

FINAL REPORT

**Foundation Investigation Report
Gabion Wall Construction near Laronde Creek
Hwy 17, District 54
G.W.P. 5274-08-00
MTO GEOCRES No. 31L-137**

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October 15, 2009

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1. Part I: FOUNDATION INVESTIGATION

1.1 Introduction

This report presents the results of a geotechnical investigation completed by Trow Associates Inc. (Trow) for the Gabion wall construction near Laronde Creek. The Gabion walls will be located on the east and west side of a cantilevered pedestrian walkway at Laronde Creek Bridge on Hwy 17 about 20 km west of North Bay.

The work was undertaken under Agreement # 5006-E-0094, Assignment No. 3. The terms of reference were as presented in MTO letter dated July 30, 2009.

The purpose of the investigation is to examine the existing soil conditions within the proposed construction limits. The site specific geotechnical investigation consisted of test borings, borehole logging, and field and laboratory testing. This foundation investigation report has been prepared specifically and solely for the project described herein. It contains the factual results of the investigation and the laboratory testing.

1.2 Site Description and Geological Setting

1.2.1 Site Description

The site is located near Laronde Creek Bridge on Hwy 17, approximately 20 km west of North Bay, where Hwy 17 crosses Laronde Creek. Hwy 17 runs approximately east-west and the Laronde Creek flows north to south towards Lake Nipissing. The site plan and cross-section profiles are as shown on the drawings in Appendix B.

The existing Laronde Creek Bridge is a one span structure approximately 28.7 m long and 9.4 m wide. The bridge conveys one westbound lane and one eastbound lane of Hwy 17 over the Laronde Creek, as shown in Photograph No. 1 in Appendix A. The side slope at the south side of Hwy 17 embankment is approximately 2H:1V to 1.5H:1V. The surface at the existing bridge is at Elevation about 201.7 m and the water level in the creek is at Elevation about 195.9 m at the time of geotechnical investigation (Sept./11/2009).

The bank on the east side of the creek is relatively steep. On the west side, the bank is much flatter, as shown in Photographs 2 and 3 Appendix A. The vegetation in the area consists of shrubs and grass. However, there is a dense clump of trees and brush on the south side of Hwy 17, east of the Laronde Creek, as shown in Photograph 2, Appendix A.

The drainage in the area generally consists of road side open ditches which drain into Laronde Creek. The ditches are lined with gravel/cobble and sand at the east side of Laronde Creek, and with sand and silt at the west side, as shown in Photographs 2 and 3, Appendix A.

1.2.2 Geological Setting

The site lies within the Canadian Shield in an area where the bedrock is overlain by deep overburden. According to Bedrock Geology of Ontario Map 2544 (Ministry of Northern Development and Mines, Ontario), the bedrock underlying the site consists of Mesoproterozoic Precambrian rocks (approximately 900 to 1600 million years old), primarily felsic igneous tonalite, granodiorite, monzonite, granite, syenite, and derived gneisses. According to Ontario Department of Mines and Northern Affairs Map 2216 (North Bay Area), the overburden consists of boulder clay, clay, varved clay, minor gravel, sand, and silt.

In general, the overburden consists of surficial sands and silts overlying thick deposit of clay.

1.3 Investigation Procedures

1.3.1 General

The field work for this investigation was performed between September 03, 2009 and September 11, 2009. The field work consisted of drilling seven (7) sampled boreholes (BH-1, BH-2, BH-3, BH-4, BH-5, BH-6, and BH-7) and installing three (3) monitoring wells in (BH-1, BH-2, and BH-5). Drawing No. 1 in Appendix B shows the locations of the seven boreholes. Boreholes BH-1, BH-6 and BH-7 were drilled on the east side of the creek, whereas boreholes BH-2, BH-3, BH-4, and BH-5 were drilled on the west side. Boreholes BH-1, BH-2, BH-4, and BH-6 were advanced near the edge of pavement in the east bound lane, approximately at Stations 13+660, 13+565, 13+585, and 13+626, respectively. Boreholes BH-3, BH-5, and BH-7 were drilled near the ditch bottom at Stations 13+578, 13+590, and 13+626. The boreholes were advanced to depths ranging from about 15.4 m to 22.3 m.

Boreholes BH-1, BH-2, BH-4, and BH-6 were advanced using a bombardier mounted CME 55 drill rig, equipped with continuous flight hollow stem augers (4-1/4" HAS). The other boreholes including BH-3, BH-5, and BH-7 were advanced using a tri-pod wash-type boring hollow stem auger (2.5" inside diameter). All borehole drilling/sampling were operated by a specialist drilling contractor, LandCore Drilling Co. Ltd.

During the drilling, soil samples were obtained using thin wall tubes (Shelby), and a 51 outside diameter (O.D.) split-spoon sampler in accordance with Standard Penetration Tests (SPT) procedures (ASTM D 1586), at intervals shown on the attached borehole logs (Appendix C). The SPT "N" values were recorded and used to provide an assessment of in-situ consistency or relative density of non-cohesive soils. In-situ field vane testing (ASTM D 2573) was performed in the cohesive deposits to measure the in-situ undrained shear strength. The torque was measured using two calibrated scales on a lever arm threaded to the drill rod.

Following completion of the boreholes, water level measurements were obtained from the boreholes in accordance with Ministry of Transportation guidelines. Monitoring wells were installed in Borehole BH-1, BH-2, and BH-5 to permit monitoring of groundwater levels at the site. After completion, boreholes were sealed with bentonite pellets.

The fieldwork was supervised by a member of Trow's engineering staff who directed the drilling and sampling operation, logged borehole data in accordance with MTO Soils Classification System for foundation report, and retrieved soil samples for subsequent laboratory testing and identification. All of the recovered soil samples were placed in moisture-proof bags and returned to Trow's Sudbury and Brampton laboratories for additional visual, textual and olfactory examination.

Details of the soil strata encountered in the boreholes are included in attached borehole log sheets in Appendix C, and plotted on the profiles in Appendix B.

The borehole locations and the ground surface elevations along the cross sections were surveyed by Trow personnel, with reference to the benchmark at the south-west end corner of the concrete bridge slab at the south concrete guard rail. The final geodetic locations and elevations were established based on the site survey map provided by MTO.

1.3.2 Laboratory Testing

All samples returned to the laboratory were subjected to detailed visual examination and classification. The laboratory testing program included natural water content of all samples (LS-701), and routine classification testing of approximately 25% of the selected soil samples. The routine tests included Atterberg Limits (LS-702), grain size distribution (LS703/704), and specific gravity tests.

The laboratory test results are provided on the attached borehole log sheets in Appendix C. The results of the Atterberg Limits tests and grain size analyses are presented in Appendix D.

1.4 Subsurface Conditions

The detailed subsurface conditions encountered in the boreholes advanced during this investigation are presented on the borehole log sheets in Appendix C, and the laboratory test results are provided in Appendix D. The "Explanation of Terms Used in Report" preceding the borehole logs in Appendix C forms an integral part of and should be read in conjunction with this report.

A borehole location plan and cross section soil profiles are provided in Appendix B. It should be noted that the stratigraphic boundaries indicated on the borehole log and cross section soil profiles are inferred from non-continuous sampling, observations of drilling progress, results of Standard Penetration Tests, and in-situ vane shear tests. These boundaries

typically represent transitions from one soil type to another and should not be regarded as exact planes of geological change. Further, subsurface conditions may vary between and beyond the borehole locations.

In general, the stratigraphic sequence at the site typically consists of surficial sand fill, followed by silty sand, sandy silt, clayey silt, and a thick layer of silty clay overlying tills. The silty clay is the dominant deposit in this location.

A summary of the soil and groundwater conditions encountered in the boreholes is provided below.

1.4.1 Asphalt

At BH-1, BH-2, BH-4, and BH-6, asphalt was encountered at ground surface. The thickness of the asphalt layer ranges from 50 mm to 300 mm, and the elevation of this layer are between 201.5 m and 202.2 m.

1.4.2 Sand Fill

In all boreholes, sand fill was encountered. At BH-1, BH-2, BH-4, and BH-6, the sand fill was found directly below the asphalt. At BH-7, the sand fill was encountered at ground surface. At BH-3 and BH-5, the sand fill was overlaid by a 15 mm to 76 mm thick topsoil layer at ground surface. The thickness of the sand fill ranges from 0.6 m to 2.8 m.

The composition of this layer is sand, trace to some gravel, and trace to some silt. The fill is brown in color, and damp to wet. Uncorrected STP "N" value ranges from 2 to 25 blows per 300 mm, classifying the material as very loose to compact in compactness condition.

Laboratory testing performed on selected samples consisted of moisture content and grain size distribution tests. The test results are as follows:

Moisture Content:

- 2% to 22%

Grain Size Distribution:

- 24% to 64% gravel;
- 71% to 30% sand; and
- 5% to 6% fines

The result of the moisture content and grain size distribution tests are provided on the record of borehole sheet in Appendix C. The results of the grain size distribution tests on the sand fill are also provided on Figure 3 in Appendix D.

1.4.3 Sandy Silt

Beneath the sand fill, sandy silt was encountered BH-6. This sandy silt layer has a thickness of 4.4 m and extends to a depth of about 5.3 m below the existing grade (approximately Elevation 196.5 m). The deposit consists of silt, sand, trace to some gravel, and trace clay. The sandy silt is brown in color, and wet. Uncorrected SPT “N” values range from 2 to 11 blows per 300 mm, classifying the sandy silt as very loose to compact in compactness condition.

Laboratory testing performed on selected samples consisted of moisture content and grain size distribution tests. The test results are as follows:

Moisture Content:

- 16 % to 28%

Grain Size Distribution:

- 10% gravel;
- 33% sand;
- 50% silt; and
- 7% clay

The result of the moisture content and grain size distribution tests are provided on the record of borehole sheet (BH-6) in Appendix C. The result of the grain size distribution test on the sandy silt is also provided on Figure 4 in Appendix D.

1.4.4 Silty Sand

Silty sandy was encountered in BH-4 underneath the sand fill layer. This silty sand has a thickness of 3 m, and extends to a depth of 6.1 m (approximately at Elevation of 195.7 m). The deposit consists of silt, sand, and trace clay. The sandy silt is brown in color, and damp to wet. Uncorrected SPT “N” values range from 2 to 7 blows per 300 mm, classifying the silty sand as very loose to loose in compactness condition.

Laboratory testing performed on selected samples consisted of moisture content and grain size distribution tests. The test results are as follows:

Moisture Content:

- 16% to 24%

Grain Size Distribution:

- 0% gravel;
- 56% sand;

- 31% silt; and
- 13% clay

The result of the moisture content and grain size distribution tests are provided on the record of borehole sheet in Appendix C. The result of the grain size distribution test on the sandy silt is also provided on Figure 5 in Appendix D.

1.4.5 Clayey Silt

A layer of clayey silt was encountered underlying the fill in BH-1 and BH-2. The thickness of the clayey silt at these locations is between 1.1 m to 1.6 m. The deposit extends to depths between 2.3 m and 3.1 m, corresponding to Elevations of approximately between 199.9 m and 198.8 m, respectively. The clayey silt contains trace to some sand, and trace to some clay. The deposit is grey in color, and damp to wet. Uncorrected SPT “N” values range from 2 to 10 blows per 300 mm, classifying the clayey silt as very loose to loose in compactness condition.

