

**FOUNDATION INVESTIGATION REPORT
HIGHWAY 427 WIDENING
FROM FASKEN DRIVE TO STEELES AVENUE
DISCO ROAD / GOREWAY DRIVE OVERPASS
TORONTO, ONTARIO
G.W.P. 202-95-00**

Geocres Number: 30M12-289

Report to

SNC-Lavalin

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PART 1: FACTUAL INFORMATION

1 INTRODUCTION

This report presents the factual findings obtained from a foundation investigation conducted for the design and construction of the proposed inside widening of the existing mainline bridge structures at the Highway 427 overpass at Disco Road / Goreway Drive in Toronto, Ontario.

The purpose of the investigation was to explore the subsurface conditions at the site and, based on the data obtained, provide a borehole location plan, borehole logs, stratigraphic profile and cross-sections and a written description of the subsurface conditions. A model of the subsurface conditions was developed to describe the geotechnical conditions influencing design and construction of the foundations and approach embankments for the structures.

Thurber carried out the investigation as a sub-consultant to SNC-Lavalin under the Ministry of Transportation Ontario (MTO) Agreement Number 2004-E-0071.

During the preparation of this report and in addition to the boreholes drilled for the proposed structure widening, reference has been made to available information on subsurface conditions from a previous investigation documented in the report below.

- MTO report titled “Foundation Investigation and Design Report, Highway 427 overpass at Disco Road, W.P. 387-65, Site No. 37-994, Municipality of Metropolitan Toronto & Peel Borough of Etobicoke & City of Mississauga”, 1972 (Reference 1).

2 PROJECT AND SITE DESCRIPTION

The project involves the inside widening of the northbound and southbound (NBL and SBL) bridges of the Highway 427 overpass at Disco Road / Goreway Drive in the air gap between the existing bridges.

The site is located approximately 1.8 km west of Highway 27 in Toronto, Ontario. Lands surrounding the site have been developed for commercial and industrial uses.

A concrete culvert carrying the realigned Mimico Creek is located under Disco Road/Goreway Drive, running approximately perpendicular to the existing Highway 427 NBL and SBL.

An aerial photograph of the site is included in Appendix D and shows the general lay of the land in the vicinity of the site.

The site is situated within the South Slope physiographic region. The geology generally comprises a till plain consisting of clayey silt to silty clay (Halton Till) overlying bedrock. The bedrock consists of grey shale with hard siltstone and limestone interlayers of the Georgian Bay Formation.

3 SITE INVESTIGATION AND FIELD TESTING

The present site investigation was carried out from October 28 to November 19, 2008. The field program consisted of drilling and sampling eleven (11) boreholes (numbered GD-01 to GD-07, GD-07A, GD-08 to GD-10) at the site. Boreholes were drilled at locations of the structure abutments, piers and approaches along the alignment of the existing Highway 427 bridges.

Boreholes GD-02, GD-04 to GD-06, GD-07A and GD-08 and GD-10 were terminated in dense soils at depths ranging from 15.3 m to 27.5 m (Elevations 143.5 to 154.6 m). Boreholes GD-01 and GD-07 encountered auger refusal at 22.9 m and 13.7 m depth (Elevations 146.6 and 147.5 m) on weathered shale bedrock in Borehole GD-01 and on possible boulders or hard limestone slabs in Borehole GD-07, and were further advanced below these depths by coring to 25.9 m and 18.0 m (Elevations 143.5 and 143.2 m). Borehole GD-03 was terminated upon refusal on weathered shale bedrock at 15.7 m depth (Elevation 145.5 m).

The approximate borehole locations are shown on the Borehole Locations and Soil Strata Drawing in Appendix E. The coordinates and elevations of the boreholes are given on these drawings and on the individual Record of Borehole sheets in Appendix A. Records of boreholes (numbered 1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17 and 18) drilled during the previous investigation (1972) are enclosed in Appendix C.

Prior to commencement of drilling, utility clearances were obtained for all borehole locations.

Solid stem augers were used to advance the boreholes in the overburden and into the shale bedrock. Samples were obtained at selected intervals using a split spoon sampler in conjunction with Standard Penetration Testing (SPT). NQ rock coring equipment was used to advance Boreholes GD-01 and GD-07 into bedrock. Core samples of the shale bedrock were carefully protected to prevent drying during transport to the laboratory.

A member of Thurber's engineering staff supervised the drilling and sampling operations on a full time basis. The supervisor logged the boreholes, visually examined the recovered samples, and transported them to Thurber's laboratory for further examination and testing.

All rock cores were logged, and the Total Core Recovery (TCR), Rock Quality Designation (RQD) and the Fracture Indices (FI) were determined.

Groundwater conditions in the open boreholes were observed throughout the drilling operations. Three standpipe piezometers consisting of 19 mm PVC pipes with screens were installed in selected boreholes to permit monitoring of groundwater levels. Details of the piezometer installations and other borehole completion details are as shown in Table 3.1.

Table 3.1 – Borehole Completion Details

Foundation Unit	Borehole	Piezometer Tip Depth/ Elevation (m)	Completion Details
South Approach	GD-09	None installed	Bentonite to surface.
South Abutment	GD-01	None installed	Bentonite to surface.
	GD-05	26.0/144.0	Piezometer with 1.5 m slotted screen installed with sand filter to 21.4 m, then bentonite holeplug to ground surface.
Pier 1 (south)	GD-02	None installed	Bentonite to surface.
	GD-06	None installed	Bentonite to surface.
Pier 2 (north)	GD-03	None installed	Bentonite to surface.
	GD-07	None installed	Bentonite to surface.
North Abutment	GD-04	25.9/145.1	Piezometer with 1.5 m slotted screen installed with sand filter to 22.8 m, then bentonite holeplug to ground surface.
	GD-08	None installed	Bentonite to surface.
North Approach	GD-10	None installed	Bentonite to surface.

4 LABORATORY TESTING

All recovered soil samples were subjected to Visual Identification (VI) and rock samples to geological logging. At least 25% of the recovered samples of soil were also subjected to grain size distribution analyses (sieve and hydrometer) and Atterberg Limits testing where appropriate. Moisture content determinations were carried out on all soil samples. The results of this testing program are shown on the Record of Borehole sheets in Appendix A and on the figures contained in Appendix B. Record of Borehole sheets and laboratory testing results from the previous investigation (Reference 1) are also included in Appendix C.

5 DESCRIPTION OF SUBSURFACE CONDITIONS

Reference is made to the Record of Borehole sheets in Appendix A. Details of the encountered soil and rock stratigraphy are presented in this appendix and on the Borehole Locations and Soil Strata Drawing in Appendix E. An overall description of the stratigraphy is given in the following paragraphs. However, the factual data presented in the Record of Borehole Sheets governs any interpretation of the site conditions.

In general terms, the soil stratigraphy encountered at this site comprises clayey silt fill with layers of silty clay, silty sand and sandy silt fill, underlain by native clayey silt and sand till, with occasional silty clay till overlying clayey silt till with frequent shale and limestone slabs. Weathered shale bedrock was contacted below clayey silt till at the south abutment area. More detailed descriptions of the individual strata are presented below.

5.1 Fill

Fill consisting predominantly of clayey silt with interlayers of various soils was encountered in all the boreholes drilled for the present investigation and in Boreholes 11, 16 and 17 drilled in 1972. The fill consisted of the following soils:

- Brown, black and grey silty clay fill containing trace to some sand, trace to some gravel and occasional rootlets and organics was contacted surficially in Boreholes GD-01, GD-04 and GD-10, and at 3.0, 3.7, 7.2 m depths in Boreholes GD-03, GD-06, GD-07, respectively. Thickness of the silty clay fill ranged from 1.5 to 2.1 m.
- Brown to black sandy silt fill containing some clay and occasional rootlets and organics was contacted surficially in Borehole GD-05. A layer of reddish brown sandy silt fill containing trace gravel and trace clay was contacted below the clayey silt fill at 3.5 m depth (Elevation 157.4 m) in Borehole GD-02. The thickness of the sandy silt fill was 1.5 m and 2.6 m in Boreholes GD-05 and GD-02, respectively. A 200-mm thick layer of sandy silt fill was encountered at 6.4 m depth (Elevation 154.5 m) in Borehole GD-06.
- Layers of brown to black silty sand containing trace to some gravel and trace to some clay was contacted below the silty clay fill at 2.1 m depth (Elevation 168.1 m) in Borehole GD-10 and surficially in Borehole GD-09. Occasional organics were observed in the silty sand fill in Borehole GD-09. The thickness of the silty sand fill was 0.8 m where encountered.
- Brown and, mottled brown to grey clayey silt and sand fill was contacted below the silty clay fill in Boreholes GD-01 and GD-04, below the sandy silt and silty sand fill in Boreholes GD-05, GD-09 and GD-10 and surficially in Boreholes GD-02, GD-03 and GD-06 to GD-08. The clayey silt and sand fill was also contacted at 6.1 m depth (Elevation 154.8) in Borehole GD-02. The thickness of the clayey silt and sand fill

ranged from 1.1 m to 13.7 m. The fill contains occasional wood pieces, organics and pieces or slabs of shale.

- Layers of fill ranging from clayey silt fill underlain by garbage fill were encountered surficially in the 1972 Boreholes 11, 16 and 17 (in Appendix C). The fill thickness ranged from 1.4 m to 6.6 m. A 3.4 m to 4.3 m thick layer of garbage fill was encountered at Elevations 157.7 and 158.9 m in Boreholes 11 and 16, respectively.

In Boreholes GD-01 to GD-10, the depths to the base of the fill ranged from 7.2 m to 15.2 m (Elevations 152.0 to 162.6 m).

Based on SPT 'N' values ranging from 6 to 85 blows for 0.3 m of penetration, the cohesive clayey silt fill is described as firm to hard in consistency. An occasional SPT 'N' value of 62 blows for 0.2 m of penetration indicating a hard consistency was measured in Borehole GD-03 near Elevation 160.3 m. SPT 'N' values of 15 and 33 blows per 0.3 m of penetration were measured within the sandy silt/silty sand fill, indicating a compact to dense relative density. The moisture contents of the fill samples recovered ranged from 4% to 35%.

Grain size distribution curves for samples of clayey silt and sand, and silty clay, fill are presented on the Record of Borehole sheets and on Figures B1 to B4 of Appendix B. Grain size distribution curves for samples of silty sand fill are presented on the Record of Borehole sheets and on Figure B5 of Appendix B. Atterberg Limit test results for the clayey silt and sand fill, and silty clay fill are presented on Figures B11 to B13 of Appendix B.

Laboratory test results of the previous investigation are presented in Appendix C.

The results of the laboratory tests are summarized as follows:

Soil Particles	Clayey Silt and Sand Fill (%)	Silty Sand Fill (%)
Gravel	0 to 11	8 to 22
Sand	20 to 39	52 to 61
Silt	29 to 46	26
Clay	19 to 38	14
Silt & Clay	-	17
Liquid Limit	28 to 37	-
Plasticity Index	13 to 19	-

The above results show that the cohesive fill is typically of low to medium plasticity with group symbols of CL-CI.

5.2 Upper Clayey Silt and Sand Till

Native brown and mottled brown to grey clayey silt and sand till containing trace to some gravel and occasional boulders and shale fragments was encountered below the fill in Boreholes GD-01, GD-02, GD-04, GD-05 and GD-08 to GD-10 drilled during the present investigation and in all the boreholes drilled during the previous investigation. Thickness of the clayey silt till ranged from at least 3.2 m to 9.2 m in Boreholes GD-01, GD-02, GD-04, GD-05, GD-08 to GD-10, and from at least 6.2 m to 15.2 m in the 1972 boreholes.

The depth to the base of the clayey silt and sand till ranged from 10.7 m to 23.0 m (Elevations 148.1 to 153.0 m) in Boreholes GD-01, GD-02 and GD-04 to GD-08. Boreholes GD-09 and GD-10 were terminated within the clayey silt and sand till at 15.8 m and 15.6 m depth (Elevations 154.2 and 154.6 m), respectively. The base of the entire unit of glacial till is noted at Elevation 140.4 to 145.3 m in the 1972 boreholes.

Layers of silty clay and sand till were encountered below the fill in Boreholes GD-06 and GD-07, and within the upper clayey silt till in Borehole GD-10. Where encountered, these layers are 1.4 m to 2.5 m thick with base elevations ranging between 149.6 and 155.5 m. Layers of sand and gravel were encountered within the upper clayey silt and sand till in Borehole 7.

Based on SPT 'N' values ranging from 8 to 100 blows for less than 0.3 m of penetration, the upper clayey silt to silty clay and sand till is described as stiff to hard in consistency. SPT 'N' values of 2 and 4 were measured in Borehole 13. In Borehole GD-10 an SPT 'N' value of 150 blows per 0.225 m of penetration was measured near borehole termination depth (15.6 m). High SPT 'N' values, generally 100 blows for less than 0.3 m of penetration, were measured below Elevation 149.0 to 146.0 in the 1972 boreholes.

The natural moisture contents of the clayey silt and sand till samples ranged from 8% to 29%.

Grain size distribution curves for upper clayey silt and sand till samples tested are presented on the Record of Borehole sheets and on Figures B6 to B8 of Appendix B. Atterberg Limit test results are presented on Figures B14 and B15 of Appendix B.

Laboratory test results of previous investigation are presented in Appendix C.

The results of laboratory tests are summarized as follows:

Soil Particles	Clayey Silt and Sand Till (%)	Sand and Gravel (%)
Gravel	0 to 36	21 to 34
Sand	5 to 44	24 to 29
Silt	27 to 59	31 to 35
Clay	8 to 48	11 to 15

Liquid Limit	20 to 38	-
Plasticity Index	12 to 21	-

The above results show that the upper clayey silt and sand till is typically of low to medium plasticity with group symbols of CL-CI.

Glacial tills inherently contain cobbles and boulders and the lower part of the till contains pieces and slabs of bedrock which may account for some high blow counts.

5.3 Silty Clay

Native grey silty clay containing trace sand and trace gravel was contacted within the upper clayey silt till or below the fill at 20.0 m, 8.7 m and 18.0 m depth (Elevations 149.4, 152.5 and 153.0 m) in Boreholes GD-01, GD-03 and GD-08, respectively. Thickness of the silty clay ranged from 1.3 m to 2.3 m.

The depths to the base of the silty clay were 21.3 m, 11.0 m and 20.0 m (Elevations 148.1, 150.2 and 151.0 m) in Boreholes GD-01, GD-03 and GD-08, respectively.

Based on SPT 'N' values of 23, 33 and 83 blows for 0.3 m of penetration, the silty clay is described as very stiff to hard in consistency. The natural moisture contents of the silty clay samples ranged from 19% and 25%.

Grain size distribution curves for the silty clay samples tested are presented on the Record of Borehole sheets and on Figure B9 of Appendix B. Atterberg Limit test results are presented on Figure B16 of Appendix B.

The results of laboratory tests are summarized as follows:

Soil Particles	Silty Clay (%)
Gravel	0
Sand	7 to 13
Silt	42 to 44
Clay	44 to 50

Liquid Limit	37 to 39
Plasticity Index	18 to 20

The above results show that the silty clay is typically of medium plasticity with a group symbol of CI.

5.4 Lower Clayey Silt Till with Shale and Limestone Slabs

Native grey clayey silt till with frequent shale and limestone slabs, trace of sand to some sand and boulders was contacted below the upper clayey silt and sand till in Boreholes GD-02, GD-04 and GD-05, below the silty clay till in GD-06 and GD-07, and below the silty clay in Boreholes GD-01, GD-03 and GD-08. The thickness of the lower clayey silt till with slabs of bedrock was 1.6 m and 4.4 m in Boreholes GD-01 and GD-03.

Borehole GD-07 encountered auger refusal at 13.7 m depth (Elevation 147.5 m). Coring was conducted below this depth. Cores confirmed the presence of limestone and shale slabs within the clayey silt till. Thickness of the limestone slabs varied from 50 mm to 90 mm and the thickness of a shale slab was approximately 80 mm.

The depth to the base of this lower clayey silt till with slabs of bedrock was 22.9 m and 15.4 m (Elevations 146.6 and 145.8 m) in Boreholes GD-01 and GD-03, respectively.

Boreholes GD-02 and GD-04 to GD-08 were terminated within this lower clayey silt till with slabs of rock at depths ranging from 15.3 m to 27.5 m (Elevations 143.2 to 145.9 m). The lower part of the glacial till below about Elevations 149 to 146 in the 1972 boreholes are reported to contain boulders and shale fragments.

Based on SPT 'N' values ranging from 80 to 149 blows for less than 0.3 m of penetration, the lower clayey silt till with slabs of rock is described as hard in consistency. SPT 'N' values of 128 blows per 0.275 m of penetration to 100 blows per 0.0 m of penetration were measured in Borehole GD-08 below Elevation 149.8 m.

The natural moisture contents of the samples recovered from this lower clayey silt till with slabs of rock layer ranged from 5% to 21%.

Grain size distribution curves for the lower clayey silt till samples are presented on the Record of Borehole sheets and on Figure B10 of Appendix B.

Laboratory test results of previous investigation are presented in Appendix C.

The results of laboratory tests are summarized as follows:

Soil Particles	Clayey Silt Till with frequent shale and limestone slabs (%)
Gravel	0 to 6
Sand	7 to 24
Silt	53 to 76
Clay	17 to 20

As indicated earlier, this hard till layer contains boulders, pieces and slabs of shale and limestone which may account for the consistent high blow counts.

5.5 Shale Bedrock

The soils described above were found to be underlain by grey highly to moderately weathered shale bedrock. The shale encountered in the boreholes is described as thinly bedded and contains numerous very strong interbedded limestone layers/slabs.

An SPT 'N' value obtained in the weathered shale bedrock was 100 blows per 0.3 m penetration in Borehole GD-03. Moisture contents were measured at 6% and 17%.

Elevations of the top of bedrock are presented in Table 5.1.

Table 5.1 – Elevation of Top of Weathered Bedrock

Foundation Element	Borehole	Depth (m)	Bedrock Elevation (m)
South Abutment	GD-01	22.9**	146.6**
	2	12.2	142.9
	3	11.6*	144.8*
Pier 1 (south)	7	12.6*	143.1*
	8	12.2	144.1
Pier 2 (north)	GD-03	15.4*	145.8*
	12	15.2	140.4
	13	12.3*	144.1*
North Abutment	17	11.0	145.2

* Probable bedrock – split spoon refusal

** Bedrock proven by coring

Bedrock cores were collected using NQ sized coring equipment in Borehole GD-01. Total core recovery (TCR) in the bedrock were 80% and 100% in the two core runs.

RQD values recorded in the core runs were 0% and 8%, indicating a very poor rock quality.

The shale bedrock typically contains layers of siltstone and limestone that can be significantly harder than the shale itself. The distribution, thickness and strength of these layers vary from location to location, and these layers typically exhibit less pronounced weathering than the shale. The thickness of limestone layers generally ranges from 50 to 120 mm. Clay seams were also observed within the rock cores. It is noted that sampling and interpretation from small diameter boreholes may underestimate the frequency, thickness and strength of the

strong layers and therefore geological expertise and past experience must be applied in any decision making process regarding the bedrock.

5.6 Water Levels

Water levels were observed in the boreholes during and upon completion of drilling. Standpipe piezometers were installed in three boreholes to monitor water levels after completion of drilling. The water levels measured in the piezometers are summarized in Table 5.1, along with the measurements in the boreholes upon completion of drilling.

