

**FOUNDATION INVESTIGATION REPORT
BIG TROUT CREEK CULVERT
HIGHWAY 628
TOWNSHIP OF RED ROCK, ONTARIO**

G.W.P. 497-93-00, SITE No. 48C-192/C

Geocres Number: 52A-181

Report to

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PART 1: FACTUAL INFORMATION

1 INTRODUCTION

This report presents the factual findings obtained from a foundation investigation conducted at the proposed location of the replacement culvert carrying Highway 628 over Big Trout Creek, located in the Township of Red Rock, Ontario.

The purpose of this investigation was to explore the subsurface conditions at the site and, based on the data obtained, to provide a borehole location plan, records of boreholes, stratigraphic profile, laboratory test results and a written description of the subsurface conditions. A model of the subsurface conditions was developed from the data obtained in the course of the investigation.

Thurber carried out the investigation as a sub-consultant to MMM Group Limited (MMM), under the Ministry of Transportation Ontario (MTO) Agreement Number 6010-E-0011.

2 SITE DESCRIPTION

The existing Big Trout Creek culvert is located in the Township of Red Rock, Ontario, about 2.5 km southeast of the intersection of Highway 628 and Highway 11/17. At the crossing of Highway 628, Big Trout Creek flows in a general north to south direction. The culvert under the existing highway embankment consists of a 27.8 m long corrugated steel arch culvert with an approximate 3.0 x 5.0 m opening. The interior of the arch was noted to be strutted with timber supports.

Existing road grade on Highway 628 is at approximate Elev. 196.4 and the culvert invert is at approximate Elev. 192.0. The embankment height adjacent to the culvert is about 2.5 m. Preliminary drawings provided by MMM indicate a water level at Elev. 192.9 m in February 2011.

The surrounding lands are mainly treed with grass and shrubs in close proximity to the highway. Residential properties are located on the south side of Highway 628, to the west and east of the

culvert. Photographs in Appendix C show the existing Big Trout Creek culvert and the general nature of the site.

The site lies within the physiographic region known as the Quetico Subprovince of the Superior Province of the Canadian Shield, characterized by early Precambrian metasedimentary bedrock (paragneiss and migmatites) (OGS Map 2664, “Precambrian Geology Compilation Series, Thunder Bay Sheet” dated 2001). At the site, the metasedimentary bedrock is overlain by sedimentary bedrock (primarily shale, mudstone and sandstone) of the Sibley Formation. The bedrock is mantled by deep deposits of glaciolacustrine clay and a surficial organic terrain.

3 SITE INVESTIGATION AND FIELD TESTING

The site investigation and field testing for this project was carried out between April 12 and May 1, 2014. The investigation comprised drilling and sampling four boreholes identified as Boreholes BTC-01 to BTC-04 along the proposed replacement culvert alignment. Boreholes BTC-01 and BTC-04 were drilled near the proposed inlet and outlet respectively, and Boreholes BTC-02 and BTC-03 were drilled on the east and west sides of the culvert alignment through the shoulders of the existing highway embankment.

The approximate borehole locations are shown on the attached Borehole Locations and Soil Strata Drawing in Appendix D.

The borehole locations were marked in the field and utility clearances were obtained prior to drilling.

Boreholes BTC-02 and BTC-03 were advanced to depths of 33.5 to 35.8 m (Elev. 162.9 and 160.4 m), with drilling carried out using a truck mounted drill rig with NW casing and NQ coring techniques. NQ coring was used to advance the boreholes between 0.3 and 3.0 m into bedrock. Boreholes BTC-01 and BTC-04 were drilled using portable tripod equipment and wash boring to advance NW casing until encountering refusal at depths of 15.8 m (Elev. 178.2 to 177.9 m). Dynamic Cone Penetration Tests (DCPTs) were conducted from the bottom of boreholes BTC-01 and BTC-04 to advance to total depths of 28.6 and 27.7 m (Elev. 165.4 and 166.0 m) respectively upon encountering DCPT refusal. Soil samples were obtained at selected intervals in the boreholes using a split spoon sampler in conjunction with Standard Penetration Testing (SPT). In situ vane shear testing was conducted to further assess the undrained shear strength of the cohesive deposits.

The drilling and sampling operations were supervised on a full time basis by a member of Thurber’s technical staff. The supervisor logged the boreholes and processed the recovered soil and rock samples for transport to Thurber’s laboratory for further examination and testing.

Groundwater conditions were observed in the open boreholes upon completion of the drilling operations. Standpipe piezometers were installed in two boreholes to measure groundwater levels. The piezometers were subsequently decommissioned in general accordance with MOE Regulation

903 following completion of the final water level reading. The piezometer installation and borehole completion details are summarized in Table 3.1.

Table 3.1 – Borehole Completion and Piezometer Installation Details

Borehole	Piezometer Tip Depth/ Elev. (m)	Completion and Installation Details
BTC-01	24.7 / 169.3	19 mm diameter piezometer installed with filter sand from 28.6 m to 21.3 m, then bentonite holeplug to surface.
BTC-02	None installed	Backfilled with bentonite holeplug to 0.1 m, then asphalt to surface.
BTC-03	None installed	Backfilled with bentonite holeplug to 0.2 m, then sand and gravel to surface.
BTC-04	27.7 / 166.0	19 mm diameter piezometer installed with filter sand from 27.7 m to 23.9 m, then bentonite holeplug to surface.

4 LABORATORY TESTING

The recovered soil samples were subjected to Visual Identification (VI) and to natural moisture content determination. Selected samples were also subjected to gradation analysis (hydrometer and sieve) and Atterberg Limits testing, where appropriate. The results of these tests are summarized on the Record of Borehole sheets included in Appendix A and are presented on the figures included in Appendix B.

Point load tests were carried out on selected samples of intact bedrock to evaluate the unconfined compressive strength (UCS) of the bedrock. The UCS values of the rock assessed from the point load data are reported on the borehole logs (as average per run).

5 DESCRIPTION OF SUBSURFACE CONDITIONS

Reference is made to the Record of Borehole sheets included in Appendix A. Details of the encountered soil stratigraphy are presented in these sheets and on the “Borehole Locations and Soil Strata” drawing included in Appendix D. An overall description of the stratigraphy is given in the following paragraphs. However, the factual data presented in the Record of Borehole sheets governs any interpretation of the site conditions.

In general, the subsurface stratigraphy encountered at the culvert site consisted of topsoil or asphalt overlying existing embankment fill underlain by native deposits of sand and silt to sand and gravel, a thick deposit of silty clay, and a layer of sand and silt overlying bedrock. More detailed descriptions of the individual strata are presented below.

5.1 Topsoil

A thin layer of topsoil was encountered at the ground surface in Boreholes BTC-01 and BTC-04. The topsoil layer was 75 to 125 mm thick at these locations. The thickness of the topsoil layer may vary between and beyond the borehole locations.

5.2 Asphalt

An 80 mm thick layer of asphalt was encountered on the roadway shoulder in Borehole BTC-02.

5.3 Embankment Fill

Cohesionless embankment fill comprising sand and gravel to gravelly sand was encountered below the asphalt in Borehole BTC-02 and at the surface in Borehole BTC-03 drilled on the highway shoulder. The base of the granular fill was encountered at depths of 4.9 and 4.7 m (Elev. 191.3 and 191.7).

Fill comprising silty sand to sand, some silt was encountered below the topsoil in Boreholes BTC-01 and BTC-04 drilled adjacent to the ends of the culvert. This fill layer was 0.8 and 1.2 m thick with a lower boundary at depths of 0.9 and 1.3 m (Elev. 192.8 and 192.7).

SPT N-values recorded in the granular embankment fill ranged from 23 to 66 blows for 0.3 m penetration, indicating a compact to very dense condition. An N-value of 50 blows for 0.1 m penetration was recorded on probable cobbles in the fill in Borehole BTC-02. N-values of 10 to 33 blows for 0.3 m (compact to dense) were obtained in the fill adjacent to the embankment, however the higher value may reflect a frozen condition.

Moisture contents ranged from 8% to 15% in the granular fill, and 33% to 39% in the sand fill.

Three samples of the embankment fill were selected for laboratory grain size analysis testing. The results of the tests are summarized below and are presented on the corresponding Record of Borehole sheets included in Appendix A. The grain size distribution curves for the samples are plotted on Figure B1, Appendix B.

Gravel %	21 to 38
Sand %	57 to 69
Silt and Clay %	5 to 10

5.4 Sand and Silt to Sand and Gravel

Native deposits of sand, sand and gravel, and sand and silt were encountered beneath the fill in Boreholes BTC-01, BTC-03 and BTC-04. These deposits were 1.4 to 3.1 m thick, with a lower boundary at depths of 3.3 to 6.1 m (Elev. 190.7 to 189.7 m). Wood fibres, organics and occasional cobbles were noted in these deposits.

SPT N-values recorded within the sand/gravel deposits ranged from 0 to 15 blows for 0.3 m penetration, indicating a very loose to compact relative density. Higher N-values of 66 blows/0.3 m and 114 blows/0.175 m were obtained in the sand and silt in Borehole BTC-04, reflecting a frozen condition. Moisture contents ranged from 19% to 30%.

Grain size analyses were undertaken on samples of the sand/gravel/silt deposits. The results are presented on the Record of Borehole sheets included in Appendix A and on Figures B2 and B3 of Appendix B. The results are summarized below.

	Sand & Silt	Sand	Sand & Gravel
Gravel %	3	0	46
Sand %	47	92	45
Silt %	37	8	9
Clay %	13		

5.5 Silty Clay

Native silty clay was encountered below the fill in Borehole BTC-02 and below the sand/gravel/silt deposits in the remaining boreholes. The silty clay was typically grey with occasional silt seams.