Laboratory testing performed on selected samples consisted of moisture content and grain size distribution tests. The test results are as follows:

Moisture Content:

- 21.4 % to 31%

Grain Size Distribution:

- 0% gravel;
- 1% sand;
- 52 % silt; and
- 47% clay

Atterberg Limits:

- Liquid Limit: 32%;
- Plastic Limit: 24%; and
- Plasticity Index: 8%

The result of the moisture content and grain size distribution tests are provided on the record of borehole sheet in Appendix C. The results of the Atterberg Limits and grain size distribution tests on the clayey silt are also provided on Figure 2 and Figure 6, respectively, in Appendix D.

1.4.6 Silty Clay

A deposit of silty clay was encountered in all boreholes. The top of this deposit ranged from Elevation 195.7 m to 199.9 m. The silty clay has thickness between about 18.2 m to 20 m, and extends to Elevation ranging from about 180.8 m to 180.5 m at BH-1 and BH-2, respectively. The other boreholes, BH-3, BH-4, BH-5, BH-6, and BH-7, were terminated in the silty clay deposit at Elevations in the range of about 179.6 m to 185.7 m.

The silty clay is grey in color and saturated. It is varved with clayey silt. The thickness of individual layers or laminations varies from a few millimeters to a few centimeters, but in general is about one centimeter. The portion of silty clay and clayey silt varies from about 2:1 to 5:1, and the clay portion in general dominates.

Uncorrected SPT “N” values range from 0 (weight of hammer) to 18 blows per 300 mm of penetration. *In-situ* field vane tests were performed to measure undrained shear strengths of the silty clay. The results of the *in-situ* field vane tests measured in the boreholes are shown on the record of borehole sheets in Appendix C and Figure 1.1. The in-situ vane shear strength ranges from 15 kPa to 90.1 kPa, indicating a soft to stiff consistency. Sensitivity ranges from 2 to 5 (the average sensitivity is about 3), classifying the silty clay as low sensitivity according to Canadian Foundation Engineering Manual 2006 (CFEM, Chapter 3, page 18).

Figure 1.1 summarizes the measured field vane shear tests that were carried out as part of the current investigation. The results show that the silty clay has a crust extending to about 5 m depth below the ground surface. The typical vane strength is about 35 kPa for the crust layer. Beneath the crust, the typical vane strength reduces to 30 kPa at a depth of 10 m and then increases with depth at a rate of about 4 kPa/meter.

Laboratory testing performed on selected samples consisted of moisture content, grain size distribution, and Atterberg Limits. The test results are as follows:

Moisture Content:

- 22% to 68%

Grain Size Distribution:

- 0% gravel;
- 0% to 2% sand;
- 25% to 70% silt; and
- 28% to 73% clay

Atterberg Limits:

- Liquid Limits: 31% to 38%

- Plastic Limits: 19% to 25%
- Plasticity Index: 8% to 16%

The results of the moisture content, grain size distribution, and Atterberg Limits are provided on the record of borehole sheets in Appendix C. The results of the grain size distribution tests on the silty clay are provided on Figures 7 and 8 in Appendix D. The results of the Atterberg Limits tests are provided on Figure 1 in Appendix D.

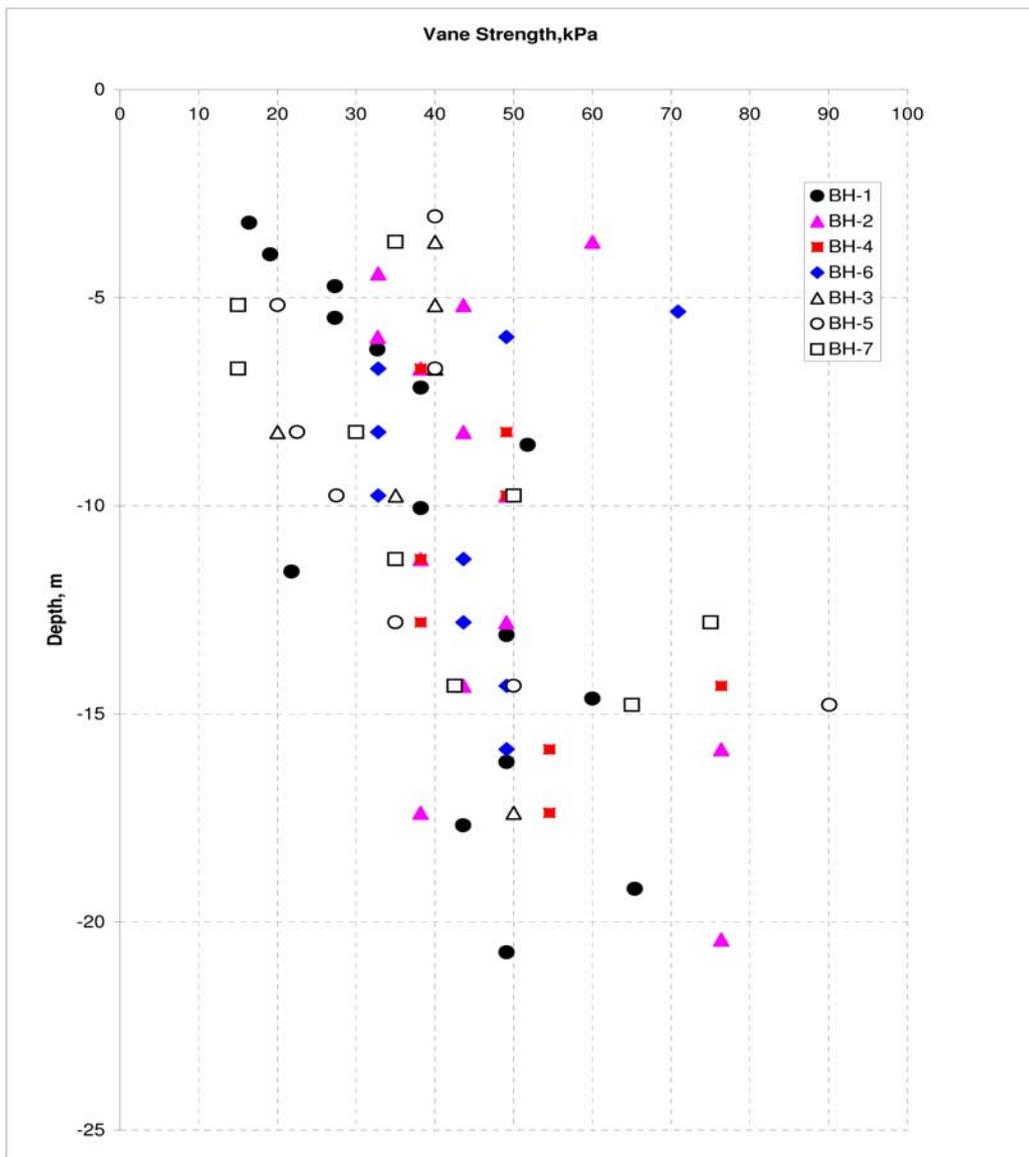


Figure 1.1 Vane strength of the silty clay measured on the site

1.4.7 Till

Beneath the silty clay, silty sandy till and suspected sand and gravel till were encountered at BH-1 and BH-2, respectively. The top elevation of the till ranges from Elevation 180.5 m to 180.8 m, corresponding to a depth of 21.3 m below ground surface. The till extends to about 22.3 m depth at the borehole termination due to auger refusal. The till is grey in color and wet.

1.5 Groundwater Conditions

Information regarding to the groundwater levels at the site was obtained by measuring the water levels in the open boreholes after completion of drilling and in monitoring wells installed in Boreholes BH-1, BH-2, and BH-5. The ground water levels encountered in the boreholes are also shown in Table 1.1.

The monitoring wells consists of a 6 m long slotted screen embedded in a sand pack and bentonite seals above and below the sand pack.

The difference in groundwater level between boreholes could be due to disturbance in the holes a time of drilling and that the boreholes had not stabilized prior to backfilling. It should be noted that the groundwater level is subject to seasonal fluctuations.

Table 1.1 Groundwater levels recorded at the site

Borehole No.	Date of drilling	Well tip depth, (m)	Water level	
			Depth, (m)	Elevation, (m)
BH-1*	09/03/2009	12.2	0.9	201.3
BH-2*	09/04/2009	12.2	1.52	200.4
BH-3	09/08/2009	Open hole	0.84	197.4
BH-4	09/09/2009	Open hole	3.05	198.7
BH-5*	09/09/2009	11.2	0.2	196.6
BH-6	09/10/2009	Open hole	0.91	200.9
BH-7	09/10/2009	Open hole	1.5	196.9

*Monitoring well GWL reading was taken on 09/11/2009

1.6 Closure

A soil investigation is a limited sampling of a site. The information is collected at specific borehole locations and can be extrapolated to an approximate limited area around the borehole. The extent of the limited area depends on the variability of the soil and groundwater conditions as influenced by geological processes and the construction activities. Should any conditions at the site be encountered which differ from those reported at the test locations, we require that we be notified immediately in order to allow reassessment of our recommendations. It may then be necessary to carry out additional field work and analyses.

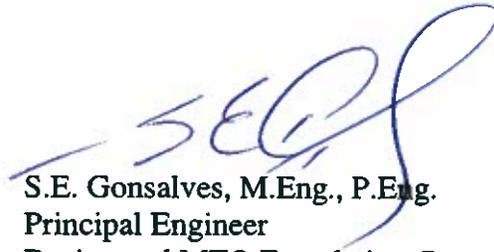
This report has been prepared by S. Micic, Ph.D., P.Eng and G. Qu, Ph.D. and reviewed by S. Gonsalves, M.Eng., P.Eng., Designated MTO Foundation Contact.

Yours truly,

Trow Associates Inc.



Silvana Micic, Ph.D, P.Eng.
Geotechnical Engineer



S.E. Gonsalves, M.Eng., P.Eng.
Principal Engineer
Designated MTO Foundation Contact



Encl.



