

**FOUNDATION INVESTIGATION AND DESIGN REPORT  
GROUND MOUNTED SIGN SUPPORTS  
HIGHWAY 17/417 WIDENING  
NEAR ARNPRIOR, ONTARIO  
G.W.P. 4067-03-00**

**GEOCRES NO. 31F-166**

**Submitted**

**To**

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**PART 1 FACTUAL INFORMATION**

**1.0 INTRODUCTION**

This report presents the factual data from a foundation investigation carried out by Thurber Engineering Ltd. (Thurber) for the design of eleven ground mounted sign supports at various locations along the Highway 17/417 alignment near Arnprior, Ontario. Thurber has been retained by McCormick Rankin Corporation (MRC) to carry out this investigation under the Ministry of Transportation Ontario (MTO) Purchase Order No. 4006-E-0003.

The purpose of this investigation was to determine the subsurface conditions at and in close proximity to the proposed sign supports and, based on this data, to provide a borehole location drawing, records of boreholes, laboratory test results and a written description of the subsurface conditions.

**2.0 SITE DESCRIPTION**

In general, the ground mounted signs are located within the physiographic region known as the Ottawa Valley Clay Plains. This area is located between the Laurentian upland to the north and west, and the Ottawa lowland to the south and east. Native soil deposits typically consist of glacio-lacustrine clayey silts to silty clays that were deposited when the Champlain Sea inundated the Ottawa – St. Lawrence lowland. In Renfrew County, there are prominent east-west trending scarps (fault zones), including a major depression geologically known as the “Ottawa-Bonnechere” graben. Bedrock in the site area mainly consists of crystalline limestone of the Ordovician Period that had been subjected to faulting, weathering and erosion. Occasional volcanic or metamorphic intrusions are also present.

The ground mounted signs are to be located at various locations along Highway 17/417. To the west and south of Arnprior, the highway runs through relatively flat terrain in the vicinities of

Scheel Drive, Campbell Drive and Division Street. Open fields with some rock outcrops are present along both sides of the existing highway alignment. The land is lightly vegetated with grass, shrubs and small patches of trees. At the location near the west approach to the Madawaska River Bridge, the highway slopes in an easterly direction towards the river valley. Further east some 1.2 km east of Kinburn Side Road, the highway is formed through a rock cut. These last two locations refer to areas not within the present contract limits of this design assignment.

### 3.0 INVESTIGATION PROCEDURES

#### 3.1 Field Investigation

The borehole investigation program was carried out in two phases. The first phase for the six proposed ground mounted signs was carried out between October 23 and 25, 2007. The second phase for the other five signs was carried out on May 21 and 22, 2008. All eleven boreholes are listed as follows:

**Table 3.1 Borehole Depths**

Site Location	Borehole	Drilling Date	Depth (m)
Hwy. 17 EBL Between Campbell Drive and Scheel Drive	GMS-01	October 25, 2007	4.5
Hwy. 17 EBL West of Campbell Drive	GMS-02	October 25, 2007	4.5
Hwy. 17 WBL East of Campbell Drive	GMS-03	October 23, 2007	6.2
Hwy. 17 EBL West of Division Street	GMS-04	October 23, 2007	6.9
Hwy. 17 WBL 1.2 km East of Kinburn Side Road	GMS-05	October 24, 2007	4.1
Hwy. 17 EBL West Approach to Madawaska River Bridge	GMS-06	October 24, 2007	5.6
Hwy. 17 EBL East of Scheel Drive	GMS-07	May 21, 2008	4.8
Hwy. 17 EBL East of Scheel Drive	GMS-08	May 21, 2008	6.4
Hwy. 17 EBL East of Scheel Drive	GMS-09	May 21, 2008	4.8
Hwy. 17 WBL East of Scheel Drive	GMS-10	May 22, 2008	3.2
Hwy. 17 WBL West of Campbell Drive	GMS-11	May 22, 2008	7.1



The approximate locations of the above boreholes are shown on Drawings 1 to 3. The investigation was carried out using a track mounted drill rig supplied and operated by a specialist drilling contractor.

In these boreholes, soil drilling was carried out using hollow stem augers and all soil samples were obtained using a 50 mm outside diameter split spoon sampler driven in accordance with the Standard Penetration Test (SPT). Bedrock was cored using an NQ core barrel in conjunction with N size casings. Groundwater conditions in the open boreholes were observed throughout the drilling operations. The borehole completion details are shown in Table 3.2 below.

**Table 3.2 – Borehole Completion Details**

<b>Borehole Location</b>	<b>Piezometer Tip Depth / Elevation (m)</b>	<b>Completion Details</b>
07-GMS-01	None Installed	Bentonite grout to 0.3 m, then crushed limestone to surface
07-GMS-02	None Installed	Bentonite grout to 0.3 m, then sand and gravel to surface
07-GMS-03	None Installed	Bentonite grout to surface
07-GMS-04	None Installed	Bentonite grout to surface
07-GMS-05	None Installed	Bentonite grout to surface
07-GMS-06	None Installed	Bentonite grout to surface
08-GMS-07	None Installed	Borehole grouted to 0.9m, bentonite holeplug to 0.3m, then sand and gravel to surface
08-GMS-08	None Installed	Borehole grouted to 0.9 m, bentonite holeplug to 0.3 m, then crushed limestone to surface
08-GMS-09	None Installed	Borehole grouted to 1.2 m, bentonite holeplug to 0.3 m, then crushed limestone to surface
08-GMS-10	None Installed	Bentonite holeplug to surface
08-GMS-11	None Installed	Borehole grouted and bentonite holeplug to surface

The field work was supervised on a full-time basis by a member of our field staff who located the boreholes in the field, cleared borehole locations of underground utilities, directed the drilling, sampling and in-situ testing operations, and logged the boreholes. The soil and rock samples were identified in the field, placed in appropriately labelled containers and core boxes, respectively, and transported back to Thurber's laboratory for further examination and testing.



Upon completion of drilling and coring, the boreholes were grouted and/or filled with bentonite, and capped with granular materials at some locations.

### **3.2 Laboratory Testing**

Geotechnical laboratory testing consisted of natural moisture content determination and visual identification of all soil samples in accordance with the current MTO standards. Grain size distribution analysis and Atterberg Limits tests are conducted on selected samples. All rock core samples were logged and subjected to Rock Quality Designation (RQD) and core recovery measurements. Point load tests were conducted on selected rock cores to infer the unconfined compressive strength. The laboratory test results are presented in Appendix B.

## **4.0 SUBSURFACE STRATIGRAPHY**

### **4.1 General**

This section presents a generalized summary of the subsurface conditions encountered in the boreholes. The detailed subsurface soil, rock and groundwater conditions encountered in all eleven boreholes are presented on the Records of Boreholes in Appendix A.

In general, the subsurface conditions encountered in the boreholes consist of topsoil or fill overlying native silty clay and silty clay till which is underlain by bedrock. The Borehole Locations drawings illustrate the approximate locations of the eleven boreholes.

#### **4.1.1 Topsoil**

Topsoil ranging from 75 to 300 mm in thickness was encountered at ground surface in Boreholes 07-GMS-03 to GMS-06 directly overlying native soils or bedrock. Topsoil is anticipated to exist elsewhere within the sites and its thickness will vary between and beyond the borehole locations. The data provided in this report is not intended for estimating topsoil quantities.

#### **4.1.2 Fill**

Fill was encountered at ground surface in Boreholes 07-GMS-01, 07-GMS-02, 08-GMS-07, 08-GMS-08, 08-GMS-09 and 08-GMS-11. In Borehole 07-GMS-01 and 08-GMS-09, the fill



consists of crusher run limestone overlying silty clay for a combined thickness of 1.5 m (base Elevations 122.8 and 124.5 m, respectively). In Boreholes 07-GMS-02 and 08-GMS-07, the fill consists of sand and gravel with occasional cobbles extending to 1.4 m depth (base Elevations 117.6 and 125.1 m, respectively). The silty clay fill and the lower portion of the sand and gravel fill contained rock fragments. In Boreholes 08-GMS-08 and 08-GMS-09, crusher run limestone overlies sand and gravel fill, and silty clay fill, respectively. The fill extends to 1.5 to 2.0 m depths with base Elevations of 124.3 to 124.5 m. In Borehole 08-GMS-11, the silty clay fill with occasional rockfill intrusion extends to 1.4 m depth (base Elevation 120.7 m), and is underlain by an inferred boulder.

The crusher run limestone was in a compact to very dense state as indicated by an SPT 'N' value ranging from 20 to 66 blows per 0.3 m penetration. The silty clay fill had a stiff to hard consistency as indicated by 'N' values of 12 to 58 blows per 0.3 m penetration. The sand and gravel was in a compact to very dense as indicated by 'N' values ranging between 21 and 76 blows per 0.3 m penetration. Measured moisture contents of the granular materials ranged between 3% and 8%, whereas the measured values for the silty clay fill ranged from 8% to 20%.

Grain size distribution analyses were carried out on samples of the sandy gravel fill and silty clay fill. The results of these analyses are shown on Figures B1 and B2 in Appendix B and also summarized in the table below.