Where fully penetrated in Boreholes BTC-02 and BTC-03, the silty clay layer was 24.4 to 25.6 m thick, with a lower boundary encountered at a depth of 30.5 m (Elev. 165.7 to 165.9). Sampling in Boreholes BTC-01 and BTC-04 was terminated within the silty clay layer at 15.8 m depth (Elev. 178.2 to 177.9 m).

SPT N-values recorded in the silty clay ranged from 0 to 6 blows for 0.3 m penetration, typically less than 2. In situ shear vane testing indicated undrained shear strengths in the order of 22 to 75 kPa, typically about 30 to 40 kPa. Based on this data, the consistency of the silty clay ranges from soft to stiff, and is typically firm.

The moisture content of the silty clay generally ranged from 31% to 57%, with one value of 121% measured in Borehole BTC-01.

The results of grain size distribution analyses conducted on samples of the silty clay are presented on the Record of Borehole sheets in Appendix A and on Figures B4 to B6 in Appendix B. The results of Atterberg Limits testing conducted on the samples are

presented on the Record of Borehole sheets and plotted on Figures B8 and B9 of Appendix B. The results are summarized below.

Gravel %	0
Sand %	0
Silt %	32 to 57
Clay %	43 to 68
Liquid Limit	31 to 44
Plastic Limit	18 to 20

The results of the Atterberg Limits tests indicate that the silty clay is typically of intermediate plasticity (CI), varying to low plasticity (CL).

5.6 Lower Sand and Silt

A deposit of sand and silt with some clay, trace to some gravel, and occasional cobbles was encountered below the silty clay in Boreholes BTC-02 and BTC-03. The sand and silt deposit was 2.3 to 2.7 m thick with a lower boundary at 32.8 to 33.2 m depth (Elev. 163.4 to 163.2 m).

SPT N-values of 60 and 64 blows for 0.3 m penetration were recorded in the silt and sand, indicating that the material has a very dense relative density. The moisture content was measured as 8% to 9%.

A grain size analysis was undertaken on one sample of the sand and silt. The results are presented on the Record of Borehole sheets included in Appendix A and on Figure B7 of Appendix B. The results are summarized below.

Gravel %	1
Sand %	46
Silt %	42
Clay %	11

5.7 Bedrock

Bedrock was encountered below the sand and silt deposit in Boreholes BTC-02 and BTC-03 at depths of 32.8 and 33.2 m (Elev. 163.4 and 163.2 m).

Boreholes BTC-02 and BTC-03 were extended 3.0 and 0.3 m respectively into bedrock by coring (further coring in Borehole BTC-03 was obstructed by casing damage). The bedrock recovered in the boreholes was described as red shale with grey mottles and calcareous zones. Total core recovery was 100% in both runs from Borehole BTC-02.

RQD values of 77 to 98% were recorded, indicating good to excellent rock quality. The Fracture Index (FI) of the rock, expressed as fractures per 0.3 m of core, ranged from 0 to greater than 10 (typically under 3).

Average unconfined compressive strengths (UCS) of 150 and 133 MPa were assessed from the results of point load tests conducted on the rock core samples, indicating a very strong intact rock strength. The strength results are included on the borehole logs in Appendix A (as average per run).

5.8 Water Levels

Groundwater levels in the boreholes were observed during drilling and standpipe piezometers were installed in two boreholes to monitor groundwater levels after completion of drilling. A summary of the recorded groundwater levels is provided below.

Table 5.1 - Groundwater Level Measurements

Borehole	Date	Groundwater Level		Comment
		Depth (m)	Elevation	
BTC-01	May 01, 2014	-1.0*	195.0	In piezometer
BTC-04	May 01, 2014	-1.0*	194.7	In piezometer

* indicates artesian groundwater level above the ground surface

The water levels measured above the ground surface are indicative of artesian pressures present in the cohesionless deposits below the silty clay layer.

The recorded groundwater levels are considered short-term readings and seasonal fluctuations of the groundwater level are to be expected, particularly after spring snowmelt as well as periods of prolonged and/or significant precipitation.

The groundwater level is also expected to be influenced by the water level in Big Trout Creek, which is shown on the preliminary drawings provided by MMM to be at Elev. 192.9 m in February 2011.

6 MISCELLANEOUS

In general, the borehole locations were positioned in the field by Thurber staff and were established relative to site features. The co-ordinates and ground surface elevations at the boreholes were inferred from the MMM Group Limited General Arrangement drawing dated March 2014.

Eastern Ontario Diamond Drilling Limited from Hawkesbury, Ontario supplied a tri-pod and truck mounted CME 75 drill rig and conducted the drilling, sampling and in-situ testing operations.

Full time supervision of the field activities was carried out by Ms. Eckie Siu of Thurber. Overall supervision of the field program was conducted by Mr. Mark Farrant, P.Eng.

Interpretation of the data and preparation of this report were carried out by Mr. Mark Farrant, P.Eng. and Mr. Murray R. Anderson, P.Eng. The report was reviewed by Dr. P.K. Chatterji, P.Eng., a Designated Principal Contact for MTO Foundations Projects.

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Appendix A

Record of Borehole Sheets

SYMBOLS, ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES

1. TEXTURAL CLASSIFICATION OF SOILS

CLASSIFICATION	PARTICLE SIZE	VISUAL IDENTIFICATION
Boulders	Greater than 200mm	same
Cobbles	75 to 200mm	same
Gravel	4.75 to 75mm	5 to 75mm
Sand	0.075 to 4.75mm	Not visible particles to 5mm
Silt	0.002 to 0.075mm	Non-plastic particles, not visible to the naked eye
Clay	Less than 0.002mm	Plastic particles, not visible to the naked eye

2. COARSE GRAIN SOIL DESCRIPTION (50% greater than 0.075mm)

TERMINOLOGY	PROPORTION
Trace or Occasional	Less than 10%
Some	10 to 20%
Adjective (e.g. silty or sandy)	20 to 35%
And (e.g. sand and gravel)	35 to 50%

3. TERMS DESCRIBING CONSISTENCY (COHESIVE SOILS ONLY)

DESCRIPTIVE TERM	UNDRAINED SHEAR STRENGTH (kPa)	APPROXIMATE SPT ⁽¹⁾ 'N' VALUE
Very Soft	12 or less	Less than 2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	Greater than 200	Greater than 30

NOTE: Hierarchy of Soil Strength Prediction

- 1) Laboratory Triaxial Testing
- 2) Field Insitu Vane Testing
- 3) Laboratory Vane Testing
- 4) SPT value
- 5) Pocket Penetrometer

4. TERMS DESCRIBING DENSITY (COHESIONLESS SOILS ONLY)

DESCRIPTIVE TERM	SPT "N" VALUE
Very Loose	Less than 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	Greater than 50

5. LEGEND FOR RECORDS OF BOREHOLES

SYMBOLS AND ABBREVIATIONS FOR SAMPLE TYPE	SS Split Spoon Sample	WS Wash Sample	AS Auger (Grab) Sample
	TW Thin Wall Shelby Tube Sample	TP Thin Wall Piston Sample	
	PH Sampler Advanced by Hydraulic Pressure	PM Sampler Advanced by Manual Pressure	
	WH Sampler Advanced by Self Static Weight	RC Rock Core	SC Soil Core

$$\text{Sensitivity} = \frac{\text{Undisturbed Shear Strength}}{\text{Remoulded Shear Strength}}$$

 Water Level
 Shear Strength Determination by Pocket Penetrometer

- (1) SPT 'N' Value Standard Penetration Test 'N' Value – refers to the number of blows from a 63.5kg hammer free falling a height of 0.76m to advance a standard 50 mm outside diameter split spoon sampler for 0.3 m depth into undisturbed ground.
- (2) DCPT Dynamic Cone Penetration Test – Continuous penetration of a 50 mm outside diameter, 60° conical steel point attached to "A" size rods driven by a 63.5 kg hammer free falling a height of 0.76 m. The resistance to cone penetration is the number of hammer blows required for each 0.3 m advance of the conical point into undisturbed ground.

UNIFIED SOILS CLASSIFICATION

MAJOR DIVISIONS		GROUP SYMBOL	TYPICAL DESCRIPTION
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	Well-graded gravels or gravel-sand mixtures, little or no fines.
		GP	Poorly-graded gravels or gravel-sand mixtures, little or no fines.
		GM	Silty gravels, gravel-sand-silt mixtures.
		GC	Clayey gravels, gravel-sand-clay mixtures.
	SAND AND SANDY SOILS	SW	Well-graded sands or gravelly sands, little or no fines.
		SP	Poorly-graded sands or gravelly sands, little or no fines.
		SM	Silty sands, sand-silt mixtures.
		SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS	SILTS AND CLAYS W _L < 50%	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays. (W _L < 30%).
		CI	Inorganic clays of medium plasticity, silty clays. (30% < W _L < 50%).
		OL	Organic silts and organic silty-clays of low plasticity.
	SILTS AND CLAYS W _L > 50%	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
		CH	Inorganic clays of high plasticity, fat clays.
		OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS		Pt	Peat and other highly organic soils.
CLAY SHALE			
SANDSTONE			
SILTSTONE			
CLAYSTONE			
COAL			

EXPLANATION OF ROCK LOGGING TERMS


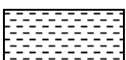

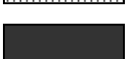

ROCK WEATHERING CLASSIFICATION

Fresh (FR)	No visible signs of weathering.
Fresh Jointed (FJ)	Weathering limited to the surface of major discontinuities.
Slightly Weathered (SW)	Penetrative weathering developed on open discontinuity surfaces, but only slight weathering of rock material.
Moderately Weathered (MW)	Weathering extends throughout the rock mass, but the rock material is not friable.
Highly Weathered (HW)	Weathering extends throughout the rock mass and the rock is partly friable.
Completely Weathered (CW)	Rock is wholly decomposed and in a friable condition, but the rock texture and structure are preserved.

