FINAL REPORT

FOUNDATION INVESTIGATION REPORT

Cedar Creek Culvert No. 3 Replacement, Highway 590, Site No. 48W-156/C,
Township of O'Connor, District of Thunder Bay

Agreement No. 6014-E-0017
Assignment No. 2
GWP 6348-14-00
Geocres No. 52A-215

Prepared for:

Ontario Ministry of Transportation
Regional Director's Office -NW Region
615 James Street South
Thunder Bay, ON P7E 6P6
Attn: Mike Satten

Ontario Ministry of Transportation
Pavements and Foundations Section
Foundations Group
Building 'C', Room 223
1201 Wilson Avenue
Downsview, ON M3M 1J8
Attn: K.Ahmad

exp Services Inc.
April 14, 2016

Ontario Ministry of Transportation

Foundation Investigation Report
Agreement No. 6014-E-0017
Assignment No. 2
GWP 6348-14-00
Geocres No. 52A-215

Type of Document:
Final

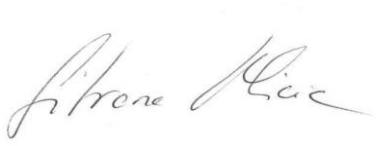
Project Name:
Foundation Investigation and Design Report for Cedar Creek Culvert No. 3 Replacement
HWY 590, Site No. 48W-156/C, Township of O'Connor, District of Thunder Bay

Project Number:
ADM-00223648-B0

Prepared By:
Ahileas Mitsopoulos, P.Eng.
Demetri N. Georgiou, MASc. P.Eng.
Nimesh Tamrakar, M.Eng, EIT.
Silvana Micic, Ph.D., P.Eng.

Reviewed By:
TaeChul Kim, M.E.Sc. P.Eng.
Stan E. Gonsalves, M.Eng., P.Eng.

exp Services Inc.
56 Queen St, East, Suite 301
Brampton, ON L6V 4M8
Canada



Silvana Micic, Ph.D., P.Eng.
Senior Geotechnical Engineer
Project Manager

Stan E. Gonsalves, M.Eng., P.Eng.
Executive Vice President
Designated MTO Contact

Date Submitted:
April 14, 2016

Table of Contents

Appendices

PART I: FOUNDATION INVESTIGATION REPORT

1.1 Introduction

This foundation investigation report presents the results of a geotechnical investigation completed by **exp** Services Inc. for the replacement of Cedar Creek Culvert No. 3 on Highway 590, located approximately 9 km west of the junction of Highway 590 and Highway 11/17 at Cedar Creek, in the Township of O'Connor, the Ministry of Transportation (MTO) Northwestern Region. The work was undertaken under Agreement # 6014-E-0017, Assignment No. 2 (GWP 6348-14-00). The terms of reference (TOR) were as presented in the MTO letter dated January 23, 2015.

Based on preliminary information provided, it is understood the existing culvert is a cast-in-place concrete rigid frame structure with a width of about 6.1 m, length of about 10.0 m and a height of about 2.0 m. It is understood that the existing culvert construction date was unknown, and is intended to be replaced with a new culvert along the same alignment.

The purpose of the investigation was to evaluate the subsurface conditions along the alignment, to permit detailed design for the culvert replacement. The site specific geotechnical investigation consisted of borings, soil sampling, borehole logging, and field and laboratory testing.

This foundation investigation report has been prepared specifically and solely for the project described herein. It contains the factual results of the investigation and the laboratory testing completed for this project.

1.2 Site Description and Geological Setting

1.2.1 Site Description

As shown on Drawing 1 (Appendix B), the Cedar Creek Culvert No. 3 replacement site is located on Hwy 590, approximately 9 km west of the junction of Hwy 590 and Hwy 11/17, in the Township of O'Connor. At the site, Hwy 590 is a two lane roadway, with a speed limit of 80 km/h and is about 7 m wide from edge of pavement to edge of pavement, with narrow sand and gravel shoulders. Based on drawings provided, the roadway embankment is about 3.5 m high with steep side slopes of about 1H:5V.

During the fieldwork on March 1 to 4, as well as March 19 and 20, 2015, the general site conditions were assessed; however, the site was generally snow covered which limited observations possible. Hwy 590 runs in an east to west direction and Cedar Creek, flows from north to south towards Kakabeka Falls, which is about 11 km east of the site. At the time of this investigation, Cedar Creek was frozen and the approximate creek elevations (top of ice) at the inlet and outlet were about 374.44 m and 374.21 m, respectively. The elevation of highway pavement centerline at the culvert centerline is about 377.82 m. Overhead wires were observed along the south side of the roadway.

The vicinity of the inlet and outlet of the culvert was snow covered but the visible vegetation was generally reeds and grasses. The inlet and outlet appeared to be clear of debris and excess vegetation, and as such the flow does not appear to be restricted.

Select photographs are provided in Appendix A.

1.2.2 Geological Setting

According to the MNR Northern Ontario Engineering Geology Terrain Data Base Map, Ontario Geological Survey Map 5047. Scale 1:100,000, dated 1979, the underlying native soil at the sites consists of clay till ground moraine with mainly low local relief, undulating to rolling and dry surface conditions.

The Precambrian Geology Compilation Series, Map 2664, Thunder Bay Sheet, indicates that the bedrock geology of the site is of the Neo to Mesoarchean Era (2.5 to 3.4 Ga), and generally consist of granite-granodiorite. The granite-granodiorite is generally expected to be of a massive to foliated texture; locally porphyritic (phenocrysts include quartz, feldspar, biotite and amphibole minerals) and containing quartz diorite and diorite in some plutons or plutons complexes,

1.3 Investigation Procedures

1.3.1 Site Investigation and Field Testing

The field investigation was performed on March 1 to 4, as well as March 19 and 20 2015. The field program consisted of drilling four (4) sampled boreholes (BH201 to BH204). Two (2) boreholes were located within the roadway, BH201 and BH202. BH201 was located about 4 m east of the culvert as near as possible to the edge of pavement (about 1.4 m) in the eastbound lane and BH202 was located about 3 m west of the culvert as near as was possible to the centerline of Hwy 590 (about 1.6 m) within the westbound lane. An additional two (2) boreholes (BH203 and BH204) were advanced off the roadway, near the culvert inlet and outlet. BH203 was located about 2.5 m north of the culvert (inlet side) and BH204 was located about 3 m south of the culvert (outlet side). The borehole locations are shown on Drawing 1 in Appendix B.

The roadway boreholes (BH201 and BH202) were advanced using a CME 850 track mounted drill rig, and the off-road boreholes (BH203 and BH204) were advanced using a CME 45 rubber track mounted drill rig. A T340XL crane was used to lower/lift the CME 45 drill rig at BH203. All drill rigs were equipped with hollow and solid stem continuous flight augers, and standard soil sampling equipment (includes 51 mm outside diameter split spoon samplers and *in situ* shear vane testing equipment). In addition, the CME 850 drill rig was equipped with rock coring equipment, NQ size.

The roadway boreholes BH201 and BH202 were advanced to depths of about 14.2 m and 14.3 m, respectively. The off-road boreholes BH203 and BH204 were advanced to auger and SPT refusal, at depths of about 7.8 m and 9.6 m below ground surface, respectively. The off-road boreholes were terminated at the refusal depths. The four boreholes were advanced to geodetic elevations ranging between about 363.5 m and 365.9 m

At BH201, premature shallow auger and SPT refusal was encountered at about 1.8 m below ground surface due to rock fill / cobbles, as such, the borehole was relocated about 0.9 m east of

the original location. At the relocated BH201, shallow/premature auger and SPT refusal was again encountered at about 2.0 m depth, and rock coring techniques, NQ, were conducted to advance the borehole beyond auger refusal. No rock coring techniques were conducted at the remaining borehole locations.

The borehole locations were referenced to the MTM ON-15 NAD83 coordinate system and their ground surface elevations were surveyed by **exp** personnel. The ground surface elevations, including top of culvert and top of water/ice at the upgradient and downgradient sides of the highway, were referenced to a geodetic benchmark (BM) provided by the client (nail in Birch tree west of the existing culvert). The elevation of the BM is 377.711 m, and location of the BM is shown on Drawing 1, in Appendix B.

During the drilling of the boreholes, soil samples were obtained using a 51 mm outside diameter (O.D.) split-spoon sampler in accordance with Standard Penetration Test (SPT) procedures (ASTM D1586), and were generally performed at intervals of about 0.75 m. The original field (uncorrected) SPT "N" values were recorded on the borehole logs as recommended in the Canadian Foundation Engineering Manual and used to provide an assessment of *in-situ* compactness (cohesionless) or consistency (cohesive) soils. In addition, five (5) *in-situ* field vane tests were conducted where suitable cohesive soils were encountered.

Upon completion of the boreholes, groundwater level measurements were carried out in boreholes in accordance with the Ministry of Transportation guidelines. The measured groundwater levels after completion of drilling boreholes were recorded on borehole log sheets in Appendix C. The boreholes were backfilled with a mixture of bentonite and auger cuttings and cold patch was used to repair the asphalt surface damaged by the augers. The borehole decommissioning was in general accordance with the Ministry of the Environment Regulation 903, as amended by Regulation 128/03 (the well regulation under the *Ontario Water Resources Act)*.

The fieldwork was supervised by a member of **exp**'s engineering staff who directed the drilling and sampling operation, logged borehole data in accordance with MTO and/or ASTM Standards for Soils Classification, and retrieved soil samples for subsequent laboratory testing and identification.

All of the recovered soil samples were placed in labelled moisture-proof bags and rock cores were brought to **exp**'s Thunder Bay laboratory for additional visual, textual and olfactory examination.

1.3.2 **Laboratory Testing**

All samples brought to the laboratory were subjected to visual examination and classification. The laboratory testing program included the determination of natural moisture content and particle size distribution for approximately 25% of the collected soil samples. Atterberg Limits tests were carried out on select cohesive soil samples. All of the laboratory tests were carried out in accordance with MTO and/or ASTM Standards, as appropriate, at the **exp** laboratory in Thunder Bay, ON.

The laboratory test results are provided on the attached borehole log sheets in Appendix C as well as graphically in Appendix D.

In addition, chemical testing of two select soil samples was conducted. The soil samples were sent via courier, in a secure cooler under chain of custody, to Maxxam Analytics Inc., a CALA-certified

and accredited laboratory in Mississauga, Ontario. Details of the chemical testing are discussed below and the lab results are included in Appendix E.

1.4 Subsurface Conditions

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

A borehole location plan and stratigraphic sections are provided in Appendix B. It should be noted that the stratigraphic boundaries indicated on the borehole log and stratigraphic sections are inferred from semi-continuous sampling, observations of drilling progress and results of Standard Penetration Tests. These boundaries typically represent transitions from one soil type to another and should not be interpreted as exact planes of geological change. Furthermore, subsurface conditions may vary between and beyond the borehole locations.

In general, the subsurface conditions along the proposed culvert alignment consist of layers of fill material composed of silty sand with gravel and sandy silty clay. Beneath the fill was silt and peat. Underlying the silt and peat and surfacing the off-road boreholes, deposits of native lean clayey silt were encountered, overlying sand, and overlying silt with sand till. A more detailed summary of the subsurface conditions encountered in the boreholes is provided in the following sections.

1.4.1 Fill

Fill material was encountered beneath the asphalt at BH201 and BH202. The asphalt thickness was about 250 mm and 100 mm at BH201 and BH202, respectively. The fill was comprised of silty sand with gravel layer, underlain by sandy silt with some clay layer. At BH201, a rock fill / cobbles strata was encountered underlying the sandy silt fill at about 2.0 m depth, and at BH202 some gravel and/or cobbles were noted during augering at about 2.3 m to 3.4 m depth. The fill was generally described as frozen and brown. SPT sampling was only conducted within the sandy silt with some clay layer at BH202, due to the frozen soil and difficulty auguring conditions at BH201; the SPT "N" values ranged between 34 and 69. The fill extended to about 3.5 m below asphalt surface at elevations ranging between about 374.2 m and 374.3 m.

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

Moisture content:

- 6.4% to 28.6%

Grain size distribution:

- 8% to 27% gravel;
- 40% to 49% sand; and
- 24% to 52% silt and clay sizes.

The results of the grain size distribution tests are provided on the record of borehole sheets in Appendix C. The results of the grain size distribution tests are also provided on Figures 1 and 2, in Appendix D.

1.4.2 Silt and Peat

The silt and peat was encountered beneath the fill at BH201 and BH202. The silt and peat was generally described as firm to stiff, dark brown/black to grey and moist to wet. Trace wood pieces were noted at BH202. The SPT "N" values ranged between about 3 and 8 blows per 300 mm penetration. The silt and peat at BH201 and BH202 extended to about 4.2 m (373.5 m elevation) and 4.3 m (373.5 m elevation) below ground surface, respectively. The thickness of the silt and peat was about 700 and 800 mm.

