



THURBER ENGINEERING LTD.

**FOUNDATION INVESTIGATION REPORT
EAST HUMBER RIVER ARCH CULVERT
RETAINING WALLS
SITE NO. 37-94
HIGHWAY 400 WIDENING
YORK REGION, ONTARIO
G.W.P. 2539-04-00**

GEOCRES NO. 30M13-219

Report

to

SNC-Lavalin Inc.

Date: April 16, 2018
File: 15591



TABLE OF CONTENTS

PART 1 FACTUAL INFORMATION

1	INTRODUCTION	1
2	SITE AND PROJECT DESCRIPTION.....	2
3	INVESTIGATION PROCEDURES	2
4	LABORATORY TESTING	4
5	DESCRIPTION OF SUBSURFACE CONDITIONS	4
5.1	Topsoil.....	5
5.2	Silty Clay	5
5.3	Silty Sand to Sand and Silt	5
5.4	Gravelly Sand.....	6
5.5	Sand.....	6
5.6	Clayey Silt Till.....	7
5.7	Groundwater Conditions	8
6	MISCELLANEOUS	9

APPENDICES

Appendix A	Record of Borehole Sheets
Appendix B	Laboratory Test Results
Appendix C	Drawings titled "Borehole Locations and Soil Strata"



**FOUNDATION INVESTIGATION REPORT
EAST HUMBER RIVER ARCH CULVERT
RETAINING WALLS
SITE NO. 37-94
HIGHWAY 400 WIDENING
YORK REGION, ONTARIO
G.W.P. 2539-04-00**

GEOCRES NO. 30M13-217

PART 1: FACTUAL INFORMATION

1 INTRODUCTION

This report presents the factual findings from a foundation investigation carried out by Thurber Engineering Ltd. (Thurber) for the design and construction of wingwalls as part of the proposed extension of the existing East Humber River Arch Culvert crossing under Highway 400 at King Township, Regional Municipality of York, Ontario. Thurber was retained by SNC Lavalin Inc. (SLI) to carry out the foundation investigation at this site on behalf of the Ministry of Transportation Ontario (MTO).

The purpose of the field investigation was to explore the subsurface conditions at the site and, based on the data obtained, to provide a borehole locations plan and soil strata drawing with stratigraphic profiles, records of boreholes, laboratory test results, and a written description of the subsurface conditions. A model of the subsurface conditions was developed from the data obtained during the course of the present investigation.

During the preparation of this report and in addition to the boreholes drilled under the current assignment, reference has been made to information on subsurface conditions contained in earlier preliminary foundation investigation and design reports. The titles of these reports are listed as follows:

- Preliminary Foundation Investigation and Design Report, Humber River Arch Culvert Extension, Highway 400 Widening from North of Major Mackenzie Drive to South Canal

Client: SNC-Lavalin Inc.

File No.: 15591

E file: H:\15000-15999\15591 East Humber Arch Culvert Extension Highway 400 Widening\Reports & Memos\FINAL\15591 Hwy 400 East Humber Arch Retaining Wall FIR mar 18.docx

Date: April 16, 2018

Page: 1 of 10



Road, G.W.P. 222-97-00, Agreement No. 2005-A-000106, prepared by Golder Associates (Golder), dated May 2001; Geocres No. 30M13-51 (Reference 1).

- Final Foundation Investigation and Design Report, Proposed Humber River Arch Culvert Extension, Highway 400 Interim Widening, Vaughan, Ontario, G.W.P. 192-00-00, prepared by Amec, dated September 8, 2003; Geocres No. 30M13-156 (Reference 2).

2 SITE AND PROJECT DESCRIPTION

The site is located on Highway 400 approximately 1 km south of King Road (King City, Ontario) and approximately 1 km north of King Vaughan Road (Maple, Ontario). Highway 400 over the culvert is at an elevation of approximately 267 m. At this site, the Humber River flows from east to west under Highway 400 through the culvert. The areas surrounding the inlet and outlet of the culvert are generally moderately vegetated.

Based on the available drawings provided by SLI dated October 4, 2016, this project includes the proposed extension of the existing 72.7 m long East Humber River Culvert by approximately 8.3m on both sides of the highway. The existing arch culvert is founded on 2.4 m wide spread footings at approximate Elevation 252.4 m. The culvert extensions will be covered by new fill for highway platform widening up to a maximum thickness of approximately 6 m. The side slope of the new high fill will be 2H : 1V. As part of the earthwork required to extend the culvert and widen the highway, four wingwalls will be constructed (two at the inlet and two at the outlet) to support the new embankment fill. The length of the four wingwalls varies between a maximum length of about 28 m for the wingwall at the southwest quadrant to a minimum length of 9.6 m for the wingwall at the southeast quadrant.

From published geological information in *The Physiography of Southern Ontario* by Chapman and Putnam (1984), the site lies within the physiographic region known as South Slope of Oak Ridges Moraine. The South Slope of Oak Ridges Moraine generally consists of sandy materials (derived from glacial tills) overlying glacial tills. The soil deposit is underlain at deep depths by shale bedrock.

3 INVESTIGATION PROCEDURES

The site investigation for this project was carried out between October 17 and October 25, 2016

Client: SNC-Lavalin Inc.

File No.: 15591

E file: H:\15000-15999\15591 East Humber Arch Culvert Extension Highway 400 Widening\Reports & Memos\FINAL\15591

Hwy 400 East Humber Arch Retaining Wall FIR mar 18.docx

Date: April 16, 2018

Page: 2 of 10



during which time a total of four (4) boreholes denoted as Boreholes 16-01 to 16-04 were advanced to depths ranging from 10.2 m to 12.8 m.

Boreholes 16-01 and 16-03 were located to the north and south of the culvert outlet, respectively. Boreholes 16-02 and 16-04 were located to the north and south of the culvert inlet, respectively. The approximate locations of the boreholes are shown on the Borehole Locations and Soil Strata Drawing provided in Appendix C. Borehole details are provided in Table 3.1 below.

Table 3.1 – Borehole Details

Borehole Number	Location	Approximate Ground Surface Elevation (m)	Borehole Termination Depth (m)	Borehole Termination Elevation (m)
16-01	North of culvert outlet	255.5	12.8	242.7
16-02	North of culvert inlet	257.3	10.2	247.1
16-03	South of culvert outlet	256.8	12.2	244.6
16-04	South of culvert inlet	257.0	10.4	246.6

A mobile tripod drill rig was used throughout the field investigation. This rig operated in conjunction with B size casing that was advanced using the wash-boring method. The head of water inside the casing served the purpose of counteracting the upward hydrostatic pressure. In all boreholes, soil samples were obtained with a 50 mm outside diameter split spoon sampler driven in conjunction with the Standard Penetration Test (SPT). Dynamic Cone Penetration test was carried out at the bottom of Boreholes 16-02 and 16-04.

Groundwater conditions were observed in the open boreholes throughout the drilling operations. Standpipe piezometers were installed in Boreholes 16-01 and 16-04 to permit monitoring of the groundwater levels at the site. Each piezometer consisted of a 25 mm diameter PVC pipe with a slotted screen sealed at a selected depth within the borehole. The boreholes in which no piezometer was installed were backfilled in general accordance with Ontario Regulation 903. Piezometer installation and borehole completion details are summarized in Table 3.2 below.



Table 3.2 – Piezometer and Borehole Completion Details

Borehole Number	Piezometer Tip Depth / Elevation (m)	Completion Details
16-01	9.0 / 246.5	Backfilled with filter sand from 12.0 m to 6.9 m, then bentonite holeplug and auger cuttings from 6.9 m to 0.15 m, then concrete to surface.
16-02	None installed	Backfilled with bentonite holeplug to surface.
16-03	None installed	Backfilled with bentonite holeplug to surface.
16-04	8.7 / 248.3	Backfilled with filter sand from 10.4 m to 7.5 m, then bentonite holeplug and auger cuttings 7.5 m to surface.

The field work was supervised on a full time basis by a member of Thurber's technical staff who marked/staked the boreholes in the field, arranged for the clearance of buried utilities, directed the drilling, sampling and in-situ testing operations, logged the boreholes and processed the recovered soil and rock samples for transport to Thurber's laboratory for further examination and testing.

4 LABORATORY TESTING

All recovered soil samples were subjected to visual identification and to natural moisture content determination. Selected samples were also subjected to grain size distribution analysis (hydrometer and/or sieve analysis) and Atterberg Limits testing, where appropriate. Laboratory testing results are summarized on the Record of Borehole sheets included in Appendix A and are presented on the figures included in Appendix B.

5 DESCRIPTION OF SUBSURFACE CONDITIONS

Details of the encountered soil stratigraphy are presented on the Record of Borehole sheets included in Appendix A and on the Borehole Location and Soil Strata Drawings in Appendix C. A general description of the stratigraphy, based on the conditions encountered in the boreholes, is given in the following paragraphs. However, the factual data presented on the Record of Borehole sheets takes precedence over this general description and must be used for interpretation of the



site conditions. It should be recognized and expected that soil conditions may vary between and beyond borehole locations.

In general, the subsurface stratigraphy encountered in the boreholes consists of surficial topsoil overlying interlayered sands and silts. The groundwater level varied from 0.2 m to 0.7 m below the existing ground surface. This soil stratigraphy is generally consistent with the stratigraphy reported in Reference 1 and 2. The description of each major stratigraphic layer is provided below.