DISCONTINUITY SPACING

Bedding	Bedding Plane Spacing
Very thickly bedded	Greater than 2m
Thickly bedded	0.6 to 2m
Medium bedded	0.2 to 0.6m
Thinly bedded	60mm to 0.2m
Very thinly bedded	20 to 60mm
Laminated	6 to 20mm
Thinly Laminated	Less than 6mm

SYMBOLS

	CLAYSTONE
	SILTSTONE
	SANDSTONE
	COAL
	BEDROCK

STRENGTH CLASSIFICATION

Rock Strength	Approximate Uniaxial Compressive Strength		Field Estimation of Hardness*
	(MPa)	(psi)	
Extremely Strong	Greater than 250	Greater than 36,000	Specimen can only be chipped with a geological hammer
Very Strong	100-250	15,000 to 36,000	Requires many blows of geological hammer to break
Strong	50-100	7,500 to 15,000	Requires more than one blow of geological hammer to break
Medium Strong	25.0 to 50.0	3,500 to 7,500	Breaks under single blow of geological hammer.
Weak	5.0 to 25.0	750 to 3,500	Can be peeled by a pocket knife with difficulty
Very Weak	1.0 to 5.0	150 to 750	Can be peeled by a pocket knife, crumbles under firm blows of geological pick.
Extremely Weak (Rock)	0.25 to 1.0	35 to 150	Indented by thumbnail

TERMS

Total Core Recovery: (TCR)	Core recovered as a percentage of total core run length
Solid Core Recovery:(SCR)	Percent Ratio of solid core of full cylindrical shape recovered. Expressed with respect to the total length of core run
Rock Quality Designation:(RQD)	Total length of sound core recovered in pieces 0.1m in length or larger as a % of total core run length.
Uniaxial Compressive Strength (UCS)	Axial stress required to break the specimen
Fracture Index:(FI)	Frequency of natural fractures per 0.3m of core run.

RECORD OF BOREHOLE No BTC-01

1 OF 3

METRIC

WP# 4497-93-01 LOCATION Big Trout Creek Culvert N 5 423 171.0 E 208 286.3 ORIGINATED BY ES
 HWY 628 BOREHOLE TYPE Tripod/Wash Boring COMPILED BY AN
 DATUM Geodetic DATE 2014.04.13 - 2014.04.13 CHECKED BY MEF

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										WATER CONTENT (%)
194.0								20	40	60	80	100						
0.0	TOPSOIL: (75mm) SAND, silty to trace silt, trace to some gravel, trace rootlets Compact Brown Wet (FILL)		1	SS	10													
0.1																		
192.7			2	SS	11		193											
1.3	SAND and GRAVEL, trace silt, occasional wood fibres Compact Brown Wet																	
			3	SS	15		192											
			4	SS	12												46 45 9 (SI+CL)	
190.7						191												
3.3	Silty CLAY Firm Grey (Cl)		5	SS	5													
			6	SS	1		190											0 0 41 59
			7	SS	0													
			8	SS	1		188											
			9	SS	3		187											

Continued Next Page

+³, ×³: Numbers refer to Sensitivity
 20
 15
 10
 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No BTC-01

2 OF 3

METRIC

WP# 4497-93-01 LOCATION Big Trout Creek Culvert N 5 423 171.0 E 208 286.3 ORIGINATED BY ES
 HWY 628 BOREHOLE TYPE Tripod/Wash Boring COMPILED BY AN
 DATUM Geodetic DATE 2014.04.13 - 2014.04.13 CHECKED BY MEF

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	WATER CONTENT (%)					
	Continued From Previous Page													
	Silty CLAY , occasional silt seams Firm Grey		10	SS	0		183	5.0 +					121	
			11	SS	1		182	5.0 +						
			12	SS	0		180	4.0 +						0 0 44 56
			13	SS	1		179	4.0 +						
178.2	DCPT starts at 15.8m						178							
15.8							177							
							176							
							175							

Continued Next Page

+³, ×³: Numbers refer to Sensitivity
 20
15 10 5 0 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No BTC-01

3 OF 3

METRIC

WP# 4497-93-01 LOCATION Big Trout Creek Culvert N 5 423 171.0 E 208 286.3 ORIGINATED BY ES
 HWY 628 BOREHOLE TYPE Tripod/Wash Boring COMPILED BY AN
 DATUM Geodetic DATE 2014.04.13 - 2014.04.13 CHECKED BY MEF

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 (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60	W P W W L				
	Continued From Previous Page													
165.4														
28.6	END OF BOREHOLE AT 28.6m UPON DCPT REFUSAL. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 3.0m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) May 01/14 1.0* 195.0 * Above ground surface													

ONTMT4S 1197.GPJ 2012TEMPLATE(MTO).GDT 7/3/14

RECORD OF BOREHOLE No BTC-02

1 OF 4

METRIC

WP# 4497-93-01 LOCATION Big Trout Creek Culvert N 5 423 153.5 E 208 291.3 ORIGINATED BY ES
 HWY 628 BOREHOLE TYPE NW Casing/NQ Coring COMPILED BY AN
 DATUM Geodetic DATE 2014.05.01 - 2014.05.01 CHECKED BY MEF

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			20	40	60	80	100	W _P	W		W _L	GR	SA	SI	CL
								SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE						WATER CONTENT (%)						
196.2							20	40	60	80	100	20	40	60						
0.0																				
0.1	ASPHALT: (80mm)																			
	SAND and GRAVEL, trace silt Compact to Very Dense Brown Moist (FILL)		1	GS								○								
			1	SS	29							○								
			2	SS	23							○					38	57	5 (SI+CL)	
	Occasional cobbles		3	SS	66							○								
			4	SS	50/ 0.100							○								
191.3			5	SS	2								○							
4.9	Silty CLAY Firm Grey (Cl)																			
			6	SS	2								○				0	0	49 51	
			7	SS	0								○							
			8	SS	0								○							
</																				

Continued Next Page

+³, ×³: Numbers refer to
Sensitivity

20
15 10 5 0
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No BTC-02

2 OF 4

METRIC

WP# 4497-93-01 LOCATION Big Trout Creek Culvert N 5 423 153.5 E 208 291.3 ORIGINATED BY ES
 HWY 628 BOREHOLE TYPE NW Casing/NQ Coring COMPILED BY AN
 DATUM Geodetic DATE 2014.05.01 - 2014.05.01 CHECKED BY MEF

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 (%) GR SA SI CL				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa			WATER CONTENT (%)								
								○ UNCONFINED + FIELD VANE			w _p w w _L								
								● QUICK TRIAXIAL × LAB VANE											
	Continued From Previous Page							20 40 60 80 100											
	Silty CLAY Firm Grey (Cl)					186	4.0 +												
			9	SS	1										0 0 43 57				
						185													
							5.0 +												
						184													
			10	SS	1														
						183	5.0 +												
						182													
			11	SS	0														
						181	5.0 +												
			12	SS	0														
						180	5.0 +												
			179										0 0 51 49						
						178	5.0 +												
			14	SS	0														
						177	5.0 +												

Continued Next Page

+³, ×³: Numbers refer to
Sensitivity

20
15 10 5
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No BTC-02

3 OF 4

METRIC

WP# 4497-93-01 LOCATION Big Trout Creek Culvert N 5 423 153.5 E 208 291.3 ORIGINATED BY ES
HWY 628 BOREHOLE TYPE NW Casing/NQ Coring COMPILED BY AN
DATUM Geodetic DATE 2014.05.01 - 2014.05.01 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
							20	40	60	80	100						
	Continued From Previous Page																
	Silty CLAY Firm Grey (Cl)						176										
	Occasional silt seams		15	SS	3		175										
	Becoming Stiff						174			5.0							
							173										
							172										
			16	SS	2		171			4.0							
							170										
							169										
			17	SS	6		168			3.0							
							167										

Continued Next Page











+³, ×³: Numbers refer to Sensitivity
20
15 10 5 0 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No BTC-02

4 OF 4

METRIC

WP# 4497-93-01 LOCATION Big Trout Creek Culvert N 5 423 153.5 E 208 291.3 ORIGINATED BY ES
HWY 628 BOREHOLE TYPE NW Casing/NQ Coring COMPILED BY AN
DATUM Geodetic DATE 2014.05.01 - 2014.05.01 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
								20 40 60 80 100						
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE						
							WATER CONTENT (%)							
							PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT W _P W W _L							
Continued From Previous Page														
165.7	Silty CLAY , silt seams Stiff Grey						166							
30.5	SAND and SILT , some clay, trace gravel, occasional cobbles Very Dense Reddish Brown Moist		18	SS	64									1 46 42 11
							165							
							164							
163.4														
32.8	BEDROCK , red shale with grey mottling and occasional calcareous zones Broken zone (25mm to 75mm thick) at 32.8m, 33.3m, 33.5m, 33.9m Sub-vertical fracture (75mm thick) at 33.5m Vertical fracture (50mm thick) at 33.9m		1	RUN			163							RUN #1 TCR=100% SCR=77% RQD=77% UCS=150MPa (Average)
							162							
			2	RUN			161							RUN #2 TCR=100% SCR=98% RQD=98% UCS=133MPa (Average)
160.4														
35.8	END OF BOREHOLE AT 35.8m. 1.3m OF ARTESIAN PRESSURE INSIDE NW CASING UPON COMPLETION. WATER LEVEL AT 1.0m BELOW GROUND SURFACE IN OPEN BOREHOLE. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 0.1m, THEN ASPHALT TO SURFACE.													

