

**FOUNDATION INVESTIGATION REPORT
NORTH TROUT CREEK BRIDGE EBL
HIGHWAY 11/17 RED ROCK TO NIPIGON
FROM 4.8 KM WEST OF HWY 628 TO 1.5KM WEST OF HWY 585
TOWNSHIP OF NIPIGON**

G.W.P. 647-89-00, SITE NO. 48C-11B

Geocres Number: 52A-165

Report to

Hatch Mott MacDonald

Thurber Engineering Ltd.
2010 Winston Park Drive, Suite 103
Oakville, Ontario
L6H 5R7
Phone: (905) 829 8666
Fax: (905) 829 1166

March 28, 2014
File: 19-1605-117

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NORTH TROUT CREEK BRIDGE EBL
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DISTRICT OF THUNDER BAY**

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PART 1: FACTUAL INFORMATION

1 INTRODUCTION

This report presents the factual findings obtained from a foundation investigation conducted at the proposed location of a bridge planned to carry the new Highway 11/17 eastbound lanes (EBL) over the North Trout Creek near the boundary of the Townships of Red Rock and Nipigon, Ontario. The proposed bridge is part of the Highway 11/17 four-laning project, involving construction of a divided highway from 4.8 km west of Highway 628 to 1.5 km west of Highway 585 in the District of Thunder Bay.

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, a stratigraphic profile, 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 in the course of the investigation.

Thurber carried out the investigation as a sub-consultant to Hatch Mott MacDonald (HMM), under the Ministry of Transportation Ontario (MTO) Agreement Number 6010-E-0006.

A previous foundation investigation report was available for the existing bridge on the current Highway 11/17 alignment (Soil Conditions, Proposed North Trout Creek Bridge, Highway No. 17, Nipigon, Ontario; November 26, 1956, by Geocon Ltd.; Geocres 56-F-216C). However, this bridge is located approximately 200 m to the east of the new location, and the data is not considered relevant to the new bridge site.

2 SITE DESCRIPTION

The site is located approximately 10 km (by highway) southwest of Nipigon, Ontario and about 500 m north of the intersection of Highway 11/17 and Highway 528. At the bridge location, the new eastbound lanes of Highway 11/17 will be approximately 200 m west of the existing highway.

North Trout Creek at the proposed crossing generally flows southerly and then easterly towards Lake Superior at Red Rock. The creek is situated at the base of an approximate 80 m wide by 8 m deep valley. The surrounding lands are typically heavily treed with occasional vacant areas of grass and shrubs.

An MTO inspection station is located on the west side of existing Highway 11/17 approximately 200 m north of the site. A hydro corridor runs parallel to the west side of the highway.

Photographs in Appendix C show the general nature of the site and the surrounding lands.

The site lies within the physiographic region known as the Quetico Subprovince of the Superior Province of the Canadian Shield. The region is characterized by early Precambrian felsic igneous (granite) and metamorphic (granitic gneiss) bedrock. The bedrock is mantled by a thin discontinuous layer of drift or deeper deposits of glaciolacustrine clay.

3 SITE INVESTIGATION AND FIELD TESTING

The site investigation and field testing for this project were carried out during the period of June 28 to July 12, 2012 and consisted of drilling and sampling eighteen boreholes (numbered NTE-01 to NTE-18) in the area of the proposed foundation units. The borehole locations were selected on the basis of a three span structure originally proposed at this location.

The design was subsequently revised to two spans, and two additional boreholes (numbered NTE-19 and NTE-20) were drilled at the revised location of the west abutment on February 24 to 26, 2014.

A summary of the borehole locations, designations, termination depths and termination elevations is provided in Table 3.1. The approximate borehole locations are shown on the attached Borehole Locations and Soil Strata Drawing in Appendix D.

As shallow bedrock was encountered on the east side of North Trout Creek, additional boreholes were drilled at the east abutment and pier to establish the bedrock surface within the foundation areas.

Boreholes NTE-03, NTE-04, NTE-07, NTE-08, NTE-11, NTE-13, NTE-15, NTE-16, NTE-19 and NTE-20 were advanced 3.0 m to 5.8 m into bedrock by NQ size diamond coring.

The borehole locations were marked in the field and utility clearances were obtained prior to drilling.

Table 3.1 – Borehole Designations

Foundation Unit		Borehole Number	Borehole Termination Depth (m)	Borehole Termination Elevation (m)
original three-span structure	revised two-span structure			
West approach	West approach	NTE-01	12.8	204.1
	West abutment	NTE-19 and NTE-20	21.6 to 24.2	194.7 to 192.9
West abutment	Pier	NTE-02 and NTE-03	11.0 to 13.1	201.2 to 197.5
West pier		NTE-04 and NTE-05	8.5 to 15.2	200.8 to 195.0
East pier	East Abutment	NTE-06, NTE-07, NTE 11 to NTE-13	0.5 to 7.1	209.4 to 202.8
East abutment		NTE-08, NTE-09, NTE-14 to NTE-18	0.9 to 6.4	212.6 to 206.1
East approach	East approach	NTE-10	1.7	216.0

Drilling was carried out using a track-mounted CME 45 drill rig and the boreholes were advanced with hollow-stem augers and NQ coring techniques. In general, samples were obtained at selected intervals using a split spoon sampler in conjunction with Standard Penetration Testing (SPT) in the native soils. Rock cores were logged, and the Total Core Recovery (TCR), Fracture Index (FI) and Rock Quality Designation (RQD) were determined.

The drilling and sampling operations were supervised on a full time basis by a member of Thurber's technical staff. The supervisor logged the boreholes and processed the recovered soil and rock samples for transport to Thurber's laboratory for further examination and testing.

Groundwater conditions in the open boreholes were observed throughout the drilling operations. The boreholes were backfilled with bentonite holeplug in general accordance with O.Reg. 903 upon completion. Standpipe piezometers consisting of 19 mm PVC pipe with slotted screen enclosed in filter sand were installed in Boreholes NTE-02 and NTE-05 to permit longer term groundwater level monitoring. The piezometers were subsequently decommissioned in general accordance with MOE Regulation 903. The installation and completion details of the piezometer and boreholes are shown in Table 3.2.

Table 3.2 – Borehole Completion Details

Borehole	Piezometer Tip Depth/ Elevation (m)	Completion Details
NTE-01	None installed	Borehole backfilled with bentonite to 1.8 m, then auger cuttings to surface.
NTE-02	10.7/201.5	Borehole caved to 10.7 m, then backfilled with sand from 10.7 m to 8.3 m, bentonite from 8.3 m to 1.0 m, then auger cuttings to surface.
NTE-03	None installed	Borehole backfilled with bentonite to 0.9 m, then auger cuttings to surface.
NTE-04	None installed	Borehole backfilled with bentonite and auger cuttings to surface.

Borehole	Piezometer Tip Depth/ Elevation (m)	Completion Details
NTE-05	8.5/200.8	Sand from 8.5 m to 6.1 m, bentonite from 6.1 m to 1.1 m, then auger cuttings to surface.
NTE-06	None installed	Backfilled with excavated soils.
NTE-07	None installed	Borehole backfilled with bentonite to surface.
NTE-08	None installed	Borehole backfilled with bentonite to surface.
NTE-09	None installed	Borehole backfilled auger cuttings to surface.
NTE-10	None installed	Borehole backfilled with auger cuttings to surface.
NTE-11	None installed	Borehole backfilled with bentonite and auger cuttings to surface.
NTE-12	None installed	Borehole backfilled auger cuttings to surface.
NTE-13	None installed	Borehole backfilled with bentonite to 0.9 m, then auger cuttings to surface.
NTE-14	None installed	Borehole backfilled auger cuttings to surface.
NTE-15	None installed	Borehole backfilled with bentonite and auger cuttings to surface.
NTE-16	None installed	Borehole backfilled with bentonite and auger cuttings to surface.
NTE-17	None installed	Borehole backfilled auger cuttings to surface.
NTE-18	None installed	Borehole backfilled auger cuttings to surface.
NTE-19	None installed	Borehole backfilled with bentonite and auger cuttings to surface.
NTE-20	None installed	Borehole backfilled with bentonite and auger cuttings to surface.

4 LABORATORY TESTING

All recovered soil samples were subjected to Visual Identification (VI) and natural moisture content determination. Selected samples were also subjected to grain size distribution analyses (sieve and hydrometer) and Atterberg Limits testing where appropriate. The results of this testing program are summarized on the Record of Borehole sheets included in Appendix A and on the figures presented in Appendix B.

Rock samples were subjected to geological logging. Point load tests were carried out on selected samples of intact bedrock upon arrival at the laboratory to assist in evaluation of the compressive strength of the bedrock. Results of point load tests on the rock core samples are included on the Record of Borehole sheets in Appendix A (as average unconfined compressive strength per run).

5 DESCRIPTION OF SUBSURFACE CONDITIONS

Reference is made to the Record of Borehole sheets included in Appendix A. Details of the encountered soil and rock stratigraphy are presented in these sheets and on the “Borehole Locations and Soil Strata” drawing included in Appendix D. 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.

The subsurface stratigraphy at this site varies significantly between the west and east sides of North Trout Creek. On the west side, the stratigraphy typically consists of a topsoil layer over a relatively thick deposit of silty clay, overlying a discontinuous sand layer, underlain by bedrock. On the east side, bedrock was encountered at relatively shallow depths below surficial topsoil, sand and clay layers. More detailed descriptions of the individual strata are presented below.

5.1 Wood and Clay Fill

A layer of wood (trees and brush) mixed with clay was encountered surficially in Boreholes NTE-03 and NTE-05. This layer was placed as a drilling platform constructed over sloped ground, and was 0.6 to 0.9 m thick.

5.2 Topsoil

Topsoil was identified below the fill in Boreholes NTE-03 and NTE-05 and at the ground surface in all other boreholes. The topsoil thickness ranged from 75 mm to 300 mm. The topsoil thickness may vary between and beyond the borehole locations and the data is not intended for the purpose of estimating quantities.

5.3 Silt to Sandy Silt

A 1.2 m thick layer of silt, trace sand was encountered below the topsoil in Borehole NTE-19 and a 0.8 m thick layer of sandy silt was encountered below the topsoil in Borehole NTE-20. The depth to the base of the silt/sandy silt was 1.3 m and 0.9 m (Elev. 215.8 and 215.4), respectively.

SPT N-values of 15 and 6 blows per 0.3 m of penetration were recorded in these layers, indicating a compact and loose relative density. Moisture contents of 17 and 18% were measured.

5.4 Sand

Native brown to dark brown sand containing some clay, trace silt and trace gravel was contacted below the topsoil in Boreholes NTE-04 and NTE-05. The thickness of the sand layer was 1.2 m and 0.5 m. The depth to the base of the sand was 1.4 m (Elev. 208.8 and 208.0).

An SPT N-value recorded in the sand layer was 3 blows per 0.3 m of penetration, indicating a very loose relative density.

The moisture content of one sample of the sand was 36%, possibly indicating an organic component.

5.5 Silty Clay

Native brown to grey silty clay containing silt seams (varved) was encountered below the silt/sand in Boreholes NTE-04, NTE-05, NTE-19 and NTE-20, and below the topsoil in all other boreholes except Boreholes NTE-12, NTE-13 and NTE-17.

On the west side of the creek, the clay deposit ranged from 7.1 m to 16.4 m in thickness, with a lower boundary at depths of 8.5 m to 17.7 m (Elev. 199.5 to 204.7). A layer of silt to sandy silt was encountered within the clay deposit in Boreholes NTE-19 and NTE-20. On the east side, the clay layer was 0.2 m to 2.1 m thick with a lower boundary at depths of 0.5 m to 2.4 m (Elev. 208.4 to 216.0).

Standard Penetration tests performed in the silty clay on the west side of the creek gave SPT N-values ranging from 0 to 6 blows per 0.3 m of penetration, indicating a very soft to firm consistency. On the east side, the SPT N-values typically ranged from 4 to 13 blows per 0.3 m of penetration, indicating a firm to stiff consistency. One N-value of 2 blows per 0.3 m (soft) was obtained at the ground surface in Borehole NTE-11.

In-situ vane shear tests carried out on the cohesive deposits measured undrained shear strengths of 40 to 100 kPa. It is likely however that the measured strengths, particularly the higher values, are affected by the silt seams in the clay. The sensitivity ranged from 3 to 9.

The moisture contents of samples of the silty clay varied from 15% to 64%, typically in the order of about 25% to 55%.

Selected samples of the silty clay underwent laboratory grain size analysis testing and Atterberg Limits tests. The grain size distribution curves for tested samples of silty clay are presented in Appendix B, Figures B1 to B3. The results of the Atterberg Limits tests are presented in Figures B7 to B9, Appendix B. The results are summarized on the Record of Borehole sheets included in Appendix A, and in the following tables:

	West Side of Creek	East Side of Creek
Gravel %	0	0
Sand %	0	2 to 18
Silt %	20 to 65	33 to 53
Clay %	35 to 80	39 to 60

Liquid Limit	24 to 58
Plastic Limit	16 to 23

The above results indicate that the silty clay varies from low to high plasticity with group symbols of CL, CI and CH.

5.6 Silt to Sandy Silt

In Boreholes NTE-01, NTE-19 and NTE-20, a layer of grey silt to sandy silt was encountered within the silty clay deposit at depths of 12.2 to 12.8 m (Elev. 204.7 to 204.2). Borehole NTE-01 was terminated within the silt at 12.8 m depth (Elev. 204.1). The silt/sandy silt layer was 0.9 m and 1.5 m thick in Boreholes NTE-19 and NTE-20, with a lower boundary at 13.7 m depth (Elev. 203.4 and 202.6).

SPT N-values of 1 and 2 blows per 0.3 m of penetration were recorded in the silt/sandy silt, indicating a very loose relative density. Moisture contents of 23% and 29% were measured.

