WWW.THURBER.CA

THURBER ENGINEERING LTD.

THURBER ENGINEERING LTD.

Geotechnical Design Report

CHEO Integrated Treatment Centre - 1Door4care

Client Name: EllisDon
Date: August 30, 2024
File: 36182

Suite 202 - 1908 Ironoak Way, Oakville, ON L6H 0N1 | Phone: (905) 829-8666

THURBER ENGINEERING LTD.

TABLE OF CONTENTS

IN-TEXT TABLES

THURBER ENGINEERING LTD.

APPENDICES

APPENDIX A

Borehole Location Plan (from GHD Report)

Estimated Bedrock Contours

Record of Boreholes and Laboratory Test Results

THURBER ENGINEERING LTD.

1. INTRODUCTION

Thurber Engineering Ltd. (Thurber) has been retained by EllisDon to provide geotechnical input to the design of foundations for the proposed development at the Children's Hospital for southwestern portion of Ontario (CHEO) Campus.

Geo-environmental (chemical) aspects of the project including disposal excess soil/groundwater off site, consequences of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources, are outside of the scope of this report.

This report has been issued based on a review of the geotechnical investigations conducted by Infrastructure Ontario's Consultant (GHD). The soil conditions may vary between and beyond the borehole locations, and accordingly geotechnical inspection during construction is important to assess any variation of subsurface conditions and to provide additional recommendations if necessitated by such variations.

The use of this report is contingent to ED obtaining a reliance letter from the owner (Infrastructure Ontario) for all the subsurface investigation report(s) provided by the owner and that the reliance letter will include Thurber in conjunction with ED for use of the information.

It should be noted that Thurber accepts no responsibility for the accuracy and quality of the factual information provided by others.

It is a condition of this report that Thurber's performance of its professional services is subject to the attached Statement of Limitations and Conditions.

2. BACKGROUND

Geotechnical investigations were conducted at the Site by GHD (Infrastructure Ontario's Consultant), the results of which were presented in a report titled "1Door4Care: CHEO Integrated Treatment Centre – Geotechnical Investigation Report (1Door4Care)" dated October 25, 2022.

The scope of geotechnical investigation included advancing a total of 13 boreholes and 11 monitoring wells, conducting Multi-channel Analysis of Surface Waves (MASW), and geophysical survey using Ground Penetration Radar (GPR).

3. UNDERSTANDING OF SUBSURFACE CONDITIONS

The subsurface conditions outlined in this report have been inferred based on the record of boreholes presented in the above GHD's report.

A plan showing the location of the footprint of the proposed structure at the site as well as the location of the boreholes and monitoring wells advanced at the site has been included in Appendix A. Furthermore, Appendix A also contains contour maps describing the bedrock surface elevation and the elevation of competent bedrock, and the record of borehole sheets along with the laboratory test results.

In general, the subsurface conditions at the site consisted of topsoil/asphalt generally over non-cohesive fill (predominantly silty sand to silty sand and gravel) which is in turn underlain by non-cohesive native soil (predominantly compact to dense silty sand with gravel, possible glacial till, over shale bedrock. The thickness of the fill at the site varied between 0.4 m and 3.2 m. Where the boreholes extended to the bedrock, the silty sand till extended to depths ranging from 1.4 m to 3.8 m below existing ground surface.

Due to the method of investigation and the presence of highly weathered shale below native soil, the top of the bedrock profile cannot be accurately determined. However, the estimated depths to the highly weathered shale bedrock surface as well as estimated elevation of the competent shale bedrock from augering and coring or auger refusal at the location of each borehole at the site have been presented in the following table:

Table 3.1: Approximate Depth and Elevation of Bedrock

Borehole Identification Number	Estimated Depth/Elevation of Bedrock Surface (mbgs/m)	Estimated Elevation of Competent Bedrock Surface (m)	Comment
MW1	3.8 / 78.7	Below 77.1	Outside building area
MW2	3.8 / 78.6	78.3	Outside building area
MW3	3.1 / 78.6	77.5	
MW4	1.5 / 78.8	77.7	
MW5	1.7 / 78.8	Below 77.4	Outside building area
BH6	0.9 / 79.2	Below 77.6	Outside building area
BH7	1.5 / 78.9	Below 78.0	

Borehole Identification Number	Estimated Depth/Elevation of Bedrock Surface (mbgs/m)	Estimated Elevation of Competent Bedrock Surface (m)	Comment
BH8	1.5 / 79.3	Below 77.7	
MW9	2.0 / 78.5	76.7	
MW10	2.3 / 77.6	76.1	Outside building area
BH11	1.5 / 79.8	78.8	Outside building area
BH12	2.3 / 79.0	77.5	
BH13	1.1/ 80.3	79.0	Outside building area
BH14	1.0 / 80.1	78.9	Outside building area
MW14	1.6 / 79.6	79.1	
BH16	1.2 / 79.8	79.4	
MW17	1.3 / 79.6	79.1	
BH20	2.2 / 79.0	78.6	
BH21	2.6 / 78.4	78.4	
MW23	3.5 / 79.4	77.9	Proposed tunnel to existing CHEO

* Estimated Elevation due to Auger Refusal

** mbgs: metre below ground surface

The groundwater level measurements in the wells are summarized below:

Table 3.2: Groundwater Level Readings at the Site

Borehole	Ground Surface Elev. (m)	Date	Depth to Water (m)	Groundwater Elev. (m)	Main Screened Deposit	Comment
MW1	82.5	05-Dec-19 13-Dec-19 15-Jan-20 26-Feb-20 08-Apr-20 09-Jul-20 05-Oct-20	5.0 5.1 5.1 5.1 5.0 5.2* 5.2*	77.5 77.4 77.4 77.4 77.5 77.3 77.3	Weathered Shale	-
MW2	82.4	05-Dec-19 13-Dec-19 15-Jan-20	- 4.6 4.6	- 77.8 77.8	Weathered Shale	Shallow Well

Borehole	Ground Surface Elev. (m)	Date	Depth to Water (m)	Groundwater Elev. (m)	Main Screened Deposit	Comment
		26-Feb-20	4.6	77.8		
		08-Apr-20	4.4	78.1		
		09-Jul-20	4.6	77.8		
		05-Oct-20	4.6	77.8		
		05-Dec-19	5.0	77.5	Shale	Deeper Well
		13-Dec-19	5.0	77.4		
		15-Jan-20	5.0	77.4		
		26-Feb-20	5.0	77.5		
		08-Apr-20	4.9	77.6		
		09-Jul-20	5.0	77.4		
		05-Oct-20	5.0	77.4		
MW3	81.6	05-Dec-19	3.8	77.8	Native Soil	Shallow Well
		13-Dec-19	3.8	77.8		
		15-Jan-20	3.8	77.8		
		26-Feb-20	3.9	77.7		
		08-Apr-20	3.7	77.9		
		09-Jul-20	3.9	77.7		
		05-Oct-20	3.9	77.7		
		05-Dec-19	4.3	77.3	Shale	Deeper Well
		13-Dec-19	4.4	77.2		
		15-Jan-20	4.5	77.1		
		26-Feb-20	4.4	77.2		
		08-Apr-20	4.2	77.4		
		09-Jul-20	4.5	77.1		
		05-Oct-20	4.5	77.1		
MW4	80.3	05-Dec-19	-	-	Native Soil	Shallow Borehole
		13-Dec-19	1.5	78.8		
		15-Jan-20	-	-		
		26-Feb-20	-	-		
		08-Apr-20	1.6	78.8		
		09-Jul-20	-	-		
		05-Oct-20	1.6	78.8		
		05-Dec-19	3.1	77.3	Shale	Deep Well
		13-Dec-19	3.1	77.2		
		15-Jan-20	-	-		
		26-Feb-20	-	-		
		08-Apr-20	2.9	77.4		
		09-Jul-20	3.2	77.2		
		05-Oct-20	3.2	77.2		

Borehole	Ground Surface Elev. (m)	Date	Depth to Water (m)	Groundwater Elev. (m)	Main Screened Deposit	Comment
MW5	80.5	05-Dec-19 13-Dec-19 15-Jan-20 26-Feb-20 08-Apr-20 09-Jul-20 05-Oct-20	- 2.4 2.0 2.5 2.1 2.4 2.4	- 78.1 78.6 78.0 78.4 78.2 78.2	Weathered Shale	-
MW9	80.5	05-Dec-19 13-Dec-19 15-Jan-20 26-Feb-20 08-Apr-20 09-Jul-20 05-Oct-20	- - - - 2.0 - 2.0	- - - - 78.5 - 78.5	Weathered Shale	-
MW10	79.9	05-Dec-19 13-Dec-19 15-Jan-20 26-Feb-20 08-Apr-20 09-Jul-20 05-Oct-20	2.5 2.5 - - 2.3 2.8 2.7	77.4 77.4 - - 77.5 77.1 77.1	Weathered Shale	-
MW14	81.2	05-Jul-22 13-Jul-22 21-Jul-22 22-Jul-22 25-Jul-22 27-Jul-22 28-Jul-22 03-Aug-22	1.5 - - 1.6 - - 1.7* -	79.7 - - 79.6 - - 79.6 -	Native Soil	Shallow Well
		05-Jul-22 13-Jul-22 21-Jul-22 22-Jul-22 25-Jul-22 27-Jul-22 28-Jul-22 03-Aug-22	2.9 - 2.9 - - 2.9 - -	78.3 - 78.3 - - 78.3 - -	Shale	Deeper Well
MW17	80.9	05-Jul-22 13-Jul-22	- -	- -	Native Soil	-

Borehole	Ground Surface Elev. (m)	Date	Depth to Water (m)	Groundwater Elev. (m)	Main Screened Deposit	Comment
		21-Jul-22	-	-		
		22-Jul-22	1.6*	79.3		
		25-Jul-22	-	-		
		27-Jul-22	-	-		
		28-Jul-22	1.6*	79.3		
		03-Aug-22	-	-		
MW18	81.0	05-Jul-22	--	-	Native Soil	-
		13-Jul-22	-	-		
		21-Jul-22	-	-		
		22-Jul-22	1.5	79.5		
		25-Jul-22	-	-		
		27-Jul-22	-	-		
		28-Jul-22	-	-		
		03-Aug-22	-	-		
MW23	82.9	05-Jul-22	-	-	Shale	-
		13-Jul-22	5.2	77.7		
		21-Jul-22	-	-		
		22-Jul-22	-	-		
		25-Jul-22	5.3	77.6		
		27-Jul-22	-	-		
		28-Jul-22	-	-		
		03-Aug-22	5.2	77.7		

*Reading showed water at/near the bottom of the monitoring well screen, probable false reading

The groundwater level will be subject to seasonal fluctuations and precipitation events and should be expected to be higher during wet seasons. Perched water may be present at higher levels within the existing fills and/or directly above the bedrock surface.

4. FOUNDATION DESIGN RECOMMENDATIONS

The discussions and design recommendations presented in this report are based on the information provided to us and on the factual data obtained as part of the investigations completed by GHD.

It is understood that the proposed structure includes a 7-storey building (L1 to L6 and a Penthouse). Based on the elevation of the boreholes advanced at the site, the ground surface elevation varies between Elev. 79.7 m and 82.9 m (predominantly around Elev. 81 m). Based on correspondence with the designers it is understood that the final grades of the lowest level of the proposed structure will be at about Elev. 80.1 m.

The reference geotechnical report indicated that bedrock at the site is Shale of Georgian Bay formation which is the dominant bedrock formation in the Greater Toronto Area (GTA). However, a review of bedrock geology maps for Ottawa (MAP 1508A published by Geological Survey of Canada) indicates that the site is located at the border of Carlsbad and Billings Shale formations.

Although the Georgian Bay Shale formation presents some long-term swelling potential associated with changes in salinity, changes in groundwater regime, changes in in-situ stresses, etc., the Carlsbad and Billings Shale formations of Ottawa have not shown such behavior. However, the shale from the Billings Formation (which is likely to be encountered at the site) is susceptible to heaving if allowed to weather in the presence of oxygen and moisture. The general mechanism is that oxidation of pyrite within the shale produces sulfuric acid, which in turn reacts with calcite in the shale to form gypsum crystals, which occupy a larger volume than the original materials. A by-product of this chain of reactions also tends to increase sulphate levels which can attack buried concrete structures. Background documents indicate that long term heave due to this mechanism has occurred at some locations on the CHEO property in the past.

4.1 Protection of Expansive Shale Upon Exposure

The shale bedrock at this site has the potential to swell following exposure to oxygen. The general mechanism is considered to be that pyrite (FeS_2) which is present at low concentrations in the shale, is weathered in the combined presence of oxygen and water to form sulphuric acid.

That sulphuric acid then reacts with calcite, which is also present within the shale either as an integral part of the rock or as filling within fractures, to form gypsum. The gypsum crystals tend to form within existing fractures and to be volumetrically larger than the materials that formed them, thus resulting in heaving/swelling.

For the above reactions to occur there must be both water and oxygen available. An increase in the ground temperature, such as due to the heat from the parking vehicle, heated areas, etc., is also considered to promote the above reactions.

It is also possible for the products of the above reactions to attack the concrete (i.e., sulphate attack).

To help prevent expansion of the shale and/or reaction with the concrete, the shale must be protected from exposure to oxygen both in the long term as well as temporarily during construction adjacent to the existing building.

The shale bedrock subgrade, when exposed during construction, should be covered as soon as practical (within 12 hours) following the first exposure with a lean concrete layer at least 100 mm thick.

Construction planning should ensure the shale is not left exposed and uncovered overnight. Where shale is exposed at the base or on the sides of the excavation, the mud slab (with sulphate resistant cement) or shotcrete with a thickness of at least 100 mm should be placed such that the concrete covers the shale.

Previous excavations or trenches within the proposed construction area should be re-excavated down to shale bedrock and approximately 150 mm of the previously exposed shale removed prior to the placement of the concrete skim coat.

4.2 Site Preparation

The existing fill and loose native soils found at the site are not suitable for the support of foundations, floor slabs, engineered fill and/or controlled fill. These unsuitable in-situ materials, along with all existing foundations, floor slabs and utilities associated with the current site development, will need to be removed from beneath proposed foundations and slabs and from within the influence zone of the foundations and slabs.

Following stripping of these unsuitable surficial soils, the prepared subgrade should be confirmed by proof-rolling, inspection and/or field density test measurement under the direct supervision of the geotechnical engineer. The thickness of unsuitable materials may vary between and beyond borehole locations. Therefore, the required extent of stripping of any loose granular soils, softened, upper portions of the native sand soils will need to be determined based on the proof-rolling and inspection. Any loose, softened or poorly performing areas of the subgrade must be sub-excavated and replaced with engineered fill.

Care will be required to ensure that the prepared area extends far enough to encompass the limits of the engineered fill. The engineered fill limits are defined such that the fill extends to at least one metre beyond the outside edge of the founding level of any footing/pad or other settlement sensitive areas and then downward and outward at a slope of one horizontal to one vertical.

The prepared subgrade shall be protected from freezing and/or other potential disturbances such as traffic due to construction equipment.

4.3 Foundation Design

Based on the record of the boreholes and the proposed founding elevations indicated on the latest structural drawings, the foundations of some of the columns for the building will be founded on weathered shale bedrock while some other columns will be supported on drilled shafts (caissons) socketed into the bedrock. While the estimated settlement of shallow foundations (supported on engineered fill after excavation to weathered shale) designed based on the factored geotechnical resistances provided in the following sections may be up to 20 mm, the columns supported on drilled shafts may experience negligible amounts of settlement. The differential settlements between adjacent foundations of different types should be considered/accommodated in the structural/architectural design.

The following options are considered feasible for support of the building structure:

Table 4.1: Foundation Design Options

Foundation Options	Advantages	Disadvantages
Spread/Square Footings on Competent Bedrock	Allows for relatively high geotechnical bearing capacities at ULS and SLS	May require deeper excavations and lower founding elevations
Spread/Square Footings on 0.3 m thick engineered fill on Weathered Bedrock	Allows shallower excavations	Will provide moderate geotechnical resistances at ULS and SLS
Raft/Mat Footing on Competent Bedrock	Allows for high geotechnical bearing capacities at ULS and SLS, reduces the differential settlement	May require deeper excavations and lower founding elevations
Raft/Mat Footing on Weathered Bedrock	Allows for relatively high geotechnical bearing capacities at ULS and SLS, limit the differential settlement, allows shallower excavations	Potential cost differences relative to shallow foundations
Cast-in-Place Reinforced Concrete Piles (Drilled Shafts or Caissons)	Will limit the area of excavation for each column	Potential cost differences relative to shallow foundations

4.3.1 Spread/Square Footings

The following Table may be used for the design of shallow foundations bearing on 0.3 m to 1.0 m thick engineered fill pad over weathered shale or directly supported on competent bedrock:

Table 4.2: Recommended Geotechnical Resistances at ULS and SLS

Founding Stratum	Footing Size (m)/Type	Factored Geotechnical Resistance at ULS (kPa)	Geotechnical Resistance at SLS (kPa) for 20 mm of Settlement
0.3 m to 1.0 m thick Engineered Fill Pad over Weathered Shale	2 m wide strip	600	500
	3 m wide strip	650	480
	4 m wide strip	700	400
	2 m Square	850	800
	3 m Square	880	550
	4 m Square	900	400
Competent Shale	2 m wide strip	1,100	1,100
	3 m wide strip	1,200	1,100
	4 m wide strip	1,300	1,200
	2 m Square	1,600	1,500
	3 m Square		1,200
	4 m Square		1,000

The resistance values provided above are for vertical, concentric loads. Where eccentric or inclined loads are applied, the resistance values used in the design must be reduced accordingly.

The sliding resistance of a cast-in-place footing on sound bedrock or weathered bedrock/engineered fill may be computed using the unfactored friction coefficient of 0.7 or 0.55, respectively.

Due to potential swelling of Billings Shale, the final prepared bedrock surface shall be covered by shotcrete or lean concrete within 12 hours of exposure.

Where previous excavations or trenches are present within about 1 m from the closest edge of each proposed foundation or within the footprint of the slab-on-grade, those utilities (including their bedding and backfill) should be fully removed (abandoned) and backfilled with lean concrete

(to the top of the adjacent shale bedrock) after removal of about 150 mm of the previously exposed shale (the shale which was exposed during construction of the existing trenches).

4.3.2 Raft/Mat Foundations

Raft/Mat foundations can be supported on 0.3 m to 1.0 m of compacted engineered fill after sub-excavation to weathered bedrock, or can directly be supported on competent bedrock. If supported on weathered bedrock, the engineered fill underlying the foundation must be extended at least 1 m beyond the footprint of the raft.

A modulus of subgrade reaction may be used to represent the soil stiffness for structural design of the rafts. For foundations on weathered or disturbed bedrock the modulus of subgrade reaction, k_{v1}, for a 0.3 m (1 ft.) square plate, is estimated to be about 80 MPa/m. For foundations on competent (sound/undisturbed) bedrock, the k_{v1} for a 0.3 m (1 ft.) square plate is estimated to be 200 MPa/m for both static and seismic conditions.

For design purposes, the value of k_{v1} provided above needs to be modified to account for size effects (i.e., reduced for loaded areas larger than 0.3 m square) as per standard design methods as outlined in the 4th Edition of the Canadian Foundation Engineering Manual (CFEM 2006). The modulus of subgrade reaction for a foundation supported on granular soils with a foundation width of (b) in meters (k_{vb}) may be determined using the following correlation:

$$k_{vb} = k_{v1} ((b+0.3)/2b)^2$$

This results in the value of k_{vb} (modulus for actual foundation dimension) being approximately one quarter of the value of k_{v1} for large foundation widths.

The modulus of subgrade reaction is not a fundamental soil property. It is an approach to analyze soil-structure interaction for design purposes. The modulus of subgrade reaction depends on many factors such as soil type (and variation in soil type), foundation geometry, the location of the foundation under consideration (i.e., center versus edge), size of foundation/loaded area, the rigidity of the foundation and others. In this regard, the value of subgrade reaction varies beneath a given foundation unit; and therefore, there should be additional discussion between Thurber and the structural engineer as design progresses. Given the variability of the site soils and depending on the results obtained by the structural engineer, when using the above values for modulus of subgrade reaction, consideration should be given to carrying out settlement analyses to refine the modulus values and structural design of the foundation.

For design of a mat/raft foundation against sliding on sound bedrock or weathered bedrock/engineered fill an unfactored friction coefficient of 0.7 or 0.55, respectively, may be used in the design.

For estimation of the passive resistance provided by the weathered shale and the competent bedrock against the stems of the raft foundations bulk unit weights of 22 kN/m^3 and 24 kN/m^3, and passive coefficients of lateral earth pressure of 3.3 and 4.6 may be used in the design (under both permanent and earthquake loading of weathered shale and only permanent loading of competent bedrock). A factored lateral resistance of 300 kPa may be used for estimation of the passive resistances provided by the competent bedrock.

4.3.3 Caissons Socketed into Bedrock

Caissons would be constructed by installing a (temporary or permanent) steel casing (liner) into the top of the bedrock using drilling methods that would allow reliable penetration through potential debris, cobbles and boulders that may be encountered in the fill and till layers and to advance into the bedrock. A socket would then be drilled into bedrock, cleaned, and the casing and socket would be filled with concrete in a single pour after installation of reinforcing steel. The rock socket depth may have to be increased based on lateral resistance requirements. Caissons should be installed in accordance with OPSS.PROV 903. The caisson installation equipment must be able to advance through cobbles and boulders within the till overlying the bedrock. The strength and hardness of the bedrock at this site must be considered when selecting equipment to excavate the rock socket.

Given the risk of the saturated silty sand till layer sloughing, the caisson construction method should include use of temporary or permanent casings (liners) sealed into the bedrock. Ultimately, the contractor will be responsible for selecting the construction means and methods based on cost and risk considerations.

Subcontractors bidding on caisson construction should assess all subsurface data (e.g., record of boreholes, laboratory test results, etc.) and select their means and methods accordingly.

The Contractor shall use appropriate means to clean and inspect the bottom of the excavation of all caissons. The Contractor shall apply means necessary (such as air lift pump or hydraulic pump, etc.) to clean the base of the caissons.

The length of the socket into the bedrock depends on the location of the point of fixity against lateral loads, the compression and uplift loads, and the contractors means and methods in cleaning and inspection of the base of the caissons.

Caissons that rely only on sidewall (shaft) resistance, even if socketed into the bedrock, may be designed using a factored geotechnical resistance in compression at ULS and SLS of 550 kPa and 400 kPa, respectively. The resistances provided in compression should be reduced by 25% for computation of geotechnical resistance of the caissons in tension (against uplift). Rock socket drilling should be conducted after the casings (liners) are properly sealed and seated into the bedrock. Following the completion of the excavation for each caisson (including excavation of the rock socket), each rock socket shall be cleaned and inspected to ensure that the length of socket into sound bedrock is not reduced and to ensure that the quality of the reinforced concrete is not impacted due to presence of sediments (i.e., sediments being mixed with the freshly poured concrete). As such it is recommended that the thickness of the sediment at the base at the time of concreting be less than 75 mm, if the end bearing resistance of the caissons is not relied on.

More stringent criteria for caisson cleaning and inspection will be required if end-bearing resistance of the caissons are to be relied on. In addition, the upper 1.4 m of the bedrock should not be relied on to provide axial resistance, to account for fractured (highly weathered) portion of the bedrock. Consideration should be given to extending the rock sockets deeper than the theoretical (design) lengths to account for potential impact of the socket cleaning on the quality of the concrete.

The geotechnical lateral resistance of the socket in the bedrock may be calculated using ultimate lateral resistance (p_{ult}), in terms of stress, as follows:

$$\text{For } z \leq 3D,\ p_{ult} = (1+1.4 * z / D) * \sigma_{rm} \text{ (MPa)}$$

$$\text{For } z > 3D,\ p_{ult} = 5.2 * \sigma_{rm} \text{ (MPa)}$$

where: z = depth of socket below competent bedrock surface (m)

D = caisson diameter (m)

σ_{rm} = rock mass strength, recommend 800 kPa

The ultimate lateral resistance, P_{ult}, in terms of forces, may be obtained from the expression, $P_{ult} = p_{ult} * L * D$ (MN), where D is the caisson diameter (m) and L is the length (m) of the caisson segment or element (below top of competent bedrock) used in the analysis. This represents the ultimate load at which the rock fails and will not support any additional load at greater displacement. A resistance factor of 0.5 should be applied to the calculated ultimate lateral resistance.

The spring constant of the socket in the limestone bedrock can be calculated using coefficient of subgrade reaction (k_h) as follows:

$$k_h = \frac{0.65E_M}{D(1-v_r^2)}\left[\frac{E_M D^4}{E_s I_s}\right]^{1/12} (MN/m^3)$$

where: D = caisson diameter (m)

E_M = rock mass modulus, recommend 3,700 MPa

v_r = 0.2, Poisson's ratio of bedrock

E_s = elastic modulus of caisson concrete (MPa)

I_s = moment of inertia of a caisson in bending (m^4)

The spring constant, K_h, for analysis may be obtained by the expression, $K_h = k_h$ L D (kN/m), where D is the caisson diameter (m), and L is the length (m) of the caisson segment or element used in the analysis.

4.3.4 Tunnel Foundations

An underground cut and cover tunnel will be constructed between the existing CHEO building and the proposed 1Door4Care structure. The proposed finish grade inside the tunnel varies between Elev. 78.8 m and 80.1 m. Based on the record of Boreholes MW1 and MW14 advanced near the location of the proposed tunnel, the foundation of the tunnel is expected to be founded within the shale. Where the shale is exposed under the foundation or on the side walls of the tunnel (during construction) it should be protected from swelling as per the recommendations provided in the previous sections of this report.

The tunnel shall be supported on a 250 mm to 1,000 mm thick engineered fill after sub-excavation to bedrock and/or very dense native silty sand.

Waterproofing shall be provided as per the project Output Specifications.

4.4 Foundation Excavation and Temporary Dewatering

It is anticipated that the finished floor of the building be at about Elev. 80.1 m and that the excavations of the structure be extended to about Elev. 78.0 m. In general, the open-cut excavations will extend through non-cohesive fill (predominantly silty sand to silty sand and

gravel), non-cohesive native soil (predominantly compact to dense silty sand with gravel, possible glacial till), over shale bedrock. The depth to the groundwater table at this site ranged between 1.5 m to 5.3 m below grade at the elevations varied between 77.1 m and 79.3 m. Therefore, seepage is expected into the excavation within the native silty/gravelly sand deposits (moderate to high).

Use of a hydraulic excavator should be suitable for trench excavation within the overburden soils. Provision should be made for handling and removal of asphalt and possible obstructions (i.e., cobbles and boulders) within the fill/soils.

All temporary excavations must be carried out in accordance with the current Occupational Health and Safety Act (OHSA) of Ontario and local regulations. Provided that the excavations are adequately dewatered, the overburden soils are classified as Type 3 above the groundwater level in accordance with the OHSA. Accordingly, excavations in the overburden above the groundwater level can be inclined at 1H:1V, or flatter.

Soil must not be stockpiled beside the excavation within a horizontal distance from the excavation wall equal to the depth of excavation.

Depending on the final elevation of the footings, bedrock removal may be necessary. It will be possible to remove the upper highly weathered portion of shale, to about 0.3 to 1.6 m depth using large hydraulic excavating equipment. Further shale bedrock removal could be accomplished using mechanical methods (such as hoe ramming); however, it is likely that removal of competent shale would be necessary for excavations with their base at or below Elev. 79.0 m.

Provided that the base of excavation is kept at or above Elev. 78 m, groundwater seepage into the excavation is anticipated to be handled by filtered sumps and drains connected to the stormwater gravity drainage system.

4.5 Engineered Fill Pad for Building Footprint

The engineered fill, where and if required, should consist of Ontario Provincial Standard Specification (OPSS) Granular A or Granular B Type II placed in a maximum 300 mm thick loose lifts and compacted to 100 percent of the material's standard Proctor maximum dry density (SPMDD). The top of the engineered fill should be at least 1.0 m wider than foundations at the underside of the footing. Where engineered fill is placed to support the structure footings, its thickness should not be less than 1.0 m unless the engineered fill is placed on bedrock, in which case a lower thickness would be acceptable.

4.6 Grade Raises and Controlled Fill

The placement of controlled fill for paved areas (parking lots and access roads) may be required at the site. The above geotechnical recommendations for engineered fill apply to the placement of controlled fill as well, except that the controlled fill should be compacted to at least 95 percent of SPMDD. However, the upper 300 mm of controlled fill must be compacted to 100 percent of SPMDD. The placement of the controlled fill should be monitored by geotechnical personnel on a regular basis.

4.7 Frost Protection

The depth of frost in Ottawa is about 1.8 m. For the purpose of frost protection in this section, the term foundations include spread footings, deep foundations, pile caps, grade beams, and raft foundations.

- Heated Structures and Buildings: Perimeter and interior foundations and slabs-on-grade within 1.5 m of perimeter walls of heated structures should be protected by a minimum soil cover of 1.5 m or equivalent insulations (see below for discussion on frost protection options). For interior foundations and slabs-on-grade with a horizontal distance greater than 1.5 m from the perimeter of a heated building, frost protection is not required.

- Unheated Structures and Buildings: All exterior foundations and interior foundations within unheated structures must be protected from frost. All exterior slabs-on-grade and interior slabs-on-grad within unheated structures must be protected from frost

Foundations may be protected from frost by several different methods including:

- **Soil Cover**: placing a minimum of 1.8 m (unless otherwise specified) of soil above the underside of the foundation can typically prevent frost from reaching the soil beneath the foundation. The thickness of clear stone, track ballast, rip-rap or other high-void materials should not be included in the calculation of the soil cover.
- **Insulation:** rigid insulation can be used to protect foundations and slabs-on-on-grade from frost. Careful detailing of the placement of the insulation is essential and it should be noted that the use of insulation may impact the design and construction of other design elements.
- **Drained Non-Frost Susceptible Pad:** the requirement for soil cover and/or insulation can be waived if the foundations and/or slabs-on-grade are supported on free-draining non frost susceptible fill (e.g., OPSS Granular O or Granular B Type II) extending to below the depth of frost penetration. This fill pad must have a drainage outlet located below the depth

of frost penetration. In determining the depth of frost penetration, the thickness of clear stone, track ballast, rip-rap or other high-void materials should be neglected.

The use of rigid polystyrene insulation for frost protection of foundations should consider the following:

- Differential frost movements may occur near the outer limits of the extent of the insulation. Where the lateral extent of the insulation terminates beneath soft landscaping this is typically not a problem, however, where it terminates beneath hard features such as asphalt pavement structures, concrete slabs or interlock pathways, differential movement and cracking may occur. In these cases, the use of insulation may not be feasible, or the extent of insulation may need to be extended or granular frost tapers may be required to provide a gradual transition.
- The extent of insulation needs to be coordinated with the layout of services (plumbing, electrical, duct banks, etc.). In addition, where the insulation is adjacent to pavement or track structures, the placement of insulation needs to be coordinated so that it does not block drainage of these structures.
- Polystyrene may dissolve when exposed to petroleum-based hydrocarbon products and should be provided with suitable protection where there is a risk of this exposure.
- The insulation must be able to support the design loads of the overlying structure. Where footings are placed directly on rigid insulation, the bearing resistances will be the lesser of those available from the insulation or the underlying soil/rock.
- As a general guideline, 25 mm of rigid insulation provides about the same frost protection as 600 mm of soil cover, however, a minimum insulation thickness of 50 mm is recommended for durability reasons. It is also noted that many grades of rigid insulation are not available in sheets less than 50 mm thick.

4.8 Slab-On-Grade

A conventional slab-on-grade is suitable for this project after completion of the site preparation and protection of the swelling shale as described in previous sections (e.g., Section 4.1 and 4.2). The design of slabs-on-grade may be based on a modulus of subgrade reaction of 25 MPa/m, based on a loaded area of 0.3 m by 0.3 m. A layer of free draining granular material such as OPSS Granular A at least 300 mm thick compacted to 100% of SPMDD should be placed below the floor slab and surrounding the perimeter walls to create a level construction pad and to provide drainage and support. Any bulk fill required to raise the grade to the underside of the Granular A should consist of OPSS Granular B Type II.

Perimeter drains and under slab drains are not required in areas where the Finished Floor Elevation is at least 200 mm above the exterior grades and surface water is directed away from the building.

In building areas that include below grade structures (e.g., elevator pits), the walls and floors should be designed as water-tight and to resist hydrostatic pressures unless perimeter and under slab drainage is provided. The decision on whether to provide drainage for the below grade structures should consider factors such as the quality and quantity of water that will be removed from the site and the need to prevent the underlying shale bedrock from drying out which could lead to heave.

The recorded groundwater levels of some of the monitoring wells installed at the site indicate that the water table may be within 1 m of the bottom of the slab. The Output Specifications (OS) for the project requires placement of waterproofing under the slabs for these circumstances. However, if accepted by the owner (CHEO), consideration may be given to the use of free draining granular materials below the slab (which have their underside elevation at or above Elev. 80 m), in conjunction with an under-slab drainage system at the base of the granular layer and surrounding the perimeter walls in lieu of use of waterproofing. The drainage system should be connected to an outlet outside the footprint of the building. In addition, the precipitation within the footprint of the building roofs should be drained outside and away from the perimeter walls, and surface water infiltration from connected service trenches and landscaped areas must be controlled to prevent the water from permeating beneath the slab. The above comments only reflect the geotechnical design of the slabs.

4.9 Backfill to Structures and Lateral Earth Pressure

Backfilling the structures should be conducted with free draining non frost susceptible granular material such as OPSS Granular A or Granular B Type I, II or III conforming to the requirements of OPSS.MUNI 1010. Small vibratory compaction equipment should be used within about 0.5 m of the wall to minimize compaction induced stresses. Compaction of the backfill materials should be conducted as per OPSS.MUNI 501.

A perimeter wall drainage system shall be installed to collect groundwater from within the surficial earth fill and native soil layers.

The grade surrounding the foundation walls should be sloped to provide positive drainage away from the foundation walls.

Lateral earth pressures acting on the structure (static conditions) may be assumed to be triangular and to be governed by the characteristics of the backfill. For a fully drained condition, the pressures should be computed in accordance with the CHBDC but generally are given by the expression:

$$P_h(d) = K^*(\gamma d + q)$$

where: $P_h(d)$ = lateral earth pressure at depth d (kPa);

K = static earth pressure coefficient (see table);

γ = unit weight of retained soil (kN/m^3), adjusted for groundwater level;

d = depth below top of fill where pressure is computed (m); and

q = value of any surcharge (kPa).

A compaction surcharge should be applied in the design. The magnitude of the lateral pressure representing the compaction surcharge should be 12 kPa at the top of fill which linearly decreases to zero at a depth of 1.7 m (for OPSS Granular B Type I) or at a depth of 2.0 m (for OPSS Granular A or Granular B Type II).

Earth pressure coefficients for backfill to the structure walls are dependent on properties of the granular fill used as the backfill. Typical earth pressure coefficients are shown in the table below, assuming the ground surface behind the wall is flat.

Table 4.3: Lateral Earth Pressure Coefficients

Loading Condition	OPSS Granular A or Granular B Type II Φ = 35°, γ = 22.0 kN/m^3	OPSS Granular B Type I or Type III Φ = 32°, γ = 21.0 kN/m^3
Active, K_a	0.27	0.31
At-Rest, K_o	0.43	0.47
Passive, K_p	3.7	3.3

The earthquake-induced dynamic pressure distribution, which is to be added to the static earth pressure distribution, is a linear distribution with maximum pressure at the top of the wall and minimum pressure at its toe (i.e., an inverted triangular pressure distribution).

The total pressure distribution (static plus seismic) may be determined as follows:

$$P_h(d) = K\,\gamma'\,d + (K_{AE} - K)\,\gamma'\,(H-d)$$

where: $P_h(d)$ = Lateral earth pressure at depth d (kPa);

K = Static at rest earth pressure coefficient, K_0 to be used for restrained walls;

K = Static active earth pressure coefficient, K_a to be used for non-restrained walls;

K_{AE} = Seismic active earth pressure coefficient;

γ' = Effective unit weight of the backfill soil (kN/m^3);

d = Depth below the top of the wall (m); and

H = Total height of the wall above the bedrock surface (m).

The seismic active pressure coefficients (K_{AE}) provided in the table below may be used in the design. These seismic active earth pressure coefficients assume that the back of the wall is vertical and the ground surface behind the wall is flat.

Table 4.4: Seismic Active Earth Pressure Coefficients

Wall Type	Site PGA for Vs of 1,300 m/s (2475 Year Earthquake)	K_{AE}	
		OPSS Granular A or Granular B Type II Φ = 35°, γ = 22.0 kN/m³	**OPSS Granular B Type I or Type III Φ = 32°, γ = 21.0 kN/m³**
Non-restrained Wall	0.31	0.29	0.33
Restrained Wall		0.45	0.50

4.10 Site Seismic Classification

Based on the results of the MASW survey conducted in the vicinity of the proposed structure, described in a report by GHD titled “1Door4Care: CHEO Integrated Treatment Centre – Geotechnical Investigation Report (1Door4Care)” dated October 25, 2022, the average shear wave velocity at the site is greater than 760 m/s, and less than 1,500 m/s, therefore, a Site Class B designation should be used in the design of the proposed structure provided that the thickness of soil between underside of the foundations and the top of bedrock does not exceed 3 m.

4.11 Cement Type

The results of corrosivity assessment of the in-situ soil and/or bedrock samples have been included in GHD's report. The test results indicate that the in-situ soil/bedrock have a negligible to moderate (predominantly negligible with the exception of one bedrock sample) potential for sulphate attack as per CSA A23.1.

However, the foundations of the building will be found on at least 200 mm thick engineered fill (as per Section 4.6 and Table 4.1 of this report) and the exterior retaining walls will be backfilled with OPSS Granular A or Granular B Type II. Design of the foundations and below grade walls of the proposed structure may consider CSA Type MS or MH cements provided that the imported materials to be in direct contact with concrete are tested for sulphate content to verify that the above-stated recommendations for the cement type remain valid. Where the foundations and/or exterior walls are poured directly in contact with shale, consideration should be given to the use of CSA Type MS or HS cements.

4.12 Site Servicing

Bedding requirements for the sewers and watermains are summarized as follows:

- Where the subgrade consists of native soil, a bedding thickness of 150 mm can be used in accordance with City of Ottawa Standard Detail Drawing, S6, S7 and W17; or

- Where the subgrade consists of bedrock, the bedding thickness should be increased to 300 mm in accordance with City of Ottawa Standard Detail Drawing S6, S7, and W17 to reduce the potential for point loads from a potentially irregular bedrock surface.

In all cases the bedding material and pipe cover (to at least 300 mm above the top of pipe) should consist of Granular A (S.P. F-3147) that is compacted using suitable vibratory compaction equipment in accordance with S.P. D-029.

The lateral clearance from the outside edge of the pipe to the trench wall should be a minimum of 450 mm for a pipe diameter less than or equal to 900 mm. For pipes with a diameter larger than 900 mm, the minimum lateral clearance should be increased to 500 mm.

The use of clear crushed stone as a bedding layer should not be permitted since fine particles of the overlying backfill soils could potentially migrate into the voids in the clear crushed stone and cause settlement of the pipe and/or the road surface.

Trench backfill above the pipe cover/embedment material should conform to City of Ottawa specification S.P. F-2120 and/or OPSD 802.030 to 803.034 whichever is governing. Backfill should consist of approved excavated material, such as heterogeneous fill (provided that it is free of organic matter and other deleterious materials), or native inorganic overburden that has a suitable moisture content for compaction.

As noted previously, the shale bedrock at this site is potentially expansive following exposure to oxygen. Due to the risk for expansion, the excavated shale bedrock is not recommended for reuse as trench backfill. The excavated shale, as well as any fill that contains organic and/or deleterious materials, should be transferred off-site in accordance with the Soil Characterization Report prepared for this project, which is provided under separate cover.

If imported fill is required to make up the balance of trench backfill, it should consist of compactable and inorganic earth borrow (OPSS.MUNI 206/212) or Select Subgrade Material (OSSS.MUNI 1010).

All trench backfill, including re-used soils and imported fill, should be compacted in accordance with City S.P. D-029. If the trench backfill material is too wet to achieve the required compaction requirements, it should be stockpiled and allowed to dry, or wasted and replaced with more suitable fill.

The trench backfill above the bedrock surface and within the frost zone (i.e., between the pavement subgrade level and 1.8 m depth, or the bedrock surface, whichever is shallower) should match the soil exposed on the trench walls for frost heave compatibility. This will require some separation of materials upon excavation. Qualified geotechnical personnel should approve the backfill materials for frost compatibility and review the requirements for frost tapers at the time of construction based on the soils exposed in the trench walls. Watermains with less than 2.4 m of cover should be insulated in accordance with City of Ottawa Standard Detail Drawing W22.

Backfilling operations during cold weather must avoid frozen lumps of material, snow, and ice; otherwise, settlement should be expected.

Seepage barriers should be constructed at periodic intervals along the trench to reduce the potential for groundwater level lowering in the surrounding area due to the “French drain” effect on the granular bedding and surround. Otherwise, long-term groundwater level lowering could result in heaving of the shale beneath the new service pipes or adjacent structures. Seepage barriers also act as cut-offs to prevent migration of contaminants along the relatively permeable

backfill in the trenches, as well as a mitigation method during construction to limit groundwater inflow along the trench.

It is important that the seepage barriers extend from trench wall to trench wall and that they fully penetrate the granular surround materials to the trench bottom. The seepage barriers should be at least 1.5 m long. Construction of the seepage barriers should be in accordance with the City of Ottawa's Standard Detail Drawing No. S8. Seepage barriers should be placed at a maximum spacing of 75 m along the trench and on either side of crossing roadways to limit hydraulic connections with intersecting services.

4.13 Pavement Structures

References should be made to the GHD's Geotechnical Investigation Report (1Door4Care) for design and construction of Pavement structures at the site.

5. CLOSURE

This report was issued before any final design or construction details had been prepared or issued. Therefore, differences may exist between the report recommendations and the final design, the project specifications, or conditions during construction. In such instances, Thurber Engineering Ltd. should be contacted immediately to address these differences. Designers and contractors undertaking or bidding the work should examine the factual results of the investigation, satisfy themselves as to the adequacy of the information for design and construction, and make their own interpretation of the data as it may affect their proposed scope of work, cost, schedules, safety, and equipment capabilities.

Upon review of the available subsurface data Thurber recommended conducting a supplemental geotechnical investigation. The investigation was meant to assess geotechnical related risks some of which have been outlined below:

- The elevation of weathered and competent bedrock varies at the site, and one of the purposes of the supplemental investigation was to further delineate those elevations. The foundation subcontractor may encounter bedrock at different elevations from the design assumptions during construction which may result in changes in the foundation design of the building.

- The supplemental geotechnical investigation would have confirmed the shale type. Without the supplemental investigation and based on a review of some of the past histories of the nearby sites, it must be assumed that the shale bedrock has the swelling potential and protection against swelling shall be applied immediately upon exposure of any bedrock.

It is understood that due to planning reasons such as tight schedule, EllisDon has elected to finalize the design and construction based on the currently available data only and address the associated risks during construction.

We trust this information meets your present needs. If you have any questions, please contact the undersigned at your convenience.

THURBER ENGINEERING LTD.

Nina Warrier, P. Eng., P. Geo.
Geotechnical Engineer

Date: ***August 30, 2024***
File: ***36182***

Mehdi Mostakhdemi, M.Sc., P. Eng.
Review Engineer

THURBER

STATEMENT OF LIMITATIONS AND CONDITIONS

1. STANDARD OF CARE

This Report has been prepared in accordance with generally accepted engineering or environmental consulting practices in the applicable jurisdiction. No other warranty, expressed or implied, is intended or made.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report, which is of a summary nature and is not intended to stand alone without reference to the instructions given to Thurber by the Client, communications between Thurber and the Client, and any other reports, proposals or documents prepared by Thurber for the Client relative to the specific site described herein, all of which together constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. THURBER IS NOT RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

3. BASIS OF REPORT

The Report has been prepared for the specific site, development, design objectives and purposes that were described to Thurber by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the Report, subject to the limitations provided herein, are only valid to the extent that the Report expressly addresses proposed development, design objectives and purposes, and then only to the extent that there has been no material alteration to or variation from any of the said descriptions provided to Thurber, unless Thurber is specifically requested by the Client to review and revise the Report in light of such alteration or variation.

4. USE OF THE REPORT

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT THURBER'S WRITTEN CONSENT AND SUCH USE SHALL BE ON SUCH TERMS AND CONDITIONS AS THURBER MAY EXPRESSLY APPROVE. Ownership in and copyright for the contents of the Report belong to Thurber. Any use which a third party makes of the Report, is the sole responsibility of such third party. Thurber accepts no responsibility whatsoever for damages suffered by any third party resulting from use of the Report without Thurber's express written permission.

5. INTERPRETATION OF THE REPORT

a) Nature and Exactness of Soil and Contaminant Description: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature. Comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and the Client and all other persons making use of such documents or records with our express written consent should be aware of this risk and the Report is delivered subject to the express condition that such risk is accepted by the Client and such other persons. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.

b) Reliance on Provided Information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to Thurber. Thurber has relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, Thurber does not accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other persons providing information relied on by Thurber. Thurber is entitled to rely on such representations, information and instructions and is not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.

c) Design Services: The Report may form part of design and construction documents for information purposes even though it may have been issued prior to final design being completed. Thurber should be retained to review final design, project plans and related documents prior to construction to confirm that they are consistent with the intent of the Report. Any differences that may exist between the Report's recommendations and the final design detailed in the contract documents should be reported to Thurber immediately so that Thurber can address potential conflicts.

d) Construction Services: During construction Thurber should be retained to provide field reviews. Field reviews consist of performing sufficient and timely observations of encountered conditions in order to confirm and document that the site conditions do not materially differ from those interpreted conditions considered in the preparation of the report. Adequate field reviews are necessary for Thurber to provide letters of assurance, in accordance with the requirements of many regulatory authorities.

6. RELEASE OF POLLUTANTS OR HAZARDOUS SUBSTANCES

Geotechnical engineering and environmental consulting projects often have the potential to encounter pollutants or hazardous substances and the potential to cause the escape, release or dispersal of those substances. Thurber shall have no liability to the Client under any circumstances, for the escape, release or dispersal of pollutants or hazardous substances, unless such pollutants or hazardous substances have been specifically and accurately identified to Thurber by the Client prior to the commencement of Thurber's professional services.

7. INDEPENDENT JUDGEMENTS OF CLIENT

The information, interpretations and conclusions in the Report are based on Thurber's interpretation of conditions revealed through limited investigation conducted within a defined scope of services. Thurber does not accept responsibility for independent conclusions, interpretations, interpolations and/or decisions of the Client, or others who may come into possession of the Report, or any part thereof, which may be based on information contained in the Report. This restriction of liability includes but is not limited to decisions made to develop, purchase or sell land.

THURBER ENGINEERING LTD.

APPENDIX A

Borehole Location Plan (from GHD Report)

Estimated Bedrock Contours

Record of Boreholes and Laboratory Test Results

LEGEND

- PROPOSED ABOVEGROUND BUILDING FOOTPRINT
- PROPOSED BELOWGROUND BUILDING FOOTPRINT
- PROPOSED PARKING AREA OR SITE FEATURE
- PROPOSED PROJECT AREA FOR SITE DUE DILIGENCE BOUNDARY
- BOREHOLE LOCATION (GHD, 2022)
- SHALLOW OVERBURDEN/BEDROCK MONITORING WELL LOCATION (GHD, 2022)
- NESTED MONITORING WELL LOCATION (GHD, 2022)
- BOREHOLE LOCATION (GHD, 2019)
- DEEP BEDROCK MONITORING WELL LOCATION (GHD, 2020-21)
- SHALLOW OVERBURDEN/BEDROCK MONITORING WELL LOCATION (GHD, 2020-21)
- NESTED MONITORING WELL LOCATION (GHD, 2020-21)

0 8 16 24m

1:800

Coordinate System: NAD 83 UTM ZONE 18 METRES

N

GHD

PROPOSED 1DOOR4CARE FACILITY
CHILDREN'S HOSPITAL OF EASTERN ONTARIO CAMPUS
401 & 407 SMYTH ROAD, OTTAWA, ONTARIO

INVESTIGATIVE LOCATION PLAN

Project No. **11205379**
Date **September 2022**

FIGURE 2

Filename: N:\CA\Toronto\Projects\662\11205379\Digital_Design\ACAD 2018\Figures\RPT014\11205379-GHD-00-00-RPT-EN-D101_WA-014.dwg
Plot Date: 23 September 2022 11:09 AM

Data Sources: SURVEY BY J.D. BARNES LIMITED, DECEMBER 19, 2019. (UTM18-NAD83).
CHEO, 1DOORFOR4CARE (1D4C), SITE PLAN - PHASE 1A, Solic. No: 2111095, Date: 02/20/22.

LEGEND:

BOREHOLE LOCATION

NOTE:
THE BEDROCK SURFACE CONTOURS PROVIDED IN THIS DOCUMENT ARE CONSIDERED APPROXIMATE. THE ACTUAL ELEVATIONS WILL VARY FROM THE APPROXIMATIONS PRESENTED HEREIN, AND DESIGN CHANGES MAY BE REQUIRED ONCE THE ACTUAL ELEVATIONS ARE KNOWN.

1DOOR4CARE, CHEO INTEGRATED TREATMENT CENTRE
BOREHOLE LOCATIONS AND
BEDROCK SURFACE CONTOURS

JOB# 36182

THURBER ENGINEERING LTD.

ENGINEER :	DRAWN :	APPROVED :
NW	MFA	MM
DATE :	SCALE :	DRAWING No.
MAY 2024	1:800	36182-1

FILENAME: H:\Drafting\36000\36182\TED-36182-CTPL.dwg
PLOTDATE: May 28, 2024 - 10:57 AM

LEGEND:

BOREHOLE LOCATION

NOTE:
THE BEDROCK SURFACE CONTOURS PROVIDED IN THIS DOCUMENT ARE CONSIDERED APPROXIMATE. THE ACTUAL ELEVATIONS WILL VARY FROM THE APPROXIMATIONS PRESENTED HEREIN, AND DESIGN CHANGES MAY BE REQUIRED ONCE THE ACTUAL ELEVATIONS ARE KNOWN.

1DOOR4CARE, CHEO INTEGRATED TREATMENT CENTRE
BOREHOLE LOCATIONS AND
COMPETENT BEDROCK SURFACE CONTOURS

JOB# 36182

THURBER ENGINEERING LTD.

ENGINEER :	DRAWN :	APPROVED :
NW	MFA	MM
DATE :	SCALE :	DRAWING No.
MAY 2024	1:800	36182-2

FILENAME: H:\Drafting\36000\36182\TED-36182-CTPL.dwg
PLOTDATE: May 28, 2024 - 10:57 AM

Notes on Borehole and Test Pit Reports

Soil description :

Each subsurface stratum is described using the following terminology. The relative density of granular soils is determined by the Standard Penetration Index ("N" value), while the consistency of clayey sols is measured by the value of undrained shear strength (Cu).

Classification (Unified system)

Clay	< 0.002 mm		
Silt	0.002 to 0.075 mm		
Sand	0.075 to 4.75 mm	fine	0.075 to 4.25 mm
		medium	0.425 to 2.0 mm
		coarse	2.0 to 4.75 mm
Gravel	4.75 to 75 mm	fine	4.75 to 19 mm
		coarse	19 to 75 mm
Cobbles	75 to 300 mm		
Boulders	>300 mm		

Terminology

"trace"	1-10%
"some"	10-20%
adjective (silty, sandy)	20-35%
"and"	35-50%

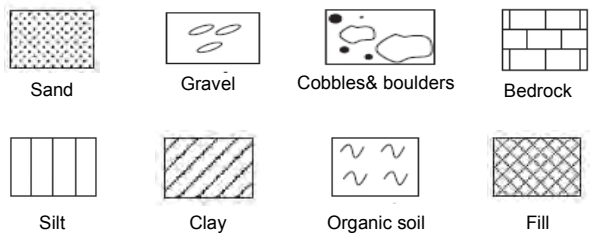
Relative density of granular soils	Standard penetration index "N" value (BLOWS/ft – 300 mm)
Very loose	0-4
Loose	4-10
Compact	10-30
Dense	30-50
Very dense	>50

Consistency of cohesive soils	Undrained shear strength (Cu) (P.S.F)	(kPa)
Very soft	<250	<12
Soft	250-500	12-25
Firm	500-1000	25-50
Stiff	1000-2000	50-100
Very stiff	2000-4000	100-200
Hard	>4000	>200

Rock quality designation

"RQD" (%) Value	Quality
<25	Very poor
25-50	Poor
50-75	Fair
75-90	Good
>90	Excellent

STRATIGRAPHIC LEGEND



Samples:

Type and Number

The type of sample recovered is shown on the log by the abbreviation listed hereafter. The numbering of samples is sequential for each type of sample.

SS: Split spoon
ST: Shelby tube
AG: Auger
SSE, GSE, AGE: Environmental sampling
PS: Piston sample (Osterberg)
RC: Rock core
GS: Grab sample

Recovery

The recovery, shown as a percentage, is the ratio of length of the sample obtained to the distance the sampler was driven/pushed into the soil

RQD

The "Rock Quality Designation" or "RQD" value, expressed as percentage, is the ratio of the total length of all core fragments of 4 inches (10 cm) or more to the total length of the run.

IN-SITU TESTS:

N: Standard penetration index
R: Refusal to penetration
N_c: Dynamic cone penetration index
Cu: Undrained shear strength
Pr: Pressure meter
k: Permeability
ABS: Absorption (Packer test)

LABORATORY TESTS:

I_p: Plasticity index
W_l: Liquid limit
Wp: Plastic limit
H: Hydrometer analysis
GSA: Grain size analysis
A: Atterberg limits
w: Water content
γ: Unit weight
C: Consolidation
CS: Swedish fall cone
CHEM: Chemical analysis
O.V.: Organic vapor

Explanation of Terms Used in the Bedrock Core Log

Strength (ISRM)

Terms	Grade	Description	Unconfined Compressive Strength (MPa)	(psf)
Extremely Weak Rock	RQ	Indented by thumbnail	0.25-1.0	36-145
Very Weak	R1	Crumbles under firm blows with point of geological hammer, can be peeled by a pocket knife.	1.0-5.0	145-725
Weak Rock	R2	Can be peeled by a pocket knife with difficulty, shallow indentations made by firm blow with point of geological hammer.	5.0-25	725-3625
Medium Strong	R3	Cannot be scraped or peeled with a pocket knife, specimen can be fractured with single firm blow of geological hammer.	25-50	3625-7250
Strong Rock	R4	Specimen requires more than one blow of geological hammer to fracture it.	50-100	7250-14500
Very strong Rock	R5	Specimen requires many blows of geological hammer to fracture it.	100-250	14500-36250
Extremely Strong Rock	R6	Specimen can only be chipped with geological hammer.	>250	>36250

Bedding (Geological Society Eng. Group Working Party, 1970, Q.J. of Eng. Geol. Vol 3)

Term	Bed Thickness	
Very thickly bedded	>2 m	>6.5 ft.
Thickly bedded	600 mm-2 m	2.00-6.50 ft.
Medium bedded	200 mm-600 mm	0.65-2.00 ft.
Thinly bedded	60 mm-200 mm	0.20-0.65 ft.
Very thinly bedded	20 mm-60 mm	0.06-0.20 ft.
Laminated	6 mm-20 mm	0.02-0.06 ft.
Thinly laminated	<6 mm	<0.02 ft.

