



FINAL REPORT

FOUNDATION INVESTIGATION REPORT

**Non-Structural Culvert Replacement and Slope Stability Analysis, At Highway
85-Bridgeport Road Interchange, Kitchener, ON**

Agreement No. 3015-E-0017

Assignment No. 5

W.O. 2017-11009

Geocres No. 40P8-244

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Ministry of Transportation

Western Region – Geotechnical Section

Foundation Investigation Report

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Foundation Investigation and Design Report for Non- Structural Culvert Replacement and Slope Stability Analysis at Hwy 85-Bridgeport Interchange, Kitchener, ON

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PART I: FOUNDATION INVESTIGATION REPORT

1.1 Introduction

This foundation investigation report presents the results of a geotechnical investigation completed by **exp** Services Inc. (**exp**) for the replacement of an existing non-structural culvert and slope stability analysis at STA 24+470 on Highway 85 and Bridgeport Road Interchange, Kitchener, part of the Ministry of Transportation (MTO) West Region. The work was undertaken under Agreement No. 3015-E-0017, Assignment No. 5. The terms of reference (TOR) were as presented in the MTO document entitled "Foundation Engineering Terms of Reference, MTO West Region – Foundations Retainer Assignment, Assignment 5 – Culvert Replacement and Slope Stability Analysis Hwy 85-Bridgeport Interchange" provided via e-mail on March 16, 2017.

Based on information provided by MTO, it was initially understood that the slope failure was only in the vicinity of existing non-structural culvert. During a site reconnaissance, additional slope failure above the storm water drainage outlet located south of the existing culvert was noted. Following discussion with MTO, the initial scope was modified to incorporate the additional slope failure identified during site visit.

The purpose of the investigation is to determine the subsurface conditions along the culvert alignment and to permit detailed design for the culvert replacement including assessment of the slope failure to provide detailed recommendations with clear alternatives to rectify the problem. The site specific geotechnical investigation consisted of borings, soil sampling, borehole logging, and field and laboratory testing.

This foundation investigation report has been prepared specifically and solely for the project described herein. It contains the factual results of the investigation and the laboratory testing completed for this project.

1.2 Site Description and Geological Setting

1.2.1 Site Description

At the culvert replacement site location, the Highway 85 and Bridgeport road interchange ramps E/W-N and N-E/W runs on east side of the Highway 85 and Bridgeport road interchange. The ramps are single lane asphalt roadway and is about 6.8 m wide from edge to edge of road lane marks, with approximately 2.0 m wide paved shoulder on one side. The road surface elevations of ramps E/W-N and N-E/W along the culvert centerline is approximately at Elev. 321.1 m.

Based on the information provided in the TOR, the existing culvert is concrete culvert with a 1.37 m internal diameter runs from a catch basin at the curb of the E/W-N ramp for a length of 14 m to outlet. At the time of writing this report the type and dimensions of the new culvert is not known. Select photographs of the site and existing culvert are presented in Appendix A. The site plan and cross-section profiles for the proposed culvert alignment are shown on the drawing attached in Appendix B.

The area surrounding the culvert site at inlet side is gently sloping towards the catch basin and at outlet side the embankment is 5.2 m high with approximate side slope of ~2.5H:1V. Highway 85 runs in north-south direction and Bridgeport road runs in east-west direction under the Highway 85 at interchange. The overall drainage at the existing culvert site is from the west to east direction. The culvert crosses the ramps (N-E/W and E/W-N) and discharge at drain runs along the toe of the embankment with bends at two shafts (located at shoulder of N-E/W ramp and between two ramps at median ditch). The storm water pipe located on south of the existing culvert also discharge at the drain on east side of the ramp and the drain further flows toward south. some vegetation was observed along the flow area at the inlet side of the culvert. However, no obstruction in flow were observed. At the time of the investigation, the bottom of the existing culvert at inlet and outlet of the culvert were measured at approximate Elevations 318.0 m and 314.7 m, respectively. The bottom of the storm water pipe on outlet side was also measured and it was at approximate Elev. 316.5 m. The elevation of ramps N-E/W and E/W-N at the culvert centerline is approximately Elev. 321.1 m.

The failure scarps are situated approximately at stations 24+355 and 24+470 on the E/W-N ramp side slope. The slope failure had occurred above outlet end of the culvert and the storm water drainage pipe. During a field reconnaissance, formation of a sink holes and depressions on the embankment slope were observed due to washouts. it was observed that the washouts of the embankment slope at the outlet side of the existing culvert and the storm water pipe were observed causing sink holes and depressions (see Photos 11,12,13 and 14, in Appendix A). Some concrete pieces on top of the existing culvert and the storm water pipe were observed (see photo 7 and 9, in Appendix A), that appears to have been temporarily repaired.

1.2.2 Geological Setting

The Map P.2715 (Physiography of Southern Ontario, Third Edition,1984) of the Ministry of Natural Resources indicates that the project area is in a spillway. The Map 2556 (Quaternary Geology of Ontario, Southern Sheet, 1991) of the Ministry of Northern Development and Mines, indicates that the surface conditions consist of Port Stanley till of silt to sandy silt matrix becoming silty to silty clay near Lake Erie, strongly calcareous, moderate to low clast content decreasing southward. The Map 2544 (Bedrock Geology of Ontario, Southern Sheet, 1991) of the Ministry of Northern Development and Mines, indicates that the bedrock formation in the project area consists of Salina formation of shale, limestone, dolostone, sandstone, gypsum and salt.

1.3 Investigation Procedures

1.3.1 Site Investigation and Field Testing

The field investigation was performed between May 1st and 5th, 2017. The field program consisted of drilling nine (9) sampled boreholes, numbered BH-1 to BH-9. Four (4) boreholes (BH-1, BH-2, BH-3, and BH-5) were strategically located along the existing culvert alignment to provide subsurface information for the design of the proposed new culvert. Boreholes BH-1 and BH-3 were advanced at accessible locations near the inlet and outlet of the culvert, respectively. Borehole BH-2 was advanced approximately 2.5 m north of the culvert alignment in the grass median and Borehole BH-5 was advanced approximately 2.5 m south of the culvert alignment in the shoulder of the HWY 85 E/W-N

ramp. Two (2) boreholes (BH-4 and BH-6) were advanced on the shoulder of the HWY 85 E/W-N ramp and in the grass median to provide subsurface information for the temporary road protection at distances of approximately 25 m north and south of the culvert, respectively. Additionally, three (3) boreholes (Boreholes BH-7, BH-8, and BH-9) were advanced in the area of the existing stormwater pipe to investigate the cause of the slope failure. Boreholes BH-7 and BH-8 were advanced at the stormwater inlet and outlet, respectively and Borehole BH-9 was advanced approximately 25 m south of the stormwater inlet in the shoulder of the HWY 85 E/W-N ramp. The borehole locations are shown on Drawing No. 1 in Appendix B.

The boreholes drilled on the E/W-N ramp (Boreholes BH-4, BH-5, BH-7, and BH-9) were advanced to depths ranging from 11.3 to 15.9 m below grade using a truck mounted CME-75 drill rig. The boreholes drilled at the culvert inlet and median (Boreholes BH-1, BH-2, and BH-6) were advanced to depths 10.5 to 11.3 m below grade using a track mounted CME-75 drill rig. The truck and track mounted drills were equipped with hollow stem augers and standard soil sampling equipment. Due to the limited access at the culvert and stormwater outlets, Boreholes BH-3 and BH-8 were advanced using manual SPT equipment (70-pound hammer with 15 inch drop height) to a depth of 3.1 m below grade. The boreholes were advanced by a specialist drilling contractor, Aardvark Drilling Inc.

The borehole locations (referenced to the MTM NAD83 coordinate system) and their ground surface elevations were surveyed by **exp** personnel using a Temporary Benchmark (TBM). The TBM used was the catch basin at the west curb of the HWY 85 E/W-N ramp and located approximately 105 m north of the existing culvert. Based on the Information provided on as contract drawings (Contract No. 68-62, W.P. 619-64, Dwg. 134) provided by the MTO, the TBM was assigned an approximately geodetic elevation of 322 m. The temporary benchmark location is shown on Drawing. 1 in Appendix B.

For the drilling program, soil samples were obtained using a 51 mm outside diameter (O.D.) split-spoon sampler in accordance with Standard Penetration Test (SPT) procedures (ASTM D1586) at intervals ranging from 0.75 m to 1.5 m in depth as shown on the attached borehole logs (Appendix C). The original field (uncorrected) SPT “N” values were recorded on the borehole logs as recommended in the Canadian Foundation Engineering Manual (CFEM, pg. 40) and used to provide an assessment of in-situ consistency or relative density of non-cohesive soils. The SPT “N” values shown on the borehole logs of Borehole BH-3 and BH-8 are corrected for the reduced energy input of the manual equipment.

Upon completion of the boreholes, ground water level measurements were carried out in boreholes in accordance with the Ministry of Transportation guidelines. The measured ground water levels after completion of drilling boreholes were recorded on the borehole log sheets in Appendix C. The boreholes were decommissioned by bentonite/cement mixtures in accordance with the Ministry of the Environment Regulation 903, as amended by Regulation 128/03 (the well regulation under the *Ontario Water Resources Act*).

The fieldwork was supervised by members of **exp**'s engineering staff who directed the drilling and sampling operation, logged borehole data in accordance with MTO and/or ASTM Standards for Soils Classification, and retrieved soil samples for subsequent laboratory testing and identification.

All the recovered soil samples placed in labelled moisture-proof bags returned to **exp**'s Hamilton laboratory for additional visual, textual, olfactory examination and selective testing.

1.3.2 Previous Investigation

No foundation reports are available in the MTO GEOCREs library for this site. However, one foundation report related to the adjacent site on Hwy 85 was recovered from the MTO GEOCREs library. The document is as follows:

- Foundation Investigation Report for Bridgeport Road Overpass, Kitchener-Waterloo Expressway; District #4 (Hamilton) W.J. 66-F-64; W.P. 640-64; Geocres No. 40-P08-050; Department of Highways Ontario; August 17, 1966.

1.3.3 Laboratory Testing

All samples returned to the laboratory were subjected to visual examination and classification. The laboratory testing program included the determination of natural moisture content of all samples and particle size distribution for approximately 25% of the collected soil samples. Atterberg limits tests were carried out on select cohesive soil samples. One corrosivity test was also performed for a selected sample. All of the laboratory tests were carried out in accordance with MTO and/or ASTM Standards, as appropriate.

The laboratory test results are provided on the attached borehole log sheets in Appendix C as well as graphically in Appendix D.

The corrosivity test was performed by AGAT Laboratories, a CALA-certified and accredited laboratory in Mississauga, Ontario. Details of the chemical testing are discussed below and the lab results are presented in Appendix E.

1.4 Subsurface Conditions

The detailed subsurface conditions encountered in the boreholes advanced during this investigation are presented on the borehole log sheets in Appendix C. Laboratory test results are provided in Appendix D. The “Explanation of Terms Used in Report” preceding the borehole logs in Appendix C forms an integral part of, and should be read in conjunction with, this report.

A borehole location plan and stratigraphic section are provided in Appendix B. It should be noted that the stratigraphic boundaries indicated on the borehole log and stratigraphic section are inferred from semi-continuous sampling, observations of drilling progress and results of Standard Penetration Tests. These boundaries typically represent transitions from one soil type to another and should not be interpreted as exact planes of geological change. Furthermore, subsurface conditions may vary between and beyond the borehole locations.

In general, the subsurface conditions along the existing culvert alignment consists of a layer of sand to silty sand fill underlain by native deposit of silty clay. A more detailed description of the subsurface conditions encountered in the boreholes is discussed further in subsequent sections.

1.4.1 Asphalt

Asphalt was encountered at the surface of boreholes advanced on the roadway, i.e. BH-4, BH-5, BH-7 and BH-9, and thickness of about 0.100 m. Asphalt thicknesses may further vary beyond the borehole locations.

1.4.2 Topsoil

Topsoil was encountered at the surface of the off-road boreholes (BH-1, BH-2, BH-3, BH-6 and BH-8), and ranged in thickness from approximately 0.2 m to 0.3 m. Topsoil thicknesses may further vary beyond the borehole locations.

1.4.3 Fill: Sand and Gravel

Sand and gravel fill was encountered below the asphalt in all boreholes (BH-4, BH-5, BH-7 and BH-9) advanced through the road surface. The sand and gravel fill extended to depths ranging between 0.4 m to 0.5 m below ground surface with elevations ranging between 321.2 m to 320.7 m. The explored thickness of this layer was between 0.3 m to 0.4 m.

The composition of this fill layer is sand and gravel and trace silt. The material is brown in color, and dry to moist. The SPT “N” values within this layer ranged from 21 to 34 blows per 0.3 m penetration, suggesting compact to dense relative density.

Laboratory testing performed on selected samples consisted of four (4) moisture content tests. The test results are as follows:

Moisture Content:

- 4% to 11%

The results of the moisture content tests are provided on the record of borehole sheets in Appendix C.

1.4.4 Fill: Sand to Silty Sand

Sand to silty sand fill was encountered below the sand and gravel fill in all boreholes advanced through the road surface (BH-4, BH-5, BH-7 and BH-9) and below the topsoil in all off-road boreholes (BH-1, BH-2, BH-3, BH-6 and BH-8). The sand to silty sand fill extended to depths ranging between 2.4 m to 6.9 m below ground surface with elevations ranging between 316.0 m to 313.4 m. The explored thickness of this layer was between 2.2 m and 6.4 m.

