



Terraprobe

*Consulting Geotechnical & Environmental Engineering
Construction Materials Inspection & Testing*

**FOUNDATION INVESTIGATION REPORT
HIGH FILLS
MERRITT ROAD INTERCHANGE
HIGHWAY 406 TWINNING
PORT ROBINSION ROAD TO EAST MAIN STREET
AGREEMENT No. 2008-E-0016, W.P. 280-99-00
GEOCRES No. 30M3-252**

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**FOUNDATION INVESTIGATION REPORT
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HIGHWAY 406 TWINNING
ONTARIO**

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PART 1: FACTUAL INFORMATION

1 INTRODUCTION

This report presents the factual findings obtained from a foundation investigation for the proposed high fill embankments at the Merritt Road Interchange. The project area is located at the existing at grade intersection of Highway 406 and Merritt Road in the City of Thorold, Ontario.

Preliminary and detailed foundation investigations were conducted for the Merritt Road Underpass and the factual data from these investigations have been used as general reference for the preparation of this report.

The purpose of this investigation was to explore the subsurface conditions at the site and based on the data obtained, to provide a borehole location plan, records of boreholes, stratigraphic profile and cross-sections, laboratory test results and a written description of the subsurface conditions. A model of the subsurface conditions was developed from the data obtained.

Terraprobe conducted the investigation as a sub-consultant to Giffels Associates Ltd./IBI Group, under the Ministry of Transportation Ontario (MTO) Agreement Number 2008-E-0016.

The following documents are referenced in the preparation of this report:

- Peto MacCallum Ltd., "Preliminary Foundation Investigation and Design Report for Merritt Road Underpass", Highway 406 Four-Laning, G.W.P. 280-99-00, City of Thorold, Ontario, GEOCREs 30M03-233, dated November 20, 2008.
- Peto MacCallum Ltd., "Foundation Investigation and Design Report for Merritt Road Underpass, Site No. 34-460", Highway 406 Four-Laning, G.W.P. 280-99-00, City of Thorold, Ontario, GEOCREs 30M03-240, dated April 06, 2009.



2 SITE DESCRIPTION & PHYSIOGRAPHY

The site is located at the existing intersection of Highway 406 and Merritt Road in the City of Thorold, Regional Municipality of Niagara. The Merritt Road underpass is currently under construction approximately 30 m north of this intersection.

The topography is generally flat with scattered man-made high ground areas in the vicinity of the proposed bridge approaches. Vegetation at this site consists primarily of deciduous trees and wild bush.

The site is located between the Niagara Escarpment and Lake Erie in the physiographic region of Southern Ontario referred to as the Haldimand Clay Plain. The Haldimand Clay Plain is best described as falling into a series of parallel belts with the highest ground adjacent to the Escarpment. Generally this region is flat and poorly drained although it includes several distinctive landforms such as dunes, cobble, clay and sand beaches, limestone pavements and back-shore wetland basins¹.

The Niagara Region is underlain by a sequence of very gently south-dipping dolostones, limestones, shales and sandstones overlying Precambrian basement rock. The key elements in the bedrock geology of the region are the multiple layers of softer sedimentary limestones, shale, sandstone and dolostone.

The bedrock unit at this site is the Salina Formation of Upper Silurian Age². This unit consists essentially of easily weathered, grey, very finely crystalline, laminated argillaceous dolostone with grey, calcareous shale partings and gypsum veins and lenses of varying thicknesses.

3 SITE INVESTIGATION AND FIELD TESTING

The site investigation and field testing for this project were carried out between August 31 and September 10, 2009 and consisted of drilling and sampling thirty nine boreholes to depths ranging from 3.5 m to 15.3 m. The approximate borehole locations are shown on the attached Borehole Locations and Soil Strata Drawing in Appendix D.

The borehole locations were marked in the field by surveyors from Callon Dietz Inc. who also provided Terraprobe with their coordinates and geodetic elevations. Utility clearances were obtained by Terraprobe prior to drilling.

Samples of the overburden soils were obtained at selected intervals using a split spoon sampler in conjunction with Standard Penetration Testing (SPT), as specified in ASTM Method D1586. In the cohesive (clayey) deposits the undrained shear strength of the soil was measured in-situ by means of field vane tests using an MTO type field vane. Relatively undisturbed soil samples were also collected with thin-walled Shelby Tube samplers.

¹ Chapman and Putnam, "The Physiography of South Ontario", 3rd Edition, 1984.

² Ontario Division of Mines, "Quaternary Geology Of The Welland Area", Preliminary Map P.796, 1972.



Ground water conditions in the open boreholes were observed throughout the drilling operations and either standpipe piezometers or monitoring wells were installed in selected boreholes to permit longer term ground water level monitoring. The standpipe piezometers consisted of 19 mm diameter PVC pipe with a slotted screen enclosed in sand and the monitoring wells consisted of 50 mm diameter PVC pipe with a slotted screen enclosed in sand. The remaining boreholes were abandoned in accordance with MOE Regulation 903 by sealing/grouting with a clay slurry mixture after drilling was complete.

The locations and completion details of the piezometers are shown in Tables 3.1 and 3.2.

Table 3.1 – Piezometer Installation Details (South East Quadrant)

Piezometer Location	Piezometer Details	
	Tip Depth/ Elevation (m)	Completion Details
SEW 10+200CL	4.6/174.1	Piezometer with 1.5 m slotted screen installed with filter sand to 2.4 m and bentonite seal from 2.4 m to ground surface.
C1	4.0/174.5	Piezometer with 1.5 m slotted screen installed with filter sand to 2.1 m and bentonite seal from 2.1 m to ground surface.
C2	3.0/175.4	Piezometer with 1.5 m slotted screen installed with filter sand to 1.2 m and bentonite seal from 1.2 m to ground surface.
SEW 10+300CL	6.1/172.8	Piezometer with 1.5 m slotted screen installed with filter sand to 4.3 m, bentonite seal from 4.3 m to 3.4 m, silty clay cuttings from 3.4 m to 0.6 m and bentonite seal from 0.6 m to ground surface.
SEW 10+350Rt.	6.1/173.0	Monitoring well with 3.0 m slotted screen installed with filter sand to 2.6 m and bentonite seal from 2.6 m to ground surface.
WN 10+000Rt.	10.7/169.7	Monitoring well with 3.0 m slotted screen installed with filter sand to 6.9 m, bentonite seal from 6.9 m to ground surface.
WN 10+050CL	5.8/175.0	Piezometer with 1.5 m slotted screen installed with filter sand to 3.6 m, bentonite seal from 3.6 m to 3.4 m, silty clay cuttings from 3.4 m to 0.3 m and bentonite seal from 0.3 m to ground surface.
EWN 10+150CL	5.2/173.5	Piezometer with 1.5 m slotted screen installed with filter sand to 3.4 m, bentonite seal from 3.4 m to 2.4 m, silty clay cuttings from 2.4 m to 0.6 m and bentonite seal from 0.6 m to ground surface.
C3	3.0/176.0	Piezometer with 1.5 m slotted screen installed with filter sand to 1.2 m and bentonite seal from 1.2 m to ground surface.
C4	3.0/175.8	Piezometer with 1.5 m slotted screen installed with filter sand to 1.2 m and bentonite seal from 1.2 m to ground surface.
MR 10+075Lt.	13.7/172.5	Piezometer with 1.5 m slotted screen installed with filter sand to 11.9 m, bentonite seal from 11.9 m to 11.0 m, silty clay cuttings from 11.0 m to 0.9 m and bentonite seal from 0.9 m to ground surface.
MR 10+100CL	13.7/171.7	Monitoring well with 1.5 m slotted screen installed with filter sand to 11.6 m and bentonite seal from 11.6 m to ground surface.
MR 10+150Lt.	6.7/173.3	Piezometer with 1.5 m slotted screen installed with filter sand to 4.9 m, bentonite seal from 4.9 m to 4.0 m, silty clay cuttings from 4.0 m to 0.9 m and bentonite seal from 0.9 m to ground surface.



Table 3.2 – Piezometer Installation Details (North West Quadrant)

Piezometer Location	Piezometer Details	
	Tip Depth/ Elevation (m)	Completion Details
NEW 10+350CL	5.2/175.7	Piezometer with 1.5 m slotted screen installed with filter sand to 3.4 m, bentonite seal from 3.4 m to 2.4 m, silty clay cuttings from 2.4 m to 0.9 m and bentonite seal from 0.9 m to ground surface.
NW 10+000Rt.	5.2/175.0	Piezometer with 1.5 m slotted screen installed with filter sand to 3.4 m, bentonite seal from 3.4 m to 2.4 m, silty clay cuttings from 2.4 m to 0.9 m and bentonite seal from 0.9 m to ground surface.
NE 10+450CL	8.7/171.5	Monitoring well with 3.0 m slotted screen installed with filter sand to 5.0 m and bentonite seal from 5.0 m to ground surface.
ES 10+000Rt.	13.0/171.9	Monitoring well with 3.0 m slotted screen installed with filter sand to 9.8 m and bentonite seal from 9.8 m to ground surface.
ES 10+050CL	12.2/173.7	Piezometer with 1.5 m slotted screen installed with filter sand to 10.0 m and bentonite seal from 10.0 m to ground surface.
EWS 10+100Rt.	5.7/175.0	Piezometer with 1.5 m slotted screen installed with filter sand to 3.7 m, bentonite seal from 3.7 m to 3.4 m, silty clay cuttings from 3.4 m to 0.3 m and bentonite seal from 0.3 m to ground surface.
EWS 10+150CL	4.6/176.5	Piezometer with 1.5 m slotted screen installed with filter sand to 2.4 m, bentonite seal from 2.4 m to 2.1 m, silty clay cuttings from 2.1 m to 0.3 m and bentonite seal from 0.3 m to ground surface.
WS 10+025CL	7.6/172.6	Piezometer with 1.5 m slotted screen installed with filter sand to 5.5 m, bentonite seal from 5.5 m to 5.2 m, silty clay cuttings from 5.2 m to 0.3 m and bentonite seal from 0.3 m to ground surface.
MR 9+850Rt.	6.1/173.7	Monitoring well with 1.5 m slotted screen installed with filter sand to 4.3 m, bentonite seal from 4.3 m to 4.0 m, silty clay cuttings from 4.0 m to 0.3 m and bentonite seal from 0.3 m to ground surface.
MR 9+950Rt.	9.1/171.1	Piezometer with 1.5 m slotted screen installed with filter sand to 7.0 m, bentonite seal from 7.0 m to 6.7 m, silty clay cuttings from 6.7 m to 0.6 m, bentonite seal from 0.6 m to 0.3 m and a flush mounted well cap at ground surface.

The drilling, sampling and in-situ testing operations were observed on a full time basis by members of Terraprobe's technical staff. Staff logged the boreholes and processed the recovered soil samples for transport to Terraprobe's Brampton laboratory for further examination and testing.

4 LABORATORY TESTING

The recovered soil samples were subjected to Visual Identification (VI) and natural moisture content determination. Select samples were also subjected to a laboratory testing programme consisting of gradation analysis and Atterberg Limits tests, consolidation tests, unit weight and undrained shear strength testing with a laboratory vane. Unconfined compressive strength tests were also conducted on selected Shelby tube samples. The results of this testing program are shown on the Record of Borehole sheets in Appendix A and the figures in Appendix B.



5 DESCRIPTION OF SUBSURFACE CONDITIONS

Reference is made to the Record of Borehole sheets in Appendix A. Details of the encountered soil and stratigraphy are presented in these appendices and on the “Borehole Locations and Soil Strata” drawings in Appendix D. The previously drilled boreholes for the proposed new Merritt Road bridge are presented in Appendix C.

An overall description of the stratigraphy of the current investigations is provided in the following paragraphs under two sections viz. Merritt Road I/C (South East Quadrant) and Merritt Road I/C (North West Quadrant). However, the factual data presented in the Record of Borehole Sheets governs any interpretation of the site conditions.

In general, the south east quadrant of the site is underlain by topsoil, fill material consisting of compact sand and gravel and firm to stiff silty clay. These soils are further underlain by native deposits of loose to dense silty sand to sandy silt, a major deposit of firm to hard silty clay and a lower deposit of compact silt.

The north west quadrant of the site is underlain by topsoil, a flexible pavement, and fill material consisting of loose to compact silt to sandy silt and firm to hard silty clay. Amorphous peat, organic sandy silt and a layer of silty fine sand were encountered below the stockpile material at Borehole ES 10+000Lt. These soils are further underlain by a major deposit of firm to hard silty clay followed by a compact silt deposit.

5.1 Merritt Road I/C – South East Quadrant

5.1.1 Topsoil

The topsoil encountered in this area ranged in thickness from 50 mm to 205 mm. Topsoil thickness may vary between and beyond the boreholes.

5.1.2 Fill – Sand and Gravel

Some of the boreholes were advanced through the shoulders of Merritt Road where they encountered a layer of sand and gravel fill that extends to depths ranging from 0.4 m (Elev. 180.4 m) to 0.8 m (Elev. 179.7 m) below ground surface.

The grain size distribution plot of a tested sample of this fill is presented in Figure B1-1. These results show a grain size distribution consisting of 36% gravel, 41% sand, 19% silt and 4% clay size particles.

In this fill the SPT ‘N’ values ranged from 11 to 19 blows for 0.3 m penetration indicating a compact relative density. The moisture content of samples of the sand and gravel fill varies from 3% to 4% by weight.



5.1.3 Fill – Silty Clay

Silty clay fill was encountered at this site extending to depths ranging from 0.3 m to 7.0 m below ground surface or to elevations ranging from Elev. 180.1 m to Elev. 177.7 m. The fill generally extends to a maximum depth of 0.7 m across the site but up to 7.0 m deep fill exists in the area of an existing fill stockpile in the vicinity of the west bridge approach. The three boreholes that were drilled through this stockpile are MR10+050CL, MR10+075Lt. and MR10+100CL.

The grain size distribution plots of tested samples of this fill are presented in Figures B1-2. These results show a grain size distribution consisting of 0-24% gravel, 2-16% sand, 30-40% silt and 20-68% clay size particles. Zones of sandy and gravelly fill were also encountered in the fill stockpile.

Samples were also subjected to Atterberg Limits tests and the results are presented in Figures B1-3. The index values from these tests are summarized below:

Liquid Limit:	27-61%
Plastic Limit:	17-28%
Plasticity Index:	10-33%
Natural Moisture Content:	17-23%

These values indicate that the fill material has a low to high plasticity.

Standard Penetration tests in this silty clay fill gave 'N' values that ranged from 6 to 27 blows per 0.3 m penetration. Based on these results the silty clay fill is considered to have a firm to very stiff consistency. The moisture content (by weight) of samples of this fill ranged from 11% to 26%.

5.1.4 Silty Sand to Sandy Silt

Silty sand to sandy silt deposits were encountered in this quadrant extending to depths ranging from 0.7 m to 2.1 m below ground surface or to elevations ranging from 177.9 m to 176.8 m.

The grain size distribution plots of tested samples of these native soils are presented in Figure B1-4. These results show a grain size distribution consisting of 0% gravel, 35-54% sand, 30-47% silt and 8-18% clay size particles.

The blow counts from Standard Penetration tests in this deposit ranged from 4 to 31 blows per 0.3 m penetration. Based on these results these soils are considered to have a loose to dense relative density. The moisture content of samples from these strata ranged from 15% to 27% by weight.

5.1.5 Silty Clay

A major silty clay deposit was encountered in all of the boreholes in this quadrant of the interchange. This silty clay deposit was fully penetrated in Borehole WN10+000Rt. at a depth of 10.5 m (Elev. 169.9 m) below ground surface. In the remaining boreholes the investigations were terminated in this layer.



The grain size distribution plots of tested samples of the silty clay are presented in Figures B1-5 to B1-10. These results show a grain size distribution consisting of 0-2% gravel, 0-5% sand, 30-66% silt and 33-67% clay size particles.

Samples were also subjected to Atterberg Limits tests and the results are plotted on the plasticity charts in Figures B1-11 to B1-16. The index values from these tests are summarized below:

Liquid Limit:	24-54%
Plastic Limit:	16-26%
Plasticity Index:	7-28%
Natural Moisture Content:	18-40%

These values are characteristic of clayey soils of generally low to intermediate plasticity with infrequent zones of high plasticity.

Standard Penetration tests in this deposit yielded 'N' values ranging from 0 to 43 blows for 0.3 m penetration and field vane tests gave in-situ undrained shear strengths ranging from 32 kPa to in excess of 100 kPa. An unconfined compression test gave an undrained shear strength of 30 kPa and laboratory vane tests on Shelby Tube samples gave undrained shear strengths ranging from 47 kPa to 67 kPa. These values indicate that the consistency of the silty clay is generally firm to hard.

The variation of undrained shear strength with depth is depicted in the attached plot of field vane test results versus depth, Figure B1-18. There is a trend in the variation of shear strength with depth. The upper portion of this deposit up to about Elev. 175.5 m has a relatively higher undrained shear strength i.e. in excess of 100 kPa. Below Elev. 175.5 m the undrained shear strength decreases with depth and then begins to increase again below Elev. 172.0 m.

The results of the Atterberg Limits tests are also plotted against elevation (Figure B1-19). Up to about Elev. 176.0 m the natural moisture content is at or close to the plastic limit. Below Elev. 176.0 m the plot depicts a trend of increasing liquidity index with depth.

Four consolidation tests were also performed on relatively undisturbed samples retrieved from Borehole SEW10+300CL, SEW10+350Rt., WN10+000Rt. and WN10+050CL and the results are attached in Figures B1-20 to B1-31. Preconsolidation pressures were estimated from the e-log p curves. Due to the rounded nature of the curves the preconsolidation pressures were also assessed based on the 'Work' – method proposed by Becker et al. (1987).



The details of the test results are summarized below.

Borehole/Sample No.	Sample Depth/Elevation (m)	P _c (kPa)	C _c	C _r	e _o
SEW 10+300CL TW6	4.6/174.3	280 – 400	0.439	0.089	1.09
SEW 10+350Rt. TW6	4.6/174.5	300 – 420	0.177	0.029	0.65
WN 10+000Rt. TW7	6.0/174.4	240 – 330	0.549	0.114	1.14
WN 10+050CL TW6	4.6/176.2	280 – 300	0.211	0.049	0.64

Where: P_c = Preconsolidation pressure
C_c = Compression index
C_r = Recompression index
e_o = Initial void ratio

The field and laboratory data indicate that the silty clay deposit consists of a generally stiff to hard overconsolidated desiccated crust that is estimated to extend to about Elev. 176.0 m. Below Elev. 176.0 m the silty clay deposit is generally firm to very stiff.

5.1.6 Silt

A lower silt deposit was encountered in Borehole WN 10+000Rt. at a depth of 10.5 m (Elev. 169.9 m) and it extends to at least the termination depth of the borehole or deeper.

A sample of this soil was subjected to a grain size distribution test and the results are depicted on the grain size distribution curve in Figure B1-17. These results show a grain size distribution consisting of 0% gravel, 1% sand, 91% silt and 8% clay size particles.

A Standard Penetration test conducted in this deposit gave an 'N' value of 13 blows for 0.3 m penetration indicating a compact relative density. The moisture content (by weight) of a sample of the silt was 29%.

5.2 Merritt Road I/C – North West Quadrant

5.2.1 Topsoil

The topsoil encountered in this quadrant of the interchange ranged in thickness from 25 mm to 230 mm. Topsoil thickness may vary between and beyond the boreholes.

5.2.2 Flexible Pavement

Borehole MR 9+950 was located on the existing Ramp Hwy. 406 N - Merritt Road-W. The borehole data indicates a flexible pavement consisting of 100 mm thick asphalt concrete underlain by a layer of sand and gravel fill that extends to a depth of 0.6 m (Elev. 179.6 m) below ground surface.

The grain size distribution plot of a sample of the sand and gravel fill is presented in Figure B2-1. These results show a grain size distribution consisting of 21% gravel, 50% sand, 24% silt and 5% clay size particles.



A Standard Penetration test conducted in this fill material gave an 'N' value of 16 blows for 0.3 m penetration indicating a compact relative density. The moisture content of the sand and gravel fill was 6% by weight.

5.2.3 Fill – Silt to Silty Sand

Fill material ranging from silt some sand to silty sand were encountered in this quadrant extending to depths ranging from 0.7 m to 5.6 m below ground surface or to elevations ranging from 180.4 m to 179.2 m.

The grain size distribution plots of tested samples of this fill are presented in Figure B2-2. These results show a grain size distribution consisting of 0% gravel, 12-56% sand, 30-72% silt and 13-16% clay size particles.

The blow counts from Standard Penetration tests in this deposit ranged from 6 to 19 blows per 0.3 m penetration. Based on these results the deposit is considered to have a loose to compact relative density. The moisture content of samples from this stratum ranged from 9% to 23% by weight.

5.2.4 Fill – Silty Clay

Silty clay fill was encountered at this site extending to depths ranging from 0.7 m to 7.0 m below ground surface or to elevations ranging from Elev. 181.0 m to Elev. 177.9 m. There is an existing fill stockpile in this quadrant and the fill depth ranges from about 5.6 m to 7.0 m. The boreholes that were drilled through this stockpile are ES10+000Rt, ES10+050CL and MR9+900CL.

The grain size distribution plots of tested samples of this fill are presented in Figure B2-3. These results show a grain size distribution consisting of 0-6% gravel, 3-17% sand, 38-49% silt and 28-59% clay size particles.

A sample of the fill material was also subjected to Atterberg Limits tests and the results are presented in Figure B2-4. The index values from these tests are summarized below:

Liquid Limit:	27-43%
Plastic Limit:	16-24%
Plasticity Index:	11-19%
Natural Moisture Content:	13-20%

These values are characteristic of clayey soils of low to intermediate plasticity.

Standard Penetration tests in this silty clay fill gave 'N' values that ranged from 4 to 34 blows per 0.3 m penetration. Based on these results the silty clay fill is considered to have a firm to hard consistency. The moisture content (by weight) of samples of this fill generally ranged from 13% to 38% and a value of 45% was obtained where the sampled material contained organics.



5.2.5 Peat, Organic Sandy Silt and Silty Fine Sand

A 0.8 m thick layer of amorphous peat was encountered below the stockpile material in Borehole ES10+000Lt. The peat extends to a depth of 6.4 (Elev. 178.6 m) and is further underlain by a 300 mm thick layer of organic sandy silt that extends to a depth of 6.7 m (Elev. 178.3 m).

The peat and organic silt in Borehole ES10+000Lt. are underlain by a 300 mm thick layer of wet silty fine sand that extends to a depth of 7.0m (Elev. 178.0 m).

A Standard Penetration test in these strata gave an 'N' value of 20 blows per 0.3 m penetration. Based on these results the peat is considered to have a very stiff consistency. The moisture content (by weight) of samples of these soils ranged from 20% to 66%.

5.2.6 Silty Clay

A major silty clay deposit was encountered in all of the boreholes in this quadrant of the interchange. This silty clay deposit was fully penetrated in Boreholes NE10+450CL and MR9+950Rt. at depths of 8.9 m (Elev. 171.3 m) and 8.7 m (Elev. 171.5 m) respectively. In the remaining boreholes the investigations were terminated in this layer.

The grain size distribution plots of tested samples of the silty clay are presented in Figures B2-5 to B2-9. These results show a grain size distribution consisting of 0% gravel, 0-14% sand, 31-69% silt and 31-69% clay size particles.

Samples were also subjected to Atterberg Limits tests and the results are plotted on the plasticity charts in Figures B2-10 to B2-14. The index values from these tests are summarized below:

Liquid Limit:	26-47%
Plastic Limit:	16-24%
Plasticity Index:	10-27%
Natural Moisture Content:	19-35%

These values are characteristic of clayey soils of generally low to intermediate plasticity.

Standard Penetration tests in this deposit yielded 'N' values ranging from 1 to 55 blows for 0.3 m penetration and field vane tests gave in-situ undrained shear strengths ranging from 32 kPa to in excess of 100 kPa. An unconfined compression test gave an undrained shear strength of 33 kPa and laboratory vane tests on Shelby Tube samples gave undrained shear strengths ranging from 30 kPa to 56 kPa. These values indicate that the consistency of the silty clay is generally firm to hard.

The variation of undrained shear strength with depth is depicted in the attached plot of field vane test results versus depth, Figure B2-16. There is a trend in the variation of shear strength with depth. The upper portion of this deposit up to about Elev. 175.5 m has a relatively higher undrained shear strength i.e. in excess of 100 kPa. Below Elev. 175.5 m the undrained shear strength decreases then increases again below Elev. 172.0 m.



The results of the Atterberg Limits tests are also plotted against elevation (Figure B2-17). Up to about Elev. 177.0 m the natural moisture content is at or close to the plastic limit. Below Elev. 177.0 m the plot indicates a trend of increasing liquidity index.

Three consolidation tests were also performed on relatively undisturbed samples retrieved from Borehole MR9+850Rt., NE10+450CL and EWS10+100Rt. and the results are attached in Figures B2-18 to B2-26. Preconsolidation pressures were estimated from the e-log p curves. Due to the rounded nature of the curves the preconsolidation pressures were also assessed based on the 'Work' – method proposed by Becker et al. (1987). The details of the test results are summarized below.

Borehole/Sample No.	Sample Depth/Elevation (m)	P _c (kPa)	C _c	C _r	e _o
MR 9+850Rt. TW7	6.0/173.8	280	0.478	0.091	1.06
NE 10+450 CL TW8	7.6/172.6	190 – 220	0.254	0.045	0.68
EWS 10+100Rt. TW7	6.0/174.7	290 – 400	0.433	0.073	0.99

Where: P_c = Preconsolidation pressure
C_c = Compression index
C_r = Recompression index
e_o = Initial void ratio

The field and laboratory data indicate that the silty clay deposit consists of a generally stiff to hard overconsolidated desiccated crust that is estimated to extend to about Elev. 176.5 m. Below Elev. 176.5 m the silty clay deposit is generally firm to very stiff.

5.2.7 Silt

A lower silt deposit was encountered in Boreholes NE 10+450CL and MR 9+950Rt at depths of 8.9 m (Elev. 171.3 m) and 8.7 m (Elev. 171.5 m) respectively. The silt deposit extends to at least the termination depths of the boreholes or deeper.

A sample of this soil was subjected to a grain size distribution test and the results are depicted on the grain size distribution curve in Figure B2-15. These results show a grain size distribution consisting of 1% gravel, 1% sand, 91% silt and 7% clay size particles.

Standard Penetration tests conducted in this deposit gave 'N' values that ranged from 7 to 32 blows for 0.3 m penetration indicating a compact relative density. The moisture content (by weight) of a sample of the silt was 23%.



5.3 Water Levels

A standpipe piezometer was installed in selected boreholes. The water level readings measured on separate visits made after the completion of drilling are presented in Table 5.2.

Table 5.2 – Water Level Measurements (South East Quadrant)

Borehole	Date	Water Levels	
		Depth (m)	Elevation (m)
SEW 10+200CL	September 09, 2009	3.7	175.0
	September 10, 2009	3.0	175.7
C1	September 09, 2009	Dry	-
	September 10, 2009	Dry	-
	September 11, 2009	Dry	-
	September 15, 2009	2.4	176.1
C2	September 09, 2009	1.2	177.2
	September 10, 2009	1.3	177.1
	September 11, 2009	1.3	177.1
	September 15, 2009	1.4	177.0
SEW 10+300CL	September 09, 2009	1.4	177.5
	September 10, 2009	1.3	177.6
	September 15, 2009	1.0	177.9
SEW 10+350Rt.	September 09, 2009	5.5	173.6
	September 11, 2009	5.4	173.7
	September 15, 2009	5.0	174.1
WN 10+000Rt.	September 09, 2009	2.4	178.0
	September 10, 2009	2.5	177.9
	September 11, 2009	2.5	177.9
	September 15, 2009	2.6	177.8
WN 10+050CL	September 09, 2009	4.6	176.2
	September 11, 2009	3.9	176.9
	September 15, 2009	3.9	176.9
EWN 10+150CL	September 09, 2009	4.8	173.9
	September 10, 2009	4.7	174.0
	September 15, 2009	4.6	174.1
C3	September 09, 2009	2.8	176.2
	September 10, 2009	2.7	176.3
	September 11, 2009	2.2	176.8
	September 15, 2009	2.1	176.9
C4	September 09, 2009	Dry	-
	September 10, 2009	Dry	-
	September 11, 2009	Dry	-
	September 15, 2009	Dry	-
MR 10+075Lt.	September 09, 2009	7.2	179.0
	September 10, 2009	7.0	179.2
	September 11, 2009	6.9	179.3
	September 15, 2009	6.8	179.4
MR 10+100CL	September 09, 2009	12.3	173.1
	September 11, 2009	12.3	173.1
	September 15, 2009	10.3	175.1
MR 10+150Lt.	Destroyed by Construction Activity	-	-



Table 5.2 – Water Level Measurements (North West Quadrant)

Borehole	Date	Water Levels	
		Depth (m)	Elevation (m)
NEW 10+350CL	September 10, 2009	4.9	176.0
	September 11, 2009	4.3	176.6
	September 15, 2009	4.2	176.7
NW 10+000Rt.	September 10, 2009	Dry	-
	September 11, 2009	Dry	-
	September 15, 2009	4.4	175.8
NE 10+450CL	September 10, 2009	1.9	178.3
	September 11, 2009	1.8	178.4
	September 15, 2009	1.5	178.7
ES 10+000Rt.	September 10, 2009	12.6	172.3
	September 11, 2009	12.0	172.9
	September 15, 2009	11.2	173.7
ES 10+050CL	September 10, 2009	12.3	173.6
	September 11, 2009	12.3	173.6
	September 15, 2009	12.2	173.7
EWS 10+100Rt.	September 10, 2009	Dry	-
	September 11, 2009	Dry	-
	September 15, 2009	Dry	-
EWS 10+150CL	September 10, 2009	Dry	-
	September 11, 2009	Dry	-
	September 15, 2009	Dry	-
WS 10+025CL	September 10, 2009	7.9	172.3
	September 11, 2009	7.3	172.9
	September 15, 2009	6.6	173.6
MR 9+850Rt.	September 10, 2009	6.0	173.8
	September 11, 2009	4.6	175.2
	September 15, 2009	3.9	175.9
MR 9+950Rt.	Destroyed by Construction Activity	-	-

The groundwater table was estimated based on the recorded water levels in standpipe piezometers, our review of moisture contents of the retrieved samples and the change in colour of the soil matrix from brown to grey.

This interpretation indicates a groundwater table that is estimated to range between Elev. ± 176.0 m and Elev. ± 177.0 m. Perched water can also be expected to occur where permeable layers of sands and silts and sand and gravel are underlain by relatively impermeable silty clay layers.

All ground water observations at this site are short term and the levels are expected to fluctuate seasonally and after severe weather events.



5.4 Miscellaneous

The drilling, sampling and in-situ testing operations were conducted with track and truck mounted drill rigs owned and operated by Groundworks Drilling Limited of Toronto, Ontario, DBW Drilling Limited of Ajax, Ontario and Determination Drilling & Soil Investigations of Hamilton, Ontario. The boreholes were advanced using both solid stem and hollow-stem auger drilling techniques.

Messrs. Sajjad Shah, E.I.T, Marc Paoliello, E.I.T, and Bob Racher, C.E.T., carried out the field supervision. The laboratory testing was performed at Terraprobe's Brampton laboratory and the Mississauga laboratory of Golder Associates. The report was written by Rehman Abdul, P.Eng. and reviewed by Michael Tanos, P.Eng.



Prepared by:
R. Abdul, P.Eng.,
Senior Geotechnical Engineer

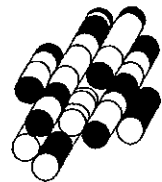


Report Reviewed by:
Michael Tanos, P.Eng.,
Review Principal



APPENDICES

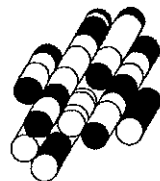
Terraprobe Inc.



APPENDIX A

Log of Borehole Sheets (South East Quadrant)

Terraprobe Inc.



EXPLANATION OF TERMS USED IN REPORT

N VALUE: THE STANDARD PENETRATION TEST (SPT) N VALUE IS THE NUMBER OF BLOWS REQUIRED TO CAUSE A STANDARD 51mm O.D. SPLIT BARREL SAMPLER TO PENETRATE 0.3m INTO UNDISTURBED GROUND IN A BOREHOLE WHEN DRIVEN BY A HAMMER WITH A MASS OF 63.5kg, FALLING FREELY A DISTANCE OF 0.76m. FOR PENETRATIONS OF LESS THAN 0.3m N VALUES ARE INDICATED AS THE NUMBER OF BLOWS FOR THE PENETRATION ACHIEVED. AVERAGE N VALUE IS DENOTED THUS \bar{N} .

DYNAMIC CONE PENETRATION TEST: CONTINUOUS PENETRATION OF A CONICAL STEEL POINT (51mm O.D. 60° CONE ANGLE) DRIVEN BY 475J IMPACT ENERGY ON 'A' SIZE DRILL RODS. THE RESISTANCE TO CONE PENETRATION IS MEASURED AS THE NUMBER OF BLOWS FOR EACH 0.3m ADVANCE OF THE CONICAL POINT INTO THE UNDISTURBED GROUND.

SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSENESS.

CONSISTENCY: COHESIVE SOILS ARE DESCRIBED ON THE BASIS OF THEIR UNDRAINED SHEAR STRENGTH (c_u) AS FOLLOWS:

c_u (kPa)	0-12	12-25	25-50	50-100	100-200	>200
	VERY SOFT	SOFT	FIRM	STIFF	VERY STIFF	HARD

DENSENESS: COHESIONLESS SOILS ARE DESCRIBED ON THE BASIS OF DENSENESS AS INDICATED BY SPT N VALUES AS FOLLOWS:

N (BLOWS/0.3m)	0-5	5-10	10-30	30-50	>50
	VERY LOOSE	LOOSE	COMPACT	DENSE	VERY DENSE

ROCKS ARE DESCRIBED BY THEIR COMPOSITION AND STRUCTURAL FEATURES AND/OR STRENGTH.

RECOVERY: SUM OF ALL RECOVERED ROCK CORE PIECES FROM A CORING RUN EXPRESSED AS A PERCENT OF THE TOTAL LENGTH OF THE CORING RUN.

MODIFIED RECOVERY: SUM OF THOSE INTACT CORE PIECES, 100mm+ IN LENGTH EXPRESSED AS A PERCENT OF THE LENGTH OF THE CORING RUN. THE ROCK QUALITY DESIGNATION (RQD), FOR MODIFIED RECOVERY IS:

RQD (%)	0-25	25-50	50-75	75-90	90-100
	VERY POOR	POOR	FAIR	GOOD	EXCELLENT

JOINTING AND BEDDING:

SPACING	50mm	50-300mm	0.3m-1m	1m-3m	>3m
JOINTING	VERY CLOSE	CLOSE	MOD. CLOSE	WIDE	VERY WIDE
BEDDING	VERY THIN	THIN	MEDIUM	THICK	VERY THICK

ABBREVIATIONS AND SYMBOLS

FIELD SAMPLING

SS	SPLIT SPOON	TP	THINWALL PISTON
WS	WASH SAMPLE	OS	OSTERBERG SAMPLE
ST	SLOTTED TUBE SAMPLE	RC	ROCK CORE
BS	BLOCK SAMPLE	PH	TW ADVANCED HYDRAULICALLY
CS	CHUNK SAMPLE	PM	TW ADVANCED MANUALLY
TW	THINWALL OPEN	FS	FOIL SAMPLE

STRESS AND STRAIN

u_p	kPa	PORE WATER PRESSURE
r_u	1	PORE PRESSURE RATIO
σ	kPa	TOTAL NORMAL STRESS
σ'	kPa	EFFECTIVE NORMAL STRESS
τ	kPa	SHEAR STRESS
$\sigma_1, \sigma_2, \sigma_3$	kPa	PRINCIPAL STRESSES
ϵ	%	LINEAR STRAIN
$\epsilon_1, \epsilon_2, \epsilon_3$	%	PRINCIPAL STRAINS
E	kPa	MODULUS OF LINEAR DEFORMATION
G	kPa	MODULUS OF SHEAR DEFORMATION
μ	1	COEFFICIENT OF FRICTION

MECHANICAL PROPERTIES OF SOIL

m_v	kPa ⁻¹	COEFFICIENT OF VOLUME CHANGE
C_c	1	COMPRESSION INDEX
C_s	1	SWELLING INDEX
C_α	1	RATE OF SECONDARY CONSOLIDATION
C_v	m ² /s	COEFFICIENT OF CONSOLIDATION
H	m	DRAINAGE PATH
T_v	1	TIME FACTOR
U	%	DEGREE OF CONSOLIDATION
σ'_{vo}	kPa	EFFECTIVE OVERBURDEN PRESSURE
σ'_p	kPa	PRECONSOLIDATION PRESSURE
τ_f	kPa	SHEAR STRENGTH
c'	kPa	EFFECTIVE COHESION INTERCEPT
ϕ'	-°	EFFECTIVE ANGLE OF INTERNAL FRICTION
c_u	kPa	APPARENT COHESION INTERCEPT
ϕ_u	-°	APPARENT ANGLE OF INTERNAL FRICTION
τ_R	kPa	RESIDUAL SHEAR STRENGTH
τ_r	kPa	REMOULDED SHEAR STRENGTH
S_r	1	SENSITIVITY = c_u / τ_r

PHYSICAL PROPERTIES OF SOIL

ρ_s	kg/m ³	DENSITY OF SOLID PARTICLES	e	1%	VOID RATIO	e_{min}	1%	VOID RATIO IN DENSEST STATE
γ_s	kN/m ³	UNIT WEIGHT OF SOLID PARTICLES	n	1%	POROSITY	I_D	1	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
ρ_w	kg/m ³	DENSITY OF WATER				D	mm	GRAIN DIAMETER
γ_w	kN/m ³	UNIT WEIGHT OF WATER	w	1%	WATER CONTENT	D_n	mm	n PERCENT - DIAMETER
ρ	kg/m ³	DENSITY OF SOIL	w_L	%	LIQUID LIMIT	C_u	1	UNIFORMITY COEFFICIENT
γ	kN/m ³	UNIT WEIGHT OF SOIL	w_p	%	PLASTIC LIMIT	h	m	HYDRAULIC HEAD OR POTENTIAL
ρ_d	kg/m ³	DENSITY OF DRY SOIL	w_s	%	SHRINKAGE LIMIT	q	m ² /s	RATE OF DISCHARGE
γ_d	kN/m ³	UNIT WEIGHT OF DRY SOIL	I_p	%	PLASTICITY INDEX = $(w_L - w_p)$	v	m/s	DISCHARGE VELOCITY
ρ_{sat}	kg/m ³	DENSITY OF SATURATED SOIL	I_L	1	LIQUIDITY INDEX = $(w - w_p)/I_p$	i	1	HYDRAULIC GRADIENT
γ_{sat}	kN/m ³	UNIT WEIGHT OF SATURATED SOIL	I_c	1	CONSISTENCY INDEX = $(w_L - w)/I_p$	k	m/s	HYDRAULIC CONDUCTIVITY
ρ'	kg/m ³	DENSITY OF SUBMERGED SOIL	e_{max}	1%	VOID RATIO IN LOOSEST STATE	j	kN/m ³	SEEPAGE FORCE
γ'	kN/m ³	UNIT WEIGHT OF SUBMERGED SOIL						

LIMITATIONS AND RISK

Procedures

The soil conditions were confirmed at the borehole and test pit locations only and conditions may vary between and beyond the boreholes. The boundaries between the various strata as shown on the logs are based on non-continuous sampling. These boundaries represent an inferred transition between the various strata, rather than a precise plane of stratigraphic change.

This investigation has been carried out using investigation techniques and engineering analysis methods consistent with those ordinarily exercised by Terraprobe and other engineering practitioners, working under similar conditions and subject to the time, financial and physical constraints applicable to this project. The discussions and recommendations that have been presented are based on the factual data obtained.

It must be recognized that there are special risks whenever engineering or related disciplines are applied to identify subsurface conditions. Even a comprehensive sampling and testing programme implemented in accordance with the most stringent level of care may fail to detect certain conditions. Terraprobe has assumed for the purposes of providing design parameters and advice, that the conditions that exist between sampling points are similar to those found at the sample locations. The conditions that Terraprobe has interpreted to exist between sampling points can differ from those that actually exist.

It may not be possible to drill a sufficient number of boreholes or sample and report them in a way that would provide all the subsurface information that could affect construction costs, techniques, equipment and scheduling. Contractors bidding on or undertaking work on the project should be directed to draw their own conclusions as to how the subsurface conditions may affect them, based on their own investigations and their own interpretations of the factual investigation results, cognizant of the risks implicit in the subsurface investigation activities.

Changes In Site And Scope

It must be recognized that the passage of time, natural occurrences, and direct or indirect human intervention at or near the site have the potential to alter subsurface conditions. Groundwater levels are particularly susceptible to seasonal fluctuations.

The design advice is based on the factual data obtained from this investigation made at the site by Terraprobe and are intended for use by the owner and its retained designers in the design phase of the project. If there are changes to the project scope and development features, or there is any additional information relevant to the interpretations made of the subsurface information, the geotechnical design parameters and comments relating to constructibility issues and quality control may not be relevant or complete for the revised project. Terraprobe should be retained to review the implications of such changes with respect to the contents of this report

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RECORD OF BOREHOLE No SEW 10+200 CL

1 OF 1

METRIC

W.P. 280-99-00 LOCATION Coords: N:4765982.3 E:326771.7 ORIGINATED BY SS
 DIST HWY 406 BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
 DATUM Geodetic DATE 09.02.09 CHECKED BY RA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)																	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60						80	100	20	40	60	80	100	10	20	30	GR	SA	SI	CL			
178.7	Ground Surface																															
178.6	100mm TOPSOIL																															
0.1	FILL - Silty Clay, trace sand, trace rootlets, stiff, brown, damp		1	SS	10																											
178.0			2	SS	20																											
0.7	SILTY CLAY trace sand, stiff to very stiff, brown to 4.0m, grey below, damp to moist		3	SS	14																											
			4	SS	23																											
			5	SS	20*																											
	firm to stiff		6	SS	4																											
172.9	End of Borehole																															
5.8	<p>Borehole was dry (not stabilized) and hole open to full depth on completion.</p> <p>* Moved 1m away from original location and drilled to 3.0m to obtain TVW sample at 3.0m.</p> <p>Piezometer installation consists of a 19mm diameter, Schedule 40 PVC pipe with a 1.52m slotted screen.</p> <p>Water Level Readings:</p> <table><thead><tr><th>Date</th><th>Depth(m)</th><th>Elevation(m)</th></tr></thead><tbody><tr><td>Sep.09.09</td><td>3.7</td><td>175.0</td></tr><tr><td>Sep.10.09</td><td>3.0</td><td>175.7</td></tr></tbody></table>																							Date	Depth(m)	Elevation(m)	Sep.09.09	3.7	175.0	Sep.10.09	3.0	175.7
Date	Depth(m)	Elevation(m)																														
Sep.09.09	3.7	175.0																														
Sep.10.09	3.0	175.7																														

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RECORD OF BOREHOLE No C1

1 OF 1

METRIC

W.P. 280-99-00 LOCATION Coords: N:4765568.0 E:327000.6 ORIGINATED BY SS
DIST HWY 406 BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
DATUM Geodetic DATE 09.02.09 CHECKED BY RA

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES		20	40	60	80	100					
178.5	Ground Surface															
178.4	130mm TOPSOIL															
0.1	occasional sand pockets, trace rootlets		1	SS	7											
	SILTY CLAY firm to very stiff, brown, damp to moist		2	SS	18											
			3	SS	28											
	grey / brown		4	SS	19											
			5	SS	12											
174.2	End of Borehole															
4.3	Borehole was dry (not stabilized) and hole open to full depth on completion. Piezometer installation consists of a 19mm diameter, Schedule 40 PVC pipe with a 1.52m slotted screen. Water Level Readings: Date Depth(m) Elevation(m) Sep.09.09 Dry - Sep.10.09 Dry - Sep.11.09 Dry - Sep.15.09 2.4 176.1															

RECORD OF BOREHOLE No C2

1 OF 1

METRIC

W.P. 280-99-00 LOCATION Coords: N:4766023.8 E:326775.9 ORIGINATED BY SS
DIST HWY 406 BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
DATUM Geodetic DATE 09.02.09 CHECKED BY RA

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES		20	40	60	80	100					
178.4	Ground Surface															
178.2	205mm TOPSOIL															
0.2	FILL - Silty Clay, trace sand, stiff, grey, damp		1	SS	8											
177.7																
0.7	frequent silty fine sand seams and partings		2	SS	16											
	SILTY CLAY very stiff, brown, damp to moist		3	SS	18											
	grey		4	SS	23											
			5	SS	20											
174.9	End of Borehole															
3.5	Borehole was dry (not stabilized) and hole open to full depth on completion. Piezometer installation consists of a 19mm diameter, Schedule 40 PVC pipe with a 1.52m slotted screen. Water Level Readings: Date Depth(m) Elevation(m) Sep.09.09 1.2 177.2 Sep.10.09 1.3 177.1 Sep.11.09 1.3 177.1 Sep.15.09 1.4 177.0															

RECORD OF BOREHOLE No SEW 10+250 Lt

1 OF 1

METRIC

W.P. 280-99-00 LOCATION Coords: N:4765032.0 E:326766.9 ORIGINATED BY SS
 DIST HWY 406 BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
 DATUM Geodetic DATE 09.03.09 CHECKED BY RA

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		
178.6	Ground Surface													
178.6 0.1	90mm TOPSOIL		1	SS	7		178							0 35 47 18
177.9 0.7	SANDY SILT - trace to some clay, trace gravel, loose, brown, wet		2	SS	33		177							
			3	SS	32		176							
			4	SS	35		175							
			5	SS	22		174							0 2 52 46
			6	SS	12		173							
172.7 5.9	End of Borehole													
	Borehole was dry (not stabilized) and hole open to full depth on completion.													

RECORD OF BOREHOLE No SEW 10+250 Rt

1 OF 1

METRIC

W.P. 280-99-00 LOCATION Coords: N:4766032.5 E:326766.6 ORIGINATED BY SS
 DIST HWY 406 BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
 DATUM Geodetic DATE 09.02.09 CHECKED BY RA

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES		20	40	60	80	100					
178.6	Ground Surface															
178.4	205mm TOPSOIL															
0.2	SILTY SAND - gravelly, trace clay, trace organics, loose, brown, moist to wet		1	SS	4											
177.9																
0.7	SILTY CLAY very stiff, brown to 2.1m, grey below, damp to moist		2	SS	17											
			3	SS	16											
			4	SS	24											
			5	SS	20											
			6	SS	7											
172.8	End of Borehole															
5.8	Water level at 4.4m (not stabilized) and hole open to full depth on completion.															

RECORD OF BOREHOLE No SEW 10+300 CL 1 OF 1 METRIC

W.P. 280-99-00 LOCATION Coords: N:4765080.2 E:326759.9 ORIGINATED BY BR
DIST HWY 406 BOREHOLE TYPE Hollow Stem Augers COMPILED BY DB
DATUM Geodetic DATE 09.02.09 CHECKED BY RA

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		W _p W W _L				
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE × LAB VANE	WATER CONTENT (%)				
178.9 0.0	Ground Surface						20 40 60 80 100							GR SA SI CL
	trace rootlets, firm		1	SS	7									
	----		2	SS	16									
	very stiff		3	SS	19									0 1 66 33
	firm to stiff		4	SS	9									
	SILTY CLAY - trace sand, weathered to 1.4m, brown to 2.9m, grey below, damp to moist		5	SS	5									
			6	TW	PH									
			7	SS	2									
171.6 7.3	End of Borehole													
	Water level at 5.9m (not stabilized) and hole open to full depth on completion.													
	Piezometer installation consists of a 19mm diameter, Schedule 40 PVC pipe with a 1.52m slotted screen.													
	Water Level Readings:													
	Date Depth(m) Elevation(m)													
	Sep.09.09 1.4 177.5													
	Sep.10.09 1.3 177.6													
	Sep.15.09 1.0 177.9													
	Consolidation test performed on TW 6.													

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RECORD OF BOREHOLE No SEW 10+350 Lt

1 OF 1

METRIC

W.P. 280-99-00 LOCATION Coords: N:4766119.2 E:326728.7 ORIGINATED BY BR
DIST HWY 406 BOREHOLE TYPE Hollow Stem Augers COMPILED BY DB
DATUM Geodetic DATE 09.02.09 CHECKED BY RA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)						
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)					
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE							W _p	W	W _L			
							20	40	60	80	100	10	20	30	GR	SA	SI	CL		
179.5	Ground Surface																			
179.3	180mm TOPSOIL																			
0.2	SILTY SAND trace to some clay, loose, brown, moist to wet		1	SS	9															
			2	SS	7															0 54 30 16
177.8	SILTY CLAY very stiff, brown, damp to moist firm to very stiff		3	SS	22															
1.7																			0 1 51 48	
			4	SS	23															
			5	SS	22															
			6	SS	10															0 0 60 40
			7	SS	6															
172.2	End of Borehole																			
7.3	Borehole was dry (not stabilized) and hole open to full depth on completion.																			

ONTARIO MOT 1-09-4135 MERRITT RD 2.GPJ ONTARIO MOT.GDT 05/10/10

RECORD OF BOREHOLE No SEW 10+350 Rt

1 OF 1

METRIC

W.P. 280-99-00 LOCATION Coords: N:4766123.7 E:326734.7 ORIGINATED BY BR
DIST HWY 406 BOREHOLE TYPE Hollow Stem Augers COMPILED BY DB
DATUM Geodetic DATE 09.02.09 CHECKED BY RA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100					
179.1 0.0	Ground Surface						179										
	SILTY CLAY trace sand to 0.7m depth, firm to stiff, brown, damp to moist		1	SS	7		179										
			2	SS	11		178										
177.7 1.4	SILTY SAND trace organics, compact, brown / dark brown, wet		3	SS	11		177										
177.0 2.1	SILTY CLAY very stiff, brown to 5.6m, grey below, damp to moist		4	SS	16		177										
			5	SS	16		176										
							175										
	firm to stiff		6	TW	PH		174									20.2	0 1 63 36
							173										
			7	SS	7		173										
							172										
171.8 7.3	End of Borehole						172										
	Borehole was dry (not stabilized) and hole open to full depth on completion. Monitoring well installation consists of a 50mm diameter, Schedule 40 PVC pipe with a 3.0m slotted screen. Water Level Readings: Date Depth(m) Elevation(m) Sep.09.09 5.5 173.6 Sep.11.09 5.4 173.7 Sep.15.09 5.0 174.1 Consolidation test performed on TW 6.																

