



**FOUNDATION INVESTIGATION REPORT
HIGHWAY 11 AT PAN LAKE, 10.6 km NORTH OF HIGHWAY 64
STATION 14+750 TO 14+950, IN OLIVE TOWNSHIP.
WP 5578-04-00, NORTH BAY AREA
GEOCRES No. 31L-123**

**MTO NE REGION CONTRACT #5006-E-0070
ASSIGNMENT #7**

Submitted to:

Ministry of Transportation
Northeastern Region, Engineering Office
Geotechnical Section
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North Bay, Ontario P1B 9S9

Submitted by:

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3 September 2008
TB7206007-I

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1.0 INTRODUCTION

AMEC Earth & Environmental, a division of AMEC Americas Limited (AMEC), Consulting Geotechnical, Construction Quality Control and Environmental Engineers, was retained by the Ministry of Transportation (North East Region) to conduct a foundation investigation and detail design to assess the stability of an existing embankment on Highway 11 at Pan Lake, 10.6 km north of Highway 64, in Olive Township, Ontario. The embankment has undergone historical slope movement and settlement, e.g., tilting guiderail. The approximate site location is shown on Figure 1.

Twelve (12) boreholes, with a total drilling length of approximately 114 m in the vicinity of the existing guiderail were specified by the MTO in the Terms of Reference. Authorization to proceed with this investigation was signed by the Regional / Branch Director of MTO dated 17th March 2008 and faxed on 18th March 2008. The work was carried out by AMEC according to the MTO Northeastern Region Terms of Reference Agreement #5006-E-0070 Assignment #7; Foundation Investigation and Design for Highway 11 at Pan Lake, 10.6 km north of Highway 64.

Subsurface information from a previous project that was available was reviewed prior to carrying out the fieldwork for this project. The following information was reviewed at the MTO Foundation Library (GEOCREG), in Downsview, and used in preparing this report wherever applicable.

- ***“Foundation Investigation Report for Culvert Replacements: Hwy 11, Sta.15+225 – Robin Creek, Site 43-363, Hwy 11, Sta.15+060 – Angus Creek, Site 43-366 and Hwy 11, Sta. 17+984 – North Mile Creek (Rabbit Creek), Site 43-365, WP 714-92-00, District 54, Sudbury”***, Jacques, Whitford Limited, Project 10993, April 14, 1998.

However, the subsoil information for the project site under this investigation was not available in the above-mentioned report.

The investigation was carried out by means of a limited number of boreholes, in-situ tests and laboratory tests on selected samples. The factual results of the soil conditions encountered in the boreholes and laboratory tests are presented in this report. The detail design is presented in a separate report (Foundation Investigation and Design Report – Reference No. TB7206007-II, dated 3 September 2008).

2.0 SITE DESCRIPTION

The site for the foundation investigation is on Highway 11, approximately 10.6 km east of Highway 64, in Olive Township. The area under investigation on Hwy 11 is located west of the highway from MTO Stations 14+750 to 14+950. Highway 11, at this location, is a two lane road with gravel shoulders with both post and wire, and steel guiderails.

The general site limits are shown on Figure 1 – Site Location Plan and Figure 2 – Borehole Location Plan.

The area under investigation included the edge of the roadway, shoulder, the embankment and an area below the embankment adjacent to Pan Lake. At the time the fieldwork was conducted, the embankment slope comprised grass and rock fill / bedrock, and was snow-covered. There was also approximately 0.6 m thick ice covering the lake. Typical photographs can be found in Appendix C.

According to the Terms of Reference, the existing guiderail will be replaced and the shoulders will be regraded by adding 150 mm to 300 mm lift of Granular A during 2008/2009. Furthermore, future embankment widening by shifting the horizontal alignment by about 2.5 m away from the lake and raising the existing grade by about 2 m has been considered by MTO, of which the design depends on the results of this investigation.

3.0 GEOLOGY

A previous geotechnical investigation carried out approximately 250 m north of the project site indicates that the surficial soils comprise glacial sand and gravel till from the area known as Northern Upland. It also indicates the depth to bedrock to be in the order of 0.8 m to 6.1 m, with some areas of bedrock on the surface. The bedrock comprises Precambrian granite, syenite and gneiss.

4.0 INVESTIGATION PROCEDURES

4.1 Field Investigation

In accordance with the Terms of Reference for this investigation, twelve (12) borehole locations (BH 1 to BH 12) were staked and cleared of underground utilities.

These twelve boreholes were put down at the locations indicated by the MTO on the TOR. Numerous additional boreholes (using labels BH #A-E) were completed, extending to depths of between 0.6 m and 12.9 m below ground surface. These boreholes were put down in order to confirm bedrock in locations where the original boreholes had encountered shallow refusal on

possible rock fill / bedrock. Each of the boreholes encountered split spoon, cone penetration or auger refusal.

The boreholes were drilled at the locations indicated in Table 1 of the TOR, as shown below:

TABLE 1 – Field and Laboratory Testing Requirements (TOR)								
Borehole	Location & Approximate Offset	Depth (m)	SPT	FVT *	LS-701	LS-702	LS-703 *	LS-704 *
BH-1	14+750, 4m lt.	6.0	8	0	2	2		
BH-2	14+750, 12m lt.	12.0	12	2	4	4	1	1
BH-3	14+800, 4m lt.	6.0	8	0	2	2		
BH-4	14+800, 12m lt.	12.0	12	2	4	4	1	1
BH-5	14+850, 4m lt.	6.0	8	1	2	2		
BH-6	14+850, 12m lt.	12.0	12	2	4	4	2	2
BH-7	14+850, 20m lt.	12.0	12	2	4	4	2	2
BH-8	14+900, 4m lt.	6.0	8	1	2	2		
BH-9	14+900, 12m lt.	12.0	12	2	4	4	2	2
BH-10	14+900, 20m lt.	12.0	12	2	4	4	2	2
BH-11	14+950, 4m lt.	6.0	8	0	2	2		
BH-12	14+950, 12m lt.	12.0	12	2	4	4	1	1
Totals	12	114	124	16	38	38	11	11

The fieldwork was performed on March 28th, 31st and April 2nd, 2008. Prior to drilling, utility locates were carried out. The holes were drilled by Walker Drilling Ltd, using a tripod and a truck-mount drilling rig.

The borehole locations are presented on Figure 2 – Borehole Location Plan and detailed in Table 1A.

The borehole investigation was carried out under the full-time supervision of experienced geotechnical personnel from AMEC.

Soil samples were taken at 0.75 m intervals during the performance of Standard Penetration Test (SPT) in accordance with ASTM D1586. This consisted of freely dropping a 63.5 kg (140 lbs.) hammer for a vertical distance of 0.76 m (30 inches) to drive a 51 mm (2 inches) diameter O.D. split-barrel (split spoon) sampler into the ground. The number of blows of the hammer required to drive the sampler into the relatively undisturbed ground by a vertical distance of 0.30 m (12 inches) was recorded as SPT 'N' value of the soil which indicated the consistency of cohesive soils or the relative density of non-cohesive soils.

The dynamic cone penetration test (DCPT) was carried out by advancing a steel cone into the ground with a 63.5 kg (140 lbs.) hammer. The number of blows per 0.3 m required to advance the cone was recorded and presented in the Record of Boreholes (Appendix A).

Table 1A: Drilled Borehole Locations and Depths

Borehole No.	Location	Drilled Depth (m)	Depth Required by TOR (m)	Notes
1	Stn(14+750), 4.0m Lt of CL	1.25	6.0	
1A	Stn(14+725), 4.7m Lt of CL	1.45		
1B	Stn(14+715), 4.5m Lt of CL	1.40		
1C	Stn(14+700), 4.65m Lt of CL	1.43		
2	Stn(14+750), 12.0m Lt of CL	0.00	12.0	Visible rock fill / bedrock at surface
2A	Stn(14+750), 17.0m Lt of CL	12.90		
3	Stn(14+800), 4.0m Lt of CL	0.90	6.0	
3A	Stn(14+790), 4.0m Lt of CL	0.92		
3B	Stn(14+780), 4.0m Lt of CL	1.20		
3C	Stn(14+776), 4.0m Lt of CL	1.25		
3D	Stn(14+760), 4.0m Lt of CL	1.20		
4	Stn(14+800), 12.0m Lt of CL	0.00	12.0	Visible rock fill / bedrock at surface
4A	Stn(14+800), 14.0m Lt of CL	1.52		
4B	Stn(14+800), 18.0m Lt of CL	10.90		
5	Stn(14+850), 4.2m Lt of CL	1.10	6.0	
5A	Stn(14+840), 4.2m Lt of CL	0.91		
5B	Stn(14+830), 4.2m Lt of CL	0.76		
5C	Stn(14+820), 4.2m Lt of CL	0.66		
5D	Stn(14+810), 4.2m Lt of CL	0.60		
5E	Stn(14+805), 4.2m Lt of CL	1.10		
6	Stn(14+850), 12.0m Lt of CL	1.52	12.0	
6A	Stn(14+850), 13.0m Lt of CL	2.44		
6B	Stn(14+850), 15.0m Lt of CL	8.40		
7	Stn(14+850), 20.0m Lt of CL	8.10	12.0	
8	Stn(14+900), 4.2m Lt of CL	1.40	6.0	
8A	Stn(14+890), 4.2m Lt of CL	1.45		
8B	Stn(14+880), 4.2m Lt of CL	1.07		
8C	Stn(14+870), 4.2m Lt of CL	1.06		
8D	Stn(14+860), 4.2m Lt of CL	1.25		
8E	Stn(14+856), 4.2m Lt of CL	1.07		
9	Stn(14+900), 12.0m Lt of CL	1.52	12.0	
9A	Stn(14+900), 13.0m Lt of CL	10.00		
10	Stn(14+900), 20.0m Lt of CL	10.90	12.0	
11	Stn(14+950), 4.2m Lt of CL	1.10	6.0	
11A	Stn(14+947), 4.2m Lt of CL	1.07		

Borehole No.	Location	Drilled Depth (m)	Depth Required by TOR (m)	Notes
11B	Stn(14+944), 4.2m Lt of CL	1.16		
11C	Stn(14+940), 4.2m Lt of CL	1.20		
11D	Stn(14+930), 4.2m Lt of CL	1.25		
11E	Stn(14+920), 4.2m Lt of CL	1.20		
11F	Stn(14+910), 4.2m Lt of CL	1.20		
11G	Stn(14+905), 4.2m Lt of CL	1.28		
12	Stn(14+950), 12.0m Lt of CL	10.4	12.0	

Four boreholes (BH 2A, 4B, 7, 10) encountered firm to very soft clay soils through which MTO Field Vane Testing was carried out.

In Boreholes 1A, 3A-D, 4A, 6 and 6A, auger samples were taken from the boreholes to depths of between 0.9 m and 2.4 m below existing site grade. The additional boreholes were put down in order to confirm the subsurface soils as well as the depth of auger refusal.

Soil samples were normally collected from each soil layer exposed in the boreholes for laboratory inspection and testing.

Upon completion of drilling, the boreholes that were deeper than 3 m were backfilled with bentonite in accordance with the general requirements of Ministry of the Environment Regulation 903 as indicated on the Records of Boreholes.

The soil samples were transported to AMEC's Soil Laboratory in Hamilton for further examination and laboratory soil testing. The program of laboratory testing included grain size analysis, Liquid and Plastic Limits, and moisture content determination.

The results of the in-situ and laboratory tests are presented in the corresponding Records of Boreholes (Appendix A) and Laboratory Test Results (Appendix B).

AMEC will retain the soil samples for a period of one year after completion of the Project, unless otherwise advised in writing by the Ministry.

4.2 Laboratory Tests

In accordance with the Terms of Reference for this investigation, representative soil samples were subjected to laboratory testing in AMEC's Soil Laboratory in Hamilton for soil classification. The following tests were conducted:

- In-situ water content determination (38);
- Grain size distribution analysis (38); and
- Liquid and Plastic Limits (11).

The results of the laboratory tests are included in the Record of Boreholes in Appendix A. The grain size distribution curves and Liquid / Plastic Limits are shown in Appendix B.

5.0 SUB-SURFACE CONDITIONS

The general soil profile below road at the edge of the pavement and shoulder consisted of sand and gravel over sand to sand and silt. Refusal due to the presence of rock fill was encountered in this area from depths between 0.6 m and 1.5 m below ground surface. Coring through the rock fill was not required by the MTO.

Only two boreholes (Boreholes 2A and 12) were able to be put down at deep depth within the embankment area. This was due to the large amount of rock fill / bedrock in the area which was visible on the surface throughout the embankment. Borehole 2A encountered silt to silty clay underlain by silty sand to sandy silt. Borehole 12 encountered layers of peat and silty clay fill underlain by silty clay.

The general soil profile within the lake adjacent to the road embankment consisted of a layer of peat with thickness ranging from 1.9 m to 3.9 m, underlain by silty clay to clayey silt, which was further underlain by sand or silt.

The stratigraphic units and groundwater conditions at the borehole locations are discussed in the following sections. Detailed information is provided in the Record of Boreholes (Appendix A).

The following summary is to assist the designers of the project with an understanding of the anticipated soil conditions across the site. However, it should be noted that the soil and groundwater conditions may vary between the borehole locations.

5.1 Surficial Material

In Boreholes 1A, 5, 8, and 11, 300 mm to 600 mm thick sand and gravel was encountered. This material was in a frozen state in Boreholes 5, 8 and 11.

Boreholes 1, 3, 3A, 3B, 3C, 3D that were put down along the edge of pavement on Highway 11 encountered between 170 mm and 410 mm thick asphaltic concrete. The asphaltic concrete in Boreholes 1, 3C, and 3D was underlain by 15 mm to 50 mm thick sand and gravel, which was further underlain by 200 mm to 230 mm thick asphaltic concrete.

5.2 Peat/Organic Matters

A number of the boreholes (BH's 2A, 4B, 6, 6A, 6B, 7, 10, 12) put down within the embankment and lake areas encountered peat and/or organic matters to depths between 1.5 m and 4.6 m below ground surface. The deposits in Borehole 2A and 12 were encountered at ground surface and were about 300 mm thick. The deposits in the remaining boreholes were

encountered within the lake, beneath ice and/or water. The peat comprised mainly woodchips and trace rootlets with some silt. The SPT 'N' values recorded in Boreholes 4B, 7, 10, indicated a very loose relative density with values of 1 to 2 blows per 0.3 m.

5.3 Silt Fill

Underlying the surficial peat (possibly organics fill material) in Boreholes 12, silt fill was encountered to a depth of 3.6 m below ground surface. The silt fill comprised trace rootlets, wood chips, sand and gravel and some organic matters.

The SPT 'N' values varied from 5 to 10 blows per 0.3 m, indicating a very loose to loose relative density.

The results of laboratory tests conducted on selected soil samples are as follows:

Plastic Limit (1 sample):	24
Liquid Limit (1 sample):	27
Plasticity Index (1 sample):	3
Grain size (5 samples):	Gravel (%): 0
	Sand (%): 2 to 9
	Silt (%): 79 to 91
	Clay (%): 7 to 16

The plasticity indices are plotted in Enclosure 39B and the grain size distribution curves are presented in Enclosures 34B to 38B in Appendix B.

5.4 Sand and Gravel to Gravely Sand

Underlying the asphaltic concrete in Boreholes 1, 3, 3A, 3B, 3C, 3D, the ice in Borehole 4A, and the frozen sand and gravel in Borehole 5, sand and gravel to gravely sand was encountered to depths between 250 mm and the maximum depths investigated. The sand and gravel in Borehole 4A contained silt and cobbles.

The SPT 'N' values recorded in Boreholes 1, 3 and 11 ranged from 17 blows to 50 blows per 0.3 m (compact to very dense relative density).

The results of laboratory tests conducted on selected soil samples are as follows:

Natural moisture content (%):	14 to 16
Grain size (6 samples):	Gravel (%): 13 to 36
	Sand (%): 62 to 70

Silt (%): 10 to 17

Clay (%): 3 to 4

The grain size distribution curves are presented in Enclosures 1B, 2B, 17B, 18B, 24B and 32B in Appendix B.

5.5 Sand/Silty Sand to Sandy Silt/Silt

Underlying the sand and gravel in Boreholes 3A, 3B, 3C and 11, sand to silty sand was encountered to the maximum depths investigated.

Underlying the peat in Borehole 2A, silt was encountered at a depth of 0.3 m below ground surface. Underlying the silt to silty clay in Borehole 2A, silty sand to sandy silt was encountered at a depth of 4.5 m below ground surface. Underlying the silty clay to silt in Borehole 4B, and the sand and gravel in Borehole 8, sand to silty sand was encountered to the maximum depths investigated.

SPT 'N' values of between 1 and 24 blows per 0.3 m were recorded indicating a very loose to compact consistency. In Boreholes 2A, 4B and 8, refusal to split spoon sampling occurred which was likely due to the presence of cobbles.

The results of laboratory tests conducted on selected soil samples are as follows:

Natural moisture content (%): 18 to 19

Grain size (10 samples): Gravel (%): 0 to 19

Sand (%): 4 to 80

Silt (%): 14 to 93

Clay (%): 3 to 7

The grain size distribution curves are presented in Enclosures 3B, 7B to 10B, 14B to 16B, 25B and 33B in Appendix B.

5.6 Silt to Silty Clay to Clayey Silt

Underlying the peat in Boreholes 4B, 7, and 10, and the silt in Borehole 2A, silt to silty clay to clayey silt was encountered to depths between 0.6 m and the maximum depths investigated.

The SPT 'N' values ranged from 1 to 32 blows per 0.3 m indicating a very soft to hard consistency. Five MTO field vanes resulted in shear strengths of between 14.4 kPa and 33.5 kPa (soft to firm consistency).

The results of laboratory tests conducted on selected soil samples are as follows:

Natural moisture content (%):	19 to 30
Plastic Limit (4 samples):	16 to 28
Liquid Limit (4 samples):	17 to 29
Grain size (17 samples):	Gravel (%): 0 to 36
	Sand (%): 1 to 38
	Silt (%): 56 to 90
	Clay (%): 6 to 26

The plasticity indices are plotted in Enclosure 39B and the grain size distribution curves are presented in Enclosures 4B to 6B, 11B to 13B, 19B to 23B and 26B to 31B in Appendix B.

5.7 Groundwater

The groundwater levels were observed in seven of the boreholes and measured upon completion of drilling. In each of the remaining boreholes, no groundwater level was observed upon completion. The measured groundwater levels are shown in the Record of Boreholes (Appendix A).

Groundwater levels were encountered as follows:

Borehole No.	Groundwater Depth below Existing Ground Surface, m	Groundwater Elevation, m	Notes
2A	1.1	292.7	caved at 3.2m
4B	0	289.9	caved at 4.7m
6B	0	289.8	caved to surface
7	0	289.9	caved at 0.9m
9A	0	289.9	caved to surface
10	0	289.9	caved at 4.5m
12	1.4	289.0	caved at 2.3m

It should be noted that the groundwater at the site would fluctuate seasonally and can be expected to be somewhat higher during the spring months and in response to major weather events / water levels in the lake.

6.0 CLOSURE

The sub-soil information and recommendations contained in this report should be used solely for the purpose of foundation/slope stability assessment of this site.

AMEC should be retained to review the recommendations provided in this report, once the details of the project are finalized and prior to the final design stage of the project.

The Limitations of Report, as quoted on the following page, is an integral part of this report.

The information presented in this report is complete within the Terms of Reference. If there are any further questions concerning this report, please do not hesitate to contact the undersigned.

Sincerely,

AMEC Earth & Environmental,
A division of AMEC Americas Limited



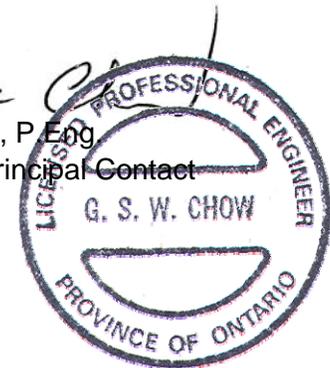
Laura Cowan, B.Eng.
Geotechnical EIT



Siva Nadarajah, M.Eng.
Engineering Analyst



Prapote Boonsinsuk, Ph.D., P.Eng.
Geotechnical Engineer



George Chow, P. Eng.
Designated Principal Contact

LIMITATIONS OF REPORT

The conclusions and recommendations given in this report are based on information determined at the testhole locations. The information contained herein in no way reflects on the environmental aspects of the project, unless otherwise stated. Subsurface and groundwater conditions between and beyond the testholes may differ from those encountered at the testhole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. It is recommended practice that the Geotechnical Engineer be retained during the construction to confirm that the subsurface conditions across the site do not deviate materially from those encountered in the testholes.

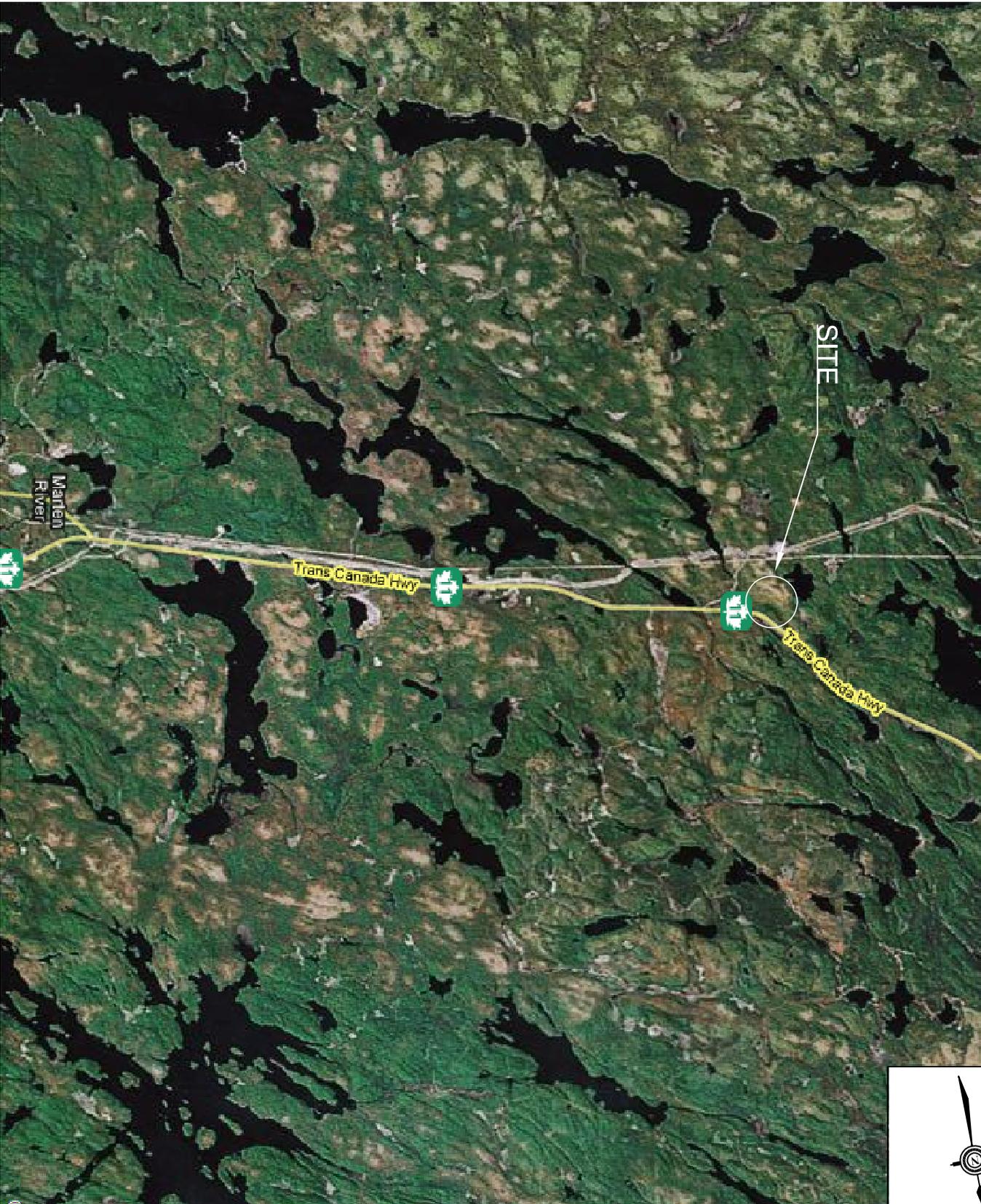
The design recommendations given in this report are applicable only to the project described in the text, and then only if constructed substantially in accordance with the details stated in this report. Since all details of the design may not be known, we recommend that we be retained during the final design stage to verify that the design is consistent with our recommendations, and that assumptions made in our analysis are valid.

