GeoPro Consulting Limited

Geotechnical-Hydrogeology-Environmental-Materials-Inspection

Geotechnical Investigation

Proposed Road Improvements on First Avenue (from Simcoe Street South to Drew Street) and McNaughton Avenue (from Drew Street to Ritson Road South), City of Oshawa, Ontario

Prepared For:

Parsons Corporation

GeoPro Project No.: 24-4656GH
Report Date: May 2, 2024

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GeoPro CONSULTING LIMITED

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1. INTRODUCTION

GeoPro Consulting Limited (GeoPro) was retained by Parsons Corporation (the Client) to conduct a geotechnical investigation for the proposed road improvements on First Avenue from Simcoe Street South to Drew Street, and McNaughton Avenue from Drew Street to Ritson Road South, City of Oshawa, Ontario.

The purpose of this geotechnical investigation was to obtain information on the existing subsurface conditions by means of a limited number of boreholes, in-situ tests, and laboratory tests of soil samples to provide required geotechnical design information. Based on GeoPro's interpretation of the data obtained, geotechnical comments and recommendations related to the project designs are provided.

The report is prepared with the condition that the design will be in accordance with all applicable standards and codes, regulations of authorities having jurisdiction, and good engineering practice. Further, the recommendations and opinions in this report are applicable only to the proposed project as described above. On-going liaison and communication with GeoPro during the design stage and construction phase of the project are strongly recommended to confirm that the recommendations in this report are applicable and/or correctly interpreted and implemented. Also, any queries concerning the geotechnical aspects of the proposed project shall be directed to GeoPro for further elaboration and/or clarification.

This report is provided on the basis of the terms of reference presented in our approved proposal prepared based on our understanding of the project. If there are any changes in the design features relevant to the geotechnical analyses, or if any questions arise concerning the geotechnical aspects of the codes and standards, this office should be contacted to review the design. It may then be necessary to carry out additional borings and reporting before the recommendations of this report can be relied upon.

This report deals with geotechnical issues only. The geo-environmental (chemical) aspects of the subsurface conditions, including the consequences of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources, were not included in this geotechnical report. However, limited chemical testing was carried out on selected soil samples for excess soil disposal purposes.

Concurrent with this program, a hydrogeological study has been carried out by GeoPro and the results of which will be addressed under separate cover.

The site investigation and recommendations follow generally accepted practice for geotechnical consultants in Ontario. Laboratory testing follows ASTM or CSA Standards or modifications of these standards that have become standard practice in Ontario.

This report has been prepared for the Client. Third party use of this report without GeoPro's consent is prohibited. The limitations to the report presented in this report form an integral part of the report and they must be considered in conjunction with this report.

2. PROJECT DESCRIPTION

It is understood that the project is for the road improvements on First Avenue from Simcoe Street South to Drew Street and McNaughton Avenue from Drew Street to Ritson Road South, City of Oshawa, Ontario. It is understood that the road improvements include road widening to accommodate sidewalk and cycling infrastructure improvements as well as minor intersection improvements for dedicated turning lanes.

3. INVESTIGATION PROCEDURE

3.1 Existing Pavement Condition Survey

The section of First Avenue from Simcoe Street South to Drew Street and McNaughton Avenue from Drew Street to Ritson Road South was visited on February 23, 2024 by a GeoPro pavement engineer who carried out a detailed visual pavement condition survey of the existing pavement. The survey was conducted in general accordance with MTO SP-022 Flexible Pavement Condition Rating Guidelines for Municipalities. During the site visit, key pavement distresses were observed (noting the type, severity, and general density of surface distresses); the general site and pavement drainage conditions were also noted. Photographs, including descriptions of the typical pavement distresses, are enclosed in Appendix A.

3.2 Borehole Investigation

Field work for the geotechnical investigation was carried out on February 16, 20, and 21, 2024, during which time nine (9) boreholes (Boreholes BH1 to BH9) were advanced to depths ranging from about 6.4 m to 6.9 m below the existing ground surface. The borehole locations are shown on the attached Drawings.

A proposed borehole location plan prepared by GeoPro was provided to the Client for review prior to the field investigation work. The approved borehole locations were staked in the field by GeoPro; the borehole locations in the field were adjusted according to the drill rig accessibility and the underground utility conditions. The field work for this investigation was monitored by a member of our engineering staff who logged the boreholes and cared for the recovered samples.

The boreholes were advanced using a continuous flight auger drilling equipment supplied by a drilling specialist subcontracted to GeoPro. Samples were retrieved with a 51 mm (2 inches) O.D. split-barrel (split spoon) sampler driven with a hammer weighing 624 N and dropping 760 mm (30 inches) in accordance with the Standard Penetration Test (SPT) method.

Groundwater condition observations were made in the boreholes during drilling and upon completion of drilling. A monitoring well (51 mm in diameter) was installed in selected borehole(s) to measure the groundwater tables. The remaining boreholes were backfilled and sealed upon completion of drilling.

All soil samples obtained during this investigation were brought to our laboratory for further examination. These soil samples will be stored for a period of three (3) months after the day of issuing draft report, after which time they will be discarded unless we are advised otherwise in writing. Geotechnical classification testing (including water content, grain size distribution and Atterberg Limits, when applicable) was carried out on selected soil samples. The laboratory test results are provided in the attached Figures.

The ground surface elevations at the as-drilled borehole locations were not available at the time of preparing this report. Therefore, the stratigraphy at each borehole location has been referenced to the current grade level. Contractors performing the work should confirm the elevations prior to construction. The borehole locations plotted on the Borehole Location Plan were based on the measurements of the site features and should be considered to be approximate.

4. SUBSURFACE CONDITIONS

Notes on sample descriptions are presented in Enclosure 1A. Explanations of terms used in the borehole logs are presented in Enclosure 1B. The subsurface conditions in the boreholes are presented in the individual borehole logs. Detailed descriptions of the major soil strata encountered in the boreholes drilled at the site are provided as follows.

4.1 Soil Conditions

Topsoil

Topsoil with a thickness of about 320 mm was encountered surficially in Borehole BH3. In general, the topsoil consists of high contents of organics with trace to some rootlets. It should be noted that the thickness of the topsoil explored at the borehole location may not be representative for the site and should not be relied on to calculate the amount of topsoil at the site.

First Avenue Pavement Structure

The composition thicknesses of the pavement structure at borehole locations are summarized in the following table.

BH No.	Pavement Structure (mm)		
	Asphalt	Granular Base	Granular Subbase
BH1	220	160	170
BH2	200	60	200
BH4	130	220	500
BH5	130	220	500
BH6	130	280	190
BH7	180	450	
Range (Average)	130 – 220 (165)	260 – 720 (490)	

Notes: Due to the generally silty/sandy nature of the subgrade soils, the exact depth of granular subbase was difficult to distinguish in some boreholes; due to likely previous pavement restorations/rehabilitations, variation of pavement structure/thickness should be anticipated between and beyond the borehole locations.

McNaughton Avenue Pavement Structure

The composition thicknesses of the pavement structure at borehole locations are summarized in the following table.

BH No.	Pavement Structure (mm)		
	Asphalt	Granular Base	Granular Subbase
BH8	150	190	500
BH9	170	190	490
Range (Average)	150 – 170 (160)	190 – 190 (190)	490 – 500 (490)

Notes: Due to the generally silty nature of the subgrade soils, the exact depth of granular subbase was difficult to distinguish in some boreholes; due to likely previous pavement restorations/rehabilitations, variation of pavement structure/thickness should be anticipated between and beyond the borehole locations.

Fill Materials

Fill materials consisting of were encountered below the topsoil or granular base/subbase materials in Boreholes BH1 to BH8, and extended to depths ranging from about 1.1 m to 2.1 m below the existing ground surface. For cohesive fill materials, SPT N values ranging from 4 to 28 blows per 300 mm penetration indicated a soft to very stiff consistency. For cohesionless fill materials, SPT N values ranging from 8 to 29 blows per 300 mm penetration indicated a loose to compact compactness. The in-situ moisture content measured in the soil samples ranged from approximately 7% to 35%.

Upper Sandy Silt, Sand and Silt, Silty Sand, Sand, Gravelly Sand, and Sand and Gravel

Upper sandy silt, sand and silt, silty sand, sand, gravelly sand, and sand and gravel deposits were encountered below the fill materials in boreholes BH1, BH2, and BH8, and extended to depths ranging from about 1.4 m to 6.5 m below the existing ground surface. Borehole BH2 was terminated in these deposits. SPT N values ranging from 9 to greater than 100 blows per 300 mm penetration indicated loose to very dense compactness. The natural moisture content measured in the soil samples ranged from approximately 4% to 13%.

Upper Clayey Silt

Upper clayey silt deposit was encountered below the fill materials in Boreholes BH3 to BH7 and BH9, and extended to depths ranging from about 1.4 m to 4.0 m below the existing ground surface. SPT N values ranging from 7 to greater than 100 blows per 300 mm penetration indicated a firm to hard consistency. The natural moisture content measured in the soil samples ranged from approximately 16% to 35%.

Sandy Silt Till, and Silty Sand Till to Sand and Silt Till

Sandy silt till, and silty sand till to sand and silt till deposits were encountered below the clayey silt, sandy silt, and/or sand and silt deposits in Boreholes BH1, BH4, and BH8, and extended to depths ranging from about 4.0 m to 6.5 m below the existing ground surface. Borehole BH8 was terminated in these deposits. SPT N values ranging from 29 to greater than 100 blows per 300 mm penetration indicated a compact to very dense compactness. The natural moisture content measured in the soil samples ranged from approximately 6% to 9%.

Lower Clayey Silt To Silty Clay

Lower clayey silt to silty clay deposit was encountered below the silt deposit in Borehole BH5, and extended to a depth of about 6.9 m below the existing ground surface. Borehole BH5 was terminated in this deposit. SPT N values ranging from 2 to 12 blows per 300 mm penetration indicated a soft to stiff consistency. The natural moisture content measured in the soil samples ranged from approximately 22% to 42%.

Lower Silt, Sandy Silt, Sand and Silt, Sand, and Gravelly Sand

Lower silt, sandy silt, sand and silt, sand, and gravelly sand deposits were encountered below the clayey silt and/or till deposits in boreholes BH1, BH3 to BH7, and BH9, and extended to depths ranging from about 2.9 m to 6.6 m below the existing ground surface. Boreholes BH1, BH3, BH4, BH6, BH7, and BH9 were terminated in these deposits. SPT N values ranging from 9 to greater than 100 blows per 300 mm penetration indicated loose to very dense compactness. The natural moisture content measured in the soil samples ranged from approximately 3% to 21%.

4.2 Groundwater Conditions

Groundwater condition observations made in the boreholes during and immediately upon completion of drilling are shown in the borehole logs and are also summarized in the following table. It should be noted that there may have not been enough time for groundwater to be stabilized inside the boreholes upon completion of drilling.

Borehole No.	BH Depth (m)	Depth of Water Encountered during Drilling (mBGS)	Water Level upon Completion of Drilling (mBGS)	Cave-in Depth upon Completion of Drilling (mBGS)
BH1	6.4	1.5	-	5.7
BH2	6.5	1.5	3.6	4.6
BH3	6.5	4.6	-	6.2
BH4	6.6	4.7	-	6.4
BH5	6.9	1.7	3.0	6.1
BH6	6.6	3.0	-	5.9
BH7	6.6	1.5	-	6.3
BH8	6.5	1.5	3.1	6.0
BH9	6.4	2.3	-	6.0

Note: mBGS = meters below ground surface.

Monitoring well construction details and measured groundwater levels are shown in the borehole logs and are also summarized in the following table.

Monitoring Well ID	Screen Interval (mBGS)	Water Level (mBGS)	
		March 5, 2024	March 13, 2024
BH2	3.3 – 4.8	3.75	3.43
BH5	4.8 – 6.3	1.83	1.79
BH8	4.5 – 6.0	1.70	1.59

Note: mBGS = meters below ground surface.

It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations in response to weather events.

4.3 Geotechnical Classification Testing Results

In the laboratory, each soil sample was examined as to its visual and textural characteristics by the Project Engineer. Moisture content determinations were carried out on all granular base/subbase and subgrade soil samples.

Sieve analyses were carried out on selected samples of the recovered granular base/subbase materials, and the results were compared to OPSS 1010 Granular A and Granular B Type I specifications. The gradation distribution curves are presented in the attached Figures and a summary of the results is provided in the following table.

Sample	OPSS 1010 Granular A	OPSS 1010 Granular B Type I
BH2 AS1A	Does not meet requirements due to excessive percentages passing most sieves	Does not meet requirements due to excessive fines (9.2% passing 0.075 mm sieve)
BH6 AS1A	Does not meet requirements due to excessive percentages passing most sieves	Does not meet requirements due to excessive fines (8.8% passing 0.075 mm sieve)

Grain size analyses were carried out on selected samples to confirm the visual descriptions of the subgrade soils. In addition, the soils were examined and compared to frost susceptibility characteristics in accordance with the MTO Pavement Design and Rehabilitation Manual. The summarized results are provided in the following table, and the grain size distribution curves of these samples are presented in the attached Figures.

Soil Sample	Description	Susceptibility of Frost Heaving
BH2 SS4	Sand and Gravel	Low
BH5 SS5	Clayey Silt to Silty Clay	Low
BH8 SS5	Silty Sand	Low

5. DISCUSSION AND RECOMMENDATIONS

This report contains the findings of GeoPro's geotechnical investigation, together with the geotechnical engineering recommendations and comments. These recommendations and comments are based on factual information and are intended only for use by the design engineers. The number of boreholes and test pits may not be sufficient to determine all the factors that may affect construction methods and costs. Subsurface conditions between and beyond the boreholes may differ from those encountered at the borehole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. The anticipated construction conditions are also discussed, but only to the extent that they may influence design decisions. Construction methods discussed, however, express GeoPro's opinion only and are not intended to direct the contractors on how to carry out the construction. Contractors should also be aware that the data and their interpretation presented in this report may not be sufficient to assess all the factors that may have an effect on the construction.

The design drawings of the project were not available at the time of preparing this report. Once the design drawings and detailed site plan are available, this report should be reviewed by GeoPro and further recommendations be provided as appropriate.

5.1 Existing Pavement Conditions

Based on the geotechnical investigation carried out by GeoPro, the existing pavement structures on First Avenue from Simcoe Street South to Drew Street and McNaughton Avenue from Drew Street to Ritson Road South consist of flexible pavement structure.

In general, the existing pavement along First Avenue and McNaughton Avenue was observed to be mainly in poor condition with localized fair areas. The main distresses were extensive slight to severe longitudinal and transverse cracking, extensive slight to severe random cracking, extensive slight to severe pavement raveling, frequent slight to severe pavement edge cracking, frequent to intermittent slight to severe alligator cracking, intermittent slight to moderate pavement rutting, intermittent slight pavement depressions, few slight to moderate block cracking, few moderate to severe construction joint cracking, and few slight to moderate potholes. In addition, slight to moderate random cracking, slight depressions, moderate to severe alligator cracking and

patching around manholes and/or catch basins, sections of patching, and utility patching were noted.

The existing road along First Avenue and McNaughton Avenue has an urban cross-section (curb and catch basins). The overall surface drainage was generally considered to be fair to poor. Observations along the roadway within the project limits indicated that pavement surface water generally flowed along the existing pavement grades and was being directed to catch basins. However, the drainage was impaired by poor grading and surface distresses with unsealed cracks and potholes allowing surface water to infiltrate into the underlying pavement and subgrade. The catch basins were observed to be in a poor condition.

5.2 Pavement Structure Designs

5.2.1 Traffic Data Analysis

First Avenue is currently a two-lane collector road from Simcoe Street South to Drew Street, and McNaughton Avenue is currently a two-lane collector road from Drew Street to Ritson Road South with a dedicated turning lane (project limits). The traffic data information within the project limits were provided by the Client in an email sent on March 12, 2024. Based on the email, the subject roadway section within the project limits carried about 9% commercial vehicle traffic and an annual growth rate of 2%.

