

Final Foundation Investigation Report (FIR)

Highway 61 Culvert Replacement

Station 19+250, Township of Blake

Gannett Fleming

Ontario Ministry of Transportation (MTO)

GWP 6176-15-00

GEOCRES No. 52A-266

Assignment No.: 6020-E-0021

Latitude: 48.238602° Longitude: -89.479167°

September 16, 2022

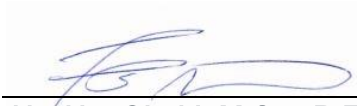
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Gannett Fleming GWP 6176-15-00

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2022-09-15

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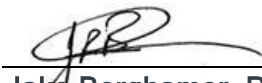


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Table of Contents

1	Introduction	1
2	Site Description.....	1
2.1	Site Physiography and Surficial Geology	2
3	Investigation Procedures	2
3.1	Site Investigation	2
4	Laboratory Investigation.....	3
5	Subsurface Conditions.....	4
5.1	Asphalt	5
5.2	Embankment Fill.....	5
5.3	Silt 6	
5.4	Sand 7	
5.5	Groundwater Conditions	7
5.6	Soil Corrosivity Testing	7
6	General Comments	8
7	STATEMENT OF LIMITATIONS	8

TABLES

Table 1	Borehole Locations	3
Table 2	Summary of Generalized Stratigraphy in Boreholes with Depth and Elevation (m).....	4
Table 3	Particle Size Distribution and Atterberg Limits Results of the Sand Fill	5
Table 4	Particle Size Distribution and Atterberg Limits Results of the Silt Fill.....	5
Table 5	Particle Size Distribution and Atterberg Limits Results of the Silty Clay Fill	6
Table 6	Particle Size Distribution Results of the Native Silt.....	6
Table 7	Particle Size Distribution and Atterberg Limits Results of the Native Sand	7
Table 8	Groundwater Levels.....	7
Table 9	Soil Corrosivity Chemical Analysis Results	8

APPENDICES

Appendix A	Drawings
Appendix B	Subsurface Data
Appendix C	Borehole Plan and Laboratory Data
Appendix D	Culvert Inspection Report (as provided by Gannett Fleming)

1

1 Introduction

Englobe Corp. (Englobe) has been retained by Gannett Fleming (Client), on behalf of the Ministry of Transportation of Ontario (MTO, Owner), to carry out a foundation investigation and prepare Foundation Investigation (FIR) and Foundation Investigation and Design (FIDR) Reports for the proposed replacement of an existing culvert at approximate Station 19+250 on Highway No. 61 in the Township of Blake, Ontario (Site) shown on Drawing No. 1, Appendix A. This assignment was performed at the request of the Client as per the project Terms of Reference outlined in MTO Request for Quotation (RFQ) Version 3.2 under Assignment Number 6020-E-0021 (GEOCREs No. 52A-266).

2

2 Site Description

The existing 53.09 m long culvert structure is a corrugated steel pipe (CSP) at the inlet and reinforced concrete box culvert (RFB) at the outlet. The culvert is crossing Highway 61 at approximate Station 19+250, approximately 725 m south of the Blake Hall Road and Highway 61 intersection, in the Township of Blake. Highway 61 at this culvert crossing is a three-lane undivided highway with asphalt surface and partially paved shoulders on both sides running in an approximate north-south direction, as shown on Drawing No. 1 in Appendix A. Highway 61 is constructed on an embankment about 20.0 m wide (including shoulders) and up to approximately 5.8 m in height above the crown of the culvert, with the centreline of the roadway at an approximate elevation 233.1 m at the culvert location. The pavement surface is generally in good to fair condition with some longitudinal and transverse cracks across the asphalt surface. The sides of the roadway at the culvert crossing were observed to be heavily vegetated with bushes, shrubs, and mature trees. An access to a private property at the east side of Highway 61 is located about 125 m to the south of the culvert crossing. In addition, another access for a private property is located approximately 160 m south of the culvert crossing on the west side of Highway 61. On the east side of the Highway 61, low hanging hydro lines were observed.

The existing culvert structure is crossing Highway 61 at a skew alignment (approximately 57 degree) from east (upstream) to west (downstream). The existing culvert structure is 2.10 m wide and 1.55 m high at the inlet; and 1.85 m wide and 1.22 m high at the outlet, as shown on Drawing No. 2 in Appendix A and described in detail and shown on the sketches and Figures in GF Culvert Inspection Report in Appendix D. The culvert was observed to be deteriorated (has cracking and major separation joints between the upstream CSP and downstream box culvert, and the CSP portion is rusting and sagging). The upstream soffit of the structure has sagged below the downstream obvert, which is impacting hydraulics as well as the overall condition of the crossing. The channel dimensions were described by GF in general as 3 m wide with banks at ~5H:1V and water depth of 400 mm at the channel upstream (US) and 3 m wide with banks at ~3H:1V and water depth of 100 mm at the channel downstream (DS). The top of the culvert elevations at the inlet and outlet are 227.3 and 227.5 m, respectively (i.e. culvert slope has inverse flow) with clearance of 1140 mm at US and dry at DS. Water was observed standing in the culvert as shown on field inspection photos in GF Culvert Inspection Report in Appendix D.

2.1 Site Physiography and Surficial Geology

Based on published Northern Ontario Geology Terrain Study (NOEGTS) of the general area by D.G. Mollard, and J.D. Mollard (1983), the Site is located within the Glaciolacustrine Plain with native overburden/sediments within the immediate project area consisting mainly of silt and sandy soil deposits (mLP and sLP).

Sediments in Glaciolacustrine Plains consist of varved and massive, fine grained materials deposited in glacial lake basins of varying size and depth. These sediments deposited into glacial lakes which inundated large parts of the Thunder Bay area. Glaciolacustrine silt deposits (mLP) with clay contents may have high water retention capacity, low permeability, and poor internal drainage. These characteristics are largely controlled by a network of closely spaced joints. Generally, these landforms possess low density, low bearing strength, and moderate to high compressibility, unless the fine-grained sediments have been consolidated by the weight of overriding glacier ice or by the effects of desiccation. Lacustrine sand plains (sLP) contain mostly fine and medium sand with minor silt. Coarse sand, gravel, cobbles, boulders, and till are rare in these deposits. A high-water table may occur at sites located some distance from the groundwater lowering effects of deep valleys and ravines. Sandy lacustrine materials are typically nonplastic and have high permeability, low compressibility, moderate to high bearing capacity, and high shear strength. They are generally not frost susceptible unless they contain significant amounts of silt and very fine sand.

Bedrock plateaus (RL) and Bedrock knob landscape (RN) occur within the township of Blake. Areas mapped as bedrock plateau (RL) contain bold mesa-like features that have a capping of resistant rock consisting of eroded remnants of Proterozoic diabase sheets. The surface aspect of mesas and plateaus varies from nearly level to moderately sloping. Cliffs around part or all of these elevated features are strewn with coarse talus debris. Bedrock knob landscape (RN) is characterized by an irregular bedrock surface having complex multiple slopes of varying steepness. The cover of glacial deposits overlying the bedrock knobs is generally thin and discontinuous. Much of the glacial overburden consists of bouldery, sand-rich till that was transported only a short distance by the ice.

3

3 Investigation Procedures

3.1 Site Investigation

The purpose of the geotechnical investigation was to explore and record the subsurface conditions at both ends of the existing culvert and in the roadway embankment at the culvert crossing. The fieldwork was carried out between May 10 and June 27, 2022 and consisted of two boreholes on the roadway extending down to a maximum depth of 18.3 m below existing ground/road surface (mbgs) and two boreholes off the roadway at the culvert inlet and outlet to a maximum depth of 6.7 mbgs.

The fieldwork included locating the boreholes, clearing the borehole locations of underground services, in-situ sampling and testing operations, logging of the boreholes, labeling and preparation of samples for transportation to the Englobe North Bay laboratory, plus overall drill supervision.

Englobe's staff visited the Site before the planned site investigation to mark out the proposed borehole locations. Utility clearance was obtained from Ontario-1-Call. Public utility authorities were informed,

and all utility clearance documents were obtained before the commencement of drilling work. A traffic control plan was prepared and implemented by Workforce Inc. of Sudbury, Ontario, according to Ontario Traffic Manual Book 7 during the fieldwork. The drilling rigs used for drilling were owned and operated by Maple Leaf Drilling Ltd. of Sunnyside, Manitoba. Boreholes were advanced using a CME 750 track mounted drill and a B20 portable drilling rig.

The fieldwork for this investigation included four (4) sampled boreholes (BH) were advanced. BH Nos. 1 and 2 were advanced in the roadway shoulders through the embankment. BH Nos. 3 and 4 were advanced at the inlet (Rt) and outlet (Lt) ends of the culvert, respectively. The locations of the boreholes are shown on Drawing No. 2 in Appendix A and are provided in the Table below.

Table 1 Borehole Locations

Borehole No.	Borehole Location (MTM Nad 83)		Borehole Location (Geographic)		
1	N 5344554.5	E 343489.3	Lat: 48.23860°	Long: - 89. 479094°	EL. 233.2 m
2	N 5344565.7	E 343475.6	Lat: 48.23870°	Long: - 89. 479278°	EL. 233.6 m
3	N 5344549.2	E 343506.8	Lat: 48.23855 °	Long: - 89. 478859°	EL. 277.6 m
4	N 5344574.8	E 343460.2	Lat: 48.23878°	Long: - 89.47948°	EL. 226.6 m

BH Nos. 1 and 2 were advanced using a hollow stem auger aided by track-mounted CME 750 drilling rig equipped with routine geotechnical sampling equipment. BH Nos. 3 and 4, which were drilled off the roadway near the inlet and outlet, were advanced using a B20 portable drilling rig equipped with a solid stem auger.

Soil samples were obtained at regular intervals of depth at the borehole locations using a standard 51 mm split spoon sampler advanced in accordance with the Standard Penetration Test (SPT) procedures ASTM D1586. All soil samples taken during this investigation were stored in labeled airtight containers for transport to the Englobe North Bay laboratory for visual examination and select laboratory testing. In addition, due to a flowing sand condition, a dynamic cone penetration testing (DCPT) was also carried out in BH Nos. 1 and 2 up to 18.3 m depth to assess the strength of the subsoils below the SPT sample depths.