The comments made in this report relating to potential construction problems and possible methods of construction are intended only for the guidance of the designer. The number of testholes may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of surficial topsoil or fill layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work. This work has been undertaken in accordance with normally accepted geotechnical engineering practices. No other warranty is expressed or implied.

The benchmark and elevations mentioned in this report were obtained strictly for use by this office in the geotechnical design of the project. They should not be used by any other party for any other purpose.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. AMEC Earth & Environmental accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

DRAWINGS



LEGEND
 BOREHOLE
 METAL GUIDE RAIL



TITLE:

SITE LOCATION PLAN

PROJECT:

FOUNDATION INVESTIGATION &
 DESIGN
 HWY 11 AT PAN LAKE,
 OLIVE TWP, ONTARIO

CLIENT:

Ministry of Transportation
 North East Region, Engineering Office
 Geotechnical Section
 447 McKeown Avenue, Suite 301
 North Bay, Ontario P1B 9S9

DRAWN BY:

LC

CHECKED BY:

HS

DATE:

APRIL 2008

PROJECT NO.:

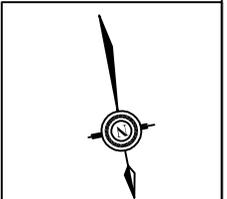
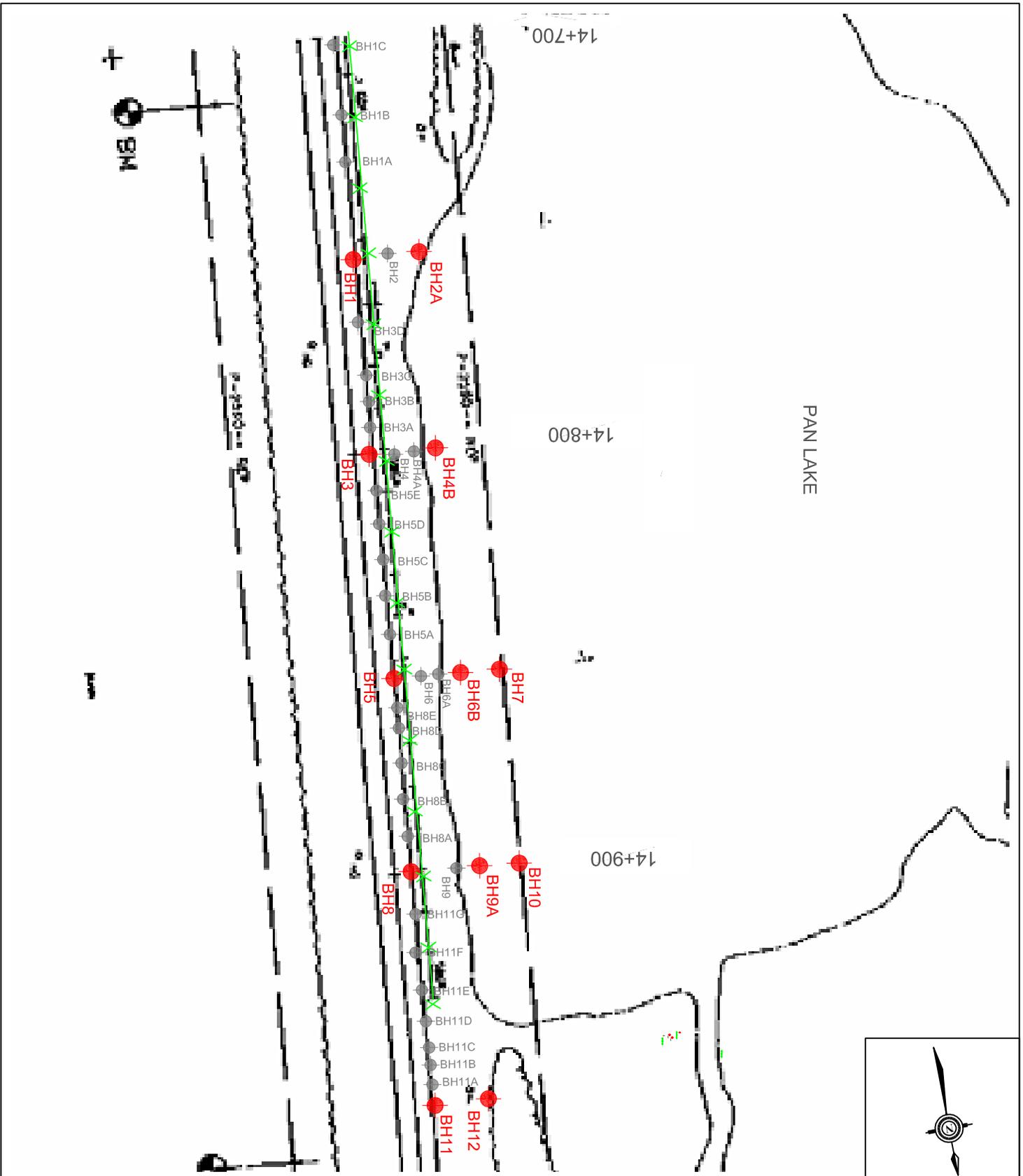
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SCALE:

As Indicated

FIGURE NO.:

1



- LEGEND**
- BH1 BOREHOLE (with SPT values)
 - BH1 BOREHOLE
 - * METAL GUIDE RAIL

Note:
 Figure based on Drawing W/P No. 713-92-00
 provided to AMEC by the MTO.
 Borehole locations are approximate.

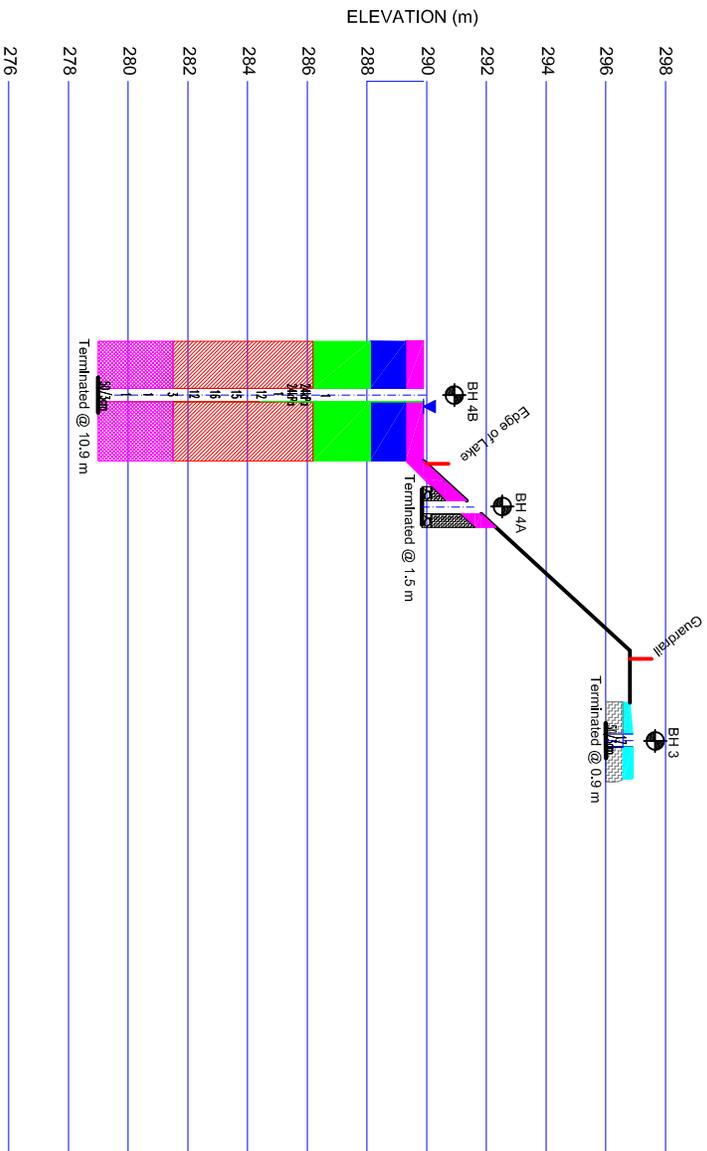
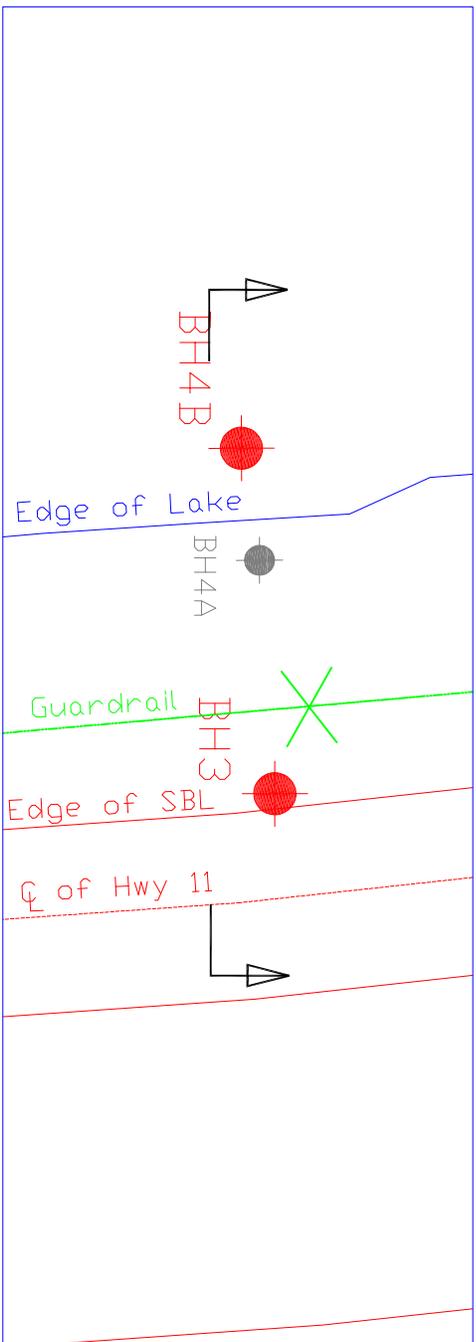


TITLE:
 BOREHOLE LOCATION PLAN

PROJECT:
 FOUNDATION INVESTIGATION &
 DESIGN
 HWY 11 AT PAN LAKE,
 OLIVE TWP, ONTARIO

CLIENT:
 Ministry of Transportation
 North East Region, Engineering Office
 Geotechnical Section
 447 Mckeown Avenue, Suite 301
 North Bay, Ontario P1B 9S9

DRAWN BY:	LC
CHECKED BY:	HS
DATE:	APRIL 2008
PROJECT NO.:	TB7206007
SCALE:	n.l.s
FIGURE NO.:	2



PROFILE

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

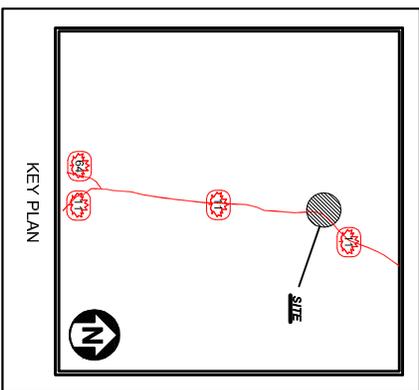
AGREEMENT No.
5006-E-0070

CONSTRUCTION INVESTIGATION
 HWY 11 AT PAUL LAKE, 10.6800 NORTH OF
 HWY 64
 OLIVE TWP, ONTARIO
 ASSIGNMENT #7

Figure No. 3
 Stratigraphical Cross Section
 BH3, BH4A, BH4B



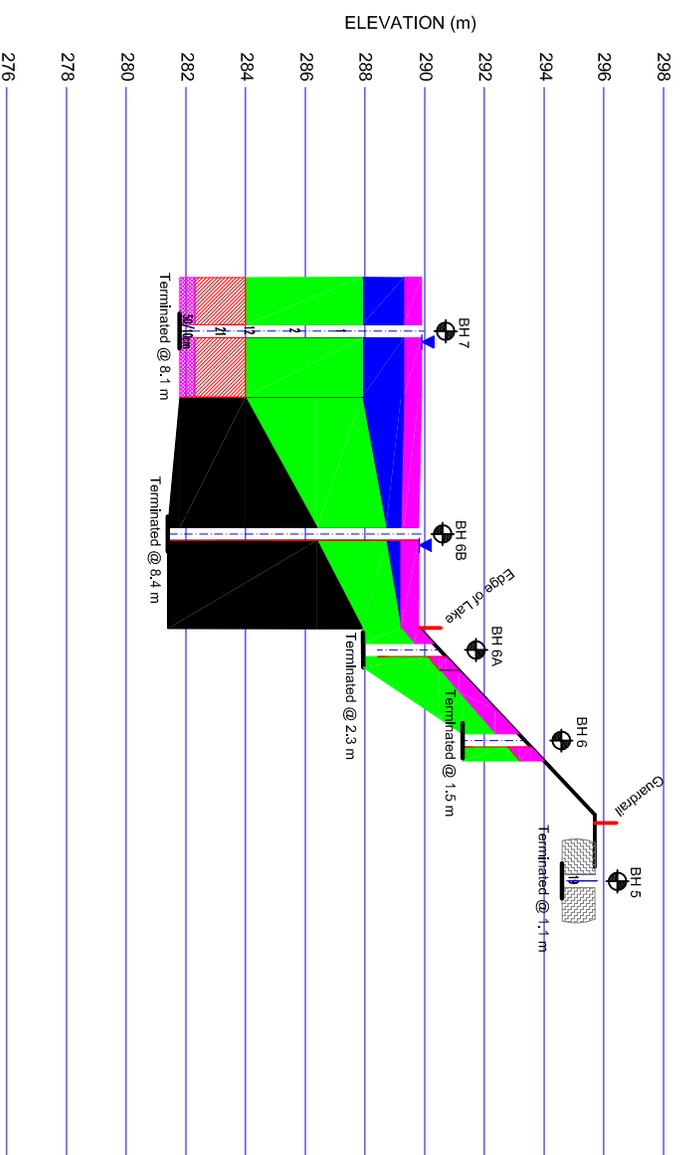
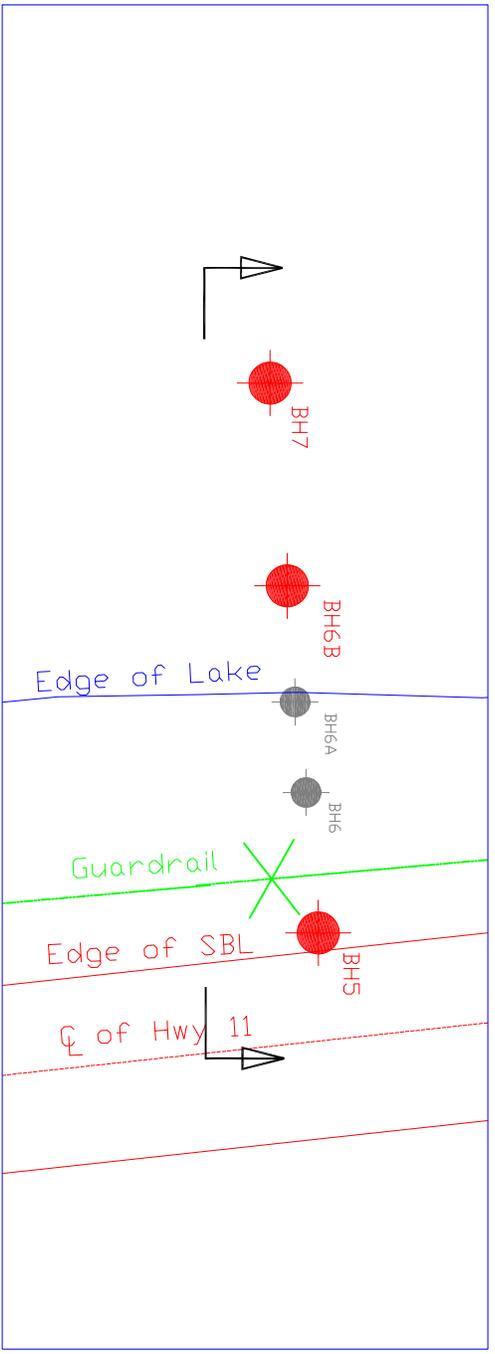
amec
 AMEC Earth & Environmental
 a Division of AMEC Americas Limited



LEGEND			
	BOREHOLE LOCATION		
	WATER LEVEL		
BOREHOLE	UTM COORDINATES (NAD83)	ELEVATION	(m)
	NORTHING	EASTING	

NOTES:
 1. The boundaries between soil strata have been established only at borehole locations. Between boreholes, the boundaries are assumed from geological evidence and may be subject to considerable error.

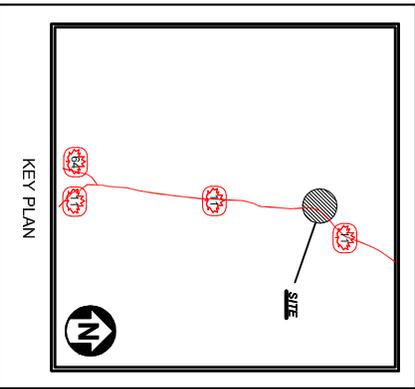
SOIL STRATIGRAPHY			
	Ice		Asphalt
	Water		Silt, Sand & Gravel
	Peat / Organics		Cobbles and Boulders
	Silty Clay		No Data Available
	Silt / Silty Sand		Borehole Terminated



PROFILE

METRIC
 AGREEMENT No. **5006-E-0070**
 DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN

CONVEYANCE INVESTIGATION HWY 11 AT PAUL LAKE, 10.6800 NORTH OF OLIVE TWP, ONTARIO ASSIGNMENT #7	TB7206007 Figure No. 4
Draw Title Stratigraphical Cross Section BH 6, BH 6A, BH 6B, BH 7	
AMEC Earth & Environmental a Division of AMEC Americas Limited	



LEGEND			
	BOREHOLE LOCATION		
	WATER LEVEL		
	ULTM COORDINATES (NAD83)		ELEVATION (m)
	NORTHING		EASTING

NOTES:
 1. The boundaries between soil strata have been established only at borehole locations. Between boreholes, the boundaries are assumed from geological evidence and may be subject to considerable error.

SOIL STRATIGRAPHY	
	Ice
	Water
	Peat / Organics
	Silty Clay
	Silt / Silty Sand
	Asphalt
	Silt, Sand & Gravel
	Cobbles and Boulders
	No Data Available
	Borehole Terminated

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

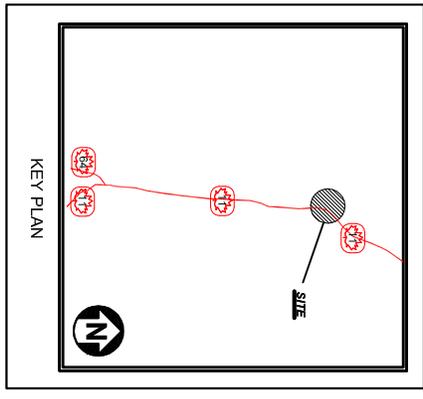
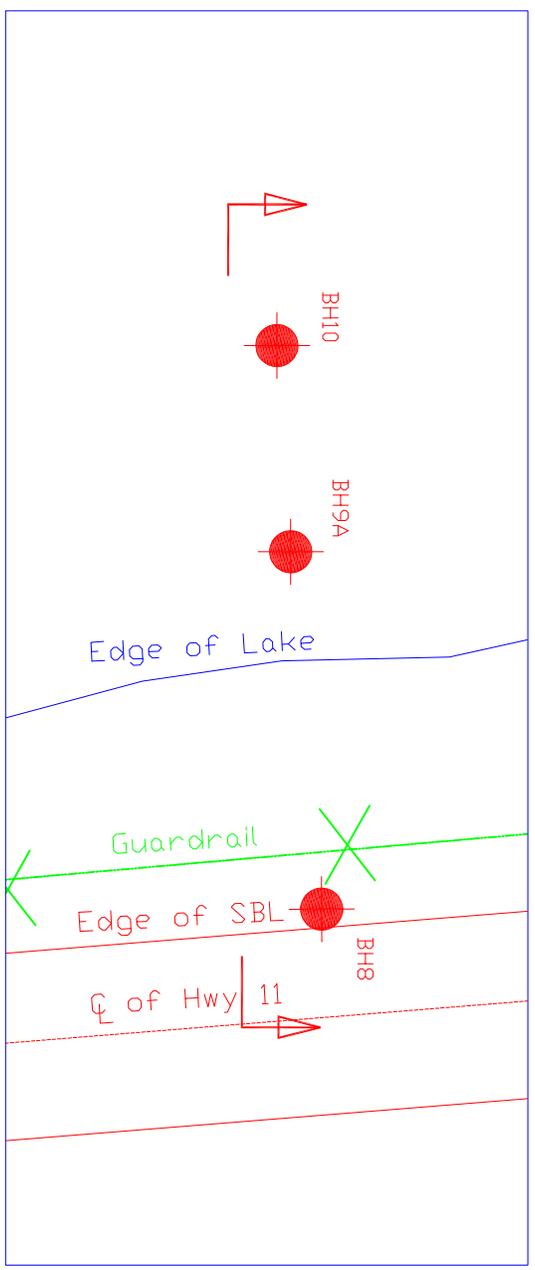
AGREEMENT No.
5006-E-0070

CONSTRUCTION INVESTIGATION
 HWY 11 AT PAN LAKE 10.6800 NORTH OF
 HWY 64
 OLIVE TWP, ONTARIO
 ASSIGNMENT #7
 Date: TBA
 Stratigraphical Cross Section
 BH 8, BH 9A, BH 10

Figure No. 5



amec AMEC Earth & Environmental
 a Division of AMEC Americas Limited



LEGEND

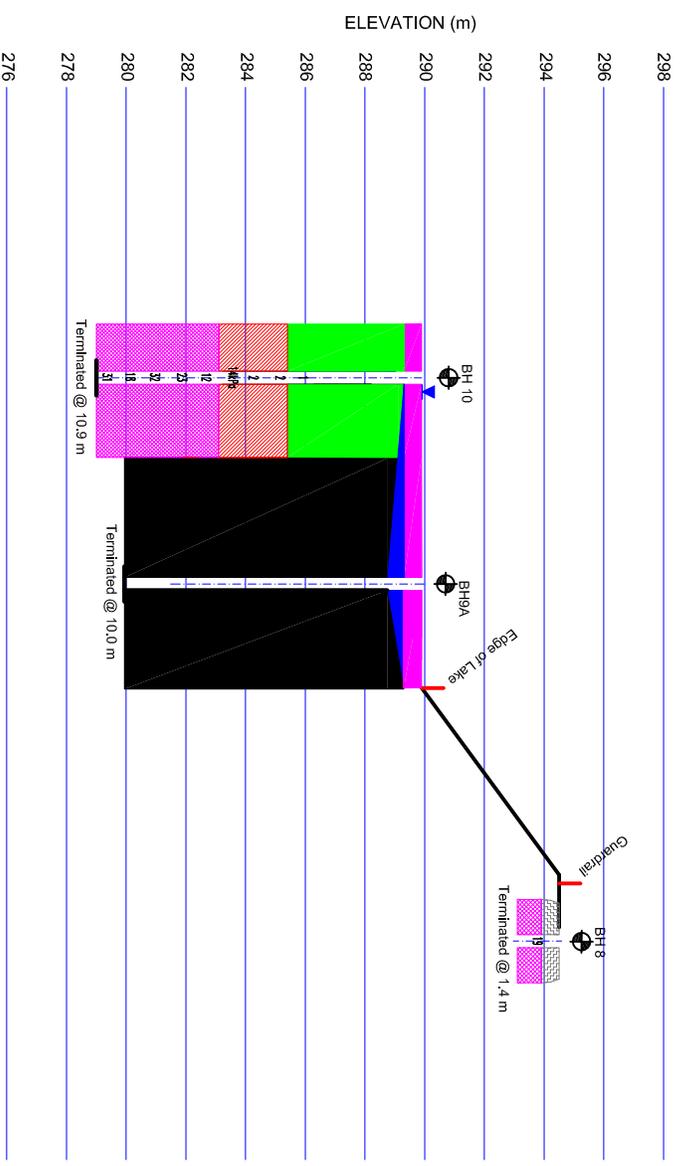
	BOREHOLE LOCATION
	WATER LEVEL
	BOREHOLE
	ULTIM. COORDINATES (NAD83)
	NORTHING
	EASTING
	ELEVATION (m)

NOTES:
 1. The boundaries between soil strata have been established only at borehole locations. Between boreholes, the boundaries are assumed from geological evidence and may be subject to considerable error.