Table 5.1 – Measured Groundwater Levels

Foundation Element	Borehole	Date	Water Level (m)		Comment
			Depth (m)	Elevation (m)	
South Abutment	GD-05	May 5, 2009 June 8, 2009	13.7 13.6	156.3 156.4	In piezometer
	1	February 3, 1972	2.0	153.3	In open borehole
	2	February 1, 1972	1.5	153.6	In open borehole
	3	January 27, 1972	2.5	153.9	In open borehole
Pier 1 (south)	6	February 3, 1972	1.9	153.6	In open borehole
	7	February 3, 1972	1.9	153.8	In open borehole
	8	January 28, 1972	1.9	154.4	In open borehole
Pier 2 (north)	11	February 4, 1972	5.4	153.9	In open borehole
	12	February 1, 1972	1.7	153.9	In open borehole
	13	February 31, 1972	2.5	153.9	In open borehole
North Abutment	GD-04	May 5, 2009 June 8, 2009	14.4 14.3	156.6 156.7	In piezometer
	17	February 3, 1972	2.3	153.9	In open borehole
	16	February 2, 1972	7.1	154.1	In open borehole
North Approach	18	February 1, 1972	1.3	153.9	In open borehole

Groundwater levels measured in the piezometers ranged from Elevations 156.4 to 156.7 m.

Lower water levels were noted in the open boreholes at elevations ranging from 153.3 to 154.4 m during the 1972 investigation.

The above values are short-term readings and seasonal fluctuations of the groundwater level are to be expected. In particular, the groundwater level may reach higher elevations after the spring snowmelt or after periods of heavy rainfall. Further, perched water may be

encountered at higher levels in pockets or zones of more permeable sands and silts within the heterogeneous tills, or within the fill.

6 MISCELLANEOUS

Borehole locations and ground surface elevations were supplied to Thurber by SNC-Lavalin.

The drilling and sampling equipment was supplied and operated by DBW Drilling of Ajax, Ontario and Groundwork Drilling Inc. of Etobicoke, Ontario. The field work was supervised on a full time basis by Mr. Luke Gilarski of Thurber Engineering Ltd. under the direction of Dr. Sydney Pang, P. Eng.

Laboratory testing was carried out at Thurber's Laboratory in Oakville, Ontario.

Overall supervision of the field program was conducted by Dr. Sydney Pang, P. Eng. Interpretation of the data and preparation of the report were carried out by Dr. Sydney Pang, P. Eng, P.Eng and Ms. R. Palomeque Reyna, P.Eng.

Dr. P.K. Chatterji, P.Eng., a Designated Principal Contact for MTO Foundations Projects, reviewed the report.

THURBER ENGINEERING LTD.



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Appendix A

**Record of Borehole Sheets
(Present Investigation)**

SYMBOLS, ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES

1. TEXTURAL CLASSIFICATION OF SOILS

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

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

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

3. TERMS DESCRIBING CONSISTENCY (COHESIVE SOILS ONLY)

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

NOTE: Hierarchy of Soil Strength Prediction

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

4. TERMS DESCRIBING DENSITY (COHESIONLESS SOILS ONLY)

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

5. LEGEND FOR RECORDS OF BOREHOLES

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

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



Water Level

C_{pen}






Shear Strength Determination by Pocket Penetrometer

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

UNIFIED SOILS CLASSIFICATION

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

EXPLANATION OF ROCK LOGGING TERMS

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

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

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

RECORD OF BOREHOLE No GD-01

1 OF 3

METRIC

G.W.P. 202-95-00 LOCATION N 4 840 128.4 E 295 955.1 Disco Rd./Goreway Dr. ORIGINATED BY GA
 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY AN
 DATUM Geodetic DATE 2008.11.12 - 2008.11.17 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100					w _p	w	w _L					
								SHEAR STRENGTH kPa										WATER CONTENT (%)		
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE												
169.4																				
0.0	Silty CLAY, trace sand, occasional rootlets Firm Brown to Black (FILL)		1	SS	6		169													
167.9							168													
1.5	Clayey SILT and sand, trace gravel Very Stiff Brown (FILL)		2	SS	17											6 35 35 24				
166.8							167													
2.6	Stiff Mottled brown and grey		3	SS	14		166													
165.3							165													
4.1	Very Stiff		4	SS	28		164													
							163													
							162													
			6	SS	26		161													
							160									5 32 38 25				
			7	SS	27															

Continued Next Page

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

RECORD OF BOREHOLE No GD-01

2 OF 3

METRIC

G.W.P. 202-95-00 LOCATION N 4 840 128.4 E 295 955.1 Disco Rd./Goreway Dr. ORIGINATED BY GA
HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY AN
DATUM Geodetic DATE 2008.11.12 - 2008.11.17 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT Y kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT		
	Continued From Previous Page							SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL X LAB VANE	W _p	W	W _L		
	Clayey SILT and sand, trace gravel Hard Brown (FILL)		8	SS	47		159						
157.2							158						
12.2	Clayey SILT and sand, trace to some gravel Hard Brown (TILL)		9	SS	100/ 0.100		157						
	Mottled brown to grey		10	SS	36		156						1 31 42 26
			11	SS	42		155						
			12	SS	53		154						
	Grey		13	SS	41		153						
							152						
							151						
							150						

Continued Next Page

+ 3 . X 3 : Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No GD-01

3 OF 3

METRIC

G.W.P. 202-95-00

LOCATION N 4 840 128.4 E 295 955.1 Disco Rd./Goreway Dr.

ORIGINATED BY GA

HWY 427

BOREHOLE TYPE Solid Stem Auger

COMPILED BY AN

DATUM Geodetic

DATE 2008.11.12 - 2008.11.17

CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
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								
Continued From Previous Page																				
20.0	Silty CLAY, trace sand Hard Brown		14	SS	33		149										GR SA SI CL			
148.1																				
21.3	Clayey SILT, with frequent shale and limestone slabs Hard Grey (TILL)		15	SS	100/ 0.225		148													
146.6							147													
22.9	SHALE, highly to moderately weathered, with limestone interbeds, very thinly to thinly bedded, grey Zones of broken core		16	SS	50/ 0.0		146													
	Limestone (50mm) at 24m Clay seams (50mm) at 25m Limestone (120mm) at 25.5m		1	RUN			145													
			2	RUN			144													
143.5																				
25.9	END OF BOREHOLE AT 25.9m. BOREHOLE BACKFILLED WITH BENTONITE TO SURFACE.																			

+³ . ×³ : Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No GD-02

2 OF 2

METRIC

G.W.P. 202-95-00 LOCATION N 4 840 157.8 E 295 941.7 Disco Rd./Goreway Dr. ORIGINATED BY GA
 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY AN
 DATUM Geodetic DATE 2008.11.18 - 2008.11.18 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE							
	Continued From Previous Page						20 40 60 80 100	PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT w _p w w _L WATER CONTENT (%)							
	Clayey SILT and sand, trace gravel Hard Grey (TILL) Highly weathered shale fragments		10	SS	65		150								
148.7							149								
12.2	Frequent shale and limestone slabs, trace sand		11	SS	100/ 0.050										
			12	SS	100/ 0.200		147								0 8 73 19
			13	SS	100/ 0.100		146								
144.1			14	SS	100/ 0.050		145								
16.8	END OF BOREHOLE AT 16.8m. BOREHOLE BACKFILLED WITH BENTONITE TO SURFACE.														

ONTM14S 9270.GPJ 7/7/09

ONTMT4S 9270.GPJ 7/7/09

RECORD OF BOREHOLE No GD-03

1 OF 2

METRIC

G.W.P. 202-95-00 LOCATION N 4 840 184.5 E 295 932.2 Disco Rd./Goreway Dr. ORIGINATED BY GA
 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY AN
 DATUM Geodetic DATE 2008.10.28 - 2008.10.28 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
								20 40 60 80 100 40 80 120 160 200						
161.2														
0.0	Clayey SILT and sand, trace gravel, rootlets Stiff to Very Stiff Brown (FILL)		1	SS	19									7 38 34 21
			2	SS	62/ 0.200									
			3	SS	22									
			4	SS	16									
158.2														
3.0	Silty CLAY and sand, trace gravel Very Stiff to Stiff (FILL)		5	SS	17									4 27 38 31
			6	SS	10									
			7	SS	10									
			8	SS	8									
156.7														
4.5	Occasional shale slabs		9	SS	25									
152.5														
8.7	Silty CLAY, trace sand, trace gravel Very Stiff Grey		10	SS	23									0 8 42 50

Continued Next Page

+³, X³: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No GD-03

2 OF 2

METRIC

G.W.P. 202-95-00 LOCATION N 4 840 184.5 E 295 932.2 Disco Rd./Goreway Dr. ORIGINATED BY GA
 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY AN
 DATUM Geodetic DATE 2008.10.28 - 2008.10.28 CHECKED BY SKP

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	20	40	60	80			100	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L
Continued From Previous Page							SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE					WATER CONTENT (%)					
							40	80	120	160	200	20	40	60			
150.2	Silty CLAY, trace sand, trace gravel Very Stiff Grey		11	SS	25								○				
11.0	Clayey SILT, with frequent shale and limestone slabs, trace sand Hard Grey (TILL)												○				
			12	SS	80/ 0.225									○			
			13	SS	100									○			
			14	SS	100/ 0.225												
145.8																	
15.4	SHALE, highly weathered, thinly bedded, grey, limestone interbeds		15	SS	100								○				
145.5																	
15.7	END OF BOREHOLE AT 15.7m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO SURFACE.																

0 7 76 17

+ 3 . X 3 : Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No GD-04

1 OF 3

METRIC

G.W.P. 202-95-00 LOCATION N 4 840 212.4 E 295 915.5 Disco Rd./Goreway Dr. ORIGINATED BY GA
 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY AN
 DATUM Geodetic DATE 2008.11.06 - 2008.11.07 CHECKED BY SKP

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			20 40 60 80 100	40 80 120 160 200	W _P W W _L					
171.0														
0.0	Silty CLAY, trace sand, trace gravel, occasional rootlets Very Stiff Brown (FILL)		1	SS	17	171								
169.5						170								
1.5	Clayey SILT and sand, trace gravel Very Stiff Mottled Brown to Grey (FILL)		2	SS	21	169								
						168								5 38 34 23
			3	SS	18	167								
						166								
			4	SS	16	165								
	Grey					164								
			5	SS	18	163								
						162								
	Mottled Brown to Grey		6	SS	20									
	Becoming hard		7	SS	41									4 39 29 28

Continued Next Page

+³, X³: Numbers refer to
Sensitivity

20
15
10
5
0
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No GD-04

2 OF 3

METRIC

G.W.P. 202-95-00 LOCATION N 4 840 212.4 E 295 915.5 Disco Rd./Goreway Dr. ORIGINATED BY GA
HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY AN
DATUM Geodetic DATE 2008.11.06 - 2008.11.07 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	T _N VALUES			20 40 60 80 100	PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	
	Continued From Previous Page							SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL X LAB VANE	W _P	W	W _L	
								40 80 120 160 200	WATER CONTENT (%)			GR SA SI CL
	Clayey SILT and sand, trace gravel Hard Mottled Brown to Grey (FILL)		8	SS	49		161					
							160					
							159					
			9	SS	46		158					
							157					
			10	SS	49		156					
155.8							155					
15.2	Clayey SILT and sand, trace gravel Hard Mottled Brown to Grey (TILL)		11	SS	36		154					4 43 31 22
							153					
	Brown		12	SS	84		152					
			13	SS	68							

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+³ . X³ . Numbers refer to
Sensitivity

20
15
5
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No GD-04

3 OF 3

METRIC

G.W.P. 202-95-00 LOCATION N 4 840 212.4 E 295 915.5 Disco Rd./Goreway Dr. ORIGINATED BY GA
 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY AN
 DATUM Geodetic DATE 2008.11.06 - 2008.11.07 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
								○ UNCONFINED + FIELD VANE		● QUICK TRIAXIAL x LAB VANE				
								20 40 60 80 100	PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT		WATER CONTENT (%)		GR SA SI CL	
Continued From Previous Page														
148.1 														

ONTMT4S 9270.GPJ 7/3/09

+³ . x³ : Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No GD-05

1 OF 3

METRIC

G.W.P. 202-95-00

LOCATION N 4 840 127.4 E 295 961.7 Disco Rd./Goreway Dr.

ORIGINATED BY GA

HWY 427BOREHOLE TYPE Solid Stem Auger

COMPILED BY AN

DATUM Geodetic

DATE 2008.11.11 - 2008.11.12

CHECKED BY SKP

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+ 3, X 3; Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

ONTMT4S 9270.GPJ 6/26/09

RECORD OF BOREHOLE No GD-05

3 OF 3

METRIC

G.W.P. 202-95-00 LOCATION N 4 840 127.4 E 295 961.7 Disco Rd./Goreway Dr. ORIGINATED BY GA
 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY AN
 DATUM Geodetic DATE 2008.11.11 - 2008.11.12 CHECKED BY SKP

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa					
	Continued From Previous Page												
148.7	Clayey SILT and sand, trace gravel Very Stiff to Hard Grey (TILL)		14	SS	25								
21.3	Frequent shale and limestone slabs, some sand		15	SS	100								
			16	SS	149/ 0.225								1 12 67 20
			17	SS	149								
144.0			18	SS	100/ 0.075								
26.0	END OF BOREHOLE AT 26.0m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 2009.05.05 13.7 156.3 2009.06.08 13.6 156.4												

ONTMT4S 9270.GPJ 7/7/09

RECORD OF BOREHOLE No GD-06

1 OF 2

METRIC

G.W.P. 202-95-00 LOCATION N 4 840 157.1 E 295 946.8 Disco Rd./Goreway Dr. ORIGINATED BY GA
 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY AN
 DATUM Geodetic DATE 2008.10.30 - 2008.10.30 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT		UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	100	W _p W W _L	WATER CONTENT (%)		
160.9 0.0	Clayey SILT and sand, occasional rootlets Stiff to Very Stiff Brown (FILL)		1	SS	13								0 29 46 25
			2	SS	10		160						
			3	SS	9		159						
			4	SS	15		158						
			5	SS	13								
157.1 3.7	Silty CLAY and sand, trace gravel Very Stiff (FILL)		6	SS	21		157						2 28 37 33
			7	SS	16		156						
155.5 5.4	Layer of sandy silt at 6.4m (200mm)		8	SS	13		155						
							154						
153.2 7.6	Silty CLAY and sand, trace gravel Very Stiff to Hard Grey (TILL)		9	SS	32		153						3 22 40 35
			10	SS	21		152						
150.9							151						

Continued Next Page

+³ . X³ : Numbers refer to Sensitivity

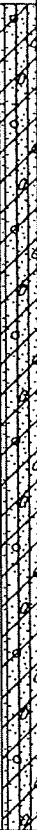
20
15
10
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No GD-06

2 OF 2

METRIC

G.W.P. 202-95-00 LOCATION N 4 840 157.1 E 295 946.8 Disco Rd./Goreway Dr. ORIGINATED BY GA
 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY AN
 DATUM Geodetic DATE 2008.10.30 - 2008.10.30 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)		
								○ UNCONFINED + FIELD VANE												
	Continued From Previous Page							20	40	60	80	100								
	Clayey SILT and sand, trace gravel Very Stiff to Hard Grey (TILL)																			
150.2																				
10.7	Frequent shale and limestone slabs, sandy		11	SS	31															
			12	SS	86															
			13	SS	118/ 0.225															

RECORD OF BOREHOLE No GD-07

1 OF 2

METRIC

G.W.P. 202-95-00 LOCATION N 4 840 184.9 E 295 934.3 Disco Rd./Goreway Dr. ORIGINATED BY GA
 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY AN
 DATUM Geodetic DATE 2008.10.29 - 2008.10.30 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT Y 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 (%)					
161.2							20 40 60 80 100	PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L			
0.0	Clayey SILT and sand, trace gravel, occasional rootlets Very Stiff to Stiff Brown (FILL)		1	SS	18								
			2	SS	14								4 35 36 25
			3	SS	26								
			4	SS	20								
			5	SS	21								
			6	SS	12								1 29 43 27
			7	SS	10								
			8	SS	25								
154.0													
7.2	Silty CLAY and sand, trace gravel Hard Brown (FILL)		9	SS	32								4 20 38 38
152.0													
9.1	Silty CLAY and sand, trace gravel Very Stiff Grey (TILL)		10	SS	20								

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+ 3 . X 3 : Numbers refer to
Sensitivity

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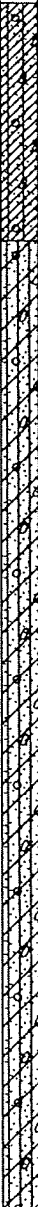
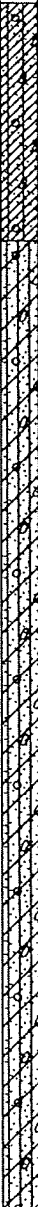
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No GD-07

2 OF 2

METRIC

G.W.P. 202-95-00 LOCATION N 4 840 184.9 E 295 934.3 Disco Rd./Goreway Dr. ORIGINATED BY GA
 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY AN
 DATUM Geodetic DATE 2008.10.29 - 2008.10.30 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							
								20 40 60 80 100		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT					
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE				WATER CONTENT (%) w _p w w _L				
Continued From Previous Page															
	Silty CLAY and sand, trace gravel Hard Grey (TILL)						151								
	Layer of grey sand (200mm)		11	SS	33			150							3 29 31 37
149.6															
11.6	Clayey SILT and sand, trace gravel, Frequent shale and limestone slabs Hard Grey (TILL)						149								
			12	SS	87			148							
								147							
	Coring started at 13.7m Limestone (90mm) at 14.0m Shale (80mm) at 14.6m		1	RUN				146							RUN 1# TCR=100%, SCR=0%, RQD=0%
			2	RUN				145							RUN 2# TCR=75%, SCR=8.33%, RQD=0%
	Limestone pieces		3	RUN				144							RUN 3# TCR=85%, SCR=0%, RQD=0%
	Limestone pieces (50mm) at 16.3m		4	RUN											RUN 4# TCR=66%, SCR=0%, RQD=0%
143.2			5	RUN										RUN 5# TCR=20%, SCR=0%, RQD=0%	
18.0	END OF BOREHOLE AT 17.9m. BOREHOLE BACKFILLED WITH BENTONITE TO SURFACE.														

ONTMT4S 9270.GPJ 8/13/09

RECORD OF BOREHOLE No GD-07A

2 OF 2

METRIC

G.W.P. 202-95-00 LOCATION N 4 840 184.9 E 295 934.3 Disco Rd./Goreway Dr. ORIGINATED BY GA
HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY AN
DATUM Geodetic DATE 2008.11.19 - 2008.11.19 CHECKED BY SKP


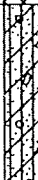
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT Y kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa 20 40 60 80 100 O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL X LAB VANE 40 80 120 160 200								
150.5	Continued From Previous Page						151									
10.7	Clayey SILT, with frequent shale slabs and limestone fragments Hard Grey (TILL)		1	SS	120/ 0.200		150									
			2	SS	100		149									
			3	SS	100		148									
							147									
145.9			4	SS	100/ 0.075		146									
15.3	END OF BOREHOLE AT 15.3m. BOREHOLE BACKFILLED WITH BENTONITE TO SURFACE.															

