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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 50 Bed Living Unit, Westmorland Ins	
Solicitation No. - N° de l'invitation EC016-130878/A	**Amendment No. - N° modif.** 002
Client Reference No. - N° de référence du client R.043929.001	**Date** 2012-08-14
GETS Reference No. - N° de référence de SEAG PW-$PWB-020-3101	
File No. - N° de dossier PWB-2-35024 (020)	**CCC No./N° CCC - FMS No./N° VME**
Solicitation Closes - L'invitation prend fin **at - à 02:00 PM** **on - le 2012-09-13**	**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: Donovan, Janine PWB	**Buyer Id - Id de l'acheteur** pwb020
Telephone No. - N° de téléphone (506) 636-5347 ( )	**FAX No. - N° de FAX** (506) 636-4376
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Canada

Cette modification de l'invitation numéro 2 est soumise et comprend la modification numéro 2 suivante.

La modification qui suit apportée aux documents de soumission entre en vigueur dès maintenant. L'addenda fera partie des documents de contrat. **Toutes autres conditions ne changent pas.**

Modification numéro 2

1. **DEVIS**

AJOUTEZ Geotechnical Investigation Report ci-attaché.

AJOUTEZ "Detailed Topographic Survey" inclus comme ATT 2 (EDD Ang.)

AJOUTEZ "CSC 40(50)-Bed Living Units Technical Specification Rev. 1" inclus comme ATT 3 (EDD Ang.)

2. **FORMULAIRE DE SOUMISSION**

IP01 Document de Soumission, 3. Attestations pour le Code de conduite - Consentement la vérification de l'existance d'un casier judiciaire, **AJOUTEZ**

Ce qui précède devrait être rempli et fourni avec à la soumission la date de clôture de l'invitation à soumissionner. Si ce qui précède n'est pas rempli et fourni avec la soumission à la date de clôture de l'invitation à soumissionner, l'autorité contractante en informera le soumissionnaire et lui donnera un délai afin de se conformer aux exigences. Le défaut de répondre à la demande de l'autorité contractante et de se conformer aux exigences dans les délais prévus aura pour conséquence que la soumission sera déclare non recevable.

3. **MODIFICATION DE L'INVITATION 1**

SUPPRIMEZ Question et Réponse 1.

GEOTECHNICAL INVESTIGATION REPORT:

GEOTECHNICAL INVESTIGATION
WESTMORLAND INSTITUTION
DORCHESTER,
NEW BRUNSWICK

Prepared for:

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

April 2011

Prepared by:

FUNDY Engineering

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

www.fundyeng.com

Project No: 8255

EXECUTIVE SUMMARY

Fundy Engineering & Consulting Ltd. (Fundy Engineering) was contracted by Public Works and Government Services Canada to complete a geotechnical investigation at Westmorland Institution in Dorchester, New Brunswick. The purpose of this geotechnical investigation was to identify the soils and rock within the area of the proposed structure, determine the properties of the soils and rock, and to provide earthwork recommendations for the construction of a new structure. The geotechnical investigation consisted of six (6) boreholes in the cleared area to the east of the existing facilities. A track mount drill supplied and operated by Lantech Drilling was used. The boreholes were extended through the overburden material until bedrock was encountered and then the bedrock was cored for a minimum of 3 m.

Soils encountered in this geotechnical investigation can generally be described as a Loose to Dense Brown Silty Sand with Trace Gravel that overlays a Very Stiff to Hard Reddish Brown Clay and Sand Till with Some Gravel. A thin layer of vegetation with roots at the ground surface overlays the materials noted above. Throughout the Till stratum, various sand seams were encountered. Bedrock was encountered in every borehole, with a depth ranging from 2.9 m to 6.5 m. The bedrock's, rock quality designation (RQD) ranged from 11% to 100% (Very Poor to Excellent), can be classified as an interbedded Sandstone and Mudstone. Compressive strength testing was performed on a representative sample of rock cores, and had results ranging from 23 MPa in BH1 at 5.2 m depth to 43.1 MPa in BH6 at 10 m depth. Groundwater was encountered in various boreholes, with depths ranging from 1.2 m to 2.4 m.

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

- Any expanded parking areas and roadways will require the removal of the overburden and organic materials down to the design depths. Approved Engineered fills will be required for fill to the underside of the asphalt base.
- Footings founded on Very Stiff to Hard Reddish Brown Clay and Sand Till may be designed with an allowable bearing capacity of 150 kPa and should be a minimum 600 mm wide. Total and differential settlements under the proposed loading will be less than 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.

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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 Westmorland Institution in Dorchester, 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 structure. The geotechnical investigation consisted of six (6) boreholes in the cleared area to the east of the existing facilities. A track mount drill supplied and operated by Lantech Drilling was used.

The boreholes were extended through the overburden material until bedrock was encountered, which was then cored for a minimum of 3 m. All elevations are referenced to the manhole noted on the attached Site Plan (see Sheet S1).

1.1.1 Scope of Work Completed

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

- Six (6) 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 a new structure.

1.1.2 Limitations

The observations made and facts presented in this report are based on the site visit carried out in March 2011. While every effort has been made to comprehensively catalogue geotechnical concerns pertaining to Westmorland Institution in Dorchester, 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

2.1.1 Area of Interest

The existing area is a cleared vegetated field, which is located to the east of the existing facilities that make up Westmorland Institution. There is a gravel road that runs west to east along the northern side of this cleared area, with an existing baseball field beyond this road to the north. In addition, there is a small watercourse that exists to the east of the area of interest. The focus of this geotechnical investigation was primarily to the north-west of this cleared area.

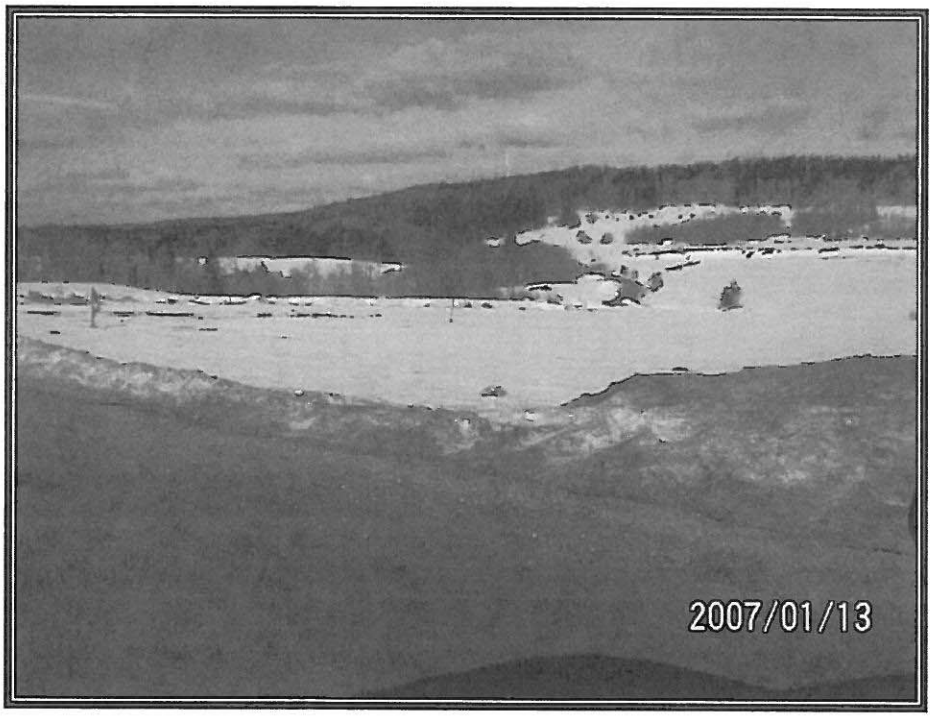

Figure 1 – Cleared vegetative area to the east of the existing facilities (photo taken by Darren Oulton on March 14, 2011).

2.1.2 Location and Property Ownership

The subject property is the location of Westmorland Institution at 4209 Main Street in Dorchester, NB. This facility contains numerous structures, in addition to the cleared vegetated area noted above. The property is identified by Service New Brunswick as PID#00795633. The registered owner of the 143.5 ha property is the Government of Canada-Public Works. The property is accessible via Route 106.

2.1.3 Geotechnical Setting

Surficial geology in the area consists of Marine Sediments of the Holocene epoch, namely intertidal plains and salt marshes: clay, silt, some fine sand, minor peat and organic sediment; generally more than 2 m thick (New Brunswick Department of Natural Resources, Surficial Geology-New Brunswick, Geological Survey of Canada, Map 1594A, 1984).

3.0 SITE WORK COMPLETED

3.1.1 Borehole Investigation

The purpose of the borehole investigation was to assess the underlying soils and bedrock in the cleared field to the east of the existing facilities in order to provide recommendations for the earthwork required in the construction of a new structure. On March 21st and 22nd, 2011, six (6) geotechnical boreholes were put down to obtain such information via a track mounted drill provided by Lantech Drilling Services 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 a minimum of 3 m into the bedrock. Elevations are in reference to the manhole located to the west of the work area, which is located on the attached Site Plan (see Sheet S1).

3.1.2 Soils Encountered

Soils encountered in this geotechnical investigation can generally be described as a Loose to Dense Brown Silty Sand with Trace Gravel that overlays a Very Stiff to Hard Reddish Brown Clay and Sand Till with Some Gravel. A thin layer of vegetation with roots at the ground surface overlays the materials noted above. Throughout the Till stratum, various sand seams were encountered. 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).

3.1.3 Bedrock Encountered

Bedrock was encountered in every borehole with a depth ranging from 2.9 m to 6.5 m. The bedrock's rock quality designation (RQD) ranged from 11% to 100% (Very Poor to Excellent), can be classified as an interbedded Sandstone and Mudstone. Compressive strength testing was performed on a representative sample of rock cores, and had results ranging from 23 MPa in BH1 at 5.2 m depth to 43.1 MPa in BH6 at 10 m depth. Please see the attached borehole logs (Appendix III) for completed information on the bedrock encountered in this investigation.

The 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 8.6 suggests the sample is basic / alkaline), 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 < 1 % 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 £ 2.6 kg $CaCO_3 \times tonne^{-1}$. This represents the amount of acid generating sulfur minerals contained in the sample. The neutralizing potential pH 8.6 data indicate that the sample is capable of neutralizing a considerable amount (*i.e.*, 40 ×) of the acidity potentially produced. A rock substrate is considered "potentially toxic" when the net acid-base accounting is < - 5 kg $CaCO_3 \times tonne^{-1}$. The sample submitted yielded a net neutralizing potential between 102 kg $CaCO_3 \times tonne^{-1}$ indicating that there is extremely limited potential that the rock could lead to toxic conditions from acid rock drainage.