SOIL STRATIGRAPHY

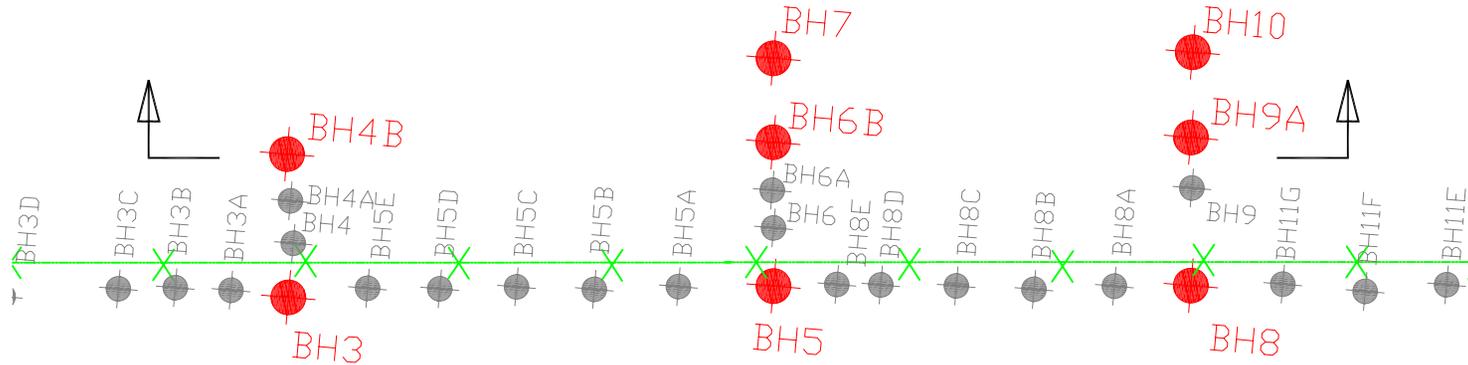
	Ice		Asphalt
	Water		Silt, Sand & Gravel
	Peat / Organics		Cobbles and Boulders
	Silty Clay		No Data Available
	Silt / Silty Sand		Borehole Terminated

PROFILE



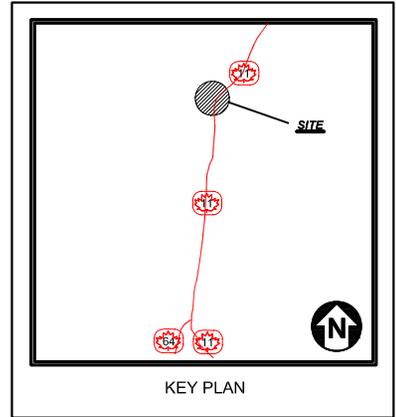
14+800

14+900



PLAN

Scale: 1 : 800



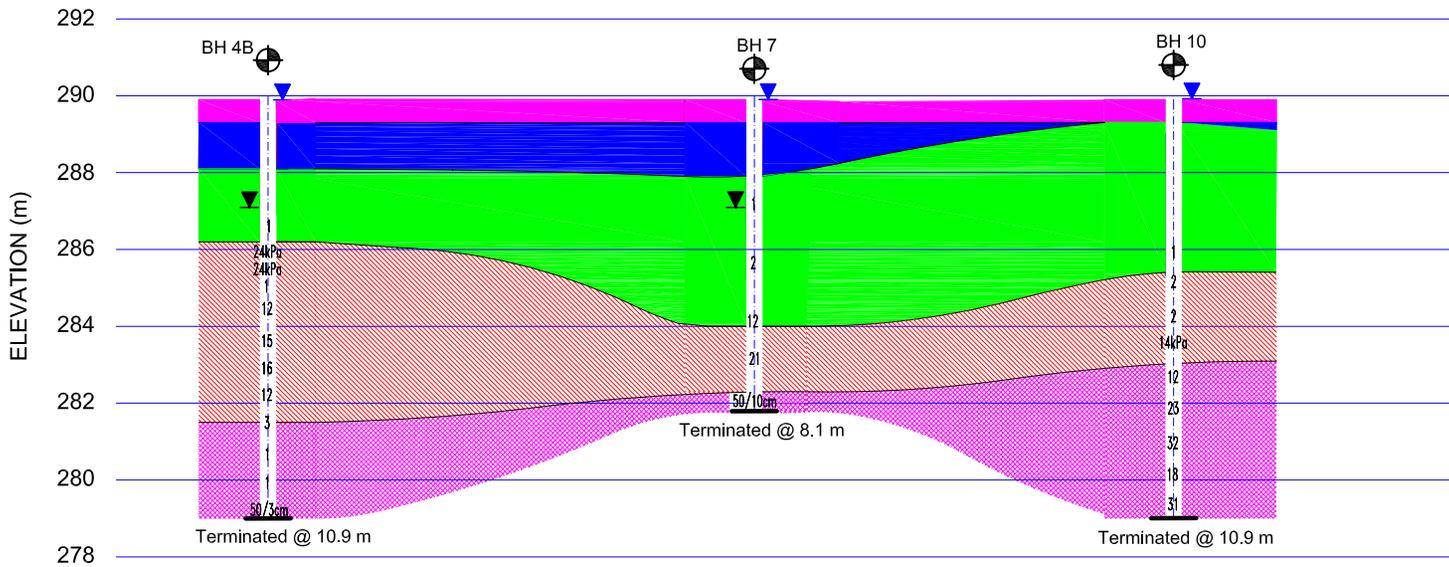
KEY PLAN

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

AGREEMENT No. 5006-E-0070	
FOUNDATION INVESTIGATION HWY 11 AT PAN LAKE, 10.6KM NORTH OF HWY 64 OLIVE TWP, ONTARIO ASSIGNMENT #7	
Dwg. Title Stratigraphical Cross Section BH4B, BH7, BH10	TB7206007 Figure No. 6
AMEC Earth & Environmental, a Division of AMEC-AMEC Limited	

LEGEND			
	BOREHOLE LOCATION		
	WATER LEVEL		
BOREHOLE	UTM COORDINATES		ELEVATION (m)
	NORTHING	EASTING	
-	-	-	-
-	-	-	-
-	-	-	-

NOTES:
1. The boundaries between soil strata have been established only at borehole locations. Between boreholes, the boundaries are assumed from geological evidence and may be subject to considerable error.



PROFILE

Scale: Horizontal 1 : 800
Vertical 1 : 200

SOIL STRATIGRAPHY			
	Ice		Asphalt
	Water		Silt, Sand & Gravel
	Peat / Organics		Cobbles and Boulders
	Silty Clay		No Data Available
	Silt / Silty Sand		Borehole Terminated

APPENDIX A
RECORD OF BOREHOLES

RECORD OF BOREHOLE No 1

PROJECT Foundation Investigation and Design LOCATION As shown on Borehole Location Plan. ORIGINATED BY JF
 CLIENT MTO NE Region - Cont. #5006-E-0070 Sta(14+750), 4.0m left of center line. COMPILED BY LC
 JOB NO. TB7206007 DATE 28 March 2008 CHECKED BY HS

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	DEPTH (m)	STANDARD PENETRATION TEST <input type="checkbox"/> DYNAMIC PENETRATION TEST <input checked="" type="checkbox"/>					WATER CONTENT			OBSERVATIONS & REMARKS		
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH (kPa)					(%)				
						○ UNCONFINED ▲ FIELD VANE ● QUICK TRIAXIAL ✦ LAB VANE											
						10	20	30	40	50	100	200	300	20	40	60	
299.5 0.0 299.1 0.4 298.2 1.3	185 mm ASPHALT over 15 mm SAND & GRAVEL over 220 mm ASPHALT GRAVELY SAND TO SAND , some silt, trace clay. BOREHOLE TERMINATED DUE TO AUGER REFUSAL ON ASSUMED ROCKFILL/BEDROCK		1 2	SS SS	20 50/3cm												Borehole open and dry upon completion. SS1 75 µm to 4.75 mm - 62.0% 2 µm to 75 µm - 9.9% <2µm - 3.4% SS2 75 µm to 4.75 mm - 69.8% 2 µm to 75 µm - 13.4% <2µm - 4.0%

RECORD OF BOREHOLE No 3

1 OF 1

PROJECT Foundation Investigation and Design LOCATION As shown on Borehole Location Plan. ORIGINATED BY JF
 CLIENT MTO NE Region - Cont. #5006-E-0070 Sta(14+800), 4.0m left of center line. COMPILED BY LC
 JOB NO. TB7206007 DATE 28 March 2008 CHECKED BY HS

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	DEPTH (m)	STANDARD PENETRATION TEST <input type="checkbox"/> DYNAMIC PENETRATION TEST <input checked="" type="checkbox"/>					WATER CONTENT (%)			OBSERVATIONS & REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH (kPa)							
						10	20	30	40	50					
						○ UNCONFINED ▲ FIELD VANE ● QUICK TRIAXIAL ✦ LAB VANE					20	40	60		
296.9						100	200	300							
0.0 296.8	330 mm ASPHALT														
0.3	Dark Brown SAND & GRAVEL , moist.		1	SS	17										
296.0			2	SS	50/3cm										
0.9	BOREHOLE TERMINATED DUE TO SPLIT SPOON REFUSAL ON ASSUMED ROCKFILL/BEDROCK													Borehole open and dry upon completion.	

RECORD OF BOREHOLE No 5

PROJECT Foundation Investigation and Design LOCATION As shown on Borehole Location Plan. ORIGINATED BY JF
 CLIENT MTO NE Region - Cont. #5006-E-0070 Sta(14+850), 4.2m left of center line. COMPILED BY LC
 JOB NO. TB7206007 DATE 28 March 2008 CHECKED BY HS

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	DEPTH (m)	STANDARD PENETRATION TEST <input type="checkbox"/> DYNAMIC PENETRATION TEST <input checked="" type="checkbox"/>					WATER CONTENT			OBSERVATIONS & REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	10	20	30	40	50	20	40	
295.7															
298.9	Frozen SAND , some silt and gravel, trace clay. Yellowish Brown		1	AUGER											
0.3			2	SS	19					<input type="checkbox"/>					
294.6	GRAVELY SAND , trace silt and clay, compact.														
1.1															
	BOREHOLE TERMINATED DUE TO SPLIT SPOON REFUSAL ON ASSUMED ROCKFILL/BEDROCK													Borehole open and dry upon completion. AS1 75 µm to 4.75 mm - 65.0% 2 µm to 75 µm - 16.8% <2µm - 4.0% SS2 75 µm to 4.75 mm - 62.2% 2 µm to 75 µm - 8.0% <2µm - 2.6%	

RECORD OF BOREHOLE No 7

PROJECT Foundation Investigation and Design LOCATION As shown on Borehole Location Plan. ORIGINATED BY JF
 CLIENT MTO NE Region - Cont. #5006-E-0070 Sta(14+850), 20.0m left of center line. COMPILED BY LC
 JOB NO. TB7206007 DATE 31 March 2008 CHECKED BY HS

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	DEPTH (m)	STANDARD PENETRATION TEST <input type="checkbox"/> DYNAMIC PENETRATION TEST <input checked="" type="checkbox"/>					WATER CONTENT			OBSERVATIONS & REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH (kPa)					(%)		
						10	20	30	40	50	20	40	60		
						○ UNCONFINED ▲ FIELD VANE ● QUICK TRIAXIAL ✦ LAB VANE									
289.9 0.0	ICE														
289.3 0.6	WATER														
287.9 2.0	Dark Brown PEAT , trace rootlets and wood chips.		1	AUGER											
			2	AUGER											
			3	AUGER											
285.3 4.6	Brown SILT AND SAND to SILT , some sand and silt, trace clay and gravel, some organics.		4	SS	1										
284.0 5.9	Grey SILTY CLAY TO SILT , trace sand, apl, stiff to very stiff.		6	VANE											
			7	SS	12										
			8	SS	21										
282.3 7.6	Grey SILT , some sand, trace clay and gravel, occasional cobbles, moist to wet, very dense.		9	SS	50/10cm										
281.8 8.1	BOREHOLE TERMINATED DUE TO SPLIT SPOON REFUSAL ON ASSUMED BEDROCK Borehole was backfilled with Bentonite upon completion.														

SS4
75 µm to 4.75 mm - 37.8%
2 µm to 75 µm - 56.2%
<2µm - 6.0%

SS5
75 µm to 4.75 mm - 10.2%
2 µm to 75 µm - 80.6%
<2µm - 6.5%

SS7
75 µm to 4.75 mm - 2.5%
2 µm to 75 µm - 87.5%
<2µm - 10.0%

SS8
75 µm to 4.75 mm - 4.5%
2 µm to 75 µm - 83.5%
<2µm - 11.0%

SS8
Non-plastic

SS9
75 µm to 4.75 mm - 10.8%
2 µm to 75 µm - 78.1%
<2µm - 9.5%

SS9
Non-plastic

LL-29%, PL-28%, PI-1%
Field Vane 33.5kPa, 14.4kPa
Borehole caved to 0.9 m and water at surface upon completion.

RECORD OF BOREHOLE No 8

1 OF 1

PROJECT Foundation Investigation and Design LOCATION As shown on Borehole Location Plan. ORIGINATED BY JF
 CLIENT MTO NE Region - Cont. #5006-E-0070 Sta(14+900), 4.2m left of center line. COMPILED BY LC
 JOB NO. TB7206007 DATE 28 March 2008 CHECKED BY HS

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	DEPTH (m)	STANDARD PENETRATION TEST <input type="checkbox"/> DYNAMIC PENETRATION TEST <input checked="" type="checkbox"/>					WATER CONTENT			OBSERVATIONS & REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH (kPa)					(%)		
						10	20	30	40	50	20	40	60		
						○ UNCONFINED ▲ FIELD VANE ● QUICK TRIAXIAL ✦ LAB VANE									
294.5 0.0	Frozen SAND & GRAVEL , some silt.	[Symbol]	1	SS	65										
293.9 0.6	Yellowish Brown SILTY SAND , trace cobbles, moist to wet, compact.	[Symbol]	2	SS	24										
293.1 1.4	BOREHOLE TERMINATED DUE TO SPLIT SPOON REFUSAL ON ASSUMED ROCKFILL/BEDROCK													Borehole open and dry upon completion. SS1 75 µm to 4.75 mm - 53.5% 2 µm to 75 µm - 8.5% <2µm - 2.0% SS2 75 µm to 4.75 mm - 56.4% 2 µm to 75 µm - 29.4% <2µm - 4.5%	

RECORD OF BOREHOLE No 10

1 OF 1

PROJECT Foundation Investigation and Design LOCATION As shown on Borehole Location Plan. ORIGINATED BY JF
 CLIENT MTO NE Region - Cont. #5006-E-0070 Sta(14+900), 20.0m left of center line. COMPILED BY LC
 JOB NO. TB7206007 DATE 31 March 2008 CHECKED BY HS

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	DEPTH (m)	STANDARD PENETRATION TEST <input type="checkbox"/> DYNAMIC PENETRATION TEST <input checked="" type="checkbox"/>					WATER CONTENT			OBSERVATIONS & REMARKS			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH (kPa)					(%)					
						10	20	30	40	50	100	200	300	20	40	60		
289.9 0.0	ICE																	
289.3 0.6	Dark Brown PEAT , some wood chips.																	
285.4 4.5	Grey CLAYEY SILT , apl, very soft.		1	SS	1													SS2 75 µm to 4.75 mm - 1.0% 2 µm to 75 µm - 73.0% <2µm - 26.0% Field Vane = 14.4kPa, 9.6kPa
283.1 6.8	Grey CLAYEY SILT to SILT , with clay, trace sand and gravel, apl and wet, compact to dense.		2	SS	2													SS5 75 µm to 4.75 mm - 3.0% 2 µm to 75 µm - 71.5% <2µm - 25.5%
279.0 10.9	BOREHOLE TERMINATED DUE TO SPLIT SPOON REFUSAL ON ASSUMED ROCKFILL/BEDROCK		3	SS	2													SS6 75 µm to 4.75 mm - 2.6% 2 µm to 75 µm - 79.9% <2µm - 17.5%
			4	VANE														SS6 LL-19%, PL-18%, PI-1%
			5	SS	12													SS7 75 µm to 4.75 mm - 3.1% 2 µm to 75 µm - 90.4% <2µm - 6.5%
			6	SS	23													SS7 LL-17%, PL-16%, PI-1%
			7	SS	32													
			8	SS	18													
			9	SS	31													
	Borehole was backfilled with Bentonite upon completion.																	SS8 75 µm to 4.75 mm - 11.8% 2 µm to 75 µm - 78.2% <2µm - 10.0%
																		SS8 Non-plastic
																		SS9 75 µm to 4.75 mm - 16.8% 2 µm to 75 µm - 67.0% <2µm - 8.5%

RECORD OF BOREHOLE No 11

PROJECT Foundation Investigation and Design LOCATION As shown on Borehole Location Plan. ORIGINATED BY JF
 CLIENT MTO NE Region - Cont. #5006-E-0070 Sta(14+950), 4.2m left of center line. COMPILED BY LC
 JOB NO. TB7206007 DATE 28 March 2008 CHECKED BY HS

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	DEPTH (m)	STANDARD PENETRATION TEST <input type="checkbox"/> DYNAMIC PENETRATION TEST <input checked="" type="checkbox"/>					WATER CONTENT			OBSERVATIONS & REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH (kPa)					(%)		
						10	20	30	40	50					
						○ UNCONFINED ▲ FIELD VANE ● QUICK TRIAXIAL ✦ LAB VANE									
						100	200	300			20	40	60		
291.1 0.0	Frozen SAND & GRAVEL , some silt, trace clay. SILTY SAND , trace clay and gravel, moist.		1	SS	40				40						
290.6 0.5			2	SS	50/10cm										
290.0 1.1	BOREHOLE TERMINATED DUE TO AUGER REFUSAL ON ASSUMED ROCKFILL/BEDROCK														Borehole open and dry upon completion. SS1 75 µm to 4.75 mm - 50.9% 2 µm to 75 µm - 8.0% <2µm - 5.5% SS2 75 µm to 4.75 mm - 67.1% 2 µm to 75 µm - 23.2% <2µm - 5.0%

RECORD OF BOREHOLE No 12

1 OF 1

PROJECT Foundation Investigation and Design LOCATION As shown on Borehole Location Plan. ORIGINATED BY JF
 CLIENT MTO NE Region - Cont. #5006-E-0070 Sta(14+950), 12.0m left of center line. COMPILED BY LC
 JOB NO. TB7206007 DATE 2 April 2008 CHECKED BY HS

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	DEPTH (m)	STANDARD PENETRATION TEST □ DYNAMIC PENETRATION TEST ■					WATER CONTENT (%)			OBSERVATIONS & REMARKS	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH (kPa)								
						○ UNCONFINED ▲ FIELD VANE ● QUICK TRIAXIAL ◆ LAB VANE										
						10 20 30 40 50 100 200 300					20 40 60					
290.4 290.2 0.3	PEAT , some sand, trace rootlets. Brown to Grey Silt FILL , trace sand and clay, some organics, trace rootlets and wood chips, moist, very loose to loose.	[Hatched Pattern]	1	SS	4	▽	1	□								SS1 75 μm to 4.75 mm - 4.5% 2 μm to 75 μm - 86.5% <2μm - 9.0% SS2 75 μm to 4.75 mm - 2.2% 2 μm to 75 μm - 91.0% <2μm - 6.8%
			2	SS	10		2	□								
			3	SS	10		3	□								
			4	SS	7		4	□								
			5	SS	5		5	□								
286.8 3.6	Grey SILTY CLAY , trace cobbles, apl. Dynamic Cone Penetration testing. No samples taken.	[Diagonal Pattern]	6	AUGER			4	■								SS3 75 μm to 4.75 mm - 2.6% 2 μm to 75 μm - 86.3% <2μm - 11.0% SS4 75 μm to 4.75 mm - 8.5% 2 μm to 75 μm - 83.3% <2μm - 8.0% SS5 75 μm to 4.75 mm - 4.9% 2 μm to 75 μm - 78.6% <2μm - 16.5% SS5 LL-27%,PL-24%,PI-3%
			5				5	■								
			6				6	■								
			7				7	■								
			8				8	■								
280.0 10.4	BOREHOLE TERMINATED DUE TO SPLIT SPOON REFUSAL ON ASSUMED ROCKFILL/BEDROCK					9	■								Borehole caved to 2.3 m and water at 1.4 m upon completion.	

RECORD OF BOREHOLE No 2A

1 OF 1

PROJECT Foundation Investigation and Design LOCATION As shown on Borehole Location Plan. ORIGINATED BY JF
 CLIENT MTO NE Region - Cont. #5006-E-0070 Sta(14+750), 17.0m left of center line. COMPILED BY LC
 JOB NO. TB7206007 DATE 28 March 2008 CHECKED BY HS

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	DEPTH (m)	STANDARD PENETRATION TEST <input type="checkbox"/> DYNAMIC PENETRATION TEST <input checked="" type="checkbox"/>					WATER CONTENT (%)			OBSERVATIONS & REMARKS				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH (kPa)											
						○ UNCONFINED	▲ FIELD VANE	● QUICK TRIAXIAL	◆ LAB VANE	□	10	20	30	40	50	20	40	60	
293.8 293.8 293.2 0.6	300 mm PEAT , frozen. Grey SILT , trace sand and clay, apl. firm. Grey SILT TO SILTY CLAY , some sand, trace clay, apl. firm to stiff.	[Strat Plot]	1	SS	6														SS1 75 µm to 4.75 mm - 3.9% 2 µm to 75 µm - 93.1% <2µm - 3.0% SS3 75 µm to 4.75 mm - 4.0% 2 µm to 75 µm - 83.0% <2µm - 13.0% Field Vane 33.5kPa, 23.9kPa SS6 75 µm to 4.75 mm - 1.2% 2 µm to 75 µm - 85.3% <2µm - 13.5% SS7 75 µm to 4.75 mm - 10.6% 2 µm to 75 µm - 82.9% <2µm - 6.5% SS7 Non-plastic SS8 75 µm to 4.75 mm - 23.4% 2 µm to 75 µm - 70.1% <2µm - 6.5% SS8 Non-plastic SS9 75 µm to 4.75 mm - 27.5% 2 µm to 75 µm - 67.4% <2µm - 4.8% Split Spoon refusal at 6.2 m.
289.3 4.5	Grey SILTY SAND TO SANDY SILT , trace clay, some cobbles, wet, firm to stiff.		2	SS	8														
287.6 6.2	Split spoon refusal on assumed cobbles/boulders. No samples taken		3	SS	9														
287.6 6.2			4	VANE															
287.6 6.2			5	SS	10														
287.6 6.2			6	SS	14														
287.6 6.2			7	SS	13														
287.6 6.2			8	SS	14														
287.6 6.2			9	SS	5														
287.6 6.2			10	SS	50/1cm														
280.9 12.9	BOREHOLE TERMINATED AT 12.9 m DUE TO CONE PENETRATION REFUSAL ON ASSUMED ROCKFILL/BEDROCK Borehole backfilled with Bentonite upon completion.																		Borehole caved to 3.2 m and water at 1.1 m upon completion.