ONTARIO MOT 1-09-4135 MERRITT RD 2.GPJ ONTARIO MOT.GDT 05/10/10

RECORD OF BOREHOLE No WN 10+000 Rt

1 OF 1

METRIC

W.P. 280-99-00 LOCATION Coords: N:4766077.8 E:326640.4 ORIGINATED BY BR
DIST HWY 406 BOREHOLE TYPE Hollow Stem Augers COMPILED BY DB
DATUM Geodetic DATE 09.01.09 CHECKED BY RA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100					
180.4	Ground Surface													
0.0														
179.7	FILL - Silty Clay, trace rootlets, stiff, brown, damp		1	SS	9		180							
0.7														
	SILTY CLAY trace sand, very stiff to hard, brown, damp to moist		2	SS	25		179							
			3	SS	28		178							
			4	SS	43		177							
			5	SS	16		176							
			6	SS	6		175							
			7	TW	PH		174							
			8	SS	4		173							
			9	SS	4		172							
			10	SS	13		171							
169.9	SILT trace clay, trace sand, compact, grey, wet						170							
10.5														
169.2	End of Borehole													
11.2														
	Wet cave at 10.2m upon completion. Monitoring well installation consists of a 50mm diameter, Schedule 40 PVC pipe with a 3.0m slotted screen. Water Level Readings: Date Depth(m) Elevation(m) Sep.09.09 2.4 178.0 Sep.10.09 2.5 177.9 Sep.11.09 2.5 177.9 Sep.15.09 2.6 177.8 Consolidation test performed on TW 7.													

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

ONTARIO MOT 1-09-4135 MERRITT RD 2.GPJ ONTARIO MOT.GDT 05/10/10

RECORD OF BOREHOLE No WN 10+050 CL

1 OF 1

METRIC

W.P. 280-99-00 LOCATION Coords: N:4766096.3 E:326684.8 ORIGINATED BY MP
 DIST HWY 406 BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
 DATUM Geodetic DATE 09.01.09 CHECKED BY RA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED	+ FIELD VANE						
180.8	Ground Surface						20 40 60 80 100								
0.0	FILL - Sand and Gravel, trace to some silt, compact, brown, dry to damp		1	SS	19										
180.4															
0.4	FILL - Silty Clay, trace sand, inferred stiff, brown, dry to damp														
180.1															
0.7															
	Weathered		2	SS	11										

	SILTY CLAY trace sand, firm to stiff, brown, damp to moist		3	SS	11										
			4	SS	6										
			5	SS	10										

	trace gravel		6	TW	PH										

			7	SS	0*										
173.5															
7.3	End of Borehole														
	Borehole was dry (not stabilized) and hole open to full depth on completion.														
	* Sample sinking under weight of hammer and / or rods.														
	Piezometer installation consists of a 19mm diameter, Schedule 40 PVC pipe with a 1.52m slotted screen.														
	Water Level Readings:														
	Date Depth(m) Elevation(m)														
	Sep.09.09 4.6 176.2														
	Sep.11.09 3.9 176.9														
	Sep.15.09 3.9 176.9														
	Consolidation test performed on TW 6.														

+ 3 x 3

Numbers refer to
Sensitivity

○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No EN 10+025 CL

1 OF 1

METRIC

W.P. 260-99-00 LOCATION Coords: N:4766125.3 E:326710.0 ORIGINATED BY MP
 DIST HWY 406 BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
 DATUM Geodetic DATE 09.01.09 CHECKED BY RA

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			20	40	60	80	100					
180.5 0.0	Ground Surface															
179.8 0.7	660mm FILL - Sand and Gravel, some silt, trace clay, compact, brown, dry to damp		1	SS	18	180										36 41 19 4
	SILTY CLAY - trace sand, weathered to 2.9m, stiff to very stiff, brown, damp to moist		2	SS	11	179										
			3	SS	21	178									46	0 1 47 52
			4	SS	16	177										
	stiff, grey / brown		5	SS	0*	176										
			6	SS	0*	175										
						174										0 0 66 34
173.2 7.3	End of Borehole															
	Borehole was dry (not stabilized) and hole open to full depth on completion. * Sampler sinking under weight of hammer and / or rods.															

ONTARIO MOT 1-09-4135 MERRITT RD 2.GPJ ONTARIO MOT.GDT 05/10/10

METRIC

W.P.	280-99-00	LOCATION	Coords: N:4766088.4 E:326736.2	ORIGINATED BY	SS
DIST	HWY 406	BOREHOLE TYPE	Solid Stem Augers	COMPILED BY	DB
DATUM	Geodetic	DATE	09.02.09	CHECKED BY	RA

[illegible]

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

RECORD OF BOREHOLE No EWN 10+100 Rt

1 OF 1

METRIC

W.P. 280-99-00 LOCATION Coords. N:4766081.3 E:326729.7 ORIGINATED BY SS
 DIST HWY 406 BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
 DATUM Geodetic DATE 09.02.09 CHECKED BY RA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100					
179.1	Ground Surface																
178.0	100mm TOPSOIL																
0.1	FILL - Silty Clay, trace rootlets, stiff, brown, damp		1	SS	11		179										
178.4			2	SS	21		178										
0.7	occasional silt inclusions		3	SS	24		177										
	SILTY CLAY stiff to very stiff, brown to 4.4m, grey below, damp to moist		4	SS	24		176										
			5	SS	12		175										
	firm to stiff		6	SS	5		174										
			7	SS	2		173										
171.8	End of Borehole						172										
7.3	Borehole was dry (not stabilized) and hole open to full depth on completion.																

+ 3, x 3. Numbers refer to
Sensitivity

○ 3% STRAIN AT FAILURE

ONTARIO MOT. 1-09-4135 MERRITT RD 2.GPJ ONTARIO MOT. GOT. 05/10/10

RECORD OF BOREHOLE No EWN 10+150 CL

1 OF 1

METRIC

W.P. 280-99-00 LOCATION Coords: N:4766038.4 E:326749.7 ORIGINATED BY SS
DIST HWY 406 BOREHOLE TYPE Hollow Stem Augers COMPILED BY DB
DATUM Geodetic DATE 09.03.09 CHECKED BY RA

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	20 40 60 80 100					
178.7	Ground Surface													
178.6 0.1	80mm TOPSOIL		1	SS	13									
178.0	FILL - Silty Clay, with sand, trace gravel, stiff, brown, damp to moist													
0.7														
176.8	SAND AND SILT trace clay, dense, brown, wet		2	SS	31									0 52 40 8
1.9														
			3	SS	26									
	SILTY CLAY trace sand, very stiff to hard, brown to 2.1m, grey below, damp to moist													
			4	SS	38									0 1 51 48
			5	SS	22									
			6	TW	PH									0 0 44 56
172.6 6.1	End of Borehole													
	Borehole was dry (not stabilized) and hole open to full depth on completion. Piezometer installation consists of a 19mm diameter, Schedule 40 PVC pipe with a 1.52m slotted screen. Water Level Readings: Date Depth(m) Elevation(m) Sep.09.09 4.8 173.9 Sep.10.09 4.7 174.0 Sep.15.09 4.6 174.1													

RECORD OF BOREHOLE No C3

1 OF 1

METRIC

W.P. 280-99-00 LOCATION Coords: N:4765991.3 E:326660.7 ORIGINATED BY SS
 DIST HWY 406 BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
 DATUM Geodetic DATE 09.09.09 CHECKED BY RA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m³	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								
						○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE											
179.0	Ground Surface							20	40	60	80	100	10	20	30		
178.9	150mm TOPSOIL																
0.2	trace sand, trace rootlets		1	SS	9												
	SILTY CLAY stiff to hard, brown, damp to moist		2	SS	19		178										
			3	SS	35		177										
			4	SS	29												
	grey / brown		5	SS	24		176										
175.5	End of Borehole																
3.5	Borehole was dry (not stabilized) and hole open to full depth on completion. Piezometer installation consists of a 19mm diameter, Schedule 40 PVC pipe with a 1.52m slotted screen. Water Level Readings: Date Depth(m) Elevation(m) Sep.09.09 2.8 176.2 Sep.10.09 2.7 176.3 Sep.11.09 2.2 176.8 Sep.15.09 2.1 176.9																

RECORD OF BOREHOLE No C4

1 OF 1

METRIC

W.P. 280-99-00 LOCATION Coords: N:4766003.4 E:326657.8 ORIGINATED BY SS
 DIST HWY 406 BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
 DATUM Geodetic DATE 09.08.09 CHECKED BY RA

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES		20	40	60	80	100					
178.8	Ground Surface															
178.6	180mm TOPSOIL															
0.2	topsoil stained, trace rootlets		1	SS	14											
	SILTY CLAY occasional sandy silt inclusions and silt seams to 2.1m depth, stiff to hard, brown, damp to moist		2	SS	26											
			3	SS	33											
			4	SS	26											
			5	SS	18											
174.5	End of Borehole															
4.3	Borehole was dry (not stabilized) and hole open to full depth on completion. Piezometer installation consists of a 19mm diameter, Schedule 40 PVC pipe with a 1.52m slotted screen. Date Depth(m) Elevation(m) Sep.09.09 Dry - Sep.10.09 Dry - Sep.11.09 Dry - Sep.15.09 Dry -															

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 (%)
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa		WATER CONTENT (%)			
						○ UNCONFINED	+ FIELD VANE						
						● QUICK TRIAXIAL	x LAB VANE						
								20	40	60	80	100	
186.4	Ground Surface												
186.3	100mm TOPSOIL												
0.1													
	FILL - Silty Clay, trace to some sand, trace gravel, firm to very stiff, brown, damp to moist		1	SS		17							
			2	SS		6							
			3	SS		10							
			4	SS		15							
			5	SS		12							
	----- gravelly		6	SS		27							
	----- trace organics, dark brown		7	SS		13							
179.4													
7.0													
	SILTY CLAY trace sand, hard, brown to 10.1m, grey below, damp to moist		8	SS		34							
	----- stiff to very stiff		9	SS		20							
			10	SS		7							
			11	SS		5							
			12	SS		0*							

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

ONTARIO MOT 1-09-4135 MERRITT RD 2.GPJ ONTARIO MOT.GDT 05/10/10

METRIC

CHECKED BY RA

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

RECORD OF BOREHOLE No MR 10+075 Lt

1 OF 2

METRIC

W.P. 280-99-00 LOCATION Coords: N:4766107.2 E:326624.3 ORIGINATED BY SS
 DIST HWY 406 BOREHOLE TYPE Hollow Stem Augers COMPILED BY DB
 DATUM Geodetic DATE 08.31.09 CHECKED BY RA

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						
186.2	Ground Surface					20 40 60 80 100									
0.0	trace rootlets		1	SS	17	186									
	----		2	SS	12	185									
	FILL - Silty Clay, trace sand, trace gravel, stiff to very stiff, brown, damp to moist		3	SS	9	184									
	----		4	SS	22	183									
	sandy		5	SS	12	182									
	----		6	SS	12	181									
			7	SS	14	180									
179.2						179									
7.0	SILTY CLAY trace sand, firm to very stiff, brown to 11.7m, grey below, damp to moist		8	SS	27	178									
			9	SS	21	177									
			10	SS	5	176									
			11	SS	1	175									
			12	SS	3	174									
172.0						173									
14.2	End of Borehole					172									

Continued Next Page

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

RECORD OF BOREHOLE No MR 10+075 Lt

2 OF 2

METRIC

W.P. 280-99-00 LOCATION Coords: N:4766107.2 E:326624.3 ORIGINATED BY SS
 DIST HWY 406 BOREHOLE TYPE Hollow Stem Augers COMPILED BY DB
 DATUM Geodetic DATE 08.31.09 CHECKED BY RA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL																		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa																											
						○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE					WATER CONTENT (%)																								
						20	40	60	80	100	20	40	60	80	100	10	20	30																	
	Borehole was dry (not stabilized) and hole open to full depth on completion. Piezometer installation consists of a 19mm diameter, Schedule 40 PVC pipe with a 1.52m slotted screen. Water Level Readings: <table border="1"> <thead> <tr> <th>Date</th> <th>Depth(m)</th> <th>Elevation(m)</th> </tr> </thead> <tbody> <tr> <td>Sep.08.09</td> <td>7.2</td> <td>179.0</td> </tr> <tr> <td>Sep.10.09</td> <td>7.0</td> <td>179.2</td> </tr> <tr> <td>Sep.11.09</td> <td>6.9</td> <td>179.3</td> </tr> <tr> <td>Sep.15.09</td> <td>6.8</td> <td>179.4</td> </tr> </tbody> </table>	Date	Depth(m)	Elevation(m)	Sep.08.09	7.2	179.0	Sep.10.09	7.0	179.2	Sep.11.09	6.9	179.3	Sep.15.09	6.8	179.4																			
Date	Depth(m)	Elevation(m)																																	
Sep.08.09	7.2	179.0																																	
Sep.10.09	7.0	179.2																																	
Sep.11.09	6.9	179.3																																	
Sep.15.09	6.8	179.4																																	

RECORD OF BOREHOLE No MR 10+100 CL

1 OF 2

METRIC

W.P. 280-99-00 LOCATION Coords: N:4766108.7 E:326654.0 ORIGINATED BY SS
DIST HWY 406 BOREHOLE TYPE Hollow Stem Augers COMPILED BY DB
DATUM Geodetic DATE 09.01.09 CHECKED BY RA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							
								20 40 60 80 100	20 40 60 80 100	20 40 60 80 100					
185.4	Ground Surface														
0.0	FILL - Silty Clay, trace sand, trace gravel, stiff to very stiff, brown, damp to moist		1	SS	14		185								
			2	SS	13										
			3	SS	12		184								
			4	SS	12		183								
			5	SS	15		182								
			6	SS	15		181								
			7	SS	20		179								0 2 30 68
178.4	SILTY CLAY very stiff to hard, brown to 11.5m, grey below, damp to moist		8	SS	36		178								0 0 53 47
7.0			9	SS	16		176								
			10	SS	9		175								
			11	SS	3		173								
			12	SS	2		172								
							171								0 0 64 36
170.5															

Continued Next Page

+ 3. x 3. Numbers refer to
Sensitivity

○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No MR 10+100 CL

2 OF 2

METRIC

W.P. 280-99-00 LOCATION Coords: N:4766108.7 E:326654.0 ORIGINATED BY SS
DIST HWY 406 BOREHOLE TYPE Hollow Stem Augers COMPILED BY DB
DATUM Geodetic DATE 09.01.09 CHECKED BY RA

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																
14.9	<p>End of Borehole</p> <p>Borehole was dry (not stabilized) and hole open to full depth on completion.</p> <p>Monitoring well installation consists of a 50mm diameter, Schedule 40 PVC pipe with a 1.52m slotted screen.</p> <p>Water Level Readings:</p> <table border="1"> <thead> <tr> <th>Date</th> <th>Depth(m)</th> <th>Elevation(m)</th> </tr> </thead> <tbody> <tr> <td>Sep.09.09</td> <td>12.3</td> <td>173.1</td> </tr> <tr> <td>Sep.11.09</td> <td>12.3</td> <td>173.1</td> </tr> <tr> <td>Sep.15.09</td> <td>10.3</td> <td>175.1</td> </tr> </tbody> </table>	Date	Depth(m)	Elevation(m)	Sep.09.09	12.3	173.1	Sep.11.09	12.3	173.1	Sep.15.09	10.3	175.1															
Date	Depth(m)	Elevation(m)																										
Sep.09.09	12.3	173.1																										
Sep.11.09	12.3	173.1																										
Sep.15.09	10.3	175.1																										

RECORD OF BOREHOLE No MR 10+150 Lt

1 OF 1

METRIC

W.P. 280-99-00 LOCATION Coords: N:4766144.7 E:326689.8 ORIGINATED BY SS
 DIST HWY 406 BOREHOLE TYPE Hollow Stem Augers COMPILED BY DB-
 DATUM Geodetic DATE 09.01.09 CHECKED BY RA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
								20 40 60 80 100									
								20 40 60 80 100									
180.0	Ground Surface																
179.9 0.1	80mm TOPSOIL																
179.3	FILL - Silty Clay, trace sand, stiff, dark brown, moist		1	SS	9												
0.7	SILTY CLAY trace sand, very stiff, brown to 5.6m, grey below, damp to moist		2	SS	16												
			3	SS	22												
			4	SS	30												
			5	SS	17												
			6	TW	PH												
			7	SS	4												
172.7 7.3	End of Borehole																
	Borehole was dry (not stabilized) and hole open to full depth on completion. Piezometer installation consists of a 19mm diameter, Schedule 40 PVC pipe with a 1.52m slotted screen. Water Level Readings: Date Depth(m) Elevation(m) Piezometer destroyed by construction activity.																

+ 3. x 3. Numbers refer to
Sensitivity

○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No MR 10+200 Lt

1 OF 1

METRIC

W.P. 280-99-00 LOCATION Coords: N:4766173.9 E:326730.3 ORIGINATED BY SS
 DIST HWY 406 BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
 DATUM Geodetic DATE 09.01.09 CHECKED BY RA

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 x LAB VANE										

179.8	Ground Surface													
179.7	80mm TOPSOIL													
179.5	FILL - Silty Clay, trace organics, stiff, dark brown, damp		1	SS	14									
0.3														
	SILTY CLAY trace sand, firm to very stiff, brown to 4.4m, grey below, damp to moist		2	SS	22									
			3	SS	20									
			4	SS	26									
			5	SS	13									
			6	SS	7									
174.0	End of Borehole													
5.8	Borehole was dry (not stabilized) and hole open to full depth on completion.													

ONTARIO MOT 1-09-4135 MERRITT RD 2.GPJ ONTARIO MOT.GDT 05/10/10

RECORD OF BOREHOLE No MR 10+200 Rt

1 OF 1

METRIC

W.P. 280-99-00 LOCATION Coords: N:4766160.5 E:326739.9 ORIGINATED BY MP
 DIST HWY 406 BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
 DATUM Geodetic DATE 08.31.09 CHECKED BY RA

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								10 20 30				
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE												
180.5	Ground Surface																			
0.0	790mm FILL - Sand and Gravel, trace silt, compact, brown, dry		1	SS	11		180													
179.7	Weathered		2	SS	9		179													
0.8	SILTY CLAY stiff to very stiff, brown, damp to moist		3	SS	15		178													
	occasional silt partings		4	SS	21		177													
			5	SS	17		176													
			6	SS	10		175													
175.0	End of Borehole																			
5.5	Borehole was dry (not stabilized) and hole open to full depth on completion. Resistance to augering at 3.6-4.0m.																			

+ 3 . x 3

Numbers refer to
Sensitivity

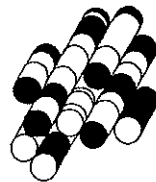
○ 3%

STRAIN AT FAILURE

APPENDIX A

Log of Borehole Sheets (North West Quadrant)

Terraprobe Inc.



RECORD OF BOREHOLE No NEW 10+350 CL 1 OF 1 METRIC

W.P. 280-99-00 LOCATION Coords: N:4766042.9 E:326379.6 ORIGINATED BY SS
DIST HWY 406 BOREHOLE TYPE Hollow Stem Augers COMPILED BY DB
DATUM Geodetic DATE 09.09.09 CHECKED BY RA

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES		20	40	60	80	100					
180.9	Ground Surface															
180.8	150mm TOPSOIL															
0.2	FILL - Silty Clay, sandy, trace rootlets, firm, brown, damp		1	SS	5											
180.2																
0.7	SILTY CLAY stiff to hard, brown, damp to moist		2	SS	29											
			3	SS	26											
			4	SS	57											
	grey		5	SS	26											
			6	TW	PH											
174.8	End of Borehole															
6.1	Borehole was dry (not stabilized) and hole open to full depth on completion. Piezometer installation consists of a 19mm diameter, Schedule 40 PVC pipe with a 1.52m slotted screen. Water Level Readings: Date Depth(m) Elevation(m) Sep.10.09 4.9 176.0 Sep.11.09 4.3 176.6 Sep.15.09 4.2 176.7															

RECORD OF BOREHOLE No NW 10+000 Rt

1 OF 1

METRIC

W.P. 280-99-00 LOCATION Coords: N:4765995.8 E:326390.9 ORIGINATED BY SS
DIST HWY 406 BOREHOLE TYPE Hollow Stem Augers COMPILED BY DB
DATUM Geodetic DATE 09.09.09 CHECKED BY RA

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			20 40 60 80 100	20 40 60 80 100	W _p	W	W _L		
180.2	Ground Surface													
180.1	150mm TOPSOIL													
0.2	FILL - Silt, some sand, frequent clayey inclusions, trace rootlets, compact, brown, moist		1	SS	12		180							0 12 72 16
179.5														
0.7	SILTY CLAY hard, brown to grey / brown, damp to moist		2	SS	43		179							
			3	SS	41		178							0 1 49 50
			4	SS	51		177							
	firm to stiff		5	SS	8		176							0 1 44 56
							175							
			6	TW	PH									
174.1	End of Borehole													
6.1	Borehole dry (not stabilized) and hole open to full depth on completion. Piezometer installation consists of a 19mm diameter, Schedule 40 PVC pipe with a 1.52m slotted screen. Water Level Readings: Date Depth(m) Elevation(m) Sep.10.09 Dry - Sep.11.09 Dry - Sep.15.09 4.4 175.8													

RECORD OF BOREHOLE No NW 10+050 CL

1 OF 1

METRIC

W.P. 280-99-00 LOCATION Coords: N:4765948.1 E:326394.7 ORIGINATED BY MP
DIST HWY 406 BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
DATUM Geodetic DATE 09.03.09 CHECKED BY RA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100					
180.2	Ground Surface													
180.1	130mm TOPSOIL													
0.1														
	firm		1	SS	7		180							

	SILTY CLAY		2	SS	29		179							
	very stiff to hard,													
	brown to 4.0m, grey below,		3	SS	32								42	0 0 48 52
	damp to moist						178							
			4	SS	36									
			5	SS	33		177							
	----						176							
	stiff to very stiff		6	SS	10									0 0 58 42
							175							
174.4	End of Borehole													
5.8														
	Borehole was dry (not stabilized) and hole open to full depth on completion.													

RECORD OF BOREHOLE No NW 10+100 Rt

1 OF 1

METRIC

W.P. 280-99-00 LOCATION Coords: N:4765913.2 E:326359.9 ORIGINATED BY MP
DIST HWY 406 BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
DATUM Geodetic DATE 09.03.09 CHECKED BY RA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100					
179.8	Ground Surface																
178.6	230mm TOPSOIL																
0.2	firm		1	SS	4		179										
	SILTY CLAY		2	SS	23		178										
	very stiff,		3	SS	26		177										
	brown to 2.1m, grey below,		4	SS	26		176										
	damp to moist		5	SS	17		175										
			6	TW	PH												
174.4	End of Borehole																
5.4	Borehole was dry (not stabilized) and hole open to full depth on completion.																

ONTARIO MOT 1-09-4135 MERRITT RD 2.GPJ ONTARIO MOT.GDT 05/10/10

+ 3 x 3

Numbers refer to
Sensitivity

○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No NE 10+400 Lt

1 OF 1

METRIC

W.P. 280-99-00 LOCATION Coords: N:4766001.9 E:326406.6 ORIGINATED BY SS
DIST HWY 406 BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
DATUM Geodetic DATE 09.10.09 CHECKED BY RA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100					
180.2	Ground Surface																
180.0	190mm TOPSOIL																
0.2	trace rootlets		1	SS	13		180										

	SILTY CLAY		2	SS	45		179										
	stiff to hard, brown, damp to moist		3	SS	37												
			4	SS	25		178										
			5	SS	17		177										
	----		6	SS	12		176										
	grey																
							175										
174.3	End of Borehole																
5.9	Borehole was dry (not stabilized) and hole open to full depth on completion.																

RECORD OF BOREHOLE No NE 10+450 CL

1 OF 1

METRIC

W.P. 280-99-00 LOCATION Coords: N:4765958.5 E:326432.0 ORIGINATED BY MP
 DIST HWY 406 BOREHOLE TYPE Hollow Stem Augers COMPILED BY DB
 DATUM Geodetic DATE 09.09.09 CHECKED BY RA

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			20 40 60 80 100	20 40 60 80 100					
180.2	Ground Surface												
180.1	100mm TOPSOIL												
0.1	SILTY CLAY stiff to hard, brown to 2.1m, grey below, damp to moist		1	SS	12	180							
			2	SS	24	179							
			3	SS	36	178							0 1 46 53
			4	SS	26	177							0 0 38 62
			5	SS	22	176							
			6	SS	10	175							
			7	SS	5	174							
			8	TW	PH	173							
			9	SS	32	172							
171.3	SILT trace clay, dense, grey, wet					171							
8.9	End of Borehole												
170.6													
9.6													

RECORD OF BOREHOLE No ES 10+000 Lt

1 OF 2

METRIC

W.P. 280-99-00 LOCATION Coords: N:4766013.3 E:326507.0 ORIGINATED BY MP
DIST HWY 406 BOREHOLE TYPE Hollow Stem Augers COMPILED BY DB
DATUM Geodetic DATE 09.04.09 CHECKED BY RA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)			
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE										
185.0	Ground Surface						20	40	60	80	100	10	20	30	GR SA SI CL			
0.1	50mm TOPSOIL		1	SS	9													
	FILL - Silty Clay, trace to some sand, trace gravel, firm to stiff, brown, damp to moist		2	SS	9										6 17 49 28			
	----		3	SS	11													
	occasional wood pieces		4	SS	7													
	----		5	SS	6													
	trace sand, trace gravel																	
181.0																		
4.0	FILL - Sand and Silt, occasional silty clay inclusions, trace rootlets, loose, brown, moist		6	SS	8										0 46 40 14			
179.4																		
5.6	PEAT - amorphous, inferred very stiff, black, damp																	
178.6			7	SS	20													
6.4	300mm ORGANIC SANDY SILT																	
178.3	SILTY FINE SAND - brown, wet																	
178.0																		
7.0	SILTY CLAY very stiff, brown, damp to moist																	
			8	SS	18													
			9	SS	19													
			10	SS	8													
			11	SS	3										0 0 64 36			
			12	SS	4													
170.0																		

Continued Next Page

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

ONTARIO MOT 1-09-4135 MERRITT RD 2.GPJ ONTARIO MOT.GDT 05/10/10

RECORD OF BOREHOLE No ES 10+000 Lt

2 OF 2

METRIC

W.P. 280-99-00 LOCATION Coords: N:4768013.3 E:326507.0 ORIGINATED BY MP
 DIST HWY 406 BOREHOLE TYPE Hollow Stem Augers COMPILED BY DB
 DATUM Geodetic DATE 09.04.09 CHECKED BY RA

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	20	40	60	80	100	w_p	w		
15.0	End of Borehole Water level at 13.1m (not stabilized) on completion.															

ONTARIO MOT 1-09-4135 MERRITT RD 2.GPJ ONTARIO MOT.GDT 05/10/10

RECORD OF BOREHOLE No ES 10+000 Rt

1 OF 2

METRIC

W.P. 280-99-00 LOCATION Coords: N:4766020.5 E:326509.5 ORIGINATED BY MP
DIST HWY 406 BOREHOLE TYPE Hollow Stem Augers COMPILED BY DB
DATUM Geodetic DATE 09.03.09 CHECKED BY RA

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES		20 40 60 80 100	20 40 60 80 100					
184.9	Ground Surface												
184.9 0.1	80mm TOPSOIL		1	SS	12								
	FILL - Clayey Silt to Silty Clay, trace to some sand, firm to very stiff, damp to moist		2	SS	14	184							
			3	SS	8	183							
			4	SS	4	182							
			5	SS	4	181							
	topsoil stained, trace rootlets		6	SS	23	180							
			7	SS	20	179							
177.9 7.0	SILTY CLAY very stiff, brown to 10.1m, grey below, damp to moist		8	SS	19	178							
	firm to stiff		9	SS	8	177							
			10	SS	1	176							
			11	SS	4	175							
			12	TW	PH	174							
						173							
						172							
						171							
						170							

Continued Next Page

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

ONTARIO MOT 1-09-4135 MERRITT RD 2.GPJ ONTARIO MOT.GDT 05/10/10

RECORD OF BOREHOLE No ES 10+000 Rt

2 OF 2

METRIC

W.P. 280-99-00 LOCATION Coords: N:4766020.5 E:326509.5 ORIGINATED BY MP
DIST HWY 406 BOREHOLE TYPE Hollow Stem Augers COMPILED BY DB
DATUM Geodetic DATE 09.03.09 CHECKED BY RA

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	20	40	60	80	100	W _p	W			W _L											
189.6		X																										
15.3	<p>End of Borehole</p> <p>Borehole dry (not stabilized) and hole open to full depth on completion.</p> <p>Resistance to augering at 0.0-0.6m, 1.8-2.1m, and 4.6-7.0m.</p> <p>Monitoring well installation consists of a 50mm diameter PVC pipe with a 3.0m slotted screen.</p> <p>Water Level Readings:</p> <table border="1"> <thead> <tr> <th>Date</th> <th>Depth(m)</th> <th>Elevation(m)</th> </tr> </thead> <tbody> <tr> <td>Sep. 10.09</td> <td>12.6</td> <td>172.3</td> </tr> <tr> <td>Sep. 11.09</td> <td>12.0</td> <td>172.9</td> </tr> <tr> <td>Sep. 15.09</td> <td>11.2</td> <td>173.7</td> </tr> </tbody> </table>	Date	Depth(m)	Elevation(m)	Sep. 10.09	12.6	172.3	Sep. 11.09	12.0	172.9	Sep. 15.09	11.2	173.7															
Date	Depth(m)	Elevation(m)																										
Sep. 10.09	12.6	172.3																										
Sep. 11.09	12.0	172.9																										
Sep. 15.09	11.2	173.7																										

ONTARIO MOT. 1-09-4135 MERRITT RD 2.GPJ ONTARIO MOT. GDT. 05/10/10

1 OF 2

METRIC

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

ONTARIO MOT 1-09-4135 MERRITT RD 2.GPJ ONTARIO MOT.GDT 05/10/10

2 OF 2

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 (%)
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE			"N" VALUES	20			
							SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE		w_p ——— w ——— w_L WATER CONTENT (%) 10 20 30		

[illegible]

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

ONTARIO MOT 1-09-4135 MERRITT RD 2.GPJ ONTARIO MOT.GDY 05/10/10

1 OF 1

METRIC

W.P. 280-99-00

LOCATION

Coords: N:4766010.6 E:326413.2

ORIGINATED BY SS

DIST HWY 406

BOREHOLE TYPE Solid Stem Augers

COMPILED BY DB

DATUM Geodetic

DATE 09.10.09

CHECKED BY RA

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

RECORD OF BOREHOLE No EWS 10+100 Rt 1 OF 1 METRIC

W.P. 280-99-00 LOCATION Coords. N:4768016.9 E:326419.0 ORIGINATED BY MP
DIST HWY 406 BOREHOLE TYPE Hollow Stem Augers COMPILED BY DB
DATUM Geodetic DATE 09.10.09 CHECKED BY RA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
180.7	Ground Surface							20	40	60	80	100		
180.6 0.1	80mm TOPSOIL		1	SS	11									
180.0 0.7	FILL - Sand and Silt, occasional clay lumps, compact, brown, dry to damp		2	SS	34									
	FILL - Silty Clay, trace sand, very stiff to hard, brown, damp to moist		3	SS	29									
178.6 2.1	Weathered		4	SS	31									
	---- very stiff to hard		5	SS	22									
	---- SILTY CLAY firm to stiff, brown to 4.2m, grey below, damp to moist		6	SS	6									
			7	TW	PH									
173.2 7.5	End of Borehole													
	Borehole was dry (not stabilized) and hole open to 5.8m on completion.													
	Piezometer installation consists of a 19mm diameter, Schedule 40 PVC pipe with a 1.52m slotted screen.													
	Water Level Readings:													
	Date Depth(m) Elevation(m)													
	Sep.10.09 Dry -													
	Sep.11.09 Dry -													
	Sep.15.09 Dry -													
	Consolidation test performed on TW 7.													

RECORD OF BOREHOLE No EWS 10+150 CL 1 OF 1 METRIC

W.P. 280-99-00 LOCATION Coords: N:4766059.9 E:326399.4 ORIGINATED BY MP
DIST HWY 406 BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
DATUM Geodetic DATE 09.10.09 CHECKED BY RA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL LIQUID LIMIT MOISTURE CONTENT			UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		w _p	w	w _L		
181.1	Ground Surface							20 40 60 80 100						GR SA SI CL
0.0	FILL - Sand and Silt, trace clay, compact, brown, dry to damp		1	SS	19									0 52 35 13
180.4														
0.7	FILL - Silty Clay, trace sand, trace gravel, very stiff, brown, damp		2	SS	24									
179.7														
1.4	SILTY CLAY stiff to hard, brown, damp to moist		3	SS	29									
			4	SS	24									
			5	SS	31									
			6	SS	11									
175.2	End of Borehole													
5.9	Borehole dry (not stabilized) and hole open to full depth on completion. Piezometer installation consists of a 19mm diameter, Schedule 40 PVC pipe with a 1.52m slotted screen. Water Level Readings: Date Depth(m) Elevation(m) Sep.10.09 Dry - Sep.11.09 Dry - Sep.15.09 Dry -													

RECORD OF BOREHOLE No WS 10+025 CL

1 OF 1

METRIC

W.P. 280-99-00 LOCATION Coords: N:4765979.6 E:326435.7 ORIGINATED BY MP
DIST HWY 406 BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
DATUM Geodetic DATE 09.09.09 CHECKED BY RA

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL												
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa						WATER CONTENT (%)											
								○ UNCONFINED ● QUICK TRIAXIAL							+ FIELD VANE × LAB VANE										
180.2	Ground Surface						20 40 60 80 100	20 40 60 80 100																	
180.0	205mm TOPSOIL																								
0.2	FILL - Silty Sand, frequent clayey inclusions, loose, moist		1	SS	6								0 56 30 14												
179.2	SILTY CLAY stiff to very stiff, brown to 4.0m, grey below, damp to moist		2	SS	12																				
1.0			3	SS	20																				
			4	SS	29								0 1 53 46												
			5	SS	17																				
			6	SS	9																				
			7	SS	2								0 1 37 62												
	firm to stiff		8	SS	9																				
171.2	End of Borehole																								
9.0	<p>Borehole was dry (not stabilized) and hole open to full depth on completion.</p> <p>Piezometer installation consists of a 19mm diameter, Schedule 40 PVC pipe with a 1.52m slotted screen.</p> <p>Water Level Readings:</p> <table><tr><th>Date</th><th>Depth(m)</th><th>Elevation(m)</th></tr><tr><td>Sep.10.09</td><td>7.9</td><td>172.3</td></tr><tr><td>Sep.11.09</td><td>7.3</td><td>172.9</td></tr><tr><td>Sep.15.09</td><td>6.6</td><td>173.6</td></tr></table>													Date	Depth(m)	Elevation(m)	Sep.10.09	7.9	172.3	Sep.11.09	7.3	172.9	Sep.15.09	6.6	173.6
Date	Depth(m)	Elevation(m)																							
Sep.10.09	7.9	172.3																							
Sep.11.09	7.3	172.9																							
Sep.15.09	6.6	173.6																							

RECORD OF BOREHOLE No MR 9+800 CL

1 OF 1

METRIC

W.P. 280-99-00 LOCATION Coords: N:4765935.2 E:326409.3 ORIGINATED BY MP
DIST HWY 406 BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
DATUM Geodetic DATE 09.03.09 CHECKED BY RA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m³	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		
180.0	Ground Surface					20	40	60	80	100	10	20	30			
179.9	150mm TOPSOIL															
0.2	SILTY CLAY stiff to hard, brown, damp to moist		1	SS	14											
			2	SS	27											
			3	SS	32											
			4	SS	23											
			5	SS	11											
			6	TW	PH											
173.9	End of Borehole															
6.1	Borehole was dry (not stabilized) and hole open to full depth on completion.															

RECORD OF BOREHOLE No MR 9+850 Rt

1 OF 1

METRIC

W.P. 280-99-00 LOCATION Coords: N:4765953.0 E:326458.1 ORIGINATED BY MP
DIST HWY 406 BOREHOLE TYPE Hollow Stem Augers COMPILED BY DB
DATUM Geodetic DATE 09.09.09 CHECKED BY RA

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			20 40 60 80 100	20 40 60 80 100	W _p W W _L	WATER CONTENT (%)	GR SA SI CL		
179.8	Ground Surface													
179.7 0.1	60mm TOPSOIL		1	SS	10									
	firm													
	SILTY CLAY very stiff, brown to 4.0m, grey below, damp to moist		2	SS	26		179							
			3	SS	27		178						0 1 47 52	
			4	SS	21		177							
	firm to stiff		5	SS	10		176		1.4					
			6	SS	3		175						0 0 61 39	
							174		2.0					
			7	TW	PH		173		1.8			18.3	0 0 33 67	
172.3 7.5	End of Borehole								2.5					
Borehole was dry (not stabilized) and hole open to full depth on completion.														
Monitoring well installation consists of a 50mm diameter, Schedule 40 PVC pipe with a 1.52m slotted screen.														
Water Level Readings:														
Date Depth(m) Elevation(m)														
Sep.10.09 6.0 173.8														
Sep.11.09 4.6 175.2														
Sep.15.09 3.9 175.9														
Consolidation test performed on TW 7.														

RECORD OF BOREHOLE No MR 9+900 CL

1 OF 2

METRIC

W.P. 280-99-00 LOCATION Coords: N:4765994.9 E:326489.5 ORIGINATED BY MP
 DIST HWY 406 BOREHOLE TYPE Hollow Stem Augers COMPILED BY DB
 DATUM Geodetic DATE 09.08.09 CHECKED BY RA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE × LAB VANE						
185.3	Ground Surface							20 40 60 80 100	10 20 30					GR SA SI CL	
0.0	25mm TOPSOIL		1	SS	10		185								
	FILL - Silty Clay, trace sand to sandy, occasional gravel inclusions below 1.4m, firm to stiff, brown / dark brown, damp to moist		2	SS	10		184								
			3	SS	7		183	--- sampler wet at 2.2m							
			4	SS	7		182								
			5	SS	4		181								
			6	SS	5		180								
179.7	some sand		7	SS	21		179							0 14 47 39	
5.6	SILTY CLAY very stiff, brown to 7.1m, grey below, damp to moist		8	SS	27		178								
			9	SS	26		177								
	firm to stiff		10	SS	9		176							0 1 51 48	
			11	SS	6		175								
			12	SS	4		174	+ 1.8							
							173	+ 1.7							
							172	+ 1.7							
							171	+ 1.1							
								+ 1.2						0 0 69 31	

Continued Next Page

+ 3, x 3: Numbers refer to Sensitivity
 O 3% STRAIN AT FAILURE

ONTARIO MOT 1-09-4135 MERRITT RD 2.GPJ ONTARIO MOT.GDT 05/10/10

2 OF 2

METRIC

W.P.	280-99-00	LOCATION	Coords: N:4765994.9 E:326489.5	ORIGINATED BY	MP
DIST	HWY 406	BOREHOLE TYPE	Hollow Stem Augers	COMPILED BY	DB
DATUM	Geodetic	DATE	09.08.09	CHECKED BY	RA

[illegible]

ONTARIO MOT 1-09-4135 MERRITT RD 2.GPJ ONTARIO MOT.GDT 05/10/10

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

RECORD OF BOREHOLE No MR 9+950 Rt

1 OF 1

METRIC

W.P. 280-99-00 LOCATION Coords: N:4766011.5 E:326537.9 ORIGINATED BY MP
 DIST HWY 405 BOREHOLE TYPE Solid Stem Augers COMPILED BY DB
 DATUM Geodetic DATE 09.02.09 CHECKED BY RA

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa					
180.2	Ground Surface						20 40 60 80 100						
180.1	100mm ASPHALT						○ UNCONFINED + FIELD VANE						
0.1	FILL - Sand and Gravel, trace to some silt, compact, brown, dry		1	SS	16		● QUICK TRIAXIAL × LAB VANE						
179.6							20 40 60 80 100						
0.6	SILTY CLAY stiff to very stiff, brown, damp to moist		2	SS	14								
			3	SS	28								
			4	SS	14								
	soft to stiff, grey		5	SS	2								
			6	SS	1								
			7	SS	1								
			8	TW	PH								
171.5	SILT trace clay, trace sand, trace gravel, loose, grey, wet		9	SS	7								
8.7													
170.6	End of Borehole												
9.6	Borehole was dry (not stabilized) and hole open to full depth on completion. Piezometer installation consists of a 19mm diameter, Schedule 40 PVC pipe with a 1.52m slotted screen. Water Level Readings: Date Depth(m) Elevation(m) Piezometer destroyed by construction activity.												

ONTARIO MOT 1-09-4135 MERRITT RD 2.GPJ ONTARIO MOT.GDT 05/10/10

APPENDIX B

Laboratory Test Results (South East Quadrant)

Terraprobe Inc.

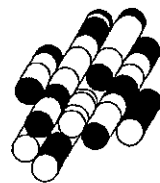


FIGURE B1-1

The graph displays the grain size distribution of a soil sample. The y-axis represents the percentage of soil finer than a given grain size, ranging from 0 to 100. The x-axis represents the grain size in millimeters on a logarithmic scale, ranging from 100 mm to 0.001 mm. A smooth curve is drawn through the data points, showing that approximately 100% of the soil is finer than 4.75 mm, and the percentage finer decreases as the grain size decreases, reaching about 3% finer than 0.075 mm.

Grain Size (mm)	Percent Finer (%)
4.75	100
2.5	98
1.18	81
0.85	64
0.6	48
0.425	37
0.3	31
0.25	28
0.15	24
0.106	22
0.075	18
0.06	15
0.0425	12
0.03	9
0.025	7
0.015	5
0.0106	3
0.0075	2

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

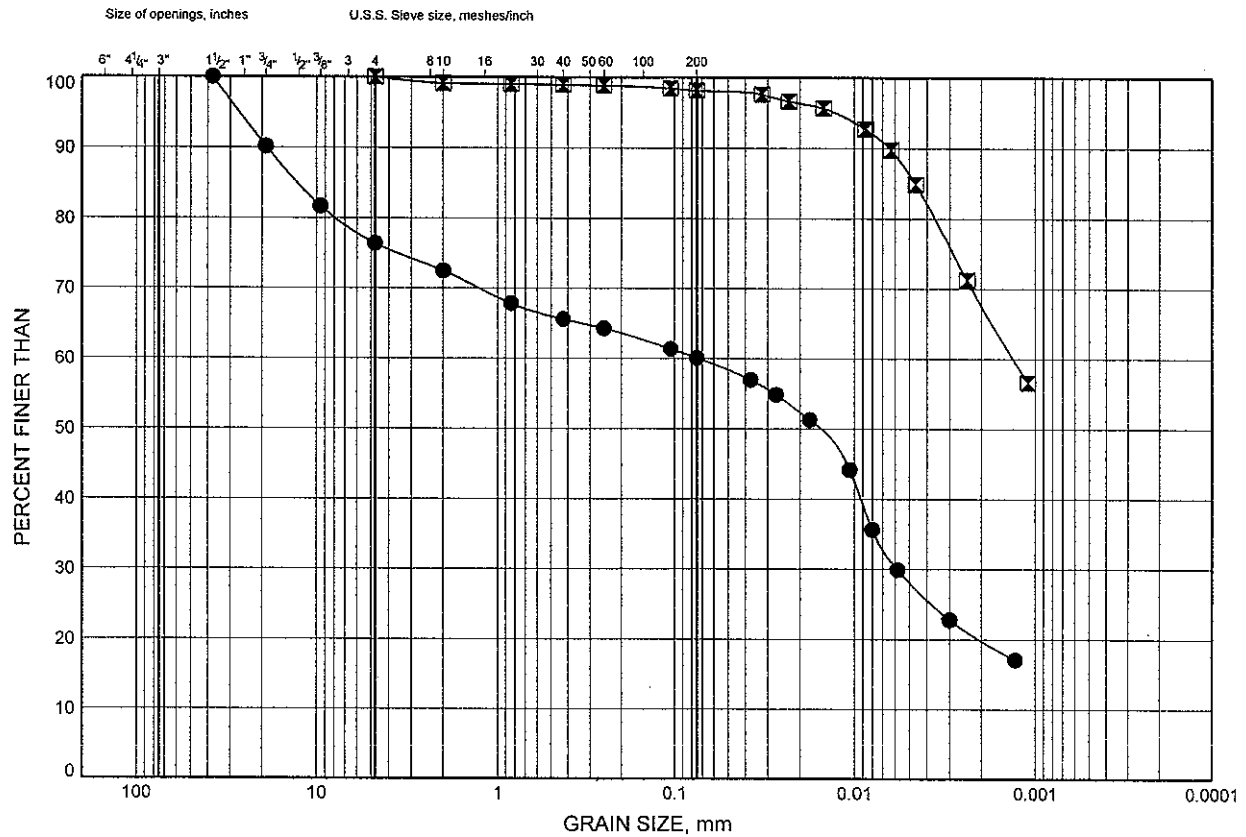
SYMBOL	BOREHOLE	DEPTH (m)	ELEVATION (m)
●	EN 10+025 CL	0.3	180.2

Chkd. RA

GRAIN SIZE DISTRIBUTION

FIGURE B1-2

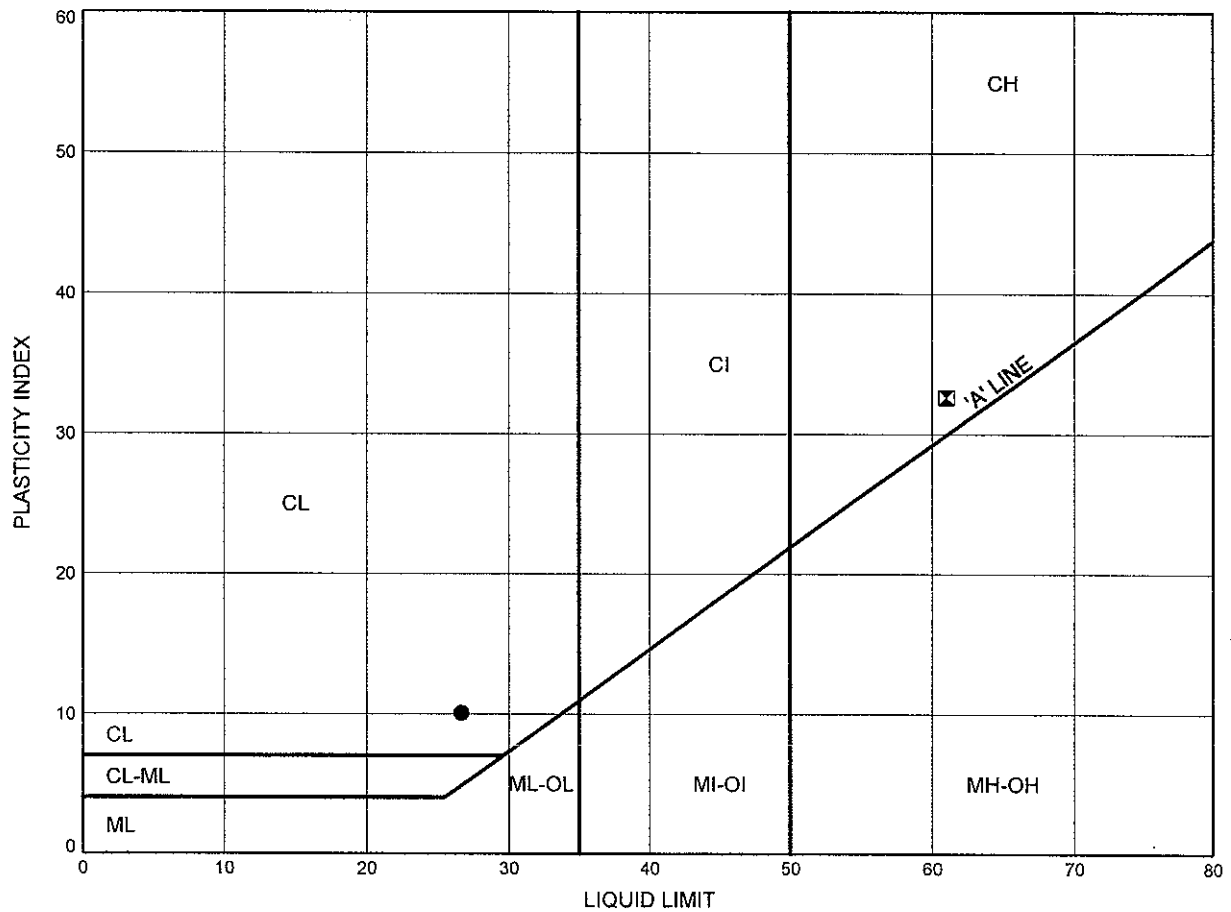
FILL - Silty Clay



ATTERBERG LIMITS TEST RESULTS

FIGURE B1-3

FILL - Silty Clay

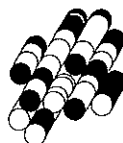


SYMBOL	BOREHOLE	DEPTH (m)	ELEVATION (m)
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●	MR 10+050 CL	4.7	181.7
☒	MR 10+100 CL	6.3	179.1

