

July 29, 2015

To: Jean-Pierre Perron
Project Soil Engineer
MTO Northeastern Region
Downsview, Ontario

Re: Memorandum Dated July 13, 2015
Draft Foundation Investigation Report
Agreement # 5013-E-0033, Assignment # 8
Spanish River Bridge Rehabilitation, Site No. 46-167
GWP 5251-10-00, HWY 17

Ref : GS-TB-020906

The comments provided by MTO on the review of delivered items have been addresses as follow in green color and underlined text:

1. The Geocres No. for this project is **411-334**. This number should be provided in the Final Foundation Reports and Foundation Drawings (BH Location and Soil Strata).
Geocres No. was added to the report and drawing.
2. **General:** Please include the GWP number in the title of the report.
GWP No. was added to the report.
3. **Section 3.0 – Investigation Procedure and Laboratory Testing:** Please include Northing and Easting of Boreholes 1 and 2 in the report and in the borehole logs.
Northing and Easting of Boreholes 1 and 2 were included both in the report and in the borehole logs.
4. **Section 4 – Description of Subsurface Conditions:** Remove the internal friction angle value and the unit weight, from Table 4.1 and Table 4.2.
The internal friction angle value and the unit weight were removed from Table 4.1 and Table 4.2.
5. **Section 4 – Description of Subsurface Conditions:** In Table 4.2, for each of the layer description where cobbles/boulders were encountered, instead of describing some cobbles/boulders, please replace the description with containing cobbles/boulders.
In Tables 4.2, the descriptions were replaced with containing cobbles/boulders for each of the layer description where cobbles/boulders were encountered, instead of describing some cobbles/boulders.

6. **Section 4.2 – Fill-Sand with Gravel:** The heading for this section should be fill, the description of the fill is in the text. The description of the fill encountered in Borehole 1 should be sand and gravel containing trace silt. There is no cobbles indicated in Borehole 1 log, please review the log and revise the description accordingly. Similarly the description of fill encountered in Borehole 2 should be course to fine sand and gravel containing trace silt. Cobbles were encountered within the fill in Borehole 2. Please revise the section accordingly.

The heading of this section was changed to Fill. The description of the soil strata was revised and changed accordingly.

7. **Section 4.3 – Silt with Sand:** Based on the grain size distribution this layer should be described as Sandy Silt, containing trace to some gravel and trace clay. Please revise the description on the text and on the borehole log.

The description of the soil strata was revised and changed accordingly.

8. **Section 4.4 – Sand and Silt:** Silt should start with upper case.

The change was made accordingly.

9. **Section 4.5 – Sand:** Please clarify if this layer is sand with gravel or sand containing some gravel, please change the text accordingly and the description of the borehole log.

The text was changed accordingly.

10. **Section 4.6 – Bedrock:** Please describe the bedrock strength based on the UCS test results.

The bedrock strength was described based on the UCS Test results.

11. **Appendix C – Drawings:** Please include the Borehole Location and Soil Strata drawings, signed and stamped two Professional Engineers licensed by PEO, one of which shall be DST's MTO Foundation Designated Contact. The current drawing enclosed in the report is not sufficient; the drawing should include the plan view with the location of the boreholes and the soil strata on a cross section along the bridge centerline. The drawing should be presented on an 11x17 format.

As per discussion with Ms. Olta Kociu, P. Eng., the Borehole Location and Soil Strata drawings were revised accordingly and signed and stamped by two Professional Engineers licensed by PEO.

12. **Appendix D – General:** In all the borehole logs, under the soil descriptions please include the compactness or the consistency of the soil layer. The layer description for fill should be all lower case.

The compactness or the consistency of the soil layer was included in all the borehole logs, under the soil descriptions and the layer description for fill wrote in all lower case.

13. **Borehole 1 log:** What are the blow counts for sample AS2, this sample was described as compacted in the report. The layer on sample SS1 should be described as Sandy Silt, trace to some gravel, trace clay. The layer on SS2 is Coarse to fine Sand, trace to some gravel, some silt. Please revised the soil description accordingly. Please include the UCS test result in the borehole log and indicate if the borehole was dry upon completion or otherwise indicate the water level.

Sample AS2 is auger cutting sample and not a SPT sample. The relative density of this layer was based on conditions encountered during drilling. The soil descriptions were updated and revised accordingly. The UCS Test result was included in the borehole log.

14. **Borehole 2 log:** Fill should be described as sand and gravel, trace silt, cobbles encountered. The layer in samples SS4 to SS6 should state containing organics and not trace organics. The description of the sample SS7 and SS8 is not clear, is it Sand and Gravel or Sand, some gravel, there is no gradation test done. Please review the soil layer description and revise accordingly. Also, the symbol for the bottom two soil layers should be different from each other, currently the same symbol has been used. Please include the UCS test results for the bedrock in the borehole log.

The soil descriptions were reviewed and revised accordingly. The UCS Test result was included in the borehole log.

15. **Grain Size Distribution Charts:** Please separate the grain size test results according to the layer description, one chart for each soil layer and provide the layer description on the title box.

Grain size distribution graphs were altered to be separated by soil classification and titled accordingly.

16. The Final Foundation Investigation Report must be signed and stamped by two Professional Engineers licensed by PEO, one of which shall be DST's MTO Foundation Designated Contact.



DST Consulting Engineer
605 Hewitson Street,
Thunder Bay, ON P7B 5V5
Phone: 807-623-2929
Fax: 807-623-1792

The Final Foundation Investigation Report was signed and stamped by two Professional Engineers licensed by PEO.

