



**THURBER** ENGINEERING LTD.

**FINAL  
FOUNDATION INVESTIGATION REPORT  
REHABILITATION OF BRIDGE STRUCTURE No. 46-236  
NEBSKWASHI RIVER BRIDGE HIGHWAY 129  
CHAPLEAU TOWNSHIP  
G.W.P. 5144-10-00  
AGREEMENT NO.: 5015-E-0027**

**GEOCRES NUMBER: 41O-28**

**SUBMITTED TO  
MCINTOSH PERRY CONSULTING ENGINEERS**

**Location:**

Latitude: 47.819766°

Longitude: -83.398725°

**October 2018  
THURBER FILE NO.: 13624**

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**PART 1: FACTUAL INFORMATION**

**1 INTRODUCTION**

This section of the report presents the factual data obtained from a foundation investigation conducted by Thurber Engineering Ltd. (Thurber) for the proposed foundation work required for the rehabilitation of the Nebskwashi River Bridge which is located on Highway 129, within Chapleau Township. Thurber carried out the investigation as a subconsultant to McIntosh Perry Consulting Engineers (MPCE) as part of Change Proposal 1 for Agreement No. 5015-E-0027.

The purpose of this investigation was to explore the subsurface conditions at the site and, based on this data, provide a borehole location plan, record of boreholes, a stratigraphic profile, laboratory test results and a written description of the subsurface conditions. A base plan survey drawing was provided by MPCE for the preparation of this report.

An earlier foundation investigation report that has been obtained from the Geocres Library and reviewed in preparation of this report is as follows:

Report to Department of Highways Ontario on Soil Conditions and Foundations,  
Proposed Nebskwashi River Bridge, Chapleau, Ontario (Geocres 41O00-005),  
dated March 1965.

A copy of the historic boreholes have been included in Appendix B for information purposes only and have not been included in the description of the subsurface conditions within this report.

**2 SITE DESCRIPTION**

The Nebskwashi River Bridge (Structure No. 46-236) is located on Highway 129, approximately 1.0 km north of the north junction of Highway 101 and Highway 129. It is noted that for orientation purposes, Highway 129 within the project limits, will be described with an east-west alignment. The location of the bridge is shown on the inset Key Plan on Drawing No. 1 in Appendix A.

Within the project limits, Highway 129 is a two-lane, rural, arterial, undivided highway. Based on the December 2016 drawing the roadway cross-section consists of two, 3.6 m wide lanes, and paved shoulders with a width of 1.1 m and 0.7 m on the WBL and EBL respectively. Guide rails are located on both sides of the highway for a short distance from the bridge.

Site photographs showing the general conditions at the site during the time of the field investigation are presented in Appendix D.

### 3 SITE INVESTIGATION AND FIELD TESTING

Thurber contacted Ontario One Call in advance of the field investigation to provide utility locate clearances in the vicinity of the intended borehole locations.

The field investigation for this site included two boreholes drilled on May 12, 2017. The northing, easting and elevation of the boreholes are shown on the Borehole Location and Soil Strata Drawing No. 1 in Appendix A and are summarized in Table 3-1.

**Table 3-1: Borehole Summary**

<b>Borehole No.</b>	<b>Drilled Location</b>	<b>Northing (m)</b>	<b>Easting (m)</b>	<b>Ground Surface Elevation (m)</b>	<b>Borehole Depth below Existing Ground Surface (m)</b>
17-1	West Abutment – eastbound lane	5 298 031.2	349 811.5	431.0	4.8
17-2	West Approach – eastbound lane	5 298 034.7	349 802.2	431.4	4.0

All boreholes were advanced through the roadway embankment with a track mounted CME 550 drill rig equipped with hollow stem augers and HW/NW casing. The subsurface stratigraphy encountered in the boreholes was recorded in the field by Thurber personnel. Split spoon samples were collected at regular depth intervals in the boreholes via the completion of Standard Penetration Tests (SPT), following the methods described in ASTM Standard D1586. All soil samples recovered from the boreholes were transported to Thurber's laboratory for further examination and testing.

The boreholes were backfilled with a low-permeability mixture of bentonite pellets and auger cuttings in general accordance with Ontario MOE Regulation 903. Boreholes were capped with granular auger cuttings followed by 150 mm of cold patch asphalt to reinstate the travelling surface.

The as-drilled locations and ground surface elevation of the boreholes were surveyed by Thurber following completion of drilling.

#### 3.1 Laboratory Testing

Geotechnical laboratory testing consisted of natural moisture content determination and visual identification of all retained soil samples in accordance with the current MTO standards. Grain size distribution testing was also carried out on selected samples to MTO and ASTM standards.

The results of the geotechnical tests are summarized on the Record of Borehole sheets included in Appendix B and all laboratory results are presented on the figures included in Appendix C.

## **4 DESCRIPTION OF SUBSURFACE CONDITIONS**

### **4.1 Overview / General**

Reference is made to the Record of Borehole sheets in Appendix B for details of the soil stratigraphy encountered at the investigated locations. A stratigraphic profile is presented on Drawing No. 1 in Appendix A for illustrative purposes. An overall description of the stratigraphy is given in the following paragraphs; however, the factual data presented in the Record of Boreholes governs any interpretation of the site conditions.

The stratigraphy in the area of the west approach is generally characterized by the asphalt pavement structure and sand with gravel fill overlying native deposits varying from sand to silty sand with gravel, cobbles and boulders above inferred bedrock. Bedrock was confirmed at both abutments at elevations ranging from 424.4 to 427.7 in the original MTO investigation (Geocres 41O00-005).

### **4.2 Asphalt**

The boreholes were advanced through the Highway 129 pavement structure and the thickness of the asphalt was found to be 100 mm in both boreholes.