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

Moisture content:

- 21.6% to 63.8%

1.4.3 Silty Sand

Silty sand was encountered underlying the silt and peat at BH202 and surfacing BH204. The silty sand was generally described as very loose to compact, brown to grey and wet. The silty sand at BH204 was also described as with gravel, and at BH202, trace peat and trace wood pieces were noted. The SPT "N" values were about 3 and 6 blows per 300 mm penetration at BH204 and BH202, respectively. The sand extended to a depth of about 0.2 m below ground surface (373.5 m elevation) at BH204 and about 4.6 m below ground surface (373. m elevation) at BH202.

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

Moisture content:

- 11.9% to 18.1%

1.4.4 Clayey Silt to Clayey Silt with Sand

Clayey silt to clayey silt with sand was encountered underlying the silt and peat, silty sand and surfacing BH203. In BH202 silt with sand layer was encountered between clayey silt layers. The clayey silt was generally described as soft to hard, grey, and moist. The SPT "N" values ranged between about 2 and 52 blows per 300 mm penetration. In addition, three (3) *in-situ* shear vane tests were performed and field results ranged between about 122 kPa and greater than 330 kPa. The clayey silt extended to depth ranging between 4.9 m to 10.2 m below ground surface with elevations ranging between about 367.5 m and 368.8 m.

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

Moisture content:

- 11.9% to 61.5%

Grain size distribution:

- 1% to 28% gravel,
- 13% to 26% sand,
- 33% to 52% silt, and
- 18% to 39% clay size.

Total saturated unit weights have been calculated based on the moisture contents and are estimated to range from about 16.1 to 22.4 kN/m^3. Atterberg Limit testing was performed on eight (8) representative samples of the clayey silt (BH201-S8, BH201-S9, BH201-S10, BH201-S12A, BH202-S10, BH203-S3, BH203-S6 and BH204-S4) and indicated that the soil is of low to medium plasticity. The data is shown on the plasticity chart, Figure 7 in Appendix D. The liquid limit, plastic limit and plasticity index ranged between about 24% to 34%, 13% to 15% and 11% to 20%, respectively.

The results of the moisture content, grain size distribution and Atterberg Limits tests are provided on the record of borehole sheets in Appendix C. The results of the grain size distribution are also provided on Figure 3 in Appendix D, and Atterberg Limits tests are provided on Figure 7 in Appendix D.

1.4.5 **Silt with Sand**

Silt with sand was encountered between the clayey silt layers in BH202. The silt with sand was generally described as loose to dense, grey, and wet. The SPT "N" values ranged between 5 and 43 blows per 300 mm penetration. The silt with sand extended to depths about 8.6 m below ground surface with elevation about 369.2 m.

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

Moisture content:

- 15.2% to 19%

Grain size distribution:

- 6% gravel,
- 24% sand,
- 60% silt, and
- 10% clay size.

Total saturated unit weights have been calculated based on the moisture contents and are estimated to range from about 20.8 to 21.6 kN/m^3. Atterberg Limits testing was performed on one (1) representative sample of the silt with sand (BH202-S12). The data is shown on the plasticity

chart, Figure 8. The liquid limit, plastic limit and plasticity index were 16%, 16% and <1%, respectively.

The results of the moisture content, grain size distribution and Atterberg Limits tests are provided on the record of borehole sheets in Appendix C. The results of the grain size distribution are also provided on Figures 4 in Appendix D, and Atterberg Limits tests are provided on Figure 8 in Appendix D.

1.4.6 Silty Sand with Clay

Silty sand with clay was encountered underlying the clayey silt layers in BH202 and BH203. The silty sand with clay was generally described as very loose to compact, grey, and wet. The SPT "N" values ranged between 0 and 13 blows per 300 mm penetration. The silty sand with clay extended to depths ranging between 7.6 m to 10.5 m below ground surface with elevations ranging between about 366.1 m and 367.3 m.

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

Moisture content:

- 19.6% to 30.4%

Grain size distribution:

- 0% to <1% gravel,
- 56% to 87% sand,
- 13% to 19% silt, and
- 25% clay size.

Total saturated unit weights have been calculated based on the moisture contents and are estimated to range from about 19.0 to 20.6 kN/m^3.

The results of the moisture content and grain size distribution tests are provided on the record of borehole sheets in Appendix C. The results of the grain size distribution are also provided on Figures 5 in Appendix D.

1.4.7 Silt with Sand Till

Silt with sand till was encountered underlying the silty sand and clayey silt. The till was generally described as compact to dense, grey, and moist to wet. The SPT "N" values ranged between about 3 and 100 blows (i.e. SPT refusal), per 300 mm penetration. The till extended to the termination depths of all four boreholes, ranging between 7.8 m to 14.3 m below ground surface with elevations ranging between 363.5 m and 365.9 m.

Cobbles and boulders were noted to be contained within the till deposit; therefore their presence should be anticipated despite not encountering any within the layer in the boreholes.

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

Moisture content:

- 12.0% to 58.6%

Grain size distribution:

- 5% to 7% gravel,
- 16% to 33% sand,
- 44% to 64% silt and
- 13% to 18% clay size.

Total saturated unit weights have been calculated based on the moisture contents and are estimated to range from about 16.2 to 22.4 kN/m^3. Atterberg Limits testing was performed on one (1) representative sample of the silt with sand (BH202-S17); the data is shown on the plasticity chart, Figure 8. The liquid limit, plastic limit and plasticity index were 13%, 16% and 3%, respectively.

The results of the moisture content, grain size distribution and Atterberg limit tests are provided on the record of borehole sheets in Appendix C. The results of the grain size distribution are also provided on Figure 6 in Appendix D, and Atterberg Limits tests are provided on Figure 8 in Appendix D.

1.5 Groundwater and Surface Water Conditions

Information of groundwater levels at the site was obtained by measuring the water levels in the open boreholes after completion of drilling. The groundwater levels encountered in the boreholes are shown on the borehole logs and presented below in Table 1.1.

Seasonal variations in the water table should be expected, with higher levels occurring during wetter periods of the year and lower levels during drier periods.

Table 1.1. Groundwater data

Borehole	Date Completed	Date Measured	Ground Surface Elevation[2]	Depth to Water[3]	Groundwater Elevation
BH201	Mar. 2/15	Mar. 2/15	377.68	4.10	373.58
BH202	Mar. 4/15	Mar. 4/15	377.83	3.96	373.87
BH203[4]	Mar. 19/15	Mar. 19/15	373.68	- 0.8	374.48
BH204[4]	Mar. 20/15	Mar. 20/15	373.72	- 0.6	374.32

Borehole	Date Completed	Date Measured	Ground Surface Elevation[2]	Depth to Water[3]	Groundwater Elevation
Cedar Creek WL Upstream (North) Side	--	Mar. 23/15	--	--	374.44[5]
Cedar Creek WL Downstream (South) Side	--	Mar. 23/15	--	--	374.21[5]

Notes:
1) All units in metres.
2) Elevations surveyed are referenced to a geodetic benchmark (BM) provided by the client (nail in Birch tree west of the existing culvert). The elevation of the BM is 377.711 m,
3) Depths are relative to ground surface.
4) Borehole was advanced through ice and water and ground surface is below water surface.
5) Indicates top of ice elevation at Cedar Creek.

1.6 Chemical Analysis of Soil

Two soil samples were selected for chemical analyses and were sent via courier, in a secure cooler under chain of custody, to Maxxam Analytics Inc., a CALA-certified and accredited laboratory in Mississauga, Ontario. The analytical laboratory results are presented in Appendix E, and are summarized in Table 1.2, below.

Table 1.2. Corrosivity Chemical Analysis

Borehole	pH (unitless)	Chloride (ppm)	Soluble Sulphate (ppm)	Resistivity (ohm-cm)	Conductivity (mS/cm)
BH202–S10/11	7.82	57	240	2,400	0.42
BH203-S3	7.95	<20	50	5,200	0.19

1.7 Closure

A subsurface investigation is a limited sampling of a site; the subsurface conditions have been established only at the test hole locations. Should conditions at the site be encountered which differ from those reported at the test locations, we require that we be notified immediately in order to assess this additional information and our recommendations, as appropriate. It may then be necessary to perform additional investigation and analysis.

Contractors bidding on or undertaking any proposed work at this site should, relative to the subsurface conditions, decide on their own investigations, if deemed necessary, as well as their own interpretations of the factual results provided herein, so they may draw their own conclusions as to how the subsurface conditions may affect them.

This Foundation Investigation Report has been prepared by Ahileas Mitsopoulos, P.Eng., Nimesh Tamrakar, M.Eng, EIT., Demetri N. Georgiou, MASc. P.Eng., and Silvana Micic, Ph.D., P.Eng. It was reviewed by TaeChul Kim, P.Eng. and by Stan E. Gonsalves, M.Eng., P.Eng., Designated MTO Foundation Contact. The field investigation was supervised by Elwin Farkas.

Yours truly,

exp Services Inc.

Nimesh Tamrakar, M.Eng., EIT.
Technical Specialist

TaeChul Kim, M.E.Sc., P.Eng.
Senior Geotechnical/Foundation Specialist

Silvana Micic, PhD., P.Eng.
Senior Geotechnical Engineer
Project Manager

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

Encl.

Appendix A –
Site Photographs

Photo 1. Inlet side of existing culvert north of Highway 590

Photo 2. Outlet of existing culvert at south side of Highway 590, deterioration observed

Photo 3. Facing east on Hwy 590 before the existing culvert

Photo 4. Facing west on Hwy 590 before the existing culvert

Photo 5. Embankment slope on north side facing west

Photo 6. Embankment slope on south side facing east

Appendix B – Drawings

Agreement No. 6014-E-0017
Assignment No. 2
GWP 6348-14-00

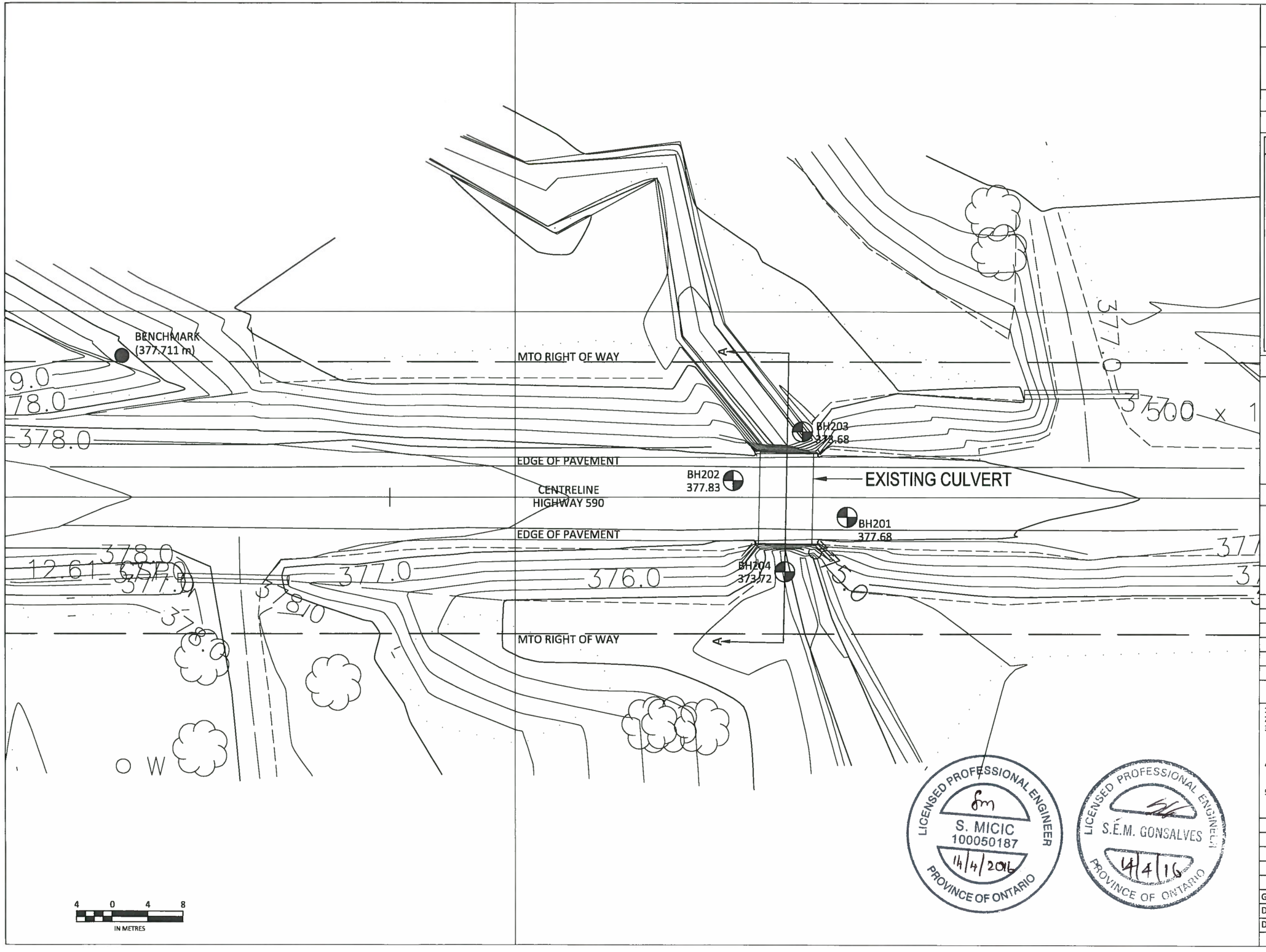
CEDAR CREEK CULVERT #3

(Highway 590, O'Connor Township)

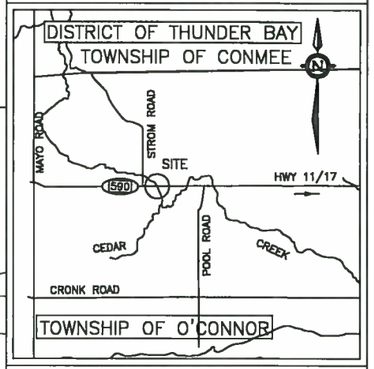
PLAN

DWG 1

exp Services Inc.