Soil Particles	%
<b>Sandy Gravel Fill</b>	
Gravel	64
Sand	25
Silt and Clay	11
<b>Silty Clay Fill</b>	
Gravel	0 to 5
Sand	52 to 59
Silt	26 to 29
Clay	12 to 17



#### 4.1.3 Silty Clay

Deposits of native cohesive silty clay were encountered below the topsoil in Boreholes 07-GMS-03 and 07-GMS-06, below the fill in Borehole 08-GMS-11, and at ground surface in Borehole 08-GMS-10. Where encountered, these cohesive deposits extend to variable depths ranging from 2.6 to 3.9 m, or between Elevations 99.7 m and 118.2 m, except in Borehole 08-GMS-10 where the silty clay was 0.2 m thick. The silty clay is typically brown in colour becoming grey with depth at some locations. Cobbles or boulders were inferred in this deposit at elevations close to bedrock. Boulders were encountered at 1.4 to 1.6 m depth and inferred at 3.1 m depth within this deposit in Borehole 08-GMS-11.

Measured SPT 'N' values within the silty clay deposit typically range between 25 blows and 4 blows per 0.3 m penetration indicating a very stiff becoming firm consistency with depth. An occasional 'N' value of >50 blows for <0.3 m penetration in Borehole 08-GMS-11 infers the presence of boulders. Measured moisture contents of samples of the silty clay increased from approximately 18% to 55% with depth.

Grain size distribution analyses were carried out on selected silty clay samples. The results of these analyses are presented in Figure B3. Atterberg limits tests were also conducted and the results plotted on a plasticity chart shown on Figure B5. The results are also summarized in the tables below.

Soil Particles	%
Silty Clay	
Gravel	0
Sand	3 to 14
Silt	53 to 63
Clay	33 to 40

Index Property	%
Silty Clay	
Liquid Limit	43 to 54
Plastic Limit	17 to 22
Plasticity Index	26 to 32





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

Glacially derived soils inherently contain cobbles and boulders as inferred in some of the boreholes.

#### 4.1.4 Silty Clay Till

Deposits of native cohesive silty clay till were encountered below the topsoil in Boreholes 07-GMS-04 and below the fill in Boreholes 08-GMS-08. Where encountered, this cohesive till extends to depths between 3.0 m and 4.0 m, or between Elevations 110.9 m and 123.3 m. The silty clay till is typically brown in colour. Cobbles or boulders were inferred in the till deposit in Borehole 07-GMS-04.

Measured 'N' values within the silty clay till typically varied from 18 to 31 blows per 0.3 m penetration indicating a very stiff to hard consistency. An occasional 'N' value of 68 blows for 0.3 m penetration infers the presence of cobbles. Moisture contents of the silty clay till ranged between 6% and 22%.

Grain size distribution analyses were carried out on selected silty clay till samples. The results of these analyses are presented in Figure B4. Atterberg limits tests were also conducted and the results plotted on a plasticity chart shown on Figure B6. The results are also summarized in the tables below.

Soil Particles	%
Silty Clay Till	
Gravel	10
Sand	46
Silt	28
Clay	16

Index Property	%
Silty Clay Till	
Liquid Limit	18
Plastic Limit	9
Plasticity Index	9



The above results show that the silty clay matrix of the till is of low plasticity with a group symbol of CL.

Glacially derived soils inherently contain cobbles and boulders as inferred in some of the boreholes.

#### 4.1.5 Bedrock

The overburden soils are underlain by bedrock which was proven by coring beyond the augered depths in all eleven boreholes. The following table summarizes the depth to bedrock encountered at the borehole locations.

**Table 4.1 Depths and Elevations of Bedrock**

<b>Borehole Number</b>	<b>Depth to Bedrock (m)</b>	<b>Top of Bedrock Elevation (m)</b>
07-GMS-01	1.5	122.8
07-GMS-02	1.4	117.6
07-GMS-03	3.8	108.2
07-GMS-04	4.0	110.9
07-GMS-05	0.3	117.9
07-GMS-06	2.6	99.7
08-GMS-07	1.4	125.1
08-GMS-08	3.4	122.9
08-GMS-09	1.5	124.5
08-GMS-10	0.2	124.8
08-GMS-11	3.9	118.2

The bedrock encountered in Boreholes 07-GMS-01 to 07-GMS-06, 08-GMS-07 to 08-GMS-10 is typically a grey crystalline limestone with dark grey, black and occasionally white banding. The bedrock is typically in a fresh state with slight weathering at the joints occurring at shallow depths. Many of the bandings and joints are sub-vertical. Granite bedrock was encountered in Borehole 08-GMS-11. This rock is massive with a grey to pink colour.

Total Core Recovery (TCR) of the bedrock was 100%. In Boreholes 07-GMS-01 to 07-GMS-04, 07-GMS-06, 08-GMS-08 and 08-GMS-11, the Rock Quality Designation (RQD) values were typically 100% indicating an excellent rock quality. The Fracture Indices (FI) of the rock, expressed as fractures per 0.3 m of core, were generally 0 and 1. In Boreholes 08-GMS-05 and 08-GMS-09, the RQD values of the two Runs #1 were 53% and 62% indicating a fair rock



quality. The measured FIs in these two boreholes typically ranged from 5 to 0 with depth. In Boreholes 08-GMS-07 and 08-GMS-10, the RQD values of the two Runs #1 were 13% and 38% indicating a poor to very poor rock quality. The FIs were greater than 10 (broken cores) at shallow depths, decreasing to 0 near the bottom of the boreholes.

Point load tests were carried out on selected rock cores. The Unconfined Compressive Strengths (UCS) of the rock cores, as inferred from the point load test results, range from 53 MPa to 228 MPa indicating that the rock is strong to very strong. An occasional value of 295 MPa indicates the presence of an extremely strong zone. It is also apparent that the overall strength of the rock mass increases with depth.

#### 4.1.6 Groundwater Conditions

Groundwater conditions were observed during and upon completion of drilling. All the boreholes were largely dry during augering. The depths and elevations of water level readings observed in the open boreholes upon completion are presented in the following table.

Borehole	Water Level Depth (m)	Water Level Elevation (m)
07-GMS-01	2.7	121.7
07-GMS-02	3.3	115.7
07-GMS-03	1.8	110.3
07-GMS-04	1.8	113.0
07-GMS-05	0.1	118.1
07-GMS-06	2.7	99.6
08-GMS-07	1.5	125.0
08-GMS-08	3.0	123.3
08-GMS-09	1.5	124.5
08-GMS-10	0.9	124.1
08-GMS-11	3.8	118.3

Some of the water levels noted above may be attributed to the drill water accumulated inside the borehole.

It should be noted that these observed levels are based on short term observations and groundwater levels are subject to seasonal fluctuations and severe climatic events.



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## 5.0 MISCELLANEOUS

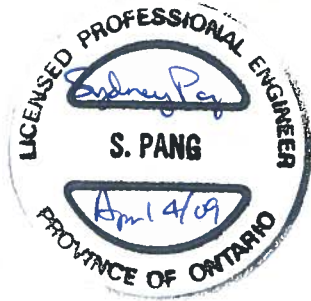
The borehole locations were marked in the field by surveyors from J.D. Barnes Ltd. who also provided Thurber with the coordinates and geodetic elevations. Thurber obtained utility clearances prior to drilling. Eastern Ontario Diamond Drilling Limited of Hawkesbury, Ontario supplied the drill rig and conducted 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. George Azzopardi of Thurber. Laboratory testing was carried out by Thurber in its MTO-approved Oakville laboratory.

Dr. Sydney Pang, P.Eng. directed the field operations and prepared this report.