Yours truly,

For DST CONSULTING ENGINEERS INC.

A handwritten signature in blue ink, appearing to read 'Bo M W Bo', with a horizontal line drawn underneath.

Dr. M W Bo, P. Eng, P.Geo, Int. PE, C.Geol, C. Eng, Eur Geol, Eur Eng.
Senior Vice President / Senior Principal



**FOUNDATION INVESTIGATION REPORT
SPANISH RIVER BRIDGE - HIGHWAY 17
TOWNSHIP OF MERRITT, SUDBURY DISTRICT
AGREEMENT NO.: 5013-E-0033
ASSIGNMENT NO.: 8
SITE NO.: 46-167
GWP 5251-10-00
GEOCRES NO.: 41I-334**

**JULY 29, 2015
GS-TB-020906**

PREPARED FOR:

Ministry of Transportation
Geotechnical Section
Northeastern Region Office
447 McKeown Avenue, Suite 301
North Bay, ON P1B 9S9

1 Copy - Ministry of Transportation, North Bay, ON
1 Copy - Ministry of Transportation, Downsview, ON
1 Copy - DST Consulting Engineers, Thunder Bay, ON

DST CONSULTING ENGINEERS INC.
605 Hewitson Street, Thunder Bay, Ontario P7B 5V5
Phone: 1-807-623-2929 Fax: 1-807-623-1792

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**FOUNDATION INVESTIGATION REPORT
SPANISH RIVER BRIDGE - HIGHWAY 17
TOWNSHIP OF MERRITT, SUDBURY DISTRICT
AGREEMENT NO.: 5013-E-0033 - ASSIGNMENT #8
SITE NO.: 46-167**

PART 1: FACTUAL INFORMATION

1. INTRODUCTION

DST Consulting Engineers Inc. (DST) has been retained by the Ministry of Transportation (MTO), Geotechnical Section, Northeastern Region to conduct a foundation investigation in order to recommend the temporary protection systems at Spanish River Bridge on Highway 17, Township of Nairn, Sudbury District. This work was carried out under Agreement No.: 5013-E-0033, Geotechnical Retainer, Assignment No. 8.

This report addresses the field investigation, laboratory test program, factual report on soils conditions at the bridge location.

2. SITE DESCRIPTION

The site is located on Highway 17, approximately 8.2 km East of the junction of Highway 17 and Highway 6 (latitude 46°18'4" N, longitude 81°40'53" W), Station 11+577, in the Township of Nairn, in the District of Sudbury.

Figure 2.1 and 2.2 illustrate the Spanish River Bridge looking both East and West respectively. Figure 2.3 and 2.4 show the West embankment of abutment looking both North and South respectively. All photographs were taken by DST during the field investigations (Figures 2.1 to 2.4).

Geological information is available from published *Ontario Geological Survey Map #41ISW* by the *Ontario Ministry of Natural Resources* for the Nairn Township area. The map indicates that the local area landform is identified as sand, sandy outwash plain. The topography in the area is mainly low local relief; plain with mixed wet and dry drainage conditions.



Figure 2.1 Spanish River Bridge on Highway 17 (Looking East)



Figure 2.2 Spanish River Bridge on Highway 17 (Looking West)



Figure 2.3 Embankment West of Abutment (Looking North) at BH 1 location



Figure 2.4 Embankment West of Abutment (Looking South) at BH 1 location

3. INVESTIGATION PROCEDURES AND LABORATORY TESTING

Site work was carried out on April 8, 2015 utilizing a CME 750 drill rig equipped for geotechnical drilling and operated by DST. A total of two boreholes were advanced to depths ranging from 4.9 m to 10.8 m. The minimum number and depth of the boreholes was specified by the Ministry of Transportation (MTO).

Borehole 1 (UTM Zone 17 444954 mE, 5127726 mN) was advanced at Station 11+577 (7.0 m West of the West expansion joint), 3.1 m left of centreline in the Eastbound lane. Borehole 2 (UTM Zone 17 448103 mE, 5127787 mN) was advanced at Station 11+387 (7.0 m East of the East expansion joint), 3.0 m right of centreline in the Westbound lane.

The borehole locations are referenced to the MTO station numbering system as indicated on the drawings provided by MTO. The ground surface elevations at the borehole locations were surveyed by DST personnel and referenced to a local BM (nail) located at the top of the guard rail post (12th post counting from the West of BH1) with elevation of 100.0 m. Table 3.1 summarizes the detail of borehole locations and depths.

All boreholes were abandoned using suitable abandonment barrier as described in Ontario Regulation 903 and its amendments. Boreholes were decommissioned by backfilling to the bottom of the road base with cuttings and/or bentonite chips. From the bottom of the road base, granular materials were replaced to the bottom of the asphalt and the asphalt was sealed with a cold patch.

The fieldwork was supervised on a full-time basis by DST personnel who located the boreholes in the field, performed sampling, in-situ testing and logged the boreholes. Soil samples were obtained from the auger flights and from the split spoon sampler used for the standard penetration test (SPT). The SPT involves driving a 51 mm diameter thick-walled sampler into the soil under the energy of a 63.5 kg weight falling through 760 mm. The number of blows required to drive the sampler 305 mm is known as the standard penetration blow count (N) which provides an indication of the condition or consistency of the soil. The soil samples collected during drilling were identified in the field, placed in labelled containers and transported to DST's laboratory in Thunder Bay for further analysis.