TCR (Total Core Recovery)

Sum of lengths of rock core recovered from a core run, divided by the length of the core rum and expressed as a percentage

SCR (Solid Core Recover)

Sum length of solid full diameter drill core recovered expressed as a percentage of the total length of the core run.

Explanation of Terms Used in the Bedrock Core Log

Weathering (ISRM)

Terms	Grade	Description
Fresh	W1	No visible sign of rock material weathering.
Slightly	W2	Discolouration indicates weathering of rock weathered material and discontinuity surfaces. All the rock material may be discoloured by weathering and may be somewhat weaker than in its fresh condition.
Moderately	W3	Less than half of the rock material is weathered decomposed and/or disintegrated a soil. Fresh or discoloured rock is present either as a corestone.
Highly Weathered	W4	More than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discoloured rock is present either as a continuous framework or as corestones.
Completely Weathered	W5	All rock material is decomposed and/or disintegrated to a soil. The original mass structure is still largely intact.
Residual Soil	W6	All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has been significantly transported.

ROD (Rock Quality Designation, after Deere, 1968)

Sum of lengths of pieces of rock core measured along centerline of core equal to or greater than 100 mm from a core run, divided by the length of the core run, divided by the length of the core run and expressed as a percentage.
Core fractured by drilling is considered intact. RQD normally quoted for N-Size core.

RQD (%)	Rock Quality
90-100	Excellent
75-90	Good
50-75	Fair
25-50	Poor
0-25	Very Poor

(FI) Fracture Index

Expressed as the number of discontinuities per 300 mm (1 ft.) Excluded drill-induced fractures and fragmented zones. Reported as “>25” if frequency exceeds 25 fractures/0.3 m.

Broken Zone
Zone where core diameter core of very low RQD which may include some drill-induced fractures.

Fragmented Zone
Zone where core is less than full diameter and RQD = 0.

Discontinuity Spacing (ISRM)

Term	Average Spacing	
Extremely widely spaced	>6 m	>20.00 ft.
Very widely spaced	2 m-6 m	6.50-20.00 ft.
Widely spaced	600 mm-2 m	2.00-6.50 ft.
Moderately spaced	200 mm-600 mm	0.65-2.00 ft.
Closely spaced	60 mm-200 mm	0.20-0.65 ft.
Very closely spaced	20 mm-60 mm	0.06-0.20 ft.
Extremely closely spaced	<20 mm	>0.06 ft.

Note: Excludes drill-induced fractures and fragmented rock.

Discontinuity Orientation

Discontinuity, fracture, and bedding plane orientations are cited as the acute angle measured with respect to the core axis. Fractures perpendicular to the core axis are at 90 degrees and those parallel to the core axis are at 0 degrees.

REFERENCE No.: 11205379 ENCLOSURE No.: 1

BOREHOLE No.: MW1
ELEVATION: 82.53 m

BOREHOLE REPORT

Page: 1 of 1

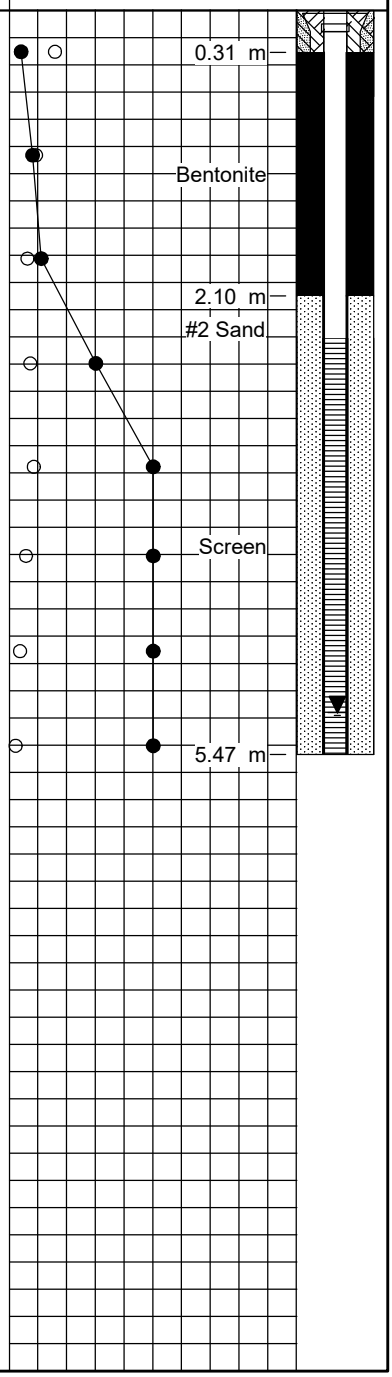
CLIENT: Infrastructure Ontario (I.O.)
PROJECT: Preliminary Geotechnical Investigation - Children's Hospital of Eastern Ontario Campus
LOCATION: 401 Smyth Road, Ottawa, Ontario
DESCRIBED BY: R. V. Tillaart CHECKED BY: A. Sorour
DATE (START): November 26, 2019 DATE (FINISH): November 26, 2019

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

NORTHING: 5027668.515 EASTING: 448936.947

Depth (Feet)	Depth (Metres)	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery %	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetraion Index N
		82.53		GROUND SURFACE						
0	0.08	82.46		TOPSOIL : 75 mm						
1				FILL : SILTY SAND, some gravel, asphalt fragments, wood pieces, brown, moist, loose		SS1	58	16	1-1-3-10	4
2										
3	1.0			cobble fragments		SS2	50	9	4-4-4-6	8
4										
5	1.52	81.01		NATIVE : SM-SILTY SAND with gravel, cobble fragments, grey, moist, compact Gravel : 26%, Sand : 58%, Silt : 11%, Clay : 5%		SS3	62	6	5-4-7-32	11
6	2.0			cobble fragments						
7						SS4	67	7	22-16-14-11	30
8										
9										
10	3.0			very dense		SS5	67	8	6-17-33-23	50
11										
12										
13	3.81 4.0	78.72		SHALE, completely weathered, grey		SS6	75	6	17-32-50/ 100mm	50+
14										
15										
16						SS7	55	4	39-50/ 125mm	50+
17	5.0									
18	5.47	77.06				SS8	20	2	50/ 125mm	50+
19				**END OF BOREHOLE :**						
20	6.0			**NOTE :**						
21				- End of Borehole at 5.47 m bgs						
22				- Borehole was dry upon completion						
23	7.0			- 50 mm diameter monitoring well installed at 5.47 m bgs						
24				- Groundwater level measured at 5.04 m bgs on December 5, 2019						
25				- Groundwater level measured at 5.06 m bgs on December 13, 2019						
26	8.0			- Groundwater level measured at 5.14 m bgs on January 15, 2020						
27				- Groundwater level measured at 5.10 m bgs on February 26, 2020						
28				- Groundwater level measured at 4.98 m bgs on April 08, 2020						
29				- Groundwater level measured at 5.15 m bgs on July 09, 2020						
30	9.0			- Groundwater level measured at 5.16 m bgs on October 05, 2020						
31				- bgs donates 'below ground surface'						
32										



File: N:\CA\MISSISSAUGA - 111 BRUNEL\LEGACY\LOG DATABASE\8-CHAR\11------\1120----\112053--\112053791\11205379 - REVISED.GPJ Library File: GHD_GEOTECH_V02.GLB Report: SOIL LOG WITH GRAPH+WELL Date: 11/17/20

REFERENCE No.: 11205379 ENCLOSURE No.: 2

BOREHOLE No.: MW2
ELEVATION: 82.43 m

BOREHOLE REPORT

Page: 1 of 2

CLIENT: Infrastructure Ontario (I.O.)
PROJECT: Preliminary Geotechnical Investigation - Children's Hospital of Eastern Ontario Campus
LOCATION: 401 Smyth Road, Ottawa, Ontario
DESCRIBED BY: R. V. Tillaart CHECKED BY: A. Sorour
DATE (START): November 26, 2019 DATE (FINISH): November 27, 2019

LEGEND

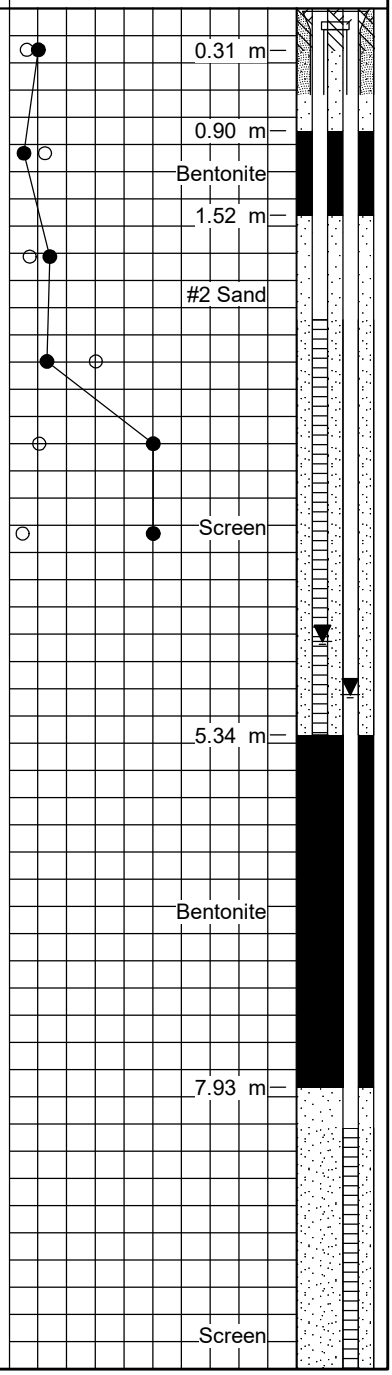
- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

NORTHING: 5027646.036 EASTING: 448956.593

Depth (Feet)	Depth (Metres)	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery %	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetraion Index N
		82.43		GROUND SURFACE						
0	0.08	82.35		TOPSOIL : 75 mm						
1				FILL : SANDY SILT, some gravel, brown, moist, compact		SS1	54	6	4-5-5-7	10
2										
3	1.0			loose		SS2	67	12	4-2-3-3	5
4										
5	1.52	80.91		NATIVE : SM-SILTY SAND with gravel, cobble fragments, brown, moist, compact		SS3	67	7	6-6-8-6	14
6				Gravel : 32%, Sand : 48%, Silt : 13%, Clay : 7%						
7	2.0			clay pocket		SS4	67	30	13-5-8-8	13
8										
9										
10	3.0			very dense		SS5	75	10	26-50/ 150mm	50+
11										
12										
13	3.81	78.62		SHALE, completely weathered, grey		SS6	17	5	50/ 100mm	50+
	4.0			Auger refusal						
	4.12	78.31								
14				SHALE-BEDROCK, clay seams, laminated, interbeds of limestone/siltstone (hard layers), highly weathered to fresh, weak to moderately strong, grey		RC1	90	--	15	--
15										
16	5.0					RC2	80	--	0	--
17										
18										
19										
20	6.0					RC3	97	--	79	--
21										
22										
23	7.0									
24						RC4	98	--	98	--
25										
26	8.0									
27										
28										
29						RC5	99	--	99	--
30	9.0									
31										
32										

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
w_p w_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90



File: N:\CA\MISSISSAUGA - 111 BRUNEL\LEGACY\LOG DATABASE\8-CHAR\11------\1120----\112053--\1120537911205379 - REVISED.GPJ Library File: GHD_GEOTECH_V02.GLB Report: SOIL LOG WITH GRAPH+WELL Date: 11/17/20

REFERENCE No.: 11205379 ENCLOSURE No.: 2

BOREHOLE No.: MW2
ELEVATION: 82.43 m

BOREHOLE REPORT

Page: 2 of 2

CLIENT: Infrastructure Ontario (I.O.)
PROJECT: Preliminary Geotechnical Investigation - Children's Hospital of Eastern Ontario Campus
LOCATION: 401 Smyth Road, Ottawa, Ontario
DESCRIBED BY: R. V. Tillaart CHECKED BY: A. Sorour
DATE (START): November 26, 2019 DATE (FINISH): November 27, 2019

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

NORTHING: 5027646.036 EASTING: 448956.593

Depth Feet	Depth Metres	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery %	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetraion Index N
		82.43		GROUND SURFACE						
	11.0					RC6	95	--	88	--
	11.28	71.15								

Shear test (Cu) △ Field
Sensitivity (S) ☐ Lab
○ Water content (%)
w_p w_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

11.28 m

END OF BOREHOLE :

NOTE :
- End of Borehole at 11.28 m bgs
- Borehole was dry upon completion
- Rock coring from 4.12 m bgs
- 50 mm diameter shallow and deep monitoring wells installed at 5.34 m and 11.28 m bgs respectively

Shallow Monitoring Well
- Borehole was dry on December 5, 2019
- Groundwater level measured at 4.61 m bgs on December 13, 2019
- Groundwater level measured at 4.54 m bgs on January 15, 2020
- Groundwater level measured at 4.59 m bgs on February 26, 2020
- Groundwater level measured at 4.37 m bgs on April 08, 2020
- Groundwater level measured at 4.64 m bgs on July 09, 2020
- Groundwater level measured at 4.66 m bgs on October 05, 2020

Deep Monitoring Well
- Groundwater level measured at 4.97 m bgs on December 5, 2019
- Groundwater level measured at 4.99 m bgs on December 13, 2019
- Groundwater level measured at 5.05 m bgs on January 15, 2020
- Groundwater level measured at 4.96 m bgs on February 26, 2020
- Groundwater level measured at 4.85 m bgs on April 08, 2020
- Groundwater level measured at 5.03 m bgs on July 09, 2020
- Groundwater level measured at 5.04 m bgs on October 05, 2020
- bgs donates 'below ground surface'
- shallow and deep monitoring wells installed in separate holes adjacent to each other
- No methane gas was detected during drilling/coring

File: N:\CA\MISSISSAUGA - 111 BRUNEL\LEGACY\LOG DATABASE\8-CHAR\11------\1120----\112053--\11205379\11205379 - REVISED.GPJ Library File: GHD_GEOTECH_V02.GLB Report: SOIL LOG WITH GRAPH+WELL Date: 11/17/20

REFERENCE No.: 11205379 ENCLOSURE No.: 3

BOREHOLE No.: MW3
ELEVATION: 81.58 m

BOREHOLE REPORT

Page: 1 of 2

CLIENT: Infrastructure Ontario (I.O.)
PROJECT: Preliminary Geotechnical Investigation - Children's Hospital of Eastern Ontario Campus
LOCATION: 401 Smyth Road, Ottawa, Ontario
DESCRIBED BY: R. V. Tillaart CHECKED BY: A. Sorour
DATE (START): November 28, 2019 DATE (FINISH): November 29, 2019

NORTHING: 5027642.051 EASTING: 448935.546

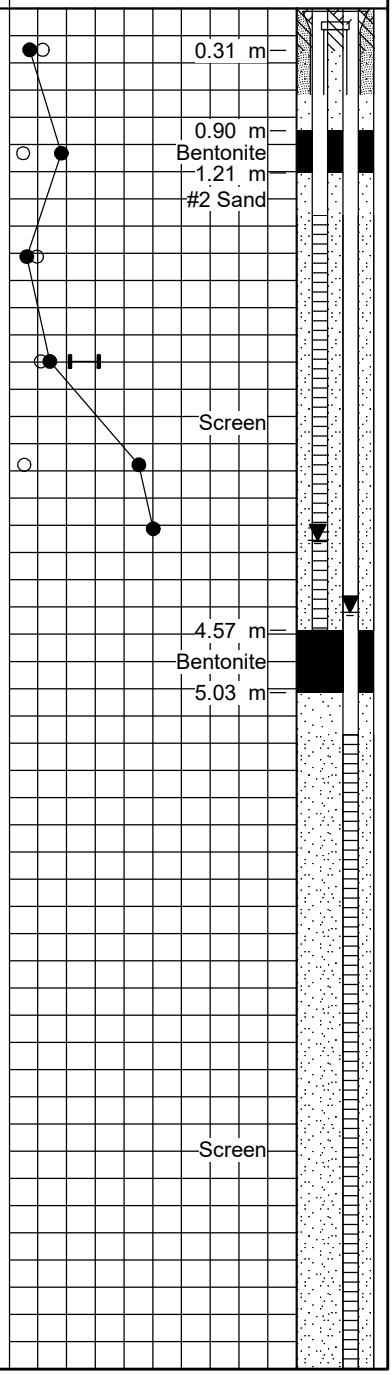
LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

Depth (Feet)	Depth (Metres)	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery %	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetraion Index N
		81.58		GROUND SURFACE						
0	0.10	81.48		TOPSOIL : 100 mm						
1				FILL : SANDY SILT, trace gravel, trace rootlets, wood pieces, grey/brown, frozen, loose		SS1	50	12	5-3-4-4	7
2	0.76	80.82		SAND and GRAVEL, brown, moist, compact						
3	1.0			Gravel : 43%, Sand : 52%, Clay & Silt (Fines) : 5%		SS2	46	5	5-9-9-5	18
4										
5	1.70	79.88		NATIVE : SM-SILTY SAND with gravel, cobble fragments, brown/grey, moist, loose to compact		SS3	50	10	3-2-4-4	6
6	2.0			Gravel : 16%, Sand : 59%, Silt : 17%, Clay : 8%		SS4	42	11	5-5-9-14	14
7										
8										
9										
10	3.0	78.53		SHALE, completely weathered, grey		SS5	33	5	14-17-28-20	45
11	3.05									
12						SS6	0	--	50/ 25mm	50+
13	4.0			no recovery						
14	4.11	77.47		SHALE-BEDROCK, laminated, interbeds of limestone/siltstone (hard layers), highly weathered to fresh, weak to moderately strong, grey		RC1	80	--	71	--
15										
16	5.0									
17										
18										
19										
20	6.0					RC2	99	--	86	--
21										
22										
23	7.0									
24										
25										
26	8.0					RC3	100	--	96	--
27										
28										
29										
30	9.0					RC4	100	--	100	--
31										
32										

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90



File: N:\CA\MISSISSAUGA - 111 BRUNEL\LEGACY\LOG DATABASE\8-CHAR\11-----\1120----\112053--\1120537911205379 - REVISED.GPJ Library File: GHD_GEOTECH_V02.GLB Report: SOIL LOG WITH GRAPH+WELL Date: 11/17/20

REFERENCE No.: 11205379 ENCLOSURE No.: 3

BOREHOLE No.: MW3
ELEVATION: 81.58 m

BOREHOLE REPORT

Page: 2 of 2

CLIENT: Infrastructure Ontario (I.O.)
PROJECT: Preliminary Geotechnical Investigation - Children's Hospital of Eastern Ontario Campus
LOCATION: 401 Smyth Road, Ottawa, Ontario
DESCRIBED BY: R. V. Tillaart CHECKED BY: A. Sorour
DATE (START): November 28, 2019 DATE (FINISH): November 29, 2019

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

NORTHING: 5027642.051 EASTING: 448935.546

Depth (Feet)	Depth (Metres)	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery %	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetraion Index N
		81.58		GROUND SURFACE						
	11.0					RC5	100	--	86	--
	11.43	70.15								

Shear test (Cu) △ Field
Sensitivity (S) ☐ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

11.43 m

END OF BOREHOLE :

NOTE :
- End of Borehole at 11.43 m bgs
- Borehole was dry upon completion
- Rock coring from 4.11 m bgs
- 50 mm diameter shallow and deep monitoring wells installed at 4.57 m and 11.43 m bgs respectively

Shallow Monitoring Well
- Groundwater level measured at 3.76 m bgs on December 5, 2019
- Groundwater level measured at 3.83 m bgs on December 13, 2019
- Groundwater level measured at 3.76 m bgs on January 15, 2020
- Groundwater level measured at 3.87 m bgs on February 26, 2020
- Groundwater level measured at 3.66 m bgs on April 08, 2020
- Groundwater level measured at 3.91 m bgs on July 09, 2020
- Groundwater level measured at 3.91 m bgs on October 05, 2020

Deep Monitoring Well
- Groundwater level measured at 4.28 m bgs on December 5, 2019
- Groundwater level measured at 4.37 m bgs on December 13, 2019
- Groundwater level measured at 4.45 m bgs on January 15, 2020
- Groundwater level measured at 4.43 m bgs on February 26, 2020
- Groundwater level measured at 4.22 m bgs on April 08, 2020
- Groundwater level measured at 4.48 m bgs on July 09, 2020
- Groundwater level measured at 4.47 m bgs on October 05, 2020
- bgs donates 'below ground surface'
- shallow and deep monitoring wells installed in separate holes adjacent to each other
- No methane gas was detected during drilling/coring

File: N:\CA\MISSISSAUGA - 111 BRUNEL\LEGACY\LOG DATABASE\8-CHAR\11------\1120----\112053--\11205379\11205379 - REVISED.GPJ Library File: GHD_GEOTECH_V02.GLB Report: SOIL LOG WITH GRAPH+WELL Date: 11/17/20

REFERENCE No.: 11205379 ENCLOSURE No.: 4

BOREHOLE No.: MW4
ELEVATION: 80.34 m

BOREHOLE REPORT

Page: 1 of 2

CLIENT: Infrastructure Ontario (I.O.)
PROJECT: Preliminary Geotechnical Investigation - Children's Hospital of Eastern Ontario Campus
LOCATION: 401 Smyth Road, Ottawa, Ontario
DESCRIBED BY: R. V. Tillaart CHECKED BY: A. Sorour
DATE (START): December 2, 2019 DATE (FINISH): December 3, 2019

LEGEND

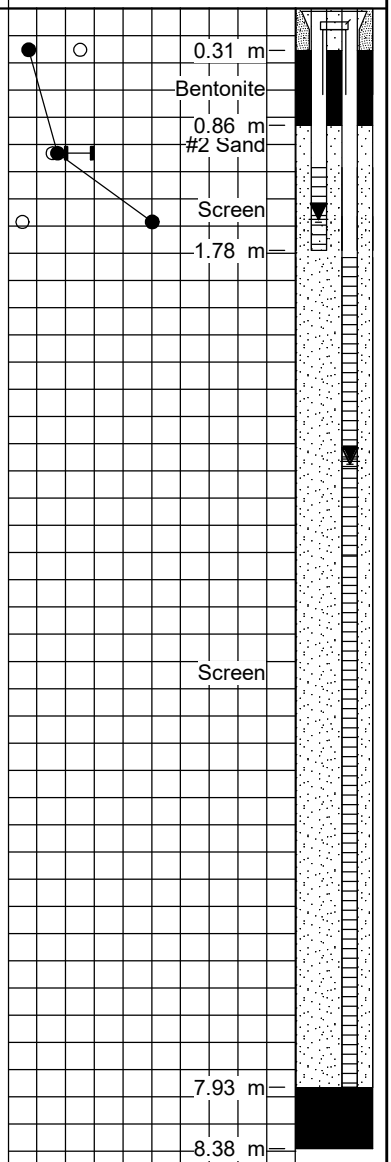
- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

NORTHING: 5027621.964 EASTING: 448917.848

Depth (Feet)	Depth (Metres)	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery %	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetraion Index N
0	0.08	80.26		TOPSOIL : 75 mm						
1				FILL : SILTY CLAY, trace sand and gravel, brown, frozen, firm, moist		SS1	50	25	4-3-4-4	7
2	0.76	79.58		NATIVE : SM-SILTY SAND, some clay and gravel, brown, moist, compact						
3	1.0					SS2	58	15	4-7-10-25	17
4				Gravel : 11%, Sand : 59%, Silt : 20%, Clay : 10%						
5	1.52	78.82				SS3	100	5	50/ 100mm	50+
6				SHALE, completely weathered, grey						
7	2.0									
8				auger refusal						
9	2.69	77.65		SHALE-BEDROCK, laminated, interbeds of limestone/siltstone (hard layers), highly weathered to fresh, weak to moderately strong, grey						
10	3.0					RC1	88	--	39	--
11										
12										
13	4.0									
14										
15						RC2	100	--	78	--
16										
17	5.0									
18										
19										
20	6.0					RC3	99	--	83	--
21										
22										
23	7.0									
24										
25						RC4	100	--	100	--
26										
27	8.0									
28	8.38	71.96								
29				**END OF BOREHOLE :**						
30	9.0			**NOTE :** - End of Borehole at 8.38 m bgs - Borehole was dry upon completion - Rock coring from 2.69 m bgs - 50 mm diameter shallow and deep monitoring wells installed at 1.78 m and						
31										
32										

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
w_p w_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90



File: N:\CA\MISSISSAUGA - 111 BRUNEL\LEGACY\LOG DATABASE\8-CHAR\11------\1120----\112053--\11205379\11205379 - REVISED.GPJ Library File: GHD_GEOTECH_V02.GLB Report: SOIL LOG WITH GRAPH+WELL Date: 11/17/20

REFERENCE No.: 11205379 ENCLOSURE No.: 4

BOREHOLE No.: MW4
ELEVATION: 80.34 m

BOREHOLE REPORT

Page: 2 of 2

CLIENT: Infrastructure Ontario (I.O.)
PROJECT: Preliminary Geotechnical Investigation - Children's Hospital of Eastern Ontario Campus
LOCATION: 401 Smyth Road, Ottawa, Ontario
DESCRIBED BY: R. V. Tillaart CHECKED BY: A. Sorour
DATE (START): December 2, 2019 DATE (FINISH): December 3, 2019

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

NORTHING: 5027621.964 EASTING: 448917.848

Depth Feet	Depth Metres	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery %	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetraion Index N
		80.34		GROUND SURFACE						
				7.93 m bgs respectively **Shallow Monitoring Well** - Borehole was dry on December 5, 2019 - Groundwater level measured at 0.07 m bgs on December 13, 2019 - Frozen/Iced condition on January 15, 2020 - Frozen/iced condition on February 26, 2020 - Groundwater level measured at 1.56 m bgs on April 08, 2020 - Borehole was dry on July 09, 2020 - Groundwater level measured at 1.55 m bgs on October 05, 2020 **Deep Monitoring Well** - Groundwater level measured at 3.09 m bgs on December 5, 2019 - Groundwater level measured at 3.12 m bgs on December 13, 2019 - Frozen/Iced condition on January 15, 2020 - Frozen/iced condition on February 26, 2020 - Groundwater level measured at 2.93 m bgs on April 08, 2020 - Groundwater level measured at 3.18 m bgs on July 09, 2020 - Groundwater level measured at 3.18 m bgs on October 05, 2020 - bgs donates 'below ground surface' - shallow and deep monitoring wells installed in separate holes adjacent to each other - No methane gas was detected during drilling/coring						
33										
34										
35										
36	11.0									
37										
38										
39	12.0									
40										
41										
42										
43	13.0									
44										
45										
46	14.0									
47										
48										
49	15.0									
50										
51										
52	16.0									
53										
54										
55										
56	17.0									
57										
58										
59	18.0									
60										
61										
62	19.0									
63										
64										
65										

Shear test (Cu) △ Field
Sensitivity (S) ☐ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

REFERENCE No.: 11205379 ENCLOSURE No.: 5

BOREHOLE No.: MW5
ELEVATION: 80.54 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Infrastructure Ontario (I.O.)
PROJECT: Preliminary Geotechnical Investigation - Children's Hospital of Eastern Ontario Campus
LOCATION: 401 Smyth Road, Ottawa, Ontario
DESCRIBED BY: R. V. Tillaart CHECKED BY: A. Sorour
DATE (START): December 4, 2019 DATE (FINISH): December 4, 2019

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

NORTHING: 5027604.917 EASTING: 448917.805

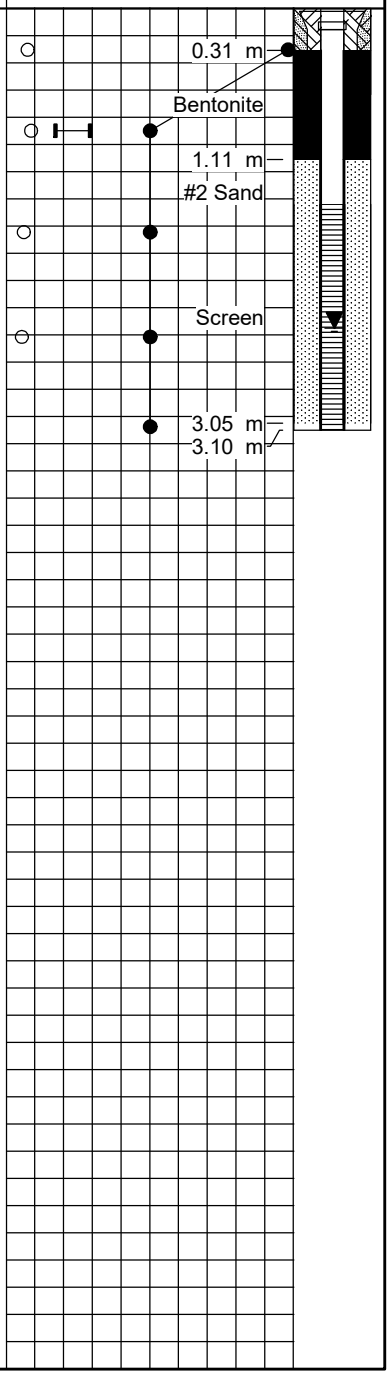
Depth (Feet)	Depth (Metres)	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery %	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetraion Index N
		80.54		GROUND SURFACE						
0	0.05	80.49		ASPHALT : 50 mm						
1				FILL : SAND and GRAVEL, grey/brown, frozen, very dense		SS1	67	7	65-85-13-16	98
2										
3	0.91	79.63				SS2	46	9	16-50/ 125mm	50+
	1.0			NATIVE : SM-SILTY SAND, grey/brown, moist, very dense						
4				Gravel : 8%, Sand : 62%, Silt : 20%, Clay : 10%						
5						SS3	41	6	25-50/ 100mm	50+
6	1.70	78.84		SHALE, completely weathered, grey						
	2.0									
7										
8						SS4	40	5	9-50/ 100mm	50+
9										
10	3.0			no recovery		SS5	0	--	50/ 50mm	50+
	3.10	77.44								

END OF BOREHOLE :

NOTE :
- End of Borehole at 3.10 m bgs
- Borehole was dry upon completion
- 50 mm diameter monitoring well installed at 3.05 m bgs
- Borehole was dry on December 5, 2019
- Groundwater level measured at 2.42 m bgs on December 13, 2019
- Groundwater level measured at 1.97 m bgs on January 15, 2020
- Groundwater level measured at 2.50 m bgs on February 26, 2020
- Groundwater level measured at 2.10 m bgs on April 08, 2020
- Groundwater level measured at 2.38 m bgs on July 09, 2020
- Groundwater level measured at 2.35 m bgs on October 05, 2020
- bgs donates 'below ground surface'

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90



File: N:\CA\MISSISSAUGA - 111 BRUNEL\LEGACY\LOG DATABASE\8-CHAR\11-----\1120----\112053--\1120537911205379 - REVISED.GPJ Library File: GHD_GEOTECH_V02.GLB Report: SOIL LOG WITH GRAPH+WELL Date: 11/17/20

REFERENCE No.: 11205379 ENCLOSURE No.: 6

BOREHOLE No.: BH6

ELEVATION: 80.04 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Infrastructure Ontario (I.O.)

PROJECT: Preliminary Geotechnical Investigation - Children's Hospital of Eastern Ontario Campus

LOCATION: 401 Smyth Road, Ottawa, Ontario

DESCRIBED BY: R. V. Tillaart CHECKED BY: A. Sorour

DATE (START): December 2, 2019 DATE (FINISH): December 2, 2019

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

NORTHING: 5027626.342 EASTING: 448896.247

Depth (Feet)	Depth (Metres)	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery %	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetraion Index N
		80.04		GROUND SURFACE						
0										
1	0.40	79.64		FILL : SAND and GRAVEL, grey, frozen, very dense		SS1	75	8	49-50-18-6	68
2				NATIVE :						
3	0.86	79.18		SM-SILTY SAND, some clay, grey/brown, moist, very dense		SS2	50	6	12-46-50/ 75mm	50+
4	1.0			SHALE, completely weathered, grey						
5						SS3	20	3	50/ 125mm	50+
6										
7	2.0									
8	2.43	77.61				SS4	20	3	50/ 125mm	50+
9				**END OF BOREHOLE :**						
10	3.0			**NOTE :**						
11				- End of Borehole at 2.43 m bgs						
12				- Borehole was dry upon completion						
13	4.0			- bgs donates 'below ground surface'						
14										
15										
16	5.0									
17										
18										
19	6.0									
20										
21										
22										
23	7.0									
24										
25										
26	8.0									
27										
28										
29	9.0									
30										
31										
32										

Shear test (Cu) △ Field
Sensitivity (S) ☐ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

REFERENCE No.: 11205379 ENCLOSURE No.: 7

BOREHOLE No.: BH7

ELEVATION: 80.40 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Infrastructure Ontario (I.O.)

PROJECT: Preliminary Geotechnical Investigation - Children's Hospital of Eastern Ontario Campus

LOCATION: 401 Smyth Road, Ottawa, Ontario

DESCRIBED BY: R. V. Tillaart CHECKED BY: A. Sorour

DATE (START): November 29, 2019 DATE (FINISH): November 29, 2019

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

NORTHING: 5027643.798 EASTING: 448912.466

Depth Feet	Depth Metres	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery %	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetraion Index N
		80.40		GROUND SURFACE						
0				FILL : SAND and GRAVEL, cobble fragments, grey, moist, compact		SS1	58	2	5-7-8-5	15
2	0.76	79.64		NATIVE : SM-SILTY SAND, some clay, grey/brown, moist, dense Gravel : 3%, Sand : 54%, Silt : 30%, Clay : 13%		SS2	55	7	4-15-22-50/ 75mm	37
5	1.52	78.88		SHALE, completely weathered, grey		SS3	46	4	38-50/ 125mm	50+
8	2.43	77.97				SS4	21	3	50/ 125mm	50+

END OF BOREHOLE :

NOTE :
- End of Borehole at 2.43 m bgs
- Borehole was dry upon completion
- bgs donates 'below ground surface'

Shear test (Cu) △ Field
Sensitivity (S) ☐ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

REFERENCE No.: 11205379 ENCLOSURE No.: 8

BOREHOLE No.: BH8

ELEVATION: 80.82 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Infrastructure Ontario (I.O.)

PROJECT: Preliminary Geotechnical Investigation - Children's Hospital of Eastern Ontario Campus

LOCATION: 401 Smyth Road, Ottawa, Ontario

DESCRIBED BY: R. V. Tillaart CHECKED BY: A. Sorour

DATE (START): December 2, 2019 DATE (FINISH): December 2, 2019

NORTHING: 5027623.431 EASTING: 448936.551

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

Depth (Feet)	Depth (Metres)	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery %	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetraion Index N
		80.82		GROUND SURFACE						
0				FILL : SAND with gravel, trace organics, grey, moist, compact		SS1	50	9	6-4-5-6	9
1										
2										
	0.76	80.06		NATIVE : SM-SILTY SAND, grey/brown, moist, compact		SS2	75	10	2-5-6-45	11
3	1.0			Gravel : 8%, Sand : 59%, Silt : 22%, Clay : 11%						
4										
5	1.52	79.30		SHALE, completely weathered, grey		SS3	41	5	40-50/ 100mm	50+
6	2.0									
7										
8						SS4	12	2	50/ 75mm	50+
9										
10	3.0					SS5	12	5	50/ 75mm	50+
	3.13	77.69		**END OF BOREHOLE :**						
11										
12				**NOTE :**						
13	4.0			- End of Borehole at 3.13 m bgs						
14				- Borehole was dry upon completion						
15				- bgs donates 'below ground surface'						
16	5.0									
17										
18										
19										
20	6.0									
21										
22										
23	7.0									
24										
25										
26	8.0									
27										
28										
29	9.0									
30										
31										
32										

Shear test (Cu) △ Field
Sensitivity (S) ☐ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

REFERENCE No.: 11205379 ENCLOSURE No.: 9

BOREHOLE No.: MW9
ELEVATION: 80.52 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Infrastructure Ontario (I.O.)
PROJECT: Preliminary Geotechnical Investigation - Children's Hospital of Eastern Ontario Campus
LOCATION: 401 Smyth Road, Ottawa, Ontario
DESCRIBED BY: R. V. Tillaart CHECKED BY: A. Sorour
DATE (START): December 3, 2019 DATE (FINISH): December 3, 2019

LEGEND

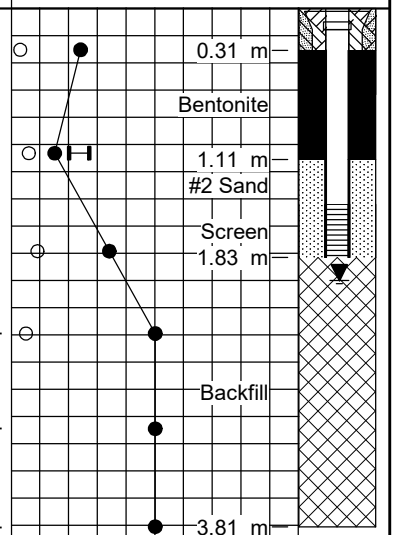
- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

NORTHING: 5027678.629 EASTING: 448898.487

Depth Feet	Depth Metres	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery %	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetraion Index N
		80.52		GROUND SURFACE						
0				FILL : SAND and GRAVEL, grey, moist, compact		SS1	58	3	24-18-6-4	24
	0.76	79.76		NATIVE : SM-SILTY SAND, some clay and gravel, cobble fragments, brown, moist, compact to dense		SS2	58	6	4-8-7-17	15
	1.0			Gravel : 14%, Sand : 53%, Silt : 20%, Clay : 13%		SS3	76	9	7-8-26-50/ 75mm	34
	1.98									
	2.0	78.54		SHALE, completely weathered, grey		SS4	100	5	49-50/ 50mm	50+
	3.0			no recovery		SS5	0	--	50/ 50mm	50+
	3.81	76.71				SS6	0	--	50/ 0mm	50+
	4.0			**END OF BOREHOLE :**						
	5.0			**NOTE :** - End of Borehole at 3.81 m bgs - Borehole was dry upon completion - 50mm diameter monitoring well installed at 1.83 m bgs - Borehole was dry on December 5, 2019 - Borehole was dry on December 13, 2019 - Borehole was dry on January 15, 2020 - Groundwater level measured at 1.98 m bgs on April 08, 2020 - Borehole was dry on July 09, 2020 - Groundwater level measured at 2.00 m bgs on October 05, 2020 - bgs donates 'below ground surface'						
	6.0									
	7.0									
	8.0									
	9.0									

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90



File: N:\CA\MISSISSAUGA - 111 BRUNEL\LEGACY\LOG DATABASE\8-CHAR\11------\1120----\112053--\1120537911205379 - REVISED.GPJ Library File: GHD_GEOTECH_V02.GLB Report: SOIL LOG WITH GRAPH+WELL Date: 11/17/20

REFERENCE No.: 11205379 ENCLOSURE No.: 10

BOREHOLE No.: MW10
ELEVATION: 79.86 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Infrastructure Ontario (I.O.)
PROJECT: Preliminary Geotechnical Investigation - Children's Hospital of Eastern Ontario Campus
LOCATION: 401 Smyth Road, Ottawa, Ontario
DESCRIBED BY: R. V. Tillaart CHECKED BY: A. Sorour
DATE (START): December 2, 2019 DATE (FINISH): December 2, 2019

LEGEND

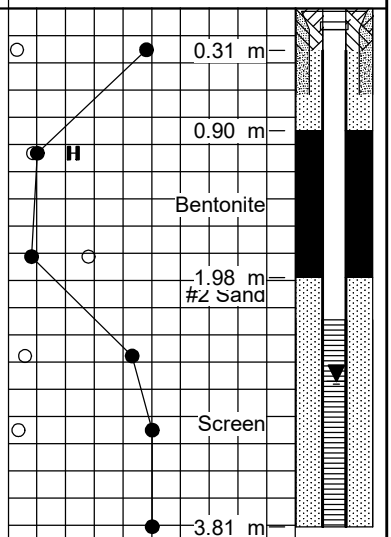
- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

NORTHING: 5027644.571 EASTING: 448886.323

Depth (Feet)	Depth (Metres)	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery %	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetraion Index N
		79.86		GROUND SURFACE						
0				FILL :						
1				SAND and GRAVEL, grey, frozen, dense		SS1	58	3	24-37-11-3	48
2	0.76	79.10								
3	1.0			NATIVE :						
4				SM-SILTY SAND with gravel, grey/brown, moist, compact/loose		SS2	42	9	5-3-7-10	10
5				Gravel : 26%, Sand : 47%, Silt : 18%, Clay : 9%						
6				clay pocket		SS3	42	28	2-3-5-7	8
7	2.0									
8	2.29	77.57		SHALE, completely weathered, grey		SS4	57	6	45-6-37-50/ 125mm	43
9										
10	3.0					SS5	16	3	50/ 100mm	50+
11										
12										
13	3.81	76.05				SS6	0	--	50/ 50mm	50+
14	4.0			**END OF BOREHOLE :**						
15				**NOTE :**						
16				- End of Borehole at 3.81 m bgs						
17	5.0			- Borehole was dry upon completion						
18				- 50mm diameter monitoring well installed at 3.81 m bgs						
19				- Groundwater level measured at 2.45 m bgs on December 5, 2019						
20	6.0			- Groundwater level measured at 2.49 m bgs on December 13, 2019						
21				- Groundwater level measured at 2.33 m bgs on April 08, 2020						
22				- Groundwater level measured at 2.79 m bgs on July 09, 2020						
23	7.0			- Groundwater level measured at 2.74 m bgs on October 05, 2020						
24				- bgs donates 'below ground surface'						
25										
26	8.0									
27										
28										
29	9.0									
30										
31										
32										

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
Atterberg limits (%) w_p w_l
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90



File: N:\CA\MISSISSAUGA - 111 BRUNEL\LEGACY\LOG DATABASE\8-CHAR\11-----\1120----\112053--\1120537911205379 - REVISED.GPJ Library File: GHD_GEOTECH_V02.GLB Report: SOIL LOG WITH GRAPH+WELL Date: 11/17/20

REFERENCE No.: 11205379 ENCLOSURE No.: 11

BOREHOLE No.: BH11
ELEVATION: 81.32 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Infrastructure Ontario (I.O.)
PROJECT: Preliminary Geotechnical Investigation - Children's Hospital of Eastern Ontario Campus
LOCATION: 401 Smyth Road, Ottawa, Ontario
DESCRIBED BY: R. V. Tillaart CHECKED BY: A. Sorour
DATE (START): December 4, 2019 DATE (FINISH): December 4, 2019

LEGEND

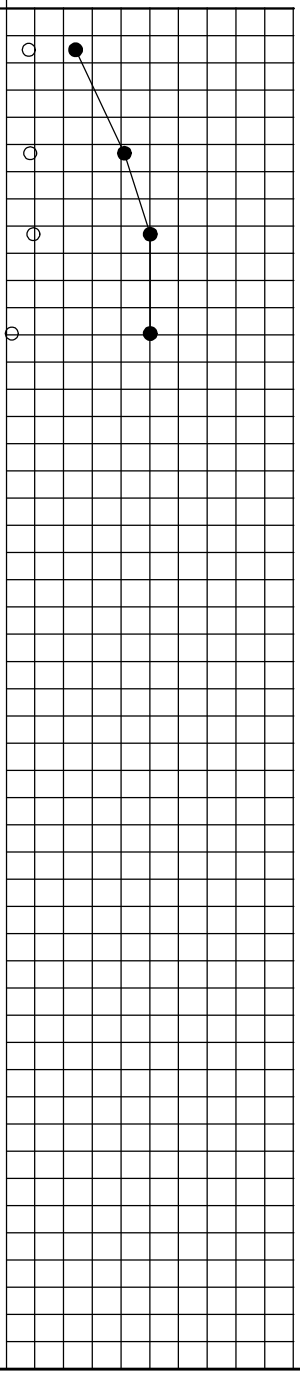
- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

NORTHING: 5027617.468 EASTING: 448987.177

Depth (Feet)	Depth (Metres)	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery %	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetraion Index N
0	0.08	81.24		ASPHALT : 75 mm						
1				FILL : SAND and GRAVEL, brown, frozen, compact		SS1	67	8	16-17-7-5	24
2	0.76	80.56		NATIVE : SM-SILTY SAND, some clay, brown/grey, moist, dense		SS2	55	8	16-17-24-32	41
3	1.0									
4										
5	1.52	79.80		SHALE, completely weathered, grey		SS3	36	9	20--50/ 125mm	50+
6										
7	2.0									
8	2.49	78.83				SS4	33	2	30-50/ 50mm	50+
9				**END OF BOREHOLE :**						
10	3.0			**NOTE :** - End of Borehole at 2.49 m bgs - Borehole was dry upon completion - bgs donates 'below ground surface'						
11										
12										
13	4.0									
14										
15										
16	5.0									
17										
18										
19	6.0									
20										
21										
22										
23	7.0									
24										
25										
26	8.0									
27										
28										
29	9.0									
30										
31										
32										

Shear test (Cu) △ Field
Sensitivity (S) ☐ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90



File: N:\CA\MISSISSAUGA - 111 BRUNEL\LEGACY\LOG DATABASE\8-CHAR\11------\1120----\112053--\1120537911205379 - REVISED.GPJ Library File: GHD_GEOTECH_V02.GLB Report: SOIL LOG WITH GRAPH+WELL Date: 11/17/20

REFERENCE No.: 11205379 ENCLOSURE No.: 12

BOREHOLE No.: BH12
ELEVATION: 81.27 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Infrastructure Ontario (I.O.)
PROJECT: Preliminary Geotechnical Investigation - Children's Hospital of Eastern Ontario Campus
LOCATION: 401 Smyth Road, Ottawa, Ontario
DESCRIBED BY: R. V. Tillaart CHECKED BY: A. Sorour
DATE (START): December 4, 2019 DATE (FINISH): December 4, 2019

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

NORTHING: 5027580.895 EASTING: 448953.963

Depth (Feet)	Depth (Metres)	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery %	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetraion Index N
		81.27		GROUND SURFACE						
0	0.08	81.19		ASPHALT : 75 mm						
1				FILL : SAND and GRAVEL, brown, moist, dense		SS1	58	5	25-30-14-8	44
2										
3	0.84	80.43		NATIVE : SM-SILTY SAND with gravel, some clay, brown/grey, moist, compact to dense Gravel : 18%, Sand : 52%, Silt : 19%, Clay : 11%		SS2	75	4	3-5-15-33	20
4	1.0									
5						SS3	76	11	7-15-17-50/ 75mm	32
6										
7	2.0									
8	2.29	78.98		SHALE, completely weathered, grey		SS4	38	7	38-50/ 75mm	50+
9										
10	3.0					SS5	0	--	50/ 25mm	50+
11										
12										
13	3.81	77.46				SS6	0	--	50/ 0mm	50+
	4.0			**END OF BOREHOLE :**						
14				**NOTE :**						
15				- End of Borehole at 3.81 m bgs						
16				- Borehole was dry upon completion						
17	5.0			- bgs donates 'below ground surface'						
18										
19										
20	6.0									
21										
22										
23	7.0									
24										
25										
26	8.0									
27										
28										
29	9.0									
30										
31										
32										

Shear test (Cu) △ Field
Sensitivity (S) ☐ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

REFERENCE No.: 11205379 ENCLOSURE No.: 13

BOREHOLE No.: BH13
ELEVATION: 81.37 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Infrastructure Ontario (I.O.)
PROJECT: Preliminary Geotechnical Investigation - Children's Hospital of Eastern Ontario Campus
LOCATION: 401 Smyth Road, Ottawa, Ontario
DESCRIBED BY: R. V. Tillaart CHECKED BY: A. Sorour
DATE (START): December 4, 2019 DATE (FINISH): December 4, 2019

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

NORTHING: 5027562.877 EASTING: 448996.612

Depth (Feet)	Depth (Metres)	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery %	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetraion Index N
		81.37		GROUND SURFACE						
0	0.08	81.29		ASPHALT : 75 mm						
1				FILL : SAND and GRAVEL, brown, frozen, compact		SS1	83	6	16-12-12-9	24
2	0.76	80.61		NATIVE : SM-SILTY SAND, some clay, brown/grey, moist, very dense		SS2	71	7	10-12-50/ 125mm	50+
3	1.0 / 1.07	80.30		SHALE, completely weathered, grey		SS3	33	4	15-50/ 100mm	50+
4										
5										
6	2.0									
7						SS4	12	--	50/ 75mm	50+
8	2.37	79.00								
9				**END OF BOREHOLE :**						
10	3.0			**NOTE :**						
11				- End of Borehole at 2.37 m bgs						
12				- Borehole was dry upon completion						
13	4.0			- bgs donates 'below ground surface'						
14										
15										
16	5.0									
17										
18										
19	6.0									
20										
21										
22										
23	7.0									
24										
25										
26	8.0									
27										
28										
29	9.0									
30										
31										
32										

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

REFERENCE No.: 11205379 ENCLOSURE No.: 15

BOREHOLE No.: BH14
ELEVATION: 81.17 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Infrastructure Ontario (I.O.)
PROJECT: Preliminary Geotechnical Investigation - Children's Hospital of Eastern Ontario Campus
LOCATION: 401 Smyth Road, Ottawa, Ontario
DESCRIBED BY: R. V. Tillaart CHECKED BY: A. Sorour
DATE (START): December 4, 2019 DATE (FINISH): December 4, 2019

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

NORTHING: 5027560.884 EASTING: 448919.434

Depth (Feet)	Depth (Metres)	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery %	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetraion Index N
		81.17		GROUND SURFACE						
0	0.08	81.09		ASPHALT : 75 mm						
1				FILL : SAND and GRAVEL, brown, frozen, compact		SS1	83	6	29-14-6-2	20
2	0.81	80.36		NATIVE : SM-SILTY SAND, some clay, brown/grey, moist, very dense		SS2	100	9	15-36-50/ 25mm	50+
3	1.0	80.16		SHALE, completely weathered, grey						
4	1.01					SS3	45	7	36-50/ 125mm	50+
5										
6	2.0									
7	2.32	78.85		no recovery		SS4	0	--	50/ 25mm	50+
8				**END OF BOREHOLE :**						
9				**NOTE :** - End of Borehole at 2.32 m bgs - Borehole was dry upon completion - bgs donates 'below ground surface'						
10	3.0									
11										
12										
13	4.0									
14										
15										
16	5.0									
17										
18										
19	6.0									
20										
21										
22										
23	7.0									
24										
25										
26	8.0									
27										
28										
29	9.0									
30										
31										
32										

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

REFERENCE No.: 11205379 ENCLOSURE No.: 14

BOREHOLE No.: MW14
ELEVATION: 81.2 m

BOREHOLE REPORT

Page: 1 of 2

CLIENT: Infrastructure Ontario (I.O.) PROJECT: Preliminary Geotechnical Investigation

LOCATION: 401 Smyth Road, Ottawa, Ontario

DRILLING RIG: Track Drill Rig DRILLING METHOD: 203mm OD Hollow Stem Augers

DESCRIBED BY: S. Wallis CHECKED BY: A. Khandekar

DATE (START): 5 July 2022 DATE (FINISH): 5 July 2022

LEGEND

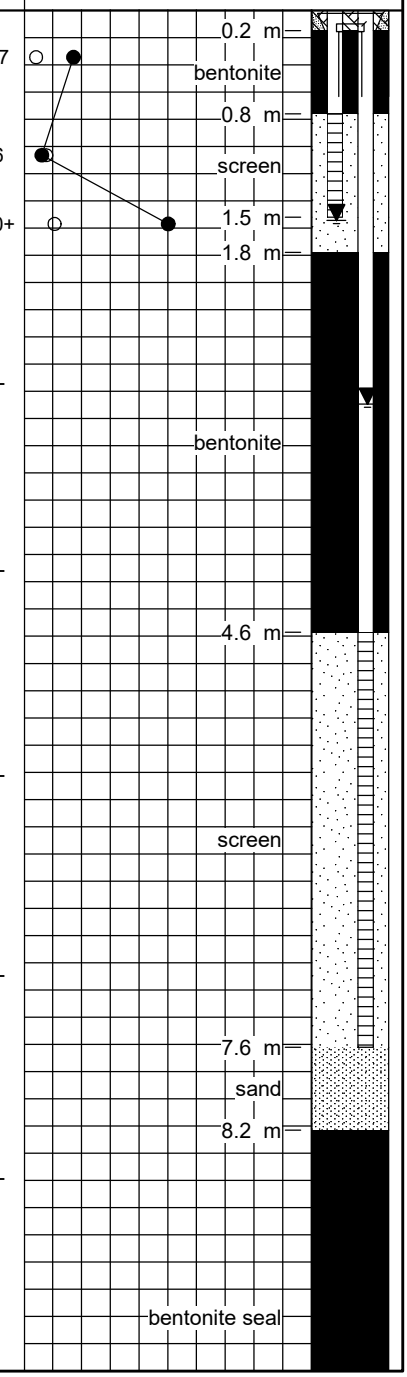
- SS - SPLIT SPOON
- ST - SHELBY TUBE
- RC - ROCK CORE
- ▼ - WATER LEVEL

NORTHING: 5027581.3 m EASTING: 448971.5 m

Depth (Feet)	Depth (Metres)	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content %	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
		81.2		GROUND SURFACE						
0	0.1	81.1		ASPHALT : 75 mm						
1				FILL : SW-SM-SAND and GRAVEL, brown, moist, compact		SS1	100	4	3-8-9-8	17
2	0.8	80.4		NATIVE : SM-SILTY SAND, some clay, brown/black, moist, loose to very dense						
3	1.0					SS2	100	8	3-2-4-8	6
4										
5	1.6	79.6		SHALE-BEDROCK, weathered, grey		SS3	100	10	50/ 100mm	50+
6	2.0									
7	2.1	79.1		SHALE-BEDROCK, shattered limestone, shale partings, vertical fractures infilled with calcites, moderately to highly weathered, thinly bedded, highly to moderately fractured, grey, very weak to strong		RC1	77	--	0	--
8										
9										
10	3.0			clay seams						
11										
12										
13	4.0					RC2	65	--	43	--
14										
15										
16	5.0									
17										
18						RC3	100	--	57	--
19										
20	6.0									
21										
22										
23	7.0					RC4	87	--	67	--
24										
25										
26	8.0			shale layers						
27										
28						RC5	100	--	98	--
29										
30	9.0									
31										
32										

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
Atterberg limits (%) W_p W_l
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90



File: N:\CA\TORONTO\PROJECTS\66211\205379\TECH\LOG DATABASE\111205379 - 1D4C AREA.GPJ Library File: 11205379 GHD_GEOTECH_V05.GLB Report: 11205379 SOIL LOG WITH GRAPH+WELL Date: 1/9/22

REFERENCE No.: 11205379 ENCLOSURE No.: 14

BOREHOLE No.: MW14
ELEVATION: 81.2 m

BOREHOLE REPORT

Page: 2 of 2

CLIENT: Infrastructure Ontario (I.O.) PROJECT: Preliminary Geotechnical Investigation

LOCATION: 401 Smyth Road, Ottawa, Ontario

DRILLING RIG: Track Drill Rig DRILLING METHOD: 203mm OD Hollow Stem Augers

DESCRIBED BY: S. Wallis CHECKED BY: A. Khandekar

DATE (START): 5 July 2022 DATE (FINISH): 5 July 2022

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- RC - ROCK CORE
- ▼ - WATER LEVEL

NORTHING: 5027581.3 m EASTING: 448971.5 m

Depth Feet	Depth Metres	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
		81.2		GROUND SURFACE				%		
	11.0	70.2				RC6	100	--	88	--

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value
(blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

