

Appendix A

Geotechnical Report



Englobe

Soils Materials Environment

SNC Lavalin Inc.

**Geotechnical Investigation
Clyburn Brook Bridge
Cabot Trail, Cape Breton Highlands
National Park, Nova Scotia**

Final Report

Date: December 14, 2015
Ref. N°: 20333

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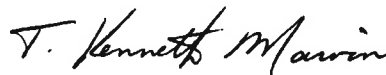
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REVISION AND PUBLICATION REGISTER		
Revision N°	Date	Modification And/Or Publication Details
0	2015-08-07	Draft Report
1	2015-12-14	Final Report

1 INTRODUCTION

Englobe Corp. at the request of SNC Lavalin Inc., has carried out a geotechnical investigation at the site of a proposed bridge replacement identified as Clyburn Brook Bridge near Ingonish, Nova Scotia. The purpose of the work was to assess the subsurface conditions at select areas of the site and to make recommendations for the design and costing of earthworks and foundations.

This report presents the observations and engineering recommendations associated with the geotechnical investigation of the site. Included herein are the factual results of the field investigation including discussion of field procedures, subsurface conditions, and recommendations for site development.

2 SITE AND PROJECT DESCRIPTION

It is understood that Park Canada proposes to replace the existing bridge structure on the Cabot Trail in the Cape Breton Highland National Park near Ingonish, Nova Scotia. In addition, the existing pedestrian and golf cart bridge joining the holes at the Highland Links Golf Course will be replaced. Detail design drawings are not available; however, the foundation for the structures will likely be supported on either concrete spread footings or driven steel 'H' or pipe piles. It is understood that current best practice for bridge design is to utilize either fully integral or semi-integral abutments as a measure to reduce maintenance costs during the life span of the bridge. Current information regarding design indicates the bridges will have single spans supported on integral or semi-integral abutments with approach slabs at each end.

3 INVESTIGATION PROCEDURE

The fieldwork for the investigation was carried out from July 4 to 10, 2015, when nine (9) boreholes were drilled at the locations shown on the enclosed Figure 1. The boreholes investigation was carried out using a CME-55 track-mounted auger drill rig supplied by Logan Geotech of Stewiacke, Nova Scotia.

The investigation was carried out by qualified field engineering personnel who logged the subsurface conditions. The boreholes were advanced using continuous flyte augers and casing rod with field sampling and testing performed in the open borehole. Standard Penetration Tests (SPT) were carried out at regular intervals in the boreholes to obtain soil blow counts (i.e. N-values) using a 50-mm O.D. split spoon sampler. Disturbed soil samples were obtained from the boreholes using conventional techniques. Bedrock was drilled and sampled using NQ-sized (i.e. 50 mm dia.) coring equipment.

Following field sampling and visual description, overburden samples were placed in sample bags and transported to our Dartmouth laboratory for further examination and testing.

4 SUBSURFACE CONDITIONS

An explanation of terms and symbols used in the report is provided in Appendix 1. A summary of the encountered geologic conditions is provided in the Borehole Logs in Appendix 2. Laboratory test results are provided in Appendix 3.

It should be noted that the stratigraphic boundaries on the Borehole Logs typically represent a transition of one soil type to another and do not necessarily indicate an exact plane of geologic change. Subsurface conditions may vary between and beyond the borehole locations.

The subsurface conditions encountered at the borehole locations were found to be similar. In general fill deposits were encountered overlying undisturbed site-native sand and gravel and bedrock. The following paragraphs further describe the subsurface conditions at the site.

Table 4-1. Summary of Subsurface Conditions at Boreholes.

BOREHOLE NUMBER	NORTHING (metres)	EASTING (metres)	DEPTH TO SAND AND GRAVEL (metres)	DEPTH TO BEDROCK (metres)	DEPTH OF BOREHOLE (metres)
BH 1	5169623.219	4583433.898	7.0	-	9.14
BH 2	5169597.423	4583421.515	5.5	20.7	23.77
BH 3	5169576.256	4583399.644	2.5	18.6	23.16
BH 4	5169540.711	4583445.198	0.2	20.0	22.86
BH 5	5169555.377	4583449.170	0.6	20.5	25.00
BH 6	5169564.419	4583459.639	5.5	-	9.14
BH 7	5169533.209	4583471.058	2.8	-	6.71
BH 8	5169539.550	458342.610	2.5	-	4.57
BH 9	5169591.219	4583414.989	5.0	-	13.72

4.1 Asphalt Pavement, Gravels and/or Topsoil

A layer of asphalt pavement was encountered at the surface of boreholes BH 1 and BH 7. The asphalt pavement was approximately 50 mm in thickness. Gravel was encountered at the surface of boreholes BH 2 and BH 9 and was approximately 150 mm in thickness. Topsoil was encountered at the surface of boreholes BH 3, BH 4, BH 5 and BH 6. The topsoil layer can be described as dark brown silty sand and was loose and moist.

4.2 Fill

Fill was encountered (except BH 4) beneath the asphalt pavement, gravels and/or topsoil. The fill can generally be described as sand and gravel to sand, some silt, containing occasional to some cobbles. The fill was moist and brown to gray and/or pink in colour. Standard penetration N-values for the fill deposits at the boreholes ranged from 5 to 56 blows per 300 mm penetration, indicating a loose to very dense material. The higher N-values recorded are due mainly to gravel and cobble content in the fill interfering with the test and not necessarily representative of *insitu* relative density. The fill was proven to a total depth of 7.0 metres at borehole BH 1.

Laboratory gradation testing of select fill samples indicated a material with 12 to 35 percent gravel, 55 to 80 percent sand and a fines (i.e. silt and clay sizes) content of 8 to 10 percent. Moisture content testing of select fill samples provided values of 7.5 and 14.3 percent.

4.3 Sand and Gravel

At all borehole locations, a sand and gravel deposit was encountered beneath the fill layer. These typically compact to dense soils are described on the Borehole Logs in Appendix 2 as having trace to some silt and clay with occasional cobbles and boulders. In several boreholes, boulders became abundant below a depth of between 9.0 and 15.0 metres. Observations of the *insitu* deposits indicated that the material was reddish brown to gray and/or pink in colour and its moisture content was described as moist. Standard penetration N-values for the sand and gravels deposit at the boreholes ranged from 6 to 65 blows per 300 mm penetration, indicating a loose to very dense material. The sand and gravel was proven to a total depth of 20.7 metres below the existing ground surface at borehole BH 2.

Laboratory gradation testing of select sand and gravel samples indicated a material with 0 to 45 percent gravel, 40 to 87 percent sand and a fines (i.e. silt and clay sizes) content of 13 to 15 percent. Moisture content testing of select sand and gravel samples provided values of 9.6 and 23 percent.

4.4 Bedrock

Geologic mapping of the proposed development area indicates that the site is underlain by granite and granodiorite bedrock.

Bedrock was core-drilled in boreholes BH 2, BH 3, BH 4 and BH 5, at depths ranging from 18.6 to 20.7 metres. Examination of bedrock core samples indicates that the site is underlain by granite and granodiorite bedrock.

The bedrock has been observed to be moderately to highly fractured, medium strong and gray to pink in colour. The Rock Quality Designation (RQD) values of core samples ranged from 0% to 50% indicating a very poor to poor quality rock. Unconfined Compressive Strength on "intact" cores indicated strengths of 16.7 MPa and 125.5 MPa which classified the bedrock as poor (R2) to very strong (R5) in strength.

4.5 Groundwater

Since wash flush and casing was used to advance the boreholes through the coarse alluvial deposits, it was not possible to make groundwater observations during the field investigation through open-hole measurement at the borehole locations. The groundwater level is expected to be influenced by the water level in adjacent brook; thus it is expected that the groundwater level at the site should be encountered at between 4.6 and 6.0 metres.

