RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

REPORT ON

Geotechnical Investigation
Proposed Robotics Laboratory Environment Building
3255 Principal's Road
Mississauga, Ontario

PREPARED FOR:

University of Toronto, Mississauga

DS Project No: 20-201-100 **R1**
Date: November 19, 2020

DS CONSULTANTS LTD.
6221 Highway 7, Unit 16
Vaughan, Ontario, L4H 0K8
Telephone: (905) 264-9393
www.dsconsultants.ca

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

Table of Contents

1. INTRODUCTION 2
2. FIELD AND LABORATORY WORK 3
3. SITE AND SUBSURFACE CONDITIONS 3
   3.1 Soil Conditions 4
   3.2 Groundwater Conditions 5
   3.3 Subsurface Concrete 5
   3.4 Environmental Testing for Excess Soil Disposal 5
4. INFILTRATION TESTING 7
5. FOUNDATIONS 8
   5.1 Footings Founded on Engineered Fill 8
   5.2 Extended Footings/Short Drilled Piers Founded on Native Soils 9
   5.3 Other Comments on Foundations 10
6. FLOOR SLAB AND PERMANENT DRAINAGE 10
7. EARTH PRESSURES 11
8. EXCAVATIONS AND BACKFILL 11
9. EARTHQUAKE CONSIDERATIONS 12
10. PAVEMENTS 12
11. GENERAL COMMENTS AND LIMITATIONS OF REPORT 14

DRAWINGS

Borehole Location Plan	1
General Comments On Sample Descriptions	1A
Borehole Logs	2 – 9
Generalized Sub-surface profile	10
Gradation Curves	11-12
Drainage and Backfill Recommendations	13

Appendix A: General Requirements For Engineered Fill
Appendix B: In-situ Infiltration Test Results
Appendix C: Chemical Testing Results for pH & Sulphate
Appendix D: Chemical Testing Results for Soil Disposal
Appendix E: Terms of Reference By Blackwell Structural Engineers

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

1. INTRODUCTION

DS Consultants Ltd. (DS) was retained by University of Toronto, Mississauga to undertake a geotechnical investigation for the proposed Robotics Laboratory Environment building located at 3255 Principal's Road, Mississauga, Ontario.

Six (6) boreholes (BH20-1 to BH20-6) were drilled within the footprints of the proposed building (Phase 1) and two boreholes (BH20-7 and BH20-8) were drilled for phase 2 of proposed building.

In addition to boreholes, two shallow infiltration test boreholes (IT1 and IT2) and one in-situ permeability test in borehole BH20-5 were completed to evaluate the soil permeability properties.

It is understood that the proposed building will be a single storey structure, with slab-on-grade construction, i.e without a basement. Finished floor elevation of the proposed building is not available to us at the time of writing this report.

The purpose of this geotechnical investigation was to determine the subsurface conditions at eight (8) borehole locations and from the findings in the boreholes make engineering recommendations for the following:

1. Foundations
2. Floor slabs and permanent drainage
3. Excavations and backfill
4. Earth pressures
5. Earthquake considerations
6. Pavements

This report is provided on the basis of the terms of reference for soil investigation , dated my 14, 2020 prepared by Blackwell Structural Engineers (Attached in Appendix E) and, on the assumption that the design will be in accordance with the applicable codes and standards. 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 office can be relied upon.

The site investigation and recommendations follow generally accepted practice for geotechnical consultants in Ontario. The format and contents are guided by client specific needs and economics and do not conform to generalized standards for services. Laboratory testing for most

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

part follows ASTM or CSA Standards or modifications of these standards that have become standard practice.

This report has been prepared for University of Toronto-Mississauga and their architects and designers. Third party use of this report without DS Consultants Ltd. consent is prohibited.

2. FIELD AND LABORATORY WORK

Eight (8) boreholes (BH20-1 to BH20-8, see **Drawing 1** for location plan) were drilled at the site to depths of 4.8 to 5.2 m below the existing grade.

Boreholes were drilled with solid stem continuous flight auger equipment by a drilling sub-contractor under the direction and supervision of DS Consultants Limited personnel. Samples were retrieved at regular intervals with a 50 mm O.D. split-barrel sampler driven with a hammer weighing 624 N and dropping 760 mm in accordance with the Standard Penetration Test (SPT) method. The samples were logged in the field and returned to the DS Consultants Ltd. laboratory for detailed examination by the project engineer and for laboratory testing.

As well as visual examination in the laboratory, all soil samples were tested for moisture contents. Selected three (3) soil samples were subjected to grain size analyses and the gradation curves are provided on **Drawing 11**.

Water level observations were made during drilling and in the open boreholes at the completion of the drilling operations. Borehole (BH20-5) was converted to monitoring well for long term groundwater measurements.

The elevation at the boreholes were interpolated from the survey plan provided to us by the client.

Selected three (3) soil samples were tested for chemical testing for pH and Sulphate parameters. Laboratory certificates are presented in **Appendix C.**

Selected three (3) samples were tested for chemical testing for off-site soil disposal purposes. Laboratory certificates are presented in **Appendix D.**

3. SITE AND SUBSURFACE CONDITIONS

The locations of the boreholes (BH20-1 to BH20-8) are shown on **Drawing 1**. General comments on samples description are presented on **Drawing 1A**. The subsurface conditions in the boreholes are presented in the individual borehole logs (**Drawing Nos. 2 to 9**). The subsurface conditions in the boreholes are summarized in the following paragraphs. A generalized sub-surface profile is presented on **Drawing 10**.

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

3.1 Soil Conditions

Topsoil/Fill Material:

A surficial topsoil layer of thickness varying from 100 to 150 mm was encountered in all the boreholes. Below the topsoil, fill material consisting of silty sand, sand, sandy silt and sand & gravel was encountered in the boreholes, extending to depths of 1.1 to 2.3 m below existing grade. Fill material contained topsoil/organics and was in a very loose to compact state, based on the measured SPT 'N' values ranging from 2 to 28 blows per 300mm.

Silt:

Below the fill materials, upper native soils consisting of silt were encountered in boreholes BH20-3, BH20-6 and BH20-7, extending to depths varying from 2.5 to 3.1 m.

The silt was present in a compact state, as indicated by the measured SPT 'N' values of 16 to 18 blows per 300mm of penetration.

Grain size analyses of one (1) silt soil sample (BH20-3/SS4) was conducted and the results are presented in Drawing 11, with the following fractions:

Clay: 16 %

Silt: 80%

Sand: 4%

Silty Clay to Clayey Silt Till:

A silty clay to clayey silt till deposit was encountered in all the boreholes below the fill and silt deposits and extended to maximum explored depth of boreholes. This deposit was present in stiff to hard consistency, as indicated by SPT values of 13 to over 30 blows per 300 mm of penetration.

Grain size analyses of two (2) silty clay till samples (BH20-1/SS3 and BH20-5/SS4) were conducted and the results are presented in Drawing 11, with the following fractions:

Clay: 21 %

Silt: 53 to 55%

Sand: 16 to 20%

Gravel: 4 to 10%

Atterberg limits test of the two (2) silty clay till samples (BH20-1/SS3 and BH20-5/SS4) were conducted. The results are shown on the borehole logs and are summarized as follows:

Liquid limit (WL): 28 to 29%

Plastic limit (WP): 16 to 17 %

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

Plasticity index (PI): 12

3.2 Groundwater Conditions

During drilling or upon completion, all the boreholes were found dry except BH20-7. Short-term groundwater (unstabilized) was encountered in BH20-7 upon completion of borehole at depth of 1.8 m below the existing grade. Water level in the monitoring well installed in BH20-5 was measured at a depth of 2.5 m, corresponding to Elevation 129.8m on October 19, 2020.

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

3.3 Subsurface Concrete

The sulphate (SO4) resistance of concrete in contact with the soils was evaluated by performing water-soluble sulphate tests on then samples. **Table 3.3** presents the tested soil samples and the test results for water soluble sulphate content. Laboratory certificates are presented in **Appendix C**.

Table 3.3: - Sulphate Test Results

Sample No.	Water Soluble Sulphate Content	
	µg/g	%
BH-20-2/SS3	15	0.0015
BH-20-8/SS4	190	0.0190
BH-20-6/SS5	160	0.0160

According to Table 3 of CSA Standard, CAN/CSA-A23.1-14, the degree of exposure to sulphate attack is negligible for the soil samples tested, and therefore general use hydraulic Portland cement (GU) or high-early-strength hydraulic cement (HE) can be used in the subsurface concrete. For more information regarding the degree of exposure and type of cement required, reference should be made to the above-mentioned CSA Standard.

3.4 Environmental Testing for Excess Soil Disposal

Chemical analysis on selected three (3) soils samples collected from boreholes was carried out to provide a preliminary assessment of the quality of the soil that will be excavated during construction activities associated with the building development, for off-site disposal purposes.

For the purposes of assessing off-site disposal options, the results of the chemical analyses were assessed against the following Site Condition Standards (SCS) contained in the document "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act" published by the Ministry of Environment, Conservation and Parks (April 15, 2011):

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

- Table 1 RPIICC: Full Depth Background Site Condition Standards for Residential/Parkland/ Institutional/Industrial/Commercial/Community Use.
- Table 2 RPI: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition for Residential/Parkland/Institutional Use.
- Table 3 ICC: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition for Industrial/Commercial/Community Use.

Six (6) boreholes were advanced on the Site on October 8, 2020, under the supervision of DS personnel in conjunction with a geotechnical investigation. Three (3) soil samples were collected from three (3) of the boreholes (BH20-2/SS1, BH20-6/SS2 and BH20-7/SS2) for chemical testing. The samples were collected using a split spoon sampler. The split spoon sampler was brushed clean of debris, washed in a solution of potable water and Alconox, and then rinsed with potable water between each sampling event to mitigate cross-contamination.

A portion of the sample was placed in a resealable plastic bag for field screening, and the remaining portion was placed into laboratory supplied glass sampling jars. All sample jars were stored in dedicated coolers with ice for storage, pending transport to the analytical laboratory. A formal chain of custody was maintained for the sample submitted to the laboratory.

Field screening in the form of visual and olfactory observation was conducted at the time of sampling to assess for the potential presence of chemical and aesthetic impacts (i.e. staining, debris, odours). There were no visual or olfactory observations that would suggest possible impact to the soil.

The three (3) samples were submitted for the analysis of metals and inorganics to SGS Canada Inc (SGS), located in Lakefield, Ontario, under chain of custody protocols. SGS Canada is a member of the Canadian Association for Laboratory Accreditation (CALA) and meets the requirements of Section 47 of O.Reg. 153/04 (as amended) certifying that the analytical laboratory be accredited in accordance with the International Standard ISO/IEC 17025 and with standards developed by the Standards Council of Canada. Laboratory certificates are presented in Appendix D.

The results of the chemical analysis indicated that all three (3) samples met Table 1 RPIICC SCS for the parameters tested. Table 1 RPIICC includes the most stringent criteria, and as such, the samples also meet the less stringent criteria of Table 2 RPI and Table 3 ICC.

Based on the results of this investigation, DS presents the following conclusions:

- The three (3) samples submitted for chemical analysis met MECP Table 1 RPIICC standards for the parameters tested.
- The material represented by samples BH20-2, SS1, BH20-6, SS2 and BH20-7, SS2 may be suitable for re-use at sites accepting Table 1 RPIICC material.
- Reception of the material will be at the discretion of the receiving site(s).

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

The purpose of this program was to assess the chemical quality of the soils, the scope of work conducted does not constitute a Phase Two Environmental Site Assessment as defined under O.Reg. 153/04 (as amended). It should be noted that the results of the chemical analyses conducted refer only to the soil sample analysed, which was obtained from a specific location and depth. The soil chemistry may vary between and beyond the locations of the sample tested. The analytical results contained in this report should not be considered a warranty with respect to the soil quality, nor does it pertain to the geotechnical suitability of the material. The intent of this letter is to provide factual results of the chemical analyses conducted for the parameters analysed.

This report was prepared for the account of the University of Toronto Mississauga. All material contained within this report reflects the interpretation of the information available to DS at the time of this investigation. Any use, which a Third Party not noted above makes use of this report, or any reliance on the decisions to be made based on it are the responsibility of such Third Parties. DS accepts no responsibility for any damages suffered by any Third Party as a result of decisions made or actions taken based on the findings of this report.

4. INFILTRATION TESTING

DS completed a borehole percolation test at a depth of 1.0 and 2.0 meters below the ground surface (mbgs) to estimate the infiltration potential of soils across the site. The soil within the test depths consisted of sandy silt to silty sand with trace gravel and is considered as fill based on the subsurface investigation at the site. The locations of the infiltration test are shown in **Drawing 1**. The results of the infiltration testing are summarized below in **Table 4.1**. The test results are presented in Appendix B. Based on field infiltration tests, the fill has a measured infiltration rate an average infiltration rate of 88 mm/hr.

Table 4.1: Summary of Measured Soil Infiltration Rates

Test Location	Test Depth mbgs	Soil type	Measured Infiltration Rate (mm/hr)
IT 1	1.0	Fill- Silty Sand, trace to some gravel	94
IT 2	1.9	Fill- Silty Sand, trace to some gravel	82
		Average	88

Note: -mbgs– meters below ground surface

For comparative purposes, DS used estimated hydraulic conductivity (k) values from grain size analysis results using the Hazen method to estimate infiltration rates for the representative soils for comparison purposes. Also, DS conducted an in-situ permeability test at the adjacent monitoring well BH20-5 to estimate the hydraulic conductivity(k) value of soil within the screened

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

depth. The gradation curves and k-test analysis are presented in Drawing 12 and Appendix B. A summary of the results is presented in **Table 4.2**. Based on grain-size analyses, the fill material shows an average infiltration rate of 32 mm/hr.