Classification and index tests were subsequently performed in the laboratory on samples collected from the boreholes to aid in the selection of engineering properties. Laboratory tests included moisture contents and particle size analyses. A total of fourteen (14) moisture contents and ten (10) sieve analyses have been carried out for this assignment. Laboratory test results are

presented in the Boreholes Logs and in graphical plots attached Appendix D (Enclosures).

Table 3.1 Detail of borehole locations

Borehole ID	Station	Elevation (m)	Depth (m)	Offset (m)
BH1	11+577	99.21	4.9	3.1 Lt
BH2	11+387	99.27	10.8	3.0 Rt

4. DESCRIPTION OF SUBSURFACE CONDITIONS

The subsurface conditions are presented based on the information obtained during power auger drilling.

The generalized stratigraphy of the existing roadway embankment, based on the conditions encountered- Borehole 1 consists of surface layer of asphalt overlaying a granular sand fill layer underlain by silt with some sand to sand with some gravel and silt which is again underlain by bedrock. Borehole 2 consists of surface layer of asphalt overlaying a granular sand fill layer underlain by sand and silt to sand with some gravel which is again underlain by bedrock. The summary of soil strata for Borehole 1 and Borehole 2 are listed in Table 4.1 and 4.2.

Table 4.1 Summary of soil strata for BH 1 at the bridge location

Layer	Depth (m)	Elevation (m)	Comments
Asphalt	0 to 0.2 m	99.2 to 99.0 m	
Fill-Sand and Gravel, trace silt	0.2 to 0.8 m	99.0 to 98.4 m	Moisture Content between 3% to 9%
Sandy Silt, trace to some Gravel, trace Clay	0.8 to 1.3 m	98.4 to 97.9 m	Moisture Content between 7% to 9%
Sand, containing some Gravel and Silt	1.3 to 2.0 m	97.9 to 97.2 m	Moisture Content between 7% to 9%
Bedrock-Gabbro	2.0 to 4.9 m	97.2 to 94.3 m	RQD* = 100% UCS# = 135.3 MPa

#UCS= Unconfined Compressive Strength

*RQD=Rock Quality Designation

Table 4.2 Summary of soil strata for BH 2 at the bridge location

Layer	Depth (m)	Elevation (m)	Comments
Asphalt	0 to 0.2 m	99.3 to 99.1 m	
Fill- Coarse to Fine Sand with Gravel, containing Cobbles, trace Silt	0.2 to 3.1 m	99.1 to 96.2 m	Moisture Content between 2% to 8%
Sand and Silt, trace Gravel, trace Clay, containing Organics and Cobbles	3.1 to 7.6 m	96.2 to 91.7 m	Moisture Content between 1% to 28%
Bedrock-Gabbro	7.6 to 10.8 m	91.7 to 88.5 m	RQD* = 87 to 92% UCS# = 147.4 MPa

#UCS= Unconfined Compressive Strength

*RQD=Rock Quality Designation

4.1 Asphalt

Asphaltic concrete was encountered at surface in Boreholes 1 and 2 with thickness of approximately 200 mm.

4.2 Fill

Fill coarse to fine sand and gravel containing trace silt was encountered in Borehole 1 below the asphalt with a thickness of 0.6 m at depths between 0.2 m to 0.8 m (Elev. 99.0 to 98.4 m). In Borehole 2, coarse to fine sand and gravel containing trace silt was encountered below the asphalt with a thickness of 2.9 m at depths between 0.2 m to 3.1 m (Elev. 99.1 to 96.2 m). Cobbles were encountered within the fill in Borehole 2.

SPT 'N' values vary from 12 to 36, indicating a compact to dense condition. The moisture contents of samples tested range from 2 to 9%. The sieve analysis results of laboratory tests are summarized in Table 4.3.

Table 4.3 Summary of sand and gravel fill sieve analyses

Laboratory Results - Sieve Analyses	
Gravel %	27 to 44
Sand %	49 to 67
Fines %	6 to 8

4.3 Sandy Silt

Sandy Silt, containing trace to some gravel and trace clay was encountered in Boreholes 1 at strata depths of 0.8 m to 1.3 m (Elev. 98.4 m to 97.9 m).

SPT 'N' value was 37, indicating a dense condition. The moisture contents of samples tested was approximately 9%. The sieve analysis results of laboratory tests are summarized in Table 4.4.

Table 4.4 Summary of silt with sand sieve analyses

Laboratory Results - Sieve Analyses	
Gravel %	7 to 12
Sand %	28 to 32
Silt %	52 to 62
Clay %	3 to 4

4.4 Sand and Silt

Sand and Silt containing trace gravel and clay, containing organics was encountered in Boreholes 2 at strata depths of 3.1 m to 7.6 m (Elev. 96.2 m to 91.7 m). Cobbles were encountered in Borehole 2.

SPT 'N' values vary from 5 to 50, indicating a loose to dense condition. The moisture contents of samples tested range from 1 to 28%. The sieve analysis results of laboratory tests are summarized in Table 4.5.

Table 4.5 Summary of sand and silt sieve analyses

Laboratory Results - Sieve Analyses	
Gravel %	0 to 2
Sand %	54 to 59
Silt %	36 to 40
Clay %	4 to 5

4.5 Sand

Coarse to fine sand containing some gravel and silt was encountered in Borehole 1 at depth of 1.3 m to 2.0 m (Elev. 97.9 m to 97.2 m).