5 DISCUSSION AND RECOMMENDATIONS FOR DESIGN

5.1 Site Development – General

In the following paragraphs, a discussion of site development is presented in light of the observed subsurface conditions. Currently, detailed design information is not available; however, the bridges will likely be single spans using integral or semi-integral abutments supported on either concrete spread footings or driven steel 'H' or pipe piles.

For reporting, it has been necessary to make some assumptions regarding the extent of development, particularly, the type of structure, site grades, construction methodology, etc. As a result, some of the recommendations outlined below are of a preliminary nature and can only be confirmed as specific designs are presented for the site.

5.2 Site Preparation, Excavation and Earthworks

To prepare the immediate bridge area to receive shallow foundations, it will be necessary to remove all organic soils, fill materials, and wet / loose soils from beneath foundation bearing areas. This material should be subexcavated to the level of competent soil (i.e. material noted on the Borehole Logs as "Site-Native Sand and Gravel Deposit"). This excavation will vary depending on final bridge location(s) and design grades. At the boreholes located in proximity to the proposed bridge abutments, this is expected to range from 0.9 metres to 5.5 metres. This excavation may extend below the water table in some areas, so inflow of groundwater into the excavation should be anticipated. All work will require diversion of the water flow from the brook utilizing cofferdams, diversion piping and pumps of suitable capacity so that bridge foundation installation work can be carried out in the dry.

Following this initial subexcavation, a general proof-rolling of the exposed subgrade (with vibratory compaction equipment) is recommended to identify any loose or soft areas. Any such areas identified should be subexcavated and replaced with an approved fill. Importation of an approved structural fill may be utilized for this purpose.

Excavations in the site-native sand and gravel deposits are expected to remain temporarily stable at side slopes of 1:1 (horizontal to vertical), while long-term stability can be achieved at 3:1.

For pile foundations, only nominal earthworks will be necessary to ready the site for construction. Subexcavation of unsuitable soils is not required – only removal of materials that would impede installation of piles and regrading of the site is anticipated. Some minor earthworks may be necessary to temporarily support pile cap concrete.

5.3 Spread Footings

After removal of all unsuitable soil, if loose/wet soil conditions are encountered at proposed design grades, further subexcavation followed by placement of a properly prepared engineered fill may be required. Structural fill materials may consist of varied material types, subject to approval, which can be compacted to the required density. Structural fill should consist of a well-graded rockfill or, if conditions require, clear rockfill. The material should have a maximum particle size of 200 mm and a nominal "fines" content (i.e. minus 0.08 mm size). Fill should be placed in lifts not exceeding 300 mm thickness and should be compacted to the equivalent of 100 percent of the materials standard Proctor maximum dry density or equivalent for rockfill. Water and loose/soft soils should be removed from excavations, and bearing stratum approved prior to fill placement. It is strongly recommended that an approved clean rockfill be used for the bottom lift(s) (i.e. 1 metres thickness), due to expected wet conditions. Placement of alternative structural fill materials can be utilized upon approval from the geotechnical engineer. Geotechnical inspection and certification of engineered fill material placement is recommended.

For design of foundations by Limit States Design, the factored soil bearing resistance (using a bearing resistance factor of 0.5) of footings with a minimum width of 0.6 metres and at a minimum depth of 1.2 metres are as follows:

Table 5-1. Limit States Design Parameters.

LIMIT STATES DESIGN PARAMETERS	ALLUVIAL DEPOSIT / STRUCTURAL FILL
Factored Geotechnical Bearing Resistance at Ultimate Limit States (ULS)	300 kPa
Geotechnical Resistance at Serviceability Limit States (SLS)	200 kPa

The serviceability limit states are based on a maximum allowable settlement of 25 mm. Unfactored loads should be used with the SLS bearing pressures in accordance with the 2010 National Building Code of Canada (NBCC).

5.4 Pile Foundations

Piled foundations maybe considered as a foundation design for support of the bridge abutments. Driven steel piles may be either traditional pipe piles or 'H' type piles. These piles may be driven to practical refusal within the bedrock encountered at depths of between 18.7 and 20.7 metres below existing grade at the bridge structures.

Load carrying capacity for either the pipe or 'H' type steel piles for two typical end bearing piles on bedrock are given below. The pile type and size chosen for design will be influenced by several factors such as the structural loads carried by the foundation, the availability of the pile type/size and the pile driving equipment.

The pile capacities given below are based on the proposed pile size and anticipated site conditions. Final pile capacities are a function of pile size, penetration depth, resistance criteria, site grading requirements, etc. For preliminary design of piles driven to a suitable depth end-bearing in the bedrock, the calculated ULS load capacity (with applied resistance factor of 0.4) is as follows:

Pile Type	ULS Capacity
HP 360 x 152 'H' Pile	1200 kN
355 x 12.7 Pipe Pile (open-ended)	1000 kN

Note that in BH 2, BH 4 and BH 5 located in proximity to the proposed bridge abutments, boulders became abundant below a depth of between 9 and 15 metres. The presence of this layer may present some difficulty during driving of piles and require preboring prior to pile driving.

Steel piles should have a minimum wall thickness of 12 mm and the tip protected with a driving shoe. For steel piles, a pile driving hammer capable of delivering energy of 252 Joules/cm² to 315 Joules/cm² of steel cross-section is recommended. The pile hammer shall deliver a rated energy of not less than 33,895 kN-m. Piles should be re-tapped no sooner than 24 hours after achieving the refusal criteria and sufficiently driven to re-establish the refusal criteria. Additional subsequent re-taps should be conducted as necessary.

Piles should be spaced no closer than 3 times the pile diameter (measured centre-to-centre). Strict control of pile location and verticality should be exercised to ensure accurate pile spacing and prevent eccentric and non-vertical loading of piles and groups.

Quality control inspection during piling operations is recommended to ensure proper seating of piles and that driving criteria has been met. A quality assurance-testing program for piles is recommended and should include Pile Driving Analyzer (PDA) monitoring to confirm load capacities.

Driving records should be kept throughout the pile installation period. Information to be recorded should include, pile dimensions, hammer type, rated energy, ram weight, anvil weight and driving resistance.

Due to the presence of numerous cobbles and boulders at depth, it may be necessary to pre-drill the piles.

5.5 Re-use of On-site Materials and Backfilling

Select portions of the alluvial deposits and fill maybe considered suitable for reuse at the site as common material or, in some applications, as engineered fill. Any organic soils, and loose/wet soils are not suitable to reuse for engineered fill, these may be reused at the site in general site grading and landscaping (i.e. in non-settlement sensitive areas). The reuse of on-site materials will be contingent to a large extent on the condition of the materials after excavation, handling and stockpiling.

To qualify as engineered wall backfill, all boulders, debris and deleterious inclusions should be removed. Wall backfill should be placed in lifts not exceeding 250 mm thickness and compacted in-place to 95 percent standard Proctor maximum dry density.

5.6 Seismic Response

The effect of site conditions on seismic response should be considered in the design of foundations. Based on the subsurface soil conditions encountered in the boreholes, the site may be considered as Class D for seismic site response (CHBDC 2014 Table 4.1).

5.7 Interpreted Soil Design Parameters

Soil parameters recommended for use in design are outlined in the following table. The parameters indicated have been summarized from laboratory and field testing and from known empirical correlations. The values indicated are provided as a guide and their specific use in design should be confirmed with the geotechnical engineer.

Table 5-2. Interpreted Soil Design Parameters

PARAMETER	SITE-NATIVE SAND AND GRAVEL DEPOSITS
Bulk Unit Weight, kN/m^3	21
Moisture Content, %	11
Effective Unit Weight, kN/m^3	11
Soil Cohesion (C_u), kN/m^2	0
Effective Angle of Internal Friction	32°
Active Earth Pressure Coeff. (K_a)	0.31
Passive Earth Pressure Coeff. (K_p)	3.3

5.8 De-watering

All work will require diversion of the water flow from the brook around the construction site utilizing pumps of suitable capacity (i.e. minimum 150 mm diameter) so that foundation installation work

can be carried out in the dry. The rate of infiltration into the foundation excavations is expected to be moderate to high and can be controlled by conventional dewatering techniques consisting of 75 to 100 mm diameter portable pumps and grading of excavations to sump locations. Water pumped from excavations is expected to contain “fines” and will require care in disposal. Provision for proper site drainage in accordance with applicable municipal, provincial, and federal environmental requirements should be made at the construction stage. The use of coffer dams or sheet piling may be necessary where excavations encroach on the watercourse boundary(s).