Table 4.2: Summary of Infiltration Rates from Grain-size Analysis

Location	Depth (mbgs)	Soil Type	K-value (cm/s) *	Estimated Infiltration (mm/hr)
*K-values from grain size-Hazen method (cm/s)				
IT 1	1.0	Fill- Silty Sand, trace to some gravel	4.2×10^{-5}	37
IT 2	1.9	Fill- Silty Sand, trace to some gravel	1.6×10^{-5}	28
			Average	32
*K-values from in-situ permeability test (cm/s)				
MW20-5(BH20-5)	3.2-5.2	Fill and Silty Clay to Clayey Silt, some sand	1.9×10^{-4}	-

It is recommended to complete in-situ infiltration testing at the invert depth to obtain a representative infiltration rate for any proposed LID measures later when designs are available. For the design of on-site LID measures, design infiltration rates should be used. Design infiltration rates can be obtained by applying a safety correction factor to measured infiltration rates as per Table C2 in the "Low Impact Development Storm Water Management(SWM) Planning and Design Guide" (Appendix C) for each of the test locations. The safety factors are applied to the measured infiltration rates of soils to address the heterogeneity of the soils.

5. FOUNDATIONS

It is understood that the proposed building will be a single storey structure, with slab-on-grade construction, i.e without a basement. Finished floor elevation of the proposed building is not available to us at the time of writing this report.

Fill materials were encountered in all boreholes, extending to depths varying from 1.1 to 2.3m below the existing grade.

Based on the borehole information, the proposed buildings can be supported on conventional footings founded on engineered fill or extended footings/short drilled piers founded on native soils.

5.1 Footings Founded on Engineered Fill

The proposed building can be supported by spread and strip footings founded on engineered fill for a bearing capacity of 150 kPa at the Serviceability Limit States (SLS) and for a factored geotechnical resistance of 225 kPa at the Ultimate Limit States (ULS), provided all requirements on Appendix A are adhered to.

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

Prior to placement of engineered fill, all existing surficial topsoil, fill materials and weathered/disturbed native soils should be removed. The exposed subgrade should then be proof rolled with a heavy sheepsfoot roller to identify weak areas. Any weak or excessively wet zones identified during proof-rolling should be sub-excavated and replaced with compacted competent material to establish stable and uniform conditions. Prior to placement of engineered fill, the subgrade should be inspected and approved by a geotechnical engineer.

General guidelines for the placement and preparation of engineered fill are presented on Appendix A. To reduce the risk of improperly placed engineered compacted fill, full-time supervision of the contractor is essential.

The approved engineered fill material must be compacted to 100% Standard Proctor Maximum Dry Density throughout. Engineered fill should not be placed during the winter months.

5.2 Extended Footings/Short Drilled Piers Founded on Native Soils

Based on the borehole information, the proposed building can be supported by spread and strip footings or short drilled piers founded on the undisturbed native soils for a bearing capacity values of 250 kPa at SLS (Serviceability Limit States) and 375 kPa at ULS (Ultimate Limit States). The bearing values and the corresponding founding elevations at the borehole locations are summarized on **Table 5.2**.

Table 5.2: Bearing Values and Founding Levels of Spread Footings

BH No.	Material	Bearing Capacity at SLS (kPa)	Factored Geotechnical Resistance at ULS (kPa)	Minimum Depth below Existing Ground (m)	Founding Level at or Below Elevation (m)
BH20-1	Silty Clay to Clayey Silt Till	250	375	1.8	130.7
BH20-2	Silty Clay to Clayey Silt Till	250	375	1.4	130.9
BH20-3	Silt	250	375	2.6	129.4
BH20-4	Silty Clay to Clayey Silt Till	250	375	2.6	129.5
BH20-5	Silty Clay to Clayey Silt Till	250	375	2.6	129.7
BH20-6	Silty Clay to Clayey Silt Till	250	375	2.6	129.5
BH20-7	Silty Clay to Clayey Silt Till	250	375	2.6	129.1
BH20-8	Silty Clay to Clayey Silt Till	250	375	1.8	130.1

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

5.3 Other Comments on Foundations

Footings/drilled piers designed to the specified bearing capacities at the serviceability limit states (SLS) are expected to settle less than 25 mm total and 19 mm differential.

All footings exposed to seasonal freezing conditions must have at least 1.2m of soil cover for frost protection.

All footing bases must be inspected by this office prior to pouring concrete.

Where it is necessary to place footings at different levels, the upper footing must be founded below an imaginary 10 horizontal to 7 vertical line drawn up from the base of the lower footing. The lower footing must be installed first to help minimize the risk of undermining the upper footing.

It should be noted that the recommended bearing capacities have been calculated by DS Consultants Ltd. from the borehole information for the design stage only. The investigation and comments are necessarily on-going as new information of the underground conditions becomes available. For example, more specific information is available with respect to conditions between boreholes when foundation construction is underway. The interpretation between boreholes and the recommendations of this report must therefore be checked through field inspections provided by DS Consultants Limited to validate the information for use during the construction stage.

6. FLOOR SLAB AND PERMANENT DRAINAGE

The floor slab can be supported on grade provided all topsoil and fill is removed and the base thoroughly proof rolled. The backfill required to raise the grade can consist of inorganic soil, placed in shallow lifts and compacted to 98 percent of Standard Proctor Maximum Dry Density (SPMDD).

With engineered fill is used to support the foundations, the floor slab can also be supported by engineered fill.

A moisture barrier consisting of at least 200 mm of 19 mm clear crushed stone should be installed under the floor slab.

If the floor slab is more than about 300 mm higher than the exterior grade, then perimeter drainage is not considered to be necessary. If the floor is lower, then the perimeter drainage system shown on **Drawing 13** is recommended.

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

7. EARTH PRESSURES

The lateral earth pressures acting on retaining walls or underground structures may be calculated from the following expression:

$$p = K(\gamma h + q)$$

where p = Lateral earth pressure in kPa acting at depth h

K = Earth pressure coefficient, assumed to be 0.40 for vertical walls and horizontal backfill for permanent construction

Y = Unit weight of backfill, a value of 21 kN/m^3 may be assumed

h = Depth to point of interest in metres

q = Equivalent value of surcharge on the ground surface in kPa

The above expression assumes that the perimeter drainage system prevents the build up of any hydrostatic pressure behind the wall.

8. EXCAVATIONS AND BACKFILL

Excavations can be carried out with heavy hydraulic backhoe. No major problems with groundwater are anticipated for the installation of foundations. It is expected that any seepage, which occurs during wet periods or from perched water in fill material, can be removed by pumping from sumps.

It should be noted that the till is a non-sorted sediment and therefore may contain boulders. Provisions must be made in the excavation contract for the removal of possible boulders in the till or obstructions in the fill material.

All excavations must be carried out in accordance with the most recent Occupational Health and Safety Act (OHSA). In accordance with OHSA, the existing fill material, stiff clayey silt till and compact silt can be classified as Type 3 Soil above the groundwater table and Type 4 Soil below groundwater table. Very stiff to hard clayey silt till can be classified as Type 2 Soil above the groundwater table and Type 3 Soil below the groundwater table.

The existing fill material contained organics/topsoil and therefore considered unsuitable for construction backfill. The native soils free from topsoil and organics can be used as general construction backfill where it can be compacted with sheep's foot type compactors. Loose lifts of soil, which are to be compacted, should not exceed 200 mm.

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

Imported Granular 'B' fill is recommended in areas where free draining material is required, i.e. backfill behind foundation walls and in footing trenches. Imported granular fill, which can be compacted with handheld equipment, should be used in confined areas.

9. EARTHQUAKE CONSIDERATIONS

Based on the borehole information and according to Table 4.1.8.4.A of OBC 2012, the subject site for the proposed building can be classified as 'Class D' for seismic site response.

10. PAVEMENTS

The recommended pavement structures provided in **Table 10** are based upon an estimate of the subgrade soil properties determined from visual examination and textural classification of the soil samples. The values may need to be adjusted based on the city /regional standards. Consequently, the recommended pavement structures should be considered for preliminary design purposes only. A functional design life of eight to ten years has been used to establish the pavement recommendations. This represents the number of years to the first rehabilitation, assuming regular maintenance is carried out. If required, a more refined pavement structure design can be performed based on specific traffic data and design life requirements and will involve specific laboratory tests to determine frost susceptibility and strength characteristics of the subgrade soils, as well as specific data input from the client.

The long-term performance of the pavement structure is highly dependent upon the subgrade support conditions. Stringent construction control procedures should be maintained to ensure uniform subgrade moisture and density conditions are achieved. In addition, the need for adequate drainage cannot be over-emphasized. The finished pavement surface and underlying subgrade should be free of depressions and should be sloped (preferably at a minimum grade of two percent) to provide effective surface drainage toward catch basins. Surface water should not be allowed to pond adjacent to the outside edges of pavement areas. Subdrains should be installed to intercept excess subsurface moisture and prevent subgrade softening. This is particularly important in heavy-duty pavement areas.

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

Table 10: Recommended Pavement Structure Thickness for Parking Lots

Pavement Layer	Compaction Requirements	Light Duty Parking (Cars)	Heavy Duty Parking (Delivery Trucks)
Asphaltic Concrete	92.0 to 96.5% Maximum Relative Density (MRD)	40 mm HL 3 or SP 12.5 40 mm HL 8 or SP 19.0	40 mm HL 3 or SP 12.5 60 mm HL 8 or SP 19.0
OPSS Granular A Base (or 20mm Crusher Run Limestone)	100% SPMDD*	150 mm	150 mm
OPSS Granular B (or 50mm Crusher Run Limestone)	100% SPMDD	250 mm	350 mm

* Denotes Standard Proctor Maximum Dry Density, ASTM-D698
The subgrade must be compacted to 98% SPMDD for at least the upper 300 mm unless accepted by DS Consultants Ltd.

Additional comments on the construction of parking areas and access roadways are as follows:

1. As part of the subgrade preparation, proposed parking areas and access roadways should be stripped of topsoil and other obvious objectionable material. Fill required to raise the grades to design elevations should conform to backfill requirements outlined in previous sections of this report. The subgrade should be properly shaped, crowned then proof-rolled in the full-time presence of a representative of this office. Soft or spongy subgrade areas should be sub-excavated and properly replaced with suitable approved backfill compacted to 98% SPMDD.

2. The locations and extent of sub-drainage required within the paved areas should be reviewed by this office in conjunction with the proposed lot grading. Assuming that satisfactory crossfalls in the order of two percent have been provided, subdrains extending from and between catch basins may be satisfactory. In the event that shallower crossfalls are considered, a more extensive system of sub-drainage may be necessary and should be reviewed by DS Consultants Ltd.

3. The most severe loading conditions on light-duty pavement areas and the subgrade may occur during construction. Consequently, special provisions such as restricted access lanes, half-loads during paving, etc., may be required, especially if construction is carried out during unfavourable weather.

4. It is recommended that DS Consultants Ltd. be retained to review the final pavement structure designs and drainage plans prior to construction to ensure that they are consistent with the recommendations of this report.

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

11. GENERAL COMMENTS AND LIMITATIONS OF REPORT

DS Consultants Ltd should be retained for a general review of the final design and specifications to verify that this report has been properly interpreted and implemented. If not accorded the privilege of making this review, DS Consultants Ltd will assume no responsibility for interpretation of the recommendations in the report.

This report is intended solely for the Client named. The material in it reflects our best judgment in light of the information available to DS Consultants Ltd at the time of preparation. Unless otherwise agreed in writing by DS Consultants Ltd, it shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. No portion of this report may be used as a separate entity, it is written to be read in its entirety.

The conclusions and recommendations given in this report are based on information determined at the test hole locations. The information contained herein in no way reflects on the environment aspects of the project, unless otherwise stated. Subsurface and groundwater 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 benchmark and elevations used in this report are primarily to establish relative elevation differences between the borehole locations and should not be used for other purposes, such as grading, excavating, planning, development, etc.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report. The comments made in this report on potential construction problems and possible methods are intended only for the guidance of the designer. The number of test holes may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of surficial topsoil or fill layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work. This work has been undertaken in accordance with normally accepted geotechnical engineering practices.

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. DS Consultants Ltd 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.

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

We trust that the information contained in this report is satisfactory. Should you have any questions, please do not hesitate to contact this office.

Yours Very Truly,
DS CONSULTANTS LTD.

Simerjeet Singh Gill, M.Eng., P.Eng

Alka Sangar, M.Eng., P.Eng.