5.1 Topsoil

A layer of surficial topsoil with a thickness ranging from 25 mm to 75 mm was encountered in all boreholes.

5.2 Silty Clay

A 0.75 m thick layer of silty clay, trace sand and trace gravel was encountered below the topsoil layer in Borehole 16-02. The base elevation of this layer was at Elevation 256.5 m. SPT 'N' values recorded in this silty clay was 14 blows per 0.3 m penetration indicating a stiff consistency. Measured moisture contents within this layer was 10%.

5.3 Silty Sand to Sand and Silt

Interlayered silty sand to sand and silt deposit with trace to some clay and trace gravel was encountered below the topsoil in Boreholes 16-01 and 16-03, below the silty clay layer in Borehole 16-02, and below the silty sand fill in Borehole 16-04. The thickness of these interlayers varied from 2.4 m to 3.3 m. The base of these layers was encountered at 3.0 m to 7.2 m depths (Elevations 248.3 to 253.7).

SPT 'N' values recorded in this deposit ranged from 10 blows per 0.3 m penetration to greater than 50 blows for less than 0.3 m, indicating a compact to very dense condition. A lower SPT "N" value of 7 blows per 0.3 m penetration were measured in a silty sand layer in Borehole 16-01, indicating a loose condition. Measured moisture contents within this layer varied between 10% and 22%.



The results of grain size distribution analyses carried out on selected samples of these deposits are presented on the Record of Borehole Sheets included in Appendix A and on Figure B1 of Appendix B. The results of the grain size distribution analyses are summarized below:

Soil Particle	Percentage (%)
Gravel	0 to 6
Sand	36 to 66
Silt	20 to 45
Clay	8 to 19

5.4 Gravelly Sand

A 1.5-m-thick layer of gravelly sand with trace silt and clay was encountered below the silty sand layer in Borehole 16-01. The base of this layer was encountered at 2.2 m depth (Elevation 253.3).

SPT 'N' values recorded in this gravelly sand layer varied from 17 to 18 blows per 0.3 m penetration indicating a compact condition. Measured moisture contents within this layer varied between 16% to 18%.

The results of grain size distribution analysis carried out on one sample of this soil is presented on the Record of Borehole Sheets included in Appendix A and on Figure B2 of Appendix B. The results of the grain size distribution analyses are summarized below:

Soil Particle	Percentage (%)
Gravel	25
Sand	67
Silt and Clay	8

5.5 Sand

Sand with trace to some silt and clay was encountered in all boreholes at Elevations ranging between 252.5 and 253.7 m. Boreholes 16-01, 16-03 and 16-04 were terminated within this sand at elevations ranging from 242.7 to 246.6 m. In Borehole 16-02, the base of the sand was encountered at Elevation 250.1 m. This deposit has a thickness varying from 3.1 m to greater than 9.2 m.



SPT 'N' values recorded in this deposit ranged from 13 blows per 0.3 m penetration to 76 blows for 0.3 m indicating a compact to very dense condition. A low SPT "N" value of 9 blows per 0.3m penetration was measured in Borehole 16-01, indicating a loose condition. Measured moisture contents within this layer varied between 10% and 22%.

The results of grain size distribution analyses carried out on selected samples of this deposit are presented on the Record of Borehole Sheets included in Appendix A and on Figure B3 of Appendix B. The results of the grain size distribution analyses are summarized below:

Soil Particle	Percentage (%)
Gravel	0
Sand	81 to 94
Silt	8 to 16
Clay	3 to 4
Silt and Clay	6

5.6 Clayey Silt Till

A till deposit consisting of clayey silt with sand and trace gravel was found underlying the sand layer in Borehole 16-02. Borehole 16-02 was terminated within cohesive till at Elevation 247.0 m upon DCPT refusal.

SPT 'N' values recorded in this till deposit were greater than 50 blows per 0.3 m of penetration indicating a hard consistency. Glacial tills inherently contain cobbles and boulders. Measured moisture contents within the till layer varied between 10% and 15%.

The results of grain size distribution analyses and Atterberg Limits testing carried out on one sample of the clayey silt till is presented on the Record of Borehole Sheets included in Appendix A and on Figures B4 and B5 of Appendix B. The results of the grain size distribution analysis are summarized below:



Soil Particle	Percentage (%)
Gravel	0
Sand	19
Silt	61
Clay	20

The results of Atterberg Limits testing are summarized below:

Index Property	Percentage (%)
Plasticity Index	6
Liquid Limit	18

The results of the Atterberg Limits testing indicate the layer is of low to slight plasticity with a group symbol CL-ML.

5.7 Groundwater Conditions

Groundwater conditions were observed during drilling operations and groundwater levels were measured in the open boreholes upon completion of drilling. Standpipe piezometers were installed in Boreholes 16-01 and 16-04 to monitor the groundwater level at the site. The groundwater levels measured in the open boreholes and in the piezometers are summarized in Table 5.6 below.

Table 5.6 – Groundwater Levels and Observations

Borehole	Date	Water Level (m)		Comment
		Depth	Elevation	
16-01	15 November 2016	0.7 m below G.S.	254.8	Piezometer
16-02	19 October 2016	4.5 m below G.S.	252.8	Open hole
16-03	25 October 2016	Not recorded	-	Open hole
16-04	25 October 2016	3.1 m below G.S.	253.9	Piezometer
	15 November 2016	0.2 m below G.S.	256.8	

The groundwater levels above are short-term readings and are largely governed by the river water level. The latest readings suggest that the groundwater level measured in the piezometers was generally consistent with the river water level. Seasonal fluctuations of the groundwater level are also to be expected. In particular, the groundwater levels may be at a higher elevation after periods of significant or prolonged precipitation.

Client: SNC-Lavalin Inc.

File No.: 15591

E file: H:\15000-15999\15591 East Humber Arch Culvert Extension Highway 400 Widening\Reports & Memos\FINAL\15591 Hwy 400 East Humber Arch Retaining Wall FIR mar 18.docx

Date: April 16, 2018

Page: 8 of 10



6 MISCELLANEOUS

Thurber marked and/or staked the borehole locations in the field and obtained buried utility clearances prior to drilling. The northing and easting co-ordinates and elevations of the boreholes have been provided by SNC-Lavalin.

Geotechnical laboratory testing was carried out at Thurber's MTO approved Toronto area laboratory.

Walker Drilling Ltd. supplied and operated the drilling, sampling and in-situ testing equipment for the field investigation.

The field investigation was supervised on a full time basis by a member of Thurber's technical staff. Compilation of data and preparation of the report was carried out by Messrs. Mohamad Hosney, P.Eng. and Sydney Pang, P.Eng. The report was reviewed by Dr. P.K. Chatterji, P.Eng., MTO designated principal contact.

Client: SNC-Lavalin Inc.

File No.: 15591

E file: H:\15000-15999\15591 East Humber Arch Culvert Extension Highway 400 Widening\Reports & Memos\FINAL\15591
Hwy 400 East Humber Arch Retaining Wall FIR mar 18.docx

Date: April 16, 2018

Page: 9 of 10



THURBER ENGINEERING LTD.



Mohamad Hosney, P.Eng.
Geotechnical Engineer



Sydney Pang, P.Eng.
Associate, Senior Foundations Engineer



P.K. Chatterji, P.Eng.
Review Principal, Designated MTO Contact



Appendix A

Record of Borehole Sheets

SYMBOLS, ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES

1. TEXTURAL CLASSIFICATION OF SOILS

CLASSIFICATION	PARTICLE SIZE	VISUAL IDENTIFICATION
Boulders	Greater than 200mm	same
Cobbles	75 to 200mm	same
Gravel	4.75 to 75mm	5 to 75mm
Sand	0.075 to 4.75mm	Not visible particles to 5mm
Silt	0.002 to 0.075mm	Non-plastic particles, not visible to the naked eye
Clay	Less than 0.002mm	Plastic particles, not visible to the naked eye

2. COARSE GRAIN SOIL DESCRIPTION (50% greater than 0.075mm)

TERMINOLOGY	PROPORTION
Trace or Occasional	Less than 10%
Some	10 to 20%
Adjective (e.g. silty or sandy)	20 to 35%
And (e.g. sand and gravel)	35 to 50%

3. TERMS DESCRIBING CONSISTENCY (COHESIVE SOILS ONLY)

DESCRIPTIVE TERM	UNDRAINED SHEAR STRENGTH (kPa)	APPROXIMATE SPT ⁽¹⁾ 'N' VALUE
Very Soft	12 or less	Less than 2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	Greater than 200	Greater than 30

NOTE: Hierarchy of Soil Strength Prediction

- 1) Laboratory Triaxial Testing
- 2) Field Insitu Vane Testing
- 3) Laboratory Vane Testing
- 4) SPT value
- 5) Pocket Penetrometer



4. TERMS DESCRIBING DENSITY (COHESIONLESS SOILS ONLY)

DESCRIPTIVE TERM	SPT "N" VALUE
Very Loose	Less than 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	Greater than 50

5. LEGEND FOR RECORDS OF BOREHOLES

SYMBOLS AND ABBREVIATIONS FOR SAMPLE TYPE	SS Split Spoon Sample	WS Wash Sample	AS Auger (Grab) Sample
	TW Thin Wall Shelby Tube Sample	TP Thin Wall Piston Sample	
	PH Sampler Advanced by Hydraulic Pressure	PM Sampler Advanced by Manual Pressure	
	WH Sampler Advanced by Self Static Weight	RC Rock Core	SC Soil Core

$$\text{Sensitivity} = \frac{\text{Undisturbed Shear Strength}}{\text{Remoulded Shear Strength}}$$


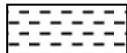



 Water Level
 Shear Strength Determination by Pocket Penetrometer

- (1) SPT 'N' Value Standard Penetration Test 'N' Value – refers to the number of blows from a 63.5kg hammer free falling a height of 0.76m to advance a standard 50 mm outside diameter split spoon sampler for 0.3 m depth into undisturbed ground.
- (2) DCPT Dynamic Cone Penetration Test – Continuous penetration of a 50 mm outside diameter, 60° conical steel point attached to "A" size rods driven by a 63.5 kg hammer free falling a height of 0.76 m. The resistance to cone penetration is the number of hammer blows required for each 0.3 m advance of the conical point into undisturbed ground.