The composition of this fill layer is sand and silt, some clay, trace to some gravel, trace organics, wood fibres and occasional plastic debris. The material is brown in color, and moist to wet. The SPT “N” values within this layer ranged from 1 to 50 blows per 0.3 m penetration, suggesting very loose to very dense relative density but generally very loose to compact relative density.

Laboratory testing performed on selected sample consisted of fifty-four (54) moisture content tests and thirteen (13) grain size distribution tests. The test results are as follow:

Moisture Content:

- 4% to 36%

Grain Size Distribution:

- 0% to 24% gravel;
- 21% to 84% sand;
- 16% to 61% silt and clay;

- 40% to 60% silt; and
- 14% to 19% clay

The results of the moisture content and grain size distribution tests are provided on the record of borehole sheets in Appendix C. The results of the grain size distribution tests are also provided on Figure 1 and 2 in Appendix D.

1.4.5 Fill: Clayey Silt

Clayey silt fill was encountered below the sand to silty sand fill in BH-4. The clayey silt fill extended to depth of about 6.9 below ground surface with elevation about 314.3 m. The explored thickness of this layer was about 0.8 m.

The composition of this fill layer is silt and clay and trace gravel. The material is light brown in color, and moist. One SPT "N" value within this layer was 8 blows per 0.3 m penetration, suggesting firm consistency.

Laboratory testing performed on selected sample consisted one (1) moisture content test. The test result is as follow:

Moisture Content:

- 21%

The result of the moisture content test is provided on the record of borehole sheets in Appendix C.

1.4.6 Organic Silty Clay

A layer of organic silty clay was encountered below the sand to silty sand fill in BH-2, BH-5 and BH-6. The organic silty clay extended to depths ranging between 5.3 m to 6.9 m below ground surface with elevations ranging between 315.4 m to 314.2 m. The explored thickness of this layer was between 0.7 m and 0.8 m.

The composition of this layer is silt and clay, some organics and some rootlets. The material is black in color, and moist. The SPT "N" values within this layer ranged from 5 to 7 blows per 0.3 m penetration, suggesting firm consistency.

Laboratory testing performed on selected sample consisted three (3) moisture content tests. The test results are as follows:

Moisture Content:

- 29% to 50%

The result of the moisture content test is provided on the record of borehole sheets in Appendix C.

1.4.7 Peat

A layer of peat was encountered below the sand to silty sand fill in BH-7 and BH-9. The peat layer extended to depths ranging between 6.3 m to 7.6 m below ground surface with elevations ranging between 315.3 m to 313.9 m. The explored thickness of this layer was about 0.7 m.

The composition of this layer is peat, some rootlets and wood fragments. The material is black in color, and moist. The SPT "N" values within this layer ranged from 6 to 7 blows per 0.3 m penetration, suggesting firm consistency.

Laboratory testing performed on selected sample consisted two (2) moisture content tests. The test results are as follows:

Moisture Content:

- 145% to 227%

The result of the moisture content test is provided on the record of borehole sheets in Appendix C.

1.4.8 Silty Clay

Native silty clay was encountered below the sand to silty sand fill in BH-1, BH-3 and BH-8; below the clayey silt fill in BH-4; below the organics silty clay in BH-2, BH-5 and BH-6; below the peat in BH-7 and below the gravelly sand in BH-9. The silty clay layer extended to depths ranging between 3.1 m to 15.9 m below ground surface with elevations ranging between 313.7 m to 305.2 m. The explored thickness of this layer was between 0.7 m and 9.0 m. All the boreholes were terminated within this layer.

The composition of this layer is silt and clay and occasional sand pockets/layers. The material is brown to grey in color, and moist. The SPT "N" values within this layer ranged from 10 to 38 blows per 0.3 m penetration, suggesting stiff to hard consistency but generally stiff to very stiff consistency.

Laboratory testing performed on selected sample consisted of forty six (46) moisture content tests, thirteen (15) grain size distribution tests and twelve (14) Atterberg Limit tests. The test results are as follow:

Moisture Content:

- 15% to 35%

Grain Size Distribution:

- 0% to 1% gravel;
- 0% to 24% sand;
- 45% to 90% silt; and
- 8% to 49% clay

Atterberg limits

- Liquid Limit: 40% to 42%
- Plastic Limit: 13% to 21%
- Plasticity Index: 19% to 29%

The results of the moisture content, grain size distribution tests and Atterberg Limit tests are provided on the record of borehole sheets in Appendix C. The result of the grain size distribution tests and Atterberg Limit tests are also provided on Figure 4,5,6 and 7 in Appendix D.

1.4.9 Gravelly Sand

Native gravelly sand was encountered below the peat in BH-9. The gravelly sand layer extended to depth of about 8.4 m below ground surface with elevation about 313.2 m. The explored thickness of this layer was about 2.1 m.

The composition of this layer is sand and gravel, trace silt. The material is brown to grey in color, and moist. The SPT "N" values within this layer ranged from 8 to 20 blows per 0.3 m penetration, suggesting loose to compact relative density.

Laboratory testing performed on selected sample consisted of three (3) moisture content tests and one (1) grain size distribution tests. The test results are as follow:

Moisture Content:

- 15% to 21%

Grain Size Distribution:

- 24% gravel;
- 67% sand;
- 9% silt and clay

The results of the moisture content and grain size distribution tests are provided on the record of borehole sheets in Appendix C. The result of the grain size distribution test is also provided on Figure 3 in Appendix D.

1.5 Groundwater & Surface Water Conditions

Information on groundwater levels at the site was obtained by measuring water levels in the open boreholes after completion of drilling. The groundwater levels encountered in the boreholes are shown on the borehole logs and presented below in Table 1.1.

Table 1.1. Groundwater data

Borehole	Date Completed	Date Measured	Ground Surface Elevation ²	Depth to Water ³	Groundwater Elevation
BH-1	May 01/17	May 01/17	319.3	7.6	311.7
BH-2	May 02/17	May 02/17	320.3	6.1	314.2
BH-3	May 05/17	May 05/17	315.9	0.3	315.6
BH-4	May 04/17	May 04/17	321.2	3.1	318.1 ⁴
BH-5	May 03/17	May 03/17	321.1	9.2	311.9
BH-6	May 02/17	May 02/17	320.7	4.3	316.4
BH-7	May 04/17	May 04/17	321.5	7.6	313.9

Borehole	Date Completed	Date Measured	Ground Surface Elevation ²	Depth to Water ³	Groundwater Elevation
BH-8	May 05/17	May 05/17	316.8	0.3	316.5
BH-9	May 03/17	May 03/17	321.6	3.1	318.5 ⁴
Notes: 1) All units in metres. 2) Elevations surveyed are referenced to a temporary benchmark (TBM) set on top of catch basin at maiden ditch approximately 105 m north of the existing culvert alignment on south of highway. The TBM elevation (322.0 m) is assumed based on the Information provided on as built drawings provided by the MTO. 3) Depths are relative to ground surface. 4) High groundwater level could be due to borehole caved at shallow depth					

Note that water levels measured in open boreholes might not be stabilized due to short term observation. At the time of investigation, water level in culvert at inlet and outlet sides were measured at approximate Elevations 318.5 m and 314.9 m, respectively. Observations at the time of investigation infer groundwater at about Elevation 318.5 m at inlet reduces down to about 316.5 and 316.0 m near BH-2 at center, and BH-5 at the crest edge; respectively. At the outlet, the groundwater level is inferred to be at about Elevation 315.0 m. In the area of storm water drainage pipe (BH-7 and BH-8) the ground water level is inferred to be near Elevation 316.5 m.

Seasonal variations in the water table should be expected, with higher levels occurring during wetter periods of the year and lower levels during drier periods. Some mounded and perched water could exist in the embankment fill as well and this would be affected by the prevailing weather conditions with higher levels occurring during wet periods.

1.6 Chemical Analyses

One soil sample was selected for chemical analysis and was sent to AGAT laboratories, a CALA-certified and accredited laboratory in Mississauga, Ontario. The analytical laboratory results are presented in Appendix E, and are summarized in Table 1.2, below.

Table 1.2. Corrosivity chemical analysis

Sample Identification	pH (unitless)	Soluble Chloride (ppm)	Soluble Sulphate (ppm)	Resistivity (ohm-cm)	Conductivity (mS/cm)	Redox Potential (mV)	Sulphide (%)
BH1-SS2 Sand to Silty Sand Fill	8.77	94	16	3100	0.323	206	<0.05

July 7, 2017

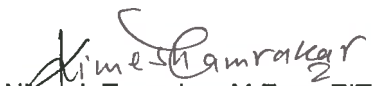
PART II: CLOSURE

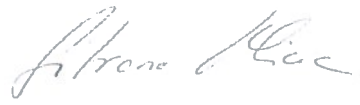
A subsurface investigation is a limited sampling of a site; the subsurface conditions have been established only at the test hole locations. Should conditions at the site be encountered which differ from those reported at the test locations, we require that we be notified immediately in order to assess this additional information and our recommendations, as appropriate. It may then be necessary to perform additional investigation and analysis.

Contractors bidding on or undertaking any proposed work at this site should, relative to the subsurface conditions, decide on their own investigations, if deemed necessary, as well as their own interpretations of the factual results provided herein, so they may draw their own conclusions as to how the subsurface conditions may affect them.

This Foundation Investigation and Design Report has been prepared by Nimesh Tamrakar, M.Eng, EIT., and Silvana Micic, Ph.D., P.Eng. It was reviewed by TaeChul Kim, P.Eng. and by Stan E. Gonsalves, M.Eng., P.Eng., Designated MTO Foundation Contact. The field investigation was supervised by Aziz Abdelmessih.


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PART III: LIMITATIONS AND USE OF REPORT

BASIS OF REPORT

This report ("Report") is based on site conditions known or inferred by the geotechnical investigation undertaken as of the date of the Report. Should changes occur which potentially impact the geotechnical condition of the site, or if construction is implemented more than one year following the date of the Report, the recommendations of exp may require re-evaluation.

The Report is provided solely for the guidance of design engineers and on the assumption that the design will be in accordance with applicable codes and standards. Any changes in the design features which potentially impact the geotechnical analyses or issues concerning the geotechnical aspects of applicable codes and standards will necessitate a review of the design by exp. Additional field work and reporting may also be required.

Where applicable, recommended field services are the minimum necessary to ascertain that construction is being carried out in general conformity with building code guidelines, generally accepted practices and exp's recommendations. Any reduction in the level of services recommended will result in exp providing qualified opinions regarding the adequacy of the work. exp can assist design professionals or contractors retained by the Client to review applicable plans, drawings, and specifications as they relate to the Report or to conduct field reviews during construction.

Contractors contemplating work on the site are responsible for conducting an independent investigation and interpretation of the borehole results contained in the Report. The number of boreholes necessary to determine the localized underground conditions as they impact construction costs, techniques, sequencing, equipment and scheduling may be greater than those carried out for the purpose of the Report.

Classification and identification of soils, rocks, geological units, contaminant materials, building envelopment assessments, and engineering estimates are based on investigations performed in accordance with the standard of care set out below and require the exercise of judgment. As a result, even comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations or building envelope descriptions involve an inherent risk that some conditions will not be detected. All documents or records summarizing investigations are based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated. Some conditions are subject to change over time. The Report presents the conditions at the sampled points at the time of sampling. Where special concerns exist, or the Client has special considerations or requirements, these should be disclosed to exp to allow for additional or special investigations to be undertaken not otherwise within the scope of investigation conducted for the purpose of the Report.

RELIANCE ON INFORMATION PROVIDED

The evaluation and conclusions contained in the Report are based on conditions in evidence at the time of site inspections and information provided to exp by the Client and others. The Report has been prepared for the specific site, development, building, design or building assessment objectives and purpose as communicated by the Client. exp has relied in good faith upon such representations, information and instructions and accepts no responsibility for any deficiency, misstatement or

inaccuracy contained in the Report as a result of any misstatements, omissions, misrepresentation or fraudulent acts of persons providing information. Unless specifically stated otherwise, the applicability and reliability of the findings, recommendations, suggestions or opinions expressed in the Report are only valid to the extent that there has been no material alteration to or variation from any of the information provided to exp.

STANDARD OF CARE

The Report has been prepared in a manner consistent with the degree of care and skill exercised by engineering consultants currently practicing under similar circumstances and locale. No other warranty, expressed or implied, is made. Unless specifically stated otherwise, the Report does not contain environmental consulting advice.

COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment form part of the Report. This material includes, but is not limited to, the terms of reference given to exp by its client ("Client"), communications between exp and the Client, other reports, proposals or documents prepared by exp for the Client in connection with the site described in the Report. In order to properly understand the suggestions, recommendations and opinions expressed in the Report, reference must be made to the Report in its entirety. exp is not responsible for use by any party of portions of the Report.