Groundwater conditions in the open boreholes were observed during the advancement of the individual boreholes. The boreholes were backfilled upon completion of drilling in accordance with requirements of Ontario Regulation 903.

The location of the individual boreholes was determined in the field using highway chainage established by the Ministry of Transportation and offsets relative to highway centreline. The MTO coordinates, northing and easting, were then established for the boring locations using coordinates from MTM Zone 15, NAD 83 CSRS. Elevations contained in this report are referenced to an on-site geodetic datum. The borehole elevations are based on the GPS RTK survey carried out by Englobe.



4 Laboratory Investigation

All soil samples obtained during the investigation were transported to Englobe Laboratory in North Bay, Ontario. This laboratory is certified by the Ministry of Transportation Ontario (MTO) under RAQS program at Medium Complexity level for Soil and Rock Testing including Testing for Foundation Engineering. All retrieved samples were subject to visual identification and tactile categorization to

describe the soils. The laboratory tests to determine index properties were performed in accordance with the Ministry of Transportation Ontario (MTO) test procedures, which follow the American Society for Testing Materials (ASTM) test procedures. Laboratory testing consisted of grain size distribution; sieve and hydrometer analysis according to ASTM D422 and LS-702, Atterberg's Limits ASTM D4318 and LS-703/704, and water content ASTM D2216 and LS-701. The results of the laboratory testing are presented on the individual Record of Borehole Sheets (Appendix B), with a summary of results presented on the laboratory sheets in Appendix C (Figures Nos. L-1 to L-6).

Chemical tests on one representative soil sample to determine the soil corrosivity characteristics (pH, chloride, resistivity, sulphate) were carried out by an accredited independent laboratory (Bureau Veritas in Mississauga) to assess soil condition for buried structural steel and concrete elements. Laboratory tests are included in Appendix C.

5

5 Subsurface Conditions

The subsurface conditions revealed by the investigation program are summarized in Table 2 below and on the stratigraphic profile presented on Drawing No. 2 (Appendix A) and on the detailed Records of Borehole Logs (Appendix B). It should be noted that the stratigraphic delineation presented on the borehole logs and soil strata plot is interpreted from the results of non-continuous sampling, response to drilling progress, recorded SPT 'N'-values, plus field observations. Typically, such boundaries represent transitions from one zone to another and are not an exact demarcation of specific geological units. Additional consideration should be given to the fact that subsurface conditions may vary markedly between adjacent boreholes and beyond any specific boring location and are shown on the drawings for illustration purposes only.

Table 2 Summary of Generalized Stratigraphy in Boreholes with Depth and Elevation (m)

Deposit/Layer Description	Depths/Elevations (m)			
	Borehole No. 1	Borehole No. 2	Borehole No. 3	Borehole No. 4
Asphalt/Topsoil	0 - 0.05 (El. 233.2)	0 - 0.06 (El. 232.6)	--	--
Embankment Fill: Loose to Dense Sand, some to with Silt (possible cobble/boulder)	0.05 - 7.6 (El. 233.2 - 225.6)	0.06 - 4.9 (El. 232.6 - 227.7)	--	--
Embankment Fill: Firm to Stiff Silty Clay	--	4.9 - 9.1 (El. 227.7- 223.5)	--	--
Embankment Fill: Compact Silt, some Clay, included wood fragments	7.6 - 9.1 (El. 225.6 - 224.1)	--	--	--
Very Loose to Compact Silt, with to trace Clay, trace wood fragments	9.1 - 13.0 (El. 224.1- 220.2)	9.1 - 14.2 (El. 223.5 - 218.4)	0.0 - 6.7 (El. 227.6 - 220.9)	0.0-6.7 (El. 226.6- 219.9)
Compact Sand, trace to with Silt (flowing condition encountered)	13.0 - 18.0 (El. 220.2- 215.2)	14.2 - 18.3 (El. 218.4- 214.3)	--	--

5.1 Asphalt

A thin layer of approximate 50 to 60 mm asphalt was observed in both BH Nos. 2 and 1, respectively, which were drilled on the shoulders through the embankment.

5.2 Embankment Fill

The encountered embankment fill materials underlying the asphalt layer extended down to 9.1 mbgs (El. 224.1 m) in BH No.1 and 9.1 mbgs (El. 223.5 m) in BH No. 2. The embankment fill materials varied in composition with depth. A layer of sand fill (4.8 to 7.6 m thick) was encountered below pavement structure extending down to El. 225.6 m in BH No.1 and to El. 227.7 m in BH No. 2. In BH No. 1, the sand fill is followed by silt fill which was observed to be 1.5 m thick and extended between El. 225.6 m and 224.1 m. Wood fragments was observed in this silt fill layer. In BH. No. 2, the sand fill is followed by a silty clay fill which was observed to be 4.2 m thick and extended between El. 227.7 m and 223.5 m.

The embankment fill, immediately below the asphalt layer, is mainly composed of brown sand with different portions of silt and clay. The sand fill layer extended to approximately 4.9 to 7.6 m depth (El. 227.7 m to 225.6 m). This sand fill layer was almost dry to moist with approximate moisture content of 7 to 19% measured in the geotechnical laboratory. The results for grain size analyses and Atterberg's Limits of representative samples comprising the sand fill layer are summarized in Table 3 and presented on Figure Nos. L-1 and L-2, Appendix C.

Table 3 Particle Size Distribution and Atterberg Limits Results of the Sand Fill

Sample Tested	Sample Depth / Elev. (m)	Grain Size Analysis (%)				Atterberg Limits (%)			Soil Classification
		Gravel	Sand	Silt	Clay	LL	PL	PI	
BH No. 1 / SS-2	1.0 (232.2)	8	76	16		-	-	-	SM
BH No. 1 / SS-5	3.2 (230.0)	17	40	34	9	19.2	15.3	3.8	SM
BH No. 1 / SS-7	4.8 (228.4)	13	34	29	25	31.9	18.2	13.7	SC-SM
BH No. 2 / SS-3	1.7 (230.9)	13	65	22		-	-	-	SM

The sand fill layer was generally very loose to dense, based on recorded SPT 'N' values ranging from 4 to 34 blows/300 mm. Due to a higher SPT 'N' value at sample SS-8 in BH No.1, possible cobbles/boulders were inferred at 5.3 mbgs within the sand fill layer.

The silt fill layer in BH No.1 was observed to be grey/brown, and was generally compact on a recorded SPT 'N' value of 28 blow/300 mm. The silt fill layer included occasional wood fragments. A representative soil sample from this silt fill layer was subjected to grain size analysis and Atterberg's Limits, the results are summarized in Table 4 and provided in Figure Nos. L-1 and L-3, Appendix C.

Table 4 Particle Size Distribution and Atterberg Limits Results of the Silt Fill

Sample Tested	Sample Depth / Elev. (m)	Grain Size Analysis (%)				Atterberg Limits (%)			Soil Classification
		Gravel	Sand	Silt	Clay	LL	PL	PI	
BH No. 1 / SS-10	7.8 (225.4)	0	3	68	29	40.7	26.7	14	CL

The silty clay fill layer was generally soft to stiff on recorded SPT 'N' values ranging from 3 to 11 blows/300 mm. Representative soil samples from this silty clay fill layer was subjected to grain size analysis and Atterberg's Limits, the results are summarized in Table 5 and provided in Figure Nos. L-1 and L-4, Appendix C.

Table 5 Particle Size Distribution and Atterberg Limits Results of the Silty Clay Fill

Sample Tested	Sample Depth / Elev. (m)	Grain Size Analysis (%)				Atterberg Limits (%)			Soil Classification
		Gravel	Sand	Silt	Clay	LL	PL	PI	
BH No. 2 / SS-7 B	5.0 (227.6)	0	7	36	57	-	-	-	CL
BH No. 2 / SS-9	6.4 (226.2)	0	2	52	47	48.4	30.8	17.6	CL

5.3 Silt

Below the embankment fill in BH Nos. 1 and 2, and from surface in BH Nos. 3 and 4, a native silt deposit was encountered. The silt was encountered between El. 223.5 m to 227.6 m and it extended to a maximum depth of El. 218.4 m. The layer was observed to be grey in general and contained trace organics (up to 3.4 %) and trace wood fragments.

The layer consisted mainly of silt with different portions of sand, clay, and gravel. This silt layer was observed to be very loose to compact based on SPT 'N' values ranging from 2 to 13 blows/300 mm. Soil sloughing condition was encountered in this layer in in BH Nos. 3 and 4.

Gradation analyses and Atterberg's Limits were carried out on representative samples of this deposit, and the results are summarized in Table 6 and provided in Figure Nos. L-1 and L-5, Appendix C.

Table 6 Particle Size Distribution Results of the Native Silt

Sample Tested	Sample Depth / Elev. (m)	Grain Size Analysis (%)				Atterberg Limits (%)			Soil Classification
		Gravel	Sand	Silt	Clay	LL	PL	PI	
BH No. 1 / SS-12	11.00 (222.2)	0	0	93	6	-	-	-	ML
BH No. 2 / SS-11	9.3 (223.3)	16	30	40	14	34.1	26.4	7.6	ML
BH No. 2 / SS-13 A	14.1 (218.5)	0	2	82	15	-	-	-	ML
BH No. 3 / SS-2B	1.3 (226.3)	-	-	-	-	32.2	25.6	6.5	ML
BH No. 3 / SS-3	1.8 (225.8)	0	1	80	19	35.1	26.2	8.9	ML
BH No. 3 / SS-8	5.5 (222.1)	6	5	81	7	-	-	-	ML
BH No. 4 / SS-4	2.4 (224.2)	0	18	54	28	-	-	-	ML
BH No. 4 / SS-7	4.9 (221.7)	0	1	85	14	-	-	-	ML

5.4 Sand

A native sand layer was observed below the silt layer in BH Nos. 1 and 2 and extended to the termination depth of these boreholes.

This deposit mainly consisted of sand with different portions of silt and clay. The sand layer was in a wet flowing condition, and thus BH Nos. 1 and 2 were extended by dynamic cone penetration testing (DCPT) method to assess the strength of this sand layer up to 18.3 m depth. The DCPT results indicated that this sand layer was generally compact.

Two gradation (hydrometer) analyses were carried out on representative samples from this deposit, and the results is summarized in Table 7 and provided in Figure No. L-5, Appendix C.

