



Englobe

Soils Materials Environment

Submitted To AECOM Canada Ltd.
189 Wyld Street Suite 103, North Bay, Ontario P1B 1Z2
On Behalf of the Ontario Ministry of Transportation

Bridge Rehabilitation – Solomon Creek Bridge
Highway 11
Stations 21+735.7 to 21+757.7 – Township of Idington
Site No. 39W-063
GWP 163-98-00

FINAL FOUNDATION INVESTIGATION REPORT

Date: January 21, 2016
Ref. N°: 15/05/15059-F3

Geocres No. 42G-55



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Site No. 39W-063
GWP 163-98-00

Final Foundation Investigation Report

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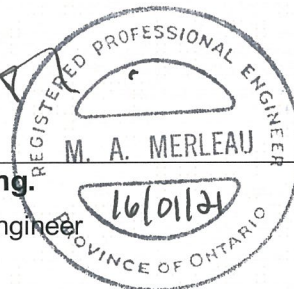


TABLE OF CONTENTS

1 INTRODUCTION	1
2 SITE DESCRIPTION	1
2.1 Site Physiography and Surficial Geology.....	1
3 INVESTIGATION PROCEDURES	2
4 SUBSURFACE CONDITIONS.....	3
4.1 Solomon Creek Bridge, Township of Idington.....	3
4.1.1 <i>Pavement Structure</i>	3
4.1.2 <i>Granular Fill</i>	3
4.1.3 <i>Mixed Fill</i>	4
4.1.4 <i>Silty Clay</i>	4
4.1.5 <i>Sandy Silt</i>	4
4.2 Groundwater data.....	5

Appendices

Appendix 1	Drawings
Appendix 2	Subsurface Data
Appendix 3	Laboratory Data
Appendix 4	Photo Essay
Appendix 5	Historical Data

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Test results mentioned herein are only valid for the sample(s) stated in this report.

Englobe's subcontractors who may have accomplished work either on site or in laboratory are duly qualified as stated in our Quality Manual's procurement procedure. Should you require any further information, please contact your Project Manager.

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Attention: Mr. Al Rose

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1 hard copy	File

1 INTRODUCTION

Englobe Corp. (Englobe), (formerly LVM-Merlex, a Division of Englobe Corp.) has been retained by AECOM Canada Ltd., on behalf of the Ministry of Transportation of Ontario (MTO), to carry out a foundation investigation to supply subsurface data for the design of a protection system to be implemented at the existing Solomon Creek Bridge during the proposed rehabilitation and conversion to semi integral abutments. The bridge is located on Highway 11, some 4.2 km west of the intersection between Highway 11 and Belanger Road in the Township of Idington (see Drawing No. 1 in Appendix 1).

The foundation investigation location was specified by the MTO in the Terms of Reference for work under Agreement No. 5014-E-0001: GWP 163-98-00. The terms of reference for the scope of work are outlined in Englobe's Proposal P-14-178 dated February 18, 2015.

The purpose of this investigation was to determine the subsurface conditions in the area of the bridge approaches in order to provide factual subsurface information and design recommendations for a protection system to be implemented during rehabilitation activities. Englobe investigated the foundation area by the drilling of boreholes, carrying out in-situ tests, and performing laboratory testing on select samples.

2 SITE DESCRIPTION

The Solomon Creek Bridge is located on Highway 11, between Stations 21+735.7 and 21+757.7, Township of Idington (Site No. 39W-063). The bridge is a single span structure, some 22 m in length along the centerline and was constructed in 1971. The topography at this site is located in an area with generally level terrain. The existing approach embankments for the bridge currently support two undivided lanes of highway, running in a west-east direction. The Solomon Creek flows from the south to the north at the bridge location (right to left). A visual review of the highway pavement surface, to the north and the south of the bridge, indicates that, in general, the approaches are in fair to good condition (see Photo Essay in Appendix 4).

At the bridge location, the existing highway centerline is at elevation 231.8 and 232.0 m at the east and west ends of the bridge. The highway pavement structure is constructed on granular fill, which overlie the natural earth deposits.

2.1 SITE PHYSIOGRAPHY AND SURFICIAL GEOLOGY

This project is located in the Geomorphic Sub-province known as the Cochrane Clay Plain. The topography on this section of Highway 11 is generally flat. Significant layers of earth overlay the bedrock. Within the project area native overburden primarily consists of fine grained soils (silty clays) overlying sands.

Bedrock in the area, as indicated on OGS Map 2506, is of the Early Precambrian felsic igneous and metamorphic rocks consisting of granitic, metasedimentary, and minor metavolcanic migmatite.

3 INVESTIGATION PROCEDURES

The fieldwork for this investigation was carried out on July 21st and 22nd, 2015 during which time one (1) sampled borehole was advanced through the existing approach slab at each end of the bridge.

The field investigation was carried out using a bombardier mounted CME drilling rig equipped with hollow stem augers, standard augers, casing equipment, and routine geotechnical sampling equipment. Soil samples were obtained at the borehole locations at regular intervals of depth using the standard 50 mm O.D. split spoon sampler advanced in accordance with the Standard Penetration Test (SPT) procedures (ASTM D-1586). The SPT method involves advancing a 50 mm O.D. split spoon sampler with the force of a 63.5 kg hammer freely dropping 760 mm. The number of blows per 300 mm penetration was recorded as the “N” value. When cohesive deposits were encountered, the in-situ strength was measured using an “N” size field vane, vane collar, and calibrated torque meter. All samples taken during this investigation were stored in labeled airtight containers for transport to our North Bay laboratory for visual examination and select laboratory testing.

Groundwater conditions in the open boreholes were observed during the advancement of and immediately following, completion of the individual boreholes. A single 19 mm diameter standpipe was installed in one open borehole prior to backfilling to allow for further monitoring of the local groundwater level. All open boreholes were backfilled upon completion with compacted auger cuttings in the general order they were removed, and where necessary, bentonite pellet backfill was added to the boreholes to bring them up to grade in accordance with requirements of Ontario Regulation 903. At the borehole through the embankment, the upper portion of the hole, where necessary, was backfilled with an asphalt cold patch to seal the existing asphalt surface.

The fieldwork for this investigation was under the full time direction of a senior member of the Englobe engineering staff, who was responsible for locating the boreholes, clearing the borehole locations of underground services, in-situ sampling and testing operations, logging of the boreholes, labeling and preparation of samples for transport to our North Bay laboratory, plus overall drill supervision. All samples received a visual confirmatory inspection in our laboratory. Laboratory testing of select samples included routine testing for natural moisture content determination and particle size analysis. The results of the laboratory testing are presented on the individual Record of Borehole Sheets (Appendix 2), with a summary of results presented on the laboratory sheets in Appendix 3 (Figures Nos. L-1 to L-5 and Table No. L-6).

The location of the individual boreholes was determined in the field using highway chainage (established by others) and offset relative to highway centerline. The MTO co-ordinates, northing and easting, were then established for the boring locations. Elevations contained in this report are referenced to a geodetic datum. The borehole elevations are based on a survey carried out by others.

4 SUBSURFACE CONDITIONS

Details of the subsurface conditions revealed by the investigation program are presented on the enclosed Records of Borehole Logs (Appendix 2) and on Drawing No. 2 (Appendix 3). Please note that stratigraphic delineations presented on the borehole logs and soil strata plot are the results of non-continuous sampling, response to drilling progress, the results of SPT, plus field observations. Typically such boundaries represent transitions from one zone to another and are not an exact demarcation of specific geological unit. Additional consideration should be given to the fact that subsurface conditions may vary markedly between adjacent boreholes and beyond any specific boring location, and are shown on the drawings for illustration purposes only.

4.1 SOLOMON CREEK BRIDGE, TOWNSHIP OF IDINGTON

A plan and profile illustrating the borehole locations and stratigraphic sequences is shown on Drawing No. 2, Appendix 3. During the course of the exploration program, two (2) sampled boreholes were put down at this site, with Borehole No. 1 advanced behind the west abutment to the right of centerline, and Borehole No. 2 advanced behind the east abutment to the left of centerline.

At the time of the subsurface investigation, the ground surface elevations at Borehole Nos. 1 and 2 were recorded at elevations 232.0 m and 231.8 m, respectively.

4.1.1 Pavement Structure

At surface, at Borehole No. 1, a pavement structure consisting of asphalt some 205 mm thick overlying a concrete slab some 255 mm thick was penetrated. At Borehole No. 2, a pavement structure consisting of some 180 mm of asphalt overlying a concrete slab 255 mm thick was penetrated.

4.1.2 Granular Fill

Underlying the concrete approach slab at Borehole Nos. 1 and 2, a layer of fill described as brown sand, trace silt, trace gravel was penetrated. The natural moisture contents measured on samples of this deposit recovered from Borehole Nos. 1 and 2 were in the order of 2 to 15%. Gradation analyses were carried out on two (2) samples of this deposit, recovered from Borehole Nos. 1 and 2, the results of which indicated 2 to 6% gravel size particles, 89 to 92% sand size particles, and 5 to 6% silt and clay size particles (Figure No. L-1, Appendix 3). Based on SPT 'N' values of 7 to 33 blows per 300 mm, the compactness of this deposit was described

as loose to dense, generally compact. This deposit was encountered to depths of 3.7 and 4.4 m below grade at Borehole Nos. 1 and 2, respectively (elevations 228.3 and 227.4 m, respectively).