The above-mentioned traffic data were used to estimate the design Equivalent Single Axle Loads (ESALs). The traffic volumes were determined for a 25-year pavement design life, which is considered typical for pavements of this type. On this basis, the ESAL applications during design period were calculated in accordance with the MTO MI-183 Adaption and Verification of AASHTO Pavement Design Guide for Ontario Conditions. The total design ESALs anticipated over the 25-year design life period are summarized in the following table.

Parameters	**Traffic Data**
	First Avenue from Simcoe Street South to Drew Street and McNaughton Avenue from Drew Street to Ritson Road South
AADT (Year of 2019)	4,630
Commercial Vehicle Percentage	9%
Annual Growth Rate	2%
Estimated Total Design ESALs (25 -Year)	1,990,200

5.2.2 Pavement Structure Design for Widening Areas and Full-Depth Reconstruction

Based on the existing pavement condition, anticipated traffic volumes on this road section, type and strength of subgrade soils, and City of Oshawa Engineering Design Criteria Manual for pavement structure, the recommended minimum pavement structure thickness for the widening areas and the full-depth reconstruction of the existing road is shown in the following table.

Material		Thickness of Pavement (mm)
Hot-Mix Asphalt (OPSS 1150)	HL3 HS Surface Course	50 (1 lift)
	HDBC Binder Course	80 (1 lift)
Granular Material (OPSS 1010)	Granular A Native Base	150
	Granular B Type I Subbase	570*
Prepared and Approved Subgrade		

Notes: *the subbase should be thickened where required to match the existing subbase depth of the adjacent pavement structure; existing pavement asphalt may need to be removed to ensure placement of a width of 3.0 m to 3.5 m in order to accommodate machine placed asphalt in the widening section.

The construction procedure may be considered as follows:

- Existing lanes: completely remove the existing asphalt concrete, granular materials, subgrade soils, organic matters, and any other obviously deleterious materials to the depth required to accommodate the new pavement structure in the above table;
- Widening areas: completely remove the existing asphalt concrete, Portland cement concrete, granular materials, subgrade soils, topsoil, organic matters and any other obviously deleterious materials to the depth required to accommodate the new pavement structure in the above table;
- The exposed subgrade surface should be graded and compacted to 98 percent of Standard Proctor Maximum Dry Density (SPMDD);
- The prepared subgrade should be carefully proofrolled using a heavily loaded truck in conjunction with the inspection by the geotechnical engineer from GeoPro; any soft/loose or wet areas or other obviously deleterious materials or organic soils must be excavated and properly replaced with material similar to the existing subgrade soils or other granular soils approved by the geotechnical engineer;
- All backfill materials should be placed in uniform loose lifts not exceeding 200 mm thickness and compacted to at least 98 percent of SPMDD. The finished subgrade should be provided with a grade of 3 percent towards the positive drainages;

- Place Granular B subbase with a minimum thickness and material specified in the table above in loose lifts not exceeding 200 mm in thickness, compacted to 100 percent of SPMDD;
- Place Granular A Native base with the thickness and materials specified in the table above compacted to 100 percent of SPMDD; and
- Place thickness of hot-mix asphalt (HMA) with the thickness and type of HMA specified in the table above, produced and placed in accordance with OPSS 310. The surface of the completed pavement should be provided with a grade of 2 percent.

The Structural Number of the recommended minimum new pavement structure as shown in the table above is 126.9 which is greater than the Design Structural Number 112.4 of the subject road. The recommended minimum new pavement structure in the above table is structurally adequate for the expected traffic loads over the 25-year design period with regular maintenance.

Where new pavement abuts existing pavement, the pavement joints shall conform to City of Oshawa Engineering Standard Drawing OS-530. It should be ensured that any undermined or broken edges resulting from the construction activities are removed by sawcut.

Disturbed/damaged pavement resulting from road improvements/widening should be restored in kind to match the existing pavement structure.

5.2.3 General Pavement Recommendations

The general pavement recommendations are provided as follows:

5.2.3.1 Pavement Materials

The following hot-mix asphalt mix types should be selected:

- HL3 HS Surface Course; and
- HDBC Binder Course

These hot mix asphalt mixes should be designed and produced in conformance with OPSS 1150 requirements.

Granular A and Granular B materials should be used as base course and subbase course, respectively. Both the Granular A and Granular B materials should meet OPSS 1010 specifications.

5.2.3.2 Asphalt Cement Grade

Performance graded asphalt cement PGAC 64-28 XJ conforming to OPSS 1101 requirements is recommended for the HMA binder and surface courses.

5.2.3.3 Tack Coat

A tack coat (SS1 or the equivalent approved by Engineers) should be applied to all construction joints prior to placing hot mix asphalt to create an adhesive bond. Prior to placing hot mix asphalt, tack coat must also be applied to all existing surfaces and between all new lifts in accordance with OPSS 308 requirements.

5.2.3.4 Compaction

All granular base and subbase materials should be placed in uniform lifts not exceeding 200 mm loose thickness and compacted to 100 percent of the material's SPMDD at ±2 percent of the materials Optimum Moisture Content (OMC). Hot mix asphalt should be placed and compacted in accordance with OPSS 310 specifications.

5.2.3.5 Pavement Tapers

At the limits of construction, appropriate tapering of the pavement thickness to match the existing pavement structure should be implemented in accordance with OPSS and the applicable local municipality specifications.

5.2.3.6 Subgrade Preparation

All topsoil, and any organic or other unsuitable soils should be stripped from the subgrade area. Following stripping, the site should be graded to the subgrade level and approved. The subgrade should then be proofrolled by a heavily loaded truck, in the presence of the geotechnical engineer from GeoPro. Any soft spots exposed during the proofroll should be completely removed and replaced by selected fill materials, similar to the existing subgrade soils and approved by the geotechnical engineer from GeoPro. The subgrade should then be re-compacted from the surface to at least 98% of its SPMDD. If the moisture contents of the local soil materials cannot be maintained at ±2% of the OMC, imported select materials may need to be used.

The final subgrade should be shaped properly to facilitate rapid drainage and to prevent the formation of local depressions in which water could accumulate. Proper shaping which allows the water to escape towards the sides (where it can be removed by means of subdrains or ditches) should be considered for the project. Otherwise, any water trapped in the granular base material may cause problems due to softened subgrade, and differential frost heave, etc.

Any fill materials required for re-grading the site or backfill should be free of topsoil, organic or any other unsuitable matter and must be approved by the geotechnical engineer from GeoPro. The approved fill materials should be placed in thin layers not exceeding 300 mm (uncompacted loose lift thickness) and compacted to at least 98% of its SPMDD or as per local municipal standards. The placing, spreading and rolling of the subgrade should be in accordance with OPSS or local municipal standards.

Frequent field density tests or full-time inspection should be carried out by the geotechnical engineer from GeoPro based on the project specifications or follow OPSS or local municipal standards.

5.2.3.7 Construction

Once the subgrade has been inspected, proof-rolled and approved, the granular base and subbase course materials should be placed in layers not exceeding 200 mm (uncompacted loose lift thickness) and should be compacted to at least 100% of their respective SPMDD. The grading of the material should conform to OPSS Specifications.

The placing, spreading, and rolling of the asphalt should be in accordance with OPSS specifications, or as required by the local authorities. Frequent field density tests should be carried out on both the asphalt and granular base and subbase materials to ensure that the required degree of compaction is achieved.

5.2.3.8 Drainage

Improvements to subsurface drainage are considered to be critical to preserve the integrity of the new paved areas. In this regard, the exposed subgrade should be carefully proof-rolled to a smooth surface and sloped towards the catch basins to prevent ponding or entrapment of water in the subbase which would lead to weakened sections, potholes and the like. Short (5 to 6 m long) perforated stub drains should be provided at internal catch basin locations, radiating outward in four directions. The need for additional internal catch basins should be reviewed and determined by the project's drainage engineer.

Continuous subdrains should also be provided along the sides of the access roads and perimeter edges of the pavement areas to promote drainage of the granular materials. Curbs surrounding any internal islands located at high points in the pavement area do not require subgrade drains, provided that the traffic island is hard surfaced to prevent the influx of groundwater. If the islands have planters that drain to grade or are landscaped, the drains along the curbs should still be used. In addition, the perimeter of the paved areas should be graded to swales to collect overland flow from adjacent unpaved areas.

Subdrains shall conform to City of Oshawa Engineering Standard Drawing OS-220, and connected to catch basins or some other permanently frost-free outlet to provide positive drainage. In addition, the subgrade should be graded at a slope of minimum 2% downwards towards the subdrains to promote the drainage.

All paved surfaces should be sloped to provide satisfactory drainage towards catch basins. The finished pavement surface and underlying subgrade should be free of depressions and should be crowned and sloped (at a crossfall of minimum 2% for the pavement surface and minimum 3% for the subgrade subject to the design engineers or local design standards) to provide effective drainage. As discussed above, any water trapped in the granular base and subbase materials should be drained rapidly towards subdrains or other interceptors.

5.2.3.9 Reuse and Disposal of Existing Pavement Materials

It should be noted that gradation analyses of the selected samples of the existing granular base and subbase materials do not meet the OPSS 1010 granular A and B Type I gradation specifications with excessive content of fines. Therefore, the existing excavated granular materials could not be reused as subbase/base materials, however, they can be reused as subgrade material to replace soft, wet, or otherwise disturbed areas identified during proofrolling, subject to the environmental quality.

5.2.3.10 Maintenance

Systematic routine preventative maintenance is strongly recommended for all newly constructed pavements. Crack routing and sealing will generally be required within 2 to 3 years after pavement construction. As the pavement ages, it will also be necessary to patch areas of medium to high severity distresses, such as potholes and ravelling. Routine maintenance should also be considered to extend the life of the pavement.

5.2.3.11 Additional Comments

Variation of subsurface conditions and pavement structure type/thickness should be anticipated, any organic soils, soft/loose or wet areas or other obviously deleterious materials must be excavated and properly replaced with material similar to the existing subgrade soils or other granular soils approved by the geotechnical engineer. A provisional cost of removing the existing pavement structure (asphalt, concrete, etc.) and a unit price of placing additional engineered fills, granular materials and asphalt should be considered in the contract.

6. ENVIRONMENTAL ANALYTICAL TEST RESULTS

6.1 Soil Sample Submission

Selected soil samples were submitted to Eurofins Laboratories ("Eurofins") in Ottawa, Ontario for chemical analyses. Descriptions of the selected soil samples, sample depths and analytical parameters are presented in the following table.

Sample ID	Soil Depth (mBGS)	Primary Soil	Assigned Analytical Parameters
BH4 SS2B*	0.9 – 1.2	Fill: Organic Silt	M&I; PAHs; PHCs; and VOCs
BH9 SS3	1.5 – 2.0	Clayey Silt	M&I; PAHs; PHCs; and VOCs

Notes: M&I = Metals and Inorganics
PAHs = Polycyclic Aromatic Hydrocarbons
PHCs = Petroleum Hydrocarbons Fractions F1 to F4
VOCs = Volatile Organic Compounds
*same sample as SS2 in COC

6.2 Soil Analytical Results

Selected soil samples were analysed for M&I, PAHs, VOCs, and PHCs under Ontario Regulation 153/04 ("O. Reg. 153/04") as amended. A copy of the soil analytical results is provided in the Laboratory Certificates of Analysis attached in Appendix B.

The soil analytical results were compared with the Ontario Ministry of the Environment, Conservation and Parks ("MECP") "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", April 2011, Table 1: Full Depth Background Site Condition Standards for Residential/Parkland/Institutional/Industrial/Commercial/Community Property Uses ("2011 MECP Table 1 Standards"), Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition ("2011 MECP Table 2 Standards"), and Table 3: Full Depth Generic Site Condition Standards in a non-potable Ground Water Condition ("2011 MECP Table 3 Standards").

Exceedances of MECP Table 1, Table 2, and Table 3 Standards

Based on the comparison, exceedances of MECP Table 1, Table 2, and Table 3 standards were noted in the tested soil samples and summarized in the following tables:

Soil Sample ID	Parameter	Detected Value / Unit	MECP Table 1 Standards Guideline Value	MECP Table 2 and 3 Standards (R/P/I) Guideline Value	MECP Table 2 and 3 Standards (I/C/C) Guideline Value
BH4 SS2B	EC	0.94 mS/cm	**0.57** mS/cm	**0.7** mS/cm	1.4 mS/cm
	SAR	20.1	**2.4**	**5**	**12**
BH9 SS3	EC	0.77 mS/cm	**0.57** mS/cm	**0.7** mS/cm	1.4 mS/cm
	SAR	24.1	**2.4**	**5**	**12**

Notes: R/P/I = Residential, Parkland and Institutional Property Use
I/C/C = Industrial, Commercial and Community Property Use
0.57 = standard value exceeded by the analytical result

6.3 Discussion of Analytical Results

Based on the analytical results, exceedances of MECP Table 1, Table 2 and Table 3 Standards were noted in the tested soil samples. It should be noted that the samples selected for analysis were taken from the boreholes located along First Avenue and McNaughton Avenue. The elevated EC and SAR values in the tested soil samples may likely be attributed to the application of de-icing salt on the road.

Based on the chemical analytical results of soil sample the following disposal option may be considered:

- The soils generated at the same tested sample depth from Boreholes BH4 and BH9 may be disposed at facilities, which are suitable to accept salt-impacted excess soil (i.e., certain former aggregate sites, mines, etc.) or at a licensed landfill site. Additional chemical testing may be required by these facilities.

It should be noted that the analytical results of the chemical test refer only to the soil samples tested, which were obtained from specific sampling locations and sampling depths, and that the soil chemistry may vary between and beyond the location and depth of the samples taken. Therefore, soil materials to be used on site or transported to other sites must be inspected during excavation for indication of variance in composition or any chemical/environmental constraints. If conditions indicate significant variations, further chemical testing should be carried out.

Please note that the level of testing outlined herein is meant to provide a broad indication of soil quality based on the limited soil samples tested. The analytical results contained in this report should not be considered a warranty with respect to the soil quality or the use of the soil for any specific purpose. Furthermore, it must be noted that our scope of work was only limited to the review of the analytical results of the limited number of samples. The scope of work did not include any environmental evaluation or assessment of the subject site (such as a Phase One or Phase Two Environmental Site Assessment).

Sites accepting fill may have requirements relating to its aesthetic or engineering properties in addition to its chemical quality. Some receiving sites may have specific chemical testing protocols, which may require additional tests to meet the requirements. The requirements for accepting the fill at an off-site location must be confirmed in advance. GeoPro would be pleased to assist once the receiving sites are determined and the requirements of the receiving sites are available.

Additional Testing and Disposal Requirements as per New Regulation O.Reg. 406/19

It should be noted that excess soil disposal practices and responsibilities have changed with the implementation of Ontario Regulation 406/19 On-Site and Excess Soil Management (O.Reg. 406/19). As of January 1, 2021, all excess soils leaving a project site are classified as waste unless reused in accordance with the new regulation. In order to be reused, the excess soil quality must meet the number of samples and the soil quality standards for the specific reuse site in accordance with the MECP 2020 Rules for Soil Management and Excess Soil Quality Standards Report. Furthermore, receiving sites will have new procedures and policies for accepting excess soil and therefore must be consulted well in advance before the soil is removed from site.

It should be noted that only the comparison to MECP Table 1, Table 2 and Table 3 is presented in this report. Should the excess soil exceed 350m^3, the soil analytical results should be compared with the new Tables as per the Soil Rules, which is not included in this report. We strongly recommend the design engineer and contractor consult a qualified person during the design and tender stage for soil disposal. Should it be required, GeoPro would be pleased to provide an additional scope of work to meet the requirements of O.Reg. 406.

