASW report is included in Appendix 5.

The elevations provided in the borehole logs are based on an assumed elevation of 100.00 on top of the concrete base light stand in north parking lot. The same location was utilized as benchmark in the previous LVM report. The relative ground surface elevations at each borehole location are shown on the borehole logs included in Appendix 2.

2 SUBSOIL CONDITIONS

The approximate borehole locations are indicated on the attached Borehole Location Drawing in Appendix 1, with the Borehole Logs provided in Appendix 2. The general subsoil conditions are outlined briefly below.

A layer of asphalt concrete ranging in thickness from 75 to 115 mm was observed in BH1 to BH6.

The subgrade soil at the borehole locations was observed to consist of a mix of sandy silt, clayey silt and till (silty sand, sandy silt, clayey silt).

The sandy silt was loose to dense in relative density having Standard Penetration Test (SPT) 'N'-values ranging from 6 to 31 blows per 300 mm of penetration. The in-situ moisture content of this material ranged from about 15.3 (moist) to 21.2 (very moist) percent.

The clayey silt was compact to dense in relative density having SPT 'N'-values ranging from 26 to 34 blows per 300 mm of penetration. The in-situ moisture content of this material ranged from about 14.5 to 16.5 (moist) percent.

The sandy silt/clayey silt till was compact to very dense in relative density having SPT 'N'-values ranging from 18 to over 50 blows per 300 mm of penetration. The in-situ moisture content of this material ranged from about 4.1 to 14.2 (moist) percent.

Bedrock is located at approximately 9.0 to 10.5 mbgs (Elev. 87.7 to 90.2). The bedrock was comprised of grey shale (Georgian Bay Formation) with limestone inclusions. The uppermost 1.5 to 4.0 m of the shale is weathered and soft. The Rock Quality Designation (RQD), a measurement of the quality of the bedrock mass below the weathered portion, ranges from 19% to 100% indicating very poor to excellent bedrock quality. The average RQD for all cores is 74.5% indicating good quality rock.

Groundwater measurements conducted in the open boreholes upon completion of drilling indicated groundwater levels of 7.0, 9.1 and 4.0 mbgs in BH-03-16, BH-05-16 and BH-06-16 respectively, with no water observed in the other boreholes.

3 LABORATORY TESTING RESULTS

Soil samples recovered during this investigation were preserved and transported to the Englobe GTA laboratory for additional testing. Moisture content testing was completed on all

recovered soil samples with the results plotted on the borehole logs. Rock cores were photographed and logs prepared detailing their Total Core Recovery Ratio (CR%) and Rock Quality Designation (RQD). Borehole logs and rock core logs are provided in Appendix 2.

Six representative soil samples were selected and tested for gradation and hydrometer analysis. Three representative soil samples were tested for unit weight. Four representative rock core samples were selected for Unconfined Compressive Strength testing. The test results indicated compressive strength of 30.4, 47.7, 49.4 and 53.2 MPa with an average strength of 45.2 MPa. The complete laboratory test results are included in Appendix 3.

The samples will be stored for a period of three months from the date of sampling. After this time, they will be discarded unless arrangements are made for extended storage.

4 FOUNDATION CONSIDERATIONS

The proposed plan of development has four levels of basement with slab-on-grade depth up to 20.0 mbgs. Therefore the founding depth for the footings is expected to be in a depth where intact shale is located.

It should be possible to employ conventional spread and strip footings, founded on the competent shale to support the buildings and underground structures.

Table 1 Bearing Pressure for Settlement (SLS), Factored Ultimate Soil Bearing Pressure (ULS) and Corresponding Founding Level

Bearing Pressure for Settlement (SLS), Factored Ultimate Soil Bearing Pressure (ULS) and Corresponding Founding Level		
Depth	SLS	ULS
11 to 20 mbgs	-	2000 kPa

For foundations bearing on bedrock, the ULS will govern the design as the bearing stratum must fail in order for appreciable deformation to occur. Settlement of the foundation on sound bedrock will be negligible. The foundation area should be inspected by a qualified geotechnical engineer to ensure that the soil/rock conditions encountered at the time of construction are suitable to support the design pressure. Any disturbed to soil/rock identified during the inspection should be removed from the footing areas and replaced with un-shrinkable fill or lean concrete.

5 EXCAVATION AND BACKFILL CONSIDERATIONS

Excavation within the soil at the site is expected to be achieved easily using conventional excavation equipment. However, the site subsoil will require properly designed and installed

shoring for excavations to proceed with depth. The shoring system should be comprised of a combination of soldier piles and tieback anchors. The number and levels of the tieback anchors will be determined in large by the depth of the excavation and the location of buried services under the street bordering the property and should be designed by a structural engineer.

Based on the results of the subsurface investigation, weathered shale bedrock will be encountered within the proposed depth of excavation. While it is likely that this material will be able to be excavated using conventional backhoe equipment equipped with ripping teeth in conjunction with a rock breaker, the presence of additional harder zones within the shale is anticipated, and therefore provision for additional rock breaking or blasting should be included in the contract documents.

The shale bedrock is likely to be capable of standing the near-vertical side slopes for relatively short periods of time. However, the weathered shale is susceptible to softening with cycles of wetting and drying (and freezing and thawing), with subsequent ravelling and/or sloughing. Is field inspection (by qualified geological engineer or engineering geologist) indicates that the shale is capable of standing unsupported for the relatively short construction period, the exposed face of the shale should be checked regularly, and measures taken to protect the shale from precipitation effects, and workers from ravelling and/or sloughing of the excavation faces. Excavation side slopes in the weathered shale bedrock must be properly and regularly scaled to remove any loose or dislodged rock pieces and covered with tarpaulins to protect them from moisture effects during the construction periods.

Weathered shale bedrock has the potential for deformations to occur due to relief of locked-in horizontal stresses and rock swell, especially if installed in relatively narrow excavations. It is, therefore, recommended that a layer of compressible material be provided between the trench sidewalls and the pipe to mitigate potential damage due to rock deformations.

Regardless, all excavations must be carried out in accordance with the Ontario Occupational Health and Safety Act (OHSA). The subsoil encountered at the site as per OHSA criteria would typically be considered:

Moist to Very Moist, Loose to Dense, Sandy Silt – Type 3

Moist, Compact to Dense, Clayey Silt – Type 3

Moist to Very Moist, Compact to Very Dense, Silty Sand Till – Type 2

Moist, Compact to Very Dense, Clayey Silt Till – Type 2

Competent Shale – Type 1

6 DRAINAGE CONSIDERATIONS

Groundwater measurements were conducted in the open boreholes upon completion of drilling and in the monitoring wells installed as part of geotechnical investigation by LVM in November 2014. The borehole location and borehole logs of previous report are provided in Appendix 6. The groundwater monitoring in the monitoring wells indicated a stabilized groundwater level at approximately 1.4 to 5.8 mbgs in the proposed high-rise development area. The anticipated excavation zone is below the groundwater level and ground water dewatering is expected. It is expected that Permit to Take Water (PTTW) may be required for basement excavations unless measures are taken to ensure excavations are watertight. The need for a PTTW must be assessed in conjunction with the final design and require a more detailed study by a qualified hydrogeologist.

7 PERMANENT EARTH PRESSURE

The subsurface walls of the structures should be designed to resist an earth pressure, 'P', at any depth, 'h', evaluated using the expression:

$$P=K_A(\gamma h+q)$$

Where K_A= 0.35, is the estimated applicable earth pressure coefficient;

γ= 22.0 KN/m³, the average unit weight of the soil behind the wall

q= is an allowance for surface surcharge, if any

It is assumed that the backfill adjacent to the walls will be free draining material so as to prevent the build-up of pore pressure behind the wall. This will not be the case if it is not drained and the design will have to be modified to take this into account.

8 SHORING DESIGN CONSIDERATIONS FOR BASEMENT LEVELS

The shoring design should be performed by a specialized engineering consultant. It is assumed that the excavation may be extended to a maximum depth of 20.0 m. Therefore, three levels of lateral supports (tie backs) should be adequate.

The active earth pressure of any depth, H, per unit length of the excavation wall can be estimated by the expression:

$$P_A = K_A\ (\gamma H + q)$$

Where;

γ = 22.0 kN/m³, the unit weight of soil being retained

H = Depth of Excavation (m)

q = Equivalent uniform vertical pressure of any surcharge adjacent to the excavation

K_A = 0.35, Active earth pressure coefficient

In order to achieve more positive support from the shoring system, a rectangular earth pressure distribution can be assumed.

The passive earth pressure resistance developed by the soil in front of the buried portion of the soldier pile can be estimated using the following expression and parameters:

$P_P = K_P (\gamma H)$

K_p = 5.0, passive earth pressure coefficient

H = embedded length of soldier piles

γ = 22.0 kN/m³, the unit weight of soil

The lateral movement of the shoring system must be monitored especially at locations in which settlement sensitive structures are present. These measurements are required not only to ascertain the stability of the shoring but also to identify any movement that may influence the thickness of the exterior subsurface walls of the proposed structure.

9 SLAB ON GRADE

Slab-on-grade construction may be employed for the lower basement level. The subgrade for the slab-on-grade is expected to be shale. It is recommended that a base course comprised of minimum 200 mm thick layer of 19 mm clear crushed limestone should be placed by rafting it over the prepared subgrade.

If a moisture-sensitive floor finish is to be applied to the slab, then we recommend that a 15 mil polyethylene moisture vapour barrier be installed directly beneath the slab as per Section 9.13.2.7 of Ontario Building Code (2012). However, it should be recognized that provision of a polyethylene vapour barrier has been known to contribute to differential slab curl unless suitable provisions are made to address differential moisture/evaporation conditions between the top and bottom of the slab.

High horizontal stresses are known to exist in the bedrock. The removal of material, i. e., both over burden and rock, relives the load on the base of the excavation. These stress related movements are time dependent and are essentially complete before the concrete is poured on a typical building site, hence are of little consequence unless construction is staged with excavation. The vast majority of stress relief shale displacements will occur within ninety days after excavation.

10 EARTHQUAKE CONSIDERATIONS

The Ontario Building Code stipulates that a building should be designed to withstand a minimum live load due to earthquake.

The Canadian Foundation Engineering Manual (4th Edition) describes the equivalent static force procedures that can be used to calculate a design seismic base shear proportional to the weight of the building that is to be constructed.

A site MASW (Multi-Channel Analysis of Surface Waves) survey was completed by Geophysics GPR International Inc. as a sub-consultant to Englobe, in order to measure the shear wave velocities in the soils for the determination of the VS30 value for seismic site classification in conformance with the current Ontario Building Code requirements. The full Geophysics GPR report is included in Appendix 5.

Based on the MASW results the site classification for seismic site response B (Rock) should be used for earthquake load and effects in accordance with Table 4.1.8.4.A of the 2012 Ontario Building Code.

11 CHEMICHAL LABORATORY TESTING

Two (2) soil samples (BH3-SS6 and BH6-SS3) were submitted to Maxxam for analysis of soil chemistry. Detailed testing was conducted to determine resistivity, Chloride (Cl), conductivity, PH, sulphate (SO4) and redox. The complete chemical analysis results, including the Maxxam Certificate of Analysis, are given in Appendix 4.

The laboratory results indicate that percentage of sulphate (SO4) in the soil samples tested is between 0.008 to 0.025 % and maximum chloride content in the samples tested was 710 µg/g, Based on these test results, there is not significant potential for sulphate attack. Accordingly, normal Type (GU) portland cement can be used in subsurface concrete. Chloride exposure is known to lead to corrosion in reinforced concrete. A designer competent is concrete mix design should complete the concrete mix design specifications.

12 PAVEMENT DESIGN RECOMMENDATIONS

The exterior area of the proposed parking areas are to be provided with a flexible pavement surfacing. At the time of our report, it has not been confirmed if the subject parking lot will be used solely for light duty passenger vehicles, or will be used as a fire route or for industrial vehicles (i.e. medium duty). As a result, Englobe has provided both light duty and medium duty pavement design options that can be used by the designers where warranted.

Following stripping of the topsoil or other obviously objectionable materials from the pavement area, the subgrade should be graded and provided with a continuous cross fall of at 3 to 4

percent. The subgrade should be proofrolled using a heavily-loaded truck to identify any soft areas exhibiting excessive deflections. Any such area should be sub-excavated and properly replaced with approved granular material.

It should be noted that the grain size analysis testing of the pavement subgrade material indicated that the subgrade is considered to be highly frost susceptible in some locations. As a result, if the subgrade is allowed to become wet during construction or by infiltration through cracks during the service life, there is a strong possibility of differential frost heave occurring during periods of freezing and thawing during the winter months resulting in bumps throughout the parking facility. In addition, a saturated subgrade will become soft/weak during the spring period resulting in localized structural damage to the pavement surface from parked cars. While it is understood that for parking facilities it is not practical to remove and replace the impacted material to the frost penetration depth, if bumps and depressions are considered to be a safety or maintenance concern (ponding and formation of ice patches, for instance) consideration could be given to taking supplemental frost protection measures for this facility. One measure would be to remove an additional amount of the subgrade and replace it with non-frost susceptible material (select subgrade material or additional Granular B Type I, for instance). Alternatively, subdrainage could be installed throughout the parking lot to direct water away from the sensitive subgrade. Regardless, proper surface drainage (surface water directed to catchbasins) and pavement surface maintenance (regular crack sealing, for instance) is considered critical for this facility in order to ensure that the pavement achieves its design service life.

Light-Duty Parking and Driveway Pavements

The following flexible pavement structure is recommended for use in areas with light duty parking and light duty driveway pavements.

50 mm of OPSS 1150 HL 3 Hot Mix Asphalt

150 mm OPSS 1010 Granular A Base

225 mm of OPSS 1010 Granular B Type I Subbase for frost susceptible subgrade (sandy silt) and 150 mm for non-frost susceptible subgrade (silty clay)

Medium-Duty Parking and Fire Routes

The following flexible pavement structure is recommended for fire routes and for medium duty traffic such as garbage trucks and recycling vehicles.

100 mm of hot-mix asphalt consisting of:
- 40 mm of OPSS 1150 HL 3 surface course
- 60 mm of OPSS 1150 HL 8 base course

150 mm OPSS 1010 Granular A Base

350 mm OPSS 1010 Granular B Type I Subbase for frost susceptible subgrade (sandy silt) and

225 mm for non-frost susceptible subgrade (silty clay)

All pavement construction work should only be completed during periods of favourable weather. These preliminary pavement design recommendations are contingent upon provision of a consistently competent, stable subgrade that is properly drained and free of soft spots and objectionable materials such as organic material, and is capable of supporting the design traffic loads. Subdrain and/or ditches should be installed as far in advance of the construction work as possible to permit proper drainage of the subgrade, particularly in cut areas. The subgrade should be properly prepared, shaped and graded to provide uniform, continuous cross-fall toward properly designed and constructed subdrains and/or ditches. The prepared subgrade should be carefully proof rolled in the presence of a qualified representative of a geotechnical engineering firm, and any soft or wet spots or other obviously objectionable materials sub-excavated and properly replaced with suitable, approved material.

13 GENERAL COMMENTS

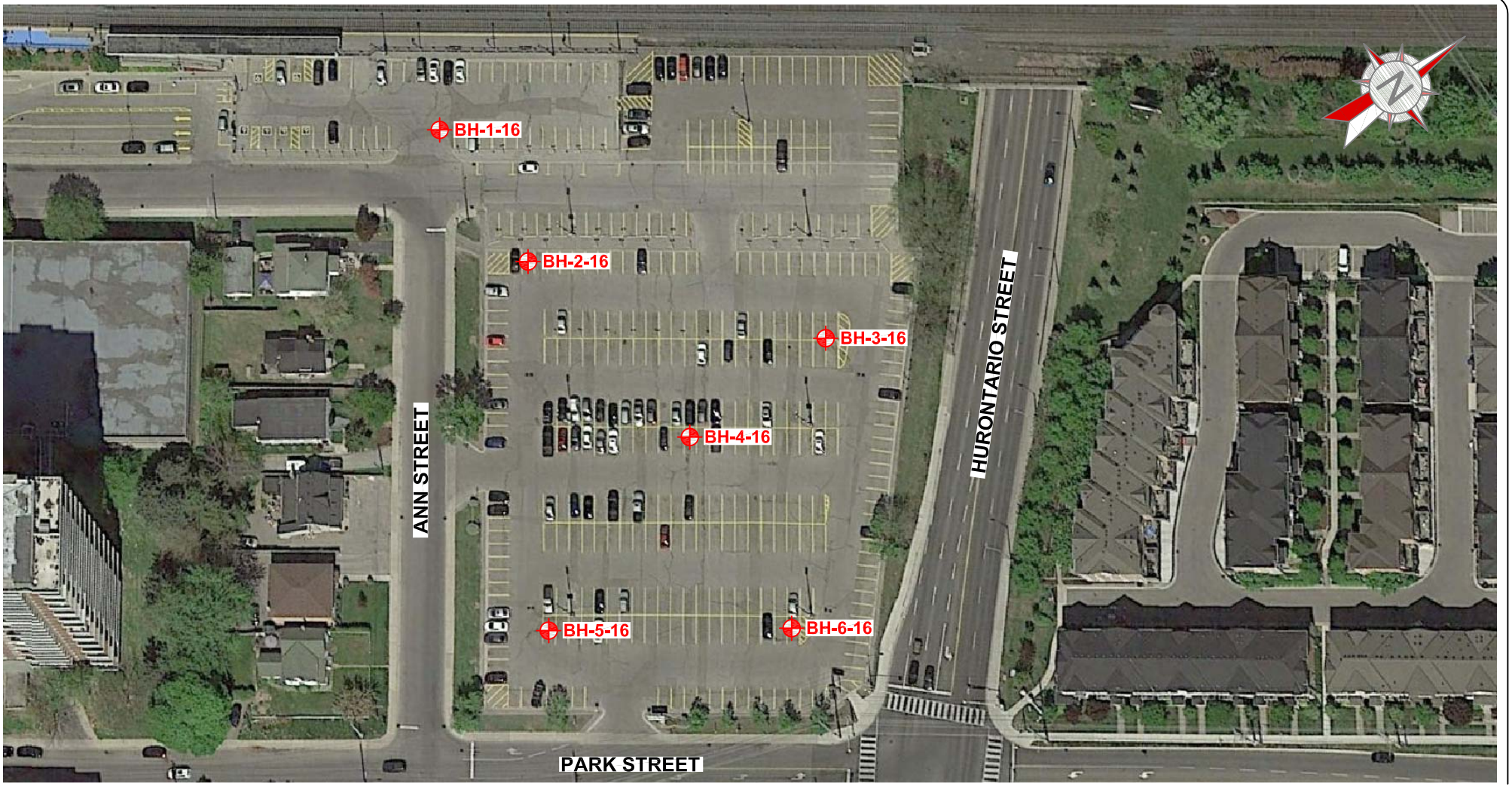
The comments provided in this report have been developed for the use of Metrolinx. It should be noted that the soil boundaries indicated on the borehole logs are inferred from non-continuous sampling and observations during drilling and should not be interpreted as exact planes of geological change. These boundaries are intended to reflect approximate transition zones for the purpose of geotechnical design. Also, the subsoil and groundwater conditions have been determined at the borehole locations only. Additional boreholes and/or test pits would be necessary to determine the localized conditions between boreholes. Contractors bidding on, or undertaking the works, must conduct their own investigations, and interpretations of the factual borehole data, and draw their own conclusions as to how the subsoil and groundwater conditions may affect their construction techniques, scheduling and costs.

It is further noted that, depending on the time of year the field work was completed, water levels should be expected to vary, perhaps significantly from those observed at the time of this investigation.

Appendix 1 Drawings

G:\124\P-0004553 METROLINX ENVIRONMENTAL SERVICES\Z5_CAD\027\P-0004553-027.DWG

0 1 2 3 4 5 10 cm



LEGEND

BOREHOLE LOCATION

NOTES :

1 - REFERENCE: Google Earth 2015
2 - Drawing scale may be distorted due to file conversion and /or copying. Measurements taken from the drawing must be verified in the field.