A grain size distribution curve for a sample of the silt is presented on Figure B4 of Appendix B. The results are summarized on the Record of Borehole sheet and are as follows:

Gravel %	0
Sand %	2
Silt %	91
Clay %	7

5.7 Silty Sand

Native brown to dark brown silty sand containing trace to some clay and trace gravel was encountered below the topsoil or silty clay in Boreholes NTE-12 to NTE-14 and NTE-17, drilled on the east side of the creek. Boreholes NTE-12, NTE-14 and NTE-17 were terminated upon auger refusal at the base of this layer, at depths of 0.9 m to 1.3 m (Elev. 211.8 to 209.4). Borehole NTE-13 encountered bedrock (proven by coring) below the silty sand at 1.7 m depth (Elev. 208.1). The layer thickness identified in these boreholes ranged from 0.2 to 1.5 m.

A grey silty sand layer with trace to some gravel was encountered below the silty clay in Boreholes NTE-04 and NTE-19 drilled on the west side of the creek. This layer was 1.2 to 1.4 m thick, and in Borehole NTE-04 was underlain by bedrock at 10.7 m depth (Elev. 199.6).

SPT N-values in the silty sand typically ranged from 2 to 34 blows per 0.3 m of penetration, indicating a very loose to dense relative density. An N-value of 74 blows per 0.3 m was obtained in Borehole NTE-19, indicating a very dense condition. Higher SPT N-values of 65 blows per 0.175 m to 100 blows per 0.05 m of penetration were obtained in tests contacting the bedrock surface.

The moisture contents of samples of the silty sand ranged from 10% to 22%.

Grain size distribution curves for the silty sand layer tested are presented on the Record of Borehole sheet and on Figure B5 of Appendix B. The results of the laboratory test are summarized as follows:

Gravel %	0 to 8
Sand %	45 to 64
Silt %	22 to 33
Clay %	6 to 27

5.8 Sand and Gravel

A deposit of grey sand and gravel containing trace to some silt and clay was contacted below the silty clay at depths of 2.3 m and 2.1 m (Elev. 208.6 and 211.3) in Boreholes NTE-07 and NTE-18. The thickness of the sand and gravel layer was 0.1 m and 0.5 m. The boreholes were terminated on bedrock or probable bedrock at depths of 2.4 m and 2.6 m (Elev. 208.5 and 210.7).

A Standard Penetration Test performed in the sand and gravel layer gave an N-value of 100 blows per 0.1 m of penetration (very dense). The bedrock surface was contacted during another test. The moisture contents of two samples of the sand and gravel were 9% and 17%.

The results of a grain size distribution analysis conducted on a sample of sand and gravel are presented on the Record of Borehole sheet and on Figure B6 of Appendix B. The results are summarized as follows:

Gravel %	32
Sand %	50
Silt & Clay%	18

5.9 Sand

A layer of grey to dark grey sand containing trace gravel and cobbles was contacted below the silty sand and silty clay in Boreholes NTE-19 and NTE-20 at depths of 18.9 m and 16.8 m (Elev. 198.2 and 199.6). The thickness of the sand layer was 2.3 m and 1.8 m. The boreholes encountered bedrock below the sand at depths of 21.2 m and 18.6 m (Elev. 196.0 and 197.8).

Standard Penetration Tests performed in the sand gave N-values of 100 blows per 0.125 m to 50 blows for 0.150 m of penetration (very dense). Moisture contents of the samples were 9% to 17%.

5.10 Bedrock

Bedrock and probable bedrock were encountered below the native soils described above. Bedrock was proved by coring in ten of the boreholes. The depths and elevations at which the top of bedrock or auger refusal on probable bedrock was encountered in the boreholes are summarized in Table 5.1.

Table 5.1 – Depths and Elevations of Top of Bedrock or Auger Refusal

Foundation Unit		Borehole	Top of Bedrock or Auger Refusal	
original three-span structure	revised two-span structure		Depth (m)	Elevation (m)
West Approach	West Approach	NTE-01	-	-
	West Abutment	NTE-19	21.2 ⁽¹⁾	196.0
		NTE-20	18.6 ⁽¹⁾	197.8
West Abutment	Pier	NTE-02	11.0	201.2
West Pier		NTE-03	10.0 ⁽¹⁾	200.6
		NTE-04	10.7 ⁽¹⁾	199.6
		NTE-05	8.5	200.8
East Pier	East Abutment	NTE-06	0.5	208.8
		NTE-07	2.4 ⁽¹⁾	208.5
		NTE-11	2.0 ⁽¹⁾	208.4
		NTE-12	1.3	209.4
		NTE-13	1.7 ⁽¹⁾	208.1
East Abutment		NTE-08	0.6 ⁽¹⁾	211.3
		NTE-09	0.9	212.6
		NTE-14	1.0	211.8
		NTE-15	0.6 ⁽¹⁾	211.9
		NTE-16	2.4 ⁽¹⁾	210.4
		NTE-17	0.9	210.7
		NTE-18	2.6	210.7
East Approach	East Approach	NTE-10	1.7	216.0

(1) Bedrock proved by coring.

As indicated by the table, the depth to bedrock varies significantly between the west and east sides of the creek. On the west side, the bedrock was contacted at depths of 8.5 m to 21.2 m (Elev. 201.2 to 196.0). On the east side, the bedrock was contacted at shallower depths of 0.5 m to 2.6 m, and the bedrock surface rises towards the east from Elev. 208.1 in Borehole NTE-13 to Elev. 216.0 in Borehole NTE-10 at the east approach.

The bedrock recovered in the cores typically consisted of grey migmatitic gneiss with occasional white bands and intrusions of pink granite. In Boreholes NTE-07 and NTE-15, the upper 1.8 m to 2.4 m of the bedrock consisted of pink granite.

The Total Core Recovery (TCR) in the bedrock was 100% in 24 of 30 cores recovered. The TCR was 60% to 88% in five other runs and 27% in one run from 3.0 m to 4.5 m depth in Borehole NTE-13.

The RQD values varied widely, from 19% to 100% where 100% core recovery was obtained, indicating a very poor to excellent rock quality. Typically the RQD ranged from 43% to 90% (poor to good quality). Where the TCR was less than 100%, the RQD values ranged from 7% to 31%, indicating a very poor to poor rock quality.

The recorded Fracture Index (FI) of the rock, expressed as fractures per 0.3 m of core, ranged from 0 to 12, typically 1 to 6. Zones of broken rock (rubble), 0.1 to 0.4 m thick, were encountered at various depths in Boreholes NTE-03, NTE-07, NTE-08, NTE-13, NTE-15 and NTE-19. A 1.2 m thick rubble zone was also encountered between 3.3 m and 4.5 m depth in Borehole NTE-13. The pink granite in the upper part of Borehole NTE-15 was highly fractured to a depth of 2.5 m.

The unconfined compressive strength of the rock, estimated from point load tests conducted on recovered rock cores, generally ranged from 63 MPa to 240 MPa, indicating a strong to very strong rock. Compressive strengths of 14 MPa to 47 MPa were measured in three core samples, indicating a weak to medium strong rock. The results are presented on the Record of Borehole Sheets in Appendix A (as average per run).

5.11 Water Levels

Water levels were observed in the boreholes during and upon completion of drilling. However, water was added into the boreholes as part of the drilling and coring operations and therefore natural groundwater levels were generally not measured during drilling.

Standpipe piezometers were installed in Boreholes NTE-02 and NTE-05 to monitor water levels after completion of drilling. The water levels measured in the piezometers are summarized in Table 5.2.

Table 5.2 – Water Level Measurements

Borehole	Date	Water Level		Comment
		Depth (m)	Elev. (m)	
NTE-02	July 12, 2012	1.2	211.0	In piezometer
	July 13, 2012	1.4	210.8	In piezometer
	November 17, 2012	2.1	210.1	In piezometer
	March 2, 2013	-	-	Frozen at ground surface
NTE-05	July 13, 2012	0.2	209.1	In piezometer
	November 17, 2012	0.2	209.1	In piezometer
	March 2, 2013	-	-	Frozen at ground surface

The above values are short-term readings and seasonal fluctuations of the groundwater level are to be expected. In particular, the groundwater level may be at a higher elevation after the spring snowmelt or after periods of heavy rainfall.

The groundwater level is also expected to be influenced by the water level in North Trout Creek, which is shown on the preliminary GA drawing provided by HMM to be at Elev. 208.8 in October 2010.

6 MISCELLANEOUS

Borehole locations were selected by Thurber Engineering Ltd. The borehole locations were staked in the field by TBT Engineering Limited surveyors. The co-ordinates and ground surface elevations at the boreholes were provided by the surveyors.

Eastern Ontario Diamond Drilling Ltd. from Hawkesbury, Ontario supplied a track mounted CME 45 drill rig and conducted the drilling, sampling and in-situ testing operations.

Full time supervision of the field activities was carried out by Mr. Stephane Loranger, Mr. Ryan Kromer and Mr. George Azzopardi of Thurber. Overall supervision of the field program was conducted by Mr. Mark Farrant, P. Eng.

Interpretation of the data and preparation of the report were carried out by Ms. R. Palomeque Reyna, P.Eng. and Mr. Murray Anderson, P.Eng. The report was reviewed by Dr. P.K. Chatterji, P.Eng., a Designated Principal Contact for MTO Foundations Projects.

Thurber Engineering Ltd.

Rocío Palomeque Reyna, P.Eng.
Geotechnical Engineer

Murray R. Anderson, P.Eng., M.Eng.
Senior Foundations Engineer

P. K. Chatterji, P.Eng.
Review Principal



Appendix A

Record of Borehole Sheets

SYMBOLS, ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES

1. TEXTURAL CLASSIFICATION OF SOILS

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

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

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

3. TERMS DESCRIBING CONSISTENCY (COHESIVE SOILS ONLY)

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

NOTE: Hierarchy of Soil Strength Prediction

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



4. TERMS DESCRIBING DENSITY (COHESIONLESS SOILS ONLY)

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

5. LEGEND FOR RECORDS OF BOREHOLES

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

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

 Water Level
 Shear Strength Determination by Pocket Penetrometer

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

UNIFIED SOILS CLASSIFICATION

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

EXPLANATION OF ROCK LOGGING TERMS

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

<u>DISCONTINUITY SPACING</u>		<u>STRENGTH CLASSIFICATION</u>			
Bedding	Bedding Plane Spacing	Rock Strength	Approximate Uniaxial Compressive Strength		Field Estimation of Hardness*
			(MPa)	(psi)	
Very thickly bedded	Greater than 2m	Extremely Strong	Greater than 250	Greater than 36,000	Specimen can only be chipped with a geological hammer
Thickly bedded	0.6 to 2m				
Medium bedded	0.2 to 0.6m	Very Strong	100-250	15,000 to 36,000	Requires many blows of geological hammer to break
Thinly bedded	60mm to 0.2m	Strong	50-100	7,500 to 15,000	Requires more than one blow of geological hammer to break
Very thinly bedded	20 to 60mm				
Laminated	6 to 20mm	Medium Strong	25.0 to 50.0	3,500 to 7,500	Breaks under single blow of geological hammer.
Thinly Laminated	Less than 6mm				
<u>TERMS</u>		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 NTE-01

1 OF 2

METRIC

WP# 647-89-00 LOCATION North Trout Creek - EBL N 5 425 830.3 E 206 908.2 ORIGINATED BY SLL
 HWY 11/17 BOREHOLE TYPE Hollow Stem Augers COMPILED BY MFA
 DATUM Geodetic DATE 2012.07.12 - 2012.07.12 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE				WATER CONTENT (%) w _p w w _L				GR	SA	SI	CL	
216.9								20	40	60	80	100								
0.0	TOPSOIL: (225mm)							20	40	60	80	100								
0.2	Silty CLAY varved, with silt seams Soft to Very Soft Brown																			
		1	SS	4																
		2	SS	4																
		3	SS	3															0 0 36 64	
		4	SS	0																
			Brown to grey																	
	Grey																			

Continued Next Page

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

RECORD OF BOREHOLE No NTE-01

2 OF 2

METRIC

WP# 647-89-00 LOCATION North Trout Creek - EBL N 5 425 830.3 E 206 908.2 ORIGINATED BY SLL
 HWY 11/17 BOREHOLE TYPE Hollow Stem Augers COMPILED BY MFA
 DATUM Geodetic DATE 2012.07.12 - 2012.07.12 CHECKED BY RPR

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							
	Continued From Previous Page							20 40 60 80 100							
								○ UNCONFINED + FIELD VANE							
								● QUICK TRIAXIAL × LAB VANE							
								20 40 60 80 100							
								W P W W L							
								WATER CONTENT (%)							
								20 40 60							
				</											

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

METRIC[illegible]

+³, ×³: Numbers refer to Sensitivity

RECORD OF BOREHOLE No NTE-02

2 OF 2

METRIC

WP# 647-89-00 LOCATION North Trout Creek - EBL N 5 425 853.7 E 206 908.9 ORIGINATED BY SLL
 HWY 11/17 BOREHOLE TYPE NW Casing COMPILED BY MFA
 DATUM Geodetic DATE 2012.07.11 - 2012.07.11 CHECKED BY RPR











SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)				
							20	40	60	80	100	W _p	W	W _L			
	Continued From Previous Page																
201.2	Silty CLAY Very Soft Grey		8	SS	100/ .175											0 0 65 35	
11.0	END OF BOREHOLE AT 11.0m UPON AUGER REFUSAL ON PROBABLE BEDROCK. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Jul. 12/12 1.2 211.0 Jul. 13/12 1.4 210.8 Nov. 17/12 2.1 210.1 Mar. 02/13 Frozen at Surface																

RECORD OF BOREHOLE No NTE-03

1 OF 2

METRIC

WP# 647-89-00 LOCATION North Trout Creek - EBL N 5 425 846.2 E 206 919.5 ORIGINATED BY SLL
 HWY 11/17 BOREHOLE TYPE NW Casing/NQ Coring COMPILED BY MFA
 DATUM Geodetic DATE 2012.07.11 - 2012.07.12 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		WATER CONTENT (%)				
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE	W _P W W _L					
210.6								20 40 60 80 100	20 40 60					
0.0	WOOD and CLAY, drilling platform (FILL)						210							
209.7														
0.9	TOPSOIL: (100mm)													
209.4														
1.2	Silty CLAY Very soft Brown													
			1	SS	0		209						0 0 35 65	
			2	SS	0		208							
			3	SS	0		207							
			4	SS	0		206							
							205	4.0 +						
	With thin silt seams		5	SS	0		204						0 0 31 69	
			1	TW			203							
							202							
	Cobble		6	SS	3		201							
200.6												FI		

Continued Next Page

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

RECORD OF BOREHOLE No NTE-03

2 OF 2

METRIC

WP# 647-89-00 LOCATION North Trout Creek - EBL N 5 425 846.2 E 206 919.5 ORIGINATED BY SLL
HWY 11/17 BOREHOLE TYPE NW Casing/NQ Coring COMPILED BY MFA
DATUM Geodetic DATE 2012.07.11 - 2012.07.12 CHECKED BY RPR





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 (%)					
								20 40 60 80 100	W _P W W _L								
Continued From Previous Page																	
10.0	BEDROCK , migmatitic gneiss, grey with white bands, occasional horizontal and sub-vertical breaks (30 degrees from vertical) Rubble zone at 10.3 (100mm)		1	RUN											0	GR SA SI CL RUN #1 TCR=100% SCR=92% RQD=89% UCS=240MPa (Average)	
															5		
															1		
															2		
															2		
															3		
															1		
															4		
																	1
																	2
197.5																	
13.1	END OF BOREHOLE AT 13.1m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 0.9m, THEN AUGER CUTTINGS TO SURFACE.																

