APPENDIX ‘A’

GEOTECHNICAL INVESTIGATION
PROPOSED STORAGE FACILITY, WABUSH AIRPORT
WABUSH, NL

Submitted to:

Public Works and Government Services Canada
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Submitted by:

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May 2011

TF11076373

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1.0 INTRODUCTION

1.1 General

AMEC Earth & Environmental, a division of AMEC Americas Limited (AMEC), was requested by Public Works and Government Services Canada (PWGSC) to carry out a geotechnical site investigation for a proposed storage facility at the existing airport in Wabush, NL (the Site). The following report outlines the results of the investigation and recommendations for design and construction.

1.2 Objectives and Scope of Work

The objective of the investigation is to determine localized subsurface stratigraphy and to provide geotechnical recommendations and geotechnical design parameters for the design and construction of the proposed structure as per the Terms of Reference provided by PWGSC in Appendix A. The investigation will address the following geotechnical aspects including:

- Depths and thicknesses of each soil type encountered and bedrock if encountered;
- Depth of frost;
- Depth to groundwater;
- Bearing capacity of subsoil and bedrock if encountered;
- Suitability of *in-situ* subsoil for backfill; and
- Drainage considerations.
- Presence or absence of radon in soil.

2.0 SITE DESCRIPTION

The Site is located at the existing airport in Wabush, NL adjacent to the combined services building. The site is relatively flat and was snow and ice covered at the time of investigation. A detailed site location plan can be found in Appendix A.

3.0 REGIONAL GEOLOGY

3.1 Bedrock Geology

The site (as reported in the literature published by the Department of Mines and Energy) is underlain by Middle Paleoproterzoic aged pelitic gneiss and pelitic schist belonging to the upper Knob Lake Group of the Grenville structural province. Note that bedrock was not encountered in the test excavations during the field program; therefore, the above description could not be verified in the field.

3.2 Surficial Geology

The site has been glaciated as evident by the deposits of glacial till. Deposits of this nature occur when portions of ancient ice sheets have stopped moving and have melted in-place, thus discharging its load of debris (till).

4.0 GEOTECHNICAL INVESTIGATION METHODOLOGY

4.1 Test Pit Excavations

The field work for this project was performed on March 25, 2011 by Ian Butt, P. Geo. of AMEC and comprised of the excavation and logging of three (3) test pits at locations determined by PWGSC. The original scope of work involved the excavation of four (4) test pits but due to time constrants, test pit TP-2 was not completed at the time of investigation. The test pits were excavated by RSM Mining Services Ltd. using a NPK GH10 hydraulic hammer attached to a Cat 320D excavator and a Komatsu PC400LC track-mounted excavator. The hydraulic hammer was necessary to penetrate frost in the upper portions of the test pits.

Test pits were excavated to depths ranging from 3.7 metres below ground surface (mbgs) to 4.6 mbgs. During excavation, the soil was visually described with respect to its gradation, relative density, colour, structure/texture, and inferred moisture content and classified in general accordance with the Canadian Foundations Engineering Manual. Relative density and strength of the soil was interpreted from the resistance to excavation advance. Soil samples were collected from the test pits for laboratory testing. Upon completion, the open test pits were inspected for indication of the groundwater elevation. All test pits were backfilled upon completion using nominal compactive effort. Summaries of the soil stratigraphy and groundwater surface depths encountered in the test pits are described in Section 5.0 and are presented on the test pit logs in Appendix B.

4.2 Laboratory Testing

Samples from each test pit were sealed in plastic bags, labeled and transported to the AMEC Materials Testing Laboratory in St. John's, NL for geotechnical index testing. Soil samples, as selected by PWGSC, from all three (3) of the test pits were submitted for the following testing:

- moisture content analysis; and
- sieve analysis.

The results of the geotechnical index property testing are provided in Appendix C.

One (1) soil sample from test pit TP-1 (2.4 – 2.5 mbgs) was submitted for radon testing. The sample was sealed in a ziploc bag and placed in an air-tight mason jar for transport to LEX Scientific in Guelph, ON for testing. The radon analysis result is provided in Appendix D.

5.0 SUBSURFACE CONDITIONS

The soil and bedrock stratigraphic boundaries indicated on the test pit logs are inferred from field observations and excavator performance. These boundaries normally represent a transition from one material to another and they do not necessarily represent exact surfaces of geological change. The subsurface conditions may vary substantially between and beyond the test pit locations.

