

**FOUNDATION INVESTIGATION REPORT  
NAISCOOT LAKE BRIDGE – SBL STRUCTURE  
HIGHWAY 69 FOUR-LANING  
FROM THE SOUTH JUNCTION OF HIGHWAY 529,  
NORTHERLY 15 KM  
G.W.P 5076-06-00, W.P. 5198-06-01, SITE NO. 44-449/2**

**Geocres Number: 41 H-93**

**Report to**

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May 3, 2012  
File: 19-5161-21

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**PART 1: FACTUAL INFORMATION**

**1 INTRODUCTION**

This report presents the factual findings obtained from a foundation investigation conducted at the location of the proposed bridge carrying Highway 69 southbound lanes (SBL) over Naiscoot Lake. The proposed bridge is part of the four-laning of Highway 69 from the south junction of Highway 69 and Highway 529 northerly for 15 km.

The purpose of this investigation was to explore the subsurface conditions at the site and, based on the data obtained, to provide a borehole location plan, records of boreholes, stratigraphic profile and cross-sections, laboratory test results and written descriptions 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 MMM Group Limited (MMM), under the Ministry of Transportation Ontario (MTO) Agreement Number 5006-E-0030.

**2 SITE DESCRIPTION**

The site of the proposed structure is located approximately 3.9 km north of the intersection of Highway 529 and Highway 69. The proposed structure lies approximately 45 m east of the existing structure that carries Highway 69 over Naiscoot Lake. The new structure at this location will carry Highway 69 SBL over Naiscoot Lake as well as Flicker Trail (located on the south shore) and Teal Trail (located on the north shore).

At the location of the proposed Naiscoot Lake SBL structure the lake is approximately 115 m wide. The water level in the lake was measured at Elevation 182.07 in August 2010.

The south lake shore slope is approximately 11 m high and the north lake shore slope is approximately 15 m high. The lake shore slopes are generally well treed, with grass and shrubs



along the river banks and in the open areas. In places, bedrock is exposed at surface at the lake shore. Site Photos are included in Appendix F

The lands surrounding the site are generally undeveloped forested land with open swamps. Bedrock outcroppings, ridges and small creeks/water bodies are visible along the existing Highway 69 corridor.

The site lies within the physiographic region known as the Georgian Bay Fringe, which covers Parry Sound and Muskoka. The region is characterized by very shallow overburden and bare rock knobs and ridges. Bedrock is exposed in many areas and intermittent swamps were filled in when glacial lake Algonquin inundated the area. The overburden materials consist of sand, silt and clay. Recent organic deposits of peat and muck occur in abundance in the bedrock hollows and valleys.

The area is underlain by strongly foliated and highly to moderately deformed rocks of Precambrian age of the following types:

- Gneisses of metasedimentary origin.
- Migmatitic rocks and gneisses.
- Felsic igneous rocks (tonalite, granodiorite, monzonite, granite, syenite, derived gneisses).
- Tectonite unit (tectonites, various gneisses).

### **3 SITE INVESTIGATION AND FIELD TESTING**

The site investigation and field testing for this project was carried out in two phases. The first phase was carried out from January 13 to 28, 2010 and the second phase was carried out from August 10 to 18, 2010.

Phase 1 of the site investigation consisted of drilling and sampling a total of 24 boreholes located at the proposed foundation elements of the Naiscoot Lake SBL structure that are located on land (South Abutment, Pier 1, Pier 3, and North Abutment). These boreholes are identified as BH10-01 to 06, BH10-13 to 18, BH10-25 to 30 and BH10-37 to 42.

Phase 2 of the site investigation consisted of drilling and sampling 12 boreholes located at the approximate location of Pier 2 of the Naiscoot Lake SBL structure, which is located in the lake. These boreholes are identified as NL10-01 to NL10-12.

Borehole advancement within the overburden on land generally ranged from 0 m to 1.5 m where the drill rig encountered refusal, while borehole advancement within the lake bed deposits generally ranged from 0.6 m to 3.4 m below the top of the lake bed prior to refusal. Bedrock outcrops and very shallow bedrock (less than 0.1 m depth) were noted at the locations of Boreholes BH10-02, BH10-16, BH10-18, BH10-27, and BH10-30. Twelve boreholes from Phase

1 and 6 boreholes from Phase 2 were advanced 2.8 to 3.4 m into bedrock by NQ or NQ2” size diamond coring.

The approximate borehole locations are shown on the drawing entitled “Borehole Locations and Soil Strata Drawing” included in Appendix E.

Prior to drilling, the borehole locations were marked in the field and all necessary utility clearances were obtained. At this site, utility location included the use of a dive team to locate the submerged Bell cable crossing the site and to attach buoys to it for future reference.

Access to the borehole locations on land proved to be difficult due to terrain and, as a result, a light tripod drill rig powered by a Hilti electric drill was mobilized. This equipment was adequate in view of the shallow overburden existing at this site. Similarly, accessing the borehole locations in Naiscoot Lake was difficult since travel from the local marina was obstructed by the existing highway bridge and loading from the lake shore would have involved unacceptable impacts on the lake shore. Accordingly, a small barge was mobilized and fitted with a light tripod drill powered by a Hilti DD-250. Soil samples were obtained using a split spoon sampler and bedrock coring was carried out in selected boreholes.

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.

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. Four standpipe piezometers consisting of 25 mm PVC pipe with slotted screens were installed and enclosed in filter sand to permit longer term groundwater level monitoring. One piezometer was installed at the proposed location of each foundation element located on land. The locations and completion details of the piezometers are summarized in Table 3.1.

**Table 3.1 – Borehole Completion Details**

<b>SBL Foundation Element</b>	<b>Borehole</b>	<b>Piezometer Tip Depth/ Elevation (m)</b>	<b>Completion Details</b>
<b>South Abutment</b>	BH10-01	None installed	Borehole backfilled with cuttings to surface.
	BH10-02	None installed	Borehole backfilled with cuttings to surface.
	BH10-03	None installed	Borehole backfilled with bentonite to surface.
	BH10-04	3.2 / 186.5	Sand from 3.2 m to 1.3 m, bentonite from 1.3 m to surface.
	BH10-05	None installed	Borehole backfilled with bentonite to surface.
	BH10-06	None installed	Borehole backfilled with cuttings to surface.
<b>Pier #1</b>	BH10-13	3.6 / 181.8	Sand from 3.6 m to 1.5 m, bentonite from 1.5 m to surface.

<b>SBL Foundation Element</b>	<b>Borehole</b>	<b>Piezometer Tip Depth/ Elevation (m)</b>	<b>Completion Details</b>
	BH10-14	None installed	Borehole backfilled with bentonite to surface.
	BH10-15	None installed	Borehole backfilled with cuttings to surface.
	BH10-16	None installed	Bedrock at surface.
	BH10-17	None installed	Borehole backfilled with cuttings to surface.
	BH10-18	None installed	Borehole backfilled with bentonite to surface.
<b>Pier #2</b>	NL10-01	None installed	Borehole backfilled with bentonite to 6.1 m. Slough to lake bed surface.
	NL10-02	None installed	Slough to lake bed surface.
	NL10-03	None installed	Slough to lake bed surface.
	NL10-04	None installed	Borehole backfilled with bentonite to 5.2 m. Slough to lake bed surface.
	NL10-05	None installed	Slough to lake bed surface.
	NL10-06	None installed	Borehole backfilled with bentonite to 4.8 m. Slough to lake bed surface.
	NL10-07	None installed	Borehole backfilled with bentonite to 5.5 m. Slough to lake bed surface.
	NL10-08	None installed	Slough to lake bed surface.
	NL10-09	None installed	Borehole backfilled with bentonite to 5.2 m. Slough to lake bed surface.
	NL10-10	None installed	Slough to lake bed surface.
	NL10-11	None installed	Slough to lake bed surface.
	NL10-12	None installed	Borehole backfilled with bentonite to 4.3 m. Slough to lake bed surface.
<b>Pier #3</b>	BH10-25	3.9 / 180.0	Sand from 3.9 m to 2.1 m, bentonite from 2.1 m to surface.
	BH10-26	None installed	Borehole backfilled with cuttings to surface.
	BH10-27	None installed	Borehole backfilled with cuttings to surface.
	BH10-28	None installed	Borehole backfilled with cuttings to surface.
	BH10-29	None installed	Borehole backfilled with bentonite to surface.
	BH10-30	None installed	Borehole backfilled with bentonite to surface.
<b>North Abutment</b>	BH10-37	None installed	Borehole backfilled with cuttings to surface.
	BH10-38	4.1 / 189.4	Sand from 4.1 m to 2.3 m, bentonite from 2.3 m to surface.
	BH10-39	None installed	Borehole backfilled with bentonite to surface.
	BH10-40	None installed	Borehole backfilled with bentonite to surface.
	BH10-41	None installed	Borehole backfilled with cuttings to surface.
	BH10-42	None installed	Borehole backfilled with cuttings to surface.

#### **4 LABORATORY TESTING**

All recovered soil samples were subjected to Visual Identification (VI) and rock samples to geological logging. Moisture content determinations were carried out on all soil samples. 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.

Point load tests were carried out in the laboratory on selected samples of intact bedrock to assist in evaluation of the compressive strength of the bedrock. The results of the point load tests performed on the rock core samples are summarized on the Record of Borehole sheets in Appendix A. The estimated UCS value recorded on the Record of Borehole sheets is the average value per core run.

#### **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 these sheets 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 overburden encountered in the boreholes drilled on land at this site consists of peat and/or thin layers of native sand overlying granitic gneiss bedrock. In one borehole a thin layer of cobbles and/or boulders was encountered below the sand, overlying bedrock. As well, in some locations bedrock was exposed at the surface. In the boreholes drilled in Naiscoot Lake, the lake bed deposits typically consist of very soft to soft silty clay to clayey silt, overlying sandy silt to silty sand overlying bedrock.

##### **5.1 Overburden (Boreholes Drilled on Land)**

###### **5.1.1 Peat**

Peat was encountered at surface in 20 of the 24 boreholes that were drilled on land for the SBL structure. In these boreholes the thickness of the peat ranged from 30 mm to 450 mm. The natural moisture content of the peat typically ranged from greater than 100% to over 350%. Lower moisture contents were measured for some peat samples and can likely be attributed to lower organic content.

It should be noted that the peat thickness may vary between and beyond the borehole locations and this data is not intended for the purpose of estimating quantities.

### **5.1.2 Sand**

Of the 24 boreholes drilled on land for the SBL structure, sand was encountered at surface in 1 borehole and below a thin layer of peat in 8 boreholes. The sand was generally brown containing trace silt, occasional organics and rootlets, and trace gravel in some boreholes. Occasional cobbles and/ boulders were also encountered within the sand layer.

The thickness of the sand layer ranged from 0.1 to 1.4 m. The elevation of the bottom of the sand layer varied from Elevation 183.4 m to Elevation 195.1 m.

SPT N-values recorded in the sand layer generally ranged from 5 to 19 blows per 0.3 m penetration, indicating a loose to compact relative density. Several SPT N-values of 50 blows for less than 0.3 m penetration were also recorded in the sand layer. However, these values were typically recorded on cobbles or boulders or just above refusal and are not necessarily representative of the relative density of the sand.

The measured moisture contents of samples collected from the sand layer typically ranged from 10 to 50%. Higher moisture content values were measured for some sand samples, which can likely be attributed to higher organic content.

### **5.1.3 Cobbles and Boulders**

A thin layer of cobbles and/or boulders was encounter in 1 borehole (BH10-25) below the sand layer and overlying bedrock. The thickness of the layer of cobbles and boulders at this location was 0.4 m and the bottom of this layer was recorded at Elevation 183.1 m.

## **5.2 Lake Bed Deposits (Boreholes Drilled in Naiscoot Lake)**

### **5.2.1 Silty Clay to Clayey Silt**

A layer of silty clay to clayey silt was encountered from the surface of the lake bed in 11 of the 12 boreholes drilled in Naiscoot Lake at the proposed location of Pier 2. The thickness of this layer ranged from 0.5 m to 1.4 m and the underside elevation of this layer ranged from Elevation 176.8 m to Elevation 177.9 m.

Very few SPT N-values were recorded in the silty clay to clayey silt layer as the split spoon sampler typically sank to the bottom of this layer, indicating a very soft consistency. An SPT N-value of 13 blows per 0.3 m penetration was recorded at one location (NL10-09), indicating a stiff consistency. A few SPT N-values of 50 blows for less than 0.3 m penetration were also recorded in this layer; however these high N-values were noted just above bedrock or refusal.

Selected samples of the silty clay to clayey silt underwent gradation and Atterberg Limits testing. The results of these tests are presented on the Record of Borehole sheets included in Appendix A and in Figures B1 and B3 of Appendix B. The test results are summarized below.



<b>Soil Particles</b>	<b>(%)</b>
Gravel	0 to 3
Sand	1 to 10
Silt	44 to 81
Clay	10 to 55

<b>Index Property</b>	<b>(%)</b>
Liquid Limit	41
Plastic Limit	18

### 5.2.2 Sandy Silt to Silty Sand

A layer of sandy silt to silty sand containing trace gravel and occasional cobbles was encountered below the silty clay to clayey silt layer in 9 boreholes and at the surface of the lake bed in one borehole. The thickness of the sandy silt to silty sand layer ranges from 0.2 m to 2.1 m, with the elevation of the bottom of this layer ranging from Elevation 175.0 m to Elevation 177.7 m.