UNIFIED SOILS CLASSIFICATION

MAJOR DIVISIONS		GROUP SYMBOL	TYPICAL DESCRIPTION
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	Well-graded gravels or gravel-sand mixtures, little or no fines.
		GP	Poorly-graded gravels or gravel-sand mixtures, little or no fines.
		GM	Silty gravels, gravel-sand-silt mixtures.
		GC	Clayey gravels, gravel-sand-clay mixtures.
	SAND AND SANDY SOILS	SW	Well-graded sands or gravelly sands, little or no fines.
		SP	Poorly-graded sands or gravelly sands, little or no fines.
		SM	Silty sands, sand-silt mixtures.
		SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS	SILTS AND CLAYS W _L < 50%	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays. (W _L < 30%).
		CI	Inorganic clays of medium plasticity, silty clays. (30% < W _L < 50%).
		OL	Organic silts and organic silty-clays of low plasticity.
	SILTS AND CLAYS W _L > 50%	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
		CH	Inorganic clays of high plasticity, fat clays.
		OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS		Pt	Peat and other highly organic soils.
CLAY SHALE			
SANDSTONE			
SILTSTONE			
CLAYSTONE			
COAL			

EXPLANATION OF ROCK LOGGING TERMS

<u>ROCK WEATHERING CLASSIFICATION</u>		<u>SYMBOLS</u>	
Fresh (FR)	No visible signs of weathering.		
Fresh Jointed (FJ)	Weathering limited to the surface of major discontinuities.		CLAYSTONE
Slightly Weathered (SW)	Penetrative weathering developed on open discontinuity surfaces, but only slight weathering of rock material.		SILTSTONE
Moderately Weathered (MW)	Weathering extends throughout the rock mass, but the rock material is not friable.		SANDSTONE
Highly Weathered (HW)	Weathering extends throughout the rock mass and the rock is partly friable.		COAL
Completely Weathered (CW)	Rock is wholly decomposed and in a friable condition, but the rock texture and structure are preserved.		Bedrock (general)

<u>DISCONTINUITY SPACING</u>		<u>STRENGTH CLASSIFICATION</u>			
Bedding	Bedding Plane Spacing	Rock Strength	Approximate Uniaxial Compressive Strength		Field Estimation of Hardness*
			(MPa)	(psi)	
Very thickly bedded	Greater than 2m	Extremely Strong	Greater than 250	Greater than 36,000	Specimen can only be chipped with a geological hammer
Thickly bedded	0.6 to 2m				
Medium bedded	0.2 to 0.6m	Very Strong	100-250	15,000 to 36,000	Requires many blows of geological hammer to break
Thinly bedded	60mm to 0.2m	Strong	50-100	7,500 to 15,000	Requires more than one blow of geological hammer to break
Very thinly bedded	20 to 60mm				
Laminated	6 to 20mm	Medium Strong	25.0 to 50.0	3,500 to 7,500	Breaks under single blow of geological hammer.
Thinly Laminated	Less than 6mm				

<u>TERMS</u>					
Total Core Recovery: (TCR)	Core recovered as a percentage of total core run length.	Weak	5.0 to 25.0	750 to 3,500	Can be peeled by a pocket knife with difficulty
Solid Core Recovery: (SCR)	Percent Ratio of solid core of full cylindrical shape recovered. Expressed with respect to the total length of core run.	Very Weak	1.0 to 5.0	150 to 750	Can be peeled by a pocket knife, crumbles under firm blows of geological pick.
Rock Quality Designation: (RQD)	Total length of sound core recovered in pieces 0.1m in length or larger as a percentage of total core run length.	Extremely Weak (Rock)	0.25 to 1.0	35 to 150	Indented by thumbnail
Uniaxial Compressive Strength (UCS)	Axial stress required to break the specimen				
Fracture Index: (FI)	Frequency of natural fractures per 0.3m of core run.				

RECORD OF BOREHOLE No 16-01

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 863 532.8 E 299 615.7 ORIGINATED BY OA
 HWY 400 BOREHOLE TYPE Tripod COMPILED BY AN
 DATUM Geodetic DATE 2016.10.17 - 2016.10.18 CHECKED BY SKP

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 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE				WATER CONTENT (%) w _P w w _L				
255.5	GROUND SURFACE							20	40	60	80	100				
0.0	TOPSOIL: (25mm)															
	Silty SAND, trace gravel		1	SS	10									○		
254.8	Compact Dark Brown															
0.7	Moist															
	Gravelly SAND, trace silt		2	SS	17									○		
	Compact															
	Dark Grey															
	Wet															
			3	SS	18									○		25 67 8 (SI+CL)
253.3																
2.2	Silty SAND, trace gravel		4	SS	12									○		
	Compact															
	Grey															
	Wet															
252.5																
3.0	SAND, trace gravel, trace silt		5	SS	9									○		0 94 6 (SI+CL)
	Loose to Compact															
	Grey															
	Wet															
			6	SS	13											
249.9																
5.6	Silty SAND		7	SS	7									○		
	Loose															
	Grey															
	Wet															
248.3																
7.2	SAND, some silt, trace clay		8	SS	18									○		0 81 16 3
	Compact to Dense															
	Grey															
	Wet															
			9	SS	38									○		

Continued Next Page

+³, ×³: Numbers refer to Sensitivity
 20
 15
 10
 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 16-01

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 863 532.8 E 299 615.7 ORIGINATED BY OA
 HWY 400 BOREHOLE TYPE Tripod COMPILED BY AN
 DATUM Geodetic DATE 2016.10.17 - 2016.10.18 CHECKED BY SKP

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					WATER CONTENT (%)				
							20	40	60	80	100	W _p	W	W _L			
	Continued From Previous Page																
	SAND , some silt, trace clay Dense Grey Wet		10	SS	44												
			11	SS	40												
242.7																	
12.8	END OF BOREHOLE AT 12.8m. Piezometer installation consists of 25mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS DATE DEPTH(m) ELEV.(m) 2016.11.15 0.7 254.8																

RECORD OF BOREHOLE No 16-02

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 863 562.1 E 299 708.3 ORIGINATED BY OA
 HWY 400 BOREHOLE TYPE Tripod COMPILED BY AN
 DATUM Geodetic DATE 2016.10.18 - 2016.10.19 CHECKED BY SKP

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 (%)					
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE				WATER CONTENT (%) w _P w w _L				GR	SA	SI	CL		
257.3	GROUND SURFACE					▽															
0.0	TOPSOIL: (50mm)																				
	Silty CLAY , trace sand, trace gravel, some organics and grass Stiff Brown Moist		1	SS	14																
256.5																					
0.8	SAND and SILT , some clay, trace gravel Very Dense to Compact Brown Moist		2	SS	63													0	51	36	13
			3	SS	63																
	Becoming wet		4	SS	17													0	48	38	14
	Trace wood pieces		5	SS	23																
253.2																					
4.1	SAND , some silt, some pieces of wood Dense Grey Wet		6	SS	30																
			7	SS	35																
250.1																					
7.2	Clayey SILT , some sand, trace gravel Hard Grey Wet (TILL)		8	SS	65												0	19	61	20	
			9	SS	54																
247.5																					
9.8	End of sampling at 9.8m and start																				

Continued Next Page

+³, ×³: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 16-02

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 863 562.1 E 299 708.3 ORIGINATED BY OA
 HWY 400 BOREHOLE TYPE Tripod COMPILED BY AN
 DATUM Geodetic DATE 2016.10.18 - 2016.10.19 CHECKED BY SKP

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									
						○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE					WATER CONTENT (%)						
						20 40 60 80 100 20 40 60 80 100					20	40	60				
247.0	DCPT		10	SS	100/												
10.2	END OF BOREHOLE AT 10.2m UPON DCPT REFUSAL. WATER LEVEL AT 4.5m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO SURFACE.				0.175												

RECORD OF BOREHOLE No 16-03

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 863 496.6 E 299 627.0 ORIGINATED BY RI
 HWY 400 BOREHOLE TYPE Tripod COMPILED BY AN
 DATUM Geodetic DATE 2016.10.22 - 2016.10.25 CHECKED BY SKP

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 (%)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE				W _P	W	W _L		WATER CONTENT (%)				GR	SA	SI	CL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
256.8	GROUND SURFACE							20	40	60	80	100																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											</

Continued Next Page

+³, ×³: Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 16-03

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 863 496.6 E 299 627.0 ORIGINATED BY RI
 HWY 400 BOREHOLE TYPE Tripod COMPILED BY AN
 DATUM Geodetic DATE 2016.10.22 - 2016.10.25 CHECKED BY SKP

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									
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE									
								20 40 60 80 100									
	Continued From Previous Page																
244.6	SAND , trace silt, trace gravel Dense to Very Dense Grey Wet	.					246										
			10	SS	55												
			11	SS	38												
12.2	END OF BOREHOLE AT 12.2m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO SURFACE.																