4.1.3 **Mixed Fill**

Underlying the granular fill at Borehole Nos. 1 and 2, a layer of fill describes as a mix of brown to grey sand, some silt and silty clay, trace gravel was penetrated. A 50 mm thick asphalt layer was encountered at a depth of 4.2 m below grade. The natural moisture contents measured on samples of this deposit recovered from Borehole Nos. 1 and 2 were in the order of 14 to 19%. A gradation analyses (hydrometer) was carried out on one (1) samples of this deposit, the results of which indicated 3% gravel size particles, 60% sand size particles, 25% silt size particles, and 12% clay size particles (Figure No. L-2, Appendix 3). Based on SPT 'N' values of 1 to 10 blows per 300 mm, the compactness of this deposit was described as very loose to loose. This deposit was encountered to depths of 5.7 and 5.0 m below grade at Borehole Nos. 1 and 2, respectively (elevations 226.1 and 227.0 m, respectively).

4.1.4 **Silty Clay**

Underlying the mixed fill at Borehole Nos. 1 and 2, a deposit of brown to grey silty clay, trace to with gravel, trace sand, was penetrated. A layer of black silty organic soils, trace wood, trace rootlets was encountered in this deposit. The natural moisture content measured on samples of this deposit was in the order of 17 to 35%. The elevated moisture content is likely associated with the organic soil layer. Gradation (hydrometer) analysis were carried out on one (1) sample of this deposit, the results of which indicated 0% gravel size particles, 29% sand size particles, 47% silt size particles, and 24% clay size particles (Figure No. L-3, Appendix 3). Atterberg Limits testing was carried out on one (1) sample of this deposit, the results of which indicated a Plastic Limit in the order of 14% and a Liquid Limit in the order of 25% (Figure No. L-6, Appendix 3). Based on in situ shear strengths of greater than 100 kPa, the consistency of this deposit was described as very stiff. This deposit was encountered to depths of 7.1 and 7.2 m below grade at Borehole Nos. 1 and 2, respectively (elevations 224.9 and 224.6 m, respectively).

4.1.5 **Sandy Silt**

Underlying the silty clay deposit at Borehole Nos. 1 and 2, a layer of grey sandy silt trace gravel, trace clay was penetrated. The natural moisture content measured on samples of this deposit was in the order of 10 to 13%. Gradation (hydrometer) analyses were carried out on two (2) samples of this deposit, the results of which indicated 2 to 6% gravel size particles, 33 to 34% sand size particles, 54 to 59% silt size particles, and 5 to 7% clay size particles (Figure No. L-5, Appendix 3). Based on SPT 'N' values of 12 to 37 blows per 300 mm penetration, the compactness of this deposit was described as compact to dense, generally compact. Sampling was terminated at a depth of 9.8 m below grade at locations of Boreholes Nos. 1 and 2 (elevations 222.2 and 222.0 m, respectively).

4.2 GROUNDWATER DATA

The creek water level was measured at elevation 226.4 m on July 21, 2015, during the period of site investigation. Measurements of the groundwater table and cave-in levels were undertaken, where possible, in the open boreholes during the advance of the individual borings and upon completion. A standpipe was installed in Borehole No. 1 to obtain the post borehole completion water level. These levels are recorded on the individual Record of Borehole Log Sheets (Appendix 2) and shown on the Borehole Locations and Soil Strata Drawing No. 2 in Appendix 3.

At the time of this investigation, the water levels were measured at elevations 227.8 m (July 23rd, 2015) and 223.4 m (July 22nd, 2015) at Borehole Nos. 1 and 2, respectively. It's noted that the groundwater level encountered at the location of Borehole No. 2 was measured immediately after completion of drilling and the water level probably had not yet become stable.

The groundwater and creek water levels will fluctuate seasonally/yearly.

Appendix 1 Drawings

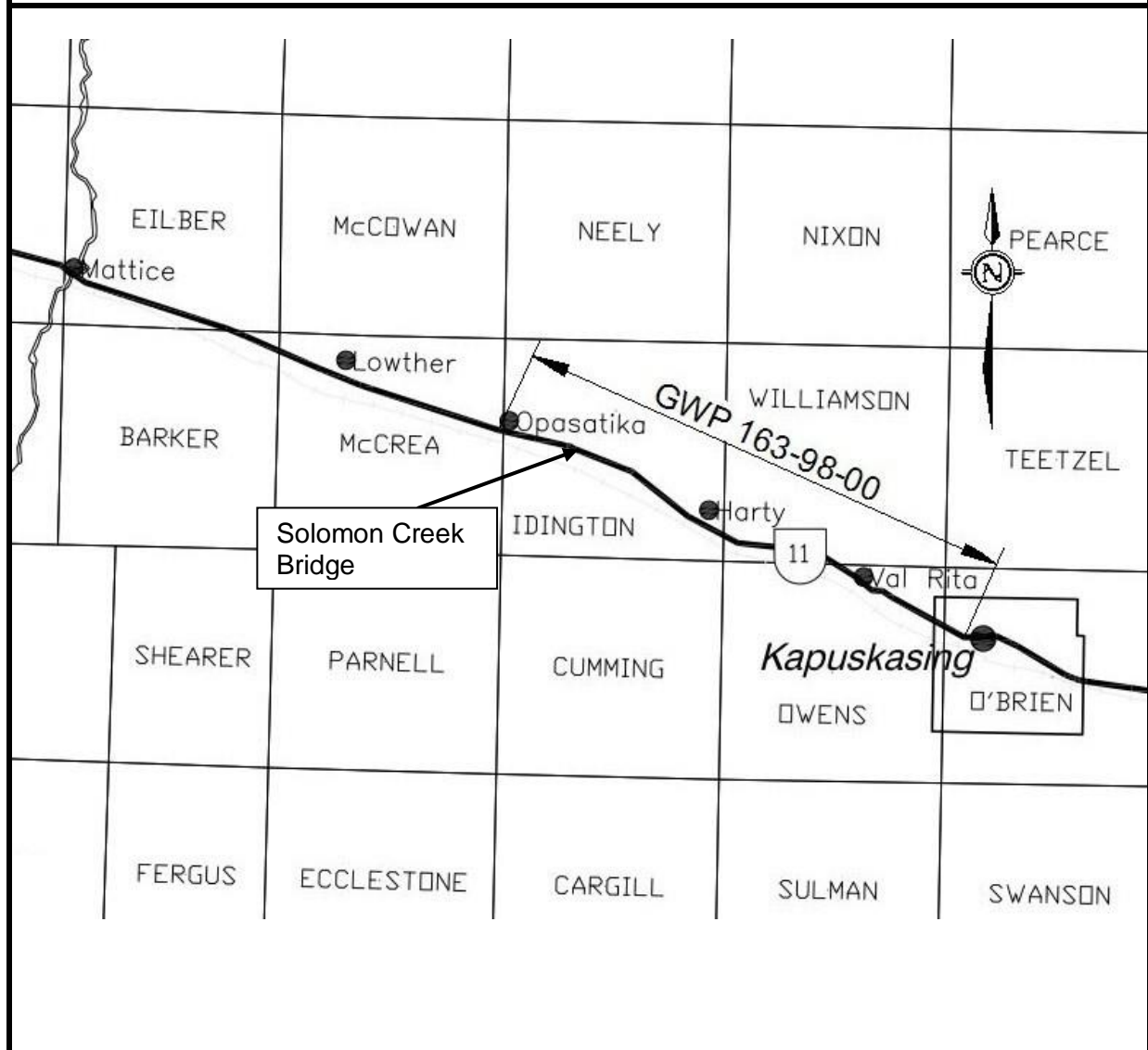
Drawing No. 1

Key Plan

MACRO KEY PLAN

Drawing No.1

NOT TO SCALE



FOUNDATION INVESTIGATION REPORT

GWP 163-98-00

Highway 11

Solomon Creek Bridge

Township of Idington

Reference No: 15/05/15059-F3

January 2016



Appendix 2 Subsurface Data

Enclosure No. 1	List of Abbreviations and Symbols
Enclosure Nos. 2 and 3	Record of Borehole Sheets

LIST OF ABBREVIATIONS & DESCRIPTION OF TERMS

The abbreviations and terms, used to describe retrieved samples and commonly employed on the borehole logs, on the figures and in the report are as follows:

1. ABBREVIATIONS

AS	Auger Sample
CS	Chunk Sample
DS	Denison type sample
FS	Foil Sample
NFP	No Further Progress
PH	Sampler advanced by hydraulic pressure
PM	Sampler advanced by manual pressure
RC	Rock core with size & percentage of recovery
SS	Split Spoon
ST	Slotted Tube
TO	Thin-walled, open
TP	Thin-walled, piston
WS	Wash Sample
WH	Sampler advanced by static weight of hammer and/or rods
Rec	% recovery from individual run of rock core
RQD	Rock quality designation (%)

2. PENETRATION RESISTANCE/"N"

Dynamic Cone Penetration Test (DCPT):

A continuous profile showing the number of blows for each 300 mm of penetration of a 50 mm diameter 60° cone attached to AW rod driven by a 63 kg hammer falling 760 mm.