SPT N-values recorded in the sandy silt to silty sandy layers ranged from 4 blows per 0.3 m penetration to 50 blows for less than 0.3 m penetration. This range in N-values indicates a loose to very dense relative density. Some N-values of 50 blows for less than 0.3 m penetration were recorded just above refusal or bedrock.

This moisture content of the sandy silt to silty sand samples typically ranged from 8 to 22%.

Selected samples of the sandy silt to silty sand were submitted for laboratory gradation testing. The results of these tests are presented on the Record of Borehole sheets in Appendix A and are summarized below. The grain size distribution curves for these samples are presented in Appendix B.

<b>Soil Particle</b>	<b>Percentage (%)</b>
Gravel	2 to 7
Sand	29 to 56
Silt	33 to 64
Clay	4 to 5

### 5.3 Bedrock

The overburden soils described above are underlain by granitic gneiss bedrock. The bedrock is slightly weathered to fresh. Occasional mechanical breaks as well as sub-

horizontal and sub-vertical fractures were observed in the rock cores. Quartz veins were also noted in several cores.

Bedrock was encountered directly below a thin layer of peat in 12 of the 24 boreholes drilled on land. Bedrock was exposed at surface at the following three borehole locations; BH10-16, BH10-18, and BH10-30.

Bedrock was encountered at various depths and it was proved by coring in 3 boreholes near the location of each proposed foundation element on land (4) and in 6 boreholes near the location of Pier 2. Table 5.3 summarizes depths and elevations to the top of bedrock in the boreholes. Where coring was not carried out, bedrock was inferred from auger refusal.

**Table 5.3 – Depths and Elevations of Top of Bedrock**

<b>SBL Foundation Element</b>	<b>Borehole</b>	<b>Bedrock Depth Below Ground Surface (m)</b>	<b>Bedrock Elevation (m)</b>
SBL South Abutment	BH10-01	0.1	191.5
	BH10-02	0.02	191.4
	BH10-03	0.1	191.1*
	BH10-04	0.2	189.5*
	BH10-05	0.1	189.8*
	BH10-06	0.1	190.7
SBL Pier 1	BH10-13	0.5	185.0*
	BH10-14	1.5	183.8*
	BH10-15	0.6	185.7
	BH10-16	0.0	185.2
	BH10-17	0.4	184.1
	BH10-18	0.0	184.9*
SBL Pier 2	NL10-01	3.4**	175.0*
	NL10-02	2.2**	175.8
	NL10-03	0.8**	177.0
	NL10-04	0.6**	176.8*
	NL10-05	2.4**	176.2
	NL10-06	1.1**	177.3*
	NL10-07	1.9**	176.3*
	NL10-08	1.4**	176.5
	NL10-09	1.9**	176.9*
	NL10-10	1.5**	177.0
	NL10-11	0.7**	177.7
	NL10-12	0.6**	177.5*
SBL Pier 3	BH10-25	0.9	183.1*
	BH10-26	0.2	183.7
	BH10-27	0.02	184.0
	BH10-28	0.2	185.8
	BH10-29	0.4	186.3*
	BH10-30	0.0	187.2*

<b>SBL Foundation Element</b>	<b>Borehole</b>	<b>Bedrock Depth Below Ground Surface (m)</b>	<b>Bedrock Elevation (m)</b>
SBL North Abutment	BH10-37	0.2	192.6
	BH10-38	1.0	192.4*
	BH10-39	0.1	194.0*
	BH10-40	1.3	193.4*
	BH10-41	0.2	195.1
	BH10-42	1.1	195.1

\* Bedrock proved by coring techniques.

\*\* Depth to bedrock measured from the surface of the lake bed.

Total core recovery (TCR) in the bedrock ranged from 60% to 100%, though was typically 100%. The RQD values typically ranged from 75% to 100% indicating good to excellent rock quality. For 8 core runs the RQD value was less than 75%, typically ranging from 50% to 71% which indicates a fair rock quality. An RQD of 0% was also noted for Borehole NL10-09 Run 3.

The Fracture Index (FI) of the rock core, expressed as fractures per 0.3 m of core, generally ranged from 0 to 5 in most cores. In some cores the FI was greater than 5, though the FI was never greater than 10.

Based on Point Load tests performed in the laboratory, the estimated uniaxial compressive strength of the selected rock cores ranges from 77 MPa to 231 MPa, indicating a strong to very strong rock. These estimated rock strength values are interpreted from point load tests that were conducted on rock cores recovered from the boreholes. The average UCS value per core run is recorded on the Record of Borehole Sheets included in Appendix A.

#### 5.4 Water Levels

Water levels were observed in the boreholes during and upon completion of drilling. One standpipe piezometer was installed at each foundation element during Phase 1 of the investigation to monitor water levels after completion of drilling. The water levels as measured in the piezometers are summarized in Table 5.4.

**Table 5.4 – Water Level Measurements**

<b>SBL Foundation Element</b>	<b>Borehole</b>	<b>Date</b>	<b>Water Level (m)</b>	
			<b>Depth</b>	<b>Elevation</b>
South Abutment	BH10-04	28-Jan-10	0.0*	189.7
Pier #1	BH10-13	28-Jan-10	1.1	184.4
Pier #3	BH10-25	28-Jan-10	1.5	182.4
North Abutment	BH10-38	28-Jan-10	1.4	192.1

\*Frozen at surface

The piezometric readings taken at the South Abutment, Pier #1, Pier #3, and North Abutment in January 2010 indicate that the groundwater levels range from Elevation 182.4 m to 192.1 m. The groundwater elevations are typically higher at the proposed abutments, located at the top of the lake shore slopes.

The water level in Naiscoot Lake was measured at Elevation 182.07 m in August 2010, during Phase 2 of the field 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 be at a higher elevation after the spring snowmelt or after periods of heavy rainfall.

## **6 MISCELLANEOUS**

Borehole locations were selected by Thurber Engineering Ltd. Surveyors from MMM Group Limited staked these locations in the field, confirmed the co-ordinates and recorded the corresponding ground surface elevations.

Thurber obtained utility clearances for the borehole locations prior to drilling.

OGS Drilling Inc. of Almonte, Ontario supplied and operated the portable coring equipment used to drill and core all of the boreholes, during Phase 1 and Phase 2, at this site.

Phase 1 field work was supervised on a full time basis by Mr. George Azzopardi and Phase 2 field work was supervised by Mr. Stephane Loranger, C.E.T., both of Thurber. Overall planning and supervision of the field program was conducted by Mr. Tony Harte, M.Sc. Interpretation of the data and preparation of the report was carried out by Mrs. L. Blaine, E.I.T. and Mr. Alastair E. Gorman, P.Eng.

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

Thurber Engineering Ltd

*L. Blaine May 3/12*

Lindsey Blaine, E.I.T.



Alastair E. Gorman, P.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 <sup>(1)</sup> '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



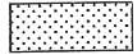


- (1) SPT 'N' Value Standard Penetration Test 'N' Value – refers to the number of blows from a 63.5kg hammer free falling a height of 0.76m to advance a standard 50 mm outside diameter split spoon sampler for 0.3 m depth into undisturbed ground.
- (2) DCPT Dynamic Cone Penetration Test – Continuous penetration 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

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.
		Weak	5.0 to 25.0	750 to 3,500	Can be peeled by a pocket knife with difficulty
		Very Weak	1.0 to 5.0	150 to 750	Can be peeled by a pocket knife, crumbles under firm blows of geological pick.
		Extremely Weak (Rock)	0.25 to 1.0	35 to 150	Indented by thumbnail

TERMS	
Total Core Recovery: (TCR)	Core recovered as a percentage of total core run length.
Solid Core Recovery: (SCR)	Percent Ratio of solid core of full cylindrical shape recovered. Expressed with respect to the total length of core run.
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 BH10-01

1 OF 1

METRIC

W.P. 5076-06-00 LOCATION N 5 056 457.0 E 234 744.7 ORIGINATED BY GA  
 HWY 69 BOREHOLE TYPE Tripod/Hilli COMPILED BY MFA  
 DATUM Geodetic DATE 2010.01.14 - 2010.01.14 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	UNIT WEIGHT γ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
191.6	GROUND SURFACE													
0.0	PEAT (100 mm)		1	SS	50/									
0.1	END OF BOREHOLE AT 0.1 m UPON REFUSAL ON PROBABLE BEDROCK BOREHOLE OPEN AND DRY TO 0.1 m.				100									

ONTMT4S 6121(NAISCOOT LAKE).GPJ 5/3/12

RECORD OF BOREHOLE No BH10-02

1 OF 1

METRIC

W.P. 5076-06-00 LOCATION N 5 056 458.1 E 234 749.8 ORIGINATED BY GA  
HWY 69 BOREHOLE TYPE Tripod/Hill COMPILED BY MFA  
DATUM Geodetic DATE 2010.01.14 - 2010.01.14 CHECKED BY LRB

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	UNIT WEIGHT γ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa					
191.4	GROUND SURFACE												
8.8	PEAT (30 mm)		1	SS	50/025								
	END OF BOREHOLE AT 0.03 m UPON REFUSAL ON PROBABLE BEDROCK. BOREHOLE OPEN AND DRY TO 0.03 m.												

ONTM14S 6121(NAISCOOT LAKE) GPJ 5/3/12

RECORD OF BOREHOLE No BH10-03

1 OF 1

METRIC

W.P. 5076-06-00 LOCATION N 5 056 459.2 E 234 754.6 ORIGINATED BY GA  
HWY 69 BOREHOLE TYPE Tripod/Hilti COMPILED BY MFA  
DATUM Geodetic DATE 2010.01.15 - 2010.01.15 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT $\gamma$ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
191.2	GROUND SURFACE													
0.0	PEAT (100 mm)		1	SS	50/		191							RUN #1 TCR=100% SCR=100% ROD=100% UCS=112MPa
0.1	BEDROCK, granitic gneiss, fresh, coarse grained, strong to very strong, black/pink/white Occasional mechanical breaks.		1	RUN	100									
			2	RUN			190							
			3	RUN			189							
188.3	Highly broken zone at 2.23 to 2.46m. Biolite seam at 2.23 to 2.46m.													RUN #2 TCR=100% SCR=100% RQD=100% UCS=85MPa
2.9	END OF BOREHOLE AT 2.9 m. BOREHOLE OPEN TO 2.9 m AND WATER LEVEL AT 1.0 m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO SURFACE.													
														RUN #3 TCR=100% SCR=88% RQD=65% UCS=217MPa

# RECORD OF BOREHOLE No BH10-04

1 OF 1

METRIC

W.P. 5076-06-00 LOCATION N 5 056 461 8 E 234 743.5 ORIGINATED BY GA  
 HWY 69 BOREHOLE TYPE Tripod/Hilti COMPILED BY MFA  
 DATUM Geodetic DATE 2010.01.14 - 2010.01.14 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT  γ  kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					
189.7	GROUND SURFACE							20 40 60 80 100					
0.0	PEAT (200 mm)		1	SS	50/			○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE					
0.2	BEDROCK, granitic gneiss, fresh, coarse grained, very strong, pink/white/black Occasional mechanical breaks				150			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT w <sub>p</sub> w w <sub>L</sub> WATER CONTENT (%)					
		1	RUN				189					0	RUN #1 TCR=100% SCR=100% RQD=100% UCS=211MPa
		2	RUN				188					0	
		3	RUN				187					0	
	Horizontal joint at 2.87m.											0	RUN #2 TCR=100% SCR=100% RQD=100% UCS=103MPa
												0	
												0	
186.5												0	RUN #3 TCR=100% SCR=100% RQD=100% UCS=109MPa
												0	
												0	
3.2	END OF BOREHOLE AT 3.2 m. BOREHOLE OPEN TO 3.2 m AND WATER LEVEL AT 1.6 m UPON COMPLETION. Piezometer installation consists of 25mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 2010.01.28 0.0* 189.7 *Frozen at surface.											0	

RECORD OF BOREHOLE No BH10-05

1 OF 1

METRIC

W.P. 5076-06-00 LOCATION N 5 056 463.0 E 234 748.6 ORIGINATED BY GA  
HWY 69 BOREHOLE TYPE Tripod/Hilti COMPILED BY MFA  
DATUM Geodetic DATE 2010.01.14 - 2010.01.15 CHECKED BY LRB

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			SHEAR STRENGTH kPa		WATER CONTENT (%)				
189.9	GROUND SURFACE							20 40 60 80 100		w <sub>p</sub> w w <sub>L</sub>				GR SA SI CL
0.0	PEAT (100 mm)		1	SS	50/			○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE					FI	
0.1	BEDROCK, granitic gneiss, fresh, coarse grained, very strong, black/pink Occasional mechanical breaks.		1	RUN	125			20 40 60 80 100		20 40 60			0	RUN #1 TCR=100% SCR=100% RQD=91% UCS=130MPa
	Sub-horizontal joint at 1.24m.						189						0	
	Horizontal joints at 1.62, 1.65, 2.03 and 2.13m.		2	RUN			188						1	RUN #2 TCR=100% SCR=98% RQD=92% UCS=116MPa
													0	
			3	RUN			187						1	RUN #3 TCR=100% SCR=100% RQD=100% UCS=201MPa
186.8													0	
3.2	END OF BOREHOLE AT 3.2 m. BOREHOLE OPEN TO 3.2 m AND WATER LEVEL AT 1.5 m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO SURFACE.													