RECORD OF BOREHOLE No GD-08

1 OF 3

METRIC

G.W.P. 202-95-00 LOCATION N 4 840 211.8 E 295 922.3 Disco Rd./Goreway Dr. ORIGINATED BY GA
 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY AN
 DATUM Geodetic DATE 2008.11.07 - 2008.11.10 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL					
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								WATER CONTENT (%)				
								○ UNCONFINED	+ FIELD VANE	×						LAB VANE				
								● QUICK TRIAXIAL												
171.0								20	40	60	80	100								
0.0	Clayey SILT and sand, trace gravel, occasional rootlets Stiff to Hard Mottled Brown to Grey (FILL)		1	SS	10										6 32 38 23					
			2	SS	18															
			3	SS	13															
			4	SS	34															
			5	SS	26										0 34 41 25					
			6	SS	40															
162.2	Clayey SILT and sand, trace gravel Hard Grey (TILL)		7	SS	58															
8.8																				

Continued Next Page

+ 3, X 3: Numbers refer to

20
15 5

100% STRAIN AT FAILURE

ONTMT4S 9270.GPJ 7/7/09

RECORD OF BOREHOLE No GD-08

2 OF 3

METRIC

G.W.P. 202-95-00 LOCATION N 4 840 211.8 E 295 922.3 Disco Rd./Goreway Dr. ORIGINATED BY GA
 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY AN
 DATUM Geodetic DATE 2008.11.07 - 2008.11.10 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL									
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						WATER CONTENT (%)								
								UNCONFINED		FIELD VANE				PLASTIC LIMIT			NATURAL MOISTURE CONTENT			LIQUID LIMIT		
								○	●	+	×			W _p	W	W _L						
								20	40	60	80	100	20	40	60	80	100					
								40	80	120	160	200	20	40	60	80	100					
																</						

Continued Next Page

+ 3, X 3: Numbers refer to

20
15 5
1% STRAIN RATE FAILURE


ONTMT4S 9270.GPJ 7/7/09

RECORD OF BOREHOLE No GD-08

3 OF 3

METRIC

G.W.P. 202-95-00 LOCATION N 4 840 211.8 E 295 922.3 Disco Rd./Goreway Dr. ORIGINATED BY GA
 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY AN
 DATUM Geodetic DATE 2008.11.07 - 2008.11.10 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							
								20 40 60 80 100							
	Continued From Previous Page							PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT							
								WATER CONTENT (%)							
								w _p w w _L							
								○ UNCONFINED + FIELD VANE							
								● QUICK TRIAXIAL x LAB VANE							
								40 80 120 160 200							
								20 40 60							
20.0	Clayey SILT, with frequent shale and limestone slabs Hard Mottled Brown to Grey (TILL)		14	SS	31		151								
							150								
			15	SS	128/ 0.275		149								
							148								
			16	SS	100/ 0.175		147								
							146								
			17	SS	100/ 0.075		145								
							146								
145.0			18	SS	100/ .0.0		146								
26.1	END OF BOREHOLE AT 26.1m. BOREHOLE BACKFILLED WITH BENTONITE TO SURFACE.														

+³, X³: Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No GD-09

1 OF 2

METRIC

G.W.P. 202-95-00 LOCATION N 4 840 121.9 E 295 960.2 Disco Rd./Goreway Dr. ORIGINATED BY GA
 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY AN
 DATUM Geodetic DATE 2008.11.08 - 2008.11.08 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
								20 40 60 80 100 ● UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE						
170.0														
0.0	Silty SAND, some gravel, trace clay, occasional organics Dense Brown to Black Moist (FILL)		1	SS	31		170							22 61 17 (SI+CL)
169.3														
0.8	Clayey SILT and sand, trace gravel Very Stiff to Hard Brown (FILL)		2	SS	27		169							
			3	SS	35		168							
	Mottled Brown to Grey		4	SS	22		167							
			5	SS	27		166							
			6	SS	27		165							2 30 40 28
			7	SS	39		164							
							163							
			8	SS	22		162							
			9	SS	23		161							
			10	SS	18									5 31 39 25

Continued Next Page

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

RECORD OF BOREHOLE No GD-09

2 OF 2

METRIC

G.W.P. 202-95-00 LOCATION N 4 840 121.9 E 295 960.2 Disco Rd./Goreway Dr. ORIGINATED BY GA
 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY AN
 DATUM Geodetic DATE 2008.11.08 - 2008.11.08 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
								○ UNCONFINED	+ FIELD VANE	● QUICK TRIAXIAL			x LAB VANE	W _P	W	W _L																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
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	Clayey SILT and sand, trace gravel Very Stiff Mottled Brown to Grey (FILL)		11	SS	20																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																</

RECORD OF BOREHOLE No GD-10

1 OF 2

METRIC

G.W.P. 202-95-00 LOCATION N 4 840 225.3 E 295 912.6 Disco Rd./Goreway Dr. ORIGINATED BY GA
 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY AN
 DATUM Geodetic DATE 2008.11.06 - 2008.11.06 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT Y 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								
								40 80 120 160 200								
				O UNCONFINED + FIELD VANE				PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT W P W W L								
				● QUICK TRIAXIAL X LAB VANE												
170.2																
0.0	Silty CLAY , trace to some sand, trace gravel, occasional rootlets Firm to Very Stiff Brown to Grey (FILL)		1	SS	7		170									
			2	SS	16		169									
			3	SS	22											
168.1																
2.1	Silty SAND , some clay, trace gravel Compact Brown Moist to Wet (FILL)		4	SS	15		168									
167.3																
2.9	Clayey SILT and sand, trace gravel Very Stiff to Hard Mottled Brown to Grey (FILL)		5	SS	31		167									
			6	SS	33		166									
			7	SS	25											
							165									
			8	SS	23		164									
							163									
162.6																
7.6	Clayey SILT and sand, trace gravel Hard Grey (TILL)		9	SS	54		162									
			10	SS	64		161									

Continued Next Page

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



ONTMT4S 9270.GPJ 6/26/09

RECORD OF BOREHOLE No GD-10

2 OF 2

METRIC

G.W.P. 202-95-00 LOCATION N 4 840 225.3 E 295 912.6 Disco Rd./Goreway Dr. ORIGINATED BY GA
 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY AN
 DATUM Geodetic DATE 2008.11.06 - 2008.11.06 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	*N* VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)		
								○ UNCONFINED		+ FIELD VANE		● QUICK TRIAXIAL			x LAB VANE		W _P
							20	40	60	80	100						
Continued From Previous Page																	
	Clayey SILT and sand, trace gravel Hard Mottled brown to grey (TILL)		11	SS	37		160										
								159									
								158									
			12	SS	34												
156.9																	
13.3	Silty CLAY and sand, trace gravel Hard (TILL)		13	SS	67		157										
								156									
155.5																	
14.7																	
154.6			14	SS	150/ 225		155										
15.6	END OF BOREHOLE AT 15.6m. BOREHOLE BACKFILLED WITH BENTONITE TO SURFACE.																

+³, X³: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

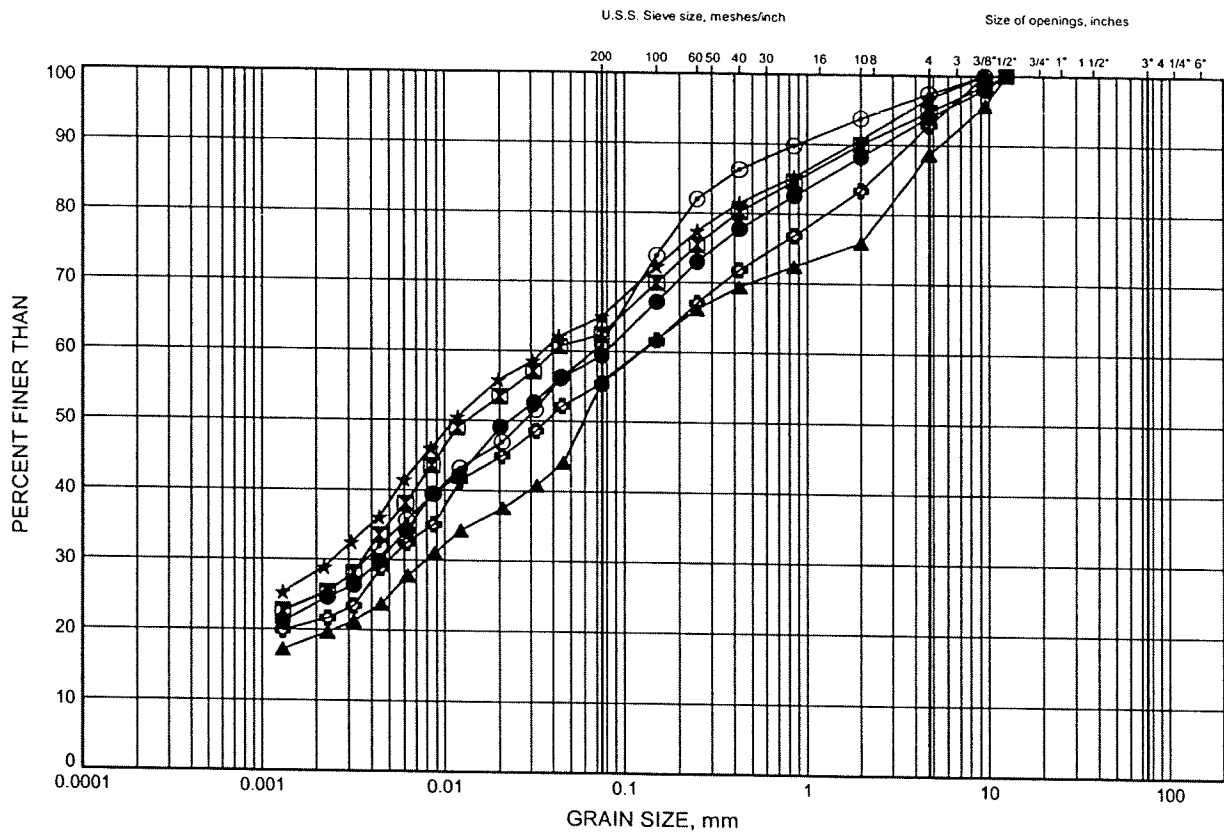
Appendix B

**Laboratory Test Results
(Present Investigation)**

Hwy 427 Northbound and Southbound GRAIN SIZE DISTRIBUTION

FIGURE B1

Clayey SILT (FILL)



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	GD-01	1.83	167.59
⊠	GD-01	9.45	159.97
▲	GD-02	0.30	160.63
★	GD-02	2.59	158.34
⊙	GD-02	6.40	154.53
⊕	GD-03	0.23	160.95

GRAIN SIZE DISTRIBUTION - THURBER 9270.GPJ 6/22/09

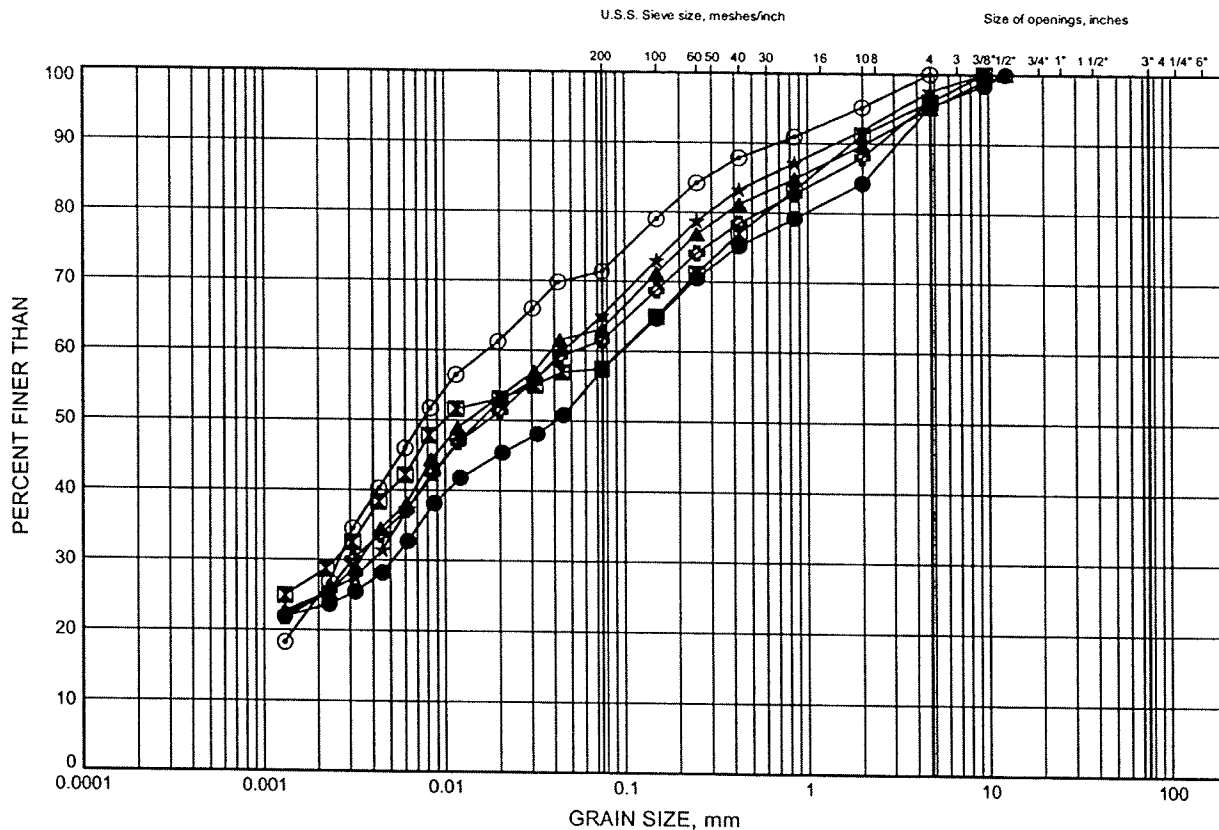
W.P.# 202-95-00.....
Prepared By AN.....
Checked By RPR.....



Hwy 427 Northbound and Southbound GRAIN SIZE DISTRIBUTION

FIGURE B2

Clayey SILT (FILL)



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	GD-04	3.35	167.69
⊠	GD-04	9.45	161.60
▲	GD-05	3.35	166.64
★	GD-05	9.45	160.55
⊙	GD-06	0.76	160.10
⊛	GD-07	1.07	160.09

GRAIN SIZE DISTRIBUTION - THURBER 9270.GPJ 7/29/09

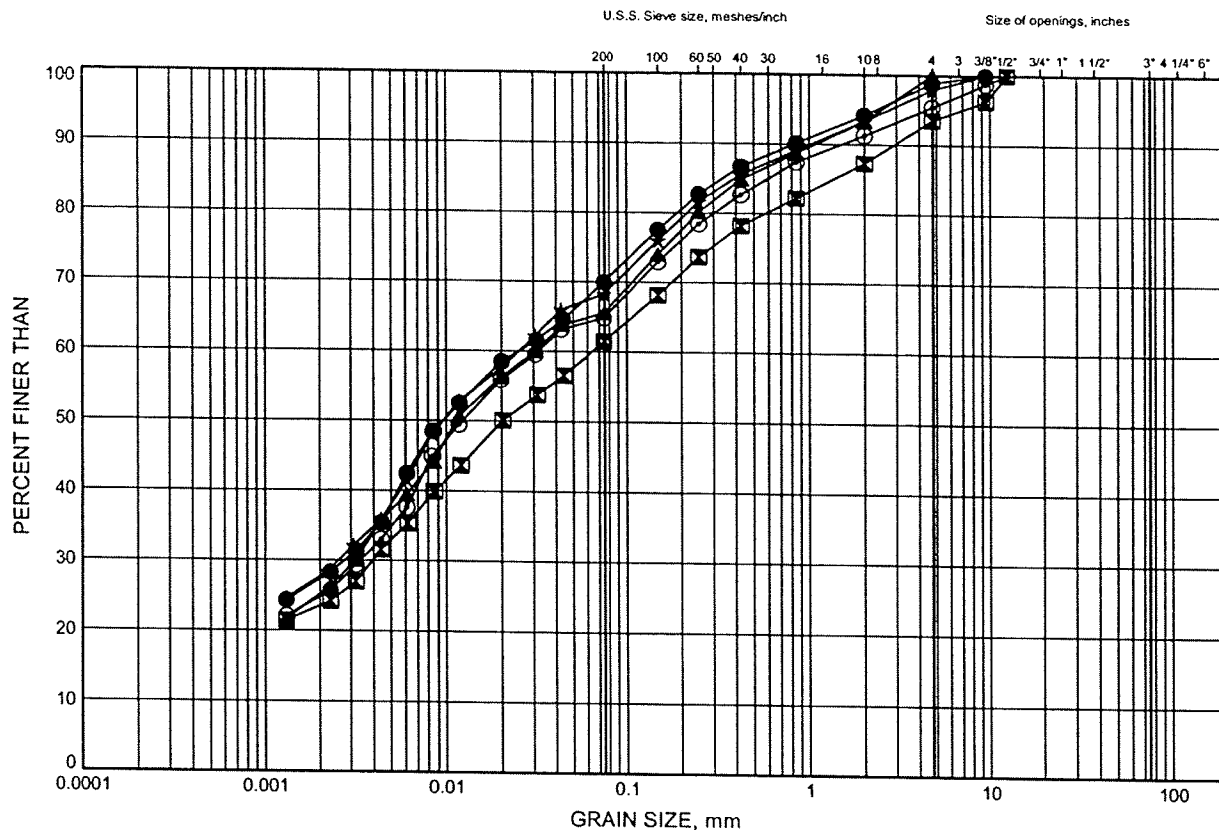
W.P.# .202-95:00.....
Prepared By .AN.....
Checked By .RPR.....



Hwy 427 Northbound and Southbound GRAIN SIZE DISTRIBUTION

FIGURE B3

Clayey SILT (FILL)



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	GD-07	4.11	157.04
⊠	GD-08	0.30	170.71
▲	GD-08	6.40	164.61
★	GD-09	4.11	165.91
⊙	GD-09	9.45	160.57

GRAIN SIZE DISTRIBUTION - THURBER 9270.GPJ 7/29/09

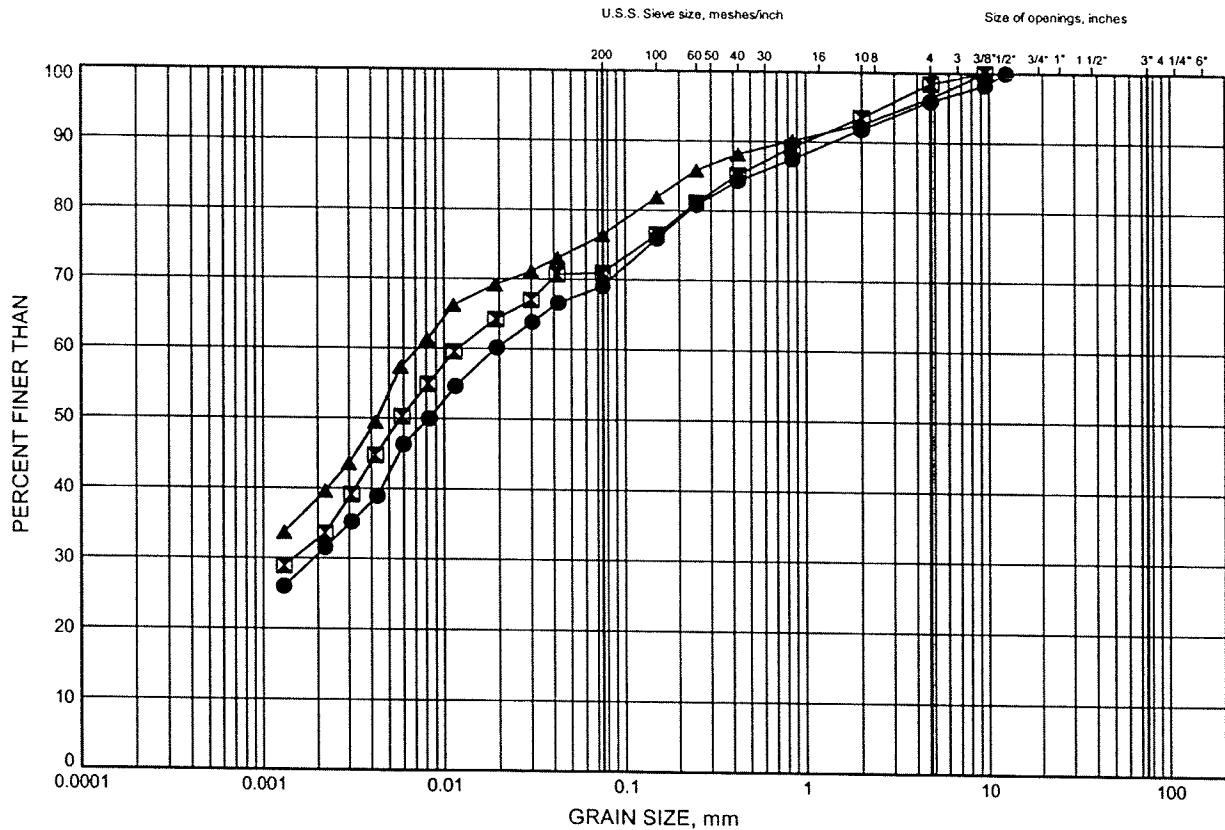
W.P.# 202-95-00.....
Prepared By AN.....
Checked By RPR.....