Descriptions of the stratigraphy encountered at the test pit locations are presented on the test pit logs compiled in Appendix B. Also shown on the test pit logs are photographs of the test pit excavation and its spoilage.

5.1 General

The soil profile at the site was glacial till predominately comprised of sand with trace to some silt and trace gravel. Trace cobbles and boulders were also encountered. A summary of subsurface conditions at the site is provided in Table 1. Detailed soil descriptions are provided in Sections 5.2 to 5.5.

Table 1 Summary of Subsurface Conditions

Location	Northing[1]	Easting[1]	Original Ground Elevation[1] (m)	Depth (m)		
				Glacial Till	Ground-water	Termination
TP-1	5866264.185	346904.513	548.023	0.1	2.7	3.7
TP-3	5866256.958	346873.908	548.345	0.1	n/e[2]	4.3
TP-4	5866241.080	346877.709	548.340	surface	n/e[2]	4.6

Notes: 1. Obtained using a TOPCON HiPer Ga GPS unit referencing MTM Zone 3 - NAD83
2. n/e – not encountered

5.2 Topsoil

Approximately 0.1 m of topsoil was encountered at test pits TP-1 and TP-3. The soil typically consisted of grass and small rootlets, some sand and silt, dark brown to black and was frozen at the time of excavation.

5.3 Glacial Till

Glacial till was encountered in all three (3) of the test pits. This material typically consisted of sand with trace to some silt, trace gravel, and trace cobbles and boulders. The soil was loose to very dense and light brown to dark brown in color.

Soil samples from all three test pits were submitted for geotechnical index testing. The results are summarized in table 2 and are provided in Appendix C.

Table 2 Summary of Laboratory Results

Sample ID	Sample Depth (mbgs)	Gravel (%)	Sand (%)	Silt/Clay (%)	Moisture Content (%)
TP-1-SA1	2.4 – 2.5	6.4	88.3	5.8	5.7
TP-1-SA2	3.6 – 3.7	6.3	62.9	30.8	8.5
TP-3-SA1	3.6 – 3.7	10.2	72.8	17.0	6.3
TP-3-SA2	4.2 – 4.3	8.7	61.3	30.0	9.1
TP-4-SA1	4.5 – 4.6	7.7	72.2	20.1	6.7

5.4 Frost

Frost was encountered in all three (3) of the test pits and ranged in thickness from 0.5 mbgs (TP-3) to 2.6 mbgs (TP-4). The frost was extremely hard to penetrate with the excavator, warranting the use of a hydraulic hammer. It should be noted that test pits locations TP-1 and TP-3 were snow covered prior to excavation. Transport Canada personnel on site indicated that both locations were snow covered for the majority of the winter season. The snow cover would therefore limit the frost penetration as the snow acts as an insulator.

5.5 Radon

Radon is a colourless, odorless, radioactive gas that occurs naturally in the environment. It is derived from the natural breakdown of uranium in soils and rocks. Results from the radon analysis show that the measurement of radon emanating Ra-226 concentration (RnERaC) in the soil is 0.066 pCi/g. This result is consistent with previous geochemical studies (Till sampling survey, NTS 13, 14, 23, 24, northern Labrador and Quebec, 1982-1987) conducted in the area, which also reported low concentrations of uranium in soils. The radon analysis result is provided in Appendix D.

5.6 Bedrock

Bedrock was not encountered in the three (3) test pit excavations.

5.7 Groundwater

Groundwater seepage was encountered in test pit TP-1 at 2.7 mbgs. Groundwater was not encountered at the TP-3 and TP-4. Some seasonal variation in groundwater levels should be anticipated.

6.0 DISCUSSION AND RECOMMENDATIONS

6.1 General Geotechnical Assessment

Based on the results of the current geotechnical information, the subsurface conditions encountered are suitable to support the proposed storage facility, using the recommendations discussed in the following sections.

6.2 Site Preparation

Conventional hydraulic earthwork equipment is anticipated to be capable of removing, replacing and re-compacting most of the granular materials. Excavators equipped with impact hammers will likely be required for removing large boulders if encountered in excavations above the design grade.

Improper site preparation could result in excessive total and/or differential settlement of the structures within the site during construction. The following are considerations related to site preparation.

