

Geotechnical Design Report for Building Permit Application CHEO 1Door4care Parking Garage

Client Name: EllisDon Date: September 21, 2023

File: 36182



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APPENDIX A

Borehole Location Plan (from GHD's) Report Record of Boreholes and Laboratory Test Results



1. INTRODUCTION

Thurber Engineering Ltd. (Thurber) has been retained by EllisDon to provide geotechnical input to the design of foundations for the proposed parking structure at the Children's Hospital for Eastern 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 our terms of reference for this project and are not addressed herein.

This report has been issued based on a review of the geotechnical investigations conducted by Infrastructure Ontario's engineer (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.

It should be noted that Thurber accepts no responsibility for the accuracy and quality of the factual information presented 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 (Parking Garage)" dated October 25, 2022.

The geotechnical investigations took place in two stages between January 12, 2021 and July 19, 2022. The scope of geotechnical investigation included advancing a total of 23 boreholes and 6 monitoring wells and geophysical survey using Ground Penetration Radar (GPR).



3. UNDERSTANDING OF SUBSURFACE CONDITIONS

A plan showing the location 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 B. The record of borehole sheets along with the laboratory test results have been included in Appendix B.

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

In general, the subsurface conditions at the site consisted of asphalt over non-cohesive fill (predominantly gravelly sand/gravel/sandy gravel/silty sand to sand and gravel) which is in turn underlain by non-cohesive native soil (predominantly compact to dense gravelly sand/sand/silty sand/sand and gravel/sand and silt) over shale bedrock. The thickness of the fill at the site varied between 0.3 m and 0.8 m. The silty native soil extended to depths ranging from 0.6 m to 1.2 m below existing ground surface, and shale bedrock was encountered or inferred at depths ranging from 0.4 m to 1.2 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	Estimated	Estimated
Identification	Depth/Elevation of	Elevation of
Number	Bedrock Surface	Competent
	(mbgs/m)	Bedrock Surface
		(m)
BH1-21	0.9 / 80.5	3.2 / 78.2*
BH2-21	1.1 / 80.2	2.8 / 78.6*
MW3-21	0.6 / 80.8	4.6 / 76.8
BH4-21	0.8 / 81.5	2.8 / 79.5*
MW5-21	0.4 / 81.4	-
MW6-21	1.2 / 80.9	3.5 / 78.7
BH7-21	0.8 / 81.5	2.5 / 79.7*
MW8-21	0.9 / 81.3	2.2 / 80.0*
B1-21	1.0 / 81.0	1.0 / 81.3*

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Borehole Identification Number	Estimated Depth/Elevation of Bedrock Surface (mbgs/m)	Estimated Elevation of Competent Bedrock Surface (m)
B2-21	0.9 / 80.5	-
B3-21	1.2 / 80.9	-
MW9-22	0.8 / 81.2	2.6 / 79.4
BH10-22	0.7 / 81.5	1.2 / 80.9*
BH11-22	0.9 / 81.3	2.5 / 79.6
BH12-22	1.1 / 81.0	1.8 / 80.2*
BH13-22	1.0 / 81.2	1.9 / 80.2
BH14-22	0.7 / 81.5	1.2 / 81.0*
BH15-22	0.6 / 81.5	1.1 / 81.1*
BH16-22	0.9 / 81.2	1.2 / 80.9*
BH17-22	1.0 / 81.1	1.1 / 81.0*
BH18-22	0.8 / 81.3	1.4 / 80.7
BH19-22	0.9 / 80.2	-
MW20-22	1.0 / 80.2	1.6 / 79.6*

^{*} Estimated Elevation due to Auger Refusal

The groundwater level measurements in the wells are summarized below:

Table 3.2: Groundwater Level Readings at the Site

Borehole	Ground Surface	Depth to	Groundwater	Main Screened
Borenoie	Elev. (m)	Water (m)	Elev. (m)	Deposit
		2.7	78.7	
MW3-21	81.37	2.5	78.9	Weathered Shale
		2.6	78.8	
MW5-21	81.83	Dry	Dry	Gravelly Sand FILL/Weathered Shale
	21 82.17	3.0	79.2	
MW6-21		3.0	79.2	Shale
IVIVVO ZI		3.1	79.1	Stale
		3.0	79.2	
		2.0	80.2	Shale

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Borehole	Ground Surface Elev. (m)	Depth to Water (m)	Groundwater Elev. (m)	Main Screened Deposit
MW8-21	82.2	2.1	80.1	
		1.7	80.5	
		1.7	80.5	

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.

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4. FOUNDATION DESIGN RECOMMENDATIONS

The discussions and preliminary 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. These preliminary recommendations are subject to changes and modifications subject to completion of a supplemental geotechnical investigation (to be carried out during execution).

It is understood that the proposed structure includes an 8-storey building with no below-grade levels. The average top of ground elevation within the proposed building footprint is about Elev. 82.1 m, based on boreholes MH6-21, B2-21, MW9-22, and BH11-22 to BH18-22. The final grades of the lowest level of the proposed structure will be at about Elev. 82.8 m, and the structure will be supported on spread/square footings founded at about Elev. 81.0 m (where bedrock was found at the site).

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, and to be confirmed as part of the supplemental investigation during the execution) 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.

4.1 Foundation Excavation and Temporary Dewatering

It is anticipated that the finished floor of the building will be at about Elev. 82.7 m and that the excavations will be extended to about Elev. 81.0 m. In general, the open-cut excavations will extend through non-cohesive fill (predominantly gravelly sand/gravel/sandy gravel/silty sand to sand and gravel), non-cohesive native soil (predominantly compact to dense gravelly

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sand/sand/silty sand/sand and gravel/sand and silt) and shale bedrock. Groundwater is expected to be at or below the base of excavation.

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 0.5 to 1.0 m depth using large hydraulic excavating equipment. Further shale bedrock removal could be accomplished using mechanical methods (such as hoe ramming); however, it is unlikely that removal of competent shale would be necessary for excavations with their base at or above Elev. 81.0 m.

Provided that the base of excavation is kept at or above Elev. 81.0 m, groundwater seepage into the excavation is expected to be handled by filtered sumps and drains.

4.2 Site Preparation

The existing fill and loose native soils founded 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. The influence zone includes the area beneath an imaginary line extending downward and outward from the edges of the proposed foundations/slabs at a 45 degrees angle down to undisturbed native soil or bedrock.

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4.3 Protection of Expansive Shale

The shale bedrock at this site has the potential to swell following exposure to oxygen. The general mechanism is considered to be that pyrite (FeS2) 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.

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 millimetres thick.

Construction planning should ensure the shale is not left exposed and uncovered overnight. Where shale is exposed on the sides of the excavation, the mud slab (with sulphate resistant cement) or shotcrete should be placed such that the concrete covers the shale to at least 100 millimetres above the top of rock level.

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

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4.4 **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 for the engineered fill.

4.5 **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.

4.6 **Foundation 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 at least 0.2 m thick engineered fill on Weathered Bedrock	Allows shallower excavations	Will provide moderate geotechnical resistances at ULS and SLS

The following Table may be used for the design of shallow foundations bearing on a maximum 1 m thick engineered fill pad over weathered shale or directly supported on competent bedrock:

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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
	2 m wide strip	600	500
	3 m wide strip	650	480
Engineered Fill Pad	4 m wide strip	700	400
over Weathered Shale	2 m Square	850	800
	3 m Square	880	550
	4 m Square	900	400
	2 m wide strip	1,100	1,100
	3 m wide strip	1,200	1,100
Compotent Chale	4 m wide strip	1,300	1,200
Competent Shale	2 m Square	1 000	1,500
	3 m Square	1,600	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 bedrock or 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 millimetres of the previously exposed shale (the shale which was exposed during construction of the existing trenches).

4.7 Frost Depth

The design frost depth in Ottawa is 1.8 m below the ground surface. The base of all footings should be founded at a minimum depth of 1.8 m, both vertically and horizontally or be provided

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with an equivalent thickness of insulation such as expanded polystyrene (EPS) for frost protection. Typically, 25 mm of EPS can be considered equivalent to 300 mm of earth cover for frost protection.

Perimeter footings and interior footings 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. For interior foundations with a horizontal distance greater than 1.5 m from the perimeter of a heated building, frost protection is not required.

4.8 Slab-On-Grade and Raft Foundations

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. 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 200 mm thick compacted to 100% of SPMDD should be placed below the floor slab 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.

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.

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Lateral earth pressures acting on the structure 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/m³), 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.

OPSS Granular A or OPSS Granular B Type I Loading **Granular B Type II** or Type III Condition $\Phi = 35^{\circ}, \gamma = 22.0 \text{ kN/m}^3$ $\Phi = 32^{\circ}, \gamma = 21.0 \text{ kN/m}^3$ Active, Ka 0.27 0.31 At-Rest, Ko 0.43 0.47 3.7 3.3 Passive, Kp

Table 4.3: Lateral Earth Pressure Coefficients

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 1500 m/s, therefore, a Site Class B

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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 severe (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.

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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 fee 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

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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 (Parking Garage) for design and construction of Pavement structures at the site.

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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.

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



Nina Warrier, P. Eng. Geotechnical Engineer



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

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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.

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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.

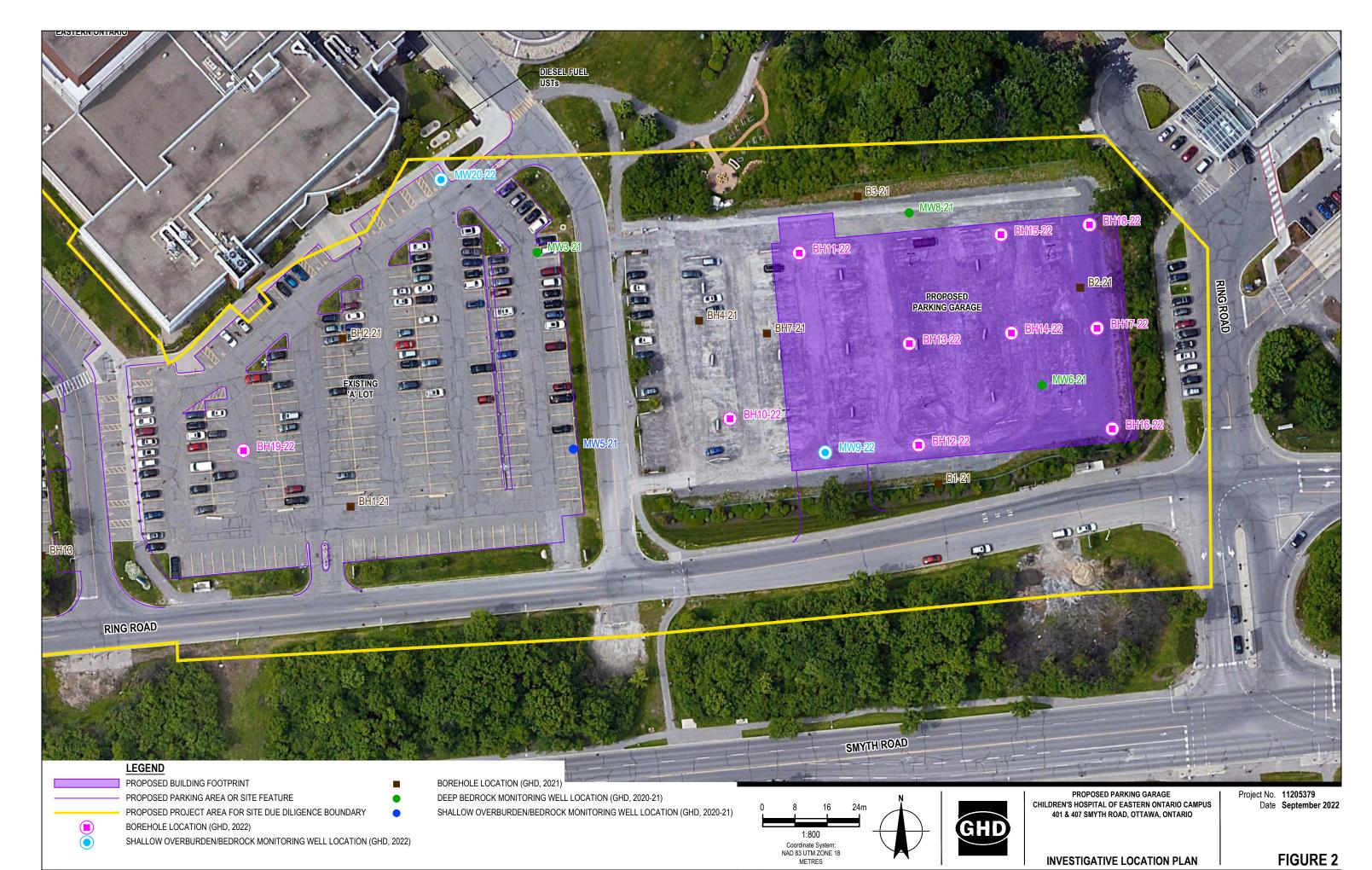
7. INDEPENDENT JUDGEMENTS OF CLIENT

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.



APPENDIX A

Borehole Location Plan (from GHD's) Report Record of Boreholes and Laboratory Test Results





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).

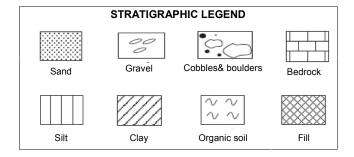
	Classification (Unified system)					
Clay	< 0.002 mm					
Silt	0.002 to 0.075 mm					
Sand	0.075 to 4.75 mm	fine medium coarse	0.075 to 4.25 mm 0.425 to 2.0 mm 2.0 to 4.75 mm			
Gravel Cobbles	4.75 to 75 mm 75 to 300 mm	fine coarse	4.75 to 19 mm 19 to 75 mm			
Boulders	>300 mm					

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

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

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

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	



CHEM: Chemical analysis

GS: Grab sample

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

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:

Wp: Plastic limit

N: Standard penetration index
R: Refusal to penetration
Cu: Undrained shear strength
Pr: Pressure meter

N_c: Dynamic cone penetration index
k: Permeability
ABS: Absorption (Packer test)

LABORATORY TESTS:

γ: Unit weight

GHD PS-020.01 - Notes on Borehole and Test Pit Reports - Rev.0 - 07/01/2015



Explanation of Terms Used in the Bedrock Core Log

Strength (ISRM)

Terms	Grade	Description	Unconfii Compressive St (MPa)	
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 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 Spac	ing
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.: 11205379-90 ENCLOSURE No.: BH1-21 BOREHOLE No.: BOREHOLE REPORT ELEVATION: 81.39 m Page: 1 of 1 CLIENT: Infrastructure Ontario (I.O.) **LEGEND** Preliminary Geotechnical Investigation - Proposed Parking Structure Children's Hospital of Eastern Ontario Campus - 401 Smyth Road, PROJECT: \boxtimes ss - SPLIT SPOON - SHELBY TUBE Ottawa, Ontario LOCATION: - ROCK CORE DESCRIBED BY: K. Schaller CHECKED BY: S. Shahangian - WATER LEVEL \mathbf{Y} DATE (START): January 15, 2021 DATE (FINISH): January 15, 2021 NORTHING: 5027575.049 **EASTING:** 449073.301 SOIL LOG WITH GRAPH+WELL Shear test (Cu) Sensitivity (S) △ Field Stratigraphy Type and Number Recovery/ TCR(%) Moisture Content 'N' Value/ SCR(%) Elevation (m) BGS ☐ Lab Blows per Depth Water content (%) **DESCRIPTION OF** 15 cm/ Atterberg limits (%) SOIL AND BEDROCK RQD(%) (blows / 12 in.-30 cm) Feet Metres 81.39 **GROUND SURFACE** Ν 10 20 30 40 50 60 70 80 90 ASPHALT: 125 mm 0.13 81.26 GS1 4 -- \circ Report: FILL SAND and GRAVEL, trace clay, brown, 25 SS1 2 5 10-5-4-6 9 moist, loose to very dense GHD GEOTECH_V02.GLB 0.91 Gravel: 48%, Sand: 41%, Clay: 3%, Silt 80.48 - 1.0 : 8% SS2 88 10 12-30-50/ 50+ ф Gravel: 39%, Sand: 39%, Clay: 7%, Silt 100mm 15% 5 SS3 50/ BEDROCK (inferred), shale fragments, 100 4 50+ 0 greyish brown, very dense 100mm 2.0 SS4 50/ 100 4 50+ 75mm SS5 100 4 50/ 50+ 75mm 3.0 ---\112053--\11205379\11205379 - 90.GPJ 10 auger refusal 3.20 78.19 11 **END OF BOREHOLE:** 12 NOTE: 13 4.0 - End of Borehole at 3.20 m bgs - Borehole was backfilled with bentonite 14 holeplug and sealed with cold patch - bgs donates 'below ground surface' 15 16 - 5.0 17 18 N:\CA\MISSISSAUGA - 111 BRUNEL\LEGACY\LOG DATABASE\8-CHAR\11 19 6.0 20 21 22 7.0 23 24 25 26 8.0 27 28 29 9.0 30 31 32

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REFERENCE No.: 11205379-90 ENCLOSURE No.: BOREHOLE No.: MW3-21 **BOREHOLE REPORT ELEVATION:** 81.37 m Page: 2 of 2 CLIENT: Infrastructure Ontario (I.O.) **LEGEND** Preliminary Geotechnical Investigation - Proposed Parking Structure Children's Hospital of Eastern Ontario Campus - 401 Smyth Road, PROJECT: \boxtimes ss - SPLIT SPOON ST - SHELBY TUBE LOCATION: Ottawa, Ontario - ROCK CORE 2/26/21 DESCRIBED BY: K. Schaller CHECKED BY: S. Shahangian - WATER LEVEL \mathbf{Y} DATE (START): January 14, 2021 DATE (FINISH): January 15, 2021 NORTHING: 5027638.113 **EASTING:** 449119.449 SOIL LOG WITH GRAPH+WELL Shear test (Cu) Sensitivity (S) △ Field Stratigraphy Type and Number Recovery/ TCR(%) Moisture Content 'N' Value/ SCR(%) Elevation (m) BGS ☐ Lab Blows per State Depth Water content (%) **DESCRIPTION OF** 15 cm/ Atterberg limits (%) SOIL AND BEDROCK RQD(%) (blows / 12 in.-30 cm) Feet Metres 81.37 **GROUND SURFACE** Ν 10 20 30 40 50 60 70 80 90 _ 10.06 71.31 10.06 mF GHD_GEOTECH_V02.GLB Report: **END OF BOREHOLE:** 34 35 NOTE: - End of Borehole at 10.06 m bgs 36 -11.0 - Borehole was dry upon completion - Rock coring from 4.57 m bgs 37 - 50 mm diameter monitoring well installed at 7.47 m bgs 38 - Groundwater found at 2.69 m bgs on 39 January 28, 2021 12.0 - Groundwater found at 2.49 m bgs on 40 Library File: February 10, 2021 - bgs donates 'below ground surface' 41 42 13.0 ---\112053--\11205379\11205379 - 90.GPJ 43 44 45 14.0 46 47 48 49 -15.0 N:\CA\MISSISSAUGA - 111 BRUNEL\LEGACY\LOG DATABASE\8-CHAR\11-----\1120-50 52 -16.053 54 55 17.0 56 57 58 59 18.0 60 61 62 19.0 63 64 65