RECORD OF BOREHOLE No NTE-04

1 OF 2

METRIC

WP# 647-89-00 LOCATION North Trout Creek - EBL N 5 425 865.3 E 206 912.1 ORIGINATED BY SLL
 HWY 11/17 BOREHOLE TYPE NW Casing/NQ Coring COMPILED BY MFA
 DATUM Geodetic DATE 2012.07.11 - 2012.07.11 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa			WATER CONTENT (%)							
								20 40 60 80 100	○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE			w _P w w _L						
210.3																		
0.0	TOPSOIL: (225mm)																	
0.2	SAND, some clay, trace gravel Very Loose Dark Brown Wet		1	SS	3		210											
208.8							209											
1.4	Silty CLAY, with silt seams Firm to Very Soft Grey		2	SS	1		208											
			3	SS	5													
			4	SS	0		207											
							206											
			5	SS	1		205											
			6	SS	0		204											
							203											
			1	TW			202											
201.0							201											
9.3	Silty SAND, some gravel Compact Grey Wet		7	SS	28													

Continued Next Page

+³, ×³: Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No NTE-04

2 OF 2

METRIC

WP# 647-89-00 LOCATION North Trout Creek - EBL N 5 425 865.3 E 206 912.1 ORIGINATED BY SLL
HWY 11/17 BOREHOLE TYPE NW Casing/NQ Coring COMPILED BY MFA
DATUM Geodetic DATE 2012.07.11 - 2012.07.11 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa				WATER CONTENT (%)				
								20 40 60 80 100				W P W W L				
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE								
	Continued From Previous Page															
199.6	Silty SAND , trace gravel Compact Grey Wet						200									
10.7	BEDROCK , grey migamatitic gneiss with pink granite intrusions, white bands, occasional horizontal and near-vertical breaks		1	RUN			199								RUN #1 TCR=60% SCR=42% RQD=7% UCS=134MPa	
			2	RUN			198								RUN #2 TCR=100% SCR=100% RQD=73% UCS=122MPa (Average)	
			3	RUN			197								RUN #3 TCR=100% SCR=100% RQD=55% UCS=124MPa (Average)	
195.0							196									
15.2	END OF BOREHOLE AT 15.2m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND AUGER CUTTINGS TO SURFACE.															

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

METRIC[illegible]

+³, ×³: Numbers refer to Sensitivity

ONTMT4S 05117.GPJ 2012TEMPLATE(MTO).GDT 3/28/14

METRIC

[illegible]

RECORD OF BOREHOLE No NTE-06

1 OF 1

METRIC

WP# 647-89-00 LOCATION North Trout Creek - EBL N 5 425 884.5 E 206 917.4 ORIGINATED BY RK
 HWY 11/17 BOREHOLE TYPE Hand Shovel COMPILED BY AN
 DATUM Geodetic DATE 2012.06.28 - 2012.06.28 CHECKED BY RPR

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									
209.3																	
0.0	TOPSOIL: (300mm)																
209.0																	
208.8	Silty CLAY						209										
0.5	END OF BOREHOLE AT 0.5m UPON REFUSAL ON BEDROCK OR BOULDERS. BOREHOLE BACKFILLED WITH EXCAVATED SOILS.																

RECORD OF BOREHOLE No NTE-07

1 OF 1

METRIC

WP# 647-89-00 LOCATION North Trout Creek - EBL N 5 425 877.3 E 206 927.5 ORIGINATED BY RK
 HWY 11/17 BOREHOLE TYPE Hollow Stem Augers/NW Casing/NQ Coring COMPILED BY AN
 DATUM Geodetic DATE 2012.06.28 - 2012.06.28 CHECKED BY RPR

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												
								20	40	60	80	100						20	40	60
210.9																				
0.0	TOPSOIL																			
0.2	Black (150mm)		1	SS	6								○							
	Silty CLAY , some sand to sandy, trace gravel Firm to Stiff Brown to Dark Brown																			
			2	SS	8		210						○							
			3	SS	10								┌─○							
							209													
208.6																				
208.8	SAND and GRAVEL		4	SS	50/0.05								○			FI				
2.4	BEDROCK , pink granite, occasional horizontal and near-vertical breaks		1	RUN												6				
																1				
																1				
																1				
	Rubble zone from 3.5m to 3.7m		2	RUN												2				
																6				
	Grey migmatitic gneiss with white bands, occasional horizontal and vertical breaks															4				
																4				
			3	RUN												4				
																12				
																4				
204.8	Rubble zone from 6m to 6.1m						205									0				
6.1	END OF BOREHOLE AT 6.1m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO SURFACE.																			

ONTMT4S 05117.GPJ 2012TEMPLATE(MTO).GDT 3/28/14

+³, ×³: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No NTE-08

1 OF 1

METRIC

WP# 647-89-00 LOCATION North Trout Creek - EBL N 5 425 896.1 E 206 920.6 ORIGINATED BY RK
 HWY 11/17 BOREHOLE TYPE Hollow Stem Augers/NQ Coring COMPILED BY AN
 DATUM Geodetic DATE 2012.06.28 - 2012.06.28 CHECKED BY RPR

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						
211.9														
0.0	TOPSOIL													
0.2	Black (150mm)		1	SS	8									
211.3	Silty CLAY , some sand													
0.6	Stiff Brown													
	BEDROCK , migmatitic gneiss, grey with white bands, frequent horizontal and vertical breaks		1	RUN			211						FI	RUN #1 TCR=100% SCR=35% RQD=19% UCS=74MPa (Average)
	Rubble zone from 0.6m to 0.8m, 1.2m to 1.6m												3	
			2	RUN			210							RUN #2 TCR=87% SCR=27% RQD=13% UCS=154MPa
	Rubble zone from 2.6m to 2.9m													
			3	RUN			209						4	RUN #3 TCR=88% SCR=47% RQD=12% UCS=175MPa (Average)
208.2													3	
3.7	END OF BOREHOLE AT 3.7m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO SURFACE.													

+³, ×³: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No NTE-09

1 OF 1

METRIC

WP# 647-89-00 LOCATION North Trout Creek - EBL N 5 425 888.8 E 206 930.9 ORIGINATED BY RK
 HWY 11/17 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2012.06.28 - 2012.06.28 CHECKED BY RPR

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									
213.5								20	40	60	80	100					
0.0	TOPSOIL																
0.2	Black (150mm)		1	SS	9		213								o		
	Silty CLAY , some sand														o		
212.6	Stiff Brown		2	SS	50/												
0.9	END OF BOREHOLE AT 0.9m UPON AUGER REFUSAL ON PROBABLE BEDROCK. BOREHOLE BACKFILLED WITH AUGER CUTTINGS TO SURFACE.				.025												

+³, ×³: Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No NTE-10

1 OF 1

METRIC

WP# 647-89-00 LOCATION North Trout Creek - EBL N 5 425 918.1 E 206 932.1 ORIGINATED BY RK
HWY 11/17 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2012.06.28 - 2012.06.28 CHECKED BY RPR

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						
217.7								20 40 60 80 100						
0.0	TOPSOIL (75mm)													
0.1	Silty CLAY , some sand Firm Brown		1	SS	5		217							
			2	SS	8									0 18 43 39
	Occasional silt seams													
216.0			3	SS	50/									
1.7	END OF BOREHOLE AT 1.7m UPON AUGER REFUSAL ON PROBABLE BEDROCK. BOREHOLE OPEN AND DRY. BOREHOLE BACKFILLED WITH AUGER CUTTINGS TO SURFACE.				.050									

+³, ×³: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No NTE-11

1 OF 1

METRIC

WP# 647-89-00 LOCATION North Trout Creek - EBL N 5 425 889.7 E 206 918.8 ORIGINATED BY RK
 HWY 11/17 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2012.06.28 - 2012.07.06 CHECKED BY RPR

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						
								20 40 60 80 100						
210.4														
0.0														
210.1														
0.3														
208.4														
2.0														

+³, ×³: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No NTE-12

1 OF 1

METRIC

WP# 647-89-00 LOCATION North Trout Creek - EBL N 5 425 879.8 E 206 928.4 ORIGINATED BY SLL
 HWY 11/17 BOREHOLE TYPE Hollow Stem Augers COMPILED BY MFA
 DATUM Geodetic DATE 2012.07.06 - 2012.07.06 CHECKED BY RPR

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									
210.7								20	40	60	80	100					GR SA SI CL
0.0	TOPSOIL: (175mm)																
0.2	Silty SAND , trace gravel and trace clay Dense Brown Moist						210										8 65 22 5
209.4			1	SS	34												
1.3	END OF BOREHOLE AT 1.3m UPON AUGER REFUSAL ON PROBABLE BEDROCK. BOREHOLE BACKFILLED WITH AUGER CUTTINGS TO SURFACE.																

+³, ×³: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No NTE-13

1 OF 1

METRIC

WP# 647-89-00 LOCATION North Trout Creek - EBL N 5 425 880.8 E 206 922.6 ORIGINATED BY SLL
 HWY 11/17 BOREHOLE TYPE Hollow Stem Augers/NQ Coring COMPILED BY MFA
 DATUM Geodetic DATE 2012.07.06 - 2012.07.06 CHECKED BY RPR

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 (%)								
209.8							20	40	60	80	100						GR	SA	SI	CL
0.0	TOPSOIL: (175mm)																			
0.2	Silty SAND , some clay, trace gravel Compact Brown Moist		1	SS	13															
208.1			2	SS	100/															
1.7	BEDROCK , migmatitic gneiss, grey with white bands, frequent horizontal and vertical breaks Rubble zone from 1.9 to 2.1m.		1	RUN	.050															
	Rubble zone from 3.3m to 4.5m		2	RUN																
			3	RUN																
			4	RUN																
202.8																				
7.1	END OF BOREHOLE AT 7.1m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 0.9m, THEN AUGER CUTTINGS TO SURFACE.																			

ONTMT4S 05117.GPJ 2012TEMPLATE(MTO).GDT 3/28/14

RECORD OF BOREHOLE No NTE-14

1 OF 1

METRIC

WP# 647-89-00 LOCATION North Trout Creek - EBL N 5 425 898.7 E 206 921.3 ORIGINATED BY SLL
 HWY 11/17 BOREHOLE TYPE Hollow Stem Augers COMPILED BY MFA
 DATUM Geodetic DATE 2012.07.06 - 2012.07.06 CHECKED BY RPR

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									
212.8								20	40	60	80	100					
0.0	TOPSOIL: (125mm)																
0.1	Silty CLAY Stiff Brown		1	SS	13												
212.0			2	SS	65/												
211.8	Silty SAND , trace gravel Dense Brown Moist				175		212										
1.0	END OF BOREHOLE AT 1.0m UPON AUGER REFUSAL ON PROBABLE BEDROCK. BOREHOLE BACKFILLED WITH AUGER CUTTINGS TO SURFACE.																

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

METRIC

[illegible]

+³, ×³: Numbers refer to Sensitivity

RECORD OF BOREHOLE No NTE-16

1 OF 1

METRIC

WP# 647-89-00 LOCATION North Trout Creek - EBL N 5 425 892.4 E 206 925.7 ORIGINATED BY SLL
 HWY 11/17 BOREHOLE TYPE NW Casing/NQ Coring COMPILED BY MFA
 DATUM Geodetic DATE 2012.07.07 - 2012.07.07 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa			WATER CONTENT (%)					
								20 40 60 80 100	○ UNCONFINED + FIELD VANE			w _P w w _L				
								20 40 60 80 100	● QUICK TRIAXIAL × LAB VANE							
212.8																
0.0																
212.5	TOPSOIL: (250mm)															
0.3	Silty CLAY , trace sand Firm to Stiff Dark Brown to Brown															
			1	SS	5		212									
			2	SS	4		211							0 2 53 45		
210.4			3	SS	100/								FI			
2.4	BEDROCK, migmatitic gneiss, grey with white bands, occasional horizontal and sub-vertical breaks (30 degrees from vertical)				.075								0	RUN #1 TCR=100% SCR=100% RQD=86% UCS=190MPa (Average)		
			1	RUN			210						2			
													1	RUN #2 TCR=100% SCR=100% RQD=97% UCS=225MPa (Average)		
			2	RUN			209						3			
													2			
													1			
							208						1	RUN #3 TCR=100% SCR=100% RQD=90% UCS=203MPa (Average)		
			3	RUN									3			
													3			
													1			
206.9							207									
5.9	END OF BOREHOLE AT 5.9m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND AUGER CUTTINGS TO SURFACE.															