Hwy 427 Northbound and Southbound GRAIN SIZE DISTRIBUTION

FIGURE B4

Silty CLAY (FILL)



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	GD-03	3.35	157.82
⊠	GD-06	4.11	156.74
▲	GD-07	7.92	153.23

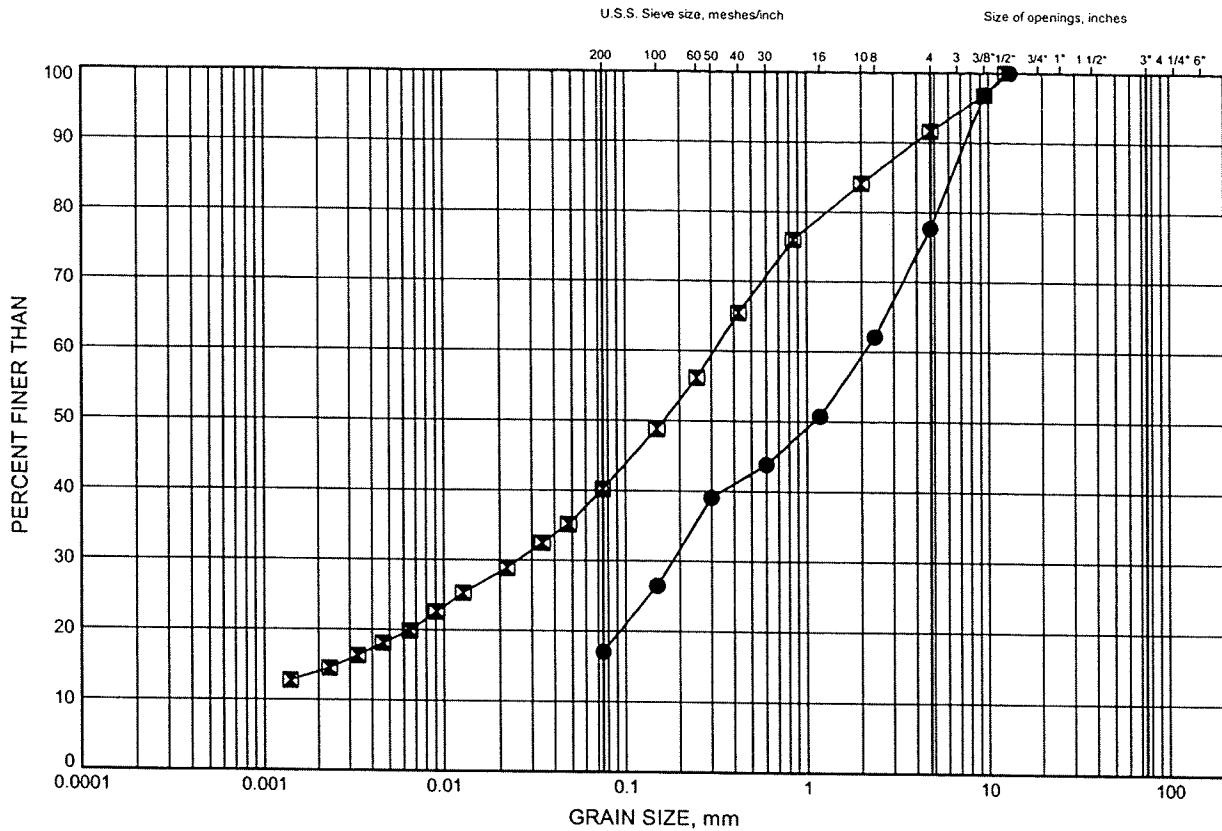


W.P.# 202-95-00.....
Prepared By AN.....
Checked By RPR.....

Hwy 427 Northbound and Southbound GRAIN SIZE DISTRIBUTION

FIGURE B5

Silty SAND (FILL)



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	GD-09	0.30	169.72
⊠	GD-10	2.59	167.61

GRAIN SIZE DISTRIBUTION - THURBER 9270.GPJ 6/22/09

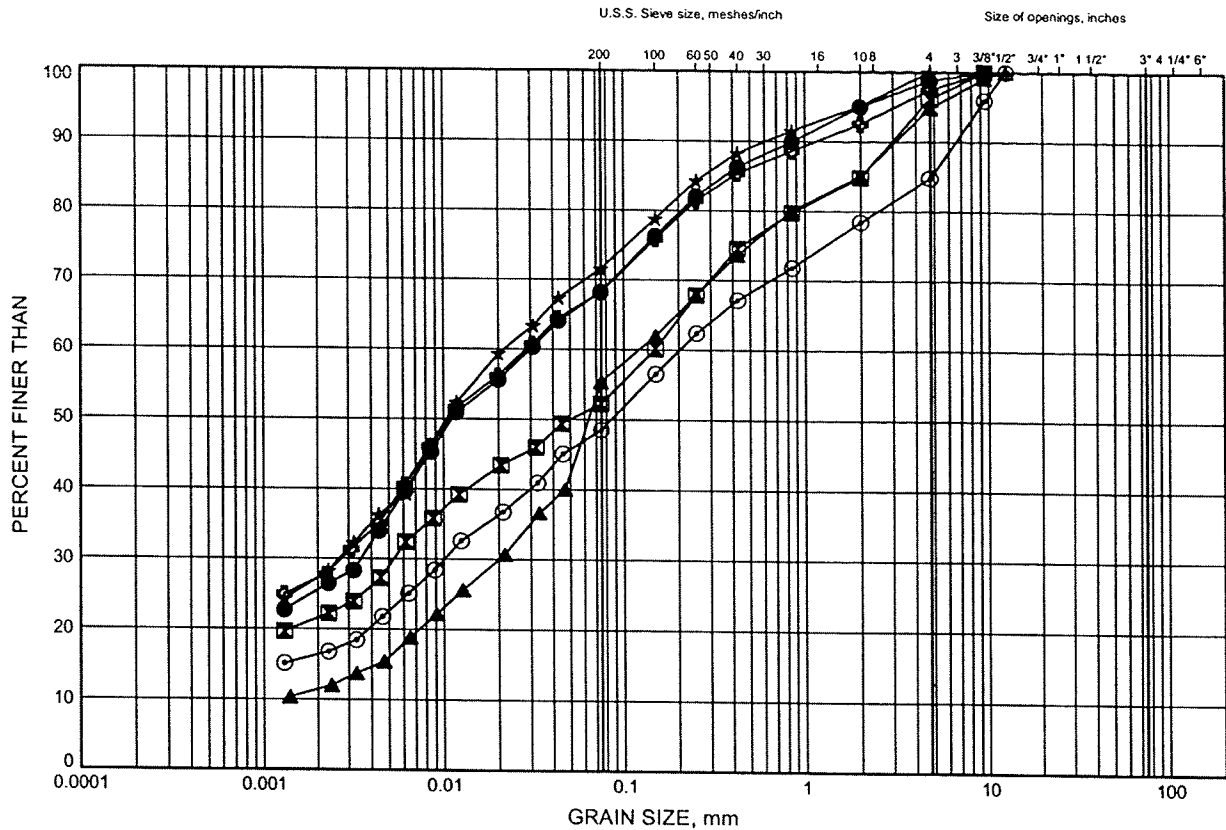
W.P.# 202-95:00
Prepared By AN
Checked By RPR



Hwy 427 Northbound and Southbound GRAIN SIZE DISTRIBUTION

FIGURE B6

Clayey SILT & Sand (TILL)



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	GD-01	14.02	155.40
⊠	GD-04	15.54	155.50
▲	GD-04	21.64	149.40
★	GD-05	15.54	154.45
⊙	GD-08	12.50	158.52
⊗	GD-09	15.54	154.48

GRAIN SIZE DISTRIBUTION - THURBER 9270.GPJ 7/29/09

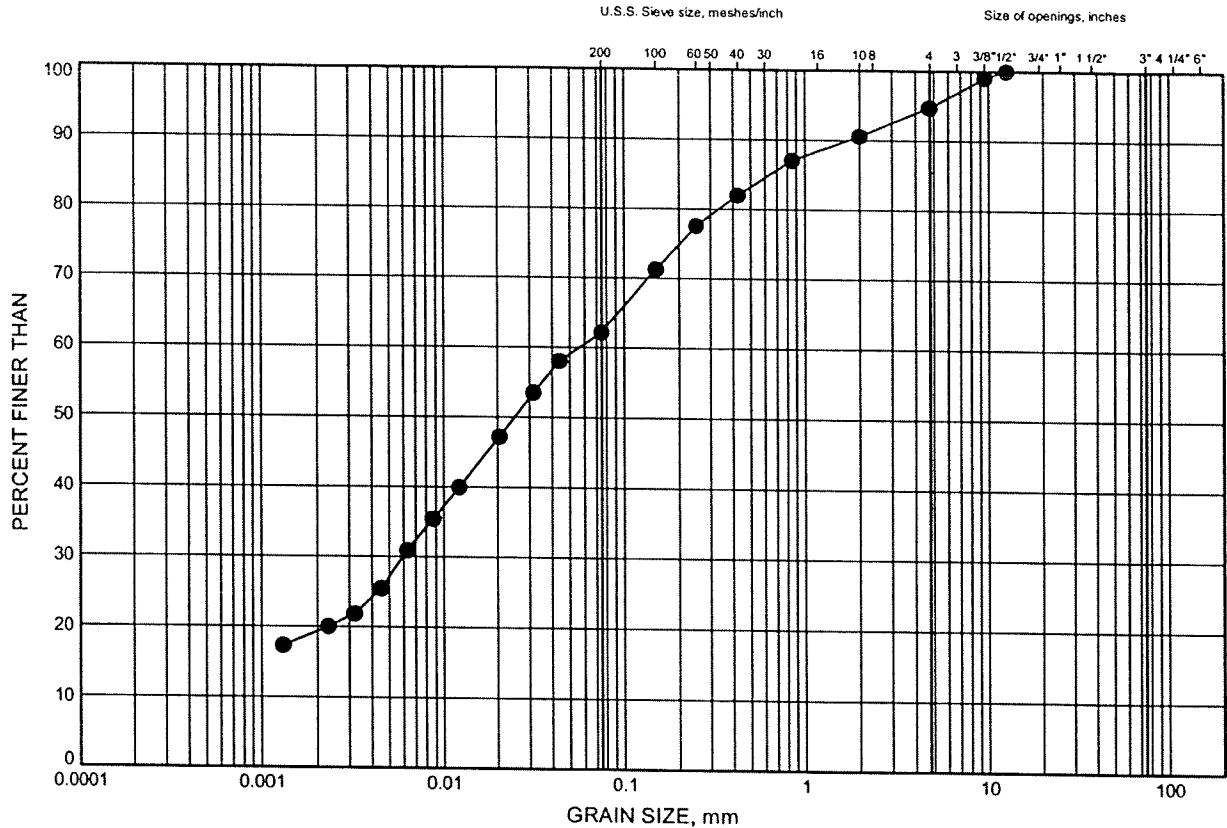
W.P.# 202-95:00
Prepared By AN
Checked By RPR



Hwy 427 Northbound and Southbound GRAIN SIZE DISTRIBUTION

FIGURE B7

Clayey SILT & Sand (TILL)



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

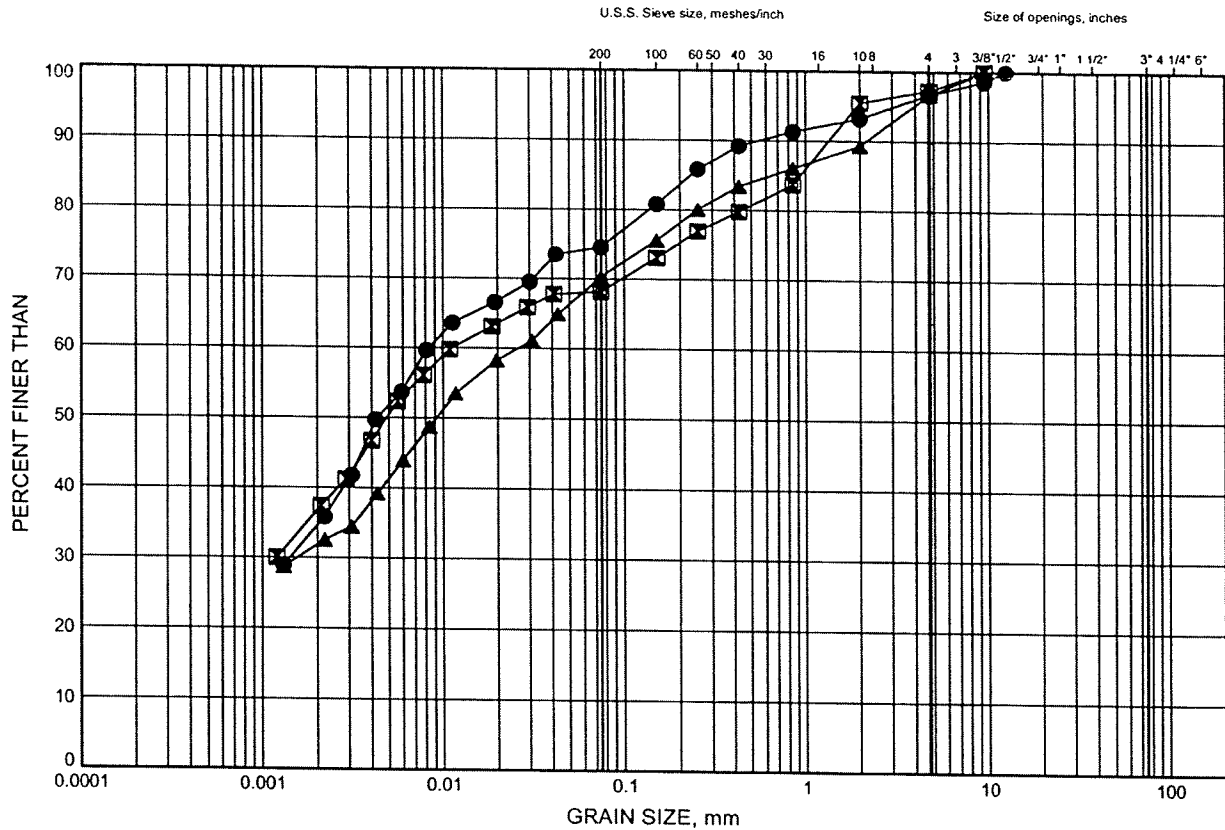
LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	GD-10	7.92	162.28

Hwy 427 Northbound and Southbound GRAIN SIZE DISTRIBUTION

FIGURE B8

Silty CLAY & Sand (TILL)



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	GD-06	7.92	152.93
⊠	GD-07	10.97	150.18
▲	GD-10	14.02	156.18

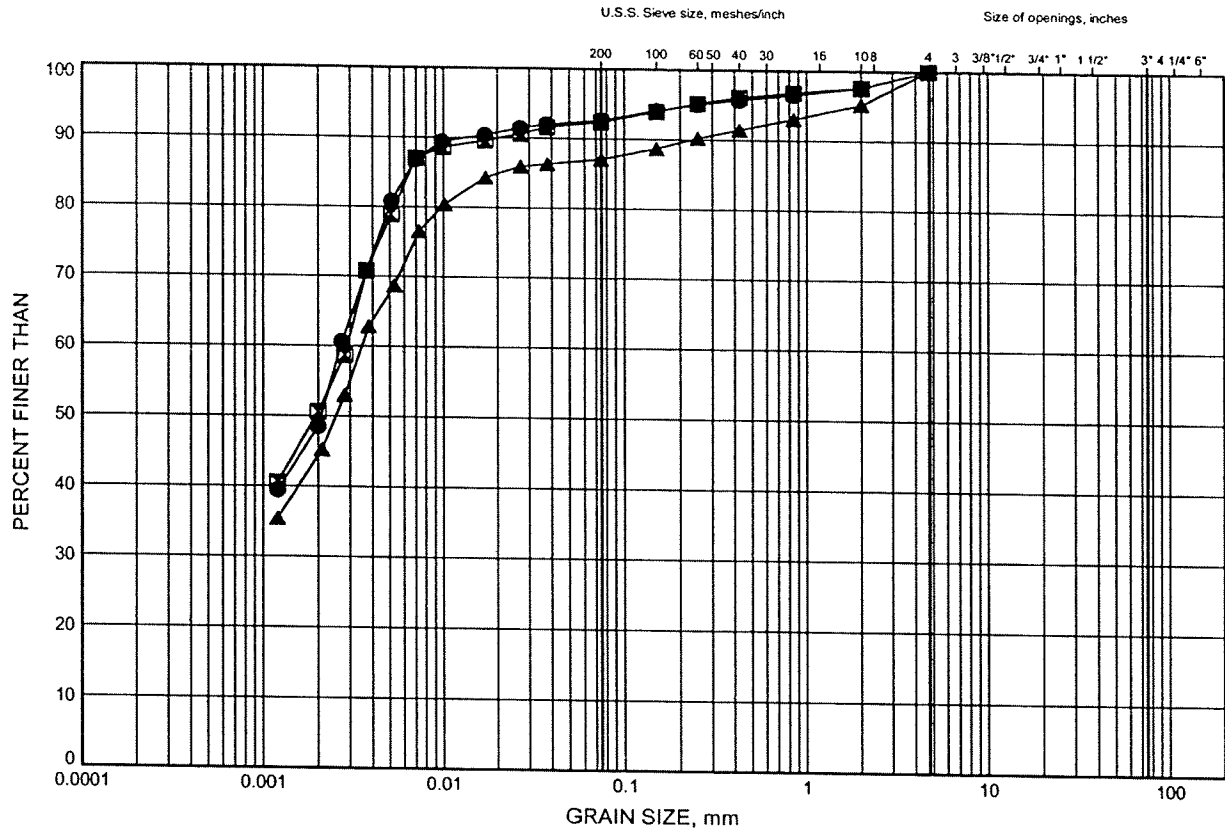


W.P.# 202-95-00.....
Prepared By AN.....
Checked By RPR.....