### **4.3 Granular Fill**

Fill consisting predominantly of sand with gravel was encountered below the asphalt in both boreholes. Occasional cobbles and boulders were noted within this layer in Borehole 17-1. This layer has a thickness ranging from 0.7 m to 1.4 m (base elevation of 429.5 m to 430.7 m). The SPT 'N' values ranged from 21 blows per 300 mm of penetration to 100 blows for 225 mm of penetration; indicating a compact to very dense condition.

The moisture content of the samples tested ranged from 1% to 2%. The results of grain size analysis conducted on one sample of this material are summarized in Table 4-1 and illustrated on Figure C1 in Appendix C.

**Table 4-1: Gradation Results for Granular Fill**

<b>Soil Particle</b>	<b>%</b>
Gravel	29
Sand	63
Silt and Clay	8

### **4.4 Sand (SP) with Gravel**

A native layer of sand with gravel was encountered directly below the fill in both boreholes. Frequent cobbles and boulders were observed in this unit in both boreholes. The surface of this deposit ranged in elevation from 429.5 m to 430.7 m. This layer has a thickness ranging from 2.1 m to 2.2 m. The SPT 'N' values ranged from 3 to blows per 300 mm of penetration to 100 blows for 275 mm of penetration; indicating a very loose to very dense condition. The refusal blow counts may represent the presence of cobbles and boulders

The moisture content for the samples tested ranged from 1% to 11%. The results of grain size analysis conducted on one sample of this material are summarized in Table 4-2 and illustrated on Figure C2 in Appendix C.

**Table 4-2: Gradation Results for Sand (SP) with Gravel**

Soil Particle	%
Gravel	43
Sand	49
Silt & Clay	8

#### **4.5 Silty Sand (SM) with Gravel**

A native layer of silty sand with gravel was encountered in both boreholes below the sand with gravel deposit. Frequent cobbles and boulders were also noted in this layer in both boreholes and wood pieces were present within Borehole 17-01. The surface of this deposit ranged in elevation from 427.5 m to 428.4 m. This layer has a thickness ranging from 1.0 m to 1.2 m. The SPT 'N' values ranged from 24 blows for 300 mm of penetration to 100 blows for 150 mm of penetration; indicating a compact to very dense condition. Both boreholes were terminated within this layer.

The moisture content for the samples tested ranged from 5% to 19%. The results of grain size analysis conducted on two samples of this material are summarized in Table 4-3 and illustrated on Figure C3 in Appendix C.

**Table 4-3: Gradation Results for Silty Sand (SM) with Gravel**

Soil Particle	%	
Gravel	21 to 24	
Sand	46 to 60	
Silt	30	16
Clay	3	

#### **4.6 Bedrock**

Bedrock coring was not required as part of the current assignment. Both boreholes were advanced to refusal on inferred bedrock at elevation ranging from 427.4 to 426.2 m. The historic MTO report (Geocres No. 41O00-005) cored bedrock for Boreholes 2 and 4 located near the west abutment and encountered a bedrock surface at elevation 427.2 to 424.4 m

#### **4.7 Groundwater**

The groundwater level was measured in the open Borehole 17-02 during drilling and was noted to be at elevation 427.7 m. This observation is considered a short-term reading and seasonal fluctuations of the groundwater level are to be expected. In particular, the groundwater level may be at a higher elevation after the spring snowmelt or after periods of heavy and/or prolonged

precipitation. Due to the open nature of the embankments and native soils, it is expected that the groundwater level will respond rapidly to the water level changes in the Nebskwashi River which was noted to be near elevation 425.9 m at the time of the investigation.

## 5 MISCELLANEOUS

Thurber obtained utility clearances prior to drilling and the borehole locations were positioned relative to existing site features and proposed foundations. Thurber personnel surveyed the borehole locations and ground surface elevations. George Downing Estate Drilling Ltd. of Hawkesbury, Ontario supplied and operated the drilling equipment to carry out the drilling, sampling, in-situ testing and borehole decommissioning. The drilling, and sampling operations in the field were supervised on a full time basis by Ms. Katya Edney, P.Eng. of Thurber. Laboratory testing was carried out in Thurber's MTO-approved laboratory in Ottawa.

Overall project management and direction of the field program was provided by Mr. Stephen Peters, P.Eng. Interpretation of the field data and preparation of this report was completed by Mr. Christopher Murray, P.Eng. The report was reviewed by Dr. Fred Griffiths, P.Eng. and Dr. P.K. Chatterji, P.Eng., the Designated Principal Contact for MTO Foundations Projects.