3.1.4 Groundwater Encountered

Groundwater was encountered in various boreholes, with depths ranging from 1.2 m in BH1 and BH4 to 2.4 m in BH6. No groundwater was encountered in BH3 and BH5.

3.1.5 Radon Testing

One (1) borehole was sampled for radon gas. The representative borehole was selected on site 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 of the EIC was conducted by our geotechnical technologist supervising the drilling operation.

1. The EIC was placed in a perforated housing and lowered into the borehole to a depth of approximately one metre below existing grade. The EIC was suspended from the top of the borehole casing.
2. The top of the borehole was then sealed airtight with a plug.
3. The EIC remained in the borehole for a total of 48 hours.

Collection of EIC Sampling Kit

The collection of the EIC was conducted by our senior air quality technologist.

1. Following the 48 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).
3. A letter report was prepared which explains the sample analysis, as well as what impacts the identified radon levels may have on the proposed structure.

Results of Radon Testing

Sample Identification	Radon Detected (Bq/m^3)
Borehole #2	<1

Health Canada recommends remedial action is taken if a radon concentration in an occupied indoor space exceeds 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 well below the recommended threshold limit value.

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 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.

In general two options are acceptable for the design of footings:

1. Footings founded on Very Stiff to Hard Reddish Brown Clay and Sand Till.
2. Footings founded on bedrock.

Design recommendations have been developed for all three of the above options to assist building designers in making the most economical choice based on building requirements, site layout, etc.

4.1.1 Site Preparation

With any development in the area of the investigation, it is recommended that the layer of topsoil be removed. In addition, the Loose to Compact Silty Sand should be removed. At a minimum the excavation to prepare the site for foundation footings should extend to the Very Stiff to Hard Reddish Brown Clay and Sand Till.

4.1.2 Footings Founded on Very Stiff to Hard Reddish Brown Clay and Sand Till

The 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 Till which is susceptible to water softening. Traffic should also be minimized in the building footprint as building grade is approached to prevent the mobilization of the Till material at the surface.

After the removal of all unsuitable materials the footings are to be placed on the Till material. 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 sandstone or other approved inorganic soil.

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 0.30 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.

Footings founded on Very Stiff to Hard Reddish Brown Clay and Sand Till may be designed with an allowable bearing capacity of 150 kPa and should be a minimum 600 mm wide. Total and differential settlements under the proposed loading will be less than 25 mm and 15 mm, respectively. 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. Footings may be placed directly on competent Till or on compacted structural fill.

All footings should have a minimum of 1.5 m of soil cover or equivalent in insulation for frost protection. All footings should also have a minimum of 600 mm coverage above any ground water.

4.1.3 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

4.1.4 Material Reuse

Any overburden material removed from the site has limited reuse application. Due to the high fine material content, these materials shall not be used as a bedding sand, roadway sub-base or roadway base.

5.0 CONCLUSIONS AND CLOSING REMARKS

The purpose of this geotechnical investigation was to identify the soils and bedrock within the area of the proposed structure, determine the properties of the soils and rock, and to provide recommendations for the earthwork required in the construction of a new structure. The geotechnical investigation consisted of six (6) boreholes located to the east of the existing facilities. The boreholes were extended through the overburden material until bedrock was encountered and then cored for a minimum of 3 m.

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- 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.

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. Gordon Mouland, M.Eng., P.Eng.

FUNDY Engineering

fundy@fundyeng.com
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Candice E. Wood, P.Eng
Public Works and Government Services Canada
1045 Main Street, Unit 100
Moncton, NB
E1C 1H1

May 12, 2011
File# 8255

RE: Westmorland Institution Project – Response to PWGSC Questions

Dear Ms. Wood,

The following letter has been prepared in response to questions forwarded to Fundy Engineering from your office on April 28th, 2011. Please refer to the attached email as a reference.

The following recommendations should be considered as an addition to our Report *"Geotechnical Investigation Westmorland Institution"*, dated April, 2011. The recommendations made in this letter do not supersede any made in our previous report.

The email forwarded to our office included three questions. There are as follows:

1. On page 3 "*Throughout the Till stratum,various sand seams were encountered*"
   Comment / Question: On several sites of development the occurrence of sand seams in the till often has resulting in water infiltration into the excavation thereby resulting in sloughing of wet soils into the excavation from the earth sidewalls and surface localized soil mess in the bottom of footing trenches that often required sub-excavation of sloppy-wet soils and replacement with either a concrete mud mat or compacted granular fill. Impact was to schedule and cost.

   Question: Is the above likely to occur at this site based on the soils investigation? Yes / No?

Answer:

Groundwater was present in all boreholes with the exception of boreholes 3 and 5. Therefore it is likely that water will enter the excavation during construction. Groundwater intrusion into the excavation for footings would cause soils to soften and reduce the bearing capacity of the insitu soils. Water intrusion into the footing excavation should be avoided wherever possible. If groundwater does enter the excavation it should be allowed to drain or be pumped out as soon as possible. In the event that groundwater softens the soils under the proposed footings then soft areas should be over excavated to competent material. Over excavated areas should be replaced with granular fills or shot rock. Over excavation activities, proposed materials inspection and fill operations should be to the satisfaction of an on-site geotechnical engineer.

2. Page 6 "Material Reuse"
   Comment / Question: The text indicates that "*Any overburden material removed from the site has limited reuse application…..shall not be used as a bedding sand, roadway sub-base or roadway base*"
   Question: Can any of the overburden material removed from the site material be considered for "engineered fills used to bring site up to grade"? Yes / No?
   Impact is contractor not knowing from the report if site material is reusable for other than specified?

Answer:

Due to the amount of fines present in the insitu material it may not be used as backfill for the underside of footings, foundation walls or floor slabs. Onsite materials may be used as subgrade to bring the site to grade, but may not be used within the building footprint, as wall backfill or as roadway and parking lot sub-base.

3. Page 5/6: "*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 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*"
   Question: In consideration of the report "*allowable bearing capacity of 150kpa*", are the slope angles 1:1 and 0.5 m apron width adequate for any fill pad thickness and material type for building support? Yes / No

Answer:

The recommendations for fill placement layout, i.e. 1:1 slope and 0.5m beyond the edge of the footing, are acceptable for any pad thickness. Fills under the footings are recommended to be a Class “B” fills. Please refer to Table 1 for acceptable grain size requirements for Class “B” fills.

Table 1 Class “B” grain size requirements

Sieve Size (mm)	% Passing
100	100
75	95 - 100
25	43 - 83
19	38 - 80
12	32 - 72
9.5	28 - 66
4.75	19 - 55
2	9 - 38
0.425	5 - 15
0.075	3 - 8

Class “B” fills should be placed over the insitu Very Stiff to Hard Reddish Brown Clay and Sand Till.

All proposed fills to be placed on site should be provided to a geotechnical engineer for approval. Grain size analysis and moisture density relations testing are recommended for proposed fills prior to placement at the site. It is recommended that all on site fill placement procedures be monitored by a geotechnical engineer and field testing to verify the compaction of materials is also recommended.

We trust the information provided herein is sufficient to meet your current needs. Should you have any questions or require additional information please contact the undersigned at your earliest convenience.

Yours truly,
Fundy Engineering & Consulting Ltd.

Alex Mouland, *P.Eng, PMP*

APPENDIX I

SITE PLAN


BH3
G 46.16m
BH1
G 41.09m
BH5
G 44.26m
49.59
MH
BH4
G 45.78m
BH2
G 39.86m
BH6
G 41.76m
INSTALLED
EXIST 200m
45.98
MH

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.

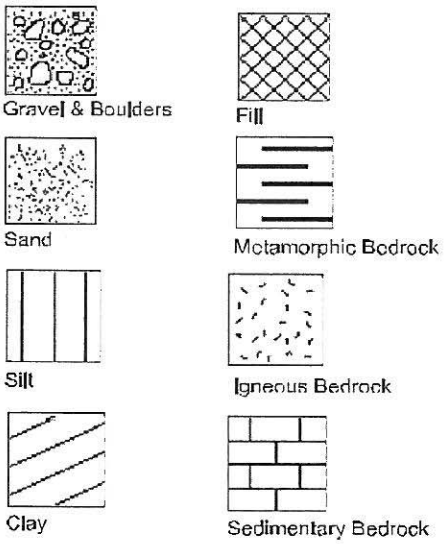
RELATIVE DENSITY	'N' VALUE	RELATIVE DENSITY %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

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.

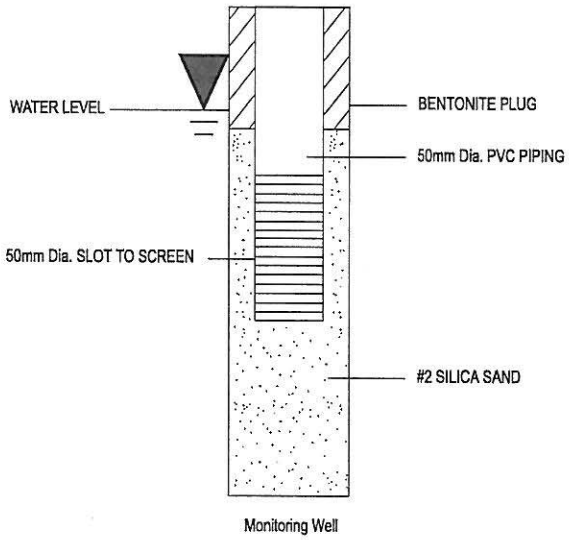
CONSISTENCY	UNDRAINED SHEAR STRENGTH		'N' VALUE
	kips/sq.ft.	kPa	
Very Soft	<0.25	<12.5	<2
Soft	0.25-0.5	12.5-25	2-4
Firm	0.5-1.0	25-50	4-8
Stiff	1.0-2.0	50-100	8-15
Very Stiff	2.0-4.0	100-200	15-30
Hard	>4.0	>200	>30

