

**FOUNDATION INVESTIGATION AND DESIGN REPORT
OVERHEAD AND CANTILEVERED SIGN SUPPORTS
HIGHWAY 400
MAJOR MACKENZIE DRIVE TO NORTH OF KING ROAD
TORONTO, ONTARIO
G.W.P. 2539-04-00**

GEOCRES No. 30M13-194

Submitted

To

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TABLE OF CONTENTS		
SECTION		PAGE
PART 1	FACTUAL INFORMATION	
1.0	INTRODUCTION	1
2.0	SITE DESCRIPTION	1
3.0	INVESTIGATION PROCEDURES	2
3.1	Field Investigation.....	2
3.2	Laboratory Testing	4
4.0	SUBSURFACE CONDITIONS	5
4.1	General	5
4.2	Pavement Structure	5
4.3	Embankment Fill	6
4.4	Clayey Silt to Silty Clay Till	7
4.5	Sandy Silt to Silt and Sand Till	8
4.6	Sandy Silt	9
4.7	Sand.....	9
4.8	Groundwater Conditions	10
5.0	Miscellaneous	11
PART 2	ENGINEERING DISCUSSION AND RECOMMENDATIONS	
6.0	OVERHEAD AND CANTILEVERED SIGN (OH&CS) SUPPORT DESIGN RECOMMENDATIONS.....	14
6.1	General	14
6.2	Foundation Design Parameters.....	14
6.3	Caisson Installation	16
6.4	Construction Concerns	17
6.5	Construction Inspection and Testing.....	17

TABLES

Table 1	Foundation Design Parameters for Overhead and Cantilevered Sign Supports
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DRAWINGS

Drawings 1 to 8	Borehole Locations Plans
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APPENDICES

Appendix A	Records of Boreholes
Appendix B	Geotechnical Laboratory Test Results
Appendix C	List of Special Provisions and Suggested Text for NSSP



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PART 1 FACTUAL INFORMATION

1.0 INTRODUCTION

This report presents the factual data obtained from a foundation investigation carried out by Thurber Engineering Ltd. (Thurber) for the detailed design of Overhead and Cantilevered Sign (OH&CS) supports at locations from Major Mackenzie Drive to north of King Road along Highway 400 in the Regional Municipality of York, Ontario. Thurber has been retained by SNC-Lavalin Inc. (SLI) to carry out this investigation under the Ministry of Transportation Ontario (MTO) Agreement No. 2005-E-0037.

The purpose of this investigation was to explore the subsurface conditions at the proposed locations of the overhead and cantilevered sign supports and, based on this data, to provide borehole locations plans, records of boreholes, laboratory test results and a written description of the subsurface conditions.

2.0 SITE DESCRIPTION

The overhead and cantilevered signs are to be located along the alignment of the proposed Highway 400 widening, between the interchange at Major Mackenzie Drive and about 1 km north of King Road.

The project area is located within the physiographic region known as the South Slope of the Oak Ridges Moraine, which is comprised predominantly of the Halton drift (till). The Halton till is an



interbedded complex of clayey silt to silt till and sand. This till comprises a slightly hummocky till plain, into which the surface watercourses have eroded 10 to 15 m deep gullies. Relatively recent fluvial sediments have been deposited in the gullies. The Halton drift overlies bedrock at depths in the order of 100 m in the vicinity of the project area.

Drainage in the vicinity of the project area is largely controlled by the Humber River and its tributaries. Localized drainage is facilitated by the creeks flowing within the gullies.

The land use adjacent to this section of Highway 400 is largely rural and agricultural, although there is increasing residential and commercial development in recent years.

3.0 INVESTIGATION PROCEDURES

3.1 Field Investigation

The field investigation for this project was carried out between January 24 and February 3, 2011, and on May 3, 2011. Twenty one (21) boreholes (11-01 to 11-19, 11-21 and 11-22) were advanced at the locations of proposed overhead signs during the first period, while Borehole 11-20 was advanced in May. All of the boreholes were located in the Highway 400 median or on the shoulder of either the northbound or southbound lanes. The locations of the boreholes were determined based on drawings provided by SNC Lavalin. The approximate locations of the boreholes covered in this report are shown on the Borehole Locations Plans (8 sheets) immediately following the text and tables.

The boreholes were advanced using solid stem augers to depths of 9.8 m to 11.3 m. In each borehole, soil samples were obtained at selected intervals with a 50 mm outside diameter split spoon sampler driven in conjunction with the Standard Penetration Test (SPT).

Groundwater conditions were observed in the open boreholes throughout the drilling operations. No standpipe piezometer was installed for this investigation since existing groundwater data along the subject highway alignment was considered sufficient to provide information for sign support design. Moreover, the boreholes were located adjacent to travelled lanes on the highway



rendering it very disruptive to the traffic during the reading and decommissioning of piezometers should they be installed. The borehole completion details are summarized below in Table 3.1.

Table 3.1 – Borehole Completion Details

Borehole Number	Completion Details
11-01	Bentonite holeplug to 9.4 m, cuttings from 9.4 m to 0.6 m, concrete from 0.6 m to 0.1 m, then asphalt from 0.1 m to surface.
11-02	Bentonite holeplug to 9.1 m, cuttings from 9.1 m to 1.8 m, bentonite holeplug from 1.8 m to 0.4 m, concrete from 0.4 m to 0.1 m, then asphalt from 0.1 m to surface.
11-03	Bentonite holeplug to 9.8 m, cuttings from 9.8 m to 0.9 m, concrete from 0.9 m to 0.1 m, then asphalt from 0.1 m to surface.
11-04	Bentonite holeplug to 9.7 m, cuttings from 9.7 m to 0.6 m, concrete from 0.6 m to 0.1 m, then asphalt from 0.1 m to surface.
11-05	Bentonite holeplug to 8.8 m, cuttings from 8.8 m to 0.6 m, concrete from 0.6 m to 0.2 m, then asphalt from 0.2 m to surface.
11-06	Bentonite holeplug to 9.4 m, cuttings from 9.4 m to 0.9 m, bentonite holeplug from 0.9 m to 0.6 m, concrete from 0.6 m to 0.1 m, then asphalt from 0.1 m to surface.
11-07	Bentonite holeplug to 9.1 m, cuttings from 9.1 m to 0.8 m, bentonite holeplug from 0.8 m to 0.4 m, concrete from 0.4 m to 0.1 m, then asphalt from 0.1 m to surface.
11-08	Bentonite holeplug to 9.6 m, cuttings from 9.6 m to 0.7 m, bentonite holeplug from 0.7 m to 0.4 m, concrete from 0.4 m to 0.1 m, then asphalt from 0.1 m to surface.
11-09	Bentonite holeplug to 9.7 m, cuttings from 9.7 m to 0.9 m, bentonite holeplug from 0.9 m to 0.4 m, concrete from 0.4 m to 0.1 m, then asphalt from 0.1 m to surface.
11-10	Bentonite holeplug to 9.7 m, cuttings from 9.7 m to 0.9 m, bentonite holeplug from 0.9 m to 0.4 m, concrete from 0.4 m to 0.1 m, then asphalt from 0.1 m to surface.
11-11	Bentonite holeplug to 10.0 m, cuttings from 10.0 m to 0.9 m, bentonite holeplug from 0.9 m to 0.4 m, concrete from 0.4 m to 0.1 m, then asphalt from 0.1 m to surface.
11-12	Bentonite holeplug to 10.0 m, cuttings from 10.0 m to 0.9 m, bentonite holeplug from 0.9 m to 0.4 m, concrete from 0.4 m to 0.1 m, then asphalt from 0.1 m to surface.
11-13	Bentonite holeplug to 9.4 m, cuttings from 9.4 m to 0.9 m, bentonite holeplug from 0.9 m to 0.4 m, concrete from 0.4 m to 0.1 m, then asphalt from 0.1 m to surface.
11-14	Bentonite holeplug to 9.9 m, cuttings from 9.9 m to 0.4 m, bentonite holeplug from 0.4 m to 0.1 m, then asphalt from 0.1 m to surface.



Borehole Number	Completion Details
11-15	Bentonite holeplug to 9.7 m, cuttings from 9.7 m to 0.8 m, bentonite holeplug from 0.8 m to 0.4 m, concrete from 0.4 m to 0.1 m, then asphalt from 0.1 m to surface.
11-16	Bentonite holeplug to 10.0 m, cuttings from 10.0 m to 0.9 m, bentonite holeplug from 0.9 m to 0.4 m, concrete from 0.4 m to 0.1 m, then asphalt from 0.1 m to surface.
11-17	Bentonite holeplug to 9.7 m, cuttings from 9.7 m to 0.9 m, bentonite holeplug from 0.9 m to 0.4 m, concrete from 0.4 m to 0.1 m, then asphalt from 0.1 m to surface.
11-18	Bentonite holeplug to 9.7 m, cuttings from 9.7 m to 0.3 m, bentonite holeplug from 0.3 m to 0.1 m, then asphalt from 0.1 m to surface.
11-19	Bentonite holeplug to 9.7 m, cuttings from 9.7 m to 0.9 m, bentonite holeplug from 0.9 m to 0.4 m, concrete from 0.4 m to 0.1 m, then asphalt from 0.1 m to surface.
11-20	Bentonite holeplug to 1.0 m, concrete from 1.0 m to 0.1 m, then asphalt from 0.1 m to surface.
11-21	Bentonite holeplug to 10.0 m, cuttings from 10.0 m to 0.7 m, bentonite holeplug from 0.7 m to 0.4 m, concrete from 0.4 m to 0.1 m, then asphalt from 0.1 m to surface.
11-22	Bentonite holeplug to 9.7 m, cuttings from 9.7 m to 0.7 m, bentonite holeplug from 0.7 m to 0.4 m, concrete from 0.4 m to 0.1 m, then asphalt from 0.1 m to surface.

The drilling investigation was supervised on a full-time basis by a member of Thurber's technical staff who located the boreholes in the field, cleared borehole locations of underground utilities, directed the drilling, sampling and in-situ testing operations, and logged the boreholes. The supervisor processed the recovered soil samples for transport to Thurber's laboratory for further examination and testing. Results of field sampling and testing are presented in the Record of Borehole sheets included in Appendix A.

3.2 Laboratory Testing

Geotechnical laboratory testing consisted of natural moisture content determination and visual identification of all soil samples in accordance with the current MTO standards. Grain size distribution analysis and Atterberg Limits tests were also conducted on selected samples. The results of these laboratory tests are summarized on the Record of Borehole sheets included in Appendix A and are illustrated on the figures included in Appendix B.



4.0 SUBSURFACE CONDITIONS

4.1 General

This section presents a generalized summary of the subsurface conditions encountered in Boreholes 11-01 to 11-22. The detailed subsurface soil and groundwater conditions encountered in these boreholes are presented on the Record of Borehole sheets included in Appendix A. The factual data presented in the records of boreholes governs any interpretation of the site conditions. It must be recognized that the subsurface conditions vary between and beyond the borehole locations.

In general, the subsurface conditions encountered in the boreholes consist of pavement structure, and in some locations embankment fill, overlying native clayey silt to silty clay till. At some locations, the clayey silt to silty clay till is underlain by deposits of silt and sand till, sand and/or silt. Approximately half of the boreholes were dry upon completion of drilling.

4.2 Pavement Structure

Pavement structure consisting of asphalt overlying granular fill materials (sand fill) was encountered in all of the boreholes. The thickness of the asphalt ranged between 150 mm and 280 mm, and was typically greater than 230 mm. The granular fill consists of sand with trace to some gravel, and trace to some silt and clay, and was found to range between 0.6 m and 1.7 m in thickness. These soils are in a compact to very dense state as indicated by SPT 'N' values ranging from 11 to 75 blows per 0.3 m penetration. The base of the granular fill varies from Elevation 226.2 m to 308.6 m.

Selected samples of the sand fill were submitted for laboratory gradation testing, the results of which are summarized below. The grain size distribution curves for these samples are included in Figure B1 of Appendix B. The results of these tests are also summarized on the Record of Borehole sheets included in Appendix A. The measured moisture contents of the granular fill ranged from 0.5% to 19%.



Soil Particles	Percentage (%)
Gravel	0 to 10
Sand	81 to 88
Silt and Clay	9 to 16

4.3 Embankment Fill

Below the pavement structure, embankment fill was encountered in Boreholes 11-02, 11-04, 11-05, 11-08, 11-10, 11-11, 11-14 to 11-17, 11-19, 11-20, 11-21, and 11-22. The embankment fill consists of clayey silt to silty clay with sand and trace gravel and is brown to grey in colour. The thickness of the fill ranged from 0.4 m to 9.1 m and the base of the fill was found to vary between Elevations 227.4 m and 307.2 m.

SPT 'N' recorded in the embankment fill materials varied from 4 to 77 blows per 0.3 m penetration, indicating a firm to hard consistency. However, in most boreholes the embankment fill was found to have a firm to very stiff consistency. The measured moisture contents of the embankment fill material ranged from 9% to 28%, typically between 10% and 20%.

Selected samples of the embankment fill were submitted for gradation analysis and Atterberg Limits testing, the results of which are summarized below. Figure B2 of Appendix B presents the grain size distribution curves for these samples and Figure B13 illustrates the Atterberg Limits classification.

Soil Particles	Percentage (%)
Gravel	0 to 1
Sand	20 to 38
Silt	44 to 62
Clay	18 to 26

Index Property	Percentage (%)
Liquid Limit	21 to 28
Plastic Limit	13 to 15
Plasticity Index	8 to 14



The results of the Atterberg Limits tests show that the clayey silt to silty clay embankment fill is low plastic, with a group symbol of CL.

4.4 Clayey Silt to Silty Clay Till

A till deposit consisting of clayey silt to silty clay with sand and trace gravel was encountered in all but Borehole 11-19 either directly below the pavement structure or below the embankment fill described above. This deposit was typically brown changing to grey with increased depth. Where fully penetrated in Boreholes 11-03, 11-06, 11-07, 11-08, 11-21 and 11-22, the thickness of the clayey silt to silty clay till ranged from 4.8 m to 8.0 m. A maximum thickness of 10.1 m was encountered in one of the remaining boreholes (11-09) where this till deposit was not fully penetrated. Where fully penetrated, the base of the till was found to vary between Elevations 230.2 and 298.4 m.

SPT 'N' values measured in this till deposit ranged from 8 to 84 blows for 0.3 m penetration indicating a stiff to hard consistency. In many locations, the SPT 'N' values increase with depth. Occasional high 'N' values of greater than 50 blows for less than 0.3 m penetration are indicative of the presence of cobbles and/or boulders within the till deposit. Measured moisture contents of the clayey silt/silty clay till samples generally ranged from 10% to 20% with occasional lower and higher values.

Selected samples of the clayey silt to silty clay till were submitted for gradation analysis and Atterberg Limits testing. The results of these tests are summarized in the tables below as well as on the Record of Borehole sheets included in Appendix A. Figures B3 to B8 present the grain size distribution curves for these samples and Figures B14 to B19 illustrate the results of the Atterberg Limits tests.

Soil Particles	Percentage (%)
Gravel	0 to 4
Sand	4 to 39
Silt	35 to 56
Clay	13 to 60



Index Property	Percentage (%)
Liquid Limit	18 to 44
Plastic Limit	12 to 20
Plasticity Index	6 to 24

The results of the Atterberg Limits tests indicate that the clayey silt to silty clay till is generally low plastic, with a group symbol of CL. At a few selected locations, the silty clay till is medium plastic, with a group symbol of CI.

Glacial tills inherently contain cobbles and boulders, and were inferred by the refusal 'N' values recorded in the boreholes.

4.5 Sandy Silt to Silt and Sand Till

Deposits of sandy silt to silt and sand till were encountered below the clayey silt to silty clay till in Boreholes 11-03, 11-06, and 11-07 at depths of 6.1 m to 9.6 m. The thickness of the sandy silt to silt and sand till encountered in these boreholes ranged from 1.2 m to 5.0 m, though these deposits were not fully penetrated in any of these boreholes.

SPT 'N' values recorded in the sandy silt to silt and sand till deposits ranged from 75 blows for 0.3 m penetration to greater than 50 blows for less than 0.3 m penetration. These 'N' values indicate a very dense condition throughout, and possible presence of cobbles and boulders in the deposit. Measured moisture contents of the sandy silt to silt and sand till samples ranged from 4 % to 15%.

Selected samples from these deposits underwent laboratory gradation testing. Figure B9 in Appendix B shows the grain size distribution curves for these samples and the results are also summarized on the Record of Borehole sheets in Appendix A. The results of the gradation testing are summarized below.



Soil Particles	Percentage (%)
Gravel	0 to 3
Sand	13 to 63
Silt	35 to 82
Clay	2 to 10

4.6 Sandy Silt

A 3.2 m thick layer of sandy silt was encountered at a depth of 2.9 m, or Elevation 237.7m, in Borehole 11-04 below the clayey silt fill. Silt to sandy silt was also encountered at a depth of 8.7 m or Elevation 296.9 m in Borehole 11-22, below a thin layer of silty sand. Borehole 11-22 was terminated within this layer.

At Borehole 11-04, the SPT 'N' values ranged from 30 to 55 blows for 0.3 m penetration, indicating a dense condition. At BH11-22, SPT 'N' values recorded in the silt and sandy silt ranged from 18 to 28 blows for 0.3 m penetration, indicating a compact condition. Measured moisture contents of samples of the silt to sandy silt ranged from 10% to 20%.

Selected samples of the silt to sandy silt were subjected to gradation analysis, the results of which are summarized below. These results are also summarized on the Record of Borehole sheets in Appendix A. The grain size distribution curves for these samples are presented on Figures B10 and B11 of Appendix B.

Soil Particles	Percentage (%)
Gravel	0
Sand	4 to 20
Silt	66 to 85
Clay	11 to 14

4.7 Sand

Sand deposits containing some silt and clay were encountered at depths ranging from 6.1 to 10.3 m, or Elevations 234.5 to 298.4 m, in Boreholes 11-04, 11-08, 11-19, 11-21 and 11-22. At Boreholes 11-08 and 11-19, the sand was not fully penetrated. Where fully penetrated, the sand



deposits were found to range in thickness from 1.0 m to 3.8 m. A thin layer of sand, 0.2 m thick, was encountered in Borehole 11-03 within the silt and sand till deposit and in Borehole 11-18, a thin layer of sand (0.5 m thick) was encountered within the silty clay till.

SPT 'N' values recorded in the sand deposits ranged from 17 to 80 blows for 0.3 m penetration, indicating a compact to very dense condition. Measured moisture contents of samples of the sand typically ranged from 10 to 20%, with some lower values.

Selected sand samples were subjected to gradation testing, the results of which are summarized below. These results are also summarized on the Record of Borehole sheets included in Appendix A and the grain size distribution curves are presented on Figure B12 of Appendix B.

Soil Particles	Percentage (%)
Gravel	0
Sand	70 to 89
Silt	14 to 26
Clay	2 to 4
Silt and Clay	11 to 16

4.8 Groundwater Conditions

Groundwater conditions were observed during drilling and water levels were measured in the open borehole upon completion of drilling. Several of the boreholes were dry upon completion. The water levels measured in the open boreholes are summarized below.



Table 4.1 Water Level Measurements in Open Boreholes

Borehole Number	Date	Depth (m)	Elevation (m)
11-01	January 24, 2011	5.4	222.3
11-02	January 24, 2011	DRY	
11-03	January 25, 2011	DRY	
11-04	January 25, 2011	6.7	233.9
11-05	January 25, 2011	DRY	
11-06	January 25, 2011	DRY	
11-07	January 26, 2011	DRY	
11-08	January 26, 2011	6.7	240.5
11-09	January 26, 2011	DRY	
11-10	January 27, 2011	DRY	
11-11	January 27, 2011	DRY	
11-12	January 27, 2011	7.9	247.3
11-13	January 28, 2011	8.5	249.1
11-14	January 31, 2011	8.8	262.8
11-15	January 28, 2011	3.6	270.6
11-16	January 28, 2011	3.6	270.9
11-17	January 31, 2011	5.1	275.3
11-18	January 31, 2011	4.5	272.6
11-19	February 3, 2011	DRY	
11-20	May 3, 2011	DRY	
11-21	February 1, 2011	7.0	299.1
11-22	February 1, 2011	4.2	301.4

Based on the observations in the open boreholes, the water level varies between 3.6 and 8.8 m depth below ground surface. It should be noted that these are very short term observations and groundwater levels are subject to seasonal fluctuations and severe climatic events.

5.0 MISCELLANEOUS

Thurber marked the borehole locations in the field and obtained utility clearances prior to drilling. J.D. Barnes Limited surveyed the as-drilled locations, and provided northing and easting coordinates and ground surface elevations.



DBW Drilling Ltd of Ajax, Ontario supplied the drill rig and conducted the drilling, sampling and in-situ testing operations. Traffic control during the field work was provided by Barricade Traffic Services Inc. where required.

The drilling and sampling operations in the field were supervised on a full time basis by Ms. Eckie Siu of Thurber. Laboratory testing was carried out by Thurber in its MTO-approved Oakville laboratory.

Mr. Mark Farrant, P.Eng provided overall direction of the field operations and Mrs. Lindsey Blaine, E.I.T prepared this report. Dr. P.K. Chatterji, P.Eng., a Designated Principal Contact for MTO Foundations projects, reviewed the report.



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PART 2 ENGINEERING DISCUSSION AND RECOMMENDATIONS

**6.0 OVERHEAD AND CANTILEVERED SIGN (OH&CS) SUPPORT DESIGN
RECOMMENDATIONS**

6.1 General

This section of the report presents foundation recommendations for the design of the proposed Overhead and Cantilevered Sign (OH & CS) supports.

This project includes a total of five (5) OHS, and twenty two (22) CS of which eight (8) are to be arranged in pairs, i.e. each with two (2) signs on one support. The OHS include Tri-Chord type structures each with two supports that are to be located at both the northbound and southbound lanes. The CS supports are to be located in the highway median.

Information on the proposed locations of the signs was provided to Thurber by SLI. Based on the proposed design layout, one borehole was drilled at the location of each proposed sign location. The Record of Borehole sheets for these boreholes are presented in Appendix A. Table 1 immediately following the text of this report indicates the relevant boreholes that are used for the design of the sign supports.

6.2 Foundation Design Parameters

Design of the sign support foundations should be carried out in accordance with the following document.



- Ministry of Transportation, Ontario (2007) “Sign Support Manual”, Policy, Planning and Standards Division, Bridge Office (Reference 1).

Reference should also be made to the following documents.

- Ministry of Transportation, Ontario (2003) “Guidelines for the Design of High Mast Pole Foundations”, Third Edition, BRO-006, Engineering Standards Branch, Bridge Office (Reference 2).
- Canadian Highway Bridge Design Code and Commentary (2006). CAN/CSA-S6-00 and S6.1-00 (Reference 3).

It is noted that Reference 2 is based on caisson design recommendations from the following:

- Broms, B.B. (1964a). Lateral Resistance of Piles in Cohesive Soils. Journal for Soil Mech. and Found. Engrg., ASCE, Vol.90, SM2, pp. 27-64 (Reference 4).
- Broms, B.B. (1964b). Lateral Resistance of Piles in Cohesionless Soils. Journal for Soil Mech. and Found. Engrg., ASCE, Vol.90, SM3, pp. 123-156 (Reference 5).