Christopher Murray, P.Eng.  
Geotechnical Engineer



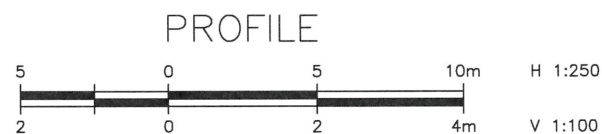
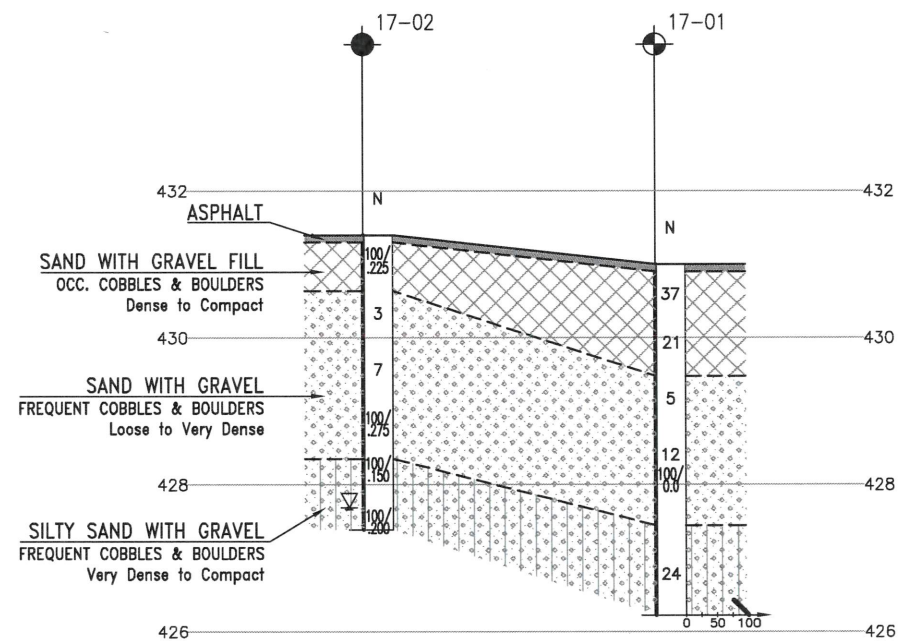
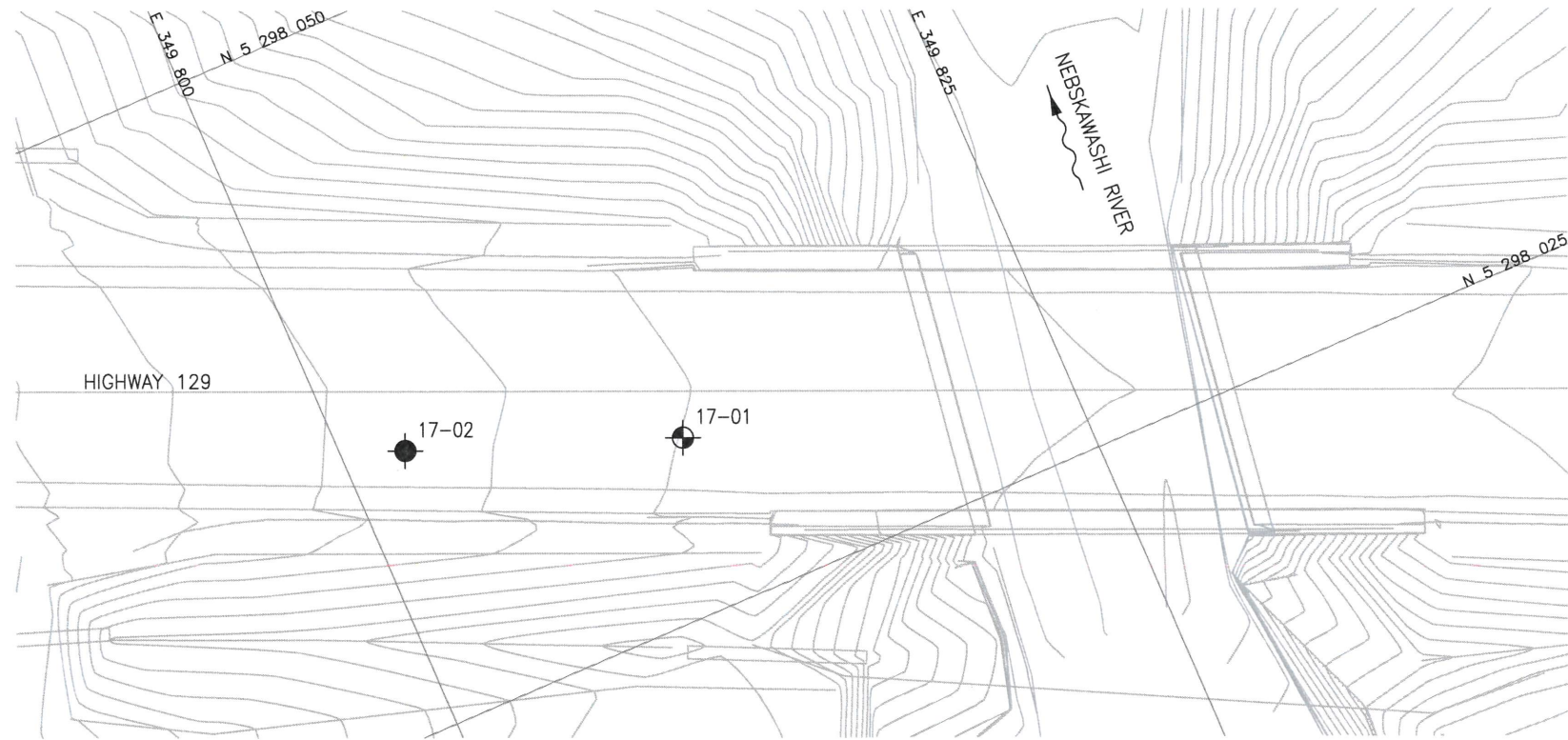
Dr. Fred Griffiths, P.Eng.  
Senior Associate  
Senior Geotechnical Engineer



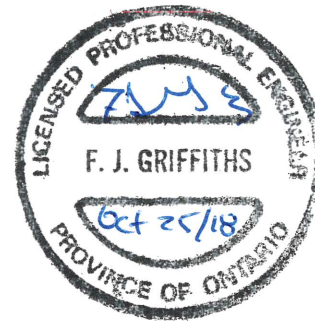
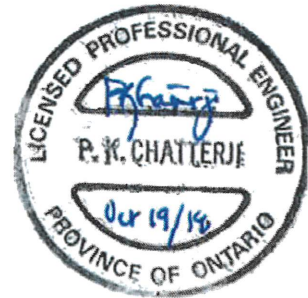
Dr. P.K. Chatterji, P.Eng.  
MTO Review Principal  
Senior Geotechnical Engineer