ONTMT4S 6121(NAISCOOT LAKE).GPJ 5/3/12

+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to  
Sensitivity

20  
15 5  
10  
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No BH10-06

1 OF 1

METRIC

W.P. 5076-06-00 LOCATION N 5 056 464.1 E 234 753.5 ORIGINATED BY GA  
HWY 69 BOREHOLE TYPE Tripod/Hill COMPILED BY MFA  
DATUM Geodetic DATE 2010.01.14 - 2010.01.14 CHECKED BY LRB

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa					
190.8	GROUND SURFACE												
0.0	PEAT (50 mm)		1	SS	50/050								
	END OF BOREHOLE AT 0.05 m UPON REFUSAL ON PROBABLE BEDROCK. BOREHOLE OPEN AND DRY TO 0.05 m.												

## METRIC

SOIL PROFILE						DYNAMIC CONE PENETRATION RESISTANCE PLOT							UNIT WEIGHT $\gamma$ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER TYPE "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	SHEAR STRENGTH kPa				WATER CONTENT (%)					
						○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE				w <sub>p</sub> w      w <sub>L</sub> PLASTIC LIMIT   NATURAL MOISTURE CONTENT   LIQUID LIMIT					
185.5	GROUND SURFACE					20	40	60	80	100	20	40	60		
0.0	SAND, trace silt, occasional organics Compact Brown	[Pattern]	1 SS 11											FI	RUN #1 TCR=100% SCR=100% RQD=100% UCS=116MPa
185.0	Damp	[Pattern]	1 RUN											0	
0.5	BEDROCK, granitic gneiss, fresh, coarse grained, very strong, dark grey/black, occasional red streaks Horizontal joints at 0.53 and 0.66m. Occasional mechanical breaks. Horizontal joints at 1.14 and 1.19m.	[Pattern]	2 RUN											0	RUN #2 TCR=100% SCR=100% RQD=96% UCS=143MPa
		[Pattern]	3 RUN											2	
	Occasional banding at 2.44 to 3.05m.	[Pattern]	4 RUN											0	RUN #3 TCR=100% SCR=100% RQD=100% UCS=170MPa
181.8														0	
3.6	END OF BOREHOLE AT 3.6 m. BOREHOLE OPEN AND DRY TO 3.6 m. Piezometer installation consists of 25mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE    DEPTH (m)    ELEV. (m) 2010.01.28    1.1    184.4													0	RUN #4 TCR=100% SCR=100% RQD=100% UCS=173MPa

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+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity



RECORD OF BOREHOLE No BH10-14

1 OF 1

METRIC

W.P. 5076-06-00 LOCATION N 5 056 492.2 E 234 741.7 ORIGINATED BY GA  
HWY 69 BOREHOLE TYPE Tripod/Hilti COMPILED BY MFA  
DATUM Geodetic DATE 2010.01.13 - 2010.01.13 CHECKED BY LRB

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 <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa				WATER CONTENT (%)				
								20	40	60	80	100	20	40		
185.3	GROUND SURFACE															
0.0	PEAT (50mm)		1	SS	5											
	SAND, trace silt, occasional rootlets Loose Brown Damp Cobble from 0.69 to 0.76 m		2	SS	50 / 0.05											
183.8			3	SS	50 / 0.1											
1.5	BEDROCK, granitic gneiss, fresh, coarse grained, strong to very strong, grey/black, occasional banding Occasional mechanical breaks.		1	RUN												
	Horizontal joint at 2.49m															
			2	RUN												
	Horizontal joints at 3.43, 3.48 and 3.71m.															
			3	RUN												
180.9	END OF BOREHOLE AT 4.4 m. BOREHOLE OPEN TO 4.4 m AND WATER LEVEL AT 1.2 m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO SURFACE.															
4.4																

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

RECORD OF BOREHOLE No BH10-15

1 OF 1

METRIC

W.P. 5076-06-00 LOCATION N 5 056 493.3 E 234 746.3 ORIGINATED BY GA  
HWY 69 BOREHOLE TYPE Tripod/Hilti COMPILED BY MFA  
DATUM Geodetic DATE 2010.01.14 - 2010.01.14 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT  <b>γ</b>  kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)  GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		WATER CONTENT (%)				
186.3	GROUND SURFACE							20 40 60 80 100						
0.0	PEAT (50mm)							20 40 60 80 100						
0.1	SAND, trace silt, occasional rootlets Compact Brown		1	SS	15		186							
185.7	Damp													
0.6	END OF BOREHOLE AT 0.6 m UPON AUGER REFUSAL ON PROBABLE BEDROCK. BOREHOLE OPEN AND DRY TO 0.6 m. BOREHOLE BACKFILLED WITH CUTTINGS TO SURFACE.													

ONTMT4S 6121(NAISCOOT LAKE).GPJ 5/3/12

## METRIC

[illegible]

RECORD OF BOREHOLE No BH10-17

1 OF 1

METRIC

W.P. 5076-06-00 LOCATION N 5 056 497.1 E 234 740.5 ORIGINATED BY GA  
HWY 69 BOREHOLE TYPE Tripod/Hilli COMPILED BY MFA  
DATUM Geodetic DATE 2010.01.13 - 2010.01.13 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT $\gamma$ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
184.5	GROUND SURFACE													
0.0	PEAT (100 mm)		1	SS	50/									
0.1					075									
184.1	SAND, trace silt, occasional rootlets													
0.4	Loose Brown Damp													
	END OF BOREHOLE AT 0.4 m UPON REFUSAL ON PROBABLE BEDROCK. BOREHOLE OPEN AND DRY TO 0.4 m. BOREHOLE BACKFILLED WITH CUTTINGS TO SURFACE.													



ONTMT4S 6121(NAISCOOT LAKE).GPJ 5/3/12

RECORD OF BOREHOLE No BH10-18

1 OF 1

METRIC

W.P. 5076-06-00 LOCATION N 5 056 498.2 E 234 745.3 ORIGINATED BY GA  
HWY 69 BOREHOLE TYPE Tripod/Hilt COMPILED BY MFA  
DATUM Geodetic DATE 2010.01.14 - 2010.01.14 CHECKED BY LRB

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 <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		WATER CONTENT (%)					
184.9	GROUND SURFACE							20 40 60 80 100		w <sub>P</sub>	w	w <sub>L</sub>		GR SA SI CL	
0.0	<b>BEDROCK</b> , granitic gneiss, fresh, coarse grained, very strong, black/pink with occasional banding Occasional mechanical breaks  Horizontal joint at 0.61m. Sub-horizontal joints at 0.66 and 0.97m.          Horizontal joint at 1.37m.		1	RUN			184							RUN #1 TCR=100% SCR=100% RQD=96% UCS=145MPa	
			2	RUN			183								RUN #2 TCR=100% SCR=100% RQD=100% UCS=195MPa
			3	RUN											RUN #3 TCR=100% SCR=100% RQD=100% UCS=163MPa
182.0	END OF BOREHOLE AT 2.9 m. BOREHOLE OPEN TO 2.9 m AND WATER LEVEL AT 0.9 m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO SURFACE.														
2.9															

RECORD OF BOREHOLE No BH10-25

1 OF 1

METRIC

W.P. 5076-06-00 LOCATION N 5 056 616.6 E 234 701.0 ORIGINATED BY GA  
HWY 69 BOREHOLE TYPE Tripod/Hilti COMPILED BY MFA  
DATUM Geodetic DATE 2010.01.20 - 2010.01.20 CHECKED BY LRB

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 <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		WATER CONTENT (%)				
183.9	GROUND SURFACE							20 40 60 80 100		20 40 60				
0.0	PEAT (50 mm)		1	SS	8									
183.4	SAND, trace silt, trace gravel, occasional rootlets													
0.5	Loose													
183.1	Brown													
0.9	Damp													
	BOULDERS and COBBLES													
	BEDROCK, granitic gneiss, fresh, coarse grained, very strong, black/white/salmon Occasional mechanical breaks. Sub-horizontal joint at 0.97 and 1.07m. Horizontal joints at 1.12 and 1.14m. Highly broken zone at 1.91 to 2.06m.		1	RUN										
			2	RUN										
			3	RUN										
180.0														
3.9	END OF BOREHOLE AT 3.9 m. BOREHOLE OPEN TO 3.9 m AND WATER LEVEL AT 0.7 m UPON COMPLETION. Piezometer installation consists of 25mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE      DEPTH (m)      ELEV. (m) 2010.01.28      1.5      182.4													


ONTM14S 6121(NAISCOOT LAKE),GPJ 5/3/12

RECORD OF BOREHOLE No BH10-26

1 OF 1

METRIC

W.P. 5076-06-00 LOCATION N 5 056 618.2 E 234 706.0 ORIGINATED BY GA  
HWY 69 BOREHOLE TYPE Tripod/Hilli COMPILED BY MFA  
DATUM Geodetic DATE 2010.01.20 - 2010.01.20 CHECKED BY LRB

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			SHEAR STRENGTH kPa						
183.9	GROUND SURFACE							20 40 60 80 100						
0.0	PEAT (200 mm)		1	SS	50/			20 40 60 80 100		20 40 60			kN/m <sup>3</sup>	GR SA SI CL
0.2	END OF BOREHOLE AT 0.2 m UPON REFUSAL ON PROBABLE BEDROCK OR BOULDER. BOREHOLE OPEN AND DRY TO 0.2 m.				000									

RECORD OF BOREHOLE No BH10-27

1 OF 1

METRIC

W.P. 5076-06-00 LOCATION N 5 056 619.8 E 234 710.7 ORIGINATED BY GA  
HWY 69 BOREHOLE TYPE Tripod/Hilti COMPILED BY MFA  
DATUM Geodetic DATE 2010.01.20 - 2010.01.20 CHECKED BY LRB

SOIL PROFILE		SAMPLES				GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT $\gamma$ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
184.0	GROUND SURFACE													
0.8	PEAT (30 mm)			SS	50/025									
	END OF BOREHOLE AT 0.03 m UPON REFUSAL ON PROBABLE BEDROCK OR BOULDER.													

ONTMT4S 6121(NAISCOOT LAKE).GPJ 5/3/12

+<sup>3</sup>, X<sup>3</sup>: Numbers refer to  
Sensitivity

20  
15 5  
10  
(%) STRAIN AT FAILURE



RECORD OF BOREHOLE No BH10-28

1 OF 1

METRIC

W.P. 5076-06-00 LOCATION N 5 056 621.3 E 234 699.4 ORIGINATED BY GA  
HWY 69 BOREHOLE TYPE Tripod/Hilli COMPILED BY MFA  
DATUM Geodetic DATE 2010.01.20 - 2010.01.20 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT $\gamma$ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
186.0	GROUND SURFACE													
0.0	PEAT (200 mm)		1	SS	50/		186							
0.2	END OF BOREHOLE AT 0.2 m UPON REFUSAL ON PROBABLE BEDROCK OR BOULDER. BOREHOLE OPEN AND DRY TO 0.2 m.				.150									

+ 3 . X 3 : Numbers refer to  
Sensitivity

20  
15 5  
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No BH10-29

1 OF 1

METRIC

W.P. 5076-06-00 LOCATION N 5 056 622.9 E 234 704.4 ORIGINATED BY GA  
HWY 69 BOREHOLE TYPE Tripod/Hill COMPILED BY MFA  
DATUM Geodetic DATE 2010.01.20 - 2010.01.25 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT $\gamma$ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
186.7	GROUND SURFACE													
0.0	PEAT		1	SS	50/ 100									
186.3														
0.4	<b>BEDROCK</b> , granitic gneiss, fresh, coarse grained, very strong, white/black/salmon, with quartz seams Highly broken zones at 0.51 to 0.61, and 1.24 to 1.37m. Quartz seam from 0.89 to 2.41m.  Occasional mechanical breaks.  Horizontal joints at 1.68, 1.73, 1.78, 1.83, 2.06, and 2.23m.  Highly broken zone at 2.72 to 3.02m.		1	RUN										
			2	RUN										
			3	RUN										
183.2														
3.5	END OF BOREHOLE AT 3.5 m. BOREHOLE OPEN TO 3.5 m AND WATER LEVEL AT 1.4 m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO SURFACE.													