REFERENCE No.: 11205379-90 ENCLOSURE No.: BH4-21 BOREHOLE No.: BOREHOLE REPORT ELEVATION: 82.23 m Page: 1 of 1 CLIENT: Infrastructure Ontario (I.O.) **LEGEND** Preliminary Geotechnical Investigation - Proposed Parking Structure Children's Hospital of Eastern Ontario Campus - 401 Smyth Road, PROJECT: \boxtimes ss - SPLIT SPOON ST - SHELBY TUBE Ottawa, Ontario LOCATION: - ROCK CORE DESCRIBED BY: K. Schaller CHECKED BY: S. Shahangian - WATER LEVEL \mathbf{Y} DATE (START): January 18, 2021 DATE (FINISH): January 18, 2021 NORTHING: 5027621.207 **EASTING:** 449159.803 SOIL LOG WITH GRAPH+WELL Shear test (Cu) Sensitivity (S) △ Field Stratigraphy Type and Number Recovery/ TCR(%) Moisture Content 'N' Value/ SCR(%) Elevation (m) BGS ☐ Lab Blows per State Depth Water content (%) **DESCRIPTION OF** 15 cm/ Atterberg limits (%) SOIL AND BEDROCK RQD(%) (blows / 12 in.-30 cm) Feet Metres 82.23 **GROUND SURFACE** % Ν 10 20 30 40 50 60 70 80 90 FILL: SAND and GRAVEL, trace clay and silt, Report: SS1 75 48 15-27-21-10 brown, moist to wet, dense Gravel: 46%, Sand: 41%, Clay: 3%, Silt GHD GEOTECH_V02.GLB 0.76 81.47 10% SS2 91 7 6-19-34-50/ 53 3 BEDROCK (inferred), shale fragments, 1.0 50mm grey, moist, very dense SS3 90 8 21-50/ 50+ 100mm 5 SS4 100 4 50/ 50+ 2.0 75mm SS5 100 5 50/ 50+ 0 75mm 2.77 79.46 auger refusal 3.0 ---\112053--\11205379\11205379 - 90.GPJ 10 **END OF BOREHOLE:** 11 NOTE: 12 - End of Borehole at 2.77 m bgs - Borehole was backfilled with bentonite 13 4.0 holeplug and sealed with cold patch 14 - bgs donates 'below ground surface' 15 16 - 5.0 17 18 N:\CA\MISSISSAUGA - 111 BRUNEL\LEGACY\LOG DATABASE\8-CHAR\11 19 6.0 20 21 22 7.0 23 24 25 26 8.0 27 28 29 9.0 30 31 32

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G WILM GRAPH+V	Depth	Elevation (m) BGS	Stratigraphy		RIPTION OF D BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content	Blows per 15 cm/ RQD(%)	'N' Value/ SCR(%)	Ser O W _p W	ear tes nsitivity Wate Atterl "N" Va ows / 1	(S) r con perg l alue	tent (imits	(%) (%)	△ Fi			
	Feet Metres				D SURFACE			%			N	10	20 30	40 5	50 60	70 8	80 90)		
) 1:10	1 - 0.10	81.53		ASPHALT : 100 m	EL, some silt, trace	X	GS1		7			-			Н	0.31	l m			
Kep n	2 - 0.40	81.43		∖clay, brown, moist		\mathbb{I}	SS1	100	8	8-18-20-35	38	9		•	B	ento	nite			
/UZ.GL	3 = 1.0			\: 13% FILL :		\succeq	SS2	100	3	50/	50+			\Rightarrow		71.05 #2 3	5 m		500 (00000)	
ECH F	4 —		臺	brown, moist, dens), some silt, trace clay, se					125mm							\perp			
SEC.	5 - 183	80.00	1	Gravel : 23%, San : 20%	d : 49%, Clay : 8%, Silt	\times	SS3	100	5	50/ 100mm	50+			+		_Scr -1.83				
ם הם	7 - 2.0	00.00		BEDROCK (inferred) grey, damp, very d	ed), shale fragments, lense											1.00				
II) FIIE	8 —			END OF BOREHO									+			+	H	_		
LIBE	9 =			NOTE:													\blacksquare			
30.GP	10 - 3.0			- End of Borehole - Borehole was dry	upon completion												\blacksquare			
3-6/50	11 —			- Borehole was dry	nstalled at 1.837 m bgs y on January 28, 2021											#	\blacksquare			
3/11/20	13 - 4.0			- Borehole was dry - bgs donates 'belo	y on February 10, 2021 ow ground surface'															
70237	14 —																			
. L\5G	15															+	\blacksquare			
11/	16 - 5.0																\blacksquare			
-07111	17 —																\blacksquare			
	19 —																			
-CHAR	20 + 6.0															\pm				
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Y ILOG	23 — 7.0																\blacksquare			
EGAC	25 —																			
ONELI	26 - 8.0																			
וו פצ	27															\pm	\pm			
- A90	28 —												+	+	H	+	+	\dashv		
SISSA	29 - 9.0															+	\Box			
AIMIS	30 - 31 - 31															#	\parallel			
N:\C	32 —															\downarrow	\parallel			

	REFERENC	E No.	: <u> </u>	11205379-90								ENCLO	DSUR	E No	o.: _		6	
			LID		BOREHOLE No.:	_		MW6	-21		В	ORE	EHC)LE	ΞR	ΕP	O	RT
		9			ELEVATION:		82.	17 m					age: _					
	CLIENT: _		Infra	structure Ontario (I.	O.)						LEC	<u>SEND</u>						
	PROJECT: LOCATION:		Child	minary Geotechnica dren's Hospital of Ea wa, Ontario	al Investigation - Propose astern Ontario Campus -		SS - SPLIT SPOON ST - SHELBY TUBE											
:6/21	DESCRIBEI	D BY:	K. S	challer	CHECKED BY:		S. Sha	hangia	an		Ţ		- ROC - WA					
te: 2/2	DATE (STA	RT):	Janu	ıary 12, 2021	DATE (FINISH):	_	Januar	y 13, :	2021		_							
:LL Da	NORTHING	i:	5027	7605.404	EASTING:		449244	1.983										
G WITH GRAPH+WE	Depth	Elevation (m) BGS	Stratigraphy		LIPTION OF D BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content	Blows per 15 cm/ RQD(%)	'N' Value/ SCR(%)	Sensi	test (C tivity (S Vater co tterber N" Value s / 12 ir) onter g limi	its (%)		Field Lab	
OIL LC	Feet Metres 8	82.17			D SURFACE			%			N	10 20	30 40	50	60 70	80 9	3 0	v / 1 - N/ -
ort: S	1 - 0.35	81.82		GRAVEL : 350 mm	1	M	SS1	87	14	10-30-18-8	48	0		•	0.3	31 m		
02.GLB Rep	I → I	81.56		FILL: SILTY SAND, trace organics, grey/brov NATIVE:	e gravel, trace wn, moist, dense	\bigvee	SS2	100	10	4-11-27-45	38	0		4		_		
GEOTECH_V		80.95		ML-GRAVELLY SA brown, moist, dens Gravel : 32%, Sand : 16%	AND, trace clay, se d : 45%, Clay : 7%, Silt	X	SS3	100	9	35-20-50/ 75mm	100							
le: GHD_G	6 - 2.0				ed), shale fragments, ense	×	SS4	100	4	50/ 75mm	50+	0		•	-Bent	tonite	<u></u>	
Library Fi	8 —					×	SS5	100	3	50/ 100mm	50+	0		•		#		
9 - 90.GPJ	10 - 3.0	70.00				×	SS6 SS7	100 100	4	50/ 100mm 50/	50+ 50+			•	2/	10/20	21	Ā
9/11205378	12 - 3.51	78.66		of limestone/siltsto highly weathered to	o fresh, weak to	1	RC1	58		50mm 50						Sand		
3-\1120537	14 —			moderately strong,	, grey		RC2	93		24					#2	Sand		
\1120\1120	16 — 5.0 17 — 18 — 18 — 18 — 18 — 18 — 18 — 18 —					Ì										‡ ‡		
=\8-CHAR\11	19 - 6.0						RC3	95		54					So	creer	\	
LOG DATABASE	21 — 22 — 7.0						RC4	97		55								
NEL/LEGACY/	24 — 25 — 26 — 26 — 20 0						1104	01							+ +	47 m Sand 78 m		
JGA - 111 BRL	27 - 28 - 28 - 28 - 28 - 28 - 28 - 28 -						RC5	100		52						 		
A/MISSISSAL	29 — 9.0 30 — 9.0 31 — 9.0													Bent	onite	Sea		
File: N:\C	32 —						RC6	100		71						\pm	\vdash	

REFERENCE No.: 11205379-90 ENCLOSURE No.: MW6-21 BOREHOLE No.: **BOREHOLE REPORT ELEVATION:** 82.17 m Page: 2 of 2 CLIENT: Infrastructure Ontario (I.O.) **LEGEND** Preliminary Geotechnical Investigation - Proposed Parking Structure Children's Hospital of Eastern Ontario Campus - 401 Smyth Road, PROJECT: \boxtimes ss - SPLIT SPOON ST - SHELBY TUBE LOCATION: Ottawa, Ontario - ROCK CORE DESCRIBED BY: K. Schaller CHECKED BY: S. Shahangian - WATER LEVEL \mathbf{Y} DATE (START): January 12, 2021 DATE (FINISH): January 13, 2021 NORTHING: 5027605.404 **EASTING:** 449244.983 SOIL LOG WITH GRAPH+WELL Shear test (Cu) Sensitivity (S) △ Field Stratigraphy Type and Number Recovery/ TCR(%) Moisture Content 'N' Value/ SCR(%) Elevation (m) BGS ☐ Lab Blows per Depth State Water content (%) **DESCRIPTION OF** 15 cm/ Atterberg limits (%) SOIL AND BEDROCK RQD(%) (blows / 12 in.-30 cm) Feet Metres 82.17 **GROUND SURFACE** Ν 10 20 30 40 50 60 70 80 90 _ 10.06 72.11 10.06 m GHD_GEOTECH_V02.GLB Report: **END OF BOREHOLE:** 34 35 NOTE: - End of Borehole at 10.06 m bgs 36 -11.0 - Borehole was dry upon completion - Rock coring from 3.51 m bgs 37 - Monitoring well installed at 7.47 m bgs - Groundwater found at 2.97 m bgs on 38 January 28, 2021 - Groundwater found at 3.09 m bgs on 39 12.0 February 10, 2021 40 - bgs donates 'below ground surface' 41 42 13.0 ---\112053--\11205379\11205379 - 90.GPJ 43 44 45 14.0 46 47 48 49 -15.0 50 N:\CA\MISSISSAUGA - 111 BRUNEL\LEGACY\LOG DATABASE\8-CHAR\11-52 -16.053 54 55 17.0 56 57 58 59 -18.0 60 61 62 19.0 63 64 65

REFERENCE No.: 11205379-90 ENCLOSURE No.: BOREHOLE No.: BH7-21 BOREHOLE REPORT **ELEVATION:** 82.22 m Page: 1 of 1 CLIENT: Infrastructure Ontario (I.O.) **LEGEND** Preliminary Geotechnical Investigation - Proposed Parking Structure Children's Hospital of Eastern Ontario Campus - 401 Smyth Road, PROJECT: \boxtimes ss - SPLIT SPOON - SHELBY TUBE LOCATION: Ottawa, Ontario - ROCK CORE DESCRIBED BY: K. Schaller CHECKED BY: S. Shahangian - WATER LEVEL \mathbf{Y} DATE (START): January 19, 2021 DATE (FINISH): January 19, 2021 NORTHING: 5027618.043 **EASTING:** 449176.612 SOIL LOG WITH GRAPH+WELL Shear test (Cu) Sensitivity (S) △ Field Stratigraphy Type and Number Recovery/ TCR(%) Moisture Content 'N' Value/ SCR(%) Elevation (m) BGS ☐ Lab Blows per Depth State Water content (%) **DESCRIPTION OF** 15 cm/ Atterberg limits (%) SOIL AND BEDROCK RQD(%) (blows / 12 in.-30 cm) Feet Metres 82.22 **GROUND SURFACE** % Ν 10 20 30 40 50 60 70 80 90 FILL: Report: SILTY SAND and GRAVEL, brown, SS1 52 0 54 6 28-35-17-10 moist, very dense GHD GEOTECH_V02.GLB 0.76 81.46 SS2 100 7 15-40-50/ 50+ BEDROCK (inferred), shale fragments, 3 125mm 1.0 grey, moist, very dense SS3 100 45-50/ 4 50+ 5 75mm SS4 100 4 50/ 50+ 0 2.0 125mm SS5 100 3 50/ 50+ 2.52 79.70 auger refusal 75mm **END OF BOREHOLE:** 3.0 ---\112053--\11205379\11205379 - 90.GPJ 10 NOTE: 11 - End of Borehole at 2.52 m bgs 12 - Borehole was backfilled with bentonite holeplug and sealed with cold patch 13 4.0 - bgs donates 'below ground surface' 14 15 16 - 5.0 17 18 N:\CA\MISSISSAUGA - 111 BRUNEL\LEGACY\LOG DATABASE\8-CHAR\11 19 6.0 20 21 22 7.0 23 24 25 26 8.0 27 28 29 9.0 30 31 32

REFERENCE No.: 11205379-90 ENCLOSURE No.: MW8-21 BOREHOLE No.: BOREHOLE REPORT **ELEVATION:** 82.20 m Page: 1 of 1 CLIENT: Infrastructure Ontario (I.O.) **LEGEND** Preliminary Geotechnical Investigation - Proposed Parking Structure Children's Hospital of Eastern Ontario Campus - 401 Smyth Road, PROJECT: \boxtimes ss - SPLIT SPOON ST - SHELBY TUBE LOCATION: Ottawa, Ontario - ROCK CORE DESCRIBED BY: K. Schaller CHECKED BY: S. Shahangian - WATER LEVEL \mathbf{Y} DATE (START): January 18, 2021 DATE (FINISH): January 18, 2021 NORTHING: 5027647.908 **EASTING:** 449211.832 SOIL LOG WITH GRAPH+WELL Shear test (Cu) Sensitivity (S) △ Field Stratigraphy Type and Number Recovery/ TCR(%) Moisture Content 'N' Value/ SCR(%) Elevation (m) BGS ☐ Lab Blows per Depth Water content (%) **DESCRIPTION OF** 15 cm/ Atterberg limits (%) SOIL AND BEDROCK RQD(%) (blows / 12 in.-30 cm) Feet Metres 82.20 **GROUND SURFACE** Ν 10 20 30 40 50 60 70 80 90 0.05 82.15 ASPHALT: 50 mm GS1 5 --Report: FILL 0.31 SANDY GRAVEL, brown, moist, loose 100 2 SS1 7 3-4-2-3 6 Gravel: 61%, Sand: 33%, Clay: 2%, Silt GHD GEOTECH_V02.GLB Bentonite : 6% 0.86 1.0 81.34 3 BEDROCK (inferred), shale fragments, SS2 23-50/ 100 18 50+ 1.22 m reddish brown/grey, wet, very dense 150mm #2 Sand 5 50/ SS3 100 8 50+ 100mm Screen 2.0 Y 2.14 m 21 SS4 100 4 50/ 50+ 2.22 79.98 auger refusal 2.22 m 75mm **END OF BOREHOLE:** 9 3.0 ---\112053--\11205379\11205379 - 90.GPJ NOTE: 10 - End of Borehole at 2.22 m bgs 11 Borehole was dry upon completionMonitoring well installed at 2.14 m bgs 12 - Groundwater found at 2.03 m bgs on January 28, 2021 13 4.0 - Groundwater found at 2.09 m bgs on February 10, 2021 14 - bgs donates 'below ground surface' 15 16 - 5.0 17 18 N:\CA\MISSISSAUGA - 111 BRUNEL\LEGACY\LOG DATABASE\8-CHAR\11 19 6.0 20 21 22 7.0 23 24 25 26 8.0 27 28 29 9.0 30 31 32

REFERENCE No.: 11205379-90 ENCLOSURE No.: B1-21 BOREHOLE No.: **BOREHOLE REPORT** ELEVATION: _ 82.29 m Page: 1 of 1 CLIENT: Infrastructure Ontario (I.O.) **LEGEND** Preliminary Geotechnical Investigation - Proposed Parking Structure Children's Hospital of Eastern Ontario Campus - 401 Smyth Road, PROJECT: \boxtimes ss - SPLIT SPOON - SHELBY TUBE Ottawa, Ontario LOCATION: - ROCK CORE DESCRIBED BY: K. Schaller CHECKED BY: S. Shahangian - WATER LEVEL \mathbf{Y} DATE (START): January 18, 2021 DATE (FINISH): January 18, 2021 NORTHING: 5027580.742 **EASTING:** 449219.213 SOIL LOG WITH GRAPH+WELL Shear test (Cu) Sensitivity (S) △ Field Stratigraphy Type and Number Recovery/ TCR(%) Moisture Content 'N' Value/ SCR(%) Elevation (m) BGS ☐ Lab Blows per State Depth Water content (%) **DESCRIPTION OF** 15 cm/ Atterberg limits (%) SOIL AND BEDROCK RQD(%) (blows / 12 in.-30 cm) Feet Metres 82.29 **GROUND SURFACE** % Ν 10 20 30 40 50 60 70 80 90 FILL: SILTY SAND and GRAVEL, greyish Report: SS1 5 62 2 7-3-2-3 brown, moist, loose 0.46 81.83 2 NATIVE: GHD_GEOTECH_V02.GLB SAND and GRAVEL, some silt, trace SS2 89 10 9-24-50/ 50+ 81.38 81.25 0.91 1.04 125mm clay, brown, moist, very dense Gravel: 39%, Sand: 39%, Clay: 7%, Silt : 15% 5 BEDROCK, shale fragments, brownish red/grey, moist, very dense auger refusal 2.0 **END OF BOREHOLE:** NOTE: - End of Borehole at 1.04 m bgs 3.0 - Borehole was dry upon completion ---\112053--\11205379\11205379 - 90.GPJ 10 - bgs donates 'below ground surface' 11 12 13 4.0 14 15 16 - 5.0 17 18 N:\CA\MISSISSAUGA - 111 BRUNEL\LEGACY\LOG DATABASE\8-CHAR\11 19 6.0 20 21 22 7.0 23 24 25 26 8.0 27 28 29 9.0 30 31 32

REFERENCE No.: 11205379-90 ENCLOSURE No.: 10 B2-21 BOREHOLE No.: **BOREHOLE REPORT ELEVATION:** 82.18 m Page: 1 of 1 CLIENT: Infrastructure Ontario (I.O.) **LEGEND** Preliminary Geotechnical Investigation - Proposed Parking Structure Children's Hospital of Eastern Ontario Campus - 401 Smyth Road, PROJECT: \boxtimes ss - SPLIT SPOON ST - SHELBY TUBE LOCATION: Ottawa, Ontario - ROCK CORE DESCRIBED BY: K. Schaller CHECKED BY: S. Shahangian - WATER LEVEL \mathbf{Y} DATE (START): January 18, 2021 DATE (FINISH): January 18, 2021 NORTHING: 5027629.392 **EASTING:** 449254.399 SOIL LOG WITH GRAPH+WELL Shear test (Cu) Sensitivity (S) △ Field Stratigraphy Type and Number Recovery/ TCR(%) Moisture Content 'N' Value/ SCR(%) Elevation (m) BGS ☐ Lab Blows per Depth State Water content (%) **DESCRIPTION OF** 15 cm/ Atterberg limits (%) SOIL AND BEDROCK RQD(%) (blows / 12 in.-30 cm) Feet Metres 82.18 **GROUND SURFACE** % Ν 10 20 30 40 50 60 70 80 90 FILL: SILTY SAND and GRAVEL, brown, Report: SS1 71 41 0 13-17-24-9 moist, dense 2 GEOTECH_V02.GLB 100 81.27 SS2 4-10-28-34 3 -991 10 38 BEDROCK, shale fragments, grey, very dense SS3 9 22-50/ 50+ 1.52 80.66 150mm **END OF BOREHOLE:** 2.0 - End of Borehole at 1.52 m bgs - Borehole was dry upon completion - bgs donates 'below ground surface' - 3.0 10 11 12 13 4.0 14 15 16 - 5.0 17 18 N:\CA\MISSISSAUGA - 111 BRUNEL\LEGACY\LOG DATABASE\8-CHAR\11 19 6.0 20 21 22 7.0 23 24 25 26 8.0 27 28 29 9.0 30 31 32

REFERENCE No.: 11205379-90 ENCLOSURE No.: BOREHOLE No.: B3-21 **BOREHOLE REPORT** ELEVATION: 82.27 m Page: 1 of 1 Infrastructure Ontario (I.O.) CLIENT: _ **LEGEND** Preliminary Geotechnical Investigation - Proposed Parking Structure Children's Hospital of Eastern Ontario Campus - 401 Smyth Road, PROJECT: \boxtimes ss - SPLIT SPOON - SHELBY TUBE LOCATION: Ottawa, Ontario - ROCK CORE CHECKED BY: _ DESCRIBED BY: K. Schaller - WATER LEVEL ¥ DATE (FINISH): DATE (START): 5027652.016 NORTHING: **EASTING**: 449199.133 Report: SOIL LOG WITH GRAPH+WELL Shear test (Cu) Sensitivity (S) △ Field Stratigraphy Recovery/ TCR(%) Moisture Content Type and Number 'N' Value/ SCR(%) Elevation (m) BGS ☐ Lab Blows per Water content (%) **DESCRIPTION OF** vvaler content (%)