ONTMT4S 1197.GPJ 2012TEMPLATE(MTO).GDT 7/3/14

RECORD OF BOREHOLE No BTC-03

1 OF 4

METRIC

WP# 4497-93-01 LOCATION Big Trout Creek Culvert N 5 423 155.4 E 208 279.5 ORIGINATED BY ES
HWY 628 BOREHOLE TYPE NW Casing/NQ Coring COMPILED BY AN
DATUM Geodetic DATE 2014.04.30 - 2014.04.30 CHECKED BY MEF


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 (%)				GR	SA	SI	CL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
								○ UNCONFINED + FIELD VANE	● QUICK TRIAXIAL × LAB VANE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
196.4								20	40	60	80	100																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															</

Continued Next Page

+³, ×³: Numbers refer to
Sensitivity

20
15 10 5 10
(%) STRAIN AT FAILURE

METRIC

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									WATER CONTENT (%)
								○ UNCONFINED + FIELD VANE									
								● QUICK TRIAXIAL × LAB VANE									
Continued From Previous Page																	
	Silty CLAY Firm Grey (CI-CL)						186	6.0 +									
			10	SS	0												
							185										
			11	SS	1				7.0 +								
							184										
							183		5.0 +								
							182										
							181		6.0 +								
			13	SS	0												
							180		7.0 +								
							179										
							178		7.0 +								
				177													
			15	SS	0												

+³, ×³: Numbers refer to Sensitivity

RECORD OF BOREHOLE No BTC-03

3 OF 4

METRIC

WP# 4497-93-01 LOCATION Big Trout Creek Culvert N 5 423 155.4 E 208 279.5 ORIGINATED BY ES
HWY 628 BOREHOLE TYPE NW Casing/NQ Coring COMPILED BY AN
DATUM Geodetic DATE 2014.04.30 - 2014.04.30 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	○ UNCONFINED + FIELD VANE	W _P W W _L	WATER CONTENT (%)			GR		SA	SI	CL		
									● QUICK TRIAXIAL × LAB VANE											
	Continued From Previous Page																			
	Silty CLAY Firm Grey (CI-CL)																			
			16	SS	4											0 0 38 62				
								7.0 +												
			17	SS	2															
								6.0 +												
			18	SS	5											0 0 49 51				
								6.0 +												

Continued Next Page

+³, ×³: Numbers refer to Sensitivity 20 15 10 5 0 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No BTC-03

4 OF 4

METRIC

WP# 4497-93-01 LOCATION Big Trout Creek Culvert N 5 423 155.4 E 208 279.5 ORIGINATED BY ES
HWY 628 BOREHOLE TYPE NW Casing/NQ Coring COMPILED BY AN
DATUM Geodetic DATE 2014.04.30 - 2014.04.30 CHECKED BY MEF

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 (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa				WATER CONTENT (%)					
								20 40 60 80 100				W _P W W _L					
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE									
	Continued From Previous Page																
165.9	Silty CLAY Firm Grey						166										
30.5	SAND and SILT , some gravel, occasional cobbles Very Dense Reddish Brown Wet		19	SS	60												
							165										
							164										
163.2																	
33.2	BEDROCK , red shale with grey mottles		1	RUN			163										
162.9																	
33.5	END OF BOREHOLE AT 33.5m. 1.2m OF ARTESIAN PRESSURE INSIDE NW CASING UPON COMPLETION. WATER LEVEL AT 0.9m BELOW GROUND SURFACE IN OPEN BOREHOLE. BOREHOLE BACKFILLD WITH BENTONITE HOLEPLUG TO 0.2m, THEN SAND AND GRAVEL TO SURFACE.																

RECORD OF BOREHOLE No BTC-04

1 OF 3

METRIC

WP# 4497-93-01 LOCATION Big Trout Creek Culvert N 5 423 139.2 E 208 276.3 ORIGINATED BY ES
HWY 628 BOREHOLE TYPE Tripod/Wash Boring COMPILED BY AN
DATUM Geodetic DATE 2014.04.12 - 2014.04.12 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w		
193.7												
0.0	TOPSOIL: (125mm)											
0.1	SAND, some silt, trace gravel Dense Brown Frozen		1	SS	33							
192.8							193					
0.9	SAND and SILT, some clay, trace gravel Very Dense Brown Frozen		2	SS	66							3 47 37 13
			3	SS	114/ 0.175		192					
191.4												
2.3	SAND, trace gravel, trace silt Compact to Very Loose Brown Wet		4	SS	13		191					
			5	SS	0							0 92 8 (SI+CL)
189.7							190					
4.0	Silty CLAY Firm Grey (Cl)		6	SS	2		189					
							188	5.0 +				
			7	SS	0							
							187	5.0 +				
			8	SS	0		186					0 0 32 68
							185	5.0 +				
			9	SS	1							
							184					

Continued Next Page

+³, ×³: Numbers refer to Sensitivity 20 15 10 5 0 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No BTC-04

2 OF 3

METRIC

WP# 4497-93-01 LOCATION Big Trout Creek Culvert N 5 423 139.2 E 208 276.3 ORIGINATED BY ES
HWY 628 BOREHOLE TYPE Tripod/Wash Boring COMPILED BY AN
DATUM Geodetic DATE 2014.04.12 - 2014.04.12 CHECKED BY MEF

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 (%) GR SA SI CL				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa			WATER CONTENT (%)								
								20 40 60 80 100	○ UNCONFINED + FIELD VANE	● QUICK TRIAXIAL × LAB VANE	W _p W W _L								
	Continued From Previous Page							20 40 60 80 100				20 40 60							
177.9 15.8	Silty CLAY Firm Grey							4.0 +											
			10	SS	0								○						
			11	SS	0								○		0 0 42 58				
			12	SS	1								○						
			1	SS	6								○						
	DCPT starts at 15.8m																		

Continued Next Page

+³, ×³: Numbers refer to Sensitivity 20 15 10 5 0 (%) STRAIN AT FAILURE

METRIC

[illegible]

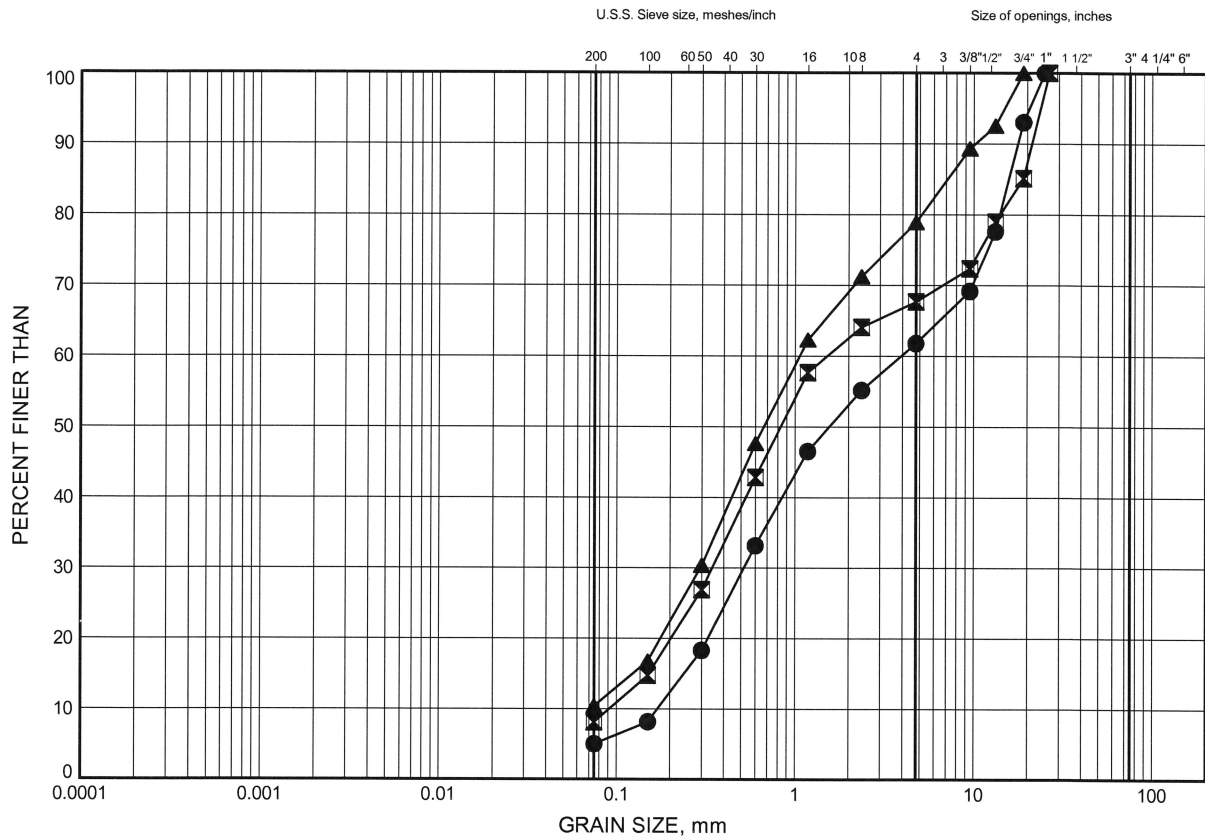
Appendix B

Laboratory Test Results

Big Trout Creek Culvert GRAIN SIZE DISTRIBUTION

FIGURE B1

SAND to SAND & GRAVEL FILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	BTC-02	1.83	194.37
⊠	BTC-03	0.30	196.10
▲	BTC-03	1.75	194.65

