

**FOUNDATION INVESTIGATION REPORT
CULVERT EXTENSIONS
ADDITION AND REPLACEMENT
HIGHWAY 11
SOUTH LIMIT OF TEMAGAMI, NORTHERLY 20.3 KM
NEW LISKEARD AREA
G.W.P. No. 715-92-00**

GEOCRES Number: 31M-78

Report to

MMM Group

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TABLE OF CONTENTS

SECTION	PAGE
PART 1 FACTUAL INFORMATION	
1 INTRODUCTION	1
2 SITE DESCRIPTION	1
3 SITE INVESTIGATION AND FIELD TESTING	2
4 LABORATORY TESTING	3
5 DESCRIPTION OF SUBSURFACE CONDITIONS	4
5.1 General.....	4
5.2 Asphalt and Topsoil	4
5.3 Fill.....	4
5.4 Rock Fill	5
5.5 Peat.....	6
5.6 Sand, Silty Sand, Silt	6
5.7 Gravelly Sand and Sand and Gravel Till	6
5.8 Silty Sand to Sand and Silt Till.....	7
5.9 Bedrock.....	7
5.10 Groundwater Conditions.....	8
6 MISCELLANEOUS	9

Appendices

Appendix A	Record of Borehole Sheets
Appendix B	Laboratory Test Results
Appendix C	Borehole Locations and Soil Strata Drawings
Appendix D	Selected Photographs of Culvert Extension Locations



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PART 1: FACTUAL INFORMATION

1 INTRODUCTION

This report presents the factual data obtained from a foundation investigation conducted by Thurber Engineering Ltd. (Thurber) at the locations of a number of culverts where new extensions and replacement of existing extensions are required along Highway 11 from the south limit of Temagami northerly 20.3 km.

A search of the Ministry of Transportation Ontario (MTO) GEOCRES Library did not reveal record of any previous foundation investigation carried out near the subject culverts.

The purpose of this investigation was to obtain subsurface information at the culvert locations and, based on the data obtained, to provide borehole location plans, stratigraphic profiles, records of boreholes, laboratory test results, and a written description of the subsurface conditions. A model of the subsurface conditions was developed from the data obtained at each culvert location during the course of the present investigation.

Thurber was retained by the MMM Group to carry out this foundation investigation under the MTO Agreement Number 5006-E-0043.

2 SITE DESCRIPTION

The culvert sites are located within a 20 km section of Highway 11 northerly from the south limit of the Town of Temagami. The subject section of highway straddles the Townships of Strathy, Best and Gillies Limit.

All nine (9) existing culverts are of the concrete open frame type. Six (6) of the culverts have CSP extensions already installed. The grade of the existing Highway 11 in the vicinities of the culverts ranges between approximate Elevations 300 m and 344 m. The embankment fill heights at the culverts vary from approximately 3 m to 5 m.



The culvert sites are located in rural areas adjacent to swamps, creeks and other watercourses. There are frequent bedrock outcrops and moderate vegetation cover in the surrounding areas.

The terrain in the general vicinity of the site is rugged featuring steep escarpments and elevations ranging from 275 to 700 m at Ishpatina Ridge, which is the highest point in Ontario. The surface geology is typically results of the Wisconsin glaciation. Soil cover is relatively thin and the underlying bedrock is predominantly volcanic and metavolcanic rocks of the Precambrian Age. Valley bottoms are often infilled with glacial fluvial sands. Peat is also commonly found in depressions located between rock ridges and outcrops. The area has been known for its mining tradition involving cobalt and other precious ores.

3 SITE INVESTIGATION AND FIELD TESTING

This borehole investigation and field testing program was carried out between November 14, 2007 and May 29, 2008. In November and December, 2007, the program consisted of drilling and sampling 24 boreholes (numbered 07-01 to 07-24) to depths ranging from 0.2 m to 10.7 m (Elevations 292.2 m to 340.5 m). The boreholes were located either on the road shoulder or in the ditch adjacent to the culverts. A subsequent site visit was carried out by one of our engineers on May 29, 2008 to the culvert site near Station 12+305, Township of Strathy. Several hand auger probes and visual observations were conducted at the inlet and outlet areas of the existing culvert.

Prior to the start of drilling, the borehole locations were marked/staked in the field and utility clearances were obtained. The drilled boreholes were subsequently surveyed by the MMM Group.

A track mounted drill rig was used to drill and sample the boreholes. Hollow stem augers were used to advance the boreholes until practical refusal. Soil samples were obtained at selected intervals using a 50 mm diameter split spoon sampler in conjunction with Standard Penetration Testing (SPT). Five of the boreholes were further advanced through rock fill and/or bedrock using NQ size coring equipment in conjunction with NW casings. Groundwater conditions in the open boreholes were observed throughout the drilling operations. The details of piezometer installations and borehole completion are summarized in Table 3.1.

Table 3.1
Borehole Completion and Piezometer Installation Details

Borehole Number	Piezometer Installations			Completion Details
	Screen Depth (m)	Screen Elevation (m)	Sand Filter Stratum	
07-01	4.5 – 7.6	307.0 – 303.9	Silt and Sand	Sand to surface
07-02		None Installed		Sand to surface
07-03		None Installed		Bentonite to surface
07-04		None Installed		Auger cuttings to surface
07-05		None Installed		Auger cuttings to surface



Borehole Number	Piezometer Installations			Completion Details
	Screen Depth (m)	Screen Elevation (m)	Sand Filter Stratum	
07-06		None Installed		Auger cuttings to surface
07-07		None Installed		Auger cuttings to surface
07-08		None Installed		Auger cuttings to surface
07-09		None Installed		Auger cuttings to surface
07-10	0.1 – 1.7	314.2 – 312.6	Peat / Sand	Bentonite from top of screen to surface
07-11		None Installed		Bentonite and auger cuttings to surface
07-12		None Installed		Bentonite with auger cuttings to surface
07-13		None Installed		Auger cuttings to surface
07-14		None Installed		Bentonite to surface
07-15		None Installed		Bentonite to surface
07-16		None Installed		Bentonite to surface
07-17		None Installed		Bentonite to surface
07-18	1.1 – 3.3	307.2 – 305.0	Silty/Gravelly Sand	Bentonite to surface
07-19		None Installed		Backfilled with auger cuttings to surface
07-20	2.6	313.1 – 311.1	Bedrock	Bentonite to surface
07-21		None Installed		Auger cuttings to surface
07-22		None Installed		Bentonite to surface
07-23		None Installed		Bentonite and auger cuttings to surface
07-24	0.9 – 3.3	341.1 – 338.6	Sand & Gravel Fill / Bedrock	Bentonite to surface

Results of field drilling and sampling are presented on the Record of Borehole sheets in Appendix A.

A member of Thurber's technical staff supervised the drilling and sampling operations on a full time basis. The supervisor logged the boreholes, secured the recovered soil samples in labelled containers, stored the rock core samples in wooden boxes, and transported the samples to Thurber's laboratory for further examination and testing.

4 LABORATORY TESTING

All recovered soil samples were subjected to Visual Identification (VI) and to natural water content determination. Selected soil samples were subjected to grain size distribution analyses (sieve and hydrometer). Point load testing was carried out on selected rock cores for unconfined compressive strength correlation. The results of this laboratory testing program are shown on the Record of Borehole sheets in Appendix A and on the figures in Appendix B.



5 DESCRIPTION OF SUBSURFACE CONDITIONS

5.1 General

Reference is made to the Record of Borehole sheets in Appendix A for details of the soil stratigraphy encountered in the boreholes. Stratigraphic profiles for the nine (9) culvert extension locations are presented on the Borehole Locations and Soil Strata Drawings in Appendix D for illustrative purposes. An overall description of the stratigraphy is given in the following paragraphs; however, the factual data presented in the record of boreholes governs any interpretation of the site conditions.

In general, the subsurface conditions encountered in the boreholes located on the highway shoulder consist of asphalt and/or granular fill overlying inferred or proven rock fill. Boreholes located in the side ditches encountered peat and/or road fill overlying native sand and silt deposits. The native soils are underlain by inferred or proven bedrock at some locations. More detailed descriptions of the individual stratum are presented below.

5.2 Asphalt and Topsoil

A layer of asphalt between 50 and 75 mm in thickness was encountered at ground surface in Boreholes 07-7, 07-9 and 07-16 drilled through the paved shoulder of the highway. Topsoil ranging from 100 to 375 mm in thickness was encountered in Boreholes 07-15, 07-18, 07-20, 07-21 and 07-24. The topsoil thickness may vary between and beyond the borehole locations, and the limited data is not suitable for estimating topsoil quantities.

5.3 Fill

Embankment fill was encountered below the asphalt or exposed at ground surface in all except Boreholes 07-1, 07-4, 07-5, 07-10, 07-12, 07-18, 07-20 and 07-21. This fill typically consists of brown sand, gravelly sand to sand and gravel. Where encountered, the fill was found extending to 0.8 m to 4.9 m depth (Elevations 292.2 to 343.0 m).

SPT N-values measured in the cohesionless fill typically ranged from 6 to greater than 100 blows per 0.3 m penetration indicating a loose to very dense state. The water contents of the recovered fill samples ranged between 2% and 22%. Grain size analyses conducted on samples of the fill are presented on Figures B1 to B4 in Appendix B. These results are summarized in the following tables.



Soil Particles	%
<u>Gravelly Sand Fill</u>	
Gravel	24 to 32
Sand	56 to 66
Silt and Clay	10 to 12
<u>Sand and Gravel Fill</u>	
Gravel	35 to 57
Sand	39 to 51
Silt and Clay	4 to 14
<u>Sand and Sandy Silt Fill</u>	
Gravel	1 to 12
Sand	25 to 76
Silt	12 to 70
Clay	0 to 4

5.4 Rock Fill

Rock fill mixed with gravelly sand and silt was encountered in Boreholes 07-15, 07-16, 07-19, 07-22, 07-23, and inferred upon auger refusal at the bottom of Boreholes 07-2, 07-3, 07-6, 07-7, 07-9, 07-11, 07-17 and 07-19. Where encountered, the rock fill underlies the surficial road fill. Where fully penetrated in Boreholes 07-15, 07-16, 07-22 and 07-23, the rock fill thickness ranged from 0.7 to 3.8 m, and the base of the rock fill was at 2.2 to 4.6 m depths (Elevations 306.9 to 340.0 m).

SPTs were attempted at selected intervals in order to detect the base of the rock fill and top of native soil. The N-values (blows per 0.3 m penetration) are shown on the Record of Boreholes sheets. However, N-values exceeding 100 blows for 0.3 m, or less, penetration generally reflect the fact that the sampling spoon was bouncing on larger rock fragments. Lower SPT values within the rock fill generally represent sampling of fines filling the spaces between larger fragments. In neither case is the SPT value a reflection of relative density of the rock fill in the conventional sense.

Gradation of the finer material sampled within the rock fill is not shown as it is not representative of the bulk grading of the embankment fill and might be misleading. Visual observations indicated that individual pieces within the rock fill are typically up to the order of 1 m in nominal dimension. However, it must also be anticipated that larger rock sizes exist in the embankment fill.



5.5 Peat

Peat was encountered in Boreholes 07-1, 07-4 and 07-10 at ground surface. The peat was fibrous, wet and had a dark brown to black colour. In these boreholes, the peat thickness ranged from 1.4 to 3.6 m and the base of the peat layers varied between Elevations 307.9 and 312.9 m. Measured water contents of peat samples ranged from 100% to over 600%.

SPT N-values measured in the peat were 2 blows per 0.3 m penetration indicating a very loose state.

5.6 Sand, Silty Sand, Silt

Layers of brown sand, silty sand, sandy silt to silt with variable amounts of gravel and occasional cobbles were encountered in Boreholes 07-1, 07-5, 07-10, 07-12, 07-14, 07-20 and 07-23, respectively. These deposits were found ranging between 0.2 and 4.3 m in thickness, with base elevations varying from 293.9 to 330.6 m.

SPT N-values measured within these deposits ranged between 12 blows per 0.3 m penetration to greater than 100 blows for less than 0.3 m penetration, indicating a compact to very dense state. The measured water contents of samples recovered from these soils typically ranged from 8% to 22%. Grain size analyses conducted on samples of the silty sand, sand and silt are presented on Figures B5, B6 and B7, respectively, in Appendix B. The results are summarized in the following table.

Soil Particles	%
Sand to Silty Sand	
Gravel	0 to 25
Sand	43 to 86
Silt and Clay	13 to 37
Silt	
Gravel	0
Sand	2
Silt	87
Clay	11

5.7 Gravelly Sand and Sand and Gravel Till

Deposits of brown to grey gravelly sand and sand and gravel with variable amounts of silt and clay were encountered in Boreholes 07-14, 07-15, 07-16, 07-18 and 07-21. These deposits were found ranging between 0.9 and 6.1 m in thickness, with base elevations at auger refusal varying from 292.2 to 340.5 m.



SPT N-values measured within these deposits ranged from 19 blows per 0.3 m penetration to greater than 100 blows for less than 0.3 m penetration, indicating a compact to very dense state. These high N-values measured in the sand and gravel till inferred the presence of cobbles and boulders. The measured water contents of samples recovered from these soils typically ranged from 8% to 18%. Grain size analyses conducted on samples of the gravelly sand to sand and gravel till are presented on Figure B8 in Appendix B. The results are summarized in the following table.

Soil Particles	%
Gravel	27 to 36
Sand	48 to 56
Silt and Clay	8 to 25

5.8 Silty Sand to Sand and Silt Till

Brown to grey silty sand, sandy silt to sand and silt till deposits were encountered in Boreholes 07-4, 07-8, 07-14 and 07-15. Where encountered, the tills ranged from 0.3 to 2.3 m in thickness with their bases at 1.3 m to 7.2 m depths (Elevations 295.4 m to 308.9 m).

SPT N-values measured within the till layers ranged from 15 blows per 0.3 m penetration to greater than 100 blows for less than 0.3 m penetration, indicating compact to very dense conditions. Some of the higher 'N'-values may be attributed to the presence of cobbles, boulders or rock fill. The water contents of the till samples were typically in the order of 10% to 17% except in Borehole 07-8 where a value of 73% was measured due to the presence of organics. Grain size analyses conducted on samples of the tills are presented in Figures B9 and B10 of Appendix B. These results are summarized in the following table.

Soil Particles	%
Gravel	9 to 18
Sand	43 to 50
Silt	28 to 40
Clay	8 to 9

5.9 Bedrock

The soils described above were found to be underlain by granite and tonalite (intrusive plutonic rock) bedrock of the Pre-Cambrian Canadian Shield. The bedrock was proven by coring in Boreholes 07-20, 07-22 and 07-24. Proven bedrock and auger refusal depths and elevations at these borehole locations are presented in the following table.



Borehole Number	Depth to Bedrock or Auger Refusal (m)	Top of Bedrock Elevation (m)
07-01	7.9	303.6
07-04	2.5	308.9
07-05	0.2	301.3
07-08	1.3	298.2
07-10	2.3	312.1
07-12	0.7	301.1
07-14	10.4	292.2
07-16	10.7	300.8
07-18	9.2	299.1
07-20	2.8*	312.9*
07-21	1.0	340.5
07-22	3.6*	340.0*
07-23	8.4	330.6
07-24	2.2*	339.8*

* Proven by coring

Visual observations and results of hand auger probes at the culvert site near Station 12+305, Township of Strathy, indicate that bedrock is exposed or located at not more than 0.4 m below the creek bed level at the west end of the existing culvert (near Boreholes 07-05, 07-06). No exposed bedrock was observed at the east end of the culvert (near Boreholes 07-07, 07-08).

The measured Total Core Recovery (TCR) was 100% in the three boreholes. The Rock Quality Designation (RQD) values varied from 73 to 94% indicating a fair to excellent rock quality. The Fracture Indices (FI) were typically between 0 and 6 per 0.3 m core run.

The estimated Unconfined Compressive Strength (UCS) for the cores ranged from 125 to 468 MPa indicating a very strong to extremely strong rock. These estimated rock strength values are based on point load tests that were conducted on selected rock cores recovered from the boreholes.