5.9 Erosion and Sediment Control Guidelines

Nova Scotia Environment has published a set of guidelines dealing with environmental protection, specifically, erosion and sedimentation control. The document is of a general nature, however, presents proven methods for lessening the impact of soil erosion on downstream receptors. The Guidelines should be adopted for construction.

6 COMMENTS ON CONSTRUCTION

The following comments on specific construction aspects of the project are provided for the guidance of designers. The contractor undertaking the work should make their own interpretation of the factual information provided in this report as it affects their construction procedures and scheduling.

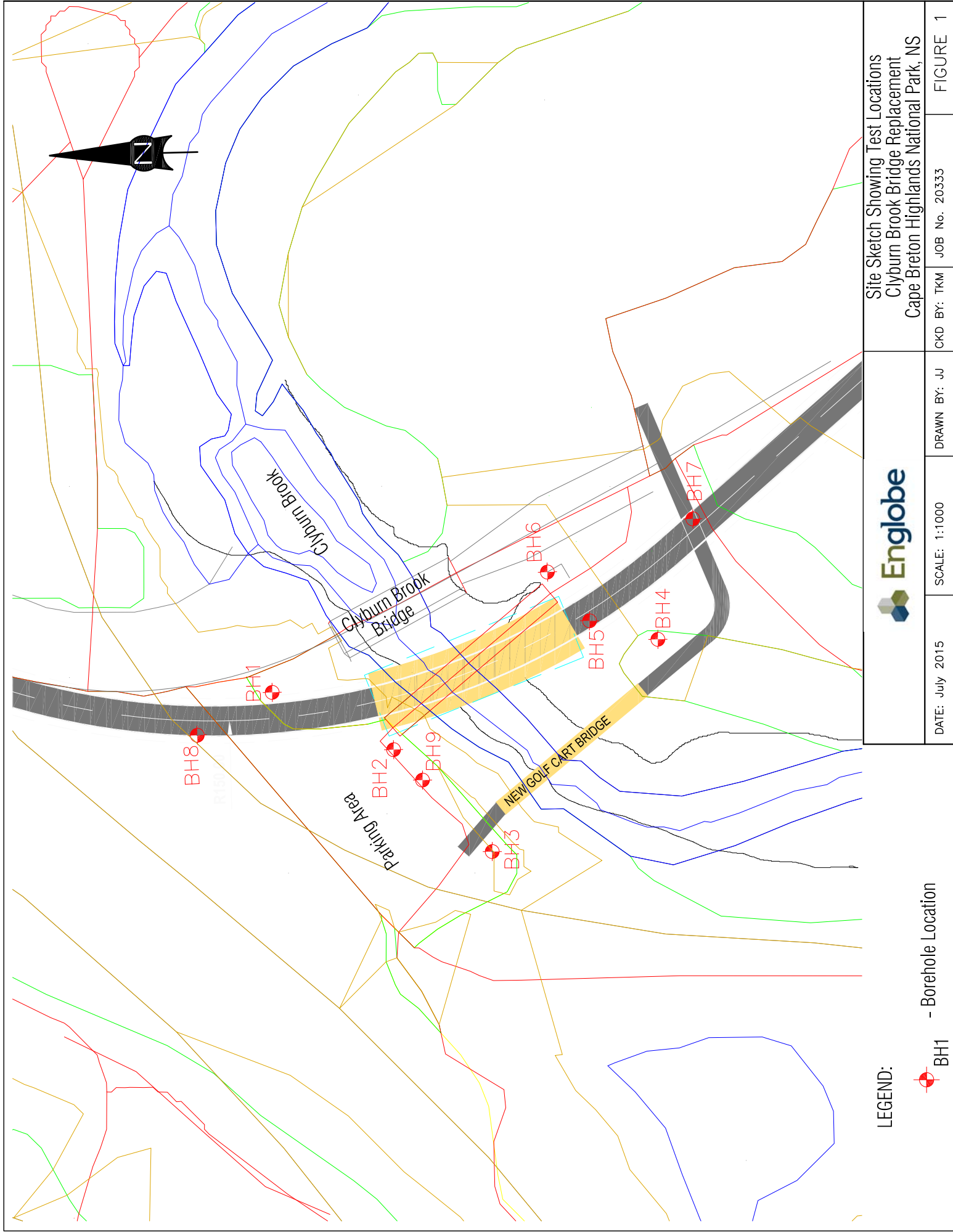
The in situ soils are subject to loosening and softening in the presence of water. Construction methods and scheduling should reflect this. If construction takes place in the winter months care must be taken not to allow freezing of subsoil. Any fill or native soil that freezes must be sub excavated and replaced.

In periods of inclement weather or during extended work delays, foundation excavations within the site native soils should be protected by a working mat of lean concrete placed over the bearing soil immediately following excavation and preparation of the foundation contact area. Alternatively, a 150 mm thick compacted granular layer (e.g. Type II gravel) can be constructed at the founding level. It may be also necessary to insulate the founding strata during periods of subzero temperatures.

Geotechnical inspection and testing by qualified personnel is recommended during earthworks construction.

7 CLOSURE

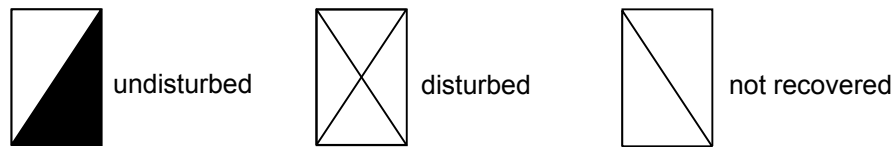
The geotechnical investigation undertaken has involved random sampling of site conditions. Should any conditions be encountered during constructions that are contrary to those reported herein, we request immediate notification so that reassessment can be undertaken.



Appendix 1 Explanation of Terms and Symbols

SOIL SAMPLES

CONDITION – This column graphically indicates the depth and condition of the sample:



TYPE – The type of sample is indicated in this column as follows:

- A auger sample
- B block sample
- C rock core, or frozen soil core
- D drive sample
- G grab sample
- SS split spoon
- P Pitcher tube sample
- U tube sample (usually thin-walled)
- W wash or air return sample
- O other (see report text)

PENETRATION RESISTANCE – Unless otherwise noted this column refers to the number of blows (N) of a 140 pound (63.5 kg) hammer freely dropping 30 inches (0.76 m) required to drive a 2 inch (50.8 mm) O.D. open-end sampler 0.5 feet (0.15 m) to 1.5 feet (0.45 m) into the soil, or until 100 blows have been applied, in which case, the penetration is stated. This is the standard penetration test referred to in ASTM D 1586.

OTHER TESTS

In this column are tabulated results of other laboratory tests as indicated by the following symbols:

*C	Consolidation test
Fines	Percentage by weight smaller than #200 sieve
D _R	Relative density (formerly specific gravity)
k	Permeability coefficient
*MA	Mechanical grain size analysis and hydrometer test (if appropriate)
pp	Pocket penetrometer strength
*q	Triaxial compression test
q _U	Unconfined compressive strength
*SB	Shearbox test
SO ₄	Concentration of water-soluble sulphate
*ST	Swelling test
TV	Torvane shear strength
VS	Vane Shear Strength (undisturbed-remolded)
ε _f	Unit strain at failure
γ	Unit weight of soil or rock
γ _d	Dry unit weight of soil or rock
ρ	Density of soil or rock
ρ _d	Dry density of soil or rock

* The results of these tests usually are reported separately

SYMBOLS AND TERMS USED ON THE BOREHOLE AND TEST PIT RECORDS

SOIL DESCRIPTION

Behavioural properties (i.e. plasticity, permeability) take precedence over particle gradation in describing soils.