**APPENDIX A**  
**BOREHOLE LOCATIONS AND SOIL STRATA DRAWINGS**





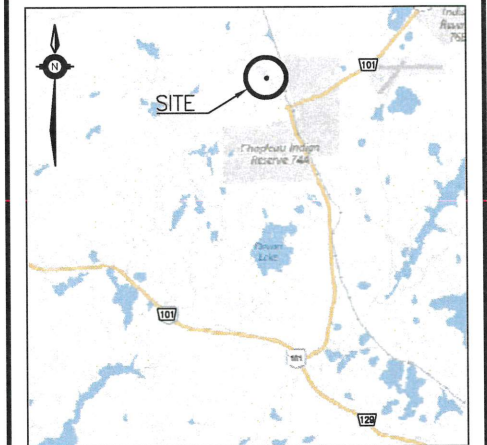
METRIC  
DIMENSIONS ARE IN METRES  
AND/OR MILLIMETRES  
UNLESS OTHERWISE SHOWN



CONT No  
GWP No 5144-10-00

HIGHWAY 129  
NEBSKAWASHI RIVER  
BRIDGE REHABILITATION  
BOREHOLE LOCATIONS AND SOIL STRATA

McINTOSH PERRY



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

NO	ELEVATION	NORTHING	EASTING
17-01	431.0	5 298 031.2	349 811.5
17-02	431.4	5 298 034.7	349 802.2

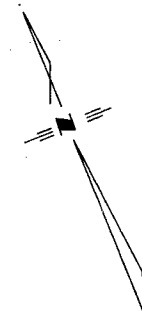
-NOTES-

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

GEOCRES No. 410-28

REVISIONS	DATE	BY	DESCRIPTION
DESIGN	SBP	CHK PKC	CODE
DRAWN	AN	CHK SBP	SITE
LOAD			
STRUCT			
DWG			

DATE OCT 2018



**APPENDIX B**  
**RECORD OF BOREHOLE SHEETS**



## SYMBOLS, ABBREVIATIONS AND TERMS USED ON TEST HOLE RECORDS

### TERMINOLOGY DESCRIBING COMMON SOIL GENESIS

Topsoil	mixture of soil and humus capable of supporting vegetative growth
Peat	mixture of fragments of decayed organic matter
Till	unstratified glacial deposit which may include particles ranging in sizes from clay to boulder
Fill	material below the surface identified as placed by humans (excluding buried services)

### TERMINOLOGY DESCRIBING SOIL STRUCTURE:

Desiccated	having visible signs of weathering by oxidization of clay materials, shrinkage cracks, etc.
Fissured	having cracks, and hence a blocky structure
Varved	composed of alternating layers of silt and clay
Stratified	composed of alternating successions of different soil types, e.g. silt and sand
Layer	> 75 mm in thickness
Seam	2 mm to 75 mm in thickness
Parting	< 2 mm in thickness

### RECOVERY:

For soil samples, the recovery is recorded as the length of the soil sample recovered.

### N-VALUE:

Numbers in this column are the field results of the Standard Penetration Test: the number of blows of a 63.5 kg hammer falling 0.76 m, required to drive a 50 mm O.D. split spoon sampler 0.3 m into undisturbed soil. For samples where insufficient penetration was achieved and N-value cannot be presented, the number of blows are reported over the sampler penetration in millimetres (e.g. 50/75).

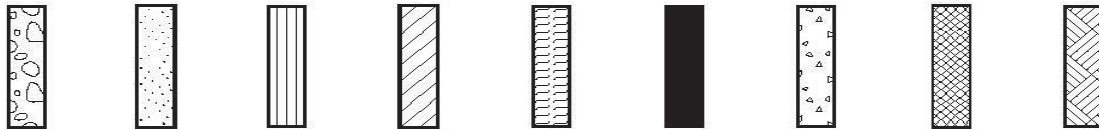
### DYNAMIC CONE PENETRATION TEST (DCPT):

Dynamic cone penetration tests are performed using a standard 60 degree apex cone connected to an "A" size drill rods with the same standard fall height and weight as the Standard Penetration Test. The DCPT value is the number of blows of the hammer required to drive the cone 0.3 m into the soil. The DCPT is used as a probe to assess soil variability.



### STRATA PLOT:

Strata plots symbolize the soil and bedrock description. They are combinations of the following basic symbols. The dimensions within the strata symbols are not indicative of the particle size, layer thickness, etc.



Boulders  
Cobbles  
Gravel      Sand      Silt      Clay      Organics      Asphalt      Concrete      Fill      Bedrock

### TEXTURING CLASSIFICATION OF SOILS

Classification	Particle Size
Boulders	Greater than 200 mm
Cobbles	75 – 200 mm
Gravel	4.75 – 75 mm
Sand	0.075 – 4.75 mm
Silt	0.002 – 0.075 mm
Clay	Less than 0.002 mm

### TERMS DESCRIBING CONSISTENCY (COHESIVE SOILS ONLY)

Descriptive Term	Undrained Shear Strength (kPa)
Very Soft	12 or less
Soft	12 – 25
Firm	25 – 50
Stiff	50 – 100
Very Stiff	100 – 200
Hard	Greater than 200

NOTE: Clay sensitivity is defined as the ratio of the undisturbed strength over the remolded strength.

### SAMPLE TYPES

SS	Split spoon samples
ST	Shelby tube or thin wall tube
DP	Direct push sample
PS	Piston sample
BS	Bulk sample
WS	Wash sample
HQ, NQ, BQ etc.	Rock core sample obtained with the use of standard size diamond coring equipment

### TERMS DESCRIBING CONSISTENCY (COHESIONLESS SOILS ONLY)

Descriptive Term	SPT “N” Value
Very Loose	Less than 4
Loose	4 – 10
Compact	10 – 30
Dense	30 – 50
Very Dense	Greater than 50

### MODIFIED UNIFIED SOIL CLASSIFICATION

Major Divisions		Group Symbol	Typical Description
COARSE GRAINED SOIL	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	SILT AND CLAY SOILS $W_L < 35\%$	ML	Inorganic silts, 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.
		OL	Organic silts and organic silty-clays of low plasticity.
	SILT AND CLAY SOILS $35\% < W_L < 50\%$	MI	Inorganic compressible fine sandy silt with clay of medium plasticity, clayey silts.
		CI	Inorganic clays of medium plasticity, silty clays.
		OI	Organic silty clays of medium plasticity.
	SILT AND CLAY SOILS $W_L > 50\%$	MH	Inorganic silts, micaceous or diatomaceous fine sandy of silty soils, elastic silts.
		CH	Inorganic clays of high plasticity, fat clays.
		OH	Organic clays of high plasticity, organic silts.
HIGHLY ORGANIC SOILS		Pt	Peat and other organic soils.