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

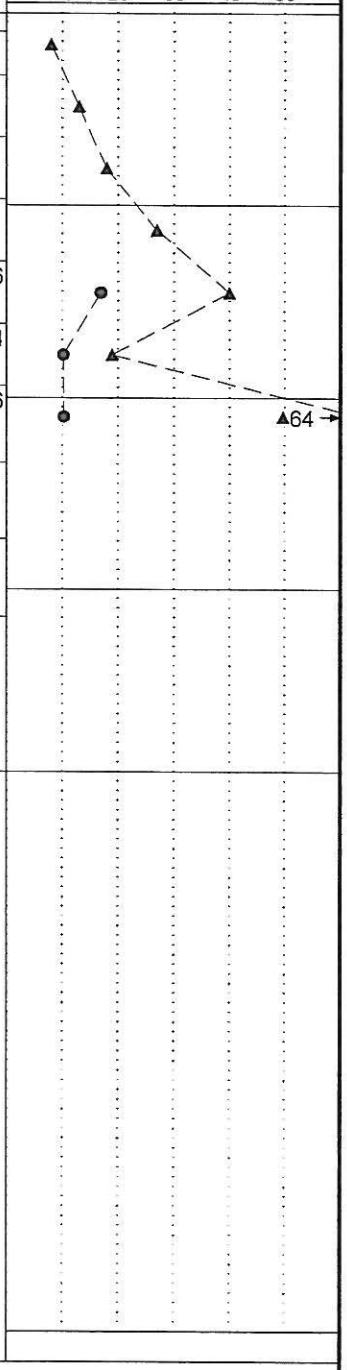
FUNDY Engineering

BOREHOLE LOG
No. BH1

PROJECT: Geotechnical Investigation- Westmorland Institution
CLIENT: PWGSC **DATUM:** Geodetic
PROJECT LOCATION: Dorchester, NB **ELEVATION (m):** 41.09
DRILLING CONTRACTOR: Lantech Drilling Services Ltd. **PROJECT #** 8255
LOGGED BY: Rob Haineault **CHECKED BY:** Al Mouland
DRILLING METHOD: Track Mount **DATE:** March 21, 2011
DEPTH TO WATER (m): INITIAL: 1.22 **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 with Roots	41.09						50	2-3-5-7 (8)	
		Loose to Compact Brown Silty Sand and Gravel							61	4-6-7-9 (13)	
1.24	4.13								0	8-9-9-10 (18)	
									61	10-11-16-15 (27)	
2.48	8.27	Compact to Dense Reddish Brown Clayey Sand Till with Trace Gravel							55	12-15-25-19 (40)	44.6
									61	9-8-11-37 (19)	32.4
3.72	12.4	Hard Reddish Brown Sandy Clay Till with Trace Gravel							61	21-33-31-32 (64)	56.6
4.96	16.53	Excellent Reddish Brown Mudstone RQD=94%									
		Excellent Reddish Brown and White Sandstone Compressive Strength= 23 MPa RQD=100%									
6.2	20.67										
7.44											

TEST RESULTS



FUNDY Engineering

BOREHOLE LOG
No. BH2

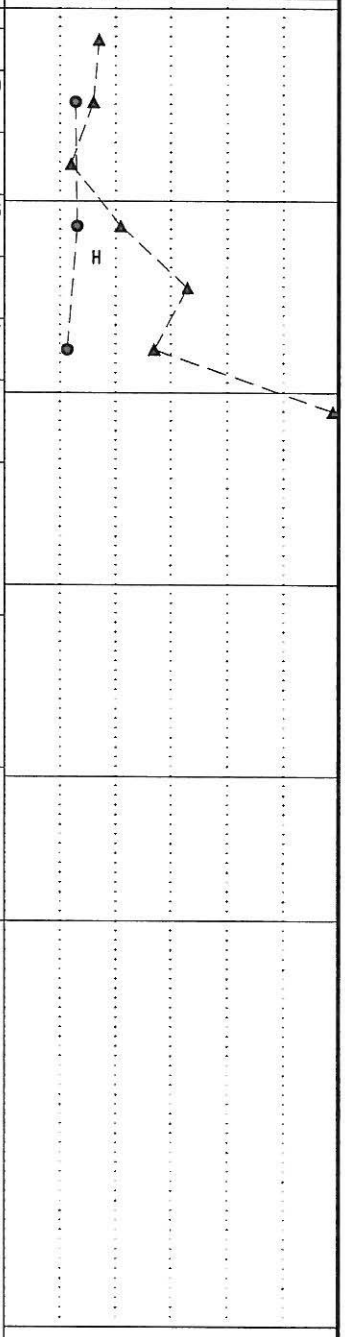
PROJECT: Geotechnical Investigation- Westmorland Institution
CLIENT: PWGSC **DATUM:** Geodetic
PROJECT LOCATION: Dorchester, NB **ELEVATION (m):** 39.86
DRILLING CONTRACTOR: Lantech Drilling Services Ltd. **PROJECT #** 8255
LOGGED BY: Rob Haineault **CHECKED BY:** Al Mouland
DRILLING METHOD: Track Mount **DATE:** March 22, 2011
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 with Roots	39.86						39	2-5-12-14 (17)	
		Compact to Dense Brown Silty Sand with Some Gravel							40	7-8-8-7 (16)	43.0
1.24	4.13								51	4-6-6-6 (12)	
									61	10-11-10-6 (21)	32.6
2.48	8.27								61	9-13-20-20 (33)	
		Very Stiff to Hard Reddish Brown Silt and Sand Till with Some Gravel							61	9-11-16-17 (27)	45.7
3.72	12.4								61		
		Poor Reddish Brown Mudstone RQD=29%									
4.96	16.53										
6.2	20.67	Poor Reddish Brown and White Sandstone RQD=35% Compressive Strength= 43 MPa									
7.44	24.8	RQD=44%									
8.68	28.93										

TEST RESULTS

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

10 20 30 40 50



FUNDY Engineering

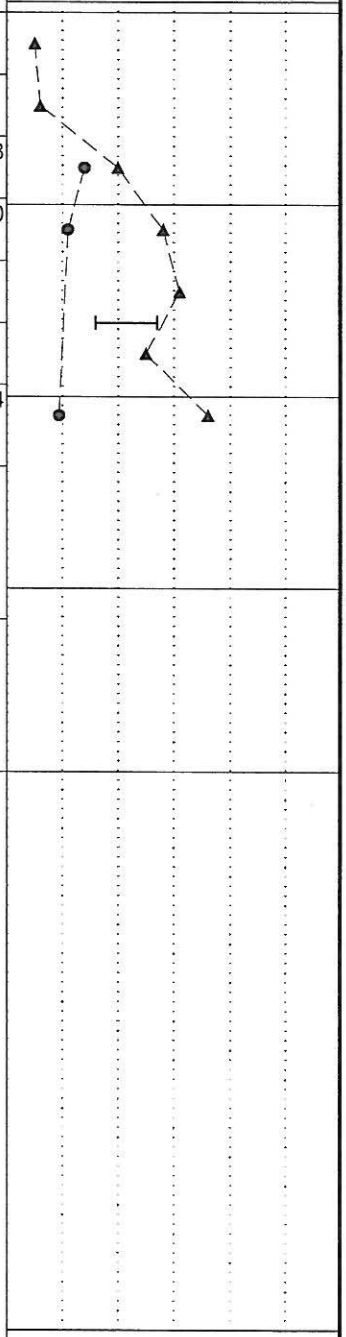
BOREHOLE LOG
No. BH3

PROJECT: Geotechnical Investigation- Westmorland Institution
CLIENT: PWGSC **DATUM:** Geodetic
PROJECT LOCATION: Dorchester, NB **ELEVATION (m):** 46.16
DRILLING CONTRACTOR: Lantech Drilling Services Ltd. **PROJECT #** 8255
LOGGED BY: Rob Haineault **CHECKED BY:** Al Mouland
DRILLING METHOD: Track Mount **DATE:** March 21, 2011
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	Loose Brown Silty Sand with Trace Gravel	46.16						51	3-2-3-3 (5)	
									53	2-3-3-2 (6)	
1.24	4.13	Very Stiff to Hard Brown Sandy Clay Till with Some Gravel							41	9-12-8-10 (20)	58.8
									61	9-13-15-15 (28)	54.0
2.48	8.27								61	12-15-16-19 (31)	
									61	6-10-15-20 (25)	
3.72	12.4								61	10-13-23-25 (36)	50.4
4.96	16.53	Good Reddish Brown and White Sandstone RQD=76%									
6.2	20.67	Fair Reddish Brown Mudstone RQD=53%									
7.44											

TEST RESULTS

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



FUNDY Engineering

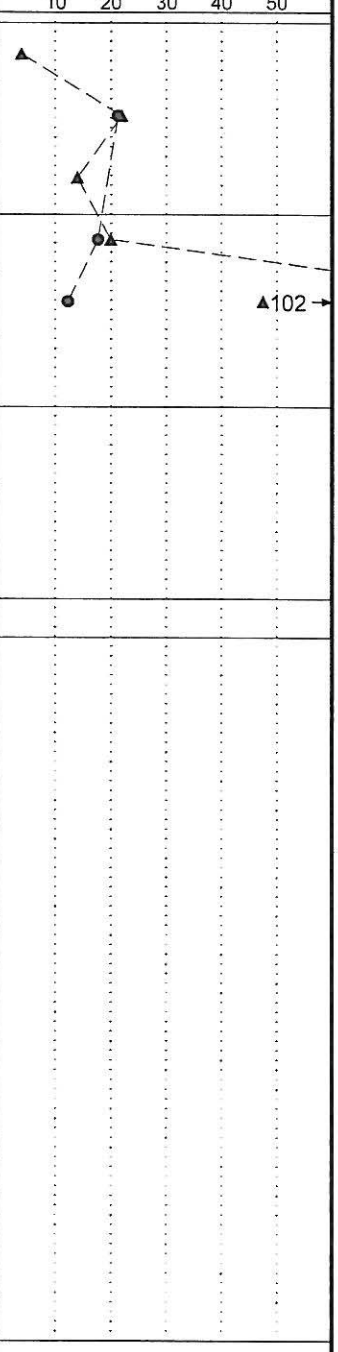
BOREHOLE LOG
No. BH4

PROJECT: Geotechnical Investigation- Westmorland Institution
CLIENT: PWGSC **DATUM:** Geodetic
PROJECT LOCATION: Dorchester, NB **ELEVATION (m):** 45.78
DRILLING CONTRACTOR: Lantech Drilling Services Ltd. **PROJECT #** 8255
LOGGED BY: Rob Haineault **CHECKED BY:** Al Mouland
DRILLING METHOD: Track Mount **DATE:** March 22, 2011
DEPTH TO WATER (m): INITIAL: 1.22 **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 with Roots	45.78						45	1-1-3-5 (4)	
		Loose Brown Sand with Trace Gravel									
		Compact Brown Silty Sand with Trace Gravel							46	6-12-10-6 (22)	26.5
1.24	4.13								15	6-6-8-10 (14)	
		Very Stiff to Hard Brown Clay and Sand Till with Some Gravel							61	7-10-10-10 (20)	44.9
2.48	8.27								61		42.9
		Poor to Fair Reddish Brown Mudstone RQD=33%									
3.72	12.4										
		RQD=69%									
4.96	16.53										