7. MONITORING AND TESTING

The geotechnical aspects of the final design drawings and specifications should be reviewed by GeoPro prior to tendering and construction, to confirm that the intent of this report has been met. During construction, full-time engineered fill monitoring and sufficient foundation inspections, subgrade inspections, in-situ density tests and materials testing should be carried out to confirm that the conditions exposed are consistent with those encountered in the boreholes, and to monitor conformance to the pertinent project specifications.

8. CLOSURE

We appreciate the opportunity to be of service to you and trust that this report provides sufficient geotechnical engineering information to facilitate the detail design of this project. We look forward to providing you with continuing service during the construction stage. Please do not hesitate to contact our office should you wish to discuss, in further detail, any aspects of this project.

Yours very truly,

GEOPRO CONSULTING LIMITED

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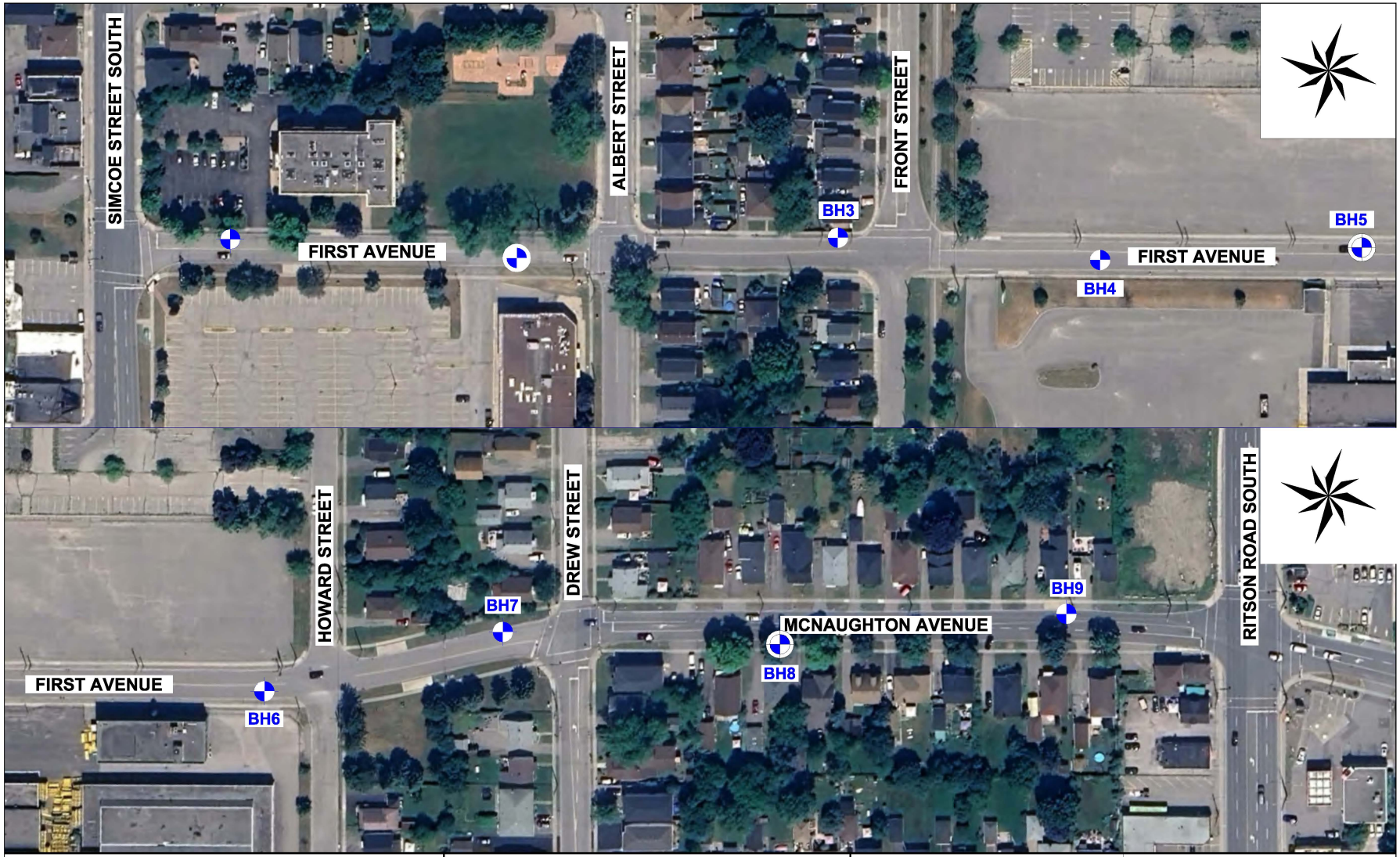
DRAWINGS



Legend:

- Borehole Location
- Monitoring Well

Client:	Parsons Corporation	Project No.:	24-4656GH
Drawn:	JC	Drawing No.:	1
Approved:	DL	Title:	Borehole Location Plan
Date:	February 2024	Project:	Geotechnical Investigation Proposed Road Improvements First Avenue and McNaughton Avenue, City of Oshawa, Ontario
Scale:	N.T.S.		
Original Size:	Letter		
Rev:	CLL		

GeoPro Consulting Limited

ENCLOSURES

Enclosure 1A: Notes on Sample Descriptions

1. Each soil stratum is described according to the *Modified Unified Soil Classification System*. The compactness condition of cohesionless soils (SPT) and the consistency of cohesive soils (undrained shear strength) are defined according to Canadian Foundation Engineering Manual, 4th Edition. Different soil classification systems may be used by others. Please note that a description of the soil stratums is based on visual and tactile examination of the samples augmented with field and laboratory test results, such as a grain size analysis and/or Atterberg Limits testing. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.

2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional preliminary geotechnical site investigation.

3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (75 to 300 mm) or boulders (over 300 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

GeoPro Consulting Limited

Geotechnical-Hydrogeology-Environmental-Materials-Inspection

Enclosure 1B: Explanation of Terms Used in the Record of Boreholes

Sample Type

AS	Auger sample
BS	Block sample
CS	Chunk sample
DO	Drive open
DS	Dimension type sample
FS	Foil sample
NR	No recovery
RC	Rock core
SC	Soil core
SS	Spoon sample
SH	Shelby tube Sample
ST	Slotted tube
TO	Thin-walled, open
TP	Thin-walled, piston
WS	Wash sample

Penetration Resistance

Standard Penetration Resistance (SPT), N:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in) required to drive a 50 mm (2 in) drive open sampler for a distance of 300 mm (12 in).

PM – Samples advanced by manual pressure
WR – Samples advanced by weight of sampler and rod
WH – Samples advanced by static weight of hammer

Dynamic Cone Penetration Resistance, N_d:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in) to drive uncased a 50 mm (2 in) diameter, 60° cone attached to "A" size drill rods for a distance of 300 mm (12 in).

Piezo-Cone Penetration Test (CPT):

An electronic cone penetrometer with a 60 degree conical tip and a projected end area of 10 cm² pushed through ground at a penetration rate of 2 cm/s. Measurement of tip resistance (Q_t), porewater pressure (PWP) and friction along a sleeve are recorded electronically at 25 mm penetration intervals.

Textural Classification of Soils (ASTM D2487)

Classification	Particle Size
Boulders	> 300 mm
Cobbles	75 mm - 300 mm
Gravel	4.75 mm - 75 mm
Sand	0.075 mm – 4.75 mm
Silt	0.002 mm-0.075 mm
Clay	<0.002 mm(*)

(*) Canadian Foundation Engineering Manual (4th Edition)

Coarse Grain Soil Description (50% greater than 0.075 mm)

Terminology	Proportion
Trace	0-10%
Some	10-20%
Adjective (e.g. silty or sandy)	20-35%
And (e.g. sand and gravel)	> 35%

Soil Description

a) Cohesive Soils (*)

Consistency	Undrained Shear Strength (kPa)	SPT "N" Value
Very soft	<12	<2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very stiff	100-200	15-30
Hard	>200	>30

(*) Hierarchy of Shear Strength prediction

1. Lab triaxial test
2. Field vane shear test
3. Lab. vane shear test
4. SPT "N" value
5. Pocket penetrometer

b) Cohesionless Soils (*)

Compactness Condition (Formerly Relative Density)	SPT "N" Value
Very loose	0-4
Loose	4-10
Compact	10-30
Dense	30-50
Very dense	>50

Soil Tests

w	Water content
w_p	Plastic limit
w_l	Liquid limit
C	Consolidation (oedometer) test
CID	Consolidated isotropically drained triaxial test
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement
D_R	Relative density (specific gravity, Gs)
DS	Direct shear test
ENV	Environmental/ chemical analysis
M	Sieve analysis for particle size
MH	Combined sieve and hydrometer (H) analysis
MPC	Modified proctor compaction test
SPC	Standard proctor compaction test
OC	Organic content test
U	Unconsolidated Undrained Triaxial Test
V	Field vane (LV-laboratory vane test)
γ	Unit weight

LOG OF BOREHOLE BH1

PROJECT: Geotechnical Investigation for Proposed Road Improvements
CLIENT: Parsons Corporation
PROJECT LOCATION: First Avenue and McNaughton Avenue, Oshawa, ON
DATUM: N/A
BH LOCATION: See Borehole Location Plan

DRILLING DATA
METHOD: Continuous Flight Auger - Auto Hammer
FIELD ENGINEER: SK
SAMPLE REVIEW: KJ
CHECKED: DX
DIAMETER: 105 mm
DATE: 2024-02-16
REF. NO.: 24-4656GH
ENCL. NO.: 2

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	"N" BLOWS/0.3m	ELEVATION
0.0	**ASPHALT:** (220 mm)				
0.2	**GRANULAR BASE:** (160 mm)	1A	AS		
0.4	**GRANULAR SUBBASE:** (170 mm)	1B	AS		
0.6		1C	AS		
1	**FILL:** sandy silt, trace to some clay, trace gravel, organic matters, layers of silty sand, seams/pockets of sand, dark brown to brown, moist, compact	2A	SS	29	
1.1		2B	SS		
1.4	**SANDY SILT:** trace clay, trace gravel, brown, moist, compact				
2	**SILTY SAND TILL TO SAND AND SILT TILL:** trace clay, trace gravel, layers of wet silty sand, seams/pockets of sand, containing cobbles and boulders, brown, moist to wet, very dense	3	SS	74 / 280 mm	
		4	SS	95 / 290 mm	
3	--- auger grinding				
	--- layers of sandy silt	5	SS	74	
4	--- auger grinding				
4.0	**GRAVELLY SAND:** trace silt, containing cobbles and boulders, brown, moist, very dense	6	SS	50 / 130 mm	
5	--- auger grinding				
5.5	**SAND:** some silt, trace gravel, brown, wet, very dense	7	SS	50 / 130 mm	
6					
6.4	**END OF BOREHOLE**				

Notes:

1) Water encountered at a depth of 1.5 m below ground surface (mBGS) during drilling.
2) Borehole caved at a depth of 5.7 mBGS upon completion of drilling.

DYNAMIC PENETRATION TEST: ○ SPT, ≈ Cone, blows/0.3m; 20 40 60 80
SHEAR STRENGTH (kPa): ● Unconfined, ✕ Field Vane & Sensitivity, ▲ Quick Triaxial, ⊠ Penetrometer, + Lab Vane; 20 40 60 80
WATER CONTENT (%): Plastic Limit (w_P), Natural Moisture Content (w), Liquid Limit (w_L); 10 20 30 40

ELEV / DEPTH (m)	UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0 – 6.4		

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ▲ε=3%: Strain at Failure

LOG OF BOREHOLE BH2

PROJECT: Geotechnical Investigation for Proposed Road Improvements
CLIENT: Parsons Corporation
PROJECT LOCATION: First Avenue and McNaughton Avenue, Oshawa, ON
DATUM: N/A
BH LOCATION: See Borehole Location Plan

DRILLING DATA

METHOD: Continuous Flight Auger - Auto Hammer
FIELD ENGINEER: SK
SAMPLE REVIEW: KJ
CHECKED: DX

DIAMETER: 105 mm
DATE: 2024-02-16
REF. NO.: 24-4656GH
ENCL. NO.: 3

ELEV DEPTH (m)	DESCRIPTION	NUMBER	TYPE	"N" BLOWS/0.3m	GROUND WATER	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	**ASPHALT:** (200 mm)				Concrete	
0.2	**GRANULAR BASE:** (60 mm)	1A	AS			29 62 9
0.3	**GRANULAR SUBBASE:** (200 mm)	1B	AS			
0.5	**FILL:** clayey silt, some sand to sandy, trace gravel, organic matters, layers of silty sand, dark brown to brown, moist, stiff --- layers of sandy silt	1C	AS			
		2	SS	13		
1.4	**SAND AND SILT:** trace clay, trace gravel, layers silty sand, pockets of sand, containing cobbles and boulders, brown, moist to wet, very dense --- auger grinding	3	SS	55	Bentonite	
2.1	**SAND AND GRAVEL:** trace clay, trace silt, containing cobbles and boulders, brown, moist, very dense	4	SS	50 / 130 mm		35 54 7 4
2.8	**SAND AND SILT TO SILTY SAND:** trace to some gravel, trace clay, seams of sand, containing cobbles and boulders, brown, moist to wet, very dense --- auger grinding from 3.5 m to 4.0 m	5	SS	50 / 130 mm	Sand; 3.4 mBGS Mar 13; 3.8 mBGS Mar 05	
4.0	**SAND:** trace silt, trace gravel, hydrocarbon odour, grey to brown, wet, very dense	6A	SS	91	Screen	
4.7	**SAND:** trace silt, trace gravel, brown, wet, very dense	6B	SS			
5.6	**GRAVELLY SAND:** trace silt, containing cobbles and boulders, brown, wet, very dense	7	SS	85 / 290 mm	Natural Pack	
6.5	**END OF BOREHOLE**					

Notes:

1) Water encountered at a depth of 1.5 m below ground surface (mBGS) during drilling.
2) Water was at a depth of 3.6 mBGS upon completion of drilling.
3) Borehole caved at a depth of 4.6 mBGS upon completion of drilling.
4) 51 mm dia. monitoring well was installed in borehole upon completion of drilling.

Water Level Readings:

Date	W. L. Depth (mBGS)
Mar. 5, 2024	3.75
Mar. 13, 2024	3.43

DYNAMIC PENETRATION TEST: SPT, Cone, blows/0.3m (20, 40, 60, 80); SHEAR STRENGTH (kPa): Unconfined, Field Vane & Sensitivity, Quick Triaxial, Penetrometer, Lab Vane (20, 40, 60, 80)

Plastic Limit W_P, Natural Moisture Content W, Liquid Limit W_L; WATER CONTENT (%) (10, 20, 30, 40); UNIT WT (kN/m^3)

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: + 3, × 3: Numbers refer to Sensitivity; ▲ ε=3% Strain at Failure

LOG OF BOREHOLE BH3

PROJECT: Geotechnical Investigation for Proposed Road Improvements
CLIENT: Parsons Corporation
PROJECT LOCATION: First Avenue and McNaughton Avenue, Oshawa, ON
DATUM: N/A
BH LOCATION: See Borehole Location Plan

DRILLING DATA
METHOD: Continuous Flight Auger - Auto Hammer
FIELD ENGINEER: SK
SAMPLE REVIEW: KJ
CHECKED: DX
DIAMETER: 105 mm
DATE: 2024-02-20
REF. NO.: 24-4656GH
ENCL. NO.: 4

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	"N" BLOWS/0.3m
0.0	**TOPSOIL:** (320 mm)			
0.3	**FILL:** clayey silt, some sand, trace gravel, organic matters, rootlet inclusions, layers of topsoil, dark brown to brown, moist, soft to very stiff	1	SS	4
		2A	SS	19
1.1	**CLAYEY SILT:** trace sand, trace gravel, seams/pockets of sand, pockets of silt, containing cobbles and boulders, brown, moist, very stiff to hard	2B	SS	
		3	SS	21
	--- layers of sand	4	SS	77 / 250 mm
	--- auger grinding			
	--- layers/zones of sandy silt till	5	SS	21
	--- auger grinding			
4.0	**SAND:** some silt, trace gravel, containing cobbles and boulders, grey, wet, dense to very dense	6	SS	39
	--- auger grinding	7	SS	91 / 250 mm
6.5	**END OF BOREHOLE**			

Notes:

1) Water encountered at a depth of 4.6 m below ground surface (mBGS) during drilling.
2) Borehole caved at a depth of 6.2 m upon completion of drilling.