USE OF REPORT

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Appendix A – Site Photographs



Photo 1: Looking north on Ramp E/W-N from Bridgeport Road



Photo 2: Looking south-east at inlet of the existing culvert



Photo 3: Looking west from the inlet of the existing culvert



Photo 4: Looking north towards inlet of existing culvert



Photo 5: Looking north on east side slope (outlet side)



Photo 6: Looking east from top of the embankment towards outlet of the existing culvert



Photo 7: Looking north from the existing culvert outlet



Photo 8: Looking south from the existing culvert outlet



Photo 9: Looking north from the storm water pipe outlet



Photo 10: Looking south from the storm water pipe outlet



Photo 11: Slope failure above the existing culvert looking west-north from the outlet



Photo 12: Slope failure above the existing culvert looking west from the outlet

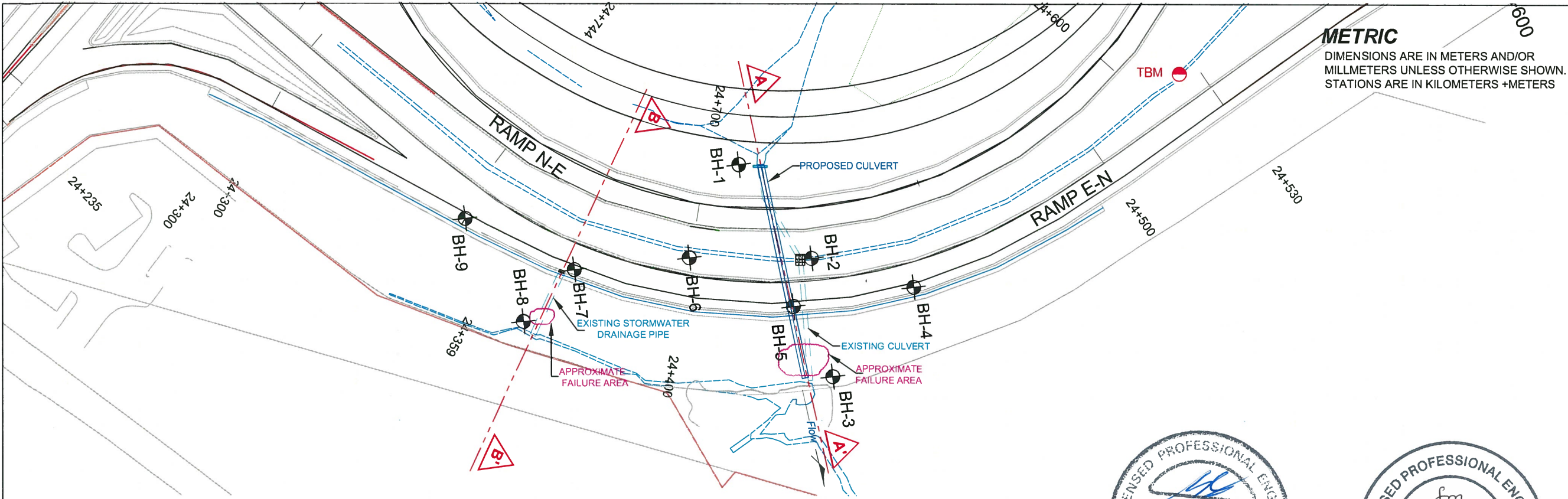


Photo 13: Slope failure above the storm water pipe looking north from the outlet



Photo 14: Slope failure above the storm water pipe looking west from the outlet

Appendix B – Drawings



METRIC
DIMENSIONS ARE IN METERS AND/OR
MILLIMETERS UNLESS OTHERWISE SHOWN.
STATIONS ARE IN KILOMETERS +METERS

WR Agreement No. 3015-E-0017
Assignment No. 5
W.O. 2017-11009

**CULVERT REPLACEMENT
HWY 85, BRIDGEPORT INTERCHANGE
BOREHOLE LOCATION PLAN AND SOIL STRATA**

SHEET

exp

exp Services Inc.

KEY PLAN

LEGEND

New Borehole by EXP

Standard Penetration Test (Blows/0.3 m)

Water Level Upon Completion of Drilling

Inferred GWL at Time of Investigation

Temporary Bench Mark

SOIL STRATA SYMBOLS

ASPHALT

FILL

SILTY CLAY

PEAT

TOPSOIL

ORGANIC SILTY CLAY

GRAVELLY SAND

BH No.	APPROX. ELEV.	MTM CO-ORDINATES	
		NORTH	EAST
BH-1	319.3	4815565.1	224474.5
BH-2	320.3	4815591.7	224473.6
BH-3	315.9	4815615.8	224485.3
BH-4	321.2	4815610.5	224458.8
BH-5	321.1	4815598.0	224483.2
BH-6	320.7	4815575.3	224495.7
BH-7	321.5	4815562.2	224518.0
BH-8	316.8	4815564.8	224534.1
BH-9	321.6	4815538.5	224531.2
TBM	322.0	4815607.3	224382.6

NOTE

This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.

The complete foundation investigation and design report for this project and other related documents may be examined at the Materials Engineering and Research Office, Downsview. Information contained in the report and related documents are specifically excluded in accordance with the conditions of Section GC 2.01 of O.P.S. Gen. Cond.

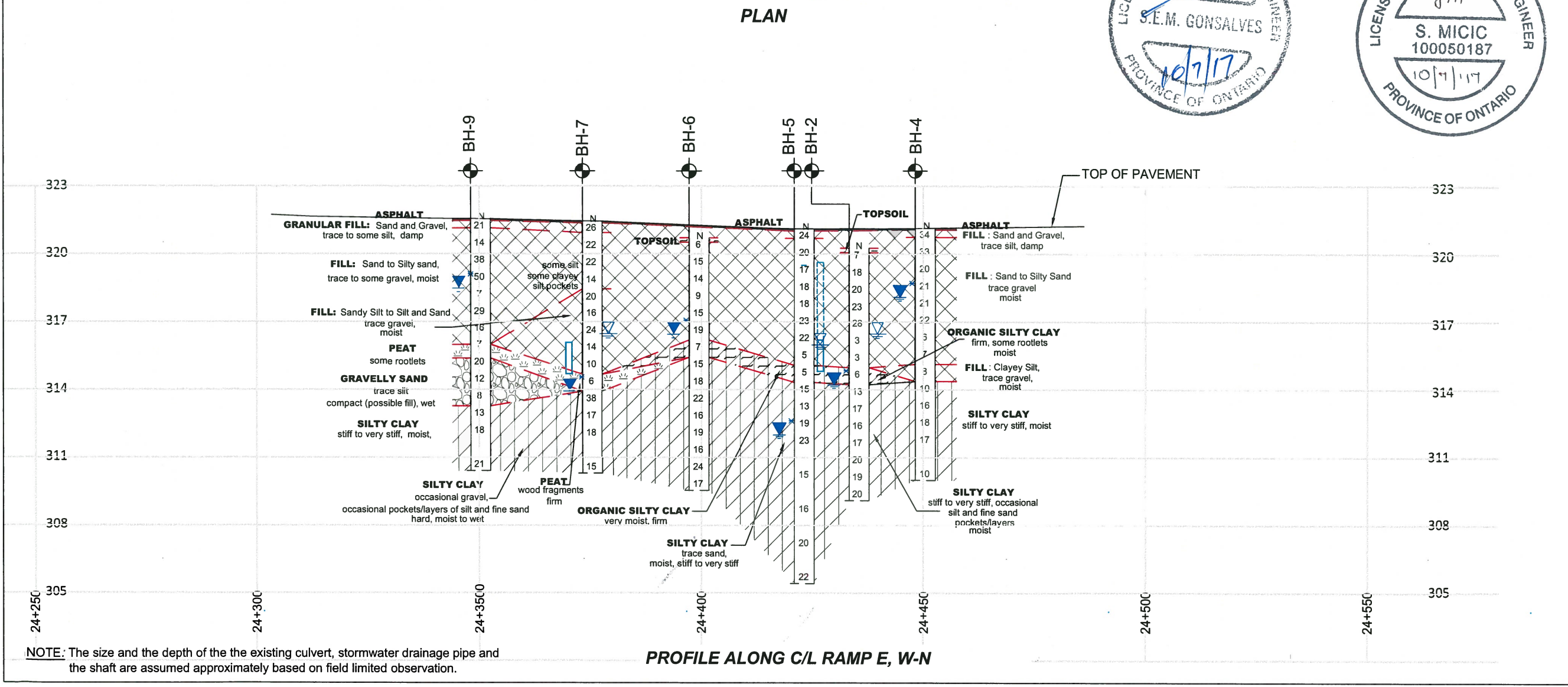
the size and the depth of the the existing culvert, stormwater drainage pipe and the shaft are assumed approximately based on field limited observation.

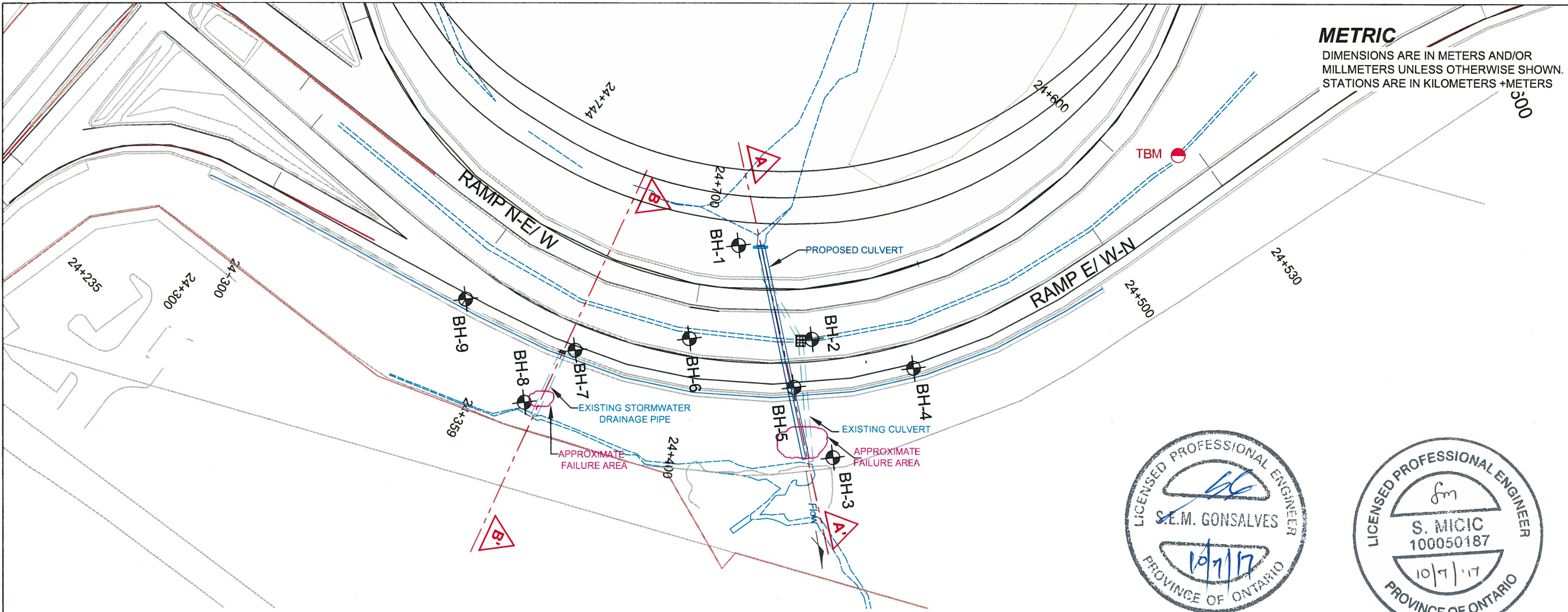
SCALE

HOR 0 25 m

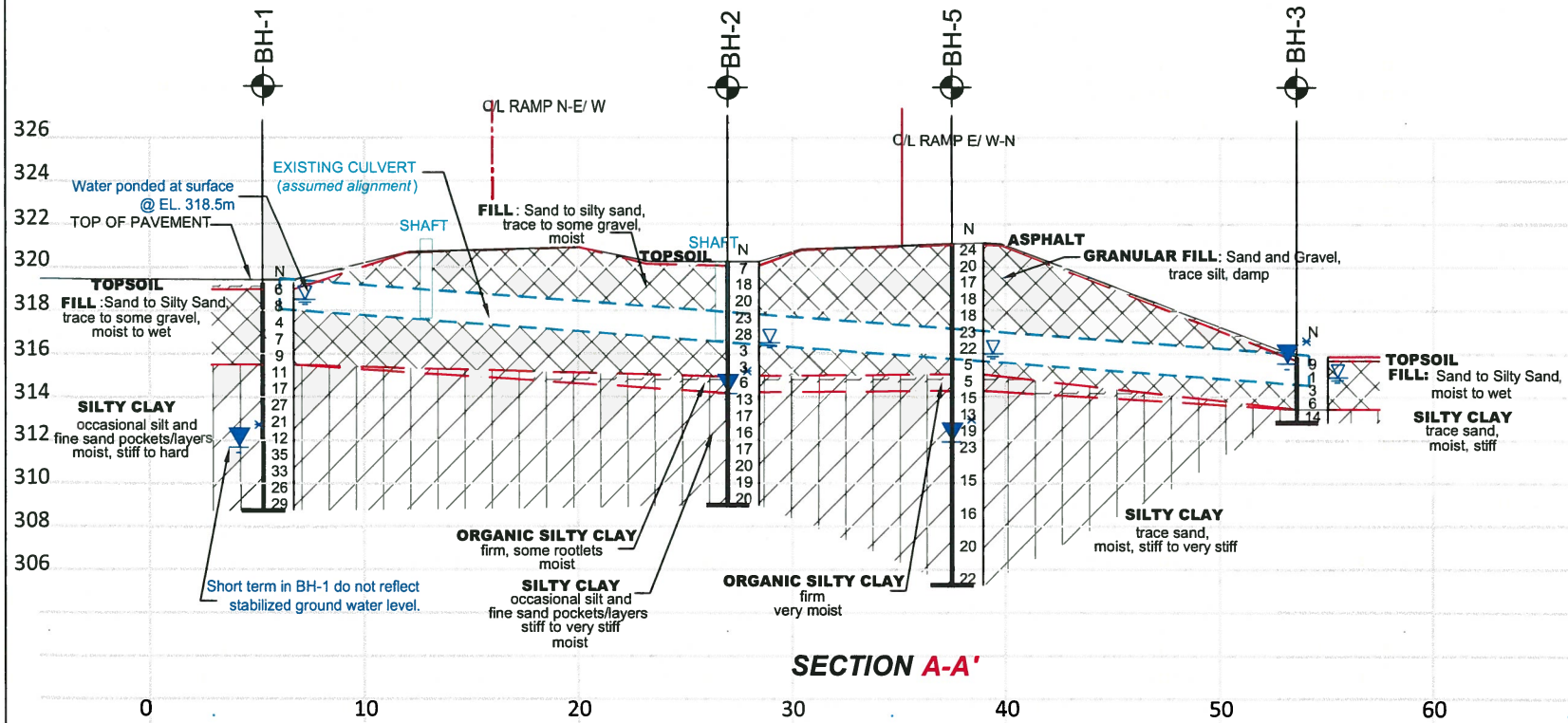
VRT 0 5 m

10/07/2017	-	SUBMISSION FOR MTQ REVIEW	
DATE	BY	DESCRIPTION	
		GEOCRES NO. 40P8-244	
		PROJECT NO. ADM-00235197-F9	
SUBMD SM	CHECKED SM	DATE	10/07/2017
DRAWN SH	CHECKED SG	APPROVED SG	DWG. 1

