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SOLICITATION AMENDMENT
MODIFICATION DE L'INVITATION

The referenced document is hereby revised; unless otherwise indicated, all other terms and conditions of the Solicitation remain the same.

Ce document est par la présente révisé; sauf indication contraire, les modalités de l'invitation demeurent les mêmes.

Comments - Commentaires

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Title - Sujet General Purpose Bldg-N.B./N.S.	
Solicitation No. - N° de l'invitation EC016-123090/A	**Amendment No. - N° modif.** 003
Client Reference No. - N° de référence du client R.043958.001	**Date** 2012-03-23
GETS Reference No. - N° de référence de SEAG PW-$PWB-007-3063	
File No. - N° de dossier PWB-1-34209 (007)	**CCC No./N° CCC - FMS No./N° VME**
Solicitation Closes - L'invitation prend fin **at - à 02:00 PM** **on - le 2012-04-19**	**Time Zone** **Fuseau horaire** Atlantic Daylight Saving Time ADT
F.O.B. - F.A.B. **Plant-Usine:** ☐ **Destination:** ☐ **Other-Autre:** ☐	
Address Enquiries to: - Adresser toutes questions à: Ellis-Herring , Alison PWB	**Buyer Id - Id de l'acheteur** pwb007
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Canada

This Solicitation Amendment Number Three (3) is raised to include the following addendum.

The following Addendum to the tender documents is effective immediately. This Addendum shall form part of the contract documents.

All other terms and conditions remain the same.

Addendum No. 3

REQUEST FOR PROPOSAL DOCUMENT

Geotechnical Investigation Report - Atlantic Institution

ADD attached "Geotechnical Investigation Report: Geotechnical Investigation, Atlantic Institution, Renous, New Brunswick" document which is referenced in the Terms of Reference, Clause 1.8.1 Documents available to Proponents in English only.

GEOTECHNICAL INVESTIGATION REPORT:

GEOTECHNICAL INVESTIGATION
ATLANTIC INSTITUTION
RENOUS, NEW BRUNSWICK

Prepared for:

Public Works and
Government Services Canada
Real Property Services
1045 Main Street
Unit 100
Moncton, NB
E1C 1H1

March 2012

Prepared by:

FUNDY Engineering

Fundy Engineering
27 Wellington Row
Saint John, NB
E2L 4S1

www.fundyeng.com

Project No: 9069

EXECUTIVE SUMMARY

Fundy Engineering & Consulting Ltd. (Fundy Engineering) was contracted by Public Works and Government Services Canada (the Client) to complete a geotechnical investigation at the Atlantic Institution in Renous, New Brunswick. The purpose of this geotechnical investigation was to identify the soils and rock within the area of the proposed new structure, determine the properties of the soils and rock, and to provide earthwork recommendations for the construction of a new general purpose structure. The geotechnical investigation consisted of eight (8) boreholes between the parking lots to the east of the existing facility. A track mount drill supplied and operated by Logan Drilling Group was used. The boreholes were extended through the overburden material until bedrock was encountered and then the bedrock was cored for 2.4 m to 4.3 m.

Soils encountered in this geotechnical investigation can generally be described as a Compact to Very Dense Brown Sand and Gravel Till with varying amounts of silt, cobbles and boulders. Bedrock was encountered in every borehole, with a depth ranging from 1.8 m to 3.7 m. The bedrock's rock quality designation (RQD) ranged from 0% to 30% (Very Poor to Poor) and can be classified as a Gold Sandstone. Compressive strength testing was performed on a representative sample of rock cores, and had results ranging from 31.6 MPa in BH6 to 49.5 MPa in BH2. Groundwater was encountered in two boreholes, with depths ranging from 1.8 m to 2.1 m below ground surface.

The following recommendations may be used for the earthwork in the construction of the new structure:

- Based on the proposed building design the preferred foundation design for the new facility is a concrete foundation consisting of spread footings. It is recommended that these footings are founded on Compact to Very Dense Sand and Gravel Till.
- Footings founded on Compact to Very Dense Sand and Gravel Till may be designed with an allowable bearing capacity of 250 kPa. Total and differential settlements under the proposed loading are anticipated to be 25 mm and 15 mm, respectively.
- Footings founded on Bedrock may be designed with an allowable bearing capacity of 500 kPa. Total and differential settlements under the proposed loading will be less than 15 mm and 10 mm, respectively.
- Footings may be founded on bedrock provided that all footings are founded on Bedrock. Footings may only be founded on both soil and bedrock if the foundation design accounts for possible differential settlements based on dissimilar bearing capacities of soil and bedrock.
- The building pad (*i.e.*, Engineered Fills used to bring site up to grade), if required, must be constructed with a minimum slope of 1:1 from the edge of the pad to the insitu bearing soils and must extend beyond the edge of the footing a minimum distance of 0.5 m from the top of the pad slope.
- All engineered Fills placed should be inspected on-site by a Geotechnical Engineer.

TABLE OF CONTENTS

LIST OF TABLES

APPENDICES

1.0 INTRODUCTION

Fundy Engineering & Consulting Ltd. (Fundy Engineering) was contracted by Public Works and Government Services Canada (PWGSC) to complete a geotechnical investigation at the Atlantic Institution in Renous, New Brunswick. The purpose of this geotechnical investigation was to identify the soils and rock within the area of the proposed expansion, determine the properties of the soils and rock, and to provide recommendations for the earthwork in the construction of a new general purpose structure. The geotechnical investigation consisted of eight (8) boreholes between the parking areas to the east of the existing facility. A track mount drill supplied and operated by Logan Drilling Group was used.

The boreholes were extended through the overburden material until bedrock was encountered, which was then cored for 2.4 m to 4.3 m. All elevations on the attached site plan are in reference to the geodetic datum (see Sheet S1).

1.1 Scope of Work Completed

This following scope of work was performed by Fundy Engineering as part of our geotechnical investigation:

- Eight (8) geotechnical boreholes;
- Identification of soils and rock encountered within boreholes and respective parameters for each material determined from laboratory testing; and
- Geotechnical report with findings and recommendations pertaining to the earthwork in the construction of the new general purpose structure.

1.2 Limitations

The observations made and facts presented in this report are based on the site visit carried out in March 2012. While every effort has been made to comprehensively catalogue geotechnical concerns pertaining to the Atlantic Institution in Renous, NB, discovery or development of other geotechnical problems cannot be precluded. Further investigation may reveal additional information that may have some bearing on the recommendations included herein. Should such information be revealed, Fundy Engineering should be notified in a timely fashion so that any required amendments to our recommendations can be made.

These results are reported confidentially to the client, who is advised to take appropriate action to rectify any areas of concern. No professional responsibility is assumed for the use or interpretation of these findings by others.

2.0 SITE DESCRIPTION

2.1 Area of Interest

The existing area is currently a green space located between two large parking lots adjacent to the main facility entrance, and is located to the east of the existing facilities that make up the Atlantic Institution. In addition, a number of underground services and above ground concrete slabs are present in the area that house propane and fuel tanks. An asphalt walkway also exists in the area that accommodates foot traffic from the northern parking lot to the main entrance.

2.2 Location and Property Ownership

The subject property is the location of the Atlantic Institution off of Route 8 in Renous, NB. This facility contains numerous structures, in addition to parking lots mentioned above. The property is identified by Service New Brunswick as PID #40466393. The registered owner of the 427.5 ha property is the Government of Canada-Public Works.

2.3 Geotechnical Setting

Surficial geology in the area consists of Morainal Sediments of the Late Wisconsinan epoch, namely discontinuous veneer over rock, less than 0.5 m thick: mainly sandy till with a sand content greater than 50% (New Brunswick Department of Natural Resources, Surficial Geology-New Brunswick, Geological Survey of Canada, Map 1594A, 1984).

3.0 SITE WORK COMPLETED

3.1 Borehole Investigation

The purpose of the borehole investigation was to assess the underlying soils and bedrock in the location of the proposed general purpose building to the east of the existing facility, in order to provide recommendations for the earthwork required in the construction of this new structure. From March 8th to 9th, 2012, eight (8) geotechnical boreholes were put down to obtain such information via a track mounted drill provided by Logan Drilling Group under the direction of Rob Haineault, EIT, of Fundy Engineering. Continuous samples of the overburden soils were obtained using a split spoon sampler and rock samples were cored 2.4 m to 4.3 m into the bedrock. Elevations on the attached Site Plan are geodetically referenced (see Sheet S1).

3.2 Soils Encountered

Soils encountered in this geotechnical investigation can generally be described as a Compact to Very Dense Brown Sand and Gravel Till with varying amounts of silt, cobbles and boulders. A thin layer of topsoil with roots and organics at the ground surface overlays the materials noted above in the green space area. Meanwhile, a layer of asphalt and fill material overlays the in-situ Till material in the parking lot area (BH1). Further details of the soils encountered in the geotechnical investigation can be found in the borehole logs that are appended to this report (see Appendix III).

3.3 Bedrock Encountered

Bedrock was encountered in every borehole with a depth ranging from 1.8 m to 3.7 m. The bedrock's rock quality designation (RQD) ranged from 0% to 30% (Very Poor to Poor) and can be classified as a Gold Sandstone. Compressive strength testing was performed on a representative sample of rock cores (see Table 1), and had results ranging from 31.6 MPa in BH6 to 49.5 MPa in BH2. Please see the attached borehole logs (Appendix III) for complete information on the bedrock encountered in this investigation.

Table 1 - Compressive Strength of Representative Rock Cores

Rock Core Identification	Rock Core Depth (m)	Compressive Strength (MPa)
Borehole #2	5.2	49.5
Borehole #3	4.1	32.6
Borehole #6	6.5	31.6
Borehole #8	4.7	47.4

A collected core sample was subsequently broken into small portions (~125 cm^3) for submission to the RPC Technical Solutions Centre in Fredericton, New Brunswick for determination of acid rock drainage characteristics. One sample, which was based on its visual characteristics representing materials yielding acid, was submitted for analysis. The sample was pulverized at the laboratory and subjected to the Sobek Modified Acid-Base Accounting method. Sobek's method is not a recognized standard by the American Society for Testing and Materials (ASTM), but is the commonly accepted method used for acid-base accounting. Many of the measurements made within Sobek's method are recognized ASTM standards. The analysis method used here assumes that all sulfur contained within a rock substrate is converted to sulfuric acid.