SPT 'N' value was found 50, indicating a dense condition. The moisture contents of samples tested range from 7 to 9%. The sieve analysis results of laboratory tests are summarized in Table 4.6.

Table 4.6 Summary of sand sieve analyses

Laboratory Results - Sieve Analyses	
Gravel %	2 to 20
Sand %	63 to 78
Fines %	17 to 20

4.6 Bedrock

Bedrock was encountered in Boreholes 1 and 2 at depths of 2.0 m to 4.9 m (Elev. 97.2 m to 94.3 m) and 7.6 m to 10.8 m (Elev. 91.7 m to 88.5 m) respectively. In both cases, Total Core Recovery (TCR) was 100% and Solid Core Recovery (SCR) were 87 to 100%. Rock Quality Designation (RQD) was found 100% for total 3.0 m of core run for Borehole 1 while for Borehole 2, first 1.5 m

of coring obtained 87% RQD and second 1.5 m of coring obtained 92% RQD indicating Excellent Rock. The type of Bedrock is Gabbro and grey in colour. The unconfined compressive strength of the bedrock at Borehole 1 and 2 locations varies between 135.3 MPa and 147.4 MPa indicating high strength.

4.7 Groundwater

No groundwater level was detected in Borehole 1; while Borehole 2 encountered groundwater at approximately 5.5 m depth from the existing ground surface.

5. MISCELLANEOUS

Fieldwork was supervised on a full time basis by Cheng Zhao who located the boreholes in the field, performed sampling, in-situ testing and logged the boreholes. Soil samples collected during drilling were identified in the field, placed in labelled containers and transported to DST's laboratory in Thunder Bay for further analysis. Interpretation of the data and preparation of the report was completed by Syed Ahmed, EIT and reviewed by Dr. Myint Win Bo, P. Eng., P. Geo., a designated principal contact for MTO projects.

6. LIMITATIONS OF REPORT

A description of limitations which are inherent in carrying out site investigation studies is given in Appendix 'A', and this forms an integral part of this report.

For DST Consulting Engineers Inc.

Prepared by:



Syed Ahmed, M.Sc.
Engineer in Training

Reviewed by:



Bernardo Villegas, M.Sc.
Manager

Reviewed By:



Dr. ASM Masud Karim, P. Eng.
Senior Geotechnical Engineer

Reviewed By:



Dr. M W Bo, P. Eng, P.Geo, Int PE,
C.Geol, C. Eng, Eur Geol, Eur Eng
Senior Vice President / Senior Principal

A 3D coordinate system with three axes: a horizontal x-axis, a vertical y-axis, and a diagonal z-axis. A point labeled **M** is located on the x-axis. A grid of squares is drawn in the first octant, with the origin (0,0,0) at point M. The grid consists of 5 squares along each axis, forming a 5x5x5 cube.

DST NSLTIN NINRS IN

□ □ **M** □

The document reports on the development of the research project and the results of the study. The document is divided into two main parts: the first part describes the research project and the second part describes the results of the study. The first part is divided into three sections: the first section describes the research project, the second section describes the research methodology, and the third section describes the research results. The second part is divided into two sections: the first section describes the results of the study and the second section describes the conclusions of the study.

The first of these steps in the reform of government administration requires a good understanding of the current situation. The second step is to identify the areas for reform. The third step is to develop a reform strategy. The fourth step is to implement the reform strategy. The fifth step is to monitor and evaluate the reform process. The sixth step is to adjust the reform strategy as needed. The seventh step is to complete the reform process.

DST □□NS□LTIN□ □N□IN□□RS IN□□

Appendix B

DESCRIPTION OF TERMS

EXPLANATION OF TERMS USED IN REPORT

SPT 'N' VALUE: THE STANDARD PENETRATION TEST (SPT) N VALUE OF THE NUMBER OF BLOWS REQUIRED TO CAUSE A STANDARD 51 mm O.D. SPLIT BARREL SAMPLES TO PENETRATE 0.3 m INTO UNDISTURBED GROUND IN A BOREHOLE WHEN DRIVEN BY A HAMMER WITH A MASS OF 63.5 kg, FALLING FREELY A DISTANCE OF 0.76 m. FOR PENETRATION OF LESS THAN 0.3 m 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 (DCPT): CONTINUOUS PENETRATION OF A CONICAL STEEL POINT (51 mm O.D. 60° CONE ANGLE) DRIVEN BY 475 J IMPACT ENERGY ON 'A' SIZE DRILL RODS. THE RESISTANCE TO CONE PENETRATION IS MEASURED AS THE NUMBER OF BLOWS FOR EACH 0.3 m ADVANCE OF THE CONICAL POINT INTO THE UNDISTURBED GROUND.

SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSENESS

TEXTURAL CLASSIFICATION OF SOILS

BOULDERS	COBBLES	GRAVEL	SAND	SILT	CLAY
GREATER THAN 200 mm	75 TO 200 mm	4.75 TO 75 mm	0.075 TO 4.75 mm	0.002 TO 0.075 mm	LESS THAN 0.002 mm

COARSE GRAIN SOIL DESCRIPTION (50% GREATER THAN 0.075 mm)

TERMINOLOGY	TRACE OR OCCASIONAL	SOME	WITH	ADJECTIVE (e.g. SILTY OR SANDY)	AND (e.g. SAND AND SILT)
	LESS THAN 10%	10 TO 20%	20 TO 30%	30 TO 40%	40 TO 60%

CONSISTENCY*: COHESIVE SOILS ARE DESCRIBED ON THE BASIS OF THEIR UNDRAINED SHEAR STRENGTH (C_u) AND SPT 'N' VALUES AS FOLLOWS

C_u (kPa)	0 – 12	12 – 25	25 – 50	50 - 100	100 - 200	> 200
N (BLOWS / 0.3 m)	<2	2 - 4	4 - 8	8 - 15	15 - 30	>30
	VERY SOFT	SOFT	FIRM	STIFF	VERY STIFF	HARD

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

N (BLOWS / 0.3 m)	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, 100 mm+ IN LENGTH EXPRESSED AS A PERCENTAGE OF THE LENGTH OF THE CORING RUN.