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





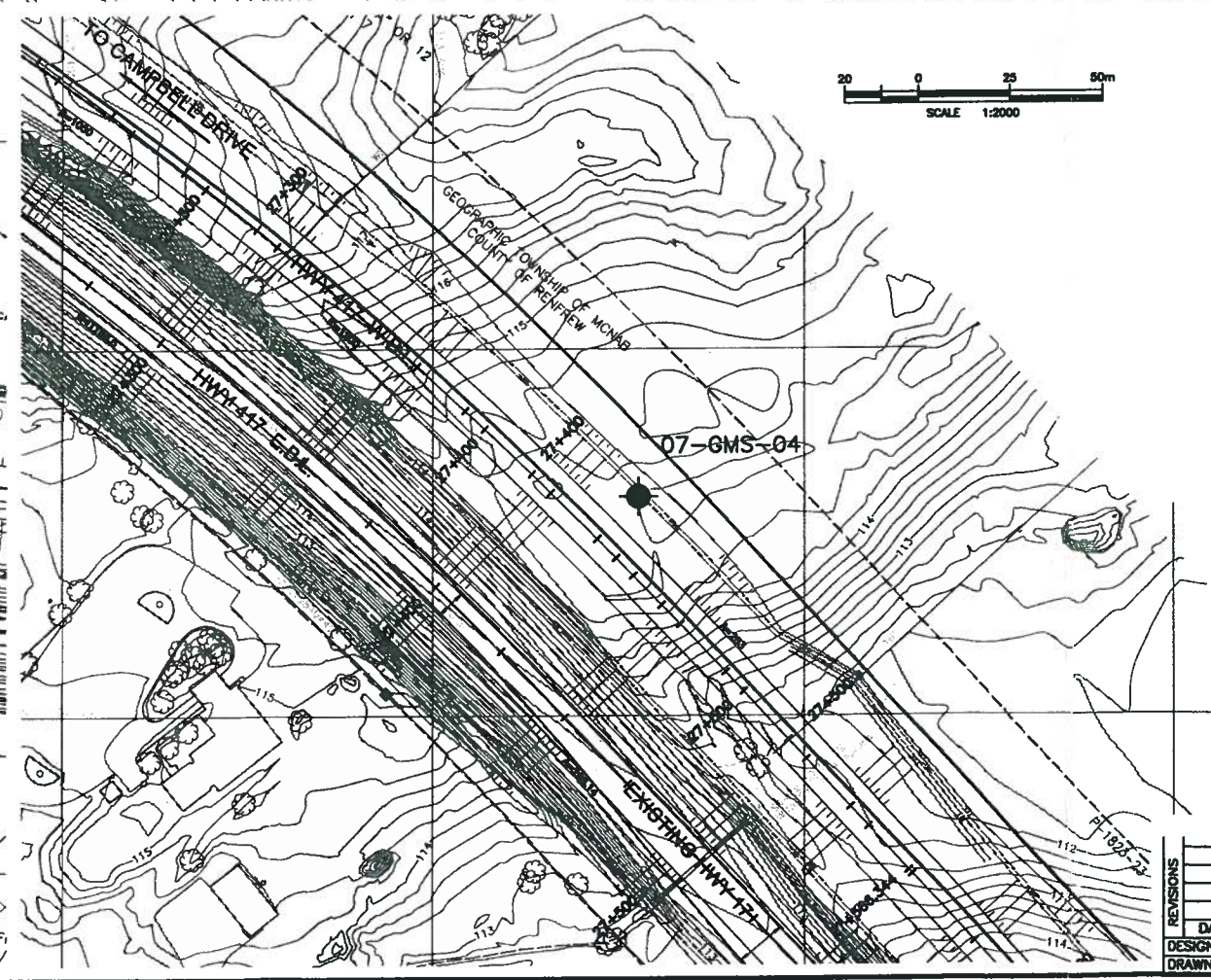
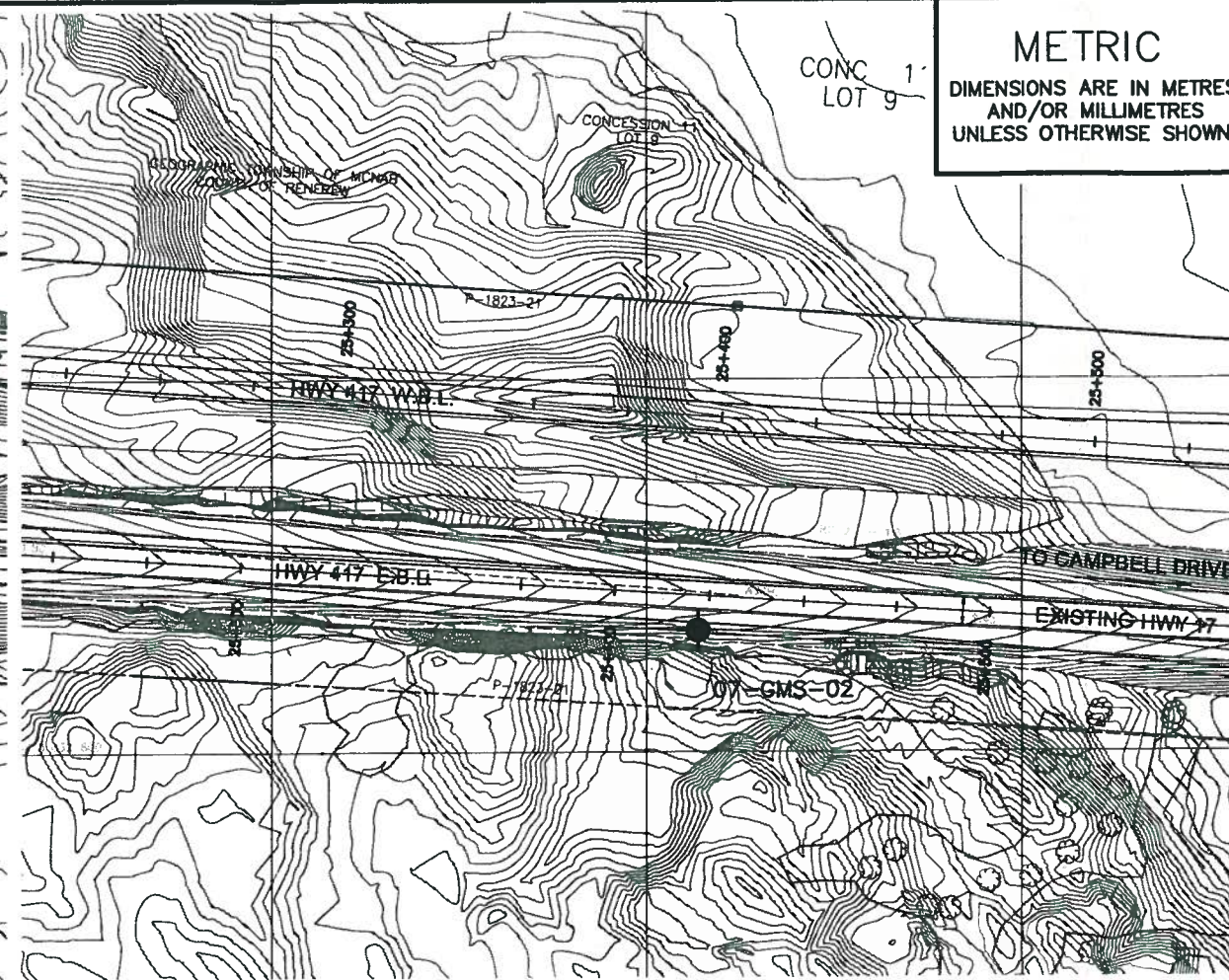
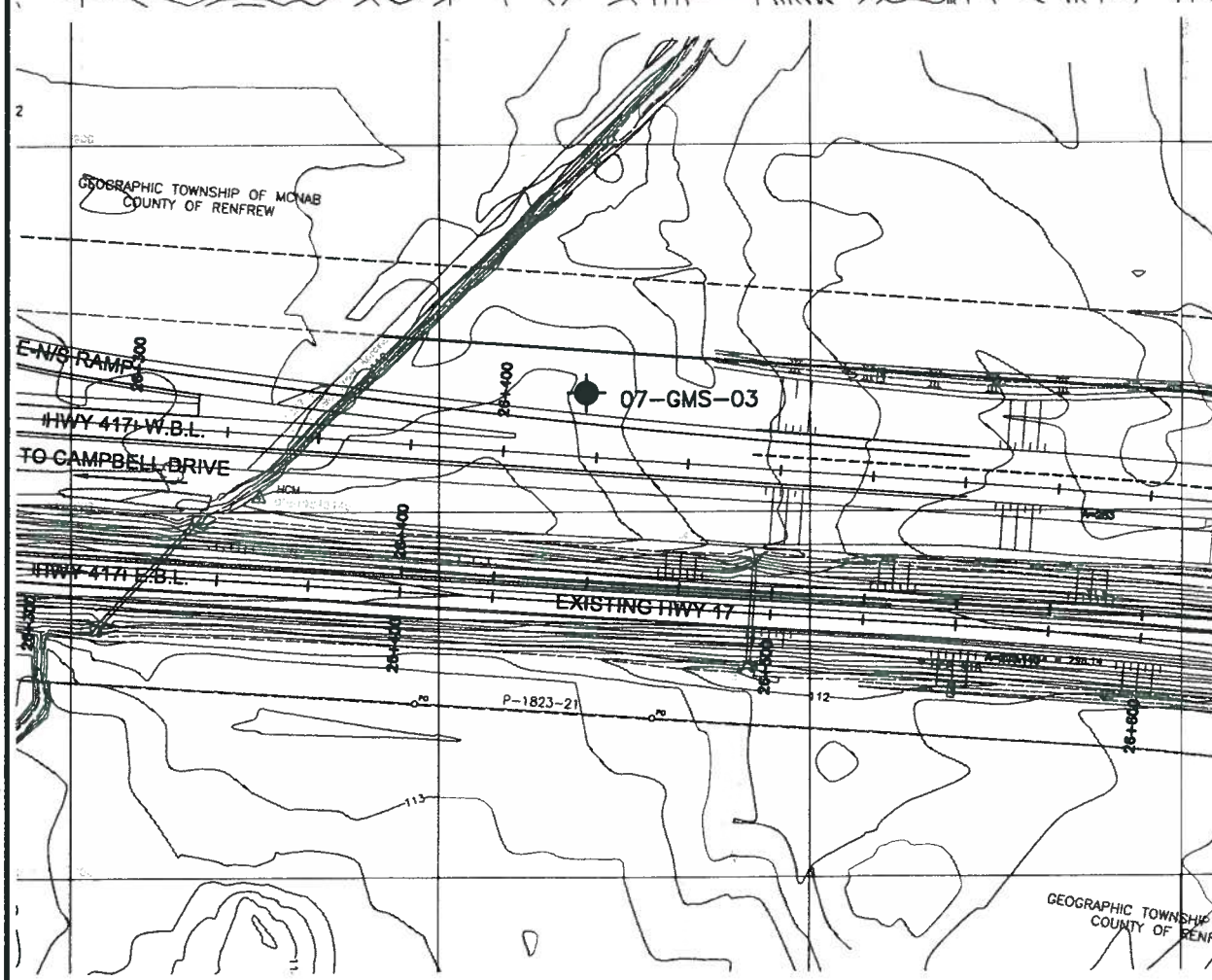
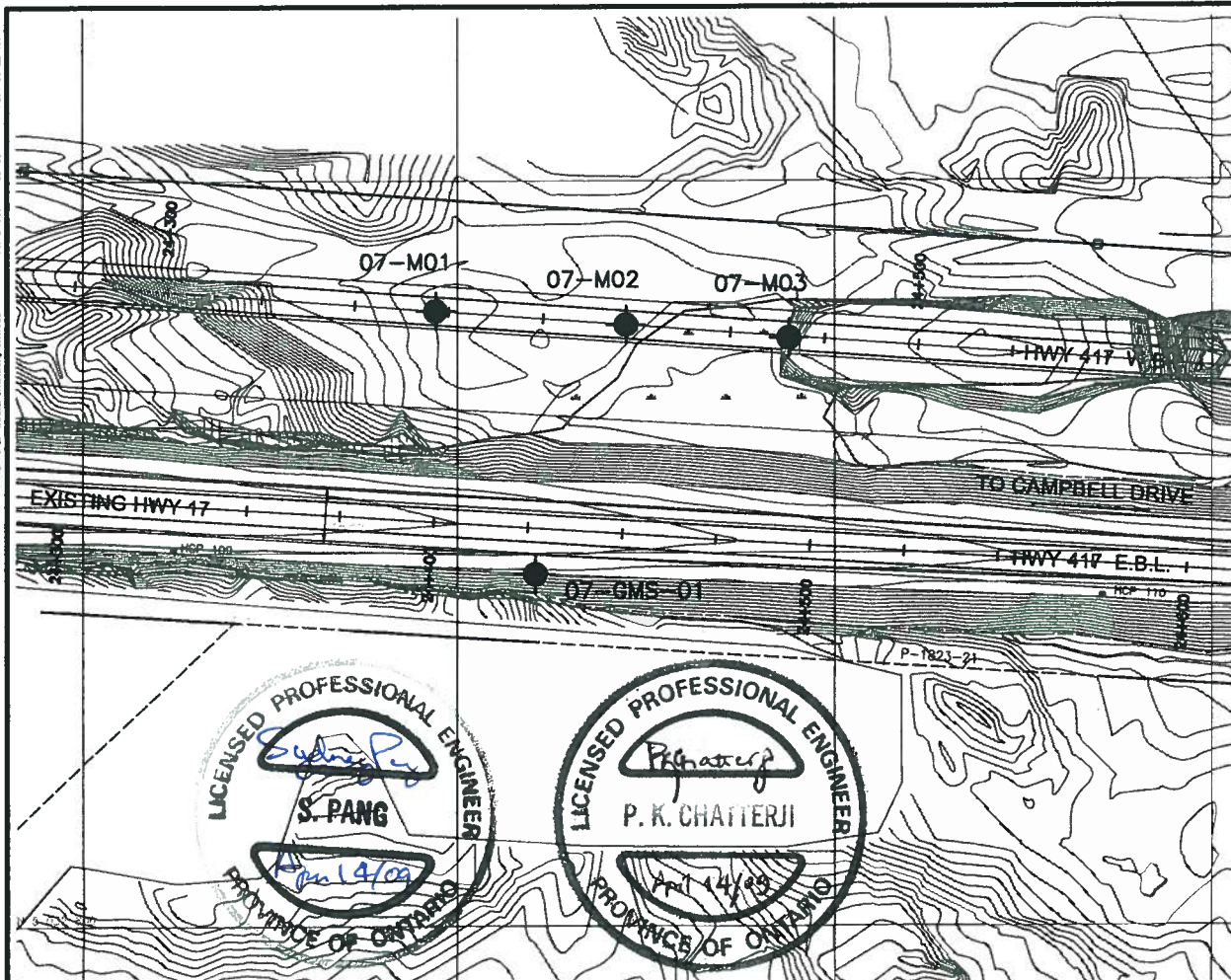
Sydney Pang, P.Eng.  
Associate, Senior Project Engineer