It is understood that a typical sign support consists of a single conventional augered caisson (drilled shaft). Table 1 following the text of this report presents the recommended geotechnical design parameters for the design of such caissons. For an OHS with two supports, both caissons should be designed using the same set of foundation design parameters as recommended in Table 1. For a CS with a single support, the caisson should be designed based on a unique set of foundation design parameters provided in Table 1.

It is recommended that MTO’s standard drawings SS 118-3, 4 and 5 and other relevant foundation design recommendations in Reference 1 be used as a basis for the sign support designs. The foundation design parameters in Table 1 should be used in conjunction with Reference 2 to confirm that the standard designs are adequate.

In order to take into account frost action and surficial disturbance, the ultimate lateral passive resistance in front of a caisson within the upper 1.2 m below final grade should be neglected in the foundation design. It is recommended that all topsoil and organics be neglected in determining lateral resistance.



Where downward sloping fill or native soil exists in front of a caisson, reduction of lateral passive resistance should be taken into account during design. The stabilized groundwater level may be higher. For foundation design at the caissons, it should be assumed that full lateral resistance can only be mobilized where the width of the soil in front of or behind the caisson is equal to or greater than approximately four (4) times the diameter of the caissons. For sloping ground in front of a caisson, the magnitude of the mobilized passive resistance can be estimated by interpolating between zero passive resistance at the level where the slope face intersects the pile, and full passive resistance at the level where the slope face is equal to or greater than four (4) times the diameter of the caisson.

Where an unconfined compressive strength, q_u , ($q_u = 2 \times C_u$, undrained shear strength) is provided for a cohesive soil (clayey silt to silty clay fill or till), the ultimate lateral passive resistance should be calculated in conjunction with the total soil unit weight. When designing for portions of the caissons below the groundwater level in cohesionless sands and silts, the submerged soil unit weight, γ' , should be used. The required depth of the drilled shaft will be governed by lateral loads, including wind loads, acting on the sign. The length of the caisson should also be sufficient to counteract frost jacking (upward) forces.

An equivalent caisson width equal to 2 times the caisson diameter may be assumed for lateral resistance calculations. Appropriate load and resistance factors should be applied for caisson design.

6.3 Caisson Installation

Caisson installation should generally be carried out in accordance with OPSS 903.

The contract documents should contain an NSSP alerting the contract bidders of the specific aspects relating to caisson construction for OHS and CS foundation supports at this site. Suggested wordings for this NSSP are provided in Appendix C.



Caisson installation equipment must be able to dislodge, handle, remove cobbles and boulders, to penetrate obstructions within the fill and to drill through hard or very dense layers, where encountered.

The short term groundwater levels were measured to be between 4 m and 8 m depth below existing ground surface. The stabilized groundwater levels may be higher. Soil sloughing and water seepage may occur in unsupported holes especially in sands and silts below the groundwater level. Temporary liners must be available to support the caisson sidewalls and to provide seepage cut-off where required. Any accumulated water may have to be pumped out from the hole prior to placing concrete. Should it be considered impractical to remove the accumulated water inside the hole, it is recommended that the concrete be placed by the tremie method.

6.4 Construction Concerns

Concerns during caisson construction mainly involve the handling and removal of cobbles or boulders, or other obstructions in the fill and till, drilling through hard/very dense soils, soil sloughing and water seepage from caisson sidewalls, and basal instability. Recommendations on how to address these issues have been outlined in the previous section.

6.5 Construction Inspection and Testing

Caisson construction should be monitored by qualified geotechnical personnel (as per OPSS 903) to verify the soil conditions and to confirm that those conditions are consistent with the design assumptions in this report.



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TABLE 1
FOUNDATION DESIGN PARAMETERS
OVERHEAD SIGN SUPPORTS
HIGHWAY 400 WIDENING
MAJOR MACKENZIE DRIVE TO KING ROAD
G.W.P. 2539-04-00

Sign Number and Location (Station)	Reference Borehole	Reference Simplified Subsurface Stratigraphy For Design	Depth Below Existing Ground Surface (m)	Foundation Design Parameters						
				q _u (kPa)	ϕ' (deg.)	n _h (MN/m ³)	K _p	γ (kN/m ³)	γ' (kN/m ³)	Groundwater Depth (m)
CS-01 (17+900)	BH11-01	Sand (Fill) Clayey Silt Till Clayey Silt Till	0.2 – 1.5	-	30	3.0	3.0	20	-	5 (below existing grade)
			1.5 – 4.0	130	-	-	-	20	-	
			4.0 – 11.3	240	-	-	-	21	-	
CS-02 and CS-03 (18+300)	BH11-02	Sand/Clayey Silt (Fill) Clayey Silt Till	0.2 – 2.3	-	30	3.0	3.0	20	-	4 (below existing grade)
			2.3 – 11.3	300	-	-	-	21	-	
OH-01 (18+894)	BH11-03	Sand (Fill) Clayey Silt Till Silt and Sand Till	0.2 – 1.3	-	30	3.0	3.0	20	-	6 (below existing grade)
			1.3 – 6.0	110	-	-	-	20	-	
			6.0 – 11.1	-	38	11.0	4.2	21	11	
OH-02 (19+301)	BH11-04	Sand/Clayey Silt (Fill) Sandy Silt Sand Silty Clay Till	0.3 – 3.0	-	30	3.0	3.0	20	-	6 (below existing grade)
			3.0 – 6.0	-	33	7.0	3.3	20	10	
			6.0 – 10.0	-	34	5.5	3.5	21	11	
			10.0 – 11.3	300	-	-	-	21	-	
OH-03 (19+484)	BH11-05	Sand/Clayey Silt (Fill) Silty Clay Till Silty Clay Till	0.3 – 2.3	-	30	3.0	3.0	20	-	4 (below existing grade)
			2.3 – 4.0	180	-	-	-	21	-	
			4.0 – 11.3	240	-	-	-	21	-	
OH-04 (19+903)	BH11-06	Sand (Fill) Silty Clay Silty Clay Till Sandy Silt Till	0.3 – 1.6	-	30	3.0	3.0	20	-	6 (below existing grade)
			1.6 – 4.5	100	-	-	-	19	-	
			4.5 – 9.5	240	-	-	-	21	-	
			9.5 – 10.8	-	38	11.0	4.2	21	11	

Notes: 1. This table must be read in conjunction with the text of this report.

2. In order to take into account frost action and surficial disturbance, the ultimate lateral passive resistance in front of the caisson within the upper 1.2 m below final grade should be neglected in the foundation design.

Overhead Sign Supports
Highway 400 Widening, Major MacKenzie Drive to King Road

Sign Number and Location (Station)	Reference Borehole	Reference Simplified Subsurface Stratigraphy For Design	Depth Below Existing Ground Surface (m)	Foundation Design Parameters							
				q _u (kPa)	ϕ' (deg.)	n _h (MN/m ³)	K _p	γ (kN/m ³)	γ' (kN/m ³)	Groundwater Depth (m)	
CS-04 (20+350)	BH11-07	Sand (Fill) Silty Clay Till Sandy Silt	0.3 – 1.3 1.3 – 7.0 7.0 – 11.0	-	30	3.0	3.0	20	-	6 (below existing grade)	
				200	-	-	-	21	-	-	
				-	38	11.0	4.2	21	11	-	
CS-05 (21+185)	BH11-08	Sand (Fill) Clayey Silt (Fill) Silty Clay Till Sand	0.3 – 1.2 1.2 – 4.5 4.5 – 10.0 10.0 – 11.1	-	30	3.0	3.0	20	-	6 (below existing grade)	
				60	-	-	-	19	-		-
				200	-	-	-	21	-		-
				-	38	11.0	4.2	21	11		-
CS-06 (21+445)	BH11-09	Sand (Fill) Silty Clay Till Silty Clay Till	0.3 – 1.2 1.2 – 5.0 5.0 – 11.3	-	30	3.0	3.0	20	-	6 (below existing grade)	
				180	-	-	-	20	-		-
CS-07 (21+775)	BH11-10	Sand (Fill) Silty Clay (Fill) Silty Clay (Fill) Clayey Silt Till	0.3 – 1.3 1.3 – 6.0 6.0 – 10.0 10.0 – 11.3	240	-	-	-	21	-	6 (below existing grade)	
				-	30	3.0	3.0	20	-		-
				60	-	-	-	20	-		-
				120	-	-	-	20	-		-
CS-08 (21+944)	BH11-11	Sand (Fill) Silty Clay (Fill) Clayey Silt Till	0.3 – 1.6 1.6 – 8.0 8.0 – 11.3	240	-	-	-	21	-	6 (below existing grade)	
				-	30	3.0	3.0	20	-		-
				150	-	-	-	20	-		-
CS-09 (22+275)	BH11-12	Sand (Fill) Silty Clay Till Silty Clay Till	0.3 – 1.3 1.3 – 5.0 5.0 – 11.3	180	-	-	-	20	-	5 (below existing grade)	
				-	30	3.0	3.0	20	-		-
				120	-	-	-	20	-		-
CS-10 and CS-11 (22+534)	BH11-13	Sand (Fill) Silty Clay Till Silty Clay Till	0.3 – 1.3 1.3 – 4.0 4.0 – 11.3	240	-	-	-	21	-	4 (below existing grade)	
				-	30	3.0	3.0	20	-		-
				180	-	-	-	21	-		-
CS-12 and CS-13 (23+621)	BH11-14	Sand/Clayey Silt (Fill) Silty Clay Till Silty Clay Till	0.3 – 2.5 2.5 – 6.0 6.0 – 11.3	200	-	-	-	21	-	6 (below existing grade)	
				-	30	3.0	3.0	20	-		-
				150	-	-	-	20	-		-

Notes: 1. This table must be read in conjunction with the text of this report.

2. In order to take into account frost action and surficial disturbance, the ultimate lateral passive resistance in front of the caisson within the upper 1.2 m below final grade should be neglected in the foundation design.

Overhead Sign Supports
Highway 400 Widening, Major MacKenzie Drive to King Road

Sign Number and Location (Station)	Reference Borehole	Reference Simplified Subsurface Stratigraphy For Design	Depth Below Existing Ground Surface (m)	Foundation Design Parameters						
				q_u (kPa)	ϕ' (deg.)	n_h (MN/m ³)	K_p	γ (kN/m ³)	γ' (kN/m ³)	Groundwater Depth (m)
CS-14 (24+135)	BH11-15	Sand (Fill) Clayey Silt (Fill) Silty Clay Till	0.3 – 1.3	-	30	3.0	3.0	20	-	4 (below existing grade)
			1.3 – 4.0	80	-	-	-	19	-	
			4.0 – 11.3	200	-	-	-	21	-	
CS-15 (24+211)	BH11-16	Sand (Fill) Silty Clay (Fill) Clayey Silt Till Silty Clay Till	0.3 – 1.2	-	30	3.0	3.0	20	-	4 (below existing grade)
			1.2 – 4.5	70	-	-	-	20	-	
			4.5 – 9.0	190	-	-	-	21	-	
			9.0 – 11.3	160	-	-	-	20	-	
CS-17 (10+129)	BH11-17	Sand (Fill) Clayey Silt (Fill) Silty Clay Till	0.3 – 1.3	-	30	3.0	3.0	20	-	5 (below existing grade)
			1.3 – 4.5	70	-	-	-	20	-	
			4.5 – 11.3	180	-	-	-	21	-	
CS-18 and CS-19 (10+645)	BH11-18	Sand (Fill) Silty Clay Till Silty Clay Till	0.3 – 1.3	-	30	3.0	3.0	20	-	4 (below existing grade)
			1.3 – 9.0	160	-	-	-	20	-	
			9.0 – 11.0	240	-	-	-	21	-	
OH-05 (11+145)	BH11-19	Sand (Fill) Clayey Silt (Fill) Clayey Silt (Fill) Sand	0.2 – 1.2	-	30	3.0	3.0	20	-	8 (below existing grade)
			1.2 – 8.0	150	-	-	-	20	-	
			8.0 – 10.0	170	-	-	-	20	-	
			10.0 – 11.3	-	35	7.0	3.7	20	10	
CS-20 (12+710)	BH11-20	Sand/Clayey Silt (Fill) Silty Clay Till Sandy Silt	0.2 – 2.2	-	30	3.0	3.0	20	-	7 (below existing grade)
			2.2 – 7.5	175	-	-	-	20	-	
			7.5 – 10.0	-	30	2.0	3.0	20	10	
CS-21 (13+056)	BH11-21	Sand/Clayey Silt (Fill) Silty Clay Till Sand	0.2 – 2.3	-	30	3.0	3.0	20	-	7 (below existing grade)
			2.3 – 7.5	150	-	-	-	20	-	
			7.5 – 11.0	-	34	6.0	3.5	20	10	
CS-22 (13+110)	BH11-22	Sand/Clayey Silt (Fill) Silty Clay Till Silty Clay Till Silts and Sands	0.2 – 2.4	-	30	3.0	3.0	20	-	4 (below existing grade)
			2.4 – 4.0	150	-	-	-	20	-	
			4.0 – 7.5	160	-	-	-	20	-	
			7.5 – 11.3	-	32	4.0	3.2	20	10	

Notes: 1. This table must be read in conjunction with the text of this report.

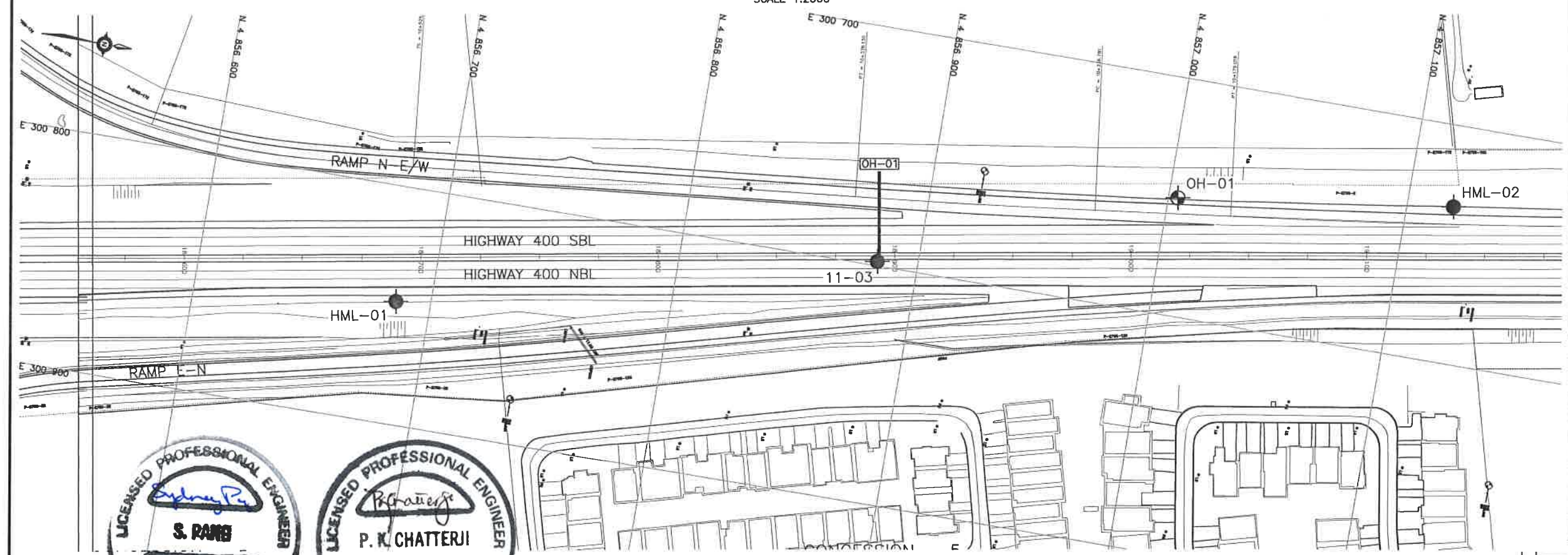
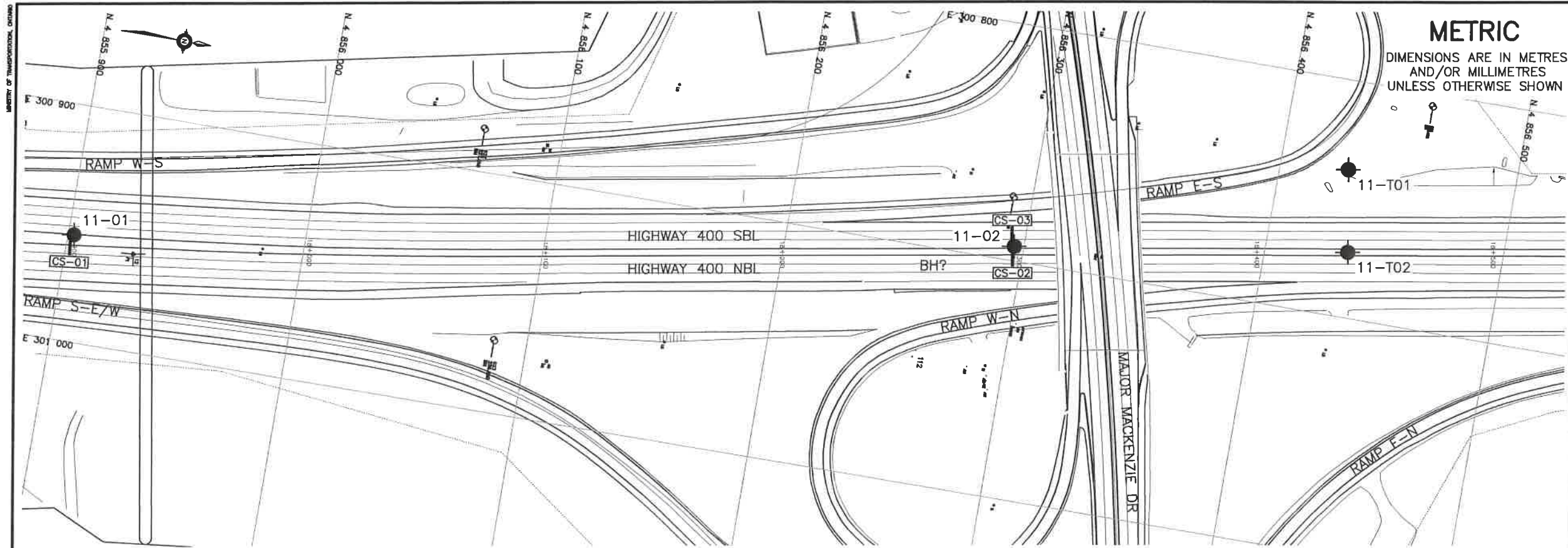
2. In order to take into account frost action and surficial disturbance, the ultimate lateral passive resistance in front of the caisson within the upper 1.2 m below final grade should be neglected in the foundation design.

Overhead Sign Supports
Highway 400 Widening, Major MacKenzie Drive to King Road

LEGEND

q_u	=	Unconfined Compressive Strength ($= 2 \times C_u$, undrained shear strength) (kPa)
ϕ'	=	Angle of Internal Friction (degrees)
n_h	=	Coefficient of Horizontal Subgrade Reaction (MN/m ³ or $\times 10^3$ kN/m ³)
K_p	=	Coefficient of Passive Earth Pressure
γ	=	Soil Unit Weight (kN/m ³)
γ'	=	Submerged Soil Unit Weight (kN/m ³) – to be used only for cohesionless soils below the groundwater table

- Notes: 1. This table must be read in conjunction with the text of this report.
2. In order to take into account frost action and surficial disturbance, the ultimate lateral passive resistance in front of the caisson within the upper 1.2 m below final grade should be neglected in the foundation design.



METRIC

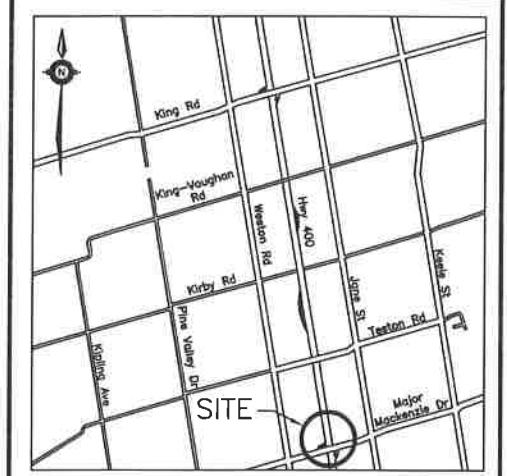
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

HIGHWAY 400
CONT No
GWP No 2539-04-00

HWY 400 WIDENING
OVERHEAD & CANTILEVERED
SIGN SUPPORTS
BOREHOLE LOCATIONS PLAN

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KEYPLAN

LEGEND

- Borehole
- Borehole and Cone
- Blows /0.3m (Std Pen Test, 475J/blow)
- Blows /0.3m (60' Cone, 475J/blow)
- Pressure, Hydraulic
- Water Level
- Head Artesian Water
- Piezometer
- Rock Quality Designation (RQD)
- Auger Refusal

NO	ELEVATION	NORTHING	EASTING
11-01	227.7	4 855 902.6	300 955.0
11-02	229.7	4 856 296.0	300 893.8
11-03	236.3	4 856 883.1	300 798.1
HML-01	233.9	4 856 685.5	300 848.3
HML-02	239.0	4 857 119.6	300 734.1
OH-01	236.3	4 857 004.0	300 750.4

NOTES

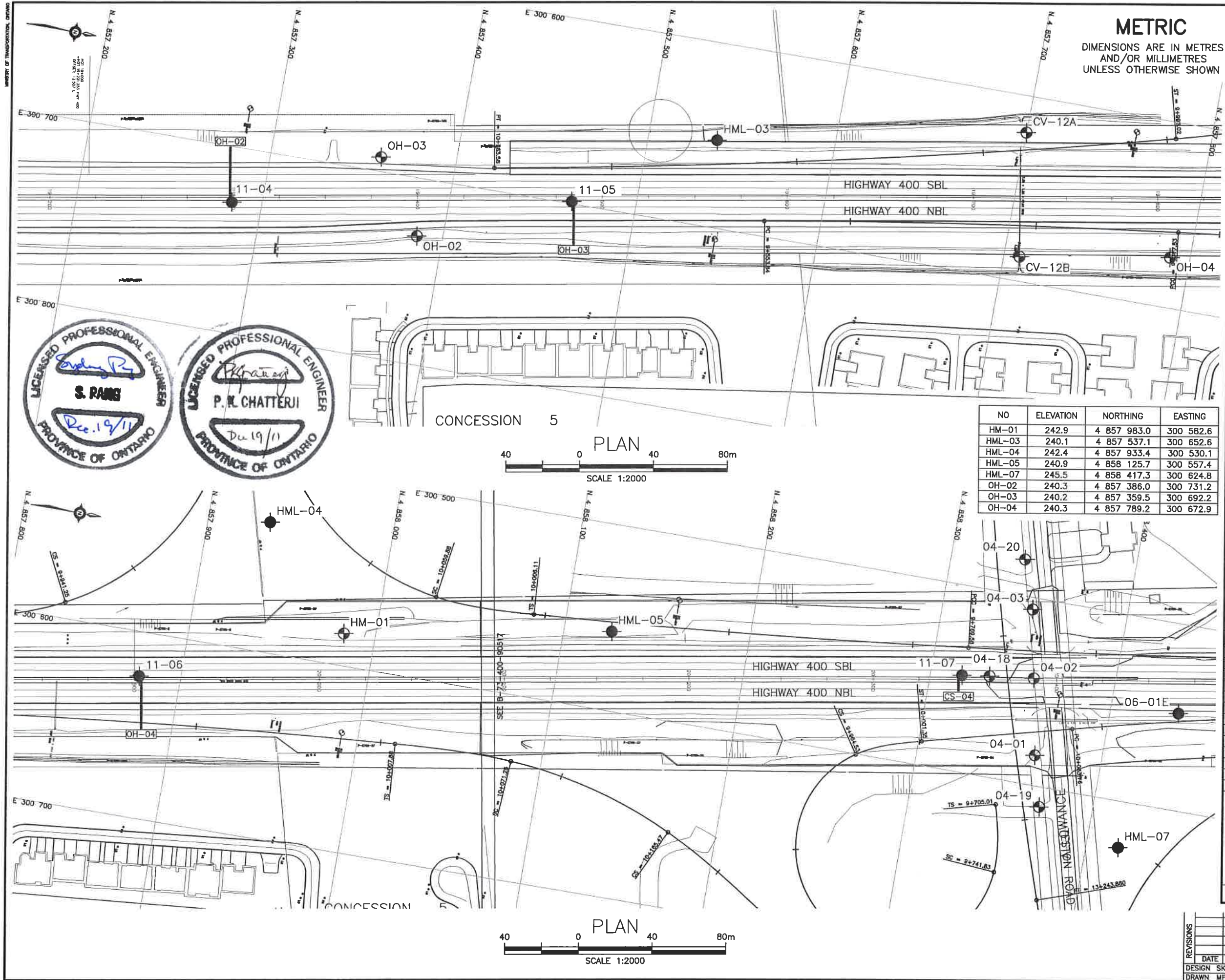
- The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
- This drawing is for subsurface information only. Surface details and features are for conceptual illustration.

