

**APPENDIX A**  
GEOTECHNICAL REPORT

Project No: R.073210.001  
EDRM No:547959 Version 1

2017-02-09

November 17, 2015

**Mr. Jeff A. MacKinnon, P. Eng.**  
**Crandall Engineering Ltd.**  
1077 boul. St. George Blvd., Suite 400  
Moncton, NB E1E 4C9

Dear Mr. MacKinnon,

**Re: Geotechnical Investigation – Proposed French Mountain Culvert Rehabilitation  
Cape Breton, NS**

This is our geotechnical investigation report for the proposed culvert rehabilitation at French Mountain in Cape Breton, NS. The conditions at the proposed culvert are generally fair to good with compact fill overlying bedrock.

The subsurface conditions within the proposed culvert rehabilitation area generally consist of fill overlying bedrock. The fill consists of gravel with silt and sand to silty sand with gravel. Organic soil was encountered below the fill in Borehole 3 and was 1.0 m thick. Bedrock was encountered at depths between 4.4 m and 7.6 m below the existing roadway. Groundwater was not encountered during drilling. The boreholes were drilled to depths up to 10.6 m.

The main findings/recommendations from our investigation are as follows:

- Conditions at the proposed culvert are generally fair to good. Thick fill was encountered overlying bedrock and the base of excavation for the culvert will need to be proof-rolled and approved as part of the construction procedure.
- If the culvert elevation intersects the silt with organics layer noted in Borehole 3, over-excavation below design grade would be necessary.
- The conditions at the proposed site indicate that the construction of the culvert would be practical following site work as discussed in this report. It is anticipated that the majority of excavations for the culvert will be into existing fill. If deeper excavations are required into bedrock, the use of blasting or hydraulic breakers will be required.
- Excavated, inorganic materials may be considered for reuse for general backfill.
- Geotechnical inspection of earthworks is recommended.

Please contact us if you have any questions.

Thank you,



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## **1.0 INTRODUCTION**

We have conducted a geotechnical investigation for the proposed culvert rehabilitation at French Mountain in Cape Breton, Nova Scotia at the request of Crandall Engineering Ltd. The purpose of this investigation was to evaluate the subsurface conditions on the site and to provide recommendations.

This report presents all of our findings and our recommendations for culvert rehabilitation and general site work. This report includes recommendations for geotechnical works only.

## **2.0 SITE DESCRIPTION AND GEOLOGY**

The proposed culvert rehabilitation is located at French Mountain along the Cabot Trail in the Cape Breton Highlands National Park, NS. The existing culvert is located under the two-lane Cabot Trail and is approximately 20 km north of Cheticamp. The site is currently a paved roadway on a turn, with high mountains on the east and down slope to the west. The upslope of the mountain is tree covered.

Photograph A shows a view of the site looking north along the Cabot Trail.

Based on geological mapping, the principal soil type in this area consists of colluvial deposits (mix of glacial deposits, weathered and frost shattered rock and soil). Bedrock is shown to be granite or fluvial sandstone of the Horton Group based on geological mapping.



**Photograph A: View of the site looking north.**

### 3.0 SUMMARIZED SUBSURFACE CONDITIONS

The field program consisted of four boreholes (Borehole 1 to Borehole 4) completed on October 26 and 27, 2015. The borehole locations are shown in Figure A (Drawing 1 in the appendix is a complete location plan).

The boreholes were conducted using a truck-mounted drill rig. Representative samples were taken during the field work and the conditions at the boreholes were logged in detail. The soil conditions encountered at the site are described in detail on the appended Borehole Records and summarized in the following paragraphs.