Note -  $W_L$  = Liquid Limit





## EXPLANATION OF ROCK LOGGING TERMS

### ROCK WEATHERING CLASSIFICATION

Fresh (FR)	No visible signs of weathering.
Fresh Jointed (FJ)	Weathering limited to surface of major discontinuities.
Slightly Weathered (SW)	Penetrative weathering developed on open discontinuity surfaces, but only slight weathering of rock materials.
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 structures are preserved.

### 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 0.1 m in length or larger, as a percentage of total core length
Unconfined Compressive Strength: (UCS)	Axial stress required to break the specimen.
Fracture Index: (FI)	Frequency of natural fractures per 0.3 m of core run.

### DISCONTINUITY SPACING

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

### STRENGTH CLASSIFICATION

Rock Strength	Approximate Uniaxial Compressive Strength (MPa)
Extremely Strong	Greater than 250
Very Strong	100 – 250
Strong	50 – 100
Medium Strong	25 – 50
Weak	5 – 25
Very Weak	1 – 5
Extremely Weak	0.25 – 1

# RECORD OF BOREHOLE No 17-01

1 OF 1

METRIC

GWP# 5144-10-00 LOCATION Hwy 129 - Nebskwashi River Bridge N 5 298 031.2 E 349 811.5 ORIGINATED BY KE  
HWY 129 BOREHOLE TYPE HSA / NW Casing COMPILED BY CM  
DATUM Geodetic DATE 12.05.2017 - 12.05.2017 CHECKED BY SP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT  $\gamma$ kN/m <sup>3</sup>	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					
								20 40 60 80 100					
431.0													
0.0	100mm ASPHALT												
0.1	SAND with Gravel FILL Occasional Cobbles and Boulders Dense to Compact Grey to Brown		1	SS	37								29 63 8 (SI+CL)
			2	SS	21		430						
429.5													
1.5	SAND (SP) with Gravel Frequent Cobbles and Boulders Loose to Compact Brown		3	SS	5		429						
			4	SS	12								
	- Auger Refusal at 2.9 m - 700 mm Boulder at 2.9 m		5	SS	100/ 0mm		428						
427.5													
3.6	Silty SAND (SM) with Gravel, trace Organics/Wood Frequent Cobbles and Boulders Compact Grey		6	SS	24		427						21 46 30 3
426.5													
4.5	End of Sampled Borehole												
426.2	DCPT from 4.5 m to 4.8 m												
4.8	Inferred Silty SAND with Gravel End of DCPT on Inferred Bedrock												

ONTMT4S 13624 - 101 AND 129 - NEBSKWASHI.GPJ 2012TEMPLATE(MTO).GDT 29/10/18








# RECORD OF BOREHOLE No 17-02

1 OF 1

METRIC

GWP# 5144-10-00 LOCATION Hwy 129 - Nebskwashi River Bridge N 5 298 034.7 E 349 802.2 ORIGINATED BY KE  
 HWY 129 BOREHOLE TYPE HSA COMPILED BY CM  
 DATUM Geodetic DATE 12.05.2017 - 12.05.2017 CHECKED BY SP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT      NATURAL MOISTURE CONTENT      LIQUID LIMIT			UNIT WEIGHT  $\gamma$  kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)  GR   SA   SI   CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					W <sub>P</sub> W      W <sub>L</sub>							
								○ UNCONFINED      + FIELD VANE ● QUICK TRIAXIAL      × LAB VANE					WATER CONTENT (%)							
431.4								20	40	60	80	100								
0.0																				
0.1	100mm ASPHALT																			
	SAND with Gravel FILL Very Dense Grey to Brown		1	SS	100/ 225mm		431													
430.7																				
0.8	SAND (SP) with Gravel Frequent Cobbles and Boulders Dense to Loose Brown		2	SS	3		430												43   49   8 (SH+CL)	
			3	SS	7															
			4	SS	100/ 275mm		429													
428.4																				
3.0	Silty SAND (SM) with Gravel Frequent Cobbles and Boulders Dense to Compact Brown		5	SS	100/ 150mm		428												24   60   16 (SH+CL)	
																				
427.4			6	SS	100/ 200mm															
4.0	End of Borehole on Inferred Bedrock Groundwater at 3.7 m BGS (Elev. 427.7 m) on completion																			

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

## GEOCON

## OFFICE REPORT ON SOIL EXPLORATION

CONTRACT T7722 BORING # 2 DATUM GEODETIC CASING BX  
 BORING DATE FEB 6<sup>TH</sup> 65 REPORT DATE FEB 23<sup>RD</sup> 65 COMPILED BY BER CHECKED BY SSO  
 SAMPLER HAMMER WT. 140 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN - LBS. ENERGY)