11.0 m

END OF BOREHOLE :

NOTE :
- End of Borehole at 10.98 m bgs
- Rock coring from 2.08 m bgs
- Deep and Shallow monitoring well installed at 7.62 m and 1.52 m bgs respectively
- bgs donates 'below ground surface'

Groundwater level measurements (Deep)

Date	Depth (m)	Elev (m)
07/21/2022	2.87	78.36
07/27/2022	2.90	78.33

Groundwater level measurements (Shallow)

Date	Depth (m)	Elev (m)
07/22/2022	1.63	79.58
07/28/2022	1.65	79.56

File: N:\CA\TORONTO\PROJECTS\66211\205379\TECH\LOG DATABASE\111205379 - 1D4C AREA.GPJ Library File: 11205379 GHD_GEOTECH_V05.GLB Report: 11205379 SOIL LOG WITH GRAPH+WELL Date: 1/9/22

REFERENCE No.: 11205379 ENCLOSURE No.: 15

BOREHOLE No.: BH15
ELEVATION: 81.2 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Infrastructure Ontario (I.O.) PROJECT: Preliminary Geotechnical Investigation
LOCATION: 401 Smyth Road, Ottawa, Ontario
DRILLING RIG: Track Drill Rig DRILLING METHOD: 203mm OD Hollow Stem Augers
DESCRIBED BY: D. Ash CHECKED BY: A. Khandekar
DATE (START): 16 July 2022 DATE (FINISH): 16 July 2022

LEGEND
SS - SPLIT SPOON
ST - SHELBY TUBE
RC - ROCK CORE
▼ - WATER LEVEL

NORTHING: 5027585.6 m EASTING: 448950.5 m

Depth Feet	Depth Metres	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content %	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
0		81.2		GROUND SURFACE						
	0.1	81.1		ASPHALT : 75 mm						
1				FILL : SW-SM-SAND and GRAVEL, trace silt, trace clay, brown, moist, compact Gravel : 43%, Sand : 47%, Silt : 8%, Clay : 2%		SS1	71	3	10-7-8-5	15
	0.5									
2	0.6	80.6		NATIVE : SM-GRAVELLY SAND, some silt, trace clay, brown, moist, loose to compact Gravel : 25%, Sand : 46%, Silt : 19%, Clay : 10%		SS2	42	6	2-2-4-5	6
3	1.0									
4										
5	1.5					SS3	100	9	9-14-11-50/ 100mm	25
6	1.8	79.4		Borehole terminated due to spoon and auger refusal						
	2.0			**END OF BOREHOLE :**						
7				**NOTE :** - End of Borehole at 1.78 m bgs - Borehole was dry upon completion - bgs donates 'below ground surface'						
8	2.5									
9										
10	3.0									
11										
12	3.5									
13	4.0									
14										
15	4.5									
16										
17	5.0									
18	5.5									
19										

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

REFERENCE No.: 11205379 ENCLOSURE No.: 16

BOREHOLE No.: BH16
ELEVATION: 81.0 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Infrastructure Ontario (I.O.) PROJECT: Preliminary Geotechnical Investigation
LOCATION: 401 Smyth Road, Ottawa, Ontario
DRILLING RIG: Track Drill Rig DRILLING METHOD: 203mm OD Hollow Stem Augers
DESCRIBED BY: D. Ash CHECKED BY: A. Khandekar
DATE (START): 12 July 2022 DATE (FINISH): 17 December 2022

LEGEND
SS - SPLIT SPOON
ST - SHELBY TUBE
RC - ROCK CORE
▼ - WATER LEVEL

NORTHING: 5027602.7 m EASTING: 448967.8 m

Depth Feet	Depth Metres	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
		81.0		GROUND SURFACE				%		
0	0.1	80.9		ASPHALT : 75 mm						
1	0.5			FILL : SW-SM-GRAVELLY SAND, trace silt, trace clay, brown, moist, compact Gravel : 33%, Sand : 56%, Silt : 8%, Clay : 3%		SS1	71	3	7-13-6-4	19
2	0.6	80.4		NATIVE : SM-SILTY SAND, some gravel, trace clay, brown, moist, loose						
3	1.0					SS2	71	7	4-4-4-6	8
4	1.2	79.8		SHALE-BEDROCK, weathered, light brown						
5	1.5					SS3	100	6	39-42-50/ 100mm	92/ 254mm
	1.6	79.4		Borehole terminated due to spoon and auger refusal						
6	2.0			**END OF BOREHOLE :**						
7				**NOTE :** - End of Borehole at 1.62 m bgs - Borehole was dry upon completion - bgs donates 'below ground surface'						
8	2.5									
9										
10	3.0									
11										
12	3.5									
13	4.0									
14										
15	4.5									
16										

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

REFERENCE No.: 11205379 ENCLOSURE No.: 17

GHD

BOREHOLE No.: MW17
ELEVATION: 80.9 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Infrastructure Ontario (I.O.) PROJECT: Preliminary Geotechnical Investigation

LOCATION: 401 Smyth Road, Ottawa, Ontario

DRILLING RIG: Track Drill Rig DRILLING METHOD: 203mm OD Hollow Stem Augers

DESCRIBED BY: D. Ash CHECKED BY: A. Khandekar

DATE (START): 11 July 2022 DATE (FINISH): 11 July 2022

LEGEND

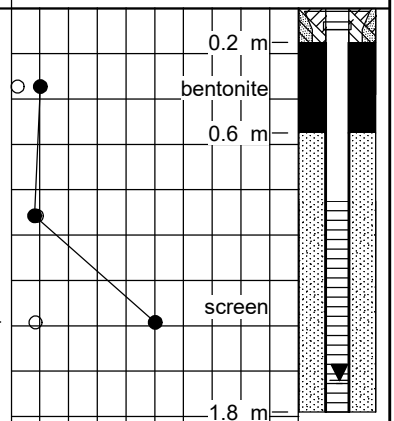
- SS - SPLIT SPOON
- ST - SHELBY TUBE
- RC - ROCK CORE
- ▼ - WATER LEVEL

NORTHING: 5027603.8 m EASTING: 448944.2 m

Depth (Feet)	Depth (Metres)	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
		80.9		GROUND SURFACE				%		
0	0.1	80.8		ASPHALT : 75 mm						
1	0.5			FILL : SM-GRAVELLY SAND, some silt, trace clay, brown, moist, compact to loose Gravel : 22%, Sand : 53%, Silt : 16%,		SS1	54	2	8-6-4-2	10
2	0.6	80.3		Clay : 9% NATIVE : SM-SILTY SAND, some gravel, trace clay, brown, moist, loose		SS2	71	9	1-3-5-4	8
3	1.0									
4	1.3	79.6		SHALE-BEDROCK, weathered, brown		SS3A	--	--	--	--
5	1.5					SS3B	100	8	5-50/ 75mm	50+
6	1.8	79.1		Borehole terminated due to spoon and auger refusal						
7	2.0			**END OF BOREHOLE :**						
8	2.5			**NOTE :** - End of Borehole at 1.78 m bgs - Borehole was dry upon completion - Monitoring well installed at 1.78 m bgs - bgs donates 'below ground surface'						
9										
10	3.0			Groundwater level measurements						
11	3.5			Date Depth (m) Elev (m) 07/22/2022 1.64 79.27 07/28/2022 1.64 79.27						
12										
13	4.0									
14										
15	4.5									
16										
17	5.0									
18	5.5									
19										

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90



File: N:\CA\TORONTO\PROJECTS\66211\205379\TECH\LOG DATABASE\111205379 - 1D4C AREA.GPJ Library File: 11205379 GHD_GEOTECH_V05.GLB Report: 11205379 SOIL LOG WITH GRAPH+WELL Date: 1/9/22

REFERENCE No.: 11205379 ENCLOSURE No.: 18

BOREHOLE No.: MW18
ELEVATION: 81.0 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Infrastructure Ontario (I.O.) PROJECT: Preliminary Geotechnical Investigation

LOCATION: 401 Smyth Road, Ottawa, Ontario

DRILLING RIG: Track Drill Rig DRILLING METHOD: 203mm OD Hollow Stem Augers

DESCRIBED BY: D. Ash CHECKED BY: A. Khandekar

DATE (START): 16 July 2022 DATE (FINISH): 16 July 2022

LEGEND

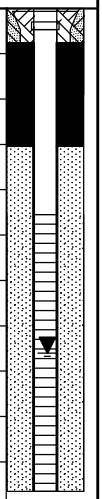
- SS - SPLIT SPOON
- ST - SHELBY TUBE
- RC - ROCK CORE
- ▼ - WATER LEVEL

NORTHING: 5027616.5 m EASTING: 448962.0 m

Depth (Feet)	Depth (Metres)	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
		81.0		GROUND SURFACE				%		
0	0.1	80.9		ASPHALT : 75 mm						
1				FILL : GW-GM-SAND and GRAVEL, trace silt, trace clay, brown, moist, compact Gravel : 49%, Sand : 44%, Silt : 5%, Clay : 2%		SS1	79	3	5-9-8-8	17
	0.5									
2	0.6	80.4		NATIVE : SM-SILTY SAND, some gravel, trace clay, brown, moist, compact						
	0.8	80.2				SS2	71	13	3-10-10-6	20
3	1.0			SM-GRAVELLY SAND, trace silt, trace clay, brown, moist to wet, compact to very dense Gravel : 35%, Sand : 50%, Silt : 11%, Clay : 4%						
4										
5	1.5					SS3	62	9	6-4-7-4	11
6						SS4	100	--	50/ 0mm	50/ 0mm
	2.0									
7	2.1	78.9		Borehole terminated due to spoon and auger refusal						
8	2.5			**END OF BOREHOLE :**						
9				**NOTE :** - End of Borehole at 2.13 m bgs - Borehole was dry upon completion - Monitoring well installed at 2.13 m bgs - bgs donates 'below ground surface'						
10	3.0			Groundwater level measurements						
11				Date Depth (m) Elev (m)						
12	3.5			07/22/2022 1.52 79.45						
13	4.0									
14										
15	4.5									
16										
17	5.0									
18	5.5									
19										

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90



File: N:\CA\TORONTO\PROJECTS\66211\205379\TECH\LOG DATABASE\111205379 - 1D4C AREA.GPJ Library File: 11205379 GHD_GEOTECH_V05.GLB Report: 11205379 SOIL LOG WITH GRAPH+WELL Date: 1/9/22

REFERENCE No.: 11205379 ENCLOSURE No.: 19

BOREHOLE No.: BH19
ELEVATION: 80.3 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Infrastructure Ontario (I.O.) PROJECT: Preliminary Geotechnical Investigation

LOCATION: 401 Smyth Road, Ottawa, Ontario

DRILLING RIG: Track Drill Rig DRILLING METHOD: 203mm OD Hollow Stem Augers

DESCRIBED BY: D. Ash CHECKED BY: A. Khandekar

DATE (START): 14 July 2022 DATE (FINISH): 14 July 2022

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- RC - ROCK CORE
- ▼ - WATER LEVEL

NORTHING: 5027647.2 m EASTING: 448901.1 m

Depth Feet	Depth Metres	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
		80.3		GROUND SURFACE				%		
0				FILL : SM-GRAVELLY SAND, trace silt, trace clay, grey, moist, compact Gravel : 39%, Sand : 47%, Silt : 9%, Clay : 5%		SS1	42	--	23-7-3-2	10
1	0.5									
2	0.6	79.7		NATIVE : SM-SAND and GRAVEL, some silt, trace clay, grey/brown, moist, compact Gravel : 37%, Sand : 40%, Silt : 13%, Clay : 10%		SS2	100	--	3-4-9-8	13
3	1.0									
4	1.4	78.9		Borehole terminated due to spoon and auger refusal						
5	1.5			**END OF BOREHOLE :**						
6				**NOTE :** - End of Borehole at 1.37 m bgs - Borehole was dry upon completion - bgs donates 'below ground surface'						
7	2.0									
8	2.5									
9										
10	3.0									
11										
12	3.5									
13	4.0									
14										
15	4.5									
16										

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

REFERENCE No.: 11205379 ENCLOSURE No.: 20

GHD

BOREHOLE No.: BH20
ELEVATION: 81.2 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Infrastructure Ontario (I.O.) PROJECT: Preliminary Geotechnical Investigation
LOCATION: 401 Smyth Road, Ottawa, Ontario
DRILLING RIG: Track Drill Rig DRILLING METHOD: 203mm OD Hollow Stem Augers
DESCRIBED BY: D. Ash CHECKED BY: A. Khandekar
DATE (START): 14 July 2022 DATE (FINISH): 14 July 2022

LEGEND
SS - SPLIT SPOON
ST - SHELBY TUBE
RC - ROCK CORE
▼ - WATER LEVEL

NORTHING: 5027660.3 m EASTING: 448923.8 m

Depth Feet	Depth Metres	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
		81.2		GROUND SURFACE				%		
0	0.1	81.1		TOPSOIL/SOD : 100 mm						
1				FILL : SM-SILTY SAND, some gravel, some clay, brown, moist, compact		SS1	50	5	2-7-8-6	15
2	0.6	80.6		Gravel : 15%, Sand : 55%, Clay : 11%, Silt : 19%						
3	1.0			NATIVE : SC-SM-CLAYEY SILTY SAND, trace gravel, brown, moist, loose to very dense		SS2	83	5	2-3-3-3	6
4				Gravel : 6%, Sand : 42%, Silt : 31%, Clay : 21%						
5						SS3	79	--	3-6-7-8	13
6	2.0									
7	2.2	79.0				SS4	100	--	6-27-50/ 125mm	77/ 125mm
				SHALE-BEDROCK, weathered						
8										
9	2.6	78.6		Borehole terminated due to spoon and auger refusal						
10	3.0			**END OF BOREHOLE :**						
11				**NOTE :**						
12				- End of Borehole at 2.59 m bgs						
13	4.0			- Borehole was dry upon completion						
14				- bgs donates 'below ground surface'						
15										
16	5.0									
17										
18										
19	6.0									
20										
21										
22										

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

REFERENCE No.: 11205379 ENCLOSURE No.: 21

BOREHOLE No.: BH21
ELEVATION: 81.0 m

BOREHOLE REPORT

Page: 1 of 2

CLIENT: Infrastructure Ontario (I.O.) PROJECT: Preliminary Geotechnical Investigation

LOCATION: 401 Smyth Road, Ottawa, Ontario

DRILLING RIG: Track Drill Rig DRILLING METHOD: 203mm OD Hollow Stem Augers

DESCRIBED BY: S. Wallis CHECKED BY: A. Khandekar

DATE (START): 6 July 2022 DATE (FINISH): 6 July 2022

LEGEND

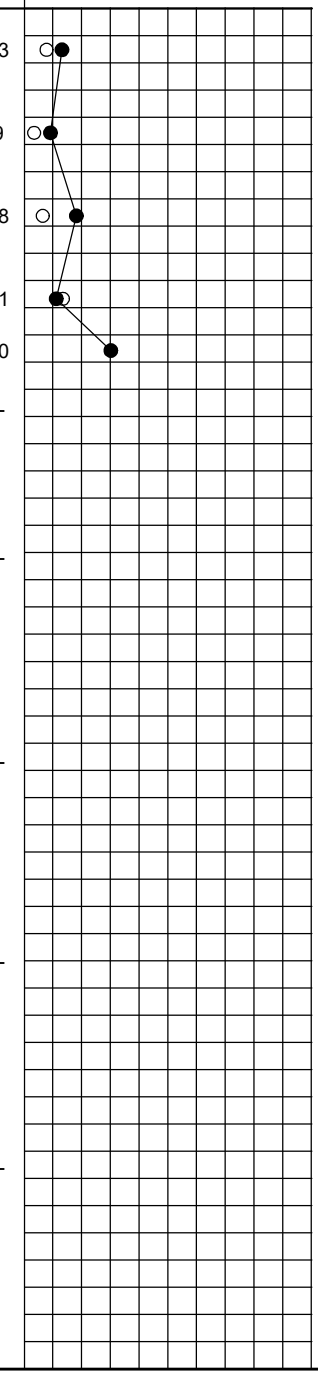
- SS - SPLIT SPOON
- ST - SHELBY TUBE
- RC - ROCK CORE
- ▼ - WATER LEVEL

NORTHING: 5027675.7 m EASTING: 448916.2 m

Depth (Feet)	Depth (Metres)	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content %	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
		81.0		GROUND SURFACE						
0	0.1	81.0		SOD : 50 mm						
1				FILL : SW-SM-SAND and GRAVEL, trace silt, grey/brown, moist, compact		SS1	37	8	5-5-8-7	13
2	0.6	80.4		NATIVE : SM-SILTY SAND, trace gravel, brown to grey/black, moist, loose to compact		SS2	67	3	4-3-6-6	9
3	1.0									
4						SS3	50	6	4-8-10-5	18
5										
6						SS4	75	13	3-5-6-10	11
7	2.0									
8						SS5	100	--	30	30
9	2.6	78.4		SHALE-BEDROCK, shattered limestone, shale partings, vertical fractures infilled with calcites, moderately to highly weathered, thinly bedded, highly to moderately fractured, grey, very weak to strong		RC1	100	--	0	--
10	3.0									
11										
12										
13	4.0					RC2	100	--	9	--
14										
15										
16										
17	5.0									
18						RC3	100	--	43	--
19										
20	6.0									
21										
22										
23	7.0					RC4	64	--	71	--
24										
25										
26										
27	8.0									
28						RC5	95	--	77	--
29										
30	9.0									
31										
32										

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90



File: N:\CA\TORONTO\PROJECTS\66211\205379\TECH\LOG DATABASE\111205379 - 1D4C AREA.GPJ Library File: 11205379 GHD_GEOTECH_V05.GLB Report: 11205379 SOIL LOG WITH GRAPH+WELL Date: 1/9/22

REFERENCE No.: 11205379 ENCLOSURE No.: 21

BOREHOLE No.: BH21
ELEVATION: 81.0 m

BOREHOLE REPORT

Page: 2 of 2

CLIENT: Infrastructure Ontario (I.O.) PROJECT: Preliminary Geotechnical Investigation
LOCATION: 401 Smyth Road, Ottawa, Ontario
DRILLING RIG: Track Drill Rig DRILLING METHOD: 203mm OD Hollow Stem Augers
DESCRIBED BY: S. Wallis CHECKED BY: A. Khandekar
DATE (START): 6 July 2022 DATE (FINISH): 6 July 2022

LEGEND
SS - SPLIT SPOON
ST - SHELBY TUBE
RC - ROCK CORE
▼ - WATER LEVEL

NORTHING: 5027675.7 m EASTING: 448916.2 m

Depth Feet	Depth Metres	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
		81.0		GROUND SURFACE				%		
						RC6	100	--	88	--
	11.0	70.1								
				END OF BOREHOLE :						
				NOTE : - End of Borehole at 10.95 m bgs - Borehole was dry upon completion - Rock coring from 2.59 m bgs - bgs donates 'below ground surface'						

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
Atterberg limits (%) W_p W_l
● "N" Value (blows / 12 in.-30 cm)
10 20 30 40 50 60 70 80 90

File: N:\CA\TORONTO\PROJECTS\66211205379\TECH\LOG DATABASE\11205379 - 1D4C AREA.GPJ Library File: 11205379 GHD_GEOTECH_V05.GLB Report: 11205379 SOIL LOG WITH GRAPH+WELL Date: 1/9/22

REFERENCE No.: 11205379 ENCLOSURE No.: 22

GHD

BOREHOLE No.: BH22

ELEVATION: 80.4 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Infrastructure Ontario (I.O.) PROJECT: Preliminary Geotechnical Investigation

LOCATION: 401 Smyth Road, Ottawa, Ontario

DRILLING RIG: Track Drill Rig DRILLING METHOD: 203mm OD Hollow Stem Augers

DESCRIBED BY: D. Ash CHECKED BY: A. Khandekar

DATE (START): 14 July 2022 DATE (FINISH): 14 July 2022

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- RC - ROCK CORE
- ▼ - WATER LEVEL

NORTHING: 5027664.6 m EASTING: 448897.9 m

Depth Feet	Depth Metres	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
		80.4		GROUND SURFACE				%		
0	0.1	80.3		FILL : SW-SM-SAND and GRAVEL, trace silt, grey/brown, moist, loose						
1				NATIVE : SM-SILTY SAND, trace gravel, grey/brown, moist, loose		SS1	50	12	6-2-3-4	5
	0.5									
2										
3	1.0					SS2	79	12	5-4-5-6	9
4										
	1.4	79.0		Borehole terminated due to spoon and auger refusal						
5	1.5			**END OF BOREHOLE :**						
6				**NOTE :** - End of Borehole at 1.37 m bgs - Borehole was dry upon completion - bgs donates 'below ground surface'						
	2.0									
7										
8	2.5									
9										
10	3.0									
11										
	3.5									
12										
13	4.0									
14										
	4.5									
15										
16										

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

REFERENCE No.: 11205379 ENCLOSURE No.: 23

BOREHOLE No.: MW23
ELEVATION: 82.9 m

BOREHOLE REPORT

Page: 1 of 2

CLIENT: Infrastructure Ontario (I.O.) PROJECT: Preliminary Geotechnical Investigation

LOCATION: 401 Smyth Road, Ottawa, Ontario

DRILLING RIG: Track Drill Rig DRILLING METHOD: 203mm OD Hollow Stem Augers

DESCRIBED BY: D. Ash CHECKED BY: A. Khandekar

DATE (START): 13 July 2022 DATE (FINISH): 13 July 2022

LEGEND

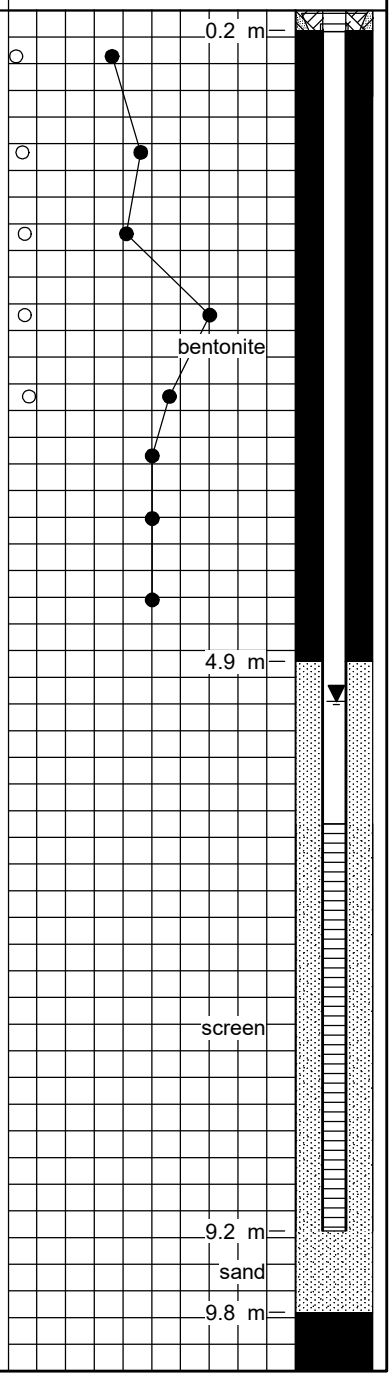
- SS - SPLIT SPOON
- ST - SHELBY TUBE
- RC - ROCK CORE
- ▼ - WATER LEVEL

NORTHING: 5027676.3 m EASTING: 448955.6 m

Depth (Feet)	Depth (Metres)	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
		82.9		GROUND SURFACE				%		
0	0.1	82.8		ASPHALT : 75 mm						
1				FILL : SM-GRAVELLY SAND, some silt, trace clay, brown, moist, dense		SS1	67	3	10-18-18-14	36
2										
3	1.0					SS2	100	5	10-20-26-15	46
4										
5				Gravel : 34%, Sand : 48%, Silt : 13%, Clay : 5%		SS3	75	6	15-26-15-28	41
6										
7	2.0					SS4	83	6	17-40-30-37	70
8										
9						SS5	79	7	15-28-28-22	56
10	3.0									
11	3.2	79.7		NATIVE : GM-SANDY GRAVEL, some silt, trace clay, brown, moist, very dense		SS6	100	--	6-50/ 125mm	+50
12	3.5	79.4		Gravel : 49%, Sand : 32%, Silt : 13%, Clay : 6%		SS7	100	--	50/ 0mm	+50
13	4.0			SHALE-BEDROCK, weathered, grey						
14						SS8	100	--	50/ 0mm	+50
15										
16										
17	5.0	77.9		auger/spoon refusal						
18	5.0			SHALE-BEDROCK, occasional fractures infilled with clay infills, highly to slightly weathered, highly to moderately fractured, grey, very weak to medium strong		RC1	80	--	6	--
19										
20	6.0									
21										
22				occasional clay and silt seams						
23	7.0					RC2	100	--	48	--
24										
25										
26	8.0									
27										
28										
29						RC3	100	--	45	--
30	9.0									
31										
32										
33	10.0									

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90



File: N:\CA\TORONTO\PROJECTS\66211205379\TECH\LOG DATABASE\11205379 - 1D4C AREA.GPJ Library File: 11205379 GHD_GEOTECH_V05.GLB Report: 11205379 SOIL LOG WITH GRAPH+WELL Date: 1/9/22

REFERENCE No.: 11205379 ENCLOSURE No.: 23

BOREHOLE No.: MW23
ELEVATION: 82.9 m

BOREHOLE REPORT

Page: 2 of 2

CLIENT: Infrastructure Ontario (I.O.) PROJECT: Preliminary Geotechnical Investigation

LOCATION: 401 Smyth Road, Ottawa, Ontario

DRILLING RIG: Track Drill Rig DRILLING METHOD: 203mm OD Hollow Stem Augers

DESCRIBED BY: D. Ash CHECKED BY: A. Khandekar

DATE (START): 13 July 2022 DATE (FINISH): 13 July 2022

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- RC - ROCK CORE
- ▼ - WATER LEVEL

NORTHING: 5027676.3 m EASTING: 448955.6 m

Depth Feet	Depth Metres	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
		82.9		GROUND SURFACE				%		
34						RC4	100	--	52	--
35										
36	11.0									
37	11.1	71.8		**END OF BOREHOLE :**						
38				**NOTE :** - End of Borehole at 11.13 m bgs - Rock coring from 5.03 m bgs - Monitoring well installed at 9.15 m bgs - bgs donates 'below ground surface'						
39	12.0			Groundwater level measurements Date Depth (m) Elev (m) 07/25/2022 5.29 77.61 08/03/2022 5.18 77.72						
40										
41										
42										
43	13.0									
44										
45										
46	14.0									
47										
48										
49	15.0									
50										
51										
52	16.0									
53										
54										
55										
56	17.0									
57										
58										
59	18.0									
60										
61										
62	19.0									
63										
64										
65	20.0									
66										

Shear test (Cu) △ Field
Sensitivity (S) ☐ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

bentonite seal

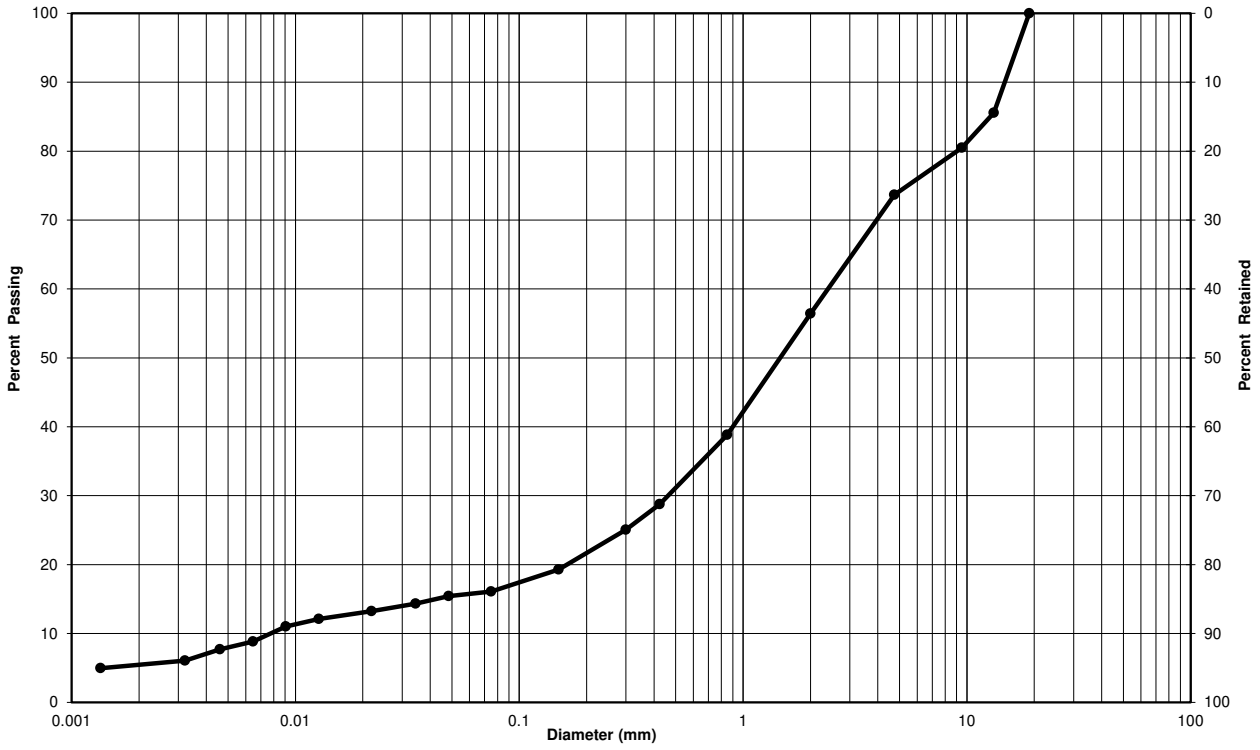
11.1 m

File: N:\CA\TORONTO\PROJECTS\66211\205379\TECH\LOG DATABASE\111205379 - 1D4C AREA.GPJ Library File: 11205379 GHD_GEOTECH_V05.GLB Report: 11205379 SOIL LOG WITH GRAPH+WELL Date: 1/9/22

Particle-Size Analysis of Soils
ASTM D422 (Geotechnical)

Client:	Infrastructure Ontario (IO)	**Lab No.:**	G2256
Project, Site:	Geotechnical Investigation - Childrens Hospital of Eastern Ontario, Ottawa, ON	**Project No.:**	11205379

Borehole No.:	MW1	Sample No.:	SS3 + SS4
Depth:	1.5m-2.1m / 2.3m - 2.9m	Enclosure:	



Silty Clay	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Particle-Size Limits as per USCS (ASTM D-2487)					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Silty Sand with Gravel, Trace Clay	26	58	16

Remarks: Silt-size particles (0.074 to 0.002 mm): 11%, Clay-size particles (<0.002 mm): 5%

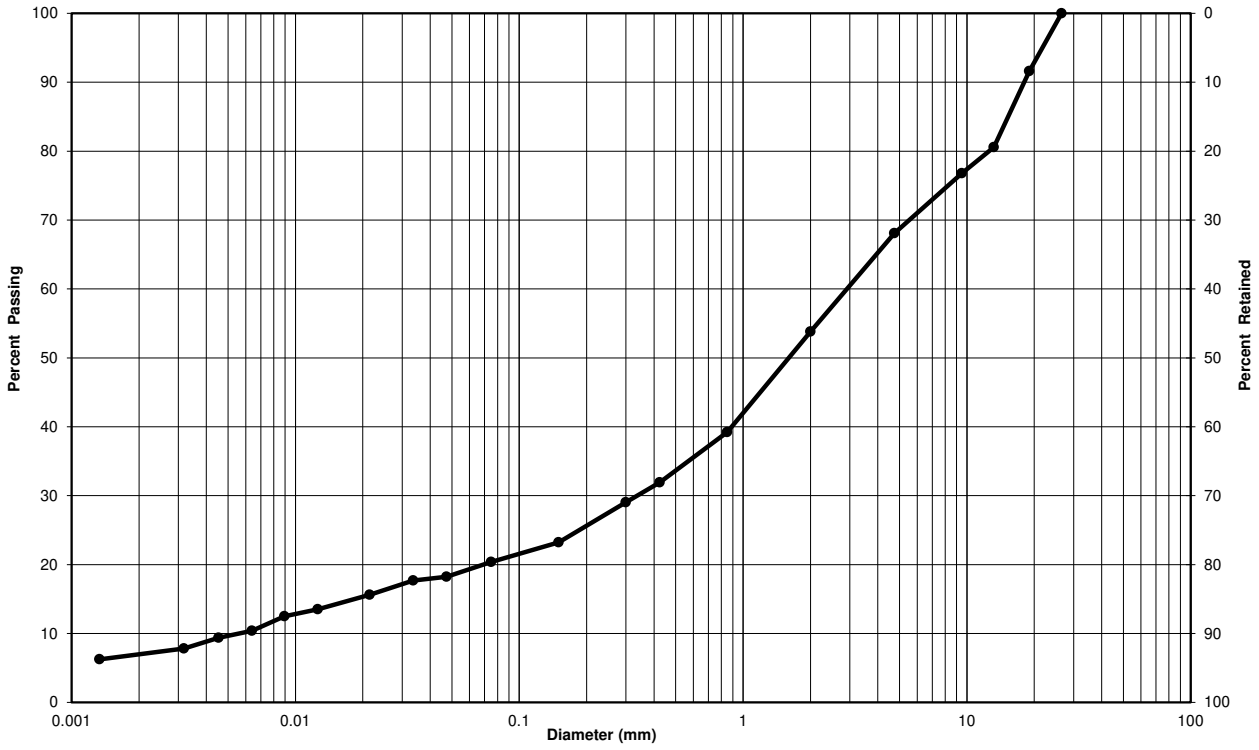
Gravel 26%, Sand 58%, Silt 11%, Clay 5%

Performed by:	Riddhee Panchal	**Date:**	December 16, 2019
Verified by:	Raj Kadia, C.E.T.	**Date:**	December 27, 2019

Particle-Size Analysis of Soils
ASTM D422 (Geotechnical)

Client:	Infrastructure Ontario (IO)	**Lab No.:**	G2256
Project, Site:	Geotechnical Investigation - Childrens Hospital of Eastern Ontario, Ottawa, ON	**Project No.:**	11205379

Borehole No.:	MW2	Sample No.:	SS3 + SS4
Depth:	1.5m-2.1m / 2.3m - 2.9m	Enclosure:	



Silty Clay	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Particle-Size Limits as per USCS (ASTM D-2487)					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Silty Sand with Gravel, Trace Clay	32	48	20

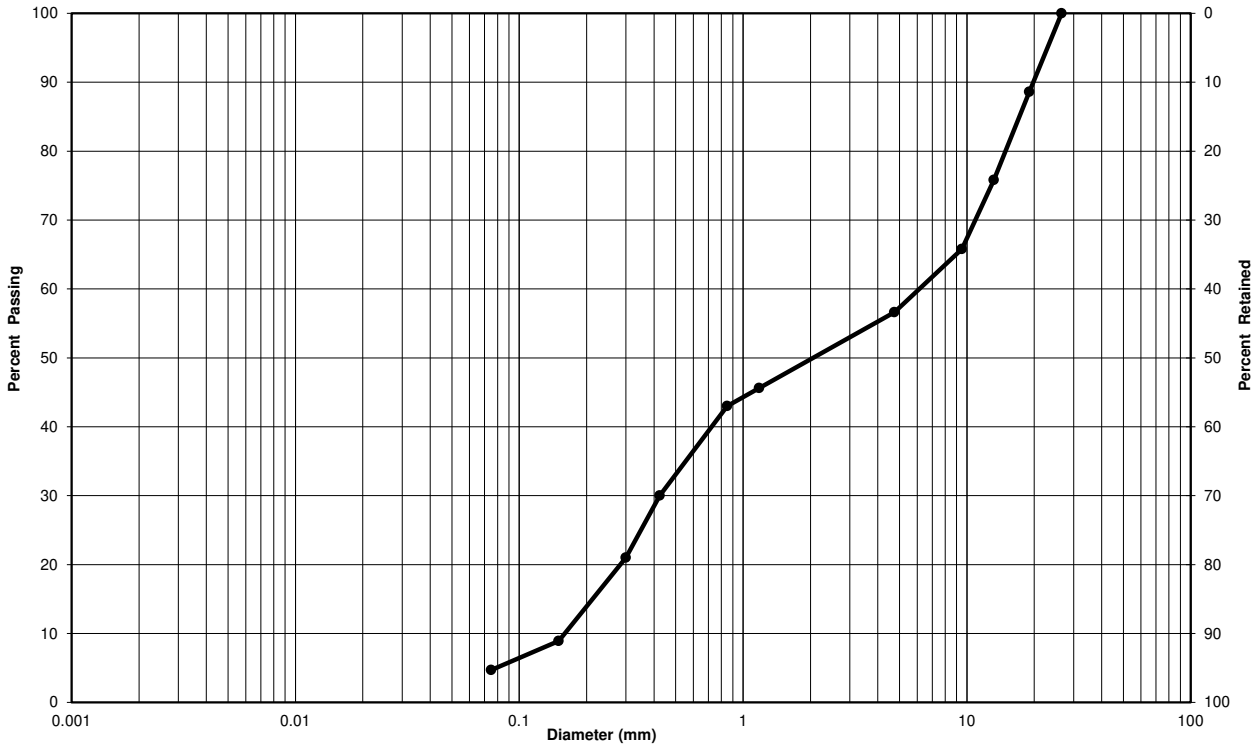
Remarks: Silt-size particles (0.074 to 0.002 mm): 13%, Clay-size particles (<0.002 mm): 7%

Gravel 32%, Sand 48%, Silt 13%, Clay 7%

Performed by:	Riddhee Panchal	**Date:**	December 16, 2019
Verified by:	Raj Kadia, C.E.T.	**Date:**	December 27, 2019

Particle-Size Analysis of Soils
ASTM D422 (Geotechnical)

Client:	Infrastructure Ontario (IO)	**Lab No.:**	G2256
Project, Site:	Geotechnical Investigation - Childrens Hospital of Eastern Ontario, Ottawa, ON	**Project No.:**	11205379
Borehole No.:	MW3	Sample No.:	SS2
Depth:	0.8m - 1.4m	Enclosure:	



Silty Clay	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Particle-Size Limits as per USCS (ASTM D-2487)					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Sand with Gravel and Silt	43	52	5

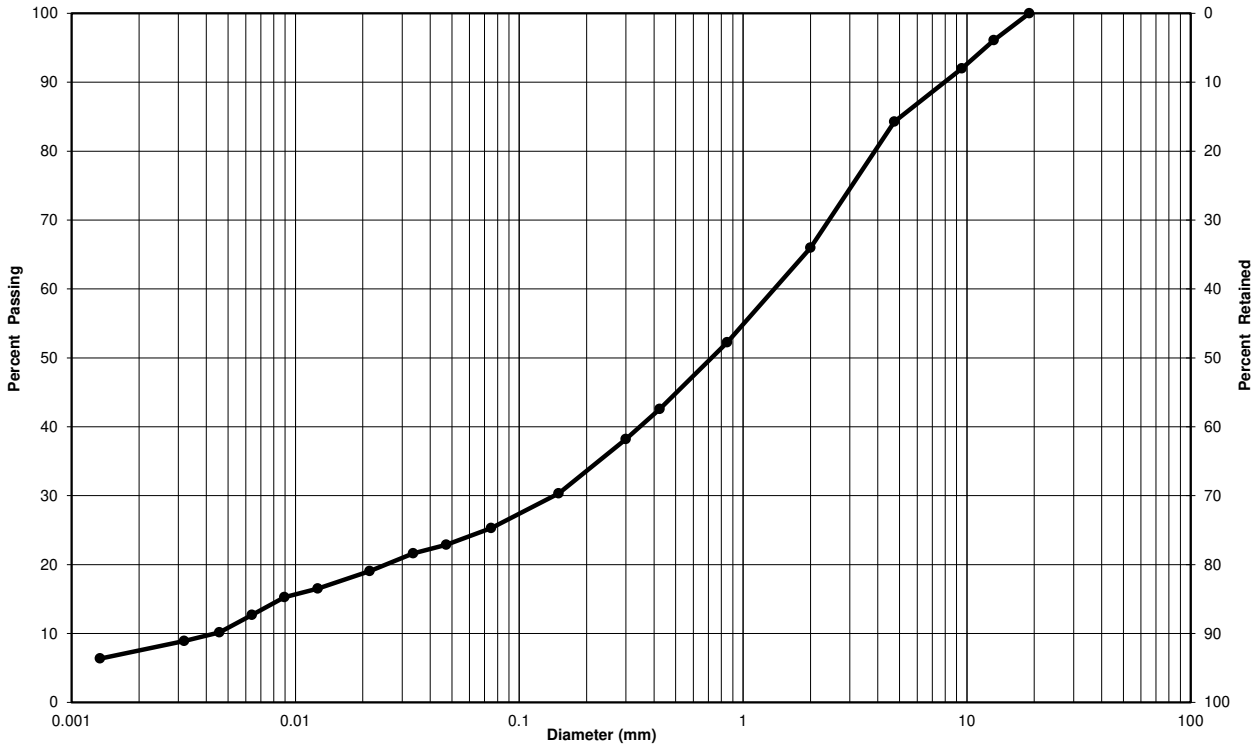
Remarks: Gravel 43%, Sand 52%, Silt 5%

Performed by:	Riddhee Panchal	**Date:**	December 16, 2019
Verified by:	Raj Kadia, C.E.T.	**Date:**	December 31, 2019

Particle-Size Analysis of Soils
ASTM D422 (Geotechnical)

Client:	Infrastructure Ontario (IO)	**Lab No.:**	G2256
Project, Site:	Geotechnical Investigation - Childrens Hospital of Eastern Ontario, Ottawa, ON	**Project No.:**	11205379

Borehole No.:	MW3	Sample No.:	SS4
Depth:	2.3m - 2.9m	Enclosure:	



Silty Clay	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Particle-Size Limits as per USCS (ASTM D-2487)					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Silty Sand with Gravel, Trace Clay	16	59	25

Remarks: Silt-size particles (0.074 to 0.002 mm): 17%, Clay-size particles (<0.002 mm): 8%

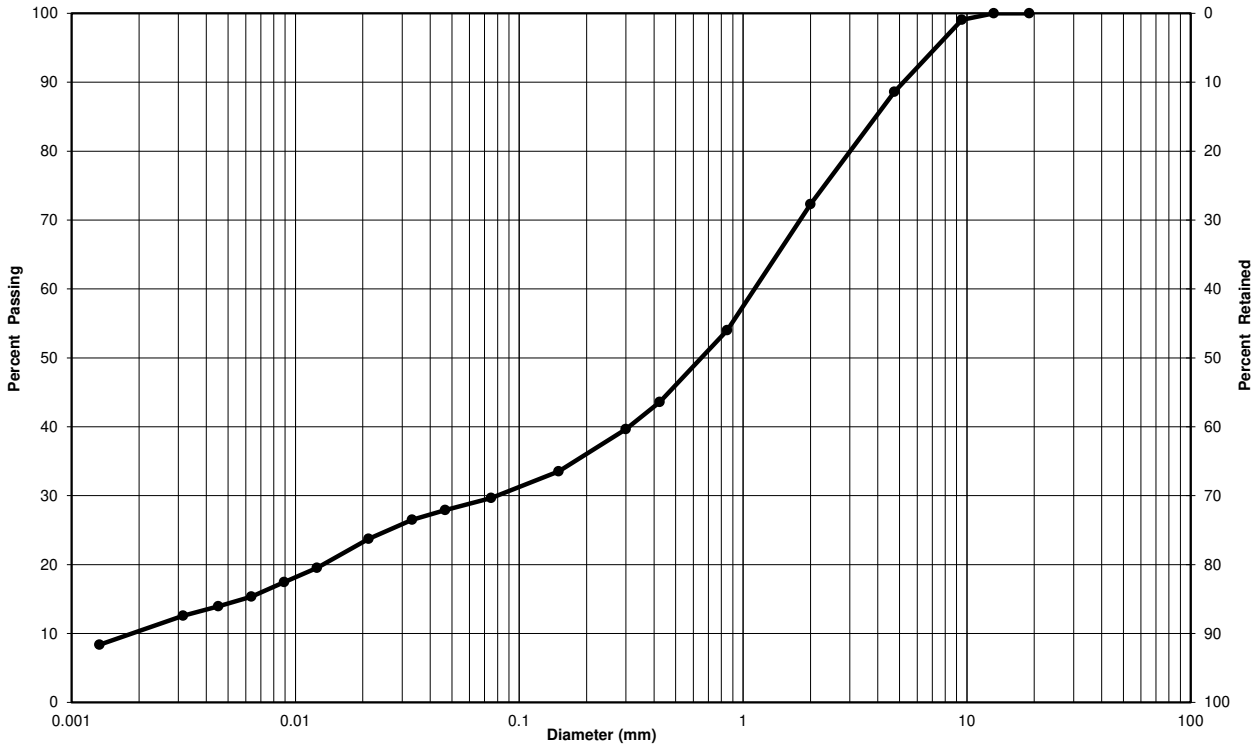
Gravel 16%, Sand 59%, Silt 17%, Clay 8%

Performed by:	Riddhee Panchal	**Date:**	December 16, 2019
Verified by:	Raj Kadia, C.E.T.	**Date:**	December 27, 2019

Particle-Size Analysis of Soils
ASTM D422 (Geotechnical)

Client:	Infrastructure Ontario (IO)	**Lab No.:**	G2256
Project, Site:	Geotechnical Investigation - Childrens Hospital of Eastern Ontario, Ottawa, ON	**Project No.:**	11205379

Borehole No.:	MW4	Sample No.:	SS2
Depth:	0.8m-1.4m	Enclosure:	



Silty Clay	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Particle-Size Limits as per USCS (ASTM D-2487)					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Silty Sand, Some Gravel, Trace Clay	11	59	30

Remarks: Silt-size particles (0.074 to 0.002 mm): 20%, Clay-size particles (<0.002 mm): 10%

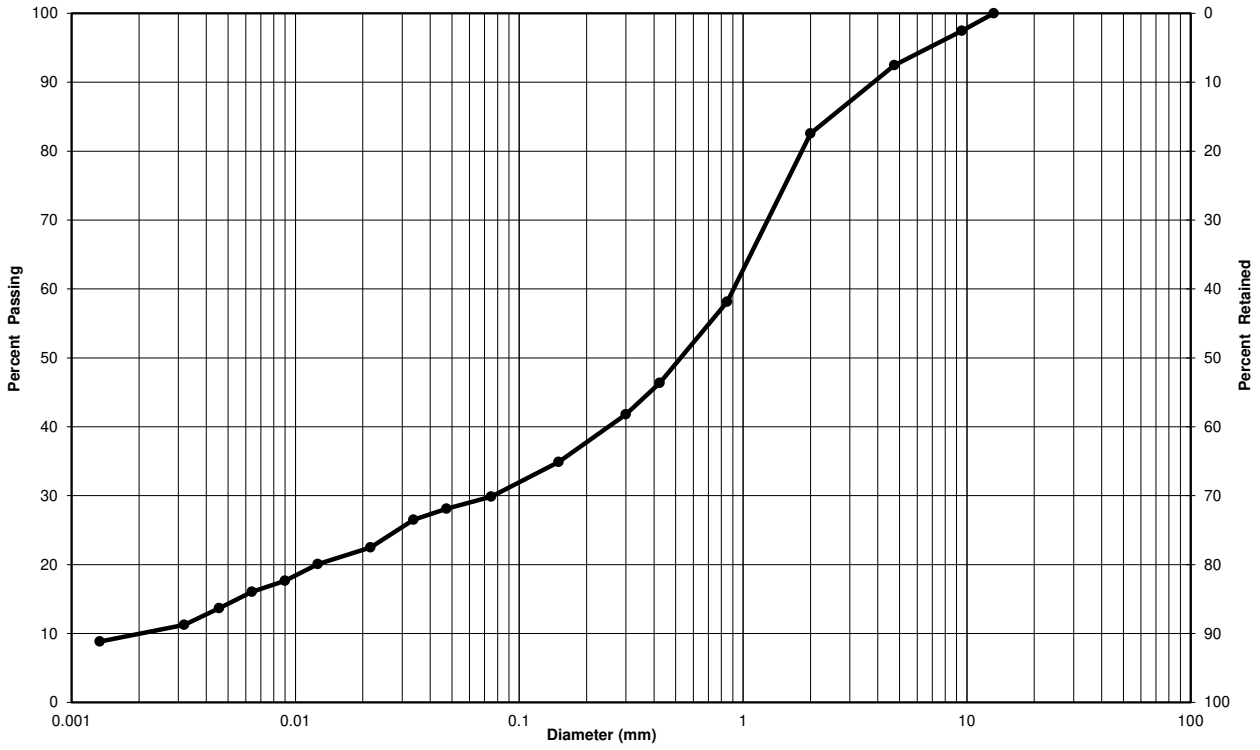
Gravel 11%, Sand 59%, Silt 20%, Clay 10%

Performed by:	Riddhee Panchal	**Date:**	December 16, 2019
Verified by:	Raj Kadia, C.E.T.	**Date:**	December 27, 2019

Particle-Size Analysis of Soils
ASTM D422 (Geotechnical)

Client:	Infrastructure Ontario (IO)	**Lab No.:**	G2256
Project, Site:	Geotechnical Investigation - Childrens Hospital of Eastern Ontario, Ottawa, ON	**Project No.:**	11205379

Borehole No.:	MW5-19	Sample No.:	SS2 + SS3
Depth:	0.9m-1.2m / 1.5m-1.7m	Enclosure:	



Silty Clay	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Particle-Size Limits as per USCS (ASTM D-2487)					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Silty Sand, Trace Gravel, Trace Clay	8	62	30

Remarks: Silt-size particles (0.074 to 0.002 mm): 20%, Clay-size particles (<0.002 mm): 10%

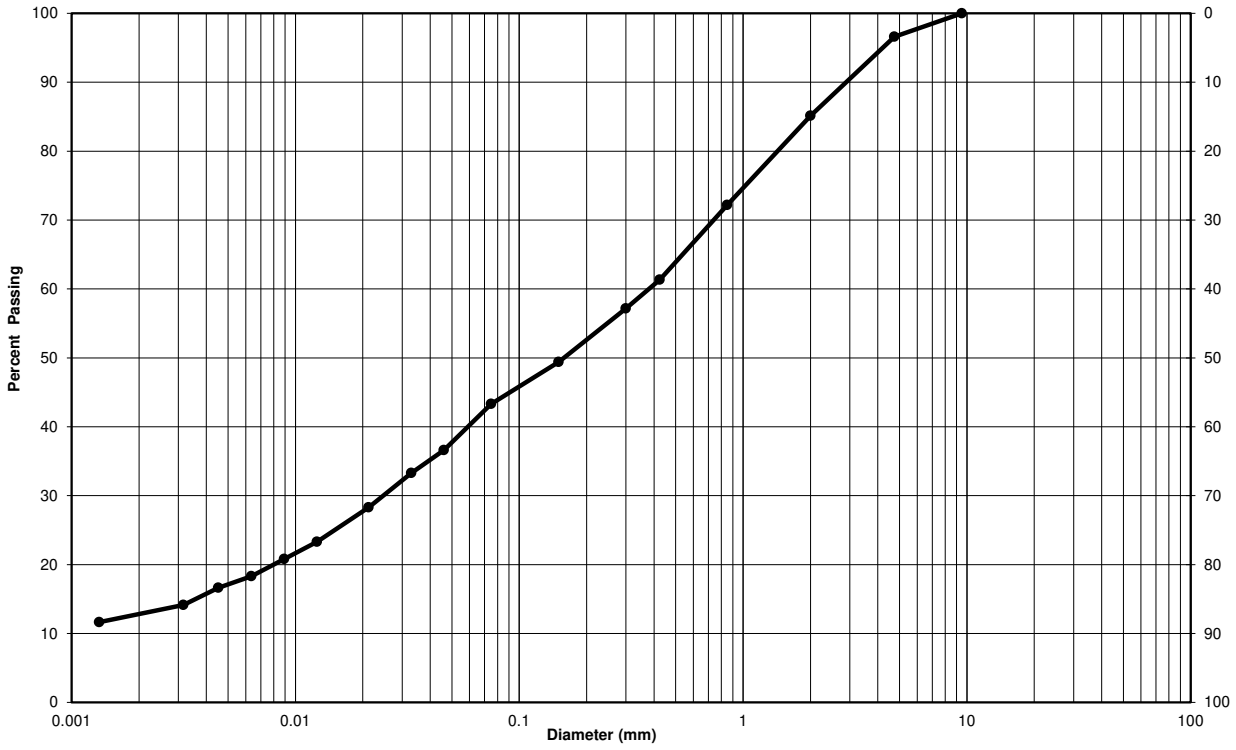
Gravel 8%, Sand 62%, Silt 20%, Clay 10%

Performed by:	Riddhee Panchal	**Date:**	December 16, 2019
Verified by:	Raj Kadia, C.E.T.	**Date:**	December 27, 2019

Particle-Size Analysis of Soils
ASTM D422 (Geotechnical)

Client:	Infrastructure Ontario (IO)	**Lab No.:**	G2256
Project, Site:	Geotechnical Investigation - Childrens Hospital of Eastern Ontario, Ottawa, ON	**Project No.:**	11205379

Borehole No.:	MW7	Sample No.:	SS2
Depth:	0.8m - 1.4m	Enclosure:	



Silty Clay	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Particle-Size Limits as per USCS (ASTM D-2487)					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Silty Sand, Some Clay , Trace Gravel	3	54	43

Remarks: Silt-size particles (0.074 to 0.002 mm): 30%, Clay-size particles (<0.002 mm): 13%

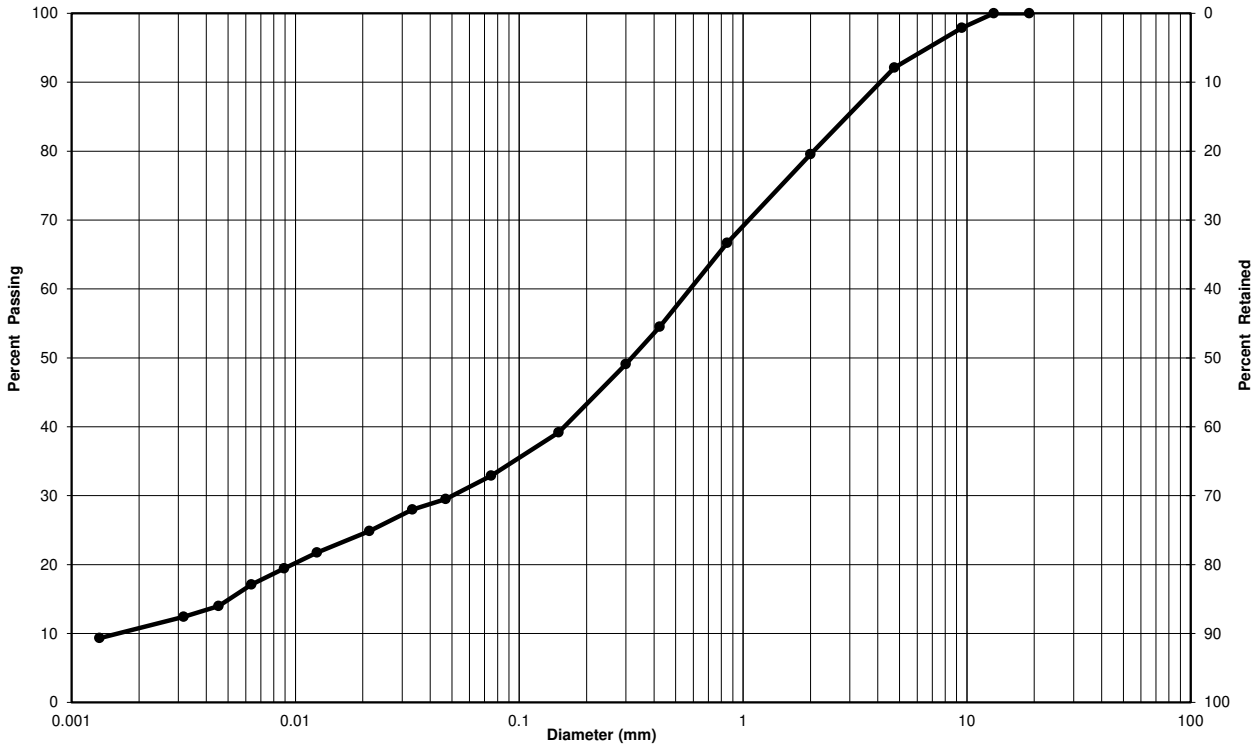
Gravel 3%, Sand 54%, Silt 30%, Clay 13%

Performed by:	Riddhee Panchal	**Date:**	December 16, 2019
Verified by:	Raj Kadia, C.E.T.	**Date:**	December 27, 2019