The paste pH shows the current acidity status of the sample (a pH of 6.1 suggests the sample is slightly acidic), but this measurement (*i.e.*, mixing a portion of the sample with deionized water and then measuring pH after one hour) provides little indication regarding the future behaviour of the sample (*e.g.*, the propensity to produce acid rock drainage). The sample contains < 0.005 % of sulfur by volume and is well below the significant "threshold" value of 0.5 %. The sample has an extremely low maximum acid production potential of <0.2 kg $CaCO_3$ × $tonne^{-1}$. This represents the amount of acid generating sulfur minerals contained in the sample. The neutralizing potential pH 8.3 data indicate that the sample is not capable of neutralizing a considerable amount (*i.e.*, 2.9 ×) of the acidity potentially produced. A rock substrate is considered "potentially toxic" when the net acid-base accounting is ≤ 5 kg $CaCO_3$ × $tonne^{-1}$. The sample submitted yielded a net neutralizing potential of 1.0 kg $CaCO_3$ × $tonne^{-1}$ indicating that there is a chance that the substrate could lead to toxic conditions from acid rock drainage.

3.4 Groundwater Encountered

Groundwater was encountered in two boreholes, with depths of 1.8 m in BH4 and 2.1 m in BH6.

3.5 Radon Testing

One area was sampled for radon gas. An additional hole was drilled to a depth of approximately 0.75 m in order to collect the sample. This hole, dilled adjacent to BH4, was chosen as a good location for a general representation of the entire area of interest and was within the footprint of the proposed structure.

Radon samples were collected using Electret Ion Chambers (EIC). The EIC's were obtained from and analyzed by RPC Laboratory in Fredericton, NB. The EIC's were placed, collected, and shipped following the recommendations of RPC Laboratory. The sample collection procedure was as follows:

Placement of EIC Sampling Kit

The placement and collection of the EIC was conducted by our geotechnical technologist supervising the drilling operation.

1. The EIC was placed in an open plastic bag and lowered into the borehole to a depth of approximately one metre below existing grade. The bag that contained the EIC was placed directly on the in-situ soils.
2. The in-situ soils removed from the hole during drilling were then placed back into the hole up to the existing grade.
3. The EIC remained in the borehole for a total of 45 hours.

Collection of EIC Sampling Kit

The collection of the EIC was conducted by our geotechnical technologist supervising the drilling operation.

1. Following the 45 hour sampling period, the EIC was removed from the borehole and properly prepared for shipment to the laboratory.
2. The analysis was completed by a third party laboratory (RPC Laboratory).

Results of Radon Testing

Table 2 – Radon Testing Results

Sample Identification	Radon Detected (Bq/m^3)
Radon Borehole	147,566

Health Canada recommends remedial action is taken if a radon concentration in an occupied indoor space exceeds the threshold limit value (TLV) of 200 Bq/m^3 (Becquerels per cubic meter). However, when testing in a subsoil condition as in a borehole, the concentration of radon is expected to be approximately 100 times higher than what it would be inside a building located in that same place. Therefore, a radon concentration collected from a borehole, with a concentration ≤20,000 Bq/m^3 would be considered acceptable. The radon concentration identified during this testing procedure was measured at a concentration above the recommended subsoil threshold limit value. Section 9.13.4 of the 2010 National Building Code of Canada requires newly constructed buildings to be provided with a rough-in for the future connection of a subfloor depressurization system. Based on these sampling results, it is recommended that further testing be carried out once the proposed structure is constructed.

4.0 RECOMMENDATIONS

Based on our observations made in the field the preferred foundation design for the new facility is a standard concrete wall on strip footings. At the time of this report the design of the foundations was not known to us. Some assumptions have been made based on the underground conditions.

Design recommendations have been developed for spread footings founded on the Compact to Very Dense Sand and Gravel Till and spread footings founded on Bedrock. These recommendations have been developed in order to assist building designers in making the most economical choice based on building requirements, site layout, etc.

4.1 Site Preparation

With any development in the area of the investigation, it is recommended that the layer of topsoil be removed. In addition, any material that contains organics should be removed, as well as any identified soft areas. The excavation to prepare the site for foundation footings should extend to the Compact to Very Dense Sand and Gravel Till.

4.2 Footings Founded on Compact to Very Dense Sand and Gravel Till

The Compact to Very Dense Sand and Gravel Till bearing stratum should be proof rolled with a large highway type vibratory roller and approved by a Geotechnical Engineer. Soft areas identified should be removed and replaced with compacted structural fill. Any surface water should be directed away from the excavated areas to prevent any disturbance of the bearing material. Traffic should also be minimized in the building footprint as building grade is approached to prevent the mobilization of the bearing material at the surface.

After the removal of all unsuitable materials, the footings are to be placed on the Compact to Very Dense Sand and Gravel Till material. The allowable bearing capacity for this material was calculated to be 250 KPa. Additionally, the anticipated total and differential settlements for this material are 25 mm and 15 mm, respectively. The recommended depth of soil cover for frost protection is 1.5 metres. If this depth of soil cover is unobtainable in the design, insulation is recommended to make up for any lack of soil depth. An insulation thickness of 20 mm is equivalent to 300 mm of soil cover. An insulation width of 300 mm is equivalent to 300 mm of soil cover.

The base preparation for a potential slab-on-grade shall consist of proof rolling the in-situ soils and placing 100 mm of Class 'A' material to the underside of the slab. In addition, any identified soft areas shall be removed and replaced with a Class 'A' material (please see Table 3 for Class 'A' grain size requirements).

Table 3 – Class 'A' Grain Size Requirements

Sieve Size (inches)	(mm)	% Passing
1	25	95-100
¾	19	75-95
½	12	60-82
3/8	9.5	56-75
#4	4.75	36-61
#10	2	16-36
#40	0.425	4-10
#200	0.075	3-7

If additional material is required to bring the building footings or slabs up to grade, it should be done so using a structural fill. Structural fill should consist of an approved material which is free from organics and deleterious materials, such as a pit run or other approved inorganic soil. The

building pad (*i.e.*, engineered fills used to bring site up to grade), if required, must be constructed with a minimum slope of 1:1 from the edge of the pad to the in-situ bearing soils and must extend beyond the edge of the footing a minimum distance of 0.5 m to the top of the pad slope.

All structural fill placed within the building area should be placed and compacted in lifts to 100 percent of its Standard Proctor density. The lift thickness must be compatible with the compaction equipment used. A maximum lift thickness of 0.3 m is recommended for structural fill material placed under the building.

It is recommended that removal of all unsuitable materials and the placement of structural fills be monitored by a Geotechnical Engineer. This will ensure that all unwanted materials that are susceptible to excessive settlements are removed and replaced with suitable load bearing materials, and that the required degree of compaction is attained during the placement of the structural fills.

4.3 Footings Founded on Bedrock

Footings may be founded on bedrock provided that all footings are founded on Bedrock. Footings may only be founded on both soil and bedrock if the foundation design accounts for possible differential settlements based on dissimilar bearing capacities of soil and bedrock.

Footings founded on Bedrock may be designed with an allowable bearing capacity of 500 kPa. Total and differential settlements under the proposed loading will be less than 15 mm and 10 mm, respectively

4.4 Material Reuse

Various samples collected during the investigation have reuse applications, namely as a Bedding Sand and/or a Pit Run Gravel Sub-base. The in-situ Till material sampled in BH2 (1.2 m), BH4 (0.6 m) and BH8 (0.6 m) may be used as a Bedding material. In addition, the Till material collected in BH1 (3 m) and BH8 (1.8 m) may be used as a Pit Run Gravel Sub-base.

4.5 Seismic Site Class

As per the National Building Code of Canada, Division B, the soil encountered in this investigation can be classified as seismic site class D.

5.0 CONCLUSIONS AND CLOSING REMARKS

Fundy Engineering & Consulting Ltd. (Fundy Engineering) was contracted by Public Works and Government Services Canada (the Client) to complete a geotechnical investigation at the Atlantic Institution in Renous, New Brunswick. The purpose of this geotechnical investigation was to identify the soils and rock within the area of the proposed new structure, determine the properties of the soils and rock, and to provide earthwork recommendations for the construction of a new general purpose structure. The geotechnical investigation consisted of eight (8) boreholes between the parking lots to the east of the existing facility. A track mount drill supplied and operated by Logan Drilling Group was used. The boreholes were extended through the overburden material until bedrock was encountered and then the bedrock was cored for 2.4 m to 4.3 m.

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- All engineered Fills placed should be inspected on-site by a Geotechnical Engineer.

We trust this is sufficient for your present needs, please feel free to contact the undersigned for any additional information or clarification that may be required.

Sincerely,

Fundy Engineering & Consulting Ltd.

Mr. Al Mouland, P.Eng., PMP

APPENDIX I

SITE PLAN

GENERAL NOTES

1. All dimensions in millimeters unless otherwise specified.
2. Elevations in meters and based on NAD83 (CSRS) Datum.
3. Northings and Eastings are UTM Zone 20.
4. Site plan (overlay) by others.