6.2.1 Excavation and Construction Dewatering

It is expected that excavations will be required for the storage facility foundation and for any buried infrastructure (i.e. drainage pipes, etc.) installed on the site. Conventional unsupported excavations though the glacial till are feasible where the groundwater table is below the bottom of the excavation. Sidewalls of excavation less than 1 m in depth can be sloped no steeper than 1H:1V (Horizontal : Vertical – H:V) to the top of the excavation. For excavations deeper than 1 m, the slopes should be no steeper than 2H:1V. If loose pockets of material are encountered during the excavation, the slopes of the excavations may need to be flatter (less than 2H:1V). If space does not permit sloped excavations, trench boxes may be used to support the excavations.

Groundwater seepage was encountered in test pit TP-1 at 2.7 mbgs. Groundwater was not encountered at the TP-3 and TP-4 to depths of 4.3 mbgs and 4.6 mbgs, respectively. Groundwater levels, however, could be higher than those observed due to runoff from rain and snow melt. It is anticipated that groundwater infiltration can be controlled using perimeter trenches, sumps, and pumps within the excavation.

Stockpiling or storage of excavated spoils, construction materials, or heavy equipment should not be permitted within 5 m of the crest of excavated slopes in order to prevent overloading the crest.

All excavations should be carried out in accordance with applicable occupational health and safety rules and regulations including, but not limited to, Sections 139 to 143 of the Newfoundland and Labrador Occupational Health and Safety Regulations.

6.2.2 Subgrade Preparation

All organic soils, weak or loose soil, and topsoil should be stripped and removed to expose competent native till in the area of the proposed building. Based on the soil conditions encountered, native undisturbed till will be exposed on the surface after stripping of topsoil. If required, engineered fill as described in Section 6.2.3 should be used to raise the subgrade to the design elevation.

6.2.3 Engineered Fill

The suitability of the excavated till material to use as engineered fill depends on the moisture content during placement. In general, excavated materials free of organic matter and with a moisture content at its optimum moisture content may be used as engineered fill for certain applications. All materials to be used as engineered fill should be approved by the geotechnical engineer prior to placement.

Engineered fill may be required to reach design subgrade elevation in areas sensitive to settlements such as beneath foundations, slabs, and parking areas. Engineered fill should consist of well-graded, granular material such as sand and gravel or well graded rockfill from a quarry source. The maximum particle size should not exceed 100 mm and the fines content should not exceed 8%. General backfill may be used in areas not sensitive to excessive settlements or adfreeze effects.

Based on the application, all fill should be compacted to the specifications in Table 3. Lift thickness must be compatible with the compaction equipment used to assure the required compactive effort is achieved throughout the lift. Typically, lift thicknesses should not exceed 300 mm. Due to the particle size distribution of blasted rock fill, verification of the field density by visual inspection during proof rolling by experienced geotechnical personnel is required if used.

Table 3 Compaction Requirements

Fill Application	Compaction Requirements Percent of Standard Proctor maximum dry density (ASTM D698)
Foundation Areas	100
Floor Slab Areas	100
Roads / Parking Areas	98
General Backfill	95

Backfill material used against foundations should be free of deleterious material, free draining and classed as non-frost susceptible to reduce the potential effects of adfreeze. Maximum particle size should not exceed 100 mm. The granular backfill should be capped with a less permeable material and graded to promote positive drainage away from the foundations.

6.3 Frost Considerations

The maximum frost penetration at this location is expected to be 3.0 metres based on a Freezing Index of 2500-degree days (Canadian Foundation Engineering Manual).

Based on site observations and the results of the geotechnical investigation, the glacial till soils are susceptible to the effects of frost. The maximum observed frost penetration at this location during the field program was 2.7 mbgs.

6.4 Foundations

It is assumed that foundations for the proposed storage facility will be placed below the frost level on undisturbed till. Foundations on this material may be designed based on an **allowable** bearing pressure of **200 kPa**, provided it is inspected by AMEC.

If grades are such that foundations are required on fill, the fill should be a high quality, well graded material, free from organics with low fines content and placed at optimum moisture content. For dry conditions, a 100 mm minus well-graded blast rock fill (see Section 6.2.4) is recommended. Alternatives may be used providing its quality is inspected and approved by AMEC prior to its use. The fill should be placed in lifts not exceeding 150 mm thick and compacted to 100% of its corrected maximum dry density (ASTM D 698-78). Foundations on fill may be designed based on an **allowable** bearing pressure of **150 kPa**, provided it is inspected by AMEC.