5.10 Groundwater Conditions

Free water was not observed in most of the boreholes upon completion of drilling, except for Borehole 07-14 where a water level at 4.0 m depth (Elevation 298.6 m) in the open borehole was recorded. A standpipe piezometer was installed in each of Boreholes 07-1, 07-10, 07-18, 07-20 and 07-24. Measured water levels in these piezometers are presented below.



Borehole (screen location)	Date of Reading	Water Level Depth (m)	Water Level Elevation (m)
07-1 (silty sand/silt)	December 13, 2007	3.6	307.9
	December 15, 2007	3.7	307.8
07-10 (peat/sand)	December 15, 2007	1.6	312.7
07-18 (silty sand/ gravelly sand)	November 28, 2007	2.9	305.4
	December 13, 2007	Found damaged	-
07-20 (silty sand/bedrock)	December 13, 2007	3.1	312.6
	December 15, 2007	3.3	312.4
07-24 (sand and gravel fill /bedrock)	December 13, 2007	Dry	-
	December 15, 2007	Dry	-

Where surface water is present, the groundwater level should be assumed to coincide with the local surface water level. Local high water levels and the effects of heavy rainfalls must also be taken into consideration.

6 MISCELLANEOUS

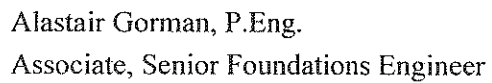
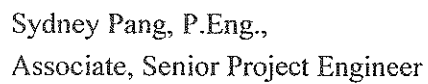
Thurber staked and/or marked the borehole locations in the field and obtained utility clearances prior to drilling. The MMM Group surveyed the as-drilled locations, and provided the northing and easting coordinates and ground surface elevations.

Landcore Drilling of Chelmsford, Ontario supplied and operated a track-mounted CME 55 drill rig to carry out the drilling, sampling and in-situ testing operations.

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

Overall project management and direction of the field program was provided by Mr. Alastair Gorman, P.Eng. Interpretation of the field data and preparation of this report was completed by Dr. Sydney Pang, P.Eng. The report was reviewed by Dr. P.K. Chatterji, P.Eng., a Designated Principal Contact for MTO Foundations Projects.





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

C_{pen}


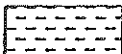
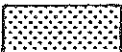

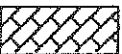
Shear Strength Determination by Pocket Penetrometer

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

UNIFIED SOILS CLASSIFICATION

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

EXPLANATION OF ROCK LOGGING TERMS

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

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

TERMS					
Total Core Recovery: (TCR)	Core recovered as a percentage of total core run length.	Weak	5.0 to 25.0	750 to 3,500	Can be peeled by a pocket knife with difficulty
Solid Core Recovery: (SCR)	Percent Ratio of solid core of full cylindrical shape recovered. Expressed with respect to the total length of core run.	Very Weak	1.0 to 5.0	150 to 750	Can be peeled by a pocket knife, crumbles under firm blows of geological pick.
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.	Extremely Weak (Rock)	0.25 to 1.0	35 to 150	Indented by thumbnail
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 07-01

1 OF 1

METRIC

G.W.P. 715-92-00 LOCATION N 5 215 737.9 E 396 521.9, Strathly (Sta. 11+975) ORIGINATED BY ES
 HWY 11 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SLL
 DATUM Geodetic DATE 2007.12.12 - 2007.12.12 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		WATER CONTENT (%)			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	GR		
311.5	PEAT, fibrous Very Loose Dark Brown to Black Wet		1	AS										
			2	SS	2									
			3	SS	2									
			4	SS	2									
			5	SS	2									
307.9	Silty SAND, trace organics Very Loose Brown Moist to Wet													
306.8														
4.7	SILT, some clay, trace sand Compact Grey Moist		6	SS	12									
			7	SS	17									
303.6	END OF BOREHOLE AT 7.9m UPON AUGER REFUSAL. Piezometer installation consists of 19mm diameter schedule 40 PVC pipe with a 3.05m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 2007.12.13 3.6 307.9 2007.12.15 3.7 307.8													
7.9														

+³, ×³: Numbers refer to
Sensitivity

20
15
10


(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 07-02

1 OF 1

METRIC

G.W.P. 715-92-00 LOCATION N 5 215 746.1 E 396 532.1, Strathy (Sta. 11+975) ORIGINATED BY ES
HWY 11 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SLL
DATUM Geodetic DATE 2007.12.12 - 2007.12.12 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							
315.0								20 40 60 80 100							
								40 80 120 160 200							
0.0	SAND, some gravel, some silt Compact to Loose Brown Moist (FILL)		1	AS			315								Augers grinding a 0.4 to 0.5m. 13 75 12 (SI+CL) Augers grinding a 1.7 to 1.8m.
			2	SS	14			314							
			3	SS	6		313								
312.8	END OF BOREHOLE AT 2.1m UPON AUGER REFUSAL ON PROBABLE ROCKFILL. BOREHOLE BACKFILLED WITH SAND TO SURFACE.														
2.1															

RECORD OF BOREHOLE No 07-03

1 OF 1

METRIC

G.W.P. 715-92-00 LOCATION N 5 215 738.7 E 396 541.3, Strathy (Sta. 11+975) ORIGINATED BY ES
HWY 11 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SLL
DATUM Geodetic DATE 2007.12.12 - 2007.12.12 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	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	40 80 120 160 200					
314.9 0.0	Gravelly SAND, some silt Dense Brown Moist (FILL.)		1	AS		315								26 63 11 (SI+CL)
			2	SS	42	314								
			3	SS	32	313								
312.6 2.3	END OF BOREHOLE AT 2.3m UPON AUGER REFUSAL ON PROBABLE ROCKFILL. BOREHOLE BACKFILLED WITH BENTONITE AND AUGER CUTTINGS TO SURFACE.													Augers grinding at 2.1 to 2.3m.

+³ . X³ : Numbers refer to
Sensitivity



20
15 10 5
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 07-04

1 OF 1

METRIC

G.W.P. 715-92-00 LOCATION N 5 215 740.7 E 396 550.0, Strathy (Sta. 11+975) ORIGINATED BY ES
 HWY 11 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SLL
 DATUM Geodetic DATE 2007.12.15 - 2007.12.15 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
311.4								20 40 60 80 100						
0.0	PEAT, fibrous, trace to some sand, some rootlets Very Loose Dark Brown to Black Wet		1	AS			311					475		
			2	SS	2		310							
			3	SS	2							105		
309.2														
2.2	SAND and SILT, trace gravel, trace clay Very Dense Grey Moist (TILL)		4	SS	50/		309						9 43 40 8	
308.9														
2.5	END OF BOREHOLE AT 2.5m UPON AUGER REFUSAL ON PROBABLE BEDROCK OR ROCKFILL. BOREHOLE BACKFILLED WITH AUGER CUTTINGS TO SURFACE.													

+³. X³: Numbers refer to
Sensitivity

20
15 10 5
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 07-06

1 OF 1

METRIC

G.W.P. 715-92-00 LOCATION N 5 216 064.7 E 396 516.6, Strathy (Sta. 12+305) ORIGINATED BY ES
HWY 11 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SLL
DATUM Geodetic DATE 2007.12.11 - 2007.12.11 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE									
303.5							20	40	60	80	100						
0.0	Gravelly SAND, some silt Dense Brown Moist (FILL.) Augers grinding at 0.7 to 0.9m		1	AS													
			2	SS	31												
301.9	Augers grinding at 1.4 to 1.5m																
1.6	END OF BOREHOLE AT 1.6m UPON AUGER REFUSAL ON PROBABLE ROCKFILL. BOREHOLE BACKFILLED WITH AUGER CUTTINGS TO SURFACE.																

ONTMT4S 6110.GPJ 4/28/09

RECORD OF BOREHOLE No 07-07

1 OF 1

METRIC

G.W.P. 715-92-00 LOCATION N 5 216 065.0 E 396 525.6, Strathy (Sta. 12+305) ORIGINATED BY ES
HWY 11 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SLL
DATUM Geodetic DATE 2007.12.11 - 2007.12.11 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					
303.6							20 40 60 80 100						
0.0	ASPHALT: (50mm)		1	AS									
302.8	SAND and GRAVEL Brown Moist (FILL)					303							
0.8	END OF BOREHOLE AT 0.8m UPON AUGER REFUSAL ON PROBABLE ROCKFILL. BOREHOLE BACKFILLED WITH AUGER CUTTINGS TO SURFACE.												



ONTMT4S 6110.GPJ 4/28/09

RECORD OF BOREHOLE No 07-08

1 OF 1

METRIC

G.W.P. 715-92-00 LOCATION N 5 216 066.7 E 396 535.8, Strathy (Sta. 12+305) ORIGINATED BY ES
 HWY 11 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SLL
 DATUM Geodetic DATE 2007.12.15 - 2007.12.15 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL X LAB VANE							PLASTIC LIMIT w _p NATURAL MOISTURE CONTENT w LIQUID LIMIT w _L WATER CONTENT (%)	
299.5							20	40	60	80	100					
0.0	SAND, trace to some gravel, trace rootlets, some organics Brown Moist (FILL)		1	AS											123	
298.7																
0.8	Sandy SILT, trace gravel, trace rootlets Very Dense Dark Brown Moist (TILL)		2	SS	50/										○	Augers grinding at 0.8 to 1.2m.
298.2					.075											
1.3	END OF BOREHOLE AT 1.3m UPON AUGER REFUSAL. BOREHOLE BACKFILLED WITH AUGER CUTTINGS TO SURFACE.															

RECORD OF BOREHOLE No 07-09

1 OF 1

METRIC

G.W.P. 715-92-00 LOCATION N 5 217 410.3 E 396 468.6, Strathy (Sta. 13+650) ORIGINATED BY ES
 HWY 11 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SLL
 DATUM Geodetic DATE 2007.12.11 - 2007.12.11 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100	W _P	W	W _L		
317.7 0.0 0.1	ASPHALT: (75mm) Gravelly SAND, some silt Dense to Very Dense Brown Dry (FILL)		1	AS													
			2	SS	34											32 56 12 (SI+CL)	
315.9 1.8	END OF BOREHOLE AT 1.8m UPON AUGER REFUSAL ON PROBABLE ROCKFILL. BOREHOLE BACKFILLED WITH AUGER CUTTINGS TO SURFACE.		3	SS	50/ .100												

RECORD OF BOREHOLE No 07-10

1 OF 1

METRIC

G.W.P. 715-92-00 LOCATION N 5 217 418.7 E 396 482.8, Strathy (Sta. 13+650) ORIGINATED BY ES
 HWY 11 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SLL
 DATUM Geodetic DATE 2007.12.13 - 2007.12.13 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	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	W P W W L	WATER CONTENT (%)	20 40 60	kN/m ³			GR SA SI CL
314.3	PEAT, fibrous Very Loose Dark Brown to Black Wet		1	SS	2		314							215	
312.9															
1.4	SAND, trace gravel, trace silt, trace rootlets Dense Mottled Brown and Grey Wet		2	SS	35		313								
312.1															
2.3	END OF BOREHOLE AT 2.3m 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) 2007.12.15 1.6 312.7														

RECORD OF BOREHOLE No 07-11

1 OF 1

METRIC

G.W.P. 715-92-00 LOCATION N 5 222 051.0 E 397 770.9, Strathy (Sta. 18+957) ORIGINATED BY ES
 HWY 11 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SLL
 DATUM Geodetic DATE 2007.11.30 - 2007.11.30 CHECKED BY MEF

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL							
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa						WATER CONTENT (%)						
								20 40 60 80 100												
306.1							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL X LAB VANE													
0.0	Gravelly SAND, some silt Very Dense Brown Moist (FILL)		1	AS		306														
			2	SS	105															
			3	SS	70/ 275		305													
303.9																				
2.2	END OF BOREHOLE AT 2.2m UPON AUGER REFUSAL ON PROBABLE ROCKFILL. BOREHOLE BACKFILLED WITH BENTONITE AND AUGER CUTTINGS TO SURFACE.																			

+³ . X³ : Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 07-12

1 OF 1

METRIC

G.W.P. 715-92-00 LOCATION N 5 222 045.8 E 397 781.3, Strathy (Sta. 18+957) ORIGINATED BY ES
 HWY 11 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SLL
 DATUM Geodetic DATE 2007.12.14 - 2007.12.14 CHECKED BY MEF

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa									
						20	40	60	80	100	○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE						
301.8 0.0	SILT, trace to some sand, occasional gravel Dense Brown Moist		1	SS	40												
301.1 0.7	END OF BOREHOLE AT 0.7m UPON AUGER REFUSAL ON PROBABLE BEDROCK OR ROCKFILL. BOREHOLE BACKFILLED WITH AUGER CUTTINGS TO SURFACE.					301											

RECORD OF BOREHOLE No 07-13

1 OF 1

METRIC

G.W.P. 715-92-00 LOCATION N 5 223 082.1 E 398 289.3, Strathy (Sta. 20+120) ORIGINATED BY ES
 HWY 11 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SLL
 DATUM Geodetic DATE 2007.12.14 - 2007.12.14 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								
293.5	SAND and GRAVEL, trace rootlets Compact Brown Moist (FILL)		1	AS												
0.0			2	SS	24											
292.2	END OF BOREHOLE AT 1.4m UPON AUGER REFUSAL ON PROBABLE BEDROCK OR ROCKFILL. BOREHOLE BACKFILLED WITH AUGER CUTTINGS TO SURFACE.															
1.4																

+³, ×³: Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 07-14

2 OF 2

METRIC

G.W.P. 715-92-00 LOCATION N 5 223 066.0 E 398 300.1, Strathly (Sta. 20+120) ORIGINATED BY ES
HWY 11 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SLL
DATUM Geodetic DATE 2007.12.10 - 2007.12.10 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			20 40 60 80 100	W P W W L	20 40 60				
292.2	Continued From Previous Page													
10.4	Gravelly SAND, some silt Very Dense Grey Wet END OF BOREHOLE AT 10.4m UPON AUGER REFUSAL ON PROBABLE BEDROCK. WATER LEVEL AT 4.0m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO SURFACE.						292							

METRIC

[illegible]

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 07-15

2 OF 2

METRIC

G.W.P. 715-92-00 LOCATION N 5 224 759.1 E 400 453.8, Best (Sta. 11+818) ORIGINATED BY ES
HWY 11 BOREHOLE TYPE Hollow Stem Augers / NQ Coring COMPILED BY SLL
DATUM Geodetic DATE 2007.11.20 - 2007.11.20 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			20 40 60 80 100	40 80 120 160 200					
	Continued From Previous Page													
298.0	SAND and GRAVEL, some silt Very Dense Gray Wet (TILL)		10	SS	50									
10.7	END OF BOREHOLE AT 10.7m. BOREHOLE BACKFILLED WITH BENTONITE AND AUGER CUTTINGS TO SURFACE.				.075		298							

RECORD OF BOREHOLE No 07-16

1 OF 2

METRIC

G.W.P. 715-92-00 LOCATION N 5 224 751.9 E 400 461.3, Best (Sta. 11+818) ORIGINATED BY ES
 HWY 11 BOREHOLE TYPE Hollow Stem Augers / NQ Coring COMPILED BY SLL
 DATUM Geodetic DATE 2007.11.26 - 2007.11.26 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					
311.4								20 40 60 80 100					
0.0	ASPHALT: (75mm)							40 80 120 160 200					
0.1	SAND and GRAVEL Brown Moist (FILL)		1	AS			311						
310.7													
0.8	ROCKFILL, mixed with gravelly sand, some silt Compact to Very Dense Brown Moist (FILL)		2	SS	23		310						
			3	SS	50/ .100								
							309						
	Loose		4	SS	8		308						
306.8							307						
4.6	Gravelly SAND, some silt and clay Very Dense Grey Moist		5	SS	78		306						
			6	SS	65		305						27 59 14 (SI+CL)
			7	SS	50/ .100		304						
							303						
302.2													
9.2	SAND and GRAVEL, some silt and clay Very Dense Grey Moist: (TILL)		8	SS	50/ .125		302						37 38 25 (SI+CL)

27 50 23
Auger Refusal at
1.8m, switched to
NQ Coring to
3.2m.