No.	REVISION/ISSUE	DATE

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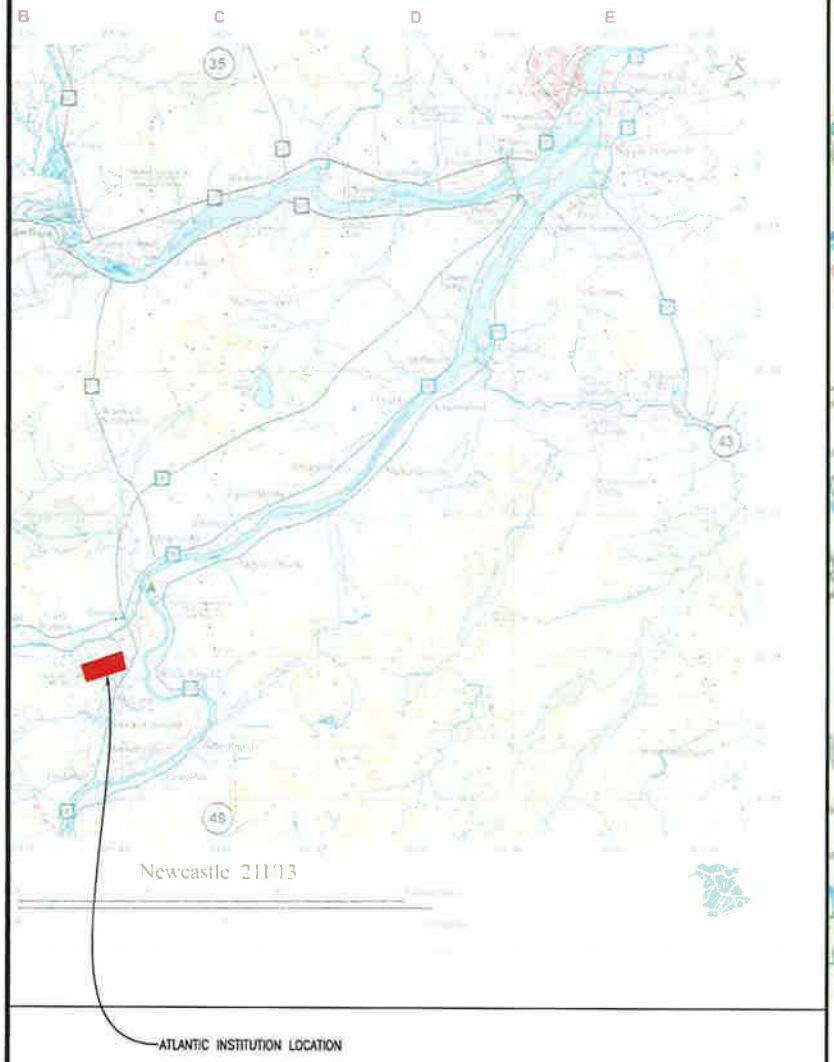
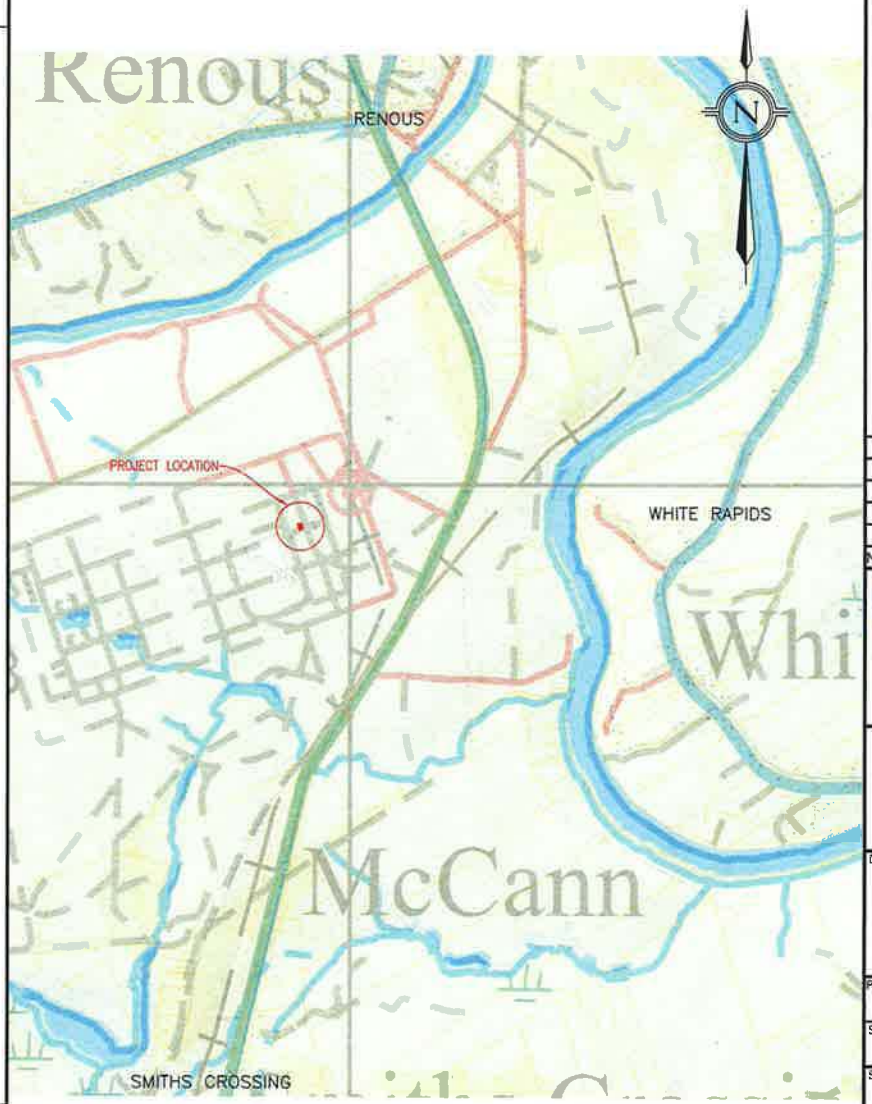
Project:
GEOTECHNICAL INVESTIGATION
ATLANTIC INSTITUTION
RENOUS, NB

Drawing:
BOREHOLE LOCATIONS

Project No.	Designed	Date (yy/mm/dd)
9069	AGM	12/03/14
Scale	Drawn	Rev.
1:200	RTH	

Sheet
S1





GENERAL NOTES

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2. Elevations in meters and based on NAD83 (CSRS) Datum.
3. Northings and Eastings are UTM Zone 20.
4. Site plan (overlay) by others.

No.	REVISION/ISSUE	DATE

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Project:
GEOTECHNICAL INVESTIGATION
ATLANTIC INSTITUTION
RENOUS, NB

Drawing:
SITE LOCATION

Project No.	Designed	Date (y/mm/dd)
9069	AGM	12/03/14
Scale	Drawn	Rev.
1:20,000	RTH	

Sheet
S2

APPENDIX II

SYMBOLS AND TERMS

SYMBOLS AND TERMS - TEST PIT AND BOREHOLE 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 oxidization 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 sizes present:

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

The standard terminology to describe cohesion less 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 (64kg) hammer falling 30 inches (50.8mm) O.D. split spoon sampler one foot (305mm) into the soil.

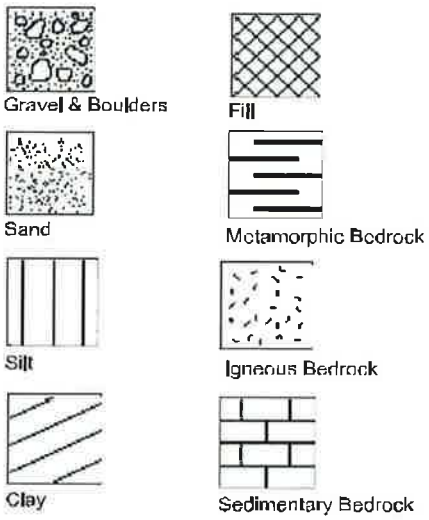
RELATIVE DENSITY	'N' VALUE	RELATIVE DENSITY %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

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

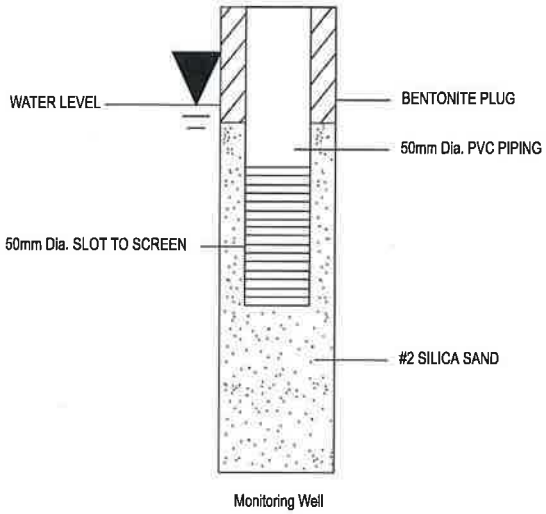
CONSISTENCY	UNDRAINED SHEAR STRENGTH		'N' VALUE
	kips/sq.ft.	kPa	
Very Soft	<0.25	<12.5	<2
Soft	0.25-0.5	12.5-25	2-4
Firm	0.5-1.0	25-50	4-8
Stiff	1.0-2.0	50-100	8-15
Very Stiff	2.0-4.0	100-200	15-30
Hard	>4.0	>200	>30

SYMBOLS AND TERMS CONTINUED

STRATA PLOT



WATER MEASUREMENT



SAMPLES

SS...	Split Spoon
ST...	Shelby Tube
PS...	Piston Sample
BS...	Bulk Sample
WS...	Wash Sample
RC...	Rock Core
RF...	Split Spoon Refusal (50 Blows/25 mm)

OTHER TESTS

G...	Specific Gravity
H...	Hydrometer Analysis
S...	Sieve Analysis
(...	Unit Weight
C...	Consolidation
CD...	Consolidation Drained Triaxial
CU...	Consolidated Undrained Triaxial
UU...	Unconsolidated Undrained Triaxial
DS...	Direct Shear
P...	Field Permeability

ROCK DESCRIPTION

The description of bedrock is based on the rock quality designation (RQD).

The classification is based on a modified core recovery percentage in which all pieces of sound core over 100mm long are expressed as a percentage of total recovery. The small pieces are considered to be due to close shearing, jointing, faulting, or weathering in the rock mass and are not counted. In most cases RQD is measured on NXL core.

RQD	ROCK QUALITY
90-100	Excellent, intact, very sound
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

APPENDIX III

BOREHOLE LOGS

FUNDY Engineering

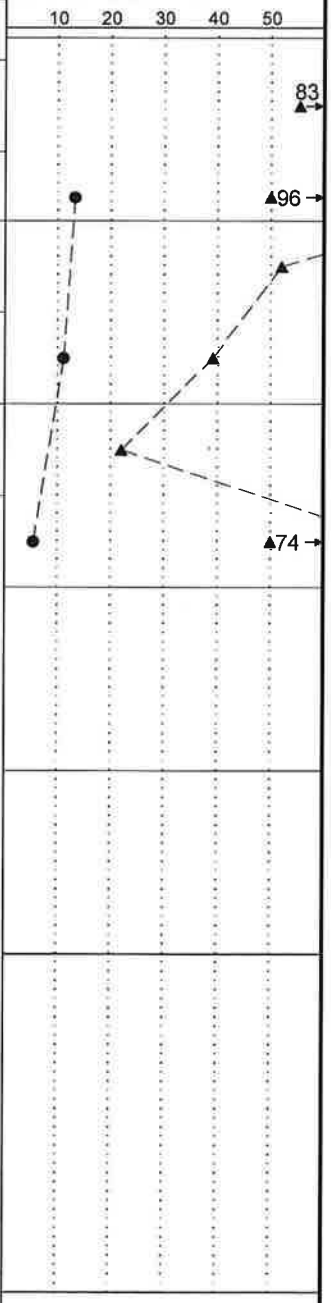
BOREHOLE LOG No. BH1

PROJECT: Geotechnical Investigation - Atlantic Institution
CLIENT: PWGSC **DATUM:** Geodetic
PROJECT LOCATION: Renous, NB **ELEVATION (m):** 55.1
DRILLING CONTRACTOR: Logan Drilling Group **PROJECT #** 9069
LOGGED BY: Rob Haineault **CHECKED BY:** Al Mouland
DRILLING METHOD: Track Mount **DATE:** March 8 2012
DEPTH TO WATER (m): INITIAL: **24 hrs.**