DYNAMIC PENETRATION TEST: ○ SPT, ≳ Cone, blows/0.3m; 20 40 60 80
SHEAR STRENGTH (kPa): ● Unconfined, ✕ Field Vane & Sensitivity, ▲ Quick Triaxial, ⊠ Penetrometer, + Lab Vane; 20 40 60 80
Plastic Limit (w_P) | Natural Moisture Content (w) | Liquid Limit (w_L)
WATER CONTENT (%): 10 20 30 40
UNIT WT (kN/m³)
REMARKS AND GRAIN SIZE DISTRIBUTION (%): GR SA SI CL

GROUNDWATER ELEVATIONS
Measurement: 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: + 3, × 3: Numbers refer to Sensitivity; ▲ ε=3% Strain at Failure

LOG OF BOREHOLE BH4

PROJECT: Geotechnical Investigation for Proposed Road Improvements
CLIENT: Parsons Corporation
PROJECT LOCATION: First Avenue and McNaughton Avenue, Oshawa, ON
DATUM: N/A
BH LOCATION: See Borehole Location Plan

DRILLING DATA

METHOD: Continuous Flight Auger - Auto Hammer
FIELD ENGINEER: SK
SAMPLE REVIEW: KJ
CHECKED: DX

DIAMETER: 105 mm
DATE: 2024-02-16
REF. NO.: 24-4656GH
ENCL. NO.: 5

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	"N" BLOWS/0.3m
0.0	**ASPHALT:** (130 mm)			
0.1	**GRANULAR BASE:** (220 mm)	1A	AS	
0.4	**GRANULAR SUBBASE:** (500 mm)	1B	AS	
0.9	**FILL:** organic silt, some clay, trace sand, trace gravel, layers of clayey silt, layers of sandy silt, pockets of sand, dark brown, moist, compact	2A / 2B	SS	11
1.4	**FILL:** clayey silt, trace sand, trace gravel, organic inclusions, pockets of sand, brown, moist, stiff	3	SS	14
2.1	**CLAYEY SILT:** trace sand, trace gravel, pockets of silt, brown, moist, very stiff	4	SS	18
2.9	**SANDY SILT TILL:** some clay, trace gravel, layers of wet sandy silt, seam/pockets of wet sand, containing cobbles and boulders, grey, moist to wet, compact	5	SS	29
4.0	**SAND:** some silt, trace to some gravel, grey, wet, dense to very dense	6	SS	53
		7	SS	50
6.6	**END OF BOREHOLE**			

Notes:

1) Water encountered at a depth of 4.7 m below ground surface (mBGS) during drilling.
2) Borehole caved at a depth of 6.4 mBGS upon completion of drilling.

DYNAMIC PENETRATION TEST: ○ SPT, ≳ Cone, blows/0.3m; 20 40 60 80
SHEAR STRENGTH (kPa): ● Unconfined, ✕ Field Vane & Sensitivity, ▲ Quick Triaxial, ⊠ Penetrometer, + Lab Vane; 20 40 60 80
Plastic Limit (w_P) | Natural Moisture Content (w) | Liquid Limit (w_L)
WATER CONTENT (%): 10 20 30 40

GROUNDWATER ELEVATIONS
Measurement: 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ▲ε=3%: Strain at Failure

LOG OF BOREHOLE BH5

PROJECT: Geotechnical Investigation for Proposed Road Improvements
CLIENT: Parsons Corporation
PROJECT LOCATION: First Avenue and McNaughton Avenue, Oshawa, ON
DATUM: N/A
BH LOCATION: See Borehole Location Plan

DRILLING DATA
METHOD: Continuous Flight Auger - Auto Hammer
FIELD ENGINEER: SK
SAMPLE REVIEW: KJ
CHECKED: DX
DIAMETER: 105 mm
DATE: 2024-02-20
REF. NO.: 24-4656GH
ENCL. NO.: 6

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	"N" BLOWS/0.3m	GROUND WATER	ELEVATION
0.0	**ASPHALT:** (130 mm)					
0.1	**GRANULAR BASE:** (220 mm)	1A	AS			Concrete
0.4	**GRANULAR SUBBASE:** (500 mm)	1B	AS			
0.9	**FILL:** sandy silt, some clay, trace gravel, organic matters, layers of organic silt, layers of silty sand, containing slag fragments, dark brown to brown, moist, loose	2A	SS			
		2B	SS	8		
	--- layers of clayey silt	3A	SS			
1.6	**CLAYEY SILT:** some sand, layers of wet silt, brown, moist to wet, firm to stiff	3B	SS	8	1.8 mBGS Mar 13 1.8mBGS Mar 05	
2.1	**SILT:** some sand, trace to some clay, trace gravel, seams of sand, brown, moist to wet, compact					Bentonite
		4	SS	20		
2.9	**CLAYEY SILT TO SILTY CLAY:** trace sand, trace gravel, layers of silt, brown to grey, moist to wet, soft to stiff	5	SS	12		
	--- grey	6	SS	4		Sand Screen
		7	SS	2		Natural Pack
6.9	**END OF BOREHOLE**					

Notes:

1) Water encountered at a depth of 1.7 m below ground surface (mBGS) during drilling.
2) Water was at a depth of 3.0 mBGS upon completion of drilling.
3) Borehole caved at a depth of 6.1 mBGS upon completion of drilling.
4) 51 mm dia. monitoring well was installed in borehole upon completion of drilling.

Water Level Readings:

Date	W. L. Depth (mBGS)
Mar. 5, 2024	1.83
Mar. 13, 2024	1.79

DYNAMIC PENETRATION TEST
○ SPT ≳ Cone blows/0.3m
20 40 60 80
SHEAR STRENGTH (kPa)
● Unconfined ✕ Field Vane & Sensitivity
▲ Quick Triaxial ⊠ Penetrometer + Lab Vane
20 40 60 80

Plastic Limit w_P | Natural Moisture Content w | Liquid Limit w_L
WATER CONTENT (%)
10 20 30 40

UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

GR	SA	SI	CL
0	5	43	52

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: +³, ×³: Numbers refer to Sensitivity; ▲ ε=3% Strain at Failure

LOG OF BOREHOLE BH6

PROJECT: Geotechnical Investigation for Proposed Road Improvements
CLIENT: Parsons Corporation
PROJECT LOCATION: First Avenue and McNaughton Avenue, Oshawa, ON
DATUM: N/A
BH LOCATION: See Borehole Location Plan

DRILLING DATA
METHOD: Continuous Flight Auger - Auto Hammer
FIELD ENGINEER: LL/ML
SAMPLE REVIEW: KJ
CHECKED: DX
DIAMETER: 105 mm
DATE: 2024-02-21
REF. NO.: 24-4656GH
ENCL. NO.: 7

ELEV / DEPTH (m)	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" BLOWS/0.3m	GROUND WATER ELEVATION	DYNAMIC PENETRATION TEST: SPT / Cone blows/0.3m; SHEAR STRENGTH (kPa): Unconfined, Field Vane & Sensitivity, Quick Triaxial, Penetrometer, Lab Vane	Plastic Limit / Natural Moisture Content / Liquid Limit; WATER CONTENT (%)	UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	**ASPHALT:** (130 mm)									
0.1	**GRANULAR BASE:** (280 mm)		1A	AS						35 56 9
0.4	**GRANULAR SUBBASE:** (190 mm)		1B	AS						
0.6	**FILL:** organic clayey silt, some sand, trace gravel, layers of clayey silt, dark brown, moist		1C	AS						
0.8	**FILL:** sandy silt, some clay, trace gravel, layers of silty sand, containing rock pieces, brown, moist, loose to compact		2	SS	10					
1.4	**CLAYEY SILT:** trace sand, trace gravel, pockets of silt, brown, moist, firm to stiff		3	SS	12					
			4	SS	7					
2.9	**SANDY SILT TO SAND AND SILT:** trace to some clay, trace to some gravel, layers of silty sand, pockets of sand, brown to grey, wet, loose to dense		5	SS	12					
	--- grey		6	SS	10					
	--- layers of silty sand		7	SS	34					
6.6	**END OF BOREHOLE**									

Notes:

1) Water encountered at a depth of 3.0 m below ground surface (mBGS) during drilling.
2) Borehole caved at a depth of 5.9 mBGS upon completion of drilling.

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +³, ×³: Numbers refer to Sensitivity; ▲ ε=3% Strain at Failure

01 - GEOPRO SOIL LOG GEOPRO 24-4656GH BH LOG 20240430 SR MB CLL RC.GPJ 2024-05-01 05:12

LOG OF BOREHOLE BH7

PROJECT: Geotechnical Investigation for Proposed Road Improvements
CLIENT: Parsons Corporation
PROJECT LOCATION: First Avenue and McNaughton Avenue, Oshawa, ON
DATUM: N/A
BH LOCATION: See Borehole Location Plan

DRILLING DATA

METHOD: Continuous Flight Auger - Auto Hammer
FIELD ENGINEER: LB/ML
SAMPLE REVIEW: KJ
CHECKED: DX

DIAMETER: 105 mm
DATE: 2024-02-20
REF. NO.: 24-4656GH
ENCL. NO.: 8

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	"N" BLOWS/0.3m
0.0	**ASPHALT:** (180 mm)			
0.2	**GRANULAR BASE/SUBBASE:** (450 mm)	1A	AS	
		1B	AS	
0.6	**FILL:** clayey silt, trace to some sand, trace gravel, organic inclusions, layers of silty sand, containing rock fragments/pieces, brown, moist, very stiff	2A	SS	28
1.2		2B	SS	
1.4	**CLAYEY SILT:** some sand, trace gravel, brown, moist, very stiff			
	SANDY SILT: trace clay, trace gravel, brown, moist to wet, dense	3A	SS	36
1.9	**GRAVELLY SAND:** trace silt, pockets of sandy silt, containing cobbles and boulders, brown, moist, dense	3B	SS	
2.1	**SANDY SILT TO SAND AND SILT:** trace clay, trace gravel, layers/zones of sandy silt till, pockets of sand, containing cobbles and boulders, brown to grey, wet, dense to very dense	4	SS	57
		5	SS	40
	--- layers of silty fine sand	6	SS	83
	--- layers of sandy silt till	7	SS	76
6.6	**END OF BOREHOLE**			

Notes:

1) Water encountered at a depth of 1.5 m below ground surface (mBGS) during drilling.
2) Borehole caved at a depth of 6.3 mBGS upon completion of drilling.

DYNAMIC PENETRATION TEST: ○ SPT, ≳ Cone, blows/0.3m; 20 40 60 80
SHEAR STRENGTH (kPa): ● Unconfined, ✕ Field Vane & Sensitivity, ▲ Quick Triaxial, ⊠ Penetrometer, + Lab Vane; 20 40 60 80
Plastic Limit, Natural Moisture Content, Liquid Limit; w_P, w, w_L
WATER CONTENT (%): 10 20 30 40
UNIT WT (kN/m³)
REMARKS AND GRAIN SIZE DISTRIBUTION (%): GR SA SI CL

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +³, ×³: Numbers refer to Sensitivity; ▲ ε=3% Strain at Failure

GeoPro

LOG OF BOREHOLE BH8

PROJECT: Geotechnical Investigation for Proposed Road Improvements
CLIENT: Parsons Corporation
PROJECT LOCATION: First Avenue and McNaughton Avenue, Oshawa, ON
DATUM: N/A
BH LOCATION: See Borehole Location Plan

DRILLING DATA
METHOD: Continuous Flight Auger - Auto Hammer
FIELD ENGINEER: LB/ML
SAMPLE REVIEW: KJ
CHECKED: DX
DIAMETER: 105 mm
DATE: 2024-02-16
REF. NO.: 24-4656GH
ENCL. NO.: 9

ELEV DEPTH (m)	DESCRIPTION (SOIL PROFILE)	SAMPLE NUMBER	TYPE	"N" BLOWS/0.3m	GROUND WATER	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	**ASPHALT:** (150 mm)				Concrete	
0.2	**GRANULAR BASE:** (190 mm)	1A	AS			
0.3	**GRANULAR SUBBASE:** (500 mm)	1B	AS			
		2A	SS			
0.8	**FILL:** clayey silt, trace sand, trace gravel, layers of sandy silt, pockets of organic silt, brown, moist, very stiff	2B	SS	25		
1.4	**SANDY SILT TO SAND AND SILT:** some clay, trace gravel, layers of clayey silt, pockets of sand, brown, wet, loose to compact	3	SS	10	1.6 mBGSMar 13 1.7mBGS Mar 05 Bentonite	
		4	SS	28		
2.9	**SILTY SAND:** some clay, trace gravel, layers of sandy silt, layers of sand and silt, brown, wet, loose to compact	5	SS	10		5 51 30 14
4.0	**SAND AND SILT:** trace clay, trace gravel, grey, wet, loose to very dense	6	SS	9	Sand Screen	
	--- layers/zones of silty sand	7A	SS	80 / 280 mm	Natural Pack	
6.4 6.5	**SANDY SILT TILL:** trace clay, trace gravel, layers of sandy silt, containing cobbles and boulders, grey, moist, very dense	7B	SS			

Dynamic penetration test at sample 7A: > >100

END OF BOREHOLE

Notes:

1) Water encountered at a depth of 1.5 m below ground surface (mBGS) during drilling.
2) Water was at a depth of 3.1 mBGS upon completion of drilling.
3) Borehole caved at a depth of 6.0 mBGS upon completion of drilling.
4) 51 mm dia. monitoring well was installed in borehole upon completion of drilling.

Water Level Readings:

Date	W. L. Depth (mBGS)
Mar. 5, 2024	1.70
Mar. 13, 2024	1.59

Column headings: STRATA PLOT; ELEVATION; DYNAMIC PENETRATION TEST (○ SPT, Cone, blows/0.3m, 20 40 60 80); SHEAR STRENGTH (kPa) (● Unconfined, ✕ Field Vane & Sensitivity, ▲ Quick Triaxial, ⊠ Penetrometer, + Lab Vane, 20 40 60 80); Plastic Limit w_P, Natural Moisture Content w, Liquid Limit w_L; WATER CONTENT (%) 10 20 30 40; UNIT WT (kN/m^3)

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^3, \times^3$: Numbers refer to Sensitivity; ▲ ε=3% Strain at Failure

LOG OF BOREHOLE BH9

PROJECT: Geotechnical Investigation for Proposed Road Improvements
CLIENT: Parsons Corporation
PROJECT LOCATION: First Avenue and McNaughton Avenue, Oshawa, ON
DATUM: N/A
BH LOCATION: See Borehole Location Plan

DRILLING DATA
METHOD: Continuous Flight Auger - Auto Hammer
FIELD ENGINEER: JB/LL
SAMPLE REVIEW: KJ
CHECKED: DX
DIAMETER: 105 mm
DATE: 2024-02-16
REF. NO.: 24-4656GH
ENCL. NO.: 10

ELEV / DEPTH (m)	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" BLOWS/0.3m	GROUND WATER ELEVATION
0.0	**ASPHALT:** (170 mm)					
0.2	**GRANULAR BASE:** (190 mm)		1A	AS		
0.4	**GRANULAR SUBBASE:** (490 mm)		1B	AS		
0.9	**NO SAMPLE RECOVERY**		2A / 2B	SS / NR	12	
1.4	**CLAYEY SILT:** some sand, trace gravel, seams of sand, interlayers of silt, brown, moist, very stiff		3	SS	21	
2.1	**SANDY SILT TO SAND AND SILT:** trace clay, trace gravel, layers of silty sand, layers/zones of sandy silt till, seams/pockets of sand, brown to grey, wet, loose to very dense		4	SS	42	
	--- grey		5	SS	9	
	--- layers of silty sand		6	SS	55	
			7	SS	50 / 130 mm	
6.4	**END OF BOREHOLE**					

Notes:

1) Water encountered at a depth of 2.3 m below ground surface (mBGS) during drilling.
2) Borehole caved at a depth of 6.0 mBGS upon completion of drilling.