Terminology describing soil structure:

Desiccated	- having visible signs of weathering by oxidation of clay minerals, shrinkage cracks etc.
Fissured	- having cracks, and hence a blocky structure
Varved	- composed of regular alternating layers of silt and clay
Stratified	- composed of alternating layers of different soil types, e.g. silt and sand or silt and clay
Well Graded	- having wide range in grain sizes and substantial amounts of all intermediate particle sizes
Uniformly Graded	- predominantly of one grain size.

Terminology used for describing soil strata based upon the proportion of individual particle size present:

Trace, or occasional	Less than 10%
Some	10-20%
Adjective (e.g. silty or sandy)	20-35%
And (e.g. silt and sand)	35-50%

The standard terminology to describe cohesionless soils includes the relative density, as determined by laboratory test or by the Standard Penetration Test 'N' - value: the number of blows of 140 pound (64 kg) hammer falling 30 inches (760 mm), required to drive a 2 inch (50.8 mm) O.D. split spoon sampler one foot (305 mm) into the soil.

Relative Density	'N' Value	Relative Density %
Very loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe cohesive soils includes the consistency, which is based on undrained shear strength as measured by insitu vane tests, penetrometer tests, unconfined compression test, or occasionally by standard penetration tests.

Consistency	Undrained Shear Strength		'N' Value
	Kips/sq.ft.	kPa	
Very Soft	<0.25	<12.5	<2
Soft	0.25-0.5	12.5-25	2-4
Firm	0.5-1.0	25-50	4-8
Stiff	1.0-2.0	50-100	8-15
Very Stiff	2.0-4.0	100-200	15-30
Hard	>4.0	>200	>30

SOIL CLASSIFICATION SYSTEM (MODIFIED U.S.C.)

MAJOR DIVISION			GROUP SYMBOL	GRAPHIC SYMBOL	COLOR CODE	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA	
HIGHLY ORGANIC SOILS			Pt		ORANGE	PEAT AND OTHER HIGHLY ORGANIC SOILS	STRONG COLOR OR ODOR, AND OFTEN FIBROUS TEXTURE	
COARSE-GRAINED SOILS (MORE THAN HALF BY WEIGHT LARGER THAN NO. 200 SIEVE SIZE)	GRAVELS MORE THAN HALF COARSE FRACTION LARGER THAN NO. 4 SIEVE SIZE	CLEAN GRAVELS	GW		RED	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, <5% FINES	$C_u = \frac{D_{60}}{D_{10}} > 4$ $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$	
			GP		RED	POORLY-GRADED GRAVELS, AND GRAVEL-SAND MIXTURES, <5% FINES	NOT MEETING ALL ABOVE REQUIREMENTS	
		DIRTY GRAVELS	GM		YELLOW	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES >12% FINES	ATTERBERG LIMITS BELOW 'A' LINE OR $I_p < 4$	
			GC		YELLOW	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES >12% FINES	ATTERBERG LIMITS ABOVE 'A' LINE OR $I_p > 7$	
	SANDS MORE THAN HALF COARSE FRACTION SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS	SW		RED	WELL-GRADED SANDS, GRAVELLY SANDS, <5% FINES	$C_u = \frac{D_{60}}{D_{10}} > 6$ $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$	
			SP		RED	POORLY-GRADED SANDS, OR GRAVELLY SANDS, <5% FINES	NOT MEETING ALL ABOVE REQUIREMENTS	
		DIRTY SANDS	SM		YELLOW	SILTY SANDS, SAND-SILT MIXTURES >12% FINES	ATTERBERG LIMITS BELOW 'A' LINE OR $I_p < 4$	
			SC		YELLOW	CLAYEY SANDS, SAND-CLAY MIXTURES >12% FINES	ATTERBERG LIMITS ABOVE 'A' LINE OR $I_p > 7$	
FINE - GRAINED SOILS (MORE THAN HALF BY WEIGHT PASSES NO. 200 SIEVE SIZE)	SILTS		ML		GREEN	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY SANDS OF SLIGHT PLASTICITY	$W_L < 50$	SEE CHART BELOW
	BELOW 'A' LINE ON PLASTICITY CHART; NEGLECTIBLE ORGANIC CONTENT		MH		BLUE	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOILS	$W_L > 50$	
	CLAYS		CL		GREEN	INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY, OR SILTY CLAYS, LEAN CLAYS	$W_L < 30$	
	ABOVE 'A' LINE ON PLASTICITY CHART; NEGLECTIBLE ORGANIC CONTENT		CI		GREEN-BLUE	INORGANIC CLAYS OF MEDIUM PLASTICITY SILTY CLAYS	$W_L > 30, < 50$	
			CH		BLUE	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	$W_L > 50$	
	ORGANIC SILTS & ORGANIC CLAYS		OL		GREEN	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	$W_L < 50$	
	BELOW 'A' LINE ON PLASTICITY CHART		OH		BLUE	ORGANIC CLAYS OF HIGH PLASTICITY	$W_L > 50$	



FILL



TILL

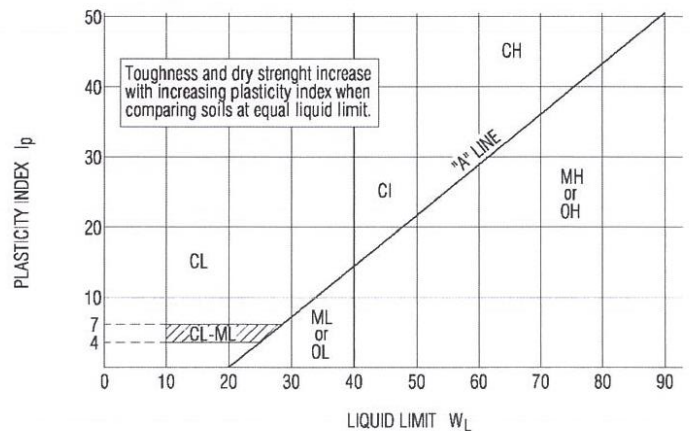


BEDROCK

- All sieve sizes mentioned on this chart are U.S. Standard, ASTM E11.
- Boundary classifications possessing characteristics of two groups are given combined group symbols eg GW-GC is a well-graded gravel-sand mixture with clay binder between 5% and 12%.
- Soil fractions and limiting textural boundaries are in accordance with the Unified Soil Classification System, except that an inorganic clay of medium plasticity (CI) is recognized.
- The following adjectives may be employed to define percentage ranges by weight of minor components:

and	50 - 36%
gravelly, sandy, silty, clayey, ect.	35 - 21%
some	20 - 11%
trace	10 - 1%

PLASTICITY CHART



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Appendix 2 Borehole Logs



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BOREHOLE LOG

PROJECT

Geotechnical Investigation -
Clyburn Brook Bridge, CBHNP, NS

LOGGED/DWN. LL		CKD. TKM		DATE OF INVEST. 7/7/15		JOB NO. 20333		HOLE NO. BH 1	
CASING RESISTANCE blows/300mm		DEPTH ft m	MODIFIED USCS	SOIL SYMBOL	SOIL DESCRIPTION		SOIL SAMPLE		DRILL TYPE
WC % wp- □ w- ● wl- △ 10 20 30 40 50					DATUM	Ground Surface Elevation provided by SNC Lavalin	COND.	TYPE	PENE. RESIST.
					SURFACE ELEVATION 5.40 meters				OTHER TESTS
					Asphalt Pavement (50 mm)				
		4	1		FILL : sand and gravel, trace silt, cobble and small boulders, compact, moist, brown.		⊗	SS	N=10
		8	2				⊗	SS	N=17
		12	3				⊗	SS	N=17
		16	4				⊗	SS	N=17
		20	5				⊗	SS	N=17
		24	6				⊗	SS	N=17
		28	7		SAND AND GRAVEL: silty, trace to some gravel, compact to dense, moist, brown.		⊗	SS	N=21
		32	8				⊗	SS	N=49
		36	9				⊗	SS	N=49
		40	10		End of Borehole at 9.14 metres in Sand.				
		44	11						
		48	12						
		52	13						
		56	14						
		60	15						
		64	16						
			17						
			18						
			19						
			20						