Plotted as —●—●—●—●—

Standard Penetration Test (SPT) or "N" Values

The number of blows of a 63 kg hammer falling 760 mm required to advance a 50 mm O.D. drive open sampler 300 mm.

3. SOIL DESCRIPTION

a) Cohesionless Soils:

"N" (blows/0.3 m)	Relative Density
0 to 4	very loose
4 to 10	loose
10 to 30	compact
30 to 50	dense
over 50	very dense

b) Cohesive Soils:

Undrained Shear Strength (kPa)	Consistency
Less than 12	very soft
12 to 25	soft
25 to 50	firm
50 to 100	stiff
100 to 200	very stiff
over 200	hard

3. SOIL DESCRIPTION (Cont'd)

c) Bedrock:

RQD (%)	Classification
Less than 25	Very poor quality
25 to 50	Poor quality
50 to 75	Fair quality
75 to 90	Good quality
90 to 100	Excellent quality

d) Method of Determination of Undrained Shear Strength of Cohesive Soils:

- + 3.2 - Field Vane test in borehole.
The number denotes the sensitivity to remoulding.
- D - Laboratory Vane Test
- " - Compression test in laboratory

For a saturated cohesive soil the undrained shear strength is taken as one-half of the undrained compressive strength.

e) Soil Moisture:

Moisture	Described as
Dry	Below optimum moisture content
Moist	Near optimum moisture content
Wet	Above optimum moisture content

4. TERMINOLOGY

Terminology used for describing soil strata is based on the proportion of individual particle sizes present in the samples (please note that, with the exception of those samples subject to a grain-size analysis, all samples were classified visually and the accuracy of visual examination is not sufficient to determine exact grain sizing):

Trace, or occasional	Less than 10%
Some	10 to 20%
With	20 to 30%
Adjective (i.e. silty or sandy)	30 to 40%
And (i.e. sand and gravel)	40 to 60%

Terminology for cobbles and boulders is based on auger response and field observations:

Occasional	Obstructions encountered in borehole, however advance is not impeded
Numerous	Obstructions are essentially continuous over drilled length

SAMPLE DESCRIPTION NOTES:

1. **FILL:** The term fill is used to designate all man-made deposits of natural soil and/or waste materials. The reader is cautioned that fill materials can be very heterogeneous in nature and variable in depth, density and degree of compaction. Fill materials can be expected to contain organics, waste materials, construction materials, shot rock, rip-rap, and/or larger obstructions such as boulders, concrete foundations, slabs, abandoned tanks, etc.; none of which may have been encountered in the borehole. The description of the material penetrated in the borehole therefore may not be applicable as a general description of the fill material on the site as boreholes cannot accurately define the nature of fill material. During the boring and sampling process, retrieved samples may have certain characteristics that identify them as 'fill'. Fill materials (or possible fill materials) will be designated on the Borehole Logs. If fill material is identified on the site, it is highly recommended that testpits be put down to delineate the nature of the fill material. However, even through the use of testpits defining the true nature and composition of the fill material cannot be guaranteed. Fill deposits often contain pockets or seams of organics, organically contaminated soils or other deleterious material that can cause settlement or result in the production of methane gas. It should be noted that the origins and history of fill material is frequently very vague or non-existent. Often fill material may be contaminated beyond environmental guidelines and the material will have to be disposed of at a designated site (i.e. registered landfill). Unless requested or stated otherwise in this report, fill material on this site has not been tested for contaminants however, environmental testing of the fill material can be carried out at your request. Detection of underground storage tanks cannot be determined with conventional geotechnical procedures.
2. **TILL:** The term till indicates a material that is an unstratified, glacial deposit, heterogeneous in nature and, as such, may consist of mixtures and pockets of clay, silt, sand, gravel, cobbles and/or boulders. These heterogeneous deposits originate from a geological process associated with glaciation. It must be noted that due to the highly heterogeneous nature of till deposits, the description of the deposit on the borehole log may only be applicable to a very limited area and therefore, caution must be exercised when dealing with a till deposit. When excavating in till, contractors may encounter cobbles/boulders or possibly bedrock even if they are not indicated on the borehole logs. It must be appreciated that conventional geotechnical sampling equipment does not identify the nature or size of any obstruction.
3. **BEDROCK:** Auger refusal may be due to the presence of bedrock, but possibly could also be due to the presence of very dense underlying deposits, boulders or other large obstructions. Auger refusal is defined as the point at which an auger can no longer be practically advanced. It must be appreciated that conventional geotechnical sampling equipment does not differentiate between nature and size of obstructions that prevent further penetration of the boring below grade. Bedrock indicated on the borehole logs will be labeled 'possibly' or 'probable' etc. based on the response of the boring and sampling equipment, surrounding topography, etc. Bedrock can be proven at individual borehole locations, at your request, by diamond core drilling operations or, possibly, by testpits. It must also be appreciated that bedrock surfaces can be, and most times are, very erratic in nature (i.e. sheer drops, isolated rock knobs, etc.) and caution must be used when interpreting subsurface conditions between boreholes. A bedrock profile can be more accurately estimated, at the clients' request, through a series of closely positioned unsampled auger probes combined with core drilling.
4. **GROUNDWATER:** Although the groundwater table may have been encountered during this investigation and the elevation noted in the report and/or on the record of boreholes, it must be appreciated that the elevation of the groundwater table will fluctuate based upon seasonal conditions, localized changes, erratic changes in the underlying soil profile between boreholes, underlying soil layers with highly variable permeabilities, etc. These conditions may affect the design and type and nature of dewatering procedures. Cave-in levels recorded in borings give a general indication of the groundwater level in cohesionless soils however, it must be noted that cave-in levels may also be due to the relative density of the deposit, drilling operations etc.

METRIC**RECORD OF BOREHOLE NO. 1**

REFERENCE 15/05/15059-F3 DATUM Geodetic LOCATION N 5484792.9 E 396972.5 - Idington Twp., Station 21+730.3 ORIGINATED BY JL

PROJECT GWP 163-98-00, Highway 11 BOREHOLE TYPE Track Mounted CME 45 - Hollow Stem Augers COMPILED BY SH

CLIENT AECOM DATE (Started) 21 July 2015 TIME (Completed) 4:45:00 PM CHECKED BY MAM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION (see Enclosure No. 1)	STRATA PLOT	NUMBER	TYPE	"N" VALUES			20	40					
232.0	Ground Surface													
0.0	205 mm Asphalt 255 mm Concrete													
231.5														
0.5	GRANULAR FILL - sand, trace gravel, trace silt brown, moist (compact)		1	SS	17									
			2	SS	19									
			3	SS	20									
			4	SS	23									
			5	SS	23									
228.3														
3.7	MIXED FILL - mixture of sands and silty clays, trace organic soils brown to grey 50 mm asphalt layer		6	SS	10									
			7	SS	1									
227.0														
5.0	silty CLAY - with sand moist (very stiff) brown													
			8	SS	3									
224.9														
7.1	SANDY SILT - trace gravel, trace clay wet (compact) grey		9	SS	28									
			10	SS	12									
222.2														
9.8	End of Sampling End of Borehole													

COMMENTS		WATER LEVEL RECORDS	
+ 3, × 3 : Numbers on right refer to Sensitivity Numbers on left refer to values greater than 120 kPa ○ 3% STRAIN AT FAILURE		Date (dd/mm/yy)/Time	Water Depth (m)
		1) 21/7/15 4:55:00 PM	8.2
		2) 22/7/15 9:33:00 AM	4.2
		3) 23/7/15 12:05:00 PM	4.2

The stratification lines represent approximate boundaries. The transition may be gradual.

EnGlobe Corp.

120 Progress Court, North Bay, On P1A 0C2 Phone: (705)476-2550 Fax: (705)476-8882 Email: northbay@vm.ca

MEL-GEO 15059 - F3 BOREHOLE LOGS GPJ MEL-GEO.GDT 21/1/16

METRIC**RECORD OF BOREHOLE NO. 2**

REFERENCE 15/05/15059-F3 DATUM Geodetic LOCATION N 5484777.2 E 397001.9 - Idington Twp., Station 21+763.3 ORIGINATED BY JL

PROJECT GWP 163-98-00, Highway 11 BOREHOLE TYPE Track Mounted CME 45 - Hollow Stem Augers COMPILED BY SH

CLIENT AECOM DATE (Started) 22 July 2015 TIME (Completed) 9:30:00 AM CHECKED BY MAM

DATE (Completed) 22 July 2015

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION (see Enclosure No. 1)	STRATA PLOT	NUMBER	TYPE	"N" VALUES			20	40					
231.8	Ground Surface													
0.0	180 mm Asphalt 255 mm Concrete													
231.4	GRANULAR FILL - sand, trace gravel, trace silt		1	SS	18									
	brown, moist		2	SS	21									
	(loose/dense)		3	SS	24									
			4	SS	33									
			5	SS	30									
			6	SS	7									
227.4	MIXED FILL - mixture of sand, some silt, trace gravel, and silty clay		7	SS	5									
	grey													
226.1	Black layer of silty organic soils, decayed wood pieces, rootlets		8	SS	8									
	Silty CLAY - trace sand trace gravel													
	moist													
	(very stiff)													
224.6	brown SANDY SILT - trace gravel, trace clay		9	SS	37									
	grey													
	wet													
	(dense/compact)													
222.0	End of Sampling End of Borehole		10	SS	23									
9.8														

COMMENTS		WATER LEVEL RECORDS	
+ 3, × 3 : Numbers on right refer to Sensitivity Numbers on left refer to values greater than 120 kPa ○ 3% STRAIN AT FAILURE		Date (dd/mm/yy)/Time	Water Depth (m)
		1) 22/7/15 9:30:00 AM	8.4
		2)	-
		3)	-

The stratification lines represent approximate boundaries. The transition may be gradual.