Hwy 427 Northbound and Southbound GRAIN SIZE DISTRIBUTION

FIGURE B9

Silty CLAY



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	GD-01	20.12	149.31
■	GD-03	9.45	151.73
▲	GD-08	18.59	152.42

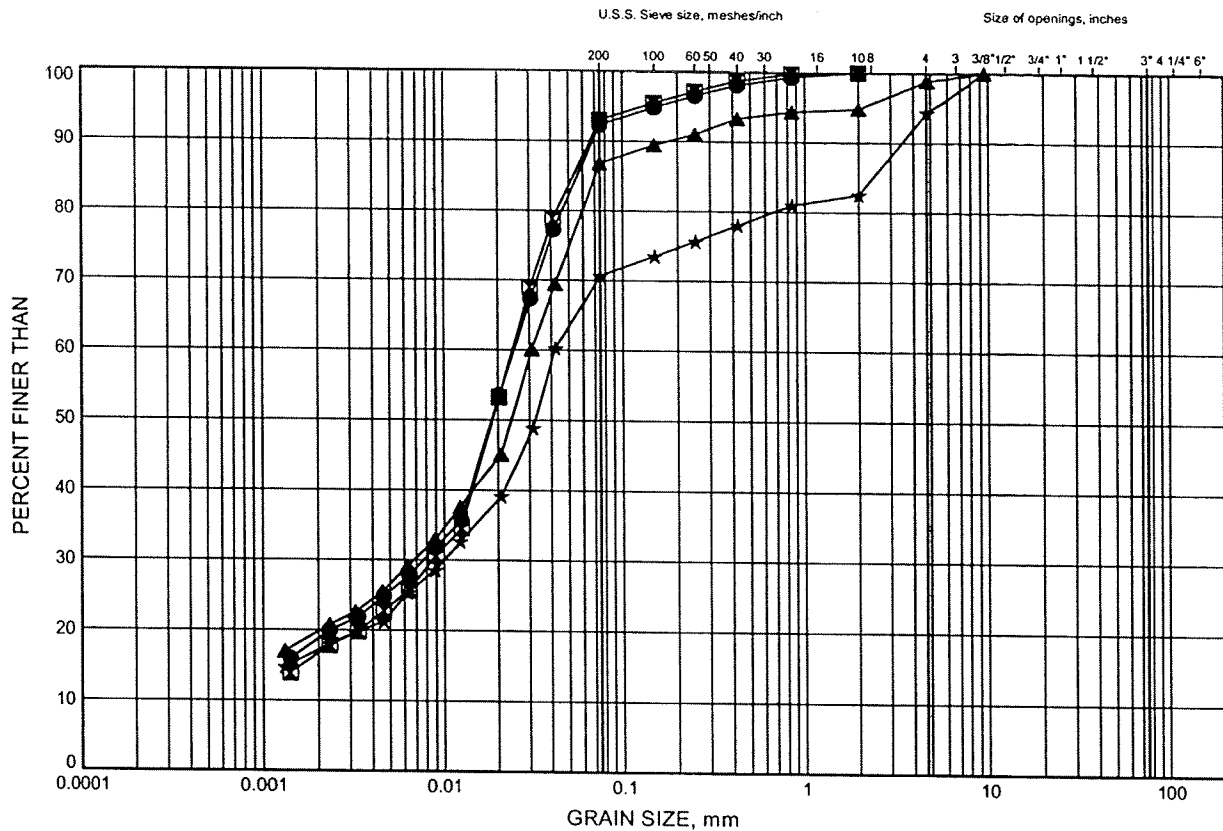


W.P.# 202-95-00
Prepared By AN
Checked By RPR

Hwy 427 Northbound and Southbound GRAIN SIZE DISTRIBUTION

FIGURE B10

Clayey SILT (TILL)
with frequent shale & limestone slabs



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	GD-02	13.72	147.22
⊠	GD-03	13.72	147.46
▲	GD-05	23.16	146.83
★	GD-06	12.50	148.36

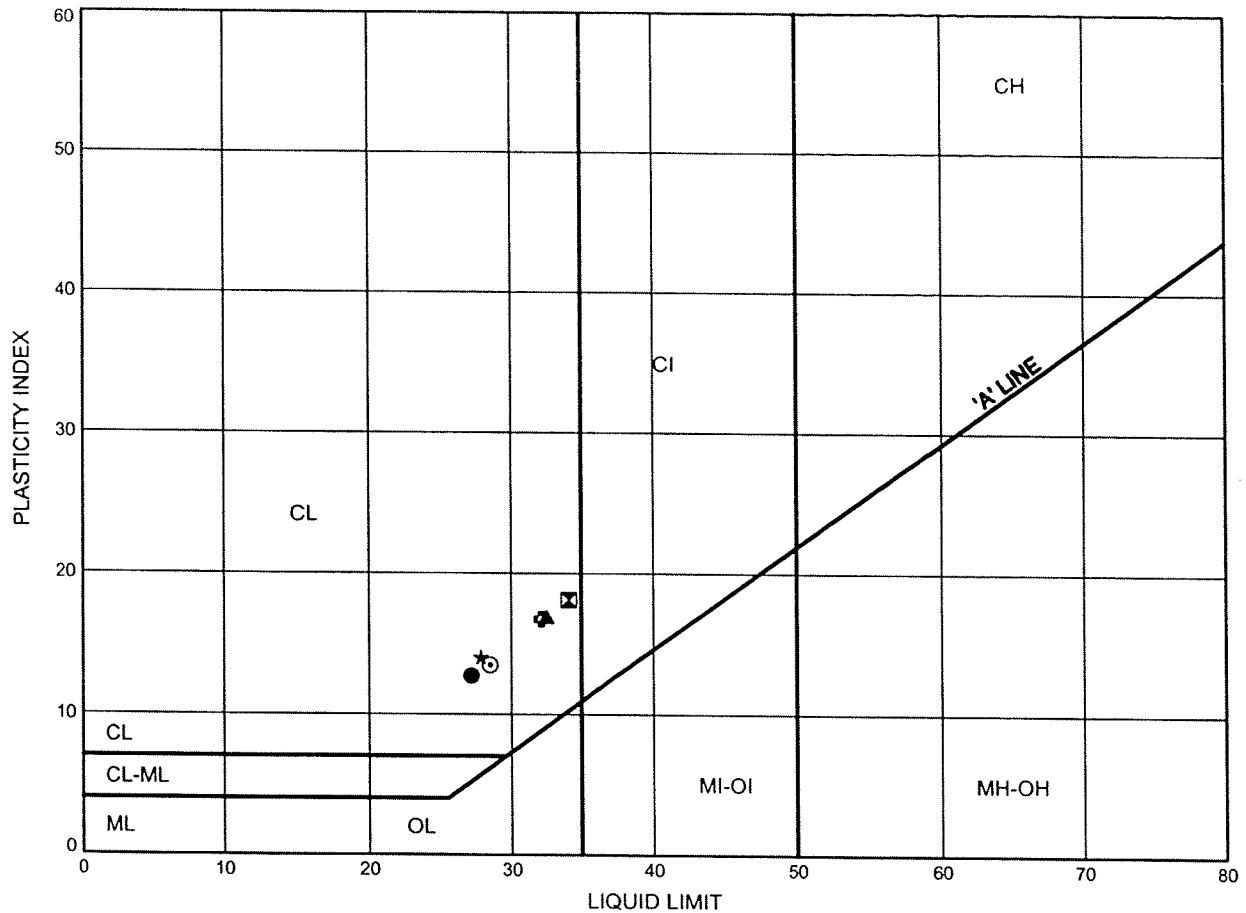


W.P.# 202-95-00
Prepared By AN
Checked By RPR

Hwy 427 Northbound and Southbound
ATTERBERG LIMITS TEST RESULTS

FIGURE B11

Clayey SILT (FILL)



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	GD-01	9.45	159.97
⊠	GD-02	2.29	158.65
▲	GD-02	6.40	154.53
★	GD-04	9.45	161.60
⊙	GD-05	3.35	166.64
⊗	GD-06	1.07	159.79

THURBALT 9270.GPJ 7/29/09

Date July 2009

Project 202-95-00



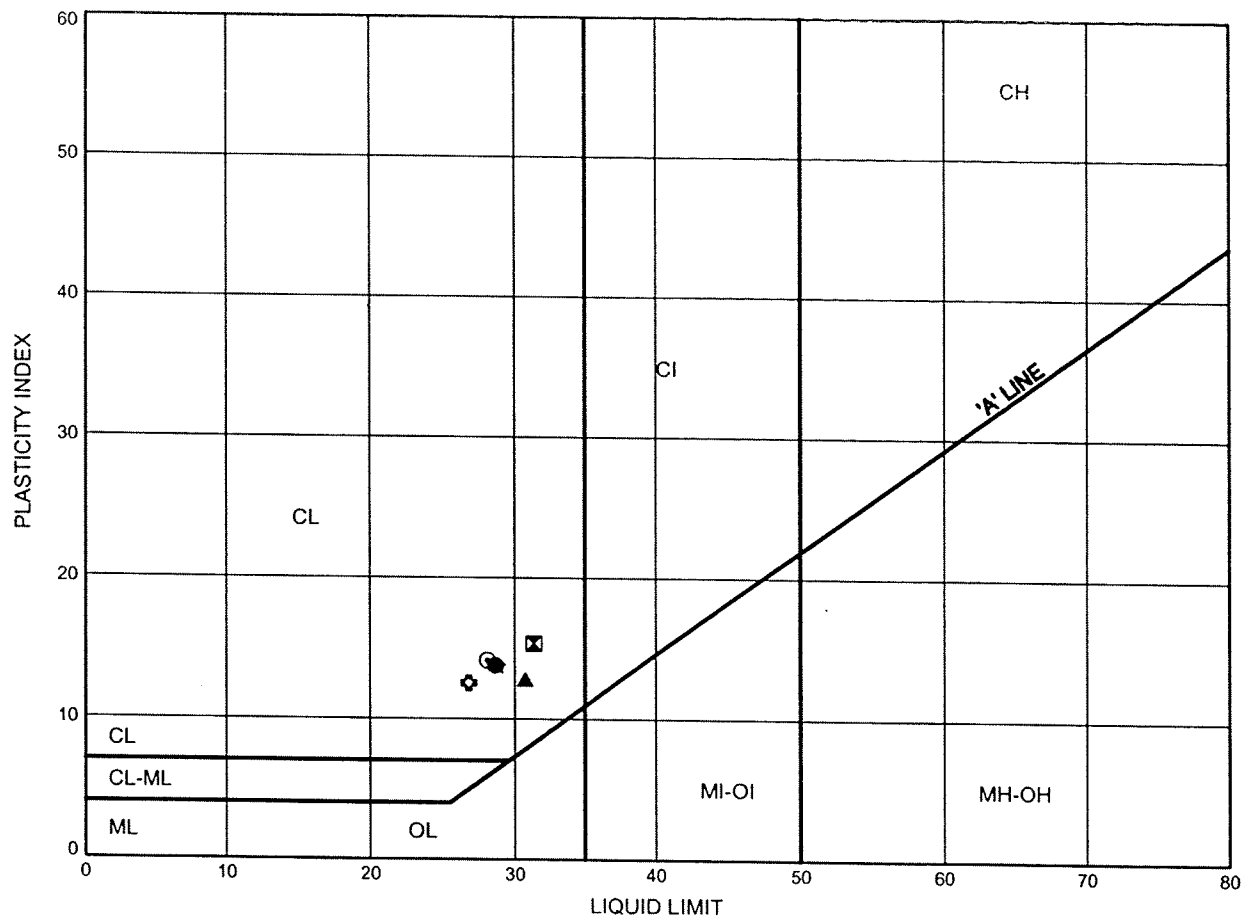
Prep'd AN

Chkd. RPR

Hwy 427 Northbound and Southbound
ATTERBERG LIMITS TEST RESULTS

FIGURE B12

Clayey SILT (FILL)



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	GD-07	1.07	160.09
⊠	GD-07	4.11	157.04
▲	GD-08	0.30	170.71
★	GD-08	6.40	164.61
⊙	GD-09	4.11	165.91
⊕	GD-09	9.45	160.57

Date July 2009
 Project 202-95-00

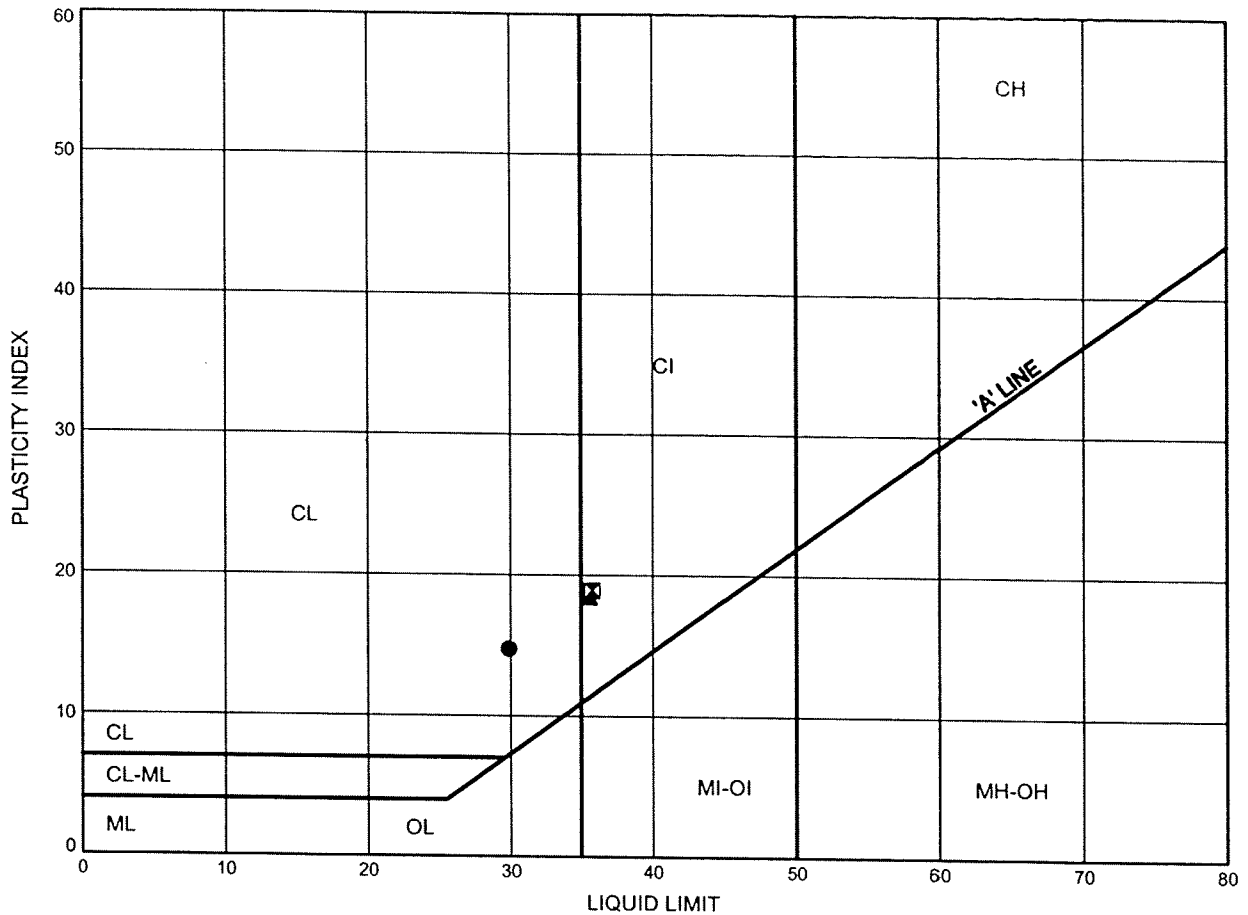


Prep'd AN
 Chkd. RPR

Hwy 427 Northbound and Southbound
ATTERBERG LIMITS TEST RESULTS

FIGURE B13

Silty CLAY (FILL)



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	GD-03	3.35	157.82
⊠	GD-06	4.11	156.74
▲	GD-07	7.92	153.23

Date July 2009
 Project 202-95-00

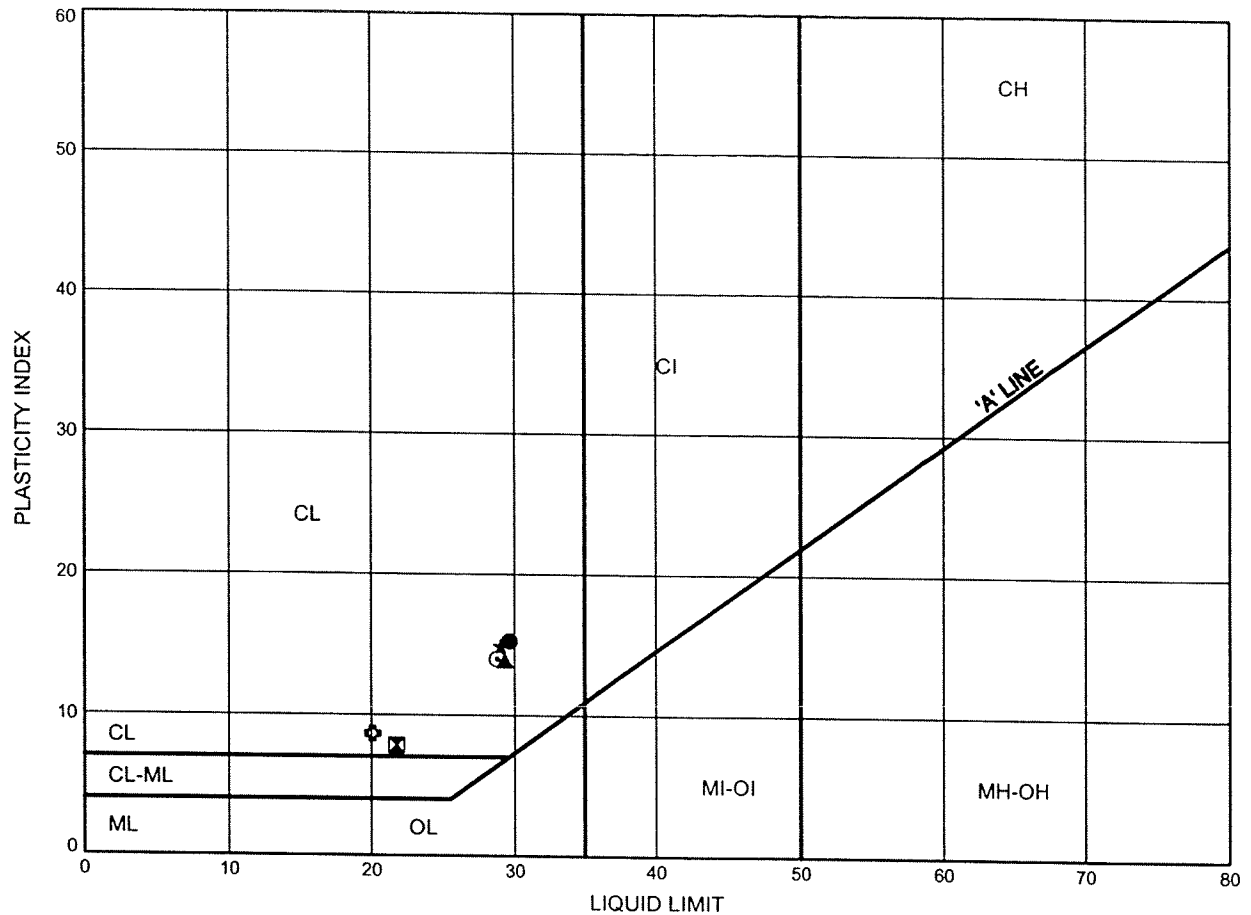


Prep'd AN
 Chkd. RPR

Hwy 427 Northbound and Southbound
ATTERBERG LIMITS TEST RESULTS

FIGURE B14

Clayey SILT & Sand (TILL)



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	GD-04	15.54	155.50
⊠	GD-04	21.64	149.40
▲	GD-05	15.54	154.45
★	GD-08	12.50	158.52
⊙	GD-09	15.54	154.48
⊕	GD-10	7.92	162.28

Date July 2009

Project 202-95-00



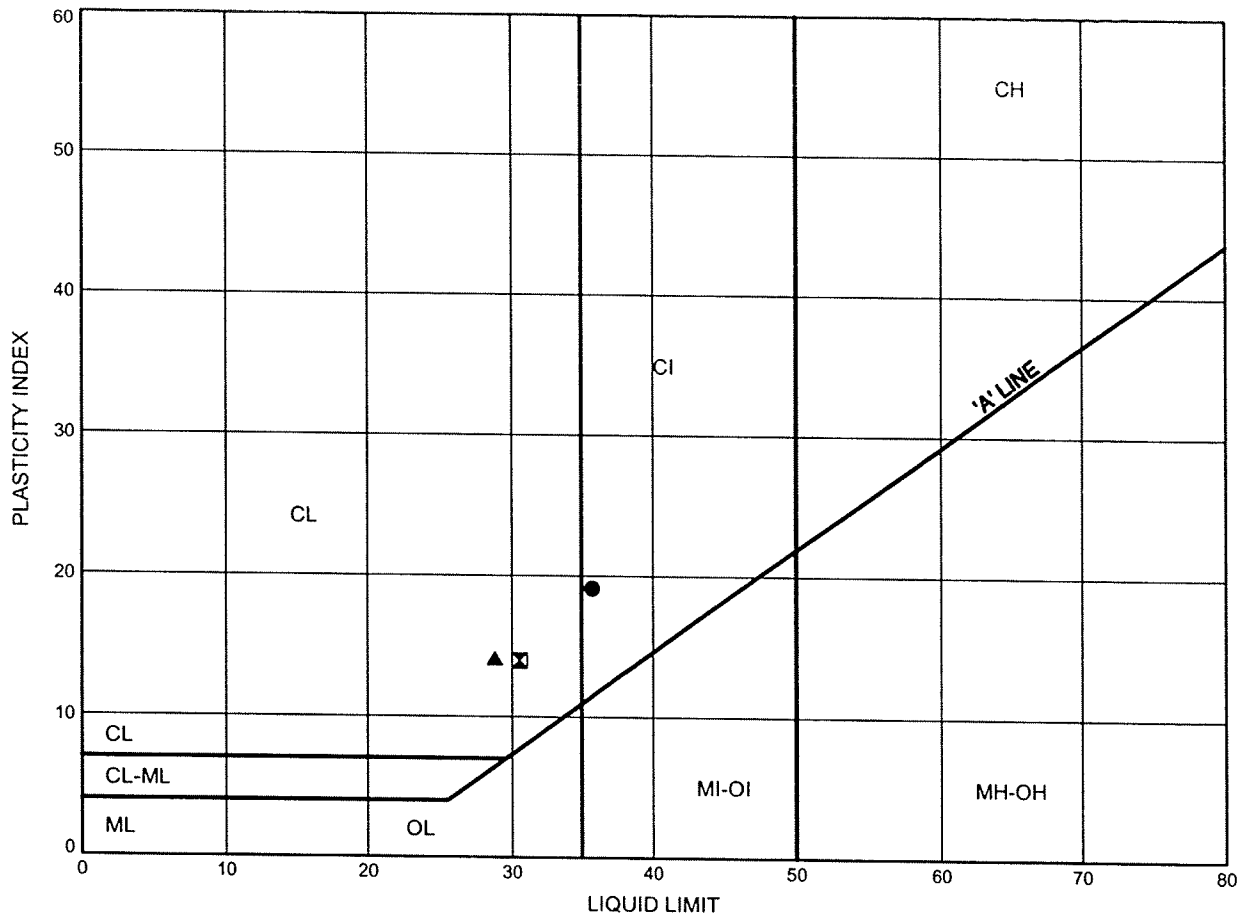
Prep'd AN

Chkd. RPR

Hwy 427 Northbound and Southbound
ATTERBERG LIMITS TEST RESULTS

FIGURE B15

Silty CLAY & Sand (TILL)