## SAMPLE CONDITION

☒ DISTURBED  
☐ FAIR  
☐ GOOD  
☐ LOST

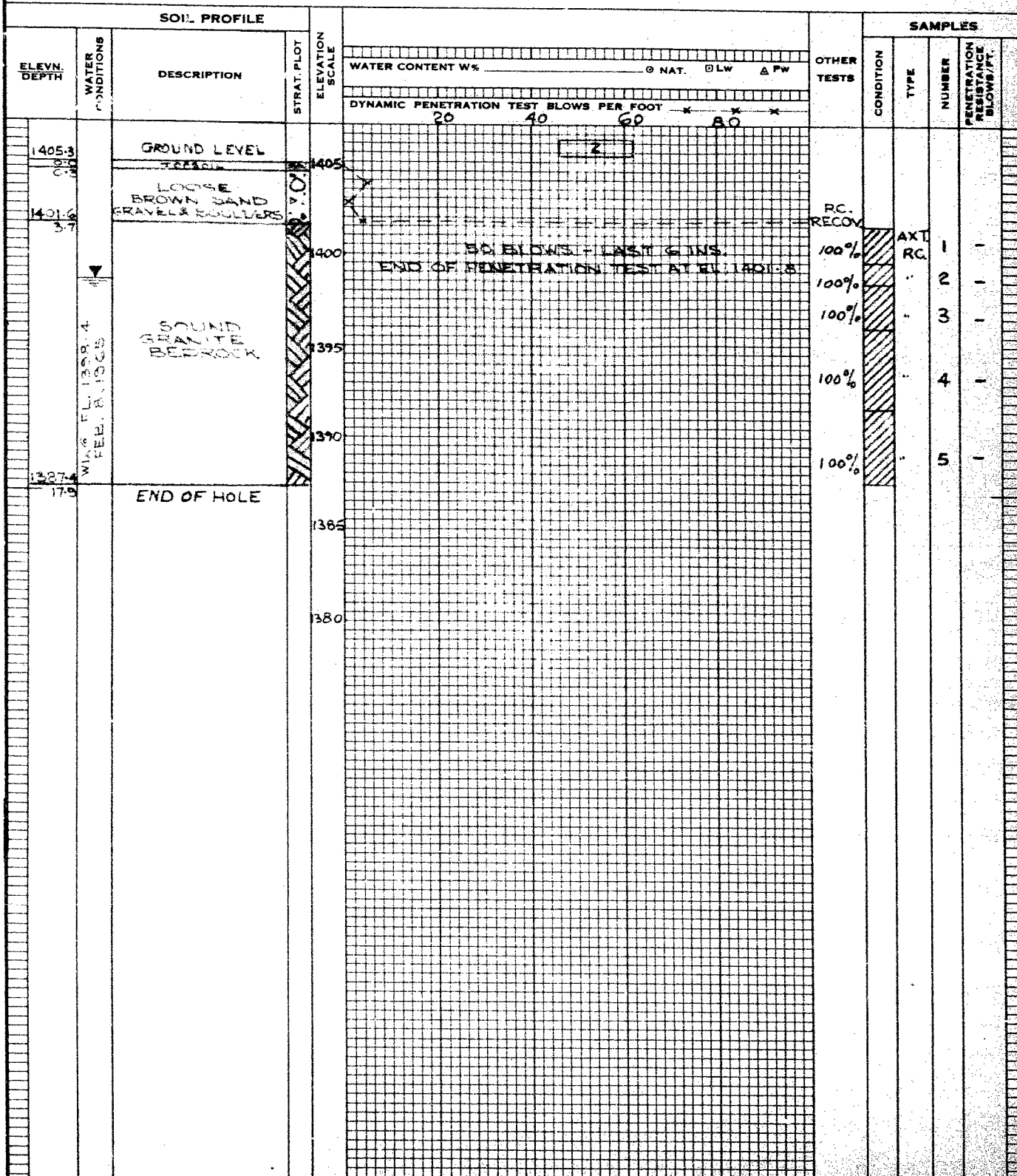
## SAMPLE TYPES

A.S. - AUGER SAMPLE  
 S.T. - SLOTTED TUBE  
 W.S. - WASHED SAMPLE  
 D.O. - DRIVE-OPEN  
 D.F. - DRIVE-FOOT VALVE  
 C.S. - CHUNK SAMPLE

F.S. - FOIL SAMPLE  
 S.O. - SLEEVE-OPEN  
 S.F. - SLEEVE-FOOT VALVE  
 T.O. - THIN WALLED OPEN  
 R.C. - ROCK CORE

## ABBREVIATIONS

V - IN-SITU VANE TEST  
 M - MECHANICAL ANALYSIS  
 U - UNCONFINED COMPRESSION  
 QC - TRIAXIAL CONSOLIDATED UNDRAINED  
 Q - TRIAXIAL UNDRAINED  
 S - TRIAXIAL DRAINED  
 γ - WET UNIT WEIGHT  
 K - PERMEABILITY  
 C - CONSOLIDATION  
 WL - WATER LEVEL IN CASING  
 WT - WATER TABLE IN SOIL



## GEOCON

## OFFICE REPORT ON SOIL EXPLORATION

CONTRACT T7722 BORING # 4 DATUM GEODETIC CASING EXT  
 BORING DATE FEB 13 1965 REPORT DATE FEB 23 1965 COMPILED BY BER CHECKED BY DBO  
 SAMPLER HAMMER WT. — LBS. DROP — INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN - LBS. ENERGY)

## SAMPLE CONDITION

 DISTURBED  
 FAIR  
 GOOD  
 LOST

## SAMPLE TYPES

A.S. - AUGER SAMPLE  
 S.T. - SLOTTED TUBE  
 W.S. - WASHED SAMPLE  
 D.O. - DRIVE-OPEN  
 D.F. - DRIVE-FOOT VALVE  
 C.S. - CHUNK SAMPLE  
 F.S. - FOIL SAMPLE  
 S.O. - SLEEVE-OPEN  
 S.F. - SLEEVE-FOOT VALVE  
 T.O. - THIN WALLED OPEN  
 R.C. - ROCK CORE

## ABBREVIATIONS

V - IN-SITU VANE TEST  
 M - MECHANICAL ANALYSIS  
 U - UNCONFINED COMPRESSION  
 OC - TRIAXIAL CONSOLIDATED UNDRAINED  
 Q - TRIAXIAL UNDRAINED  
 S - TRIAXIAL DRAINED  
 T - WET UNIT WEIGHT  
 K - PERMEABILITY  
 C - CONSOLIDATION  
 WL - WATER LEVEL IN CASING  
 WT - WATER TABLE IN SOIL