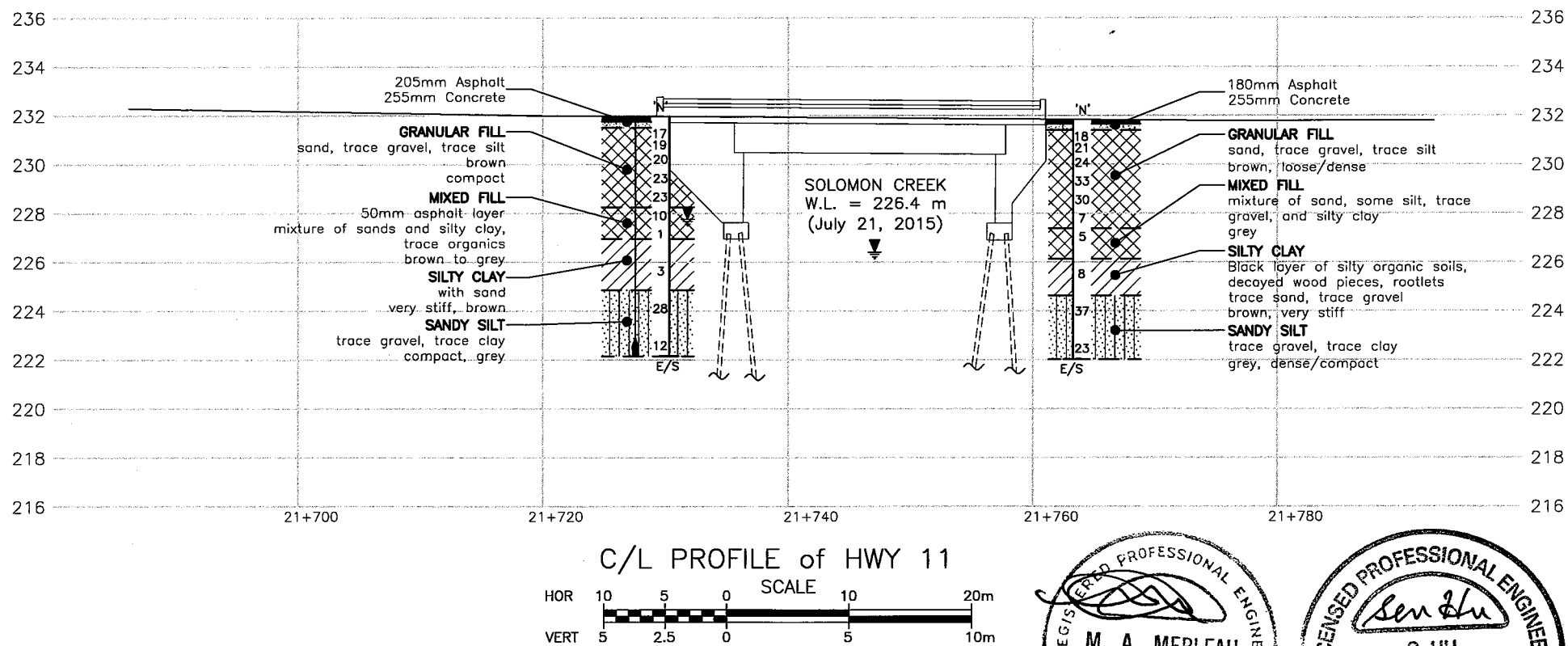
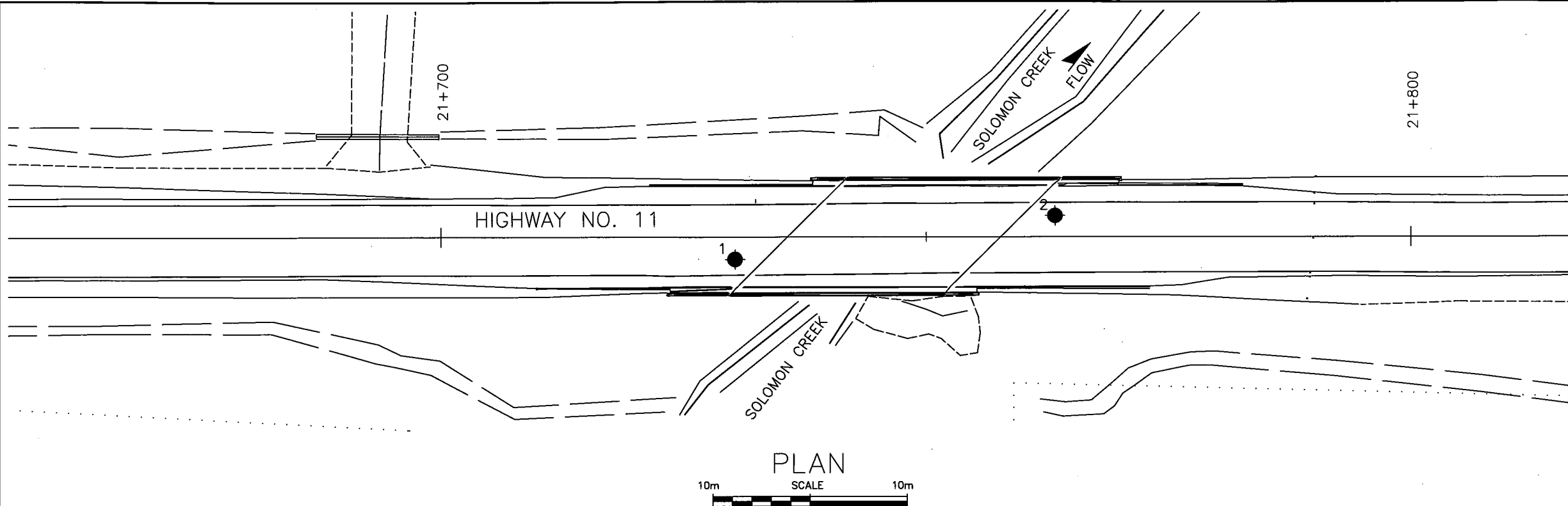
EnGlobe Corp.

120 Progress Court, North Bay, On P1A 0C2 Phone: (705)476-2550 Fax: (705)476-8882 Email: northbay@vm.ca

MEL-GEO 15059 - F3 BOREHOLE LOGS GPJ MEL-GEO.GDT 21/1/16

Appendix 3 Laboratory Data

Drawing No. 2:	Borehole Location and Soil Strata
Figure Nos. L-1 to L-4:	Grain Size Distribution Curves
Figure No. L-5:	Atterberg Limits Summary
Table No. L-6:	Laboratory Test Summary Sheet



DISTRICT
CONT. No.
GWP No. 163-98-00

SHEET
2

HWY 11 BRIDGE
STA. 21+735.7 TO STA. 21+757.7
SITE NO. 39W-063
BOREHOLE LOCATIONS
AND SOIL STRATIGRAPHY

Borehole w/ DCPT

Borehole

Blows/0.3 m (Std Pen Test, 475 J/blow)

Blows/0.3 m (60' Cone, 475 J/blow)

Water Level at Time of Investigation

Auger Refusal at Elevation

End of Sampling

Piezometer

BOREHOLE No.	ELEVATION	O/S	NORTHING	EASTING
1	232.0	2.3m Rt	5484792.9	396972.5
2	231.8	2.2m Lt	5484777.2	397001.9

NOTES:

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

Base plan and alignment provided in digital format by Callon Dietz on August 4, 2015

Geometry of bridge below grade referred to historical drawing titled "General Layout of Solomon Creek Bridge" (W.P. 61-68-ON, drawing no. D-6926-1) published in February, 1971