Table 7 Particle Size Distribution and Atterberg Limits Results of the Native Sand

Sample Tested	Sample Depth / Elev. (m)	Grain Size Analysis (%)				Soil Classification
		Gravel	Sand	Silt	Clay	
BH No. 1/SS-2	13.4 (219.8)	0	98	2		SP
BH No. 2/SS-2	14.3 (218.3)	12	51	38		SM

5.5 Groundwater Conditions

Groundwater and cave-in levels were measured in the open boreholes during the course of the fieldwork as summarized in Table 8.

Table 8 Groundwater Levels

BH No.	Drilling Date	Ground Surface Elev. (m)	Borehole Bottom		Monitoring Date	GW in boreholes		Monitoring Date	Surface water levels at the ends of the culverts	
			Depth (m)	Elev. (m)		Depth (m)	Elev. (m)		Depth (m)	Elev. (m)
BH No. 1	May 11, 2022	233.2	18.0	215.2	May 11, 2022	6.8	226.4	--	--	--
BH No. 2	May 10, 2022	232.6	18.3	214.3	May 10, 2022	6.8	225.8	--	--	--
BH No. 3	June 27, 2022	227.6	6.7	220.9	May 04, 2022	-	--	July 14, 2022	1.1	226.5
BH No. 4	May 27, 2022	226.6	6.7	219.9	May 05, 2022	-	--	July 14, 2022	0.1	226.5

The groundwater and surface water levels should be expected to fluctuate seasonally/yearly. The stabilized groundwater level is anticipated to correspond with the creek water level. The lowest creek level is anticipated to be above the average invert elevation of the culvert at elevation 226.2 m. The water level in the creek was measured in July 14, 2022 and was at EL. 226.5 m adjacent to BH No. 3 and EL. 226.5 m adjacent to BH No. 4.

5.6 Soil Corrosivity Testing

A representative soil sample collected from BH No. 1 was subjected to corrosivity chemical tests by Bureau Veritas Laboratories in Thunder Bay to determine its potential corrosivity by measuring

resistivity, pH, sulphate and chloride content of the sample within the estimated infrastructure depths. The results are presented in Table 9.

Table 9 Soil Corrosivity Chemical Analysis Results

BH No.	Sample	Depth (Elev.) (m)	pH	Sulphate (%)	Chloride (%)	Resistivity (Ohm-cm)
BH No. 1	SS-11	9.4 (223.8)	7.54	<0.1800	0.0180	530

6

6 General Comments

The field investigation was carried out using track mounted CME 750 drilling rigs and a portable B20 drilling rig owned and operated by Maple Leaf Drilling Ltd. Laboratory testing of select soil samples was undertaken at the Englobe Laboratory in North Bay. The fieldwork for this site investigation was under the full-time supervision of Englobe technical staff. The report was written by Mr. Ala Abu Obeid, M.Sc., P.Eng., PMP, and peer reviewed by the MTO Designated Contact Mike Tanos, P.Eng., with independent review by Jake Berghamer, P.Eng.

7 STATEMENT OF LIMITATIONS

The design recommendations given in this geotechnical report are applicable only to the project described in the text and only if constructed substantially in accordance with details of alignment and elevations stated in the report. Since all details of the design may not be known, in our analysis certain assumptions had to be made. The actual conditions, however, may vary from those assumed, in which case changes and modifications may be required to our geotechnical recommendations.

The comments in this report are intended solely for the guidance of the design engineer and address the geotechnical conditions only. The number of boreholes required to determine the localized conditions between boreholes directly affecting construction costs, equipment, scheduling, etc. would in fact be greater than what has been carried out for design purposes. Therefore, contractors bidding on this project or undertaking this work should make their own interpretations of the factual borehole results and carry out further work as they deem necessary to assess the scope of the project.

Foundation Design of this report is intended solely for the use of the client and the design team for the detail design of this specific project on behalf of the Ministry of Transportation and is not intended to be included in the tender documents; and shall not be used for any other purposes or by any other parties including the construction Contractor.

Appendix A

Drawings

Drawing No. 1 - Site Location Plan & Key Map

Drawing No. 2 - Borehole Location Plan & Embankment Profile

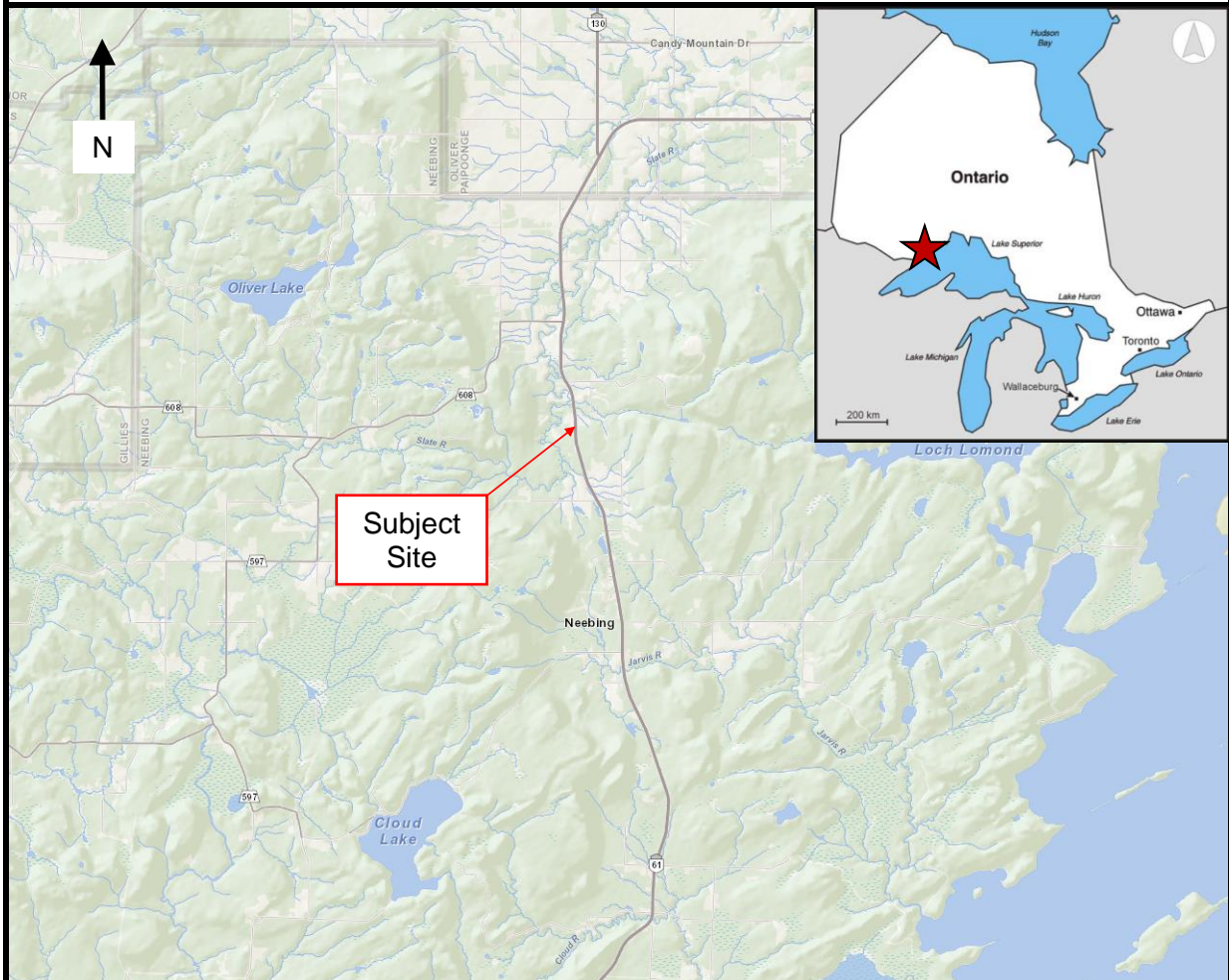


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KEY PLAN

Drawing No. 1

NOT TO SCALE



FINAL FOUNDATION INVESTIGATION REPORT

Station 19+250 Culvert
Culvert Replacement
Highway No. 61, Twp. of Blake Assignment
Number 6020-E-0021
GWP 6176-15-00