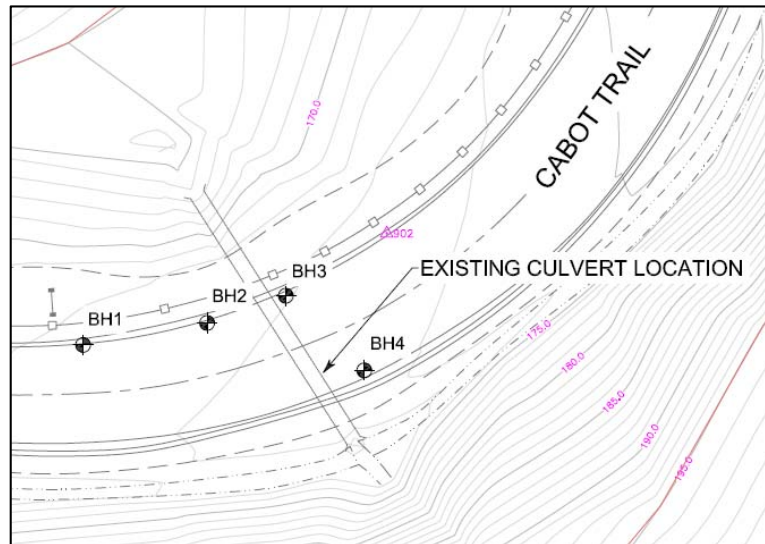


Figure A: Borehole Locations

The subsurface conditions within the proposed culvert rehabilitation area generally consist of fill overlying bedrock. The fill consists of gravel with silt and sand to silty sand with gravel. Organic soil was encountered below the fill in Borehole 3 and was 1.0 m thick. Bedrock was encountered at depths between 4.4 m and 7.6 m below the existing roadway. Groundwater was not encountered during drilling. The boreholes were drilled to depths up to 10.6 m.

Grain size testing conducted on four samples of the fill shows 26% to 51% gravel, 38% to 60% sand, and 11% to 15% fines (clay and silt). The moisture content of the fill ranged from 2.9% to 6.8%. The grain size curves are shown in Figure 1 in the appendix.

Table A: Summary of Findings

Location	Borehole Elevation <sup>1</sup> (m)	Fill Thickness (m)	Depth to Bedrock (m)	Borehole Depth (m)
Borehole 1	172.2	6.6	6.6	6.6
Borehole 2	172.5	7.6	7.6	10.6
Borehole 3	172.9	5.5	6.5	9.5
Borehole 4	173.8	4.4	4.4	4.4

Notes: <sup>1</sup>Borehole elevations estimated from Crandall survey.

## **4.0 DISCUSSION AND RECOMMENDATIONS**

### **4.1 Main Findings**

It is understood that replacement of the existing culvert on French Mountain located along the Cabot Trail in the Cape Breton Highlands National Park is proposed. It is also understood that a retaining wall is proposed at the culvert site. The conditions at the culvert site are generally fair to good with compact fill overlying bedrock.

The main findings/recommendations from our investigation are as follows:

- Conditions at the proposed culvert are generally fair to good. Thick fill was encountered overlying bedrock and the base of excavation for the culvert will need to be proof-rolled and approved as part of the construction procedure.
- If the culvert elevation intersects the silt with organics layer noted in Borehole 3, over-excavation below design grade would be necessary.
- The conditions at the proposed site indicate that the construction of the culvert would be practical following site work as discussed in this report. It is anticipated that the majority of excavations for the culvert will be into existing fill. If deeper excavations are required into bedrock, the use of blasting or hydraulic breakers will be required.
- Excavated, inorganic materials may be considered for reuse for general backfill.
- Geotechnical inspection of earthworks is recommended.

The following sections outline our geotechnical recommendations for site preparation and design.

### **4.2 Earthworks**

Earthworks for this project will involve excavations, placement of bedding, backfilling, and roadway reinstatement. If necessary, excavations into bedrock would require the use of blasting or hydraulic breakers.

#### **4.2.1 Surface Water Control and Erosion Control**

Prior to excavations, surface water drainage controls should be provided on the up-gradient side of the site to minimize run-off onto exposed soils. Suitable erosion and sedimentation control measures should be employed. These may include silt fences, check dams in ditches, and granular working pads.

#### **4.2.2 Excavation**

Excavation into the site soils will be practical with conventional earth-moving equipment. If deep excavations are planned, the use of blasting or hydraulic breaks should be anticipated.

Within the proposed culvert area, excavation should be made to design elevations and inspected at that time. A proof-roll inspection should be conducted using a 10 tonne roller prior to placement of bedding. Loose zones should be replaced with approved fill. An allowance should be carried for additional fill excavation and replacement in loose zones.

Temporary excavated side slopes in soil should be stable at one horizontal to one vertical (1H:1V).

Material that is planned for re-use should be placed directly in the intended areas or compacted in stockpiles for later use. Unsuitable materials should be used in landscaped areas or wasted off-site.

#### 4.2.3 Dewatering of Excavations

With proper surface water controls, dewatering of excavations through the use of ditches and swales draining to sumps would be practical. Sumps should be anticipated by the contractor for the culvert excavation.