+<sup>3</sup>, X<sup>3</sup>: Numbers refer to  
Sensitivity

20  
15 5  
10  
(%) STRAIN AT FAILURE

**RECORD OF BOREHOLE No BH10-30**

1 OF 1

**METRIC**

W.P. 5076-06-00 LOCATION N 5 056 624.5 E 234 709.2 ORIGINATED BY GA  
HWY 69 BOREHOLE TYPE Tripod/Hilti COMPILED BY MFA  
DATUM Geodetic DATE 2010.01.25 - 2010.01.26 CHECKED BY LRB

SOIL PROFILE				SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	SHEAR STRENGTH kPa												
						○ UNCONFINED      + FIELD VANE ● QUICK TRIAXIAL    x LAB VANE												
187.2	GROUND SURFACE																	
0.0	<b>BEDROCK</b> , granitic gneiss, fresh, coarse grained, very strong, black/white/salmon Occasional mechanical breaks.   <																	

+ <sup>3</sup> , × <sup>3</sup> : Numbers refer to  
Sensitivity

20  
15  
10  
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No BH10-37

1 OF 1

METRIC

W.P. 5076-06-00 LOCATION N 5 056 649.7 E 234 689.9 ORIGINATED BY GA  
 HWY 69 BOREHOLE TYPE Tripod/Hilli COMPILED BY MFA  
 DATUM Geodetic DATE 2010.01.18 - 2010.01.18 CHECKED BY LRB

SOIL PROFILE		SAMPLES				GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
192.8	GROUND SURFACE													
0.0	PEAT (200 mm)		1	SS	50/									
0.2	END OF BOREHOLE AT 0.2 m UPON REFUSAL ON PROBABLE BEDROCK OR BOULDER. BOREHOLE OPEN AND DRY TO 0.2 m. BOREHOLE BACKFILLED WITH CUTTINGS TO SURFACE.				.075									

ONTMT4S 6121(NAISCOOT LAKE).GPJ 5/3/12

+ 3 , × 3 : Numbers refer to  
Sensitivity





20  
15 5  
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No BH10-38

1 OF 1

METRIC

W.P. 5076-06-00 LOCATION N 5 056 651.4 E 234 694.8 ORIGINATED BY GA  
HWY 69 BOREHOLE TYPE Tripod/Hilli COMPILED BY MFA  
DATUM Geodetic DATE 2010.01.18 - 2010.01.19 CHECKED BY LRB

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 <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa ○ UNCONFINED      + FIELD VANE ● QUICK TRIAXIAL      x LAB VANE			WATER CONTENT (%) w <sub>P</sub> w      w <sub>L</sub>							
193.5	GROUND SURFACE						20	40	60	80	100				GR	SA	SI	CL
0.0	PEAT (450mm)		1	SS	19													
193.0																		
0.5	SAND, trace silt, trace gravel, occasional rootlets Compact																	
192.4	Dark Brown to Brown																	
1.0	Occasional cobbles																	
	BEDROCK, granitic gneiss, fresh, medium to coarse grained, very strong, dark grey/black/white Occasional mechanical breaks Horizontal joint at 1.09m.		1	RUN														
	Vertical joint at 2.64 to 3.00m.		2	RUN														
			3	RUN														
189.4																		
4.1	END OF BOREHOLE AT 4.1 m. BOREHOLE OPEN TO 4.1 m AND WATER LEVEL AT 0.9 m UPON COMPLETION. Piezometer installation consists of 25mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE      DEPTH (m)      ELEV. (m) 2010.01.28      1.4      192.1																	

RECORD OF BOREHOLE No BH10-39

1 OF 1

METRIC

W.P. 5076-06-00 LOCATION N 5 056 653.0 E 234 699.5 ORIGINATED BY GA  
HWY 69 BOREHOLE TYPE Tripod/Hilti COMPILED BY MFA  
DATUM Geodetic DATE 2010.01.19 - 2010.01.19 CHECKED BY LRB

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			20	40	60	80	100		
194.1	GROUND SURFACE												
0.0	PEAT (100 mm)		1	SS	50/	194							
0.1	BEDROCK, granitic gneiss, fresh, medium to coarse grained, strong to very strong, black/white/salmon Occasional mechanical breaks. Horizontal joints at 0.79 and 0.81m.		1	RUN		194							RUN #1 TCR=100% SCR=97% RQD=97% UCS=98MPa
			2	RUN		193							RUN #2 TCR=100% SCR=100% RQD=100% UCS=216MPa
			3	RUN		192							RUN #3 TCR=100% SCR=100% RQD=100% UCS=162MPa
191.0	Biotite seam at 2.62 to 2.69m.												
3.0	END OF BOREHOLE AT 3.0 m. BOREHOLE OPEN TO 3.0 m AND WATER LEVEL AT 0.6 m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO SURFACE.												

+ 3, X 3

Numbers refer to  
Sensitivity

20  
15  
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No BH10-40

1 OF 1

METRIC

W.P. 5076-06-00 LOCATION N 5 056 654.4 E 234 688.2 ORIGINATED BY GA  
HWY 69 BOREHOLE TYPE Tripod/Hilti COMPILED BY MFA  
DATUM Geodetic DATE 2010.01.18 - 2010.01.18 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT LIMIT			UNIT WEIGHT  kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		WATER CONTENT (%)				
194.6	GROUND SURFACE							20 40 60 80 100		20 40 60				
0.0	PEAT (100 mm)							20 40 60 80 100		20 40 60				
0.1	SAND, trace silt, occasional rootlets Loose to Compact Brown Wet Boulder at 0.7m (100mm)		1	SS	7		194							
			2	SS	50/ 075									
193.4			3	SS	50/ 050		193							
1.3	BEDROCK, granitic gneiss, fresh, coarse grained, strong to very strong, dark grey/black/white/salmon Occasional mechanical breaks. Horizontal joints at 1.32 and 1.37m		1	RUN			192							
			2	RUN			191							
			3	RUN										
190.5														
4.2	END OF BOREHOLE AT 4.2 m. BOREHOLE OPEN TO 4.2 m AND WATER LEVEL AT 0.8 m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO SURFACE.													

RECORD OF BOREHOLE No BH10-41

1 OF 1

METRIC

W.P. 5076-06-00 LOCATION N 5 056 656 1 E 234 693 2 ORIGINATED BY GA  
HWY 69 BOREHOLE TYPE Tripod/Hilti COMPILED BY MFA  
DATUM Geodetic DATE 2010.01.18 - 2010.01.18 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
195.3	GROUND SURFACE													
0.0	PEAT (100mm)		1	SS	50/									
0.1														
0.2	SAND, trace silt, occasional rootlets Loose Brown Moist  END OF BOREHOLE AT 0.2 m UPON REFUSAL ON PROBABLE BEDROCK OR BOULDER. BOREHOLE OPEN AND DRY TO 0.2 m. BOREHOLE BACKFILLED WITH CUTTINGS TO SURFACE.				075									

ONTMT4S 6121(NAISCOOT LAKE).GPJ 5/3/12



RECORD OF BOREHOLE No BH10-42

1 OF 1

METRIC

W.P. 5076-06-00 LOCATION N 5 056 657.7 E 234 697.9 ORIGINATED BY GA  
HWY 69 BOREHOLE TYPE Tripod/Hilli COMPILED BY MFA  
DATUM Geodetic DATE 2010.01.19 - 2010.01.19 CHECKED BY LRB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT $\gamma$ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
196.2	GROUND SURFACE													
0.0	PEAT (100 mm)													
0.1	SAND, trace silt, occasional rootlets, organic odour Loose to Compact Brown to Dark Brown Damp to Moist		1	SS	7		196							
195.1			2	SS	15									
1.1	END OF BOREHOLE AT 1.1 m UPON REFUSAL ON PROBABLE BEDROCK. BOREHOLE OPEN AND DRY TO 1.1 m. BOREHOLE BACKFILLED WITH CUTTINGS TO SURFACE.													

ONTM/T4S 6121(NAISCOOT LAKE).GPJ 5/3/12

+<sup>3</sup>, X<sup>3</sup>: Numbers refer to  
Sensitivity

20  
15  
10  
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No NL10-01

1 OF 2

METRIC

W.P. 5076-06-00 LOCATION N 5 056 544.5 E 234 724.1 ORIGINATED BY SLL  
HWY 69 BOREHOLE TYPE BW Casing - Split Spoon/AQ Core COMPILED BY LRB  
DATUM Geodetic DATE 2010.08.10 - 2010.08.11 CHECKED BY AEG

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT $\gamma$ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
182.1 0.0	LAKE SURFACE  <b>WATER</b>						182							
178.4 3.7	Silty <b>CLAY</b> Soft to firm Grey						181							
177.1 5.0	Silty <b>SAND</b> , trace gravel, occasional cobbles Dense to very dense Grey Moist		1	SS	34		180							
			2	SS	50 / 0.075		179							
175.0 7.1	<b>BEDROCK</b> , granitic gneiss, very strong Sub-horizontal joints at 7.2, 7.3, 7.4, 7.5, and 7.7 m  Vertical joint from 8.89 to 8.94 m Quartz vein from 9.04 to 9.14 m		1	RUN			178							
			2	RUN			177							
			3	RUN			176							
							175							
							174							
							173							

Continued Next Page

+<sup>3</sup> . X<sup>3</sup> : Numbers refer to  
Sensitivity

20  
15 5  
10 (%) STRAIN AT FAILURE

ONTMT4S 6121(NAISCOOT LAKE).GPJ 5/3/12

RECORD OF BOREHOLE No NL10-01

2 OF 2

METRIC

W.P. 5076-06-00 LOCATION N 5 056 544.5 E 234 724.1 ORIGINATED BY SLL  
 HWY 69 BOREHOLE TYPE BW Casing - Split Spoon/AQ Core COMPILED BY LRB  
 DATUM Geodetic DATE 2010.08.10 - 2010.08.11 CHECKED BY AEG

SOIL PROFILE		SAMPLES				GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>P</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100					
	Continued From Previous Page																
171.9							172										
10.2	END OF BOREHOLE AT 10.2 m. BOREHOLE BACKFILLED WITH BENTONITE TO 6.1 m.																

ONTMT4S 6121(NAISCOOT LAKE).GPJ 5/3/12

+ 3, x 3: Numbers refer to  
Sensitivity

20  
15 5  
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No NL10-02

1 OF 1

METRIC

W.P. 5076-06-00 LOCATION N 5 056 548 1 E 234 722.6 ORIGINATED BY SLL  
HWY 69 BOREHOLE TYPE BW Casing - Split Spoon/AQ Core COMPILED BY LRB  
DATUM Geodetic DATE 2010.08.13 - 2010.08.13 CHECKED BY AEG

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT  $\gamma$  kN/m <sup>3</sup>	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				
182.1	LAKE SURFACE											
0.0	WATER											

ONTMT4S 6121(NAISCOOT LAKE).GPJ 5/3/12

+<sup>3</sup> . X<sup>3</sup> : Numbers refer to  
Sensitivity

20  
15 5  
10 (%) STRAIN AT FAILURE

## METRIC

[illegible]

RECORD OF BOREHOLE No NL10-04

1 OF 1

METRIC

W.P. 5076-06-00 LOCATION N 5 056 552.9 E 234 721.4 ORIGINATED BY SLL  
HWY 69 BOREHOLE TYPE BW Casing - Split Spoon/AQ Core COMPILED BY LRB  
DATUM Geodetic DATE 2010.08.11 - 2010.08.11 CHECKED BY AEG

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT  $\gamma$ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)		
								20	40	60			80	100	20
182.1	LAKE SURFACE														
0.0	<b>WATER</b>														
177.4															
4.7	Silty <b>CLAY</b> , trace sand, trace organics Very soft Grey		1	GS											
176.8			2	SS	50/0.05										
5.3	<b>BEDROCK</b> , granitic gneiss, fresh, strong		1	RUN											
			2	RUN											
			3	RUN											
173.8															
8.3	END OF BOREHOLE AT 8.3 m. BOREHOLE BACKFILLED WITH BENTONITE TO 5.2m.														

ONTMT4S 6121(NAISCOOT LAKE) GPJ 5/3/12

RECORD OF BOREHOLE No NL10-05

1 OF 1

METRIC

W.P. 5076-06-00 LOCATION N 5 056 544.7 E 234 727.2 ORIGINATED BY SLL  
HWY 69 BOREHOLE TYPE BW Casing - Split Spoon/AQ Core COMPILED BY LRB  
DATUM Geodetic DATE 2010.08.13 - 2010.08.13 CHECKED BY AEG

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT $\gamma$ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	
182.1	LAKE SURFACE							SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE				
0.0	WATER							20 40 60 80 100				
178.6	Silty CLAY Very soft Grey (Cl)		1	GS								0 1 44 55
177.6	Sandy SILT, trace gravel Loose Grey Moist		2	SS	7							
176.9	Silty SAND, trace gravel, occasional cobbles Very dense Grey Moist											
176.2			3	SS	50 / 0.1							
175.0	BEDROCK											
6.1	END OF BOREHOLE AT 6.1 m.											

ONTM4S 6121(NAISCOOT LAKE).GPJ 5/3/12

RECORD OF BOREHOLE No NL10-06

1 OF 1

METRIC

W.P. 5076-06-00 LOCATION N 5 056 548.7 E 234 726.4 ORIGINATED BY SLL  
HWY 69 BOREHOLE TYPE BW Casing - Split Spoon/AQ Core COMPILED BY LRB  
DATUM Geodetic DATE 2010.08.12 - 2010.08.12 CHECKED BY AEG

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT LIMIT			UNIT WEIGHT  $\gamma$  kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)  GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE		WATER CONTENT (%) w <sub>p</sub> w w <sub>L</sub>				
182.1 0.0	LAKE SURFACE  WATER						20 40 60 80 100	20 40 60						
178.4 3.7	Silty CLAY Very soft Grey		1	GS										
177.5 4.6 177.3 4.8	Sandy SILT, trace gravel Very dense Grey Moist to wet		2	SS	50 / 0.08									
	BEDROCK, granitic gneiss, fresh, very strong Sub-vertical joints at 5.41 to 5.43 m, 6.12 to 6.15 m, 6.25 to 6.32 m, and 6.45 to 6.48 m		1	RUN										
			2	RUN										
			3	RUN										
174.0 8.1	Quartz veins at 7.67 to 7.72 m and 7.92 to 8.08 m													
	END OF BOREHOLE AT 8.1 m. BOREHOLE BACKFILLED WITH BENTONITE TO 4.8m.													