Project

GEOTECHNICAL INVESTIGATION
PORT CREDIT GO TRANSIT
PARKING LOT

MISSISSAUGA, ONTARIO

Title

BOREHOLE LOCATION PLAN

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Checked	H. Akbari	Date	2016/02/01		

M. dept.	Project	Work pckg.	Sub-w.p.	Disc.	Type	Drawing no.	Rev.
124	P-0004553	0-01	027	GE	D	01	00

Appendix 2 Borehole and RQD Logs

LOG OF BOREHOLE No. 01-16

Englobe

Project No. P-0004553-027 DRAWING No. BH01-16

Project: Geotechnical Investigation - Port Credit Go Station Sheet No. 1 of 2

Location: North of North Access Road

Date Drilled: 21/1/2016

Drill Type: Hollow Stem Augers & NQ Core Barrel

Datum: Geodetic

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

GWL	SYMBOL	SOIL DESCRIPTION	ELEV. m
			99.3
		ASPHALT CONCRETE (75 mm)	99.2
		SAND AND GRAVEL: compact, brown to dark brown, moist	98.5
		SANDY SILT: compact, brown, very moist	97.8
		CLAYEY SILT: some sand, compact, brown, moist	97.0
		SANDY SILT: compact, brown to grey, very moist	95.8
		TILL: sandy silt, grey, compact, moist trace shale fragments, dense to very dense	90.2
		WEATHERED SHALE	88.6
		BEDROCK: shale interbedded with a few thin limestone layers, fair, grey CR = 88.6% RQD = 55.4% CR = 100% RQD = 58.3% CR = 100% RQD = 88.3%	

DEPTH 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Standard Penetration Test N Value: 20 40 60 80
Shear Strength kPa: 50 100 150 200
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30

/25 mm
/75 mm
/15 mm

SAMPLES

Natural Unit Weight kN/m³

Continued Next Page

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	none	none

LOG OF BOREHOLE No. 01-16

Englobe

Project No. P-0004553-027 DRAWING No. BH01-16

Project: Geotechnical Investigation - Port Credit Go Station Sheet No. 2 of 2

GWL	SYMBOL	SOIL DESCRIPTION	ELEV. m	DEPTH	Standard Penetration Test N Value / Shear Strength kPa	Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Weight kN/m³
			84.3	15	20 40 60 80 / 50 100 150 200	10 20 30		
		BEDROCK: shale interbedded with a few thin limestone layers, fair, grey						
		CR = 88.6% RQD = 55.4% *(continued)*		16				
		CR = 100% RQD = 92.3%						
		CR = 100% RQD = 93.9%		17				
		CR = 71.9% RQD = 32.0%		18				
		CR = 100% RQD = 19.0%		19				
		CR = 100% RQD = 50.7%		20				
		CR = 100% RQD = 37.8%		21				
		CR = 100% RQD = 54.9%		22				
			73.3	23				
		Terminated at 26.0 m		24				
		Borehole advanced using continuous flight hollow stem augering and NQ core barrel equipment on January 21, 2016 by Drilltech Drilling Limited.		25				
		No water was encountered upon borehole completion.		26				

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	none	none

LOG A GWWL02_ENGLOBE P-0004553-027-BOREHOLE LOGS.GPJ LOG A GWGL02.GDT 8/2/16

LOG OF BOREHOLE No. 02-16

Englobe

Project No. P-0004553-027 DRAWING No. BH02-16

Project: Geotechnical Investigation - Port Credit Go Station Sheet No. 1 of 2

Location: Northwest Corner of East Parking Lot

Date Drilled: 23/1/2016

Drill Type: Hollow Stem Augers & NQ Core Barrel

Datum: Geodetic

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

GWL	SYMBOL	SOIL DESCRIPTION	ELEV. m	DEPTH
		ASPHALT CONCRETE (75 mm)	98.8	0
		SAND AND GRAVEL: very dense, light brown, moist	98.7	
		SANDY SILT: compact, dark brown to brown, wet	98.0	
		TILL: silty sand, some clay, trace gravel, compact, grey, moist	95.8	3
		trace shale fragments		6
		WEATHERED SHALE	89.8	9
		BEDROCK: shale interbedded with a few thin limestone layers, fair, grey	88.1	11
		CR = 100% RQD = 52.6%		
		CR = 94.8% RQD = 53.9%		
		CR = 100% RQD = 67.4%		

Standard Penetration Test N Value
Shear Strength kPa: 20 40 60 80 / 50 100 150 200
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30
SAMPLES
Natural Unit Weight kN/m³

100 mm
/50 mm

Continued Next Page

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	none	none

LOG A GWWL02_ENGLOBE P-0004553-027-BOREHOLE LOGS.GPJ LOG A GWGL02.GDT 8/2/16

LOG OF BOREHOLE No. 02-16

Englobe

Project No. P-0004553-027 DRAWING No. BH02-16

Project: Geotechnical Investigation - Port Credit Go Station Sheet No. 2 of 2

GWL	SYMBOL	SOIL DESCRIPTION	ELEV. m	DEPTH	Standard Penetration Test N Value / Shear Strength kPa	Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Weight kN/m³
			83.8	15	20 40 60 80 / 50 100 150 200	10 20 30		
		BEDROCK: shale interbedded with a few thin limestone layers, fair, grey						
		CR = 100% RQD = 52.6% *(continued)*		16				
		CR = 98.7% RQD = 68.4%		17				
		CR = 100% RQD = 90.2%		18				
		CR = 98.0% RQD = 38.2%		19				
		CR = 100% RQD = 49.0%		20				
		CR = 100% RQD = 94.1%		21				
		CR = 98.7% RQD = 87.1%		22				
		CR = 95.4% RQD = 47.4%		23				
			72.8	24				
		Terminated at 26.0 m		25				
		Borehole advanced using continuous flight hollow stem augering and NQ core barrel equipment on January 23, 2016 by Drilltech Drilling Limited.		26				
		No water was encountered upon borehole completion.						

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	none	none

LOG A GWWL02_ENGLOBE P-0004553-027-BOREHOLE LOGS.GPJ LOG A GWGL02.GDT 8/2/16

LOG OF BOREHOLE No. 03-16

Englobe

Project No. P-0004553-027 DRAWING No. BH03-16

Project: Geotechnical Investigation - Port Credit Go Station Sheet No. 1 of 2

Location: Northeast Corner of East Parking Lot

Date Drilled: 18/1/2016

Drill Type: Hollow Stem Augers & NQ Core Barrel

Datum: Geodetic

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

GWL	SYMBOL	SOIL DESCRIPTION	ELEV. m
		ASPHALT CONCRETE (100 mm)	98.8
		SAND AND GRAVEL: trace silt, compact, brown, moist	98.7
		SANDY SILT: trace clay, compact, brown, very moist	98.0
		TILL: clayey silt, some sand, trace gravel, compact, brown, moist	97.3
		grey	
		becoming dense	
		trace shale fragments, becoming very dense	
▼			91.8
		WEATHERED SHALE	88.3

Standard Penetration Test N Value
Shear Strength kPa
Natural Moisture Content % Atterberg Limits (% Dry Weight)

/25 mm
/200 mm
/125 mm
/75 mm
/50 mm

SAMPLES: 21.0

Natural Unit Weight kN/m³

LOG A GWWL02_ENGLOBE P-0004553-027-BOREHOLE LOGS.GPJ LOG A GWGL02.GDT 8/2/16

Continued Next Page

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	7.0 m	none

LOG OF BOREHOLE No. 03-16

Englobe

Project No. P-0004553-027 DRAWING No. BH03-16

Project: Geotechnical Investigation - Port Credit Go Station Sheet No. 2 of 2

GWL	SYMBOL	SOIL DESCRIPTION	ELEV. m	DEPTH	Standard Penetration Test N Value / Shear Strength kPa	Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Weight kN/m³
			83.8		20 40 60 80 / 50 100 150 200	10 20 30		
			83.6	15				
		BEDROCK: shale interbedded with a few thin limestone layers, good, grey						
		CR = 88.0% RQD = 60.7% CR = 93.4% RQD = 92.8%		16				
		CR = 100% RQD = 100%		17				
				18				
		CR = 100% RQD = 100%		19				
				20				
		CR = 92.1% RQD = 80.9%		21				
				22				
		CR = 100% RQD = 82.2%		23				
				24				
		CR = 100% RQD = 94.7%		25				
		CR = 100% RQD = 78.0%	72.8	26				
		Terminated at 26.0 m						

Borehole advanced using continuous flight hollow stem augering and NQ core barrel equipment on January 18, 2016 by Determination Drilling.

Water was encountered at 7.0 m upon borehole completion.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	7.0 m	none

LOG OF BOREHOLE No. 04-16

Englobe

Project No. P-0004553-027 DRAWING No. BH04-16

Project: Geotechnical Investigation - Port Credit Go Station Sheet No. 1 of 2

Location: In the Center of East Parking Lot

Date Drilled: 21/1/2016

Drill Type: Hollow Stem Augers & NQ Core Barrel

Datum: Geodetic

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

GWL	SYMBOL	SOIL DESCRIPTION	ELEV. m	DEPTH
			98.5	0
		ASPHALT CONCRETE (115 mm)	98.4	
		SAND AND GRAVEL: some silt, compact, brown, moist	97.7	
		SANDY SILT: trace clay, loose, brown, wet	97.0	1
		TILL: silty sand, some clay, trace gravel, compact to dense, brown, very moist		2
		moist		
		grey		3
				4
				5
				6
				7
		trace shale fragments, becoming very dense		8
			89.4	9
		WEATHERED SHALE		10
			87.7	11
		BEDROCK: shale interbedded with a few thin limestone layers, good, grey		12
		CR = 69.2% RQD = 30.8% CR = 97.4% RQD = 90.8%		13
		CR = 100% RQD = 98.7%		14
				15

Standard Penetration Test N Value: 20, 40, 60, 80
Shear Strength kPa: 50, 100, 150, 200
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10, 20, 30
/50 mm

SAMPLES: 21.6

Natural Unit Weight kN/m³

LOG A GWWL02_ENGLOBE P-0004553-027-BOREHOLE LOGS.GPJ LOG A GWGL02.GDT 8/2/16

Continued Next Page

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	none	none

LOG OF BOREHOLE No. 04-16

Englobe

Project No. P-0004553-027 DRAWING No. BH04-16

Project: Geotechnical Investigation - Port Credit Go Station Sheet No. 2 of 2

GWL	SYMBOL	SOIL DESCRIPTION	ELEV. m	DEPTH	Standard Penetration Test N Value / Shear Strength kPa	Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Weight kN/m³
			83.5	15	20 40 60 80 / 50 100 150 200	10 20 30		
		CR = 98.7% RQD = 97.1% BEDROCK: shale interbedded with a few thin limestone layers, good, grey						
		CR = 69.2% RQD = 30.8% *(continued)*		16				
		CR = 100% RQD = 84.2%		17				
		CR = 100% RQD = 96.1%		18				
		CR = 100% RQD = 97.4%		19				
		CR = 100% RQD = 100%		20				
		CR = 100% RQD = 100%		21				
		CR = 100% RQD = 82.2%		22				
		CR = 100% RQD = 82.0%	72.5	23				
		Terminated at 26.0 m		24				
		Borehole advanced using continuous flight hollow stem augering and NQ core barrel equipment on January 21, 2016 by Determination Drilling. No water was encountered upon borehole completion.		25				
				26				

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	none	none

LOG A GWWL02_ENGLOBE P-0004553-027-BOREHOLE LOGS.GPJ LOG A GWGL02.GDT 8/2/16

LOG OF BOREHOLE No. 05-16

Englobe

Project No. P-0004553-027 DRAWING No. BH05-16

Project: Geotechnical Investigation - Port Credit Go Station Sheet No. 1 of 2

Location: Southwest Corner of East Parking Lot

Date Drilled: 18/1/2016

Drill Type: Hollow Stem Augers & NQ Core Barrel

Datum: Geodetic

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

GWL	SYMBOL	SOIL DESCRIPTION	ELEV. m	DEPTH
		ASPHALT CONCRETE (100 mm)	97.5	0
		SAND AND GRAVEL: compact, brown, moist	97.4	
		SANDY SILT: some clay, compact, brown, very moist	96.7	1
		CLAYEY SILT: trace sand, dense, grey, moist	96.0	2
		TILL: clayey silt, trace sand, compact, grey, moist	95.2	
		becoming dense to very dense		3
				4
				5
				6
				7
		trace shale fragments		8
▼			88.4	9
				10
			87.0	
		WEATHERED SHALE		11
				12
				13
				14
				15

Standard Penetration Test N Value
Shear Strength kPa: 20, 40, 60, 80; 50, 100, 150, 200
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10, 20, 30
SAMPLES
Natural Unit Weight kN/m³

/75 mm
/100 mm
/100 mm
/100 mm
/100 mm

LOG A GWWL02_ENGLOBE P-0004553-027-BOREHOLE LOGS.GPJ LOG A GWGL02.GDT 8/2/16

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Time	Water Level (m)	Depth to Cave (m)
Upon Completion	9.1 m	none

LOG OF BOREHOLE No. 05-16

Englobe

Project No. P-0004553-027 DRAWING No. BH05-16

Project: Geotechnical Investigation - Port Credit Go Station Sheet No. 2 of 2

GWL	SYMBOL	SOIL DESCRIPTION	ELEV. m	DEPTH	Standard Penetration Test N Value / Shear Strength kPa (20 40 60 80 / 50 100 150 200)	Natural Moisture Content % Atterberg Limits (% Dry Weight) (10 20 30)	SAMPLES	Natural Unit Weight kN/m³
			82.5	15				
			82.3					
		BEDROCK: shale interbedded with a few thin limestone layers, fair, grey		16				
		CR = 29.6% RQD = 0%						
		CR = 100% RQD = 56.2%		17				
				18				
		CR = 95.4% RQD = 74.7%		19				
		CR = 79.1% RQD = 60.1%		20				
				21				
		CR = 90.1% RQD = 77.0%		22				
		CR = 100% RQD = 75.0%		23				
				24				
		CR = 92.2% RQD = 87.3%		25				
			71.5	26				
		Terminated at 26.0 m						

Borehole advanced using continuous flight hollow stem augering and NQ core barrel equipment on January 18, 2016 by Drilltech Drilling Limited.

Water water was encountered at 9.1 m upon borehole completion.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	9.1 m	none

LOG A GWWL02_ENGLOBE P-0004553-027-BOREHOLE LOGS.GPJ LOG A GWGL02.GDT 8/2/16

LOG OF BOREHOLE No. 06-16

Englobe

Project No. P-0004553-027 DRAWING No. BH06-16

Project: Geotechnical Investigation - Port Credit Go Station Sheet No. 1 of 2

Location: Southeast Corner of East Parking Lot

Date Drilled: 20/1/2016

Drill Type: Hollow Stem Augers & NQ Core Barrel

Datum: Geodetic

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

GWL	SYMBOL	SOIL DESCRIPTION	ELEV. m	DEPTH
		ASPHALT CONCRETE (100 mm)	97.4	0
		SAND AND GRAVEL: dense, brown, moist	97.3	
		SANDY SILT: trace clay, compact, brown, very moist	96.7	1
		TILL: silty sand, some clay, trace gravel, dense to very dense, brown, moist	95.9	2
		grey		3
▼			93.4	4
		trace shale fragments		5
				6
				7
		/15 mm		8
		/25 mm		9
			87.7	10
		WEATHERED SHALE		
			86.7	11
		BEDROCK: shale interbedded with a few thin limestone layers, good, grey		12
		CR = 80.8% RQD = 52.5% CR = 98.7% RQD = 78.1%		13
		CR = 100% RQD = 91.4%		14
		CR = 96.2%		15

Standard Penetration Test N Value: 20 40 60 80
Shear Strength: 50 100 150 200 kPa
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30

SAMPLES

Natural Unit Weight kN/m³: 21.7

Continued Next Page

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	4.0 m	none

LOG A GWWL02_ENGLOBE P-0004553-027-BOREHOLE LOGS.GPJ LOG A GWGL02.GDT 8/2/16

LOG OF BOREHOLE No. 06-16

Englobe

Project No. P-0004553-027 DRAWING No. BH06-16

Project: Geotechnical Investigation - Port Credit Go Station Sheet No. 2 of 2

GWL	SYMBOL	SOIL DESCRIPTION	ELEV. m	DEPTH	Standard Penetration Test N Value / Shear Strength kPa	Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Weight kN/m³
			82.4		20 40 60 80 / 50 100 150 200	10 20 30		
		RQD = 78.8% BEDROCK: shale interbedded with a few thin limestone layers, good, grey		15				
		CR = 80.8% RQD = 52.5% *(continued)*		16				
		CR = 100% RQD = 71.6%		17				
		CR = 100% RQD = 98.3%		18				
		CR = 100% RQD = 96.0%		19				
		CR = 96.1% RQD = 92.8%		20				
		CR = 100% RQD = 95.4%		21				
		CR = 100% RQD = 100%		22				
		CR = 100% RQD = 100%		23				
				24				
				25				
			71.4	26				

Terminated at 26.0 m

Borehole advanced using continuous flight hollow stem augering and NQ core barrel equipment on January 20, 2016 by Determination Drilling.

Water was encountered at 4.0 m upon borehole completion.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	4.0 m	none

LOG A GWWL02_ENGLOBE P-0004553-027-BOREHOLE LOGS.GPJ LOG A GWGL02.GDT 8/2/16

RQD Data Sheet

Project:	P-0004553-027, Port Credit Go Station			Date:	2016-01-25
Core Box I.D.No.:	59603		BH 1-1	Recorder:	J. Yao
Total Length of Core Run, mm	15260		Drilling Company:	Drilltech Drilling Limited	
Core Diametre, mm	47	Depth:	10.74 m to 26.00 m	Drilling Date:	2016-01-21

Depth, m	Photographic Image of Core	Length of Each Sound Piece of Core > 100 mm	Remarks
10.760 to 10.900		140	RUN # CR (%) RQD (%)
11.275 to 11.400		125	RUN 1 88.6 55.4
11.430 to 11.620		190	RUN 2 100.0 58.3
11.760 to 12.260		500	RUN 3 100.0 88.3
12.720 to 12.880		160	RUN 4 100.0 92.3
12.960 to 13.180		220	RUN 5 100.0 93.9
13.230 to 13.460		230	RUN 6 100.0 32.0
13.530 to 13.665		135	RUN 7 71.9 19.0
13.860 to 15.080		1220	RUN 8 100.0 50.7
15.170 to 15.280		110	RUN 9 100 37.8
15.375 to 17.390		2015	RUN 10 100 54.9
17.410 to 17.720		310	
17.730 to 18.035		305	
18.060 to 18.270		210	
18.970 to 19.120		150	
19.170 to 19.310		140	
19.370 to 19.560		190	
20.700 to 20.990		290	
21.620 to 21.880		260	
22.060 to 22.190		130	
22.300 to 22.430		130	

Total Core Recovery Ratio (CR %) = 14.01÷15.26x100 = 91.8 %

Length of Sound Pieces of Core > 100 mm: 7160

$$\text{RQD (\%)} = \frac{\text{Length of Sound Pieces of Core > 100 mm * 100\%}}{\text{Total Length of Core Run, mm}}$$

RQD (%) =	57.8%	Rock Classification:	Fair - Shale Interbedded with a few thin Limestone Layers

RQD Data Sheet

Project:	P-0004553-027, Port Credit Go Station			Date:	2016-01-25
Core Box I.D.No.:	59603		BH 1-2	Recorder:	J. Yao
Total Length of Core Run, mm	15260		Drilling Company:	Drilltech Drilling Limited	
Core Diametre, mm	47	Depth:	10.74 m to 26.00 m	Drilling Date:	2016-01-21

Depth, m	Photographic Image of Core	Length of Each Sound Piece of Core > 100 mm	Remarks
22.530 to 22.780		250	
23.210 to 23.400		190	
23.910 to 24.095		185	
24.180 to 24.380		200	
24.390 to 24.620		230	
24.660 to 24.830		170	
24.920 to 25.030		110	
25.170 to 25.500		330	

RUN #	CR (%)	RQD (%)
RUN 1	88.6	55.4
RUN 2	100.0	58.3
RUN 3	100.0	88.3
RUN 4	100.0	92.3
RUN 5	100.0	93.9
RUN 6	100.0	32.0
RUN 7	71.9	19.0
RUN 8	100.0	50.7
RUN 9	100	37.8
RUN 10	100	54.9

Total Core Recovery Ratio (CR %) = 14.01÷15.26x100 = 91.8 %

Length of Sound Pieces of Core > 100 mm: 1665

$$\text{RQD (\%)} = \frac{\text{Length of Sound Pieces of Core > 100 mm * 100\%}}{\text{Total Length of Core Run, mm}}$$

RQD (%) =	57.8%	Rock Classification:	Fair - Shale Interbedded with a few thin Limestone Layers

RQD Data Sheet

Project:	P-0004553-027, Port Credit Go Station			Date:	2016-01-25
Core Box I.D.No.:	59603		BH 2-1	Recorder:	J. Yao
Total Length of Core Run, mm	15330		Drilling Company:	Drilltech Drilling Limited	
Core Diametre, mm	47	Depth:	10.67 m to 26.00 m	Drilling Date:	2016-01-24