#### 4.2.4 Fill Placement and Compaction

Fill required for the culvert should consist of the following materials:

- approved, drier portions of the excavated material from the site, or;
- imported, quarried rockfill, or sand and gravel pit run.

Re-use of the existing fill from the site is possible, but may require removal of any oversized cobbles and boulders if encountered. Excavated organic material will not be suitable for re-use.

The lift thickness used during placement of fills must be compatible with the compaction equipment and the material type to ensure the specified density throughout. The lift thickness should not exceed approximately 450 mm for mass filling and 200 mm for backfilling of foundations and services. The maximum particle size should be no larger than  $\frac{2}{3}$  of the lift thickness.

Fill materials should be compacted to project specification pertaining to fill in roadways and services trenches.

#### 4.2.5 Frost Protection

The trench for the culvert should provide a minimum cover over the pipe of 1.2 m from finished grade to provide frost protection, or as required by Transportation or Parks Canada.

#### 4.2.6 Slopes and Toe Drainage

Permanent fill slopes should be 2H:1V, or lower, and permanent cut slopes in soil should be stable at 3H:1V for slope heights of less than 2 m. Cut slopes of greater heights will require a 300 mm thick granular blanket or deep root vegetation to reinforce slopes. A toe drain or swale should be provided for drainage at the base of cut slopes.



#### 4.2.7 Inspection and Testing

It is recommended that inspection and testing during site grading and backfilling operations be conducted by experienced geotechnical personnel.

#### 4.3 Retaining Wall

It is understood that a retaining wall is proposed at the culvert location, although the type and location is unknown at this time. On the lower side of the road, the embedment at the bottom of the wall should be more than normal because of existing slopes and geogrid should be used between concrete block layers if used (i.e.; an MSE wall is recommended over a gravity wall).

For design of retaining walls, the following parameters can be used:

- Total unit weight of soil,  $\gamma_T = 21 \text{ kN/m}^3$  (granular backfill)
- Passive earth pressure coefficient,  $K_p = 3.2$
- Active earth pressure coefficient,  $K_a = 0.3$
- At-rest earth pressure coefficient,  $K_o = 0.5$
- Ultimate friction factor for sliding,  $\mu = 0.35$  (cast-in-place concrete on granular backfill)
- Angle of internal friction,  $\Phi = 36$  degrees (granular backfill)
- Wall friction angle,  $\delta = 24$  degrees (granular backfill)

The earth pressure coefficients are based on horizontal backfill. The retaining wall design should include the influence of sloping backfill or surcharge loads behind the wall. Drainage from the backfill zone with a positive outlet is recommended.

#### 4.4 Pavement Structure

Within proposed pavement areas over and around the culvert, the subgrade should be proof-rolled and approved by the Geotechnical Consultant or TIR prior to placement of base gravels. The following pavement structure is recommended.

**Table B: Pavement Structure Thicknesses**

Material	Typical Parks Canada Pavement
Asphalt Concrete: Surface Course, Type C Base Course, Type B	100 mm (placed in two lifts) -
Type 1 Gravel	150 mm
Type 2 Gravel	300 mm

All aggregate and asphalt concrete materials should meet the DTIR Standard Specifications and match the thickness of the adjacent pavement. The gravels should be compacted to 100% of Standard Proctor maximum dry density. Asphalt concrete should be compacted to 92.5% of Maximum Theoretical Relative Density.

#### **4.5 Seismic Classification**

The site classification for seismic site response was based on our investigation results. Bedrock was encountered prior to 30 m depth during our investigation.

The recommended site classification for seismic site response, as per Table 4.1.8.4.A of NBCC 2005 is Site Class C.

#### **4.6 Additional Geotechnical Services**

Additional geotechnical input at the final design and tendering stage is recommended to ensure that the project fully considered all of the information from the geotechnical investigation.

## **5.0 CLOSURE**

This report has been prepared for the sole benefit of Crandall Engineering Ltd., its designates, nominees and partners. Any use or reliance on this report under any of the following conditions would render this report inapplicable:

- where there have been any change in site conditions; or
- where used for purposes not intended or delineated in this report; or
- where used by third parties without express written agreement of Conquest Engineering.

Any use of, or reliance upon, this report under such circumstances or by such parties is strictly prohibited and without risk or liability to Conquest.