+³, ×³: Numbers refer to
Sensitivity

20
15 10 5 0
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No NTE-17

1 OF 1

METRIC

WP# 647-89-00 LOCATION North Trout Creek - EBL N 5 425 893.6 E 206 919.8 ORIGINATED BY SLL
 HWY 11/17 BOREHOLE TYPE Hollow Stem Augers COMPILED BY MFA
 DATUM Geodetic DATE 2012.07.06 - 2012.07.06 CHECKED BY RPR

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									
211.5								20	40	60	80	100					
0.0	TOPSOIL: (150mm)																
0.2	Silty SAND , some clay, trace gravel Very Loose Dark Brown Moist		1	SS	2		211									86	
210.7			2	SS	53/												3 44 33 20
0.9	END OF BOREHOLE AT 0.9m UPON AUGER REFUSAL ON PROBABLE BEDROCK. BOREHOLE BACKFILLED WITH AUGER CUTTINGS TO SURFACE.				.050												

+³, ×³: Numbers refer to
Sensitivity

20
15
10



(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No NTE-18

1 OF 1

METRIC

WP# 647-89-00 LOCATION North Trout Creek - EBL N 5 425 891.5 E 206 931.4 ORIGINATED BY SLL
 HWY 11/17 BOREHOLE TYPE Hollow Stem Augers COMPILED BY MFA
 DATUM Geodetic DATE 2012.07.07 - 2012.07.07 CHECKED BY RPR

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							
213.4								20	40	60	80	100			
0.0	TOPSOIL: (225mm)														
0.2	Silty CLAY , trace sand Stiff Brown						213								
			1	SS	10										
	With sand seams						212								
			2	SS	13										
211.3															
2.1	SAND and GRAVEL , trace to some silt and clay Brown						211								
210.7	Wet		3	SS	100/										
2.6					100										
	END OF BOREHOLE AT 2.6m UPON AUGER REFUSAL ON PROBABLE BEDROCK. BOREHOLE OPEN AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH AUGER CUTTINGS TO SURFACE.														

+³, ×³: Numbers refer to
Sensitivity

20
15
10



(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No NTE-19

1 OF 3

METRIC

WP# 647-89-00 LOCATION North Trout Creek - EBL N 5 425 835.8 E 206 903.7 ORIGINATED BY GA
 HWY 11/17 BOREHOLE TYPE Hollow Stem Augers/NQ Coring COMPILED BY AN
 DATUM Geodetic DATE 2014.02.24 - 2014.02.24 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa				WATER CONTENT (%)					
								○ UNCONFINED + FIELD VANE	○ QUICK TRIAXIAL × LAB VANE								
										20 40 60 80 100	20 40 60						
217.1																	
0.0																	
0.1	TOPSOIL: (100mm)		1	SS	15							○					
	SILT , trace sand, occasional rootlets Compact Brown Dry																
215.8																	
1.3	Silty CLAY Firm to Very Soft Brown		2	SS	6							○					
	Becoming grey		3	SS	3							○					
													</				

Continued Next Page

+³, ×³: Numbers refer to
Sensitivity





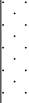
20
15 10 5 0
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No NTE-19

2 OF 3

METRIC

WP# 647-89-00 LOCATION North Trout Creek - EBL N 5 425 835.8 E 206 903.7 ORIGINATED BY GA
 HWY 11/17 BOREHOLE TYPE Hollow Stem Augers/NQ Coring COMPILED BY AN
 DATUM Geodetic DATE 2014.02.24 - 2014.02.24 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)								
								○ UNCONFINED + FIELD VANE					w P w w L								
								● QUICK TRIAXIAL × LAB VANE													
	Continued From Previous Page							20	40	60	80	100									
204.3	Silty CLAY , varved Very Soft to Firm Grey		8	SS	2		207														
							206														
							205														
12.8	SILT , trace sand Grey Wet		9	SS	6		204														
203.4																					
13.7	Silty CLAY , varved Firm Grey		10	SS	4		203														
							202														
							201														
							200														
							199														
199.5			11	SS	6																
17.7	Silty SAND , trace gravel Very Dense Grey Wet		12	SS	6																
198.2																					
18.9	SAND , trace gravel and cobbles Very Dense Dark Grey Wet		13	SS	74																
			14	SS	100/		198														

Continued Next Page

+³, ×³: Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No NTE-19

3 OF 3

METRIC

WP# 647-89-00 LOCATION North Trout Creek - EBL N 5 425 835.8 E 206 903.7 ORIGINATED BY GA
 HWY 11/17 BOREHOLE TYPE Hollow Stem Augers/NQ Coring COMPILED BY AN
 DATUM Geodetic DATE 2014.02.24 - 2014.02.24 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									WATER CONTENT (%)		
								○ UNCONFINED	+	FIELD VANE									
								● QUICK TRIAXIAL	×	LAB VANE									
	Continued From Previous Page				0.125														
196.0							197												
21.2	BEDROCK , migmatitic gneiss, grey with pink and white bands Occasional horizontal breaks Highly broken zone at 21.4m (50mm)		1	RUN			196												
							195												
			2	RUN			194												
192.9							193												
24.2	END OF BOREHOLE AT 24.2m. BOREHOLE OPEN TO 24.2m AND WATER LEVEL AT 8.8m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CUTTINGS TO SURFACE.																		

RECORD OF BOREHOLE No NTE-20

1 OF 3

METRIC

WP# 647-89-00 LOCATION North Trout Creek - EBL N 5 425 825.2 E 206 913.4 ORIGINATED BY GA
 HWY 11/17 BOREHOLE TYPE Hollow Stem Augers/NQ Coring COMPILED BY AN
 DATUM Geodetic DATE 2014.02.25 - 2014.02.26 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa			WATER CONTENT (%)				
								<div><div><div>20 40 60 80 100</div><div>○ UNCONFINED + FIELD VANE</div><div>● QUICK TRIAXIAL × LAB VANE</div></div></div>			<div><div><div>W P W W L</div><div>○</div></div></div>				
								<div><div><div>20 40 60 80 100</div><div></div></div></div>			<div><div><div>20 40 60</div><div></div></div></div>				
216.4															
0.0	TOPSOIL: (125mm)														
0.1	Sandy SILT , occasional rootlets Loose Brown Dry			1	SS	6									
							216								
215.4															
0.9	Silty CLAY Firm to Very Soft Brown														
							215								
				2	SS	5									
							214								
	Becoming grey			3	SS	2									
							213								
							212								
				4	SS	2									
							211								
				5	SS	1									
							210								
							209								
				6	SS	1									
							208								
	Becoming varved														
				7	SS	0									
							207								

Continued Next Page

+³, ×³: Numbers refer to
Sensitivity

20
15 10 5 0
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No NTE-20

2 OF 3

METRIC

WP# 647-89-00 LOCATION North Trout Creek - EBL N 5 425 825.2 E 206 913.4 ORIGINATED BY GA
 HWY 11/17 BOREHOLE TYPE Hollow Stem Augers/NQ Coring COMPILED BY AN
 DATUM Geodetic DATE 2014.02.25 - 2014.02.26 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) 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									
Continued From Previous Page																	
204.2	Silty CLAY , varved Very Soft Grey		8	SS	0	▽	206										
							205										
12.2	Sandy SILT Very Loose Grey Wet		9	SS	2		204										
							203										
202.6							202										
13.7	Silty CLAY , varved Very Soft to Soft Grey		10	SS	1		201										
							200										
199.6							199										
16.8	SAND , trace silt, trace gravel Very Dense Grey Wet		12	SS	50/ 0.150		198										
197.8			13	SS	50/ 0.150	197											
18.6	BEDROCK , migmatitic gneiss, grey with pink and white bands Occasional horizontal and near vertical breaks		1	RUN													

Continued Next Page

+³, ×³: Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

ONTMT4S 05117.GPJ 2012TEMPLATE(MTO).GDT 3/28/14

RECORD OF BOREHOLE No NTE-20

3 OF 3

METRIC

WP# 647-89-00 LOCATION North Trout Creek - EBL N 5 425 825.2 E 206 913.4 ORIGINATED BY GA
 HWY 11/17 BOREHOLE TYPE Hollow Stem Augers/NQ Coring COMPILED BY AN
 DATUM Geodetic DATE 2014.02.25 - 2014.02.26 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)				
							20	40	60	80	100	W _p	W	W _L			
	Continued From Previous Page																
			2	RUN			196										
							195										
194.7 21.6	END OF BOREHOLE AT 21.6m. BOREHOLE OPEN TO 21.6m AND WATER LEVEL AT 11.8m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CUTTINGS TO SURFACE.																

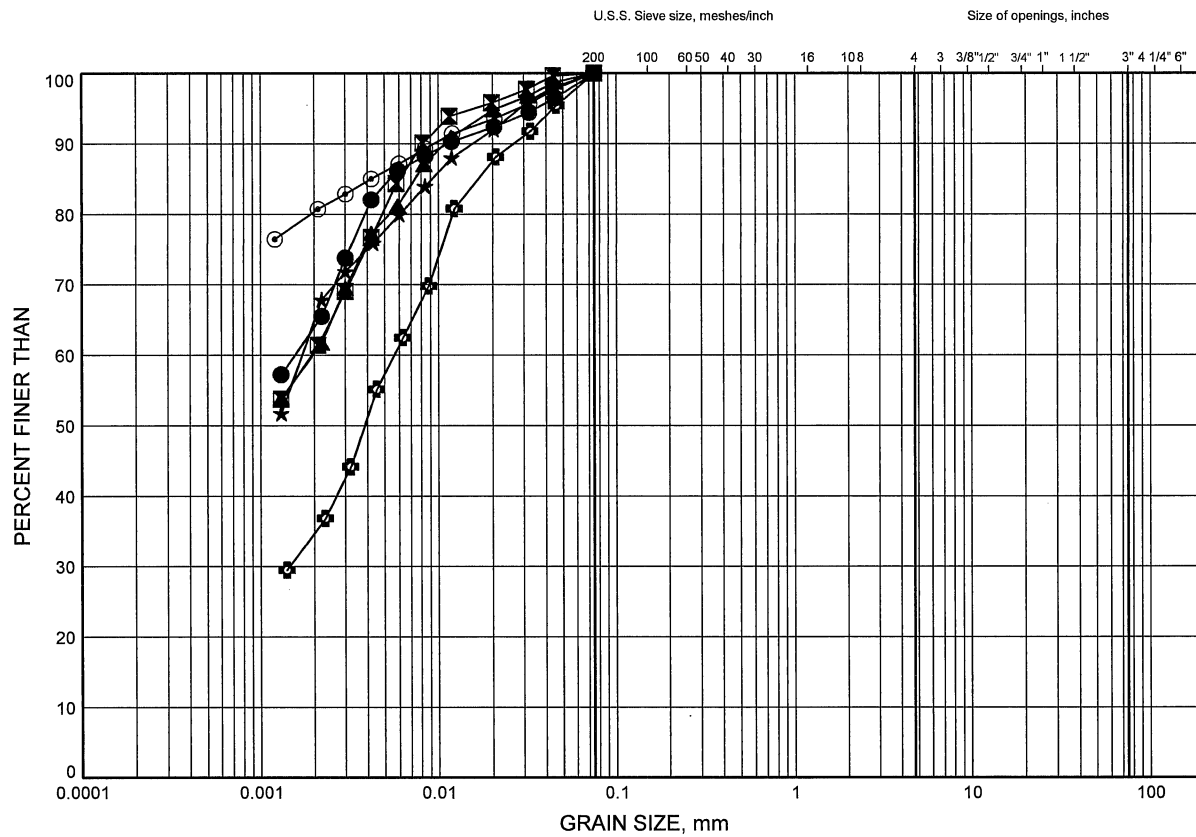
Appendix B

Laboratory Test Results

Hwy 11/17 Nipigon GRAIN SIZE DISTRIBUTION

FIGURE B1

SILTY CLAY



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	NTE-01	2.59	214.35
⊠	NTE-01	6.40	210.54
▲	NTE-01	10.97	205.97
★	NTE-02	3.35	208.86
⊙	NTE-02	7.92	204.29
⊕	NTE-02	10.71	201.50

Date September 2012

W.P.# 647-89-00



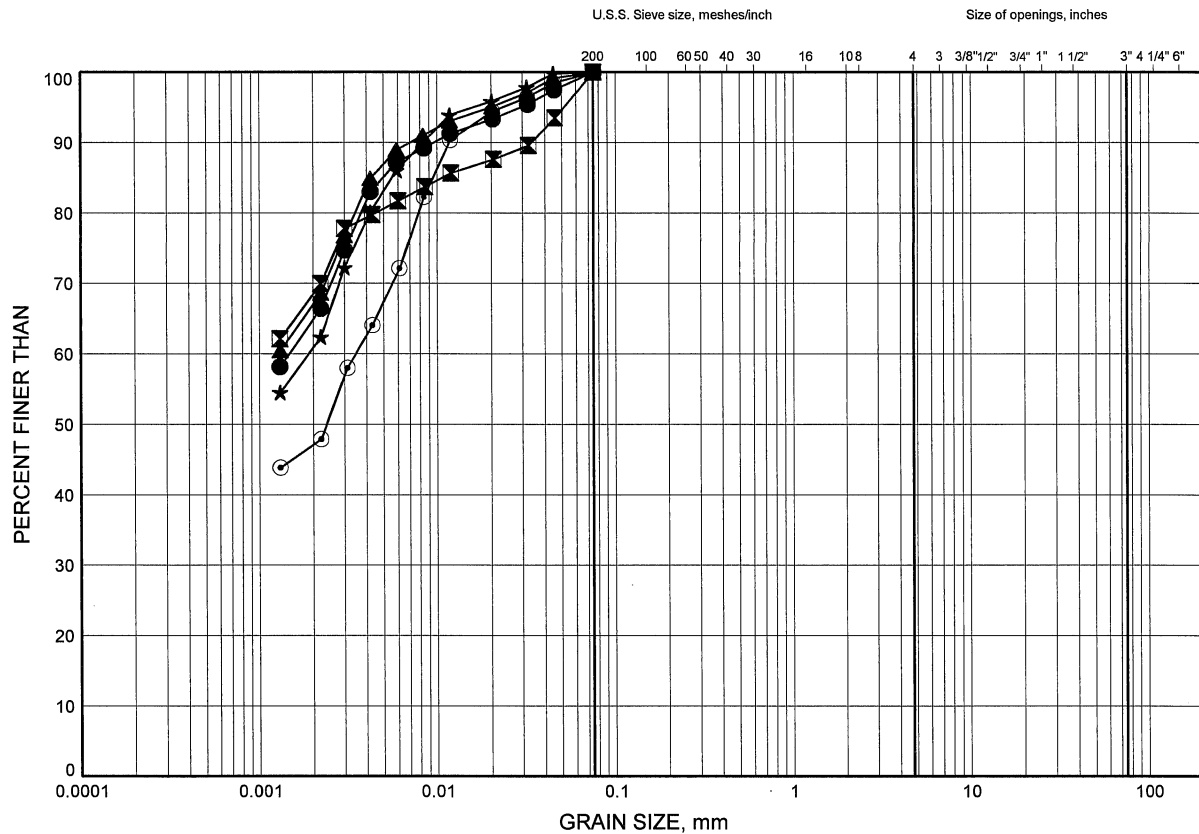
Prep'd AN

Chkd. RPR

Hwy 11/17 Nipigon GRAIN SIZE DISTRIBUTION

FIGURE B2

SILTY CLAY



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	NTE-03	1.83	208.79
⊠	NTE-03	6.40	204.22
▲	NTE-04	3.35	206.90
★	NTE-05	2.59	206.74
⊙	NTE-05	7.92	201.41