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	GD-06	7.92	152.93
⊠	GD-07	10.97	150.18
▲	GD-10	14.02	156.18

Date July 2009

Project 202-95-00



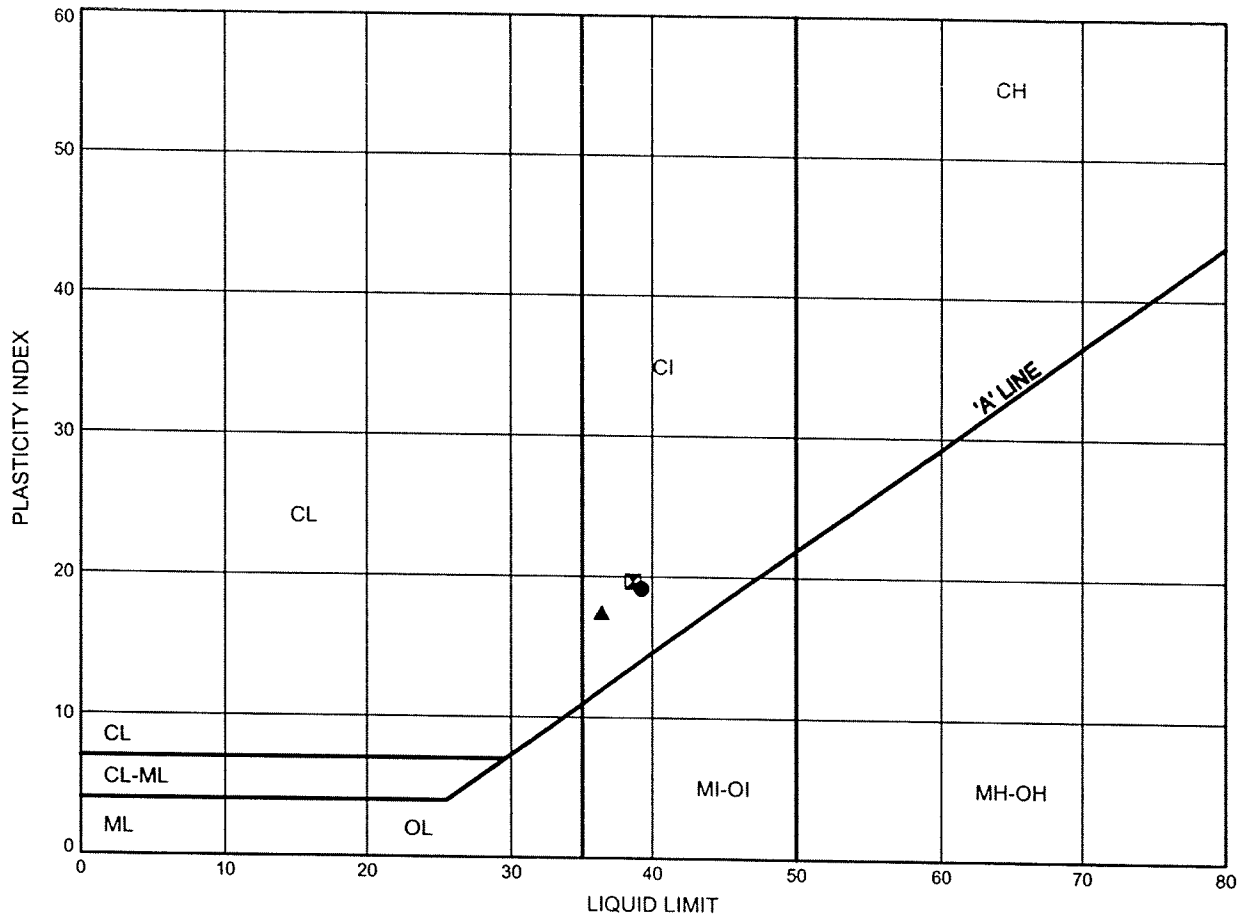
Prep'd AN

Chkd. RPR

Hwy 427 Northbound and Southbound ATTERBERG LIMITS TEST RESULTS

FIGURE B16

Silty CLAY



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	GD-01	20.12	149.31
⊠	GD-03	9.45	151.73
▲	GD-08	18.59	152.42

THURBALT 9270.GPJ 7/29/09

Date July 2009

Project 202-95-00

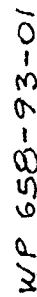


Prep'd AN

Chkd. RPR

Appendix C

Record of Borehole Sheets and Laboratory Test Results (Previous Investigation)



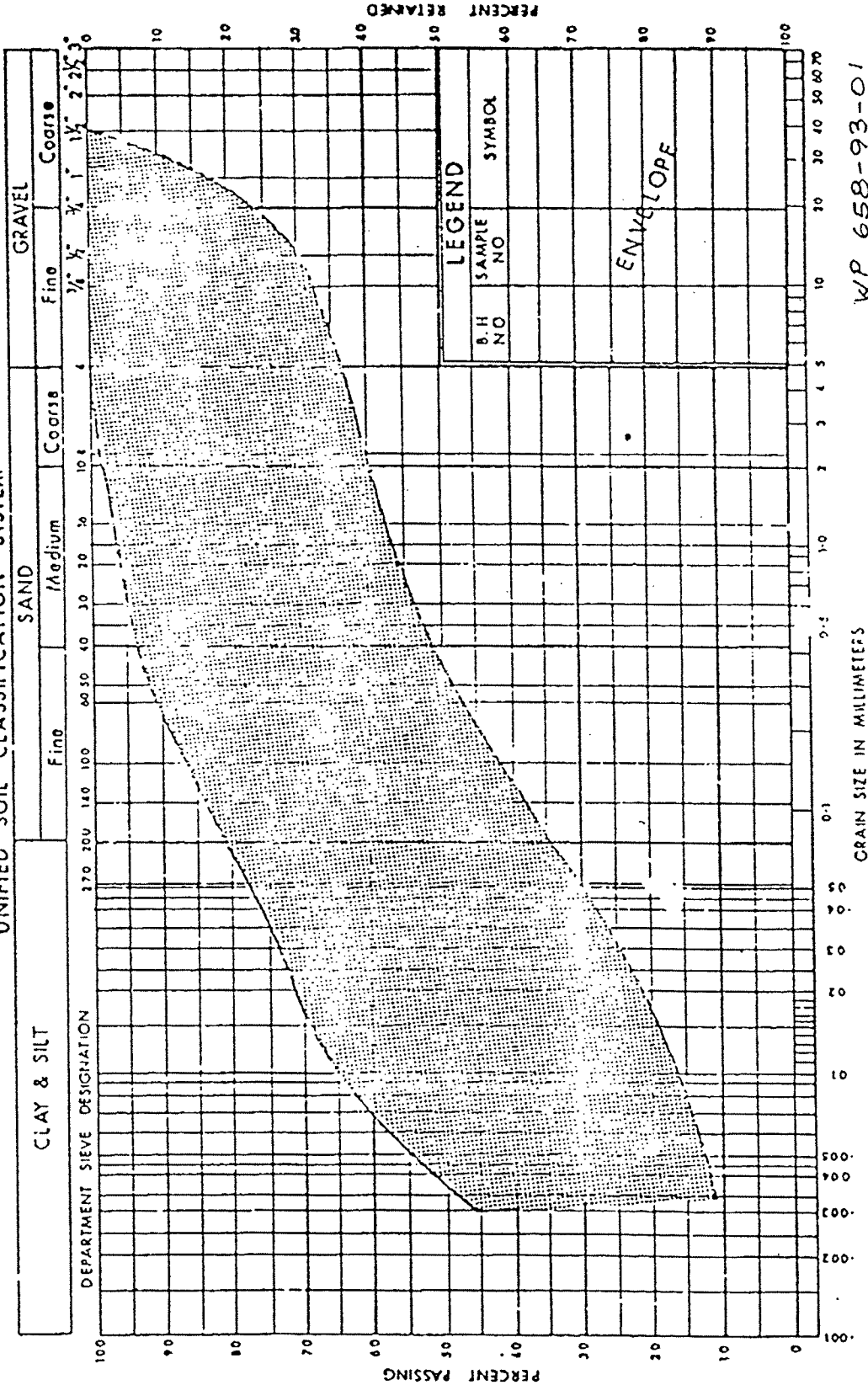
PLASTICITY CHART
GLACIAL TILL

к.р. № 387 - 65

JOB No. 72 - 11C02

FIG. 1

UNIFIED SOIL CLASSIFICATION SYSTEM



WP 658-93-01

DEPARTMENT
OF
TRANSPORTATION AND COMMUNICATIONS

DESIGN SERVICES
BRANCH

GRAIN SIZE DISTRIBUTION

GLACIAL TILL.

W.P. No. 387 - 65

JOB No. 72 - 11002

FIG. 2

OFFICE REPORT ON SOIL EXPLORATION

13

WP 658-93-01

DEPARTMENT OF HIGHWAYS- ONTARIO

MATERIALS & TESTING OFFICE

JOB 72-11002

W.P. 387-65

DATUM Geodetic

RECORD OF BOREHOLE No. 1 IMPERIAL FOUNDATION SECTION

Co-ords: N 4 839 920.1, E 295 980.0

Co-ords: 15,879,003 N; 971,063 E.

LOCATION

BORING DATE Feb. 3, 1972

BOREHOLE TYPE Auger

ORIGINATED BY VK

COMPILED BY TST

CHECKED BY

ELEV. DEPTH	SOIL PROFILE DESCRIPTION	SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION BLOWS / FOOT	SHEAR STRENGTH P.S.F.	WATER CONTENT %	BULK DENSITY	REMARKS
		NUMBER	TYPE						
0.0	Ground Level								
155.2	Ht. mix. of clayey silty sand & occ. gravel.	1	SS						
159.2	Very Stiff - Hard	2	SS						
	Glacial Till	3	SS						
	Silty sand with gravel	4	SS						
		5	SS						
		6	SS						
		7	SS						
		8	SS						
		9	SS						
173.6	End of Borehole. Probable Redrock	10	SS						

WP 658-93-01

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

JOB 72-11002

LOCATION

Co-ords: N 4 839 918.3, E 295 944.3

RECORD OF BOREHOLE No.2 IMPERIAL FOUNDATION SECTION

W.P. 387-65

BORING DATE

Feb. 1, 1972

ORIGINATED BY

VX

COMPILED BY

TST

DATUM Geodetic

BOREHOLE TYPE

Auger

CHECKED BY

S.C.

ELEV. DEPTH 155.1 508.9	SOIL PROFILE DESCRIPTION	SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT PLASTIC LIMIT WATER CONTENT %	BULK DENSITY P.C.F.	REMARKS
		NUMBER	TYPE		20	100			
0.0	Ground Level								
	Het. mix. of clayey silt, sand and occ. gravel.	1	SS 1h						
		2	SS 17						
		3	SS 2h						
	Very Stiff to Hard	4	SS 17						
	Glacial Till	5	SS 20						
		6	SS 65						
		7	SS 65						
	Sand and gravel	8	SS 70						
	with occ. boulders	9	SS 70						
468.9		10	SS 70						
460.0	weathered	11	SS 70						
462.9	shale bedrock sound	12	BKL 100						
460.0	End of Borehole								

WP 658-93-01

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING OFFICE

JOB 72-11002

W.P. 387-65

DATUM Geodetic

LOCATION 15,878,926 N; 970,052 E.

BORING DATE Jan. 27, 1972

BOREHOLE TYPE Auger

RECORD OF BOREHOLE No.3

IMPERIAL FOUNDATION SECTION

Co-ords: N 4 839 918.0; E 225 915.4

ORIGINATED BY VK

COMPILED BY TST

CHECKED BY

ELEV. DEPTH (56.4)	SOIL PROFILE DESCRIPTION	SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT		LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — w		REMARKS
		NUMBER	TYPE		UNCONFINED SHEAR STRENGTH P.S.F.	FIELD VANE QUICK TRIAXIAL X LAB. VANE	WATER CONTENT %	BULK DENSITY P.C.F. GR. SA. ST. CL.	
513.0	Ground Level								
508.0	O.C. sand and gravel with clayey silt. Compact	1	SS	10					36 29 27 8
5.0	Hot mix. of clayey silt, sand & gravel	2	SS	20					Y 505.
	Glacial Till	3	SS	25					
	Very Stiff to Hard	4	SS	30					
		5	SS	20					
		6	SS	20					
		7	SS	20					
		8	SS	17					
		9	SS	50					
171.9		10	SS	60/20"					
38.1	End of Borehole Probably Bedrock	11	SS	100/10"					

WP 658-93-01

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE
JOB 72-11002
W.P. 387-65
DATE 387-65
LOCATION 15, 872, 051, 11, 970, 920 E.
BORING DATE Feb. 3, 1972
BOREHOLE TYPE Auger
RECORD OF BOREHOLE No.7 IMPERIAL FOUNDATION SECTION
Co-ords: N 4 839 935.7, E 295 936.4
ORIGINATED BY VK
COMPILED BY TST
CHECKED BY C.L.

ELEV. DEPTH	SOIL PROFILE	SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT PLASTIC LIMIT WATER CONTENT	BULK DENSITY	REMARKS
		NUMBER	TYPE		BLOWS / FOOT	SHEAR STRENGTH P.S.F.			
510.8	Ground Level			510					
0.0	Sand and gravel	1	SS						
		2	SS						
	Het. mix. of clayey silt and sand	3	SS						
	Glacial Till	4	SS						
	Stiff to Hard	5	SS						
	Sand and gravel	6	SS						
		7	SS						
		8	SS						
		9	SS						
	with shale frags.	10	SS						
160.3	End of Borehole								
17.5	Probable Bedrock								

WP 658-93-01

DEPARTMENT OF HIGHWAYS - ONTARIO
 MATERIALS & TESTING OFFICE
 JOB 72-11002 LOCATION Co-ords: N4 839935.7, E 295 905.0
 W.P. 387-65 BORING DATE Jan. 28, 1972 Co-ords. 15,879,054 N; 970,817 E.
 DATUM Geodetic BOREHOLE TYPE Auger, EXL Core

RECORD OF BOREHOLE No. 8 IMPERIAL FOUNDATION SECTION
 ORIGINATED BY VI
 COMPILED BY TST
 CHECKED BY S.A.

ELEV. DEPTH	SOIL PROFILE DESCRIPTION	SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT PLASTIC LIMIT WATER CONTENT %		REMARKS
		NUMBER	TYPE		20	40	60	80	
512.8	Ground Level								
0.0	Het. mix. of clayey sil and sand, trace of gravel	1	SS	512					
	Glacial Till	2	SS	511					
	Stiff to Hard	3	SS	510					
		4	SS	509					
		5	SS	508					
		6	SS	507					
		7	SS	506					
		8	SS	505					
		9	SS	504					
		10	SS	503					
		11	SS	502					
		12	SS	501					
172.8	with shalo frags.			500					
160.0	weathered Shale bedrock			499					
145.8	found			498					

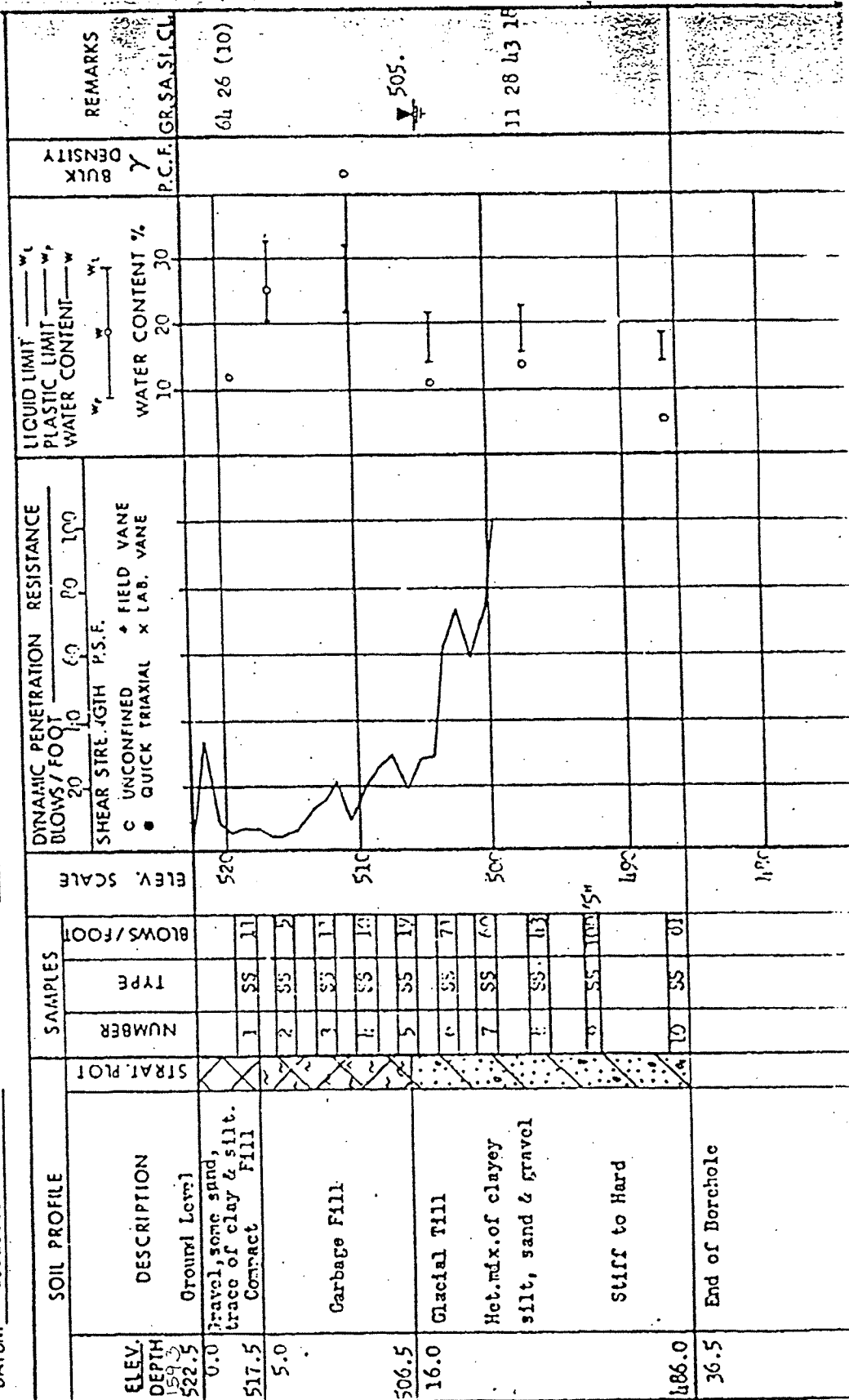
WP 658-93-01

DEPARTMENT OF HIGHWAYS - ONTARIO
 MATERIALS & TESTING OFFICE
 JOB 72-11002
 W.P. 387-65
 DATUM Geodetic

RECORD OF BOREHOLE No. 11 IMPERIAL FOUNDATION SECTION
 Co-ords: N 4 839 963.4, E 295 938.7
 Co-ords. 15,079, 115 N; 970,993 E.