RECORD OF BOREHOLE No 4B

1 OF 1

PROJECT Foundation Investigation and Design LOCATION As shown on Borehole Location Plan. ORIGINATED BY JF
 CLIENT MTO NE Region - Cont. #5006-E-0070 Sta(14+800), 18.0m left of center line. COMPILED BY LC
 JOB NO. TB7206007 DATE 2 April 2008 CHECKED BY HS

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	DEPTH (m)	STANDARD PENETRATION TEST <input type="checkbox"/> DYNAMIC PENETRATION TEST <input checked="" type="checkbox"/>					WATER CONTENT (%)			OBSERVATIONS & REMARKS	
							SHEAR STRENGTH (kPa)					20	40	60		
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	10	20	30	40	50	100	200	300			
289.9 0.0	ICE															
289.3 0.6	WATER															
288.1 1.8	Brown PEAT , some silt.		1	AUGER												
286.2 3.7	Grey SILTY CLAY TO SILT , trace sand, apl, very soft to very stiff.		2	SS	1											
			3	VANE												Field Vane 23.9kPa,19.2kPa
			4	VANE												Field Vane 23.9kPa,19.2kPa
			5	SS	1											SS5 75 µm to 4.75 mm - 1.1% 2 µm to 75 µm - 86.9% <2µm - 12.0%
			6	SS	12											SS5 LL-20%,PL-18%,PI-2%
			7	SS	15											SS7 75 µm to 4.75 mm - 3.6% 2 µm to 75 µm - 87.4% <2µm - 9.0%
			8	SS	16											SS7
			9	SS	12											SS8 75 µm to 4.75 mm - 4.0% 2 µm to 75 µm - 86.5% <2µm - 9.5%
281.5 8.4	SANDY SILT/SILTY SAND to SAND , trace clay, wet, very loose.		10	SS	3											SS7 Non-plastic
			11	SS	1											SS8
			12	SS	1											SS8
279.1 10.9	BOREHOLE TERMINATED DUE TO SPLIT SPOON REFUSAL ON ASSUMED ROCKFILL/BEDROCK Borehole backfilled with Bentonite upon completion.		13	SS	50/3cm											SS10 75 µm to 4.75 mm - 30.3% 2 µm to 75 µm - 64.76% <2µm - 5.0%
																SS11 75 µm to 4.75 mm - 64.5% 2 µm to 75 µm - 32.0% <2µm - 3.5%
																SS13 75 µm to 4.75 mm - 80.4% 2 µm to 75 µm - 16.1% <2µm - 3.5%

RECORD OF BOREHOLE No 6B

PROJECT Foundation Investigation and Design LOCATION As shown on Borehole Location Plan. ORIGINATED BY JF
 CLIENT MTO NE Region - Cont. #5006-E-0070 Sta(14+850), 15.0m left of center line. COMPILED BY LC
 JOB NO. TB7206007 DATE 31 March 2008 CHECKED BY HS

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	DEPTH (m)	STANDARD PENETRATION TEST <input type="checkbox"/> DYNAMIC PENETRATION TEST <input checked="" type="checkbox"/>					WATER CONTENT (%)			OBSERVATIONS & REMARKS				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH (kPa)											
						○ UNCONFINED	● QUICK TRIAXIAL	▲ FIELD VANE	◆ LAB VANE	□	10	20	30	40	50	20	40	60	
289.8 0.0	ICE																		
289.2 0.6	WATER																		
288.7 1.1	PEAT																		
286.4 3.4	No sample taken. Dynamic Cone Penetration test.																		
281.4 8.4	BOREHOLE TERMINATED DUE TO CONE PENETRATION REFUSAL ON ASSUMED ROCKFILL/BEDROCK Borehole backfilled with Bentonite upon completion.																		Borehole caved and water at surface upon completion.

RECORD OF BOREHOLE No 9A

1 OF 1

PROJECT Foundation Investigation and Design LOCATION As shown on Borehole Location Plan. ORIGINATED BY JF
 CLIENT MTO NE Region - Cont. #5006-E-0070 Sta(14+900), 13.0m left of center line. COMPILED BY LC
 JOB NO. TB7206007 DATE 2 April 2008 CHECKED BY HS

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	DEPTH (m)	STANDARD PENETRATION TEST □ DYNAMIC PENETRATION TEST ■		WATER CONTENT (%)			OBSERVATIONS & REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT PLOT NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH (kPa)					
					▽	10 20 30 40 50	○ UNCONFINED ▲ FIELD VANE					
						100 200 300	● QUICK TRIAXIAL ◆ LAB VANE	20 40 60				
289.9 0.0	ICE	[Hatched Box]										
289.3 0.6	WATER	[Hatched Box]										
288.7 1.2	No Samples taken. Dynamic Cone Penetration testing to 10 mbgs.					1 2 3 4 5 6 7 8 9						
279.9 10.0	BOREHOLE TERMINATED DUE TO CONE PENETRATION REFUSAL ON ASSUMED ROCKFILL/BEDROCK Borehole backfilled with Bentonite upon completion.					10						Borehole caved and water at surface upon completion.

BOREHOLE LOG DATA

Note: All units of measurement are in millimeters unless otherwise noted.

BH# 1A: Sta(14+725), o/s 4.7 m Lt of Hwy 11 CL
Shoulder

0	-	600	Sa & Gr	
600	-	1.36 m	Gr(y) Sa NFP (Blds)	moist

BH# 3A: Sta(14+790), o/s 4.0 m Lt of Hwy 11 CL
Edge of Pavement

0	-	345	Asph	
345	-	600	Sa & Gr	moist
600	-	920	F Sa Tr Gr NFP (Blds)	moist

BH# 3B: Sta(14+780), o/s 4.0 m Lt of Hwy 11 CL
Edge of Pavement

0	-	410	Asph	
410	-	610	Sa & Gr	moist
610	-	1.2 m	F Sa Tr Gr NFP (Blds)	moist

BH# 3C: Sta(14+776), o/s 4.0 m Lt of Hwy 11 CL
Edge of Pavement

0	-	170	Asph	
170	-	220	Sa & Gr	moist
220	-	450	Asph	moist
450	-	700	Sa & Gr	moist
700	-	1.25 m	Si(y) Sa Tr Gr & Cl w @900 mm = 13.3%	
			4.75 mm	92.4
			2.00 mm	86.7
			425 mm	78.4
			75 µm	30.8
			5 µm	6.5
			2 µm	4.5
			NFP (Blds)	

Soil Description:
 And > 40%.
 Adjective (Si(y), Sa(y) 30-40%
 With 20-30%
 Some 10-20%
 Trace 1-10%

BOREHOLE LOG DATA

BH# 3D:

Edge of Pavement Sta(14+760), o/s 4.0 m Lt of Hwy 11 CL

0	-	180		
180	-	210	Asph	moist
210	-	410	Sa & Gr	
410	-	620	Asph	moist
			Sa, some Gr & Si, Tr Cl	
620	-	1.2 m	w @500 mm = 7.5%	moist
			4.75 mm	80.6
			2.00 mm	69.4
			425 mm	47.6
			75 µm	16.9
			5 µm	4.8
			2 µm	3.5
			Gr(y) Sa	
			NFP (Blds)	

BH# 4A:

Sta(14+800), o/s 14.0 m Lt of Hwy 11 CL

0	-	600	
600	-	1.2 m	Ice
1.2 m	-	1.5 m	Cobs & Si(y) Sa & Gr Cobs & Blds NFP (Blds)

BH# 6:

Sta(14+850), o/s 12.0 m Lt of Hwy 11 CL

0	-	760	
760	-	1.5 m	Snow & Ice Org NFP (Blds)

BH# 6A:

Sta(14+850), o/s 13.0 m Lt of Hwy 11 CL

0	-	600	
600	-	2.3 m	Ice Org NFP (Blds)

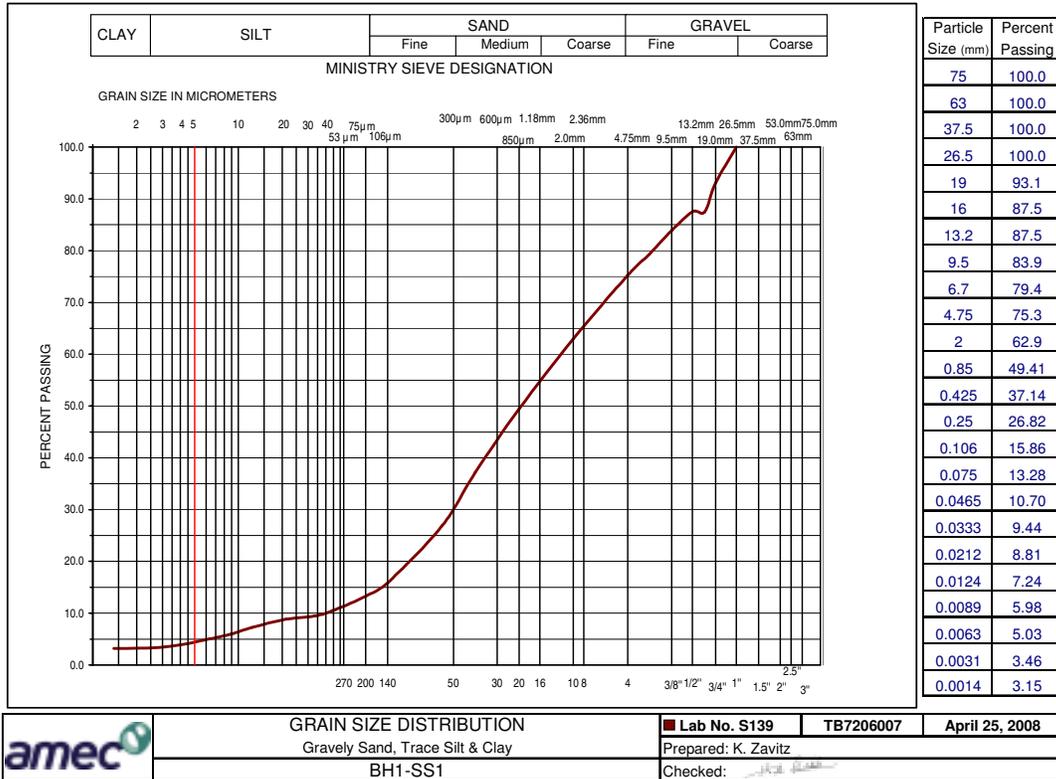
Soil Description:
 And > 40%.
 Adjective (Si(y), Sa(y) 30-40%
 With 20-30%
 Some 10-20%
 Trace 1-10%