27 59 14
(SI+CL)

Auger Refusal at
7.7m, switched to
NQ Coring to
9.1m.

ONTMT4S 6110.GPJ 4/28/09

Continued Next Page

+³, X³: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 07-16

2 OF 2

METRIC

G.W.P. 715-92-00 LOCATION N 5 224 751.9 E 400 461.3, Best (Sta. 11+818) ORIGINATED BY ES
 HWY 11 BOREHOLE TYPE Hollow Stem Augers / NQ Coring COMPILED BY SLL
 DATUM Geodetic DATE 2007.11.26 - 2007.11.26 CHECKED BY MEF


SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE								
300.8	SAND and GRAVEL, some silt and clay Very Dense Grey Moist (TILL)						301									
10.7	END OF BOREHOLE AT 10.7m UPON AUGER REFUSAL ON PROBABLE BEDROCK OR BOULDER. BOREHOLE BACKFILLED WITH BENTONITE TO SURFACE.															

RECORD OF BOREHOLE No 07-17

1 OF 1

METRIC

G.W.P. 715-92-00 LOCATION N 5 224 737.8 E 400 460.2, Best (Sta. 11+818) ORIGINATED BY ES
 HWY 11 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SLL
 DATUM Geodetic DATE 2007.11.28 - 2007.11.28 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							
311.9								20 40 60 80 100							
0.0	SAND and GRAVEL, some silt Compact to Dense Brown Moist (FILL)		1	AS			312								38 48 14 (SI+CL)
			2	SS	23		311								
			3	SS	36		310								
309.5															
2.4	END OF BOREHOLE AT 2.4m UPON AUGER REFUSAL ON PROBABLE ROCKFILL. BOREHOLE BACKFILLED WITH BENTONITE TO SURFACE.														

+³, ×³: Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 07-18

1 OF 2

METRIC

G.W.P. 715-92-00 LOCATION N 5 224 731.9 E 400 467.1, Best (Sta. 11+818) ORIGINATED BY ES
 HWY 11 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SLL
 DATUM Geodetic DATE 2007.11.28 - 2007.11.28 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
308.3							20 40 60 80 100	PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT w _p w w _L						
0.0	TOPSOIL: (375mm), some clay, trace sand, occasional black staining		1	AS				○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE						
307.9	Black Wet							WATER CONTENT (%)						
0.4	Gravelly SAND, some silt Compact to Very Dense Grey Moist		2	SS	29			40 80 120 160 200	20 40 60				26 42 32 (SI+CL)	
			3	SS	19									
			4	SS	28									
			5	SS	21								30 54 16 (SI+CL)	
			6	SS	50/ .125									
			7	SS	50/ .025								Auger Refusal at 6.3m, switched to NQ coring to 9.1m.	
			8	SS										
299.1														
9.2	END OF BOREHOLE AT 9.2m UPON REFUSAL ON PROBABLE BEDROCK OR BOULDER. Piezometer installation consists of a 19mm diameter schedule 40 PVC pipe													

Continued Next Page

+³ . X³ : Numbers refer to
Sensitivity

20
15 10 5
(%) STRAIN AT FAILURE

METRIC

[illegible]

RECORD OF BOREHOLE No 07-19

1 OF 1

METRIC

G.W.P. 715-92-00 LOCATION N 5 225 858.8 E 400 723.8, Best (Sta. 12+990) ORIGINATED BY TG
 HWY 11 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SLL
 DATUM Geodetic DATE 2007.11.18 - 2007.11.19 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	120 160 200	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L		
318.9														
0.0	SAND and GRAVEL, trace silt Brown Wet (FILL)		1	AS										58 38 4 (SI+CL)
318.1														
0.8	ROCKFILL Very Dense Brown		2	SS	50 .050		318							Auger and Casing Refusal at various depths.
316.7							317							
2.2	END OF BOREHOLE AT 2.2m UPON AUGER REFUSAL ON PROBABLE ROCKFILL. BOREHOLE BACKFILLED WITH AUGER CUTTINGS TO SURFACE.													

+³, X³: Numbers refer to
Sensitivity

20
15 10 5
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 07-20

1 OF 1

METRIC

G.W.P. 715-92-00 LOCATION N 5 225 851.3 E 400 738.6, Best (Sta. 12+990) ORIGINATED BY TG
 HWY 11 BOREHOLE TYPE Hollow Stem Augers / NQ Coring COMPILED BY SLL
 DATUM Geodetic DATE 2007.11.17 - 2007.11.18 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
315.7								20	40	60	80	100		
0.0								UNCONFINED + FIELD VANE						
0.1	TOPSOIL: (100mm), trace rootlets Black Wet		1	AS				QUICK TRIAXIAL x LAB VANE						
	SAND, some silt Compact Brown Wet		2	SS	29		315							0 87 13 (SI+CL)
314.4														
1.4	Silty SAND, trace to some gravel, trace clay Compact to Very Dense Brown Wet		3	SS	22		314							
			4	SS	67									12 51 30 7
312.9							313							
2.8	GRANITE BEDROCK Very Strong		5	SS	507									Auger Refusal at 2.8m, switched to NQ Coring.
					.050									TCR=100%, SCR=100%, RQD=90%, UCS=219MPa
			1	RUN			312							Range UCS = 196 to 245MPa
311.1														
4.6	END OF BOREHOLE AT 4.6m. Piezometer installation consists of 30mm PVC schedule 40 PVC pipe with a 1.52m slotted screen. DATE DEPTH (m) ELEV. (m) 2007.12.13 3.1 312.6 2007.12.15 3.3 312.4													

RECORD OF BOREHOLE No 07-21

1 OF 1

METRIC

G.W.P. 715-92-00 LOCATION N 5 230 944.3 E 400 828.3, Gillies Limit (Sta. 14+565) ORIGINATED BY SLL, TG
 HWY 11 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SLL
 DATUM Geodetic DATE 2007.11.16 - 2007.11.17 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
341.5	TOPSOIL: (100mm), trace rootlets Black Wet SAND and GRAVEL, trace silt and rootlets Very Dense Dark Brown Moist END OF BOREHOLE AT 1.0m UPON AUGER REFUSAL ON PROBABLE BEDROCK. BOREHOLE BACKFILLED WITH AUGER CUTTINGS TO SURFACE.													
0.0														
0.1														
340.5			1	AS			341							
1.0			1	SS	50/									37 55 8
					.125									(SI+CL)

ONTMT4S 6110.GPJ 4/28/09

+³, x³: Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 07-22

1 OF 1

METRIC

G.W.P. 715-92-00 LOCATION N 5 230 936.1 E 400 838.2, Gillies Limit (Sta. 14+565) ORIGINATED BY SLL, TG
 HWY 11 BOREHOLE TYPE Hollow Stem Augers / NQ Coring COMPILED BY SLL
 DATUM Geodetic DATE 2007.11.16 - 2007.11.18 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 (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
343.7																	
0.0	SAND and GRAVEL, trace silt Brown Moist (FILL)		1	AS												35 58 7 (Si+Cl) Auger Refusal at 0.7m, switched to NQ Coring.	
343.0																	
0.7	ROCKFILL Very Dense Brown (FILL)																
			2	SS	50/												
					.050												
			3	SS	50/												
					.025												
340.0																	
3.6	TONALITE BEDROCK Very Strong to Extremely Strong		1	RUN												RUN 1# TCR=100%, SCR=100%, RQD=73%, UCS=304MPa Range UCS = 140 to 468MPa	
338.5																	
5.2	END OF BOREHOLE AT 5.2m. BOREHOLE BACKFILLED WITH BENTONITE TO SURFACE.																

+³, X³: Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 07-23

1 OF 1

METRIC

G.W.P. 715-92-00 LOCATION N 5 231 946.8 E 400 702.4, Gillies Limit (Sta. 15+630) ORIGINATED BY ES
HWY 11 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SLL
DATUM Geodetic DATE 2007.11.14 - 2007.11.15 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
339.0														
0.0	SAND and GRAVEL, trace silt Brown Moist (FILL)		1	AS			339							47 47 6 (SI+CL)
337.8							338							
1.2	ROCKFILL, some gravel, some sand Compact to Very Dense Brown Moist (FILL)		1	SS	10		337							
			2	SS	50/ .100		336							
335.2	Obstruction at 3.2 to 3.8m													
3.8	Silty CLAY, with inferred cobbles and boulders Hard Grey Moist		3	SS	75		335							
333.5							334							
5.5	SAND, some silt, trace inferred cobbles Dense to compact Grey Wet		4	SS	46		333							
							332							
			5	SS	18		331							
330.6														
8.4	END OF BOREHOLE AT 8.4m UPON AUGER REFUSAL ON PROBABLE BEDROCK OR BOULDER. BOREHOLE BACKFILLED WITH BENTONITE AND AUGER CUTTINGS TO SURFACE.													

+³ . X³ : Numbers refer to
Sensitivity

20
15
10










(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 07-24

1 OF 1

METRIC

G.W.P. 715-92-00 LOCATION N 5 231 943.4 E 400 691.2, Gillies Limit (Sta. 15+630) ORIGINATED BY ES
 HWY 11 BOREHOLE TYPE Hollow Stem Augers / NQ Coring COMPILED BY SLL
 DATUM Geodetic DATE 2007.11.16 - 2007.11.16 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							
342.0	TOPSOIL: (375mm) Black Wet						342	20	40	60	80	100		GR SA SI CL	
0.0								40	80	120	160	200			20
341.6	SAND and GRAVEL, trace silt Dense to Very Dense Dark Brown Moist to Wet (FILL)		1	SS	30		341							FI	50 43 7 (SI+CL)
0.4								340							
339.8	TONALITE BEDROCK Very Strong to Extremely Strong		2	SS	65		340							1	RUN 1# Auger Refusal at 2.2m=100% No run 100% north, Auger Refusal at 4.5m. UCS=289MPa Range UCS = 125 to 437MPa
2.2								339							
338.6	END OF BOREHOLE AT 3.3m. Piezometer installation consists of a 19mm diameter schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 2007.12.13 Dry - 2007.12.15 Dry -		1	RUN			339							1	
3.3															

+³, ×³: Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

Appendix B

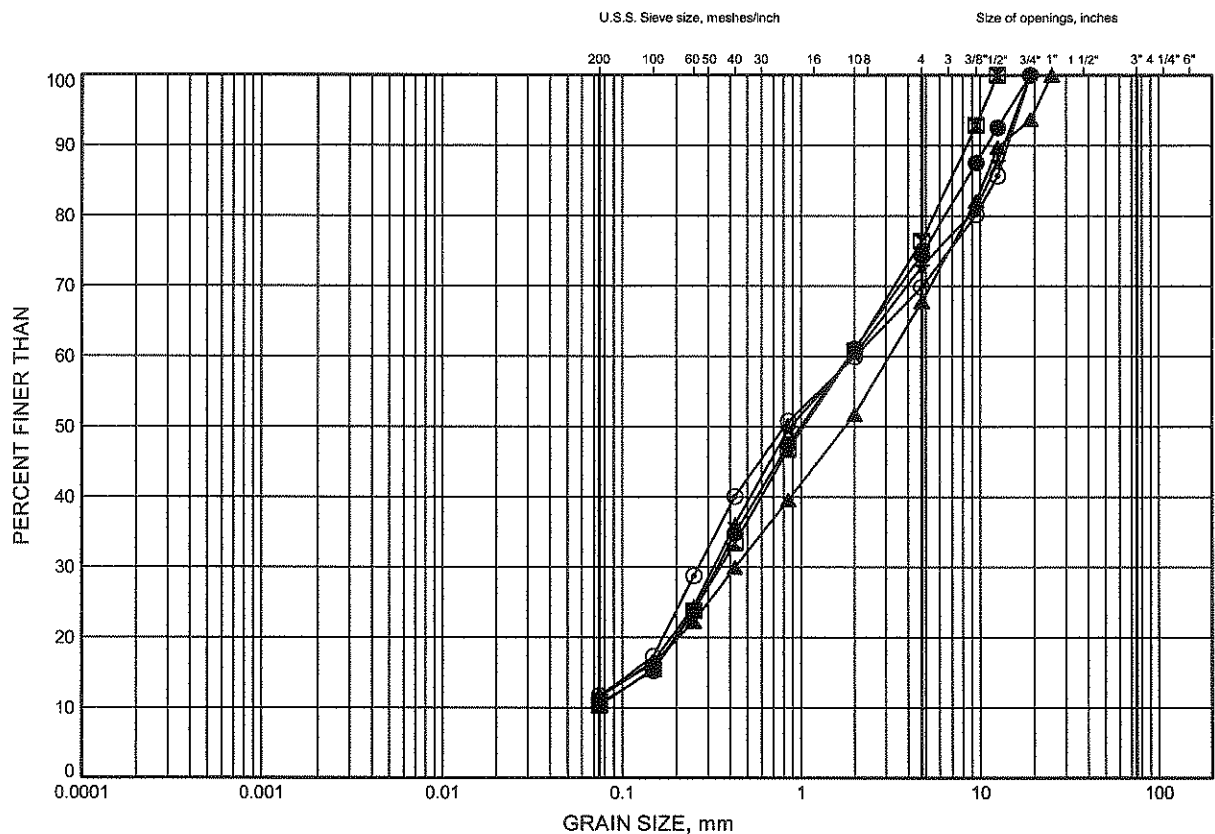
Laboratory Test Results



Hwy 11 - Temagami GRAIN SIZE DISTRIBUTION

FIGURE B1

GRAVELLY SAND FILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	07-03	1.07	313.87
⊠	07-06	1.07	302.42
▲	07-09	1.07	316.64
★	07-11	1.74	304.36
⊙	07-14	1.83	300.73

GRAIN SIZE DISTRIBUTION - THURBER 6110.GPJ 4/28/09

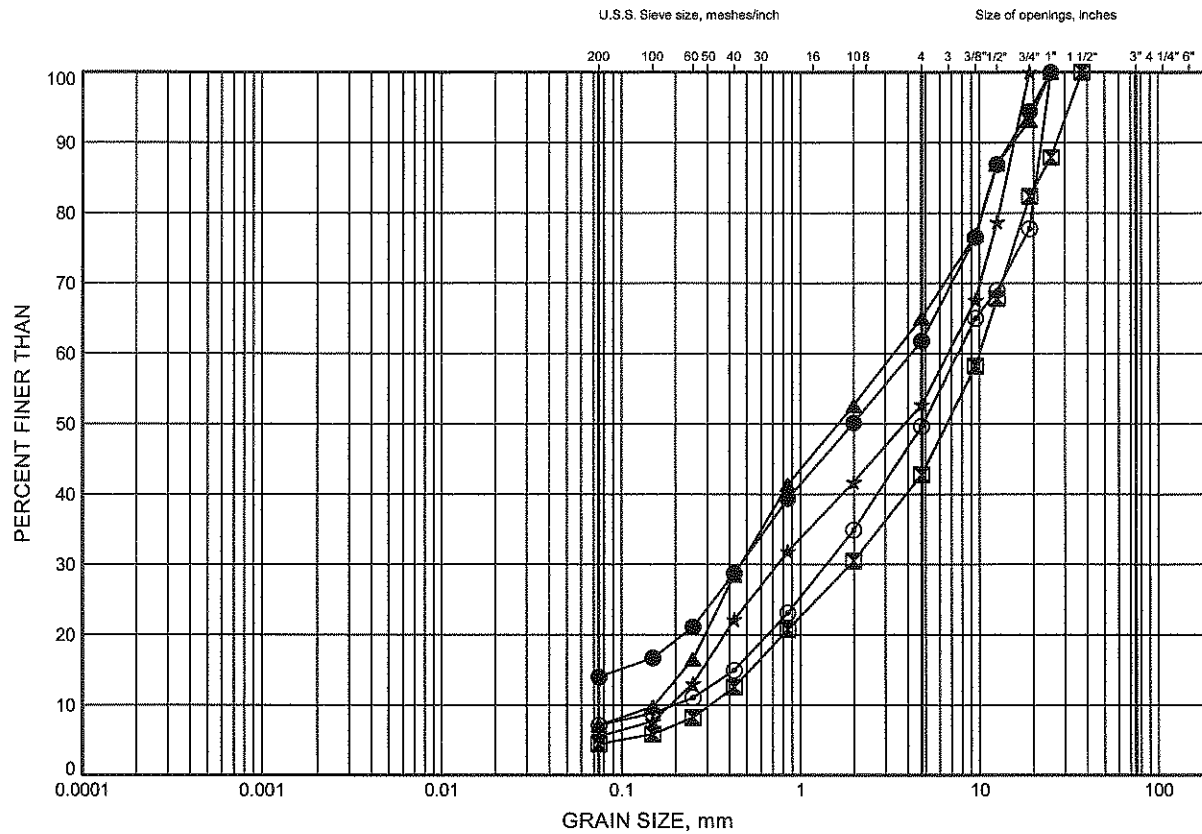
W.P.# 715-92-00.....
Prepared By AN.....
Checked By SKP.....