Particle-Size Analysis of Soils
ASTM D422 (Geotechnical)

Client:	Infrastructure Ontario (IO)	**Lab No.:**	G2256
Project, Site:	Geotechnical Investigation - Childrens Hospital of Eastern Ontario, Ottawa, ON	**Project No.:**	11205379

Borehole No.:	BH8	Sample No.:	SS2
Depth:	0.8m - 1.4m	Enclosure:	



Silty Clay	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Particle-Size Limits as per USCS (ASTM D-2487)					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Silty Sand, Some Clay , Trace Gravel	8	59	33

Remarks: Silt-size particles (0.074 to 0.002 mm): 22%, Clay-size particles (<0.002 mm): 11%

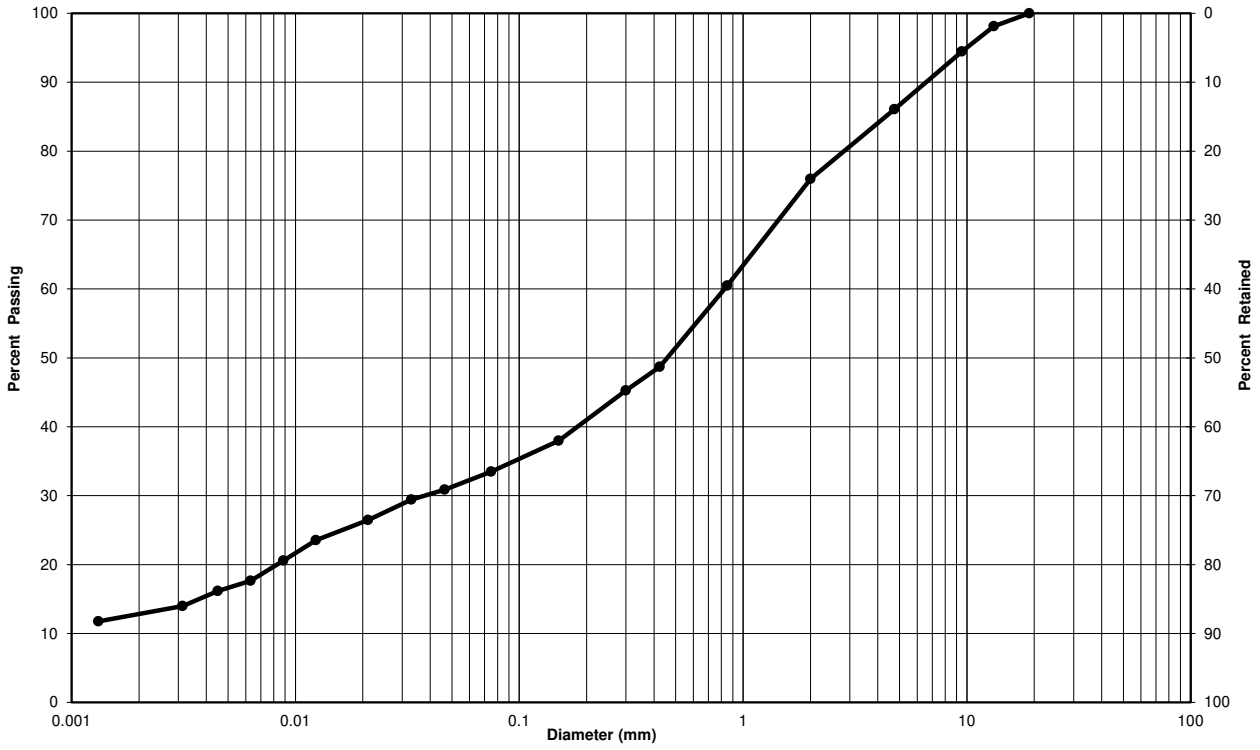
Gravel 8%, Sand 59%, Silt 22%, Clay 11%

Performed by:	Riddhee Panchal	**Date:**	December 16, 2019
Verified by:	Raj Kadia, C.E.T.	**Date:**	December 27, 2019

Particle-Size Analysis of Soils
ASTM D422 (Geotechnical)

Client:	Infrastructure Ontario (IO)	**Lab No.:**	G2256
Project, Site:	Geotechnical Investigation - Childrens Hospital of Eastern Ontario, Ottawa, ON	**Project No.:**	11205379

Borehole No.:	MW9	Sample No.:	SS2 + SS3
Depth:	0.8m-1.4m / 1.5m-2.0m	Enclosure:	



Silty Clay	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Particle-Size Limits as per USCS (ASTM D-2487)					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Silty Sand, Some Gravel, Some Clay	14	53	33

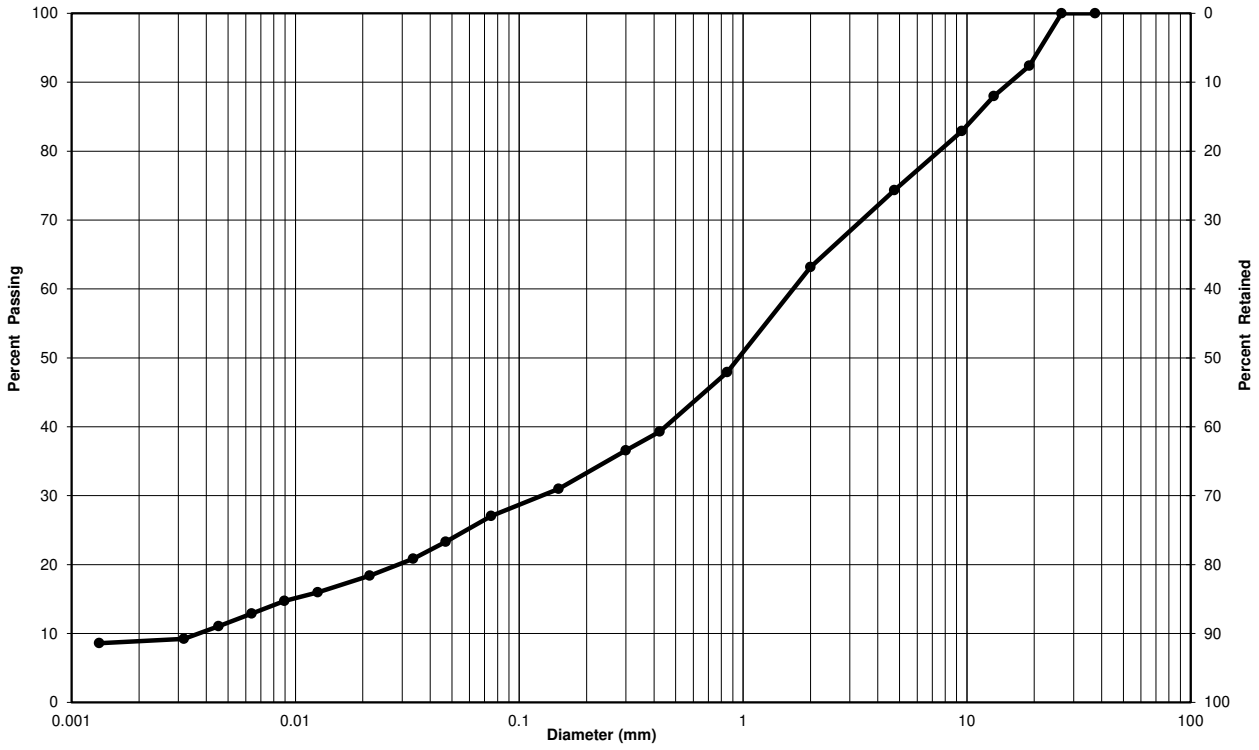
Remarks: Silt-size particles (0.074 to 0.002 mm): 20%, Clay-size particles (<0.002 mm): 13%

Gravel 14%, Sand 53%, Silt 20%, Clay 13%

Performed by:	Riddhee Panchal	**Date:**	December 16, 2019
Verified by:	Raj Kadia, C.E.T.	**Date:**	December 27, 2019

Particle-Size Analysis of Soils
ASTM D422 (Geotechnical)

Client:	Infrastructure Ontario (IO)	**Lab No.:**	G2253
Project, Site:	Geotechnical Investigation - Childrens Hospital of Eastern Ontario, Ottawa, ON	**Project No.:**	11205379
Borehole No.:	MW10	Sample No.:	SS2
Depth:	0.8m-1.4m	Enclosure:	



Silty Clay	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Particle-Size Limits as per USCS (ASTM D-2487)					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Silty Sand with Gravel, Trace Clay	26	47	27

Remarks: Silt-size particles (0.074 to 0.002 mm): 18%, Clay-size particles (<0.002 mm): 9%

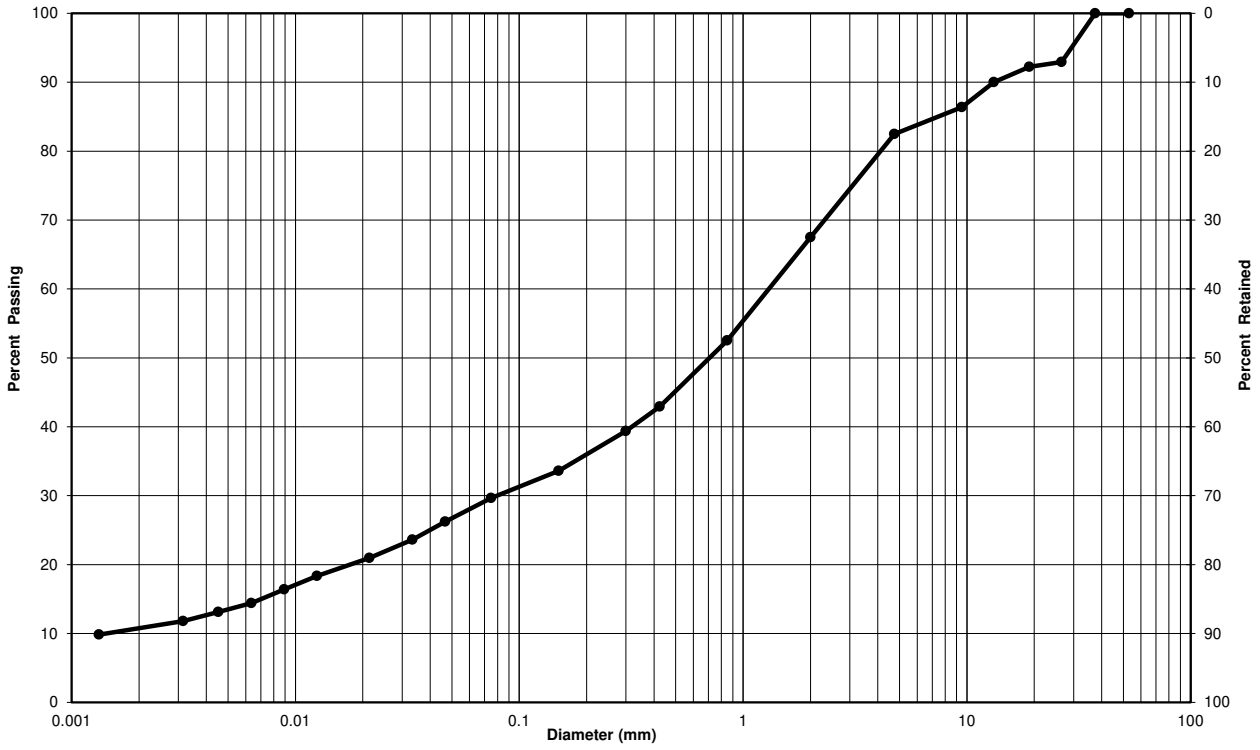
Gravel 26%, Sand 47%, Silt 18%, Clay 9%

Performed by:	Riddhee Panchal	**Date:**	December 16, 2019
Verified by:	Raj Kadia, C.E.T.	**Date:**	December 27, 2019

Particle-Size Analysis of Soils
ASTM D422 (Geotechnical)

Client:	Infrastructure Ontario (IO)	**Lab No.:**	G2253
Project, Site:	Geotechnical Investigation - Childrens Hospital of Eastern Ontario, Ottawa, ON	**Project No.:**	11205379

Borehole No.:	BH12	Sample No.:	SS2 + SS3
Depth:	0.8m-1.4m / 1.5m-2.1m	Enclosure:	



Silty Clay	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Particle-Size Limits as per USCS (ASTM D-2487)					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Silty Sand with Gravel, Some Clay	18	52	30

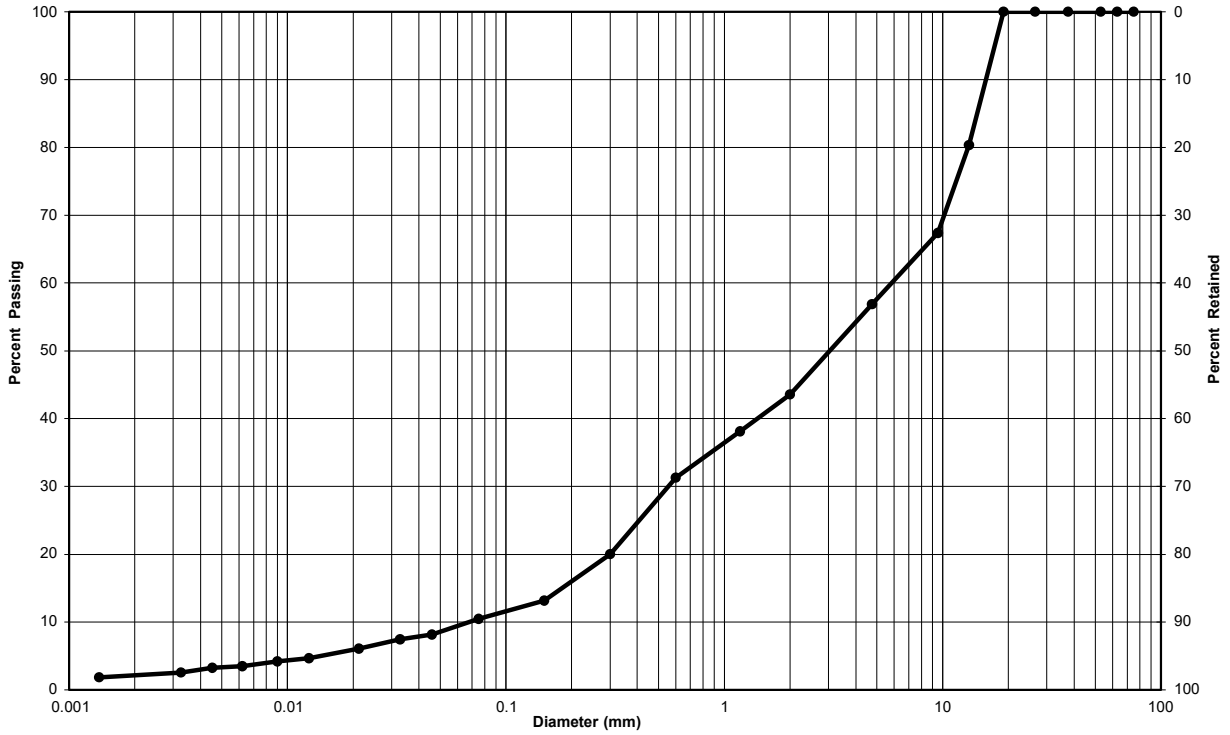
Remarks: Silt-size particles (0.074 to 0.002 mm): 19%, Clay-size particles (<0.002 mm): 11%

Gravel 18%, Sand 52%, Silt 19%, Clay 11%

Performed by:	Riddhee Panchal	**Date:**	December 16, 2019
Verified by:	Raj Kadia, C.E.T.	**Date:**	December 27, 2019

Particle-Size Analysis of Soils
MTO LS-702 (Geotechnical)

Client:	Infrastructure Ontario	**Lab No.:**	G-22-03
Project, Site:	Children Hospital	**Project No.:**	11205379
Borehole No.:	BH-15	Sample No.:	SS-1
Depth:	0,08 - 0,61 m	Enclosure:	-



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Particle-Size Limits as per USCS (ASTM D-2487)					

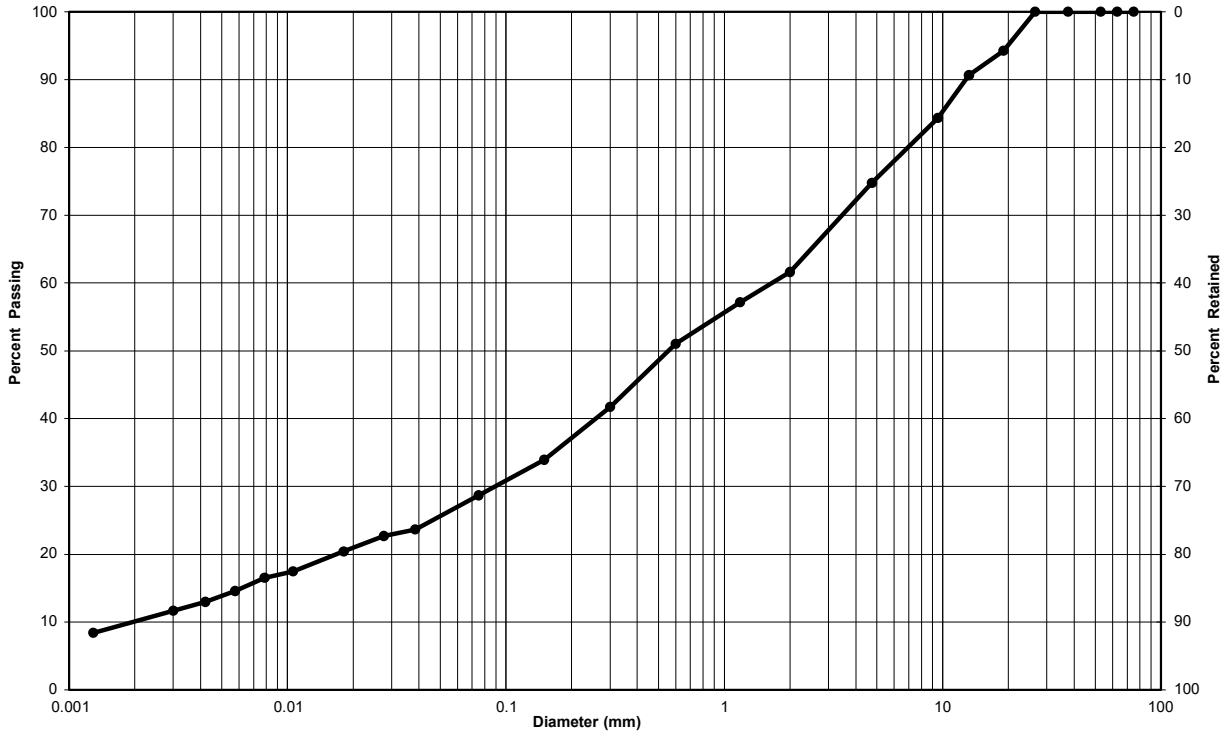
Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Sand and Gravel, Traces of Silt and Clay	43	47	10
Silt-size particles (%) :	8		
Clay-size particles (%) (<0.002 mm):	2		

Remarks: More information is available upon request.

Performed by:	J. Lalonde	**Date:**	August 3, 2022
Verified by:		**Date:**	August 3, 2022

Particle-Size Analysis of Soils
MTO LS-702 (Geotechnical)

Client:	Infrastructure Ontario	**Lab No.:**	G-22-03
Project, Site:	Children Hospital	**Project No.:**	11205379
Borehole No.:	BH-15	Sample No.:	SS-2
Depth:	0,61 - 1,22 m	Enclosure:	-



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Particle-Size Limits as per USCS (ASTM D-2487)					

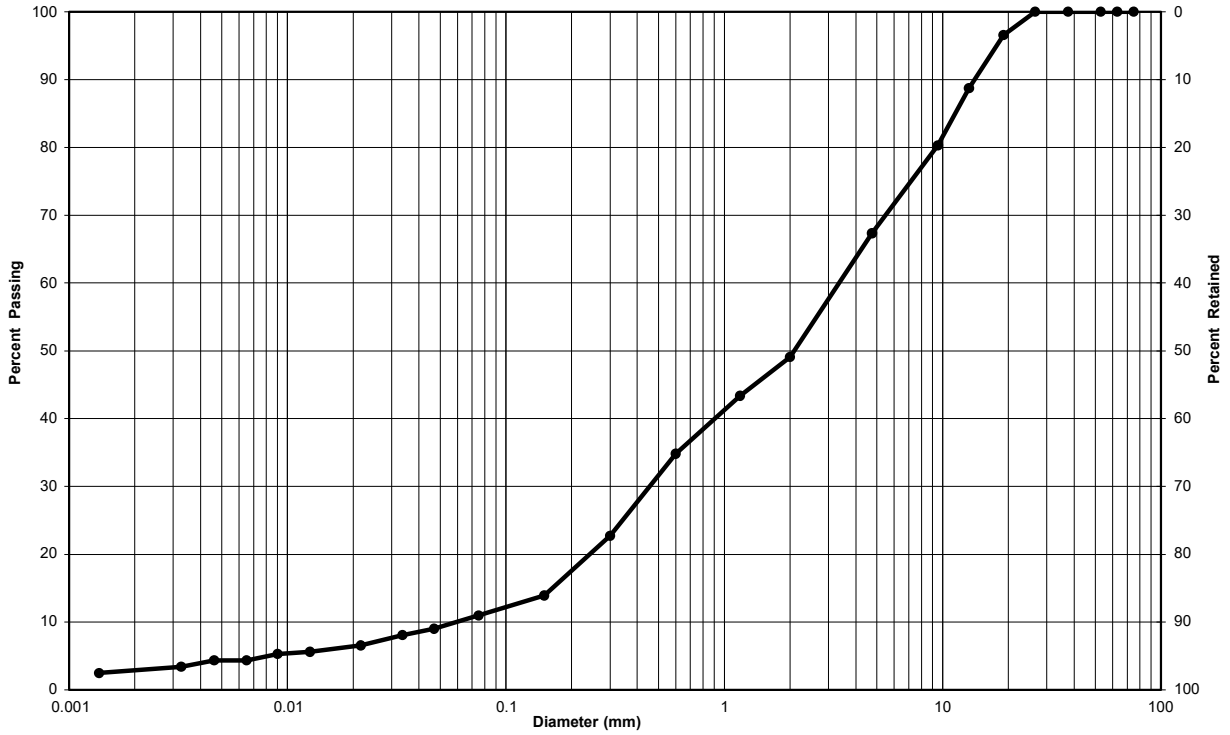
Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Gravely Sand, with Some Silt and Some Clay	25	46	29
Silt-size particles (%) :	19		
Clay-size particles (%) (<0.002 mm):	10		

Remarks: More information is available upon request.

Performed by:	J. Lalonde	**Date:**	August 3, 2022
Verified by:		**Date:**	August 3, 2022

Particle-Size Analysis of Soils
MTO LS-702 (Geotechnical)

Client:	Infrastructure Ontario	**Lab No.:**	G-22-03
Project, Site:	Children Hospital	**Project No.:**	11205379
Borehole No.:	BH-16	Sample No.:	SS-1
Depth:	0,08 - 0,61 m	Enclosure:	-



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Particle-Size Limits as per USCS (ASTM D-2487)					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Gravely Sand, with Traces of Silt and Clay	33	56	11
Silt-size particles (%) :	8		
Clay-size particles (%) (<0.002 mm):	3		

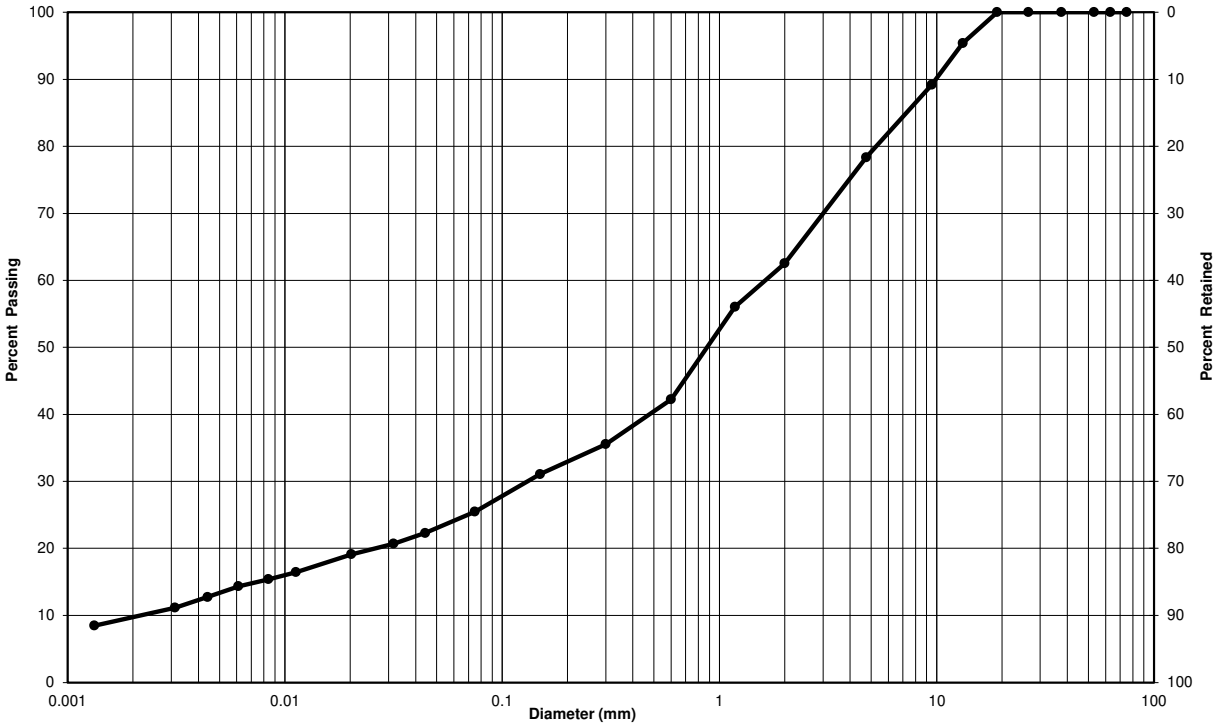
Remarks: More information is available upon request.

Performed by:	J. Lalonde	**Date:**	August 3, 2022
Verified by:		**Date:**	August 3, 2022

Particle-Size Analysis of Soils
MTO LS-702 (Geotechnical)

Client:	Infrastructure Ontario	**Lab No.:**	G-22-03
Project, Site:	Children Hospital	**Project No.:**	11205379

Borehole No.:	MW-17	Sample No.:	SS-2
Depth:	0,08 - 0,61 m	Enclosure:	-



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Particle-Size Limits as per USCS (ASTM D-2487)					

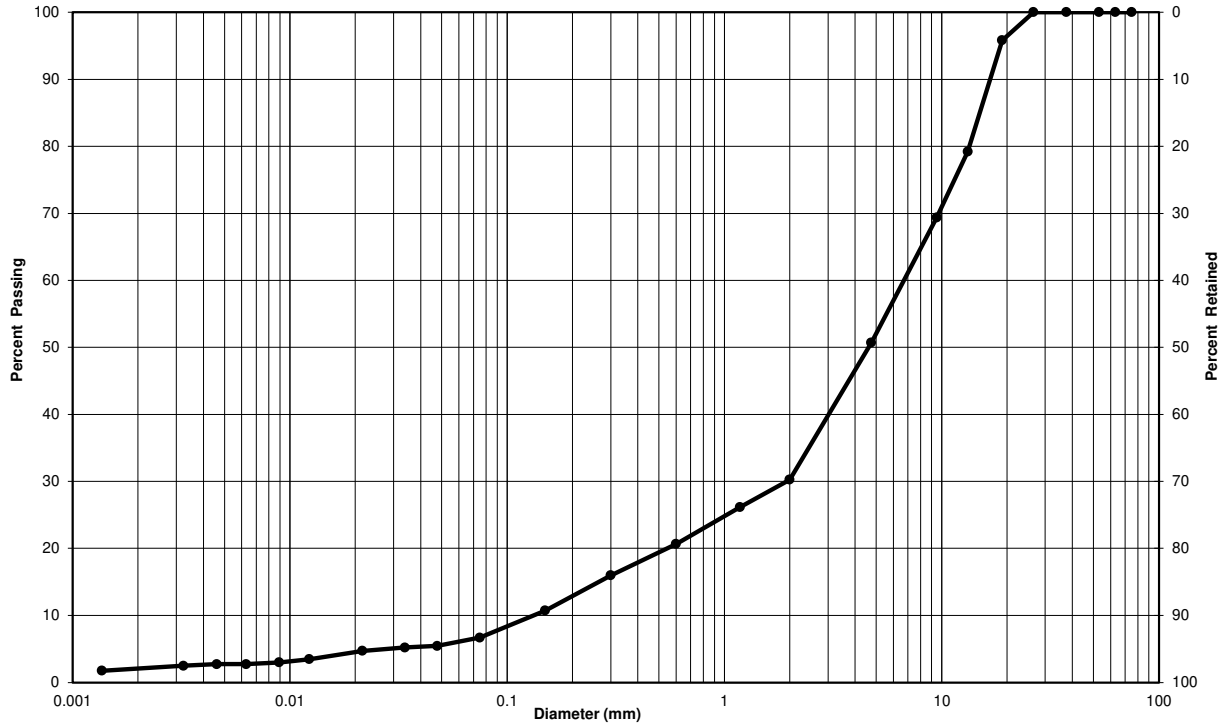
Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Gravely Sand, with Some Silt and Traces of Clay	22	53	25
Silt-size particles (%) :	16		
Clay-size particles (%) (<0.002 mm):	9		

Remarks: More information is available upon request.

Performed by:	J. Lalonde	**Date:**	August 3, 2022
Verified by:		**Date:**	August 24, 2022

Particle-Size Analysis of Soils
MTO LS-702 (Geotechnical)

Client:	Infrastructure Ontario	**Lab No.:**	G-22-03
Project, Site:	Children Hospital	**Project No.:**	11205379
Borehole No.:	MW-18	Sample No.:	SS-1
Depth:	0,08 - 0,61 m	Enclosure:	-



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Particle-Size Limits as per USCS (ASTM D-2487)					

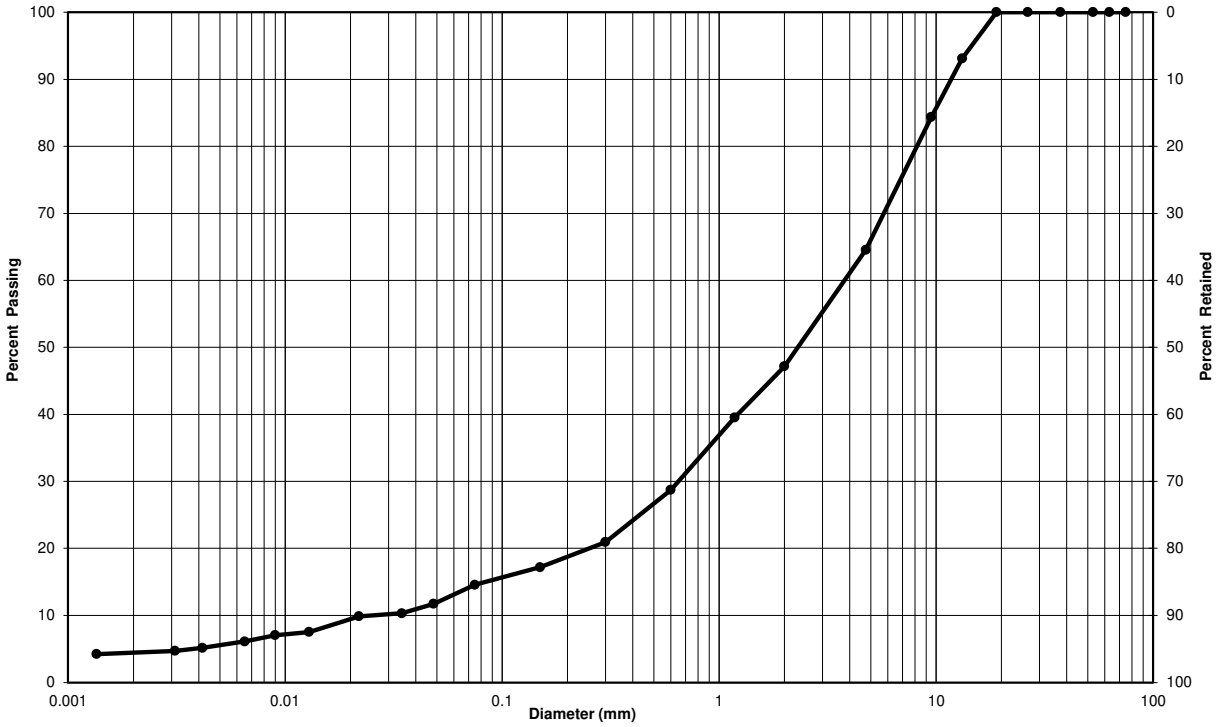
Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Gravel and Sand, with Traces of Silt and Clay	49	44	7
Silt-size particles (%) :	5		
Clay-size particles (%) (<0.002 mm):	2		

Remarks: More information is available upon request.

Performed by:	J. Lalonde	**Date:**	August 11, 2022
Verified by:		**Date:**	August 24, 2022

Particle-Size Analysis of Soils
MTO LS-702 (Geotechnical)

Client:	Infrastructure Ontario	**Lab No.:**	G-22-03
Project, Site:	Children Hospital	**Project No.:**	11205379
Borehole No.:	MW-18	Sample No.:	SS-3
Depth:	1,22 - 1,83 m	Enclosure:	-



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Particle-Size Limits as per USCS (ASTM D-2487)					

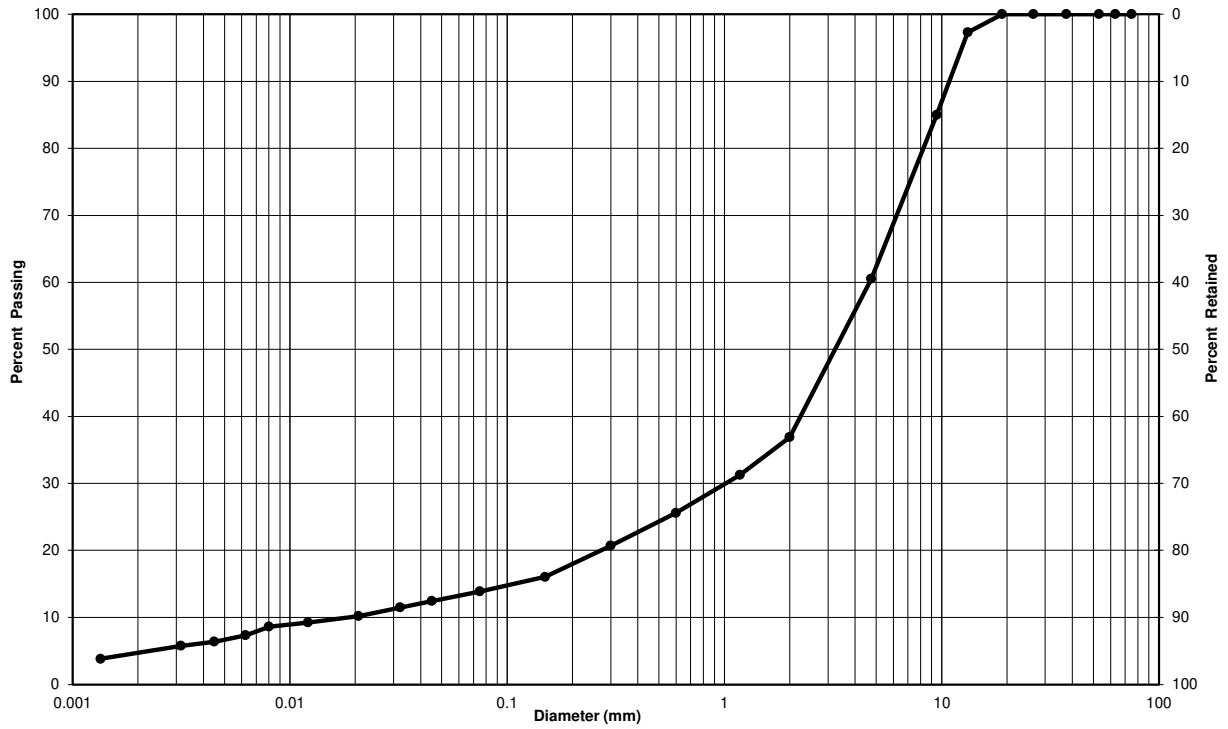
Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Sand and Gravel, with Some Silt and Traces of Clay	35	50	15
Silt-size particles (%) :	11		
Clay-size particles (%) (<0.002 mm):	4		

Remarks: More information is available upon request.

Performed by:	J. Lalonde	**Date:**	August 9, 2022
Verified by:		**Date:**	August 24, 2022

Particle-Size Analysis of Soils
MTO LS-702 (Geotechnical)

Client:	Infrastructure Ontario	**Lab No.:**	G-22-03
Project, Site:	Children Hospital	**Project No.:**	11205379
Borehole No.:	BH19	Sample No.:	SS-1
Depth:	0,15 - 0,76 m	Enclosure:	-



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Particle-Size Limits as per USCS (ASTM D-2487)					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Sand and Gravel, with Traces of Silt and Clay	39	47	14
Silt-size particles (%) :	9		
Clay-size particles (%) (<0.002 mm):	5		

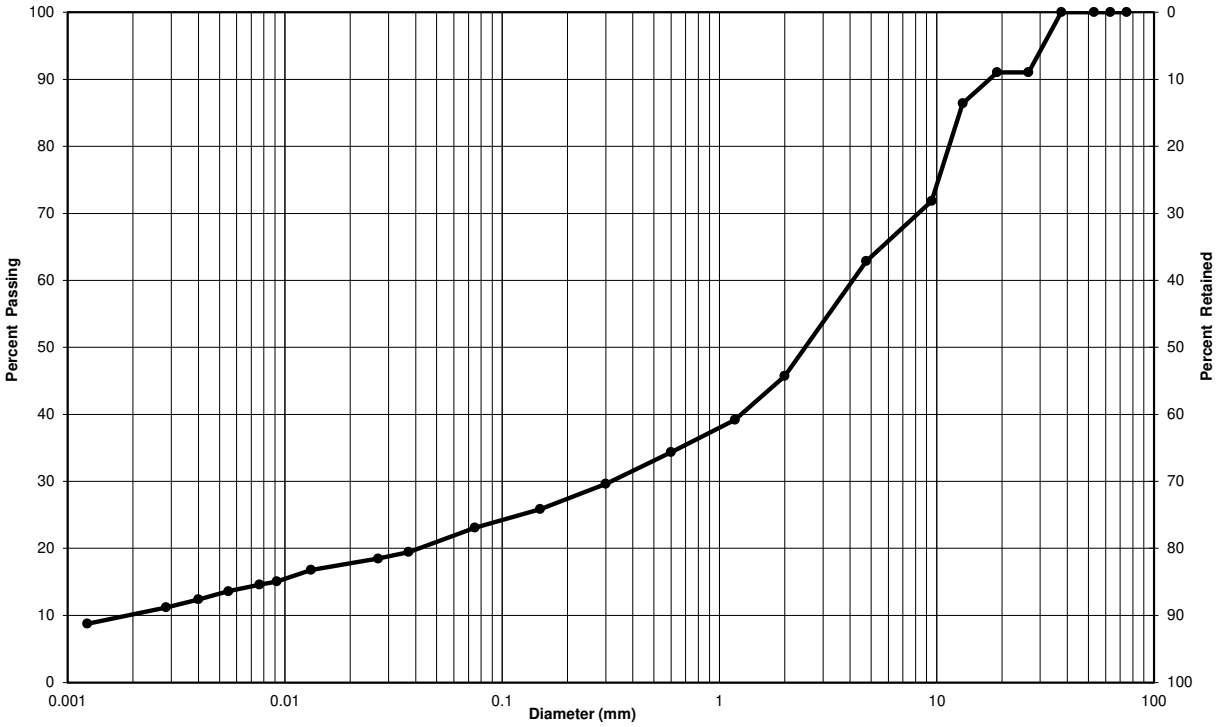
Remarks: More information is available upon request.

Performed by:	J. Lalonde	**Date:**	August 3, 2022
Verified by:		**Date:**	August 24, 2022

Particle-Size Analysis of Soils
MTO LS-702 (Geotechnical)

Client:	Infrastructure Ontario	**Lab No.:**	G-22-03
Project, Site:	Children Hospital	**Project No.:**	11205379

Borehole No.:	BH19	Sample No.:	SS-2
Depth:	0,76 - 1,37 m	Enclosure:	-



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Particle-Size Limits as per USCS (ASTM D-2487)					

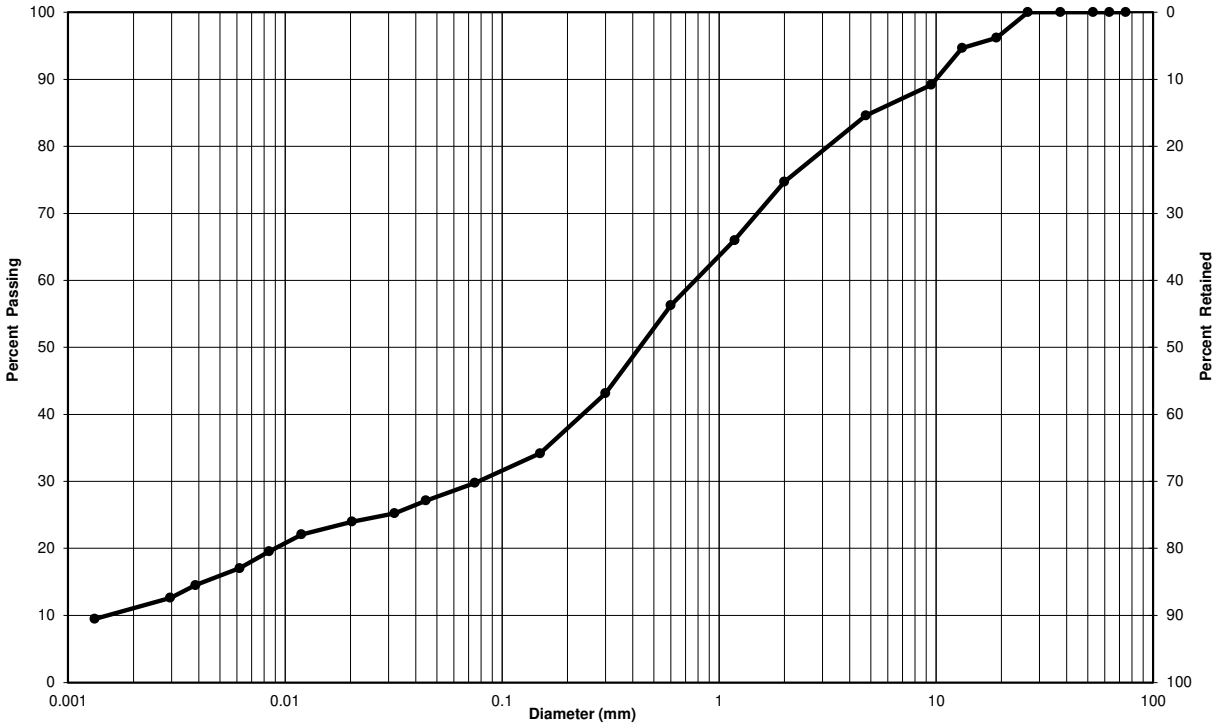
Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Sand and Gravel, with Some Silt and Clay	37	40	23
Silt-size particles (%) :	13		
Clay-size particles (%) (<0.002 mm):	10		

Remarks: More information is available upon request.

Performed by:	J. Lalonde	**Date:**	August 3, 2022
Verified by:		**Date:**	August 24, 2022

Particle-Size Analysis of Soils
MTO LS-702 (Geotechnical)

Client:	Infrastructure Ontario	**Lab No.:**	G-22-03
Project, Site:	Children Hospital	**Project No.:**	11205379
Borehole No.:	BH-20	Sample No.:	SS-1
Depth:	0,10 - 0,61 m	Enclosure:	-



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Particle-Size Limits as per USCS (ASTM D-2487)					

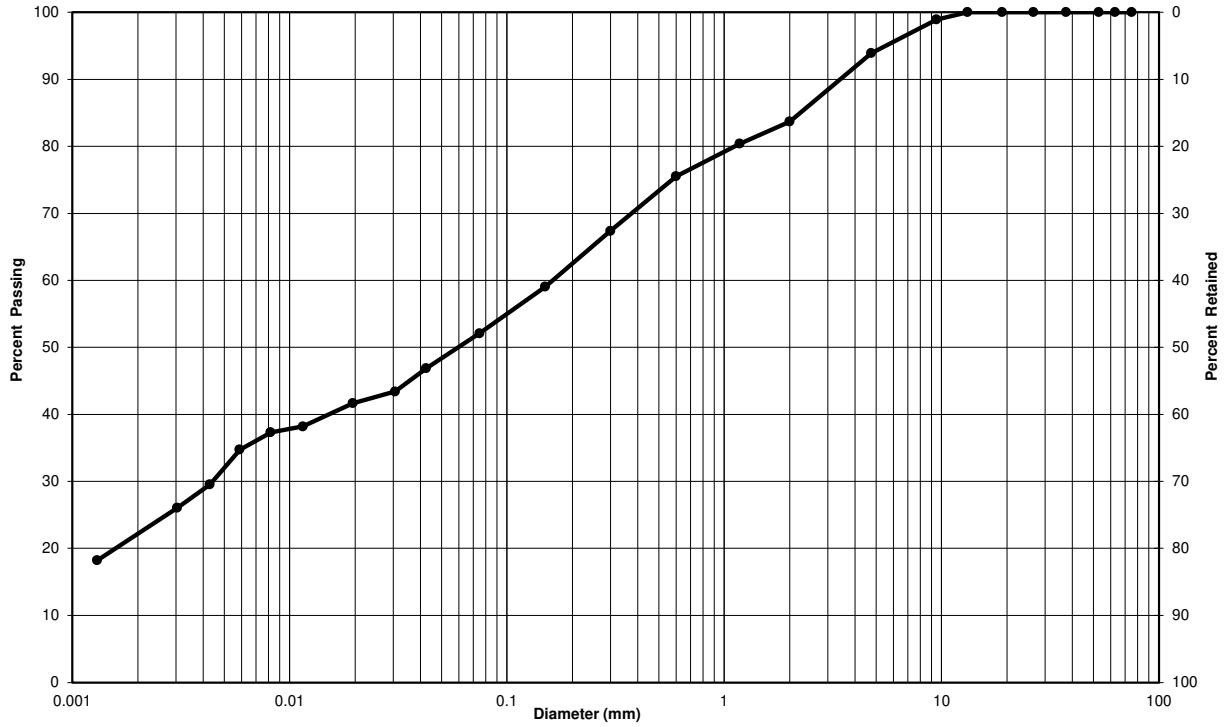
Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Sand, with Some Silt, Gravel and Clay	15	55	30
Silt-size particles (%) :	19		
Clay-size particles (%) (<0.002 mm):	11		

Remarks: More information is available upon request.

Performed by:	J. Lalonde	**Date:**	August 9, 2022
Verified by:		**Date:**	August 24, 2022

Particle-Size Analysis of Soils
MTO LS-702 (Geotechnical)

Client:	Infrastructure Ontario	**Lab No.:**	G-22-03
Project, Site:	Children Hospital	**Project No.:**	11205379
Borehole No.:	BH-20	Sample No.:	SS-3
Depth:	1,22 - 1,83 m	Enclosure:	-



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Particle-Size Limits as per USCS (ASTM D-2487)					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Silty and Clayey Sand, with Traces of Gravel	6	42	52
Silt-size particles (%) :	31		
Clay-size particles (%) (<0.002 mm):	21		

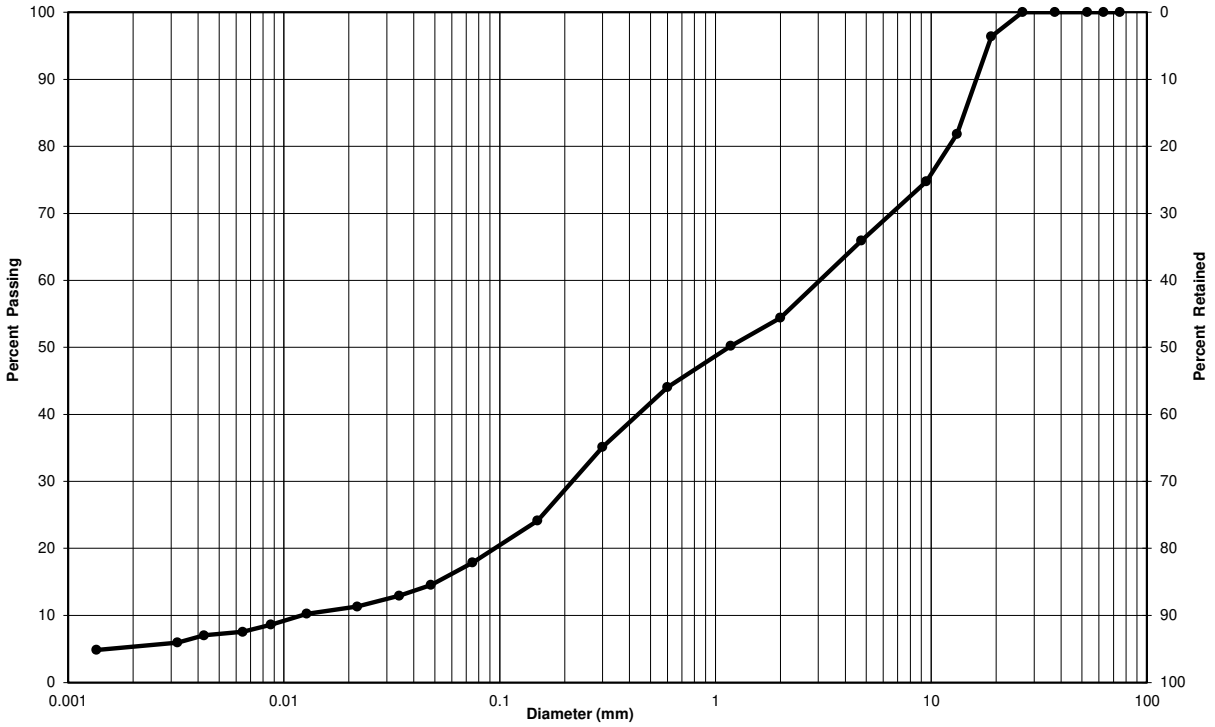
Remarks: More information is available upon request.

Performed by:	J. Lalonde	**Date:**	August 9, 2022
Verified by:		**Date:**	August 23, 2022

Particle-Size Analysis of Soils
MTO LS-702 (Geotechnical)

Client:	Infrastructure Ontario	**Lab No.:**	G-22-03
Project, Site:	Children Hospital	**Project No.:**	11205379

Borehole No.:	MW-23	Sample No.:	SS-3
Depth:	1,37 - 1,98 m	Enclosure:	-



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Particle-Size Limits as per USCS (ASTM D-2487)					

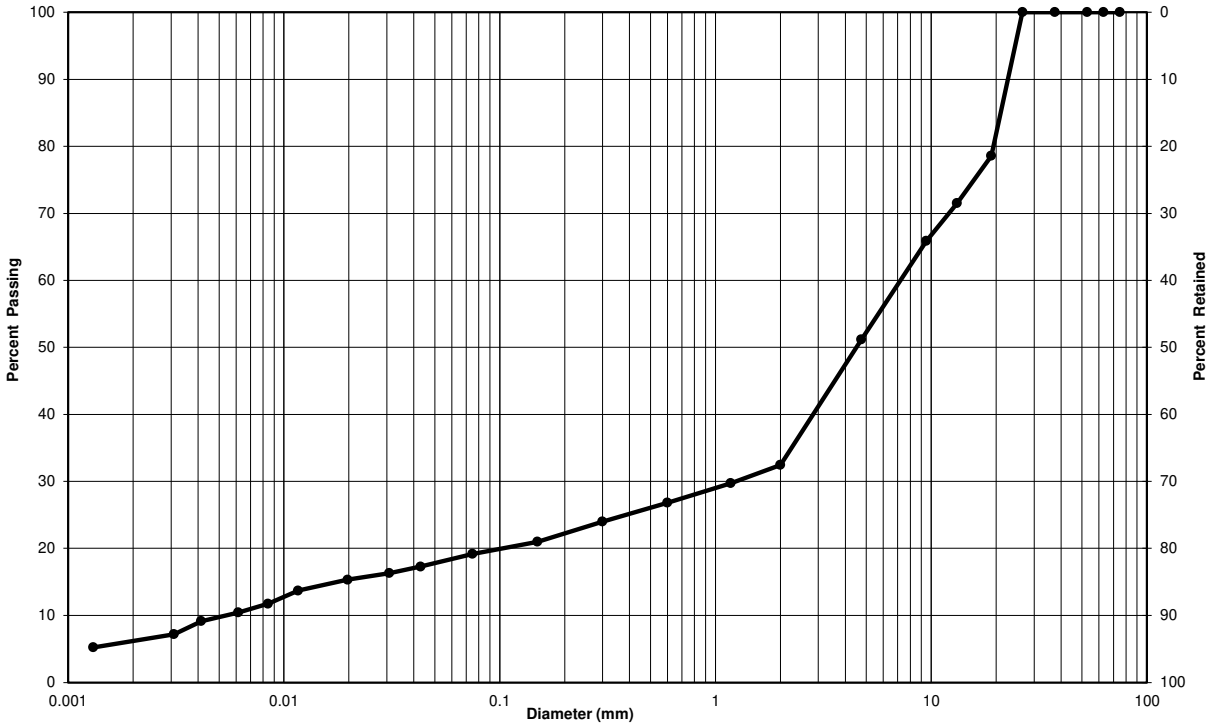
Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Gravely Sand, With some Silt and Traces of Clay	34	48	18
Silt-size particles (%) :	13		
Clay-size particles (%) (<0.002 mm):	5		

Remarks: More information is available upon request.

Performed by:	J. Lalonde	**Date:**	August 9, 2022
Verified by:		**Date:**	August 23, 2022

Particle-Size Analysis of Soils
MTO LS-702 (Geotechnical)

Client:	Infrastructure Ontario	**Lab No.:**	G-22-03
Project, Site:	Children Hospital	**Project No.:**	11205379
Borehole No.:	MW23	Sample No.:	SS-6
Depth:	3,20 - 3,81 m	Enclosure:	-



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Particle-Size Limits as per USCS (ASTM D-2487)					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Sandy Gravel, with Some Silt and Traces of Clay	49	32	19
Silt-size particles (%) :	13		
Clay-size particles (%) (<0.002 mm):	6		

Remarks: More information is available upon request.