GEOCRES NO. 30M13-194



REVISIONS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
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METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

HIGHWAY 400
CONT No
GWP No 2539-04-00

SHEET

HWY 400 WIDENING
OVERHEAD & CANTILEVERED
SIGN SUPPORTS
BOREHOLE LOCATIONS PLAN

SNC-LAVALIN

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KEYPLAN

LEGEND

Borehole

Borehole and Cone

Blows /0.3m (Std Pen Test, 475J/blow)

Blows /0.3m (60° Cone, 475J/blow)

Pressure, Hydraulic

Water Level

Head Artesian Water

Piezometer

Rock Quality Designation (RQD)

Auger Refusal

NO	ELEVATION	NORTHING	EASTING
04-01	245.0	4 858 363.9	300 583.6
04-02	239.0	4 858 356.0	300 542.9
04-03	244.2	4 858 348.8	300 506.4
04-18	239.5	4 858 332.0	300 546.0
04-19	245.4	4 858 371.2	300 610.7
04-20	243.5	4 858 339.9	300 480.6
06-01E	238.1	4 858 436.6	300 547.8
11-04	240.6	4 857 283.8	300 729.9
11-05	241.4	4 857 465.5	300 698.7
11-06	243.8	4 857 877.7	300 623.8
11-07	239.6	4 858 317.2	300 548.1
CV-12A	239.3	4 857 699.9	300 619.9
CV-12B	240.0	4 857 708.5	300 686.8

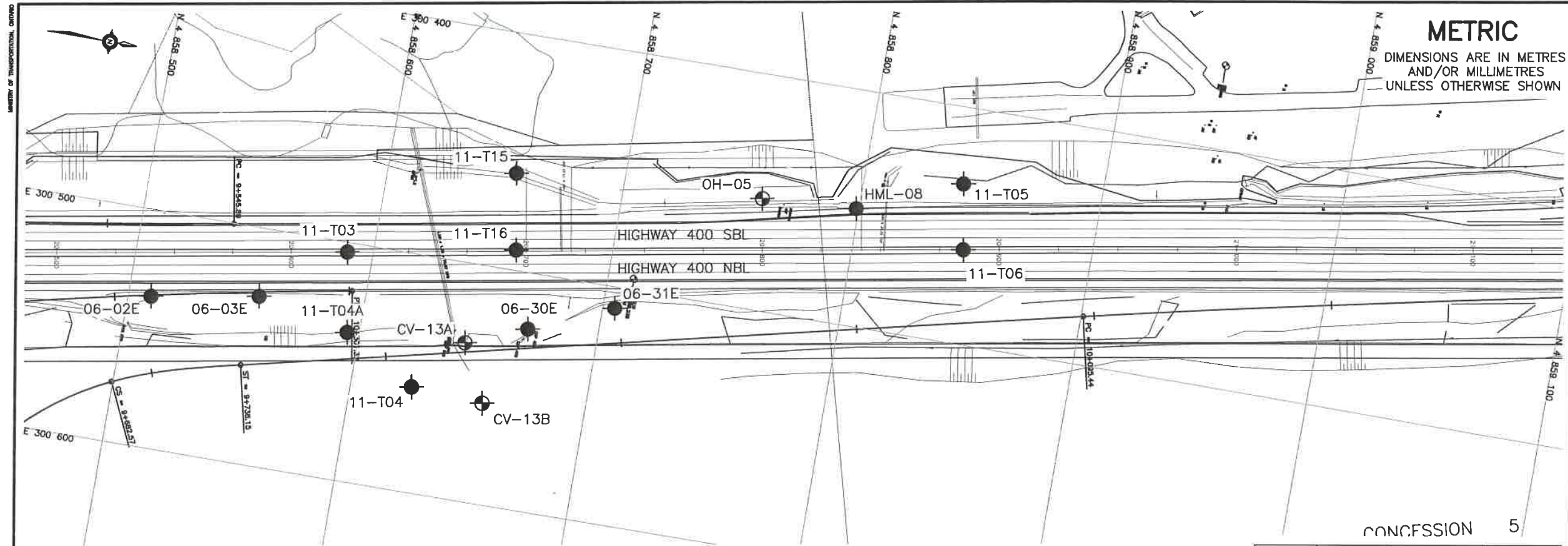
- NOTES
- 1) The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.

2) This drawing is for subsurface information only. Surface details and features are for conceptual illustration.

GEOCRES NO. 30M13-194

REVISIONS		DATE	BY	DESCRIPTION
DESIGN	SKP	CHK	PKC	CODE
DRAWN	MFA	CHK	PKC	SITE
		LOAD	DATE	DEC. 2011
		STRUCT	DWG	2

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METRIC

DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
— UNLESS OTHERWISE SHOWN



HIGHWAY 400
CONT No
GWP No 2539-04-00

HWY 400 WIDENING
OVERHEAD & CANTILEVERED
SIGN SUPPORTS
BOREHOLE LOCATIONS PLAN

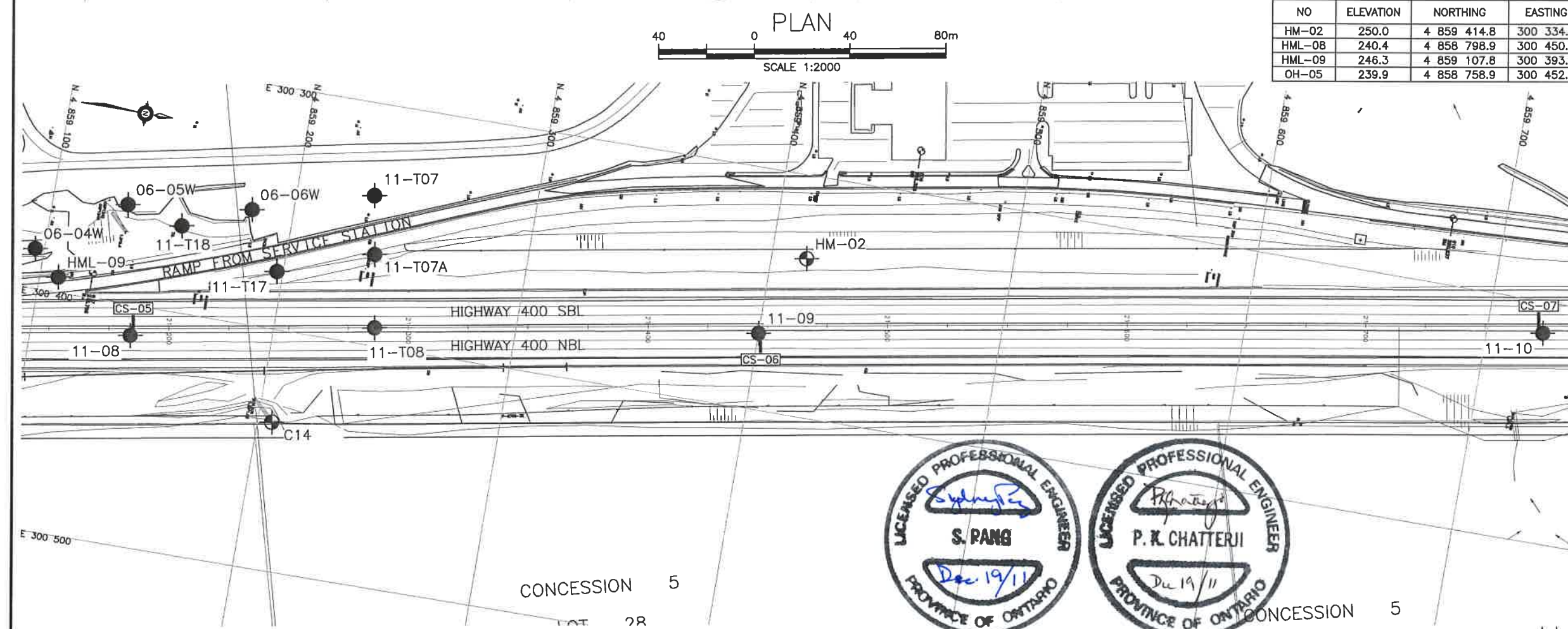
SHEET



KEYPLAN

LEGEND

NO	ELEVATION	NORTHING	EASTING
HM-02	250.0	4 859 414.8	300 334.
HML-08	240.4	4 858 798.9	300 450.
HML-09	246.3	4 859 107.8	300 393.
OH-05	239.9	4 858 758.9	300 452.



PLAN

SCALE 1:2000

PLAN

SCALE 1:2000



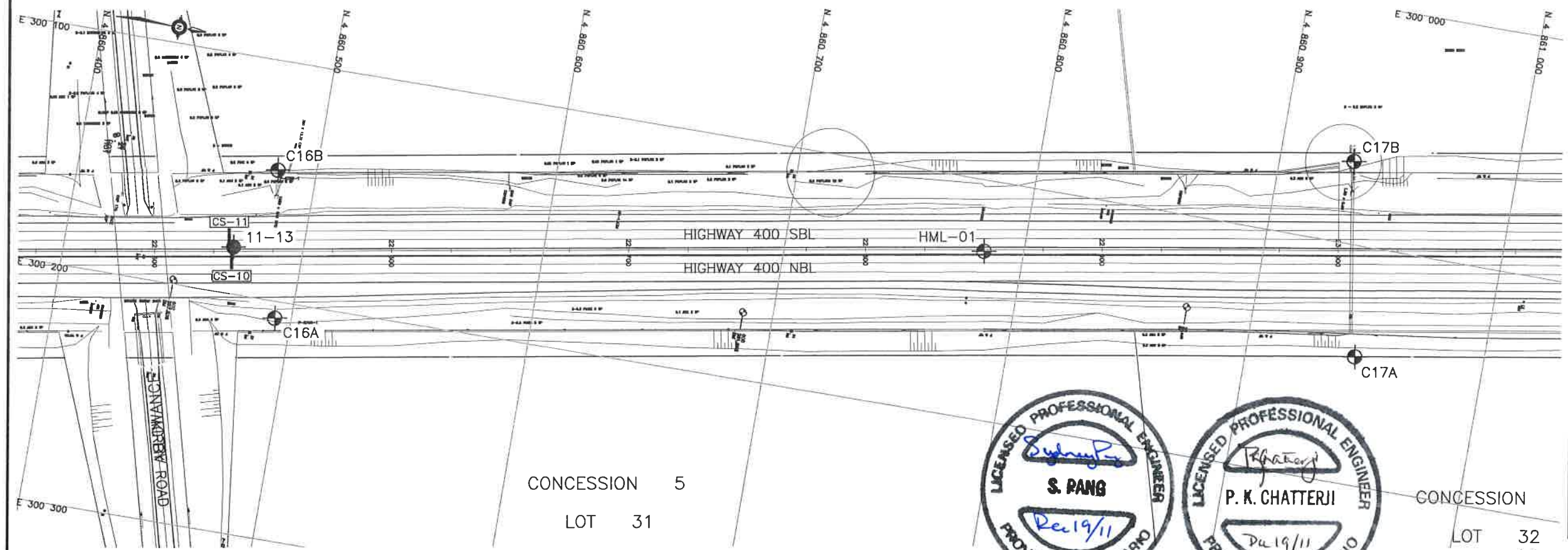
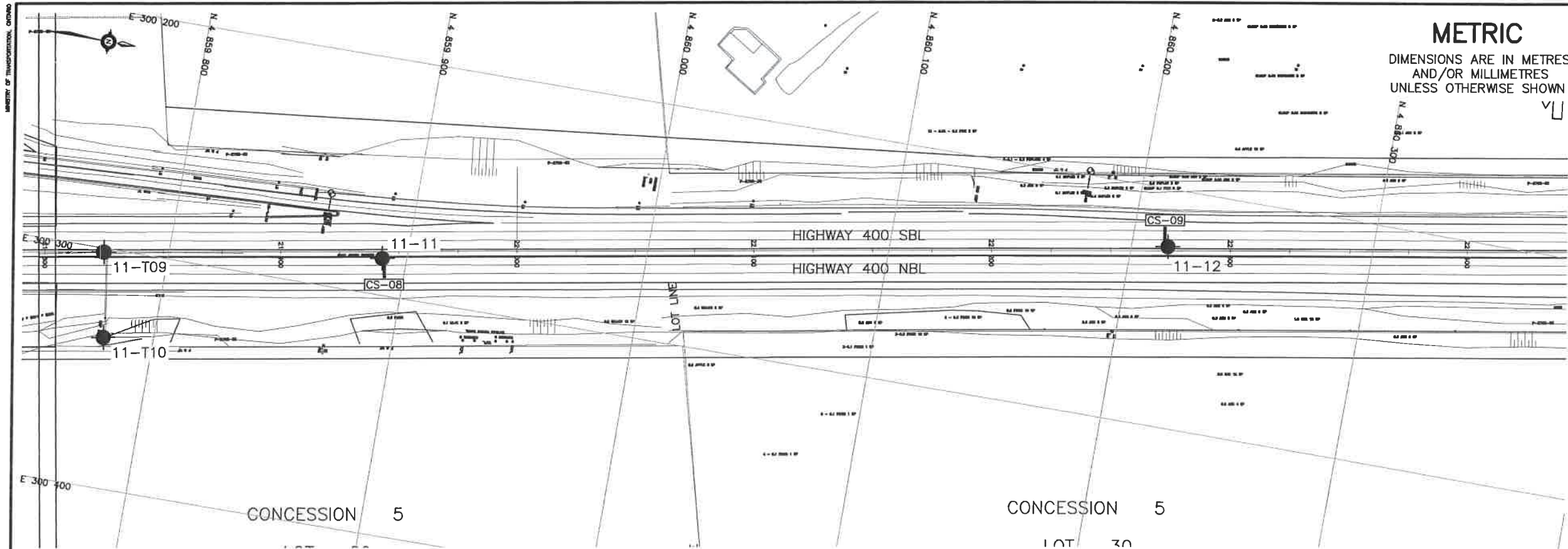
NO	ELEVATION	NORTHING	EASTING
06-02E	236.9	4 858 509.7	300 536.5
06-03E	236.7	4 858 555.2	300 528.8
06-04W	246.1	4 859 096.3	300 383.5
06-05W	240.9	4 859 131.2	300 359.1
06-06W	249.5	4 859 182.8	300 352.5
06-30E	233.0	4 858 670.5	300 523.6
06-31E	238.2	4 858 705.1	300 508.9
11-08	247.2	4 859 141.5	300 412.5
11-09	249.4	4 859 400.1	300 368.3
11-10	251.0	4 859 723.2	300 313.0
C14	—	4 859 205.9	300 438.2
CV-13A	229.0	4 858 645.1	300 533.6
CV-13B	229.7	4 858 656.8	300 557.6

-NOTES-

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GEOCRES NO. 30M13-194

[illegible]



CONCESSION 5
LOT 32

METRIC

DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

HIGHWAY 400
CONT No
GWP No 2539-04-00

HWY 400 WIDENING
OVERHEAD & CANTILEVERED
SIGN SUPPORTS
BOREHOLE LOCATIONS PLAN

SNC-LAVALIN

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KEYPLAN

LEGEND

- ◆ Borehole
- ◆ Borehole and Cone
- N Blows /0.3m (Std Pen Test, 475J/blow)
- CONE Blows /0.3m (60° Cone, 475J/blow)
- PH Pressure, Hydraulic
- W Water Level
- W Head Artesian Water
- P Piezometer
- 90% Rock Quality Designation (RQD)
- A/R Auger Refusal

NO	ELEVATION	NORTHING	EASTING
11-11	252.0	4 859 889.9	300 284.5
11-12	255.2	4 860 215.2	300 224.2
11-13	257.6	4 860 470.9	300 180.5
C16A	-	4 860 493.2	300 207.0
C16B	-	4 860 483.9	300 145.6
C17A	-	4 860 945.9	300 146.3
C17B	-	4 860 931.1	300 065.6
HML-01	-	4 860 783.4	300 129.6

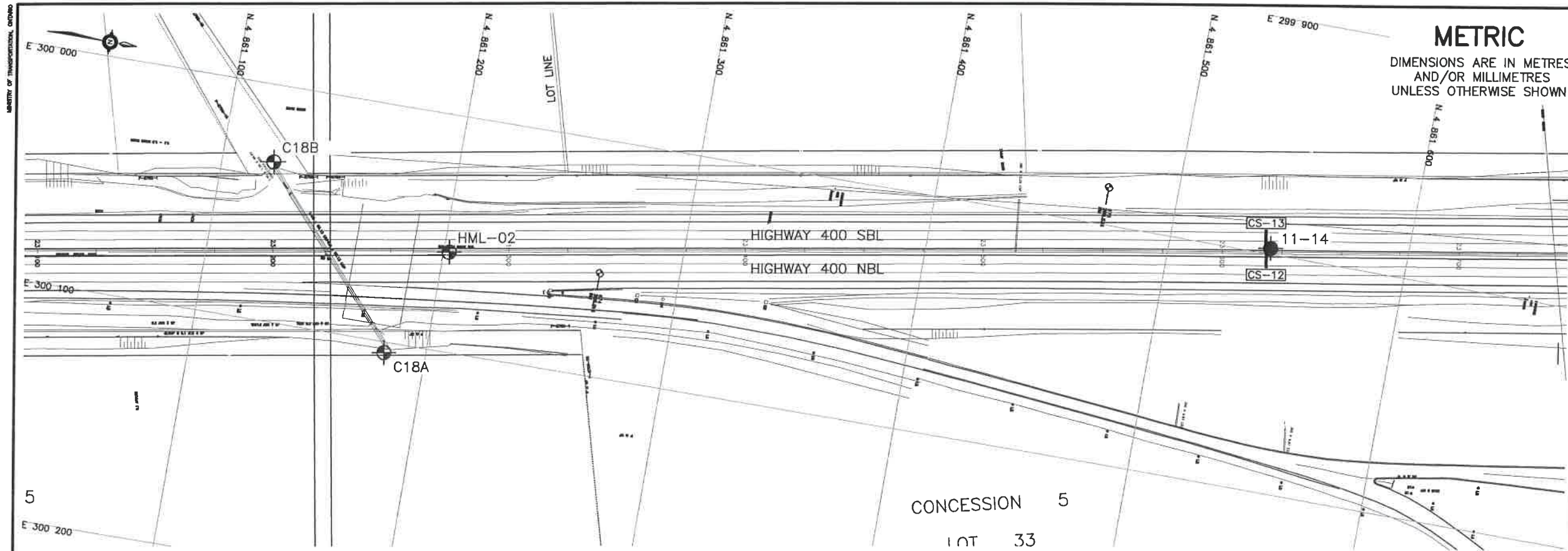
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GEOCRES NO. 30M13-194

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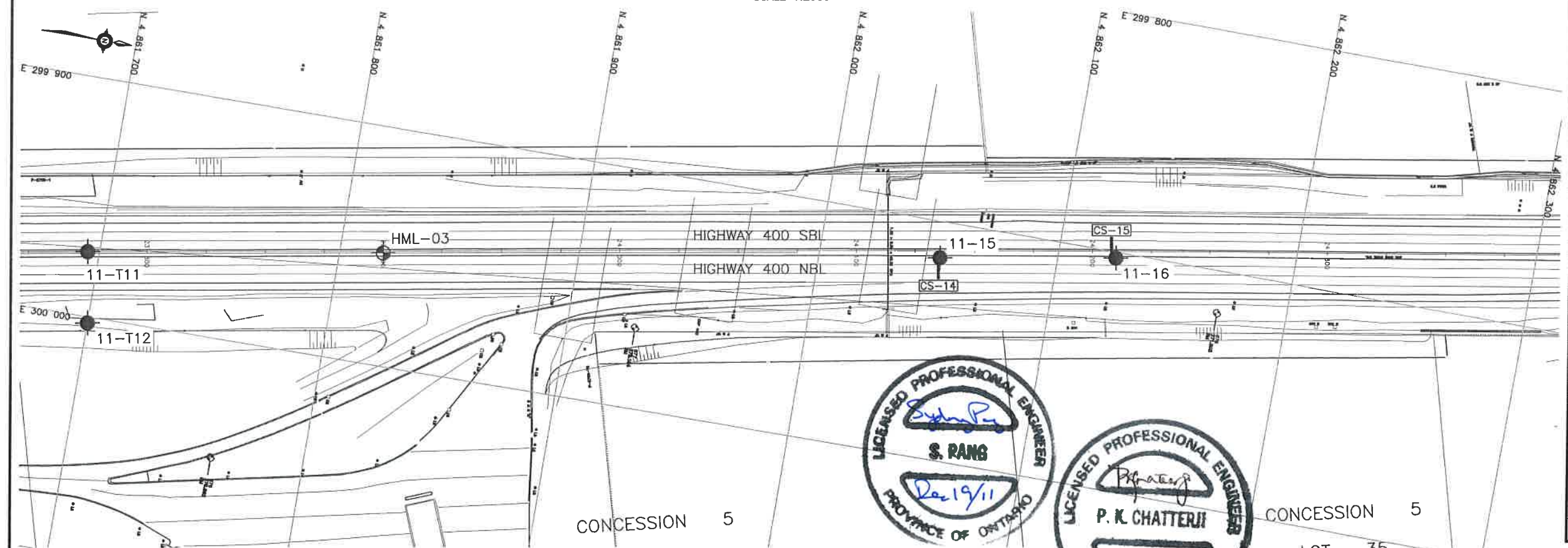
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CONCESSION 5
LOT 33



PLAN




CONCESSION 5
LOT 35





PLAN

METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

HIGHWAY 400
CONT No
GWP No 2539-04-00


SHEET














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KEYPLAN

LEGEND

-  Borehole
-  Borehole and Cone
-  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
-  90% Rock Quality Designation (RQD)
-  A/R Auger Refusal