KEY PLAN



LEGEND

BH201 377.68 BOREHOLE LOCATION GROUND SURFACE ELEVATION IN METRES

BH No.	APPROX. ELEV. (m)	MTM COORDINATES	
		NORTH	EAST
BH201	377.68	5,362,179	323,935
BH202	377.83	5,362,184	323,921
BH203	373.68	5,362,183	323,932
BH204	373.72	5,362,171	323,930

NOTES

1. ALL DIMENSIONS ARE IN METRES.
2. BASE MAP PROVIDED BY CLIENT.
3. BOREHOLE LOCATIONS ARE BASED ON FIELD MEASUREMENTS FROM EXISTING CULVERT AND/OR PROJECTED MTM COORDINATES FOR ZONE ON-15 AS PER PROVIDED FIGURE.
4. THIS DRAWING IS FOR SUBSURFACE INFORMATION ONLY. THE PROPOSED STRUCTURE DETAILS/WORKS ARE SHOWN FOR ILLUSTRATION PURPOSES ONLY.
5. BH203 AND BH204 ADVANCED THROUGH ABOUT 0.8 m AND 0.6 m OF ICE/WATER, RESPECTIVELY. ELEVATIONS SHOWN ARE TOP OF GROUND.

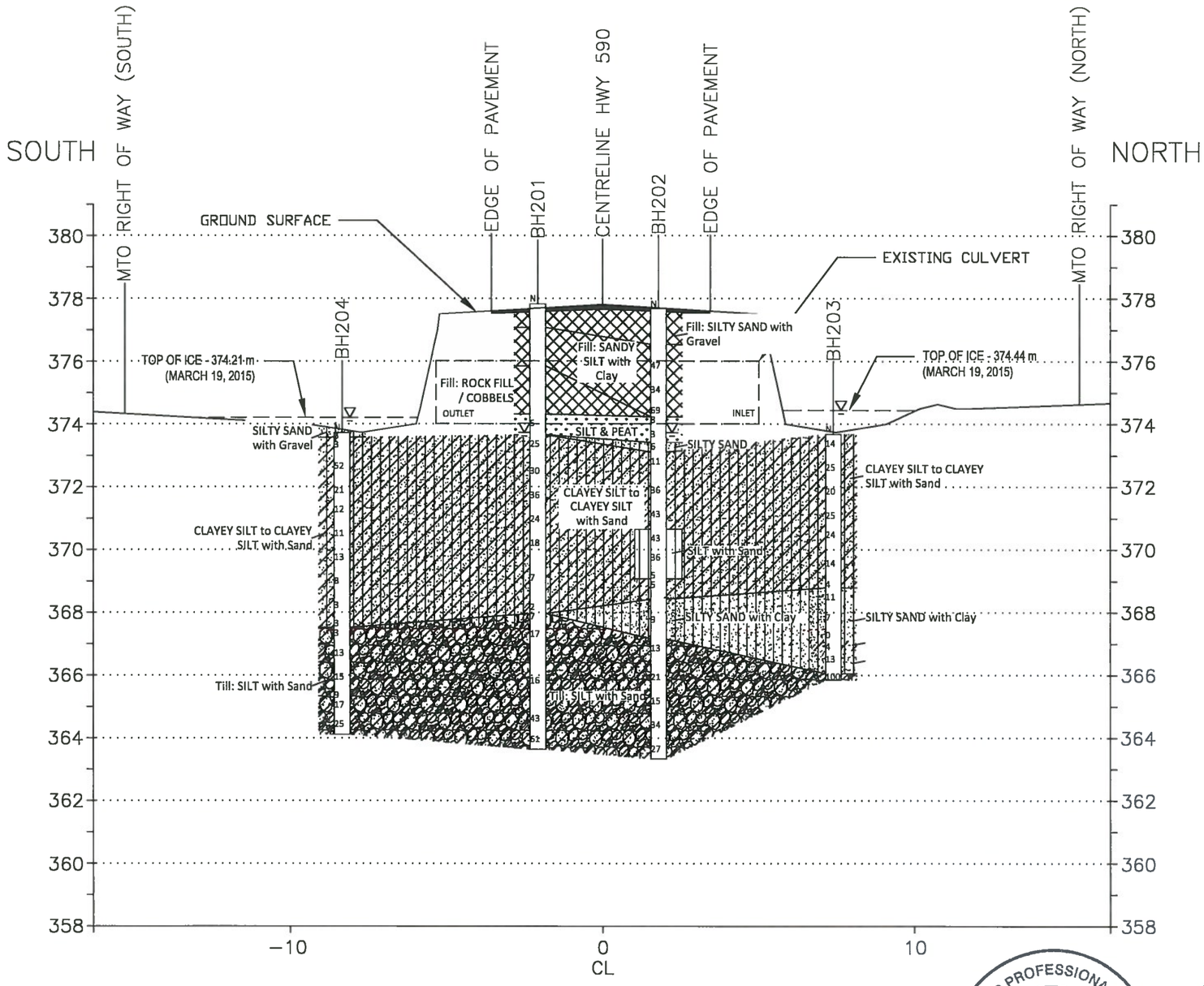
REVISIONS

DATE	BY	DESCRIPTION

LICENSED PROFESSIONAL ENGINEER
S. MICIC
100050187
14/4/2016
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
S.É.M. GONSALVES
14/4/16
PROVINCE OF ONTARIO

GEOCRES No. 52A-215	Project No. ADM-00223648-B0
Date: April 29, 2015	Scale : 1:400
Drawn By: RM	Checked By: AM
	Checked By: DG



A–A

PROFILE OF CEDAR CREEK CULVERT #3

3 0 3 6

IN METRES

LICENSED PROFESSIONAL ENGINEER
S. MICIC
100050187
14/4/2016
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
S.E.M. GONSALVES
14/4/16
PROVINCE OF ONTARIO

Agreement No. 6014-E-0017
Assignment No. 2
GWP 6348-14-00

CEDAR CREEK CULVERT #3

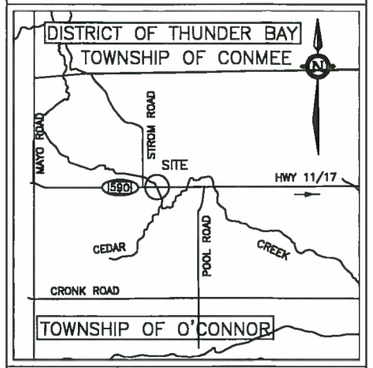
(Highway 590, O'Connor Township)

CROSS SECTION

DWG 2

exp Services Inc.

KEY PLAN



LEGEND

N STANDARD PENETRATION TEST (BLOWS/0.3 m)

MEASURED WATER LEVEL

SOIL STRATA SYMBOLS

FILL

SILT & PEAT

CLAYEY SILT with Sand

SILTY SAND

SILT WITH SAND TILL

BH No.	APPROX. ELEV. (m)	MTM COORDINATES	
		NORTH	EAST
BH201	377.68	5,362,179	323,935
BH202	377.83	5,362,184	323,921
BH203	373.68	5,362,183	323,932
BH204	373.72	5,362,171	323,930

NOTES

1. ALL DIMENSIONS ARE IN METRES.
2. BASE MAP PROVIDED BY CLIENT.
3. THIS DRAWING IS FOR SUBSURFACE INFORMATION ONLY. THE PROPOSED STRUCTURE DETAILS/WORKS ARE SHOWN FOR ILLUSTRATION PURPOSES ONLY.
4. BH203 AND BH204 ADVANCED THROUGH ABOUT 0.8 m AND 0.6 m OF ICE/WATER, RESPECTIVELY. ELEVATIONS SHOWN ARE TOP OF GROUND.

REVISIONS

DATE	BY	DESCRIPTION

GEOCRES No. 52A-215	Project No. ADM-00223648-B0
Date: February 3, 2016	Horizontal Scale : 1:150
Drawn By: RM	Vertical Scale: 1:150
Checked By: DG	Checked By: AM

Appendix C –
Borehole Logs and Bedrock Core Photos

Explanation of Terms Used on Borehole Records

SOIL DESCRIPTION

Terminology describing common soil genesis:

Topsoil: mixture of soil and humus capable of supporting good vegetative growth.

Peat: fibrous fragments of visible and invisible decayed organic matter.

Fill: where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc.; none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional geotechnical site investigation.

Till: the term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

Terminology describing soil structure:

Desiccated: having visible signs of weathering by oxidization of clay minerals, shrinkage cracks, etc.

Stratified: alternating layers of varying material or color with the layers greater than 6 mm thick.

Laminated: alternating layers of varying material or color with the layers less than 6 mm thick.

Fissured: material breaks along plane of fracture.

Varved: composed of regular alternating layers of silt and clay.

Slickensided: fracture planes appear polished or glossy, sometimes striated.

Blocky: cohesive soil that can be broken down into small angular lumps which resist further breakdown.

Lensed: inclusion of small pockets of different soil, such as small lenses of sand scattered through a mass of clay; not thickness.

Seam: a thin, confined layer of soil having different particle size, texture, or color from materials above and below.

Homogeneous: same color and appearance throughout.

Well Graded: having wide range in grain sized and substantial amounts of all predominantly on grain size.

Uniformly Graded: predominantly on grain size.

All soil sample descriptions included in this report follow the ASTM D2487-11 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System). The system divides soils into three major categories: (1) coarse grained, (2) fine-grained, and (3) highly organic. The soil is then subdivided based on either gradation or plasticity characteristics. The system provides a group symbol (e.g. SM) and group name (e.g. silty sand) for identification. The classification excludes particles larger than 76 mm. Please note that, with the exception of those samples where a grain size analysis has been made, all samples are classified visually in accordance with ASTM D2488-09a Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems. Others may use different classification systems; one such system is the ISSMFE Soil Classification.

ISSMFE SOIL CLASSIFICATION

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE		

0.002	0.006	0.02	0.06	0.2	0.6	2.0	6.0	20	60	200

EQUIVALENT GRAIN DIAMETER IN MILLIMETRES

CLAY (PLASTIC) TO	FINE	MEDIUM	CRS.	FINE	COARSE
SILT (NONPLASTIC)	SAND			GRAVEL	

UNIFIED SOIL CLASSIFICATION

Terminology describing materials outside the USCS, (e.g. particles larger than 76 mm, visible organic matter, construction debris) is based upon the proportion of these materials present and as described below in accordance with Note 16 in ASTM D2488-09a:

Table a: Percent or Proportion of Soil, Pp

	Criteria
Trace	Particles are present but estimated to be less than 5%
Few	5≤Pp≤10%
Little	15≤Pp≤25%
Some	30≤Pp≤45%
Mostly	50≤Pp≤100%

The standard terminology to describe cohesionless soils includes the compactness as determined by the Standard Penetration Test ‘N’ value:

Table b: Apparent Density of Cohesionless Soil

	‘N’ Value (blows/0.3 m)
Very Loose	N<5
Loose	5≤N<10
Compact	10≤N<30
Dense	30≤N<50
Very Dense	50≤N

The standard terminology to describe cohesive soils includes consistency, which is based on undrained shear strength as measured by insitu vane tests, penetrometer tests, unconfined compression tests or similar field and laboratory analysis, Standard Penetration Test 'N' values can also be used to provide an approximate indication of the consistency and shear strength of fine grained, cohesive soils:

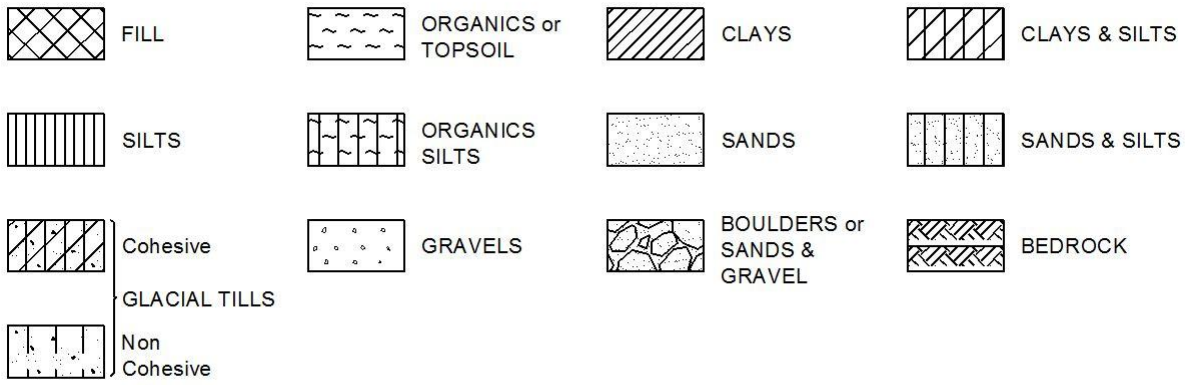
Table c: Consistency of Cohesive Soil

Consistency	Vane Shear Measurement (kPa)	'N' Value
Very Soft	<12.5	<2
Soft	12.5-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very Stiff	100-200	15-30
Hard	>200	>30

Note: 'N' Value - The Standard Penetration Test records the number of blows of a 140 pound (64kg) hammer falling 30 inches (760mm), required to drive a 2 inch (50.8mm) O.D. split spoon sampler 1 foot (305mm). For split spoon samples where full penetration is not achieved, the number of blows is reported over the sampler penetration in meters (e.g. 50/0.15).