APPENDIX B

LABORATORY TEST RESULTS

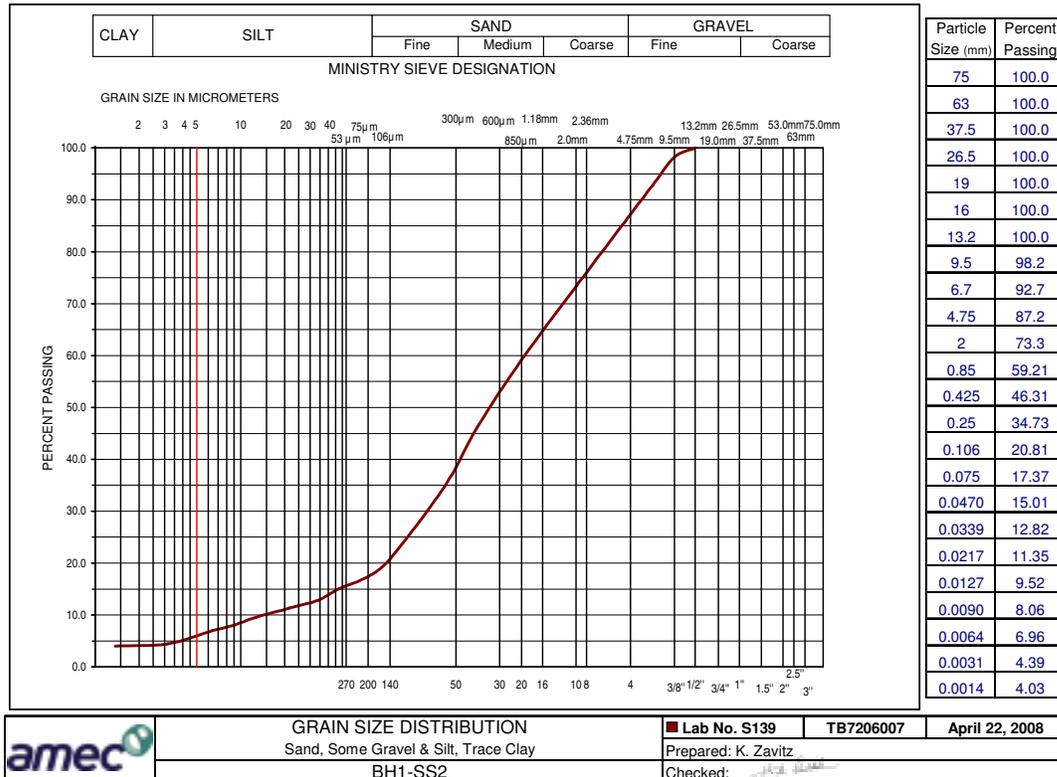
UNIFIED SOIL CLASSIFICATION SYSTEM

Enclosure: 1B



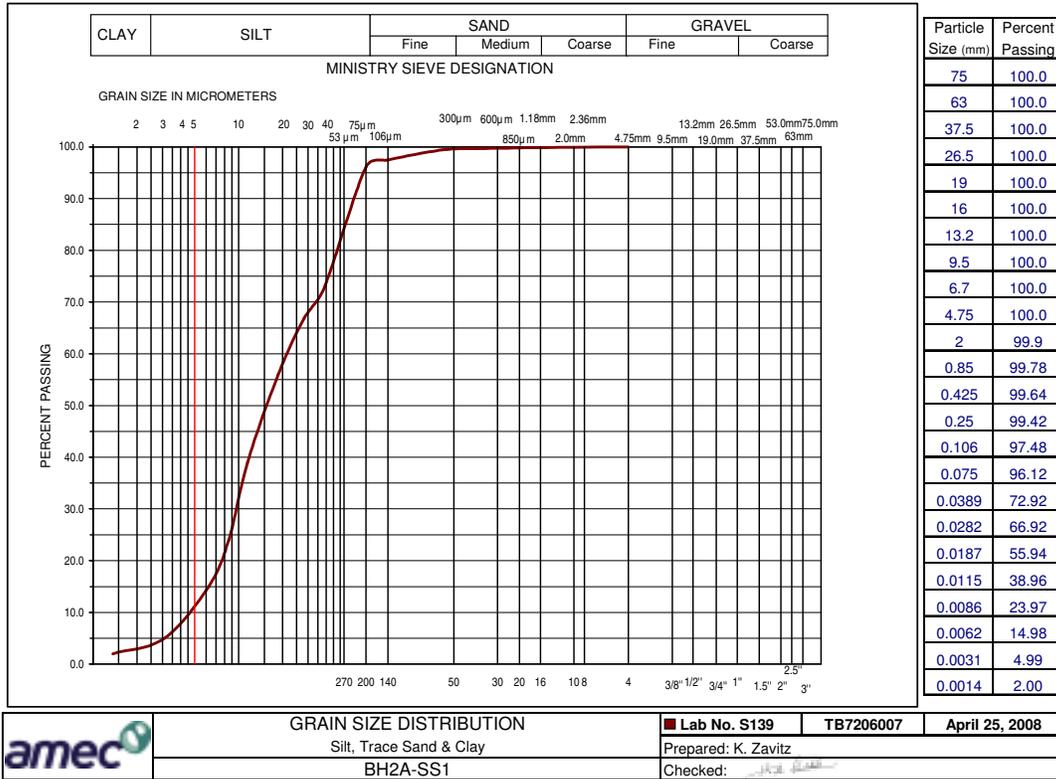
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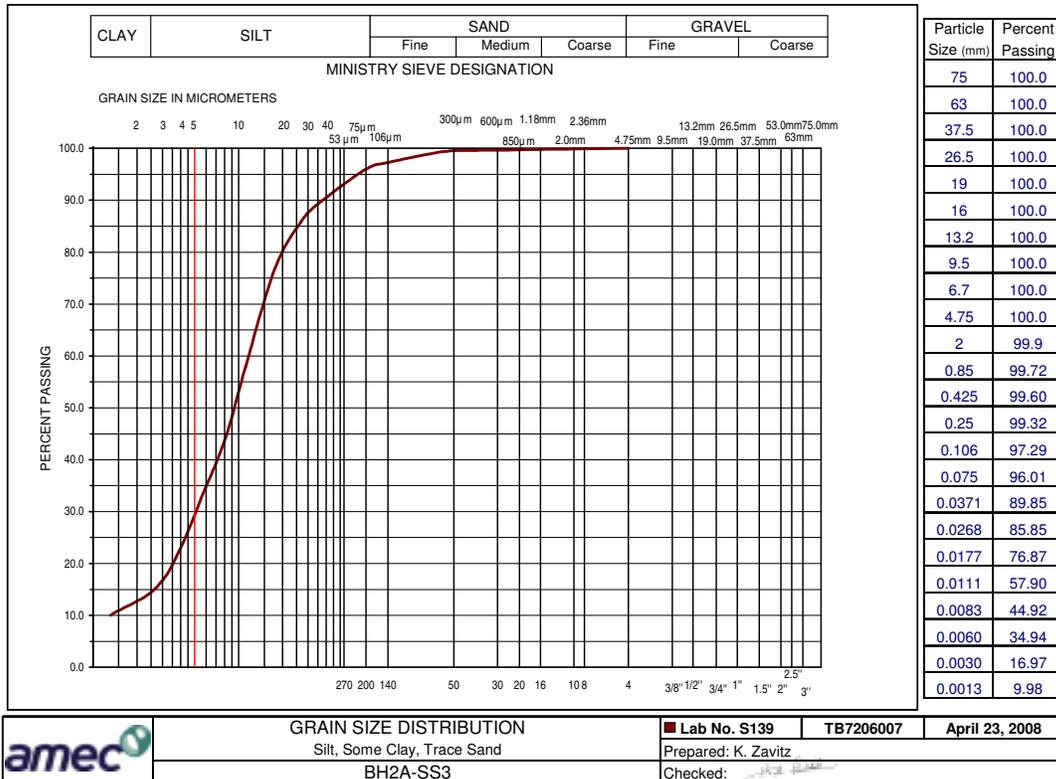
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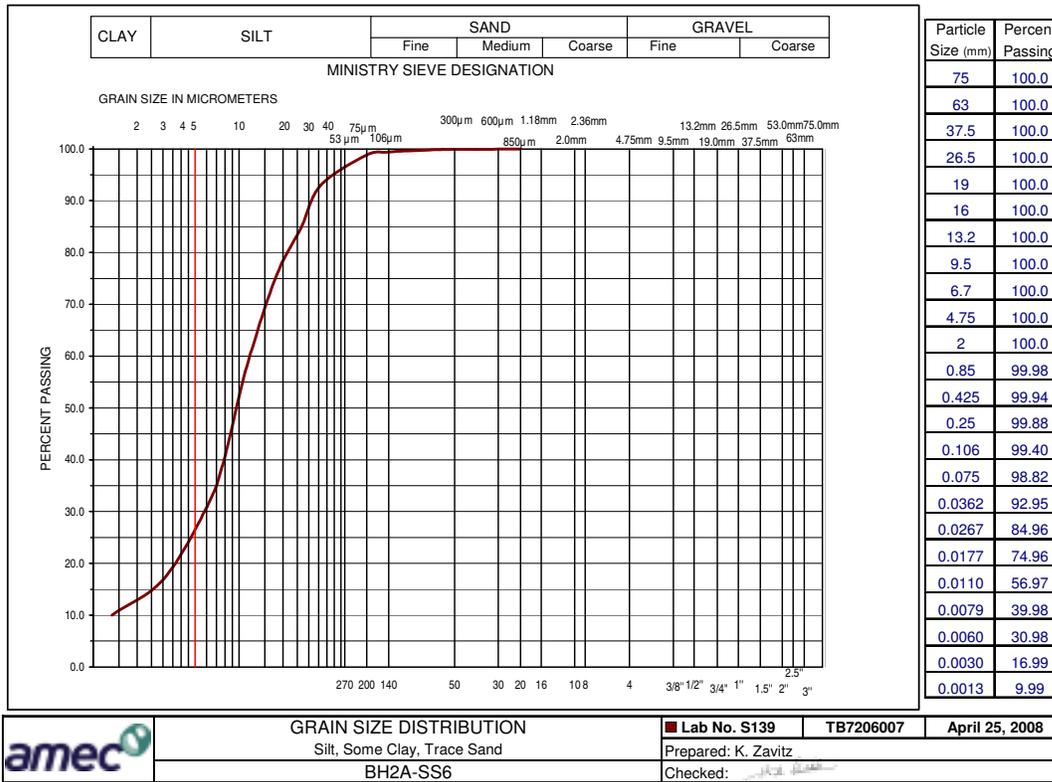
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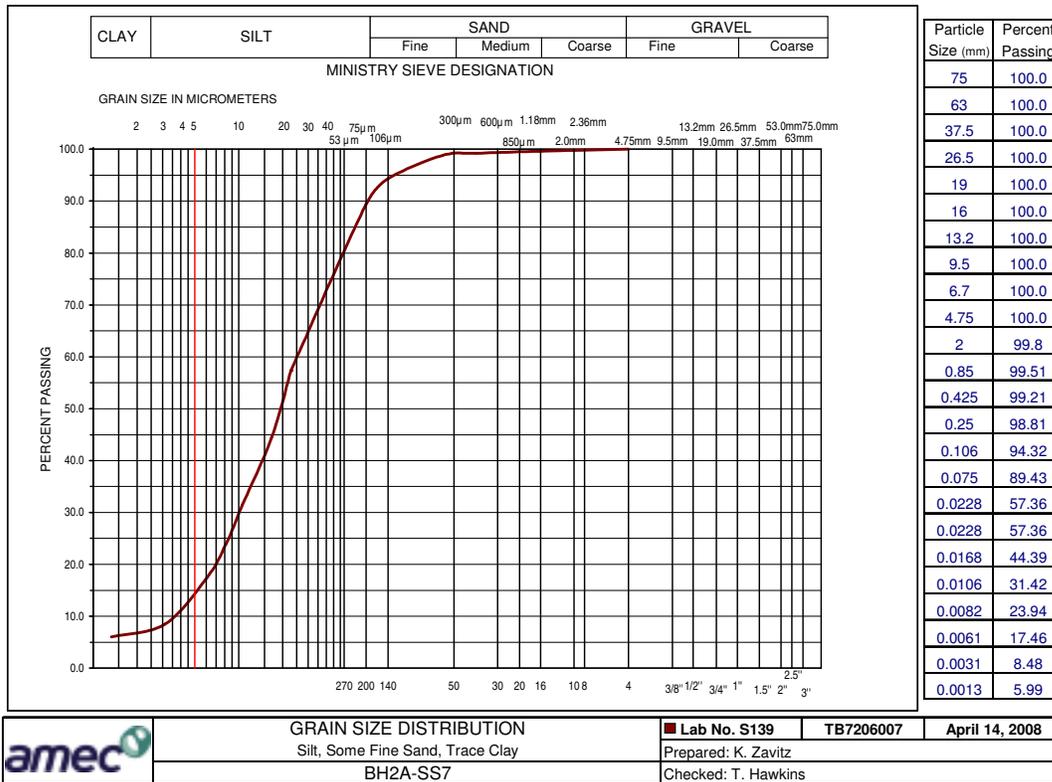
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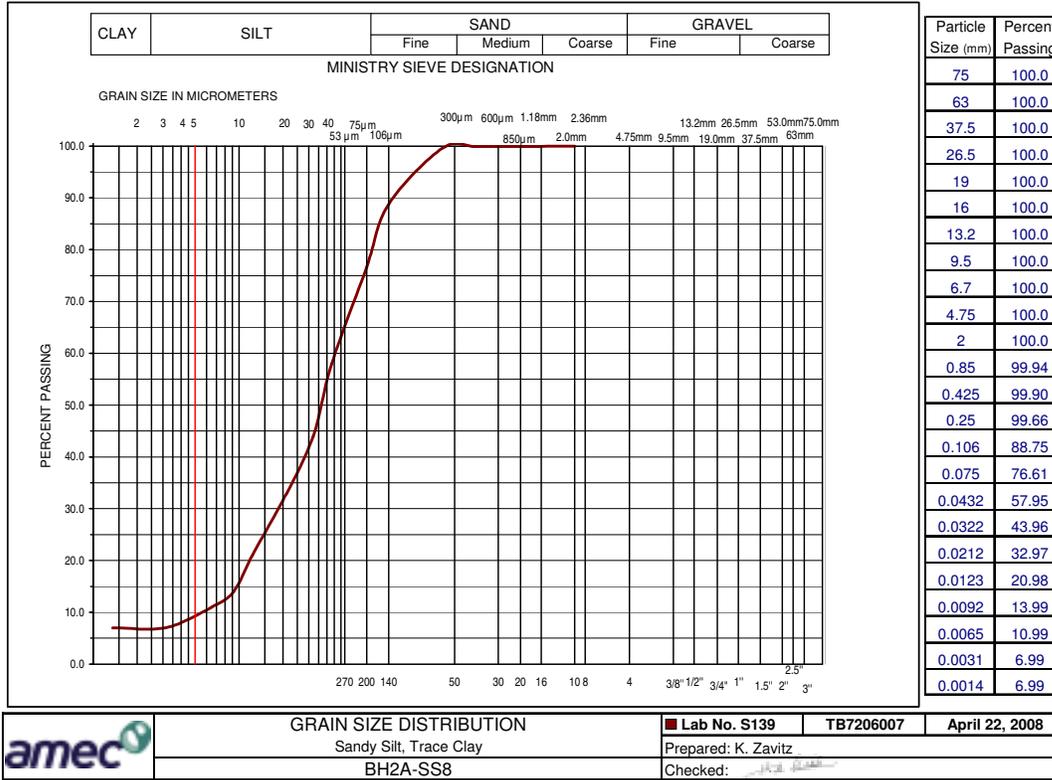
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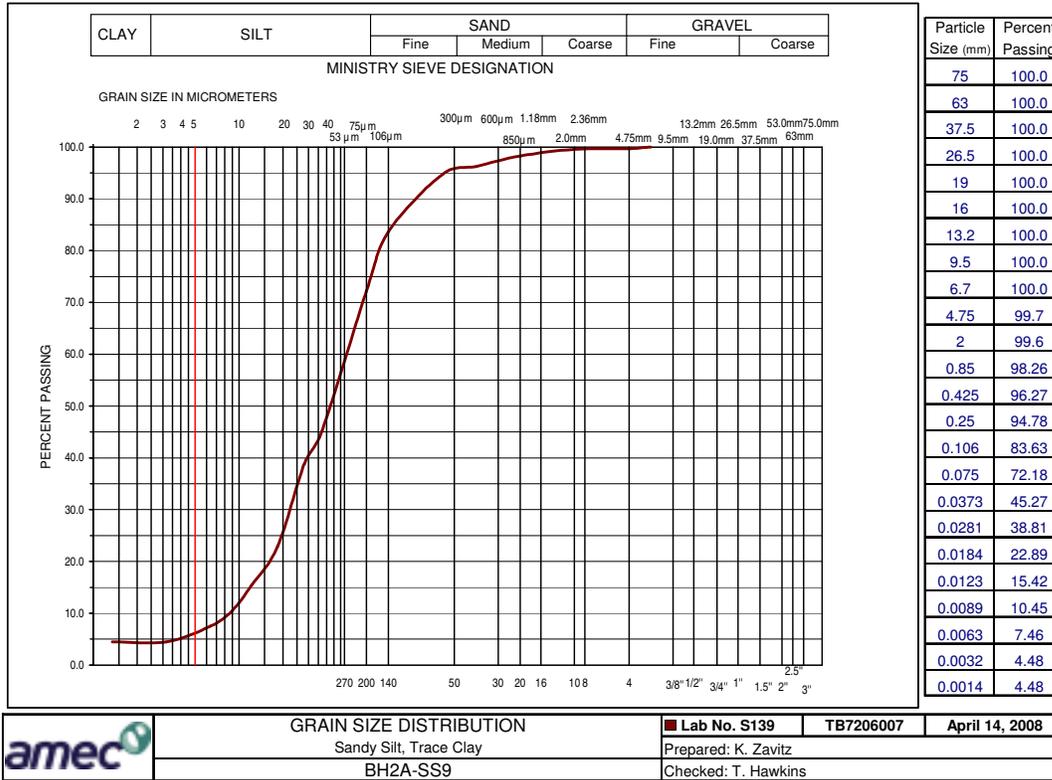
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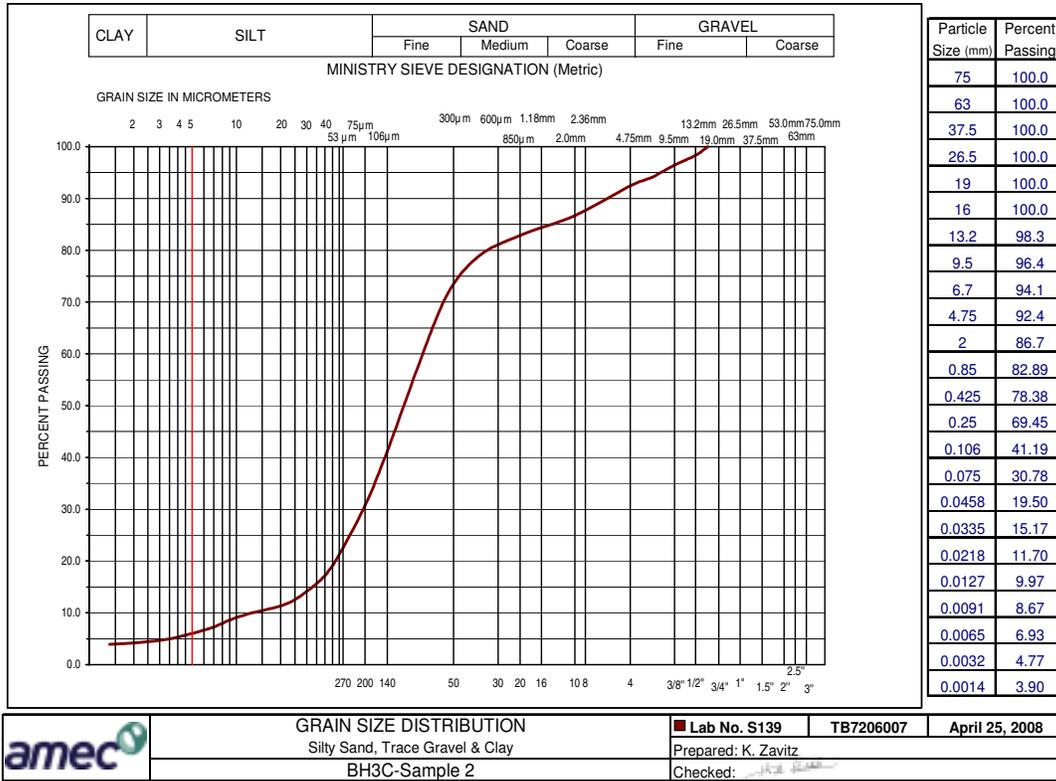
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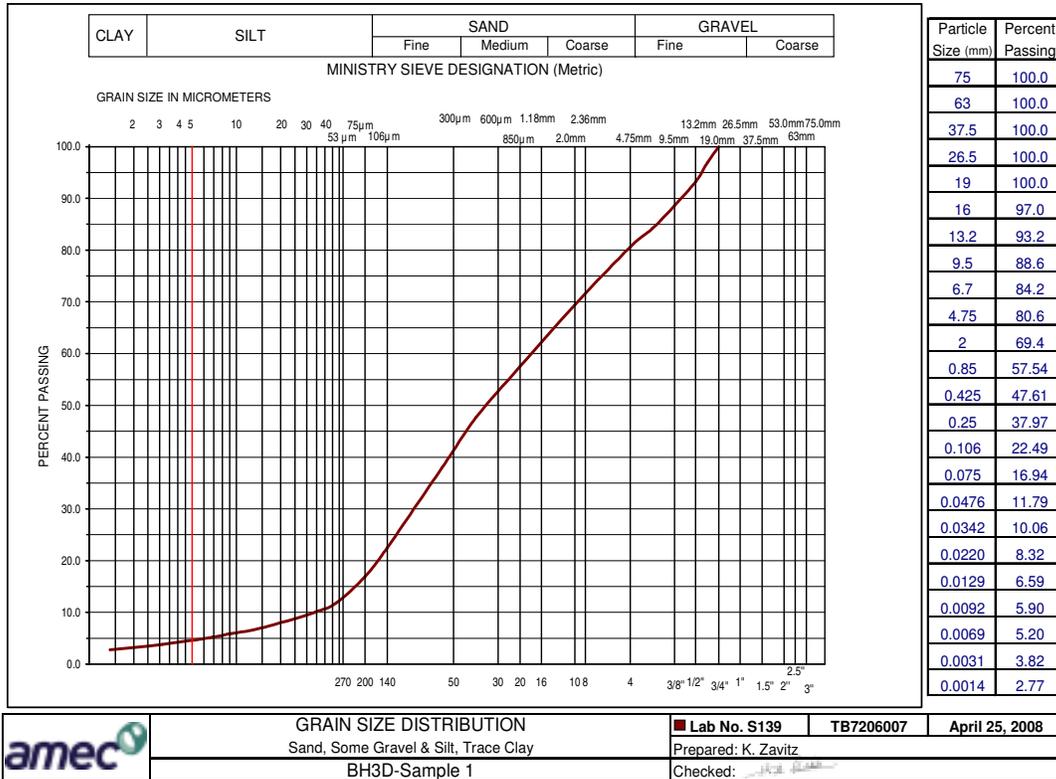
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Enclosure: 9B