Depth, m	Photographic Image of Core	Length of Each Sound Piece of Core > 100 mm	Remarks
12.285 to 12.405		120	RUN # CR (%) RQD (%)
12.460 to 12.660		200	RUN 1 100.0 52.6
13.030 to 13.310		280	RUN 2 94.8 53.9
13.590 to 13.700		110	RUN 3 100.0 67.4
12.460 to 12.575		115	RUN 4 98.7 68.4
13.960 to 14.260		300	RUN 5 100.0 90.2
14.400 to 14.550		150	RUN 6 98.0 38.2
14.610 to 14.720		110	RUN 7 100.0 49.0
14.860 to 15.045		185	RUN 8 100.0 94.1
15.060 to 15.420		360	RUN 9 98.7 87.1
15.445 to 16.155		710	RUN 10 95.4 47.4
16.000 to 16.150		150	
16.800 to 18.030		1230	
18.080 to 18.230		150	
19.005 to 19.160		155	
19.275 to 19.700		425	
19.910 to 20.610		700	
20.900 to 21.100		200	
21.340 to 21.590		250	
21.680 to 23.200		1520	
23.205 to 23.405		200	

Total Core Recovery Ratio (CR %) = 15.02÷15.33x100 = 98.0 %

Length of Sound Pieces of Core > 100 mm: 7620

$$\text{RQD (\%)} = \frac{\text{Length of Sound Pieces of Core > 100 mm * 100\%}}{\text{Total Length of Core Run, mm}}$$

RQD (%) =	62.8%	Rock Classification:	Fair - Shale Interbedded with a few thin Limestone Layers

RQD Data Sheet

Project:	P-0004553-027, Port Credit Go Station			Date:	2016-01-25
Core Box I.D.No.:	59603		BH 2-2	Recorder:	J. Yao
Total Length of Core Run, mm	15330		Drilling Company:	Drilltech Drilling Limited	
Core Diametre, mm	47	Depth:	10.67 m to 26.00 m	Drilling Date:	2016-01-24

Depth, m	Photographic Image of Core	Length of Each Sound Piece of Core > 100 mm	Remarks
23.570 to 23.965		395	
23.980 to 24.370		390	
24.570 to 24.685		115	
24.700 to 24.875		175	
24.960 to 25.290		330	
25.400 to 26.000		600	

RUN #	CR (%)	RQD (%)
RUN 1	100.0	52.6
RUN 2	94.8	53.9
RUN 3	100.0	67.4
RUN 4	98.7	68.4
RUN 5	100.0	90.2
RUN 6	98.0	38.2
RUN 7	100.0	49.0
RUN 8	100.0	94.1
RUN 9	98.7	87.1
RUN 10	95.4	47.4

Total Core Recovery Ratio (CR %) = 15.02÷15.33x100 = 98.0 %

Length of Sound Pieces of Core > 100 mm: 2005

$$\text{RQD (\%)} = \frac{\text{Length of Sound Pieces of Core > 100 mm * 100\%}}{\text{Total Length of Core Run, mm}}$$

RQD (%) =	62.8%	Rock Classification:	Fair - Shale Interbedded with a few thin Limestone Layers

RQD Data Sheet

Project:	P-0004553-027, Port Credit Go Station			Date:	2016-01-20
Core Box I.D.No.:	59593		BH 3	Recorder:	J. Yao
Total Length of Core Run, mm	10940		Drilling Company:	Determination Drilling	
Core Diametre, mm	47	Depth:	15.24 m to 26.18 m	Drilling Date:	2016-01-18

Depth, m	Photographic Image of Core	Length of Each Sound Piece of Core > 100 mm	Remarks		
			RUN #	CR (%)	RQD (%)
15.660 to 16.310		650			
16.310 to 17.070		760	RUN 1	88.0	60.7
17.080 to 17.730		650	RUN 2	93.4	92.8
17.830 to 19.350		1520	RUN 3	100.0	100.0
19.350 to 20.880		1530	RUN 4	100.0	100.0
20.880 to 21.590		710	RUN 5	92.1	80.9
21.610 to 22.130		520	RUN 6	100.0	82.2
22.400 to 23.090		690	RUN 7	100.0	94.7
23.140 to 23.700		560	RUN 8	100.0	78.0
23.930 to 24.800		870			
24.880 to 25.450		570			
25.610 to 26.180		570			

Total Core Recovery Ratio (CR %) = 10.59÷10.94x100 = 96.8 %

Length of Sound Pieces of Core > 100 mm: 9600

$$\text{RQD (\%)} = \frac{\text{Length of Sound Pieces of Core } > 100 \text{ mm} * 100\%}{\text{Total Length of Core Run, mm}}$$

RQD (%) =	87.8%	Rock Classification:	Good - Shale Interbedded with a few thin Limestone Layers

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RQD Data Sheet

Project:	P-0004553-027, Port Credit Go Station			Date:	2016-01-26
Core Box I.D.No.:	59601		BH 4-1	Recorder:	J. Yao
Total Length of Core Run, mm	15180		Drilling Company:	Determination Drilling	
Core Diametre, mm	47	Depth:	10.82 m to 26.00 m	Drilling Date:	2016-01-22

Depth, m	Photographic Image of Core	Length of Each Sound Piece of Core > 100 mm	Remarks
11.450 to 11.730		280	RUN # CR (%) RQD (%)
11.765 to 11.980		215	RUN 1 69.2 30.8
11.990 to 12.130		140	RUN 2 97.4 90.8
12.150 to 12.495		345	RUN 3 100.0 98.7
12.570 to 13.260		690	RUN 4 98.7 97.1
13.260 to 14.560		1300	RUN 5 100.0 84.2
14.580 to 14.780		200	RUN 6 100.0 96.1
14.790 to 15.580		790	RUN 7 100.0 97.4
15.615 to 16.310		695	RUN 8 100.0 100.0
16.310 to 16.590		280	
16.630 to 17.110		480	
17.150 to 17.670		520	
17.830 to 18.750		920	
18.810 to 19.350		540	
19.350 to 20.290		940	
20.330 to 20.880		550	
20.880 to 22.400		1520	

Total Core Recovery Ratio (CR %) = 14.90÷15.18x100 = 98.2 %

Length of Sound Pieces of Core > 100 mm: 10405

$$\text{RQD (\%)} = \frac{\text{Length of Sound Pieces of Core } > 100 \text{ mm} * 100\%}{\text{Total Length of Core Run, mm}}$$

RQD (%) =	89.8%	Rock Classification:	Good - Shale Interbedded with a few thin Limestone Layers

RQD Data Sheet

Project:	P-0004553-027, Port Credit Go Station			Date:	2016-01-26
Core Box I.D.No.:	59601		BH 4-2	Recorder:	J. Yao
Total Length of Core Run, mm	15180		Drilling Company:	Determination Drilling	
Core Diametre, mm	47	Depth:	10.82 m to 26.00 m	Drilling Date:	2016-01-22

Depth, m	Photographic Image of Core	Length of Each Sound Piece of Core > 100 mm	Remarks
22.400 to 23.930		1530	RUN # CR (%) RQD (%)
23.965 to 24.090		125	RUN 9 100.0 100.0
24.130 to 24.600		470	RUN 10 100.0 82.2
24.790 to 25.445		655	RUN 11 100.0 82.0
25.450 to 25.670		220	
25.780 to 26.000		220	

Total Core Recovery Ratio (CR %) = 14.90÷15.18x100 = 98.2 %

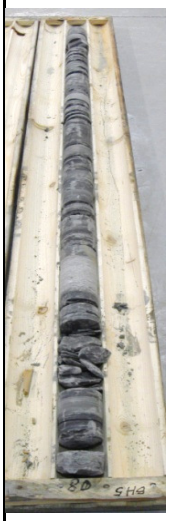
Length of Sound Pieces of Core > 100 mm: 3220

$$\text{RQD (\%)} = \frac{\text{Length of Sound Pieces of Core } > 100 \text{ mm} * 100\%}{\text{Total Length of Core Run, mm}}$$

RQD (%) =	89.8%	Rock Classification:	Good - Shale Interbedded with a few thin Limestone Layers

RQD Data Sheet

Project:	P-0004553-027, Port Credit Go Station			Date:	2016-01-20
Core Box I.D.No.:	59593		BH 5	Recorder:	J. Yao
Total Length of Core Run, mm	10760		Drilling Company:	Drilltech Drilling Limited	
Core Diametre, mm	47	Depth:	15.24 m to 26.0 m	Drilling Date:	2016-01-18

Depth, m	Photographic Image of Core	Length of Each Sound Piece of Core > 100 mm	Remarks
17.410 to 18.270		860	
18.320 to 18.435		115	
18.500 to 18.820		320	
18.860 to 18.980		120	
19.030 to 19.460		430	
19.480 to 19.630		150	
20.070 to 20.500		430	
20.630 to 21.120		490	
21.580 to 22.750		1170	
22.860 to 23.370		510	
23.660 to 24.290		630	
24.380 to 25.570		1190	
25.765 to 26.000		235	

RUN #	CR (%)	RQD (%)
RUN 1	29.6	0
RUN 2	100.0	56.2
RUN 3	95.4	74.7
RUN 4	79.1	60.1
RUN 5	90.1	77.0
RUN 6	100.0	75.0
RUN 7	92.2	87.3

Total Core Recovery Ratio (CR %) = 8.94÷10.76x100 = 83.1 %

Length of Sound Pieces of Core > 100 mm: 6650

$$\text{RQD (\%)} = \frac{\text{Length of Sound Pieces of Core } > 100 \text{ mm} * 100\%}{\text{Total Length of Core Run, mm}}$$

RQD (%) =	61.8%	Rock Classification:	Fair - Shale Interbedded with a few thin Limestone Layers

RQD Data Sheet

Project:	P-0004553-027, Port Credit Go Station			Date:	2016-01-21
Core Box I.D.No.:	59593		BH 6-1	Recorder:	J. Yao
Total Length of Core Run, mm	15330		Drilling Company:	Determination Drilling	
Core Diametre, mm	47	Depth:	10.67 m to 26.00 m	Drilling Date:	2016-01-20

Depth, m	Photographic Image of Core	Length of Each Sound Piece of Core > 100 mm	Remarks
11.130 to 11.650		520	RUN # CR (%) RQD (%)
11.660 to 11.840		180	RUN 1 80.8 52.5
11.895 to 12.015		120	RUN 2 98.7 78.1
12.120 to 12.520		400	RUN 3 100.0 91.4
12.530 to 12.800		270	RUN 4 96.2 78.8
12.820 to 13.050		230	RUN 5 100.0 71.6
13.210 to 13.770		560	RUN 6 100.0 98.3
13.770 to 14.410		640	RUN 7 100.0 96.0
14.535 to 14.660		125	
14.660 to 15.520		860	
15.680 to 15.880		200	
15.930 to 16.130		200	
16.370 to 16.685		315	
16.745 to 16.910		165	
16.915 to 17.105		190	
17.310 to 17.425		115	
17.500 to 17.860		360	
17.860 to 18.130		270	
18.140 to 19.330		1190	
19.380 to 20.010		630	
20.040 to 20.850		810	

Total Core Recovery Ratio (CR %) = 15.04÷15.33x100 = 98.1 %

Length of Sound Pieces of Core > 100 mm: 8350

$$\text{RQD (\%)} = \frac{\text{Length of Sound Pieces of Core > 100 mm * 100\%}}{\text{Total Length of Core Run, mm}}$$

RQD (%) =	86.9%	Rock Classification:	Good - Shale Interbedded with a few thin Limestone Layers

RQD Data Sheet

Project:	P-0004553-027, Port Credit Go Station			Date:	2016-01-21
Core Box I.D.No.:	59593		BH 6-2	Recorder:	J. Yao
Total Length of Core Run, mm	15330		Drilling Company:	Determination Drilling	
Core Diametre, mm	47	Depth:	10.67 m to 26.00 m	Drilling Date:	2016-01-20

Depth, m	Photographic Image of Core	Length of Each Sound Piece of Core > 100 mm	Remarks		
20.850 to 21.560		710	RUN #	CR (%)	RQD (%)
21.670 to 22.380		710	RUN 8	96.1	92.8
22.380 to 23.730		1350	RUN 9	100.0	95.4
23.800 to 23.900		100	RUN 10	100.0	100.0
23.900 to 25.450		1550	RUN 11	100.0	100.0
25.450 to 26.000		550			

Total Core Recovery Ratio (CR %) = 15.04÷15.33x100 = 98.1 %

Length of Sound Pieces of Core > 100 mm: 4970

$$\text{RQD (\%)} = \frac{\text{Length of Sound Pieces of Core > 100 mm * 100\%}}{\text{Total Length of Core Run, mm}}$$

RQD (%) =	86.9%	Rock Classification:	Good - Shale Interbedded with a few thin Limestone Layers

Appendix 3 Geotechnical Testing

Englobe
1821 Albion Road, Unit 7, Toronto (Ontario) M9WW8
T 416.213.1060 | F 416.213.1070
toronto@englobecorp.com | www.englobecorp.com

GRAIN SIZE ANALYSIS AND HYDROMETER TEST REPORT
MTO LS-602, 702, AND 703/704

PROJECT: P-0004553-027 CLIENT/JOB NAME: Metrolinx Environmental Sevices CONTRACT NUMBER: NA

SAMPLE ID: 59604 PROJECT/LOCATION: Geotechnical Investigation/ Port Credit Go Station

SAMPLING LOCATION:	BH1 SS8
SAMPLING DEPTH, m	7.50
SAMPLING METHOD:	SS
SAMPLED BY:	EM, LVM
SAMPLE DESCRIPTION:	Sandy Silt, some Clay, trace Gravel
SAMPLING DATE:	25/01/2016
SAMPLE RECEIVED DATE:	25/01/2016
GRAIN SIZE PROPORTIONS, %	
% GRAVEL (> 4.75 mm):	6.7
% SAND (75 µm to 4.75 mm):	31.0
% Silt (5 µm to 75 µm):	32.4
% Clay (<5 µm):	29.9
SUSCEPTIBILITY TO FROST HEAVING:	Low

GRAIN SIZE ANALYSIS		HYDROMETER ANALYSIS	
SIEVE SIZE mm	% PASSING	DIAMETER mm	% PASSING
53.0	100.0	0.037	51.3
37.5	100.0	0.026	47.5
26.5	100.0	0.017	42.8
19.0	100.0	0.010	38.2
13.2	97.9	0.007	33.9
9.5	97.1	0.005	29.9
4.75	93.3	0.003	24.2
2.36	87.3	0.001	15.0
1.18	82.5	ATTERBERG LIMITS, %	
0.60	77.6		
0.30	73.0	Plastic Limit	
0.15	67.6	Liquid Limit	
0.075	62.3	Plastic Index	

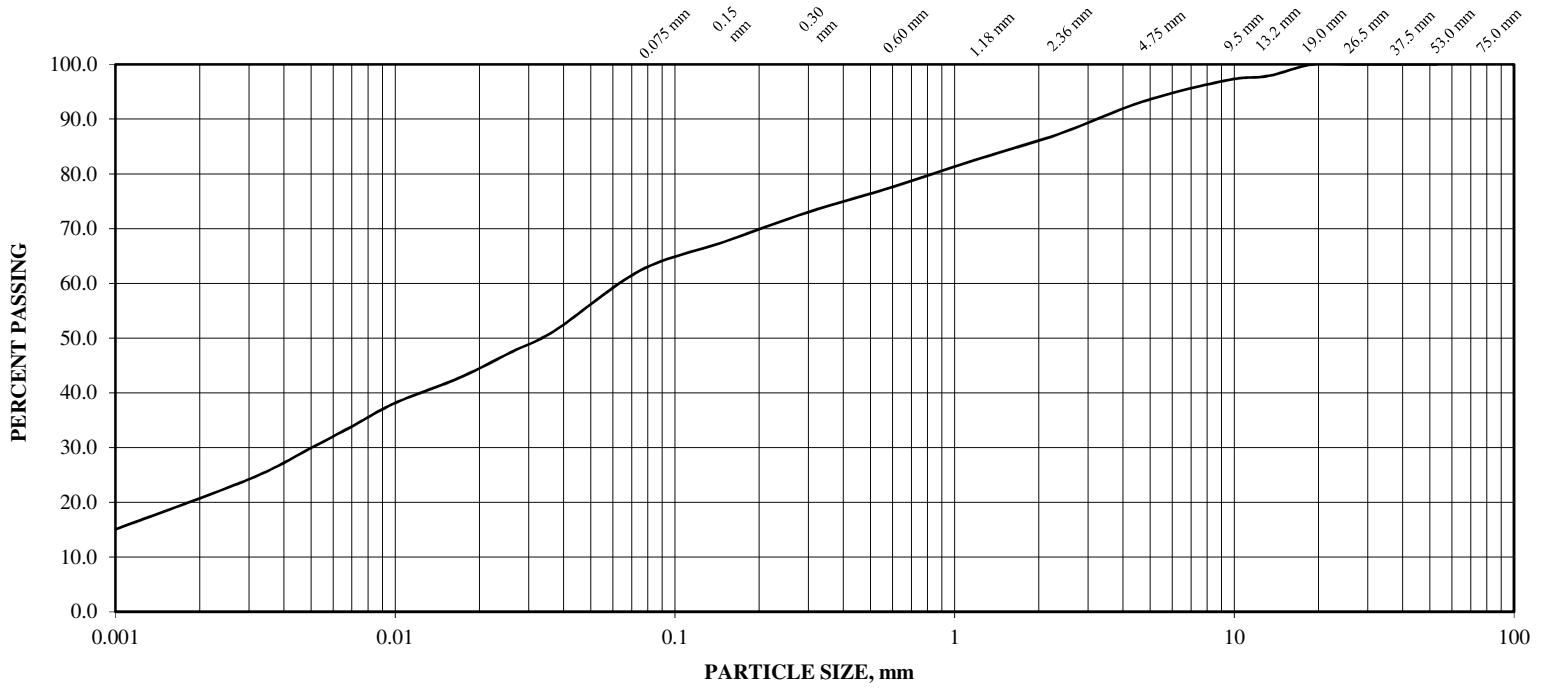
PARTICLE SIZE DISTRIBUTION, MTO LS-702

U.S. BUREAU OF SOILS CLASSIFICATION (AS USED IN MINISTRY OF TRANSPORTATION OF ONTARIO PAVEMENT DESIGNS)

CLAY	SILT	VERY FINE SAND	FINE SAND	MEDIUM SAND	COARSE SAND	FINE GRAVEL	GRAVEL

UNIFIED SOILS CLASSIFICATION ASTM D 2487

FINES (SILT & CLAY)	FINE SAND	MEDIUM SAND	COARSE SAND	FINE GRAVEL	COARSE GRAVEL



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GRAIN SIZE ANALYSIS AND HYDROMETER TEST REPORT
MTO LS-602, 702, AND 703/704

PROJECT: P-0004553-027 CLIENT/JOB NAME: Metrolinx Environmental Sevices CONTRACT NUMBER: NA

SAMPLE ID: 59605 PROJECT/LOCATION: Geotechnical Investigation/ Port Credit Go Station

SAMPLING LOCATION:	BH2 SS6
SAMPLING DEPTH, m	6.00
SAMPLING METHOD:	SS
SAMPLED BY:	EM, LVM
SAMPLE DESCRIPTION:	Silty Sand, some Clay, trace Gravel
SAMPLING DATE:	25/01/2016
SAMPLE RECEIVED DATE:	25/01/2016
GRAIN SIZE PROPORTIONS, %	
% GRAVEL (> 4.75 mm):	6.8
% SAND (75 µm to 4.75 mm):	35.1
% Silt (5 µm to 75 µm):	30.0
% Clay (<5 µm):	28.1
SUSCEPTIBILITY TO FROST HEAVING:	Low

GRAIN SIZE ANALYSIS		HYDROMETER ANALYSIS	
SIEVE SIZE mm	% PASSING	DIAMETER mm	% PASSING
53.0	100.0	0.037	48.0
37.5	100.0	0.026	44.6
26.5	100.0	0.017	41.1
19.0	100.0	0.010	36.0
13.2	97.2	0.007	32.3
9.5	97.2	0.005	28.1
4.75	93.2	0.003	21.5
2.36	87.5	0.001	15.1
1.18	81.7	ATTERBERG LIMITS, %	
0.60	74.7		
0.30	68.7	Plastic Limit	
0.15	63.1	Liquid Limit	
0.075	58.1	Plastic Index	