APPENDIX A : PHOTOGRAPHS



Photograph 1 Laronde Creek Bridge on Highway 17, south side



Photograph 2 The east side of Laronde Creek, south side of Highway 17

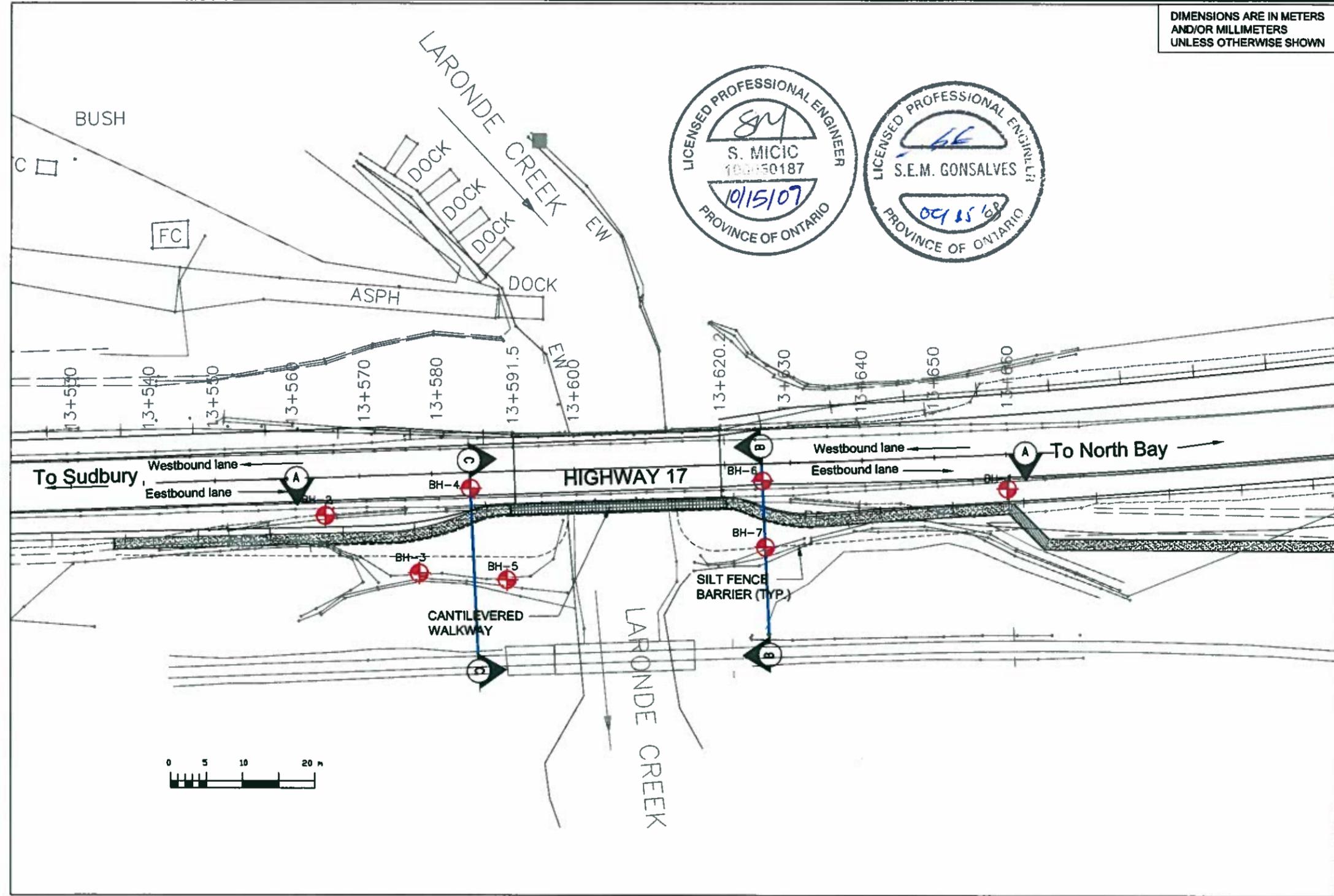


Photograph 3 The west side of Laronde Creek, south side of Highway 17

APPENDIX B : DRAWING

DIMENSIONS ARE IN METERS AND/OR MILLIMETERS UNLESS OTHERWISE SHOWN

GWP No. 5274-08-00
 SHEET 1



KEY MAP
Not to Scale

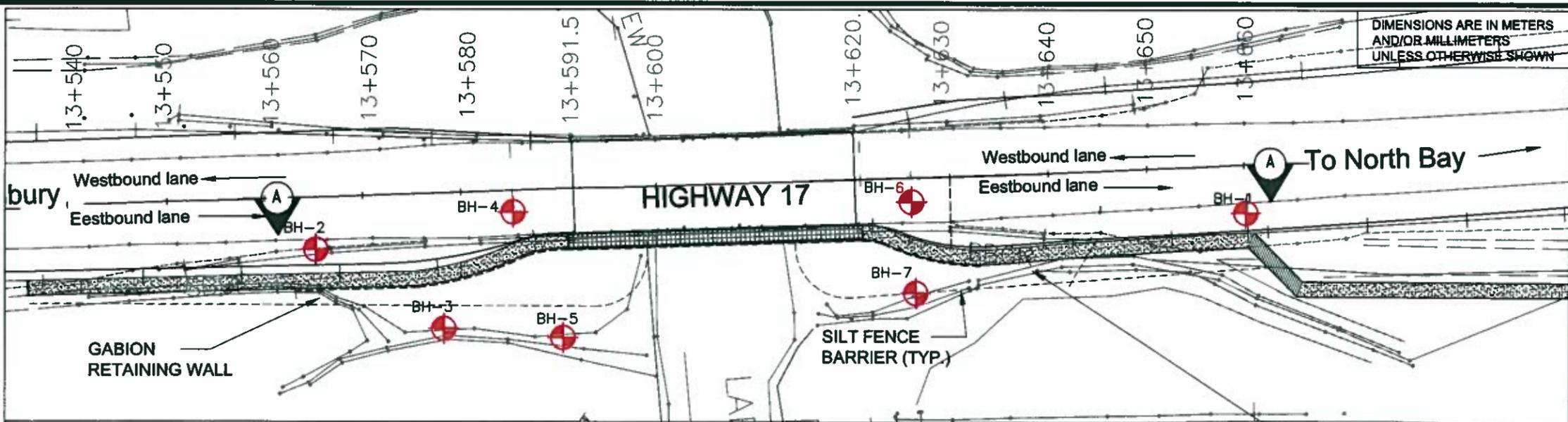
LEGEND

- BOREHOLE
- Water Level (Piezometer)
- Water Level (Open hole)

No.	ELEVATION	STATION	OFFSET
BH-1	202.183	13+659.9	4.9
BH-2	201.872	13+565.0	5.3
BH-3	198.224	13+577.7	13.8
BH-4	201.799	13+585.3	2.2
BH-5	196.842	13+590.0	15.2
BH-6	201.824	13+625.9	2.2
BH-7	199.429	13+625.9	11.7

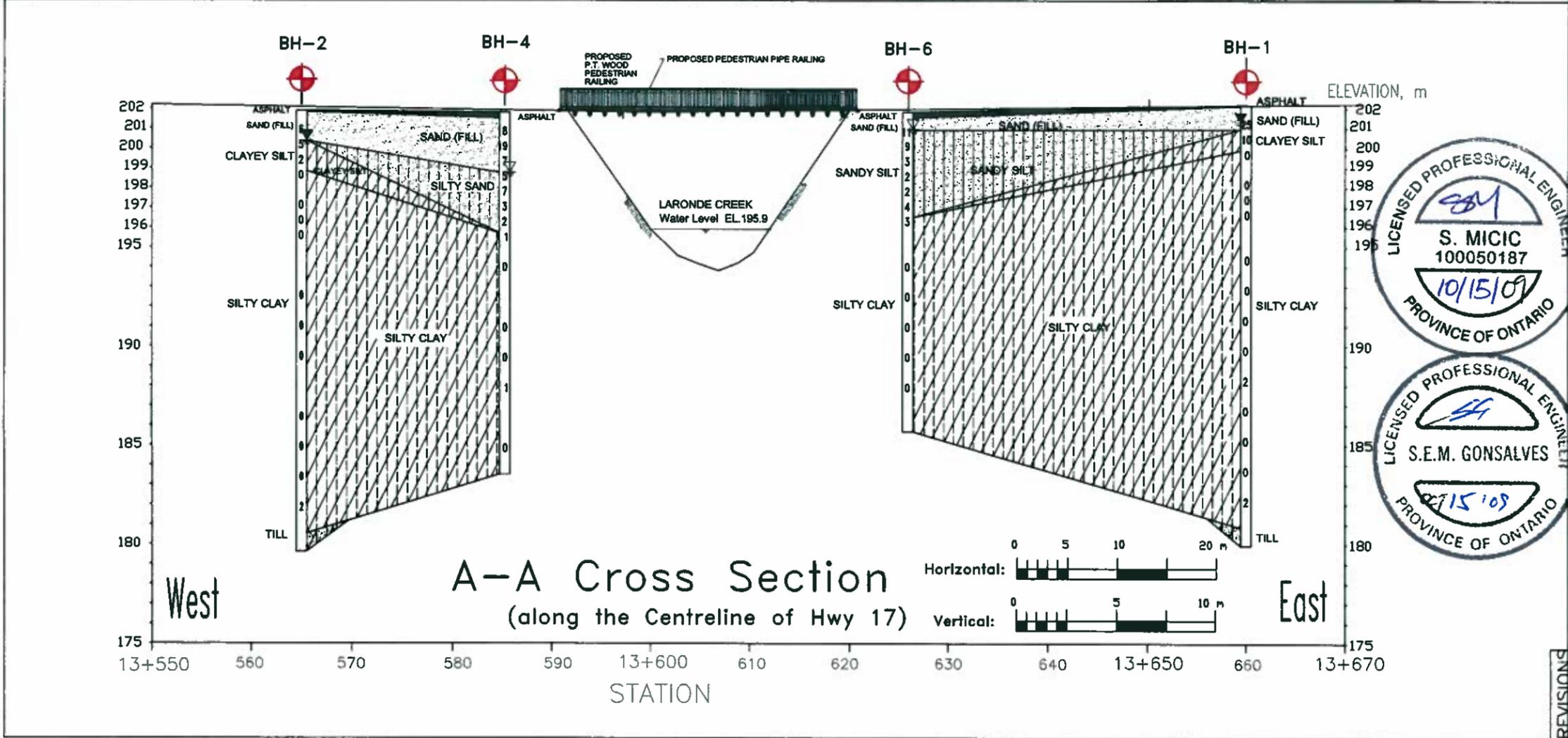
REVISIONS	DATE	BY	DESCRIPTION

<p>Trow Associates Inc. 56 QUEEN STREET EAST, SUIT 301 BRAMPTON, ONTARIO, L6V 4M8 (905) 796-3200</p>	<p>PROJECT TITLE AND LOCATION: Gabion Wall Construction near Laronde Creek Hwy 17, Sudbury</p>	<p>DRAWING TITLE: SITE PLAN AND BOREHOLE LOCATIONS</p>	PROJECT NO. 5274-08-00	DWN.: GQ
			SCALE: AS NOTED	CHKD.: SM
			DATE: Sept. 2009	DWG. No.: 1



GWP No. 5274-08-00

SHEET 2



LEGEND

- BOREHOLE
- Water Level (Piezometer)
- Water Level (Open hole)

LICENSED PROFESSIONAL ENGINEER
S. MICIC
100050187
10/15/09
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
S.E.M. GONSALVES
02/15/09
PROVINCE OF ONTARIO

No.	ELEVATION	STATION	OFFSET
BH-1	202.183	13+659.9	4.9
BH-2	201.872	13+565.0	5.3
BH-3	198.224	13+577.7	13.8
BH-4	201.799	13+585.3	2.2
BH-5	196.842	13+590.0	15.2
BH-6	201.824	13+625.9	2.2
BH-7	199.429	13+625.9	11.7

- NOTES-
- The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
 - This drawing to be read with subject report.
 - This drawing is for subsurface information only. Surface details and features are for conceptual illustration only.
 - Borehole locations are approximate.
 - Borehole elevations should not be used to design building(s), or floor slab(s), or parking lot(s) grades.
 - The elevation of the water level in the creek was measured by TROW on 11/Sept./2009