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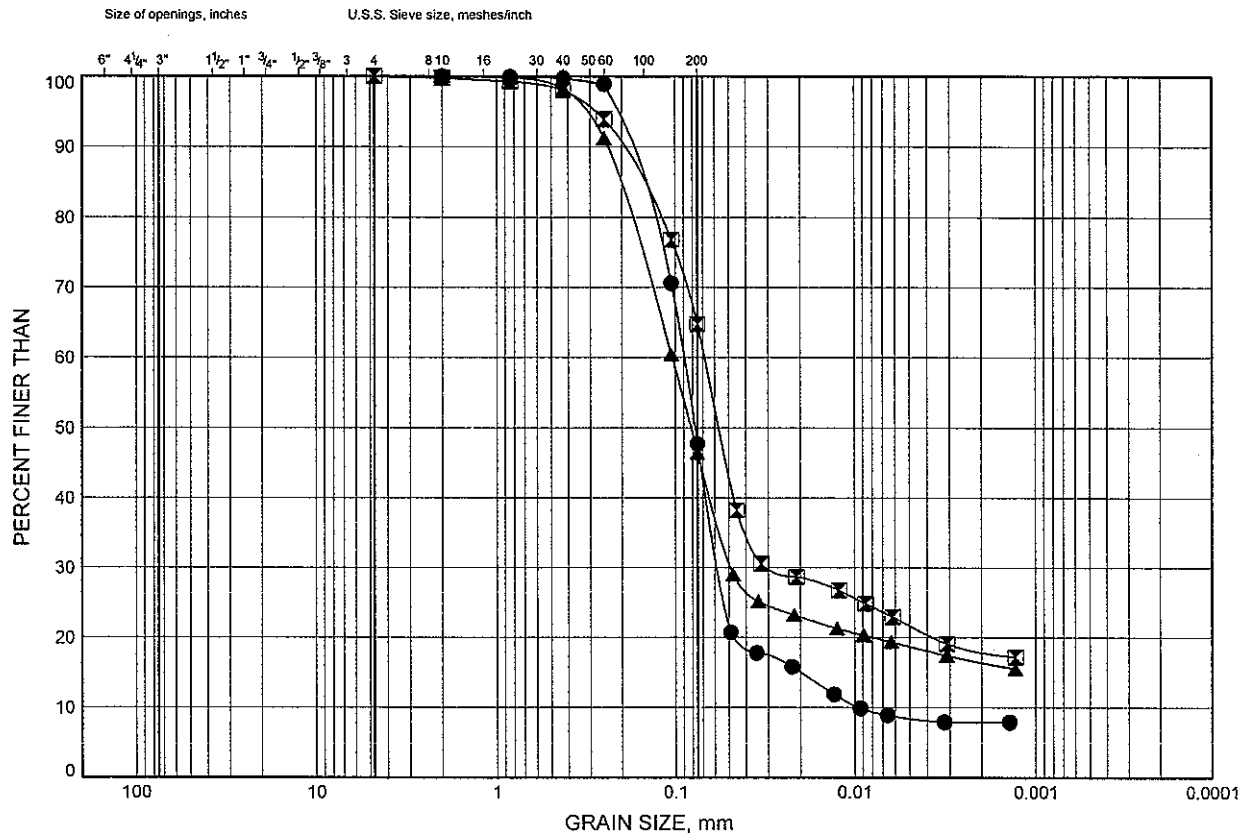
Prep'd DB

Chkd. RA

GRAIN SIZE DISTRIBUTION

FIGURE B1-4

SILTY SAND TO SANDY SILT



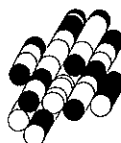
COBBLE SIZE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT and CLAY
	GRAVEL		SAND			FINE GRAINED

SYMBOL BOREHOLE DEPTH (m) ELEVATION (m)

●	EWN 10+150 CL	1.0	177.7
⊠	SEW 10+250 Lt	0.3	178.3
▲	SEW 10+350 Lt	1.0	178.5

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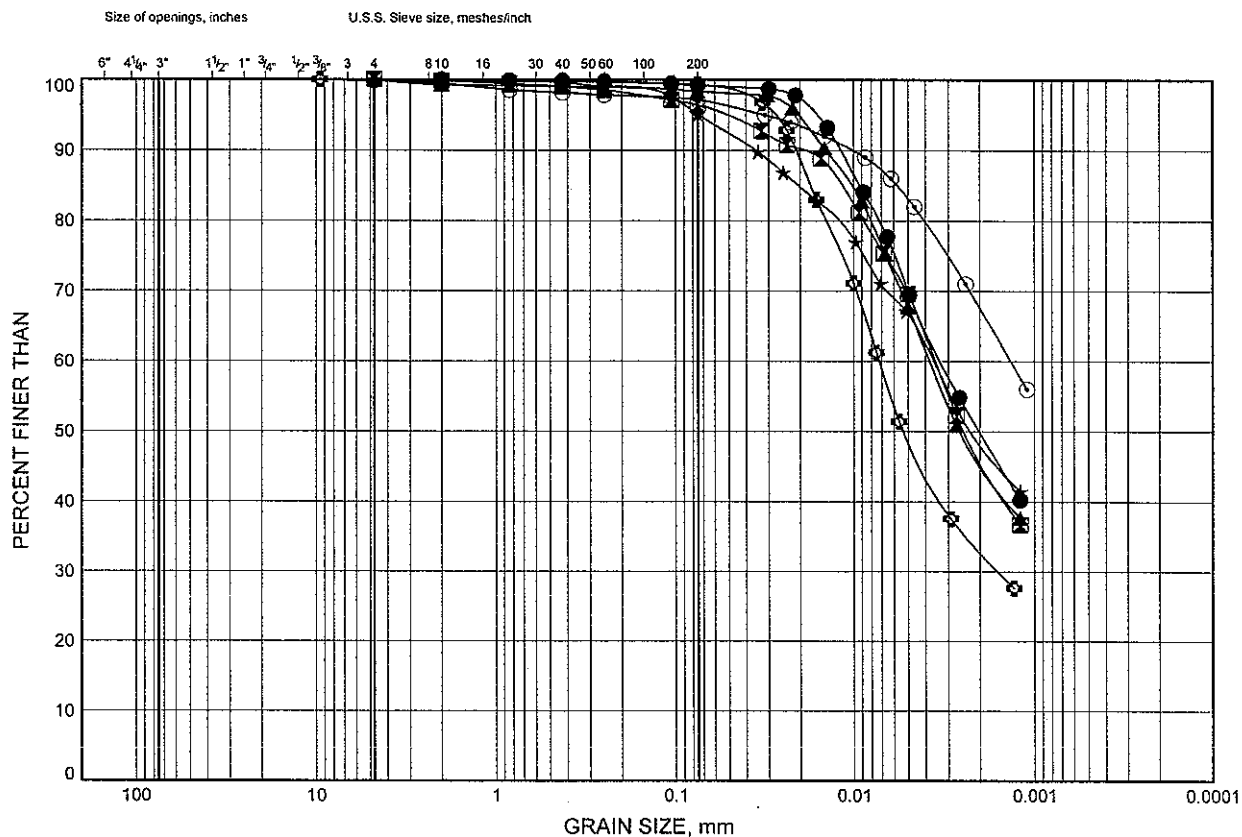
Prep'd DB

Chkd. RA

GRAIN SIZE DISTRIBUTION

FIGURE B1-5

SILTY CLAY



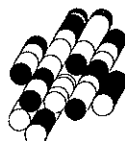
COBBLE SIZE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT and CLAY
	GRAVEL		SAND			FINE GRAINED

SYMBOL BOREHOLE DEPTH (m) ELEVATION (m)

●	SEW 10+200 CL	2.5	176.2
⊠	SEW 10+200 CL	4.7	174.0
▲	SEW 10+250 Lt	3.2	175.4
★	SEW 10+250 Rt	1.7	176.9
⊙	SEW 10+250 Rt	4.7	173.9
⊕	SEW 10+300 CL	1.7	177.2

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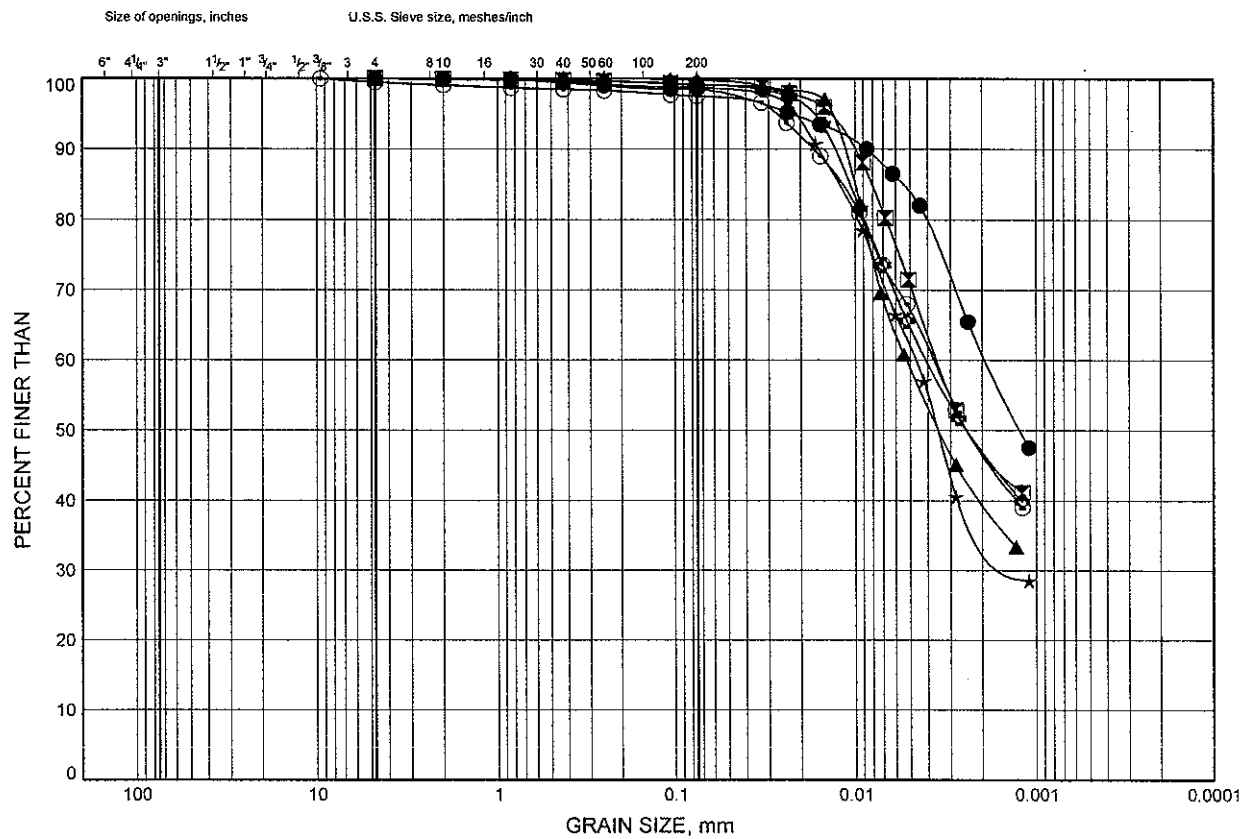
Prep'd DB

Chkd. RA

GRAIN SIZE DISTRIBUTION

FIGURE B1-6

SILTY CLAY



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

SYMBOL BOREHOLE DEPTH (m) ELEVATION (m)

●	SEW 10+300 CL	4.9	174.0
⊠	SEW 10+350 Lt	2.5	177.0
▲	SEW 10+350 Rt	4.7	174.8
★	SEW 10+350 Rt	4.9	174.2
⊙	WN 10+000 Rt	3.2	177.2
⊗	WN 10+000 Rt	4.7	175.7

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Project 1-09-4135



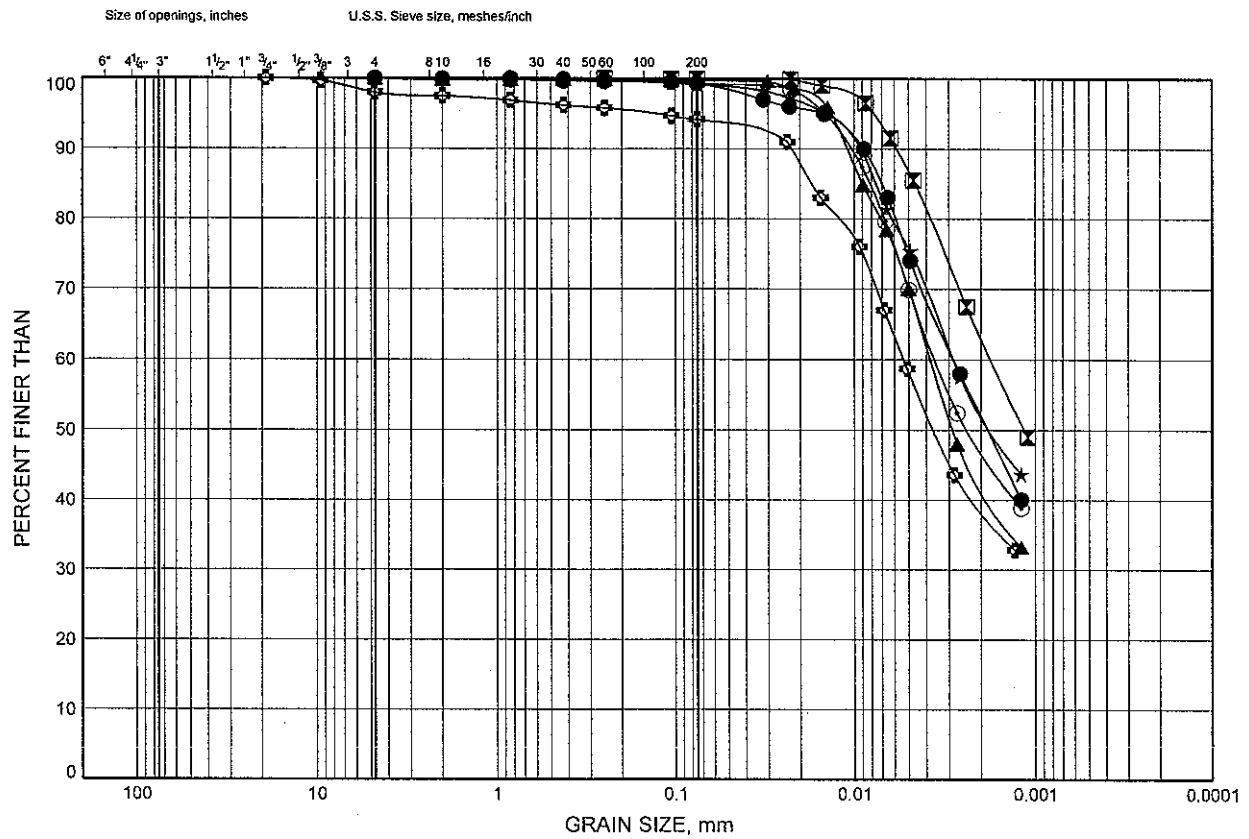
Prep'd DB

Chkd. RA

GRAIN SIZE DISTRIBUTION

FIGURE B1-7

SILTY CLAY



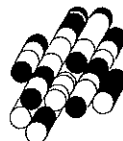
COBBLE SIZE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT and CLAY
	GRAVEL		SAND			FINE GRAINED

SYMBOL BOREHOLE DEPTH (m) ELEVATION (m)

●	EN 10+025 CL	2.5	178.0
☒	WN 10+000 Rt	6.4	174.0
▲	WN 10+000 Rt	9.3	171.1
★	WN 10+050 CL	1.0	179.8
⊙	WN 10+050 CL	1.7	179.1
⊗	WN 10+050 CL	4.7	176.1

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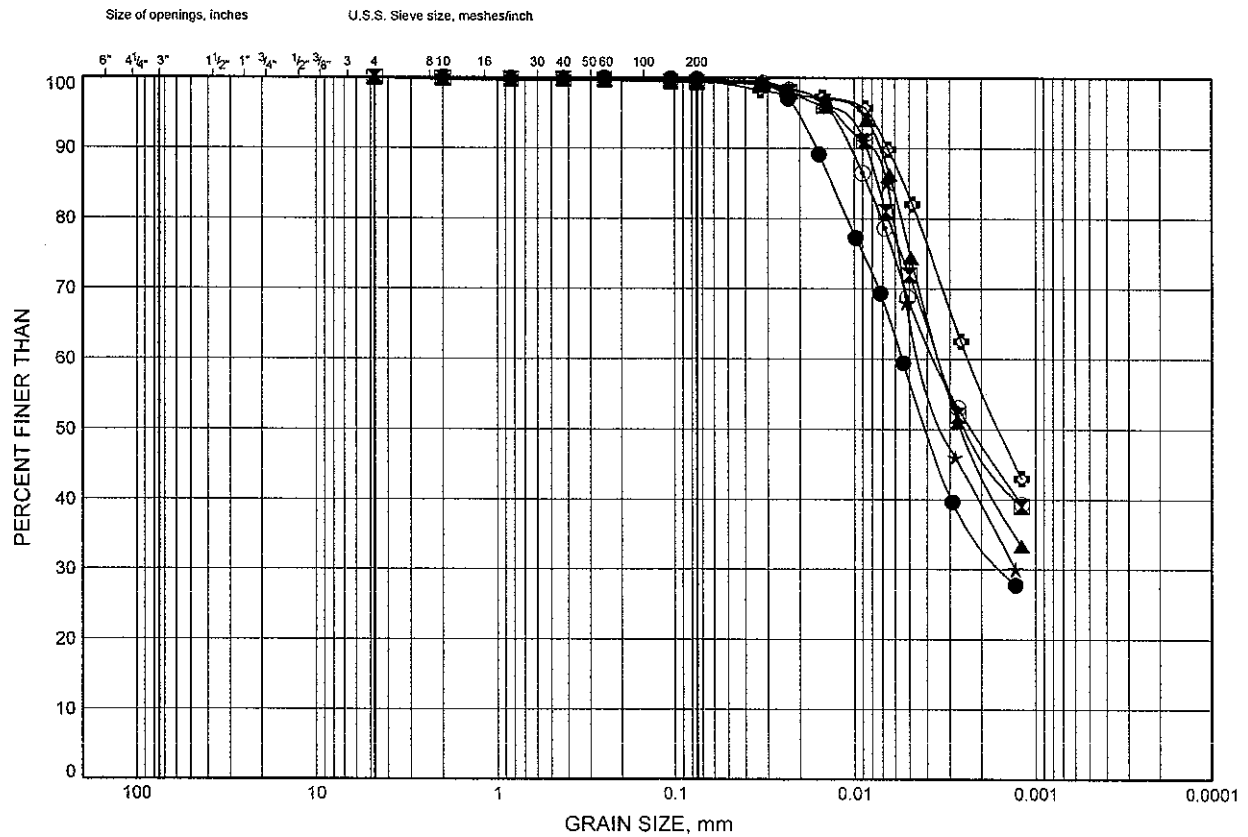
Prep'd DB

Chkd. RA

GRAIN SIZE DISTRIBUTION

FIGURE B1-8

SILTY CLAY



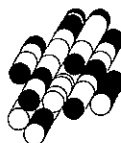
COBBLE SIZE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT and CLAY
	GRAVEL		SAND			FINE GRAINED

SYMBOL BOREHOLE DEPTH (m) ELEVATION (m)

●	EN 10+025 CL	6.3	174.2
⊠	EWN 10+100 Lt	2.5	176.7
▲	EWN 10+100 Lt	6.3	172.9
★	EWN 10+100 Rt	6.3	172.8
⊙	EWN 10+150 CL	2.5	176.2
⊛	EWN 10+150 CL	4.8	173.9

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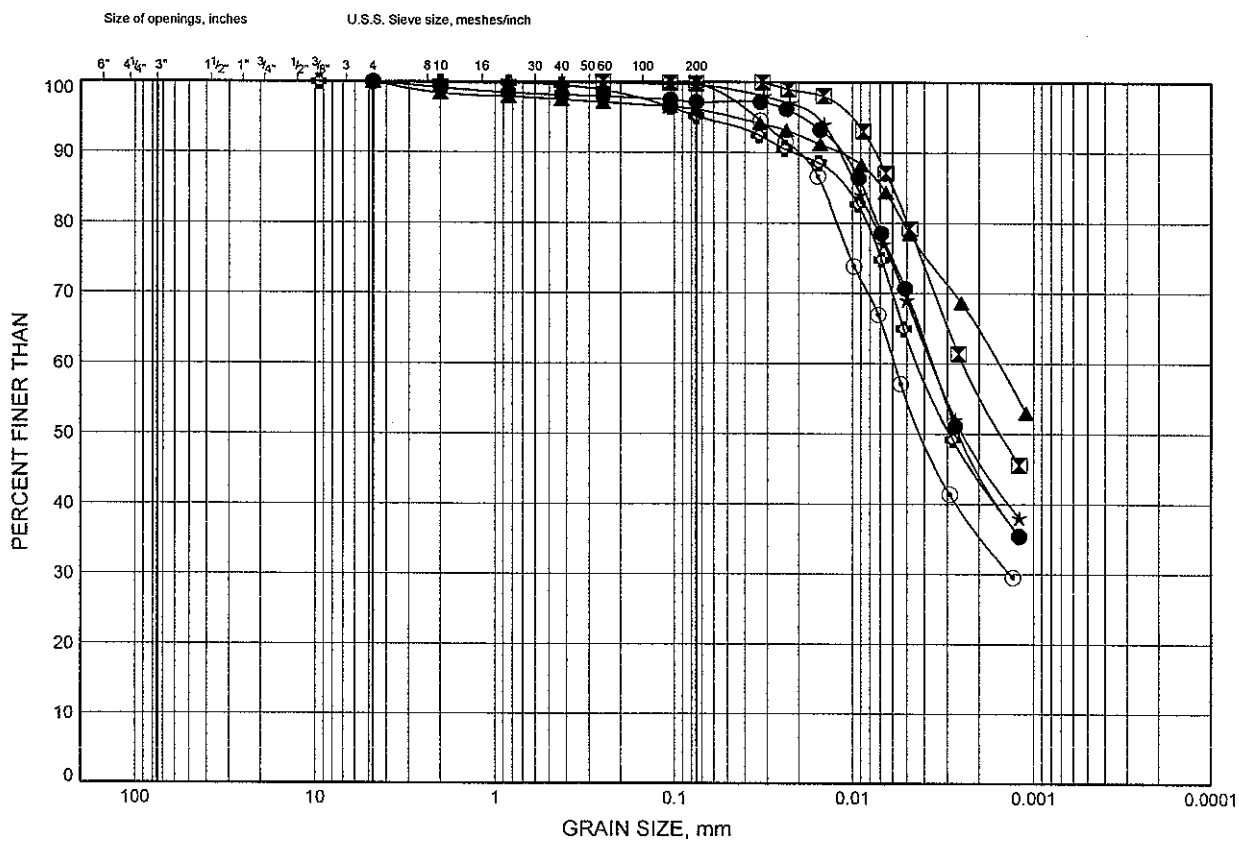


Prep'd DB

Chkd. RA

GRAIN SIZE DISTRIBUTION

FIGURE B1-9

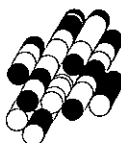


SYMBOL BOREHOLE DEPTH (m) ELEVATION (m)

●	MR 10+050 CL	9.3	177.1
⊠	MR 10+075 Lt	7.8	178.4
▲	MR 10+075 Lt	12.4	173.8
★	MR 10+100 CL	7.8	177.6
⊙	MR 10+100 CL	13.9	171.5
⊕	MR 10+150 Lt	1.0	179.0

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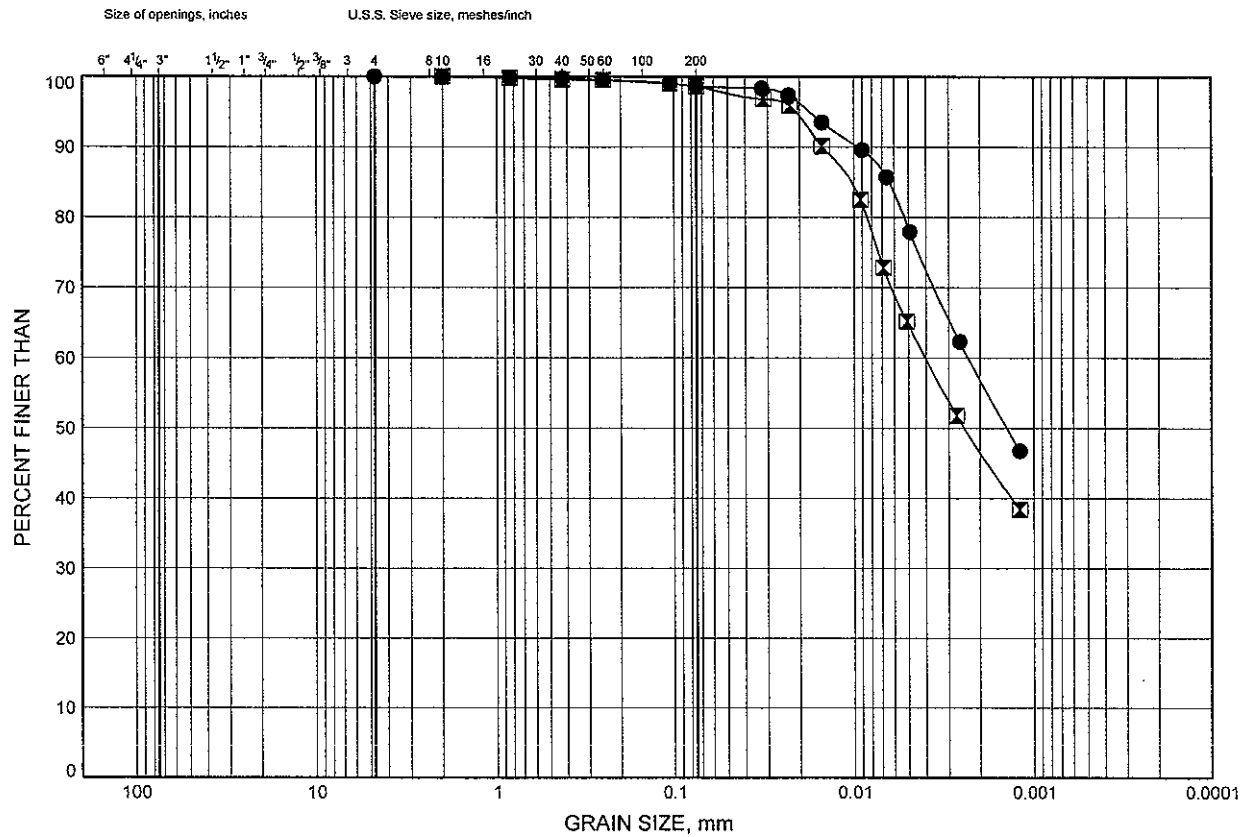
Prep'd DB

Chkd. RA

GRAIN SIZE DISTRIBUTION

FIGURE B1-10

SILTY CLAY



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

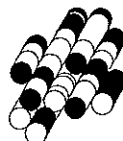
SYMBOL BOREHOLE DEPTH (m) ELEVATION (m)

● MR 10+200 Lt 1.7 178.1

x MR 10+200 Lt 4.7 175.1

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Project 1-09-4135



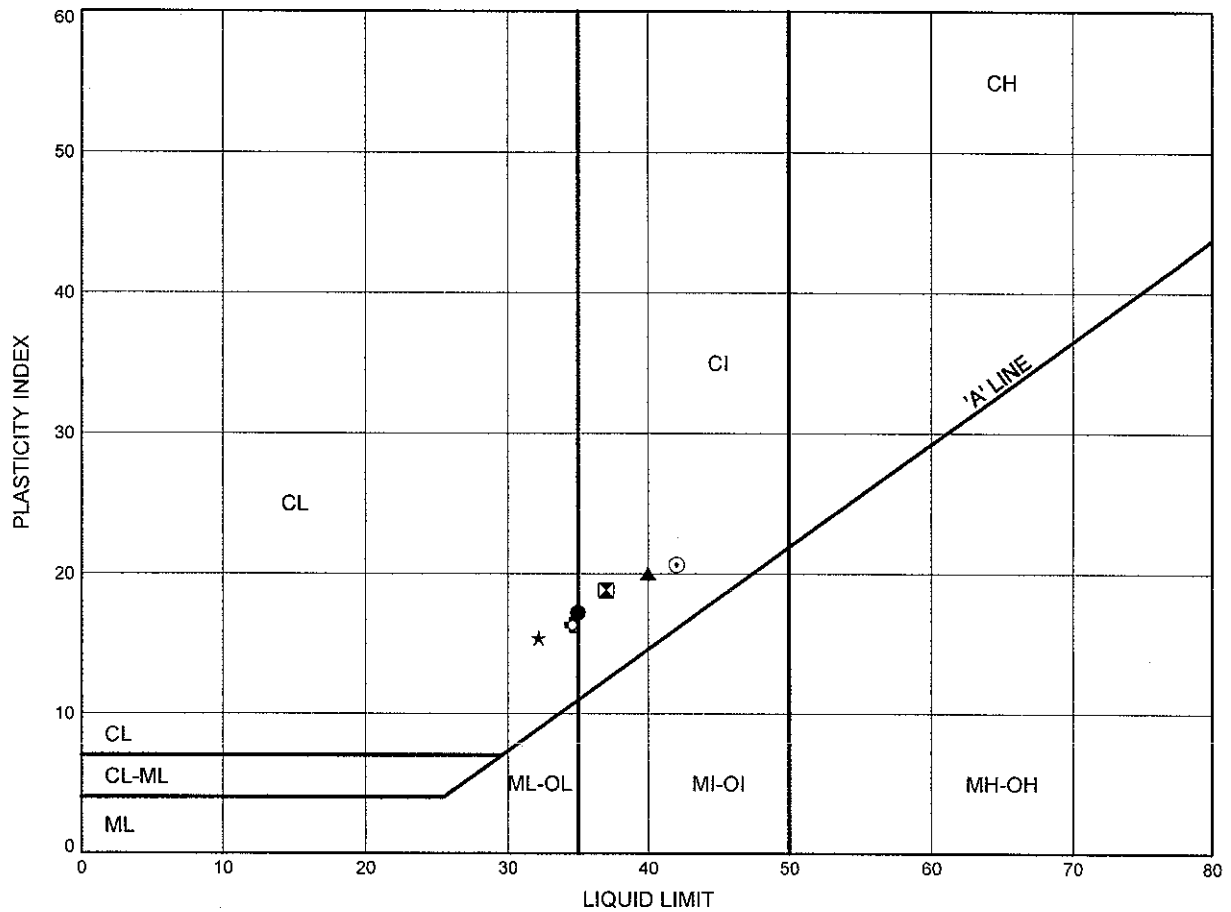
Prep'd DB

Chkd. RA

ATTERBERG LIMITS TEST RESULTS

FIGURE B1-11

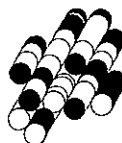
SILTY CLAY



SYMBOL	BOREHOLE	DEPTH (m)	ELEVATION (m)
●	SEW 10+200 CL	2.5	176.2
⊠	SEW 10+200 CL	4.7	174.0
▲	SEW 10+250 Lt	3.2	175.4
★	SEW 10+250 Rt	1.7	176.9
⊙	SEW 10+250 Rt	4.7	173.9
⊛	SEW 10+300 CL	1.7	177.2

Date May 2010

Project 1-09-4135



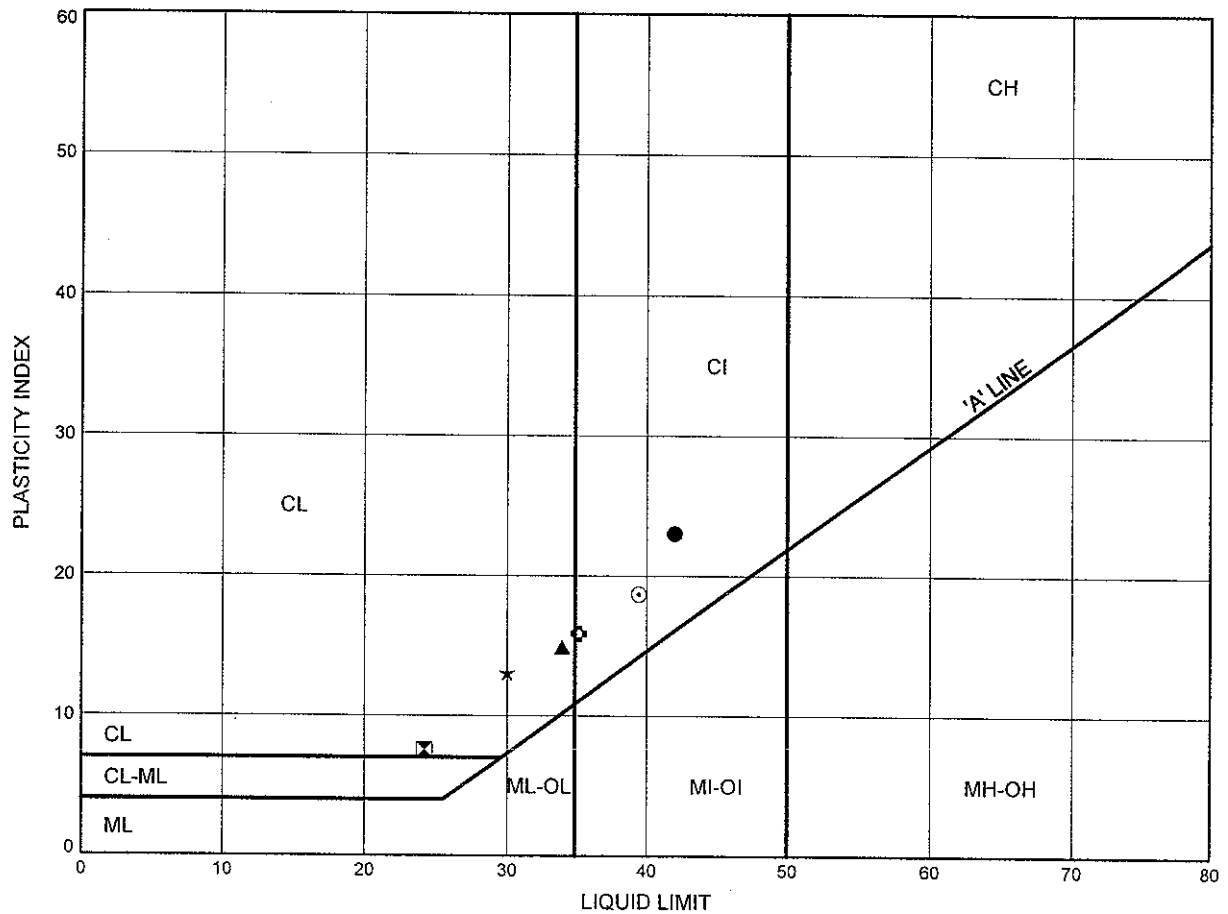
Prep'd DB

Chkd. RA

ATTERBERG LIMITS TEST RESULTS

FIGURE B1-12

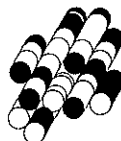
SILTY CLAY



SYMBOL	BOREHOLE	DEPTH (m)	ELEVATION (m)
●	SEW 10+300 CL	4.9	174.0
⊠	SEW 10+350 Lt	2.5	177.0
▲	SEW 10+350 Lt	4.7	174.8
★	SEW 10+350 Rt	4.9	174.2
⊙	WN 10+000 Rt	3.2	177.2
⊛	WN 10+000 Rt	4.7	175.7

Date May 2010

Project 1-09-4135



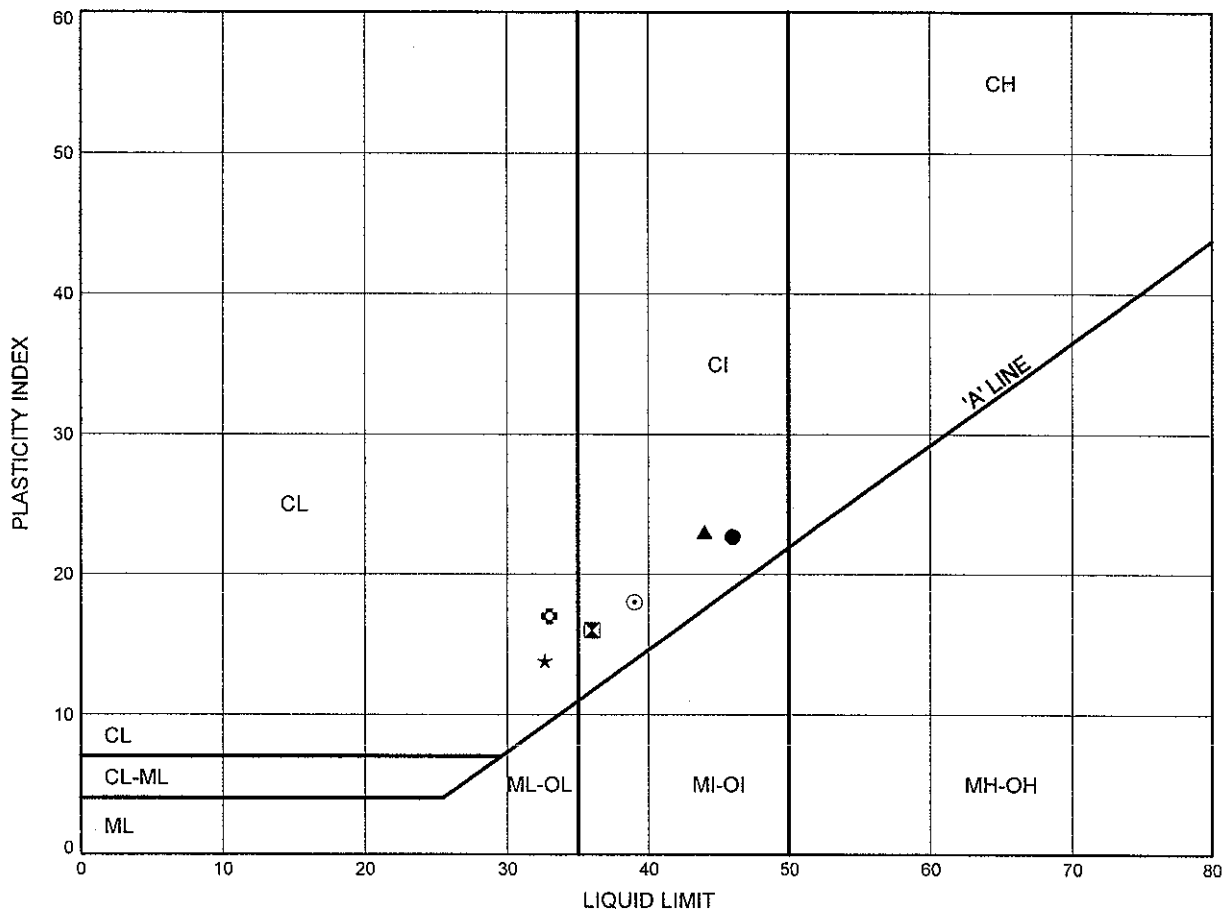
Prep'd DB

Chkd. RA

ATTERBERG LIMITS TEST RESULTS

FIGURE B1-13

SILTY CLAY

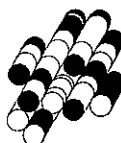


SYMBOL BOREHOLE DEPTH (m) ELEVATION (m)

●	EN 10+025 CL	2.5	178.0
⊠	EN 10+025 CL	6.3	174.2
▲	WN 10+000 Rt	6.4	174.0
★	WN 10+000 Rt	9.3	171.1
⊙	WN 10+050 CL	1.0	179.8
⊗	WN 10+050 CL	4.7	176.1

Date May 2010

Project 1-09-4135



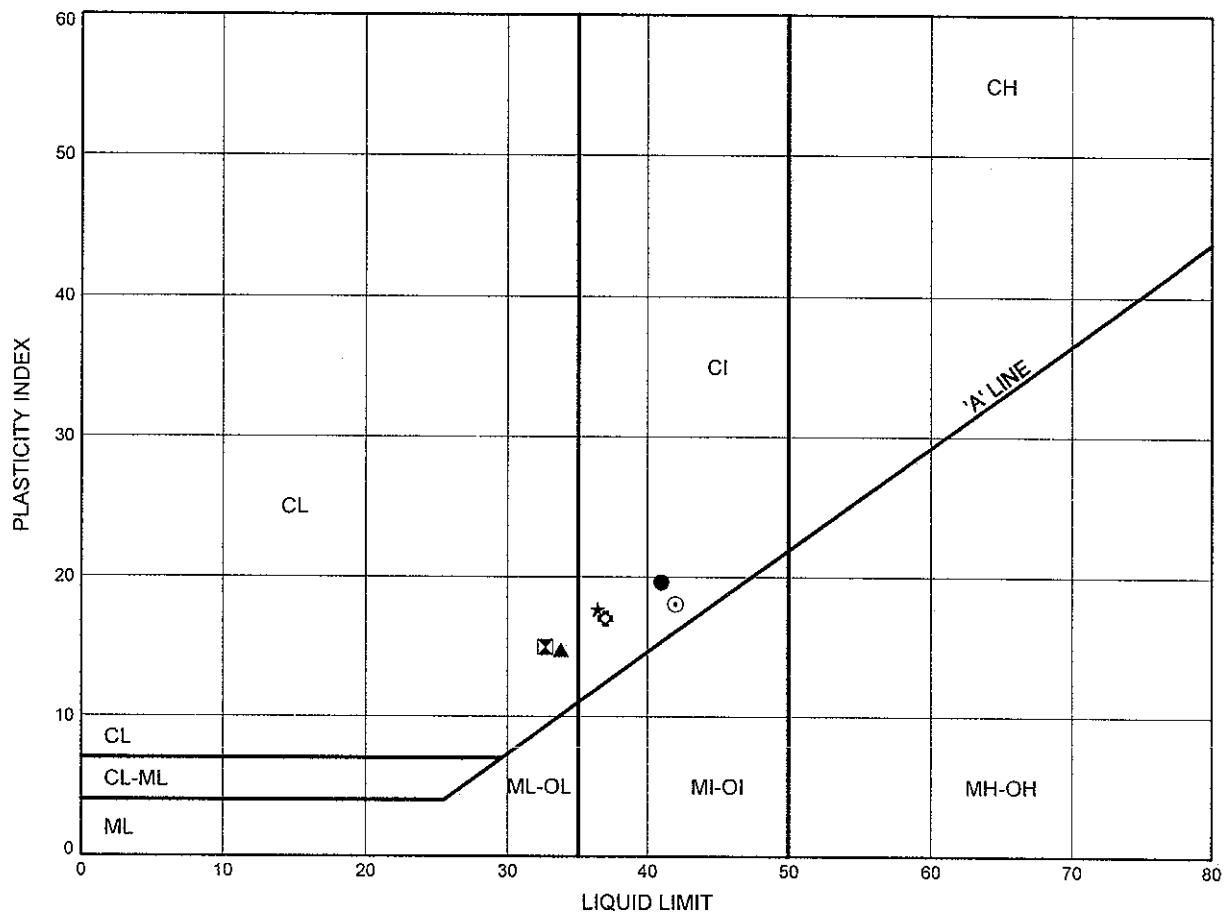
Prep'd DB

Chkd. RA

ATTERBERG LIMITS TEST RESULTS

FIGURE B1-14

SILTY CLAY

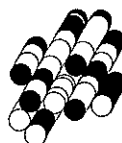


SYMBOL BOREHOLE DEPTH (m) ELEVATION (m)

●	EWN 10+100 Lt	2.5	176.7
⊠	EWN 10+100 Lt	6.3	172.9
▲	EWN 10+100 Rt	6.3	172.8
★	EWN 10+150 CL	2.5	176.2
⊙	EWN 10+150 CL	4.8	173.9
⊛	MR 10+050 CL	9.3	177.1

Date May 2010

Project 1-09-4135



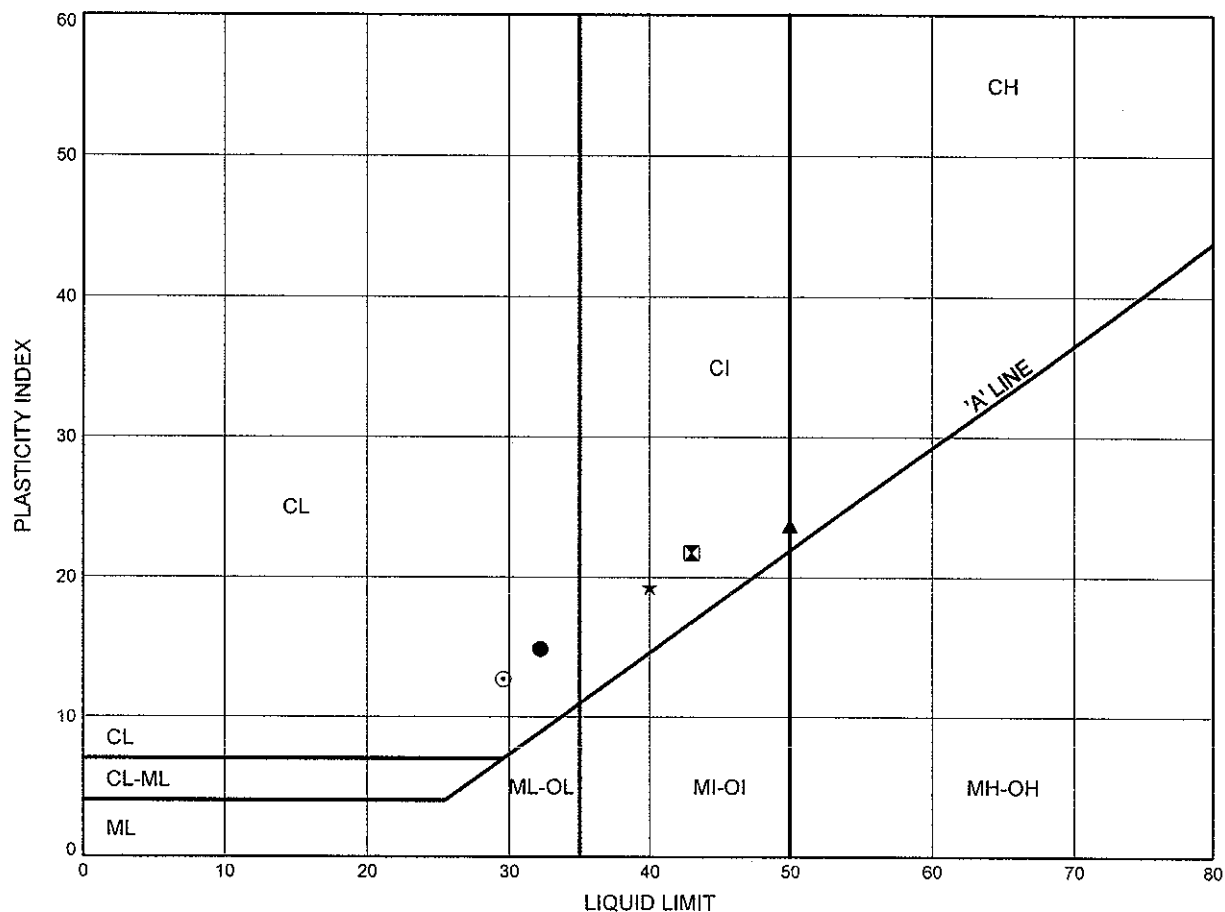
Prep'd DB

Chkd. RA

ATTERBERG LIMITS TEST RESULTS

FIGURE B1-15

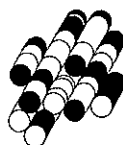
SILTY CLAY



SYMBOL	BOREHOLE	DEPTH (m)	ELEVATION (m)
●	MR 10+050 CL	13.9	172.5
⊠	MR 10+075 Lt	7.8	178.4
▲	MR 10+075 Lt	12.4	173.8
★	MR 10+100 CL	7.8	177.6
⊙	MR 10+100 CL	13.9	171.5