Date July 2014

WP# 4497-93-01



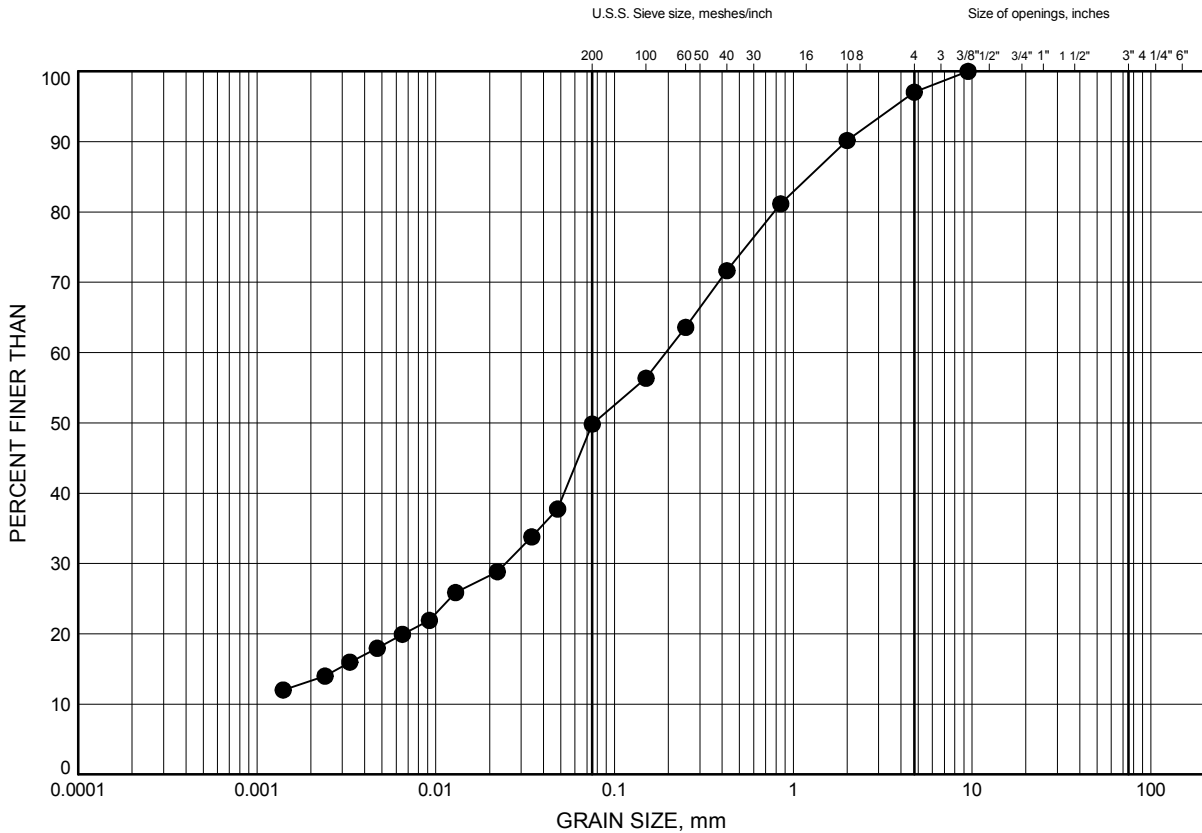
Prep'd AN

Chkd. MEF

Big Trout Creek Culvert GRAIN SIZE DISTRIBUTION

FIGURE B2

Upper SAND & SILT



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	BTC-04	1.07	192.63

Date June 2014
WP# 4497-93-01

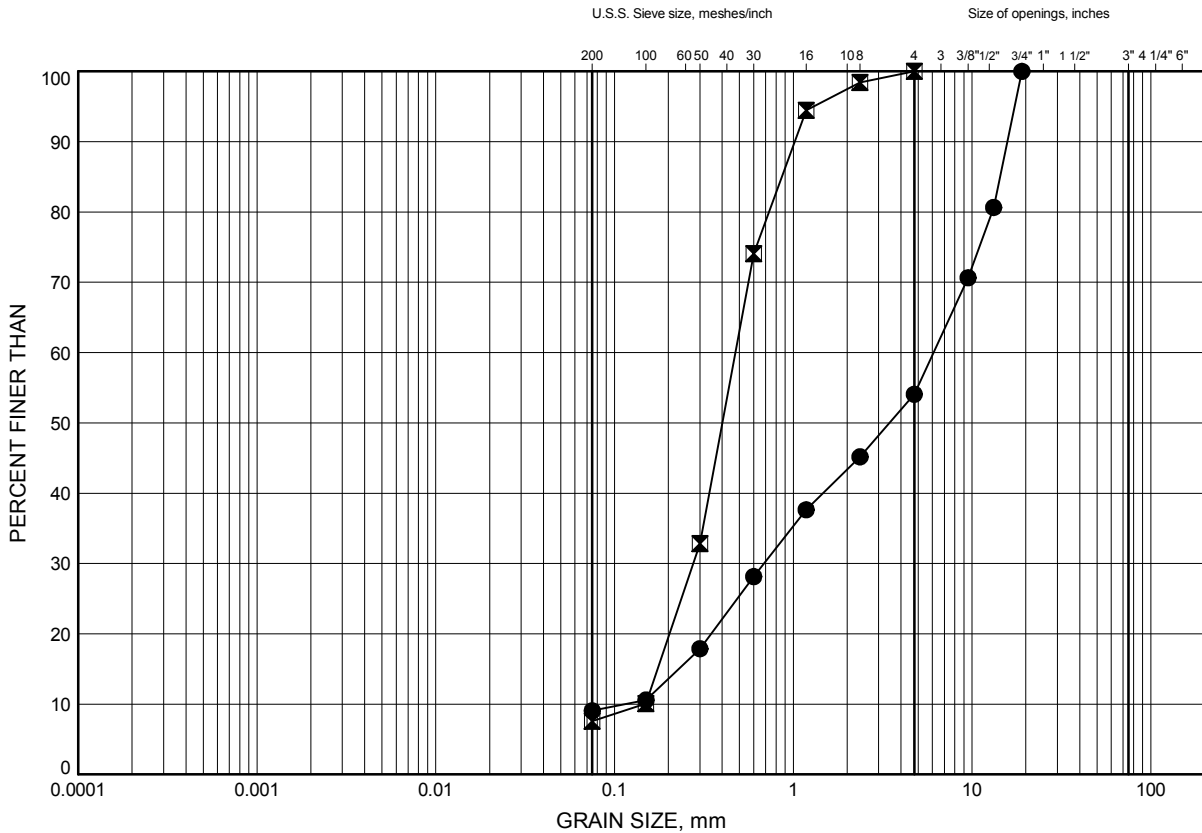


Prep'd AN
Chkd. MEF

Big Trout Creek Culvert GRAIN SIZE DISTRIBUTION

FIGURE B3

SAND to SAND & GRAVEL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	BTC-01	2.59	191.41
⊠	BTC-04	3.35	190.35

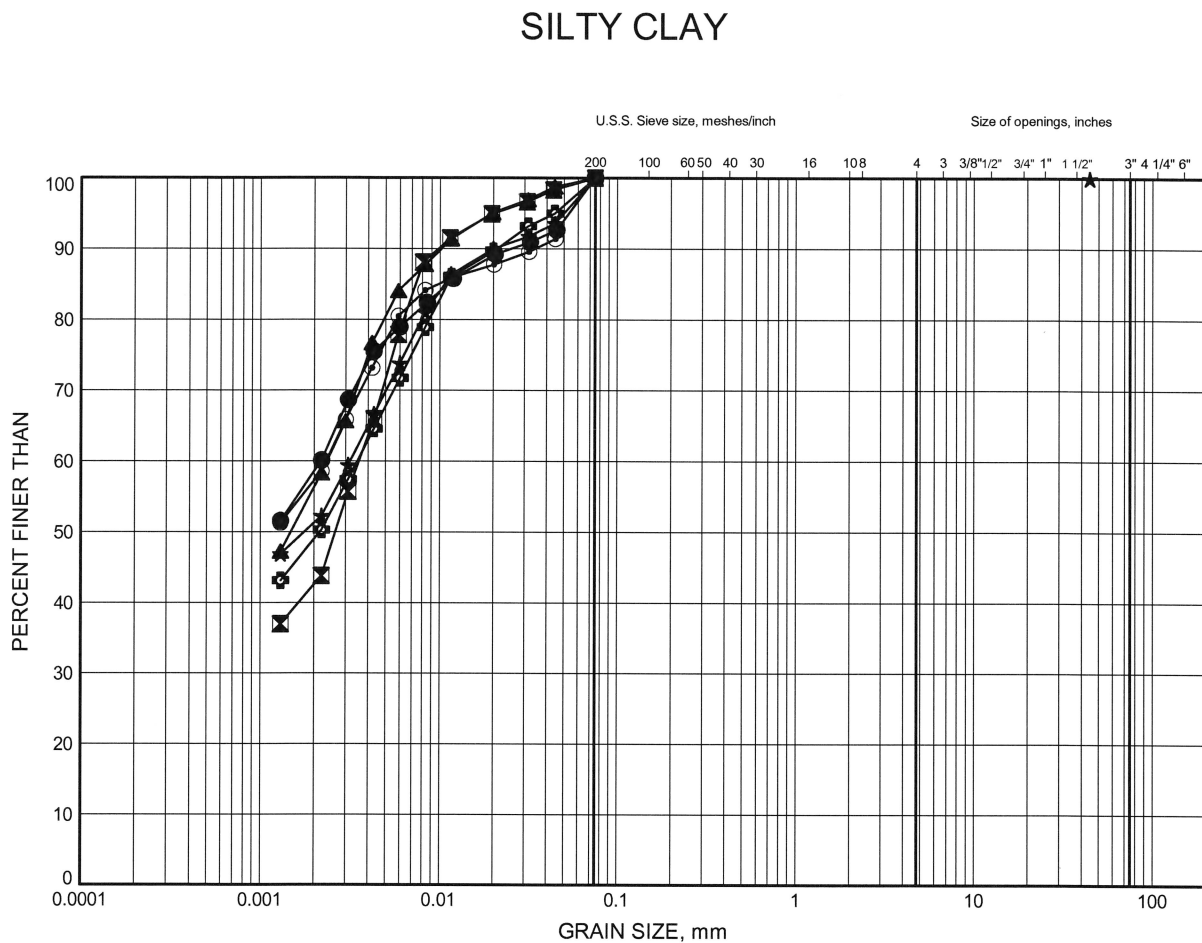
Date June 2014
WP# 4497-93-01



Prep'd AN
Chkd. MEF

Big Trout Creek Culvert GRAIN SIZE DISTRIBUTION

FIGURE B4



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	BTC-01	4.88	189.12
⊠	BTC-01	9.45	184.55
▲	BTC-01	14.02	179.98
★	BTC-02	6.40	189.80
⊙	BTC-02	10.97	185.23
⊕	BTC-02	17.07	179.13