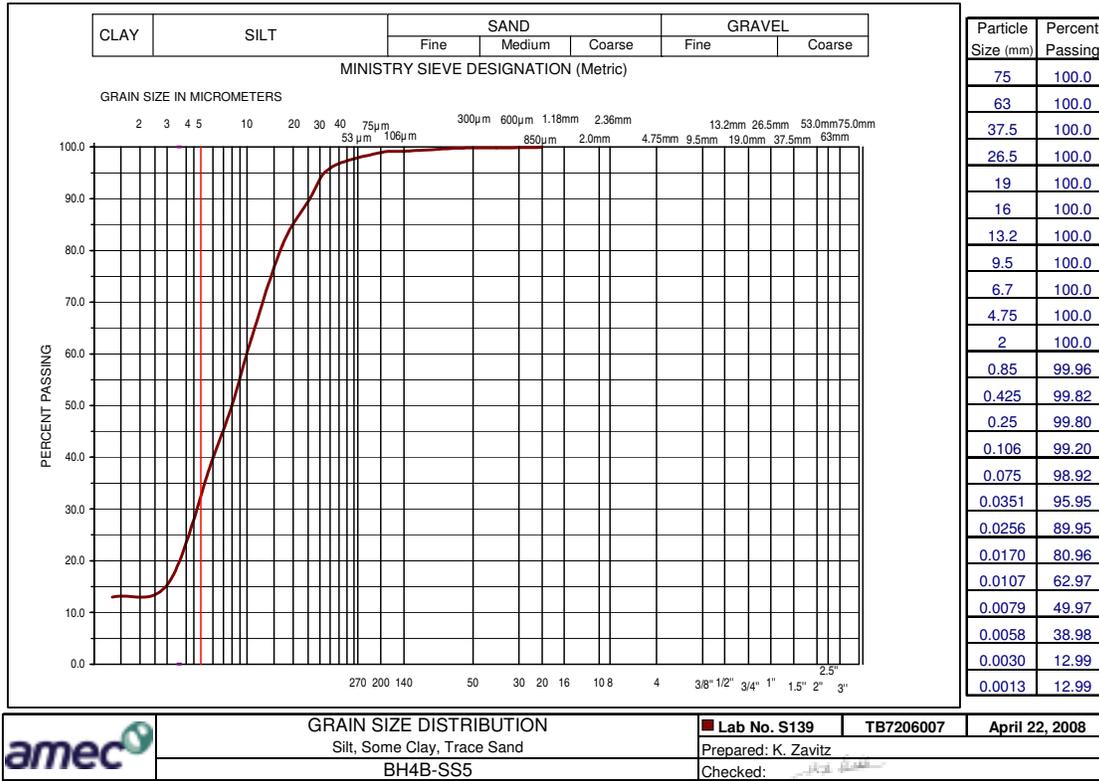
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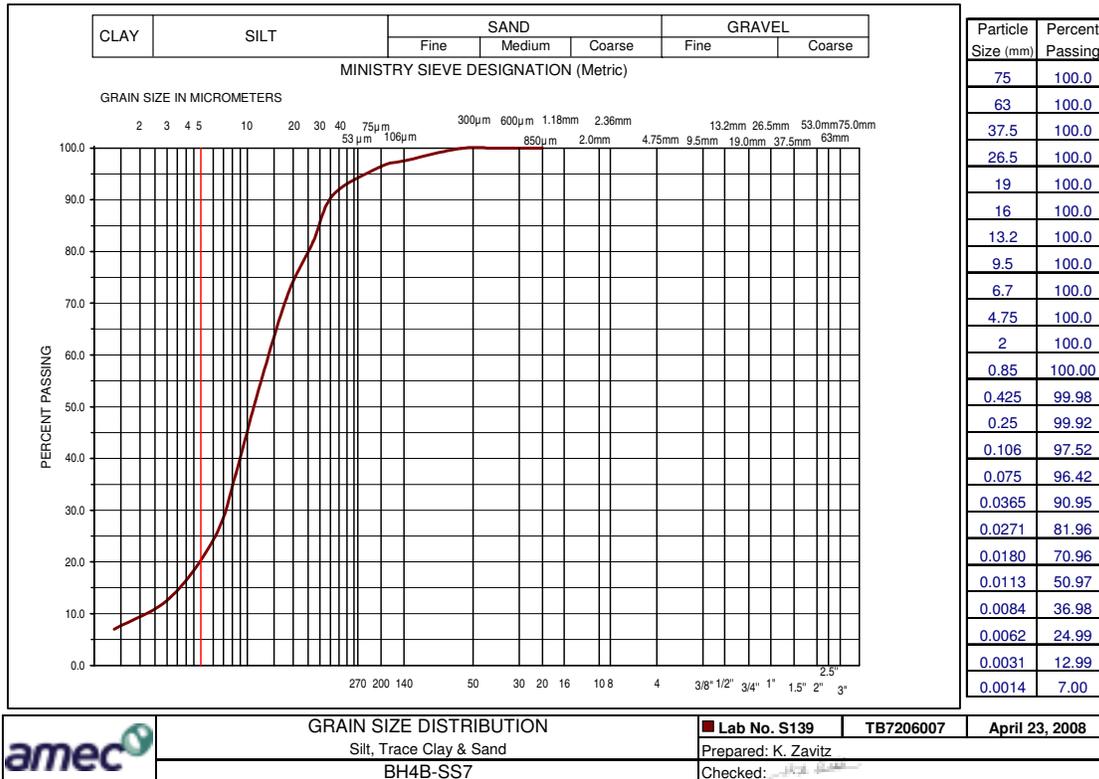
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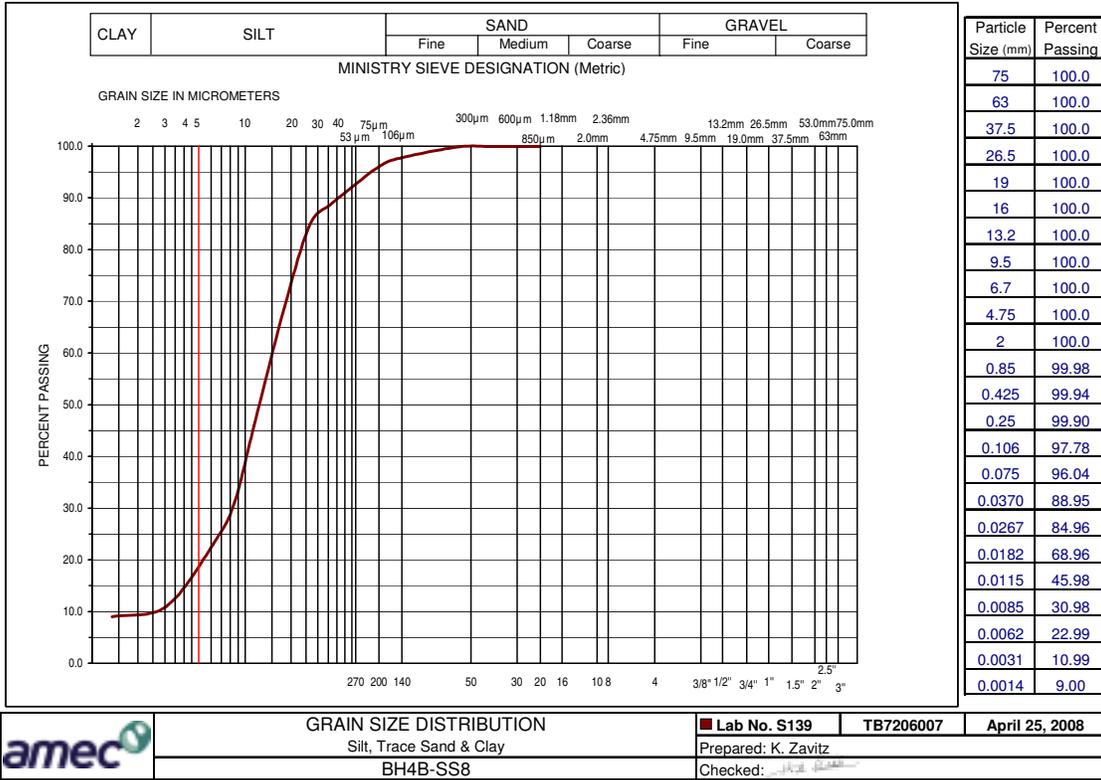
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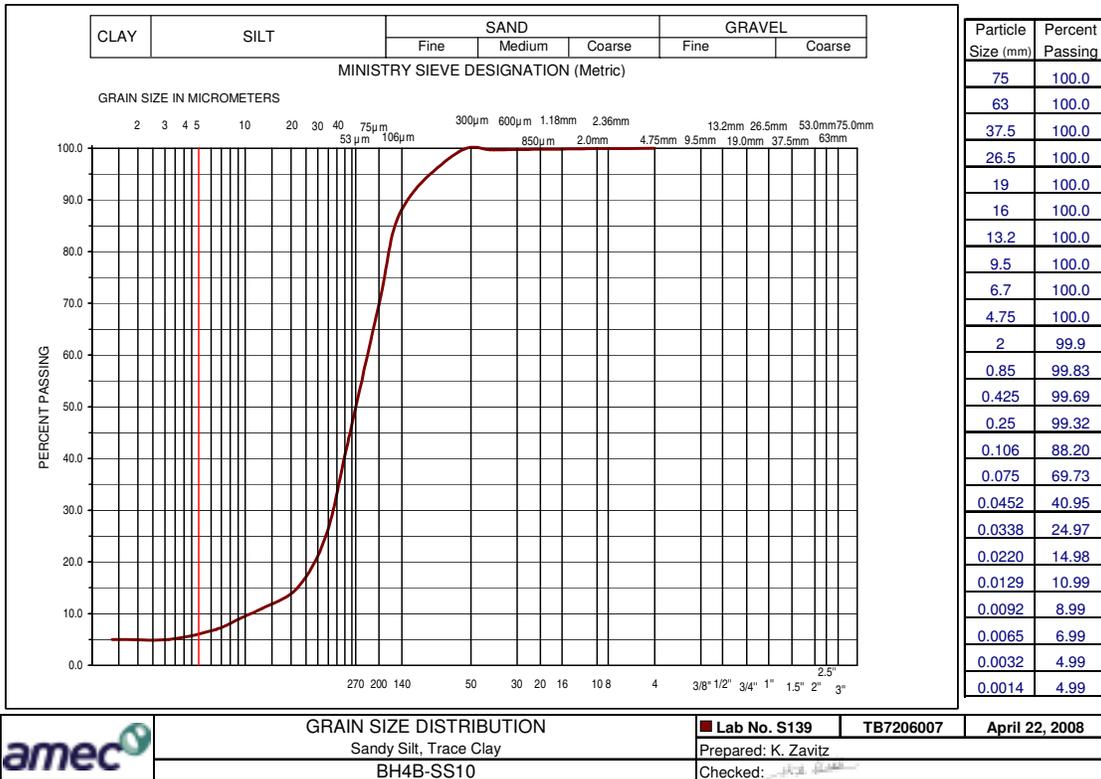
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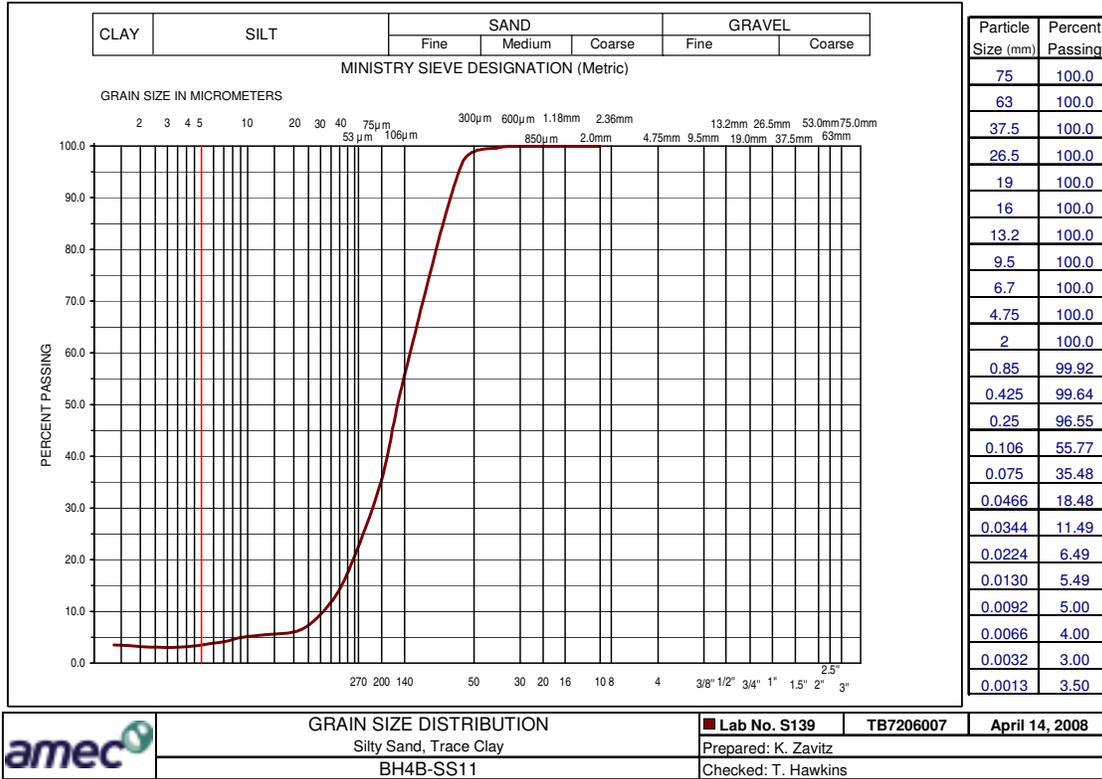
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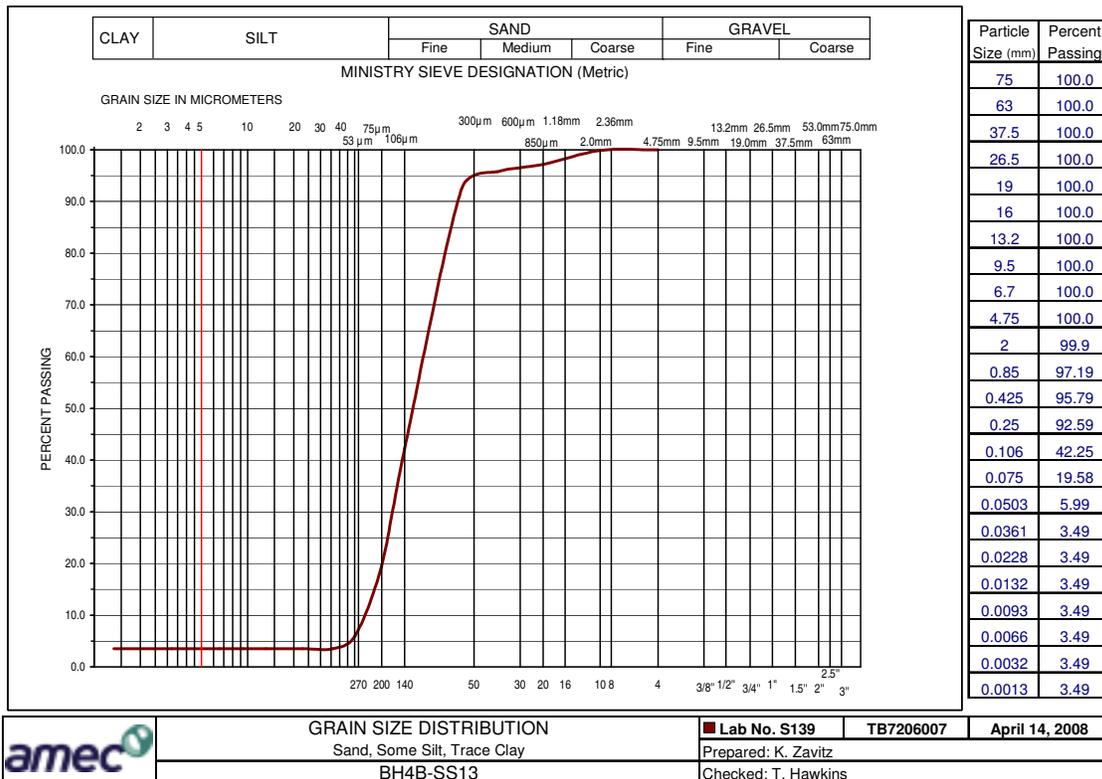
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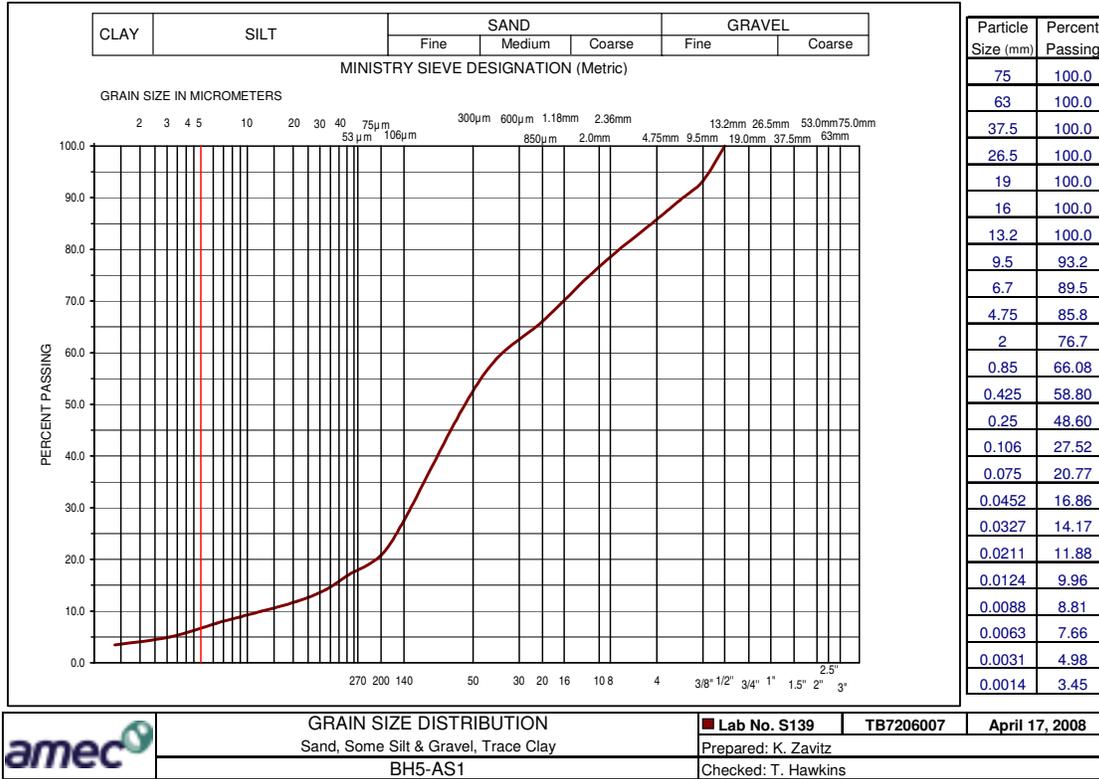
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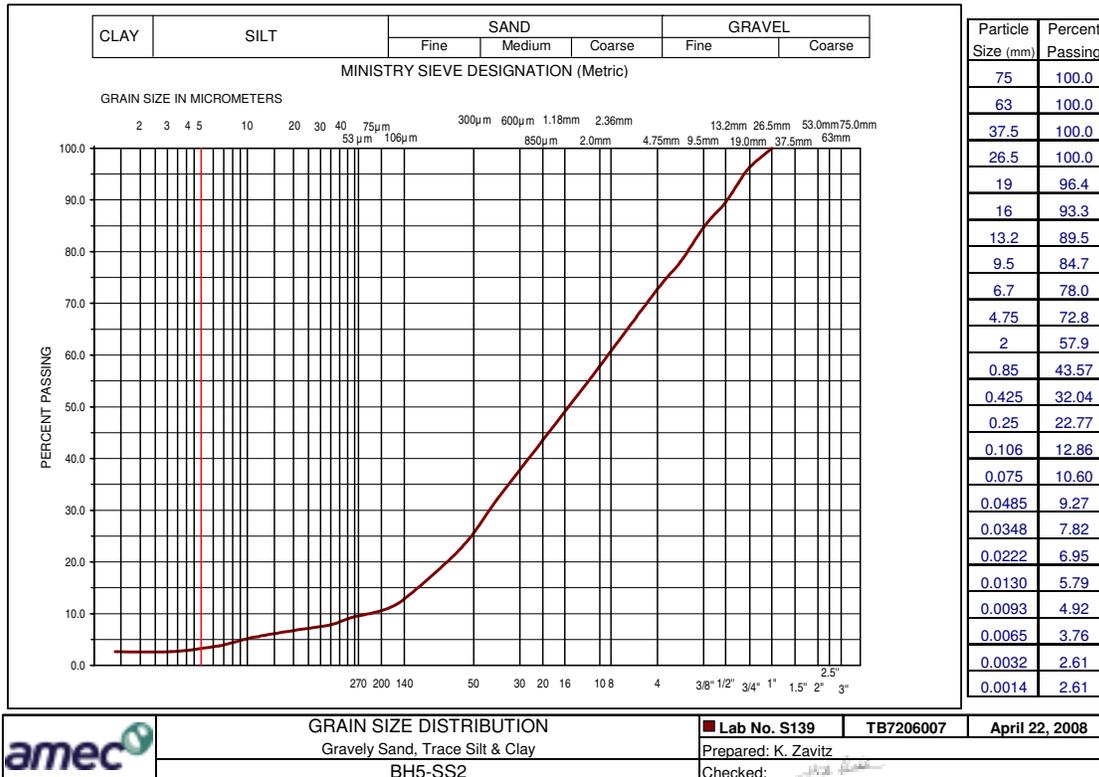
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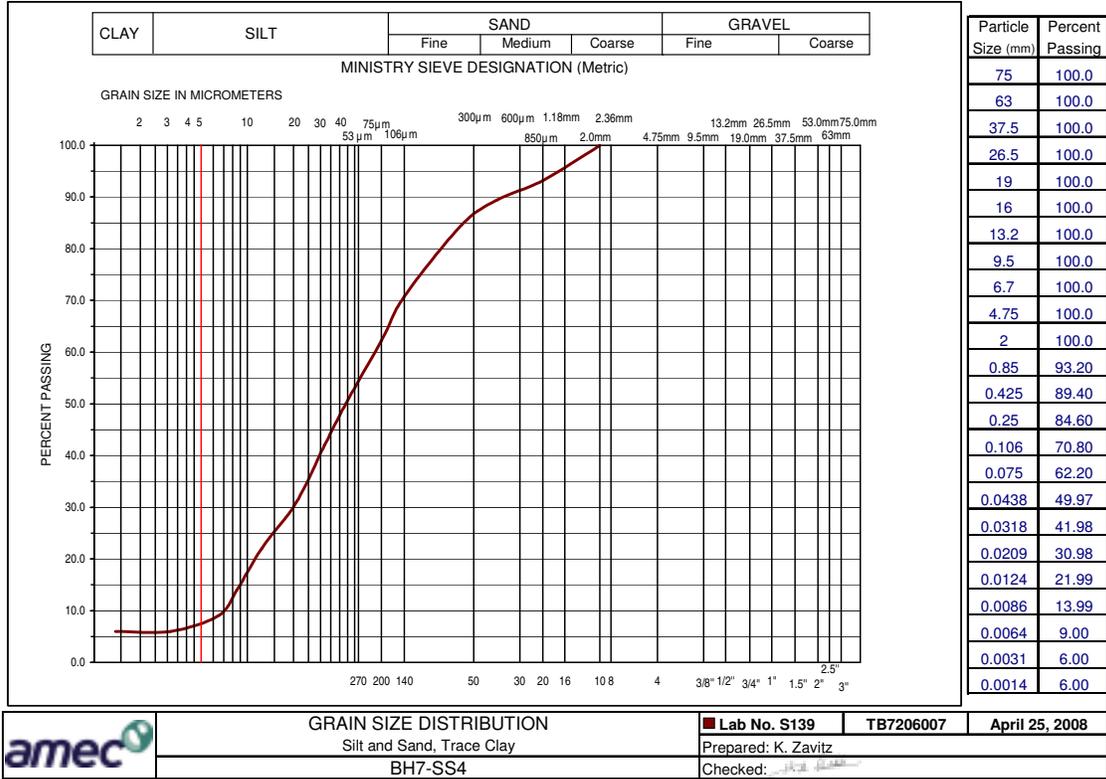
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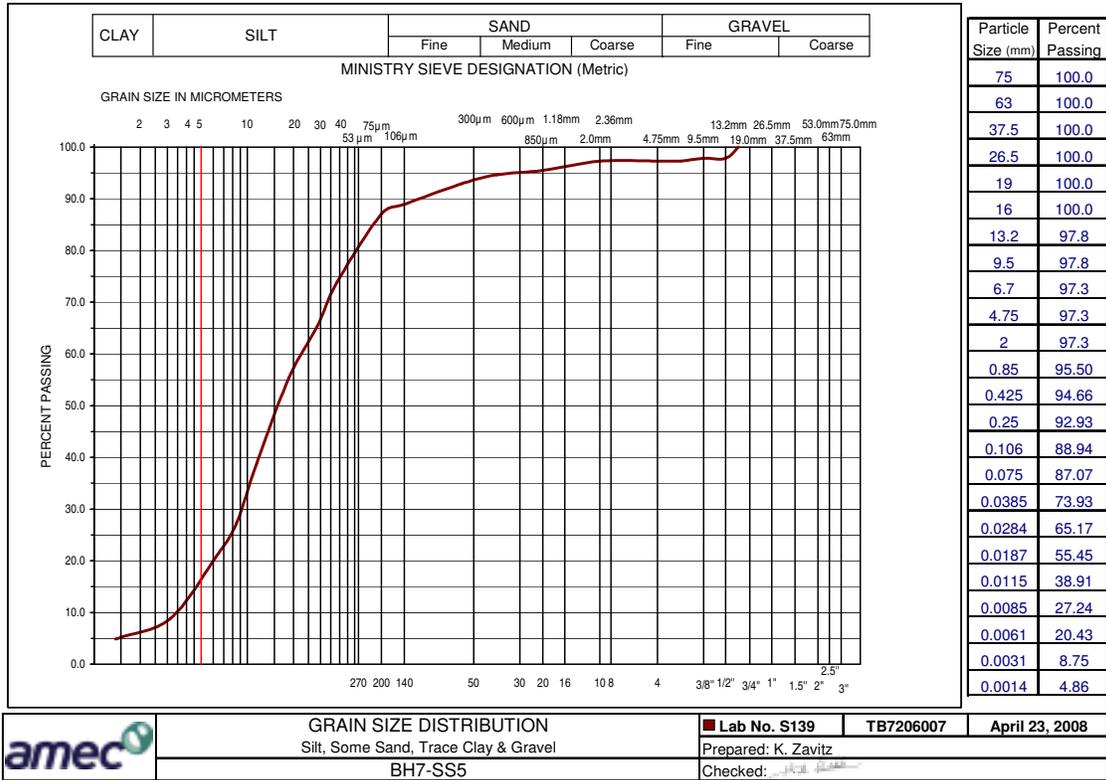
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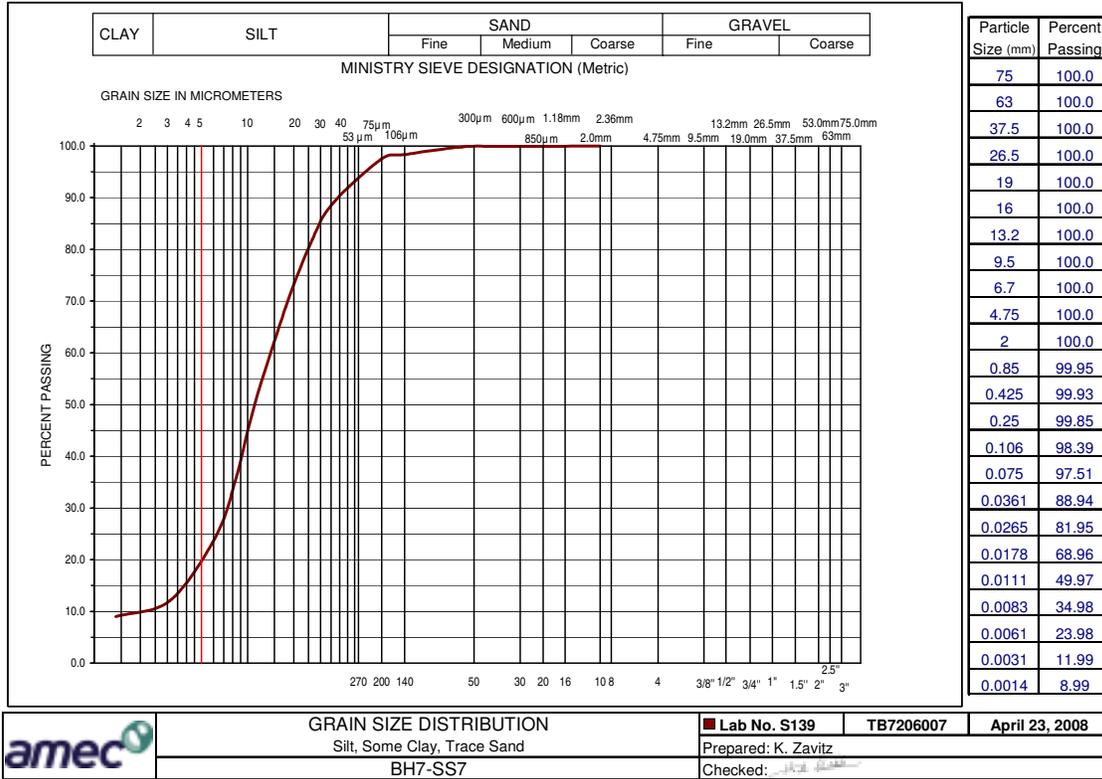
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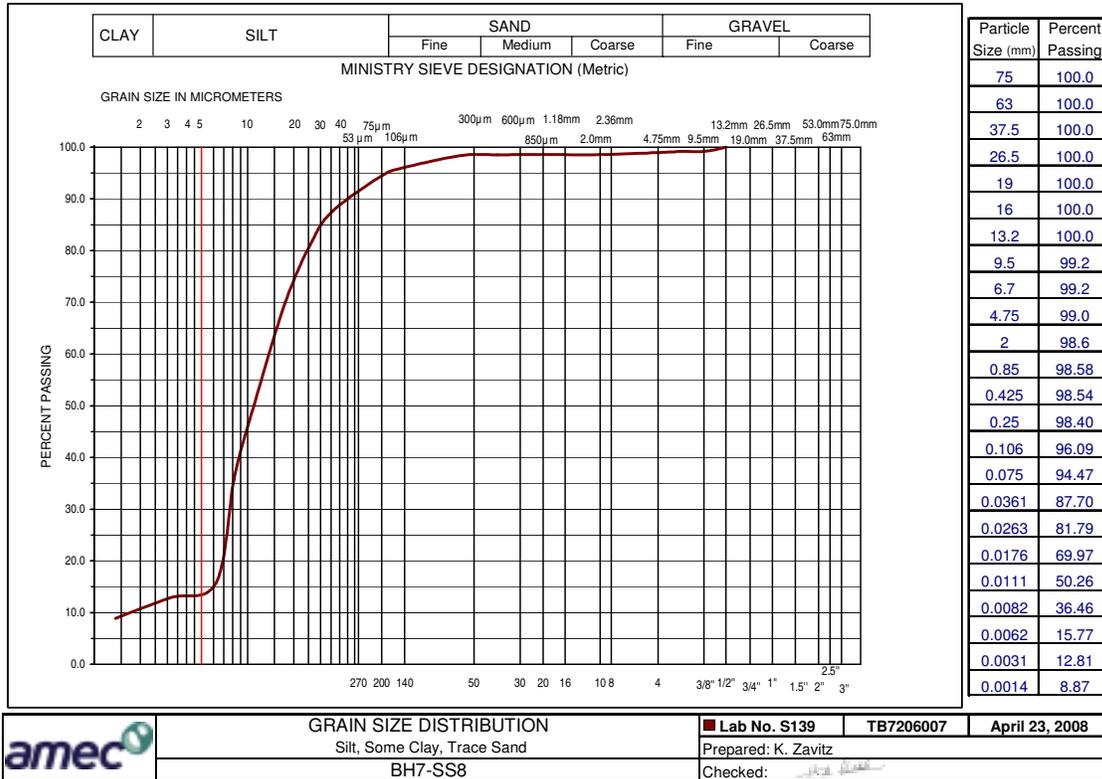
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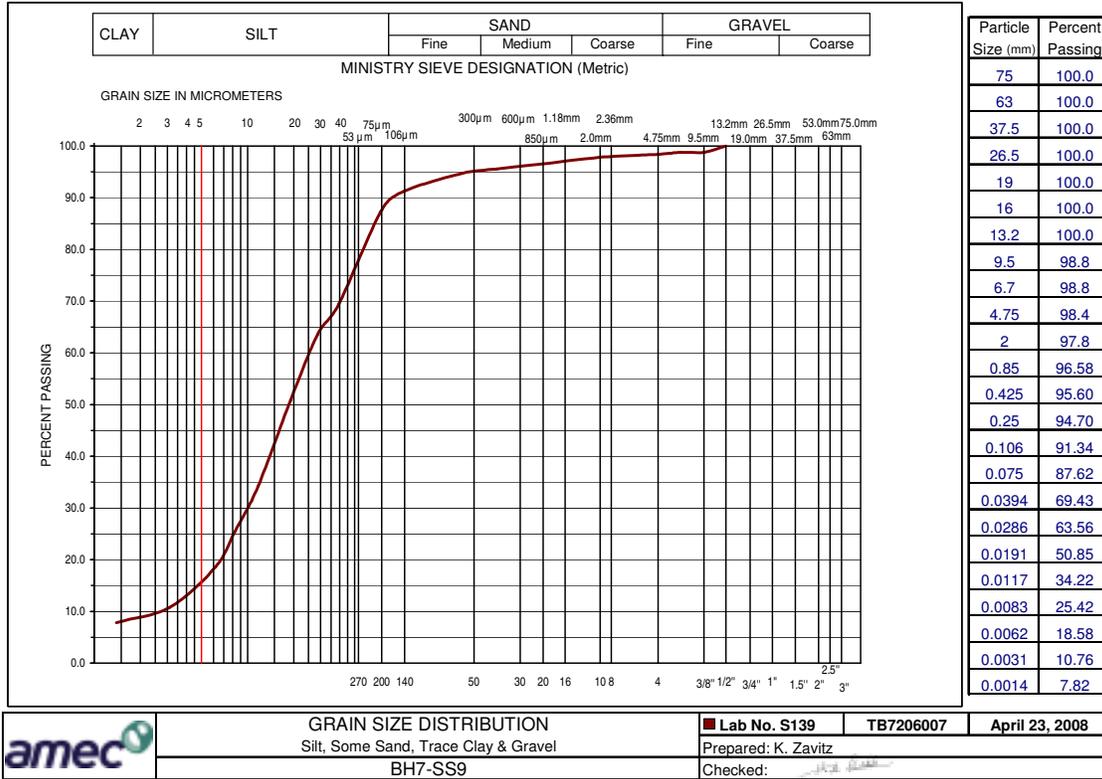
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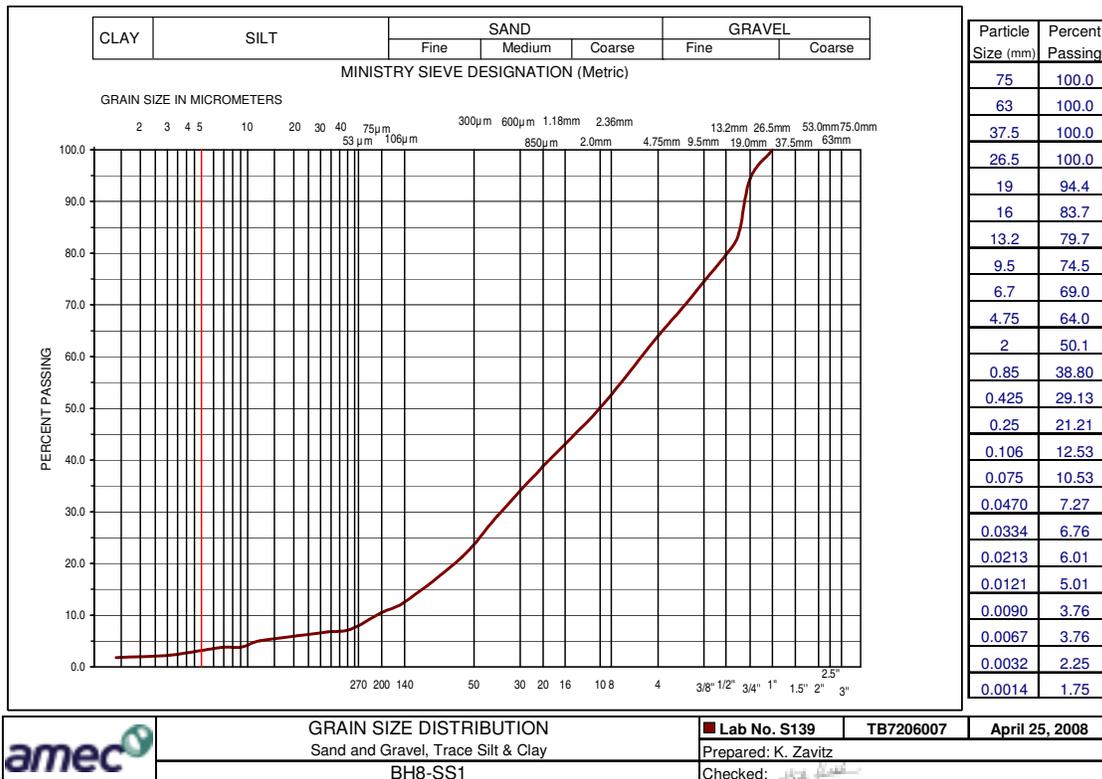
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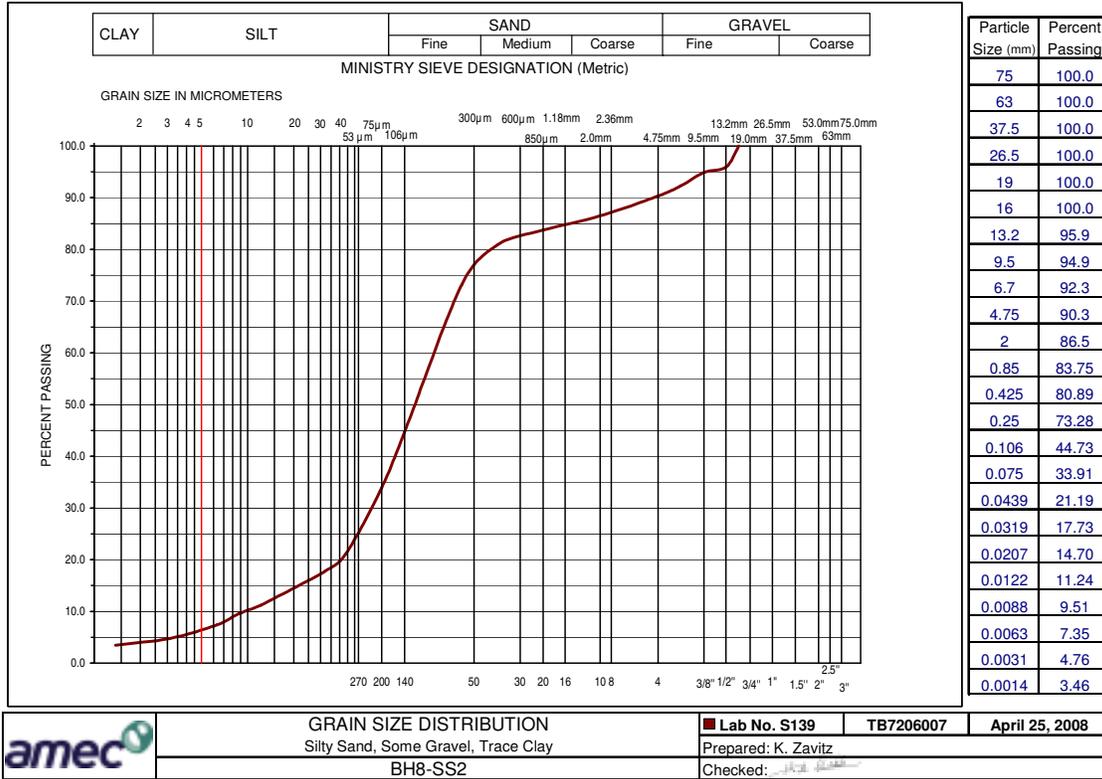