Hwy 11 - Temagami GRAIN SIZE DISTRIBUTION

FIGURE B2

SAND AND GRAVEL FILL



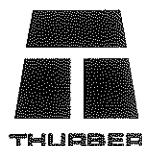
SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	07-17	0.30	311.63
⊠	07-19	0.46	318.43
▲	07-22	0.46	343.21
★	07-23	0.27	338.73
⊙	07-24	1.83	340.13

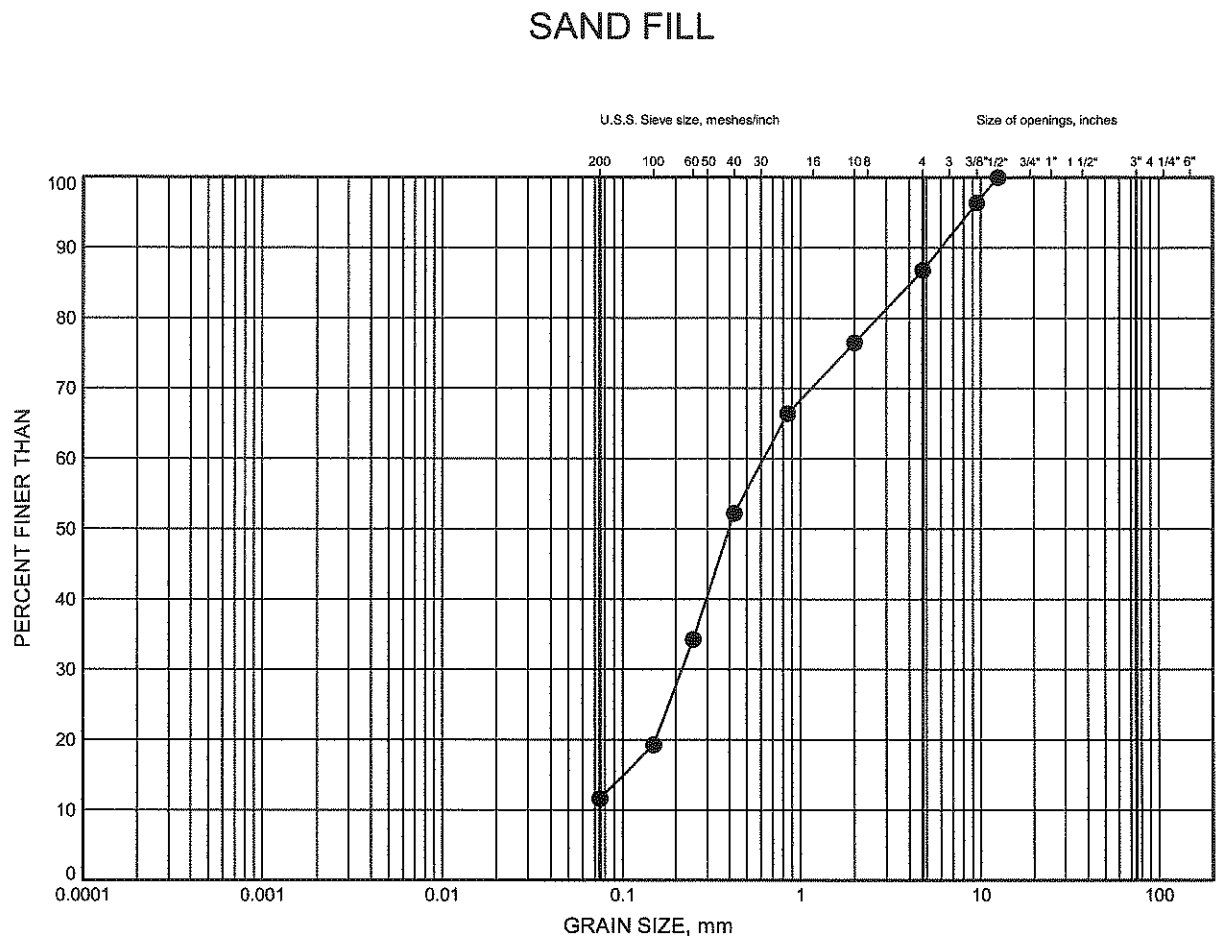
GRAIN SIZE DISTRIBUTION - THURBER 6110.GPJ 4/28/09

W.P.# 715-92-00
Prepared By AN
Checked By SKP



Hwy 11 - Temagami
GRAIN SIZE DISTRIBUTION

FIGURE B3



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	07-02	1.07	313.89

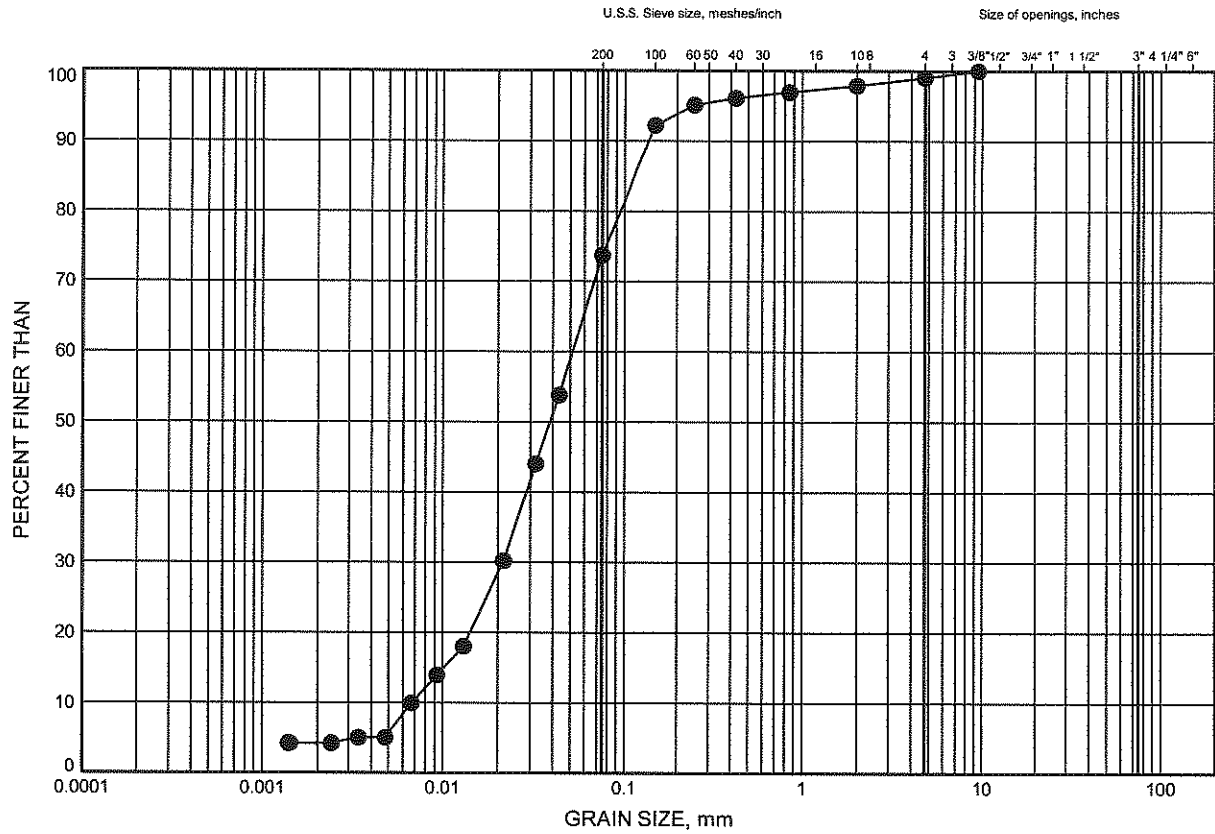


W.P.# 715-92-00
Prepared By AN
Checked By SKP

Hwy 11 - Temagami GRAIN SIZE DISTRIBUTION

FIGURE B4

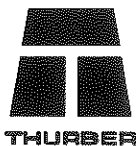
SANDY SILT FILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	07-15	2.40	306.32

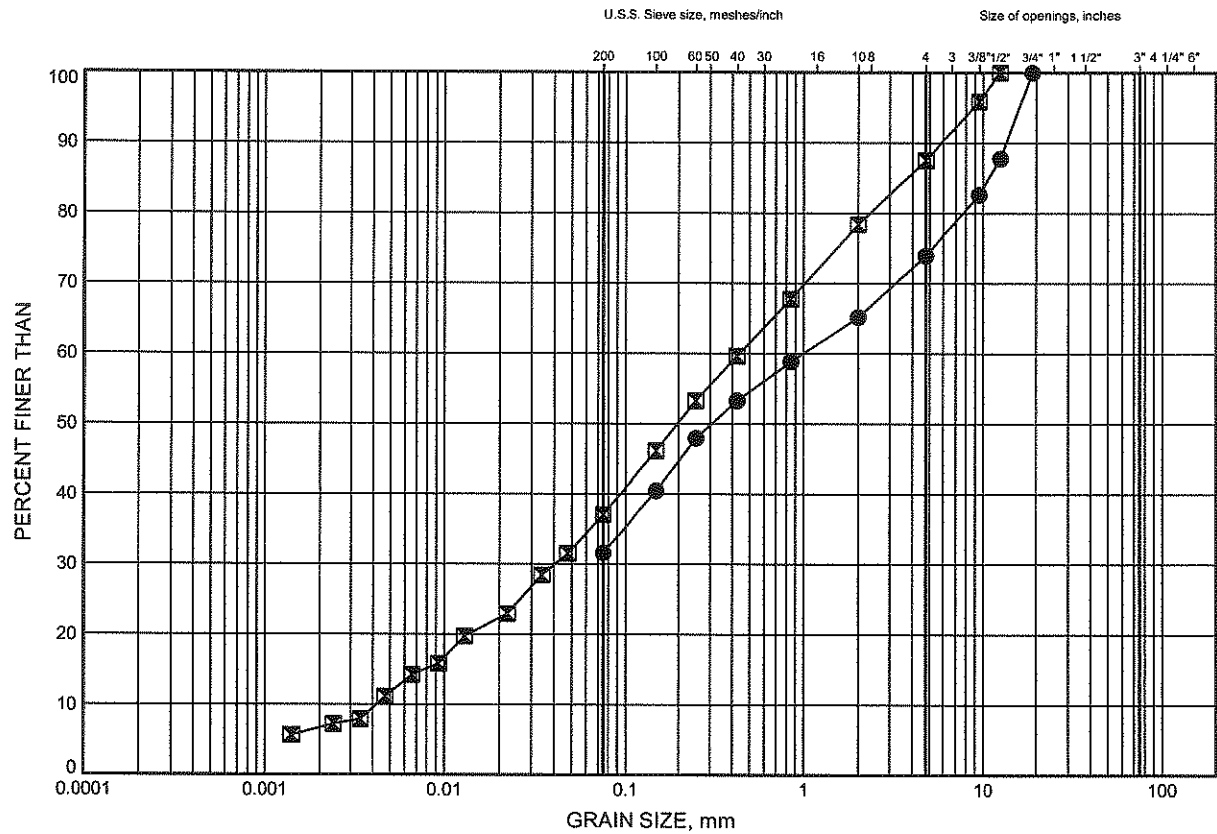


W.P.# 715-92-00
Prepared By AN
Checked By SKP

Hwy 11 - Temagami GRAIN SIZE DISTRIBUTION

FIGURE B5

SILTY SAND



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

LEGEND

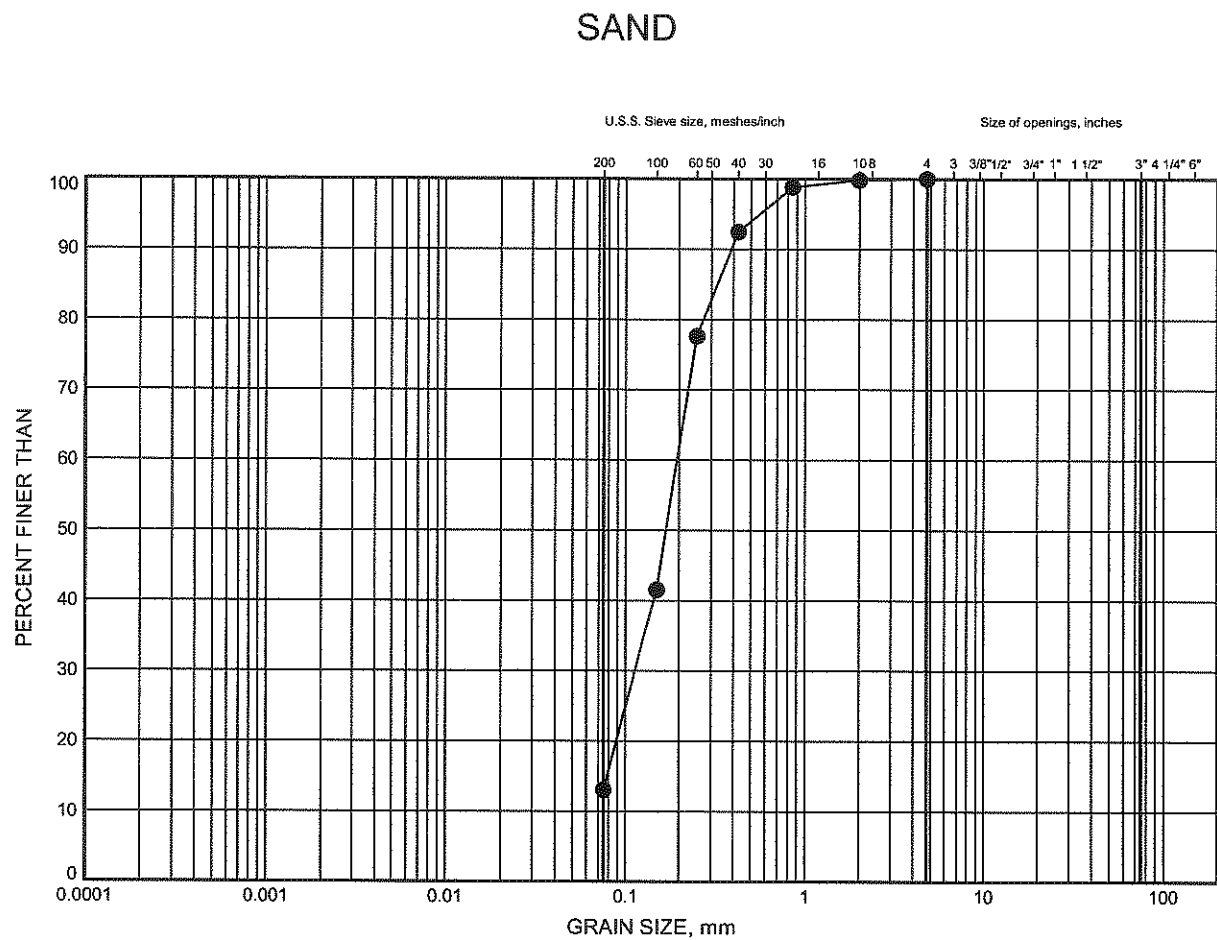
SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	07-18	1.07	307.24
◻	07-20	2.46	313.27