Date May 2010

Project 1-09-4135



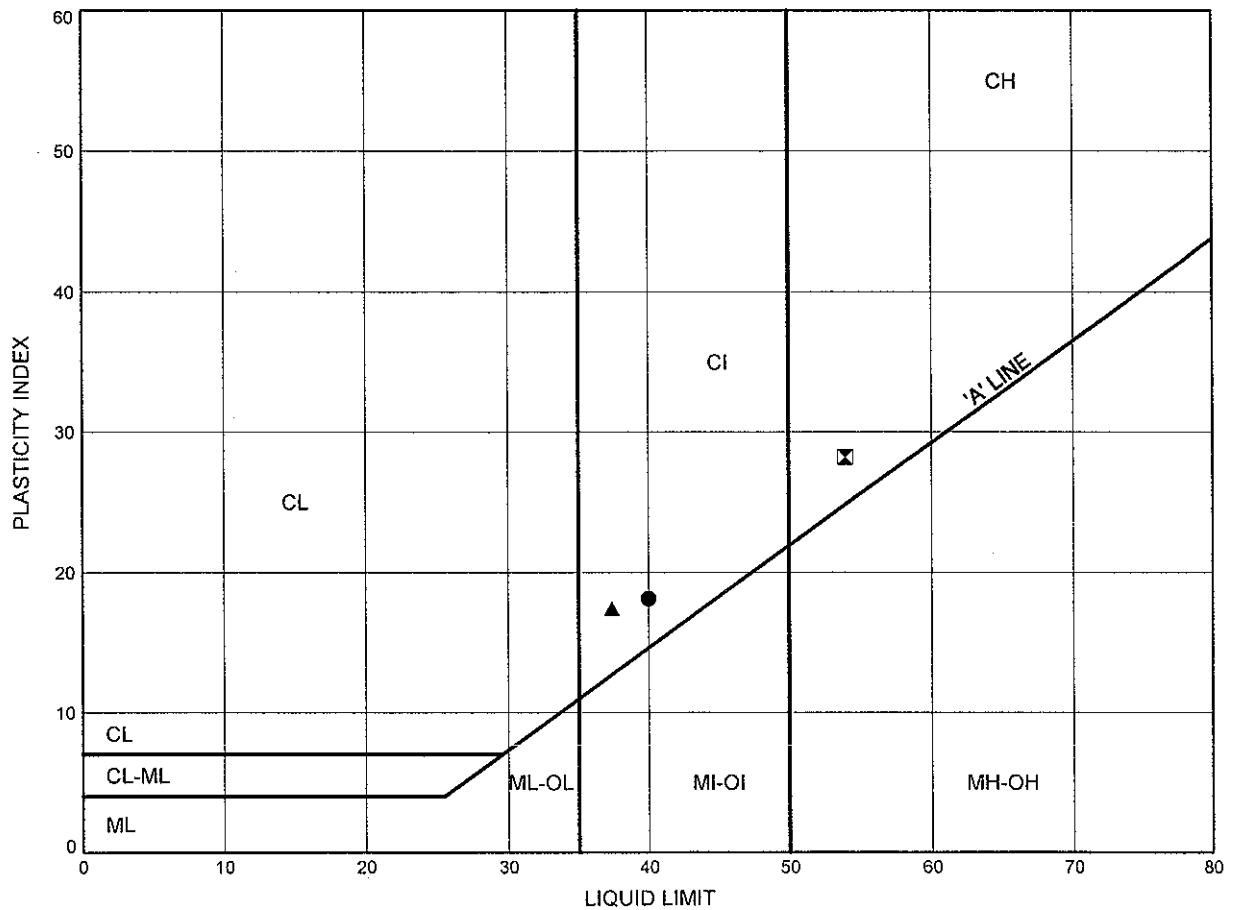
Prep'd DB

Chkd. RA

ATTERBERG LIMITS TEST RESULTS

FIGURE B1-16

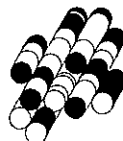
SILTY CLAY



SYMBOL	BOREHOLE	DEPTH (m)	ELEVATION (m)
●	MR 10+150 Lt	1.0	179.0
⊠	MR 10+200 Lt	1.7	178.1
▲	MR 10+200 Lt	4.7	175.1

Date May 2010

Project 1-09-4135



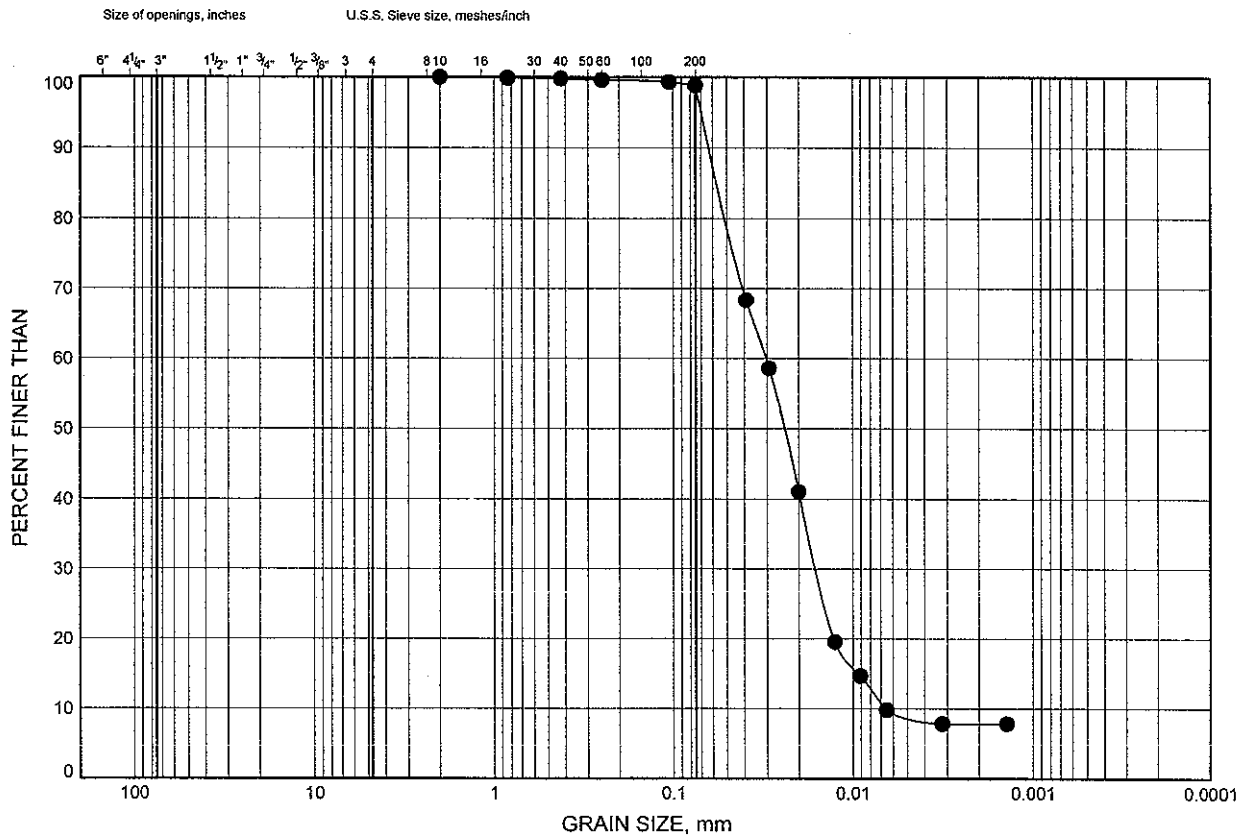
Prep'd DB

Chkd. RA

GRAIN SIZE DISTRIBUTION

FIGURE B1-17

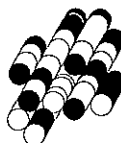
SILT



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

SYMBOL	BOREHOLE	DEPTH (m)	ELEVATION (m)
●	WN 10+000 Rt	10.9	169.5

Date May 2010
Project 1-09-4135



Prep'd DB
Chkd. RA

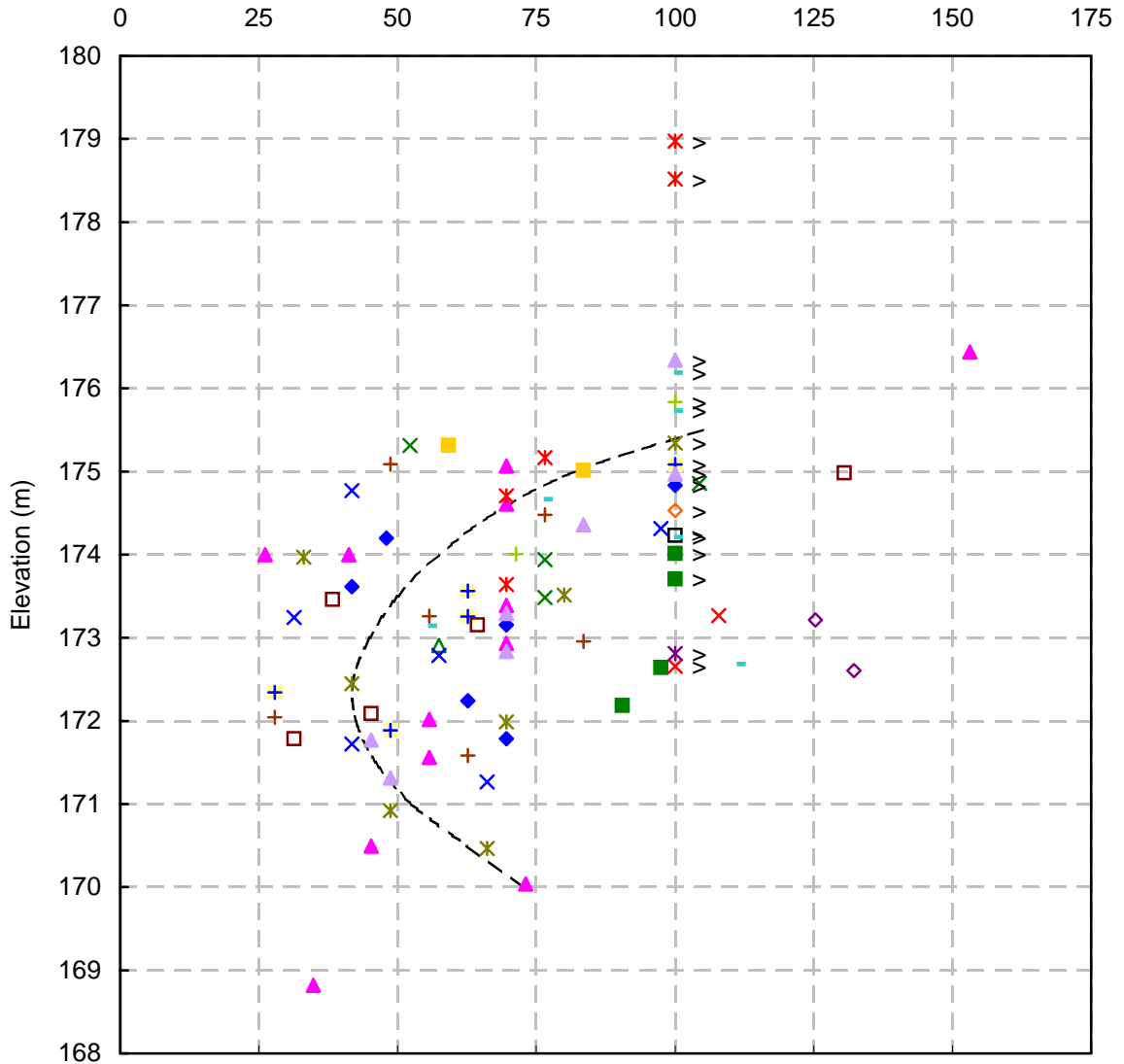
CORRECTED UNDRAINED SHEAR STRENGTH

FIGURE B1-18

MERRITT ROAD INTERCHANGE - SOUTHEAST QUADRANT

Silty Clay

Corrected Cu (kPa)



□ C1	◇ C4	△ SEW 10+200 CL	× SEW 10+250 LT	× SEW 10+250 RT
+ SEW 10+300 CL	■ SEW 10+350 LT	◆ SEW 10+350 RT	▲ WN 10+000 RT	× WN 10+050 CL
× EN 10+025 CL	+ EWN 10+100 LT	□ EWN 10+100 RT	◇ EWN 10+150 CL	▲ MR 10+050 CL
× MR 10+075 LT	× MR 10+100 CL	- MR 10+150 LT	+ MR 10+200 LT	■ MR 10+200 RT

Field Shear Vane Correction

Morris & Williams (1994)

$$(\mu = 1.18 \text{ EXP}(-0.08 \text{ Ip}) + 0.57)$$

Applied Correction Factors

0.84 (Elev.>176.5m)

0.87 (Elev.<176.5m)

Project No. : 1-09-4135

Date : September, 2010



Terraprobe Inc.

Prepared By : HW

Checked By : RA

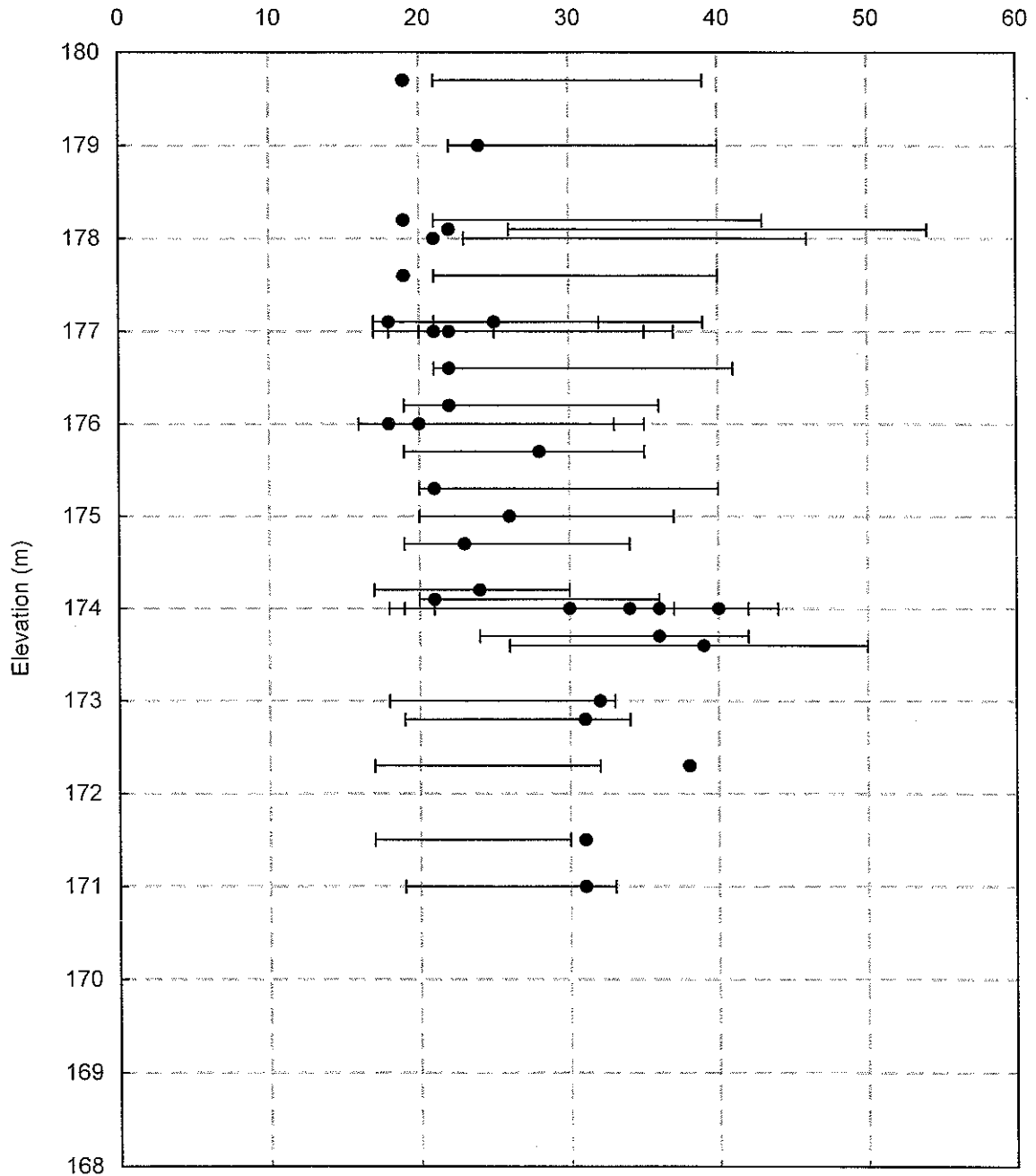
ATTERBERG LIMITS AND WATER CONTENTS

FIGURE B1-19

MERRITT ROAD INTERCHANGE - SOUTHEAST QUADRANT

Silty Clay

Atterberg Limits & Water Contents (%)



Project No. : 1-09-4135

Date : May, 2010

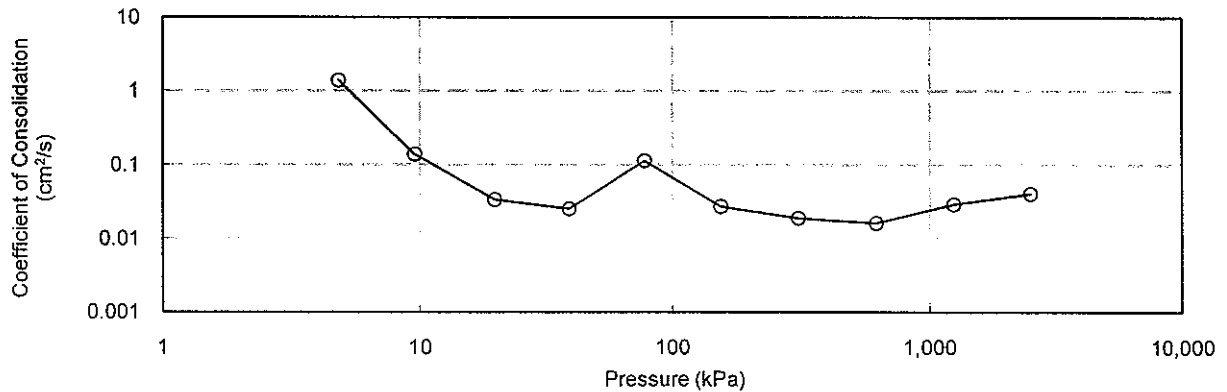


Terraprobe Inc.

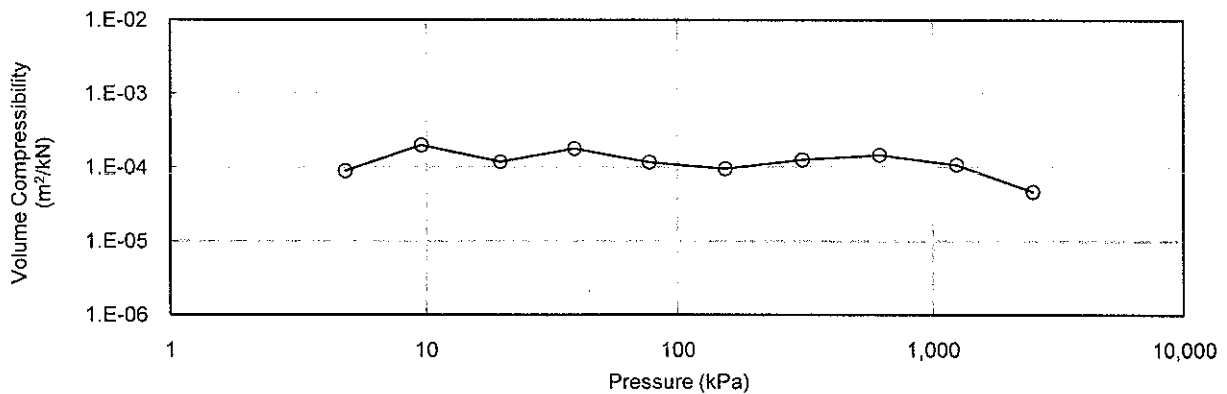
Prepared By : HW

Checked By : RA

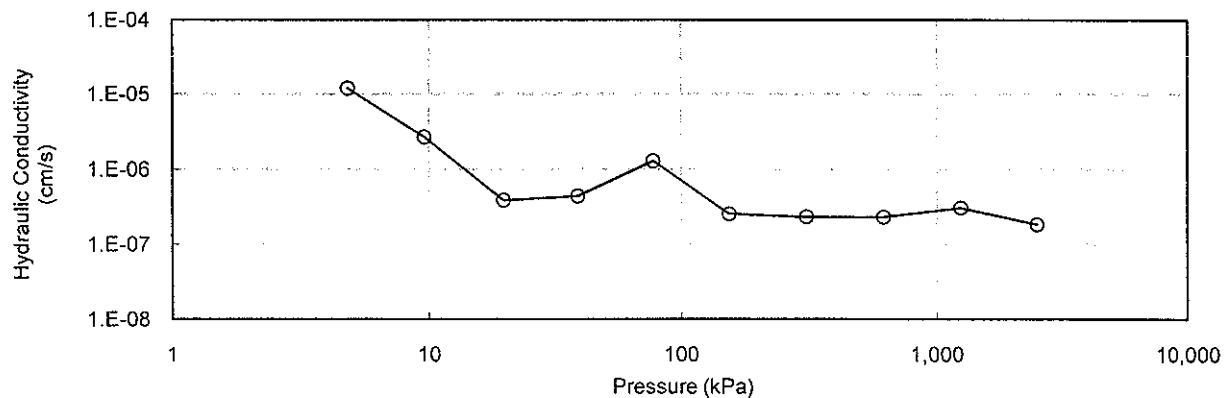
CONSOLIDATION TEST
Cv vs Pressure
SEW 10+300 CL, TW6



CONSOLIDATION TEST
mv vs Pressure
SEW 10+300 CL, TW6



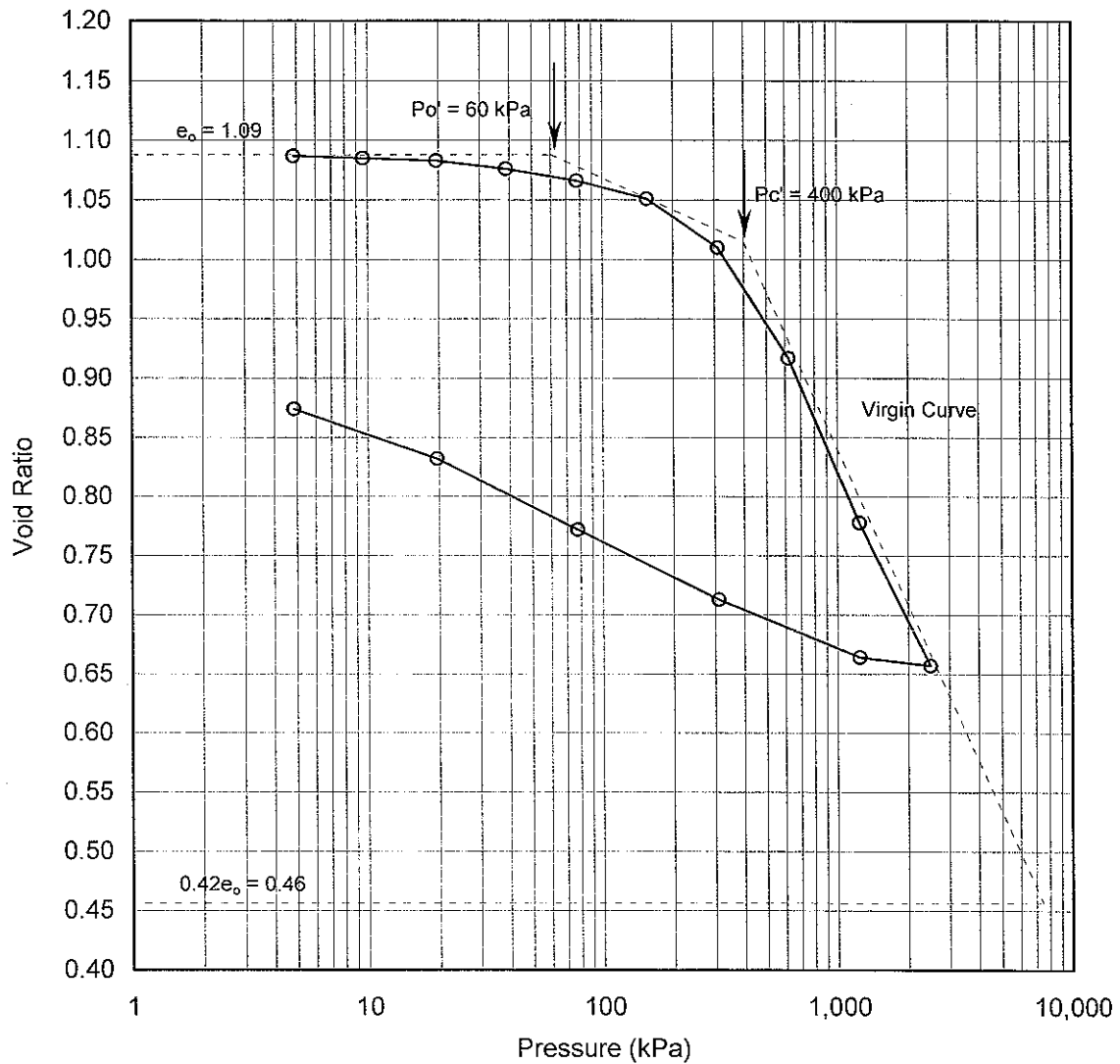
CONSOLIDATION TEST
k vs Pressure
SEW 10+300 CL, TW6



CONSOLIDATION TEST

e vs Pressure

SEW 10+300 CL, TW6



Soil Type : Silty Clay

$e_o =$	1.09	$\omega_L =$	43%	$P_{o'} =$	60 kPa
$\omega =$	36%	$\omega_p =$	19%	$P_{c'} =$	400 kPa
$\gamma =$	18.3 kN/m ³	PI =	23%	Cc =	0.439
Gs =	2.81			Cr =	0.089

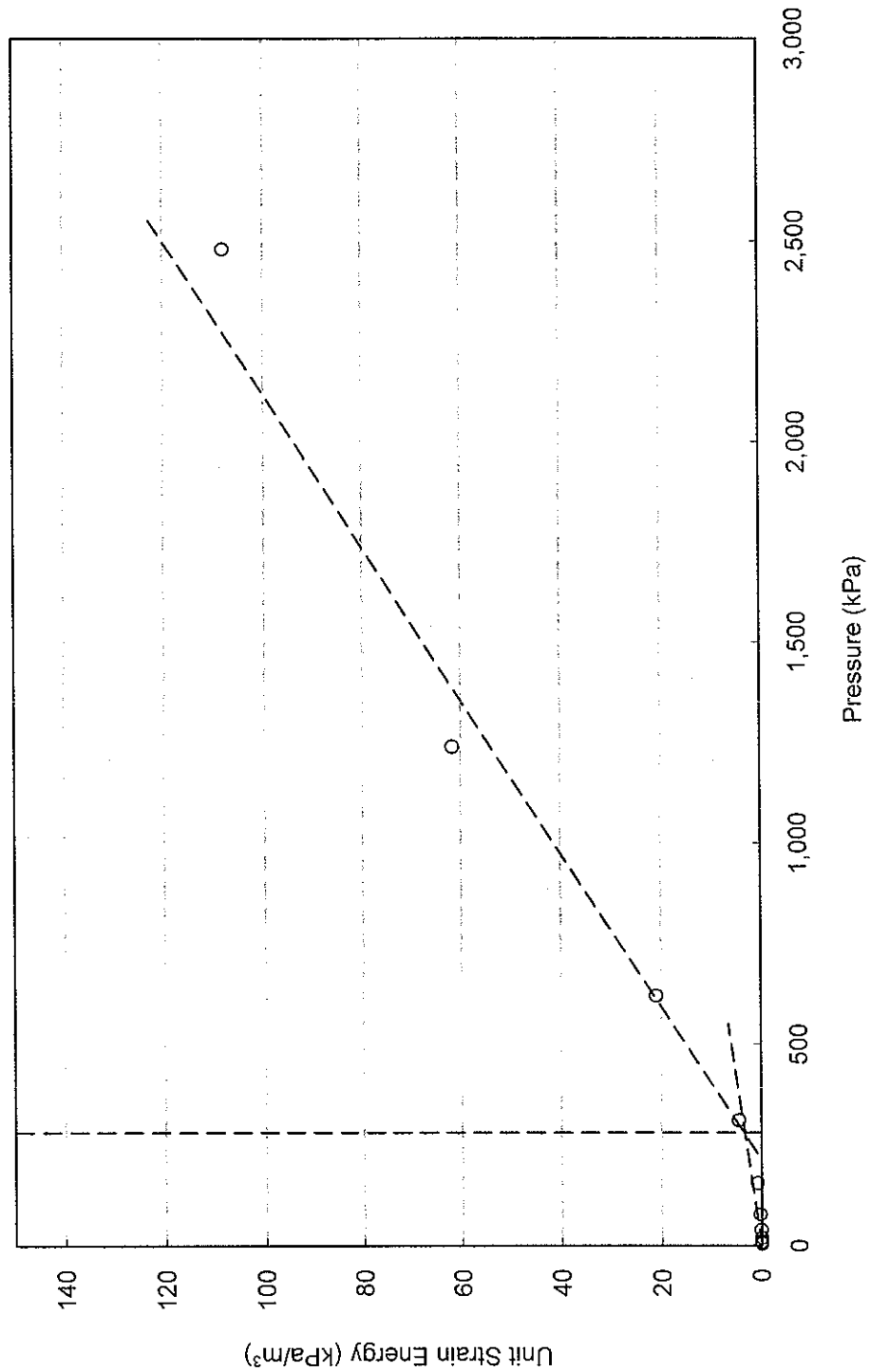
Project No. : 1-09-4135
Date : May 2010



Terraprobe Inc.

Prepared By : HW
Checked By : RA

CONSOLIDATION TEST
Unit Strain Energy vs Pressure
SEW 10+300 CL, TW6

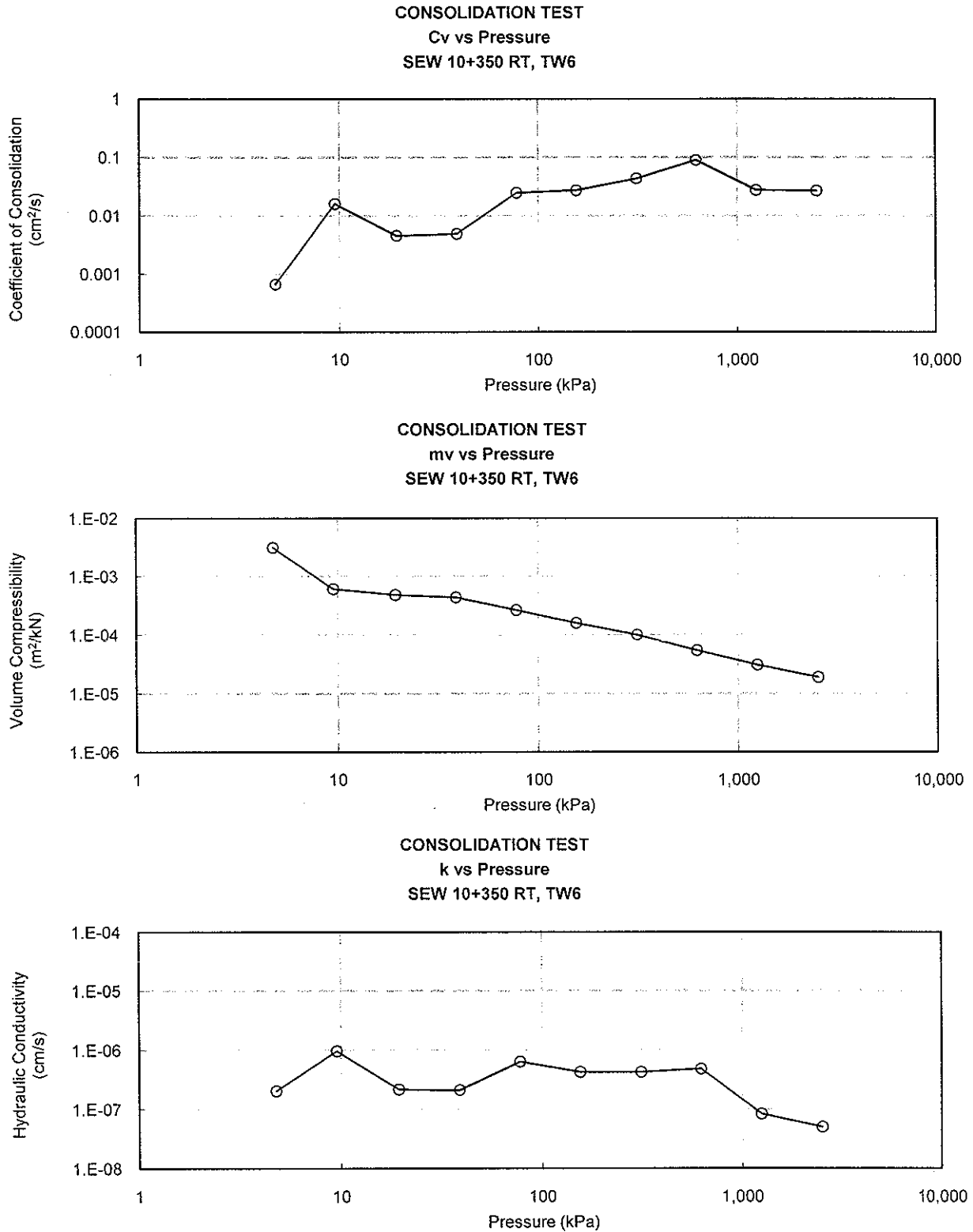


Project No. : 1-09-4135
 Date : May 2010



Terraprobe Inc.

Prepared By : HW
 Checked By : RA



C:\Documents and Settings\lanna\My Documents\Consolidation Results-Merritt Rd.xls

Project No. : 1-09-4135
Date : May 2010



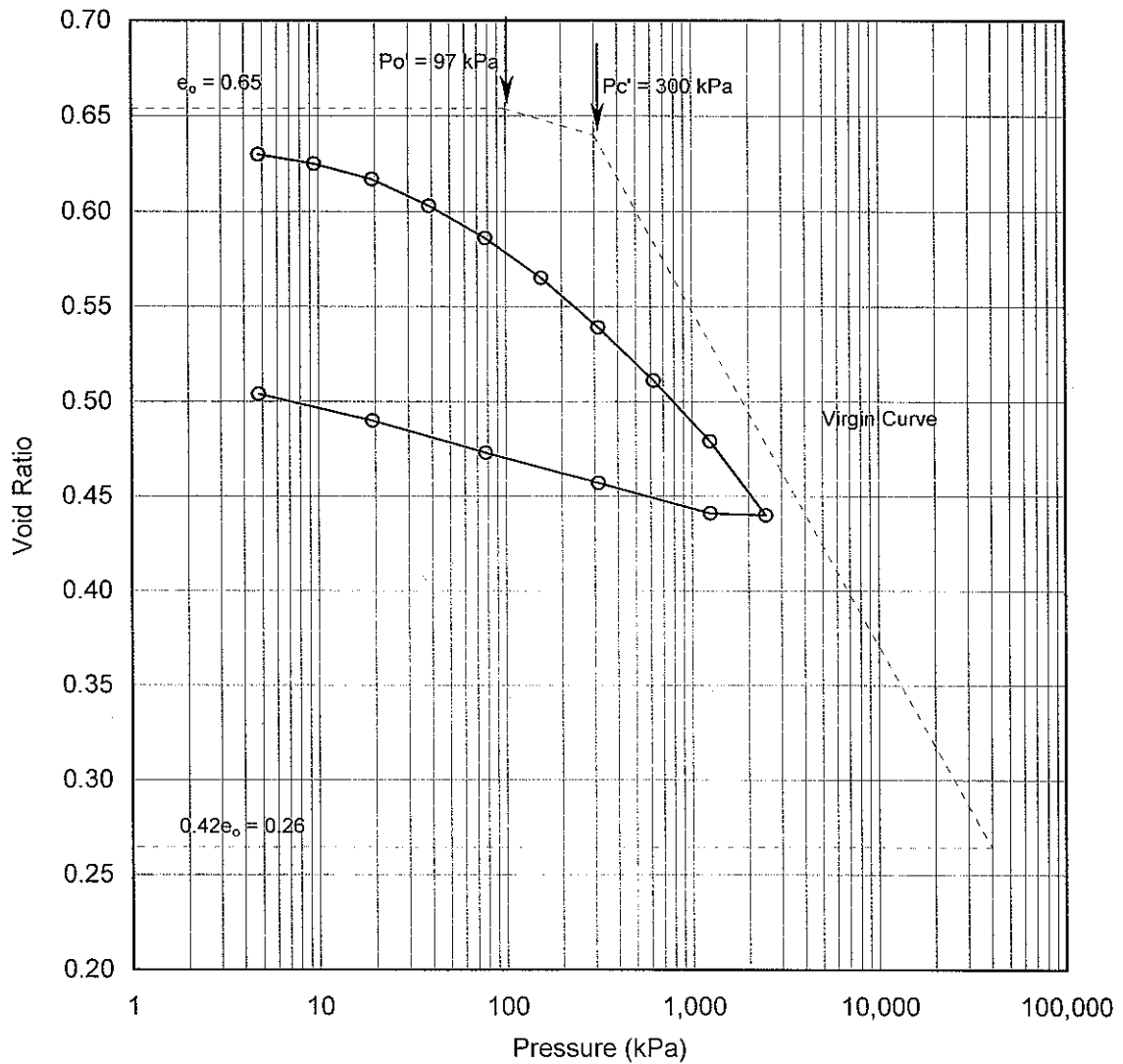
Terraprobe Inc.

Prepared By : HW
Checked By : RA

CONSOLIDATION TEST

e vs Pressure

SEW 10+350 RT, TW6



Soil Type : Silty Clay

$e_o =$	0.65	$\omega_L =$	30%	$P_o' =$	97 kPa
$\omega =$	24%	$\omega_P =$	17%	$P_c' =$	300 kPa
$\gamma =$	20.2 kN/m ³	PI =	12%	Cc =	0.177
Gs =	2.76			Cr =	0.029

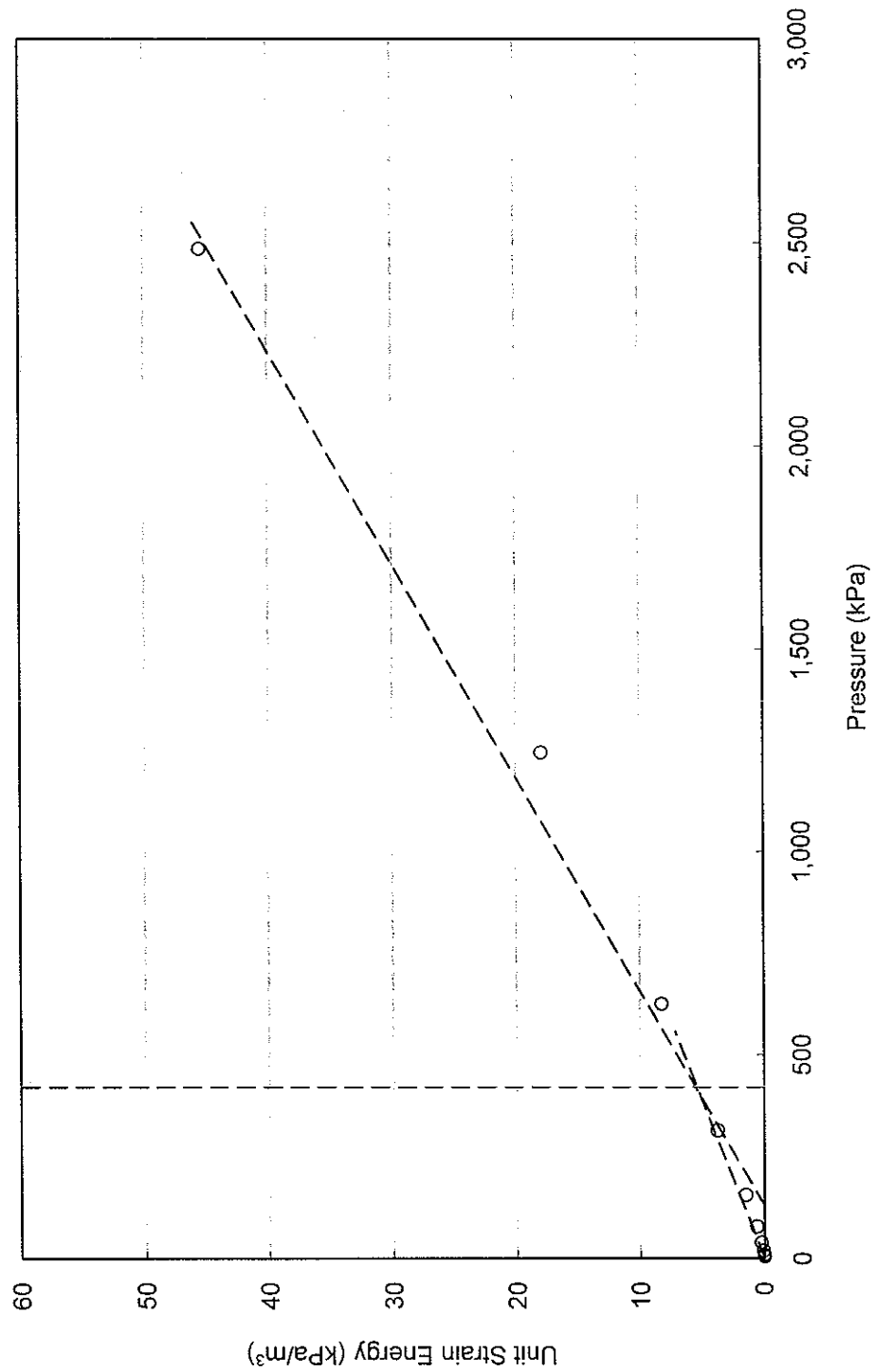
Project No. : 1-09-4135
 Date : May 2010



Terraprobe Inc.

Prepared By : HW
 Checked By : RA

CONSOLIDATION TEST
Unit Strain Energy vs Pressure
SEW 10+350 RT, TW6



$P_c = 420$ kPa

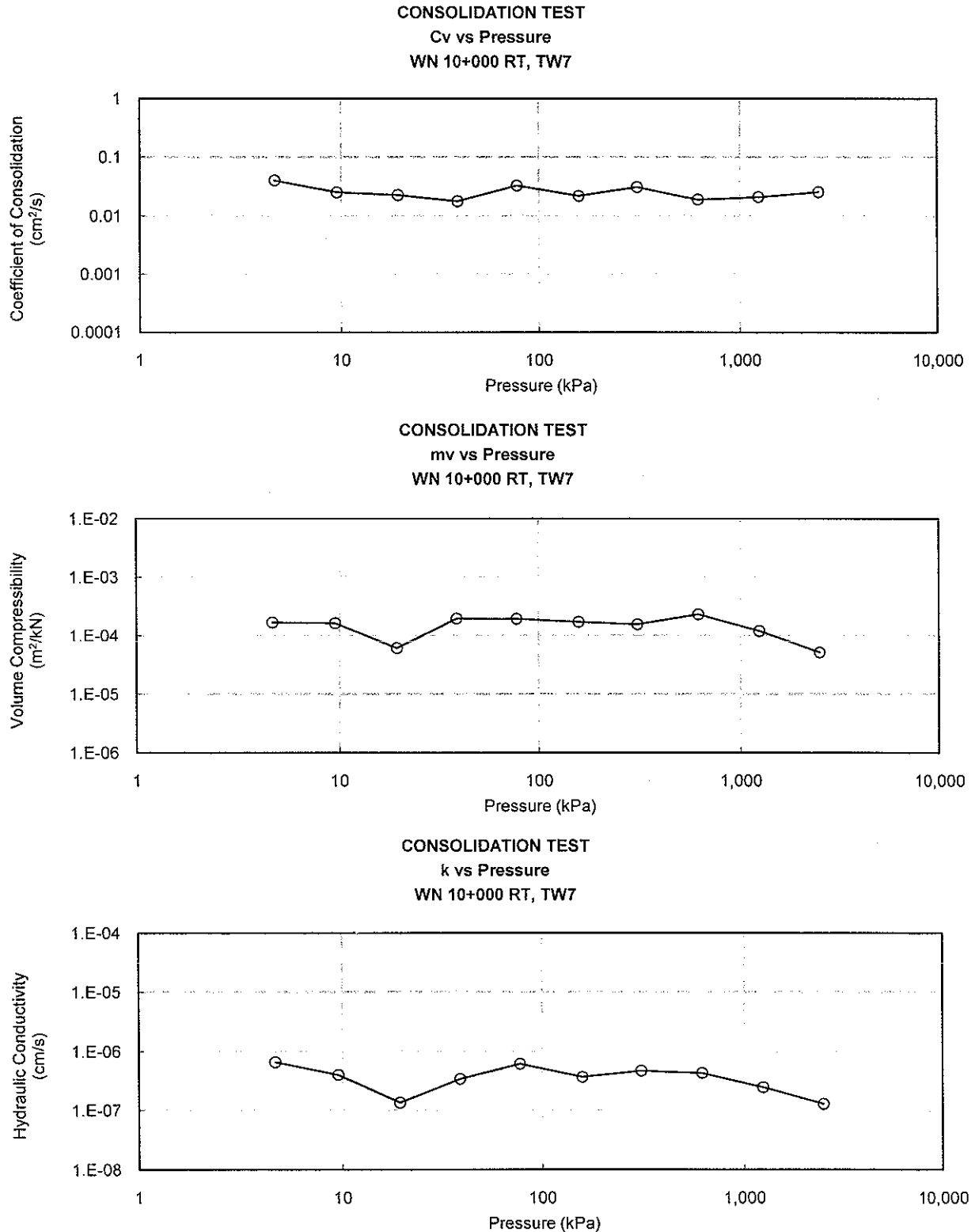
C:\Documents and Settings\Janna\My Documents\Consolidation Results-Merritt Rd.xls

Project No. : 1-09-4135
Date : May 2010



Terraprobe Inc.

Prepared By : HW
Checked By : RA



C:\Documents and Settings\jannalmy\Documents\Consolidation Results-Merritt Rd.xls

Project No. : 1-09-4135
Date : May 2010



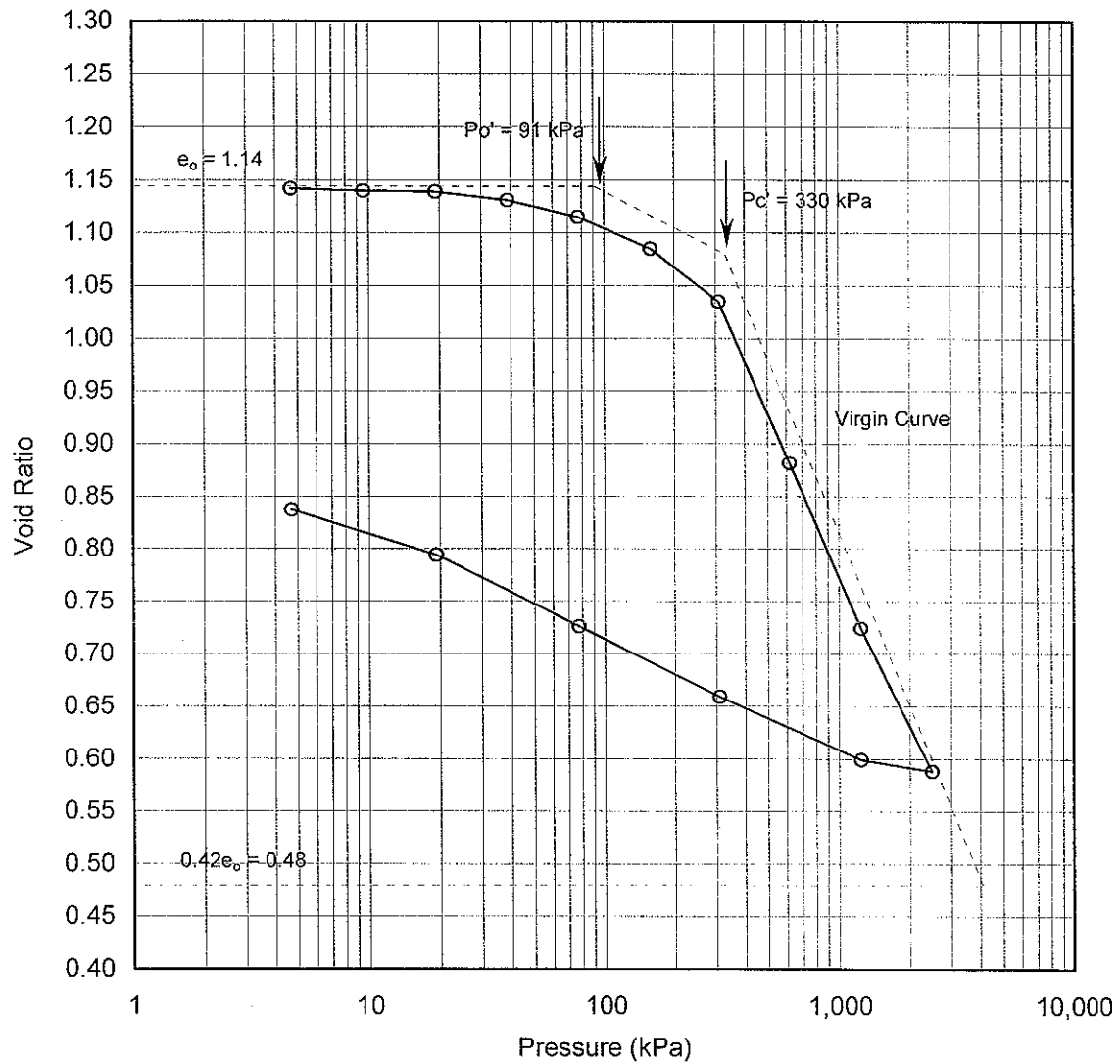
Terraprobe Inc.

Prepared By : HW
Checked By : RA

CONSOLIDATION TEST

e vs Pressure

WN 10+000 RT, TW7



Soil Type : Silty Clay

$e_0 =$	1.14	$\omega_L =$	44%	$P_{o'} =$	91 kPa
$\omega =$	40%	$\omega_P =$	21%	$P_{c'} =$	330 kPa
$\gamma =$	17.9 kN/m ³	PI =	23%	Cc =	0.549
Gs =	2.78			Cr =	0.114

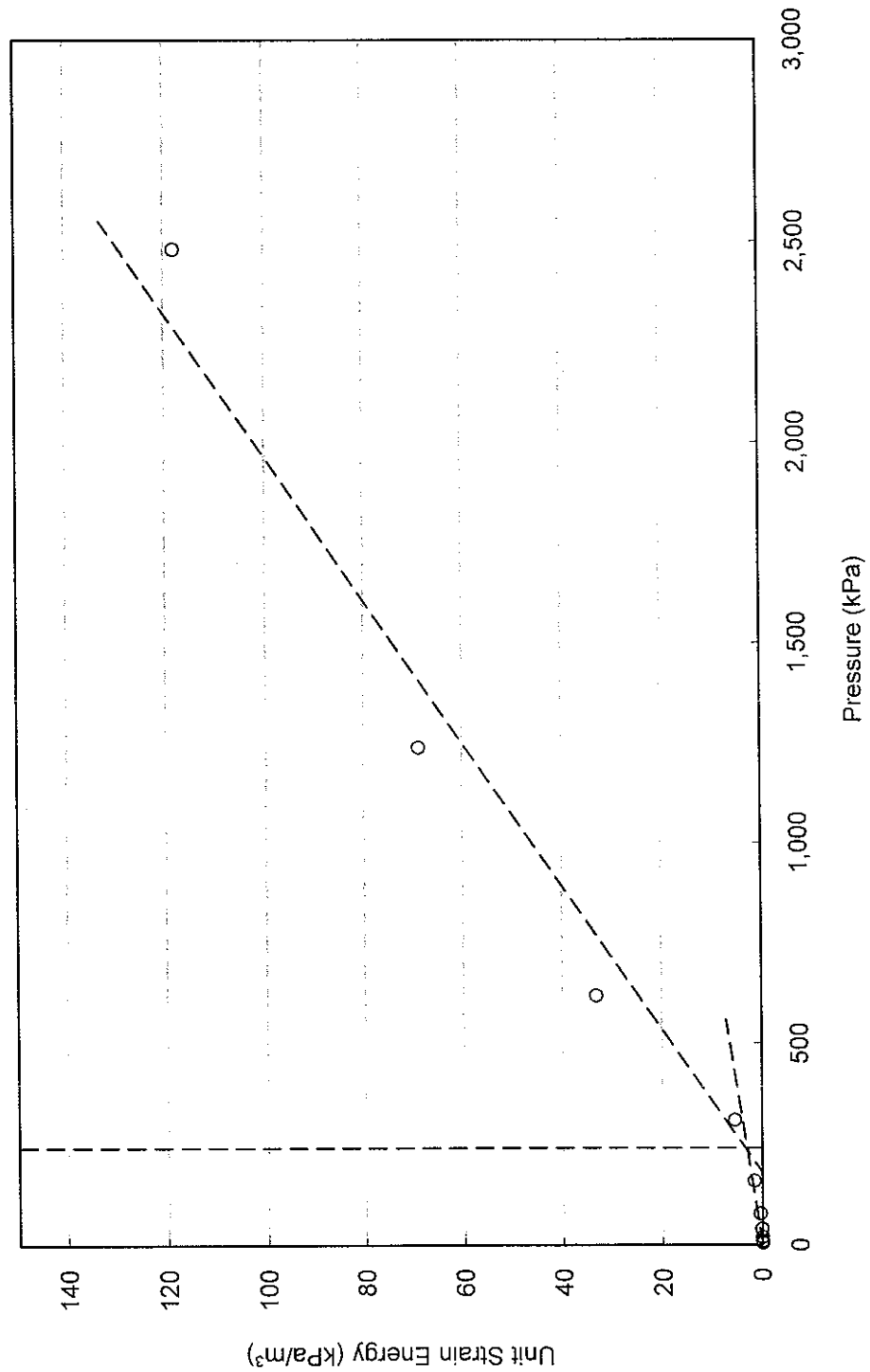
Project No. : 1-09-4135
Date : May 2010



Terraprobe Inc.