These recommended values are based on the conditions that footings will have a minimum width of 1.0 m and that suitable subgrade preparation has been carried out. These values take into consideration a factor safety of three. With these allowable bearing pressures, the total and differential settlements are expected to be less than 25 mm and 20 mm, respectively on glacial till and fill.

These values assume the following:

Unit weight of till (natural, undisturbed)	21 kN/m^3 11 kN/m^3 (submerged)
Unit weight of compacted engineered fill	21 kN/m^3 11 kN/m^3 (submerged)
Groundwater Level	2.7 m
Frost Penetration	3.0 m
Minimum Footing Depth	2.7 m
Minimum Footing Width	1.0 m
Drained Angle of Internal Friction (undisturbed till)	32°
Drained Angle of Internal Friction (compacted engineered fill)	30°

Should the proposed footing depths be shallower than the maximum depth of frost, insulating of the footings will be required.

Prior to placing foundation footings, AMEC should be contacted to inspect the foundation-bearing surface to confirm its condition.

6.5 Floor Slabs

Grade-supported concrete floor slabs should be constructed on a prepared subgrade as recommended in Section 6.2.2. A minimum of 100 mm of free-draining, clear, washed, crushed gravel should be provided beneath all floor slabs. Should elevations be such that floor slabs are below the exterior finished grade, a properly designed and installed weeping tile drainage system is required. Install a damp-proofing membrane under the concrete slabs-on-grade.

The recommended live load on the slab-on-grade is to 20 kPa. Higher live load on slab-on-grade should be designed as a mat foundation by considering the soil conditions underlying the mat foundation and its impact on any adjacent foundations. All slabs should be structurally independent from walls and columns supported on foundations. Should heavy, concentrated loads be expected near the perimeter of slabs, thickened and reinforced slab edges should be structurally designed accordingly. This will reduce any structural distress that may occur as a result of differential soil movements.

Some relative movement between slabs-on-grade and adjacent walls or foundations and differential movements within the slabs should be anticipated. Generally, if the recommendations outlined in this report are followed, these movements are expected to be less than 25 mm. If differential movements of this magnitude are considered intolerable, then an alternative slab support system such as a structural slab supported by foundations or mat foundation should be considered.

The excavated subgrade beneath slabs-on-grade should be protected at all times from rain, snow, freezing temperatures, excessive drying and the ingress of free water.

6.6 Inspections and Testing

The following minimum inspection and testing activities should be conducted during construction:

- Shallow foundations – subgrade inspection prior to placing concrete; and
- Concrete testing – to ensure compliance with design requirements.

Should the subsurface conditions vary significantly during construction from those noted within this report, AMEC should be notified in order to review the recommendations presented herein in light of any new findings. At the time this report was prepared, information on subsurface stratigraphy was available only at discrete test pit locations and recommendations were based on extrapolation and interpretation of these locations. Adequate monitoring during construction should be provided to confirm that these assumptions are reasonable. Qualified persons, under the supervision of a geotechnical engineer independent of the contractor, should carry out all monitoring.

It is important that the foundation design and the foundation construction procedures become available for review by the geotechnical engineer prior to construction to confirm consistency with the intent of this report. In addition, a program of stringent quality control should be in place during construction of the foundation to verify that the construction methodology and material comply with design requirements.

7.0 CLOSURE

This report was prepared for the exclusive use of Public Works and Government Services Canada for specific application to the project site. The geotechnical investigation was conducted in accordance with the work plan developed for this site and verbal requests from the client. The work was performed using generally accepted geotechnical practices and procedures commonly used in the industry. The limitations of this report are stated in Appendix E.

Respectfully submitted,

AMEC Earth & Environmental,
A Division of AMEC Americas Limited

Reviewed by:

REGISTERED PROFESSIONAL ENGINEER
PEGNL
JANET WILLIAMS
SIGNATURE
May 16, 2011
DATE
NEWFOUNDLAND & LABRADOR

Ian Butt, P. Geo.
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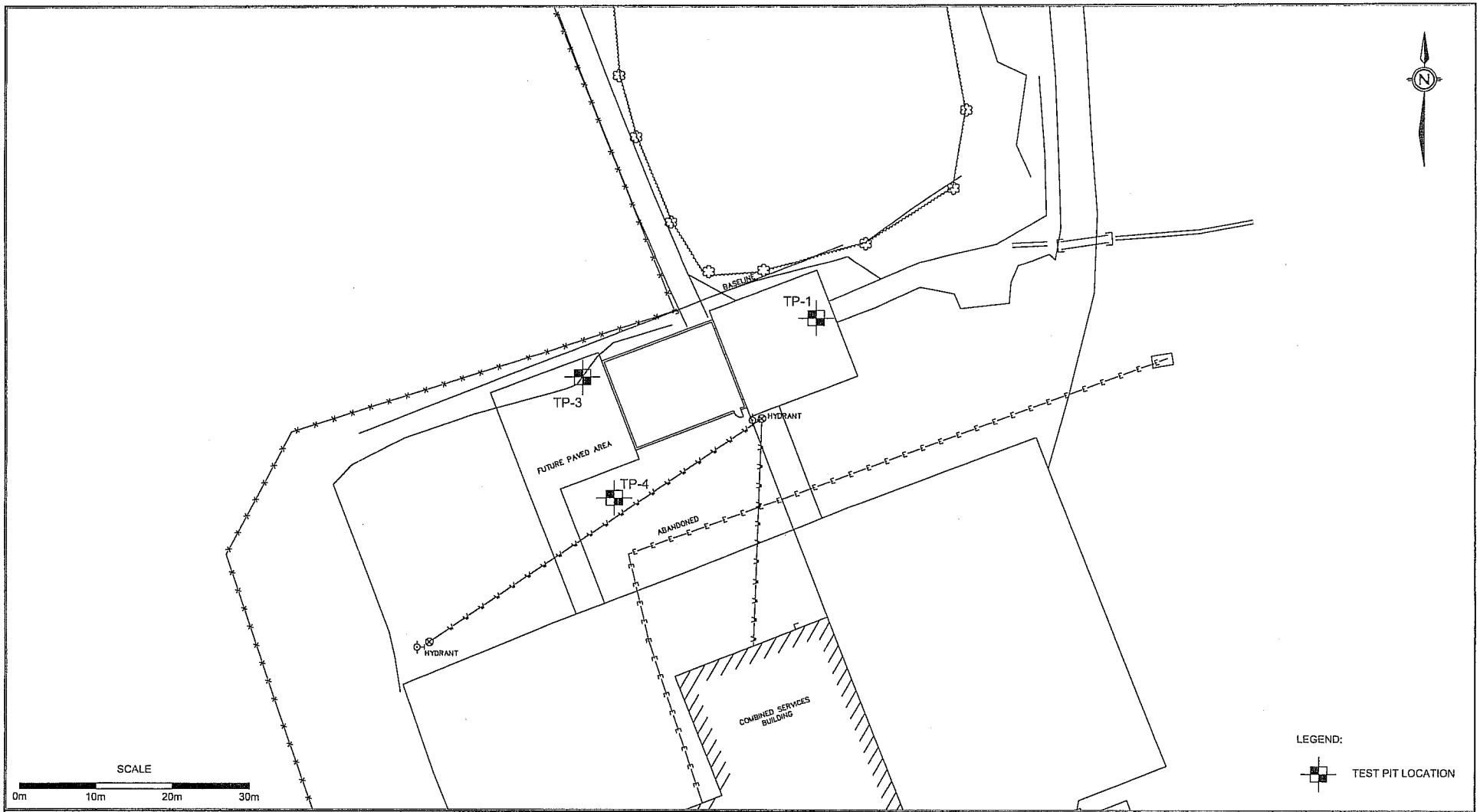
Janet Williams, P. Eng.
Geotechnical Engineer

PROVINCE OF NEWFOUNDLAND AND LABRADOR
PEGNL
PERMIT HOLDER
This Permit Allows
AMEC AMERICAS LIMITED
To practice Professional Engineering
in Newfoundland and Labrador.
Permit No. as issued by PEG D0018
which is valid for the year 2011

APPENDIX A

TEST PIT LOCATION PLAN



NOTE:

1. ALL DIMENSIONS ARE IN METERS.
2. DO NOT SCALE FROM DRAWING.
3. THIS DRAWING IS INTENDED TO SHOW RELATIVE LOCATIONS AND CONFIGURATION OF THE STUDY AREA IN SUPPORT OF THIS REPORT.
4. ALL LOCATIONS, DIMENSIONS, AND ORIENTATIONS ARE APPROXIMATE.
5. THIS DRAWING SHOULD NOT BE USED FOR PURPOSES OTHER THAN THOSE OUTLINED ABOVE.
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amec