P.K. Chatterji, P.Eng.  
Review Principal, Designated MTO Contact







CONC 1  
LOT 9

METRIC

DIMENSIONS ARE IN METRES  
AND/OR MILLIMETRES  
UNLESS OTHERWISE SHOWN

HWY 17/417  
SITE No  
GWP No 4067-03-00



GROUND MOUNTED SIGNS  
HIGHWAY 17/417 TWINNING  
BOREHOLE LOCATIONS PLAN

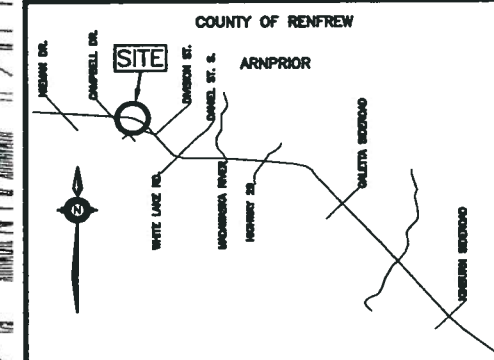
**SHEET**








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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-GMS-01	124.4	5 032 894.3	310 620.6
07-GMS-02	119.0	5 032 832.6	311 613.5
07-GMS-03	112.1	5 032 832.4	312 639.5
07-GMS-04	114.8	5 032 459.8	313 555.6
07-M01	121.7	5 032 964.9	310 584.2
07-M02	121.8	5 032 961.2	310 644.5
07-M03	121.0	5 032 957.7	310 687.9

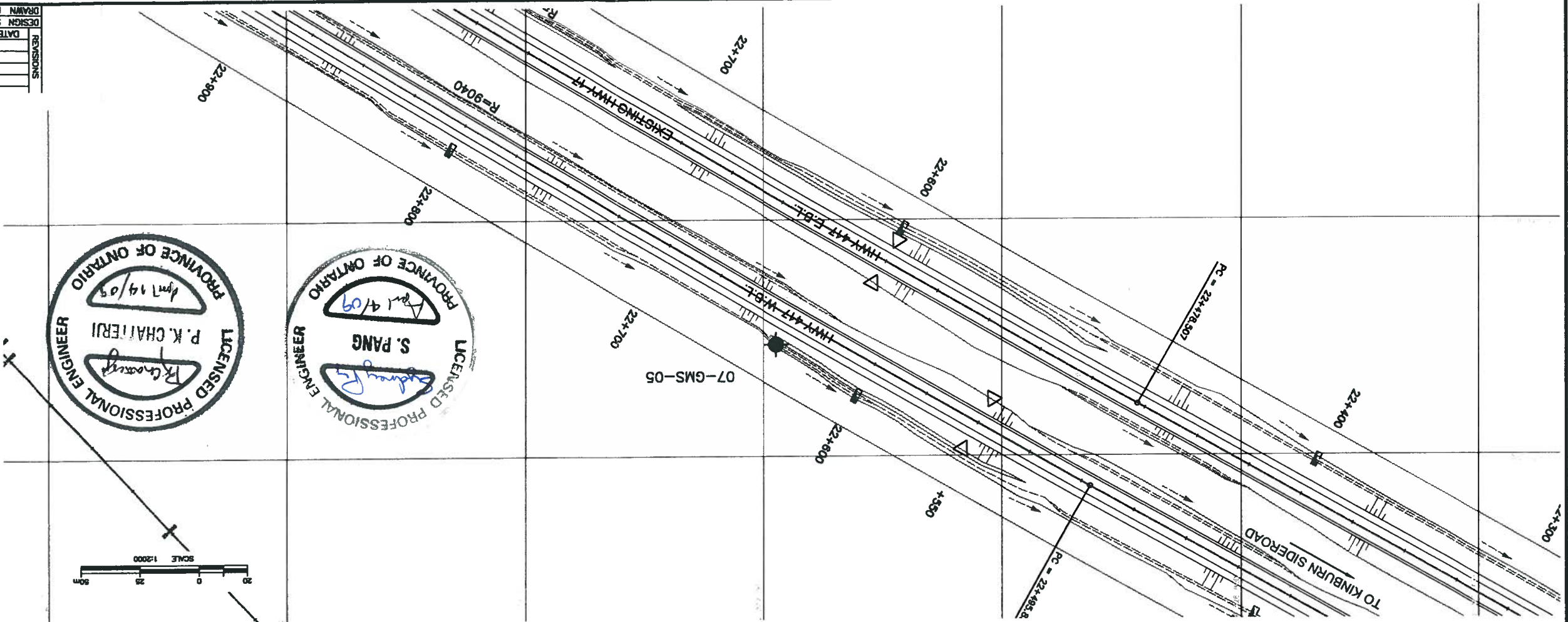
**-NOTES-**

- 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. 31F-166**

[illegible]



[illegible]



[illegible]