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BOREHOLE LOG

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Geotechnical Investigation -
Clyburn Brook Bridge, CBHNP, NS

LOGGED/DWN. LL		CKD. TKM		DATE OF INVEST. 7/6/15		JOB NO. 20333		HOLE NO. BH 2		
CASING RESISTANCE blows/300mm		DEPTH ft m	MODIFIED USCS	SOIL SYMBOL	SOIL DESCRIPTION		SOIL SAMPLE		DRILL TYPE	
WC % wp- □ w- ● wl- △ 10 20 30 40 50					DATUM	Ground Surface Elevation provided by SNC Lavalin	COND.	TYPE	PENE. RESIST.	Drill Rig
					SURFACE ELEVATION 6.70 meters				OTHER TESTS	
		1			Gravel, loose, gray, dry to moist.				TCR - Total Core Recovery RQD - Rock Quality Designation UCS - Unconfined Compressive Strength Sieve	
		4			FILL : sand, some gravel, trace silt, occasional cobble, compact, moist, brown to pink.					N=21
		8								N=10
		12								N=14
		16			SAND AND GRAVEL: trace to some gravel, cobble and boulders, compact to dense, moist, brown to pink.					
		20								N=22
		24								
		28								
		32								N=16
		36								
		40								
		44								N=39
		48								
		52								N=46
		56								
		60								
		64			Becoming with numerous boulders.					
		68								
		72								
		76								
		80								
		84								
		88								
		92								
		96								
		100								



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Geotechnical Investigation -
Clyburn Brook Bridge, CBHNP, NS

LOGGED/DWN. LL		CKD. TKM		DATE OF INVEST. 7/6/15		JOB NO. 20333		HOLE NO. BH 2				
CASING RESISTANCE blows/300mm		DEPTH ft m	MODIFIED USCS	SOIL SYMBOL	SOIL DESCRIPTION		SOIL SAMPLE		DRILL TYPE			
WC % wp- □ w- ● wl- △ 10 20 30 40 50					DATUM	Ground Surface Elevation provided by SNC Lavalin	COND.	TYPE	PENE. RESIST.	Drill Rig		
					SURFACE ELEVATION 6.70 meters				OTHER TESTS			
		21			BEDROCK : Granite and Granodiorite, poor quality, greenish gray and pink.			RC	TCR = 100% RQD = 32% UCS = 16.7 MPa			
		72 22										
		76 23									RC	TCR = 78% RQD = 50%
		24 80										
		25			End of Borehole at 23.77 metres in Bedrock.							
		84 26										
		88 27										
		92 28										
		96 29										
		30										
		100 31										
		104 32										
		108 33										
		112 34										
		35										
		116 36										
		37										
		120 38										
		124 39										
		40										
		132 41										





















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Geotechnical Investigation -
Clyburn Brook Bridge, CBHNP, NS

LOGGED/DWN. LL				CKD. TKM		DATE OF INVEST. 7/5/15		JOB NO. 20333		HOLE NO. BH 3		
CASING RESISTANCE blows/300mm				DEPTH	MODIFIED USCS	SOIL SYMBOL	SOIL DESCRIPTION		SOIL SAMPLE		DRILL TYPE	
							DATUM	Ground Surface Elevation provided by SNC Lavalin	COND.	TYPE	PENE. RESIST.	Drill Rig
WC % wp- □ w- ● wl- △ 10 20 30 40 50							SURFACE ELEVATION 7.36 meters					OTHER TESTS
				1			TOPSOIL : silty sand, loose, moist, dark brown.			SS	N=20	TCR - Total Core Recovery RQD - Rock Quality Designation
				4			FILL : sand and gravel, some silt, occasional cobble, compact, moist, brown to gray.			SS	N=14	
				2								
				8			SAND AND GRAVEL : trace of silt, cobble and boulders, compact to dense, moist, gray.			SS	N=17	
				3								
				12								
				4						SS	N=32	
				16								
				5						SS	N=35	
				20								
				6						SS	N=24	
				24								
				7						SS	N=16	
				8								
				28					SS	N=19		
				9								
				32					SS	N=16		
				10								
				36					SS	N=41		
				11								
				40					SS	N=45		
				12								
				44								
				13								
				48								
				14					SS	50/5		
				52								
				15					SS			
				56								
				16								
				60								
				17								
				18								
				60								
				18								
				19		BEDROCK : Granodiorite, very poor to poor quality, greenish gray.			SS RC		TCR = 91% RQD = 0%	
				64					RC			
				20					RC			
											TCR = 67% RQD = 36% PLATE 4	



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BOREHOLE LOG

PROJECT

Geotechnical Investigation -
Clyburn Brook Bridge, CBHNP, NS

LOGGED/DWN. LL		CKD. TKM		DATE OF INVEST. 7/5/15		JOB NO. 20333		HOLE NO. BH 3	
CASING RESISTANCE blows/300mm		DEPTH ft m	MODIFIED USCS	SOIL SYMBOL	SOIL DESCRIPTION		SOIL SAMPLE		DRILL TYPE
WC % wp- □ w- ● wl- △ 10 20 30 40 50					DATUM	Ground Surface Elevation provided by SNC Lavalin	COND.	TYPE	PENE. RESIST.
					SURFACE ELEVATION 7.36 meters				OTHER TESTS
		21						RC	TCR = 100% RQD = 31% TCR = 100% RQD = 16% TCR = 100% RQD = 0% TCR = 100% RQD = 50%
		72 22						RC	
		76 23						RC	
					End of Borehole at 23.16 metres in Bedrock.				
		24							
		80							
		25							
		84							
		26							
		88							
		27							
		92							
		28							
		96							
		29							
		30							
		100							
		31							
		104							
		32							
		108							
		33							
		112							
		34							
		116							
		35							
		120							
		36							
		124							
		37							
		128							
		38							
		132							
		39							
		40							
		41							



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BOREHOLE LOG

PROJECT

Geotechnical Investigation -
Clyburn Brook Bridge, CBHNP, NS

LOGGED/DWN. LL					CKD. TKM		DATE OF INVEST. 7/9/15			JOB NO. 20333		HOLE NO. BH 4		
CASING RESISTANCE blows/300mm					DEPTH	MODIFIED USCS	SOIL SYMBOL	SOIL DESCRIPTION		SOIL SAMPLE			DRILL TYPE	
								DATUM	Ground Surface Elevation provided by SNC Lavalin	COND.	TYPE	PENE. RESIST.	Drill Rig	
WC % wp- □ w- ● wl- △ 10 20 30 40 50								SURFACE ELEVATION 1.81 meters					OTHER TESTS	
					1			TOPSOIL (Grass) : silty sand, loose, moist, dark brown.					TCR - Total Core Recovery RQD - Rock Quality Designation UCS - Unconfined Compressive Strength	
					2			SAND AND GRAVEL : trace of silt, cobble and boulders, compact to dense, moist, gray.						
					3									
					4									
					5									
					6									
					7									
					8									
					9									
					10									
					11									
					12									
					13									
					14									
					15									
					16			Becoming with numerous boulders.						
					17									
					18									
					19									
					20			BEDROCK : Granodiorite, very poor to poor quality. greenish gray .						