Depth (meters)	Depth (feet)	Description	Elevation (m)	Groundwater	Graphic	Sample Type	Sample No.	Lab Tests	Sample Rec (cm)	Blow Counts (N Value)	% < #200
0	0	Asphalt	55.1								
		Compact Brown Sand and Gravel Fill	55.02				1		20	--33-50/4"-- (83)	
0.8	2.67	Very Dense Brown Gravelly Sand Till with Some Silt and Cobbles	54.95								
			54.34				2		39	--47-49-37 (96)	17
1.6	5.33		53.88				3		55	28-26-26-34 (52)	
		Compact to Very Dense Brown Sand and Gravel Till with Trace Silt and Cobbles	53.27				4		61	7-24-15-11 (39)	9.8
2.4	8		52.66				5		50	3-7-15-11 (22)	
3.2	10.67		52.05				6		31	17-24-50/4"-- (74)	8.7
		Very Poor Gold Sandstone Recovery=83% RQD=0%	51.44								
4	13.33										
		Recovery=93% RQD=9%	50.68								
4.8	16										
5.6	18.67										
			49								

TEST RESULTS

Plastic Limit ⊢ Liquid Limit
Water Content - ●
SPT N-Value - ▲



FUNDY Engineering

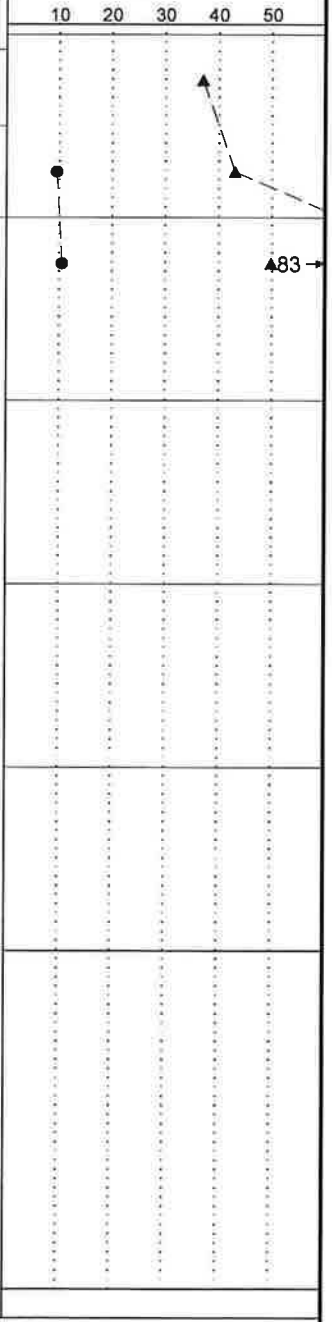
BOREHOLE LOG
No. BH2

PROJECT: Geotechnical Investigation - Atlantic Institution
CLIENT: PWGSC **DATUM:** Geodetic
PROJECT LOCATION: Renous, NB **ELEVATION (m):** 54.99
DRILLING CONTRACTOR: Logan Drilling Group **PROJECT #** 9069
LOGGED BY: Rob Haineault **CHECKED BY:** Al Mouland
DRILLING METHOD: Track Mount **DATE:** March 8 2012
DEPTH TO WATER (m): INITIAL: **24 hrs.**

Depth (meters)	Depth (feet)	Description	Elevation (m)	Groundwater	Graphic	Sample Type	Sample No.	Lab Tests	Sample Rec (cm)	Blow Counts (N Value)	% < #200
0	0	Topsoil	54.99								
		Dense to Very Dense Brown Gravelly Sand with Some Silt and Cobbles and Trace Organics	54.89				1		46	10-17-20-25 (37)	
0.8	2.67		54.38				2		24	24-23-20-20 (43)	15
1.6	5.33		53.77				3		46	31-33-50/5"-- (83)	11
		Very Poor Gold Sandstone Recovery=33% RQD=0%	53.16								
2.4	8										
3.2	10.67	Recovery=100% RQD=0%	51.94								
4	13.33										
		Recovery=100% RQD=14%	50.42								
4.8	16										
5.6	18.67		48.89								

TEST RESULTS

Plastic Limit ⊢ Liquid Limit
Water Content - ●
SPT N-Value - ▲



FUNDY Engineering

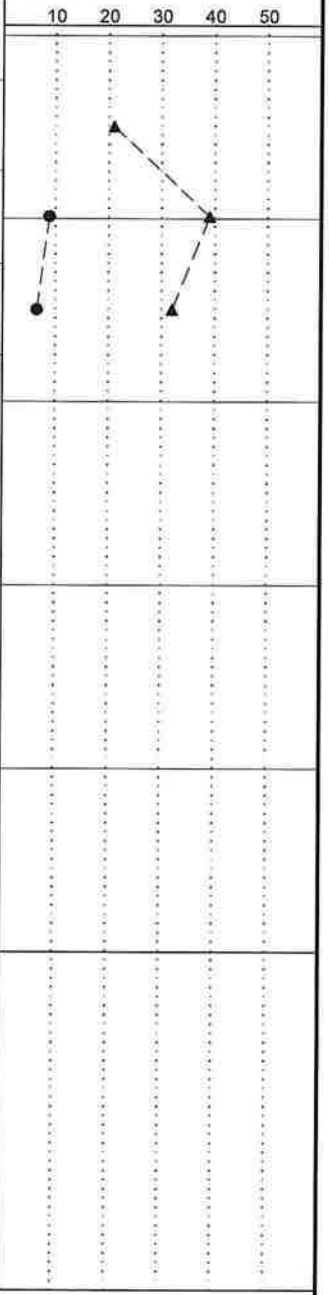
BOREHOLE LOG No. BH3

PROJECT: Geotechnical Investigation - Atlantic Institution
CLIENT: PWGSC **DATUM:** Geodetic
PROJECT LOCATION: Renous, NB **ELEVATION (m):** 55.07
DRILLING CONTRACTOR: Logan Drilling Group **PROJECT #** 9069
LOGGED BY: Rob Haineault **CHECKED BY:** Al Mouland
DRILLING METHOD: Track Mount **DATE:** March 9 2012
DEPTH TO WATER (m): INITIAL: **24 hrs.**

Depth (meters)	Depth (feet)	Description	Elevation (m)	Groundwater	Graphic	Sample Type	Sample No.	Lab Tests	Sample Rec (cm)	Blow Counts (N Value)	% < #200
0	0	Topsoil	55.07								
		Compact to Dense Goldish Brown Gravelly Sand Till with Some Silt and Cobbles	54.77				1		44	--8-13-13 (21)	
0.8	2.67		54.17				2		52	13-19-20-14 (39)	15
1.6	5.33	Dense Greyish Goldish Brown Gravelly Sand Till with Trace Silt and Cobbles	53.55				3		53	13-18-14-11 (32)	7.9
2.4	8		52.94				4		18		
3.2	10.67	Very Poor Gold Sandstone Recovery=53% RQD=8%	52.02								
4	13.33										
4.8	16	Recovery=100% RQD=7%	50.5								
5.6	18.67		48.97								

TEST RESULTS

Plastic Limit ⊢ Liquid Limit
Water Content - ●
SPT N-Value - ▲



FUNDY Engineering

BOREHOLE LOG
No. BH4

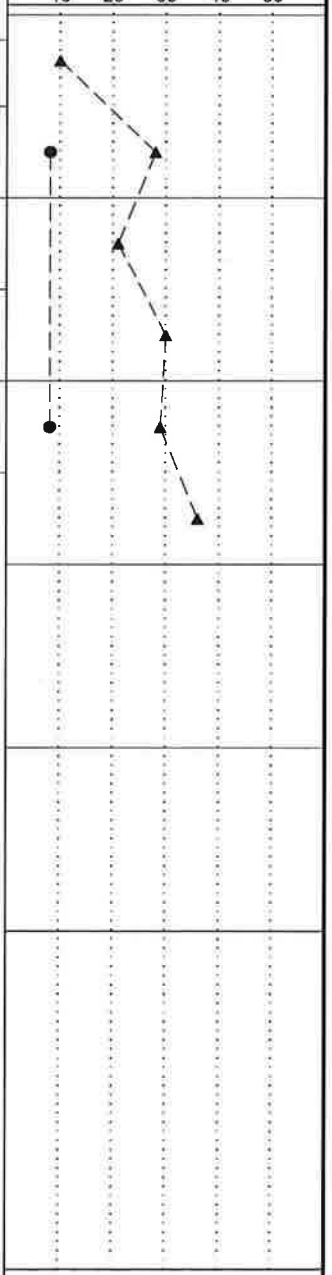
PROJECT: Geotechnical Investigation - Atlantic Institution
CLIENT: PWGSC **DATUM:** Geodetic
PROJECT LOCATION: Renous, NB **ELEVATION (m):** 54.96
DRILLING CONTRACTOR: Logan Drilling Group **PROJECT #** 9069
LOGGED BY: Rob Haineault **CHECKED BY:** Al Mouland
DRILLING METHOD: Track Mount **DATE:** March 8 2012
DEPTH TO WATER (m): INITIAL: 1.83 **24 hrs.**

Depth (meters)	Depth (feet)	Description	Elevation (m)	Groundwater	Graphic	Sample Type	Sample No.	Lab Tests	Sample Rec (cm)	Blow Counts (N Value)	% < #200
0	0	Topsoil	54.96								
		Compact Brown Gravelly Sand Till with Roots and Organics	54.79				1		61	5-5-5-6 (10)	
0.8	2.67	Compact to Dense Goldish Brown Gravelly Sand Till with Trace Silt and Cobbles	54.35				2		40	8-14-14-50/4" (28)	8.5
			53.74				3		51	10-10-11-11 (21)	
1.6	5.33		53.13	▽			4		61	10-15-15-15 (30)	
2.4	8	Compact to Dense Goldish Brown Gravelly Sand Till with Some Silt and Cobbles	52.52				5		61	14-14-15-14 (29)	11
3.2	10.67		51.91				6		50	9-12-24-30 (36)	
4	13.33	Very Poor Gold Sandstone Recovery=66% RQD=24%	51.3								
4.8	16	Recovery=100% RQD=0%	50.39								
5.6	18.67		48.86								