**Appendix A**

**Record of Boreholes**



# 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	
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 07-GMS-01

1 OF 1

METRIC

G.W.P. 4067-03-00 LOCATION Highway 17 EBL between Campbell and Scheel N 5 032 894.3 E 310 620.6 ORIGINATED BY GA  
HWY 17/417 BOREHOLE TYPE Hollow Stem Augers / NQ Coring COMPILED BY ES  
DATUM Geodetic DATE 2007.10.25 - 2007.10.25 CHECKED BY SKP

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										WATER CONTENT (%)		
								○ UNCONFINED		+ FIELD VANE		● QUICK TRIAXIAL						× LAB VANE		
124.4							20	40	60	80	100									
0.0	CRUSHER RUN LIMESTONE Compact Grey to Brown (FILL)		1	SS	20															
123.6																				
0.8	Silty CLAY, some sand, trace to some gravel, mixed with rock fragments Hard Brown (FILL)		2	SS	45												0 59 29 12			
122.8																				
1.5	CRYSTALLINE LIMESTONE (BEDROCK) Fresh, thinly bedded, grey with black and white banding, occasional iron oxide staining, strong to very strong		1	RUN													RUN 1# TCR=100%, SCR=100%, RQD=100%, UCS=84 to 126MPa			
																		RUN 2# TCR=100%, SCR=100%, RQD=100%, UCS=53 to 147MPa		
				2	RUN															
119.8																				
4.5	END OF BOREHOLE AT 4.52m. BOREHOLE OPEN AND WATER LEVEL AT 2.74m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO 0.3m, THEN CRUSHED LIMESTONE FROM 0.3m TO SURFACE.																			

+ 3, X 3: Numbers refer to  
Sensitivity

20  
15  
10

(%) STRAIN AT FAILURE

# RECORD OF BOREHOLE No 07-GMS-02

1 OF 1

METRIC

G.W.P. 4067-03-00 LOCATION Highway 17 EBL near Campbell N 5 032 832.6 E 311 613.5 ORIGINATED BY GA  
 HWY 17/417 BOREHOLE TYPE Hollow Stem Augers / NQ Coring COMPILED BY ES  
 DATUM Geodetic DATE 2007.10.25 - 2007.10.25 CHECKED BY SKP

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 (%)									
119.0							20	40	60	80	100	PLASTIC LIMIT W <sub>P</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>			
0.0	SAND and GRAVEL Dense Brown and Black (FILL)		1	SS	32												
118.4																	
0.6	SAND and GRAVEL, mixed with rock fragments Very Dense Brown (FILL)		2	SS	65												
117.6																	
1.4	CRYSTALLINE LIMESTONE (BEDROCK) Fresh, thinly bedded, grey with occasional banding, strong to very strong		1	RUN													
				2	RUN												
114.5																	
4.5	END OF BOREHOLE AT 4.52m. BOREHOLE OPEN TO 4.52m AND WATER LEVEL AT 3.35m. BOREHOLE BACKFILLED WITH BENTONITE TO 0.3m THEN SAND AND GRAVEL TO SURFACE																

RECORD OF BOREHOLE No 07-GMS-03									
1 OF 1									
METRIC									
G.W.P. 4067-03-00		LOCATION Highway 17 WBL near Campbell N 5 032 832.4 E 312 639.5		ORIGINATED BY GA		COMPILED BY ES		CHECKED BY SKP	
DATE 2007.10.23 - 2007.10.23		BOREHOLE TYPE Hollow Stem Augers / NO Coring		2007.10.23 - 2007.10.23		2007.10.23 - 2007.10.23		2007.10.23 - 2007.10.23	
DATUM Geodetic		17/417		2007.10.23 - 2007.10.23		2007.10.23 - 2007.10.23		2007.10.23 - 2007.10.23	
SOIL PROFILE		SAMPLER		SAMPLER		SAMPLER		SAMPLER	
ELEV		DEPTH		DESCRIPTION		STRAT PLOT		NUMBER	
112.1		0.0		TOPSOIL (15mm)				1	
0.1		0.1		Silty CLAY, trace sand, occasional rootlets				20	
				Brown Very Stiff				15	
				becoming Grey				3	
								5	
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RECORD OF BOREHOLE No 07-GMS-04									
1 OF 1									
METRIC									
G.W.P. 4067-03-00		LOCATION Highway 17 WBL west of Division N 5 032 459.8 E 313 555.6		ORIGINATED BY GA		COMPILED BY ES		CHECKED BY SKP	
DATUM Geodetic		DATE 2007.10.23 - 2007.10.23		BOREHOLE TYPE Hollow Stem Augers / NO Coring		2007.10.23 - 2007.10.23			
HWY 17/417		BOREHOLE TYPE		Hollow Stem Augers / NO Coring		2007.10.23 - 2007.10.23			
ELEV		DEPTH		DESCRIPTION		SOIL PROFILE		SAMPLES	
114.8		0.0		TOPSOIL (90mm)		0.1		1	
				Silty CLAY, some sand, trace gravel		Very Stiff to Hard		Brown	
				(TILL)				2	
				Inferred cobble (100mm)				3	
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# RECORD OF BOREHOLE No 07-GMS-06

1 OF 1

METRIC

G.W.P. 4067-03-00 LOCATION Hwy 17 EBL west approach to Madawaska River Bridge N 5 031 140.2 E 316 105.6 ORIGINATED BY GA

HWY 17/417 BOREHOLE TYPE Hollow Stem Augers / NQ Coring COMPILED BY ES

DATUM Geodetic DATE 2007.10.24 - 2007.10.24 CHECKED BY SKP

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			SHEAR STRENGTH kPa								
								WATER CONTENT (%)								
102.3						20	40	60	80	100	PLASTIC LIMIT W <sub>P</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>			
0.0	TOPSOIL (75mm)															
0.1	Clayey SILT, trace sand, occasional rootlets Very Stiff Brown		1	SS	19											
101.9																
0.5	Silty CLAY, trace to some sand, occasional rootlets Very Stiff Brown		2	SS	25											
			3	SS	23											
	Inferred cobble (100mm) Inferred cobble (100mm)															
99.7																
2.6	CRYSTALLINE LIMESTONE (BEDROCK) Fresh, thinly bedded, grey with black banding, strong to very strong		4	SS	50/ .000											
			1	RUN												
			2	RUN												
96.8																
5.6	END OF BOREHOLE AT 5.59m. BOREHOLE OPEN TO 5.59m AND WATER LEVEL AT 2.74m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO SURFACE.															

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

20  
15  
10  
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 08-GMS-07

1 OF 1

METRIC

G.W.P. 4067-03-00 LOCATION Highway 17 EBL East of Scheel N 5 032 992.0 E 309 121.2 ORIGINATED BY GA  
HWY 17/417 BOREHOLE TYPE Hollow Stem Augers / NQ Coring COMPILED BY MFA  
DATUM Geodetic DATE 2008.05.21 - 2008.05.21 CHECKED BY SKP

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						
126.5								20	40	60	80	100		
0.0	SAND and GRAVEL, occasional silt, occasional rootlets Compact Brown		1	SS	21		126							
125.9	Dry to Moist (FILL)													
0.6	GRAVEL, sandy, some silt and clay, occasional inferred cobbles Very Dense Brown		2	SS	76									
125.1	Dry (ROCK FILL)						125							
1.4	CRYSTALLINE LIMESTONE (BEDROCK), slightly weathered to fresh, thinly bedded, grey to mottled grey/brown with black and white banding, strong to very strong Highly broken zone at 1.45 to 2.06m Sub-vertical joints at 2.26, 2.44, 2.49, 2.57, 2.62 and 2.82m Horizontal joint at 2.72m		1	RUN			124							
	Highly broken zone at 3.66 to 3.71 and 3.18 to 5.05m Sub-vertical joints at 2.97, 3.68, 4.09 and 4.24m Horizontal joint at 3.83m		2	RUN			123							
121.7			3	RUN			122							
4.8	END OF BOREHOLE AT 4.80m. BOREHOLE OPEN AND WATER LEVEL AT 1.52m UPON COMPLETION. BOREHOLE GROUTED TO 0.90m, BENTONITE HOLEPLUG TO 0.30m, THEN SAND AND GRAVEL TO SURFACE.													

RECORD OF BOREHOLE No 08-GMS-08

1 OF 1

METRIC

G.W.P. 4067-03-00 LOCATION Highway 17 EBL East of Scheel N 5 032 972.4 E 309 420.2 ORIGINATED BY GA  
HWY 17/417 BOREHOLE TYPE Hollow Stem Augers / NQ Coring COMPILED BY MFA  
DATUM Geodetic DATE 2008.05.21 - 2008.05.21 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT  Y  kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
126.3								20	40	60	80	100		
0.0	CRUSHER RUN LIMESTONE Very Dense Grey Dry (FILL)		1	SS	66		126							
125.7														
0.6	SAND and GRAVEL, trace clay, occasional silt Compact to Dense Brown Dry to Moist (FILL)		2	SS	23		125							
124.3			3	SS	34									
2.0	Silty CLAY, with sand, trace gravel Very Stiff Brown (TILL)		4	SS	18		124							
123.3														
3.0	Silty SAND, occasional gravel, occasional iron oxide staining Very Dense Brown Moist to Wet		5	SS	50/ .150		123							
122.9														
3.4	CRYSTALLINE LIMESTONE (BEDROCK), fresh, thinly bedded, grey with black and white banding, strong to very strong Horizontal quartz seams at 3.86, 4.04 and 4.34m Vertical quartz seams at 3.35 to 3.48m Sub-vertical joint at 3.61m Horizontal joints at 3.86 and 4.04m  Quartz seam at 4.90 to 4.98m Sub-vertical calcite seam at 5.33 to 5.49m Horizontal joint at 5.84m		1	RUN			122							
			2	RUN			121							
119.9							120							
6.4	END OF BOREHOLE AT 6.40m. BOREHOLE OPEN AND WATER LEVEL AT 3.05m UPON COMPLETION. BOREHOLE GROUTED TO 0.90m, BENTONITE HOLEPLUG TO 0.30m, THEN CRUSHER RUN LIMESTONE TO SURFACE.													