Prepared By : HW
Checked By : RA

CONSOLIDATION TEST
Unit Strain Energy vs Pressure
WN 10+000 RT, TW7



C:\Documents and Settings\JannalMy Documents\Consolidation Results-Merritt Rd.xls

Project No. : 1-09-4135
 Date : May 2010



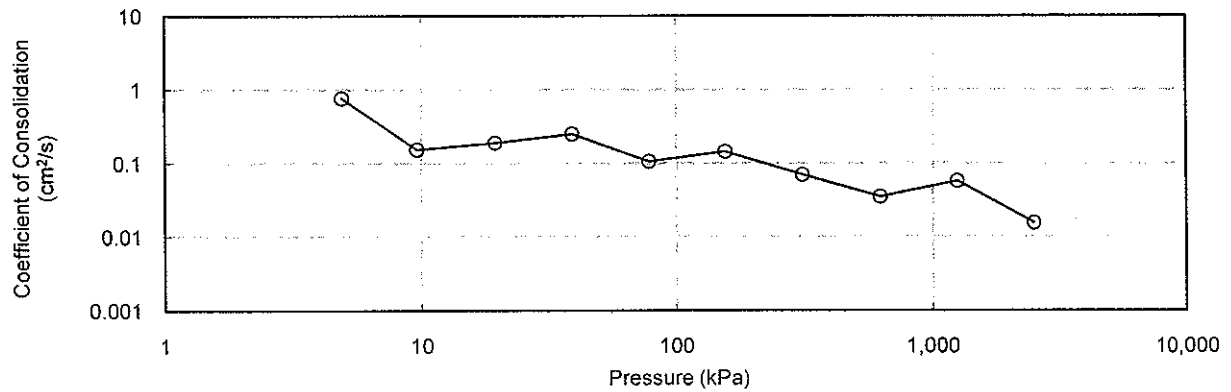
Terraprobe Inc.

Prepared By : HW
 Checked By : RA

CONSOLIDATION TEST

Cv vs Pressure

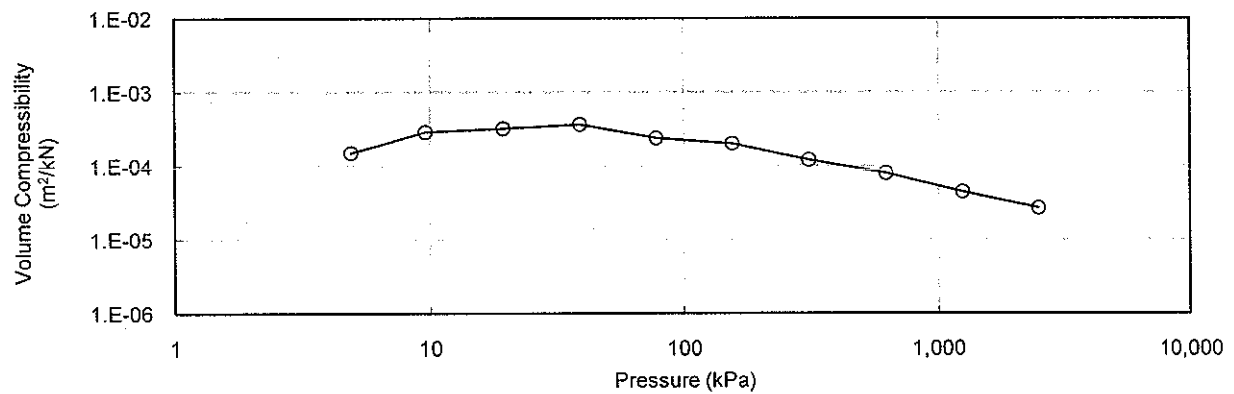
WN 10+050 CL, TW6



CONSOLIDATION TEST

mv vs Pressure

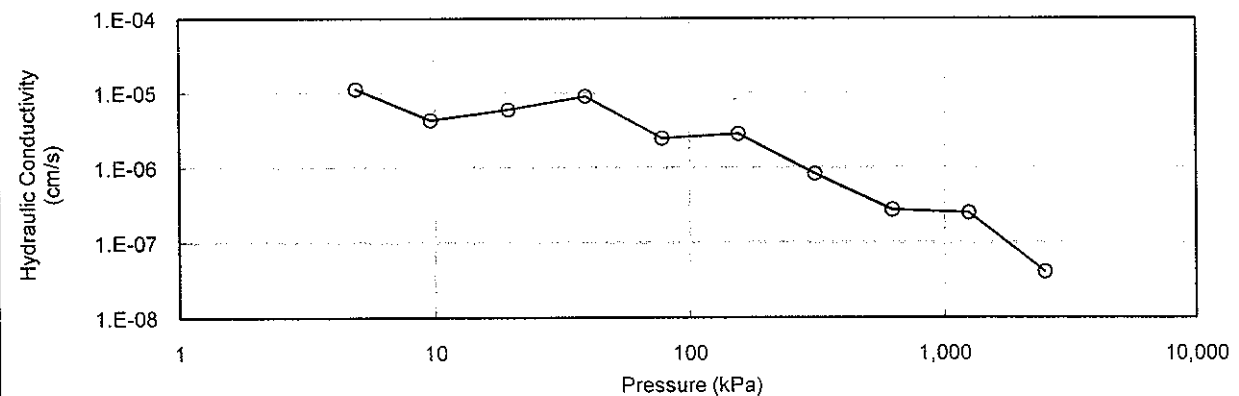
WN 10+050 CL, TW6



CONSOLIDATION TEST

k vs Pressure

WN 10+050 CL, TW6



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Project No. : 1-09-4135
Date : May 2010



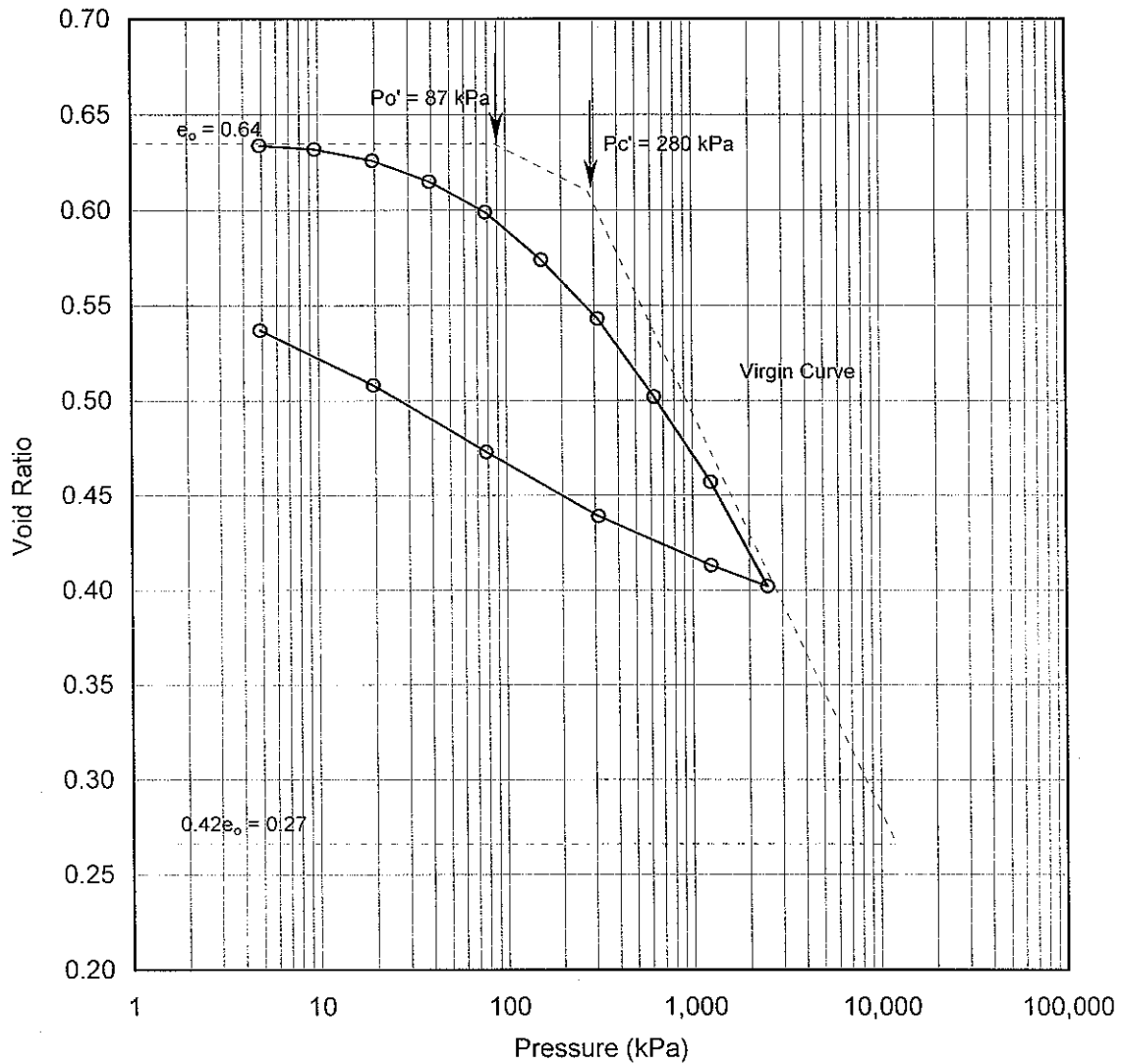
Terraprobe Inc.

Prepared By : HW
Checked By : RA

CONSOLIDATION TEST

e vs Pressure

WN 10+050 CL, TW6



Soil Type : Silty Clay

$e_o =$	0.64	$\omega_L =$	33%	$Po' =$	87 kPa
$\omega =$	20%	$\omega_p =$	17%	$Pc' =$	280 kPa
$\gamma =$	20.4 kN/m ³	PI =	17%	Cc =	0.211
Gs =	2.77			Cr =	0.049

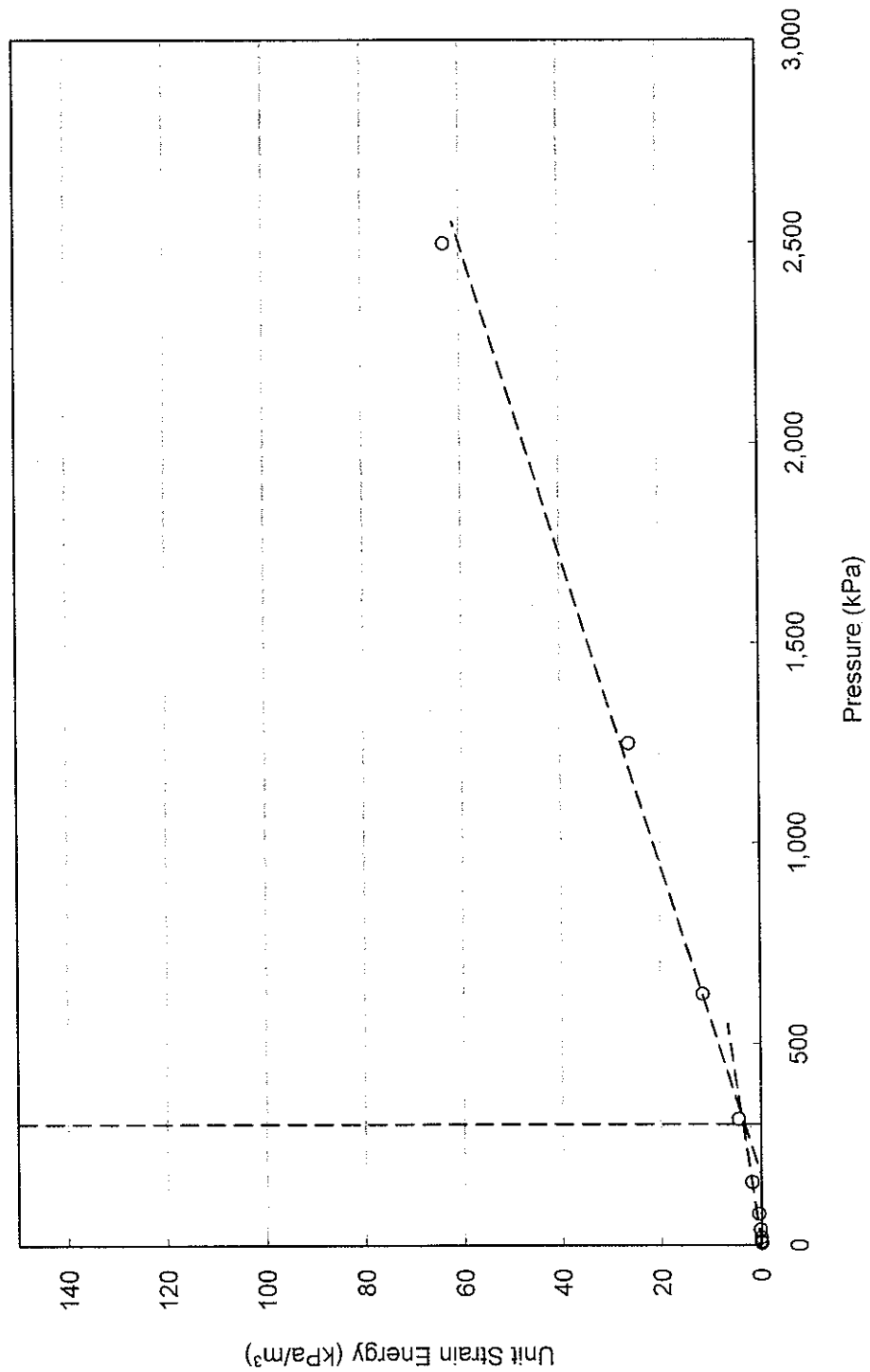
Project No. : 1-09-4135
 Date : May 2010



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Prepared By : HW
 Checked By : RA

CONSOLIDATION TEST
Unit Strain Energy vs Pressure
WN 10+050 CL, TW6



$P_c = 300 \text{ kPa}$

Project No. : 1-09-4135

Date : May 2010



Terraprobe Inc.

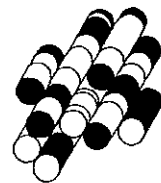
Prepared By : HW

Checked By : RA

APPENDIX B

Laboratory Test Results (North West Quadrant)

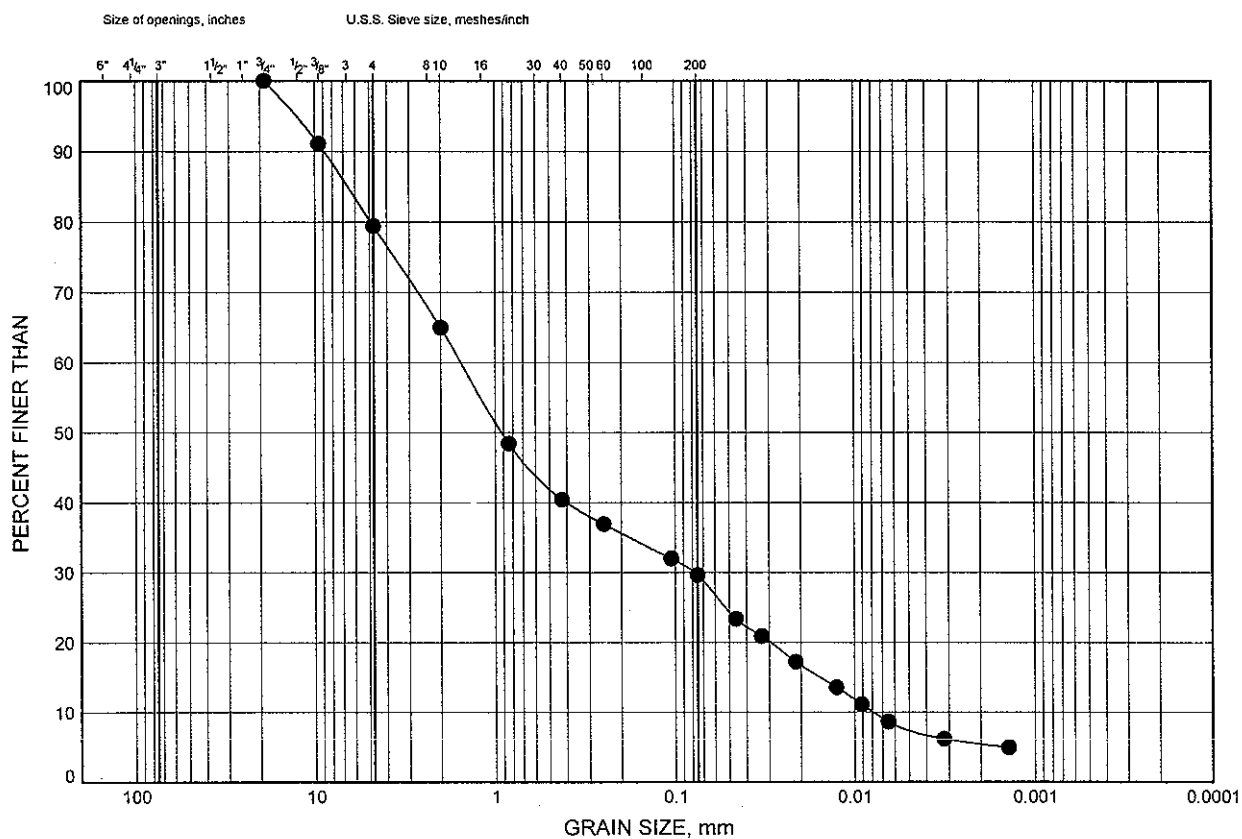
Terraprobe Inc.



GRAIN SIZE DISTRIBUTION

FIGURE B2-1

FILL - Sand and Gravel

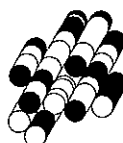


COBBLE SIZE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT and CLAY
	GRAVEL		SAND			FINE GRAINED

SYMBOL	BOREHOLE	DEPTH (m)	ELEVATION (m)
●	MR 9+950 Rt	0.3	179.9

Date May 2010

Project 1-09-4135



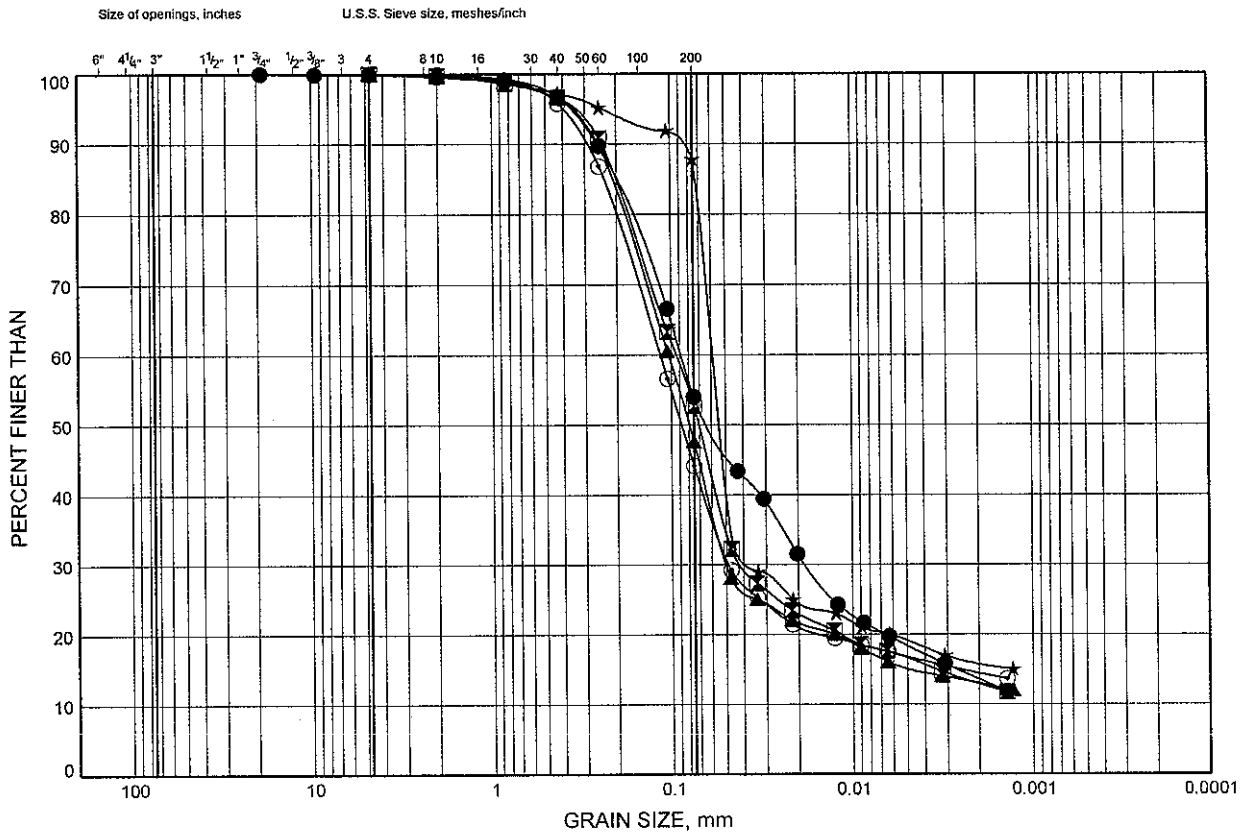
Prep'd DB

Chkd RA

GRAIN SIZE DISTRIBUTION

FIGURE B2-2

FILL - Silt to Silty Sand



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

SYMBOL BOREHOLE DEPTH (m) ELEVATION (m)

●	ES 10+000 Lt	4.7	180.3
⊠	EWS 10+100 Lt	0.3	180.2
▲	EWS 10+150 CL	0.3	180.8
★	NW 10+000 Rt	0.3	179.9
⊙	WS 10+025 CL	0.3	179.9

Date May 2010

Project 1-09-4135



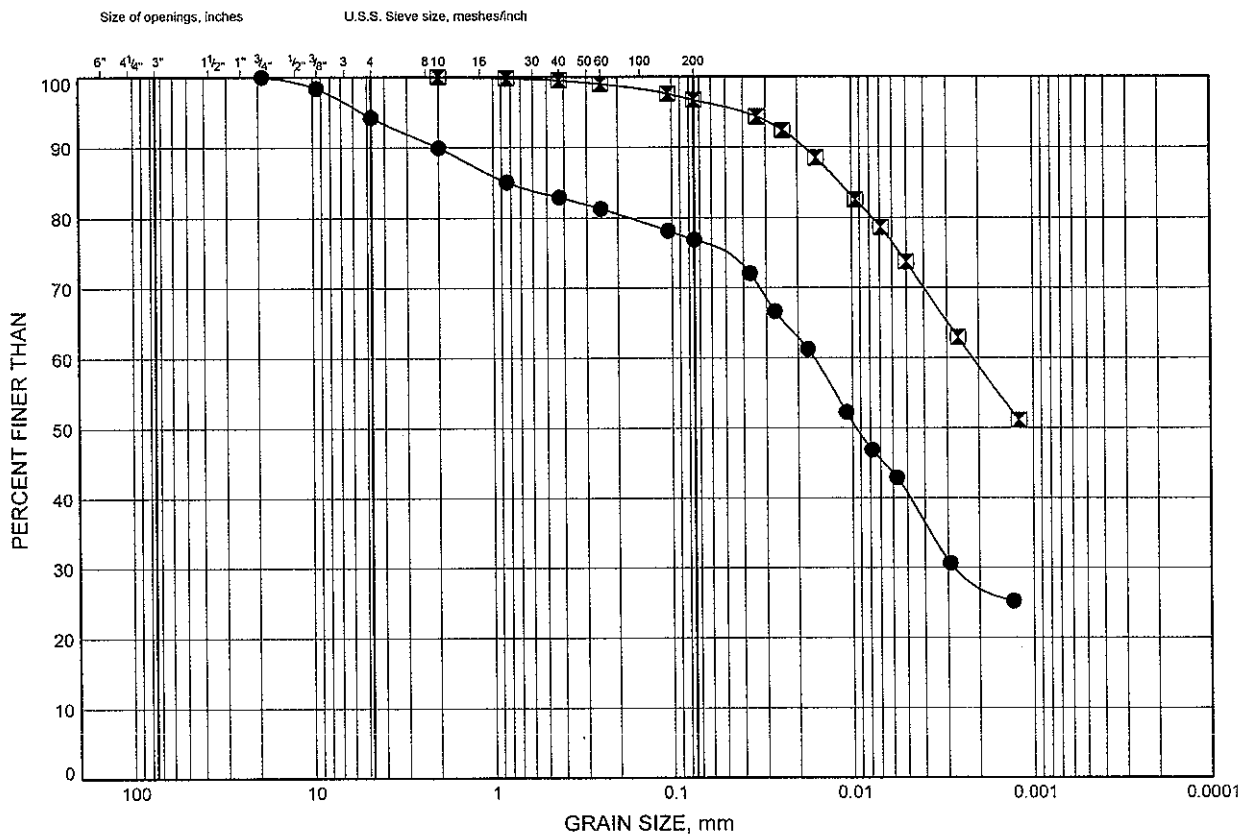
Prep'd DB

Chkd. RA

GRAIN SIZE DISTRIBUTION

FIGURE B2-3

FILL - Silty Clay



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

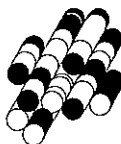
SYMBOL BOREHOLE DEPTH (m) ELEVATION (m)

● ES 10+000 Lt 1.0 184.0

⊠ EWS 10+100 Rt 1.0 179.7

Date May 2010

Project 1-09-4135



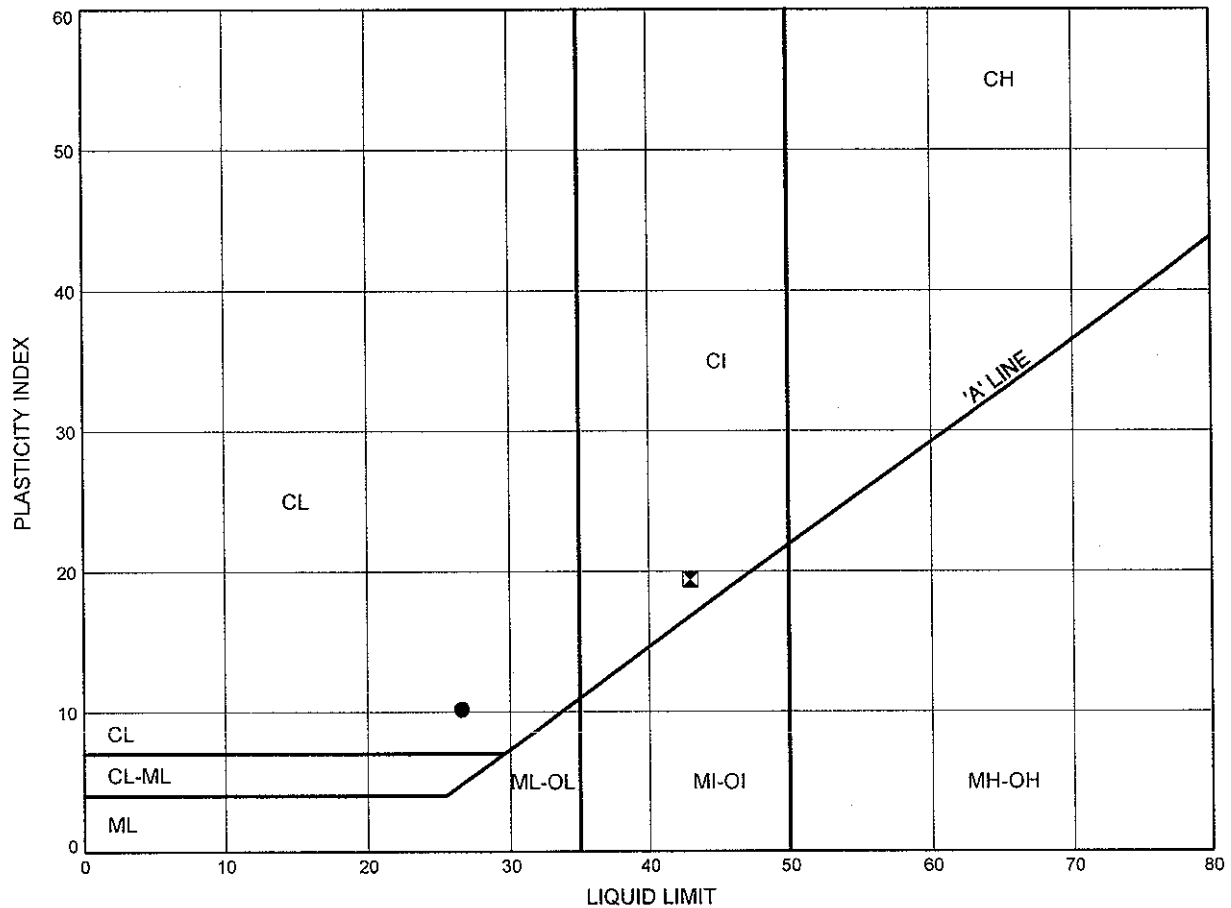
Prep'd DB

Chkd. RA

ATTERBERG LIMITS TEST RESULTS

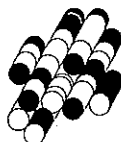
FIGURE B2-4

FILL - Silty Clay



SYMBOL	BOREHOLE	DEPTH (m)	ELEVATION (m)
●	ES 10+000 Lt	1.0	184.0
⊠	EWS 10+100 Rt	1.0	179.7

Date May 2010
Project 1-09-4135

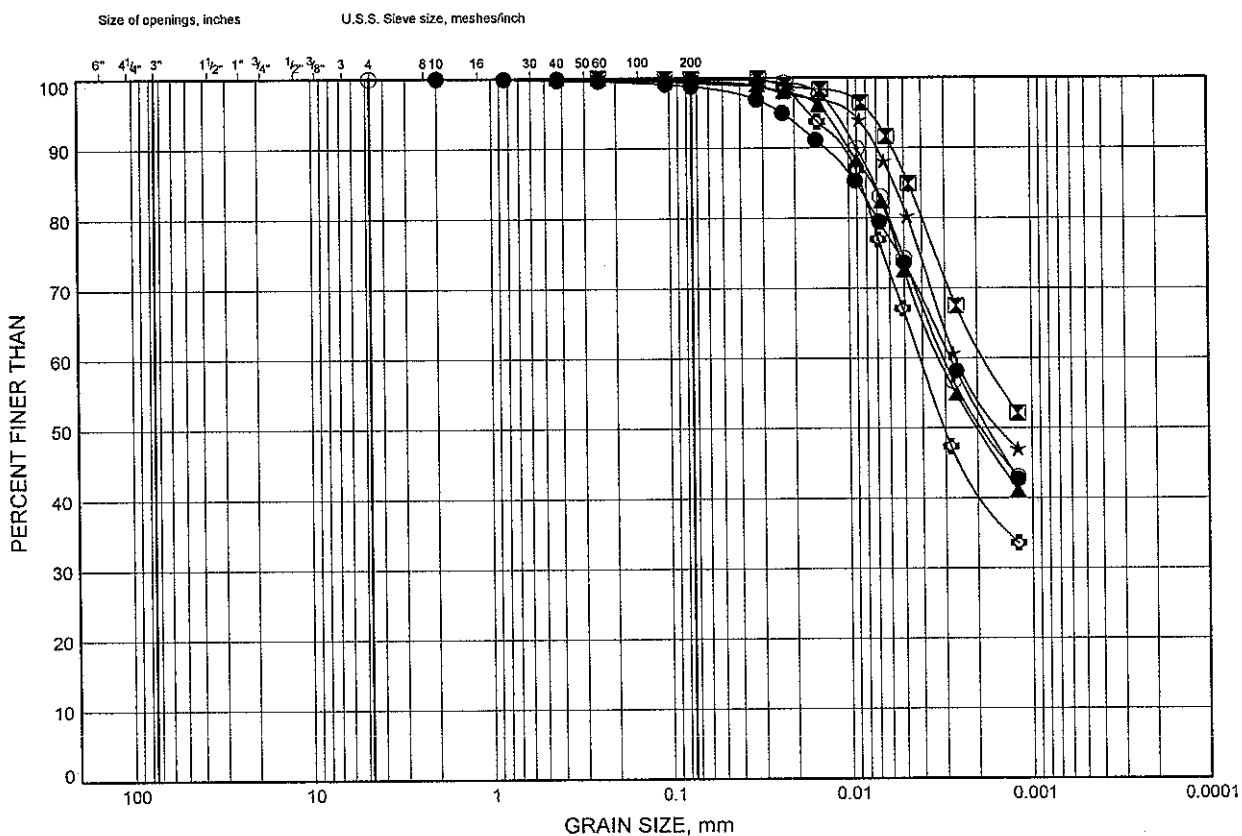


Prep'd DB
Chkd. RA

GRAIN SIZE DISTRIBUTION

FIGURE B2-5

SILTY CLAY



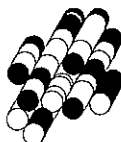
COBBLE SIZE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT and CLAY
	GRAVEL		SAND			FINE GRAINED

SYMBOL BOREHOLE DEPTH (m) ELEVATION (m)

●	NE 10+450 CL	1.7	178.5
⊠	NE 10+450 CL	2.5	177.7
▲	NW 10+000 Rt	1.7	178.5
★	NW 10+000 Rt	3.2	177.0
⊙	NW 10+050 CL	1.7	178.5
⊗	NW 10+050 CL	4.7	175.5

Date May 2010

Project 1-09-4135



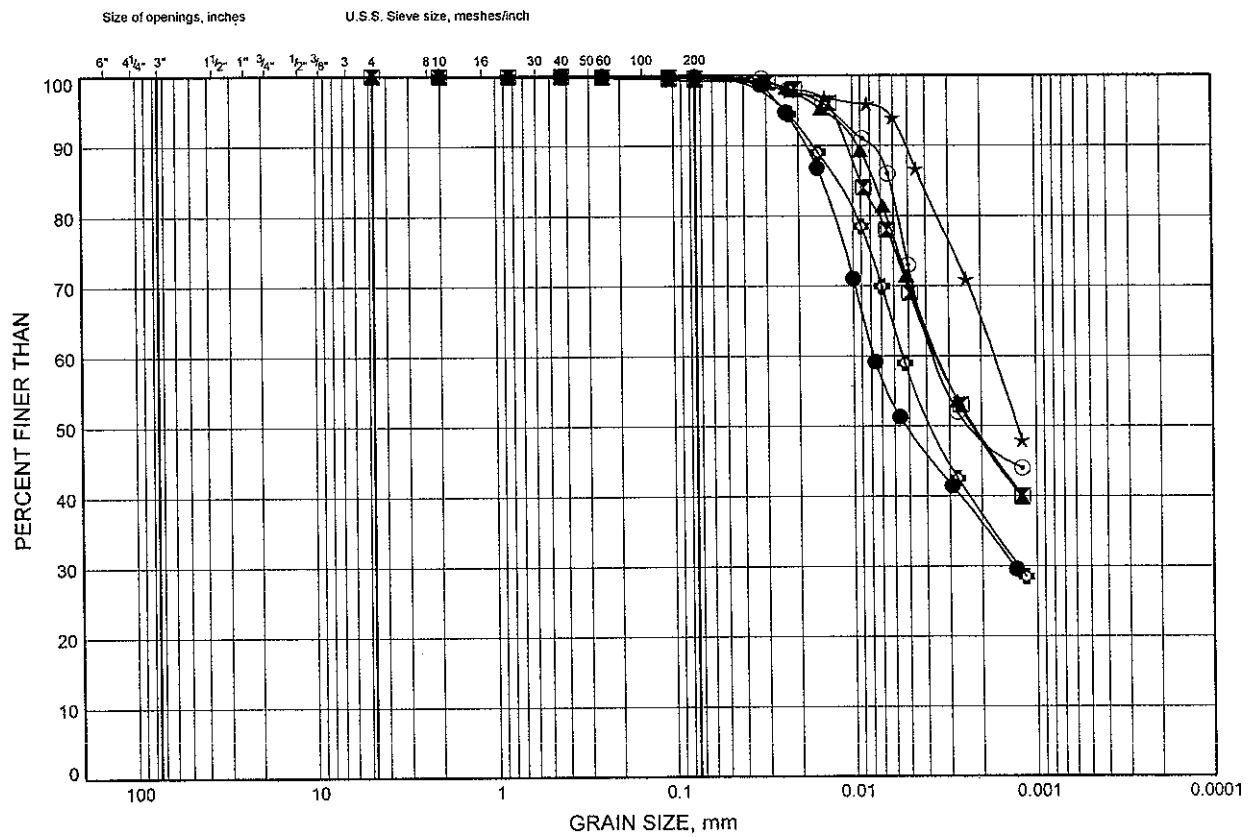
Prep'd DB

Chkd. RA

GRAIN SIZE DISTRIBUTION

FIGURE B2-6

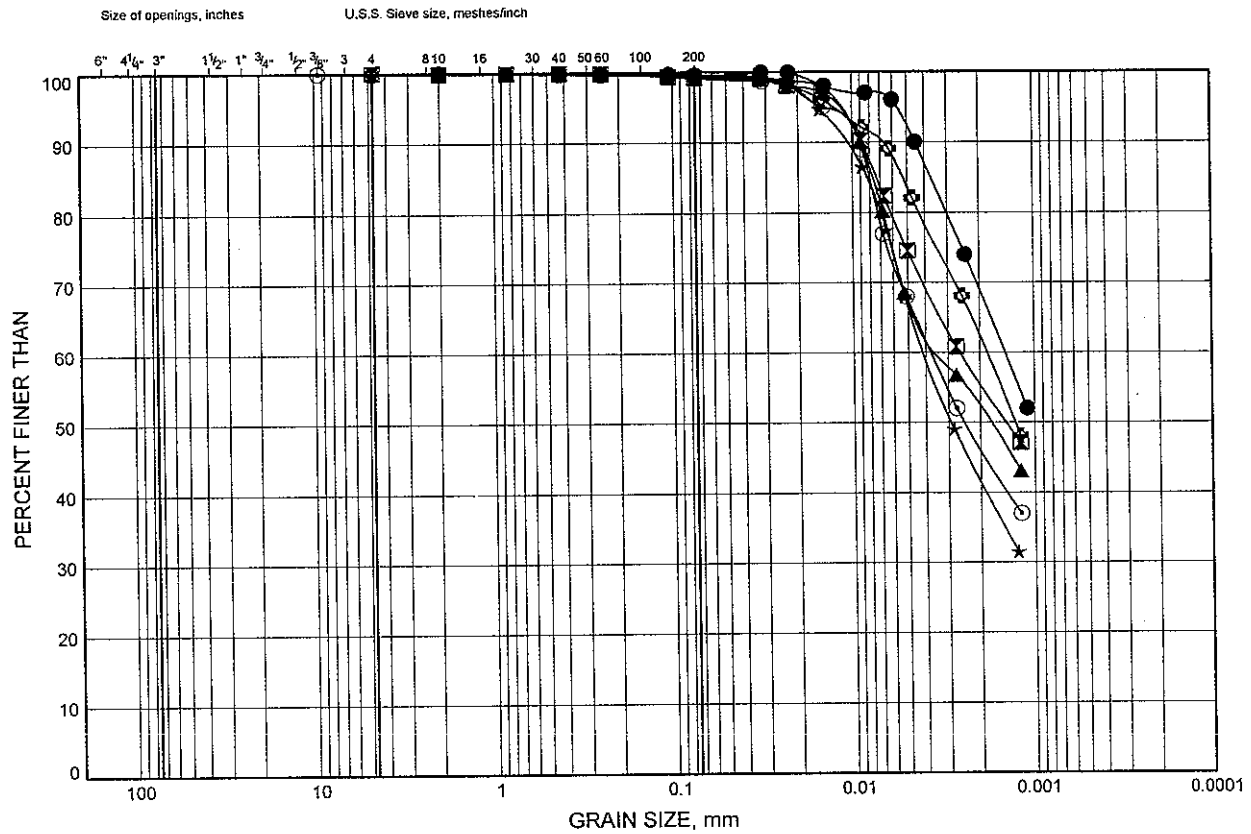
SILTY CLAY



GRAIN SIZE DISTRIBUTION

FIGURE B2-7

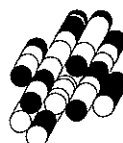
SILTY CLAY



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

SYMBOL	BOREHOLE	DEPTH (m)	ELEVATION (m)
●	EWS 10+100 Lt	6.3	174.2
⊠	EWS 10+100 Rt	2.5	178.2
▲	EWS 10+100 Rt	4.7	176.0
★	EWS 10+100 Rt	6.3	174.4
⊙	WS 10+025 CL	2.5	177.7
⊛	WS 10+025 CL	6.3	173.9

Date May 2010
Project 1-09-4135

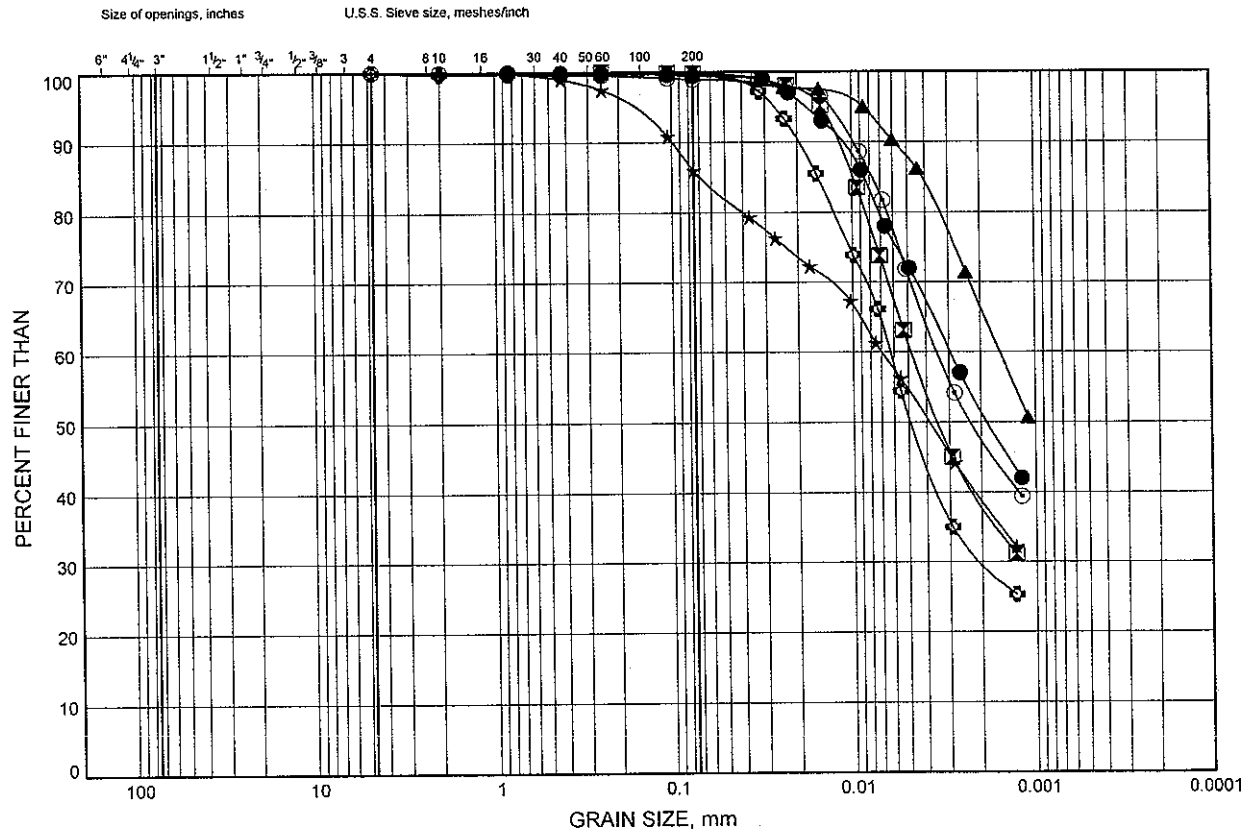


Prep'd DB
Chkd RA

GRAIN SIZE DISTRIBUTION

FIGURE B2-8

SILTY CLAY

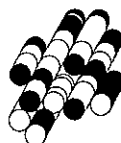


COBBLE SIZE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT and CLAY
	GRAVEL		SAND			FINE GRAINED

SYMBOL	BOREHOLE	DEPTH (m)	ELEVATION (m)
●	MR 9+850 Rt	1.7	178.1
⊠	MR 9+850 Rt	4.7	175.1
▲	MR 9+850 Rt	6.3	173.5
★	MR 9+900 CL	6.3	179.0
⊙	MR 9+900 CL	10.9	174.4
⊛	MR 9+900 CL	13.9	171.4

Date May 2010

Project 1-09-4135



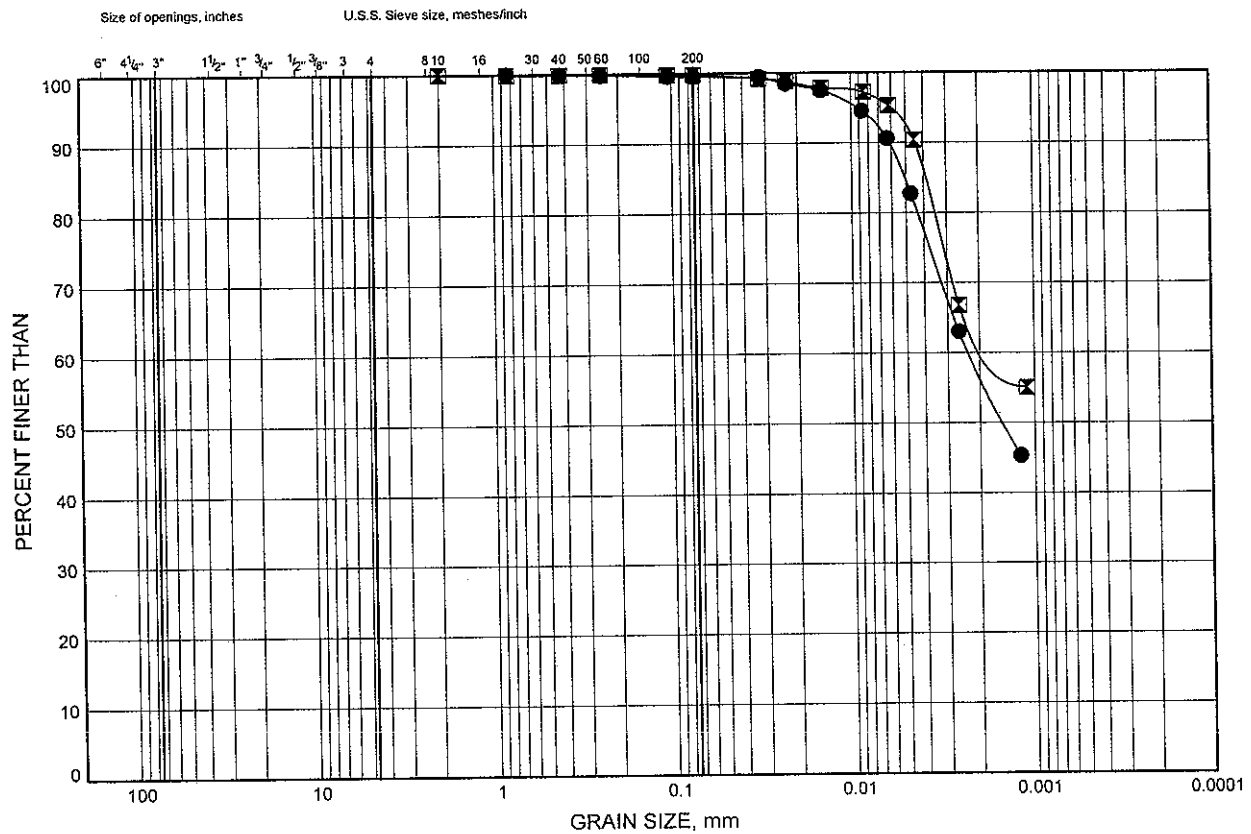
Prep'd DB

Chkd. RA

GRAIN SIZE DISTRIBUTION

FIGURE B2-9

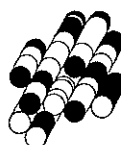
SILTY CLAY



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

SYMBOL	BOREHOLE	DEPTH (m)	ELEVATION (m)
●	MR 9+950 Rt	0.9	179.3
⊠	MR 9+950 Rt	6.3	173.9

Date May 2010
Project 1-09-4135

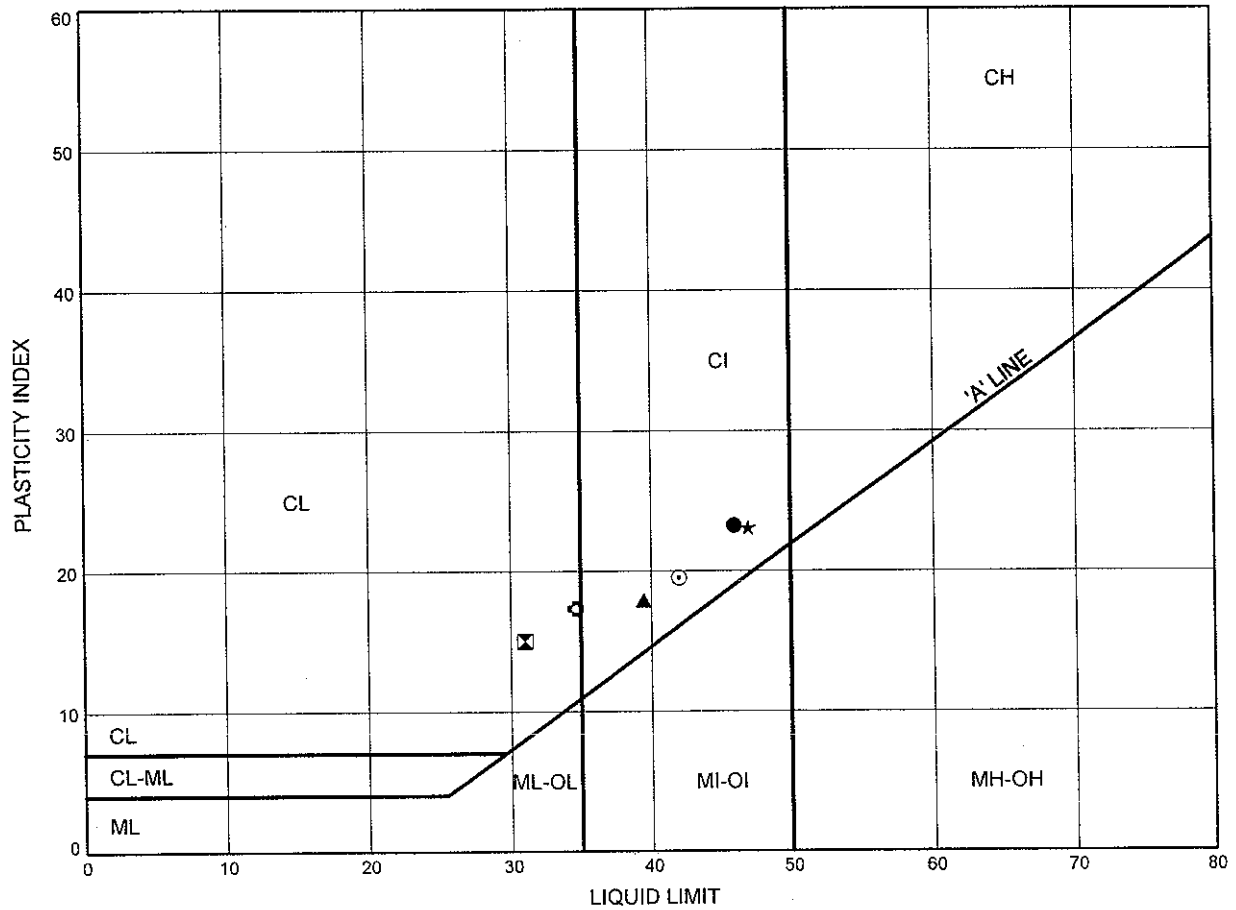


Prep'd DB
Chkd. RA

ATTERBERG LIMITS TEST RESULTS

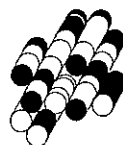
FIGURE B2-10

SILTY CLAY



SYMBOL	BOREHOLE	DEPTH (m)	ELEVATION (m)
●	NE 10+450 CL	2.5	177.7
⊠	NE 10+450 CL	7.8	172.4
▲	NW 10+000 Rt	1.7	178.5
★	NW 10+000 Rt	3.2	177.0
⊙	NW 10+050 CL	1.7	178.5
⊛	NW 10+050 CL	4.7	175.5

Date May 2010
Project 1-09-4135



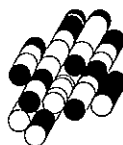
Prep'd DB
Chkd. RA

FIGURE B2-11

SYMBOL	BOREHOLE	DEPTH (m)	ELEVATION (m)
●	ES 10+000 Lt	12.4	172.6
⊠	ES 10+000 Rt	9.3	175.6
▲	ES 10+050 CL	7.8	178.1
★	ES 10+050 CL	12.4	173.5
⊙	EWS 10+100 Lt	1.7	178.8
⊛	EWS 10+100 Lt	6.3	174.2

Prep'dDB.....