TEST RESULTS

Plastic Limit ⊢ Liquid Limit
Water Content - ●
SPT N-Value - ▲

10 20 30 40 50



FUNDY Engineering

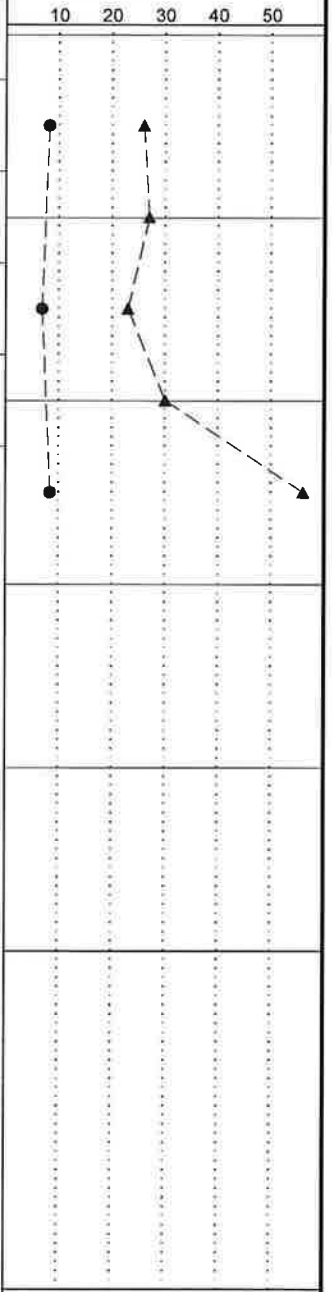
BOREHOLE LOG
No. BH5

PROJECT: Geotechnical Investigation - Atlantic Institution
CLIENT: PWGSC **DATUM:** Geodetic
PROJECT LOCATION: Renous, NB **ELEVATION (m):** 54.9
DRILLING CONTRACTOR: Logan Drilling Group **PROJECT #** 9069
LOGGED BY: Rob Haineault **CHECKED BY:** Al Mouland
DRILLING METHOD: Track Mount **DATE:** March 9 2012
DEPTH TO WATER (m): INITIAL: **24 hrs.**

Depth (meters)	Depth (feet)	Description	Elevation (m)	Groundwater	Graphic	Sample Type	Sample No.	Lab Tests	Sample Rec (cm)	Blow Counts (N Value)	% < #200
0	0	Topsoil	54.9								
		Compact Brown Gravelly Sand Till with Some Silt and Cobbles	54.6				1		49	9-13-13-11 (26)	11
0.8	2.67		53.99				2		51	17-15-12-10 (27)	
1.6	5.33	Compact to Dense Brown Sand and Gravel Till with Trace Silt and Organics	53.38				3		46	7-9-14-12 (23)	6.3
2.4	8		52.77				4		52	10-13-17-22 (30)	
		Very Dense Brown Sand and Gravel Till with Some Silt and Cobbles	52.16				5		36	15-21-35/2"-- (56)	12
3.2	10.67	Very Poor Gold Sandstone Recovery=73% RQD=0%	51.85								
4	13.33										
		Recovery=100% RQD=7%	50.33								
4.8	16										
5.6	18.67		48.8								

TEST RESULTS

Plastic Limit ⊢ Liquid Limit
Water Content - ●
SPT N-Value - ▲



FUNDY Engineering

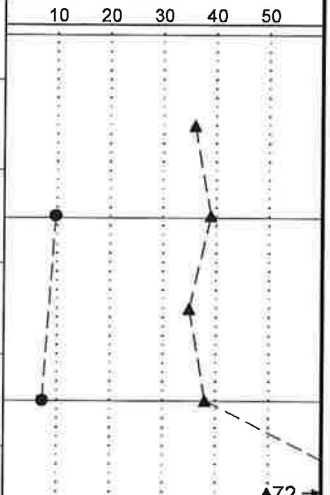
BOREHOLE LOG No. BH6

PROJECT: Geotechnical Investigation - Atlantic Institution
CLIENT: PWGSC **DATUM:** Geodetic
PROJECT LOCATION: Renous, NB **ELEVATION (m):** 54.78
DRILLING CONTRACTOR: Logan Drilling Group **PROJECT #** 9069
LOGGED BY: Rob Haineault **CHECKED BY:** Al Mouland
DRILLING METHOD: Track Mount **DATE:** March 8 2012
DEPTH TO WATER (m): INITIAL: 2.13 **24 hrs.**

Depth (meters)	Depth (feet)	Description	Elevation (m)	Groundwater	Graphic	Sample Type	Sample No.	Lab Tests	Sample Rec (cm)	Blow Counts (N Value)	% < #200
0	0	Topsoil	54.78								
0.8	2.67	Dense to Very Dense Goldish Brown Gravelly Sand Till with Trace Silt and Cobbles	54.48				1		61	18-20-16-15 (36)	
			53.88				2		61	15-14-25-30 (39)	9.5
1.6	5.33		53.26				3		61	19-17-18-19 (35)	
2.4	8		52.65	▽			4		49	26-21-17-13 (38)	9.0
3.2	10.67		52.04				5		30	27-42-30/1"-- (72)	
4	13.33	Very Poor Gold Sandstone Recovery=25% RQD=0%	51.43								
4.8	16	Recovery=33% RQD=0%	50.21								
5.6	18.67										
6.4	21.33	Recovery=100% RQD=23%	48.68								
7.2	24		47.16								

TEST RESULTS

Plastic Limit ⊢ Liquid Limit
Water Content - ●
SPT N-Value - ▲



FUNDY Engineering

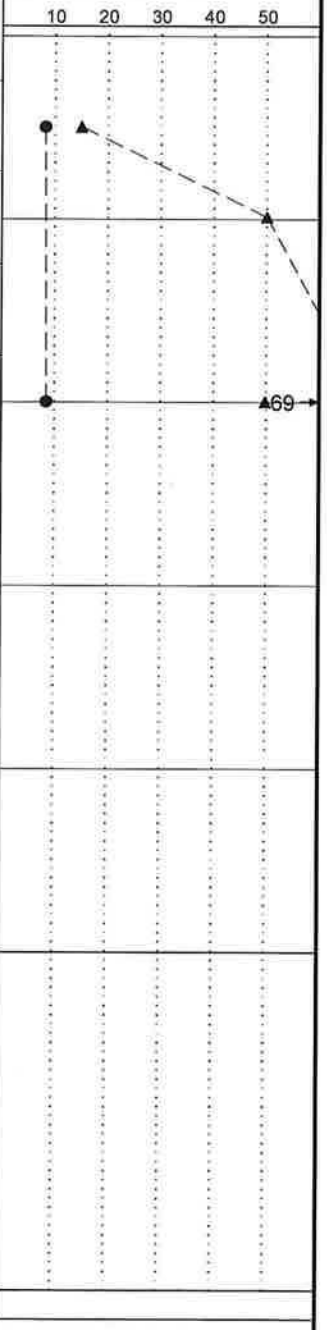
BOREHOLE LOG
No. BH7

PROJECT: Geotechnical Investigation - Atlantic Institution
CLIENT: PWGSC **DATUM:** Geodetic
PROJECT LOCATION: Renous, NB **ELEVATION (m):** 54.72
DRILLING CONTRACTOR: Logan Drilling Group **PROJECT #** 9069
LOGGED BY: Rob Haineault **CHECKED BY:** Al Mouland
DRILLING METHOD: Track Mount **DATE:** March 8 2012
DEPTH TO WATER (m): INITIAL: **24 hrs.**

Depth (meters)	Depth (feet)	Description	Elevation (m)	Groundwater	Graphic	Sample Type	Sample No.	Lab Tests	Sample Rec (cm)	Blow Counts (N Value)	% < #200
0	0	Topsoil	54.72								
		Compact to Very Dense Brown Gravelly Sand Till with Some Silt and Cobbles	54.42				1		50	4-4-11-18 (15)	10
0.8	2.67		53.82				2		61	12-24-26-20 (50)	
1.6	5.33		53.2				3		10		
2.4	8		52.59				4		56	7-22-47-50/4" (69)	9.6
3.2	10.67	Very Poor Gold Sandstone Recovery=40% RQD=0%	51.67								
4	13.33										
4.8	16	Recovery=100% RQD=0%	50.15								
5.6	18.67		48.62								

TEST RESULTS

Plastic Limit ⊢⊣ Liquid Limit
Water Content - ●
SPT N-Value - ▲



FUNDY Engineering

BOREHOLE LOG No. BH8

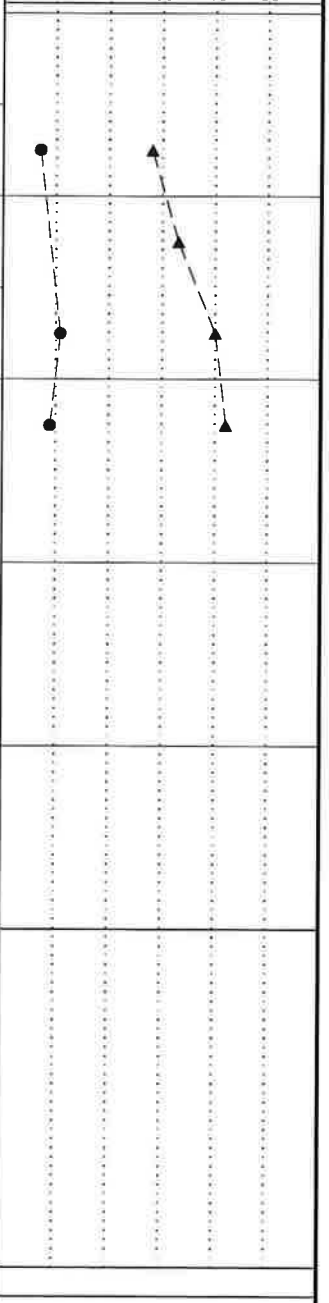
PROJECT: Geotechnical Investigation - Atlantic Institution
CLIENT: PWGSC **DATUM:** Geodetic
PROJECT LOCATION: Renous, NB **ELEVATION (m):** 54.87
DRILLING CONTRACTOR: Logan Drilling Group **PROJECT #** 9069
LOGGED BY: Rob Haineault **CHECKED BY:** Al Mouland
DRILLING METHOD: Track Mount **DATE:** March 9 2012
DEPTH TO WATER (m): INITIAL: **24 hrs.**

Depth (meters)	Depth (feet)	Description	Elevation (m)	Sample No.	Sample Rec (cm)	Blow Counts (N Value)	% < #200
0	0	Compact Brown Gravelly Sand with Trace Silt and Organics	54.87				
0.8	2.67		54.26	1	55	6-11-17-18 (28)	8.3
1.6	5.33	Dense Goldish Brown Sand and Gravel Till with Trace Silt and Cobbles	53.65	2	61	24-22-11-10 (33)	
			53.04	3	30	9-10-30/2"-- (40)	9.1
2.4	8	Dense Goldish Brown Gravelly Sand Till with Some Silt and Cobbles	52.43	4	61	12-20-22-40 (42)	14
3.2	10.67	Very Poor to Poor Gold Sandstone Recovery=87% RQD=0%	51.82				
4	13.33						
4.8	16	Recovery=100% RQD=30%	50.3				
5.6	18.67						