+ 3, x 3: Numbers refer to  
Sensitivity

20  
15 5  
10 (%) STRAIN AT FAILURE

### METRIC

ORIGINATED BY GA

COMPILED BY MF

CHECKED BY SKP

+ 3, x 3: Numbers refer to Sensitivity

RECORD OF BOREHOLE No 08-GMS-10

1 OF 1

METRIC

G.W.P. 4067-03-00  
 HWY 17/417  
 BOREHOLE TYPE Hollow Stem Augers / NQ Coring  
 LOCATION Highway 17 WBL East of Scheel N 5 033 051.7 E 309 526.2  
 DATE 2008.05.22 - 2008.05.22  
 ORIGINATED BY GA  
 COMPILED BY MFA  
 CHECKED BY SKP

SOIL PROFILE		ELEVATION SCALE		GROUND WATER CONDITIONS		SAMPLES		STRAT PLOT		ELEV DEPTH		DESCRIPTION	
NUMBER	TYPE	N° VALUES	RESISTANCE PLOT	SHEAR STRENGTH KPa	WATER CONTENT (%)	UNIT WEIGHT	REMARKS	GRAIN SIZE DISTRIBUTION (%)	GR SA SI CL	FL	0.0	0.2	125.0
1	SS	50/	150	20	20	20	20	20	20	20	20	20	20
2	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
3	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
4	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
5	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
6	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
7	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
8	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
9	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
10	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
11	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
12	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
13	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
14	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
15	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
16	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
17	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
18	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
19	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
20	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
21	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
22	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
23	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
24	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
25	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
26	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
27	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
28	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
29	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
30	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
31	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
32	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
33	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
34	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
35	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
36	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
37	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
38	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
39	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
40	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
41	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
42	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
43	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
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66	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
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68	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
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71	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
72	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
73	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
74	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
75	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
76	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
77	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
78	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
79	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
80	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
81	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
82	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
83	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
84	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
85	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
86	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
87	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
88	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
89	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
90	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
91	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
92	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
93	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
94	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
95	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
96	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
97	RUN	50/	150	20	20	20	20	20	20	20	20	20	20
98	RUN	50/	150	20	20	20	20</						



METRIC

1 OF 1

RECORD OF BOREHOLE NO 08-GMS-11

G.W.P. 4067-03-00 HWY 17/417 LOCATION Highway 17 WBL West of Campbell N 5 032 945.4 E 311 022.5  
BOREHOLE TYPE Hollow Stem Augers / NO Coring  
DATE 2008.05.22 - 2008.05.22  
CHECKED BY SKP  
COMPILED BY MFA  
ORIGINATED BY GA

SOIL PROFILE									
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	RESISTANCE PLOT	
								DYNAMIC CONE PENETRATION	
								SHEAR STRENGTH kPa	
								● QUICK TRIAXIAL x LAB VANE	
								○ UNCONFINED + FIELD VANE	
								WATER CONTENT (%)	
								w <sub>p</sub> PLASTIC LIMIT	
								w NATURAL MOISTURE LIMIT	
								w <sub>L</sub>	
								UNIT WEIGHT	
								KN/m <sup>3</sup>	
								REMARKS & GRAIN SIZE DISTRIBUTION (%)	
								GR SA SI CL	
122.1								0 14 53 33	
0.0	Silly CLAY, with sand, trace gravel, occasional rootlets, occasional rockfill		1	SS	12			5 52 26 17	
120.7	(FILL) Brown Silty		2	SS	14				
120.5	Inferred Boulder: (200mm)								
1.6	Silly CLAY, some sand Very Silty Brown		3	SS	24				
			4	SS	20				
			5	SS	50				
118.2	Inferred boulder at 3.05m								
3.9	GRANITE (BEDROCK), fresh, massive, grey to pink, strong to very strong Horizontal joint at 5.00m		1	RUN					
			2	RUN					
			3	RUN					
115.0	Vertical quartz seam at 5.79 to 5.94m Horizontal joint at 6.00m								
7.1	END OF BOREHOLE AT 7.06m. BOREHOLE OPEN AND WATER LEVEL AT 3.81m UPON COMPLETION. BOREHOLE GROUTED AND BENTONITE HOLEPLUG TO SURFACE.								