Performed by:	J. Lalonde	**Date:**	August 9, 2022
Verified by:		**Date:**	August 23, 2022

Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)

Client:	Infrastructure Ontario (IO)	**Lab no.:**	G2256
Project/Site:	Preliminary Geotechnical Investigation – Childrens Hospital of Eastern Ontario, Ottawa, Ontario	**Project no.:**	11205379

Borehole no.:	MW3	Sample no.:	SS4	Depth:	2.3m- 2.9 m
Soil description:	Low Plasticity Inorganic Clay (CL)			Date sampled:	28-Nov-19

Apparatus:	Hand Crank	Balance no.:	1	Porcelain bowl no.:	3
Liquid limit device no.:	2	Oven no.:	2	Spatula no.:	1
Sieve no.:	40	Glass plate no.:	1		

Liquid Limit (LL):

	Test No. 1	Test No. 2	Test No. 3
Number of blows	35	25	16
Water Content:			
Tare no.	A27	A13	A11
Wet soil+tare, g	19.30	22.77	20.44
Dry soil+tare, g	17.99	20.60	18.71
Mass of water, g	1.31	2.17	1.73
Tare, g	13.54	13.55	13.33
Mass of soil, g	4.45	7.05	5.38
Water content %	29.4%	30.8%	32.2%

Plastic Limit (PL) - Water Content:

Tare no.	A26	A52
Wet soil+tare, g	19.60	19.51
Dry soil+tare, g	18.52	18.47
Mass of water, g	1.08	1.04
Tare, g	13.49	13.47
Mass of soil, g	5.03	5.00
Water content %	21.5%	20.8%
Average water content %	21.1%	

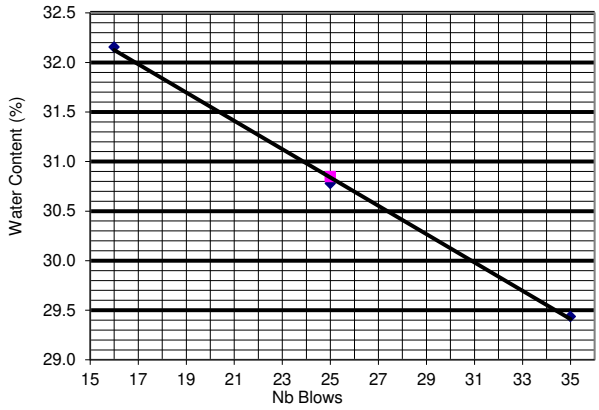
Natural Water Content (W^n):

Tare no.	W21	
Wet soil+tare, g	25.7	
Dry soil+tare, g	23.3	
Mass of water, g	2.40	
Tare, g	1.30	
Mass of soil, g	22.00	
Water content %	10.9%	

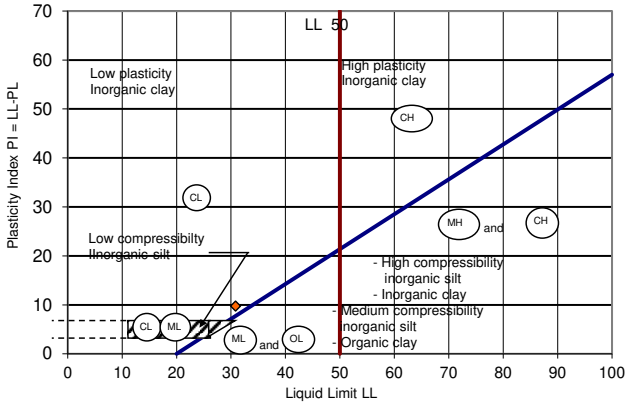
Soil Preparation:

- ☑ Cohesive <425 µm
- ☐ Cohesive >425 µm
- ☐ Non-cohesive
- ☑ Dry preparation
- ☐ Wet preparation

Results



Soil Plasticity Chart



Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Natural Water Content W^n
31	21	10	11

Remarks:

Performed by:	Sharif Hossain	**Date:**	12/27/2019
Verified by:	Raj Kadia, C.E.T.	**Date:**	12/31/2019

Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)

Client:	Infrastructure Ontario (IO)	**Lab no.:**	G2256
Project/Site:	Preliminary Geotechnical Investigation – Childrens Hospital of Eastern Ontario, Ottawa, Ontario	**Project no.:**	11205379
Borehole no.:	MW4	Sample no.: SS2	Depth: 0.8m- 1.4m
Soil description:	Low Plasticity Inorganic Clay (CL)		Date sampled: 28-Nov-19
Apparatus:	Hand Crank	Balance no.: 1	Porcelain bowl no.: 1
Liquid limit device no.:	2	Oven no.: 2	Spatula no.: 1
Sieve no.:	40	Glass plate no.: 1	

Liquid Limit (LL):

	Test No. 1	Test No. 2	Test No. 3
Number of blows	30	29	16
Water Content:			
Tare no.	A23	A52	A13
Wet soil+tare, g	23.42	25.76	25.88
Dry soil+tare, g	21.39	23.04	23.00
Mass of water, g	2.03	2.72	2.88
Tare, g	13.86	13.47	13.54
Mass of soil, g	7.53	9.57	9.46
Water content %	27.0%	28.4%	30.4%

Plastic Limit (PL) - Water Content:

Tare no.	A71	A22
Wet soil+tare, g	19.51	19.57
Dry soil+tare, g	18.49	18.54
Mass of water, g	1.02	1.03
Tare, g	13.34	13.44
Mass of soil, g	5.15	5.10
Water content %	19.8%	20.2%
Average water content %	20.0%	

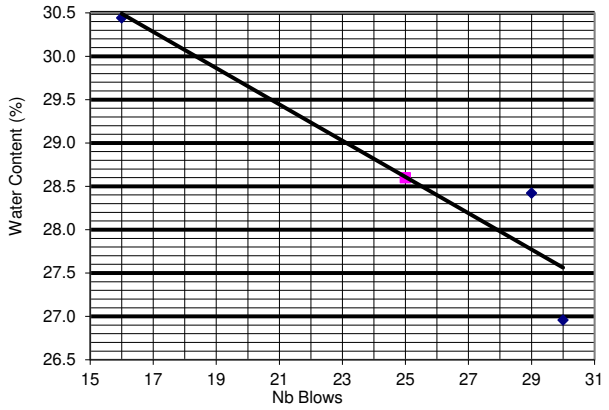
Natural Water Content (W^n):

Tare no.	A18	
Wet soil+tare, g	51.9	
Dry soil+tare, g	45.2	
Mass of water, g	6.70	
Tare, g	1.30	
Mass of soil, g	43.90	
Water content %	15.3%	

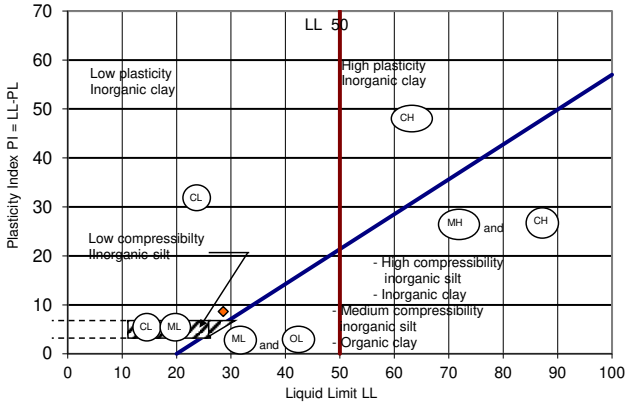
Soil Preparation:

- ☑ Cohesive <425 µm
- ☐ Cohesive >425 µm
- ☐ Non-cohesive
- ☑ Dry preparation
- ☐ Wet preparation

Results



Soil Plasticity Chart



Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Natural Water Content W^n
29	20	9	15

Remarks:

Performed by:	Sharif Hossain	**Date:**	12/27/2019
Verified by:	Raj Kadia, C.E.T.	**Date:**	12/31/2019

Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)

Client:	Infrastructure Ontario (IO)	**Lab no.:**	G2253
Project/Site:	Preliminary Geotechnical Investigation – Childrens Hospital of Eastern Ontario, Ottawa, Ontario	**Project no.:**	11205379

Borehole no.:	MW5	Sample no.:	SS2+SS3	Depth:	0.9m- 1.7m
Soil description:	Low Plasticity Inorganic Clay (CL)			Date sampled:	28-Nov-19

Apparatus:	Hand Crank	Balance no.:	1	Porcelain bowl no.:	2
Liquid limit device no.:	2	Oven no.:	2	Spatula no.:	1
Sieve no.:	40	Glass plate no.:	1		

Liquid Limit (LL):

	Test No. 1	Test No. 2	Test No. 3
Number of blows	35	30	25
Water Content:			
Tare no.	A2	A20	A10
Wet soil+tare, g	23.83	23.44	25.84
Dry soil+tare, g	21.66	21.24	23.07
Mass of water, g	2.17	2.20	2.77
Tare, g	13.40	13.23	13.61
Mass of soil, g	8.26	8.01	9.46
Water content %	26.3%	27.5%	29.3%

Plastic Limit (PL) - Water Content:

Tare no.	A23	A24
Wet soil+tare, g	19.62	20.27
Dry soil+tare, g	18.75	19.26
Mass of water, g	0.87	1.01
Tare, g	13.59	13.33
Mass of soil, g	5.16	5.93
Water content %	16.9%	17.0%
Average water content %	16.9%	

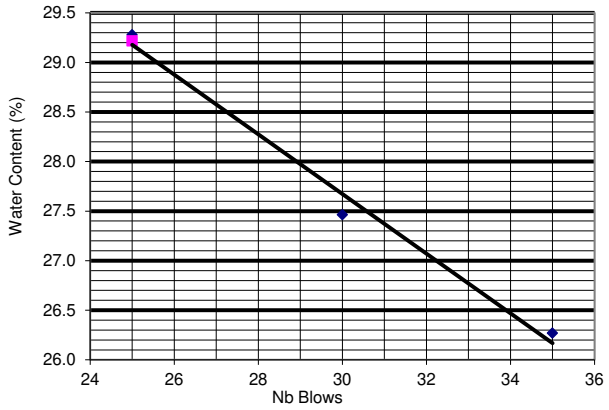
Natural Water Content (W^n):

Tare no.	W1	
Wet soil+tare, g	24.2	
Dry soil+tare, g	22.4	
Mass of water, g	1.80	
Tare, g	1.30	
Mass of soil, g	21.10	
Water content %	8.5%	

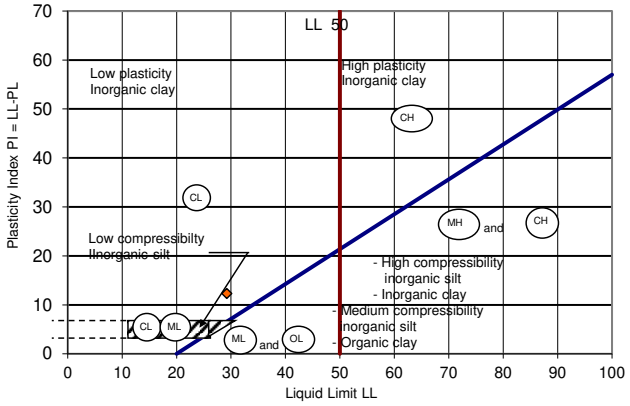
Soil Preparation:

- ☑ Cohesive <425 µm
- ☐ Cohesive >425 µm
- ☐ Non-cohesive
- ☑ Dry preparation
- ☐ Wet preparation

Results



Soil Plasticity Chart



Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Natural Water Content W^n
29	17	12	9

Remarks:

Performed by: Riddhee Panchal **Date:** 12/24/2019

Verified by: Raj Kadia, C.E.T. **Date:** 12/31/2019

Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)

Client:	Infrastructure Ontario (IO)	**Lab no.:**	G2256
Project/Site:	Preliminary Geotechnical Investigation – Childrens Hospital of Eastern Ontario, Ottawa, Ontario	**Project no.:**	11205379

Borehole no.:	BH7	Sample no.:	SS2	Depth:	0.8m- 1.4m
Soil description:	Low Plasticity Inorganic Clay (CL)			Date sampled:	28-Nov-19

Apparatus:	Hand Crank	Balance no.:	1	Porcelain bowl no.:	1
Liquid limit device no.:	2	Oven no.:	2	Spatula no.:	1
Sieve no.:	40	Glass plate no.:	1		

Liquid Limit (LL):

	Test No. 1	Test No. 2	Test No. 3
Number of blows	35	20	19
Water Content:			
Tare no.	A9	A16	A23
Wet soil+tare, g	19.65	20.31	25.45
Dry soil+tare, g	18.23	18.73	22.73
Mass of water, g	1.42	1.58	2.72
Tare, g	13.33	13.42	13.83
Mass of soil, g	4.90	5.31	8.90
Water content %	29.0%	29.8%	30.6%

Plastic Limit (PL) - Water Content:

Tare no.	A71	A4
Wet soil+tare, g	17.55	17.65
Dry soil+tare, g	16.75	16.94
Mass of water, g	0.80	0.71
Tare, g	13.34	13.62
Mass of soil, g	3.41	3.32
Water content %	23.5%	21.4%
Average water content %	22.4%	

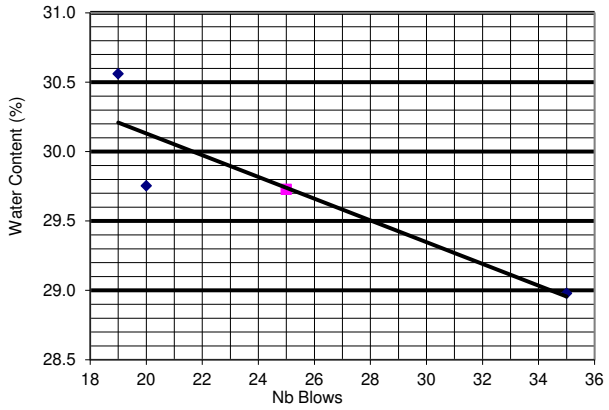
Natural Water Content (W^n):

Tare no.	W89	
Wet soil+tare, g	30.5	
Dry soil+tare, g	28.6	
Mass of water, g	1.90	
Tare, g	1.30	
Mass of soil, g	27.30	
Water content %	7.0%	

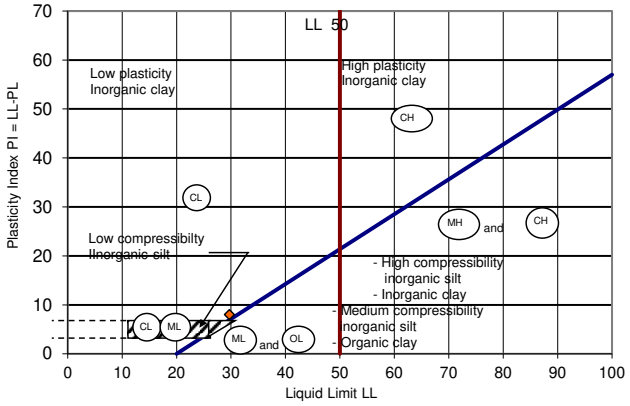
Soil Preparation:

- ☑ Cohesive <425 µm
- ☐ Cohesive >425 µm
- ☐ Non-cohesive
- ☑ Dry preparation
- ☐ Wet preparation

Results



Soil Plasticity Chart



Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Natural Water Content W^n
30	22	8	7

Remarks:

Performed by:	Sharif Hossain	**Date:**	12/27/2019
Verified by:	Raj Kadia, C.E.T.	**Date:**	12/31/2019

Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)

Client:	Infrastructure Ontario (IO)	**Lab no.:**	G2256
Project/Site:	Preliminary Geotechnical Investigation – Childrens Hospital of Eastern Ontario, Ottawa, Ontario	**Project no.:**	11205379

Borehole no.:	BH8	Sample no.:	SS2	Depth:	0.8m- 1.4m
Soil description:	Low Compressibiity Inorganic Silt (CL-ML)			Date sampled:	28-Nov-19

Apparatus:	Hand Crank	Balance no.:	1	Porcelain bowl no.:	1
Liquid limit device no.:	2	Oven no.:	2	Spatula no.:	1
Sieve no.:	40	Glass plate no.:	1		

Liquid Limit (LL):

	Test No. 1	Test No. 2	Test No. 3
Number of blows	28	27	18
Water Content:			
Tare no.	A11	A9	A16
Wet soil+tare, g	25.69	27.66	29.73
Dry soil+tare, g	23.34	24.96	26.50
Mass of water, g	2.35	2.70	3.23
Tare, g	13.35	13.34	13.43
Mass of soil, g	9.99	11.62	13.07
Water content %	23.5%	23.2%	24.7%

Plastic Limit (PL) - Water Content:

Tare no.	A20	A10
Wet soil+tare, g	21.21	20.11
Dry soil+tare, g	19.94	19.07
Mass of water, g	1.27	1.04
Tare, g	13.23	13.63
Mass of soil, g	6.71	5.44
Water content %	18.9%	19.1%
Average water content %	19.0%	

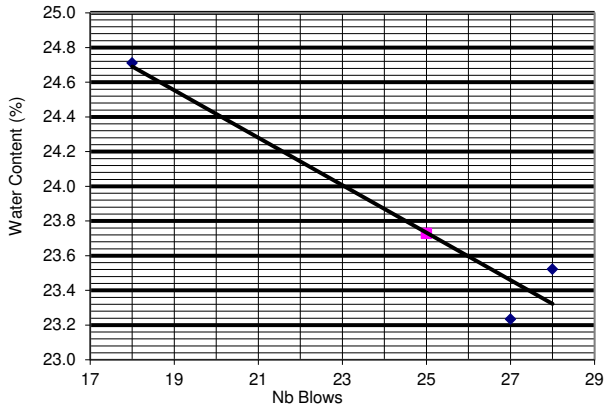
Natural Water Content (W^n):

Tare no.	C97	
Wet soil+tare, g	31.8	
Dry soil+tare, g	29.1	
Mass of water, g	2.70	
Tare, g	1.30	
Mass of soil, g	27.80	
Water content %	9.7%	

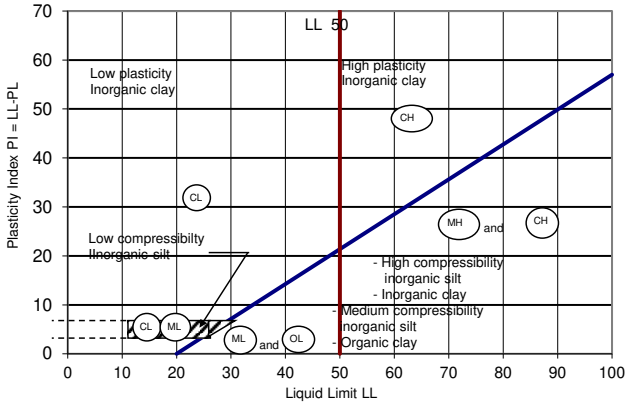
Soil Preparation:

- ☑ Cohesive <425 µm
- ☐ Cohesive >425 µm
- ☐ Non-cohesive
- ☑ Dry preparation
- ☐ Wet preparation

Results



Soil Plasticity Chart



Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Natural Water Content W^n
24	19	5	10

Remarks:

Performed by:	Sharif Hossain	**Date:**	12/27/2019
Verified by:	Raj Kadia, C.E.T.	**Date:**	12/31/2019

Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)

Client:	Infrastructure Ontario (IO)	**Lab no.:**	G2256
Project/Site:	Preliminary Geotechnical Investigation – Childrens Hospital of Eastern Ontario, Ottawa, Ontario	**Project no.:**	11205379

Borehole no.:	MW9	Sample no.:	SS2+SS3	Depth:	0.8m- 2.0m
Soil description:	Low Compressibiity Inorganic Silt (CL-ML)			Date sampled:	28-Nov-19

Apparatus:	Hand Crank	Balance no.:	1	Porcelain bowl no.:	1
Liquid limit device no.:	2	Oven no.:	2	Spatula no.:	1
Sieve no.:	40	Glass plate no.:	1		

Liquid Limit (LL):

	Test No. 1	Test No. 2	Test No. 3
Number of blows	25	22	16
Water Content:			
Tare no.	A14	A12	A28
Wet soil+tare, g	23.85	26.05	31.69
Dry soil+tare, g	21.68	23.42	27.71
Mass of water, g	2.17	2.63	3.98
Tare, g	13.47	13.77	13.53
Mass of soil, g	8.21	9.65	14.18
Water content %	26.4%	27.3%	28.1%

Plastic Limit (PL) - Water Content:

Tare no.	A71	A22
Wet soil+tare, g	19.51	19.57
Dry soil+tare, g	18.49	18.54
Mass of water, g	1.02	1.03
Tare, g	13.34	13.44
Mass of soil, g	5.15	5.10
Water content %	19.8%	20.2%
Average water content %	20.0%	

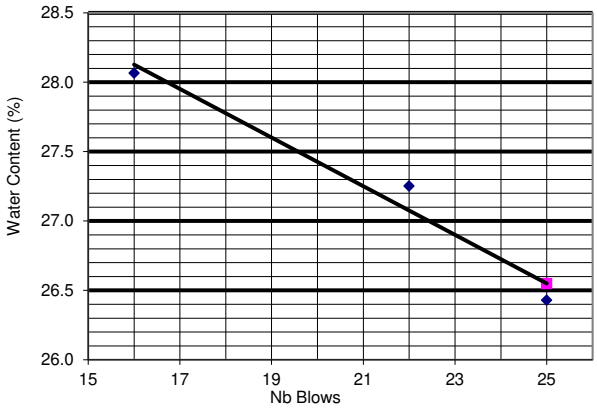
Natural Water Content (W^n):

Tare no.	W29	
Wet soil+tare, g	23.6	
Dry soil+tare, g	21.7	
Mass of water, g	1.90	
Tare, g	1.30	
Mass of soil, g	20.40	
Water content %	9.3%	

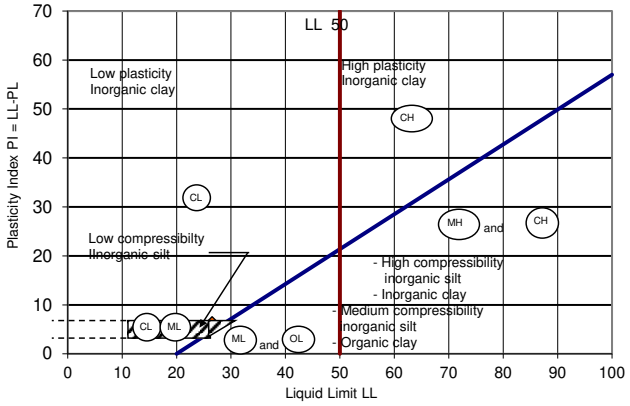
Soil Preparation:

- ☑ Cohesive <425 µm
- ☐ Cohesive >425 µm
- ☐ Non-cohesive
- ☑ Dry preparation
- ☐ Wet preparation

Results



Soil Plasticity Chart



Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Natural Water Content W^n
27	20	7	9

Remarks:

Performed by:	Sharif Hossain	**Date:**	12/27/2019
Verified by:	Raj Kadia, C.E.T.	**Date:**	12/31/2019

Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)

Client:	Infrastructure Ontario (IO)	**Lab no.:**	G2253
Project/Site:	Preliminary Geotechnical Investigation – Childrens Hospital of Eastern Ontario, Ottawa, Ontario	**Project no.:**	11205379

Borehole no.:	MW10	Sample no.:	SS2	Depth:	0.8m- 1.4m
Soil description:	Inorganic Silt (ML)			Date sampled:	28-Nov-19

Apparatus:	Hand Crank	Balance no.:	1	Porcelain bowl no.:	3
Liquid limit device no.:	2	Oven no.:	2	Spatula no.:	1
Sieve no.:	40	Glass plate no.:	1		

Liquid Limit (LL):

	Test No. 1	Test No. 2	Test No. 3
Number of blows	28	21	16
Water Content:			
Tare no.	A4	A26	A24
Wet soil+tare, g	19.22	33.10	27.75
Dry soil+tare, g	18.24	28.82	24.41
Mass of water, g	0.98	4.28	3.34
Tare, g	13.56	13.50	13.34
Mass of soil, g	4.68	15.32	11.07
Water content %	20.9%	27.9%	30.2%

Plastic Limit (PL) - Water Content:

Tare no.	A27	A23
Wet soil+tare, g	19.22	22.51
Dry soil+tare, g	18.24	20.90
Mass of water, g	0.98	1.61
Tare, g	13.56	13.57
Mass of soil, g	4.68	7.33
Water content %	20.9%	22.0%
Average water content %	21.5%	

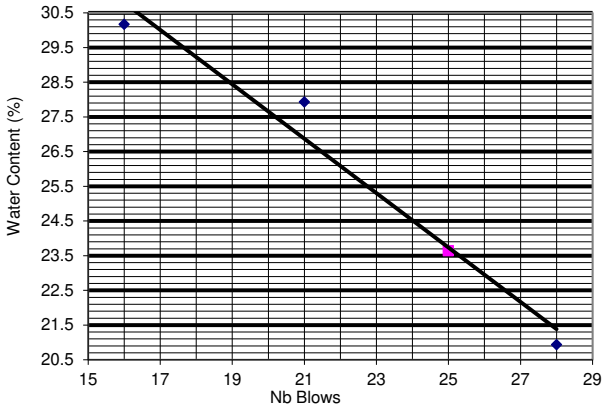
Natural Water Content (W^n):

Tare no.	E10	
Wet soil+tare, g	21.7	
Dry soil+tare, g	20.1	
Mass of water, g	1.60	
Tare, g	1.30	
Mass of soil, g	18.80	
Water content %	8.5%	

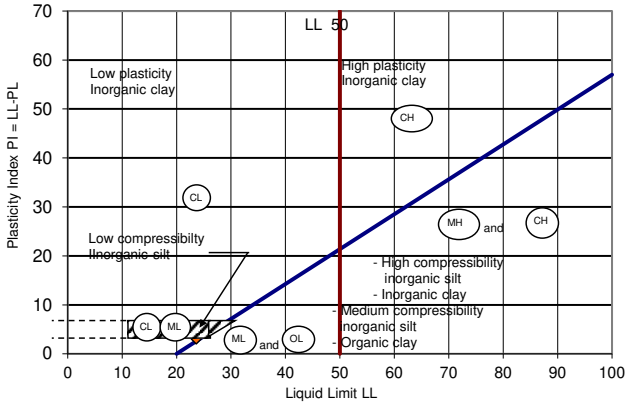
Soil Preparation:

- ☑ Cohesive <425 µm
- ☐ Cohesive >425 µm
- ☐ Non-cohesive
- ☑ Dry preparation
- ☑ Wet preparation

Results



Soil Plasticity Chart



Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Natural Water Content W^n
24	21	3	9

Remarks:

Performed by:	Sharif Hossain	**Date:**	12/27/2019
Verified by:	Raj Kadia, C.E.T.	**Date:**	12/31/2019

Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)

Client:	Infrastructure Ontario (IO)	**Lab no.:**	G2253
Project/Site:	Preliminary Geotechnical Investigation – Childrens Hospital of Eastern Ontario, Ottawa, Ontario	**Project no.:**	11205379

Borehole no.:	BH12	Sample no.:	SS2+SS3	Depth:	0.8m- 2.1m
Soil description:	Low Compressibility Inorganic Silt (CL-ML)			Date sampled:	28-Nov-19

Apparatus:	Hand Crank	Balance no.:	1	Porcelain bowl no.:	3
Liquid limit device no.:	2	Oven no.:	2	Spatula no.:	1
Sieve no.:	40	Glass plate no.:	1		

Liquid Limit (LL):

	Test No. 1	Test No. 2	Test No. 3
Number of blows	34	25	17
Water Content:			
Tare no.	A7	A17	A21
Wet soil+tare, g	26.98	27.17	25.65
Dry soil+tare, g	24.30	24.30	23.10
Mass of water, g	2.68	2.87	2.55
Tare, g	13.32	13.35	13.50
Mass of soil, g	10.98	10.95	9.60
Water content %	24.4%	26.2%	26.6%

Plastic Limit (PL) - Water Content:

Tare no.	A18	A25
Wet soil+tare, g	21.35	20.11
Dry soil+tare, g	20.07	18.99
Mass of water, g	1.28	1.12
Tare, g	13.64	13.42
Mass of soil, g	6.43	5.57
Water content %	19.9%	20.1%
Average water content %	20.0%	

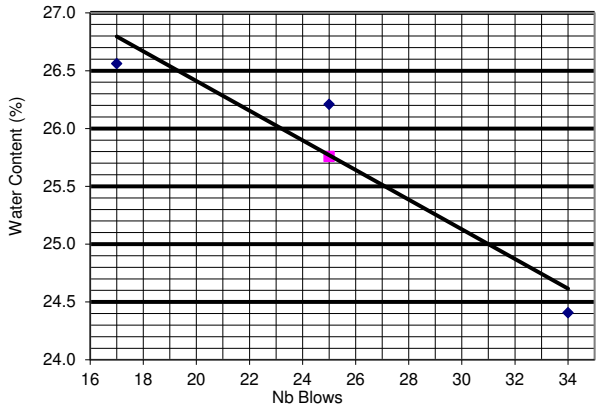
Natural Water Content (W^n):

Tare no.	E6	
Wet soil+tare, g	32.5	
Dry soil+tare, g	31.2	
Mass of water, g	1.30	
Tare, g	1.30	
Mass of soil, g	29.90	
Water content %	4.3%	

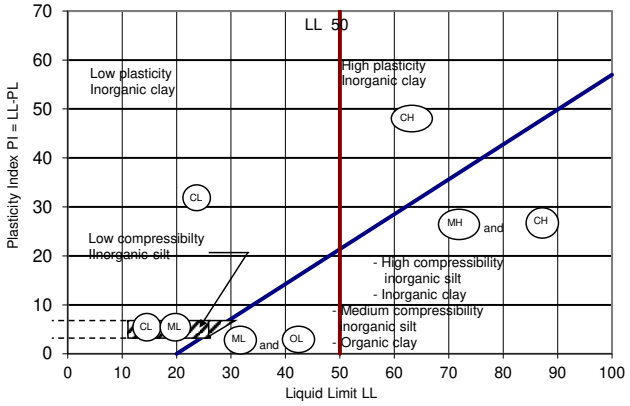
Soil Preparation:

- ☑ Cohesive <425 µm
- ☐ Cohesive >425 µm
- ☐ Non-cohesive
- ☑ Dry preparation
- ☐ Wet preparation

Results



Soil Plasticity Chart



Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Natural Water Content W^n
26	20	6	4

Remarks:

Performed by:	Sharif Hossain	**Date:**	12/27/2019
Verified by:	Raj Kadia, C.E.T.	**Date:**	12/31/2019

Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)

Client:	Infrastructure Ontario	**Lab no.:**	G-22-03
Project/Site:	Children Hospital	**Project no.:**	11205379

Borehole no.:	BH-15	Sample no.:	SS-2	Depth:	0,61 - 1,22 m
Soil Description:				Date sampled:	

Apparatus:	Hand Crank	Balance no.:	8033031049	Porcelain bowl no.:	1
Liquid limit device no.:	1	Oven no.:	B23-04645	Spatula no.:	1
Sieve no.:	0155690	Glass plate no.:	1		

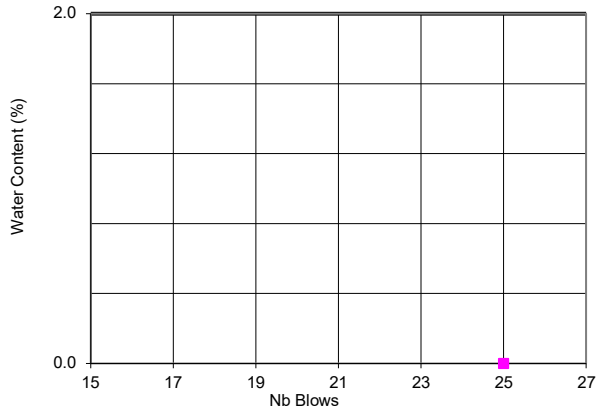
Liquid Limit (LL):

	Test No. 1	Test No. 2	Test No. 3
Number of blows			
Water Content:			
Tare no.			
Wet soil+tare, g			
Dry soil+tare, g			
Mass of water, g			
Tare, g			
Mass of soil, g			
Water content %			
Plastic Limit (PL) - Water Content:			
Tare no.			
Wet soil+tare, g			
Dry soil+tare, g			
Mass of water, g			
Tare, g			
Mass of soil, g			
Water content %			
Average water content %			
Natural Water Content (W^n):			
Tare no.			
Wet soil+tare, g			
Dry soil+tare, g			
Mass of water, g			
Tare, g			
Mass of soil, g			
Water content %			

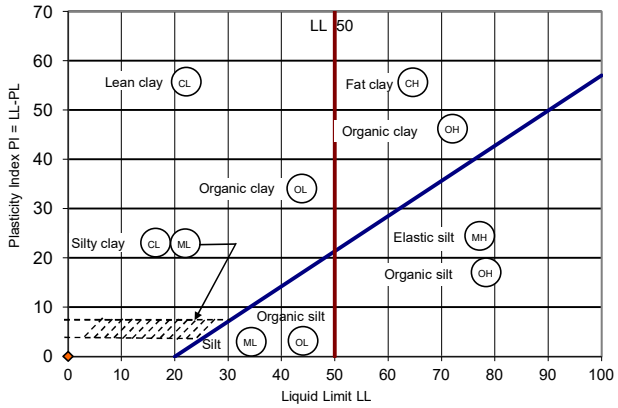
Soil Preparation:

- ☑ Cohesive <425 µm
- ☐ Cohesive >425 µm
- ☐ Non-cohesive
- ☑ Dry preparation
- ☐ Wet preparation

Results



Soil Plasticity Chart ASTM D2487



Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Natural Water Content W^n

Remarks: Non-Plastic Sample

Performed by:	J. Lalonde	**Date:**	September 13, 2022
Verified by:		**Date:**	September 13, 2022
Laboratory Location:	179 Colonnade Rd. Suite 400, Ottawa, Ontario		

Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)

Client:	Infrastructure Ontario	**Lab no.:**	G-22-03
Project/Site:	Children Hospital	**Project no.:**	11205379

Borehole no.:	BH-16	Sample no.:	SS-2	Depth:	0,61 - 1,22 m
Soil Description:				Date sampled:	

Apparatus:	Hand Crank	Balance no.:	8033031049	Porcelain bowl no.:	1
Liquid limit device no.:	1	Oven no.:	B23-04645	Spatula no.:	1
Sieve no.:	0155690	Glass plate no.:	1		

Liquid Limit (LL):

	Test No. 1	Test No. 2	Test No. 3
Number of blows			
Water Content:			
Tare no.			
Wet soil+tare, g			
Dry soil+tare, g			
Mass of water, g			
Tare, g			
Mass of soil, g			
Water content %			

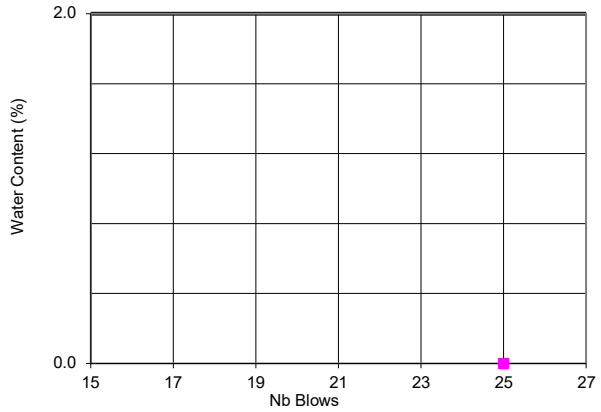
Plastic Limit (PL) - Water Content:		
Tare no.		
Wet soil+tare, g		
Dry soil+tare, g		
Mass of water, g		
Tare, g		
Mass of soil, g		
Water content %		
Average water content %		

Natural Water Content (W^n):		
Tare no.		
Wet soil+tare, g		
Dry soil+tare, g		
Mass of water, g		
Tare, g		
Mass of soil, g		
Water content %		

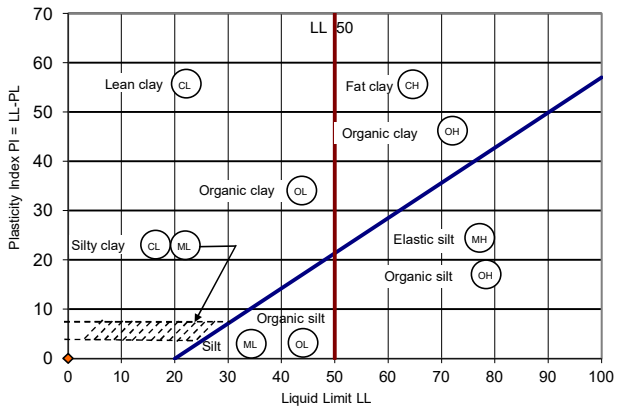
Soil Preparation:

- ☑ Cohesive <425 µm
- ☐ Cohesive >425 µm
- ☐ Non-cohesive
- ☑ Dry preparation
- ☐ Wet preparation

Results



Soil Plasticity Chart ASTM D2487



Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Natural Water Content W^n

Remarks: Non-Plastic Sample

Performed by:	J. Lalonde	**Date:**	September 13, 2022
Verified by:		**Date:**	September 13, 2022
Laboratory Location:	179 Colonnade Rd. Suite 400, Ottawa, Ontario		

Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)

Client:	Infrastructure Ontario	**Lab no.:**	G-22-03
Project/Site:	Children Hospital	**Project no.:**	11205379

Borehole no.:	BH-19	Sample no.:	SS-2	Depth:	0,76 - 1,37 m
Soil Description:				Date sampled:	

Apparatus:	Hand Crank	Balance no.:	8033031049	Porcelain bowl no.:	1
Liquid limit device no.:	1	Oven no.:	B23-04645	Spatula no.:	1
Sieve no.:	0155690	Glass plate no.:	1		

Liquid Limit (LL):

	Test No. 1	Test No. 2	Test No. 3
Number of blows			
Water Content:			
Tare no.			
Wet soil+tare, g			
Dry soil+tare, g			
Mass of water, g			
Tare, g			
Mass of soil, g			
Water content %			

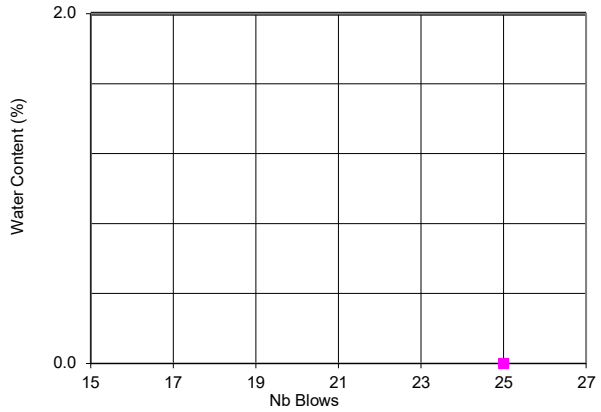
Plastic Limit (PL) - Water Content:		
Tare no.		
Wet soil+tare, g		
Dry soil+tare, g		
Mass of water, g		
Tare, g		
Mass of soil, g		
Water content %		
Average water content %		

Natural Water Content (W^n):		
Tare no.		
Wet soil+tare, g		
Dry soil+tare, g		
Mass of water, g		
Tare, g		
Mass of soil, g		
Water content %		

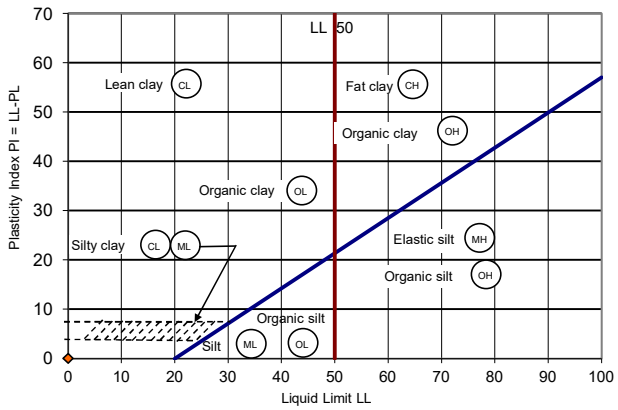
Soil Preparation:

- ☑ Cohesive <425 µm
- ☐ Cohesive >425 µm
- ☐ Non-cohesive
- ☑ Dry preparation
- ☐ Wet preparation

Results



Soil Plasticity Chart ASTM D2487



Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Natural Water Content W^n

Remarks: Non-Plastic Sample

Performed by:	J. Lalonde	**Date:**	September 13, 2022
Verified by:		**Date:**	September 13, 2022
Laboratory Location:	179 Colonnade Rd. Suite 400, Ottawa, Ontario		

Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)

Client:	Infrastructure Ontario	**Lab no.:**	G-22-03
Project/Site:	Children Hospital	**Project no.:**	11205379

Borehole no.:	BH-20	Sample no.:	SS-3	Depth:	1,22 - 1,83 m
Soil Description:				Date sampled:	

Apparatus:	Hand Crank	Balance no.:	8033031049	Porcelain bowl no.:	1
Liquid limit device no.:	1	Oven no.:	B23-04645	Spatula no.:	1
Sieve no.:	0155690	Glass plate no.:	1		

Liquid Limit (LL):

	Test No. 1	Test No. 2	Test No. 3
Number of blows			
Water Content:			
Tare no.			
Wet soil+tare, g			
Dry soil+tare, g			
Mass of water, g			
Tare, g			
Mass of soil, g			
Water content %			

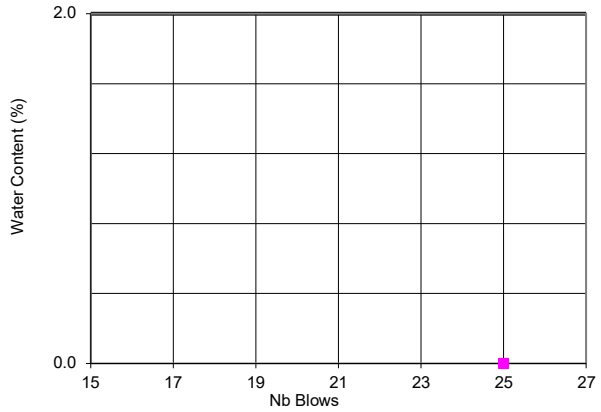
Plastic Limit (PL) - Water Content:		
Tare no.		
Wet soil+tare, g		
Dry soil+tare, g		
Mass of water, g		
Tare, g		
Mass of soil, g		
Water content %		
Average water content %		

Natural Water Content (W^n):		
Tare no.		
Wet soil+tare, g		
Dry soil+tare, g		
Mass of water, g		
Tare, g		
Mass of soil, g		
Water content %		

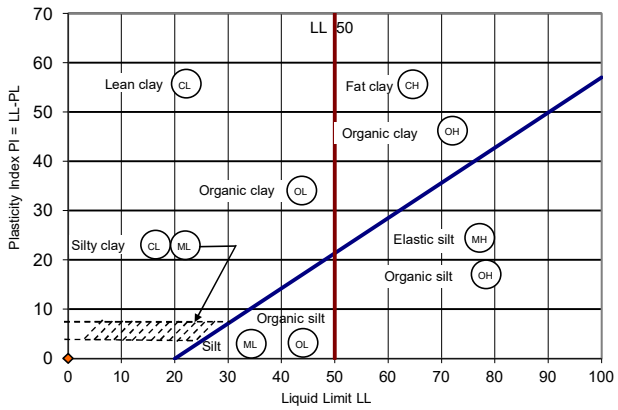
Soil Preparation:

- ☑ Cohesive <425 µm
- ☐ Cohesive >425 µm
- ☐ Non-cohesive
- ☑ Dry preparation
- ☐ Wet preparation

Results



Soil Plasticity Chart ASTM D2487



Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Natural Water Content W^n

Remarks: Non-Plastic Sample

Performed by:	J. Lalonde	**Date:**	September 13, 2022
Verified by:		**Date:**	September 13, 2022
Laboratory Location:	179 Colonnade Rd. Suite 400, Ottawa, Ontario		

Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)

Client:	Infrastructure Ontario	**Lab no.:**	G-22-03
Project/Site:	Children Hospital	**Project no.:**	11205379

Borehole no.:	BH-21	Sample no.:	SS-2	Depth:	0,61 - 1,22 m
Soil Description:				Date sampled:	

Apparatus:	Hand Crank	Balance no.:	8033031049	Porcelain bowl no.:	1
Liquid limit device no.:	1	Oven no.:	B23-04645	Spatula no.:	1
Sieve no.:	0155690	Glass plate no.:	1		

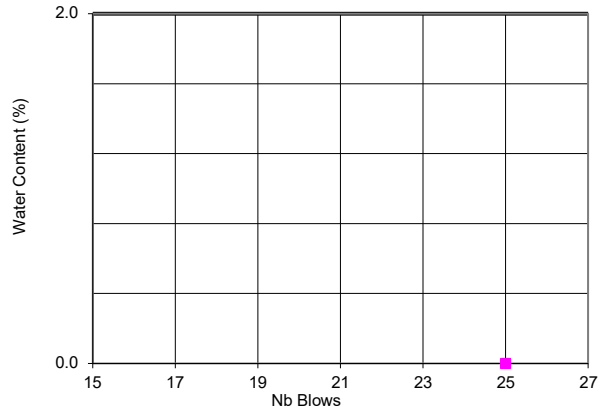
Liquid Limit (LL):

	Test No. 1	Test No. 2	Test No. 3
Number of blows			
Water Content:			
Tare no.			
Wet soil+tare, g			
Dry soil+tare, g			
Mass of water, g			
Tare, g			
Mass of soil, g			
Water content %			
Plastic Limit (PL) - Water Content:			
Tare no.			
Wet soil+tare, g			
Dry soil+tare, g			
Mass of water, g			
Tare, g			
Mass of soil, g			
Water content %			
Average water content %			
Natural Water Content (W^n):			
Tare no.			
Wet soil+tare, g			
Dry soil+tare, g			
Mass of water, g			
Tare, g			
Mass of soil, g			
Water content %			

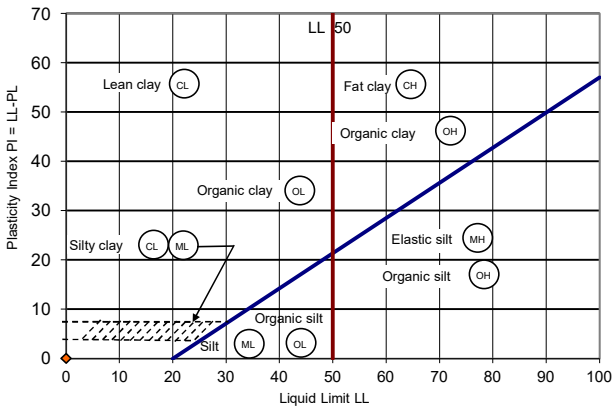
Soil Preparation:

- ☑ Cohesive <425 µm
- ☐ Cohesive >425 µm
- ☐ Non-cohesive
- ☑ Dry preparation
- ☐ Wet preparation

Results



Soil Plasticity Chart ASTM D2487



Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Natural Water Content W^n

Remarks: Non-Plastic Sample

Performed by:	J. Lalonde	**Date:**	September 13, 2022
Verified by:		**Date:**	September 13, 2022
Laboratory Location:	179 Colonnade Rd. Suite 400, Ottawa, Ontario		

Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)

Client:	Infrastructure Ontario	**Lab no.:**	G-22-03
Project/Site:	Children Hospital	**Project no.:**	11205379

Borehole no.:	MW-14	Sample no.:	SS-2	Depth:	0,61 - 1,22 m
Soil Description:				Date sampled:	

Apparatus:	Hand Crank	Balance no.:	8033031049	Porcelain bowl no.:	1
Liquid limit device no.:	1	Oven no.:	B23-04645	Spatula no.:	1
Sieve no.:	0155690	Glass plate no.:	1		

Liquid Limit (LL):

	Test No. 1	Test No. 2	Test No. 3
Number of blows			
Water Content:			
Tare no.			
Wet soil+tare, g			
Dry soil+tare, g			
Mass of water, g			
Tare, g			
Mass of soil, g			
Water content %			

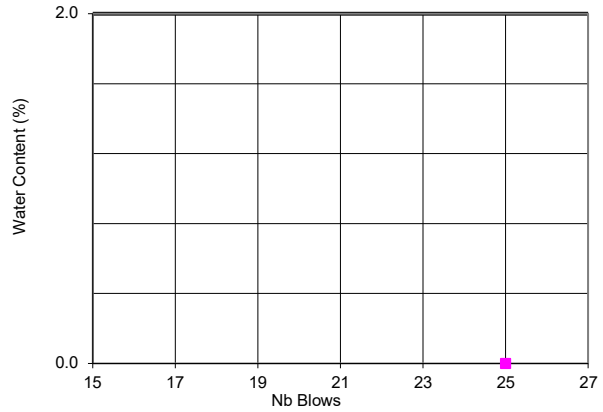
Plastic Limit (PL) - Water Content:		
Tare no.		
Wet soil+tare, g		
Dry soil+tare, g		
Mass of water, g		
Tare, g		
Mass of soil, g		
Water content %		
Average water content %		

Natural Water Content (W^n):		
Tare no.		
Wet soil+tare, g		
Dry soil+tare, g		
Mass of water, g		
Tare, g		
Mass of soil, g		
Water content %		

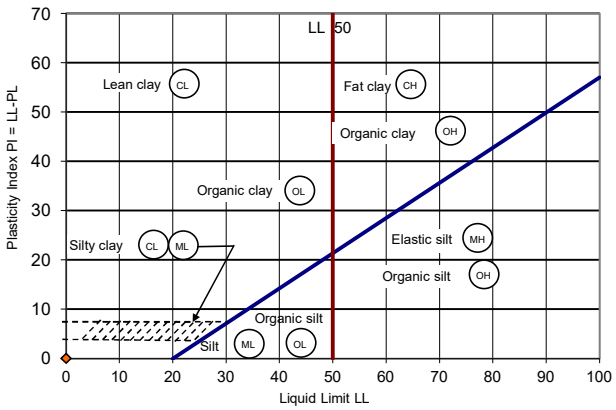
Soil Preparation:

- ☑ Cohesive <425 µm
- ☐ Cohesive >425 µm
- ☐ Non-cohesive
- ☑ Dry preparation
- ☐ Wet preparation

Results



Soil Plasticity Chart ASTM D2487



Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Natural Water Content W^n

Remarks: Non-Plastic Sample

Performed by:	J. Lalonde	**Date:**	September 13, 2022
Verified by:		**Date:**	September 13, 2022
Laboratory Location:	179 Colonnade Rd. Suite 400, Ottawa, Ontario		

Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)

Client:	Infrastructure Ontario	**Lab no.:**	G-22-03
Project/Site:	Children Hospital	**Project no.:**	11205379

Borehole no.:	MW-17	Sample no.:	SS-2	Depth:	0,08 - 0,61 m
Soil Description:				Date sampled:	

Apparatus:	Hand Crank	Balance no.:	8033031049	Porcelain bowl no.:	1
Liquid limit device no.:	1	Oven no.:	B23-04645	Spatula no.:	1
Sieve no.:	0155690	Glass plate no.:	1		

Liquid Limit (LL):

	Test No. 1	Test No. 2	Test No. 3
Number of blows			
Water Content:			
Tare no.			
Wet soil+tare, g			
Dry soil+tare, g			
Mass of water, g			
Tare, g			
Mass of soil, g			
Water content %			

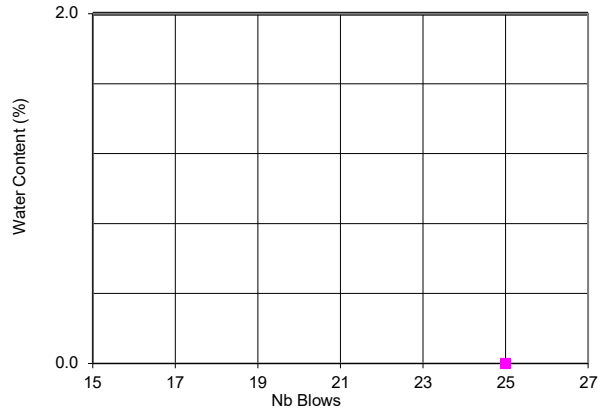
Plastic Limit (PL) - Water Content:		
Tare no.		
Wet soil+tare, g		
Dry soil+tare, g		
Mass of water, g		
Tare, g		
Mass of soil, g		
Water content %		
Average water content %		

Natural Water Content (W^n):		
Tare no.		
Wet soil+tare, g		
Dry soil+tare, g		
Mass of water, g		
Tare, g		
Mass of soil, g		
Water content %		

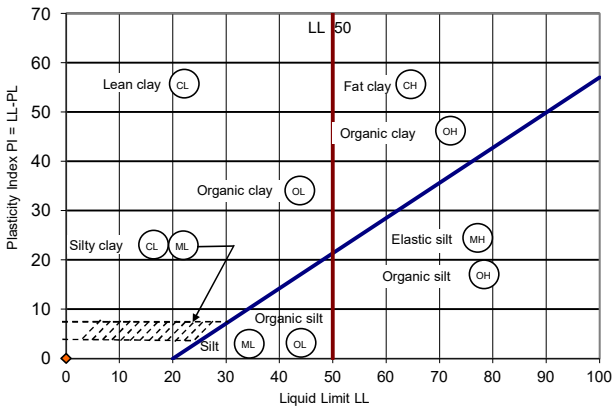
Soil Preparation:

- ☑ Cohesive <425 µm
- ☐ Cohesive >425 µm
- ☐ Non-cohesive
- ☑ Dry preparation
- ☐ Wet preparation

Results



Soil Plasticity Chart ASTM D2487



Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Natural Water Content W^n

Remarks: Non-Plastic Sample

Performed by:	J. Lalonde	**Date:**	September 13, 2022
Verified by:		**Date:**	September 13, 2022
Laboratory Location:	179 Colonnade Rd. Suite 400, Ottawa, Ontario		

Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)

Client:	Infrastructure Ontario	**Lab no.:**	G-22-03
Project/Site:	Children Hospital	**Project no.:**	11205379

Borehole no.:	MW-23	Sample no.:	SS-6	Depth:	3,20 - 3,81 m
Soil Description:				Date sampled:	

Apparatus:	Hand Crank	Balance no.:	8033031049	Porcelain bowl no.:	1
Liquid limit device no.:	1	Oven no.:	B23-04645	Spatula no.:	1
Sieve no.:	0155690	Glass plate no.:	1		

Liquid Limit (LL):

	Test No. 1	Test No. 2	Test No. 3
Number of blows			
Water Content:			
Tare no.			
Wet soil+tare, g			
Dry soil+tare, g			
Mass of water, g			
Tare, g			
Mass of soil, g			
Water content %			

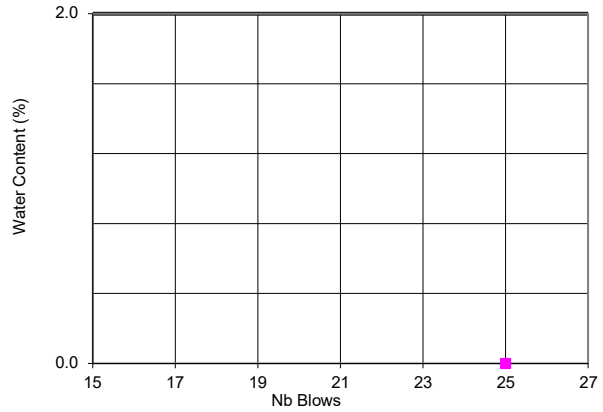
Plastic Limit (PL) - Water Content:		
Tare no.		
Wet soil+tare, g		
Dry soil+tare, g		
Mass of water, g		
Tare, g		
Mass of soil, g		
Water content %		
Average water content %		