Atterberg limits (%)

"N" Value 15 cm/ SOIL AND BEDROCK RQD(%) (blows / 12 in.-30 cm) Feet Metres 82.27 **GROUND SURFACE** Ν 10 20 30 40 50 60 70 80 90 FILL: SILTY SAND with gravel, greyish brown, SS1 62 15 6-6-2-2 8 moist, loose 0.61 81.66 trace to some clay GHD_GEOTECH_V02.GLB Sand, some gravel, silt and clay, reddish SS2 3 100 ٠ 1.0 13 4-5-9-25 14 grey, moist, stiff 81.05 SS3 BEDROCK (inferred), shale fragments, 100 7 50/ 50+ 0 1.37 150mm \greyish brown, very dense **END OF BOREHOLE:** - 2.0 NOTE: - End of Borehole at 1.37 m bgs - Borehole was dry upon completion - bgs donates 'below ground surface' **—** 3.0 10 -11 12 -13 - 4.0 14 15 16 -- 5.0 17 18 N:\CA\MISSISSAUGA - 111 BRUNEL\LEGACY\LOG DATABASE\8-CHAR\11-19 6.0 20 21 22 7.0 23 -24 25 26 8.0 27 28 29 9.0 30 31 32

REFER	ENCE N	o.:	11205379								ENCLO	SUR	E No.:			9	
		ŒU		BOREHOLE No.:	_	l	MW9	-22		В	ORE	HC	DLE	RE	EP(ORT	ſ
				ELEVATION:		82	.0 m				Pa	ge: _	1_	of _	1_		
CLIENT	: Infra	structu	re Ontario (I.O.)	PROJECT: P	reli	minary (Geote	chnic	al Investiga	tion	LEG	END	!				
LOCAT	ION:	401	Smyth Road, Ottaw	<i>r</i> a, Ontario									- SPL				
	NG RIG:	Trac	ck Drill Rig	DRILLING MET	НО	D: 203	mm C	D Ho	llow Stem A	Augers			- SHE - RO				
	RIBED BY	: <u>D. A</u>	Ash								Ā		- WA	TER	LEVI	EL	
DATE (START):	19 、	July 2022	_ DATE (FINISH):	:	19 July	2022	2									
	IING:		7588.5 m	EASTING:	_	449191	1.1 m		T		01						
9 SOIL LOG WITH Depth	Elevation (m)	Stratigraphy		RIPTION OF D BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)	Shear Sensit O W W _p W _l At O "N (blows	ivity (S ater c terber " Value	S) ´ ontent (g limits	(%) (%)	∆ Fie □ La		
Feet Met	res 82.0			ID SURFACE				%			10 20	30 40	0 50 60			N-7	- V-
2 Seport:	.3 81.8		moist, compact	RAVEL, grey/brown,	$\frac{1}{2}$	SS1	62	6	9-8-10-4	18	0			_0.2	2 m_		
뛔 두 이	.8 81.2 .0			and GRAVEL, , compact to dense K, weathered, light	$\sqrt{}$	SS2	83	3	2-11-27-50	38	0			entor	nite_		
5			brown	k, weathered, light										+	$\frac{1}{1}$		
6 2 7 2	.0													2.1	m_	_	
8 + 2	.6 79.4				L										H		
9 — 3 10 — 3	.0		SHALE-BEDROC weathered, moder moderately strong	K, highly to moderately rately bedded, weak to grey/black		RC1	90		13					_	 		
					1												
13 ± 4	.0					RC2	100		40					<u>+</u>			
RAGE A 15 —														scre	∍en		
16 - 5 17 - 5	.0				Ħ												
18 — 1						RC3	97		65	-				_			
19 + 6	.0														m– and		7
20 21 					1										m-		
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24 —															\vdash		
25 7	.9 74.2 .0				1									_) m=		
99 20 <u>-</u> 8	.0		END OF BOREHO	LE:										#	Ħ		
28 -			NOTE: - End of Borehole	at 7.85 m bas										+	\parallel		
29 - 9	.0		- Rock coring from											\pm	\parallel		
30 -			- bgs donates 'bel	ow ground surface'										\pm	\pm		
31 — 32 —											+	+		+	+		

		GHE		BOREHOLE N ELEVATION:						В	ORI		OLE			
CLIENT:	Infras	tructur	e Ontario (I.O.)	PROJECT:	Preli	minary (Geote	chnic	al Investigat	ion	LE	GEN				
LOCATION	1:	401	Smyth Road, Ottaw	a, Ontario							\boxtimes			PLIT	SPOC	N
			ck Drill Rig		лЕТНО	D: 203	mm C	D Ho	llow Stem A	ugers		ST	- Sł	HELE	Y TU	BE
DESCRIBE	D BY:	D. A	sh	CHECKED	BY: _	A. Kha	ndeka	ar			Ш Т	RC			CORI R LEV	
DATE (STA	ART):	12 J	uly 2022	DATE (FINI	SH): _	12 July	2022	2			_					
NORTHING	 3:	502	7596.9 m	EASTING:		449167	7.5 m									
Depth	Elevation (m)	Stratigraphy	DESCR	RIPTION OF D BEDROCK	State		Recovery/ TCR(%)	Moisture Content	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)	Sens $\bigcup_{W_p} \bigvee_{W_l}$	Atterbe 'N" Val	(S) ´ conten erg limi	ts (%)	△ F.	
Feet Metres	82.1		GROUN	D SURFACE				%			_ `		40 50		80 90)
			FILL : GM-SAND and GF	RAVEL, some silt.												
1 - 0.5			trace clay, brown,		\bigvee	SS1	83	3	16-13-12-4	25	0	•				
2 - 0.6	81.5 81.4		clay, very dense	and GRAVEL, trace		SS2	87	6	7-38-50/ 75mm	88/ 75mm	0					
			brown	it, would be a fight												
4 - 1.2	80.9	=	Borehole terminate auger refusal	ed due to spoon and												
5 1.5			END OF BOREHO	<u>LE :</u>										Ш		
6			NOTE: - End of Borehole - Borehole was dry - bgs donates 'beld	upon completion												
7 - 2.0			290 40.14.00 20.1	on ground canada												
8 - 2.5																
9 - 3.0																
11 —																
- 3.5 12 -																
13 - 4.0																
14 —																
15 — 4.5																
16												\vdash	+	+	-	\Box

REFERENCE No .: 11205379 ENCLOSURE No.: BOREHOLE No.: BH11-22 BOREHOLE REPORT ELEVATION: 82.1 m Page: 1 of 1 PROJECT: Preliminary Geotechnical Investigation CLIENT: Infrastructure Ontario (I.O.) **LEGEND** 401 Smyth Road, Ottawa, Ontario LOCATION: \boxtimes ss - SPLIT SPOON ST - SHELBY TUBE DRILLING METHOD: 203mm OD Hollow Stem Augers DRILLING RIG: Track Drill Rig - ROCK CORE DESCRIBED BY: D. Ash CHECKED BY: A. Khandekar - WATER LEVEL ¥ DATE (START): ___18 July 2022 DATE (FINISH): 18 July 2022 NORTHING: 5027638.0 m **EASTING:** 449184.6 m Shear test (Cu) Sensitivity (S) △ Field Stratigraphy Type and Number Recovery/ TCR(%) 'N' Value/ SCR(%) Elevation (m) Moisture ☐ Lab Content Blows per Water content (%) **DESCRIPTION OF** 15cm/ Atterberg limits (%) SOIL AND BEDROCK RQD(%) (blows / 12 in.-30 cm) Feet Metres 82.1 **GROUND SURFACE** % 10 20 30 40 50 60 70 80 90 FILL: GW-GM-SANDY GRAVEL, trace silt, SS1 67 2 19-17-11-3 28 trace clay, brown, moist, compact 2 0.6 81.5 Gravel: 52%, Sand: 37%, Silt: 8%, Clay 81.3 SS2 62 9 3-6-11-14 17 NATIVE: SM-ML-SAND and SILT, trace clay, SS3 100 50/ 50+ 75mm grey/brown, moist, compact 5 SHALE-BEDROCK, weathered, light SS4 50/ 50+ 100 brown 2.0 50mm auger refusal 2.5 79.6 SHALE-BEDROCK, moderately bedded, 9 moderately weathered, medium strong, RC1 78 36 - 3.0 10 grey/black 11 12 13 -- 4.0 RC2 100 60 14 15 16 5.0 17 18 RC3 100 50 19 - 6.0 20 21 22 23 - 7.0 RC4 100 55 24 25 8:8 74.2 27 **END OF BOREHOLE:** 28

11205379 SOIL LOG WITH GRAPH+WELL

Report:

11205379 GHD

N./CA\TORONTO\PROJECTS\662\11205379\TECH\LOG DATABASE\11205379 - PARKING GARAGE ADDITION.GPJ

29

30

31 32

34 35 9.0

10.0

- End of Borehole at 7.98 m bgs

- Borehole was dry upon completion

- bgs donates 'below ground surface'

_	REF	EREN	CE No.	:	11205379								ENCL	.osui	RE N	o.: _		12	
				GHE		BOREHOLE N ELEVATION:						В		EH(RT
Ì	CLIE	NT:	Infrast	ructur	e Ontario (I.O.)	PROJECT:	Preli	minary (Geote	chnica	al Investiga	ation	LE	GENI	<u> </u>				
2	LOC	ATION	N:	401	Smyth Road, Ottaw	a, Ontario								SS	- - S	PLIT	SPO	ON	
1/9/2	DRIL	LING	RIG: _	Trac	k Drill Rig	DRILLING N	ЛЕТНО	D: 203	mm C	D Ho	llow Stem	Augers		ST RC			BY TI		
Date	DES	CRIBE	ED BY:	D. A	sh	CHECKED I	BY: _	A. Kha	ndeka	r			Ā	NO			R LE		
+WELL	DAT	E (STA	ART):	12 J	uly 2022	DATE (FINIS	SH): _	12 July	2022										
SRAPH	NOR	RTHING	G:	5027	7590.3 m	EASTING:		449214	l.3 m										
11205379 SOIL LOG WITH GRAPH+WELL Date: 1/9/22	Depth		Elevation (m)	Stratigraphy	SOIL AN	RIPTION OF D BEDROCK	State	Type and Number	Recovery/ TCR(%)		Blows pe 15cm/ RQD(%)	'N' Value/ SCR(%)	Sens	ar test (sitivity (Water Atterbe "N" Valu vs / 12	S) (conter erg lim ue	its (%	, 🗆	Field Lab	
12053	Feet M	/letres	82.1	XXX	GROUN FILL :	D SURFACE				%			10 2	20 30 4	40 50	60 7	0 80 9	90	
Library File: 11205379 GHD_GEOTECH_V05.GLB Report: 1	1 -				GM-GRAVEL, son clay, brown, moist,	ne sand and silt, trac , compact d : 14%, Clay & Silt :	IV	SS1	46	3	13-25-5-5	30	0	•					
тесн_v05	2 -	0.5	81.4		NATIVE : SM-ML-SAND and	LCII T trace clay													
GHD_GEC	3 -	- 1.0 1.1	81.0		brown, moist, very	dense	\bigwedge	SS2	100	5	15-39-40-5 75mm	79	0						
e: 11205379	4 -	1.1	01.0		SHALE-BEDROCK brown	K, weathered, light		SS3	100		50/ 0mm	50/ 0mm							
- 1	5 -	1.5																	
ON.GPJ	6	1.8	80.2	=	Borehole terminate auger refusal	ed due to spoon and													
E ADDITI	7	- 2.0			END OF BOREHO	LE:													
FIIe: N:\CA\TORONTO\PROJECTS\662\11205379\TECH\LOG DATABASE\11205379 - PARKING GARAGE ADDITION.GPJ	8 –	2.5			NOTE: - End of Borehole - Borehole was dry														
9 - PARKII	9 —				- bgs donates 'beld	ow ground surface'													
=\1120537	10 —	- 3.0																	
DATABASE	+																		
NLOG [11 —	3.5																	
379\ТЕСН	12 —	0.0																	
362\11205	13 —	- 4.0																	
)JECTS/(14 —	-														+		\parallel	
NTO/PRC	" -	4.5														+		H	
A\TORO	15 —	7.0																+	
File: N:\C	16																		

REFERENCE No.: 11205379 ENCLOSURE No.: BOREHOLE No.: BH13-22 BOREHOLE REPORT ELEVATION: 82.2 m Page: 1 of 1 PROJECT: Preliminary Geotechnical Investigation CLIENT: Infrastructure Ontario (I.O.) **LEGEND** 401 Smyth Road, Ottawa, Ontario LOCATION: \boxtimes ss - SPLIT SPOON 1/9/22 ST - SHELBY TUBE Track Drill Rig DRILLING RIG: DRILLING METHOD: 203mm OD Hollow Stem Augers - ROCK CORE DESCRIBED BY: L. McCann/S. Wallis CHECKED BY: A. Khandekar - WATER LEVEL Ţ 11205379 SOIL LOG WITH GRAPH+WELL DATE (START): 4 July 2022 DATE (FINISH): 4 July 2022 NORTHING: 5027615.5 m **EASTING:** 449212.0 m Shear test (Cu) Sensitivity (S) △ Field Stratigraphy Type and Number Recovery/ TCR(%) Elevation (m) Value/ Moisture 'N' Value SCR(%) ☐ Lab Blows per Content Depth Water content (%) **DESCRIPTION OF** 15cm/ Atterberg limits (%) SOIL AND BEDROCK RQD(%) (blows / 12 in.-30 cm) Feet Metres 82.2 **GROUND SURFACE** % 10 20 30 40 50 60 70 80 90 82.1 0.1 ASPHALT: 75 mm Library File: 11205379 GHD_GEOTECH_V05.GLB Report: SS1 100 FILL 10-13-10-5 23 GW-GM-SANDY GRAVEL. light 2 brown/grey, dry, compact 0.9 1.8 81.3 81.2 NATIVE: SS2 2-2-11-15 13 71 SP-GP-SAND and GRAVEL, trace clay, brown, moist, compact SHALE-BEDROCK, weathered, grey 5 RC1 82 0 80.2 2:8 SHALE-BEDROCK, moderately to highly weathered, thinly bedded, highly to moderately fractured, grey, weak RC2 10 95 3.0 10 11 occasional clay and shale layers N.)CA\TORONTO\PROJECTS\662\11205379\TECH\LOG DATABASE\11205379 - PARKING GARAGE ADDITION.GPJ 12 13 4.0 RC3 100 37 14 15 16 - 5.0 occasional clay and shale layers 17 18 19 RC4 100 43 6.0 20 21 6.6 75.5 22 **END OF BOREHOLE:** 7.0 23 NOTE: 24 - End of Borehole at 2.37 m bgs 25 - Borehole was dry upon completion - Rock coring from 1.32 m bgs 26 - bgs donates 'below ground surface' 8.0 27 28 29 9.0 30 31 32

DESCRIBED BY: D. Ash CHECKED BY: A. Khandekar 12 July 2022	HOLE REPO e: <u>1</u> of <u>1</u>
DOCATION: 401 Smyth Road, Ottawa, Ontario	ND
DRILLING RIG: Track Drill Rig DRILLING METHOD: 203mm OD Hollow Stem Augers 2 ST RC	
DESCRIBED BY: D. Ash CHECKED BY: A. Khandekar 12 July 2022	- SHELBY TUBE
NORTHING: 5027618.1 m EASTING: 449237.3 m	- ROCK CORE - WATER LEVEL
Signature Description of Soil And Bedrock Description of Soil And Be	
Second S	
Feet Metres 82.2 GROUND SURFACE	ty (S) ☐ Lab er content (%) rberg limits (%)
1	0 40 50 60 70 80 90
1 — 0.5	
SS2 100 5 7-35-48-42 83 0 100 10	
3 — 1.0 SS2 100 5 7-35-48-42 83 O	
1.0 brown 1.2 81.0 Borehole terminated due to spoon and auger refusal END OF BOREHOLE: NOTE: - End of Borehole at 1.22 m bgs - Borehole was dry upon completion - bgs donates 'below ground surface' 8 - 2.5 9 - 10 - 3.0 11 - 3.5 12 - 3.5	
Borehole terminated due to spoon and auger refusal END OF BOREHOLE: NOTE: - End of Borehole at 1.22 m bgs - Borehole was dry upon completion - bgs donates 'below ground surface' 8 - 2.5 9 - 10 - 3.0 11 - 3.5 12 - 10 - 3.5	
auger refusal END OF BOREHOLE: NOTE: - End of Borehole at 1.22 m bgs - Borehole was dry upon completion - bgs donates 'below ground surface' 8 - 2.5 9 - 10 - 3.0 11 - 3.5 12 - 4.0	
NOTE: - 2.0 - 2.0 - 2.5 9	
- End of Borehole at 1.22 m bgs - Borehole was dry upon completion - bgs donates 'below ground surface' - 2.5 9 - 10 - 3.0 11 - 3.5 12 - 3.5	
- 2.0 7	
7 — 2.5 8 — 2.5 9 — 10 — 3.0 11 — 3.5 12 — 40	
8 - 2.5 9 - 10 - 3.0 11 - 1 - 3.5 12 - 1	
9 - 3.0	
9 3.0	
10 — 3.0	
11 - 3.5	
11 - 3.5	
- 3.5 12	
- 3.5 12	
13 — 4.0	
13 — 4.0	
14 —	
<u>-</u>	
15 — 4.5	
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			GHE		BOREHOLE No. ELEVATION:						В	ORI		DLE			OF
CLIE	ENT: _	Infrast	tructur	e Ontario (I.O.)	PROJECT: _F	reli	minary (Geote	chnic	al Investigat	ion	LEC	SENE	<u> </u>			
LOC	CATION	1:	401	Smyth Road, Ottaw	a, Ontario							\boxtimes		- SF	LIT S	SPOO	Ν
DRI	LLING	RIG: _	Trac	k Drill Rig	DRILLING MET	ΉΟ	D: 203	mm C	D Ho	llow Stem A	ugers		ST RC			Y TUE CORE	
DES	SCRIBE	D BY:	D. A	sh	CHECKED BY:	_	A. Kha	ndeka	ır			Ā				R LEV	
DAT	TE (STA	ART):	12 J	uly 2022	DATE (FINISH)	: _	12 July	2022									
NOF	RTHING	3 :	5027	7642.6 m	EASTING:		449234	1.7 m									
Depth		Elevation (m)	Stratigraphy		IIPTION OF D BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)	Sensi	N" Valu	S) [′] conten erg limit		△ Fi	
Feet I	Metres	82.1			D SURFACE				%			10 2	0 30 4	10 50 (50 70	80 90	_
+	.				RAVEL, trace silt, trace	$\backslash /$											
1	-			clay, brown, moist Gravel : 40%, San Clay : 3%	, dense d : 47%, Silt : 10%,	IX	SS1	62	3	16-18-13-5	31	0	•				
2	0.5	81.5		·													
_ {				SHALE-BEDROCI brown	K, weathered, light	\mathbb{N}											
3 -						ΙX	SS2	100	6	20-25-50/ 125mm	75/ 125mn						
-	- 1.0 . 1.1	81.1	=	Borehole terminate	ed due to spoon and	+											
4	.			auger refusal											\vdash		
+	. , _			END OF BOREHO	<u>LE :</u>												
5	- 1.5			NOTE: - End of Borehole	at 1 07 m has												
6	.			- Borehole was dry - bgs donates 'beld	upon completion												
	. 20			- bgs donates ben	ow ground surface												
7 -	- 2.0																
+	.																
8 –	- 2.5																
+	. 2.5																
9	-																
	- - 3.0																
10 —																	
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··	- 3.5														$\dagger \dagger$		\dashv
12 —															+	++	\dashv
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13 —	- 4.0												+		\dashv	+	\dashv
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L	_					1				1		$\sqcup \sqcup$		\vdash	$\perp \perp$	\perp	