STRATA PLOT

Strata plots symbolize the soil or bedrock description. They are combinations of the following basic symbols:



WATER LEVEL MEASUREMENT

ABBREVIATIONS AND SYMBOLS

FIELD SAMPLING

SS	Split spoon sample (obtained from the Standard Penetration Test)
WS	Wash sample
BS	Bulk sample
TW	Thin wall sample or Shelby tube
PS	Piston sample
AS	Auger sample
VT	Vane test
GS	Grab sample
HQ, NQ, etc.	Rock core samples obtained with the use of standard size diamond drilling bits

STRESS AND STRAIN

u_w	kPa	Pore water pressure
r_u	1	Pore pressure ratio
σ	kPa	Total normal stress
σ'	kPa	Effective normal stress
τ	kPa	Shear stress
$\sigma_1, \sigma_2, \sigma_3$	kPa	Principal stresses
ε	%	Linear strain
$\varepsilon_1, \varepsilon_2, \varepsilon_3$	%	Principal strains
E	kPa	Modulus of linear deformation
G	kPa	Modulus of shear deformation
μ	1	Coefficient of friction

MECHANICALL PROPERIES OF SOIL

m_v	kPa^{-1}	Coefficient of volume change
c_c	1	Compression index
c_s	1	Swelling index
c_r	1	Recompression index
c_v	m^2/s	Coefficient of consolidation
H	m	Drainage path
T_V	1	Time factor
U	%	Degree of consolidation
σ'_{v0}	kPa	Effective overburden pressure
σ'_P	kPa	Preconsolidation pressure
τ_f	kPa	Shear strength
c'	kPa	Effective cohesion intercept
ϕ'	$-°$	Effective angle of internal friction
c_u	kPa	Apparent cohesion intercept
ϕ_u	$-°$	Apparent angle of internal friction
τ_R	kPa	Residual shear strength
τ_r	kPa	Remoulded shear strength
S_t	1	Sensitivity = c_u/τ_r

PHYSICAL PROPERTIES OF SOIL

P_s	kg/m^3	Density of solid particles
γ_s	kN/m^3	Unit weight of solid particles
ρ_w	kg/m^3	Density of water
γ_w	kN/m^3	Unit weight of water
ρ	kg/m^3	Density of soil
γ	kN/m^3	Unit weight of soil
ρ_d	kg/m^3	Density of dry soil
γ_d	kN/m^3	Unit weight of dry soil
ρ_{sat}	kg/m^3	Density of saturated soil
γ_{sat}	kN/m^3	Unit weight of saturated soil
ρ'	kg/m^3	Density of submerged soil
γ'	kN/m^3	Unit weight of submerged soil
e	1, %	Void ratio
n	1, %	Porosity
w	1, %	Water content
S_r	%	Degree of saturation
W_L	%	Liquid limit
W_P	%	Plastic limit
W_s	%	Shrinkage limit
I_P	%	Plasticity index = $(W_L - W_P)$
I_L	%	Liquidity index = $(W - W_P)/I_P$
I_C	%	Consistency index = $(W_L - W)/I_P$
e_{max}	1, %	Void ratio in loosest state
e_{min}	1, %	Void ratio in densest state
I_D	1	Density index = $(e_{max} - e)/(e_{max} - e_{min})$
D	mm	Grain diameter
D_n	mm	N percent - diameter
C_u	1	Uniformity coefficient
h	m	Hydraulic head or potential
q	m^3/s	Rate of discharge
v	m/s	Discharge velocity
i	1	Hydraulic gradient
k	m/s	Hydraulic conductivity
j	kN/m^3	Seepage force

RECORD OF BOREHOLE No BH201 1 OF 1 METRIC

W. P. GWP No. 6348-14-00 LOCATION **Cedar Creek Culvert #3 (Site No. 48W-156/C) MTM ON-15 323,935 E 5,362,179 N** ORIGINATED BY EF

DIST 61 11 BOREHOLE TYPE CME 850 Track Mount / HSA / NQ COMPILED BY AM

DATUM **Geodetic** DATE 2015/03/01 - 2015/03/02 CHECKED BY DG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DNYAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH: Cu, KPa (○ UNCONFINED, × QUICK TRIAXIAL, + FIELD VANE, LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
377.7	Asphalt										
377.5	**ASPHALT** - about 250 mm										
0.3 / 376.9	**SILTY SAND with Gravel (SM) Fill** - frozen, brown		S1	AUGER							
			S2	AUGER			377				
0.8 / 375.7	**SANDY SILT with some Clay (ML) Fill** - frozen, brown		S3	AUGER							9 39 (52)
			S4	AUGER			376				
2.0 / 374.2	- refusal to auger and SPT, initiated rock coring at about 2.0 m depth **ROCK FILL / COBBLES**		S4A	CORE			375				
3.5 / 373.5	**SILT AND PEAT** - firm, dark brown, moist to wet, trace sand		S5	SS	5	▽	374				
4.2	**CLAYEY SILT to CLAYEY SILT with Sand (CL)** - very stiff to hard, grey, wet		S6	SS	25				61.5		
			S7	SS	30		373				
	- becoming gravelly from about 5.8 to 6.6 m depth		S8	SS	36		372				28 21 33 18
			S9	SS	24		371				5 26 43 26
			S10	SS	18		370				11 25 39 25
				VANE				>> 3.0			Field vane ~ 199 kPa
			S11	SS	7		369				
				VANE				>>			Field vane > 332 kPa
			S12A	SS	2		368				1 14 46 39
367.5	- becoming grey, wet loose to compact silty sand @ 9.9 m		S12B	SS	7						
10.2	**SILT with Sand (ML) Till** - compact to very dense, grey, wet		S13	SS	18		367				
			S14A	SS			366		58.6		
	- about 40 mm reddish brown clay seam at about 12.0 m depth		S14B	SS	16						
			S14C	SS			365				
			S15	SS	43						
363.5			S16	SS	61		364				
14.2	**END OF BOREHOLE**										

NOTES:
1. This drawing is to be read with the subject report and project numbers as presented above.
2. Groundwater level at 4.1 m depth upon completion of borehole.

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

OPG_EXP RECORD OF BOREHOLE F-15103-BG - ADM-00223648-B0 - MTO 2 - CEDAR CREEK CULVERT NO. 3.GPJ ONTARIO MOT.GDT 4/12/16

RECORD OF BOREHOLE No BH202 1 OF 1 METRIC

W. P. GWP No. 6348-14-00 LOCATION **Cedar Creek Culvert #3 (Site No. 48W-156/C) MTM ON-15 323,921 E 5,362,184 N** ORIGINATED BY EF

DIST 61 11 BOREHOLE TYPE CME 850 Track Mount / HSA COMPILED BY AM

DATUM **Geodetic** DATE 2015/03/02 - 2015/03/04 CHECKED BY DG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DNYAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH: Cu, KPa (○ UNCONFINED, × QUICK TRIAXIAL, + FIELD VANE, LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
377.8	Asphalt										
377.7 / 0.1	**ASPHALT** - about 100 mm										
	SILTY SAND with Gravel (SM) Fill - frozen, brown		S1	AUGER							
			S2	AUGER							
376.7			S3	AUGER			377		○		27 49 (24)
1.1	**SANDY SILT with some Clay (ML) Fill** - frozen, brown		S4	AUGER							
			S5	SS	47		376		○		
	- gravel and/or cobbles encountered during augering at about 2.3 m to 3.4 m depth		S6	SS	34		375		○		8 40 36 16
374.3			S7A	SS	69				○		
3.5	**SILT AND PEAT** - firm to stiff, dark grey to black, moist		S7B	SS	8		374		○		
	- becoming wet, trace wood pieces at about 3.8 m depth		S8A	SS	3	▽			○ 63.8		
373.5			S8B	SS	6				○		
4.3 / 373.2	**SILTY SAND (SM)** - loose to compact, grey, wet, trace peat, trace wood pieces		S9	SS	11		373		○		
4.6	**CLAYEY SILT to CLAYEY SILT with Sand (CL)** - stiff to very stiff, grey, moist			VANE				>>2.0			Field Vane ~ 122 kPa
	- becoming hard at about 5.5 m depth		S10	SS	36		372		○		8 24 47 21
			S11	SS	43				○		
370.8							371				
7.0	**SILT with Sand (ML)** - dense to loose, grey, moist		S12	SS	43				○		6 24 60 10
			S13	SS	36		370		○		
369.2			S14A	SS	5				○		
8.6	**CLAYEY SILT (CL)** - firm to stiff, grey, moist to wet		S14B	SS	5		369		○		
368.5	- about 300 mm of blow-up in augers at about 9.1 m depth										
9.3	**SILTY SAND with Clay (SM)** - loose to compact, grey, wet, occasional 2 to 3 mm reddish brown clay seams		S15	SS	9		368		○		0 56 19 25
367.3											
10.5	**SILT with Sand (ML) Till** - compact to dense, grey, moist to wet		S16	SS	13		367		○		
			S17	SS	21		366		○		7 16 64 13
			S18	SS	15				○		
	- becoming reddish brown at about 13.0 m depth		S19	SS	34		365		○		
	- becoming grey at about 13.7 m depth		S20	SS	27		364		○		
363.5											
14.3	**END OF BOREHOLE**										

NOTES:
1. This drawing is to be read with the subject report and project numbers as presented above.
2. Groundwater level at 4.0 m depth upon completion of borehole.

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

OPG_EXP RECORD OF BOREHOLE F-15103-BG - ADM-00223648-B0 - MTO 2 - CEDAR CREEK CULVERT NO. 3.GPJ ONTARIO MOT.GDT 4/12/16

RECORD OF BOREHOLE No BH203 1 OF 1 METRIC

W. P. GWP No. 6348-14-00 LOCATION **Cedar Creek Culvert #3 (Site No. 48W-156/C) MTM ON-15 323,932 E 5,362,183 N** ORIGINATED BY EF

DIST 61 11 BOREHOLE TYPE CME 45 Yanmar Track Mount / HSA COMPILED BY RM

DATUM **Geodetic** DATE 2015/03/19 - 2015/03/19 CHECKED BY AM/DG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DNYAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH: Cu, KPa (○ UNCONFINED + FIELD VANE × QUICK TRIAXIAL LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
373.7	0.8 m ice and water										
	CLAYEY SILT to CLAYEY SILT with Sand(CL) - stiff to very stiff, grey, moist, trace roots rootlets in upper 0.6 m		S1	SS	14						
			S2	SS	25		373				
			S3	SS	20		372				13 51 36
			S4	SS	25						
			S5	SS	24		371				
			S6	SS	14		370				20 50 30
368.8	- becoming firm to stiff clayey silt, grey, wet		S7A	SS	4		369		42.6		
4.9	**SILTY SAND with Clay (SM)** - very loose to compact, grey, wet		S7B	SS	11						
			S8	SS	7		368				0 87 (13)
	- becoming very loose at about 6.1 m depth		S9A	SS	0						
	- becoming soft to firm clayey silt, grey, moist		S9B	SS	4		367				
			S10	SS	13						
366.1											
365.9	**SILT with Sand (ML) Till** - very dense, grey, moist		S11	SS	100		366				
7.8	**END OF BOREHOLE** - refusal to SPT and auger										

NOTES:
1. This drawing is to be read with the subject report and project numbers as presented above.
2. Borehole was advance throuh ice and water and ice surface at 0.8 m above ground surface.