Geotechnical Investigation - Clyburn Brook Bridge, CBHNP, NS

LOGGED/DWN. LL		CKD. TKM		DATE OF INVEST.7/9/15		JOB NO. 20333		HOLE NO.BH 4				
CASING RESISTANCE blows/300mm		DEPTH		MODIFIED USCS	SOIL SYMBOL	SOIL DESCRIPTION		SOIL SAMPLE		DRILL TYPE		
						DATUM Ground Surface Elevation provided by SNC Lavalin		COND. •	TYPE	PENE. • RESIST. •	Drill Rig	
WC %	wp- □	w- ●	wl- △	ft	m	SURFACE ELEVATION1.81 meters						
10	20	30	40	50	21		Red intrusion from 20.8 to 21.6 metres.			RC	TCR = 88% RQD = 0%	
					72	22				RC	TCR = 100% RQD = 37% UCS = 125.5 MPa	
					76	23	End of Borehole at 22.86 metres in Bedrock.					
					24							
					80							
					25							
					84							
					26							
					88	27						
					92	28						
					96	29						
					30							
					100							
					31							
					104	32						
					108	33						
					112	34						
					35							
					116							
					36							
					120							
					37							
					124	38						
					128	39						
					132	40						
					41							
PLATE 7												



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BOREHOLE LOG

PROJECT

Geotechnical Investigation -
Clyburn Brook Bridge, CBHNP, NS

LOGGED/DWN. LL		CKD. TKM		DATE OF INVEST.7/8/15		JOB NO. 20333		HOLE NO.BH 5		
CASING RESISTANCE blows/300mm		DEPTH	MODIFIED USCS	SOIL SYMBOL	SOIL DESCRIPTION		SOIL SAMPLE		DRILL TYPE	
					DATUM	Ground Surface Elevation provided by SNC Lavalin	COND.	TYPE	PENE. RESIST.	Drill Rig
					SURFACE ELEVATION3.29 meters					OTHER TESTS
<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><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BOREHOLE LOG

PROJECT

Geotechnical Investigation -
Clyburn Brook Bridge, CBHNP, NS

LOGGED/DWN. LL		CKD. TKM		DATE OF INVEST. 7/8/15		JOB NO. 20333		HOLE NO. BH 5	
CASING RESISTANCE blows/300mm		DEPTH ft m	MODIFIED USCS	SOIL SYMBOL	SOIL DESCRIPTION		SOIL SAMPLE		DRILL TYPE
WC % wp- □ w- ● wl- △ 10 20 30 40 50					DATUM	Ground Surface Elevation provided by SNC Lavalin	COND.	TYPE	PENE. RESIST.
					SURFACE ELEVATION 3.29 meters				OTHER TESTS
		21			BEDROCK : Granodiorite, very poor to poor quality, greenish gray.			RC	TCR = 88% RQD = 34%
		72	22						
		76	23						
		80	24						
		84	25						
		88	26		End of Borehole at 25.0 metres in Bedrock.			RC	TCR = 100% RQD = 39%
		92	27						
		96	28						
		100	29						
		104	30						
		108	31						
		112	32						
		116	33						
		120	34						
		124	35						
		128	36						
		132	37						
			38						
			39						
			40						
		41							TCR = 100% RQD = 0%
									TCR = 100% RQD = 38%



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BOREHOLE LOG

PROJECT

Geotechnical Investigation -
Clyburn Brook Bridge, CBHNP, NS

LOGGED/DWN. LL		CKD. TKM		DATE OF INVEST. 7/7/15		JOB NO. 20333		HOLE NO. BH 6	
CASING RESISTANCE blows/300mm		DEPTH ft m	MODIFIED USCS	SOIL SYMBOL	SOIL DESCRIPTION		SOIL SAMPLE		DRILL TYPE
WC % wp- □ w- ● wl- △ 10 20 30 40 50					DATUM	Ground Surface Elevation provided by SNC Lavalin	COND.	TYPE	PENE. RESIST.
					SURFACE ELEVATION 4.32 meters				OTHER TESTS
		1			TOPSOIL (Grass) : silty sand, loose, moist, dark brown.				
		4			FILL : sand some silt, trace of gravel, boulders, compact, moist, brown.		⊗	SS	N=5
		8							
		12					⊗	SS	N=8
		16					⊗	SS	N=14
		20			SAND AND GRAVEL : trace of silt, cobble and boulders, compact to very dense, moist, gray.		⊗	SS	N=26
		24					⊗	SS	N=25
		28					⊗	SS	N=32
		32			End of Borehole at 9.14 metres in Sand and Gravel.				
		36							
		40							
		44							
		48							
		52							
		56							
		60							
		64							
		68							
		72							
		76							
		80							
		84							
		88							
		92							
		96							
		100							



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BOREHOLE LOG

PROJECT

Geotechnical Investigation -
Clyburn Brook Bridge, CBHNP, NS

LOGGED/DWN. LL		CKD. TKM		DATE OF INVEST. 7/7/15		JOB NO. 20333		HOLE NO. BH 7	
CASING RESISTANCE blows/300mm		DEPTH ft m	MODIFIED USCS	SOIL SYMBOL	SOIL DESCRIPTION		SOIL SAMPLE		DRILL TYPE
WC % wp- □ w- ● wl- △ 10 20 30 40 50					DATUM	Ground Surface Elevation provided by SNC Lavalin	COND.	TYPE	PENE. RESIST.
					SURFACE ELEVATION 4.32 meters				OTHER TESTS
					Asphalt Pavement (50 mm)				
		4	1		FILL : sand and gravel, trace silt, very loose to very dense, moist, brown.		×	SS	N=56
							×	SS	N=31
		8	2				×	SS	N=18
							×	SS	N=15
		12	3		SAND AND GRAVEL : trace of silt, compact to dense, moist, pink to brown.		×	SS	N=6
							×	SS	N=14
		16	4				×	SS	N=25
							×	SS	N=44
		20	5						
		24	6						
		28	7		End of Borehole at 6.71 metres in Sand and Gravel.				
		32	8						
		36	9						
		40	10						
		44	11						
		48	12						
		52	13						
		56	14						
		60	15						
		64	16						
			17						
			18						
			19						
			20						



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BOREHOLE LOG

PROJECT

Geotechnical Investigation -
Clyburn Brook Bridge, CBHNP, NS

LOGGED/DWN. LL		CKD. TKM		DATE OF INVEST. 7/4/15		JOB NO. 20333		HOLE NO. BH 8		
CASING RESISTANCE blows/300mm		DEPTH ft m	MODIFIED USCS	SOIL SYMBOL	SOIL DESCRIPTION		SOIL SAMPLE		DRILL TYPE	
WC % wp- □ w- ● wl- △ 10 20 30 40 50					DATUM	Ground Surface Elevation provided by SNC Lavalin	COND.	TYPE	PENE. RESIST.	Drill Rig
					SURFACE ELEVATION 6.56 meters				OTHER TESTS	
●		4		[Cross-hatched symbol]	FILL : sand and gravel, trace to some silt, occasional cobble and small boulders, very loose to loose, dry to moist, brown to gray and pink.		×	SS	N=10	Sieve
		8			×	SS	N=12			
		12			×	SS	N=11			
		16		[Dotted symbol]	SAND AND GRAVEL : trace of silt, cobble, dense to very dense, moist, gray to brown.		×	SS	N=31	
		20			×	SS	N=54			
		24			×	SS	N=33			
		28		End of Borehole at 4.57 metres in Sand and Gravel.						
		32								
		36								
		40								
		44								
		48								
		52								
		56								
		60								
		64								
		68								
		72								
		76								
		80								
		84								
		88								
		92								
		96								
		100								



Geotechnical Investigation - Clyburn Brook Bridge, CBHNP, NS

HOLE NO. BH 9

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PLATE 13

Appendix 3 Laboratory Test Results

TABLE 3-1: SUMMARY OF LABORATORY DATA
Geotechnical Investigation
Clyburn Brook Bridge
Englobe Project No. 20333

Borehole No.	Sample No.	Depth (m)	Description	Moisture Content (%)	Particle Size Distribution			UCS (MPa)
					Gravel (%)	Sand (%)	Fines (silts and clays) (%)	
BH 2	3	3.9 - 4.5	Fill	14.3	12	80	8	16.7
	14	9.4 - 9.7	Granite					
BH 4	12	10.4 - 10.6	Granodiorite					125.5
BH 5	11	12.5 - 13.1	Sand, some silt	23	0	87	13	
BH 8	1+2+3	0 - 2.1	Fill	7.5	35	55	10	
BH 9	6	10.4 - 11.0	Sand and gravel, some silt	9.6	45	40	15	