SOIL PROFILE				SAMPLES						
ELEV. DEPTH	WATER CONDITIONS	DESCRIPTION	STRAT. PLOT	ELEVATION SCALE	WATER CONTENT W% <span style="margin-left: 20px;">⊙ NAT. ⊠ LW Δ Pw</span>	OTHER TESTS	CONDITION	TYPE	NUMBER	PENETRATION RESISTANCE BLOWS/FT.
1338.1		GROUND LEVEL		1400						
332.0	W.L. 6 EL. 1007.9 FEB 13, 1965	BROWN SAND SOME GRAVEL AND BOULDERS		375						
332.0		SOUND GRANITE BEDROCK		390						
332.0		END OF HOLE		385						

RC. RECOV.  
 30%  
 46%  
 —

EXT. RC.  
 1  
 2  
 3

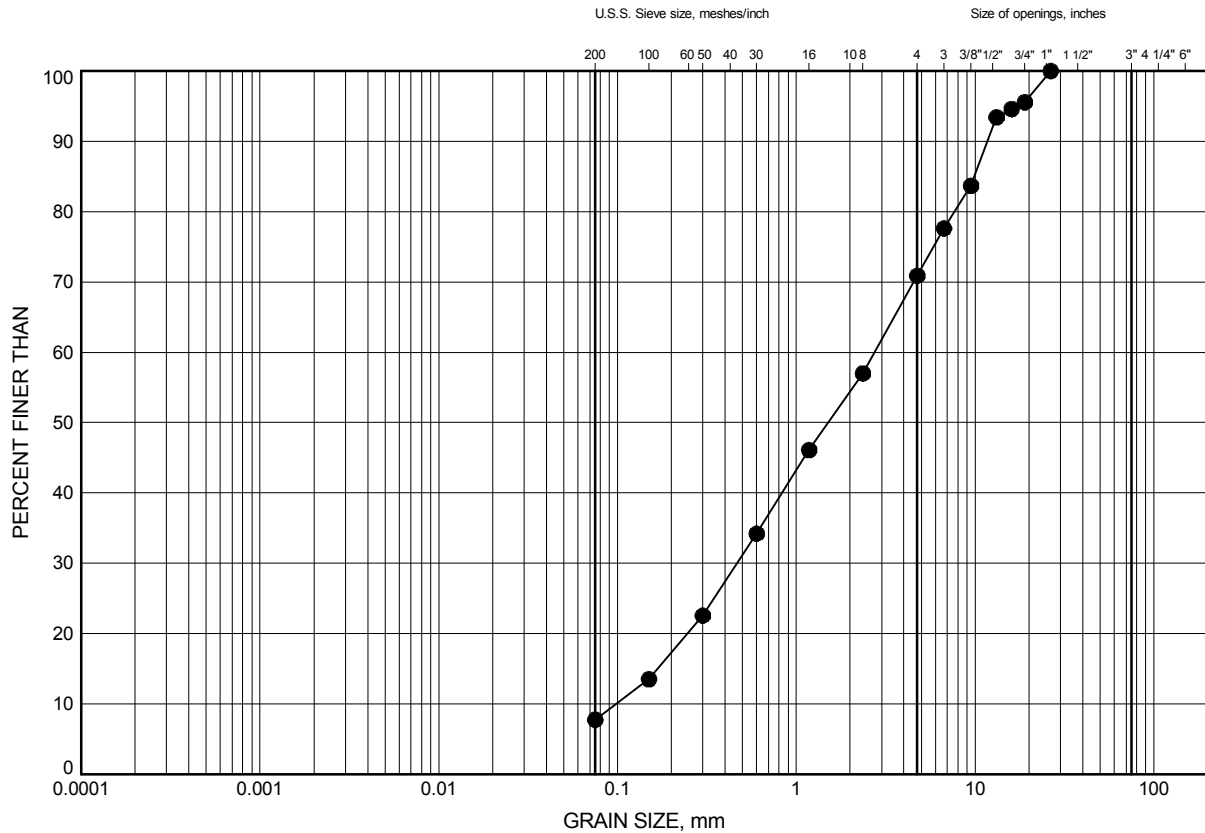
**APPENDIX C**  
**LABORATORY TEST RESULTS**

