FINAL

Geotechnical Investigation – Proposed Industrial Development

1250 Appleby Line (4495 North Service Road),
Burlington, Ontario

Prepared for:

Cooper Construction Limited
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1.0 INTRODUCTION AND SCOPE

Pinchin Ltd. (Pinchin) was retained by Cooper Construction Limited (Client) to conduct a Geotechnical Investigation and provide subsequent geotechnical design recommendations for the proposed industrial development to be located at 1250 Appleby Line (4495 North Service Road), Burlington, Ontario (Site). The Site location is shown on Figure 1.

Based on information provided by the Client, it is Pinchin's understanding that the development will consist of two single-storey slab-on-grade (i.e., no basement level) industrial buildings with associated loading docks and truck parking. The remainder of the 26.1 acres Site will consist of treed and grass covered areas.

Pinchin's geotechnical comments and recommendations are based on the results of the Geotechnical Investigation and our understanding of the project scope.

The purpose of the Geotechnical Investigation was to delineate the subsurface conditions and soil engineering characteristics by advancing a total of twenty-four (24) sampled boreholes (Boreholes BH201 to BH224), at the Site.

Based on a desk top review and the results of the Geotechnical Investigation, the following geotechnical data and engineering design recommendations are provided herein:

- A detailed description of the soil and groundwater conditions;
- Site preparation recommendations;
- Open cut excavations;
- Anticipated groundwater management;
- Site service trench design;
- Lateral earth pressure coefficients and unit densities;
- Foundation design recommendations including soil bearing resistances at Ultimate Limit States (ULS) and Serviceability Limit States (SLS) design;
- Potential total and differential settlements;
- Foundation frost protection and engineered fill specifications and installation;
- Seismic Site classification for seismic Site response;
- Concrete floor slab-on-grade support recommendations;
- Asphaltic concrete pavement structure design for parking areas and access roadways; and,

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- Potential construction concerns.

Abbreviations, terminology and principle symbols commonly used throughout the report, borehole logs and appendices are enclosed in Appendix I.

2.0 DESKTOP REVIEW

2.1 SITE DESCRIPTION AND GEOLOGICAL SETTING

The Site considered for development is located to the southwest of the intersection at Appleby Line and North Service Road in Burlington, Ontario. The Site is approximately 26.1 acres in Site and is currently used for truck trailer storage. A tributary of Appleby Creek runs to the west of the Site and crosses the subject Site in the north end. The lands adjacent to the Site are developed with commercial and industrial buildings. A vacant field borders the Site to the southeast. Based on available air photo imagery, the central and southwest portion of the Site were previously occupied with a building and associated parking and storage areas. Site grades vary from 122.8 meters above sea level (masl) to 126.5 masl at the borehole locations.

The Site is located within the Physiographic Region identified as Iroquois Plain comprising Shale Plains (Chapman and Putnam 2007, Physiography of Southern Ontario; Ontario Geological Survey, Miscellaneous Release--Data 228).

Data obtained from the Ontario Geological Survey Maps, as published by the Ontario Ministry of Energy, Northern Development and Mines (Ontario Geological Survey 2010, Surficial Geology of Southern Ontario; Ontario Geological Survey, Miscellaneous Release--Data 128-REV), indicates that the Site is located on paleozoic bedrock bordered by clay to silt-textured till (derived from glaciolacustrine deposits or shale) to the west. Quaternary Geology mapping (Ontario Geological Survey 2000, Quaternary geology, seamless coverage of the Province of Ontario; Ontario Geological Survey, Data Set 14---Revised) indicates that the Site is underlain by Halton Till (predominantly silt to silty clay matrix).

The underlying bedrock at this Site is of the Queenston Formation consisting of shale, siltstone, minor limestone and sandstone (Ontario Geological Survey 2011, Paleozoic Geology of Southern Ontario; Ontario Geological Survey, Miscellaneous Release--Data 219).

2.2 Previous Investigations Completed at the Site

2.2.1 Previous Investigations (Pinchin)

2.2.1.1 Preliminary Geotechnical Investigation (October 2018)

In 2018, Pinchin completed a preliminary geotechnical investigation at the subject Site titled “Preliminary Geotechnical Investigation – Proposed Commercial Development, 1250 Appleby Line (4495 North

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Service Road, Burlington, Ontario" (Pinchin reference number 229041.001, dated October 31, 2018). The scope of work included the advancement of twenty-nine (29) boreholes to depths of 1.2 to 6.6 meters below ground surface (mbgs) throughout the subject Site. Nine of the boreholes were equipped with monitoring wells. The soils contacted at the boreholes consisted of topsoil (0.2 to 1.1 m thick), granular fill (0.2 to 2.1 m thick) and fill (0.2 to 6.0 m thick) underlain by silt till. The silt till consisted of stiff to hard clayey silt to compact to very dense sandy silt. Inferred highly weathered shale bedrock was contacted at depths of 0.9 to 6.5 mbgs (Elevation 119.7 to 123.5 masl). Groundwater levels measured in the monitoring wells installed at the Site ranged from 1.1 to 3.1 mbgs (Elevation 121.5 to 121.9 masl) on October 4, 2018. The site plan and borehole logs of this previous investigation are included in Appendix II.

2.2.1.2 Groundwater Monitoring and Sampling Program (November 2022)

In 2022, Pinchin completed a groundwater sampling and monitoring program at 4475 and 4495 North Service Road, Burlington, Ontario (Pinchin reference number 313301.001, dated November 10, 2022). As part of the scope of work, one of the monitoring wells previously installed by Pinchin in 2018 was replaced. Groundwater levels were measured at five monitoring wells on October 25, 2022, at depths of 3.6 to 5.5 mbgs.

2.2.2 Previous Investigations (By Others)

2.2.2.1 Soil, Sediment and Groundwater Delineation Investigation (EXP Services Inc., 2019)

EXP Services Inc. (EXP) completed a soil, sediment and groundwater delineation investigation at the subject Site (EXP reference number BRM-00250233-B0, dated February 6, 2019). The fieldwork included the advancement of seven (7) boreholes to depths of 2.1 to 9.1 mbgs and twelve (12) test pits to 2.1 to 4.4 mgs. Four of the boreholes were equipped with monitoring wells. The soils contacted consisted of topsoil and/or fill underlain by clayey silt. Inferred bedrock was contacted at depths of 0.8 to 4.5 mbgs. Groundwater was measured in the monitoring wells on December 14, 2018, and January 4, 2019, and ranged from 1.8 to 4.6 mbgs. The site plan and borehole / test pit logs of this previous investigation are included in Appendix II.

3.0 GEOTECHNICAL FIELD INVESTIGATION AND METHODOLOGY

Pinchin completed the field investigation at the Site from November 21 to 25, 2022 by advancing a total of twenty-four (24) sampled boreholes throughout the Site. The boreholes were advanced to depths of approximately 4.6 and 7.6 mbgs. The approximate spatial locations of the boreholes advanced at the Site are shown on Figure 2. It is noted that access into the southeastern portion of the Site was limited by an existing fence line.

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The boreholes were advanced with the use of a tracked CME drill rig which was equipped with standard soil sampling equipment. Soil samples were collected at 0.75 m intervals using a 51 mm outside diameter (OD) split spoon barrel in conjunction with Standard Penetration Tests (SPT) "N" values (ASTM D1586). The SPT "N" values were used to assess the compactness condition of the non-cohesive soil. Approximate shear strengths of the cohesive deposits were measured using a handheld pocket penetrometer and the results are presented on the appended borehole logs.

Monitoring wells were installed in seven of the boreholes (specifically Boreholes BH201, BH203 to BH205, BH215, BH217, and BH220) to allow measurement of groundwater levels. The monitoring wells were constructed using flush-threaded 50 mm diameter Trilock pipe with 3.0 meter long 10-slot well screens, delivered to the Site in pre-cleaned individually sealed plastic bags. The screen and riser pipes were not allowed to come into contact with the ground or drilling equipment prior to installation.

A completed well record was submitted to the property owner and the Ministry of the Environment, Conservation and Parks for Ontario (MECP) as per Ontario Regulation 903, as amended. A licensed well technician must properly decommission the monitoring wells prior to construction according to Regulation 903 of the Ontario Water Resources Act.

Groundwater observations and measurements were obtained from the open boreholes during and upon completion of drilling. Groundwater levels were measured in the monitoring wells on December 2 and 12, 2022. The groundwater observations and measurements recorded are included on the appended borehole logs.

The borehole locations and ground surface elevations were surveyed by Pinchin using a Sokkia Model GRX 2 Global Navigation Satellite System (GNSS) rover. The ground surface elevations are geodetic, based on GNSS and local base station telemetry with a precision static of less than 20 mm.

The field investigation was monitored by experienced Pinchin personnel. Pinchin logged the drilling operations and identified the soil samples as they were retrieved. The recovered soil samples were sealed into plastic bags and carefully transported to Pinchin's materials testing laboratory for detailed analysis and testing. All soil samples were classified according to visual and index properties by the project engineer.

The field logging of the soil and groundwater conditions was performed to collect geotechnical engineering design information. The borehole logs include textural descriptions of the subsoil in accordance with a modified Unified Soil Classification System (USCS) and indicate the soil boundaries inferred from non-continuous sampling and observations made during the borehole advancement. These boundaries reflect approximate transition zones for the purpose of geotechnical design and should not be interpreted as exact planes of geological change. The modified USCS classification is explained in further

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detail in Appendix I. Details of the soil and groundwater conditions encountered within the boreholes are included on the Borehole Logs within Appendix III.

Select soil samples collected from the boreholes were submitted to Pinchin's material testing laboratory to determine the grain size distribution, Atterberg Limits, as well as moisture contents of the select soil samples. A copy of the laboratory analytical reports is included in Appendix IV. In addition, the collected samples were compared against previous geotechnical information from the area, for consistency and calibration of results.

4.0 LIMITED ENVIRONMENTAL SOIL SAMPLING PROGRAM AND METHODOLOGY

This Limited Soil Sampling Program was completed in general accordance with the Canadian Standards Association document entitled "*Phase II Environmental Site Assessment, CSA Standard Z769-00 (R2018)*", dated 2000 and reaffirmed in 2018.

It is noted that this soil sampling plan does not meet the requirements of Ontario Regulation 406/19, On-Site and Excess Soil Management and additional studies including sampling, analysis and reporting will be required for excess soil generated at the Site in order to meet the requirements of Ontario Regulation 406/19.

4.1 Scope of Work

The scope of work for the Limited Soil Sampling Program included the following activities:

- Submit a total of eight most-apparent "worst case" soil sample (Boreholes BH202 SS1, BH204 SS1, BH207 SS1, BH212 SS1, BH213 SS1, BH220 SS2, BH221 SS1, BH223 SS1), based on the field screening methodologies, from the geotechnical borehole for chemical analyses of chemical analyses of metals and inorganics; benzene, toluene, ethylbenzene and xylenes (BTEX), and petroleum hydrocarbons (PHCs) F1 to F4, metals and inorganics;
- Compare the soil and groundwater laboratory analytical results with the applicable standards stipulated in the *MECP Standards*; and
- Incorporate the laboratory analytical results into the geotechnical report.

4.2 Analytical Laboratory

Selected soil samples were delivered to ALS Environmental in Waterloo for analysis. ALS Environmental is an independent laboratory accredited by the Standards Council of Canada and the Canadian Association for Laboratory Accreditation. Formal chain of custody records of the sample submissions were maintained between Pinchin and the staff at ALS Environmental.

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4.3 Site Condition Standards and Analytical Results

The Site is located within the City of Burlington. It is Pinchin's understanding that potable water for the Site and surrounding area is supplied by the Halton Region drinking water system, with the Lake Ontario as the water source, therefore non-potable conditions apply.

Ontario Regulation 153/04 (as amended) states that a Site is classified as an "environmentally sensitive area" if the pH of the surface soil (less than 1.5 mbgs) is less than 5 or greater than 9, the pH of the subsurface soil (greater than 1.5 mbgs) is less than 5 or greater than 11, or if the Site is an area of natural significance or is adjacent to or contains land within 30 metres of an area of natural significance.

Eight representative soil samples collected from the boreholes advanced at the Site were submitted for pH analysis. The pH values measured in the submitted soil samples ranged from 7.81 to 9.34 including values within the pH range for a sensitive site. However, Pinchin notes that these sensitive site values originated from surface soils samples collected from an area of poor-quality fill material on-site, and contained limestone gravel and slag. As such Pinchin referred to pH values of native soils, which included soil samples with pH values within range for non-sensitive sites.

Based on Pinchin's understanding of the Site, a tributary of Appleby Creek runs to the west of the Site and crosses the subject Site in the northeast.

Based on the boreholes advanced at the Site the overburden thickness is less than 2 m over more than one-third of the Site, excluding any surface treatment such as asphalt, concrete or aggregate, classifying the Site as a shallow soil property as per Section 43.1 of O. Reg. 153/04.

Based on the above, the appropriate Site Condition Standards for the Site are:

- "*Table 7: Generic Site Conditions Standards for Use in a Non-Potable Groundwater Condition", provided in the Ontario Ministry of the Environment, Conservation and Parks (MECP) document titled, "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", dated April 15, 2011 (Table 7 Standards)* for a industrial/commercial/community property use for medium to fine-textured shallow soils.
- "*Table 9: Generic Site Conditions Standards for Use in a Non-Potable Groundwater Condition", provided in the Ontario Ministry of the Environment, Conservation and Parks (MECP) document titled, "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", dated April 15, 2011 (Table 9 Standards)* for a industrial/commercial/community property use for medium to fine-textured soils within 30 m of a water body.

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As the boreholes were not located within 30 m of a waterbody, Pinchin compared the analytical data to the MECP Table 7 Standards for industrial/commercial/community land-use and medium/fine-textured soil. The samples submitted from the boreholes met the Table 7 Standards, with the exception for the following:

- BH204 SS1, BH213 SS1, and BH220 SS2 exceeded the Table 7 Standard for boron (hot water soluble), and
- BH207 SS1 and BH212 SS1 exceeded the Table 7 Standards for boron (total) and boron (hot water soluble).

The lateral and vertical extent of the impacted soil is not known, and additional soil characterization may be warranted. Pinchin completed an Environmental Peer Review under separate cover, summarizing the previous assessments and estimated extents of the impacted soil on Site. The excess soils must be re-used or disposed of at appropriate sites considering the concentrations of the analyzed parameters in the excess material.

5.0 SUBSURFACE CONDITIONS

In general, the soil stratigraphy at the Site comprised fill and possible fill overlying native silty clay till, which in turn was underlain by shale bedrock at depths of approximately 0.8 to 4.6 mbgs. The appended borehole logs provide detailed soil descriptions and stratigraphies, results of SPT and pocket penetrometer testing, moisture content profiles, details of monitoring well installations, and groundwater measurements.

5.1 Borehole Soil Stratigraphy

5.1.1 Fill and Possible Fill

Fill or possible fill materials were contacted at ground surface at all borehole locations. The fill generally extended to depths of 0.5 to 1.7 mbgs. Locally, the fill was thicker in the northeast end of the site (area of Boreholes BH206 and BH218), where the ground surface is raised. The fill generally varied in composition from sand and gravel to silty clay with nil to trace sand and gravel. Clay inclusions, pieces of slag, concrete, asphalt or metal, and/or pieces wood were noted within the fill. At the time of sampling the sand and gravel fill was described as damp to wet and the silty clay fill as variable Drier Than the Plastic Limit (DTPL) to Wetter Than the Plastic Limit (WTPL). Laboratory determined moisture contents of 4 to 21 % were reported. SPT N-values within the sand and gravel fill ranged from 17 to 47 blows per 300 mm indicating compact to dense relative densities. Approximate shear strengths of 125 to 225 kPa and SPT N-values of 4 to 49 blows per 300 mm indicated a variable firm to hard consistency of the cohesive fill.

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The possible fill generally extended to depths of 0.8 to 1.5 mbgs. The possible fill ranged in composition from sandy silt with some gravel to silty clay with trace sand and trace to some gravel. Pieces of cobbles were observed within the possible fill. At the time of drilling the non-cohesive possible fill was described as moist and cohesive possible fill as DTPL to APL. Laboratory determined moisture contents of 10 to 21 % were reported. The non-cohesive possible fill was loose based on an SPT N-value of 6 blows per 300 mm. Approximate shear strengths of 75 to 175 kPa and SPT N-values of 7 to greater than 50 blows per 300 mm indicated a firm to very stiff consistency of the cohesive possible fill.

The extend of the fill and possible fill as observed at the borehole locations is summarized in the following table:

Borehole Number	Fill Bottom Depth (mbgs)	Fill Bottom Elevation (masl)	Possible Fill Bottom Depth (mbgs)	Possible Fill Bottom Elevation (masl)
BH201	--	--	1.5	121.5
BH202	1.1	121.7	--	--
BH203	--	--	1.5	123.3
BH204	0.9	123.1	--	--
BH205	0.8	122.4	1.5	121.7
BH206	3.8	122.8	--	--
BH207	0.5	123.0	--	--
BH208	1.2	123.2	--	--
BH209	0.5	124.1	--	--
BH210	--	--	0.8	124.4
BH211	0.8	124.4	--	--
BH212	0.8	123.7	--	--
BH213	0.8	123.6	--	--
BH214	--	--	0.8	123.9
BH215	0.8	124.3	--	--
BH216	1.5	123.7	--	--
BH217	1.7	124.1	--	--
BH218	4.6	121.9	--	--
BH219	0.8	123.4	--	--
BH220	1.5	123.1	--	--
BH221	1.5	123.7	--	--
BH222	--	--	0.8	123.8

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Borehole Number	Fill Bottom Depth (mbgs)	Fill Bottom Elevation (masl)	Possible Fill Bottom Depth (mbgs)	Possible Fill Bottom Elevation (masl)
BH223	0.8	122.5	--	--
BH224	0.8	122.2	--	--

5.1.2 Silty Clay Till

Silty clay till with trace to some sand and gravel was contacted at Boreholes BH203, BH204, BH207 to BH213, BH215, BH217, and BH222 to BH224 underlying the fill and possible fill materials. Pieces of cobbles were noted within the glacial till deposit.

The results of particle size distribution tests performed on two samples of the silty clay till are provided in Appendix III and summarized in the following table:

Borehole / Sample Number	Depth (mbgs)	Soil Type	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
BH211, SS1	0.8 – 1.4	Silty Clay Till	1	7	56	36
BH222, SS1	0.8 – 1.4	Silty Clay Till	1	15	55	29

The results of two Atterberg Limit test results are summarized in the following table:

Borehole / Sample Number	Depth (mbgs)	Soil Type	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Moisture Content (%)
BH211, SS1	0.8 – 1.4	Silty Clay Till	36	19	18	17
BH222, SS1	0.8 – 1.4	Silty Clay Till	37	21	16	14

Based on the Atterberg Limits test results, the silty clay till is of medium plasticity. Moisture contents varied from 8 to 18%. At the time of drilling the silty clay till was described as DTPL to APL. Based on SPT N-values of 13 to greater than 50 blows per 300 mm and approximate shear strengths of 100 to 225 kPa, the silty clay till has a stiff to hard consistency.

5.2 Highly Weathered Shale Bedrock

Highly weathered shale bedrock was contacted at depths of 0.8 to 4.6 mbgs (Elevations 121.5 to 124.0 masl) throughout the Site. Trace limestone interlayers were noted within the shale. SPT N-values of 16 to greater than 50 blows per 300 mm indicate that the shale had a compact to very dense relative density. Moisture contents from 4 to 12% were determined in the shale. The shale was described as damp to wet at the time of drilling.

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The depth to shale bedrock as contacted at the borehole locations is summarized in the following table:

Borehole Number	Highly Weathered Shale Bedrock Depth (mbgs)	Highly Weathered Shale Bedrock Elevation (masl)
BH201	1.5	121.5
BH202	1.1	121.7
BH203	2.3	122.5
BH204	1.7	122.3
BH205	1.5	121.7
BH206	3.8	122.8
BH207	1.5	122.0
BH208	2.3	122.1
BH209	1.5	123.1
BH210	2.4	122.8
BH211	3.0	122.2
BH212	1.5	123.0
BH213	1.5	122.9
BH214	0.8	123.9
BH215	1.5	123.6
BH216	1.5	123.7
BH217	2.3	123.5
BH218	4.6	121.9
BH219	0.8	123.4
BH220	1.5	123.1
BH221	1.5	123.7
BH222	1.7	122.9
BH223	1.5	121.8
BH224	1.5	121.5

5.3 Groundwater Conditions

Groundwater observations and measurements were obtained in the open boreholes at the completion of drilling and are summarized on the appended borehole logs. Stabilized groundwater levels were measured on December 2, 2022, and December 12, 2022, and the results are summarized in the following table:

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Borehole Number	Ground Surface Elevation (masl)	Date	Depth to Groundwater (mbgs)	Groundwater Elevation (masl)
BH201	123.0	December 2, 2022	3.1	119.9
		December 12, 2022	1.4	121.6
BH203	124.8	December 2, 2022	3.6	121.2
		December 12, 2022	3.7	121.1
BH204	124.0	December 2, 2022	2.6	121.4
		December 12, 2022	2.7	121.3
BH205	123.2	December 2, 2022	1.9	121.3
		December 12, 2022	2.0	121.2
BH215	125.1	December 2, 2022	3.5	121.6
		December 12, 2022	3.8	121.3
BH217	125.8	December 2, 2022	4.1	121.7
		December 12, 2022	4.3	121.5
BH220	124.6	December 2, 2022	3.0	121.6
		December 12, 2022	3.2	121.5

There is potential for perched groundwater conditions within the fill/possible fill overlying the generally stiff to hard glacial till and/or shale bedrock particularly following heavy rainfall or snowmelt.

Seasonal variations in the water table should be expected, with higher levels occurring during wet weather conditions in the spring and fall and lower levels occurring during dry weather conditions.

Reference is made to the hydrogeological assessment completed by Pinchin for additional details pertaining to the groundwater regime below the Site.

6.0 GEOTECHNICAL DESIGN RECOMMENDATIONS

6.1 General Information

The recommendations presented in the following sections of this report are based on the information available regarding the proposed construction, the results obtained from the geotechnical investigation, and Pinchin's experience with similar projects. Since the investigation only represents a portion of the subsurface conditions, it is possible that conditions may be encountered during construction that are substantially different than those encountered during the investigation. If these situations are encountered, adjustments to the design may be necessary. A qualified geotechnical engineer should be

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on-Site during the foundation preparation to ensure the subsurface conditions are the same/similar to what was observed during the investigation.

It is Pinchin's understanding that the development will consist of two single-storey slab-on-grade (i.e., no basement level) industrial buildings with associated loading docks and truck parking. Site grades vary from 122.8 meters above sea level (masl) to 126.5 masl at the borehole locations with highest grades in the northeast and southwest.

Details pertaining to proposed site grades, finished floor elevation, as well as foundation details were not available at the time of this preliminary geotechnical investigation.

The soils contacted at the Site generally consisted of fill to depths of 0.8 to 4.6 mbgs or possible fill to depths of 0.8 to 1.5 mbgs. Fill was previously contacted to depths of 0.2 to 3.0 mbgs and localized up to 6.0 mbgs (Pinchin, 2018). The greater fill l thicknesses were generally contacted in the northeast portion of the Site. Silty clay till was encountered below the fill / possible fill in some areas. Shale bedrock was contacted underlying the fill / possible fill and silty clay till throughout the site. All boreholes were terminated within the shale bedrock, which was generally contacted at depths of 0.8 to 4.6 mbgs (Elevations 121.5 to 124.0 masl).

The depth to native inorganic stiff to hard glacial till or shale bedrock considered suitable for foundation support is summarized in the following table:

Borehole Number	Depth to Stiff to Hard Silty Clay Till (mbgs)	Elevation of Stiff to Hard Silty Clay Till (masl)	Depth to Highly Weathered Shale Bedrock (mbgs)	Elevation of Highly Weathered Shale Bedrock (masl)
BH201	--	--	1.5	121.5
BH202	--	--	1.1	121.7
BH203	1.5	123.3	2.3	122.5
BH204	0.9	123.1	1.7	122.3
BH205	--	--	1.5	121.7
BH206	--	--	3.8	122.8
BH207	0.5	123.0	1.5	122.0
BH208	1.2	123.2	2.3	122.1
BH209	0.5	124.1	1.5	123.1
BH210	0.8	124.4	2.4	122.8
BH211	0.8	124.4	3.0	122.2
BH212	0.8	123.7	1.5	123.0

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Borehole Number	Depth to Stiff to Hard Silty Clay Till (mbgs)	Elevation of Stiff to Hard Silty Clay Till (masl)	Depth to Highly Weathered Shale Bedrock (mbgs)	Elevation of Highly Weathered Shale Bedrock (masl)
BH213	0.8	123.6	1.5	122.9
BH214	--	--	0.8	123.9
BH215	0.8	124.3	1.5	123.6
BH216	--	--	1.5	123.7
BH217	1.7	124.1	2.3	123.5
BH218	--	--	4.6	121.9
BH219	--	--	0.8	123.4
BH220	--	--	1.5	123.1
BH221	--	--	1.5	123.7
BH222	0.8	123.8	1.7	122.9
BH223	0.8	122.5	1.5	121.8
BH224	0.8	122.2	1.5	121.5

The fill is not considered suitable to remain below the proposed buildings, site services, or pavement structures. Additional test pits could be completed in the areas of possible fill to confirm the material's suitability to remain below the proposed buildings, services, and/or pavement structures. Conventional foundations on the native glacial till or shale bedrock are considered suitable at the Site. Localized foundations may need to be lowered to reach competent soil / shale subgrade. Alternative foundation options in areas of greater fill thickness could include helical piers / micropiles, Rammed Aggregate Piers and Controlled Modulus Columns.

6.2 Site Preparation

Any existing structures and utilities not to be maintained should be fully removed and/or relocated. All fill materials, topsoil, and native soil with organic content, or very loose/soft soils should be removed from below the proposed building footprints, associated pavements, and site services. Inorganic fill materials may remain below proposed pavement areas if the owner accepts the increased potential for required pavement maintenance and repairs as well as potential for decreased pavement life. The suitability of the inorganic fill to remain below pavement structures should be confirmed by proof-rolling and inspection by geotechnical personnel.

Disturbed or very loose/softened soils at foundation level should be over-excavated and replaced with structural fill.

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Pinchin recommends that any engineered fill required at the Site be compacted in accordance with the criteria stated in the following table:

Type of Engineered Fill	Maximum Loose Lift Thickness (mm)	Compaction Requirements	Moisture Content (Percent of Optimum)
Structural fill to support foundations and floor slabs	200	100% SPMDD	Plus 2 to minus 4
Subgrade fill beneath parking lots and access roadways	300	98% SPMDD	Plus 2 to minus 4

Structural fill placed below foundations should extend horizontally 1 m beyond the edge of foundation. The structural fill pad should be sloped at an inclination of 1 horizontal to 1 vertical to the approved subgrade soil.

Prior to placing any fill material at the Site, the subgrade should be inspected by a qualified geotechnical engineer and loosened/soft pockets should be sub excavated and replaced with engineered fill. In addition, the natural subgrade soil is to be roll compacted with a minimum 10 tonne non-vibratory steel drum roller to provide a more uniform subgrade surface and compact near surface loose zones.

Inorganic on-site soils may be geotechnically suitable for reuse as engineered fill to achieve design grades. Depending on the moisture content at the time of construction some moisture conditioning will need to be done. Any additional material required for site preparation should consist of granular material such as Ontario Provincial Standards and Specifications (OPSS) 1010 Granular ‘B’ Type I material; or material with similar characteristics to the on-site soils. If the work is carried out during very dry weather, water may have to be added to the material to improve compaction.

A qualified geotechnical engineering technician should be on site to observe fill placement operations on a full-time basis and perform field density tests at random locations throughout each lift, to indicate the specified compaction is being achieved.

Dust control measures may be required during periods of dry weather. Work shall be in accordance with OPSS 506.

6.3 Open Cut Excavations

Servicing details were not available at the time of this report and it is anticipated that site services will be at conventional depths of approximately 2 to 4 m below finished grade. It is further anticipated that foundations will be constructed at conventional frost depth for the planned slab-on-grade buildings.

Based on the subsurface information obtained from within the boreholes, it is anticipated that the excavated material will predominately consist of fill materials underlain by stiff to hard silty clay till, which

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in turn is underlain by shale bedrock. Water levels were measured at 1.4 to 4.3 mbgs (Elevation 121.1 to 121.6 masl) on December 12, 2022, in the monitoring well installed as part of this investigation.

Where workers must enter trench excavations deeper than 1.2 m, the trench excavations should be suitably sloped and/or braced in accordance with the Occupational Health and Safety Act (OHSA), Ontario Regulation 213/91, Construction Projects, July 1, 2011, Part III - Excavations, Section 226.

Based on the OHSA, the predominant fill and possible fill materials above the water table would be classified as Type 3 soil and temporary excavations in these soils must be sloped at an inclination of 1 horizontal to 1 vertical (H to V) from the base of the excavation. The underlying silty clay till would be classified Type 2 soil. The weathered shale should be considered Type 1 soil. Temporary excavations in Type 1 and Type 2 soils may be cut vertical in the bottom 1.2 m and must be sloped back at an inclination of 1 horizontal to 1 vertical (H to V) above. Excavations in soil extending below the groundwater table would be classified as a Type 4 soil and temporary excavations will have to be sloped back at 3 H to 1 V from the base of the excavation. Where more than one soil type is exposed in an excavation, the soils type with the higher number governs.

In addition to compliance with the OHSA, the excavation procedures must also be in compliance to any potential other regulatory authorities, such as federal and municipal safety standards.

Alternatively, the excavation walls may be supported by either closed shoring, bracing, or trench boxes complying with sections 235 to 239 and 241 under O. Reg. 231/91, s. 234(1). Trench boxes can most likely be used for temporary support of vertical side walls. The appropriate trench should be designed/confirmed for use in this soil deposit.

It is anticipated that excavations extending into the underlying weathered shale bedrock can be done with large mechanical equipment with ripper teeth. A hoe ram or hydraulic hammer may be required to break up limestone layers within the shale bedrock.

6.4 Anticipated Groundwater Management

Water levels were measured at 1.4 to 4.3 mbgs (Elevation 121.1 to 121.6 masl) on December 12, 2022, in the monitoring well installed as part of this investigation. Seasonal variations in the water table should be expected, with higher levels occurring during wet weather conditions in the spring and fall and lower levels occurring during dry weather conditions. The rate of groundwater inflow into an excavation will depend on the depth of excavation below groundwater as well as soils exposed in the excavation slopes. Low to moderate groundwater inflow is generally expected from the silty clay till and weathered shale bedrock. In general, it is believed that groundwater inflow from excavations extending less than 0.6 m below the groundwater table can be controlled using a gravity dewatering system with perimeter interceptor ditches and high-capacity pumps.

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For excavations extending more than 0.6 m below the stabilized groundwater table, a dewatering system installed by a specialist dewatering contractor may be required to lower the groundwater level prior to excavation. The design of the dewatering system should be left to the contractor's discretion, and the system should meet a performance specification to maintain and control the groundwater at least 0.3 m below the excavation base.

Seasonal variations in the water table should be expected, with higher levels occurring during wet weather conditions in the spring and fall and lower levels occurring during dry weather conditions. If construction commences during wet periods (typically spring or fall), there is a greater potential that the groundwater elevation could be higher and/or perched groundwater may be present. Any potential inflow of perched groundwater should be able to be controlled from pumping from filtered sumps.

Prior to commencing excavations, it is critical that all existing surface water and potential surface water is controlled and diverted away from the Site to prevent infiltration and subgrade softening. At no time should excavations be left open for a period of time that will expose them to precipitation and cause subgrade softening.

All collected water is to discharge a sufficient distance away from the excavation to prevent re-entry. Sediment control measures, such as a silt fence should be installed at the discharge point of the dewatering system. The utmost care should be taken to avoid any potential impacts on the environment.

It is the responsibility of the contractor to propose a suitable dewatering system based on the groundwater elevation at the time of construction. The method used should not adversely impact any nearby structures. A Permit to Take Water or a submission to the Environmental Activity and Sector Registry (EASR) may be required depending on the proposed site grades and excavation depths. It is the responsibility of the contractor to make this application if required.

As previously mentioned, above average seasonal variations in the groundwater table should be expected, with higher levels occurring during wet weather conditions in the spring and fall and lower levels occurring during dry weather conditions. As such, depending on the groundwater at the time of the excavation works, a more involved dewatering system may be required.

The above recommendations should be reviewed once the grading details, foundation depths, and servicing details are available.

Reference is made to the hydrogeological assessment completed by Pinchin for the proposed development for anticipated groundwater inflow rates and the need for a Permit to Take Water or a submission to the Environmental Activity and Sector Registry (EASR).

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6.5 Site Servicing

6.5.1 Pipe Bedding and Cover Materials for Flexible and Rigid Pipes

Servicing details were not available at the time of this report and it is anticipated that site services will be at conventional depths of approximately 2 to 4 m below finished grade. The subgrade at the pipe invert levels are anticipated to consist of fill or possible fill, native inorganic glacial till and shale bedrock. The pipe subgrade soils should be inspected at the time of excavations and any fill materials remaining below proposed pipe inverts should be removed and replaced with additional bedding material.

No support problems are anticipated for flexible or rigid pipes founded in the natural mineral soils or within the shale bedrock. Any organic soils, or loose/soft material encountered below the pipe invert should be removed and replaced with additional bedding material.

Service pipes require an adequate base to ensure proper pipe connection and positive flow is maintained post construction. As such, pipe bedding should be placed to be of uniform thickness and compactness. The pipe bedding and cover material should conform to OPSD 802.010 and 802.013 specifications for flexible pipes and to OPSD 802.031 to 802.033 with Class “B” bedding for rigid pipes. The pipe bedding material should consist of a minimum thickness of 150 mm Granular “A” (OPSS 1010) below the pipe and extend up the sides to the spring line. However, the bedding thickness may have to be increased depending on the pipe diameter or if wet or weak subgrade conditions are encountered. The pipe cover material from the spring line should consist of a Granular “B” Type I (OPSS 1010) and should extend to a minimum of 300 mm above the top of the pipe. All granular fill material is to be placed in maximum 200 mm thick loose lifts compacted to a minimum of 98% SPMDD.

The bedding material, pipe and cover material should be installed as soon as practically possible after the excavation subgrade is exposed. The longer the excavated subgrade soil remains open to weather conditions and groundwater seepage, the greater the chance for construction problems to occur. Where it is difficult to stabilize the subgrade due to groundwater or the material is higher than the optimum moisture content, a Granular “B” Type II material may be required. Alternatively, if constant groundwater infiltration becomes an issue, then an approximate 150 mm granular pad consisting of 19 mm clear stone gravel (OPSS 1004) wrapped in a non-woven geotextile should be considered to maintain the integrity of the natural subgrade soil. The clear stone should contain a minimum of 50% crushed particles. Water collected within the stone should be controlled through sumps and filtered pumps.

6.5.2 Trench Backfill

Above the pipe cover material, the trench can be backfilled by re-using the excavated native soils matching the materials exposed on the sides of the trenches. Any large cobbles or boulders (greater than

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150 mm) should be removed from the backfill material. The reuse of inorganic on-site materials is subject to environmental constraints and approval by a geotechnical consultant at the time of trench backfilling. Moisture conditioning may be required at the time of construction.

The cohesive fill/possible fill materials as well as native glacial till soils will have a blocky/lumpy texture, and a sheepsfoot roller is recommended for any soils considered suitable for on-site reuse in order to achieve proper compaction and to ensure that all air voids are removed to avoid long-term softening and settlement.

Excavated shale bedrock is not considered suitable for reuse as trench backfill.

The trench backfill should be placed to the underside of the granular subbase of the pavement structure and be compacted in maximum 300 mm thick lifts to a minimum of 98% SPMDD within 4% of the optimum moisture content. This is recommended to provide soil compatibility and help minimize potential abrupt differential frost heave between surrounding natural materials similar in composition.

All stockpiled material should be protected from deleterious materials, additional moisture and be kept from freezing.

Quality control will be the utmost importance when selecting the trench backfill material. The selection of the material should be done as early in the contract as possible to allow sufficient time for gradation and proctor testing on representative samples to ensure it meets the projects specifications.

Depending on weather conditions at the time of construction, an imported material may be required to achieve adequate compaction. If the imported material is not the same/similar to the soil observed on the side walls of the excavation, then a horizontal transition between the materials should be sloped as per frost heave taper OPSD 205.060. Any natural material is to be placed in maximum 300 mm thick lifts compacted to 98% SPMDD within plus 2% to minus 4% optimum moisture content. Imported material should consist of a Granular “A” or Granular “B” (OPSS 1010). Heavy construction equipment and truck traffic should not cross any pipe until at least 1 m of compacted soil is placed above the top of the pipe.

Post compaction settlement of finer grained soil can be expected, even when placed to compaction specifications. As such, trench backfill materials should be installed as far in advance as possible before finishing the roadway in order to mitigate post compaction settlements.

6.5.3 Seepage Collars

Seepage collars should be considered where pipes are installed below the groundwater table to minimize the flow of groundwater through the granular bedding and backfill thereby possibly causing unwatering of the native soils. The need for seepage collars should be reviewed once additional design details become available.

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6.6 Foundation Design

The existing inorganic native stiff to hard silty clay till and highly weathered shale are considered suitable to support the proposed buildings, provided all pre-existing fill and topsoil are removed, and the subgrade prepared as above.

6.6.1 Shallow Foundations Bearing on Native Inorganic Soil or Approved Engineered Fill and Weathered Shale Bedrock

Conventional shallow strip footings established on the inorganic stiff to hard silty clay till or approved engineered fill may be sized for a bearing resistance at Serviceability Limit States (SLS) of 150 kPa and a factored geotechnical bearing resistance of 225 kPa at Ultimate Limit States (ULS). A resistance factor of 0.5 was applied to the ULS.

Conventional shallow strip footings established on the highly weathered shale bedrock may be sized for a bearing resistance at SLS of 200 kPa and a factored geotechnical bearing resistance of 300 kPa at ULS. A resistance factor of 0.5 was applied to the ULS. Higher bearing resistances may be available from the unweathered bedrock; however, additional boreholes should be completed and coring of the bedrock undertaken to determine these values.

The associated total and differential settlements for these pressures are anticipated to be less than 25 mm and 19 mm, respectively for continuous foundations less than 1.5 m in width and spread (square) footings of up to 3.0 m.

As the actual service loads were not known at the time of this report, these should be reviewed by the project structural engineer to determine if SLS or ULS governs the footing design.

It is noted that there is a potential for weaker subgrade soil to be encountered between the investigation locations. Pinchin presumes that any areas of weaker subgrade soil will consist of small pockets of soft/loose natural soil which can be compacted to match the density of the remainder of the Site. As such, the material must be compacted to a minimum of 100% Standard Proctor Maximum Dry Density (SPMDD) prior to installing the concrete formwork. Any soft/loose areas which are not able to achieve the recommended 100% SPMDD are to be removed and replaced with a low strength concrete.

Pinchin notes that a qualified geotechnical engineering consultant should be on-Site during the proof roll and foundation preparation activities to verify the recommended level of compaction is achieved and to verify the design assumptions and recommendations. This is especially critical with respect to the recommended soil bearing pressures. If variations occur in the soil conditions between the borehole locations, site verification and site review by Pinchin is recommended to provide appropriate recommendations at that time.

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The natural subgrade soil is sensitive to change in moisture content and can become loose/soft if subjected to additional water or precipitation. As well, it could be easily disturbed if travelled on during construction. Once it becomes disturbed it is no longer considered adequate to support the recommended design bearing pressures. It is recommended that a working slab of lean concrete (mud slab) be placed in the footing areas immediately after excavation and inspection to protect the founding soils during placement of formwork and reinforcing steel.

In addition, to ensure and protect the integrity of the subgrade soil during construction operations, the following is recommended:

- Prior to commencing excavations, it is critical that all existing surface water, potential surface water and perched groundwater are controlled and diverted away from the work Site to prevent infiltration and subgrade softening. At no time should excavations be left open for a period of time that will expose them to inclement weather conditions and cause subgrade softening;
- The subgrade should be sloped to a sump outside the excavation to promote surface drainage and the collected water pumped out of the excavation. Any potential precipitation or seepage entering the excavations should be pumped away immediately (not allowed to pond);
- The footing areas should be cleaned of all deleterious materials such as topsoil, organics, fill, disturbed, caved materials or loosened bedrock pieces;
- Any potential large cobbles or boulders (i.e., greater than 200 mm in diameter) within the subgrade material are to be removed and replaced with a similar soil type not containing particles greater than 200 mm in diameter. It is critical that particles greater than 200 mm in diameter are not in contact with the foundation to prevent point loading and overstressing; and
- If the excavated subgrade soil remains open to weather conditions and groundwater seepage, sidewall stability and suitability of the subgrade soil will need to be verified prior to construction.

If construction proceeds during freezing weather conditions, adequate temporary frost protection for the footing bases and concrete must be provided and maintained above freezing at all times.

6.6.2 Cast-in-place Concrete Caissons in Areas of Greater Fill Thickness on Highly Weathered Shale Bedrock

Bored piles (drilled shafts) may be used for the building foundations in areas of greater fill thicknesses. Bored piles typically involve drilling a 0.9 to 1.5 m diameter vertical hole into the ground and filling the

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hole with structural concrete and reinforcing steel. At this Site the concrete caissons should extend on to the weathered shale bedrock underlying the fill materials.

For cast-in-place end-bearing concrete caissons socketed 1 m into the highly weathered shale bedrock, a preliminary bearing resistance at SLS of 200 kPa and a factored geotechnical bearing resistance at ULS of 300 kPa may be used.

The bedrock was not confirmed through coring as part of this investigation. Higher bearing resistances may be available in the bedrock; however, additional boreholes including coring of bedrock will be required.

To maintain the recommended capacities, the caissons should be spaced at a minimum distance of 2.5 times the caisson diameter to avoid interference between caissons.

A temporary steel liner is required in order to facilitate the cleaning and inspection of the founding soils, and to prevent collapse and cave-in of the sidewalls of the shafts.

All concrete is to be installed immediately upon completion of auguring, as delay may result in significant horizontal soil strength loss. High groundwater inflow from sand and gravel deposits/layers as contacted at borehole BH3 may require concrete to be placed by tremie.

Augured cast-in-place concrete caissons are to be installed by an experienced contractor familiar with the installation process and soil conditions. The installation of the caissons should be monitored on a full-time basis by a qualified geotechnical consultant.

6.6.3 Alternative Solutions in Areas of Greater Fill Thickness

Depending on the proposed site grades, site improvement options such as a Rammed Aggregate Pier System or Controlled Modulus Columns System; or alternate foundation options such as helical piers / micropiles may be suitable options. This should be reviewed once the design for the proposed site development progresses.

6.6.3.1 Rammed Aggregate Piers

Rammed Aggregate Pier ® (RAP) soil reinforcing elements using the Geopier ® installation methodology are installed by drilling 0.76 m diameter cavity and ramming thin lifts of aggregate within the cavity to form very stiff, high-density aggregate piers. The lengths of the piers will be site-specific. The first lift of aggregate forms a bulb below the bottoms of the piers, thereby pre-stressing and pre-straining the soils to a depth equal to at least one pier diameter below the base of the drill cavity. Subsequent lifts are typically about 300 mm in thickness. Ramming takes place with a high-energy bevelled tamper that both densifies

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the aggregate and forces the aggregate laterally into the sidewalls of the drill cavity. This action increases the lateral stress in surrounding soil; thereby further stiffening the stabilized composite soil mass.

The result of the Geopier RAP installation is a significant strengthening and stiffening of subsurface soils that then support high bearing capacity footings.

Rammed aggregate piers are a proprietary design and will require input from specialized contractors and engineers. The installation of the rammed aggregate piers should be monitored on a full-time basis by a qualified geotechnical consultant.

6.6.3.2 Controlled Modulus Column

The Controlled Modulus Column (CMC) method utilizes a specialized & patented, high torque, displacement drill system capable of displacing in-situ soils during penetration and installing a controlled structural grout element during withdrawal. The displacement drill system produces virtually no vibrations or excess soils and is suitable for construction adjacent to existing structures.

The installed CMC elements are then overlain with a structural/engineered fill pad known as a Load Transfer Platform (LTP). The LTP is typically designed as 150-300 mm of compacted granular placed between the CMC element tops and the underside of footing which is distributes the imposed footing loads evenly over the CMC treatment area. The CMC / LTP system allows for the design of high-capacity strip / spread footings and relatively thin, lightly reinforced floor slabs.

CMC design is proprietary, and a specialist contracting firm and structural engineer must be retained for design.

6.6.3.3 Helical Pier/Micropile Foundation System

Helical piers or micropiles bearing on the native glacial till or shale bedrock can be used through areas of greater fill materials. The supporting grade beam system for the structure would bear upon the helical piles or micropiles.

Helical Pier or micropile foundations can be used in place of traditional deep foundations such as cast-in-place concrete caissons. The ‘Helical-Pier Foundation System’ generally comprises 200 to 400 mm diameter steel plates on the end of 30 to 50 mm diameter solid square shafts. The steel helicals are screwed into the ground with a torque driver machine. Sections are added as the pier is screwed into the ground until a suitable bearing is reached. The pier load capacity is then determined and the pier is capped with a load bearing plate. Similarly, micropiles generally comprise small diameter piles consisting of combinations of steel casing, threaded bars, and grout. They are bored or drilled to a suitable bearing stratum. Micropiles are capable of being advanced through obstructions such as cobbles and boulders.

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Both the helical pier and micropile systems are proprietary and a specialist contracting firm and structural engineer must be retained for design.

6.6.4 Site Classification for Seismic Site Response & Soil Behaviour

The following information has been provided to assist the building designer from a geotechnical perspective only. These geotechnical seismic design parameters should be reviewed in detail by the structural engineer and be incorporated into the design as required.

The seismic site classification has been based on the 2012 OBC. The parameters for determination of Site Classification for Seismic Site Response are set out in Table 4.1.8.4.A of the OBC. The site classification is based on the average shear wave velocity in the top 30 m of the site stratigraphy. If the average shear wave velocity is not known, the site class can be estimated from energy corrected Standard Penetration Resistance (N60) and/or the average undrained shear strength of the soil in the top 30 m.