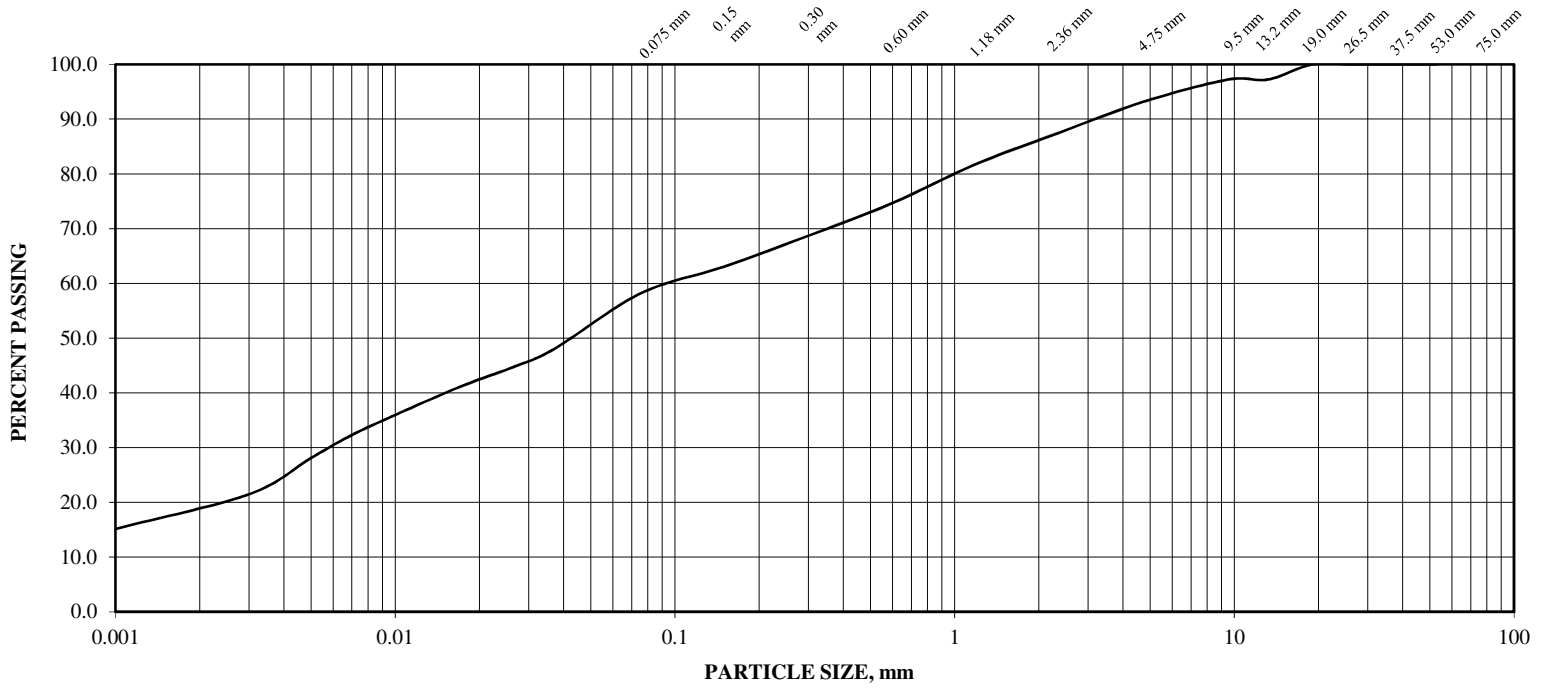
PARTICLE SIZE DISTRIBUTION, MTO LS-702

U.S. BUREAU OF SOILS CLASSIFICATION (AS USED IN MINISTRY OF TRANSPORTATION OF ONTARIO PAVEMENT DESIGNS)

CLAY	SILT	VERY FINE SAND	FINE SAND	MEDIUM SAND	COARSE SAND	FINE GRAVEL	GRAVEL

UNIFIED SOILS CLASSIFICATION ASTM D 2487

FINES (SILT & CLAY)	FINE SAND	MEDIUM SAND	COARSE SAND	FINE GRAVEL	COARSE GRAVEL



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GRAIN SIZE ANALYSIS AND HYDROMETER TEST REPORT
MTO LS-602, 702, AND 703/704

PROJECT: P-0004553-027 CLIENT/JOB NAME: Metrolinx CONTRACT NUMBER: NA

SAMPLE ID: 59580 PROJECT/LOCATION: Geotechnical Investigation/ Port Credit Go Station

SAMPLING LOCATION:	BH3 SS4
SAMPLING DEPTH, m	
SAMPLING METHOD:	SS
SAMPLED BY:	EM, LVM
SAMPLE DESCRIPTION:	Clayey Silt, some Sand, trace Gravel
SAMPLING DATE:	14/01/2016
SAMPLE RECEIVED DATE:	14/01/2016

GRAIN SIZE PROPORTIONS, %

% GRAVEL (> 4.75 mm):	5.2
% SAND (75 µm to 4.75 mm):	27.9
% Silt (5 µm to 75 µm):	36.5
% Clay (<5 µm):	30.4
SUSCEPTIBILITY TO FROST HEAVING:	Low

GRAIN SIZE ANALYSIS		HYDROMETER ANALYSIS	
SIEVE SIZE mm	% PASSING	DIAMETER mm	% PASSING
53.0	100.0	0.037	57.8
37.5	100.0	0.026	53.2
26.5	100.0	0.017	48.8
19.0	100.0	0.010	41.2
13.2	100.0	0.007	35.1
9.5	98.0	0.005	30.4
4.75	94.8	0.003	24.4
2.36	89.0	0.001	17.1
1.18	85.1	ATTERBERG LIMITS, %	
0.60	80.2		
0.30	75.7	Plastic Limit	
0.15	71.4	Liquid Limit	
0.075	66.9	Plastic Index	

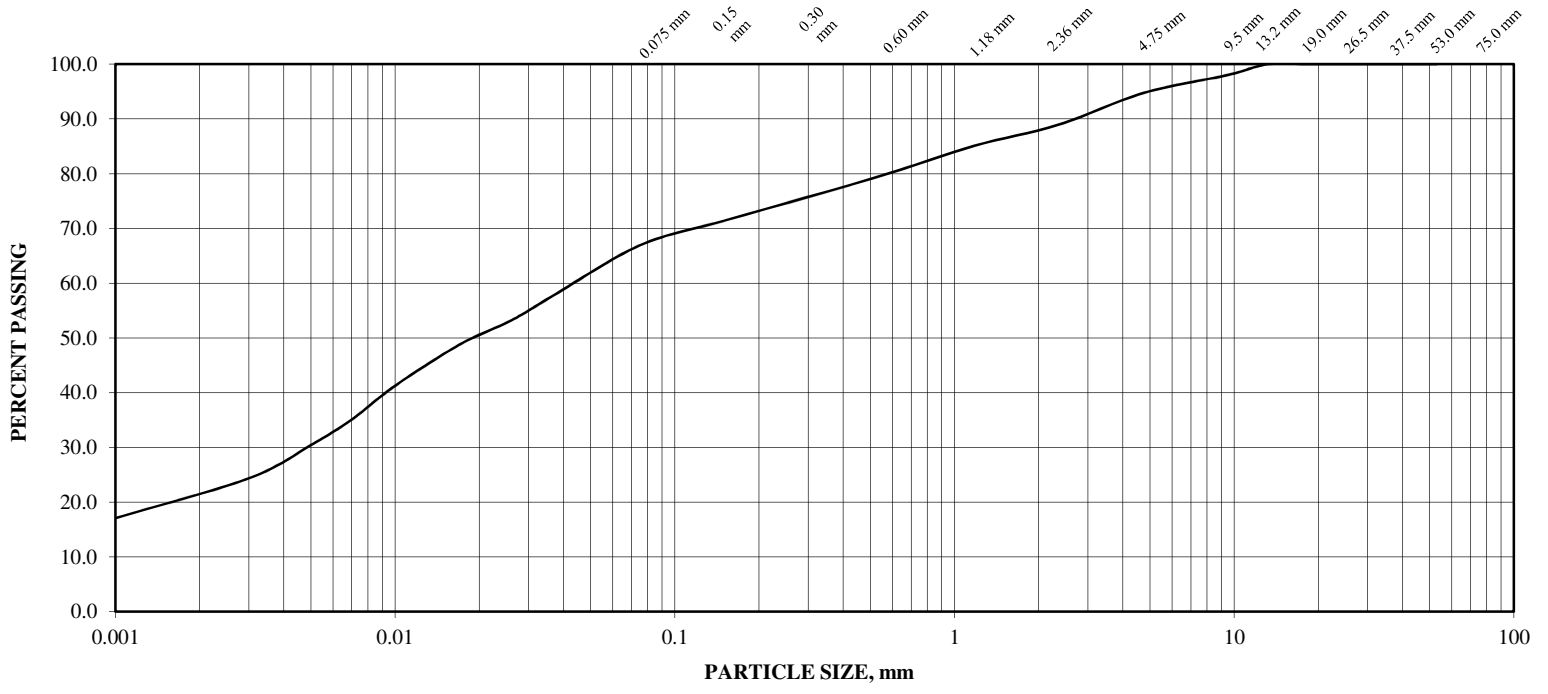
PARTICLE SIZE DISTRIBUTION, MTO LS-702

U.S. BUREAU OF SOILS CLASSIFICATION (AS USED IN MINISTRY OF TRANSPORTATION OF ONTARIO PAVEMENT DESIGNS)

CLAY	SILT	VERY FINE SAND	FINE SAND	MEDIUM SAND	COARSE SAND	FINE GRAVEL	GRAVEL

UNIFIED SOILS CLASSIFICATION ASTM D 2487

FINES (SILT & CLAY)	FINE SAND	MEDIUM SAND	COARSE SAND	FINE GRAVEL	COARSE GRAVEL



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GRAIN SIZE ANALYSIS AND HYDROMETER TEST REPORT
MTO LS-602, 702, AND 703/704

PROJECT: P-0004553-027 CLIENT/JOB NAME: Metrolinx Environmental Sevices CONTRACT NUMBER: NA

SAMPLE ID: 59599 PROJECT/LOCATION: Geotechnical Investigation/ Port Credit Go Station

SAMPLING LOCATION:	BH4 SS6
SAMPLING DEPTH, m	5.00
SAMPLING METHOD:	SS
SAMPLED BY:	EM, LVM
SAMPLE DESCRIPTION:	Silty Sand, some Clay, trace Gravel
SAMPLING DATE:	21/01/2016
SAMPLE RECEIVED DATE:	21/01/2016
GRAIN SIZE PROPORTIONS, %	
% GRAVEL (> 4.75 mm):	4.6
% SAND (75 µm to 4.75 mm):	33.8
% Silt (5 µm to 75 µm):	32.1
% Clay (<5 µm):	29.5
SUSCEPTIBILITY TO FROST HEAVING:	Low

GRAIN SIZE ANALYSIS		HYDROMETER ANALYSIS	
SIEVE SIZE mm	% PASSING	DIAMETER mm	% PASSING
53.0	100.0	0.037	52.6
37.5	100.0	0.026	48.8
26.5	100.0	0.017	44.6
19.0	100.0	0.010	39.4
13.2	99.3	0.007	35.0
9.5	99.3	0.005	29.5
4.75	95.4	0.003	22.8
2.36	89.9	0.001	16.3
1.18	85.5	ATTERBERG LIMITS, %	
0.60	78.8		
0.30	72.6	Plastic Limit	
0.15	67.0	Liquid Limit	
0.075	61.6	Plastic Index	

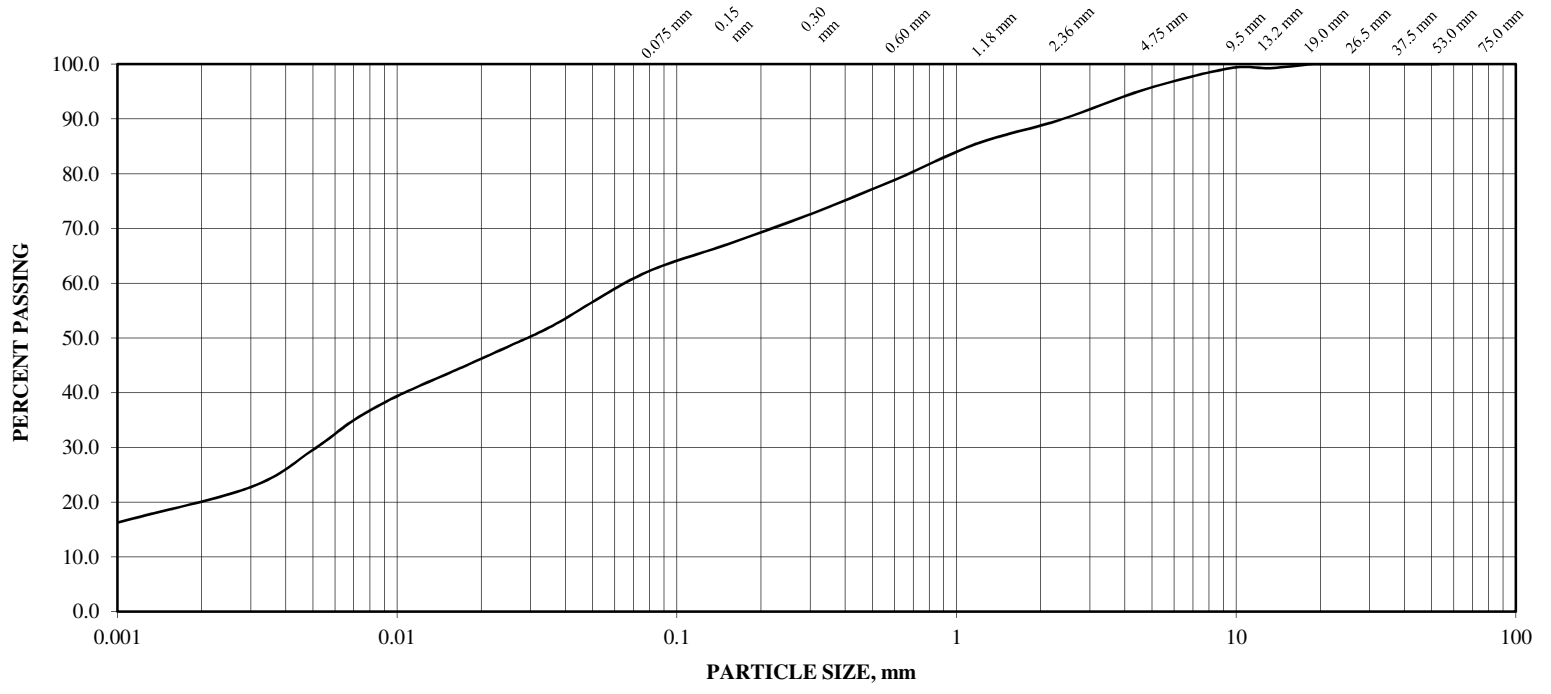
PARTICLE SIZE DISTRIBUTION, MTO LS-702

U.S. BUREAU OF SOILS CLASSIFICATION (AS USED IN MINISTRY OF TRANSPORTATION OF ONTARIO PAVEMENT DESIGNS)

CLAY	SILT	VERY FINE SAND	FINE SAND	MEDIUM SAND	COARSE SAND	FINE GRAVEL	GRAVEL

UNIFIED SOILS CLASSIFICATION ASTM D 2487

FINES (SILT & CLAY)	FINE SAND	MEDIUM SAND	COARSE SAND	FINE GRAVEL	COARSE GRAVEL



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GRAIN SIZE ANALYSIS AND HYDROMETER TEST REPORT
MTO LS-602, 702, AND 703/704

PROJECT: P-0004553-027 CLIENT/JOB NAME: Metrolinx Environmental Sevices CONTRACT NUMBER: NA

SAMPLE ID: 59590 PROJECT/LOCATION: Geotechnical Investigation/ Port Credit Go Station

SAMPLING LOCATION:	BH5 SS3
SAMPLING DEPTH, m	
SAMPLING METHOD:	SS
SAMPLED BY:	EM, LVM
SAMPLE DESCRIPTION:	Clayey Silt, trace Sand
SAMPLING DATE:	18/01/2016
SAMPLE RECEIVED DATE:	18/01/2016

GRAIN SIZE PROPORTIONS, %

% GRAVEL (> 4.75 mm):	0.0
% SAND (75 µm to 4.75 mm):	4.1
% Silt (5 µm to 75 µm):	60.8
% Clay (<5 µm):	35.1
SUSCEPTIBILITY TO FROST HEAVING:	High

GRAIN SIZE ANALYSIS		HYDROMETER ANALYSIS	
SIEVE SIZE mm	% PASSING	DIAMETER mm	% PASSING
53.0	100.0	0.037	81.9
37.5	100.0	0.026	72.1
26.5	100.0	0.017	61.7
19.0	100.0	0.010	51.1
13.2	100.0	0.007	43.0
9.5	100.0	0.005	35.1
4.75	100.0	0.003	26.5
2.36	99.6	0.001	19.3
1.18	99.2	ATTERBERG LIMITS, %	
0.60	98.5		
0.30	97.9	Plastic Limit	
0.15	97.5	Liquid Limit	
0.075	95.9	Plastic Index	

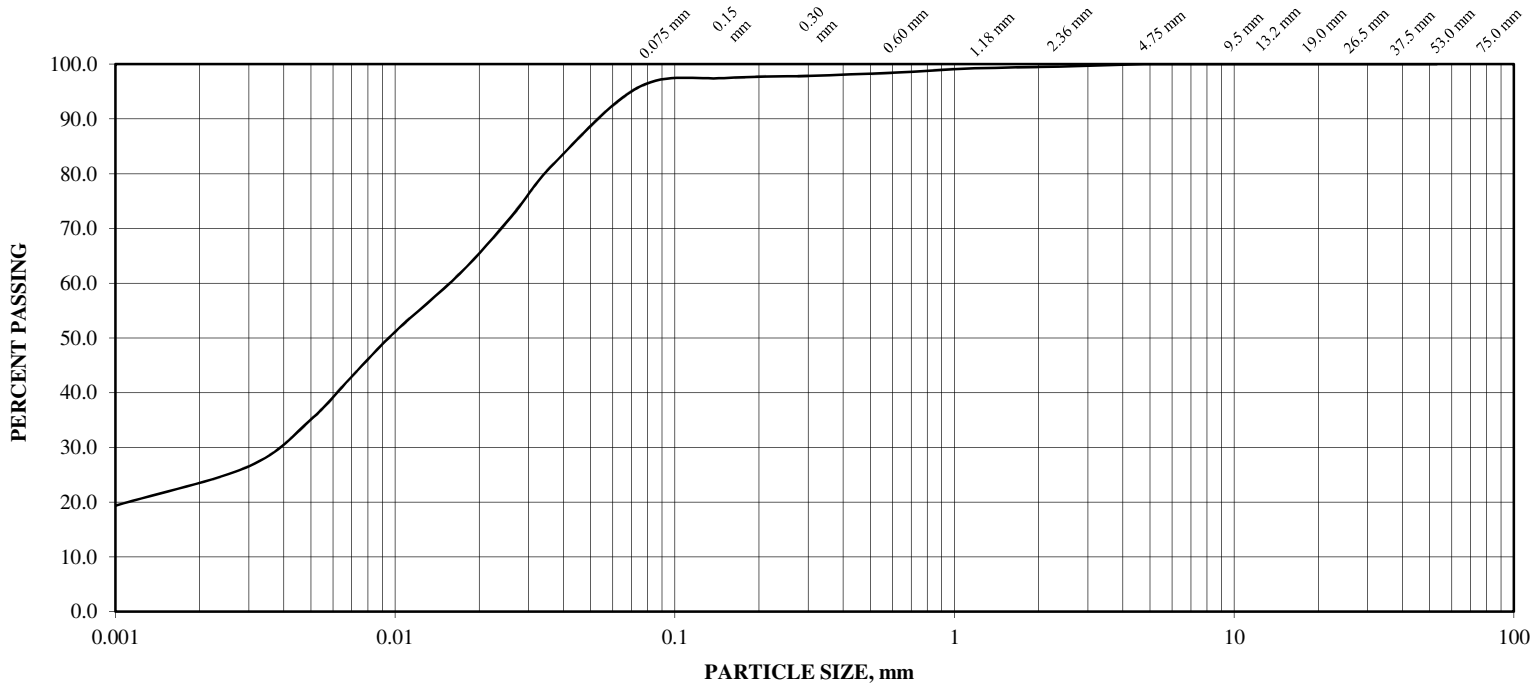
PARTICLE SIZE DISTRIBUTION, MTO LS-702

U.S. BUREAU OF SOILS CLASSIFICATION (AS USED IN MINISTRY OF TRANSPORTATION OF ONTARIO PAVEMENT DESIGNS)

CLAY	SILT	VERY FINE SAND	FINE SAND	MEDIUM SAND	COARSE SAND	FINE GRAVEL	GRAVEL

UNIFIED SOILS CLASSIFICATION ASTM D 2487

FINES (SILT & CLAY)	FINE SAND	MEDIUM SAND	COARSE SAND	FINE GRAVEL	COARSE GRAVEL



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GRAIN SIZE ANALYSIS AND HYDROMETER TEST REPORT
MTO LS-602, 702, AND 703/704