TEST RESULTS

Plastic Limit ⊢ Liquid Limit
Water Content - ●
SPT N-Value - ▲

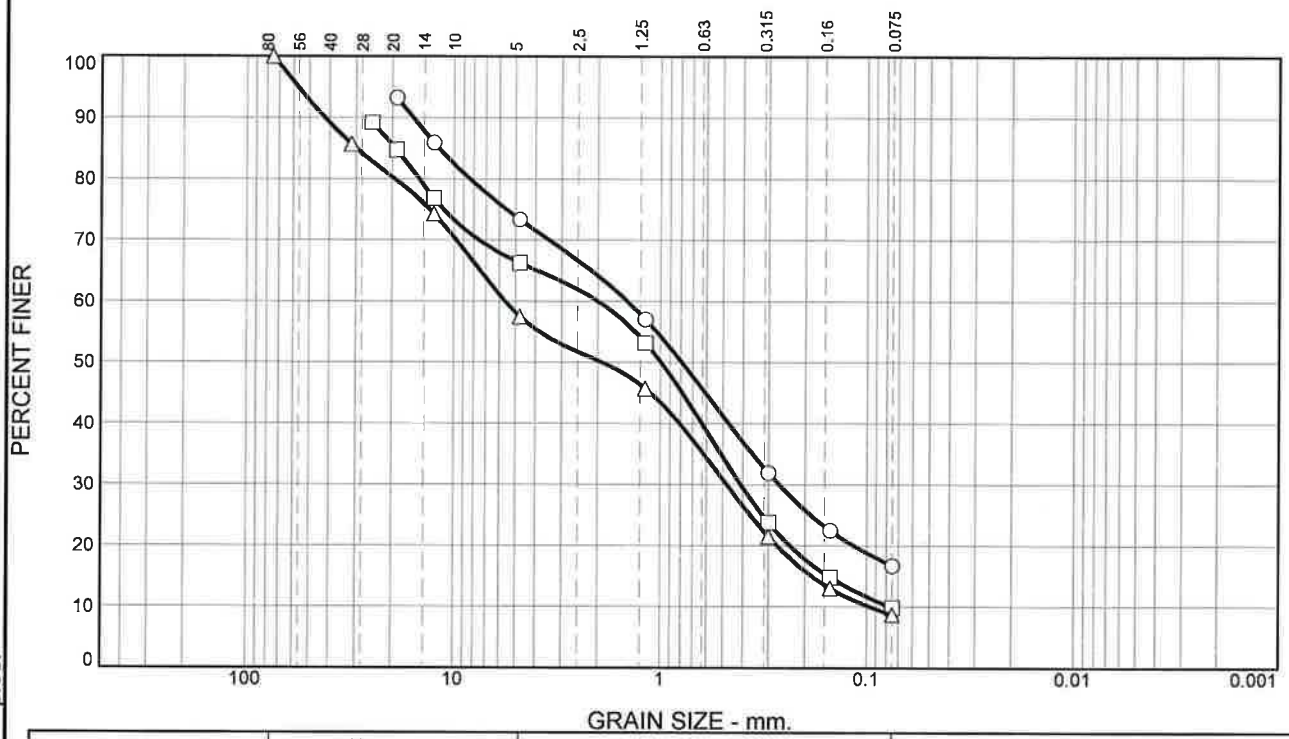
10 20 30 40 50



APPENDIX IV

LABORATORY TESTING RESULTS

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○				9	26	21	17	
□			19	6	29	21	10	
△	0	20	23	7	22	19	9	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			11.8456	1.4490	0.7902	0.2673				
□			19.3161	2.0070	0.9955	0.4093	0.1533	0.0771	1.08	26.04
△			29.9117	5.6231	1.9142	0.4793	0.1848	0.0961	0.43	58.53

	Material Description	USCS	AASHTO
○			
□	Compact to Very Dense Brown Sand and Gravel Till with Trace Silt and Cobbles		
△			

Project No. 9069 **Client:** PWGSC

Project: Geotechnical Investigation - Atlantic Institution

○ **Source of Sample:** BH1 **Depth:** .76 **Sample Number:** 2

□ **Source of Sample:** BH1 **Depth:** 1.83 **Sample Number:** 4

△ **Source of Sample:** BH1 **Depth:** 3.05 **Sample Number:** 6

Remarks:

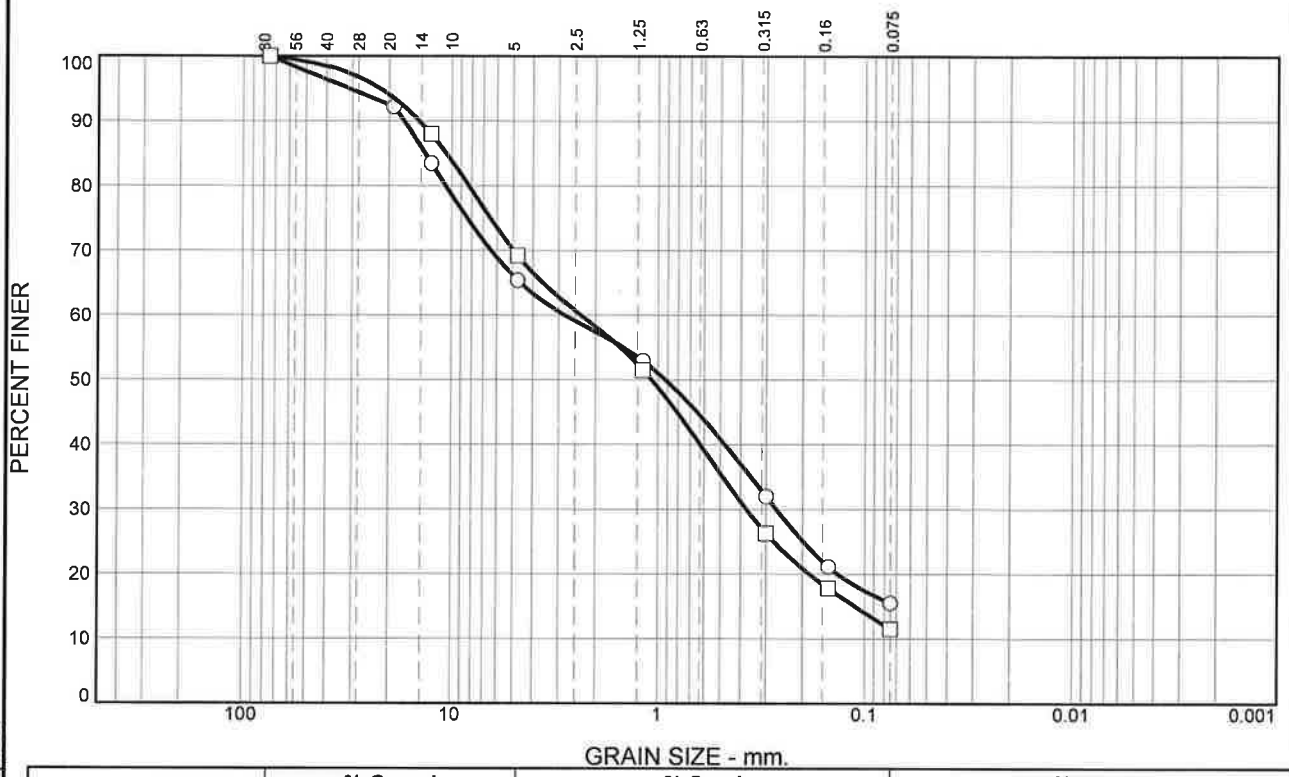
FUNDY Engineering

Figure

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently identical samples.

Tested By: Rob Haineault

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	8	27	8	19	23	15	
□	0	6	25	11	26	21	11	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			13.4075	2.8106	0.9220	0.2685				
□			10.6109	2.3484	1.0730	0.3748	0.1119			

	Material Description	USCS	AASHTO
○			
□			

Project No. 9069 **Client:** PWGSC

Project: Geotechnical Investigation - Atlantic Institution

○ **Source of Sample:** BH2 **Depth:** .61 **Sample Number:** 2

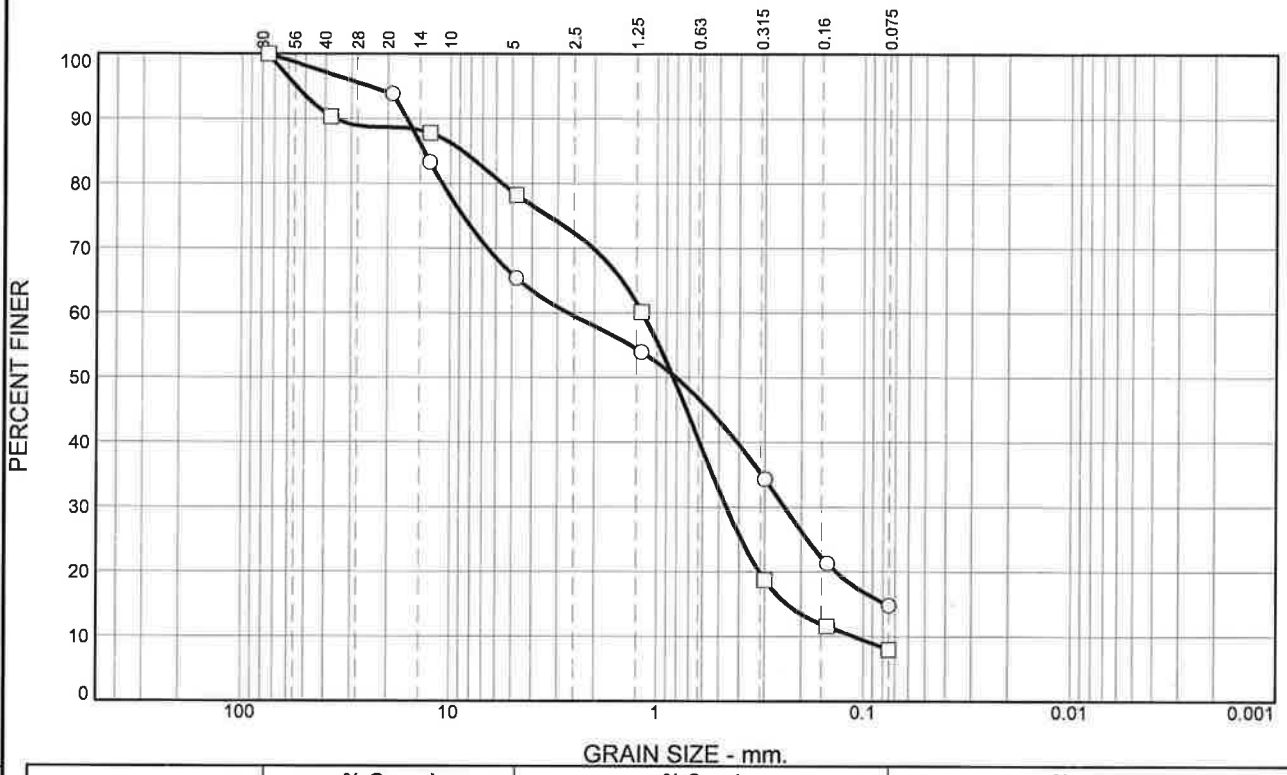
□ **Source of Sample:** BH2 **Depth:** 1.22 **Sample Number:** 3