	GHD	BOREHOLE No.:			В	OREH(Page:	OLE F	_
CLIENT: Infras	40.4 O th. D 1 Ott	PROJECT: Prelin	minary Geotechr	nical Investigati	on_	LEGENI	- - SPLIT	T SPOON
DESCRIBED BY:	Track Drill Rig D. Ash 12 July 2022	CHECKED BY:	A. Khandekar		ugers	⊠ ST RC ▼	- ROCŁ	.BY TUBE K CORE ER LEVEL
NORTHING: under the second of	Stratig SOIL AN	EASTING: RIPTION OF D BEDROCK		Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)	Shear test (Sensitivity (Water Water Water "N" Valu (blows / 12	S) Content (% erg limits (% ue in30 cm)	
1 - 0.5 2 - 0.7 81.4 3 - 0.9 81.2 - 1.0 4 - 1.2 80.9 5 - 1.5 - 2.0 7	FILL: SW-SM-SAND and trace clay, brown, Gravel: 44%, Sare: 2% NATIVE: SP-GP-SAND and trace clay, brown, SHALE-BEDROC brown Borehole terminate auger refusal END OF BOREHO NOTE: - End of Borehole - Borehole was dr	d GRAVEL, trace silt, moist, compact ad : 45%, Silt : 9%, Clay	SS1 54 3	3 2-6-8-6 7 2-4-11-14 - 50/	14 (15) 50/ Omm			

_	REFERENCE No.: 1120	5379							ENCLO	SURE	No.:		17	7
	GHD	BOREHOLE No.: ELEVATION:						В	ORE Pag	HO				RT
		(I.O.) PROJECT: Pro	elir	minary (Geote	chnic	al Investiga	ation_	LEG					
/22	LOCATION: 401 Smyth R								⊠ s ⊠ s				POON Tube	
te: 1/9	DRILLING RIG: Track Drill Ric								∭ R	C	- 800			=
∐ Da	DESCRIBED BY: D. Ash								Ā		- WA	ΓER	LEVE	L
H+WE	DATE (START): <u>12 July 2022</u>	DATE (FINISH):	_	12 July	2022									
GRAP	NORTHING: 5027619.3 m	EASTING:	_	449258	8.6 m		T							
11205379 SOIL LOG WITH GRAPH+WELL Date: 1/9/22	Depth Elevation (m) Stratigraphy		State	Type and Number	Recovery/ TCR(%)		Blows pe 15cm/ RQD(%)	'N' Value/ SCR(%)	(SWOID)	vity (S) ater co terberg ' Value / 12 in.	ntent (limits	%) (%) n)	△ Field	
12053	Feet Metres 82.1 FILL:	GROUND SURFACE	Н			%			10 20	30 40	50 60	70 8	80 90 T	1
5.GLB Report: 1	GW-GN trace cl Gravel : 2%,	M-GRAVEL with SAND, trace silt, ay, brown, moist, compact: 52%, Sand: 39%, Silt: 7%, Clay	\bigvee	SS1	54		4-10-17-1 ⁻	1 27						
Library File: 11205379 GHD_GEOTECH_V05.GLB Report:	2 — 0.7 81.4 NATIVE SP-GP- trace cl	E : -SAND and GRAVEL, trace silt, ay, brown, moist, compact	$\left\langle \cdot \right\rangle$	SS2	100		3-8-22-50 75mm	/ 30		•				
rary File: 11205379	4 — 1.1 81.0 SHALE brown, Boreho auger r													
FIIe: N:\CA\TORONTO\PROJECTS\662/11205379\TECH\LOG DATABASE\11205379 - PARKING GARAGE ADD TION.GPJ LIbr	6 — NOTE: - End of Series - End of Series - Boreh - bgs do	f Borehole at 1.14 m bgs ole was dry upon completion onates 'below ground surface'												
PARKING GARA	8 - 2.5													
4BASE\11205379	10 — 3.0													
9\TECH\LOG DAT	11 - 3.5													
TS\662\1120537.	13 — 4.0													
ROJEC	14 —									++		+		+
JA/OTNC											+			
SA/TOR	15 —													-
File: N:\(16 —													

REFERENCE No .: 11205379 ENCLOSURE No.: BOREHOLE No.: BH18-22 BOREHOLE REPORT **ELEVATION:** 82.1 m Page: 1 of 1 PROJECT: Preliminary Geotechnical Investigation CLIENT: Infrastructure Ontario (I.O.) **LEGEND** 401 Smyth Road, Ottawa, Ontario \boxtimes ss - SPLIT SPOON 1/9/22 ST - SHELBY TUBE DRILLING RIG: Track Drill Rig DRILLING METHOD: 203mm OD Hollow Stem Augers - ROCK CORE DESCRIBED BY: D. Ash CHECKED BY: A. Khandekar - WATER LEVEL Ţ 11205379 SOIL LOG WITH GRAPH+WELL DATE (START): 15 July 2022 DATE (FINISH): 15 July 2022 NORTHING: 5027645.0 m **EASTING:** 449256.7 m Shear test (Cu) Sensitivity (S) △ Field Stratigraphy Type and Number Recovery/ TCR(%) 'N' Value/ SCR(%) Elevation (m) Moisture ☐ Lab Blows per Content Water content (%) **DESCRIPTION OF** 15cm/ Atterberg limits (%) SOIL AND BEDROCK RQD(%) (blows / 12 in.-30 cm) Feet Metres 82.1 **GROUND SURFACE** % 10 20 30 40 50 60 70 80 90 FILL: GW-GM-SANDY GRAVEL with sand, SS1 62 9-8-10-4 18 trace silt, trace clay, grey/brown, moist, 0.6 81.5 compact GEOTECH V05.GLB 8.0 81.3 Gravel: 73%, Sand: 21%, Silt: 5%, Clay SS2 38 3 83 2-11-27-50 1% 1.0 NATIVE: SP-GP-SAND and GRAVEL, trace silt, 1.4 80.7 trace clay, moist, dense SHALE-BEDROCK RC1 100 0 auger refusal **Library File:** 11205379 GHD 2.0 SHALE-BEDROCK, moderately to highly weathered, thinly bedded, very weak to moderately strong, grey/black 3.0 10 RC2 100 0 11 N.)CA\TORONTO\PROJECTS\662\11205379\TECH\LOG DATABASE\11205379 - PARKING GARAGE ADDITION.GPJ 12 13 4.0 14 15 RC3 100 36 16 - 5.0 17 18 19 6.0 20 RC4 100 51 21 22 23 75.0 24 **END OF BOREHOLE:** 25 - End of Borehole at 7.13 m bgs 26 8.0 - Rock coring from 1.40 m bgs 27 - Borehole was dry upon completion - bgs donates 'below ground surface' 28 29 9.0 30 31 32

_	REFERENCE	E No.:		11205379								ENCL	.OSUF	RE No).: _		19	
					BOREHOLE N	o.: _		3H19	-22		В	OR	EHO	DLE	ΕR	EP	OF	₹T
		9			ELEVATION:		81	.1 m					age:					
	CLIENT: _li	nfrastru	cture C	Ontario (I.O.)	PROJECT:	Preli	minary (Geote	chnica	al Investiga	tion	<u>LE</u>	GENE	2				
52	LOCATION:		401 Sn	nyth Road, Ottaw	a, Ontario							\boxtimes				SPOC		
e: 1/9/;	DRILLING RI	IG:	Track [Drill Rig	DRILLING M	ETHC	D: 203	mm C	D Ho	llow Stem /	<u>Augers</u>		ST RC			SY TU CORI		
∏ Dat				l .								Ā		- W	ATE	R LE\	/EL	
H+WE	DATE (STAR	RT):	14 July	/ 2022	DATE (FINIS	SH): _	14 July	2022										
H GRAF	NORTHING:			38.9 m	EASTING:		449046					Shes	ar test (Cir)		ΔF	ield	
79 SOIL LOG WITH	Depth	Elevation (m)	Stratigraphy		IPTION OF D BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content	Blows pe 15cm/ RQD(%)	'N' Value/ SCR(%)	Sens W _p W _l	itest (sitivity (Water (Atterbe "N" Valu vs / 12	S) ´ conten erg limi ıe	ts (%)			
12053	0	31.1	Δ	GROUN ASPHALT : 75 mm	D SURFACE				%			10 2	0 30 4	10 50	60 70	80 9	0	
H_V05.GLB Report: 1	1 0.5	81.0	FSC	FILL :	AND, trace silt, trace		SS1	79	1	4-5-3-6	8	•						
11205379 GHD_GEOTEC	3 - 0.9 8	80.2	S tr	race clay, brown, i Gravel : 31%, San Clay : 7%	d : 46%, Silt : 16%, K, weathered, light		SS2	71	ı	17-33-50/ 125mm	83/ 125mn	1						
PARKING GARAGE ADDITION.GPJ Libra	5 — 1.5 - 2.0 7 — 2.5 9 — 9		N															
G DATABASE\112053	3.0																	
11205379\TECH\LC	- 3.5 12 -																	
ECTS\662\	13 - 4.0																	
ONPROJ	14 —														\prod			
TORON	15 — 4.5																	
N:\CA\]	16 —											+				+		
E E																		

REFERENCE No.: 11205379 ENCLOSURE No.: BOREHOLE No.: MW20-22 BOREHOLE REPORT **ELEVATION:** 81.2 m Page: 1 of 1 PROJECT: Preliminary Geotechnical Investigation CLIENT: Infrastructure Ontario (I.O.) **LEGEND** 401 Smyth Road, Ottawa, Ontario \boxtimes ss - SPLIT SPOON **Date:** 1/9/22 ST - SHELBY TUBE DRILLING RIG: Track Drill Rig DRILLING METHOD: 203mm OD Hollow Stem Augers - ROCK CORE DESCRIBED BY: D. Ash CHECKED BY: A. Khandekar - WATER LEVEL Ţ FIIE: N.CATORONTOIPROJECTS1662/112053791TECHLOG DATABASE1/1205379 - PARKING GARAGE ADDITION. GPJ LIDRAY FIIE: 1/205379 GHD. GEOTECH V05. GLB Report: 1/205379 SOIL LOG WITH GRAPH+WELL DATE (START): 14 July 2022 DATE (FINISH): 14 July 2022 NORTHING: 5027656.2 m **EASTING:** 449095.7 m Shear test (Cu) Sensitivity (S) △ Field Stratigraphy Type and Number Recovery/ TCR(%) 'N' Value/ SCR(%) Elevation (m) Moisture ☐ Lab Content Blows per Depth Water content (%) **DESCRIPTION OF** 15cm/ Atterberg limits (%) SOIL AND BEDROCK RQD(%) (blows / 12 in.-30 cm) Feet Metres 81.2 **GROUND SURFACE** 10 20 30 40 50 60 70 80 90 ASPHALT: 75 mm 0.1 81.1 0.2 FILL: SM-GRAVELLY SAND, some silt, trace SS1 58 5 6-10-8-5 18 0 clay, brown, moist, compact bentonite 0.5 Gravel: 36%, Sand: 44%, Silt: 16%, Clay: 4% 0.7 m 8.0 80.5 NATIVE: 3 SP-GP-SAND and GRAVEL, trace silt, 1.0 80.2 trace clay, brown, moist, dense SS2 87 5 8-21-29-27 50 0 1.0 Gravel: 46%, Sand: 41%, Silt: 9%, Clay screer SHALE-BEDROCK, weathered, grey 1.5 SS3 100 50/ 50/ 1.6 79.6 1.6 m Borehole terminated due to spoon and 75mm 75mm auger refusal **END OF BOREHOLE:** 2.0 NOTE: - End of Borehole at 1.60 m bgs - Monitoring well installed at 1.60 m bgs 2.5 - bgs donates 'below ground surface' 9 3.0 3.5 12 13 4.0 14 4.5 15 16 5.0 17 18 5.5 19



Soil Description Gravel (%) Sand (%) Clay & Silt (%)	CIIE	ent:	Intrastructure Ontario			Lab No.:	G-21-01	
Depth: 0.7-1.0m Enclosure:	Pro	ject, Site:	Children's Hospital of Easte	ern Ontario C	Campus	Project No.:	11205379-80	
Depth: 0.7-1.0m Enclosure:		Borehole No.:	•			Sample No.:	SS2	
Clay & Silt Sand Gravel		Depth:	0.7-1.	0m			-	
Clay & Silt Sand Gravel								
Clay & Silt Sand Gravel	Percent Passing	90						0 10 20 Bercent Betained 60
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, some Silt, trace Clay 39 39 22 Clay-size particles (<0.002 mm): 7 %		20						70 80 90
Fine Medium Coarse Fine Coarse		0.001	0.01	0.1 Diam	neter (mm)		10	100
Particle-Size Limits as per USCS (ASTM D-2487) Soil Description Gravel (%) Sand (%) Clay & Silt (%) Sand and Gravel, some Silt, trace Clay 39 39 22 Clay-size particles (<0.002 mm): 7 % Remarks:			Clav & Silt					
Soil Description Gravel (%) Sand (%) Clay & Silt (%) Sand and Gravel, some Silt, trace Clay 39 39 22 Clay-size particles (<0.002 mm): 7 % Remarks:							Fine Coarse	_
Sand and Gravel, some Silt, trace Clay 39 39 22 Clay-size particles (<0.002 mm): 7 % Remarks:						· 		
Clay-size particles (<0.002 mm): 7 % Remarks:			Soil Description		Gravel (%)	Sand (%)	Clay & Silt (%))
Remarks:		S			39	39		
			Clay-size particles (<0.002 mr	n):			7 %	
Performed by: Z. Mathurin Date: February 10, 2021	Rer	narks:						
	Per	formed by:	Z. M	athurin	<u>-</u>	Date:	February 10, 20	21
Verified by: E. Bennett Date: February 17, 2021	Ver	ified by:	E. B	ennett		Date:	February 17, 20	21



Clie	ent:	Infrastructure Ontario			Lab No.:	G-21-01		_
Pro	ject, Site:	Proposed Parking Str Children's Hospital of	Eastern Ontario	Campus	Project No.:	11205379-80		
		401 Smyth Road, Otta	awa, Ontario					
	Borehole No.:		B3-21		Sample No.:	SS2		_
	Depth:	0.	.7-1.0		Enclosure:	-		-
	100						0	
	90						10	0
	80						20	0
	70						30	0
assing	60						40	etained
Percent Passing	50						50	Percent Retained
_	40						60	
	30						70	0
	20						80	0
	10						90	0
	0.001	0.01	0.1 Diam e	eter (mm)		10	100	00
				Sand		Gravel		
		Clay & Silt	Fine		m Coarse		arse	
		Pa	article-Size Limits	as per USCS (ASTM	D-2487)			
		Soil Description		Gravel (%)	Sand (%)	Clay & Si	It (%)	
	Sar	nd, some Gravel, some Silt, s	some Clay	19	50	31		
		Clay-size particles (<0.00	2 mm):			14 %)	
Rer	narks:							
								•
Per	erformed by: Z. Mathurin				Date:	February 1	0, 2021	
Ver	ified by:	E	E. Bennett		Date:	February 1	7, 2021	-



Clie	nt:	Infrastructure Ontario			Lab No.:	G-21-01		
		Proposed Parking Str	ructure					
Pro	ect, Site:	Children's Hospital of 401 Smyth Road, Ott		Campus	Project No.:	11205379-80		
		·						
	Borehole No.:	<u>_</u>	BH1-21		Sample No.:	Grab		
	Depth:	0	.1-0.3m		Enclosure:	-		
	100						0	
						/		
	90						10	,
	00					 /		,
	80						20	'
	70						30)
						/		-
ssing	60						40	taine
ıt Pa					$ \cdot \cdot Y$			t Re
Percent Passing	50						50	Percent Retained
ď	40							
	40						60	,
	30						70)
	20						80)
	10						90)
	0.001	0.01	0.1	eter (mm)		10	100	Ю
			Diani	eter (mm)				
		Clay & Silt		Sand		Gravel		
			Fine			Fine Coars	se	
		Р	article-Size Limits	as per USCS (ASTM	D-2487)			
		Soil Description		Gravel (%)	Sand (%)	Clay & Silt	(%)	
	G	ravel and Sand, trace Silt, tr	ace Clay	48	41	11		
		Taver and Sand, trace Siit, th	ace clay	40	41			
						3 %		1
Ron	narks:							
nen								
Per	formed by: Z. Mathuri				Date:	February 10,	2021	
Veri	fied by:	I	E. Bennett		Date:	February 17,	2021	
						. oblidary 11,		



Clie	ent:	Infrastructure Ont			Lab No.:	G-21-01		_
		Proposed Parking		0				
Pro	ject, Site:	401 Smyth Road,	al of Eastern Ontario Ottawa, Ontario	Campus	Project No.:	11205379-80		-
	Davahala Na		BH2-21		Camania Na	Grab		
	Borehole No.:	-			Sample No.:	Grab		-
	Depth:		0.1-0.3m		Enclosure:	-		-
	100						0	
	90						10	0
	80						20	0
	70						30	0
	70							
sing	60				-		40	o ained
Percent Passing								Percent Retained
rcen	50						50	o
Pe	40							
	40						60	U
	30						70	0
	20						80	0
	40							•
	10						90	U
	0							00
	0.001	0.01	0.1 Dian	neter (mm)		10	100	
				Sand		Gravel		
		Clay & Silt	Fin	e Mediu	ım Coarse	Fine Coa	ırse	
			Particle-Size Limits	as per USCS (ASTM	D-2487)	<u>'</u>		
				1	Γ			1
		Soil Description	on	Gravel (%)	Sand (%)	Clay & Sil	t (%)	
	Sa	and and Gravel, trace Si	It, trace Clay	42	50	8		
			·			2 %		
				•				•
Rer	narks:							_
								_
Per	formed by:		Z. Mathurin		Date:	February 10), 2021	•
Ver	ified by:		E. Bennett		Date:	February 17	7, 2021	
					•			-



Clie	ent:	Infrastructure Ontario			Lab No.:	G-21-01		
Pro	ject, Site:	Proposed Parking Stru- Children's Hospital of E	Eastern Ontario	Campus	Project No.:	11205379-8	30	
		401 Smyth Road, Ottav	wa, Ontario					
	Borehole No.:	BH	12-21		Sample No.:	SS1		
	Depth:	0.5	i-0.8m		Enclosure:	_		
	100							0
	90							10
	80							20
	70							30
ssing	60							40 tained
Percent Passing	50							05 09 Percent Retained
Perce	30							Perce
	40							60
	30							70
	20							80
	10							90
	0.001	0.01	0.1	1		10		100 100
			— I	eter (mm)				
		Clay & Silt	Fine	Sand • Mediu	m Coarse	Gravel Fine	Coarse	
		Par		as per USCS (ASTM				
		Soil Description		Gravel (%)	Sand (%)	Clay &	Silt (%)	
	Sar	nd, some Silt, some Gravel, tra	ace Clay	15	61	2	<u> </u>	
		Clay-size particles (<0.002	mm):			6	%	
Rer	narks:							
Per	formed by:	Z.	Mathurin		Date:	February	10, 2021	
Ver	ified by:	E.	. Bennett		Date:	February	<i>,</i> 17, 2021	



Clie	nt:	Infrastructure On			Lab No.:	G-21-01		
		Proposed Parking	g Structure					
Pro	ject, Site:	401 Smyth Road	al of Eastern Ontario	o Campus	Project No.:	11205379-80		
	Danahala Na	,,	BH4-21		OI- N	SS1		
	Borehole No.:				Sample No.:	331		,
	Depth:		0.2-0.5m		Enclosure:	-		
	100						0	
	90						10	n
	90							,
	80						20	3
						🖌		
	70						30)
6								þ
assin	60						40	etain
nt P	50							nt R
Percent Passing	50						50	Percent Retained
_	40						60	
	30						70)
	20						80)
	10						90)
	0						10	00
	0.001	0.01	0.1 Dian	neter (mm)		10	100	,,
		Clay & Silt	Fin	Sand		Gravel		
			Fin Particle-Size Limits			Fine Coar	se	
			T di ticle-Gize Elimits	as per occo (ACTIV	1 5-2-01)			
		Soil Descripti	-n	Gravel (9/)	Sand (9/)	Clay 9 Sile	(9/)	
		Soil Descripti	on	Gravel (%)	Sand (%)	Clay & Silt	. (%)	
	G	ravel and Sand, trace S	ilt, trace Clay	46	41	13		
		,						
						3 %		1
Ren	narks:							
1101								
Per	formed by:		Z. Mathurin		Date:	February 10	, 2021	
Vor	fied by:		E. Bennett		Date:	February 17	2021	
V G1	iica by.		L. Deilliett		- Date.	I Goldaly I/	, 2021	