ONTM14S 6121(NAISCOOT LAKE) GPJ 5/3/12

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



RECORD OF BOREHOLE No NL10-07

1 OF 1

METRIC

W.P. 5076-06-00 LOCATION N 5 056 551.6 E 234 726.1 ORIGINATED BY SLL  
HWY 69 BOREHOLE TYPE BW Casing - Split Spoon/AQ Core COMPILED BY LRB  
DATUM Geodetic DATE 2010.08.12 - 2010.08.12 CHECKED BY AEG

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>		
182.1 0.0	LAKE SURFACE  WATER						182						
178.1 3.9	Silty CLAY Very soft Grey		1	GS			181						
177.4 4.7	Silty SAND, trace gravel Very dense Grey Moist		2	SS	66		180						
176.3 5.8	Occasional cobbles BEDROCK, granitic gneiss, very strong		1	RUN			179						
			2	RUN			178						
			3	RUN			177						
	Sub-vertical joint at 7.54 to 7.62 m and 7.87 to 7.92 m						176						
173.2 8.9	END OF BOREHOLE AT 8.9 m. BOREHOLE BACKFILLED WITH BENTONITE TO 5.5m.						175						
							174						

ONTMT4S 6121(NAISCOOT LAKE).GPJ 5/3/12

+<sup>3</sup> ×<sup>3</sup>: Numbers refer to  
Sensitivity 20  
15 5  
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No NL10-08

1 OF 1

METRIC

W.P. 5076-06-00 LOCATION N 5 056 553.5 E 234 726.1 ORIGINATED BY SLL  
HWY 69 BOREHOLE TYPE BW Casing - Split Spoon/AQ Core COMPILED BY LRB  
DATUM Geodetic DATE 2010.08.13 - 2010.08.13 CHECKED BY AEG

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	UNIT WEIGHT γ kN/m <sup>3</sup>	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							
182.1	LAKE SURFACE							20 40 60 80 100							
0.0	WATER							20 40 60 80 100							
178.0															
4.1	Silty <b>CLAY</b> Very soft Grey		1	GS											
177.4															
4.7	Silty <b>SAND</b> , trace gravel Very dense Grey Moist		2	SS	56										
176.5															
176.5	Probable <b>BEDROCK</b>														
5.7	END OF HOLE AT 5.7 m.														

ONTMT4S 6121(NAISCOOT LAKE) GPJ 5/3/12

+<sup>3</sup> X<sup>3</sup> Numbers refer to  
Sensitivity 20  
15 5  
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No NL10-09

1 OF 1

METRIC

W.P. 5076-06-00 LOCATION N 5 056 544.4 E 234 730.8 ORIGINATED BY SLL  
HWY 69 BOREHOLE TYPE BW Casing - Split Spoon/AQ Core COMPILED BY LRB  
DATUM Geodetic DATE 2010.08.10 - 2010.08.10 CHECKED BY AEG

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 <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		WATER CONTENT (%)				
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE × LAB VANE	w <sub>p</sub>	w	w <sub>L</sub>		
182.1	LAKE SURFACE						20 40 60 80 100						GR SA SI CL	
0.0	WATER													
178.8							182							
							181							
							180							
							179							
3.3	Silty CLAY Very soft to firm Grey						178							
			1	SS	13									
177.4														
4.7	Silty SAND, trace gravel Compact to dense Grey													
176.9	Moist		1	RUN			177							
5.2	BEDROCK, granitic gneiss, fresh, very strong													
			2	RUN			176							
	Vertical joints at 6.61 to 6.93 m and 7.09 to 7.42 m		3	RUN			175							
			4	RUN										
			5	RUN			174							
173.6														
8.5	END OF BOREHOLE AT 8.5 m. BOREHOLE BACKFILLED WITH BENTONITE TO 5.2 m.													

ONTM14S 6121(NAISCOOT LAKE) GPJ 5/3/12

RECORD OF BOREHOLE No NL10-10

1 OF 1

METRIC

W.P. 5076-06-00 LOCATION N 5 056 549.9 E 234 729.9 ORIGINATED BY SLL  
HWY 69 BOREHOLE TYPE BW Casing - Split Spoon/AQ Core COMPILED BY LRB  
DATUM Geodetic DATE 2010.08.14 - 2010.08.14 CHECKED BY AEG

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT $\gamma$ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	
182.1	LAKE SURFACE							SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE				
0.0	WATER						182	20 40 60 80 100	20 40 60			
178.5							181					
3.6	Silty CLAY Very Soft Grey		1	GS			180					
177.9							179					
4.2	Sandy SILT, trace clay Loose Grey Moist to wet		2	SS	4		178					2 29 65 4
177.0												
5.1	END OF BOREHOLE AT 5.1 m UPON AUGER REFUSAL ON PROBABLE BEDROCK											

ONT\MT4S 6121(NAISCOOT LAKE).GPJ 5/3/12

# RECORD OF BOREHOLE No NL10-11

1 OF 1

METRIC

W.P. 5076-06-00 LOCATION N 5 056 552.3 E 234 729.5 ORIGINATED BY SLL  
 HWY 69 BOREHOLE TYPE BW Casing - Split Spoon/AQ Core COMPILED BY LRB  
 DATUM Geodetic DATE 2010.08.14 - 2010.08.14 CHECKED BY AEG

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT  γ  kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)  GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					
182.1	LAKE SURFACE							20 40 60 80 100					
0.0	WATER							20 40 60 80 100					

ONTM14S 6121(NAISCOOT LAKE).GPJ 5/3/12

# RECORD OF BOREHOLE No NL10-12

1 OF 1

METRIC

W.P. 5076-06-00 LOCATION N 5 056 554.6 E 234 728.7 ORIGINATED BY SLL  
 HWY 69 BOREHOLE TYPE BW Casing - Split Spoon/AQ Core COMPILED BY LRB  
 DATUM Geodetic DATE 2010.08.11 - 2010.08.12 CHECKED BY AEG

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT $\gamma$ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
182.1	LAKE SURFACE													
0.0	WATER													
178.2														
3.9	Sandy SILT, some clay Very loose to dense Grey Wet		1	SS	50 / 0.15									
177.5														
4.5	BEDROCK, granitic gneiss, fresh, very strong Vertical joint at 4.62 to 4.70 m		1	RUN										
			2	RUN										
			3	RUN										
174.3														
7.7	END OF BOREHOLE AT 7.7 m. BOREHOLE BACKFILLED WITH BENTONITE TO 4.3m.													

ONTMT4S 6121(NAISCOOT LAKE)/GPJ 5/3/12

+ <sup>3</sup> , X <sup>3</sup> : Numbers refer to  
Sensitivity

20  
15 10 5  
(%) STRAIN AT FAILURE

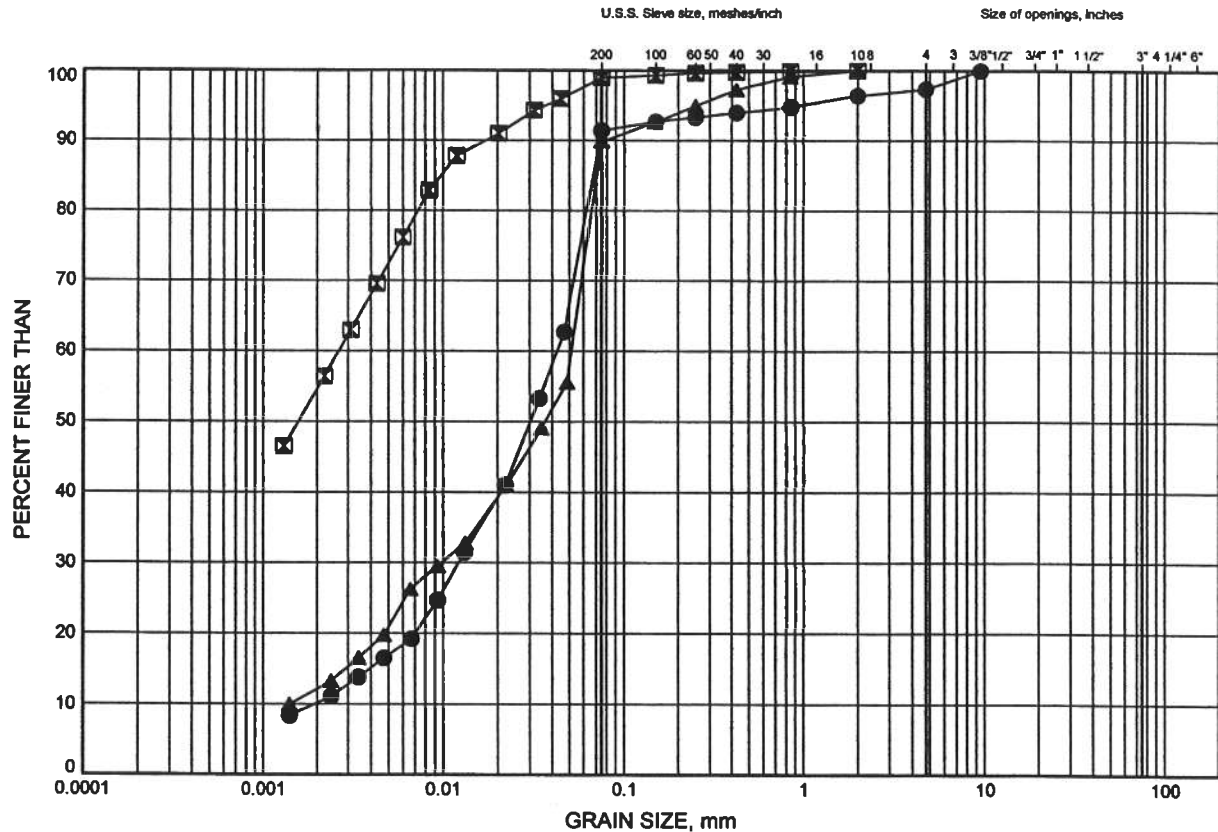
## **Appendix B**

### **Laboratory Test Results**

# Hwy 69 Four-Laning North of Hwy 529 GRAIN SIZE DISTRIBUTION

FIGURE B1

## Silty Clay to Clayey Silt



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

### LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	NL10-03	5.03	177.06
⊠	NL10-05	3.89	178.23
▲	NL10-11	3.96	178.13



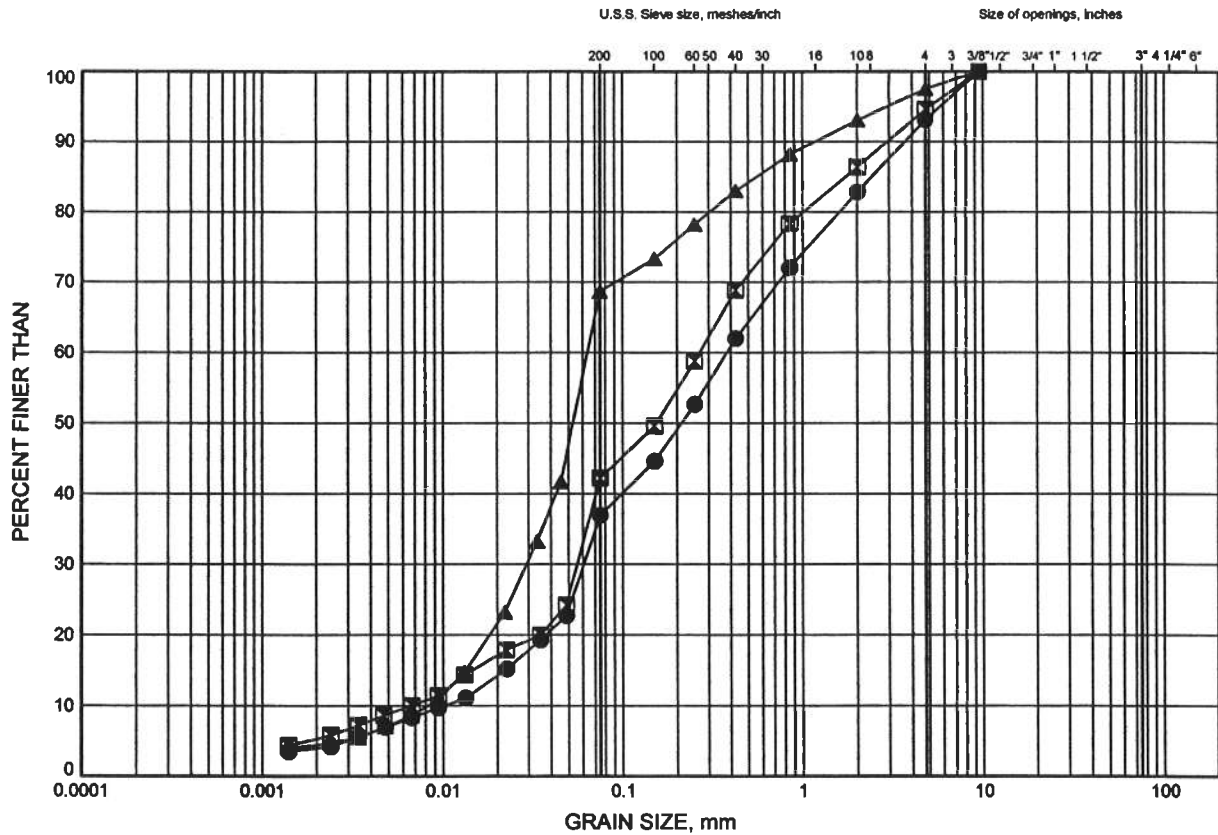
W.P.# 5076-06-00  
Prepared By LRB  
Checked By AEG



# Hwy 69 Four-Laning North of Hwy 529 GRAIN SIZE DISTRIBUTION

FIGURE B2

Sandy Silt to Silty Sand



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

## LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	NL10-02	5.31	176.81
◻	NL10-08	5.23	176.86
▲	NL10-10	4.44	177.64