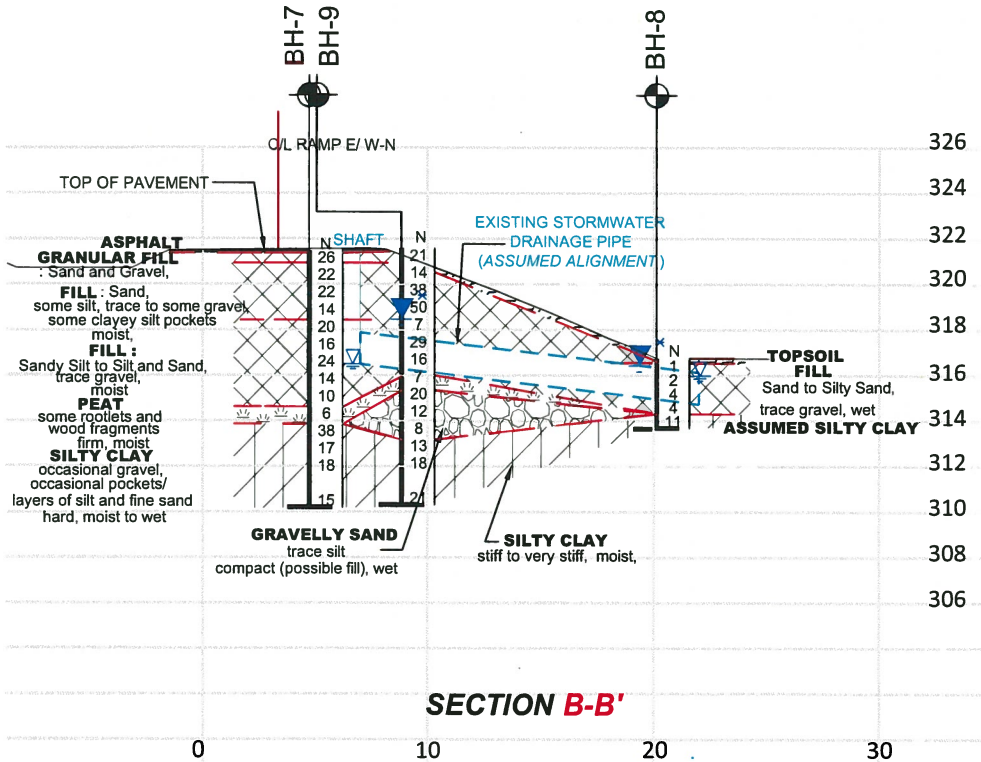




PLAN



SECTION A-A'



SECTION B-B'

NOTE: The size and the depth of the the existing culvert, stormwater drainage pipe and the shaft are assumed approximately based on field limited observation.

METRIC
DIMENSIONS ARE IN METERS AND/OR
MILLIMETERS UNLESS OTHERWISE SHOWN.
STATIONS ARE IN KILOMETERS +METERS

WR Agreement No. 3015-E-0017
Assignment No. 5
W.O. 2017-11009

SHEET

CULVERT REPLACEMENT
HWY 85, BRIDGEPORT INTERCHANGE
BOREHOLE LOCATION PLAN AND SOIL STRATA

exp Services Inc.

KEY PLAN

LEGEND

New Borehole by EXP

Standard Penetration Test (Blows/0.3 m)

Water Level Upon Completion of Drilling

Inferred GWL at Time of Investigation

Temporary Bench Mark

SOIL STRATA SYMBOLS

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PEAT

TOPSOIL

ORGANIC SILTY CLAY

GRAVELLY SAND

BH No.	APPROX. ELEV.	MTM CO-ORDINATES	
		NORTH	EAST
BH-1	319.3	4815565.1	224474.5
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BH-5	321.1	4815598.0	224483.2
BH-6	320.7	4815575.3	224495.7
BH-7	321.5	4815562.2	224518.0
BH-8	316.8	4815564.8	224534.1
BH-9	321.6	4815538.5	224531.2
TBM	322.0	4815607.3	224382.6

NOTE

This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents

The complete foundation investigation and design report for this project and other related documents may be examined at the Materials Engineering and Research Office, Downsview. Information contained in the report and related documents are specifically excluded in accordance with the conditions of Section GC 2.01 of OPS Gen. Cond.

SCALE

10/07/2017	-	SUBMISSION FOR MTQ REVIEW	
DATE	BY	DESCRIPTION	
		GEOCRES NO. 40P8-244	
		PROJECT NO. ADM-00235197-F0	
SUBMD SM	CHECKED SM	DATE	10/07/2017
DRAWN SH	CHECKED SG	APPROVED SG	DWG. 2

Appendix C – Borehole Logs

Explanation of Terms Used on Borehole Records

SOIL DESCRIPTION

Terminology describing common soil genesis:

Topsoil: mixture of soil and humus capable of supporting good vegetative growth.

Peat: fibrous fragments of visible and invisible decayed organic matter.

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 geotechnical site investigation.

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.

Terminology describing soil structure:

Desiccated: having visible signs of weathering by oxidization of clay minerals, shrinkage cracks, etc.

Stratified: alternating layers of varying material or color with the layers greater than 6 mm thick.

Laminated: alternating layers of varying material or color with the layers less than 6 mm thick.

Fissured: material breaks along plane of fracture.

Varved: composed of regular alternating layers of silt and clay.

Slickensided: fracture planes appear polished or glossy, sometimes striated.

Blocky: cohesive soil that can be broken down into small angular lumps which resist further breakdown.

Lensed: inclusion of small pockets of different soil, such as small lenses of sand scattered through a mass of clay; not thickness.

Seam: a thin, confined layer of soil having different particle size, texture, or color from materials above and below.

Homogeneous: same color and appearance throughout.

Well Graded: having wide range in grain sized and substantial amounts of all predominantly on grain size.

Uniformly Graded: predominantly on grain size.

All soil sample descriptions included in this report follow generally the ASTM D2487-11 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System) with some modification to reflect current MTO practices. The system divides soils into three major categories: (1) coarse grained, (2) fine-grained, and (3) highly organic. The soil is then subdivided based on either gradation or plasticity characteristics. The system provides a group symbol (e.g. SM) and group name (e.g. silty sand) for identification. The classification excludes particles larger than 76 mm. Please note that, with the exception of those samples where a grain size analysis has been made, all samples are classified visually in accordance with ASTM D2488-09a Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems. Others may use different classification systems; one such system is the ISSMFE Soil Classification.

ISSMFE SOIL CLASSIFICATION											
CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE		
<div><div>0.002</div><div>0.006</div><div>0.02</div><div>0.06</div><div>0.2</div><div>0.6</div><div>2.0</div><div>6.0</div><div>20</div><div>60</div><div>200</div></div>											
EQUIVALENT GRAIN DIAMETER IN MILLIMETRES											
CLAY (PLASTIC) TO				FINE		MEDIUM		CRS.	FINE	COARSE	
SILT (NONPLASTIC)				SAND				GRAVEL			
UNIFIED SOIL CLASSIFICATION											

Terminology describing materials outside the USCS, (e.g. particles larger than 76 mm, visible organic matter, construction debris) is based upon the proportion of these materials present and as described below in accordance with Note 16 in ASTM D2488-09a:

Table a: Percent or Proportion of Soil, Pp

	Criteria
Trace	Particles are present but estimated to be less than 5%
Few	$5 \leq Pp \leq 10\%$
Little	$15 \leq Pp \leq 25\%$
Some	$30 \leq Pp \leq 45\%$
Mostly	$50 \leq Pp \leq 100\%$

The standard terminology to describe cohesionless soils includes the compactness as determined by the Standard Penetration Test 'N' value:

Table b: Apparent Density of Cohesionless Soil

	'N' Value (blows/0.3 m)
Very Loose	$N < 5$
Loose	$5 \leq N < 10$
Compact	$10 \leq N < 30$
Dense	$30 \leq N < 50$
Very Dense	$50 \leq N$

The standard terminology to describe cohesive soils includes consistency, which is based on undrained shear strength as measured by insitu vane tests, penetrometer tests, unconfined compression tests or similar field and laboratory analysis, Standard Penetration Test 'N' values can also be used to provide an approximate indication of the consistency and shear strength of fine grained, cohesive soils:

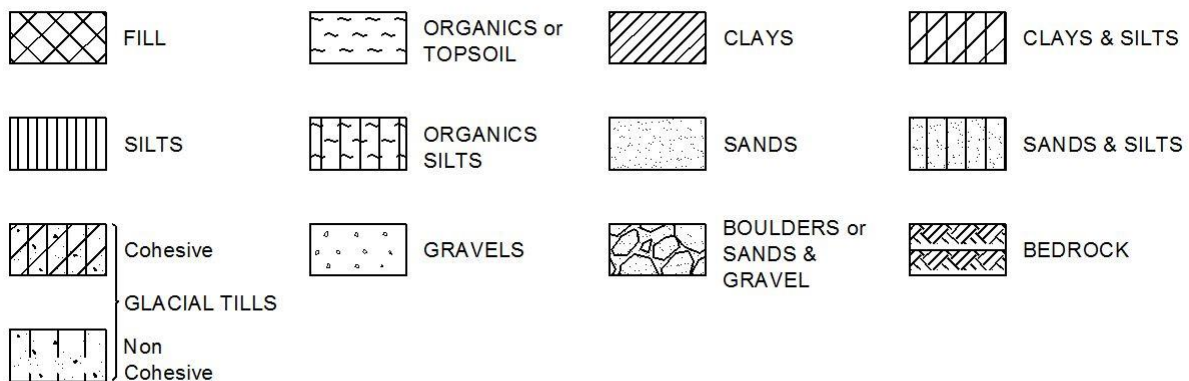
Table c: Consistency of Cohesive Soil

Consistency	Vane Shear Measurement (kPa)	'N' Value
Very Soft	<12.5	<2
Soft	12.5-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very Stiff	100-200	15-30
Hard	>200	>30

Note: 'N' Value - The Standard Penetration Test records the number of blows of a 140 pound (64kg) hammer falling 30 inches (760mm), required to drive a 2 inch (50.8mm) O.D. split spoon sampler 1 foot (305mm). For split spoon samples where full penetration is not achieved, the number of blows is reported over the sampler penetration in meters (e.g. 50/0.15).

STRATA PLOT

Strata plots symbolize the soil or bedrock description. They are combinations of the following basic symbols:



WATER LEVEL MEASUREMENT



Open Borehole or Test Pit



Monitoring Well, Piezometer or Standpipe

ABBREVIATIONS AND SYMBOLS

FIELD SAMPLING

SS	Split spoon sample (obtained from the Standard Penetration Test)
WS	Wash sample
BS	Bulk sample
TW	Thin wall sample or Shelby tube
PS	Piston sample
AS	Auger sample
VT	Vane test
GS	Grab sample
HQ, NQ, etc.	Rock core samples obtained with the use of standard size diamond drilling bits

STRESS AND STRAIN

u_w	kPa	Pore water pressure
r_u	1	Pore pressure ratio
σ	kPa	Total normal stress
σ'	kPa	Effective normal stress
τ	kPa	Shear stress
$\sigma_1, \sigma_2, \sigma_3$	kPa	Principal stresses
ε	%	Linear strain
$\varepsilon_1, \varepsilon_2, \varepsilon_3$	%	Principal strains
E	kPa	Modulus of linear deformation
G	kPa	Modulus of shear deformation
μ	1	Coefficient of friction

MECHANICAL PROPERTIES OF SOIL

m_v	kPa^{-1}	Coefficient of volume change
c_c	1	Compression index
c_s	1	Swelling index
c_r	1	Recompression index
c_v	m^2/s	Coefficient of consolidation
H	m	Drainage path
T_v	1	Time factor
U	%	Degree of consolidation
σ'_{v0}	kPa	Effective overburden pressure
σ'_p	kPa	Preconsolidation pressure
τ_f	kPa	Shear strength
c'	kPa	Effective cohesion intercept
ϕ'	$-\circ$	Effective angle of internal friction
c_u	kPa	Apparent cohesion intercept
ϕ_u	$-\circ$	Apparent angle of internal friction
τ_R	kPa	Residual shear strength
τ_r	kPa	Remoulded shear strength
S_t	1	Sensitivity = c_u/τ_r