RECORD OF BOREHOLE No 16-04

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 863 520.2 E 299 702.5 ORIGINATED BY RI
 HWY 400 BOREHOLE TYPE Tripod / Dynamic Cone Penetration Test COMPILED BY AN
 DATUM Geodetic DATE 2016.10.20 - 2016.10.20 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					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						
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE						
257.0	GROUND SURFACE						20 40 60 80 100	PLASTIC LIMIT W _P NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L						
0.8	TOPSOIL: (25mm)						20 40 60 80 100	WATER CONTENT (%)						
256.2	Silty SAND, trace gravel Dense Brown Moist		1	SS	35									
0.8	SAND and SILT, some clay, trace gravel Dense to Very Dense Brown Moist (TILL)		2	SS	34		256							
254.7			3	SS	68		255							0 36 45 19
2.3	Silty SAND, trace clay, trace gravel Compact Grey Wet		4	SS	14		254							
253.5			5	SS	10									2 68 22 8
3.5	SAND, trace silt, trace gravel Dense to Very Dense Grey Wet		6	SS	50		253							
			7	SS	37		252							
			8	SS	76		251							
			9	SS	56		250							
247.2	End of sampling at 9.8m and start						249							
9.8							248							

Continued Next Page

+³, ×³: Numbers refer to Sensitivity
 20
 15
 10
 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 16-04

2 OF 2

METRIC

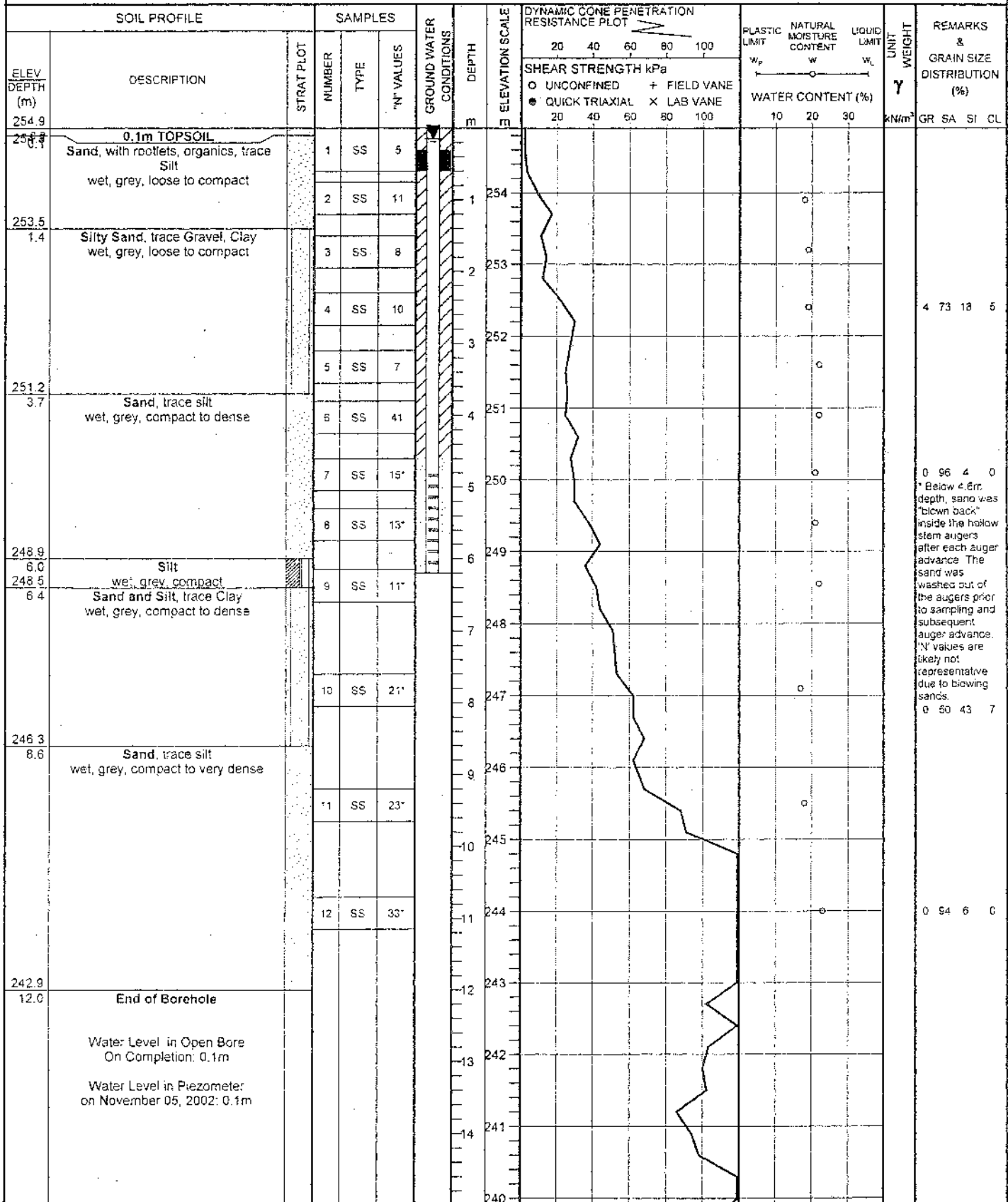
W.P. 2539-04-00 LOCATION N 4 863 520.2 E 299 702.5 ORIGINATED BY RI
 HWY 400 BOREHOLE TYPE Tripod / Dynamic Cone Penetration Test COMPILED BY AN
 DATUM Geodetic DATE 2016.10.20 - 2016.10.20 CHECKED BY SKP

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																	
	Continued From Previous Page																								
246.6	DCPT																								
10.4	END OF BOREHOLE AT 10.4m UPON DCPT REFUSAL. Piezometer installation consists of 25mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS <table border="1"> <thead> <tr> <th>DATE</th> <th>DEPTH(m)</th> <th>ELEV.(m)</th> </tr> </thead> <tbody> <tr> <td>2016.10.25</td> <td>3.1</td> <td>253.9</td> </tr> <tr> <td>2016.11.15</td> <td>0.2</td> <td>256.8</td> </tr> </tbody> </table>	DATE	DEPTH(m)	ELEV.(m)	2016.10.25	3.1	253.9	2016.11.15	0.2	256.8															
DATE	DEPTH(m)	ELEV.(m)																							
2016.10.25	3.1	253.9																							
2016.11.15	0.2	256.8																							

RECORD OF BOREHOLE No HR1



W.P. 192-00-00	LOCATION 4863532.7N 299710.2E	1 OF 2	ORIGINATED BY FPM
DIST HWY 400	BOREHOLE TYPE Hollow Stem Augering	COMPILED BY IH	
DATUM Geodetic	DATE 16 September 2002 - 16 September 2002	CHECKED BY AD	
PROJECT HWY 400 Widening, Vaughan, Ontario		JOB NO. TT22852	



Continued Next Page

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

RECORD OF BOREHOLE No HR1

2 OF 2

W.P. 192-00-00 LOCATION 4863532.7N 299710.2E ORIGINATED BY PPM
 DIST HWY 400 BOREHOLE TYPE Hollow Stem Augering COMPILED BY IH
 DATUM Geodetic DATE 15 September 2002 - 16 September 2002 CHECKED BY AD
 PROJECT HWY 400 Widening, Vaughan, Ontario JOB NO. TT22852

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	DEPTH m	ELEVATION SCALE m	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 (m)	DESCRIPTION	STRAT PLOT	NUMBER	TYPE				"N" VALUES	20						40
236.6	End of DCPT DCPT carried out about 2m east of borehole					16	239								
18.3						17	238								
						18	237								

RECORD OF BOREHOLE No HR2



W.P. 192-00-00 LOCATION 4863525.9N 299615.6E 1 OF 1 ORIGINATED BY IH
 DIST HWY 400 BOREHOLE TYPE Hollow Stem Augering COMPILED BY IH
 DATUM Geodetic DATE 17 September 2002 - 17 September 2002 CHECKED BY AD
 PROJECT HWY 400 Widening, Vaughan, Ontario JOB NO. TT22852