TEST RESULTS

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



FUNDY Engineering

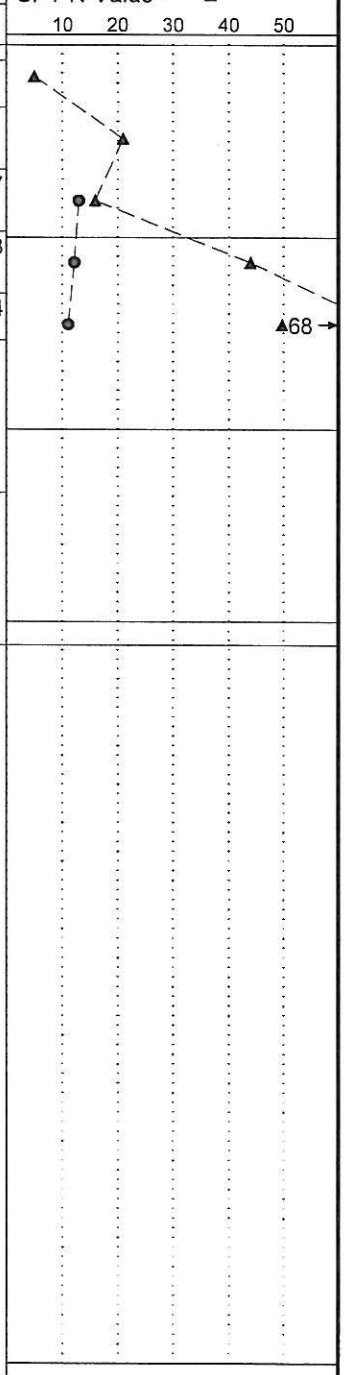
BOREHOLE LOG
No. BH5

PROJECT: Geotechnical Investigation- Westmorland Institution
CLIENT: PWGSC **DATUM:** Geodetic
PROJECT LOCATION: Dorchester, NB **ELEVATION (m):** 44.26
DRILLING CONTRACTOR: Lantech Drilling Services Ltd. **PROJECT #** 8255
LOGGED BY: Rob Haineault **CHECKED BY:** Al Mouland
DRILLING METHOD: Track Mount **DATE:** March 21, 2011
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 with Roots	44.26						41	1-2-3-7 (5)	
		Loose Brown Sand with Gravel									
		Compact Brown Silt and Sand with Trace Gravel							52	5-11-10-8 (21)	
1.24	4.13								48	7-8-8-8 (16)	37.7
		Hard Reddish Brown Sandy Clay Till with Some Gravel							43	15-16-28-34 (44)	47.8
2.48	8.27								40		47.4
		Poor Reddish Brown Mudstone RQD=39%									
3.72	12.4										
		Fair Reddish Brown and White Sandstone RQD=53% Compressive Strength= 29 MPa									
4.96	16.53										

TEST RESULTS

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



FUNDY Engineering

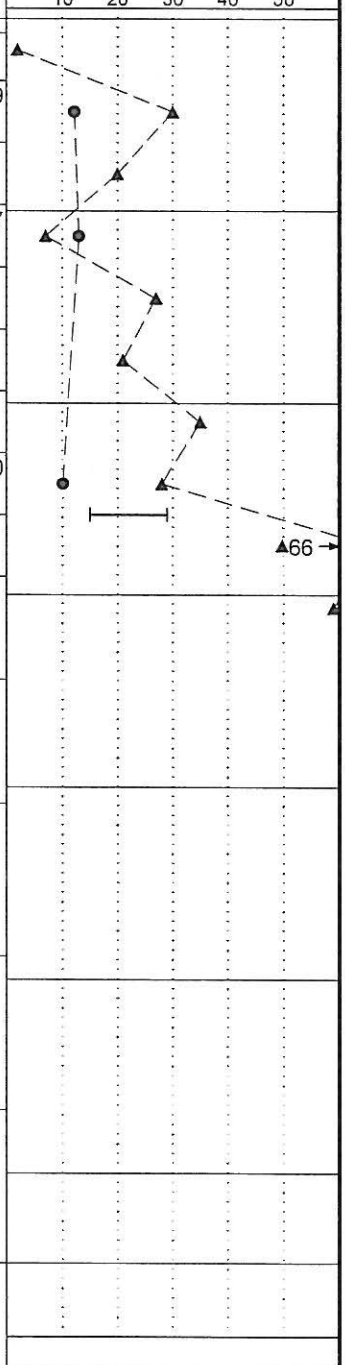
BOREHOLE LOG
No. BH6

PROJECT: Geotechnical Investigation- Westmorland Institution
CLIENT: PWGSC **DATUM:** Geodetic
PROJECT LOCATION: Dorchester, NB **ELEVATION (m):** 41.76
DRILLING CONTRACTOR: Lantech Drilling Services Ltd. **PROJECT #** 8255
LOGGED BY: Rob Haineault **CHECKED BY:** Al Mouland
DRILLING METHOD: Track Mount **DATE:** March 22, 2011
DEPTH TO WATER (m): INITIAL: 2.44 **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 with Roots	41.76						40	1-1-1-5 (2)	
		Very Loose Brown Sand with Gravel							53	10-16-14-11 (30)	13.9
1.24	4.13	Compact to Dense Brown Gravely Sand with Some Silt							46	6-10-10-7 (20)	
		Firm to Very Stiff Reddish Brown Clay and Sand Till with Some Gravel							48	6-3-4-4 (7)	41.7
2.48	8.27								61	10-10-17-16 (27)	
									61	4-7-14-11 (21)	
3.72	12.4	Compact to Very Dense Reddish Brown Clayey Sand Till with Some Gravel							61	12-16-19-18 (35)	
									61	8-11-17-16 (28)	33.0
4.96	16.53								61	13-32-34-38 (66)	
6.2	20.67								61		
		Very Poor Reddish Brown and White Sandstone RQD=11%									
7.44	24.8	RQD=13%									
8.68	28.93										
		Fair Reddish Brown Mudstone RQD=66% Compressive Strength= 43.1 MPa									
9.92	33.07										
		Excellent Reddish Brown and White Sandstone RQD=92%									
11.16	37.2										

TEST RESULTS

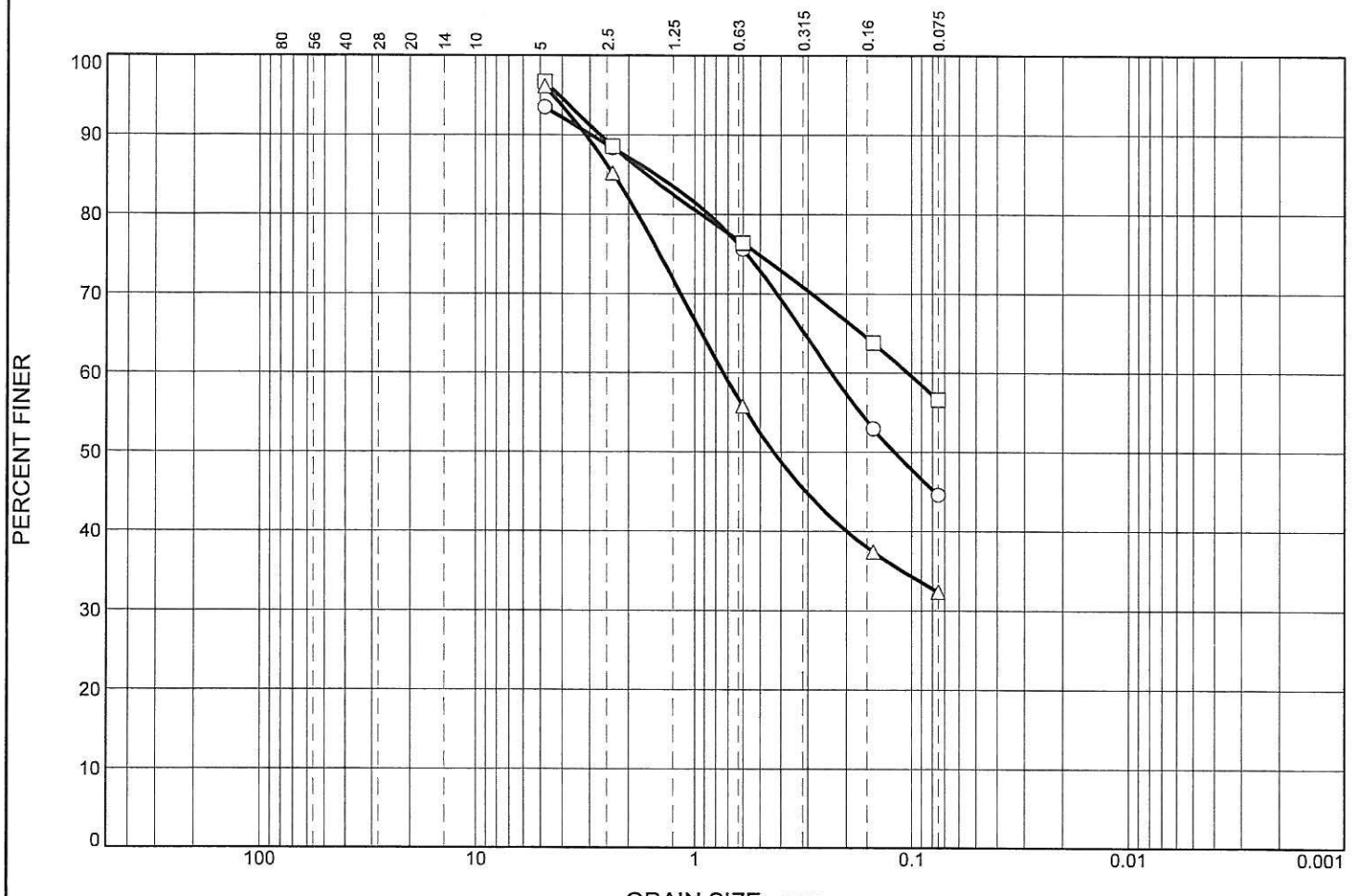
Plastic Limit ⊢ Liquid Limit
Water Content - ●
SPT N-Value - ▲