REVISIONS	DATE	BY	DESCRIPTION

<p>SOIL STRATA SYMBOLS:</p> <ul style="list-style-type: none"> <li style="width: 25%;"> ASPHALT <li style="width: 25%;"> SAND <li style="width: 25%;"> SILTY CLAY <li style="width: 25%;"> SILTY SAND <li style="width: 25%;"> CLAYEY SILT <li style="width: 25%;"> TILL 	<p>TROW Associates Inc. 56 QUEEN STREET EAST, SUIT 301 BRAMPTON, ONTARIO, L6V 4M8 (905) 796-3200</p>	<p>PROJECT TITLE AND LOCATION: Gabion Wall Construction near Laronde Creek Hwy 17, Sudbury</p>	<p>DRAWING TITLE: A-A CROSS-SECTION</p>	<p>PROJECT NO. 5274-08-00</p> <p>SCALE: AS NOTED</p> <p>DATE: Sept. 2009</p>	<p>DWN.: GQ</p> <p>CHKD.: SM</p> <p>DWG. No.: 2</p>
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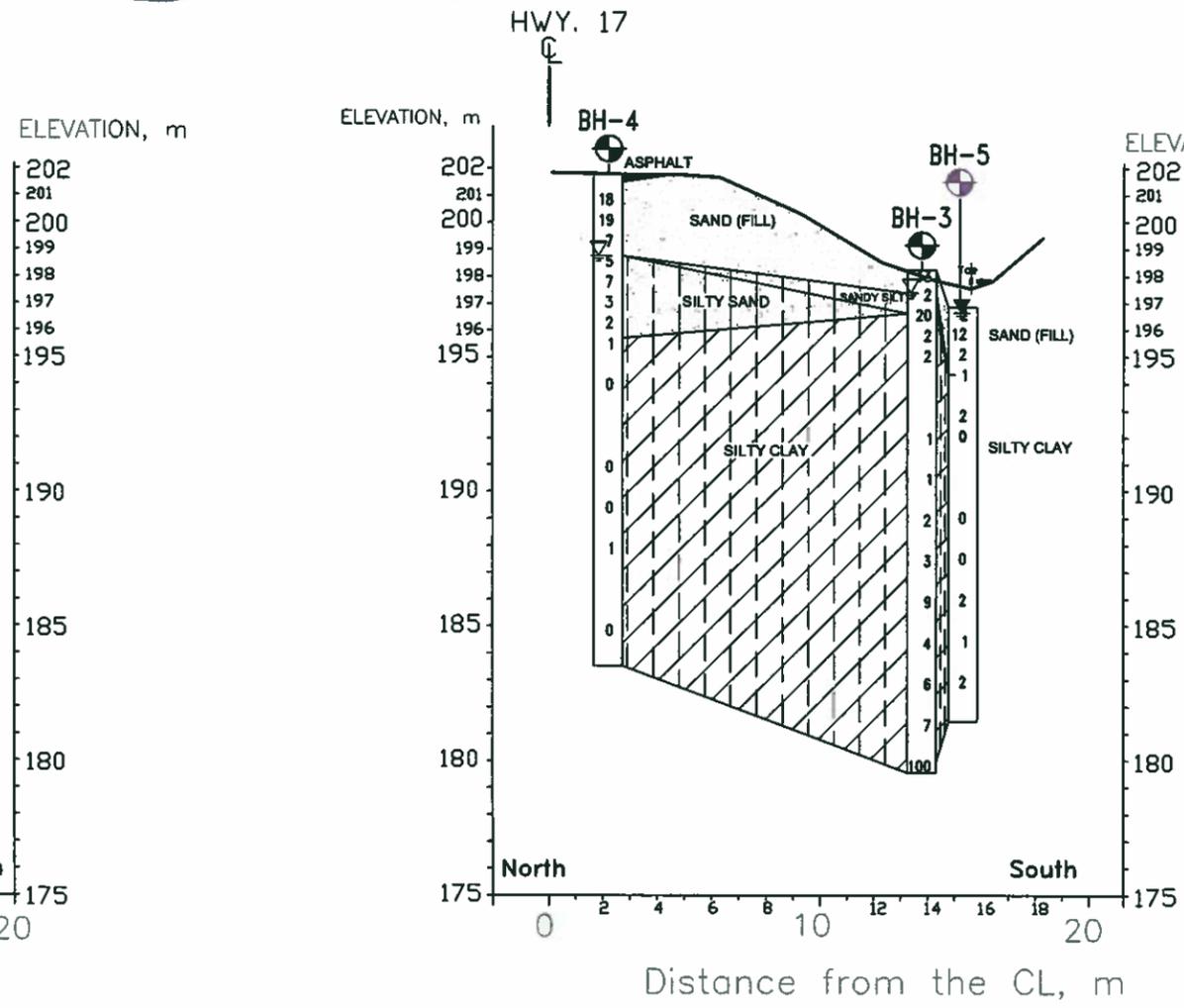
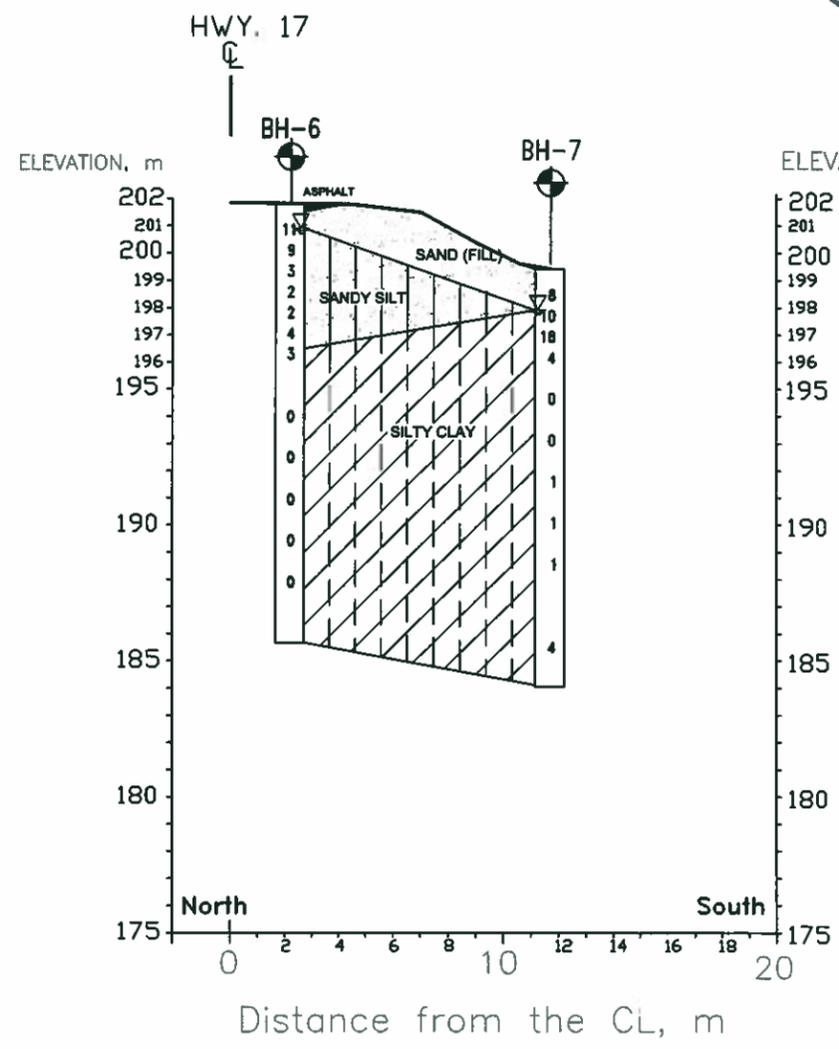
DIMENSIONS ARE IN METERS AND/OR MILLIMETERS UNLESS OTHERWISE SHOWN

GWP	No. 5274-08-00	 SHEET 3



Cross Section B-B
(at Station ~13+626)

Cross Section C-C
(at Station ~13+585)



KEY MAP
Not to Scale

LEGEND

- BOREHOLE
- Water Level (Piezometer)
- Water Level (Open hole)

No.	ELEVATION	STATION	OFFSET
BH-1	202.183	13+659.9	4.9
BH-2	201.872	13+565.0	5.3
BH-3	198.224	13+577.7	13.8
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REVISIONS	DATE	BY	DESCRIPTION

SOIL STRATA SYMBOLS: ASPHALT SAND SANDY SILT SILTY SAND CLAYEY SILT SILTY CLAY TILL	 TROW Associates Inc. 56 QUEEN STREET EAST, SUIT 301 BRAMPTON, ONTARIO, L6V 4M8 (905) 796-3200	PROJECT TITLE AND LOCATION: Gabion Wall Construction near Laronde Creek Hwy 17, Sudbury	DRAWING TITLE: CROSS-SECTIONS B-B and C-C	<table border="1" style="width: 100%;"> <tr> <td>PROJECT NO.</td> <td>5274-08-00</td> <td>DWN.:</td> <td>GQ</td> </tr> <tr> <td>SCALE:</td> <td>AS NOTED</td> <td>CHKD.:</td> <td>SM</td> </tr> <tr> <td>DATE:</td> <td>Sept. 2009</td> <td>DWG. No.:</td> <td>3</td> </tr> </table>	PROJECT NO.	5274-08-00	DWN.:	GQ	SCALE:	AS NOTED	CHKD.:	SM	DATE:	Sept. 2009	DWG. No.:	3
PROJECT NO.	5274-08-00	DWN.:	GQ													
SCALE:	AS NOTED	CHKD.:	SM													
DATE:	Sept. 2009	DWG. No.:	3													

APPENDIX C : BOREHOLE LOGS

EXPLANATION OF TERMS USED IN REPORT

N-VALUE: THE STANDARD PENETRATION TEST (SPT) N-VALUE IS THE NUMBER OF BLOWS REQUIRED TO CAUSE A STANDARD 51mm O.D SPLIT BARREL SAMPLER TO PENETRATE 0.3m INTO UNDISTURBED GROUND IN A BOREHOLE WHEN DRIVEN BY A HAMMER WITH A MASS OF 63.5kg, FALLING FREELY A DISTANCE OF 0.76m. FOR PENETRATIONS OF LESS THAN 0.3m N-VALUES ARE INDICATED AS THE NUMBER OF BLOWS FOR THE PENETRATION ACHIEVED. AVERAGE N-VALUE IS DENOTED THUS \bar{N} .

DYNAMIC CONE PENETRATION TEST: CONTINUOUS PENETRATION OF A CONICAL STEEL POINT (51mm O.D. 60° CONE ANGLE) DRIVEN BY 475J IMPACT ENERGY ON 'A' SIZE DRILL RODS. THE RESISTANCE TO CONE PENETRATION IS MEASURED AS THE NUMBER OF BLOWS FOR EACH 0.3m ADVANCE OF THE CONICAL POINT INTO THE UNDISTURBED GROUND.

SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSENESS.