DYNAMIC PENETRATION TEST
○ SPT ≳ Cone blows/0.3m
20 40 60 80

SHEAR STRENGTH (kPa)
● Unconfined ✕ Field Vane & Sensitivity
▲ Quick Triaxial ⊠ Penetrometer + Lab Vane
20 40 60 80

Plastic Limit w_P | Natural Moisture Content w | Liquid Limit w_L
WATER CONTENT (%)
10 20 30 40

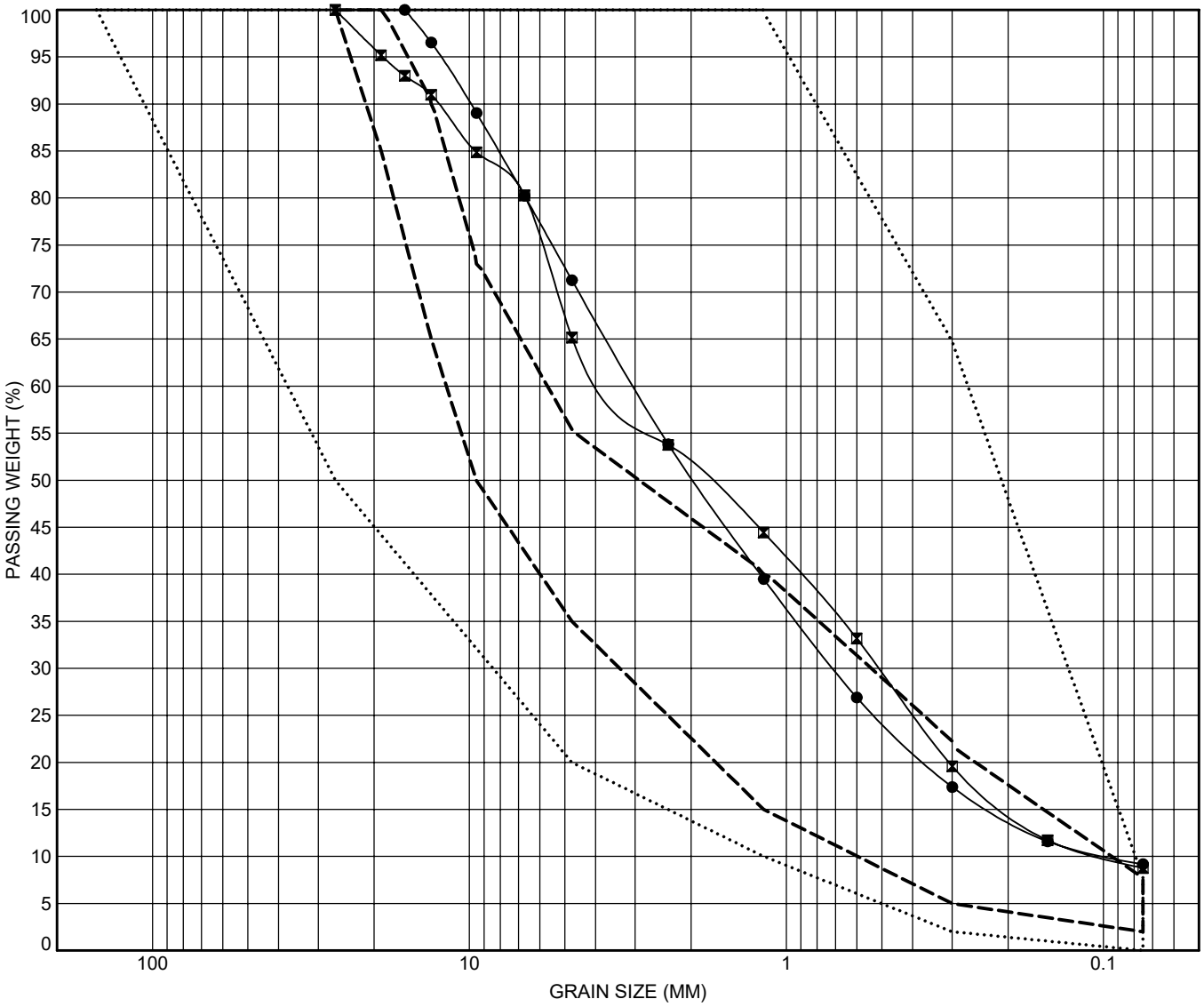
UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
▲ ε=3% Strain at Failure

FIGURES



COBBLES	GRAVEL		SAND			FINES
	coarse	fine	coarse	medium	fine	

OPSS 1010 GRANULAR A

OPSS 1010 GRANULAR B TYPE I

Specimen Identification				D100	D60	D30	D10	%Gravel	%Sand	%Fines
●	**BH2**	**AS1A**	**0.20**	**16**	**3.024**	**0.709**	**0.095**	**28.7**	**62.1**	**9.2**
⊠	**BH6**	**AS1A**	**0.13**	**26.5**	**3.461**	**0.51**	**0.1**	**34.8**	**56.4**	**8.8**

GeoPro CONSULTING LIMITED

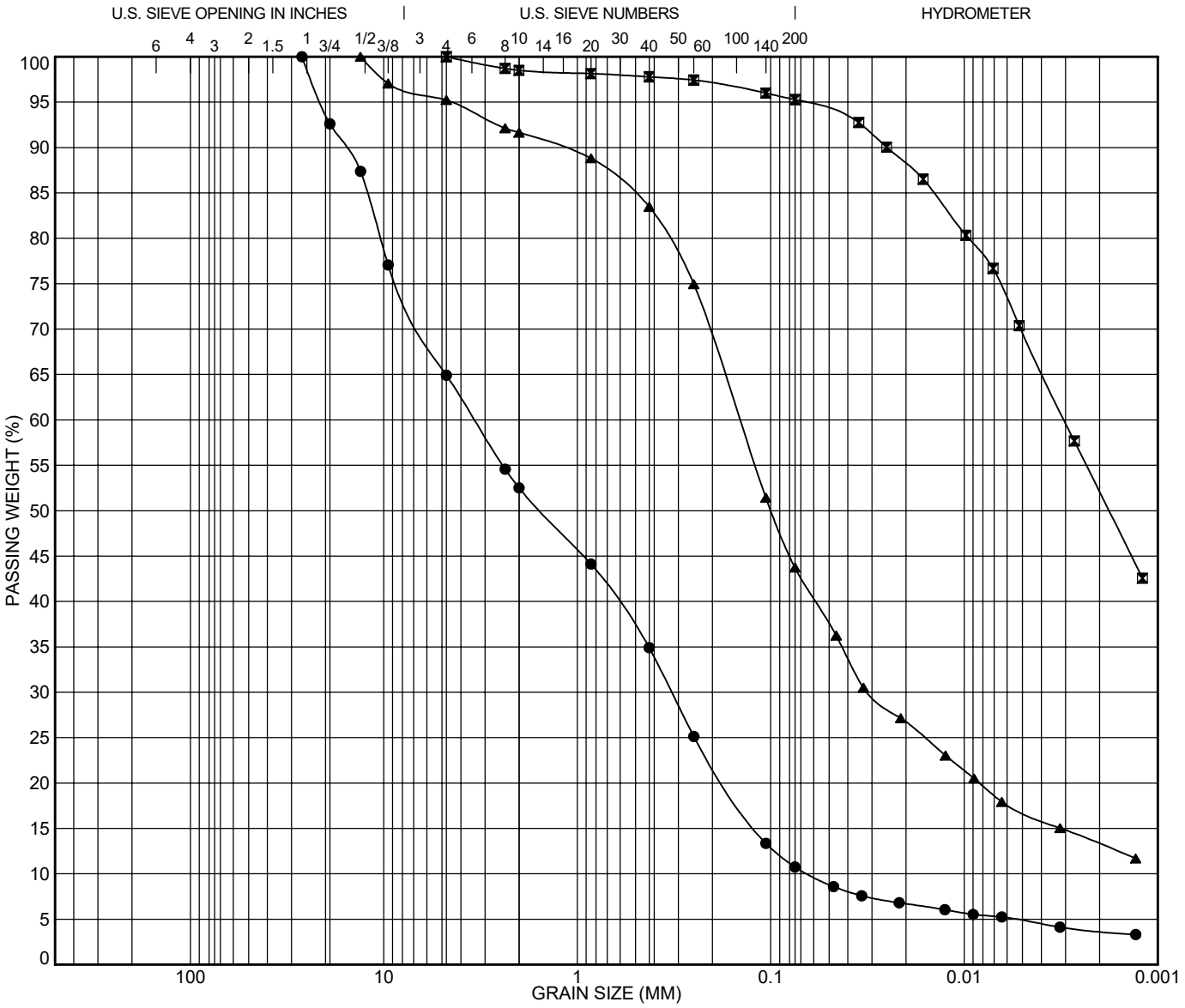
Unit 57, 40 Vogell Road, Richmond Hill, Ontario L4B 3N6
Tel: 905-237-8336 Fax: 905-248-3699
office@geoproconsulting.ca www.geoproconsulting.ca

GRAIN SIZE DISTRIBUTION

PROJECT: Geotechnical Investigation for Proposed Road Improvements

LOCATION: First Avenue and McNaughton Avenue, Oshawa, ON

PROJECT NO.: 24-4656GH	SAMPLED ON: 2024-02-21
FIGURE NO.: 1	TESTED ON: 2024-02-29



COBBLES	GRAVEL		SAND			SILT	CLAY
	coarse	fine	coarse	medium	fine		

	Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	BH2	SS4	2.29					0.49	53.24
⊠	BH5	SS5	3.05						
▲	BH8	SS5	3.05						

	Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	BH2	SS4	2.29	26.5	3.406	0.326	0.064	35.1	54.2	7.0	3.7
⊠	BH5	SS5	3.05	4.75	0.003			0.0	4.7	43.2	52.1
▲	BH8	SS5	3.05	13.2	0.145	0.031		4.8	51.5	30.5	13.3

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GRAIN SIZE DISTRIBUTION

PROJECT: Geotechnical Investigation for Proposed Road Improvements

LOCATION: First Avenue and McNaughton Avenue, Oshawa, ON

PROJECT NO.: 24-4656GH | SAMPLED ON: 2024-02-16

FIGURE NO.: 2 | TESTED ON: 2024-02-29

APPENDIX A

Photograph 1 – First Avenue, approximately 30 m East of Simcoe Street South, looking West, showing moderate to severe longitudinal and transverse cracking associated with slight to moderate random cracking, moderate to severe alligator cracking, moderate to severe pavement edge cracking, and moderate to severe pavement raveling.

Photograph 2 – First Avenue, approximately 30 m East of Simcoe Street South, looking East, showing moderate to severe longitudinal and transverse cracking associated with moderate to severe alligator cracking, moderate random cracking, severe pavement edge cracking, and moderate to severe pavement raveling.

Photograph 3 – First Avenue, approximately 50 m East of Simcoe Street South, looking East, showing slight to moderate longitudinal and transverse cracking associated with moderate to severe alligator cracking, slight to moderate random cracking, severe pavement edge cracking, and moderate to severe pavement raveling.

Photograph 4 – First Avenue, approximately 75 m East of Simcoe Street South, looking East, showing slight to moderate longitudinal and transverse cracking associated with moderate to severe alligator cracking, slight to moderate random cracking, severe pavement edge cracking, and moderate to severe pavement raveling. Noting moderate to severe alligator cracking around manhole.

Photograph 5 – First Avenue, approximately 60 m West of Albert Street, looking East, showing moderate to severe longitudinal and transverse cracking associated with severe alligator cracking, slight to moderate random cracking, severe pavement edge cracking, slight pavement depressions, and moderate to severe pavement raveling.

Photograph 6 – First Avenue, approximately 30 m West of Albert Street, looking East, showing moderate longitudinal and transverse cracking associated with moderate to severe alligator cracking, moderate random cracking, slight pavement depressions, severe pavement edge cracking, and moderate to severe pavement raveling.

Photograph 7 – First Avenue, approximately 25 m East of Albert Street, looking West, showing moderate longitudinal and transverse cracking associated with moderate random cracking, slight alligator cracking, slight to moderate potholes, slight pavement edge cracking, and moderate pavement raveling. Noting moderate alligator cracking around manholes, slight random cracking around catch basin, and utility patching.

Photograph 8 – First Avenue, approximately 30 m West of Front Street, looking West, showing moderate longitudinal and transverse cracking associated with moderate alligator cracking, slight to moderate random cracking, slight pavement depression, slight to moderate block cracking, slight to moderate pavement edge cracking, and slight pavement raveling. Noting utility patching.

Photograph 9 – First Avenue, approximately 30 m West of Front Street, looking East, showing slight to moderate longitudinal and transverse cracking associated with slight random cracking, slight alligator cracking, slight to moderate pavement edge cracking, slight pavement rutting, and moderate to severe pavement raveling.

Photograph 10 – First Avenue, in the vicinity of the intersection of Front Street and First Avenue, looking West, showing moderate longitudinal and transverse cracking associated with moderate to severe random cracking, slight alligator cracking, moderate construction joint cracking, and slight to moderate pavement raveling. Noting slight to moderate random cracking around manholes.

Photograph 11 – First Avenue, in the vicinity of the intersection of Front Street and First Avenue, looking East, showing moderate to severe longitudinal and transverse cracking associated with moderate random cracking, slight pavement edge cracking, and moderate pavement raveling.

Photograph 12 – First Avenue, approximately 45 m East of Front Street, looking East, showing slight to moderate longitudinal and transverse cracking associated with slight random cracking, slight pavement edge cracking, slight pavement rutting, and moderate pavement raveling.

Photograph 13 – First Avenue, approximately 100 m East of Front Street, looking West, showing slight to moderate longitudinal and transverse cracking associated with slight random cracking, slight alligator cracking, slight pavement edge cracking, and moderate to severe pavement raveling. Noting moderate alligator cracking around manhole and catch basin, and utility patching.

Photograph 14 – First Avenue, approximately 130 m East of Front Street, looking West, showing slight to moderate longitudinal and transverse cracking associated with slight to moderate alligator cracking, slight random cracking, slight pavement edge cracking, and moderate pavement raveling.

Photograph 15 – First Avenue, approximately 105 m West of Howard Street, looking West, showing moderate longitudinal and transverse cracking associated with moderate random cracking, slight pavement edge cracking, and moderate to severe pavement raveling. Noting moderate random cracking and patching around manholes.

Photograph 16 – First Avenue, approximately 130 m East of Front Street, looking West, showing slight to moderate longitudinal and transverse cracking associated with moderate random cracking, slight to moderate alligator cracking, slight to moderate pavement edge cracking, and moderate to severe pavement raveling. Noting severe alligator cracking and slight random cracking around catch basins.