APPENDIX IV

LABORATORY TESTING RESULTS

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○				6.4	16.8	25.7	44.6	
□				9.9	13.3	16.9	56.6	
△				14.2	32.2	17.3	32.4	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			1.5049	0.2332	0.1201					
□			1.6561	0.1036						
△			2.3416	0.7381	0.4320					

Material Description	USCS	AASHTO
○ BH1 8-10 ft	CL/SC	
□ BH1 12-14 ft	CL	
△ BH1 10-12 ft		

Project No. 8255 **Client:** PWGSC

Project: Geotechnical Investigation- Westmorland Institution

○ **Source of Sample:** BH1 **Depth:** 2.44

□ **Source of Sample:** BH1 **Depth:** 3.66

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

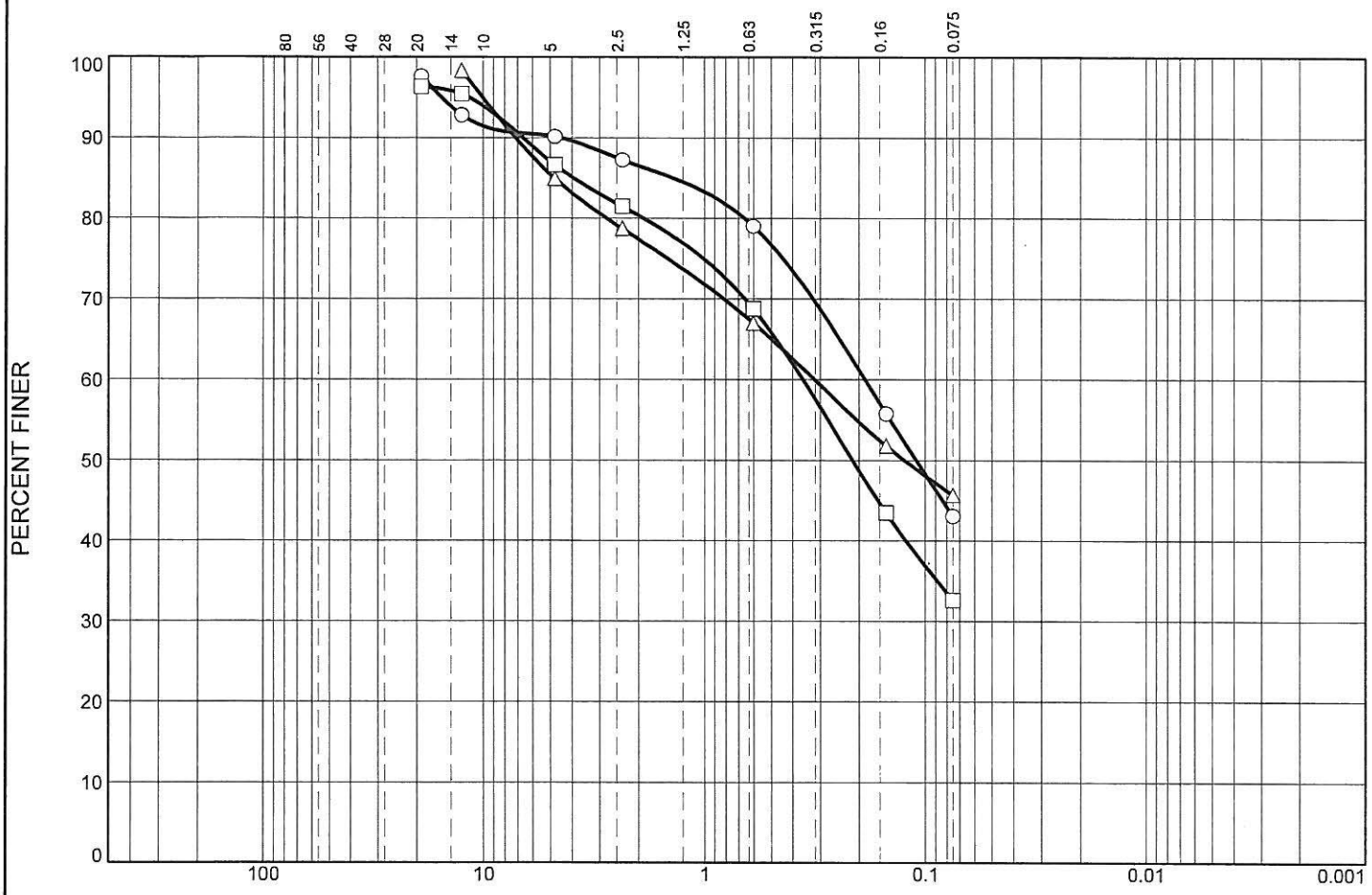
Remarks:

FUNDY Engineering

Figure

Tested By: Rob Haineault

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○				3.6	12.1	31.4	43.0	
□				6.2	17.3	30.5	32.6	
△				7.5	14.1	17.6	45.7	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			1.3917	0.1873	0.1099					
□			3.9476	0.3586	0.2137					
△			4.8012	0.3177	0.1239					

Material Description	USCS	AASHTO
○ BH2 2-4 ft □ BH2 6-8 ft △ BH2 10-12 ft	VS	

Project No. 8255 **Client:** PWGSC

Project: Geotechnical Investigation- Westmorland Institution

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

□ **Source of Sample:** BH2 **Depth:** 1.83

△ **Source of Sample:** BH2 **Depth:** 3.05

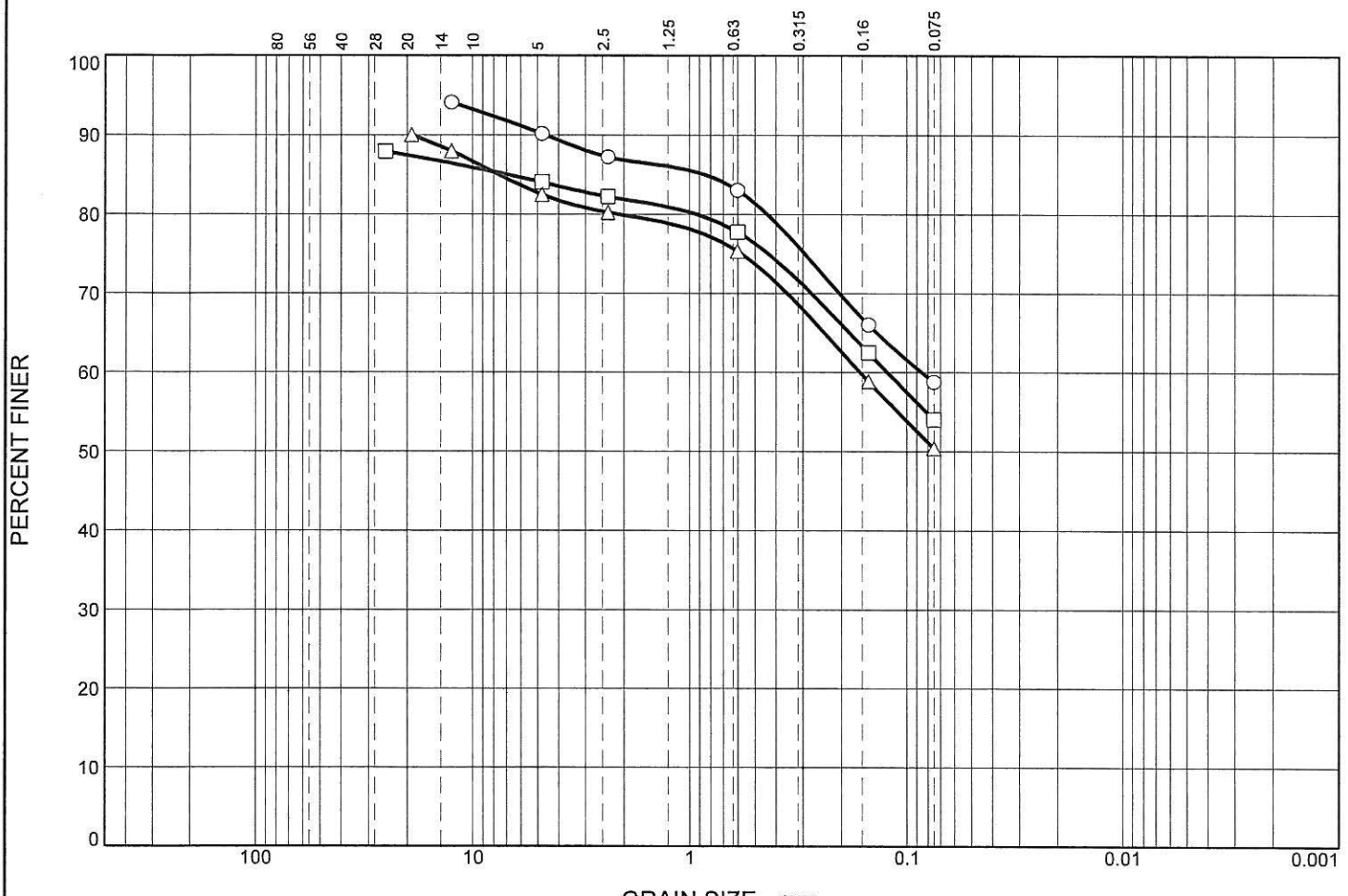
Remarks:

FUNDY Engineering

Figure

Tested By: Rob Haineault

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○				3.3	7.1	20.9	58.8	
□			3.3	2.2	7.0	20.8	54.0	
△				2.6	7.8	21.7	50.4	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_C	C_U
○			0.8482	0.0851						
□			6.8920	0.1228						
△			7.5437	0.1639						