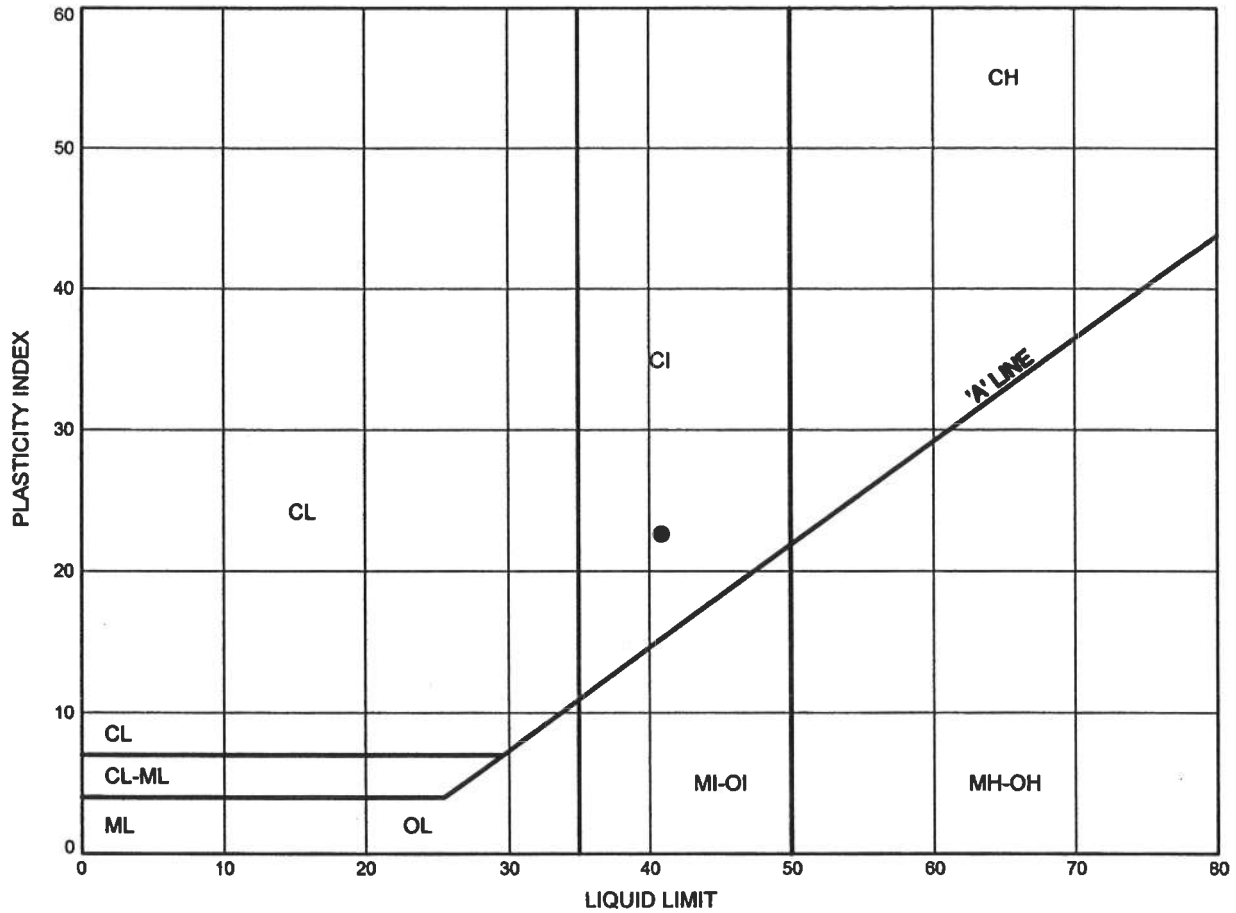


W.P.# 5076-06-00  
Prepared By LRB  
Checked By AEG

Hwy 69 Four-Laning North of Hwy 529  
**ATTERBERG LIMITS TEST RESULTS**

FIGURE B3

Silty Clay to Clayey Silt



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	NL10-05	3.89	178.23

Date September 2010  
 Project 5076-06-00



Prep'd LRB  
 Chkd. AEG

**TABLE 1 - Point Load Test Results**

NAISCOOT LAKE BRIDGE - SBL

## HWY 69 FOUR-LANING

**FROM THE SOUTH JUNCTION OF HIGHWAY 69 AND HIGHWAY 529, NORTHERLY 15 KM**

[illegible][illegible][illegible][illegible]

[illegible]

**TABLE 1 - Point Load Test Results**

**NAISCOOT LAKE BRIDGE - SBL**

## HWY 69 FOUR-LANING

**FROM THE SOUTH JUNCTION OF HIGHWAY 69 AND HIGHWAY 529, NORTHERLY 15 KM**

[illegible][illegible][illegible][illegible]

**FROM THE SOUTH JUNCTION OF HIGHWAY 69 AND HIGHWAY 529, NORTHERLY 15 KM**

[illegible][illegible][illegible]



**FROM THE SOUTH JUNCTION OF HIGHWAY 69 AND HIGHWAY 529, NORTHERLY 15 KM**

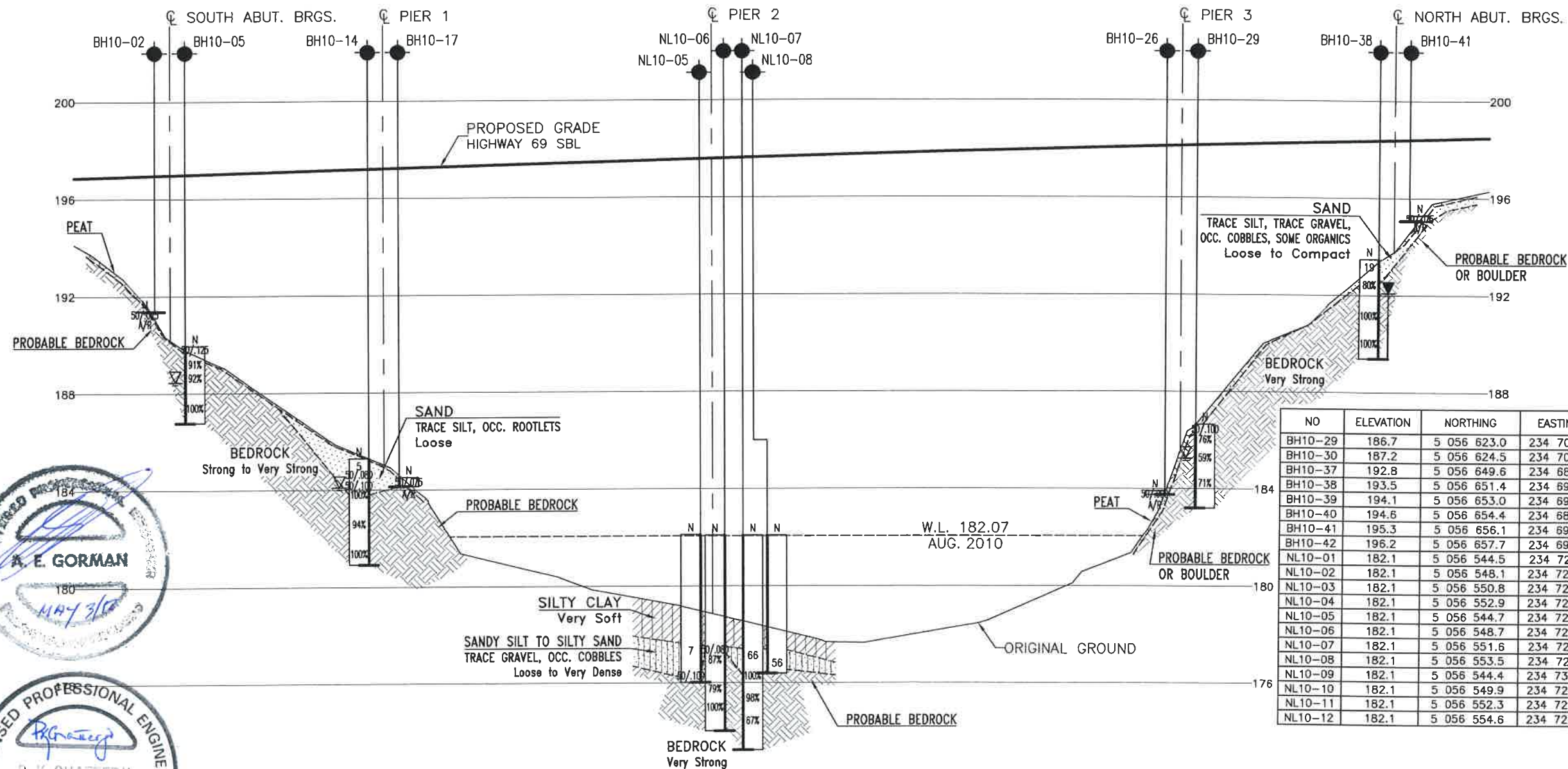
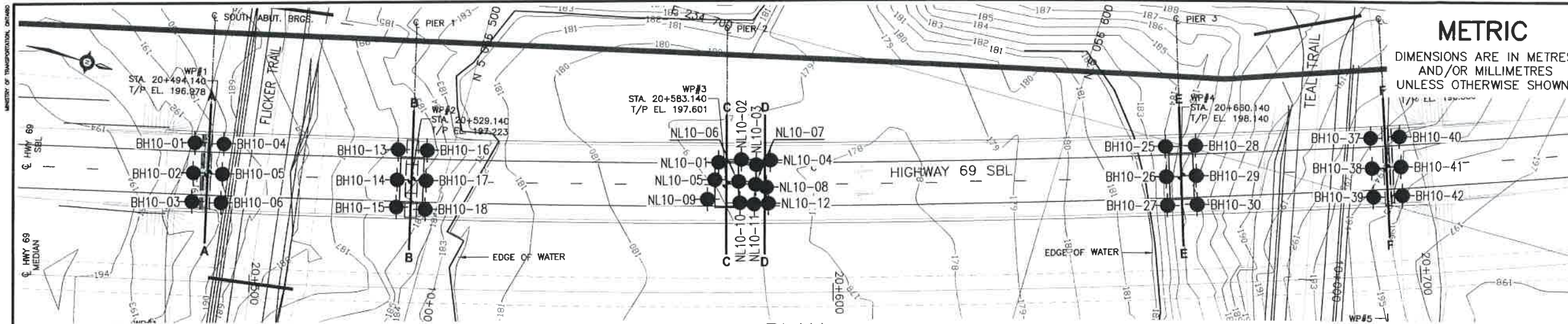
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## **Appendix C**

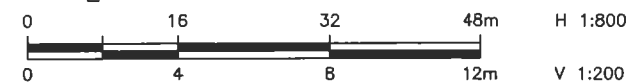
### **Drawings**

#### **Borehole Locations and Soil Strata**





PROFILE ALONG C HIGHWAY 69 SBL AT NAISCOOT LAKE



## METRIC

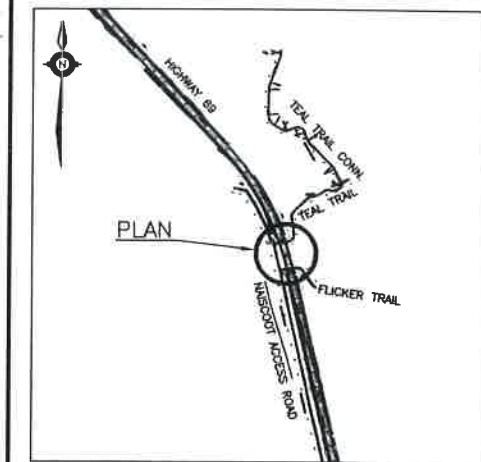
DIMENSIONS ARE IN METRES  
AND/OR MILLIMETRES  
UNLESS OTHERWISE SHOWN

CONT No  
WP No 5076-06-00

HIGHWAY 69 FOUR-LANING  
NAISCOOT LAKE BRIDGE  
SOUTHBOUND LANES  
BOREHOLE LOCATIONS AND SOIL STRATA

**MMM GROUP**

**THURBER ENGINEERING LTD.**



## 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
- Head Artesian Water
- Piezometer
- 90%
- Rock Quality Designation (RQD)
- A/R
- Auger Refusal

NO	ELEVATION	NORTHING	EASTING	NO	ELEVATION	NORTHING	EASTING
BH10-29	186.7	5 056 623.0	234 704.4	BH10-01	191.6	5 056 457.0	234 744.7
BH10-30	187.2	5 056 624.5	234 709.2	BH10-02	191.4	5 056 458.1	234 749.8
BH10-37	192.8	5 056 649.6	234 689.9	BH10-03	191.2	5 056 459.2	234 754.6
BH10-38	193.5	5 056 651.4	234 694.8	BH10-04	189.7	5 056 461.8	234 743.5
BH10-39	194.1	5 056 653.0	234 699.5	BH10-05	190.0	5 056 463.0	234 748.6
BH10-40	194.6	5 056 654.4	234 688.2	BH10-06	190.8	5 056 464.1	234 753.5
BH10-41	195.3	5 056 656.1	234 693.2	BH10-13	185.5	5 056 490.9	234 736.6
BH10-42	196.2	5 056 657.7	234 697.9	BH10-14	185.3	5 056 492.2	234 741.7
NL10-01	182.1	5 056 544.5	234 724.1	BH10-15	186.3	5 056 493.3	234 746.3
NL10-02	182.1	5 056 548.1	234 722.6	BH10-16	185.2	5 056 495.8	234 735.4
NL10-03	182.1	5 056 550.8	234 722.8	BH10-17	184.5	5 056 497.1	234 740.5
NL10-04	182.1	5 056 552.9	234 721.4	BH10-18	184.9	5 056 498.2	234 745.3
NL10-05	182.1	5 056 544.7	234 727.2	BH10-25	183.9	5 056 618.6	234 701.0
NL10-06	182.1	5 056 548.7	234 726.4	BH10-26	183.9	5 056 618.2	234 706.0
NL10-07	182.1	5 056 551.6	234 726.1	BH10-27	184.0	5 056 619.8	234 710.7
NL10-08	182.1	5 056 553.5	234 726.1	BH10-28	186.0	5 056 621.3	234 699.4
NL10-09	182.1	5 056 544.4	234 730.8				
NL10-10	182.1	5 056 549.9	234 729.9				
NL10-11	182.1	5 056 552.3	234 729.5				
NL10-12	182.1	5 056 554.6	234 728.7				