Coordinates based on MTM Zone 13 NAD 83 CSRS

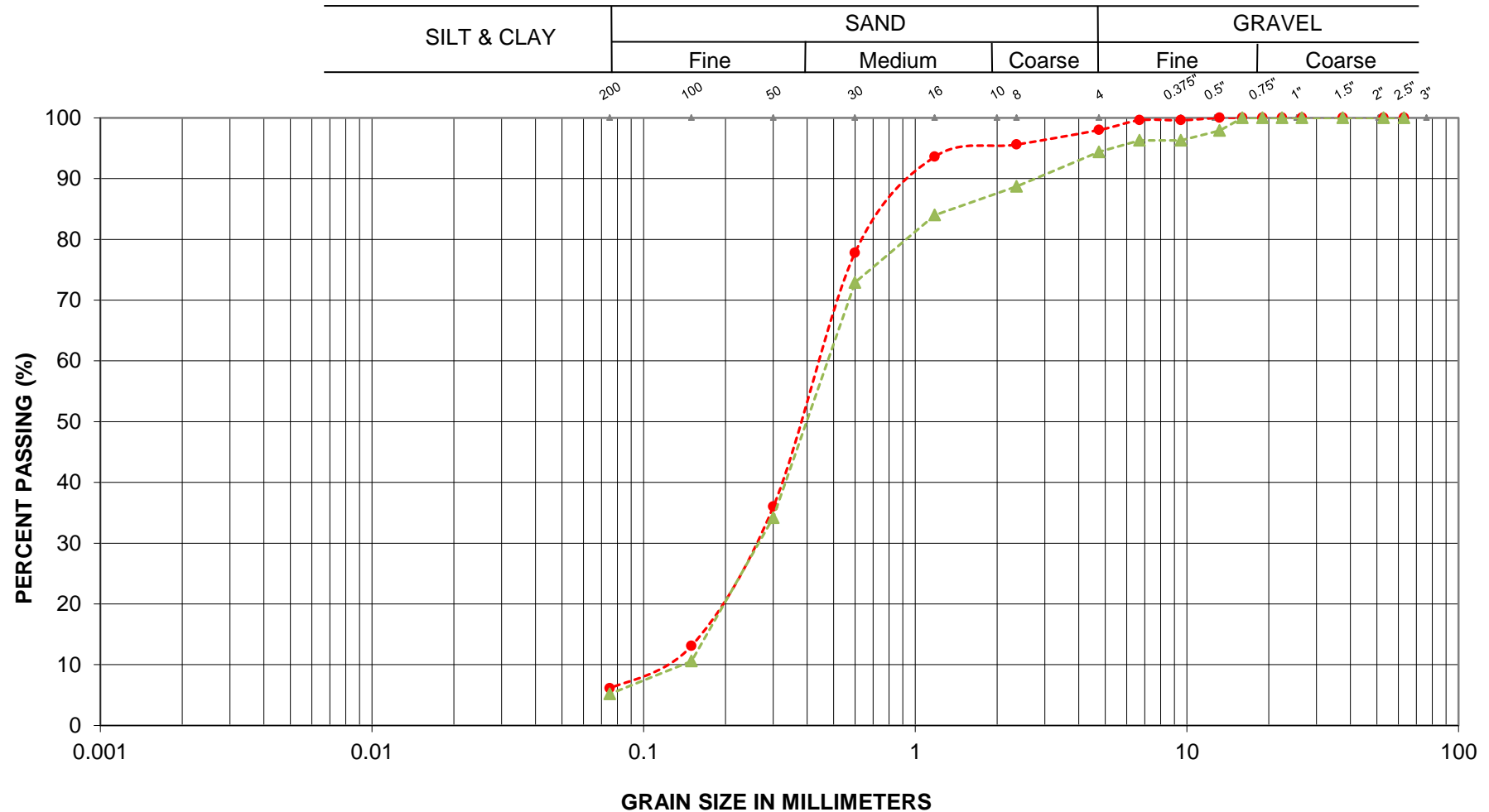
GEOCRES No. 42G-55

DESIGN	CHK	CODE	LOAD	DATE
DRAWN	DM	CHK	SH	JAN/16

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



REVISIONS					DESCRIPTION		DATE
DESIGN	CHK	CODE	LOAD	DATE	JAN/16		
DRAWN	DM	CHK	SH	SITE 39W-063	STRUCT	SCHEME	DWG 2

GRAIN SIZE ANALYSIS

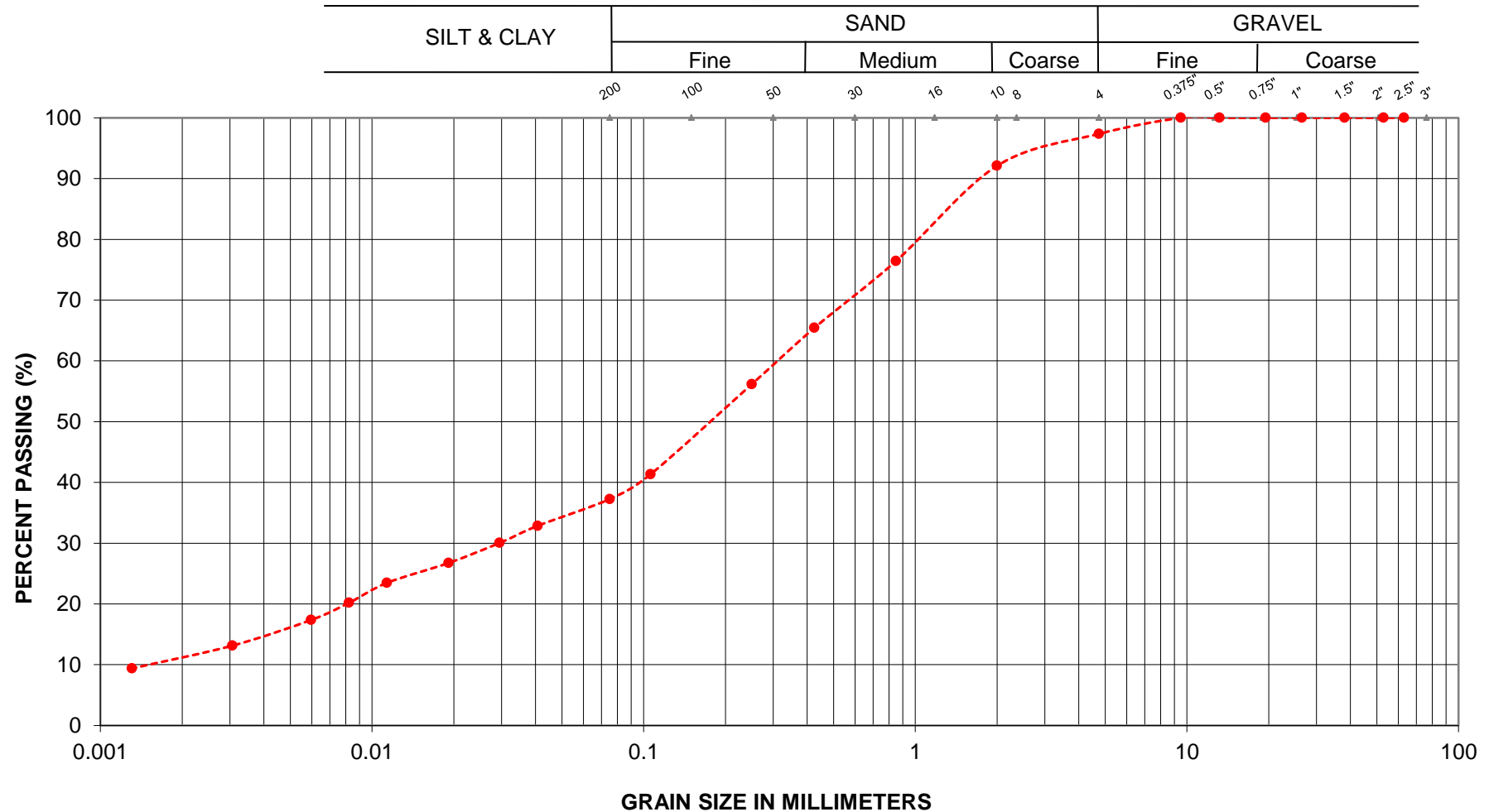
GRANULAR FILL

LOCATION: Hwy 11, Solomon Creek Culvert
TWP of Idington

Englobe Corp.