Conquest Engineering used reasonable care, skill, competence and judgment in the preparation of this report. The information and conclusions contained in this report are based upon work undertaken by trained professional and technical staff in accordance with generally accepted engineering and scientific practices current at the time the work was performed. The information and conclusions contained in this report are generally consistent with professional standards for individuals providing similar services at the same time, in the same locale and under like circumstances.

A field investigation is a limited sampling of a site. Some variation between sampling locations should be expected. The conclusions presented in this report represent the best technical judgment of Conquest Engineering based on the data obtained from the work. The conclusions are based on the site conditions observed by Conquest Engineering at the time the work was performed at the specific testing and/or sampling locations, and can only be extrapolated to an undefined limited area around these locations. The extent of the limited area depends on the soil and groundwater conditions, as well as the history of the site reflecting natural, construction and other activities. Due to the nature of the investigation and the limited data available, Conquest Engineering cannot warrant against undiscovered environmental liabilities.

If any conditions become apparent that differ significantly from our understanding of conditions as presented in this report, we request that we be notified immediately to reassess the conclusions provided herein. Further, if there are changes to the proposed work, such as adjustments in founding elevation or building loads, etc., we require that we be notified to allow for review of our recommendations.



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## SOIL DESCRIPTION

Terminology describing common soil genesis:

<i>Topsoil</i>	- mixture of soil and humus capable of supporting good vegetative growth
<i>Peat</i>	- fibrous aggregate of visible and invisible fragments of decayed organic matter
<i>Till</i>	- unstratified glacial deposit which may range from clay to boulders
<i>Fill</i>	- any materials below the surface identified as placed by humans (excluding buried services)

Terminology describing soil structure:

<i>Desiccated</i>	- having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
<i>Fissured</i>	- having cracks, and hence a blocky structure
<i>Varved</i>	- composed of regular alternating layers of silt and clay
<i>Stratified</i>	- composed of alternating successions of different soil types, e.g. silt and sand
<i>Layer</i>	- >75 mm
<i>Seam</i>	- 2 mm to 75 mm
<i>Parting</i>	- < 2 mm
<i>Well Graded</i>	- having wide range in grain sizes and substantial amounts of all intermediate particle sizes
<i>Uniformly Graded</i>	- predominantly of one grain size

Terminology describing soils on the basis of grain size and plasticity is based on the Unified Soil Classification System (USCS) (ASTM D-2488). The classification excludes particles larger than 76 mm (3 inches). This system provides a group symbol (e.g. SM) and group name (e.g. silty sand) for identification.

Terminology describing materials outside the USCS, (e.g. particles larger than 76 mm, visible organic matter, construction debris) is based upon the proportion of these materials present:

<i>Trace or occasional</i>	Less than 10%
<i>Some</i>	10-20%
<i>Numerous or Frequent</i>	20% - 50%

The standard terminology to describe cohesionless soils includes the compactness (formerly “relative density”), as determined by laboratory test or by the Standard Penetration Test ‘N’ – value.

Relative Density	‘N’ Value	Compactness %
<i>Very Loose</i>	<4	<15
<i>Loose</i>	4-10	15-35
<i>Compact</i>	10-30	35-65
<i>Dense</i>	30-50	65-85
<i>Very Dense</i>	>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 tests, or occasionally by standard penetration tests.

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

## ROCK DESCRIPTION

### Rock Quality Designation (RQD)

The classification is based on a modified core recovery percentage in which all pieces of intact core over 100 mm long are totalled and divided by the core drilled length. The smaller pieces are considered to be due to close shearing, jointing, faulting, or weathering in the rock mass and are not counted. RQD was originally intended to be done on N-size (45 mm) core; however, it can be used on different core sizes if the bulk of the fractures caused by drilling stresses are easily distinguishable from in situ fractures.

RQD	ROCK QUALITY
90 – 100	very sound
75 – 90	sound
50 – 75	fractured
25 – 50	severely fractured
0 – 25	very severely fractured

Terminology describing rock mass:

Spacing (mm)	Bedding, Laminations, Bands	Discontinuities
2000 – 6000	<i>Very Thick</i>	<i>Very Wide</i>
600 – 2000	<i>Thick</i>	<i>Wide</i>
200 – 600	<i>Medium</i>	<i>Moderate</i>
60 – 200	<i>Thin</i>	<i>Close</i>
20 – 60	<i>Very Thin</i>	<i>Very Close</i>
< 20	<i>Laminated</i>	<i>Extremely Close</i>
< 6	<i>Thinly Laminated</i>	