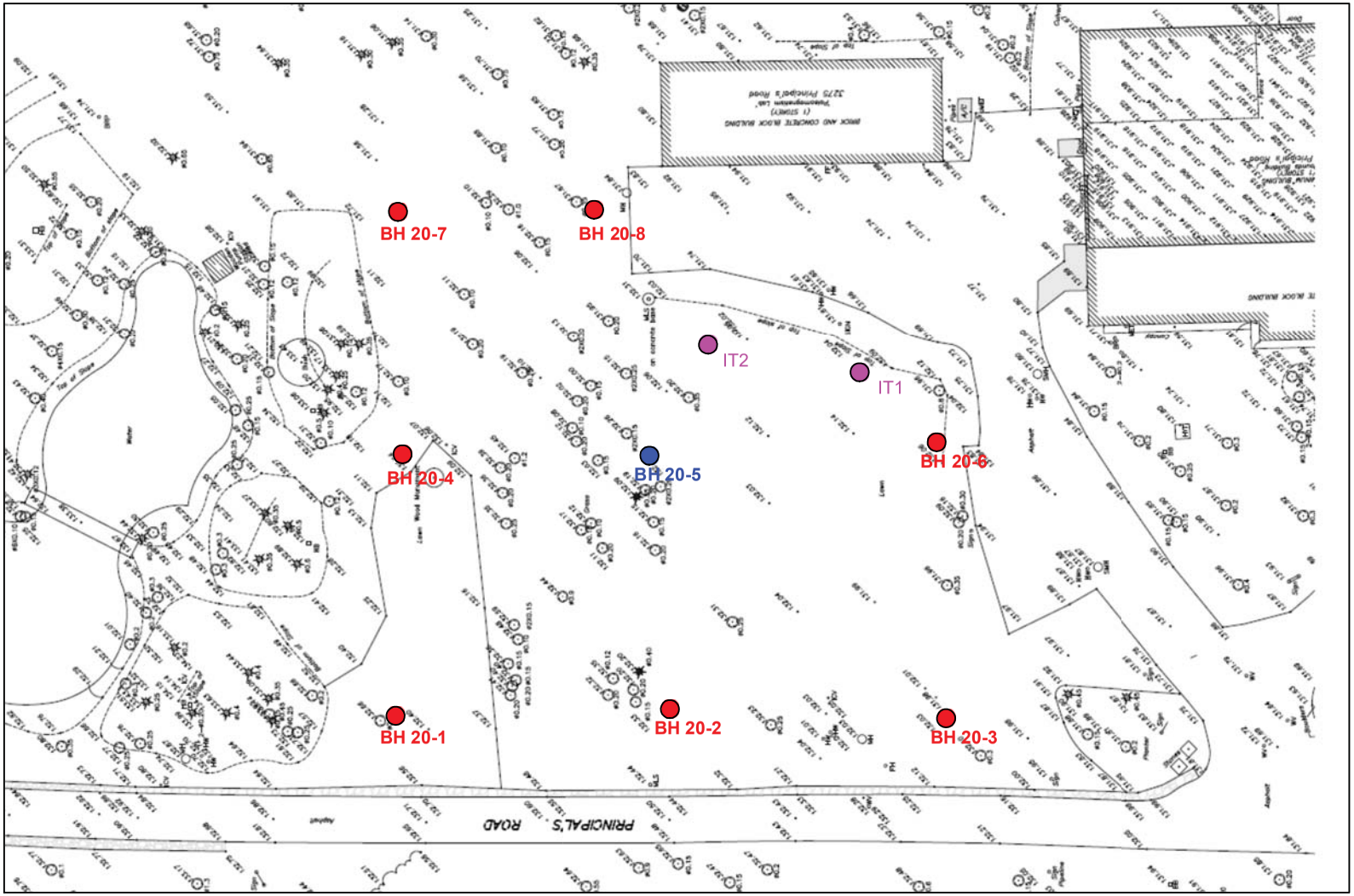
Fanyu Zhu, Ph.D., P.Eng

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

Drawings

Path:c:\users\zaid.alhashimi\desktop\utm borehole location plan.dwg

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020



Legend

- DS Boreholes
- DS Monitoring Well
- Infiltration Test Locations

DS CONSULTANTS LTD.
6221 Highway 7, UNIT 16
Vaughan, Ontario L4H 0K8
Telephone: (905) 264-9393
www.dsconsultants.ca

Project: Geotechnical Investigation - 3255 Principal's Road, Mississauga, ON			
Title: **Borehole Location Plan**			
Client: University of Toronto	Size: 8.5 x 11	Approved By: N.W	Drawn By: Z.A	Date: Oct 9, 2020
	Rev.	Scale: As Shown	Project No: 20-201-100	Figure No. 1

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

Drawing 1A: Notes On Sample Descriptions

1. All sample descriptions included in this report generally follow the Unified Soil Classification. Laboratory grain size analyses provided by DS also follow the same system. Different classification systems may be used by others, such as the system by the International Society for Soil Mechanics and Foundation Engineering (ISSMFE). Please note that, with the exception of those samples where a grain size analysis and/or Atterberg Limits testing have been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.

ISSMFE SOIL CLASSIFICATION

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE		

0.002 0.006 0.02 0.06 0.2 0.6 2.0 6.0 20 60 200

EQUIVALENT GRAIN DIAMETER IN MILLIMETRES

CLAY (PLASTIC) TO	FINE	MEDIUM	CRS.	FINE	COARSE
SILT (NONPLASTIC)	SAND			GRAVEL	

UNIFIED SOIL CLASSIFICATION

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 (60 to 200 mm) or boulders (over 200 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.

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

DS CONSULTANTS LTD.
Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH20-1

PROJECT: Geotechnical Investigation- UTM Robotics Laboratory
CLIENT: University of Toronto
PROJECT LOCATION: 3255 Principal's Road, Mississauga
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Oct/08/2020

REF. NO.: 20-201-100
ENCL NO.: 2

SOIL PROFILE (m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	"N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
132.5 / 0.0	**TOPSOIL:** 100mm											
132.4 / 0.1	**FILL:** silty sand, trace gravel, trace rootlets/topsoil, brown, moist, compact		1	SS	12		132					
131.7 / 0.8	**FILL:** sand, trace silt, trace gravel, brown, moist, compact		2	SS	16							
131.0 / 1.5	**SILTY CLAY TO CLAYEY SILT TILL:** some sand to sandy, trace gravel, brownish grey to grey, moist, very stiff to hard grey below 2.3m		3	SS	28		131					10 16 53 21
			4	SS	20		130					
			5	SS	32		129					
			6	SS	18		128					
127.3 / 5.2	**END OF BOREHOLE:** Notes: 1) Borehole open and dry upon completion.											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

DS CONSULTANTS LTD.
Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH20-2

PROJECT: Geotechnical Investigation- UTM Robotics Laboratory
CLIENT: University of Toronto
PROJECT LOCATION: 3255 Principal's Road, Mississauga
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Oct/08/2020

REF. NO.: 20-201-100
ENCL NO.: 3

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	"N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
132.3 / 0.0	**TOPSOIL:** 100mm											
132.2 / 0.1	**FILL:** silty sand, trace gravel, trace rootlets, brown, moist, loose		1	SS	7		132					
131.2 / 1.1	**SILTY CLAY TO CLAYEY SILT TILL:** sandy, trace gravel, trace cobble, brown, moist, very stiff to hard		2	SS	19		131					
			3	SS	48							
			4	SS	45		130					
	grey below 3m		5	SS	36		129					
	very stiff below 4.5m		6	SS	21		128					
127.1 / 5.2	**END OF BOREHOLE:** Notes: 1) Borehole open and dry upon completion.											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

DS CONSULTANTS LTD.
Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH20-3

PROJECT: Geotechnical Investigation- UTM Robotics Laboratory
CLIENT: University of Toronto
PROJECT LOCATION: 3255 Principal's Road, Mississauga
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Oct/08/2020

REF. NO.: 20-201-100
ENCL NO.: 4

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS / 0.3 m ("N")	ELEVATION	Dynamic Cone Penetration Resistance (20 40 60 80 100)	Shear Strength (kPa) ○ Unconfined ● Quick Triaxial + Field Vane & Sensitivity × Lab Vane (20 40 60 80 100)	Plastic Limit w_P / Natural Moisture Content w / Liquid Limit w_L — Water Content (%) (10 20 30)	Pocket Pen. (Cu) (kPa)	Natural Unit Wt (kN/m³)	Methane and Grain Size Distribution (%) GR SA SI CL
132.0 / 0.0	**TOPSOIL:** 100mm										
131.9 / 0.1	**FILL:** sandy silt, mixed with organics, trace topsoil/ rootlets, trace debris, brown to grey, moist, compact	1	SS	13							
131.5 / 0.5	**FILL:** silty sand, trace topsoil, trace gravel, brown, moist, very loose	2	SS	2	131						
130.5 / 1.5	**FILL:** sand and gravel, trace cobble, brown, very moist, compact	3	SS	16	130						
129.7 / 2.3	**SILT:** some clay, trace sand, occasional gravel, brownish grey, wet, compact	4	SS	17							0 4 80 16
128.9 / 3.1	grey below 3m **SILTY CLAY TO CLAYEY SILT TILL:** sandy, trace gravel, brownish grey, moist, very stiff	5	SS	17	129						
					128						
126.8 / 5.2		6	SS	19	127						

END OF BOREHOLE:
Notes:
1) Borehole open and dry upon completion.

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

DS CONSULTANTS LTD.
Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH20-4

PROJECT: Geotechnical Investigation- UTM Robotics Laboratory
CLIENT: University of Toronto
PROJECT LOCATION: 3255 Principal's Road, Mississauga
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Oct/08/2020

REF. NO.: 20-201-100
ENCL NO.: 5

SOIL PROFILE (m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	"N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION
132.1 / 0.0	**TOPSOIL:** 150mm						132
0.2 / 131.3	**FILL:** silty sand, trace gravel, trace rootlets, brown, moist, loose		1	SS	7		
0.8 / 130.6	**FILL:** sand, trace silt, trace rootlets, trace gravel, brown, moist, compact		2	SS	13		131
1.5 / 129.8	**FILL:** sand and gravel, trace cobble, brown, moist, compact		3	SS	28		130
2.3	**SILTY CLAY TO CLAYEY SILT TILL:** sandy, trace gravel, trace cobble, brownish grey, moist, very stiff to hard		4	SS	22		
	sand seams, grey below 3m		5	SS	45		129
	trace cobble below 4.5m		6	SS	56		128
126.9 / 5.2	**END OF BOREHOLE:**						127

Notes:
1) Borehole open and dry upon completion.

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20, 40, 60, 80, 100)
SHEAR STRENGTH (kPa): ○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE & Sensitivity, × LAB VANE (20, 40, 60, 80, 100)
PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%) (10, 20, 30)
POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)
METHANE 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

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

DS CONSULTANTS LTD.
Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH20-5

PROJECT: Geotechnical Investigation- UTM Robotics Laboratory
CLIENT: University of Toronto
PROJECT LOCATION: 3255 Principal's Road, Mississauga
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Oct/08/2020

REF. NO.: 20-201-100
ENCL NO.: 6

SOIL PROFILE (m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	"N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
132.3												
130.9 / 0.1	**TOPSOIL:** 100mm											
	FILL: silty sand, trace gravel, trace rootlets, brown, moist, loose to compact		1	SS	7		132					
							Bentonite					
1			2	SS	11							
130.8 / 1.5	**FILL:** sand and gravel, brown, very moist, compact		3	SS	17		131					
2												
130.0 / 2.3	**SILTY CLAY TO CLAYEY SILT TILL:** some sand to sandy, trace gravel, occasional cobble, brownish grey, moist, very stiff		4	SS	15		130					4 20 55 21
3	grey below 3m						W. L. 129.8 m Oct 10, 2020					
							Slotted Pipe					
			5	SS	25		129					
4												
							128					
	very moist below 4.5m											
5 / 127.1			6	SS	16							
5.2	**END OF BOREHOLE:**											

Notes:
1) 50mm dia. monitoring well installed upon completion.
2) Water level Reading:

Date:	Water Level (mbgl):
Sep 20, 2020	2.5

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

DS CONSULTANTS LTD.
Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH20-6

PROJECT: Geotechnical Investigation- UTM Robotics Laboratory
CLIENT: University of Toronto
PROJECT LOCATION: 3255 Principal's Road, Mississauga
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Oct/08/2020

REF. NO.: 20-201-100
ENCL NO.: 7

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS / 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
132.1												
132.0 / 0.1	**TOPSOIL:** 100mm						132					
	FILL: sandy silt to silty sand, trace rootlets/ topsoil, trace gravel/cobble, brown, moist, compact to loose		1	SS	24							
1			2	SS	5		131					
130.6 / 1.5	**FILL:** sand and gravel, brown, very moist, compact		3	SS	14							
2 / 129.8							130					
2.3 / 129.5	**SILT:** some clay, trace sand, brown, wet, compact		4	SS	16							
2.6	**SILTY CLAY TO CLAYEY SILT TILL:** sandy, trace gravel, trace cobble, grey, very moist, stiff to very stiff											
3			5	SS	14		129					
4							128					
5 / 126.9			6	SS	16		127					
5.2	**END OF BOREHOLE:** Notes: 1) Borehole open and dry upon completion.											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

DS CONSULTANTS LTD.
Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH20-7

PROJECT: Geotechnical Investigation- UTM Robotics Laboratory
CLIENT: University of Toronto
PROJECT LOCATION: 3255 Principal's Road, Mississauga
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Oct/08/2020

REF. NO.: 20-201-100
ENCL NO.: 8

SOIL PROFILE (m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
131.7												
130.6 / 0.1	**TOPSOIL:** 125mm											
	FILL: silty sand, trace gravel, trace rootlets, brown, moist, loose		1	SS	4							
130.9 / 0.8	**FILL:** sand and gravel, brown, moist, compact		2	SS	14		131					
130.2 / 1.5	**FILL:** sand, trace silt, trace gravel, brown, wet, loose		3	SS	9		130					
129.4 / 2.3	**SILT:** some clay, trace sand, brown, wet, compact		4	SS	18		129					
129.2 / 2.5	**CLAYEY SILT TO SILTY CLAY TILL:** sandy, trace gravel, trace cobble, grey, very moist, very stiff to hard		5	SS	31		128					
126.9 / 4.8			6	SS	50/ 50mm		127					
	END OF BOREHOLE: Notes: 1) Water level at 1.8m upon completion.											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

DS CONSULTANTS LTD.
Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH20-8

PROJECT: Geotechnical Investigation- UTM Robotics Laboratory
CLIENT: University of Toronto
PROJECT LOCATION: 3255 Principal's Road, Mississauga
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Oct/08/2020