Natural Water Content (W^n):		
Tare no.		
Wet soil+tare, g		
Dry soil+tare, g		
Mass of water, g		
Tare, g		
Mass of soil, g		
Water content %		

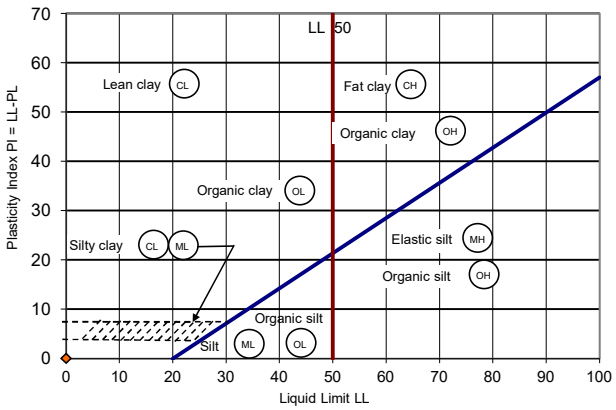
Soil Preparation:

- ☑ Cohesive <425 µm
- ☐ Cohesive >425 µm
- ☐ Non-cohesive
- ☑ Dry preparation
- ☐ Wet preparation

Results



Soil Plasticity Chart ASTM D2487



Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Natural Water Content W^n

Remarks: Non-Plastic Sample

Performed by:	J. Lalonde	**Date:**	September 13, 2022
Verified by:		**Date:**	September 13, 2022
Laboratory Location:	179 Colonnade Rd. Suite 400, Ottawa, Ontario		

Moisture Content of Soils
(ASTM D 2216)

Client:	Infrastructure Ontario	**Lab No.:**	G-22-03
Project/Site:	Children's Hospital	**Project No.:**	11205379

Apparatus Used for Testing **Oven No.:** B23-04645 **Scale No.:** 8033031049

BH No.:	BH21	BH21	BH21	BH21	BH15-22	BH15-22	BH16-22	BH16-22
Sample No.:	SS1	SS2	SS3	SS4	SS1	SS2	SS1	SS2
Depth:	0,0-2,0	2,0-4,0	4,0-6,0	6,0-8,0	0,0-2,0	2,0-3,5	0.0-2,0	2,0-4,0
Container no.	21	14	13	2	18	9	13	23
Mass of container + wet soil (g)	53.50	53.80	61.80	65.50	61.00	62.70	78.90	58.40
Mass of container + dry soil (g)	50.79	52.57	59.01	59.51	59.50	60.20	77.00	55.40
Mass of container (g)	15.10	14.80	14.70	14.50	15.00	14.70	14.80	15.10
Mass of dry soil (g)	35.7	37.8	44.3	45.0	44.5	45.5	62.2	40.3
Mass of water (g)	2.7	1.2	2.8	6.0	1.5	2.5	1.9	3.0
Moisture content (%)	7.6	3.3	6.3	13.3	3.4	5.5	3.1	7.4
BH No.:								
Sample No.:								
Depth:								
Container no.								
Mass of container + wet soil (g)								
Mass of container + dry soil (g)								
Mass of container (g)								
Mass of dry soil (g)								
Mass of water (g)								
Moisture content (%)								

Remarks:

Performed By:	J A Baptiste	**Date:**	July 27, 2022
Verified by :		**Date:**	August 3, 2022

Moisture Content of Soils
(ASTM D 2216)

Client:	Infrastructure Ontario	**Lab No.:**	G-22-03
Project/Site:	Children's Hospital	**Project No.:**	11205379

Apparatus Used for Testing **Oven No.:** B23-04645 **Scale No.:** 8033031049

BH No.:	BH15	BH16	BH22	BH22				
Sample No.:	SS3	SS3	SS1	SS2				
Depth:	4,0-6,0	4,0-5,4	0,5-2,5	2,5-4,5				
Container no.	35	11	47	52				
Mass of container + wet soil (g)	45.20	48.30	42.80	49.20				
Mass of container + dry soil (g)	42.40	46.30	39.50	45.20				
Mass of container (g)	11.50	11.40	11.50	11.40				
Mass of dry soil (g)	30.9	34.9	28.0	33.8				
Mass of water (g)	2.8	2.0	3.3	4.0				
Moisture content (%)	9.1	5.7	11.8	11.8				
MW No.:	BH14	BH14	BH14	BH17	BH17	BH17	BH18	BH18
Sample No.:	SS1	SS2	SS3A	SS1	SS2	SS3	SS1	SS2A
Depth:	0,6-2,6	2,6-4,6	4,6-5,4	0,3-2	2,0-4,0	4,0-4,9	0,3-2	2,0-2,7
Container no.	1	25	26	6	8	22	37	16
Mass of container + wet soil (g)	37.30	38.60	46.50	67.70	61.40	39.00	50.00	45.00
Mass of container + dry soil (g)	36.30	36.70	43.20	66.60	57.60	36.90	48.80	41.20
Mass of container (g)	11.20	11.40	11.40	15.00	14.30	11.50	11.30	11.40
Mass of dry soil (g)	25.1	25.3	31.8	51.6	43.3	25.4	37.5	29.8
Mass of water (g)	1.0	1.9	3.3	1.1	3.8	2.1	1.2	3.8
Moisture content (%)	4.0	7.5	10.4	2.1	8.8	8.3	3.2	12.8

Remarks:

Performed By:	J A Baptiste	**Date:**	July 27, 2022
Verified by :		**Date:**	August 3, 2022

Moisture Content of Soils
(ASTM D 2216)

Client:	Infrastructure Ontario	**Lab No.:**	G-22-03
Project/Site:	IO Children's Hospital	**Project No.:**	11205379

Apparatus Used for Testing **Oven No.:** B23-04645 **Scale No.:** 8033031049

MW No.:	BH18							
Sample No.:	SS3							
Depth:	4,0-6,0							
Container no.	4							
Mass of container + wet soil (g)	56.00							
Mass of container + dry soil (g)	52.30							
Mass of container (g)	11.30							
Mass of dry soil (g)	41.0							
Mass of water (g)	3.7							
Moisture content (%)	9.0							
BH No.:								
Sample No.:								
Depth:								
Container no.								
Mass of container + wet soil (g)								
Mass of container + dry soil (g)								
Mass of container (g)								
Mass of dry soil (g)								
Mass of water (g)								
Moisture content (%)								

Remarks:

Performed By: J A Baptiste **Date:** July 27, 2022

Verified by : **Date:** August 3, 2022

Moisture Content of Soils
(ASTM D 2216)

Client:	Infrastructure Ontario	**Lab No.:**	G-22-03
Project/Site:	Children's Hospital	**Project No.:**	11205379

Apparatus Used for Testing **Oven No.:** B23-04645 **Scale No.:** 8033031049

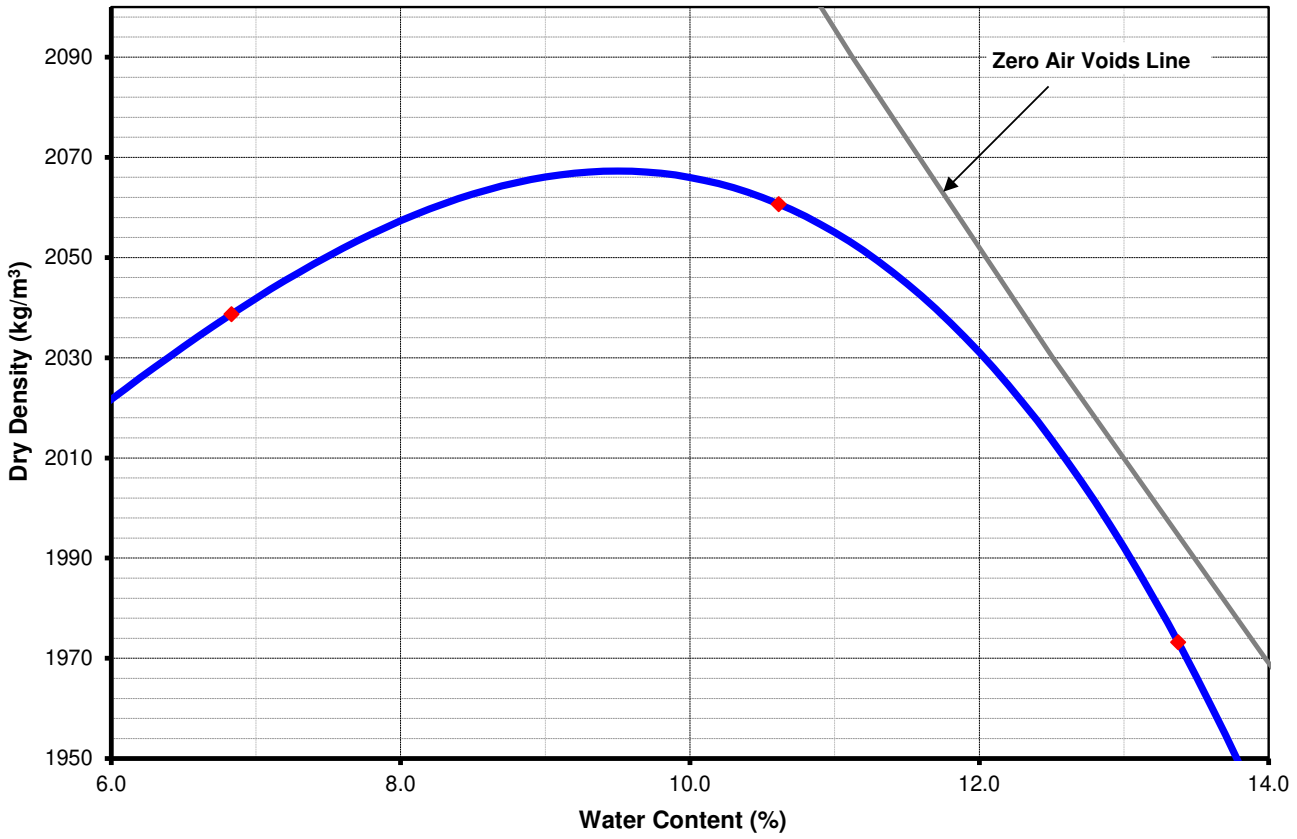
MW No.:	BH23	BH23	BH23	BH23	BH23			
Sample No.:	SS1	SS2	SS3	SS4	SS5			
Depth:	0,3-2,0	2,5-4,5	4,5-6,5	6,5-8,5	8,5-10			
Container no.	33	2	13	18	15			
Mass of container + wet soil (g)	70.60	73.50	61.70	62.40	55.50			
Mass of container + dry soil (g)	69.20	70.80	59.20	59.90	52.80			
Mass of container (g)	14.60	14.50	14.70	15.00	14.80			
Mass of dry soil (g)	54.6	56.3	44.5	44.9	38.0			
Mass of water (g)	1.4	2.7	2.5	2.5	2.7			
Moisture content (%)	2.6	4.8	5.6	5.6	7.1			
MW No.:	BH20-22	BH20-22						
Sample No.:	SS1	SS2						
Depth:	0,5-2,5	2,5-4,5						
Container no.	16	28						
Mass of container + wet soil (g)	48.50	58.60						
Mass of container + dry soil (g)	47.00	56.40						
Mass of container (g)	14.90	14.90						
Mass of dry soil (g)	32.1	41.5						
Mass of water (g)	1.5	2.2						
Moisture content (%)	4.7	5.3						

Remarks:

Performed By:	J A Baptiste	**Date:**	July 27, 2022
Verified by :		**Date:**	August 3, 2022

Standard Proctor Test
(ASTM D698)

Client :	Infrastructure Ontario (IO)	**Lab No :**	S1912
Project/Site :	Preliminary Geotechnical Investigation – Children's Hospital of Eastern Ontario Campus	**Project No :**	11205379



Prepared Sample:	Dry	X	Moist	--		Assumed G_s:	2.80
ASTM D698 Test Method:	A	X	B	--	C -	Type of Hammer:	Manual

Soil Type:	Fill
Material:	Augured Material
Proposed Use:	N/A
Sample Identification:	MW1
Sample Location:	N/A
Aggregate Supplier / Pit Name:	N/A
Sample Date:	December 9, 2019
Sampled By:	S.H

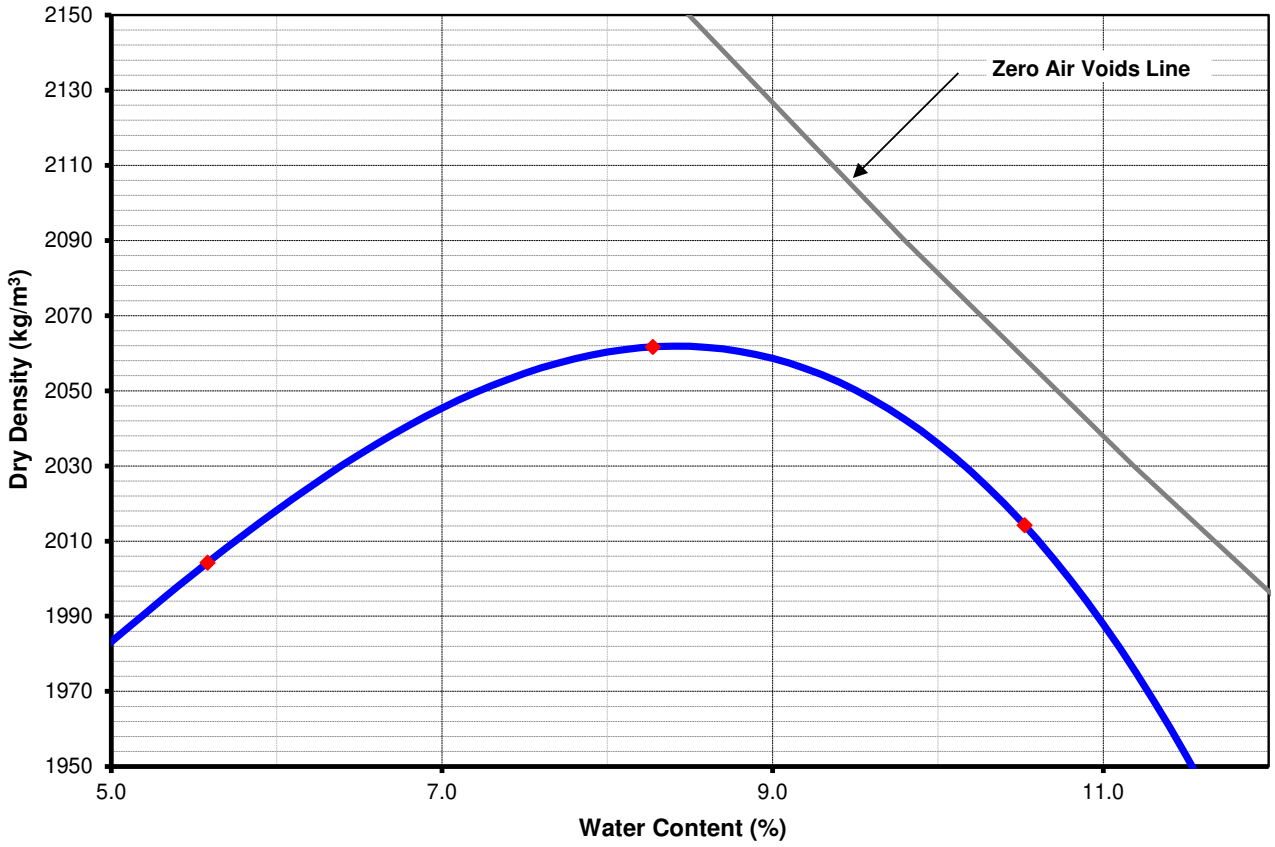
Max. Dry Density:	**2067**	**kg/m³**
Optimum Moisture:	**9.5**	**%**
% Retained on 19.0 mm:	**0.0**	**%**
Corrected Dry Density:	**2067**	**kg/m³**
Corrected Opt. Moist.:	**9.5**	**%**

Remarks :

Performed by :	Sharif Hossain	**Date :**	December 19, 2019
Verified by :	Raj Kadia, C.E.T.	**Date :**	December 31, 2019

Standard Proctor Test
(ASTM D698)

Client :	Infrastructure Ontario (IO)	**Lab No :**	S1916
Project/Site :	Preliminary Geotechnical Investigation – Children's Hospital of Eastern Ontario Campus	**Project No :**	11205379



Prepared Sample:	Dry	X	Moist	--			Assumed G_s:	2.70
ASTM D698 Test Method:	A	X	B	--	C	-	Type of Hammer:	Manual

Soil Type:	Sandy Silt, Trace Gravel
Material:	Augured Material
Proposed Use:	N/A
Sample Identification:	MW3-19
Sample Location:	N/A
Aggregate Supplier / Pit Name:	N/A
Sample Date:	December 9, 2019
Sampled By:	S.H

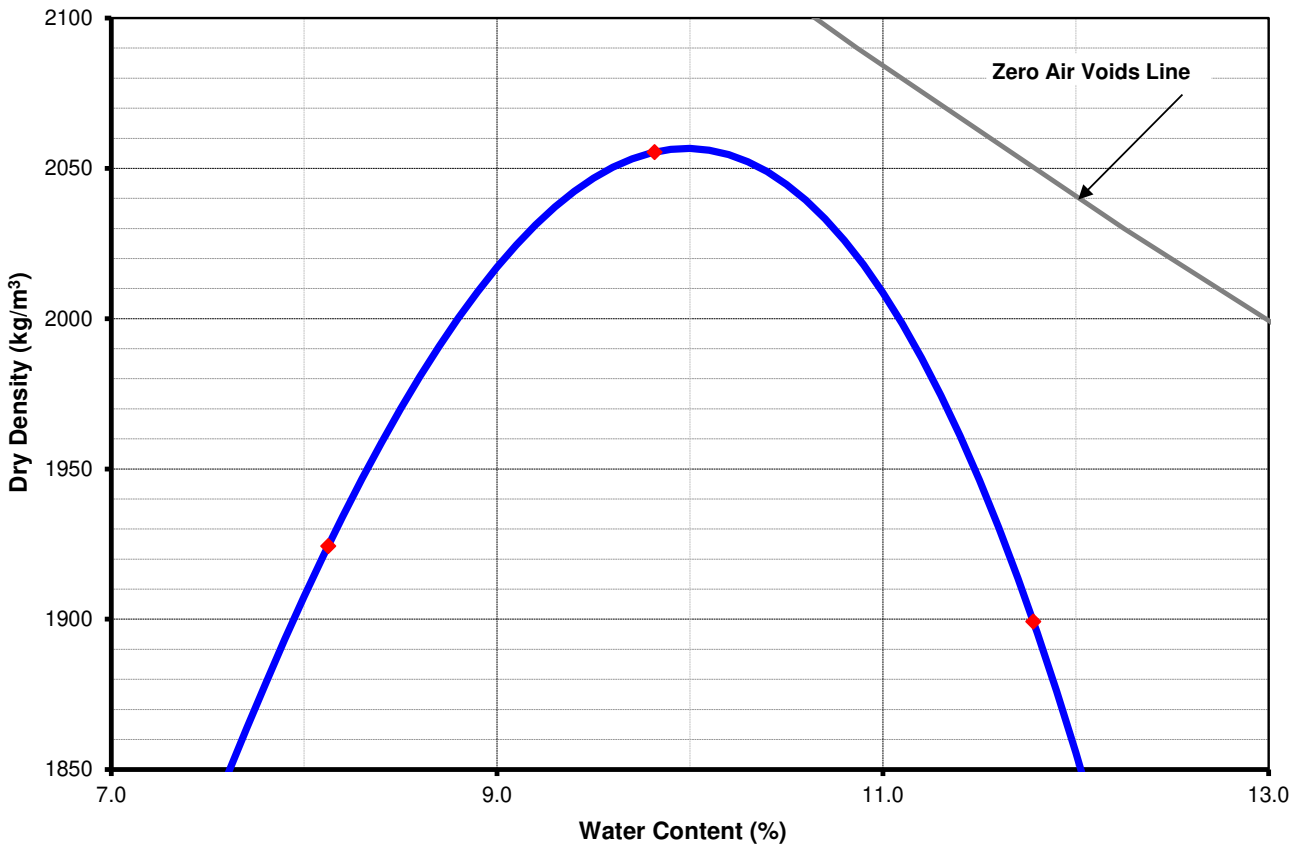
Max. Dry Density:	**2062**	**kg/m³**
Optimum Moisture:	**8.4**	**%**
% Retained on 19.0 mm:	**0.0**	**%**
Corrected Dry Density:	**2062**	**kg/m³**
Corrected Opt. Moist.:	**8.4**	**%**

Remarks :

Performed by :	Sharif Hossain	**Date :**	December 19, 2019
Verified by :	Raj Kadia, C.E.T.	**Date :**	December 31, 2019

Standard Proctor Test
(ASTM D698)

Client :	Infrastructure Ontario (IO)	**Lab No :**	S1914
Project/Site :	Preliminary Geotechnical Investigation – Children's Hospital of Eastern Ontario Campus	**Project No :**	11205379



Prepared Sample:	Dry	X	Moist	--		Assumed G_s:	2.80
ASTM D698 Test Method:	A	X	B	--	C	-	Type of Hammer: Manual

Soil Type:	Fill
Material:	Augured Sample
Proposed Use:	N/A
Sample Identification:	MW5
Sample Location:	N/A
Aggregate Supplier / Pit Name:	N/A
Sample Date:	December 9, 2019
Sampled By:	S.H

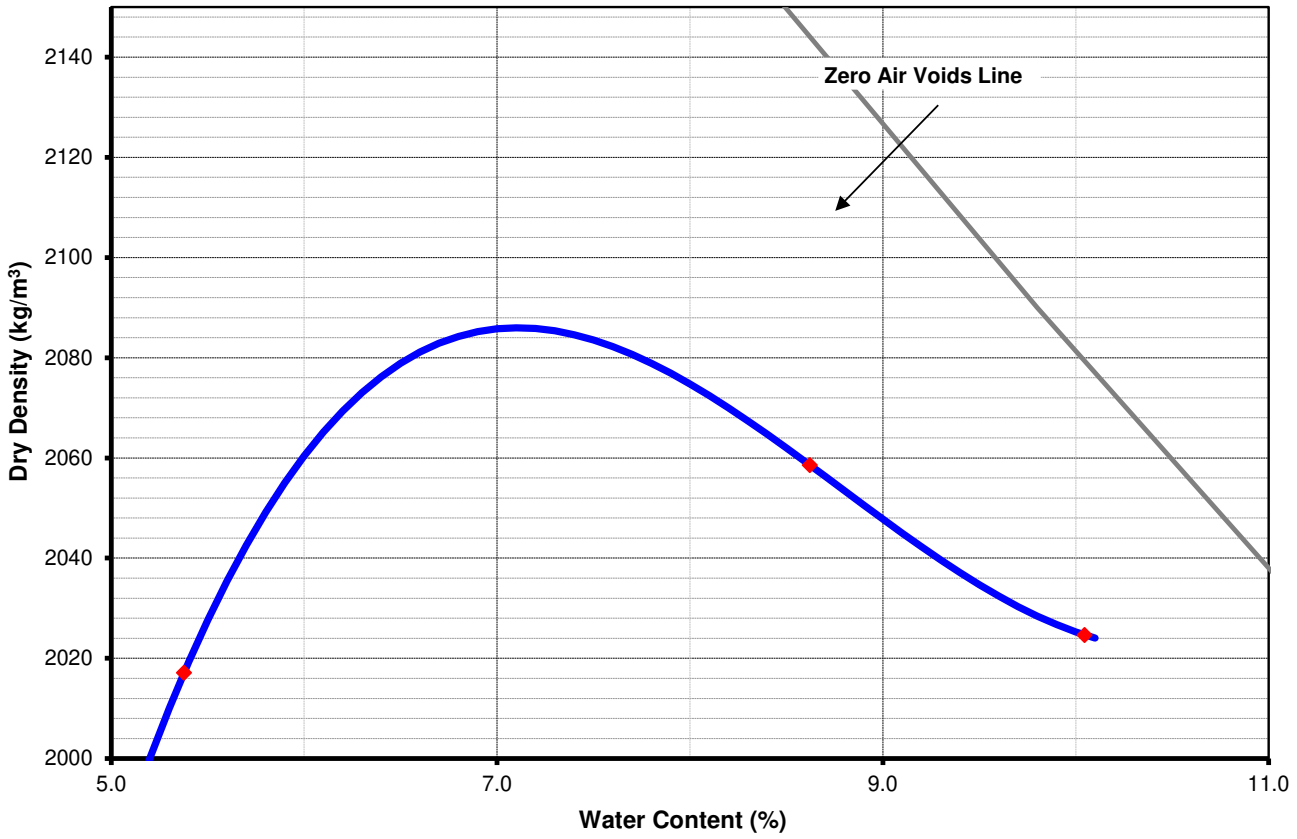
Max. Dry Density:	**2057**	**kg/m³**
Optimum Moisture:	**10.0**	**%**
% Retained on 19.0 mm:	**0.0**	**%**
Corrected Dry Density:	**2057**	**kg/m³**
Corrected Opt. Moist.:	**10.0**	**%**

Remarks :

Performed by :	Basharat Ali	**Date :**	December 17, 2019
Verified by :	Raj Kadia, C.E.T.	**Date :**	December 20, 2019

Standard Proctor Test
(ASTM D698)

Client :	Infrastructure Ontario (IO)	**Lab No :**	S1913
Project/Site :	Preliminary Geotechnical Investigation – Children's Hospital of Eastern Ontario Campus	**Project No :**	11205379



Prepared Sample:	Dry	X	Moist	--		Assumed G_s:	2.80
ASTM D698 Test Method:	A	X	B	--	C -	Type of Hammer:	Manual

Soil Type:	Fill
Material:	Augured Material
Proposed Use:	N/A
Sample Identification:	BH6
Sample Location:	
Aggregate Supplier / Pit Name:	N/A
Sample Date:	December 9, 2019
Sampled By:	S.H

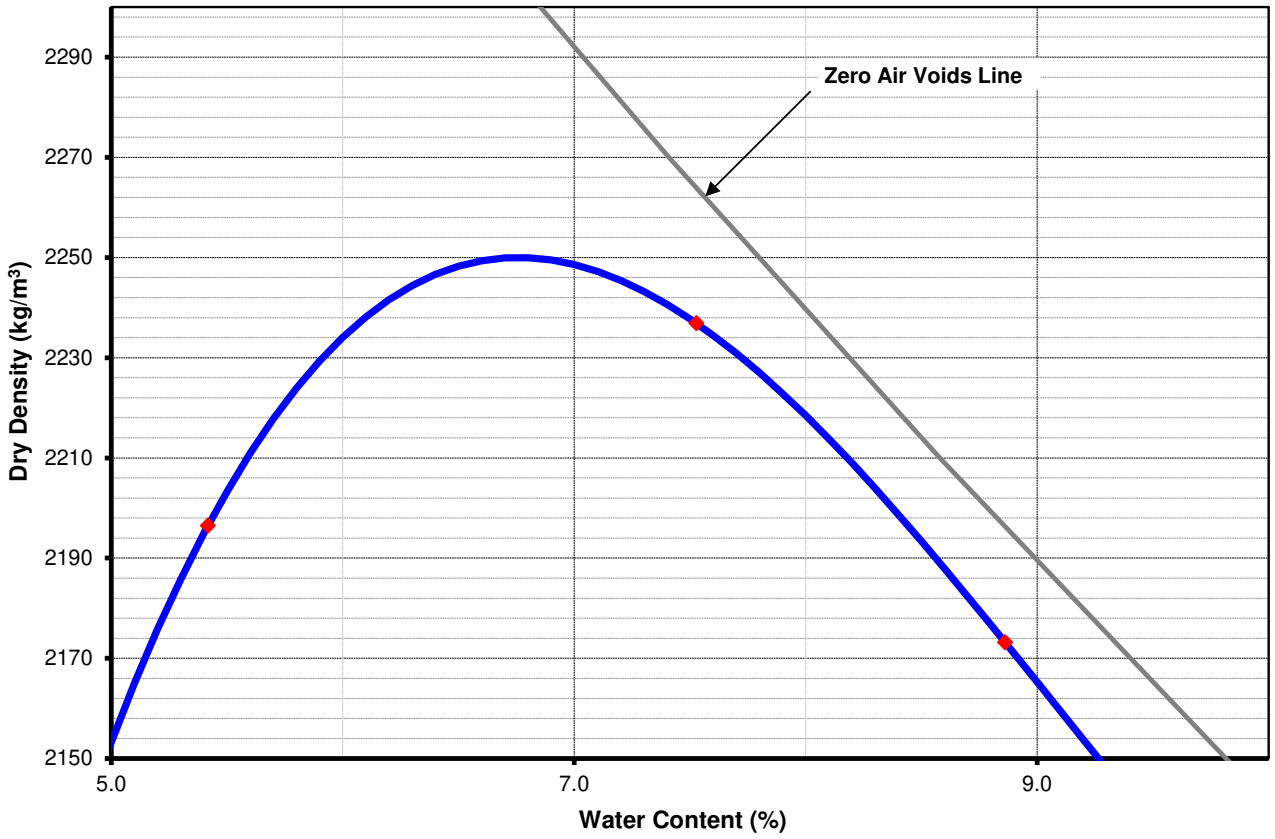
Max. Dry Density:	**2086**	**kg/m³**
Optimum Moisture:	**7.1**	**%**
% Retained on 19.0 mm:	**0.0**	**%**
Corrected Dry Density:	**2086**	**kg/m³**
Corrected Opt. Moist.:	**7.1**	**%**

Remarks :

Performed by :	Sharif Hossain	**Date :**	December 17, 2019
Verified by :	Raj Kadia, C.E.T.	**Date :**	December 31, 2019

Standard Proctor Test
(ASTM D698)

Client :	Infrastructure Ontario (IO)	**Lab No :**	S1917
Project/Site :	Preliminary Geotechnical Investigation – Children's Hospital of Eastern Ontario Campus	**Project No :**	11205379



Prepared Sample:	Dry	X	Moist	--		Assumed G_s:	2.80
ASTM D698 Test Method:	A	X	B	--	C -	Type of Hammer:	Manual

Soil Type:	Fill
Material:	Augured Material
Proposed Use:	N/A
Sample Identification:	BH12
Sample Location:	
Aggregate Supplier / Pit Name:	N/A
Sample Date:	December 9, 2019
Sampled By:	S.H

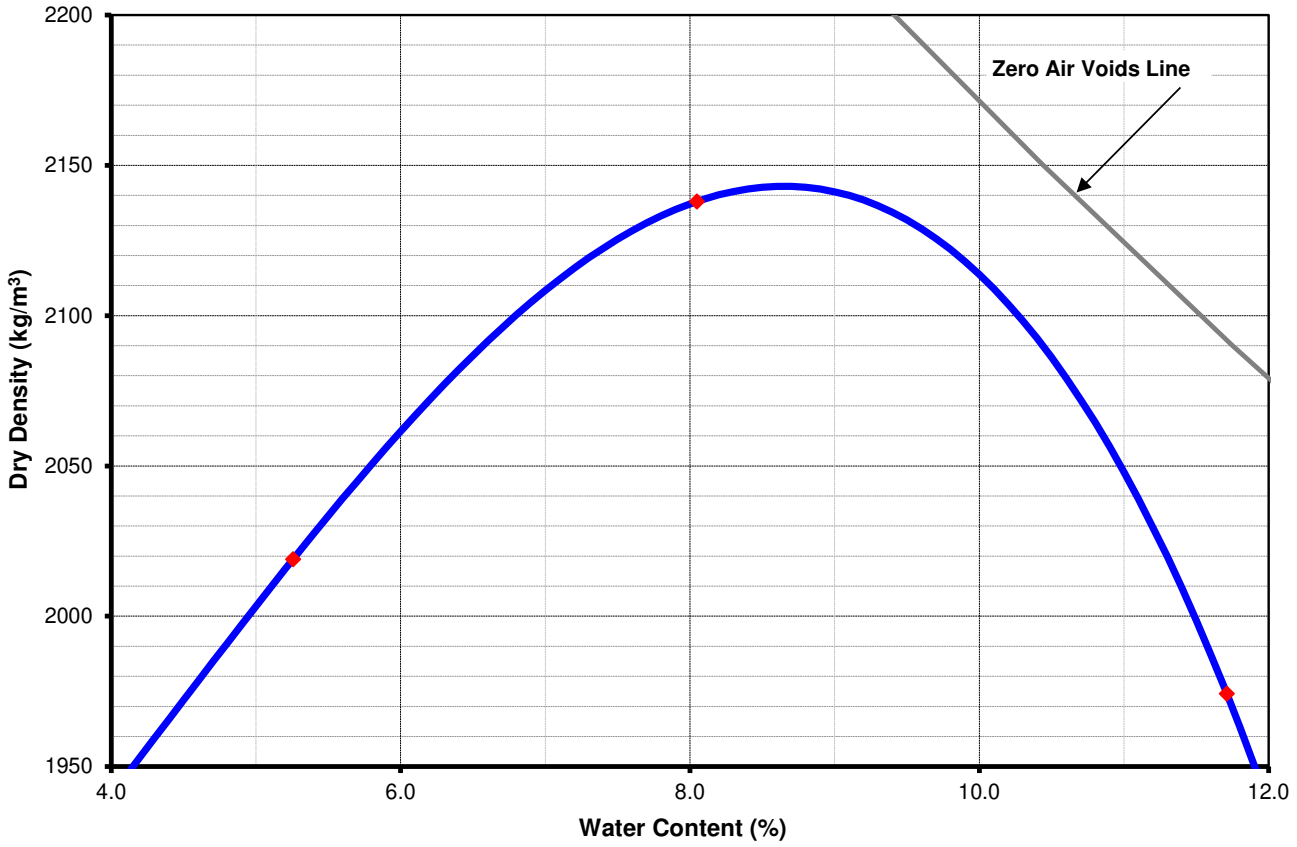
Max. Dry Density:	**2250**	**kg/m³**
Optimum Moisture:	**6.8**	**%**
% Retained on 19.0 mm:	**0.7**	**%**
Corrected Dry Density:	**2250**	**kg/m³**
Corrected Opt. Moist.:	**6.8**	**%**

Remarks :

Performed by :	B.Ali	**Date :**	December 14, 2019
Verified by :	Raj Kadia, C.E.T.	**Date :**	December 31, 2019

Standard Proctor Test
(ASTM D698)

Client :	Infrastructure Ontario (IO)	**Lab No :**	S1910
Project/Site :	Preliminary Geotechnical Investigation – Children's Hospital of Eastern Ontario Campus	**Project No :**	11205379



Prepared Sample:	Dry	X	Moist	--		Assumed G_s:	2.80
ASTM D698 Test Method:	A	X	B	--	C -	Type of Hammer:	Manual

Soil Type:	Fill
Material:	Augured Material
Proposed Use:	N/A
Sample Identification:	BH13
Sample Location:	
Aggregate Supplier / Pit Name:	N/A
Sample Date:	December 12, 2019
Sampled By:	Simon

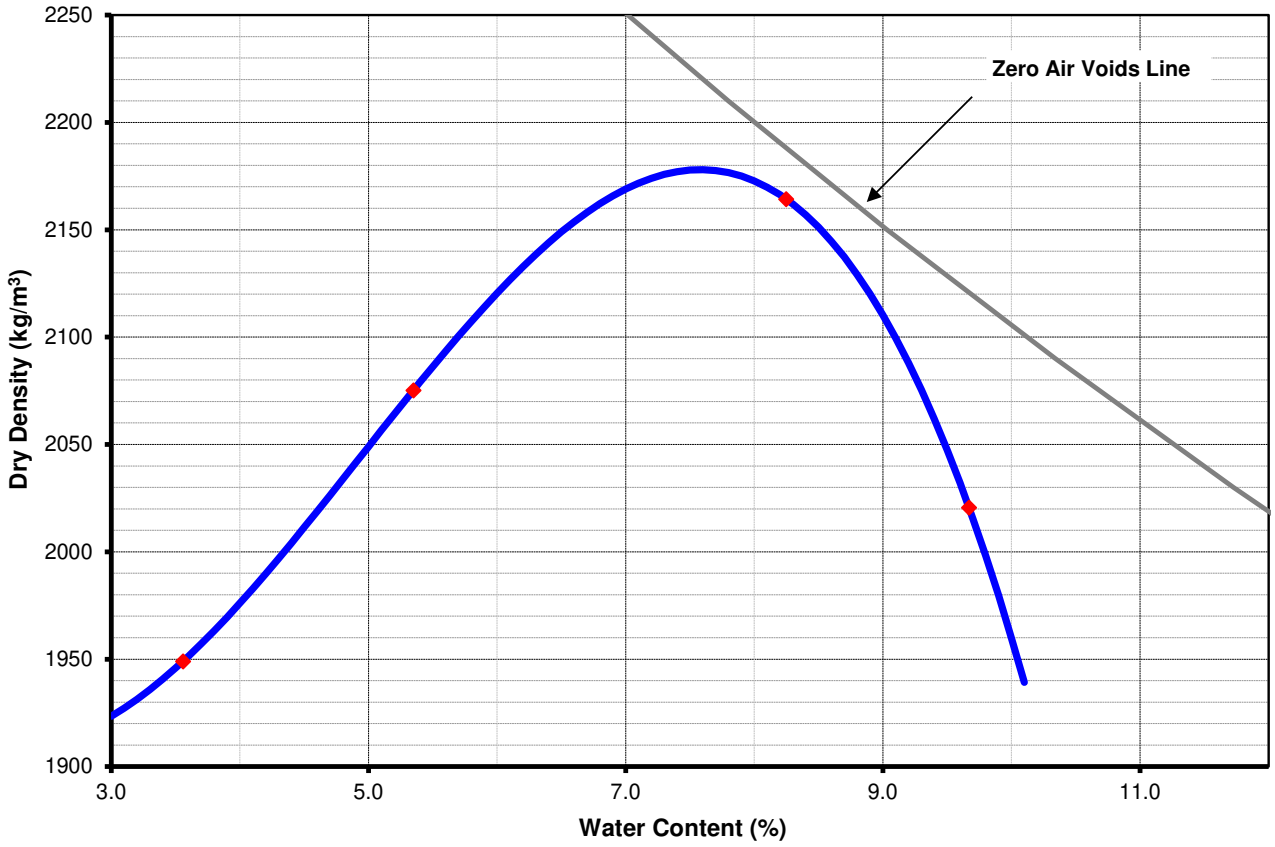
Max. Dry Density:	**2143**	**kg/m³**
Optimum Moisture:	**8.7**	**%**
% Retained on 19.0 mm:	**0.0**	**%**
Corrected Dry Density:	**2143**	**kg/m³**
Corrected Opt. Moist.:	**8.7**	**%**

Remarks :

Performed by :	Sharif Hossain	**Date :**	December 17, 2019
Verified by :	Raj Kadia, C.E.T.	**Date :**	December 31, 2019

Standard Proctor Test
(ASTM D698)

Client :	Infrastructure Ontario (IO)	**Lab No :**	S1919
Project/Site :	Preliminary Geotechnical Investigation – Children's Hospital of Eastern Ontario Campus	**Project No :**	11205379



Prepared Sample:	Dry	X	Moist	--		Assumed G_s:	2.80
ASTM D698 Test Method:	A	X	B	--	C -	Type of Hammer:	Manual

Soil Type:	Fill
Material:	Augured Material
Proposed Use:	N/A
Sample Identification:	BH14
Sample Location:	Depth 0' to 2'
Aggregate Supplier / Pit Name:	N/A
Sample Date:	December 9, 2019
Sampled By:	S.H

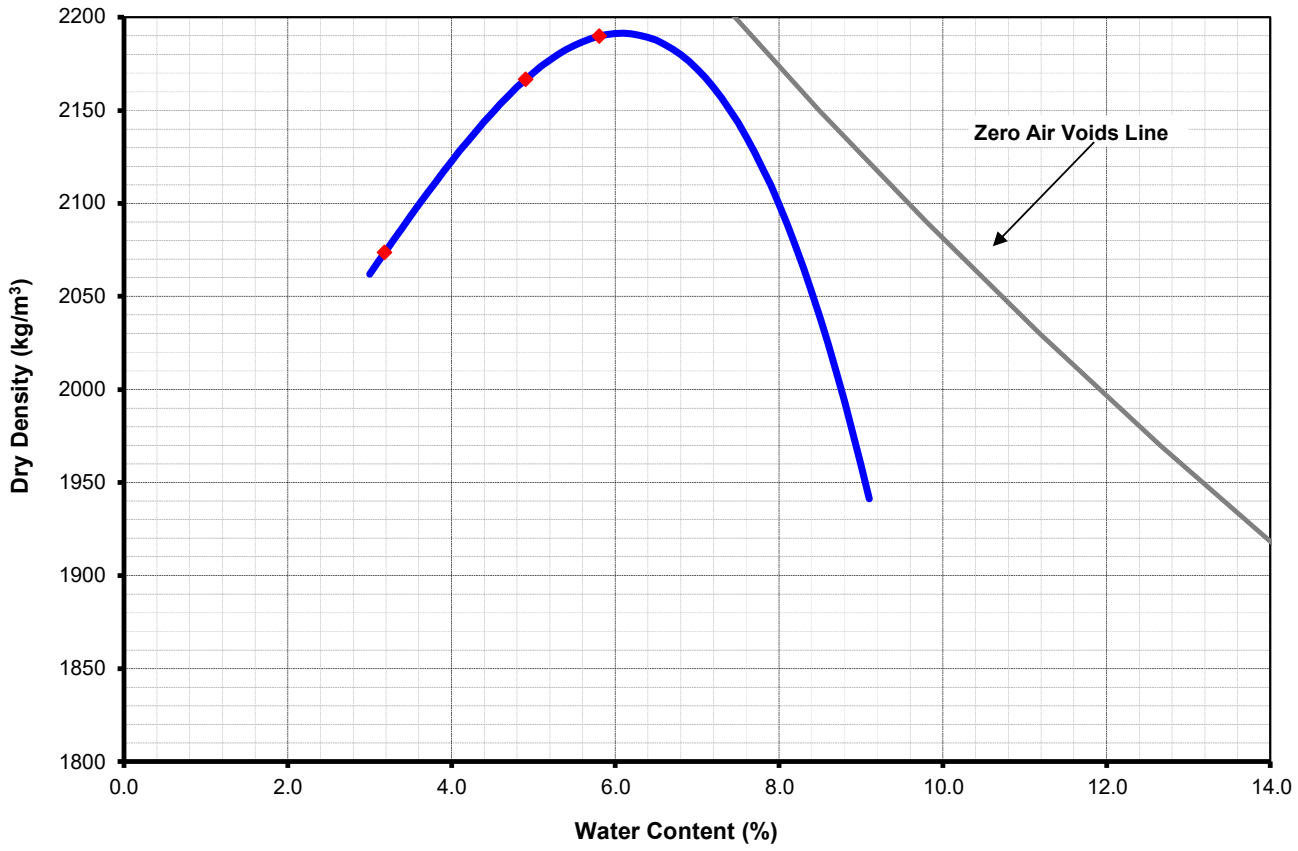
Max. Dry Density:	**2178**	**kg/m³**
Optimum Moisture:	**7.6**	**%**
% Retained on 19.0 mm:	**0.0**	**%**
Corrected Dry Density:	**2178**	**kg/m³**
Corrected Opt. Moist.:	**7.6**	**%**

Remarks :

Performed by :	Sharif Hossain	**Date :**	December 12, 2019
Verified by :	Raj Kadia, C.E.T.	**Date :**	December 31, 2019

Standard Proctor Test (ASTM D698)

Client :	Infrastructure Ontario	**Lab No :**	A-22-02
Project/Site :	Children Hospital	**Project No :**	11205379



Prepared Sample:	Dry	0	Moist	x			Assumed G_s:	2.70
ASTM D698 Test Method:	A	0	B	0	C	x	Type of Hammer:	Manual
		4.75 mm		9.50 mm		19.0 mm		

Soil Type:	Crushed Stone
Material:	
Proposed Use:	
Sample Identification:	BH22
Sample Location:	
Aggregate Supplier / Pit Name:	In Place
Sample Date:	
Sampled By:	D. Ash

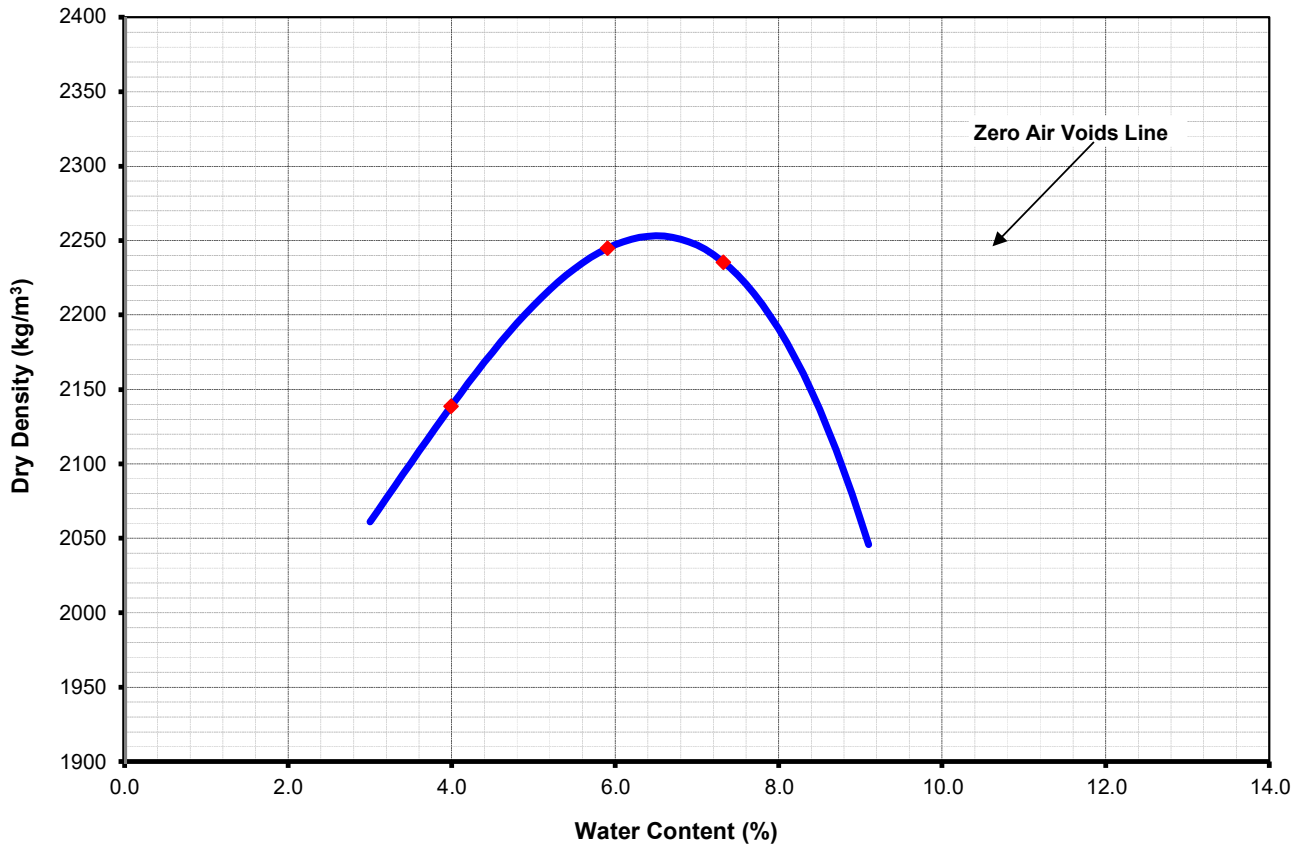
Max. Dry Density:	**2191**	**kg/m³**
Optimum Moisture:	**6.1**	**%**
% Retained on 19.0 mm:	**4.1**	**%**
Corrected Dry Density:	**2191**	**kg/m³**
Corrected Opt. Moist.:	**6.1**	**%**

Remarks :

Performed by :	J. Lalonde	**Date :**	September 2, 2022
Verified by :		**Date :**	September 6, 2022

Standard Proctor Test (ASTM D698)

Client :	Infrastructure Ontario	**Lab No :**	A-22-02
Project/Site :	Children Hospital	**Project No :**	11205379



Prepared Sample:	Dry	0	Moist	x			Assumed G_s:	2.70
ASTM D698 Test Method:	A	0	B	0	C	x	Type of Hammer:	Mechanical
		4.75 mm		9.50 mm		19.0 mm		

Soil Type:	Crushed Stone
Material:	
Proposed Use:	
Sample Identification:	MW14
Sample Location:	
Aggregate Supplier / Pit Name:	In Place
Sample Date:	
Sampled By:	D. Ash

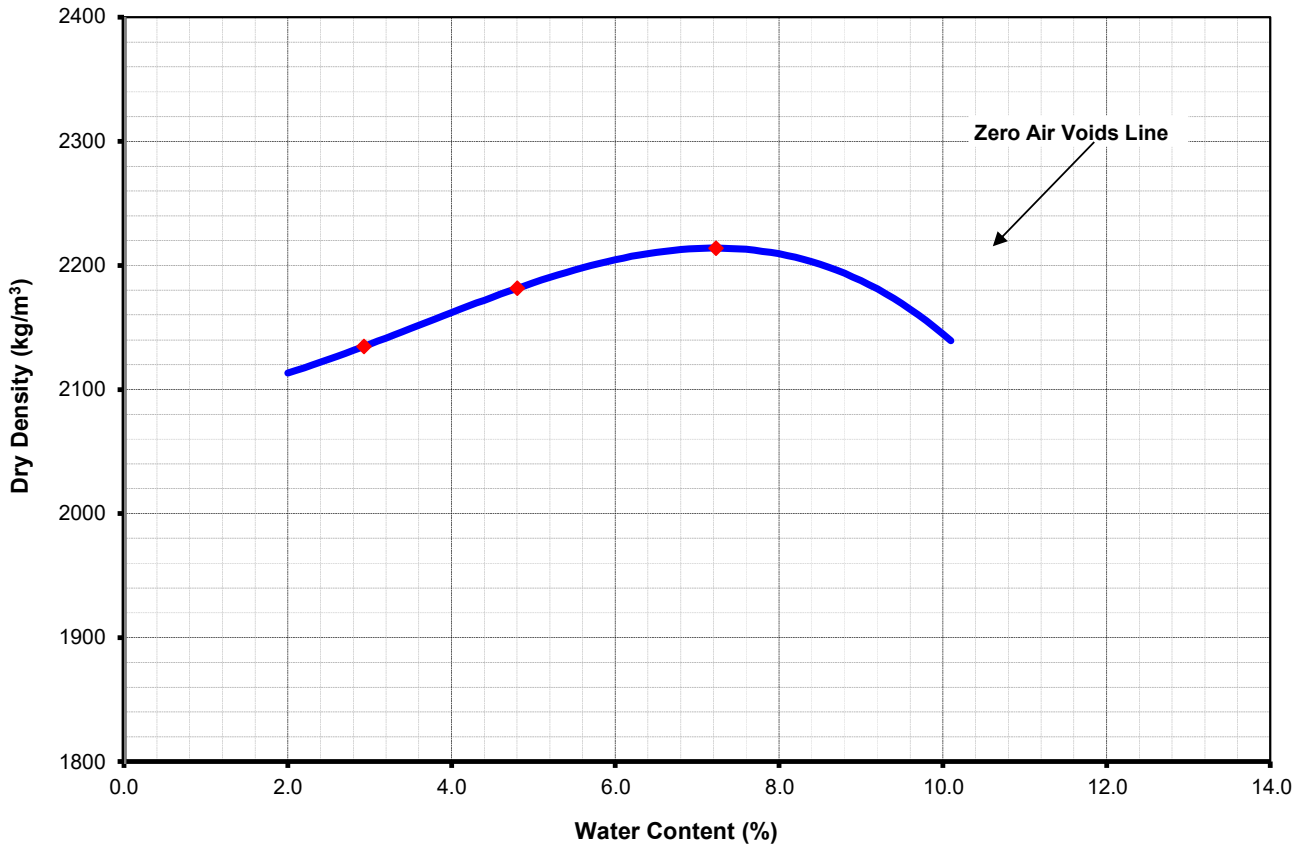
Max. Dry Density:	**2253**	**kg/m³**
Optimum Moisture:	**6.5**	**%**
% Retained on 19.0 mm:	**2.0**	**%**
Corrected Dry Density:	**2253**	**kg/m³**
Corrected Opt. Moist.:	**6.5**	**%**

Remarks :

Performed by :	J. Lalonde	**Date :**	September 8, 2022
Verified by :		**Date :**	September 13, 2022

Standard Proctor Test (ASTM D698)

Client :	Infrastructure Ontario	**Lab No :**	A-22-02
Project/Site :	Children Hospital	**Project No :**	11205379



Prepared Sample:	Dry	0	Moist	x			Assumed G_s:	2.70
ASTM D698 Test Method:	A	0	B	0	C	x	Type of Hammer:	Mechanical
		4.75 mm		9.50 mm		19.0 mm		

Soil Type:	Crushed Stone
Material:	
Proposed Use:	
Sample Identification:	MW17
Sample Location:	
Aggregate Supplier / Pit Name:	In Place
Sample Date:	
Sampled By:	D. Ash

Max. Dry Density:	**2214**	**kg/m³**
Optimum Moisture:	**7.2**	**%**
% Retained on 19.0 mm:	**1.0**	**%**
Corrected Dry Density:	**2214**	**kg/m³**
Corrected Opt. Moist.:	**7.2**	**%**

Remarks :

Performed by :	J. Lalonde	**Date :**	September 7, 2022
Verified by :		**Date :**	September 13, 2022

Uniaxial Compressive Strength of Intact Rock Core Specimens
(ASTM D7012 - Method C)

CLIENT:	Infrastructure Ontario	**LAB No.:**	WLT 293-1
PROJECT/ SITE:	Preliminary Geotechnical Investigation: 401 Smyth Road, Ottawa, ON	**PROJECT No.:**	11205379

Borehole No.:	MW2	**Sampled ID:**	n/a
Depth:	5.13 m	**Date Sampled:**	n/a

Lithologic Description: Shale

Initial Specimen Parameters	
Diameter, cm	6.3
Height, cm	12.8
Height-to-Diameter Ratio	2.0
Volume, cm^3	391.7
Mass, g	1042.0
Bulk Density, kg/m^3	2661
Moisture Condition	As Received
Moisture Content, %	2.0

Maximum Applied Load, kN	110.3
Compressive Strength, MPa	35.9

REMARKS:

PERFORMED BY:	M. Mitchell	**DATE:**	December 3, 2019
VERIFIED BY:	Michael Braverman	**DATE:**	December 16, 2019

Uniaxial Compressive Strength of Intact Rock Core Specimens
(ASTM D7012 - Method C)

CLIENT:	Infrastructure Ontario	**LAB No.:**	WLT 293-2
PROJECT/ SITE:	Preliminary Geotechnical Investigation: 401 Smyth Road, Ottawa, ON	**PROJECT No.:**	11205379

Borehole No.:	MW2	**Sampled ID:**	-
Depth:	7.67 m	**Date Sampled:**	n/a

Lithologic Description: Shale

Initial Specimen Parameters	
Diameter, cm	6.2
Height, cm	13.1
Height-to-Diameter Ratio	2.1
Volume, cm^3	402.4
Mass, g	1067.1
Bulk Density, kg/m^3	2652
Moisture Condition	As Received
Moisture Content, %	2.3