Date July 2014

WP# 4497-93-01

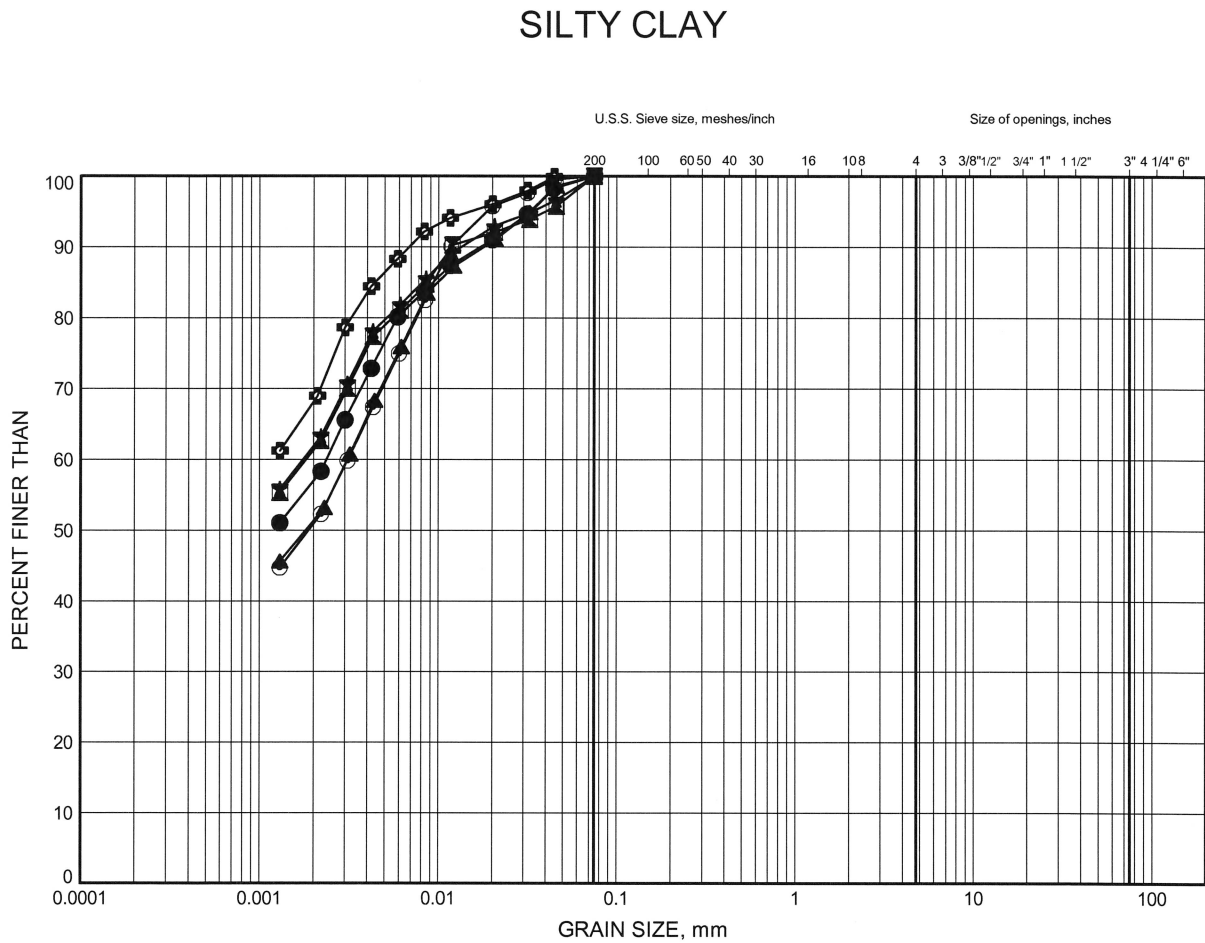


Prep'd AN

Chkd. MEF

Big Trout Creek Culvert GRAIN SIZE DISTRIBUTION

FIGURE B5



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	BTC-02	24.69	171.51
⊠	BTC-03	6.40	190.00
▲	BTC-03	15.54	180.86
★	BTC-03	21.64	174.76
⊙	BTC-03	27.74	168.66
⊕	BTC-04	7.92	185.78