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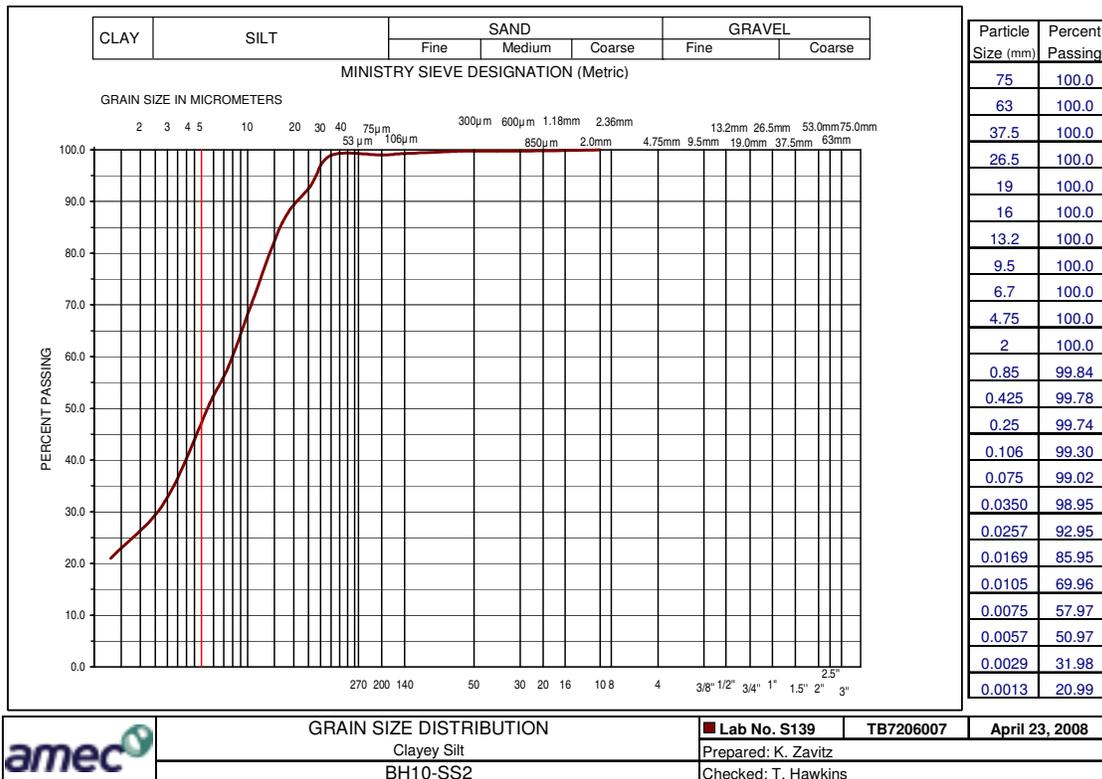
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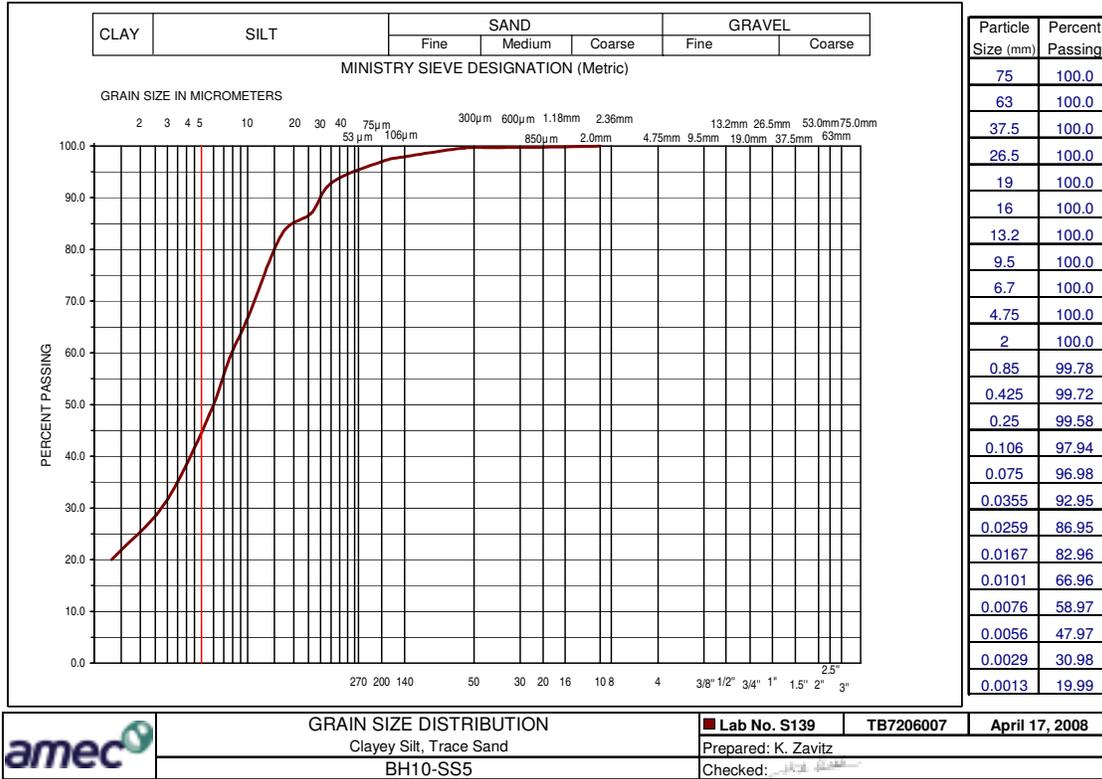
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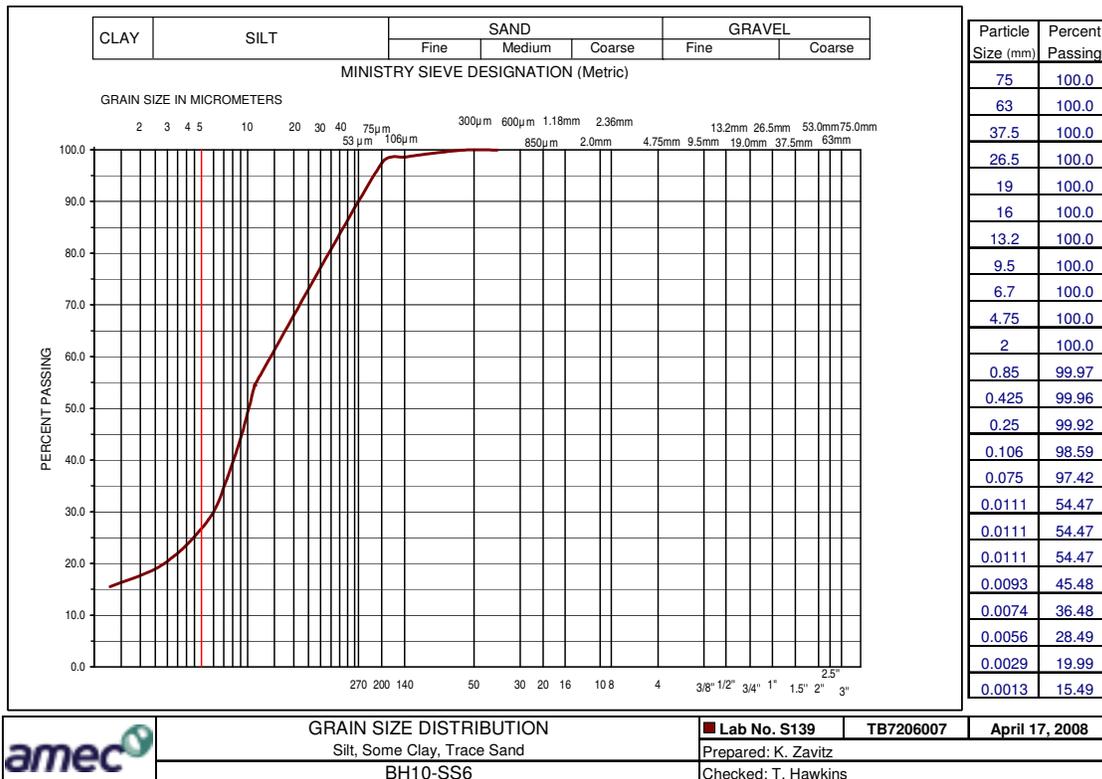
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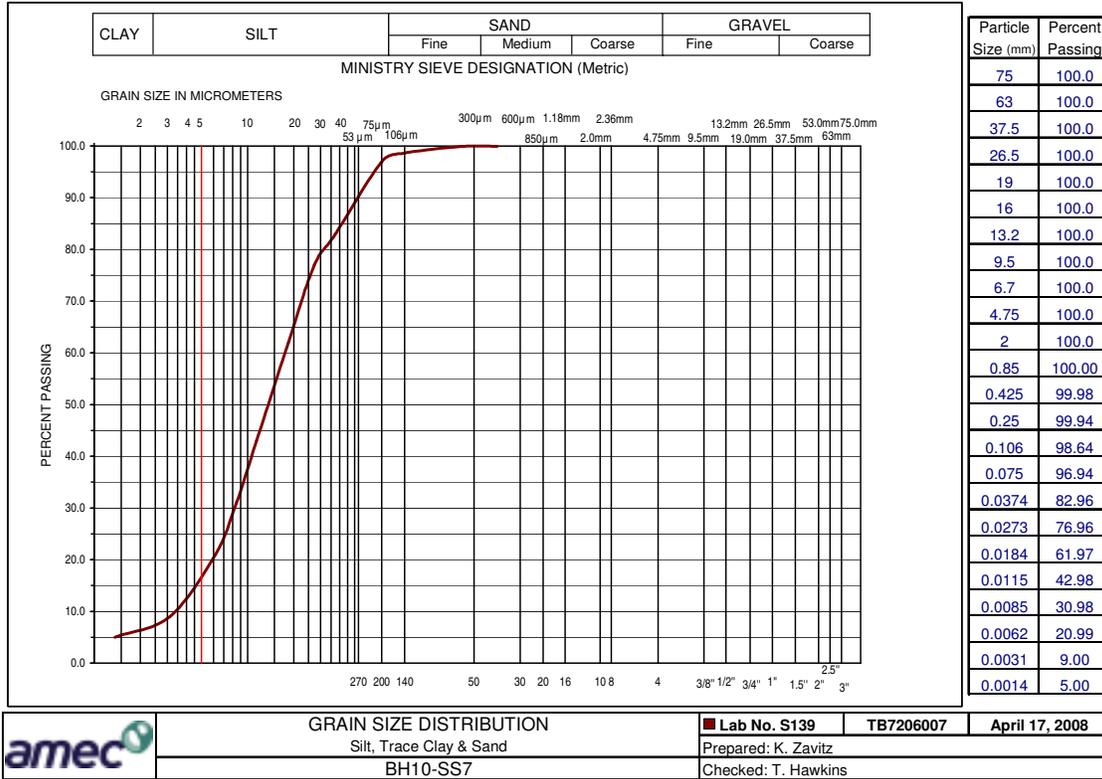
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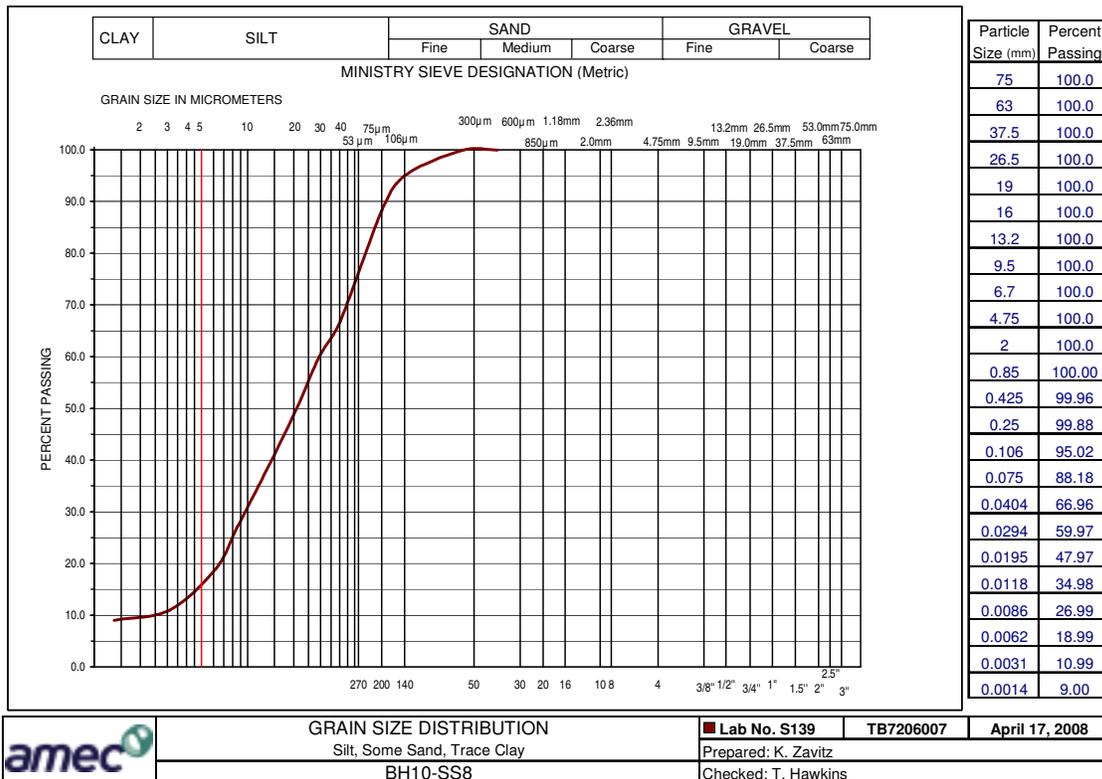
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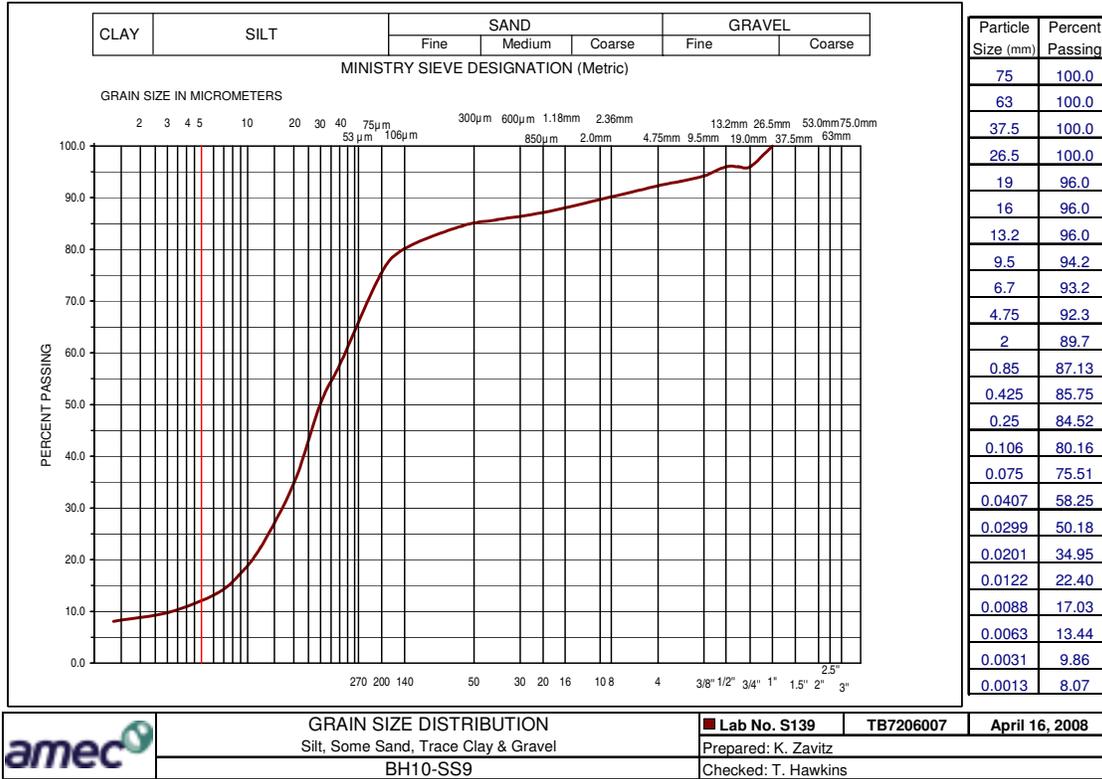
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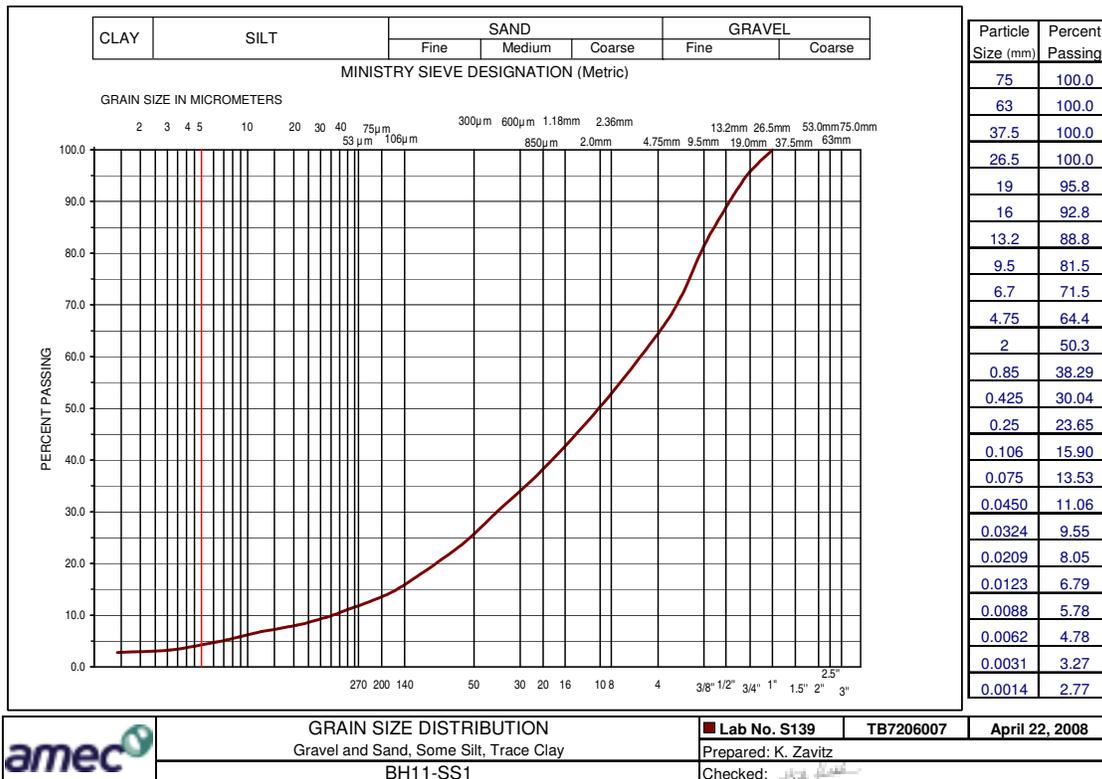
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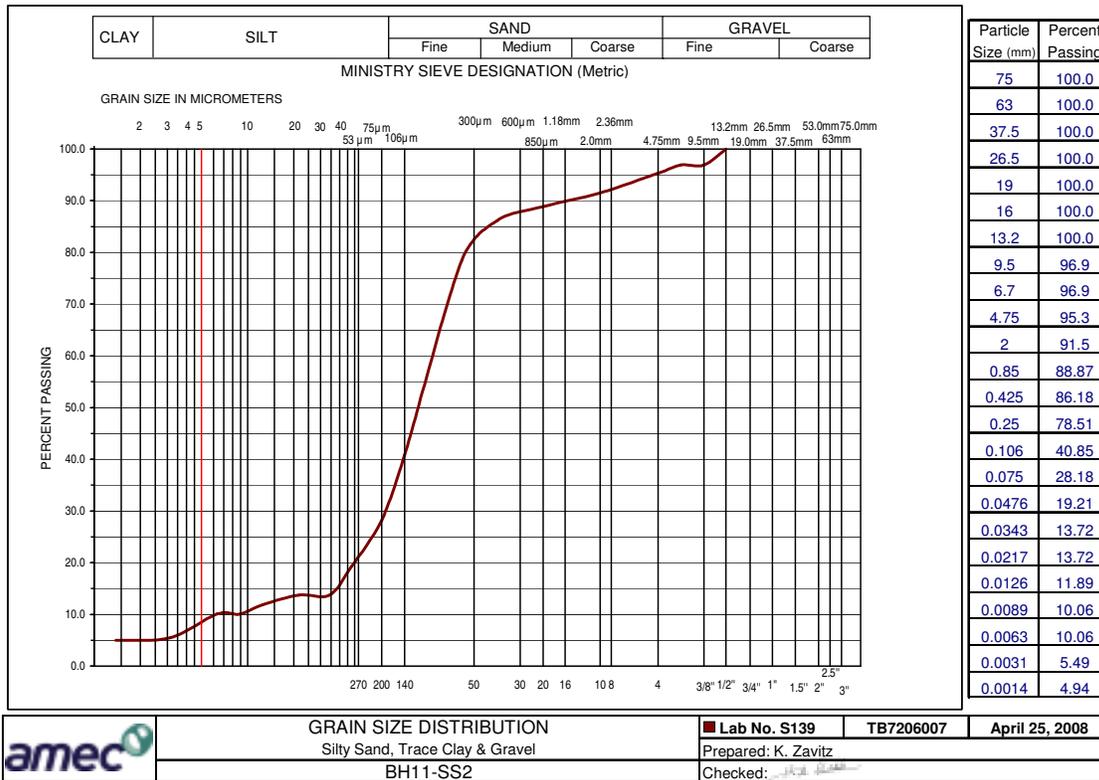
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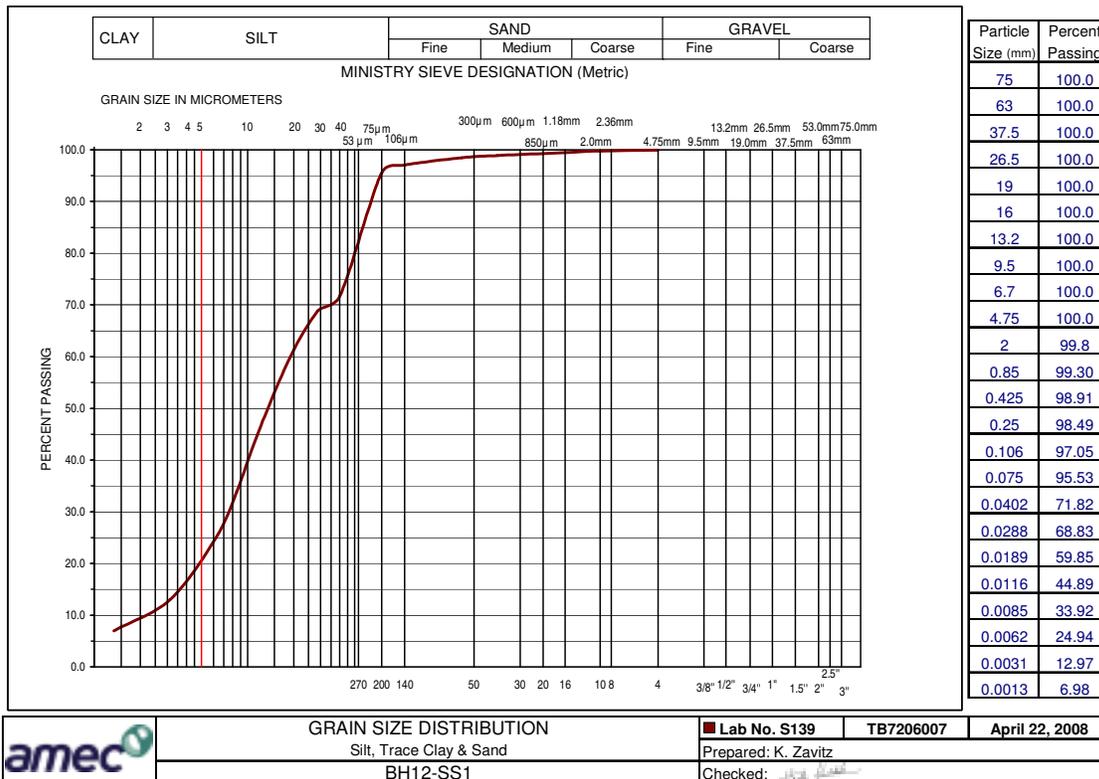
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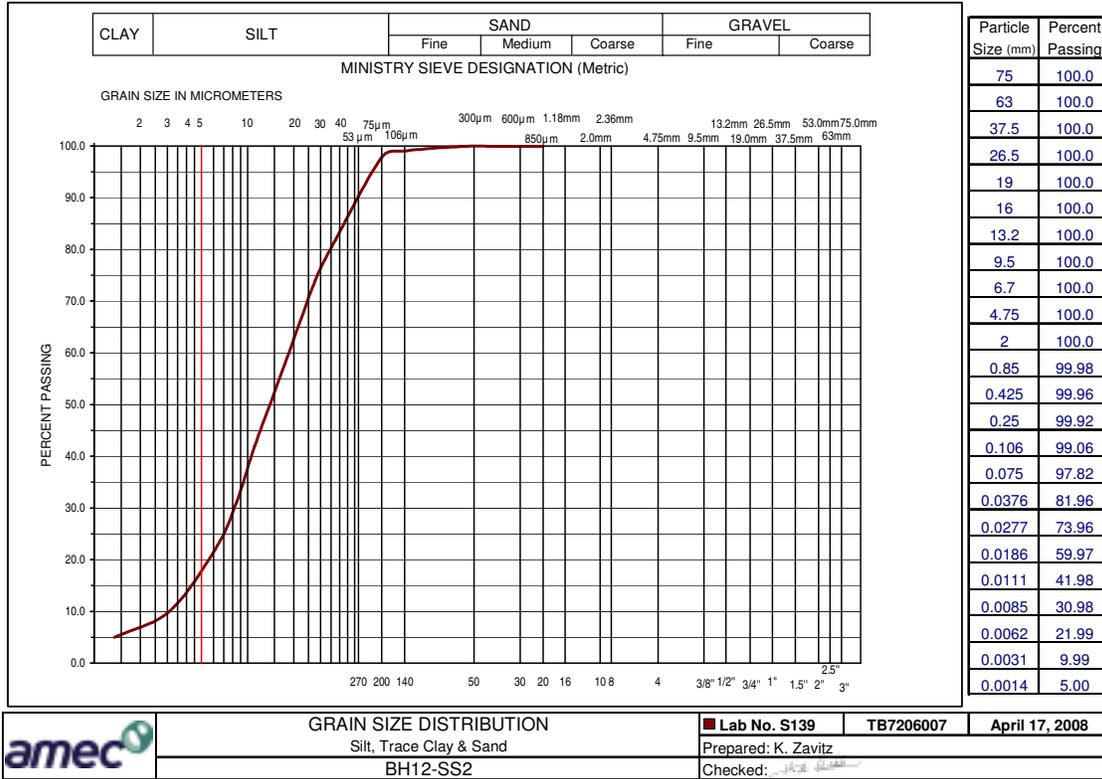
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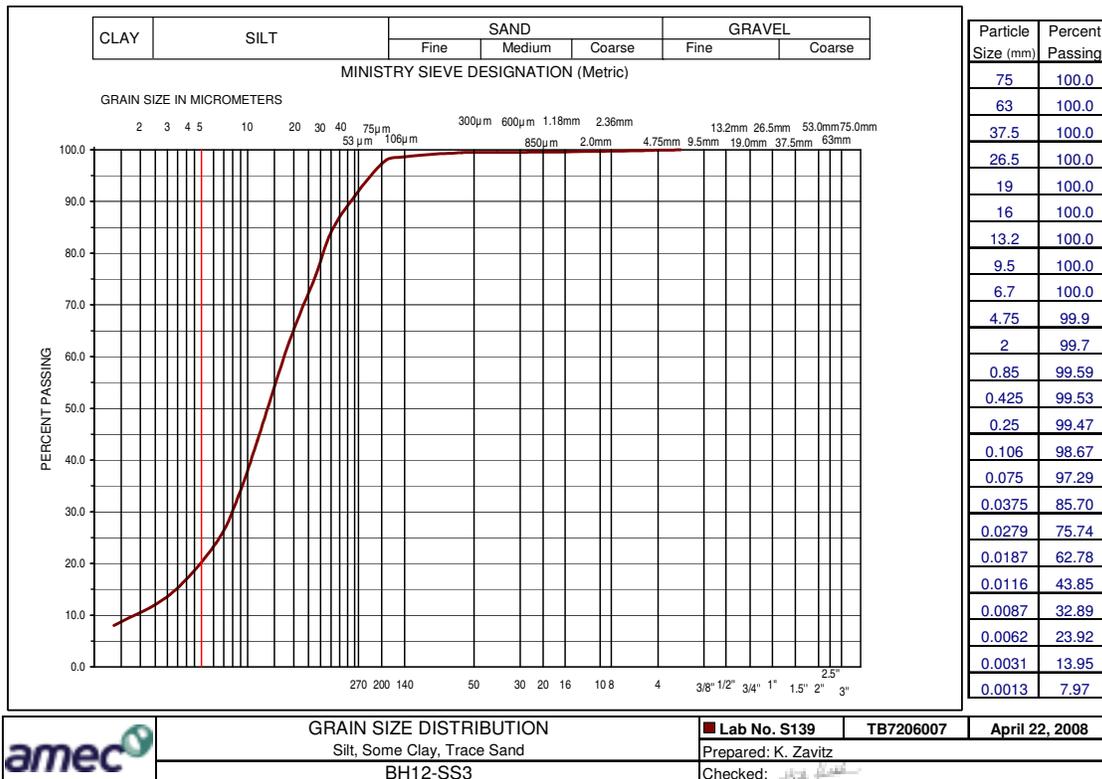
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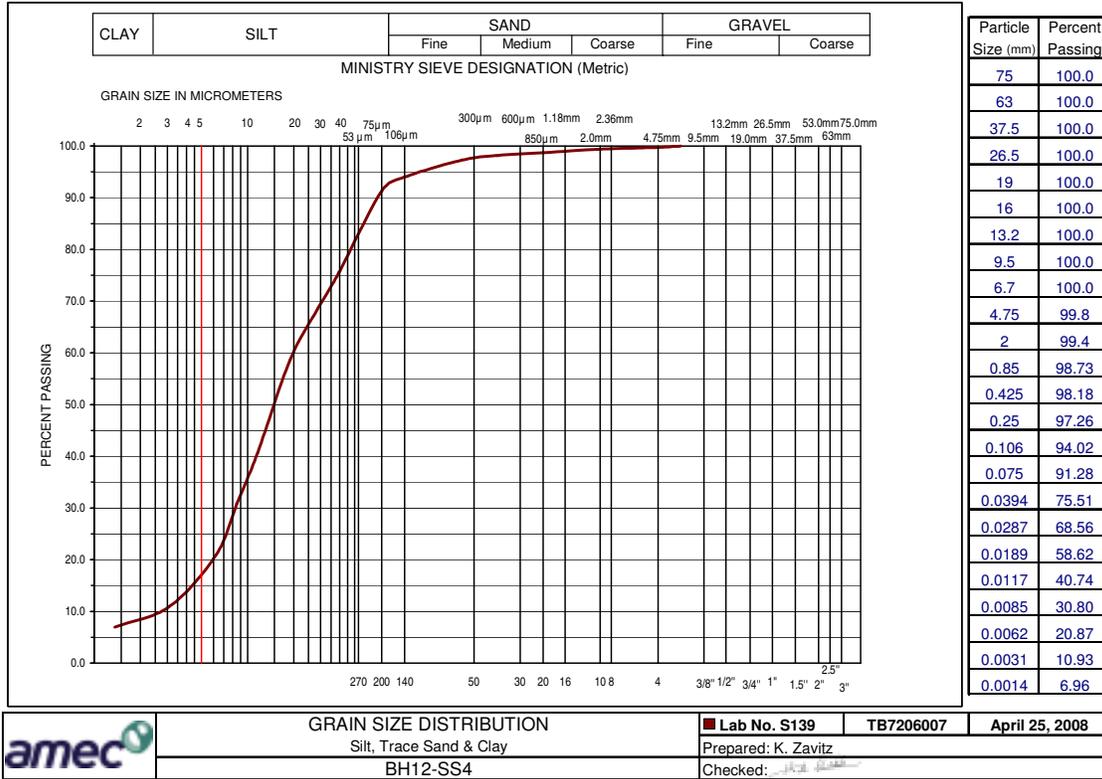
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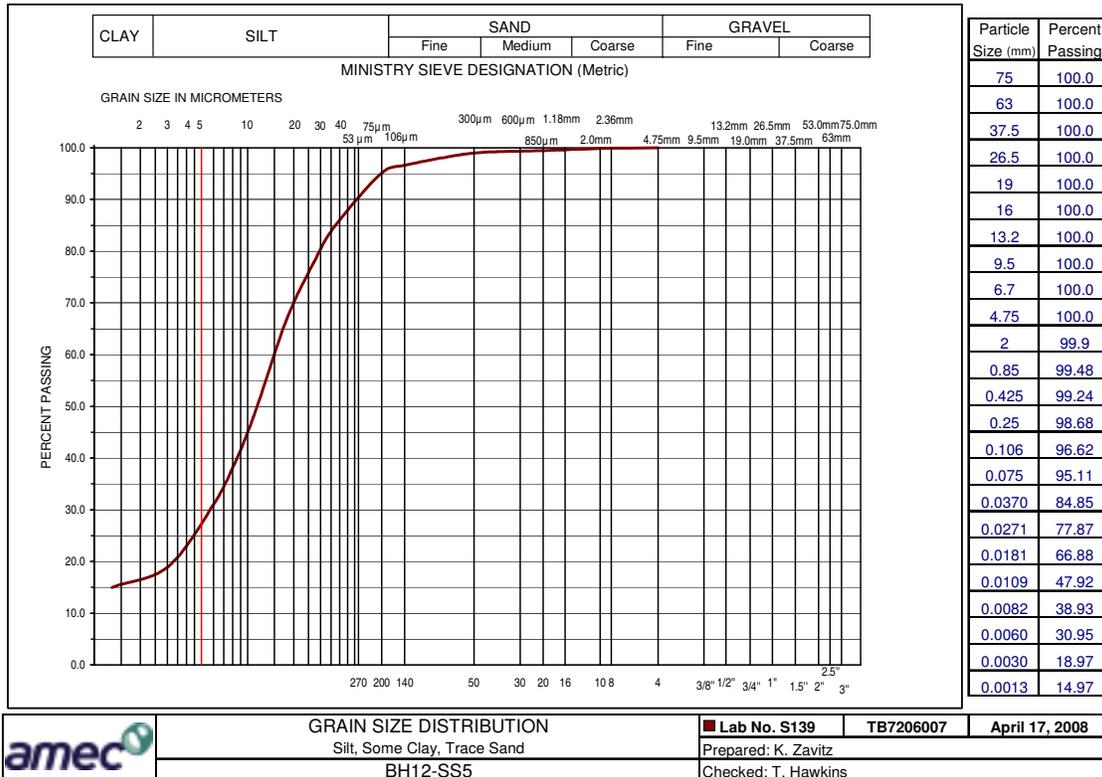
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Enclosure: 37B