$+^3, \times^3$: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

OPG_EXP RECORD OF BOREHOLE F-15103-BG - ADM-00223648-B0 - MTO 2 - CEDAR CREEK CULVERT NO. 3.GPJ ONTARIO MOT.GDT 4/12/16

RECORD OF BOREHOLE No BH204 1 OF 1 METRIC

W. P. GWP No. 6348-14-00 LOCATION **Cedar Creek Culvert #3 (Site No. 48W-156/C) MTM ON-15 323,930 E 5,362,171 N** ORIGINATED BY EF

DIST 61 11 BOREHOLE TYPE CME 45 Yanmar Track Mount / HSA COMPILED BY RM

DATUM **Geodetic** DATE 2015/03/19 - 2015/03/20 CHECKED BY AM/DG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DNYAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH: Cu, KPa (○ UNCONFINED, + FIELD VANE, × QUICK TRIAXIAL, LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
373.7	0.6 m ice and water										
373.5 / 0.2	**SILTY SAND with Gravel (SM)** - very loose to loose, brown, wet		S1A	SS	3						
			S1B	SS	3						
	CLAYEY SILT to CLAYEY SILT with Sand (CL) - soft to hard, grey, moist		S2	SS	52		373				
			S3	SS	21		372				
			S4	SS	12						0 20 52 28
			S5	SS	11		371				
			S6	SS	13		370				
			S7	SS	8		369				
			S8	SS	3						
367.5			S9A	SS	3		368				
6.2	**SILT with Sand (ML) Till** - loose to compact, grey, moist		S9B	SS	3						
			S10	SS	13		367				5 33 44 18
			S11	SS	15		366				
			S12A	SS	9						
	- becoming, brown to grey, wet at about 8.5 m depth		S12B	SS	17		365				
	- becoming moist at about 9.0 m depth		S13	SS	25						
364.1											
9.6	**END OF BOREHOLE**										

NOTES:
1. This drawing is to be read with the subject report and project numbers as presented above.
2. Borehole was advance throuh ice and water and ice surface at 0.6 m above ground surface.

$+^3$, $\times^3$: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

OPG_EXP RECORD OF BOREHOLE F-15103-BG - ADM-00223648-B0 - MTO 2 - CEDAR CREEK CULVERT NO. 3.GPJ ONTARIO MOT.GDT 4/12/16

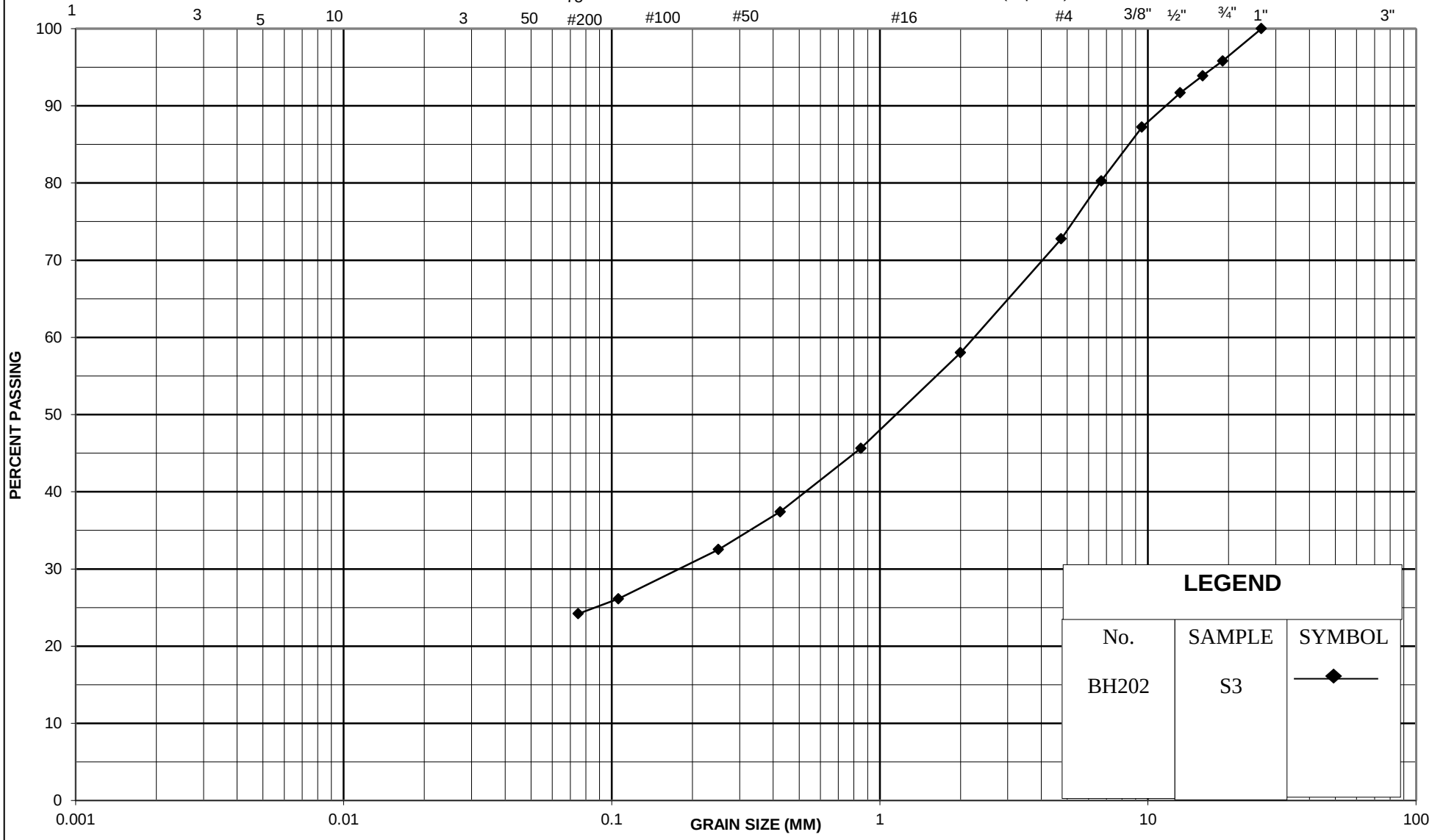
Appendix D – Laboratory Data

UNIFIED SOIL CLASSIFICATION SYSTEM

CLAY AND SILT	SAND			GRAVEL	
	Fine	Medium	Coarse	Fine	Coarse

GRAIN SIZE IN MICROMETERS

SIEVE DESIGNATION (Imperial)



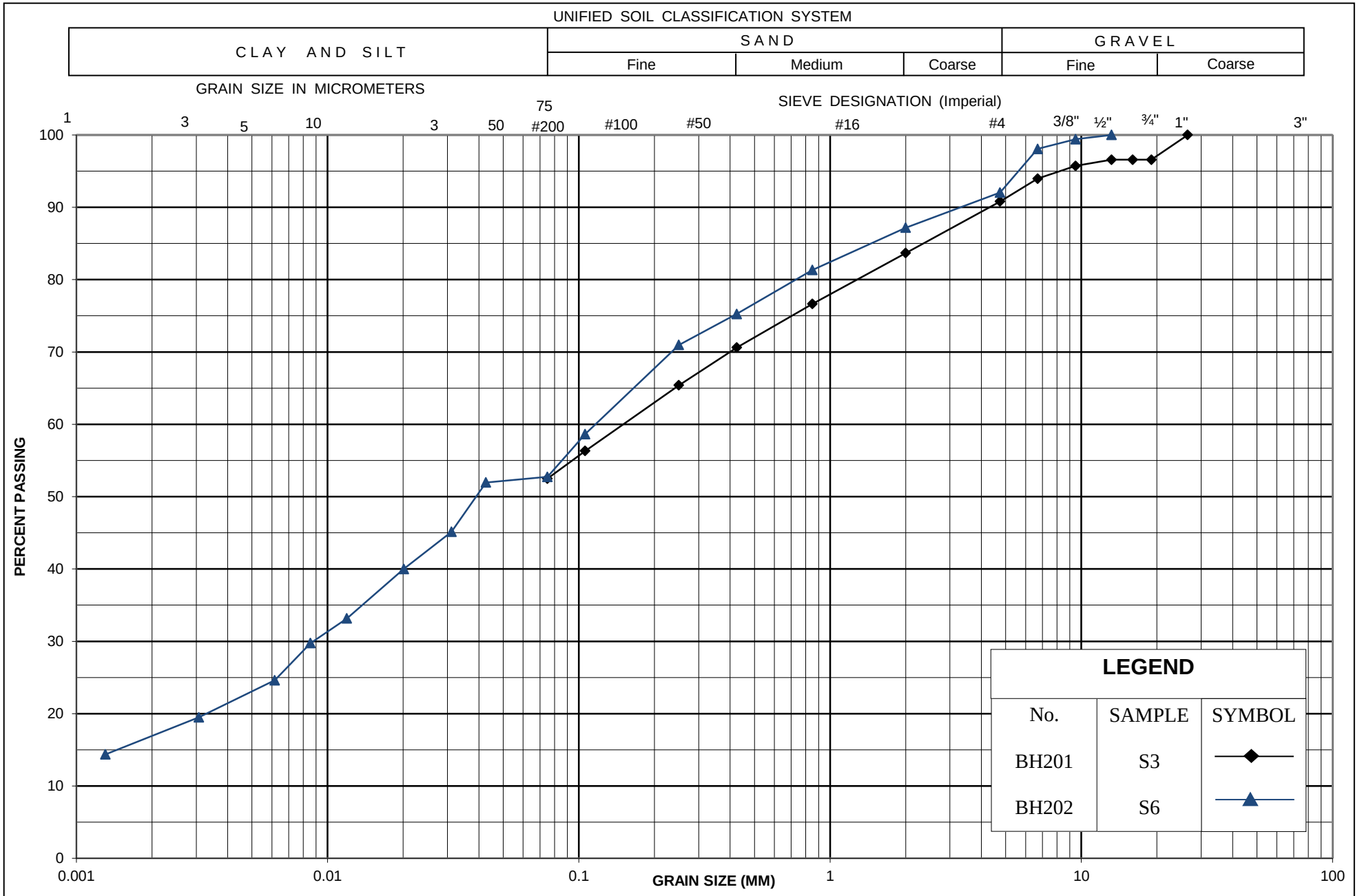
GRAIN SIZE DISTRIBUTION

FILL: SILTY SAND with GRAVEL (SM) - EXISTING CULVERT

FIGURE : No. 1

GWP : 6348-14-00

DATE : April 13, 2015



GRAIN SIZE DISTRIBUTION

Fill: SANDY SILT with Clay (CL-ML) - EXISTING CULVERT

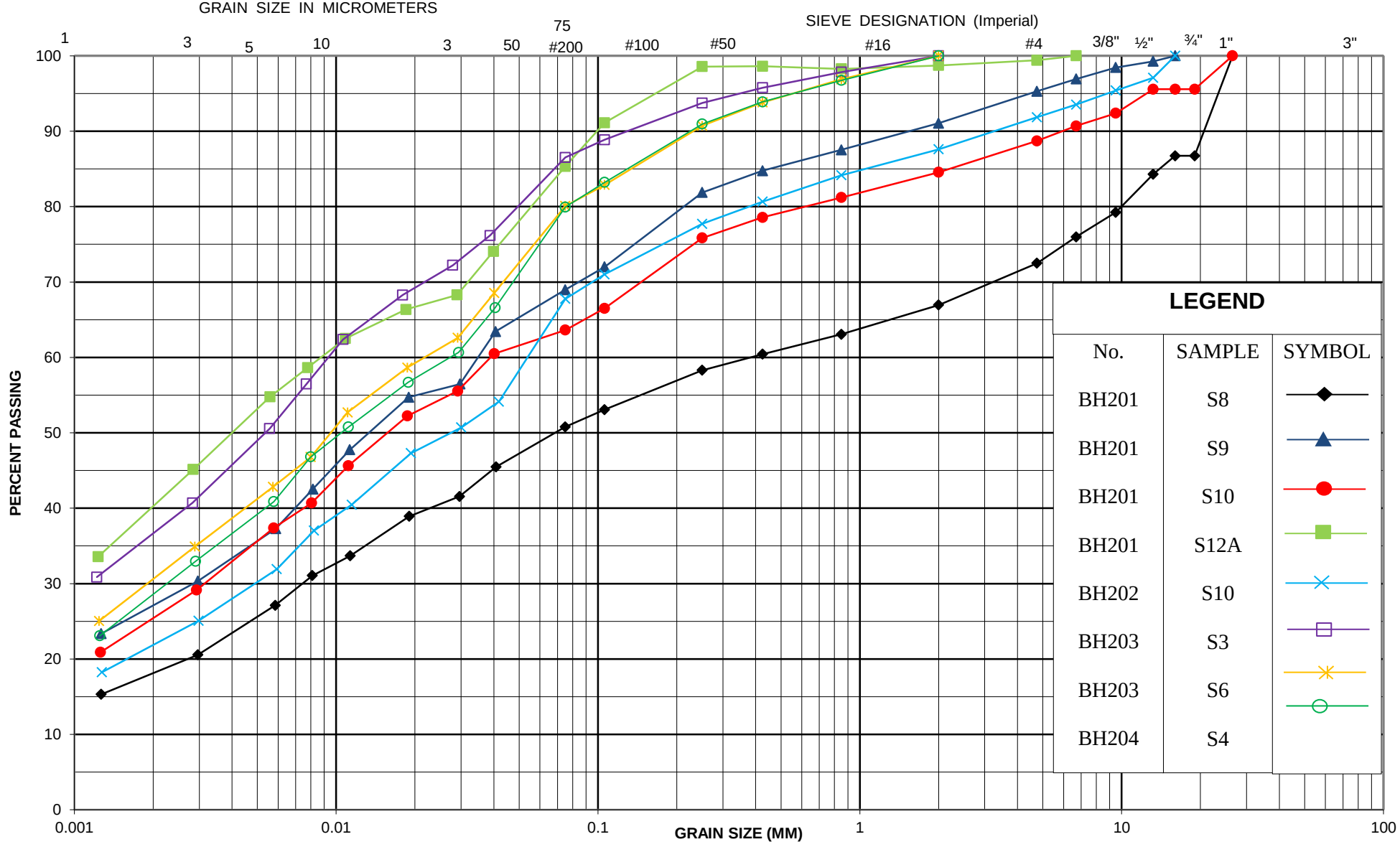
FIGURE : No. 2

GWP : 6348-14-00

DATE : April 10, 2015

UNIFIED SOIL CLASSIFICATION SYSTEM

CLAY AND SILT	SAND			GRAVEL	
	Fine	Medium	Coarse	Fine	Coarse



exp.