DWN BY:	M. Day
CHK'D BY:	I. Butt
SCALE:	As Shown
PROJECT	WABUSH AIRPORT GEOTECHNICAL INVESTIGATION
TITLE	DETAILED SITE LOCATION PLAN
DATE	March 2011
PROJECT No.	TF11076373
REV. No.	
FIGURE No.	1

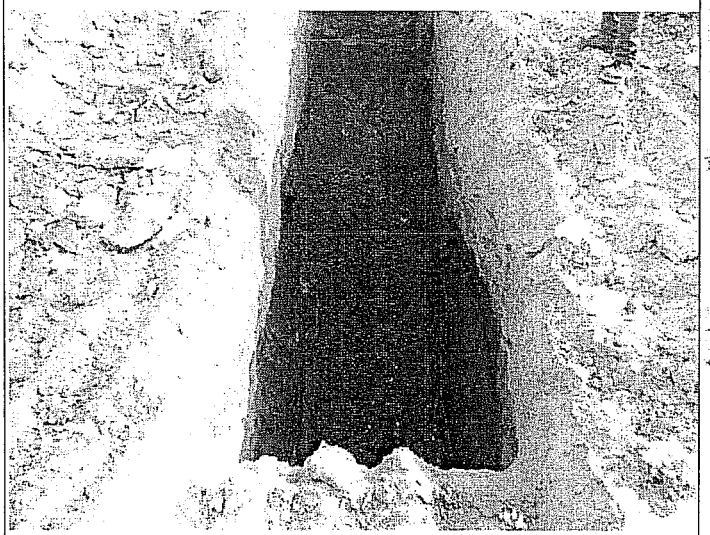
APPENDIX B

TEST PIT LOGS

Test Pit: TP-1

Firm:	Public Works and Government Services Canada				Date: March 25, 2011
Project:	Wabush Airport Geotechnical Investigation				Inspector: I. Butt
Contract No.	TF11076373	Location	N 5866264.185	E 346904.513	Elevation (m): 548.023

PHOTOGRAPHS



Soil and Groundwater Conditions

Depth (m) From - To	Description	Sample ID	Sample Depth (m)	Sample Type
0.0 – 0.1	**TOPSOIL** – some sand and silt, grass and small rootlets, dark brown to black, frozen.	N/A	N/A	N/A
0.1 – 1.0	**GLACIAL TILL** – SAND, some gravel (subrounded), trace silt, trace cobbles and boulders, brown to dark brown, frozen.	N/A	N/A	N/A
1.0 – 2.7	**GLACIAL TILL** – SAND, some gravel (subrounded), trace silt, trace cobbles and boulders, loose to compact, brown to dark brown, moist.	TP-1-SA1	2.4 – 2.5	GRAB
2.7 – 3.7	**GLACIAL TILL** – SAND, trace silt to silty, trace gravel (subrounded), dense to very dense, dark brown, moist. Increased silt content with depth.	TP-1-SA2	3.6 – 3.7	GRAB
3.7	Test pit terminated at 3.7 m depth in GLACIAL TILL.			

Estimated Cobbles (%) <5	Estimated Boulders (%) <5	Estimated Max Diameter (m) 0.45
Start Time: 3:10 pm	End Time: 4:20 pm	