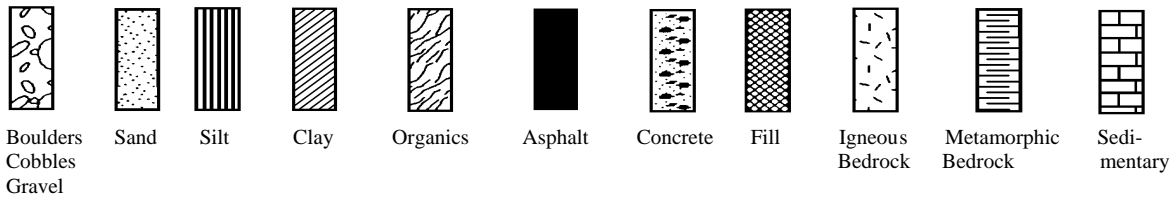
Strength Classification	Uniaxial Compressive Strength (MPa)
<i>Very Weak</i>	1 – 5
<i>Weak</i>	5 – 25
<i>Medium Strong</i>	25 – 50
<i>Strong</i>	50 – 100
<i>Very Strong</i>	100 – 250
<i>Extremely Strong</i>	> 250

Terminology describing weathering:

<i>Slight</i>	-	Weathering limited to the surface of major discontinuities. Typically iron stained.
<i>Moderate</i>	-	Weathering extends throughout rock mass. Rock is not friable.
<i>High</i>	-	Weathering extends throughout rock mass. Rock is friable.

## STRATA PLOT

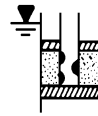
Strata plots symbolize the soil or bedrock description. They are combinations of the following basic symbols:



## WATER LEVEL MEASUREMENT



Borehole or  
Standpipe



Piezometer

## SAMPLE TYPE

SS	Split spoon sample (obtained by performing the standard Penetration Test)	AS	Auger Sample
ST	Shelby tube or thin wall tube	BS	Bulk Sample
PS	Piston sample	WS	Wash Sample
DC	Dynamic Cone Penetration	HQ, NQ, BQ, etc.	Rock core samples obtained with the use of standard size diamond drilling bits
SV	Field Shear Vane		

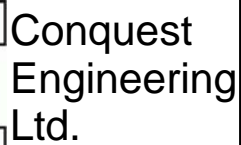
## N- VALUE

Numbers in this column are the results of the Standard Penetration Test: the number of blows of a 140 pound (64kg) 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. For split spoon samples where insufficient penetration was achieved and 'N' values cannot be presented, the blow count and penetration are shown.

## OTHER TESTS

Symbols in this column indicate that the following laboratory tests have been carried out and the results are presented separately.

S	Sieve analysis	H	Hydrometer analysis
G <sub>s</sub>	Specific gravity of soil particles	γ	Unit weight
k	Permeability	C	Consolidation
⌋	Single packer permeability test; test interval from depth shown to bottom of borehole	CD	Consolidation drained triaxial
⌋	Double packer permeability test; Test interval as indicated	CU	Consolidated undrained triaxial with pore pressure measurements
○	Falling head permeability test using casing	UU	Unconsolidated undrained triaxial
○	Falling head permeability test using well point or piezometer	DS	Direct shear
		Q <sub>u</sub>	Unconfined compression
		I <sub>p</sub>	Point Load Index (I <sub>p</sub> on Borehole Records equals I <sub>p</sub> (50); the index corrected to a reference diameter of 50 mm)



**Project Name:** Geotechnical Investigation - French Mountain Culvert Rehabilitation  
**Project No.:** 071-170  
**Client:** Crandall Engineering Ltd.  
**Location:** French Mountain, Cape Breton, NS  
**Water Level Date:** October 27, 2015

**Borehole No.:** 1  
**Page:** 1 of 1  
**Date Drilled:** Oct.  
**Datum:** Geodetic

Datum: Geodetic

[illegible]