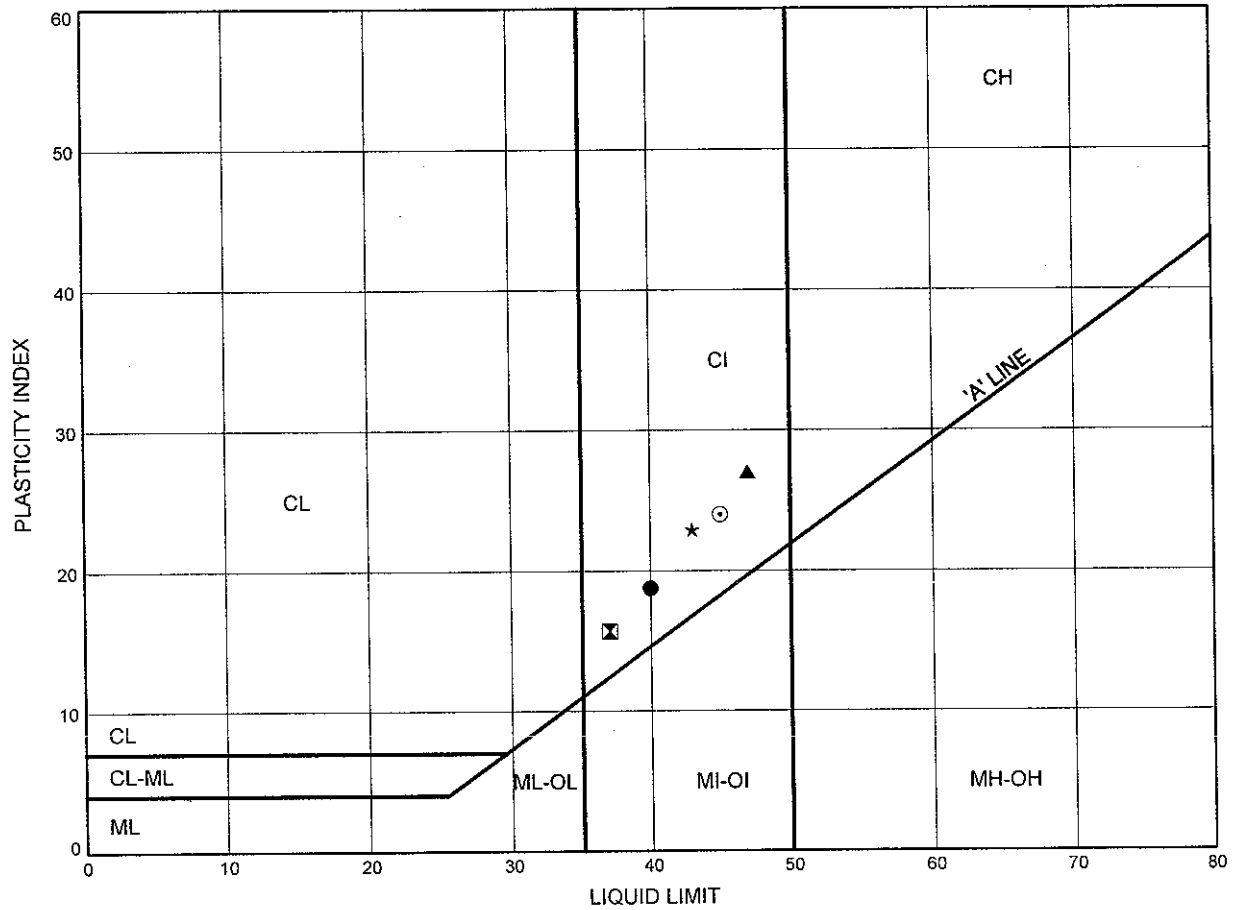
Chkd. RA



ATTERBERG LIMITS TEST RESULTS

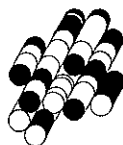
FIGURE B2-12

SILTY CLAY



SYMBOL	BOREHOLE	DEPTH (m)	ELEVATION (m)
●	EWS 10+100 Rt	2.5	178.2
⊠	EWS 10+100 Rt	4.7	176.0
▲	EWS 10+100 Rt	6.3	174.4
★	WS 10+025 CL	2.5	177.7
⊙	WS 10+025 CL	6.3	173.9

Date May 2010
Project 1-09-4135

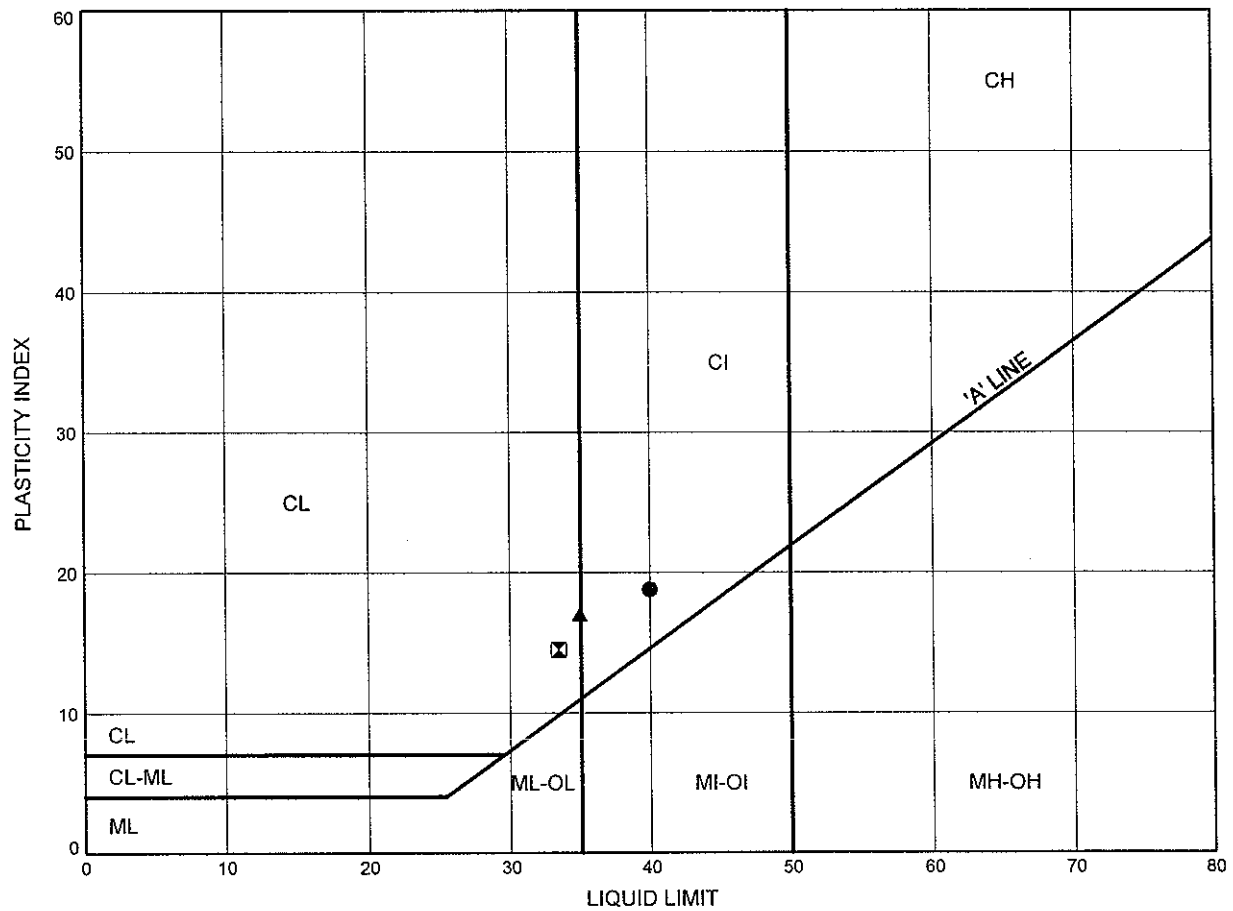


Prep'd DB
Chkd. RA

ATTERBERG LIMITS TEST RESULTS

FIGURE B2-13

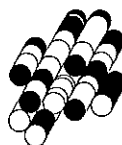
SILTY CLAY



SYMBOL	BOREHOLE	DEPTH (m)	ELEVATION (m)
●	MR 9+850 Rt	1.7	178.1
⊠	MR 9+850 Rt	4.7	175.1
▲	MR 9+850 Rt	6.3	173.5

Date May 2010

Project 1-09-4135



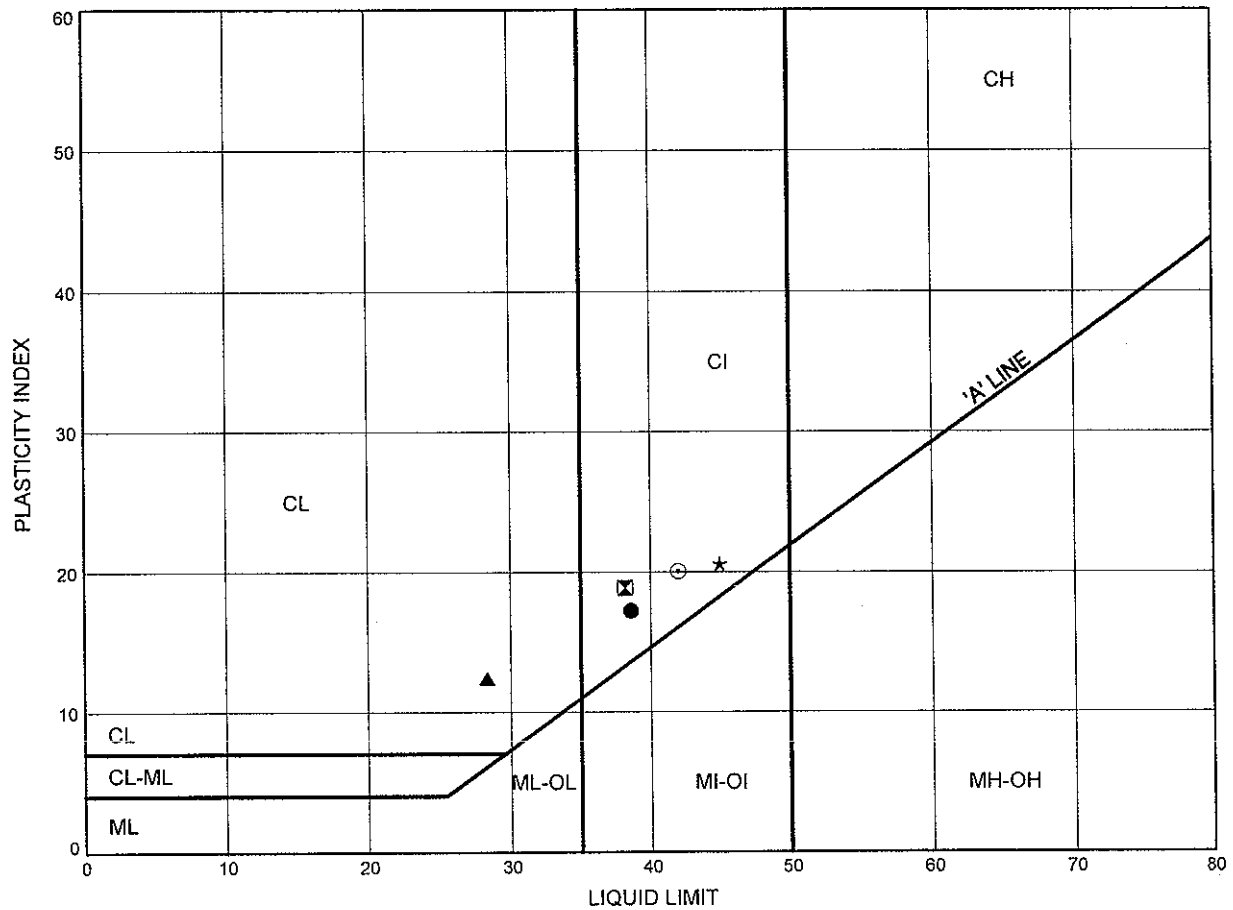
Prep'd DB

Chkd. RA

ATTERBERG LIMITS TEST RESULTS

FIGURE B2-14

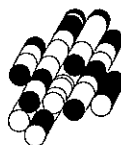
SILTY CLAY



SYMBOL	BOREHOLE	DEPTH (m)	ELEVATION (m)
●	MR 9+900 CL	6.3	179.0
⊠	MR 9+900 CL	10.9	174.4
▲	MR 9+900 CL	13.9	171.4
★	MR 9+950 Rt	0.9	179.3
⊙	MR 9+950 Rt	6.3	173.9

Date May 2010

Project 1-09-4135



Prep'd DB

Chkd. RA

FIGURE B2-15

Size of openings, inches

U.S.S. Sieve size, meshes/inch

PERCENT FINER THAN

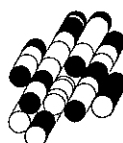
GRAIN SIZE, mm

Grain Size (mm)	Percent Finer (%)
100	100
75	100
60	100
48	100
40	100
30	100
25	100
20	100
16	100
12	100
10	100
8	100
6	100
4	100
3	100
2	100
1.5	100
1.18	100
0.85	100
0.75	100
0.6	100
0.5	100
0.425	100
0.354	100
0.3	100
0.25	100
0.2	100
0.15	100
0.125	100
0.106	100
0.085	100
0.075	100
0.06	66
0.05	56
0.04	41
0.03	22
0.025	16
0.02	12
0.015	9
0.0125	8
0.01	8
0.0075	8
0.006	8
0.005	8
0.004	8
0.003	8
0.0025	8
0.002	8
0.0015	8
0.00125	8
0.001	8
0.00075	8
0.0006	8
0.0005	8
0.0004	8
0.0003	8
0.00025	8
0.0002	8
0.00015	8
0.000125	8
0.0001	8
0.000075	8
0.00006	8
0.00005	8
0.00004	8
0.00003	8
0.000025	8
0.00002	8
0.000015	8
0.0000125	8
0.00001	8
0.0000075	8
0.000006	8
0.000005	8
0.000004	8
0.000003	8
0.0000025	8
0.000002	8
0.0000015	8
0.00000125	8
0.000001	8
0.00000075	8
0.0000006	8
0.0000005	8
0.0000004	8
0.0000003	8
0.00000025	8
0.0000002	8
0.00000015	8
0.000000125	8
0.0000001	8
0.000000075	8
0.00000006	8
0.00000005	8
0.00000004	8
0.00000003	8
0.000000025	8
0.00000002	8
0.000000015	8
0.0000000125	8
0.00000001	8
0.0000000075	8
0.000000006	8
0.000000005	8
0.000000004	8
0.000000003	8
0.0000000025	8
0.000000002	8
0.0000000015	8
0.00000000125	8
0.000000001	8
0.00000000075	8
0.0000000006	8
0.0000000005	8
0.0000000004	8
0.0000000003	8
0.00000000025	8
0.0000000002	8
0.00000000015	8
0.000000000125	8
0.0000000001	8
0.000000000075	8
0.00000000006	8
0.00000000005	8
0.00000000004	8
0.00000000003	8
0.000000000025	8
0.00000000002	8
0.000000000015	8
0.0000000000125	8
0.00000000001	8
0.0000000000075	8
0.000000000006	8
0.000000000005	8
0.000000000004	8
0.000000000003	8
0.0000000000025	8
0.000000000002	8
0.0000000000015	8
0.00000000000125	8
0.000000000001	8
0.00000000000075	8
0.0000000000006	8
0.0000000000005	8
0.0000000000004	8
0.0000000000003	8
0.00000000000025	8
0.0000000000002	8
0.00000000000015	8
0.000000000000125	8
0.0000000000001	8
0.0000000000000	

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

SYMBOL	BOREHOLE	DEPTH (m)	ELEVATION (m)
●	MR 9+950 Rt	9.3	170.9

Chkd. RA



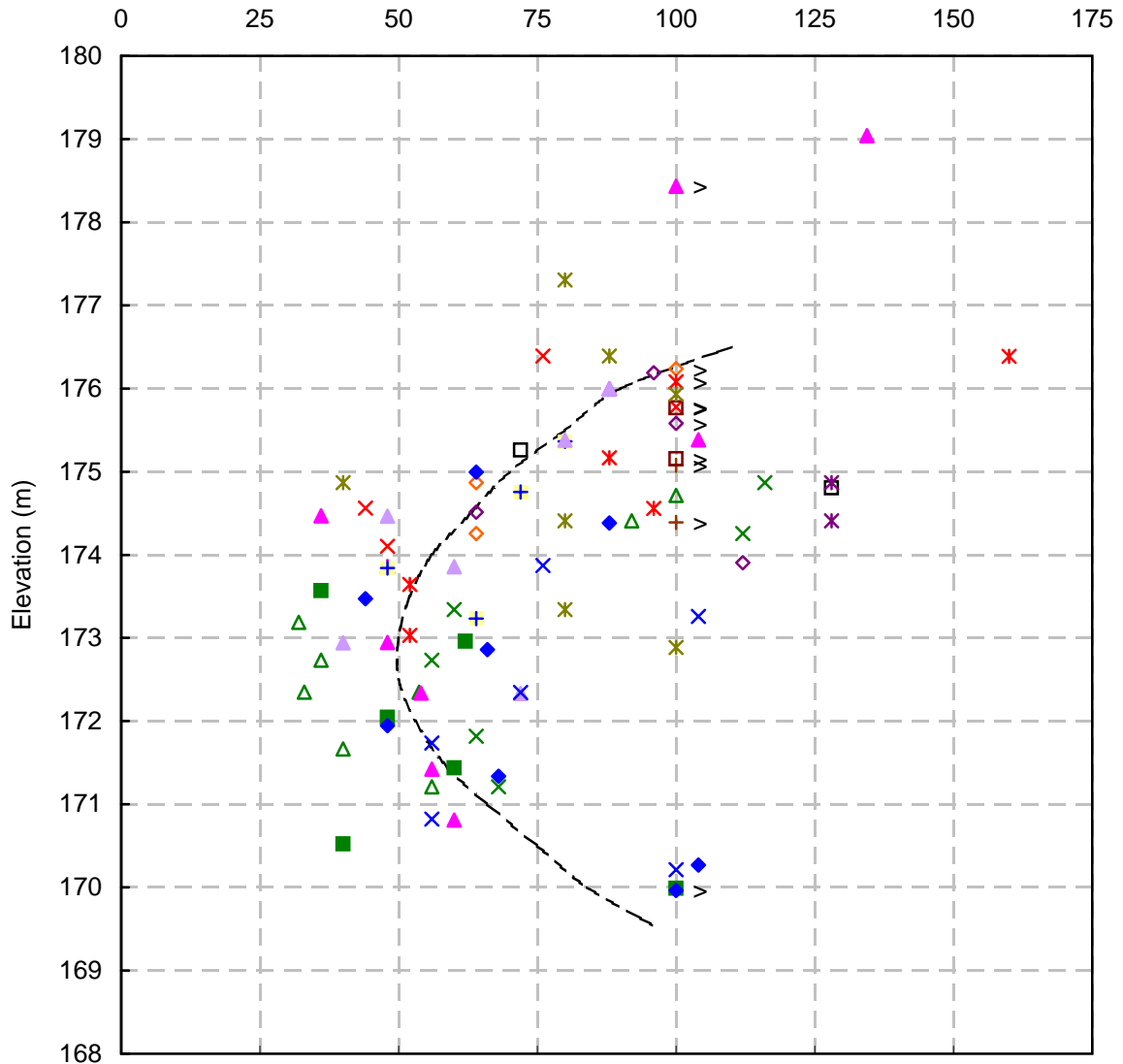
CORRECTED UNDRAINED SHEAR STRENGTH

FIGURE B2-16

MERRITT ROAD INTERCHANGE - NORTHWEST QUADRANT

Silty Clay

Corrected Cu (kPa)



□ NEW 10+350 CL	◇ NE 10+400 LT	△ NE 10+450 CL	× NW 10+000 RT	× NW 10+050 CL
+ NW 10+100 RT	■ ES 10+000 LT	◆ ES 10+000 RT	▲ ES 10+050 CL	× WS 10+025 CL
× EWS 10+100 LT	+ EWS 10+100 RT	□ EWS 10+150 CL	◇ MR 9+800 CL	▲ MR 9+850 RT
× MR 9+900 CL	× MR 9+950 RT			

Field Shear Vane Correction

Morris & Williams (1994)
 $(\mu = 1.18 \text{ EXP}(-0.08 \text{ Ip}) + 0.57)$

Applied Correction Factors

0.80 (Elev.>176.5m) 0.85 Elev.<176.5m

Project No. : 1-09-4135

Date : September, 2010



Terraprobe Inc.

Prepared By : HW

Checked By : RA

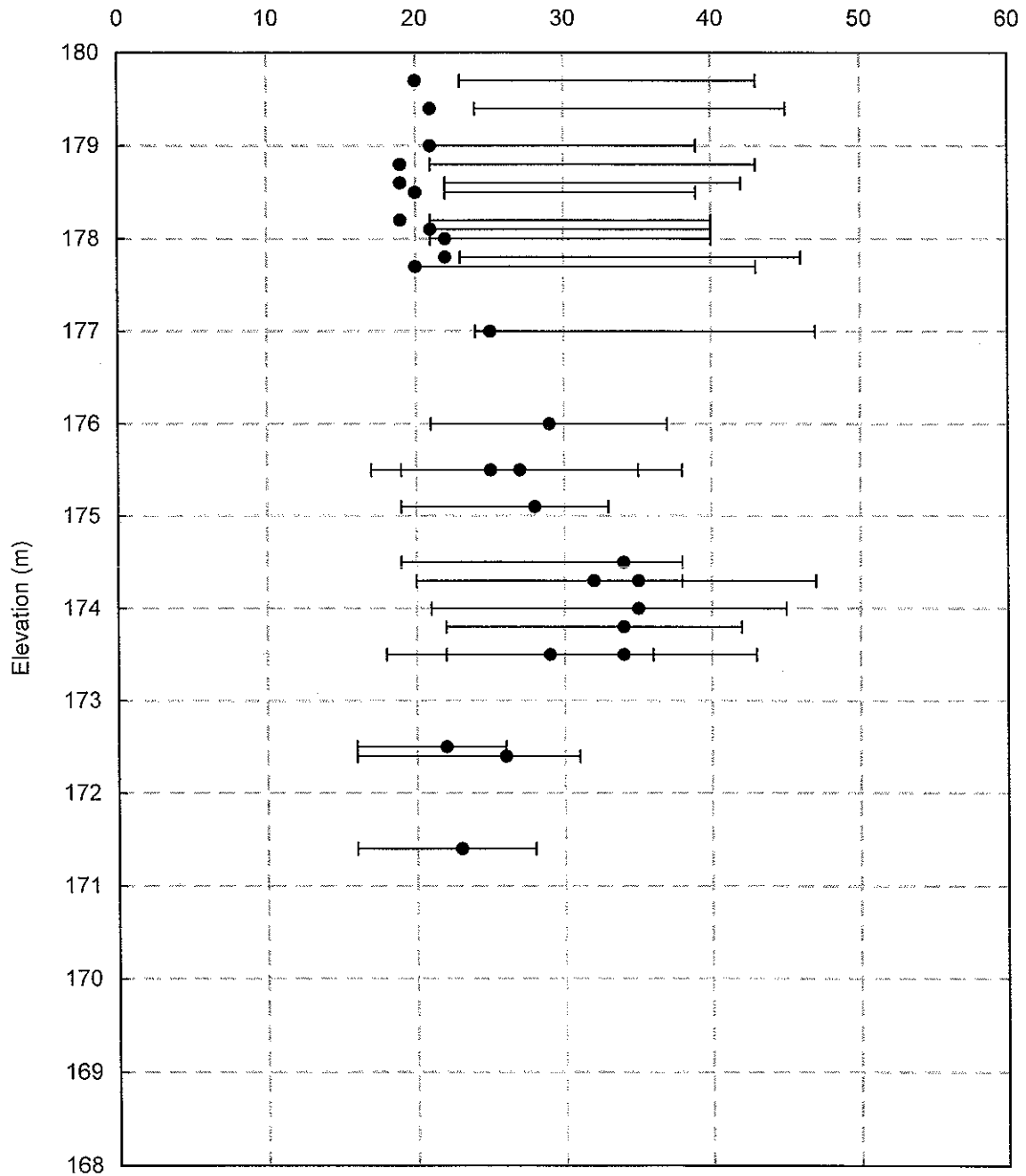
ATTERBERG LIMITS AND WATER CONTENTS

FIGURE B2-17

MERRITT ROAD INTERCHANGE - NORTHWEST QUADRANT

Silty Clay

Atterberg Limits & Water Contents (%)



Project No. : 1-09-4135

Date : May, 2010

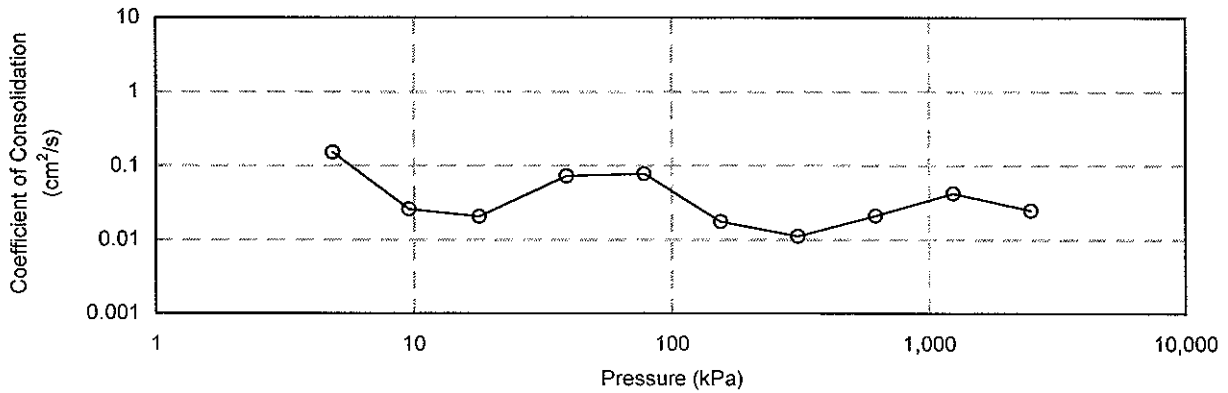


Terraprobe Inc.

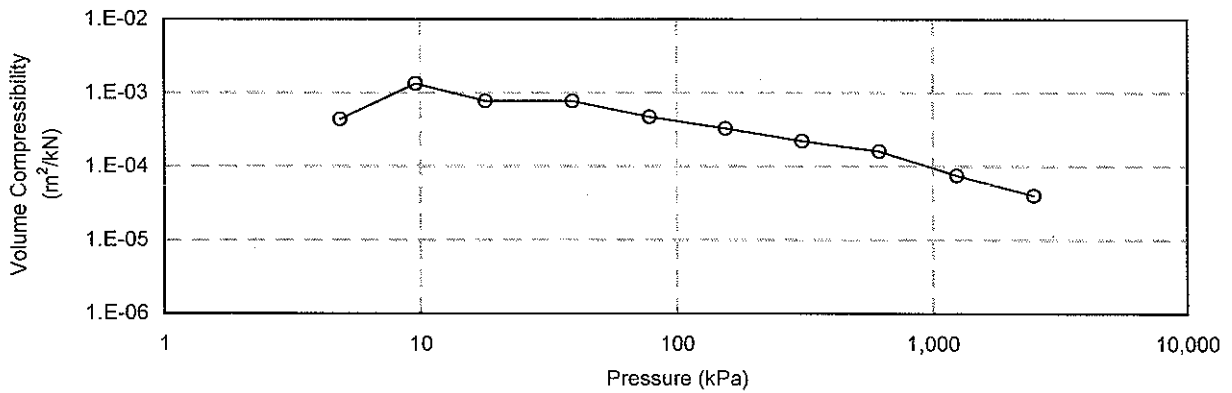
Prepared By : HW

Checked By : RA

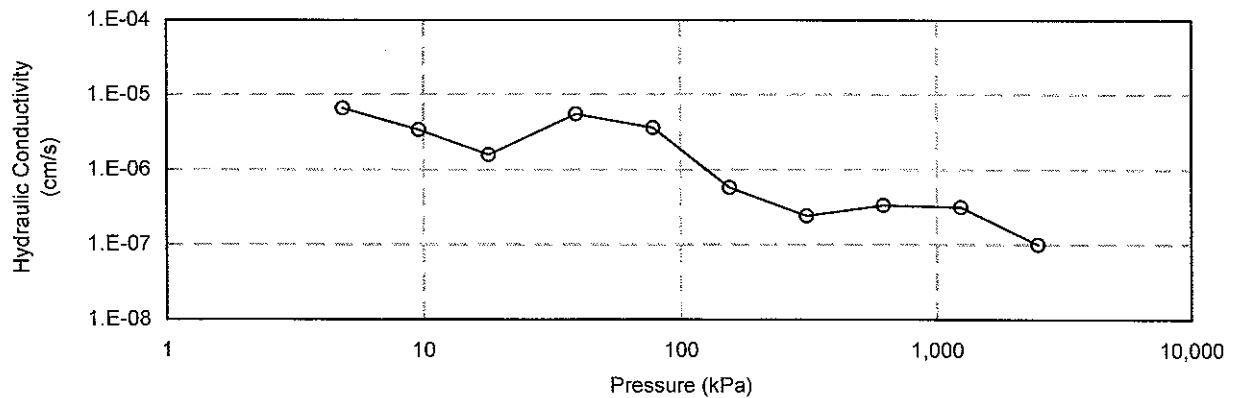
CONSOLIDATION TEST
Cv vs Pressure
MR 9+850 RT, TW7



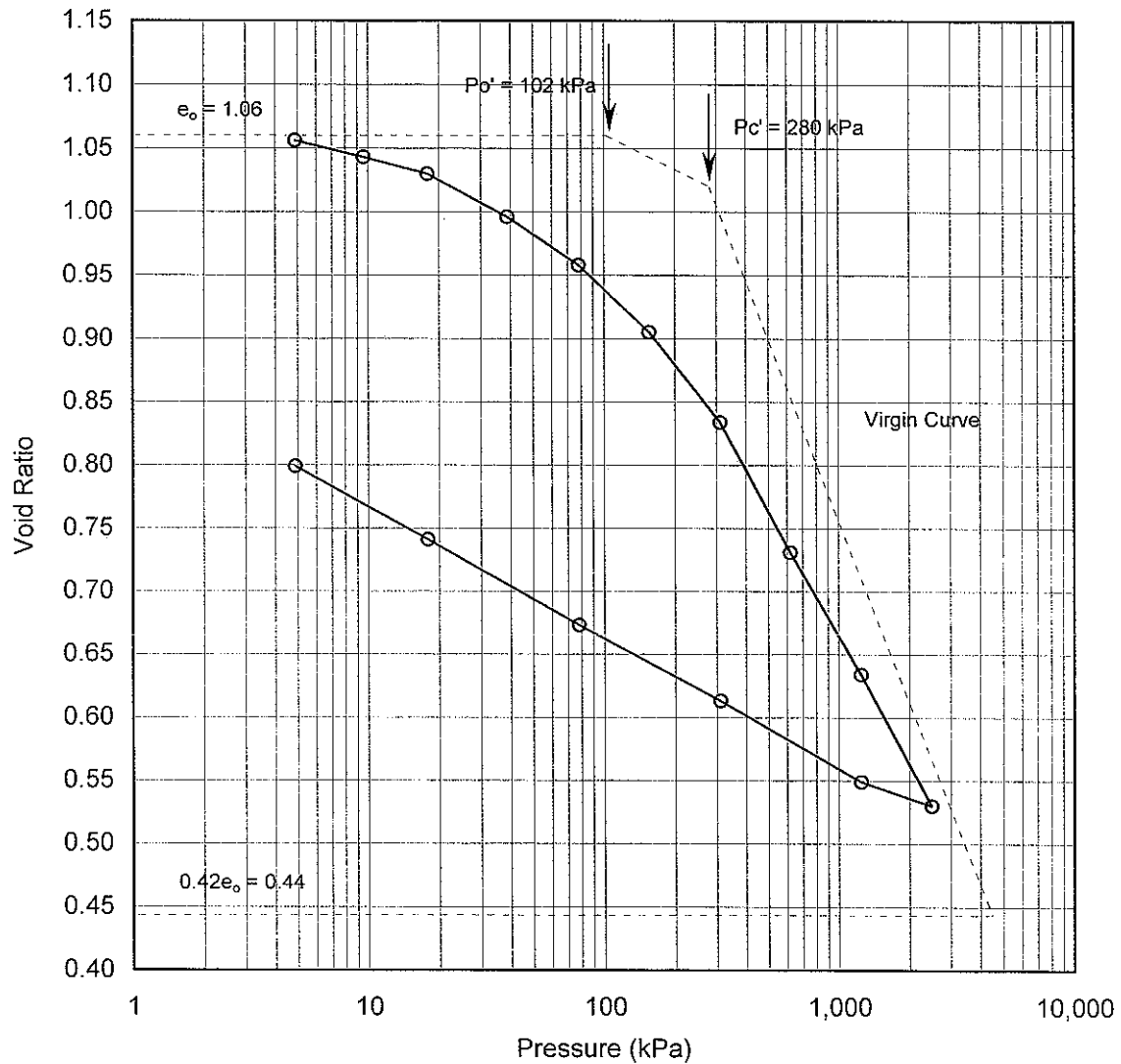
CONSOLIDATION TEST
mv vs Pressure
MR 9+850 RT, TW7



CONSOLIDATION TEST
k vs Pressure
MR 9+850 RT, TW7



CONSOLIDATION TEST
e vs Pressure
MR 9+850 RT, TW7



Soil Type : Silty Clay

$e_o =$	1.06	$\omega_L =$	36%	$P_o' =$	102 kPa
$\omega =$	29%	$\omega_p =$	18%	$P_c' =$	280 kPa
$\gamma =$	18.3 kN/m ³	$PI =$	18%	$C_c =$	0.478
$G_s =$	2.78			$Cr =$	0.091

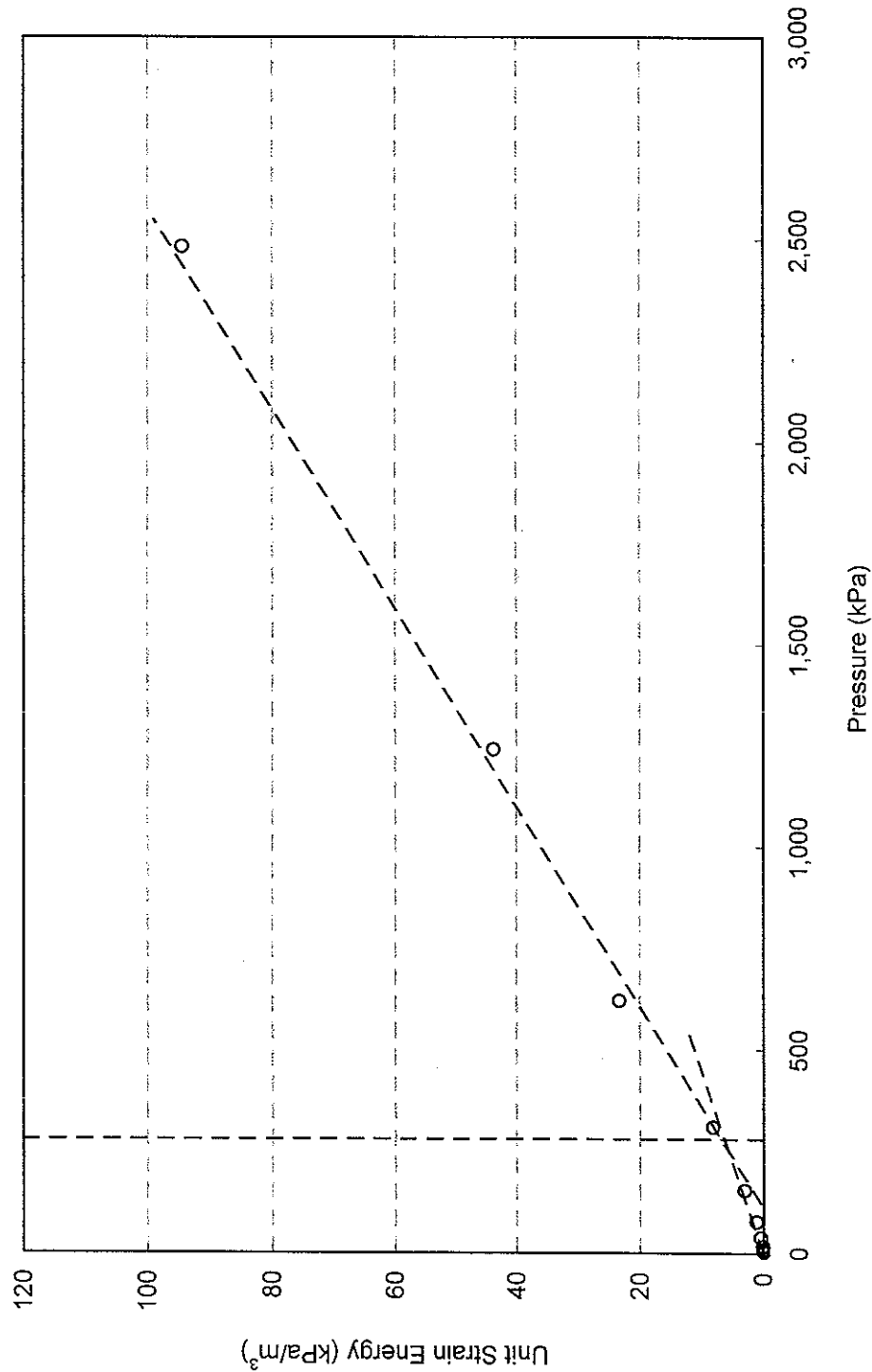
Project No. : 1-09-4135
 Date : May 2010



Terraprobe Inc.

Prepared By : HW
 Checked By : RA

CONSOLIDATION TEST
Unit Strain Energy vs Pressure
MR 9+850 RT, TW7

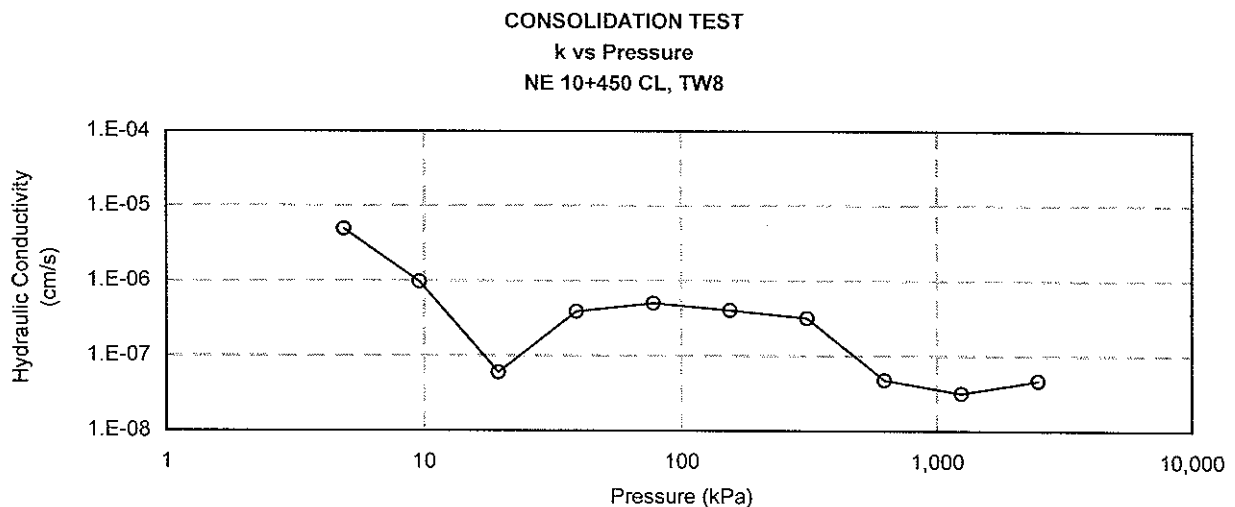
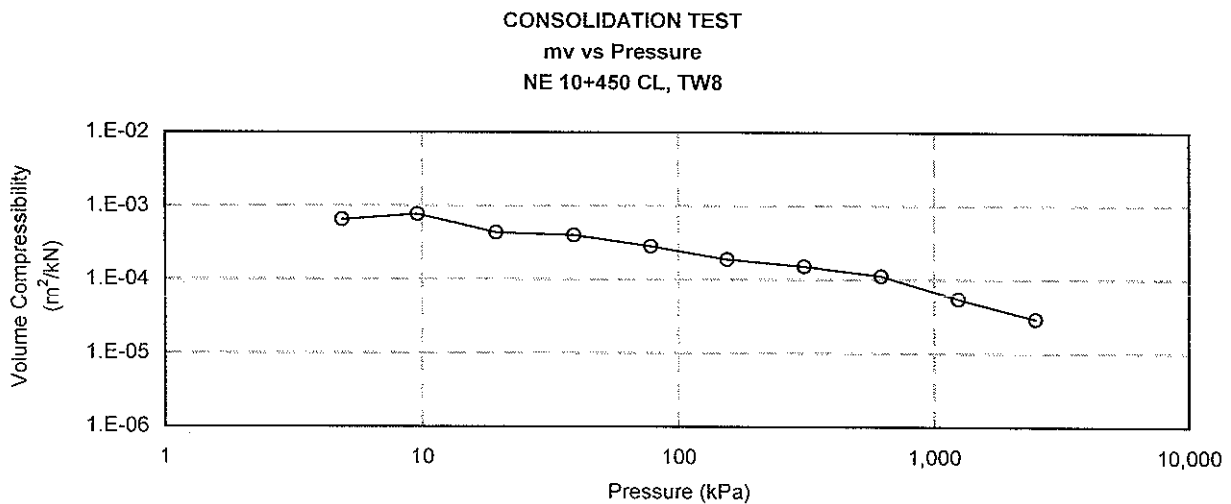
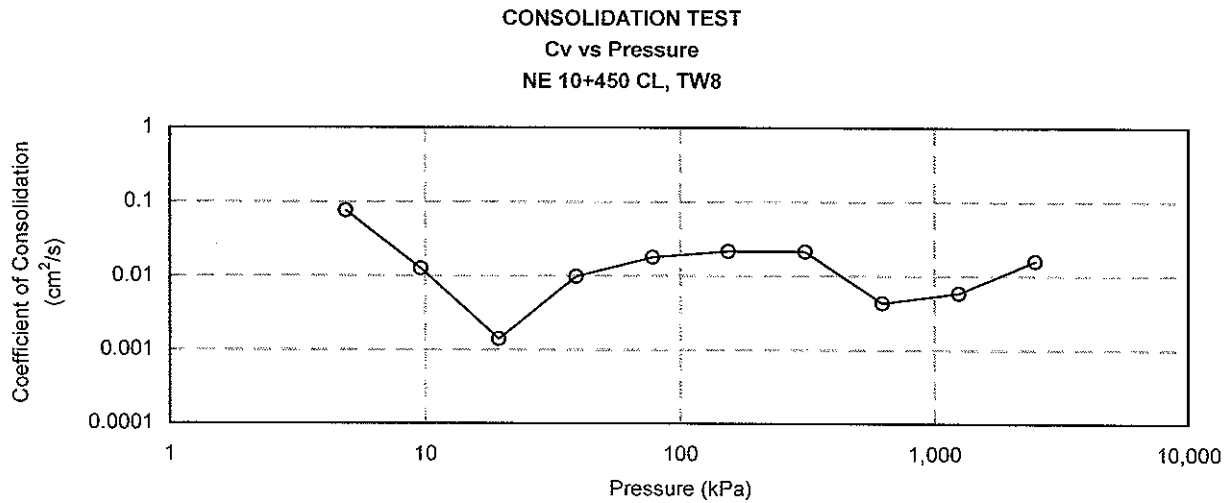


Project No. : 1-09-4135
 Date : May 2010



Terraprobe Inc.

Prepared By : HW
 Checked By : RA



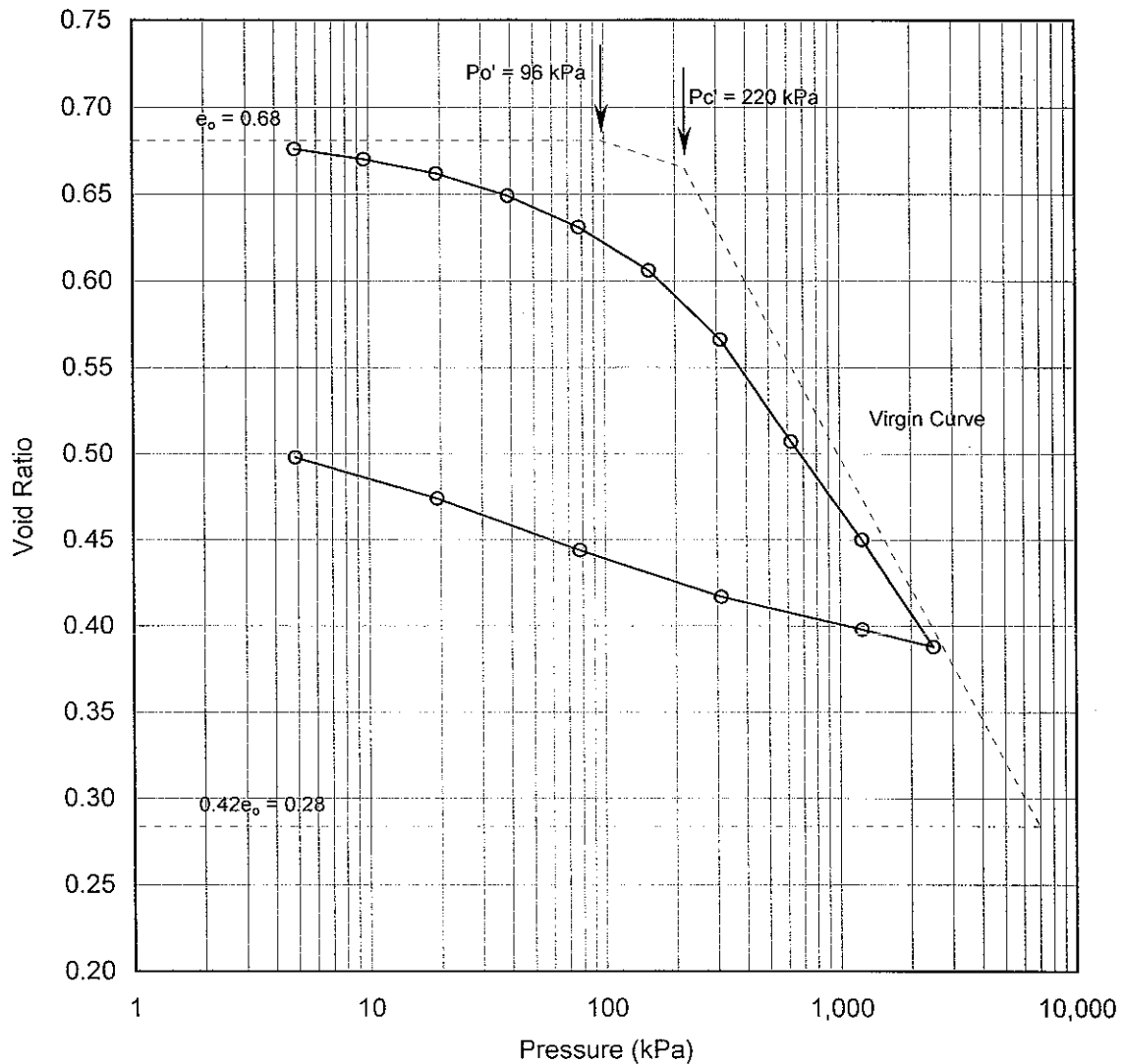
Project No. : 1-09-4135
Date : May 2010



Terraprobe Inc.