PHYSICAL PROPERTIES OF SOIL

P_s	kg/m^3	Density of solid particles
γ_s	kN/m^3	Unit weight of solid particles
ρ_w	kg/m^3	Density of water
γ_w	kN/m^3	Unit weight of water
ρ	kg/m^3	Density of soil
γ	kN/m^3	Unit weight of soil
ρ_d	kg/m^3	Density of dry soil
γ_d	kN/m^3	Unit weight of dry soil
ρ_{sat}	kg/m^3	Density of saturated soil
γ_{sat}	kN/m^3	Unit weight of saturated soil
ρ'	kg/m^3	Density of submerged soil
γ'	kN/m^3	Unit weight of submerged soil
e	1, %	Void ratio
n	1, %	Porosity
w	1, %	Water content
S_r	%	Degree of saturation
W_L	%	Liquid limit
W_P	%	Plastic limit
W_s	%	Shrinkage limit
I_p	%	Plasticity index = $(W_L - W_P)$
I_L	%	Liquidity index = $(W - W_P)/I_p$
I_C	%	Consistency index = $(W_L - W)/I_p$
e_{max}	1, %	Void ratio in loosest state
e_{min}	1, %	Void ratio in densest state
I_D	1	Density index = $(e_{max} - e)/(e_{max} - e_{min})$
D	mm	Grain diameter
D_n	mm	N percent - diameter
C_u	1	Uniformity coefficient
h	m	Hydraulic head or potential
q	m^3/s	Rate of discharge
v	m/s	Discharge velocity
i	1	Hydraulic gradient
k	m/s	Hydraulic conductivity
j	kN/m^3	Seepage force

Brampton, Ontario

RECORD OF BOREHOLE No BH-1

1 OF 1

METRIC

W.P. 2017-11009 LOCATION Hwy 85, Kitchner, MTM ON10 N4815565.1, E224474.5 ORIGINATED BY AA
 DIST Waterloo HWY 85 TEST PIT TYPE Continuous Flight Hollow Stem Augers COMPILED BY JG
 DATUM TBM (322.00 m) DATE 2017.05.01 - 2017.05.01 LATITUDE 43.4756897 LONGITUDE -80.4928833 CHECKED BY SM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)		
								○ UNCONFINED		+ FIELD VANE								● QUICK TRIAXIAL		× LAB VANE
319.3	Ground Surface						20	40	60	80	100									
0.0 319.0	TOPSOIL: (~305 mm thick)		1	SS	6	▽	319							○			18 55 (27)			
0.3	FILL: SAND TO SILTY SAND trace to some gravel, brown, very moist		2	SS	8		318								○					
			3	SS	4									○						
			4	SS	7		317								○					
			5	SS	9		316								○					
			6	SS	11		315								○					
315.5 3.8	SILTY CLAY: brown to grey, moist, stiff to hard, occasional silt and fine sand pockets/layers		7	SS	17										○			0 24 49 27 Wet Spoon		
			8	SS	27		314								○					
			9	SS	21		313								○			0 8 84 8		
			10	SS	12		312								○					
			11	SS	35		311								○			0 3 57 40		
			12	SS	33		310								○					
			13	SS	26										○					
			14	SS	29		309								○					
308.8 10.5	End of borehole at 10.5 m depth. Water level at 7.6 m upon completion of drilling. Borehole open to 9.15 m and water level measure at 7.6 m upon completion of drilling Notes: 1. This drawing is to be read with the subject report and project numbers as presented above. 2. Groundwater level was measured in open hole upon completion of drilling.																			

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

ONTARIO MTO ASSIGNMENT#5.GPJ ONTARIO MTO.GDT 7/11/17

Brampton, Ontario

RECORD OF BOREHOLE No BH-2

1 OF 1

METRIC

W.P. 2017-11009 LOCATION Hwy 85, Kitchner, MTM ON10 N4845591.7, E224473.6 ORIGINATED BY AA
 DIST Waterloo HWY 85 TEST PIT TYPE Continuous Flight Hollow Stem Augers COMPILED BY JG
 DATUM TBM (322.00 m) DATE 2017.05.02 - 2017.05.02 LATITUDE 43.475929 LONGITUDE -80.4928983 CHECKED BY SM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
320.3	Ground Surface							20	40	60	80	100					
320.0	TOPSOIL: (~200 mm thick)							20	40	60	80	100					
0.2	FILL: SAND TO SILTY SAND trace to some gravel, brown, moist		1	SS	7		320										
			2	SS	18		319										
	some silty clay pockets at 1.5 m depth		3	SS	20		318										
	layer of moist, grey, clayey silt at 2.3 m depth		4	SS	23		317										
			5	SS	28		316										10 53 (37)
	saturated below 3.8 m depth		6	SS	3		315										Wet Spoon
	dark brown to black, some organics and wood fibres below 4.6 m depth		7	SS	3		314										
315.0							313										
5.3	ORGANIC SILTY CLAY: black, moist, firm, some rootlets		8	SS	6		312										
314.2							311										
6.1	SILTY CLAY: brown, moist, stiff to very stiff, occasional silt and fine sand pockets/layers		9	SS	13		310										0 13 55 32
	light brown to grey below 6.9 m depth		10	SS	17		309										
			11	SS	16												
			12	SS	17												
			13	SS	20												0 6 55 39
			14	SS	19												
			15	SS	20												0 0 90 10
309.0																	
11.3	End of borehole at 11.3 m depth. Borehole open to 8.85 m and water level measured at 6.1 m upon completion of drilling																
	Notes: 1. This drawing is to be read with the subject report and project numbers as presented above. 2. Groundwater level was measured in open hole upon completion of drilling.																

+³, ×³: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

ONTARIO MTO ASSIGNMENT#5.GPJ ONTARIO MTO.GDT 7/11/17

Brampton, Ontario

RECORD OF BOREHOLE No BH-3

1 OF 1

METRIC

W.P. 2017-11009 LOCATION Hwy 85, Kitchner, MTM ON10 N4815615.8, E224485.3 ORIGINATED BY AA
 DIST Waterloo HWY 85 TEST PIT TYPE Manual SPT COMPILED BY JG
 DATUM TBM (322.00 m) DATE 2017.05.05 - 2017.05.05 LATITUDE 43.4761472 LONGITUDE -80.4927573 CHECKED BY SM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										
315.9	Ground Surface																	
315.0	TOPSOIL: (~200 mm thick)		1	SS	9	▽	315										0 84 (16)	
0.2	FILL: SAND TO SILTY SAND brown, moist to wet		2	SS	1													
	wet, pockets of organic silt and rootlets below 0.8 m depth		3	SS	3													
			4	SS	6													
313.4							314											
2.4	SILTY CLAY: trace sand, brown, moist, stiff		5	SS	14		313										0 6 57 37	
312.8																		
3.1	End of borehole at 3.1 m depth. Borehole open to 0.76 m and water level measured at 0.3 m upon completion of drilling																	
	Notes: 1. This drawing is to be read with the subject report and project numbers as presented above. 2. Groundwater level was measured in open hole upon completion of drilling. 3. SPT "N" values corrected for manual operations (70 lb drop weight, 15 inch drop height)																	

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

Brampton, Ontario

RECORD OF BOREHOLE No BH-4

1 OF 1

METRIC

W.P. 2017-11009 LOCATION Hwy 85, Kitchner, MTM ON10 N4815610.5, E224458.8 ORIGINATED BY AA
 DIST Waterloo HWY 85 TEST PIT TYPE Continuous Flight Hollow Stem Augers COMPILED BY JG
 DATUM TBM (322.00 m) DATE 2017.05.04 - 2017.05.04 LATITUDE 43.4760967 LONGITUDE -80.493084 CHECKED BY SM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									WATER CONTENT (%)		
								○ UNCONFINED		+ FIELD VANE							○		
							20	40	60	80	100								
321.2	Road Surface																		
320.9	ASPHALT: (~100 mm thick)		1	SS	34														
320.8	FILL: SAND AND GRAVEL sand and gravel, trace silt, brown, damp (~330 mm thick)		2	SS	33											1 72 (27)			
0.4	FILL: SAND TO SILTY SAND trace gravel, brown, moist		3	SS	20														
	clayey silt, trace sand layer at 2.3 m depth		4	SS	21											0 21 60 19			
	gravelly, some silty clay pockets, trace wood fibres below 3.1 m depth		5	SS	21														
	trace gravel, dark brown, some organic staining below 3.8 m depth		6	SS	22											3 69 (28)			
	light brown to grey, wet below 4.6 m depth		7	SS	6											Wet Spoon			
	brown and dark brown, occasional rootlets below 5.3 m depth		8	SS	7														
315.1																			
6.1	FILL: CLAYEY SILT trace gravel, light brown, moist		9	SS	8														
314.3																			
6.9	SILTY CLAY: light brown, moist, stiff to very stiff		10	SS	10														
			11	SS	16														
	grey below 8.4 m depth		12	SS	18											0 0 64 36			
			13	SS	17														
	very moist below 10.7 m depth		14	SS	10														
309.9																			
11.3	End of borehole at 11.3 m depth. Borehole open to 4.3 m and water level measured at 3.1 m upon completion of drilling																		
	Notes: 1. This drawing is to be read with the subject report and project numbers as presented above. 2. Groundwater level was measured in open hole upon completion of drilling.																		

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

ONTARIO MTO ASSIGNMENT#5.GPJ ONTARIO MTO.GDT 7/11/17

Brampton, Ontario

RECORD OF BOREHOLE No BH-5

1 OF 2

METRIC

W.P. 2017-11009 LOCATION Hwy 85, Kitchner, MTM ON10 N4815598.0, E224483.2 ORIGINATED BY AA
 DIST Waterloo HWY 85 TEST PIT TYPE Continuous Flight Hollow Stem Augers COMPILED BY JG
 DATUM TBM (322.00 m) DATE 2017.05.03 - 2017.05.03 LATITUDE 43.4759868 LONGITUDE -80.4927806 CHECKED BY SM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL						
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										W _P	W	W _L
								○ UNCONFINED + FIELD VANE		● QUICK TRIAXIAL × LAB VANE										
321.1	Road Surface						20	40	60	80	100									
320.0	ASPHALT: (~100 mm thick)		1	SS	24															
320.7	FILL: SAND AND GRAVEL sand and gravel, trace silt, brown, damp (~330 mm thick)		2	SS	20															
0.4	FILL: SAND TO SILTY SAND trace gravel, brown, moist																			
	some silty clay pockets below 1.5 m depth		3	SS	17															
			4	SS	18															
			5	SS	18															
			6	SS	23															
			7	SS	22															
	black, very moist, some organics and wood fibres below 5.3 m depth		8	SS	5															
315.0	ORGANIC SILTY CLAY: black, very moist, firm		9	SS	5															
314.2	SILTY CLAY: trace sand, light brown, moist, stiff to very stiff		10	SS	15															
6.9	light brown to grey below 7.6 m depth		11	SS	13															
			12	SS	19															
			13	SS	23															
			14	SS	15															
			15	SS	16															
	some sand pockets below 13.7 m depth		16	SS	20															

Continued Next Page

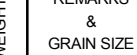
+³, ×³: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

ONTARIO MTO ASSIGNMENT#5.GPJ ONTARIO MTO.GDT 7/11/17

Brampton, Ontario

2 OF 2

METRIC

SOIL PROFILE														
ELEV DEPTH	DESCRIPTION	<div>STRAT PLOT</div>	SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 	<div>PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT</div> <div>w_p w w_L</div> <div>WATER CONTENT (%)</div> <div>20 40 60</div>	<div>UNIT WEIGHT</div> <div>γ</div> <div>kN/m³</div>	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
N° VALUES			Type	NUMBER	GR			SA			SI	CL		
305.2	SILTY CLAY: trace sand, light brown, moist, stiff to very stiff (<i>continued</i>)	<div style="background-image: linear-gradient(to top right, transparent 49%, black 49% 51%, black 51% 53%, transparent 53%); background-size: 4px 4px;"></div>	17	SS	22		306							
15.9	End of borehole at 15.9 m depth. Water level at 9.2 m upon completion of drilling.													
<div>Notes:</div> <div>1. This drawing is to be read with the subject report and project numbers as presented above.</div> <div>2. Groundwater level was measured in open hole upon completion of drilling.</div>														

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

ONTARIO MTO ASSIGNMENT#5.GPJ ONTARIO MTO.GDT 7/11/17

Brampton, Ontario

RECORD OF BOREHOLE No BH-6

1 OF 1

METRIC

W.P. 2017-11009 LOCATION Hwy 85, Kitchner, MTM ON10 N4815575.3, E224495.7 ORIGINATED BY AA
 DIST Waterloo HWY 85 TEST PIT TYPE Continuous Flight Hollow Stem Augers COMPILED BY JG
 DATUM TBM (322.00 m) DATE 2017.05.02 - 2017.05.02 LATITUDE 43.4757838 LONGITUDE -80.4926228 CHECKED BY SM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									WATER CONTENT (%)		
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE × LAB VANE										
320.7	Ground Surface																		
320.6	TOPSOIL: (~230 mm thick)																		
0.2	FILL: SAND TO SILTY SAND brown, moist		1	SS	6		320										15 56 (29)		
			2	SS	15		319												
			3	SS	14		318												
			4	SS	9		317												
			5	SS	15		316												
	wet to saturated below 3.8 m depth		6	SS	19		315												
316.1							314												
4.6	ORGANIC SILTY CLAY: black, moist, firm, some rootlets		7	SS	7		313												
315.4							312												
5.3	SILTY CLAY: brown, moist, very stiff, occasional silt and fine sand pockets/layers		8	SS	15		311												
	light brown to grey below 6.1 m depth		9	SS	18		310												
			10	SS	22														
			11	SS	16														
			12	SS	19														
			13	SS	16														
			14	SS	24														
			15	SS	17														
309.4																			
11.3	End of borehole at 11.3 m depth. Borehole open to 4.3 m and water level measured at 4.3 m upon completion of drilling																		
	Notes: 1. This drawing is to be read with the subject report and project numbers as presented above. 2. Groundwater level was measured in open hole upon completion of drilling.																		