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	DEPTH m	ELEVATION SCALE m	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 (m)	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES				SHEAR STRENGTH kPa						
254.6									20 40 60 80 100						
0.0	Silty Sand, with Gravel, trace clay, rootlets		1	SS	3			254	○ UNCONFINED + FIELD VANE						
254.0	damp, brown, very loose		2	SS	6		1		● QUICK TRIAXIAL x LAB VANE						0 93 7 0
0.6	Sand, trace silt		3	SS	47		2	253							
	wet, brown to grey, loose		4	SS	5*		3	252							
251.6			5	SS	9*		4	251							8 78 (14)
3.0	Silty Sand, trace Gravel, Clay		6	SS	9*		5	250							0 57 27 6
	wet, grey, loose to compact		7	SS	17*		6	249							* Below 2.3m depth, sand was "blown back" inside the hollow stem augers after each auger advance. The sand was washed out of the augers prior to sampling and subsequent auger advance. "N" values are likely not representative due to blowing sands
			8	SS	5*		7	248							
247.6			9	SS	6*		8	247							
7.0	Sand, trace Silt, Clay		10	SS	12*		9	246							
	wet, grey, loose to compact		11	SS	20*		10	245							1 83 10 6
243.3							11	244							
11.3	End of DCPT						12	243							
242.4	DCPT carried out about 2m west of borehole														
12.2	End of Borehole														
	Water Level in Open Bore On Completion : 1.2m September 18, 2002: 0.3m above augers November 05, 2002: 0.2 m above ground														

RECORD OF BOREHOLE No HR3

1 OF 1

W.P. 192-00-00	LOCATION 4863514.9N 299615.6E	ORIGINATED BY IH
DIST HWY 400	BOREHOLE TYPE Hollow Stem Augering	COMPILED BY IH
DATUM Geodetic	DATE 17 September 2002 - 18 September 2002	CHECKED BY AD
PROJECT HWY 400 Widening, Vaughan, Ontario	JOB NO. TT22852	

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	DEPTH m	ELEVATION SCALE m	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	NUMBER	TYPE				SHEAR STRENGTH kPa		w_p	w	w_L		
254.7 0.0	Sand, with Gravel, some Organics, Rootlets		1	SS	3			20	40	60	80	100		
254.0 0.7	damp, brown to grey, very loose		2	SS	8			20	40	60	80	100		
253.3 1.4	Sand, with Gravel moist, grey, loose		3	SS	17			20	40	60	80	100		
	Sand, trace Silt wet, grey, loose to dense		4	SS	50			20	40	60	80	100		
			5	SS	6*			20	40	60	80	100		
			6	SS	7*			20	40	60	80	100		
250.3 4.4	Silty Sand, trace Clay wet, grey, loose to compact		7	SS	5*			20	40	60	80	100		
			8	SS	20*			20	40	60	80	100		
			9	SS	13*			20	40	60	80	100		
			10	SS	19*			20	40	60	80	100		
			11	SS	31*			20	40	60	80	100		
243.1 11.6	CLAYEY SILT, with Sand, trace gravel (TILL)							20	40	60	80	100		
242.5 12.2	moist, gray, hard							20	40	60	80	100		
242.0 12.7	End of DCPT							20	40	60	80	100		
	DCPT carried out about 2m west of borehole							20	40	60	80	100		
	End of Borehole							20	40	60	80	100		
	Water Level in Open Bore On Completion : 0.9 m							20	40	60	80	100		

+ 3 . X 3: Numbers refer to Sensitivity O 3% STRAIN AT FAILURE

PROJECT 001-1122F		RECORD OF BOREHOLE No 90		1 OF 2		METRIC										
W.P. 222-97-00		LOCATION N 4853549 E 2996599		ORIGINATED BY AZ												
DIST Central HWY 400		BOREHOLE TYPE 108mm I.D. Hollow Stem Augers		COMPILED BY LCC												
DATUM Geodetic		DATE October 16 & 17, 2000		CHECKED BY ASP												
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	T _N VALUES	20						40	60	80
255.0	GROUND SURFACE															
254.7	Topsoil (silty clay with organics)															
254.4	Silty Clay, trace organics Brown															
254.0	Silty Sand, trace gravel, trace clay, trace organics Compact to dense Brown to grey Wet below 1.5m depth 20mm layer of organics at about 1.8m depth		1	SS	47											
252.8			2	SS	12											
252.2	Sand, trace to some silt Compact to dense Brown becoming grey at 4.5m depth Wet		3	SS	13											
	SPT "N" values are considered to be impacted by blowing sands (See Note 1)		4	SS	3											
			5	SS	7											0 93 7
			6	SS	8											
			7	SS	15											0 94 7
			8	SS	12											
	Layer of grey sandy silt, trace clay encountered at 7.6m depth		9	SS	19											
			10	SS	20											
			11	SS	18											
242.5	Probably compact to dense sand															
241.5																
241.0																

Continued Next Page

+ 3 X 3

Numbers refer to
Sensitivity

0.3%

100 STRAIN AT FAILURE

ON MOT 001-1122F ON MOT 001 19/001

PROJECT 001-1122F		RECORD OF BOREHOLE No 90				2 OF 2		METRIC					
W.P. 222-97-00		LOCATION N 4803549 # 299699				ORIGINATED BY AZ							
DIST Central HWY 400		BOREHOLE TYPE 105mm I.D. Hollow Stem Augers				COMPILED BY LCC							
DATUM Geodetic		DATE October 16 & 17 2000				CHECKED BY ASP							
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					
	— CONTINUED FROM PREVIOUS PAGE —						20 40 60 80 100						
	Probably compact to dense sand						20 40 60 80 100						
238.2						239							
18.8	END OF BOREHOLE												
	Notes: 1. Below about 2.5m depth, between 1.5m and 3.5m of sand was "blown back" inside the hollow stem augers after each auger advance. This material was washed out of the augers prior to sampling and subsequent auger advance. 2. Water level in open borehole at 1.5m depth (Elev. 253.5m) during drilling and at 1.1m depth (Elev. 253.9m) on completion of drilling. 3. Water level in piezometer at 0.2m depth (Elev. 254.5m) on January 18, 2001.												

+ 3 x 2

Numbers refer to Sensitivity

○ 3%

STRAIN AT FAILURE

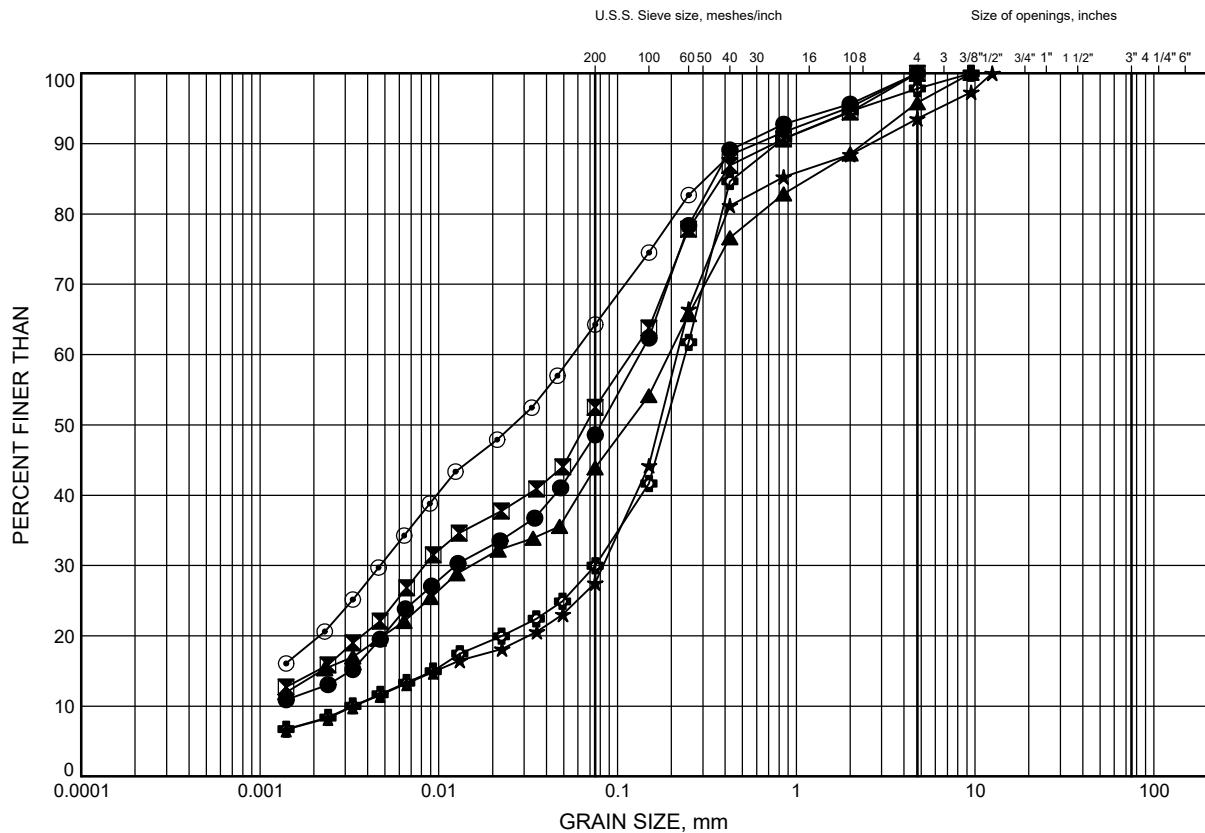


Appendix B

Laboratory Test Results

GRAIN SIZE DISTRIBUTION

Silty SAND to SAND and SILT



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	16-02	1.1	256.2
⊠	16-02	2.6	254.7
▲	16-03	0.3	256.5
★	16-03	2.6	254.2
⊙	16-04	1.8	255.2
⊕	16-04	3.4	253.6