REF. NO.: 20-201-100
ENCL NO.: 9

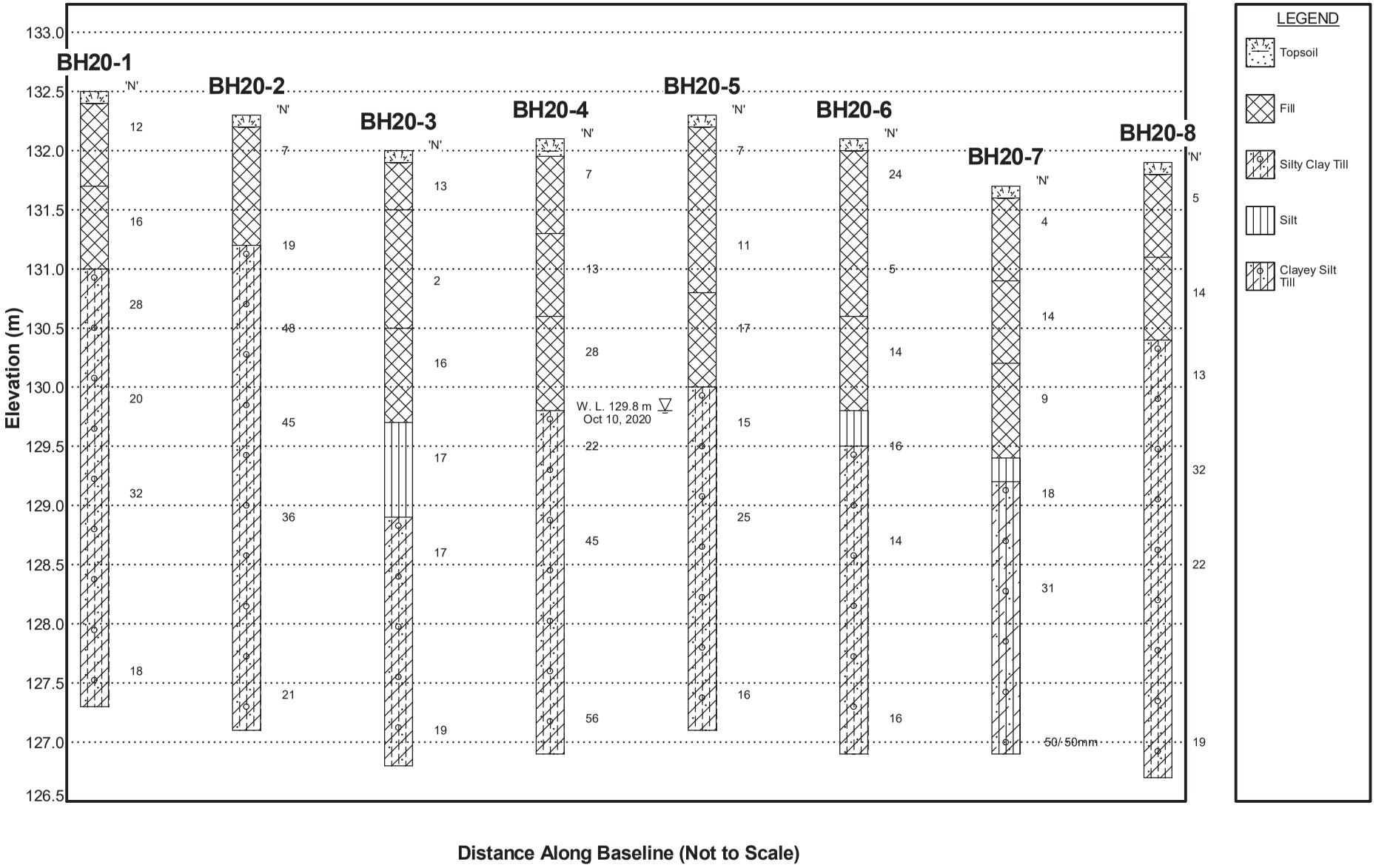
SOIL PROFILE (m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	"N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
131.9												
131.8 / 0.1	**TOPSOIL:** 125mm											
	FILL: silty sand, trace gravel, trace rootlets, brown, moist, loose		1	SS	5							
131.1 / 0.8	**FILL:** sand, trace silt, trace gravel, trace rootlets, brown, moist, compact		2	SS	14		131					
130.4 / 1.5	**SILTY CLAY TO CLAYEY SILT TILL:** sandy, trace gravel, trace cobble, brownish grey, moist, stiff to hard		3	SS	13		130					
	grey below 2.3m		4	SS	32							
	very stiff, trace cobble below 3m		5	SS	22		129					
							128					
	very moist below 4.5m		6	SS	19		127					
126.7 / 5.2	**END OF BOREHOLE:** Notes: 1) Borehole open and dry upon completion.											

DS SOIL LOG 20-201-100 UTM ROBOTICS LABORATORY_UNIVERSITY OF TORONTO.GPJ DS.GDT 11/6/20

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020



DS CONSULTANTS LTD.
Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

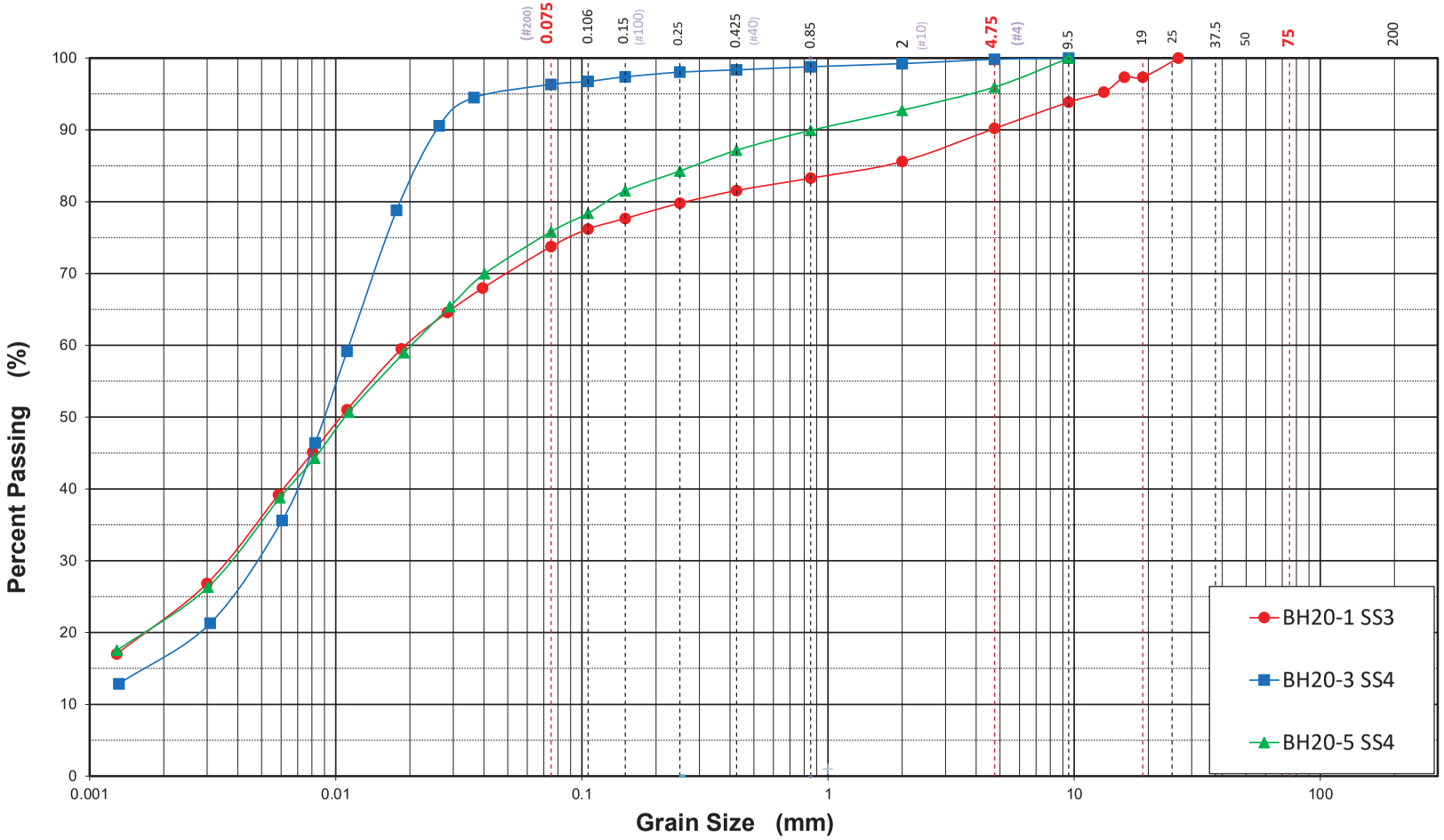
Generalized Sub-surface Profile

DRAWING NO.	10
JOB NO.	20-201-100
DATE	Nov 05, 2020

DS FENCE (M) 20-201-100 UTM ROBOTICS LABORATORY UNIVERSITY OF TORONTO.GPJ DS.GDT 11/6/20

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

Particle Size Distribution (ASTM-D421/D422)



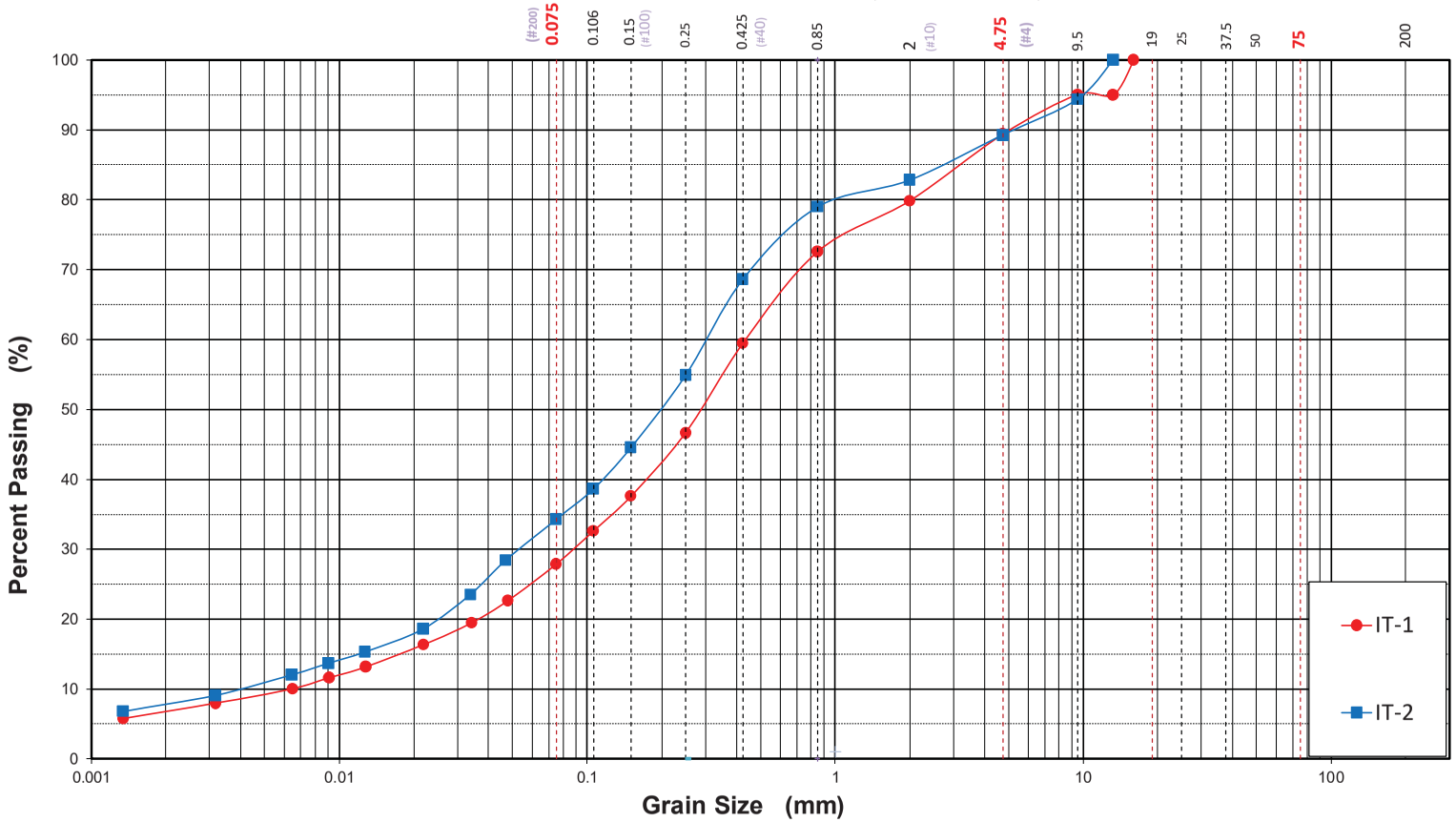
Silt and Clay		Sand			Gravel		Cobble +
Clay	Silt	Fine	Medium	Coarse	Fine	Coarse	

DS CONSULTANTS LTD.
6221 Highway 7, Unit 16
Vaughan, Ontario, L4H 0K8
Telephone: (905) 264-9393
www.dsconsultants.ca

Project	UTM Robotics Laboratory	Project No	20-201-100
Location	3255 Principal's Road, Mississauga, ON	Date	Oct-21-2020
Client	University of Toronto	Figure No	11

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

Particle Size Distribution (ASTM-D421/D422)