## BOREHOLE RECORD

**Project Name:** Geotechnical Investigation - French Mountain Culvert Rehabilitation

**Project No.:** 071-170

**Client:** Crandall Engineering Ltd.

**Location:** French Mountain, Cape Breton, NS

**Water Level Date:** October 27, 2015

**Borehole No.:** 2

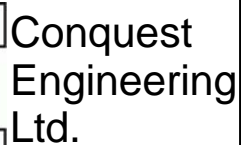
**Page:** 1 of 2

**Date Drilled:** Oct. 27, 2015

**Datum:** Geodetic

Depth (m)	Water Level (m)	Sample Type	Sample Number	Recovery (mm)	N Value or RQD %	Symbols	SOIL AND/OR ROCK DESCRIPTION	Elevation (m)	Moisture Content (%) Wp  ---O---  WL	SPT (N) Blows/300mm
0							ASPHALT (150 mm)	172.5		
		SS	1	250	38		FILL: Dense to loose reddish brown gravel with silt and sand to silty sand with gravel - coal inclusions in SS3 - rock in tip of SS6			
1		SS	2	250	28					
		SS	3	200	8					
2		SS	4	150	18					
		SS	5	200	18					
3		SS	6	150	92					
		SS	7	150	16					
4		SS	8	200	9					
		SS	9	100	10					
5		SS	10	0	14					
		SS	11	0	16					
6		SS	12	0	9					
		SS	13	150	50-0mm			164.9		
8		HQ	14	940	0%		BEDROCK: Very severely fractured pink-grey granite			
9										
10		HQ	15	1500	0%					





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**Borehole No.:** 2  
**Page:** 2 of 2  
**Date Drilled:** Oct.  
**Datum:** Geodetic

Datum: Geodetic

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## BOREHOLE RECORD

**Project Name:** Geotechnical Investigation - French Mountain Culvert Rehabilitation

**Project No.:** 071-170

**Client:** Crandall Engineering Ltd.

**Location:** French Mountain, Cape Breton, NS

**Water Level Date:** October 26, 2015

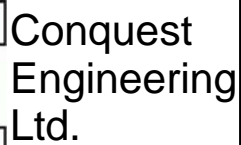
**Borehole No.:** 3

**Page:** 1 of 1

**Date Drilled:** Oct. 26, 2015

**Datum:** Geodetic

Depth (m)	Water Level (m)	Sample Type	Sample Number	Recovery (mm)	N Value or RQD %	Symbols	SOIL AND/OR ROCK DESCRIPTION	Elevation (m)	Moisture Content (%) Wp  ---O---  WL	SPT (N) Blows/300mm
0							ASPHALT (100 mm)	172.9		
1		SS	1	300	40		FILL: Dense to loose reddish brown silty sand with gravel - rock in tip of SS6			
2		SS	2	250	14					
3		SS	3	200	11					
4		SS	4	200	13					
5		SS	5	200	9					
6		SS	6	250	33					
7		SS	7	200	53					
8		SS	8	200	19					
9		SS	9	200	14					
10		SS	10	100	4		SILT: Very loose dark brown silt with organics	167.4		
11		SS	11	100	83-280mm			166.4		
12		HQ	12	1020	0%		BEDROCK: Very severely fractured pink-grey granite			
13		HQ	13	1500	0%					
14							End of Borehole at 9.5 m - no groundwater encountered during drilling	163.4		



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**Location:** French Mountain, Cape Breton, NS  
**Water Level Date:** October 27, 2015