PROJECT: P-0004553-027 CLIENT/JOB NAME: Metrolinx Environmental Sevices CONTRACT NUMBER: NA

SAMPLE ID: 59591 PROJECT/LOCATION: Geotechnical Investigation/ Port Credit Go Station

SAMPLING LOCATION:	BH6 SS5
SAMPLING DEPTH, m	
SAMPLING METHOD:	SS
SAMPLED BY:	EM, LVM
SAMPLE DESCRIPTION:	Silty Sand, some Clay, trace Gravel
SAMPLING DATE:	20/01/2016
SAMPLE RECEIVED DATE:	20/01/2016

GRAIN SIZE PROPORTIONS, %

% GRAVEL (> 4.75 mm):	7.1
% SAND (75 µm to 4.75 mm):	33.5
% Silt (5 µm to 75 µm):	31.5
% Clay (<5 µm):	27.8
SUSCEPTIBILITY TO FROST HEAVING:	Low

GRAIN SIZE ANALYSIS		HYDROMETER ANALYSIS	
SIEVE SIZE mm	% PASSING	DIAMETER mm	% PASSING
53.0	100.0	0.037	49.0
37.5	100.0	0.026	44.6
26.5	100.0	0.017	40.5
19.0	100.0	0.010	35.8
13.2	97.7	0.007	32.4
9.5	96.3	0.005	27.8
4.75	92.9	0.003	21.9
2.36	87.6	0.001	16.6
1.18	82.1	ATTERBERG LIMITS, %	
0.60	75.9		
0.30	70.0	Plastic Limit	
0.15	64.4	Liquid Limit	
0.075	59.4	Plastic Index	

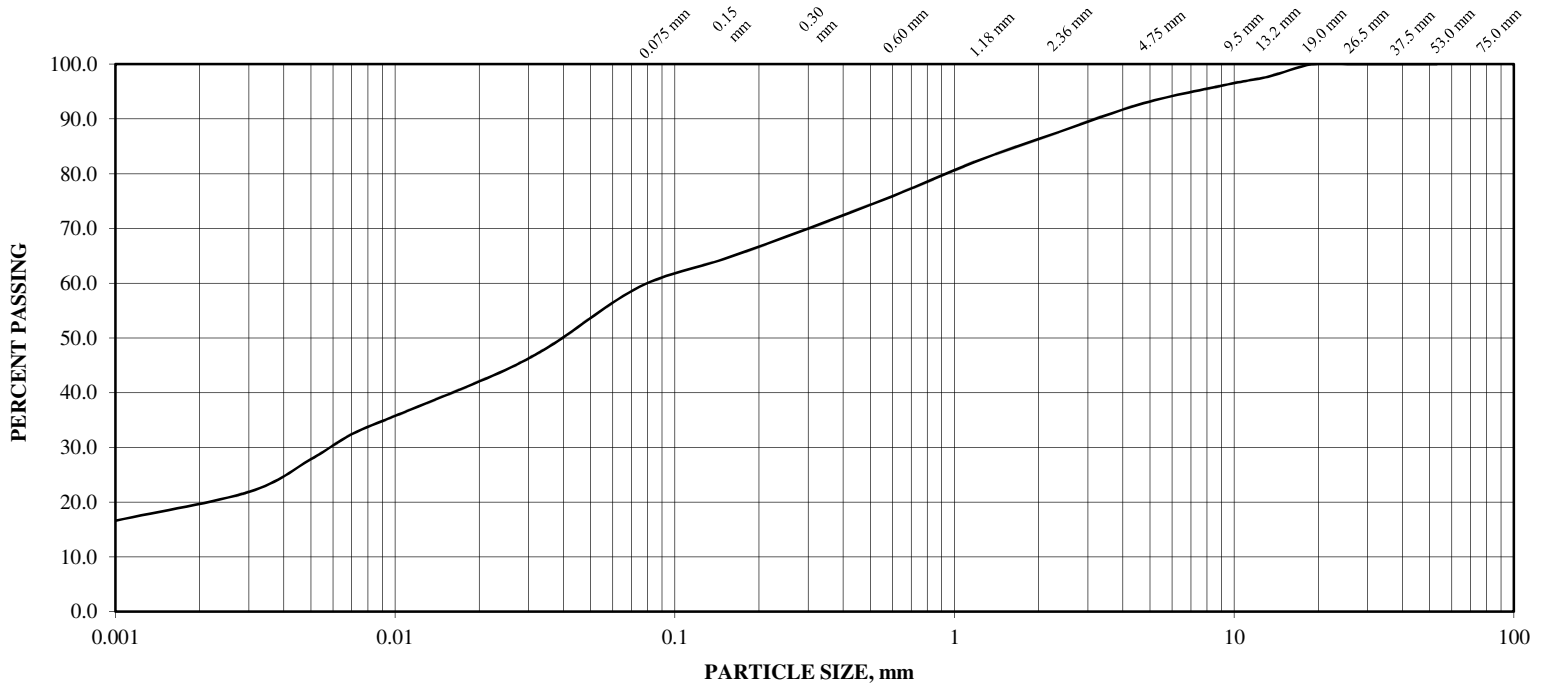
PARTICLE SIZE DISTRIBUTION, MTO LS-702

U.S. BUREAU OF SOILS CLASSIFICATION (AS USED IN MINISTRY OF TRANSPORTATION OF ONTARIO PAVEMENT DESIGNS)

CLAY	SILT	VERY FINE SAND	FINE SAND	MEDIUM SAND	COARSE SAND	FINE GRAVEL	GRAVEL

UNIFIED SOILS CLASSIFICATION ASTM D 2487

FINES (SILT & CLAY)	FINE SAND	MEDIUM SAND	COARSE SAND	FINE GRAVEL	COARSE GRAVEL



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COMPRESSIVE STRENGTH OF CONCRETE CORES
MTO LS-410, A23.2-14C

PROJECT NO.: P004553 CLIENT: Metrolinx CONTRACT: DATE: 29/01/2016

ROS NO.: 59590 PROJECT/LOCATION: Port Credit GO Station

SPECIFIED STRENGTH, MPa: - SEAL NO.: LOT: SUBLOT:

MATERIAL TYPE: Bore Hole Core SAMPLE RECEIVED DATE: 08/01/2016

Core No.	BH1 Run 3	BH4 Run 7	BH5 Run 6	BH6 Run 6
Station No.	19.17 m to 19.31 m	19.88 m to 20.025 m	23.22 m to 23.37 m	18.14 m to 18.295 m
Core Length as Received, mm	140.0	145.0	150.0	155.0
Date Placed				
Date Cored	08/01/2016	08/01/2016	42377	08/01/2016
Core Abnormalities	None	None	None	None
Trimmed Length, mm	94.0	94.0	94.0	94.0
Capping Material Used	-	-	-	-
Max. Size Aggregate, mm	-	-	-	-
Moisture Condition	Moist	Moist	Moist	Moist
Core Mass, kg	0.444	0.432	0.425	0.427
Core Density, kg/m^3	2723	2649	2606	2618
Compressive Strength				
Date Tested	29/01/2016	29/01/2016	29/01/2016	29/01/2016
Concrete Age, day				
Diameter, D, mm	47.0	47.0	47.0	47.0
Capped Length, L, mm	-	-	-	-
L/D Ratio	2	2	2	2
Max. Load Applied, kN	82.8	52.8	92.3	85.7
Correction Factor	1.0	1.0	1.0	1.0
Strength, MP$_a$	47.7	30.4	53.2	49.4
Corrected Strength, MP$_a$	47.7	30.4	53.2	49.4
Type of Failure	T2	T2	T2	T2

Notes: Load (N) = Dial Reading (lb) * Conversion Factor (4.44822)
Load (kN) = Load (N) / 1000
Strength (MPa) = Load (kN) / Area
Testing shall be in accordance to CSA A23.2-14C
Testing requirements shall be in accordance to CSA A23.1-94 17.5.8.2

RESULTS REPORTED TO: FAX

TECHNICIAN: LB CHECKED BY: DA DATE: 29/01/2016

SIGNED:

Dawit Amar/Laboratory Supervisor

Appendix 4 Chemical Testing Results

Maxxam
A Bureau Veritas Group Company

Your P.O. #: A03254
Your Project #: P-0004553-027
Site Location: PORT CREDIT
Your C.O.C. #: NA

Attention:A.J. Antonacci

Englobe Corp
1821 Albion Rd, Unit 7
Etobicoke, ON
CANADA M9W 5W8

Report Date: 2016/02/03
Report #: R3876199
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B613720
Received: 2016/01/22, 12:02

Sample Matrix: Soil
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Chloride (20:1 extract)	2	N/A	2016/01/29	CAM SOP-00463	EPA 325.2 m
Conductivity	2	N/A	2016/01/28	CAM SOP-00414	OMOE E3138 v2 m
pH CaCl2 EXTRACT	2	2016/01/27	2016/01/27	CAM SOP-00413	EPA 9045 D m
Resistivity of Soil	2	2016/01/22	2016/01/28	CAM SOP-00414	SM 22 2510 m
Sulphate (20:1 Extract)	2	N/A	2016/01/29	CAM SOP-00464	EPA 375.4 m
Redox Potential (1)	2	2016/01/25	N/A	SLA SOP-00101	In house

Remarks:

Maxxam Analytics has performed all analytical testing herein in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. All methodologies comply with this document and are validated for use in the laboratory. The methods and techniques employed in this analysis conform to the performance criteria (detection limits, accuracy and precision) as outlined in the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act.

Maxxam Analytics is accredited for all specific parameters as required by Ontario Regulation 153/04. Maxxam Analytics is limited in liability to the actual cost of analysis unless otherwise agreed in writing. There is no other warranty expressed or implied. Samples will be retained at Maxxam Analytics for three weeks from receipt of data or as per contract.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam Sladeview Petrochemical

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Augustyna Dobosz, Project Manager
Email: ADobosz@maxxam.ca
Phone# (905)817-5700 Ext:5798

==========

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Maxxam Job #: B613720
Report Date: 2016/02/03

Englobe Corp
Client Project #: P-0004553-027
Site Location: PORT CREDIT
Your P.O. #: A03254
Sampler Initials: AJA

RESULTS OF ANALYSES OF SOIL

Maxxam ID			BRY398	BRY399	BRY399		
Sampling Date			2016/01/21	2016/01/21	2016/01/21		
COC Number			NA	NA	NA		
	UNITS	Criteria	BH3 SS6	BH6 SS3	BH6 SS3 Lab-Dup	RDL	QC Batch
Calculated Parameters							
Resistivity	ohm-cm	-	1500	760	N/A	N/A	4355083
Inorganics							
Soluble (20:1) Chloride (Cl)	ug/g	-	200	710	N/A	20	4361556
Conductivity	mS/cm	**0.7**	0.68	**1.3**	N/A	0.002	4361555
Available (CaCl2) pH	pH	-	7.71	7.73	N/A	N/A	4359905
Soluble (20:1) Sulphate (SO4)	%	-	0.025	0.008	0.008	0.002	4361574
Subcontracted Analysis							
Redox Potential	mV	-	+173	+141	+128	N/A	4357189

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria: Ontario Reg. 153/04 (Amended April 15, 2011)
Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition
Soil - Residential/Parkland/Institutional Property Use - Coarse Texture
N/A = Not Applicable

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Maxxam Job #: B613720
Report Date: 2016/02/03

Englobe Corp
Client Project #: P-0004553-027
Site Location: PORT CREDIT
Your P.O. #: A03254
Sampler Initials: AJA

TEST SUMMARY

Maxxam ID: BRY398
Sample ID: BH3 SS6
Matrix: Soil

Collected: 2016/01/21
Shipped:
Received: 2016/01/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride (20:1 extract)	KONE/EC	4361556	N/A	2016/01/29	Deonarine Ramnarine
Conductivity	AT	4361555	N/A	2016/01/28	Lemeneh Addis
pH CaCl2 EXTRACT	AT	4359905	2016/01/27	2016/01/27	Neil Dassanayake
Resistivity of Soil		4355083	2016/01/28	2016/01/28	Automated Statchk
Sulphate (20:1 Extract)	KONE/EC	4361574	N/A	2016/01/29	Deonarine Ramnarine
Redox Potential	PH	4357189	2016/01/25		Grace Sison

Maxxam ID: BRY399
Sample ID: BH6 SS3
Matrix: Soil

Collected: 2016/01/21
Shipped:
Received: 2016/01/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride (20:1 extract)	KONE/EC	4361556	N/A	2016/01/29	Deonarine Ramnarine
Conductivity	AT	4361555	N/A	2016/01/28	Lemeneh Addis
pH CaCl2 EXTRACT	AT	4359905	2016/01/27	2016/01/27	Neil Dassanayake
Resistivity of Soil		4355083	2016/01/28	2016/01/28	Automated Statchk
Sulphate (20:1 Extract)	KONE/EC	4361574	N/A	2016/01/29	Deonarine Ramnarine
Redox Potential	PH	4357189	2016/01/25		Grace Sison

Maxxam ID: BRY399 Dup
Sample ID: BH6 SS3
Matrix: Soil

Collected: 2016/01/21
Shipped:
Received: 2016/01/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Sulphate (20:1 Extract)	KONE/EC	4361574	N/A	2016/01/29	Deonarine Ramnarine
Redox Potential	PH	4357189	2016/01/25		Grace Sison

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Maxxam Job #: B613720
Report Date: 2016/02/03

Englobe Corp
Client Project #: P-0004553-027
Site Location: PORT CREDIT
Your P.O. #: A03254
Sampler Initials: AJA

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	1.3°C

Revised report (2016/02/03): Units for Sulphate have been ammended to %.

Results relate only to the items tested.

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Maxxam Job #: B613720
Report Date: 2016/02/03

Englobe Corp
Client Project #: P-0004553-027
Site Location: PORT CREDIT
Your P.O. #: A03254
Sampler Initials: AJA

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4357189	MJP	QC Standard	Redox Potential			+245	%	238 - 248
4357189	MJP	Method Blank	Redox Potential		+138		mV	
4357189	MJP	RPD [BRY399-02]	Redox Potential		9.7		%	20
4359905	NYS	Spiked Blank	Available (CaCl2) pH	2016/01/27		99	%	97 - 103
4359905	NYS	RPD	Available (CaCl2) pH	2016/01/27	0.75		%	N/A
4361555	L_A	Spiked Blank	Conductivity	2016/01/28		100	%	90 - 110
4361555	L_A	Method Blank	Conductivity	2016/01/28	<0.002		mS/cm	
4361555	L_A	RPD	Conductivity	2016/01/28	1.3		%	10
4361556	DRM	Matrix Spike	Soluble (20:1) Chloride (Cl)	2016/01/29		113	%	70 - 130
4361556	DRM	Spiked Blank	Soluble (20:1) Chloride (Cl)	2016/01/29		103	%	70 - 130
4361556	DRM	Method Blank	Soluble (20:1) Chloride (Cl)	2016/01/29	<20		ug/g	
4361556	DRM	RPD	Soluble (20:1) Chloride (Cl)	2016/01/29	NC		%	35
4361574	DRM	Matrix Spike [BRY399-01]	Soluble (20:1) Sulphate (SO4)	2016/01/29		NC	%	70 - 130
4361574	DRM	Spiked Blank	Soluble (20:1) Sulphate (SO4)	2016/01/29		99	%	70 - 130
4361574	DRM	Method Blank	Soluble (20:1) Sulphate (SO4)	2016/01/29	<0.002		%	
4361574	DRM	RPD [BRY399-01]	Soluble (20:1) Sulphate (SO4)	2016/01/29	NC		%	35

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

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Maxxam Job #: B613720
Report Date: 2016/02/03

Englobe Corp
Client Project #: P-0004553-027
Site Location: PORT CREDIT
Your P.O. #: A03254
Sampler Initials: AJA

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Cristina Carriere

Cristina Carriere, Scientific Services

Grace Sison, B.Sc., C.Chem, Senior Project Manager - Petroleum Division

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IMMEDIATE TEST

CHAIN OF CUSTODY RECORD

Page 1 of 1

INVOICE INFORMATION:		REPORT INFORMATION (if differs from invoice):		PROJECT INFORMATION:		MAXXAM JOB NUMBER:
Company Name:	Englobe	Company Name:		Quotation #	B53844	
Contact Name:	A.J. Antonacci	Contact Name:		P.O. #:	A03254	CHAIN OF CUSTODY # :
Address:	1821 Albion Road Etobicoke, Ontario	Address:		Project #:	P-0004553-027	
Phone:	416 213 1060 Fax:	Phone:	Fax:	Project Name:	Port Credit	
Email:	arthur.antonacci@englobecorp.com	Email:	houshang.akbari@englobecorp.com	Location:		
				Sampled By:	A.J. Antonacci	

REGULATORY CRITERIA

Note: For regulated drinking water samples - please use the Drinking Water Chain of Custody Form

- ☐ MISA
- ☐ PWQO
- ☐ Reg. 558
- Reg. 153: ☐ Table 1 ☐ Table 2 ☑ Table 3 ☐ Table 6
- ☑ Residential / Parkland ☐ Industrial / Commercial ☐ Medium / Fine ☑ Coarse
- Sewer Use: ☐ Sanitary ☐ Storm
- Municipality:
- Other (specify):
- Report Criteria on C of A ? ☐

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

ANALYSIS REQUESTED (Please be specific):

	Sample Identification	Date Sampled	Time Sampled	Matrix (GW, SW, Soil, etc.)	Regulated Drinking Water ? (Y / N)	Metals Field Filtered ? (Y / N)	Water soluble sulphate	Chloride	pH	Electrical Resistivity/Conductivity	Redox potential	# of Cont.	COMMENTS / TAT COMMENTS
1	BH3 SS6	2016/01/21	AM	Soil			X	X	X	X	X	2	
2	BH6 SS3	2016/01/21	AM	Soil			X	X	X	X	X	2	
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													

TURNAROUND TIME (TAT) REQUIRED:

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Regular (Standard) TAT:
☑ 5 to 7 Working Days

Rush TAT: Rush Confirmation # _____ (call Lab for #)
☐ 1 day ☐ 2 days ☐ 3 days
DATE Required: _____
TIME Required: _____

Please note that TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

22-Jan-16 12:02
Augustyna Dobosz
B613720
RGN ENV-936

RELINQUISHED BY: (Signature/Print)	RECEIVED BY: (Signature/Print)	Date:	Time:	# JARS USED AND NOT SUBMITTED	Laboratory Use Only Temperature (°C) on Receipt
A.J. Antonacci	ALICA DAVIE	2016/01/22	9:30am		21 | |
		2016/01/22	12:02		

* MANDATORY SECTIONS IN GREY MUST BE FILLED OUT. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS

White: Maxxam Yellow: Mail Pink: Client

Maxxam Analytics International Corporation o/a Maxxam Analytics

B22193

Maxxam
A Bureau Veritas Group Company

Your P.O. #: A03254
Your Project #: P-0004553-027
Site Location: PORT CREDIT
Your C.O.C. #: NA

Attention:A.J. Antonacci

Englobe Corp
1821 Albion Rd, Unit 7
Etobicoke, ON
CANADA M9W 5W8

Report Date: 2016/01/28
Report #: R3869899
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B613724
Received: 2016/01/22, 12:02

Sample Matrix: Soil
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Cyanide (WAD) in Leachates	1	N/A	2016/01/27	CAM SOP-00457	OMOE 3015 m
Fluoride by ISE in Leachates	1	2016/01/27	2016/01/27	CAM SOP-00449	SM 22 4500-F- C m
Mercury (TCLP Leachable) (mg/L)	1	N/A	2016/01/27	CAM SOP-00453	EPA 7470A m
Total Metals in TCLP Leachate by ICPMS	1	2016/01/27	2016/01/27	CAM SOP-00447	EPA 6020A m
Nitrate(NO3) + Nitrite(NO2) in Leachate	1	N/A	2016/01/27	CAM SOP-00440	SM 22 4500-NO3I/NO2B
TCLP - % Solids	1	2016/01/26	2016/01/27	CAM SOP-00401	EPA 1311 Update I m
TCLP - Extraction Fluid	1	N/A	2016/01/27	CAM SOP-00401	EPA 1311 Update I m
TCLP - Initial and final pH	1	N/A	2016/01/27	CAM SOP-00401	EPA 1311 Update I m

Remarks:

Maxxam Analytics has performed all analytical testing herein in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. All methodologies comply with this document and are validated for use in the laboratory. The methods and techniques employed in this analysis conform to the performance criteria (detection limits, accuracy and precision) as outlined in the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act.