Date May 2013
GWP# 647-89-00

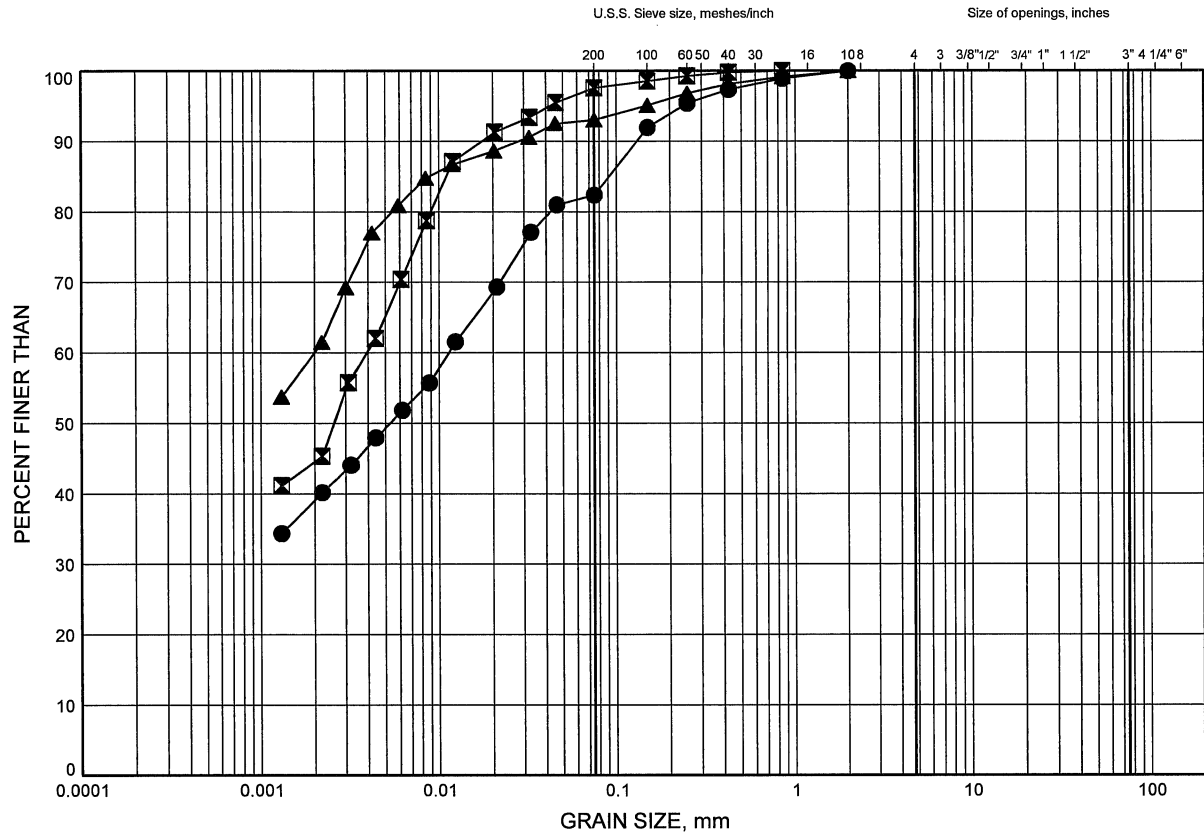


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Chkd. RPR

Hwy 11/17 Nipigon GRAIN SIZE DISTRIBUTION

FIGURE B3

SILTY CLAY



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	NTE-10	1.07	216.65
■	NTE-16	1.83	210.95
▲	NTE-18	1.07	212.29

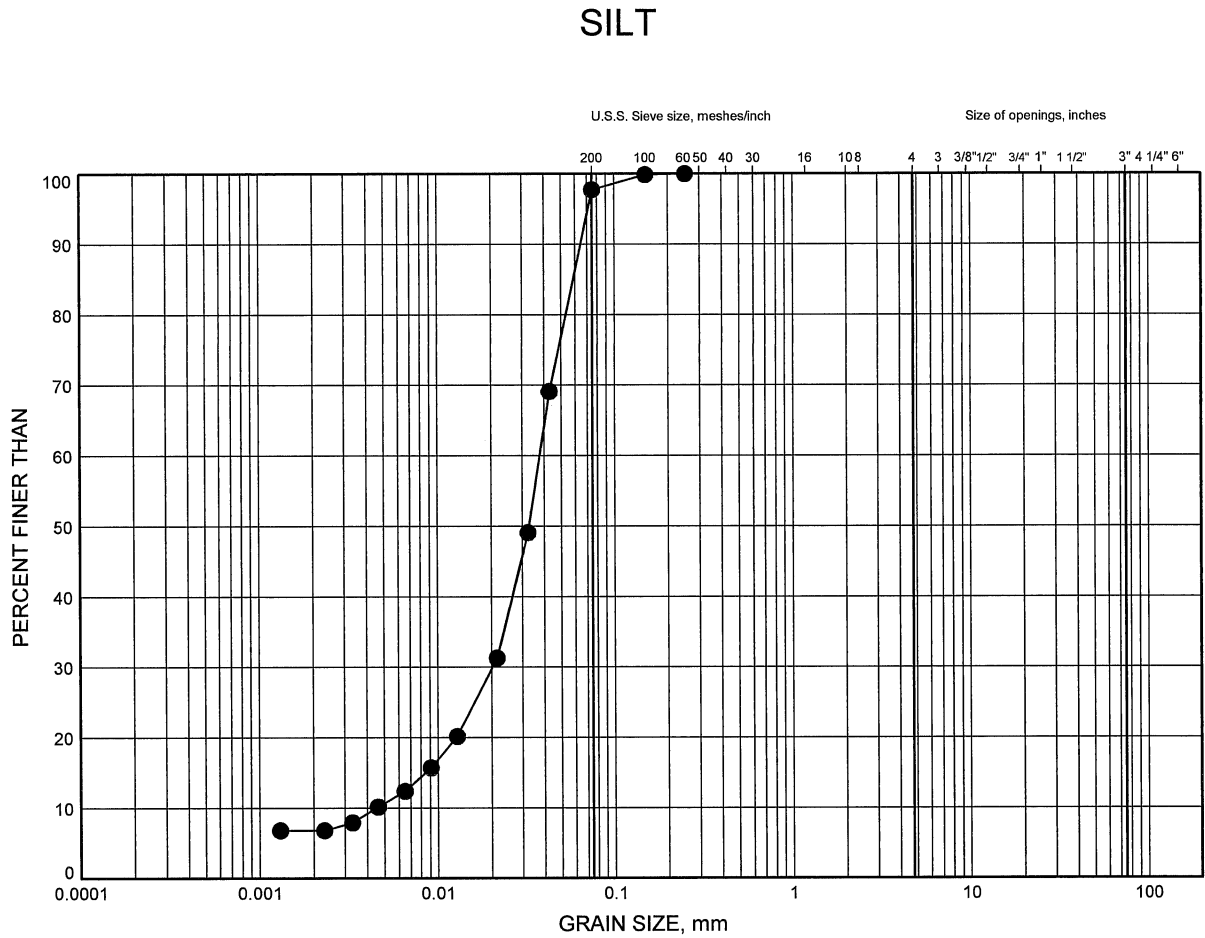
Date ..October 2012.....
W.P.# ..647-89-00.....



Prep'dAN.....
Chkd.RPR.....

Hwy 11/17 Nipigon GRAIN SIZE DISTRIBUTION

FIGURE B4



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	NTE-01	12.50	204.44

Date September 2012

W.P.# 647-89-00



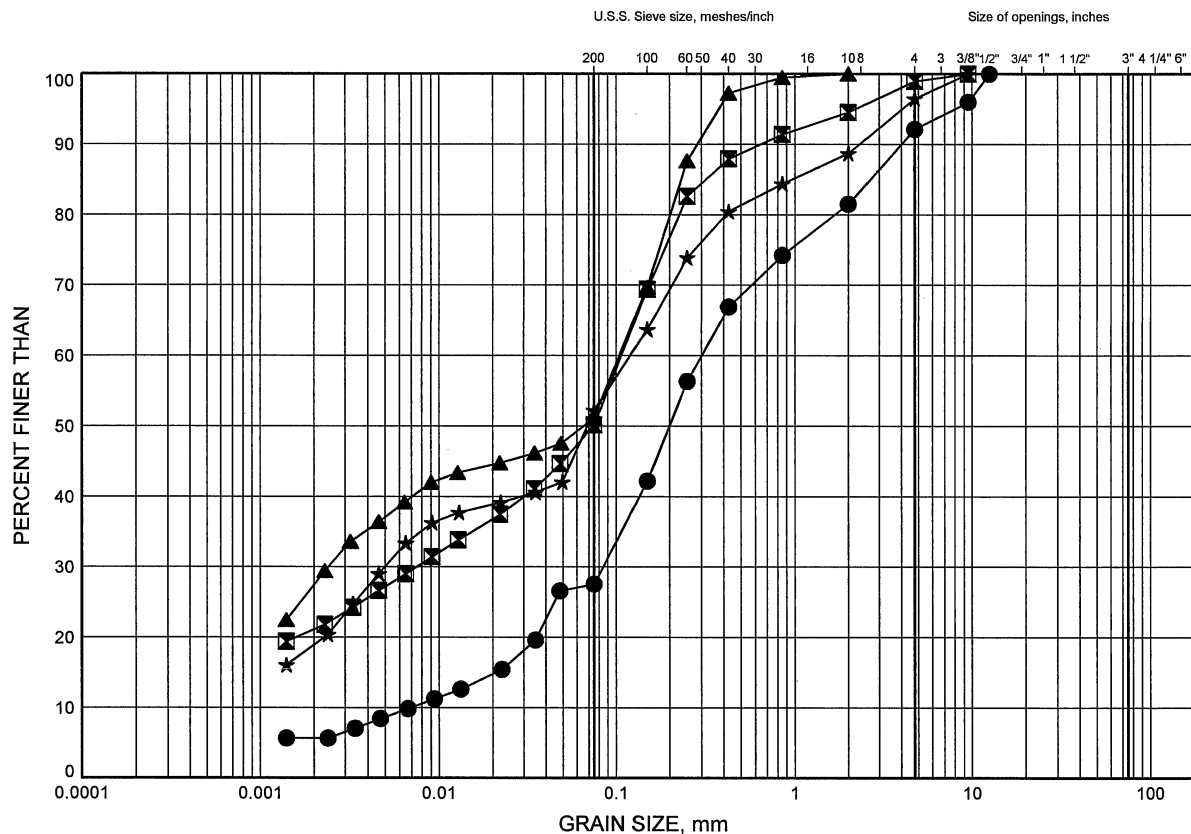
Prep'd AN

Chkd. RPR

Hwy 11/17 Nipigon GRAIN SIZE DISTRIBUTION

FIGURE B5

SILTY SAND



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	NTE-12	1.07	209.67
■	NTE-13	0.88	208.94
▲	NTE-13	1.07	208.75
★	NTE-17	0.71	210.81

Date ..October 2012.....
W.P.# ..647-89-00.....

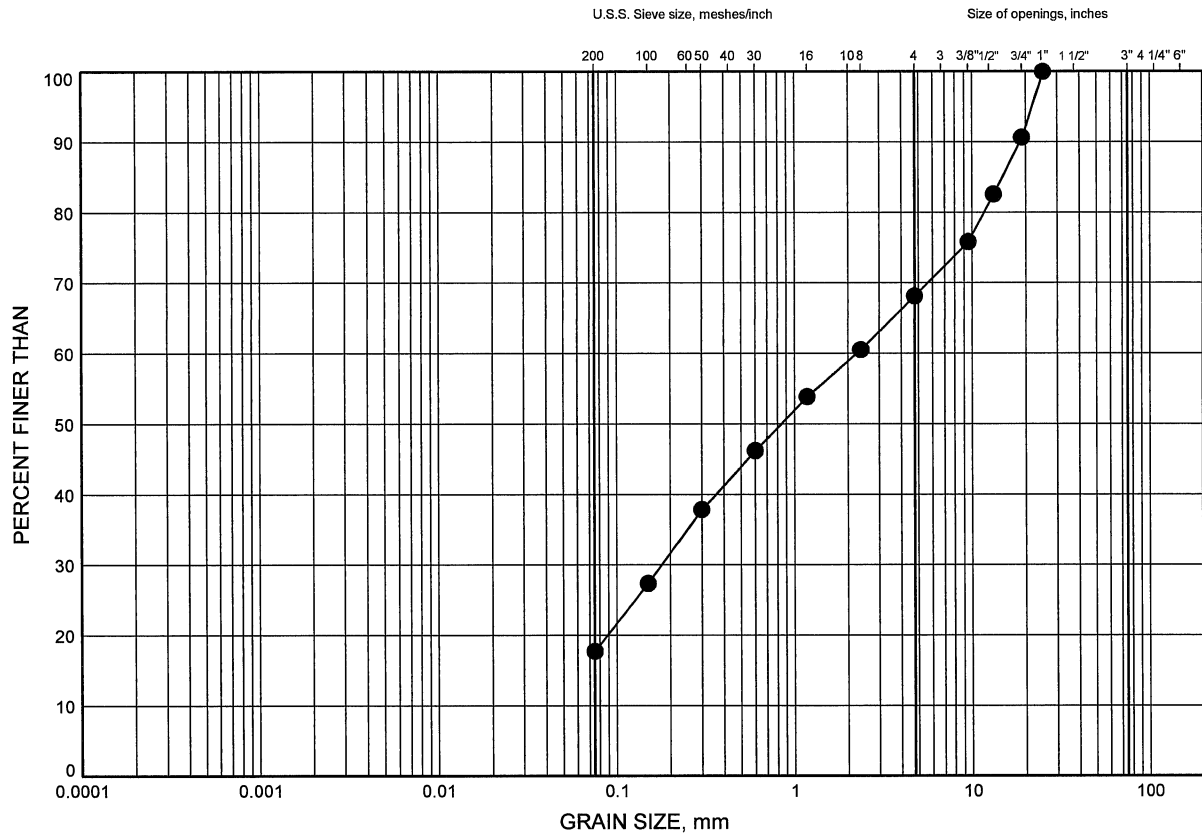


Prep'd ..AN.....
Chkd.RPR.....