CONSISTENCY: COHESIVE SOILS ARE DESCRIBED ON THE BASIS OF THEIR UNDRAINED SHEAR STRENGTH (c_u) AS FOLLOWS:

C_u (kPa)	0 – 12	12 – 25	25 – 50	50 – 100	100 – 200	>200
	VERY SOFT	SOFT	FIRM	STIFF	VERY STIFF	HARD

DENSENESS: COHESIONLESS SOILS ARE DESCRIBED ON THE BASIS OF DENSENESS AS INDICATED BY SPT N VALUES AS FOLLOWS:

N (BLOWS/0.3m)	0 – 5	5 – 10	10 – 30	30 – 50	>50
	VERY LOOSE	LOOSE	COMPACT	DENSE	VERY DENSE

ROCKS ARE DESCRIBED BY THEIR COMPOSITION AND STRUCTURAL FEATURES AND/OR STRENGTH.

RECOVERY: SUM OF ALL RECOVERED ROCK CORE PIECES FROM A CORING RUN EXPRESSED AS A PERCENT OF THE TOTAL LENGTH OF THE CORING RUN.

MODIFIED RECOVERY: SUM OF THOSE INTACT CORE PIECES, 100mm+ IN LENGTH EXPRESSED AS A PERCENT OF THE LENGTH OF THE CORING RUN. THE ROCK QUALITY DESIGNATION (RQD), FOR MODIFIED RECOVERY IS:

RQD (%)	0 – 25	25 – 50	50 – 75	75 – 90	90 – 100
	VERY POOR	POOR	FAIR	GOOD	EXCELLENT

JOINT AND BEDDING:

SPACING	50mm	50 – 300mm	0.3m – 1m	1m – 3m	>3m
JOINTING	VERY CLOSE	CLOSE	MOD. CLOSE	WIDE	VERY WIDE
BEDDING	VERY THIN	THIN	MEDIUM	THICK	VERY THICK

ABBREVIATIONS AND SYMBOLS

FIELD SAMPLING

SS	SPLIT SPOON	TP	THINWALL PISTON
WS	WASH SAMPLE	OS	OSTERBERG SAMPLE
ST	SLOTTED TUBE SAMPLE	RC	ROCK CORE
BS	BLOCK SAMPLE	PH	TW ADVANCED HYDRAULICALLY
CS	CHUNK SAMPLE	PM	TW ADVANCED MANUALLY
TW	THINWALL OPEN	FS	FOIL SAMPLE

STRESS AND STRAIN

U_w	kPa	PORE WATER PRESSURE
r_u	1	PORE PRESSURE RATIO
σ	kPa	TOTAL NORMAL STRESS
σ'	kPa	EFFECTIVE NORMAL STRESS
τ	kPa	SHEAR STRESS
$\sigma_1, \sigma_2, \sigma_3$	kPa	PRINCIPAL STRESSES
ϵ	%	LINEAR STRAIN
$\epsilon_1, \epsilon_2, \epsilon_3$	%	PRINCIPAL STRAINS
E	kPa	MODULUS OF LINEAR DEFORMATION
G	kPa	MODULUS OF SHEAR DEFORMATION
μ	1	COEFFICIENT OF FRICTION

MECHANICAL PROPERTIES OF SOIL

m_v	kPa^{-1}	COEFFICIENT OF VOLUME CHANGE
c_c	1	COMPRESSION INDEX
c_s	1	SWELLING INDEX
c_a	1	RATE OF SECONDARY CONSOLIDATION
c_v	m^2/s	COEFFICIENT OF CONSOLIDATION
H	m	DRAINAGE PATH
T_v	1	TIME FACTOR
U	%	DEGREE OF CONSOLIDATION
σ'_{vo}	kPa	EFFECTIVE OVERBURDEN PRESSURE
σ'_p	kPa	PRECONSOLIDATION PRESSURE
τ_r	kPa	SHEAR STRENGTH
c'	kPa	EFFECTIVE COHESION INTERCEPT
ϕ'	°	EFFECTIVE ANGLE OF INTERNAL FRICTION
c_u	kPa	APPARENT COHESION INTERCEPT
ϕ_u	°	APPARENT ANGLE OF INTERNAL FRICTION
τ_R	kPa	RESIDUAL SHEAR STRENGTH
τ_r	kPa	REMOULDED SHEAR STRENGTH
S_r	1	SENSITIVITY = c_u / τ_r

PHYSICAL PROPERTIES OF SOIL

P_s	kg/m^3	DENSITY OF SOLID PARTICLES	e	1, %	VOID RATIO	e_{min}	1, %	VOID RATIO IN DENSEST STATE
γ_s	kN/m^3	UNIT WEIGHT OF SOLID PARTICLES	n	1, %	POROSITY	I_D	1	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
P_w	kg/m^3	DENSITY OF WATER	w	1, %	WATER CONTENT	D	mm	GRAIN DIAMETER
γ_w	kN/m^3	UNIT WEIGHT OF WATER	s_r	%	DEGREE OF SATURATION	D_n	mm	N PERCENT - DIAMETER
P	kg/m^3	DENSITY OF SOIL	w_L	%	LIQUID LIMIT	C_u	1	UNIFORMITY COEFFICIENT
γ	kN/m^3	UNIT WEIGHT OF SOIL	w_p	%	PLASTIC LIMIT	h	m	HYDRAULIC HEAD OR POTENTIAL
P_d	kg/m^3	DENSITY OF DRY SOIL	w_s	%	SHRINKAGE LIMIT	q	m^3/s	RATE OF DISCHARGE
γ_d	kN/m^3	UNIT WEIGHT OF DRY SOIL	I_p	%	PLASTICITY INDEX = $(w_L - w_p)$	v	m/s	DISCHARGE VELOCITY
P_{sat}	kg/m^3	DENSITY OF SATURATED SOIL	I_L	1	LIQUIDITY INDEX = $(w - w_p) / I_p$	l	1	HYDAULIC GRADIENT
γ_{sat}	kN/m^3	UNIT WEIGHT OF SATURATED SOIL	I_C	1	CONSISTENCY INDEX = $(w_L - w) / I_p$	k	m/s	HYDRAULIC CONDUCTIVITY
P'	kg/m^3	DENSITY OF SUBMERGED SOIL	e_{max}	1, %	VOID RATIO IN LOOSEST STATE	j	kN/m^2	SEEPAGE FORCE
γ'	kN/m^3	UNIT WEIGHT OF SUBMERGED SOIL						

RECORD OF BOREHOLE No BH-1

1 OF 2

METRIC

W.P. 5274-08-00 LOCATION Laronde Creek, Nipissing Indian Reserve No. 10 ORIGINATED BY CS
 DIST 54 HWY 17 BOREHOLE TYPE CME 200mm OI Hollow Stem Auger COMPILED BY KR
 DATUM Geodetic DATE 09.9.3 CHECKED BY IM

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	20	40	60	80	100	10	20
202.2	ASPHALT , (~ 50 mm)					202																		
200.9	SAND (FILL) (SW) , brown, damp, well graded, compact, fine to coarse grained, some gravel, trace to some silt.		1	AS																				64 30 (6)
201.0			2	SS	25	201																		
1.2	Clayey SILT (ML) , grey, damp to wet, compact, poorly graded, some fine grained sand.		3	SS	10	200																		
199.9			4	SS	0	199	2.4																	
2.3	SILTY CLAY (CL) , grey, saturated, low plasticity, soft to stiff.		5	TW		198	3.5																	
			6	SS	0	197	3.3																	
			7	SS	0	196	3.3																	
			8	SS	0	195	3.4																	
			9	TW		194																		
			10	SS	0	193	3.5																	
			11	SS	0	192	3.5																	
			12	SS	0	191	3.2																	
			13	SS	0	190																		
			14	SS	2	189	3.6																	
			15	SS	0	188	2.4																	
			16	SS	0	187	2.0																	
			17	SS	0	186	2.3																	
						185	3.4																	
						184																		
						183																		

ON_MOT_SO11878G - LARONDE CREEK BRIDGE BY GREG & GPJ ON_MOT_GDT_09/10/21

Continued Next Page

+ 3, X 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No BH-1

2 OF 2

METRIC

W.P. 5274-08-00 LOCATION Laronde Creek, Nipissing Indian Reserve No. 10 ORIGINATED BY CS
 DIST 54 HWY 17 BOREHOLE TYPE CME 200mm OI Hollow Stem Auger COMPILED BY KR
 DATUM Geodetic DATE 09.9.3 CHECKED BY IM

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	20	40	60	80					
180.8	trace to some fine grained sand below ~ 19.81 m depth.		18	SS	2											
21.3	SILTY SAND TILL , grey, wet, compact, poorly graded, trace to some gravel.		19	BAG												
179.9	BOREHOLE TERMINATED AT ~ 22.25 m DEPTH DUE TO AUGER REFUSAL ON SUSPECTED BEDROCK															
22.3																

NOTES:
 1. This drawing is to be read with the subject report and project number as presented above.
 2. Interpretation assistance by Trow is required before use by others.
 3. Date of W.L.=Sept. 11, 2009.
 4. Installed monitoring well to 12.2 m depth.

RECORD OF BOREHOLE No BH-2

1 OF 2

METRIC

W.P. 5274-08-00 LOCATION Laronde Creek, Nipissing Indian Reserve No. 10 ORIGINATED BY CS
 DIST 54 HWY 17 BOREHOLE TYPE CME 200mm OI Hollow Stem Auger COMPILED BY KR
 DATUM Geodetic DATE 09.9.4 CHECKED BY IM

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	20	40	60	80	100
201.9	ASPHALT , (~ 50 mm)																					
200.9	SAND (FILL) (SW) , brown, damp, loose, well graded, fine to coarse grained, some fine to coarse gravel, trace silt. - some silt below 0.8 m		1	AS																		
200.4	CLAYEY SILT (ML) , grey, wet, very loose to loose, trace sand, trace to some clay. very loose below ~ 2.29 m depth.		2	SS	6																	
1.5			3	SS	5																	
198.8			4	SS	2																	
3.1	SILTY CLAY (CI) , grey, saturated, medium plasticity, firm to stiff.		5	SS	0																	
			6	TW																		
			7	SS	0																	
			8	SS	0																	
			9	SS	0																	
			10	TW																		
			11	SS	0																	
			12	SS	0																	
			13	SS	0																	
			14	TW																		
			15	SS	0																	
			16	SS	0																	
			17	SS	0																	

(G_s=2.726)
0 1 52 47

(G_s=2.721)
0 2 25 73

ON_MOT_SO11878G - LARONDE CREEK BRIDGE BY GREG & GPJ ON_MOT_GDT_09/10/21

Continued Next Page

+³, ×³: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No BH-2

2 OF 2

METRIC

W.P. 5274-08-00 LOCATION Laronde Creek, Nipissing Indian Reserve No. 10 ORIGINATED BY CS
 DIST 54 HWY 17 BOREHOLE TYPE CME 200mm 0l Hollow Stem Auger COMPILED BY KR
 DATUM Geodetic DATE 09.9.4 CHECKED BY IM

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					WATER CONTENT (%)					
						20	40	60	80	100	10	20	30			
180.5			18	SS	2				3.5							
21.3	HARD AUGERING, suspected sand and gravel till.		19	BAG												
179.6																
22.3	BOREHOLE TERMINATED AT ~ 22.25 m DEPTH DUE TO AUGER REFUSAL ON SUSPECTED BEDROCK															
	NOTES: 1. This drawing is to be read with the subject report and project number as presented above. 2. Interpretation assistance by Trow is required before use by others. 3. Date of W.L.=Sept. 11, 2009. 4. Installed monitoring well to 12.2 m depth.															