NO	ELEVATION	NORTHING	EASTING
11-14	271.6	4 861 542.3	299 997.5
11-15	274.2	4 862 050.9	299 915.2
11-16	274.5	4 862 124.3	299 902.5
C18A	-	4 861 182.3	300 104.4
C18B	-	4 861 122.0	300 032.7
HML-02	-	4 861 202.4	300 058.0
HML-03	-	4 861 818.4	299 952.6

NOTES

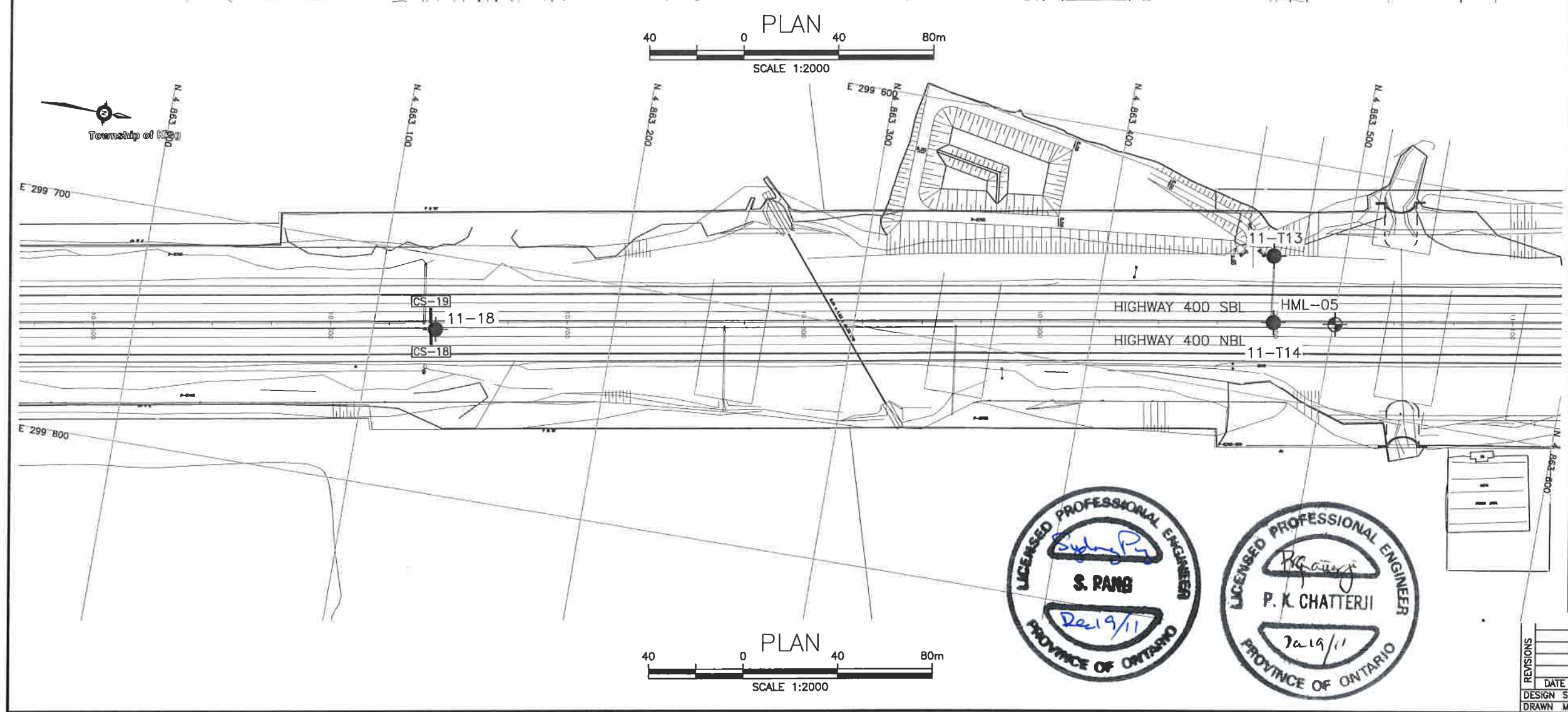
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GEOCRES NO. 30M13-194



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METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

HIGHWAY 400
CONT No
GWP No 2539-04-00








HWY 400 WIDENING
OVERHEAD & CANTILEVERED
SIGN SUPPORTS
BOREHOLE LOCATIONS PLAN

SHEET



KEYPLAN

LEGEND

	Borehole
	Borehole and Cone
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
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

NO	ELEVATION	NORTHING	EASTING
11-17	280.4	4 862 616.7	299 818.6
11-18	277.1	4 863 126.1	299 731.1
C20	—	4 862 549.3	299 792.8
HML-04	—	4 862 810.8	299 782.9
HML-05	—	4 863 500.8	299 664.9

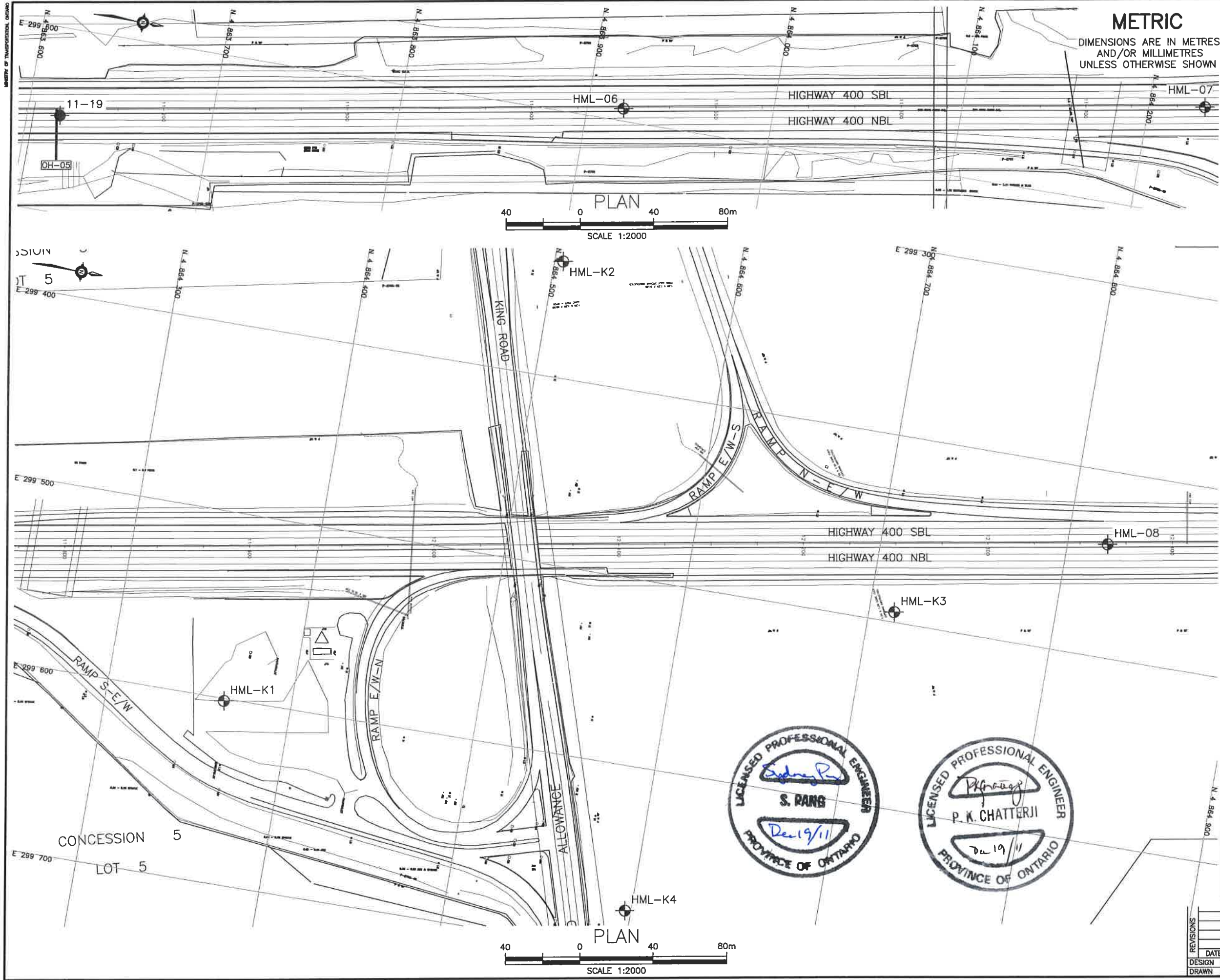
-NOTES-

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

GEOCRES NO. 30M13-194

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MINISTRY OF TRANSPORTATION, ONTARIO



METRIC

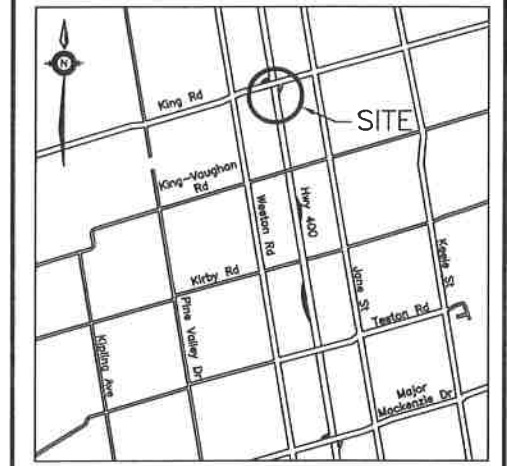
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

HIGHWAY 400
CONT No
GWP No 2539-04-00



HWY 400 WIDENING
OVERHEAD & CANTILEVERED
SIGN SUPPORTS
BOREHOLE LOCATIONS PLAN

SHEET



KEYPLAN

LEGEND

- ◆ Borehole
- ◆ Borehole and Cone
- N Blows /0.3m (Std Pen Test, 475J/blow)
- CONE Blows /0.3m (60' Cone, 475J/blow)
- PH Pressure, Hydraulic
- W Water Level
- HA Head Artesian Water
- PZ Piezometer
- 90% Rock Quality Designation (RQD)
- A/R Auger Refusal

NO	ELEVATION	NORTHING	EASTING
11-19	267.6	4 863 618.0	299 647.5
HML-06	-	4 863 919.7	299 593.2
HML-07	-	4 864 230.3	299 540.3
HML-08	-	4 864 821.7	299 439.1
HML-K1	-	4 864 363.7	299 601.3
HML-K2	-	4 864 504.6	299 337.6
HML-K3	-	4 864 713.6	299 494.5
HML-K4	-	4 864 596.8	299 677.5

-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. 30M13-194



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FILENAME: H:\Projects\19\04\00 Hwy400\190400-BoreholePlan.dwg
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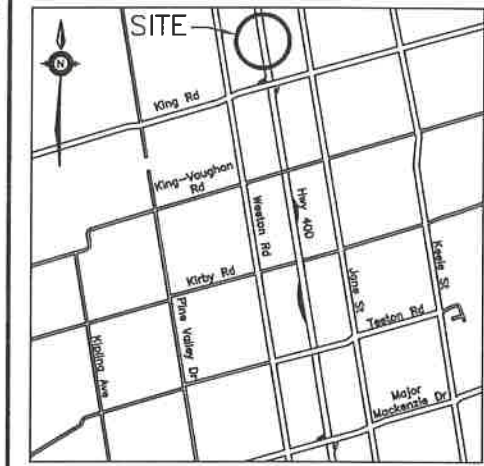
METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

HIGHWAY 400
CONT No
GWP No 2539-04-00



HWY 400 WIDENING
OVERHEAD & CANTILEVERED
SIGN SUPPORTS
BOREHOLE LOCATIONS PLAN

SHEET



KEYPLAN

LEGEND

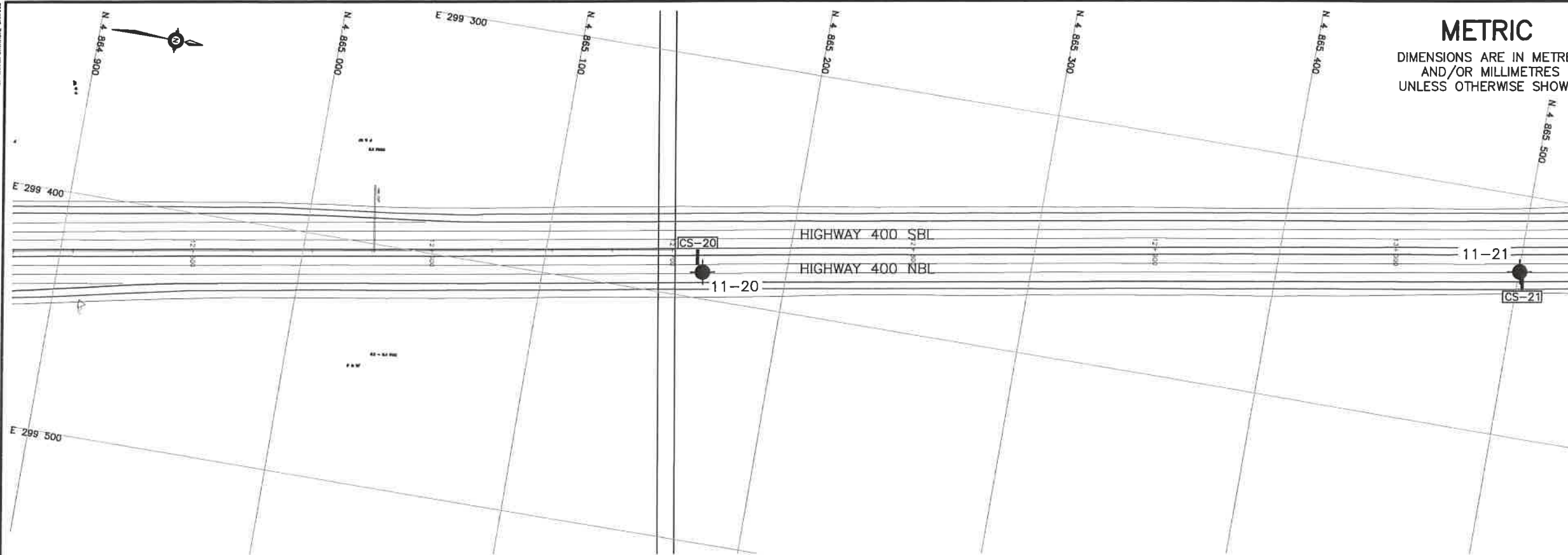
- Borehole
- Borehole and Cone
- N Blows /0.3m (Std Pen Test, 475J/blow)
- CONE Blows /0.3m (60' Cone, 475J/blow)
- PH Pressure, Hydraulic
- Water Level
- Head Artesian Water
- Piezometer
- 90% Rock Quality Designation (RQD)
- A/R Auger Refusal

NO	ELEVATION	NORTHING	EASTING
11-20	309.3	4 865 165.7	299 389.0
11-21	306.1	4 865 500.3	299 331.6
11-22	305.6	4 865 555.8	299 322.0
HML-09	-	4 866 063.6	299 226.6

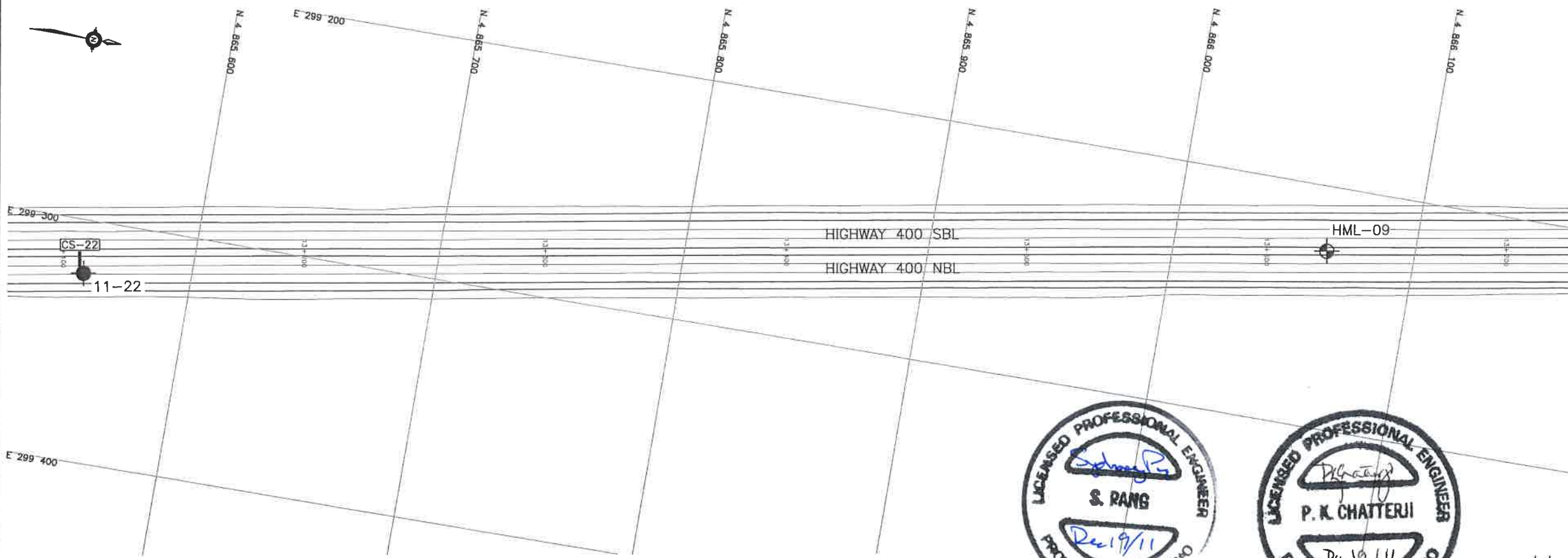
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GEOCRES NO. 30M13-194



PLAN
SCALE 1:2000



PLAN
SCALE 1:2000



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Appendix A

Record of Boreholes



RECORD OF BOREHOLE No 11-01

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 855 902.6 E 300 955.0 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.01.24 - 2011.01.24 CHECKED BY MEF

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					
227.7							20 40 60 80 100						
0.0	ASPHALT: (150mm)												
0.2	SAND, trace to some gravel, trace silt Dense Brown Moist (FILL)		1	GS									
			1	SS	33								10 81 9 (SI+CL)
226.2													
1.5	Clayey SILT, with sand, trace gravel Stiff to Very Stiff Brown Moist (TILL)		2	SS	14								
			3	SS	8								
			4	SS	15								0 39 48 13
223.6													
4.1	Becomes hard		5	SS	38								
	Becomes grey		6	SS	34								
			7	SS	36								
			8	SS	33								1 25 53 21

Continued Next Page

+³ . X³ : Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 11-01

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 855 902.6 E 300 955.0 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.01.24 - 2011.01.24 CHECKED BY MEF

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT			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															
216.4	Clayey SILT, with sand, trace gravel Stiff to Hard Grey Moist (TILL)		9	SS	29											
11.3	END OF BOREHOLE AT 11.3m. BOREHOLE OPEN TO 9.7m AND WATER LEVEL AT 5.4m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 9.4m, CUTTINGS TO 0.6m, CONCRETE TO 0.1m, THEN ASPHALT TO SURFACE.															

+³ . X³ : Numbers refer to
Sensitivity

20
15 10 5
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 11-02

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 856 296.0 E 300 893.8 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.01.24 - 2011.01.24 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					
229.7 0.0	ASPHALT: (240mm)						20 40 60 80 100	○ UNCONFINED + FIELD VANE		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT		GR SA SI CL	
0.2 229.0	SAND, some gravel Brown Moist (FILL)		1	GS			20 40 60 80 100	● QUICK TRIAXIAL × LAB VANE		w _p w w _L			
0.7 227.8	SAND, some silt, trace gravel Compact Brown Moist (FILL)		1	SS	15							0 84 16 (SI+CL)	
1.9 227.4	Clayey SILT, some sand, trace gravel Stiff Grey (FILL)		2	SS	12								
2.3 226.7	Clayey SILT, with sand, trace gravel Very Stiff Brown (TILL)		3	SS	21								
3.0	Becomes hard		4	SS	42							0 34 48 18	
	Becomes grey		5	SS	45								
			6	SS	70								
			7	SS	43							0 24 54 22	
			8	SS	38								

Continued Next Page

+³ × 3³: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 11-02

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 856 296.0 E 300 893.8 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.01.24 - 2011.01.24 CHECKED BY MEF

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																
218.4	Clayey SILT, with sand, trace gravel Hard Grey (TILL)		9	SS	45		219										
11.3	END OF BOREHOLE AT 11.3m. BOREHOLE OPEN TO 10.6m AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 9.1m, CUTTINGS TO 1.8m, BENTONITE HOLEPLUG TO 0.4m, CONCRETE TO 0.1m, THEN ASPHALT TO SURFACE.																

RECORD OF BOREHOLE No 11-03

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 856 883.1 E 300 798.1 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.01.25 - 2011.01.25 CHECKED BY MEF

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		WATER CONTENT (%)				
236.3								20 40 60 80 100		20 40 60				
0.0	ASPHALT: (200mm)							○ UNCONFINED + FIELD VANE		W _P W W _L				
0.2	SAND, some gravel		1	GS			236	● QUICK TRIAXIAL × LAB VANE						
235.6	Brown													
0.7	Moist (FILL)													
235.0	SAND, fine grained, trace gravel		1	SS	35		235							
1.3	Dense													
	Brown													
	Moist (FILL)													
	Clayey SILT, with sand, trace gravel		2	SS	9		234							
	Stiff to Very Stiff													
	Brown													
	Moist (TILL)		3	SS	10		233							
			4	SS	21									
232.2	Hard						232							
4.1			5	SS	50/ .150									
230.8							231							
5.5														
230.2							230							
6.1	SILT and SAND, some clay, trace gravel		6	SS	85		229							
	Very Dense													
	Brown													
	Moist (TILL)													
228.6			7	SS	81/ 0.280		228							
228.3	SAND, some silt and clay													
7.9			8	SS	50/ .150		227							

Continued Next Page

+³, X³: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 11-03

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 856 883.1 E 300 798.1 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.01.25 - 2011.01.25 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
	Continued From Previous Page							SHEAR STRENGTH kPa						
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE						
								WATER CONTENT (%)						
								20	40	60	80	100		
225.2	SILT and SAND, trace clay, trace gravel Very Dense Brown Moist (TILL)		9	SS	75		226							0 63 35 2
11.1	END OF BOREHOLE AT 11.1m. BOREHOLE OPEN AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 9.8m, CUTTINGS TO 0.9m, CONCRETE TO 0.1m, THEN ASPHALT TO SURFACE.													

RECORD OF BOREHOLE No 11-04

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 857 283.8 E 300 730.0 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.01.25 - 2011.01.25 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					
240.6								20	40	60	80	100	
0.0	ASPHALT: (250mm)												
240.3													
0.3	SAND, some gravel		1	GS									
240.0	Brown												
0.6	Moist (FILL)												
239.4	SAND, fine grained, trace gravel		1	SS	11								
1.2	Compact												
	Brown												
	Moist (FILL)												
	Clayey SILT, some sand, trace gravel		2	SS	9								
	Firm to Stiff												
	Brown												
	Moist (FILL)												
			3	SS	7								
237.7													
2.9	Sandy SILT, some clay, trace gravel		4	SS	30								
	Dense to Very Dense												
	Brown												
	Moist												
			5	SS	55								
234.5													
6.1	SAND, fine grained, some silt, trace clay		6	SS	50								
	Dense to Very Dense												
	Brown												
	Moist to Wet												
			7	SS	32								
			8	SS	57								
230.7													

Continued Next Page

+³ ×³: Numbers refer to Sensitivity 20 15 10 5 0 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 11-04

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 857 283.8 E 300 730.0 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.01.25 - 2011.01.25 CHECKED BY MEF

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												
	Continued From Previous Page							20	40	60	80	100								
9.9	Silty CLAY, with sand, trace gravel Hard Grey Moist (TILL)						230													
229.3			9	SS	72												0 21 48 31			
11.3	END OF BOREHOLE AT 11.3m. BOREHOLE OPEN AND WATER LEVEL AT 6.7m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 9.7m, CUTTINGS TO 0.6m, CONCRETE TO 0.1m, THEN ASPHALT TO SURFACE.																			