THE **ROCK QUALITY DESIGNATION (R.Q.D)** FOR MODIFIED RECOVERY IS:

R.Q.D (%)	0 – 25	25 – 50	50 – 75	75 – 90	90 – 100
	VERY POOR	POOR	FAIR	GOOD	EXCELLENT

LEGEND OF RECORDS FOR BOREHOLES: SYMBOLS AND ABBREVIATIONS FOR SAMPLE TYPE

SS	SPLIT SPOON SAMPLE	WS	WASH SAMPLE
TW	THIN WALL SHELBY TUBE SAMPLE	AS	AUGER (GRAB) SAMPLE
PH	SAMPLER ADVANCED BY HYDRAULIC PRESSURE	TP	THIN WALL PISTON SAMPLE
WH	SAMPLER ADVANCED BY SELF STATIC WEIGHT	PM	SAMPLER ADVANCED BY MANUAL PRESSURE
SC	SOIL CORE	RC	ROCK CORE
	WATER LEVEL	$SENSITIVITY = \frac{UNDISTURBED\ SHEAR\ STRENGTH}{REMOLDED\ SHEAR\ STRENGTH}$	

*HIERARCHY OF SOIL STRENGTH PREDICTION: **1)** LABORATORY TRIAXIAL TESTING. **2)** FIELD INSITU VANE TESTING. **3)** LABORATORY VANE TESTING. **4)** SPT VALUES. **5)** POCKET PENETROMETER.

Appendix C

DRAWINGS

Appendix D
ENCLOSURES

RECORD OF BOREHOLE No BH1

1 OF 1

METRIC

W.P. _____ LOCATION STA: + LT m: UTM Zone 1 4 mE, 5 mN ORIGINATED BY CZ
DIST _____ HWY HIGHWAY BOREHOLE TYPE Hollow Stem Auger - 80 mm ID COMPILED BY MD
DATUM Local DATE 2015 04 08 CHECKED BY DB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
99.2	GROUND SURFACE													
99.0	Asphalt		AS1	AS		DR <input type="checkbox"/>	99							44 49 (7)
0.2	Fill - Sand and Gravel, trace Silt, <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> rown		AS2	AS										
98.4														
0.8	Sandy Silt, trace to some Gravel, trace Clay, Dense, Brown to Light Grey		SS1	SS	37		98							12 32 52 4 7 28 62 3 <input type="checkbox"/> 63 (17)
97.9														
1.3	Coarse to Fine Sand, trace to some Gravel, some Silt, Dense, Brown		SS2	SS	50									
97.2														
2.0	Bedrock - Gabbro, Grey						97							2 78 (20)
	TCR = 100% SCR = 100% RQD = 100%		RC1	RC										
	UCS = 135.3 MPa						96							
			RC2	RC										
							95							
94.3														
4.9	End of Borehole at 4.9 m.													