ON_MOT_SO11878G - LARONDE CREEK BRIDGE BY GREG G.P.J. ON_MOT.GDT 09/10/21

+³, ×³: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No BH-3

1 OF 1

METRIC

W.P. 5274-08-00 LOCATION Laronde Creek, Nipissing Indian Reserve No. 10 ORIGINATED BY CS
 DIST 54 HWY 17 BOREHOLE TYPE Hollow Stem Auger (Wash Boring) COMPILED BY KR
 DATUM Geodetic DATE 09.9.8 CHECKED BY IM

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	20						40	60
198.2	TOPSOIL (~76mm) over SAND (FILL) (SW) , brown, damp, compact, poorly graded, fine to coarse grained, some silt, trace to some gravel. SANDY SILT (SM) , grey, wet, very loose, some gravel. SILTY CLAY (CI-MI) , brown, saturated, medium plasticity, soft to stiff. grey below ~ 3.05 m depth. varved, with silt seems below ~ 10.67 m depth.		1	SS	13		198								
197.4			2	SS	2		197								
196.6			3	SS	20		196								
			4	SS	2		195								
			5	SS	2		194								
			6	TW			193								
			7	SS	1		192								
			8	SS	1		191								
			9	SS	2		190								
			10	SS	3		189								
			11	SS	9		188								
			12	SS	4		187								
			13	SS	6		186								
			14	SS	7		185								
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RECORD OF BOREHOLE No BH-4

1 OF 2

METRIC

W.P. 5274-08-00 LOCATION Laronde Creek, Nipissing Indian Reserve No. 10 ORIGINATED BY CS
 DIST 54 HWY 17 BOREHOLE TYPE CME 200mm OI Hollow Stem Auger COMPILED BY KR
 DATUM Geodetic DATE 09.9.9 CHECKED BY IM

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	20	40	60	80	100
201.8	ASPHALT , (~ 300 mm)																					
209.8	SAND (FILL) (SW) , brown, damp, loose to compact, poorly graded, fine grained, trace to some silt, trace gravel, with silt below ~ 0.76 m depth. HARD AUGERING		1	AS																		
0.3			2	SS	18																	
			3	SS	19																	
	No Sample Recovery		4	SS	7																	
198.7	SILTY SAND(SM) , brown, damp to wet, loose, trace clay.		5	SS	5																	
3.1			6	SS	7																	
	brown to grey, very loose below ~ 4.57 m depth.		7	SS	3																	
	brown, wet, fine to medium grained, trace organics below ~ 5.33 m depth.		8	SS	2																	
195.7	SILTY CLAY (CL) , grey, saturated, firm to stiff, low plasticity		9	SS	1																	
6.1			10	SS	0																	
			11	TW																		
			12	SS	0																	
			13	SS	0																	
	varved below ~ 12.19 m depth.		14	SS	1																	
			15	TW																		
			16	SS	0																	
183.5	BOREHOLE TERMINATED AT ~ 18.28 m DEPTH																					
18.3	NOTES: 1. This drawing is to be read with the subject report and project number as presented above.																					

ON_MOT_SO11878G - LARONDE CREEK BRIDGE BY GREG G. GPJ ON_MOT_GDT_09/10/21

Continued Next Page

+³, ×³: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No BH-4

2 OF 2

METRIC

W.P. 5274-08-00 LOCATION Laronde Creek, Nipissing Indian Reserve No. 10 ORIGINATED BY CS
 DIST 54 HWY 17 BOREHOLE TYPE CME 200mm OI Hollow Stem Auger COMPILED BY KR
 DATUM Geodetic DATE 09.9.9 CHECKED BY IM

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			20	40	60	80	100					
	2. Interpretation assistance by Trow is required before use by others. 3. Date of W.L.=Sept. 11, 2009. 4. Installed PVC standpipes to 12.2 m depth.															

ON_MOT_SO11878G - LARONDE CREEK BRIDGE BY GREG G.GPJ ON_MOT_GDT 09/10/21

+³, X³: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No BH-5

1 OF 1

METRIC

W.P. 5274-08-00 LOCATION Laronde Creek, Nipissing Indian Reserve No. 10 ORIGINATED BY GQ
 DIST 54 HWY 17 BOREHOLE TYPE Hollow Stem Auger (Wash Boring) COMPILED BY GQ
 DATUM Geodetic DATE 09.9.9 CHECKED BY VD

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	20	40	60	80	100
196.8	TOPSOIL, (~ 15 mm) over SAND (FILL) (SW), some silt, trace rootlets and wood deris. brown, damp to wet, very loose to compact, fine grained. - a thin (0.15 m) layer of silty clay at a depth of about 0.9 m - become wet below 1.05 m		1	SS	2																	
196			2	SS	12																	
195			3	SS	2																	
194.4	SILTY CLAY (CL), varved, grey, saturated, soft to stiff, low plasticity - reddish clay interbedded with grey silty clay seams.		4	SS	1																	
194																						
193																						
192																						
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181.5	BOREHOLE TERMINATED AT ~ 15.4 m DEPTH																					
15.4	NOTES: 1. This drawing is to be read with the subject report and project number as presented above. 2. Interpretation assistance by Trow is required before use by others. 3. Date of W.L.=Sept. 11, 2009. 4. Installed monitoring well to 11.2 m depth.																					

ON_MOT_SO11878G - LARONDE CREEK BRIDGE BY GREG & GPJ ON_MOT_GDT_09/10/21

+ 3, X 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No BH-6

1 OF 1

METRIC

W.P. 5274-08-00 LOCATION Laronde Creek, Nipissing Indian Reserve No. 10 ORIGINATED BY CS
 DIST 54 HWY 17 BOREHOLE TYPE CME 200mm OI Hollow Stem Auger COMPILED BY KR
 DATUM Geodetic DATE 09.9.10 CHECKED BY IM

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									
201.8	ASPHALT, (~ 300 mm)																
200.9	SAND (FILL) (SW), brown, damp, fine to coarse grained, trace fine grained gravel, some silt.		1	AS													
200.9	SANDY SILT(SM), brown, wet, very loose to compact, trace fine to coarse grained gravel.		2	SS	11												
0.9	very loose below ~ 2.57 m depth. trace clay below ~ 3.05 m depth. clayey below ~ 4.57 m depth.		3	SS	9												
			4	SS	3												
			5	SS	2												
			6	SS	2												
			7	SS	4												
			8	SS	3												
			9	TW													
196.5	SILTY CLAY (CL), grey, saturated, low plasticity, firm to stiff		10	SS	0												
5.3			11	SS	0												
			12	SS	0												
			13	SS	0												
			14	SS	0												
			15	TW													
185.7	BOREHOLE TERMINATED AT ~ 16.15 m DEPTH																
16.2	NOTES: 1. This drawing is to be read with the subject report and project number as presented above. 2. Interpretation assistance by Trow is required before use by others. 3. Date of W.L.=Sept. 11, 2009. 4. Installed PVC standpipes to 12.2 m depth.																

ON_MOT_SO11878G - LARONDE CREEK BRIDGE BY GREG & GPJ ON_MOT_GDT_09/10/21

+³, ×³: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No BH-7

1 OF 1

METRIC

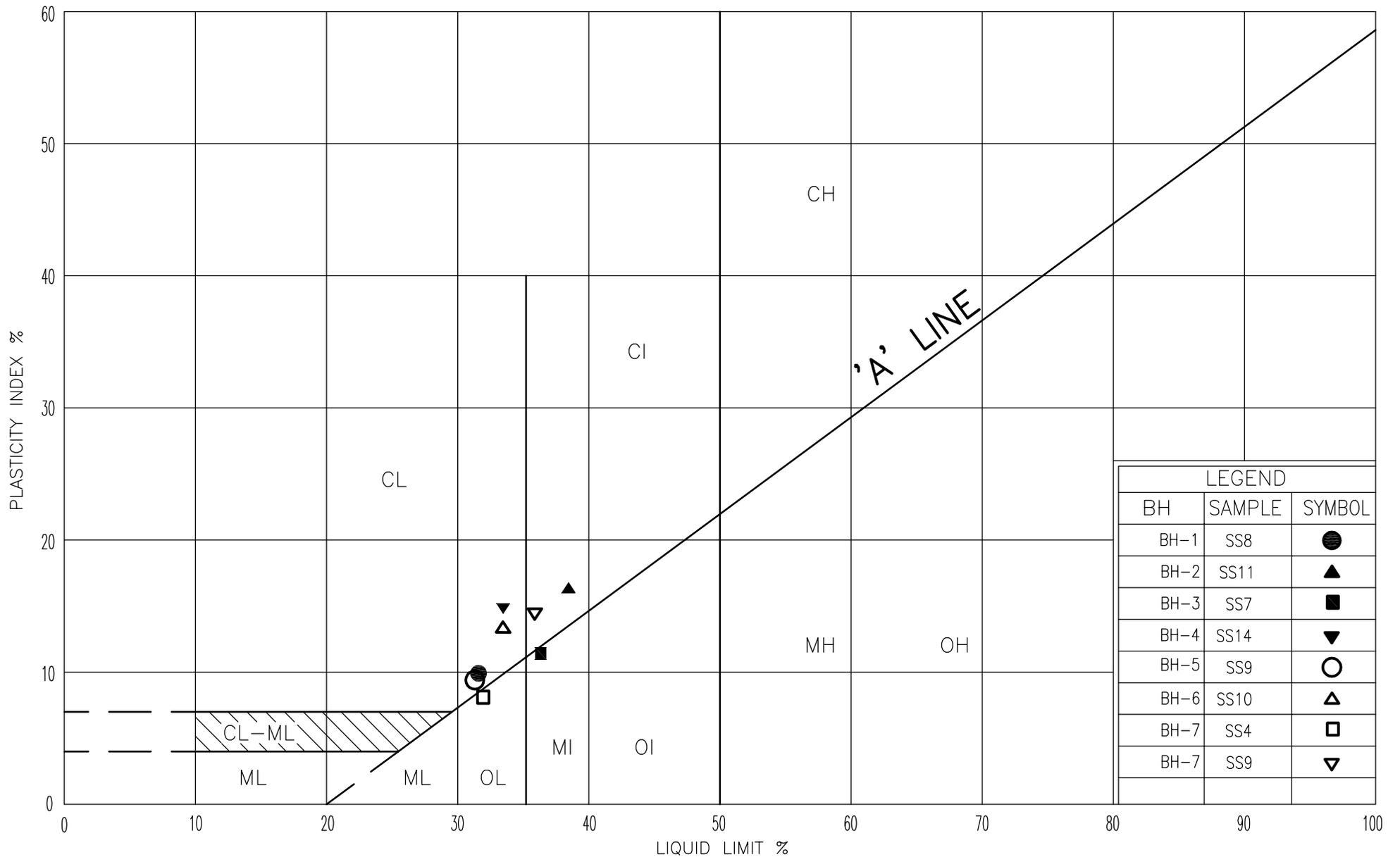
W.P. 5274-08-00 LOCATION Laronde Creek, Nipissing Indian Reserve No. 10 ORIGINATED BY GQ
 DIST 54 HWY 17 BOREHOLE TYPE Hollow Stem Auger (Wash Boring) COMPILED BY GQ
 DATUM Geodetic DATE 09.9.10 CHECKED BY VD