# Nebskwashi River Bridge

## GRAIN SIZE DISTRIBUTION

FIGURE C1

### Granular Fill



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

### LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	17-01	0.41	430.61

Date July 2017  
GWP# 5144-10-00



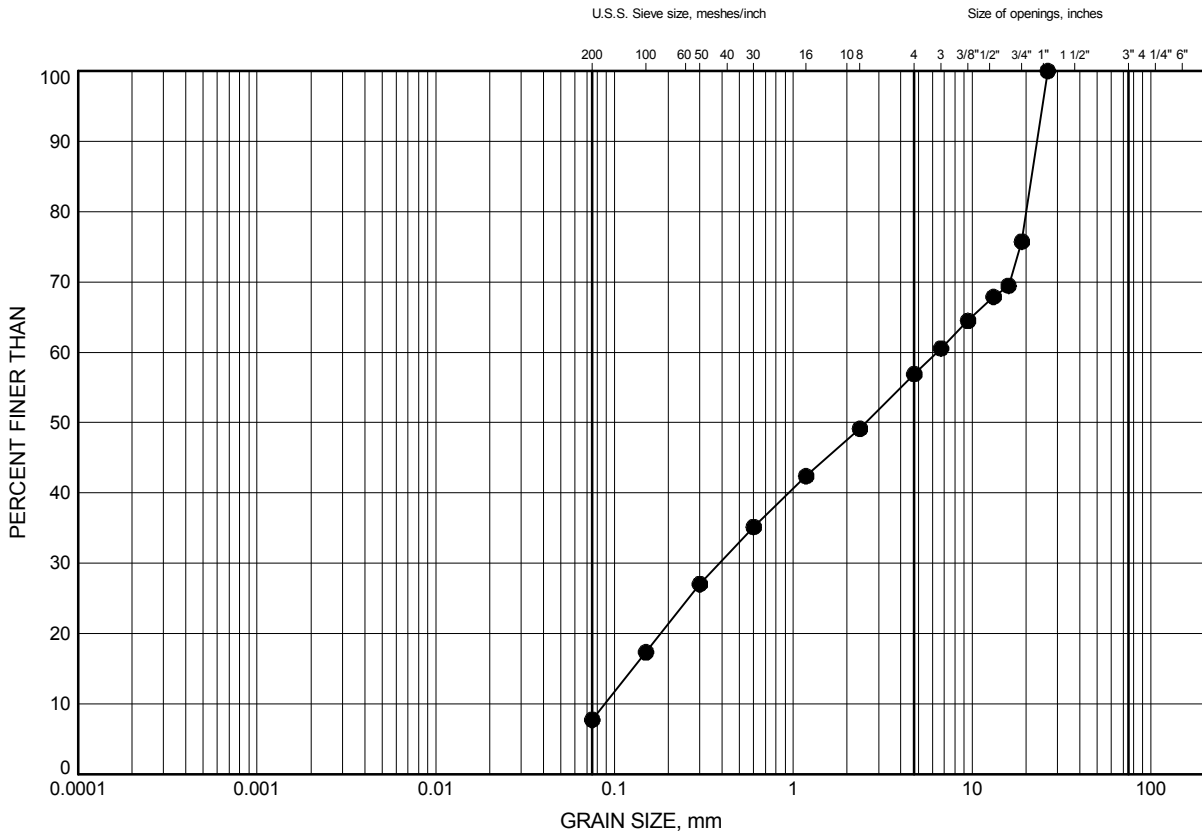
Prep'd DJP  
Chkd. SP

# Nebskwashi River Bridge

## GRAIN SIZE DISTRIBUTION

FIGURE C2

### Sand with Gravel



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

### LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	17-02	1.07	430.36

Date July 2017  
GWP# 5144-10-00



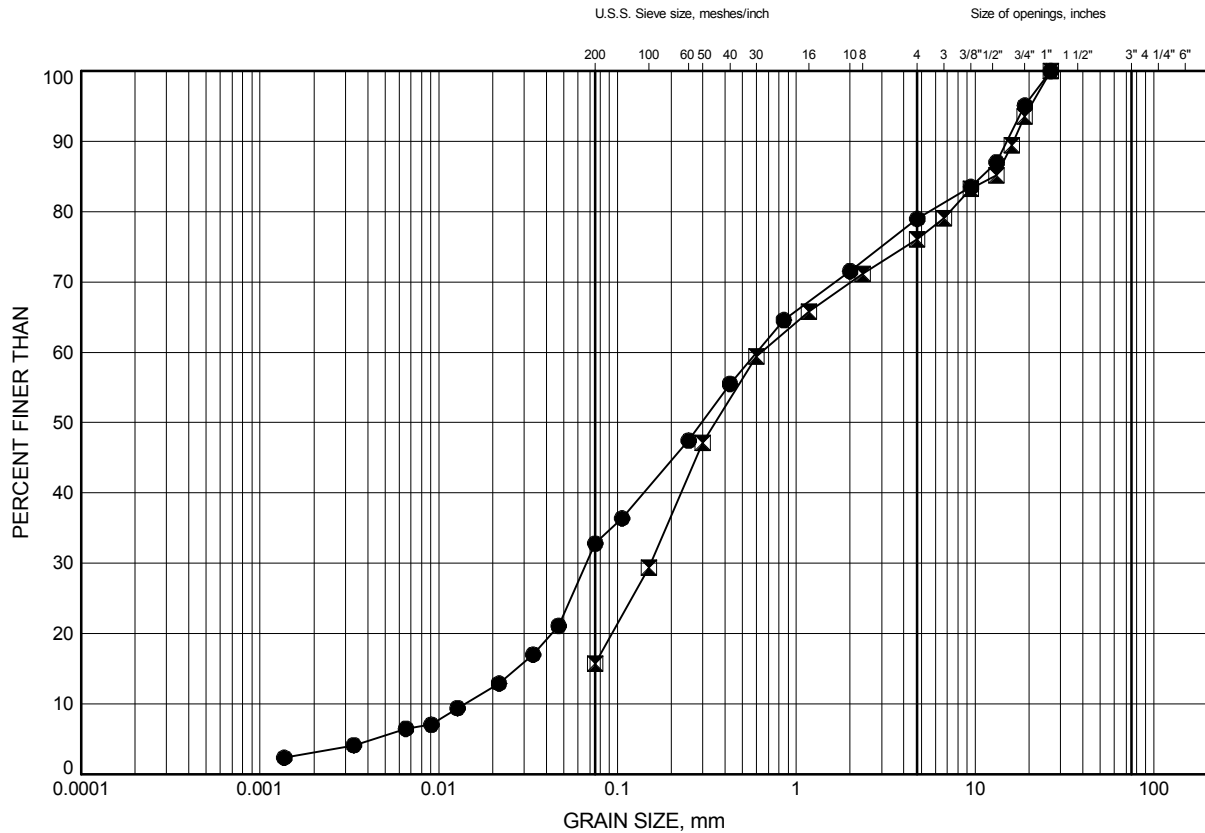
Prep'd DJP  
Chkd. SP

# Nebskwashi River Bridge

## GRAIN SIZE DISTRIBUTION

FIGURE C3

### Silty Sand with Gravel



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

### LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	17-01	4.22	426.80
⊠	17-02	3.20	428.23

Date July 2017

GWP# 5144-10-00



Prep'd DJP

Chkd. SP

**APPENDIX D**  
**SELECTED PHOTOGRAPHS**





**Figure 1: As Drilled Boreholes at Bridge 46-236 looking East [taken May 5, 2017]**



**Figure 2: Looking towards West Abutment [taken May 5, 2017]**