FIGURE L-1

GRAIN SIZE ANALYSIS



---●--- BH No.: 1 Sa No.: 6 Depth: 3.8 - 4.3 m

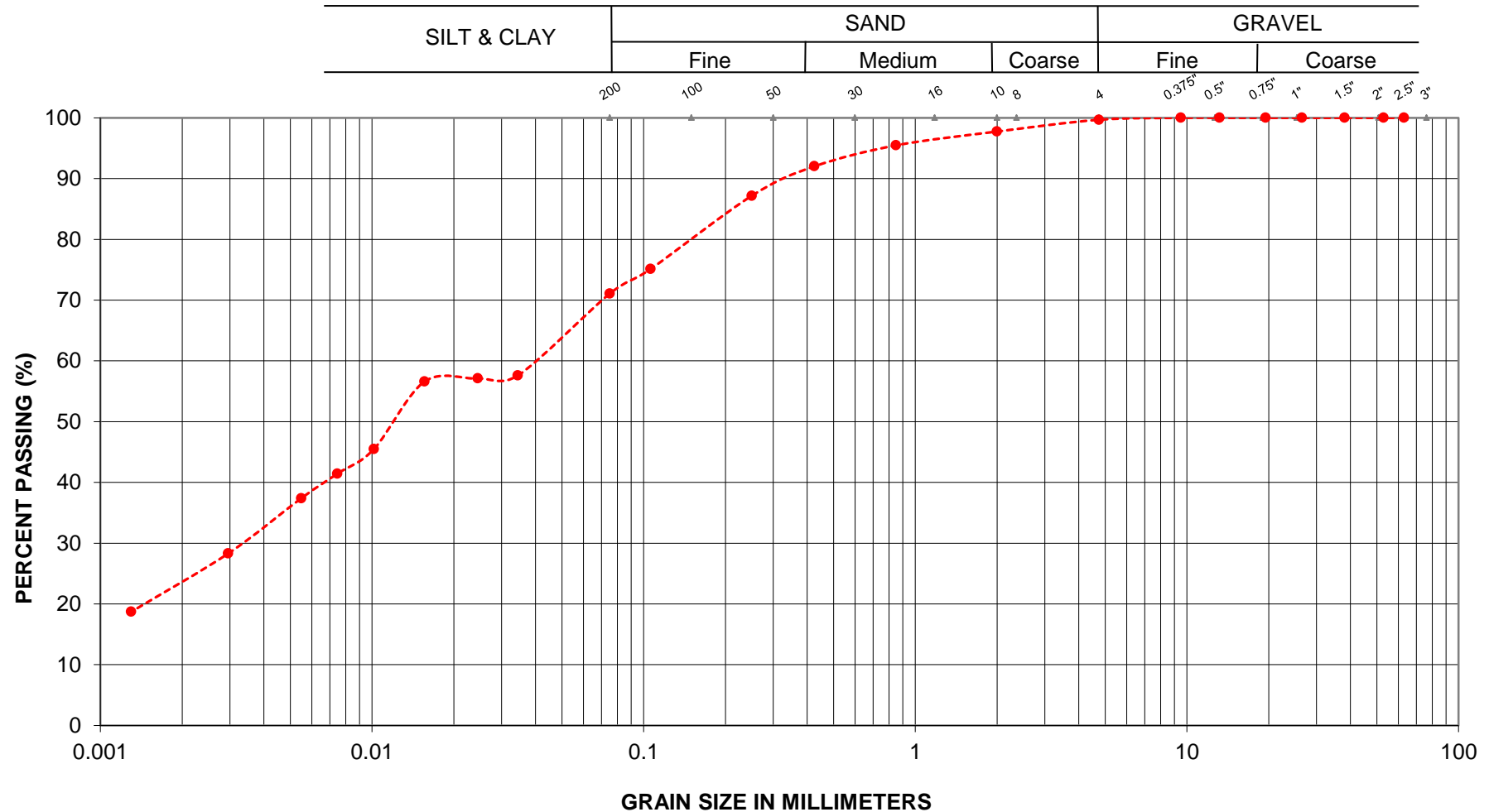
MIXED FILL

LOCATION: Hwy 11, Solomon Creek Culvert
TWP of Idington

Englobe Corp.

FIGURE L-2

GRAIN SIZE ANALYSIS



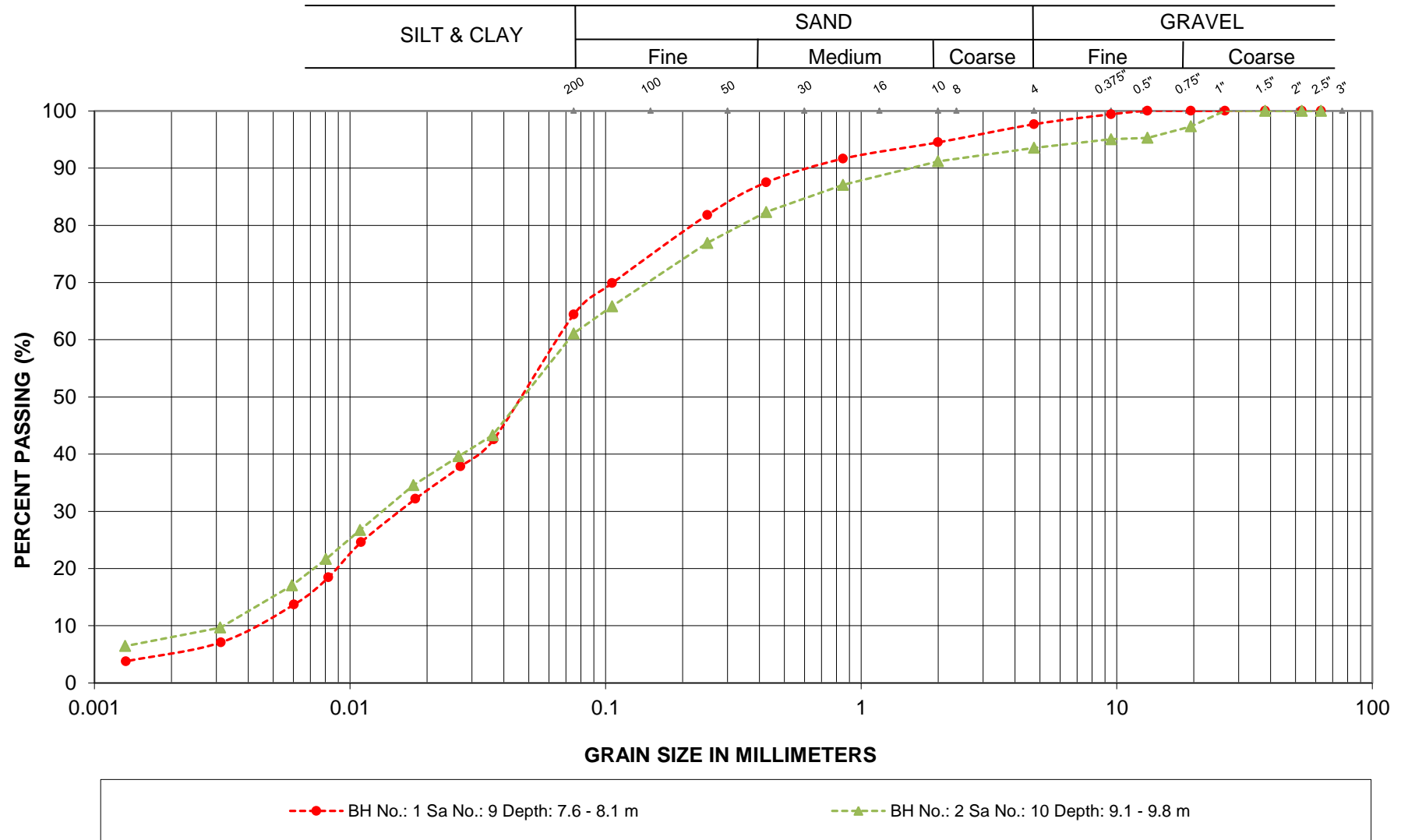
SILTY CLAY

LOCATION: Hwy 11, Solomon Creek Culvert
TWP of Idington

Englobe Corp.

FIGURE L-3

GRAIN SIZE ANALYSIS



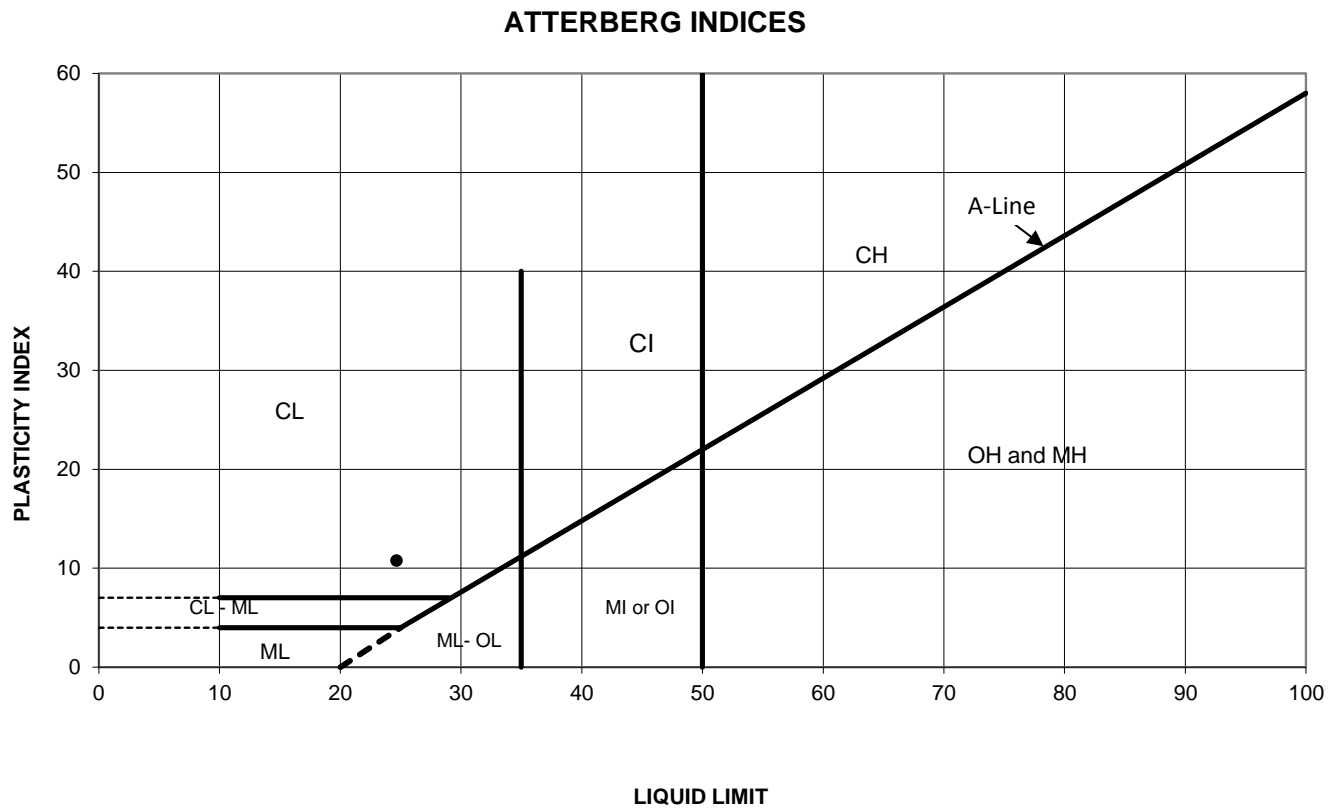
SANDY SILT

LOCATION: Hwy 11, Solomon Creek Culvert
TWP of Idington

Englobe Corp.