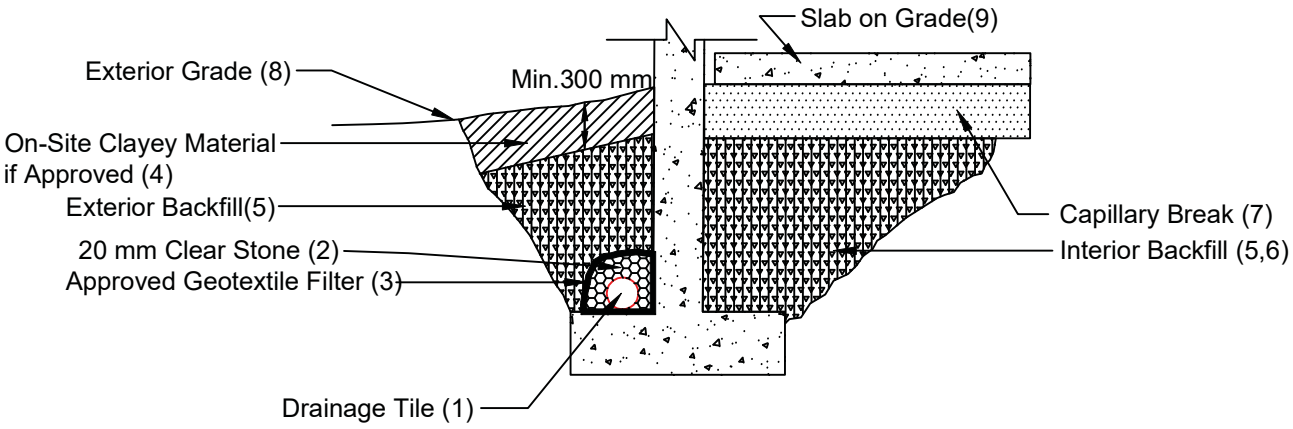
Silt and Clay		Sand			Gravel		Cobble +
Clay	Silt	Fine	Medium	Coarse	Fine	Coarse	

DS CONSULTANTS LTD.
6221 Highway 7, Unit 16
Vaughan, Ontario, L4H 0K8
Telephone: (905) 264-9393
www.dsconsultants.ca

Project	UTM Robotics Laboratory	Project No	20-201-100
Location	3255 Principal's Road, Mississauga, ON	Date	Oct/21/2020
Client	University of Toronto	Figure No	12

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

Project: 20-201-100 Drawing No. 13



EXTERIOR FOOTING

Notes

1. Drainage tile to consist of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet.
2. 20 mm (3/4") clear stone - 150 mm (6") top and side of drain. If drain is not on footing, place100 mm (4 inches) of stone below drain .
3. Wrap the clear stone with an approved geotextile filter (Terrafix 270R or equivalent).
4. The on-site clayey material, if approved, can be used as backfill in the upper 300 mm.
5. The interior and exterior fill adjacent to foundation walls should be OPSS Granular 'B' Type I. Compact to at least 98% SPMDD.
6. Do not use heavy compaction equipment within 450 mm (18") of the wall. Do not fill or compact within 1.8 m (6') of the wall. Place fill on both sides simultaneously.
7. Capillary break to be at least 200 mm (8") of compacted clear 20 mm (3/4") stone or equivalent free draining material. A vapour barrier may be required for specialty floors (consult with architect).
8. Exterior grade to slope away from building at min. 2%.
9. Slab on grade should not be structurally connected to the wall or footing.
10. Review the geotechnical report for specific details.

DRAINAGE AND BACKFILL RECOMMENDATIONS
Slab on Grade Construction Without Underfloor Drainage
(not to scale)

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

Appendix A:
General Requirements for Engineered Fill

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

GENERAL REQUIREMENTS FOR ENGINEERED FILL

Compacted imported soil that meets specific engineering requirements and is free of organics and debris and that has been continually monitored on a full-time basis by a qualified geotechnical representative is classified as engineered fill. Engineered fill that meets these requirements and is bearing on suitable native subsoil can be used for the support of foundations.

Imported soil used as engineered fill can be removed from other portions of a site or can be brought in from other sites. In general, most of Ontario soils are too wet to achieve the 100% Standard Proctor Maximum Dry Density (SPMDD) and will require drying and careful site management if they are to be considered for engineered fill. Imported non-cohesive granular soil is preferred for all engineered fill. For engineered fill, we recommend use of OPSS Granular 'B' sand and gravel fill material.

Adverse weather conditions such as rain make the placement of engineered fill to the required degree of density difficult or impossible; engineered fill cannot be placed during freezing conditions, i.e. normally not between December 15 and April 1 of each year.

The location of the foundations on the engineered fill pad is critical and certification by a qualified surveyor that the foundations are within the stipulated boundaries is mandatory. Since layout stakes are often damaged or removed during fill placement, offset stakes must be installed and maintained by the surveyors during the course of fill placement so that the contractor and engineering staff are continually aware of where the engineered fill limits lie. Excavations within the engineered fill pad must be backfilled with the same conditions and quality control as the original pad.

To perform satisfactorily, engineered fill requires the cooperation of the designers, engineers, contractors and all parties must be aware of the requirements. The minimum requirements are as follows; however, the geotechnical report must be reviewed for specific information and requirements.

1. Prior to site work involving engineered fill, a site meeting to discuss all aspects must be convened. The surveyor, contractor, design engineer and geotechnical engineer must attend the meeting. At this meeting, the limits of the engineered fill will be defined. The contractor must make known where all fill material will be obtained from and samples must be provided to the geotechnical engineer for review, and approval before filling begins.

2. Detailed drawings indicating the lower boundaries as well as the upper boundaries of the engineered fill must be available at the site meeting and be approved by the geotechnical engineer.

3. The building footprint and base of the pad, including basements, garages, etc. must be defined by offset stakes that remain in place until the footings and service connections are all constructed. Confirmation that the footings are within the pad, service lines are in place, and that the grade conforms to drawings, must be obtained by the owner in writing from the surveyor and DS Consultants Ltd (DSCL). Without this confirmation no responsibility for the performance of the structure can be accepted by DSCL. Survey drawing of the pre and post fill location and elevations will also be required.

4. The area must be stripped of all topsoil and fill materials. Subgrade must be proof-rolled. Soft spots must be dug out. The stripped native subgrade must be examined and approved by a DSCL engineer prior to placement of fill.

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

5. The approved engineered fill material must be compacted to 100% Standard Proctor Maximum Dry Density throughout. Engineered fill should not be placed during the winter months. Engineered fill compacted to 100% SPMDD will settle under its own weight approximately 0.5% of the fill height and the structural engineer must be aware of this settlement. In addition to the settlement of the fill, additional settlement due to consolidation of the underlying soils from the structural and fill loads will occur and should be evaluated prior to placing the fill.

6. Full-time geotechnical inspection by DSCL during placement of engineered fill is required. Work cannot commence or continue without the presence of the DSCL representative.

7. The fill must be placed such that the specified geometry is achieved. Refer to the attached sketches for minimum requirements. Take careful note that the projection of the compacted pad beyond the footing at footing level is a minimum of 2 m. The base of the compacted pad extends 2 m plus the depth of excavation beyond the edge of the footing.

8. A bearing capacity of 150 kPa at SLS (225 kPa at ULS) can be used provided that all conditions outlined above are adhered to. A minimum footing width of 500 mm (20 inches) is suggested and footings must be provided with nominal steel reinforcement.

9. All excavations must be done in accordance with the Occupational Health and Safety Regulations of Ontario.

10. After completion of the engineered fill pad a second contractor may be selected to install footings. The prepared footing bases must be evaluated by engineering staff from DSCL prior to footing concrete placements. All excavations must be backfilled under full time supervision by DSCL to the same degree as the engineered fill pad. Surface water cannot be allowed to pond in excavations or to be trapped in clear stone backfill. Clear stone backfill can only be used with the approval of DSCL.

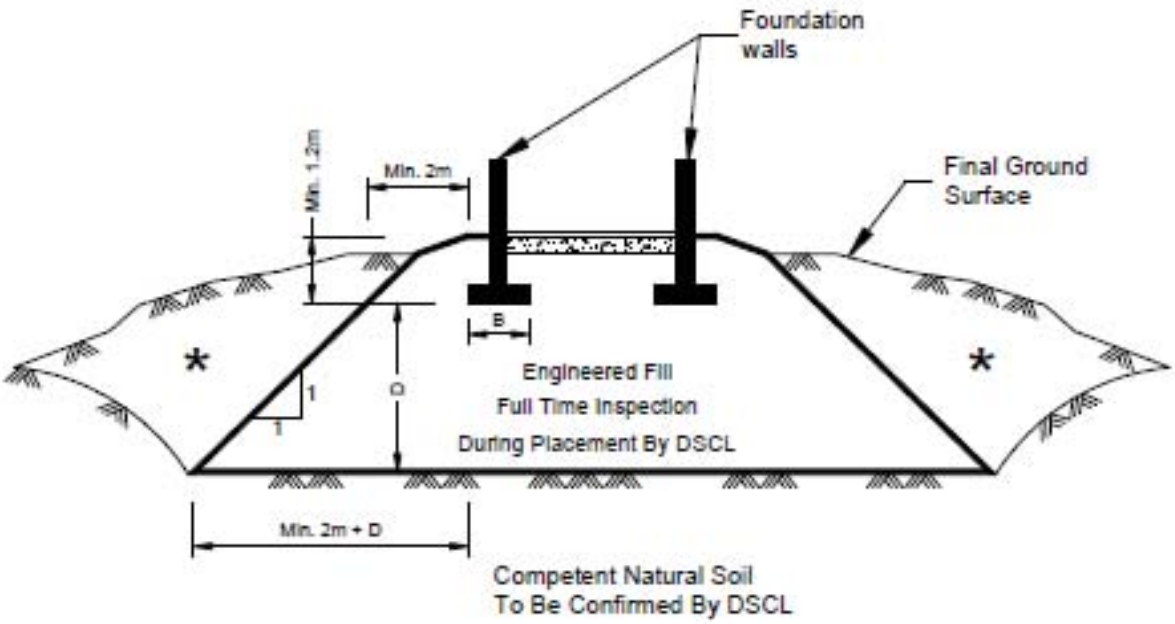
11. After completion of compaction, the surface of the engineered fill pad must be protected from disturbance from traffic, rain and frost. During the course of fill placement, the engineered fill must be smooth-graded, proof-rolled and sloped/crowned at the end of each day, prior to weekends and any stoppage in work in order to promote rapid runoff of rainwater and to avoid any ponding surface water. Any stockpiles of fill intended for use as engineered fill must also be smooth-bladed to promote runoff and/or protected from excessive moisture take up.

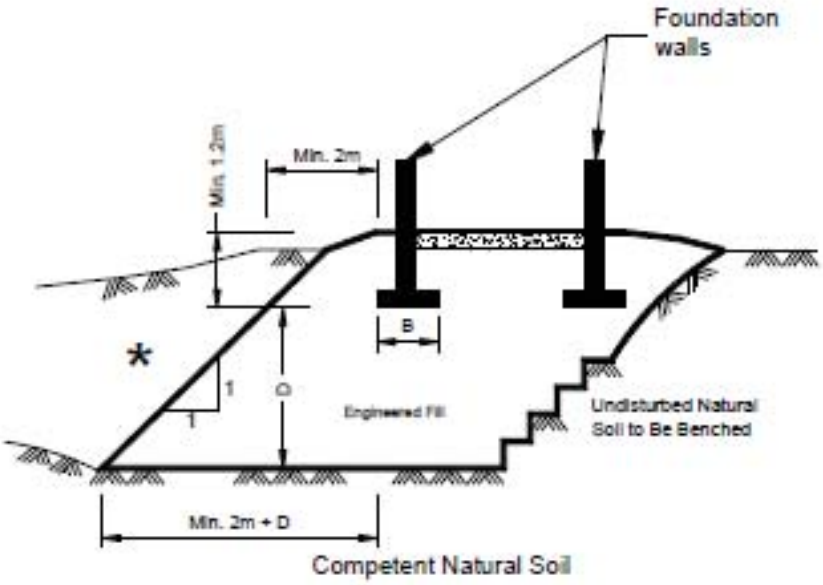
12. If there is a delay in construction, the engineered fill pad must be inspected and accepted by the geotechnical engineer. The location of the structure must be reconfirmed that it remains within the pad.

13. The geometry of the engineered fill as illustrated in these General Requirements is general in nature. Each project will have its own unique requirements. For example, if perimeter sidewalks are to be constructed around the building, then the projection of the engineered fill beyond the foundation wall may need to be greater.

14. These guidelines are to be read in conjunction with DS Consultants Ltd report attached.

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020





* Backfill in this area to be as per the DSCL report.