W.P.# 715-92-00
Prepared By AN
Checked By SKP

Hwy 11 - Temagami GRAIN SIZE DISTRIBUTION

FIGURE B6



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	07-20	0.46	315.28

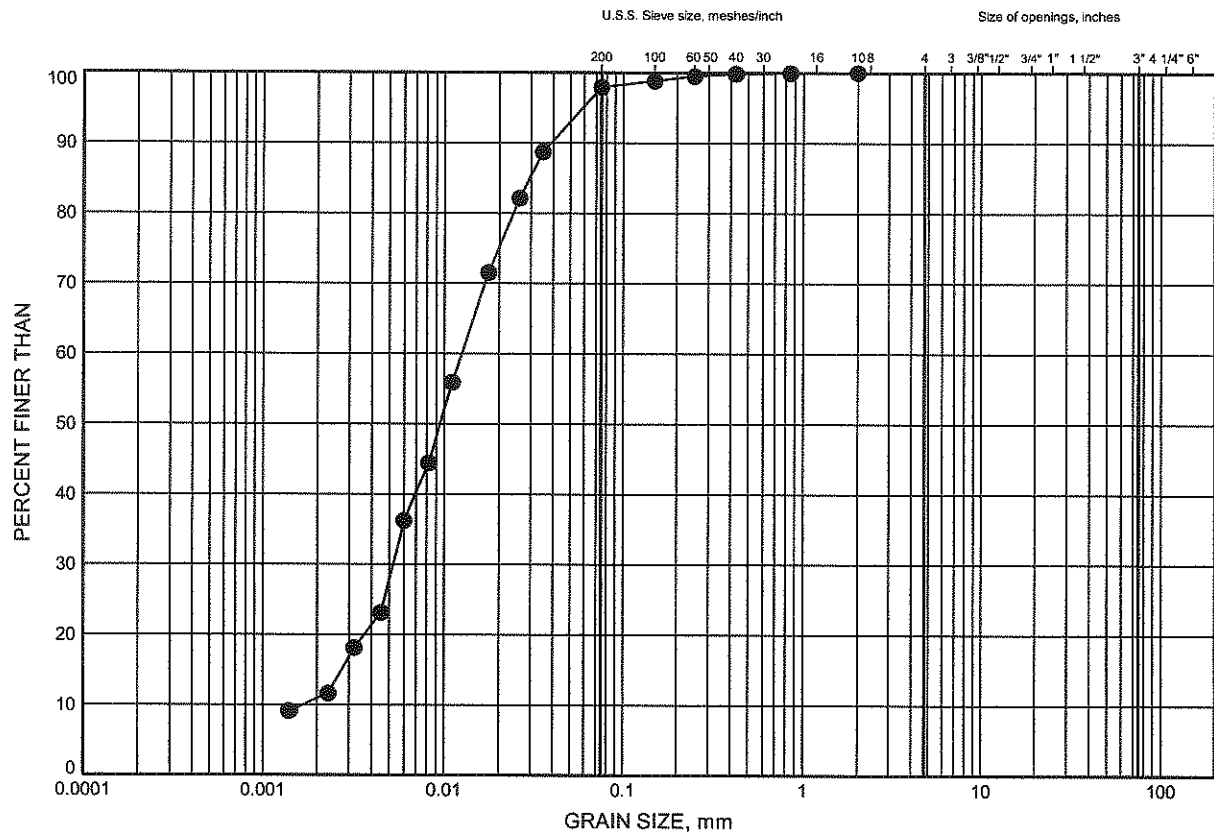


W.P.# .715-92-00.....
 Prepared By .AN.....
 Checked By .SKP.....

Hwy 11 - Temagami GRAIN SIZE DISTRIBUTION

FIGURE B7

SILT



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	07-01	4.88	306.60

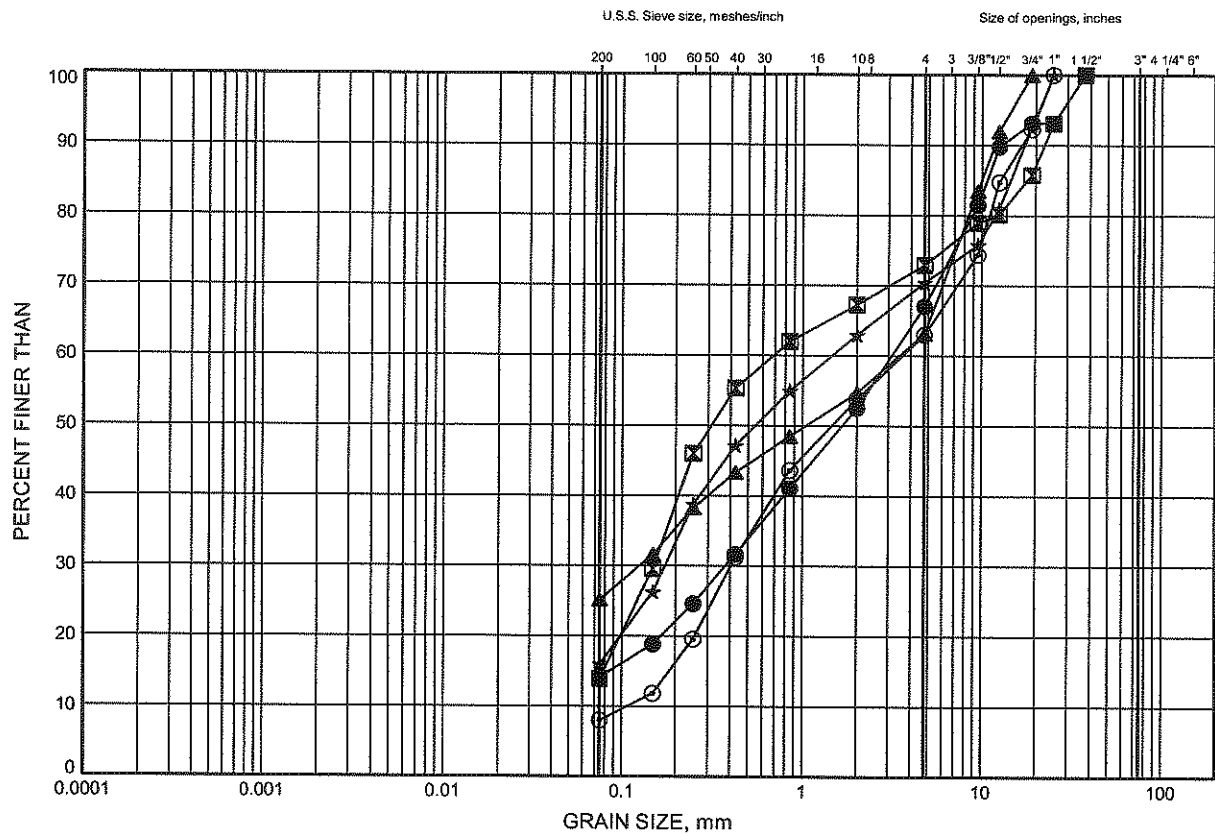


W.P.# 715-92-00
Prepared By AN
Checked By SKP

Hwy 11 - Temagami GRAIN SIZE DISTRIBUTION

FIGURE B8

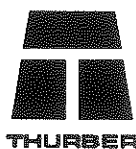
GRAVELLY SAND AND SAND AND GRAVEL TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	07-14	9.41	293.14
⊠	07-16	6.40	305.02
▲	07-16	9.21	302.21
★	07-18	3.35	304.95
⊙	07-21	0.90	340.61

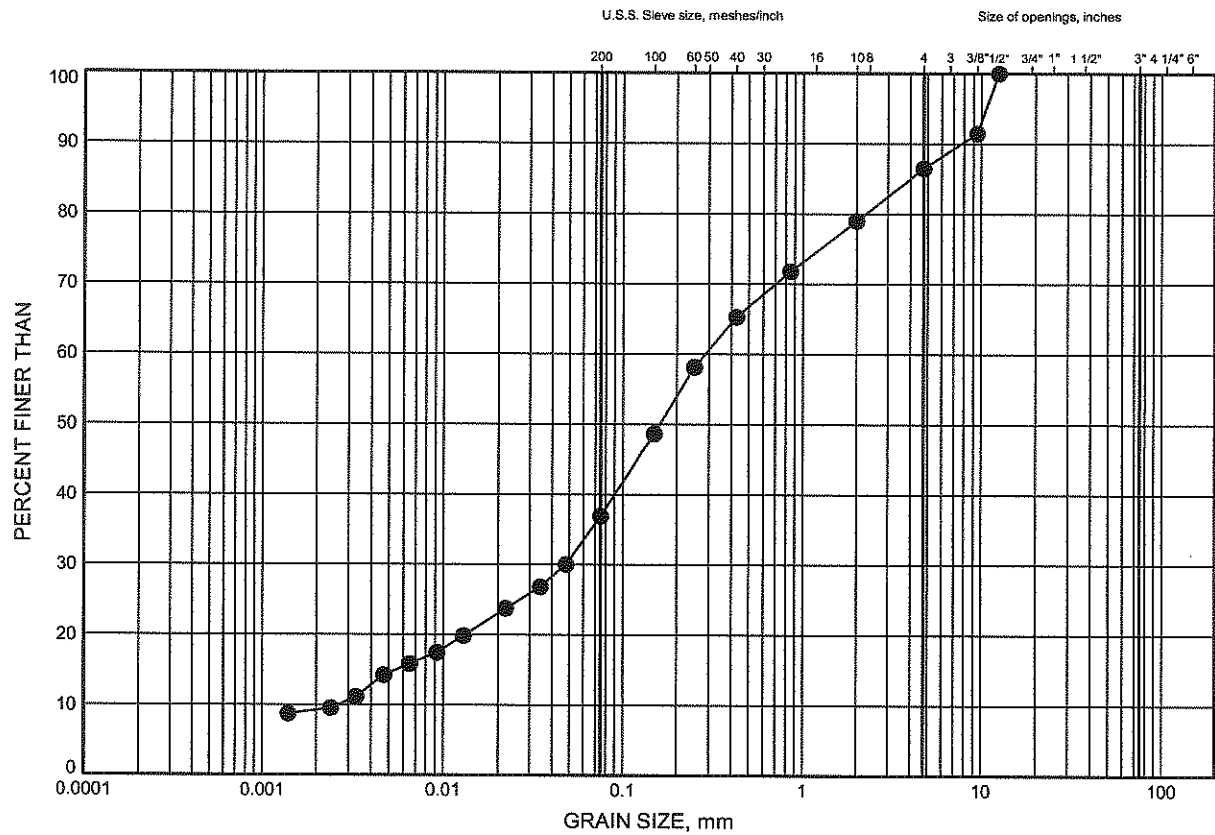


W.P.# .715-92-00.....
Prepared By .AN.....
Checked By .SKP.....

Hwy 11 - Temagami GRAIN SIZE DISTRIBUTION

FIGURE B9

SILTY SAND TILL



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

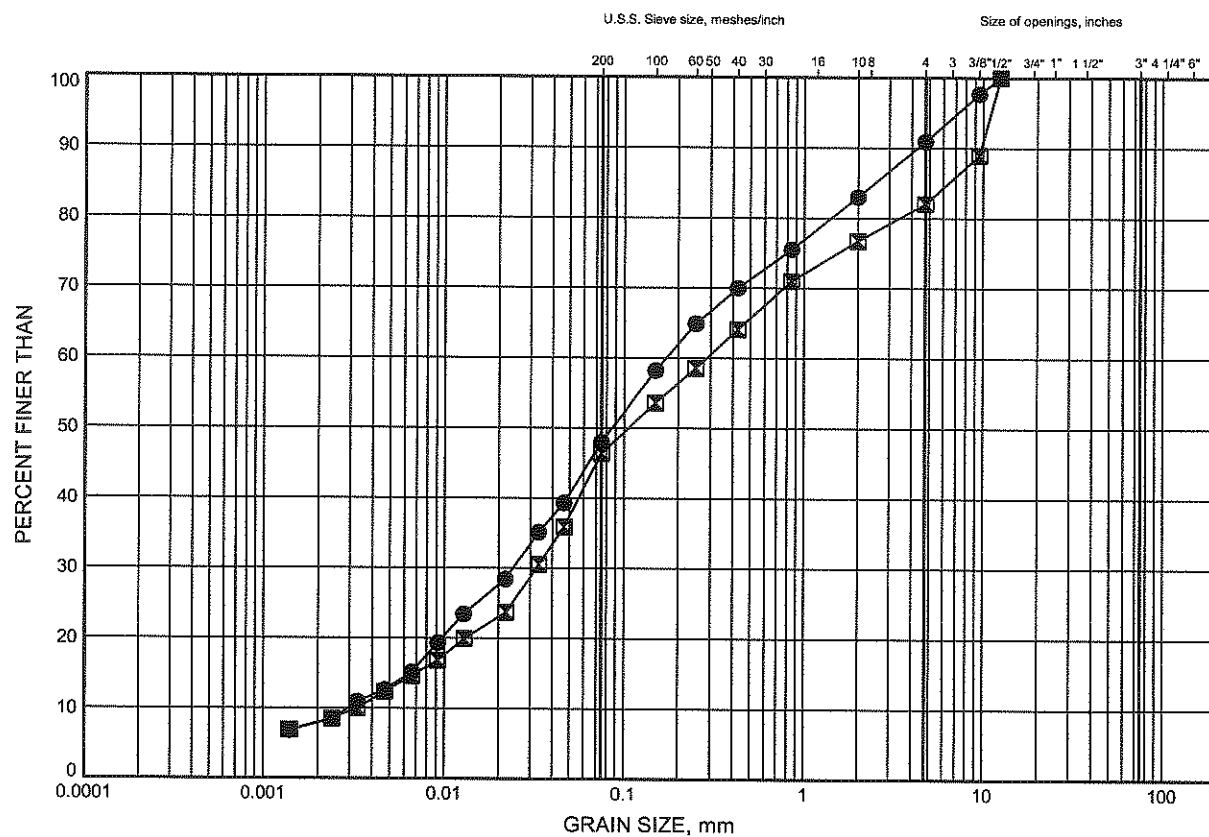
LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	07-15	4.70	304.02

Hwy 11 - Temagami GRAIN SIZE DISTRIBUTION

FIGURE B10

SAND AND SILT TILL



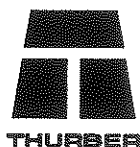
SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	07-04	2.41	308.99
⊠	07-14	4.88	297.68

GRAIN SIZE DISTRIBUTION - THURBER 6110.GPJ 4/28/09

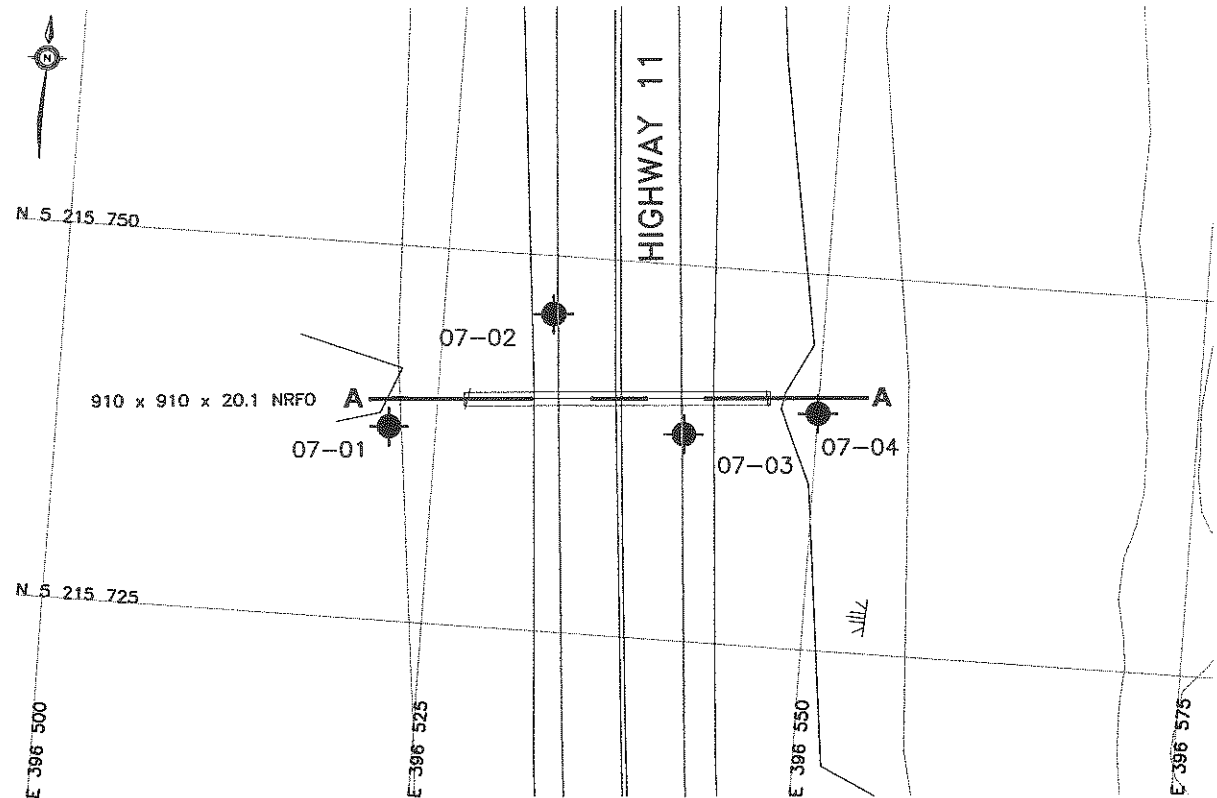
W.P.# .715-92-00.....
Prepared By .AN.....
Checked By .SKP.....