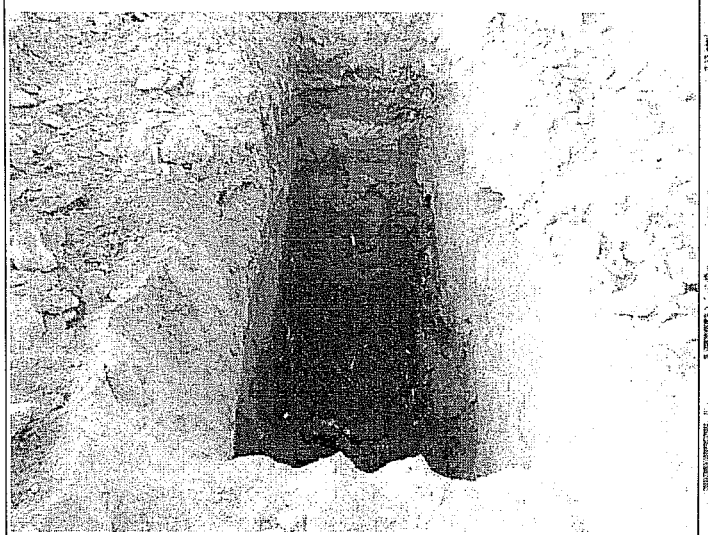
General Notes

1. Test pit terminated at 3.7 m depth in GLACIAL TILL.
2. Groundwater encountered at 2.7 m depth.
3. Depth of frost – 1.0 mbgs
4. Test pit location was snow covered prior to excavation.
5. Test pit excavated with a NPK GH10 hydraulic hammer and a Komatsu PC400LC excavator.
6. MTM coordinates and elevation obtained using TOPCON HiPer Ga GPS unit referencing MTM Zone 3 - NAD83.
7. Monument 88G4121 used as control point.

Test Pit: TP-3

Firm:	Public Works and Government Services Canada				Date: March 25, 2011
Project:	Wabush Airport Geotechnical Investigation				Inspector: I. Butt
Contract No.	TF11076373	Location	N 5866256.958	E 346873.908	Elevation (m): 548.345

PHOTOGRAPHS



Soil and Groundwater Conditions

Depth (m) From - To	Description	Sample ID	Sample Depth (m)	Sample Type
0.0 – 0.1	**TOPSOIL** – some sand and silt, grass and small rootlets, dark brown to black, frozen.	N/A	N/A	N/A
0.1 – 0.5	**GLACIAL TILL** – SAND, some gravel (subrounded), trace to some silt, trace cobbles and boulders, frozen.	N/A	N/A	N/A
0.5 – 4.3	**GLACIAL TILL** – SAND, trace gravel (subrounded), some silt to silty, trace cobbles and boulders, compact to dense, brown, moist. Increased silt content with depth.	TP-3-SA1	3.6 – 3.7	GRAB
		TP-3-SA2	4.2 – 4.3	GRAB
4.3	Test Pit terminated at 4.3 m depth in GLACIAL TILL.			

Estimated Cobbles (%) 5-10	Estimated Boulders (%) <5	Estimated Max Diameter (m) 0.45
Start Time: 4:45 pm	End Time: 6:00 pm	

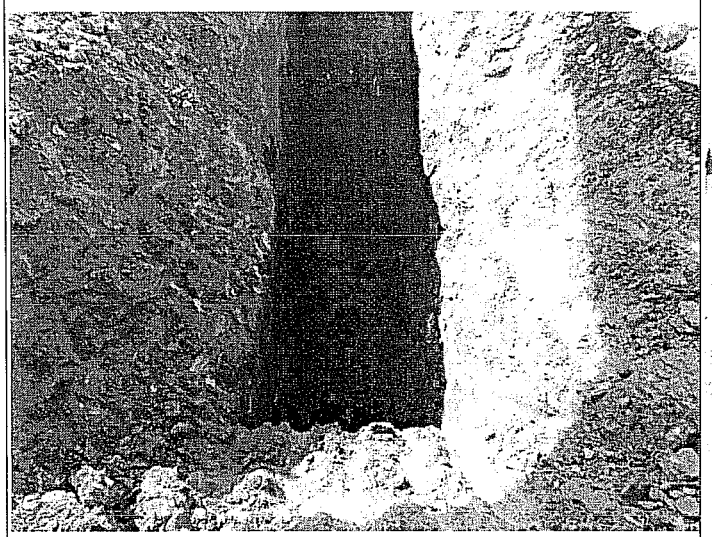
General Notes

1. Test Pit terminated at 4.3 m depth in GLACIAL TILL.
2. Groundwater not encountered.
3. Depth of frost – 0.5 mbgs
3. Test pit location was snow covered prior to excavation.
4. Test pit excavated with a NPK GH10 hydraulic hammer and a Komatsu PC400LC excavator.
5. MTM coordinates and elevation obtained using TOPCON HiPer Ga GPS unit referencing MTM Zone 3 - NAD83.
6. Monument 88G4121 used as control point.