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Client:

SNC Lavalin Inc.
65 Beech Hill Road, Suite 2
Antigonish, Nova Scotia
B2G 2P9

Our Project No:

20333

Client Contract No.:

Client PO.:

CC:

Attn: Todd Barkhouse

PHONE (902) 863-1220

FAX: (902) 863-3225

Project: Geotechnical Investigation - Clyburn Brook Bridge, CBHNP, Nova Scotia

Source: BH 2

Sample No: SA3

Location: 3.9 - 4.5 m

Date Sampled: 06-Jul-15

Sampled by: LL

Date Received:

Date Tested: 21-Jul-15

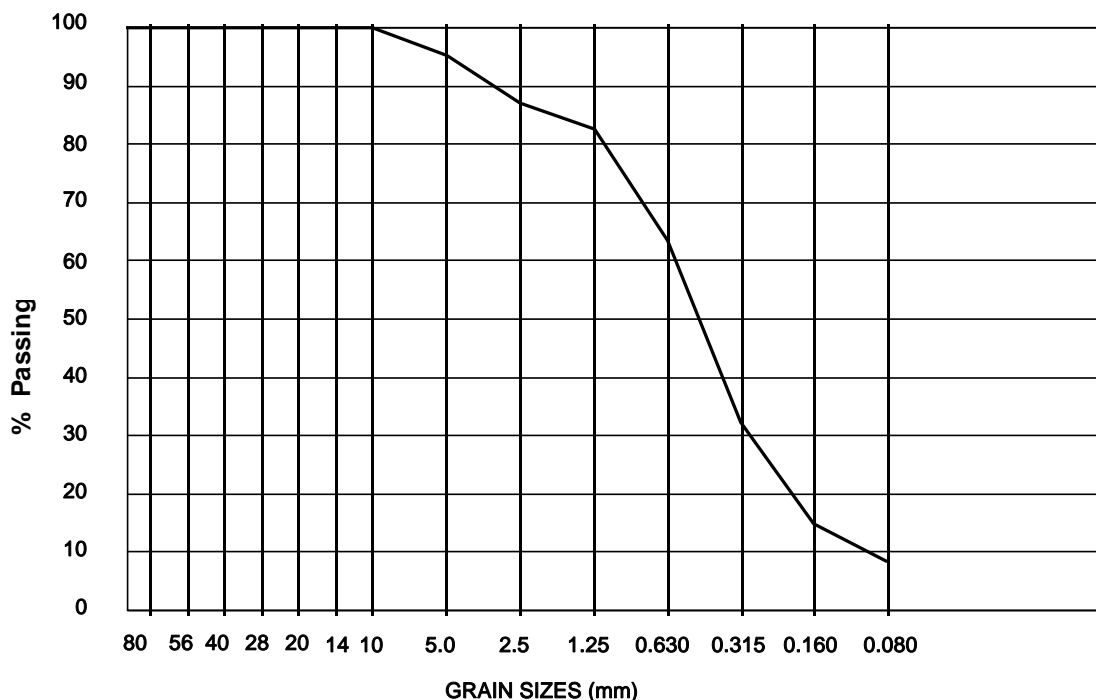
PHYSICAL PROPERTY TESTS

Soil Type	Fill	Liquid Limit	Flat and Elongated Particles, %
Gravel, %	12	Plastic Limit	Coarse Spec. Gravity
Sand, %	80	Plasticity Index	Fractured Faces, %
Silt and Clay, %	8	Coarse Absorption, %	Petrographic No.
Moisture Cont., %	14.3	Fine Absorption, %	Max. Dry Density, (kg/m3)
Abrasion Loss, %		Micro Deval Loss, %	Optimum Moisture, %

Sieve Size (mm)	Percent Passing	Spec. Band
112		
80		
56		
40	100	
28	95	
20	91	
14	90	
10	89	
5.0	88	
2.5	87	
1.25	83	
0.630	63	
0.315	32	
0.160	15	
0.080	8.4	

GRAIN SIZE CURVE

Spec Band
NO SPEC



Comments:

Record No: 9237

MTL Tech: MM/JPG

PER



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FOR TESTING CONCRETE

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pm KM

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Project: Geotechnical Investigation - Clyburn Brook Bridge, CBHNP, Nova Scotia

Source: BH 5

Sample No: SA11

Location: 12.5 - 13.0 m

Date Sampled: 06-Jul-15

Sampled by: LL

Date Received:

Date Tested: 21-Jul-15

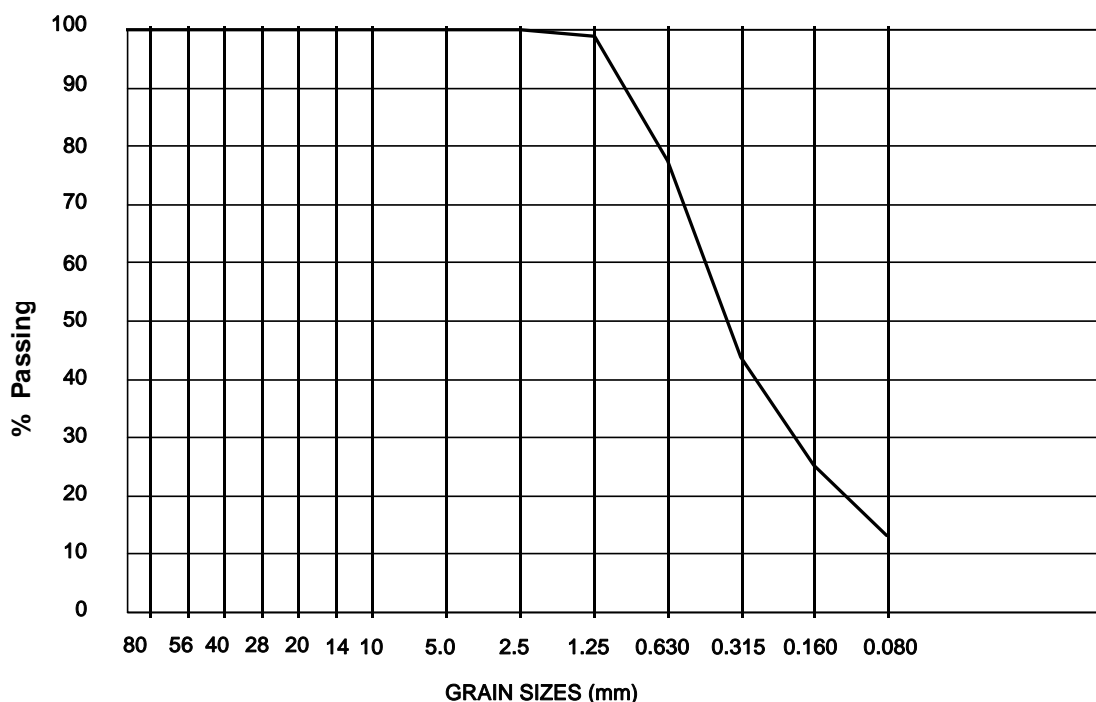
PHYSICAL PROPERTY TESTS

Soil Type	Sand	Liquid Limit	Flat and Elongated Particles, %
Gravel, %	0	Plastic Limit	Coarse Spec. Gravity
Sand, %	87	Plasticity Index	Fractured Faces, %
Silt and Clay, %	13	Coarse Absorption, %	Petrographic No.
Moisture Cont., %	23	Fine Absorption, %	Max. Dry Density, (kg/m3)
Abrasion Loss, %		Micro Deval Loss, %	Optimum Moisture, %