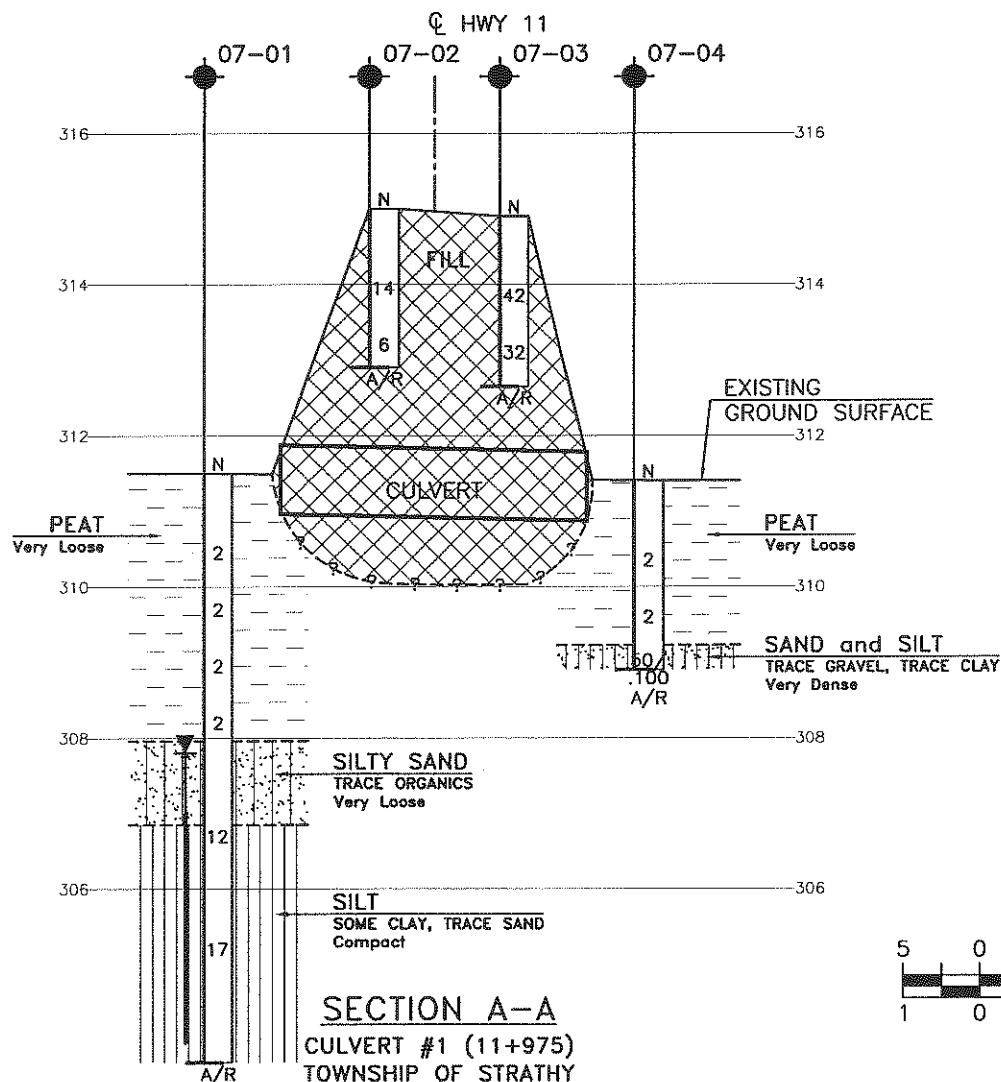
Appendix C

Borehole Locations and Soil Strata Drawings

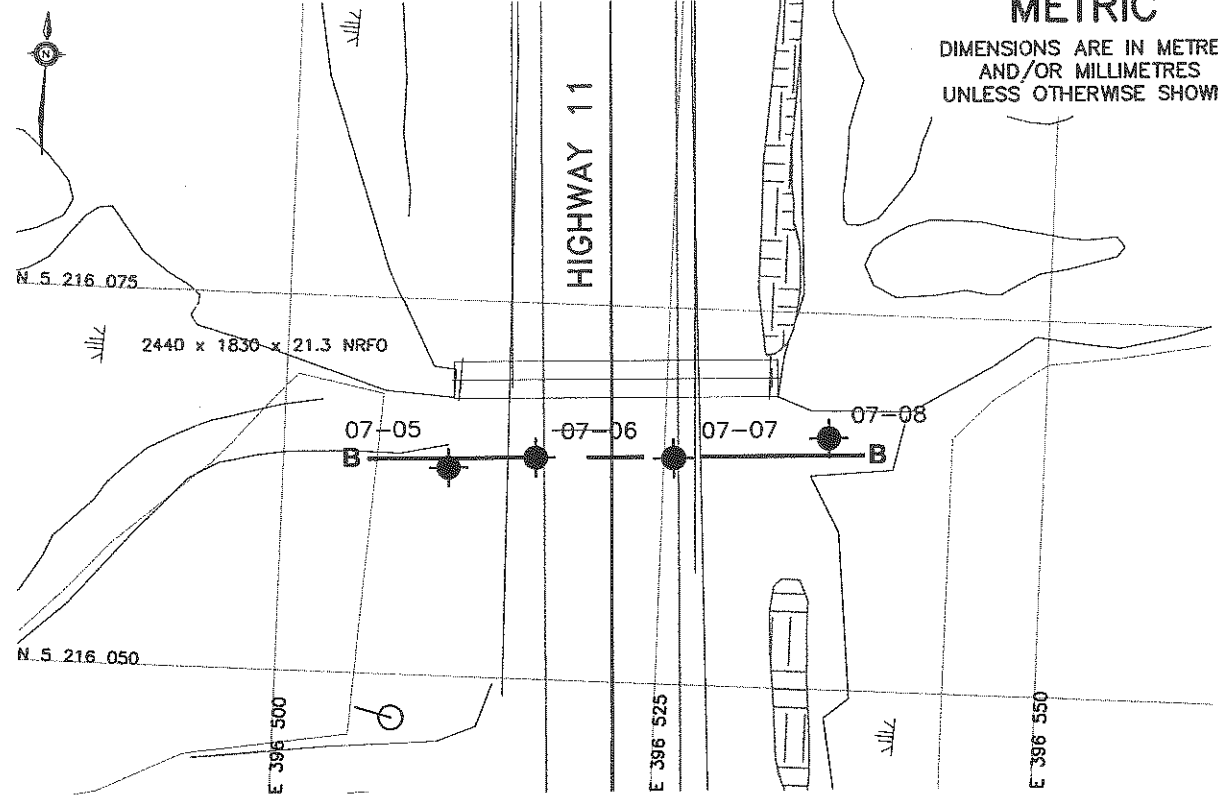
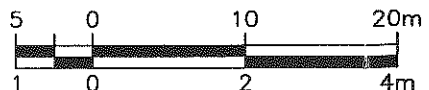




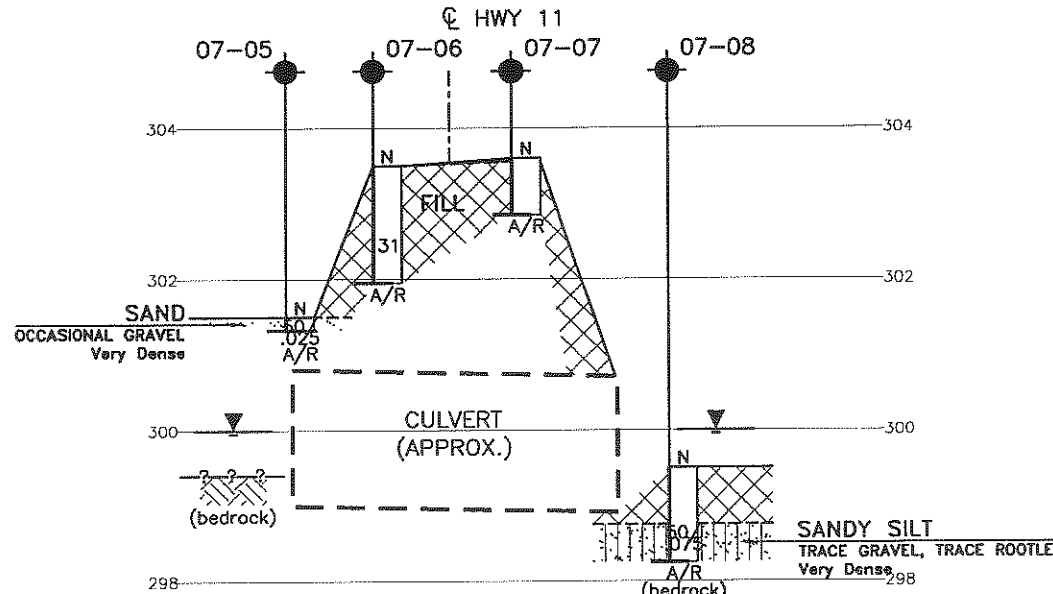
PLAN



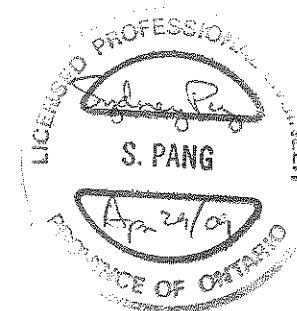
SECTION A-A
 CULVERT #1 (11+975)
 TOWNSHIP OF STRATHY



PLAN



SECTION B-B
 CULVERT #2 (12+305)
 TOWNSHIP OF STRATHY



DRAWING NOT TO BE SCALED
 100 mm ON ORIGINAL DRAWING

CONT No
 GWP No 715-92-00

HWY 11 CULVERT EXTENSION
 TEMAGAMI TO LATCHFORD
 CULVERTS 1 & 2
 BOREHOLE LOCATIONS AND SOIL STRATA

MMM GROUP

THURBER ENGINEERING LTD.
 GEOTECHNICAL • ENVIRONMENTAL • MATERIALS

SHEET

KEYPLAN

LEGEND

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

NO	ELEVATION	NORTHING	EASTING
07-01	311.5	5 215 737.9	396 521.9
07-02	315.0	5 215 746.1	396 532.1
07-03	314.9	5 215 738.7	396 541.3
07-04	311.4	5 215 740.7	396 550.0
07-05	301.5	5 216 063.8	396 510.8
07-06	303.5	5 216 064.7	396 516.6
07-07	303.6	5 216 065.0	396 525.6
07-08	299.5	5 216 066.7	396 535.8