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	SHEAR STRENGTH kPa	
											○ UNCONFINED	+ FIELD VANE							
											● QUICK TRIAXIAL	× LAB VANE	WATER CONTENT (%)				GR SA SI CL		
198.4	SAND (FILL) (SW) , brown, damp, loose, fine to coarse grained, some silt, trace gravel.		1	AS															
0.0			2	SS	8														24 70 (6)
196.8	SILTY CLAY (ML-CI) , grey, saturated, soft to stiff, low to medium plasticity - varved below about 4.57 m		3	SS	10														
1.5			4	SS	18														
			5	SS	4														
			6	SS	0														
			7	SS	0														
			8	SS	1														
			9	SS	1														
			10	SS	1														
			11	TW															
			12	SS	4														
183.0	BOREHOLE TERMINATED AT ~ 15.4 m DEPTH																		
15.4																			

ON_MOT_SO11878G - LARONDE CREEK BRIDGE BY GREG & GPJ ON_MOT_GDT_09/10/21

+³, ×³: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

Appendix D: LABORATORY DATA



PLASTICITY CHART
SILTY CLAY, (CL,CI,ML,MI)

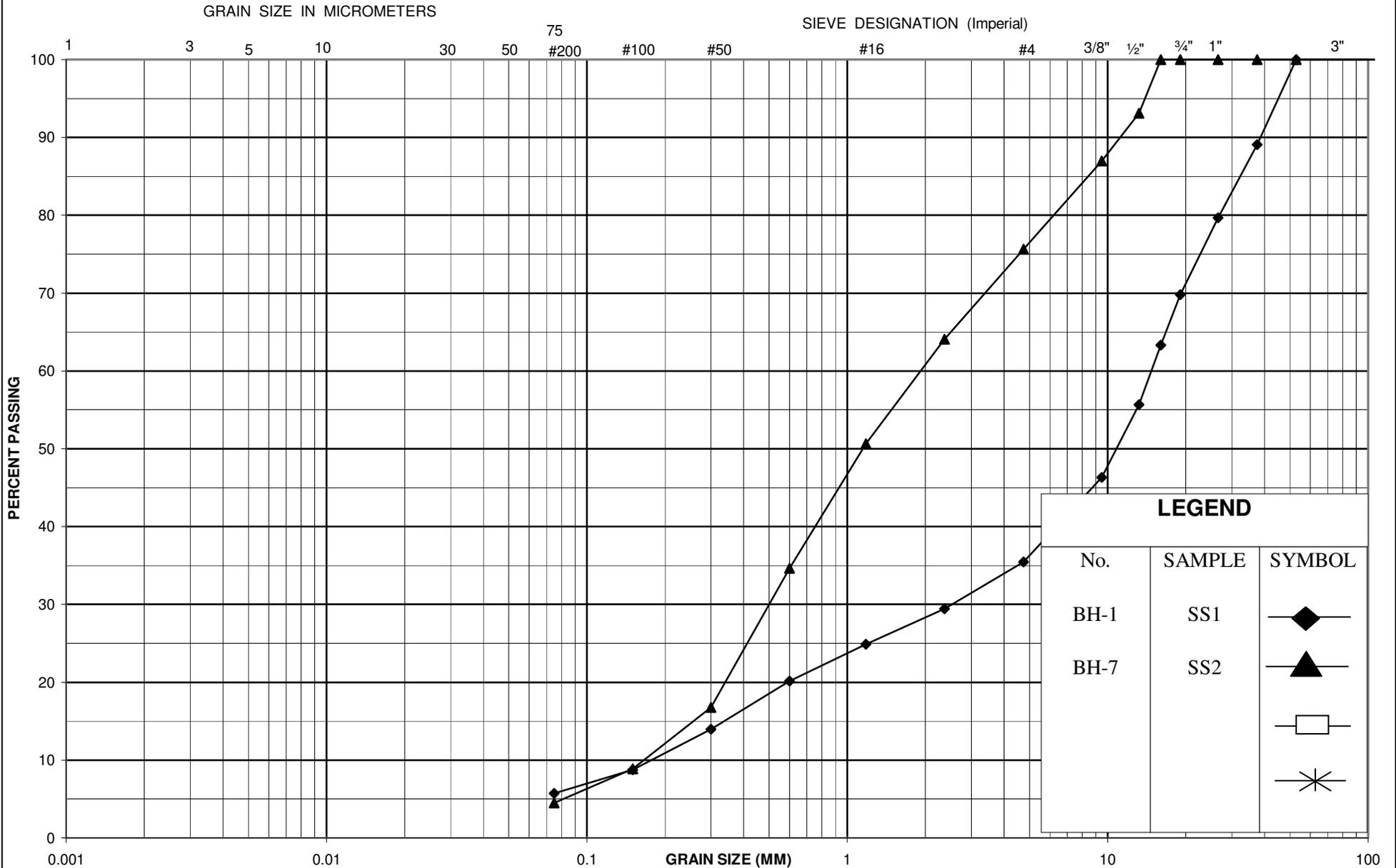
FIGURE No. 1

WO: 5274-08-00

Gabion Wall Construction, Hwy 17 Sudbury

UNIFIED SOIL CLASSIFICATION SYSTEM

CLAY AND SILT	SAND			GRAVEL	
	Fine	Medium	Coarse	Fine	Coarse