LOCATION _____
 BORING DATE Feb. 11, 1972
 BOREHOLE TYPE Washboring, NX Casing

ORIGINATED BY VK
 COMPILED BY TST
 CHECKED BY S.R.



WP 658-93-01

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICERECORD OF BOREHOLE No. 12
C.O. ORDS. IN 4 839 970.4, E. 295 925.4
Co-ords. 15,879,138 N; 970,951, E.

IMPERIAL FOUNDATION SECTION

A 72-11002

LOCATION

ORIGINATED BY VK

M.P. 387 - 65

BORING DATE Feb. 1, 1972

COMPILED BY TST

DATUM Geodetic

BOREHOLE TYPE Auger, BIL Core

CHECKED BY

SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT				LIQUID LIMIT — PLASTIC LIMIT — WATER CONTENT —		BULK DENSITY Y P.C.F.	REMARKS
ELEV. DEPTH 55.0 510.5	DESCRIPTION	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	WATER CONTENT % 10 20 30		
0.0	Ground Level												
	Het. mix. of clayey silt, sand & gravel	1	SS	0									
		2	SS	37									
	Glacial Till	3	SS	65									
	Stiff to Hard	4	SS	10									
		5	SS	11									
	Sand and Gravel	6	SS	7.5									
		7	SS	52									
		8	SS	13.5									
		9	SS	13.5									
		10	SS	105.2"									
		11	SS	100.2"									
		12	SS	100.2"									
40.5	Weathered	13	CC	100.2"									
50.0	Shale Bedrock	14	BIL	MR									
50.5	Sound	15	RC	90%									
60.0	End of Borehole												

20
14-3 % STRAIN AT FAILURE
M

WP 658-93-01

DEPARTMENT OF HIGHWAYS-ONTARIO MATERIALS & TESTING OFFICE			RECORD OF BOREHOLE No. 16 IMPERIAL FOUNDATION SECTION							
P. 72-11002		LOCATION Co-ords: N 4 839 977.1, E 295 948.6		ORIGINATED BY HS & YK						
V.P. 387-65		BORING DATE Feb. 2 & 27 Jan. 1977		COMPILED BY TST						
DATUM Guelphic		BOREHOLE TYPE Auger, RI Casinr, Washborin-		CHECKED BY S.R.						
ELEV. DEPTH (ft.)	SOIL PROFILE DESCRIPTION	STRAT. NO.	SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT		LIQUID LIMIT — % PLASTIC LIMIT — % WATER CONTENT — %	BULK DENSITY P.C.F.	REMARKS
			NUMBER	TYPE		20	40			
528.6	Ground level									
521.6	Fill material, clayey silt with sand and gravel.		1	SS	10					7 20 43 27
517.5			2	SS	11					
			3	SS	22					
	Garbage Fill		4	SS	30					
			5	SS	1					
507.1			6	SS	0					
21.5	Glacial Till		7	SS	23					505.5 7 23 43 27
	Het. mix. of clayey silt sand & gravel		8	SS	23					
	Stiff to Hard		9	SS	13					
	Sand and gravel		10	SS	137					
			11	SS	131					16 40 26 15
			12	SS	101					
	with shale frags.		13	SS	101					
			14	SS	101					
663.9			15	SS	101					
65.0	weathered		16	SS	101					
459.9	Shale Bedrock		17	SH	101					
70.0	End of Borehole									

20
10-15 % STRAIN AT FAILURE
10

WP 658-93-01

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 17 IMPERIAL FOUNDATION SECTION

Co-ords: N4 839 974.7, E 295 918.1
Co-ords: 15,879,162 N; 970,860 E.

ORIGINATED BY VK

JOB 72-11002

COMPILED BY TST

BORING DATE Feb. 3, 1972

W.P. 387-65

CHECKED BY J.S.

BOREHOLE TYPE Auger

DATUM Geodetic

ELEV. DEPTH US ₆₂	SOIL PROFILE		SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION BLOWS/FOOT		LIQUID LIMIT PLASTIC LIMIT WATER CONTENT %		BULK DENSITY γ	REMARKS
	DESCRIPTION	STRAT. ROT	NUMBER	TYPE		20	100	W _p	W _L		
512.6	Ground Level										
508.1	Fill Material		1	SS	510						5 24 51 20
4.5	Glacial Till		2	SS	500						505.
	Ret.mdx. of clayey silt, sand & gravel		3	SS							
			4	SS							
			5	SS							
	Very Stiff to Hard		6	SS	490						
			7	SS							
			8	SS							
	with shale frags.		9	SS	480						
476.6			10	SS							
36.0	weathered shale End of Borehole Probable Bedrock				470						

WP 658-93-01

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 18 IMPERIAL FOUNDATION SECTION

Co-ords: N 4839 998.7, E 295 883.1

Co-ords: 15,079,205 N; 970,715 E.

JOB 72-11002

LOCATION

W.P. 387.-65

BORING DATE Feb. 1, 1972

ORIGINATED BY VK

COMPILED BY TST

DATUM Geodetic

BOREHOLE TYPE Auger, BXL Core

CHECKED BY J.Z.

ELEV. DEPTH (E.S. 2)	SOIL PROFILE DESCRIPTION	STRAT. PT.	SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT PLASTIC LIMIT WATER CONTENT		REMARKS
			NUMBER	TYPE		20	100	W _L	W _P	
0.0	Ground Level									
0.0	Hot. mix. of clayey silt, sand & gravel		1	SS	5					
			2	SS	69					
			3	SS	75					
			4	SS	70					
			5	SS	57					
			6	SS	63					
			7	SS	70					
			8	SS	70					
			9	SS	70					
			10	SS	70					
			11	RC	70					
167.8	Shale Bedrock									
161.5	Shale Bedrock									
162.8	Shale Bedrock									
166.5	End of Borehole									

Appendix D

Site photograph

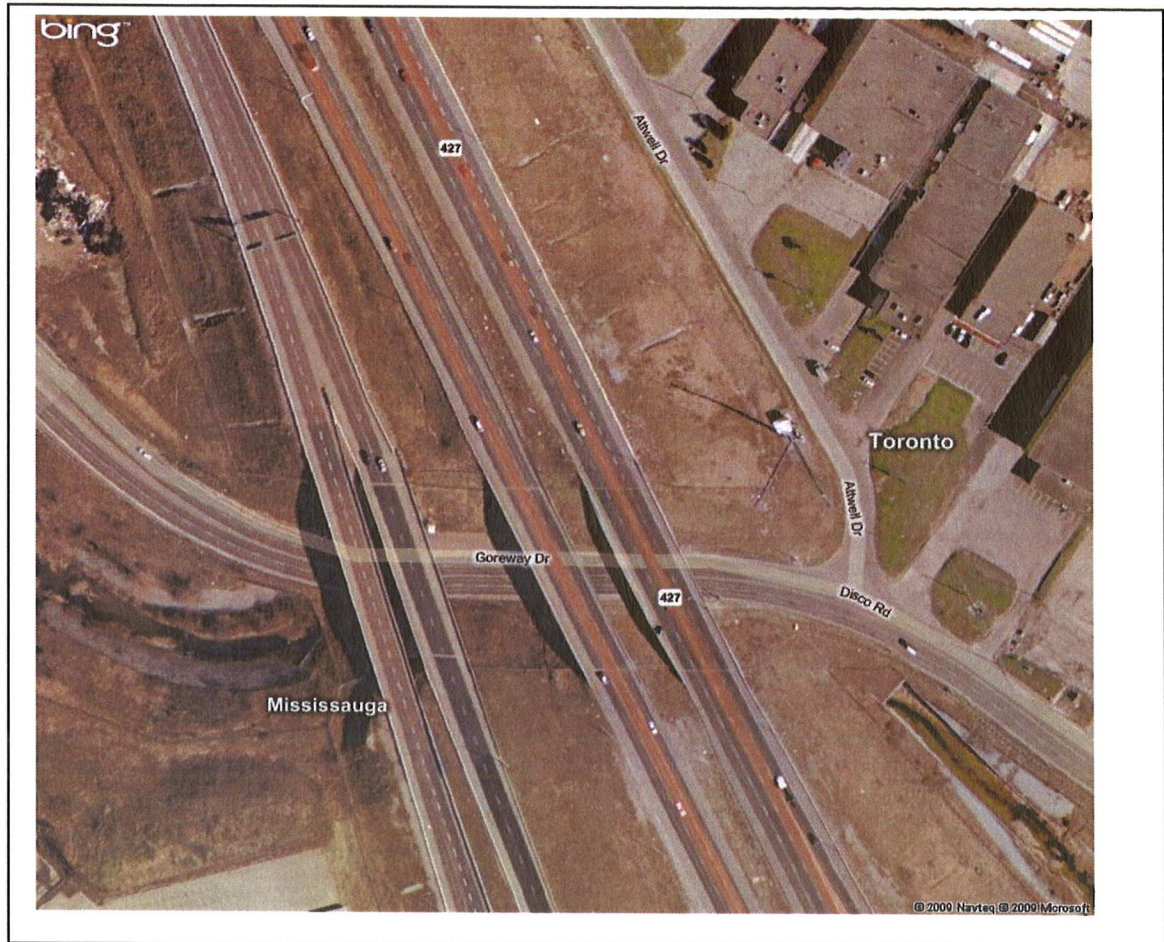
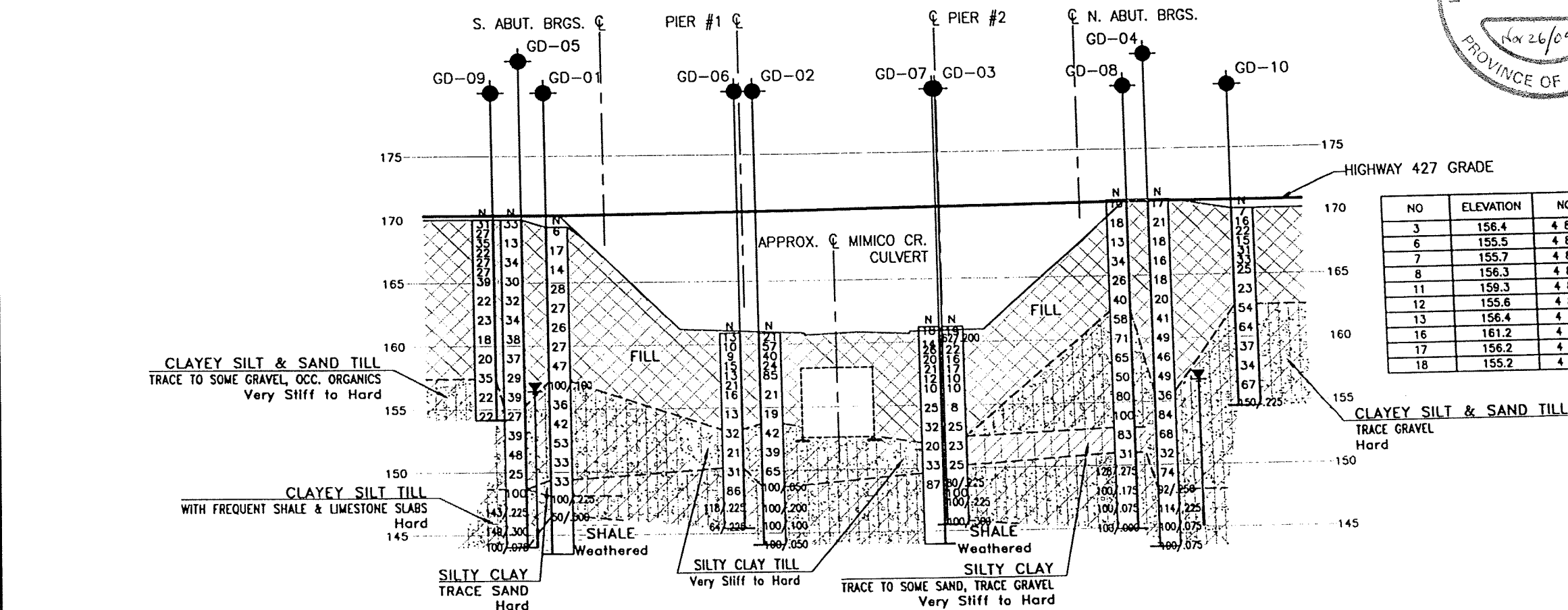
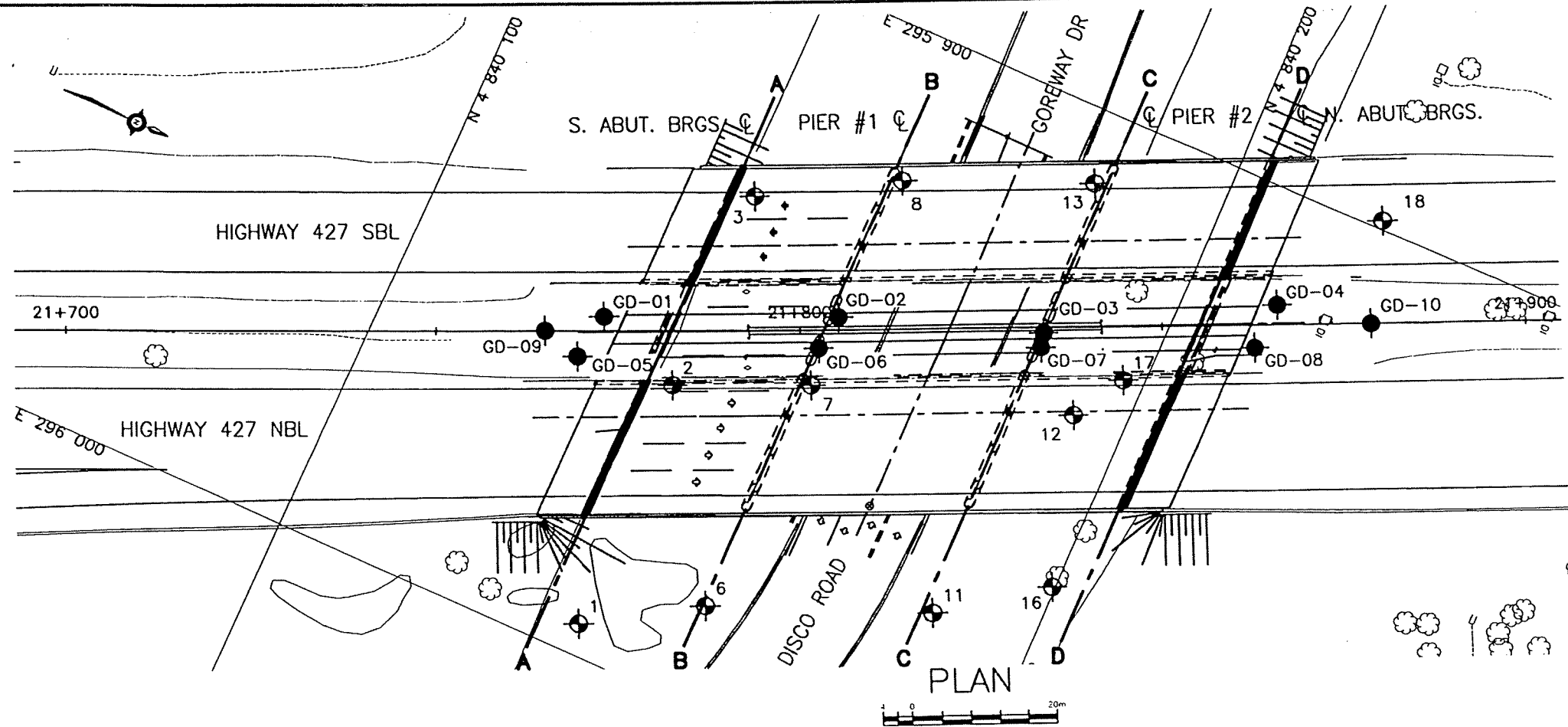


Photo 1. Aerial photograph of the site

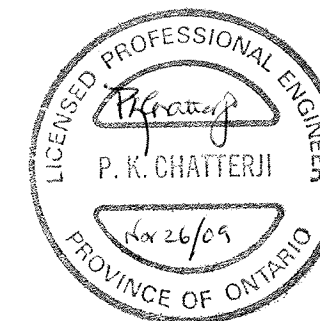
Appendix E

Borehole Locations and Soil Strata Drawings



HIGHWAY 427 PROFILE

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

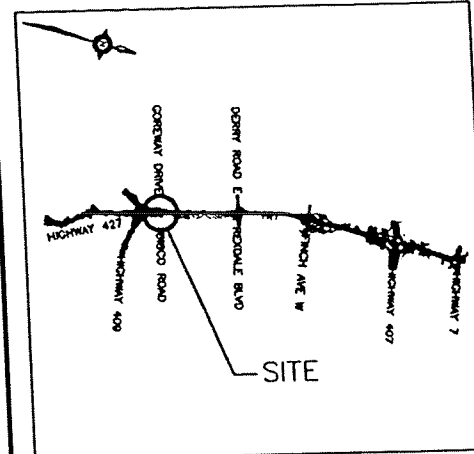


CONT No
GWP No 202-95-00

HIGHWAY 427
DISCO RD/GOREWAY DR OVERPASS
REHABILITATION & WIDENING
BOREHOLE LOCATIONS AND SOIL STRATA

SNC-LAVALIN

THURBER ENGINEERING LTD.
GEOTECHNICAL • ENVIRONMENTAL • MATERIALS



KEYPLAN

LEGEND

- Borehole by Thurber (Present Investigation)
- ◊ Borehole by Others (Previous Investigation)
- N Blows /0.3m (Std Pen Test, 475J/blow)
- CONE Blows /0.3m (60° Cone, 475J/blow)
- PH Pressure, Hydraulic
- W Water Level
- HA Head Artesian Water
- PZ Piezometer
- 90% Rock Quality Designation (RQD)
- A/R Auger Refusal

NO	ELEVATION	NORTHING	EASTING	NO	ELEVATION	NORTHING	EASTING
3	156.4	4 840 140.5	295 931.1	GD-01	169.4	4 840 128.4	295 955.1
6	155.5	4 840 157.2	295 986.3	GD-02	160.9	4 840 157.8	295 941.1
7	155.7	4 840 158.2	295 952.1	GD-03	161.2	4 840 184.5	295 932.1
8	156.3	4 840 158.2	295 920.7	GD-04	171.0	4 840 212.4	295 915.1
11	159.3	4 840 185.9	295 974.4	GD-05	170.0	4 840 127.4	295 961.1
12	155.6	4 840 192.9	295 941.1	GD-06	160.9	4 840 157.1	295 946.1
13	156.4	4 840 182.8	295 910.1	GD-07	161.2	4 840 185.0	295 934.1
16	161.2	4 840 199.6	295 964.3	GD-08	171.0	4 840 211.8	295 922.1
17	156.2	4 840 197.2	295 933.8	GD-09	170.0	4 840 121.9	295 960.1
18	155.2	4 840 221.2	295 898.8	GD-10	170.2	4 840 225.3	295 912.1
				1	155.3	4 840 142.6	295 995.1
				2	155.1	4 840 140.8	295 960.1