FIGURE L-4

FIGURE L-5

[illegible]

Date: Sep-15

Project: Hwy 11,

Location: Solomon Creek Bridge, TWP. of Idington

Prep'd: AT

Chkd: MAM

Ref. No.: 15/05/15059-F3

Englobe Corp.

Laboratory Tests - Summary Sheet



Borehole No.	Sample No.	Depth	Grain Size Analysis				NMC	Atterberg Limits			SPT 'N'	USCS	Unit Weight (kN/m3)	Remarks
			Gravel Size (%)	Sand Size (%)	Silt Size (%)	Clay Size (%)		LL (%)	PL (%)	IP (%)				
1	1	0.5					3.2				17			
	2	0.9					3.0				19			
	3	1.5	2	92	6		3.2				20			
	4	2.3					7.4				23			
	5	3.1					14.5				23			
	6	3.8	3	60	25	12	13.8				10			Non-Plastic (NP)
	7	4.6					18.5				1			
	8	6.1	0	29	47	24	16.7	24.7	13.9	10.8	3			
	9	7.6	2	34	59	5	12.1				28			Non-Plastic (NP)
	10	9.2					10.2				12			
2	1	0.5	6	89	5		2.4				18			
	2	0.9					2.7				21			
	3	1.5					2.8				24			
	4	2.3					3.9				33			
	5	3.1					4.7				30			
	6	3.8					10.8				7			
	7	4.6					15.9				5			
	8	6.1					35.3				8			
	9	7.6					13.3				37			
	10	9.2	6	33	54	7	10.6				23			Non-Plastic (NP)

Appendix 4

Photo Essay

Enclosure No. 4:

Photo Essay

Existing Bridge – Looking West (down chainage)

Photo: 1



Existing Bridge – Looking East (up chainage)

Photo: 2



Project: Hwy 11 – Solomon Creek Bridge, Township of Idington

Photos Provided By:Englobe

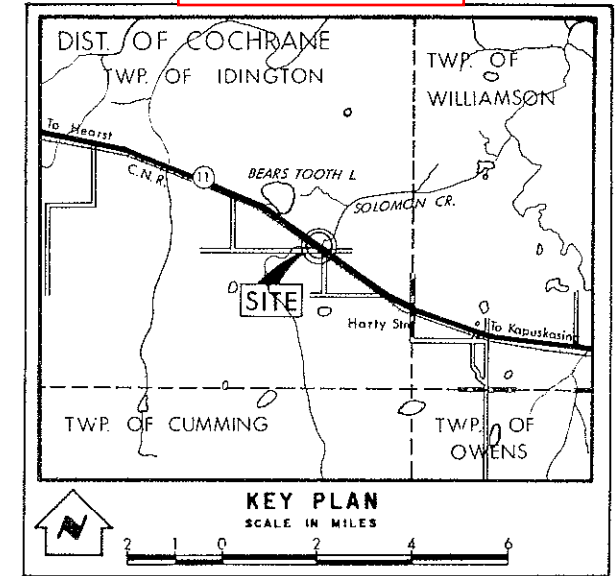
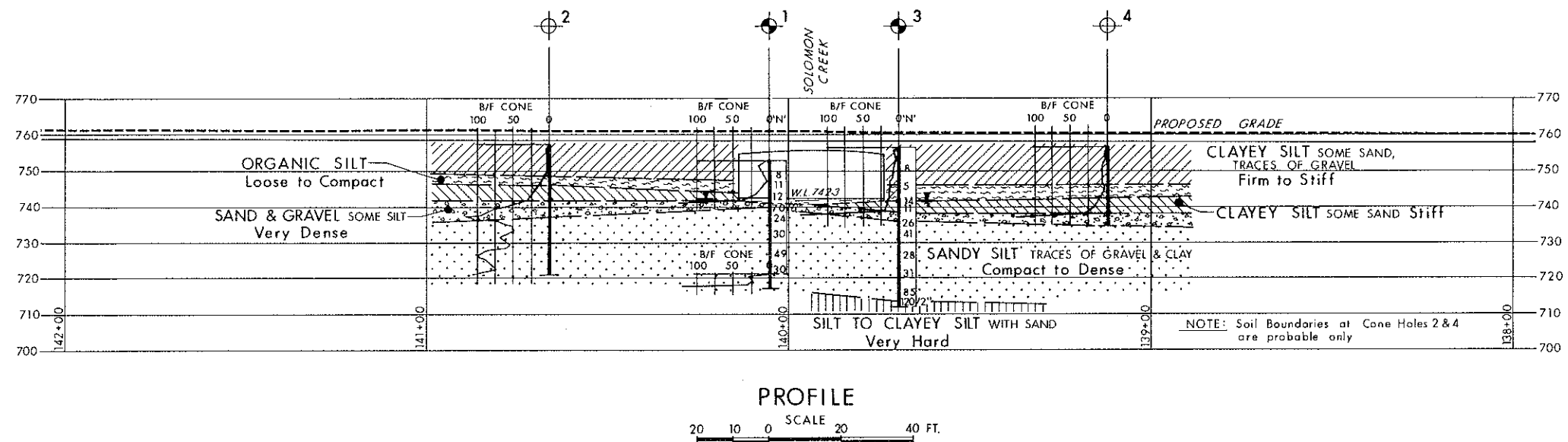
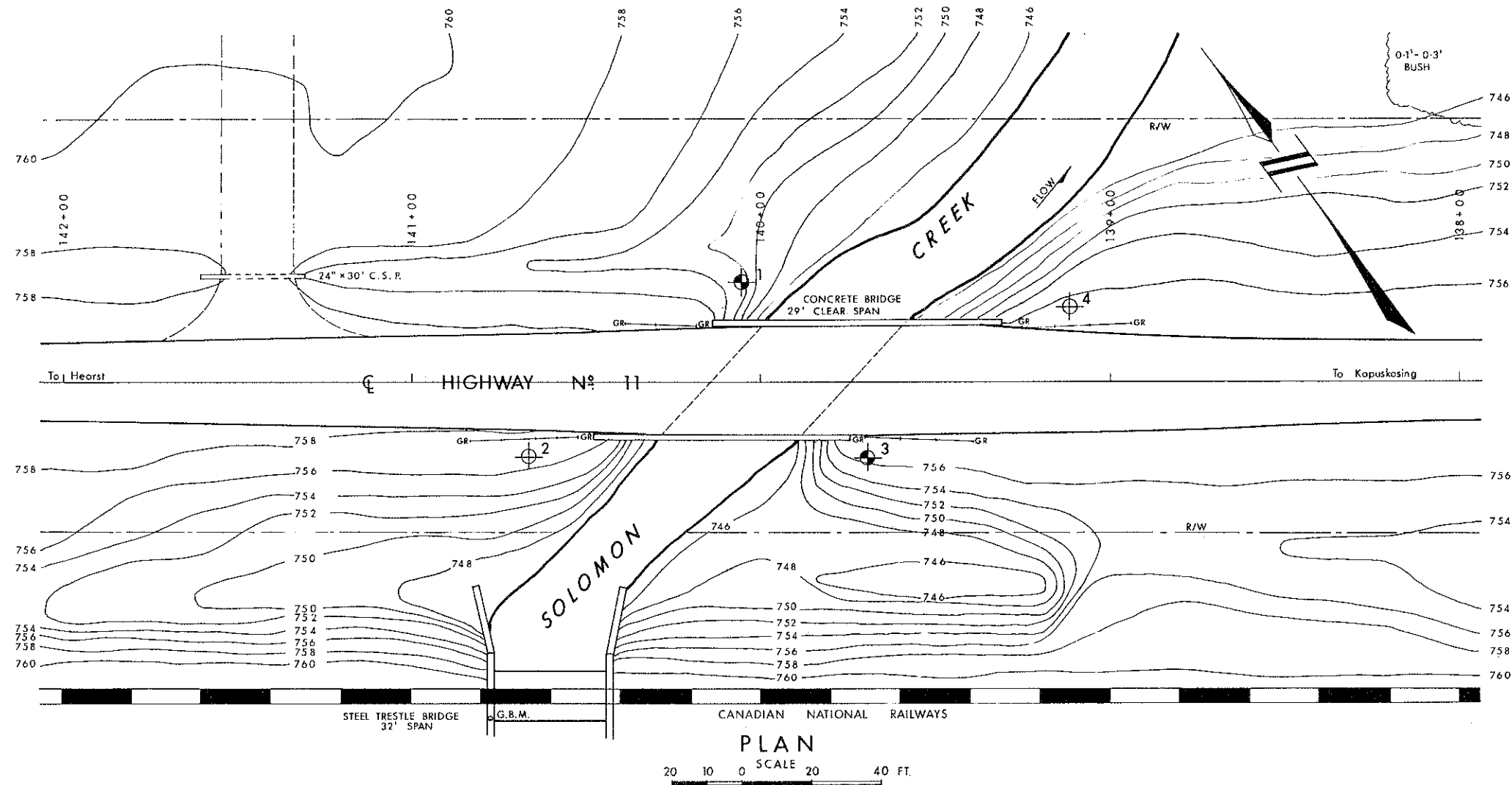
Date: August 2015

Appendix 5

Historical Data

Enclosure Nos. 5 and 6:

Historical Drawings



LEGEND			
	Bore Hole		
	Cone Penetration Hole		
	Bore & Cone Penetration Hole		
	Water Levels established at time of field investigation. JULY 1970.		
	Water Levels not established in Bore Holes 2 & 4.		
NO.	ELEVATION	STATION	OFFSET
1	753.0	140+05	28' RT.
2	757.3	140+66	22' LT.
3	756.6	139+70	22' LT.
4	757.0	139+12	21' RT.