METRIC

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 x LAB VANE	W _p	W	W _L		
241.4 0.0 241.2	ASPHALT: (250mm)	[Solid Black]											
0.3 240.9 0.6	SAND, some gravel Brown Moist (FILL)	[Cross-hatch]	1	GS									
239.9 1.5	SAND, fine grained, trace gravel Dense Brown Moist (FILL)	[Cross-hatch]	1	SS	31								
239.2 2.3	Clayey SILT, some sand, trace gravel Very Stiff Brown (FILL)	[Cross-hatch]	2	SS	18								
	Silty CLAY, with sand, trace gravel Very Stiff to Hard Brown Moist (TILL)	[Diagonal Lines]	3	SS	26								
		[Diagonal Lines]	4	SS	22								0 25 49 26
	Becomes grey	[Diagonal Lines]	5	SS	29								
		[Diagonal Lines]	6	SS	40								
		[Diagonal Lines]	7	SS	45								0 24 56 20
	Occasional cobbles	[Diagonal Lines]	8	SS	47								

+³, ×³: Numbers refer to Sensitivity

RECORD OF BOREHOLE No 11-05

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 857 465.5 E 300 698.7 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.01.25 - 2011.01.25 CHECKED BY MEF

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				
	Continued From Previous Page							20 40 60 80 100						
								○ UNCONFINED + FIELD VANE						
								● QUICK TRIAXIAL x LAB VANE						
								20 40 60 80 100						
	</													

RECORD OF BOREHOLE No 11-06

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 857 877.7 E 300 623.8 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.01.25 - 2011.01.25 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 (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					
243.8								20 40 60 80 100					
0.0	ASPHALT: (280mm)												
243.5													
0.3	SAND, some gravel		1	GS									
243.2	Brown												
0.6	Moist (FILL)												
	SAND, fine grained, trace gravel		1	SS	32		243						
	Dense												
	Brown												
242.2	Moist (FILL)						242						
1.6	Silty CLAY, with sand, trace gravel		2	SS	11								
	Stiff												
	Brown												
	(TILL)												
			3	SS	9		241						
			4	SS	9								0 33 45 22
							240						
	Becomes hard												
			5	SS	40		239						
							238						
	Occasional cobbles		6	SS	84								
							237						
			7	SS	42		236						0 20 46 34
							235						
			8	SS	50/ .100								
234.2													
9.6	Sandy SILT, trace gravel Very Dense						234						

Continued Next Page

+³, X³: Numbers refer to Sensitivity 20 15 10 5 0 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 11-06

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 857 877.7 E 300 623.8 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.01.25 - 2011.01.25 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 (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)				
						20 40 60 80 100 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE					20 40 60 w _p — w — w _L						
	Continued From Previous Page																
233.0	Sandy SILT, trace gravel Brown Moist (TILL)		9	SS	50/												
10.8	END OF BOREHOLE AT 10.8m. BOREHOLE OPEN AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 9.4m, CUTTINGS TO 0.9m, BENTONITE HOLEPLUG TO 0.6m, CONCRETE TO 0.1m, THEN ASPHALT TO SURFACE.				.150												

METRIC

+³, ×³: Numbers refer to Sensitivity

METRIC

[illegible]

RECORD OF BOREHOLE No 11-08

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 859 141.5 E 300 412.5 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.01.26 - 2011.01.26 CHECKED BY MEF

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		WATER CONTENT (%)				GR	SA	SI	CL
247.2								20 40 60 80 100		W _p	W	W _L					
0.0	ASPHALT: (280mm)						247										
246.9																	
0.3	SAND, some gravel		1	GS													
246.5	Brown																
0.6	Moist (FILL)																
	SAND, fine grained		1	SS	18		246										
245.9	Compact																
1.2	Brown																
	Moist (FILL)																
	Clayey SILT, some sand, trace gravel		2	SS	10		245										
	Firm to Stiff																
	Brown																
	Moist (FILL)																
	Dark grey from 2.3m to 3.4m		3	SS	9		244										
			4	SS	5												
							243										
242.6																	
4.6	Silty CLAY, with sand, trace gravel		5	SS	32		242								0	22 50 28	
	Hard																
	Brown																
	Moist (TILL)																
			6	SS	35		241										
240.0							240										
7.2	SILT and SAND, trace clay																
	Compact																
	Grey																
239.3	Moist		7	SS	10		239								0	37 58 5	
7.8																	
			8	SS	33		238								1	31 44 24	

Continued Next Page

+³ × 3³ Numbers refer to Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 11-08

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 859 141.5 E 300 412.5 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.01.26 - 2011.01.26 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT 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 X LAB VANE					WATER CONTENT (%) w _p w w _L				
236.9	Continued From Previous Page						20	40	60	80	100						
10.2	SAND, some silt Very Dense Grey Moist		9	SS	80		20	40	60	80	100						
236.0																	
11.1	END OF BOREHOLE AT 11.1m. BOREHOLE OPEN AND WATER LEVEL AT 6.7m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 9.6m, CUTTINGS TO 0.7m, BENTONITE HOLEPLUG TO 0.4m, CONCRETE TO 0.1m, THEN ASPHALT TO SURFACE.																

RECORD OF BOREHOLE No 11-09

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 859 400.1 E 300 368.3 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.01.26 - 2011.01.26 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
249.4								20	40	60	80	100		
0.0	ASPHALT: (250mm)													
249.1														
0.3	SAND, some gravel		1	GS			249							
248.8	Brown													
0.6	Moist (FILL)													
248.2	SAND, fine grained		1	SS	11									
1.2	Compact													
	Brown						248							
	Moist (FILL)													
	Silty CLAY, with sand, trace gravel		2	SS	28									
	Very Stiff to Hard													
	Brown						247							
	Moist (TILL)													
			3	SS	19									
			4	SS	28		246							
							245							
			5	SS	34									
							244							
243.3														
6.1	SILT and SAND, trace gravel		6	SS	50/ .150		243							
242.8	Very Dense													
6.6	Grey													
	Moist						242							
	Becomes grey													
			7	SS	32									
							241							
			8	SS	60		240							

Continued Next Page

+³, x³: Numbers refer to Sensitivity 20 15 10 5 0 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 11-09

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 859 400.1 E 300 368.3 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.01.26 - 2011.01.26 CHECKED BY MEF

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT 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															
238.1			9	SS	58											
11.3	END OF BOREHOLE AT 11.3m. BOREHOLE OPEN AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 9.7m, CUTTINGS TO 0.9m, BENTONITE HOLEPLUG TO 0.4m, CONCRETE TO 0.1m, THEN ASPHALT TO SURFACE.															

RECORD OF BOREHOLE No 11-10

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 859 723.2 E 300 313.0 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.01.27 - 2011.01.27 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL LIMIT 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 (%)					
								○ UNCONFINED + FIELD VANE		w _p w w _L					
								● QUICK TRIAXIAL × LAB VANE							
251.0						20	40	60	80	100	20	40	60		
0.0	ASPHALT: (250mm)														
250.7															
0.3	SAND, some gravel		1	GS											
250.3	Brown														
0.7	Moist (FILL)														
	SAND, fine grained		1	SS	17										
249.7	Compact														
1.3	Brown														
	Moist (FILL)														
	Silty CLAY, with sand, trace gravel		2	SS	7										
	Firm to Very Stiff														
	Brown														
	(FILL)														
			3	SS	11										
			4	SS	9										
			5	SS	17										
			6	SS	12										
			7	SS	12										

Continued Next Page

+³, X³: Numbers refer to Sensitivity 20 15 10 5 0 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 11-10

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 859 723.2 E 300 313.0 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.01.27 - 2011.01.27 CHECKED BY MEF

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 x LAB VANE					
	Continued From Previous Page							20 40 60 80 100					
240.9 10.1	Clayey SILT, with sand, trace gravel Hard Grey (TILL)		9	SS	41		241						
239.7							240					0 32 50 18	
11.3	END OF BOREHOLE AT 11.3m. BOREHOLE OPEN AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 9.7m, CUTTINGS TO 0.9m, BENTONITE HOLEPLUG TO 0.4m, CONCRETE TO 0.1m, THEN ASPHALT TO SURFACE.												

+³, X³: Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 11-11

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 859 889.9 E 300 284.5 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.01.27 - 2011.01.27 CHECKED BY MEF

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			20	40	60	80	100					
	Continued From Previous Page																
	Clayey SILT, with sand, trace gravel Hard Grey Moist (TILL)		9	SS	61		242										
240.7							241										
11.3	END OF BOREHOLE AT 11.3m. BOREHOLE OPEN AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 10.0m, CUTTINGS TO 0.9m, BENTONITE HOLEPLUG TO 0.4m, CONCRETE TO 0.1m, THEN ASPHALT TO SURFACE.																

+³, ×³: Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

METRIC

[illegible]

+³, ×³ Numbers refer to Sensitivity

ONTMT4S 9268.GPJ 10/31/11

RECORD OF BOREHOLE No 11-12

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 860 215.2 E 300 224.2 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.01.27 - 2011.01.27 CHECKED BY MEF

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 (%)		
								20 40 60 80 100										20 40 60		
Continued From Previous Page																				
243.9	Silty CLAY , with sand, trace gravel Very Stiff Grey (TILL)		9	SS	26		245													
11.3	END OF BOREHOLE AT 11.3m. BOREHOLE OPEN AND WATER LEVEL AT 7.9m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 10.0m, CUTTINGS TO 0.9m, BENTONITE HOLEPLUG TO 0.4m, CONCRETE TO 0.1m, THEN ASPHALT TO SURFACE.						244													

RECORD OF BOREHOLE No 11-13

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 860 470.9 E 300 180.5 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.01.28 - 2011.01.28 CHECKED BY MEF

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		WATER CONTENT (%)				
257.6 0.0 257.3	ASPHALT: (250mm)						20 40 60 80 100	○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE	20 40 60					
0.3 256.9	SAND, some gravel Brown Moist (FILL)		1	GS										
0.6 256.3	SAND, some silt, trace gravel Compact Brown (FILL)		1	SS	18									0 88 12 (SI+CL)
1.3	Silty CLAY, trace to some sand, trace gravel Very Stiff to Hard Brown Moist (TILL)		2	SS	20									
	Occasional sand seams, occasional oxide staining		3	SS	36									
			4	SS	31									0 19 55 26
	Becomes grey		5	SS	22									
			6	SS	22									
			7	SS	38									
			8	SS	22									0 9 35 56

Continued Next Page

+³, ×³: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

METRIC

[illegible]

RECORD OF BOREHOLE No 11-14

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 861 542.3 E 299 997.5 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.01.31 - 2011.03.31 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					
271.6								20 40 60 80 100					
0.0	ASPHALT: (280mm)												
271.3													
0.3	SAND, some gravel		1	GS									
270.9	Dark Brown						271						
0.6	Moist (FILL)												
	SAND, trace gravel		1	SS	24								
	Compact												
	Brown												
270.0	Moist (FILL)						270						
1.6	Clayey SILT, some sand, trace gravel		2	SS	9								
	Stiff												
	Brown to Dark Brown (FILL)												
269.1													
2.5	Silty CLAY, with sand, trace gravel		3	SS	13		269						
	Stiff to Hard												
	Brown												
	Moist (TILL)		4	SS	19		268						1 23 49 27
							267						
			5	SS	27								
							266						
							265						
	Becomes grey		6	SS	34								
							264						
			7	SS	26								
							263						
							262						1 14 45 40
			8	SS	36								

Continued Next Page

+³, X³: Numbers refer to
Sensitivity

20
15 10 5
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 11-14

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 861 542.3 E 299 997.5 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.01.31 - 2011.03.31 CHECKED BY MEF

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT 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															
260.3	Silty CLAY, with sand, trace gravel Hard Grey Moist (TILL)		9	SS	49	261										
11.3	END OF BOREHOLE AT 11.3m. BOREHOLE OPEN AND WATER LEVEL AT 8.8m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 9.9m, CUTTINGS TO 0.4m, BENTONITE HOLEPLUG TO 0.1m, THEN ASPHALT TO SURFACE.															

RECORD OF BOREHOLE No 11-15

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 862 050.9 E 299 915.2 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.01.28 - 2011.01.28 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	
274.2	ASPHALT: (250mm)						274					
0.0												
274.0												
0.3	SAND, some gravel		1	GS								
273.6	Brown											
0.6	Moist											
	(FILL)											
	SAND, some silt, trace gravel		1	SS	18							2 84 14
	Compact											(SI+CL)
272.9	Brown						273					
1.3	Moist											
	(FILL)											
	Clayey SILT, some sand, trace gravel		2	SS	11							
	Stiff to Firm											
	Brown						272					
	Moist											
	(FILL)											
	Becomes grey		3	SS	5							
			4	SS	4		271					
270.2												
4.0	Silly CLAY, some sand, trace gravel											
	Hard to Very Stiff						270					
	Brown											
	Moist											
	(TILL)		5	SS	33							
							269					
	Occasional sand seams											
	Becomes grey		6	SS	53		268					4 15 45 36
							267					
			7	SS	25							
							266					
							265					
			8	SS	18							

Continued Next Page

+³, ×³: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 11-15

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 862 050.9 E 299 915.2 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.01.28 - 2011.01.28 CHECKED BY MEF

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 (%)		
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE							w _P w w _L		
	Continued From Previous Page						20	40	60	80	100	20	40	60			
	Silty CLAY, some sand, trace gravel Very Stiff Grey Moist (TILL)		9	SS	26		264										
262.9																	
11.3	END OF BOREHOLE AT 11.3m. BOREHOLE OPEN AND WATER LEVEL AT 3.6m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 9.7m, CUTTINGS TO 0.8m, BENTONITE HOLEPLUG TO 0.4m, CONCRETE TO 0.1m, THEN ASPHALT TO SURFACE.						263										

+³, ×³: Numbers refer to
Sensitivity

20
15
10
5
0
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 11-16

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 862 124.3 E 299 902.5 ORIGINATED BY ES
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2011.01.28 - 2011.01.28 CHECKED BY MEF

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						WATER CONTENT (%)		
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE						W _P	W	W _L
274.5						20	40	60	80	100	20	40	60			
0.0	ASPHALT: (280mm)															
274.2																
0.3	SAND, some gravel		1	GS												
273.9	Brown															
0.7	Moist (FILL)															
273.3	SAND, trace gravel		1	SS	26											
	Compact															
1.2	Brown															
	Moist (FILL)															
	Silty CLAY, with sand, trace gravel		2	SS	16											
	Very Stiff to Firm															
	Brown (FILL)															
	Becomes grey		3	SS	14											
	Occasional roots and rootlets		4	SS	7											
270.3																
4.3	Clayey SILT, with sand, trace gravel, occasional clay seams		5	SS	14											
	Stiff to Hard															
	Brown															
	Moist (TILL)															
	Occasional oxide staining		6	SS	39											
	Becomes grey		7	SS	47											
265.4																
9.1	Silty CLAY, trace sand, trace gravel		8	SS	18											
	Very Stiff															
	Grey															
	Moist (TILL)															

Continued Next Page

+³ . X³ : Numbers refer to Sensitivity 20 15 10 5 0 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 11-16

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 862 124.3 E 299 902.5 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.01.28 - 2011.01.28 CHECKED BY MEF

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 x LAB VANE									
	Continued From Previous Page							20	40	60	80	100					
263.3	Silty CLAY , trace sand, trace gravel Very Stiff Grey Moist (TILL)		9	SS	21		264										
11.3	END OF BOREHOLE AT 11.3m. BOREHOLE OPEN AND WATER LEVEL AT 3.6m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 10.0m, CUTTINGS TO 0.9m, BENTONITE HOLEPLUG TO 0.4m, CONCRETE TO 0.1m, THEN ASPHALT TO SURFACE.																

+³, X³: Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

METRIC

W.P.	2539-04-00	LOCATION	N 4 862 616.7 E 299 818.6	ORIGINATED BY	ES
HWY	400	BOREHOLE TYPE	Solid Stem Augers	COMPILED BY	AN
DATUM	Geodetic	DATE	2011.01.31 - 2011.01.31	CHECKED BY	MEF

[illegible]

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 11-17

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 862 616.7 E 299 818.6 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.01.31 - 2011.01.31 CHECKED BY MEF

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							20	40	60	80	100					

+³, X³: Numbers refer to
Sensitivity

20
15 10 5
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 11-18

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 863 126.1 E 299 731.1 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.01.31 - 2011.01.31 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT NATURAL MOISTURE LIMIT LIQUID CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa				WATER CONTENT (%)				GR	SA	SI	CL	
								○ UNCONFINED + FIELD VANE					w _P	w		w _L				
								● QUICK TRIAXIAL × LAB VANE	20	40	60	80	100	20		40	60			
277.1																				
0.0																				
276.9	ASPHALT: (250mm)																			
0.3	SAND, some gravel		1	GS																
276.5	Brown																			
0.6	Moist																			
	(FILL)																			
	SAND, trace gravel		1	SS	38															
275.8	Dense																			
1.3	Brown																			
	Moist																			
	(FILL)																			
	Silty CLAY, some sand, trace gravel		2	SS	19															
	Stiff to Very Stiff																			
	Brown																			
	Moist																			
	(TILL)																			
			3	SS	11													0 16 47 37		
	Occasional oxide staining		4	SS	26															
			5	SS	19															
271.0																				
6.1	SAND, fine grained, some silt, trace		6	SS	21													0 78 20 2		
	clay, occasional oxide staining																			
270.6	Compact																			
6.6	Brown																			
	Moist																			
			7	SS	23															
			8	SS	43													0 27 52 21		

Continued Next Page

+³ X³ Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 11-18

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 863 126.1 E 299 731.1 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.01.31 - 2011.01.31 CHECKED BY MEF

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								
						20 40 60 80 100 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE					WATER CONTENT (%)					
						20 40 60 80 100					20	40	60			
	Continued From Previous Page															
266.2	Silty CLAY, with sand, trace gravel Hard Grey Moist (TILL)		9	SS	55/											
11.0	END OF BOREHOLE AT 11.0m. BOREHOLE OPEN AND WATER LEVEL AT 4.5m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 9.7m, CUTTINGS TO 0.3m, HOLEPLUG TO 0.1m, THEN ASPHALT TO SURFACE.				150											

RECORD OF BOREHOLE No 11-19

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 863 618.0 E 299 647.5 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.02.03 - 2011.02.03 CHECKED BY MEF

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 (%)								
267.6							20	40	60	80	100	20	40	60		
0.0	ASPHALT: (200mm)															
0.2	SAND, some gravel		1	GS												
266.9	Brown															
0.6	Damp															
	(FILL)															
266.4	SAND, trace gravel		1	SS	47											
	Dense															
1.2	Brown															
	Damp															
	(FILL)															
	Clayey SILT, some sand to sandy,		2	SS	49											
	trace gravel															
	Hard to Stiff															
	Brown															
	(FILL)															
			3	SS	13											
			4	SS	31											
			5	SS	33											
			6	SS	16											
			7	SS	26											
			8	SS	35											

Continued Next Page

+³, ×³: Numbers refer to Sensitivity 20 15 10 5 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 11-19

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 863 618.0 E 299 647.5 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.02.03 - 2011.02.03 CHECKED BY MEF

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																	
257.3	SAND, trace silt, trace gravel Dense Brown Moist					257											
10.3			9	SS	35												
256.3	END OF BOREHOLE AT 11.3m. BOREHOLE OPEN AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 9.7m, CUTTINGS TO 0.9m, BENTONITE HOLEPLUG TO 0.4m, CONCRETE TO 0.1m, THEN ASPHALT TO SURFACE.																
11.3																	

RECORD OF BOREHOLE No 11-20

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 865 160.6 E 299 383.2 ORIGINATED BY MAT
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2011.05.03 - 2011.05.03 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
309.4												
0.0	ASPHALT: (150mm)											
0.2	SAND, some gravel Compact (FILL)		1	SS	22		309					
308.6												
0.8	Clayey SILT, trace sand, trace gravel Stiff Grey Moist (FILL)		2	SS	11		308					
			3	SS	12							
307.2												
2.2	Silty CLAY, some sand, trace gravel Very Stiff to Hard Brown Moist (TILL)		4	SS	16		307					
			5	SS	22		306					0 16 49 35
			6	SS	27		305					
			7	SS	36		303					
301.8							302					
7.6	Sandy SILT, trace clay Dense Brown Moist		8	SS	37		301					0 28 66 6
300.2												
9.1	Silty CLAY, some sand Hard Grey Moist (TILL)		9	SS	38		300					
299.6												
9.8												

Continued Next Page

+³ × 3³ Numbers refer to Sensitivity 20 15 10 5 0 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 11-20

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 865 160.6 E 299 383.2 ORIGINATED BY MAT
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.05.03 - 2011.05.03 CHECKED BY MEF

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT 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															
	END OF BOREHOLE AT 9.8m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 1.0m, CONCRETE MIX TO 0.1m, THEN ASPHALT TO SURFACE.															

RECORD OF BOREHOLE No 11-21

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 865 500.3 E 299 331.6 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.02.01 - 2011.02.01 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	
306.1												
0.0	ASPHALT: (200mm)											
0.2	SAND, some gravel Very Dense Brown Moist (FILL)		1	GS			306					
304.8			1	SS	75		305					
1.3	Clayey SILT, some sand, trace gravel Stiff Brown to Dark Grey (FILL)		2	SS	9		304					
303.9			3	SS	18		303					
2.3	Silty CLAY, some sand, trace gravel Stiff to Very Stiff Brown Moist (TILL)		4	SS	18		302					
			5	SS	23		301					
			6	SS	12		300					
	Becomes grey						299					
298.4			7	SS	33		298					
7.7	SAND, fine to coarse grained, some silt, trace to some gravel Dense Brown Moist		8	SS	32		297					

Continued Next Page

+³ . X³ : Numbers refer to
Sensitivity

20
15 10 5
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 11-21

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 865 500.3 E 299 331.6 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.02.01 - 2011.02.01 CHECKED BY MEF

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						WATER CONTENT (%)		
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE								
	Continued From Previous Page						20 40 60 80 100				w _P w w _L		GR SA SI CL			
							296									
295.2																
10.9	Silty CLAY, some sand, trace gravel		9	SS	48								0 12 58 30			
294.9	Hard						295									
11.3	Grey (TILL)															
	END OF BOREHOLE AT 11.3m. BOREHOLE OPEN AND WATER LEVEL AT 7.0m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 10.0m, CUTTINGS TO 0.7m, BENTONITE HOLEPLUG TO 0.4m, CONCRETE TO 0.1m, THEN ASPHALT TO SURFACE.															

RECORD OF BOREHOLE No 11-22

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 865 555.8 E 299 322.0 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2011.02.01 - 2011.02.01 CHECKED BY MEF

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									
	Continued From Previous Page							20	40	60	80	100					
9.9	Sandy SILT, trace gravel Compact Grey Moist						295										
294.3			9	SS	28									○			
11.3	END OF BOREHOLE AT 11.3m. BOREHOLE OPEN AND WATER LEVEL AT 4.2m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 9.7m, CUTTINGS TO 0.7m, BENTONITE HOLEPLUG TO 0.4m, CONCRETE TO 0.1m, THEN ASPHALT TO SURFACE.																