ONL_MOT-HIGH VANES GS-TB-020906 SPANISH RIVER BH LOGS.GPJ DST_MIN.GDT 16/7/15

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

RECORD OF BOREHOLE No BH2

1 OF 1

METRIC

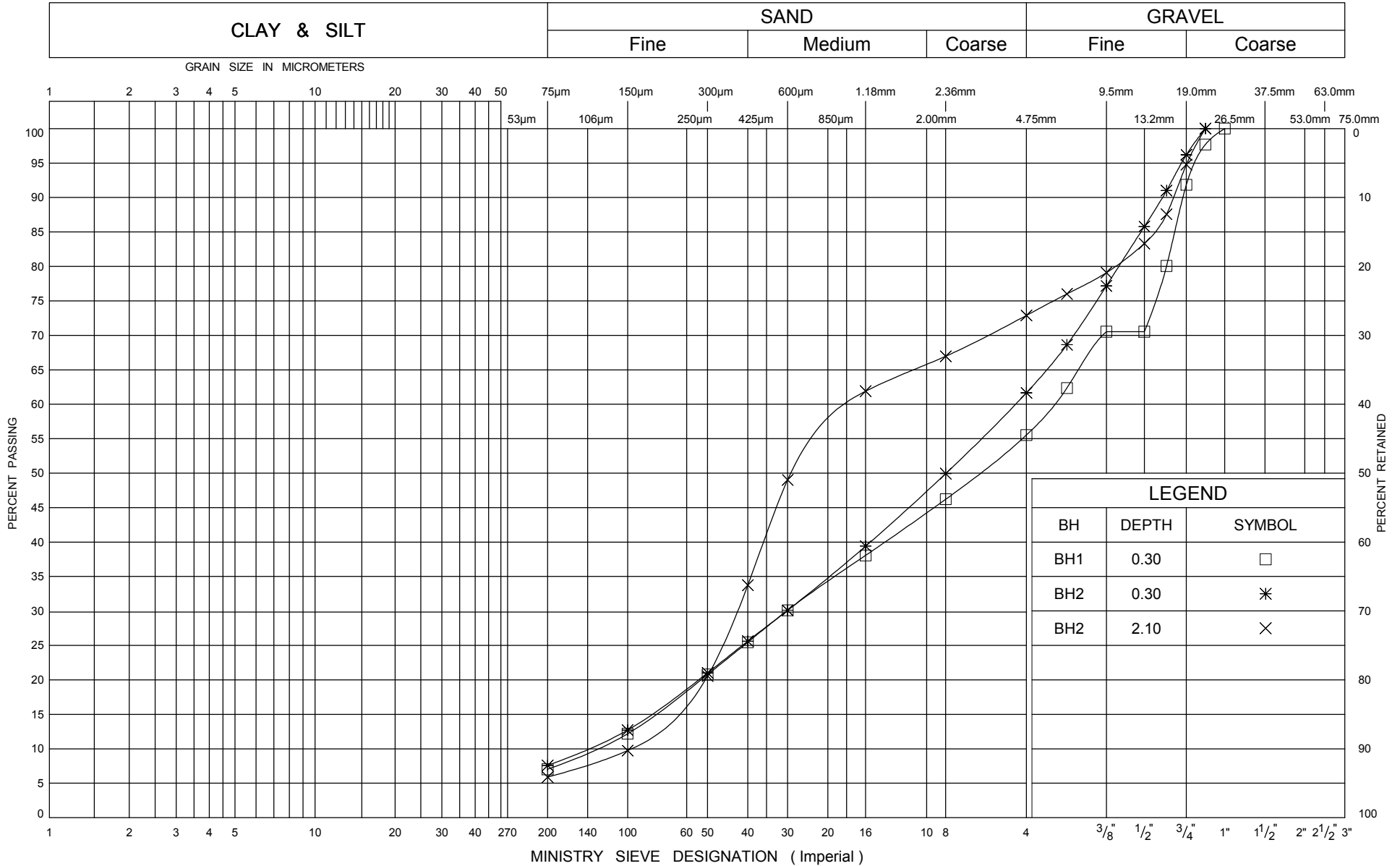
W.P. _____ LOCATION STA: + RT m: UTM Zone 1 4 mE, 5 mN
 DIST _____ HWY HIGHWAY BOREHOLE TYPE Hollow Stem Auger - 80 mm ID
 DATUM Local DATE 2015 04 08
 ORIGINATED BY CZ
 COMPILED BY MD
 CHECKED BY DB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
99.3	GROUND SURFACE													
99.1	Asphalt		AS1	AS			99							38 54 (8)
0.2	Fill - Sand and Gravel, trace Silt Compact to Dense, Light Brown		AS2	AS										
			SS1	SS	35		98							
			SS2	SS	36									
							97							27 67 (6)
	- Cobbles		SS3	SS	12									
96.2							96							<input type="checkbox"/> 54 40 <input type="checkbox"/>
3.1	Sand and Silt, trace Gravel, trace Clay, containing Organics, Loose to Dense, Light Brown		SS4	SS	8									0 55 (45)
			SS5	SS	6		95							
			SS6	SS	5									
							94							0 59 36 <input type="checkbox"/>
			SS7	SS	15		93							
							92							
91.7	- Cobbles		SS8	SS	50									
7.6	Bedrock - Gabbro, Grey		RC1	RC			91							
	TCR = 100% SCR = 87% RQD = 87%						90							
	UCS = 147.4 MPa		RC2	RC			89							
	TCR = 100% SCR = 100% RQD = 92%													
88.5	End of Borehole at 10.0 m													
10.8														