Clie	nt:	Infrastructure Ontario			Lab No.:	G-21-01		
Dro	Depth: 100 90 80 70 40 30 20 10 0.001	Proposed Parking Stru Children's Hospital of		Campus	Project No.:	11205379-80		
FIO	jeci, Sile.	401 Smyth Road, Otta	wa, Ontario	Campus	Project No	11203379-80		
	Borehole No.:	M	W5-21		Sample No.:	Grab		
	Depth:	0.	1-0.3m		Enclosure:	-		
	100 -						0	
	90						10	١
	00						20	
	80						20	
	70						30)
ng	00					/	40	ned
Passi	80						40	Percent Retained
rcent	50						50	rcent
Pe	40						60	
	40							
	30						70)
	20						80	
	20							
	10						90	١
		+					100	10
		0.01	0.1 Diame	eter (mm)		10	100	
		Oleve 9. Oila		Sand		Gravel		
		Clay & Silt	Fine			Fine Coar	se	
		Ра	rticle-Size Limits a	as per USCS (ASTM	D-2487)			
		Soil Description		Gravel (%)	Sand (%)	Clay & Silt	(%)	
	G	Gravel and Sand, some Silt, tra	ice Clay	43	41	16		
		Clay-size particles (<0.002	? mm):			3 %		
Rer	narks:							
Per	formed by:	Z	. Mathurin		Date:	February 10	, 2021	
Ver	ified by:	E	. Bennett		Date:	February 17	, 2021	



Clie	ent:	Infrastructure Ontario			Lab No.:	G-21-01		
		Proposed Parking Str		0				
Pro	ject, Site:	Children's Hospital of 401 Smyth Road, Otta		Campus	Project No.:	11205379-80		
		•				004		
	Borehole No.:	1	W5-21		Sample No.:	SS1		
	Depth:	0.	5-0.8m		Enclosure:	-		
	100						• • • • • • • • • • • • • • • • • • • •	- 0
	90							- 10
	80							- 20
	00							- 20
	70							- 30
Percent Passing	60							05 05 Percent Retained
t Pa								t Rei
ercen	50							- 50 Licel
A.								_
	40							- 60
	30							- 70
								70
	20							- 80
	10							- 90
	0.001	0.01	0.1 Diam s	1 ator (mm)		10	10	- 100 00
			Diame	eter (mm)				
		Clay & Silt		Sand		Gravel		
			Fine			Fine Co	arse	
		Pa	rticle-Size Limits	as per USCS (ASTM	D-2487)			
								\neg
		Soil Description		Gravel (%)	Sand (%)	Clay & S	ilt (%)	
		Gravelly Sand, some Silt, trac	ce Clav	23	49	28		
			·			8 %		
		Clay-size particles (<0.002	2 mm):			8 %	·	
Rer	narks:							
								_
De:	formed b	7	Mathurin		Data		0. 2024	
rer	formed by:		. Mathurin		Date:	February 1	0, 2021	_
Ver	ified by:	E	E. Bennett		Date:	February 1	7, 2021	



Clie	nt:	Infrastructure Ontario	1		Lab No.:	G-21-01	
Proj	ect, Site:	Proposed Parking Str Children's Hospital of	Eastern Ontario	Campus	Project No.:	11205379-80	
		401 Smyth Road, Otta					
	Borehole No.:		1W6-21		Sample No.:	SS2	
	Depth:	0	.8-1.1m		Enclosure:	-	
Percent Passing	100 90 80 70 60 50						0 10 20 30 Forcent Betained
	30 20 10						70 80 90
	0.001	0.01	0.1 Diam e	eter (mm)		10	100
				Sand		Gravel	
		Clay & Silt	Fine	e Mediu	m Coarse	Fine Coarse	,
		P	article-Size Limits	as per USCS (ASTM	D-2487)		
		Soil Description		Gravel (%)	Sand (%)	Clay & Silt (%)
	G	Gravelly, Sand, some Silt, tra	ce Clay	32	45	23	
		Clay-size particles (<0.00	2 mm):			7 %	
Rem	arks:						
Perf	ormed by:		Z. Mathurin		Date:	February 10, 2	2021
Veri	fied by:		E. Bennett		Date:	February 17, 2	2021



Clie	nt:	Infrastructure Ontar	io		Lab No.:	G-21-01		
		Proposed Parking S		0				
Pro	ject, Site:	Children's Hospital 401 Smyth Road, C	ot Eastern Ontario Dttawa. Ontario	Campus	Project No.:	11205379-80		
	Borehole No.:		MW8-21		Sample No.:	Grab		
						Ciub		
	Depth:	-	0.0-0.3m		Enclosure:	-		
	100						0	
	90					- <i> </i>	10	
						/		
	80						20	
	70						30	
						🗲		-
ssing	60						40	tainec
Percent Passing								Percent Retained
ercer	50						50	ercer
a	40						60	Ъ
	40							
	30						70	
	20						80	
	10						90	
	0 001	0.04				10	100	
	0.001	0.01	0.1 Diam e	eter (mm)		10	100	
				Sand		Gravel		
		Clay & Silt	Fine			Fine Coars	e	
			Particle-Size Limits a	as per USCS (ASTM	D-2487)			
		Soil Description		Gravel (%)	Sand (%)	Clay & Silt (%)	
		Sandy Gravel, trace Silt, tr	race Clav	61	33	6		
		, - , , , , , , , , , , , , , , , , , ,	- ,	-		2 %		
Rer	narks:							
Dar	farmer al barr		7. Madhania		Data	Fahmam (40)	2024	
rer	formed by:		Z. Mathurin		Date:	February 10,	<u> </u>	
Ver	ified by:		E. Bennett		Date:	February 17,	2021	



Clie	ent:			Infrastructur	e Ontario			Lab No.:		G-22-03		
Pro	ject, Sit	e: _		Children F	Hospital			Project No.:		11205379		
	Borehole Depth:	e No.:		BH10-22 0 - 0,61 r				Sample No.:		SS-1		
	100										0	
	80										20	
	70										30	
Percent Passing	50										40	nt Reta
Perc	40										60	
	30										70	
	10										90	
	0.001		0.01		0.1 Diame	eter (mm)	1		10		100 100	00
						S	Sand		Gra	avel		
			Clay & Silt		Fine		Mediu	m Coarse	Fine	Coarse		
				Particle-S	ize Limits a	s per USC	S (ASTM	D-2487)				
			Soil Descr	iption		Grave	el (%)	Sand (%)	CI	ay & Silt (%)		
	G	Gravel and S	Sand, with Some	Silt and Traces	s of Clay	43	3	43		14		
		Clay	Silt-size parti y-size particles		m):			3				
Rer	narks:	More inf	formation is ava	ilable upon requ	ıest.							
Per	formed	by:		J. Lalo	nde)			Date:	Aug	gust 15, 2022		
Ver	ified by	: _		bool	\$			Date:	Aug	gust 24, 2022		



Clie	nt:							Inf	rast	ruc	tur	e C	Ontai	rio						Lal	b N	o.:					(G-2	2-03	3			
Pro	ject,	Site:						(Chile	dre	n F	łos	spital	<u>l</u>						_Pro	ojec	t N	o.:				1	120	537	'9			
	Bore Dep	ehole No.:	_							H11 - 0,6										Sar	mple							SS	S-1 -				
Sercent Passing		0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0							I I I I I I I I I I I I I I I I I I I	Diame Fine its a	s is pe	er U	Sa	(AS	STN	um	187)	Coa and 37	(%)	8833	1 Fir	ne	Grav	c ny &	Silt 1			7 0 - 10 - 20 - 30 - 40 - 50 - 60 - 70 - 80 - 90	Percent Retained				
		_										_																					
Per	form	ied by:			_		$\overline{}$		J	J. L	alo	nd	<u>e</u>							_	D	ate	:			Α	lugi	ust 1	11, :	202	2		
Ver	ified	by:		_	>	<	= }	0	\subseteq		<u>X</u>	_								_	D	ate	:				lugi	ust 2	24, :	202	2		,



Client	t:			Infrastructur	e Ontario			_Lab No.:		G-22-03	
Proje	ct, Site:			Children F	Hospital			_Project No.:	1	1205379	
	orehole i	No.:		BH12-22	2			Sample No.:		SS-1	
D	epth:			0 - 0,61 r	n			Enclosure:		-	
			0.01		0.1 Diame	eter (mm)	Sand		10 Grav	/el	0
		(Clay & Silt		Fine	, 1	Sand Medi	um Coarse	Grav Fine	/el Coarse	
				Particle-S	Size Limits a				rine	Coarse	
			Soil Descri	ption		Grav	vel (%)	Sand (%)	Cla	y & Silt (%)	
	Gravel, with Some Sand and Silt, Traces of 0						66	14		20	
			It-size partic ze particles (les (%) : [%) (<0.002 mi	m):						
Rema	rks:	More inform	nation is avail	able upon requ	ıest.						
Perfo	rmed by	v:		J. Lalo	nde			Date:	Auai	ust 11, 2022	
	ed by:			Doce	<u> </u>			Date:		ust 24, 2022	



Clie	nt:	Infrastruct	ure Ontario		Lab No.:	G-22-03	
Pro	ject, Site:	Children	Hospital		Project No.:	11205379	
	Borehole No	0 - 0,61			Sample No.: Enclosure:	SS-1 -	
Percent Passing	100 90 80 70 60 40 30 20 10 0.001	0.01	0.1 Diameter	Sand	TO COMPA	Gravel	0 10 20 30 40 Hercent Retained 90 100 100
			Fine	Mediu		Fine Coarse	
		Particle	-Size Limits as p	per USCS (ASTM	D-2487)		
		Soil Description		Gravel (%)	Sand (%)	Clay & Silt (%)	
		Sandy Gravel, with Traces of Silt and	Clay	66	22	12	
		Silt-size particles (%) : Clay-size particles (%) (<0.002 i	mm):				
Rer	narks:	More information is available upon re	quest.				
Per	formed by:	:	londe		Date:	August 11, 2022	
Ver	ified by:		<u> </u>		Date:	August 24, 2022	



Clie	Depth: 100 90 80 70 40 30 20 10 0.001							nfra	stru	ıctu	ıre	Ont	taric)					La	b N	o.:					G	G-22	-03			
Pro	roject, Site: Borehole No.: Depth: 100 90 80 70 40 30 20 10 0.001							Ch	ildr	en	Но	spit	tal						_Pro	ojed	et N	o.:				11	205	379)	_	
										15-2),61										mple							SS-	-1		_	
Percent Passing	90 - 80 - 70 - 60 - 70 - 30 - 20 - 10 - 0	01							0.1	Diar	neter	(mm			1							0					0 10 20 30 40 50 60 70 80 90	Percent Retained			
				Cla	8	k Silt										Si	and								G	Grave	el				
				Ola	. y c	. Oilt		F	Parti	icle-	-Siz	e Liı	Fir mits		oer L	JSCS			ium /I D-2		Coa	rse		Fi	ne		Co	arse)		
				S	oil	Des	crip	tion							Gra	avel	(%)		Sa	nd	(%)			•	Clay	· & S	Silt (%)		
		Sand and	d Grav	vel, v	witl	n Sor	ne S	ilt an	d T	race	es c	of Cl	lay			40					47						13	}			
		Sand and Gravel, with Some Silt and Tra Silt-size particles (%): Clay-size particles (%) (<0.002)2 m	nm)):											10 3									
Ren	narks	Mor	e infoi	rmat	ion	is a	/ailal	ole u	pon	req	ques	st.																		_	
Per	orme	ed by:			_	_	\		J.	Lal	മ്പു	de							_	D	ate	:			A	ugu	st 1	1, 2	022		
Ver	fied	by:		(7			<u>X</u>	2	2	<u>X</u>								_	D	ate	:			A	ugu	st 2	4, 2	022	_	



Clie	ent:	Infrastructure Onta	rio	Lab No.:	G-22-03	
Pro	ject, Site	: Children Hospita	<u> </u>	Project No.:	11205379	_
	Borehole	No.: BH16-22		Sample No.:	SS-1	
	Depth:	0 - 0,61 m		Enclosure:	-	_
Percent Passing	100 90 80 70 60 50 40 30 20 10 0.001	0.01	Diameter (mm)		10 100	0 10 20 30 40 30 40 40 50 50 60 70 80
		Clay & Silt	Sand		Gravel	
			Fine Mediu its as per USCS (ASTM		Fine Coarse	
		Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)	
		Sand and Gravel, with Traces of Silt and Clay	44	45	11	
		Silt-size particles (%) : Clay-size particles (%) (<0.002 mm):		9		
Rer	narks:	More information is available upon request.				_
Per	formed b	y: J. Lalonde		Date:	August 11, 2022	_
Ver	ified by:	- Josef		Date:	August 24, 2022	_



Client:	Infrastructure	Ontario	Lab No.: G-22-03		
Project, Site:	oject, Site: Children Hospital		Project No.:	11205379	
Borehole No.: _ Depth: _					
Cla	Clay & Silt Particle-Siz Soil Description Gravel, with Traces of Silt and Cla Silt-size particles (%): ay-size particles (%) (<0.002 mm):		Gravel Fine Coarse Clay & Silt (%)	0 0 10 20 20 30 Percent Betained
Performed by: Verified by:	J. Lalon	de	Date:	August 9, 2022 August 24, 2022	_



Client:	Infrastructure O	ntario	Lab No.: G-22-03 Project No.: 11205379		
Project, Site:	Children Hosp	ital			
Borehole No.: _ Depth: _					
Cla	Clay & Silt Particle-Size Soil Description Gravel, with Traces of Silt and Clay Silt-size particles (%): ay-size particles (%) (<0.002 mm): Information is available upon request.	Diameter (mm) Sand Fine Medii Limits as per USCS (ASTN Gravel (%) 73		10 Gravel Fine Coarse Clay & Silt (%)	0 10 20 30 90 90 100 100 100 100 100 100 100 100
Performed by: J. Lalonde Date: August 9, 2022 Verified by: Date: August 24, 2022					



Client: Project, Site:		Infrastructure Or	ntario	Lab No.: G-22-03		
		Children Hosp	Children Hospital Project			
	Borehole No.: Depth: 0,76 - 1,37 m Enclosure:		SS-2 -			
100 96 86 70 40 30 30		0.01 0.1 Clay & Silt	Diameter (mm) Sand Fine Mediu	m Coarse	10 Gravel Fine Coarse	0 10 20 30 40 40 40 40 40 40 40 40 40 40 40 40 40
		Particle-Size L	imits as per USCS (ASTM		riile Coaise	=
	Soil Description		Gravel (%)	Sand (%)	Clay & Silt (%)	
	Sand and Gravel, with Some Silt and Traces of Clay		Clay 31	31 46 23		
		Silt-size particles (%) :		16		
		Clay-size particles (%) (<0.002 mm):		7		
Rema	rks: <u> </u>	More information is available upon request.				
Perfor	med by:	J. Lalonde		Date:	August 17, 202	2
Verifie	ed by:	Social		Date:	August 24, 202	2



Client:		Infrastru	icture Ontario		Lab No.: G-22-03			
		: Childr	Children Hospital			11205379		
	Borehole No.: MW20-22 Depth: 0,00 - 0,61 m			Sample No.: Enclosure:	SS-1			
	100						0 10	1
6	70						20	1
Percent Passing	50 40 20						50 50 60 70	Percent Reta
	0 0.001	0.01	0.1			10	90	
			Diame	eter (mm)				
		Clay & Silt	Fine	Sand Mediu	m Coarse	Gravel Fine Coa	rse	
		Parti	cle-Size Limits a	s per USCS (ASTM	D-2487)	I		
	Soil Description			Gravel (%)	Sand (%)	Clay & Sil	lt (%)	
	Sand and Gravel, with Some Silt and Traces of Clay		36 44 20					
		Silt-size particles (%) : Clay-size particles (%) (<0.00	12 mm):		16 4			
Rei	marks:	More information is available upon	request.					
Per	formed b	ру:	Lalonde		Date:	August 9,	2022	
Ver	ified by:		<u> </u>		Date:	August 24,	, 2022	



Client: Project, Site:		Infrastructure On	tario	Lab No.: G-22-03		
		Children Hospi	tal	Project No.:	11205379	_
	Borehole No.: MW20-22			Sample No.:	SS-2	_
	Depth:	0,61 - 1,22 m	-	Enclosure:	<u> </u>	_
Percent Passing	100 90 80 70 60 50 40 20					0 10 20 30 40 80 60 70
	0.001	0.01 0.1	Diameter (mm)		10 100	100
		Clay & Silt	Sand Fine Mediu	m Coarse	Gravel Fine Coarse	
		Particle-Size Li	mits as per USCS (ASTM	D-2487)		
	Soil Description Gravel and Sand, Traces of Silt and Clay		Gravel (%)	Sand (%)	Clay & Silt (%)	
			46	41	13	
		Silt-size particles (%) : Clay-size particles (%) (<0.002 mm):		9		
Rer	narks: <u>N</u>	Nore information is available upon request.				_
Per	formed by:	J. Lalonde		Date:	August 9, 2022	_
Ver	ified by:	- Josef		Date:	August 23, 2022	_



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

Client:	Infrastructure Ontario			tario	Lab no.:	G-20-01
Project/Site:		CHEO P	roposed New Pa	rking Garage	Project no.:	11205379-80
Borehole no.:	ВН3		Sample no.:	SS2	Depth:	0.6-1.2m
Soil description:					Date sampled:	18-Jan-21
Apparatus:	Hand	Crank	Balance no.:	1	Porcelain bowl no.:	1
Liquid limit device no.:		1	Oven no.:	1	Spatula no.:	1
Sieve no.:		1	Glass plate no.:	1	_	
	Liquid Limit (LL):		Soil Preparation:		
	Test No. 1	Test No. 2	Test No. 3	☑ Cohesive <425	µm 🗆	Dry preparation
Number of blows	30	25	20	☐ Cohesive >425	um 🔽	Wet preparation
	Water Conte	ent:		☐ Non-cohesive		
Tare no.	S39	S11	S32]	Results	
Wet soil+tare, g	32.39	33.80	32.26	38.0		
Dry soil+tare, g	29.85	30.89	29.53	26.0		
Mass of water, g	2.54	2.91	2.73	36.0		
Tare, g	21.63	21.65	21.60	34.0	•	
Mass of soil, g	8.22	9.24	7.93	L Co		
Water content %	30.9%	31.5%	34.4%	gg 32.0 →		
Plastic Limit (P	L) - Water Cont	ent:		1		Y
Tare no.	S37	S18		30.0		
Wet soil+tare, g	28.17	28.51		28.0		
Dry soil+tare, g	27.24	27.53		15 17 19	21 23 25 27 Nb Blows	7 29 31 33 35
Mass of water, g	0.93	0.98		Sc	il Plasticity Chart	
Tare, g	21.98	22.23		70	LL 50	
Mass of soil, g	5.26	5.30		60 Low plasticity	High plasti Inorganic	icity
Water content %	17.7%	18.5%		리 50 Inorganic clay		CH)
Average water content %	18.	1%		<u>a</u> 40 ⋅		
Natural Wate	r Content (W ⁿ):		Inorganic clay Inorganic clay Inorganic clay Inorganic clay Low compressibility Low compressibility Low compressibility Inorganic clay		
Tare no.	G			Low compressibility		MH and CH
Wet soil+tare, g	445.80			20	V. info	h compressibility rganic silt
Dry soil+tare, g	393.10			10 CL (ML)	- Infor - Medium co norganic s	ganic day mpressibility ilt ay
Mass of water, g	52.70			0 10 20	(ML) _{and} (OL) - Organic cli	
Tare, g	0.00			10 10 20	Liquid Limit LL	.0 00 00 100
Mass of soil, g	393.10			Liquid Limit (Plastic Limit (F	L) Plasticity Index (PI)	Natural Water Content W ⁿ
Water content %	13.4%			32 18	14	13
Remarks:	•					1
Performed by:				Date		
renomieu by:		Ali E	lhaddad	Date:	Feb	oruary 12, 2021
Verified by:		E. E	Bennett	Date:	Feb	oruary 18, 2021