Maxxam Analytics is accredited for all specific parameters as required by Ontario Regulation 153/04. Maxxam Analytics is limited in liability to the actual cost of analysis unless otherwise agreed in writing. There is no other warranty expressed or implied. Samples will be retained at Maxxam Analytics for three weeks from receipt of data or as per contract.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Augustyna Dobosz, Project Manager
Email: ADobosz@maxxam.ca
Phone# (905)817-5700 Ext:5798

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Maxxam Job #: B613724
Report Date: 2016/01/28

Englobe Corp
Client Project #: P-0004553-027
Site Location: PORT CREDIT
Your P.O. #: A03254
Sampler Initials: AJA

O.REG 558 TCLP INORGANICS PACKAGE (SOIL)

Maxxam ID			BRY469		
Sampling Date			2016/01/20		
COC Number			NA		
	UNITS	Criteria	TCLP	RDL	QC Batch
Inorganics					
Leachable Fluoride (F-)	mg/L	**150**	0.25	0.10	4360063
Leachable Free Cyanide	mg/L	**20**	<0.010	0.010	4360060
Leachable Nitrite (N)	mg/L	**-**	<0.10	0.10	4360064
Leachable Nitrate (N)	mg/L	**-**	<1.0	1.0	4360064
Leachable Nitrate + Nitrite (N)	mg/L	**1000**	<1.0	1.0	4360064
Metals					
Leachable Mercury (Hg)	mg/L	**0.1**	<0.0010	0.0010	4359734
Leachable Arsenic (As)	mg/L	**2.5**	<0.20	0.20	4360005
Leachable Barium (Ba)	mg/L	**100**	0.74	0.20	4360005
Leachable Boron (B)	mg/L	**500**	0.16	0.10	4360005
Leachable Cadmium (Cd)	mg/L	**0.5**	<0.050	0.050	4360005
Leachable Chromium (Cr)	mg/L	**5**	<0.10	0.10	4360005
Leachable Lead (Pb)	mg/L	**5**	<0.10	0.10	4360005
Leachable Selenium (Se)	mg/L	**1**	<0.10	0.10	4360005
Leachable Silver (Ag)	mg/L	**5**	<0.010	0.010	4360005
Leachable Uranium (U)	mg/L	**10**	<0.010	0.010	4360005

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: Ontario Reg. 347/90 Schedule 4 Leachate Quality Criteria (as amended by Reg 558/00)

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Maxxam Job #: B613724
Report Date: 2016/01/28

Englobe Corp
Client Project #: P-0004553-027
Site Location: PORT CREDIT
Your P.O. #: A03254
Sampler Initials: AJA

O.REG 558 TCLP LEACHATE PREPARATION (SOIL)

Maxxam ID		BRY469		
Sampling Date		2016/01/20		
COC Number		NA		
	UNITS	**TCLP**	**RDL**	**QC Batch**
Inorganics				
Final pH	pH	6.16	N/A	4359722
Initial pH	pH	9.86	N/A	4359722
TCLP - % Solids	%	100	0.2	4359717
TCLP Extraction Fluid	N/A	FLUID 1	N/A	4359721

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

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Maxxam Job #: B613724
Report Date: 2016/01/28

Englobe Corp
Client Project #: P-0004553-027
Site Location: PORT CREDIT
Your P.O. #: A03254
Sampler Initials: AJA

TEST SUMMARY

Maxxam ID: BRY469
Sample ID: TCLP
Matrix: Soil

Collected: 2016/01/20
Shipped:
Received: 2016/01/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Cyanide (WAD) in Leachates	SKAL/CN	4360060	N/A	2016/01/27	Christine Pham
Fluoride by ISE in Leachates	ISE	4360063	2016/01/27	2016/01/27	Surinder Rai
Mercury (TCLP Leachable) (mg/L)	CV/AA	4359734	N/A	2016/01/27	Ron Morrison
Total Metals in TCLP Leachate by ICPMS	ICP1/MS	4360005	2016/01/27	2016/01/27	Cristina Petran
Nitrate(NO3) + Nitrite(NO2) in Leachate	LACH	4360064	N/A	2016/01/27	Chandra Nandlal
TCLP - % Solids	BAL	4359717	2016/01/26	2016/01/27	Jian (Ken) Wang
TCLP - Extraction Fluid		4359721	N/A	2016/01/27	Jian (Ken) Wang
TCLP - Initial and final pH	PH	4359722	N/A	2016/01/27	Jian (Ken) Wang

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Maxxam Job #: B613724
Report Date: 2016/01/28

Englobe Corp
Client Project #: P-0004553-027
Site Location: PORT CREDIT
Your P.O. #: A03254
Sampler Initials: AJA

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	1.3°C

Results relate only to the items tested.

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Maxxam Job #: B613724
Report Date: 2016/01/28

Englobe Corp
Client Project #: P-0004553-027
Site Location: PORT CREDIT
Your P.O. #: A03254
Sampler Initials: AJA

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4359734	RON	Matrix Spike	Leachable Mercury (Hg)	2016/01/27		103	%	75 - 125
4359734	RON	Leachate Blank	Leachable Mercury (Hg)	2016/01/27	<0.0010		mg/L	
4359734	RON	Spiked Blank	Leachable Mercury (Hg)	2016/01/27		95	%	80 - 120
4359734	RON	Method Blank	Leachable Mercury (Hg)	2016/01/27	<0.0010		mg/L	
4359734	RON	RPD	Leachable Mercury (Hg)	2016/01/27	NC		%	25
4360005	CPE	Matrix Spike	Leachable Arsenic (As)	2016/01/27		98	%	80 - 120
			Leachable Barium (Ba)	2016/01/27		NC	%	80 - 120
			Leachable Boron (B)	2016/01/27		98	%	80 - 120
			Leachable Cadmium (Cd)	2016/01/27		100	%	80 - 120
			Leachable Chromium (Cr)	2016/01/27		98	%	80 - 120
			Leachable Lead (Pb)	2016/01/27		95	%	80 - 120
			Leachable Selenium (Se)	2016/01/27		98	%	80 - 120
			Leachable Silver (Ag)	2016/01/27		95	%	80 - 120
			Leachable Uranium (U)	2016/01/27		95	%	80 - 120
4360005	CPE	Leachate Blank	Leachable Arsenic (As)	2016/01/27	<0.20		mg/L	
			Leachable Barium (Ba)	2016/01/27	<0.20		mg/L	
			Leachable Boron (B)	2016/01/27	<0.10		mg/L	
			Leachable Cadmium (Cd)	2016/01/27	<0.050		mg/L	
			Leachable Chromium (Cr)	2016/01/27	<0.10		mg/L	
			Leachable Lead (Pb)	2016/01/27	<0.10		mg/L	
			Leachable Selenium (Se)	2016/01/27	<0.10		mg/L	
			Leachable Silver (Ag)	2016/01/27	<0.010		mg/L	
			Leachable Uranium (U)	2016/01/27	<0.010		mg/L	
4360005	CPE	Spiked Blank	Leachable Arsenic (As)	2016/01/27		95	%	80 - 120
			Leachable Barium (Ba)	2016/01/27		105	%	80 - 120
			Leachable Boron (B)	2016/01/27		102	%	80 - 120
			Leachable Cadmium (Cd)	2016/01/27		98	%	80 - 120
			Leachable Chromium (Cr)	2016/01/27		97	%	80 - 120
			Leachable Lead (Pb)	2016/01/27		97	%	80 - 120
			Leachable Selenium (Se)	2016/01/27		96	%	80 - 120
			Leachable Silver (Ag)	2016/01/27		98	%	80 - 120
			Leachable Uranium (U)	2016/01/27		96	%	80 - 120
4360005	CPE	RPD	Leachable Arsenic (As)	2016/01/27	NC		%	35
			Leachable Barium (Ba)	2016/01/27	NC		%	35
			Leachable Boron (B)	2016/01/27	NC		%	35
			Leachable Cadmium (Cd)	2016/01/27	NC		%	35
			Leachable Chromium (Cr)	2016/01/27	NC		%	35
			Leachable Lead (Pb)	2016/01/27	NC		%	35
			Leachable Selenium (Se)	2016/01/27	NC		%	35
			Leachable Silver (Ag)	2016/01/27	NC		%	35
			Leachable Uranium (U)	2016/01/27	NC		%	35
4360060	CP	Matrix Spike	Leachable Free Cyanide	2016/01/27		107	%	80 - 120
4360060	CP	Leachate Blank	Leachable Free Cyanide	2016/01/27	<0.010		mg/L	
4360060	CP	Spiked Blank	Leachable Free Cyanide	2016/01/27		106	%	80 - 120
4360060	CP	Method Blank	Leachable Free Cyanide	2016/01/27	<0.0020		mg/L	
4360060	CP	RPD	Leachable Free Cyanide	2016/01/27	NC		%	20
4360063	SAU	Matrix Spike	Leachable Fluoride (F-)	2016/01/27		100	%	80 - 120
4360063	SAU	Leachate Blank	Leachable Fluoride (F-)	2016/01/27	<0.10		mg/L	
4360063	SAU	Spiked Blank	Leachable Fluoride (F-)	2016/01/27		102	%	80 - 120
4360063	SAU	Method Blank	Leachable Fluoride (F-)	2016/01/27	<0.10		mg/L	
4360063	SAU	RPD	Leachable Fluoride (F-)	2016/01/27	NC		%	25

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B613724
Report Date: 2016/01/28

Englobe Corp
Client Project #: P-0004553-027
Site Location: PORT CREDIT
Your P.O. #: A03254
Sampler Initials: AJA

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4360064	C_N	Matrix Spike	Leachable Nitrite (N)	2016/01/27		106	%	80 - 120
			Leachable Nitrate (N)	2016/01/27		94	%	80 - 120
			Leachable Nitrate + Nitrite (N)	2016/01/27		96	%	80 - 120
4360064	C_N	Leachate Blank	Leachable Nitrite (N)	2016/01/27	<0.10		mg/L	
			Leachable Nitrate (N)	2016/01/27	<1.0		mg/L	
			Leachable Nitrate + Nitrite (N)	2016/01/27	<1.0		mg/L	
4360064	C_N	Spiked Blank	Leachable Nitrite (N)	2016/01/27		107	%	80 - 120
			Leachable Nitrate (N)	2016/01/27		95	%	80 - 120
			Leachable Nitrate + Nitrite (N)	2016/01/27		97	%	80 - 120
4360064	C_N	Method Blank	Leachable Nitrite (N)	2016/01/27	<0.10		mg/L	
			Leachable Nitrate (N)	2016/01/27	<1.0		mg/L	
			Leachable Nitrate + Nitrite (N)	2016/01/27	<1.0		mg/L	
4360064	C_N	RPD	Leachable Nitrite (N)	2016/01/27	NC		%	25
			Leachable Nitrate (N)	2016/01/27	NC		%	25
			Leachable Nitrate + Nitrite (N)	2016/01/27	NC		%	25

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Leachate Blank: A blank matrix containing all reagents used in the leaching procedure. Used to determine any process contamination.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B613724
Report Date: 2016/01/28

Englobe Corp
Client Project #: P-0004553-027
Site Location: PORT CREDIT
Your P.O. #: A03254
Sampler Initials: AJA

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Cristina Carriere

Cristina Carriere, Scientific Services

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Analytics

6740 Campobello Road Mississauga, ON L5N 2L8
Phone: 905-817-5700 Fax: 905-817-5778 Toll Free: (800) 563-6266

CHAIN OF CUSTODY RECORD

Page 1 of 1

INVOICE INFORMATION:		REPORT INFORMATION (if differs from invoice):		PROJECT INFORMATION:		MAXXAM JOB NUMBER:
Company Name:	Englobe	Company Name:		Quotation #	B53844	
Contact Name:	A.J. Antonacci	Contact Name:		P.O. #:	A03254	
Address:	1821 Albion Road Etobicoke, Ontario	Address:		Project #:	P-0004553-027	CHAIN OF CUSTODY # :
				Project Name:	Port Credit	
Phone:	416 213 1060 Fax:	Phone:	Fax:	Location:		
Email:	arthur.antonacci@englobecorp.com	Email:		Sampled By:	A.J. Antonacci	

REGULATORY CRITERIA

Note: For regulated drinking water samples - please use the Drinking Water Chain of Custody Form

☐ MISA ☐ PWQO ☑ Reg. 558

Reg. 153: ☐ Table 1 ☐ Table 2 ☐ Table 3 ☐ Table 6 ☐ Residential / Parkland ☐ Industrial / Commercial ☐ Medium / Fine ☐ Coarse

Sewer Use: ☐ Sanitary ☐ Storm Municipality:

Other (specify):

Report Criteria on C of A ? ☑

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

ANALYSIS REQUESTED (Please be specific):

	Sample Identification	Date Sampled	Time Sampled	Matrix (GW, SW, Soil, etc.)	Regulated Drinking Water ? (Y / N)	Metals Field Filtered ? (Y / N)	O.Reg. 558 Metals & Inorgs	# of Cont.	COMMENTS / TAT COMMENTS
1	TCLP	2016/01/20	PM	Soil			X	1	
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									

22-Jan-16 12:02
Augustyna Dobosz
B613724
RGN ENV-936

TURNAROUND TIME (TAT) REQUIRED:

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Regular (Standard) TAT: ☑ 5 to 7 Working Days

Rush TAT: Rush Confirmation # (call Lab for #)

☐ 1 day ☐ 2 days ☐ 3 days

DATE Required:

TIME Required:

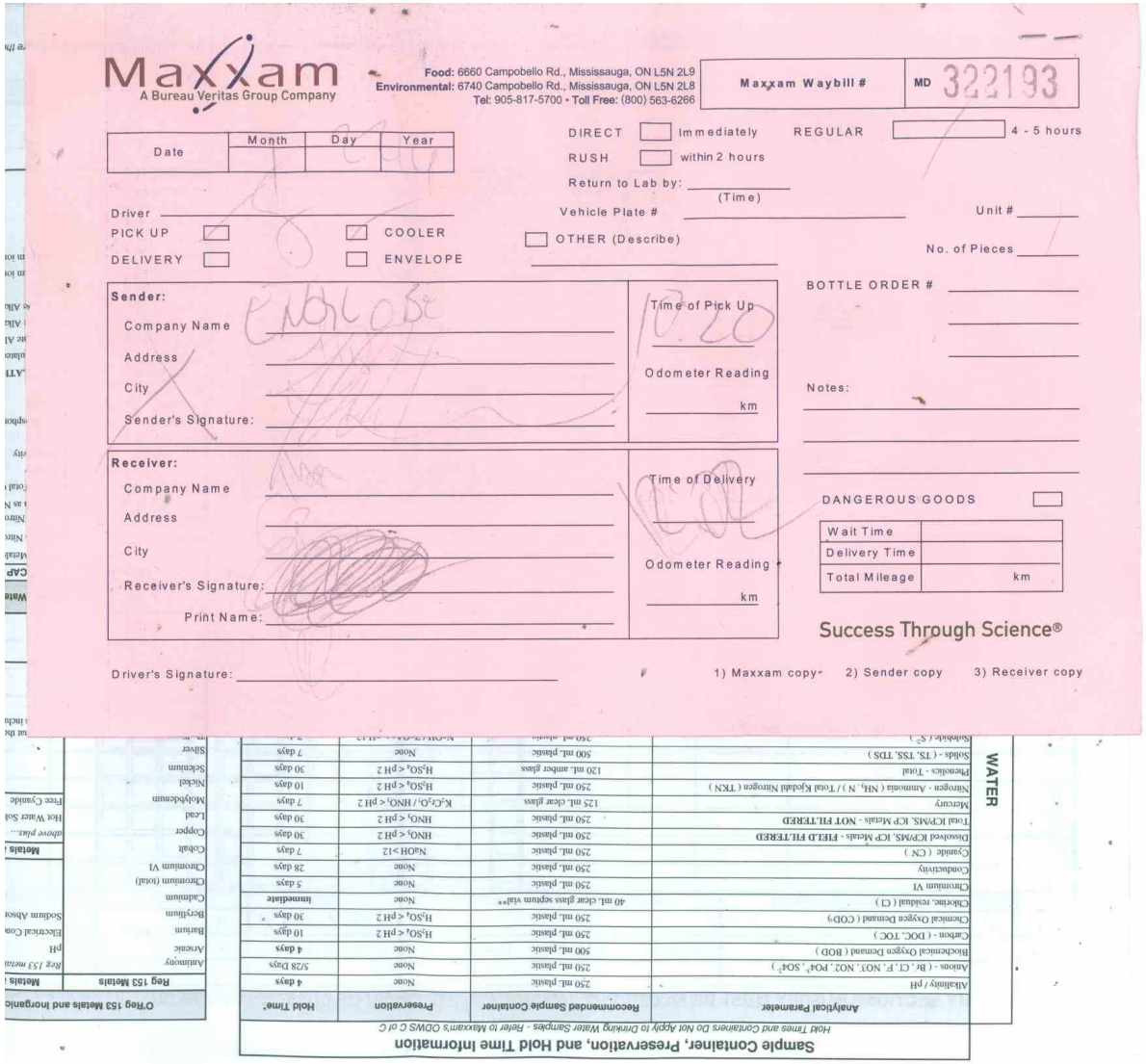
Please note that TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

RELINQUISHED BY: (Signature/Print)	RECEIVED BY: (Signature/Print)	Date:	Time:	# JARS USED AND NOT SUBMITTED	Laboratory Use Only
A.J. Antonacci		2016/01/22	9:30 am		Temperature (°C) on Receipt
	ANGELA PATCH	2016/01/22	12:02		21 | 1

*** MANDATORY SECTIONS IN GREY MUST BE FILLED OUT. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS**

White: Maxxam Yellow: Mail Pink: Client

Maxxam Analytics International Corporation o/a Maxxam Analytics



Maxxam
A Bureau Veritas Group Company

Food: 6660 Campobello Rd., Mississauga, ON L5N 2L9
Environmental: 6740 Campobello Rd., Mississauga, ON L5N 2L8
Tel: 905-817-5700 • **Toll Free:** (800) 563-6266

Maxxam Waybill # MD 322193

Date	Month	Day	Year

DIRECT ☐ Immediately REGULAR ☐ 4 - 5 hours
RUSH ☐ within 2 hours
Return to Lab by: _____ (Time)

Driver _____ Vehicle Plate # _____ Unit # _____

PICK UP ☐ COOLER ☐
DELIVERY ☐ ENVELOPE ☐
☐ OTHER (Describe) _____

No. of Pieces _____

Sender:
Company Name _____
Address _____
City _____
Sender's Signature: _____

Time of Pick Up _____
Odometer Reading _____ km

BOTTLE ORDER # _____

Notes: _____

Receiver:
Company Name _____
Address _____
City _____
Receiver's Signature: _____
Print Name: _____

Time of Delivery _____
Odometer Reading _____ km

DANGEROUS GOODS ☐

Wait Time	
Delivery Time	
Total Mileage	km

Success Through Science®

Driver's Signature: _____

1) Maxxam copy 2) Sender copy 3) Receiver copy

Sample Container, Preservation, and Hold Time Information

Hold Times and Containers Do Not Apply to Drinking Water Samples - Refer to Maxxam's OWS C of C

Analytical Parameter	Recommended Sample Container	Preservation	Hold Time*
Alkalinity / pH	250 mL plastic	None	4 days
Anions - (Br⁻, Cl⁻, F⁻, NO3⁻, PO4³⁻, SO4²⁻)	250 mL plastic	None	5/28 Days
Biochemical Oxygen Demand (BOD)	500 mL plastic	None	4 days
Carbon - (DOC, TOC)	250 mL plastic	H_2SO_4 < pH 2	10 days
Chemical Oxygen Demand (COD)	250 mL plastic	H_2SO_4 < pH 2	30 days
Chlorine, residual (Cl)	40 mL clear glass septum vial**	None	Immediate
Chromium VI	250 mL plastic	None	5 days
Conductivity	250 mL plastic	None	28 days
Cyanide (CN⁻)	250 mL plastic	NaOH >12	7 days
Dissolved ICP/MS, ICP Metals - **FIELD FILTERED**	250 mL plastic	HNO_3 < pH 2	30 days
Total ICP/MS, ICP Metals - **NOT FILTERED**	250 mL plastic	HNO_3 < pH 2	30 days
Mercury	125 mL clear glass	$K_2Cr_2O_7$ / HNO_3 < pH 2	7 days
Nitrogen - Ammonia (NH_3, N) / Total Kjeldhl Nitrogen (TKN)	250 mL plastic	H_2SO_4 < pH 2	10 days
Phenolics - Total	120 mL amber glass	H_2SO_4 < pH 2	30 days
Solids - (TS, TSS, TDS)	500 mL plastic	None	7 days
Sulphide (S^{2-})	250 mL plastic	$NaOH/Zn(CH_3COO)_2$ < pH 12	7 days

WATER

Reg 153 Metals and Inorganics	Metals
Aluminum	Reg 153 Metals
Arsenic	pH
Barium	Electrical Conductivity
Beryllium	Sodium Adsorption Ratio
Cadmium	
Chromium (total)	
Chromium VI	
Cobalt	
Copper	above plus...
Lead	Hot Water Soluble Boron
Molybdenum	Free Cyanide
Nickel	
Selenium	
Silver	

Appendix 5 MASW Analysis

GEOPHYSICS GPR INTERNATIONAL INC.
6741 Columbus Road
Unit 14
Mississauga, Ontario
Canada L5T 2G9
Tel.: (905) 696-0656
Fax: (905) 696-0570
gprtor@gprtor.com
www.geophysicsgpr.com

January 6, 2016 GPR file: T15793B

Houshang Akbari, P.Eng.,
Senior Geotechnical Engineer
Englobe
1821 Albion Road, Suite 7
Toronto, ON
M9W 5W8

RE: Shear-wave velocity sounding at the Port Credit GO station parking lot, NW corner of Hurontario Street and Park Street East, Mississauga, Ontario

Dear Mr. Akbari:

Geophysics GPR International Inc. has been requested by Englobe to carry out a shear-wave velocity sounding at the above site in Mississauga. Figure 1 shows the location of the test profile.