Hwy 11/17 Nipigon
GRAIN SIZE DISTRIBUTION

FIGURE B6

SAND & GRAVEL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	NTE-18	2.41	210.94

Date .. October 2012 ..
W.P.# .. 647-89-00 ..

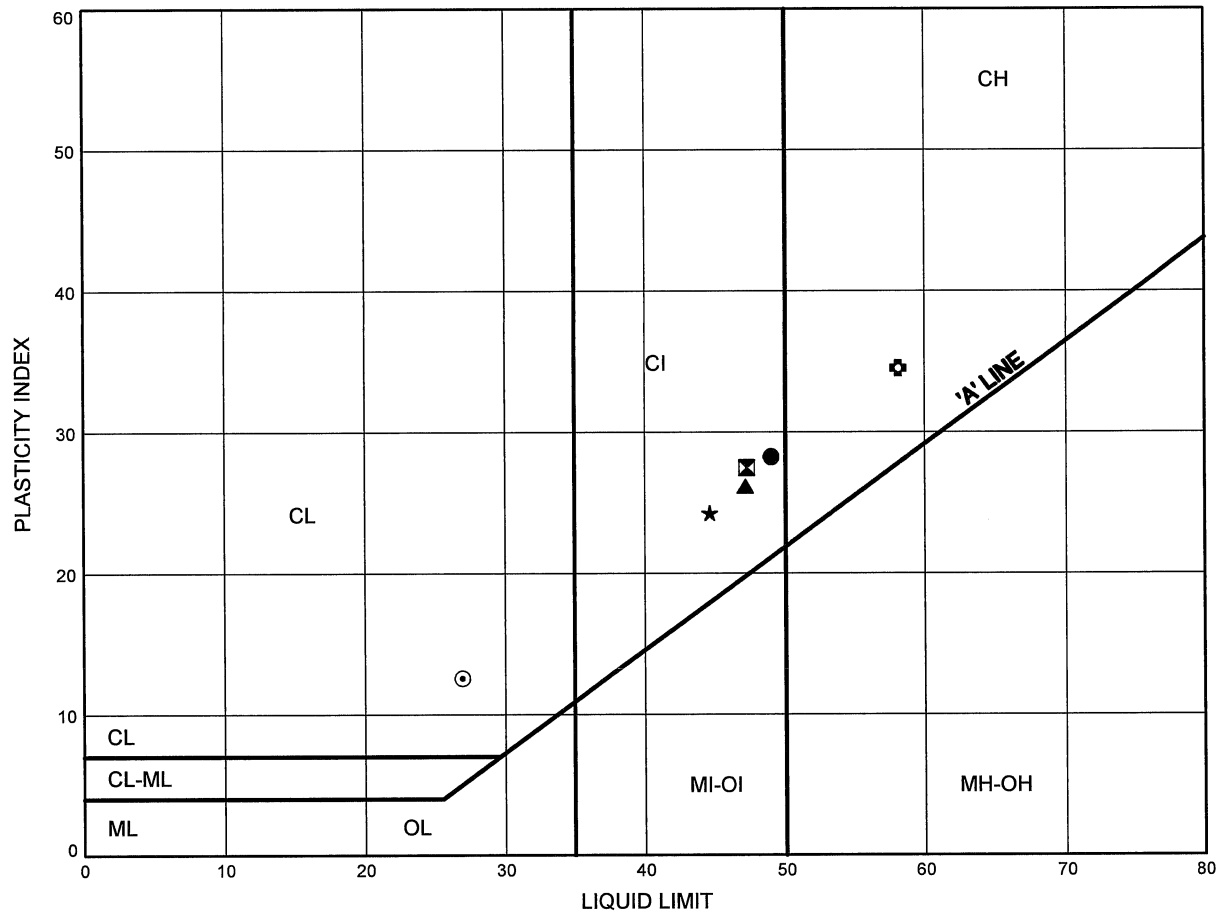


Prep'd .. AN ..
Chkd. .. RPR ..

Hwy 11/17 Nipigon ATTERBERG LIMITS TEST RESULTS

FIGURE B7

SILTY CLAY



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	NTE-01	2.59	214.35
⊠	NTE-01	6.40	210.54
▲	NTE-01	10.97	205.97
★	NTE-02	3.35	208.86
⊙	NTE-02	6.40	205.81
⊕	NTE-02	7.92	204.29

Date October 2012
W.P.# 647-89-00

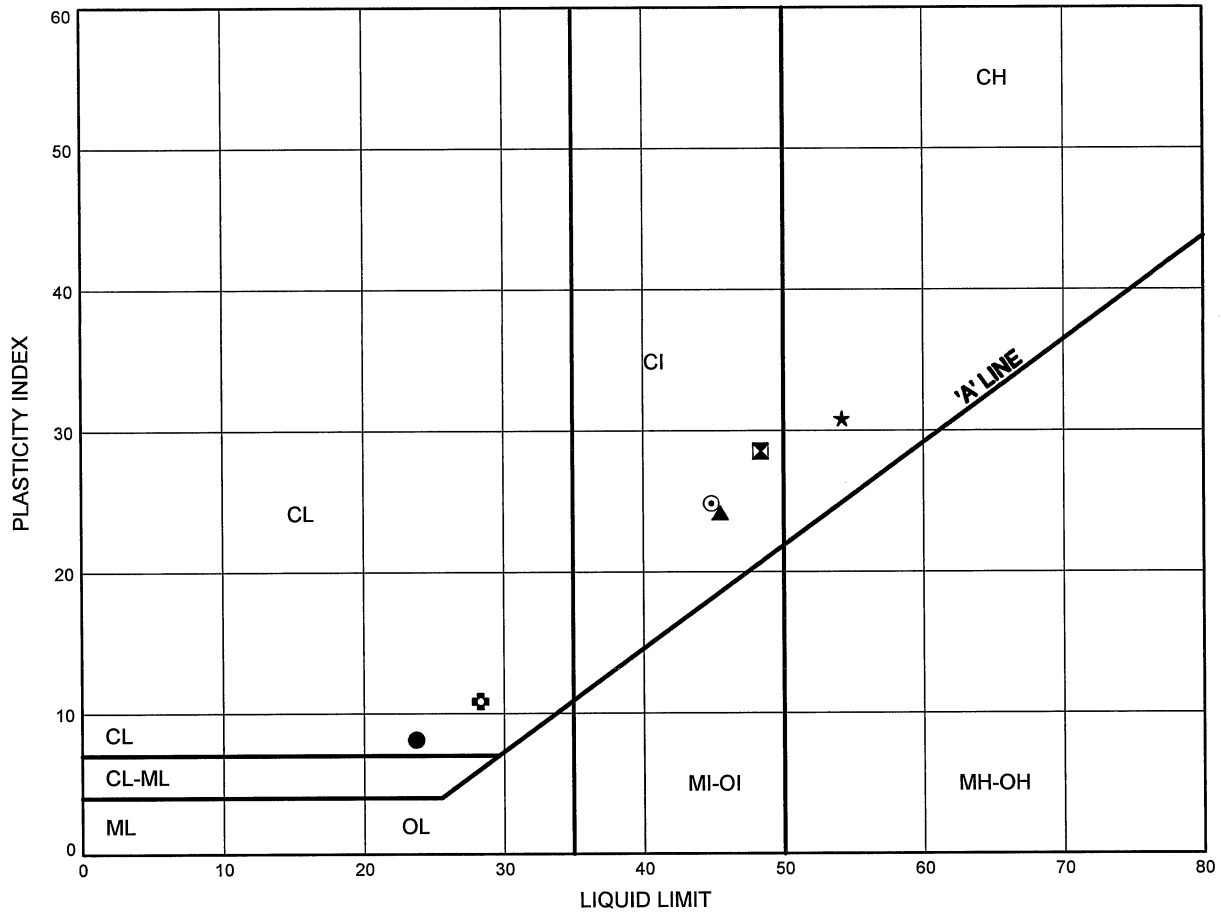


Prep'd AN
Chkd. RPR

Hwy 11/17 Nipigon
ATTERBERG LIMITS TEST RESULTS

FIGURE B8

SILTY CLAY



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	NTE-02	10.71	201.50
⊠	NTE-03	1.83	208.79
▲	NTE-03	6.40	204.22
★	NTE-03	7.92	202.70
⊙	NTE-04	3.35	206.90
⊕	NTE-04	7.92	202.33

Date October 2012
W.P.# 647-89-00

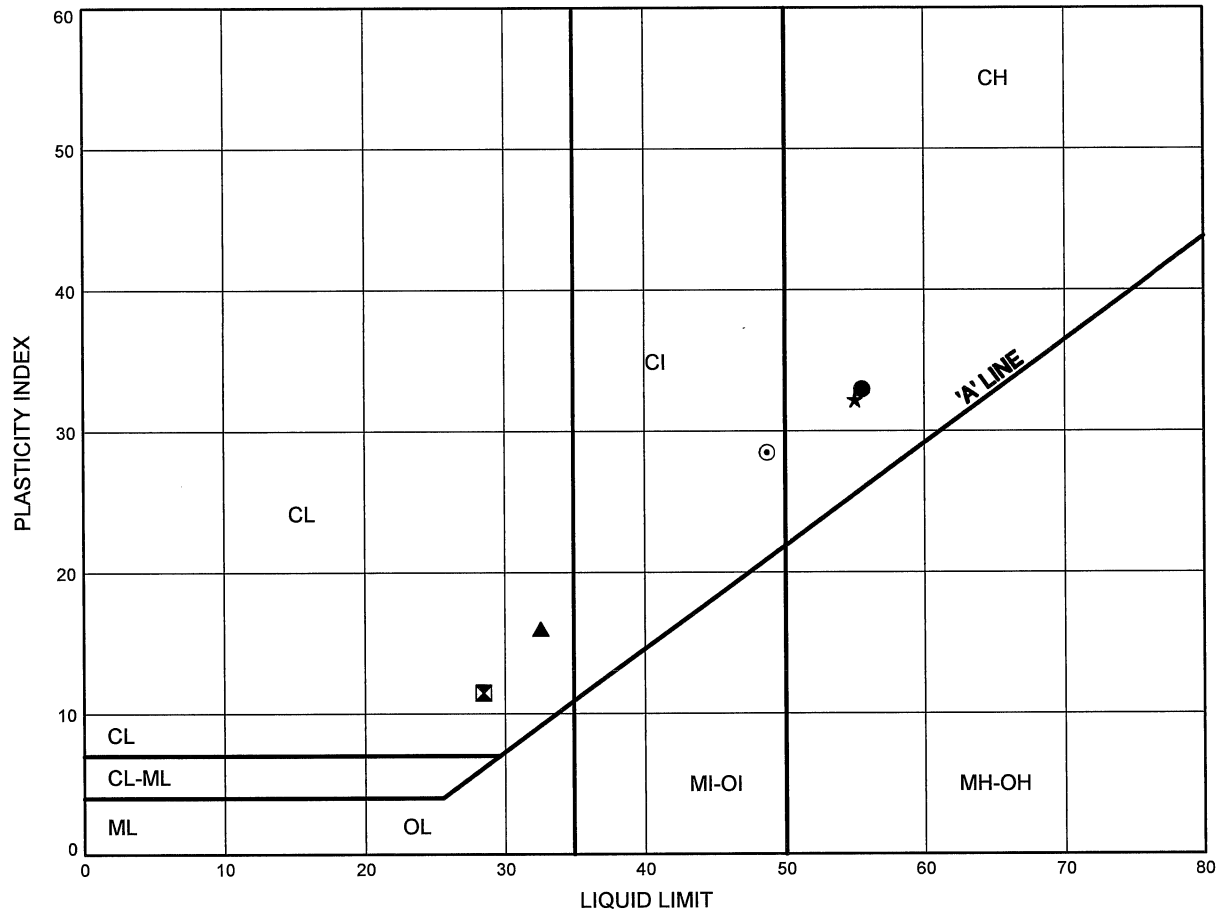


Prep'd AN
Chkd. RPR

Hwy 11/17 Nipigon
ATTERBERG LIMITS TEST RESULTS

FIGURE B9

SILTY CLAY



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	NTE-05	6.40	202.93
⊠	NTE-05	7.92	201.41
▲	NTE-07	1.83	209.10
★	NTE-10	1.07	216.65
⊙	NTE-16	1.83	210.95

Date October 2012
W.P.# 647-89-00



Prep'd AN
Chkd. RPR

Appendix C

Site Photographs



Photograph 1 – Existing conditions at North Trout Creek, looking west from east bank.



Photograph 2 – Existing conditions at North Trout Creek, looking east from west bank.