The boreholes advanced at this Site extended to approximately 4.6 to 7.6 mbgs and were terminated in highly weathered shale bedrock. SPT “N” values within the native silty clay till and highly weathered shale bedrock ranged between 13 and greater than 50 blows per 300 mm. Given the shallow depth to bedrock, and based on Table 4.1.8.4.A of the OBC, this Site has been classified as Class C. A Site Class C has an average shear wave velocity (Vs) of between 360 and 760 m/s.

A higher site class (Site Class B) may be applicable for the Site, but this would need to be confirmed through shear wave velocity soundings.

6.6.5 Foundation Transition Zones

Excessive differential settlements can occur where the subgrade support material types differ below the underside of continuous strip footings, (i.e., glacial till / shale to engineered fill). As such, where strip footings transition from one material to another the transition between the materials should be suitably sloped or benched to mitigate differential settlements.

Pinchin also recommends the following transition precautions to mitigate/accommodate potential differential settlements:

- For strip footings, the transition zones should be adequately reinforced with additional reinforced steel lap lengths or widened footings;
- Steel reinforced poured concrete foundation walls; and
- Control joints throughout the transition zone(s).

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The above recommendations should be reviewed by the structural engineer and incorporated into the design as necessary.

Where strip footings are founded at different elevations, the subgrade soil is to have a maximum slope of 2 H to 1 V, with the concrete footing having a maximum rise of 600 mm and a minimum run of 600 mm between each step, as detailed in the 2012 Ontario Building Code (OBC). The lower footing should be installed first to mitigate the risk of undermining the upper footing.

Individual spread footings are to be spaced a minimum distance of one and a half times the largest footing width apart from each other to avoid stress bulb interaction between footings. This assumes the footings are at the same elevation.

Foundations may be placed at a higher elevation relative to one another provided that the slope between the outside face of the foundations are separated at a minimum slope of 2H to 1V with an imaginary line drawn from the underside of the foundations. The lower footing should be installed first to mitigate the risk of undermining the upper footing.

6.6.6 Estimated Settlement

All individual spread footings should be founded on uniform subgrade soils, reviewed and approved by a licensed geotechnical engineer.

Foundations installed in accordance with the recommendations outlined in the preceding sections are not expected to exceed total settlements of 25 mm and differential settlements of 19 mm.

All foundations are to be designed and constructed to the minimum widths as detailed in the 2012 OBC.

6.6.7 Building Drainage

To assist in maintaining the building dry from surface water seepage, it is recommended that exterior grades around the buildings be sloped away at a 2% gradient or more, for a distance of at least 2.0 m. Roof drains should discharge a minimum of 1.5 m away from the structure to a drainage swale or appropriate storm drainage system.

Exterior perimeter foundations drains are not required, where the finished floor elevation is established a minimum of 150 mm above the exterior final grades or that the exterior gradient is properly sloped to divert surface water away from the building.

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6.6.8 Frost Protection & Foundation Backfill

In the Burlington, Ontario area, exterior perimeter foundations for heated buildings require a minimum of 1.2 m of soil cover above the underside of the footing or grade beams to provide soil cover for frost protection.

Where the foundations or grade beams for heated buildings do not have the minimum 1.2 m of soil cover frost protection, they should be protected from frost with a combination of soil cover and rigid polystyrene insulation, such as Dow Styrofoam or equivalent product. If required, Pinchin can provide appropriate foundation frost protection recommendations as part of the design review.

To minimize potential frost movements from soil frost adhesion, the perimeter foundation backfill should consist of a free draining granular material, such as a Granular 'B' Type I (OPSS 1010) or an approved sand fill, extending a minimum lateral distance of 600 mm beyond the foundation. The backfill material must be brought up evenly on both sides of foundation walls not designed to resist lateral earth pressure. All backfill material is to be placed in maximum 300 mm thick lifts compacted to a minimum of 100% SPMDD below the interior of building and exterior hard landscaping areas; and 95% SPMDD below exterior soft landscaping areas. It is recommended that inspection and testing be carried out during construction to confirm backfill quality, thickness and to ensure compaction requirements are achieved.

6.7 Floor Slabs

Prior to the installation of the engineered fill material, all pre-existing fill, topsoil, and native soils with organics should be removed to the underlying organic free in-situ soil. The suitability of possible fill material to remain below floor slabs is to be confirmed by geotechnical personnel. The natural subgrade soil is to be proof roll compacted with a minimum 10 tonne non-vibratory steel drum roller to observe for weak/soft spots

The in-situ inorganic native soils and shale bedrock or engineered fill placed on-site during the site preparation stage is considered adequate for the support of the concrete floor slabs provided it is proof roll compacted as outlined above. Any soft area(s) encountered during proof rolling should be excavated and replaced with a similar soil type.

Once the subgrade soil is exposed it is to be inspected and approved by a qualified geotechnical engineering consultant to ensure that the material conforms to the soil type and consistency observed during the subsurface investigation work.

Based on the in-situ soil conditions, it is recommended to establish the concrete floor slab on a minimum 300 mm thick layer of Granular "A" (OPSS 1010) compacted to 100% SPMDD. Alternatively, consideration may also be given to using a 200 mm thick layer of uniformly compacted 19 mm clear stone

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placed over the approved subgrade. Any required up fill should consist of a Granular "B" Type I or Type II (OPSS 1010).

The following table provides the unfactored modulus of subgrade reaction values:

Material Type	Modulus of Subgrade Reaction (kN/m^3)
Granular A (OPSS 1010)	85,000
Granular "B" Type I (OPSS 1010)	75,000
Granular "B" Type II (OPSS 1010)	85,000
Silty Clay Till	20,000
Highly Weathered Shale Bedrock	55,000
Engineered Fill	25,000

The values in the table above are for loaded areas of 0.3 m by 0.3 m.

6.8 Loading Dock Design

It is understood that multiple loading docks are considered along the planned court between the proposed two buildings.

Resistance to sliding of retaining structures is developed by friction between the base of the footing and the soil. This friction (**R**) depends on the normal load on the soil contact (**N**) and the frictional resistance of the soil (**tan δ**) expressed as **R = N tan δ**. The frictional resistance by soil is summarized in the following table:

Subgrade Soil	Friction Factor, tan δ
Silty Clay Till	0.35
Highly Weathered Shale Bedrock	0.40
Engineered Fill using imported OPSS 1010 Granular B Type I	0.40

A The factored geotechnical resistance at ULS is **0.8 R**.

Passive earth pressure resistance is generally not considered as a resisting force against sliding for conventional retaining structure design because a structure must deflect significantly to develop the full passive resistance.

The following parameters (un-factored) should be used for the design for the loading bays. It should be noted that these earth pressure coefficients assume that the back of the wall is vertical; condition of the ground surface behind the wall is assumed to be flat.

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Soil Layer	Bulk Unit Weight (kN/m^3)	Angle of Internal Friction (deg)	At rest Earth Pressure Coefficient	Active Earth Pressure Coefficient	Passive Earth Pressure Coefficient
Granular Fill OPSS 1010 Granular 'B' Type I	21	33	0.46	0.29	3.39
Silty Clay Till, stiff to hard	19	28	0.53	0.36	2.77
Highly Weathered Bedrock	26	25	0.58	0.40	2.46

The loading dock walls should be backfilled with free draining materials.

6.9 Asphaltic Concrete Pavement Structure Design for Parking Lot and Driveways

6.9.1 Discussion

Parking areas and driveway access will be constructed around the proposed buildings. The in-situ native silty clay till, highly weathered shale or approved engineered fill placed during the site preparation stage are considered a sufficient bearing material for an asphaltic concrete pavement structure provided all organics and deleterious materials are removed prior to installing the engineered fill material.

The existing inorganic fill material may remain below the proposed parking areas subject to proof rolling, inspection by a geotechnical engineer and acceptance of the potential for future settlements by the owner.

At this time Pinchin is unaware of the proposed final grades for the parking lot and access roadways. As such, provided the pavement structure overlies the in-situ silty clay till and shale material, the following pavement structure is recommended.

6.9.2 Pavement Structure

No traffic design details were available at the time of this report; however, it is understood that truck traffic is anticipated along the planned court between the two buildings. Car parking is planned along the east and west property lines. No detailed pavement design analyses were completed as part of this scope of work and it is recommended that Pinchin review the provided pavement design recommendations once additional traffic design detail becomes available.

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The following table presents the minimum specifications for a flexible asphaltic concrete pavement structure, including light duty use for with minimal track traffic and heavy duty use for truck traffic:

Pavement Layer	Compaction Requirements	Light Duty Areas	Heavy Duty Areas
Surface Course Asphaltic Concrete HL-3 (OPSS 1150)	92% MRD as per OPSS 310	40 mm	40 mm
Binder Course Asphaltic Concrete HL-8 (OPSS 1150)	92 % MRD as per OPSS 310	60 mm	100 mm
Base Course: Granular “A” (OPSS 1010)	100% Standard Proctor Maximum Dry Density (ASTM-D698)	150 mm	150 mm
Subbase Course: Granular “B” Type I (OPSS 1010)	100% Standard Proctor Maximum Dry Density (ASTM D698)	400 mm	500 mm

Notes:

I. Prior to placing the pavement structure, the subgrade soil is to be proof rolled with a smooth drum roller without vibration to observe weak spots and the deflection of the soil; and

II. The recommended pavement structure may have to be adjusted according to the City of Burlington standards. Also, if construction takes place during times of substantial precipitation and the subgrade soil becomes wet and disturbed, the granular thickness may have to be increased to compensate for the weaker subgrade soil. In addition, the granular fill material thickness may have to be temporarily increased to allow heavy construction equipment to access the Site, in order to avoid the subgrade from “pumping” up into the granular material.

Performance grade PG 58-28 asphaltic concrete should be specified for Marshall mixes within the light duty pavement areas and PG 64-28 asphaltic concrete for heavy duty pavement area; however, this should be reviewed once traffic data is available.

6.9.3 Pavement Structure Subgrade Preparation and Granular up Fill

The proper placement of base and subbase fill materials becomes very important in addressing the proper load distribution to provide a durable pavement structure.

The pavement subgrade materials should be thoroughly proof-rolled prior to placement of the Granular ‘B’ subbase course. If any unstable areas are noted, then the Granular ‘B’ thickness may need to be increased to support pavement construction traffic. This should be left as a field decision by a qualified geotechnical engineer at the time of construction, but it is recommended that additional Granular ‘B’ be carried as a provisional item under the construction contract.

Where fill material is required to increase the grade to the underside of the pavement structure it should consist of Granular ‘B’ Type I (OPSS 1010). The up fill material is to be placed in maximum 300 mm thick lifts compacted to 98% SPMDD within 4% of the optimum moisture content.

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Samples of both the Granular 'A' and Granular 'B' Type I aggregates should be tested for conformance to OPSS 1010 prior to utilization on Site and during construction. All stockpiled material should be protected from deleterious materials, additional moisture and be kept from freezing.

Post compaction settlement of fine-grained soil can be expected, even when placed to compaction specifications. As such, fill material should be installed as far in advance as possible before finishing the parking lot and access roadways for best grade integrity.

Where the subgrade material types differ below the underside of the pavement structure, the transition between the materials should be sloped as per frost heave taper OPSD 205.60.

6.9.4 Drainage

Control of surface water is a critical factor in achieving good pavement structure life. The pavement thickness designs are based on a drained pavement subgrade via sub-drains or ditches.

The silty clay till and shale bedrock have poor natural drainage and therefore it is recommended that continuous pavement subdrains are installed along both sides of the driveway and in lower areas beneath parking areas and be connected to the catch basins. Subdrains should comprise 150 mm diameter perforated pipe in filter sock, bedded in concrete sand. The upper limit of the concrete sand bedding should be at the lower limit of the subbase, with the subgrade below the subbase sloped towards the subdrain.

The surface of the roadways should be free of depressions and be sloped at a minimum grade of 1% in order to drain to appropriate drainage areas. Subgrade soil should slope a minimum of 3% toward stormwater collection points. Positive slopes are very important for the proper performance of the drainage system. The granular base and subbase materials should extend horizontally to any potential ditches or swales.

In addition, routine maintenance of the drainage systems will assist with the longevity of the pavement structure. Ditches, culverts, sewers and catch basins should be regularly cleared of debris and vegetation.

7.0 SITE SUPERVISION & QUALITY CONTROL

It is recommended that all geotechnical aspects of the project be reviewed and confirmed under the appropriate geotechnical supervision, to routinely check such items. This includes but is not limited to inspection and confirmation of the undisturbed natural subgrade material prior to subgrade preparation, pouring any foundations or footings, backfilling, or engineered fill installation to ensure that the actual conditions are not markedly different than what was observed at the borehole locations and geotechnical components are constructed as per Pinchin's recommendations. Compaction quality control of

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engineered fill material (full-time monitoring) is recommended as standard practice, as well as regular sampling and testing of aggregates and concrete, to ensure that physical characteristics of materials for compliance during installation and satisfies all specifications presented within this report.

8.0 TERMS AND LIMITATIONS

This Geotechnical Investigation was performed for the exclusive use of Cooper Construction Limited (Client) in order to evaluate the subsurface conditions at 1250 Appleby Line (4495 North Service Road), Burlington, Ontario. Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practises in the field of geotechnical engineering for the Site. Classification and identification of soil, and geologic units have been based upon commonly accepted methods employed in professional geotechnical practice. No warranty or other conditions, expressed or implied, should be understood. Conclusions derived are specific to the immediate area of study and cannot be extrapolated extensively away from sample locations.

Performance of this Geotechnical Investigation to the standards established by Pinchin is intended to reduce, but not eliminate, uncertainty regarding the subgrade soil at the Site, and recognizes reasonable limits on time and cost.

Regardless how exhaustive a Geotechnical Investigation is performed; the investigation cannot identify all the subsurface conditions. Therefore, no warranty is expressed or implied that the entire Site is representative of the subsurface information obtained at the specific locations of our investigation. If during construction, subsurface conditions differ from then what was encountered within our test location and the additional subsurface information provided to us, Pinchin should be contacted to review our recommendations. This report does not alleviate the contractor, owner, or any other parties of their respective responsibilities.

This report has been prepared for the exclusive use of the Client and their authorized agents. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of the third parties. If additional parties require reliance on this report, written authorization from Pinchin will be required. Pinchin disclaims responsibility of consequential financial effects on transactions or property values, or requirements for follow-up actions and costs. No other warranties are implied or expressed. Furthermore, this report should not be construed as legal advice.

The liability of Pinchin or our officers, directors, shareholders or staff will be limited to the lesser of the fees paid or actual damages incurred by the Client. Pinchin will not be responsible for any consequential or indirect damages. Pinchin will only be liable for damages resulting from the negligence of Pinchin. Pinchin will not be liable for any losses or damage if the Client has failed, within a period of two years following the date upon which the claim is discovered (Claim Period), to commence legal proceedings

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against Pinchin to recover such losses or damage unless the laws of the jurisdiction which governs the Claim Period which is applicable to such claim provides that the applicable Claim Period is greater than two years and cannot be abridged by the contract between the Client and Pinchin, in which case the Claim Period shall be deemed to be extended by the shortest additional period which results in this provision being legally enforceable.

Pinchin makes no other representations whatsoever, including those concerning the legal significance of its findings, or as to other legal matters touched on in this report, including, but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and these interpretations may change over time. Please refer to Appendix VI, Report Limitations and Guidelines for Use, which pertains to this report.

Specific limitations related to the legal and financial and limitations to the scope of the current work are outlined in our proposal, the attached Methodology and the Authorization to Proceed, Limitation of Liability and Terms of Engagement which accompanied the proposal.

Information provided by Pinchin is intended for Client use only. Pinchin will not provide results or information to any party unless disclosure by Pinchin is required by law. Any use by a third party of reports or documents authored by Pinchin or any reliance by a third party on or decisions made by a third party based on the findings described in said documents, is the sole responsibility of such third parties. Pinchin accepts no responsibility for damages suffered by any third party as a result of decisions made or actions conducted. No other warranties are implied or expressed.

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Template: Master Geotechnical Investigation Report – Ontario, GEO, September 2, 2021

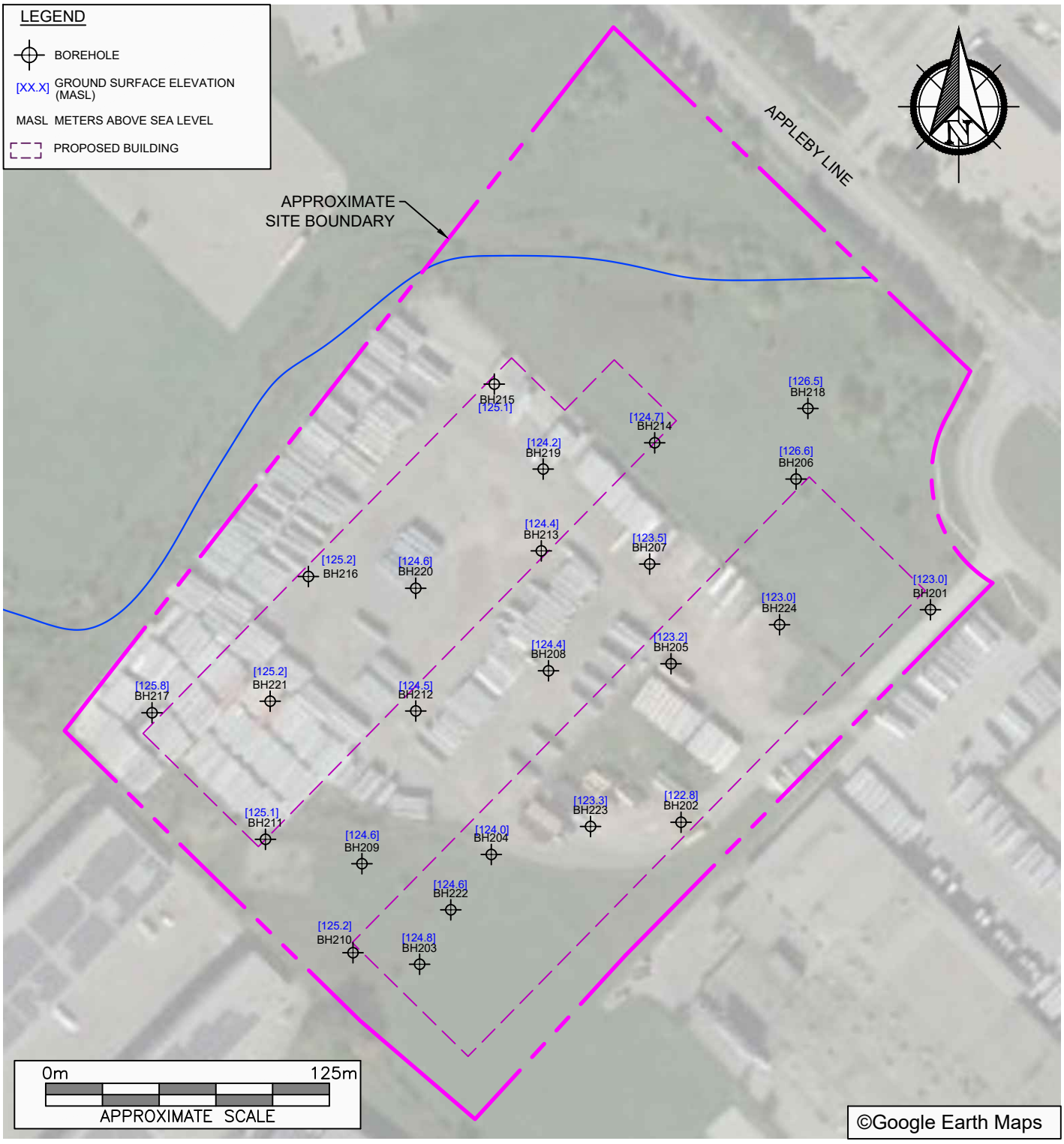
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FIGURES



PINCHIN

PROJECT NAME:	PROPOSED LAND DEVELOPMENT				
CLIENT NAME:	COOPER CONSTRUCTION LIMITED				
PROJECT LOCATION:	1250 APLEBY, BURLINGTON, ONTARIO				
FIGURE NAME:	KEY MAP				FIGURE NUMBER: 1
PROJECT NUMBER: 318728	SCALE: 1:15,000	DRAWN BY: SIN	REVIEWED BY: KT	DATE: JAN. 2023	



PINCHIN

PROJECT NAME: PROPOSED LAND DEVELOPMENT			
CLIENT NAME: COOPER CONSTRUCTION LIMITED			
PROJECT LOCATION: 1250 APPLEBY LINE, BURLINGTON, ONTARIO			
FIGURE NAME: BOREHOLE LOCATION PLAN			FIGURE NO.: 2
APPROXIMATE SCALE: AS SHOWN	PROJECT NO.: 318728	DATE: JAN. 2023	

APPENDIX I

Abbreviations, Terminology and Principle Symbols used in Report and Borehole Logs

ABBREVIATIONS, TERMINOLOGY & PRINCIPAL SYMBOLS USED

Sampling Method

AS	Auger Sample	**w**	Washed Sample
SS	Split Spoon Sample	**HQ**	Rock Core (63.5 mm diam.)
ST	Thin Walled Shelby Tube	**NQ**	Rock Core (47.5 mm diam.)
BS	Block Sample	**BQ**	Rock Core (36.5 mm diam.)

In-Situ Soil Testing

Standard Penetration Test (SPT), "N" value is the number of blows required to drive a 51 mm outside diameter spilt barrel sampler into the soil a distance of 300 mm with a 63.5 kg weight free falling a distance of 760 mm after an initial penetration of 150 mm has been achieved. The SPT, "N" value is a qualitative term used to interpret the compactness condition of cohesionless soils and is used only as a very approximation to estimate the consistency and undrained shear strength of cohesive soils.

Dynamic Cone Penetration Test (DCPT) is the number of blows required to drive a cone with a 60 degree apex attached to "A" size drill rods continuously into the soil for each 300 mm penetration with a 63.5 kg weight free falling a distance of 760 mm.

Cone Penetration Test (CPT) is an electronic cone point with a 10 cm2 base area with a 60 degree apex pushed through the soil at a penetration rate of 2 cm/s.

Field Vane Test (FVT) consists of a vane blade, a set of rods and torque measuring apparatus used to determine the undrained shear strength of cohesive soils.

Soil Descriptions

The soil descriptions and classifications are based on an expanded Unified Soil Classification System (USCS). The USCS classifies soils on the basis of engineering properties. The system divides soils into three major categories; coarse grained, fine grained and highly organic soils. The soil is then subdivided based on either gradation or plasticity characteristics. The classification excludes particles larger than 75 mm. To aid in quantifying material amounts by weight within the respective grain size fractions the following terms have been included to expand the USCS:

Soil Classification		Terminology	Proportion
Clay	< 0.002 mm		
Silt	0.002 to 0.06 mm	“trace”, trace sand, etc.	1 to 10%
Sand	0.075 to 4.75 mm	“some”, some sand, etc.	10 to 20%
Gravel	4.75 to 75 mm	Adjective, sandy, gravelly, etc.	20 to 35%
Cobbles	75 to 200 mm	And, and gravel, and silt, etc.	>35%
Boulders	>200 mm	Noun, Sand, Gravel, Silt, etc.	>35% and main fraction

Notes:

- Soil properties, such as strength, gradation, plasticity, structure, etcetera, dictate the soils engineering behaviour over grain size fractions; and
- With the exception of soil samples tested for grain size distribution or plasticity, all soil samples have been classified based on visual and tactile observations. The accuracy of visual and tactile observation is not sufficient to differentiate between changes in soil classification or precise grain size and is therefore an approximate description.

The following table outlines the qualitative terms used to describe the compactness condition of cohesionless soil:

Cohesionless Soil	
Compactness Condition	**SPT N-Index (blows per 300 mm)**
Very Loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	> 50

The following table outlines the qualitative terms used to describe the consistency of cohesive soils related to undrained shear strength and SPT, N-Index:

Cohesive Soil		
Consistency	**Undrained Shear Strength (kPa)**	**SPT N-Index (blows per 300 mm)**
Very Soft	<12	<2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	>200	>30

Note: Utilizing the SPT, N-Index value to correlate the consistency and undrained shear strength of cohesive soils is only very approximate and needs to be used with caution.

Soil & Rock Physical Properties

General

W Natural water content or moisture content within soil sample

γ Unit weight

γ' Effective unit weight

γ_d Dry unit weight

γ_{sat} Saturated unit weight

ρ Density

ρ_s Density of solid particles

ρ_w Density of Water

ρ_d Dry density

ρ_{sat} Saturated density e Void ratio

n Porosity

S_r Degree of saturation

E_{50} Strain at 50% maximum stress (cohesive soil)

Consistency

W_L	Liquid limit
W_P	Plastic Limit
I_P	Plasticity Index
W_S	Shrinkage Limit
I_L	Liquidity Index
I_C	Consistency Index
e_{max}	Void ratio in loosest state
e_{min}	Void ratio in densest state
I_D	Density Index (formerly relative density)

Shear Strength

C_u, S_u	Undrained shear strength parameter (total stress)
C'_d	Drained shear strength parameter (effective stress)
r	Remolded shear strength
τ_p	Peak residual shear strength
τ_r	Residual shear strength
ø’	Angle of interface friction, coefficient of friction = tan ø’

Consolidation (One Dimensional)

C_C	Compression index (normally consolidated range)
C_r	Recompression index (over consolidated range)
C_S	Swelling index
m_V	Coefficient of volume change
c_V	Coefficient of consolidation
T_V	Time factor (vertical direction)
U	Degree of consolidation
σ'_O	Overburden pressure
σ'_p	Preconsolidation pressure (most probable)
OCR	Overconsolidation ratio

Permeability

The following table outlines the terms used to describe the degree of permeability of soil and common soil types associated with the permeability rates**:**

Permeability (k cm/s)	Degree of Permeability	Common Associated Soil Type
$> 10^{-1}$	Very High	Clean gravel
10^{-1} to 10^{-3}	High	Clean sand, Clean sand and gravel
10^{-3} to 10^{-5}	Medium	Fine sand to silty sand
10^{-5} to 10^{-7}	Low	Silt and clayey silt (low plasticity)
$>10^{-7}$	Practically Impermeable	Silty clay (medium to high plasticity)

Rock Coring

Rock Quality Designation (RQD) is an indirect measure of the number of fractures within a rock mass, Deere et al. (1967). It is the sum of sound pieces of rock core equal to or greater than 100 mm recovered from the core run, divided by the total length of the core run, expressed as a percentage. If the core section is broken due to mechanical or handling, the pieces are fitted together and if 100 mm or greater included in the total sum**.**

RQD is calculated as follows:

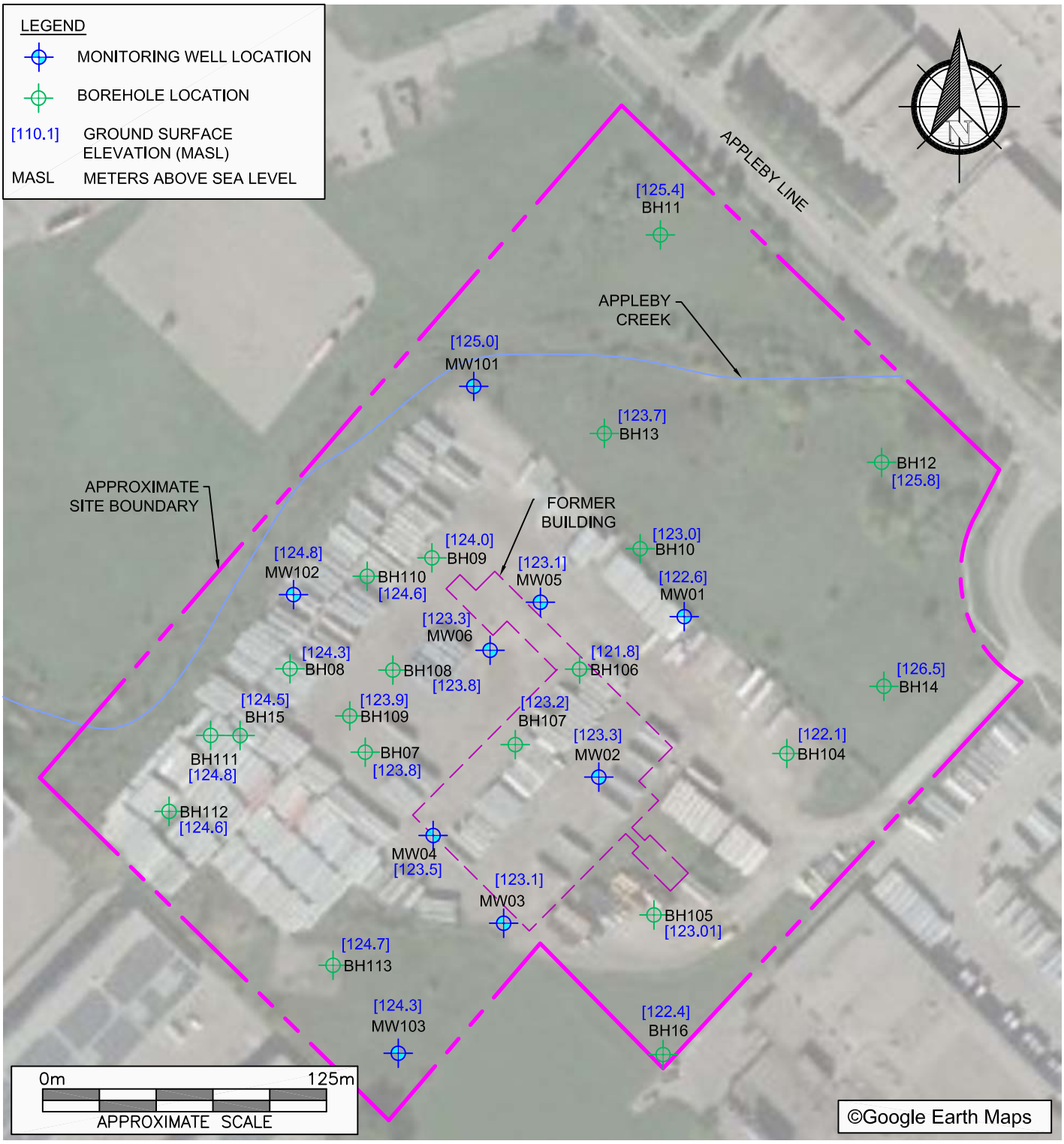
$$\text{RQD (\%)} = \frac{\Sigma \text{ Length of core pieces} > 100 \text{ mm} \times 100}{\text{Total length of core run}}$$

The following is the Classification of Rock with Respect to RQD Value:

RQD Classification	RQD Value (%)
Very poor quality	**<25**
Poor quality	25 to 50
Fair quality	50 to 75
Good quality	75 to 90
Excellent quality	90 to 100

APPENDIX II

Previous Investigations – Site Plan and Borehole Logs



PINCHIN

PROJECT NAME: GEOTECHNICAL INVESTIGATION		
CLIENT NAME: SIGMA ASSET MANAGEMENT LIMITED		
PROJECT LOCATION: 1250 APPLEBY LINE (4495 NORTH SERVICE ROAD), BURLINGTON, ONTARIO		
FIGURE NAME: BOREHOLE AND MONITORING WELL LOCATION PLAN		FIGURE NO.: 2
APPROXIMATE SCALE: AS SHOWN	PROJECT NO.: 229041.001	DATE: OCT. 2018

Log of Borehole: MW01

Project #: 229041 **Logged By:** MA/AH

Project: Geotechnical Investigation / Phase II ESA

Client: Sigma Asset Management Limited

Location: 1250 Appleby Line (4495 North Service Road), Burlington, ON

Drill Date: September 27, 2018 **Project Manager:** VM/CG

Depth (m)	Description	Elevation (m)
0	Ground Surface	122.60
	Fill Greyish brown sand and gravel, some pieces of slag, moist	121.84
1	***Silt Till*** Reddish brown clayey silt, hard, DTPL	121.38
	Weathered shale bedrock inclusions	120.69
2	***Shale Bedrock***	
3		
4		118.03
	End of Borehole	
5	Borehole terminated at approximately 4.6 mbgs. Sample refusal on probable bedrock at approximately 1.91 mbgs.	
6	*BH01-1 sampled for: Metals, pH, PAHs, EC and SAR. **BH01-2 sampled for: Metals, pH, PAHs, PHCs, VOCs, EC and SAR.	
7	DTPL: Drier than the plastic limit.	
8		
9		

Monitoring Well Details: Riser, Bentonite, Screen, Silica Sand

Water level = 1.12 mbgs, as measured on October 4, 2018.

Sample Type	Sampler #	Recovery (%)	SPT N-Value	Standard Penetration N-Value (20, 40, 60)	Shear Strength kPa (100, 200)	Water Content (%)	Sample ID	Soil Vapour Concentration (ppm)	Laboratory Analysis
SS	1	50	28				1	<5/<1	*
SS	2	100	66				2	<5/<1	**
SS	3	50	>50				3	<5/<1	

Contractor: Aardvark Drilling Inc.

Grade Elevation: 122.60 masl

Drilling Method: Hollow Stem Auger / Split Spoon

Top of Casing Elevation: 122.46 masl

Well Casing Size: 5.08 cm

Sheet: 1 of 1

Log of Borehole: MW02

Project #: 229041 **Logged By:** JL

Project: Geotechnical Investigation / Phase II ESA

Client: Sigma Asset Management Limited

Location: 1250 Appleby Line (4495 North Service Road), Burlington, ON

Drill Date: September 28, 2018 **Project Manager:** VM/CG

SUBSURFACE PROFILE | **SAMPLE**

Depth (m)	Symbol	Description	Elevation (m)	Monitoring Well Details	Sample Type	Sampler #	Recovery (%)	SPT N-Value	Standard Penetration N-Value (20, 40, 60)	Shear Strength kPa (100, 200)	Water Content (%)	Sample ID	Soil Vapour Concentration (ppm)	Laboratory Analysis
0		Ground Surface	123.25											
0		***Fill*** Greyish brown sand and gravel, damp			SS	1	70	36				1	10/<1	*
1			121.95		SS	2	70	24				2	<5/<1	
1		***Silt Till*** Reddish brown clayey silt, some sand and gravel, very stiff, DTPL	121.73		SS	3	80	17				3	<5/<1	
2		Trace sand and gravel			SS	4	60	>50				4	<5/<1	**
3			120.05			5		>50						
3		***Shale Bedrock***												
4			118.68											
4		End of Borehole												
5		Borehole terminated at approximately 4.6 mbgs. Sample refusal on probable bedrock at approximately 3.2 mbgs.												
6		* BH02-1 sampled for: Metals, pH, PAHs, EC and SAR. ** BH02-4 sampled for: Metals, PHCs and VOCs.												
7		DTPL: Drier than the plastic limit.												
8														
9														

Monitoring Well Details: Riser, Bentonite, Screen, Silica Sand

Water level = 1.72 mbgs, as measured on October 4, 2018.

Contractor: Aardvark Drilling Inc.

Grade Elevation: 123.25 masl

Drilling Method: Hollow Stem Auger / Split Spoon

Top of Casing Elevation: 123.15 masl

Well Casing Size: 5.08 cm

Sheet: 1 of 1

Log of Borehole: MW03

Project #: 229041 **Logged By:** JL

Project: Geotechnical Investigation / Phase II ESA

Client: Sigma Asset Management Limited

Location: 1250 Appleby Line (4495 North Service Road), Burlington, ON

Drill Date: October 1, 2018 **Project Manager:** VM/CG

Depth (m)	Symbol	Description	Elevation (m)	Monitoring Well Details	Sample Type	Sampler #	Recovery (%)	SPT N-Value	Standard Penetration N-Value (□ 20 40 60 □)	Shear Strength (△ kPa △ 100 200)	Water Content (%)	Sample ID	Soil Vapour Concentration (ppm)	Laboratory Analysis
		Ground Surface	123.12											
0		***Fill*** Greyish brown sand and gravel, damp	122.36	Riser, Bentonite	SS	1	90	26				1	<5/<1	
1		***Silt Till*** Reddish brown clayey silt, trace sand and gravel, very stiff, DTPL	121.60		SS	2	60	22				2	<5/<1	*
2		***Shale Bedrock***												
3				Screen, Silica Sand										
4			118.55											
		End of Borehole		Water level = 1.57 mbgs, as measured on October 4, 2018.										
5		Borehole terminated at approximately 4.6 mbgs. Sample refusal on probable bedrock at approximately 1.5 mbgs.												
6		* BH03-2 sampled for: Metals, PHCs and VOCs.												
7		DTPL: Drier than the plastic limit.												
8														
9														

Contractor: Aardvark Drilling Inc. **Grade Elevation:** 123.12 masl

Drilling Method: Hollow Stem Auger / Split Spoon **Top of Casing Elevation:** 123.06

Well Casing Size: 5.08 cm **Sheet:** 1 of 1

Log of Borehole: MW04

Project #: 229041 **Logged By:** JL

Project: Geotechnical Investigation / Phase II ESA

Client: Sigma Asset Management Limited

Location: 1250 Appleby Line (4495 North Service Road), Burlington, ON

Drill Date: October 1, 2018 **Project Manager:** VM/CG

Depth (m)	Symbol	Description	Elevation (m)	Monitoring Well Details	Sample Type	Sampler #	Recovery (%)	SPT N-Value	Standard Penetration N-Value (20, 40, 60)	Shear Strength kPa (100, 200)	Water Content (%)	Sample ID	Soil Vapour Concentration (ppm)	Laboratory Analysis
0		Ground Surface	123.54											
		Fill Greyish brown sand and gravel, damp	122.78	Riser, Bentonite	SS	1	80	38				1	<5/<1	
1		***Silt Till*** Reddish brown clayey silt, trace sand and gravel, very stiff, DTPL			SS	2	90	17				2	<5/<1	
2					SS	3	30	>50				3	<5/<1	*
3			120.11	Screen, Silica Sand		4		>50						
4		***Shale Bedrock***	118.97											
		End of Borehole												
5		Borehole terminated at approximately 4.6 mbgs. Sample refusal on probable bedrock at approximately 3.4 mbgs. At drilling completion, the borehole was open to approximately 4.6 mbgs and water was measured at approximately 4.0 mbgs.		Water level = 1.94 mbgs, as measured on October 4, 2018.										
6		* BH04-3 sampled for: Metals, PHCs, VOCs and PAHs.												
7		DTPL: Drier than the plastic limit.												
8														
9														

Contractor: Aardvark Drilling Inc.

Grade Elevation: 123.54 masl

Drilling Method: Hollow Stem Auger / Split Spoon

Top of Casing Elevation: 123.47 masl

Well Casing Size: 5.08 cm

Sheet: 1 of 1

Log of Borehole: MW05

Project #: 229041 **Logged By:** JL

Project: Geotechnical Investigation / Phase II ESA

Client: Sigma Asset Management Limited

Location: 1250 Appleby Line (4495 North Service Road), Burlington, ON

Drill Date: September 28, 2018 **Project Manager:** VM/CG

Depth (m)	Symbol	Description	Elevation (m)	Monitoring Well Details	Sample Type	Sampler #	Recovery (%)	SPT N-Value	Standard Penetration N-Value (20 40 60)	Shear Strength kPa (100 200)	Water Content (%)	Sample ID	Soil Vapour Concentration (ppm)	Laboratory Analysis
0		Ground Surface	123.05											
		Fill Greyish brown sand and gravel, damp		Riser	SS	1	30	30				1	<5/<1	*
1		***Silt Till*** Reddish brown clayey silt, trace sand and gravel, very stiff, DTPL		Bentonite	SS	2	40	>50				2	<5/<1	
2					SS	3	40	>50				3	<5/<1	**
3			120.00	Screen / Silica Sand										
		Shale Bedrock												
4			118.48											
		End of Borehole		Water level = 1.47 mbgs, as measured on October 4, 2018.										
5		Borehole terminated at approximately 4.6 mbgs. Sample refusal on probable bedrock at approximately 3.0 mbgs. At drilling completion, the borehole was open to approximately 4.6 mbgs and water was measured at approximately 4.0 mbgs.												
6		* BH05-1 sampled for: Metals, pH, PAHs, EC and SAR.												
7		** BH05-3 sampled for: Metals, PAHs, PHCs and VOCs.												
8		DTPL: Drier than the plastic limit.												
9														

Contractor: Aardvark Drilling Inc. **Grade Elevation:** 123.05 masl

Drilling Method: Hollow Stem Auger / Split Spoon **Top of Casing Elevation:** 122.91 masl

Well Casing Size: 5.08 cm **Sheet:** 1 of 1

Log of Borehole: MW06

Project #: 229041 **Logged By:** JL

Project: Geotechnical Investigation / Phase II ESA

Client: Sigma Asset Management Limited

Location: 1250 Appleby Line (4495 North Service Road), Burlington, ON

Drill Date: October 2, 2018 **Project Manager:** VM/CG

Depth (m)	Description	Elevation (m)	Monitoring Well Details	Sample Type	Sampler #	Recovery (%)	SPT N-Value	Standard Penetration N-Value (20 / 40 / 60)	Shear Strength kPa (100 / 200)	Water Content (%)	Sample ID	Soil Vapour Concentration (ppm)	Laboratory Analysis
0	Ground Surface	123.34											
	Fill Dark brown sand and gravel, damp	122.88	Riser, Bentonite	SS	1	60	26				1	<5/3	Metals, pH
1	**Silt Till** Reddish brown clayey silt, trace sand and gravel, stiff, DTPL			SS	2	70	21				2	<5/<1	
		121.59		SS	3	20	>50				3	<5/11	*
2	**Shale Bedrock**												
3			Screen, Silica Sand										
4		118.77											
	End of Borehole		Water level = 1.79 mbgs, as measured on October 4, 2018.										
5	Borehole terminated at approximately 4.6 mbgs. Sample refusal on probable bedrock at approximately 1.8 mbgs.												
6	* BH03-3 sampled for: Metals, VOCs and PHCs.												
7	DTPL: Drier than the plastic limit.												
8													
9													

Contractor: Aardvark Drilling Inc. **Grade Elevation:** 123.34 masl

Drilling Method: Hollow Stem Auger / Split Spoon **Top of Casing Elevation:** 123.25 masl

Well Casing Size: 5.08 cm **Sheet:** 1 of 1

Log of Borehole: BH07

Project #: 229041 **Logged By:** JL

Project: Geotechnical Investigation / Phase II ESA

Client: Sigma Asset Management Limited

Location: 1250 Appleby Line (4495 North Service Road), Burlington, ON

Drill Date: September 28, 2018 **Project Manager:** VM/CG

Depth (m)	Symbol	Description	Elevation (m)	Monitoring Well Details	Sample Type	Sampler #	Recovery (%)	SPT N-Value	Standard Penetration N-Value (20, 40, 60)	Shear Strength kPa (100, 200)	Water Content (%)	Sample ID	Soil Vapour Concentration (ppm)	Laboratory Analysis
0		Ground Surface	123.84	No Monitoring Well Installed										
		Fill Dark grey/brown sand and gravel, damp	123.08		SS	1	90	32				1	<5/2	PHCs, BTEX, PAHs
1		***Silt Till*** Reddish brown clayey silt, trace sand and gravel, hard, DTPL	122.01		SS	2	90	34				2	<5/<1	
					SS	3	50	>50				3	25/<1	
2		End of Borehole												
		Borehole terminated at approximately 1.8 mbgs due to sample refusal on probable bedrock.												
3		DTPL: Drier than the plastic limit.												
4														
5														
6														
7														
8														
9														

Contractor: Aardvark Drilling Inc. **Grade Elevation:** 123.84 masl

Drilling Method: Hollow Stem Auger / Split Spoon **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH08

Project #: 229041 **Logged By:** JL

Project: Geotechnical Investigation / Phase II ESA

Client: Sigma Asset Management Limited

Location: 1250 Appleby Line (4495 North Service Road), Burlington, ON

Drill Date: September 28, 2018 **Project Manager:** VM/CG

Depth (m)	Symbol	Description	Elevation (m)	Monitoring Well Details	Sample Type	Sampler #	Recovery (%)	SPT N-Value	Standard Penetration N-Value (20 40 60)	Shear Strength kPa (100 200)	Water Content (%)	Sample ID	Soil Vapour Concentration (ppm)	Laboratory Analysis
0		Ground Surface	124.33	No Monitoring Well Installed										
		Fill Dark grey/brown sand and gravel, damp	123.57		SS	1	90	53				1	<5/<1	PHCs, BTEX, PAHs
1		***Silt Till*** Reddish brown clayey silt, trace sand and gravel, hard, DTPL	123.19		SS	2	80	>50				2	<5/<1	
		End of Borehole												
2		Borehole terminated at approximately 1.1 mbgs due to sample refusal on probable bedrock.												
3		DTPL: Drier than the plastic limit.												
4														
5														
6														
7														
8														
9														

Contractor: Aardvark Drilling Inc. **Grade Elevation:** 124.33 masl

Drilling Method: Hollow Stem Auger / Split Spoon **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH09

Project #: 229041 **Logged By:** JL

Project: Geotechnical Investigation / Phase II ESA

Client: Sigma Asset Management Limited

Location: 1250 Appleby Line (4495 North Service Road), Burlington, ON

Drill Date: September 28, 2018 **Project Manager:** VM/CG

Depth (m)	Description	Elevation (m)	Monitoring Well Details	Sample Type	Sampler #	Recovery (%)	SPT N-Value	Standard Penetration N-Value (20, 40, 60)	Shear Strength kPa (100, 200)	Water Content (%)	Sample ID	Soil Vapour Concentration (ppm)	Laboratory Analysis
	SUBSURFACE PROFILE			**SAMPLE**									
0	Ground Surface	124.00	No Monitoring Well Installed										
0	***Fill*** Dark grey/brown sand and gravel, damp			SS	1	80	20				1	<5/<1	PHCs, BTEX, PAHs
1	***Silt Till*** Reddish brown clayey silt, trace sand and gravel, very stiff to hard, DTPL			SS	2	90	50				2	<5/<1	
2		121.56											
3	End of Borehole Borehole terminated at approximately 2.4 mbgs due to sample refusal on probable bedrock.												
4	DTPL: Drier than the plastic limit.												
5													
6													
7													
8													
9													

Contractor: Aardvark Drilling Inc. **Grade Elevation:** 124.00 masl

Drilling Method: Hollow Stem Auger / Split Spoon **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH10

Project #: 229041 **Logged By:** JL

Project: Geotechnical Investigation / Phase II ESA

Client: Sigma Asset Management Limited

Location: 1250 Appleby Line (4495 North Service Road), Burlington, ON

Drill Date: October 2, 2018 **Project Manager:** VM/CG

Depth (m)	Symbol	Description	Elevation (m)	Monitoring Well Details	Sample Type	Sampler #	Recovery (%)	SPT N-Value	Standard Penetration N-Value (20 40 60)	Shear Strength kPa (100 200)	Water Content (%)	Sample ID	Soil Vapour Concentration (ppm)	Laboratory Analysis
		Ground Surface	122.95	No Monitoring Well Installed										
0		**Fill** Dark grey/brown sand and gravel, damp	122.19		SS	1	60	21				1	<5/<1	Metals, PHCs, VOCs
1		**Silt Till** Reddish brown clayey silt, trace sand and gravel, very stiff to hard, DTPL				2		>50				2	<5/<1	
		End of Borehole												
2		Borehole terminated at approximately 0.9 mbgs due to sample refusal on probable bedrock.												
3		DTPL: Drier than the plastic limit.												
4														
5														
6														
7														
8														
9														

Contractor: Aardvark Drilling Inc.