Maximum Applied Load, kN	96.2
Compressive Strength, MPa	31.4

REMARKS:

PERFORMED BY:	M. Mitchell	**DATE:**	December 3, 2019
VERIFIED BY:	Michael Braverman	**DATE:**	December 16, 2019

Uniaxial Compressive Strength of Intact Rock Core Specimens
(ASTM D7012 - Method C)

CLIENT:	Infrastructure Ontario	**LAB No.:**	WLT 293-3
PROJECT/ SITE:	Preliminary Geotechnical Investigation: 401 Smyth Road, Ottawa	**PROJECT No.:**	11205379

Borehole No.:	MW2	**Sampled ID:**	-
Depth:	9.70 m	**Date Sampled:**	n/a

Lithologic Description: Shale

Initial Specimen Parameters	
Diameter, cm	6.2
Height, cm	12.8
Height-to-Diameter Ratio	2.1
Volume, cm^3	393.6
Mass, g	1052.9
Bulk Density, kg/m^3	2675
Moisture Condition	As Received
Moisture Content, %	2.0

Maximum Applied Load, kN	75.0
Compressive Strength, MPa	24.4

REMARKS:

PERFORMED BY:	M. Mitchell	**DATE:**	December 3, 2019
VERIFIED BY:	Michael Braverman	**DATE:**	December 16, 2019

Uniaxial Compressive Strength of Intact Rock Core Specimens
(ASTM D7012 - Method C)

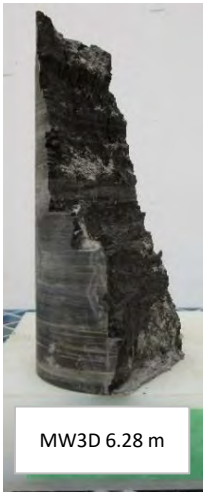
CLIENT:	Infrastructure Ontario	**LAB No.:**	WLT 293-4
PROJECT/ SITE:	Preliminary Geotechnical Investigation: 401 Smyth Road, Ottawa, ON	**PROJECT No.:**	11205379

Borehole No.:	MW3	**Sampled ID:**	-
Depth:	6.28 m	**Date Sampled:**	n/a

Lithologic Description: Shale

Initial Specimen Parameters	
Diameter, cm	6.3
Height, cm	13.1
Height-to-Diameter Ratio	2.1
Volume, cm^3	401.6
Mass, g	1067.4
Bulk Density, kg/m^3	2658
Moisture Condition	As Received
Moisture Content, %	2.1

Maximum Applied Load, kN	87.2
Compressive Strength, MPa	28.4



REMARKS:

PERFORMED BY: M. Mitchell **DATE:** December 3, 2019

VERIFIED BY: Michael Braverman **DATE:** December 16, 2019

Uniaxial Compressive Strength of Intact Rock Core Specimens (ASTM D7012 - Method C)

CLIENT:	Infrastructure Ontario	**LAB No.:**	WLT 293-5
PROJECT/ SITE:	Preliminary Geotechnical Investigation: 401 Smyth Road, Ottawa. ON	**PROJECT No.:**	11205379
Borehole No.:	MW3	**Sampled ID:**	-
Depth:	7.83 m	**Date Sampled:**	n/a
Lithologic Description:	Shale		

Initial Specimen Parameters	
Diameter, cm	6.3
Height, cm	12.8
Height-to-Diameter Ratio	2.0
Volume, cm^3	394.0
Mass, g	1041.1
Bulk Density, kg/m^3	2642
Moisture Condition	As Received
Moisture Content, %	2.2

Maximum Applied Load, kN	103.2
Compressive Strength, MPa	33.5

REMARKS:

PERFORMED BY:	M. Mitchell	**DATE:**	December 3, 2017
VERIFIED BY:	Michael Braverman	**DATE:**	December 16, 2019

Uniaxial Compressive Strength of Intact Rock Core Specimens (ASTM D7012 - Method C)

CLIENT:	Infrastructure Ontario	**LAB No.:**	WLT 293-6
PROJECT/ SITE:	Preliminary Geotechnical Investigation: 401 Smyth Road, Ottawa	**PROJECT No.:**	11205379

Borehole No.:	MW3	**Sampled ID:**	-
Depth:	10.27 m	**Date Sampled:**	n/a

Lithologic Description: Shale

Initial Specimen Parameters	
Diameter, cm	6.3
Height, cm	12.4
Height-to-Diameter Ratio	2.0
Volume, cm^3	383.6
Mass, g	1036.8
Bulk Density, kg/m^3	2703
Moisture Condition	As Received
Moisture Content, %	1.8

Maximum Applied Load, kN	109.0
Compressive Strength, MPa	35.4

REMARKS:

PERFORMED BY: M. Mitchell **DATE:** December 3, 2019

VERIFIED BY: Michael Braverman **DATE:** December 16, 2019

Uniaxial Compressive Strength of Intact Rock Core Specimens
(ASTM D7012 - Method C)

CLIENT:	Infrastructure Ontario	**LAB No.:**	WLT 293-7
PROJECT/ SITE:	Preliminary Geotechnical Investigation: 401 Smyth Road, Ottawa	**PROJECT No.:**	11205379

Borehole No.:	MW4	**Sampled ID:**	-
Depth:	3.26 m	**Date Sampled:**	n/a

Lithologic Description: Shale

Initial Specimen Parameters	
Diameter, cm	6.2
Height, cm	12.5
Height-to-Diameter Ratio	2.0
Volume, cm^3	383.9
Mass, g	1023.1
Bulk Density, kg/m^3	2665
Moisture Condition	As Received
Moisture Content, %	2.2

Maximum Applied Load, kN	128.0
Compressive Strength, MPa	41.8

REMARKS:

PERFORMED BY:	M. Mitchell	**DATE:**	December 3, 2019
VERIFIED BY:	Michael Braverman	**DATE:**	December 16, 2019

Uniaxial Compressive Strength of Intact Rock Core Specimens
(ASTM D7012 - Method C)

CLIENT:	Infrastructure Ontario	**LAB No.:**	WLT 293-8
PROJECT/ SITE:	Preliminary Geotechnical Investigation: 401 Smyth Road, Ottawa	**PROJECT No.:**	11205379

Borehole No.:	MW4	**Sampled ID:**	-
Depth:	6.38 m	**Date Sampled:**	n/a

Lithologic Description: Shale

Initial Specimen Parameters	
Diameter, cm	6.3
Height, cm	12.5
Height-to-Diameter Ratio	2.0
Volume, cm^3	384.0
Mass, g	1020.3
Bulk Density, kg/m^3	2657
Moisture Condition	As Received
Moisture Content, %	1.8

Maximum Applied Load, kN	87.5
Compressive Strength, MPa	28.5

REMARKS:

PERFORMED BY:	M. Mitchell	**DATE:**	December 3, 2019
VERIFIED BY:	Michael Braverman	**DATE:**	December 16, 2019

Uniaxial Compressive Strength of Intact Rock Core Specimens
(ASTM D7012 - Method C)

CLIENT:	Infrastructure Ontario	**LAB No.:**	WLT 293-9
PROJECT/ SITE:	Preliminary Geotechnical Investigation: 401 Smyth Road, Ottawa	**PROJECT No.:**	11205379

Borehole No.:	MW4	**Sampled ID:**	-
Depth:	7.58 m	**Date Sampled:**	n/a

Lithologic Description: Shale

Initial Specimen Parameters	
Diameter, cm	6.2
Height, cm	12.7
Height-to-Diameter Ratio	2.0
Volume, cm^3	390.5
Mass, g	1036.8
Bulk Density, kg/m^3	2655
Moisture Condition	As Received
Moisture Content, %	2.3

Maximum Applied Load, kN	93.5
Compressive Strength, MPa	30.5

REMARKS:

PERFORMED BY:	M. Mitchell	**DATE:**	December 3, 2019
VERIFIED BY:	Michael Braverman	**DATE:**	December 16, 2019

Unconfined Compressive Strength of Intact Rock Core Specimen
ASTM D 7012, ASTM D 4543

Client : Infrastructure Ontario

Project : Children Hospital

Project N° : 11205379

Sample N° : BH21-rc5

Depth : 8,13 - 8,24 m

Sampling Date :

Testing Apparatus Used :

Loading device N° _9130____

Caliper N° _1_____

Technical Data

				Average	
Diameter :	63.37	63.24	63.31	**63.31**	(mm)
Length :	111.13	112.75	110.08	**111.32**	(mm)
Straightness (0.5mm maximum) (S1) :	0.3	0.3	0.2	**0.3**	(mm)
Flatness (25µm maximum) (FP2) :	Ok	Ok	Ok	**Ok**	(µm)
Parallelism (0.25 ° maximum) (FP2) :	0.15	0.10	0.20	**0.15**	(°)

Mass : 937.9 (g) Volume: 350398 (mm^3)

Density : 2677 (kg/m^3)

Moisture Conditions : Dry

Loading Rate (0.5 to 1.0 MPa / sec) : 0.90 (MPa/sec)

Type of Fracture : Along Foliation

Test Duration (2-15 Minutes) : 78 (seconds)

Maximum Applied Load : 220.86 (kN)

Compressive Strength : 70.2 (MPa)

View of Specimen

Before Test :

After Test :

Remarks :

Analysed by : J. Lalonde **Date :** 8/12/2022

Verified by : **Date :** 9/13/2022

FINAL REPORT

Results of Free Swell Tests on Shale of Georgian Bay Formation and Blue Mountain/Billings Formations

Children's Hospital of Eastern Ontario Campus – Preliminary Geotechnical Investigation
Ottawa, ON

Project No. 11205379

Prepared for:

GHD
111 Brunel Road Suite 200
Mississauga, ON

K. Y. Lo Inc.

July 22, 2020

TABLE OF CONTENT

Appendix

1. Introduction

K.Y. Lo Inc. was retained by GHD to test the swelling characteristics of shale cores of the Georgian Bay Formation and Blue Mountain/Billings Formations for the Children's Hospital of Eastern Ontario Campus – Preliminary Geotechnical Investigation project in Ottawa. Rock cores from boreholes MW2D, MW3D and MW4D were provided for testing. Four (4) free swell tests were requested by GHD to be performed on these rock cores; one from MW2D, one from MW3D and two from MW4D.

This report presents factual laboratory results of four (4) free swell tests completed on the received rock samples. The results of calcite content test, pore water salinity tests and water content tests done on the same rock samples are also included.

2. Methodology of Testing

2.1 Free Swell Test

Free swell test (FST) was performed using the method developed by Lo et al. (1978). In free swell tests, freshly trimmed rock specimen is permitted to deform unrestrictedly in all directions. A typical specimen for a free swell test is shown on Figure 1. The diameter-ratio of the cylindrical sample should be approximately one to one. However, sometimes it is controlled by availability of the rock core.

Three orthogonal dimensional changes of the specimen preserved under constant temperature and 100% relative humidity with direct access to fresh (tap) water, are measured with time. The "UWO deformation gauge" shown on Figure 1 is used to measure the dimensions of the two horizontal (X and Y) and vertical (axial/Z) directions for 100 days. Test data were plotted as strain vs. the logarithm (to the base of 10) of elapsed time.

2.2 Water Content, Salinity and Calcite Content Tests

The gravimetric method was used to measure water content of the rock sample. In this method the measurement of water content is direct, being simply the mass of water lost on drying in a convection oven at a temperature of 105^{o}C until the mass remains constant.

It was experimentally established that shales need 4 days of drying to reach constant dry mass.

The salinity of rock pore fluid was determined by adding distilled water to the powdered rock sample and then centrifuging the mixture. The electrical conductivity of the supernatant of the centrifuged solution was measured using a conductivity meter (WTW TetraCon 325), and then converted to the salinity (salt concentration) expressed in grams per litre of pore water, NaCl equivalent.

Water content and salinity of each swell test specimen were measured before and after the test (after 100 days of swelling). Before a swell test, water content and salinity were measured on rock pieces adjacent to the swell test specimen. After swell test, water content and salinity tests were performed on the actual swell test specimen. The gasometric method using the Chittick apparatus (Dreimanis, 1962) was used to estimate the amount of calcite in the rock samples after swell test.

3. Results of Laboratory Testing

The results of free swell tests are presented on the attached graphs. The results of calcite content, water content and salinity tests performed before and after free swell tests are presented on the insert in each graph.

K.Y. Lo Inc.

Prepared by
Silvana Micic, Ph.D., P.Eng.

Reviewed by
Kwan Yee Lo, Ph.D., P.Eng., FEIC

4. References

Dreimans, A. 1962. Quantitative Gasometric Determination of Calcite and Dolomite Using Chittick Apparatus. Journal of Sedimentary Petrology, Vol. 32, pp. 520-529.

Lo, K.Y., Wai, R.S.C., Palmer, J.H.L. and Quigley, R.M. 1978. Time-dependent Deformation of Shaly Rocks in Southern Ontario. Canadian Geotechnical Journal, Vol. 15, pp. 537-547.

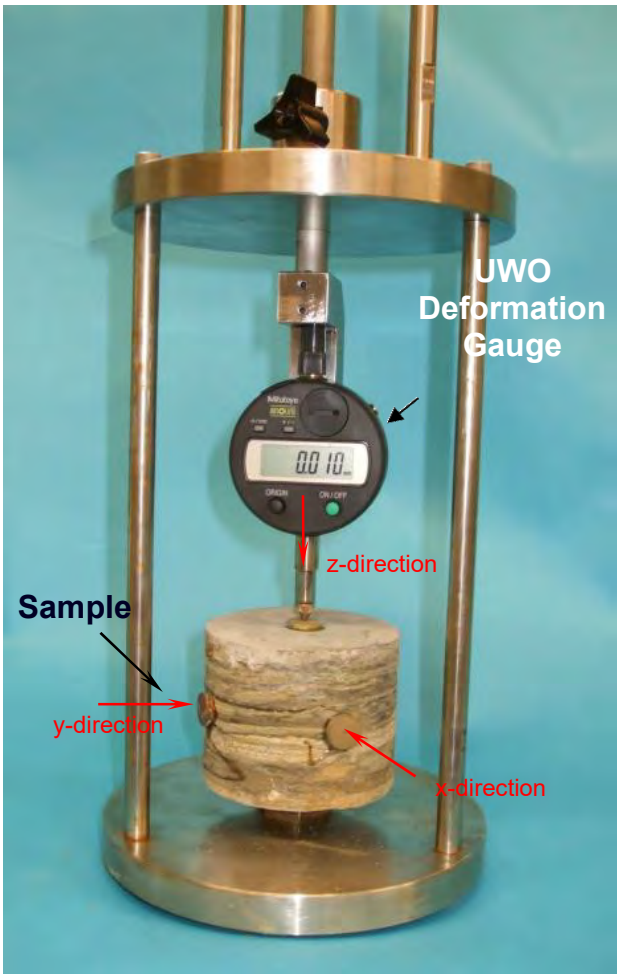
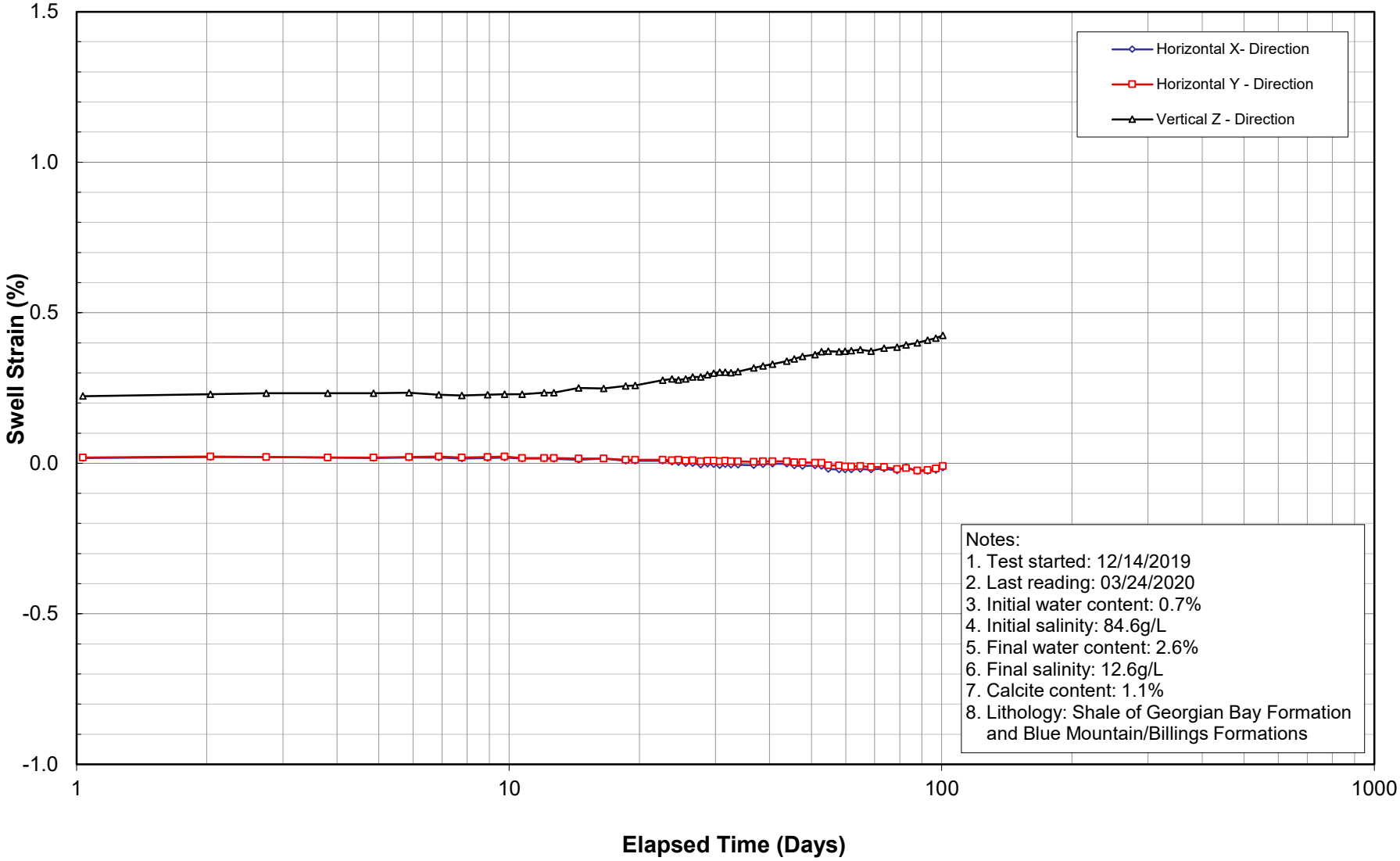


Figure 1. Typical set-up for free swell tests

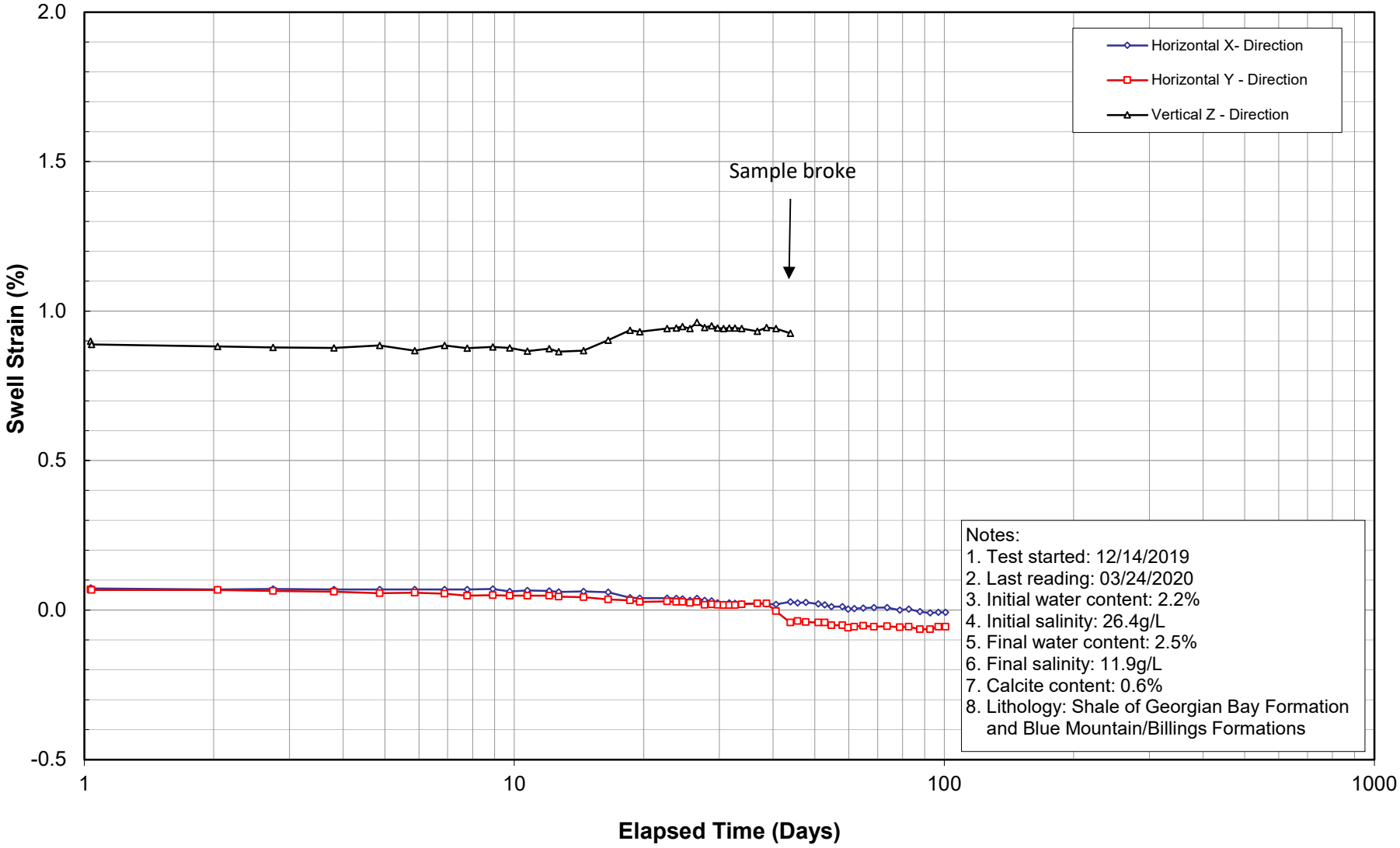
.

Appendix A – Results of Free Swell Tests

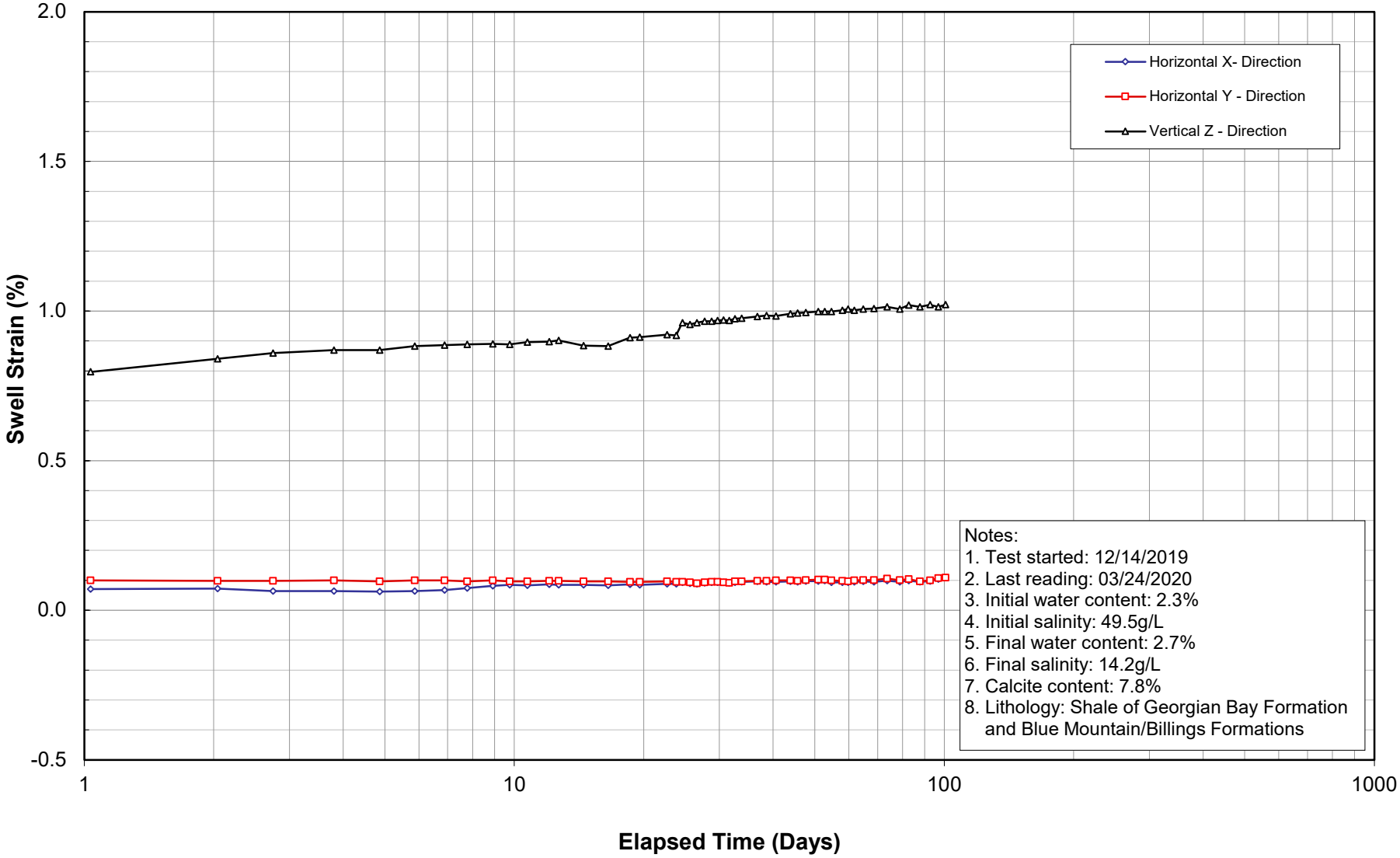
Free Swell Test
Children's Hospital of Eastern Ontario Campus -
Preliminary Geotechnical Investigation, Ottawa
FST-MW2D-1
BH: MW2D; **Depth**: 4.38m - 4.44m



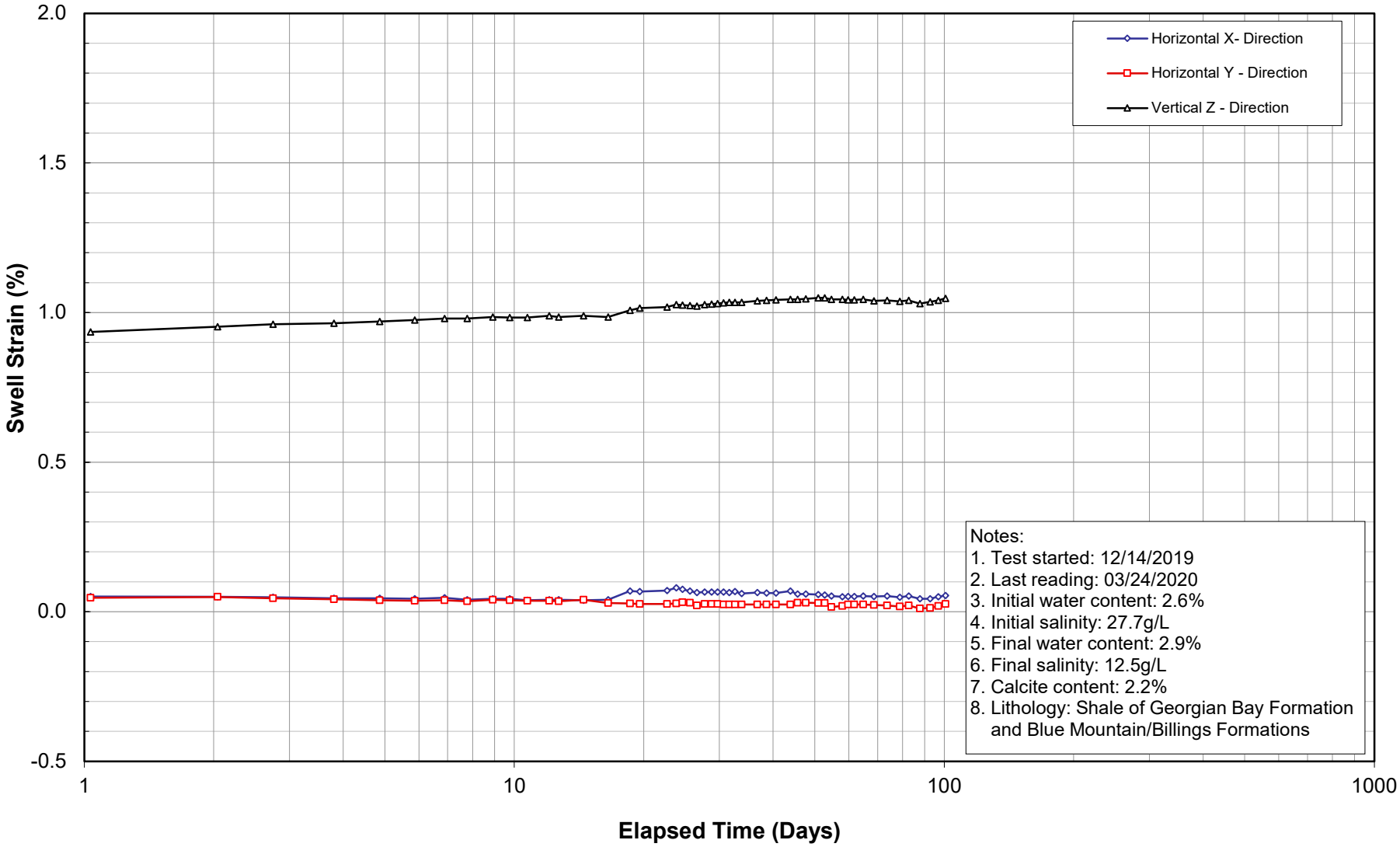
Free Swell Test
Children's Hospital of Eastern Ontario Campus -
Preliminary Geotechnical Investigation, Ottawa
FST-MW3D-1
BH: MW3D; **Depth**: 4.85m - 4.91m



Free Swell Test
Children's Hospital of Eastern Ontario Campus -
Preliminary Geotechnical Investigation, Ottawa
FST-MW4D-1
BH: MW4D; **Depth**: 4.51m - 4.60m



Free Swell Test
Children's Hospital of Eastern Ontario Campus -
Preliminary Geotechnical Investigation, Ottawa
FST-MW4D-2
BH: MW4D; **Depth**: 4.84m - 4.90m



MASW Investigation
Seismic Site Classification

Portion of Children's Hospital of
Eastern Ontario
401 and 407 Smyth Road
Ottawa, Ontario

Infrastructure Ontario

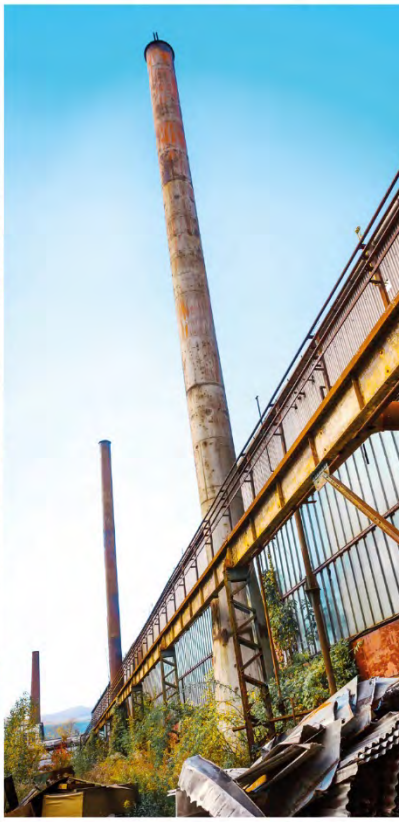


Table of Contents

Figure Index

Table Index

Appendix Index

1. Introduction

GHD was retained by Ontario Infrastructure and Lands Corporation (Client) to conduct a Multichannel Analysis of Surface Waves (MASW) investigation for the proposed 1Door4Care building which will be part of the Children's Hospital of Eastern Ontario (CHEO) Campus in Ottawa, Ontario (Site). The proposed development would be located at the southwestern portion of the CHEO's Campus, which is currently developed with parking lot and landscape areas. A site location map is provided on **Figure 1**.

The purpose of the MASW survey was to assist with the seismic site class determination by measuring the average shear wave velocity approximately within the upper 30 m of the soil/rock profile below the founding elevation of the proposed building at the site. The shear wave velocity measurements were carried out along two MASW survey lines assumed to be representative of the Site. The investigation line locations are shown in the attached **Figure 2**.

Based on the available geotechnical information (GHD Report 3 – Preliminary Geotechnical Investigation, Jan 2020), the Site in general consists of fill materials consisting of sitly sand to sand. The fill is underlain by sandy silty clay deposit which is underlain by bedrock. The thickness of the overburden (fill and native) layer range from 1.0 to 3.81 m. The boreholes were terminated in the bedrock.

The SPT 'N' values within the native layer ranged from 6 to over 50 blows per 0.3 m of penetration. The low 'N' values (less than 15) in some boreholes were obtained at the interface of fill and native layer. The SPT 'N' values (above 15) indicate the stiff to hard consistency of the native deposit.

2. MASW Procedure

To carry out the MASW test, 24 transducers (geophones) are deployed along a line at certain distances from a seismic source. The length of the geophone array determines the deepest investigation depth that can be obtained from the measurements. The source should produce enough seismic energy over the desired test frequency range to allow for detection of Rayleigh waves above background noise (Park et al 1999[1]). A common seismic source is either a sledgehammer or a drop weight hitting a metallic or rubber base plate set at ground surface. The existing traffic noise or the noise generated by heavy machinery travelling close to the survey line can also be utilized as a source for investigating deep soil layers. For this site, only active seismic source is used. Figure 2.1 shows a typical MASW setup.

[1] Park, C.B., Miller, R.D., and Xia, J., 1999, Multichannel analysis of surface waves: Geophysics, v. 64, n. 3, pp. 800-808.

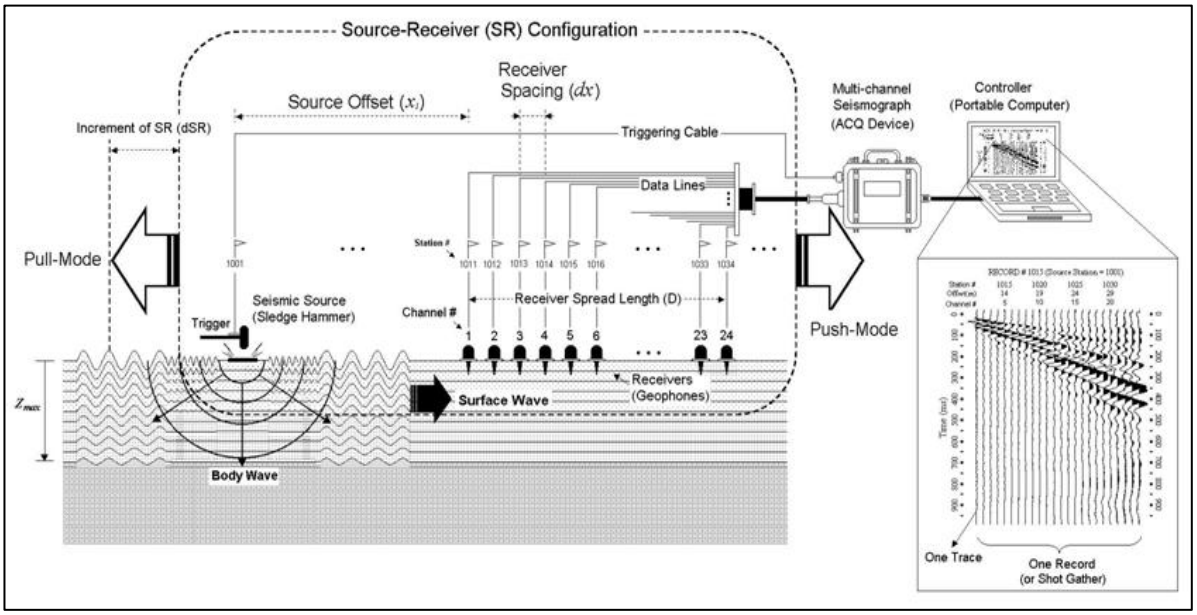


Figure 2.1: Schematic Layout of MASW Test Setup (Park et al 1999 and Xia et al 1999[2])

3. Fieldwork

The fieldwork for this MASW investigation program was carried out on December 17, 2019 by GHD professionals. The field data was collected using a 24 channel seismograph (Geometrics Geode 24 consol #3389), twenty-four 4.5 Hz geophones, and one 24 take-out cable with 5 m spacing. A Panasonic Toughbook© laptop was used in the field to record and collect the seismic data utilizing Geometrics single geode OS controller version 9.14.0.0.

The survey was carried out along two survey lines along the north-south and east-west directions in the vicinity of boreholes and monitoring wells MW-9, BH-6, BH-7, BH-8, MW-4S, and MW-2S as shown on **Figure 2**. For all line locations, the geophones were installed 75 mm into the ground by manually pushing them into position.

A multi geometry approach was utilized for data collection along both lines. The active data sets were collected using a 4.5 kg sledge hammer hitting the ground surface at three different offset distances (distance between the source and first geophone) along each survey line. The following table summarizes the geometry for each investigation line.

MASW Line Geometry

Line No.	Designation	Geophone Spacing (m)	Array Length (m)	Offset Distances (m)
Line 1 and Line 2	Long	2.0	46.0	24.0, 16.0, 8.0
	Short	1.0	23.0	12.0, 8.0, 4.0

[2] Xia, J., Miller, R.D., and Park, C.B., 1999, Estimation of near-surface shear-wave velocity by inversion of Rayleigh waves: Geophysics, v. 64, n. 3, p. 691-700.

Three sets of data files (active) were collected for each array location/set up. For the active survey measurements, the ground vibrations were recorded for four seconds with one sample per 0.25 ms.

4. Data Interpretation

Data analysis including generation of dispersion curves, inversion of the obtained dispersion curves and development of the 1D shear wave velocity profiles at the Site were carried out using SurfSeis© version 6.0. The dispersion curves were calculated at the middle stations along each line. At each investigation line, the dispersion images obtained from active data at different offsets were stacked to obtain a combined dispersion curve. The data inversion was carried out using a 10-layer soil velocity numerical model to obtain 1D shear wave velocity profiles at the location of each mid station. The calculated 1D velocity profile along the investigation lines are shown on the attached Shear Wave Velocity Profile. **Figure 3** shows the obtained results at the proposed location for the construction of the building.

In accordance with the requirements of Ontario Building Code (OBC 2012) and National Building Code of Canada 2015 (NBC 2015), the variation of the measured shear wave velocity versus depth up to 30 m below the proposed founding level of the building (assumed to be 1.5 m bgs) was obtained along each line and is shown on Tables 1-A and 1-B. The average shear wave velocity within the upper 30 m of the soil/rock profile (Vs_{30}) immediately below the founding level of the building (at 3.0 m bgs) were obtained utilizing the averaging scheme introduced in Sentence 4.1.8.4 (2) of Commentary J of NBC (2010) User's Guide.

Based on the calculations presented in the attached Tables, the lowest average shear wave velocity (from 3.0 m bgs to 33.0 m bgs) along the investigation line is **1302 m/s** (along **Line 1**). Therefore, in accordance Table 4.1.8.4.A of OBC 2012 (Table 2) and based on the measured average shear wave velocity, for seismic load calculations the Site can be classified as Class 'B'.

As per the Geotechnical report (GHD, 2019), the foundation of the structure will be supported on native sandy silt, the Site can be classified as **Class 'C'. As per OBC 2012, Site Class A and B are only applicable if footings are founded on bedrock.**

The seismic site classification provided in this report is based solely on the shear wave velocity values derived from the MASW method and that it can be superseded by other geotechnical information as per requirement from NBC (2010).

The seismic hazards for the site as obtained from Natural Resources Canada (NRC) website are provided as **Appendix A** to this correspondence.

5. Closure

It is important to emphasize that the results and conclusions of the MASW analysis are based on the available geotechnical information and the survey conducted along two investigation lines. Should any conditions at the Site be encountered which differ from those found at the test locations, we request that we be notified immediately in order to permit a reassessment of our recommendations.

All of Which is Respectfully Submitted,

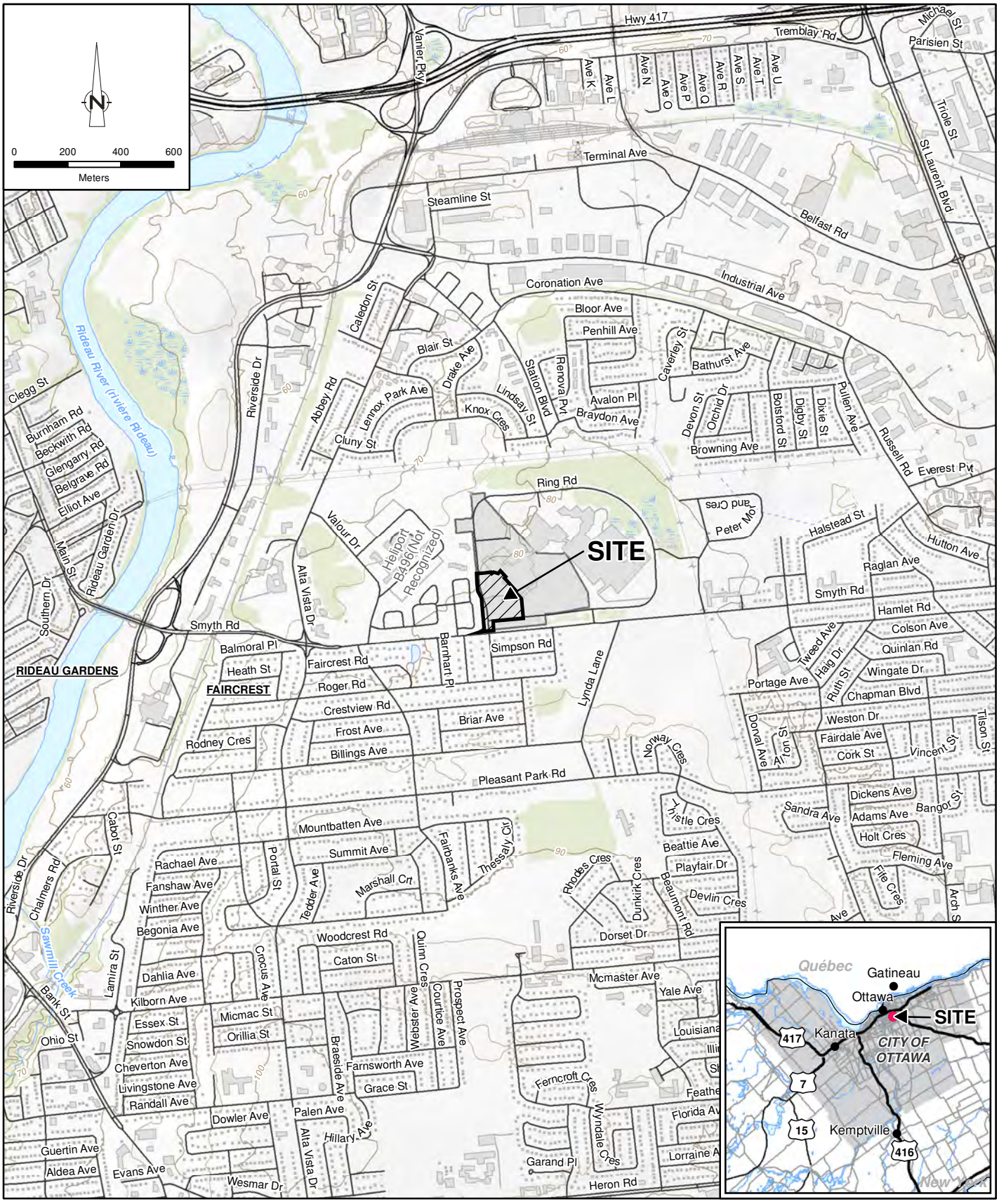
GHD

Hassan Ali, Ph.D. P. Eng.

Ali Ghassemi, Ph.D.

Farsheed Bagheri, P. Eng.

Figures



Source: MNRF NRVIS, 2018. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2020

PARKING LOT AND ACCESS ROADS
PORTION OF CHILDREN'S HOSPITAL OF EASTERN ONTARIO
401 AND 407 SMYTH ROAD, OTTAWA, ONTARIO

11205379
Jan 14, 2020

SITE LOCATION MAP

FIGURE 1

GIS File: Q:\GIS\PROJECTS\11205000s\11205379\Layouts\202001_MASW\11205379_202001_MASW_GIS001.mxd

0 10 20 30m

Coordinate System:
UTM ZONE 18 NAD83
METRES

N

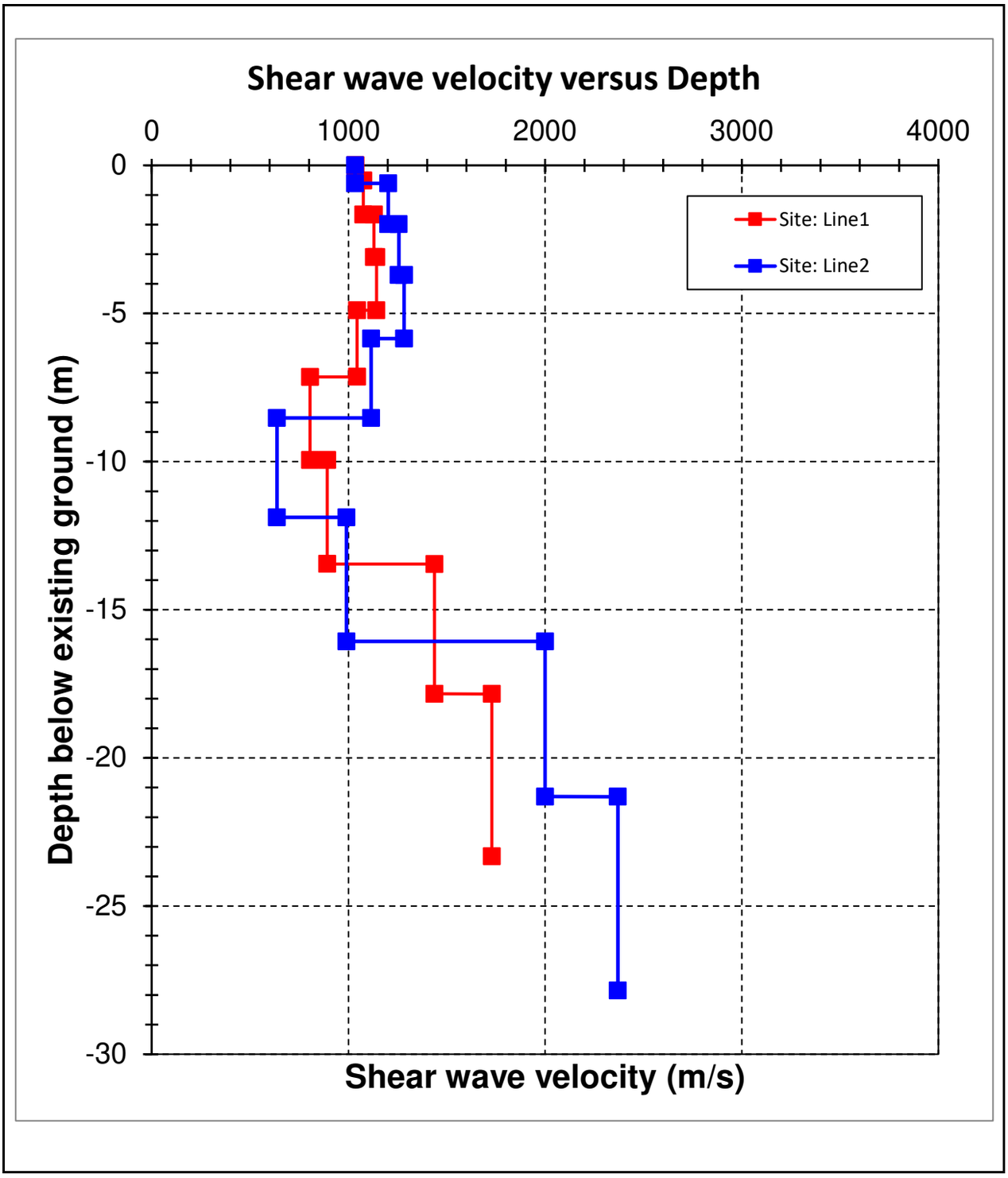
GHD

PROPOSED 1DOOR4CARE BULIDING
CHILDREN'S HOSPITAL OF
EASTERN ONTARIO CAMPUS
401 SMYTH ROAD, OTTAWA, ONTARIO

SITE PLAN AND
INVESTIGATIVE LOCATIONS

Project No. **11205379**
Date **January 15,2020**

FIGURE 2



Infrastructure Ontario
Proposed 1Door4Care Development
Part of Childrens Hospital of Eastern Ontario Campus
401 and 407 Smyth Road, Ottawa Ontario

SHEAR WAVE VELOCITY VS DEPTH

PROJECT NO.
11205379
DATE
13-Jan-19

FIGURE NO. 3

Tables

Table 1
Summary of Shear Wave Velocity Measurements
Seismic Site Class Determination
Proposed 1Door4Care Development
Part of Childrens Hospital of Eastern Ontario Campus
401 and 407 Smyth Road, Ottawa Ontario

Table 1-A: Average Shear Wave Velocity (VS_{30})
(Assumed foundaiton at 3.0 m below existing ground surface)

Line 1

Layer No.	Depth (m bgs)		Thickness	V_s	d_i/V_{si}
	From	To	m	m/s	
1	3.0	3.1	0.1	1130	0.0001
2	3.1	4.9	1.8	1143	0.0016
3	4.9	7.1	2.2	1045	0.0021
4	7.1	9.9	2.8	805	0.0035
5	9.9	13.5	3.5	893	0.0039
6	13.5	17.8	4.4	1438	0.0030
7	17.8	33.0	15.2	1729	0.0088
Total			30.0		0.0230
Average Shear Wave Velocity Along the Line (m/s)					***1302***

Table 1-B: Average Shear Wave Velocity (VS_{30})
(Assumed foundaiton at 3.0 m below existing ground surface)

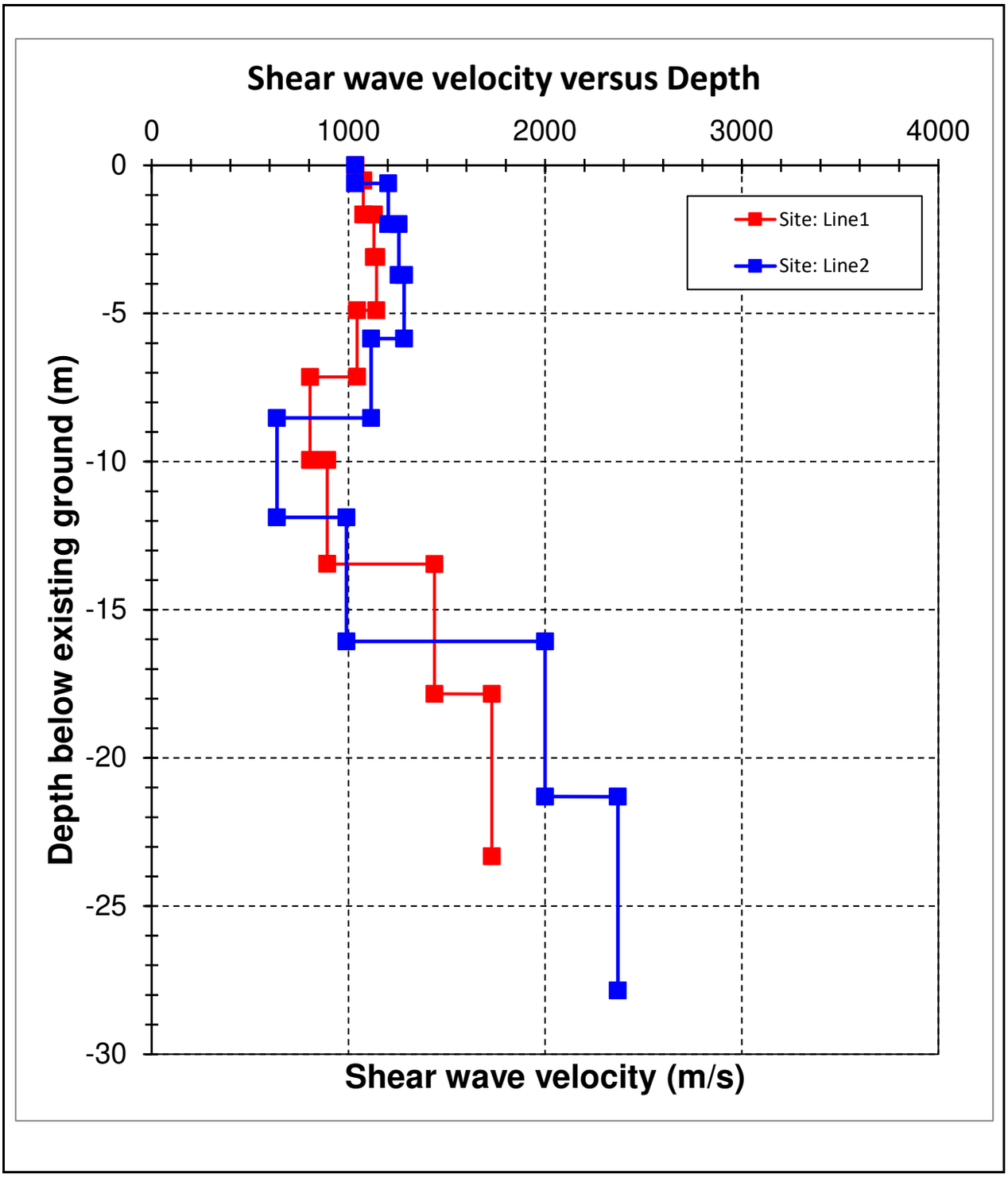
Line 2

Layer No.	Depth (m bgs)		Thickness	V_s	d_i/V_{si}
	From	To	m	m/s	
1	3.0	3.7	0.7	1256	0.0006
2	3.7	5.8	2.1	1284	0.0017
3	5.8	8.5	2.7	1115	0.0024
4	8.5	11.9	3.4	637	0.0053
5	11.9	16.1	4.2	990	0.0042
6	16.1	21.3	5.2	2000	0.0026
7	21.3	33.0	11.7	2370	0.0049
Total			30.0		0.0217
Average Shear Wave Velocity Along the Line (m/s)					***1384***

Average VS_{30} = **1343** **m/s**

Recommended Site Class: **B** Subjected to Code requirements

Notes:
1 - The Seismic Site class is recommended in accordance to Table 4.1.8.4.A of the National Building code of Canada 2010 and based on the lowest measured average shear wave velocity measured along the investigated lines.
2 - VS30 is calculated based on the average shear wave velocity below the proposed founding elevation.
3 - Site Classes A and B are only applicable if footings are founded on bedrock or there is no more than 3.0 m of soil between founding elevation and bedrock.
4 - The recommended site class is only applicable if site conditions for Site Class F (liquefiable soil/soft soil layers more than 3.0 m thick) are not applicable.