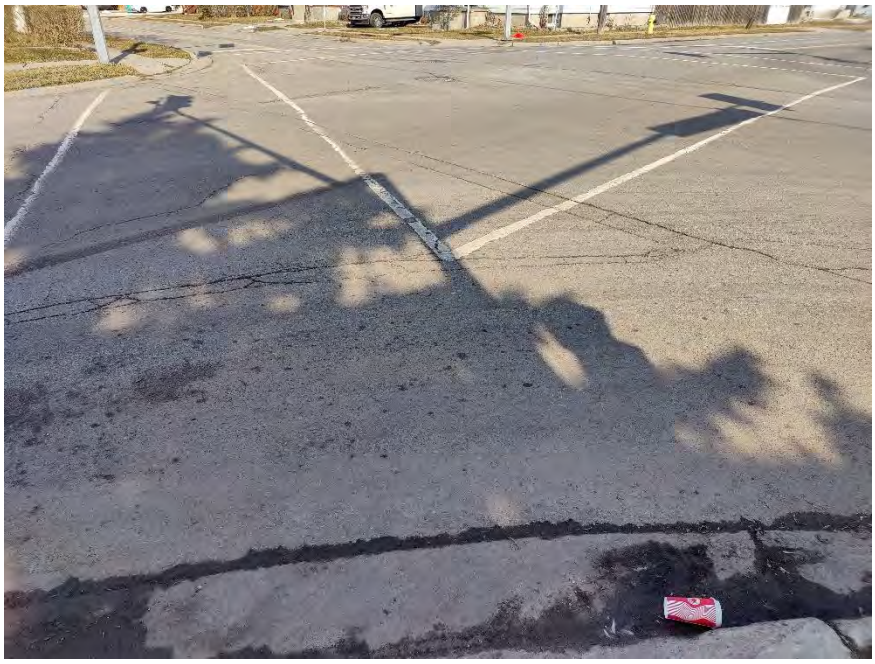
Photograph 17 – First Avenue, approximately 35 m West of Howard Street, looking West, showing moderate to severe longitudinal and transverse cracking associated with moderate random cracking, slight alligator cracking, slight pavement edge cracking, and moderate pavement raveling. Noting moderate random cracking around manholes.

Photograph 18 – First Avenue, approximately 35 m West of Howard Street, looking East, showing slight to moderate transverse cracking, slight pavement edge cracking, and slight to moderate pavement raveling.

Photograph 19 – First Avenue, in the vicinity of the intersection of Howard Street and First Avenue, looking North, showing moderate to severe random cracking, slight pavement edge cracking, and moderate to severe pavement raveling. Noting severe alligator cracking around manholes and section of patching.

Photograph 20 – First Avenue, approximately 40 m East Howard Street, looking Southwest, showing slight longitudinal and transverse cracking, slight random cracking, slight pavement edge cracking, and slight to moderate pavement raveling.

Photograph 21 – First Avenue, approximately 40 m East Howard Street, looking Northeast, showing slight to moderate longitudinal and transverse cracking associated with slight random cracking, slight alligator cracking, slight pavement edge cracking, and moderate pavement raveling.



Photograph 22 – First Avenue, in the vicinity of the intersection of Drew Street and First Avenue, looking North, showing slight to moderate longitudinal and transverse cracking associated with moderate random cracking, slight to moderate alligator cracking, slight pavement edge cracking, moderate to severe construction joint cracking, and moderate pavement raveling. Noting severe alligator cracking around manholes and utility patching.

Photograph 23 – McNaughton Avenue, approximately 30 m East of Drew Street, looking West, showing slight to moderate longitudinal and transverse cracking associated with slight random cracking, slight pavement edge cracking, slight to moderate pavement rutting, slight to moderate pavement patching, and slight pavement raveling.

Photograph 24 – McNaughton Avenue, approximately 30 m East of Drew Street, looking East, showing slight to moderate longitudinal and transverse cracking associated with slight random cracking, slight pavement edge cracking, slight pavement rutting, and slight pavement raveling. Noting patching around manhole.

Photograph 25 – McNaughton Avenue, approximately 65 m East of Drew Street, looking East, showing moderate longitudinal cracking associated with slight random cracking, slight pavement edge cracking, slight to moderate pavement rutting, and slight to moderate pavement raveling.

Photograph 26 – McNaughton Avenue, approximately 100 m East of Drew Street, looking East, showing slight longitudinal cracking associated with slight random cracking, and moderate pavement raveling. Noting moderate random cracking around manhole.

Photograph 27 – McNaughton Avenue, approximately 100 m West of Ritson Road South, looking West, showing slight longitudinal and transverse cracking, slight pavement edge cracking, and slight pavement raveling. Noting slight depression and random cracking around manholes and catch basins, and section of patching.

Photograph 28 – McNaughton Avenue, approximately 100 m West of Ritson Road South, looking East, showing slight to moderate longitudinal cracking, slight random cracking, and slight pavement raveling.

Photograph 29 – McNaughton Avenue, approximately 55 m West of Ritson Road South, looking East, showing slight to moderate longitudinal and transverse cracking associated with slight random cracking, slight pavement edge cracking, and moderate pavement raveling. Noting moderate random cracking around manhole and section of patching.

APPENDIX B

Certificate of Analysis

eurofins | Environment Testing

Client: Geo Pro Consulting
40 Vogell Rd, Unit 57
Richmond Hill, Ontario
L4B 3K6
Attention: Kriska Javier
Invoice to: Geo Pro Consulting
PO#:

Report Number:	3005242
Date Submitted:	2024-02-20
Date Reported:	2024-02-27
Project:	24-4656GH-3741
COC #:	913034
Temperature (C):	6
Custody Seal:	

Dear Kriska Javier:

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692).

Report Comments:

Emma-Dawn Ferguson
2024.02.27
17:21:35 -05'00'

Emma-Dawn Ferguson, Chemist

All analysis is completed at Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) unless otherwise stated
.
Eurofins Environment Testing Canada Inc. is accredited by CALA, Canadian Association for Laboratory Accreditation to ISO/IEC 17025 for tests which appear on the scope of accreditation. The scope is available at https://directory.cala.ca/

Please note: Field data, where presented on the report, has been provided by the client and is presented for informational purposes only. Guideline or regulatory limits listed on this report are provided for ease of use (informational purposes) only. Eurofins recommends consulting the official guideline or regulation as required. Unless otherwise stated, measurement uncertainty is not taken into account when determining guideline or regulatory exceedances.

Client: Geo Pro Consulting
40 Vogell Rd, Unit 57
Richmond Hill, Ontario
L4B 3K6
Attention: Kriska Javier
PO#:
Invoice to: Geo Pro Consulting

Report Number: 3005242
Date Submitted: 2024-02-20
Date Reported: 2024-02-27
Project: 24-4656GH-3741
COC #: 913034

O.Reg 153-T1-All Other Soils

Exceedence Summary

Sample I.D.	Analyte	Result	Units	Criteria
Inorganics				
BH4 SS2	Electrical Conductivity	0.94	mS/cm	STD 0.57
BH4 SS2	Sodium Adsorption Ratio	20.1		STD 2.4
BH9 SS3	Electrical Conductivity	0.77	mS/cm	STD 0.57
BH9 SS3	Sodium Adsorption Ratio	24.1		STD 2.4

Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Client: Geo Pro Consulting
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Richmond Hill, Ontario
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Project: 24-4656GH-3741
COC #: 913034

Guideline = O.Reg 153-T1-All Other Soils - Res/Par/Ins/Ind/Com/Prop

Hydrocarbons

Analyte	Batch No	MRL	Units	Guideline	Lab I.D. 1718710 Soil153 2024-02-16 BH4 SS2	Lab I.D. 1718711 Soil153 2024-02-16 BH9 SS3
PHC's F1	456275	10	ug/g	STD 25	<10	<10
PHC's F1-BTEX	456280	10	ug/g		<10	<10
PHC's F2	456393	2	ug/g	STD 10		5
	456396	2	ug/g	STD 10	<2	
PHC's F2-Napth	456415	2	ug/g		<2	5
PHC's F3	456393	20	ug/g	STD 240		<20
	456396	20	ug/g	STD 240	<20	
PHC's F3-PAH	456414	20	ug/g		<20	<20
PHC's F4	456393	20	ug/g	STD 120		<20
	456396	20	ug/g	STD 120	<20	

Metals

Analyte	Batch No	MRL	Units	Guideline	Lab I.D. 1718710 Soil153 2024-02-16 BH4 SS2	Lab I.D. 1718711 Soil153 2024-02-16 BH9 SS3
Antimony	456288	1	ug/g	STD 1.3	<1	<1
Arsenic	456288	1	ug/g	STD 18	3	2
Barium	456288	1	ug/g	STD 220	145	61
Beryllium	456288	1	ug/g	STD 2.5	<1	<1
Boron (Hot Water Soluble)	456410	0.5	ug/g		<0.5	<0.5
Boron (total)	456288	5	ug/g	STD 36	7	8
Cadmium	456288	0.4	ug/g	STD 1.2	<0.4	<0.4
Chromium Total	456288	1	ug/g	STD 70	30	20
Chromium VI	456407	0.20	ug/g	STD 0.66	<0.20	<0.20

Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

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Project: 24-4656GH-3741
COC #: 913034

Guideline = O.Reg 153-T1-All Other Soils - Res/Par/Ins/Ind/Com/Prop

Metals

Analyte	Batch No	MRL	Units	Guideline	Lab I.D. 1718710 Sample Matrix Soil153 Sample Type Sample Date 2024-02-16 Sampling Time Sample I D BH4 SS2	Lab I.D. 1718711 Sample Matrix Soil153 Sample Type Sample Date 2024-02-16 Sampling Time Sample I D BH9 SS3
Cobalt	456288	1	ug/g	STD 21	8	5
Copper	456288	1	ug/g	STD 92	22	14
Lead	456288	1	ug/g	STD 120	8	5
Mercury	456288	0.1	ug/g	STD 0.27	<0.1	<0.1
Molybdenum	456288	1	ug/g	STD 2	<1	<1
Nickel	456288	1	ug/g	STD 82	19	12
Selenium	456288	0.5	ug/g	STD 1.5	1.0	<0.5
Silver	456288	0.2	ug/g	STD 0.5	<0.2	<0.2
Thallium	456288	1	ug/g	STD 1	<1	<1
Uranium	456288	0.5	ug/g	STD 2.5	<0.5	<0.5
Vanadium	456288	2	ug/g	STD 86	37	22
Zinc	456288	2	ug/g	STD 290	56	30

PAH

Analyte	Batch No	MRL	Units	Guideline	Lab I.D. 1718710 Sample Matrix Soil153 Sample Type Sample Date 2024-02-16 Sampling Time Sample I.D. BH4 SS2	Lab I.D. 1718711 Sample Matrix Soil153 Sample Type Sample Date 2024-02-16 Sampling Time Sample I.D. BH9 SS3
1+2-methylnaphthalene	456368	0.05	ug/g	STD 0.59	<0.05	<0.05
Acenaphthene	456367	0.05	ug/g	STD 0.072	<0.05	<0.05
Acenaphthylene	456367	0.05	ug/g	STD 0.093	<0.05	<0.05
Anthracene	456367	0.05	ug/g	STD 0.16	<0.05	<0.05
Benz[a]anthracene	456367	0.05	ug/g	STD 0.36	<0.05	<0.05
Benzo[a]pyrene	456367	0.05	ug/g	STD 0.3	<0.05	<0.05
Benzo[b]fluoranthene	456367	0.05	ug/g	STD 0.47	<0.05	<0.05

Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

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Report Number: 3005242
Date Submitted: 2024-02-20
Date Reported: 2024-02-27
Project: 24-4656GH-3741
COC #: 913034

Guideline = O.Reg 153-T1-All Other Soils - Res/Par/Ins/Ind/Com/Prop

PAH

Analyte	Batch No	MRL	Units	Guideline	Lab I.D. 1718710 Sample Matrix Soil153 Sample Type Sample Date 2024-02-16 Sampling Time Sample I D BH4 SS2	Lab I.D. 1718711 Sample Matrix Soil153 Sample Type Sample Date 2024-02-16 Sampling Time Sample I D BH9 SS3
Benzo[ghi]perylene	456367	0.05	ug/g	STD 0.68	<0.05	<0.05
Benzo[k]fluoranthene	456367	0.05	ug/g	STD 0.48	<0.05	<0.05
Chrysene	456367	0.05	ug/g	STD 2.8	<0.05	<0.05
Dibenz[a h]anthracene	456367	0.05	ug/g	STD 0.1	<0.05	<0.05
Fluoranthene	456367	0.05	ug/g	STD 0.56	<0.05	<0.05
Fluorene	456367	0.05	ug/g	STD 0.12	<0.05	<0.05
Indeno[1 2 3-cd]pyrene	456367	0.05	ug/g	STD 0.23	<0.05	<0.05
Methlynaphthalene, 1-	456367	0.05	ug/g	STD 0.59	<0.05	<0.05
Methlynaphthalene, 2-	456367	0.05	ug/g	STD 0.59	<0.05	<0.05
Naphthalene	456367	0.013	ug/g	STD 0.09	<0.013	<0.013
Phenanthrene	456367	0.05	ug/g	STD 0.69	<0.05	<0.05
Pyrene	456367	0.05	ug/g	STD 1	<0.05	<0.05

Volatiles

Analyte	Batch No	MRL	Units	Guideline	Lab I.D. 1718710 Sample Matrix Soil153 Sample Type Sample Date 2024-02-16 Sampling Time Sample I.D. BH4 SS2	Lab I.D. 1718711 Sample Matrix Soil153 Sample Type Sample Date 2024-02-16 Sampling Time Sample I.D. BH9 SS3
Acetone	456274	0.50	ug/g	STD 0.5	<0.50	<0.50
Benzene	456274	0.0068	ug/g	STD 0.02	<0.0068	<0.0068
Bromodichloromethane	456274	0.05	ug/g	STD 0.05	<0.05	<0.05
Bromoform	456274	0.05	ug/g	STD 0.05	<0.05	<0.05
Bromomethane	456274	0.05	ug/g	STD 0.05	<0.05	<0.05
Carbon Tetrachloride	456274	0.05	ug/g	STD 0.05	<0.05	<0.05
Chlorobenzene	456274	0.05	ug/g	STD 0.05	<0.05	<0.05

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40 Vogell Rd, Unit 57
Richmond Hill, Ontario
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Attention: Kriska Javier
PO#:
Invoice to: Geo Pro Consulting

Report Number: 3005242
Date Submitted: 2024-02-20
Date Reported: 2024-02-27
Project: 24-4656GH-3741
COC #: 913034

Guideline = O.Reg 153-T1-All Other Soils - Res/Par/Ins/Ind/Com/Prop

Volatiles

Analyte	Batch No	MRL	Units	Guideline	Lab I.D. 1718710 Sample Matrix Soil153 Sample Type Sample Date 2024-02-16 Sampling Time Sample I D BH4 SS2	Lab I.D. 1718711 Sample Matrix Soil153 Sample Type Sample Date 2024-02-16 Sampling Time Sample I D BH9 SS3
Chloroform	456274	0.05	ug/g	STD 0.05	<0.05	<0.05
Dibromochloromethane	456274	0.05	ug/g	STD 0.05	<0.05	<0.05
Dichlorobenzene, 1,2-	456274	0.05	ug/g	STD 0.05	<0.05	<0.05
Dichlorobenzene, 1,3-	456274	0.05	ug/g	STD 0.05	<0.05	<0.05
Dichlorobenzene, 1,4-	456274	0.05	ug/g	STD 0.05	<0.05	<0.05
Dichlorodifluoromethane	456274	0.05	ug/g	STD 0.05	<0.05	<0.05
Dichloroethane, 1,1-	456274	0.05	ug/g	STD 0.05	<0.05	<0.05
Dichloroethane, 1,2-	456274	0.05	ug/g	STD 0.05	<0.05	<0.05
Dichloroethylene, 1,1-	456274	0.05	ug/g	STD 0.05	<0.05	<0.05
Dichloroethylene, 1,2-cis-	456274	0.05	ug/g	STD 0.05	<0.05	<0.05
Dichloroethylene, 1,2-trans-	456274	0.05	ug/g	STD 0.05	<0.05	<0.05
Dichloropropane, 1,2-	456274	0.05	ug/g	STD 0.05	<0.05	<0.05
Dichloropropene,1,3-	456279	0.05	ug/g	STD 0.05	<0.05	<0.05
Dichloropropene,1,3-cis-	456274	0.05	ug/g		<0.05	<0.05
Dichloropropene,1,3-trans-	456274	0.05	ug/g		<0.05	<0.05
Ethylbenzene	456274	0.018	ug/g	STD 0.05	<0.018	<0.018
Ethylene dibromide	456274	0.05	ug/g	STD 0.05	<0.05	<0.05
Hexane (n)	456274	0.05	ug/g	STD 0.05	<0.05	<0.05
Methyl Ethyl Ketone	456274	0.50	ug/g	STD 0.5	<0.50	<0.50
Methyl Isobutyl Ketone	456274	0.50	ug/g	STD 0.5	<0.50	<0.50
Methyl tert-Butyl Ether (MTBE)	456274	0.05	ug/g	STD 0.05	<0.05	<0.05
Methylene Chloride	456274	0.05	ug/g	STD 0.05	<0.05	<0.05
Styrene	456274	0.05	ug/g	STD 0.05	<0.05	<0.05