Appendix B

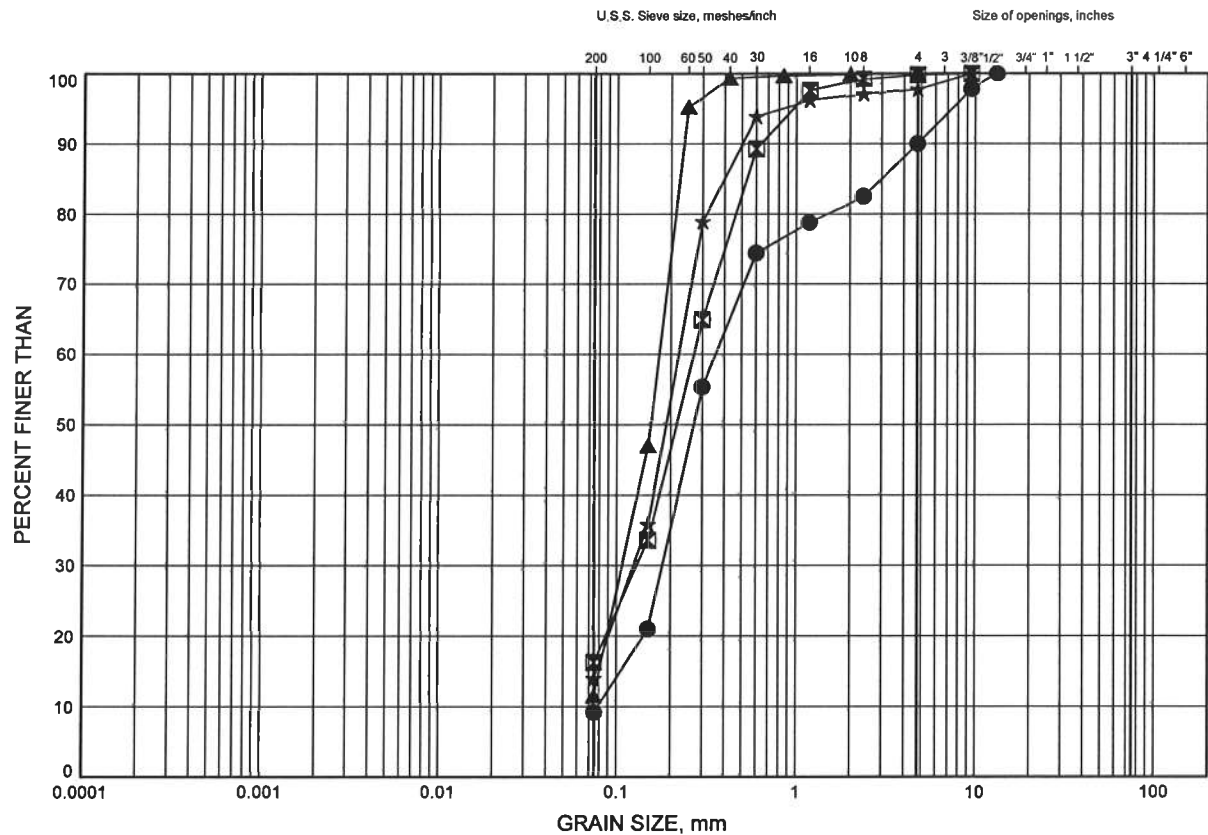
Geotechnical Laboratory Test Results



Widening of Hwy 400, Major Mackenzie to King Road
GRAIN SIZE DISTRIBUTION

FIGURE B1

SAND FILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	11-01	1.07	226.64
⊠	11-02	1.07	228.62
▲	11-13	0.99	256.56
★	11-15	1.07	273.14

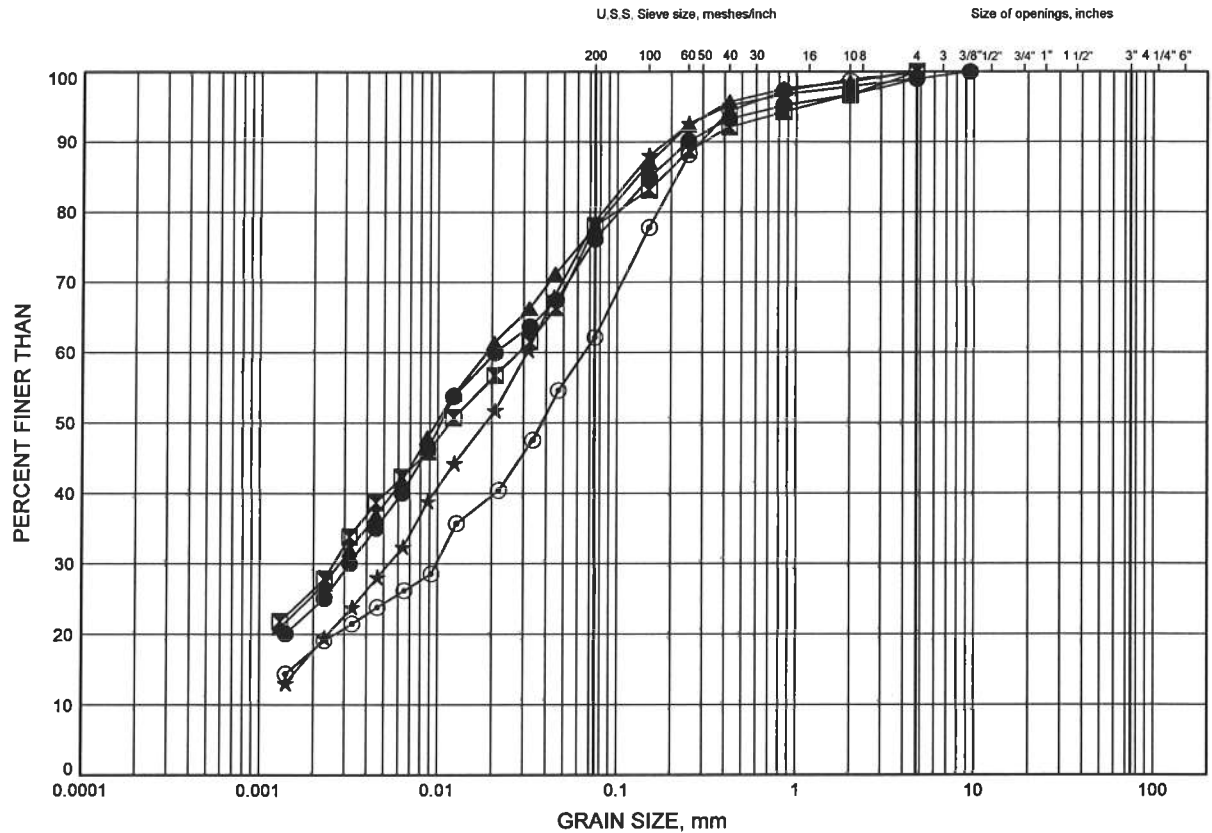


W.P.# 2539-04-00
Prepared By MFA
Checked By SKP

Widening of Hwy 400, Major Mackenzie to King Road
GRAIN SIZE DISTRIBUTION

FIGURE B2

CLAYEY SILT TO SILTY CLAY FILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	11-10	4.88	246.11
⊠	11-11	3.35	248.65
▲	11-16	2.59	271.94
★	11-19	3.35	264.20
⊙	11-19	7.92	259.63

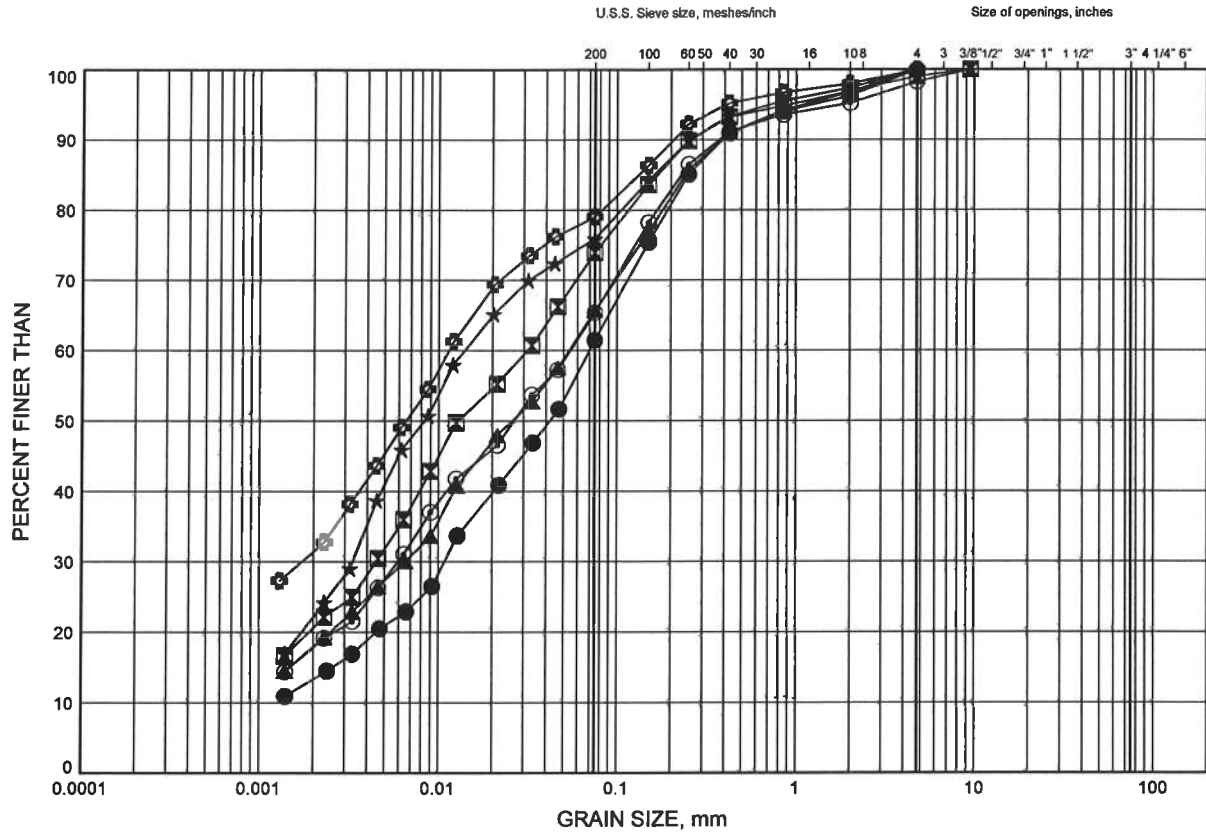


W.P.# 2539-04-00
Prepared By MFA
Checked By SKP

Widening of Hwy 400, Major Mackenzie to King Road
GRAIN SIZE DISTRIBUTION

FIGURE B3

CLAYEY SILT TO SILTY CLAY TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	11-01	3.35	224.36
⊠	11-01	9.45	218.26
▲	11-02	3.35	226.34
★	11-02	7.92	221.77
⊙	11-03	2.59	233.74
⊕	11-04	10.97	229.62

GRAIN SIZE DISTRIBUTION - THURBER 9288.GPJ 9/27/11

W.P.# .2539-04-00.....
Prepared By .MFA.....
Checked By .SKP.....

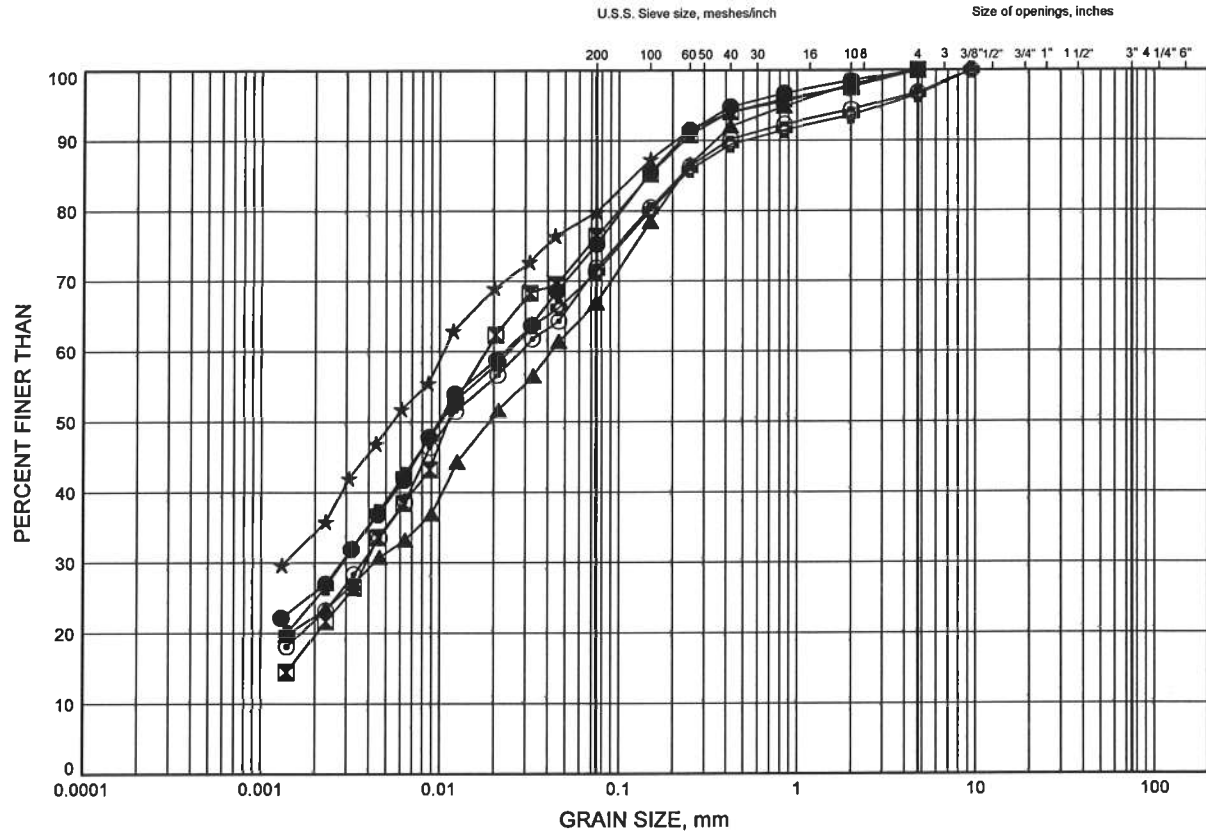


Widening of Hwy 400, Major Mackenzie to King Road

GRAIN SIZE DISTRIBUTION

FIGURE B4

CLAYEY SILT TO SILTY CLAY TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	11-05	3.35	238.09
⊠	11-05	7.92	233.52
▲	11-06	3.35	240.44
★	11-06	7.92	235.87
⊙	11-07	2.59	236.97
⊕	11-07	4.88	234.68

GRAIN SIZE DISTRIBUTION - THURBER 9268.GPJ 9/27/11

W.P.# 2539-04-00.....
 Prepared By MFA.....
 Checked By SKP.....

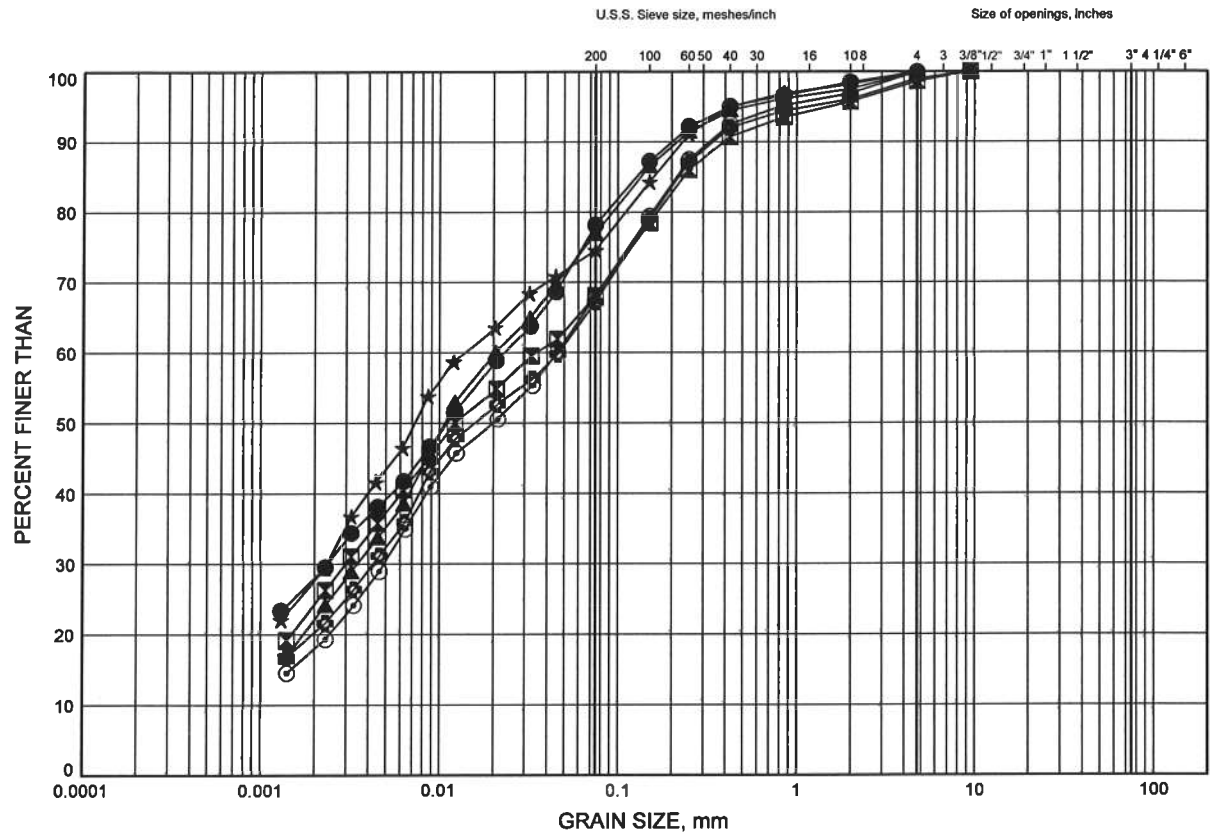


Widening of Hwy 400, Major Mackenzie to King Road

GRAIN SIZE DISTRIBUTION

FIGURE B5

CLAYEY SILT TO SILTY CLAY TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	11-08	4.88	242.27
⊠	11-08	9.45	237.70
▲	11-09	2.59	246.76
★	11-09	9.45	239.90
⊙	11-10	10.97	240.02
⊕	11-11	9.45	242.55

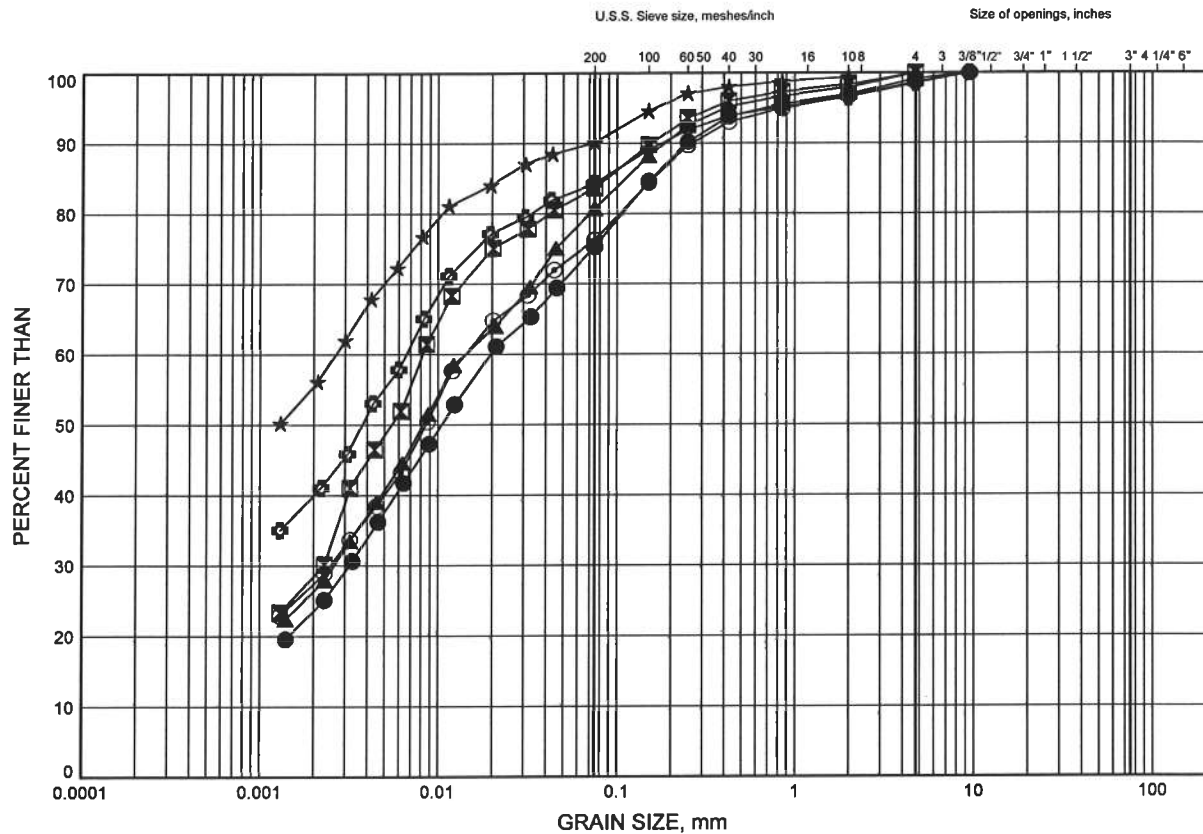


W.P.# .2539-04-00.....
 Prepared By .MFA.....
 Checked By .SKP.....

Widening of Hwy 400, Major Mackenzie to King Road
GRAIN SIZE DISTRIBUTION

FIGURE B6

CLAYEY SILT TO SILTY CLAY TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	11-12	3.35	251.86
⊠	11-12	9.45	245.76
▲	11-13	3.35	254.20
★	11-13	9.45	248.10
⊙	11-14	3.35	268.22
⊕	11-14	9.45	262.12

GRAIN SIZE DISTRIBUTION - THURBER 9268.GPJ 9/27/11

W.P.# .2539-04-00.....
Prepared By .MFA.....
Checked By .SKP.....