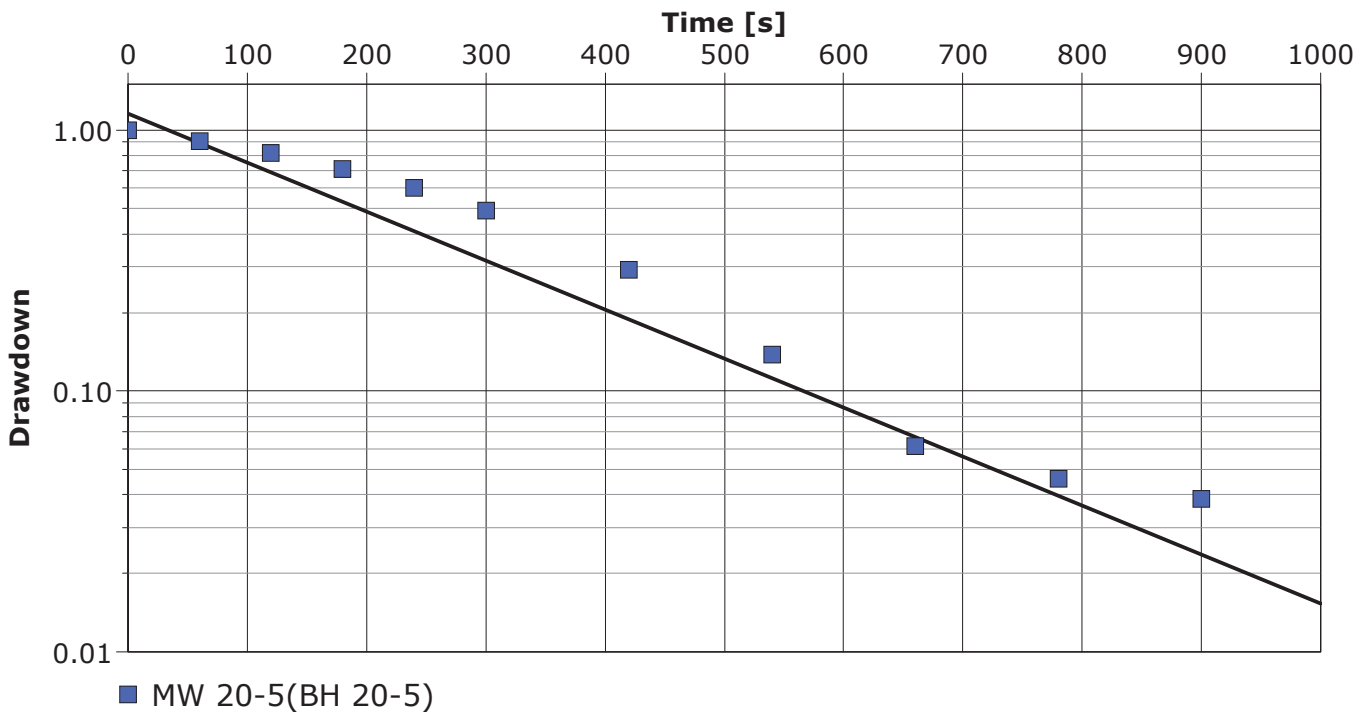
RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

Appendix B:
In-situ Infiltration Test Results

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

	Slug Test Analysis Report
	Project: Infiltration Testing
	Number: 20-201-100
	Client: Universilty of Toronto

Location: Robotic Lab-Mississauga	Slug Test: MW 20-5(BH 20-5)	Test Well: MW 20-5(BH 20-5)
Test Conducted by: PP		Test Date: 2020/11/05
Analysis Performed by: PP	Hvorslev	Analysis Date: 2020/11/05
Aquifer Thickness: 2.71 m		



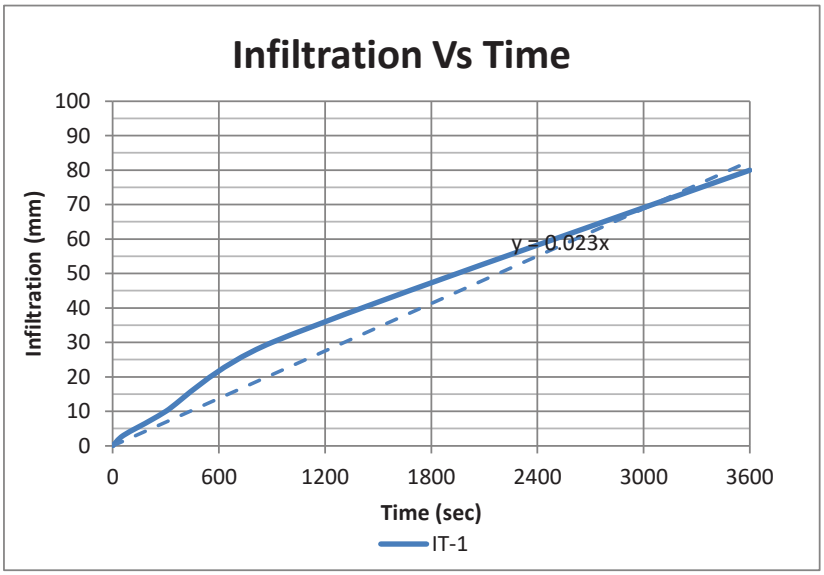
Calculation using Hvorslev

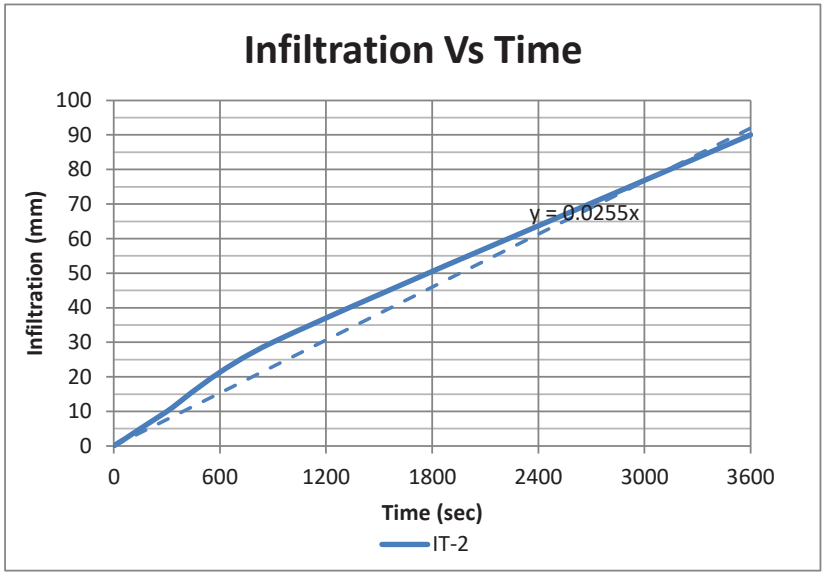
Observation Well	Hydraulic Conductivity [m/s]	
MW 20-5(BH 20-5)	1.93×10^{-6}	

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

Project No: 20-201-100 Location: University of Toronto, Mississauga,ON

IT-1		IT-2	
Time (sec)	Measured Infiltration (mm)	Time (sec)	Measured Infiltration (mm)
0	0	0	0
60	3	60	2
300	10	300	10
900	30	900	30
3600	80	3600	90
	Infiltration Rate: 82 mm/hr		Infiltration Rate: 94 mm/hr





Infitration Test **DS Consultants Ltd.**

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

Appendix C:
Chemical Testing Results for pH & Sulphate

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

FINAL REPORT

CA14397-NOV20 R1

Client: DS Consultants
Project: 20-201-100
Project Manager: Alka Sangar
Samplers: Sam

PACKAGE: **- Corrosivity Index** (SOIL)

			Sample Number	5	6	7
			Sample Name	BH-20-2, SS3	BH-20-8, SS4	BH-20-6, SS5
			Sample Matrix	Soil	Soil	Soil
			Sample Date	12/11/2020	12/11/2020	12/11/2020
Parameter	**Units**	**RL**		**Result**	**Result**	**Result**
Corrosivity Index						
pH	pH Units	0.05		8.97	8.51	8.85

PACKAGE: **- Metals and Inorganics** (SOIL)

			Sample Number	5	6	7
			Sample Name	BH-20-2, SS3	BH-20-8, SS4	BH-20-6, SS5
			Sample Matrix	Soil	Soil	Soil
			Sample Date	12/11/2020	12/11/2020	12/11/2020
Parameter	**Units**	**RL**		**Result**	**Result**	**Result**
Metals and Inorganics						
Sulphate	µg/g	0.4		15	190	160

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

FINAL REPORT

QC SUMMARY

Anions by IC

Method: EPA300/MA300-Ions1.3 | Internal ref.: ME-CA-IENVIIC-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Sulphate	DIO0283-NOV20	µg/g	0.4	<0.4	1	20	97	80	120	90	75	125

pH

Method: SM 4500 | Internal ref.: ME-CA-IENVIEWL-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
pH	EWL0251-NOV20	pH Units	0.05	NA	0		101			NA		

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

FINAL REPORT

QC SUMMARY

Method Blank: a blank matrix that is carried through the entire analytical procedure. Used to assess laboratory contamination.

Duplicate: Paired analysis of a separate portion of the same sample that is carried through the entire analytical procedure. Used to evaluate measurement precision.

LCS/Spike Blank: Laboratory control sample or spike blank refer to a blank matrix to which a known amount of analyte has been added. Used to evaluate analyte recovery and laboratory accuracy without sample matrix effects.

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

Reference Material: a material or substance matrix matched to the samples that contains a known amount of the analyte of interest. A reference material may be used in place of a matrix spike.

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

Multielement Scan Qualifier: as the number of analytes in a scan increases, so does the chance of a limit exceedance by random chance as opposed to a real method problem. Thus, in multielement scans, for the LCS and matrix spike, up to 10% of the analytes may exceed the quoted limits by up to 10% absolute and the spike is considered acceptable.

Duplicate Qualifier: for duplicates as the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Matrix Spike Qualifier: for matrix spikes, as the concentration of the native analyte increases, the uncertainty of the matrix spike recovery increases. Thus, the matrix spike acceptance limits apply only when the concentration of the matrix spike is greater than or equal to the concentration of the native analyte.

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

FINAL REPORT

LEGEND

FOOTNOTES

NSS Insufficient sample for analysis.
RL Reporting Limit.
↑ Reporting limit raised.
↓ Reporting limit lowered.
NA The sample was not analysed for this analyte
ND Non Detect

Samples analysed as received. Solid samples expressed on a dry weight basis. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act" published by the Ministry and dated March 9, 2004 as amended.

SGS provides criteria information (such as regulatory or guideline limits and summary of limit exceedances) as a service. Every attempt is made to ensure the criteria information in this report is accurate and current, however, it is not guaranteed. Comparison to the most current criteria is the responsibility of the client and SGS assumes no responsibility for the accuracy of the criteria levels indicated. This document is issued, on the Client's behalf, by the Company under its General Conditions of Service available on request and accessible at http://www.sgs.com/terms_and_conditions.htm. The Client's attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any other holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents.

This report must not be reproduced, except in full. This report supersedes all previous versions.

-- End of Analytical Report --

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

Appendix D:
Chemical Testing Results for Soil Disposal

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

FINAL REPORT

CA14953-NOV20 R

20-201-100

Prepared for

DS Consultants

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

CA14953-NOV20 R

FINAL REPORT

First Page

CLIENT DETAILS		LABORATORY DETAILS	
Client	DS Consultants	Project Specialist	Brad Moore Hon. B.Sc
		Laboratory	SGS Canada Inc.
Address	6221 Highway 7 Vaughan, Ontario L4H 0K8. Canada	Address	185 Concession St., Lakefield ON, K0L 2H0
Contact	Alka Sangar	Telephone	705-652-2143
Telephone	905-264-9393	Facsimile	705-652-6365
Facsimile	905-264-2685	Email	brad.moore@sgs.com
Email	alka.sangar@dsconsultants.ca	SGS Reference	CA14953-NOV20
Project	20-201-100	Received	11/02/2020
Order Number		Approved	11/09/2020
Samples	soil (3)	Report Number	CA14953-NOV20 R
		Date Reported	11/09/2020

COMMENTS

Temperature of Sample upon Receipt: 7 degrees C
Cooling Agent Present:Yes
Custody Seal Present:Yes

Chain of Custody Number:017276

CR6 may have alow bias as the soluble spike showed poor recovery. all other spikes and qc fine

SIGNATORIES

Brad Moore Hon. B.Sc

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

FINAL REPORT

TABLE OF CONTENTS

First Page..... 1

Index..... 2

Results..... 3-4

Exceedance Summary..... 5

QC Summary..... 6-10

Legend..... 11

Annexes..... 12

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

FINAL REPORT

CA14953-NOV20 R

Client: DS Consultants
Project: 20-201-100
Project Manager: Alka Sangar
Samplers: Sam

PACKAGE: **REG153 - Hydrides** (SOIL)

L1 = REG153 / SOIL / COARSE - TABLE 1 - Residential/Parkland/Industrial - UNDEFINED

			Sample Number	8	9	10
			Sample Name	BH-20-2, SS-1	BH-20-6, SS-2	BH-20-7, SS-2
			Sample Matrix	soil	soil	soil
			Sample Date	29/10/2020	29/10/2020	29/10/2020
Parameter	**Units**	**RL**	**L1**	**Result**	**Result**	**Result**
Hydrides						
Antimony	µg/g	0.8	1.3	< 0.8	< 0.8	< 0.8
Arsenic	µg/g	0.5	18	3.1	6.3	5.3
Selenium	µg/g	0.7	1.5	< 0.7	< 0.7	< 0.7

PACKAGE: **REG153 - Metals and Inorganics** (SOIL)

L1 = REG153 / SOIL / COARSE - TABLE 1 - Residential/Parkland/Industrial - UNDEFINED

			Sample Number	8	9	10
			Sample Name	BH-20-2, SS-1	BH-20-6, SS-2	BH-20-7, SS-2
			Sample Matrix	soil	soil	soil
			Sample Date	29/10/2020	29/10/2020	29/10/2020
Parameter	**Units**	**RL**	**L1**	**Result**	**Result**	**Result**
Metals and Inorganics						
Moisture Content	%	-		3.3	10.8	5.2
Barium	µg/g	0.1	220	33	49	36
Beryllium	µg/g	0.02	2.5	0.31	0.50	0.35
Boron	µg/g	1	36	2	3	5
Cadmium	µg/g	0.02	1.2	0.09	0.18	0.09
Chromium	µg/g	0.5	70	8.2	15	11
Cobalt	µg/g	0.01	21	4.2	7.5	6.9
Copper	µg/g	0.1	92	21	60	61
Lead	µg/g	0.1	120	7.6	14	11
Molybdenum	µg/g	0.1	2	0.2	0.3	0.3
Nickel	µg/g	0.5	82	8.7	18	15
Silver	µg/g	0.05	0.5	< 0.05	< 0.05	< 0.05