+³, ×³: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

ONTARIO MTO ASSIGNMENT#5.GPJ ONTARIO MTO.GDT 7/11/17

Brampton, Ontario

RECORD OF BOREHOLE No BH-7

1 OF 1

METRIC

W.P. 2017-11009 LOCATION Hwy 85, Kitchner, MTM ON10 N4815562.2, E224518.0 ORIGINATED BY AA
 DIST Waterloo HWY 85 TEST PIT TYPE Continuous Flight Hollow Stem Augers COMPILED BY JG
 DATUM TBM (322.00 m) DATE 2017.05.04 - 2017.05.04 LATITUDE 43.4756683 LONGITUDE -80.4923452 CHECKED BY SM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)			
								○ UNCONFINED								+ FIELD VANE		● QUICK TRIAXIAL
321.5	Road Surface						20	40	60	80	100							
320.4	ASPHALT: (~100 mm thick)		1	SS	26													
0.1	FILL: SAND AND GRAVEL sand and gravel, trace to some silt, brown, damp (~430 mm thick)																	
321.0	FILL: SAND some silt, trace to some gravel, brown, moist, some clayey silt pockets		2	SS	22													
0.5			3	SS	22													
			4	SS	14													
318.4	brown, moist, clayey silt layer at 2.3 m depth																	
3.1	FILL: SANDY SILT TO SILT AND SAND trace gravel, light brown, moist		5	SS	20													
	grey, moist, clayey silt layer at 3.8 m depth		6	SS	16													
			7	SS	24													
			8	SS	14													
			9	SS	10													
314.6																		
6.9	PEAT: black, moist, firm, some rootlets and wood fragments		10	SS	6													
313.9																		
7.6	SILTY CLAY: occasional gravel, grey, moist to wet, hard, occasional pockets/layers of silt and fine sand		11	SS	38													
	very stiff below 8.4 m depth		12	SS	17													
			13	SS	18													
			14	SS	15													
310.2																		
11.3	End of borehole at 11.3 m depth. Borehole open to 10 m and water level measured at 7.6 m upon completion of drilling																	
	Notes: 1. This drawing is to be read with the subject report and project numbers as presented above. 2. Groundwater level was measured in open hole upon completion of drilling.																	

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

ONTARIO MTO ASSIGNMENT#5.GPJ ONTARIO MTO.GDT 7/11/17

Brampton, Ontario

RECORD OF BOREHOLE No BH-8

1 OF 1

METRIC

W.P. 2017-11009 LOCATION Hwy 85, Kitchner, MTM ON10 N4815564.8, E224534.1 ORIGINATED BY AA
 DIST Waterloo HWY 85 TEST PIT TYPE Manual SPT COMPILED BY JG
 DATUM TBM (322.00 m) DATE 2017.05.05 - 2017.05.05 LATITUDE 43.4756934 LONGITUDE -80.4921466 CHECKED BY SM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)		
								○ UNCONFINED	+	FIELD VANE										
316.8	Ground Surface																			
316.6	TOPSOIL: (~200 mm thick)																			
0.2	FILL: SAND TO SILTY SAND trace gravel, brown, wet		1	SS	1	▽	316										10 64 (26)			
	wet, pockets of organic silt and rootlets below 0.8 m depth		2	SS	2															
			3	SS	4															
	mixed with clayey silt below 1.8 m below grade		4	SS	4															
314.4																				
2.4	ASSUMED SILTY CLAY unable to retrieve sample due to caving sand conditions. Assumed native silty clay below 2.4 m depth based on SPT "N" values.		5	SS	11	314														
313.7																				
3.1	End of borehole at 3.1 m depth. Borehole open to 0.61 m and water level measured at 0.3 m upon completion of drilling Notes: 1. This drawing is to be read with the subject report and project numbers as presented above. 2. Groundwater level was measured in open hole upon completion of drilling. 3. SPT "N" values corrected for manual operations (70 lb drop weight, 15 inch drop height)																			

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

Brampton, Ontario

RECORD OF BOREHOLE No BH-9

1 OF 1

METRIC

W.P. 2017-11009 LOCATION Hwy 85, Kitchner, MTM ON10 N4815538.5, E224531.2 ORIGINATED BY AA
 DIST Waterloo HWY 85 TEST PIT TYPE Continuous Flight Hollow Stem Augers COMPILED BY JG
 DATUM TBM (322.00 m) DATE 2017.05.03 - 2017.05.03 LATITUDE 43.4754564 LONGITUDE -80.4921786 CHECKED BY SM

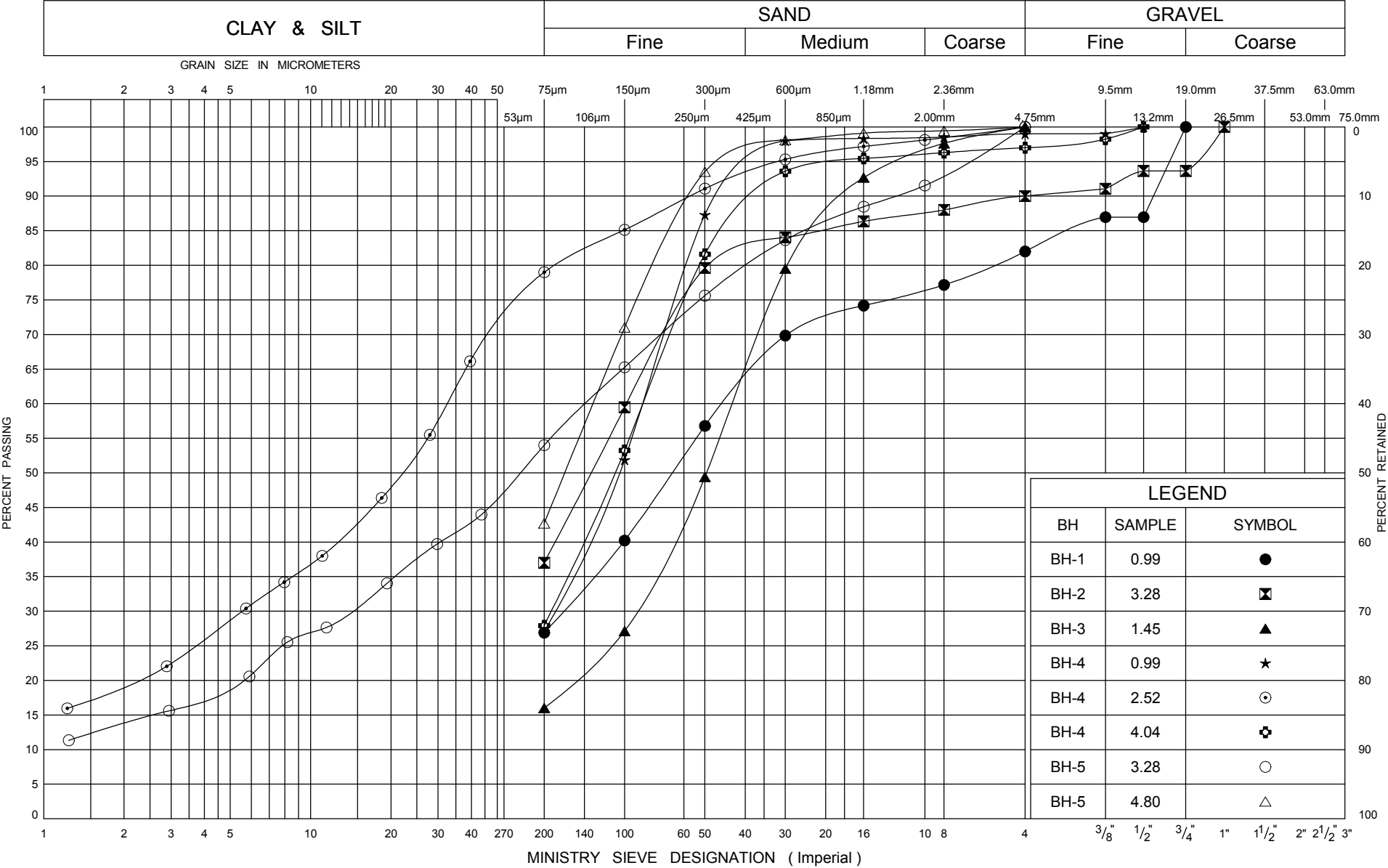
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)		
								○ UNCONFINED		+ FIELD VANE								● QUICK TRIAXIAL		× LAB VANE
321.6	Road Surface						20	40	60	80	100						GR SA SI CL			
320.0	ASPHALT: (~100 mm thick)		1	SS	21															
321.2	FILL: SAND AND GRAVEL sand and gravel, trace to some silt, brown, damp (~330 mm thick)																			
0.4	FILL: SAND TO SILTY SAND trace to some gravel, brown, moist some silty clay pockets below 0.8 m depth		2	SS	14															
			3	SS	38															
	light brown below 2.3 m depth		4	SS	50															
	wet to saturated below 3.1 m depth		5	SS	7												24 55 (21)			
			6	SS	29															
			7	SS	16															
316.0			8	SS	7											227				
5.6	PEAT: black, moist, firm, some rootlets																			
315.3			9	SS	20															
6.3	GRAVELLY SAND: trace silt, dark grey, wet, compact (possible fill)																24 67 (9)			
			10	SS	12															
	loose below 7.6 m depth		11	SS	8															
313.2																				
8.4	SILTY CLAY: brown, moist, stiff to very stiff		12	SS	13															
	grey below 9.1 m depth		13	SS	18															
			14	SS	21															
310.3																				
11.3	End of borehole at 11.3 m depth. Borehole open to 6.1 m and water level measured at 3.1 m upon completion of drilling.																			
	Notes: 1. This drawing is to be read with the subject report and project numbers as presented above. 2. Groundwater level was measured in open hole upon completion of drilling.																			

+³, ×³: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

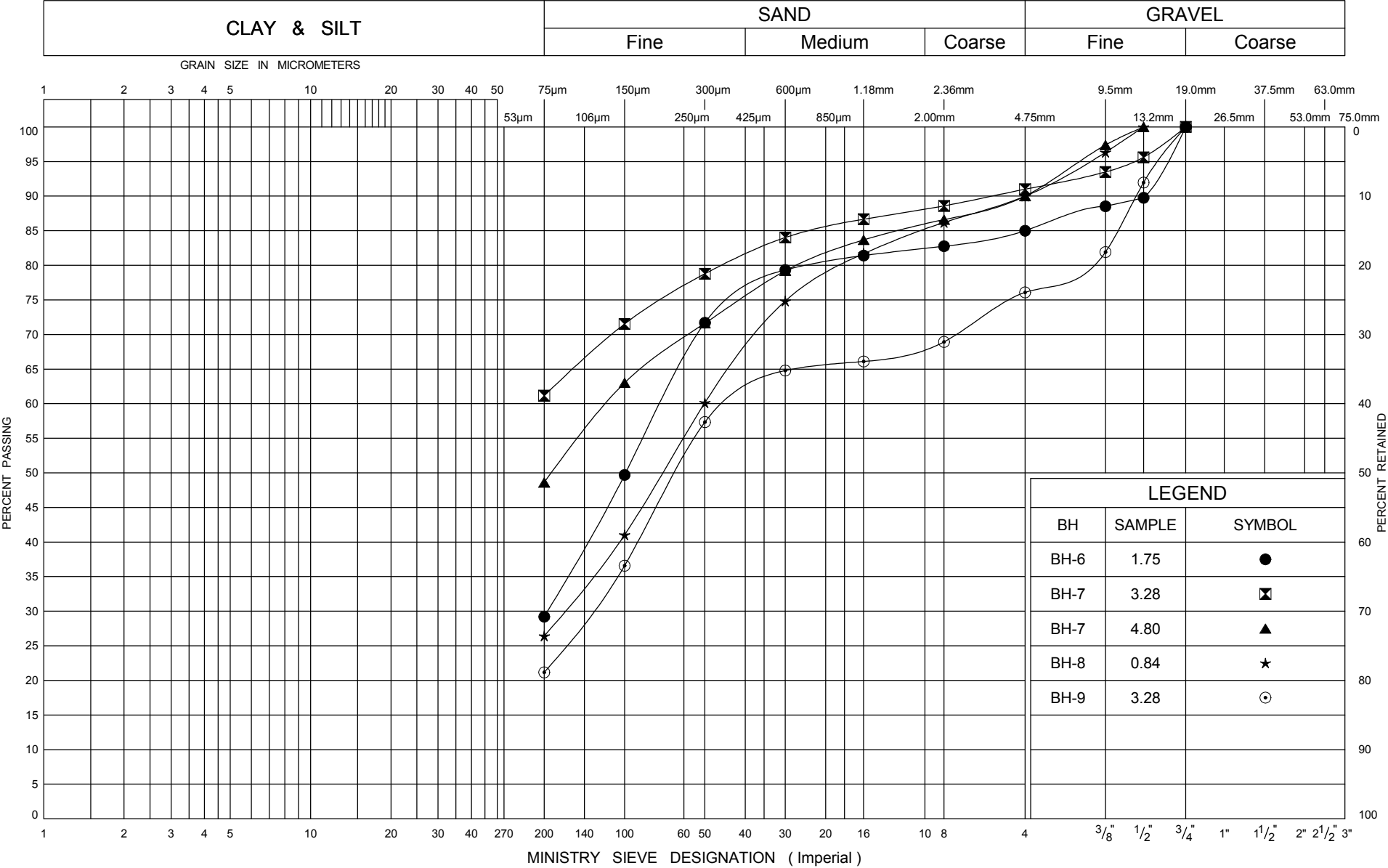
ONTARIO MTO ASSIGNMENT#5.GPJ ONTARIO MTO.GDT 7/11/17