Date July 2014

WP# 4497-93-01



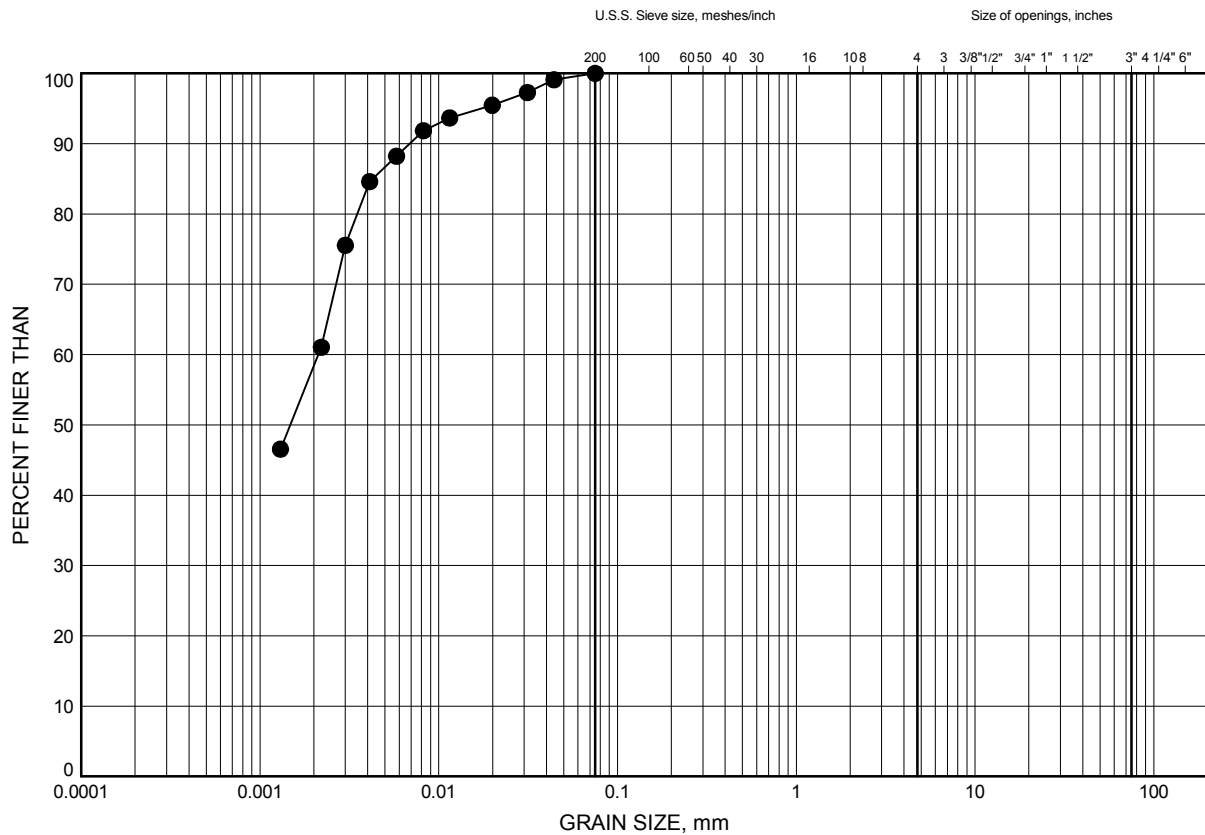
Prep'd AN

Chkd. MEF

Big Trout Creek Culvert GRAIN SIZE DISTRIBUTION

FIGURE B6

SILTY CLAY



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	BTC-04	12.50	181.20

Date June 2014
WP# 4497-93-01

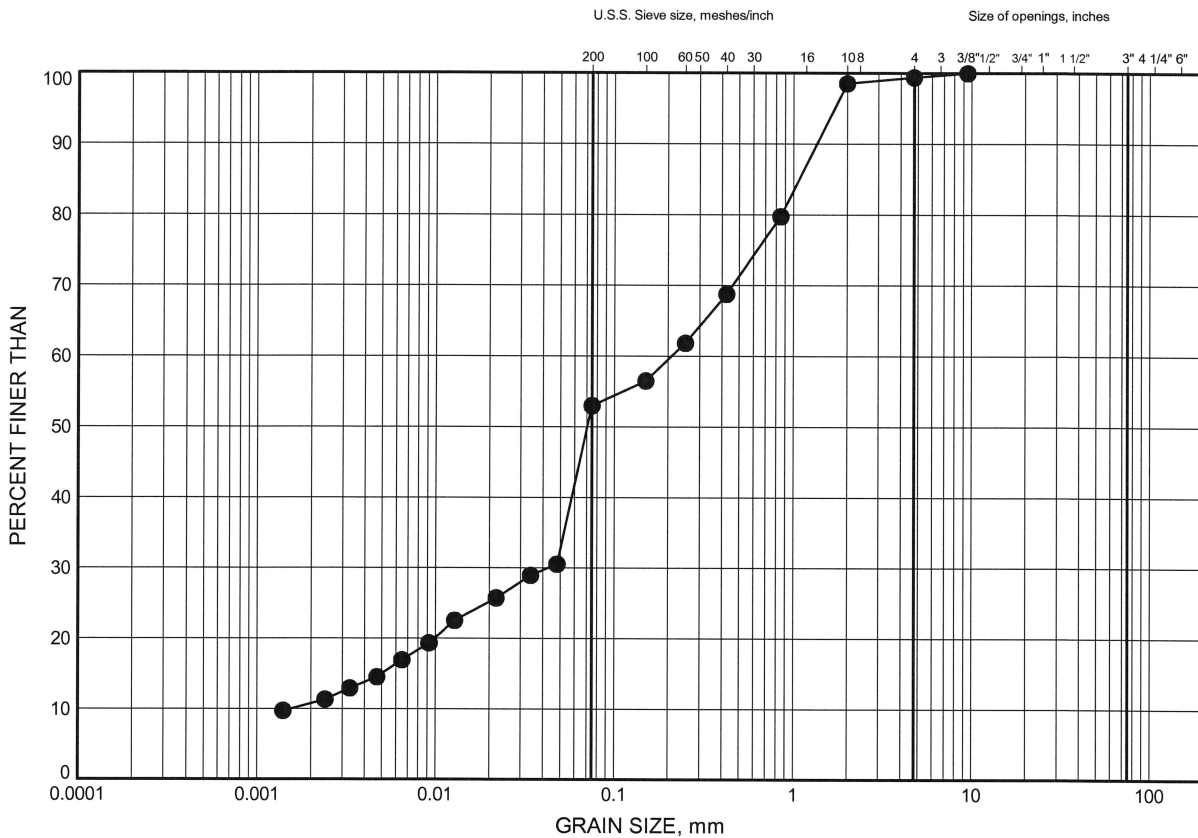


Prep'd AN
Chkd. MEF

Big Trout Creek Culvert GRAIN SIZE DISTRIBUTION

FIGURE B7

Lower SAND & SILT



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	BTC-02	30.75	165.45

Date July 2014
WP# 4497-93-01

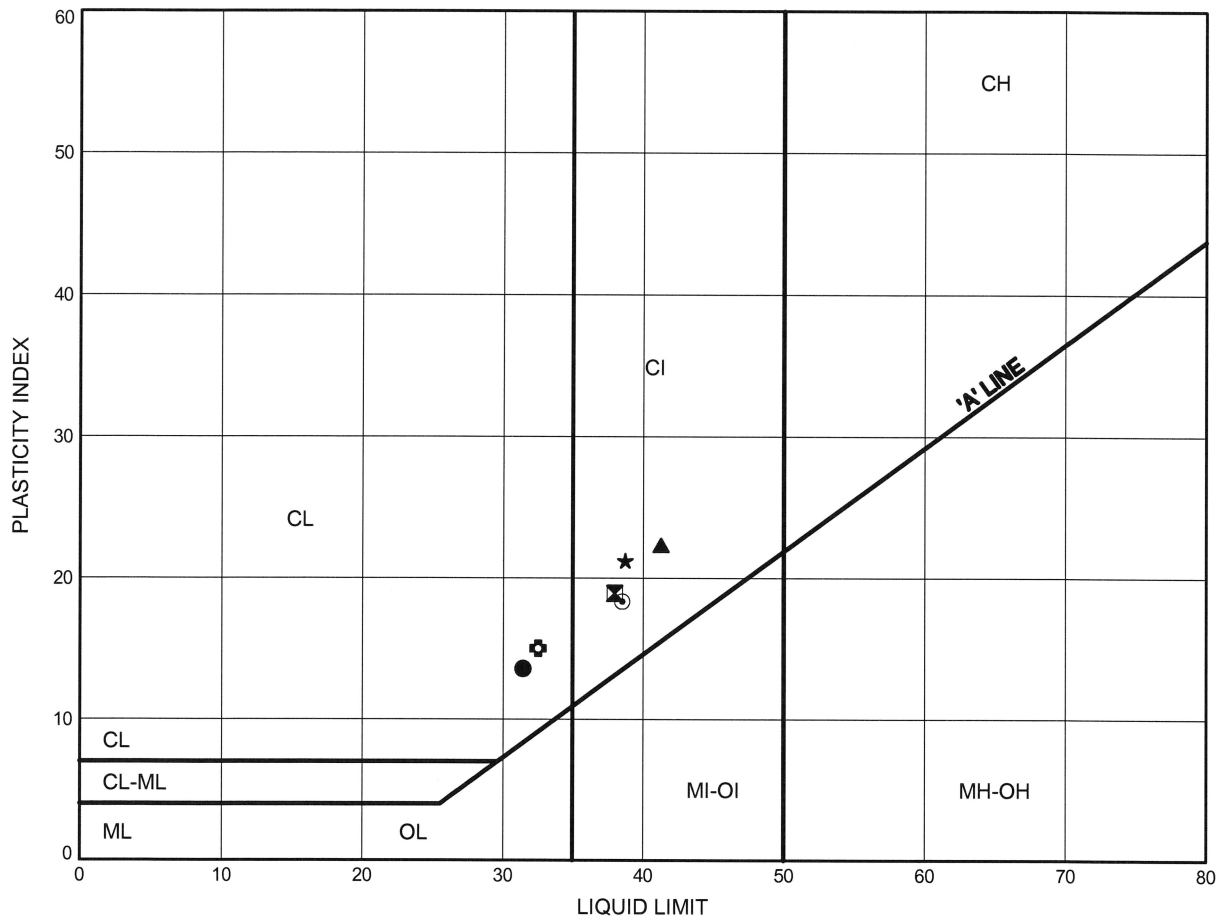


Prep'd AN
Chkd. MEF

Big Trout Creek Culvert ATTERBERG LIMITS TEST RESULTS

FIGURE B8

SILTY CLAY



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	BTC-01	9.45	184.55
⊗	BTC-01	14.02	179.98
▲	BTC-02	10.97	185.23
★	BTC-02	24.69	171.51
⊙	BTC-03	15.54	180.86
⊕	BTC-03	27.74	168.66

Date July 2014

WP# 4497-93-01



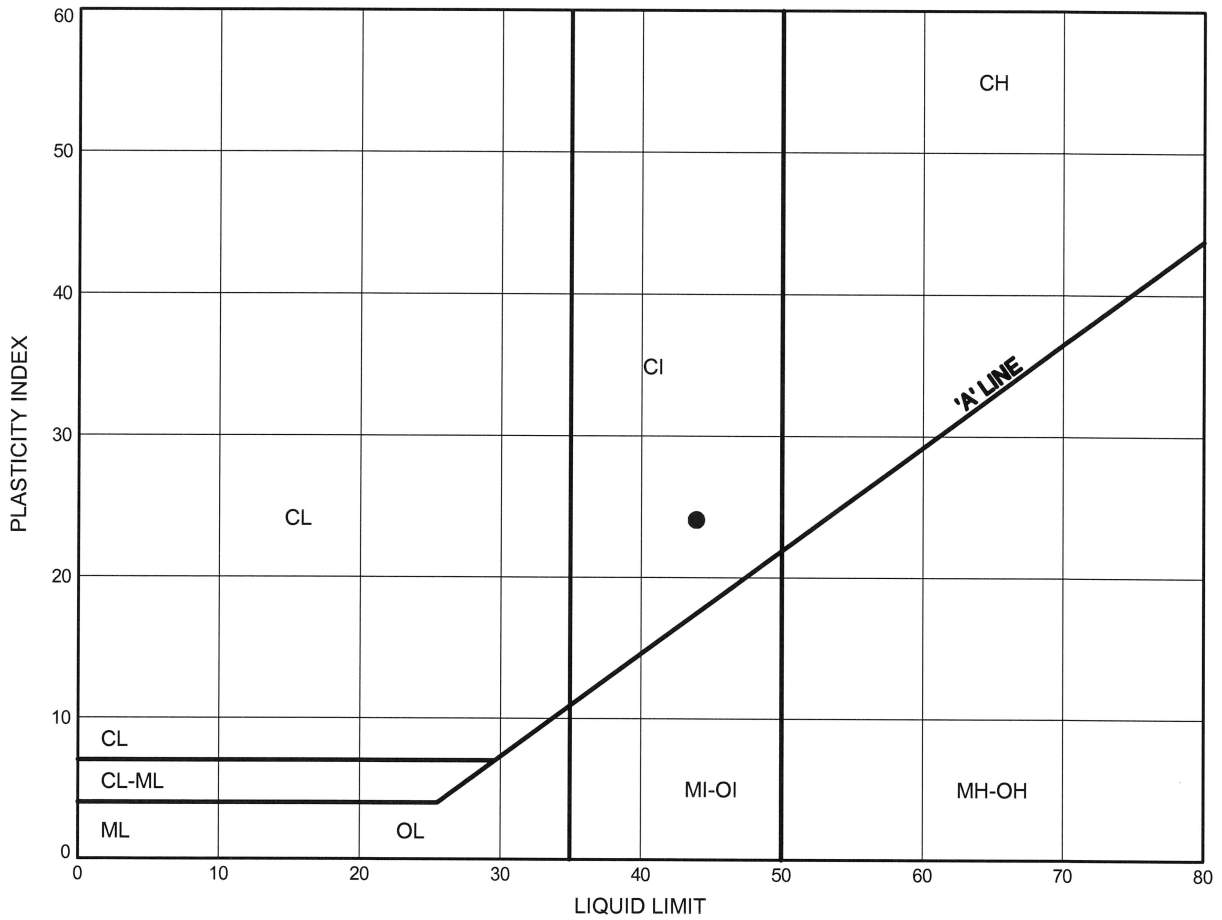
Prep'd AN

Chkd. MEF

Big Trout Creek Culvert
ATTERBERG LIMITS TEST RESULTS

FIGURE B9

SILTY CLAY



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	BTC-04	7.92	185.78

THURBALT 1197.GPJ 7/2/14

Date July 2014
 WP# 4497-93-01



Prep'd AN
 Chkd. MEF

Appendix C

Site Photographs



Photograph 1: West culvert approach looking east.