Grade Elevation: 122.95 masl

Drilling Method: Hollow Stem Auger / Split Spoon

Top of Casing Elevation: NA

Well Casing Size: NA

Sheet: 1 of 1

Log of Borehole: BH11

Project #: 229041 **Logged By:** MA

Project: Geotechnical Investigation / Phase II ESA

Client: Sigma Asset Management Limited

Location: 1250 Appleby Line (4495 North Service Road), Burlington, ON

Drill Date: September 27, 2018 **Project Manager:** VM/CG

Depth (m)	Description	Elevation (m)	Monitoring Well Details	Sample Type	Sampler #	Recovery (%)	SPT N-Value	Standard Penetration N-Value (20, 40, 60)	Shear Strength kPa (100, 200)	Water Content (%)	Sample ID	Soil Vapour Concentration (ppm)	Laboratory Analysis
	Ground Surface	125.37											
0	**Topsoil** Brown sandy silt, damp		No Monitoring Well Installed	AS	1	100					1		pH
				AS	2	100							
				AS	3	100							
1		124.30		AS	4	100							
	Silt Till Reddish brown clayey silt with grey mottling, trace organics, stiff , APL to DTPL	123.85		AS	5	100							
2	End of Borehole												
	Borehole terminated at approximately 1.5 mbgs. Sample refusal on stiff silt at approximately 1.5 mbgs.												
3	DTPL: Drier than the plastic limit.												
	APL: About the the plastic limit.												
4													
5													
6													
7													
8													
9													

Contractor: NA **Grade Elevation:** 125.37 masl

Drilling Method: Hand Auger **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH12

Project #: 229041 **Logged By:** MA

Project: Geotechnical Investigation / Phase II ESA

Client: Sigma Asset Management Limited

Location: 1250 Appleby Line (4495 North Service Road), Burlington, ON

Drill Date: September 27, 2018 **Project Manager:** VM/CG

Depth (m)	Description	Elevation (m)	Sample Type	Sampler #	Recovery (%)	SPT N-Value	Water Content (%)	Sample ID	Laboratory Analysis
0	Ground Surface	125.85							
	Topsoil Brown silt, some sand, moist (130 mm)	125.09	S	1	75	8			
1	**Fill** Reddish brown clayey silt, DTPL	124.33	S	2	50	10			
	Trace organics Trace sand, APL		S	3	75	6	17.6	SS3	Hyd
2		123.26	S	4	33	4			
	Organic seam, moist	122.80							
3	**Silt Till** Reddish brown clayey silt, trace to some gravel, hard, DTPL	122.19	S	5	100	19			
4	Some weathered shale bedrock inclusions	121.28		6		>50			
	Shale Bedrock								
5	End of Borehole								
6	Borehole terminated at approximately 4.7 mbgs due to sample refusal on weathered shale bedrock. At drilling completion, a dry cave was measured at approximately 4.0 mbgs.								
7	DTPL: Drier than the plastic limit.								
8									
9									

Monitoring Well Details: No Monitoring Well Installed

Standard Penetration N-Value: 20, 40, 60

Shear Strength: kPa 100, 200

Soil Vapour Concentration (ppm)

Contractor: Aardvark Drilling Inc.

Grade Elevation: 125.85 masl

Drilling Method: Hollow Stem Auger / Split Spoon

Top of Casing Elevation: NA

Well Casing Size: NA

Sheet: 1 of 1

Log of Borehole: BH13

Project #: 229041 **Logged By:** MA

Project: Geotechnical Investigation / Phase II ESA

Client: Sigma Asset Management Limited

Location: 1250 Appleby Line (4495 North Service Road), Burlington, ON

Drill Date: September 27, 2018 **Project Manager:** VM/CG

Depth (m)	Description	Elevation (m)
0	Ground Surface	123.71
	Topsoil Brown sandy silt, moist (150 mm)	
1	**Fill** Reddish brown clayey silt with grey mottling, trace organics, hard, DTPL	122.64
2	**Silt Till** Reddish brown clayey silt, some shale bedrock inclusions, hard, DTPL	
3		120.51
	Shale Bedrock Wet	
4	End of Borehole	
	Borehole terminated at approximately 3.3 mbgs due to sample refusal on weathered shale bedrock. At drilling completion, a dry cave was measured at approximately 2.9 mbgs.	
5	DTPL: Drier than the plastic limit.	
6		
7		
8		
9		

Monitoring Well Details: No Monitoring Well Installed

Sample Type	Sampler #	Recovery (%)	SPT N-Value
S	1	100	11
S	2	83	21
S	3	100	33
	4		>50
S	5	33	>50

Standard Penetration N-Value: 20, 40, 60

Shear Strength kPa: 100, 200

Water Content (%)

Sample ID

Soil Vapour Concentration (ppm)

Laboratory Analysis

Contractor: Aardvark Drilling Inc. **Grade Elevation:** 123.71 masl

Drilling Method: Hollow Stem Auger / Split Spoon **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH14

Project #: 229041 **Logged By:** MA

Project: Geotechnical Investigation / Phase II ESA

Client: Sigma Asset Management Limited

Location: 1250 Appleby Line (4495 North Service Road), Burlington, ON

Drill Date: September 27, 2018 **Project Manager:** VM/CG

SUBSURFACE PROFILE

Depth (m)	Description	Elevation (m)
0	Ground Surface	126.52
	Topsoil Brown silt, some sand, moist (130 mm)	
1	**Fill** Reddish brown clayey silt, trace sand, gravel and organics, stiff, DTPL	125.45
	Brown silt with red mottling, trace clay, compact, moist	125.00
2	Reddish brown silt, some clay, loose, moist	123.93
	Piece of slag	
3		
4		121.95
	Brown clayey silt, firm, APL	
5		
6		120.42
	Silt Till Reddish brown clayey silt, some shale bedrock inclusions, hard, DTPL	120.04
7	End of Borehole	
	Borehole terminated at approximately 6.5 mbgs due to sample refusal on weathered shale bedrock. At drilling completion, a dry cave was measured at approximately 5.8 mbgs.	
	DTPL: Drier than the plastic limit.	
8		
9		

Monitoring Well Details: No Monitoring Well Installed

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-Value	Sample ID	Laboratory Analysis
S	1	75	7		
S	2	100	11		
S	3	100	6		
S	4	75	23		
S	5	67	36		
S	6	100	8	SS6	pH
S	7	75	>50		

Standard Penetration N-Value: 20, 40, 60

Shear Strength: kPa 100, 200

Water Content (%)

Soil Vapour Concentration (ppm)

Contractor: Aardvark Drilling Inc.

Grade Elevation: 126.52 masl

Drilling Method: Hollow Stem Auger / Split Spoon

Top of Casing Elevation: NA

Well Casing Size: NA

Sheet: 1 of 1

Log of Borehole: BH15

Project #: 229041 **Logged By:** JL

Project: Geotechnical Investigation / Phase II ESA

Client: Sigma Asset Management Limited

Location: 1250 Appleby Line (4495 North Service Road), Burlington, ON

Drill Date: October 1, 2018 **Project Manager:** VM/CG

Depth (m)	Symbol	Description	Elevation (m)	Monitoring Well Details	Sample Type	Sampler #	Recovery (%)	SPT N-Value	Standard Penetration N-Value (20 40 60)	Shear Strength kPa (100 200)	Water Content (%)	Sample ID	Soil Vapour Concentration (ppm)	Laboratory Analysis
0		Ground Surface	124.53	No Monitoring Well Installed										
		Fill Dark grey/brown sand and gravel, damp	123.77		SS	1	90	55				1	<5/2	
1		***Silt Till*** Reddish brown clayey silt, trace sand and gravel, very stiff to hard, DTPL	122.70		SS	2	90	34			10.3	2	<5/<1	Hyd
					SS	3	60	>50				3	<5/<1	
2		End of Borehole												
		Borehole terminated at approximately 1.8 mbgs due to sample refusal on probable bedrock.												
		DTPL: Drier than the plastic limit.												
3														
4														
5														
6														
7														
8														
9														

Contractor: Aardvark Drilling Inc.

Grade Elevation: 124.53 masl

Drilling Method: Hollow Stem Auger / Split Spoon

Top of Casing Elevation: NA

Well Casing Size: NA

Sheet: 1 of 1

Log of Borehole: BH16

Project #: 229041 **Logged By:** MA

Project: Geotechnical Investigation / Phase II ESA

Client: Sigma Asset Management Limited

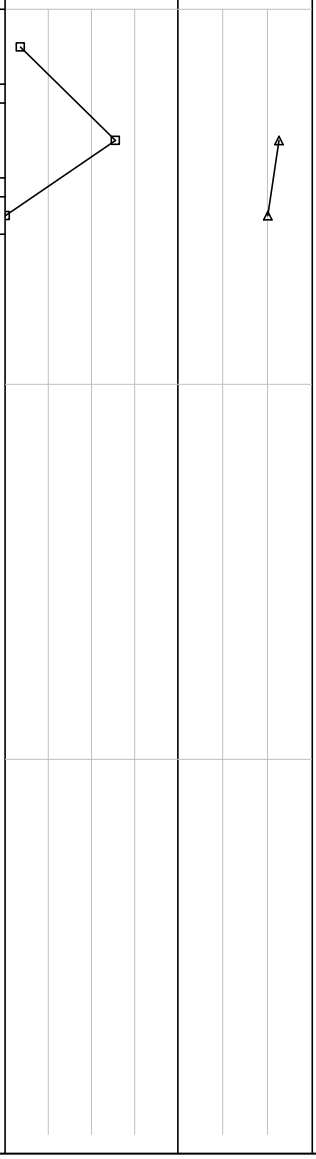
Location: 1250 Appleby Line (4495 North Service Road), Burlington, ON

Drill Date: September 27, 2018 **Project Manager:** VM/CG

Depth (m)	Description	Elevation (m)	Monitoring Well Details	Sample Type	Sampler #	Recovery (%)	SPT N-Value
0	Ground Surface	122.43	No Monitoring Well Installed				
0	**Topsoil** Brown silt, some sand, moist (150 mm)			S	1	75	7
1	**Fill** Brown clayey silt, trace sand and organics	121.36		S	2	100	51
1	**Silt Till** Reddish brown clayey silt, trace shale bedrock, DTPL	120.75		S	3	50	>50
2	**Shale Bedrock** Red, highly weathered						
3	End of Borehole						

Borehole terminated at approximately 1.8 mbgs due to sample refusal on weathered shale bedrock. At drilling completion, a dry cave was measured at approximately 1.8 mbgs.

DTPL: Drier than the plastic limit.



Water Content (%) | Sample ID | Soil Vapour Concentration (ppm) | Laboratory Analysis

Contractor: Aardvark Drilling Inc.

Grade Elevation: 122.43 masl

Drilling Method: Hollow Stem Auger / Split Spoon

Top of Casing Elevation: NA

Well Casing Size: NA

Sheet: 1 of 1

Log of Borehole: MW101

Project #: 229041 **Logged By:** JL

Project: Geotechnical Investigation / Phase II ESA

Client: Sigma Asset Management Limited

Location: 1250 Appleby Line (4495 North Service Road), Burlington, ON

Drill Date: October 2, 2018 **Project Manager:** VM/CG

Depth (m)	Description	Elevation (m)	Sample Type	Sampler #	Recovery (%)	SPT N-Value	Standard Penetration N-Value (20 40 60)	Shear Strength kPa (100 200)	Water Content (%)	Sample ID	Soil Vapour Concentration (ppm)	Laboratory Analysis
0	Ground Surface	125.01										
	Fill Greyish brown sand and gravel, damp	124.48	SS	1	70	20				1	<5/<1	
	Reddish brown clayey silt, some sand and gravel	124.25										
1	Dark brown silt, some clay, trace sand, moist		SS	2	90	10				2	<5/<1	
2		122.95	SS	3	80	21				3	<5/<1	
	Silt Till Reddish brown clayey silt with grey mottling, very stiff, DTPL	122.50	SS	4	20	>50				4	<5/<1	*
3	***Shale Bedrock***											
4		120.44										
	End of Borehole											
5	Borehole terminated at approximately 4.6 mbgs. Sample refusal on probable bedrock at approximately 2.5 mbgs.											
6	* BH101-4 sampled for: Metals, PHCs and VOCs.											
7	DTPL: Drier than the plastic limit.											
8												
9												

Monitoring Well Details: Riser, Bentonite, Screen, Silica Sand

Water level = 3.07 mbgs, as measured on October 4, 2018.

Contractor: Aardvark Drilling Inc.

Grade Elevation: 125.01 masl

Drilling Method: Hollow Stem Auger / Split Spoon

Top of Casing Elevation: 125.88 masl

Well Casing Size: 5.08 cm

Sheet: 1 of 1

Log of Borehole: MW102

Project #: 229041 **Logged By:** JL

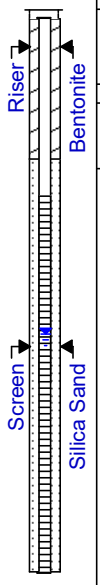
Project: Geotechnical Investigation / Phase II ESA

Client: Sigma Asset Management Limited

Location: 1250 Appleby Line (4495 North Service Road), Burlington, ON

Drill Date: October 2, 2018 **Project Manager:** VM/CG

Depth (m)	Description	Elevation (m)	Sample Type	Sampler #	Recovery (%)	SPT N-Value	Standard Penetration N-Value (20, 40, 60)	Shear Strength kPa (100, 200)	Water Content (%)	Sample ID	Soil Vapour Concentration (ppm)	Laboratory Analysis
0	Ground Surface	124.75										
0	**Fill** Dark grey sand and gravel, damp	124.22	SS	1	60	61				1	<5/<1	
1	**Silt Till** Reddish brown clayey silt, trace sand and gravel, very stiff to hard, DTPL	123.45	SS	2	50	71				2	<5/<1	*
2	**Shale Bedrock**											
4		120.18										
5	End of Borehole Borehole terminated at approximately 4.6 mbgs. Sample refusal on probable bedrock at approximately 1.4 mbgs. * BH102-2 sampled for: Metals, PHCs and VOCs. DTPL: Drier than the plastic limit.											



Water level = 2.64 mbgs, as measured on October 4, 2018.

Contractor: Aardvark Drilling Inc.

Grade Elevation: 124.75 masl

Drilling Method: Hollow Stem Auger / Split Spoon

Top of Casing Elevation: 125.61 masl

Well Casing Size: 5.08 cm

Sheet: 1 of 1

Log of Borehole: MW103

Project #: 229041 **Logged By:** JL

Project: Geotechnical Investigation / Phase II ESA

Client: Sigma Asset Management Limited

Location: 1250 Appleby Line (4495 North Service Road), Burlington, ON

Drill Date: October 3, 2018 **Project Manager:** VM/CG

SUBSURFACE PROFILE | **SAMPLE**

Depth (m)	Symbol	Description	Elevation (m)	Monitoring Well Details	Sample Type	Sampler #	Recovery (%)	SPT N-Value	Standard Penetration N-Value (□ 20 40 60 □)	Shear Strength (△ kPa △ 100 200)	Water Content (%)	Sample ID	Soil Vapour Concentration (ppm)	Laboratory Analysis
0		Ground Surface	124.30											
		Topsoil Brown, moist			SS	1	60	7				1	<5/<1	pH
1		**Silt Till** Reddish brown clayey silt, trace sand and gravel, stiff to very stiff, DTPL			SS	2	80	13				2	<5/<1	
2					SS	3	90	25				3	<5/<1	
					SS	4	90	35				4	<5/<1	PHCs, VOCs
3		**Shale Bedrock**	121.48											
4			119.73											
		End of Borehole												
5		Borehole terminated at approximately 4.6 mbgs. Sample refusal on probable bedrock at approximately 2.8 mbgs. DTPL: Drier than the plastic limit.												
6														
7														
8														
9														

Monitoring Well Details: Riser, Bentonite, Screen, Silica Sand

Water level = 3.06 mbgs, as measured on October 4, 2018.

Contractor: Aardvark Drilling Inc.

Grade Elevation: 124.30 masl

Drilling Method: Hollow Stem Auger / Split Spoon

Top of Casing Elevation: 125.11 masl

Well Casing Size: 5.08 cm

Sheet: 1 of 1

Log of Borehole: BH104

Project #: 229041 **Logged By:** JL

Project: Geotechnical Investigation / Phase II ESA

Client: Sigma Asset Management Limited

Location: 1250 Appleby Line (4495 North Service Road), Burlington, ON

Drill Date: October 2, 2018 **Project Manager:** VM

Depth (m)	Symbol	Description	Elevation (m)	Monitoring Well Details	Sample Type	Sampler #	Recovery (%)	SPT N-Value	Standard Penetration N-Value (20 / 40 / 60)	Shear Strength kPa (100 / 200)	Water Content (%)	Sample ID	Soil Vapour Concentration (ppm)	Laboratory Analysis
		Ground Surface	122.08											
0		***Fill*** Dark grey sand and gravel, moist		No Monitoring Well Installed	SS	1	80	70				1	<5/<1	*
1					SS	2	90	21				2	<5/<1	
			120.25		SS	3	10	>50				3	<5/<1	
2		End of Borehole												
		Borehole terminated at approximately 1.8 mbgs due to sample refusal on probable bedrock.												
		* BH104-1 sampled for: Metals, PAHs, EC, SAR and pH.												
		DTPL: Drier than the plastic limit.												
3														
4														
5														
6														
7														
8														
9														

Contractor: Aardvark Drilling Inc.

Grade Elevation: 122.08 masl

Drilling Method: Hollow Stem Auger / Split Spoon

Top of Casing Elevation: NA

Well Casing Size: NA

Sheet: 1 of 1

Log of Borehole: BH105

Project #: 229041 **Logged By:** JL

Project: Geotechnical Investigation / Phase II ESA

Client: Sigma Asset Management Limited

Location: 1250 Appleby Line (4495 North Service Road), Burlington, ON

Drill Date: October 2, 2018 **Project Manager:** VM/CG

Depth (m)	Symbol	Description	Elevation (m)	Monitoring Well Details	Sample Type	Sampler #	Recovery (%)	SPT N-Value	Standard Penetration N-Value (20 40 60)	Shear Strength kPa (100 200)	Water Content (%)	Sample ID	Soil Vapour Concentration (ppm)	Laboratory Analysis
		Ground Surface	123.01											
0		***Fill*** Dark grey sand and gravel, moist		No Monitoring Well Installed	SS	1	90	54				1	<5/<1	*
1					SS	2	90	19				2	<5/<1	
2			120.88		SS	3	10	82				3	<5/<1	
		End of Borehole												
3		Borehole terminated at approximately 2.1 mbgs due to sample refusal on probable bedrock.												
4		BH105-1 sampled for: Metals, PAHs, pH, EC and SAR.												
5		DTPL: Drier than the plastic limit.												
6														
7														
8														
9														

Contractor: Aardvark Drilling Inc.

Grade Elevation: 123.01 masl

Drilling Method: Hollow Stem Auger / Split Spoon

Top of Casing Elevation: NA

Well Casing Size: NA

Sheet: 1 of 1

Log of Borehole: BH106

Project #: 229041 **Logged By:** JL

Project: Geotechnical Investigation / Phase II ESA

Client: Sigma Asset Management Limited

Location: 1250 Appleby Line (4495 North Service Road), Burlington, ON

Drill Date: October 2, 2018 **Project Manager:** VM/CG

Depth (m)	Symbol	Description	Elevation (m)	Monitoring Well Details	Sample Type	Sampler #	Recovery (%)	SPT N-Value	Standard Penetration N-Value (20 40 60)	Shear Strength kPa (100 200)	Water Content (%)	Sample ID	Soil Vapour Concentration (ppm)	Laboratory Analysis
0		Ground Surface	121.78	No Monitoring Well Installed										
0		***Fill*** Dark brown sand and gravel, pieces of slag, plastic and metal, damp			SS	1	70	32				1	<5/<1	*
1					SS	2	90	9				2	<5/<1	
			120.26											
2		***Silt*** Reddish brown clayey silt, trace sand and gravel, hard, DTPL	119.72		SS	3	70	67				3	<5/<1	
		End of Borehole												
		Borehole terminated at approximately 2.1 mbgs due to sample refusal on probable bedrock.												
		* BH106-1 sampled for: Metals, PAHs, EC, SAR and pH.												
		DTPL: Drier than the plastic limit.												

Contractor: Aardvark Drilling Inc. **Grade Elevation:** 121.78

Drilling Method: Hollow Stem Auger / Split Spoon **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH107

Project #: 229041 **Logged By:** JL

Project: Geotechnical Investigation / Phase II ESA

Client: Sigma Asset Management Limited

Location: 1250 Appleby Line (4495 North Service Road), Burlington, ON

Drill Date: October 2, 2018 **Project Manager:** VM/CG

Depth (m)	Description	Elevation (m)	Monitoring Well Details	Sample Type	Sampler #	Recovery (%)	SPT N-Value	Standard Penetration N-Value (20 40 60)	Shear Strength kPa (100 200)	Water Content (%)	Sample ID	Soil Vapour Concentration (ppm)	Laboratory Analysis
	Ground Surface	123.22											
0	**Fill** Dark brown sand and gravel, some pieces of slag, moist	122.84	No Monitoring Well Installed	SS	1	90	17				1	<5/<1	*
1	**Silt Till** Reddish brown clayey silt, trace sand and gravel, hard, DTPL	122.00		SS	2	50	>50				2	<5/<1	
	End of Borehole												
2	Borehole terminated at approximately 1.2 mbgs due to sample refusal on probable bedrock.												
3	* BH107-1 sampled for: Metals, PAHs, pH, EC and SAR.												
4	DTPL: Drier than the plastic limit.												
5													
6													
7													
8													
9													

Contractor: Aardvark Drilling Inc.

Grade Elevation: 123.22 masl

Drilling Method: Hollow Stem Auger / Split Spoon

Top of Casing Elevation: NA

Well Casing Size: NA

Sheet: 1 of 1

Log of Borehole: BH108

Project #: 229041 **Logged By:** JL

Project: Geotechnical Investigation / Phase II ESA

Client: Sigma Asset Management Limited

Location: 1250 Appleby Line (4495 North Service Road), Burlington, ON

Drill Date: October 2, 2018 **Project Manager:** VM/CG

Depth (m)	Symbol	Description	Elevation (m)	Monitoring Well Details	Sample Type	Sampler #	Recovery (%)	SPT N-Value	Standard Penetration N-Value (20 40 60)	Shear Strength kPa (100 200)	Water Content (%)	Sample ID	Soil Vapour Concentration (ppm)	Laboratory Analysis
0		Ground Surface	123.83	▼ No Monitoring Well Installed										
		Fill Dark brown sand and gravel, damp	123.07		SS	1	80	21				1	<5/<1	*
1		***Silt Till*** Reddish brown clayey silt, trace sand and gravel, very stiff to hard, DTPL	122.53		SS	2	70	33				2	<5/<1	
		End of Borehole												
2		Borehole terminated at approximately 1.3 mbgs due to sample refusal on probable bedrock.												
		* BH108-1 sampled for: Metals, PAHs, pH, EC and SAR.												
3		DTPL: Drier than the plastic limit.												
4														
5														
6														
7														
8														
9														

Contractor: Aardvark Drilling Inc.

Grade Elevation: 123.83 masl

Drilling Method: Hollow Stem Auger / Split Spoon

Top of Casing Elevation: NA

Well Casing Size: NA

Sheet: 1 of 1

Log of Borehole: BH109

Project #: 229041 **Logged By:** JL

Project: Geotechnical Investigation / Phase II ESA

Client: Sigma Asset Management Limited

Location: 1250 Appleby Line (4495 North Service Road), Burlington, ON

Drill Date: October 2, 2018 **Project Manager:** VM/CG

Depth (m)	Symbol	Description	Elevation (m)	Monitoring Well Details	Sample Type	Sampler #	Recovery (%)	SPT N-Value	Standard Penetration N-Value (20 40 60)	Shear Strength kPa (100 200)	Water Content (%)	Sample ID	Soil Vapour Concentration (ppm)	Laboratory Analysis
0		Ground Surface	123.99	No Monitoring Well Installed										
		Fill Dark grey sand and gravel, some pieces of slag, moist	123.23		SS	1	70	30				1	<5/<1	*
1		***Silt Till*** Reddish brown clayey silt, trace sand and gravel, very stiff to hard, DTPL	122.24		SS	2	90	23				2	<5/<1	
					SS	3	10	>50				3	<5/<1	
2		End of Borehole												
		Borehole terminated at approximately 1.8 mbgs due to sample refusal on probable bedrock.												
		* BH109-1 sampled for: Metals, PAHs, pH, EC and SAR.												
		DTPL: Drier than the plastic limit.												
3														
4														
5														
6														
7														
8														
9														

Contractor: Aardvark Drilling Inc. **Grade Elevation:** 123.99 masl

Drilling Method: Hollow Stem Auger / Split Spoon **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH110

Project #: 229041 **Logged By:** JL

Project: Geotechnical Investigation / Phase II ESA

Client: Sigma Asset Management Limited

Location: 1250 Appleby Line (4495 North Service Road), Burlington, ON

Drill Date: October 2, 2018 **Project Manager:** VM/CG

Depth (m)	Symbol	Description	Elevation (m)	Monitoring Well Details	Sample Type	Sampler #	Recovery (%)	SPT N-Value	Standard Penetration N-Value (20 40 60)	Shear Strength kPa (100 200)	Water Content (%)	Sample ID	Soil Vapour Concentration (ppm)	Laboratory Analysis
0		Ground Surface	124.59	▼ No Monitoring Well Installed										
		Fill Dark grey sand and gravel, moist	124.06		SS	1	80	18				1	<5/<1	*
1		***Silt Till*** Reddish brown clayey silt, trace sand and gravel, very stiff to hard, DTPL	123.22		SS	2	90	58				2	<5/<1	
2		End of Borehole Borehole terminated at approximately 1.4 mbgs due to sample refusal on probable bedrock.												
3		* BH110-1 sampled for: Metals, PAHs, pH, EC and SAR.												
4		DTPL: Drier than the plastic limit.												
5														
6														
7														
8														
9														

Contractor: Aardvark Drilling Inc. **Grade Elevation:** 124.59 masl

Drilling Method: Hollow Stem Auger / Split Spoon **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH111

Project #: 229041 **Logged By:** JL

Project: Geotechnical Investigation / Phase II ESA

Client: Sigma Asset Management Limited

Location: 1250 Appleby Line (4495 North Service Road), Burlington, ON

Drill Date: October 2, 2018 **Project Manager:** VM/CG

Depth (m)	Symbol	Description	Elevation (m)	Monitoring Well Details	Sample Type	Sampler #	Recovery (%)	SPT N-Value	Standard Penetration N-Value (20 40 60)	Shear Strength kPa (100 200)	Water Content (%)	Sample ID	Soil Vapour Concentration (ppm)	Laboratory Analysis
		SUBSURFACE PROFILE			**SAMPLE**									
0		Ground Surface	124.82	No Monitoring Well Installed										
		Fill Grey sand and gravel, moist	124.29		SS	1	80	18				1	<5/<1	*
1		***Silt Till*** Reddish brown clayey silt, trace sand and gravel, very stiff to hard, DTPL	123.45		SS	2	70	23				2	<5/<1	
		End of Borehole												
2		Borehole terminated at approximately 1.4 mbgs due to sample refusal on probable bedrock.												
3		BH111-1 sampled for: Metals, PAHs, pH, EC and SAR.												
4		DTPL: Drier than the plastic limit.												
5														
6														
7														
8														
9														

Contractor: Aardvark Drilling Inc.

Grade Elevation: 124.82 masl

Drilling Method: Hollow Stem Auger / Split Spoon

Top of Casing Elevation: NA

Well Casing Size: NA

Sheet: 1 of 1

Log of Borehole: BH112

Project #: 229041 **Logged By:** JL

Project: Geotechnical Investigation / Phase II ESA

Client: Sigma Asset Management Limited

Location: 1250 Appleby Line (4495 North Service Road), Burlington, ON

Drill Date: October 2, 2018 **Project Manager:** VM/CG

Depth (m)	Symbol	Description	Elevation (m)	Monitoring Well Details	Sample Type	Sampler #	Recovery (%)	SPT N-Value	Standard Penetration N-Value (20 / 40 / 60)	Shear Strength kPa (100 / 200)	Water Content (%)	Sample ID	Soil Vapour Concentration (ppm)	Laboratory Analysis
0		Ground Surface	124.62	No Monitoring Well Installed										
		Fill Dark brown sand and gravel, moist	124.09		SS	1	70	23				1	<5/<1	*
1		***Silt Till*** Reddish brown clayey silt, trace sand and gravel, very stiff to hard, DTPL			SS	2	80	5				2	<5/<1	
			122.87		SS	3	30	>50				3	<5/<1	
2		End of Borehole												
		Borehole terminated at approximately 1.7 mbgs due to sample refusal on probable bedrock.												
3		BH112-1 sampled for: Metals, PAHs, pH, EC and SAR.												
4		DTPL: Drier than the plastic limit.												
5														
6														
7														
8														
9														

Contractor: Aardvark Drilling Inc.

Grade Elevation: 124.62 masl

Drilling Method: Hollow Stem Auger / Split Spoon

Top of Casing Elevation: NA

Well Casing Size: NA

Sheet: 1 of 1

Log of Borehole: BH113

Project #: 229041 **Logged By:** JL

Project: Geotechnical Investigation / Phase II ESA

Client: Sigma Asset Management Limited

Location: 1250 Appleby Line (4495 North Service Road), Burlington, ON

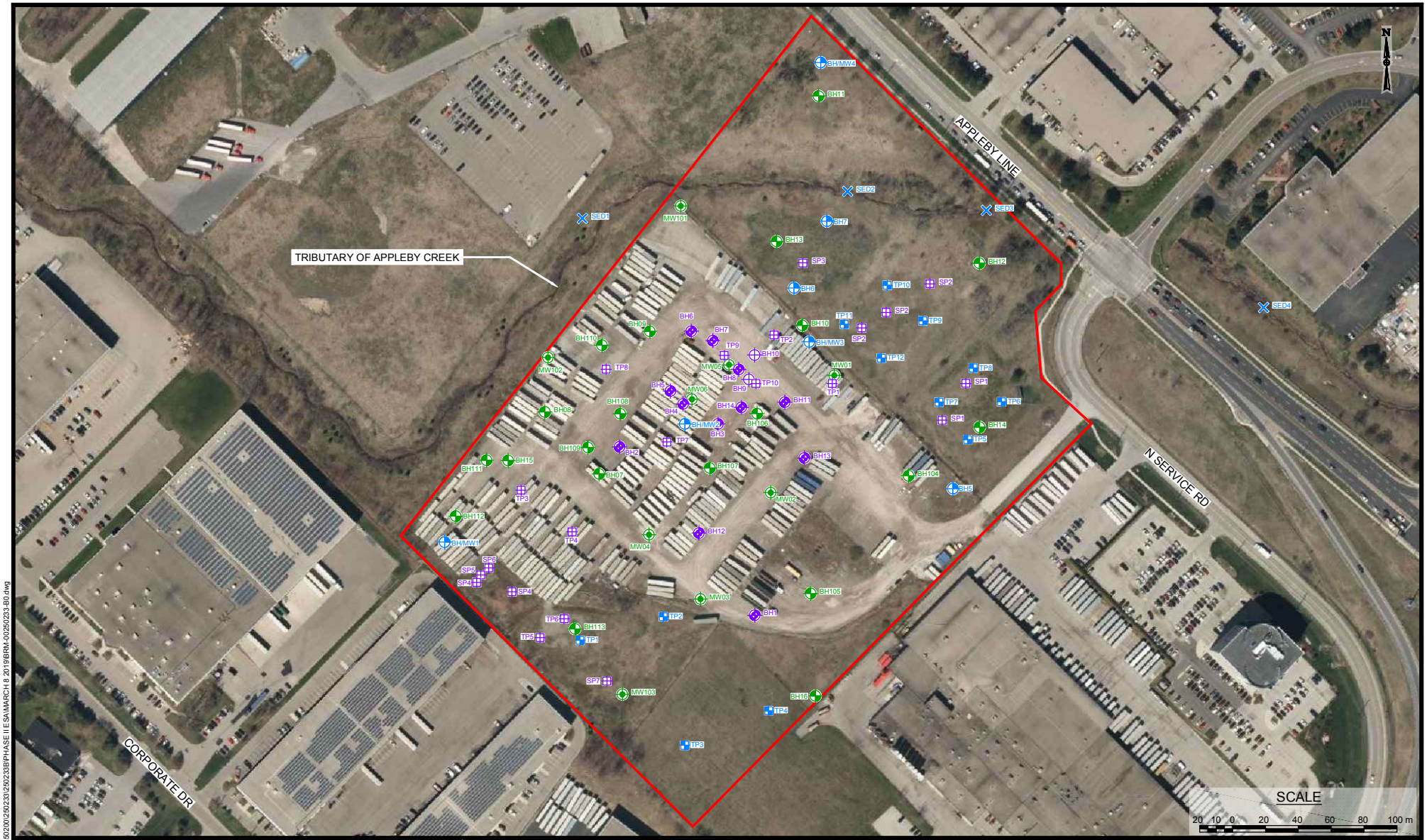
Drill Date: October 3, 2018 **Project Manager:** VM/CG

Depth (m)	Symbol	Description	Elevation (m)	Monitoring Well Details	Sample Type	Sampler #	Recovery (%)	SPT N-Value	Standard Penetration N-Value (20 40 60)	Shear Strength kPa (100 200)	Water Content (%)	Sample ID	Soil Vapour Concentration (ppm)	Laboratory Analysis
0		Ground Surface	124.70	No Monitoring Well Installed										
		Fill Dark brown sand and gravel, moist	123.94		SS	1	80	19				1	<5/<1	Metals, PAHs, pH, EC, SAR
1		***Silt Till*** Reddish brown clayey silt, trace sand and gravel, very stiff to hard, DTPL			SS	2	90	7				2	<5/<1	
2					SS	3	90	8				3	<5/<1	
			121.80		SS	4	80	20				4	<5/<1	pH, Grain Size
3		End of Borehole Borehole terminated at approximately 2.9 mbgs due to sample refusal on probable bedrock. DTPL: Drier than the plastic limit.												
4														
5														
6														
7														
8														
9														

Contractor: Aardvark Drilling Inc. **Grade Elevation:** 124.70 masl

Drilling Method: Hollow Stem Auger / Split Spoon **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1



EXP Services Inc.
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www.exp.com
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LEGEND:

- APPROXIMATE SITE BOUNDARY
- BOREHOLE LOCATION (EXP, 2018)
- MONITORING WELL LOCATION (EXP, 2018)
- SEDIMENT SAMPLE LOCATION (EXP, 2018)
- TESTPIT LOCATION (EXP, 2018)
- BOREHOLE LOCATION (PINCHIN, 2018)
- MONITORING WELL LOCATION (PINCHIN, 2018)
- BOREHOLE LOCATION (AMEC, 2007)
- MONITORING WELL LOCATION (AMEC, 2007)
- TESTPIT LOCATION (AMEC, 2007)

TITLE AND LOCATION:

BOREHOLE / MONITORING WELL LOCATION PLAN

SOIL, SEDIMENT AND GROUNDWATER DELINEATION INVESTIGATION
4495 NORTH SERVICE ROAD
BURLINGTON, ONTARIO

JOB NO.:	DRAWN BY:
BRM-00250233-B0	SGH
SCALE:	CHECKED BY:
AS NOTED	JS
DATE:	FIG NO.:
MARCH 2019	2

Y:\DRAWINGS\25000\00250200\25023\250233\BP\PHASE II ESA\MARCH 8 2019\BRM-00250233-B0.dwg

Log of Borehole BH/MW1

Project No. BRM-00250233-B0 | Drawing No. B1

Project: Phase II ESA | Sheet No. 1 of 1

Location: 4495 North Service Road, Burlington ON

Refer to Borehole Location Plan

Date Drilled: December 13, 2018

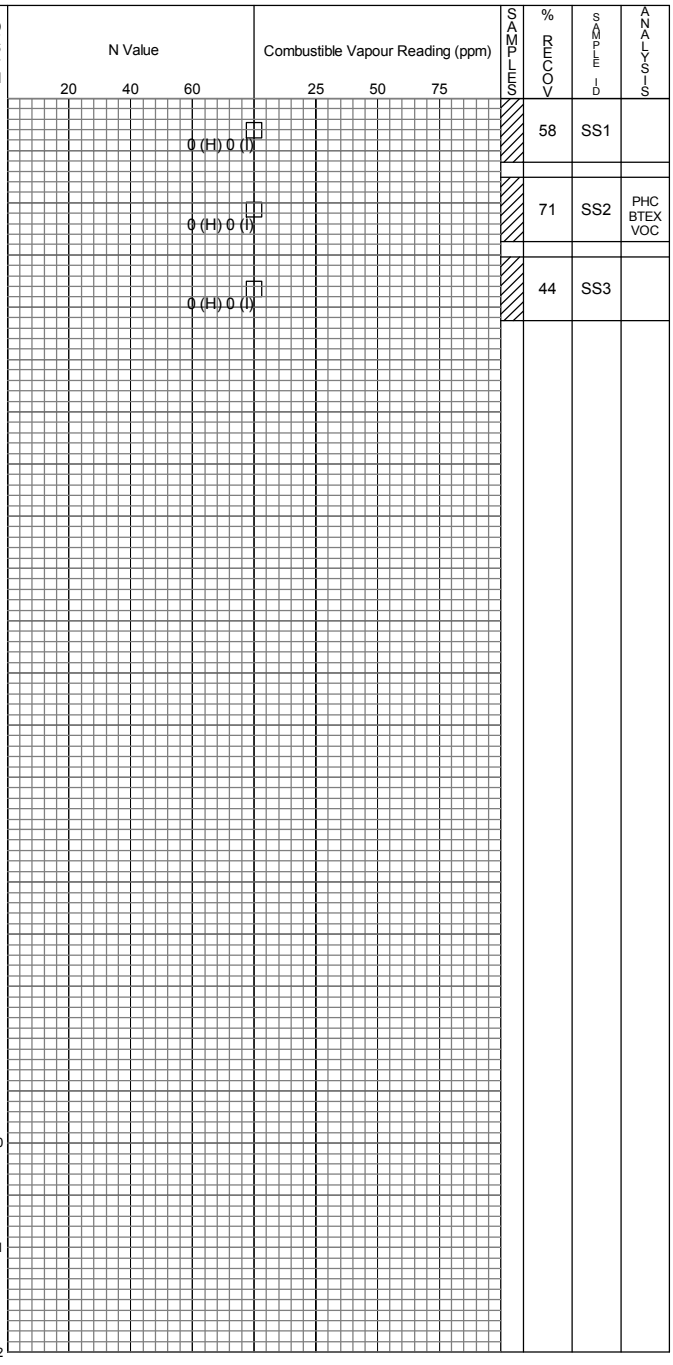
Drill Type: CME 75

Datum: Relative

Chemical Analysis

BTEX	Benzene, Toluene, Ethylbenzene and Xylenes	*	Duplicate Sample
ING	Metals and Inorganics	PCB	Polychlorinated Biphenyls
MET	Metals	PHC	Petroleum Hydrocarbons (F1-F4)
PAH	Polycyclic Aromatic Hydrocarbons	VOC	Volatile Organic Compounds
PEST	Organochlorine Pesticides		

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH
		SAND and GRAVEL (Fill): brown, hard, frozen	100.32	0
		CLAYEY SILT: brown/red, wet, soft, high plasticity	~99.6	1
		SHALE: weathered, red, some limestone	~98.8	
		SHALE: weathered, red	~98.2	2
		SHALE: weathered, red, dry	~97.3	3
		SHALE: weathered, red, wet	~95.8	4
		END OF BOREHOLE	~94.2	5
		NOTES:		6
		1) This drawing is to be read with the subject report and project number as presented above.		7
		2) Interpretation assistance by EXP is required before use by others.		8
		3) Combustible vapour reading by Photoionization Gas Detector calibrated with isobutylene.		9
		4) Due to the absence of evidence of groundwater, borehole backfilled with bentonite upon completion.		10
				11
				12



SAMPLES	% RECOV	SAMPLE ID	ANALYSIS
	58	SS1	
	71	SS2	PHC BTEX VOC
	44	SS3	

ENVIRONMENTAL-EXP BH LOGS - 4495 NORTH SERVICE ROAD, BURLINGTON.GPJ 4/18/19

EXP Services Inc.
Brampton, Ontario
Telephone: 905-793-9800
Facsimile: 905-793-0641

Time	Water Level (m)	Depth to Cave (m)
14-Dec-2018	2.890	

Log of Borehole BH/MW2

Project No. BRM-00250233-B0 | Drawing No. B2

Project: Phase II ESA | Sheet No. 1 of 2

Location: 4495 North Service Road, Burlington ON

Refer to Borehole Location Plan

Date Drilled: December 13, 2018

Drill Type: CME 75

Datum: Relative

Chemical Analysis

BTEX	Benzene, Toluene, Ethylbenzene and Xylenes	*	Duplicate Sample
ING	Metals and Inorganics	PCB	Polychlorinated Biphenyls
MET	Metals	PHC	Petroleum Hydrocarbons (F1-F4)
PAH	Polycyclic Aromatic Hydrocarbons	VOC	Volatile Organic Compounds
PEST	Organochlorine Pesticides		

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH
		SAND and GRAVEL (Fill): brown, hard, frozen	99.52	0
		SHALE: weathered, red	~98.8	1
		SHALE: weathered, red, some limestone; Augered from 5 ft to 30 ft; Wet at 25 ft.	~98.0	2
		END OF BOREHOLE	~90.4	9

NOTES:

1) This drawing is to be read with the subject report and project number as presented above.
2) Interpretation assistance by EXP is required before use by others.
3) Combustible vapour reading by Photoionization Gas Detector calibrated with isobutylene.
4) Due to the absence of evidence of

N Value: 20, 40, 60

Combustible Vapour Reading (ppm): 25, 50, 75

0 (H) 0 (I)

5 (H) 0 (I)

SAMPLES	% RECOV	SAMPLE ID	ANALYSIS
	69	SS1	PHC BTEX VOC
	100	SS2	

Continued Next Page

ENVIRONMENTAL-EXP BH LOGS - 4495 NORTH SERVICE ROAD, BURLINGTON.GPJ 4/18/19

Time	Water Level (m)	Depth to Cave (m)
14-Dec-2018	2.410	

EXP Services Inc.
Brampton, Ontario
Telephone: 905-793-9800
Facsimile: 905-793-0641

Log of Borehole BH/MW2

Project No. BRM-00250233-B0 Drawing No. B2

Project: Phase II ESA Sheet No. 2 of 2

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH	N Value	Combustible Vapour Reading (ppm)	SAMPLES	% RECOV	SAMPLE ID	ANALYSIS
		groundwater, borehole backfilled with bentonite upon completion.	87.52	12	20 40 60	25 50 75				
				13						
				14						
				15						
				16						
				17						
				18						
				19						
				20						
				21						
				22						
				23						
				24						
				25						
				26						

ENVIRONMENTAL-EXP BH LOGS - 4495 NORTH SERVICE ROAD, BURLINGTON.GPJ 4/18/19

EXP Services Inc.
Brampton, Ontario
Telephone: 905-793-9800
Facsimile: 905-793-0641

Time	Water Level (m)	Depth to Cave (m)
14-Dec-2018	2.410	

Log of Borehole BH/MW3

Project No. BRM-00250233-B0 | Drawing No. B3

Project: Phase II ESA | Sheet No. 1 of 1

Location: 4495 North Service Road, Burlington ON

Refer to Borehole Location Plan

Date Drilled: December 13, 2018

Drill Type: CME 75

Datum: Relative

Chemical Analysis

BTEX	Benzene, Toluene, Ethylbenzene and Xylenes	*	Duplicate Sample
ING	Metals and Inorganics	PCB	Polychlorinated Biphenyls
MET	Metals	PHC	Petroleum Hydrocarbons (F1-F4)
PAH	Polycyclic Aromatic Hydrocarbons	VOC	Volatile Organic Compounds
PEST	Organochlorine Pesticides		

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH
			99.15	0
		SAND and GRAVEL (Fill): brown, hard, frozen	~98.8	
		SILTY CLAY (Fill): brown, dense, dry	~98.4	
		SHALE: weathered, red	~98.2	
		LIMESTONE	~98.1	1
		SHALE: weathered, red		2
			~96.1	3
		SHALE: weathered, red; Auger from 10 ft to 30 ft; Wet at 20 ft.		4
				5
				6
				7
				8
				9
			~90.0	
		END OF BOREHOLE		10
		NOTES:		11
		1) This drawing is to be read with the subject report and project number as presented above. 2) Interpretation assistance by EXP is required before use by others. 3) Combustible vapour reading by RKI Eagle calibrated with isobutylene. 4) Borehole backfilled with bentonite upon completion.		12

N Value: 20 40 60

Combustible Vapour Reading (ppm): 25 50 75

0 (H) 0 (I)

0 (H) 0 (I)

0 (H) 0 (I)

SAMPLES	% RECOV	SAMPLE ID	ANALYSIS
	100	SS1A	
	45	SS1B	PHC BTEX VOC
	67	SS2	

ENVIRONMENTAL-EXP BH LOGS - 4495 NORTH SERVICE ROAD, BURLINGTON.GPJ 4/18/19

EXP Services Inc.
Brampton, Ontario
Telephone: 905-793-9800
Facsimile: 905-793-0641