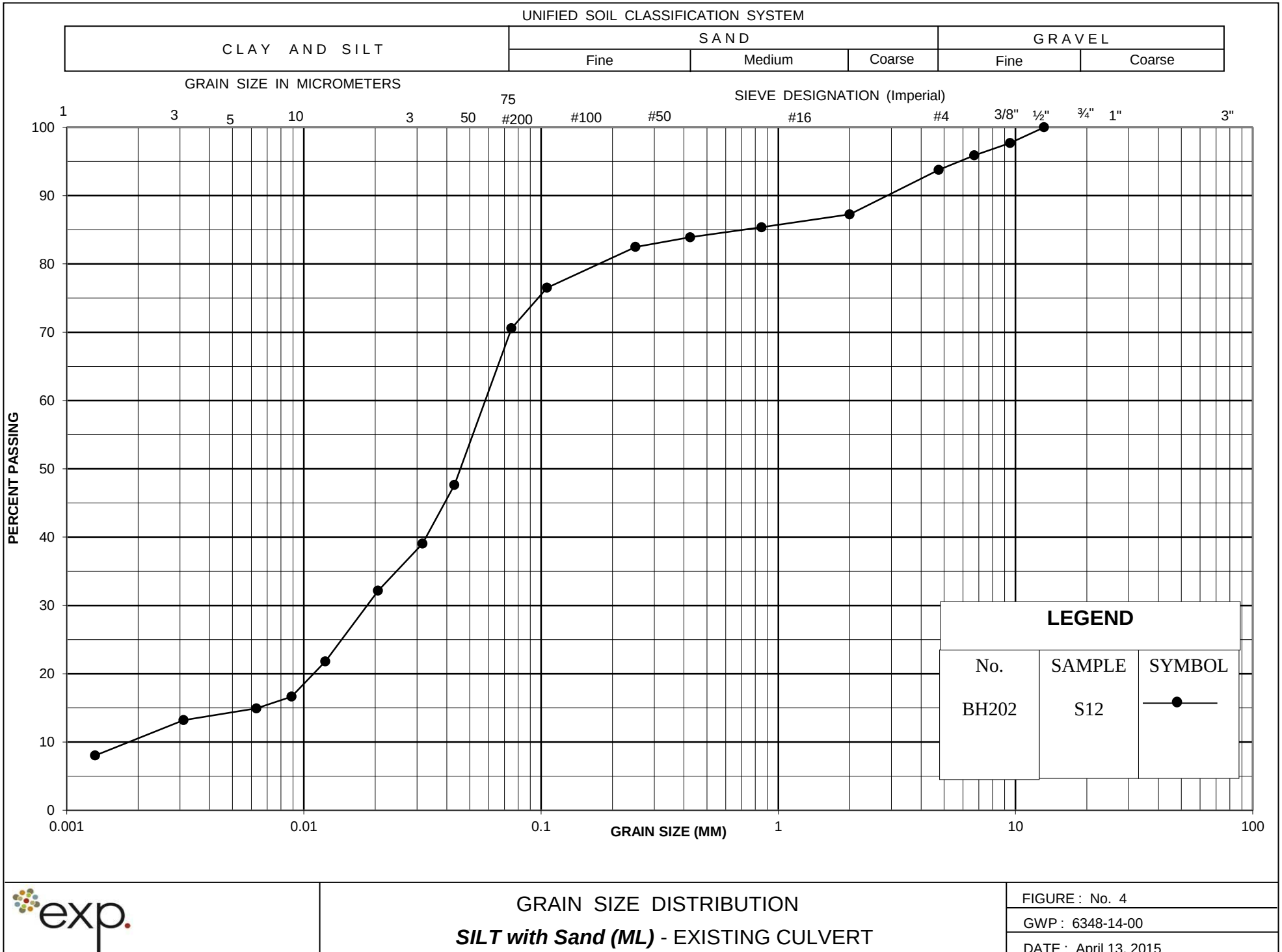
GRAIN SIZE DISTRIBUTION

CLAYEY SILT (CL) - EXISTING CULVERT

FIGURE : No. 3

GWP : 6348-14-00

DATE : April 10, 2016



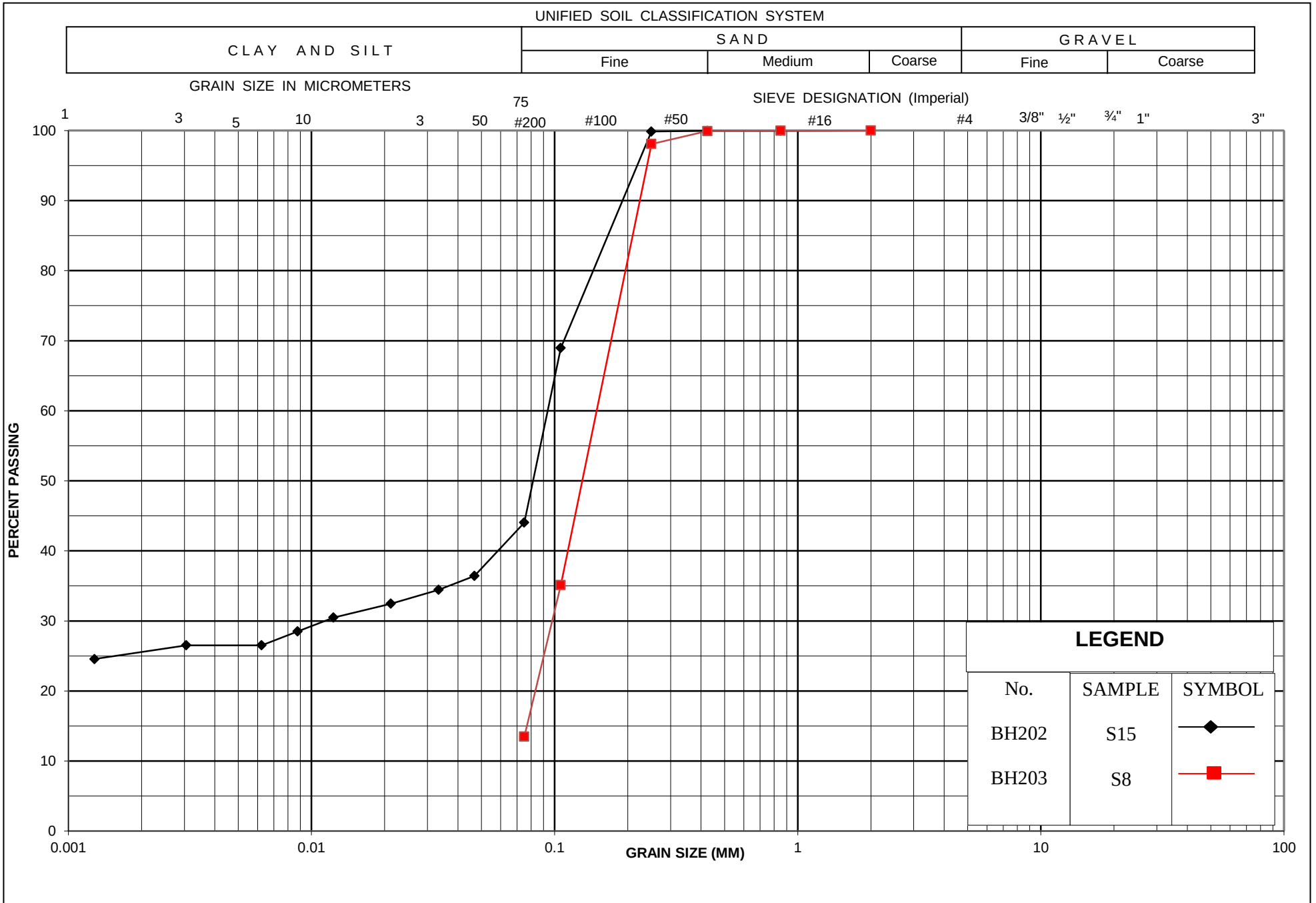
GRAIN SIZE DISTRIBUTION

SILT with Sand (ML) - EXISTING CULVERT

FIGURE : No. 4

GWP : 6348-14-00

DATE : April 13, 2015



exp.