LEGEND		
No.	SAMPLE	SYMBOL
BH-1	SS1	◆
BH-7	SS2	▲
		□
		*

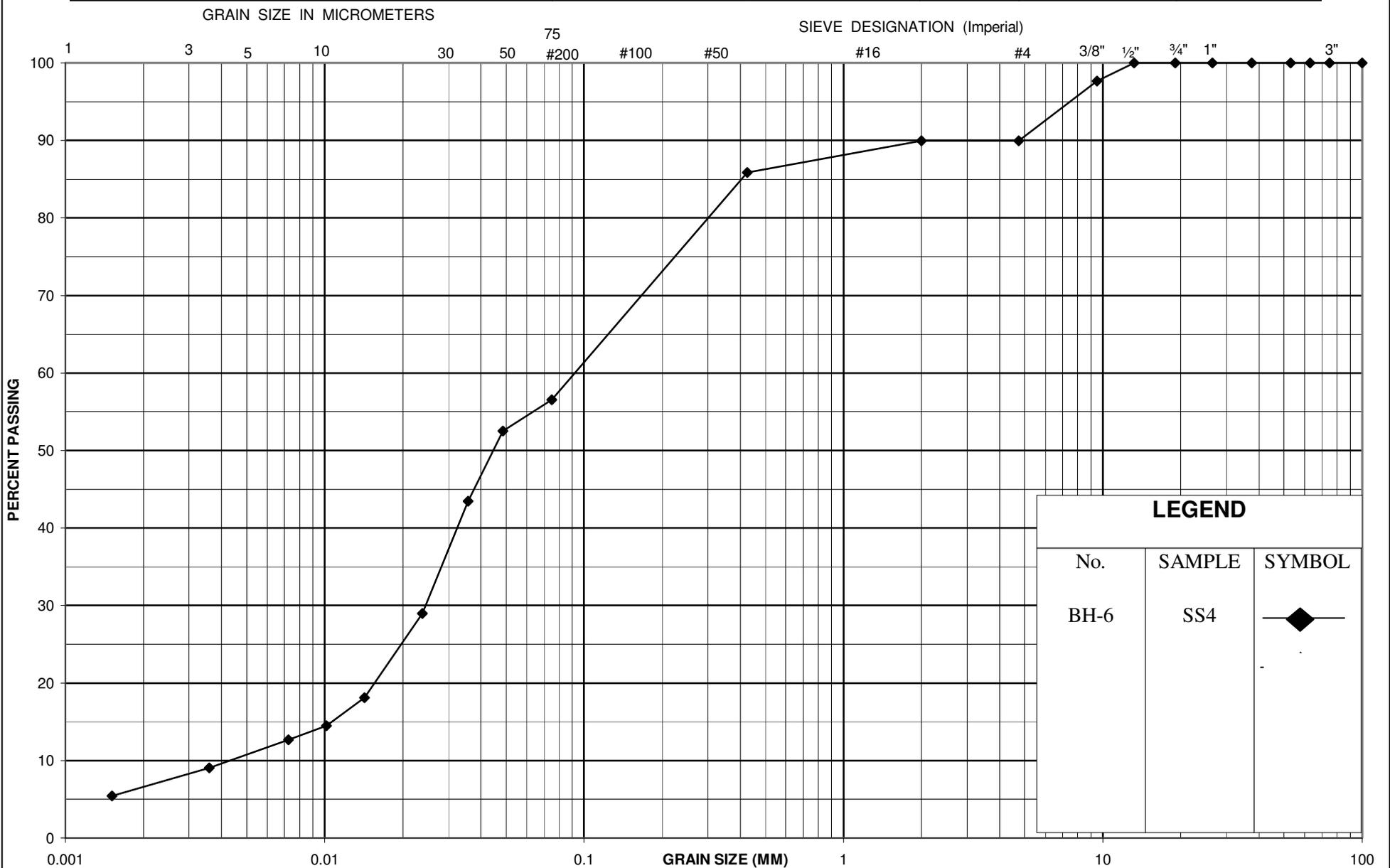


GRAIN SIZE DISTRIBUTION
Sand Fill

FIGURE No. 3
G.W.P. No. 5274-08-00
DATE Sept. 2009

UNIFIED SOIL CLASSIFICATION SYSTEM

CLAY AND SILT	SAND			GRAVEL	
	Fine	Medium	Coarse	Fine	Coarse



LEGEND		
No.	SAMPLE	SYMBOL
BH-6	SS4	◆

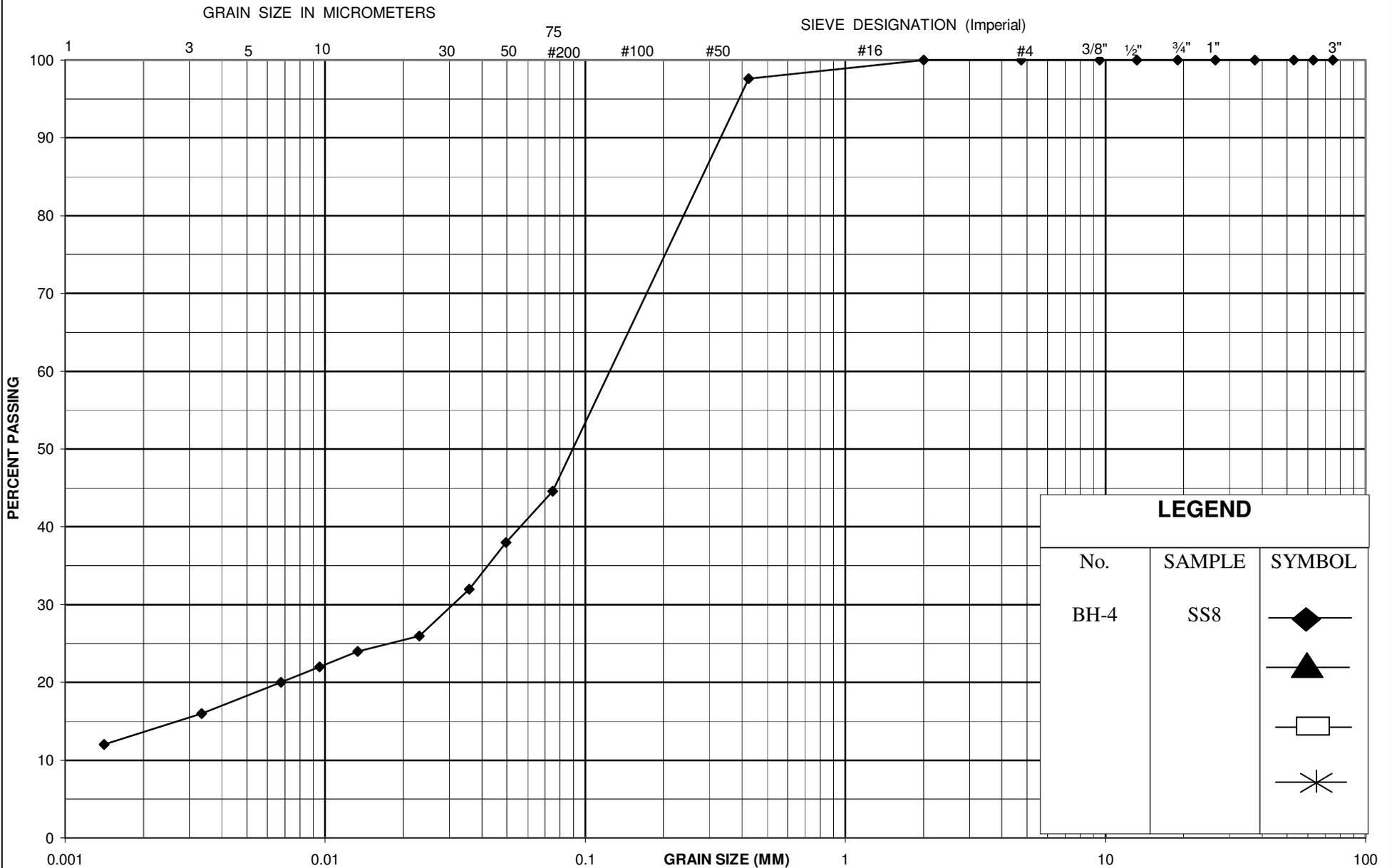


GRAIN SIZE DISTRIBUTION
Sandy Silt

FIGURE No. 4
G.W.P. No. 5274-08-00
DATE Sept. 2009

UNIFIED SOIL CLASSIFICATION SYSTEM

CLAY AND SILT	SAND			GRAVEL	
	Fine	Medium	Coarse	Fine	Coarse



LEGEND		
No.	SAMPLE	SYMBOL
BH-4	SS8	◆
		▲
		□
		*

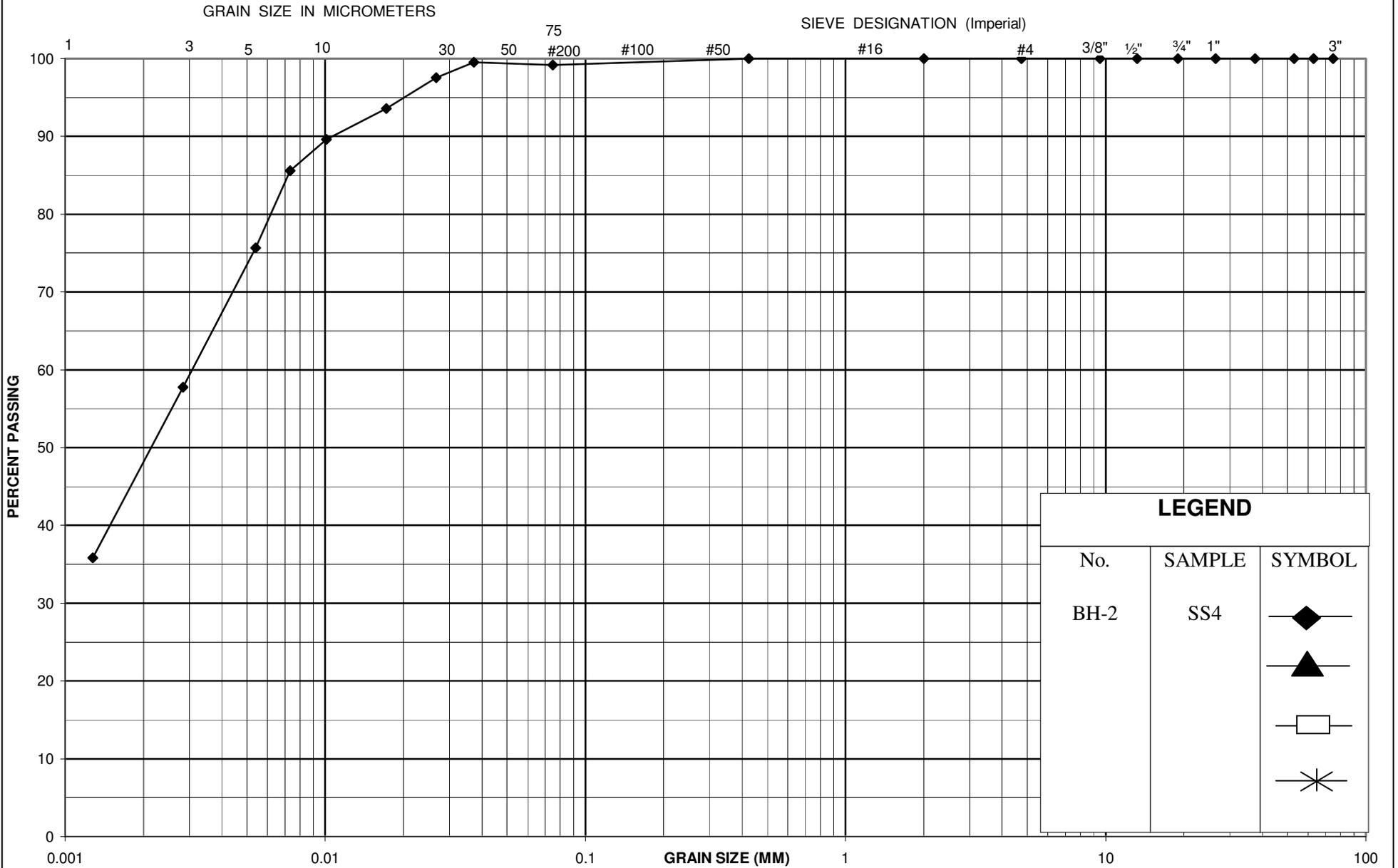


GRAIN SIZE DISTRIBUTION
Silty Sand

FIGURE No. 5
G.W.P. No. 5274-08-00
DATE Sept. 2009

UNIFIED SOIL CLASSIFICATION SYSTEM

CLAY AND SILT	SAND			GRAVEL	
	Fine	Medium	Coarse	Fine	Coarse



LEGEND		
No.	SAMPLE	SYMBOL
BH-2	SS4	◆
		▲
		□
		*



GRAIN SIZE DISTRIBUTION
Silt

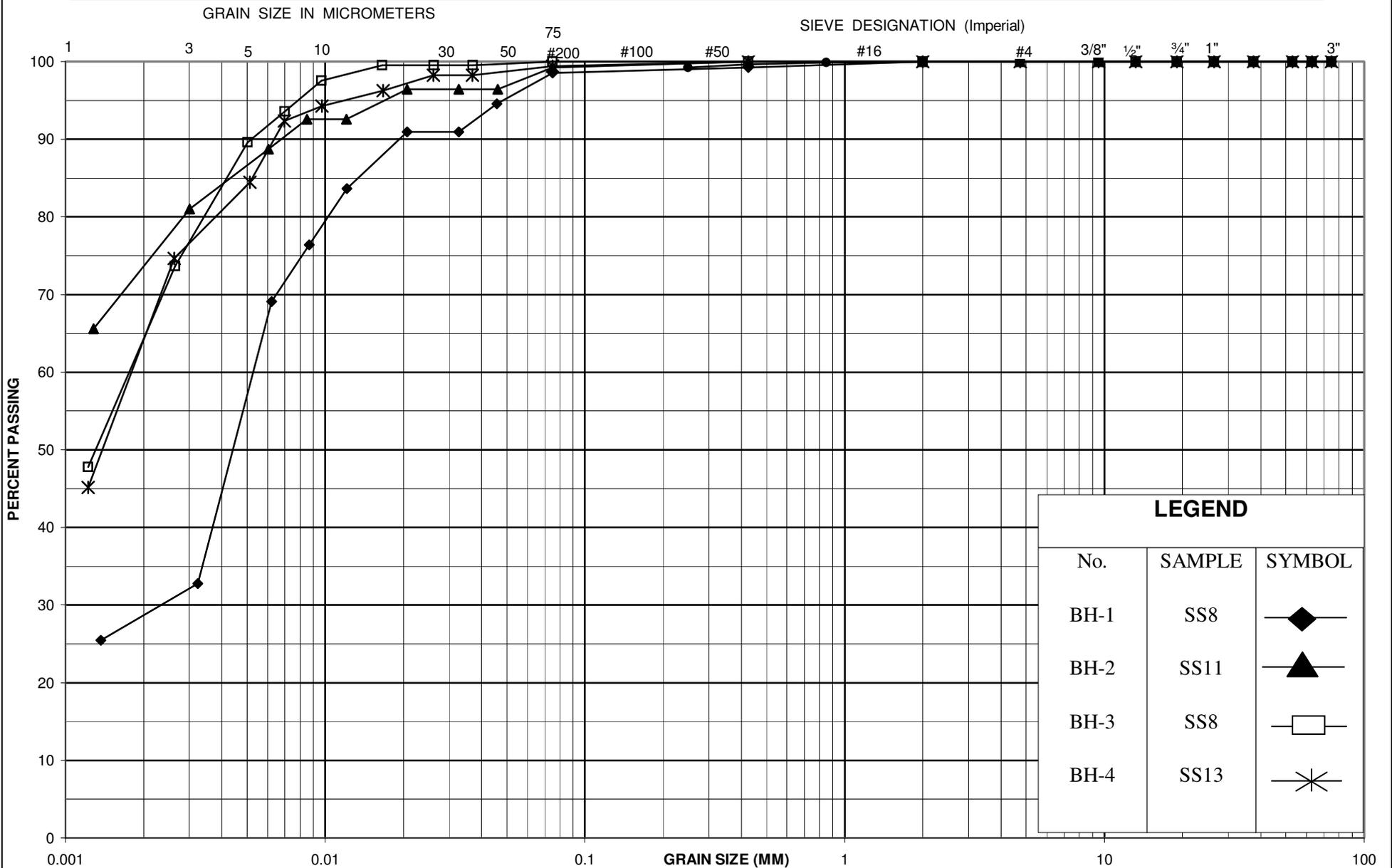
FIGURE No. 6

G.W.P. No. 5274-08-00

DATE Sept. 2009

UNIFIED SOIL CLASSIFICATION SYSTEM

CLAY AND SILT	SAND			GRAVEL	
	Fine	Medium	Coarse	Fine	Coarse



GRAIN SIZE DISTRIBUTION
Silty Clay

FIGURE No. 7

G.W.P. No. 5274-08-00

DATE Sept. 2009