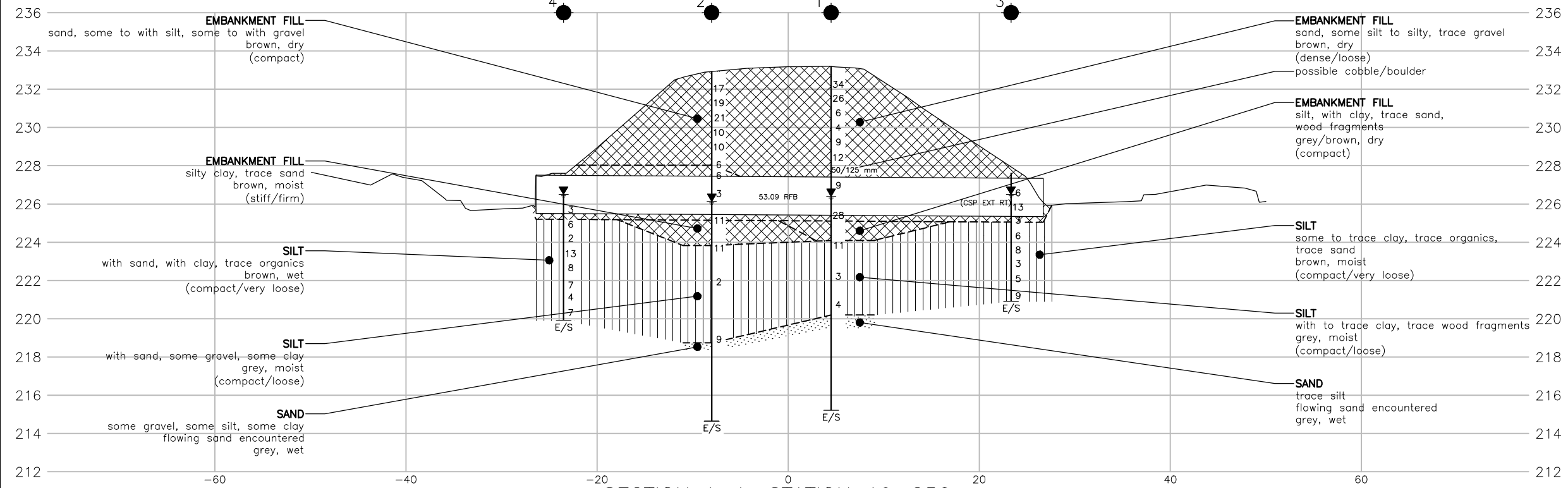
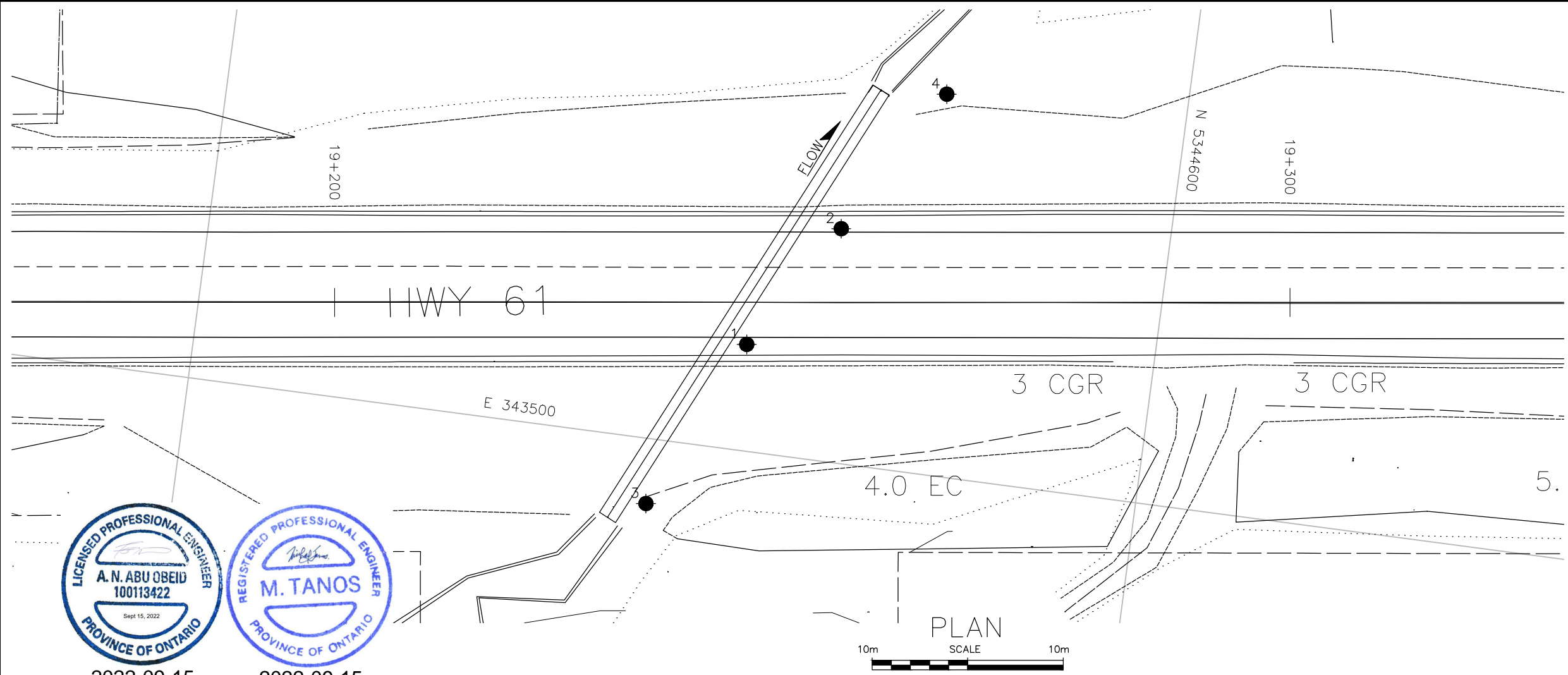
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July 2022



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DATE PLOTTED: 9/19/2022 9:34:40 AM BY:

PR-D-207 BM-03
MINISTRY OF TRANSPORTATION, ONTARIO



This drawing is for subsurface information only. Surface details and features are for conceptual illustration. The proposed structure location is shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contract Documents.



DISTRICT
CONT. No.
GWP No. 6176-15-00

REHABILITATION OF HWY 61
CULVERT REPLACEMENT
STATION ±19+250

BOREHOLE LOCATIONS
AND SOIL STRATIGRAPHY

SHEET
2

KEY PLAN
N.T.S.

Borehole

N

DCPT

Water Level at Time of Investigation

Auger Refusal at Elevation

End of Sampling

Piezometer

BOREHOLE No.	ELEVATION	O/S	NORTHING	EASTING
1	233.2	4.5 m Rt	5344554.5	343489.3
2	232.6	8.0 m Lt	5344565.7	343475.6
3	227.6	21.7 m Rt	5344549.2	343506.8
4	226.6	23.5 m Lt	5344574.8	343460.2

NOTES:

The boundaries between soil strata have been established at the borehole locations only. The boundaries illustrated and stratigraphy between boreholes on this drawing are assumed based on borehole data and may vary. They are intended for design only.

Base plan and alignment provided in digital format by Gannett Fleming on July 27, 2021

Coordinates based on MTM Zone 15 NAD83 CSRS

GEOCRES No. 52A-266

REVISIONS

NO.	DATE	BY	DESCRIPTION
1	JUL/22	DM	DRAFT
2	SEP/22	DM	FINAL

DESIGN	CHK	CODE	LOAD	DATE
DRAWN	DM	CHK	AO	SITE

STRUCT	SCHEME	DWG
		2

Appendix B

Subsurface Data

Enclosure No. 1 List of Abbreviations and Symbols
Enclosure Nos. 2 to 7 Record of Borehole Sheets



eNGLOBE



LIST OF SYMBOLS AND DEFINITIONS FOR GEOTECHNICAL SAMPLING AND COMMON LITHOLOGIES

The following is a reference sheet for commonly used symbols and definitions within this report and in any figures or appendices, including borehole logs and test results. Symbols and definitions conform to the standard proposed by the International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE) wherever possible. Discrepancies may exist when comparing to third-party results using the Unified Soil Classification System (USCS).

PART A – SOILS

Standard Penetration Test (SPT) 'N'

The number of blows required to drive a 50-mm (2 in) split barrel sampler 300 mm (12 in). The standard hammer has a mass of 63.5 kg (140 lbs) and is dropped vertically from a height of 760 mm (30 in). Additional information can be found in ASTM D1586-11 and in §4.5.2 of the CFEM 4th Ed.

For penetration less than 300 mm, 'N' is recorded with the penetration that was achieved.

Non-Cohesive Soils

The relative density of non-cohesive soils relates empirically to SPT 'N' as follows:

Relative Density	'N'
Very Loose	0 – 4
Loose	4 – 10
Compact	10 – 30
Dense	30 – 50
Very Dense	> 50

Cohesive Soils

The consistency and undrained shear strength of cohesive soils relates empirically to SPT 'N' as follows:

Consistency	Undrained Shear Strength (kPa)	'N'
Very Soft	< 12	0 – 2
Soft	12 – 25	2 – 4
Firm	25 – 50	4 – 8
Stiff	50 – 100	8 – 15
Very Stiff	100 – 200	15 – 30
Hard	> 200	> 30

PART B – ROCK

The following parameters are used to describe core recovery and to infer the quality of a rockmass.

Total Core Recovery, TCR (%)

The total length of solid drill core recovered, regardless of the quality or length of the pieces, taken as a percentage of the length of the core run.

Solid Core Recovery, SCR (%)

The total length of solid, full-diameter drill core recovered, taken as a percentage of the length of the core run.

Rock Quality Designation, RQD (%)

The sum of the lengths of solid drill core greater than 100 mm long, taken as a percentage of the length of the core run. RQD is commonly used to infer the quality of the rockmass, as follows:

Rockmass Quality	RQD (%)
Very Poor	< 25
Poor	25 – 50
Fair	50 – 75
Good	75 – 90
Excellent	> 90

Weathering

The terminology used to describe the degree of weathering for recovered rock core is defined as follows, as suggested by the *Geological Society of London*:

Completely weathered: All rock material is decomposed and/or disintegrated to soil. The original mass structure is largely intact.

Highly weathered: More than half the rock material is decomposed and/or disintegrated to soil. Fresh or discolored rock is present either as a discontinuous framework or as core stone.

Moderately weathered: Less than half the rock material is decomposed and/or disintegrates to soil. Fresh or discolored rock is present either as a continuous framework or as core stone.

Slightly weathered: Discoloration indicates weathering of rock material and discontinuity of surfaces. All the rock material may be discolored by weathering and may be somewhat weaker than its fresh condition.

Fresh: No visible signs of weathering.

PART C – SAMPLING SYMBOLS

Symbol	Description
SS	Split spoon sample
TW	Thin-walled (Shelby Tube) sample
PH	Sampler advanced by hydraulic pressure
WH	Sampler advanced by static weight
SC	Soil core

PART D – IN-SITU AND LAB TESTING

SOIL NAMING CONVENTIONS

Particle sizes are described as follows:

Particle Size Descriptor	Size (mm)
Boulder	> 300
Cobble	75 – 300
Gravel	Coarse 19 – 75 Fine 4.75 – 19
Sand	Coarse 2.0 – 4.75 Medium 0.425 – 2.0 Fine 0.075 – 0.425
Silt	0.002 – 0.075
Clay	< 0.002

The principle constituent of a soil is written in uppercase. The minor constituents of a soil are written according to the following convention:

Descriptive Term	Proportion of Soil (%)
Trace	1 – 10
Some	10 – 20
(ey) or (y)	20 – 35
And	35 – 50

Eg.: A soil comprising 65% Silt, 21% Sand and 14% Clay would be described as a: Sandy SILT, Some Clay

RECORD OF BOREHOLE No. 1

1 OF 2

METRIC

W.P. GWP 6176-15-00 LOCATION 19+243, 4.5 m Rt, Blake Twp. ORIGINATED BY RT
 DIST Thunder Bay HWY 61 BOREHOLE TYPE CME 750 - Hollow Stem Auger COMPILED BY DMc
 DATUM Geodetic DATE 2022.05.11 - 2022.05.11 MTM Zone 15 343489 E 5344554 N
 LATITUDE 48.238596 LONGITUDE -89.479093 CHECKED BY AO