Time	Water Level (m)	Depth to Cave (m)
14-Dec-2018	1.938	

Log of Borehole BH/MW4

Project No. BRM-00250233-B0 | Drawing No. B4

Project: Phase II ESA | Sheet No. 1 of 1

Location: 4495 North Service Road, Burlington ON

Refer to Borehole Location Plan

Date Drilled: January 4, 2019

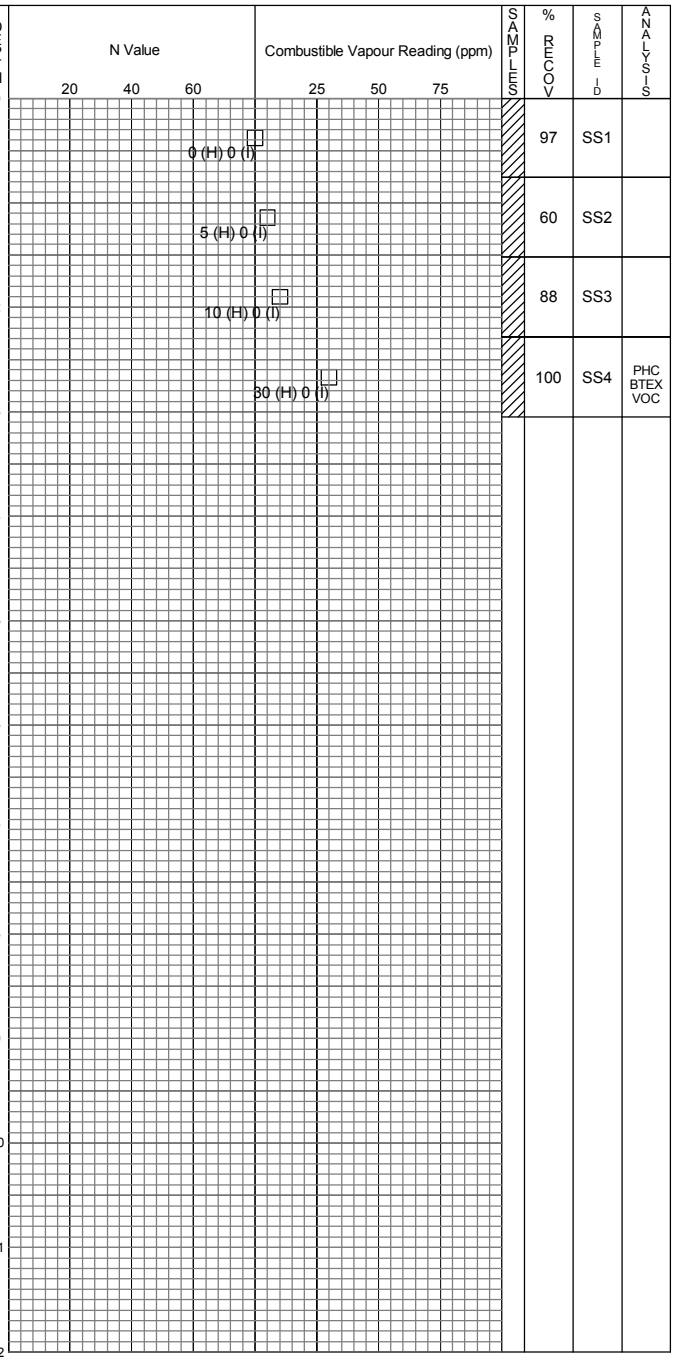
Drill Type: MARL M5T (Similar to CME 55)

Datum: Relative

Chemical Analysis

BTEX	Benzene, Toluene, Ethylbenzene and Xylenes	*	Duplicate Sample
ING	Metals and Inorganics	PCB	Polychlorinated Biphenyls
MET	Metals	PHC	Petroleum Hydrocarbons (F1-F4)
PAH	Polycyclic Aromatic Hydrocarbons	VOC	Volatile Organic Compounds
PEST	Organochlorine Pesticides		

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH
			101.43	0
		TOPSOIL: brown	~101.3	
		CLAYEY SILT: red, dry		
			~100.7	1
		CLAYEY SILT: red/brown, grey ribbon, moist		
			~99.9	2
		CLAYEY SILT: red/brown, moist		
			~99.1	
		SHALE: weathered, red/brown	~98.8	
		SHALE: weathered, red Auger from 8 ft to 20 ft; Wet at 16 ft.		3
				4
				5
				6
			~95.3	
		END OF BOREHOLE		7
		NOTES:		8
		1) This drawing is to be read with the subject report and project number as presented above. 2) Interpretation assistance by EXP is required before use by others. 3) Combustible vapour reading by RKI Eagle calibrated with isobutylene. 4) Borehole backfilled with bentonite upon completion.		9
				10
				11
				12



SAMPLES	% RECOV	SAMPLE ID	ANALYSIS
	97	SS1	
	60	SS2	
	88	SS3	
	100	SS4	PHC BTEX VOC

ENVIRONMENTAL-EXP BH LOGS - 4495 NORTH SERVICE ROAD, BURLINGTON.GPJ 4/18/19

EXP Services Inc.
Brampton, Ontario
Telephone: 905-793-9800
Facsimile: 905-793-0641

Time	Water Level (m)	Depth to Cave (m)
4-Jan-2019	3.814	
7-Jan-2019	3.895	

Log of Borehole BH5

Project No. BRM-00250233-B0 | Drawing No. B5

Project: Phase II ESA | Sheet No. 1 of 1

Location: 4495 North Service Road, Burlington ON

Refer to Borehole Location Plan

Date Drilled: December 17, 2018

Drill Type: Pionjar

Datum: Relative

Chemical Analysis

BTEX	Benzene, Toluene, Ethylbenzene and Xylenes	*	Duplicate Sample
ING	Metals and Inorganics	PCB	Polychlorinated Biphenyls
MET	Metals	PHC	Petroleum Hydrocarbons (F1-F4)
PAH	Polycyclic Aromatic Hydrocarbons	VOC	Volatile Organic Compounds
PEST	Organochlorine Pesticides		

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH	N Value (20, 40, 60)	Combustible Vapour Reading (ppm) (25, 50, 75)	SAMPLES	% RECOV	SAMPLE ID	ANALYSIS
		Sand and Gravel (fill)		0						
		CLAYEY SILT: red, moist, some gravel				15 (H) 0 (I)		63	SS1	PCB
		CLAYEY SILT: red, moist, some gravel		1						
		CLAYEY SILT: red, dry, some gravel				10 (H) 0 (I)		70	SS2	
		SHALE: weathered, red, dry		2		5 (H) 0 (I)		46	SS3	
		END OF BOREHOLE		3						
		NOTES:		4						
		1) This drawing is to be read with the subject report and project number as presented above.		5						
		2) Interpretation assistance by EXP is required before use by others.		6						
		3) Combustible vapour reading by RKI Eagle calibrated with isobutylene.		7						
		4) Borehole backfilled with bentonite upon completion.		8						
				9						
				10						
				11						
				12						

ENVIRONMENTAL-EXP BH LOGS - 4495 NORTH SERVICE ROAD, BURLINGTON.GPJ 4/18/19

EXP Services Inc.
Brampton, Ontario
Telephone: 905-793-9800
Facsimile: 905-793-0641

Time	Water Level (m)	Depth to Cave (m)

Log of Borehole BH6

Project No. BRM-00250233-B0 | Drawing No. B6

Project: Phase II ESA | Sheet No. 1 of 1

Location: 4495 North Service Road, Burlington ON

Refer to Borehole Location Plan

Date Drilled: December 17, 2018

Drill Type: Pionjar

Datum: Relative

Chemical Analysis

BTEX	Benzene, Toluene, Ethylbenzene and Xylenes	*	Duplicate Sample
ING	Metals and Inorganics	PCB	Polychlorinated Biphenyls
MET	Metals	PHC	Petroleum Hydrocarbons (F1-F4)
PAH	Polycyclic Aromatic Hydrocarbons	VOC	Volatile Organic Compounds
PEST	Organochlorine Pesticides		

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH	N Value	Combustible Vapour Reading (ppm)	SAMPLES	% RECOV	SAMPLE ID	ANALYSIS
		TOPSOIL: brown		0	20 40 60	25 50 75				
		SILT: dark brown, dry, trace clay		1	0 (H) 0 (I)			52	SS1	ING PAH PEST PCB
				2	5 (H) 0 (I)			56	SS2	
				3	0 (H) 0 (I)			55	SS3	
		SILT: dark brown with red silty clay ribbon, dry		4	0 (H) 0 (I)			83	SS4	
		SILTY CLAY: red, dry		5						
		END OF BOREHOLE		6						
		NOTES:		7						
		1) This drawing is to be read with the subject report and project number as presented above.		8						
		2) Interpretation assistance by EXP is required before use by others.		9						
		3) Combustible vapour reading by RKI Eagle calibrated with isobutylene.		10						
		4) Borehole backfilled with bentonite upon completion.		11						
				12						

ENVIRONMENTAL-EXP BH LOGS - 4495 NORTH SERVICE ROAD, BURLINGTON.GPJ 4/18/19

EXP Services Inc.
Brampton, Ontario
Telephone: 905-793-9800
Facsimile: 905-793-0641

Time	Water Level (m)	Depth to Cave (m)

Log of Borehole BH7

Project No. BRM-00250233-B0 | Drawing No. B7

Project: Phase II ESA | Sheet No. 1 of 1

Location: 4495 North Service Road, Burlington ON

Refer to Borehole Location Plan

Date Drilled: December 17, 2018

Drill Type: Pionjar

Datum: Relative

Chemical Analysis

BTEX	Benzene, Toluene, Ethylbenzene and Xylenes	*	Duplicate Sample
ING	Metals and Inorganics	PCB	Polychlorinated Biphenyls
MET	Metals	PHC	Petroleum Hydrocarbons (F1-F4)
PAH	Polycyclic Aromatic Hydrocarbons	VOC	Volatile Organic Compounds
PEST	Organochlorine Pesticides		

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH	N Value (20, 40, 60)	Combustible Vapour Reading (ppm) (25, 50, 75)	SAMPLES	% RECOV	SAMPLE ID	ANALYSIS
		TOPSOIL: brown		0						
		SILT: brown, moist, trace clay		1		5 (H) 0 (I)		40	SS1	
				2						
		SILTY CLAY: red with grey ribbon throughout, moist		3		0 (H) 0(I)		21	SS2	ING PAH
				4		3 (H) 0(I)		85	SS3	
		END OF BOREHOLE		5						
		NOTES:		6						
		1) This drawing is to be read with the subject report and project number as presented above.		7						
		2) Interpretation assistance by EXP is required before use by others.		8						
		3) Combustible vapour reading by RKI Eagle calibrated with isobutylene.		9						
		4) Borehole backfilled with bentonite upon completion.		10						
				11						
				12						

ENVIRONMENTAL-EXP BH LOGS - 4495 NORTH SERVICE ROAD, BURLINGTON.GPJ 4/18/19

Time	Water Level (m)	Depth to Cave (m)

EXP Services Inc.
Brampton, Ontario
Telephone: 905-793-9800
Facsimile: 905-793-0641

Log of Borehole TP1

Project No. BRM-00250233-B0 | Drawing No. B8

Project: Phase II ESA | Sheet No. 1 of 1

Location: 4495 North Service Road, Burlington ON

Refer to Borehole Location Plan

Date Drilled: December 17, 2018

Drill Type: Excavator

Datum: Relative

Chemical Analysis

BTEX	Benzene, Toluene, Ethylbenzene and Xylenes	*	Duplicate Sample
ING	Metals and Inorganics	PCB	Polychlorinated Biphenyls
MET	Metals	PHC	Petroleum Hydrocarbons (F1-F4)
PAH	Polycyclic Aromatic Hydrocarbons	VOC	Volatile Organic Compounds
PEST	Organochlorine Pesticides		

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH	SAMPLES	% RECOV	SAMPLE ID	ANALYSIS
		SAND and GRAVEL(Fill): dark brown, moist, loose, trace organics		0	G		SS1A	
					G		SS1B	ING PAH
		CLAYEY SILT(Fill): reddish brown, trace gravel		1	G		SS2	
					G		SS3A	
		TOPSOIL: black, slight sulphur odour, firm			G		SS3B	
		SILTY CLAY: Reddish brown, moist		2	G		SS4	
		SHALE: weathered, red		3	G		SS5	
		END OF BOREHOLE						
		NOTES:						
		1) This drawing is to be read with the subject report and project number as presented above.						
		2) Interpretation assistance by EXP is required before use by others.						
		3) Combustible vapour reading by RKI Eagle calibrated with isobutylene.						
		4) Borehole backfilled with bentonite upon completion.						

N Value: 20, 40, 60

Combustible Vapour Reading (ppm): 25, 50, 75

30 (H) 0 (I)
25 (H) 0 (I)
25 (H) 0 (I)
2 (H) 0 (I)
15 (H) 0 (I)
20 (H) 0 (I)
25 (H) 0 (I)

DEPTH: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

ENVIRONMENTAL-EXP BH LOGS - 4495 NORTH SERVICE ROAD, BURLINGTON.GPJ 4/18/19

Time	Water Level (m)	Depth to Cave (m)

EXP Services Inc.
Brampton, Ontario
Telephone: 905-793-9800
Facsimile: 905-793-0641

Log of Borehole TP2

Project No. BRM-00250233-B0 | Drawing No. B9

Project: Phase II ESA | Sheet No. 1 of 1

Location: 4495 North Service Road, Burlington ON

Refer to Borehole Location Plan

Date Drilled: December 17, 2018

Drill Type: Excavator

Datum: Relative

Chemical Analysis

BTEX	Benzene, Toluene, Ethylbenzene and Xylenes	*	Duplicate Sample
ING	Metals and Inorganics	PCB	Polychlorinated Biphenyls
MET	Metals	PHC	Petroleum Hydrocarbons (F1-F4)
PAH	Polycyclic Aromatic Hydrocarbons	VOC	Volatile Organic Compounds
PEST	Organochlorine Pesticides		

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH	SAMPLES	% RECOV	SAMPLE ID	ANALYSIS
		CLAYEY SILT(FILL): brown, loose, moist, trace organics		0	G		SS1	
		CLAYEY SILT(FILL): reddish brown, moist		1	G		SS2	ING PAH
		TOPSOIL: black			G		SS3	
		SILTY CLAY: reddish brown		2	G		SS4	PHC BTEX VOC
		SHALE: weathered, red			G		SS5	
		END OF BOREHOLE		3				
		NOTES:		4				
		1) This drawing is to be read with the subject report and project number as presented above.		5				
		2) Interpretation assistance by EXP is required before use by others.		6				
		3) Combustible vapour reading by RKI Eagle calibrated with isobutylene.		7				
		4) Borehole backfilled with bentonite upon completion.		8				
				9				
				10				
				11				
				12				

N Value: 20, 40, 60 | Combustible Vapour Reading (ppm): 25, 50, 75

10 (H) 0 (I)

15 (H) 0 (I)

15 (H) 0 (I)

35 (H) 0 (I)

15 (H) 0 (I)

ENVIRONMENTAL-EXP BH LOGS - 4495 NORTH SERVICE ROAD, BURLINGTON.GPJ 4/18/19

EXP Services Inc.
Brampton, Ontario
Telephone: 905-793-9800
Facsimile: 905-793-0641

Time	Water Level (m)	Depth to Cave (m)

Log of Borehole TP3

Project No. BRM-00250233-B0 | Drawing No. B10

Project: Phase II ESA | Sheet No. 1 of 1

Location: 4495 North Service Road, Burlington ON

Refer to Borehole Location Plan

Date Drilled: December 17, 2018

Drill Type: Excavator

Datum: Relative

Chemical Analysis

BTEX	Benzene, Toluene, Ethylbenzene and Xylenes	*	Duplicate Sample
ING	Metals and Inorganics	PCB	Polychlorinated Biphenyls
MET	Metals	PHC	Petroleum Hydrocarbons (F1-F4)
PAH	Polycyclic Aromatic Hydrocarbons	VOC	Volatile Organic Compounds
PEST	Organochlorine Pesticides		

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH	SAMPLES	% RECOV	SAMPLE ID	ANALYSIS
		CLAYEY SILT (FILL): brown, trace gravel and organics		0	G		SS1	
		SILTY CLAY (FILL): reddish brown, trace gravel		1	G		SS2A	
					G		SS2B	ING PAH
		SILTY CLAY: grey, trace gravel			G		SS3	
					G		SS4	
		SILTY CLAY: reddish brown, trace gravel		2	G		SS5	
		SHALE: weathered, red		3	G		SS6	
		END OF BOREHOLE		4				
		NOTES:		5				
		1) This drawing is to be read with the subject report and project number as presented above.		6				
		2) Interpretation assistance by EXP is required before use by others.		7				
		3) Combustible vapour reading by RKI Eagle calibrated with isobutylene.		8				
		4) Borehole backfilled with bentonite upon completion.		9				
				10				
				11				
				12				

N Value: 20, 40, 60

Combustible Vapour Reading (ppm): 25, 50, 75

15 (H) 0 (I)
15 (H) 0 (I)
15 (H) 0 (I)
20 (H) 0 (I)
25 (H) 0 (I)
20 (H) 0 (I)
20 (H) 0 (I)

ENVIRONMENTAL-EXP BH LOGS - 4495 NORTH SERVICE ROAD, BURLINGTON.GPJ 4/18/19

EXP Services Inc.
Brampton, Ontario
Telephone: 905-793-9800
Facsimile: 905-793-0641

Time	Water Level (m)	Depth to Cave (m)

Log of Borehole TP4

Project No. BRM-00250233-B0 | Drawing No. B11

Project: Phase II ESA | Sheet No. 1 of 1

Location: 4495 North Service Road, Burlington ON

Refer to Borehole Location Plan

Date Drilled: December 17, 2018

Drill Type: Excavator

Datum: Relative

Chemical Analysis

BTEX	Benzene, Toluene, Ethylbenzene and Xylenes	*	Duplicate Sample
ING	Metals and Inorganics	PCB	Polychlorinated Biphenyls
MET	Metals	PHC	Petroleum Hydrocarbons (F1-F4)
PAH	Polycyclic Aromatic Hydrocarbons	VOC	Volatile Organic Compounds
PEST	Organochlorine Pesticides		

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH	SAMPLES	% RECOV	SAMPLE ID	ANALYSIS
		CLAYEY SILT (Fill): reddish brown, trace gravel and organics, loose		0	G		SS1	PEST PCB
		SILTY CLAY (Fill): reddish brown, dense, trace gravel		1	G		SS2	
		SILT: greyish brown			G		SS3	PHC BTEX
		SILTY CLAY: reddish brown, trace gravel			G		SS4	VOC ING PAH
		SHALE: weathered, red		2	G		SS5	
		END OF BOREHOLE						

N Value: 20, 40, 60

Combustible Vapour Reading (ppm): 25, 50, 75

20 (H) 0 (I)

15 (H) 0 (I)

15 (H) 0 (I)

20 (H) 0 (I)

10 (H) 0 (I)

3

4

5

6

7

8

9

10

11

12

NOTES:

1) This drawing is to be read with the subject report and project number as presented above.
2) Interpretation assistance by EXP is required before use by others.
3) Combustible vapour reading by RKI Eagle calibrated with isobutylene.
4) Borehole backfilled with bentonite upon completion.

ENVIRONMENTAL-EXP BH LOGS - 4495 NORTH SERVICE ROAD, BURLINGTON.GPJ 4/18/19

Time	Water Level (m)	Depth to Cave (m)

EXP Services Inc.
Brampton, Ontario
Telephone: 905-793-9800
Facsimile: 905-793-0641

Log of Borehole TP5

Project No. BRM-00250233-B0 | Drawing No. B12

Project: Phase II ESA | Sheet No. 1 of 1

Location: 4495 North Service Road, Burlington ON

Refer to Borehole Location Plan

Date Drilled: December 17, 2018

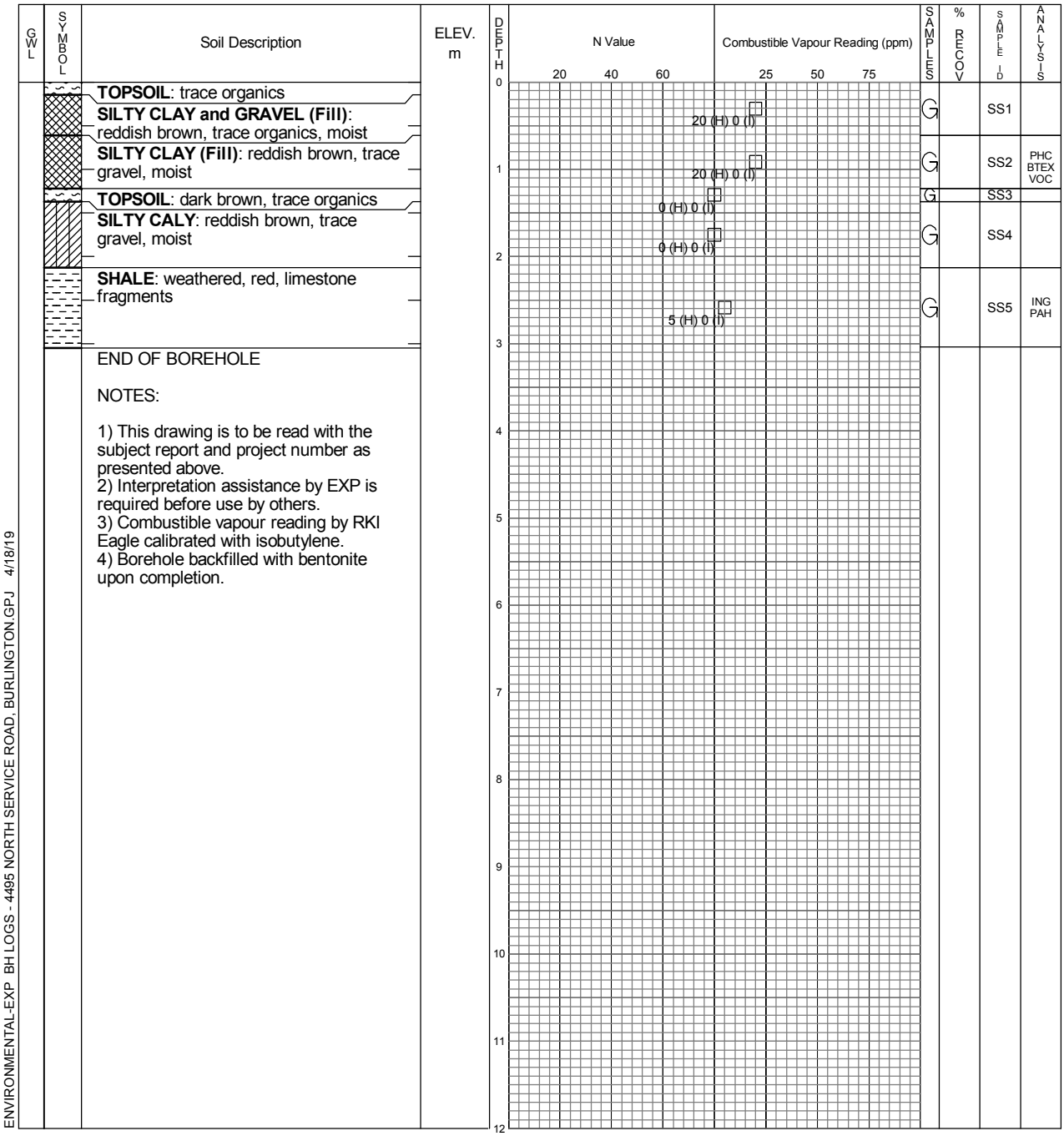
Drill Type: Excavator

Datum: Relative

Chemical Analysis

BTEX	Benzene, Toluene, Ethylbenzene and Xylenes	*	Duplicate Sample
ING	Metals and Inorganics	PCB	Polychlorinated Biphenyls
MET	Metals	PHC	Petroleum Hydrocarbons (F1-F4)
PAH	Polycyclic Aromatic Hydrocarbons	VOC	Volatile Organic Compounds
PEST	Organochlorine Pesticides		

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH
		TOPSOIL: trace organics		0
		SILTY CLAY and GRAVEL (Fill): reddish brown, trace organics, moist		
		SILTY CLAY (Fill): reddish brown, trace gravel, moist		1
		TOPSOIL: dark brown, trace organics		
		SILTY CALY: reddish brown, trace gravel, moist		2
		SHALE: weathered, red, limestone fragments		3
		END OF BOREHOLE		4
		NOTES:		5
		1) This drawing is to be read with the subject report and project number as presented above.		6
		2) Interpretation assistance by EXP is required before use by others.		7
		3) Combustible vapour reading by RKI Eagle calibrated with isobutylene.		8
		4) Borehole backfilled with bentonite upon completion.		9
				10
				11
				12



SAMPLES	% RECOV	SAMPLE ID	ANALYSIS
G		SS1	
G		SS2	PHC BTEX VOC
G		SS3	
G		SS4	
G		SS5	ING PAH

Time	Water Level (m)	Depth to Cave (m)

EXP Services Inc.
Brampton, Ontario
Telephone: 905-793-9800
Facsimile: 905-793-0641

ENVIRONMENTAL-EXP BH LOGS - 4495 NORTH SERVICE ROAD, BURLINGTON.GPJ 4/18/19

Log of Borehole TP6

Project No. BRM-00250233-B0 | Drawing No. B13

Project: Phase II ESA | Sheet No. 1 of 1

Location: 4495 North Service Road, Burlington ON

Refer to Borehole Location Plan

Date Drilled: December 17, 2018

Drill Type: Excavator

Datum: Relative

Chemical Analysis

BTEX	Benzene, Toluene, Ethylbenzene and Xylenes	*	Duplicate Sample
ING	Metals and Inorganics	PCB	Polychlorinated Biphenyls
MET	Metals	PHC	Petroleum Hydrocarbons (F1-F4)
PAH	Polycyclic Aromatic Hydrocarbons	VOC	Volatile Organic Compounds
PEST	Organochlorine Pesticides		

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH	N Value	Combustible Vapour Reading (ppm)	SAMPLES	% RECOV	SAMPLE ID	ANALYSIS
		TOPSOIL: brown, trace organic		0	20 40 60	25 50 75				
		SILTY CLAY (FILL): reddish brown, trace gravel			0 (H) 0 (I)		G		SS1	Pest PCB
				1	0 (H) 0 (I)		G		SS2	
		SILTY CLAY (FILL): grey, trace gravel			0 (H) 0 (I)		G		SS3	
		SHALE: red, limestone fragments		2	0 (H) 0 (I)		G		SS4	ING PAH
		SILTY CLAY: dark grey, moist, trace organics		3	0 (H) 0 (I)		G		SS5	
		SILTY CLAY: dark grey, moist, trace organics, sulphur odour		4	0 (H) 0 (I)		G		SS6	
		END OF BOREHOLE		5						
		NOTES:		6						
		1) This drawing is to be read with the subject report and project number as presented above.		7						
		2) Interpretation assistance by EXP is required before use by others.		8						
		3) Combustible vapour reading by RKI Eagle calibrated with isobutylene.		9						
		4) Borehole backfilled with bentonite upon completion.		10						
				11						
				12						

ENVIRONMENTAL-EXP BH LOGS - 4495 NORTH SERVICE ROAD, BURLINGTON.GPJ 4/18/19

Time	Water Level (m)	Depth to Cave (m)

EXP Services Inc.
Brampton, Ontario
Telephone: 905-793-9800
Facsimile: 905-793-0641

Log of Borehole TP7

Project No. BRM-00250233-B0 | Drawing No. B14

Project: Phase II ESA | Sheet No. 1 of 1

Location: 4495 North Service Road, Burlington ON

Refer to Borehole Location Plan

Date Drilled: December 17, 2018

Drill Type: Excavator

Datum: Relative

Chemical Analysis

BTEX	Benzene, Toluene, Ethylbenzene and Xylenes	*	Duplicate Sample
ING	Metals and Inorganics	PCB	Polychlorinated Biphenyls
MET	Metals	PHC	Petroleum Hydrocarbons (F1-F4)
PAH	Polycyclic Aromatic Hydrocarbons	VOC	Volatile Organic Compounds
PEST	Organochlorine Pesticides		

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH	N Value	Combustible Vapour Reading (ppm)	SAMPLES	% RECOV	SAMPLE ID	ANALYSIS
		TOPSOIL: brown, trace organics		0			G		SS1	
		SILTY CLAY (FILL): reddish brown, trace gravel				0 (H) 1 (I)				
				1		0 (H) 0 (I)	G		SS2	
		SILTY CLAY (FILL): grey, trace gravel				0 (H) 1 (I)	G		SS3	
		SILTY CLAY (FILL): reddish brown, trace gravel				0 (H) 0 (I)	G		SS4	
		SILTY CLAY (FILL): reddish brown, trace fragments of limestone		2		0 (H) 0 (I)	G		SS5	
				3		0 (H) 1 (I)	G		SS6	ING PAH
		TOPSOIL: dark brown, trace organics, slight sulphur odour		4		0 (H) 1 (I)	G		SS7	
		END OF BOREHOLE		5						
		NOTES:		6						
		1) This drawing is to be read with the subject report and project number as presented above.		7						
		2) Interpretation assistance by EXP is required before use by others.		8						
		3) Combustible vapour reading by RKI Eagle calibrated with isobutylene.		9						
		4) Borehole backfilled with bentonite upon completion.		10						
				11						
				12						

N Value: 20 40 60

Combustible Vapour Reading (ppm): 25 50 75

ENVIRONMENTAL-EXP BH LOGS - 4495 NORTH SERVICE ROAD, BURLINGTON.GPJ 4/18/19

EXP Services Inc.
Brampton, Ontario
Telephone: 905-793-9800
Facsimile: 905-793-0641

Time	Water Level (m)	Depth to Cave (m)

Log of Borehole TP8

Project No. BRM-00250233-B0 | Drawing No. B15

Project: Phase II ESA | Sheet No. 1 of 1

Location: 4495 North Service Road, Burlington ON

Refer to Borehole Location Plan

Date Drilled: December 17, 2018

Drill Type: Excavator

Datum: Relative

Chemical Analysis

BTEX	Benzene, Toluene, Ethylbenzene and Xylenes	*	Duplicate Sample
ING	Metals and Inorganics	PCB	Polychlorinated Biphenyls
MET	Metals	PHC	Petroleum Hydrocarbons (F1-F4)
PAH	Polycyclic Aromatic Hydrocarbons	VOC	Volatile Organic Compounds
PEST	Organochlorine Pesticides		

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH	N Value	Combustible Vapour Reading (ppm)	SAMPLES	% RECOV	SAMPLE ID	ANALYSIS
		TOPSOIL: brown		0	20 40 60	25 50 75				
		SILTY CLAY (FILL): brownish red, trace gravel		0		0 (H) 1 (I)	G		SS1	
				1		0 (H) 1 (I)	G		SS2	
						0 (H) 1 (I)	G		SS3	
		SILTY CLAY (FILL): brownish red, trace fragments of limestone		2		0 (H) 1 (I)	G		SS4	
				3		0 (H) 1 (I)	G		SS5	
						0 (H) 0 (I)	G		SS6	
		SILTY CLAY: dark grey, moist		4		0 (H) 1 (I)	G		SS7	ING PAH
		END OF BOREHOLE		5						
		NOTES:		6						
		1) This drawing is to be read with the subject report and project number as presented above.		7						
		2) Interpretation assistance by EXP is required before use by others.		8						
		3) Combustible vapour reading by RKI Eagle calibrated with isobutylene.		9						
		4) Borehole backfilled with bentonite upon completion.		10						
				11						
				12						

ENVIRONMENTAL-EXP BH LOGS - 4495 NORTH SERVICE ROAD, BURLINGTON.GPJ 4/18/19

Time	Water Level (m)	Depth to Cave (m)

EXP Services Inc.
Brampton, Ontario
Telephone: 905-793-9800
Facsimile: 905-793-0641

Log of Borehole TP9

Project No. BRM-00250233-B0 | Drawing No. B16

Project: Phase II ESA | Sheet No. 1 of 1

Location: 4495 North Service Road, Burlington ON

Refer to Borehole Location Plan

Date Drilled: December 17, 2018

Drill Type: Excavator

Datum: Relative

Chemical Analysis

BTEX	Benzene, Toluene, Ethylbenzene and Xylenes	*	Duplicate Sample
ING	Metals and Inorganics	PCB	Polychlorinated Biphenyls
MET	Metals	PHC	Petroleum Hydrocarbons (F1-F4)
PAH	Polycyclic Aromatic Hydrocarbons	VOC	Volatile Organic Compounds
PEST	Organochlorine Pesticides		

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH	N Value	Combustible Vapour Reading (ppm)	SAMPLES	% RECOV	SAMPLE ID	ANALYSIS
		TOPSOIL: dark brown, trace organics		0	20 40 60	25 50 75				
		SILTY CLAY (FILL): reddish brown, trace gravel			25 (H) 0 (I)		G		SS1	
				1	20 (H) 0 (I)		G		SS2	
					15 (H) 0 (I)		G		SS3	ING PAH
				2	25 (H) 0 (I)		G		SS4	
		SITLY CLAY (FILL): reddish brown, trace gravel, moist			15 (H) 0 (I)		G		SS5	
		SILTY CLAY: grey, moist, low plasticity		3	25 (H) 0 (I)		G		SS6	
				4	10 (H) 0 (I)		G		SS7	SIEVE
		END OF BOREHOLE		5						
		NOTES:		6						
		1) This drawing is to be read with the subject report and project number as presented above.		7						
		2) Interpretation assistance by EXP is required before use by others.		8						
		3) Combustible vapour reading by RKI Eagle calibrated with isobutylene.		9						
		4) Borehole backfilled with bentonite upon completion.		10						
				11						
				12						

ENVIRONMENTAL-EXP BH LOGS - 4495 NORTH SERVICE ROAD, BURLINGTON.GPJ 4/18/19

Time	Water Level (m)	Depth to Cave (m)

EXP Services Inc.
Brampton, Ontario
Telephone: 905-793-9800
Facsimile: 905-793-0641

Log of Borehole TP10

Project No. BRM-00250233-B0 | Drawing No. B17

Project: Phase II ESA | Sheet No. 1 of 1

Location: 4495 North Service Road, Burlington ON

Refer to Borehole Location Plan

Date Drilled: December 17, 2018

Drill Type: Excavator

Datum: Relative

Chemical Analysis

BTEX	Benzene, Toluene, Ethylbenzene and Xylenes	*	Duplicate Sample
ING	Metals and Inorganics	PCB	Polychlorinated Biphenyls
MET	Metals	PHC	Petroleum Hydrocarbons (F1-F4)
PAH	Polycyclic Aromatic Hydrocarbons	VOC	Volatile Organic Compounds
PEST	Organochlorine Pesticides		

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH	N Value	Combustible Vapour Reading (ppm)	SAMPLES	% RECOV	SAMPLE ID	ANALYSIS
		TOPSOIL: dark brown trace organics		0	20 40 60	25 50 75				
		SILTY CLAY (Fill): reddish brown, trace gravel			15 (H) 0 (I)		G		SS1	Pest PCB
				1	25 (H) 0 (I)		G		SS2	
					15 (H) 0 (I)		G		SS3	
				2	25 (H) 1 (I)		G		SS4	ING PAH
		CLAYEY SILT: grey, moist			25 (H) 1 (I)		G		SS5	
				3	15 (H) 1 (I)		G		SS6	
				4	15 (H) 1 (I)		G		SS7	
		END OF BOREHOLE		5						
		NOTES:		6						
		1) This drawing is to be read with the subject report and project number as presented above.		7						
		2) Interpretation assistance by EXP is required before use by others.		8						
		3) Combustible vapour reading by RKI Eagle calibrated with isobutylene.		9						
		4) Borehole backfilled with bentonite upon completion.		10						
				11						
				12						

ENVIRONMENTAL-EXP BH LOGS - 4495 NORTH SERVICE ROAD, BURLINGTON.GPJ 4/18/19

EXP Services Inc.
Brampton, Ontario
Telephone: 905-793-9800
Facsimile: 905-793-0641

Time	Water Level (m)	Depth to Cave (m)

Log of Borehole TP11

Project No. BRM-00250233-B0 | Drawing No. B18

Project: Phase II ESA | Sheet No. 1 of 1

Location: 4495 North Service Road, Burlington ON

Refer to Borehole Location Plan

Date Drilled: December 17, 2018

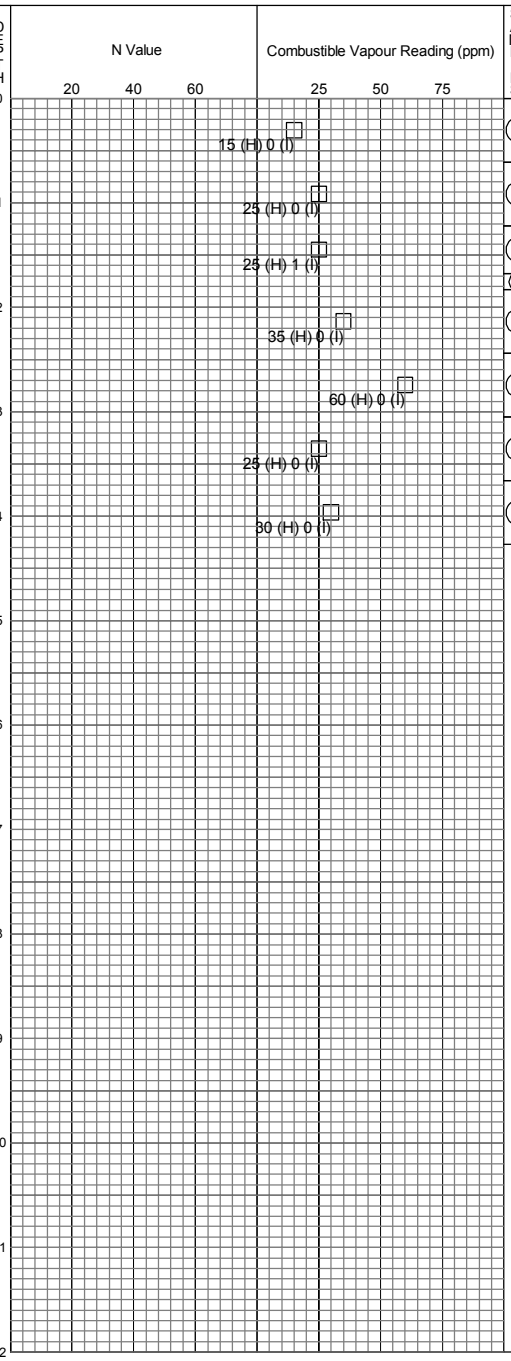
Drill Type: Excavator

Datum: Relative

Chemical Analysis

BTEX	Benzene, Toluene, Ethylbenzene and Xylenes	*	Duplicate Sample
ING	Metals and Inorganics	PCB	Polychlorinated Biphenyls
MET	Metals	PHC	Petroleum Hydrocarbons (F1-F4)
PAH	Polycyclic Aromatic Hydrocarbons	VOC	Volatile Organic Compounds
PEST	Organochlorine Pesticides		

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH
		TOPSOIL:dark brown, trace organics		0
		SHALE: weathered, red, trace fragments of limestone		1
		CLAYEY SILT: black, sulphur odour		2
		CLAYEY SILT: drk grey		3
		END OF BOREHOLE		4
		NOTES:		5
		1) This drawing is to be read with the subject report and project number as presented above.		6
		2) Interpretation assistance by EXP is required before use by others.		7
		3) Combustible vapour reading by RKI Eagle calibrated with isobutylene.		8
		4) Borehole backfilled with bentonite upon completion.		9
				10
				11
				12



SAMPLES	% RECOV	SAMPLE ID	ANALYSIS
G		SS1	
G		SS2	
G		SS3	
G		SS4	
G		SS5	ING PAH
G		SS6	PHC BTEX VOC pH
G		SS7	
G		SS8	

ENVIRONMENTAL-EXP BH LOGS - 4495 NORTH SERVICE ROAD, BURLINGTON.GPJ 4/18/19

EXP Services Inc.
Brampton, Ontario
Telephone: 905-793-9800
Facsimile: 905-793-0641

Time	Water Level (m)	Depth to Cave (m)

Log of Borehole TP12

Project No. BRM-00250233-B0 | Drawing No. B19

Project: Phase II ESA | Sheet No. 1 of 1

Location: 4495 North Service Road, Burlington ON

Refer to Borehole Location Plan

Date Drilled: December 17, 2018

Drill Type: Excavator

Datum: Relative

Chemical Analysis

BTEX	Benzene, Toluene, Ethylbenzene and Xylenes	*	Duplicate Sample
ING	Metals and Inorganics	PCB	Polychlorinated Biphenyls
MET	Metals	PHC	Petroleum Hydrocarbons (F1-F4)
PAH	Polycyclic Aromatic Hydrocarbons	VOC	Volatile Organic Compounds
PEST	Organochlorine Pesticides		

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH	N Value	Combustible Vapour Reading (ppm)	SAMPLES	% RECOV	SAMPLE ID	ANALYSIS
		TOPSOIL: dark brown, moist, trace organics		0	20 40 60	25 50 75	G		SS1	
		SHALE: weathered, red, trace fragments of limestone		1	15 (H) 1 (I)		G		SS2	
		SILTY CLAY (FILL): reddish brown, moist		2	15 (H) 1 (I)	25 (H) 0 (I)	G		SS3	
						5 (H) 1 (I)	G		SS4	
				3		10 (H) 0 (I)	G		SS5	
		SILTY CLAY: grey/reddish brown, moist				10 (H) 1 (I)	G		SS6	ING PAH
				4		15 (H) 1 (I)	G		SS7	
		END OF BOREHOLE		5						
		NOTES:		6						
		1) This drawing is to be read with the subject report and project number as presented above.		7						
		2) Interpretation assistance by EXP is required before use by others.		8						
		3) Combustible vapour reading by RKI Eagle calibrated with isobutylene.		9						
		4) Borehole backfilled with bentonite upon completion.		10						
				11						
				12						

ENVIRONMENTAL-EXP BH LOGS - 4495 NORTH SERVICE ROAD, BURLINGTON.GPJ 4/18/19

Time	Water Level (m)	Depth to Cave (m)

EXP Services Inc.
Brampton, Ontario
Telephone: 905-793-9800
Facsimile: 905-793-0641

APPENDIX III

Pinchin's Borehole Logs

Log of Borehole: BH201

Project #: 318728.000 **Logged By:** JL

Project: Geotechnical Investigation

Client: Cooper Construction Limited

Location: 1250 Appleby Line, Burlington, ON

Drill Date: November 21, 2022 **Project Manager:** VM

SUBSURFACE PROFILE

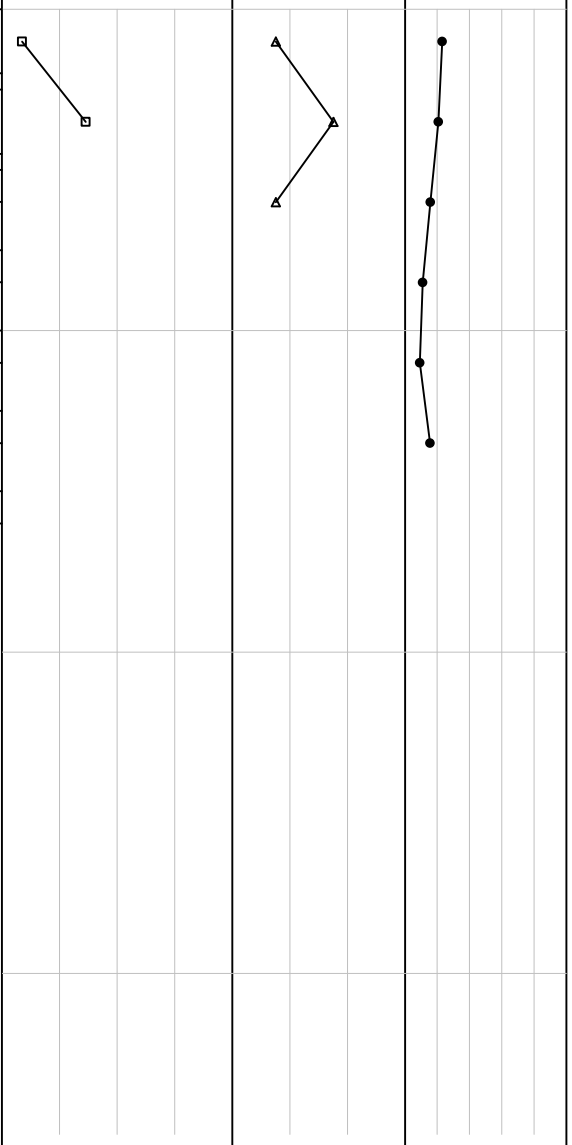
Depth (m)	Symbol	Description	Elevation (m)
0		Ground Surface	123.00
		Possible Fill Brown silty clay, trace sand and gravel, firm to stiff, DTPL	122.24
1		Reddish brown, very stiff	121.47
		Shale Highly weathered reddish brown shale, very dense, damp to moist; grey limestone interlayers	
2			
3			
4			118.40
		Unsampled	
5			
6			
7			115.38
		End of Borehole Borehole was advanced to 7.6 mbgs and a monitoring well was installed.	
8			
9			
10			

Monitoring Well Details: Riser, Bentonite, Silica Sand, Screen

Water level = 1.4 mbgs, as measured on Dec 12, 2022

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-Value
SS	1	50	7
SS	2	60	29
SS	3	30	>50
SS	4	10	>50
SS	5	10	>50
SS	6	10	>50
SS	7	0	>50



Contractor: Pontill Drilling Inc.