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

FINAL REPORT

CA14953-NOV20 R

Client: DS Consultants
Project: 20-201-100
Project Manager: Alka Sangar
Samplers: Sam

PACKAGE: **REG153 - Metals and Inorganics** (SOIL)

L1 = REG153 / SOIL / COARSE - TABLE 1 - Residential/Parkland/Industrial - UNDEFINED

			Sample Number	8	9	10
			Sample Name	BH-20-2, SS-1	BH-20-6, SS-2	BH-20-7, SS-2
			Sample Matrix	soil	soil	soil
			Sample Date	29/10/2020	29/10/2020	29/10/2020
Parameter	**Units**	**RL**	**L1**	**Result**	**Result**	**Result**
Metals and Inorganics (continued)						
Thallium	µg/g	0.02	1	0.06	0.11	0.10
Uranium	µg/g	0.002	2.5	0.33	0.47	0.47
Vanadium	µg/g	3	86	14	21	20
Zinc	µg/g	0.7	290	23	52	44
Water Soluble Boron	µg/g	0.5		< 0.5	< 0.5	< 0.5

PACKAGE: **REG153 - Other (ORP)** (SOIL)

L1 = REG153 / SOIL / COARSE - TABLE 1 - Residential/Parkland/Industrial - UNDEFINED

			Sample Number	8	9	10
			Sample Name	BH-20-2, SS-1	BH-20-6, SS-2	BH-20-7, SS-2
			Sample Matrix	soil	soil	soil
			Sample Date	29/10/2020	29/10/2020	29/10/2020
Parameter	**Units**	**RL**	**L1**	**Result**	**Result**	**Result**
Other (ORP)						
Mercury	ug/g	0.05	0.27	< 0.05	< 0.05	< 0.05
Sodium Adsorption Ratio	No unit	0.2	2.4	< 0.2	0.8	< 0.2
SAR Calcium	mg/L	0.09		17.0	32.5	20.5
SAR Magnesium	mg/L	0.02		3.2	2.1	0.70
SAR Sodium	mg/L	0.15		2.9	16.9	2.0
Conductivity	mS/cm	0.002	0.57	0.07	0.23	0.10
pH	pH Units	0.05		7.34	7.78	8.00
Chromium VI	µg/g	0.2	0.66	0.2	0.2	< 0.2
Free Cyanide	µg/g	0.05	0.051	< 0.05	< 0.05	< 0.05

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

FINAL REPORT

EXCEEDANCE SUMMARY

No exceedances are present above the regulatory limit(s) indicated

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

FINAL REPORT

QC SUMMARY

Conductivity

Method: EPA 6010/SM 2510 | Internal ref.: ME-CA-IENVIEWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Conductivity	EWL0091-NOV20	mS/cm	0.002	<0.002	0	10	99	90	110	NA		

Cyanide by SFA

Method: SM 4500 | Internal ref.: ME-CA-IENVISFA-LAK-AN-005

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Free Cyanide	SKA5011-NOV20	µg/g	0.05	<0.05	ND	20	92	80	120	89	75	125

Hexavalent Chromium by SFA

Method: EPA218.6/EPA3060A | Internal ref.: ME-CA-IENVISKA-LAK-AN-012

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Chromium VI	SKA5018-NOV20	ug/g	0.2	<0.2	15	20	82	80	120	73	75	125

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

FINAL REPORT

QC SUMMARY

Mercury by CVAAS

Method: EPA 7471A/EPA 245 | Internal ref.: ME-CA-IENVISPE-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Mercury	EMS0018-NOV20	ug/g	0.05	<0.05	ND	20	103	80	120	91	70	130

Metals in aqueous samples - ICP-OES

Method: MOE 4696e01/EPA 6010 | Internal ref.: ME-CA-IENVISPE-LAK-AN-003

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
SAR Calcium	ESG0020-NOV20	mg/L	0.09	<0.09	14	20	100	80	120	97	70	130
SAR Magnesium	ESG0020-NOV20	mg/L	0.02	<0.02	12	20	100	80	120	101	70	130
SAR Sodium	ESG0020-NOV20	mg/L	0.15	<0.15	ND	20	98	80	120	104	70	130

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

FINAL REPORT

QC SUMMARY

Metals in Soil - Aqua-regia/ICP-MS

Method: EPA 3050/EPA 200.8 | Internal ref.: ME-CA-IENVISPE-LAK-AN-005

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Silver	EMS0018-NOV20	ug/g	0.05	<0.05	3	20	101	70	130	98	70	130
Arsenic	EMS0018-NOV20	µg/g	0.5	<0.5	4	20	109	70	130	104	70	130
Barium	EMS0018-NOV20	ug/g	0.1	<0.1	6	20	108	70	130	100	70	130
Beryllium	EMS0018-NOV20	µg/g	0.02	<0.02	4	20	105	70	130	100	70	130
Boron	EMS0018-NOV20	µg/g	1	<1	1	20	109	70	130	95	70	130
Cadmium	EMS0018-NOV20	µg/g	0.02	<0.02	12	20	102	70	130	102	70	130
Cobalt	EMS0018-NOV20	µg/g	0.01	<0.01	2	20	102	70	130	106	70	130
Chromium	EMS0018-NOV20	µg/g	0.5	<0.5	5	20	105	70	130	110	70	130
Copper	EMS0018-NOV20	µg/g	0.1	<0.1	8	20	105	70	130	102	70	130
Molybdenum	EMS0018-NOV20	µg/g	0.1	<0.1	8	20	98	70	130	107	70	130
Nickel	EMS0018-NOV20	ug/g	0.5	<0.5	1	20	101	70	130	106	70	130
Lead	EMS0018-NOV20	µg/g	0.1	<0.1	3	20	104	70	130	100	70	130
Antimony	EMS0018-NOV20	µg/g	0.8	<0.8	ND	20	96	70	130	99	70	130
Selenium	EMS0018-NOV20	µg/g	0.7	<0.7	ND	20	102	70	130	99	70	130
Thallium	EMS0018-NOV20	µg/g	0.02	<0.02	5	20	101	70	130	96	70	130
Uranium	EMS0018-NOV20	µg/g	0.002	<0.002	0	20	102	70	130	98	70	130
Vanadium	EMS0018-NOV20	µg/g	3	<3	3	20	104	70	130	105	70	130
Zinc	EMS0018-NOV20	µg/g	0.7	<0.7	1	20	105	70	130	101	70	130

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

FINAL REPORT

QC SUMMARY

pH

Method: SM 4500 I Internal ref.: ME-CA-IENVIEWL-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
pH	ARD0011-NOV20	pH Units	0.05		0	20	100	80	120			

Water Soluble Boron

Method: O.Reg. 15 3/04 I Internal ref.: ME-CA-IENVI SPE-LAK-AN-003

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Water Soluble Boron	ESG0008-NOV20	µg/g	0.5	<0.5	ND	20	98	80	120	110	70	130

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

FINAL REPORT

QC SUMMARY

Method Blank: a blank matrix that is carried through the entire analytical procedure. Used to assess laboratory contamination.

Duplicate: Paired analysis of a separate portion of the same sample that is carried through the entire analytical procedure. Used to evaluate measurement precision.

LCS/Spike Blank: Laboratory control sample or spike blank refer to a blank matrix to which a known amount of analyte has been added. Used to evaluate analyte recovery and laboratory accuracy without sample matrix effects.

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

Reference Material: a material or substance matrix matched to the samples that contains a known amount of the analyte of interest. A reference material may be used in place of a matrix spike.

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

Multielement Scan Qualifier: as the number of analytes in a scan increases, so does the chance of a limit exceedance by random chance as opposed to a real method problem. Thus, in multielement scans, for the LCS and matrix spike, up to 10% of the analytes may exceed the quoted limits by up to 10% absolute and the spike is considered acceptable.

Duplicate Qualifier: for duplicates as the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Matrix Spike Qualifier: for matrix spikes, as the concentration of the native analyte increases, the uncertainty of the matrix spike recovery increases. Thus, the matrix spike acceptance limits apply only when the concentration of the matrix spike is greater than or equal to the concentration of the native analyte.

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

FINAL REPORT

LEGEND

FOOTNOTES

NSS Insufficient sample for analysis.
RL Reporting Limit.
↑ Reporting limit raised.
↓ Reporting limit lowered.
NA The sample was not analysed for this analyte
ND Non Detect

Samples analysed as received. Solid samples expressed on a dry weight basis. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act" published by the Ministry and dated March 9, 2004 as amended.

SGS provides criteria information (such as regulatory or guideline limits and summary of limit exceedances) as a service. Every attempt is made to ensure the criteria information in this report is accurate and current, however, it is not guaranteed. Comparison to the most current criteria is the responsibility of the client and SGS assumes no responsibility for the accuracy of the criteria levels indicated. This document is issued, on the Client's behalf, by the Company under its General Conditions of Service available on request and accessible at http://www.sgs.com/terms_and_conditions.htm. The Client's attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any other holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents.

This report must not be reproduced, except in full. This report supersedes all previous versions.

-- End of Analytical Report --

Request for Laboratory Services and CHAIN OF CUSTODY

SGS Environment, Health & Safety - Lakefield: 185 Concession St., Lakefield, ON K0L 2H0 Phone: 705-652-2000 Fax: 705-652-6365 Web: www.sgs.com/environment
- London: 657 Consortium Court, London, ON, N6E 2S8 Phone: 519-672-4500 Toll Free: 877-848-8060 Fax: 519-672-0361

No: 017276

Page _____ of _____

Laboratory Information Section - Lab use only

Received By: Oleg Mozhir
Received Date: 11/2/20 (mm/dd/yy)
Received Time: 11 : 30 (hr : min)
Received By (signature): [signature]
Custody Seal Present: Yes ☑ No ☐
Custody Seal Intact: Yes ☑ No ☐
Cooling Agent Present: Yes ☑ No ☐ Type: ice
Temperature Upon Receipt (°C) 7.7.7
LAB LIMS #: CA-14953-Nov20

REPORT INFORMATION	INVOICE INFORMATION
Company: DS consultants Ltd.	☑ (same as Report Information)
Contact: Alka Sangal	Company:
Address: 6221 Hwy 7, Unit 16 Woodbridge, L4H 0K8	Contact:
Phone: 905-264-9393	Address:
Fax:	Phone:
Email: alka.sangal@dsconsultants.ca	Email:

Quotation #: _____ P.O. #: _____
Project #: 20-201-100 Site Location/ID:

TURNAROUND TIME (TAT) REQUIRED

☑ Regular TAT (5-7days)

TAT's are quoted in business days (exclude statutory holidays & weekends). Samples received after 6pm or on weekends: TAT begins next business day

RUSH TAT (Additional Charges May Apply): ☐ 1 Day ☐ 2 Days ☐ 3 Days ☐ 4 Days

PLEASE CONFIRM RUSH FEASIBILITY WITH SGS REPRESENTATIVE PRIOR TO SUBMISSION

Specify Due Date: _____

*NOTE: DRINKING (POTABLE) WATER SAMPLES FOR HUMAN CONSUMPTION MUST BE SUBMITTED WITH SGS DRINKING WATER CHAIN OF CUSTODY

REGULATIONS

☑ O.Reg 153/04 ☐ O.Reg 406/19

☑ Table 1 ☐ Res/Park Soil Texture: ☐ Coarse
☐ Table 2 ☐ Ind/Com ☐ Medium/Fine
☐ Table 3 ☐ Agri/Other
☐ Table _____
Soil Volume ☐ <350m3 ☐ >350m3

Other Regulations: ☐ Reg 347/558 (3 Day min TAT) ☐ PWQO ☐ MMER ☐ CCME ☐ Other: _____ ☐ MISA ☐ ODWS Not Reportable *See note

Sewer By-Law: ☐ Sanitary ☐ Storm Municipality: _____

RECORD OF SITE CONDITION (RSC) ☐ YES ☐ NO

ANALYSIS REQUESTED

	SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	# OF BOTTLES	MATRIX	Field Filtered (Y/N)	M & I: Metals & Inorganics (incl CrVI, CN, Hg pH,(B(HWS),EC,SAR–soil) (Cl, Na-water)	M & I: Full Metals Suite (ICP metals plus B(HWS-soil only) Hg, CrVI	M & I: ICP Metals only Sb,As,Ba,Be,B,Cd,Cr,Co,Cu,Pb,Mo,Ni,	SVOC: PAHs only	SVOC: SVOCs all incl PAHs, ABNs, CPs	PCB: PCBs ☐ Total ☐ Aroclor	PHC: F1-F4 + BTEX	PHC: F1-F4 only no BTEX	VOC: VOCs all incl BTEX	VOC: BTEX only	Pest: Pesticides Organochlorine or specify other	Other (please specify)				Appendix 2: 406/19 Leachate Screening Levels Table: _____	Sewer Use: Specify pkg:	Water Characterization Pkg General ☐ Extended ☐	TCLP Specify TCLP tests ☐ M&I ☐ VOC ☐ PCB ☐ B(a)P ☐ ABN ☐ Ignit.	COMMENTS:
1	BH-20-2, SS-1	Oct 29		1	Soil		X																			
2	BH-20-6, SS-2	"		"	"		X																			
3	BH-20-7, SS-2	"		"	"		X																			
4																										
5																										
6																										
7																										
8																										
9																										
10																										
11																										
12																										

Observations/Comments/Special Instructions

RECEIVED By Maria Codispoti at 1:32 pm, Nov 23, 2020

(57 of 63 pages)

Sampled By (NAME): Sam Signature: [signature] Date: Oct 29 2020 (mm/dd/yy)

Relinquished by (NAME): Signature: Date: ___/___/___ (mm/dd/yy)

Pink Copy - Client
Yellow & White Copy - SGS

Revision #: 1.4
Date of Issue: 22 May. 2020

Note: Submission of samples to SGS is acknowledgement that you have been provided direction on sample collection/handling and transportation of samples. (2) Submission of samples to SGS is considered authorization for completion of work. Signatures may appear on this form or be retained on file in the contract, or in an alternative format (e.g. shipping documents). (3) Results may be sent by email to an unlimited number of addresses for no additional cost. Fax is available upon request. This document is issued by the Company under its General Conditions of Service accessible at http://www.sgs.com/terms_and_conditions.htm. (Printed copies are available upon request.) Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

Appendix E:

Terms of Reference by Blackwell Structural Engineers

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020

RECEIVED
By Maria Codispoti at 4:07 pm, May 27, 2020

Blackwell
STRUCTURAL ENGINEERS

TERMS OF REFERENCE FOR SOILS INVESTIGATION

DATE:	14 May 2020
PROJECT:	UTM Robotics Laboratory Environment Building
PROJECT NO:	200005
OWNER:	University of Toronto 3359 Mississauga Rd, Mississauga, ON L5L 1C6
ARCHITECT:	Baird Sampson Neuert Architects 117 Peter St, Toronto, ON M5V 1X1 Phone: (416) 363-8877 Contact: Jessy Dormody Email: jdormody@bsnarchitects.com
STRUCTURAL ENGINEER:	Blackwell 134 Peter Street, Suite 1301 Toronto, Ontario M5V 2H2 Phone: 416-593-5300 Contact: Martin Sampson-Coburn Email: m.sampsoncoburn@blackwell.ca

1. SITE

1.1. The site is located on the University of Toronto Mississauga campus bordering on Principals Road. The surroundings are suburban and lightly forested.