Photograph 2: East culvert approach looking west.



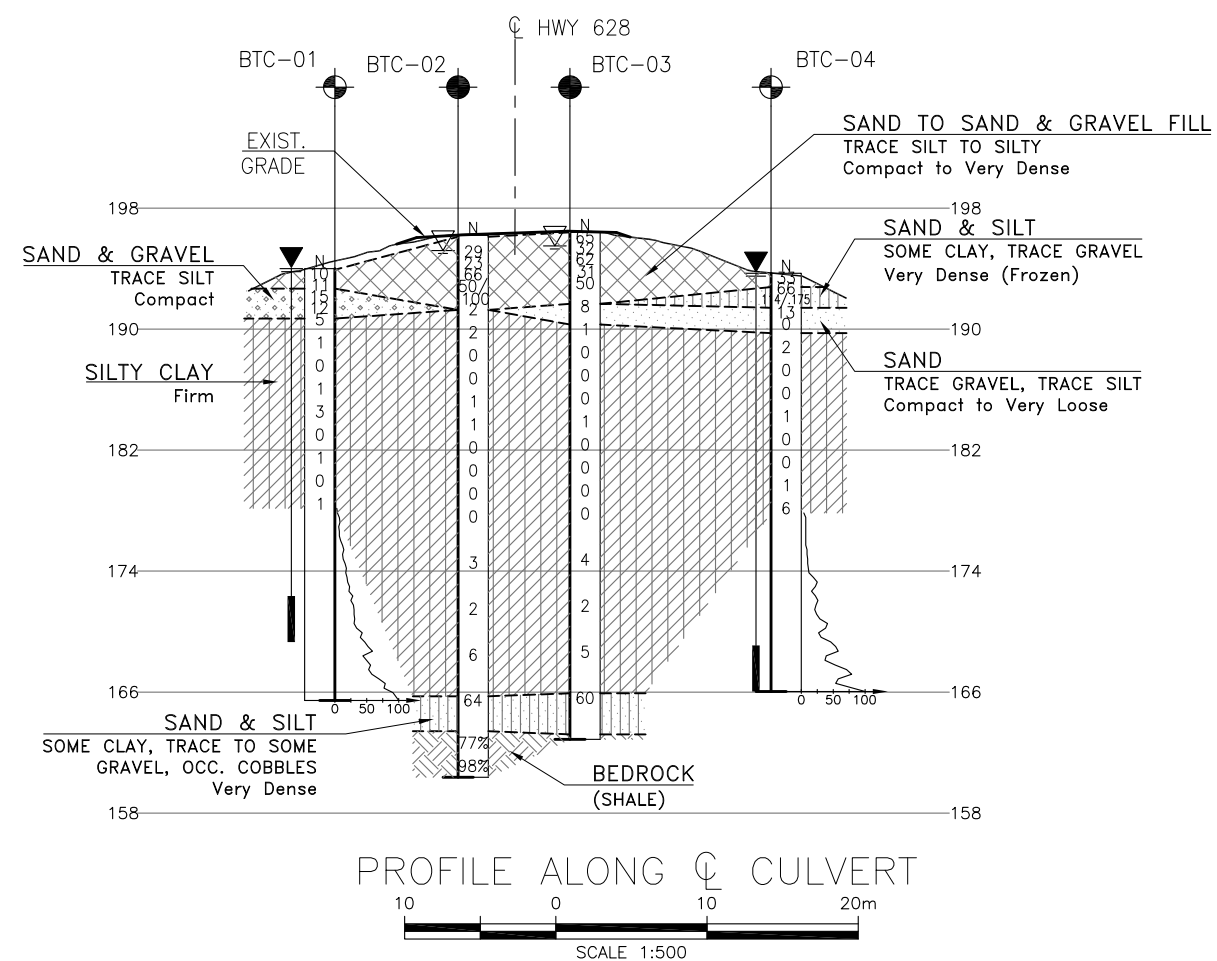
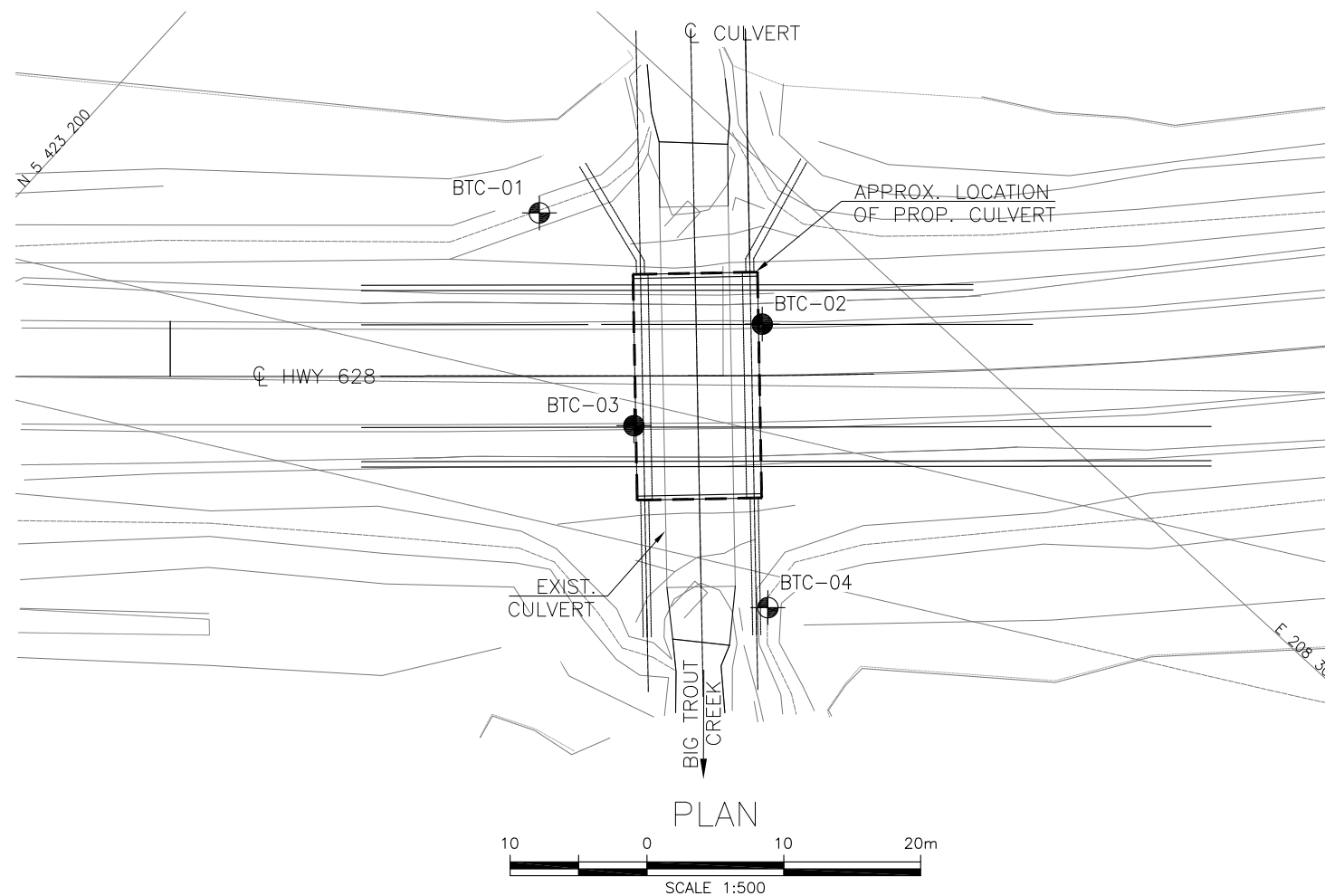
Photograph 3: Existing culvert inlet.



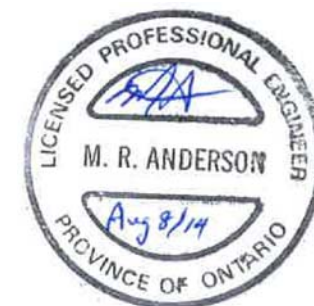
Photograph 4: Existing culvert outlet.

Appendix D

Borehole Locations and Soil Strata Drawing



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








CONT No
WP No 497-93-01

HIGHWAY 628
BIG TROUT CREEK
CULVERT REPLACEMENT
BOREHOLE LOCATIONS AND SOIL STRATA



KEYPLAN

LEGEND

	Borehole
	Borehole and Cone
N	Blows /0.3m (Std Pen Test, 475J/blow)
CONE	Blows /0.3m (60° Cone, 475J/blow)
PH	Pressure, Hydraulic
	Water Level
	Head Artesian Water
	Piezometer
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

[illegible]

-NOTES-

- 1) The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
- 2) This drawing is for subsurface information only. Surface details and features are for conceptual illustration.

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[illegible]