Grade Elevation: 123.0 masl

Drilling Method: Solid Stem Augers

Top of Casing Elevation: 124.2 masl

Well Casing Size: 51 mm

Sheet: 1 of 1

Log of Borehole: BH202

Project #: 318728.000 **Logged By:** JL

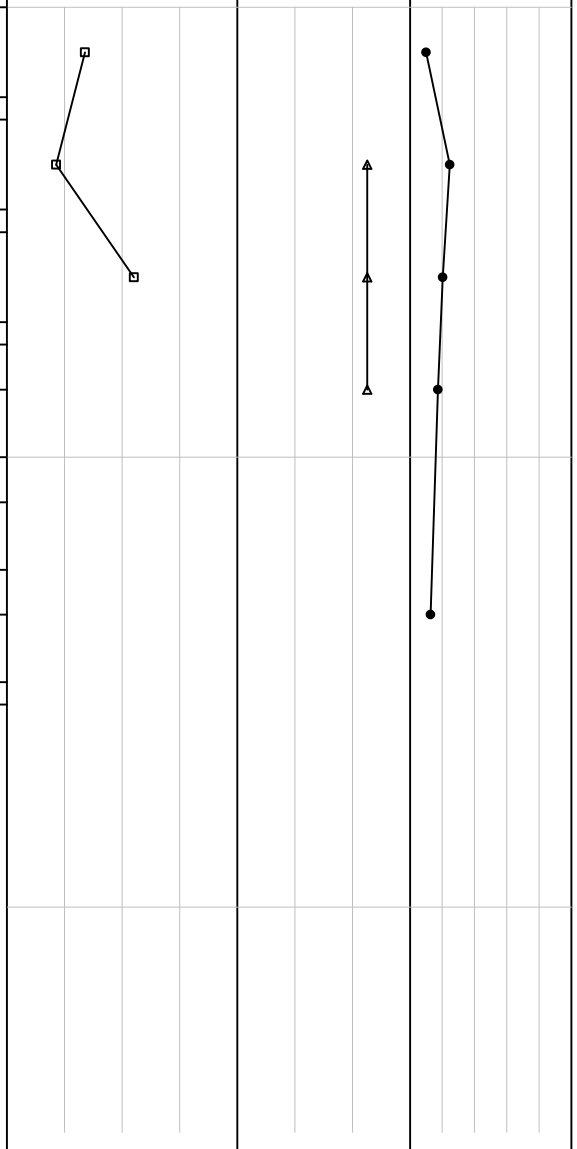
Project: Geotechnical Investigation

Client: Cooper Construction Limited

Location: 1250 Appleby Line, Burlington, ON

Drill Date: November 24, 2022 **Project Manager:** VM

Depth (m)	Symbol	Description	Elevation (m)	Monitoring Well Details	Sample Type	Sampler #	Recovery (%)	SPT N-Value
		Ground Surface	122.80					
0		**Fill** Grey sand and gravel, compact, moist; pieces of slag, clay inclucions, APL	122.04	No Monitoring Well Installed	SS	1	50	27
1		Reddish brown silty clay, trace sand and gravel, stiff to very stiff, DTPL; clay inclusions	121.73		SS	2	60	17
2		**Shale** Highly weathered reddish brown shale, compact to very dense, damp to moist; grey shale inclusions			SS	3	30	44
					SS	4	10	>50
3					SS	5	10	>50
4					SS	6	10	>50
		Wet	118.23		SS	7	0	>50
5		End of Borehole Borehole was terminated at 4.6 mbgs. at drilling completion water was measured at 4.0 mbgs.						
6								
7								



Contractor: Pontill Drilling Inc.

Grade Elevation: 122.8 masl

Drilling Method: Solid Stem Augers

Top of Casing Elevation: NA

Well Casing Size: NA

Sheet: 1 of 1

Log of Borehole: BH203

Project #: 318728.000 **Logged By:** JL

Project: Geotechnical Investigation

Client: Cooper Construction Limited

Location: 1250 Appleby Line, Burlington, ON

Drill Date: November 22, 2022 **Project Manager:** VM

SUBSURFACE PROFILE

Depth (m)	Description	Elevation (m)
0	Ground Surface	124.80
	Possible Fill Brown sandy silt, some gravel, loose, moist	124.04
1	Brown silty clay, trace sand and gravel, very stiff, DTPL	123.28
	Silty Clay Till Mottled grey brown silty clay, trace sand and gravel, very stiff, DTPL	122.51
2	***Shale*** Highly weathered reddish brown shale, very dense, damp	
3		
		120.84
4	Grey limestone interlayers	120.53
	Wet	120.20
	Unsampled	
5		
6		118.70
	End of Borehole	
7	Borehole was advanced to 6.1 mbgs and a monitoring well was installed.	
8		
9		

Monitoring Well Details: Riser, Bentonite, Silica Sand, Screen

Water level = 3.7 mbgs, as measured on Dec 12, 2022

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-Value
SS	1	40	6
SS	2	30	16
SS	3	40	13
SS	4	20	>50
SS	5	0	>50
SS	6	10	>50
SS	7	10	>50

Standard Penetration N-Value: 20, 40, 60

Shear Strength kPa: 100, 200

Water Content %: 10, 20, 30, 40

Contractor: Pontill Drilling Inc.

Grade Elevation: 124.8 masl

Drilling Method: Solid Stem Augers

Top of Casing Elevation: 125.7 masl

Well Casing Size: 51 mm

Sheet: 1 of 1

Log of Borehole: BH204

Project #: 318728.000 **Logged By:** JL

Project: Geotechnical Investigation

Client: Cooper Construction Limited

Location: 1250 Appleby Line, Burlington, ON

Drill Date: November 23, 2022 **Project Manager:** VM

SUBSURFACE PROFILE

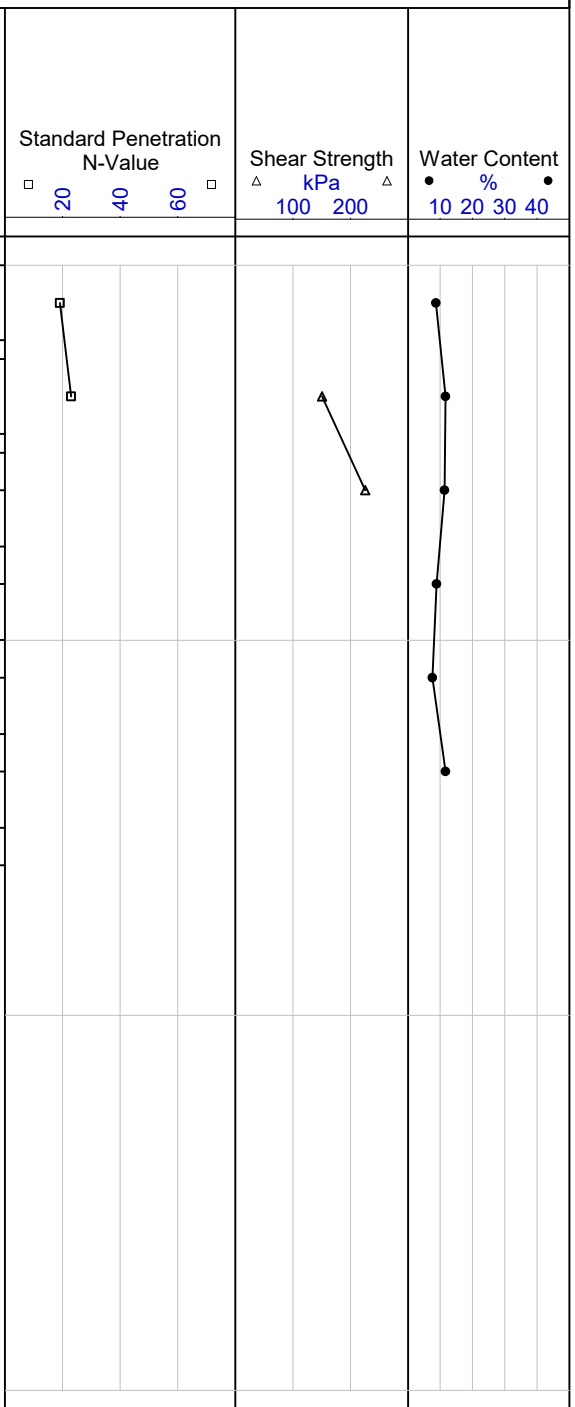
Depth (m)	Symbol	Description	Elevation (m)
0		Ground Surface	124.00
		Fill Grey sand and gravel, compact, moist	
1		Black, damp	123.08
		Silty Clay Till Reddish brown silty clay, trace sand and gravel, very stiff, DTPL	122.32
2		**Shale** Reddish brown highly weathered shale, very dense, damp to moist	
3			
4			119.40
		Unsampled	
5			
6			117.90
		End of Borehole	
7		Borehole was advanced to 6.1 mbgs and a monitoring well was installed.	
8			
9			

Monitoring Well Details: Riser, Bentonite, Silica Sand, Screen

Water level = 2.7 mbgs, as measured on Dec 12, 2022

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-Value
SS	1	70	19
SS	2	70	23
SS	3	60	>50
SS	4	40	>50
SS	5	20	>50
SS	6	10	>50
SS	7	0	>50



Contractor: Pontill Drilling Inc.

Grade Elevation: 124.0 masl

Drilling Method: Solid Stem Augers

Top of Casing Elevation: 125.0 masl

Well Casing Size: 51 mm

Sheet: 1 of 1

Log of Borehole: BH205

Project #: 318728.000 **Logged By:** JL

Project: Geotechnical Inestigation

Client: Cooper Construction Limited

Location: 1250 Appleby Line, Burlington, ON

Drill Date: November 24, 2022 **Project Manager:** VM

SUBSURFACE PROFILE

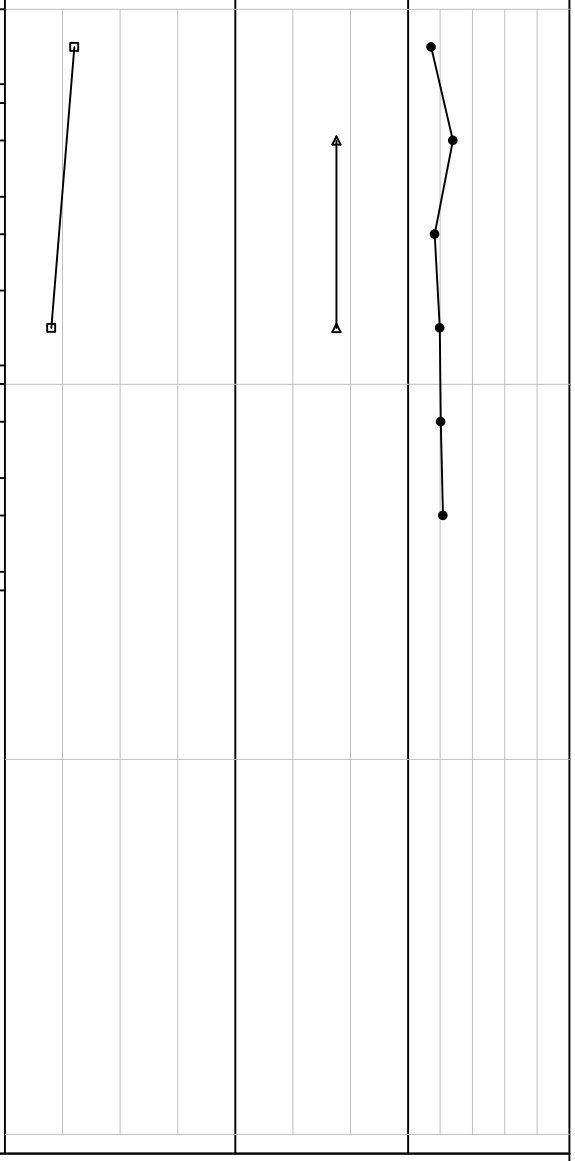
Depth (m)	Description	Elevation (m)
0	Ground Surface	123.20
	Fill Grey sand and gravel, compact, moist	122.67
	Black, pieces of slag, damp	122.44
1	Reddish brown silt and clay, some gravel, stiff to very stiff, DTPL to APL	121.68
	Possible Fill Reddish brown silty clay, trace sand and gravel, very stiff, DTPL; pieces of cobble	120.91
2	**Shale** Highly weathered reddish brown shale, very dense, damp to moist; grey limestone inter layer	120.15
3	compact	
	Wet	
4		118.60
	End of Borehole	
5		
6	Borehole was advanced to 4.6 mbgs and a monitoring well was installed.	
7		
8		
9		

Monitoring Well Details: Riser, Bentonite, Screen, Silica Sand

Water level = 2.0 mbgs, as measured on Dec 12, 2022

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-Value
SS	1	40	24
SS	2	30	>50
SS	3	40	>50
SS	4	20	16
SS	5	0	>50
SS	6	10	>50
	7		>50



Contractor: Pontill Drilling Inc.

Grade Elevation: 123.2 masl

Drilling Method: Solid Stem Augers

Top of Casing Elevation: 123.1 masl

Well Casing Size: 51 mm

Sheet: 1 of 1

Log of Borehole: BH206

Project #: 318728.000 **Logged By:** JL

Project: Geotechnical Inestigation

Client: Cooper Construction Limited

Location: 1250 Appleby Line, Burlington, ON

Drill Date: November 21, 2022 **Project Manager:** VM

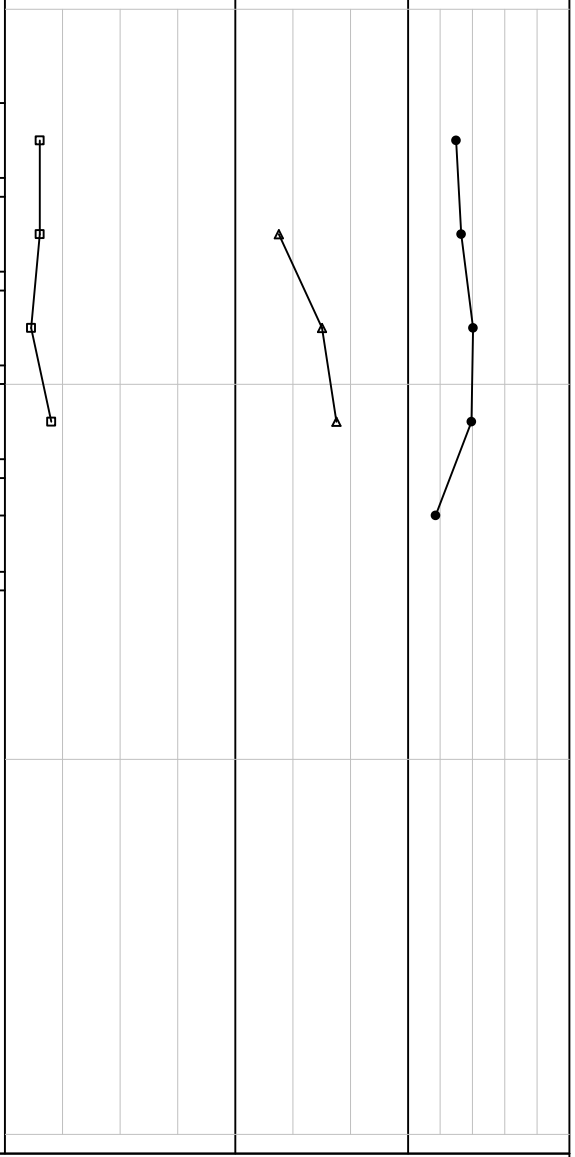
SUBSURFACE PROFILE

Depth (m)	Symbol	Description	Elevation (m)
0		Ground Surface	126.60
		Fill Brown silty clay, trace sand and gravel, damp	125.84
1		Reddish brown, stiff, DTPL; pieces of cobble	125.07
2		Grey Interlayers, APL	124.31
		Grey brown silty clay, trace sand and gravel, stiff, DTPL to APL; trace black inclusions	122.79
3			
4		***Shale*** Highly weathered reddish brown shale, very dense, damp to moist; grey limestone inter layer	122.00
		End of Borehole	
5		Borehole terminated at 4.6 mbgs, at drilling completion the borehole was open and dry.	
6			
7			
8			
9			

Monitoring Well Details: No Monitoring Well Installed

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-Value
SS	1	20	12
SS	2	20	12
SS	3	60	9
SS	4	70	16
SS	5	10	>50
	6		>50



Contractor: Pontill Drilling Inc. **Grade Elevation:** 126.6 masl

Drilling Method: Solid Stem Augers **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH207

Project #: 318728.000 **Logged By:** JL

Project: Geotechnical Inestigation

Client: Cooper Construction Limited

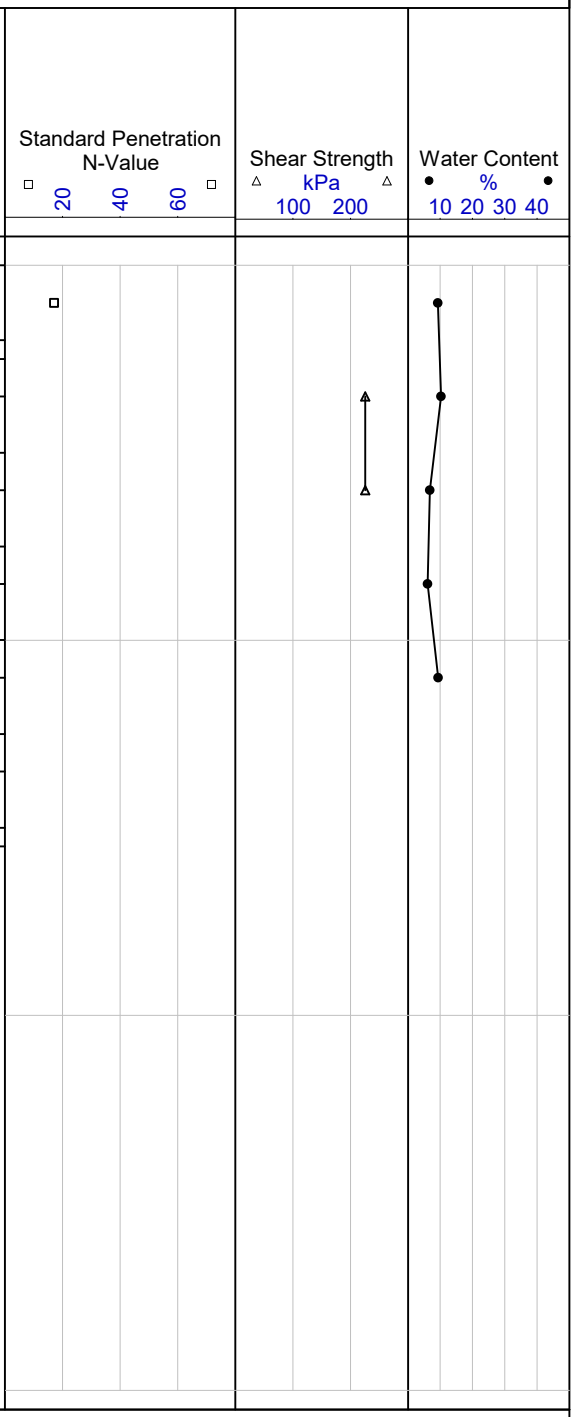
Location: 1250 Appleby Line, Burlington, ON

Drill Date: November 25, 2022 **Project Manager:** VM

Depth (m)	Description	Elevation (m)
0	Ground Surface	123.50
	Fill Brown sand and gravel, compact, moist	122.97
1	**Silty Clay Till** Reddish brown silty clay, some sand and gravel, stiff to very stiff, DTPL	122.43
	Pieces of cobble	121.97
2	**Shale** Highly weathered reddish brown shale, very dense, damp to moist; grey limestone interlayers	
3	Wet	120.45
4		118.90
	End of Borehole	
5	Borehole terminated at 4.6 mbgs, at drilling completion water was measured at 2.7 mbgs.	

Monitoring Well Details: No Monitoring Well Installed

Sample Type	Sampler #	Recovery (%)	SPT N-Value
SS	1	60	17
SS	2	50	>50
SS	3	50	>50
SS	4	10	>50
SS	5	10	>50
SS	6	0	>50
	7		>50



Contractor: Pontill Drilling Inc. **Grade Elevation:** 123.5 masl

Drilling Method: Solid Stem Augers **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH208

Project #: 318728.000 **Logged By:** JL

Project: Geotechnical Inestigation

Client: Cooper Construction Limited

Location: 1250 Appleby Line, Burlington, ON

Drill Date: November 25, 2022 **Project Manager:** VM

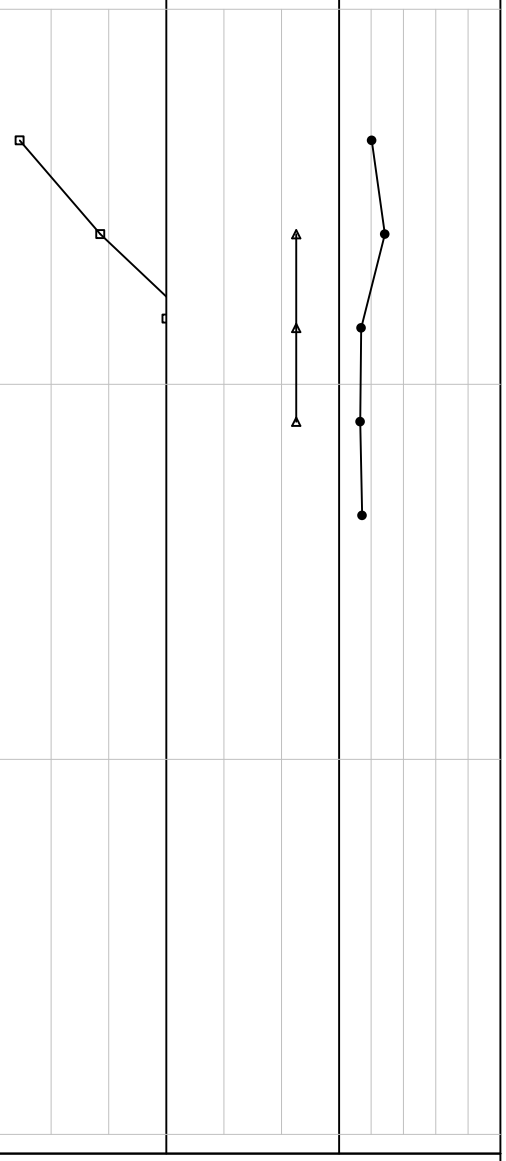
SUBSURFACE PROFILE

Depth (m)	Symbol	Description	Elevation (m)
0		Ground Surface	124.40
		Fill Brown sand and gravel, moist	123.64
1		Dark grey silty clay, trace gravel, pieces of slag, very stiff, APL to WTPL	123.18
		Silty Clay Till Reddish brown silty clay, stiff to very stiff, APL	122.12
2		***Shale*** Highly weathered reddish brown shale, damp to moist; grey limestone interlayers	
3			
4			119.80
		End of Borehole	
5		Borehole terminated at 4.6 mbgs, at drilling completion the borehole was open and dry.	
6			
7			
8			
9			

Monitoring Well Details: No Monitoring Well Installed

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-Value
SS	1	60	29
SS	2	80	57
SS	3	70	88
SS	4	20	>50
SS	5	30	>50
	6		>50



Contractor: Pontill Drilling Inc. **Grade Elevation:** 124.4 masl

Drilling Method: Solid Stem Augers **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH209

Project #: 318728.000 **Logged By:** JL

Project: Geotechnical Inestigation

Client: Cooper Construction Limited

Location: 1250 Appleby Line, Burlington, ON

Drill Date: November 22, 2022 **Project Manager:** VM

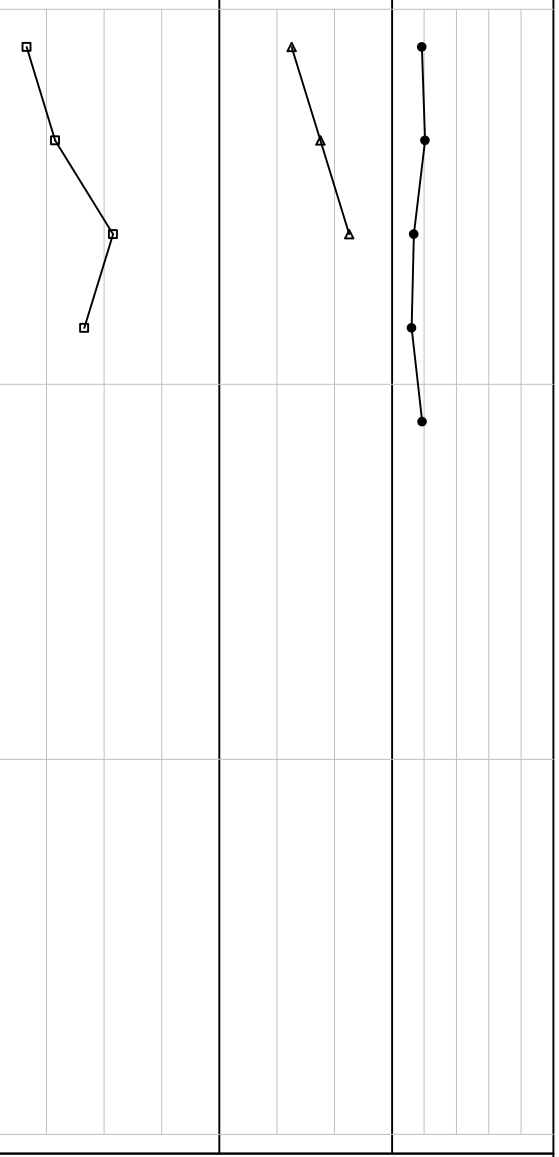
SUBSURFACE PROFILE

Depth (m)	Symbol	Description	Elevation (m)
0		Ground Surface	124.60
		Fill Brown silty clay, trace gravel, stiff, APL; pieces of slag, concrete debris	124.07
1		***Silty Clay Till*** Reddish brown silty clay, trace sand and gravel, stiff, DTPL	123.08
2		***Shale*** Highly weathered reddish brown shale, dense to very dense, damp to moist; grey limestone interlayers	
3			
			120.79
4		Wet	
			120.00
		End of Borehole	
5		Borehole terminated at 4.6 mbgs, at drilling completion water was measured at 3.2 mbgs.	
6			
7			
8			
9			

Monitoring Well Details: No Monitoring Well Installed

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-Value
SS	1	60	13
SS	2	50	23
SS	3	50	43
SS	4	70	33
SS	5	0	>50
SS	6	10	>50
	7		>50



Contractor: Pontill Drilling Inc. **Grade Elevation:** 124.6 masl

Drilling Method: Solid Stem Augers **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH210

Project #: 318728.000 **Logged By:** JL

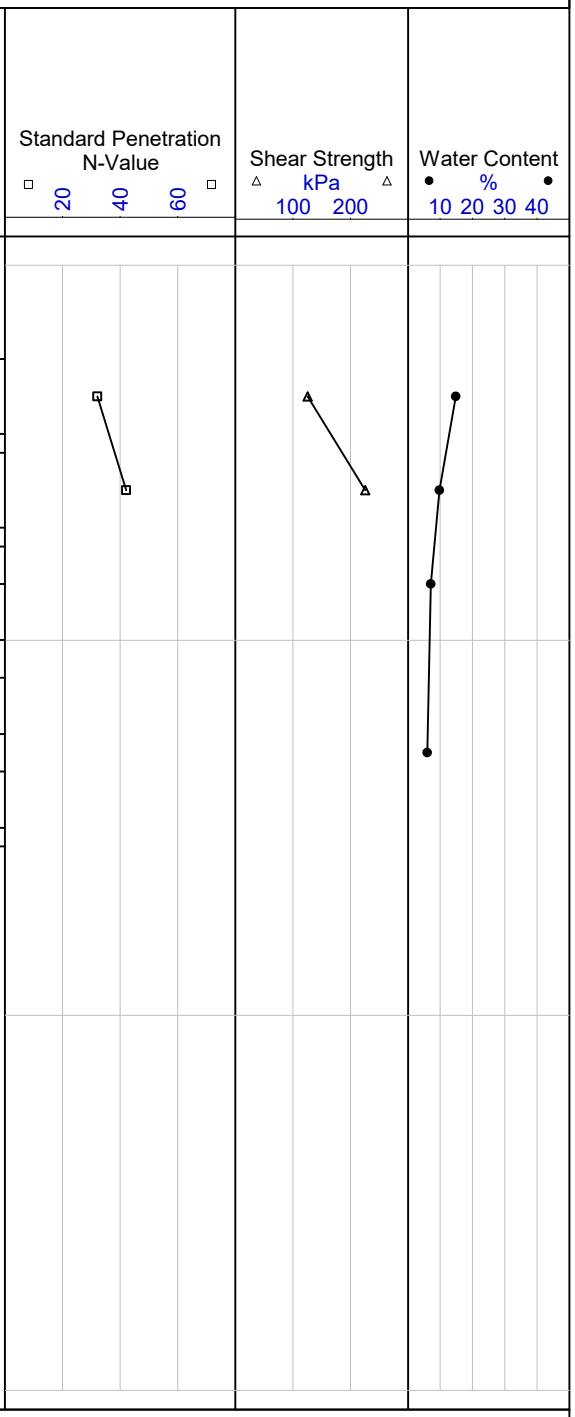
Project: Geotechnical Inestigation

Client: Cooper Construction Limited

Location: 1250 Appleby Line, Burlington, ON

Drill Date: November 22, 2022 **Project Manager:** VM

Depth (m)	Description	Elevation (m)	Monitoring Well Details	Sample Type	Sampler #	Recovery (%)	SPT N-Value
0	Ground Surface	125.20	No Monitoring Well Installed				
	Possible Fill Brown silty clay, some gravel, DTPL	124.44					
1	**Silty Clay Till** Reddish brown silty clay, trace sand and gravel, very stiff, DTPL	123.98		SS	1	70	32
	Greenish grey inclusions	123.68					
2	Silty clay, hard, DTPL	122.76		SS	2	70	42
				SS	3	20	>50
3	**Shale** Highly weathered reddish brown shale, very dense, damp to moist; grey limestone interlayers			SS	4	0	>50
4				SS	5	10	>50
		120.60			6		>50
5	End of Borehole Borehole terminated at 4.6 mbgs, at drilling completion the borehole was open and dry.						
6							
7							
8							
9							



Contractor: Pontill Drilling Inc. **Grade Elevation:** 125.2 masl

Drilling Method: Solid Stem Augers **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH211

Project #: 318728.000 **Logged By:** JL

Project: Geotechnical Inestigation

Client: Cooper Construction Limited

Location: 1250 Appleby Line, Burlington, ON

Drill Date: November 22, 2022 **Project Manager:** VM

Depth (m)	Description	Elevation (m)	Sample Type	Sampler #	Recovery (%)	SPT N-Value
0	Ground Surface	125.21				
	Fill Grey sand and gravel, moist	124.45				
1	**Silty Clay Till** Reddish brown silty clay, trace sand and gravel, stiff to very stiff, DTPL to APL		SS	1	60	13
		123.38	SS	2	60	48
2	Silty clay, greenish grey interlayers, hard	122.47	SS	3	60	42
3	Pieces of rock, stiff to very stiff	122.16				
	Shale Highly weathered reddish brown shale, very stiff, damp to moist		SS	4	30	>50
4			SS	5	0	>50
		120.62		6		>50
5	End of Borehole Borehole terminated at 4.6 mbgs, at drilling completion the borehole was open and dry.					
6						
7						
8						
9						

Monitoring Well Details: No Monitoring Well Installed

Standard Penetration N-Value: 20, 40, 60

Shear Strength: kPa, 100, 200

Water Content: %, 10, 20, 30, 40

Contractor: Pontill Drilling Inc. **Grade Elevation:** 125.1 masl

Drilling Method: Solid Stem Augers **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH212

Project #: 318728.000 **Logged By:** JL

Project: Geotechnical Inestigation

Client: Cooper Construction Limited

Location: 1250 Appleby Line, Burlington, ON

Drill Date: November 25, 2022 **Project Manager:** VM

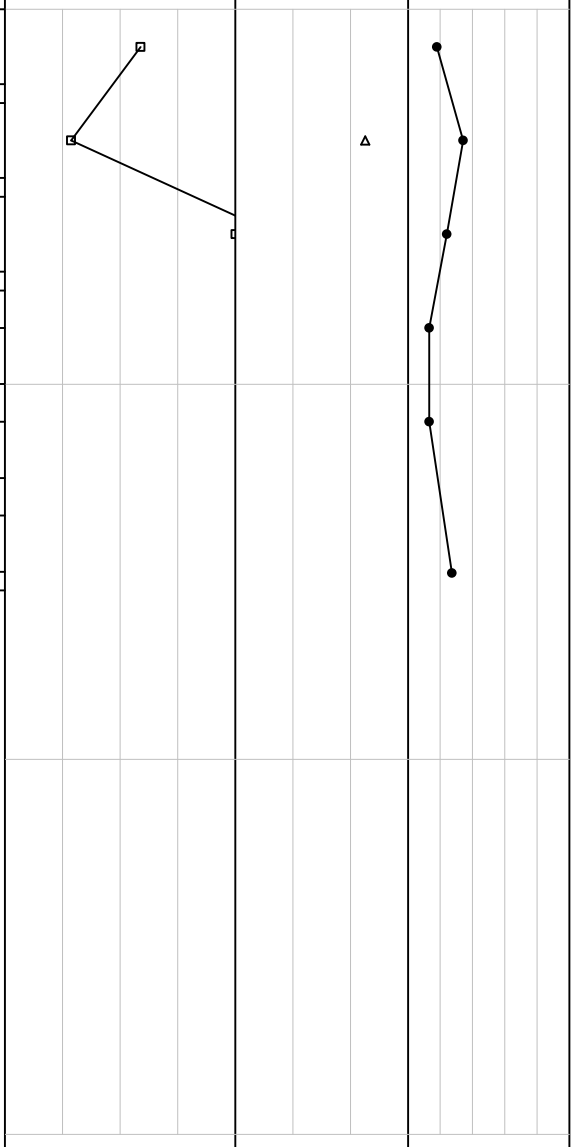
SUBSURFACE PROFILE

Depth (m)	Symbol	Description	Elevation (m)
0		Ground Surface	124.50
		Fill Brown sand and gravel, dense, damp; pieces of slag	123.74
1		***Silty Clay Till*** Reddish brown silty clay, trace sand and gravel, very stiff, DTPL	122.97
2		***Shale*** Highly weathered reddish brown shale, damp to moist; grey limestone interlayers	
3			
4			119.93
		Wet	119.72
5		End of Borehole	
		Borehole terminated at 4.8 mbgs, at drilling completion water was measured at 4.0 mbgs.	
6			
7			
8			
9			

Monitoring Well Details: No Monitoring Well Installed

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-Value
SS	1	70	47
SS	2	70	23
SS	3	60	94
SS	4	20	>50
SS	5	10	>50
SS	6	0	>50
	7		>50



Contractor: Pontill Drilling Inc. **Grade Elevation:** 124.5 masl

Drilling Method: Solid Stem Augers **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH213

Project #: 318728.000 **Logged By:** JL

Project: Geotechnical Inestigation

Client: Cooper Construction Limited

Location: 1250 Appleby Line, Burlington, ON

Drill Date: November 25, 2022 **Project Manager:** VM

Depth (m)	Symbol	Description	Elevation (m)	Monitoring Well Details	Sample Type	Sampler #	Recovery (%)	SPT N-Value
0		Ground Surface	124.40	No Monitoring Well Installed				
		Fill Brown sand and gravel, moist	123.64					
1		***Silty Clay Till*** Reddish brown silty clay, trace sand and gravel, very stiff to hard, DTPL	122.88		SS	1	70	68
		Shale Highly weathered reddish brown shale, very dense, damp to moist; grey limestone interlayers			SS	2	20	>50
2					SS	3	20	>50
3					SS	4	0	>50
4			119.80		SS	5	10	>50
		End of Borehole				6		>50
5		Borehole terminated at 4.6 mbgs, at drilling completion water was measured at 3.4 mbgs.						
6								
7								
8								
9								

Standard Penetration N-Value: 20, 40, 60

Shear Strength kPa: 100, 200

Water Content %: 10, 20, 30, 40

Contractor: Pontill Drilling Inc.

Grade Elevation: 124.4 masl

Drilling Method: Solid Stem Augers

Top of Casing Elevation: NA

Well Casing Size: NA

Sheet: 1 of 1

Log of Borehole: BH214

Project #: 318728.000 **Logged By:** JL

Project: Geotechnical Inestigation

Client: Cooper Construction Limited

Location: 1250 Appleby Line, Burlington, ON

Drill Date: November 21, 2022 **Project Manager:** VM

Depth (m)	Description	Elevation (m)	Sample Type	Sampler #	Recovery (%)	SPT N-Value
0	Ground Surface	124.70				
	Possible Fill Brown silty clay, DTPL	123.94				
1	**Shale** Highly weathered reddish brown shale, very dense, damp to moist; grey limestone interlayers		SS	1	70	54
			SS	2	10	>50
2			SS	3	0	>50
3			SS	4	20	>50
		120.89				
4	Wet		SS	5	10	>50
		120.10		6		>50
	End of Borehole					
5	Borehole terminated at 4.6 mbgs, at drilling completion water was measured at 3.4 mbgs.					
6						
7						
8						
9						

Monitoring Well Details: No Monitoring Well Installed

Standard Penetration N-Value: 20, 40, 60

Shear Strength: kPa, 100, 200

Water Content: %, 10, 20, 30, 40

Contractor: Pontill Drilling Inc.

Grade Elevation: 124.7 masl

Drilling Method: Solid Stem Augers

Top of Casing Elevation: NA

Well Casing Size: NA

Sheet: 1 of 1

Log of Borehole: BH215

Project #: 318728.000 **Logged By:** JL

Project: Geotechnical Investigation

Client: Cooper Construction Limited

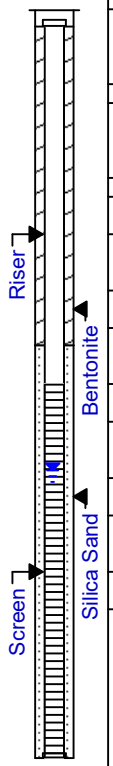
Location: 1250 Appleby Line, Burlington, ON

Drill Date: November 21, 2022 **Project Manager:** VM

SUBSURFACE PROFILE

Depth (m)	Symbol	Description	Elevation (m)
0		Ground Surface	125.10
		Fill Grey sand and gravel, trace cobbles pieces, dense, wet	124.34
1		***Silty Clay Till*** Reddish brown silty clay, trace sand and gravel, very stiff, DTPL to APL; pieces of broken limestone	123.58
2		***Shale*** Highly weathered reddish brown shale, very dense, damp to moist	
3			
4			120.50
5		***Unsampled***	
6			119.00
		End of Borehole	
7		Borehole advanced to 6.1 mbgs, a monitoring well was installed upon drilling completion.	
8			
9			

Monitoring Well Details



Water level = 3.8 mbgs, as measured on Dec 12, 2022

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-Value
SS	1	20	35
SS	2	70	20
SS	3	20	>50
SS	4	10	>50
SS	5	10	>50
SS	6	0	>50
SS	7	0	>50

Standard Penetration N-Value (20, 40, 60)



Shear Strength kPa (100, 200)

Water Content % (10, 20, 30, 40)



Contractor: Pontill Drilling Inc.

Grade Elevation: 125.1 masl

Drilling Method: Solid Stem Augers

Top of Casing Elevation: 125.0 masl

Well Casing Size: 51 mm

Sheet: 1 of 1

Log of Borehole: BH216

Project #: 318728.000 **Logged By:** JL

Project: Geotechnical Investigation

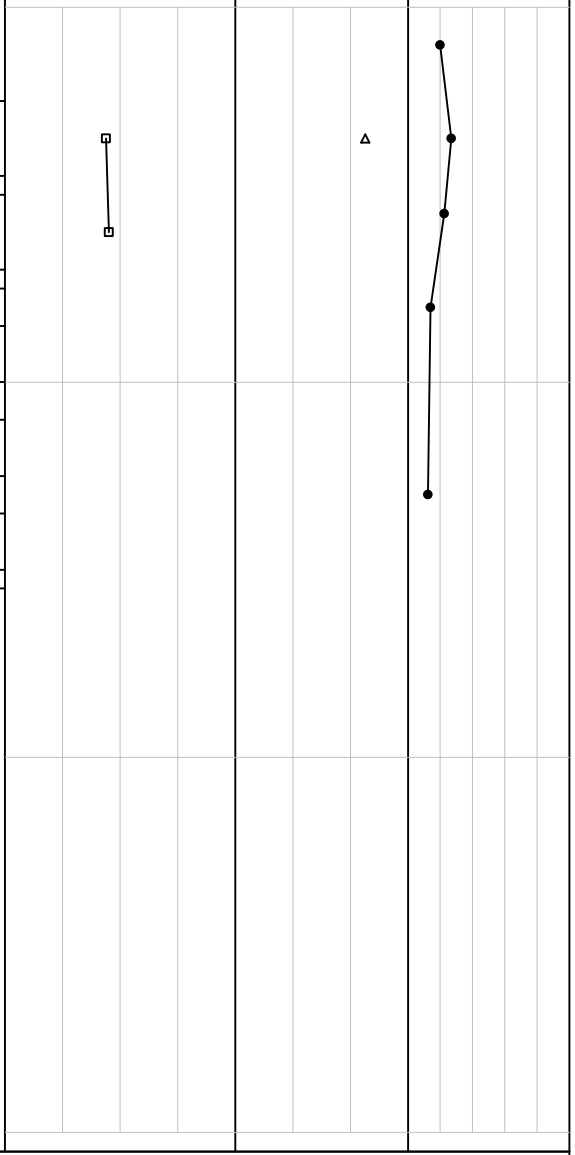
Client: Cooper Construction Limited

Location: 1250 Appleby Line, Burlington, ON

Drill Date: November 25, 2022 **Project Manager:** VM

Depth (m)	Description	Elevation (m)	Sample Type	Sampler #	Recovery (%)	SPT N-Value
0	Ground Surface	125.20				
	Fill Brown sand and gravel, dense, moist	125.02				
	Black, some slag, damp	124.44				
1	Reddish brown silty clay, some gravel, very stiff to hard, DTPL; trace asphalt pieces	123.68	SS	1	70	35
	Shale Highly weathered reddish brown shale, very dense, damp to moist		SS	2	70	36
2			SS	3	10	>50
3			SS	4	20	>50
4			SS	5	0	>50
		120.60		6		>50
5	End of Borehole					
	Borehole was terminated at 4.6 mbgs, at drilling completion a dry cave was measured at 4.2 mbgs.					
6						
7						
8						
9						

Monitoring Well Details: No Monitoring Well Installed



Contractor: Pontill Drilling Inc. **Grade Elevation:** 125.2 masl

Drilling Method: Solid Stem Augers **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH217

Project #: 318728.000 **Logged By:** JL

Project: Geotechnical Investigation

Client: Cooper Construction Limited

Location: 1250 Appleby Line, Burlington, ON

Drill Date: November 23, 2022 **Project Manager:** VM

SUBSURFACE PROFILE

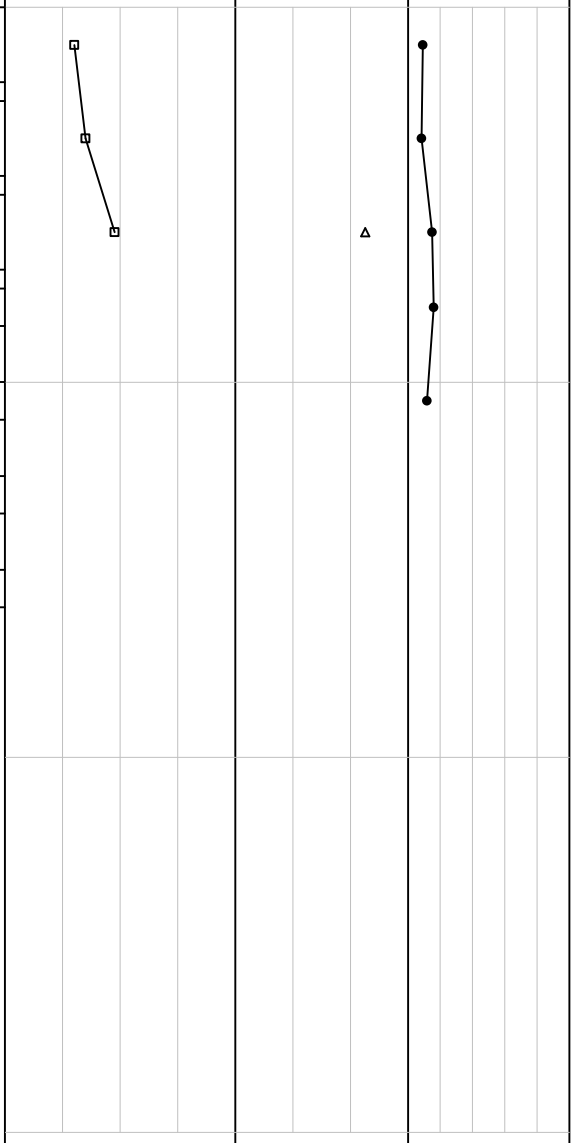
Depth (m)	Symbol	Description	Elevation (m)
0		Ground Surface	125.80
		Fill Grey sand and gravel, compact, damp	
			124.12
2		**Silty Clay Till** Reddish brown silty clay, trace sand and gravel, hard, DTPL; pieces of limestone	123.51
		Shale Highly weathered reddish brown shale, very dense, damp to moist	
			121.18
5		**Unsampled**	
			119.70
6		End of Borehole	
8		Borehole was advanced to 6.1 mbgs, at drilling completion a monitoring well was installed.	

Monitoring Well Details: Riser; Bentonite; Silica Sand; Screen

Water level = 4.3 mbgs, as measured on Dec 12, 2022

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-Value
SS	1	70	24
SS	2	60	28
SS	3	60	38
SS	4	20	>50
SS	5	20	>50
SS	6	0	>50
SS	7	0	>50



Contractor: Pontill Drilling Inc.