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

## **Appendix B**

### **Geotechnical Laboratory Test Results**

19-1351-125

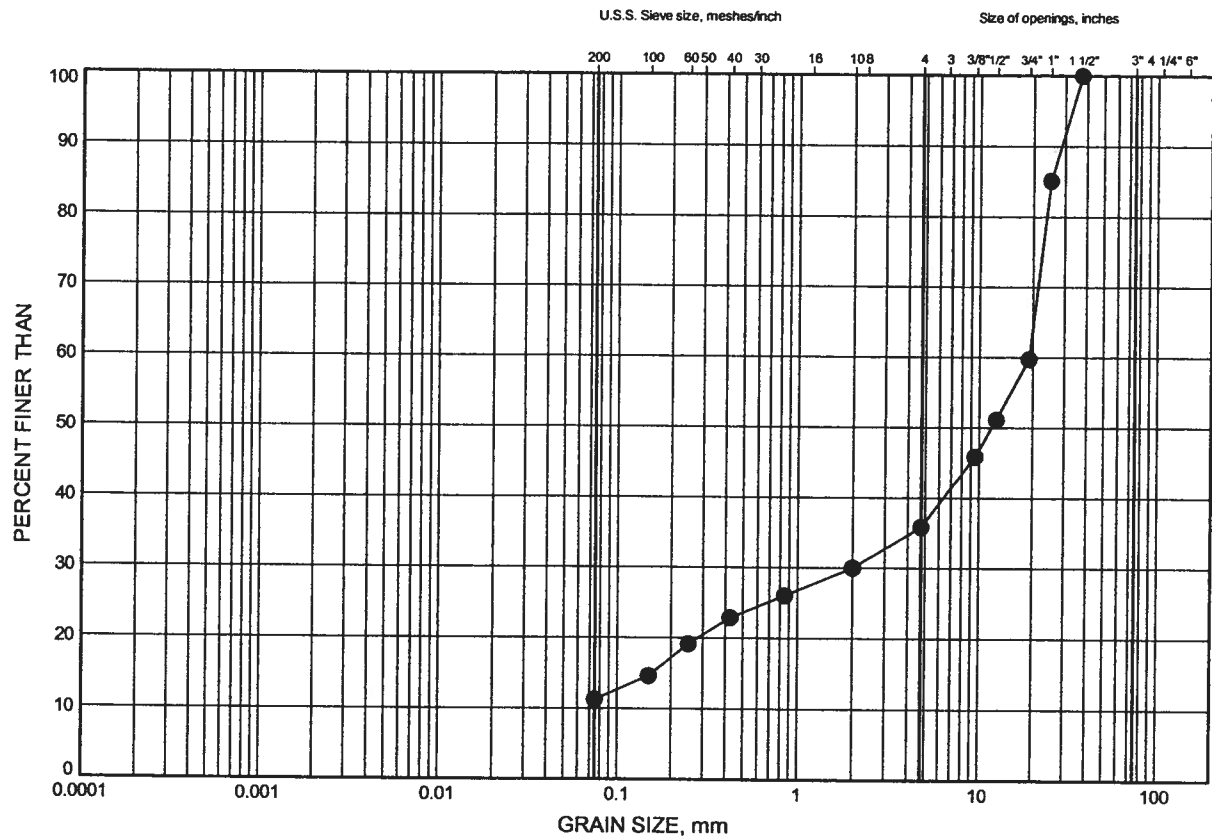




# GRAIN SIZE DISTRIBUTION

FIGURE B1

## SANDY GRAVEL FILL



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

### LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	08-GMS-07	1.07	125.43



THURBER

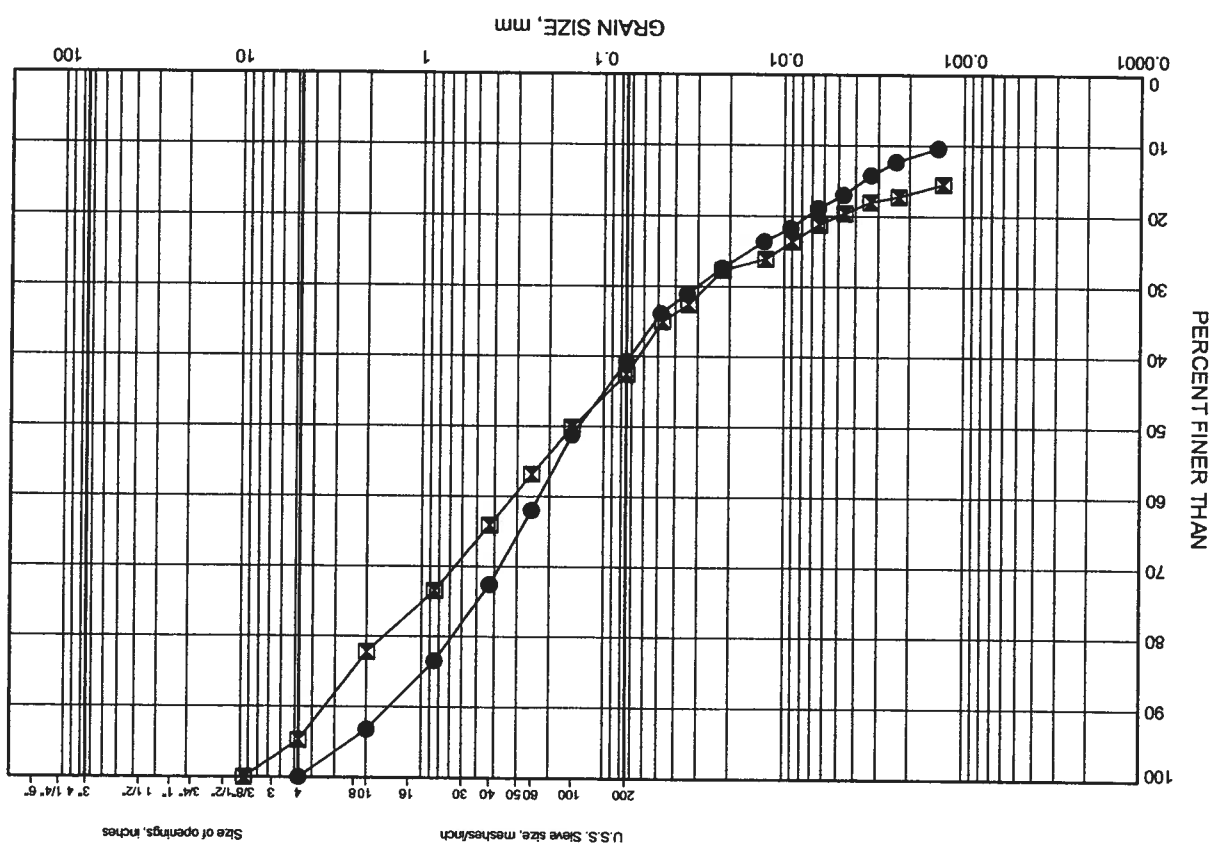
W.P.# 4067-03-00  
 Prepared By FK  
 Checked By SKP

W.P.# 4067-03-00  
Prepared By FK  
Checked By SKP



SYMBOL		BOREHOLE	DEPTH (m)	ELEV. (m)
●		07-GMS-01	1.07	123.30
⊠		08-GMS-11	1.07	121.03

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

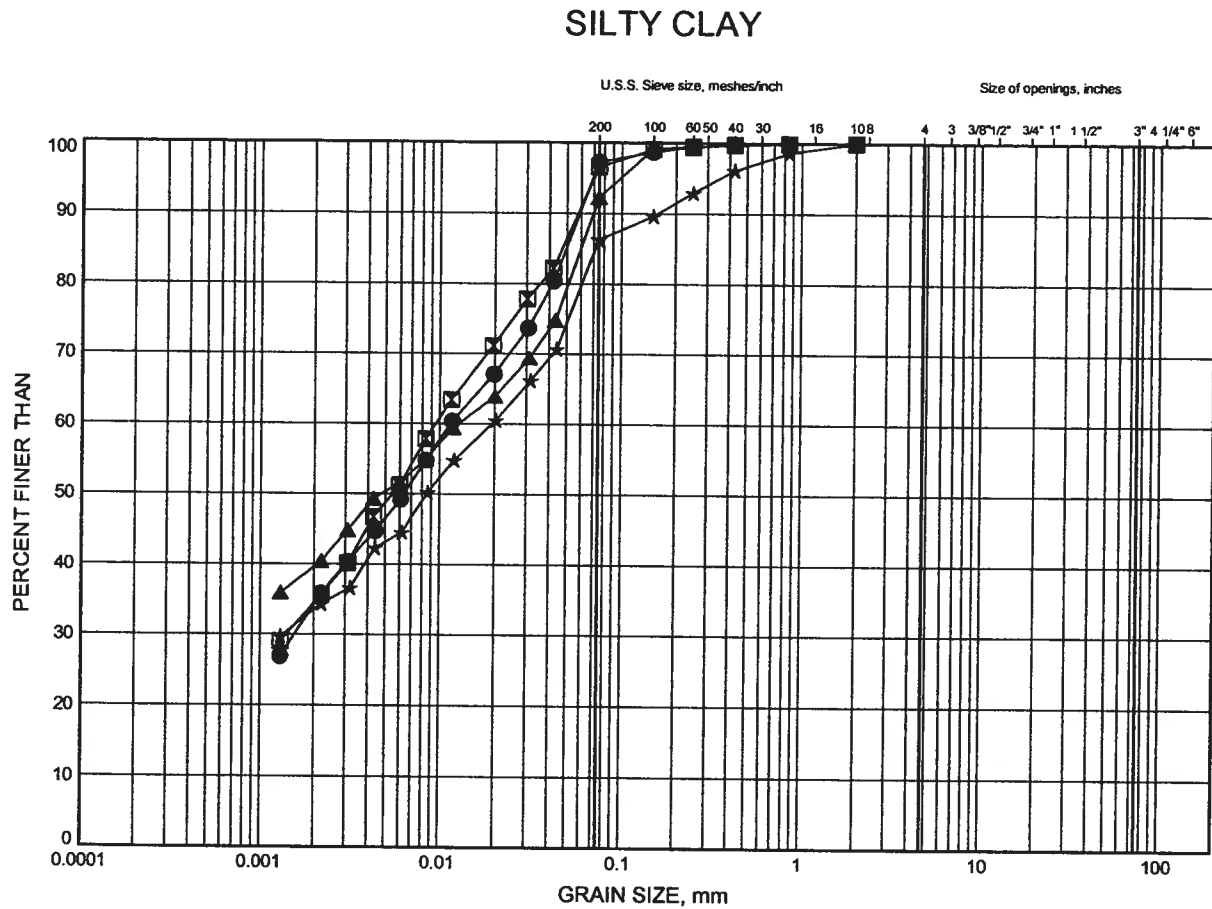


SILTY CLAY FILL

GRAIN SIZE DISTRIBUTION  
FIGURE B2

# 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-GMS-03	1.07	110.98
⊠	07-GMS-03	2.59	109.46
▲	07-GMS-06	1.83	100.51
★	08-GMS-11	1.91	120.20