Date April 2018

W.P. 2539-04-00

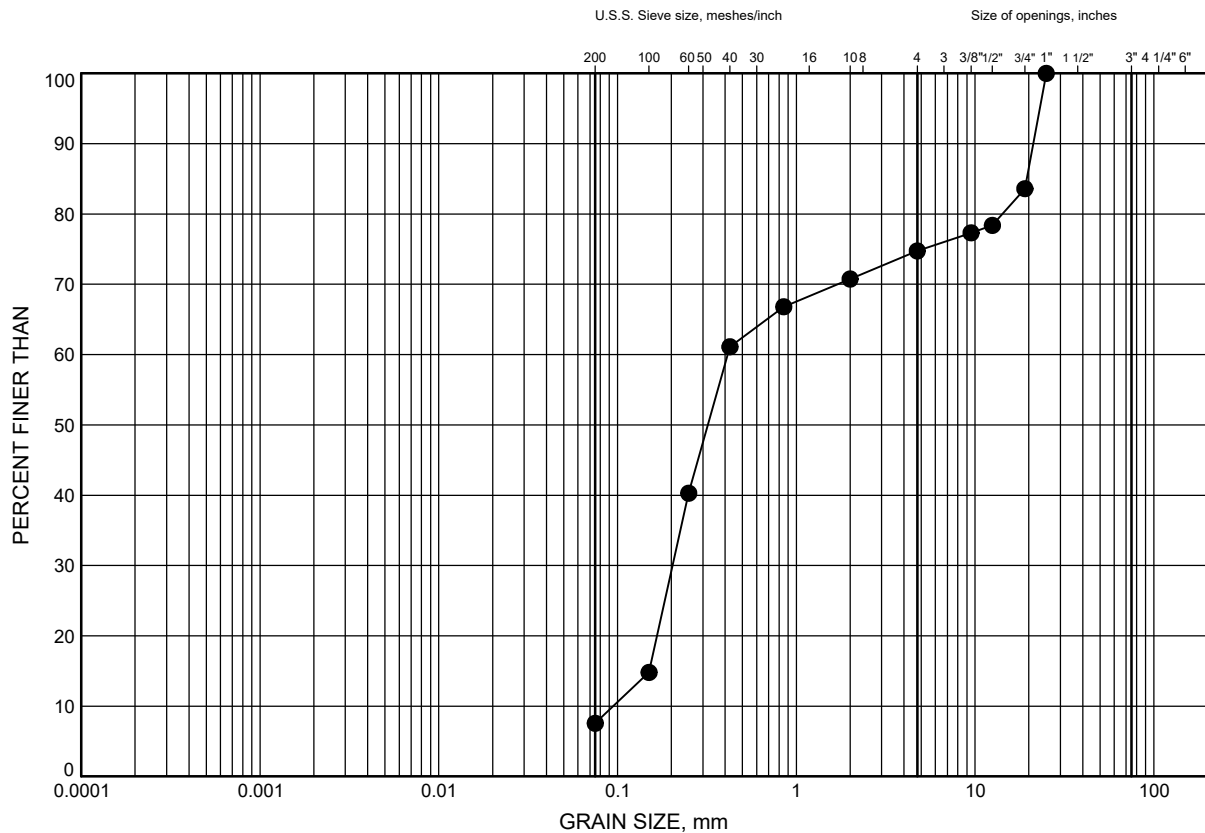


Prep'd AN

Chkd. MH

GRAIN SIZE DISTRIBUTION

Gravelly SAND



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	16-01	1.8	253.7

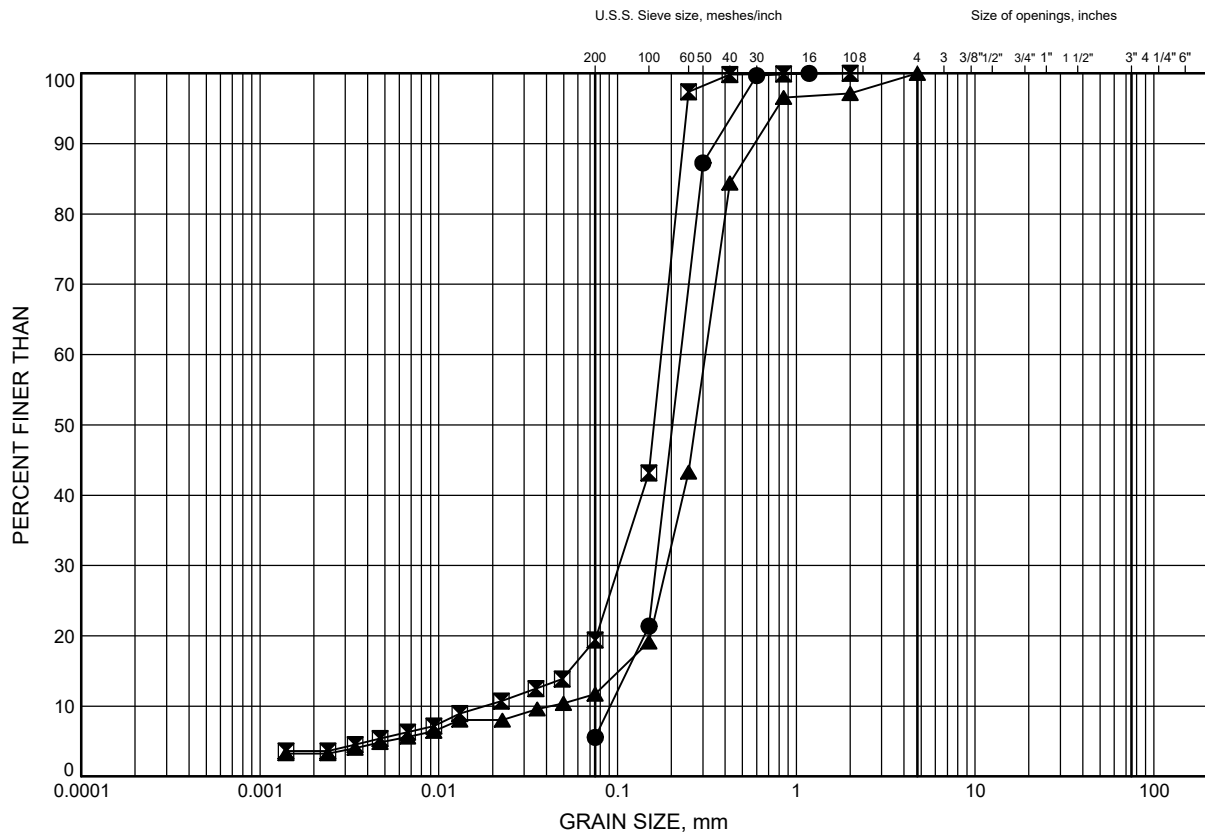
Date April 2018
W.P. 2539-04-00



Prep'd AN
Chkd. MH

GRAIN SIZE DISTRIBUTION

SAND



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	16-01	3.4	252.1
⊠	16-01	7.9	247.6
▲	16-03	6.4	250.4

Date April 2018

W.P. 2539-04-00

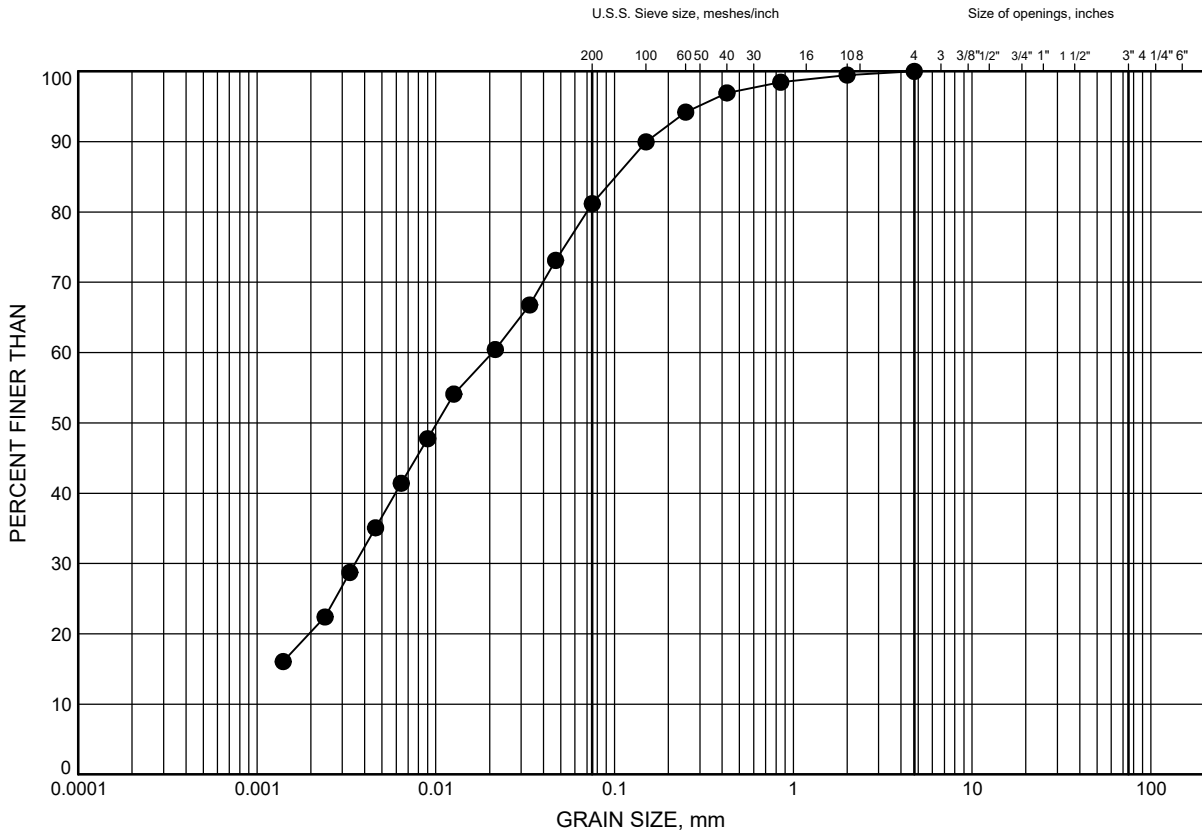


Prep'd AN

Chkd. MH

GRAIN SIZE DISTRIBUTION

Clayey SILT TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	16-02	7.9	249.4