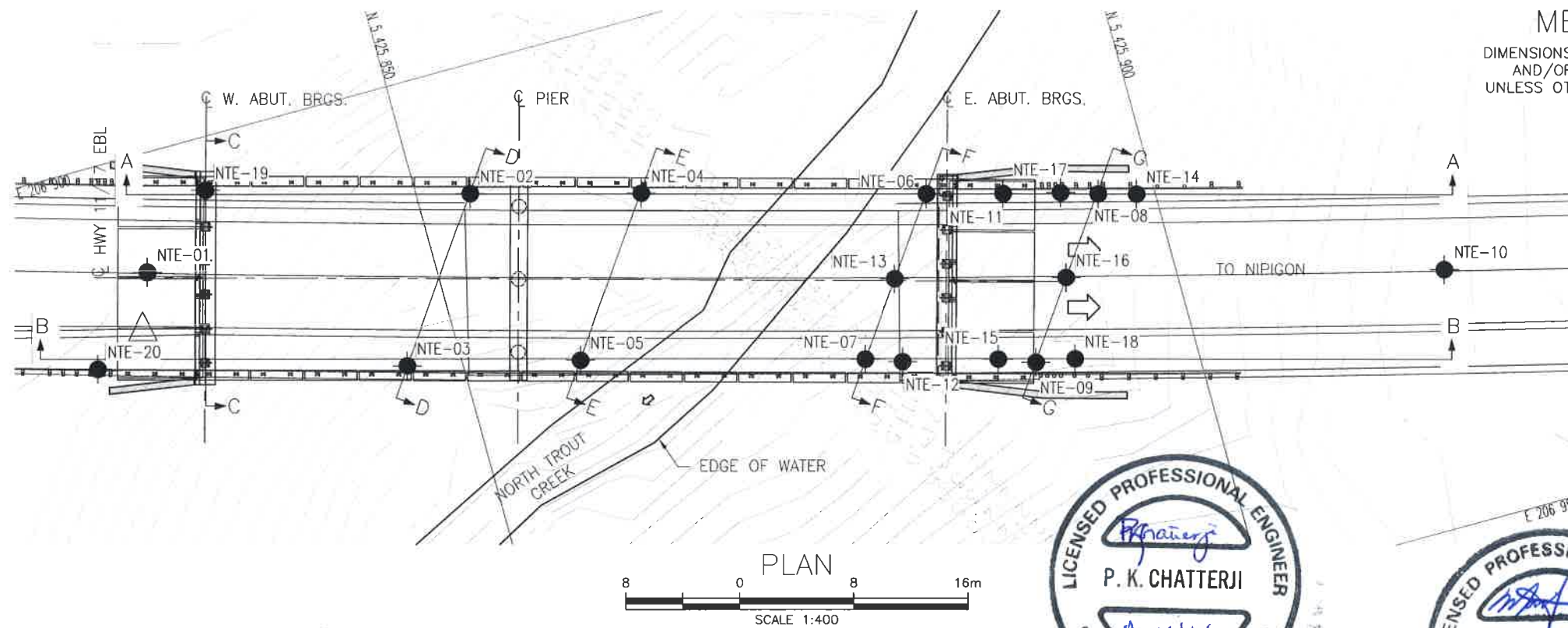
Photograph 3 – Existing conditions of the North Trout Creek



Photograph 4 – Existing conditions of the North Trout Creek

Appendix D

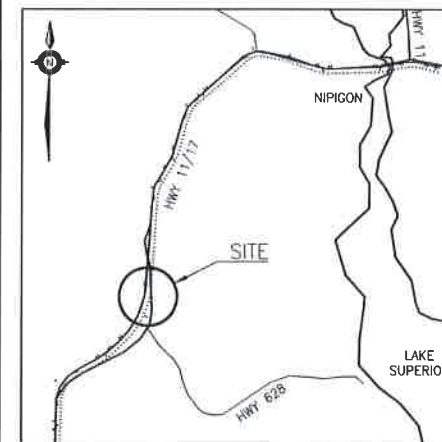
Borehole Locations and Soil Strata Drawing







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

CONT No
WP No 647-89-00

HIGHWAY 11/17 FOUR LANING
NORTH TROUT CREEK
EASTBOUND LANE
BOREHOLE LOCATIONS AND SOIL STRATA



KEYPLAN
LEGEND

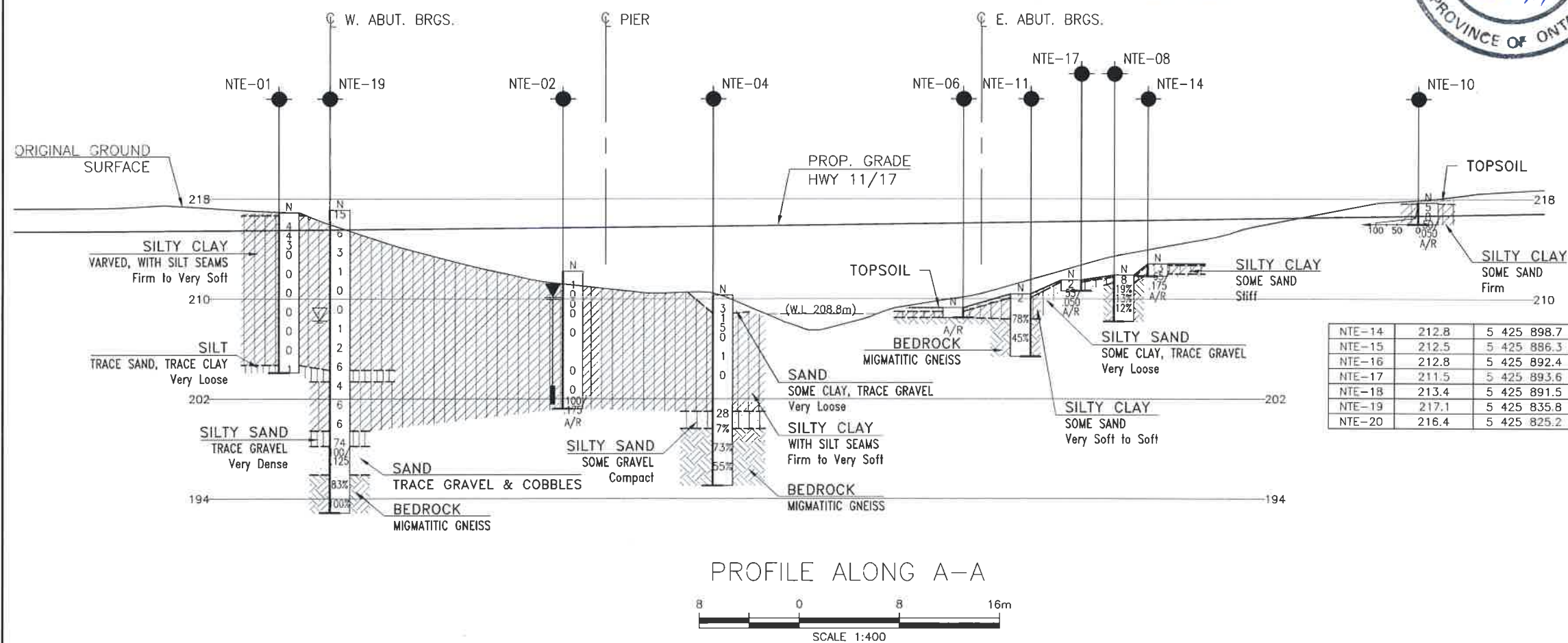
	Borehole
	Cone
N	Blows /0.3m (Std Pen Test, 475J/blow)
CONE	Blows /0.3m (60° Cone, 475J/blow)
PH	Pressure, Hydraulic
	Water Level In Open Borehole
	Water Level In Piezometer
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

NO	ELEVATION	NORTHING	EASTING
NTE-01	216.9	5 425 830.3	206 908.2
NTE-02	212.2	5 425 853.7	206 908.9
NTE-03	210.6	5 425 846.2	206 919.5
NTE-04	210.3	5 425 865.3	206 912.1
NTE-05	209.3	5 425 858.0	206 922.3
NTE-06	209.3	5 425 885.2	206 917.6
NTE-07	210.9	5 425 877.3	206 927.5
NTE-08	211.9	5 425 896.1	206 920.6
NTE-09	213.5	5 425 888.8	206 930.9
NTE-10	217.7	5 425 918.1	206 932.1
NTE-11	210.4	5 425 889.7	206 918.8
NTE-12	210.7	5 425 879.8	206 928.4
NTE-13	209.8	5 425 880.8	206 922.6

-NOTES-

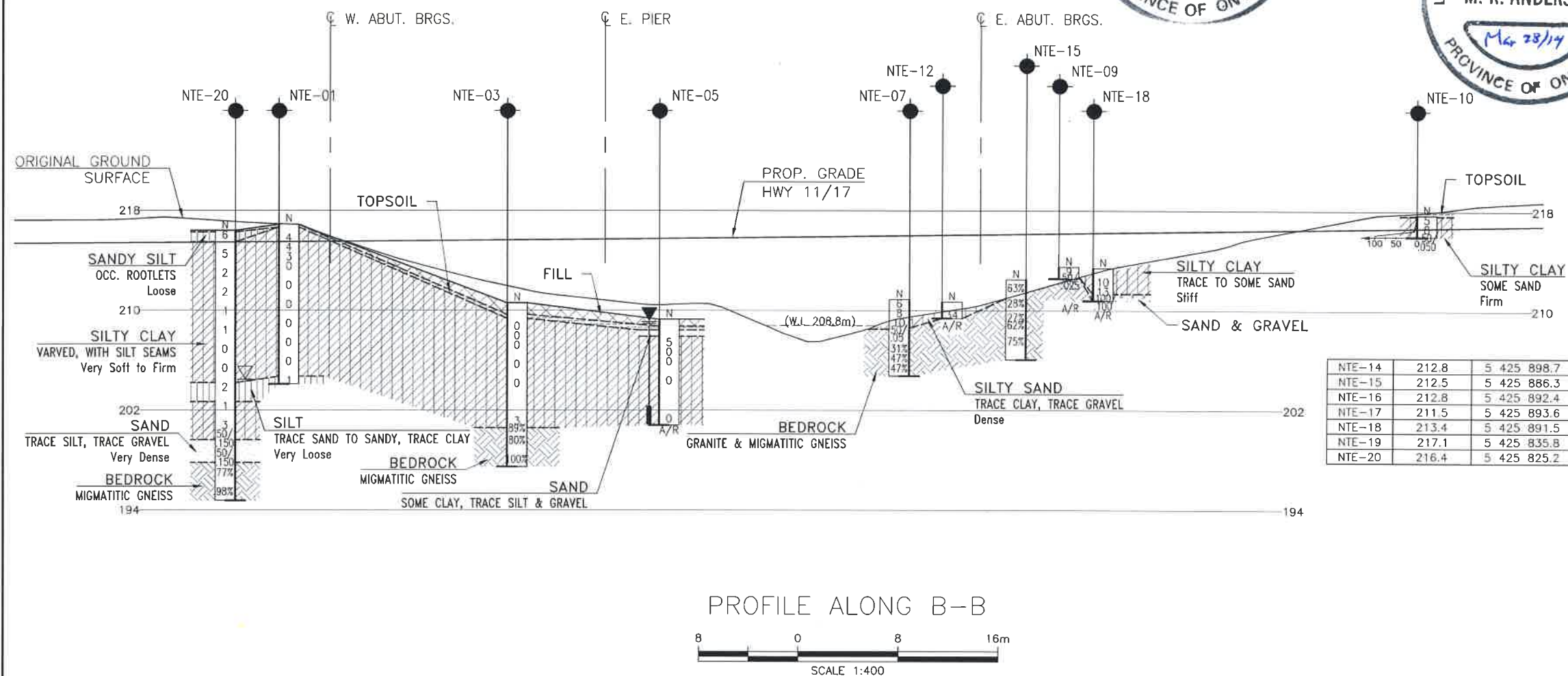
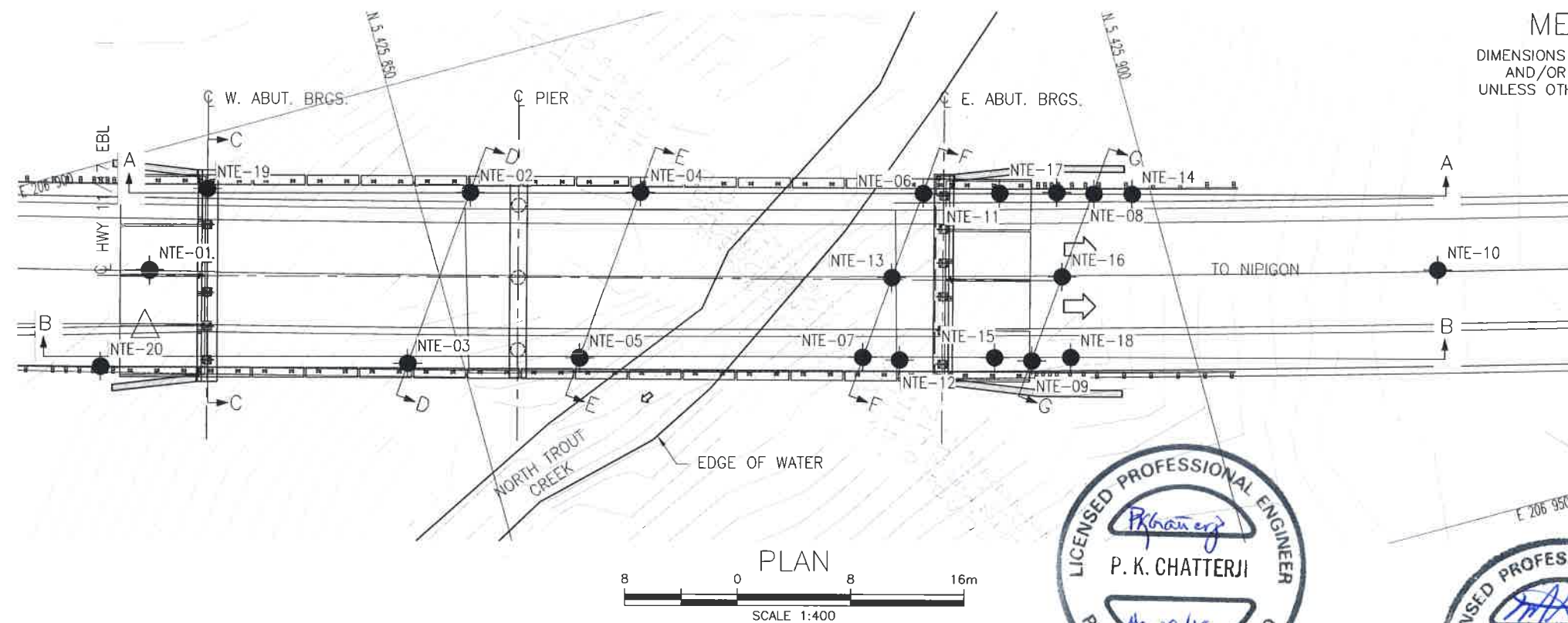
- 1) The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
- 2) This drawing is for subsurface information only. Surface details and features are for conceptual illustration.