**Borehole No.:** 4  
**Page:** 1 of 1  
**Date Drilled:** Oct.  
**Datum:** Geodetic

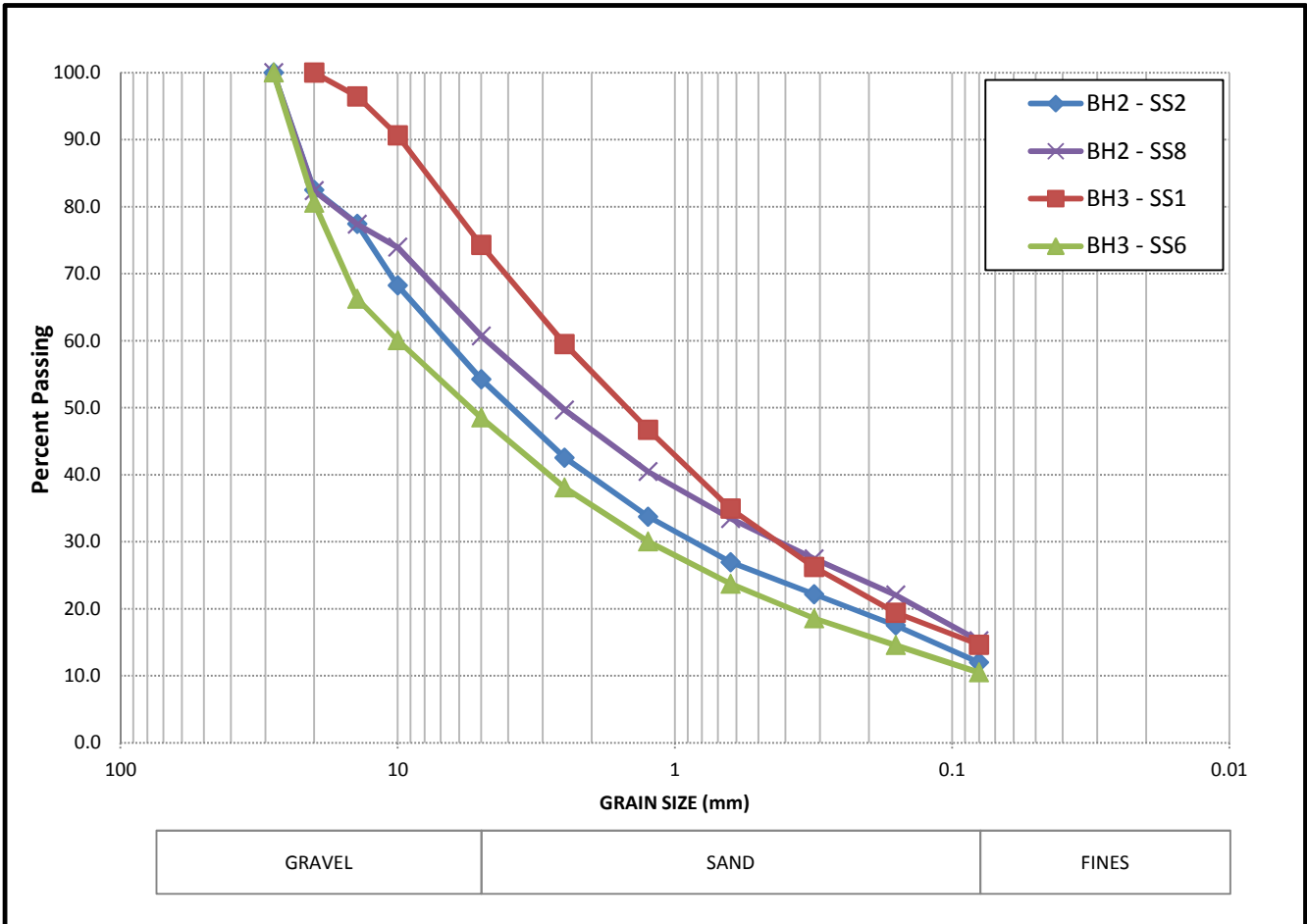
Datum: Geodetic

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# GRAIN SIZE REPORT

Project: Geotechnical Investigation - French Mountain Culvert Rehabilitation, Cape Breton, NS  
Client: Crandall Engineering Ltd.  
Project No: 071-170