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									
233.2								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE	WATER CONTENT (%)								
								20 40 60 80 100 40 80 120 160 200	20 40 60								
0.1	ASPHALT - 50 mm EMBANKMENT FILL - SAND - some silt to silty, trace gravel, brown, dry, dense to loose		1	AS			233										
			2	SS	34							○				8 76 (16)	
			3	SS	26		232										
			4	SS	6		231										
	- trace clay		5	SS	4		230					○				17 40 34 9	
			6	SS	9		229										
	- with silt, clay, some gravel, compact		7	SS	12		228									13 34 29 25	
			8	SS	50/ 125 mm		227										
	- possible cobble/boulder		9	SS	9		226										
	- wet						225										
225.6			10	SS	28		224										
7.6	EMBANKMENT FILL - SILT - with clay, trace sand, wood fragments, grey/brown, dry, compact																
224.1			11	SS	11												
9.1	SILT - with to trace clay, grey, moist, compact to loose																

Continued Next Page

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

ONTARIO MTO GWP 6176-15-00 - HIGHWAY 61 - CULVERT 19+250.GPJ ONTARIO MTO.GDT 7/19/22

2 OF 2

METRIC

DATUM	Geodetic	DATE	2022.05.11 - 2022.05.11	LATITUDE	48.238596	LONGITUDE	-89.479093	CHECKED BY	AO
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[illegible]

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

RECORD OF BOREHOLE No. 2

1 OF 2

METRIC

W.P. GWP 6176-15-00 LOCATION 19+254, 8.0 m Lt, Blake Twp. ORIGINATED BY RT
 DIST Thunder Bay HWY 61 BOREHOLE TYPE CME 750 - Hollow Stem Auger COMPILED BY DMc
 DATUM Geodetic DATE 2022.05.10 - 2022.05.10 MTM Zone 15 343476 E 5344566 N
 LATITUDE 48.238697 LONGITUDE -89.479277 CHECKED BY AO

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			SHEAR STRENGTH kPa								WATER CONTENT (%)		
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE										
232.6							20	40	60	80	100							
0.1	ASPHALT - (60 mm) EMBANKMENT FILL - SAND - some to with silt, some to with gravel, brown, dry, compact		1	AS														
			2	SS	17													
	- moist		3	SS	19													
			4	SS	21													
			5	SS	10													
			6	SS	10													
			7A 7B	SS	6													
227.7	EMBANKMENT FILL - SILTY CLAY - trace sand, brown, moist, firm to stiff		8	SS	6													
4.9	- grey/brown		9	SS	3													
	- grey		10	SS	11													
			11	SS	11													
223.5	SILT - with sand, some gravel, clay, grey, moist, compact to loose																	
9.1																		

Continued Next Page

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

ONTARIO MTO GWP 6176-15-00 - HIGHWAY 61 - CULVERT 19+250.GPJ ONTARIO MTO.GDT 7/19/22

2 OF 2

METRIC

DATUM	Geodetic	DATE	2022.05.10 - 2022.05.10	LATITUDE	48.238697	LONGITUDE	-89.479277	CHECKED BY	AO
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+³, ×³: Numbers refer to Sensitivity ○^{3%} STRAIN AT FAILURE

RECORD OF BOREHOLE No. 3

1 OF 1

METRIC

W.P. GWP 6176-15-00 LOCATION 19+230, 21.7 m Rt, Blake Twp. ORIGINATED BY RT
 DIST Thunder Bay HWY 61 BOREHOLE TYPE B20 - Hollow Stem COMPILED BY DMc
 DATUM Geodetic DATE 2022.06.27 - 2022.06.27 MTM Zone 15 343507 E 5344549 N
 LATITUDE 48.238547 LONGITUDE -89.478858 CHECKED BY AO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa				WATER CONTENT (%)				
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE				W _p W W _L				
227.6							20	40	60	80	100					
0.0	SILT - some to trace clay, trace organics, trace sand, brown, moist, very loose to compact		1	AS												
	- some organics		2A	SS	6											
			2B													
			3	SS	13											
	- grey, wet		4	SS	3											
			5	SS	6											
			6	SS	8											
			7	SS	3											
	- trace gravel		8	SS	5											
			9	SS	9											
220.9																
6.7	End of Borehole at 6.7 m bgs															

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


ONTARIO MTO GWP 6176-15-00 - HIGHWAY 61 - CULVERT 19+250.GPJ ONTARIO MTO.GDT 7/19/22

RECORD OF BOREHOLE No. 4

1 OF 1

METRIC

W.P. GWP 6176-15-00 LOCATION 19+261, 23.5 m Lt, Blake Twp. ORIGINATED BY RT
 DIST Thunder Bay HWY 61 BOREHOLE TYPE B20 - Hollow Stem COMPILED BY DMc
 DATUM Geodetic DATE 2022.06.27 - 2022.06.27 MTM Zone 15 343460 E 5344575 N
 LATITUDE 48.23878 LONGITUDE -89.479483 CHECKED BY AO

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)										
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									WATER CONTENT (%)					GR	SA	SI	CL		
																	20	40	60	80	100						
226.6	0.0	SILT - with clay, with sand, trace organics, brown, wet, very loose - some sand, moist - dark grey, wet - some clay, trace sand, compact to loose		1	AS			226													0	18	54	28			
	2			SS	3																						
	3			SS	6																						
	4			SS	2																						
	5			SS	13																						
	6			SS	8																						
	7			SS	7																						
	8	SS	4																								
	9	SS	7																								
219.9	6.7	End of Borehole at 6.7 m bgs						220																			

ONTARIO MTO GWP 6176-15-00 - HIGHWAY 61 - CULVERT 19+250.GPJ ONTARIO MTO.GDT 7/19/22

Appendix C

Borehole Plan and Laboratory Data

Figure No. L-1: Fill: Sand Grain Size Distribution Curve

Figure No. L-2: Fill: Silt Grain Size Distribution Curve

Figure No. L-3: Fill: Silty Clay Grain Size Distribution Curve

Figure No. L-4: Silt Grain Size Distribution Curve

Figure No. L-5: Sand Grain Size Distribution Curve

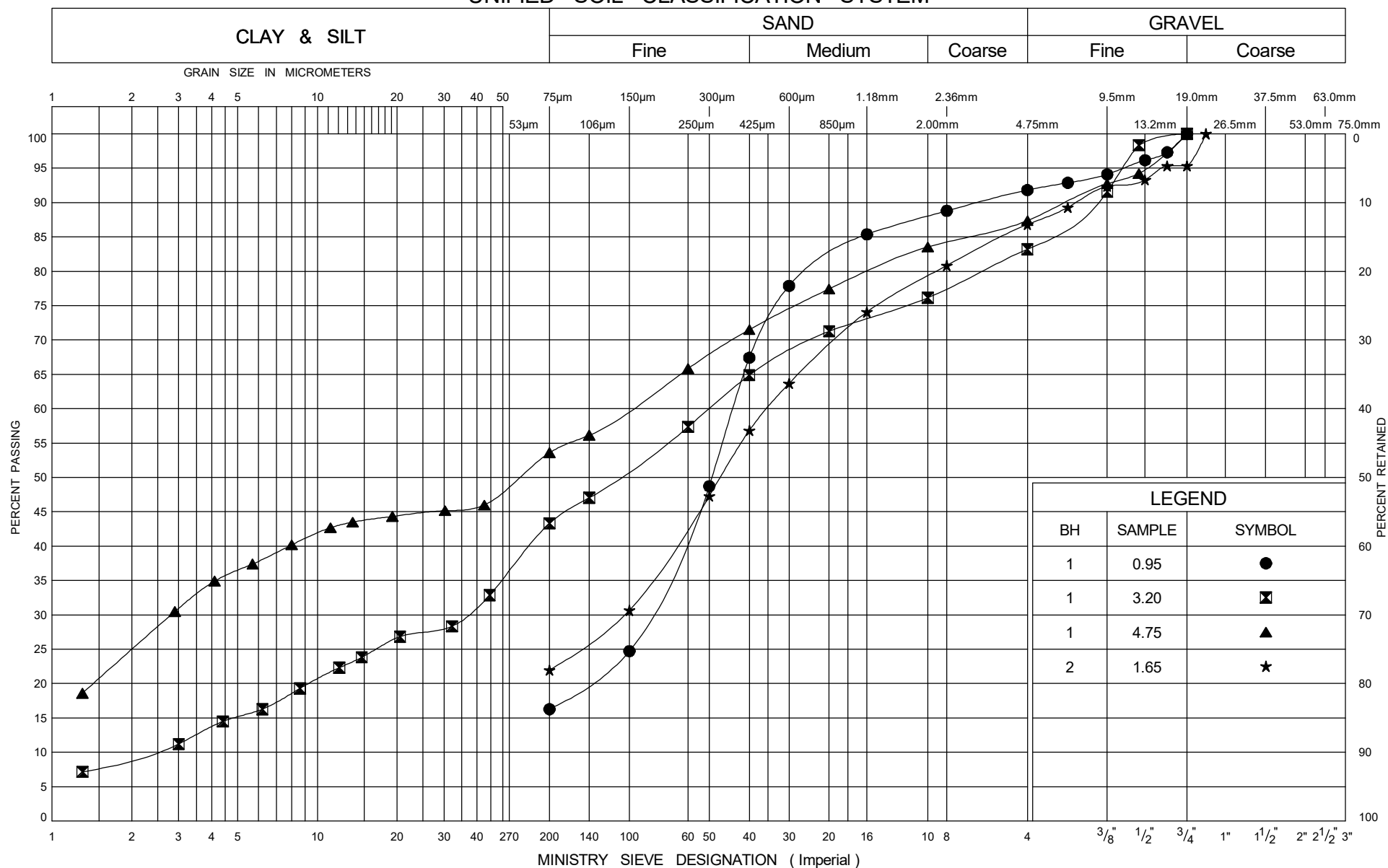
Figure No. L-6: Atterberg Limits Summary