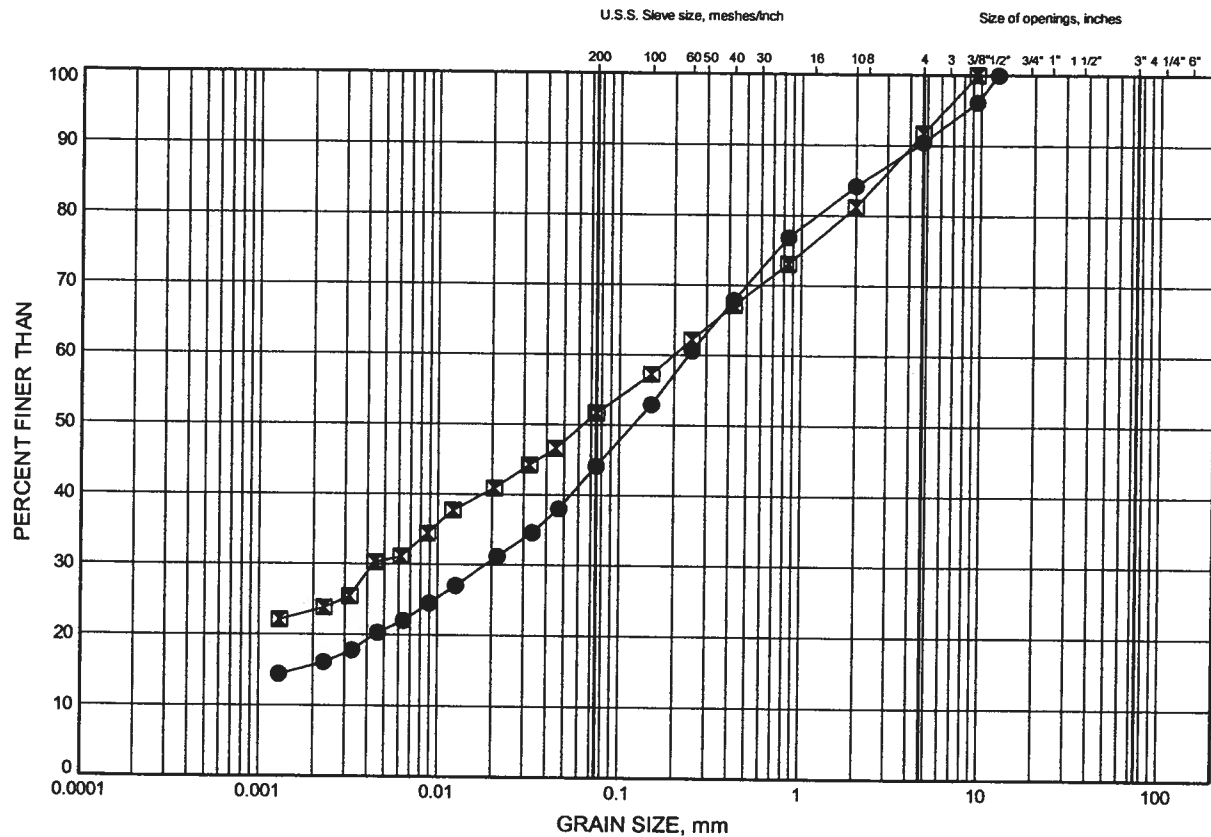


W.P.# 4067-03-00  
 Prepared By FK  
 Checked By SKP

# GRAIN SIZE DISTRIBUTION

FIGURE B4

## SILTY CLAY TILL



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

### LEGEND

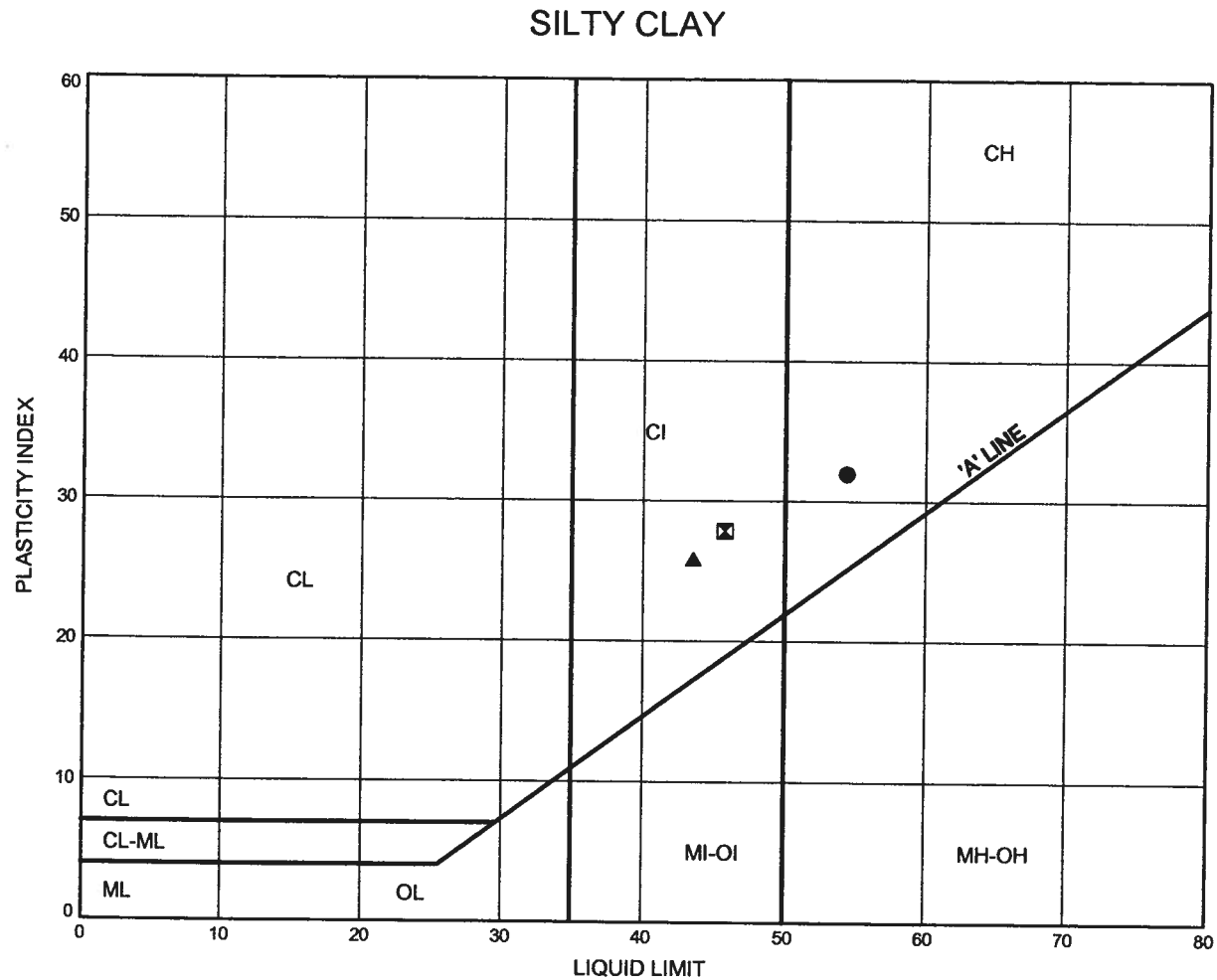
SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	07-GMS-04	3.35	111.47
◻	08-GMS-08	2.59	123.71



W.P.# 4067-03-00  
 Prepared By FK  
 Checked By SKP

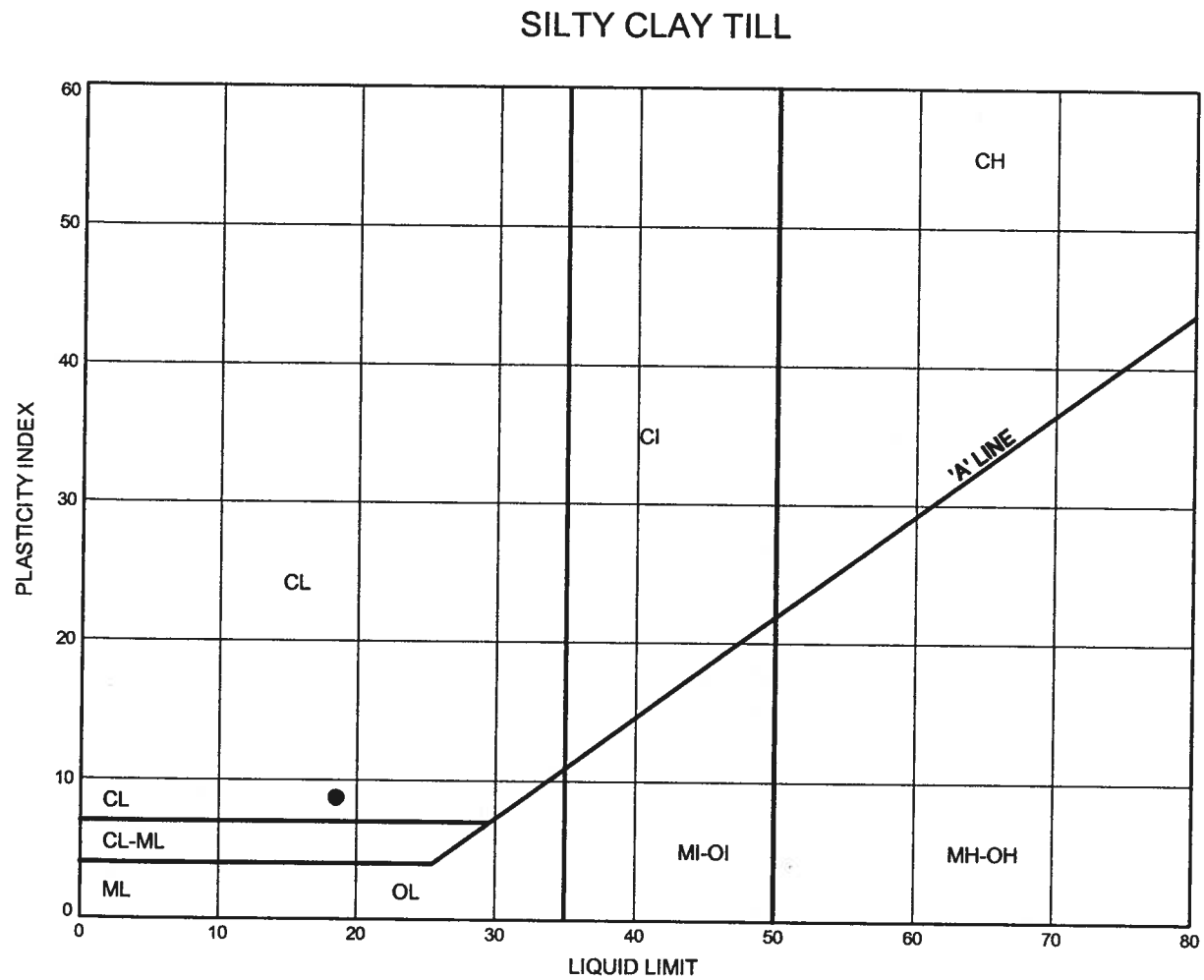
# ATTERBERG LIMITS TEST RESULTS

FIGURE B5



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	07-GMS-03	1.07	110.98
⊠	07-GMS-03	2.59	109.46
▲	07-GMS-06	1.83	100.51

FIGURE B6



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	07-GMS-04	3.35	111.47

Date September 2008  
Project 4067-03-00



Prep'd ..... FK  
Chkd. .... SKP