## GRAIN SIZE DISTRIBUTION PLOT



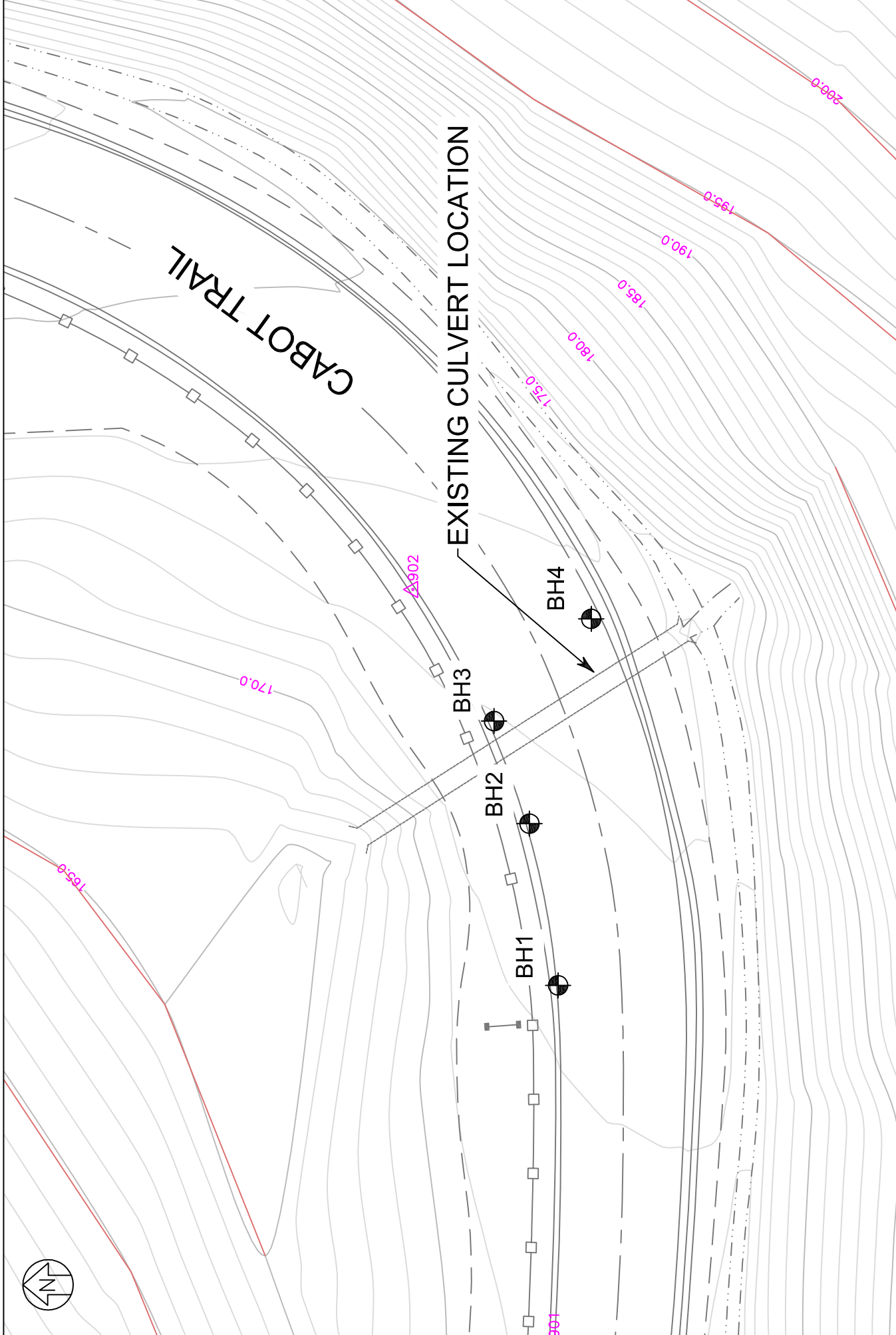
## SOIL CLASSIFICATION

Sample No	Depth	Classification	Moisture Content (%)	Gravel (%)	Sand (%)	Silt and Clay (%)
BH2 - SS2	1.1 m	gravel with silt and sand	2.9	46	42	12
BH2 - SS8	4.7 m	silty sand with gravel	6.8	39	46	15
BH3 - SS1	0.4 m	silty sand with gravel	3.2	26	60	15
BH3 - SS6	3.4 m	gravel with silt and sand	4.5	51	38	11

## Conquest Engineering Limited

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**Comments:** Samples taken from boreholes conducted on October 26 and 27, 2015.



<div></div> <div>LEGEND</div> <div>CONQUEST BOREHOLE LOCATIONS (OCTOBER 2015)</div>	<div><div>CONQUEST ENGINEERING LTD.</div><div>348 Bluewater Road Bedford, Nova Scotia B4B 1J6</div></div>	<div>PROJECT:</div> <div>BOREHOLE LOCATION PLAN</div> <div>FRENCH MOUNTAIN CULVERT REPLACEMENT, NS</div>	JOB #:	071-170	<div>DOCUMENTS PREPARED BY CONQUEST ENGINEERING LTD. ARE TO BE USED ONLY FOR THE SPECIFIC PROJECT AND SPECIFIC USE FOR WHICH THEY WERE PREPARED. ANY EXTENSION OF USE TO OTHER PROJECTS, BY OWNER OR ANY OTHER PARTY, WITHOUT THE WRITTEN AUTHORIZATION OF CONQUEST ENGINEERING LTD. IS DONE AT THE USERS OWN RISK. IF USED IN A WAY OTHER THAN WHAT WAS SPECIFICALLY INTENDED, THE OWNER WILL HOLD CONQUEST ENGINEERING LTD. HARMLESS FROM ALL CLAIMS AND LOSSES.</div>	DRAWING:	1
			SCALE:	1:300		REV:	0
			DATE:	05-NOV-2015			
			DRAWN BY:	CEM			
			CHECKED BY:	RBM			