Remarks:

FUNDY Engineering

Figure

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	6	29	7	17	26	15	
□	0	11	11	8	42	20	8	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			13.3321	2.6645	0.8083	0.2420	0.0776			
□			8.7317	1.1725	0.8356	0.4610	0.2344	0.1109	1.63	10.57

	Material Description	USCS	AASHTO
○			
□	Dense Greyish Goldish Brown Gravelly Sand Till with Trace Silt and Cobbles		

Project No. 9069 **Client:** PWGSC

Project: Geotechnical Investigation - Atlantic Institution

○ **Source of Sample:** BH3 **Depth:** .9 **Sample Number:** 2

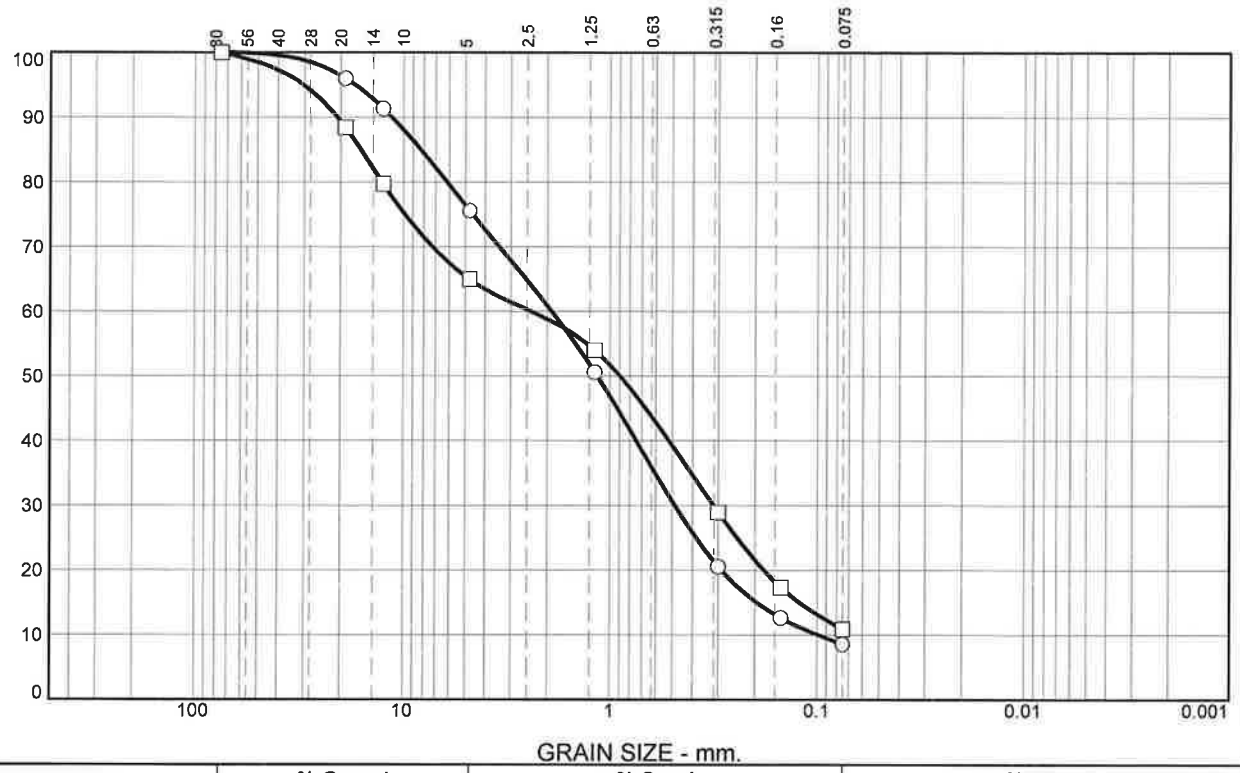
□ **Source of Sample:** BH3 **Depth:** 1.52 **Sample Number:** 3

Remarks:

FUNDY Engineering

Figure

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	4	20	15	34	18	9	
□	0	12	23	6	23	25	11	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			8.2578	1.9039	1.1492	0.4862	0.1964	0.0996	1.25	19.12
□			16.0154	2.4005	0.8947	0.3169	0.1225			

Material Description	USCS	AASHTO
○ Compact to Dense Goldish Brown Gravelly Sand Till with Trace Silt and Cobbles		
□ Compact to Dense Goldish Brown Gravelly Sand Till with Some Silt and Cobbles		

Project No. 9069 **Client:** PWGSC

Project: Geotechnical Investigation - Atlantic Institution

○ **Source of Sample:** BH4 **Depth:** .61 **Sample Number:** 2

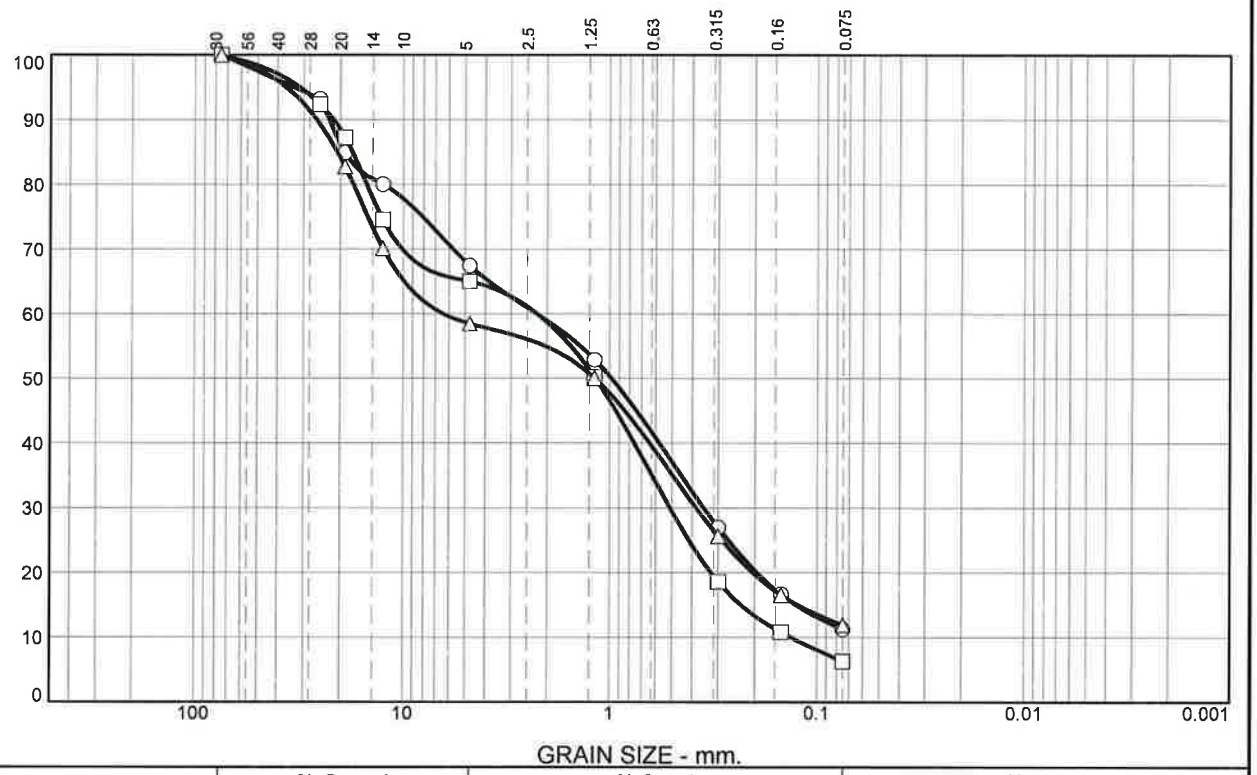
□ **Source of Sample:** BH4 **Depth:** 2.44 **Sample Number:** 5

Remarks:

FUNDY Engineering

Figure

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	15	18	8	25	23	11	
□	0	13	22	6	33	20	6	
△	0	17	24	4	23	20	12	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			19.0238	2.2400	0.9784	0.3522	0.1270			
□			17.4758	2.2321	1.1685	0.5119	0.2340	0.1342	0.87	16.64
△			20.6403	6.3808	1.1733	0.3829	0.1248			

Material Description	USCS	AASHTO
○ Compact Brown Gravelly Sand Till with Some Silt and Cobbles		
□ Compact to Dense Brown Sand and Gravel Till with Trace Silt and Organics		
△ Very Dense Brown Sand and Gravel Till with Some Silt and Cobbles		