GEOCRES No. 52A-165



NTE-14	212.8	5 425 898.7	206 921.3
NTE-15	212.5	5 425 886.3	206 930.0
NTE-16	212.8	5 425 892.4	206 925.7
NTE-17	211.5	5 425 893.6	206 919.8
NTE-18	213.4	5 425 891.5	206 931.4
NTE-19	217.1	5 425 835.8	206 903.7
NTE-20	216.4	5 425 852.2	206 913.4

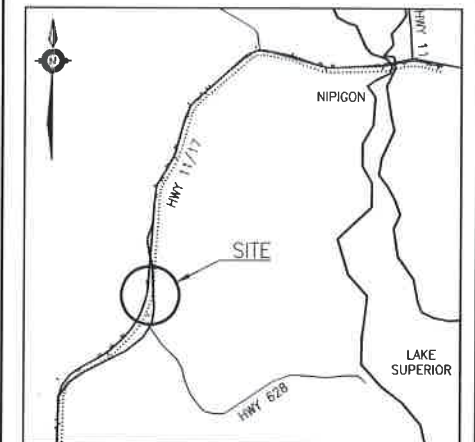
[illegible]



METRIC
DIMENSIONS ARE IN METRES
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CONT No
WP No 647-89-00

HIGHWAY 11/17 FOUR LANING
NORTH TROUT CREEK
EASTBOUND LANE
BOREHOLE LOCATIONS AND SOIL STRATA



KEYPLAN

LEGEND

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

NO	ELEVATION	NORTHING	EASTING
NTE-01	216.9	5 425 830.3	206 908.2
NTE-02	212.2	5 425 853.7	206 908.9
NTE-03	210.6	5 425 846.2	206 919.5
NTE-04	210.3	5 425 865.3	206 912.1
NTE-05	209.3	5 425 858.0	206 922.3
NTE-06	209.3	5 425 885.2	206 917.6
NTE-07	210.9	5 425 877.3	206 927.5
NTE-08	211.9	5 425 896.1	206 920.6
NTE-09	213.5	5 425 888.8	206 930.9
NTE-10	217.7	5 425 918.1	206 932.1
NTE-11	210.4	5 425 889.7	206 918.8
NTE-12	210.7	5 425 879.8	206 928.4
NTE-13	209.8	5 425 880.8	206 922.6

-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.

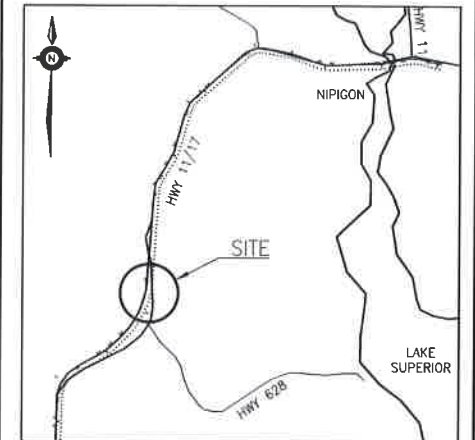
GEOCRES No. 52A-165

REVISIONS									
	DATE	BY				DESCRIPTION			
	DESIGN RPR	CHK RPR	CODE		LOAD		DATE	MAR 2014	
	DRAWN AN	CHK	SITE 48C-11B	STRUCT	IDWG	2			

METRIC

DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWNCONT No
WP No 647-89-00HIGHWAY 11/17 FOUR LANING
NORTH TROUT CREEK
EASTBOUND LANE
BOREHOLE LOCATIONS AND SOIL STRATA

SHEET



KEYPLAN

LEGEND

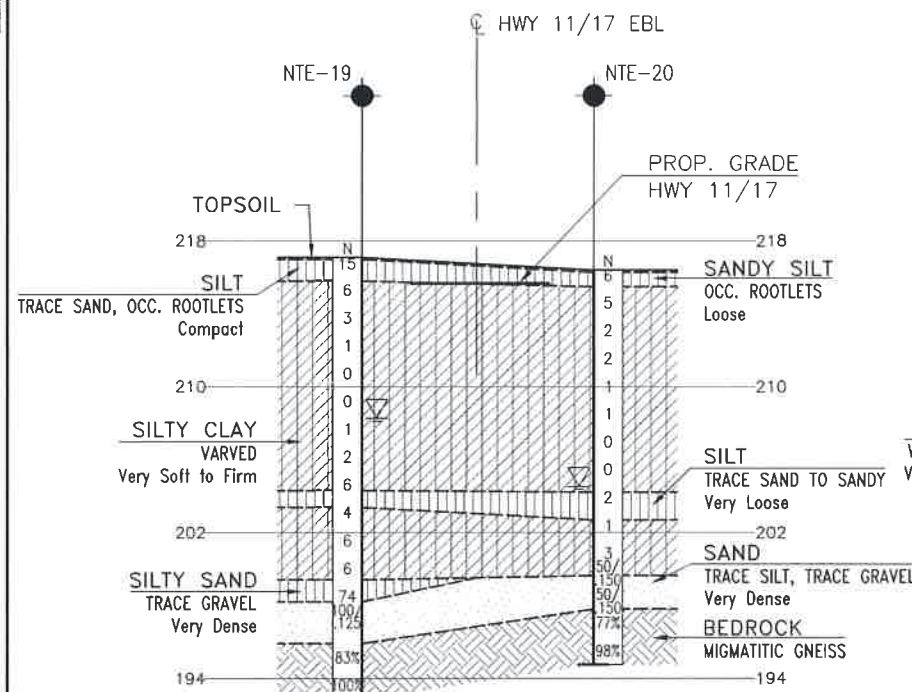
	Borehole
	Cone
N	Blows /0.3m (Std Pen Test, 475J/blow)
CONE	Blows /0.3m (60' Cone, 475J/blow)
PH	Pressure, Hydraulic
	Water Level in Open Borehole
	Water Level in Piezometer
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

NO	ELEVATION	NORTHING	EASTING
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NTE-02	212.2	5 425 853.7	206 908.9
NTE-03	210.6	5 425 846.2	206 919.5
NTE-04	210.3	5 425 865.3	206 912.1
NTE-05	209.3	5 425 858.0	206 922.3
NTE-06	209.3	5 425 885.2	206 917.6
NTE-07	210.9	5 425 877.3	206 927.5
NTE-08	211.9	5 425 896.1	206 920.6
NTE-09	213.5	5 425 888.8	206 930.9
NTE-10	217.7	5 425 918.1	206 932.1
NTE-11	210.4	5 425 889.7	206 918.8
NTE-12	210.7	5 425 879.8	206 928.4
NTE-13	209.8	5 425 880.8	206 922.6

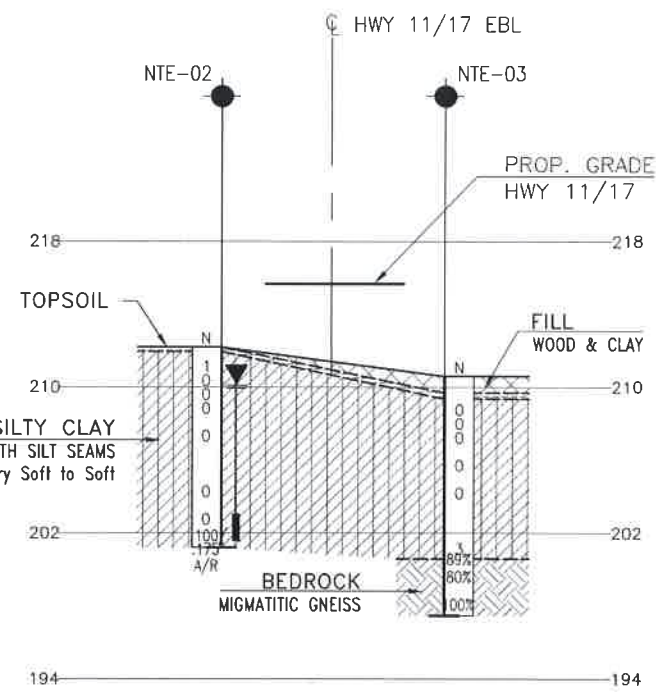
-NOTES-

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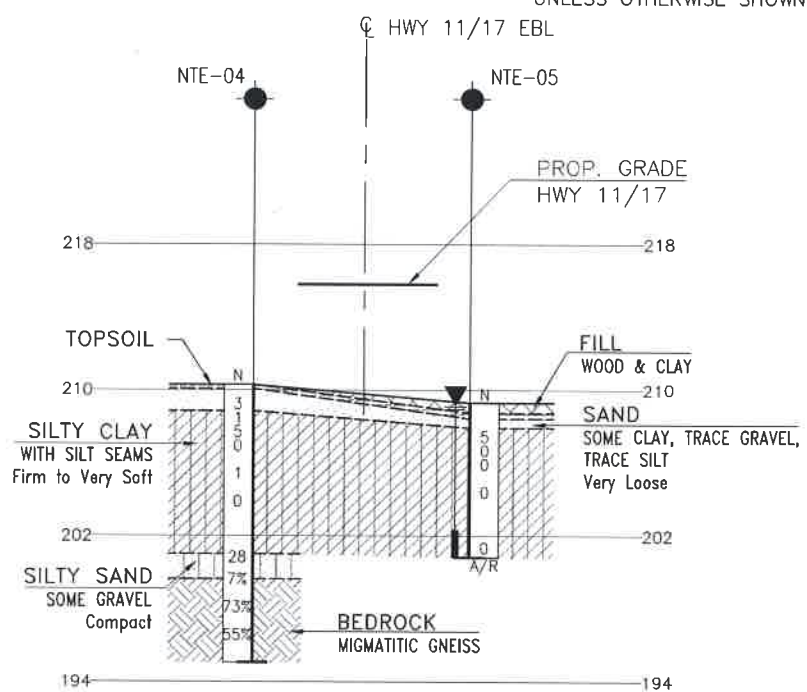
GEOCRES No. 52A-165



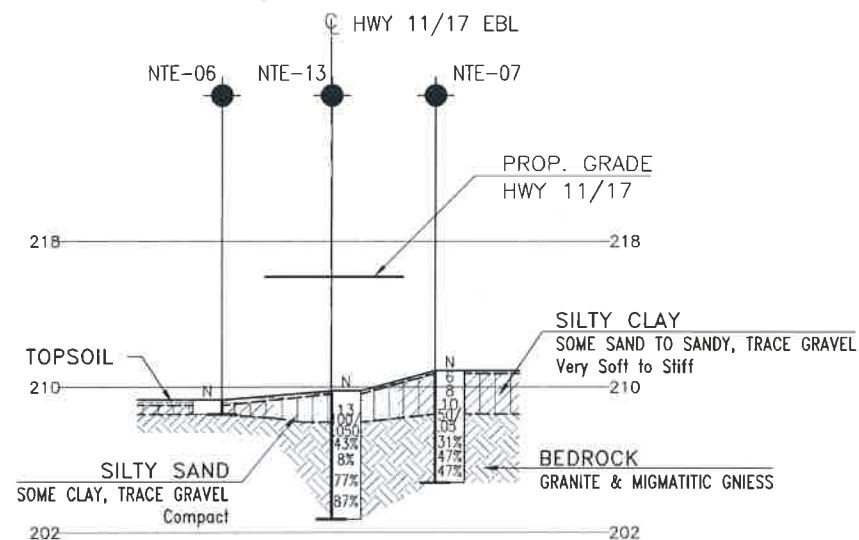
SECTION ALONG C-C



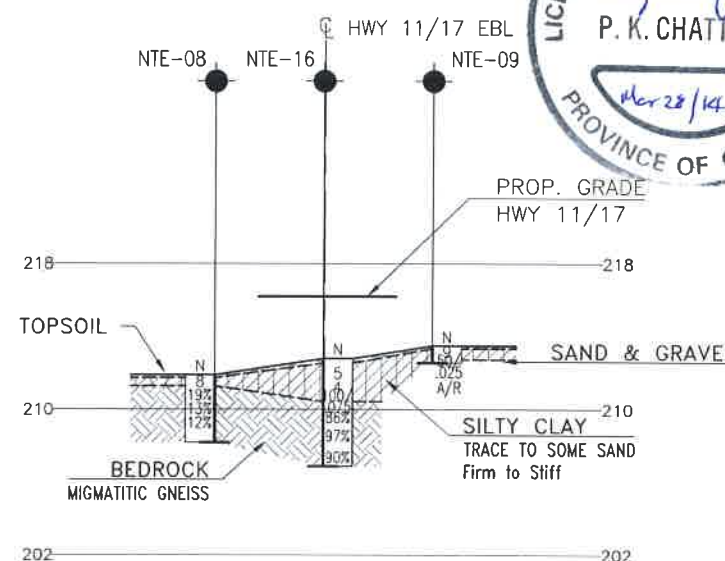
SECTION ALONG D-D



SECTION ALONG E-E



SECTION ALONG F-F



SECTION ALONG G-G



NTE-14	212.8	5 425 898.7	206 921.3
NTE-15	212.5	5 425 886.3	206 930.0
NTE-16	212.8	5 425 892.4	206 925.7
NTE-17	211.5	5 425 893.6	206 919.8
NTE-18	213.4	5 425 891.5	206 931.4
NTE-19	217.1	5 425 835.8	206 903.7
NTE-20	216.4	5 425 825.2	206 913.4



SCALE 1:400

REVISIONS	DATE	BY	DESCRIPTION
DESIGN	RPR	CHK	RPR
DRAWN	AN	CHK	SITE
LOAD	DATE	MAR 2014	DWG 3