Appendix D – Laboratory Data

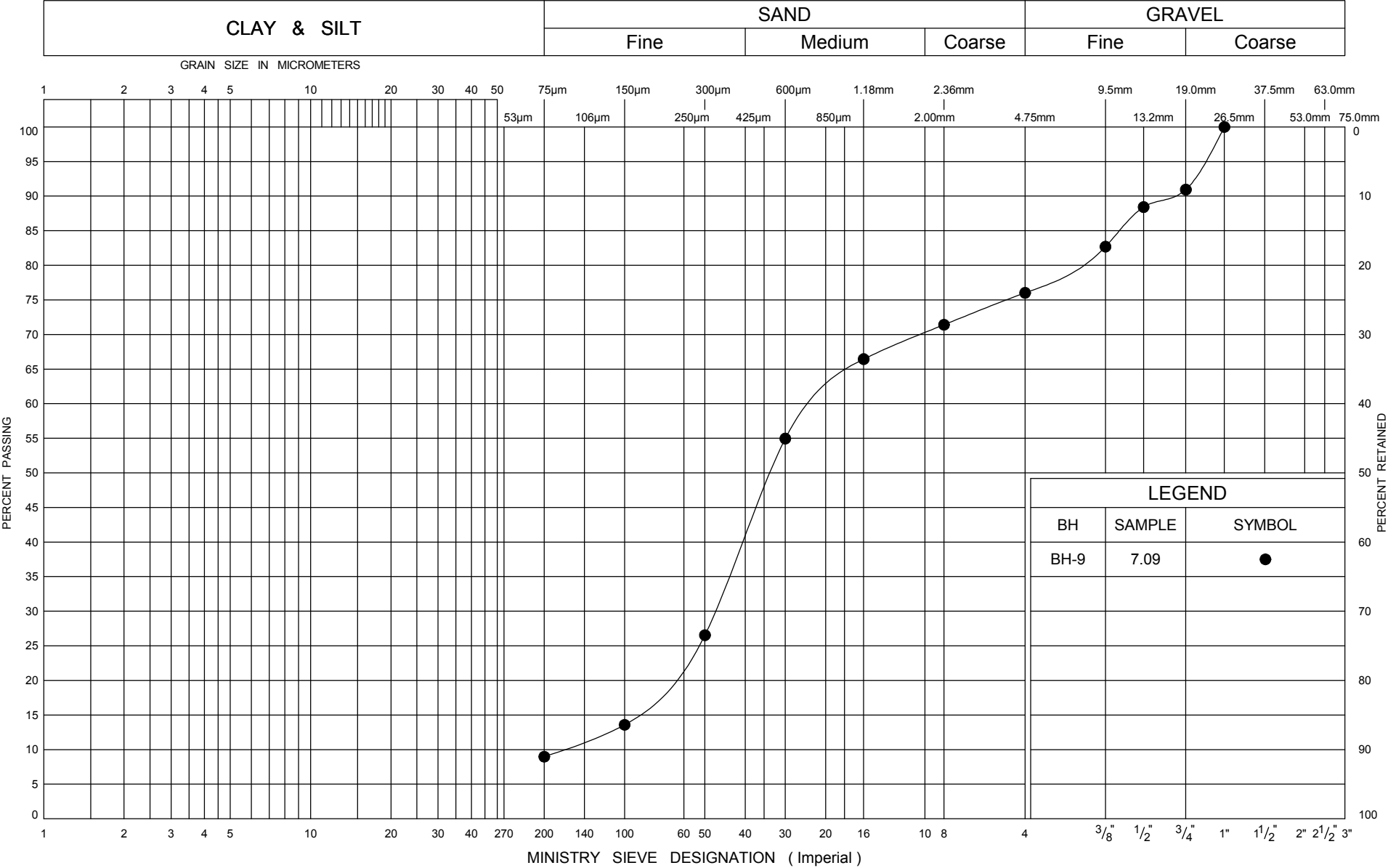
UNIFIED SOIL CLASSIFICATION SYSTEM



UNIFIED SOIL CLASSIFICATION SYSTEM



UNIFIED SOIL CLASSIFICATION SYSTEM



GRAIN SIZE DISTRIBUTION

FIG No 3

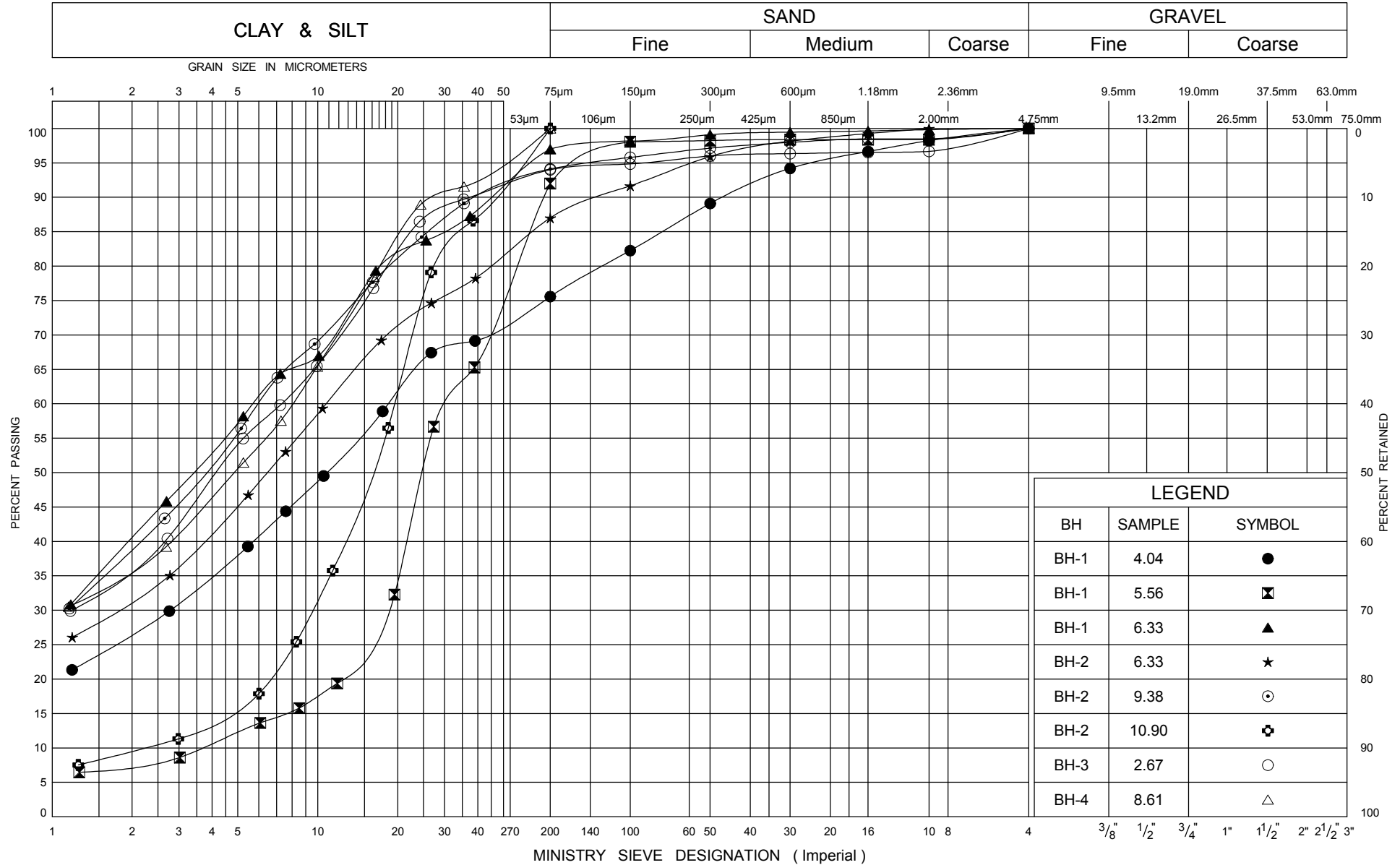
W P 2017-11009

3015-E-0017, Assignment 5



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Transportation

UNIFIED SOIL CLASSIFICATION SYSTEM



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Transportation

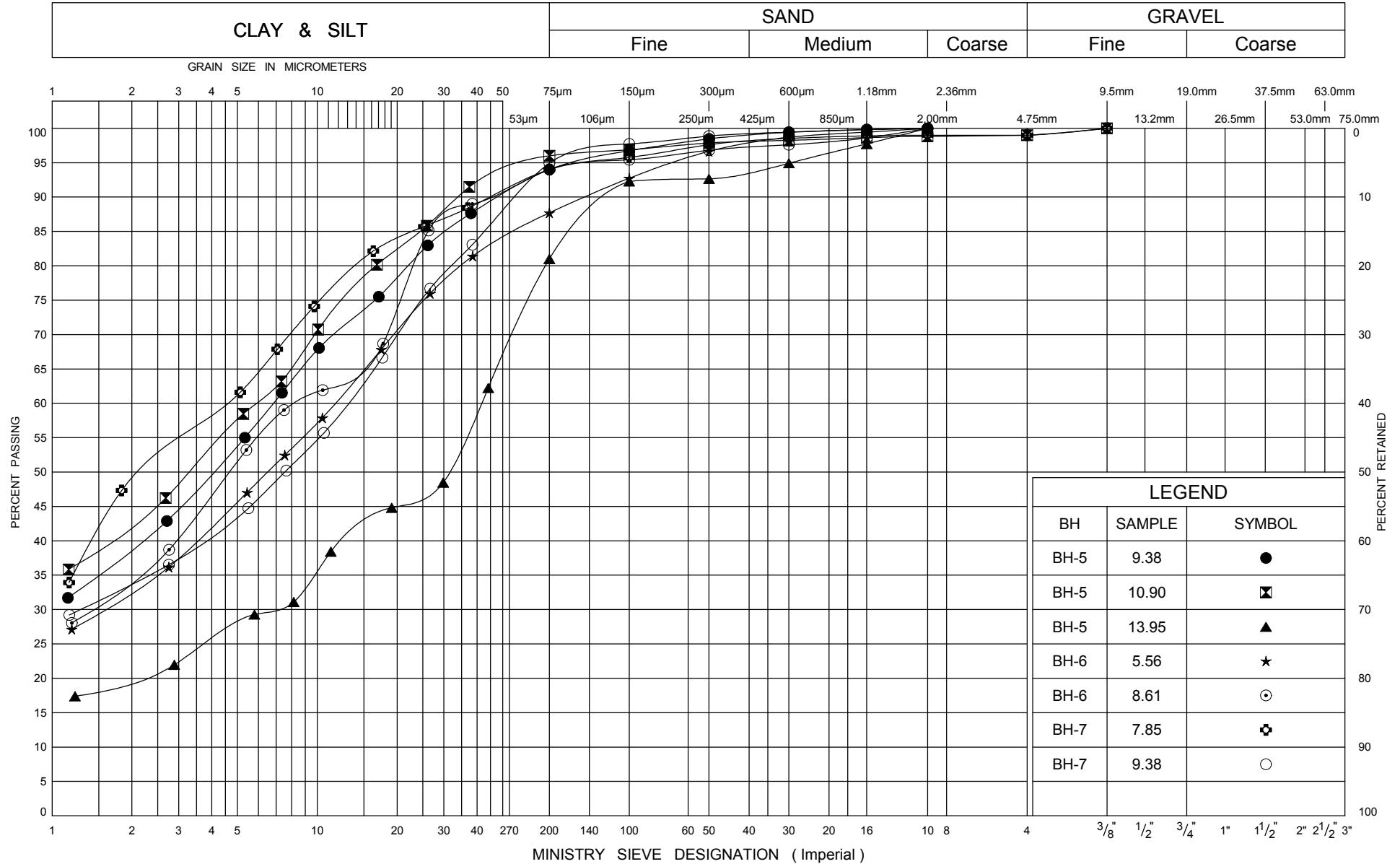
GRAIN SIZE DISTRIBUTION

FIG No 4

W P 2017-11009

3015-E-0017, Assignment 5

UNIFIED SOIL CLASSIFICATION SYSTEM



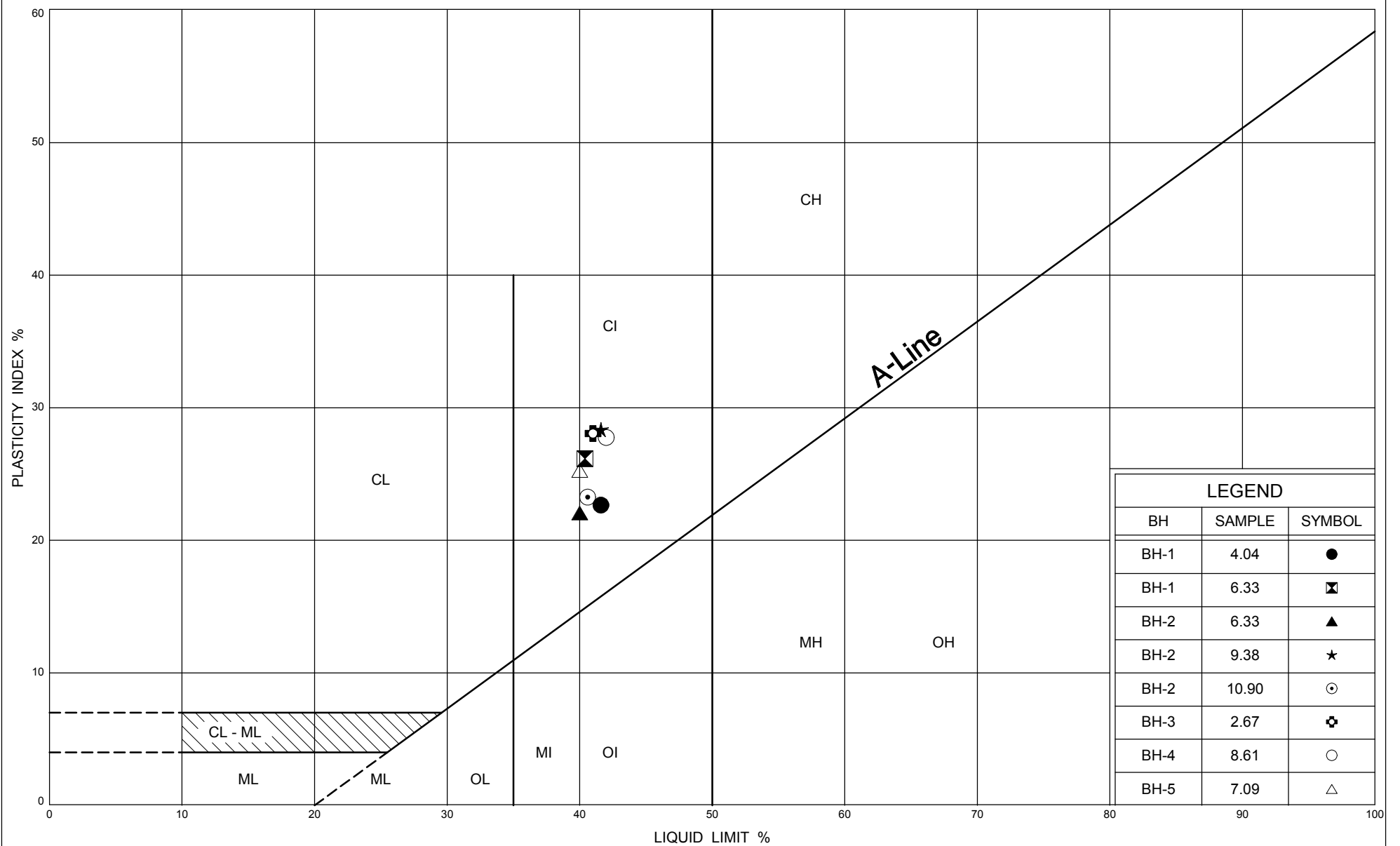
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Transportation

GRAIN SIZE DISTRIBUTION

FIG No 5

W P 2017-11009

3015-E-0017, Assignment 5



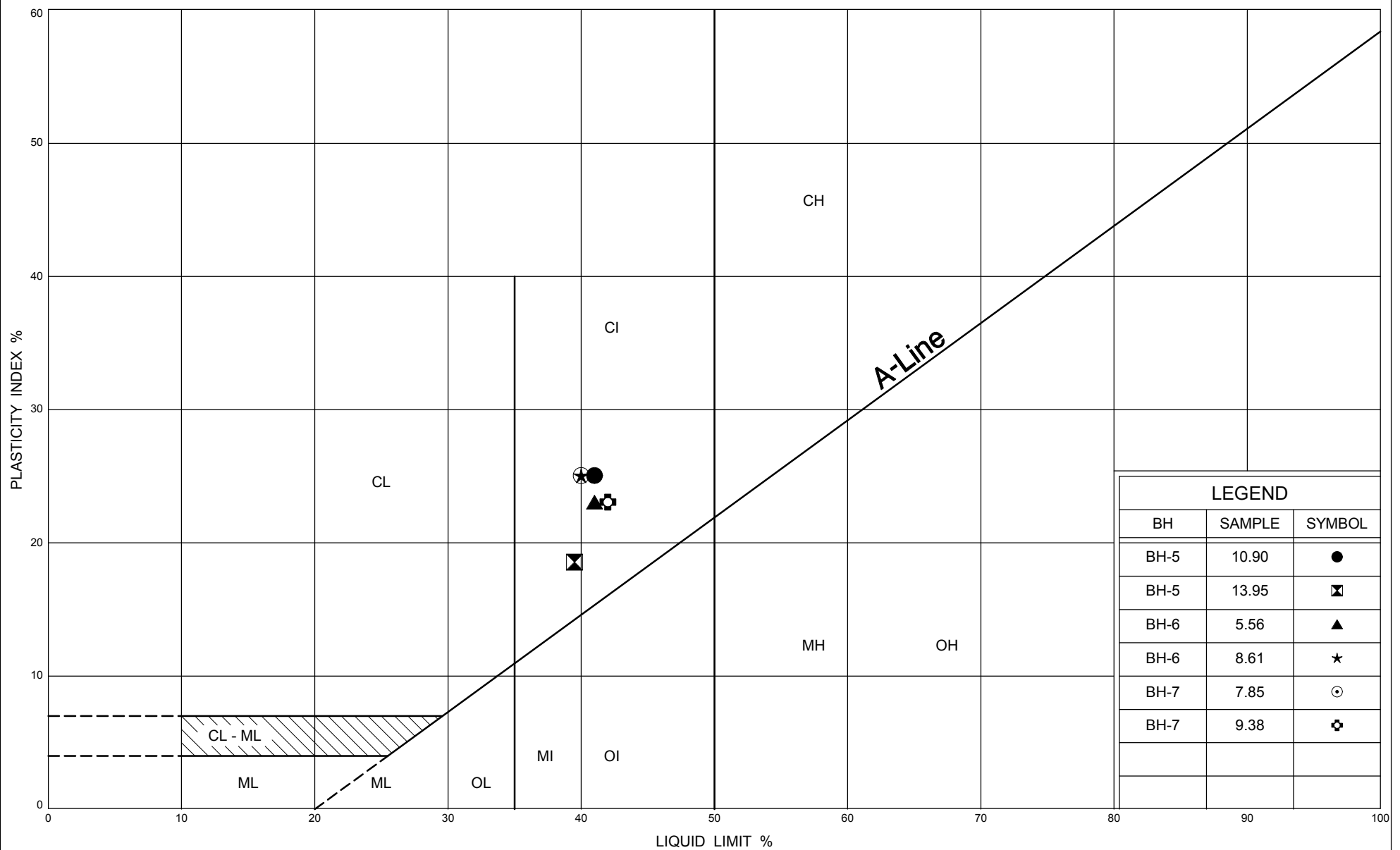
Ministry of
Transportation

PLASTICITY CHART

FIG No 6

W P 2017-11009

3015-E-0017, Assignment 5



LEGEND		
BH	SAMPLE	SYMBOL
BH-5	10.90	●
BH-5	13.95	⊠
BH-6	5.56	▲
BH-6	8.61	★
BH-7	7.85	⊙
BH-7	9.38	⊕



Ministry of
Transportation

PLASTICITY CHART

FIG No 7

W P 2017-11009

3015-E-0017, Assignment 5

Appendix E – Chemical Analyses

**CLIENT NAME: EXP. SERVICES INC.
80 BANCROFT STREET
HAMILTON, ON L8E2W5
(905) 573-4000**

ATTENTION TO: Jeff Golder

PROJECT: ADM-00235197-F0

AGAT WORK ORDER: 17T215110

SOIL ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Coordinator

DATE REPORTED: May 18, 2017

PAGES (INCLUDING COVER): 5

VERSION*: 1

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

***NOTES**

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.



AGAT Laboratories

Certificate of Analysis

AGAT WORK ORDER: 17T215110

PROJECT: ADM-00235197-F0

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: EXP. SERVICES INC.

SAMPLING SITE: Hwy 85, Kichener

ATTENTION TO: Jeff Golder

SAMPLED BY: Aziz

Corrosivity Package

DATE RECEIVED: 2017-05-11

DATE REPORTED: 2017-05-18

		SAMPLE DESCRIPTION:		BH-1 SS2
		SAMPLE TYPE:		Soil
		DATE SAMPLED:		2017-05-01
Parameter	Unit	G / S	RDL	8388149
*Sulphide	%		0.05	<0.05
Chloride (2:1)	µg/g		2	94
Sulphate (2:1)	µg/g		2	16
pH (2:1)	pH Units		NA	8.77
Electrical Conductivity (2:1)	mS/cm		0.005	0.323
Resistivity (2:1)	ohm.cm		1	3100
Redox Potential (2:1)	mV		5	206

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

8388149 EC/Resistivity, pH, Chloride, Sulphate and Redox Potential were determined on the extract obtained from the 2:1 leaching procedure (2 parts DI water: 1 part soil).

*Sulphide analyzed at AGAT Vancouver

Certified By:

Amanjot Bhela



Quality Assurance

CLIENT NAME: EXP. SERVICES INC.

PROJECT: ADM-00235197-F0

SAMPLING SITE: Hwy 85, Kichener

AGAT WORK ORDER: 17T215110

ATTENTION TO: Jeff Golder

SAMPLED BY: Aziz

Soil Analysis

RPT Date: May 18, 2017

RPT Date: May 18, 2017			DUPLICATE			Method Blank	REFERENCE MATERIAL		METHOD BLANK SPIKE			MATRIX SPIKE			
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

Corrosivity Package

*Sulphide	8386576		<0.05	<0.05	NA	< 0.05	95%	80%	120%						
Chloride (2:1)	8388149	8388149	94	94	0.0%	< 2	93%	80%	120%	101%	80%	120%	101%	70%	130%
Sulphate (2:1)	8388149	8388149	16	15	6.5%	< 2	95%	80%	120%	103%	80%	120%	102%	70%	130%
pH (2:1)	8388149	8388149	8.77	8.70	0.8%	NA	101%	90%	110%	NA			NA		
Electrical Conductivity (2:1)	8388149	8388149	0.323	0.328	1.5%	< 0.005	95%	90%	110%	NA			NA		