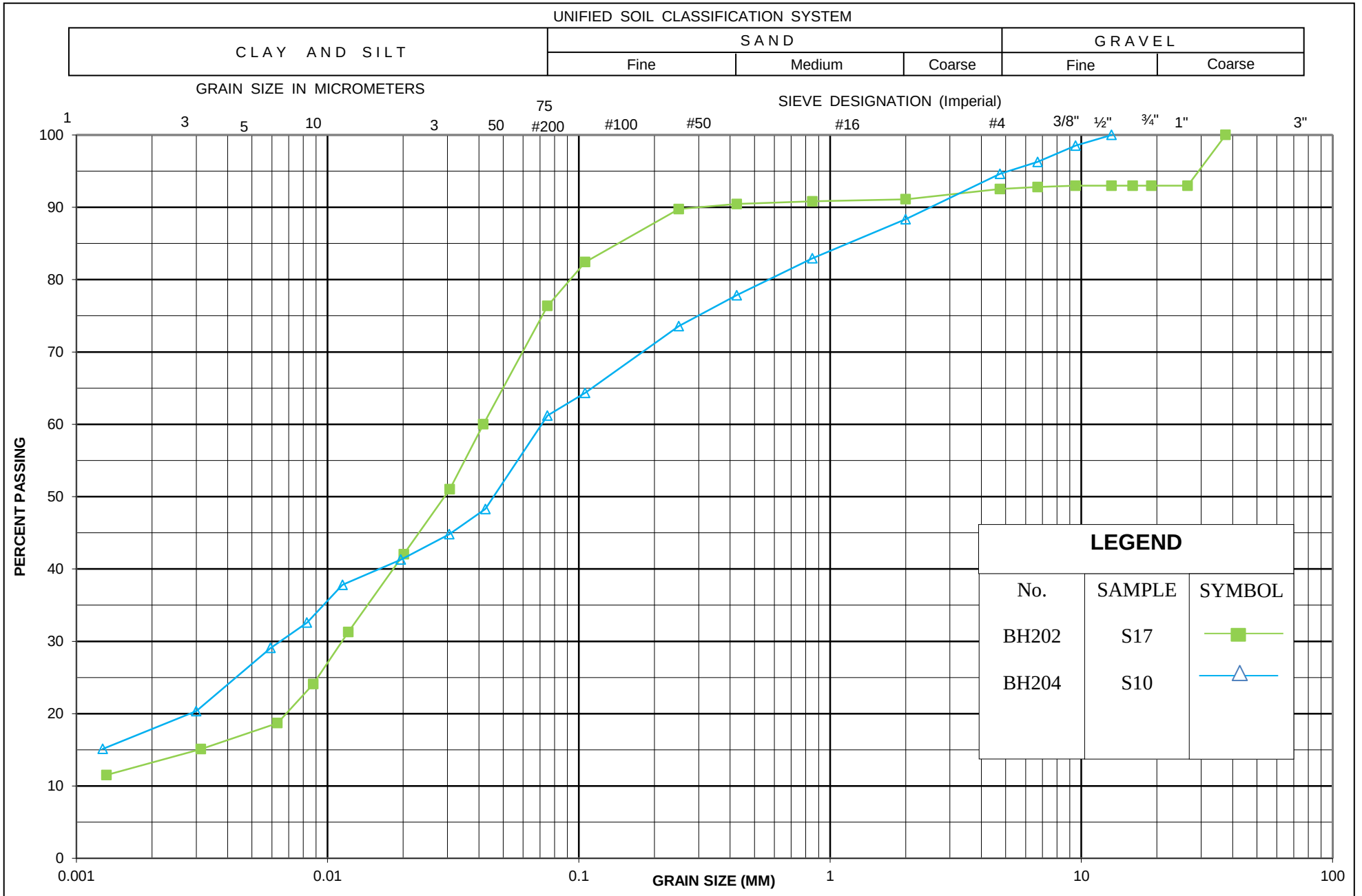
GRAIN SIZE DISTRIBUTION

SILTY SAND with Clay (SM) - EXISTING CULVERT

FIGURE : No. 5

GWP : 6348-14-00

DATE : April 10, 2015



GRAIN SIZE DISTRIBUTION

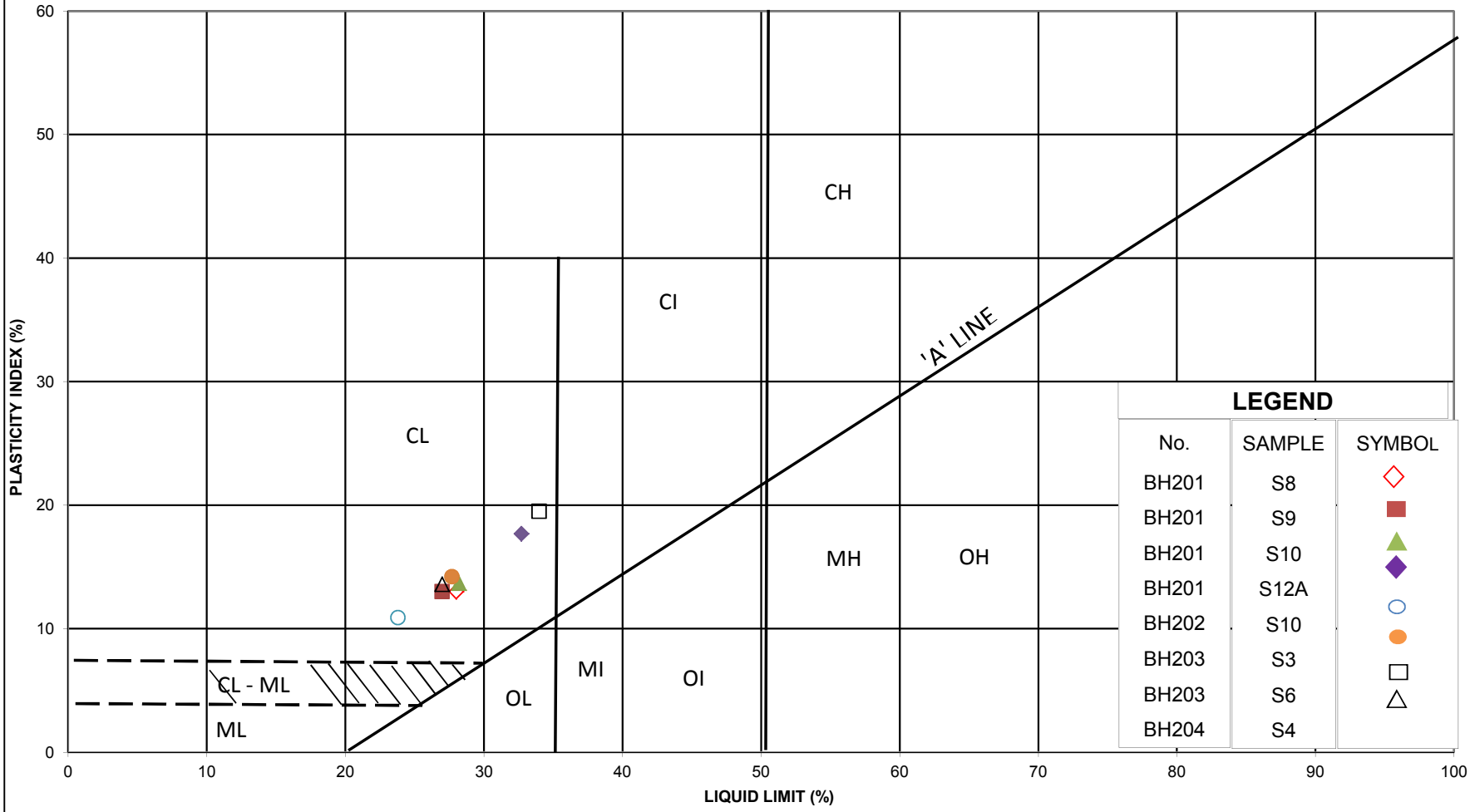
SILT with Sand Till (ML) - EXISTING CULVERT

FIGURE : No. 6

GWP : 6348-14-00

DATE : April 10, 2015

Cedar Creek Culvert #3 (Site No. 48W-156/C)
GWP No. 6348-14-00, Highway 590, Township of O'Connor, Ontario



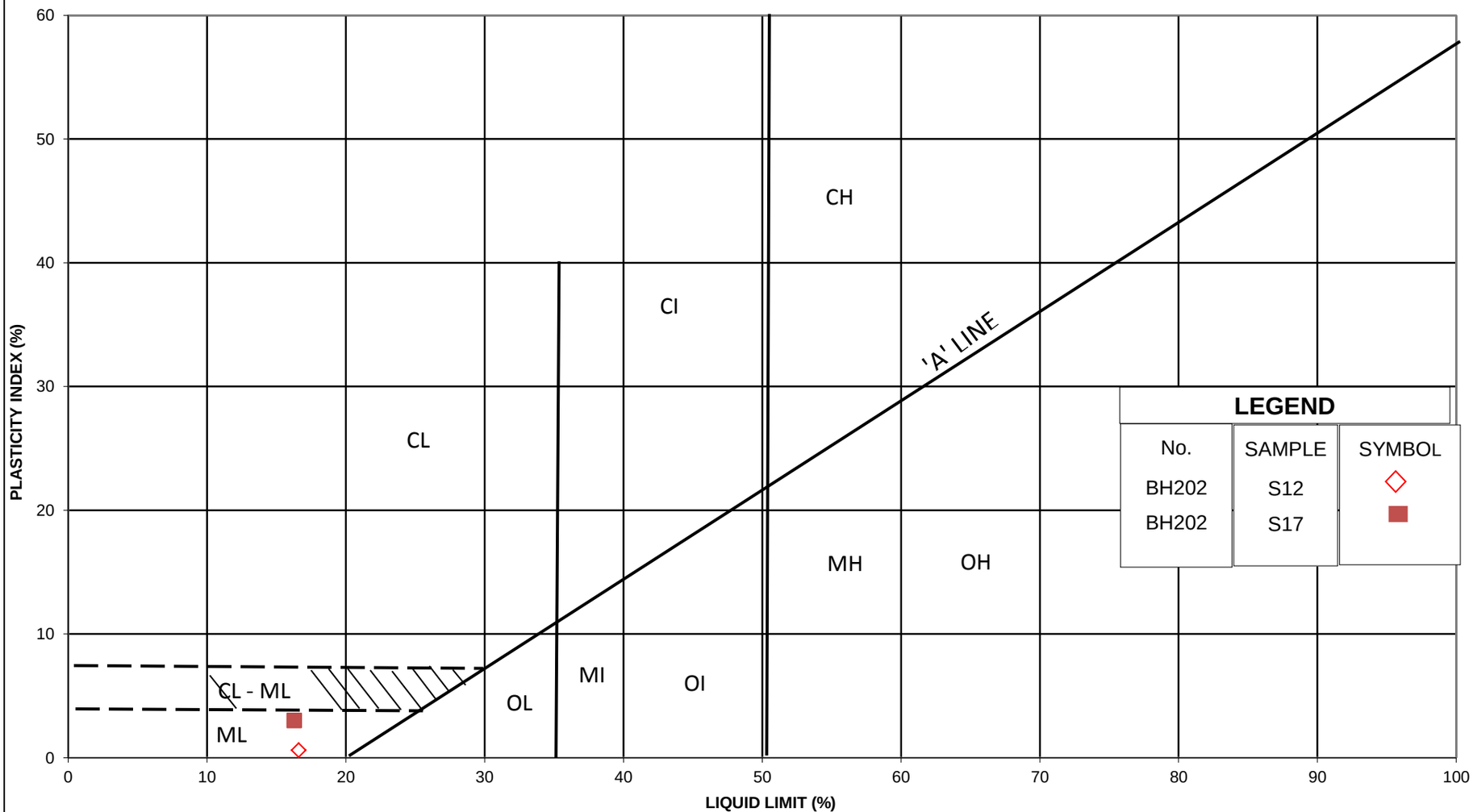
(MTO)

PLASTICITY CHART

CLAYEY SILT(CL)

FIGURE 7
GWP No. 6348-14-00
DATE April 2015

Cedar Creek Culvert #3 (Site No. 48W-156/C)
GWP No. 6348-14-00, Highway 590, Township of O'Connor, Ontario



exp. (MTO)

PLASTICITY CHART

SILT with Sand (ML)

FIGURE 8
GWP No. 6348-14-00
DATE April 2015

Appendix E – Chemical Analyses

Your Project #: ADM-00223648-B0
Site Location: HWY 590, KAKABEKA, ONTARIO
Your C.O.C. #: na

Attention:Ahileas Mitsopoulos

exp Services Inc
Thunder Bay Branch
1142 Roland St
Thunder Bay, ON
P7B 5M4

Report Date: 2015/04/01
Report #: R3378881
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B553991
Received: 2015/03/27, 10:00

Sample Matrix: Soil
Samples Received: 8

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Chloride (20:1 extract)	8	N/A	2015/04/01	CAM SOP-00463	EPA 325.2 m
Conductivity	8	N/A	2015/04/01	CAM SOP-00414	OMOE E3138 v2 m
pH CaCl2 EXTRACT	8	2015/03/31	2015/03/31	CAM SOP-00413	EPA 9045 D m
Resistivity of Soil	8	2015/03/27	2015/04/01	CAM SOP-00414	SM 22 2510 m
Sulphate (20:1 Extract)	8	N/A	2015/04/01	CAM SOP-00464	EPA 375.4 m

Remarks:

Maxxam Analytics has performed all analytical testing herein in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. All methodologies comply with this document and are validated for use in the laboratory. The methods and techniques employed in this analysis conform to the performance criteria (detection limits, accuracy and precision) as outlined in the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act.

The CWS PHC methods employed by Maxxam conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following the 'Alberta Environment Draft Addenda to the CWS-PHC, Appendix 6, Validation of Alternate Methods'. Documentation is available upon request. Maxxam has made the following improvements to the CWS-PHC reference benchmark method: (i) Headspace for F1; and, (ii) Mechanical extraction for F2-F4. Note: F4G cannot be added to the C6 to C50 hydrocarbons. The extraction date for samples field preserved with methanol for F1 and Volatile Organic Compounds is considered to be the date sampled.

Maxxam Analytics is accredited for all specific parameters as required by Ontario Regulation 153/04. Maxxam Analytics is limited in liability to the actual cost of analysis unless otherwise agreed in writing. There is no other warranty expressed or implied. Samples will be retained at Maxxam Analytics for three weeks from receipt of data or as per contract.