ONL MOT-HIGH VANES GS-TB-020906 SPANISH RIVER BH LOGS.GPJ DST_MIN.GDT 16/7/15

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

UNIFIED SOIL CLASSIFICATION SYSTEM



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GRAIN SIZE DISTRIBUTION

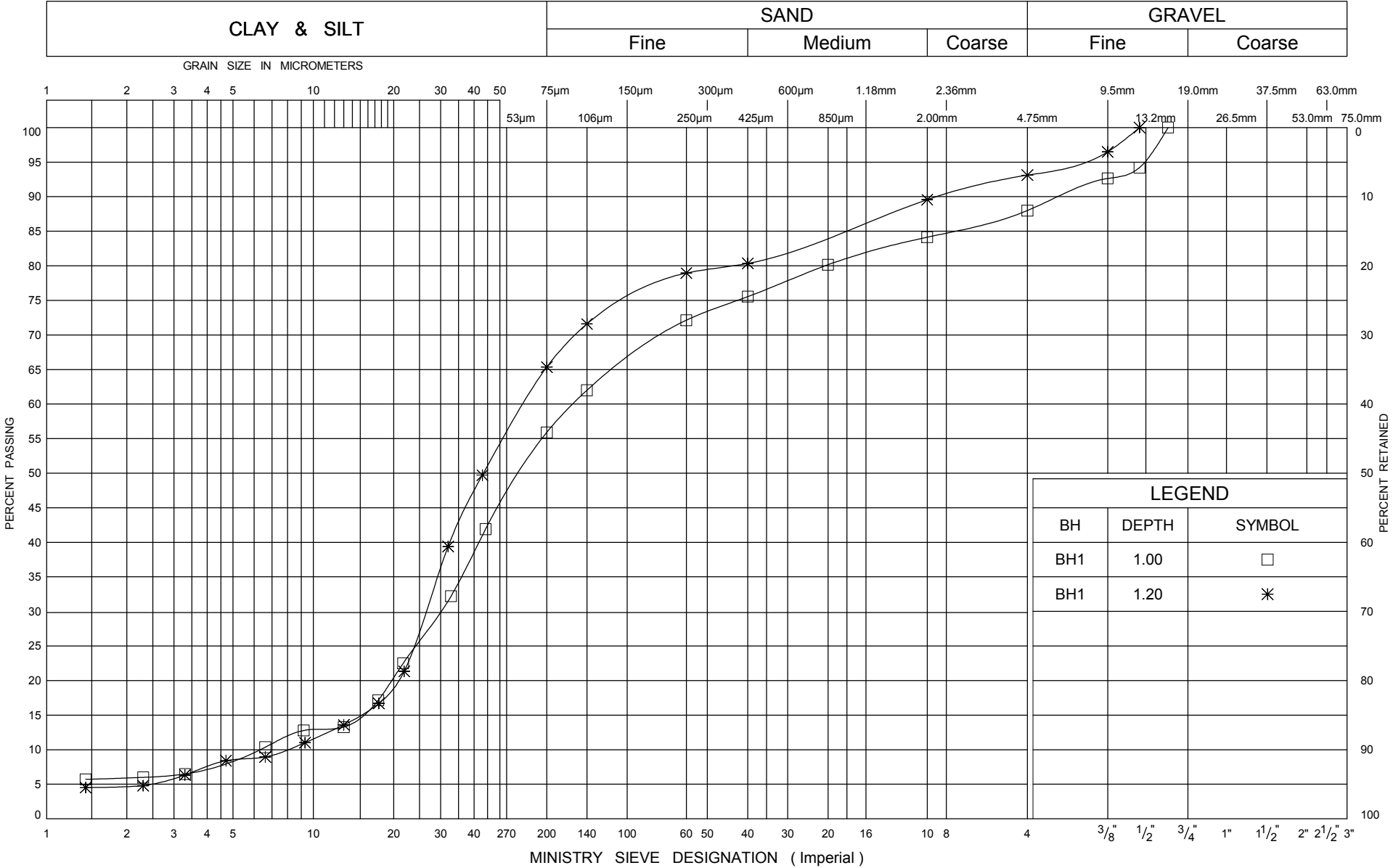
□ILL □SAND AND □RA□□L

ENCLOSURE 1

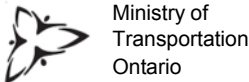
W P □□□□□□□□

HIGHWAY 17

UNIFIED SOIL CLASSIFICATION SYSTEM



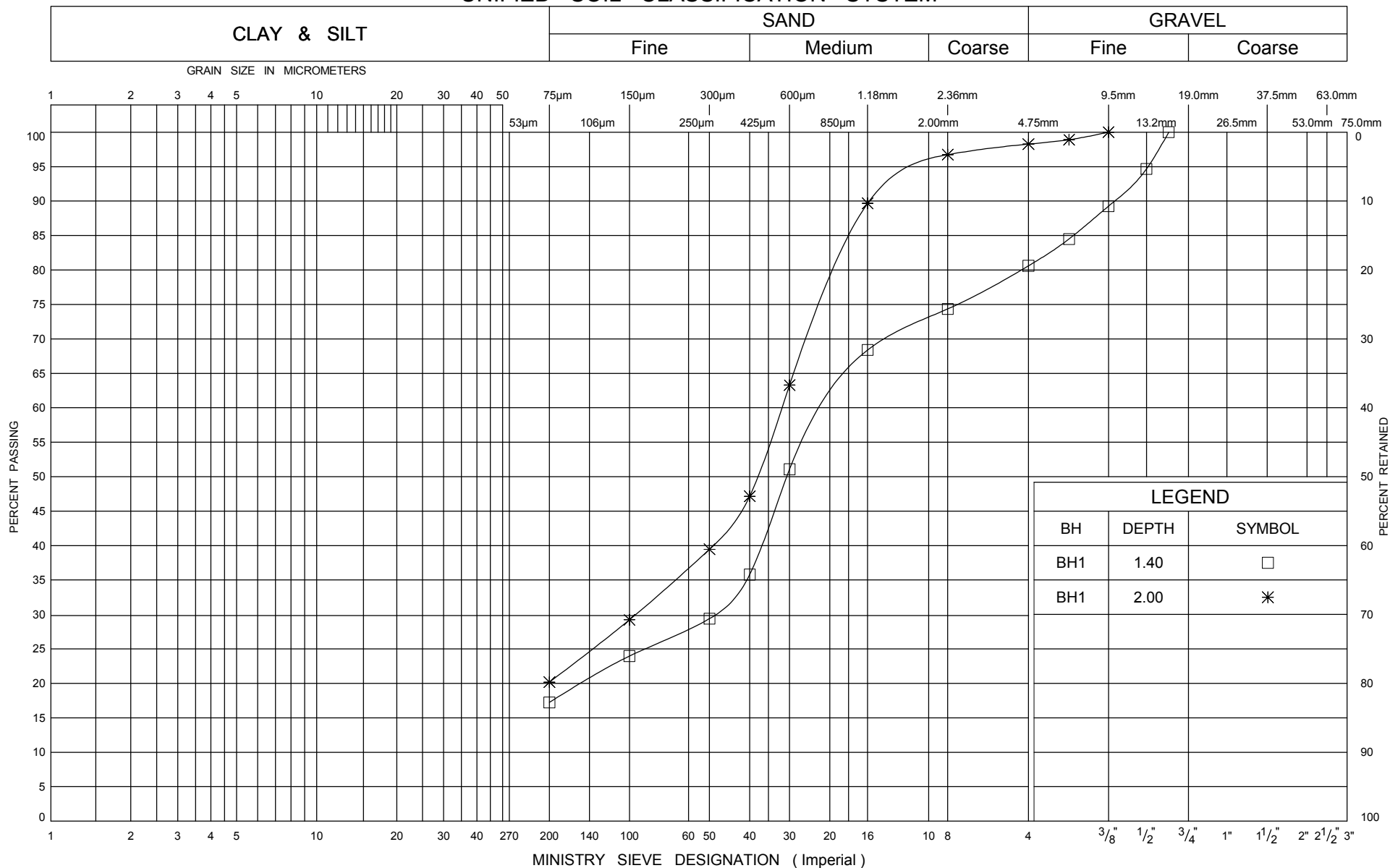
LEGEND		
BH	DEPTH	SYMBOL
BH1	1.00	□
BH1	1.20	*