Date April 2018
W.P. 2539-04-00

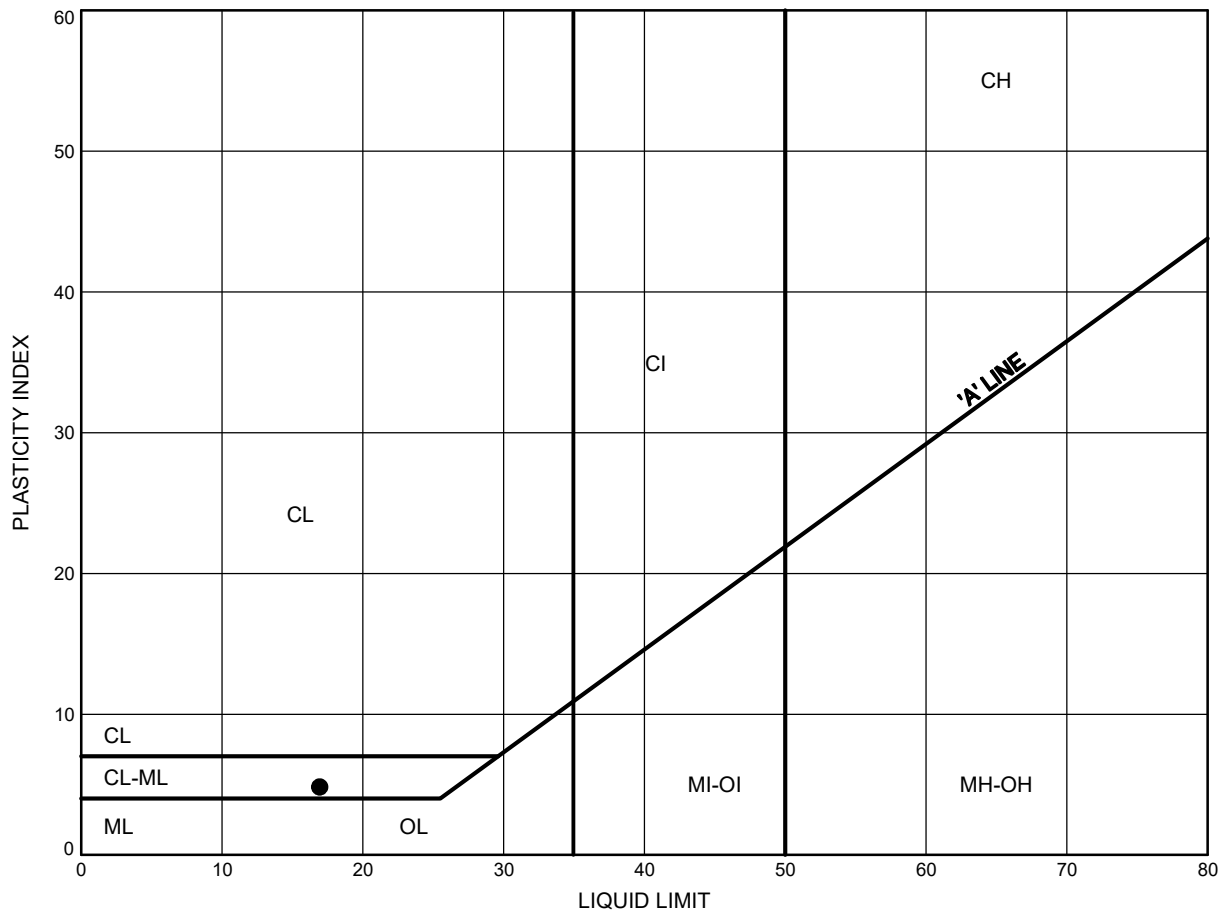


Prep'd AN
Chkd. MH

East Humber Arch Culvert Extension Highway 400 widening
ATTERBERG LIMITS TEST RESULTS

FIGURE B5

Clayey SILT TILL



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	16-02	7.9	249.4

Date April 2018
 W.P. 2539-04-00

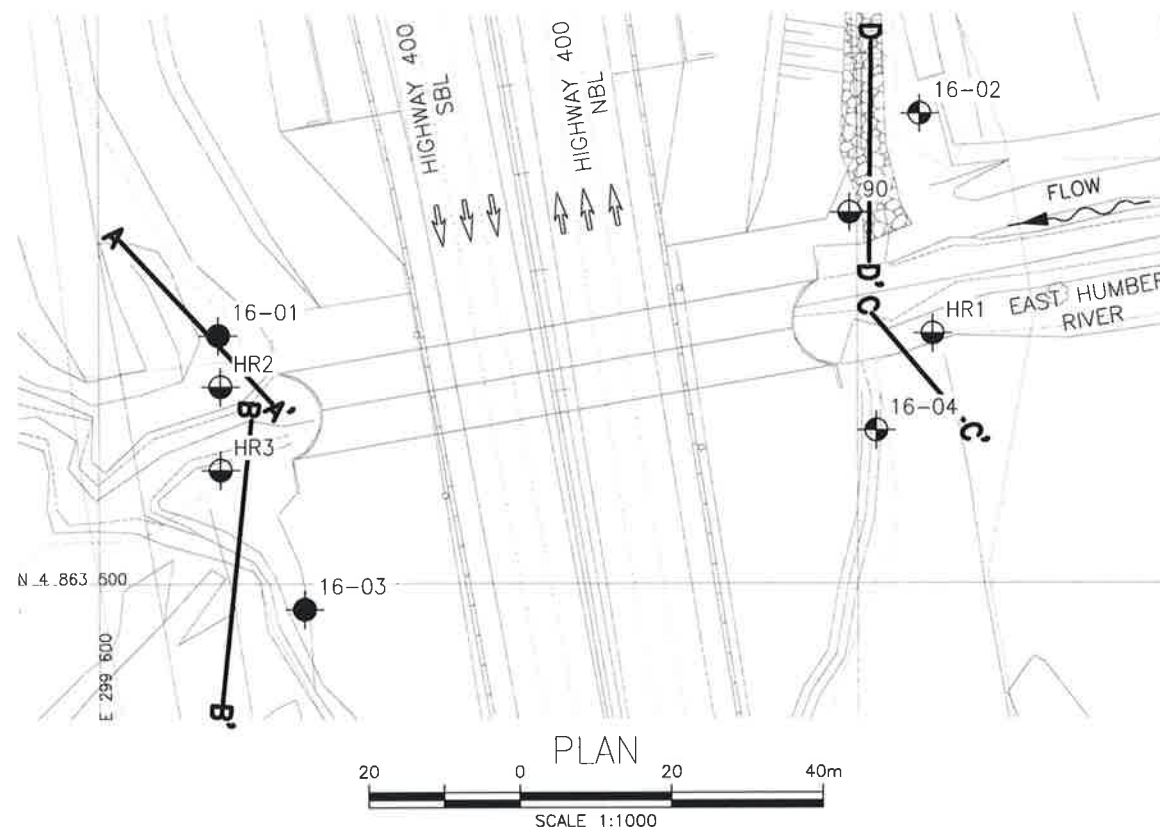
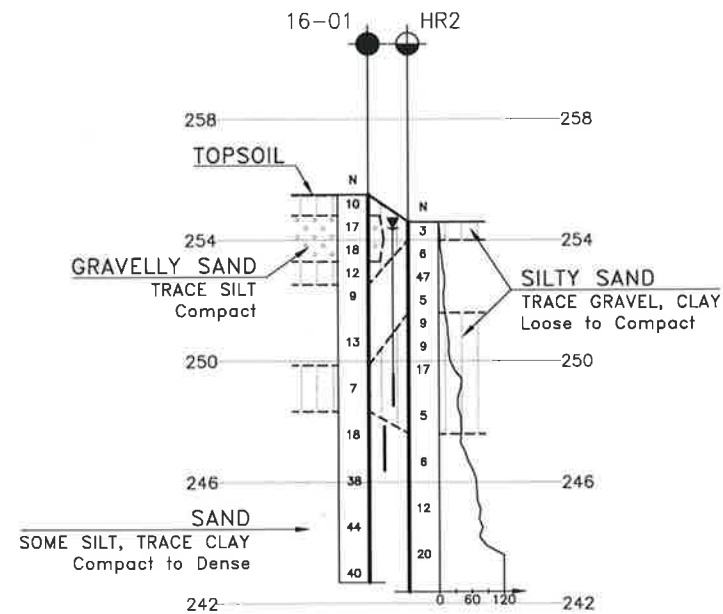