The survey was performed on December 16th, 2015.

The investigation included the multi-channel analysis of surface waves (MASW) and the refraction methods to generate a shear-wave velocity model (Figure 4).

The following paragraphs describe the survey design, the principles of the test method, the methodology for interpreting the data, and provide a culmination of the results in table format.

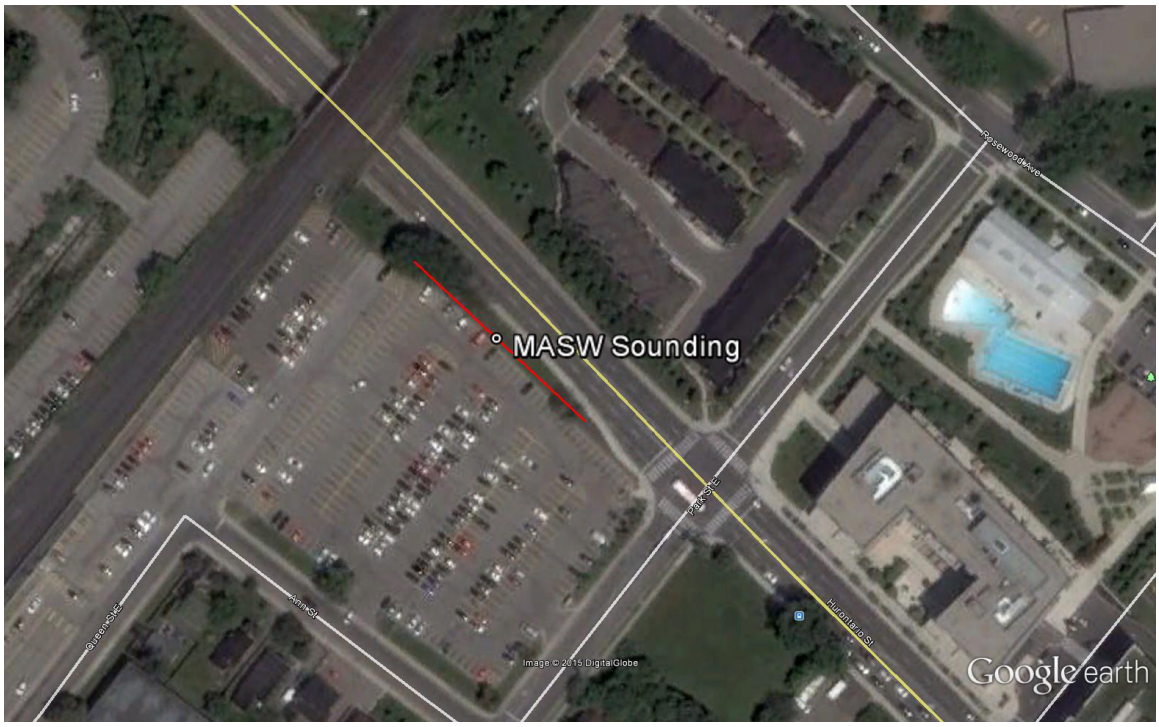


Figure 1: Approximate location of the shear-wave velocity soundings

MASW and MAM Surveys

Basic Theory

The Multi-channel Analysis of Surface Waves (MASW) and the Micro-tremor Array Measurements (MAM) are seismic methods used to evaluate the shear-wave velocities of subsurface materials through the analysis of the dispersion properties of Rayleigh surface waves ("ground roll"). The dispersion properties are measured as a change in phase velocity with frequency. Surface wave energy will decay exponentially with depth. Lower frequency surface waves will travel deeper and thus be more influenced by deeper velocity layering than the shallow higher frequency waves. Inversion of the Rayleigh wave dispersion curve yields a shear-wave (V_s) velocity depth profile (sounding). Figure 2 outlines the basic operating procedure for the MASW method. Figure 3 is an example image of a typical MASW record and resulting 1D V_s model. A more detailed description of the method can be found in the paper *Multi-channel Analysis of Surface Waves,* Park, C.B., Miller, R.D. and Xia, J. Geophysics, Vol. 64, No. 3 (May-June 1999); P. 800–808.

Survey Design

The geometry of an MASW survey is similar set to that of a seismic refraction investigation (i.e. 24 geophones in a linear array). The fundamental principle involves intentionally generating an acoustic wave at the surface and digitally recording the surface waves from the moment of source impact with a linear series of geophones on the surface. This is referred to as an "active source" method. An elastic-wave hammer was used as the primary energy source with traces being

recorded at 5 locations: approximately 6 m off both ends, 25 to 30 m off both ends, and in the middle of the spread. Data were collected with geophones spacing of 3m and 1m for a total of 10 shot records per sounding.

Unlike the refraction method, which produces a data point beneath each geophone, the shear-wave depth profile is the average of the bulk area within the middle third of the geophone spread.

The theoretical maximum depth of penetration (34.5m) is half of the maximum seismic array length (69m), in practice the maximum depth of penetration is often influenced by the geology.

The MAM/passive survey used the same geophone array set up as for the MASW survey. Unlike the MASW survey, the MAM method is considered a "passive source" method in that there is no time break and the motions recorded are from ambient energy generated by cultural noise such as traffic, wind, wave motion, etc. Data collection for the passive method involves recording approximately 10 minutes of background "noise." The records generated by the MAM method contain lower frequency data, thus increasing the data resolution at greater depths of investigation. Typically the MAM results aid in clarifying the MASW results for depths greater than 20 m; however, the direction of noise propagation relative to the spread orientation can influence the results.

Interpretation Method and Accuracy of Results

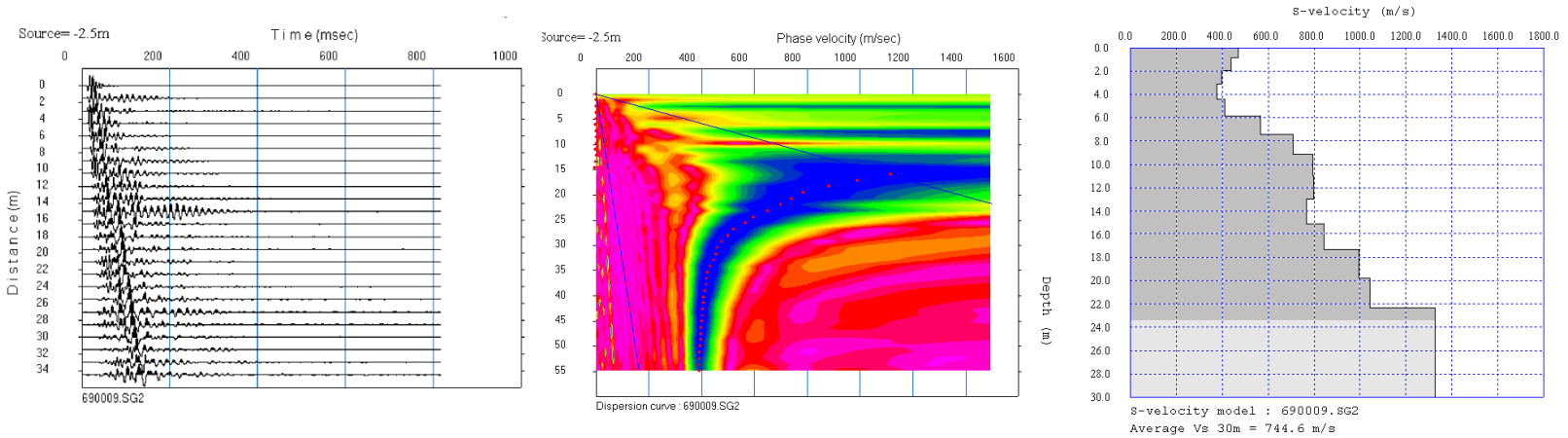
The main processing sequence involved plotting, picking, and 1-D inversion of the MASW shot records using the SeisimagerSW™ software package. In theory, all MASW shot records should produce a similar shear-wave velocity profile. In practice, however, differences can arise due to energy dissipation and localized surface variations. The results of the inversion process are inherently non-unique and the final model must be judged to be geologically realistic. The inversion modelling also assumes that all layering is flat/horizontal and laterally uniform.

The results of the MASW tests are presented in chart format as Figure 4. The chart presents the 1-D shear wave velocity values from the inversion models of the seismic records.

The V_s30 values for the sounding are presented in Table 1. The V_s30 values are based on the harmonic mean of the shear wave velocities over the upper 30 m. The V_s30 value is calculated by dividing the total depth of interest (e.g. 30 m) by the sum of the time spent in each velocity layer up to that depth. This harmonic mean value reflects the equivalent single layer response.

The estimated error in the average V_s30 value determined through MASW tests is typically +/-10 to 15% for overburden sites. The shear-wave velocities modelled through the MASW method within bedrock have a higher estimated error.

Figure 2: MASW Operating Principle



Raw Seismic Shot Record

Phase Velocity-Frequency Transformation indicating Dispersion Curve

1D Shear-Wave Velocity Profile from Inversion of Dispersion Curve

Figure 3: Example of a typical MASW shot record, phase velocity/frequency curve and resulting 1D shear-wave velocity model.

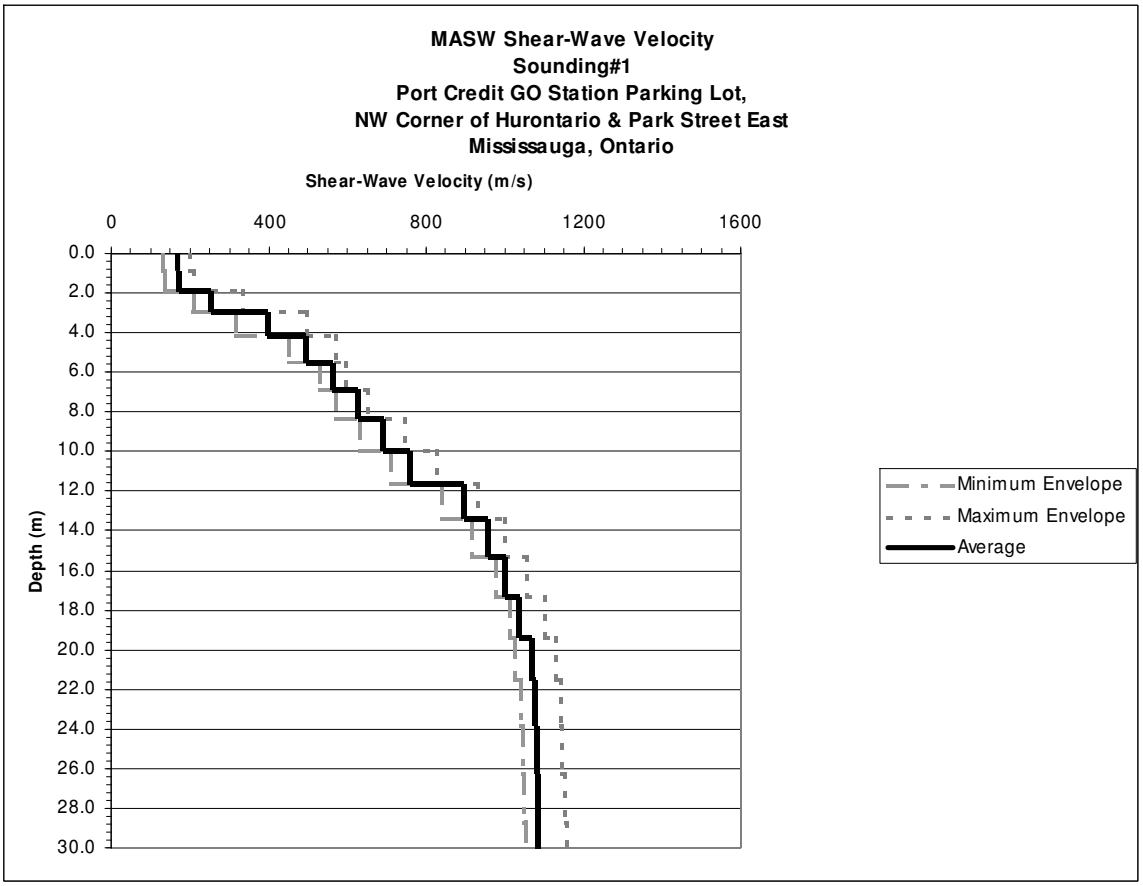


Figure 4: MASW Shear-wave Velocity Sounding

CONCLUSIONS

The approximate location of the shear-wave sounding is presented in Figure 1.

The MASW shear-wave models are presented in Figure 4. The results are summarized in Table 1. The background seismic noise levels at this site were moderate. The quality of the seismic records and resulting dispersion curves was good.

No boreholes or geotechnical data were available at the time of this report.

Table 1: Calculated V_s30 values (m/s) from the MASW data (0 to 30m)

Sounding	Minimum	Average	Maximum	Site Class
1	550	**623**	700	**C**

The calculated average V_s30 values from the 1D MASW soundings collected was 623m/s +/- 15% to 20%.

The V_s30 values calculated for the minimum and the maximum envelopes ranged from 550 to 700m/s.

Based on information provided by the client, the elevation of the bottom of the basement is approximately 15m below the grade. The V_s30 values have been recalculated taking into consideration the bottom of the basement elevation. The application of these recalculated Vs30* value is discussed below and the validity of these assumptions is at the discretion of the design engineer. The recalculated Vs30* values are presented in Table 2.

With the new subgrade basement, there may be a need to evaluate any possible ground motion on the side walls that may effect the building.

Table 2: Calculated V_s30* values (m/s) from the MASW data (15 to 45m)

Sounding	Minimum	Average	Maximum	Site Class
1	1040	**1076**	1143	**B**

The calculated average V_s30 values from the 1D MASW soundings collected was 1076m/s +/- 15% to 20%.

The V_s30 values calculated for the minimum and the maximum envelopes ranged from 1040 to 1143 m/s.

Based on the average V_s30 values (as determined through the MASW method) and table 4.1.8.4.A of the National Building Code of Canada, 2010 Edition, the investigated area is site class "B" ($760 < V_S30 \leq 1500$ m/s).

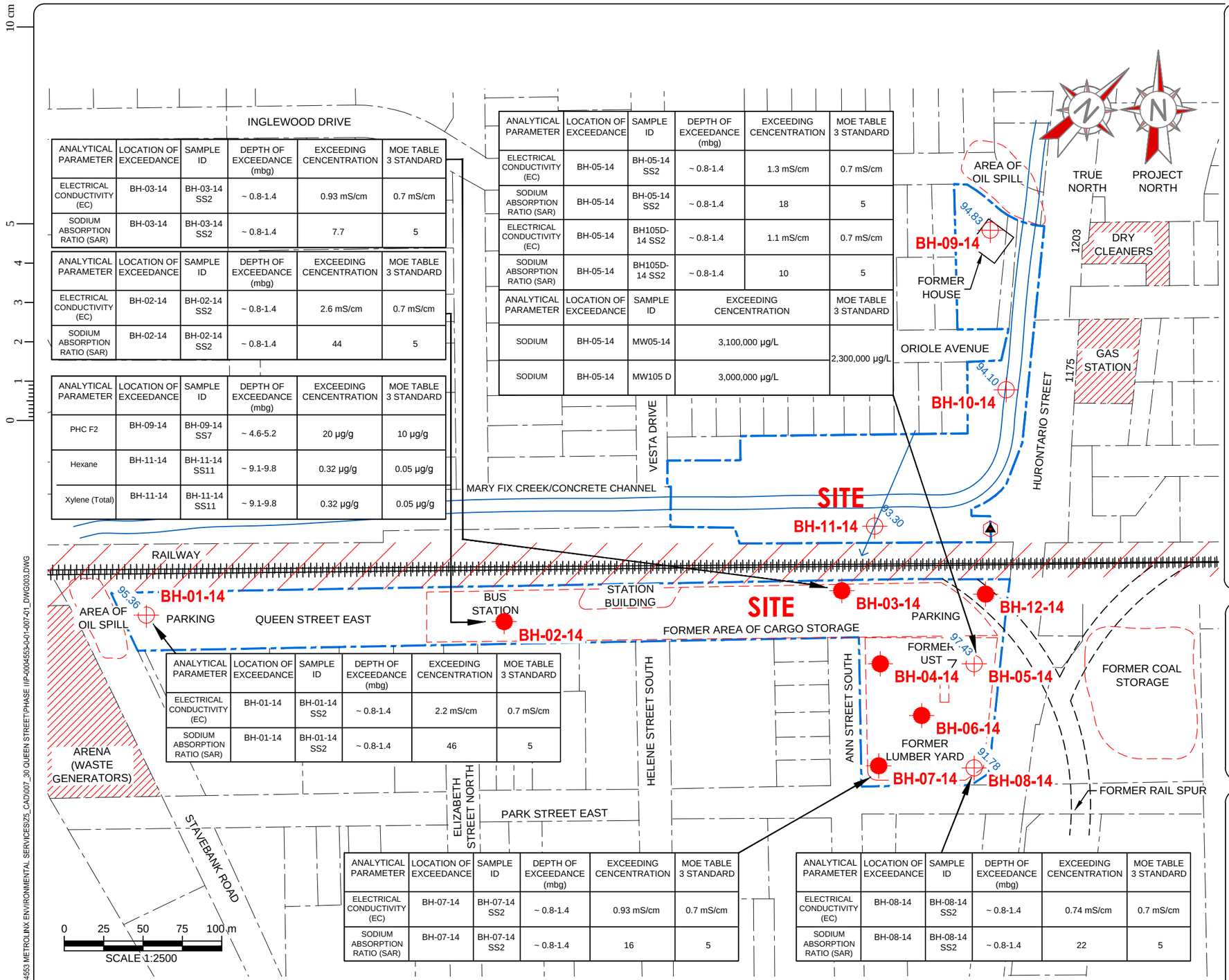
It must be noted that the site classification provided in this report is based solely on the V_s30 value as derived from the MASW method and that it can be superseded by

other geotechnical information. This geotechnical information includes, but is not limited to, the presence of sensitive and/or liquefiable soils, more than 3m of soft clays, high moisture content, etc. The reader is referred to section 4.1.8.4 of the National Building Code of Canada, 2010 Edition for more information on the requirements for site classification.

This report has been written by Milan Situm, P.Geo.