GRAIN SIZE DISTRIBUTION
SAND □ SILT

ENCLOSURE □
W P □□□□□□□□
HIGHWAY 17

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GRAIN SIZE DISTRIBUTION

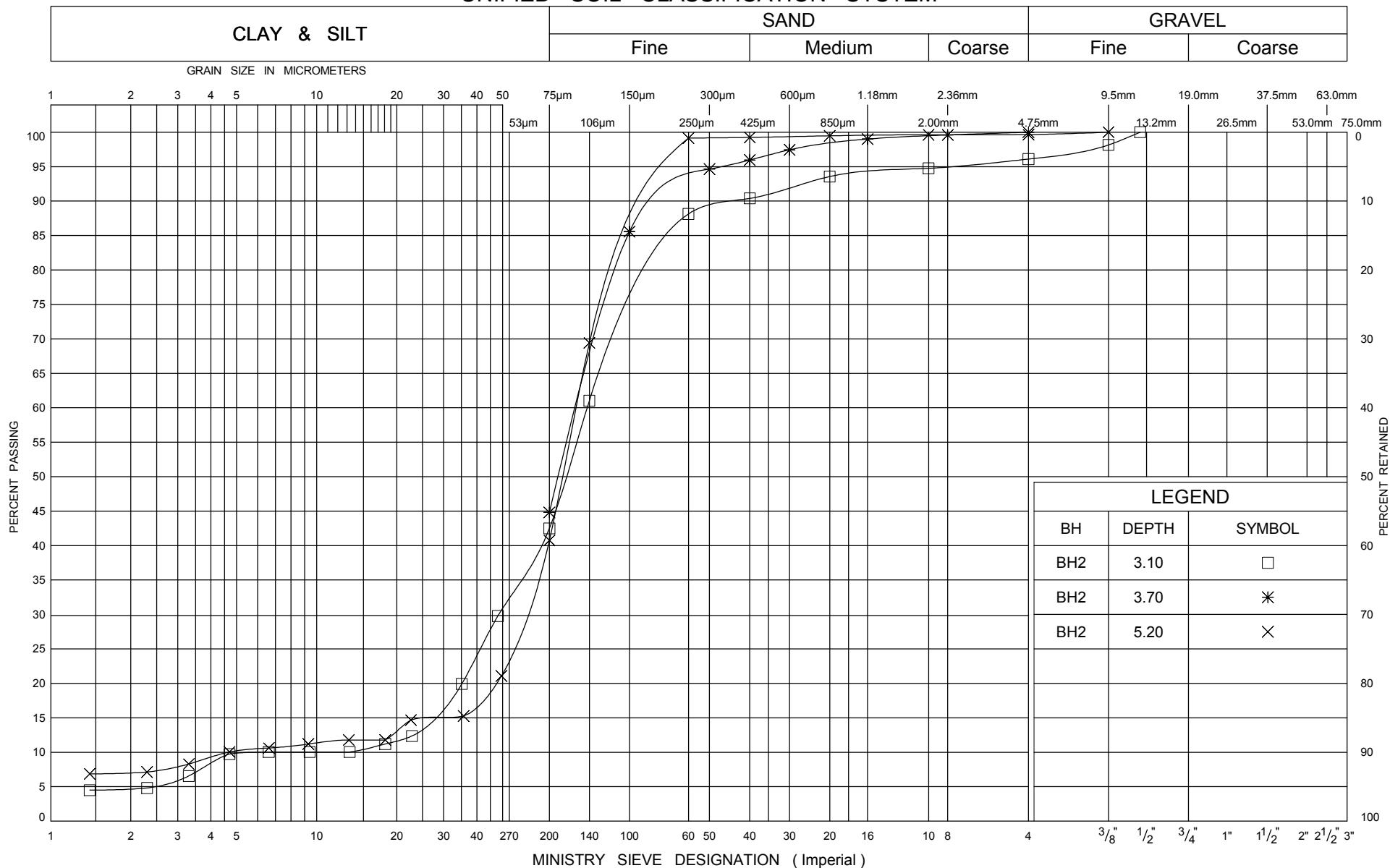
SAND

ENCLOSURE

W P

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GRAIN SIZE DISTRIBUTION

SAND AND SILT

ENCLOSURE

W P □□□□□□□□

HIGHWAY 17