Grade Elevation: 125.8 masl

Drilling Method: Solid Stem Augers

Top of Casing Elevation: 126.8 masl

Well Casing Size: 51 mm

Sheet: 1 of 1

Log of Borehole: BH218

Project #: 318728.000 **Logged By:** JL

Project: Geotechnical Investigation

Client: Cooper Construction Limited

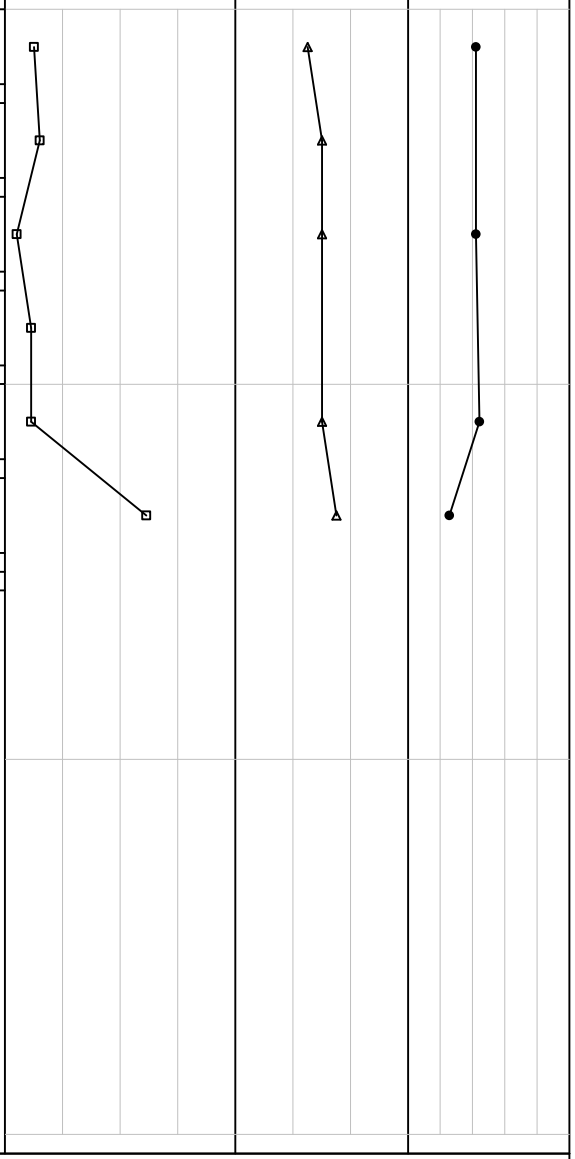
Location: 1250 Appleby Line, Burlington, ON

Drill Date: November 21, 2022 **Project Manager:** VM

Depth (m)	Description	Elevation (m)
0	Ground Surface	126.50
	Fill Brown silty clay, stiff to very stiff, DTPL; trace pieces of slag	125.74
1	Reddish brown silty clay, trace sand and gravel, DTPL	124.98
	Firm, APL; light brown silt inclusions, damp	124.22
2	Piece of wood in tip of sampler	123.45
3	Grey brown silty clay, trace sand and gravel, stiff to very stiff, APL	122.69
4	Trace to some sand and gravel, piece of metal	121.93
	Shale Highly weathered reddish brown shale, very dense, damp to moist	
5	End of Borehole	
6		
7	Borehole was terminated at 4.7 mbgs, at drilling completion a dry cave was measured at 4.6 mbgs.	
8		
9		

Monitoring Well Details: No Monitoring Well Installed

Sample Type	Sampler #	Recovery (%)	SPT N-Value
SS	1	70	10
SS	2	50	12
SS	3	50	4
SS	4	0	9
SS	5	60	9
SS	6	70	49
	7		>50



Contractor: Pontill Drilling Inc. **Grade Elevation:** 126.5 masl

Drilling Method: Solid Stem Augers **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH219

Project #: 318728.000 **Logged By:** JL

Project: Geotechnical Investigation

Client: Cooper Construction Limited

Location: 1250 Appleby Line, Burlington, ON

Drill Date: November 21, 2022 **Project Manager:** VM

Depth (m)	Description	Elevation (m)	Sample Type	Sampler #	Recovery (%)	SPT N-Value
0	Ground Surface	124.20				
	Fill Grey sand and gravel, moist	123.44				
1	**Shale** Highly weathered reddish brown shale, damp to moist; grey limestone interlayers		SS	1	20	>50
2			SS	2	20	>50
3			SS	3	10	>50
			SS	4	70	51
		120.39				
4	Wet		SS	5	20	>50
		119.58		6		>50
5	End of Borehole					
6	Borehole was terminated at 4.7 mbgs, at drilling completion a water was measured at 4.0 mbgs.					
7						
8						
9						

Monitoring Well Details: No Monitoring Well Installed

Standard Penetration N-Value: □ 20 40 60 □

Shear Strength: △ kPa △ 100 200

Water Content: ● % ● 10 20 30 40

Contractor: Pontill Drilling Inc.

Grade Elevation: 124.2 masl

Drilling Method: Solid Stem Augers

Top of Casing Elevation: NA

Well Casing Size: NA

Sheet: 1 of 1

Log of Borehole: BH220

Project #: 318728.000 **Logged By:** JL

Project: Geotechnical Investigation

Client: Cooper Construction Limited

Location: 1250 Appleby Line, Burlington, ON

Drill Date: November 24, 2022 **Project Manager:** VM

SUBSURFACE PROFILE

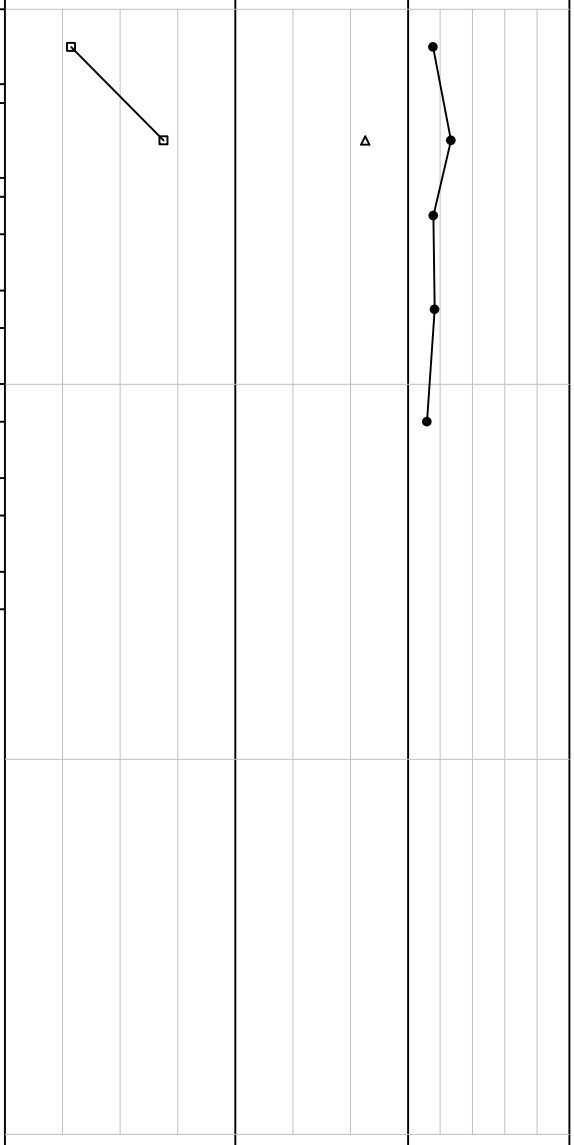
Depth (m)	Symbol	Description	Elevation (m)
0		Ground Surface	124.60
		Fill Grey sand and gravel, moist; pieces of slag	124.07
1		Reddish brown silty clay, trace to some some sand gravel, very stiff, DTPL	123.38
		Greenish grey, trace slag, limestone pieces	123.08
2		**Shale** Highly weathered reddish brown shale, very dense, damp to moist	
3			
4			120.03
		Wet	
5		**Unsampled**	
6			118.51
		End of Borehole	
7		Borehole was advanced to 6.1 mbgs, a monitoring well was installed upon completion.	
8			
9			

Monitoring Well Details: Riser, Bentonite, Silica Sand, Screen

Water level = 3.2 mbgs, as measured on Dec 12, 2022

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-Value
SS	1	80	23
SS	2	70	55
SS	3	20	>50
SS	4	30	>50
SS	5	10	>50
SS	6	0	>50
SS	7	0	>50



Contractor: Pontill Drilling Inc.

Grade Elevation: 124.6 masl

Drilling Method: Solid Stem Augers

Top of Casing Elevation: 124.5 masl

Well Casing Size: 51 mm

Sheet: 1 of 1

Log of Borehole: BH221

Project #: 318728.000 **Logged By:** JL

Project: Geotechnical Inestigation

Client: Cooper Construction Limited

Location: 1250 Appleby Line, Burlington, ON

Drill Date: November 23, 2022 **Project Manager:** VM

Depth (m)	Description	Elevation (m)	Sample Type	Sampler #	Recovery (%)	SPT N-Value
0	Ground Surface	125.20				
	Fill Grey sand and gravel, moist					
		124.29				
1	Grey brown silty clay, trace to some gravel, trace sand, stiff to very stiff, DTPL; broken limestone pieces	123.68	SS	1	50	13
			SS	2	50	>50
2	**Shale** Highly weathered reddish brown shale, damp to moist					
			SS	3	10	>50
3			SS	4	10	>50
			SS	5	0	>50
4				6		>50
		120.63				
	Wet					
5	End of Borehole					
	Borehole terminated at 4.6 mbgs, at drilling completion water was measured at 3.7 mbgs.					
6						
7						
8						
9						

Monitoring Well Details: No Monitoring Well Installed

Standard Penetration N-Value: 20, 40, 60

Shear Strength: kPa, 100, 200

Water Content: %, 10, 20, 30, 40

Contractor: Pontill Drilling Inc. **Grade Elevation:** 125.2 masl

Drilling Method: Solid Stem Augers **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH222

Project #: 318728.000 **Logged By:** JL

Project: Geotechnical Investigation

Client: Cooper Construction Limited

Location: 1250 Appleby Line, Burlington, ON

Drill Date: November 22, 2022 **Project Manager:** VM

Depth (m)	Description	Elevation (m)	Sample Type	Sampler #	Recovery (%)	SPT N-Value
0	Ground Surface	124.60				
	Possible Fill Brown silty clay, some gravel, DTPL	123.84				
1	**Silty Clay Till** Reddish brown silty clay, trace to some sand, trace gravel very stiff, DTPL	122.92	SS	1	60	21
			SS	2	60	>50
2	**Shale** Highly weathered reddish brown shale, damp to moist		SS	3	100	>50
3			SS	4	10	>50
4			SS	5	0	>50
	Wet	120.03		6		>50
5	End of Borehole					
	Borehole was terminated at 4.6 mbgs, at drilling completion water was measured at 3.5 mbgs.					
6						
7						
8						
9						

Monitoring Well Details: No Monitoring Well Installed

Standard Penetration N-Value: 20, 40, 60

Shear Strength: kPa, 100, 200

Water Content: %, 10, 20, 30, 40

Contractor: Pontill Drilling Inc.

Grade Elevation: 124.6 masl

Drilling Method: Solid Stem Augers

Top of Casing Elevation: NA

Well Casing Size: NA

Sheet: 1 of 1

Log of Borehole: BH223

Project #: 318728.000 **Logged By:** JL

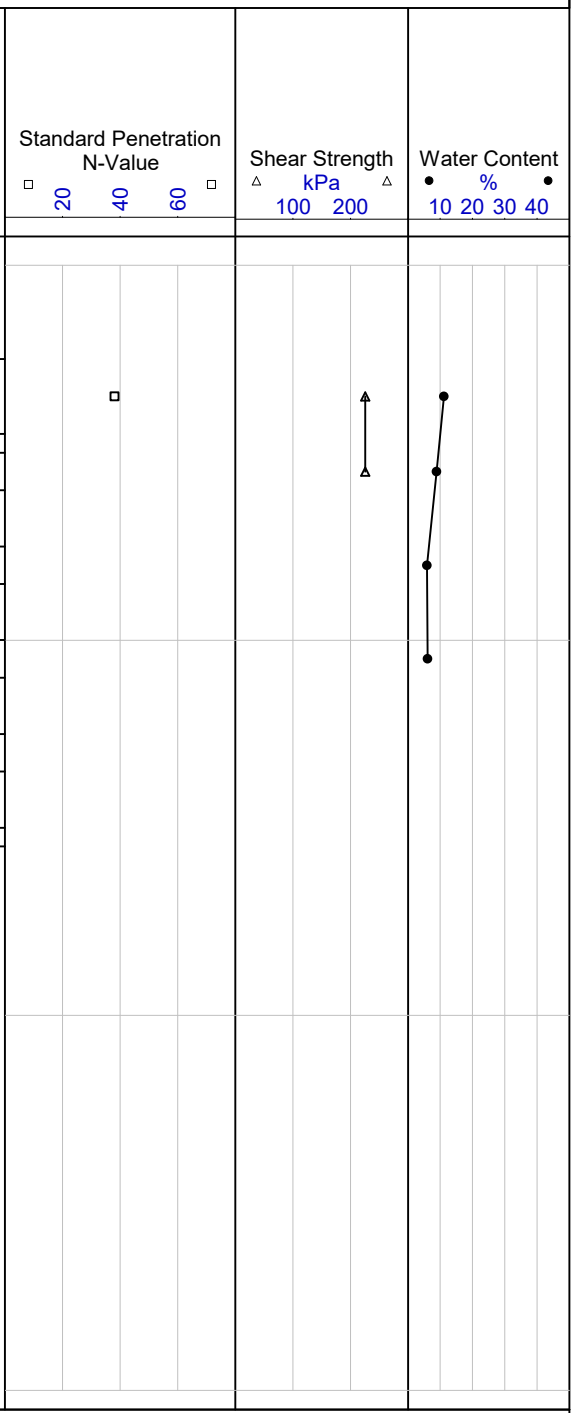
Project: Geotechnical Investigation

Client: Cooper Construction Limited

Location: 1250 Appleby Line, Burlington, ON

Drill Date: November 24, 2022 **Project Manager:** VM

Depth (m)	Symbol	Description	Elevation (m)	Monitoring Well Details	Sample Type	Sampler #	Recovery (%)	SPT N-Value
0		Ground Surface	123.30	No Monitoring Well Installed				
		Fill Grey sand and gravel, moist	122.54					
1		***Silty Clay Till*** Reddish brown silty clay, trace sand and gravel, hard, DTPL	121.78		SS	1	70	38
					SS	2	40	>50
2		***Shale*** Highly weathered reddish brown shale, very dense, damp to moist; grey limestone interlayers			SS	3	20	>50
3					SS	4	10	>50
4			118.73		SS	5	0	>50
		Wet				6		>50
5		End of Borehole						
		Borehole terminated at 4.6 mbgs, at drilling completion water was measured at 3.1 mbgs.						
6								
7								
8								
9								



Contractor: Pontill Drilling Inc. **Grade Elevation:** 123.3 masl

Drilling Method: Solid Stem Augers **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH224

Project #: 318728.000 **Logged By:** JL

Project: Geotechnical Investigation

Client: Cooper Construction Limited

Location: 1250 Appleby Line, Burlington, ON

Drill Date: November 23, 2022 **Project Manager:** VM

Depth (m)	Description	Elevation (m)	Sample Type	Sampler #	Recovery (%)	SPT N-Value
0	Ground Surface	123.00				
	Fill Grey sand and gravel, damp	122.24				
1	**Silty Clay Till** Reddish brown silty clay, trace sand and gravel, hard, DTPL	121.47	SS	1	70	70
	Shale Highly weathered reddish brown shale, very dense, damp to moist		SS	2	20	>50
2			SS	3	20	>50
3	Wet	119.95	SS	4	20	>50
4			SS	5	20	>50
		118.40		6		>50
5	End of Borehole					
	Borehole terminated at 4.6 mbgs, at drilling completion water was measured at 2.4 mbgs.					
6						
7						
8						
9						

Monitoring Well Details: No Monitoring Well Installed

Standard Penetration N-Value: 20, 40, 60

Shear Strength: kPa, 100, 200

Water Content: %, 10, 20, 30, 40

Contractor: Pontill Drilling Inc. **Grade Elevation:** 123.0 masl

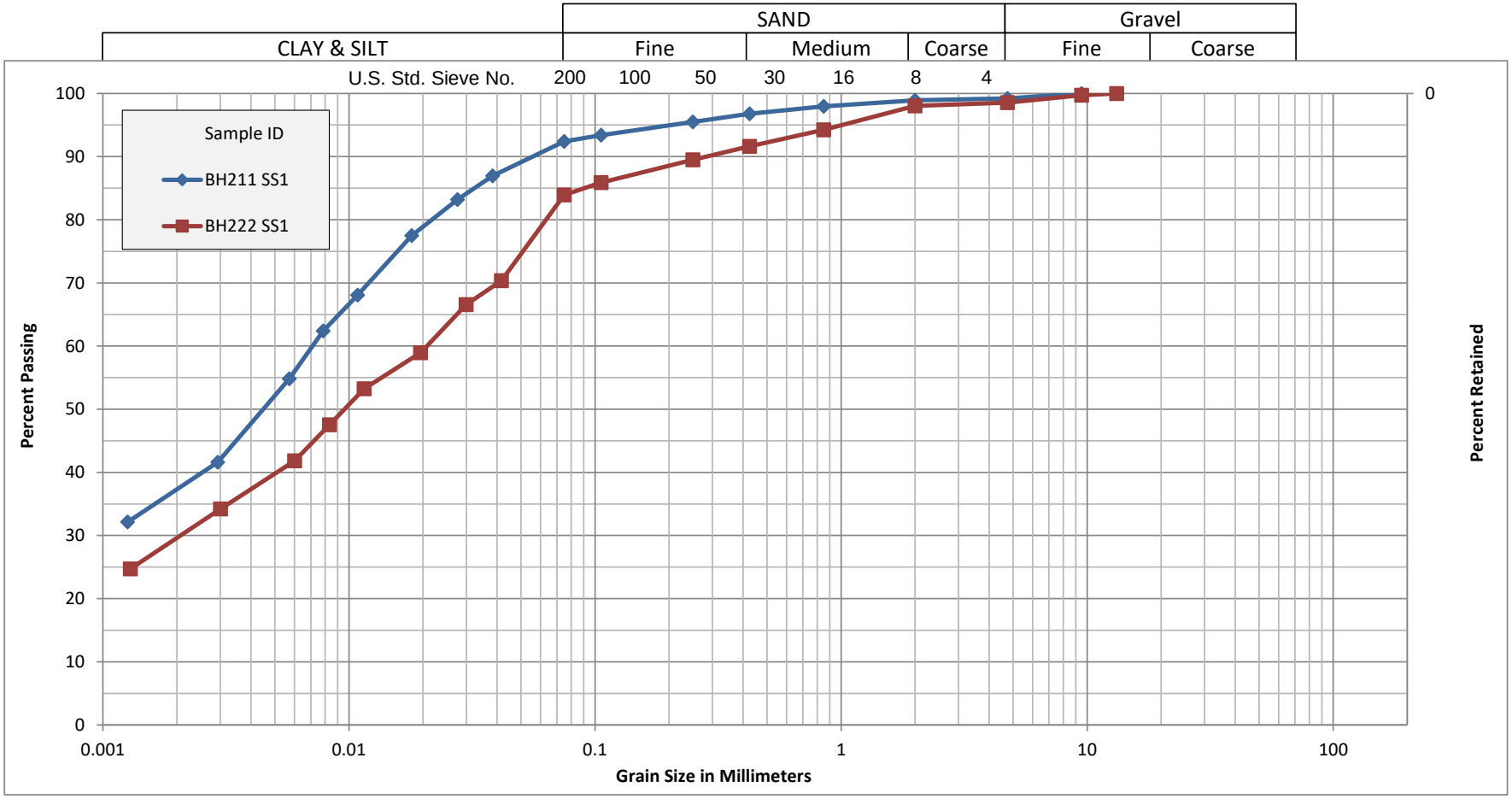
Drilling Method: Solid Stem Augers **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

APPENDIX IV

Laboratory Testing Reports for Soil Samples

Unified Soil Classification System



Sample ID	Depth (ft)	% Gravel	% Sand	% Silt	% Clay
BH211 SS1	2.5-4.5	1.0	6.6	56.4	36.0
BH222 SS1	2.5-4.5	1.0	15.1	54.9	29.0

PINCHIN

Pinchin Waterloo - 225 Labrador Drive,
Unit 1, Waterloo, Ontario N2K 4M8

PARTICLE SIZE DISTRIBUTION ANALYSIS

Proposed Land Development - 1250 Appleby Line, Burlington, ON
Cooper Construction Limited

Figure No. 1

318728.000

Reviewed By:

More information available upon request

Atterberg Limits

LS 703&704 / AASHTO T89

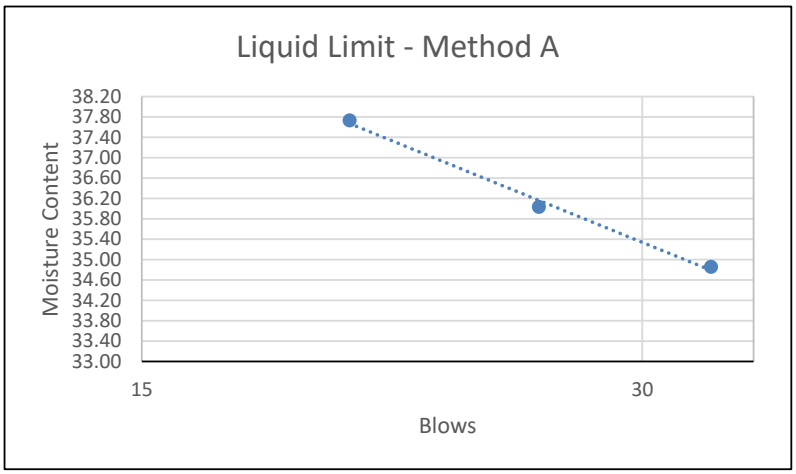
Project Name: Proposed Land Development
Project No. 318728.000
Client: Cooper Construction Limited
Location: 1250 Appleby Line, Burlington, ON
Material: Soil
Sample: BH211 SS1 2.5-4.5

Test Date: December 20, 2022
Tested By: B Frank
Sample Date: November 22, 2022
Sampled By: J Laplante
Reviewed By: V Marshall

Liquid Limit - Method A						
Pot Number	1	2	3			
Number of blows	33	26	20			
Wet mass + pot	34.91	32.63	31.11			
Dry mass + pot	29.95	28.09	26.85			
Tare	15.72	15.49	15.56			
Water content %	34.86	36.03	37.73			

Plastic Limit			
Pot Number	1	2	
Wet mass + pot	25.02	24.61	
Dry mass + pot	23.56	23.22	
Tare	15.70	15.72	
Water content %	18.6	18.5	

PI = LL - PL	
Liquid Limit %	**36**
Plastic Limit %	**19**
Plastic Index	**18**
Non Plastic	



Atterberg Limits

LS 703&704 / AASHTO T89

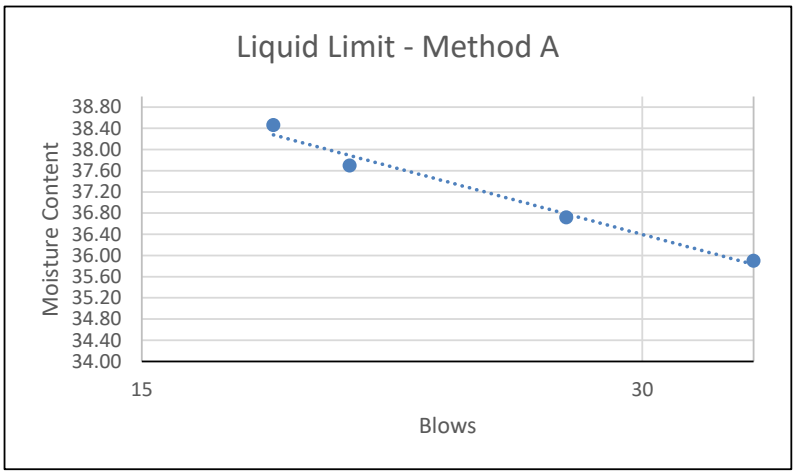
Project Name: Proposed Land Development
Project No. 318728.000
Client: Cooper Construction Limited
Location: 1250 Appleby Line, Burlington, ON
Material: Soil
Sample: BH222 SS1 2.5-4.5

Test Date: December 20, 2022
Tested By: B Frank
Sample Date: November 22, 2022
Sampled By: J Laplante
Reviewed By: V Marshall

Liquid Limit - Method A						
Pot Number	1	2	3	4		
Number of blows	35	27	20	18		
Wet mass + pot	32.06	31.92	31.34	31.53		
Dry mass + pot	27.68	27.58	27.08	27.03		
Tare	15.48	15.76	15.78	15.33		
Water content %	35.90	36.72	37.70	38.46		

Plastic Limit			
Pot Number	1	1	
Wet mass + pot	26.70	24.85	
Dry mass + pot	24.83	23.23	
Tare	15.70	15.35	
Water content %	20.5	20.6	

PI = LL - PL	
Liquid Limit %	**37.0**
Plastic Limit %	**21**
Plastic Index	**16**
Non Plastic	



APPENDIX V

Soil Analytical Results (ALS)

ALS Canada Ltd.

right solutions.
right partner.

CERTIFICATE OF ANALYSIS (GUIDELINE EVALUATION)

Work Order	: **WT2224094**	Page	: 1 of 11
Client	: **Pinchin Ltd.**	Laboratory	: Waterloo - Environmental
Contact	: Vanessa Marshall	Account Manager	: Amanda Overholster
Address	: 225 Labrador Drive Unit #1 Waterloo ON Canada N2K 4M8	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 519 746 4210, Ext. 3756	Telephone	: 1 416 817 2944
Project	: 318728	Date Samples Received	: 05-Dec-2022 16:00
PO	: ----	Date Analysis Commenced	: 06-Dec-2022
C-O-C number	: 20-1002590	Issue Date	: 14-Dec-2022 14:56
Sampler	: CLIENT		
Site	: ----		
Quote number	: 2022 SOA		
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
- Guideline Comparison

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 US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Amanda Ganouri-Lumsden	Department Manager - Microbiology and Prep	Centralized Prep, Waterloo, Ontario
Danielle Gravel	Supervisor - Semi-Volatile Instrumentation	Organics, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Inorganics, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Metals, Waterloo, Ontario
Sarah Birch	VOC Section Supervisor	Organics, Waterloo, Ontario

Summary of Guideline Breaches by Sample

SampleID/Client ID	Matrix	Analyte	Analyte Summary	Guideline	Category	Result	Limit
BH204 SS1	Soil/Solid	barium		ON406/20	T1-RPIICC	560 mg/kg	220 mg/kg
	Soil/Solid	beryllium		ON406/20	T1-RPIICC	6.84 mg/kg	2.5 mg/kg
	Soil/Solid	boron		ON406/20	T1-RPIICC	88.1 mg/kg	36 mg/kg
	Soil/Solid	selenium		ON406/20	T1-RPIICC	3.08 mg/kg	1.5 mg/kg
	Soil/Solid	uranium		ON406/20	T1-RPIICC	2.85 mg/kg	2.5 mg/kg
	Soil/Solid	boron, hot water soluble		ON406/20	T3.1-S-ICC	4.83 mg/kg	2 mg/kg
	Soil/Solid	barium		ON406/20	T3.1-S-RPI	560 mg/kg	390 mg/kg
	Soil/Solid	beryllium		ON406/20	T3.1-S-RPI	6.84 mg/kg	4 mg/kg
	Soil/Solid	boron, hot water soluble		ON406/20	T3.1-S-RPI	4.83 mg/kg	1.5 mg/kg
	Soil/Solid	selenium		ON406/20	T3.1-S-RPI	3.08 mg/kg	2.4 mg/kg
	Soil/Solid	boron, hot water soluble		ON406/20	T7.1-S-ICC	4.83 mg/kg	2 mg/kg
	Soil/Solid	barium		ON406/20	T7.1-S-RPI	560 mg/kg	390 mg/kg
	Soil/Solid	beryllium		ON406/20	T7.1-S-RPI	6.84 mg/kg	4 mg/kg
	Soil/Solid	boron, hot water soluble		ON406/20	T7.1-S-RPI	4.83 mg/kg	1.5 mg/kg
	Soil/Solid	selenium		ON406/20	T7.1-S-RPI	3.08 mg/kg	2.4 mg/kg
BH207 SS1	Soil/Solid	conductivity (1:2 leachate)		ON406/20	T1-RPIICC	0.962 mS/cm	0.57 mS/cm
	Soil/Solid	barium		ON406/20	T1-RPIICC	513 mg/kg	220 mg/kg
	Soil/Solid	beryllium		ON406/20	T1-RPIICC	5.44 mg/kg	2.5 mg/kg
	Soil/Solid	boron		ON406/20	T1-RPIICC	181 mg/kg	36 mg/kg
	Soil/Solid	selenium		ON406/20	T1-RPIICC	3.73 mg/kg	1.5 mg/kg
	Soil/Solid	F4 (C34-C50)		ON406/20	T1-RPIICC	125 mg/kg	120 mg/kg
	Soil/Solid	F4G-sg		ON406/20	T1-RPIICC	610 mg/kg	120 mg/kg
	Soil/Solid	boron		ON406/20	T3.1-S-ICC	181 mg/kg	120 mg/kg
	Soil/Solid	boron, hot water soluble		ON406/20	T3.1-S-ICC	10.5 mg/kg	2 mg/kg
	Soil/Solid	conductivity (1:2 leachate)		ON406/20	T3.1-S-RPI	0.962 mS/cm	0.7 mS/cm
	Soil/Solid	barium		ON406/20	T3.1-S-RPI	513 mg/kg	390 mg/kg
	Soil/Solid	beryllium		ON406/20	T3.1-S-RPI	5.44 mg/kg	4 mg/kg
	Soil/Solid	boron		ON406/20	T3.1-S-RPI	181 mg/kg	120 mg/kg

SampleID/Client ID	Matrix	Analyte	Analyte Summary	Guideline	Category	Result	Limit
	Soil/Solid	boron, hot water soluble		ON406/20	T3.1-S-RPI	10.5 mg/kg	1.5 mg/kg
	Soil/Solid	selenium		ON406/20	T3.1-S-RPI	3.73 mg/kg	2.4 mg/kg
	Soil/Solid	boron		ON406/20	T7.1-S-ICC	181 mg/kg	120 mg/kg
	Soil/Solid	boron, hot water soluble		ON406/20	T7.1-S-ICC	10.5 mg/kg	2 mg/kg
	Soil/Solid	conductivity (1:2 leachate)		ON406/20	T7.1-S-RPI	0.962 mS/cm	0.7 mS/cm
	Soil/Solid	barium		ON406/20	T7.1-S-RPI	513 mg/kg	390 mg/kg
	Soil/Solid	beryllium		ON406/20	T7.1-S-RPI	5.44 mg/kg	4 mg/kg
	Soil/Solid	boron		ON406/20	T7.1-S-RPI	181 mg/kg	120 mg/kg
	Soil/Solid	boron, hot water soluble		ON406/20	T7.1-S-RPI	10.5 mg/kg	1.5 mg/kg
	Soil/Solid	selenium		ON406/20	T7.1-S-RPI	3.73 mg/kg	2.4 mg/kg
BH212 SS1	Soil/Solid	barium		ON406/20	T1-RPIICC	407 mg/kg	220 mg/kg
	Soil/Solid	beryllium		ON406/20	T1-RPIICC	4.14 mg/kg	2.5 mg/kg
	Soil/Solid	boron		ON406/20	T1-RPIICC	173 mg/kg	36 mg/kg
	Soil/Solid	selenium		ON406/20	T1-RPIICC	2.15 mg/kg	1.5 mg/kg
	Soil/Solid	F4 (C34-C50)		ON406/20	T1-RPIICC	409 mg/kg	120 mg/kg
	Soil/Solid	F4G-sg		ON406/20	T1-RPIICC	1480 mg/kg	120 mg/kg
	Soil/Solid	boron		ON406/20	T3.1-S-ICC	173 mg/kg	120 mg/kg
	Soil/Solid	boron, hot water soluble		ON406/20	T3.1-S-ICC	7.53 mg/kg	2 mg/kg
	Soil/Solid	barium		ON406/20	T3.1-S-RPI	407 mg/kg	390 mg/kg
	Soil/Solid	beryllium		ON406/20	T3.1-S-RPI	4.14 mg/kg	4 mg/kg
	Soil/Solid	boron		ON406/20	T3.1-S-RPI	173 mg/kg	120 mg/kg
	Soil/Solid	boron, hot water soluble		ON406/20	T3.1-S-RPI	7.53 mg/kg	1.5 mg/kg
	Soil/Solid	boron		ON406/20	T7.1-S-ICC	173 mg/kg	120 mg/kg
	Soil/Solid	boron, hot water soluble		ON406/20	T7.1-S-ICC	7.53 mg/kg	2 mg/kg
	Soil/Solid	barium		ON406/20	T7.1-S-RPI	407 mg/kg	390 mg/kg
	Soil/Solid	beryllium		ON406/20	T7.1-S-RPI	4.14 mg/kg	4 mg/kg
	Soil/Solid	boron		ON406/20	T7.1-S-RPI	173 mg/kg	120 mg/kg
	Soil/Solid	boron, hot water soluble		ON406/20	T7.1-S-RPI	7.53 mg/kg	1.5 mg/kg
BH213 SS1	Soil/Solid	boron, hot water soluble		ON406/20	T3.1-S-ICC	3.73 mg/kg	2 mg/kg
	Soil/Solid	boron, hot water soluble		ON406/20	T3.1-S-RPI	3.73 mg/kg	1.5 mg/kg

SampleID/Client ID	Matrix	Analyte	Analyte Summary	Guideline	Category	Result	Limit
	Soil/Solid	boron, hot water soluble		ON406/20	T7.1-S-ICC	3.73 mg/kg	2 mg/kg
	Soil/Solid	boron, hot water soluble		ON406/20	T7.1-S-RPI	3.73 mg/kg	1.5 mg/kg
BH220 SS2	Soil/Solid	boron, hot water soluble		ON406/20	T3.1-S-ICC	2.23 mg/kg	2 mg/kg
	Soil/Solid	boron, hot water soluble		ON406/20	T3.1-S-RPI	2.23 mg/kg	1.5 mg/kg
	Soil/Solid	boron, hot water soluble		ON406/20	T7.1-S-ICC	2.23 mg/kg	2 mg/kg
	Soil/Solid	boron, hot water soluble		ON406/20	T7.1-S-RPI	2.23 mg/kg	1.5 mg/kg

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.

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guidelines are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Key : LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	no units
%	percent
mg/kg	milligrams per kilogram
mg/L	milligrams per litre
mS/cm	millisiemens per centimetre
pH units	pH units

>: greater than.
<: less than.
Red shading is applied where the result is greater than the Guideline Upper Limit or the result is lower than the Guideline Lower Limit.
For drinking water samples, Red shading is applied where the result for E.coli, fecal or total coliforms is greater than or equal to the Guideline Upper Limit.

Qualifiers

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
FR4	As per applicable reference method(s), soil:water ratio for Fixed Ratio Leach was modified to 1:4 due to high soil organic content.

Analytical Results Evaluation

Matrix: **Soil**

Analyte	CAS Number	Unit	Client sample ID	BH202 SS1	BH204 SS1	BH207 SS1	BH212 SS1	BH213 SS1	BH220 SS2	BH221 SS1
			Sampling date/time	05-Dec-2022	05-Dec-2022	05-Dec-2022	05-Dec-2022	05-Dec-2022	05-Dec-2022	05-Dec-2022
			Sub-Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil
				WT2224094-001	WT2224094-002	WT2224094-003	WT2224094-004	WT2224094-005	WT2224094-006	WT2224094-007
Physical Tests										
conductivity (1:2 leachate)	----	mS/cm		0.193	0.454	0.962	0.535	0.320	0.148	0.143
moisture	----	%		3.97	7.77	9.62	7.63	7.85	8.58	12.0
pH (1:2 soil:CaCl2-aq)	----	pH units		8.31	9.16	8.88	9.34	7.92	7.81	7.90
Cyanides										
cyanide, weak acid dissociable	----	mg/kg		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Fixed-Ratio Extractables										
calcium, soluble ion content	7440-70-2	mg/L		11.2	65.7	175	72.5	43.2	16.5	14.7
magnesium, soluble ion content	7439-95-4	mg/L		9.26	12.6	19.3	13.7	3.18	1.63	2.24
sodium, soluble ion content	17341-25-2	mg/L		6.58	4.19	9.14	9.85	13.8	5.84	6.11
sodium adsorption ratio [SAR]	----	-		0.35	0.12	0.18	0.28	0.54	0.37	0.39
Metals										
antimony	7440-36-0	mg/kg		0.31	<0.10	<0.10	<0.10	0.22	0.36	0.26
arsenic	7440-38-2	mg/kg		7.40	1.34	1.63	1.29	4.29	5.36	4.99
barium	7440-39-3	mg/kg		35.3	560	513	407	57.8	70.1	118
beryllium	7440-41-7	mg/kg		0.16	6.84	5.44	4.14	0.77	0.99	0.73
boron	7440-42-8	mg/kg		19.5	88.1	181	173	28.8	31.4	21.2
boron, hot water soluble	7440-42-8	mg/kg		0.21	4.83	10.5 DLHC	7.53 DLHC	3.73 DLM, FR4	2.23	0.22
cadmium	7440-43-9	mg/kg		0.547	0.263	0.210	0.099	0.092	0.102	0.198
chromium	7440-47-3	mg/kg		4.35	15.2	21.2	12.9	19.2	25.0	19.8
cobalt	7440-48-4	mg/kg		2.16	0.60	1.47	0.90	11.5	14.5	10.3
copper	7440-50-8	mg/kg		8.36	2.54	4.83	4.53	6.44	8.58	17.8
lead	7439-92-1	mg/kg		27.2	5.82	11.6	10.0	11.0	13.5	28.1
mercury	7439-97-6	mg/kg		<0.0050	<0.0050	<0.0050	0.0159	<0.0050	<0.0050	0.0092
molybdenum	7439-98-7	mg/kg		1.60	0.36	1.07	0.74	0.60	0.89	1.27
nickel	7440-02-0	mg/kg		6.38	3.08	4.74	3.48	24.4	30.7	23.7
selenium	7782-49-2	mg/kg		<0.20	3.08	3.73	2.15	<0.20	<0.20	<0.20
silver	7440-22-4	mg/kg		<0.10	0.12	<0.10	<0.10	<0.10	<0.10	<0.10
thallium	7440-28-0	mg/kg		0.108	<0.050	<0.050	<0.050	0.086	0.114	0.125

Analytical Results Evaluation

Matrix: **Soil**

Analyte	CAS Number	Unit	Client sample ID	BH202 SS1	BH204 SS1	BH207 SS1	BH212 SS1	BH213 SS1	BH220 SS2	BH221 SS1
			Sampling date/time	05-Dec-2022	05-Dec-2022	05-Dec-2022	05-Dec-2022	05-Dec-2022	05-Dec-2022	05-Dec-2022
			Sub-Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil
				WT2224094-001	WT2224094-002	WT2224094-003	WT2224094-004	WT2224094-005	WT2224094-006	WT2224094-007
Metals										
uranium	7440-61-1	mg/kg		0.443	2.85	2.35	1.68	0.537	0.679	0.765
vanadium	7440-62-2	mg/kg		4.54	10.0	11.8	8.15	23.4	32.6	27.6
zinc	7440-66-6	mg/kg		219	36.4	80.6	42.7	51.1	65.6	106
Speciated Metals										
chromium, hexavalent [Cr VI]	18540-29-9	mg/kg		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Volatile Organic Compounds										
benzene	71-43-2	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
ethylbenzene	100-41-4	mg/kg		<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
toluene	108-88-3	mg/kg		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
xylene, m+p-	179601-23-1	mg/kg		<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
xylene, o-	95-47-6	mg/kg		<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
xylenes, total	1330-20-7	mg/kg		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
BTEX, total	----	mg/kg		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Hydrocarbons										
F1 (C6-C10)	----	mg/kg		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
F2 (C10-C16)	----	mg/kg		<10	<10	<10	<10	<10	<10	<10
F3 (C16-C34)	----	mg/kg		<50	87	92	191	57	<50	<50
F4 (C34-C50)	----	mg/kg		<50	<50	125	409	109	<50	<50
F4G-sg	----	mg/kg		----	----	610	1480	----	----	----
F1-BTEX	----	mg/kg		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
hydrocarbons, total (C6-C50)	----	mg/kg		<80	87	217	600	166	<80	<80
chromatogram to baseline at nC50	n/a	-		YES	YES	NO	NO	YES	YES	YES
Hydrocarbons Surrogates										
bromobenzotrifluoride, 2- (F2-F4 surr)	392-83-6	%		89.1	82.9	88.6	89.6	89.0	87.2	88.6
dichlorotoluene, 3,4-	97-75-0	%		88.3	93.5	88.4	91.7	96.0	87.7	97.8
Volatile Organic Compounds Surrogates										
bromofluorobenzene, 4-	460-00-4	%		90.2	95.8	97.8	98.9	90.4	85.9	98.2
difluorobenzene, 1,4-	540-36-3	%		102	111	111	115	106	99.5	113

Analytical Results Evaluation

Matrix: **Soil**

Analyte	CAS Number	Unit	Client sample ID						
			BH223 SS1	----	----	----	----	----	----
			Sampling date/time						
			05-Dec-2022	----	----	----	----	----	----
			Sub-Matrix						
			Soil	----	----	----	----	----	----
			WT2224094-008	--------	--------	--------	--------	--------	--------
Physical Tests									
conductivity (1:2 leachate)	----	mS/cm	0.506	----	----	----	----	----	----
moisture	----	%	6.55	----	----	----	----	----	----
pH (1:2 soil:CaCl2-aq)	----	pH units	7.80	----	----	----	----	----	----
Cyanides									
cyanide, weak acid dissociable	----	mg/kg	<0.050	----	----	----	----	----	----
Fixed-Ratio Extractables									
calcium, soluble ion content	7440-70-2	mg/L	40.0	----	----	----	----	----	----
magnesium, soluble ion content	7439-95-4	mg/L	3.99	----	----	----	----	----	----
sodium, soluble ion content	17341-25-2	mg/L	47.1	----	----	----	----	----	----
sodium adsorption ratio [SAR]	----	-	1.90	----	----	----	----	----	----
Metals									
antimony	7440-36-0	mg/kg	0.28	----	----	----	----	----	----
arsenic	7440-38-2	mg/kg	4.76	----	----	----	----	----	----
barium	7440-39-3	mg/kg	63.2	----	----	----	----	----	----
beryllium	7440-41-7	mg/kg	0.72	----	----	----	----	----	----
boron	7440-42-8	mg/kg	24.2	----	----	----	----	----	----
boron, hot water soluble	7440-42-8	mg/kg	0.64	----	----	----	----	----	----
cadmium	7440-43-9	mg/kg	0.089	----	----	----	----	----	----
chromium	7440-47-3	mg/kg	19.9	----	----	----	----	----	----
cobalt	7440-48-4	mg/kg	11.0	----	----	----	----	----	----
copper	7440-50-8	mg/kg	6.44	----	----	----	----	----	----
lead	7439-92-1	mg/kg	12.8	----	----	----	----	----	----
mercury	7439-97-6	mg/kg	<0.0050	----	----	----	----	----	----
molybdenum	7439-98-7	mg/kg	0.77	----	----	----	----	----	----
nickel	7440-02-0	mg/kg	23.8	----	----	----	----	----	----
selenium	7782-49-2	mg/kg	<0.20	----	----	----	----	----	----
silver	7440-22-4	mg/kg	<0.10	----	----	----	----	----	----
thallium	7440-28-0	mg/kg	0.084	----	----	----	----	----	----
uranium	7440-61-1	mg/kg	0.529	----	----	----	----	----	----
vanadium	7440-62-2	mg/kg	24.7	----	----	----	----	----	----

Analytical Results Evaluation

Matrix: **Soil**

Analyte	CAS Number	Unit	Client sample ID	BH223 SS1	----	----	----	----	----	----
			Sampling date/time	05-Dec-2022	----	----	----	----	----	----
			Sub-Matrix	Soil	----	----	----	----	----	----
			Unit	WT2224094-008	--------	--------	--------	--------	--------	--------
Metals										
zinc	7440-66-6	mg/kg		50.1	----	----	----	----	----	----
Speciated Metals										
chromium, hexavalent [Cr VI]	18540-29-9	mg/kg		<0.10	----	----	----	----	----	----
Volatile Organic Compounds										
benzene	71-43-2	mg/kg		<0.0050	----	----	----	----	----	----
ethylbenzene	100-41-4	mg/kg		<0.015	----	----	----	----	----	----
toluene	108-88-3	mg/kg		<0.050	----	----	----	----	----	----
xylene, m+p-	179601-23-1	mg/kg		<0.030	----	----	----	----	----	----
xylene, o-	95-47-6	mg/kg		<0.030	----	----	----	----	----	----
xylenes, total	1330-20-7	mg/kg		<0.050	----	----	----	----	----	----
BTEX, total	----	mg/kg		<0.10	----	----	----	----	----	----
Hydrocarbons										
F1 (C6-C10)	----	mg/kg		<5.0	----	----	----	----	----	----
F2 (C10-C16)	----	mg/kg		<10	----	----	----	----	----	----
F3 (C16-C34)	----	mg/kg		<50	----	----	----	----	----	----
F4 (C34-C50)	----	mg/kg		<50	----	----	----	----	----	----
F1-BTEX	----	mg/kg		<5.0	----	----	----	----	----	----
hydrocarbons, total (C6-C50)	----	mg/kg		<80	----	----	----	----	----	----
chromatogram to baseline at nC50	n/a	-		YES	----	----	----	----	----	----
Hydrocarbons Surrogates										
bromobenzotrifluoride, 2- (F2-F4 surr)	392-83-6	%		88.4	----	----	----	----	----	----
dichlorotoluene, 3,4-	97-75-0	%		98.1	----	----	----	----	----	----
Volatile Organic Compounds Surrogates										
bromofluorobenzene, 4-	460-00-4	%		95.7	----	----	----	----	----	----
difluorobenzene, 1,4-	540-36-3	%		109	----	----	----	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

Summary of Guideline Limits

Analyte	CAS Number	Unit	ON406/20 T1-RPIICC	ON406/20 T3.1-S-ICC	ON406/20 T3.1-S-RPI	ON406/20 T7.1-S-ICC	ON406/20 T7.1-S-RPI		
Physical Tests									
conductivity (1:2 leachate)	----	mS/cm	0.57 mS/cm	1.4 mS/cm	0.7 mS/cm	1.4 mS/cm	0.7 mS/cm		
moisture	----	%							
pH (1:2 soil:CaCl2-aq)	----	pH units							
Cyanides									
cyanide, weak acid dissociable	----	mg/kg	0.051 mg/kg	0.051 mg/kg	0.051 mg/kg	0.051 mg/kg	0.051 mg/kg		
Fixed-Ratio Extractables									
calcium, soluble ion content	7440-70-2	mg/L							
magnesium, soluble ion content	7439-95-4	mg/L							
sodium adsorption ratio [SAR]	----	-	2.4 -	12 -	5 -	12 -	5 -		
sodium, soluble ion content	17341-25-2	mg/L							
Metals									
antimony	7440-36-0	mg/kg	1.3 mg/kg	40 mg/kg	7.5 mg/kg	40 mg/kg	7.5 mg/kg		
arsenic	7440-38-2	mg/kg	18 mg/kg	18 mg/kg	18 mg/kg	18 mg/kg	18 mg/kg		
barium	7440-39-3	mg/kg	220 mg/kg	670 mg/kg	390 mg/kg	670 mg/kg	390 mg/kg		
beryllium	7440-41-7	mg/kg	2.5 mg/kg	8 mg/kg	4 mg/kg	8 mg/kg	4 mg/kg		
boron, hot water soluble	7440-42-8	mg/kg		2 mg/kg	1.5 mg/kg	2 mg/kg	1.5 mg/kg		
boron	7440-42-8	mg/kg	36 mg/kg	120 mg/kg	120 mg/kg	120 mg/kg	120 mg/kg		
cadmium	7440-43-9	mg/kg	1.2 mg/kg	1.9 mg/kg	1.2 mg/kg	1.9 mg/kg	1.2 mg/kg		
chromium	7440-47-3	mg/kg	70 mg/kg	160 mg/kg	160 mg/kg	160 mg/kg	160 mg/kg		
cobalt	7440-48-4	mg/kg	21 mg/kg	80 mg/kg	22 mg/kg	80 mg/kg	22 mg/kg		
copper	7440-50-8	mg/kg	92 mg/kg	230 mg/kg	140 mg/kg	230 mg/kg	140 mg/kg		
lead	7439-92-1	mg/kg	120 mg/kg	120 mg/kg	120 mg/kg	120 mg/kg	120 mg/kg		
mercury	7439-97-6	mg/kg	0.27 mg/kg	0.27 mg/kg	0.27 mg/kg	0.27 mg/kg	0.27 mg/kg		
molybdenum	7439-98-7	mg/kg	2 mg/kg	40 mg/kg	6.9 mg/kg	40 mg/kg	6.9 mg/kg		
nickel	7440-02-0	mg/kg	82 mg/kg	270 mg/kg	100 mg/kg	270 mg/kg	100 mg/kg		
selenium	7782-49-2	mg/kg	1.5 mg/kg	5.5 mg/kg	2.4 mg/kg	5.5 mg/kg	2.4 mg/kg		
silver	7440-22-4	mg/kg	0.5 mg/kg	40 mg/kg	20 mg/kg	40 mg/kg	20 mg/kg		
thallium	7440-28-0	mg/kg	1 mg/kg	3.3 mg/kg	1 mg/kg	3.3 mg/kg	1 mg/kg		
uranium	7440-61-1	mg/kg	2.5 mg/kg	33 mg/kg	23 mg/kg	33 mg/kg	23 mg/kg		
vanadium	7440-62-2	mg/kg	86 mg/kg	86 mg/kg	86 mg/kg	86 mg/kg	86 mg/kg		
zinc	7440-66-6	mg/kg	290 mg/kg	340 mg/kg	340 mg/kg	340 mg/kg	340 mg/kg		
Speciated Metals									
chromium, hexavalent [Cr VI]	18540-29-9	mg/kg	0.66 mg/kg	8 mg/kg	8 mg/kg	8 mg/kg	8 mg/kg		
Volatile Organic Compounds									
benzene	71-43-2	mg/kg	0.02 mg/kg	0.034 mg/kg	0.02 mg/kg	0.02 mg/kg	0.02 mg/kg		
BTEX, total	----	mg/kg							
ethylbenzene	100-41-4	mg/kg	0.05 mg/kg	1.9 mg/kg	1.9 mg/kg	0.6 mg/kg	0.6 mg/kg		

Analyte	CAS Number	Unit	ON406/20 T1-RPIICC	ON406/20 T3.1-S-ICC	ON406/20 T3.1-S-RPI	ON406/20 T7.1-S-ICC	ON406/20 T7.1-S-RPI		
Volatile Organic Compounds - Continued									
toluene	108-88-3	mg/kg	**0.2 mg/kg**	**7.8 mg/kg**	**0.99 mg/kg**	**0.88 mg/kg**	**0.88 mg/kg**		
xylene, m+p-	179601-23-1	mg/kg							
xylene, o-	95-47-6	mg/kg							
xylenes, total	1330-20-7	mg/kg	**0.05 mg/kg**	**3 mg/kg**	**0.9 mg/kg**	**0.12 mg/kg**	**0.12 mg/kg**		
Hydrocarbons									
chromatogram to baseline at nC50	n/a	-							
F1 (C6-C10)	----	mg/kg	**25 mg/kg**	**25 mg/kg**	**25 mg/kg**	**25 mg/kg**	**25 mg/kg**		
F1-BTEX	----	mg/kg	**25 mg/kg**	**25 mg/kg**	**25 mg/kg**	**25 mg/kg**	**25 mg/kg**		
F2 (C10-C16)	----	mg/kg	**10 mg/kg**	**26 mg/kg**	**10 mg/kg**	**10 mg/kg**	**10 mg/kg**		
F3 (C16-C34)	----	mg/kg	**240 mg/kg**	**1700 mg/kg**	**300 mg/kg**	**1700 mg/kg**	**300 mg/kg**		
F4 (C34-C50)	----	mg/kg	**120 mg/kg**	**3300 mg/kg**	**2800 mg/kg**	**3300 mg/kg**	**2800 mg/kg**		
F4G-sg	----	mg/kg	**120 mg/kg**	**3300 mg/kg**	**2800 mg/kg**	**3300 mg/kg**	**2800 mg/kg**		
hydrocarbons, total (C6-C50)	----	mg/kg							

Please refer to the General Comments section for an explanation of any qualifiers detected.