Material Description	USCS	AASHTO
○ BH3 4-6 ft □ BH3 6-8 ft △ BH3 12-14 ft		

Project No. 8255 **Client:** PWGSC

Project: Geotechnical Investigation- Westmorland Institution

○ **Source of Sample:** BH3 **Depth:** 1.22

□ **Source of Sample:** BH3 **Depth:** 1.83

△ **Source of Sample:** BH3 **Depth:** 3.66

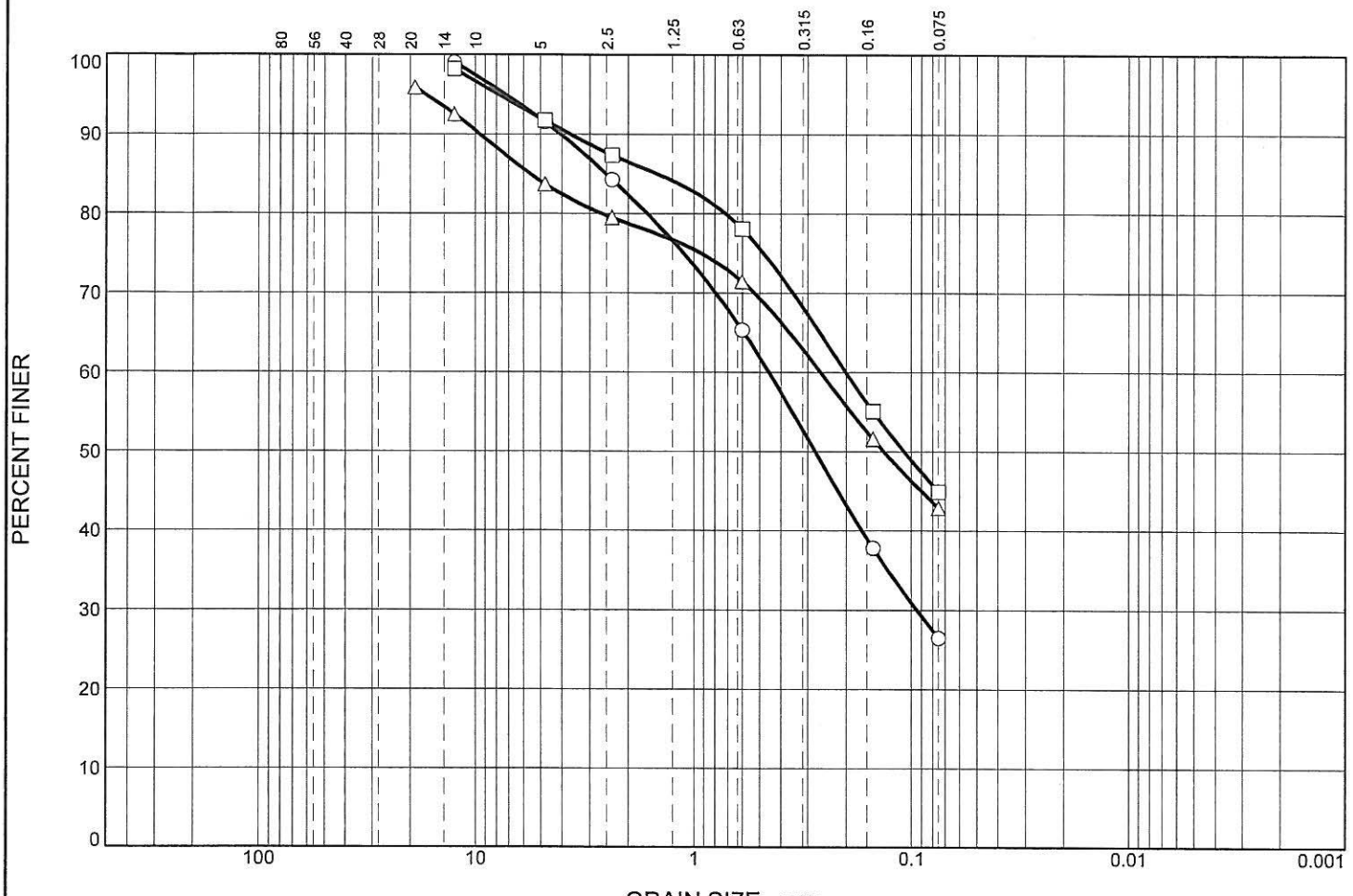
Remarks:

FUNDY Engineering

Figure

Tested By: Rob Haineault

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○				9.1	23.6	32.3	26.5	
□				5.2	13.3	28.3	44.9	
△				5.0	11.4	24.4	42.9	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			2.5286	0.4520	0.2776	0.0942				
□			1.4793	0.1998	0.1078					
△			5.5733	0.2612	0.1336					

Material Description	USCS	AASHTO
○ BH4 2-4 ft □ BH4 6-8 ft △ BH4 8-10 ft	VG	

Project No. 8255 **Client:** PWGSC

Project: Geotechnical Investigation- Westmorland Institution

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

□ **Source of Sample:** BH4 **Depth:** 1.83

△ **Source of Sample:** BH4 **Depth:** 2.44

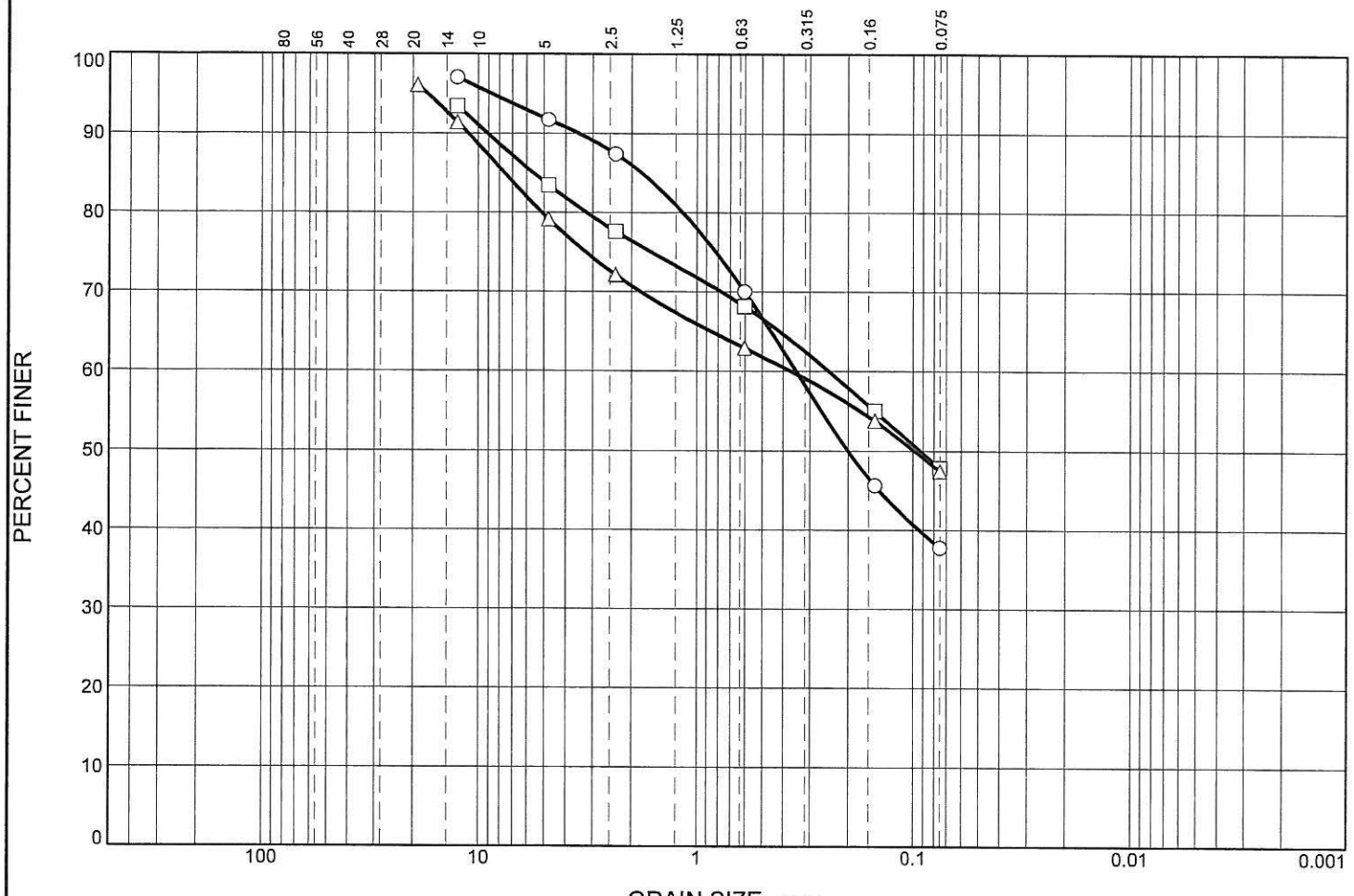
Remarks:

FUNDY Engineering

Figure

Tested By: Rob Haineault

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○				5.7	22.2	26.1	37.7	
□				7.0	11.2	17.4	47.8	
△				8.4	9.8	13.5	47.4	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			1.8002	0.3474	0.1992					
□			5.6041	0.2446	0.0925					
△			7.5826	0.3647	0.0981					