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.:	BH13-22	2	Sample no.:		SS-2		Depth:	(0,61 - 1,22 m
Soil Description:			-				Date sampled:	_	
Apparatus: Liquid limit device no.: Sieve no.:		Crank 1 5690	Balance no.: Oven no.: Glass plate no.:		33031049 3-04645 1		Porcelain bowl r	10.: _	1 1
	Liquid Limit	(LL):		Soil Prepara	tion:				
	Test No. 1	Test No. 2	Test No. 3		Cohesiv	/e <425 μι	m	∠ [Dry preparation
Number of blows				1	Cohesiv	/e >425 μι	m	_ \	Wet preparation
	Water Conte	ent:	1	1 <u> </u>	Non-col	hesive		_	
Tare no.							Results		
Wet soil+tare, g				2.0)				
Dry soil+tare, g				1					
Mass of water, g				- (%					
Tare, g				tent (
Mass of soil, g				Water Content (%)					
Water content %				Wate					
Plastic Limit (Pl	L) - Water Cont	tent:		1					
Tare no.			1						
Wet soil+tare, g			1	0.0					
Dry soil+tare, g			1		15	17	19 21 Nb Blows		23 25 27
Mass of water, g			1			Soil	Plasticity Chart	ASTM	I D2487
Tare, g			1	70			LL 50		
Mass of soil, g			1	60	Lean cl	ay (cL)	F	t clay (cr	
Water content %			1	글 50	Lean or	ay CL)		+	
Average water content %			1	7d-7T = 1d ×epul			Org	anic clay	/ ОН
Natural Wate	r Content (W ⁿ):		icity 30 -		Orga	anic clay OL		
Tare no.]	Plast	Silty clay (CL (ML)—		Elas	stic silt MH
Wet soil+tare, g			1	20				Organ	nic silt OH
Dry soil+tare, g]	10	2223		Organic silt	+	
Mass of water, g]	0	10	20 3	ML OL 50	60	70 80 90 100
Tare, g]				Liquid Limit L		
Mass of soil, g			1	Liquid Limit (LL)		ic Limit PL)	Plasticity Index	(PI)	Natural Water Content W ⁿ
Water content %			-	(22)		· <u>-</u> ,			
Remarks:	Non-Plastic S	Sample	•	<u> </u>			•		
Porformed by:			alanda		ח	ate:		Sonto	mher 13 2022
Performed by:		J. L	_atonde		-				mber 13, 2022
Verified by:		CXC			_ D	ate:		Septe	mber 13, 2022
Laboratory Location:	179 Col	onnade Rd. S	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 Hospita			ital		Project no.:	11205379	
Borehole no.:	BH19-22		Sample no.:		SS-2	Depth:	0,76 - 1,37 m	
Soil Description:						Date sampled:		
Apparatus:	Hand	Crank	Balance no.:	803	33031049	Porcelain bowl no.:	1	
Liquid limit device no.:		1	Oven no.:	B2	23-04645	Spatula no.:	1	
Sieve no.:	015	5690	Glass plate no.:		1			
	Liquid Limit ((LL):		Soil Prepara	tion:			
	Test No. 1	Test No. 2	Test No. 3	Ø	Cohesive <42	5 μm	Dry preparation	
Number of blows					Cohesive >42	5 μm	Wet preparation	
	Water Conte	ent:	ı		Non-cohesive			
Tare no.				_		Results		
Wet soil+tare, g				2.0)			
Dry soil+tare, g				_				
Mass of water, g				%				
Tare, g				ntent				
Mass of soil, g				Water Content (%)				
Water content %				Wat				
Plastic Limit (Pl	_) - Water Cont	ent:						
Tare no.			1					
Wet soil+tare, g			1	0.0	,			
Dry soil+tare, g					15 17	19 21 Nb Blows	23 25 27	
Mass of water, g			-		S	oil Plasticity Chart AS1	M D2487	
Tare, g			-	70		LL 50		
Mass of soil, g			1	60	Lean clay (CL) Fat clay		
Water content %			-	급 50 +	Lean day (CL	 		
Average water content %			1	Plasticity Index PI = LL-PL 00 0		Organic o	clay OH	
Natural Wate	r Content (W ⁿ):		<u>pu</u> 30 +		Organic clay OL		
Tare no.			1	Plastic	Silty clay (CL)ML		Elastic silt MH	
Wet soil+tare, g			-	20		Or	ganic silt OH	
Dry soil+tare, g			-	10	- 222 222222	Organic silt		
Mass of water, g			-	0	10 20	30 40 50 60	70 80 90 100	
Tare, g			-		10 20	Liquid Limit LL	70 80 90 100	
Mass of soil, g				Liquid Limit		it Plasticity Index (PI)	Natural Water Content W ⁿ	
Water content %			-	(LL)	(PL)			
Remarks:	Non-Plastic S	Sample	<u> </u>					
Performed by:		1.1	<i>e</i> londe		Date:	Sen	tember 13, 2022	
		D.C.	V.		_			
Verified by:		CCC			_ Date:	Sep	tember 13, 2022	
Laboratory Location:	179 Col	onnade Rd. S	uite 400, Ottawa	ı, Ontario	_			



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

Client:		ı	nfrastructure On	Lab no.:	G-22-03				
Project/Site:			Children Hospi	tal	Project no.: 112053			11205379	
Borehole no.:	MW20-22	2	Sample no.:		SS-2		Depth: 0,61 - 1,22 m		
Soil Description:							Date sampled:		
Apparatus:	Hand	Crank	Balance no.:	803	33031049		Porcelain bowl no.:	1	
Liquid limit device no.:		1	B2	23-04645		Spatula no.: 1			
Sieve no.:	015	5690	Glass plate no.:		1				
_	Liquid Limit ((LL):		Soil Prepara	tion:				
	Test No. 1	Test No. 2		Cohesive	e <425 µr	n 🗸	Dry preparation		
Number of blows				Cohesive	e >425 µr	m \Box	Wet preparation		
	Water Conte		Non-coh	esive					
Tare no.				_			Results		
Wet soil+tare, g				2.0	, [
Dry soil+tare, g									
Mass of water, g				(%)					
Tare, g				ntent					
Mass of soil, g				Water Content (%)					
Water content %				Wat					
Plastic Limit (Pl	_) - Water Cont	ent:		1					
Tare no.									
Wet soil+tare, g				0.0	, 📖				
Dry soil+tare, g					15	17	19 21 Nb Blows	23 25 27	
Mass of water, g			-			Soil	Plasticity Chart AST	M D2487	
Tare, g				70			LL 50		
Mass of soil, g				60					
Water content %				님 50 +	Lean cla	y (CL)	Fat clay (
Average water content %				Plasticity Index Pl = LL-PL 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			Organic c	lay (OH)	
Natural Wate	r Content (W ⁿ):		ity Ind		Orga	nic clay OL		
Tare no.				Plasticit	Silty clay (c	ML	,	lastic silt (MH)	
Wet soil+tare, g			1	20 +		1/	Orı	ganic silt OH	
Dry soil+tare, g			-	10	,7,7,7,7,7,7,7,7,7,7,7,7,7,7,7,7,7,7,		Organic silt		
Mass of water, g				0 0	-2224	20 3	ML (OL) 0 0 40 50 60	70 80 90 100	
Tare, g					10	20 3	Liquid Limit LL	70 80 90 100	
Mass of soil, g				Liquid Limit		Limit	Plasticity Index (PI)	Natural Water Content W ⁿ	
Water content %				(LL)	(P	L)			
Remarks:	Non-Plastic S	Sample	<u>I</u>		1		<u> </u>	I	
Performed by:			aloredo		Da	te:	C _c -4	ember 13, 2022	
	$\overline{}$	J. L	alonde		_				
Verified by:	~~		4		_ Da	te:	Sept	ember 13, 2022	
Laboratory Location:	179 Col	onnade Rd. S	uite 400, Ottawa	, Ontario	_				



Moisture Content of Soils (ASTM D 2216)

Client:	Infrastru	ucture Ontari	io		Lab No.:		G-22-03		
Project/Site:	Childre	en's Hospital			Project No.	:	1120	11205379	
Apparatus Used for Testing	Oven No.:	B23-0)4645	Scale No.:	80330	31049			
BH No.:					BH10-22	BH10-22	BH11-22	BH11-22	
Sample No.:					SS1	SS2	SS1	SS2	
Depth:					0,0-2,0	2,0-3,3	0,0-2,0	2,0-4,0	
Container no.					32	25	28	4	
Mass of container + wet soil (g)					70.50	70.00	75.70	72.80	
Mass of container + dry soil (g)					68.90	66.80	74.40	68.10	
Mass of container (g)					14.80	14.60	14.70	14.80	
Mass of dry soil (g)					54.1	52.2	59.7	53.3	
Mass of water (g)					1.6	3.2	1.3	4.7	
Moisture content (%)					3.0	6.1	2.2	8.8	
BH No.:	BH12-22	BH12-22	BH14-22	BH14-22	BH15-22	BH15-22	BH16-22	BH16-22	
Sample No.:	SS1	SS2	SS1	SS2	SS1	SS2	SS1	SS2	
Depth:	0,0-2,0	2,0-4,0	0,0-2,0	2,0-4,0	0,0-2,0	2,0-3,5	0.0-2,0	2,0-4,0	
Container no.	42	15	14	35	18	9	13	23	
Mass of container + wet soil (g)	83.70	74.40	79.40	74.00	61.00	62.70	78.90	58.40	
Mass of container + dry soil (g)	81.60	71.80	77.90	71.10	59.50	60.20	77.00	55.40	
Mass of container (g)	14.60	14.80	14.80	15.10	15.00	14.70	14.80	15.10	
Mass of dry soil (g)	67.0	57.0	63.1	56.0	44.5	45.5	62.2	40.3	
Mass of water (g)	2.1	2.6	1.5	2.9	1.5	2.5	1.9	3.0	
Moisture content (%)	3.1	4.6	2.4	5.2	3.4	5.5	3.1	7.4	
Remarks:									
Performed By:	→ J A Ba	ptiste		Date:		July 27	7. 2022		
Verified by :		3	Date:	July 27, 2022 August 3, 2022					



Moisture Content of Soils (ASTM D 2216)

Client:	Infrastru	ucture Ontari	io		Lab No.:		G-22	2-03
Project/Site:	Childre	en's Hospital	l		Project No.:			5379
Apparatus Used for Testing	Oven No.:	B23-0)4645	Scale No.:	80330	31049		
MW No.:	BH9-22	BH9-22						
Sample No.:	SS1	SS2						
Depth:	0,0-2,0	2,5-4,5						
Container no.	9	32						
Mass of container + wet soil (g)	59.30	55.60						
Mass of container + dry soil (g)	56.90	54.30						
Mass of container (g)	14.70	14.90						
Mass of dry soil (g)	42.2	39.4						
Mass of water (g)	2.4	1.3						
Moisture content (%)	5.7	3.3						
MW No.:	BH14	BH20-22	BH20-22					
Sample No.:	SS3B	SS1	SS2					
Depth:	2,4-5,1	0,5-2,5	2,5-4,5					
Container no.	23	16	28					
Mass of container + wet soil (g)	54.30	48.50	58.60					
Mass of container + dry soil (g)	52.60	47.00	56.40					
Mass of container (g)	15.00	14.90	14.90					
Mass of dry soil (g)	37.6	32.1	41.5					
Mass of water (g)	1.7	1.5	2.2					
Moisture content (%)	4.5	4.7	5.3					
Remarks:								
Performed By:	J A Ba	ptiste		Date:		July 27	', 2022	
Verified by :)oce	}	Date:	August 3, 2022				



Client :		nfrastructure Ontario		Lab No : A-22-02				
Project/Site :		Children Hospital		11205	5379			
2400								
2300					Zero Air Voids	Line		
2200 • (°E)								
Dry Density (kg/m³)								
2000								
1900 •								
1800	2.0	4.0	6.0	8.0	10.0 12.0	14.0		
			ater Content					
Prepared Sample:	: Dry	0 Moist	х		Assumed G _s :	2.70		
ASTM D698 Test	Method: A	0 B 2 4.75 mm 9.5	0 C 0 mm	19.0 mm	Type of Hammer:	Manual		
Soil Type: Material:		Crushed St	tone	-				
Proposed Use: Sample Identificat	ion:	BH11-2	2	Max. I	Ory Density:	2254 kg/m ³		
Sample Location: Aggregate Supplie	er / Pit Name	In Place	3	_	um Moisture: ained on 19.0 mm:	6.4 %		
Sample Date:	or y richame.	D. Ash		Corre	cted Dry Density:	2254 kg/m ³		
Sampled By: Remarks:		D. ASII		- Corre	Clau Opt. Wolst.:	6.4 %		
Performed by :		J. Lalonde		Date :	Septembe	r 2, 2022		
Verified by :		bool		Date :	Septembe	r 6, 2022		



Clie	ent :	Ir	nfrastructure Onta	ario	Lab No	Lab No : A-22-02			
Pro	oject/Site :		Children Hospita	al	Project No	:11208	5379		
Dry Density (kg/m³)	2400 2350 • 2300 • 2250 • 2200 • 2150 • 200					Zero Air Voids			
	0.0	2.0	4.0	6.0 Water Conte	8.0 n t (%)	10.0 12.0) 14.0		
	pared Sample		0 Moist 0 B 4.75 mm	x 0 0 C 9.50 mm	x 19.0 mm	Assumed G _s : Type of Hammer:	2.70 Mechanical		
Soil Type: Material: Proposed Use: Sample Identification: Sample Location: Aggregate Supplier / Pit Name: Sample Date: Sampled By:			BH	ed Stone 18-22 Place Ash	Max. Optin % Re	Dry Density: num Moisture: dained on 19.0 mm: ected Dry Density: ected Opt. Moist.:	2237 kg/m³ 6.7 % 7.2 % 2265 kg/m³ 6.2 %		
Rei	marks :								
	rformed by :		J. Lalonde		Date	-			



Cli	ent :		nfrastructure Ontario	Lab No :	Lab No :				
Pro	oject/Site :		Children Hospital	dren Hospital Project No : 11205379					
	2400								
	2300			Ze	ero Air Voids Line				
(g/m³)	2200								
Dry Density (kg/m³)	2100								
ō	2000 •								
	1900 •								
	1800	2.0	4.0 6.0 Water Conter	8.0 10.0 nt (%)	12.0 14.0				
					10 070				
	epared Samp		0 Moist x C	Assum:	ed G _s : 2.70 f Hammer: Mechanical				
			4.75 mm 9.50 mm	19.0 mm					
	l Type: terial:		Crushed Stone	_					
Pro	posed Use:	ation.	MW9-22	- May Day Day	2050 1 (3				
Sar	mple Identific mple Location	n:		Max. Dry Den	sture: 7.5 %				
	gregate Supp mple Date:	olier / Pit Name:	In Place	% Retained of Corrected Dry					
	mpled By:		D. Ash	Corrected Op					
Re	marks :			•					
Pe	rformed by	:	J. Lalonde	Date :	September 7, 2022				
Ve	rified by :		mel	Date :	September 13, 2022				



Client :	Infrastructure C	Ontario				Pr	Project N°: 11205379-80			
Project :	Proposed Park	ing Structure				Sa	mple N° : M	W3-21 RC1		
	Children's Hos 401 Smyth Roa	pital of Eastern ad Ottawa Ont	Ontario Campus ario	3			Depth: 4			
	<u> </u>	au, Ottawa, Ott	arro			— Sampl		anuary 14-15 / 2021		
Testing Ap	paratus Used :		Caliper N°1							
			Technical Data					View of Specimen		
					Average		Be	efore Test :		
Diameter :		63	63	63	63.0	(mm)		1260		
Length:		117	117	117	117.0	(mm)				
Straightness (0.5m	m maximum) (S1) :	0.3	0.2	0.3	0.3	(mm)				
Flatness (25μm ma	aximum) (FP2) :	Ok	Ok	Ok	Ok			W3-21		
Parallelism (0.25°	maximum) (FP2) :	0.15	0.15	0.15	0.15	(°)				
Mass :	96	5.2	_(g) Volume:	36	4718	(mm³)				
Density:			264	46	_(kg/m³)	_				
Moisture Conditio	ons:		Dı		_			16,191		
Loading Rate (0.5	5 to 1.0 MPa / sec) :		0.	6	- (MPa/sec)		A	fter Test :		
Type of Fracture	:		3	3	_(\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\					
Test Duration (2-	15 Minutes) :		3.	5	- (minutes)					
Maximum Applied	d Load :		251	.98	_(minutes) ☑ kN ☐ lbs			Pom		
Compressive S	Strength :		80	.8	_ _(MPa)					
Remarks :										
Analysed by :			Ali Elhaddad				Date :	February 8, 2021		
Verified by :			E. Bennett			_	Date :	February 17, 2021		
. J							<u> </u>	1 0010diy 17, 2021		



Client :	Infrastructure C	Ontario				Project N°: 11205379-80				
Project :	Proposed Parki	ing Structure				Sample N	° : MW3-21 RC2			
	Children's Hosp 401 Smyth Roa	oital of Eastern id, Ottawa, Ont	Ontario Campus ario			— Depti	h : 6.4-6.55m			
						Sampling Date	e: January 14-15 / 2021			
Testing Ap	paratus Used :			Loading	device N°	1	Caliper N°1			
			Technical Data				View of Specimen			
			T T		Average		Before Test :			
Diameter :		63	63	63	63.0	(mm)				
Length:		74	74	74	74.0	(mm)	21'0"			
Straightness (0.5m	m maximum) (S1) :	0.2	0.2	0.2	0.2	(mm)				
Flatness (25μm ma	ıximum) (FP2) :	Ok	Ok	Ok	Ok		MW3-21			
Parallelism (0.25°	maximum) (FP2):	0.1	0.1	0.1	0.15	(°)	RCZ-			
Mass:	6 ⁻	12	_(g) Volume: _	23	80676	(mm³)				
Density:			265		(kg/m³)		21.4"			
Moisture Conditio	ns:		Dr		_ (0					
Loading Rate (0.5	5 to 1.0 MPa / sec) :		0.6	6	- (MPa/sec)		After Test:			
Type of Fracture	:		3		_(\viii \a/300)					
Test Duration (2-	15 Minutes) :		4		(minutes)					
Maximum Applied	d Load :		335.	49	_ (\text{\tin\tinut{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\tinut{\text{\tinut{\text{\text{\text{\text{\text{\text{\text{\text{\text{\texi\tinut{\text{\text{\text{\text{\text{\text{\text{\text{\text{\tinut{\text{\tinin{\text{\text{\text{\tinin{\text{\text{\text{\text{\text{\tinin{\text{\tinin{\text{\tinin{\text{\texi}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}	lbs				
Compressive S	Strength :		107	'.6	– (MPa)					
					_ ` ′		4			
Remarks :										
Analysed by :			Ali Elhaddad			Date	e : February 8, 2021			
Verified by :			E. Bennett			Date	e:February 17, 2021			