Key:

ON406/20	Ontario Regulation 406/19 - Excess Soils - 17-December-20
T1-RPIICC	406 T1 - Soil - Res/Park/Inst/Ind/Com/Commu Property Use
T3.1-S-ICC	406 T3.1 - Volume Independent Soil - Ind/Com/Commu Property Use
T3.1-S-RPI	406 T3.1 - Volume Independent Soil - Res/Park/Inst Property Use
T7.1-S-ICC	406 T7.1 - Volume Independent Soil - Ind/Comm/Commu Property Use
T7.1-S-RPI	406 T7.1 - Volume Independent Soil - Res/Park/Inst Property Use

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QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WT2224094**	Page	: 1 of 19
Client	: **Pinchin Ltd.**	Laboratory	: Waterloo - Environmental
Contact	: Vanessa Marshall	Account Manager	: Amanda Overholster
Address	: 225 Labrador Drive Unit #1 Waterloo ON Canada N2K 4M8	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 519 746 4210, Ext. 3756	Telephone	: 1 416 817 2944
Project	: 318728	Date Samples Received	: 05-Dec-2022 16:00
PO	: ----	Issue Date	: 14-Dec-2022 14:56
C-O-C number	: 20-1002590		
Sampler	: CLIENT		
Site	: ----		
Quote number	: 2022 SOA		
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 Matrix Spike 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

- Quality Control Sample Frequency Outliers occur - please see following pages for full details.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Cyanides : WAD Cyanide (0.01M NaOH Extraction)										
Glass soil jar/Teflon lined cap										
BH202 SS1	E336A	05-Dec-2022	07-Dec-2022	14 days	3 days	✓	08-Dec-2022	14 days	1 days	✓
Cyanides : WAD Cyanide (0.01M NaOH Extraction)										
Glass soil jar/Teflon lined cap										
BH204 SS1	E336A	05-Dec-2022	07-Dec-2022	14 days	3 days	✓	08-Dec-2022	14 days	1 days	✓
Cyanides : WAD Cyanide (0.01M NaOH Extraction)										
Glass soil jar/Teflon lined cap										
BH207 SS1	E336A	05-Dec-2022	07-Dec-2022	14 days	3 days	✓	08-Dec-2022	14 days	1 days	✓
Cyanides : WAD Cyanide (0.01M NaOH Extraction)										
Glass soil jar/Teflon lined cap										
BH212 SS1	E336A	05-Dec-2022	07-Dec-2022	14 days	3 days	✓	08-Dec-2022	14 days	1 days	✓
Cyanides : WAD Cyanide (0.01M NaOH Extraction)										
Glass soil jar/Teflon lined cap										
BH213 SS1	E336A	05-Dec-2022	07-Dec-2022	14 days	3 days	✓	08-Dec-2022	14 days	1 days	✓
Cyanides : WAD Cyanide (0.01M NaOH Extraction)										
Glass soil jar/Teflon lined cap										
BH220 SS2	E336A	05-Dec-2022	07-Dec-2022	14 days	3 days	✓	08-Dec-2022	14 days	1 days	✓
Cyanides : WAD Cyanide (0.01M NaOH Extraction)										
Glass soil jar/Teflon lined cap										
BH221 SS1	E336A	05-Dec-2022	07-Dec-2022	14 days	3 days	✓	08-Dec-2022	14 days	1 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Cyanides : WAD Cyanide (0.01M NaOH Extraction)										
Glass soil jar/Teflon lined cap										
BH223 SS1	E336A	05-Dec-2022	07-Dec-2022	14 days	3 days	✓	08-Dec-2022	14 days	1 days	✓
Fixed-Ratio Extractables : Sodium Adsorption Ratio (SAR) - 1:2 Soil:Water (Dry)										
Glass soil jar/Teflon lined cap										
BH202 SS1	E484	05-Dec-2022	09-Dec-2022	180 days	4 days	✓	09-Dec-2022	180 days	0 days	✓
Fixed-Ratio Extractables : Sodium Adsorption Ratio (SAR) - 1:2 Soil:Water (Dry)										
Glass soil jar/Teflon lined cap										
BH204 SS1	E484	05-Dec-2022	09-Dec-2022	180 days	4 days	✓	09-Dec-2022	180 days	0 days	✓
Fixed-Ratio Extractables : Sodium Adsorption Ratio (SAR) - 1:2 Soil:Water (Dry)										
Glass soil jar/Teflon lined cap										
BH207 SS1	E484	05-Dec-2022	09-Dec-2022	180 days	4 days	✓	09-Dec-2022	180 days	0 days	✓
Fixed-Ratio Extractables : Sodium Adsorption Ratio (SAR) - 1:2 Soil:Water (Dry)										
Glass soil jar/Teflon lined cap										
BH212 SS1	E484	05-Dec-2022	09-Dec-2022	180 days	4 days	✓	09-Dec-2022	180 days	0 days	✓
Fixed-Ratio Extractables : Sodium Adsorption Ratio (SAR) - 1:2 Soil:Water (Dry)										
Glass soil jar/Teflon lined cap										
BH213 SS1	E484	05-Dec-2022	09-Dec-2022	180 days	4 days	✓	09-Dec-2022	180 days	0 days	✓
Fixed-Ratio Extractables : Sodium Adsorption Ratio (SAR) - 1:2 Soil:Water (Dry)										
Glass soil jar/Teflon lined cap										
BH220 SS2	E484	05-Dec-2022	09-Dec-2022	180 days	4 days	✓	09-Dec-2022	180 days	0 days	✓
Fixed-Ratio Extractables : Sodium Adsorption Ratio (SAR) - 1:2 Soil:Water (Dry)										
Glass soil jar/Teflon lined cap										
BH221 SS1	E484	05-Dec-2022	09-Dec-2022	180 days	4 days	✓	09-Dec-2022	180 days	0 days	✓
Fixed-Ratio Extractables : Sodium Adsorption Ratio (SAR) - 1:2 Soil:Water (Dry)										
Glass soil jar/Teflon lined cap										
BH223 SS1	E484	05-Dec-2022	09-Dec-2022	180 days	4 days	✓	09-Dec-2022	180 days	0 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial [ON MECP] BH202 SS1	E581.F1	05-Dec-2022	08-Dec-2022	14 days	4 days	✓	09-Dec-2022	40 days	1 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial [ON MECP] BH204 SS1	E581.F1	05-Dec-2022	08-Dec-2022	14 days	4 days	✓	09-Dec-2022	40 days	1 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial [ON MECP] BH207 SS1	E581.F1	05-Dec-2022	08-Dec-2022	14 days	4 days	✓	09-Dec-2022	40 days	1 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial [ON MECP] BH212 SS1	E581.F1	05-Dec-2022	08-Dec-2022	14 days	4 days	✓	09-Dec-2022	40 days	1 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial [ON MECP] BH213 SS1	E581.F1	05-Dec-2022	08-Dec-2022	14 days	4 days	✓	09-Dec-2022	40 days	1 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial [ON MECP] BH220 SS2	E581.F1	05-Dec-2022	08-Dec-2022	14 days	4 days	✓	09-Dec-2022	40 days	1 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial [ON MECP] BH221 SS1	E581.F1	05-Dec-2022	08-Dec-2022	14 days	4 days	✓	09-Dec-2022	40 days	1 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial [ON MECP] BH223 SS1	E581.F1	05-Dec-2022	08-Dec-2022	14 days	4 days	✓	09-Dec-2022	40 days	1 days	✓
Hydrocarbons : CCME PHCs - F4G by Gravimetry (Low Level)										
Glass soil jar/Teflon lined cap BH207 SS1	E601.F4G-L	05-Dec-2022	12-Dec-2022	14 days	7 days	✓	14-Dec-2022	40 days	2 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Hydrocarbons : CCME PHCs - F4G by Gravimetry (Low Level)										
Glass soil jar/Teflon lined cap BH212 SS1	E601.F4G-L	05-Dec-2022	12-Dec-2022	14 days	7 days	✓	14-Dec-2022	40 days	2 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID (Low Level)										
Glass soil jar/Teflon lined cap BH202 SS1	E601.SG-L	05-Dec-2022	07-Dec-2022	14 days	2 days	✓	13-Dec-2022	40 days	6 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID (Low Level)										
Glass soil jar/Teflon lined cap BH204 SS1	E601.SG-L	05-Dec-2022	07-Dec-2022	14 days	2 days	✓	13-Dec-2022	40 days	6 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID (Low Level)										
Glass soil jar/Teflon lined cap BH207 SS1	E601.SG-L	05-Dec-2022	07-Dec-2022	14 days	2 days	✓	13-Dec-2022	40 days	6 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID (Low Level)										
Glass soil jar/Teflon lined cap BH212 SS1	E601.SG-L	05-Dec-2022	07-Dec-2022	14 days	2 days	✓	13-Dec-2022	40 days	6 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID (Low Level)										
Glass soil jar/Teflon lined cap BH213 SS1	E601.SG-L	05-Dec-2022	07-Dec-2022	14 days	2 days	✓	13-Dec-2022	40 days	6 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID (Low Level)										
Glass soil jar/Teflon lined cap BH220 SS2	E601.SG-L	05-Dec-2022	07-Dec-2022	14 days	2 days	✓	13-Dec-2022	40 days	6 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID (Low Level)										
Glass soil jar/Teflon lined cap BH221 SS1	E601.SG-L	05-Dec-2022	07-Dec-2022	14 days	2 days	✓	13-Dec-2022	40 days	6 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID (Low Level)										
Glass soil jar/Teflon lined cap BH223 SS1	E601.SG-L	05-Dec-2022	07-Dec-2022	14 days	2 days	✓	13-Dec-2022	40 days	6 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Boron-Hot Water Extractable by ICPOES										
Glass soil jar/Teflon lined cap										
BH202 SS1	E487	05-Dec-2022	09-Dec-2022	180 days	4 days	✓	09-Dec-2022	180 days	0 days	✓
Metals : Boron-Hot Water Extractable by ICPOES										
Glass soil jar/Teflon lined cap										
BH204 SS1	E487	05-Dec-2022	09-Dec-2022	180 days	4 days	✓	09-Dec-2022	180 days	0 days	✓
Metals : Boron-Hot Water Extractable by ICPOES										
Glass soil jar/Teflon lined cap										
BH207 SS1	E487	05-Dec-2022	09-Dec-2022	180 days	4 days	✓	09-Dec-2022	180 days	0 days	✓
Metals : Boron-Hot Water Extractable by ICPOES										
Glass soil jar/Teflon lined cap										
BH212 SS1	E487	05-Dec-2022	09-Dec-2022	180 days	4 days	✓	09-Dec-2022	180 days	0 days	✓
Metals : Boron-Hot Water Extractable by ICPOES										
Glass soil jar/Teflon lined cap										
BH213 SS1	E487	05-Dec-2022	09-Dec-2022	180 days	4 days	✓	09-Dec-2022	180 days	0 days	✓
Metals : Boron-Hot Water Extractable by ICPOES										
Glass soil jar/Teflon lined cap										
BH220 SS2	E487	05-Dec-2022	09-Dec-2022	180 days	4 days	✓	09-Dec-2022	180 days	0 days	✓
Metals : Boron-Hot Water Extractable by ICPOES										
Glass soil jar/Teflon lined cap										
BH221 SS1	E487	05-Dec-2022	09-Dec-2022	180 days	4 days	✓	09-Dec-2022	180 days	0 days	✓
Metals : Boron-Hot Water Extractable by ICPOES										
Glass soil jar/Teflon lined cap										
BH223 SS1	E487	05-Dec-2022	09-Dec-2022	180 days	4 days	✓	09-Dec-2022	180 days	0 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
BH202 SS1	E510	05-Dec-2022	08-Dec-2022	----	----		09-Dec-2022	28 days	4 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
BH204 SS1	E510	05-Dec-2022	08-Dec-2022	----	----		09-Dec-2022	28 days	4 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
BH207 SS1	E510	05-Dec-2022	08-Dec-2022	----	----		09-Dec-2022	28 days	4 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
BH212 SS1	E510	05-Dec-2022	08-Dec-2022	----	----		09-Dec-2022	28 days	4 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
BH213 SS1	E510	05-Dec-2022	08-Dec-2022	----	----		09-Dec-2022	28 days	4 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
BH220 SS2	E510	05-Dec-2022	08-Dec-2022	----	----		09-Dec-2022	28 days	4 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
BH221 SS1	E510	05-Dec-2022	08-Dec-2022	----	----		09-Dec-2022	28 days	4 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
BH223 SS1	E510	05-Dec-2022	08-Dec-2022	----	----		09-Dec-2022	28 days	4 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
BH202 SS1	E440	05-Dec-2022	08-Dec-2022	----	----		09-Dec-2022	180 days	4 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
BH204 SS1	E440	05-Dec-2022	08-Dec-2022	----	----		09-Dec-2022	180 days	4 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
BH207 SS1	E440	05-Dec-2022	08-Dec-2022	----	----		09-Dec-2022	180 days	4 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
BH212 SS1	E440	05-Dec-2022	08-Dec-2022	----	----		09-Dec-2022	180 days	4 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
BH213 SS1	E440	05-Dec-2022	08-Dec-2022	----	----		09-Dec-2022	180 days	4 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
BH220 SS2	E440	05-Dec-2022	08-Dec-2022	----	----		09-Dec-2022	180 days	4 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
BH221 SS1	E440	05-Dec-2022	08-Dec-2022	----	----		09-Dec-2022	180 days	4 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
BH223 SS1	E440	05-Dec-2022	08-Dec-2022	----	----		09-Dec-2022	180 days	4 days	✓
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)										
Glass soil jar/Teflon lined cap										
BH202 SS1	E100-L	05-Dec-2022	09-Dec-2022	----	----		09-Dec-2022	30 days	4 days	✓
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)										
Glass soil jar/Teflon lined cap										
BH204 SS1	E100-L	05-Dec-2022	09-Dec-2022	----	----		09-Dec-2022	30 days	4 days	✓
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)										
Glass soil jar/Teflon lined cap										
BH207 SS1	E100-L	05-Dec-2022	09-Dec-2022	----	----		09-Dec-2022	30 days	4 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)										
Glass soil jar/Teflon lined cap										
BH212 SS1	E100-L	05-Dec-2022	09-Dec-2022	----	----		09-Dec-2022	30 days	4 days	✓
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)										
Glass soil jar/Teflon lined cap										
BH213 SS1	E100-L	05-Dec-2022	09-Dec-2022	----	----		09-Dec-2022	30 days	4 days	✓
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)										
Glass soil jar/Teflon lined cap										
BH220 SS2	E100-L	05-Dec-2022	09-Dec-2022	----	----		09-Dec-2022	30 days	4 days	✓
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)										
Glass soil jar/Teflon lined cap										
BH221 SS1	E100-L	05-Dec-2022	09-Dec-2022	----	----		09-Dec-2022	30 days	4 days	✓
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)										
Glass soil jar/Teflon lined cap										
BH223 SS1	E100-L	05-Dec-2022	09-Dec-2022	----	----		09-Dec-2022	30 days	4 days	✓
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
BH202 SS1	E144	05-Dec-2022	----	----	----		06-Dec-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
BH204 SS1	E144	05-Dec-2022	----	----	----		06-Dec-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
BH207 SS1	E144	05-Dec-2022	----	----	----		06-Dec-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
BH212 SS1	E144	05-Dec-2022	----	----	----		06-Dec-2022	----	----	

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
BH213 SS1	E144	05-Dec-2022	----	----	----		06-Dec-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
BH220 SS2	E144	05-Dec-2022	----	----	----		06-Dec-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
BH221 SS1	E144	05-Dec-2022	----	----	----		06-Dec-2022	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
BH223 SS1	E144	05-Dec-2022	----	----	----		06-Dec-2022	----	----	
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap										
BH202 SS1	E108A	05-Dec-2022	06-Dec-2022	----	----		07-Dec-2022	30 days	3 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap										
BH204 SS1	E108A	05-Dec-2022	06-Dec-2022	----	----		07-Dec-2022	30 days	3 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap										
BH207 SS1	E108A	05-Dec-2022	06-Dec-2022	----	----		07-Dec-2022	30 days	3 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap										
BH212 SS1	E108A	05-Dec-2022	06-Dec-2022	----	----		07-Dec-2022	30 days	3 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap										
BH213 SS1	E108A	05-Dec-2022	06-Dec-2022	----	----		07-Dec-2022	30 days	3 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap										
BH220 SS2	E108A	05-Dec-2022	06-Dec-2022	----	----		07-Dec-2022	30 days	3 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap										
BH221 SS1	E108A	05-Dec-2022	06-Dec-2022	----	----		07-Dec-2022	30 days	3 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap										
BH223 SS1	E108A	05-Dec-2022	08-Dec-2022	----	----		09-Dec-2022	30 days	5 days	✓
Speciated Metals : Hexavalent Chromium (Cr VI) by IC										
Glass soil jar/Teflon lined cap										
BH202 SS1	E532	05-Dec-2022	06-Dec-2022	30 days	2 days	✓	07-Dec-2022	7 days	1 days	✓
Speciated Metals : Hexavalent Chromium (Cr VI) by IC										
Glass soil jar/Teflon lined cap										
BH204 SS1	E532	05-Dec-2022	06-Dec-2022	30 days	2 days	✓	07-Dec-2022	7 days	1 days	✓
Speciated Metals : Hexavalent Chromium (Cr VI) by IC										
Glass soil jar/Teflon lined cap										
BH207 SS1	E532	05-Dec-2022	06-Dec-2022	30 days	2 days	✓	07-Dec-2022	7 days	1 days	✓
Speciated Metals : Hexavalent Chromium (Cr VI) by IC										
Glass soil jar/Teflon lined cap										
BH212 SS1	E532	05-Dec-2022	06-Dec-2022	30 days	2 days	✓	07-Dec-2022	7 days	1 days	✓
Speciated Metals : Hexavalent Chromium (Cr VI) by IC										
Glass soil jar/Teflon lined cap										
BH213 SS1	E532	05-Dec-2022	06-Dec-2022	30 days	2 days	✓	07-Dec-2022	7 days	1 days	✓
Speciated Metals : Hexavalent Chromium (Cr VI) by IC										
Glass soil jar/Teflon lined cap										
BH220 SS2	E532	05-Dec-2022	06-Dec-2022	30 days	2 days	✓	07-Dec-2022	7 days	1 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Speciated Metals : Hexavalent Chromium (Cr VI) by IC										
Glass soil jar/Teflon lined cap										
BH221 SS1	E532	05-Dec-2022	06-Dec-2022	30 days	2 days	✓	07-Dec-2022	7 days	1 days	✓
Speciated Metals : Hexavalent Chromium (Cr VI) by IC										
Glass soil jar/Teflon lined cap										
BH223 SS1	E532	05-Dec-2022	06-Dec-2022	30 days	2 days	✓	07-Dec-2022	7 days	1 days	✓
Volatile Organic Compounds : BTEX by Headspace GC-MS										
Glass soil methanol vial [ON MECP]										
BH202 SS1	E611A	05-Dec-2022	08-Dec-2022	14 days	4 days	✓	09-Dec-2022	40 days	1 days	✓
Volatile Organic Compounds : BTEX by Headspace GC-MS										
Glass soil methanol vial [ON MECP]										
BH204 SS1	E611A	05-Dec-2022	08-Dec-2022	14 days	4 days	✓	09-Dec-2022	40 days	1 days	✓
Volatile Organic Compounds : BTEX by Headspace GC-MS										
Glass soil methanol vial [ON MECP]										
BH207 SS1	E611A	05-Dec-2022	08-Dec-2022	14 days	4 days	✓	09-Dec-2022	40 days	1 days	✓
Volatile Organic Compounds : BTEX by Headspace GC-MS										
Glass soil methanol vial [ON MECP]										
BH212 SS1	E611A	05-Dec-2022	08-Dec-2022	14 days	4 days	✓	09-Dec-2022	40 days	1 days	✓
Volatile Organic Compounds : BTEX by Headspace GC-MS										
Glass soil methanol vial [ON MECP]										
BH213 SS1	E611A	05-Dec-2022	08-Dec-2022	14 days	4 days	✓	09-Dec-2022	40 days	1 days	✓
Volatile Organic Compounds : BTEX by Headspace GC-MS										
Glass soil methanol vial [ON MECP]										
BH220 SS2	E611A	05-Dec-2022	08-Dec-2022	14 days	4 days	✓	09-Dec-2022	40 days	1 days	✓
Volatile Organic Compounds : BTEX by Headspace GC-MS										
Glass soil methanol vial [ON MECP]										
BH221 SS1	E611A	05-Dec-2022	08-Dec-2022	14 days	4 days	✓	09-Dec-2022	40 days	1 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Volatile Organic Compounds : BTEX by Headspace GC-MS										
Glass soil methanol vial [ON MECP]										
BH223 SS1	E611A	05-Dec-2022	08-Dec-2022	14 days	4 days	✓	09-Dec-2022	40 days	1 days	✓

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Soil/Solid**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Boron-Hot Water Extractable by ICPOES	E487	768817	1	17	5.8	5.0	✓
BTEX by Headspace GC-MS	E611A	771930	1	20	5.0	5.0	✓
CCME PHC - F1 by Headspace GC-FID	E581.F1	771931	1	20	5.0	5.0	✓
CCME PHCs - F4G by Gravimetry (Low Level)	E601.F4G-L	777059	0	2	0.0	5.0	×
CCME PHCs - F2-F4 by GC-FID (Low Level)	E601.SG-L	769877	1	14	7.1	5.0	✓
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L	768815	1	15	6.6	5.0	✓
Hexavalent Chromium (Cr VI) by IC	E532	768786	1	20	5.0	5.0	✓
Mercury in Soil/Solid by CVAAS	E510	768813	1	17	5.8	5.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	768814	1	17	5.8	5.0	✓
Moisture Content by Gravimetry	E144	768805	1	20	5.0	5.0	✓
pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received	E108A	768782	3	60	5.0	5.0	✓
Sodium Adsorption Ratio (SAR) - 1:2 Soil:Water (Dry)	E484	768816	1	13	7.6	5.0	✓
WAD Cyanide (0.01M NaOH Extraction)	E336A	770618	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Boron-Hot Water Extractable by ICPOES	E487	768817	2	17	11.7	10.0	✓
BTEX by Headspace GC-MS	E611A	771930	1	20	5.0	5.0	✓
CCME PHC - F1 by Headspace GC-FID	E581.F1	771931	1	20	5.0	5.0	✓
CCME PHCs - F4G by Gravimetry (Low Level)	E601.F4G-L	777059	1	2	50.0	5.0	✓
CCME PHCs - F2-F4 by GC-FID (Low Level)	E601.SG-L	769877	1	14	7.1	5.0	✓
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L	768815	2	15	13.3	10.0	✓
Hexavalent Chromium (Cr VI) by IC	E532	768786	2	20	10.0	10.0	✓
Mercury in Soil/Solid by CVAAS	E510	768813	2	17	11.7	10.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	768814	2	17	11.7	10.0	✓
Moisture Content by Gravimetry	E144	768805	1	20	5.0	5.0	✓
pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received	E108A	768782	3	60	5.0	5.0	✓
Sodium Adsorption Ratio (SAR) - 1:2 Soil:Water (Dry)	E484	768816	2	13	15.3	10.0	✓
WAD Cyanide (0.01M NaOH Extraction)	E336A	770618	1	20	5.0	5.0	✓
Method Blanks (MB)							
Boron-Hot Water Extractable by ICPOES	E487	768817	1	17	5.8	5.0	✓
BTEX by Headspace GC-MS	E611A	771930	1	20	5.0	5.0	✓
CCME PHC - F1 by Headspace GC-FID	E581.F1	771931	1	20	5.0	5.0	✓
CCME PHCs - F4G by Gravimetry (Low Level)	E601.F4G-L	777059	1	2	50.0	5.0	✓
CCME PHCs - F2-F4 by GC-FID (Low Level)	E601.SG-L	769877	1	14	7.1	5.0	✓
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L	768815	1	15	6.6	5.0	✓
Hexavalent Chromium (Cr VI) by IC	E532	768786	1	20	5.0	5.0	✓

Matrix: **Soil/Solid**

Evaluation: ✗ = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Method Blanks (MB) - Continued							
Mercury in Soil/Solid by CVAAS	E510	768813	1	17	5.8	5.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	768814	1	17	5.8	5.0	✓
Moisture Content by Gravimetry	E144	768805	1	20	5.0	5.0	✓
Sodium Adsorption Ratio (SAR) - 1:2 Soil:Water (Dry)	E484	768816	1	13	7.6	5.0	✓
WAD Cyanide (0.01M NaOH Extraction)	E336A	770618	1	20	5.0	5.0	✓
Matrix Spikes (MS)							
BTEX by Headspace GC-MS	E611A	771930	1	20	5.0	5.0	✓
CCME PHC - F1 by Headspace GC-FID	E581.F1	771931	1	20	5.0	5.0	✓
CCME PHCs - F4G by Gravimetry (Low Level)	E601.F4G-L	777059	0	2	0.0	5.0	✗
CCME PHCs - F2-F4 by GC-FID (Low Level)	E601.SG-L	769877	1	14	7.1	5.0	✓
WAD Cyanide (0.01M NaOH Extraction)	E336A	770618	1	20	5.0	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L Waterloo - Environmental	Soil/Solid	CSSS Ch. 15 (mod)/APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a soil sample that has been added in a defined ratio of soil to deionized water, then shaken well and allowed to settle. Conductance is measured in the fluid that is observed in the upper layer.
pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received	E108A Waterloo - Environmental	Soil/Solid	MOEE E3137A	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C) and is carried out in accordance with procedures described in the Analytical Protocol (prescriptive method). A minimum 10g portion of the sample, as received, is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil by centrifuging, settling, or decanting and then analyzed using a pH meter and electrode.
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.
WAD Cyanide (0.01M NaOH Extraction)	E336A Waterloo - Environmental	Soil/Solid	APHA 4500-CN I (mod)	Weak Acid Dissociable (WAD) cyanide is determined after extraction by Continuous Flow Analyzer (CFA) with in-line distillation followed by colourmetric analysis.
Metals in Soil/Solid by CRC ICPMS	E440 Waterloo - Environmental	Soil/Solid	EPA 6020B (mod)	This method is intended to liberate metals that may be environmentally available. Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCl. Dependent on sample matrix, some metals may be only partially recovered, including Al, Ba, Be, Cr, Sr, Ti, Tl, V, W, and Zr. Silicate minerals are not solubilized. Volatile forms of sulfur (including sulfide) may not be captured, as they may be lost during sampling, storage, or digestion. This method does not adequately recover elemental sulfur, and is unsuitable for assessment of elemental sulfur standards or guidelines. Analysis is by Collision/Reaction Cell ICPMS.
Sodium Adsorption Ratio (SAR) - 1:2 Soil:Water (Dry)	E484 Waterloo - Environmental	Soil/Solid	SW846 6010C	A dried, disaggregated solid sample is extracted with deionized water, the aqueous extract is separated from the solid, acidified and then analyzed using a ICP/OES. The concentrations of Na, Ca and Mg are reported as per CALA requirements for calculated parameters. These individual parameters are not for comparison to any guideline.
Boron-Hot Water Extractable by ICPOES	E487 Waterloo - Environmental	Soil/Solid	HW EXTR, EPA 6010B	A dried solid sample is extracted with calcium chloride, the sample undergoes a heating process. After cooling the sample is filtered and analyzed by ICP/OES. Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Mercury in Soil/Solid by CVAAS	E510 Waterloo - Environmental	Soil/Solid	EPA 200.2/1631 Appendix (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO_3 and HCl, followed by CVAAS analysis.
Hexavalent Chromium (Cr VI) by IC	E532 Waterloo - Environmental	Soil/Solid	APHA 3500-CR C	Instrumental analysis is performed by ion chromatography with UV detection.
CCME PHC - F1 by Headspace GC-FID	E581.F1 Waterloo - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1	CCME Fraction 1 (F1) is analyzed by static headspace GC-FID. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
CCME PHCs - F4G by Gravimetry (Low Level)	E601.F4G-L Waterloo - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1	A portion of the silica gel treated sample extract is filtered and dried at 105°C and the mass of the residual gravimetric heavy hydrocarbons (F4G) is determined gravimetrically.
CCME PHCs - F2-F4 by GC-FID (Low Level)	E601.SG-L Waterloo - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1	Sample extracts are subjected to in-situ silica gel treatment prior to analysis by GC-FID for CCME hydrocarbon fractions (F2-F4).
BTEX by Headspace GC-MS	E611A Waterloo - Environmental	Soil/Solid	EPA 8260D (mod)	Volatile Organic Compounds (VOCs) are analyzed by static headspace GC-MS. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
F1-BTEX	EC580 Waterloo - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1	F1-BTEX is calculated as follows: F1-BTEX = F1 (C6-C10) minus benzene, toluene, ethylbenzene and xylenes (BTEX).
Sum F1 to F4 (C6-C50)	EC581 Waterloo - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1	Hydrocarbons, total (C6-C50) is the sum of CCME Fractions F1(C6-C10), F2(C10-C16), F3(C16-C34), and F4(C34-C50). F4G-sg is not used within this calculation due to overlap with other fractions.

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.
Leach 1:2 Soil : 0.01$CaCl_2$ - As Received for pH	EP108A Waterloo - Environmental	Soil/Solid	MOEE E3137A	A minimum 10g portion of the sample, as received, is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil by centrifuging, settling or decanting and then analyzed using a pH meter and electrode.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Cyanide Extraction for CFA (0.01M NaOH)	EP333A Waterloo - Environmental	Soil/Solid	ON MECP E3015 (mod)	Extraction for various cyanide analysis is by rotary extraction of the soil with 0.01M Sodium Hydroxide.
Digestion for Metals and Mercury	EP440 Waterloo - Environmental	Soil/Solid	EPA 200.2 (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO_3 and HCl. This method is intended to liberate metals that may be environmentally available.
Boron-Hot Water Extractable	EP487 Waterloo - Environmental	Soil/Solid	HW EXTR, EPA 6010B	A dried solid sample is extracted with weak calcium chloride, the sample undergoes a heating process. After cooling the sample is filtered and analyzed by ICP/OES. Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011)
Preparation of Hexavalent Chromium (Cr VI) for IC	EP532 Waterloo - Environmental	Soil/Solid	EPA 3060A	Field moist samples are digested with a sodium hydroxide/sodium carbonate solution as described in EPA 3060A.
VOCs Methanol Extraction for Headspace Analysis	EP581 Waterloo - Environmental	Soil/Solid	EPA 5035A (mod)	VOCs in samples are extracted with methanol. Extracts are then prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
PHCs and PAHs Hexane-Acetone Tumbler Extraction	EP601 Waterloo - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1 (mod)	Samples are subsampled and Petroleum Hydrocarbons (PHC) and PAHs are extracted with 1:1 hexane:acetone using a rotary extractor.

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QUALITY CONTROL REPORT

Work Order	: **WT2224094**	Page	: 1 of 11
Client	: Pinchin Ltd.	Laboratory	: Waterloo - Environmental
Contact	: Vanessa Marshall	Account Manager	: Amanda Overholster
Address	: 225 Labrador Drive Unit #1 Waterloo ON Canada N2K 4M8	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	:	Telephone	: 1 416 817 2944
Project	: 318728	Date Samples Received	: 05-Dec-2022 16:00
PO	: ----	Date Analysis Commenced	: 06-Dec-2022
C-O-C number	: 20-1002590	Issue Date	: 14-Dec-2022 14:56
Sampler	: CLIENT 519 746 4210, Ext. 3756		
Site	: ----		
Quote number	: 2022 SOA		
No. of samples received	: 8		
No. of samples analysed	: 8		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Reference Material (RM) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Amanda Ganouri-Lumsden	Department Manager - Microbiology and Prep	Waterloo Centralized Prep, Waterloo, Ontario
Danielle Gravel	Supervisor - Semi-Volatile Instrumentation	Waterloo Organics, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Waterloo Inorganics, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Waterloo Metals, Waterloo, Ontario
Sarah Birch	VOC Section Supervisor	Waterloo Organics, Waterloo, Ontario

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Physical Tests (QC Lot: 768782)											
EO2210621-001	Anonymous	pH (1:2 soil:CaCl2-aq)	----	E108A	0.10	pH units	7.62	7.64	0.262%	5%	----
Physical Tests (QC Lot: 768805)											
EO2210621-001	Anonymous	moisture	----	E144	0.25	%	13.4	13.6	1.95%	20%	----
Physical Tests (QC Lot: 768815)											
WT2224046-003	Anonymous	conductivity (1:2 leachate)	----	E100-L	5.00	µS/cm	1.01 mS/cm	1050	4.38%	20%	----
Physical Tests (QC Lot: 769204)											
WT2223886-001	Anonymous	pH (1:2 soil:CaCl2-aq)	----	E108A	0.10	pH units	7.53	7.62	1.19%	5%	----
Physical Tests (QC Lot: 772582)											
WT2224094-008	BH223 SS1	pH (1:2 soil:CaCl2-aq)	----	E108A	0.10	pH units	7.80	7.83	0.384%	5%	----
Cyanides (QC Lot: 770618)											
WT2224060-005	Anonymous	cyanide, weak acid dissociable	----	E336A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
Metals (QC Lot: 768813)											
WT2223207-004	Anonymous	mercury	7439-97-6	E510	0.0050	mg/kg	0.0077	0.0084	0.0006	Diff <2x LOR	----
Metals (QC Lot: 768814)											
WT2223207-004	Anonymous	antimony	7440-36-0	E440	0.10	mg/kg	0.11	<0.10	0.006	Diff <2x LOR	----
		arsenic	7440-38-2	E440	0.10	mg/kg	3.78	3.30	13.3%	30%	----
		barium	7440-39-3	E440	0.50	mg/kg	16.3	13.7	17.5%	40%	----
		beryllium	7440-41-7	E440	0.10	mg/kg	0.19	0.15	0.04	Diff <2x LOR	----
		boron	7440-42-8	E440	5.0	mg/kg	10.8	8.5	2.2	Diff <2x LOR	----
		cadmium	7440-43-9	E440	0.020	mg/kg	0.203	0.177	13.6%	30%	----
		chromium	7440-47-3	E440	0.50	mg/kg	8.50	7.08	18.2%	30%	----
		cobalt	7440-48-4	E440	0.10	mg/kg	3.47	2.90	18.1%	30%	----
		copper	7440-50-8	E440	0.50	mg/kg	24.8	22.1	11.7%	30%	----
		lead	7439-92-1	E440	0.50	mg/kg	10.9	9.67	12.3%	40%	----
		molybdenum	7439-98-7	E440	0.10	mg/kg	0.76	0.62	20.3%	40%	----
		nickel	7440-02-0	E440	0.50	mg/kg	6.10	5.42	11.9%	30%	----
		selenium	7782-49-2	E440	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	----
		silver	7440-22-4	E440	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	----
		thallium	7440-28-0	E440	0.050	mg/kg	0.072	0.061	0.011	Diff <2x LOR	----
		uranium	7440-61-1	E440	0.050	mg/kg	0.616	0.495	21.8%	30%	----

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Metals (QC Lot: 768814) - continued											
WT2223207-004	Anonymous	vanadium	7440-62-2	E440	0.20	mg/kg	17.2	14.0	20.7%	30%	----
		zinc	7440-66-6	E440	2.0	mg/kg	80.4	72.1	10.8%	30%	----
Metals (QC Lot: 768816)											
WT2224046-003	Anonymous	calcium, soluble ion content	7440-70-2	E484	0.50	mg/L	7.80	8.47	8.24%	30%	----
		magnesium, soluble ion content	7439-95-4	E484	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	----
		sodium, soluble ion content	17341-25-2	E484	0.50	mg/L	185	195	5.26%	30%	----
Metals (QC Lot: 768817)											
WT2223207-017	Anonymous	boron, hot water soluble	7440-42-8	E487	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	----
Speciated Metals (QC Lot: 768786)											
WT2223207-004	Anonymous	chromium, hexavalent [Cr VI]	18540-29-9	E532	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	----
Volatile Organic Compounds (QC Lot: 771930)											
WT2224054-019	Anonymous	benzene	71-43-2	E611A	0.0050	mg/kg	<0.0050 µg/g	<0.0050	0	Diff <2x LOR	----
		ethylbenzene	100-41-4	E611A	0.015	mg/kg	<0.015 µg/g	<0.015	0	Diff <2x LOR	----
		toluene	108-88-3	E611A	0.050	mg/kg	<0.050 µg/g	<0.050	0	Diff <2x LOR	----
		xylene, m+p-	179601-23-1	E611A	0.030	mg/kg	<0.030 µg/g	<0.030	0	Diff <2x LOR	----
		xylene, o-	95-47-6	E611A	0.030	mg/kg	<0.030 µg/g	<0.030	0	Diff <2x LOR	----
Hydrocarbons (QC Lot: 769877)											
WT2224049-001	Anonymous	F2 (C10-C16)	----	E601.SG-L	10	mg/kg	42	45	3	Diff <2x LOR	----
		F3 (C16-C34)	----	E601.SG-L	50	mg/kg	891	916	2.67%	40%	----
		F4 (C34-C50)	----	E601.SG-L	50	mg/kg	<50	<50	0	Diff <2x LOR	----
Hydrocarbons (QC Lot: 771931)											
WT2224054-019	Anonymous	F1 (C6-C10)	----	E581.F1	5.0	mg/kg	<5.0 µg/g	<5.0	0	Diff <2x LOR	----

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: 768805)						
moisture	----	E144	0.25	%	<0.25	----
Physical Tests (QCLot: 768815)						
conductivity (1:2 leachate)	----	E100-L	5	µS/cm	<5.00	----
Cyanides (QCLot: 770618)						
cyanide, weak acid dissociable	----	E336A	0.05	mg/kg	<0.050	----
Metals (QCLot: 768813)						
mercury	7439-97-6	E510	0.005	mg/kg	<0.0050	----
Metals (QCLot: 768814)						
antimony	7440-36-0	E440	0.1	mg/kg	<0.10	----
arsenic	7440-38-2	E440	0.1	mg/kg	<0.10	----
barium	7440-39-3	E440	0.5	mg/kg	<0.50	----
beryllium	7440-41-7	E440	0.1	mg/kg	<0.10	----
boron	7440-42-8	E440	5	mg/kg	<5.0	----
cadmium	7440-43-9	E440	0.02	mg/kg	<0.020	----
chromium	7440-47-3	E440	0.5	mg/kg	<0.50	----
cobalt	7440-48-4	E440	0.1	mg/kg	<0.10	----
copper	7440-50-8	E440	0.5	mg/kg	<0.50	----
lead	7439-92-1	E440	0.5	mg/kg	<0.50	----
molybdenum	7439-98-7	E440	0.1	mg/kg	<0.10	----
nickel	7440-02-0	E440	0.5	mg/kg	<0.50	----
selenium	7782-49-2	E440	0.2	mg/kg	<0.20	----
silver	7440-22-4	E440	0.1	mg/kg	<0.10	----
thallium	7440-28-0	E440	0.05	mg/kg	<0.050	----
uranium	7440-61-1	E440	0.05	mg/kg	<0.050	----
vanadium	7440-62-2	E440	0.2	mg/kg	<0.20	----
zinc	7440-66-6	E440	2	mg/kg	<2.0	----
Metals (QCLot: 768816)						
calcium, soluble ion content	7440-70-2	E484	0.5	mg/L	<0.50	----
magnesium, soluble ion content	7439-95-4	E484	0.5	mg/L	<0.50	----
sodium, soluble ion content	17341-25-2	E484	0.5	mg/L	<0.50	----
Metals (QCLot: 768817)						
boron, hot water soluble	7440-42-8	E487	0.1	mg/kg	<0.10	----

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Speciated Metals (QCLot: 768786)						
chromium, hexavalent [Cr VI]	18540-29-9	E532	0.1	mg/kg	<0.10	----
Volatile Organic Compounds (QCLot: 771930)						
benzene	71-43-2	E611A	0.005	mg/kg	<0.0050	----
ethylbenzene	100-41-4	E611A	0.015	mg/kg	<0.015	----
toluene	108-88-3	E611A	0.05	mg/kg	<0.050	----
xylene, m+p-	179601-23-1	E611A	0.03	mg/kg	<0.030	----
xylene, o-	95-47-6	E611A	0.03	mg/kg	<0.030	----
Hydrocarbons (QCLot: 769877)						
F2 (C10-C16)	----	E601.SG-L	10	mg/kg	<10	----
F3 (C16-C34)	----	E601.SG-L	50	mg/kg	<50	----
F4 (C34-C50)	----	E601.SG-L	50	mg/kg	<50	----
Hydrocarbons (QCLot: 771931)						
F1 (C6-C10)	----	E581.F1	5	mg/kg	<5.0	----
Hydrocarbons (QCLot: 777059)						
F4G-sg	----	E601.F4G-L	250	mg/kg	<250	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 768782)									
pH (1:2 soil:CaCl2-aq)	----	E108A	----	pH units	7 pH units	99.8	98.0	102	----
Physical Tests (QCLot: 768805)									
moisture	----	E144	0.25	%	50 %	99.4	90.0	110	----
Physical Tests (QCLot: 768815)									
conductivity (1:2 leachate)	----	E100-L	5	µS/cm	1409 µS/cm	101	90.0	110	----
Physical Tests (QCLot: 769204)									
pH (1:2 soil:CaCl2-aq)	----	E108A	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 772582)									
pH (1:2 soil:CaCl2-aq)	----	E108A	----	pH units	7 pH units	100	98.0	102	----
Cyanides (QCLot: 770618)									
cyanide, weak acid dissociable	----	E336A	0.05	mg/kg	2.5 mg/kg	96.8	80.0	125	----
Metals (QCLot: 768813)									
mercury	7439-97-6	E510	0.005	mg/kg	0.1 mg/kg	102	80.0	120	----
Metals (QCLot: 768814)									
antimony	7440-36-0	E440	0.1	mg/kg	100 mg/kg	105	80.0	120	----
arsenic	7440-38-2	E440	0.1	mg/kg	100 mg/kg	108	80.0	120	----
barium	7440-39-3	E440	0.5	mg/kg	25 mg/kg	103	80.0	120	----
beryllium	7440-41-7	E440	0.1	mg/kg	10 mg/kg	96.0	80.0	120	----
boron	7440-42-8	E440	5	mg/kg	100 mg/kg	94.8	80.0	120	----
cadmium	7440-43-9	E440	0.02	mg/kg	10 mg/kg	104	80.0	120	----
chromium	7440-47-3	E440	0.5	mg/kg	25 mg/kg	105	80.0	120	----
cobalt	7440-48-4	E440	0.1	mg/kg	25 mg/kg	103	80.0	120	----
copper	7440-50-8	E440	0.5	mg/kg	25 mg/kg	100	80.0	120	----
lead	7439-92-1	E440	0.5	mg/kg	50 mg/kg	101	80.0	120	----
molybdenum	7439-98-7	E440	0.1	mg/kg	25 mg/kg	98.6	80.0	120	----
nickel	7440-02-0	E440	0.5	mg/kg	50 mg/kg	103	80.0	120	----
selenium	7782-49-2	E440	0.2	mg/kg	100 mg/kg	97.0	80.0	120	----
silver	7440-22-4	E440	0.1	mg/kg	10 mg/kg	90.8	80.0	120	----
thallium	7440-28-0	E440	0.05	mg/kg	100 mg/kg	95.8	80.0	120	----
uranium	7440-61-1	E440	0.05	mg/kg	0.5 mg/kg	102	80.0	120	----
vanadium	7440-62-2	E440	0.2	mg/kg	50 mg/kg	108	80.0	120	----

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Metals (QCLot: 768814) - continued									
zinc	7440-66-6	E440	2	mg/kg	50 mg/kg	99.9	80.0	120	----
Metals (QCLot: 768816)									
calcium, soluble ion content	7440-70-2	E484	0.5	mg/L	300 mg/L	109	80.0	120	----
magnesium, soluble ion content	7439-95-4	E484	0.5	mg/L	50 mg/L	103	80.0	120	----
sodium, soluble ion content	17341-25-2	E484	0.5	mg/L	50 mg/L	104	80.0	120	----
Metals (QCLot: 768817)									
boron, hot water soluble	7440-42-8	E487	0.1	mg/kg	1.33333 mg/kg	107	70.0	130	----
Speciated Metals (QCLot: 768786)									
chromium, hexavalent [Cr VI]	18540-29-9	E532	0.1	mg/kg	0.8 mg/kg	88.2	80.0	120	----
Volatile Organic Compounds (QCLot: 771930)									
benzene	71-43-2	E611A	0.005	mg/kg	3.475 mg/kg	130	70.0	130	----
ethylbenzene	100-41-4	E611A	0.015	mg/kg	3.475 mg/kg	117	70.0	130	----
toluene	108-88-3	E611A	0.05	mg/kg	3.475 mg/kg	125	70.0	130	----
xylene, m+p-	179601-23-1	E611A	0.03	mg/kg	6.95 mg/kg	125	70.0	130	----
xylene, o-	95-47-6	E611A	0.03	mg/kg	3.475 mg/kg	120	70.0	130	----
Hydrocarbons (QCLot: 769877)									
F2 (C10-C16)	----	E601.SG-L	10	mg/kg	883.825 mg/kg	87.2	70.0	130	----
F3 (C16-C34)	----	E601.SG-L	50	mg/kg	1385.22 mg/kg	79.4	70.0	130	----
F4 (C34-C50)	----	E601.SG-L	50	mg/kg	797.55 mg/kg	86.1	70.0	130	----
Hydrocarbons (QCLot: 771931)									
F1 (C6-C10)	----	E581.F1	5	mg/kg	69.1875 mg/kg	104	80.0	120	----
Hydrocarbons (QCLot: 777059)									
F4G-sg	----	E601.F4G-L	250	mg/kg	1298.6 mg/kg	91.4	70.0	130	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Soil/Solid**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Cyanides (QCLot: 770618)										
WT2224060-005	Anonymous	cyanide, weak acid dissociable	----	E336A	1.23 mg/kg	2.5 mg/kg	99.8	70.0	130	----
Volatile Organic Compounds (QCLot: 771930)										
WT2224054-019	Anonymous	benzene	71-43-2	E611A	2.27 mg/kg	3.125 mg/kg	98.0	60.0	140	----
		ethylbenzene	100-41-4	E611A	2.09 mg/kg	3.125 mg/kg	90.1	60.0	140	----
		toluene	108-88-3	E611A	2.22 mg/kg	3.125 mg/kg	95.6	60.0	140	----
		xylene, m+p-	179601-23-1	E611A	4.46 mg/kg	6.25 mg/kg	96.2	60.0	140	----
		xylene, o-	95-47-6	E611A	2.12 mg/kg	3.125 mg/kg	91.5	60.0	140	----
Hydrocarbons (QCLot: 769877)										
WT2224049-001	Anonymous	F2 (C10-C16)	----	E601.SG-L	696 mg/kg	883.825 mg/kg	96.2	60.0	140	----
		F3 (C16-C34)	----	E601.SG-L	984 mg/kg	1385.22 mg/kg	86.8	60.0	140	----
		F4 (C34-C50)	----	E601.SG-L	602 mg/kg	797.55 mg/kg	92.1	60.0	140	----
Hydrocarbons (QCLot: 771931)										
WT2224054-019	Anonymous	F1 (C6-C10)	----	E581.F1	47.6 mg/kg	62.5 mg/kg	103	60.0	140	----

Reference Material (RM) Report

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).