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Guideline = O.Reg 153-T1-All Other Soils - Res/Par/Ins/Ind/Com/Prop

Volatiles

Analyte	Batch No	MRL	Units	Guideline	Lab I.D. 1718710 Sample Matrix Soil153 Sample Type Sample Date 2024-02-16 Sampling Time Sample I D BH4 SS2	Lab I.D. 1718711 Sample Matrix Soil153 Sample Type Sample Date 2024-02-16 Sampling Time Sample I D BH9 SS3
Tetrachloroethane, 1,1,1,2-	456274	0.05	ug/g	STD 0.05	<0.05	<0.05
Tetrachloroethane, 1,1,2,2-	456274	0.05	ug/g	STD 0.05	<0.05	<0.05
Tetrachloroethylene	456274	0.05	ug/g	STD 0.05	<0.05	<0.05
Toluene	456274	0.08	ug/g	STD 0.2	<0.08	<0.08
Trichloroethane, 1,1,1-	456274	0.05	ug/g	STD 0.05	<0.05	<0.05
Trichloroethane, 1,1,2-	456274	0.05	ug/g	STD 0.05	<0.05	<0.05
Trichloroethylene	456274	0.01	ug/g	STD 0.05	<0.01	<0.01
Trichlorofluoromethane	456274	0.05	ug/g	STD 0.25	<0.05	<0.05
Vinyl Chloride	456274	0.02	ug/g	STD 0.02	<0.02	<0.02
Xylene Mixture	456278	0.05	ug/g	STD 0.05	<0.05	<0.05
Xylene, m/p-	456274	0.05	ug/g		<0.05	<0.05
Xylene, o-	456274	0.05	ug/g		<0.05	<0.05

Inorganics

Analyte	Batch No	MRL	Units	Guideline	Lab I.D. 1718710 Sample Matrix Soil153 Sample Type Sample Date 2024-02-16 Sampling Time Sample I.D. BH4 SS2	Lab I.D. 1718711 Sample Matrix Soil153 Sample Type Sample Date 2024-02-16 Sampling Time Sample I.D. BH9 SS3
Cyanide (CN-)	456406	0.005	ug/g	STD 0.051	<0.005	<0.005
Electrical Conductivity	456405	0.05	mS/cm	STD 0.57	0.94*	0.77*
pH - CaCl2	456350	2.00			7.76	7.78
Sodium Adsorption Ratio	456409	0.01		STD 2.4	20.1*	24.1*

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Moisture

Analyte	Batch No	MRL	Units	Guideline	Lab I.D. 1718710 Sample Matrix Soil153 Sample Type Sample Date 2024-02-16 Sampling Time Sample I.D. BH4 SS2	Lab I.D. 1718711 Sample Matrix Soil153 Sample Type Sample Date 2024-02-16 Sampling Time Sample I.D. BH9 SS3
Moisture-Humidite	456393	0.1	%			10.7
	456396	0.1	%		22.9	

PHC Surrogate

Analyte	Batch No	MRL	Units	Guideline	Lab I.D. 1718710 Sample Matrix Soil153 Sample Type Sample Date 2024-02-16 Sampling Time Sample I.D. BH4 SS2	Lab I.D. 1718711 Sample Matrix Soil153 Sample Type Sample Date 2024-02-16 Sampling Time Sample I.D. BH9 SS3
Alpha-androstrane	456393	0	%			64
	456396	0	%		68	

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VOCs Surrogates

Analyte	Batch No	MRL	Units	Guideline	Lab I.D. 1718710 Sample Matrix Soil153 Sample Type Sample Date 2024-02-16 Sampling Time Sample I.D. BH4 SS2	Lab I.D. 1718711 Sample Matrix Soil153 Sample Type Sample Date 2024-02-16 Sampling Time Sample I.D. BH9 SS3
1,2-dichloroethane-d4	456274	0	%		117	123
4-bromofluorobenzene	456274	0	%		72	72
Toluene-d8	456274	0	%		119	128

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Quality Assurance Summary

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456274	Tetrachloroethane, 1,1,1,2-	<0.05 ug/g	122	60-130	107	50-140	0	0-50
456274	Trichloroethane, 1,1,1-	<0.05 ug/g	115	60-130	111	50-140	0	0-50
456274	Tetrachloroethane, 1,1,2,2-	<0.05 ug/g	119	60-130	91	50-140	0	0-30
456274	Trichloroethane, 1,1,2-	<0.05 ug/g	121	60-130	115	50-140	0	0-50
456274	Dichloroethane, 1,1-	<0.05 ug/g	117	60-130	112	50-140	0	0-50
456274	Dichloroethylene, 1,1-	<0.05 ug/g	108	60-130	87	50-140	0	0-50
456274	Dichlorobenzene, 1,2-	<0.05 ug/g	120	60-130	111	50-140	0	0-50
456274	Dichloroethane, 1,2-	<0.05 ug/g	121	60-130	114	50-140	0	0-50
456274	Dichloropropane, 1,2-	<0.05 ug/g	124	60-130	119	50-140	0	0-50
456274	Dichlorobenzene, 1,3-	<0.05 ug/g	120	60-130	112	50-140	0	0-50
456274	Dichlorobenzene, 1,4-	<0.05 ug/g	121	60-130	112	50-140	0	0-50
456274	Acetone	<0.50 ug/g	120	60-130	112	50-140	0	0-50
456274	Benzene	<0.0068	113	60-130	114	50-140	0	0-50
456274	Bromodichloromethane	<0.05 ug/g	120	60-130	110	50-140	0	0-50
456274	Bromoform	<0.05 ug/g	118	60-130	109	50-140	0	0-50
456274	Bromomethane	<0.05 ug/g	105	60-130	105	50-140	0	0-50
456274	Dichloroethylene, 1,2-cis-	<0.05 ug/g	121	60-130	115	50-140	0	0-50
456274	Dichloropropene,1,3-cis-	<0.05 ug/g	118	60-130	115	50-140	0	0-50
456274	Carbon Tetrachloride	<0.05 ug/g	115	60-130	107	50-140	0	0-50
456274	Chloroform	<0.05 ug/g	121	60-130	115	50-140	0	0-50
456274	Dibromochloromethane	<0.05 ug/g	120	60-130	101	50-140	0	0-50
456274	Dichlorodifluoromethane	<0.05 ug/g	114	60-130	106	50-140	0	0-50
456274	Methylene Chloride	<0.05 ug/g	102	60-130	95	50-140	0	0-50
456274	Ethylbenzene	<0.018 ug/g	116	60-130	121	50-140	0	0-50
456274	Ethylene dibromide	<0.05 ug/g	120	60-130	113	50-140	0	0-50
456274	Hexane (n)	<0.05 ug/g	113	60-130	112	50-140	0	0-50
456274	Xylene, m/p-	<0.05 ug/g	119	60-130	112	50-140	0	0-50
456274	Methyl Ethyl Ketone	<0.50 ug/g	118	60-130	116	50-140	0	0-50
456274	Methyl Isobutyl Ketone	<0.50 ug/g	121	60-130	114	50-140	0	0-50
456274	Methyl tert-Butyl Ether (MTBE)	<0.05 ug/g	120	60-130	114	50-140	0	0-50
456274	Chlorobenzene	<0.05 ug/g	115	60-130	115	50-140	0	0-50
456274	Xylene, o-	<0.05 ug/g	117	60-130	118	50-140	0	0-50

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Certificate of Analysis

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Project: 24-4656GH-3741
COC #: 913034

Quality Assurance Summary

Batch No	Analyte	Blank	QC % Rec	QC Limits	Spike % Rec	Spike Limits	Dup % RPD	Duplicate Limits
456274	Styrene	<0.05 ug/g	117	60-130	117	50-140	0	0-50
456274	Dichloroethylene, 1,2-trans-	<0.05 ug/g	120	60-130	110	50-140	0	0-50
456274	Dichloropropene,1,3-trans-	<0.05 ug/g	119	60-130	115	50-140	0	0-50
456274	Tetrachloroethylene	<0.05 ug/g	119	60-130	119	50-140	0	0-50
456274	Toluene	<0.08 ug/g	115	60-130	114	50-140	0	0-50
456274	Trichloroethylene	<0.01 ug/g	115	60-130	115	50-140	0	0-50
456274	Trichlorofluoromethane	<0.05 ug/g	116	60-130	98	50-140	0	0-50
456274	Vinyl Chloride	<0.02 ug/g	106	60-130	92	50-140	0	0-50
456275	PHC's F1	<10 ug/g	97	80-120	90	60-140	0	0-30
456278	Xylene Mixture							
456279	Dichloropropene,1,3-							
456280	PHC's F1-BTEX							
456288	Silver	<0.2 ug/g	98	70-130	103	70-130	0	0-20
456288	Arsenic	<1 ug/g	97	70-130	101	70-130	0	0-20
456288	Boron (total)	<5 ug/g	96	70-130	141	70-130	0	0-20
456288	Barium	<1 ug/g	93	70-130	143	70-130	3	0-20
456288	Beryllium	<1 ug/g	99	70-130	114	70-130	0	0-20
456288	Cadmium	<0.4 ug/g	96	70-130	100	70-130	0	0-20
456288	Cobalt	<1 ug/g	93	70-130	96	70-130	4	0-20
456288	Chromium Total	<1 ug/g	96	70-130	116	70-130	3	0-20
456288	Copper	<1 ug/g	99	70-130	99	70-130	5	0-20
456288	Mercury	<0.1 ug/g	100	70-130	101	70-130	0	0-20
456288	Molybdenum	<1 ug/g	99	70-130	94	70-130	0	0-20
456288	Nickel	<1 ug/g	97	70-130	99	70-130	4	0-20
456288	Lead	<1 ug/g	99	70-130	90	70-130	6	0-20
456288	Antimony	<1 ug/g	96	70-130	92	70-130	0	0-20
456288	Selenium	<0.5 ug/g	101	70-130	102	70-130	0	0-20
456288	Thallium	<1 ug/g	97	70-130	96	70-130	0	0-20
456288	Uranium	<0.5 ug/g	83	70-130	97	70-130	0	0-20
456288	Vanadium	<2 ug/g	93	70-130	133	70-130	3	0-20
456288	Zinc	<2 ug/g	104	70-130	130	70-130	3	0-20
456350	pH - CaCl2	5.43	97	90-110			0	
456367	Methlynaphthalene, 1-	<0.05 ug/g	86	50-140	80	50-140	0	0-40

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COC #: 913034

Quality Assurance Summary

Batch No	Analyte	Blank	QC % Rec	QC Limits	Spike % Rec	Spike Limits	Dup % RPD	Duplicate Limits
456367	Methlynaphthalene, 2-	<0.05 ug/g	60	50-140	53	50-140	0	0-40
456367	Acenaphthene	<0.05 ug/g	79	50-140	77	50-140	0	0-40
456367	Acenaphthylene	<0.05 ug/g	73	50-140	70	50-140	0	0-40
456367	Anthracene	<0.05 ug/g	67	50-140	76	50-140	0	0-40
456367	Benz[a]anthracene	<0.05 ug/g	81	50-140	73	50-140	0	0-40
456367	Benzo[a]pyrene	<0.05 ug/g	64	50-140	58	50-140	0	0-40
456367	Benzo[b]fluoranthene	<0.05 ug/g	62	50-140	63	50-140	0	0-40
456367	Benzo[ghi]perylene	<0.05 ug/g	77	50-140	66	50-140	0	0-40
456367	Benzo[k]fluoranthene	<0.05 ug/g	70	50-140	75		0	0-40
456367	Chrysene	<0.05 ug/g	85	50-140	77	50-140	0	0-40
456367	Dibenz[a h]anthracene	<0.05 ug/g	71	50-140	58	50-140	0	0-40
456367	Fluoranthene	<0.05 ug/g	91	50-140	71	50-140	0	0-40
456367	Fluorene	<0.05 ug/g	71	50-140	68	50-140	0	0-40
456367	Indeno[1 2 3-cd]pyrene	<0.05 ug/g	72	50-140	61	50-140	0	0-40
456367	Naphthalene	<0.013 ug/g	79	50-140	78	50-140	0	0-40
456367	Phenanthrene	<0.05 ug/g	80	50-140	71	50-140	0	0-40
456367	Pyrene	<0.05 ug/g	89	50-140	68	50-140	0	0-40
456368	1+2-methylnaphthalene							
456393	PHC's F2	<2 ug/g	118	80-120	92	60-140	0	0-30
456393	PHC's F3	<20 ug/g	118	80-120	92	60-140	0	0-30
456393	PHC's F4	<20 ug/g	118	80-120	92	60-140	0	0-30
456393	Moisture-Humidite	<0.1 %	100	80-120			2	
456396	PHC's F2	<2 ug/g	80	80-120	100	60-140	0	0-30
456396	PHC's F3	<20 ug/g	80	80-120	100	60-140	0	0-30
456396	PHC's F4	<20 ug/g	80	80-120	100	60-140	0	0-30
456396	Moisture-Humidite	<0.1 %	100	80-120			4	
456405	Electrical Conductivity	<0.05	100	90-110			1	0-10
456406	Cyanide (CN-)	<0.005 ug/g	94	75-125	91	70-130	0	0-20
456407	Chromium VI	<0.20 ug/g	108	70-130	84	70-130	0	0-35
456409	Sodium Adsorption Ratio	<0.01					6	
456410	Boron (Hot Water Soluble)	<0.5 ug/g	92	70-130	107	60-140	0	0-30
456414	PHC's F3-PAH							
456415	PHC's F2-Napth							

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Test Summary

Batch No	Analyte	Instrument	Prep aration Date	Analysis Date	Analyst	Method
456274	Tetrachloroethane, 1,1,1,2-	GC-MS	2024-02-22	2024-02-23	SS	V 8260B
456274	Tetrachloroethane, 1,1,2,2-	GC-MS	2024-02-22	2024-02-23	SS	V 8260B
456274	Trichloroethane, 1,1,2-	GC-MS	2024-02-22	2024-02-23	SS	V 8260B
456274	Dichloroethane, 1,1-	GC-MS	2024-02-22	2024-02-23	SS	V 8260B
456274	Dichloroethylene, 1,1-	GC-MS	2024-02-22	2024-02-23	SS	V 8260B
456274	Dichloroethane, 1,2-	GC-MS	2024-02-22	2024-02-23	SS	V 8260B
456274	Dichloropropane, 1,2-	GC-MS	2024-02-22	2024-02-23	SS	V 8260B
456274	Dichlorobenzene, 1,3-	GC-MS	2024-02-22	2024-02-23	SS	V 8260B
456274	Dichlorobenzene, 1,4-	GC-MS	2024-02-22	2024-02-23	SS	V 8260B
456274	Benzene	GC-MS	2024-02-22	2024-02-23	SS	V 8260B
456274	Bromodichloromethane	GC-MS	2024-02-22	2024-02-23	SS	V 8260B
456274	Bromomethane	GC-MS	2024-02-22	2024-02-23	SS	V 8260B
456274	Dichloroethylene, 1,2-cis-	GC-MS	2024-02-22	2024-02-23	SS	V 8260B
456274	Dichloropropene,1,3-cis-	GC-MS	2024-02-22	2024-02-23	SS	V 8260B
456274	Carbon Tetrachloride	GC-MS	2024-02-22	2024-02-23	SS	V 8260B
456274	Dibromochloromethane	GC-MS	2024-02-22	2024-02-23	SS	V 8260B
456274	Dichlorodifluoromethane	GC-MS	2024-02-22	2024-02-23	SS	V 8260B
456274	Methylene Chloride	GC-MS	2024-02-22	2024-02-23	SS	V 8260B
456274	Ethylbenzene	GC-MS	2024-02-22	2024-02-23	SS	V 8260B
456274	Hexane (n)	GC-MS	2024-02-22	2024-02-23	SS	V 8260B
456274	Xylene, m/p-	GC-MS	2024-02-22	2024-02-23	SS	V 8260B
456274	Methyl Ethyl Ketone	GC-MS	2024-02-22	2024-02-23	SS	V 8260B
456274	Methyl Isobutyl Ketone	GC-MS	2024-02-22	2024-02-23	SS	V 8260B
456274	Chlorobenzene	GC-MS	2024-02-22	2024-02-23	SS	V 8260B
456274	Xylene, o-	GC-MS	2024-02-22	2024-02-23	SS	V 8260B