NOTE

The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence and may be subject to considerable error.

DATE	BY	DESCRIPTION

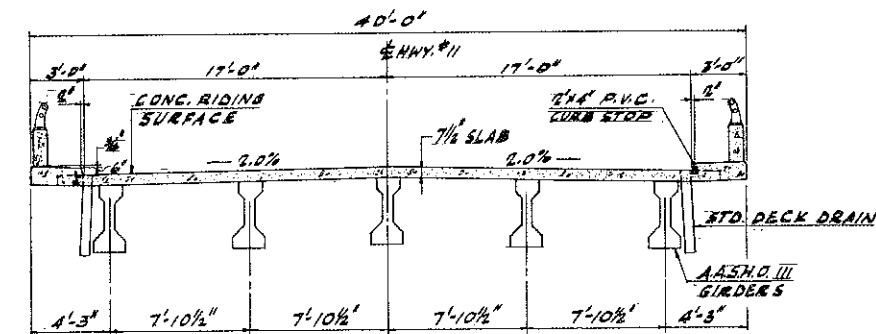
DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE - FOUNDATION SECTION

SOLOMON CREEK

KING'S HIGHWAY NO. 11 DIST. NO. 16
DIST. OF COCHRANE
TWP. IDINGTON LOT 7&8 CON. 7

BORE HOLE LOCATIONS & SOIL STRATA

SUBMD. A.P.	CHECKED	W.P. NO. 61-68-01	M.B.T. DRAWING NO.
DRAWN M.Y.	CHECKED	JOB NO. 70-11057	70-11057A
DATE Sept. 3, 1970	SITE NO. 39-63	BRIDGE DRAWING NO.	
APPROVED	CONT. NO. 71-125		D-6726-2

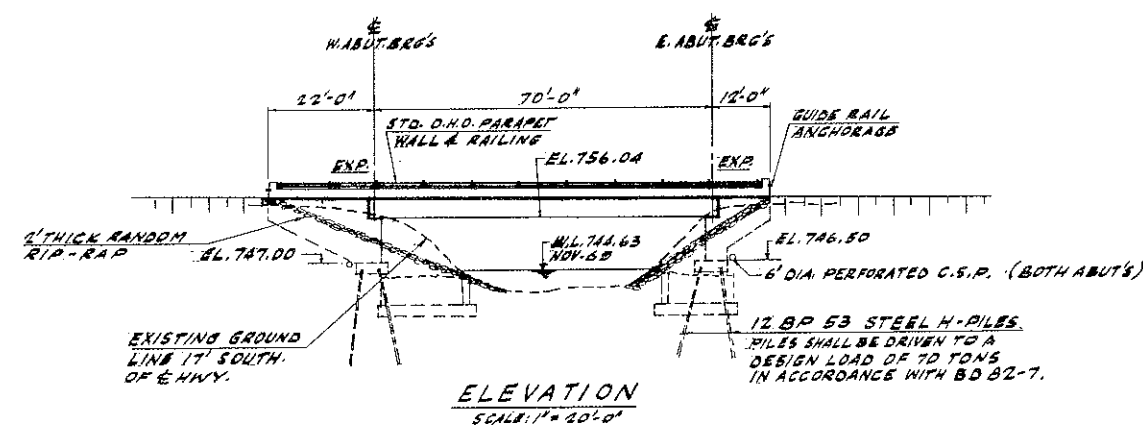


SCALE: $\frac{3}{16}'' = 1'-0''$

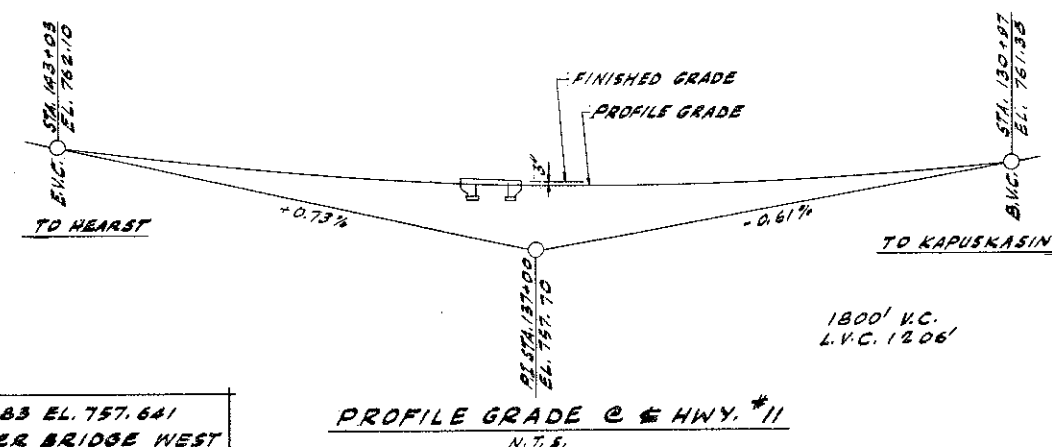
NOTES:
CLASS OF CONCRETE
 DECK, CURBS OVER DECK AND PARAPET WALLS _____ 4000 P.S.I.
 REMAINDER _____ 3000 P.S.I.
 (FOR PRESTRESSED GIRDERS SEE DWG. D-6926-5)
CLEAR COVER ON REINFORCING STEEL
 FOOTINGS & ABUTMENTS _____ 3"
 DECK — 1 1/2" TOP, 1" BOTTOM
 DIAPHRAGMS & CURBS _____ 2"
 AND/OR AS NOTED ON DRAWINGS

CONSTRUCTION NOTES
NO CONCRETE SHALL BE PLACED ABOVE THE
ABUTMENT BEARING SEATS UNTIL THE CONCRETE
IN THE DECK HAS BEEN PLACED.
THE CONTRACTOR IS RESPONSIBLE FOR FINISHING
THE BEARING SEATS DEAD LEVEL TO THE SPECIFIED
ELEVATIONS WITH A TOLERANCE OF $\pm 1/8$ INCH.

- D-6926 - 1 GENERAL LAYOUT
- 2 BOREHOLE LOCATIONS & SOIL STRATA
- 3 FOOTINGS
- 4 ABUTMENTS
- 5 PRESTRESSED GIRDERS & BEARINGS
- 6 DECK, DIAPHRAGMS & SCREED ELEVATIONS
- 7 APPROACH SLABS
- 8 PARAPET WALL DETAILS
- 9 STANDARD STEEL PARAPET RAIL
- 10 STANDARD DETAILS I
- 11 STANDARD DETAILS II

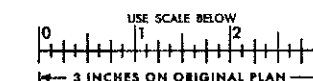


NOTE:
ORGANIC MATERIAL TO BE REMOVED FROM
UNDER ABUTMENT FOOTINGS AND REPLACED
BY SUITABLE GRANULAR BACKFILL.
FOR DETAILS SEE GRADING DRAWINGS.



G.B.M. No. 1183 EL. 757.641
C.N.R. GIRDER BRIDGE WEST
ABUTMENT. BOLT 3 FT. ABOVE
BRIDGE SEAT.

FOR REDUCED PLAN



DATE	BY	DESCRIPTION

DEPARTMENT OF HIGHWAYS ONTARIO
BRIDGE DIVISION

SOLOMON CREEK BRIDGE

APPROX. 2.3 MI. W. OF HARTY

KING'S HIGHWAY No. 11 _____ DIST. No. 16 _____
DIST. COCHRANE
TWP. IDINGTON LOT 7 & B CONJ. 7

GENERAL LAYOUT

APPROVED: [Signature]	SITE No.	W.P. No.
	39N-63	61-68-A
BRIEFLER ENGINEER	CONTRACT NO.	"I"-125
DESIGN C.F.E. CHECK P.O.L.	DRAWING No.	D-6926-1
DRAWING A.V. CHECK C.F.E.		
DATE FEB 17 1980 LOADING 1550-LB		