## 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.

GEOCRE No. 41H-93

DATE	BY	DESCRIPTION
DESIGN	LRB	CHK AEG
DRAWN	MFA	CHK PKG
		SITE
		STRUCT
		DWG 1



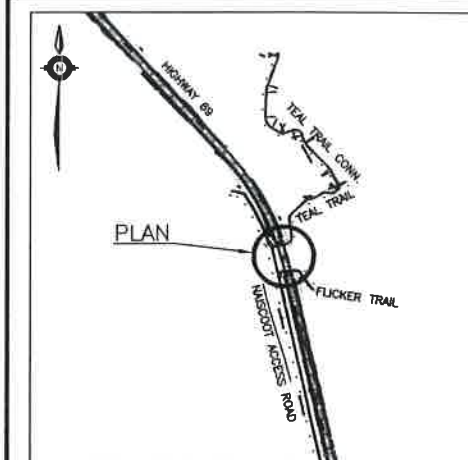


**METRIC**DIMENSIONS ARE IN METRES  
AND/OR MILLIMETRES  
UNLESS OTHERWISE SHOWNCONT No  
WP No 5076-06-00HIGHWAY 69 FOUR-LANING  
NAISCOOT LAKE BRIDGE  
SOUTHBOUND LANES  
BOREHOLE LOCATIONS AND SOIL STRATA

SHEET

**MMM GROUP**

THURBER ENGINEERING LTD.

**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
	Head Artesian Water
	Piezometer
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

NO	ELEVATION	NORTHING	EASTING
BH10-01	191.6	5 056 457.0	234 744.7
BH10-02	191.4	5 056 458.1	234 749.8
BH10-03	191.2	5 056 459.2	234 754.6
BH10-04	189.7	5 056 461.8	234 743.5
BH10-05	190.0	5 056 463.0	234 748.6
BH10-06	190.8	5 056 464.1	234 753.5
BH10-13	185.5	5 056 490.9	234 736.6
BH10-14	185.3	5 056 492.2	234 741.7
BH10-15	186.3	5 056 493.3	234 746.3
BH10-16	185.2	5 056 495.8	234 735.4
BH10-17	184.5	5 056 497.1	234 740.5
BH10-18	184.9	5 056 498.2	234 745.3
BH10-25	183.9	5 056 616.6	234 701.0
BH10-26	183.9	5 056 618.2	234 706.0
BH10-27	184.0	5 056 619.8	234 710.7
BH10-28	186.0	5 056 621.3	234 699.4

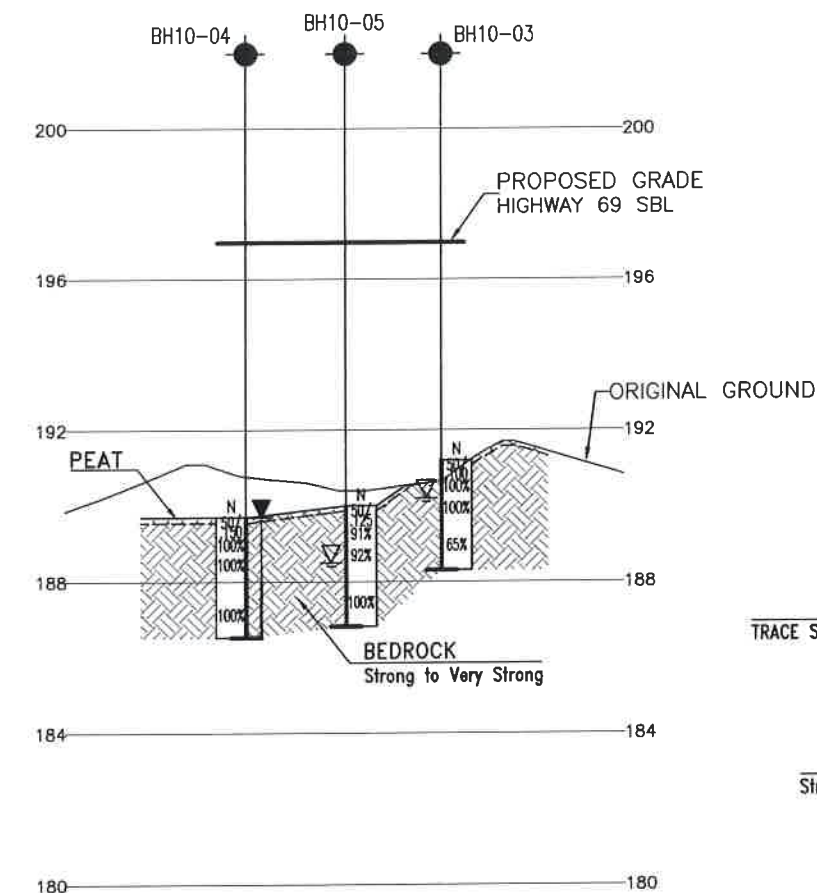
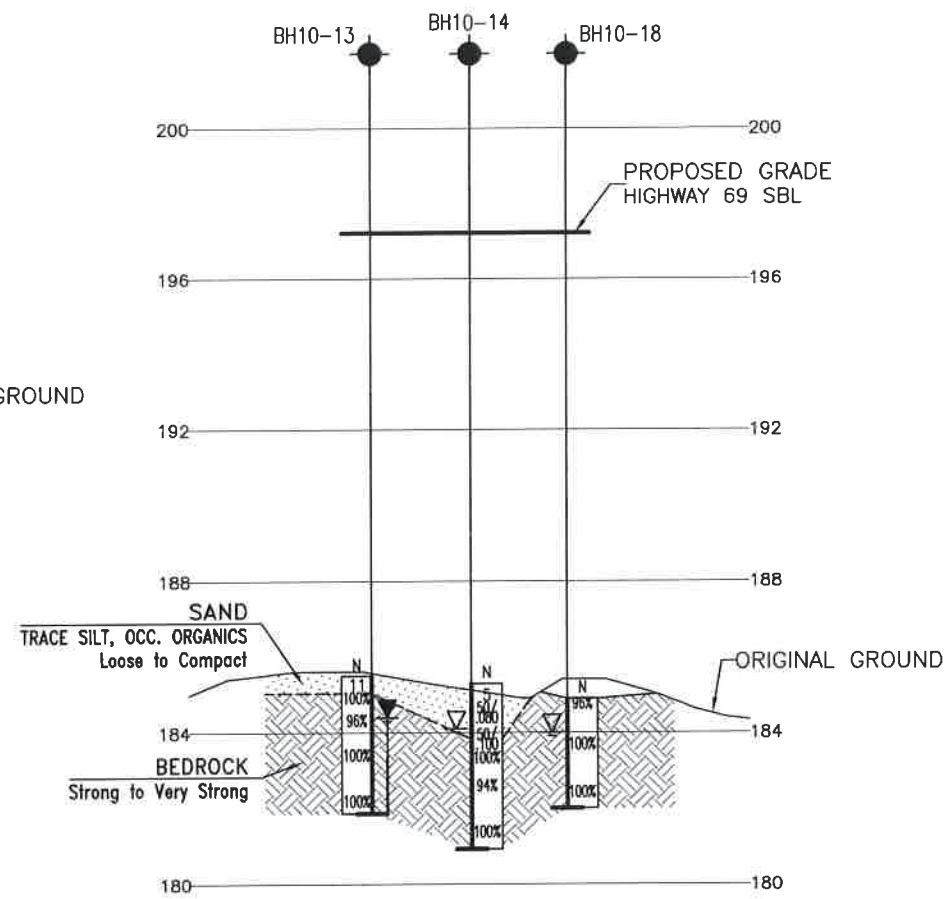
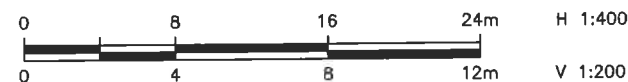
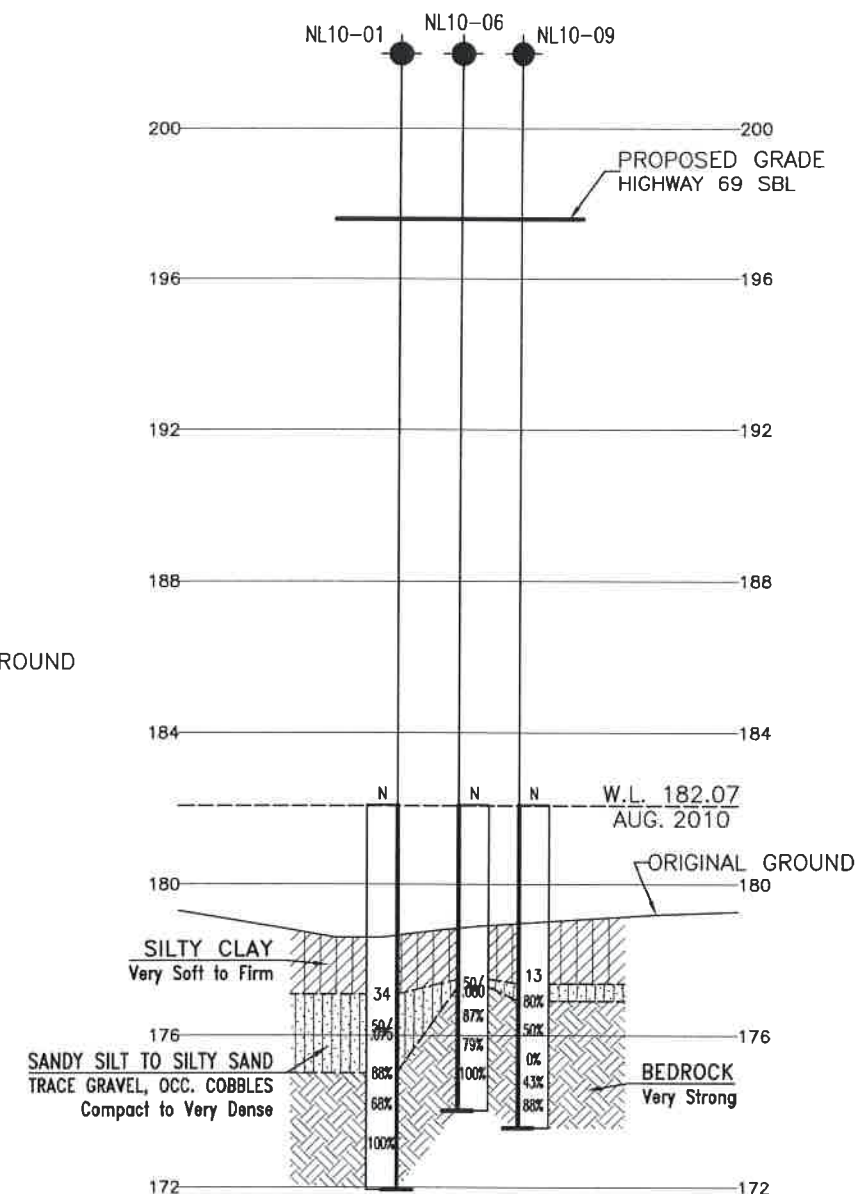
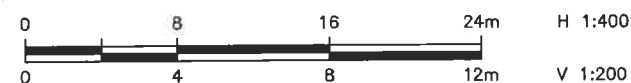
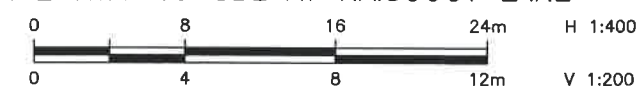
**-NOTES-**

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**GEOCRES No. 41H-93**

REVISIONS

DATE	BY	DESCRIPTION
DESIGN	LRB	CHK AEG CODE
DRAWN	MFA	CHK PKC SITE
		STRUCT DWG 2

SECTION A-A  
S. ABUT. HWY 69 SBL AT NAISCOOT LAKESECTION B-B  
PIER 1 HWY 69 SBL AT NAISCOOT LAKESECTION C-C  
PIER 2 HWY 69 SBL AT NAISCOOT LAKE

NO	ELEVATION	NORTHING	EASTING
BH10-29	186.7	5 056 623.0	234 704.4
BH10-30	187.2	5 056 624.5	234 709.2
BH10-37	192.8	5 056 649.6	234 689.9
BH10-38	193.5	5 056 651.4	234 694.8
BH10-39	194.1	5 056 653.0	234 699.5
BH10-40	194.6	5 056 654.4	234 688.2
BH10-41	195.3	5 056 656.1	234 693.2
BH10-42	196.2	5 056 657.7	234 697.9
NL10-01	182.1	5 056 544.5	234 724.1
NL10-02	182.1	5 056 548.1	234 722.6
NL10-03	182.1	5 056 550.8	234 722.8
NL10-04	182.1	5 056 552.9	234 721.4
NL10-05	182.1	5 056 544.7	234 727.2
NL10-06	182.1	5 056 548.7	234 726.4
NL10-07	182.1	5 056 551.6	234 726.1
NL10-08	182.1	5 056 553.5	234 726.1
NL10-09	182.1	5 056 544.4	234 730.8
NL10-10	182.1	5 056 549.9	234 729.9
NL10-11	182.1	5 056 552.3	234 729.5
NL10-12	182.1	5 056 554.6	234 728.7