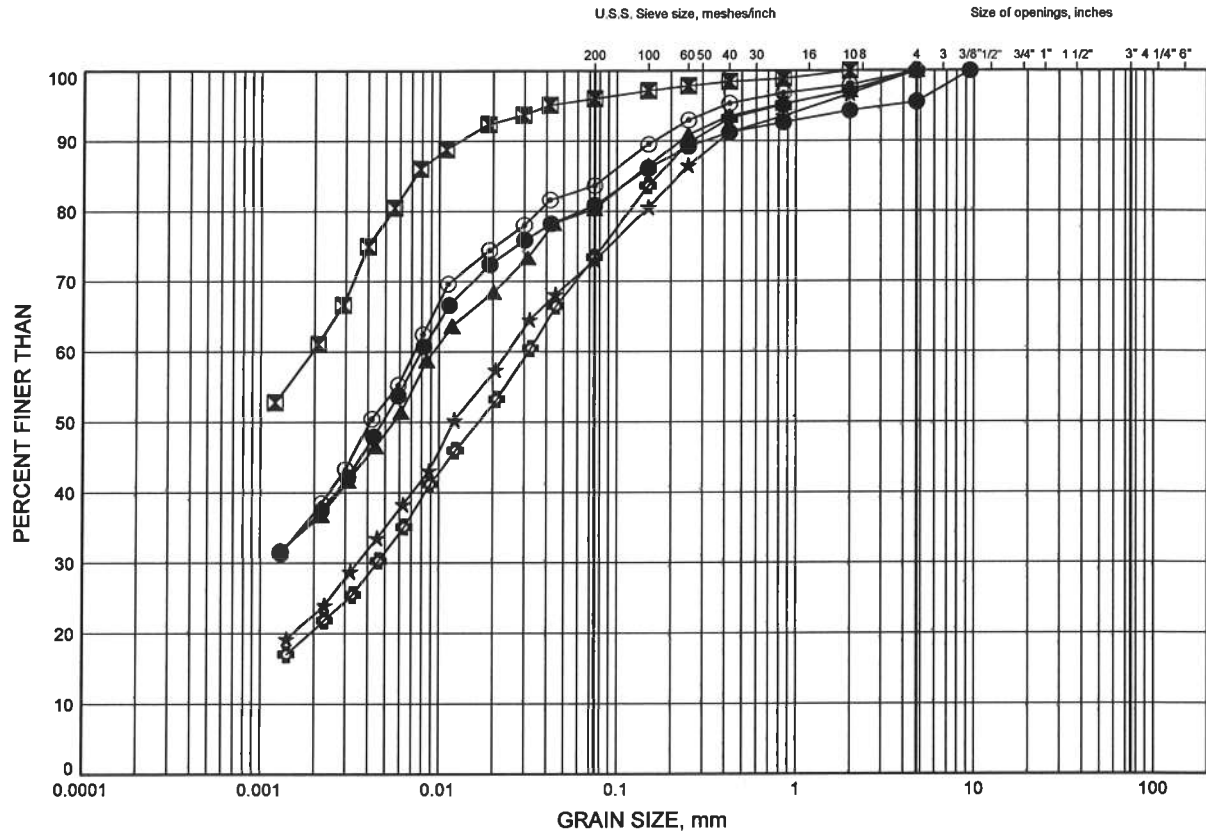


Widening of Hwy 400, Major Mackenzie to King Road

GRAIN SIZE DISTRIBUTION

FIGURE B7

CLAYEY SILT TO SILTY CLAY TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	11-15	6.40	267.81
⊠	11-16	9.45	265.08
▲	11-17	4.88	275.54
★	11-17	9.45	270.97
⊙	11-18	2.59	274.55
⊕	11-18	9.45	267.69

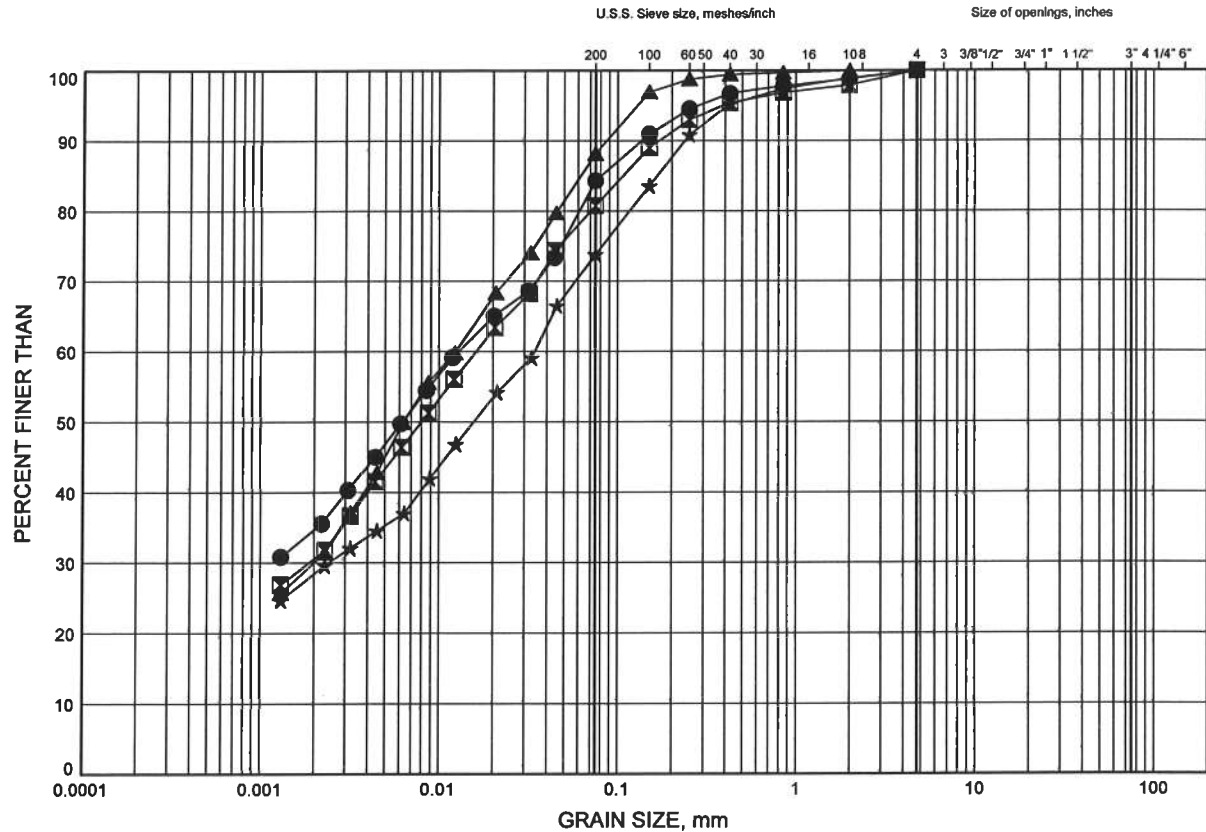


W.P.# 2539-04-00.....
 Prepared By MFA.....
 Checked By SKP.....

Widening of Hwy 400, Major Mackenzie to King Road
GRAIN SIZE DISTRIBUTION

FIGURE B8

CLAYEY SILT TO SILTY CLAY TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	11-20	3.35	306.03
⊠	11-21	2.59	303.55
▲	11-21	10.97	295.17
★	11-22	4.88	300.72

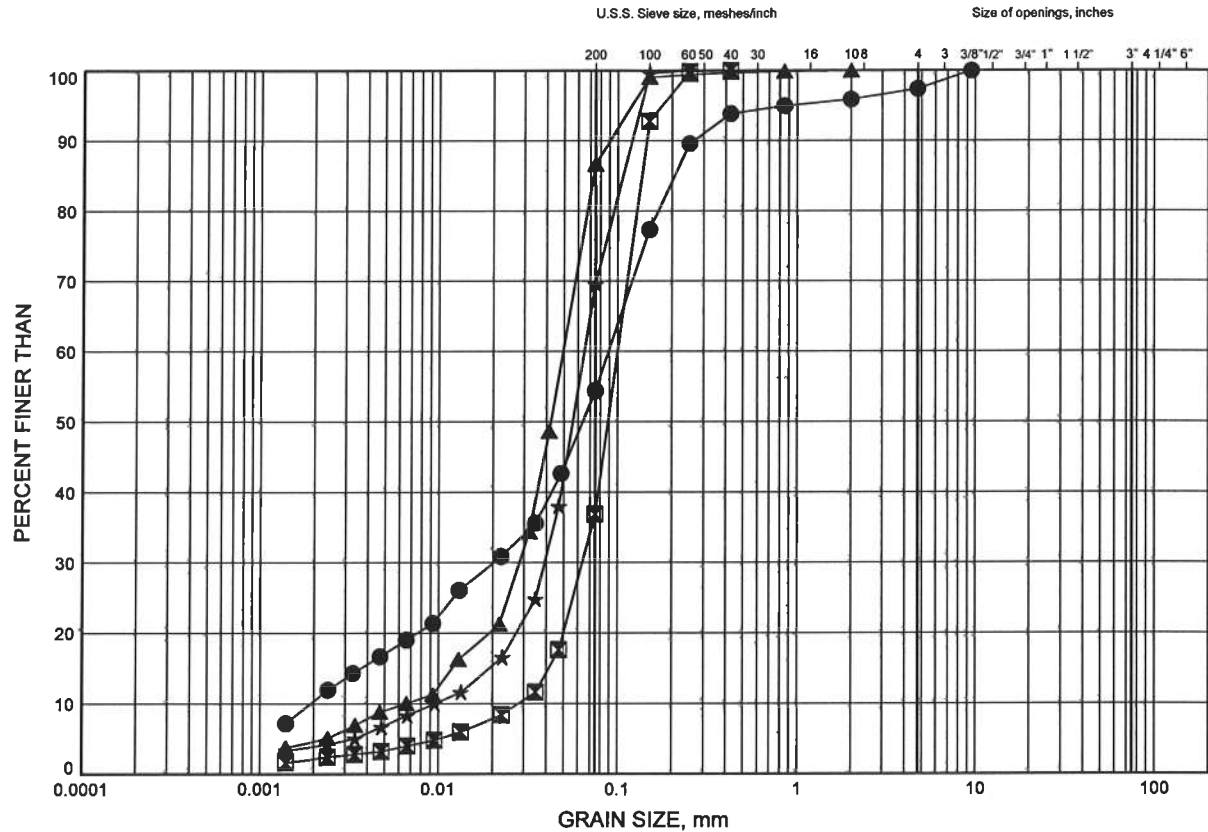


W.P.# 2539-04-00
Prepared By MFA
Checked By SKP

Widening of Hwy 400, Major Mackenzie to King Road
GRAIN SIZE DISTRIBUTION

FIGURE B9

SAND & SILT TO SANDY SILT TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	11-03	6.32	230.01
⊠	11-03	10.90	225.43
▲	11-07	7.74	231.82
★	11-07	10.82	228.74

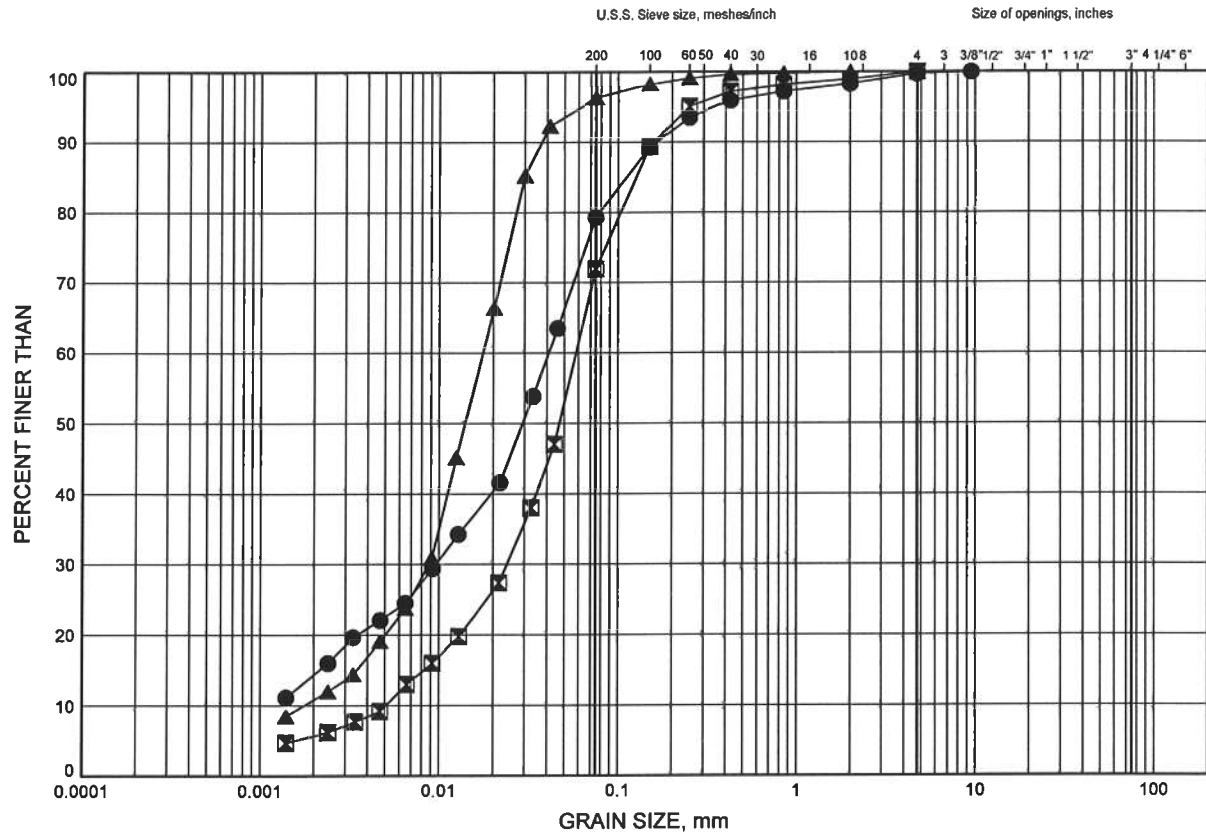


W.P.# .2539-04-00.....
Prepared By .MFA.....
Checked By .SKP.....

Widening of Hwy 400, Major Mackenzie to King Road
GRAIN SIZE DISTRIBUTION

FIGURE B10

SANDY SILT TO SILT



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

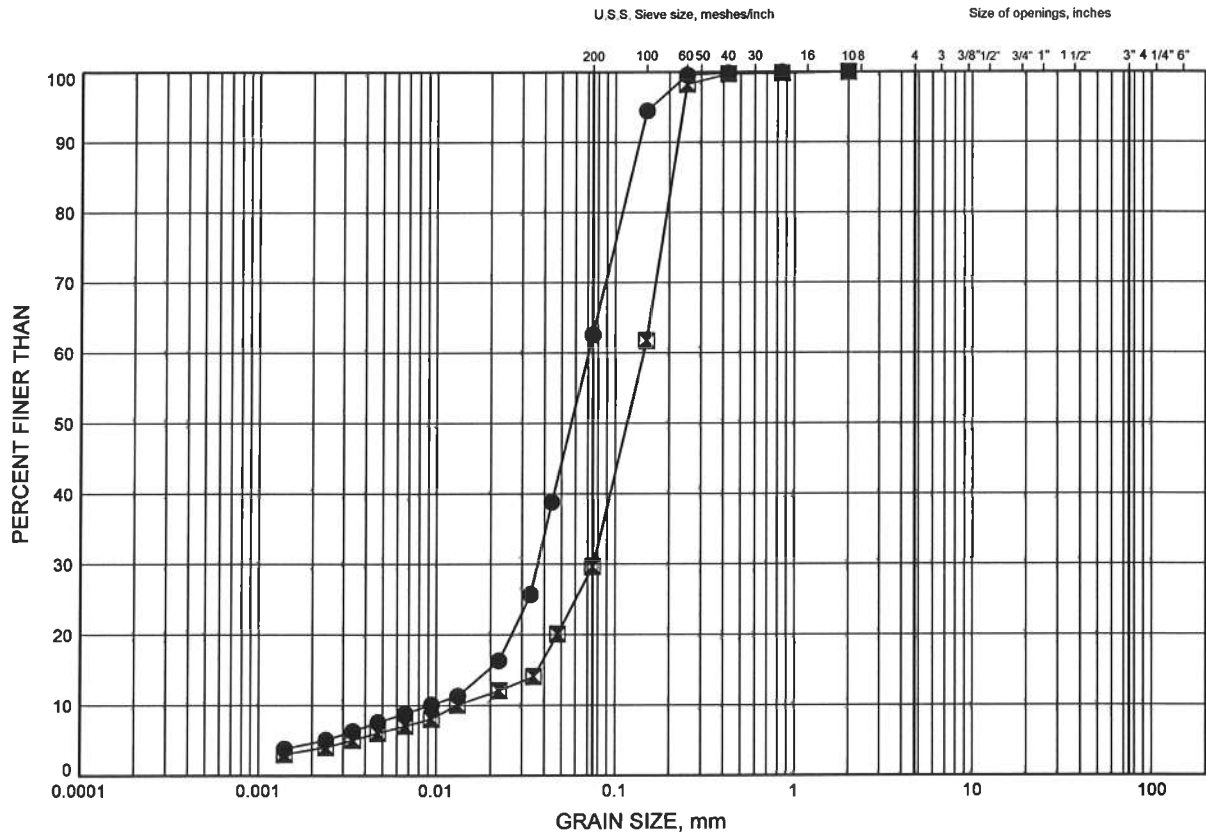
LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	11-04	3.35	237.24
⊠	11-20	7.92	301.46
▲	11-22	9.45	296.15

Widening of Hwy 400, Major Mackenzie to King Road
GRAIN SIZE DISTRIBUTION

FIGURE B11

SILT & SAND TO SILTY SAND



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	11-08	7.73	239.42
■	11-22	7.92	297.68

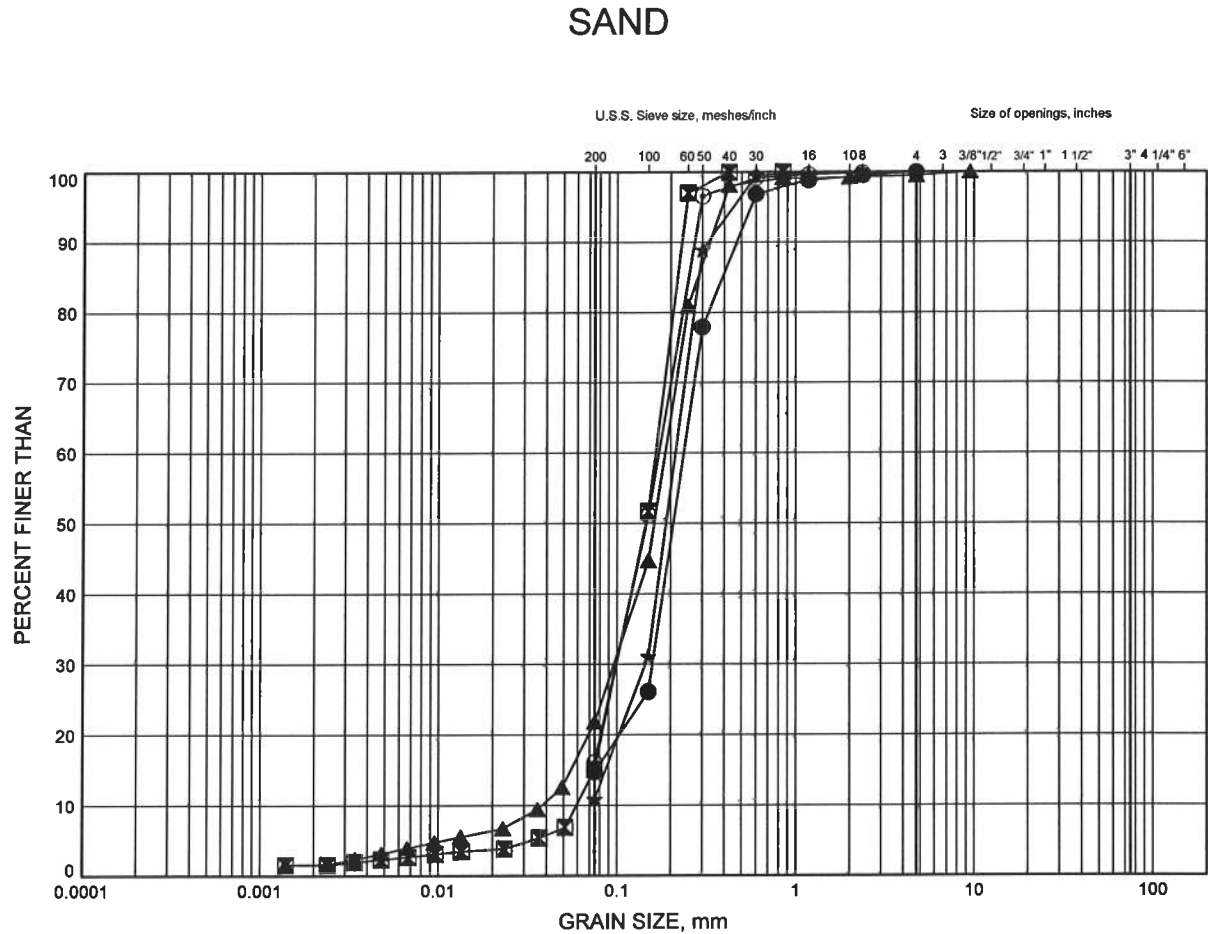


W.P.# 2539-04-00
Prepared By MFA
Checked By SKP

Widening of Hwy 400, Major Mackenzie to King Road

GRAIN SIZE DISTRIBUTION

FIGURE B12



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

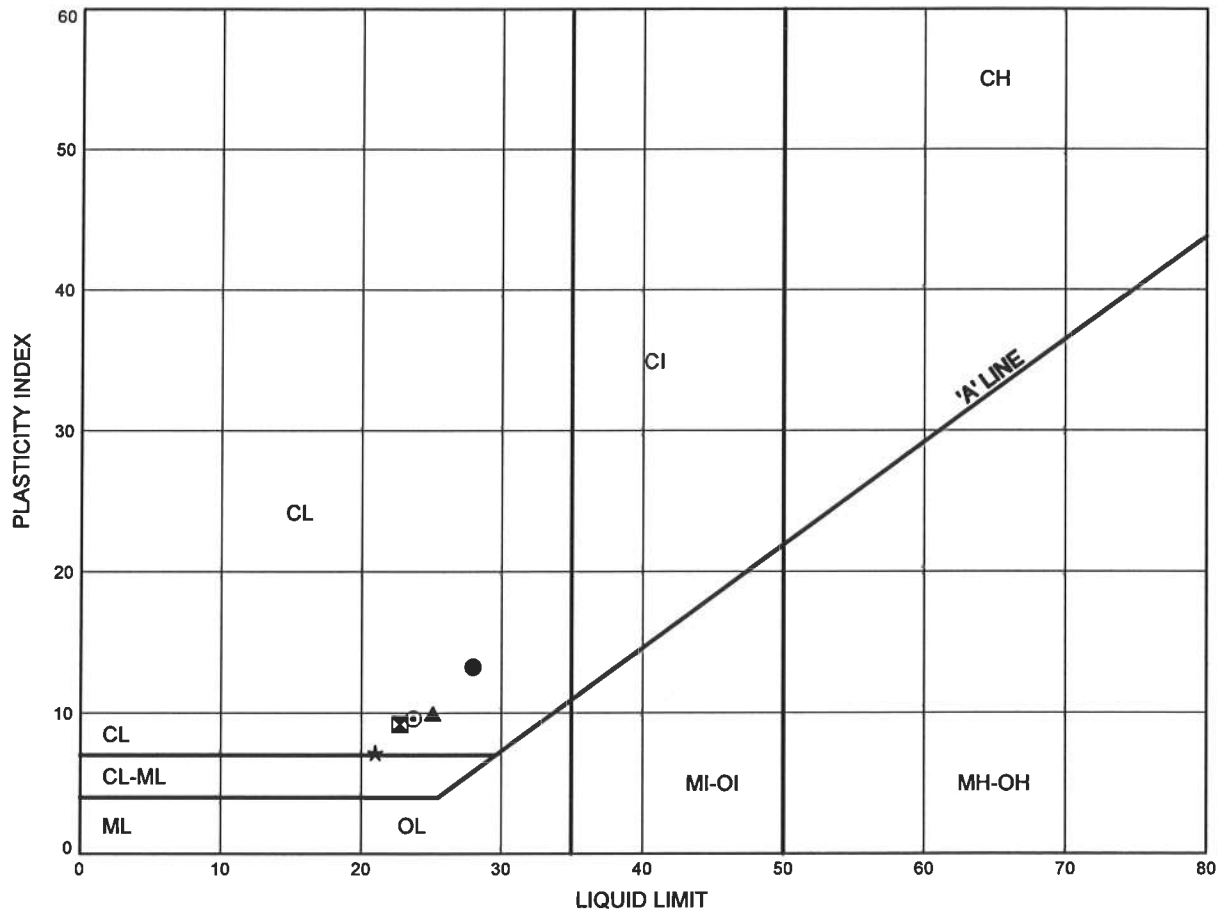
LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	11-03	7.74	228.59
⊠	11-04	7.92	232.67
▲	11-18	6.34	270.80
★	11-19	10.97	256.58
⊙	11-21	7.92	298.22