Material Description	USCS	AASHTO
○ BH5 4-6 ft □ BH5 6-8 ft △ BH5 8-10 ft		

Project No. 8255 **Client:** PWGSC

Project: Geotechnical Investigation- Westmorland Institution

○ **Source of Sample:** BH5 **Depth:** 1.22

□ **Source of Sample:** BH5 **Depth:** 1.83

△ **Source of Sample:** BH5 **Depth:** 2.44

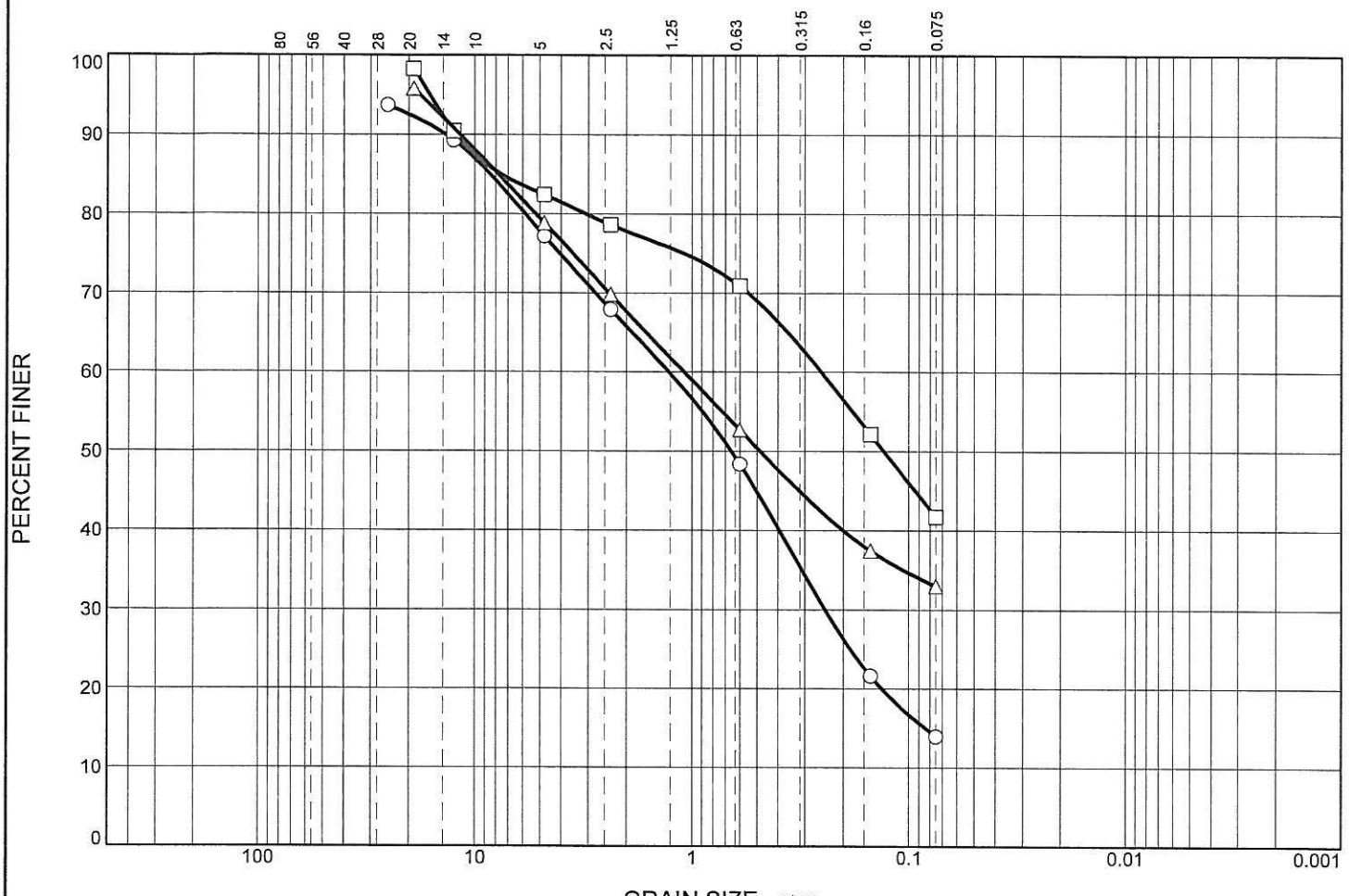
Remarks:

FUNDY Engineering

Figure

Tested By: Rob Haineault

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○			15.1	11.4	24.2	27.7	13.9	
□				4.6	10.6	25.5	41.7	
△				11.1	19.3	15.4	33.0	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_C	C_u
○			8.4753	1.2712	0.6570	0.2422	0.0842			
□			7.5373	0.2515	0.1303					
△			7.7791	1.0833	0.4829					

Material Description	USCS	AASHTO
○ BH6 2-4 ft □ BH6 6-8 ft △ BH6 14-16 ft	GM-SM	

Project No. 8255 **Client:** PWGSC

Project: Geotechnical Investigation- Westmorland Institution

○ **Source of Sample:** BH6 **Depth:** .61

□ **Source of Sample:** BH6 **Depth:** 1.83

△ **Source of Sample:** BH6 **Depth:** 4.27

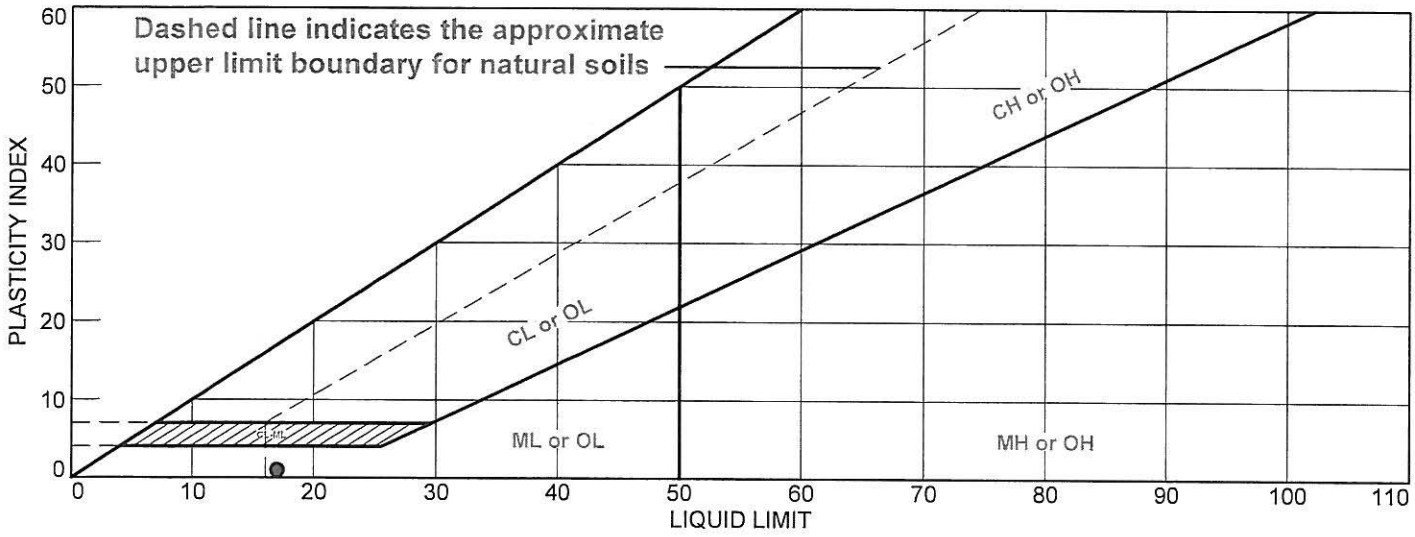
Remarks:

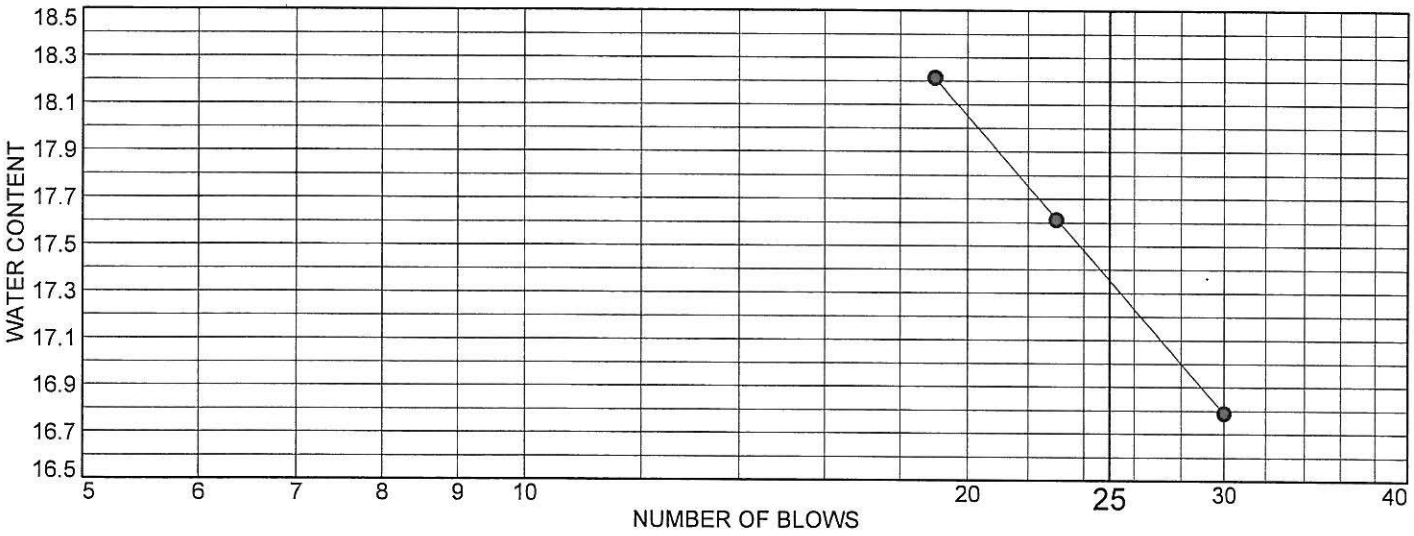
FUNDY Engineering

Figure

Tested By: Rob Haineault

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Dense Brown Silty Sand with Some Gravel	17	16	1			

Project No. 8255 **Client:** PWGSC

Project: Geotechnical Investigation- Westmorland Institution

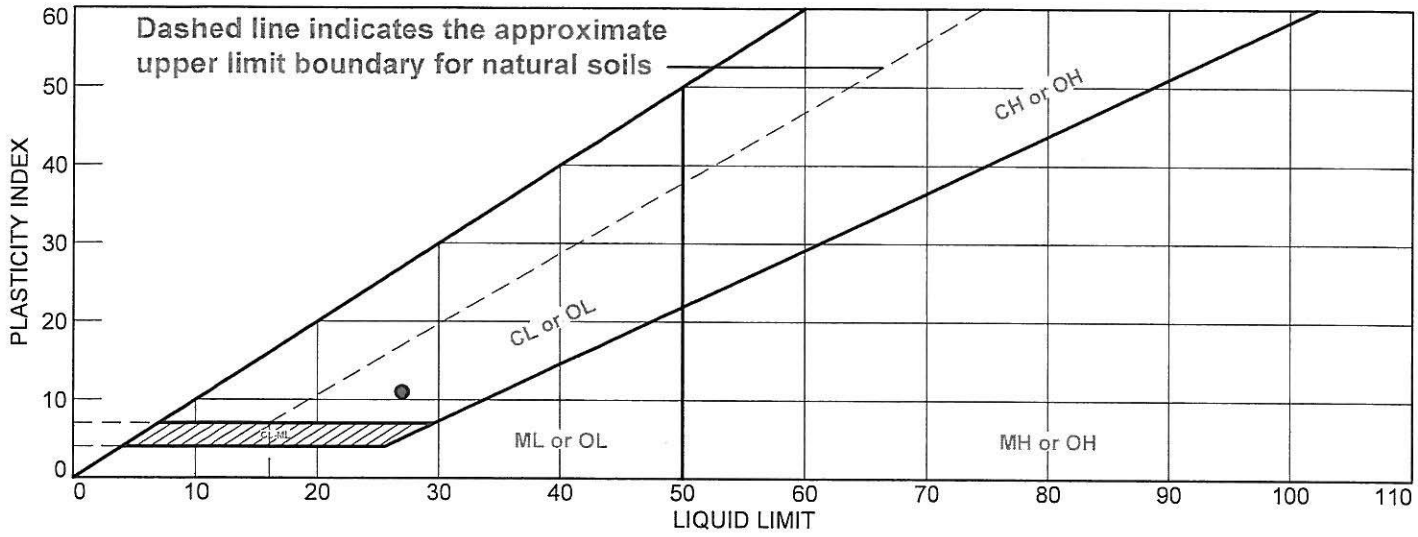
● **Source of Sample:** BH2 **Depth:** 2.44