Project No. 9069 **Client:** PWGSC

Project: Geotechnical Investigation - Atlantic Institution

○ **Source of Sample:** BH5 **Depth:** .3 **Sample Number:** 1

□ **Source of Sample:** BH5 **Depth:** 1.52 **Sample Number:** 3

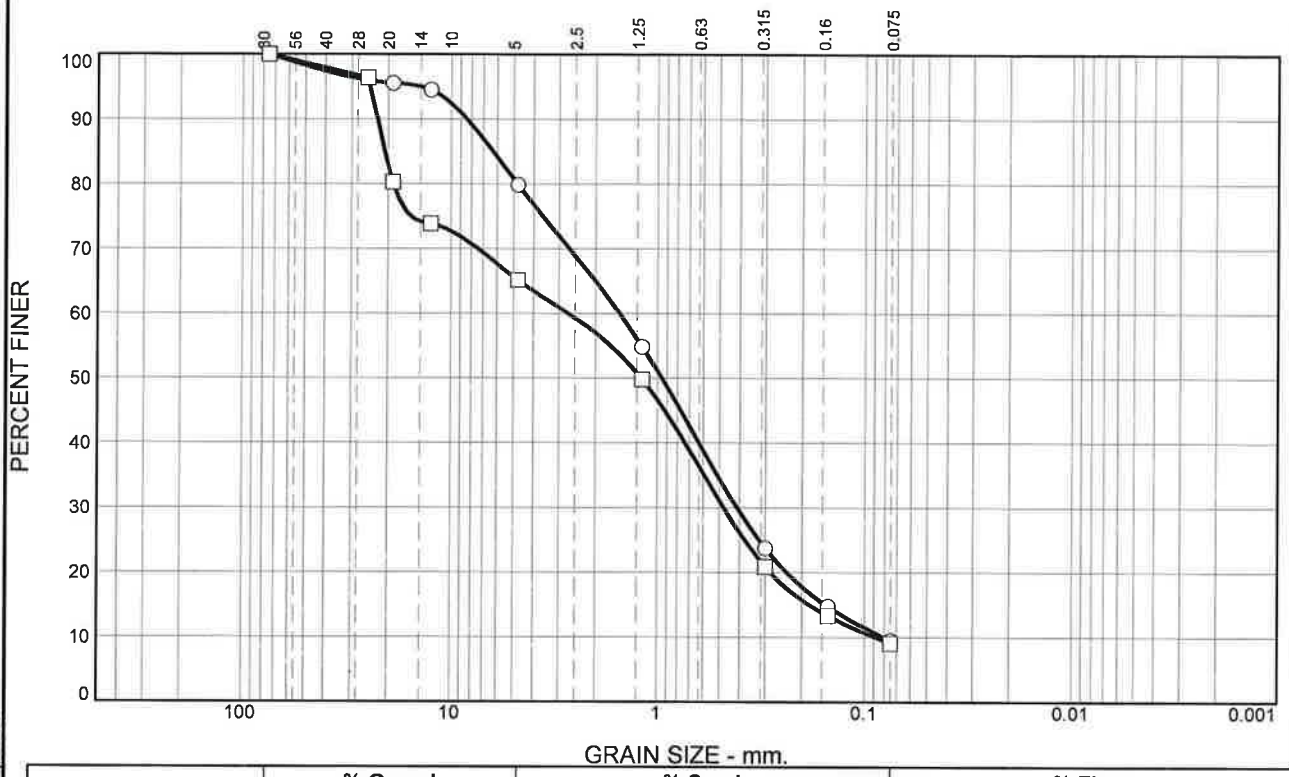
△ **Source of Sample:** BH5 **Depth:** 2.74 **Sample Number:** 5

Remarks:

FUNDY Engineering

Figure

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	4	16	15	34	22	9	
□	0	20	15	8	30	18	9	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			6.2712	1.5174	0.9514	0.4112	0.1535	0.0809	1.38	18.76
□			20.7672	2.7009	1.1922	0.4769	0.1842	0.0891	0.95	30.32

	Material Description	USCS	AASHTO
○			
□			

Project No. 9069 **Client:** PWGSC

Project: Geotechnical Investigation - Atlantic Institution

○ **Source of Sample:** BH6 **Depth:** .9 **Sample Number:** 2

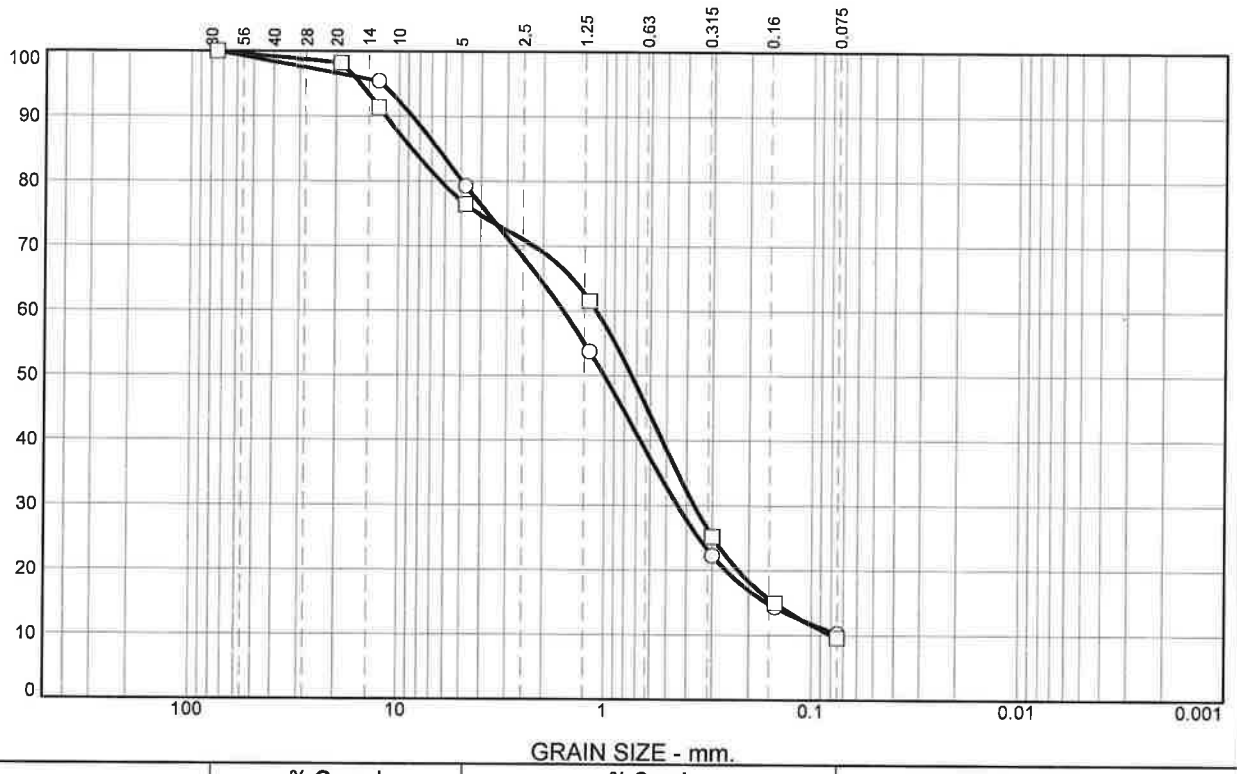
□ **Source of Sample:** BH6 **Depth:** 2.13 **Sample Number:** 4

Remarks:

FUNDY Engineering

Figure

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	4	17	15	35	19	10	
□	0	2	22	7	35	24	10	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			6.5070	1.5930	1.0049	0.4429	0.1636			
□			8.6850	1.0967	0.7413	0.3678	0.1509	0.0799	1.54	13.73

	Material Description	USCS	AASHTO
○	Compact to Very Dense Brown Gravelly Sand Till with Some Silt and Cobbles		
□			

Project No. 9069 **Client:** PWGSC

Project: Geotechnical Investigation - Atlantic Institution

○ **Source of Sample:** BH7 **Depth:** .3 **Sample Number:** 1

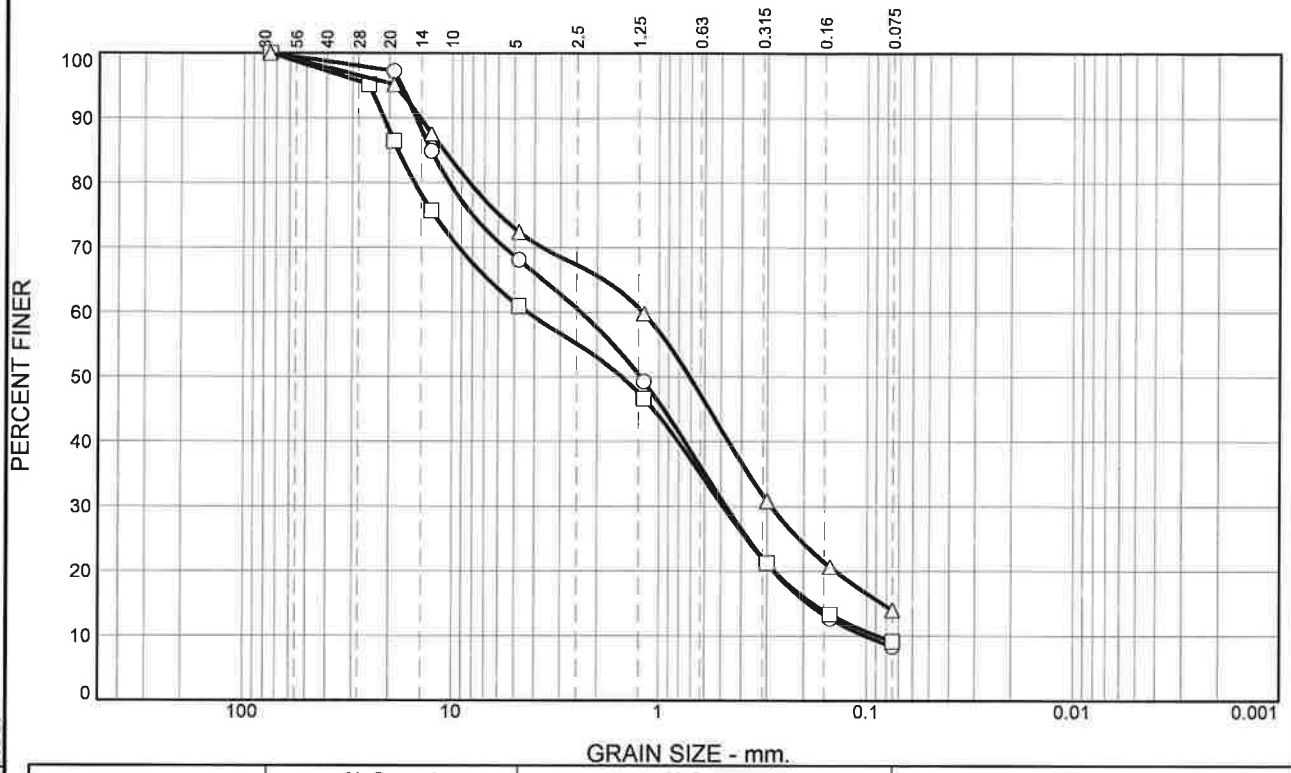
□ **Source of Sample:** BH7 **Depth:** 2.13 **Sample Number:** 4

Remarks:

FUNDY Engineering

Figure

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	3	29	10	30	20	8	
□	0	13	26	8	26	18	9	
△	0	5	23	6	28	24	14	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			12.5419	2.3898	1.2290	0.4742	0.1904	0.1020	0.92	23.42
□			18.1224	4.3205	1.5124	0.4885	0.1819	0.0890	0.62	48.56
△			10.9192	1.1973	0.7115	0.2872	0.0844			

	Material Description	USCS	AASHTO
○			
□			
△	Dense Goldish Brown Gravelly Sand Till with Some Silt and Cobbles		

Project No. 9069 **Client:** PWGSC

Project: Geotechnical Investigation - Atlantic Institution

○ **Source of Sample:** BH8 **Depth:** .61 **Sample Number:** 1

□ **Source of Sample:** BH8 **Depth:** 1.83 **Sample Number:** 3

△ **Source of Sample:** BH8 **Depth:** 2.44 **Sample Number:** 4

Remarks:

FUNDY Engineering

Figure