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Client: Geo Pro Consulting
40 Vogell Rd, Unit 57
Richmond Hill, Ontario
L4B 3K6
Attention: Kriska Javier
PO#:
Invoice to: Geo Pro Consulting

Report Number: 3005242
Date Submitted: 2024-02-20
Date Reported: 2024-02-27
Project: 24-4656GH-3741
COC #: 913034

Test Summary

Batch No	Analyte	Instrument	Prep aration Date	Analysis Date	Analyst	Method
456274	Styrene	GC-MS	2024-02-22	2024-02-23	SS	V 8260B
456274	Dichloroethylene, 1,2-trans-	GC-MS	2024-02-22	2024-02-23	SS	V 8260B
456274	Dichloropropene,1,3-trans-	GC-MS	2024-02-22	2024-02-23	SS	V 8260B
456274	Tetrachloroethylene	GC-MS	2024-02-22	2024-02-23	SS	V 8260B
456274	Toluene	GC-MS	2024-02-22	2024-02-23	SS	V 8260B
456274	Trichloroethylene	GC-MS	2024-02-22	2024-02-23	SS	V 8260B
456274	Trichlorofluoromethane	GC-MS	2024-02-22	2024-02-23	SS	V 8260B
456274	Vinyl Chloride	GC-MS	2024-02-22	2024-02-23	SS	V 8260B
456275	PHC's F1	GC/FID	2024-02-22	2024-02-23	SS	CCME
456278	Xylene Mixture	GC-MS	2024-02-23	2024-02-23	SS	V 8260B
456279	Dichloropropene,1,3-	GC-MS	2024-02-23	2024-02-23	SS	V 8260B
456280	PHC's F1-BTEX	GC/FID	2024-02-23	2024-02-23	SS	CCME
456288	Silver	ICAPQ-MS	2024-02-23	2024-02-23	AaN	EPA 200.8/6020
456288	Arsenic	ICAPQ-MS	2024-02-23	2024-02-23	AaN	EPA 200.8/6020
456288	Boron (total)	ICAPQ-MS	2024-02-23	2024-02-23	AaN	EPA 200.8/6020
456288	Barium	ICAPQ-MS	2024-02-23	2024-02-23	AaN	EPA 200.8/6020
456288	Beryllium	ICAPQ-MS	2024-02-23	2024-02-23	AaN	EPA 200.8/6020
456288	Cadmium	ICAPQ-MS	2024-02-23	2024-02-23	AaN	EPA 200.8/6020
456288	Cobalt	ICAPQ-MS	2024-02-23	2024-02-23	AaN	EPA 200.8/6020
456288	Chromium Total	ICAPQ-MS	2024-02-23	2024-02-23	AaN	EPA 200.8/6020
456288	Copper	ICAPQ-MS	2024-02-23	2024-02-23	AaN	EPA 200.8/6020
456288	Mercury	ICAPQ-MS	2024-02-23	2024-02-23	AaN	EPA 200.8/6020
456288	Molybdenum	ICAPQ-MS	2024-02-23	2024-02-23	AaN	EPA 200.8/6020
456288	Nickel	ICAPQ-MS	2024-02-23	2024-02-23	AaN	EPA 200.8/6020
456288	Lead	ICAPQ-MS	2024-02-23	2024-02-23	AaN	EPA 200.8/6020
456288	Antimony	ICAPQ-MS	2024-02-23	2024-02-23	AaN	EPA 200.8/6020
456288	Selenium	ICAPQ-MS	2024-02-23	2024-02-23	AaN	EPA 200.8/6020
456288	Thallium	ICAPQ-MS	2024-02-23	2024-02-23	AaN	EPA 200.8/6020
456288	Uranium	ICAPQ-MS	2024-02-23	2024-02-23	AaN	EPA 200.8/6020
456288	Vanadium	ICAPQ-MS	2024-02-23	2024-02-23	AaN	EPA 200.8/6020
456288	Zinc	ICAPQ-MS	2024-02-23	2024-02-23	AaN	EPA 200.8/6020
456350	pH - CaCl2	pH Meter	2024-02-26	2024-02-26	IP	AG Soil
456367	Methlynaphthalene, 1-	GC-MS	2024-02-23	2024-02-26	C_M	P 8270

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40 Vogell Rd, Unit 57
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L4B 3K6
Attention: Kriska Javier
PO#:
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Report Number: 3005242
Date Submitted: 2024-02-20
Date Reported: 2024-02-27
Project: 24-4656GH-3741
COC #: 913034

Test Summary

Batch No	Analyte	Instrument	Prep aration Date	Analysis Date	Analyst	Method
456367	Methlynaphthalene, 2-	GC-MS	2024-02-23	2024-02-26	C_M	P 8270
456367	Acenaphthene	GC-MS	2024-02-23	2024-02-26	C_M	P 8270
456367	Acenaphthylene	GC-MS	2024-02-23	2024-02-26	C_M	P 8270
456367	Anthracene	GC-MS	2024-02-23	2024-02-26	C_M	P 8270
456367	Benz[a]anthracene	GC-MS	2024-02-23	2024-02-26	C_M	P 8270
456367	Benzo[a]pyrene	GC-MS	2024-02-23	2024-02-26	C_M	P 8270
456367	Benzo[b]fluoranthene	GC-MS	2024-02-23	2024-02-26	C_M	P 8270
456367	Benzo[ghi]perylene	GC-MS	2024-02-23	2024-02-26	C_M	P 8270
456367	Benzo[k]fluoranthene	GC-MS	2024-02-23	2024-02-26	C_M	P 8270
456367	Chrysene	GC-MS	2024-02-23	2024-02-26	C_M	P 8270
456367	Dibenz[a h]anthracene	GC-MS	2024-02-23	2024-02-26	C_M	P 8270
456367	Fluoranthene	GC-MS	2024-02-23	2024-02-26	C_M	P 8270
456367	Fluorene	GC-MS	2024-02-23	2024-02-26	C_M	P 8270
456367	Indeno[1 2 3-cd]pyrene	GC-MS	2024-02-23	2024-02-26	C_M	P 8270
456367	Naphthalene	GC-MS	2024-02-23	2024-02-26	C_M	P 8270
456367	Phenanthrene	GC-MS	2024-02-23	2024-02-26	C_M	P 8270
456367	Pyrene	GC-MS	2024-02-23	2024-02-26	C_M	P 8270
456368	1+2-methylnaphthalene	GC-MS	2024-02-27	2024-02-27	C_M	P 8270
456393	PHC's F2	GC/FID	2024-02-26	2024-02-27	PJ	CCME
456393	PHC's F3	GC/FID	2024-02-26	2024-02-27	PJ	CCME
456393	PHC's F4	GC/FID	2024-02-26	2024-02-27	PJ	CCME
456393	Moisture-Humidite	Oven	2024-02-26	2024-02-27	PJ	ASTM 2216
456396	PHC's F2	GC/FID	2024-02-26	2024-02-27	PJ	CCME
456396	PHC's F3	GC/FID	2024-02-26	2024-02-27	PJ	CCME
456396	PHC's F4	GC/FID	2024-02-26	2024-02-27	PJ	CCME
456396	Moisture-Humidite	Oven	2024-02-26	2024-02-27	PJ	ASTM 2216
456405	Electrical Conductivity	Electrical Conductivity Mete	2024-02-26	2024-02-26	IP	Cond-Soil
456406	Cyanide (CN-)	Skalar CN Analyzer	2024-02-27	2024-02-27	AET	MOECC E3015
456407	Chromium VI	FAA	2024-02-27	2024-02-27	MW	M US EPA 3060A
456409	Sodium Adsorption Ratio	iCAP OES	2024-02-27	2024-02-27	IP	Ag Soil
456410	Boron (Hot Water Soluble)	iCAP OES	2024-02-27	2024-02-27	Z_S	MOECC E3470
456414	PHC's F3-PAH	GC/FID	2024-02-27	2024-02-27	PJ	CCME
456415	PHC's F2-Napth	GC/FID	2024-02-27	2024-02-27	QL	CCME

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Certificate of Analysis

eurofins | Environment Testing

Client: Geo Pro Consulting
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Richmond Hill, Ontario
L4B 3K6
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PO#:
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CWS for Petroleum Hydrocarbons in Soil - Tier 1

Notes:

1. The laboratory method complies with CCME Tier 1 reference method for PHC in soil. It is validated for laboratory use.
2. Where the F1 fraction (C6 to C10) and BTEX are both measured, F1-BTEX is reported.
3. Where the F2 fraction (C10 to C16) and naphthalene are both measured, F2-naphthalene is reported.
4. Where the F3 fraction (C16 to C34) and PAHs* are both measured, F3-PAH is reported.
5. F4G is analyzed if the chromatogram does not descend to baseline before C50. Where F4 (C34 to C50) and F4G are both reported, the higher result is compared to the standard.
6. Unless otherwise stated in the sample comments, the following criteria have been met where applicable:

   - nC6 and nC10 response factors within 30% of response factor for toluene;
   - nC10, nC16, and nC34 response factors within 10% of each other;
   - C50 response factors within 70% of nC10 + nC16 + nC34 average; and,
   - Linearity is within 15%.

7. Unless otherwise stated in the sample comments, sampling requirements and analytical holding times have been met.
8. Gravimetric heavy hydrocarbons (F4G) cannot be added to the C6 and C50 hydrocarbons.
9. *PAHs = phenanthrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-c,d)pyrene and pyrene.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

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STANDARD CHAIN-OF-CUSTODY

Eurofins Workorder #: 3005242

146 Colonnade Road, Unit #8, Ottawa, ON, K2E 7Y1 - Phone: 613-727-5692, Fax: 613-727-5222

CLIENT INFORMATION

Company:	GeoPro Consulting Limited
Contact:	ELab elab@geoproconsulting.ca
Address:	40 Vogell Road, unit 23, Richmond Hill, ON L4B 3N6
Telephone:	905-237-8336 — Cell:
Email: #1:	env@geoproconsulting.ca; kriska@geoproconsulting.ca; niko@geoproconsulting.ca
Email: #2:	elab@geoproconsulting.ca; irisg@geoproconsulting.ca; shina@geoproconsulting.ca
Project:	24-4656GH-3741 — Quote #: 191248

INVOICE INFORMATION (SAME AS CLIENT INFORMATION: YES ☑ NO ☐)

Company:		Fax:	
Contact:		Email: #1:	
Address:		Email: #2:	
Telephone:		PO #:	

TURN-AROUND TIME (Business Days)

☐ 1 Day* (100%) ☐ 2 Day** (50%) ☐ 3-5 Days (25%) ☑ 5-7 Days (Standard)

Please contact Lab in advance to determine rush availability.

*For results reported after rush due date, surcharges will apply: before 12:00 - 100%, after 12:00 - 50%.

**For results reported after rush due date, surcharges will apply: before 12:00 - 50%, after 12:00 - 25%.

REGULATION/GUIDELINE REQUIRED

☐ Sanitary Sewer, City:_____

☐ Storm Sewer, City:_____

☐ ODWSOG

☐ PWQO

☐ O. Reg 347/558

☐ Other: _____

☐ None

☑ O. Reg 153

Table # ___, Course / Fine, Surface / subsurface.

Type: Com-Ind / Res-Park / Agri / GW / All Other / Sediment

☐ Excess Soil, Table: _____ Type: _____

The sample results from this submission will form part of a formal Record of Site Condition (RSC) under O.Reg. 153/04 ☐ Yes ☐ No

The optimal temperature conditions during transport should be less than 10°C. Sample(s) cannot be frozen, unless otherwise indicated or agreed upon with the Laboratory. Note that this COC is not to be used for drinking water samples. The COC must be complete upon submission of the samples, there will be a $25 surcharge if required information is missing (required fields are shaded in grey).

Sample Analysis Required — O.Reg.153 parameters; Field Filtered -->

Sample ID	Date/Time Collected	Sample Matrix	# of Containers	PHC F1 - F4	BTEX	VOCs	PAHs	PCBs	Metals + Inorganics	Metals only	RN# (Lab Use Only)
BH4 SS2	2/16/2024	SOIL	4	✓		✓	✓		✓		1718710
BH9 SS3	2/16/2024	SOIL	4	✓		✓	✓		✓		11

	PRINT	SIGN	DATE/TIME	TEMP (°C)
Sampled By:				
Relinquished By:	Wenna Wang, Chi Kan Lam		February 20, 2024	
Received By:	Victor Gallant	V.G.	02/20/24 5:03p.m.	6.4°C

COMMENTS:

CUSTODY SEAL: ☐ YES ☐ NO — Ice packs submitted: ☑ Yes ☐ No

LIMITATIONS TO THE REPORT

This report is intended solely for the Client named. The report is prepared based on the work has been undertaken in accordance with normally accepted geotechnical engineering practices in Ontario.

The comments and recommendations given in this report are based on information determined at the limited number of the test hole and test pit locations. The boundaries between the various strata as shown on the borehole logs are based on non-continuous sampling and represent an inferred transition between the various strata and their lateral continuation rather than a precise plane of geological change. Subsurface and groundwater conditions between and beyond the test holes and test pits may differ significantly from those encountered at the test hole and test pit locations. The benchmark and elevations used in this report are primarily to establish relative elevation differences between the test hole and test pit locations and should not be used for other purposes, such as grading, excavating, planning, development, etc.

It should be noted that the results of the designated substance and chemical analysis refer only to the sample analyzed which was obtained from specific sampling location and sampling depth, and the presence of designated substance and soil chemistry may vary between and beyond the location and depth of the sample taken. Please note that the level of chemical testing outlined herein is meant to provide a broad indication of soil quality based on the limited soil samples tested. The analytical results contained in this report should not be considered a warranty with respect to the soil quality or the use of the soil for any specific purpose or the acceptability of the soils for any excess soil receiving sites.

The report reflects our best judgment based on the information available to GeoPro Consulting Limited at the time of preparation. Unless otherwise agreed in writing by GeoPro Consulting Limited, it shall not be used to express or imply warranty as to any other purposes. No portion of this report shall be used as a separate entity, it is written to be read in its entirety. The information contained herein in no way reflects on the environment aspects of the project, unless otherwise stated.

The design recommendations given in this report are applicable only to the project designed and constructed completely in accordance with the details stated in this report. Otherwise, our responsibility is limited to interpreting the subsurface information at the borehole or test pit locations.

Should any comments and recommendations provided in this report be made on any construction related issues, they are intended only for the guidance of the designers. The number of test holes and test pits may not be sufficient to determine all the factors that may affect construction activities, methods and costs. Such as, the thickness of surficial topsoil or fill layers may vary significantly and unpredictably; the amount of the cobbles and boulders may vary significantly than what described in the report; unexpected water bearing zones/layers with various thickness and extent may be encountered in the fill and native soils. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and make their own conclusions as to how the subsurface conditions may affect their work and determine the proper construction methods.

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 such third parties. GeoPro Consulting Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time.