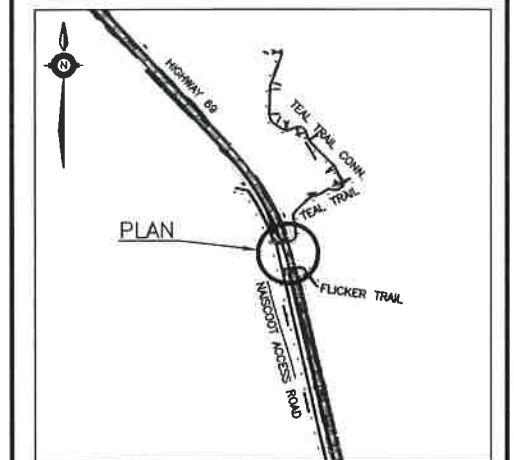
# METRIC

DIMENSIONS ARE IN METRES  
AND/OR MILLIMETRES  
UNLESS OTHERWISE SHOWN

CONT No  
WP No 5076-06-00

HIGHWAY 69 FOUR-LANING  
NAISCOOT LAKE BRIDGE  
SOUTHBOUND LANES  
BOREHOLE LOCATIONS AND SOIL STRATA

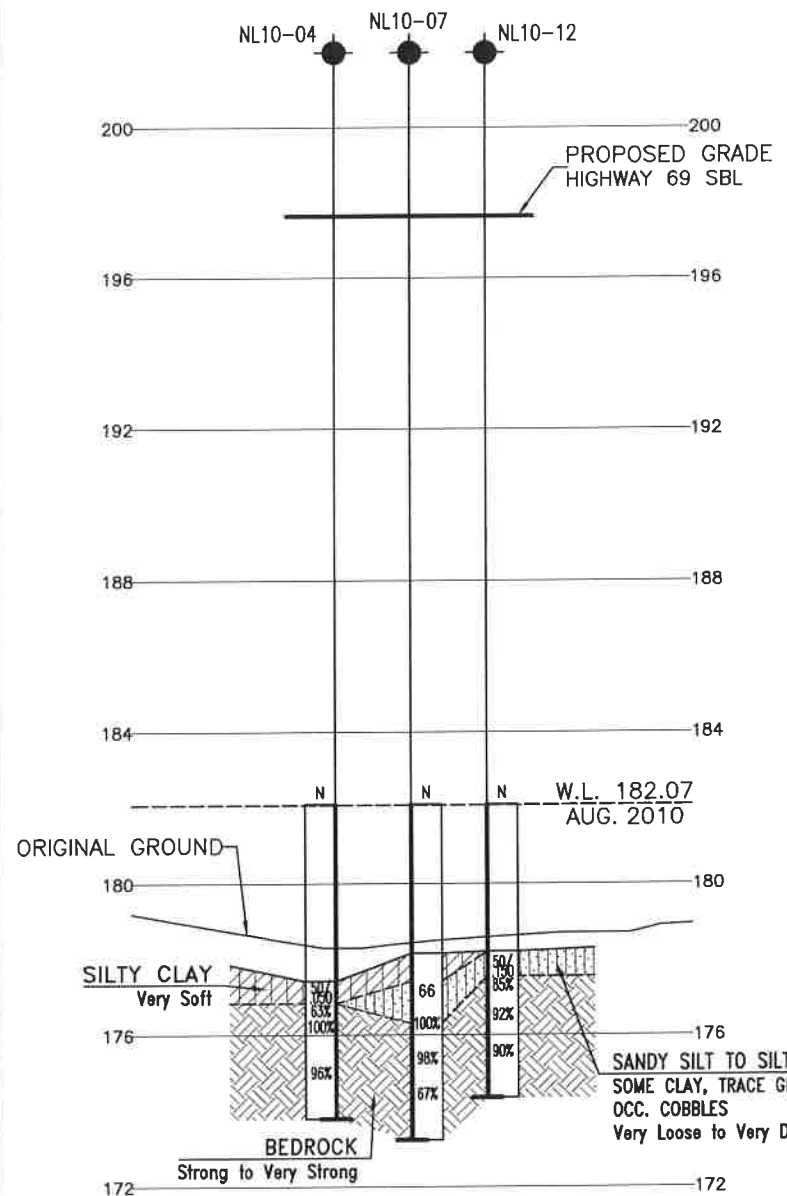
SHEET



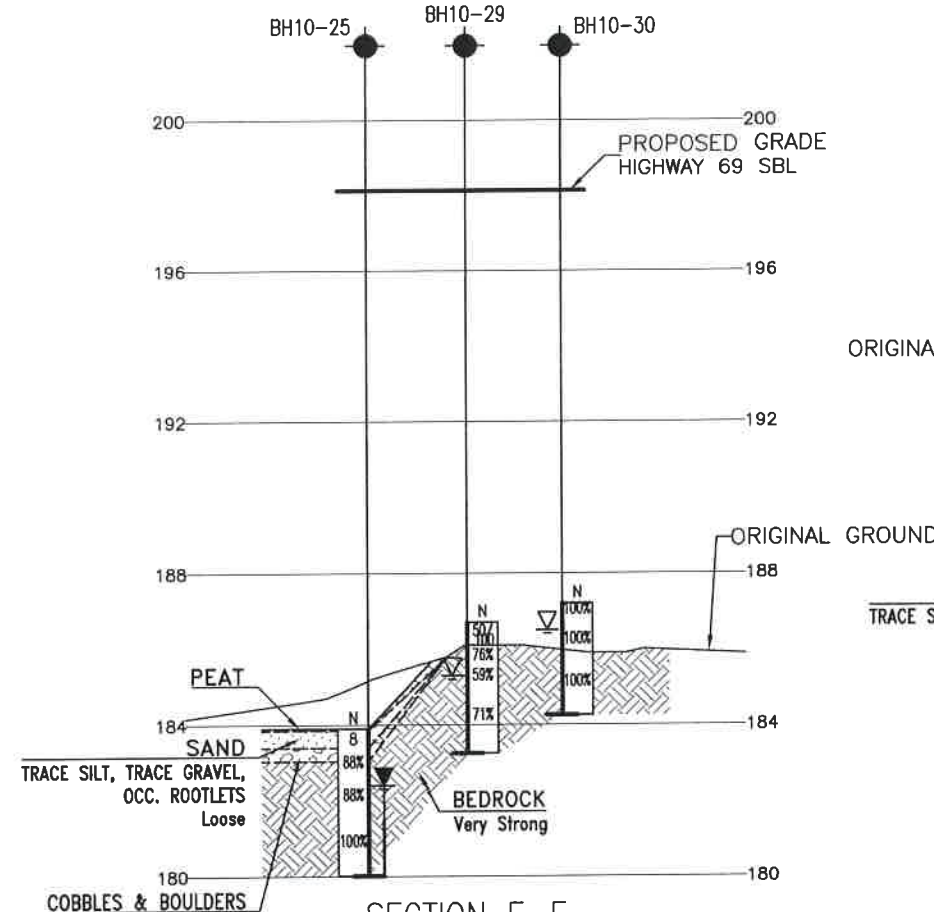
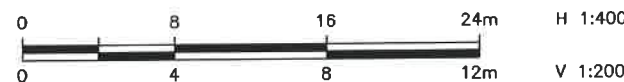
## KEYPLAN

## LEGEND

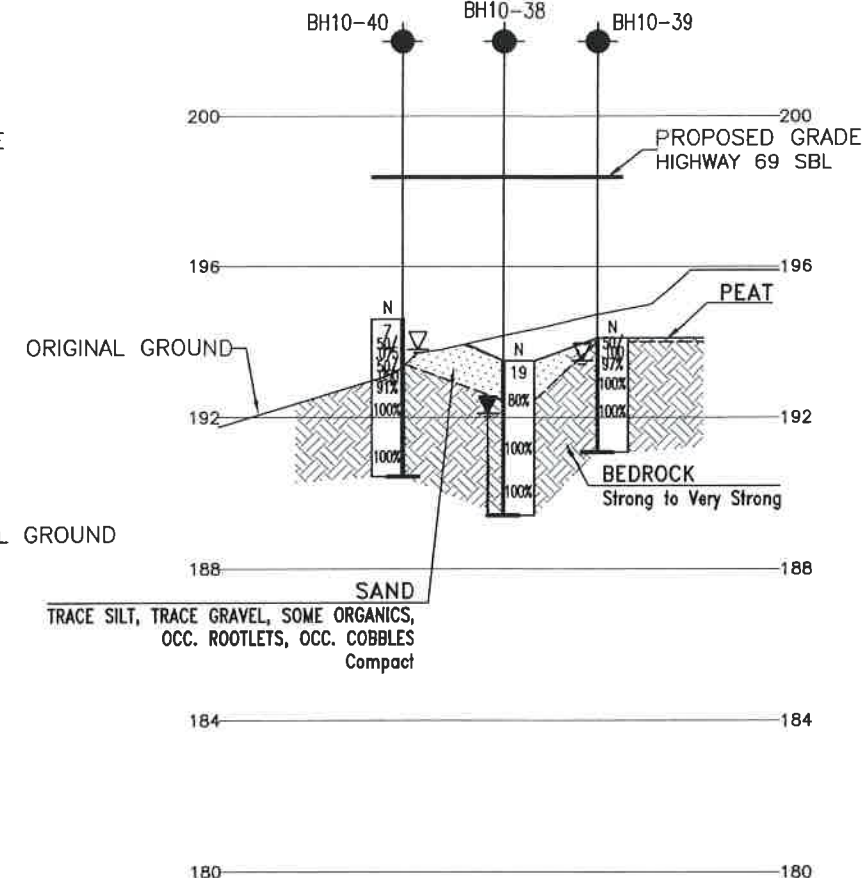
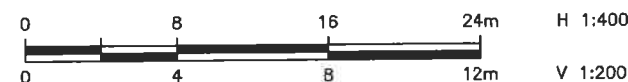
- ◆ Borehole
- ◆ Cone
- N Blows /0.3m (Std Pen Test, 475J/blow)
- CONE Blows /0.3m (60° Cone, 475J/blow)
- PH Pressure, Hydraulic
- W Water Level
- HA Head Artesian Water
- P Piezometer
- 90% Rock Quality Designation (RQD)
- A/R Auger Refusal



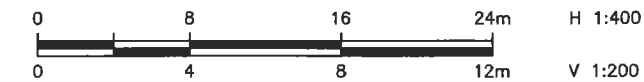
SECTION D-D  
PIER 2 HWY 69 SBL AT NAISCOOT LAKE



SECTION E-E  
PIER 3 HWY 69 SBL AT NAISCOOT LAKE



SECTION F-F  
N. ABUT. HWY 69 SBL AT NAISCOOT LAKE



NO	ELEVATION	NORTHING	EASTING	NO	ELEVATION	NORTHING	EASTING
BH10-29	186.7	5 056 623.0	234 704.4	BH10-01	191.6	5 056 457.0	234 744.7
BH10-30	187.2	5 056 624.5	234 709.2	BH10-02	191.4	5 056 458.1	234 749.8
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BH10-42	196.2	5 056 657.7	234 697.9	BH10-14	185.3	5 056 492.2	234 741.7
NL10-01	182.1	5 056 544.5	234 724.1	BH10-15	186.3	5 056 493.3	234 746.3
NL10-02	182.1	5 056 548.1	234 722.6	BH10-16	185.2	5 056 495.8	234 735.4
NL10-03	182.1	5 056 550.8	234 722.8	BH10-17	184.5	5 056 497.1	234 740.5
NL10-04	182.1	5 056 552.9	234 721.4	BH10-18	184.9	5 056 498.2	234 745.3
NL10-05	182.1	5 056 544.7	234 727.2	BH10-25	183.9	5 056 616.6	234 701.0
NL10-06	182.1	5 056 548.7	234 726.4	BH10-26	183.9	5 056 618.2	234 706.0
NL10-07	182.1	5 056 551.6	234 726.1	BH10-27	184.0	5 056 619.8	234 710.7
NL10-08	182.1	5 056 553.5	234 726.1	BH10-28	186.0	5 056 621.3	234 699.4
NL10-09	182.1	5 056 544.4	234 730.8				
NL10-10	182.1	5 056 549.9	234 729.9				
NL10-11	182.1	5 056 552.3	234 729.5				
NL10-12	182.1	5 056 554.6	234 728.7				

## NOTES

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

GEOCRES No. 41H-93



REVISIONS	DATE	BY	DESCRIPTION
DESIGN	LRB	CHK AEG	CODE
DRAWN	MFA	CHK PKC	SITE
			STRUCT
			DWG 3

## **Appendix D**

### **Site Photographs**

Highway 69 Four Laning: South junction of Hwy 529, northerly 15 Km  
Naiscoot Lake Bridge – SBL Structure

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Photo 1. Naiscoot Lake north shore from existing Highway 69



Photo 2. Looking Naiscoot Lake south shore from existing Highway