Chemical Test Results



eNGLOBE

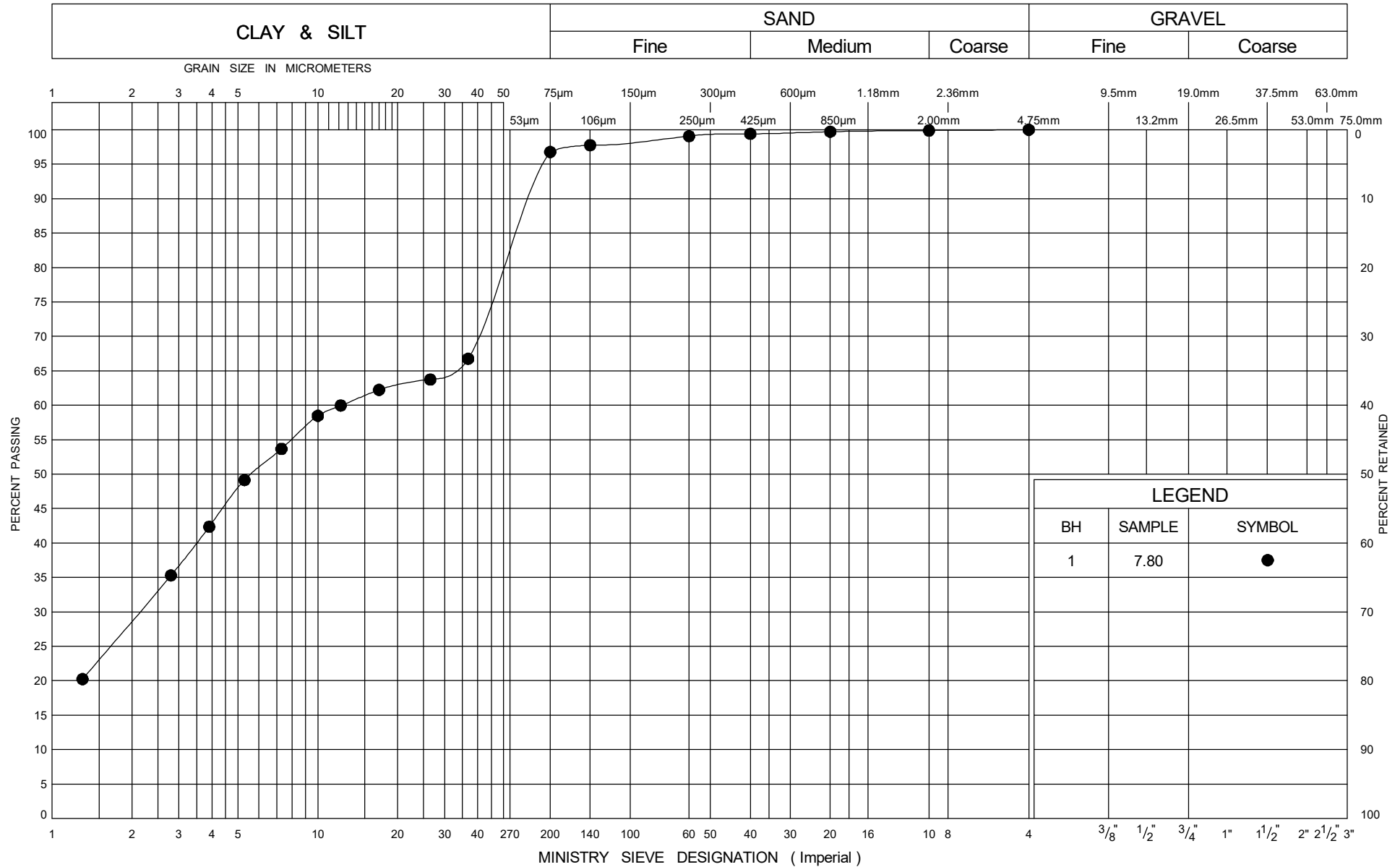
UNIFIED SOIL CLASSIFICATION SYSTEM



GRAIN SIZE DISTRIBUTION

FILL - SAND

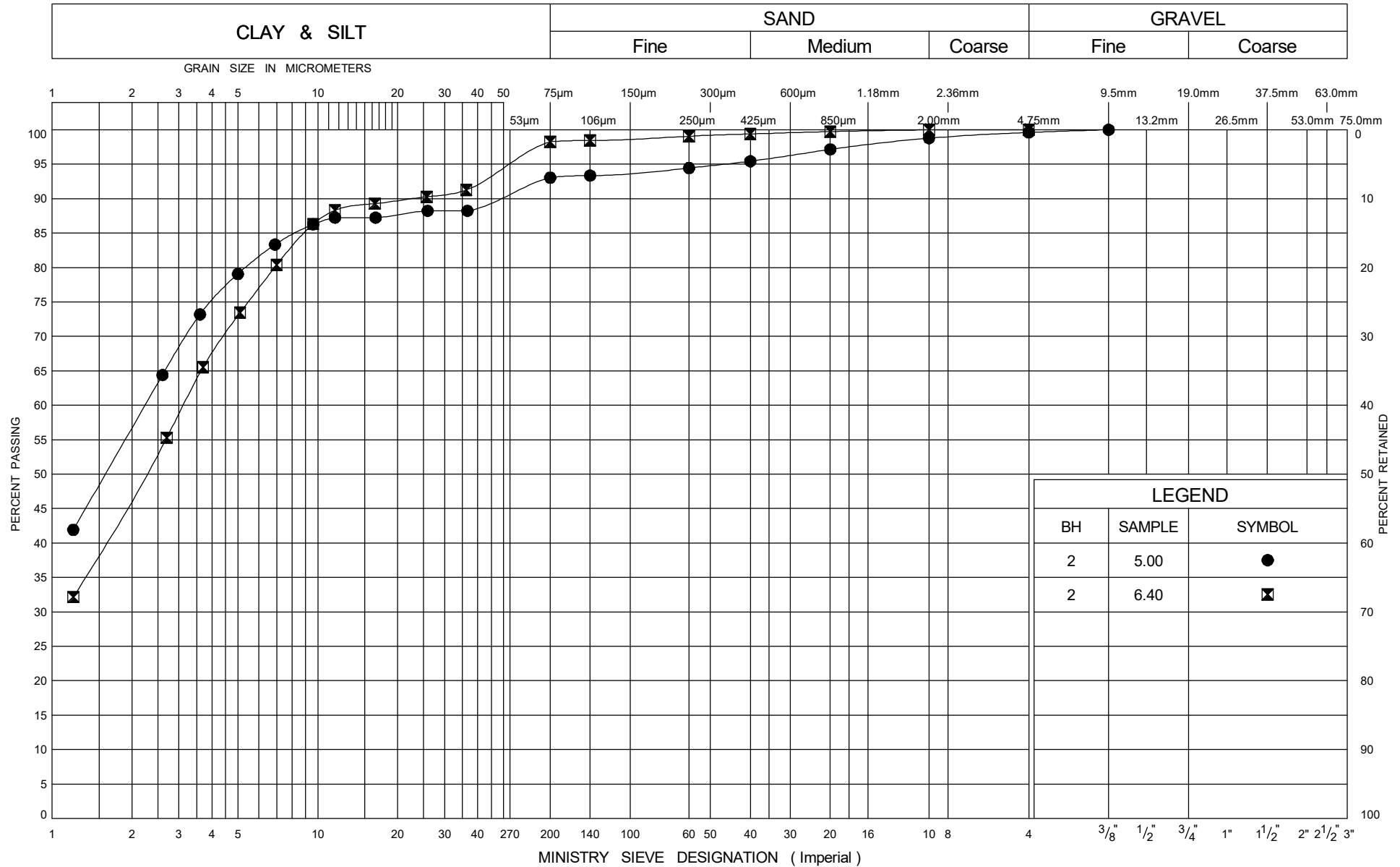
UNIFIED SOIL CLASSIFICATION SYSTEM



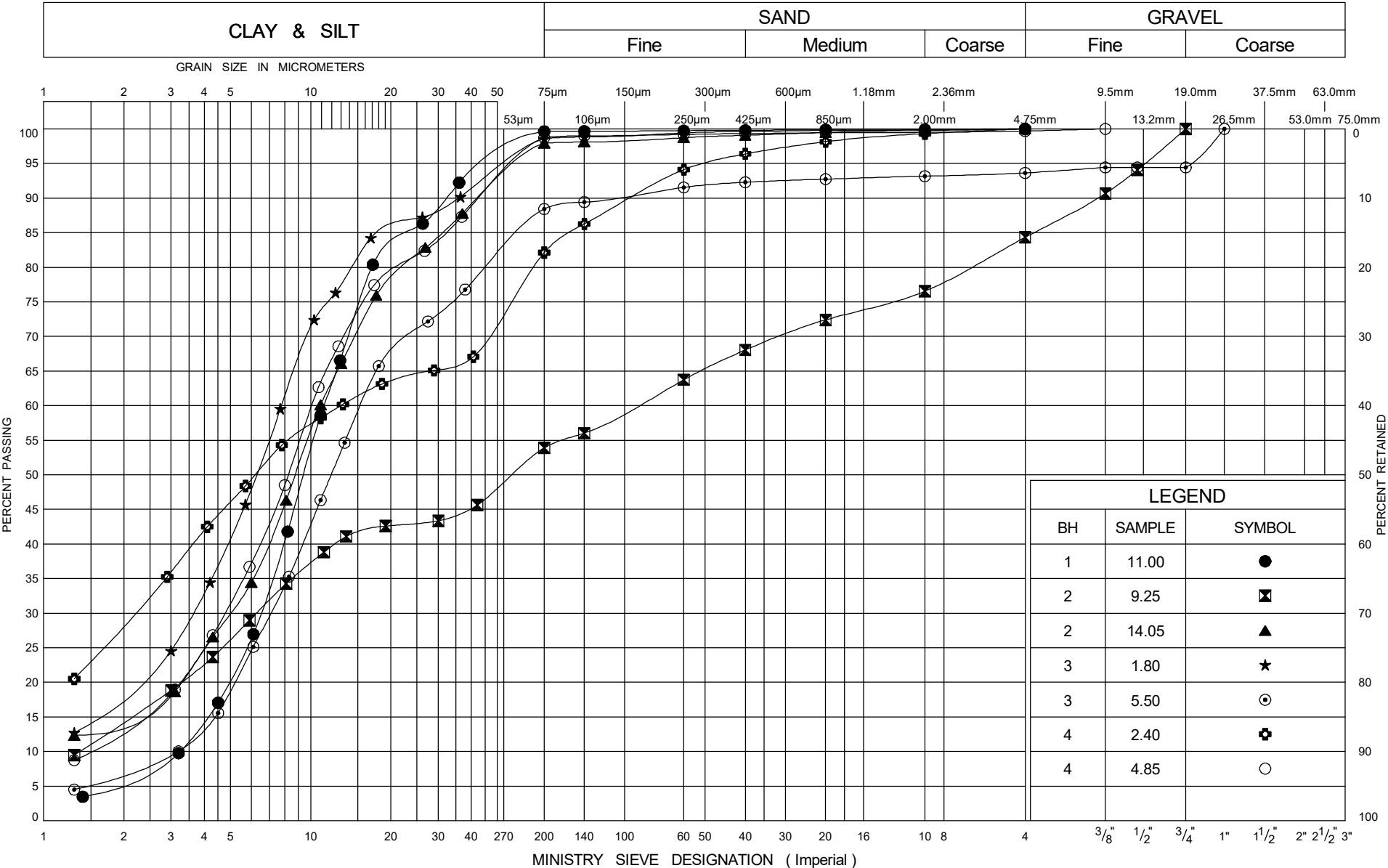
GRAIN SIZE DISTRIBUTION

FILL - SILT

UNIFIED SOIL CLASSIFICATION SYSTEM



UNIFIED SOIL CLASSIFICATION SYSTEM

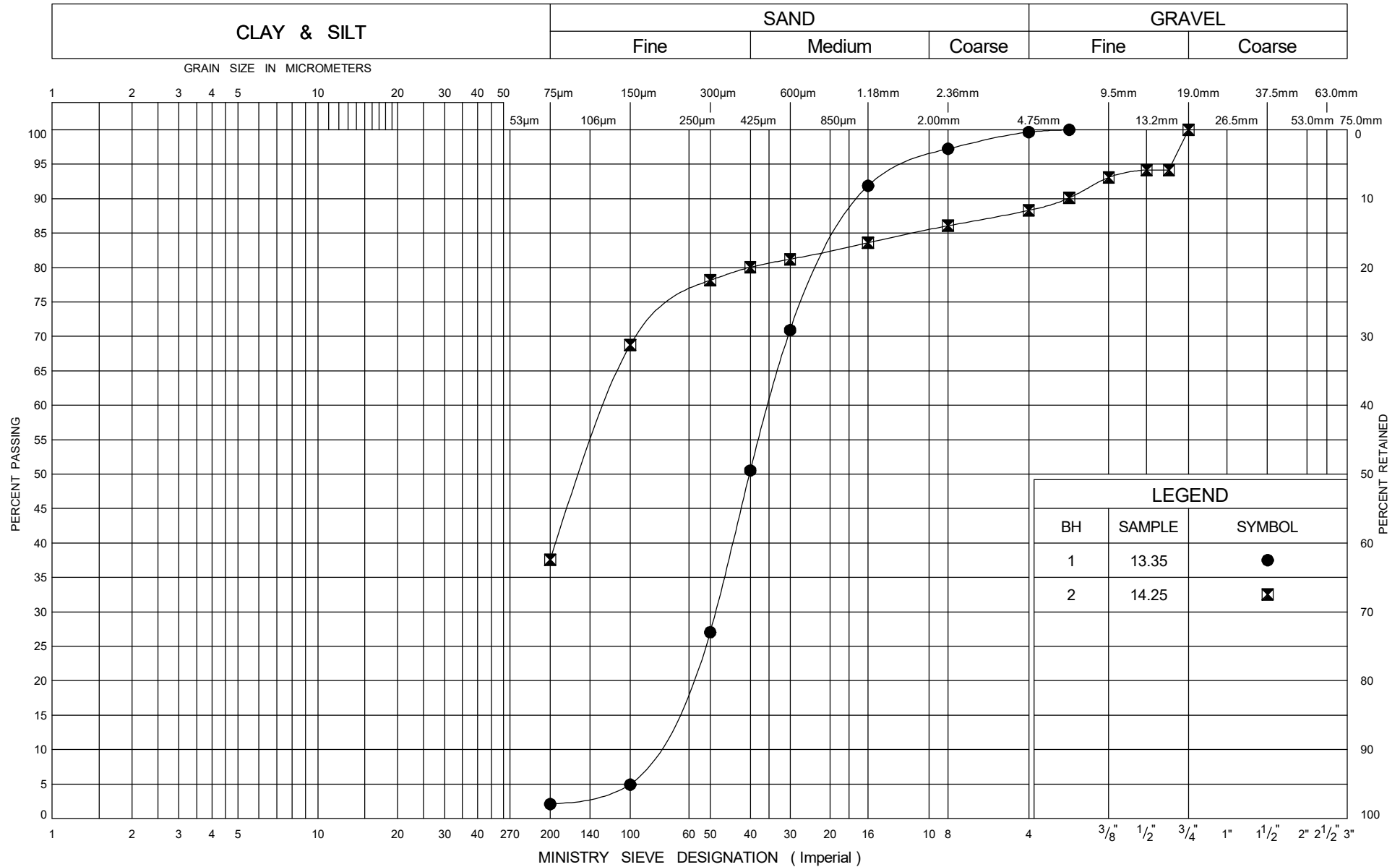


GRAIN SIZE DISTRIBUTION

SAND

GWP 6176-15-00
Highway 61, NWR

UNIFIED SOIL CLASSIFICATION SYSTEM

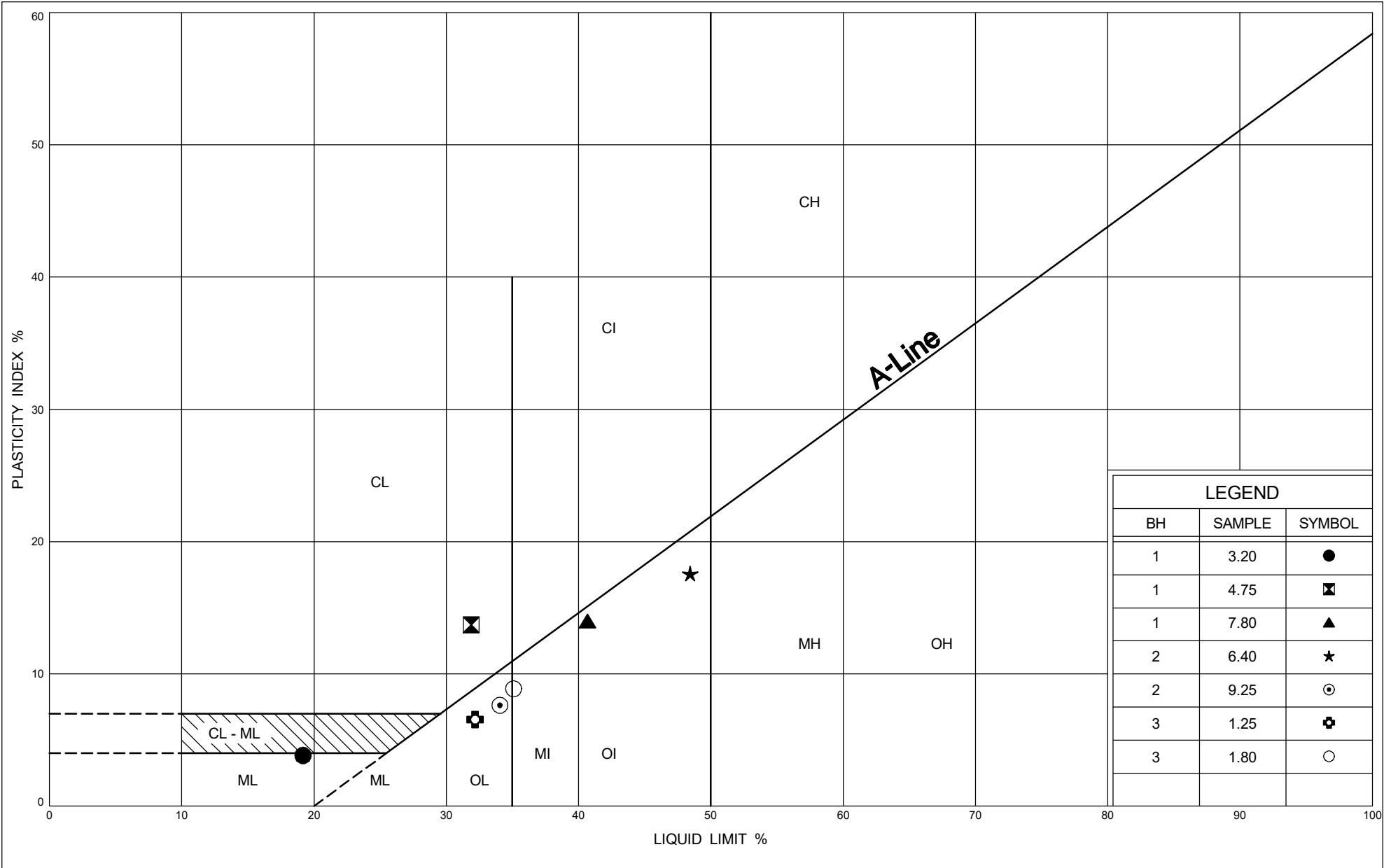


GRAIN SIZE DISTRIBUTION

SAND

ONTARIO MOT PLASTICITY CHART GWP 6176-15-00 - HIGHWAY 61 - CULVERT 19+250.GPJ ONTARIO MOT.GDT 7/18/22

Oct 75, FF - S - 21



Ministry of
Transportation

PLASTICITY CHART

GWP 6176-15-00

Highway 61, NWR



Your Project #: 2109931
Site Location: HIGHWAY 61, NEEBING ONTARIO
Your C.O.C. #: n/a

Attention: Diana McKay

Englobe Corp.
Thunder Bay - Standing Offer
605 Hewitson Street
Thunder Bay, ON
CANADA P7B 5V5

Report Date: 2022/07/27
Report #: R7229510
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C2K2504

Received: 2022/07/20, 15:11

Sample Matrix: Soil
Samples Received: 3

Analyses	Quantity	Date	Date	Laboratory Method	Analytical Method
		Extracted	Analyzed		
Chloride (20:1 extract)	3	2022/07/26	2022/07/26	CAM SOP-00463	SM 23 4500-Cl E m
Conductivity	3	2022/07/26	2022/07/26	CAM SOP-00414	OMOE E3530 v1 m
pH CaCl2 EXTRACT	3	2022/07/26	2022/07/26	CAM SOP-00413	EPA 9045 D m
Resistivity of Soil	3	2022/07/21	2022/07/27	CAM SOP-00414	SM 23 2510 m
Sulphate (20:1 Extract)	3	2022/07/26	2022/07/26	CAM SOP-00464	EPA 375.4 m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.