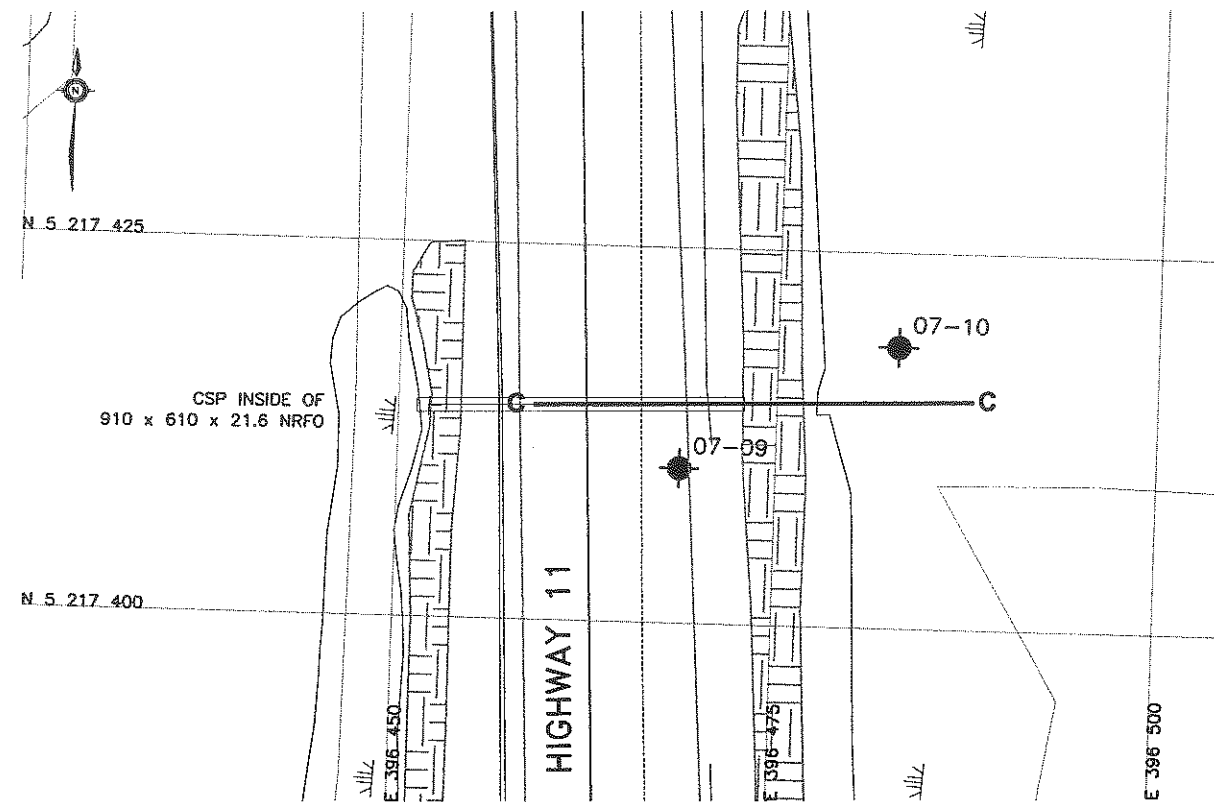
NOTES-

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

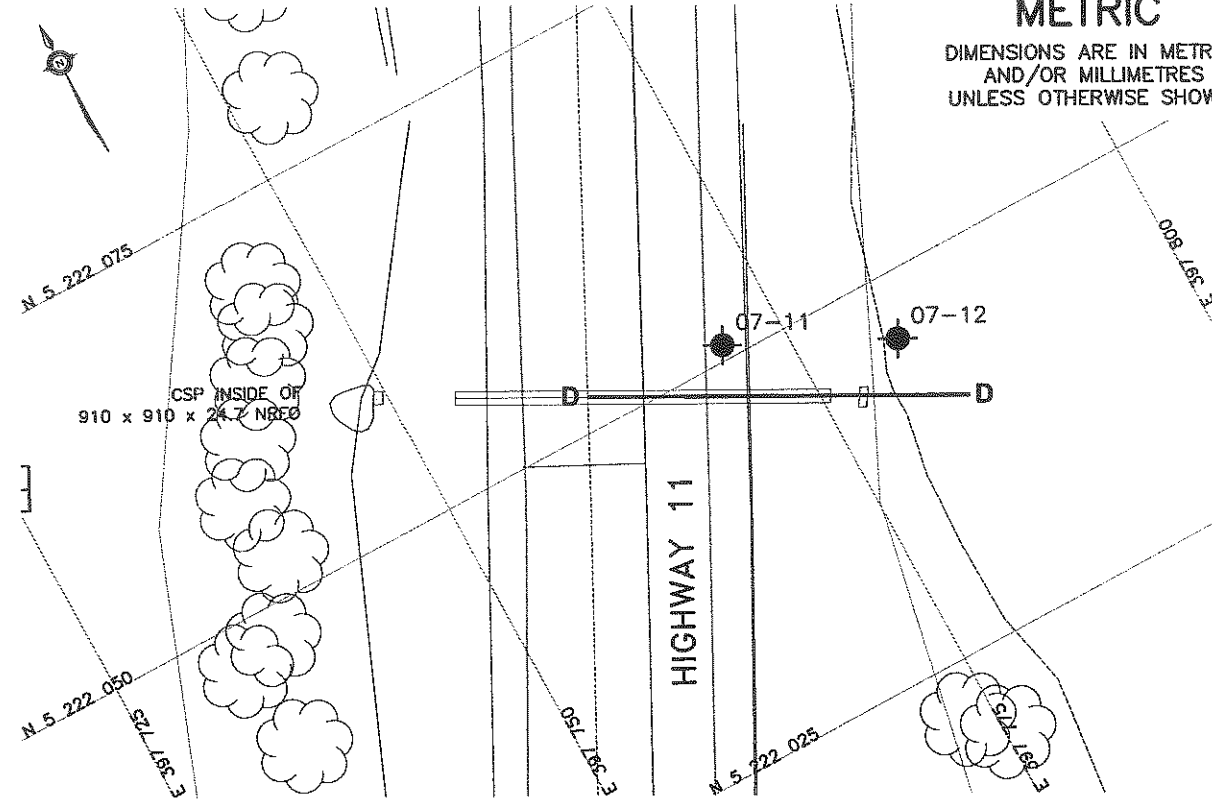
GEOCRES No. 31M-78

REVISIONS	DATE	BY	DESCRIPTION
DESIGN	SKP	CHK	PKC
DRAWN	MFA	CHK	SKP

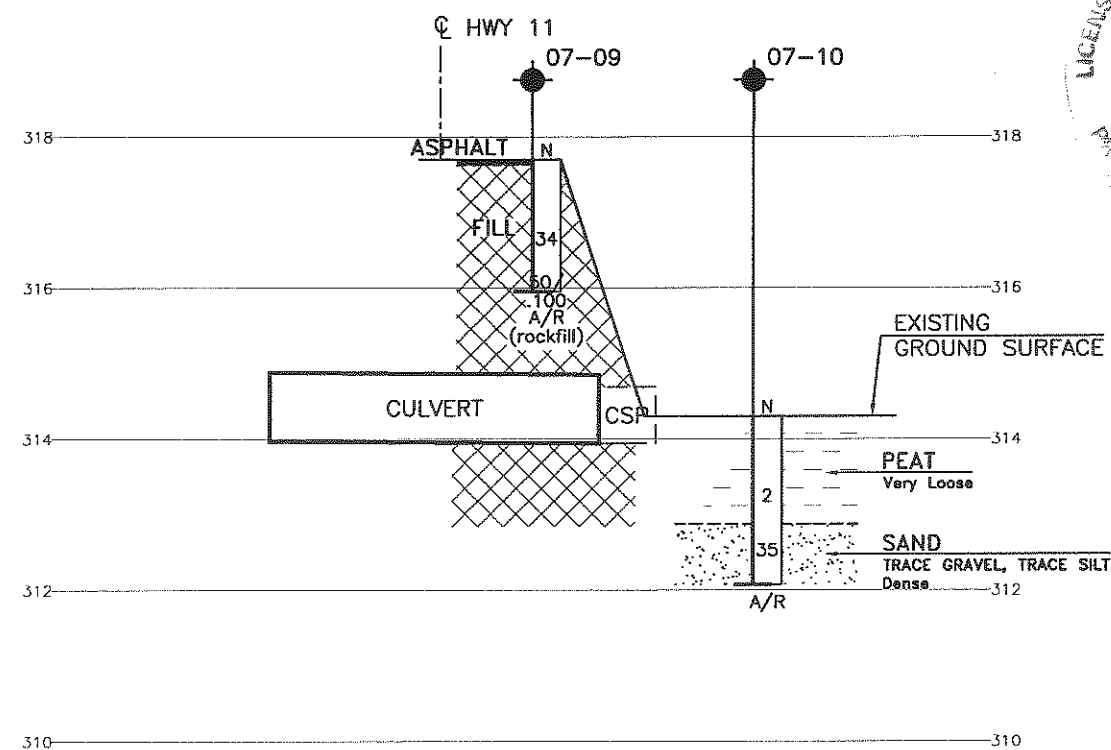
DATE	BY	DESCRIPTION
APR. 2009		



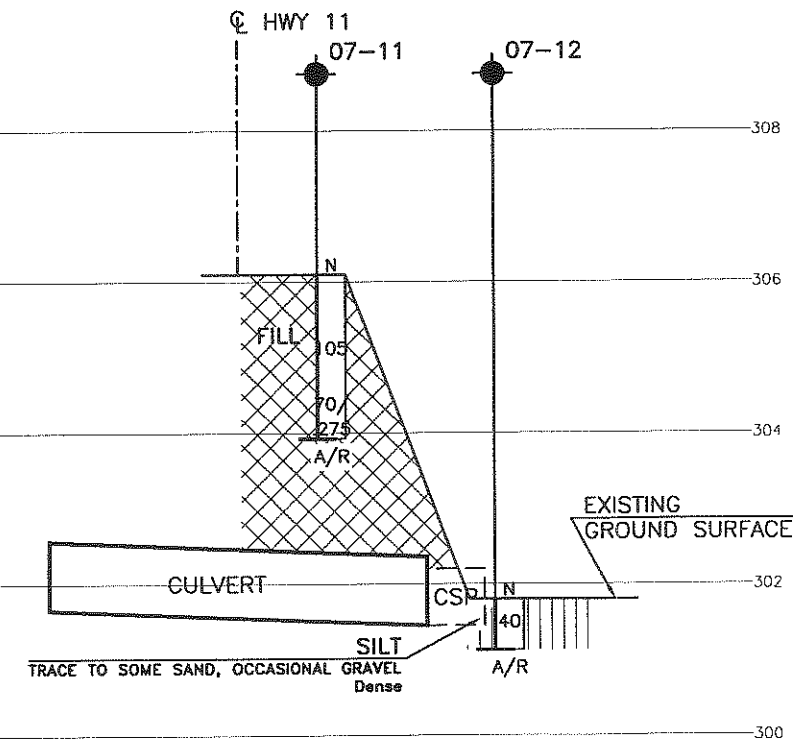
PLAN



PLAN



SECTION C-C
CULVERT #3 (13+650)
TOWNSHIP OF STRATHY



SECTION D-D
CULVERT #4 (18+957)
TOWNSHIP OF STRATHY

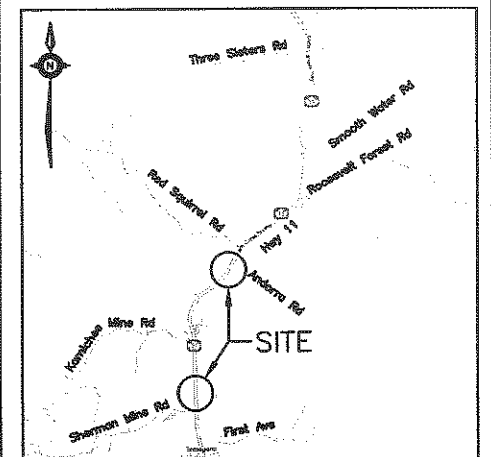


DRAWING NOT TO BE SCALED
100 mm ON ORIGINAL DRAWING

CONT No
GWP No 715-92-00
HWY 11 CULVERT EXTENSION
TEMAGAMI TO LATCHFORD
CULVERTS 3 & 4
BOREHOLE LOCATIONS AND SOIL STRATA








SHEET



KEYPLAN

LEGEND

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

NO	ELEVATION	NORTHING	EASTING
07-09	317.7	5 217 410.3	396 468.6
07-10	314.3	5 217 418.7	396 482.8
07-11	306.1	5 222 051.0	397 770.9
07-12	301.8	5 222 045.8	397 781.3

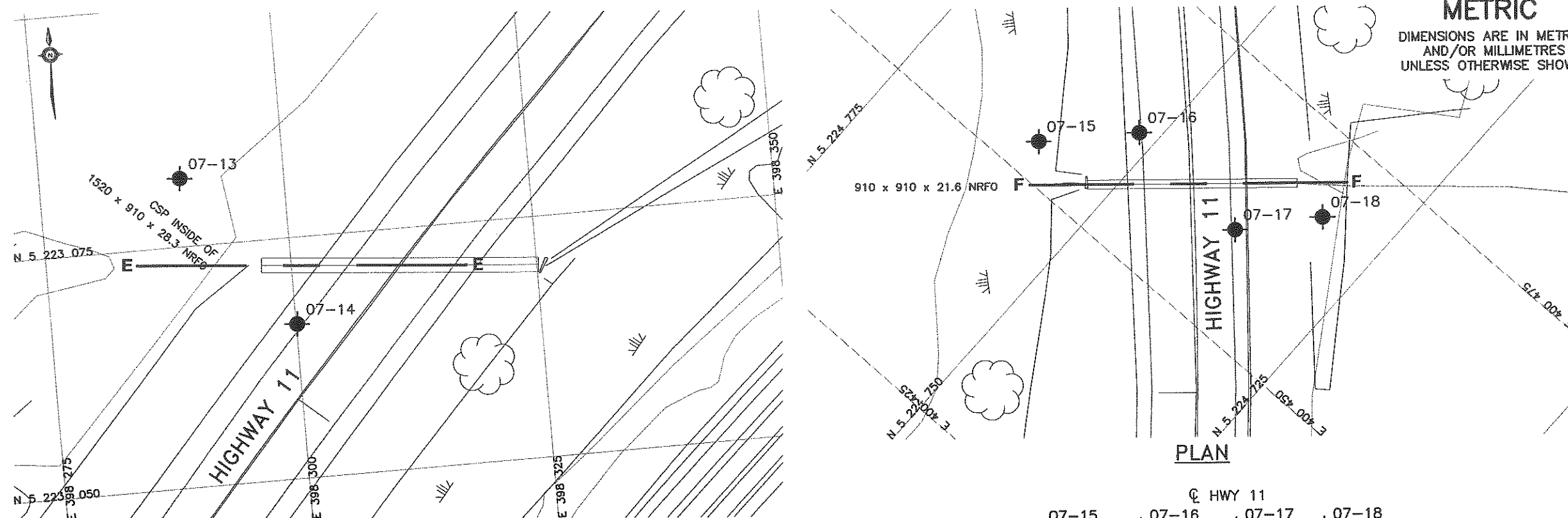
-NOTES-

- 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. 31M-78

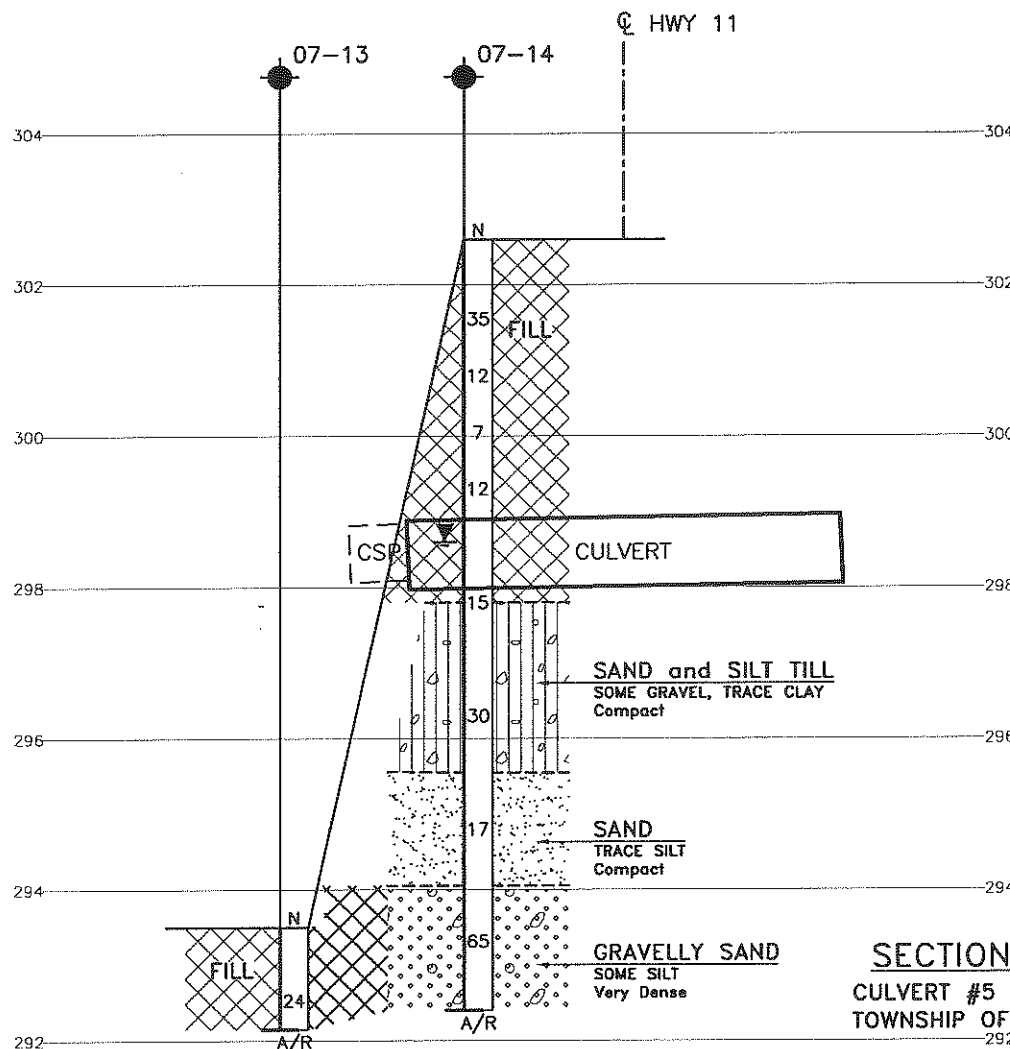
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DRAWN MFA	CHK SKP	SITE	STRUCT	DWG				