Client :	Infrastructure C)ntario				Project N° : 11205379-80				
Project :	Proposed Parki	ng Structure				Sample N°	: MW3-21 RC3			
	Children's Hosp 401 Smyth Roa	oital of Eastern (d. Ottawa. Onta	Ontario Campus ario			 Depth	: 7.92-8.07m			
							: January 14-15 / 2021			
Testing Ap	paratus Used :			Loading o	device N°	1	Caliper N°1_			
			Technical Data				View of Specimen			
					Average	7	Before Test :			
Diameter :		63	63	63	63.0	(mm)				
Length:		78	78	78	78.0	(mm)	726 ou			
Straightness (0.5m	m maximum) (S1) :	0.3	0.2	0.3	0.3	(mm)	MW 3 = 21			
Flatness (25μm ma	ximum) (FP2) :	Ok	Ok	Ok	Ok		RC3			
Parallelism (0.25 °	maximum) (FP2) :	0.1	0.15	0.1	0.15	(°)				
Mass:	65	6.6	_(g) Volume: _	24	3145	(mm³)				
Density:		0.0	_(g)		_(kg/m ³)	, (,				
Moisture Conditio	ns :		Dr		_ (,		400			
Loading Rate (0.5	5 to 1.0 MPa / sec) :		0.6	6	- (MPa/sec)		After Test:			
Type of Fracture	:		3		_ (**** *******************************					
Test Duration (2-	15 Minutes) :		3.5	5	(minutes)					
Maximum Applied	d Load :		260.	.09	_ ∨ kN □	lbs				
Compressive S	Strength :		83.	.4	_(MPa)					
Remarks :										
Analysed by :			Ali Elhaddad			Date	:February 8, 2021			
Verified by :			E. Bennett			Date	: February 17, 2021			



Client :	Infrastructure	Ontario			Project N° : 11205379-80				
Project :	Proposed Pa	rking Structure				Sample N° :	: MW3-21 RC5		
		ospital of Eastern oad, Ottawa, Ont				Depth :	: 9.63-9.75m		
						Sampling Date :	January 14-15 / 2021		
Testing Appar	atus Used :			Loading	device N°	1	Caliper N°1_		
			Technical Data				View of Specimen		
			1		Average		Before Test :		
Diameter :		63	63	63	63.0	(mm)	T 31' 74		
Length:		91	91	91	91.0	(mm)			
Straightness (0.5mm m	naximum) (S1) :	0.2	0.3	0.3	0.3	(mm)	MW 2-21		
latness (25µm maxim	num) (FP2) :	Ok	Ok	Ok	Ok		RC5		
Parallelism (0.25 ° max	ximum) (FP2) :	0.15	0.15	0.15	0.15	(°)			
Mass :		736.3	_(g) Volume:	28	33669	(mm³)			
Density:			25	96	(kg/m³)				
Moisture Conditions	:		Dı	ту					
oading Rate (0.5 to	1.0 MPa / sec)	:	0.	6	- (MPa/sec)		After Test:		
ype of Fracture :			3	}	_(
est Duration (2-15 N	Minutes) :		4		(minutes)				
Maximum Applied Lo	oad:		251	.57	☑ kN □	lbs			
Compressive Stre	ength :		80	.7	_(MPa)		0		
Remarks :									
Analysed by :			Ali Elhaddad			Date :	: February 8, 2021		
/erified by :			E. Bennett			 Date :			



Client :	Infrastructure C	Ontario				Pro	Project N°: 11205379-80			
Project :	Proposed Park	ing Structure				Sam	Sample N°: MW6-21 RC2			
	Children's Hosp 401 Smyth Roa	pital of Eastern	Ontario Campus	3			Depth: 4			
	401 Sinyar Ros	du, Ottawa, Ont	апо			— Samplin		anuary 14-15 / 2021		
							<u></u>	2		
Testing Ap	paratus Used :			Loading (device N°	1		Caliper N°1		
			Technical Data					View of Specimen		
			1		Average	7	Ве	efore Test :		
Diameter :		63	63	63	63.0	(mm)				
Length:		86	86	86	86.0	(mm)				
						<u> </u> `				
Straightness (0.5m	m maximum) (S1) :	0.3	0.3	0.3	0.3	(mm)		213 0		
Flatness (25µm ma	aximum) (FP2) :	Ok	Ok	Ok	Ok			MW6-21		
D (0.05 o	. , (500)	0.45	0.45	0.45	0.15	(0)		Res		
Parallelism (0.25 °	maximum) (FP2) :	0.15	0.15	0.15	0.15	(°)		Car Pir		
Mass :										
Wa33 .	70	2.4	(g) Volume:	26	8083	(mm ³)				
Density:			26	20	_(kg/m³)			15'7" -16'		
Moisture Conditio	ons :		Di	ry						
Loading Pate (0.5	5 to 1.0 MPa / sec) :		0.	6	_		A	fter Test :		
Loading Hate (o.c	3 to 1.0 wil a / 360).				(MPa/sec)					
Type of Fracture	:		3	3	_			. 4		
Test Duration (2-	15 Minutes) :		4	ļ	(minutes)					
Maximum Applied	d Load :		294	4.5	_ (minutes)	lbs				
					_					
Compressive S	Strength :		94	·.5	(MPa)					
Remarks :										
Analysed by :			Ali Elhaddad				Date :	February 8, 2021		
						_				
Verified by :			E. Bennett				Date :	February 17, 2021		



Client :	Infrastructure O	ntario				Project N°: 11205379-80			
Project :	Proposed Parki	ng Structure				Sample	N° : <u>MW6-21 RC4</u>		
	Children's Hosp 401 Smyth Roa		Ontario Campus tario			Dep	oth: 6.65-6.81m		
						Sampling Da	ate: January 14-15 / 2021		
Testing Appara	itus Used :			Loading	device N°	1	Caliper N°1		
			Technical Data				View of Specimen		
	1				Average		Before Test :		
Diameter :		63	63	63	63.0	(mm)			
₋ength :		82	82	82	82.0	(mm)	The state of the s		
traightness (0.5mm ma	aximum) (S1) :	0.3	0.3	0.3	0.3	(mm)	12'0"		
latness (25μm maximu	um) (FP2) :	Ok	Ok	Ok	Ok		J Zali		
arallelism (0.25 ° maxi	mum) (FP2) :	0.15	0.15	0.15	0.15	(°)	MW6-21		
Mass :	670	6.1	_(g) Volume:	25	55614	(mm³)			
Density:									
Noisture Conditions :			264 Dr		_ (kg/m ³)		23.4		
					_		After Test:		
oading Rate (0.5 to ⁻	1.0 MPa / sec) :		0.		_(MPa/sec)				
ype of Fracture :			3		_				
est Duration (2-15 M	linutes) :		4		_(minutes)				
laximum Applied Loa	ad:		311	.75	✓ kN 🗆	lbs			
Compressive Stre	ngth :		100).0	_(MPa)				
demarks :									
nalysed by :			Ali Elhaddad			Da	rite: February 8, 2021		
erified by :			E. Bennett			Da	te: February 17, 2021		



Client :	Infrastructure C)ntario				Project	N° : 11205379-80
Project :	Proposed Parki	ng Structure				Sample	N° : MW6-21 RC5
	Children's Hosp 401 Smyth Roa	oital of Eastern <u>id, Ottawa, Ont</u>	Ontario Campus ario			De _l	oth: 7.98-8.10m
						Sampling D	ate: January 14-15 / 2021
Testing Ap	paratus Used :			Loading o	device N°	1	Caliper N°1
			Technical Data				View of Specimen
					Average		Before Test :
Diameter :		63	63	63	63.0	(mm)	
Length:		93	93	93	93.0	(mm)	263
Straightness (0.5m	ım maximum) (S1) :	0.3	0.3	0.3	0.3	(mm)	
Flatness (25µm ma	aximum) (FP2) :	Ok	Ok	Ok	Ok		MW6-1
Parallelism (0.25°	maximum) (FP2) :	0.15	0.15	0.15	0.15	(°)	RCS
Mass:	77	6.4	_(g) Volume: _	28	9904	(mm³)	
Density:			267		(kg/m³)	_	
Moisture Condition	ons :		Dry		_(,		
Loading Rate (0.	5 to 1.0 MPa / sec) :		0.6	6	- (MD= /= ==)		After Test :
Type of Fracture	:		4		_(MPa/sec)		
Test Duration (2-	15 Minutes) :		5		(minutes)		
Maximum Applie	d Load :		318	3.7	_(·······ates)	lbs	
Compressive S	Strength :		102	2.2	(MPa)		
					_ ,		
Remarks :							•
Amphicad by			۸۱: ۲۱۱۸۵۵۵۵۵			-	
Analysed by :	-		Ali Elhaddad				February 8, 2021
Verified by :			E. Bennett			D:	ate: February 17, 2021



Client :	Infrastructure C					_	: <u>11205379</u>
Project :	Children's Hosp	oital					: <u>MW9-22 r.1</u> : 3,20 - 3,31 m
							:
Testing Appara	itus Used :			Loadin	ng device N°_	9130	
		ד	echnical Data				View of Specimen
					Average	7	Before Test :
Diameter :		63.09	63.09	63.21	63.13	(mm)	
Length:		109.59	108.25	109.84	109.23	(mm)	
Straightness (0.5mm ma	aximum) (S1) :	0.4	0.4	0.4	0.4	(mm)	
Flatness (25μm maximu	m) (FP2) :	Ok	Ok	Ok	Ok	(μm)	
Parallelism (0.25 ° maxir	mum) (FP2) :	0.15	0.20	0.20	0.18	(°)	After Test :
Mass :	91	3.8	(g) Volume:	34	1893	_(mm³)	
Density:			267	73	_(kg/m³)		
Moisture Conditions :			Dr	У	_		
_oading Rate (0.5 to [^]	1.0 MPa / sec) :		0.5	58	_(MPa/sec)		
Type of Fracture :			Multiple I	Fracture	_		
Test Duration (2-15 M	linutes) :		12	3	_(seconds)		
Maximum Applied Loa	ad :		222	.24	_(kN)		
Compressive Strer	ngth :		71	.0	_(MPa)		
Remarks :							
Analysed by :	J. Lalonde	<u> </u>				Date	: 8/18/2022
Verified by :	X	xex_				Date	:8/25/2022



	Infrastructure C					_	N° : 11205379 N° : MW9-22 r.2
·		- 113.1					th: 4,04 - 4,14 m
						Sampling Da	ite :
Testing Apparat	us Used :			Loadin	ng device N°_	9130	Caliper N° _1
		Т	echnical Data				View of Specimen
D: .		00.40	00.00	00.00	Average	\exists ,	Before Test:
Diameter :		63.18	63.20	63.00	63.13	(mm)	
Length:		96.49	95.36	95.29	95.71	(mm)	
Straightness (0.5mm max	kimum) (S1) :	0.1	0.1	0.2	0.1	(mm)	
Flatness (25μm maximun	n) (FP2) :	Ok	Ok	Ok	Ok	(μm)	
Parallelism (0.25 ° maxim	num) (FP2) :	0.05	0.10	0.10	0.08	(°)	After Test :
Mass :	79	8.9	(g) Volume:	29	9563	(mm³)	
Density:			266	67	_(kg/m³)		
Moisture Conditions :			Dr	у	_		PACE.
_oading Rate (0.5 to 1	.0 MPa / sec) :		0.4	18	_(MPa/sec)		
Type of Fracture :			Multiple F	- racture	_		
Test Duration (2-15 Mi	nutes):		11	8	(seconds)		
Maximum Applied Loa	d :		175.	.67	(kN)		
Compressive Stren	gth :		56.	.1	- (MPa)		
					_ `		
Remarks :							
tomano.							
Analysed by :	J. Lalonde					Da	ate: 8/18/2022
Verified by :		bool	/			Da	ate: 8/25/2022



Client :	Infrastructure C	Ontario				_	l° :11205379
Project :	Children's Hosp	pital					1° : <u>BH13-22 r.3</u>
						_	h : 3,61 - 3,71 m
						Sampling Dat	ie:
Testing Appara	itus Used :			Loadin	g device N°_	9130	Caliper N° _1
		Т	echnical Data				View of Specimen
					Average	7	Before Test:
Diameter :		63.00	63.09	63.15	63.08	(mm)	V2
Length :		100.38	100.26	100.38	100.34	(mm)	
Straightness (0.5mm ma	aximum) (S1) :	0.2	0.3	0.2	0.2	(mm)	
Flatness (25μm maximu	m) (FP2) :	Ok	Ok	Ok	Ok	(μm)	
Parallelism (0.25 ° maxir	mum) (FP2) :	0.15	0.15	0.15	0.15	(°)	After Test :
Mass :	83	1.5	(g) Volume:	31	3579	(mm³)	
Density:				52	_(kg/m³)		
Moisture Conditions :			Dr	У			210
_oading Rate (0.5 to ′	1.0 MPa / sec) :		0.3		- (MPa/sec)		
Type of Fracture :			Multiple F	-racture	-		
Test Duration (2-15 M	linutes) :		10	8	(seconds)		
Maximum Applied Loa	ad :		112.	.31	_(kN)		
Compressive Strer	ngth :		35.	.9	_(MPa)		
Remarks :							
Analysed by :	J. Latonde	0				Dat	te:8/18/2022
Verified by :	~	See				Dat	te:8/25/2022



Client :	Infrastructure C					_	1°: 11205379
Project :	Children's Hos	pital					h : 6,93 - 7,03 m
							re:
Testing Appara	atus Used :			Loadin	ng device N°_9	9130	
		7	Technical Data				View of Specimen
					Average		Before Test :
Diameter :		63.11	63.04	63.06	63.07	(mm)	
Length :		100.32	100.27	100.42	100.34	(mm)	
Straightness (0.5mm ma	aximum) (S1) :	0.2	0.1	0.2	0.2	(mm)	
Flatness (25μm maximu	ım) (FP2) :	Ok	Ok	Ok	Ok	(μm)	
Parallelism (0.25 ° maxi	mum) (FP2) :	0.10	0.15	0.15	0.13	(°)	After Test :
Mass :	84	5.1	(g) Volume:	31	3469	(mm³)	
Density :			269	96	_(kg/m³)		
Moisture Conditions :			Dr	У	_		
oading Rate (0.5 to	1.0 MPa / sec) :		0.3	39	(MPa/sec)		
Гуре of Fracture :			Multiple I	Fracture	_		
Γest Duration (2-15 N	/linutes) :		12	1	_(seconds)		
Maximum Applied Lo	ad :		146	.16	_(kN)		
Compressive Stre	ngth :		46	.8	_(MPa)		
Remarks :							
Analysed by :	J. Lalonde	\bigcirc				Dat	re: 8/18/2022
Verified by :		DOCK				Dat	e: 8/25/2022



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-RPT8

AGAT WORK ORDER: 21Z712939

SOIL ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer

DATE REPORTED: Mar 01, 2021

PAGES (INCLUDING COVER): 5 VERSION*: 1

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

*Notes	
VERSION 1:Excluding Sulphide in Soil analysis	

Disclaimer:

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Page 1 of 5

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CLIENT NAME: GHD LIMITED

SAMPLING SITE:

Redox Potential 3

Certificate of Analysis

AGAT WORK ORDER: 21Z712939

PROJECT: 11205379-RPT8

ATTENTION TO: Jennifer Balkwill

397

414

NA

SAMPLED BY:

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377

Corrosivity Package

DATE RECEIVED: 2021-02-19 DATE REPORTED: 2021-03-01 11205379-BH4-11205379-MW6- 11205379-BH7-11205379-MW8-SAMPLE DESCRIPTION: 21-SS2-0.7-1.0m 21-SS2-0.7-1.0m 21-SS2-0.7-1.0m 21-SS2-1.1-1.3m SAMPLE TYPE: Soil Soil Soil Soil 2021-01-18 DATE SAMPLED: 2021-01-18 2021-01-13 2021-01-19 2122180 RDL 2122181 2122182 2122183 Parameter Unit G/S RDL Date Prepared Date Analyzed RDL Chloride (2:1) 4 2021-02-24 2021-02-24 440 2 253 69 4 562 μg/g Sulphate (2:1) 4 2021-02-24 2021-02-24 439 2 395 6 4 195 μg/g pH (2:1) pH Units NA 2021-02-24 2021-02-24 6.35 NA 7.4 7.23 NA 7.95 0.005 0.005 Electrical Conductivity (2:1) mS/cm 0.005 2021-02-24 2021-02-24 1.21 0.936 0.163 1.40 Resistivity (2:1) (Calculated) 2021-02-24 2021-02-24 826 1 1070 6130 714 ohm.cm 1 2021-02-23 428 NA 389 429 NA 377 Redox Potential 1 mV NA 2021-02-23 Redox Potential 2 446 NA mV NA 2021-02-23 2021-02-23 NA 394 416 379

2021-02-23

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

2122180-2122183 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.

2021-02-23

NA

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

432

NA

Redox potential measurement in soil is quite variable and non reproducible due in part, to the general heterogeneity of a given soil. It is also related to the introduction of increased oxygen into the sample after extraction. The interpretation of soil redox potential should be considered in terms of its general range rather than as an absolute measurement.

Dilution required, RDL has been increased accordingly.

mV

Analysis performed at AGAT Toronto (unless marked by *)

CHARTERED S NYME BASILY OF CHEMIST AS THE CHARTER OF CHEMIST AS THE CHARTER OF CHEMIST AS THE CHARTER OF CHART



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Quality Assurance

CLIENT NAME: GHD LIMITED

AGAT WORK ORDER: 21Z712939

PROJECT: 11205379-RPT8

ATTENTION TO: Jennifer Balkwill

SAMPLING SITE:

SAMPLED BY:

O/ ()		G 222 2													
	Soil Analysis														
RPT Date: Mar 01, 2021	DUPLICATE				REFERENCE MATERIAL			METHOD	BLANK	SPIKE	MATRIX SPIK		KE		
PARAMETER	Batch Sample		Dup #1 Dup #2		RPD	Method Blank	Measured	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Lie	ptable nits
		ld	-				Value	Lower	Upper		Lower	Upper		Lower	Upper
Corrosivity Package															
Chloride (2:1)	2129123		42	42	0.0%	< 2	93%	70%	130%	102%	80%	120%	104%	70%	130%
Sulphate (2:1)	2129123		3	3	NA	< 2	100%	70%	130%	107%	80%	120%	106%	70%	130%
pH (2:1)	2122180 2	2122180	6.35	6.38	0.5%	NA	100%	90%	110%						
Electrical Conductivity (2:1)	2122180 2	2122180	1.21	1.40	14.6%	< 0.005	105%	80%	120%						
Redox Potential 1	1						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.

Duplicate NA: results are under 5X the RDL and will not be calculated.