Redox Potential (2:1)	8388149	8388149	206	200	3.0%	< 5	101%	70%	130%	NA			NA		

Comments: NA signifies Not Applicable.

Duplicate Qualifier: 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.

Certified By:

Amanjot Bhela

Method Summary

CLIENT NAME: EXP. SERVICES INC.

PROJECT: ADM-00235197-F0

SAMPLING SITE: Hwy 85, Kichener

AGAT WORK ORDER: 17T215110

ATTENTION TO: Jeff Golder

SAMPLED BY: Aziz

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
*Sulphide	INOR-181-6027	modified from ASTM E1915-11	COMBUSTION
Chloride (2:1)	INOR-93-6004	McKeague 4.12 & SM 4110 B	ION CHROMATOGRAPH
Sulphate (2:1)	INOR-93-6004	McKeague 4.12 & SM 4110 B	ION CHROMATOGRAPH
pH (2:1)	INOR 93-6031	MSA part 3 & SM 4500-H+ B	PH METER
Electrical Conductivity (2:1)	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Resistivity (2:1)	INOR-93-6036	McKeague 4.12, SM 2510 B, SSA #5 Part 3	CALCULATION
Redox Potential (2:1)		McKeague 4.12 & SM 2510 B	REDOX POTENTIAL ELECTRODE



5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water intended for human consumption)

Report Information:

Company:	exp Services Inc.	
Contact:	Jeffrey Golder	
Address:	80 Bancroft Street	
	Hamilton, ON L8E 2W5	
Phone:	905.573.4000 x5022	Fax:
<i>Reports to be sent to:</i>		
1. Email:	jeffrey.golder@exp.com	
2. Email:		

Regulatory Requirements: ☐ No Regulatory Requirement
(Please check all applicable boxes)

<input checked="" type="checkbox"/> Regulation 153/04	<input type="checkbox"/> Sewer Use	<input type="checkbox"/> Regulation 558
Table _____ <i>Indicate One</i>	<input type="checkbox"/> Sanitary	<input type="checkbox"/> CCME
<input type="checkbox"/> Ind/Com	<input type="checkbox"/> Storm	<input type="checkbox"/> Prov. Water Quality Objectives (PWQO)
<input type="checkbox"/> Res./Park		<input type="checkbox"/> Other
<input type="checkbox"/> Agriculture		
Soil Texture (<i>Check One</i>)	Region _____ <i>Indicate One</i>	
<input type="checkbox"/> Coarse		
<input type="checkbox"/> Fine		

Project Information:

Project: ADM-00235197-FO
Site Location: HWY 85, Kitchener
Sampled By: AZIL
AGAT Quote #: 159061 PO: _____
Please note: if quotation number is not provided, client will be billed full price for analysis.



Invoice Information:

Company: _____
Contact: _____
Address: _____
Email: _____

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

[illegible]

Samples Relinquished By (Print Name and Sign)		Date	Time	Samples Received By (Print Name and Sign)		Date	Time	Page <u>1</u> of <u>1</u>
Jeff Golder  D. Brown 2017/05/11		May 11, 2017	2:51	D. Brown 2017/05/11			3:00	
Samples Relinquished By (Print Name and Sign)		Date	Time	Samples Received By (Print Name and Sign)		Date	Time	
 D. Brown 2017/05/11			4:35					
Samples Relinquished By (Print Name and Sign)		Date	Time	Samples Received By (Print Name and Sign)		Date	Time	N/A

Laboratory Use Only

Work Order #: 17T215110

Cooler Quantity: _____

Arrival Temperatures: 5.6 | 5.8 | 5.8
4.6 | 4.8 | 4.8

Custody Seal Intact: ☐ Yes ☐ No ☐ N/A

Notes: _____

Turnaround Time (TAT) Required:

Regular TAT	<input checked="" type="checkbox"/> 5 to 7 Business Days
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Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ 1 Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
*TAT is exclusive of weekends and statutory holidays