Milan Situm, P.Geo.
Manager

Appendix 6 Previously Drilled Borehole Location Plan and Logs



ANALYTICAL PARAMETER	LOCATION OF EXCEEDANCE	SAMPLE ID	DEPTH OF EXCEEDANCE (mbg)	EXCEEDING CENCENTRATION	MOE TABLE 3 STANDARD
ELECTRICAL CONDUCTIVITY (EC)	BH-03-14	BH-03-14 SS2	~ 0.8-1.4	0.93 mS/cm	0.7 mS/cm
SODIUM ABSORPTION RATIO (SAR)	BH-03-14	BH-03-14 SS2	~ 0.8-1.4	7.7	5

ANALYTICAL PARAMETER	LOCATION OF EXCEEDANCE	SAMPLE ID	DEPTH OF EXCEEDANCE (mbg)	EXCEEDING CENCENTRATION	MOE TABLE 3 STANDARD
ELECTRICAL CONDUCTIVITY (EC)	BH-02-14	BH-02-14 SS2	~ 0.8-1.4	2.6 mS/cm	0.7 mS/cm
SODIUM ABSORPTION RATIO (SAR)	BH-02-14	BH-02-14 SS2	~ 0.8-1.4	44	5

ANALYTICAL PARAMETER	LOCATION OF EXCEEDANCE	SAMPLE ID	DEPTH OF EXCEEDANCE (mbg)	EXCEEDING CENCENTRATION	MOE TABLE 3 STANDARD
PHC F2	BH-09-14	BH-09-14 SS7	~ 4.6-5.2	20 µg/g	10 µg/g
Hexane	BH-11-14	BH-11-14 SS11	~ 9.1-9.8	0.32 µg/g	0.05 µg/g
Xylene (Total)	BH-11-14	BH-11-14 SS11	~ 9.1-9.8	0.32 µg/g	0.05 µg/g

ANALYTICAL PARAMETER	LOCATION OF EXCEEDANCE	SAMPLE ID	DEPTH OF EXCEEDANCE (mbg)	EXCEEDING CENCENTRATION	MOE TABLE 3 STANDARD
ELECTRICAL CONDUCTIVITY (EC)	BH-05-14	BH-05-14 SS2	~ 0.8-1.4	1.3 mS/cm	0.7 mS/cm
SODIUM ABSORPTION RATIO (SAR)	BH-05-14	BH-05-14 SS2	~ 0.8-1.4	18	5
ELECTRICAL CONDUCTIVITY (EC)	BH-05-14	BH105D-14 SS2	~ 0.8-1.4	1.1 mS/cm	0.7 mS/cm
SODIUM ABSORPTION RATIO (SAR)	BH-05-14	BH105D-14 SS2	~ 0.8-1.4	10	5

ANALYTICAL PARAMETER	LOCATION OF EXCEEDANCE	SAMPLE ID	EXCEEDING CENCENTRATION	MOE TABLE 3 STANDARD
SODIUM	BH-05-14	MW05-14	3,100,000 µg/L	2,300,000 µg/L
SODIUM	BH-05-14	MW105 D	3,000,000 µg/L	

ANALYTICAL PARAMETER	LOCATION OF EXCEEDANCE	SAMPLE ID	DEPTH OF EXCEEDANCE (mbg)	EXCEEDING CENCENTRATION	MOE TABLE 3 STANDARD
ELECTRICAL CONDUCTIVITY (EC)	BH-01-14	BH-01-14 SS2	~ 0.8-1.4	2.2 mS/cm	0.7 mS/cm
SODIUM ABSORPTION RATIO (SAR)	BH-01-14	BH-01-14 SS2	~ 0.8-1.4	46	5

ANALYTICAL PARAMETER	LOCATION OF EXCEEDANCE	SAMPLE ID	DEPTH OF EXCEEDANCE (mbg)	EXCEEDING CENCENTRATION	MOE TABLE 3 STANDARD
ELECTRICAL CONDUCTIVITY (EC)	BH-07-14	BH-07-14 SS2	~ 0.8-1.4	0.93 mS/cm	0.7 mS/cm
SODIUM ABSORPTION RATIO (SAR)	BH-07-14	BH-07-14 SS2	~ 0.8-1.4	16	5

ANALYTICAL PARAMETER	LOCATION OF EXCEEDANCE	SAMPLE ID	DEPTH OF EXCEEDANCE (mbg)	EXCEEDING CENCENTRATION	MOE TABLE 3 STANDARD
ELECTRICAL CONDUCTIVITY (EC)	BH-08-14	BH-08-14 SS2	~ 0.8-1.4	0.74 mS/cm	0.7 mS/cm
SODIUM ABSORPTION RATIO (SAR)	BH-08-14	BH-08-14 SS2	~ 0.8-1.4	22	5

LEGEND :

- SITE BOUNDARY LINE
- BOREHOLE LOCATION
- BOREHOLE AND MONITORING WELL LOCATION
- TEMPORARY BENCHMARK

NOTES :

1-The Site is irregular-shaped, and separated into two sections, bisected by a Canadian National (CN) rail line, the north section and the south section. Collectively they are approximately 4.6 hectares (approximately 11.3 acres) in area.

2- Based on the results of this Phase II ESA, the Site stratigraphy at the locations of the boreholes is generally comprised of a layer of sand and gravel over sandy silt and/or native silty clay till. Bedrock was not encountered at any of the investigated locations.

3- Based on the groundwater measurements at the monitoring well locations on October 25, 2014, the groundwater is located at depths ranging of approximately 1.4 and 5.9 mbg. It is noted that perched water was encountered at some of the borehole locations which may influence the encountered shallow groundwater depths. From the groundwater level measurements collected on October 25, 2014, the inferred shallow groundwater flow direction at the Site appears to be generally towards the south-southwest.

4-REFERENCES: MISSISSAUGA GIS LOCATOR MAPPING CENTRE, 2014 Aerial Photograph.

5-Temporary Benchmark - top of concrete base supporting lamp post.

6-Drawing scale may be distorted due to file conversion and/or copying. Measurements taken from the drawing must be verified in the field.

Project

Phase II Environmental Site Assessment

30 Queen Street East, Mississauga, Ontario

Title

DETAILED SITE PLAN (WEST PORTION)

LVM

1821, Albion Road, Unit 7
Toronto (Ontario) M9W 5WS
Telephone : 416.213.1060
Fax : 416.213.1070

Prepared	E.Ciochon	Discipline	ENVIRONMENTAL
Drawn	E.Ciochon	Scale	1:2500
Checked	A.Antonacci	Date	2014-11-17
Project manager	F.Eftekhari	Sequence no.	03 of 03

M. dept.	Project	Disc.	Dwg no.	Rev.
124	P-0004553-0-01-007-01	HG	03	0B

G:\124\P-0004553 METROLINX ENVIRONMENTAL SERVICES\25_CAD\007_30 QUEEN STREET\PHASE II\P-0004553-0-01-007-01_DWG003.DWG

LOG OF BOREHOLE No. 01-14

LVM

Project No. P-0004553-0-01-007 DRAWING No. BH-01-14

Project: Metrolinx Port Credit GO Station Sheet No. 1 of 1

Location: West Parking Lot, About 15 m East of Stavebank Road, 15 m South of North Curb

Date Drilled: 10/23/2014

Drill Type: Hollow Stem Augers

Datum: Assumed

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	ELEV. m	DEPTH
		ASPHALT CONCRETE (110 mm)	97.9	0
		SAND AND GRAVEL (Granular Base/Subbase, 290 mm)	97.8	
		SILTY CLAY, TILL: some organic matter, trace sand and gravel, stiff, dark brown, moist some silt	97.5	
		SANDY SILT: trace clay and organic matter, loose to compact, grey, very moist to wet	96.4	1
				2
			95.3	3
		SILTY CLAY, TILL: stiff, grey, moist	93.4	4
		Environmental Sample		5
				6
		Terminated at 6.8 m	91.1	
		Borehole advanced using continuous flight hollow stem augering equipment on October 23, 2014 by Determination Drilling.		

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): 10 20 30

SAMPLES

Natural Unit Weight kN/m³

Time	Water Level (m)	Depth to Cave (m)
Upon completion	3.8	none
24/10/2014	2.6	none
25/10/2014	2.6	none

LOG A GWGL02 2.1_007-BOREHOLE LOGS (WEST PARKING LOT).GPJ LOG A GWGL02.GDT 11/4/14

LOG OF BOREHOLE No. 02-14

LVM

Project No. P-0004553-0-01-007 DRAWING No. BH-02-14

Project: Metrolinx Port Credit GO Station Sheet No. 1 of 1

Location: Queen Street East, About 30 m East of Elizabeth Street North Intersection, 1.0 m South of North Curb

Date Drilled: 10/22/2014

Drill Type: Hollow Stem Augers

Datum: Assumed

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 ⊕ (0, 15, 5, 10) | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	ELEV. m
			98.1
		ASPHALT CONCRETE (135 mm)	97.9
		SAND AND GRAVEL (Granular Base/Subbase, 250mm): light brown, moist	97.7
		SILTY CLAY, TILL: some sand and gravel, very stiff, brown, moist	97.3
		SANDY SILT: dense, brown, moist	96.7
▼		SILTY CLAY, TILL: stiff, grey, moist	96.6
			94.5
		Terminated at 3.6 m	
		Borehole advanced using continuous flight hollow stem augering equipment on October 22, 2014 by Determination Drilling.	

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): 10 20 30

SAMPLES

Natural Unit Weight kN/m³

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	1.5	none

LOG A GWGL02 2.2_007-BOREHOLE LOGS (QUEEN ST E).GPJ LOG A GWGL02.GDT 11/4/14

LOG OF BOREHOLE No. 03-14

LVM

Project No. P-0004553-0-01-007 DRAWING No. BH-03-14

Project: Metrolinx Port Credit GO Station Sheet No. 1 of 1

Location: Handicap Parking Area, About 30 m East of West Curb, 7 m South of North Fenceline

Date Drilled: 10/23/2014

Drill Type: Hollow Stem Augers

Datum: Assumed

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	ELEV. m
		ASPHALT CONCRETE (120 mm)	99.6
		SAND AND GRAVEL (Granular Base/Subbase, 130 mm): brown, moist	99.5
		ASPHALT CONCRETE (150 mm)	99.4
▽		SILTY CLAY, TILL: firm, brown, very moist to moist	99.2
		some sand and gravel, very stiff to hard, grey	98.1
		Terminated at 9.2 m	90.4
		Borehole advanced using continuous flight hollow stem augering equipment on October 23, 2014 by Determination Drilling.	

DEPTH

Standard Penetration Test N Value: 20 40 60 80

Shear Strength: 50 100 200 kPa; /225 mm; /50 mm

Combustible Vapour Reading (ppm): 250 500 750

Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30

SAMPLES

Natural Unit Weight kN/m³

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	1.5	none

LOG A GWGL02 2.3_007-BOREHOLE LOGS (HANDICAP PARKING AREA).GPJ LOG A GWGL02.GDT 11/4/14

LOG OF BOREHOLE No. 04-14

LVM

Project No. P-0004553-0-01-007 DRAWING No. BH-04-14

Project: Metrolinx Port Credit GO Station Sheet No. 1 of 1

Location: East Parking Lot, About 10 m South of North Curb, 7 m East of West Curb

Date Drilled: 10/24/2014

Drill Type: Hollow Stem Augers

Datum: Assumed

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 0, 5, 10, 15
Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	ELEV. m
		ASPHALT CONCRETE (110 mm)	98.9
		SAND AND GRAVEL (Granular Base/Subbase, 510 mm): brown, moist	98.8
		SANDY SILT: some organic matter, trace clay and gravel, compact to dense, brown, very moist	98.3
		SILTY CLAY, TILL: stiff to hard, grey, moist	96.6
▼			93.6
		Terminated at 9.2 m	89.7
		Borehole advanced using continuous flight hollow stem augering equipment on October 24, 2014 by Determination Drilling.	

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): 10, 20, 30

SAMPLES

Natural Unit Weight kN/m³

/100 mm

/75 mm

/50 mm

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	5.3	none

LOG A GWGL02 2.4_007-BOREHOLE LOGS (EAST PARKING LOT).GPJ LOG A GWGL02.GDT 11/4/14

LOG OF BOREHOLE No. 05-14

LVM

Project No. P-0004553-0-01-007 DRAWING No. BH-05-14

Project: Metrolinx Port Credit GO Station Sheet No. 1 of 1

Location: East Parking Lot, About 6 m South of North Curb, 0.5 m West of East Curb

Date Drilled: 10/22/2014

Drill Type: Hollow Stem Augers

Datum: Assumed

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 ⊕ (0, 5, 10, 15)
Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	ELEV. m
		ASPHALT CONCRETE (70 mm)	98.8
		SAND AND GRAVEL (Granular Base/Subbase, 300 mm): light brown, dry	98.7
		SANDY SILT: trace clay, loose to compact, brown, very moist	98.5
			97.4
		SILTY CLAY, TILL: very stiff to hard, grey, moist	95.8
			89.3
		Terminated at 9.5 m	
		Borehole advanced using continuous flight hollow stem augering equipment on October 22, 2014 by Determination Drilling.	

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): 10, 20, 30

SAMPLES

Natural Unit Weight kN/m³

/75 mm
/125 mm
/50 mm
/50 mm

Time	Water Level (m)	Depth to Cave (m)
24/10/2014	1.4	none

LOG A GWGL02 2.4_007-BOREHOLE LOGS (EAST PARKING LOT).GPJ LOG A GWGL02.GDT 11/4/14

LOG OF BOREHOLE No. 06-14

LVM

Project No. P-0004553-0-01-007 DRAWING No. BH-06-14

Project: Metrolinx Port Credit GO Station Sheet No. 1 of 1

Location: East Parking Lot, About 45 m West of East Curb, 30 m South of North Curb

Date Drilled: 10/23/2014

Drill Type: Hollow Stem Augers

Datum: Assumed

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 0 / 15 ⊕ 5 / 10
Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	ELEV. m	DEPTH
		ASPHALT CONCRETE (100 mm)	98.6	0
		SAND AND GRAVEL (Granular Base/Subbase, 320 mm): light brown, moist	98.5	
		SANDY SILT: some clay and gravel, loose, dark grey, moist, hydrocarbon odour	98.2	1
		SILTY CLAY, TILL: very stiff, brown, moist, hydrocarbon odour	97.1	
		Terminated at 2.0 m	96.6	

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): 10 20 30

SAMPLES

Natural Unit Weight kN/m³

Borehole advanced using continuous flight hollow stem augering equipment on October 23, 2014 by Determination Drilling.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	none	none

LOG A GWGL02 2.4_007-BOREHOLE LOGS (EAST PARKING LOT).GPJ LOG A GWGL02.GDT 11/4/14

LOG OF BOREHOLE No. 07-14

LVM

Project No. P-0004553-0-01-007 DRAWING No. BH-07-14

Project: Metrolinx Port Credit GO Station Sheet No. 1 of 1

Location: East Parking Lot, About 3 m West of West Curb, 7 m North of South Curb

Date Drilled: 10/24/2014

Drill Type: Hollow Stem Augers

Datum: Assumed

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

GWL	SYMBOL	SOIL DESCRIPTION	ELEV. m	DEPTH
		TOPSOIL (250 mm)	97.5 / 97.3	0
		SILTY CLAY, TILL: trace sand and gravel, stiff to hard, brown, moist		1
		grey		2
				3
				4
				5
▼			91.1	6
				7
				8
			88.4	9
		Terminated at 9.2 m		
		Borehole advanced using continuous flight hollow stem augering equipment on October 24, 2014 by Determination Drilling.		

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): 10 20 30
SAMPLES
Natural Unit Weight kN/m³

/25 mm

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	6.4	0.0

LOG A GWGL02 2.4_007-BOREHOLE LOGS (EAST PARKING LOT).GPJ LOG A GWGL02.GDT 11/4/14

LOG OF BOREHOLE No. 08-14

LVM

Project No. P-0004553-0-01-007 DRAWING No. BH-08-14

Project: Metrolinx Port Credit GO Station Sheet No. 1 of 1

Location: East Parking Lot, About 6 m North of South Curb, 7 m West of East Curb

Date Drilled: 10/23/2014

Drill Type: Hollow Stem Augers

Datum: Assumed

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 15⊕5 10
Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	ELEV. m
		ASPHALT CONCRETE (90 mm)	97.5
		SAND AND GRAVEL (Granular Base/Subbase, 250 mm): light brown, moist	97.2
		SANDY SILT: some organic matter, trace clay and gravel, compact, brown, moist	
		some clay, dense	
		SILTY CLAY, TILL: very stiff to hard, grey, moist	95.3
			91.6
		Terminated at 9.6 m	88.0
		Borehole advanced using continuous flight hollow stem augering equipment on October 24, 2014 by Determination Drilling.	

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): 10 20 30

0 1 2 3 4 5 6 7 8 9

/75 mm

/50 mm

SAMPLES

Natural Unit Weight kN/m³

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	7.6	none
24/10/2014	5.9	none
25/10/2014	5.8	none

LOG A GWGL02 2-4_007-BOREHOLE LOGS (EAST PARKING LOT).GPJ LOG A GWGL02.GDT 11/4/14

LOG OF BOREHOLE No. 09-14

LVM

Project No. P-0004553-0-01-007 DRAWING No. BH-09-14

Project: Metrolinx Port Credit GO Station Sheet No. 1 of 1

Location: North End of Site, About 15 m South of South Curb of Eaglewood Drive, 5 m West of West Curb of Oriole Avenue

Date Drilled: 10/21/2014

Drill Type: Hollow Stem Augers

Datum: Assumed

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 ⊕ (0, 5, 10, 15)
Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	ELEV. m
		TOPSOIL (300 mm)	99.4
		SILTY CLAY, TILL: stiff to very stiff, brown, moist	99.1
		grey	
		hard	
▼			94.8
			93.3
		Terminated at 6.1 m	
		Borehole advanced using continuous flight hollow stem augering equipment on October 21, 2014 by Determination Drilling.	

DEPTH 0 1 2 3 4 5 6

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): 10 20 30

25 mm
130 mm

SAMPLES

Natural Unit Weight kN/m³

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	5.3	none
25/10/2014	4.6	none

LOG A GWGL02 2.5_007-BOREHOLE LOGS (NORTH END OF SITE).GPJ LOG A GWGL02.GDT 11/4/14

LOG OF BOREHOLE No. 10-14

LVM

Project No. P-0004553-0-01-007 DRAWING No. BH-10-14

Project: Metrolinx Port Credit GO Station Sheet No. 1 of 1

Location: North Parking Lot, About 10 m South of North Curb, 7 m East of West Curb

Date Drilled: 10/22/2014

Drill Type: Hollow Stem Augers

Datum: Assumed

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 0 15 5 10
Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	ELEV. m
		TOPSOIL (300 mm)	99.6
		SILTY CLAY, TILL: stiff to hard, brown, moist	99.3
		grey	94.1
		Terminated at 6.7 m	92.9
		Borehole advanced using continuous flight hollow stem augering equipment on October 22, 2014 by Determination Drilling.	

DEPTH 0 1 2 3 4 5 6

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): 10 20 30

SAMPLES

Natural Unit Weight kN/m³

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	6.1	none
25/10/2014	5.5	none

LOG A GWGL02 2.6_007-BOREHOLE LOGS (NORTH PARKING LOT).GPJ LOG A GWGL02.GDT 11/4/14

LOG OF BOREHOLE No. 11-14

LVM

Project No. P-0004553-0-01-007 DRAWING No. BH-11-14

Project: Metrolinx Port Credit GO Station Sheet No. 1 of 1

Location: North Parking Lot, About 90 m West of East Curb, 7 m South of North Curb

Date Drilled: 10/21/2014

Drill Type: Hollow Stem Augers

Datum: Assumed

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 I—○
Undrained Triaxial at % Strain at Failure 0 / 15 / 5 / 10
Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	ELEV. m
		TOPSOIL (300 mm)	99.2
		SANDY SILT: some clay, compact, brown, moist	98.9
		SILTY CLAY, TILL: stiff to hard, grey, moist	98.5
			93.3
		Terminated at 9.4 m	89.8

Borehole advanced using continuous flight hollow stem augering equipment on October 21, 2014 by Determination Drilling.

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): 10 20 30

0 1 2 3 4 5 6 7 8 9

/25 mm
/125 mm
/50 mm

SAMPLES

Natural Unit Weight kN/m³

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	9.1	none
25/10/2014	5.9	none

LOG A GWGL02 2.6_007-BOREHOLE LOGS (NORTH PARKING LOT).GPJ LOG A GWGL02.GDT 11/4/14

LOG OF BOREHOLE No. 12-14

LVM

Project No. P-0004553-0-01-007 DRAWING No. BH-12-14

Project: Metrolinx Port Credit GO Station Sheet No. 1 of 1

Location: North Addition to East Parking Lot, About 6 m South of North Curb, 7 m West of East Curb

Date Drilled: 10/24/2014

Drill Type: Hollow Stem Augers

Datum: Assumed

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 0 15 5 10
Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	ELEV. m	DEPTH
			100.1	0
		ASPHALT CONCRETE (60 mm)	100.0	
		SAND AND GRAVEL (Granular Base/Subbase, 240 mm): brown, moist	99.8	
		ASPHALT CONCRETE (120 mm)	99.7	
		SAND AND GRAVEL (Granular Base/Subbase, 210 mm): brown, moist	99.5	
		ASPHALT CONCRETE (110 mm)	99.4	
▼		SILTY CLAY, TILL: stiff to hard, brown, very moist to moist	98.6	1
				2
				3
		very stiff to hard, grey		4
				5
				6
			93.7	
		Terminated at 6.4 m		
		Borehole advanced using continuous flight hollow stem augering equipment on October 24, 2014 by Determination Drilling.		

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): 10 20 30
/100 mm

SAMPLES

Natural Unit Weight kN/m³

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	1.5	none

LOG A GWGL02 2.7_007-BOREHOLE LOGS (NORTH ADDITION).GPJ LOG A GWGL02.GDT 11/4/14