NOVINE BASILY SOME

Certified By:



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Method Summary

CLIENT NAME: GHD LIMITED AGAT WORK ORDER: 21Z712939
PROJECT: 11205379-RPT8 ATTENTION TO: Jennifer Balkwill

SAMPLING SITE: SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis	·	·	
Chloride (2:1)	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Sulphate (2:1)	INOR-93-6004	modified from 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	modified from MSA PART 3, CH 14 and 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	modified G200-09, SM 2580 B	REDOX POTENTIAL ELECTRODE
Redox Potential 2	INOR-93-6066	modified G200-09, SM 2580 B	REDOX POTENTIAL ELECTRODE
Redox Potential 3	INOR-93-6066	modified G200-09, SM 2580 B	REDOX POTENTIAL ELECTRODE



5835 Coopers Avenue Mississauga, Ontario L1Z 1Y2 Ph: 905.712.5100 Fax: 905.712.5122 webearth.agatlabs.com

Laboratory	Use	Only
	21	-7

Work Order #:	21	ZT	129	39	Ì
					_

Cooler Quantity: 1019 has not 18 Arrival Temperatures: 18 6 1 18 6 18 6 18 6 18 6 18 6 18 6 1			
Cooler Quantity:	lana b	a0,-11	Sip
		1(8.6)	182
LTUCEPAG	K) 40	14-61	4.8
Custody Seal Intact:	□Yes	□No	□N/A

Chain of Cu	stody Record	If this is a I	Orlnking Water	sample, plea	se use Drink	dng Water Chain o	of Custody Form (pote	able water	consum	ed by huma	ns)		_ / ^	rival Tel	mperat		7 10	0 16	101	4.0
Report Informa	tion: GHD Limited				Reg (Please	gulatory Requ	uirements:							ustody S	- /		Yes		□No	□N/
	ennifer Balkwill				-	gulation 153/04	Excess Soils F	R406	Sev	ver Use				01.03						
Address:	455 Phillip St Unit 100A	, Waterloo, ON	, N2L 3X2				_				Storm	1	Tu	rnaro	und	Time	e (TAT)	Require	∍d:	
-					- 'a'	ole <u>Indicate One</u> Ind/Com	Table Indicate O	ne	_	Region			Re	gular	TAT (Most An	alyses)	5 to 7 8	Business	Days
Phone: 5	19-340-4286	Fax:				Res/Park	Regulation 55	58	☐ Pro	v. Water Ç	uality		Ru	sh TA	T (Ruch S	iurcharg	es Apply)			
Penarts to be sent to:	ennifer.balkwill@ghd.com	rax			311	Agriculture				ectives (P										
1. Email:	emmer.baikwing/gnd.com					exture (Check One) Coarse	ССМЕ		Oth	er				□ 3	Busine avs	SS	Day:	usiness s	□ Ne	ext Busine av
2. Email:						Fine				Indicate One			-		•	Requi	red (Rush	Surcharge	s May Ap	ply):
Duele et le fe					le	this submissi	on for a	D	onort	Guldeli	20 05									
Project Informa						cord of Site Co				te of A				=				otification		
	11205379-RPT8				-] No	Е			N			*TA	AT is ex	clusive	e of weeke	nds and st	:atutory h	olidays
Site Location: Sampled By:						1 103	110		1 103] 4				me Da	y' anal	lysis, piea	se contact	t your AG.	AT CPM
AGAT ID #:		PO: _7352	22893					7 8	0.	Reg 153			0. R 55		Reg 406					
	Please note: If quotation number is r			analysis	Sam	iple Matrix Le Biota	gend	CrVI, DOC			9	-	٨.	PCB3	age					
Invoice Informa	ntion:	Ri	II To Same: Ye	e 📶 No 🗆	11 -	Ground Water		Hg, Cr			ON		Disposal Characterization TCLP.	SPLP Rainwater Leach	Prick A	<u>.</u>				
Company:			ii io odilio.		0	Oil		E T		□HWSB	□ Yes		zatic	Ns LIB(a)) water Le	tion	BIEX, FI-r4				
Contact:					P	Paint		Meta			B	Aroclor	acteri	ABNs ainw	eriza	2	45			
Address:					S	Soil		red -	nics	Hg.I	<u> </u>	□ Arc	Charg	CS LIABRA	racte		<u></u>			
Email:					SD SW	Sediment Surface Water		Field Filtered - Metals,	Inorganics	□ crvl, □	=		osal (SPLP	Chair	- Ne				
								Field	So	s - 🗆 Cr F1-F4 I	74	PCBs	Sis	Soil	Soils	EC/SAR	lo			
Sample	Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix		nments/ Instructions	Y/N	Metals	Metals - [BTEX, F1	Analyze r4G ir required	Total P	VOC	Excess (Excess Soils Characterization Peckage	Salt - EC/SAR	Corrosivity			
			AN PN																	
11205379- BH4-21 -	- SS2 - 0.7-1.0m	2021-01-18	AN PN		Soil	Corrosivity														
			AN PN									125		7	Ξ η					
11205379- MW6-21	– SS2 - 0.7-1.0m	2021-01-13	AN PN		Soil	Corrosivity					П									
11205379- BH7-21 -	- SS2 - 0.7-1.0m	2021-01-19	AN PN	1	Soil	Corrosivity		4., 1												
11205379- MW8-21	– SS2 - 1.1-1.3m	2021-01-18	AN PN	1	Soil	Corrosivity														
			AN Ph	1																
			AN Ph	1																
			AA PA	1									- 4	0						
			AN PN	4																
			AN PN																	
Samples Relinquished By (Print I	lame and Sign)		Date	Time		Samples Received By (Print Name and Sign):	Λ.	^	- 1		Date	Tio	Tim	2					
		عيرا	- (De	The	eth	Ch	O	21	Date	419		3h	M)			
Samples Relinquished By (Print I	seme and Clien LD+NA	Ma 2	1/2/19	1/6	nov	Camples Brown By	RA DO	8	24)	f	eh	Zo	121	Time	213	2	ya	age	of	
Complete Barbara Laborate Agencies		-	Proces	46.00		Managara Hawaiisa depot	Status Street and Street		-		-	Date	1	Tiete	117			100 - 10		



CERTIFICATE OF ANALYSIS

Work Order : WT2214174 Page

Client : **GHD Limited** Laboratory : Waterloo - Environmental

Contact : Rick Hawthorne Account Manager : Rick Hawthorne

Address : 60 Northland Road, Unit 1

Waterloo ON Canada N2V 2B8

: 1 of 5

Telephone : +1 519 886 6910

Date Samples Received : 14-Sep-2022 10:30

Date Analysis : 15-Sep-2022

Commenced

Issue Date : 16-Sep-2022 16:35

Telephone : ---Project : 11205379-100

Address

Site

PO : 735-004287

C-O-C number : ---Sampler : CLIENT

Quote number : 11205379-100-SSOW 735-004287

: ----

: 455 Phillip Street

Waterloo ON Canada N2L 3X2

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

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 Work Order
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 Client
 : GHD Limited

 Project
 : 11205379-100



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

mV

milligrams per kilogram

mV

millivolts

ohm cm

pH units

pH units

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

>: greater than.

<: less than.

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 Work Order
 : WT2214174

 Client
 : GHD Limited

 Project
 : 11205379-100



Analytical Results

WT2214174-001

Sub-Matrix: SoilClient 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.CI	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	QCLot
							Date	
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.CI	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: SoilClient 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.CI	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.

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 Work Order
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 Client
 : GHD Limited

 Project
 : 11205379-100



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.CI	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: SoilClient 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.CI	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.CI	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.

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 Work Order
 : WT2214174

 Client
 : GHD Limited

 Project
 : 11205379-100



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.CI	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.CI	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 : Rick Hawthorne : Rick Hawthorne Address : Address : 60 Northland Ro

: 455 Phillip Street Address : 60 Northland Road, Unit 1

Waterloo ON Canada N2L 3X2 Waterloo, Ontario Canada N2V 2B8

 Telephone
 : -- Telephone
 : +1 519 886 6910

 Project
 : 11205379-100
 Date Samples Received
 : 14-Sep-2022 10:30

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.

RIGHT SOLUTIONS | RIGHT PARTNER

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 Work Order
 : WT2214174

 Client
 : GHD Limited

 Project
 : 11205379-100



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

Matrix: Soil/Soild					⊏v	aluation. * -	Holding time exce	edance, v	– vvitriiri	Holding Hi
Analyte Group	Method	Sampling Date	Ex	traction / Pr	reparation			Analys	sis	
Container / Client Sample ID(s)			Preparation	Holding	g Times	Eval	Analysis Date	Holding	g Times	Eval
			Date	Rec	Actual			Rec	Actual	
Leachable Anions & Nutrients : Water Extractable Chloride by IC										
Glass soil jar/Teflon lined cap										
11205379- BH11-22-SS2	E236.CI	14-Sep-2022	16-Sep-2022	30	3 days	✓	16-Sep-2022	28 days	0 days	✓
				days						
Leachable Anions & Nutrients : Water Extractable Chloride by IC										
Glass soil jar/Teflon lined cap	F000 OI	44.0 0000	10.0 0000		0.1	✓	40.0 0000	00.1	0.1	√
11205379- BH16-22-SS2	E236.Cl	14-Sep-2022	16-Sep-2022	30	3 days	•	16-Sep-2022	28 days	0 days	•
				days						
Leachable Anions & Nutrients : Water Extractable Chloride by IC							I	I		
Glass soil jar/Teflon lined cap 11205379- BH16-SS2	E236.CI	14-Sep-2022	16-Sep-2022	30	3 days	✓	16-Sep-2022	28 days	0 days	✓
11203079- 01110-002	L200.01	14-00p-2022	10-00p-2022	days	0 days	•	10-00p-2022	20 days	0 days	·
Leachable Anions & Nutrients : Water Extractable Chloride by IC										
Glass soil jar/Teflon lined cap										
11205379- BH17-22-SS2	E236.CI	14-Sep-2022	16-Sep-2022	30	3 days	✓	16-Sep-2022	28 days	0 days	✓
			·	days			·			
Leachable Anions & Nutrients : Water Extractable Chloride by IC				-						
Glass soil jar/Teflon lined cap										
11205379- BH20-SS2	E236.CI	14-Sep-2022	16-Sep-2022	30	3 days	✓	16-Sep-2022	28 days	0 days	✓
				days						
Leachable Anions & Nutrients : Water Extractable Chloride by IC										
Glass soil jar/Teflon lined cap										
11205379- MW09-22	E236.CI	14-Sep-2022	16-Sep-2022	30	3 days	✓	16-Sep-2022	28 days	0 days	✓
				days						
Leachable Anions & Nutrients : Water Extractable Chloride by IC										
Glass soil jar/Teflon lined cap										
11205379- MW17-SS1	E236.CI	14-Sep-2022	16-Sep-2022	30	3 days	✓	16-Sep-2022	28 days	0 days	✓
				days						

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 Work Order
 : WT2214174

 Client
 : GHD Limited

 Project
 : 11205379-100



Matrix: Soil/Solid

Evaluation:	x = Holding time	avcoodance :	/ - Within	Holding Time

/latrix: Soil/Solid						/aluation. ^ -	Holding time exce	euance , v	- vviuiiii	Holding I
Analyte Group	Method	Sampling Date	Ex	traction / Pr	eparation			Analys	is	
Container / Client Sample ID(s)			Preparation	Holding	g Times	Eval	Analysis Date	Holding	Times	Eval
			Date	Rec	Actual			Rec	Actual	
Leachable Anions & Nutrients : Water Extractable Chloride by IC										
Glass soil jar/Teflon lined cap										
11205379- MW18-SS3	E236.CI	14-Sep-2022	16-Sep-2022	30	3 days	✓	16-Sep-2022	28 days	0 days	✓
				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	3 days	✓	16-Sep-2022	28 days	0 days	✓
				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	3 days	✓	16-Sep-2022	28 days	0 days	✓
				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	3 days	✓	16-Sep-2022	28 days	0 days	✓
				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	3 days	✓	16-Sep-2022	28 days	0 days	✓
				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	3 days	✓	16-Sep-2022	28 days	0 days	✓
				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	3 days	✓	16-Sep-2022	28 days	0 days	✓
				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	3 days	✓	16-Sep-2022	28 days	0 days	✓
				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	3 days	✓	16-Sep-2022	28 days	0 days	✓
				days						

Page : 5 of 11 : WT2214174 Work Order Client : GHD Limited : 11205379-100 Project



Matrix: Soil/Solid					Ev	aluation: × =	Holding time exce	edance ; •	= Withir	Holding T
Analyte Group	Method	Sampling Date	Ex	traction / Pr	eparation			Analys	is	
Container / Client Sample ID(s)			Preparation	Holding	g Times	Eval	Analysis Date	Holding	Times	Eval
			Date	Rec	Actual			Rec	Actual	
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction) (Low Leve	el)									
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 Leve	el)									
Glass soil jar/Teflon lined cap	E400 I	44.0 0000	40.0				40.0 0000	20.1		√
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 Leve Glass soil jar/Teflon lined cap	el) 						1			
11205379- BH16-SS2	E100-L	14-Sep-2022	16-Sep-2022				16-Sep-2022	30 days	2 days	√
11200010 21110 002	2.002	35p 2022	.0 000 2022				10 000 2022	oo aayo		
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction) (Low Leve	I)									
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 Leve	el)									
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 Leve	el)									
Glass soil jar/Teflon lined cap	E100-L	14-Sep-2022	16 Can 2022				16-Sep-2022	30 days	O days	_
11205379- MW09-22	E 100-L	14-3ep-2022	16-Sep-2022				10-3ep-2022	30 days	2 uays	•
District Control of the Control of t	D									
Physical Tests: Conductivity in Soil (1:2 Soil:Water Extraction) (Low Leve Glass soil jar/Teflon lined cap	(1)							I		
11205379- MW17-SS1	E100-L	14-Sep-2022	16-Sep-2022				16-Sep-2022	30 days	2 davs	1
11200070 1111111 001			.0 000 2022				.0 000 2022	oo aayo		
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction) (Low Leve	d)									
Glass soil jar/Teflon lined cap							T			
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			

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Matrix: **Soil/Solid**Evaluation: **x** = Holding time exceedance; ✓ = Within Holding Time

wathx: 3011/30110						aldation. •-	Holding time excee	Judinoc ,	- vvicinii	riolaling i
Analyte Group	Method	Sampling Date	Ext	traction / Pi	reparation		Analysis			
Container / Client Sample ID(s)			Preparation	Holdin	g Times	Eval	Analysis Date	Holding	g Times	Eval
			Date	Rec	Actual			Rec	Actual	
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	1 days	✓
								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	1 days	✓
								days		

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latrix: Soil/Solid						aluation: 🗴 =	Holding time exce			Holding 7
Analyte Group	Method	Sampling Date	Ex	traction / Pr	reparation		Analysis			
Container / Client Sample ID(s)			Preparation	Holding	g Times	Eval	Analysis Date		Times	Eval
			Date	Rec	Actual			Rec	Actual	
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	1 days	✓
								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	1 days	✓
								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	1 days	✓
								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	1 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	1 days	1
		, ,						days	, -	
Physical Tests : ORP by Electrode								dayo		
Glass soil jar/Teflon lined cap										
11205379- MW18-SS3	E125	14-Sep-2022	15-Sep-2022				15-Sep-2022	180	1 days	1
11200010-1WW 10-000	2.20	11 Cop 2022	10 00p 2022				10 000 2022	days	, dayo	
								uays		
Physical Tests: pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Recei	ved									
Glass soil jar/Teflon lined cap 11205379- BH11-22-SS2	E108A	14-Sep-2022	15-Sep-2022				15-Sep-2022	30 days	1 days	✓
11200379- BF11-22-352	LIOOA	14-3ep-2022	10-3ep-2022				15-3ep-2022	30 days	i uays	•
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Recei	ved									
Glass soil jar/Teflon lined cap	E400 *	44.0 0000	45 0 2000				45 0 2000	20 4	4 -1	√
11205379- BH16-22-SS2	E108A	14-Sep-2022	15-Sep-2022				15-Sep-2022	30 days	i days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Recei	ved									
Glass soil jar/Teflon lined cap										
11205379- BH16-SS2	E108A	14-Sep-2022	15-Sep-2022				15-Sep-2022	30 days	1 days	✓

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Matrix: Soil/Solid Evaluation: ▼ = Holding time exceedance; ✓ = Within Holding Time

							riolaling time exce	,		
Analyte Group	Method	Sampling Date	Ext	raction / Pr	eparation			Analys	is	
Container / Client Sample ID(s)			Preparation	Holding	g Times	Eval	Analysis Date	Holding	Times	Eval
			Date	Rec	Actual			Rec	Actual	
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).

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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	on: × = QC freque	ency outside spe	ecification; ✓ = 0	QC frequency wit	hin specification
Quality Control Sample Type			Co	ount		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.CI	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.CI	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.CI	648053	1	8	12.5	5.0	✓
Water Extractable Sulfate by IC	E236.SO4	648052	1	8	12.5	5.0	✓

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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	АРНА 2510 В	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.

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Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Leach 1:2 Soil : 0.01CaCl2 - As Received for	EP108A	Soil/Solid	MOEE E3137A	A minimum 10g portion of the sample, as received, is extracted with 20mL of 0.01M
pH				calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is
	Waterloo -			separated from the soil by centrifuging, settling or decanting and then analyzed using a
	Environmental			pH meter and electrode.
Preparation of ORP by Electrode	EP125	Soil/Solid	APHA 2580 (mod)	Field-moist sample is extracted in a 1:2 ratio with DI water and then analyzed by ORP
				meter.
	Waterloo -			
	Environmental			
Anions Leach 1:10 Soil:Water (Dry)	EP236	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.
	Waterloo -			
	Environmental			
Distillation for Acid Volatile Sulfide in Soil	EP396-L	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
	Waterloo -			evolved hydrogen sulfide gas is carried into a basic solution by argon gas for analysis.
	Environmental			



QUALITY CONTROL REPORT

Work Order : WT2214174

Contact : GHD Limited : Rick Hawthorne

:455 Phillip Street

Waterloo ON Canada N2L 3X2

Telephone : ---

Project : 11205379-100 PO : 735-004287

C-O-C number : ----

Sampler : CLIENT

Site :----

Quote number : 11205379-100-SSOW 735-004287

No. of samples received : 8
No. of samples analysed : 8

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Laboratory : Waterloo - Environmental

Account Manager : Rick Hawthorne

Address : 60 Northland Road, Unit 1

Waterloo, Ontario Canada N2V 2B8

Telephone : +1 519 886 6910

Date Samples Received : 14-Sep-2022 10:30

Date Analysis Commenced : 15-Sep-2022

Issue Date : 16-Sep-2022 16:35

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

Address

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

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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).

Laboratami Dunlinata (DUD) Donort

Sub-Matrix: Soil/Solid							Labora	tory Duplicate (D	ог) кероп		
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 8	Nutrients (QC Lot: 648	3052)									
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 8	Nutrients (QC Lot: 648	3053)									
WT2214174-006	11205379- BH16-22-SS2	chloride, soluble ion content	16887-00-6	E236.CI	5.0	mg/kg	83.2	83.3	0.136%	30%	

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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 (QCL	ot: 648052)				
sulfate, soluble ion content	14808-79-8 E236.SO4	20	mg/kg	<20	
Leachable Anions & Nutrients (QCL	ot: 648053)				
chloride, soluble ion content	16887-00-6 E236.CI	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	p-Matrix: Soil/Solid						Laboratory Control Sample (LCS) Report						
					Spike	Recovery (%)	Recovery	Limits (%)					
Analyte	CAS Number	Wethod	LOR	Unit	Concentration	LCS	Low	High	Qualifier				
Physical Tests (QCLot: 648051)													
conductivity (1:2 leachate)	E	E100-L	5	μS/cm	1409 μS/cm	98.8	90.0	110					
Physical Tests (QCLot: 648054)													
pH (1:2 soil:CaCl2-aq)	E	E108A		pH units	7 pH units	100	98.0	102					
Physical Tests (QCLot: 648057)													
moisture	E	E144	0.25	%	50 %	101	90.0	110					
Leachable Anions & Nutrients (QCLot: 648052	2)												
sulfate, soluble ion content	14808-79-8 E	E236.SO4	20	mg/kg	5000 mg/kg	100	70.0	130					
Leachable Anions & Nutrients (QCLot: 648053	3)												
chloride, soluble ion content	16887-00-6	E236.CI	5	mg/kg	5000 mg/kg	101	80.0	120					

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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:	Aatrix:						nce Material (RM) Re	port	
					RM Target	Recovery (%)	Recovery L	imits (%)	
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Physical Tests (C	(CLot: 648051)								
	RM	conductivity (1:2 leachate)		E100-L	3239 μS/cm	100	70.0	130	
Physical Tests (C	(CLot: 648056)								
	RM	oxidation-reduction potential [ORP]		E125	475 mV	102	80.0	120	
Leachable Anion	s & Nutrients (QCLot: 6	348052)							
	RM	sulfate, soluble ion content	14808-79-8	E236.SO4	217 mg/kg	98.5	60.0	140	
Leachable Anion	s & Nutrients (QCLot: 6	348053)							
	RM	chloride, soluble ion content	16887-00-6	E236.CI	673 mg/kg	94.1	70.0	130	

Chain of Custody (COC) / Analytical Request Form

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umber: ,	₽
COCN	Page

S Date Time Sample Type ON S	ALS Contact: Sampler:		OH	Major/Minor Code: Routing Code:	AFECost Center:	Oil and Gas Required Fields (client use)	Contact and company name below will appear on the final report Negative Recipients Negative Reference N	Waterloop AT) Requests The surchanges at Mark Order Reference Work Order Reference Work Order Reference Work Order Reference Work Order Reference Telephone + 1 519 886 6810 Telephone - 1 519 8	1 day (P4) if received by 3pm 1 day (P4) if received by 3pm 1 day (E) if received by 3pm 1 day (E) if received by 3pm 1 day (E) if received by 3pm 2 same day (E2) if received by 3pm Additional fees may a Additional fees may a Pate and Time Required for a feet feet for a feet feet feet feet feet feet feet fe	ecked Lipho	Coordinates In the report)	Company: GHD Limited
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Fallure 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.

If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.