2. BUILDING DESCRIPTION

The proposed building is

2.1. Number of stories: 1

2.2. Number of basements: None

2.3. Anticipated type of construction: Light Wood Framing

2.4. Approximate column spacing: 14 feet

2.5. Approximate column loads: 200 kN

2.6. Type of foundations expected: Insulated slab on grade with perimeter grade beams on insulation

2.7. Anticipated lowest floor level: Grade

2.8. Anticipated elevation of bottoms of spread footings: ~1-2' below grade

3. PROPOSAL REQUIREMENTS

3.1. Drawing F1 of the site is attached. Indicated on this drawing are the locations of boreholes BH-1 to BH-8. Review the number and location of boreholes shown, and modify as you may feel appropriate in order to obtain the required information. Do this taking into consideration all existing information related to this area that you presently have.

3.2. Based on the boreholes indicated, the proposed project, and any previous knowledge of the site, submit a proposal for the soil investigation that includes the following information:

3.2.1. Recommended number and depth of boreholes.

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020
RECEIVED
By Maria Codispoti at 4:07 pm, May 27, 2020

3.2.2. Schedule of rates covering the costs of drilling, sampling, employee's time, travel, laboratory testing, preparation of report, consultation with principals and all other rates appropriate.

3.2.3. Unit rate for additional boreholes.

3.2.4. Total estimate of the cost of the soil investigation programme including travel, on-off charges, drilling, employee's time, laboratory work, preparation of the report, and the time for examining and reporting upon the completed foundation drawings and specifications. Include a breakdown of the estimate for the categories noted.

3.2.5. Earliest starting date of field work.

3.2.6. Length of time to complete field work.

3.2.7. Length of time to complete and submit report.

3.3. As part of the proposal submission, submit a copy of the Certificate of Insurance issued by the Professional Liability Insurer of the Geotechnical Consultant. Minimum coverage required is $2,000,000 per occurrence and in aggregate. Insurance shall provide coverage for all advice provided, including any advice provided on soil contamination.

3.4. Submit proposals to the Architect at the above address, with a copy to Blackwell.

4. SOIL INVESTIGATION REQUIREMENTS

4.1. The soil investigator shall ensure they are satisfied as to working space, access facilities and other site conditions, shall secure and pay all fees for permits, etc. which may be required for the investigation to be made, shall check for underground services before drilling boreholes and shall be responsible for the repair of any damage caused. The site shall be restored to its original state on completion.

4.2. Establish the location of boreholes as per drawing F1. Locate boreholes relative to identifiable features or property lines. Establish the elevation of the ground at each borehole location, relating same to a geodetic benchmark and identifying the benchmark used.

4.3. Drill the boreholes to the depth required to obtain the required information. If extremely poor soil is encountered, or if the soil investigator is of the opinion that holes should be drilled to a greater or lesser depth, or if major obstructions are encountered within the depth of drilling specified which may impede the drilling, immediately inform the Structural Engineer.

4.4. If preliminary field investigations indicate that additional test holes should be made, the Structural Engineer shall be contacted prior to removing boring equipment from the site.

4.5. Determine the soil profile and take samples at each significant stratum. Indicate the extent of fill and methane gas, if any. Retain samples of the soil for three months in sealed airtight containers.

4.6. Conduct standard testing of the soil using methods dictated by the character of the soil to ascertain the maximum permissible bearing capacity. Take tests near the top of each layer of different soil and for each [1.5m] of depth below existing grade.

4.7. If the soil investigator considers it necessary, recommend additional soil tests that may be required to establish the safe bearing value and probable footing settlement under service loads.

4.8. Establish the elevation of the stabilized water table at each borehole, using piezometer installations where the soil investigator deems necessary.

4.9. Carry out one in-situ percolation test at approximately 2mbgs in location shown on drawing F1. Confirm location with civil engineering consultant prior to field work.

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020
RECEIVED
By Maria Codispoti at 4:07 pm, May 27, 2020

4.10. Carry out any necessary testing to satisfy the requirements of the Ministry of the Environment for soil disposal.

4.11. Measure the depth and the configuration of the existing footings in the test pits.

4.12. Preserve soil samples representative of the various soil strata in the originally extracted state in wax sealed glass jars.

4.13. Plug boreholes and backfill test pits. Remove all excess excavated material from the site.

5. INFORMATION REQUIRED IN THE REPORT

5.1. A description of the soil investigation, including details of the method of soil boring used, and a description of the general geology of the area.

5.2. A description of the soil on the site, based on the information obtained from the boreholes, and from any other information regarding the site that the soil investigator may have.

5.3. A drawing indicating the actual location of all boreholes, the grade elevation at each borehole, and any other information that the soil investigator considers pertinent.

5.4. A detailed log of for each borehole, including a description of the various soil strata including fill and the elevation of the stabilized water table, referenced to the benchmark.

5.5. Recommendations concerning the following:

5.5.1. Safe bearing values for strip and isolated spread footings at the anticipated founding levels. Relate all founding elevations to a benchmark, as well as giving them as the distance below existing grade. Recommendations for bearing capacities are to be expressed in terms of Ultimate Limit States and Serviceability Limit States, as required by the Ontario Building Code, 2012.

5.5.2. The most suitable alternative types of foundation if strip and isolated spread footings do not appear to be suitable. Particularly, under these circumstances, discuss the relative merits of the different types of caissons or piles, having regard for the nature of the overburden and the condition of the bearing stratum. Include allowable bearing values and other criteria for caissons or piles.

5.5.3. The modulus of subgrade reaction for design of mat foundations.

5.5.4. Depth of frost penetration to be allowed for in design.

5.5.5. Long-term drainage requirements around the building foundation, beneath paved areas, and behind retaining walls.

5.5.6. The Site Classification, corresponding to Table 4.1.8.4.A to be used in seismic design, as defined in the Ontario Building Code 2012.

5.5.7. Requirements for the subgrade material and drainage course below interior slabs on grade.

5.5.8. Requirements for pavement, subgrade material and drainage course below exterior parking areas, roadways, curbs and sidewalks.

5.5.9. Requirements for backfilling at new site services, including those under new pavement.

5.6. Report upon the following:

5.6.1. The anticipated total and differential footing settlements for each type of foundation being considered.

5.6.2. Possible effects of ground water during construction if the water table is close to or above the likely elevation of the bottom of excavations.

5.6.3. Special or unusual conditions revealed during the soil investigation.

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020
RECEIVED
By Maria Codispoti at 4:07 pm, May 27, 2020

5.6.4. The corrosive effects of ground water if any. Make recommendations regarding sulphate resistant cement.

5.6.5. Likely effects upon the footing bearing stratum of ground water or surface water that may accumulate adjacent to unloaded or loaded footings.

5.6.6. Frost susceptibility of the soil.

5.6.7. Sensitivity of the soil, e.g. will it lose strength when remoulded. Should special precautions be employed to avoid disturbance of soil due to ordinary construction operations.

5.6.8. Suitability of excavated material as backfill.

5.6.9. If methane gas is found in fill material and/or in underlying shale, comment on its concentration and suggest methods for its control.

6. GENERAL REQUIREMENTS

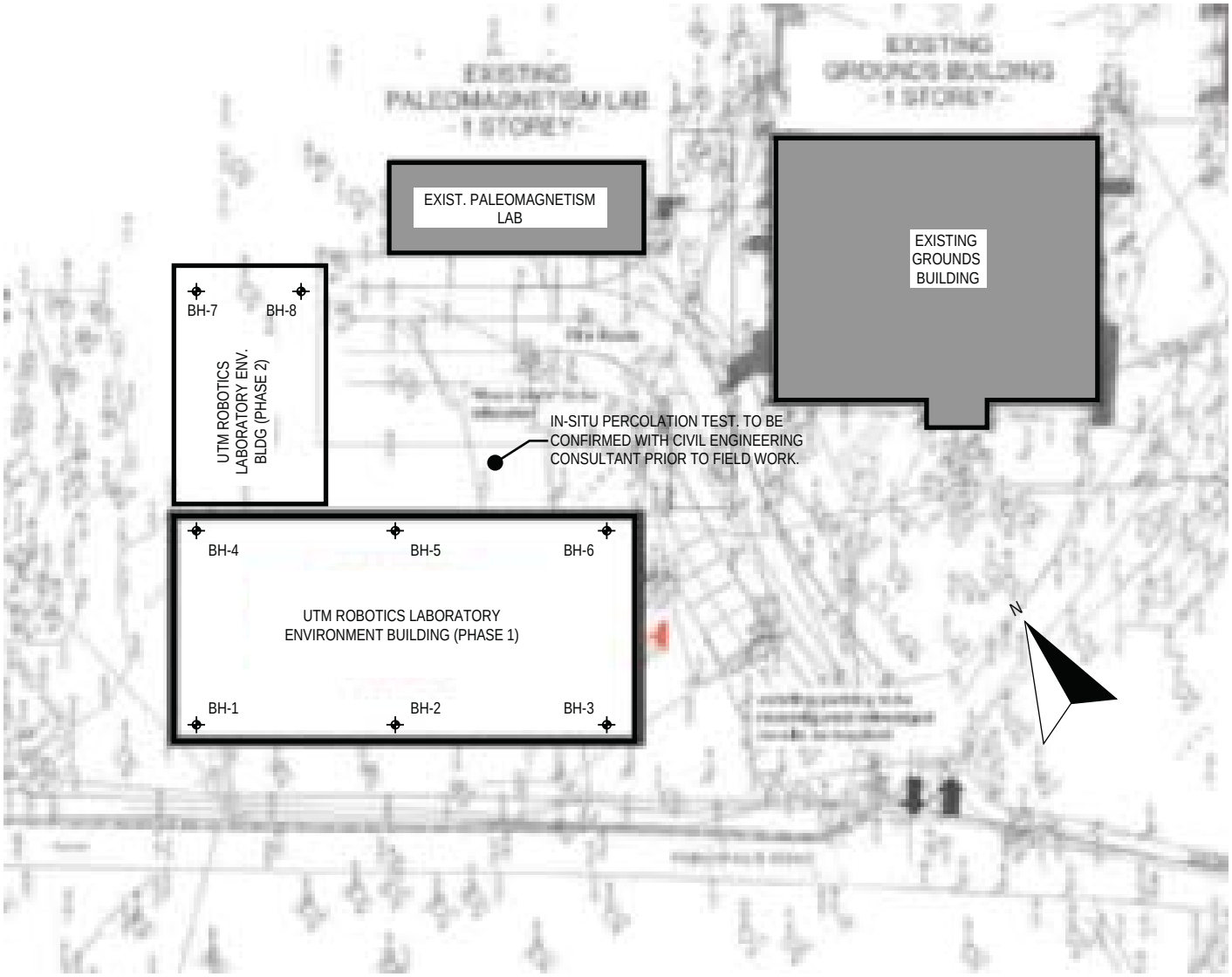
6.1. Provide an electronic copy (Adobe PDF file format) of the soil report to the owner, Architect and Blackwell, sent to the email contacts provided on page 1.

6.2. Submit invoices to the Owner, in care of the Architect, at the above address.

Seal	Title	Project #	Date
	UTM Robotics Laboratory Environment Building TERMS OF REFERENCE - BOREHOLE LOCATIONS	200005	2020/05/12
		Designer: MSC	Scale: N.T.S.
		Checked by: MSC	Sheet #: F1

Blackwell

Toronto 416.593.5300 | Waterloo 519.616.0895 | Victoria 778.817.1010 | Halifax 902.593.0125 | blackwell.ca

RECEIVED
By Maria Codispoti at 4:07 pm, May 27, 2020

RECEIVED
By Maria Codispoti at 1:32 pm, Nov 23, 2020