Prepared By : HW
Checked By : RA

CONSOLIDATION TEST
e vs Pressure
NE 10+450 CL, TW8



Soil Type : Silty Clay

$e_o =$	0.68	$\omega_L =$	31%	$P_o' =$	96 kPa
$\omega =$	26%	$\omega_p =$	16%	$P_c' =$	220 kPa
$\gamma =$	20.1 kN/m ³	PI =	15%	Cc =	0.254
Gs =	2.77			Cr =	0.045

Project No. : 1-09-4135
 Date : May 2010



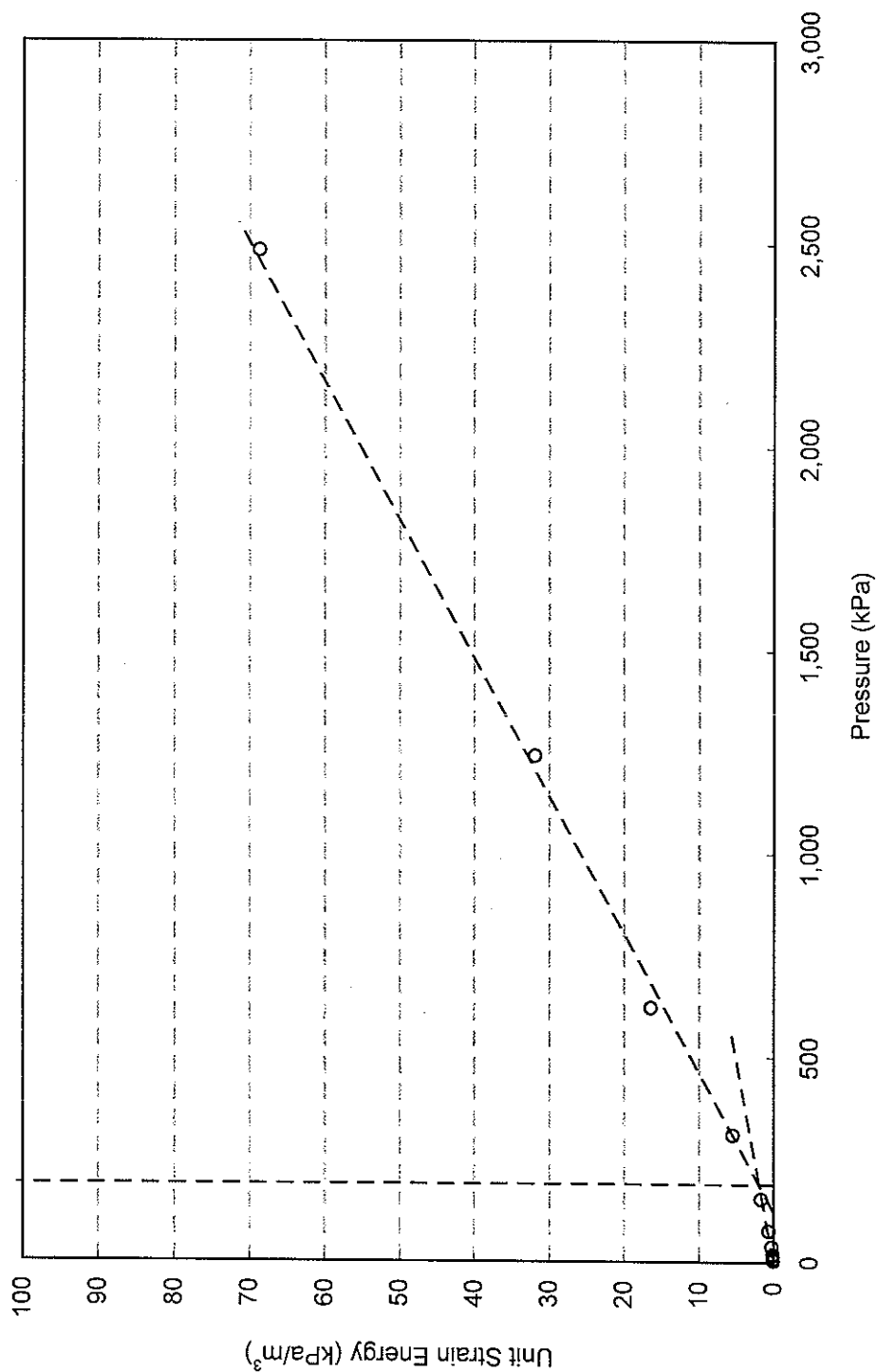
Terraprobe Inc.

Prepared By : HW
 Checked By : RA

CONSOLIDATION TEST

Unit Strain Energy vs Pressure

NE 10+450 CL, TW8



$P_c = 190 \text{ kPa}$

Project No. : 1-09-4135

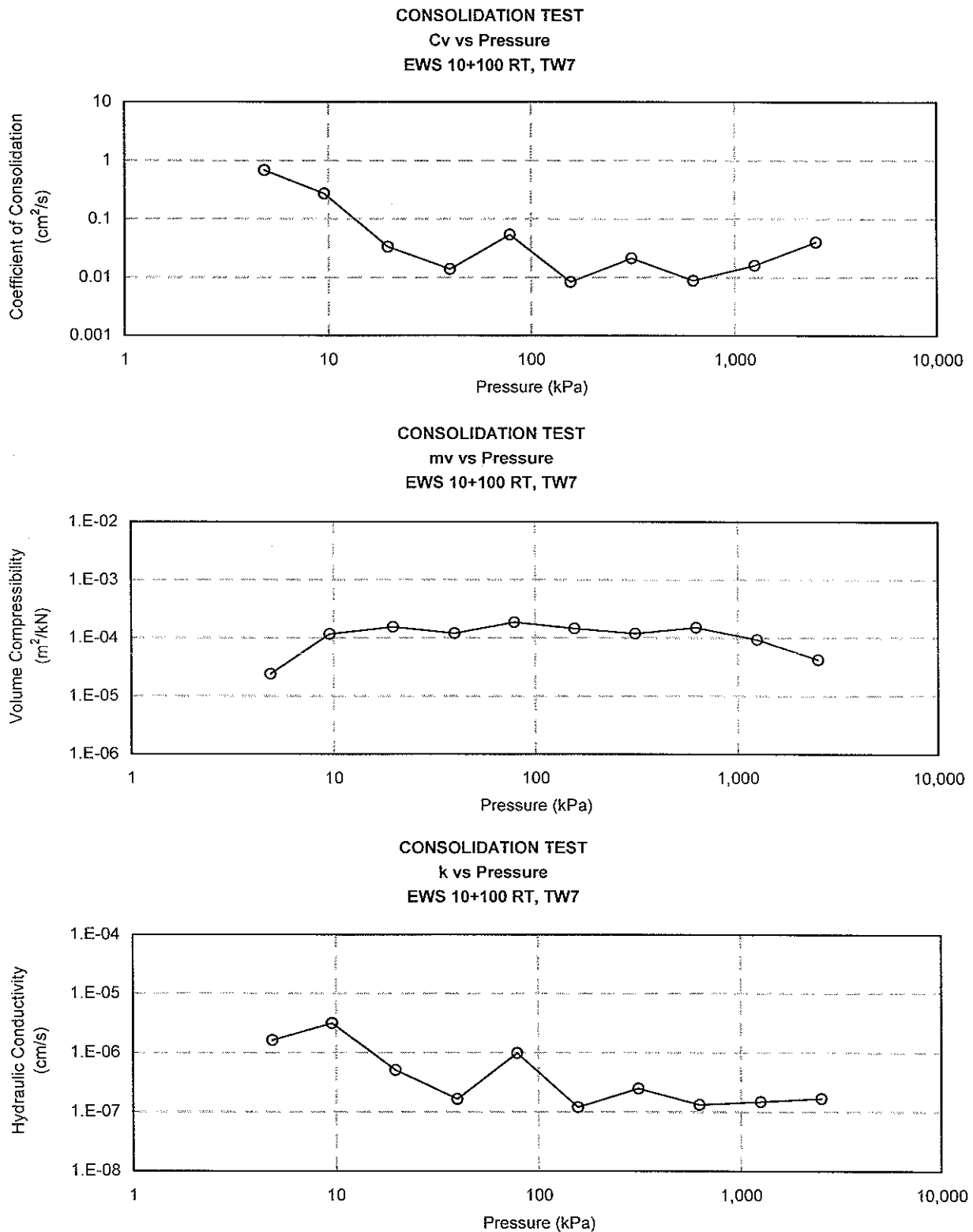
Date : May 2010



Terraprobe Inc.

Prepared By : HW

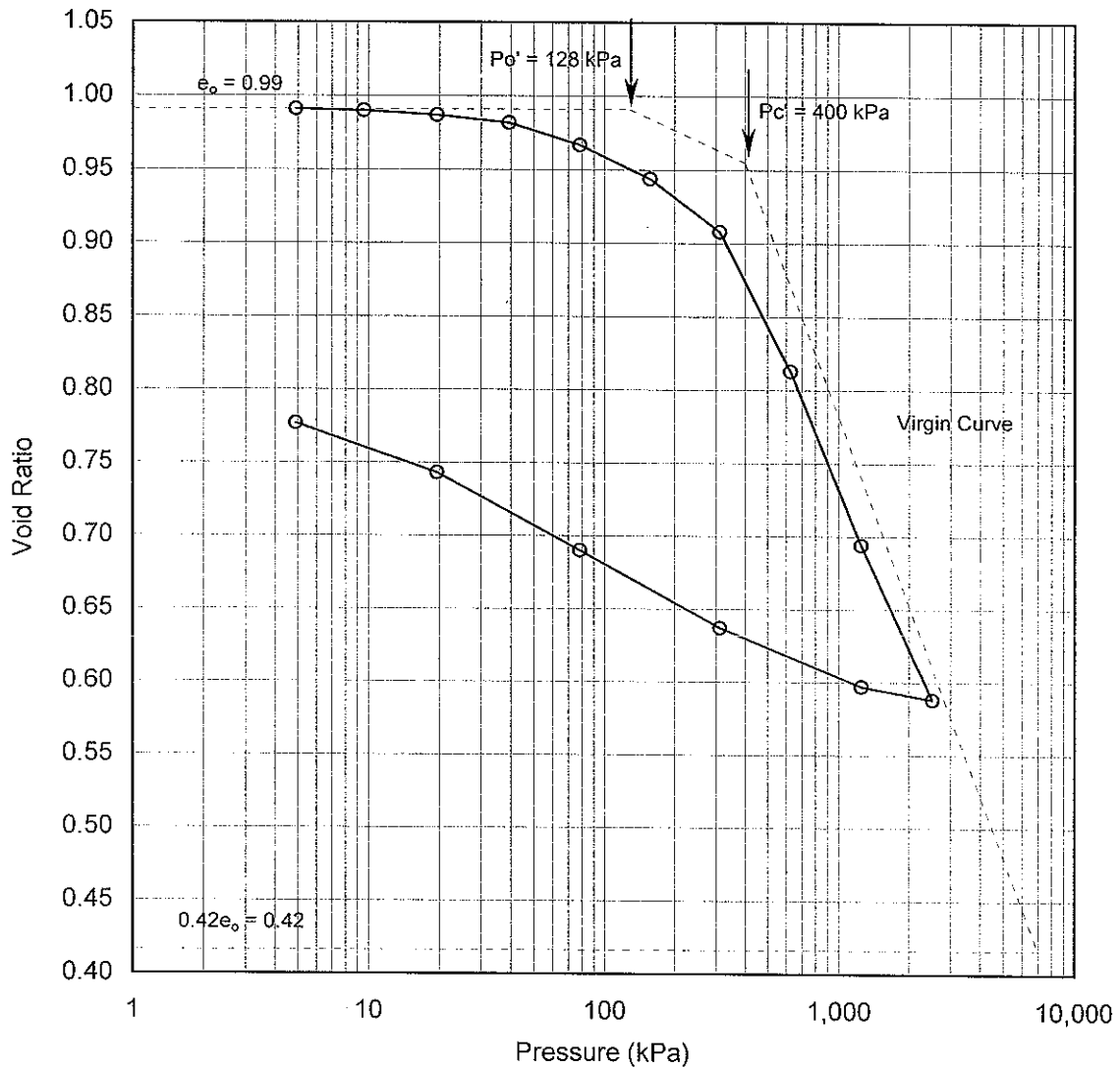
Checked By : RA



CONSOLIDATION TEST

e vs Pressure

EWS 10+100 RT, TW7



Soil Type : Silty Clay

$e_o =$	0.99	$\omega_L =$	47%	$Po' =$	128 kPa
$\omega =$	35%	$\omega_p =$	20%	$Pc' =$	400 kPa
$\gamma =$	18.6 kN/m ³	$PI =$	27%	$Cc =$	0.433
$G_s =$	2.78			$Cr =$	0.073

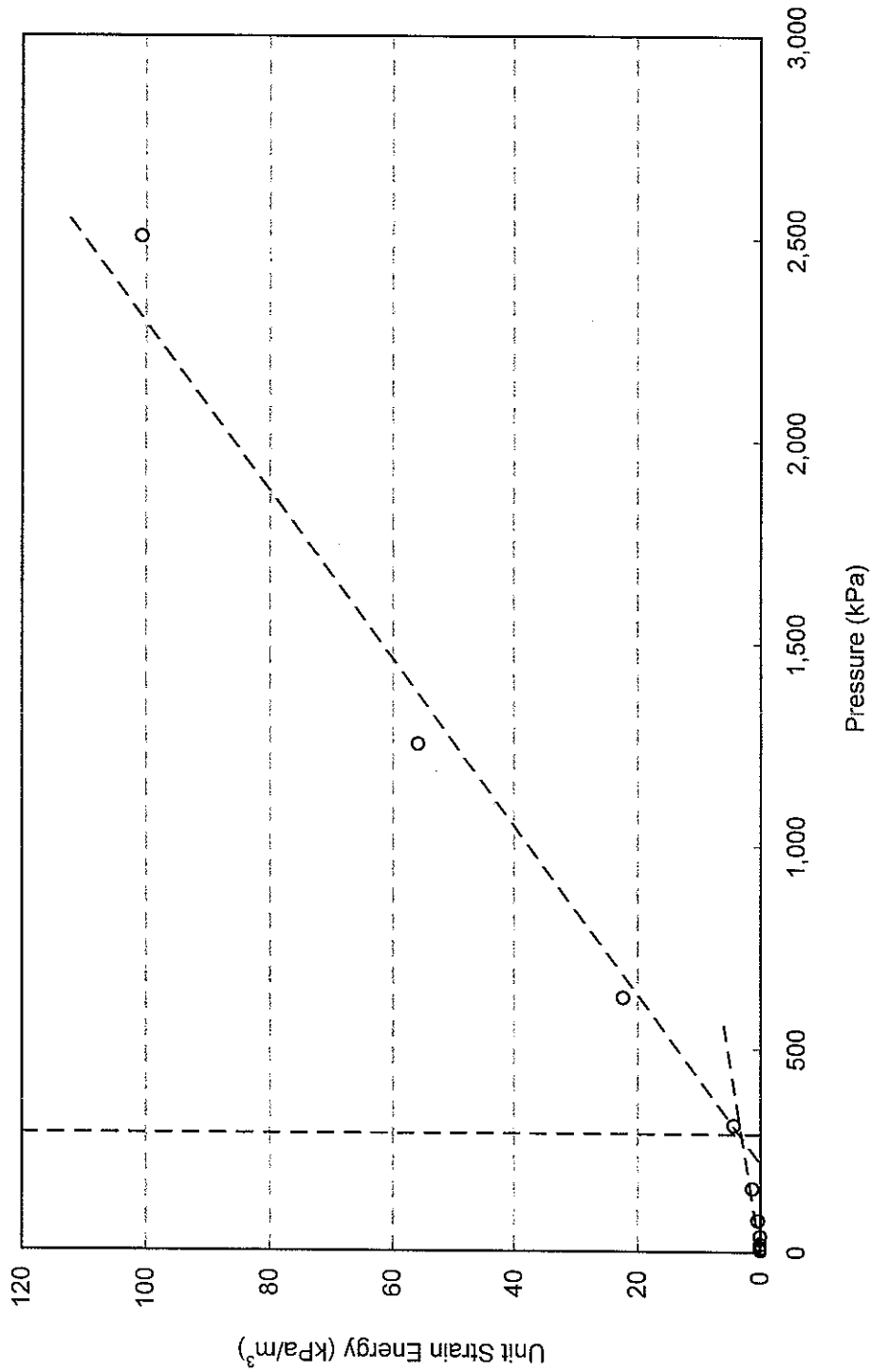
Project No. : 1-09-4135
 Date : May 2010



Terraprobe Inc.

Prepared By : HW
 Checked By : RA

CONSOLIDATION TEST
Unit Strain Energy vs Pressure
EWS 10+100 RT, TW7



$P_c = 290 \text{ kPa}$

Project No. : 1-09-4135
 Date : May 2010



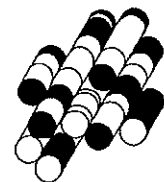
Terraprobe Inc.

Prepared By : HW
 Checked By : RA

APPENDIX C

Record of Borehole Sheets (Previous Investigations)

Terraprobe Inc.



RECORD OF BOREHOLE No 101

1 of 2

METRIC

G.W.P. 280-99-00 LOCATION Co-ords: 4 765 994 N; 326 490 E ORIGINATED BY M.R.
DIST CR HWY 406 BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY N.R.
DATUM Geodetic DATE October 27, 2008 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			* GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION kPa RESISTANCE PLOT			PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								WATER CONTENT (%)		
185.2	Ground Surface		1	SS	6	185												
0.0	Clayey silt some sand, trace gravel		2	SS	7	184												
	Firm Brown Moist (FILL)		3	SS	2	183												
	Soft Mottled brown/grey		4	SS	3	182												
	Firm		5	SS	8	181												
180.9	Topsoil		6	SS	5	180												
4.3																		
180.5																		
4.7	Clayey silt and Sand trace gravel		7	SS	5	179												
	Firm to stiff Brown Wet		8	SS	12	178												
179.4	Silty clay, trace sand		9	SS	31	177												
5.8	Hard to stiff Reddish Moist brown		10	SS	21	176												
	thin silt partings		11	SS	9	175												
	Firm to stiff		12	TW	PH	174												
				FV		173												
			13	SS	4	172												
				FV		171												
			14	SS	2													
				FV														
170.2	Cont'd																	

ON_MOT VER3 08TF005.GPJ ON_MOT.GDT 1/24/2009 8:41:38 AM

+⁷, X⁵: Numbers refer to
Sensitivity 20
15 0 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 101

2 of 2

METRIC

G.W.P. 280-99-00 LOCATION Co-ords: 4 765 994 N; 326 490 E ORIGINATED BY M.R.
DIST CR HWY 406 BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY N.R.
DATUM Geodetic DATE October 27, 2008 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			* GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION kPa RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100					
170.2																	
15.0																	
170.0	Silt, trace sand		15	SS	12		170										0 5 90 5
15.2	Compact Reddish Moist brown																
169.4																	
15.8	End of borehole																
	* Borehole dry upon completion of drilling																
	■ Penetrometer test																

RECORD OF BOREHOLE No 102										1 of 1		METRIC							
G.W.P. 280-99-00			LOCATION Co-ords: 4 766 012 N; 326 508 E			ORIGINATED BY W.L.													
DIST CR HWY 406			BOREHOLE TYPE Continuous Flight Solid Stem Augers			COMPILED BY N.R.													
DATUM Geodetic			DATE September 24, 2008			CHECKED BY C.N.													
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS		ELEVATION SCALE		DYNAMIC CONE PENETRATION kPa RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT		WATER CONTENT (%)		UNIT WEIGHT		REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES					20 40 60 80 100	20 40 60	W _p	W	W _L	γ	GR	SA	SI	CL
184.8	Ground Surface																		
0.0	Topsoil		1	SS	10							o							
	Silty clay, trace sand																		
	Stiff to Brown Moist soft		2	SS	7							o							
	trace gravel																		
			3	SS	5							o							
			4	SS	3							o							
	Clayey silt and sand some gravel topsoil inclusions		5	SS	3							o							
	Soft Wet (FILL)		6	SS	3							o							
			7	SS	2							o							
179.3	Peat		8	SS	3														
5.5																			
178.6	Sandy silt, trace clay		9	SS	2														
6.2	Very loose Brown Moist																		
178.1	Silty clay, trace sand layers of sandy silt		10	SS	3							o							
6.7	Soft to Brown Moist stiff to wet																		
			11	SS	9							o							
			12	SS	12							o							
175.0	End of borehole																		
9.8																			
	* 2008 09 24																		
	▽ Water level observed during drilling																		
	▽ Water level measured after drilling																		
	■ Penetrometer test																		

RECORD OF BOREHOLE No 103

1 of 2

METRIC

G.W.P. 280-99-00 LOCATION Co-ords: 4 766 016 N; 326 529 E ORIGINATED BY M.R.
DIST CR HWY 406 BOREHOLE TYPE C.F.H.S.A. and Dynamic Cone Penetration Test COMPILED BY N.R.
DATUM Geodetic DATE October 24, 2008 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			* GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION kPa RESISTANCE PLOT		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100					
180.4 0.0	Ground Surface		1	SS	4		180							
	Silty clay some sand, some gravel													
	Soft Silty sand													
179.2 1.2	Compact Brown Moist (FILL)		2	SS	12		179							
	Silty clay, trace sand													
	Hard Brown/ Moist grey		3	SS	11		178							
	Reddish brown													
	thin layers of silt		4	SS	13		177							
	Very stiff		5	SS	10									
	Stiff		6	SS	6		176							
			7	TW	PH									
				FV										
	Grey		8	SS	2		175							
				FV										
172.9 7.5	Clayey silt, trace sand		9	TW	PH		174							
	Stiff Reddish Moist brown													
				FV			173							
			10	SS	5		172							
170.4 10.0	Silt, trace sand						171							
	Compact Reddish Wet brown		11	SS	12		170							
168.2 12.2	End of borehole						169							
	Probable clayey silt						168							
	Firm to hard						167							
165.4							166							

ON_MOT VER3 08TF005.GPJ ON_MOT.GDT 1/24/2009 8:41:42 AM

+7, X⁵: Numbers refer to
Sensitivity 20
15-5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 103

2 of 2

METRIC

G.W.P. 280-99-00 LOCATION Co-ords: 4 766 016 N; 326 529 E ORIGINATED BY M.R.
DIST CR HWY 406 BOREHOLE TYPE C.F.H.S.A. and Dynamic Cone Penetration Test COMPILED BY N.R.
DATUM Geodetic DATE October 24, 2008 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			* GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION kPa RESISTANCE PLOT			PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE								WATER CONTENT (%)		
165.4 15.0	Cont'd Probable clayey silt Firm to hard						20	40	60	80	100	20	40	60	GR	SA	SI	CL
159.0 21.4	Probable clayey silt Hard (TILL)						20	40	60	80	100	20	40	60				
156.6 23.8	End of dynamic cone penetration test * Borehole dry upon completion of drilling ■ Penetrometer test C.F.H.S.A: denotes Continuous Flight Hollow Stem Augers						20	40	60	80	100	20	40	60				

RECORD OF BOREHOLE No 104 1 of 3 METRIC

G.W.P. 280-99-00 LOCATION Co-ords: 4 766.020 N; 326 551 E ORIGINATED BY M.R.
DIST CR HWY 406 BOREHOLE TYPE Continuous Flight Hollow Stem Augers COMPILED BY N.R.
DATUM Geodetic DATE October 22 and 23, 2008 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION kPa RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT LIMIT			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	W _p	W	W _L		
179.7	Ground Surface													
0.0 179.4 0.3	Silty clay, trace sand Firm Mottled Moist brown (FILL)		1	SS	6									
	Silty clay, trace sand thin lenses of silt		2	SS	23									
	Very stiff Mottled Moist brown		3	SS	17									
	Stiff													
			4	SS	3									0 1 44 55
	thin partings of silt			FV										
			5	SS	1									0 4 46 50
				FV										
			6	SS	3									
				FV										
			7	TW	PH									
				FV										
171.0 8.7	Silt trace sand, trace clay Loose Reddish Moist brown to wet		8	SS	7									0 2 93 5
168.8 10.9	Clayey silt trace sand, trace gravel Firm Reddish Moist brown		9	SS	7									
			10	SS	7									1 6 70 23
			11	TW	PH									
164.7														

ON_MOT VER3 08TF005.GPJ ON_MOT.GDT 1/24/2009 8:41:44 AM

+⁷ . X⁵ : Numbers refer to
Sensitivity 20
15 0 5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 104

2 of 3

METRIC

G.W.P. 280-99-00 LOCATION Co-ords: 4 766 020 N; 326 551 E ORIGINATED BY M.R.
DIST CR HWY 406 BOREHOLE TYPE Continuous Flight Hollow Stem Augers COMPILED BY N.R.
DATUM Geodetic DATE October 22 and 23, 2008 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION kPa RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100					
164.7 15.0	Stiff		12	SS	9		164										
	layers of silty clay						163										
	Firm Reddish Wet brown/grey		13	SS	6		162										0 1 67 32
	no gravel thin layers of silt		14	SS	WH**		161										0 1 64 35
159.6 20.1	Clayey silt some sand, some gravel						160										
	Stiff Reddish Moist brown (TILL)		15	SS	13		159										
							158										
157.3 22.4	Sand and silt with gravel, trace clay						157										
	Very dense Reddish Moist brown/grey (TILL)		16	SS	79		156										
							155										23 32 35 10
							154										
153.5 26.2	Silty clay, trace sand thin lenses of silt						153										
	Stiff Reddish Moist brown/grey		17	SS	16		152										
							151										
149.7	Cont'd						150										

ON_MOT VER3 08TF005.GPJ ON_MOT.GDT 1/24/2009 8:41:44 AM

+7, X⁵: Numbers refer to Sensitivity

20
15 10 5 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 104

3 of 3

METRIC

G.W.P. 280-99-00 LOCATION Co-ords: 4 766 020 N; 326 551 E ORIGINATED BY M.R.
DIST CR HWY 406 BOREHOLE TYPE Continuous Flight Hollow Stem Augers COMPILED BY N.R.
DATUM Geodetic DATE October 22 and 23, 2008 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION kPa 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 x LAB VANE												
149.7 30.0	layers of silty sand		18	SS	1		149													
148.3 31.4	Sand and silt, trace clay Very dense Reddish Moist brown/grey (TILL)		19	SS	50/10cm		148													
							147													
							146													
							145													
							144													
143.6 36.1	End of borehole Refusal on probable bedrock Sample 19: sampler bouncing * 2008 10 24 ▼ Water level measured after drilling ■ Penetrometer test WH** denotes penetration due of weight of rods and hammer Low 'N' values in samples 14 and 18 are due to hydraulic disturbance in silt and silty sand layers.																			

RECORD OF BOREHOLE No 105 1 of 3 METRIC

G.W.P. 280-99-00 LOCATION Co-ords: 4 766 049 N; 326 574 E ORIGINATED BY M.R.
DIST CR HWY 406 BOREHOLE TYPE C.F.H.S.A. + Rotary Diamond Coring COMPILED BY N.R.
DATUM Geodetic DATE October 29 and 31, 2008 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			* GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION kPa RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								20 40 60 80 100							
								○ UNCONFINED	● QUICK TRIAXIAL	+ FIELD VANE	x LAB VANE				
180.4	Ground Surface														
0.0	Sand and gravel, granular "A", crushed limestone						180								
179.6	Brown Moist (FILL)														
0.8	Silty clay, trace sand		1	SS	15										
	Very stiff Brown Moist						179								
	layers of silty sand		2	SS	17										
							178								
	Reddish brown		3	SS	22										
							177								
	Firm to stiff						176								
			4	SS	4										
				FV			175								
			5	SS	3										
				FV			174								
			6	TW	PH		173								
				FV			172								
	silt layers		7	SS	6		171								
170.6	Silt trace sand, trace clay						170								
9.8	Loose Reddish/ Moist brown to wet		8	SS	5		169								
							168								
168.7	Clayey silt, trace sand						167								
11.7	Firm Reddish Moist brown		9	SS	7		166								
	Stiff		10	SS	9										
165.4															

ON_MOT VER3 08TF005.GPJ ON_MOT.GDT 1/24/2009 8:41:46 AM

+² . X⁵ : Numbers refer to
Sensitivity

20
15 0 5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 105

2 of 3

METRIC

G.W.P. 280-99-00 LOCATION Co-ords: 4 766 049 N; 326 574 E ORIGINATED BY M.R.
DIST CR HWY 406 BOREHOLE TYPE C.F.H.S.A. + Rotary Diamond Coring COMPILED BY N.R.
DATUM Geodetic DATE October 29 and 31, 2008 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			* GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION kPa RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100					
165.4																	
15.0	Cont'd																
	Clayey silt, trace sand		11	SS	11		165										
	Stiff Reddish Moist brown																
			12	SS	12		164										
							163										
			13	SS	11		162										
							161										
160.3							160										
20.1	Sand and silt, trace clay																
	Compact Reddish Moist brown/grey (TILL)		14	SS	28		159										
							158										
							157										
			15	SS	26		156										
							155										
							154										
							153										
	Very dense		16	SS	80		152										
							151										
150.4	Cont'd																

ON_MOT VER3 08TF005.GPJ ON_MOT.GDT 1/24/2009 8:41:46 AM

+7 .X⁵ Numbers refer to
Sensitivity

20
15—5
10
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 105

3 of 3

METRIC

G.W.P. 280-99-00 LOCATION Co-ords: 4 766 049 N; 326 574 E ORIGINATED BY M.R.
DIST CR HWY 406 BOREHOLE TYPE C.F.H.S.A. + Rotary Diamond Coring COMPILED BY N.R.
DATUM Geodetic DATE October 29 and 31, 2008 CHECKED BY C.N.

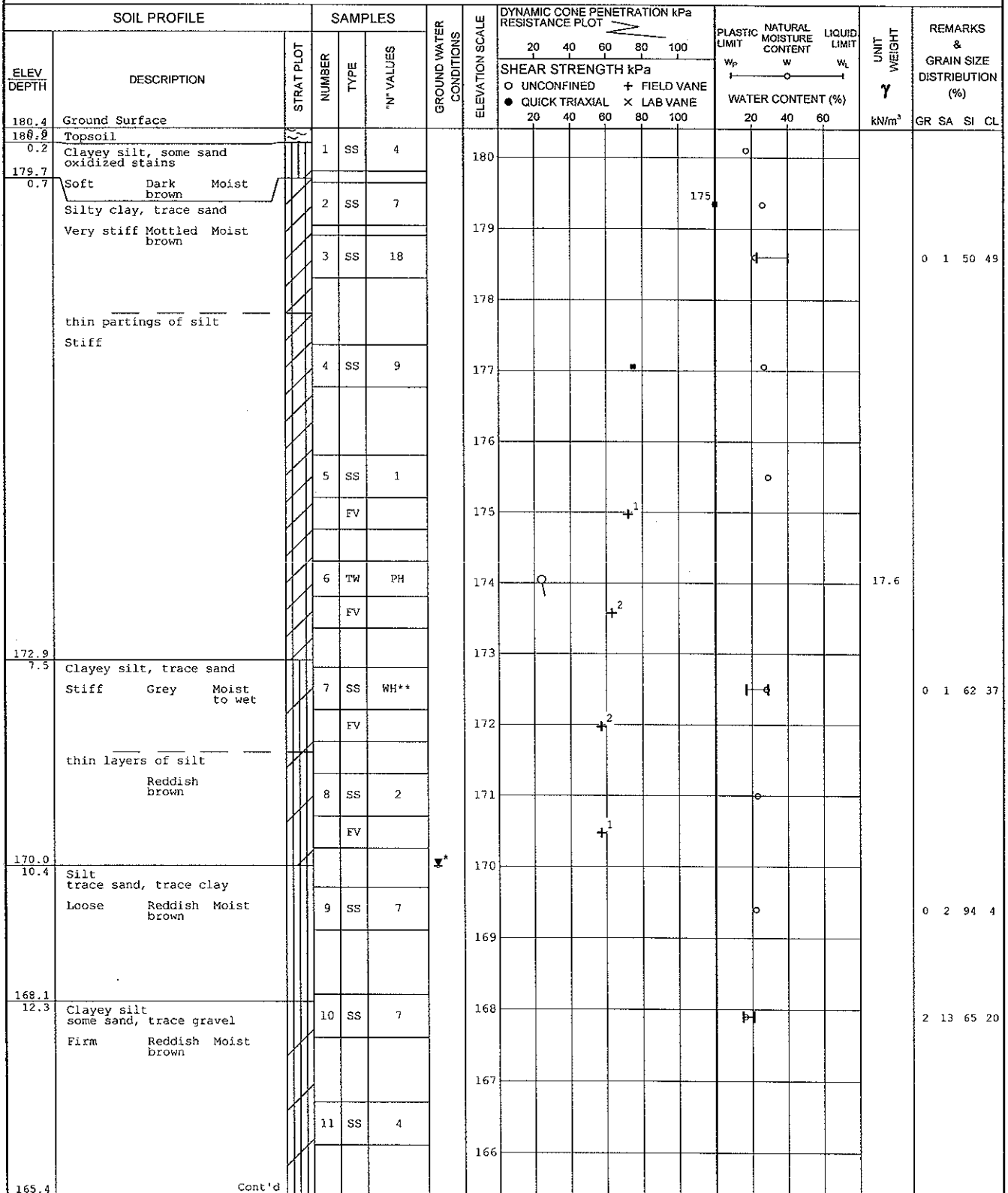
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ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)					
								○ UNCONFINED + FIELD VANE					w _p w w _L					
								● QUICK TRIAXIAL x LAB VANE										
150.4 30.0							20	40	60	80	100							
	Dense		17	SS	33													
	Very dense		18	SS	60/10cm													
144.2 36.2	Bedrock		19	RC NQ	REC 100%													RQD 0%
	Dolomitic limestone																	
	Light grey to blue grey		20	RC NQ	REC 100%													RQD 0%
143.1 37.3	Medium strength																	
	Weathered																	
	Very poor quality																	
	Dolostone		21	RC NQ	REC 100%													RQD 52%
	Dark brown to grey																	
	Medium strength																	
	Unweathered																	
	Fair quality		22	RC NQ	REC 100%													RQD 58%
140.0 40.4	End of borehole																	

RECORD OF BOREHOLE No 106

1 of 3

METRIC

G.W.P. 280-99-00 LOCATION Co-ords: 4 766 074 N; 326 590 E ORIGINATED BY M.R.
DIST CR HWY 406 BOREHOLE TYPE C.F.H.S.A. + Rotary Diamond Coring COMPILED BY N.R.
DATUM Geodetic DATE October 20 to 22, 2008 CHECKED BY C.N.



ON_MOT VER3 08TF005.GPJ ON_MOT.GDT 1/24/2009 6:41:49 AM

+7 X⁵: Numbers refer to
Sensitivity 20
15 10 5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 106

2 of 3

METRIC

G.W.P. 280-99-00 LOCATION Co-ords: 4 766 074 N; 326 590 E ORIGINATED BY M.R.
DIST CR HWY 406 BOREHOLE TYPE C.F.H.S.A. + Rotary Diamond Coring COMPILED BY N.R.
DATUM Geodetic DATE October 20 to 22, 2008 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION kPa RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
								○ UNCONFINED	● QUICK TRIAXIAL	+ FIELD VANE						× LAB VANE	WATER CONTENT (%)
165.4 15.0	trace sand Very stiff		12	SS	6												
				FV													
			13	SS	9												
			14	SS	9												

ON_MOT VER3 08TF005.GPJ ON_MOT.GDT 1/24/2009 8:41:49 AM

+7 X 5: Numbers refer to
Sensitivity 20
15-0-5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 106

3 of 3

METRIC

G.W.P. 280-99-00 LOCATION Co-ords: 4 766 074 N; 326 590 E ORIGINATED BY M.R.
DIST CR HWY 406 BOREHOLE TYPE C.F.H.S.A. + Rotary Diamond Coring COMPILED BY N.R.
DATUM Geodetic DATE October 20 to 22, 2008 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION kPa 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		
150.4 30.0	some clay, some gravel		18	SS	42		150							15 38 35 12
							149							
							148							
	Very dense		19	SS	50/10cm		147							
							146							
							145							
							144							
143.4 37.0	Bedrock						143							RQD 90%
	Dolostone		20	RC NQ	REC 100%		142							RQD 71%
	Dark brown to grey						141							
	Medium strength		21	RC NQ	REC 100%									
	Unweathered													
	Fair to good quality		22	RC NQ	REC 100%		140							RQD 75%
140.0 40.4	End of borehole													
	Samples 16 and 19: sampler bouncing													
	* 2008 10 22													
	▼ Water level measured after drilling													
	■ Penetrometer test													
	WH** denotes penetration due of weight of rods and hammer													
	* C.F.H.S.A: denotes Continuous Flight Hollow Stem Augers													

ON_MOT VER3 08TF005.GPJ ON_MOT.GDT 1/24/2009 8:41:50 AM

+7 .X⁵: Numbers refer to
Sensitivity

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15-0-5 (% STRAIN AT FAILURE
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METRIC

ON MOT VER3 08TF005.GPJ ON MOT.GDT 1/24/2009 8:41:51 AM

+⁷, X⁵: Numbers refer to Sensitivity

RECORD OF BOREHOLE No 107 2 of 2 METRIC

G.W.P. 280-99-00 LOCATION Co-ords: 4 766 083 N; 326 618 E ORIGINATED BY W.L.
DIST CR HWY 406 BOREHOLE TYPE Continuous Flight Hollow Stem Augers COMPILED BY N.R.
DATUM Geodetic DATE September 24, 2008 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION kPa RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100					
171.4 15.0			17	SS	1		171										
	Very stiff			FV													
169.7 16.7	Silt, some clay trace sand, trace gravel Compact Reddish Wet brown		18	SS	13		170										
	trace clay																
167.5 18.9	Loose		19	SS	7		169										
	End of borehole						168										
	* 2008 09 24 ▼ Water level measured after drilling ■ Penetrometer test WH** denotes penetration due of weight of rods and hammer																

ON_MOT VER3 08TF005.GPJ ON_MOT.GDT 1/24/2009 8:41:51 AM

+7, X⁵: Numbers refer to
Sensitivity 20
15 5 10 (% STRAIN AT FAILURE)

RECORD OF BOREHOLE No 108

1 of 2

METRIC

G.W.P. 280-99-00 LOCATION Co-ords: 4 766 107 N; 326 655 E ORIGINATED BY M.R.
DIST CR HWY 406 BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY N.R.
DATUM Geodetic DATE October 20, 2008 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			* GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION kPa RESISTANCE PLOT			PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							
								○ UNCONFINED	+ FIELD VANE						
								● QUICK TRIAXIAL	× LAB VANE						
185.3	Ground Surface					20	40	60	80	100	WATER CONTENT (%)				GR SA SI CL
0.0	Silty clay, trace sand layers of silt														
	Firm to Mottled Moist stiff brown		1	SS	7									Org. 1.6%	4 4 42 50
	trace gravel		2	SS	6										
	lenses of clayey silt		3	SS	6										
	Clayey silt some sand, trace gravel asphalt inclusions thin lenses of topsoil		4	SS	8									Org. 1.6%	4 15 47 34
	(FILL)		5	SS	13									Org. 1.3%	2 11 54 33
			6	SS	9										
179.7	Topsoil		7	SS	7										
5.6															
179.5	Silty clay, trace sand		8	SS	15										
5.8	Very stiff Brown Moist														
	thin partings of silt		9	SS	18										0 1 42 57
	Stiff		10	SS	4										
				FV											
			11	TW	PH										
				FV											
	Grey		12	SS	WH**										
				FV											
172.0	End of borehole														
13.3															

ON_MOT VER3 08TF005.GPJ ON_MOT.GDT 1/24/2009 8:41:53 AM

+² . X⁵ : Numbers refer to
Sensitivity 20
15-0-5 (% STRAIN AT FAILURE
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RECORD OF BOREHOLE No 108

2 of 2

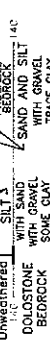
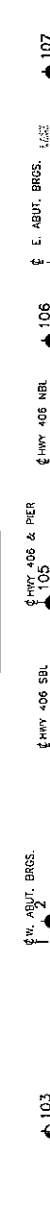
METRIC

G.W.P. 280-99-00 LOCATION Co-ords: 4 766 107 N; 326 655 E ORIGINATED BY M.R.
DIST CR HWY 406 BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY N.R.
DATUM Geodetic DATE October 20, 2008 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			* GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION kPa 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 x LAB VANE									
170.3								20	40	60	80	100					
	<div>* Borehole dry upon completion of drilling</div> <div>■ Penetrometer test</div> <div>WH** denotes penetration due of weight of rods and hammer</div>																

ON_MOT VER3 08TF005.GPJ ON_MOT.GDT 1/24/2009 8:41:53 AM

+7, X⁵: Numbers refer to Sensitivity 20 15 10 5 (%) STRAIN AT FAILURE



GEORGIN (HILL)

NOTE:

5 0 5 10m

SCALE

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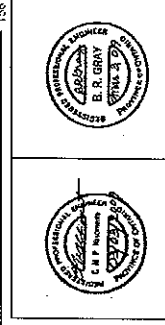
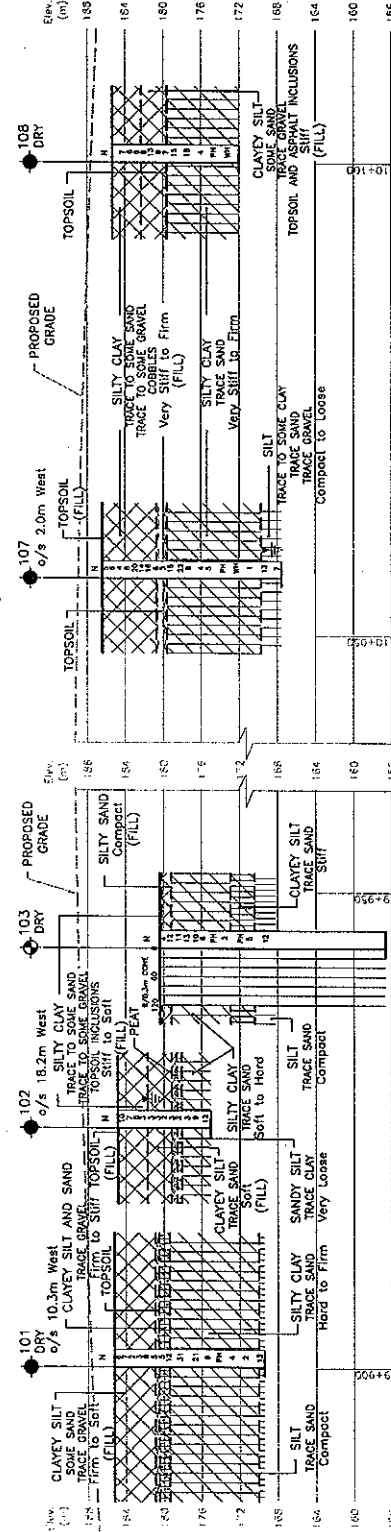
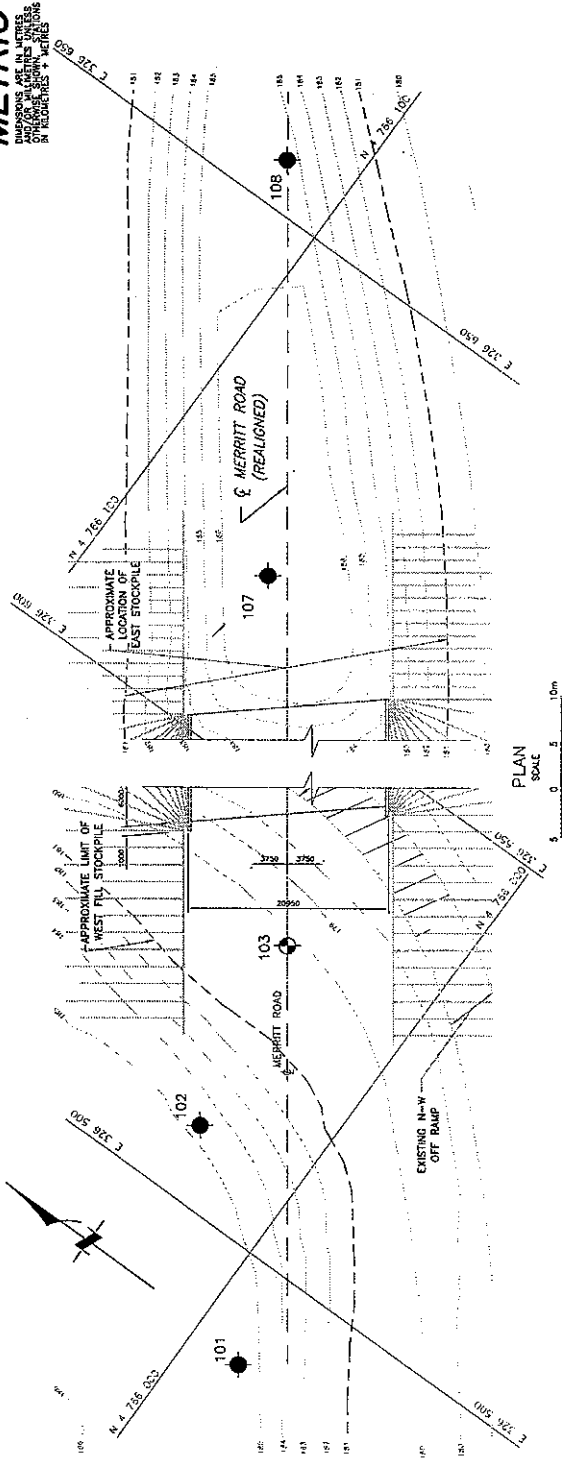
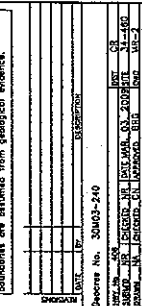
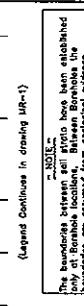
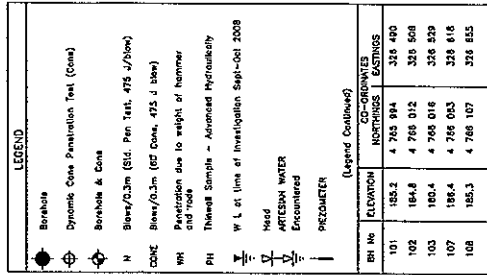
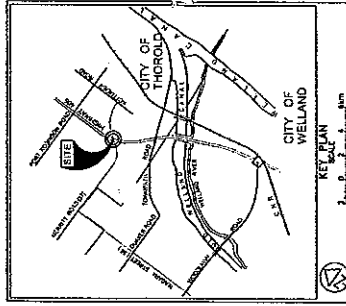
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THIS DRAWING IS FOR SUBSURFACE INFORMATION ONLY. SURFACE
DETAILS AND FEATURES ARE FOR CONCEPTUAL ILLUSTRATION.

	
REF No. PREFERRED OPTION/old-base map-ONE COLOR.dwg Retitled on Sep.23, 2008 S7303-301-0910A.dwg; Dated JANUARY, 2009	



G PROFILE

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\$		\$	

NOTE:

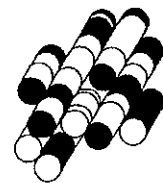
1. THIS DRAWING IS FOR SUBSURFACE INFORMATION ONLY. SURFACE DETAILS AND FEATURES ARE FOR CONCEPTUAL ILLUSTRATION.

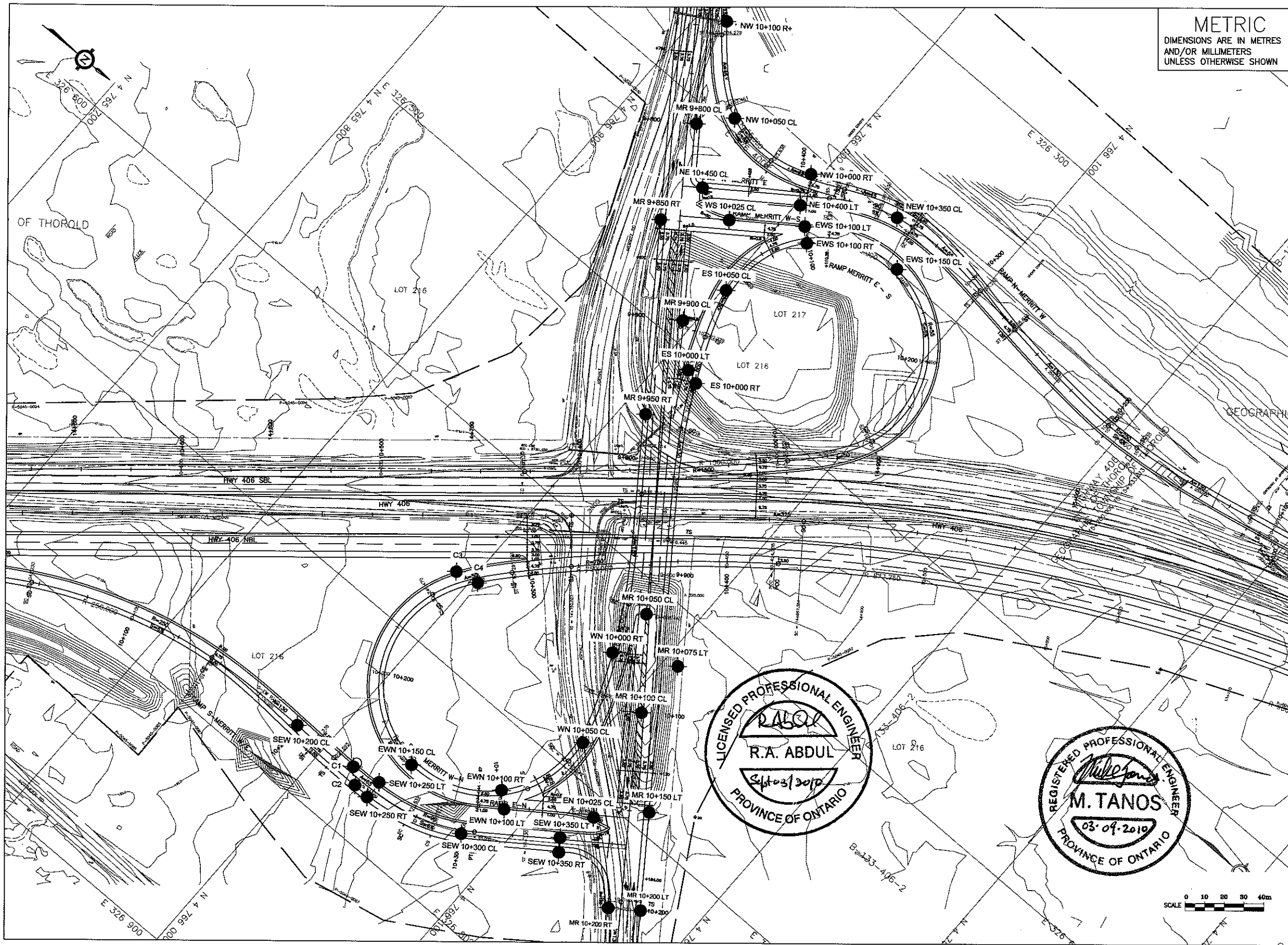
REF No. PREFERRED OPTION/old-base map-ONE COLOR.dwg.
Received on Sept.25, 2008
S7303-301-001QA.dwg; Dated JANUARY, 2009

APPENDIX D

**Drawings titled “Borehole
Locations and Soil Strata”**

Terraprobe Inc.