Sub-Matrix:

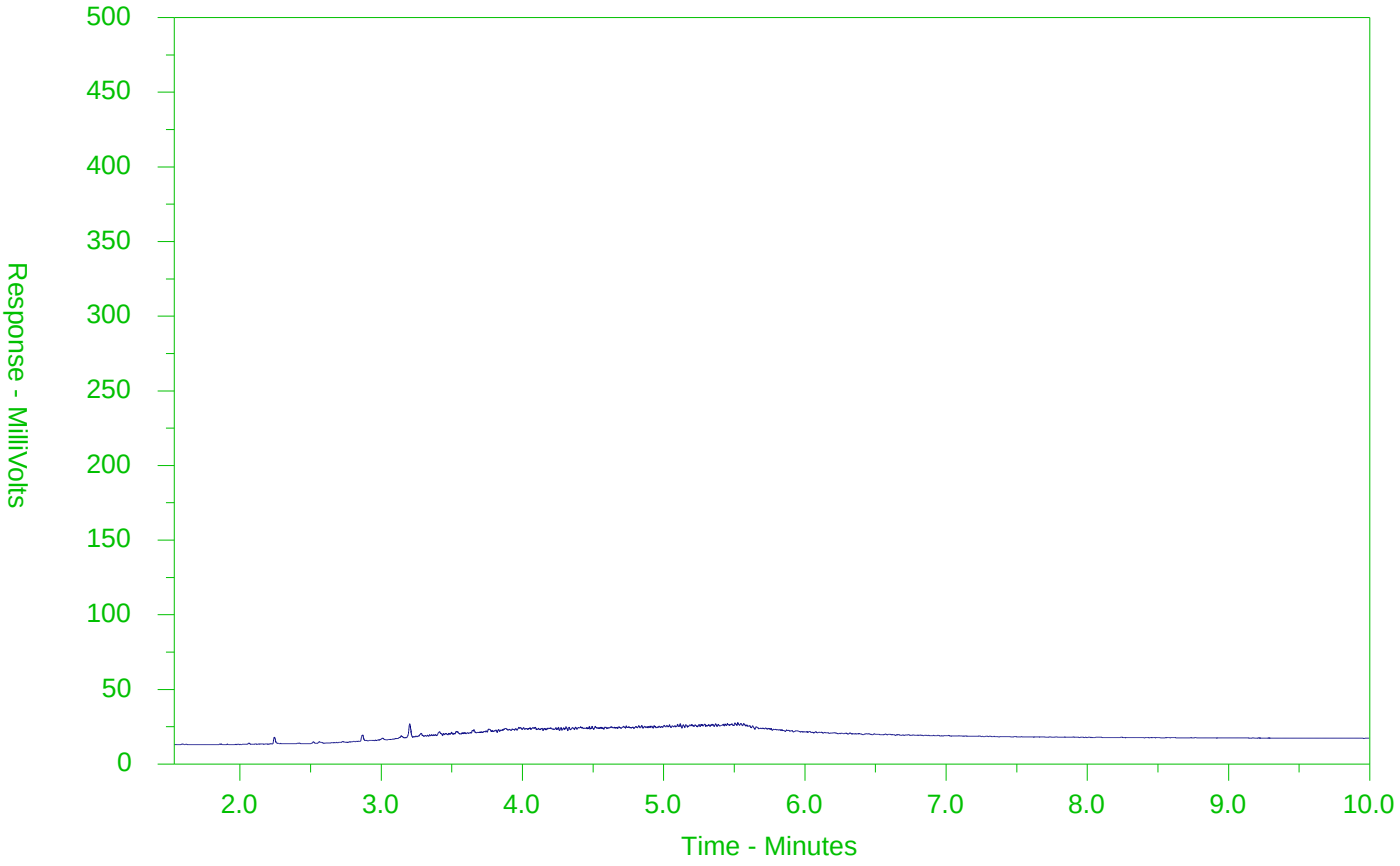
					Reference Material (RM) Report				
					RM Target	Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Physical Tests (QCLot: 768815)									
	RM	conductivity (1:2 leachate)	----	E100-L	1031.5 µS/cm	106	70.0	130	----
Metals (QCLot: 768813)									
	RM	mercury	7439-97-6	E510	0.0585 mg/kg	104	70.0	130	----
Metals (QCLot: 768814)									
	RM	antimony	7440-36-0	E440	3.99 mg/kg	85.4	70.0	130	----
	RM	arsenic	7440-38-2	E440	3.73 mg/kg	90.1	70.0	130	----
	RM	barium	7440-39-3	E440	105 mg/kg	91.9	70.0	130	----
	RM	beryllium	7440-41-7	E440	0.349 mg/kg	92.8	70.0	130	----
	RM	boron	7440-42-8	E440	8.5 mg/kg	96.5	40.0	160	----
	RM	cadmium	7440-43-9	E440	0.91 mg/kg	85.8	70.0	130	----
	RM	chromium	7440-47-3	E440	101 mg/kg	89.1	70.0	130	----
	RM	cobalt	7440-48-4	E440	6.9 mg/kg	89.8	70.0	130	----
	RM	copper	7440-50-8	E440	123 mg/kg	89.5	70.0	130	----
	RM	lead	7439-92-1	E440	267 mg/kg	92.1	70.0	130	----
	RM	molybdenum	7439-98-7	E440	1.03 mg/kg	96.1	70.0	130	----
	RM	nickel	7440-02-0	E440	26.7 mg/kg	92.5	70.0	130	----
	RM	silver	7440-22-4	E440	4.06 mg/kg	92.8	70.0	130	----
	RM	thallium	7440-28-0	E440	0.0786 mg/kg	84.4	40.0	160	----
	RM	uranium	7440-61-1	E440	0.52 mg/kg	107	70.0	130	----
	RM	vanadium	7440-62-2	E440	32.7 mg/kg	91.1	70.0	130	----
	RM	zinc	7440-66-6	E440	297 mg/kg	87.6	70.0	130	----
Metals (QCLot: 768816)									
	RM	calcium, soluble ion content	7440-70-2	E484	86.59 mg/L	103	70.0	130	----
	RM	magnesium, soluble ion content	7439-95-4	E484	25.74 mg/L	104	70.0	130	----
	RM	sodium, soluble ion content	17341-25-2	E484	30.05 mg/L	102	70.0	130	----
Metals (QCLot: 768817)									
	RM	boron, hot water soluble	7440-42-8	E487	1.4938 mg/kg	98.8	60.0	140	----
Speciated Metals (QCLot: 768786)									

Sub-Matrix:

					Reference Material (RM) Report				
					RM Target	Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Speciated Metals (QCLot: 768786) - continued									
	RM	chromium, hexavalent [Cr VI]	18540-29-9	E532	172 mg/kg	97.2	70.0	130	----

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: WT2224094-001-E601.SG-L
Client Sample ID: BH202 SS1



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

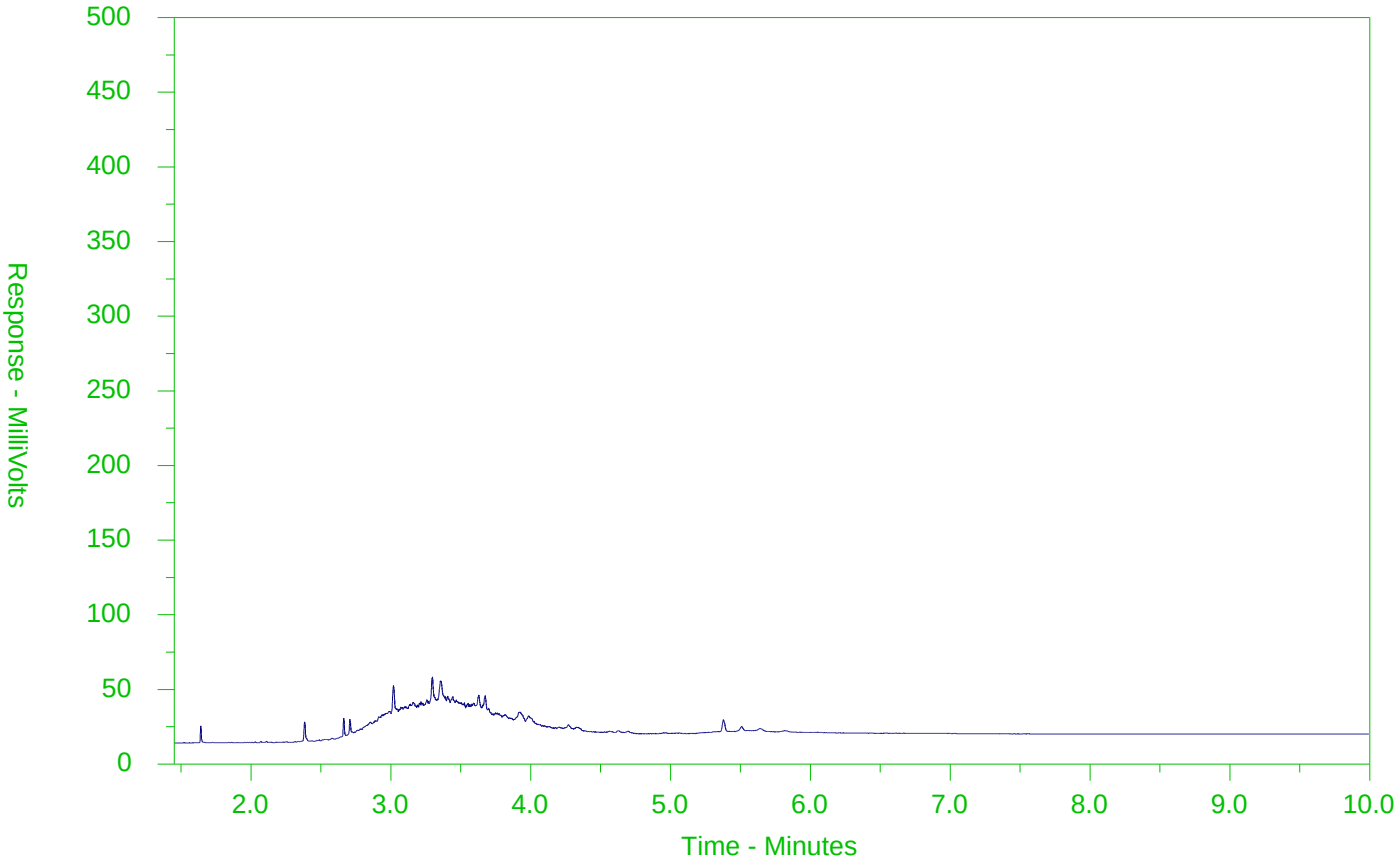
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: WT2224094-002-E601.SG-L
Client Sample ID: BH204 SS1



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

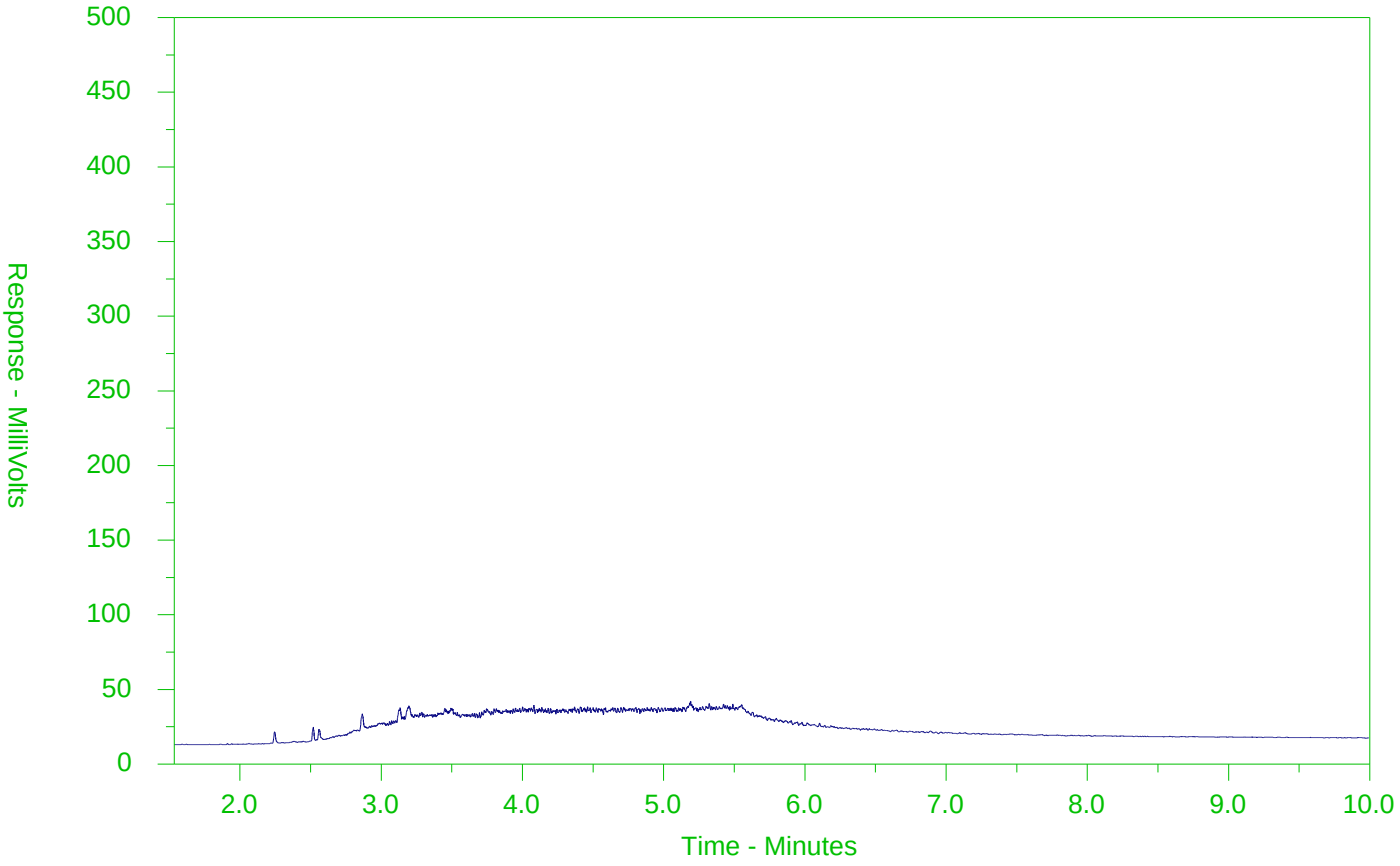
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: WT2224094-003-E601.SG-L
Client Sample ID: BH207 SS1



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

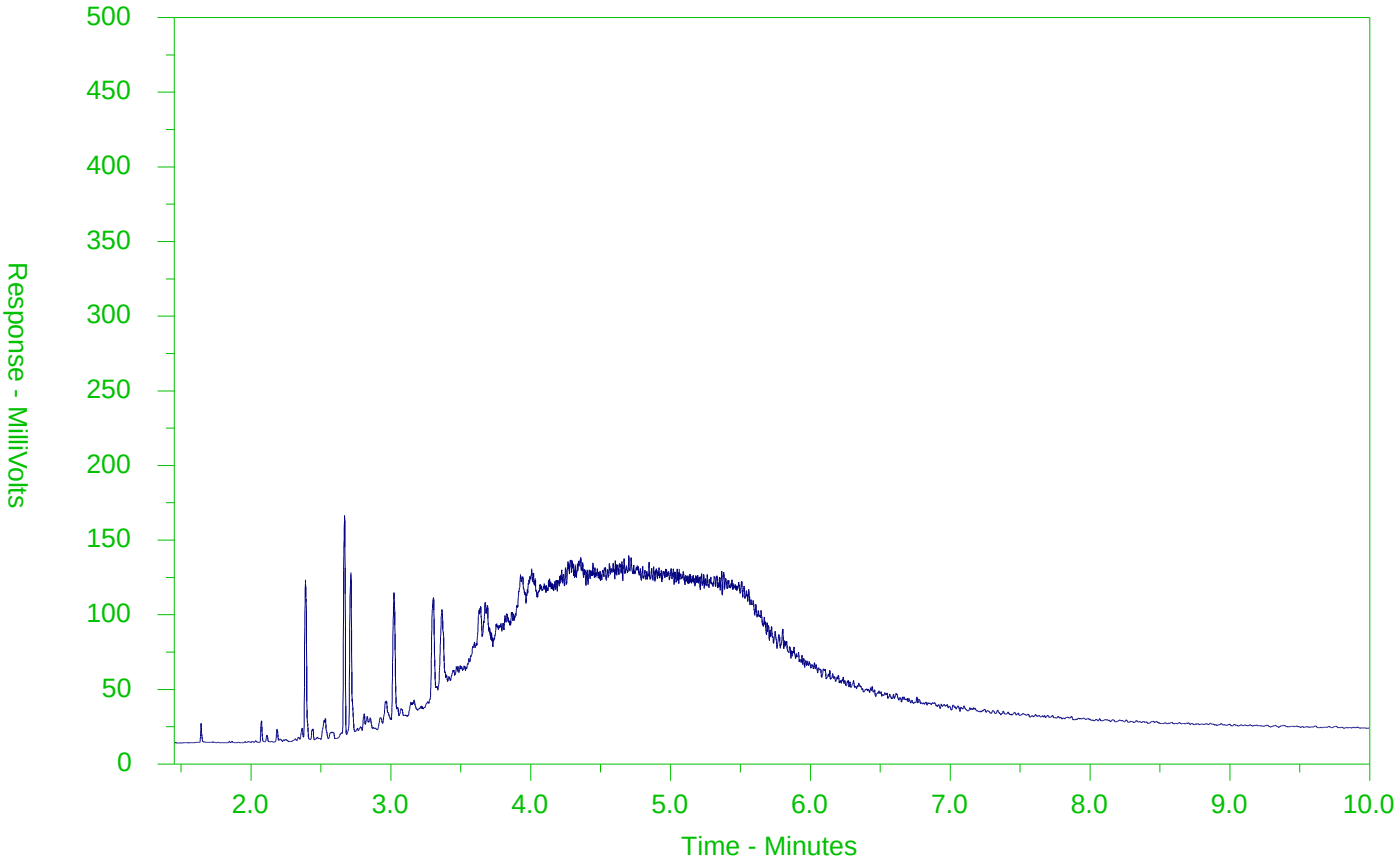
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: WT2224094-004-E601.SG-L
Client Sample ID: BH212 SS1



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

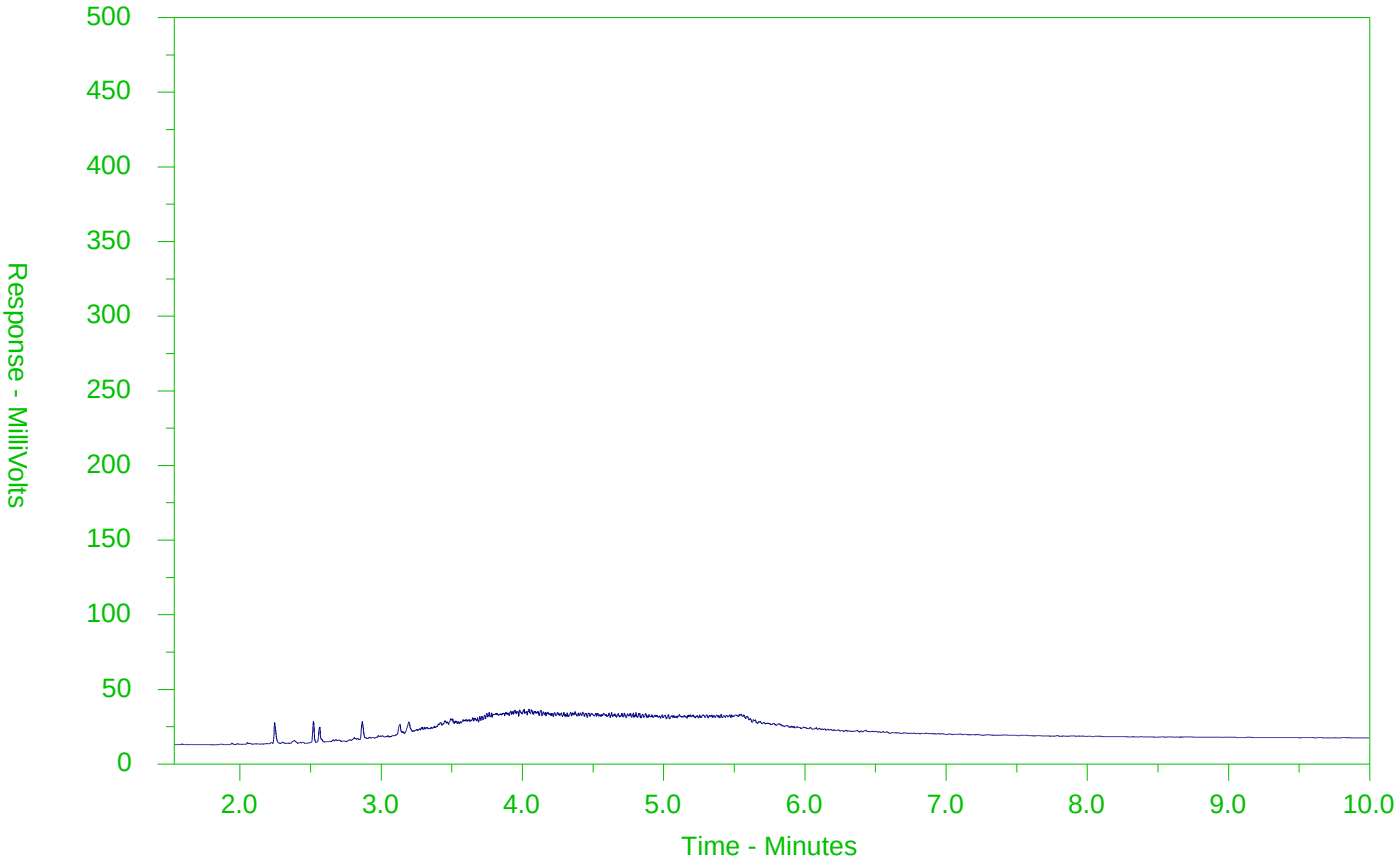
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: WT2224094-005-E601.SG-L
Client Sample ID: BH213 SS1



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

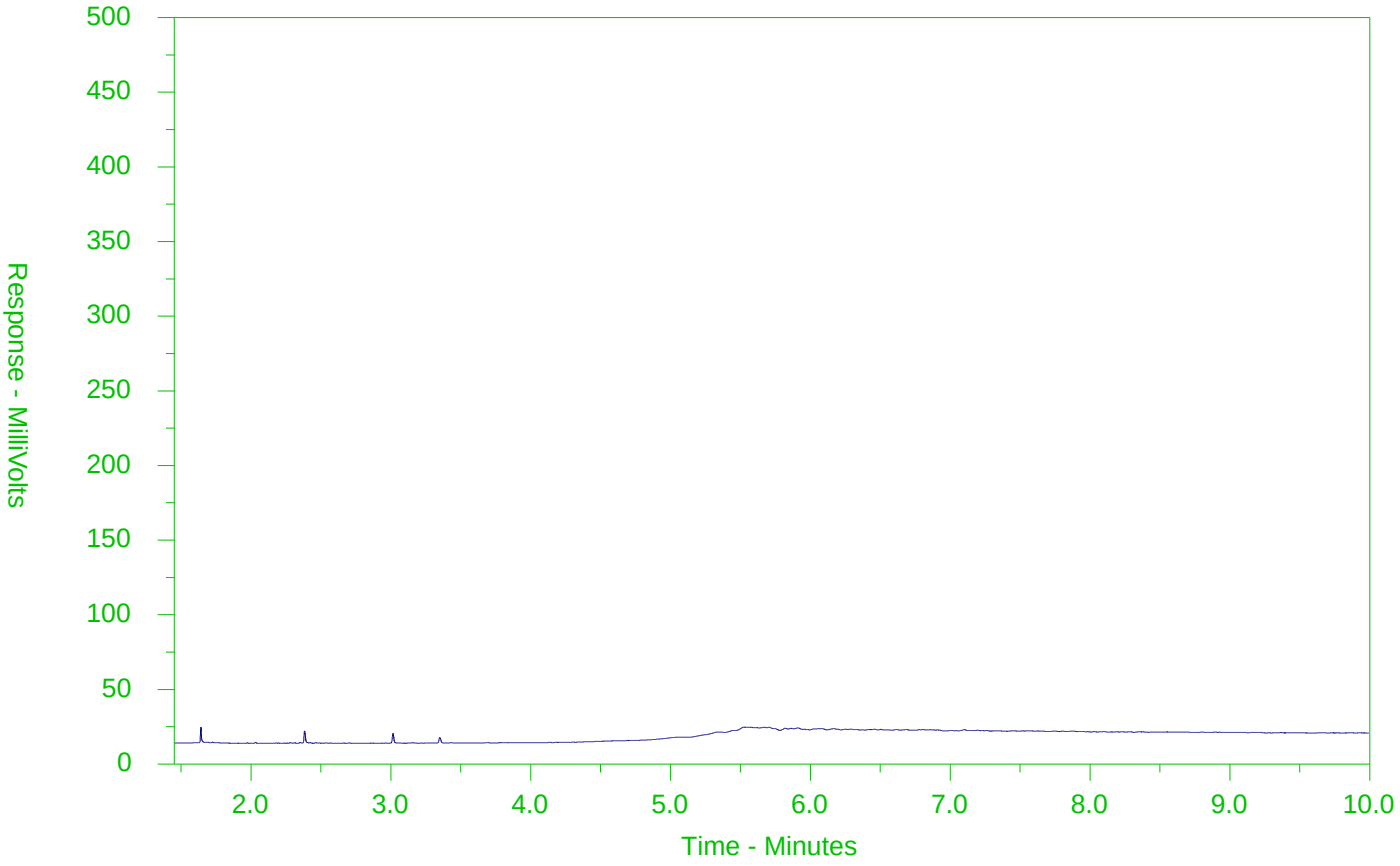
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: WT2224094-006-E601.SG-L
Client Sample ID: BH220 SS2



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

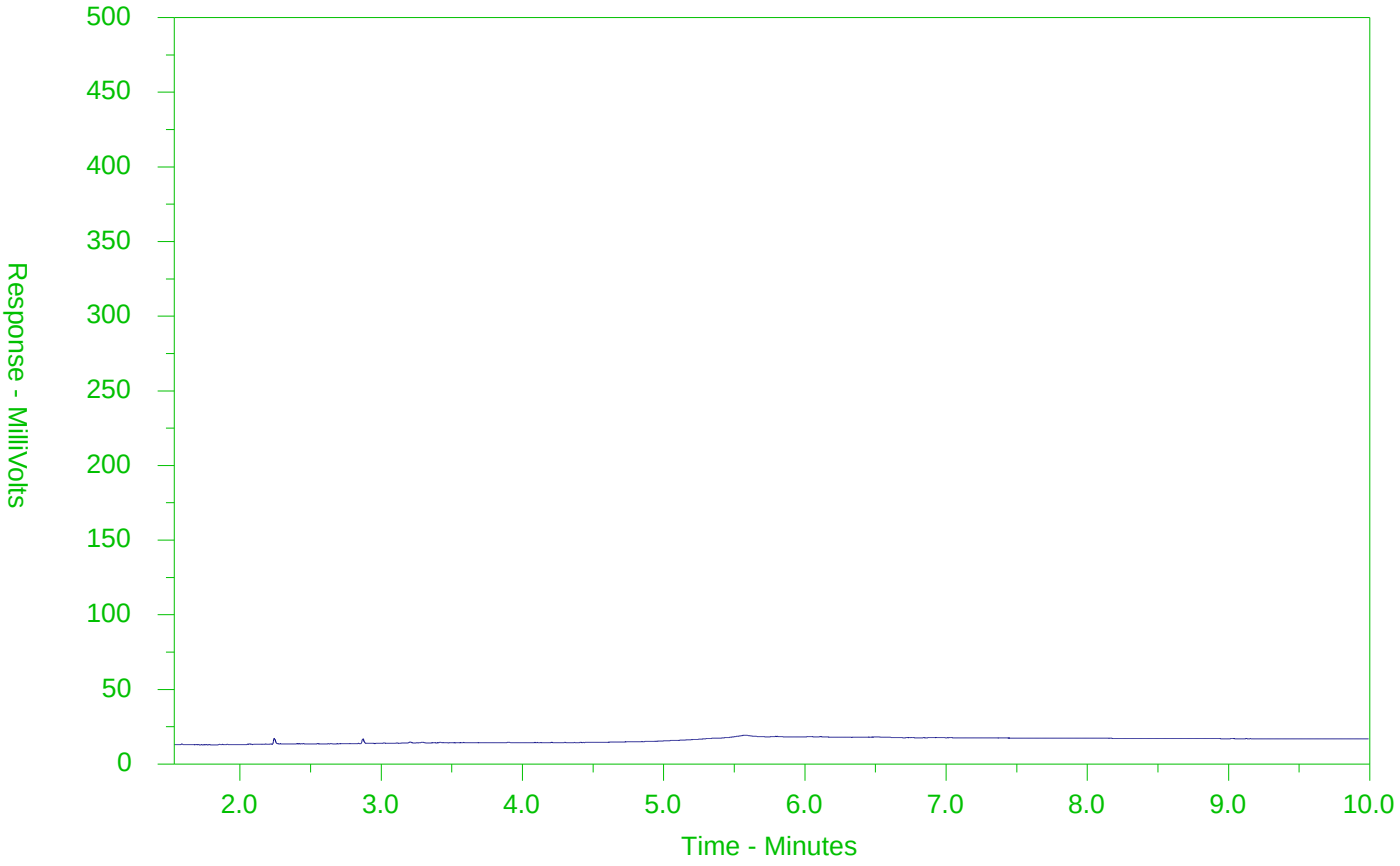
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: WT2224094-007-E601.SG-L
Client Sample ID: BH221 SS1



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

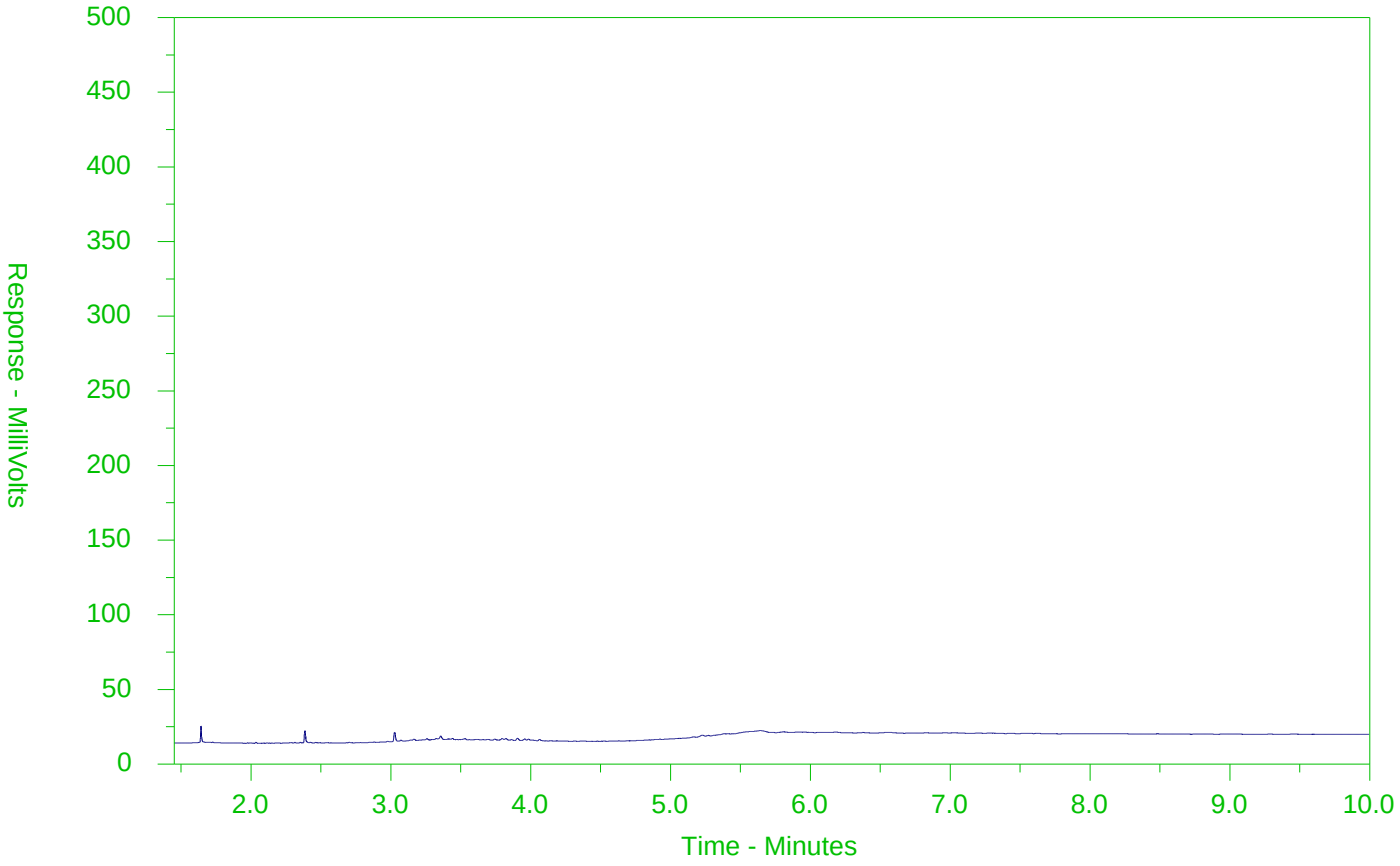
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: WT2224094-008-E601.SG-L
Client Sample ID: BH223 SS1



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

Chain of Custody (COC) / Analytical Request Form

COC Number: 20 - 1002590

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Page

Environmental Division Waterloo

Work Order Reference WT2224094

Telephone : +1 519 886 6910

Report To	Contact and company name below will appear on the final report
Company:	PINCHIN LTD.
Contact:	VANESSA MARSHALL
Phone:	519.904.4660
Company address below will appear on the final report	
Street:	
City/Province:	
Postal Code:	
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	PINCHIN LTD
Contact:	Accounts Payable

Reports / Recipients

Select Report Format: ☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)

Merge QC/QCI Reports with COA ☑ YES ☐ NO ☐ N/A

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: Vmarshall@pinchin.com

Email 2:

Email 3:

Invoice Recipients

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: ap@pinchin.com

Email 2:

Turnaround Time (TAT) Requested

☐ Routine [R] if received by 3pm M-F - no surcharges apply

☐ 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum

☐ 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum

☐ 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum

☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum

☐ Same day [E2] if received by 10am M-S - 200% rush surcharge. Addl may apply to rush requests on weekends, statutory holidays and non-rc

Date and Time Required for all E&P TATs:

For all tests with rush TATs requested, please

Project Information

ALS Account # / Quote #:

Job #: 318728

PO / AFE:

LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#:

Major/Minor Code: Routing Code:

Requisitioner:

Location:

ALS Lab Work Order # (ALS use only): WT2224094

ALS Contact: Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	Table 1 BSQS	Table 3.1 BSQS	Table 7 SCS	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
	BH202 SS1			Soil	3						
	BH204 SS1				3						
	BH207 SS1				3						
	BH212 SS1				3						
	BH213 SS1				3						
	BH220 SS2				3						
	BH221 SS1				3						
	BH223 SS1				3						

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human consumption/ use? ☐ YES ☐ NO

Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)

SAMPLE RECEIPT DETAILS (ALS use only)

Cooling Method: ☐ NONE ☐ ICE ☑ ICE PACKS ☐ FROZEN ☐ COOLING INITIATED

Submission Comments identified on Sample Receipt Notification: ☐ YES ☐ NO

Cooler Custody Seals Intact: ☐ YES ☐ N/A Sample Custody Seals Intact: ☐ YES ☐ N/A

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				6.5			

SHIPMENT RELEASE (client use)

Released by: Kawaveet Sigh Date: Dec 5 2022 Time: 4:00pm

INITIAL SHIPMENT RECEPTION (ALS use only)

Received by: Date: Time:

FINAL SHIPMENT RECEPTION (ALS use only)

Received by: Date: 5-Dec-22 Time: 16:00

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

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

VS-190, SOL-958

APPENDIX VI

Report Limitations and Guidelines for Use

REPORT LIMITATIONS & GUIDELINES FOR USE

This information has been provided to help manage risks with respect to the use of this report.

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES, PERSONS AND PROJECTS

This report was prepared for the exclusive use of the Client and their authorized agents, subject to the conditions and limitations contained within the duly authorized work plan. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of the third parties. If additional parties require reliance on this report, written authorization from Pinchin will be required. Pinchin disclaims responsibility of consequential financial effects on transactions or property values, or requirements for follow-up actions and costs. No other warranties are implied or expressed. Furthermore, this report should not be construed as legal advice.

SUBSURFACE CONDITIONS CAN CHANGE

This geotechnical report is based on the existing conditions at the time the study was performed, and Pinchin's opinion of soil conditions are strictly based on soil samples collected at specific test hole locations. The findings and conclusions of Pinchin's reports may be affected by the passage of time, by manmade events such as construction on or adjacent to the Site, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations.

LIMITATIONS TO PROFESSIONAL OPINIONS

Interpretations of subsurface conditions are based on field observations from test holes that were spaced to capture a 'representative' snap shot of subsurface conditions. Site exploration identifies subsurface conditions only at points of sampling. Pinchin reviews field and laboratory data and then applies professional judgment to formulate an opinion of subsurface conditions throughout the Site. Actual subsurface conditions may differ, between sampling locations, from those indicated in this report.

LIMITATIONS OF RECOMMENDATIONS

Subsurface soil conditions should be verified by a qualified geotechnical engineer during construction. Pinchin should be notified if any discrepancies to this report or unusual conditions are found during construction.

Sufficient monitoring, testing and consultation should be provided by Pinchin during construction and/or excavation activities, to confirm that the conditions encountered are consistent with those indicated by the test hole investigation, and to provide recommendations for design changes should the conditions revealed during the work differ from those anticipated. In addition, monitoring, testing and consultation by Pinchin should be completed to evaluate whether or not earthwork activities are completed in

accordance with our recommendations. Retaining Pinchin for construction observation for this project is the most effective method of managing the risks associated with unanticipated conditions. However, please be advised that any construction/excavation observations by Pinchin is over and above the mandate of this geotechnical evaluation and therefore, additional fees would apply.

MISINTERPRETATION OF GEOTECHNICAL ENGINEERING REPORT

Misinterpretation of this report by other design team members can result in costly problems. You could lower that risk by having Pinchin confer with appropriate members of the design team after submitting the report. Also retain Pinchin to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering or geologic report. Reduce that risk by having Pinchin participate in pre-bid and preconstruction conferences, and by providing construction observation. Please be advised that retaining Pinchin to participation in any 'other' activities associated with this project is over and above the mandate of this geotechnical investigation and therefore, additional fees would apply.

CONTRACTORS RESPONSIBILITY FOR SITE SAFETY

This geotechnical report is not intended to direct the contractor's procedures, methods, schedule or management of the work Site. The contractor is solely responsible for job Site safety and for managing construction operations to minimize risks to on-Site personnel and to adjacent properties. It is ultimately the contractor's responsibility that the Ontario Occupational Health and Safety Act is adhered to, and Site conditions satisfy all 'other' acts, regulations and/or legislation that may be mandated by federal, provincial and/or municipal authorities.

SUBSURFACE SOIL AND/OR GROUNDWATER CONTAMINATION

This report is geotechnical in nature and was not performed in accordance with any environmental guidelines. As such, any environmental comments are very preliminary in nature and based solely on field observations. Accordingly, the scope of services do not include any interpretations, recommendations, findings, or conclusions regarding the, assessment, prevention or abatement of contaminants, and no conclusions or inferences should be drawn regarding contamination, as they may relate to this project. The term "contamination" includes, but is not limited to, molds, fungi, spores, bacteria, viruses, PCBs, petroleum hydrocarbons, inorganics, pesticides/insecticides, volatile organic compounds, polycyclic aromatic hydrocarbons and/or any of their by-products.

Pinchin will not be responsible for any consequential or indirect damages. Pinchin will only be held liable for damages resulting from the negligence of Pinchin. Pinchin will not be liable for any losses or damage if the Client has failed, within a period of two years following the date upon which the claim is discovered within the meaning of the Limitations Act, 2002 (Ontario), to commence legal proceedings against Pinchin to recover such losses or damage.