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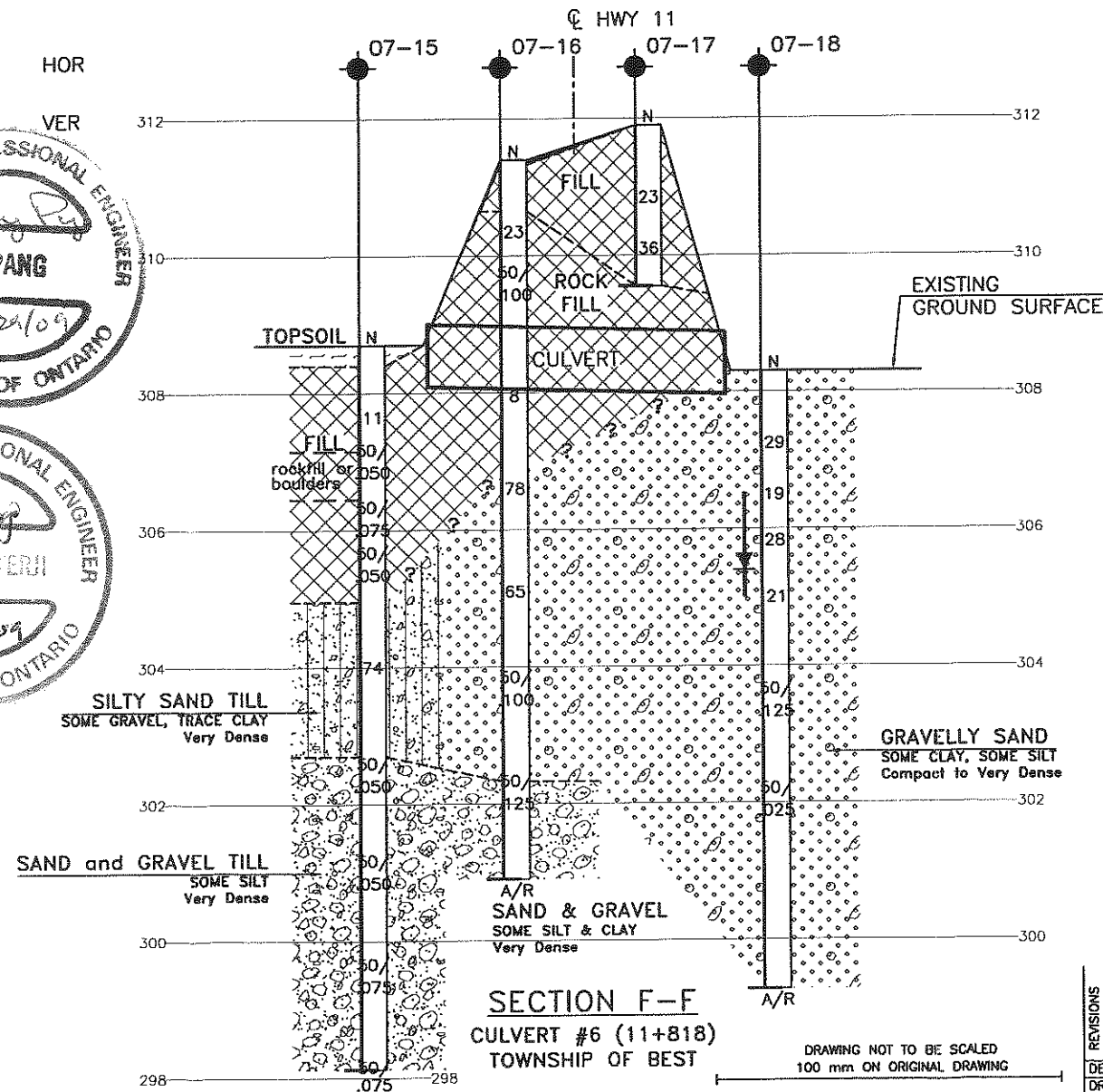


PLAN

PLAN

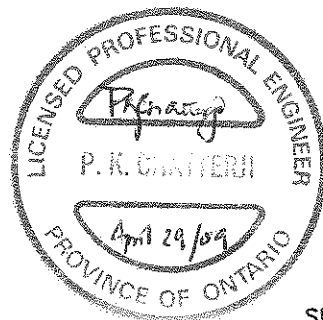
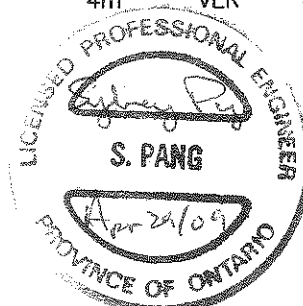


SECTION E-E
 CULVERT #5 (20+120)
 TOWNSHIP OF STRATHLY



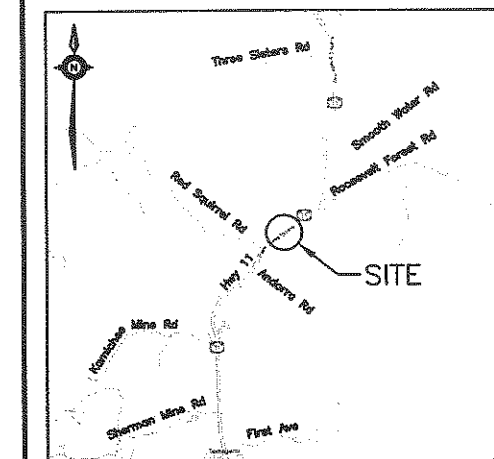
SECTION F-F
 CULVERT #6 (11+818)
 TOWNSHIP OF BEST

DRAWING NOT TO BE SCALED
 100 mm ON ORIGINAL DRAWING



CONT No
 GWP No 715-92-00

HWY 11 CULVERT EXTENSION
 TEMAGAMI TO LATCHFORD
 CULVERTS 5 & 6
 BOREHOLE LOCATIONS AND SOIL STRATA



KEYPLAN

LEGEND

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

NO	ELEVATION	NORTHING	EASTING
07-13	293.5	5 223 082.1	398 289.3
07-14	302.6	5 223 066.0	398 300.1
07-15	308.7	5 224 759.1	400 453.8
07-16	311.4	5 224 751.9	400 461.3
07-17	311.9	5 224 737.8	400 460.2
07-18	308.3	5 224 731.9	400 467.1

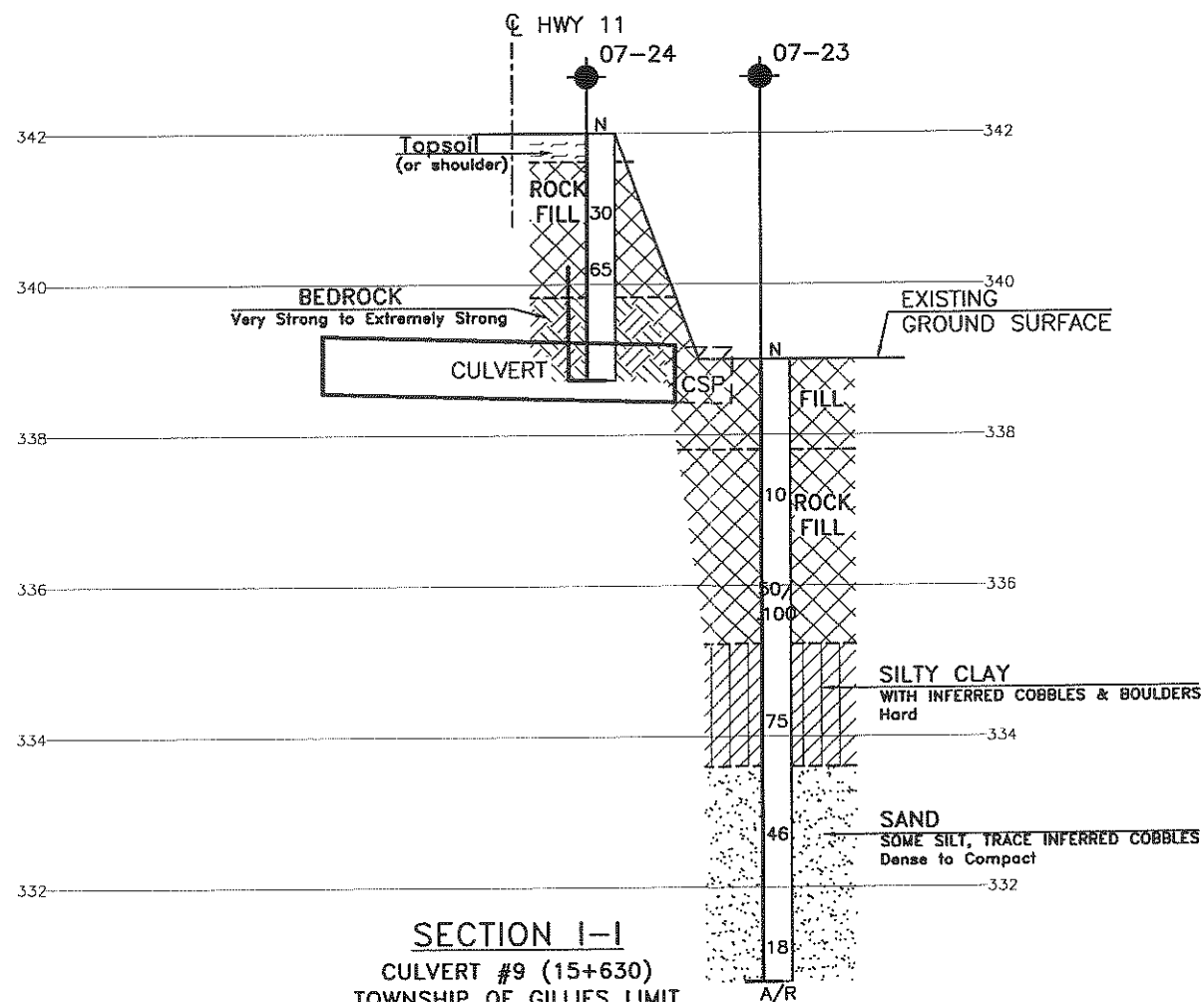
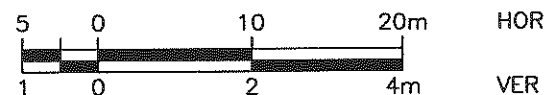
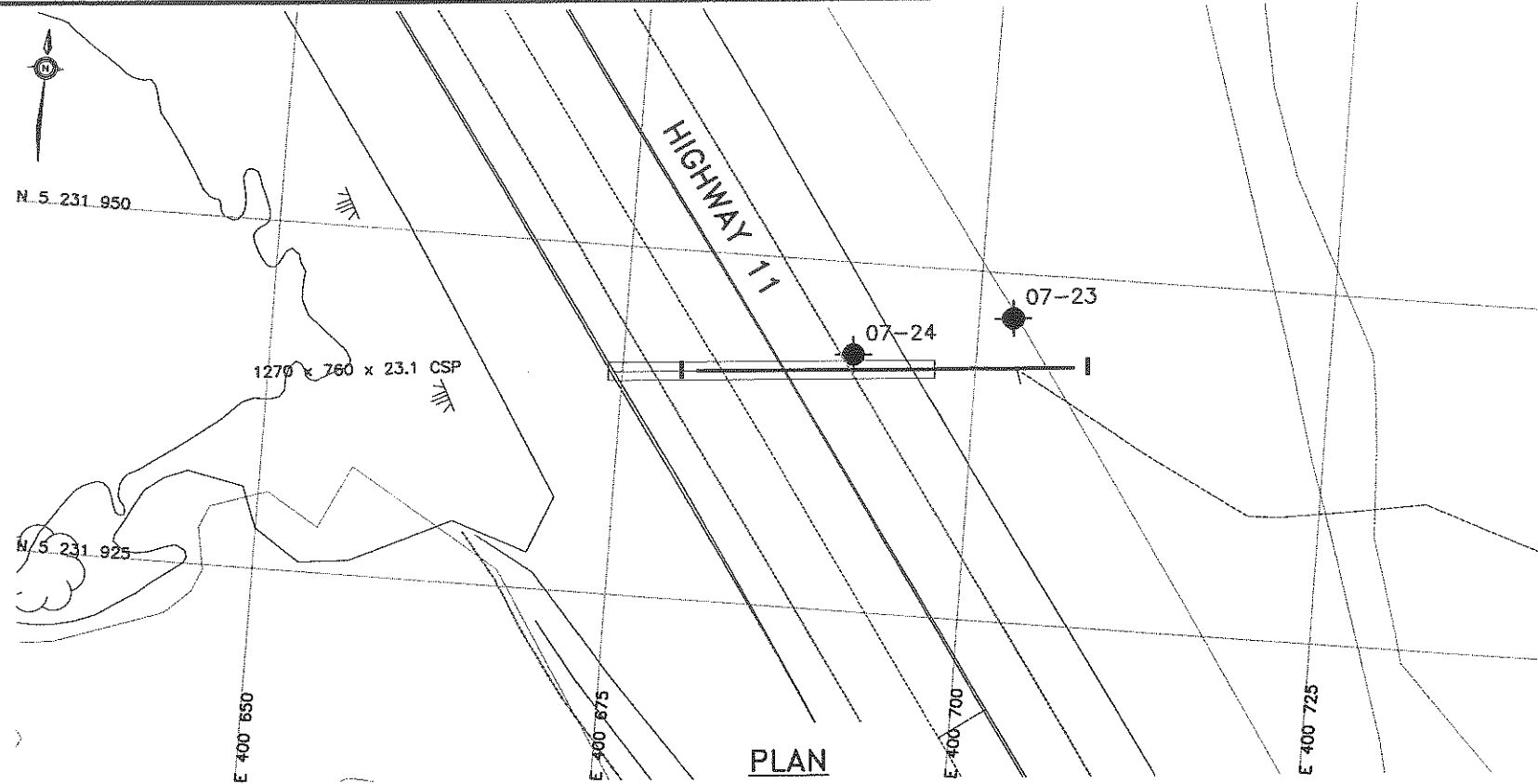
NOTES

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

GEOCREs No. 31M-78

DATE	BY	DESCRIPTION
DESIGN	SKP	CHK PKC CODE
DRAWN	MFA	CHK SKP SITE
		LOAD
		STRUCT
		DWG
		DATE APR. 2009

MINISTRY OF TRANSPORTATION, ONTARIO
PLAN SCALE 1:1
P-0-707
B-10

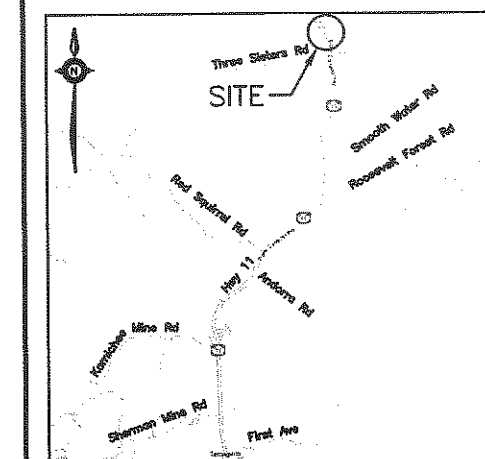


METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

CONT No
GWP No 715-92-00
HWY 11 CULVERT EXTENSION
TEMAGAMI TO LATCHFORD
CULVERT 9
BOREHOLE LOCATIONS AND SOIL STRATA



SHEET



KEYPLAN

LEGEND

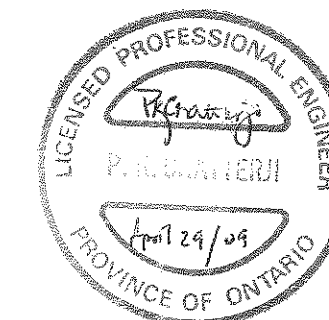
	Borehole
	Borehole and Cone
N	Blows /0.3m (Std Pen Test, 475J/blow)
CONE	Blows /0.3m (60' Cone, 475J/blow)
PH	Pressure, Hydraulic
	Water Level
	Head Artesian Water
	Piezometer
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

NO	ELEVATION	NORTHING	EASTING
07-23	339.0	5 231 946.8	400 702.4
07-24	342.0	5 231 943.4	400 691.2

-NOTES-

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

GEOCRES No. 31M-78



DRAWING NOT TO BE SCALED
100 mm ON ORIGINAL DRAWING

REVISIONS	DATE	BY	DESCRIPTION
DESIGN	SKP	CHK	PKC
DRAWN	MFA	CHK	SKP
DATE	APR. 2009		
STRUCT	DWG		

REVISIONS
DATE
BY
DESCRIPTION

Appendix D

Selected Photographs of Culvert Extension Locations





Plate 1 Culvert #1 – East (Sta. 11+975 Township of Strathy)



Plate 2 Culvert #1 West (Sta. 11+975 Township of Strathy)



Plate 3 Culvert #2 – East (Sta. 12+305 Township of Strathy)



Plate 4 Culvert #2 – West (Sta. 12+305 Township of Strathy)



Plate 5 Culvert #3 – East (Sta. 13+650 Township of Strathy)



Plate 6 Culvert #5 – West (Sta. 20+120 Township of Strathy)



Plate 7 Culvert #6 – East (Sta. 11+818 Township of Best)



Plate 8 Culvert #6 – West (Sta. 11+818 Township of Best)



Plate 9 Culvert #7 – East (Sta. 12+990 Township of Best)



Plate 10 Culvert #8 – West (Sta. 14+565 Township of Gillies Limit)



Plate 11 Culvert #9 – East (Sta. 15+630 Township of Gillies Limit)