Your Project #: 2109931
Site Location: HIGHWAY 61, NEEBING ONTARIO
Your C.O.C. #: n/a

Attention: Diana McKay

Englobe Corp.
Thunder Bay - Standing Offer
605 Hewitson Street
Thunder Bay, ON
CANADA P7B 5V5

Report Date: 2022/07/27
Report #: R7229510
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C2K2504

Received: 2022/07/20, 15:11

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Deepthi Shaji, Project Manager

Email: Deepthi.Shaji@bureauveritas.com

Phone# (905)817-5700 Ext:7065843

=====

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Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports.

For Service Group specific validation please refer to the Validation Signature Page.



RESULTS OF ANALYSES OF SOIL

Bureau Veritas ID		TFJ445			TFJ446			TFJ447		
Sampling Date		2022/05/09 11:45			2022/05/11 03:15			2022/05/12 10:00		
COC Number		n/a			n/a			n/a		
	UNITS	16+215	RDL	QC Batch	19+250	RDL	QC Batch	20+200	RDL	QC Batch
Calculated Parameters										
Resistivity	ohm-cm	740		8123845	530		8123845	3200		8123845
Inorganics										
Soluble (20:1) Chloride (Cl-)	ug/g	<20	20	8130430	180	20	8130430	110	20	8130430
Conductivity	mS/cm	1.3	0.002	8130206	1.9	0.002	8130211	0.31	0.002	8130206
Available (CaCl2) pH	pH	7.69		8130626	7.54		8130626	7.10		8130626
Soluble (20:1) Sulphate (SO4)	ug/g	1500	60	8130435	1800	80	8130435	<20	20	8130435
RDL = Reportable Detection Limit										
QC Batch = Quality Control Batch										



BUREAU
VERITAS

Bureau Veritas Job #: C2K2504

Report Date: 2022/07/27

Englobe Corp.

Client Project #: 2109931

Site Location: HIGHWAY 61, NEEBING ONTARIO

Sampler Initials: RT

TEST SUMMARY

Bureau Veritas ID: TFJ445
Sample ID: 16+215
Matrix: Soil

Collected: 2022/05/09
Shipped:
Received: 2022/07/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride (20:1 extract)	KONE/EC	8130430	2022/07/26	2022/07/26	Alina Dobreanu
Conductivity	AT	8130206	2022/07/26	2022/07/26	Kien Tran
pH CaCl2 EXTRACT	AT	8130626	2022/07/26	2022/07/26	Taslina Aktar
Resistivity of Soil		8123845	2022/07/27	2022/07/27	Automated Statchk
Sulphate (20:1 Extract)	KONE/EC	8130435	2022/07/26	2022/07/26	Alina Dobreanu

Bureau Veritas ID: TFJ446
Sample ID: 19+250
Matrix: Soil

Collected: 2022/05/11
Shipped:
Received: 2022/07/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride (20:1 extract)	KONE/EC	8130430	2022/07/26	2022/07/26	Alina Dobreanu
Conductivity	AT	8130211	2022/07/26	2022/07/26	Kien Tran
pH CaCl2 EXTRACT	AT	8130626	2022/07/26	2022/07/26	Taslina Aktar
Resistivity of Soil		8123845	2022/07/27	2022/07/27	Automated Statchk
Sulphate (20:1 Extract)	KONE/EC	8130435	2022/07/26	2022/07/26	Alina Dobreanu

Bureau Veritas ID: TFJ447
Sample ID: 20+200
Matrix: Soil

Collected: 2022/05/12
Shipped:
Received: 2022/07/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride (20:1 extract)	KONE/EC	8130430	2022/07/26	2022/07/26	Alina Dobreanu
Conductivity	AT	8130206	2022/07/26	2022/07/26	Kien Tran
pH CaCl2 EXTRACT	AT	8130626	2022/07/26	2022/07/26	Taslina Aktar
Resistivity of Soil		8123845	2022/07/27	2022/07/27	Automated Statchk
Sulphate (20:1 Extract)	KONE/EC	8130435	2022/07/26	2022/07/26	Alina Dobreanu



BUREAU
VERITAS

Bureau Veritas Job #: C2K2504

Report Date: 2022/07/27

Englobe Corp.

Client Project #: 2109931

Site Location: HIGHWAY 61, NEEBING ONTARIO

Sampler Initials: RT

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	25.0°C
-----------	--------

Results relate only to the items tested.

BUREAU
VERITAS

Bureau Veritas Job #: C2K2504

Report Date: 2022/07/27

QUALITY ASSURANCE REPORT

Englobe Corp.

Client Project #: 2109931

Site Location: HIGHWAY 61, NEEBING ONTARIO

Sampler Initials: RT

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8130206	Conductivity	2022/07/26			100	90 - 110	<0.002	mS/cm	2.3	10
8130211	Conductivity	2022/07/26			100	90 - 110	<0.002	mS/cm	4.8	10
8130430	Soluble (20:1) Chloride (Cl-)	2022/07/26	116	70 - 130	102	70 - 130	<20	ug/g	NC	35
8130435	Soluble (20:1) Sulphate (SO4)	2022/07/26	127	70 - 130	107	70 - 130	<20	ug/g	NC	35
8130626	Available (CaCl2) pH	2022/07/26			100	97 - 103			0.096	N/A

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference $\leq 2 \times \text{RDL}$).



BUREAU
VERITAS

Bureau Veritas Job #: C2K2504

Report Date: 2022/07/27

Englobe Corp.

Client Project #: 2109931

Site Location: HIGHWAY 61, NEEBING ONTARIO

Sampler Initials: RT

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Ewa Pranjić, M.Sc., C.Chem, Scientific Specialist

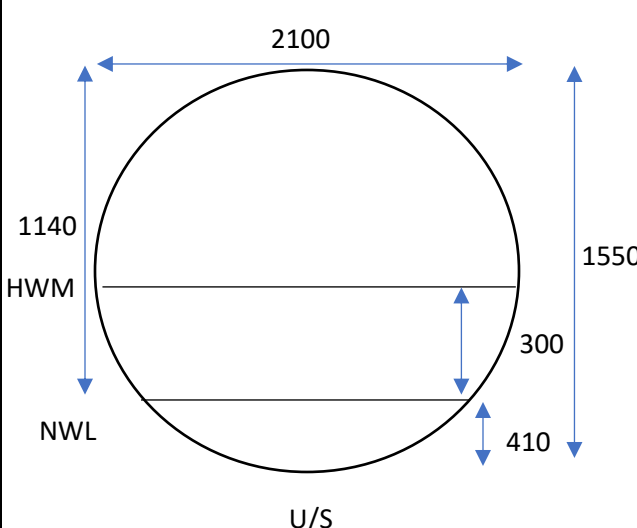
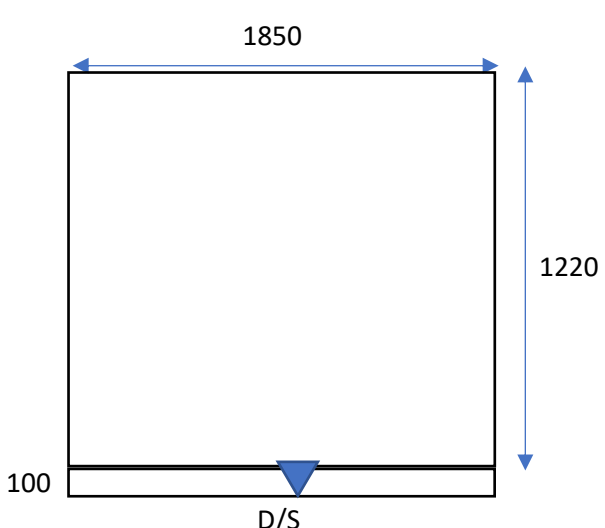
Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Appendix D
Culvert Inspection Report
(as provided by Gannett Fleming)



eNGLOBE

FIELD INSPECTION FORM

A. GENERAL INFORMATION			
Project #	6176-15-00 - Highway 61	Project Description	From 0.5km north of Jarvis Bay Road to 0.4km South of Hwy 130
Date	October 5, 2021	Weather Conditions	Sunny
Inspector 1	David Jackson	Inspector 2 /Reviewer	-
B. CULVERT ID / LOCATION			
Culvert ID	C11A	Chainage	19+250
UTM Easting	343484.1095	UTM Northing	5344556.1139
Description	South of the Blake Hall Road & Highway 61 intersection		
C. STRUCTURE DETAILS			
Material – CSP US / RFB DS			
Dimensions – 2100 x 1550 US / 1850 x 1220 DS			
Clearance (soffit to normal water level) – 1140 mm / dry			
High Water Mark (on structure) – OBV / N/A			
Structures (U/S / D/S of Crossing) – N/A			
Debris – Vegetation, wood			
D. ENVIRONMENTAL CONDITIONS			
Watercourse Type and Creek Material – Mud, muck, and wetland			
Bank Conditions (stability) – Stable			
Channel Dimensions (width and depth) – 3m, 5:1, 410mm US / 3m, 3:1 100m DS			
Observed Flow Conditions (ephemeral/permanent) – Permanent			
E. SITE CONDITIONS			
Road Condition (sag, settlement, etc.) – OK			
Physical Culvert Condition (rust, damage, etc.) – Poor			
Culvert Appearance (general comments) – Replace			
Site Sketch – <div style="display: flex; justify-content: space-around; align-items: flex-end; margin-top: 20px;"> <div style="text-align: center;">  <p>U/S</p> </div> <div style="text-align: center;">  <p>D/S</p> </div> </div>			

Corrugated Steel Pipe and Reinforced Concrete Box Culvert (Culvert #11A) @ 19+250

C11A - #1 – Upstream Channel Conditions



C11A - #2 – Upstream Face of the Culvert



C11A - #3 – Downstream Channel Conditions



C11A - #4 – Downstream Face of the Culvert