UNIFIED SOIL CLASSIFICATION SYSTEM

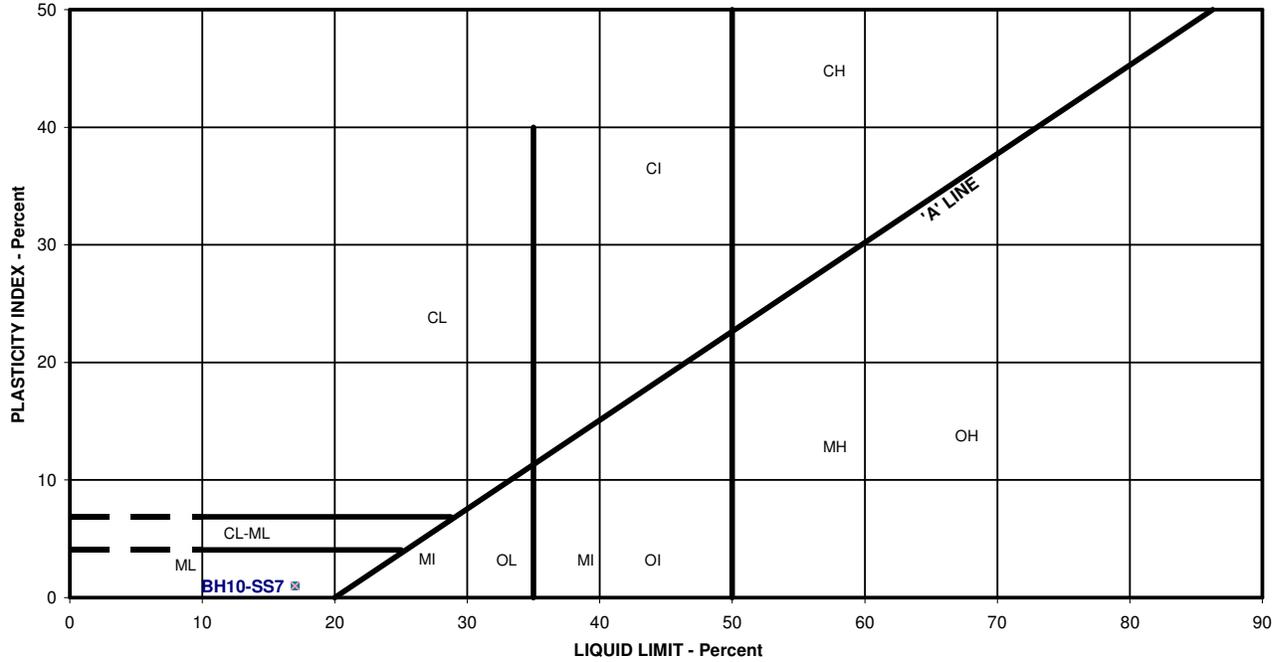
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PLASTICITY CHART

(BH10-SS7): LL = 17, PL = 16, PI = 1

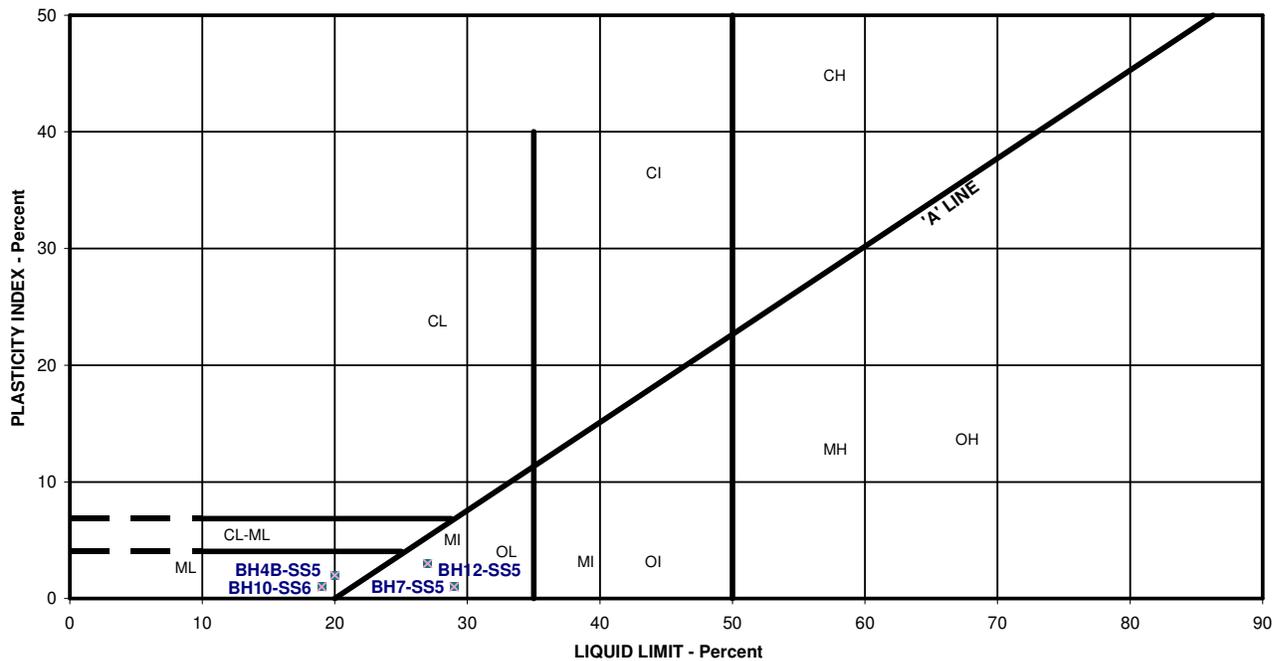
BH7-SS9, BH2A-SS8, BH4B-SS7, BH10-SS8, BH7-SS8, BH2A-SS7 were found to be non-plastic



PLASTICITY CHART

D1 (BH4B-SS5): LL = 20, PL = 18, PI = 2 ~ D2 (BH10-SS6): LL = 19, PL = 18, PI = 1

M1 (BH7-SS5): LL = 29, PL = 28, PI = 1 ~ M2 (BH12-SS5): LL = 27, PL = 24, PI = 3



APPENDIX C
SITE PHOTOGRAPHS

APPENDIX C - PHOTOGRAPHIC RECORD

PROJECT NO. MTO NE Region Agreement #5006-E-0070

PROJECT Hwy 11 at Pan Lake, 10.6km North Of Highway 64

LOCATION Olive Twp, Ontario

ENCLOSURE 1



PHOTOGRAPH	1
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General View

Hwy 11 Pan Lake Looking South



PHOTOGRAPH	2
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General View

Hwy 11 Pan Lake Looking North

APPENDIX C - PHOTOGRAPHIC RECORD

PROJECT NO. MTO NE Region Agreement #5006-E-0070

PROJECT Hwy 11 at Pan Lake, 10.6km North Of Highway 64

LOCATION Olive Twp, Ontario

ENCLOSURE 2

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	PHOTOGRAPH	3	
	<table border="1"> <tr> <td>Guiderail</td> </tr> </table>	Guiderail	
Guiderail			
<p>Hwy 11 Pan Lake Looking North. Existing guiderail and embankment on Highway 11 at Pan Lake</p>			

	<table border="1"> <tr> <td>PHOTOGRAPH</td> <td>4</td> </tr> </table>	PHOTOGRAPH	4
	PHOTOGRAPH	4	
	<table border="1"> <tr> <td>Guiderail</td> </tr> </table>	Guiderail	
Guiderail			
<p>Hwy 11 Pan Lake Looking North</p>			

APPENDIX C - PHOTOGRAPHIC RECORD

PROJECT NO. MTO NE Region Agreement #5006-E-0070

PROJECT Hwy 11 at Pan Lake, 10.6km North Of Highway 64

LOCATION Olive Twp, Ontario

ENCLOSURE 3

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	PHOTOGRAPH	5	
	<table border="1"> <tr> <td>General View</td> </tr> </table>	General View	
General View			
<p>Hwy 11 Pan Lake Looking North</p>			

	<table border="1"> <tr> <td>PHOTOGRAPH</td> <td>6</td> </tr> </table>	PHOTOGRAPH	6
	PHOTOGRAPH	6	
	<table border="1"> <tr> <td>BH #7 @ Station 14+850</td> </tr> </table>	BH #7 @ Station 14+850	
BH #7 @ Station 14+850			
<p>Hwy 11 Pan Lake Looking North. Tripod Drill rig and hand tools</p>			

APPENDIX C - PHOTOGRAPHIC RECORD

PROJECT NO. MTO NE Region Agreement #5006-E-0070

PROJECT Hwy 11 at Pan Lake, 10.6km North Of Highway 64

LOCATION Olive Twp, Ontario

ENCLOSURE 4



PHOTOGRAPH	7
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Pavement Condition

Hwy 11 Pan Lake Looking North



PHOTOGRAPH	8
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Site Condition

Existing guiderail and embankment on Highway 11 at Pan Lake