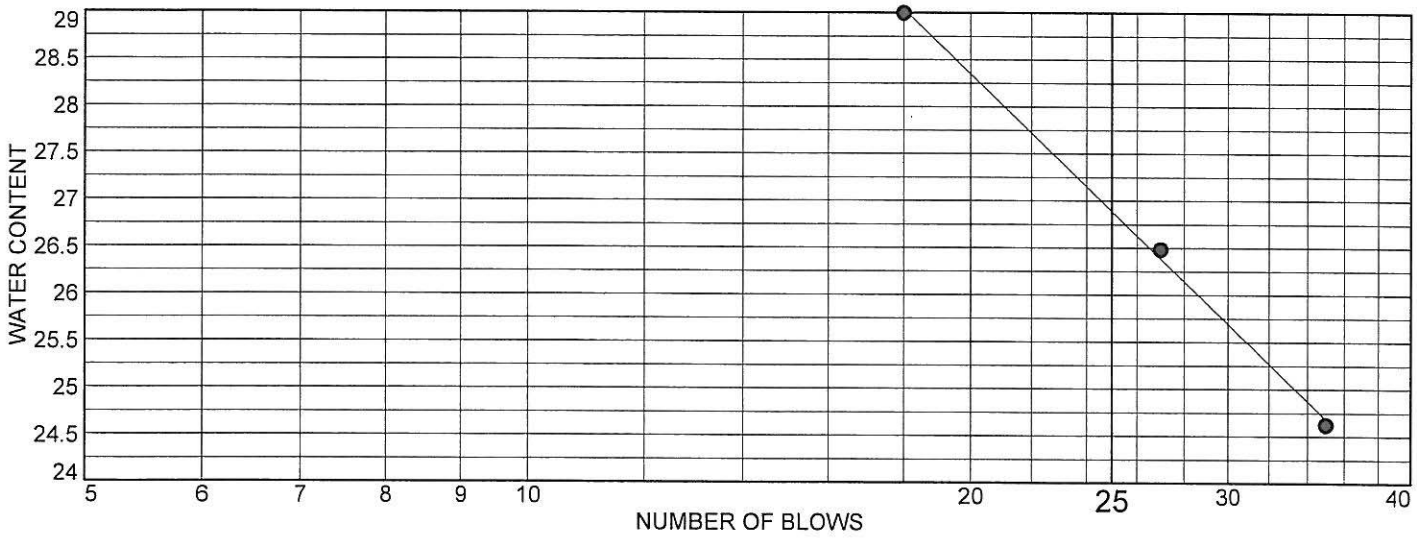
Remarks:

FUNDY Engineering

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Very Stiff Brown Sandy Silt with Some Gravel	27	16	11			

Project No. 8255 **Client:** PWGSC

Project: Geotechnical Investigation- Westmorland Institution

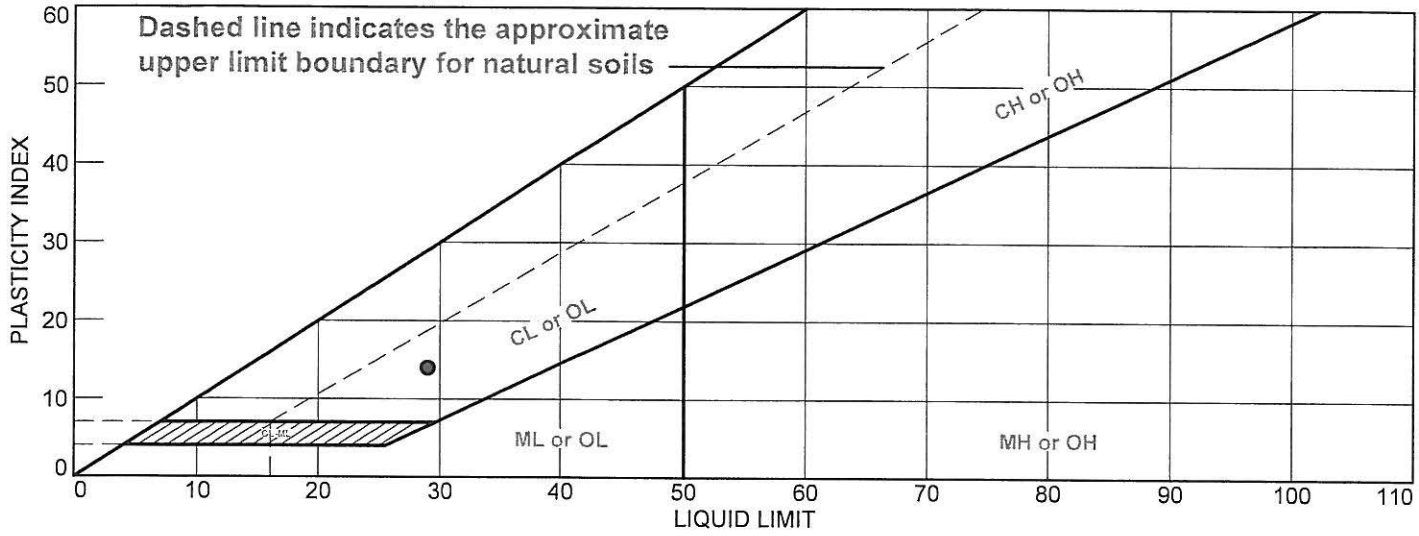
● **Source of Sample:** BH3 **Depth:** 3.05

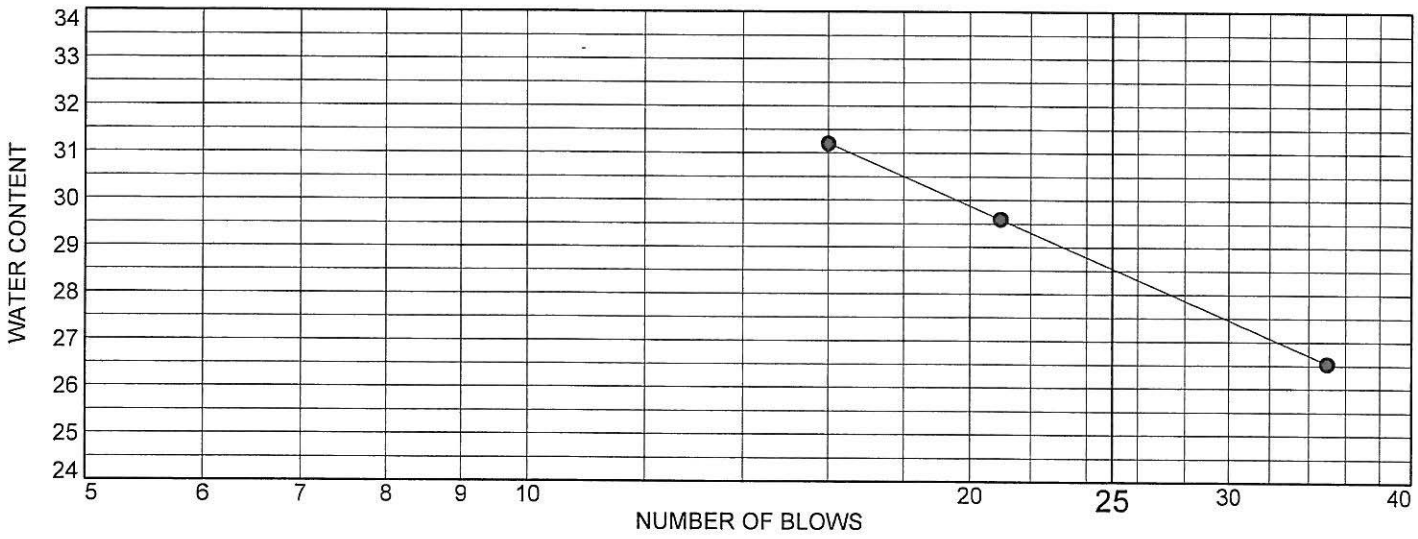
Remarks:

FUNDY Engineering

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Very Dense Reddish Brown Silty Sand with Some Gravel	29	15	14			

Project No. 8255 **Client:** PWGSC

Project: Geotechnical Investigation- Westmorland Institution

● **Source of Sample:** BH6 **Depth:** 4.88

Remarks:

FUNDY Engineering

Figure

rpc

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Reference Number: 116996-AQS

Date: March 25, 2011

Client: Greg Hoyt
Fundy Engineering & Consulting
27 Wellington Row
Saint John, NB E2L 4S1

RADON ANALYSIS

E-PERM Electret Ion Chambers were used for short-term radon screening measurements that were conducted at a location in Dorchester, NB. The sample was collected over a 48-hour time period. The results can be found in Table 1.

Table 1: Radon Results

Sample Identification	Radon (Bq/m^3)
Borehole # 2	<1

This report relates only to the sample and information provided to the laboratory

Discussion:

Radon is a radioactive gas found naturally in the environment. It is produced by the decay of uranium found in soil, rock or water. Radon is invisible, odourless and tasteless, but emits ionizing radiation, which can cause cancer. If a building is built on bedrock or soil that contains uranium, radon gas can be released in to the building through cracks in the foundation or floor.

Health Canada's guideline for radon states that remedial measures should be undertaken in a dwelling whenever the average annual radon concentration exceeds 200 Bq/m^3 in the normal occupancy area. Your results were below this level.

I trust that this information is useful to you and encourage you to call if you have any questions regarding this report.

Darren Tarr
Air Quality Technician

Thelma Green
Manager