Prep'd AN
 Chkd. MH



Appendix C

Drawings titled “Borehole Locations and Soil Strata”

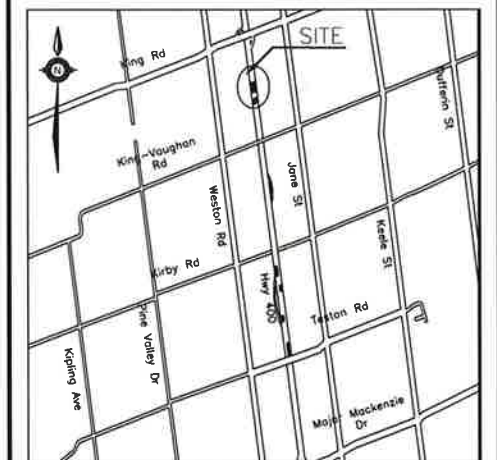


CONT No 2017-2001
WP No 2539-04-00

HIGHWAY 400
EAST HUMBER RIVER CULVERT
RETAINING WALLS
BOREHOLE LOCATIONS AND SOIL STRATA

SNC-LAVALIN

THURBER ENGINEERING LTD.



KEYPLAN

LEGEND

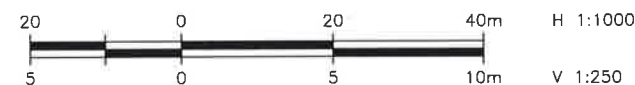
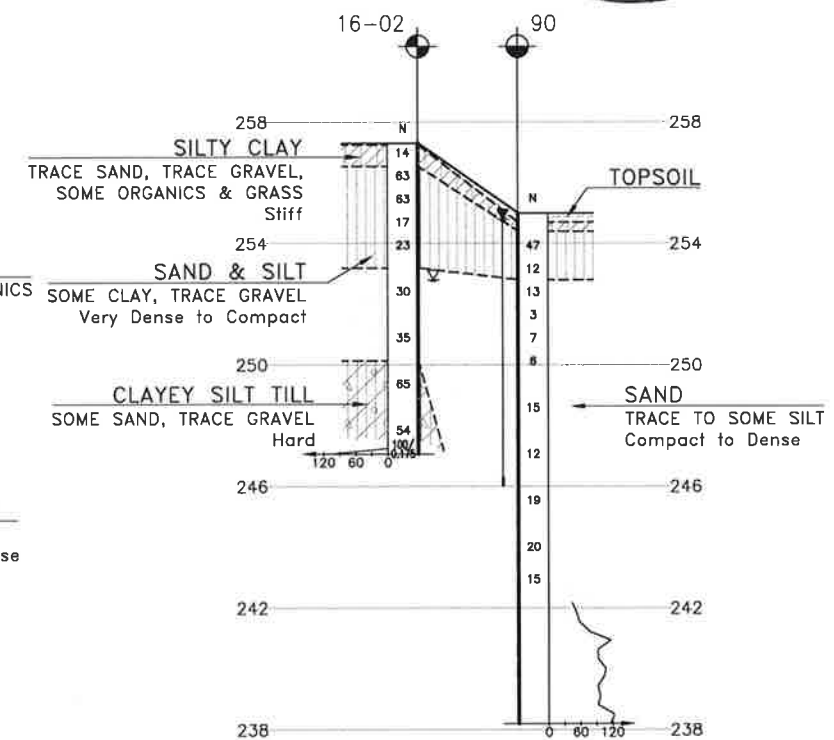
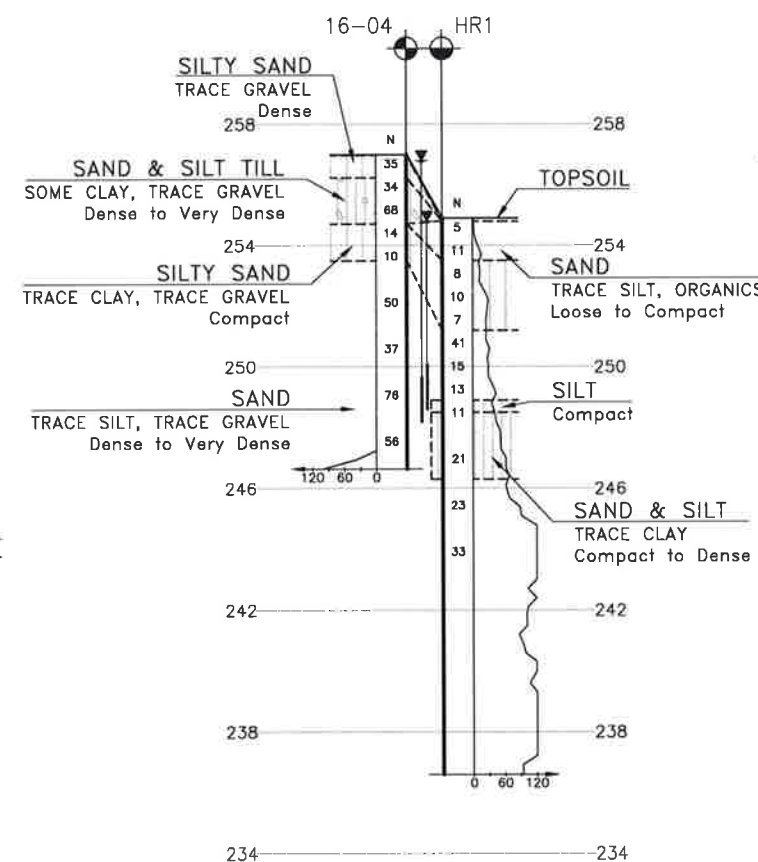
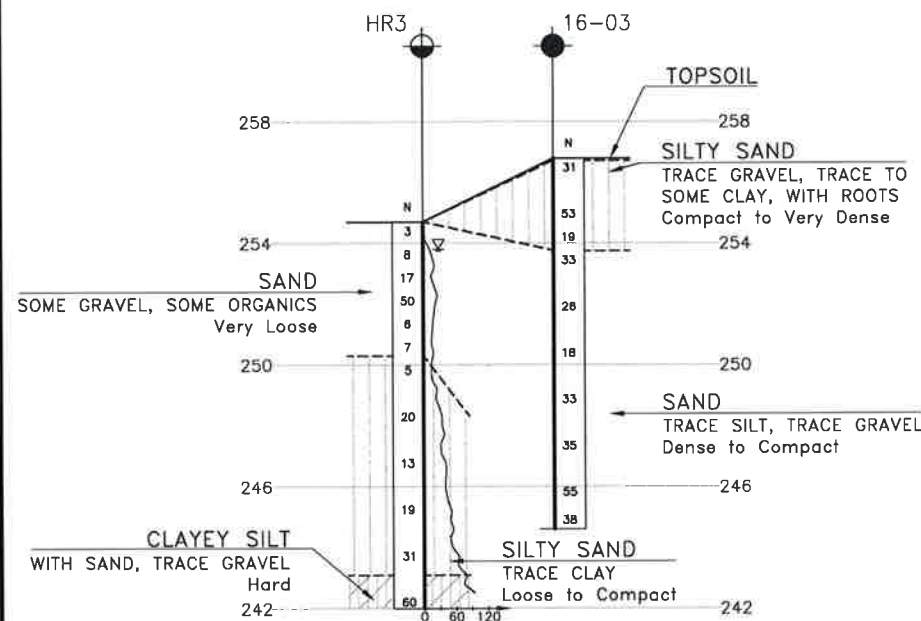
- Borehole
- ⊕ Borehole & Cone
- ⊕ Borehole (Geocres No. 30M13-156)
- N Blows /0.3m (Std Pen Test, 475J/blow)
- CONE Blows /0.3m (60' Cone, 475J/blow)
- PH Pressure, Hydraulic
- ▽ Water Level
- ⬆ Head Artesian Water
- ⬆ Piezometer
- A/R Auger Refusal

NO	ELEVATION	NORTHING	EASTING
16-01	255.5	4 863 532.8	299 615.7
16-02	257.3	4 863 562.1	299 708.3
16-03	256.8	4 863 496.6	299 627.0
16-04	257.0	4 863 520.2	299 702.5
90	255.0	4 863 549.0	299 699.0
HR1	254.9	4 863 533.0	299 710.0
HR2	254.6	4 863 526.0	299 616.0
HR3	254.7	4 863 515.0	299 616.0

NOTES

- The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
- This drawing is for subsurface information only. Surface details and features are for conceptual illustration.

GEOCRES No. 30M13-219



DATE	BY	DESCRIPTION
DESIGN	MH	CHK SKP CODE
DRAWN	AN	CHK MH SITE 37-94
		LOAD
		DATE APR 2018
		JDWG R2-2