Sieve Size (mm)	Percent Passing	Spec. Band
112		
80		
56		
40		
28		
20		
14		
10		
5.0		
2.5	100	
1.25	99	
0.630	77	
0.315	44	
0.160	25	
0.080	13.1	

GRAIN SIZE CURVE

Spec Band
NO SPEC



Comments:

Record No: 9238

MTL Tech: MM/JPG

PER



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FAX: (902) 863-3225

Project: Geotechnical Investigation - Clyburn Brook Bridge, CBHNP, Nova Scotia

Source: BH 8

Sample No: SA 1,2&3

Location: 0.0 - 2.1 m

Date Sampled: 06-Jul-15

Sampled by: LL

Date Received:

Date Tested: 21-Jul-15

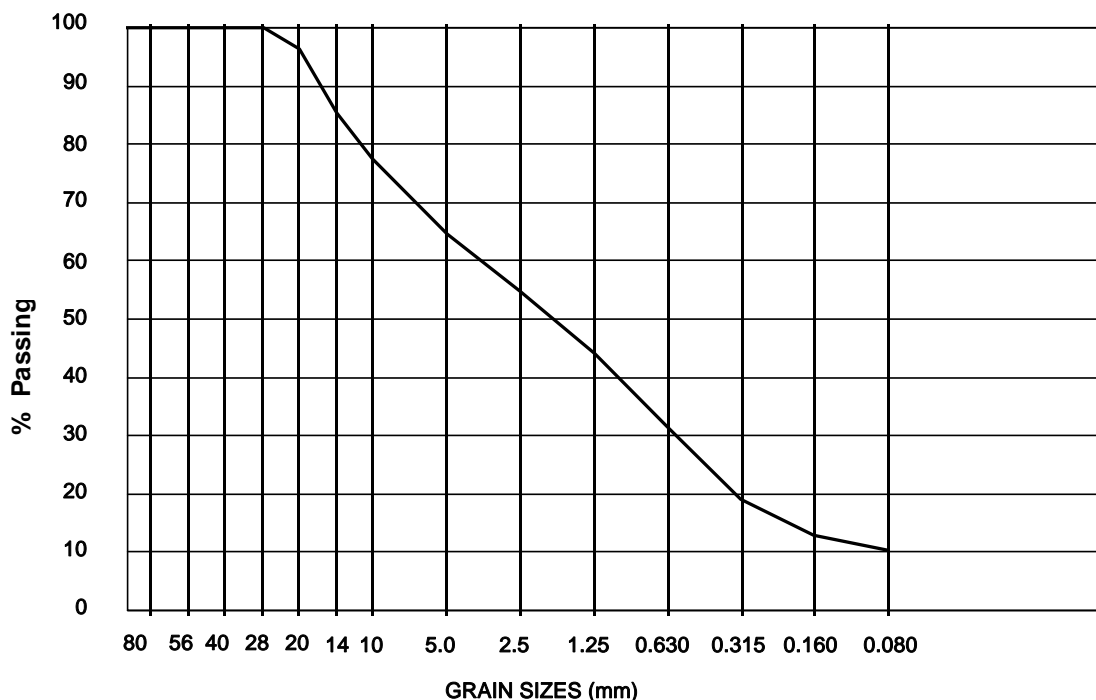
PHYSICAL PROPERTY TESTS

Soil Type	Fill	Liquid Limit	Flat and Elongated Particles, %
Gravel, %	35	Plastic Limit	Coarse Spec. Gravity
Sand, %	55	Plasticity Index	Fractured Faces, %
Silt and Clay, %	10	Coarse Absorption, %	Petrographic No.
Moisture Cont., %	7.5	Fine Absorption, %	Max. Dry Density, (kg/m3)
Abrasion Loss, %		Micro Deval Loss, %	Optimum Moisture, %

Sieve Size (mm)	Percent Passing	Spec. Band
112		
80		
56		
40		
28	100	
20	96	
14	85	
10	78	
5.0	65	
2.5	55	
1.25	44	
0.630	31	
0.315	19	
0.160	13	
0.080	10.3	

GRAIN SIZE CURVE

Spec Band
NO SPEC



Comments:

Record No: 9239

MTL Tech: MM/JPG

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Client:

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Our Project No:

20333

Client Contract No.:

Client PO.:

CC:

Attn: Todd Barkhouse

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FAX: (902) 863-3225

Project: Geotechnical Investigation - Clyburn Brook Bridge, CBHNP, Nova Scotia

Source: BH 9

Sample No: SA6

Location: 10.4 - 10.7 m

Date Sampled: 06-Jul-15

Sampled by: LL

Date Received:

Date Tested: 21-Jul-15

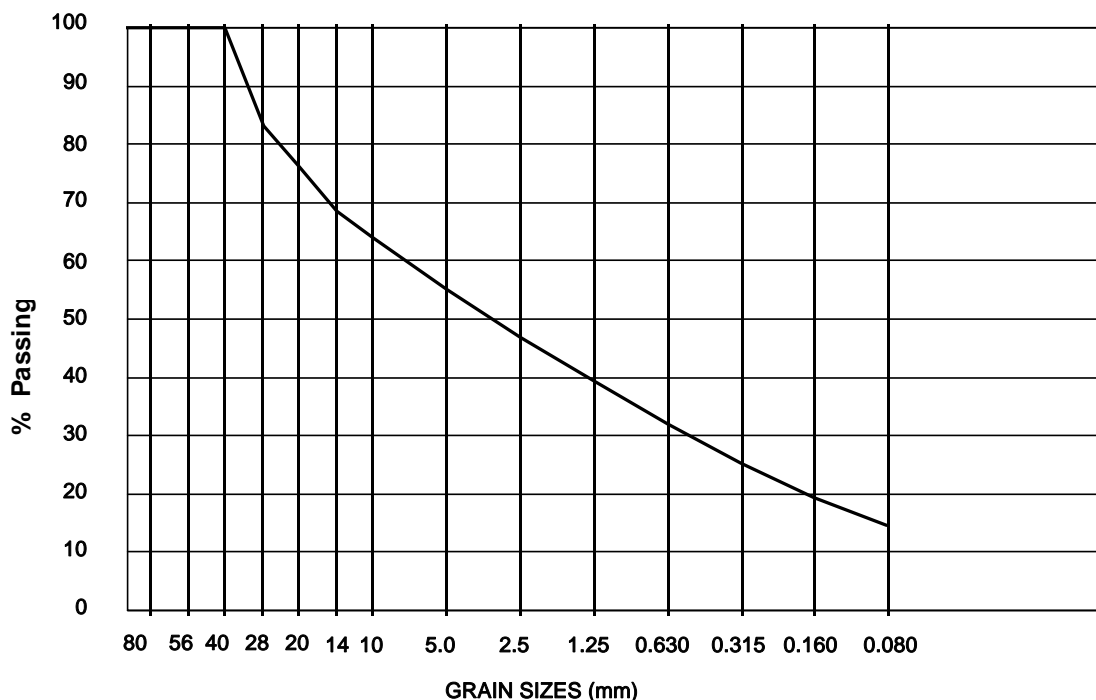
PHYSICAL PROPERTY TESTS

Soil Type	Sand & Gravel	Liquid Limit	Flat and Elongated Particles, %
Gravel, %	45	Plastic Limit	Coarse Spec. Gravity
Sand, %	40	Plasticity Index	Fractured Faces, %
Silt and Clay, %	15	Coarse Absorption, %	Petrographic No.
Moisture Cont., %	9.6	Fine Absorption, %	Max. Dry Density, (kg/m3)
Abrasion Loss, %		Micro Deval Loss, %	Optimum Moisture, %

Sieve Size (mm)	Percent Passing	Spec. Band
112		
80		
56		
40	100	
28	83	
20	76	
14	69	
10	64	
5.0	55	
2.5	47	
1.25	39	
0.630	32	
0.315	25	
0.160	19	
0.080	14.6	

GRAIN SIZE CURVE

Spec Band
NO SPEC



Comments:

Record No: 9240

MTL Tech: MM/JPG

PER



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