-NOTES-

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

GEOCRES No. 30M12-289

DATE	BY	DESCRIPTION	DATE	NOV
DESIGN	SKP	CHK PKC	CODE	
DRAWN	MFA	CHK PKC	SITE	
		STRUCT	DWG	

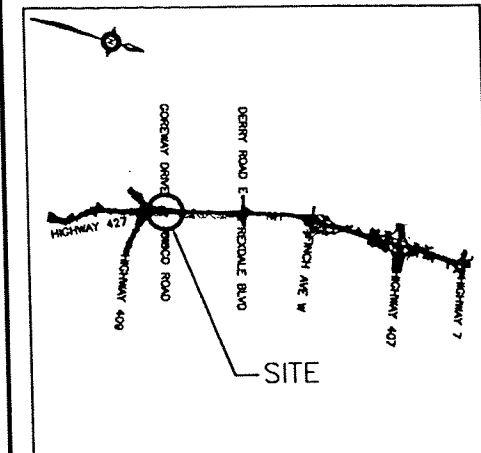
METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

CONT No
GWP No 202-95-00



HIGHWAY 427
DISCO RD/GOREWAY DR OVERPASS
REHABILITATION & WIDENING
BOREHOLE LOCATIONS AND SOIL STRATA

SHEET



KEYPLAN

LEGEND

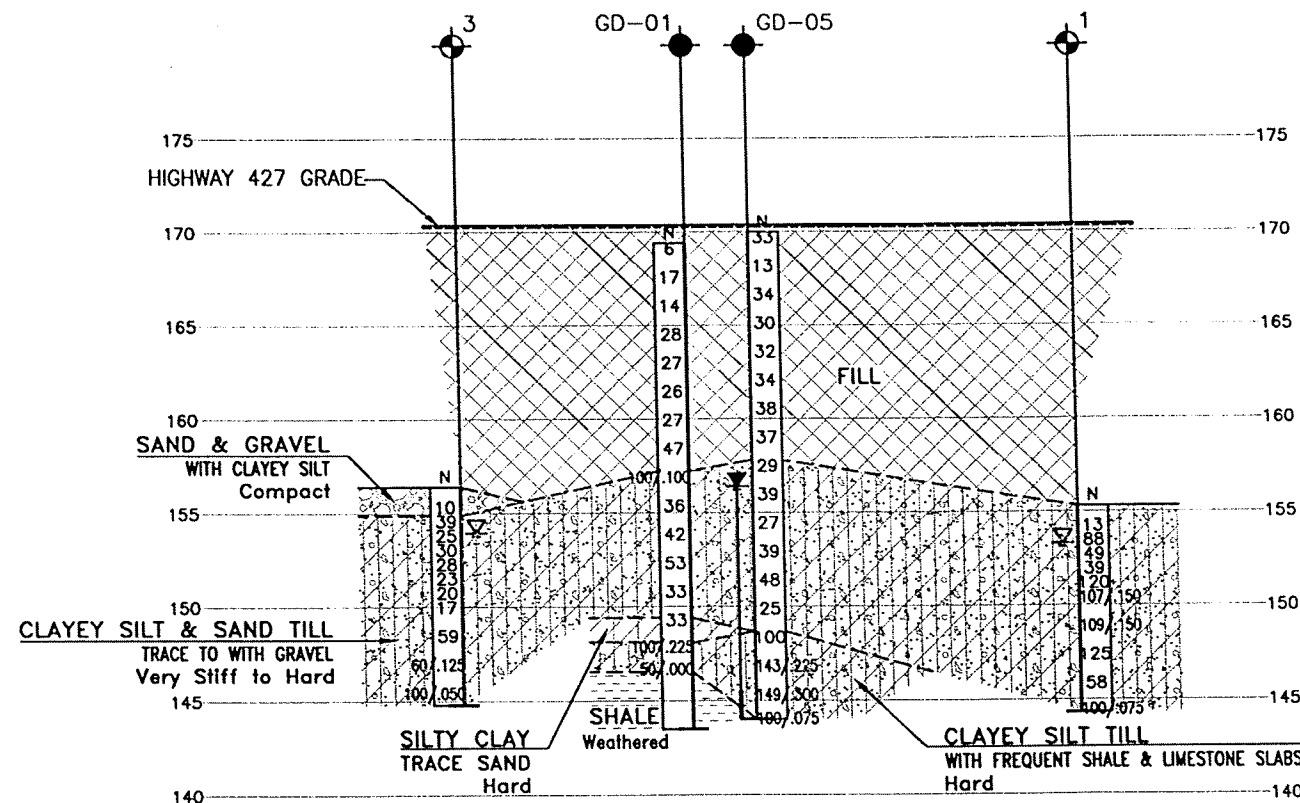
- ◆ Borehole by Thurber (Present Investigation)
- ◊ Borehole by Others (Previous Investigation)
- N Blows /0.3m (Std Pen Test, 475J/blow)
- CONE Blows /0.3m (60° Cone, 475J/blow)
- PH Pressure, Hydraulic
- W Water Level
- HA Head Artesian Water
- PZ Piezometer
- 90% Rock Quality Designation (RQD)
- A/R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

NO	ELEVATION	NORTHING	EASTING	NO	ELEVATION	NORTHING	EASTING
3	156.4	4 840 140.5	295 931.1	GD-01	169.4	4 840 128.4	295 955.1
6	155.5	4 840 157.2	295 986.3	GD-02	160.9	4 840 157.8	295 941.8
7	155.7	4 840 158.2	295 952.1	GD-03	161.2	4 840 184.5	295 932.2
8	156.3	4 840 158.2	295 920.7	GD-04	171.0	4 840 212.4	295 915.5
11	159.3	4 840 185.9	295 974.4	GD-05	170.0	4 840 127.4	295 961.7
12	155.6	4 840 192.9	295 941.1	GD-06	160.9	4 840 157.1	295 946.9
13	156.4	4 840 182.8	295 910.1	GD-07	161.2	4 840 185.0	295 934.3
16	161.2	4 840 199.6	295 964.3	GD-08	171.0	4 840 211.8	295 922.3
17	156.2	4 840 197.2	295 933.8	GD-09	170.0	4 840 121.9	295 960.2
18	155.2	4 840 221.2	295 898.8	GD-10	170.2	4 840 225.3	295 912.6
				1	155.3	4 840 142.6	295 995.7
				2	155.1	4 840 140.8	295 960.0

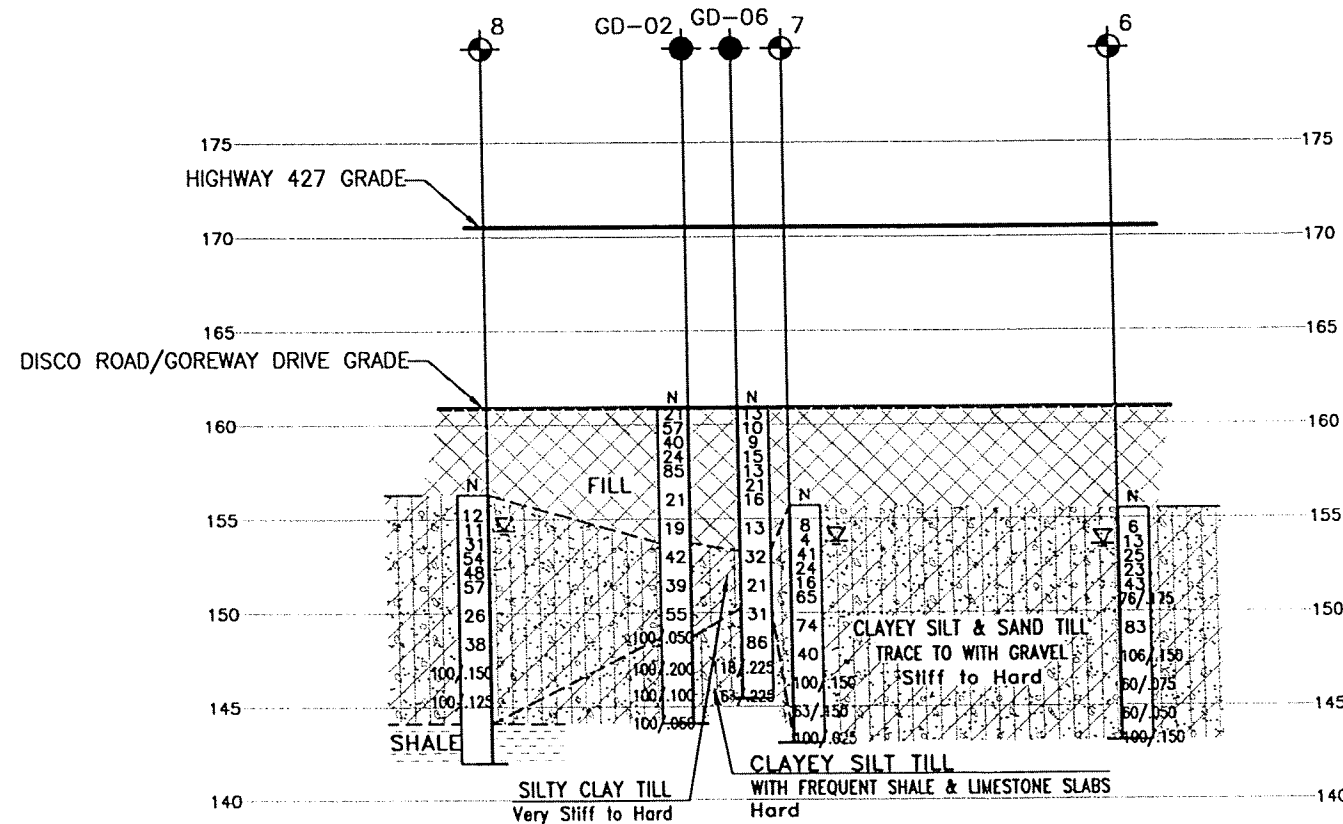
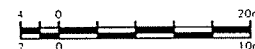
-NOTES-

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

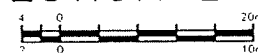
GEOCRES No. 30M12-289



SECTION A-A



SECTION B-B



DATE	BY	DESCRIPTION
DESIGN	SKP	CHK PKC
DRAWN	MFA	CHK PKC
		CODE
		LOAD
		STRUCT
		DWG 2

DATE NOV. 2009

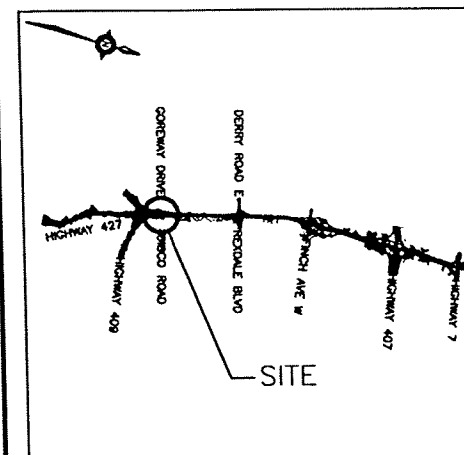
METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

CONT No
GWP No 202-95-00



HIGHWAY 427
DISCO RD/GOREWAY DR OVERPASS
REHABILITATION & WIDENING
BOREHOLE LOCATIONS AND SOIL STRATA

SHEET



KEYPLAN

LEGEND

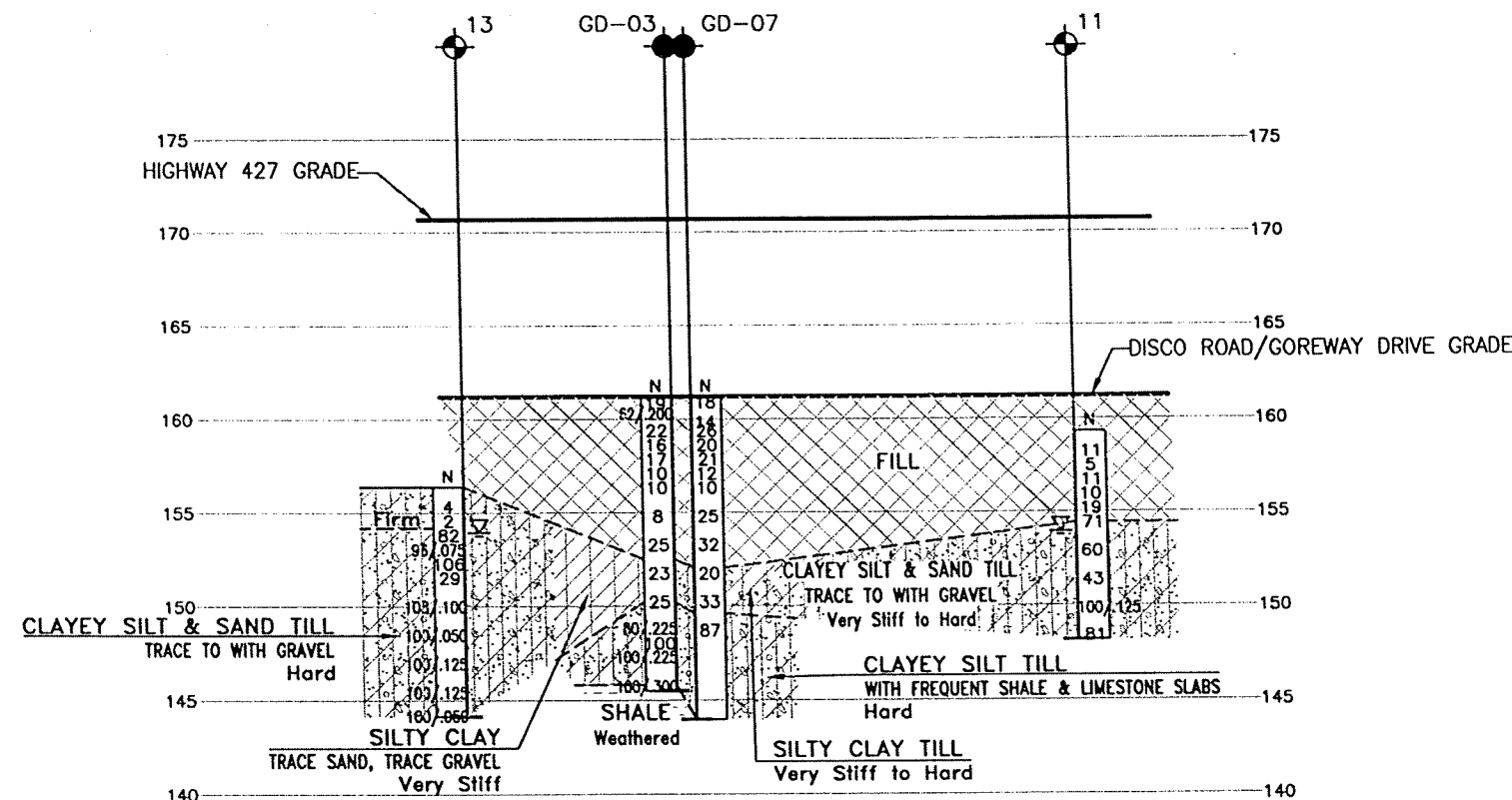
- ◆ Borehole by Thurber (Present Investigation)
- ◇ Borehole by Others (Previous Investigation)
- N Blows /0.3m (Std Pen Test, 475J/blow)
- CONE Blows /0.3m (60° Cone, 475J/blow)
- PH Pressure, Hydraulic
- W Water Level
- ↑ Head Artesian Water
- ⊥ Piezometer
- 90% Rock Quality Designation (RQD)
- A/R Auger Refusal

NO	ELEVATION	NORTHING	EASTING	NO	ELEVATION	NORTHING	EASTING
3	156.4	4 840 140.5	295 931.1	GD-01	169.4	4 840 128.4	295 955.1
6	155.5	4 840 157.2	295 986.3	GD-02	160.9	4 840 157.8	295 941.8
7	155.7	4 840 158.2	295 952.1	GD-03	161.2	4 840 184.5	295 932.2
8	156.3	4 840 158.2	295 920.7	GD-04	171.0	4 840 212.4	295 915.5
11	159.3	4 840 185.9	295 974.4	GD-05	170.0	4 840 127.4	295 961.7
12	155.6	4 840 192.9	295 941.1	GD-06	160.9	4 840 157.1	295 946.9
13	156.4	4 840 182.8	295 910.1	GD-07	161.2	4 840 185.0	295 934.3
16	161.2	4 840 199.6	295 964.3	GD-08	171.0	4 840 211.8	295 922.3
17	156.2	4 840 197.2	295 933.8	GD-09	170.0	4 840 121.9	295 960.2
18	155.2	4 840 221.2	295 898.8	GD-10	170.2	4 840 225.3	295 912.6
				1	155.3	4 840 142.6	295 995.7
				2	155.1	4 840 140.8	295 960.0

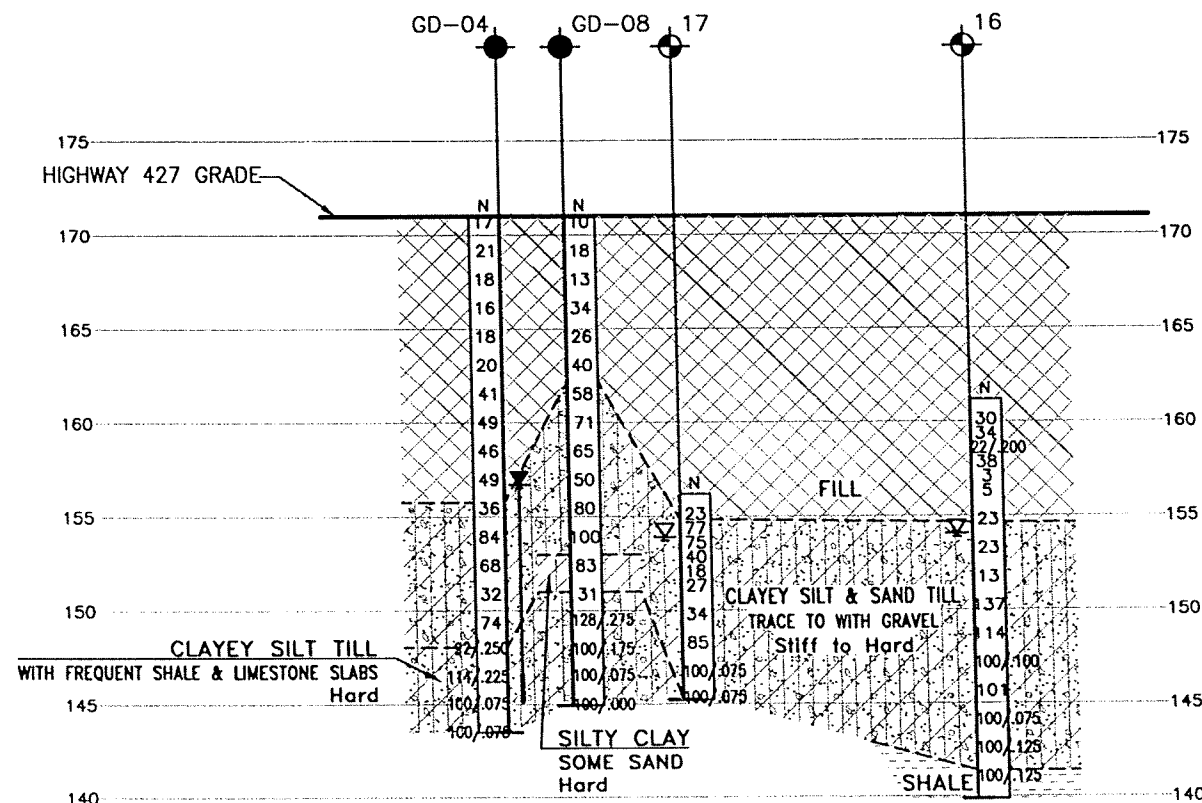
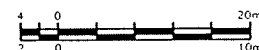
-NOTES-

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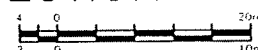
GEOCRES No. 30M12-289



SECTION C-C



SECTION D-D



DATE	BY	DESCRIPTION
DESIGN	SKP	CHK PKG CODE
DRAWN	MFA	CHK PKG SITE
		LOAD
		STRUCT
		OWG 3
		DATE NOV. 2009