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

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Your Project #: ADM-00223648-B0
Site Location: HWY 590, KAKABEKA, ONTARIO
Your C.O.C. #: na

Attention:Ahileas Mitsopoulos

exp Services Inc
Thunder Bay Branch
1142 Roland St
Thunder Bay, ON
P7B 5M4

Report Date: 2015/04/01
Report #: R3378881
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B553991
Received: 2015/03/27, 10:00

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Hina Siddiqui, Project Manager –Environmental Customer Service
Email: HSiddiqui@maxxam.ca
Phone# (905) 817-5700
==========
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B553991
Report Date: 2015/04/01

exp Services Inc
Client Project #: ADM-00223648-B0
Site Location: HWY 590, KAKABEKA, ONTARIO

RESULTS OF ANALYSES OF SOIL

Maxxam ID		AAG172	AAG173	AAG174	AAG175	AAG176	AAG176		
Sampling Date		2015/02/26 15:00	2015/03/20 16:30	2015/03/04 11:15	2015/03/19 10:20	2015/03/11 14:40	2015/03/11 14:40		
COC Number		na	na	na	na	na	na		
	Units	**B101-S12**	**BH105-S4**	**BH202-S10/S11**	**BH203-S3**	**BH302-S10**	**BH302-S10 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters									
Resistivity	ohm-cm	4300	4100	2400	5200	1500			3963203
Inorganics									
Soluble (20:1) Chloride (Cl)	ug/g	<20	<20	57	<20	370		20	3966279
Conductivity	mS/cm	0.23	0.24	0.42	0.19	0.69	0.69	0.002	3967584
Available (CaCl2) pH	pH	6.97	7.79	7.82	7.95	6.20		N/A	3965076
Soluble (20:1) Sulphate (SO4)	ug/g	42	36	240	50	<20		20	3966281

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Maxxam ID		AAG177	AAG178	AAG179	AAG179		
Sampling Date		2015/03/18 11:25	2015/03/07 17:10	2015/03/17 10:00	2015/03/17 10:00		
COC Number		na	na	na	na		
	Units	**BH303-S4**	**BH402-S14**	**BH403-S3**	**BH403-S3 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters							
Resistivity	ohm-cm	2400	3000	3100			3963203
Inorganics							
Soluble (20:1) Chloride (Cl)	ug/g	79	<20	<20	<20	20	3966279
Conductivity	mS/cm	0.42	0.33	0.32		0.002	3967584
Available (CaCl2) pH	pH	7.63	7.92	7.76	7.85	N/A	3965076
Soluble (20:1) Sulphate (SO4)	ug/g	140	190	170	150	20	3966281

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B553991
Report Date: 2015/04/01

exp Services Inc
Client Project #: ADM-00223648-B0
Site Location: HWY 590, KAKABEKA, ONTARIO

TEST SUMMARY

Maxxam ID: AAG172 **Collected:** 2015/02/26
Sample ID: B101-S12 **Shipped:**
Matrix: Soil **Received:** 2015/03/27

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride (20:1 extract)	KONE/EC	3966279	N/A	2015/04/01	Deonarine Ramnarine
Conductivity	AT	3967584	N/A	2015/04/01	Lemeneh Addis
pH CaCl2 EXTRACT	AT	3965076	2015/03/31	2015/03/31	Neil Dassanayake
Resistivity of Soil		3963203	2015/04/01	2015/04/01	Automated Statchk
Sulphate (20:1 Extract)	KONE/EC	3966281	N/A	2015/04/01	Deonarine Ramnarine

Maxxam ID: AAG173 **Collected:** 2015/03/20
Sample ID: BH105-S4 **Shipped:**
Matrix: Soil **Received:** 2015/03/27

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride (20:1 extract)	KONE/EC	3966279	N/A	2015/04/01	Deonarine Ramnarine
Conductivity	AT	3967584	N/A	2015/04/01	Lemeneh Addis
pH CaCl2 EXTRACT	AT	3965076	2015/03/31	2015/03/31	Neil Dassanayake
Resistivity of Soil		3963203	2015/04/01	2015/04/01	Automated Statchk
Sulphate (20:1 Extract)	KONE/EC	3966281	N/A	2015/04/01	Deonarine Ramnarine

Maxxam ID: AAG174 **Collected:** 2015/03/04
Sample ID: BH202-S10/S11 **Shipped:**
Matrix: Soil **Received:** 2015/03/27

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride (20:1 extract)	KONE/EC	3966279	N/A	2015/04/01	Deonarine Ramnarine
Conductivity	AT	3967584	N/A	2015/04/01	Lemeneh Addis
pH CaCl2 EXTRACT	AT	3965076	2015/03/31	2015/03/31	Neil Dassanayake
Resistivity of Soil		3963203	2015/04/01	2015/04/01	Automated Statchk
Sulphate (20:1 Extract)	KONE/EC	3966281	N/A	2015/04/01	Deonarine Ramnarine

Maxxam ID: AAG175 **Collected:** 2015/03/19
Sample ID: BH203-S3 **Shipped:**
Matrix: Soil **Received:** 2015/03/27

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride (20:1 extract)	KONE/EC	3966279	N/A	2015/04/01	Deonarine Ramnarine
Conductivity	AT	3967584	N/A	2015/04/01	Lemeneh Addis
pH CaCl2 EXTRACT	AT	3965076	2015/03/31	2015/03/31	Neil Dassanayake
Resistivity of Soil		3963203	2015/04/01	2015/04/01	Automated Statchk
Sulphate (20:1 Extract)	KONE/EC	3966281	N/A	2015/04/01	Deonarine Ramnarine

Maxxam ID: AAG176 **Collected:** 2015/03/11
Sample ID: BH302-S10 **Shipped:**
Matrix: Soil **Received:** 2015/03/27

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride (20:1 extract)	KONE/EC	3966279	N/A	2015/04/01	Deonarine Ramnarine
Conductivity	AT	3967584	N/A	2015/04/01	Lemeneh Addis

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B553991
Report Date: 2015/04/01

exp Services Inc
Client Project #: ADM-00223648-B0
Site Location: HWY 590, KAKABEKA, ONTARIO

TEST SUMMARY

Maxxam ID: AAG176
Sample ID: BH302-S10
Matrix: Soil

Collected: 2015/03/11
Shipped:
Received: 2015/03/27

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
pH CaCl2 EXTRACT	AT	3965076	2015/03/31	2015/03/31	Neil Dassanayake
Resistivity of Soil		3963203	2015/04/01	2015/04/01	Automated Statchk
Sulphate (20:1 Extract)	KONE/EC	3966281	N/A	2015/04/01	Deonarine Ramnarine

Maxxam ID: AAG176 Dup
Sample ID: BH302-S10
Matrix: Soil

Collected: 2015/03/11
Shipped:
Received: 2015/03/27

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Conductivity	AT	3967584	N/A	2015/04/01	Lemeneh Addis

Maxxam ID: AAG177
Sample ID: BH303-S4
Matrix: Soil

Collected: 2015/03/18
Shipped:
Received: 2015/03/27

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride (20:1 extract)	KONE/EC	3966279	N/A	2015/04/01	Deonarine Ramnarine
Conductivity	AT	3967584	N/A	2015/04/01	Lemeneh Addis
pH CaCl2 EXTRACT	AT	3965076	2015/03/31	2015/03/31	Neil Dassanayake
Resistivity of Soil		3963203	2015/04/01	2015/04/01	Automated Statchk
Sulphate (20:1 Extract)	KONE/EC	3966281	N/A	2015/04/01	Deonarine Ramnarine

Maxxam ID: AAG178
Sample ID: BH402-S14
Matrix: Soil

Collected: 2015/03/07
Shipped:
Received: 2015/03/27

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride (20:1 extract)	KONE/EC	3966279	N/A	2015/04/01	Deonarine Ramnarine
Conductivity	AT	3967584	N/A	2015/04/01	Lemeneh Addis
pH CaCl2 EXTRACT	AT	3965076	2015/03/31	2015/03/31	Neil Dassanayake
Resistivity of Soil		3963203	2015/04/01	2015/04/01	Automated Statchk
Sulphate (20:1 Extract)	KONE/EC	3966281	N/A	2015/04/01	Deonarine Ramnarine

Maxxam ID: AAG179
Sample ID: BH403-S3
Matrix: Soil

Collected: 2015/03/17
Shipped:
Received: 2015/03/27

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride (20:1 extract)	KONE/EC	3966279	N/A	2015/04/01	Deonarine Ramnarine
Conductivity	AT	3967584	N/A	2015/04/01	Lemeneh Addis
pH CaCl2 EXTRACT	AT	3965076	2015/03/31	2015/03/31	Neil Dassanayake
Resistivity of Soil		3963203	2015/04/01	2015/04/01	Automated Statchk
Sulphate (20:1 Extract)	KONE/EC	3966281	N/A	2015/04/01	Deonarine Ramnarine

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B553991
Report Date: 2015/04/01

exp Services Inc
Client Project #: ADM-00223648-B0
Site Location: HWY 590, KAKABEKA, ONTARIO

TEST SUMMARY

Maxxam ID: AAG179 Dup
Sample ID: BH403-S3
Matrix: Soil

Collected: 2015/03/17
Shipped:
Received: 2015/03/27

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride (20:1 extract)	KONE/EC	3966279	N/A	2015/04/01	Deonarine Ramnarine
pH CaCl2 EXTRACT	AT	3965076	2015/03/31	2015/03/31	Neil Dassanayake
Sulphate (20:1 Extract)	KONE/EC	3966281	N/A	2015/04/01	Deonarine Ramnarine

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B553991
Report Date: 2015/04/01

exp Services Inc
Client Project #: ADM-00223648-B0
Site Location: HWY 590, KAKABEKA, ONTARIO

GENERAL COMMENTS

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

Package 1	4.7°C

Sample AAG172-01 : CONDUCT-SB/PHCACL-S: Sample extracted/analysed past holding time.

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B553991
Report Date: 2015/04/01

QUALITY ASSURANCE REPORT

exp Services Inc
Client Project #: ADM-00223648-B0
Site Location: HWY 590, KAKABEKA, ONTARIO

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**% Recovery**	**QC Limits**	**Value**	**Units**	**Value (%)**	**QC Limits**
3965076	Available (CaCl2) pH	2015/03/31			100	97 - 103			1.2	N/A
3966279	Soluble (20:1) Chloride (Cl)	2015/04/01	NC	70 - 130	99	70 - 130	<20	ug/g	NC	35
3966281	Soluble (20:1) Sulphate (SO4)	2015/04/01	NC	70 - 130	100	70 - 130	<20	ug/g	9.0	35
3967584	Conductivity	2015/04/01			99	90 - 110	<0.002	mS/cm	0.44	10

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 (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

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 (one or both samples < 5x RDL).

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B553991
Report Date: 2015/04/01

exp Services Inc
Client Project #: ADM-00223648-B0
Site Location: HWY 590, KAKABEKA, ONTARIO

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Cristina Carriere

Cristina Carriere, Scientific Services

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam

6740 Campobello Road, Mississauga, Ontario L5N 2L8 www.maxxam.ca
Phone: 905-817-5700 Fax: 905-817-5779 Toll Free: 800-563-6266

CHAIN OF CUSTODY RECORD

Page 1 of 1

INVOICE INFORMATION	REPORT INFORMATION (if differs from invoice)	PROJECT INFORMATION	TURNAROUND TIME (TAT) REQUIRED
Company Name: exp Services Inc.	Company Name:	Quotation #:	[x] Regular TAT (5-7 days)
Contact Name: Michael Suslyk, Ahileas Mitsopoulos	Contact Name:	P.O. #:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: 1142 Roland Street	Address:	Project #: ADM-00223648-B0	Rush TAT (Applicable Surcharge)
Thunder Bay, ON P7B 5M4		Site Location: Hwy 590, Kakabeka, Ontario	[ ] 1 Day (100%)
Phone: 807.623.9495 Fax: 807.623.8070	Phone: Fax:	Site #:	[ ] 2 Days (50%)
Email: michael.suslyk@exp.com, ahileas.mitsopoulos@exp.com	Email:	Sampled By: Elwin Farkas	[ ] 3-4 Days (25%)

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY

REGULATION 153 (2011)

[ ] Table 1 [ ] Res/Park [ ] Med/Fine
[ ] Table 2 [ ] Ind/Comm [ ] Coarse
[ ] Table 3 [ ] Agri/Other
[ ] Table ___

FOR RSC (PLEASE CIRCLE) Yes / No

OTHER REGULATIONS

[ ] CCME [ ] Sanitary Sewer Bylaw
[ ] MISA [ ] Storm Sewer Bylaw
[ ] PWQO Municipality:
[ ] Other (Specify):
[ ] REG 558 (MINIMUM 3 DAY TAT REQUIRED)

Include Criteria on Certificate of Analysis (Y/N)? Y

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

ANALYSIS REQUESTED

	SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	MATRIX	# OF CONT.	FIELD FILTERED (PLEASE CIRCLE) Metals / Hg / CrVI	pH	Water Soluble Sulphate	Resistivity	Conductivity	Chloride								COMMENTS / TAT COMMENTS
1	B101-S12	Feb. 26/15	3:00	Soil	1		x	x	x	x	x								
2	BH105-S4	Mar. 20/15	4:30	Soil	1		x	x	x	x	x								
3	BH202-S10/S11	Mar. 04/15	11:15	Soil	1		x	x	x	x	x								
4	BH203-S3	Mar. 19/15	10:20	Soil	1		x	x	x	x	x								
5	BH302-S10	Mar. 11/15	2:40	Soil	1		x	x	x	x	x								
6	BH303-S4	Mar. 18/15	11:25	Soil	1		x	x	x	x	x								
7	BH402-S14	Mar. 07/15	5:10	Soil	1		x	x	x	x	x								
8	BH403-S3	Mar. 17/15	10:00	Soil	1		x	x	x	x	x								
9																			
10																			

Rush Confirmation #:

Date Required:

LABORATORY USE ONLY

CUSTODY SEAL (Y/N)		Temperature (°C) on Receipt
Present	N	4/5/5
Intact	N	
COOLING MEDIA PRESENT (Y / N)	Y	

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME:	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME:	# JARS USED AND NOT SUBMITTED
Michael Suslyk	26-Mar-15	1:30	MUSDAT NSD2	2015/03/27	10:00	

27-Mar-15 10:00
Hina Siddiqui
B553991

HP6 ENV-789

Maxxam Analytics International Corporation o/a Maxxam Analytics