Infrastructure Ontario
Proposed 1Door4Care Development
Part of Childrens Hospital of Eastern Ontario Campus
401 and 407 Smyth Road, Ottawa Ontario

SHEAR WAVE VELOCITY VS DEPTH

PROJECT NO.
11205379
DATE
13-Jan-19

FIGURE NO. 3

Table 2

Site Classification for Seismic Site Response
Forming Part of Sentences 4.1.8.4. (1) to (3)

	Ground Profile Name	Average Properties in Top 30 m		
		Average Shear Wave Velocity, $\bar{V}s$ (m/s)	Average Standard Penetration Resistance, $\bar{N}_{60}$	Soil Undrained Shear Strength, s_u
A	Hard rock	$\bar{V}_s > 1500$	N/A	N/A
B	Rock	$760 < \bar{V}_s \leq 1500$	N/A	N/A
C	Very dense soil and soft rock	$360 < \bar{V}_s < 760$	$\bar{N}_{60} > 50$	$s_u > 100$ kPa
D	Stiff soil	$180 < \bar{V}_s < 360$	$15 \leq \bar{N}_{60} \leq 50$	50 kPa $< s_u \leq 100$ kPa
E	Soft soil	$\bar{V}_s < 180$	$\bar{N}_{60} \leq 15$	$s_u < 50$ kPa
		Any profile with more than 3m of soil with the following characteristics: plasticity index: PI > 20 moisture content w ≥ 40%, and undrained shear strength: $s_u < 25$ kPa		
F	Other soils	Site-specific evaluation required		

Reference: *2012 Ontario Building Code Compendium, Division B – Part 4, Section 4.1.8.4.*

Appendices

Appendix A
Seismic Hazard Values

about GHD

GHD is one of the world's leading professional services companies operating in the global markets of water, energy and resources, environment, property and buildings, and transportation. We provide engineering, environmental, and construction services to private and public sector clients.

Farsheed Bagheri
Farsheed.Bagheri@ghd.com
289.374.3816

www.ghd.com

AGAT Laboratories

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

CLIENT NAME: **GHD LIMITED**
455 Phillip St
WATERLOO, ON N2V1C2
(519) 884-0510

ATTENTION TO: **Jennifer Balkwill**

PROJECT: **11205379-30 (PO#73518459)**

AGAT WORK ORDER: **19T553493**

SOIL ANALYSIS REVIEWED BY: **Amanjot Bhela, Inorganic Supervisor**

DATE REPORTED: **Jan 08, 2020**

PAGES (INCLUDING COVER): **6**

VERSION*: **2**

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

*NOTES
VERSION 2:Revised report issued January 08, 2020.

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

AGAT Laboratories

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

Certificate of Analysis

AGAT WORK ORDER: 19T553493

PROJECT: 11205379-30 (PO#73518459)

CLIENT NAME: GHD LIMITED

ATTENTION TO: Jennifer Balkwill

SAMPLING SITE:

SAMPLED BY:

Loss on Ignition (Soil)

DATE RECEIVED: 2019-12-09 **DATE REPORTED: 2020-01-08**

					SAMPLE DESCRIPTION:	**MW1**	**BH6**	**MW5**	**MW2**	**MW3**	**BH12**
					SAMPLE TYPE:	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**
					DATE SAMPLED:	**2019-12-07**	**2019-12-07**	**2019-12-07**	**2019-12-07**	**2019-12-07**	**2019-12-07**
Parameter	**Unit**	**G / S**	**RDL**	**Date Prepared**	**Date Analyzed**	**783860**	**783884**	**783885**	**783886**	**783887**	**783888**
Loss on Ignition	%		0.01	2020-01-06	2020-01-07	1.09	2.04	2.52	2.97	1.22	3.30

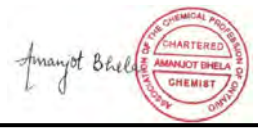
					SAMPLE DESCRIPTION:	**BH13**	**BH14**
					SAMPLE TYPE:	**Soil**	**Soil**
					DATE SAMPLED:	**2019-12-07**	**2019-12-07**
Parameter	**Unit**	**G / S**	**RDL**	**Date Prepared**	**Date Analyzed**	**783889**	**783890**
Loss on Ignition	%		0.01	2020-01-06	2020-01-07	2.28	2.46

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

783860-783890 Loss on Ignition is not an accredited analysis. Analysis was performed at 475°C .

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:



AGAT Laboratories

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

Quality Assurance

CLIENT NAME: GHD LIMITED

AGAT WORK ORDER: 19T553493

PROJECT: 11205379-30 (PO#73518459)

ATTENTION TO: Jennifer Balkwill

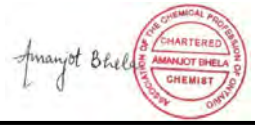
SAMPLING SITE:

SAMPLED BY:

Soil Analysis

RPT Date: Jan 08, 2020			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Loss on Igniton															
LOI	783887		11.0	11.0	0.0%	< 0.5									
Loss on Ignition (Soil)															
Loss on Ignition	783860	783860	1.09	1.06	2.8%	< 0.01									

Certified By:



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

Method Summary

CLIENT NAME: GHD LIMITED

AGAT WORK ORDER: 19T553493

PROJECT: 11205379-30 (PO#73518459)

ATTENTION TO: Jennifer Balkwill

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Loss on Ignition		MOE E3139	FURNACE
LOI	INOR-181-6030	ASTM D2974-07a	GRAVIMETRIC

AGAT Laboratories

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

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Report Information:

Company: GHD Ltd
Contact: Ahmed Sonnou
Address: 111 Brunel Rd
Mississauga Road
Phone: 647 463 3522 Fax:
Reports to be sent to:
1. Email: Ahmed.Sonnou@ghd.com
2. Email:

Project Information:

Project: 11105379 - GHD
Site Location:
Sampled By:
AGAT Quote #: PO:
Please note: If quotation number is not provided, client will be billed full price for analysis

Invoice Information:

Bill To Same: Yes ☐ No ☐

Company: GHD Ltd
Contact: Ahmed Sonnou
Address: 111 Brunel Road, Mississauga, ON
Email: Ahmed.Sonnou@ghd.com

Regulatory Requirements:

☐ No Regulatory Requirement
(Please check all applicable boxes)

☐ Regulation 153/04
Table (Indicate One) ☐ Ind/Com ☐ Res/Park ☐ Agriculture
Soil Texture (Check One) ☐ Coarse ☐ Fine

☐ Sewer Use
☐ Sanitary ☐ Storm
Region (Indicate One)
☐ MISA

☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
(Indicate One)

Is this submission for a **Record of Site Condition?** ☐ Yes ☐ No

Report Guideline on *Certificate of Analysis* ☐ Yes ☐ No

Laboratory Use Only

Work Order #: 19T553493
Cooler Quantity: 1
Arrival Temperatures: 2.0 | 1.7 | 2.3
Custody Seal Intact: ☐ Yes ☐ No ☒ N/A
Notes: ICE

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days
Rush TAT (Rush Surcharges Apply)
☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day
OR Date Required (Rush Surcharges May Apply):
Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*
For 'Same Day' analysis, please contact your AGAT CPM

Sample Matrix Legend

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

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI (Y/N)	O. Reg 153: Metals and Inorganics (☐ All Metals ☐ 153 Metals (excl Hydrides) ☐ Hydride Metals ☐ 153 Metals (incl. Hydrides))	ORPs: ☐ B-HWS ☐ Cl ☐ CN ☐ Cr^{6+} ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2	Volatiles: ☐ VOC ☐ BTEX ☐ THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☐ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	Sewer Use	Organic Contamination / Custom Standard				Potentially Hazardous or High Concentration (Y/N)
MW1	Dec 07	10:00 am	1	SOIL																	✓			
BH6	"	"	1	"																	✓			
MW5	"	"	1	"																	✓			
MW2	"	"	1	"																	✓			
MW3	"	"	1	"																	✓			
BH12	"	"	1	"																	✓			
BH13	"	"	1	"																	✓			
BH14	"	"	1	"																	✓			

Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time
Mod-Shamy Ibrahim	Dec 9/19	9:08 am	N. Dang	Dec 9	4:30
[signature]					

Page ____ of ____

No: T 098054

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

CLIENT NAME: GHD LIMITED
455 Phillip St
WATERLOO, ON N2V1C2
(519) 884-0510

ATTENTION TO: Jennifer Balkwill

PROJECT: 11205379 (PO#73518459)

AGAT WORK ORDER: 19T555371

MISCELLANEOUS ANALYSIS REVIEWED BY: Yris Verastegui, Report Reviewer

SOIL ANALYSIS REVIEWED BY: Yris Verastegui, Report Reviewer

DATE REPORTED: Dec 31, 2019

PAGES (INCLUDING COVER): 8

VERSION*: 1

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

*NOTES

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

AGAT Laboratories

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

Certificate of Analysis

AGAT WORK ORDER: 19T555371

PROJECT: 11205379 (PO#73518459)

CLIENT NAME: GHD LIMITED

ATTENTION TO: Jennifer Balkwill

SAMPLING SITE:

SAMPLED BY:

Sulphide

DATE RECEIVED: 2019-12-12

DATE REPORTED: 2019-12-31

Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	11205379-MW1 (SS2+SS3) Soil 2019-12-11 796593	11205379-MW1 (SS6) Soil 2019-12-11 796645	11205379-MW2- SS4 Soil 2019-12-11 796646	11205379-MW3- SS4 Soil 2019-12-11 796647	11205379-MW4 (SS2+SS3) Soil 2019-12-11 796648	11205379-MW5- SS4 Soil 2019-12-11 796649
SAMPLE DESCRIPTION:											
SAMPLE TYPE:											
DATE SAMPLED:											
Sulfide (S2-)	%		0.05			0.18	0.94	0.36	0.31	0.14	0.75

Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	11205379-BH6 (SS2+SS3) Soil 2019-12-11 796650	11205379-BH7 (SS3) Soil 2019-12-11 796651	11205379-BH8 (SS3) Soil 2019-12-11 796652	11205379-BH9 (SS3+SS4) Soil 2019-12-11 796653	11205379-BH12 (SS3+SS4) Soil 2019-12-11 796654
SAMPLE DESCRIPTION:										
SAMPLE TYPE:										
DATE SAMPLED:										
Sulfide (S2-)	%		0.05			0.60	0.86	0.30	0.09	0.06

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

796593-796654 Analysis performed at AGAT 5623 McAdam.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Iris Verástegui

AGAT Laboratories

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

Certificate of Analysis

AGAT WORK ORDER: 19T555371

PROJECT: 11205379 (PO#73518459)

CLIENT NAME: GHD LIMITED

ATTENTION TO: Jennifer Balkwill

SAMPLING SITE:

SAMPLED BY:

Corrosivity Package

DATE RECEIVED: 2019-12-12

DATE REPORTED: 2019-12-31

						11205379-MW1		11205379-MW1		11205379-MW2-
					SAMPLE DESCRIPTION:	(SS2+SS3)		(SS6)		SS4
					SAMPLE TYPE:	Soil		Soil		Soil
					DATE SAMPLED:	2019-12-11		2019-12-11		2019-12-11
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	796593	RDL	796645	RDL	796646
Chloride (2:1)	µg/g		2	2019-12-19	2019-12-19	60	4	185	2	145
Sulphate (2:1)	µg/g		2	2019-12-19	2019-12-19	200	4	1000	2	130
pH (2:1)	pH Units		NA	2019-12-20	2019-12-20	7.87	NA	7.78	NA	7.78
Electrical Conductivity (2:1)	mS/cm		0.005	2019-12-19	2019-12-19	0.447	0.005	1.34	0.005	0.765
Resistivity (2:1) (Calculated)	ohm.cm		1	2019-12-19	2019-12-19	2240	1	746	1	1310
Redox Potential 1	mV		NA	2019-12-19	2019-12-19	269	NA	241	NA	223
Redox Potential 2	mV		NA	2019-12-19	2019-12-19	268	NA	219	NA	214
Redox Potential 3	mV		NA	2019-12-19	2019-12-19	271	NA	230	NA	219

						11205379-MW3-		11205379-MW4		11205379-MW5-	11205379-BH6
					SAMPLE DESCRIPTION:	SS4		(SS2+SS3)		SS4	(SS2+SS3)
					SAMPLE TYPE:	Soil		Soil		Soil	Soil
					DATE SAMPLED:	2019-12-11		2019-12-11		2019-12-11	2019-12-11
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	796647	RDL	796648	RDL	796649	796650
Chloride (2:1)	µg/g		4	2019-12-19	2019-12-19	736	2	44	4	531	403
Sulphate (2:1)	µg/g		4	2019-12-19	2019-12-19	286	2	96	4	337	272
pH (2:1)	pH Units		NA	2019-12-20	2019-12-20	7.88	NA	8.29	NA	9.21	8.54
Electrical Conductivity (2:1)	mS/cm		0.005	2019-12-19	2019-12-19	1.60	0.005	0.460	0.005	1.54	1.17
Resistivity (2:1) (Calculated)	ohm.cm		1	2019-12-19	2019-12-19	625	1	2170	1	649	855
Redox Potential 1	mV		NA	2019-12-19	2019-12-19	234	NA	179	NA	173	180
Redox Potential 2	mV		NA	2019-12-19	2019-12-19	241	NA	186	NA	173	182
Redox Potential 3	mV		NA	2019-12-19	2019-12-19	246	NA	193	NA	179	186

Certified By: Iris Verástegui

AGAT Laboratories

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

Certificate of Analysis

AGAT WORK ORDER: 19T555371

PROJECT: 11205379 (PO#73518459)

CLIENT NAME: GHD LIMITED

ATTENTION TO: Jennifer Balkwill

SAMPLING SITE:

SAMPLED BY:

Corrosivity Package

DATE RECEIVED: 2019-12-12

DATE REPORTED: 2019-12-31

						11205379-BH7		11205379-BH8		11205379-BH9
					SAMPLE DESCRIPTION:	(SS3)		(SS3)		(SS3+SS4)
					SAMPLE TYPE:	Soil		Soil		Soil
					DATE SAMPLED:	2019-12-11		2019-12-11		2019-12-11
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	796651	RDL	796652	RDL	796653
Chloride (2:1)	µg/g		2	2019-12-19	2019-12-19	117	4	416	2	167
Sulphate (2:1)	µg/g		2	2019-12-19	2019-12-19	365	4	225	2	124
pH (2:1)	pH Units		NA	2019-12-20	2019-12-20	8.01	NA	8.62	NA	7.95
Electrical Conductivity (2:1)	mS/cm		0.005	2019-12-19	2019-12-19	0.732	0.005	1.12	0.005	0.573
Resistivity (2:1) (Calculated)	ohm.cm		1	2019-12-19	2019-12-19	1370	1	893	1	1750
Redox Potential 1	mV		NA	2019-12-19	2019-12-19	203	NA	206	NA	205
Redox Potential 2	mV		NA	2019-12-19	2019-12-19	206	NA	205	NA	205
Redox Potential 3	mV		NA	2019-12-19	2019-12-19	205	NA	208	NA	208

						11205379-BH12
					SAMPLE DESCRIPTION:	(SS3+SS4)
					SAMPLE TYPE:	Soil
					DATE SAMPLED:	2019-12-11
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	796654
Chloride (2:1)	µg/g		4	2019-12-19	2019-12-19	665
Sulphate (2:1)	µg/g		4	2019-12-19	2019-12-19	130
pH (2:1)	pH Units		NA	2019-12-20	2019-12-20	8.81
Electrical Conductivity (2:1)	mS/cm		0.005	2019-12-19	2019-12-19	1.41
Resistivity (2:1) (Calculated)	ohm.cm		1	2019-12-19	2019-12-19	709
Redox Potential 1	mV		NA	2019-12-19	2019-12-19	212
Redox Potential 2	mV		NA	2019-12-19	2019-12-19	225
Redox Potential 3	mV		NA	2019-12-19	2019-12-19	221

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

796593-796654 EC, pH, Chloride and Sulphate were determined on the extract obtained from the 2:1 leaching procedure (2 parts DI water: 1 part soil). Resistivity is a calculated parameter.
Redox potential measured on as received sample. Due to the potential for rapid change in sample equilibrium chemistry with exposure to oxidative/reduction conditions laboratory results may differ from field measured results.

Elevated RDLs indicate the degree of sample dilutions prior to the analysis to keep analytes within the calibration range, reduce matrix interference and/or to avoid contaminating the instrument.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Iris Verástegui

AGAT Laboratories

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

Quality Assurance

CLIENT NAME: GHD LIMITED

AGAT WORK ORDER: 19T555371

PROJECT: 11205379 (PO#73518459)

ATTENTION TO: Jennifer Balkwill

SAMPLING SITE:

SAMPLED BY:

Miscellaneous Analysis

RPT Date: Dec 31, 2019			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Sulphide															
Sulfide (S2-)	796593	796593	0.18	0.17	5.7%	< 0.01	97%	80%	120%						

Certified By: Iris Verástegui

AGAT Laboratories

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

Quality Assurance

CLIENT NAME: GHD LIMITED

AGAT WORK ORDER: 19T555371

PROJECT: 11205379 (PO#73518459)

ATTENTION TO: Jennifer Balkwill

SAMPLING SITE:

SAMPLED BY:

Soil Analysis

RPT Date: Dec 31, 2019			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Corrosivity Package															
Chloride (2:1)	796593	796593	60	60	0.0%	< 2	98%	80%	120%	106%	80%	120%	98%	70%	130%
Sulphate (2:1)	796593	796593	200	200	0.0%	< 2	104%	80%	120%	106%	80%	120%	101%	70%	130%
pH (2:1)	796593	796593	7.87	7.86	0.1%	NA	101%	90%	110%						
Electrical Conductivity (2:1)	796593	796593	0.447	0.448	0.2%	< 0.005	100%	90%	110%						
Redox Potential 1	1					NA	100%	90%	110%						

Comments: NA signifies Not Applicable.
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.

Certified By: Iris Verástegui

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

Method Summary

CLIENT NAME: GHD LIMITED

AGAT WORK ORDER: 19T555371

PROJECT: 11205379 (PO#73518459)

ATTENTION TO: Jennifer Balkwill

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Miscellaneous Analysis			
Sulfide (S2-)	MIN-200-12025	ASTM E1915-09	GRAVIMETRIC
Soil Analysis			
Chloride (2:1)	INOR-93-6004	McKeague 4.12 & SM 4110 B	ION CHROMATOGRAPH
Sulphate (2:1)	INOR-93-6004	McKeague 4.12 & SM 4110 B	ION CHROMATOGRAPH
pH (2:1)	INOR 93-6031	MSA part 3 & SM 4500-H+ B	PH METER
Electrical Conductivity (2:1)	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Resistivity (2:1) (Calculated)	INOR-93-6036	McKeague 4.12, SM 2510 B,SSA #5 Part 3	CALCULATION
Redox Potential 1	INOR-93-6066	G200-09, SM 2580 B	REDOX POTENTIAL ELECTRODE
Redox Potential 2	INOR-93-6066	G200-09, SM 2580 B	REDOX POTENTIAL ELECTRODE
Redox Potential 3	INOR-93-6066	G200-09, SM 2580 B	REDOX POTENTIAL ELECTRODE

AGAT Laboratories

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

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only

Work Order #: 19T55537|

Cooler Quantity: 1 (Med Blue/No Ice)
Arrival Temperatures: 7.1 6.9 6.8
Custody Seal Intact: ☐Yes ☐No ☐N/A
Notes:

Report Information:

Company: GHD Ltd
Contact: Ahmed Sonoms
Address: 111-BRUNEL ROAD
Mississauga Rd, ON
Phone: 647-463-3522 Fax:
Reports to be sent to:
1. Email: Ahmed.Sonoms@ghd.com
2. Email:

Regulatory Requirements:

☐ No Regulatory Requirement
(Please check all applicable boxes)

☐ Regulation 153/04
Table (Indicate One) ☐ Ind/Com ☐ Res/Park ☐ Agriculture
Soil Texture (Check One) ☐ Coarse ☐ Fine

☐ Sewer Use
☐ Sanitary ☐ Storm
Region (Indicate One)
☐ MISA

☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
(Indicate One)

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: Infrastructure Ontario
Site Location:
Sampled By: Shamf
AGAT Quote #: PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Is this submission for a **Record of Site Condition?** ☐ Yes ☐ No

Report Guideline on Certificate of Analysis ☐ Yes ☐ No

Invoice Information:

Bill To Same: Yes ☐ No ☐

Company: GHD Ltd
Contact: Ahmed Sonoms
Address: 111-BRUNEL ROAD, Mississauga, ON
Email: Ahmed.Sonoms@ghd.com

Sample Matrix Legend

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

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Y/N
11205379-MW1(SS2+SS3)	~~Dec 11~~	~~5:00pm~~	1	SOIL		
11205379-MW1(SS6)	11	5:00pm	1	11		
11205379-MW2-SS4	11	11	1	11		
11205379-MW3-SS4	11	11	1	11		
11205379-MW4(SS2+SS3)	11	11	1	11		
11205379-MW5-SS4	11	11	1	11		
11205379-BH6(SS2+SS3)	11	11	1	11		
11205379-BH7(SS3)	11	11	1	11		
11205379-BH8(SS3)	11	11	1	11		
11205379-BH9(SS3+SS4)	11	11	1	11		
11205379-BH12(SS3+SS4)	11	11	1	11		

Field Filtered - Metals, Hg, CrVI

O. Reg 153: Metals and Inorganics (☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (Incl. Hydrides)); ORPs: ☐ B-HWS ☐ Cl ☐ CN ☐ Cr6+ ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR

Full Metals Scan

Regulation/Custom Metals

Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2

Volatiles: ☐ VOC ☐ BTEX ☐ THM

PHCs F1 - F4

ABNs

PAHs

PCBs: ☐ Total ☐ Aroclors

Organochlorine Pesticides

TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs

Sewer Use

CORROSIVITY PACKAGE

Potentially Hazardous or High Concentration (Y/N)

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Md - Shamf ~~Hamm Hy Hamm~~	Dec 12/19	3:00pm	Neil Ramnarain	Dec-12-19	7:03PM
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time

Page ____ of ____

Nº: T 098350

8-1511 016

Pink Copy - Client | Yellow Copy - AGAT | White Copy- AGAT

Date Issued: March 28 2019

CERTIFICATE OF ANALYSIS

Work Order	: **WT2214174**	Page	: 1 of 5
Client	: **GHD Limited**	Laboratory	: Waterloo - Environmental
Contact	: Rick Hawthorne	Account Manager	: Rick Hawthorne
Address	: 455 Phillip Street Waterloo ON Canada N2L 3X2	Address	: 60 Northland Road, Unit 1 Waterloo ON Canada N2V 2B8
Telephone	: ----	Telephone	: +1 519 886 6910
Project	: 11205379-100	Date Samples Received	: 14-Sep-2022 10:30
PO	: 735-004287	Date Analysis Commenced	: 15-Sep-2022
C-O-C number	: ----	Issue Date	: 16-Sep-2022 16:35
Sampler	: CLIENT		
Site	: ----		
Quote number	: 11205379-100-SSOW 735-004287		
No. of samples received	: 8		
No. of samples analysed	: 8		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Greg Pokocky	Supervisor - Inorganic	Inorganics, Waterloo, Ontario
Joseph Scharbach		Centralized Prep, Waterloo, Ontario
Walt Kippenhuck	Team Leader - Inorganics	Inorganics, Waterloo, Ontario

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.
Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
%	percent
µS/cm	Microsiemens per centimetre
mg/kg	milligrams per kilogram
mV	millivolts
ohm cm	ohm centimetre (resistivity)
pH units	pH units

>: greater than.
<: less than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Qualifiers

Qualifier	*Description*
FR5	*As per applicable reference method(s), soil:water ratio for Fixed Ratio Leach was modified to 1:5 due to high soil organic content*

Analytical Results

WT2214174-001

Sub-Matrix:**Soil** *Client sample ID:* 11205379- BH16-SS2

(Matrix: **Soil/Solid**) *Client sampling date / time:* 14-Sep-2022

Analyte	CAS Number	Result	LOR	Unit	Method	Prep Date	Analysis Date	QCLot
Physical Tests								
conductivity (1:2 leachate)	----	2650 FR5,	10.0	µS/cm	E100-L	16-Sep-2022	16-Sep-2022	648051
moisture	----	10.4	0.25	%	E144	-	15-Sep-2022	648057
oxidation-reduction potential [ORP]	----	436	0.10	mV	E125	15-Sep-2022	15-Sep-2022	648056
pH (1:2 soil:CaCl2-aq)	----	8.26	0.10	pH units	E108A	15-Sep-2022	15-Sep-2022	648054
resistivity	----	380	100	ohm cm	EC100R	-	16-Sep-2022	-
Leachable Anions & Nutrients								
chloride, soluble ion content	16887-00-6	1300	5.0	mg/kg	E236.Cl	16-Sep-2022	16-Sep-2022	648053
sulfate, soluble ion content	14808-79-8	498	20	mg/kg	E236.SO4	16-Sep-2022	16-Sep-2022	648052

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

WT2214174-002

Sub-Matrix:**Soil** *Client sample ID:* 11205379- BH20-SS2

(Matrix: **Soil/Solid**) *Client sampling date / time:* 14-Sep-2022

Analyte	CAS Number	Result	LOR	Unit	Method	Prep Date	Analysis Date	QCLot
Physical Tests								
conductivity (1:2 leachate)	----	422 FR5,	10.0	µS/cm	E100-L	16-Sep-2022	16-Sep-2022	648051
moisture	----	10.1	0.25	%	E144	-	15-Sep-2022	648057
oxidation-reduction potential [ORP]	----	419	0.10	mV	E125	15-Sep-2022	15-Sep-2022	648056
pH (1:2 soil:CaCl2-aq)	----	7.78	0.10	pH units	E108A	15-Sep-2022	15-Sep-2022	648054
resistivity	----	2370	100	ohm cm	EC100R	-	16-Sep-2022	-
Leachable Anions & Nutrients								
chloride, soluble ion content	16887-00-6	19.6	5.0	mg/kg	E236.Cl	16-Sep-2022	16-Sep-2022	648053
sulfate, soluble ion content	14808-79-8	173	20	mg/kg	E236.SO4	16-Sep-2022	16-Sep-2022	648052

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

WT2214174-003

Sub-Matrix:**Soil** *Client sample ID:* 11205379- MW17-SS1

(Matrix: **Soil/Solid**) *Client sampling date / time:* 14-Sep-2022

Analyte	CAS Number	Result	LOR	Unit	Method	Prep Date	Analysis Date	QCLot
Physical Tests								
conductivity (1:2 leachate)	----	231 FR5,	10.0	µS/cm	E100-L	16-Sep-2022	16-Sep-2022	648051
moisture	----	<0.25	0.25	%	E144	-	15-Sep-2022	648057
oxidation-reduction potential [ORP]	----	419	0.10	mV	E125	15-Sep-2022	15-Sep-2022	648056
pH (1:2 soil:CaCl2-aq)	----	8.26	0.10	pH units	E108A	15-Sep-2022	15-Sep-2022	648054
resistivity	----	4330	100	ohm cm	EC100R	-	16-Sep-2022	-
Leachable Anions & Nutrients								
chloride, soluble ion content	16887-00-6	8.6	5.0	mg/kg	E236.Cl	16-Sep-2022	16-Sep-2022	648053
sulfate, soluble ion content	14808-79-8	54	20	mg/kg	E236.SO4	16-Sep-2022	16-Sep-2022	648052

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

WT2214174-004

Sub-Matrix:**Soil** *Client sample ID:* 11205379- MW18-SS3

(Matrix: **Soil/Solid**) *Client sampling date / time:* 14-Sep-2022

Analyte	CAS Number	Result	LOR	Unit	Method	Prep Date	Analysis Date	QCLot
Physical Tests								
conductivity (1:2 leachate)	----	1310 FR5,	10.0	µS/cm	E100-L	16-Sep-2022	16-Sep-2022	648051
moisture	----	8.45	0.25	%	E144	-	15-Sep-2022	648057
oxidation-reduction potential [ORP]	----	398	0.10	mV	E125	15-Sep-2022	15-Sep-2022	648056
pH (1:2 soil:CaCl2-aq)	----	8.16	0.10	pH units	E108A	15-Sep-2022	15-Sep-2022	648054
resistivity	----	760	100	ohm cm	EC100R	-	16-Sep-2022	-
Leachable Anions & Nutrients								
chloride, soluble ion content	16887-00-6	734	5.0	mg/kg	E236.Cl	16-Sep-2022	16-Sep-2022	648053
sulfate, soluble ion content	14808-79-8	215	20	mg/kg	E236.SO4	16-Sep-2022	16-Sep-2022	648052

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

WT2214174-005

Sub-Matrix:**Soil** *Client sample ID:* 11205379- BH11-22-SS2

(Matrix: **Soil/Solid**) *Client sampling date / time:* 14-Sep-2022

Analyte	CAS Number	Result	LOR	Unit	Method	Prep Date	Analysis Date	QCLot
Physical Tests								
conductivity (1:2 leachate)	----	2540 FR5,	10.0	µS/cm	E100-L	16-Sep-2022	16-Sep-2022	648051
moisture	----	6.72	0.25	%	E144	-	15-Sep-2022	648057
oxidation-reduction potential [ORP]	----	393	0.10	mV	E125	15-Sep-2022	15-Sep-2022	648056
pH (1:2 soil:CaCl2-aq)	----	7.28	0.10	pH units	E108A	15-Sep-2022	15-Sep-2022	648054
resistivity	----	390	100	ohm cm	EC100R	-	16-Sep-2022	-
Leachable Anions & Nutrients								
chloride, soluble ion content	16887-00-6	1420	5.0	mg/kg	E236.Cl	16-Sep-2022	16-Sep-2022	648053
sulfate, soluble ion content	14808-79-8	219	20	mg/kg	E236.SO4	16-Sep-2022	16-Sep-2022	648052

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

WT2214174-006

Sub-Matrix:**Soil** *Client sample ID:* 11205379- BH16-22-SS2

(Matrix: **Soil/Solid**) *Client sampling date / time:* 14-Sep-2022

Analyte	CAS Number	Result	LOR	Unit	Method	Prep Date	Analysis Date	QCLot
Physical Tests								
conductivity (1:2 leachate)	----	430 FR5,	10.0	µS/cm	E100-L	16-Sep-2022	16-Sep-2022	648051
moisture	----	6.03	0.25	%	E144	-	15-Sep-2022	648057
oxidation-reduction potential [ORP]	----	354	0.10	mV	E125	15-Sep-2022	15-Sep-2022	648056
pH (1:2 soil:CaCl2-aq)	----	7.85	0.10	pH units	E108A	15-Sep-2022	15-Sep-2022	648054
resistivity	----	2320	100	ohm cm	EC100R	-	16-Sep-2022	-
Leachable Anions & Nutrients								
chloride, soluble ion content	16887-00-6	83.2	5.0	mg/kg	E236.Cl	16-Sep-2022	16-Sep-2022	648053
sulfate, soluble ion content	14808-79-8	116	20	mg/kg	E236.SO4	16-Sep-2022	16-Sep-2022	648052

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

WT2214174-007

Sub-Matrix:**Soil** *Client sample ID:* 11205379- BH17-22-SS2

(Matrix: **Soil/Solid**) *Client sampling date / time:* 14-Sep-2022

Analyte	CAS Number	Result	LOR	Unit	Method	Prep Date	Analysis Date	QCLot
Physical Tests								
conductivity (1:2 leachate)	----	622 FR5,	10.0	µS/cm	E100-L	16-Sep-2022	16-Sep-2022	648051
moisture	----	7.97	0.25	%	E144	-	15-Sep-2022	648057
oxidation-reduction potential [ORP]	----	350	0.10	mV	E125	15-Sep-2022	15-Sep-2022	648056
pH (1:2 soil:CaCl2-aq)	----	7.47	0.10	pH units	E108A	15-Sep-2022	15-Sep-2022	648054
resistivity	----	1610	100	ohm cm	EC100R	-	16-Sep-2022	-
Leachable Anions & Nutrients								
chloride, soluble ion content	16887-00-6	609	5.0	mg/kg	E236.Cl	16-Sep-2022	16-Sep-2022	648053
sulfate, soluble ion content	14808-79-8	94	20	mg/kg	E236.SO4	16-Sep-2022	16-Sep-2022	648052

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

WT2214174-008

Sub-Matrix:**Soil** *Client sample ID:* 11205379- MW09-22

(Matrix: **Soil/Solid**) *Client sampling date / time:* 14-Sep-2022

Analyte	CAS Number	Result	LOR	Unit	Method	Prep Date	Analysis Date	QCLot
Physical Tests								
conductivity (1:2 leachate)	----	5560 FR5,	10.0	µS/cm	E100-L	16-Sep-2022	16-Sep-2022	648051
moisture	----	6.16	0.25	%	E144	-	15-Sep-2022	648057
oxidation-reduction potential [ORP]	----	371	0.10	mV	E125	15-Sep-2022	15-Sep-2022	648056
pH (1:2 soil:CaCl2-aq)	----	6.81	0.10	pH units	E108A	15-Sep-2022	15-Sep-2022	648054
resistivity	----	180	100	ohm cm	EC100R	-	16-Sep-2022	-
Leachable Anions & Nutrients								
chloride, soluble ion content	16887-00-6	611	5.0	mg/kg	E236.Cl	16-Sep-2022	16-Sep-2022	648053
sulfate, soluble ion content	14808-79-8	6500	20	mg/kg	E236.SO4	16-Sep-2022	16-Sep-2022	648052

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WT2214174**	Page	: 1 of 11
Client	: **GHD Limited**	Laboratory	: Waterloo - Environmental
Contact	: Rick Hawthorne	Account Manager	: Rick Hawthorne
Address	: 455 Phillip Street Waterloo ON Canada N2L 3X2	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: ----	Telephone	: +1 519 886 6910
Project	: 11205379-100	Date Samples Received	: 14-Sep-2022 10:30
PO	: 735-004287	Issue Date	: 16-Sep-2022 16:35
C-O-C number	: ----		
Sampler	: CLIENT		
Site	: ----		
Quote number	: 11205379-100-SSOW 735-004287		
No. of samples received	: 8		
No. of samples analysed	: 8		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Leachable Anions & Nutrients : Water Extractable Chloride by IC										
Glass soil jar/Teflon lined cap										
11205379- BH11-22-SS2	E236.Cl	14-Sep-2022	16-Sep-2022	30 days	3 days	✓	16-Sep-2022	28 days	0 days	✓
Leachable Anions & Nutrients : Water Extractable Chloride by IC										
Glass soil jar/Teflon lined cap										
11205379- BH16-22-SS2	E236.Cl	14-Sep-2022	16-Sep-2022	30 days	3 days	✓	16-Sep-2022	28 days	0 days	✓
Leachable Anions & Nutrients : Water Extractable Chloride by IC										
Glass soil jar/Teflon lined cap										
11205379- BH16-SS2	E236.Cl	14-Sep-2022	16-Sep-2022	30 days	3 days	✓	16-Sep-2022	28 days	0 days	✓
Leachable Anions & Nutrients : Water Extractable Chloride by IC										
Glass soil jar/Teflon lined cap										
11205379- BH17-22-SS2	E236.Cl	14-Sep-2022	16-Sep-2022	30 days	3 days	✓	16-Sep-2022	28 days	0 days	✓
Leachable Anions & Nutrients : Water Extractable Chloride by IC										
Glass soil jar/Teflon lined cap										
11205379- BH20-SS2	E236.Cl	14-Sep-2022	16-Sep-2022	30 days	3 days	✓	16-Sep-2022	28 days	0 days	✓
Leachable Anions & Nutrients : Water Extractable Chloride by IC										
Glass soil jar/Teflon lined cap										
11205379- MW09-22	E236.Cl	14-Sep-2022	16-Sep-2022	30 days	3 days	✓	16-Sep-2022	28 days	0 days	✓
Leachable Anions & Nutrients : Water Extractable Chloride by IC										
Glass soil jar/Teflon lined cap										
11205379- MW17-SS1	E236.Cl	14-Sep-2022	16-Sep-2022	30 days	3 days	✓	16-Sep-2022	28 days	0 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Leachable Anions & Nutrients : Water Extractable Chloride by IC										
Glass soil jar/Teflon lined cap										
11205379- MW18-SS3	E236.Cl	14-Sep-2022	16-Sep-2022	30 days	3 days	✓	16-Sep-2022	28 days	0 days	✓
Leachable Anions & Nutrients : Water Extractable Sulfate by IC										
Glass soil jar/Teflon lined cap										
11205379- BH11-22-SS2	E236.SO4	14-Sep-2022	16-Sep-2022	30 days	3 days	✓	16-Sep-2022	28 days	0 days	✓
Leachable Anions & Nutrients : Water Extractable Sulfate by IC										
Glass soil jar/Teflon lined cap										
11205379- BH16-22-SS2	E236.SO4	14-Sep-2022	16-Sep-2022	30 days	3 days	✓	16-Sep-2022	28 days	0 days	✓
Leachable Anions & Nutrients : Water Extractable Sulfate by IC										
Glass soil jar/Teflon lined cap										
11205379- BH16-SS2	E236.SO4	14-Sep-2022	16-Sep-2022	30 days	3 days	✓	16-Sep-2022	28 days	0 days	✓
Leachable Anions & Nutrients : Water Extractable Sulfate by IC										
Glass soil jar/Teflon lined cap										
11205379- BH17-22-SS2	E236.SO4	14-Sep-2022	16-Sep-2022	30 days	3 days	✓	16-Sep-2022	28 days	0 days	✓
Leachable Anions & Nutrients : Water Extractable Sulfate by IC										
Glass soil jar/Teflon lined cap										
11205379- BH20-SS2	E236.SO4	14-Sep-2022	16-Sep-2022	30 days	3 days	✓	16-Sep-2022	28 days	0 days	✓
Leachable Anions & Nutrients : Water Extractable Sulfate by IC										
Glass soil jar/Teflon lined cap										
11205379- MW09-22	E236.SO4	14-Sep-2022	16-Sep-2022	30 days	3 days	✓	16-Sep-2022	28 days	0 days	✓
Leachable Anions & Nutrients : Water Extractable Sulfate by IC										
Glass soil jar/Teflon lined cap										
11205379- MW17-SS1	E236.SO4	14-Sep-2022	16-Sep-2022	30 days	3 days	✓	16-Sep-2022	28 days	0 days	✓
Leachable Anions & Nutrients : Water Extractable Sulfate by IC										
Glass soil jar/Teflon lined cap										
11205379- MW18-SS3	E236.SO4	14-Sep-2022	16-Sep-2022	30 days	3 days	✓	16-Sep-2022	28 days	0 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)										
Glass soil jar/Teflon lined cap										
11205379- BH11-22-SS2	E100-L	14-Sep-2022	16-Sep-2022	----	----		16-Sep-2022	30 days	2 days	✓
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)										
Glass soil jar/Teflon lined cap										
11205379- BH16-22-SS2	E100-L	14-Sep-2022	16-Sep-2022	----	----		16-Sep-2022	30 days	2 days	✓
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)										
Glass soil jar/Teflon lined cap										
11205379- BH16-SS2	E100-L	14-Sep-2022	16-Sep-2022	----	----		16-Sep-2022	30 days	2 days	✓
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)										
Glass soil jar/Teflon lined cap										
11205379- BH17-22-SS2	E100-L	14-Sep-2022	16-Sep-2022	----	----		16-Sep-2022	30 days	2 days	✓
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)										
Glass soil jar/Teflon lined cap										
11205379- BH20-SS2	E100-L	14-Sep-2022	16-Sep-2022	----	----		16-Sep-2022	30 days	2 days	✓
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)										
Glass soil jar/Teflon lined cap										
11205379- MW09-22	E100-L	14-Sep-2022	16-Sep-2022	----	----		16-Sep-2022	30 days	2 days	✓
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)										
Glass soil jar/Teflon lined cap										
11205379- MW17-SS1	E100-L	14-Sep-2022	16-Sep-2022	----	----		16-Sep-2022	30 days	2 days	✓
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)										
Glass soil jar/Teflon lined cap										
11205379- MW18-SS3	E100-L	14-Sep-2022	16-Sep-2022	----	----		16-Sep-2022	30 days	2 days	✓
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
11205379- BH11-22-SS2	E144	14-Sep-2022	----	----	----		15-Sep-2022	----	----	

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
11205379- BH16-22-SS2	E144	14-Sep-2022	----	----	----		15-Sep-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
11205379- BH16-SS2	E144	14-Sep-2022	----	----	----		15-Sep-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
11205379- BH17-22-SS2	E144	14-Sep-2022	----	----	----		15-Sep-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
11205379- BH20-SS2	E144	14-Sep-2022	----	----	----		15-Sep-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
11205379- MW09-22	E144	14-Sep-2022	----	----	----		15-Sep-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
11205379- MW17-SS1	E144	14-Sep-2022	----	----	----		15-Sep-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
11205379- MW18-SS3	E144	14-Sep-2022	----	----	----		15-Sep-2022	----	----	
Physical Tests : ORP by Electrode										
Glass soil jar/Teflon lined cap										
11205379- BH11-22-SS2	E125	14-Sep-2022	15-Sep-2022	----	----		15-Sep-2022	180 days	1 days	✓
Physical Tests : ORP by Electrode										
Glass soil jar/Teflon lined cap										
11205379- BH16-22-SS2	E125	14-Sep-2022	15-Sep-2022	----	----		15-Sep-2022	180 days	1 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : ORP by Electrode										
Glass soil jar/Teflon lined cap										
11205379- BH16-SS2	E125	14-Sep-2022	15-Sep-2022	----	----		15-Sep-2022	180 days	1 days	✓
Physical Tests : ORP by Electrode										
Glass soil jar/Teflon lined cap										
11205379- BH17-22-SS2	E125	14-Sep-2022	15-Sep-2022	----	----		15-Sep-2022	180 days	1 days	✓
Physical Tests : ORP by Electrode										
Glass soil jar/Teflon lined cap										
11205379- BH20-SS2	E125	14-Sep-2022	15-Sep-2022	----	----		15-Sep-2022	180 days	1 days	✓
Physical Tests : ORP by Electrode										
Glass soil jar/Teflon lined cap										
11205379- MW09-22	E125	14-Sep-2022	15-Sep-2022	----	----		15-Sep-2022	180 days	1 days	✓
Physical Tests : ORP by Electrode										
Glass soil jar/Teflon lined cap										
11205379- MW17-SS1	E125	14-Sep-2022	15-Sep-2022	----	----		15-Sep-2022	180 days	1 days	✓
Physical Tests : ORP by Electrode										
Glass soil jar/Teflon lined cap										
11205379- MW18-SS3	E125	14-Sep-2022	15-Sep-2022	----	----		15-Sep-2022	180 days	1 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap										
11205379- BH11-22-SS2	E108A	14-Sep-2022	15-Sep-2022	----	----		15-Sep-2022	30 days	1 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap										
11205379- BH16-22-SS2	E108A	14-Sep-2022	15-Sep-2022	----	----		15-Sep-2022	30 days	1 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap										
11205379- BH16-SS2	E108A	14-Sep-2022	15-Sep-2022	----	----		15-Sep-2022	30 days	1 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap										
11205379- BH17-22-SS2	E108A	14-Sep-2022	15-Sep-2022	----	----		15-Sep-2022	30 days	1 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap										
11205379- BH20-SS2	E108A	14-Sep-2022	15-Sep-2022	----	----		15-Sep-2022	30 days	1 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap										
11205379- MW09-22	E108A	14-Sep-2022	15-Sep-2022	----	----		15-Sep-2022	30 days	1 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap										
11205379- MW17-SS1	E108A	14-Sep-2022	15-Sep-2022	----	----		15-Sep-2022	30 days	1 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap										
11205379- MW18-SS3	E108A	14-Sep-2022	15-Sep-2022	----	----		15-Sep-2022	30 days	1 days	✓

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Soil/Solid**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L	648051	1	8	12.5	5.0	✓
Moisture Content by Gravimetry	E144	648057	1	8	12.5	5.0	✓
ORP by Electrode	E125	648056	1	8	12.5	5.0	✓
pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received	E108A	648054	1	8	12.5	5.0	✓
Water Extractable Chloride by IC	E236.Cl	648053	1	8	12.5	5.0	✓
Water Extractable Sulfate by IC	E236.SO4	648052	1	8	12.5	5.0	✓
Laboratory Control Samples (LCS)							
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L	648051	2	8	25.0	10.0	✓
Moisture Content by Gravimetry	E144	648057	1	8	12.5	5.0	✓
ORP by Electrode	E125	648056	1	8	12.5	5.0	✓
pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received	E108A	648054	1	8	12.5	5.0	✓
Water Extractable Chloride by IC	E236.Cl	648053	2	8	25.0	10.0	✓
Water Extractable Sulfate by IC	E236.SO4	648052	2	8	25.0	10.0	✓
Method Blanks (MB)							
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L	648051	1	8	12.5	5.0	✓
Moisture Content by Gravimetry	E144	648057	1	8	12.5	5.0	✓
Water Extractable Chloride by IC	E236.Cl	648053	1	8	12.5	5.0	✓
Water Extractable Sulfate by IC	E236.SO4	648052	1	8	12.5	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L Waterloo - Environmental	Soil/Solid	CSSS Ch. 15 (mod)/APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a soil sample that has been added in a defined ratio of soil to deionized water, then shaken well and allowed to settle. Conductance is measured in the fluid that is observed in the upper layer.
pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received	E108A Waterloo - Environmental	Soil/Solid	MOEE E3137A	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C) and is carried out in accordance with procedures described in the Analytical Protocol (prescriptive method). A minimum 10g portion of the sample, as received, is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil by centrifuging, settling, or decanting and then analyzed using a pH meter and electrode.
ORP by Electrode	E125 Waterloo - Environmental	Soil/Solid	APHA 2580 (mod)	Oxidation Redution Potential (ORP) is reported as the oxidation-reduction potential of the platinum metal-reference electrode employed in the analysis, measured in mV.
Moisture Content by Gravimetry	E144 Waterloo - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1	Moisture is measured gravimetrically by drying the sample at 105°C. Moisture content is calculated as the weight loss (due to water) divided by the wet weight of the sample, expressed as a percentage.
Water Extractable Chloride by IC	E236.Cl Waterloo - Environmental	Soil/Solid	EPA 300.1	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection using a soil sample that has been added in a defined ratio of soil to deionized water, then shaken well and allowed to settle. Anions are measured in the fluid that is observed in the upper layer.
Water Extractable Sulfate by IC	E236.SO4 Waterloo - Environmental	Soil/Solid	EPA 300.1	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection using a soil sample that has been added in a defined ratio of soil to deionized water, then shaken well and allowed to settle. Anions are measured in the fluid that is observed in the upper layer.
Resistivity Calculation for Soil Using E100-L	EC100R Waterloo - Environmental	Soil/Solid	APHA 2510 B	Soil Resistivity (calculated) is determined as the inverse of the conductivity of a 2:1 water:soil leachate (dry weight). This method is intended as a rapid approximation for Soil Resistivity. Where high accuracy results are required, direct measurement of Soil Resistivity by the Wenner Four-Electrode Method (ASTM G57) is recommended.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Leach 1:2 Soil:Water for pH/EC	EP108 Waterloo - Environmental	Soil/Solid	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL	The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Leach 1:2 Soil : 0.01CaCl2 - As Received for pH	EP108A Waterloo - Environmental	Soil/Solid	MOEE E3137A	A minimum 10g portion of the sample, as received, is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil by centrifuging, settling or decanting and then analyzed using a pH meter and electrode.
Preparation of ORP by Electrode	EP125 Waterloo - Environmental	Soil/Solid	APHA 2580 (mod)	Field-moist sample is extracted in a 1:2 ratio with DI water and then analyzed by ORP meter.
Anions Leach 1:10 Soil:Water (Dry)	EP236 Waterloo - Environmental	Soil/Solid	EPA 300.1	5 grams of dried soil is mixed with 50 grams of distilled water for a minimum of 30 minutes. The extract is filtered and analyzed by ion chromatography.
Distillation for Acid Volatile Sulfide in Soil	EP396-L Waterloo - Environmental	Soil/Solid	APHA 4500S2J	Acid Volatile Sulfide is determined by colourimetric measurement on a sediment sample that has been treated with hydrochloric acid within a purge and trap system, where the evolved hydrogen sulfide gas is carried into a basic solution by argon gas for analysis.

QUALITY CONTROL REPORT

Work Order	: **WT2214174**	Page	: 1 of 4
Client	: GHD Limited	Laboratory	: Waterloo - Environmental
Contact	: Rick Hawthorne	Account Manager	: Rick Hawthorne
Address	: 455 Phillip Street Waterloo ON Canada N2L 3X2	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: ----	Telephone	: +1 519 886 6910
Project	: 11205379-100	Date Samples Received	: 14-Sep-2022 10:30
PO	: 735-004287	Date Analysis Commenced	: 15-Sep-2022
C-O-C number	: ----	Issue Date	: 16-Sep-2022 16:35
Sampler	: CLIENT		
Site	: ----		
Quote number	: 11205379-100-SSOW 735-004287		
No. of samples received	: 8		
No. of samples analysed	: 8		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Reference Material (RM) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Greg Pokocky	Supervisor - Inorganic	Waterloo Inorganics, Waterloo, Ontario
Joseph Scharbach		Waterloo Centralized Prep, Waterloo, Ontario
Walt Kippenhuck	Team Leader - Inorganics	Waterloo Inorganics, Waterloo, Ontario

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 648051)											
WT2214174-006	11205379- BH16-22-SS2	conductivity (1:2 leachate)	----	E100-L	10.0	µS/cm	430	438	1.84%	20%	----
Physical Tests (QC Lot: 648054)											
WT2214174-008	11205379- MW09-22	pH (1:2 soil:CaCl2-aq)	----	E108A	0.10	pH units	6.81	6.82	0.147%	5%	----
Physical Tests (QC Lot: 648056)											
WT2214174-007	11205379- BH17-22-SS2	oxidation-reduction potential [ORP]	----	E125	0.10	mV	350	430	20.5%	25%	----
Physical Tests (QC Lot: 648057)											
WT2214174-008	11205379- MW09-22	moisture	----	E144	0.25	%	6.16	6.68	8.05%	20%	----
Leachable Anions & Nutrients (QC Lot: 648052)											
WT2214174-006	11205379- BH16-22-SS2	sulfate, soluble ion content	14808-79-8	E236.SO4	20	mg/kg	116	118	1	Diff <2x LOR	----
Leachable Anions & Nutrients (QC Lot: 648053)											
WT2214174-006	11205379- BH16-22-SS2	chloride, soluble ion content	16887-00-6	E236.Cl	5.0	mg/kg	83.2	83.3	0.136%	30%	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 648051)						
conductivity (1:2 leachate)	----	E100-L	5	µS/cm	<5.00	----
Physical Tests (QCLot: 648057)						
moisture	----	E144	0.25	%	<0.25	----
Leachable Anions & Nutrients (QCLot: 648052)						
sulfate, soluble ion content	14808-79-8	E236.SO4	20	mg/kg	<20	----
Leachable Anions & Nutrients (QCLot: 648053)						
chloride, soluble ion content	16887-00-6	E236.Cl	5	mg/kg	<5.0	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 648051)									
conductivity (1:2 leachate)	----	E100-L	5	µS/cm	1409 µS/cm	98.8	90.0	110	----
Physical Tests (QCLot: 648054)									
pH (1:2 soil:CaCl2-aq)	----	E108A	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 648057)									
moisture	----	E144	0.25	%	50 %	101	90.0	110	----
Leachable Anions & Nutrients (QCLot: 648052)									
sulfate, soluble ion content	14808-79-8	E236.SO4	20	mg/kg	5000 mg/kg	100	70.0	130	----
Leachable Anions & Nutrients (QCLot: 648053)									
chloride, soluble ion content	16887-00-6	E236.Cl	5	mg/kg	5000 mg/kg	101	80.0	120	----

Reference Material (RM) Report

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).

Sub-Matrix:

					Reference Material (RM) Report				
					RM Target	Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Physical Tests (QCLot: 648051)									
	RM	conductivity (1:2 leachate)	----	E100-L	3239 µS/cm	100	70.0	130	----
Physical Tests (QCLot: 648056)									
	RM	oxidation-reduction potential [ORP]	----	E125	475 mV	102	80.0	120	----
Leachable Anions & Nutrients (QCLot: 648052)									
	RM	sulfate, soluble ion content	14808-79-8	E236.SO4	217 mg/kg	98.5	60.0	140	----
Leachable Anions & Nutrients (QCLot: 648053)									
	RM	chloride, soluble ion content	16887-00-6	E236.Cl	673 mg/kg	94.1	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

COC Number: 22 -

Page of

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Environmental Division
Waterloo
Work Order Reference
WT2214174

Telephone : +1 519 886 6910

Report To	Contact and company name below will appear on the final report	Reports / Recipients	Turnaround Time (TAT) Requeste
Company:	GHD Limited	Select Report Format: ☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)	☐ Routine [R] if received by 3pm M-F - no surcharges ap
Contact:	Jennifer Balkwill	Merge QC/QCI Reports with COA ☑ YES ☐ NO ☐ N/A	☐ 4 day [P4] if received by 3pm M-F - 20% rush surchar
Phone:	519-340-4286	☐ Compare Results to Criteria on Report - provide details below if box checked	☐ 3 day [P3] if received by 3pm M-F - 25% rush surchan
	Company address below will appear on the final report	Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	☑ 2 day [P2] if received by 3pm M-F - 50% rush surcharg
Street:	455 Phillip Street, Unit 100A	Email 1 or Fax jennifer.balkwill@ghd.com	☐ 1 day [E] if received by 3pm M-F - 100% rush surcharg
City/Province:	Waterloo, Ontario	Email 2	☐ Same day [E2] if received by 10am M-S - 200% rush su
Postal Code:	N2L 3X2	Email 3	Additional fees may apply to rush requests on we
Invoice To	Same as Report To ☑ YES ☐ NO	Invoice Recipients	Date and Time Required for all E&P TATs:
	Copy of Invoice with Report ☐ YES ☐ NO	Select Invoice Distribution: ☐ EMAIL ☐ MAIL ☐ FAX	For all tests with rush TATs requested, ple
Company:		Email 1 or Fax	Analysis
Contact:		Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:	11205379-100	Major/Minor Code:	Routing Code:
PO / AFE:	735-003472-1	Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (ALS use only):	JD	ALS Contact:	Sampler:

ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINER	Indicate Filtered (F), Preserved (P) or Filtere... (F/P) below	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes
						Corrosivity			
	11205379 - BH10-SS2					X			
	11205379 - BH20-SS2								
	11205379 - MW17-SS1								
	11205379 - MW18-SS3								
	11205379 - BH11-22-SS2								
	11205379 - BH16-22-SS2								
	11205379 - BH17-22-SS2								
	11205379 - MW09-22								

Drinking Water (DW) Samples[1] (client use)	Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)
Are samples taken from a Regulated DW System? ☐ YES ☐ NO	
Are samples for human consumption/ use? ☐ YES ☐ NO	

SAMPLE RECEIPT DETAILS (ALS use only)

Cooling Method: ☑ NONE ☐ ICE ☐ ICE PACKS ☐ FROZEN ☐ COOLING INITIATED

Submission Comments identified on Sample Receipt Notification: ☐ YES ☐ NO

Cooler Custody Seals Intact: ☐ YES ☐ N/A Sample Custody Seals Intact: ☐ YES ☐ N/A

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				20.4			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (ALS use only)			FINAL SHIPMENT RECEPTION (ALS use only)		
Released by:	Date: 2022-09-13	Time:	Received by:	Date:	Time:	Received by:	Date: 14-Sep-22	Time: 10:30

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

FEB 2022 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.