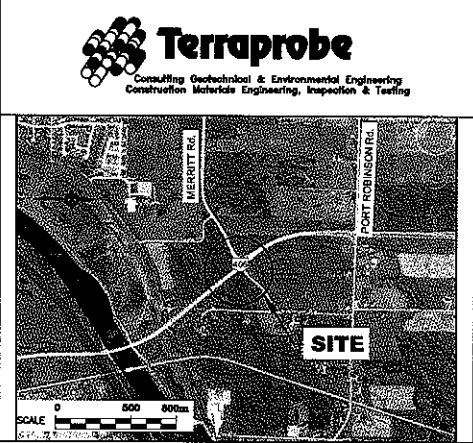
METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETERS
UNLESS OTHERWISE SHOWN

CONT No
WP No 280-99-00

HIGHWAY 406
MERRITT ROAD INTERCHANGE
BOREHOLE LOCATIONS

Giffels Associates Limited
Consulting Engineers and Architects
An IBI Group Company

SHEET
1 OF 6

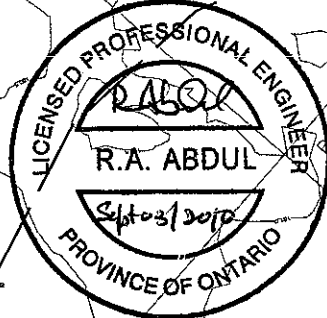


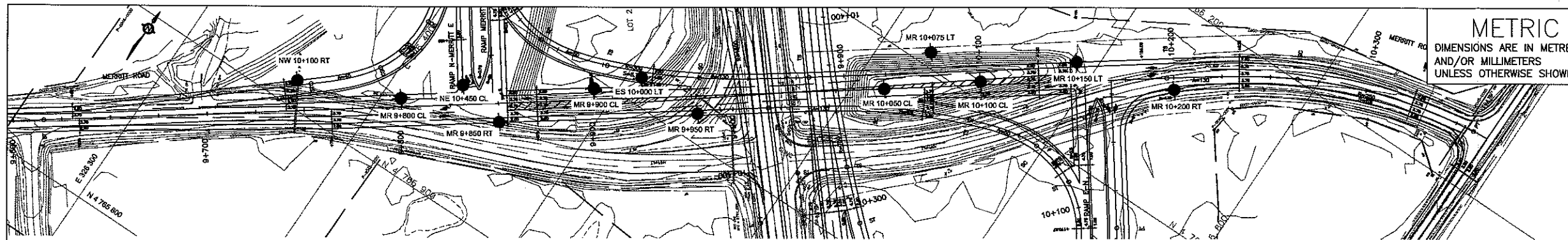
KEY PLAN	
LEGEND	
	Bore Hole
	Dynamic Cone Penetration Test
	Bore Hole And Cone
	Blows/0.3m (Std Pen Test, 475 J/blow)
	Blows/0.3m (60' Cone, 475 J/blow)
	WL at Time of Investigation
	WL in Piezometer/Monitoring Well
	Piezometer/Monitoring Well
	Rock Quality Designation
	Auger Refusal

No	ELEV.	COORDINATES	
		NORTHING	EASTING
REFER TO SHEETS 2 TO 6 FOR THIS DATA.			

NOTE
The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence.
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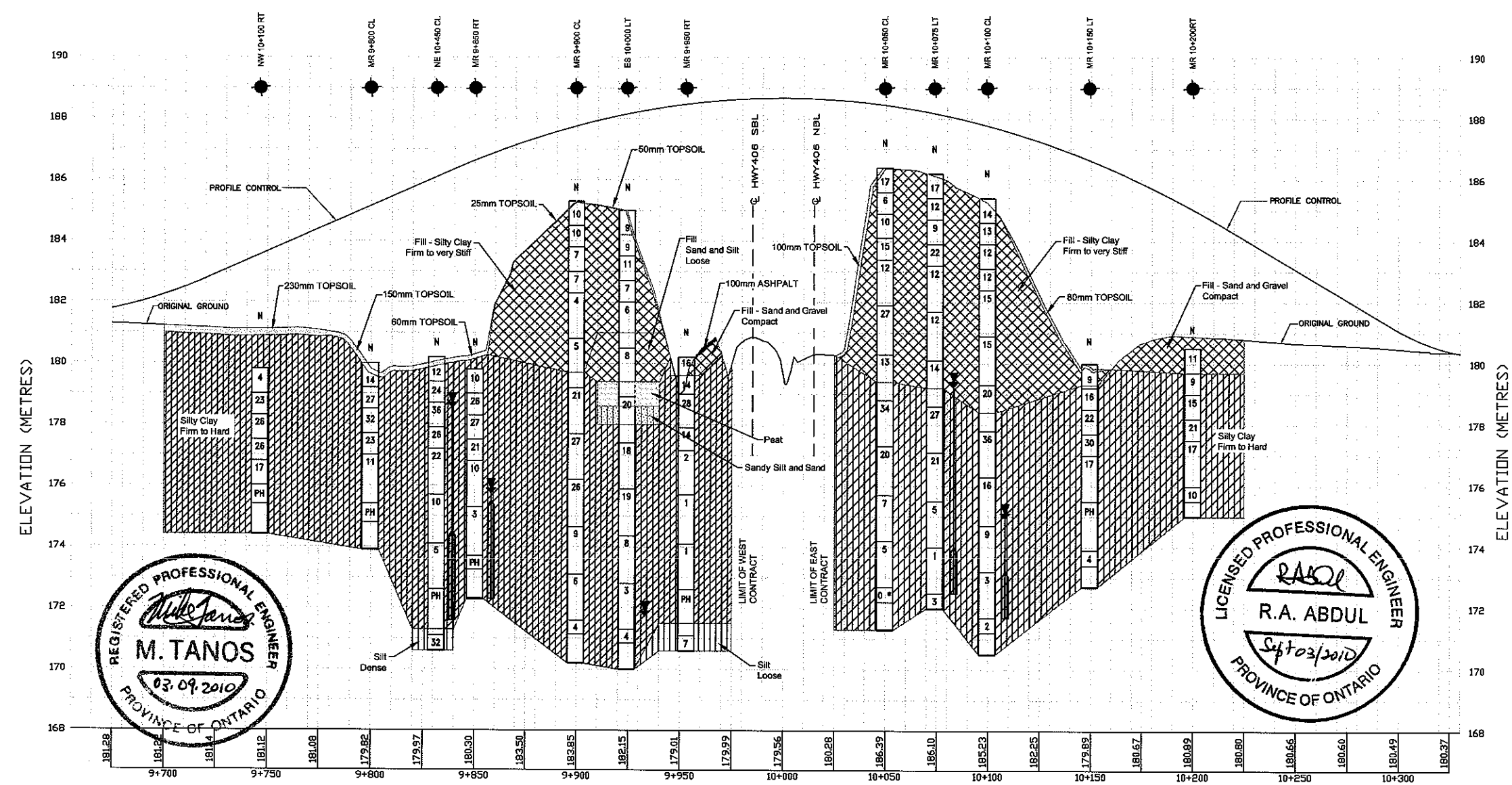
REVISIONS		DATE		BY	DESCRIPTION



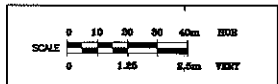


METRIC
DIMENSIONS ARE IN METRES
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UNLESS OTHERWISE SHOWN

MERRITT RD.



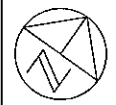
PROFILE OF MERRITT ROAD



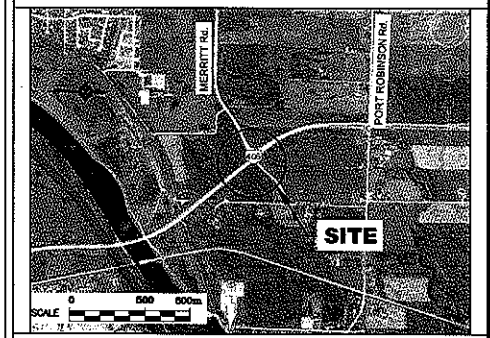
CONT No
WP No 280-99-00

HIGHWAY 406
MERRITT ROAD INTERCHANGE
BOREHOLE LOCATIONS

Giffels Associates Limited
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SHEET
2 OF 6



KEY PLAN

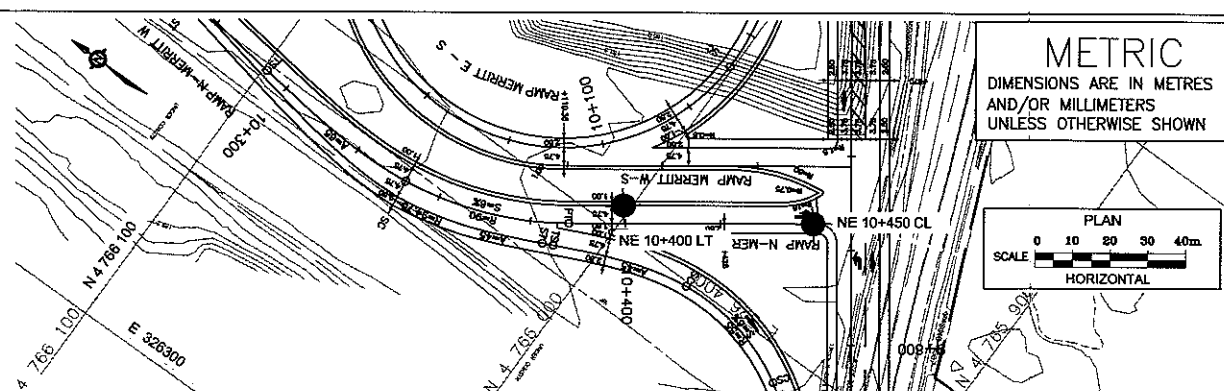
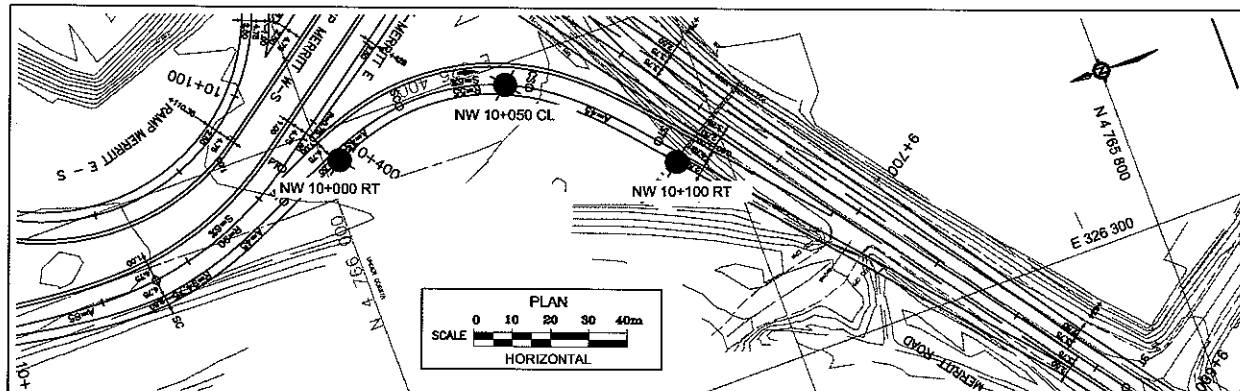
LEGEND

- Bore Hole
- Dynamic Cone Penetration Test
- Bore Hole And Cone
- Blows/0.3m (Std Pen Test, 475 J/blow)
- Blows/0.3m (60" Cone, 475 J/blow)
- WL at Time of Investigation
- WL in Piezometer/Monitoring Well
- Piezometer/Monitoring Well
- Rock Quality Designation
- Auger Refusal

No	ELEV.	COORDINATES	
		NORTHING	EASTING
NW 10+100 RT	179.8	4 765 913.2	326 359.9
MR 9+800 CL	180.0	4 765 935.2	326 409.3
NE 10+450 CL	180.2	4 765 958.5	326 432.0
MR 9+850 RT	179.8	4 765 953.0	326 458.1
MR 9+900 CL	185.3	4 765 994.9	326 489.5
ES 10+000 LT	185.0	4 766 013.3	326 507.0
MR 9+950 RT	180.2	4 766 011.5	326 537.9
MR 10+050 CL	186.4	4 766 077.8	326 614.6
MR 10+075 LT	186.2	4 766 107.2	326 624.3
MR 10+100 CL	185.4	4 766 108.7	326 654.0
MR 10+150 LT	180.0	4 766 144.7	326 689.8
MR 10+200 RT	180.5	4 766 160.5	326 739.9

NOTE
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REVISIONS	DATE	BY	DESCRIPTION
DESIGN R.A.	CODE CHBDC2006	LOAD	DATE SEPT. 2010
DRAWN K.L.	CHK R.A.	STRUCT	GEOCRE 30M3-252

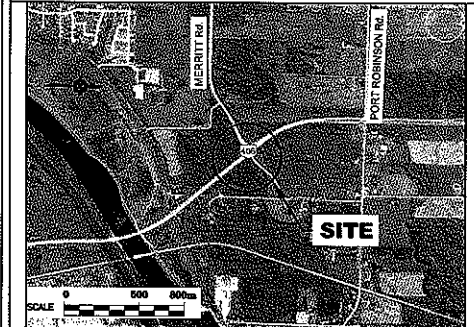


CONT No
WP No 280-99-00

HIGHWAY 406
MERRITT ROAD INTERCHANGE
BOREHOLE LOCATIONS

SHEET
3 OF 6

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KEY PLAN

LEGEND

- Bore Hole
- Dynamic Cone Penetration Test
- Bore Hole And Cone
- Blows/0.3m (Std Pen Test, 475 J/blow)
- Blows/0.3m (60° Cone, 475 J/blow)
- WL at Time of Investigation
- WL in Piezometer/Monitoring Well
- Piezometer/Monitoring Well
- Rock Quality Designation
- Auger Refusal

No	ELEV.	COORDINATES	
		NORTHING	EASTING
NW 10+000 RT	180.2	4 765 995.8	326 390.9
NW 10+050 CL	180.2	4 765 948.1	326 394.7
NW 10+100 RT	179.8	4 765 913.2	326 359.9
NE 10+ 400 LT	180.2	4 766 001.9	326 406.6
NE 10+ 450 CL	180.2	4 765 958.5	326 432.0

NOTE

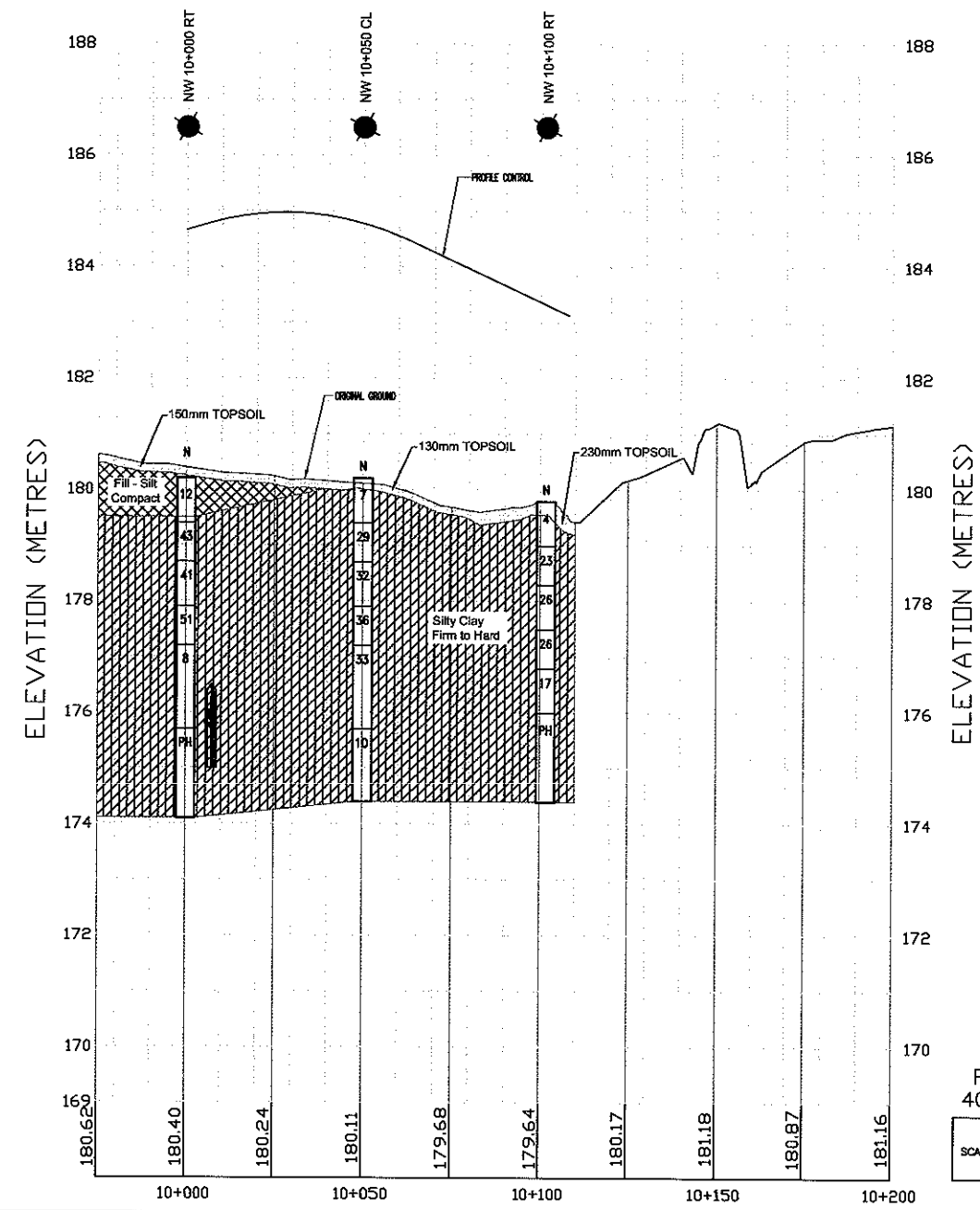
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REVISIONS	DATE	BY	DESCRIPTION

DESIGN R.A.	CODE CHBDC2006	LOAD	DATE SEPT. 2010
DRAWN K.L.	CHK R.A.	STRUCT	GEORES 30M3-252

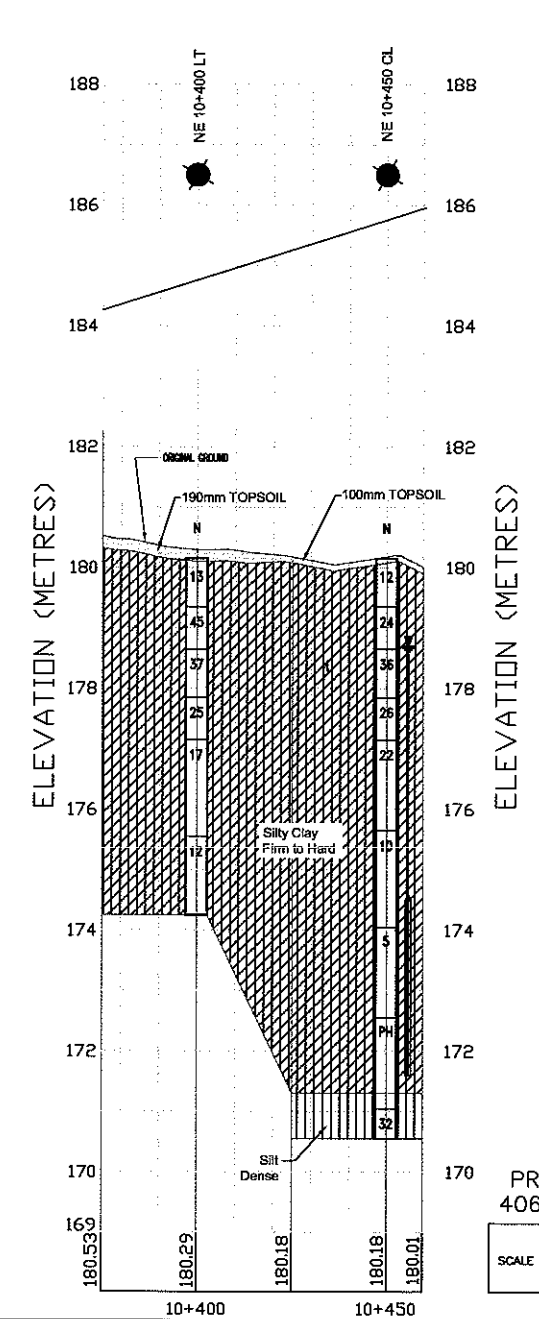
406 N-W MERRITT RAMP



PROFILE Q OF RAMP
406 N-MERRITT RD. W

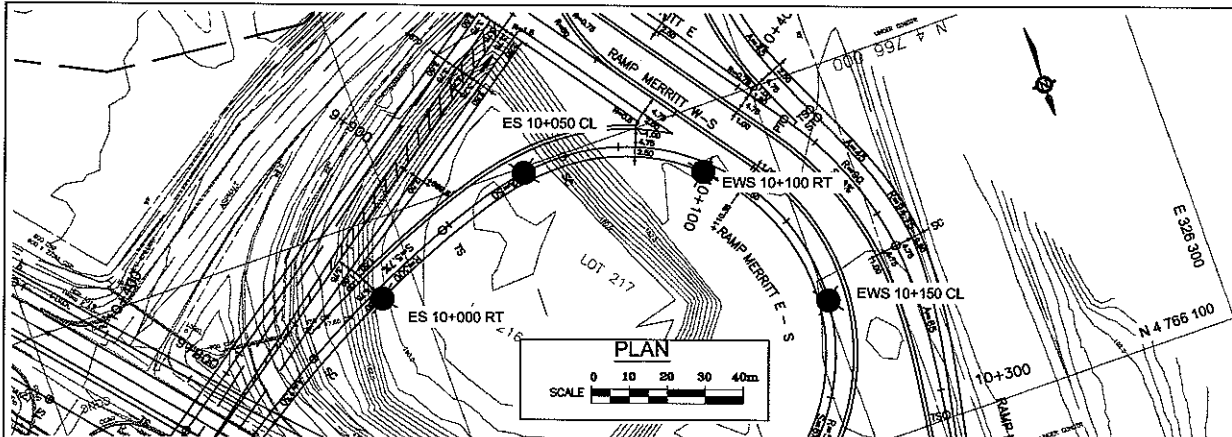
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0 1.25 2.5m VERT

406 N-E MERRITT RAMP

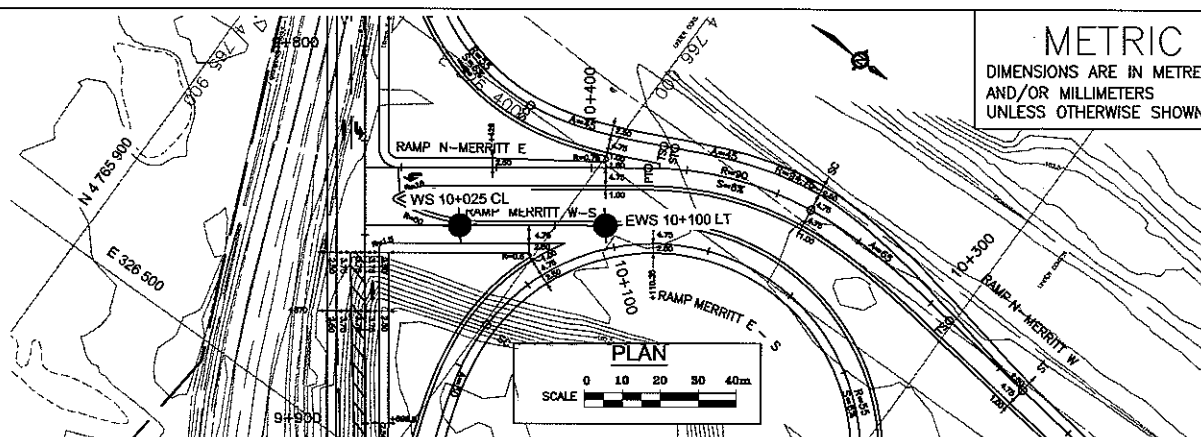


PROFILE Q OF RAMP
406 N-MERRITT RD. E

SCALE 0 10 20 30 40m HOR
0 1.25 2.5m VERT



MERRITT E-S RAMP



MERRITT W-S RAMP

METRIC
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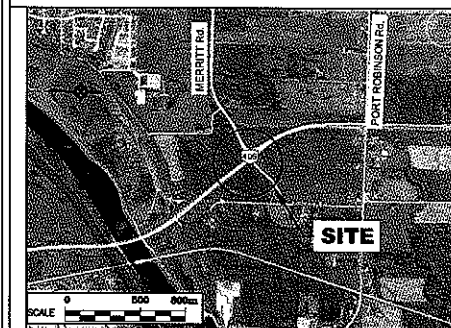
CONT No
WP No 280-99-00

HIGHWAY 406
MERRITT ROAD INTERCHANGE
BOREHOLE LOCATIONS

Giffels Associates Limited
Consulting Engineers and Architects
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SHEET
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KEY PLAN

LEGEND

- Bore Hole
- Dynamic Cone Penetration Test
- Bore Hole And Cone
- Blows/0.3m (Std Pen Test, 475 J/blow)
- Blows/0.3m (60' Cone, 475 J/blow)
- WL at Time of Investigation
- WL in Piezometer/Monitoring Well
- Piezometer/Monitoring Well
- Rock Quality Designation
- Auger Refusal

No	ELEV.	COORDINATES	
		NORTHING	EASTING
ES 10+000 RT	184.9	4 766 020.5	326 509.5
ES 10+050 CL	185.9	4 766 001.5	326 463.7
EWS 10+100 RT	180.7	4 766 016.9	326 419.0
EWS 10+150 CL	181.1	4 766 059.9	326 399.4
WS 10+025 CL	180.2	4 765 979.6	326 435.7
EWS 10+100 LT	180.5	4 766 010.6	326 413.2

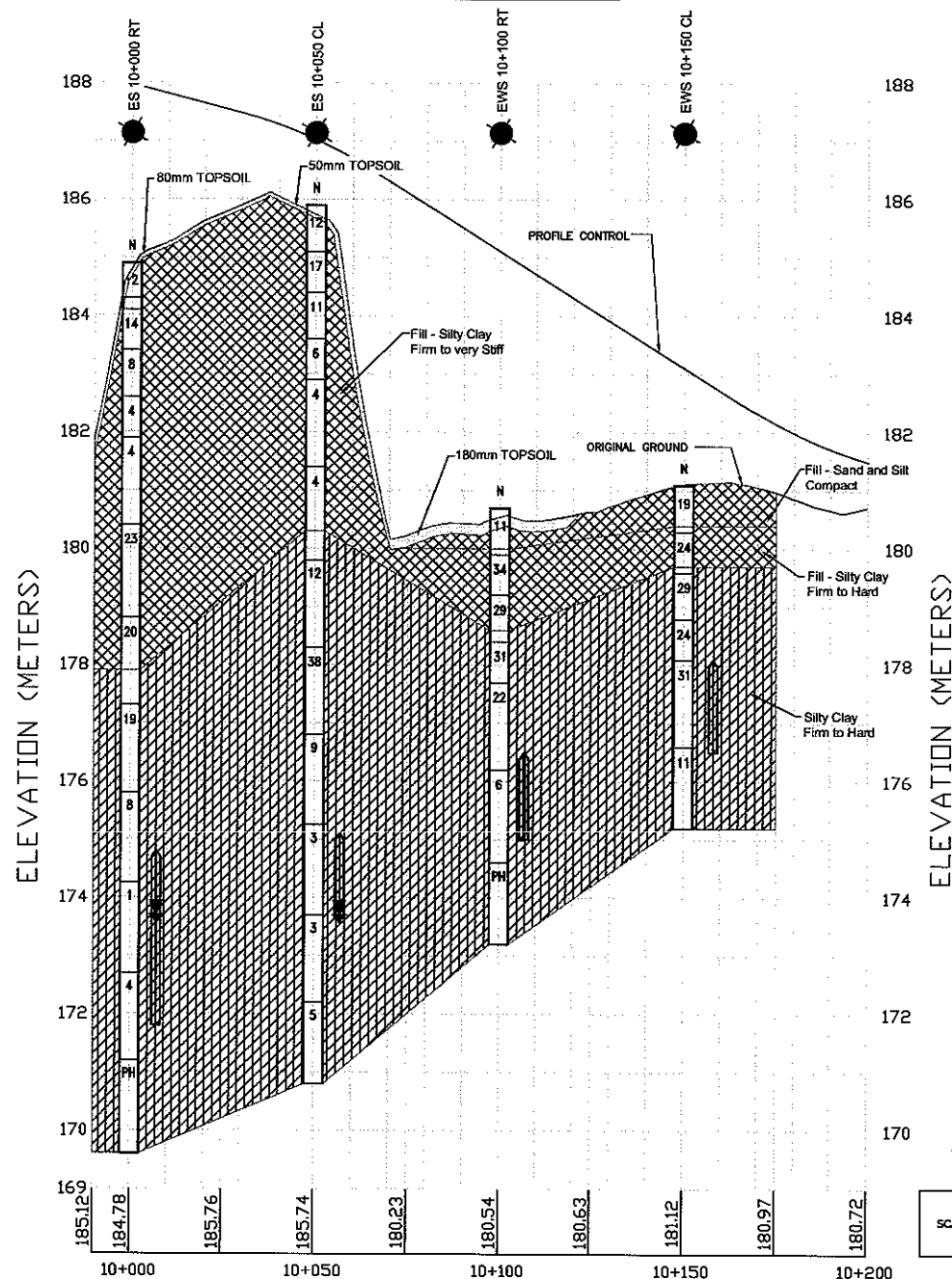
NOTE

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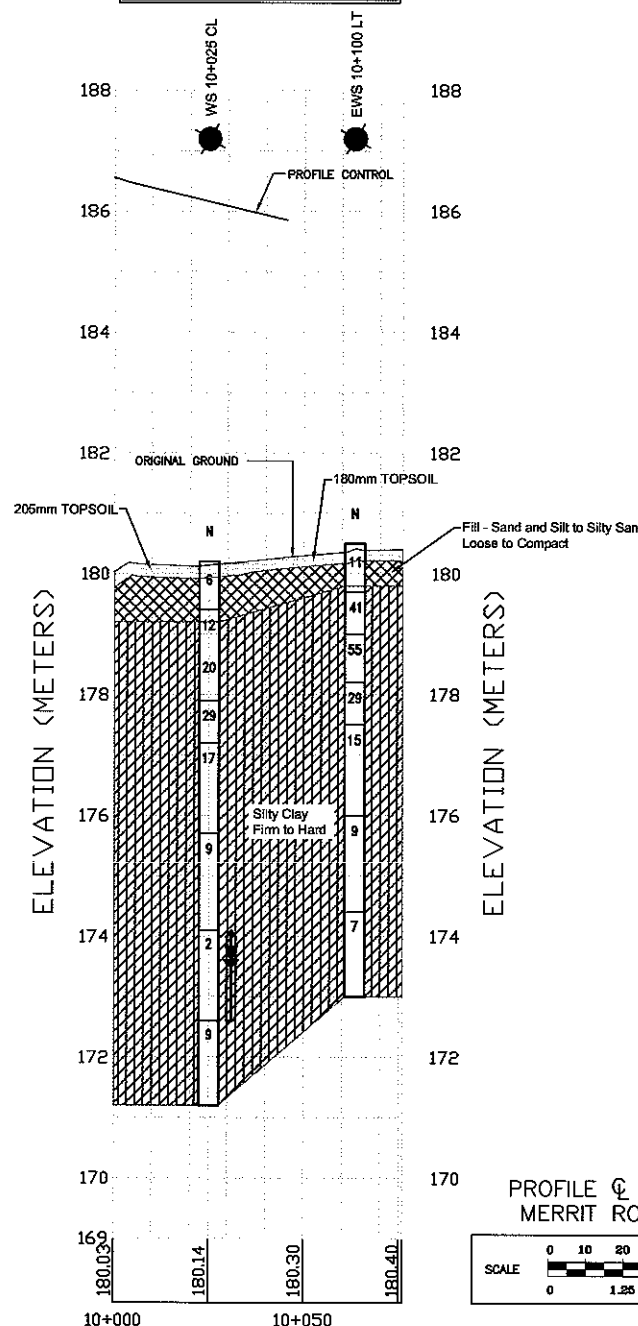
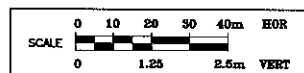
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	DATE	BY	DESCRIPTION

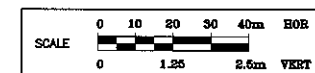
DESIGN R.A.	CODE CHBDC2006	LOAD	DATE SEPT. 2010
DRAWN K.L.	CHK R.A.	STRUCT	GEOGRES 30M3-252

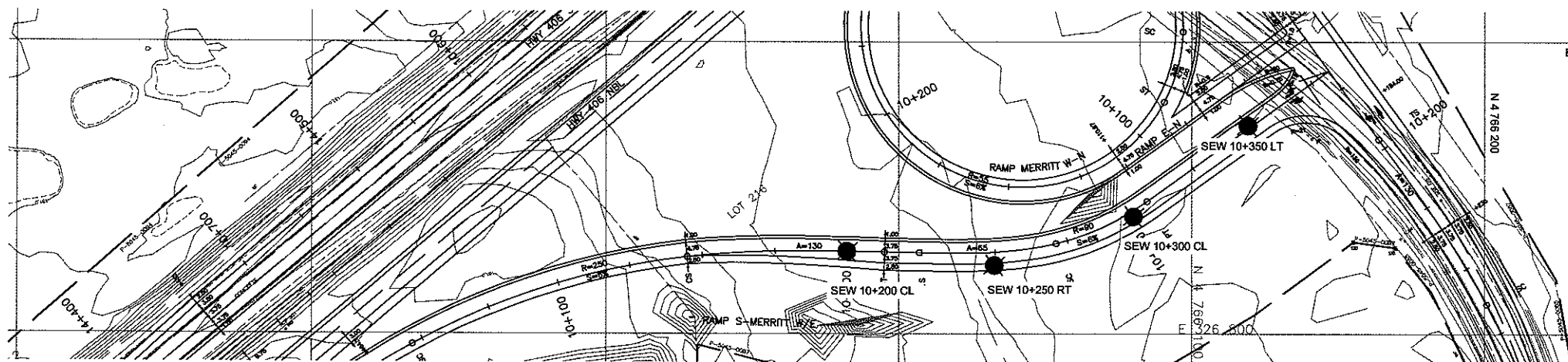


PROFILE OF RAMP
MERRITT ROAD E-S

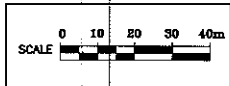


PROFILE OF RAMP
MERRITT ROAD W-S

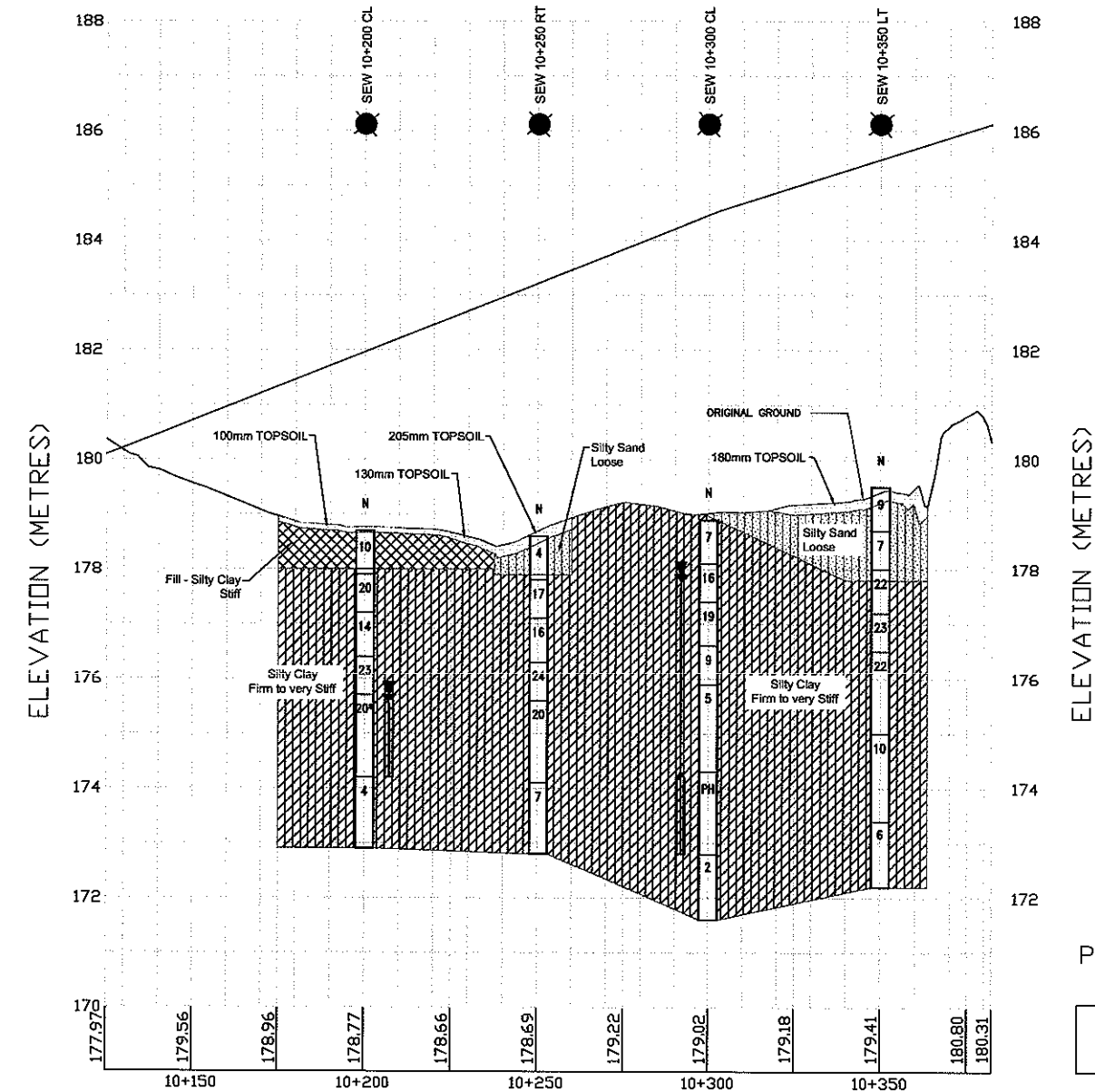




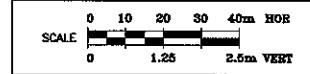
METRIC
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406 S-E/W RAMP



PROFILE ϕ OF RAMP
406 S - E/W

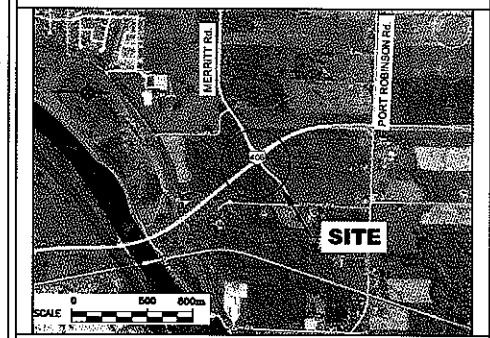


CONT No
WP No 280-99-00

HIGHWAY 406
MERRITT ROAD INTERCHANGE
BOREHOLE LOCATIONS

Giffels Associates Limited
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SHEET
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KEY PLAN

LEGEND

- Bore Hole
- Dynamic Cone Penetration Test
- Bore Hole And Cone
- Blows/0.3m (Std Pen Test, 475 J/blow)
- Blows/0.3m (60' Cone, 475 J/blow)
- WL at Time of Investigation
- WL in Piezometer/Monitoring Well
- Piezometer/Monitoring Well
- Rock Quality Designation
- Auger Refusal

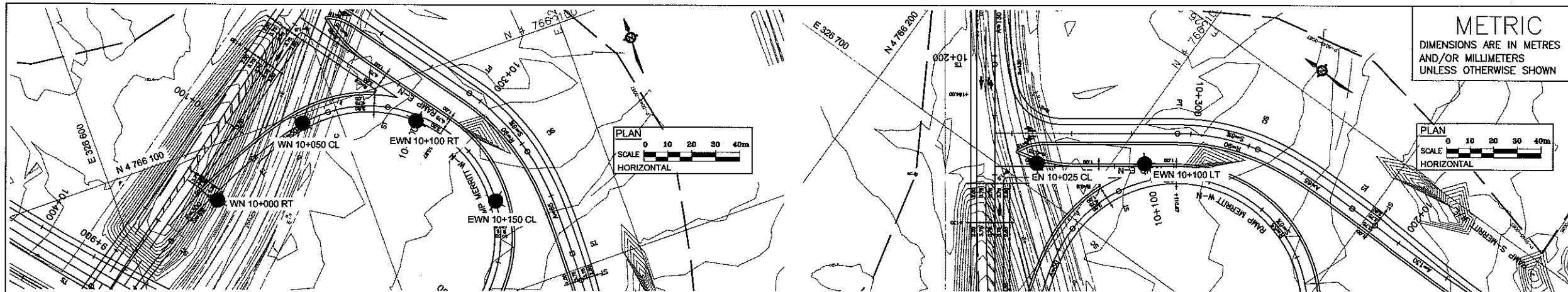
No	ELEV.	COORDINATES	
		NORTHING	EASTING
SEW 10+200 CL	178.7	4 785 982.3	326 771.7
SEW 10+250 RT	178.6	4 766 032.5	326 766.6
SEW 10+300 CL	178.9	4 766 080.2	326 759.9
SEW 10+350 LT	179.5	4 766 119.2	326 728.7

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DESIGN	R.A.	CODE	CHBDC2006	LOAD	DATE	SEPT. 2010
DRAWN	K.L.	CHK	R.A.	STRUCT	GEOCRE 30M3-252	

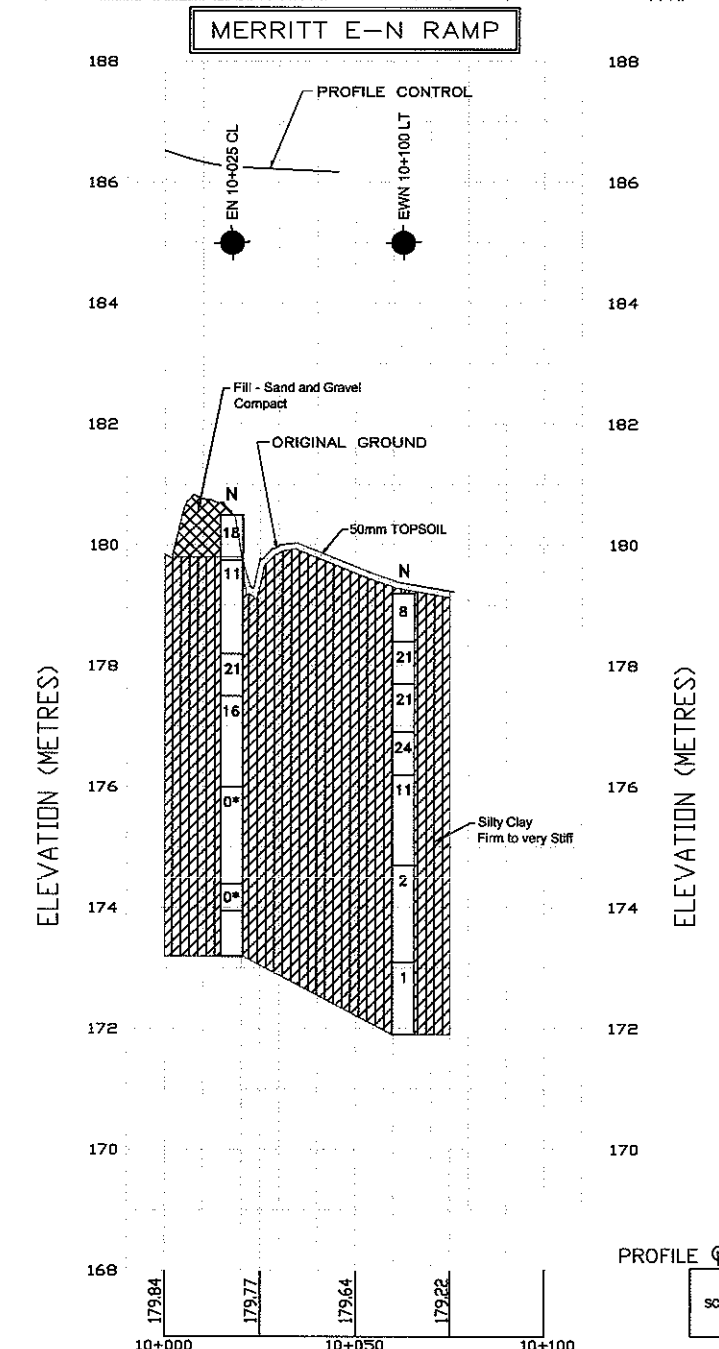
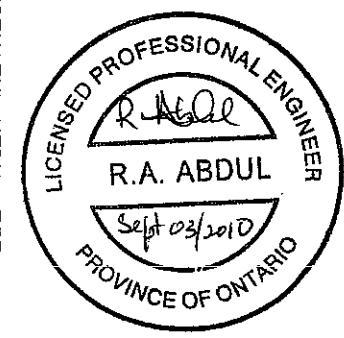
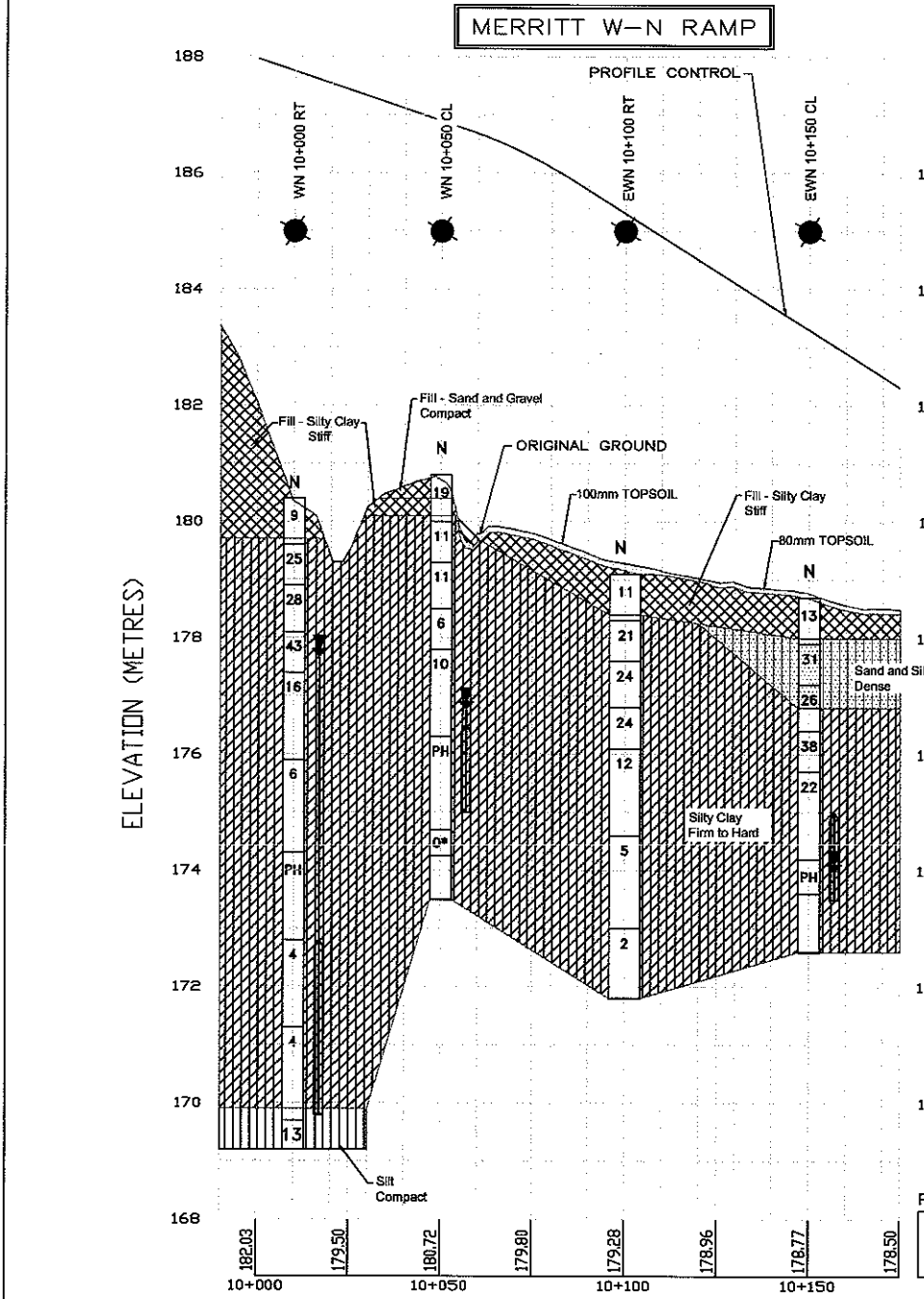
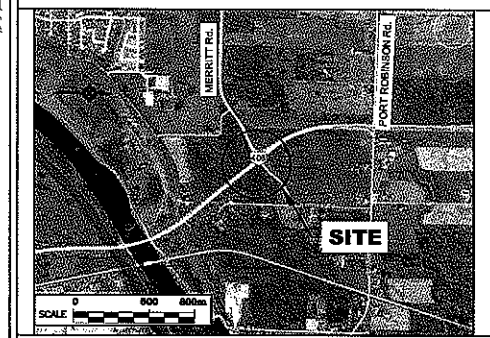


CONT No
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HIGHWAY 406
MERRITT ROAD INTERCHANGE
BOREHOLE LOCATIONS

SHEET
6 OF 6

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No	ELEV.	COORDINATES	
		NORTHING	EASTING
WN 10+000 RT	180.4	4 766 077.8	326 640.4
WN 10+050 CL	180.8	4 766 096.3	326 684.8
EWN 10+100 RT	179.1	4 766 081.3	326 729.7
EWN 10+150 CL	178.7	4 766 038.4	326 749.7
EN 10+025 CL	180.5	4 766 125.3	326 710.0
EWN 10+100 LT	179.2	4 766 088.4	326 736.2

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DRAWN K.L.	CHK R.A.	STRUCT	GEOCRIS 30M3-252