Widening of Hwy 400, Major Mackenzie to King Road
ATTERBERG LIMITS TEST RESULTS

FIGURE B13

CLAYEY SILT TO SILTY CLAY FILL



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	11-10	4.88	246.11
⊠	11-11	3.35	248.65
▲	11-16	2.59	271.94
★	11-19	3.35	264.20
⊙	11-19	7.92	259.63

Date September 2011
 Project 2539-04-00

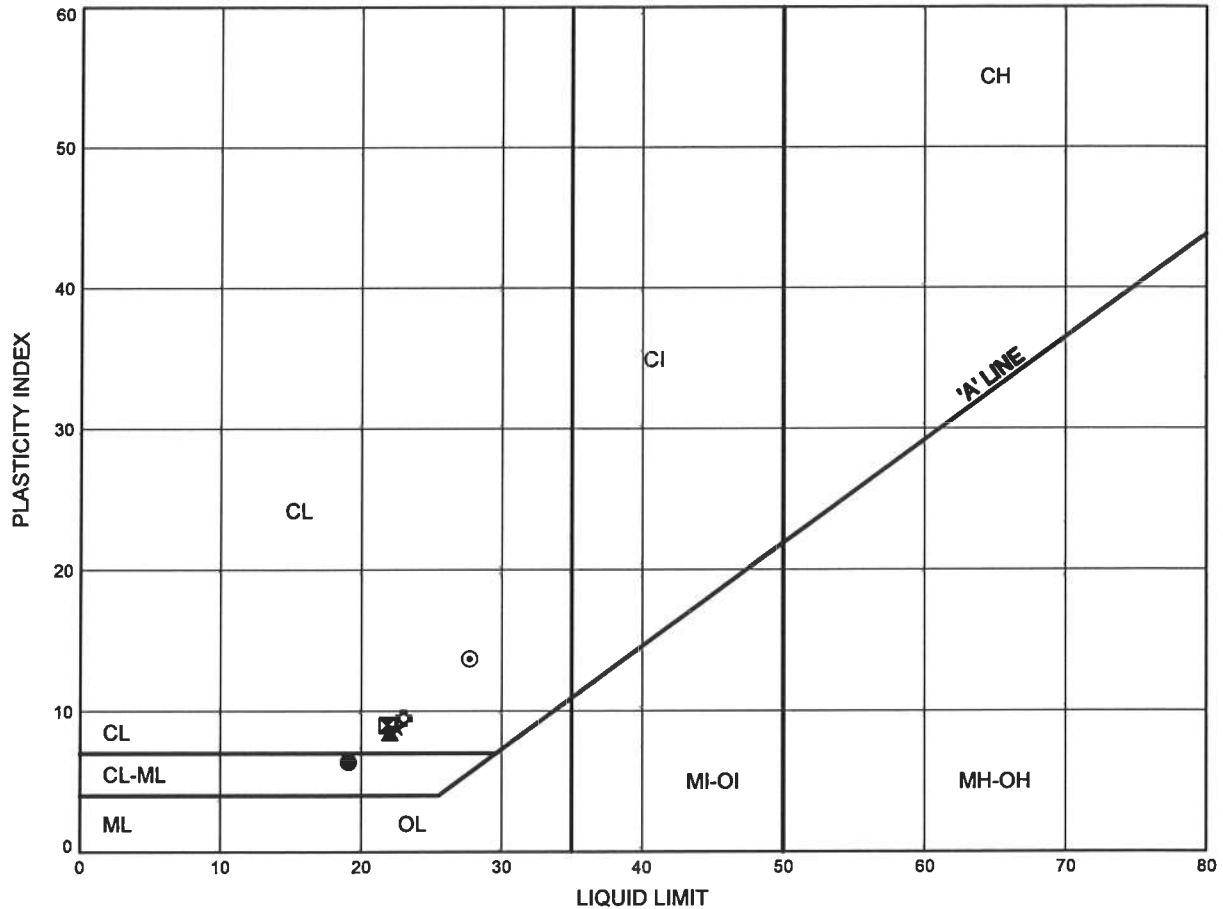


Prep'd MFA
 Chkd. SKP

Widening of Hwy 400, Major Mackenzie to King Road
ATTERBERG LIMITS TEST RESULTS

FIGURE B14

CLAYEY SILT TO SILTY CLAY TILL



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	11-01	3.35	224.36
⊠	11-02	3.35	226.34
▲	11-02	7.92	221.77
★	11-03	2.59	233.74
⊙	11-04	10.97	229.62
⊗	11-05	3.35	238.09

Date September 2011
 Project 2539-04-00

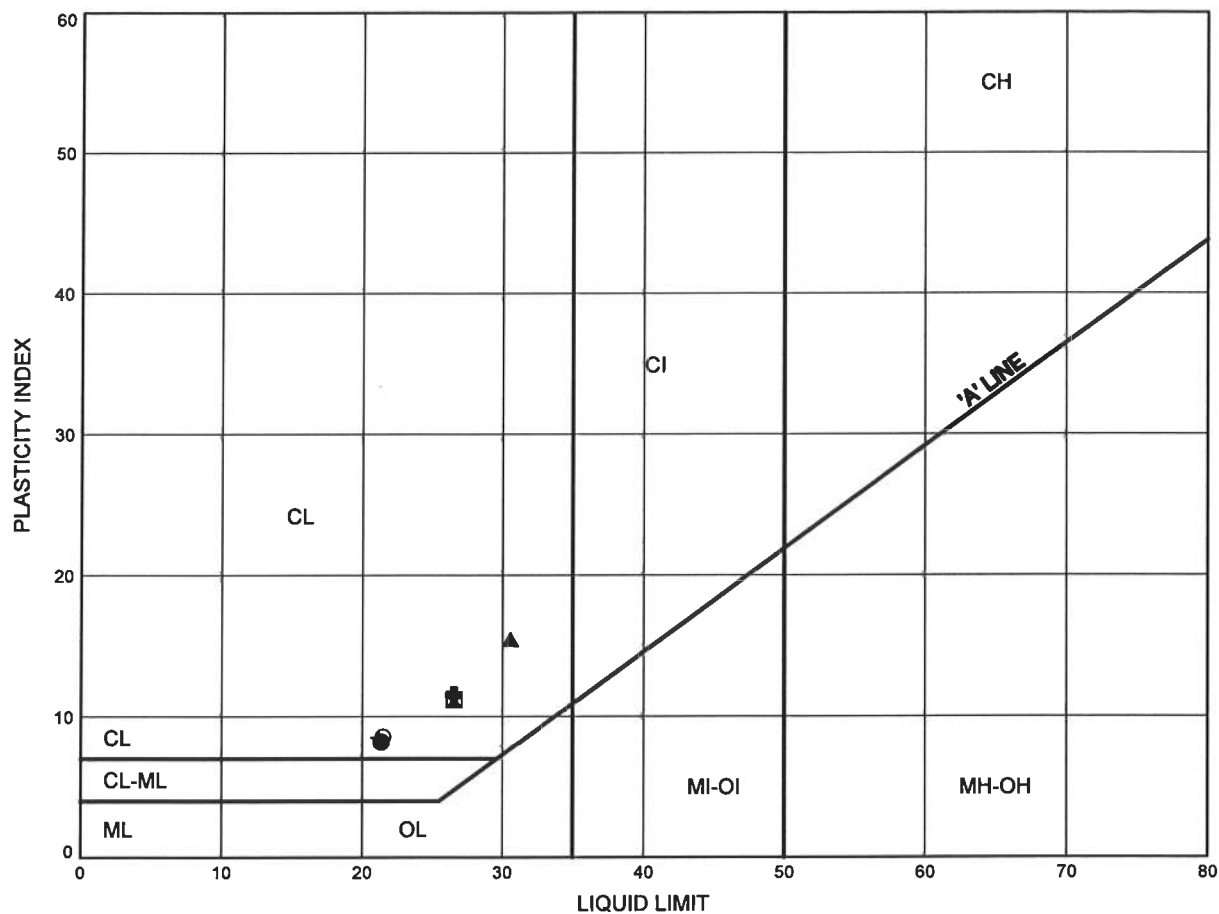


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Widening of Hwy 400, Major Mackenzie to King Road
ATTERBERG LIMITS TEST RESULTS

FIGURE B15

CLAYEY SILT TO SILTY CLAY TILL



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	11-05	7.92	233.52
⊠	11-06	3.35	240.44
▲	11-06	7.92	235.87
★	11-07	2.59	236.97
⊙	11-07	4.88	234.68
⊕	11-08	4.88	242.27

Date September 2011

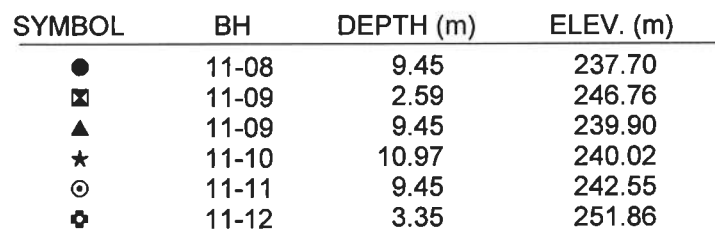
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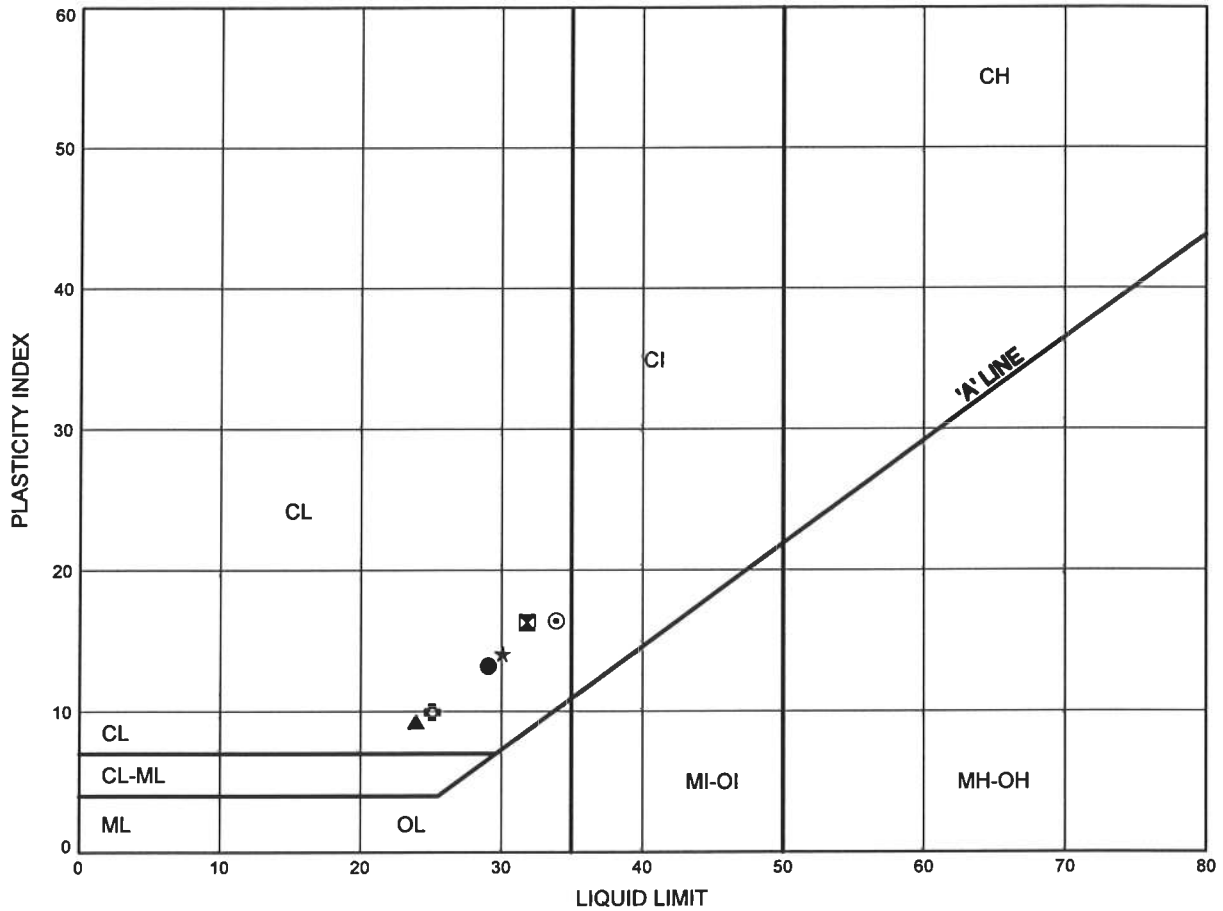
FIGURE B16



Widening of Hwy 400, Major Mackenzie to King Road
ATTERBERG LIMITS TEST RESULTS

FIGURE B17

CLAYEY SILT TO SILTY CLAY TILL

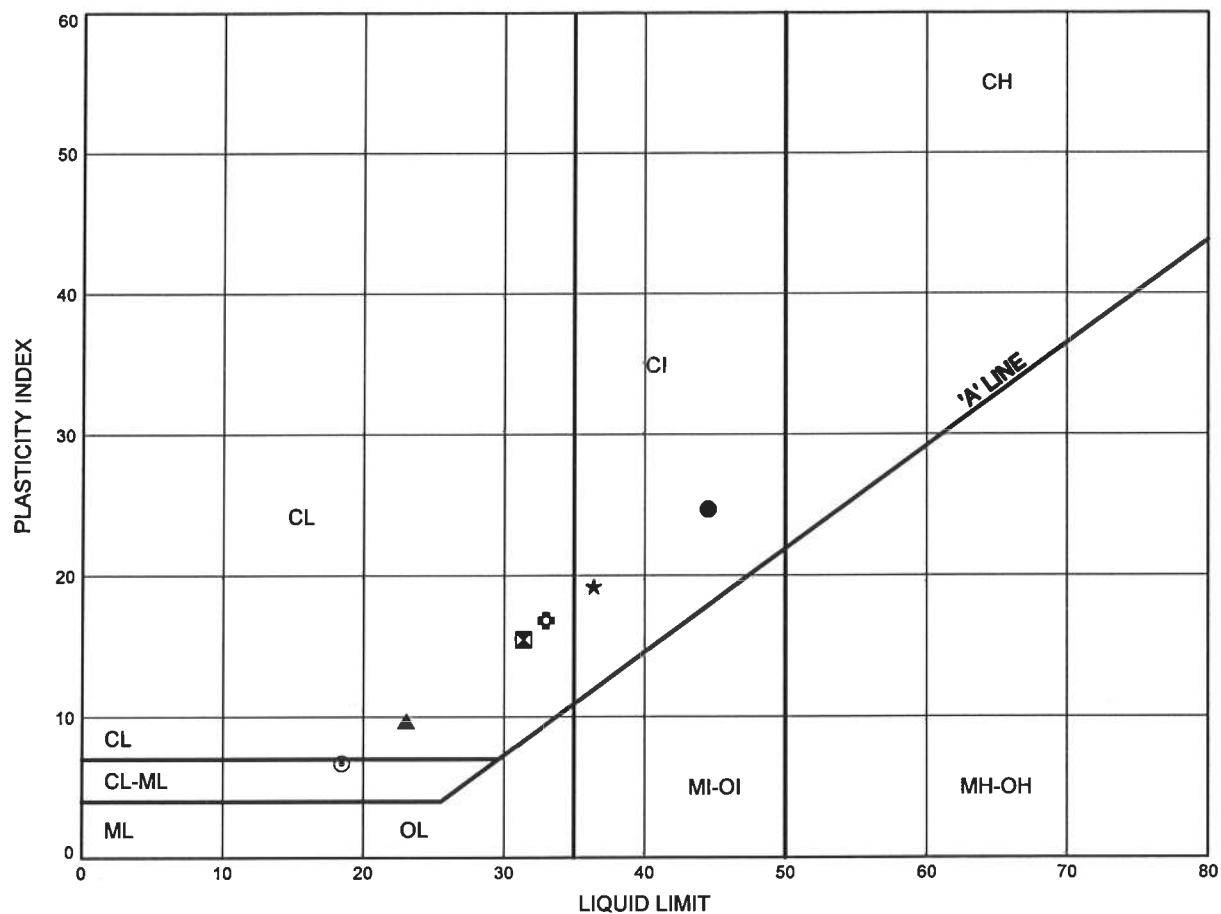


SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	11-13	3.35	254.20
⊠	11-13	9.45	248.10
▲	11-14	3.35	268.22
★	11-14	9.45	262.12
⊙	11-15	6.40	267.81
⊕	11-16	2.59	271.94

Widening of Hwy 400, Major Mackenzie to King Road
ATTERBERG LIMITS TEST RESULTS

FIGURE B18

CLAYEY SILT TO SILTY CLAY TILL



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	11-16	9.45	265.08
⊠	11-17	4.88	275.54
▲	11-17	9.45	270.97
★	11-18	2.59	274.55
⊙	11-18	9.45	267.69
⊗	11-20	3.35	306.03

Date September 2011
 Project 2539-04-00

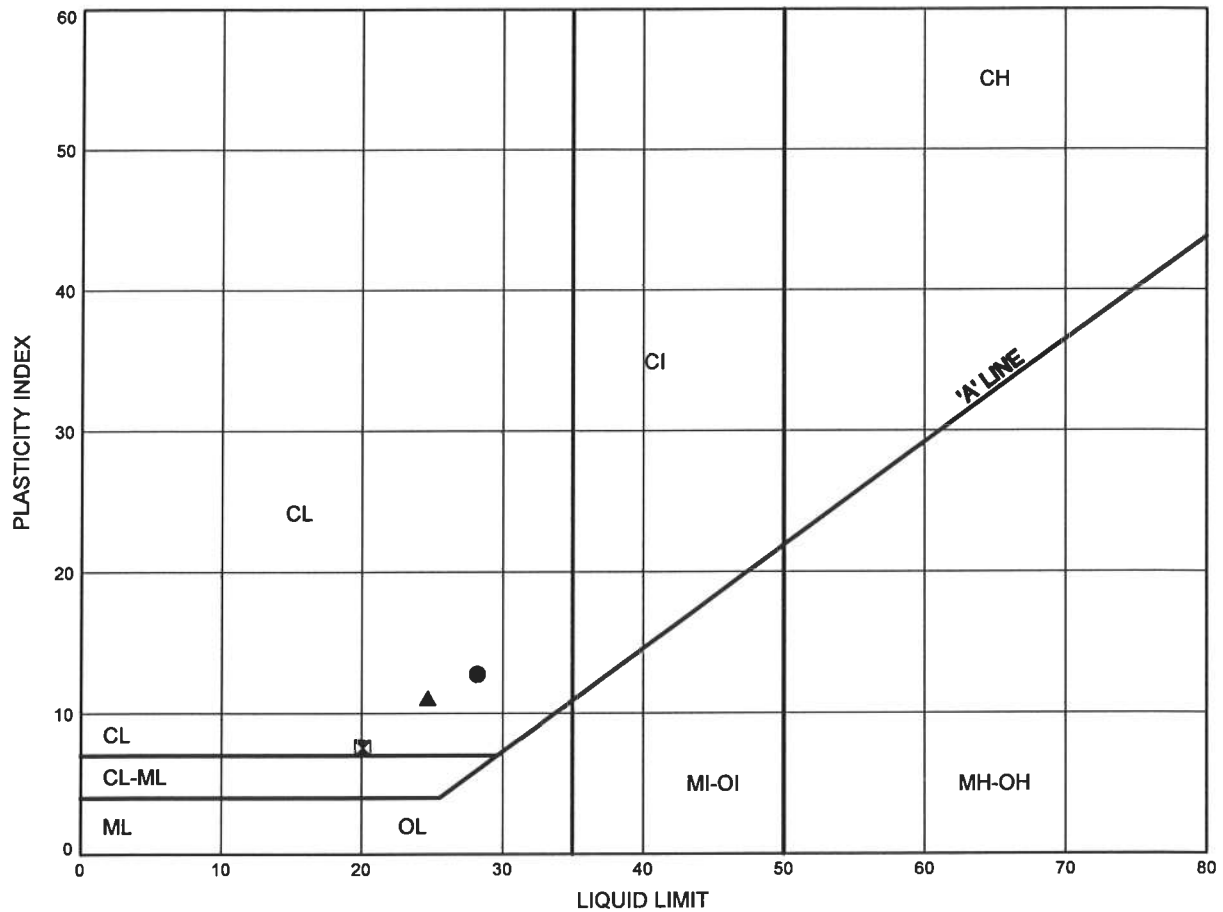


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Widening of Hwy 400, Major Mackenzie to King Road
ATTERBERG LIMITS TEST RESULTS

FIGURE B19

CLAYEY SILT TO SILTY CLAY TILL



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	11-21	2.59	303.55
■	11-21	10.97	295.17
▲	11-22	4.88	300.72

Date September 2011

Project 2539-04-00



Prep'd MFA

Chkd. SKP

Appendix C
List of Special Provisions
and
Suggested Text for NSSP



List of Special Provisions Referenced in this Report

OPSS 903

Suggested Text for NSSP on:

“Augered Caisson Construction for Overhead and Cantilevered Sign (OH&CS) Support Foundations”

The Contractor is advised that variable types of subsurface materials may be encountered at the locations of the OH&CS foundations. For additional information regarding subsurface conditions, the Contractor is referred to the Foundation Investigation Report.

For bidding purposes, the Contractor shall assume the following:

1. The subsurface conditions at an augered caisson location are the same as those encountered in the borehole closest to the subject caisson location.
2. Cobbles, boulders and rock fragments may be encountered within the glacial till deposits. Obstructions including rubble, cobbles and boulders may also be present within the embankment fills. The soil matrix is anticipated to become harder or denser with depth. Caisson installation equipment must be able to dislodge, handle, remove or otherwise penetrate these obstructions and hard/very dense layers.
3. Water seepage and/or soil sloughing into the caisson hole will occur from existing fill and cohesionless soils at some locations. The cohesionless soils would be susceptible to disturbance under conditions of unbalanced hydrostatic head. Temporary liners shall be available on site, or be made available on very short notice, to support the caisson sidewalls and provide seepage cut-off where required. All concrete should be placed in the dry.

The Contractor is responsible for constructing the OH&CS foundations without disturbing the material at the sides or bases of the foundations.