Test Pit: TP-4

Firm:	Public Works and Government Services Canada				Date: March 25, 2011
Project:	Wabush Airport Geotechnical Investigation				Inspector: I. Butt
Contract No.	TF11076373	Location	N 5866241.080	E 346877.709	Elevation (m): 548.340

PHOTOGRAPHS



Soil and Groundwater Conditions

Depth (m) From - To	Description	Sample ID	Sample Depth (m)	Sample Type
0.0 – 2.6	**GLACIAL TILL** – SAND, some gravel (subrounded), trace silt, trace cobbles and boulders, brown, frozen.	N/A	N/A	N/A
2.6 – 4.6	**GLACIAL TILL** – SAND, some silt, trace gravel (subrounded), trace cobbles and boulders, dense to very dense, brown, moist.	TP-4-SA1	4.5 – 4.6	GRAB
4.6	Test Pit terminated at 4.6 m depth in GLACIAL TILL.			

Estimated Cobbles (%) 5-10	Estimated Boulders (%) <5	Estimated Max Diameter (m) 0.75
Start Time: 10:20 am	End Time: 3:00 pm	

General Notes

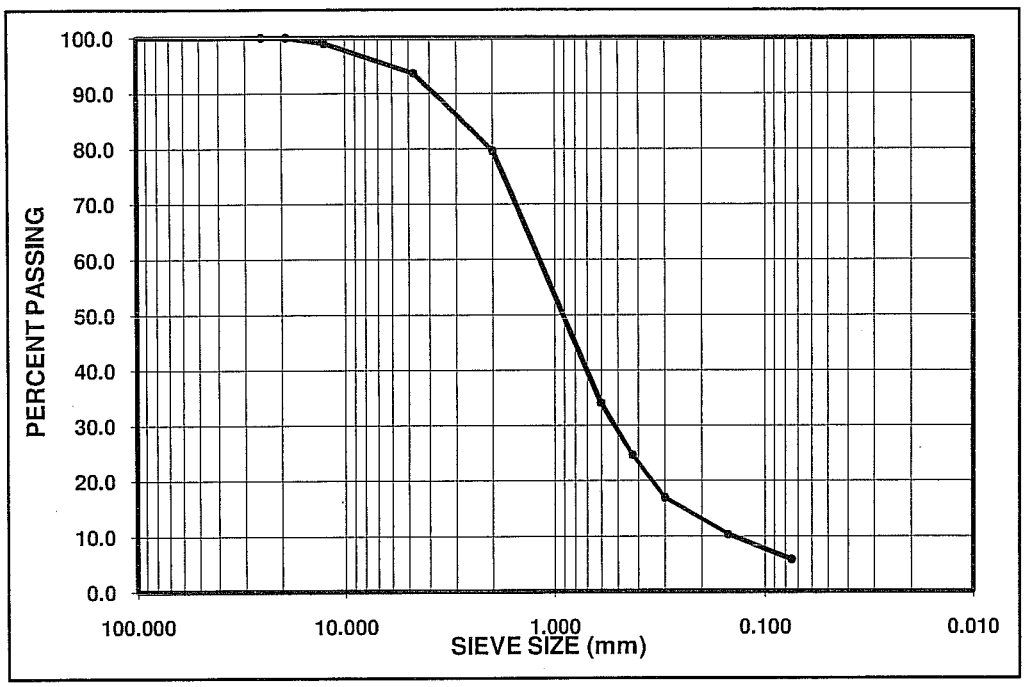
1. Test Pit terminated at 4.6 m depth in GLACIAL TILL.
2. Groundwater not encountered.
3. Depth of frost – 2.6 mbgs
4. Test pit excavated with a NPK GH10 hydraulic hammer and a Komatsu PC400LC excavator.
5. MTM coordinates and elevation obtained using TOPCON HiPer Ga GPS unit referencing MTM Zone 3 - NAD83.
6. Monument 88G4121 used as control point.

APPENDIX C

GEOTECHNICAL LABORATORY RESULTS

GRADATION ANALYSIS REPORT

Project No:	TF11076373	**Lab ID:**	3207
Project:	Wabush Airport - Geotech Investigation Wabush, NL	**Sample Type:**	Grab Sample
		Date Sampled:	25-Mar-11
Client:	PWGSC	**Date Tested:**	30-Mar-11
Sampled By:	I. Butt of AMEC	**Sample Description:**	Sand, trace Gravel, Silt/Clay
Sample ID:	TP1-SA1		
Sample Depth:	2.4 - 2.5m		



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
25.000	100.0		
19.000	100.0		
12.500	99.0		
4.750	93.6		
2.000	79.6		
0.600	34.1		
0.425	24.7		
0.300	17.0		
0.150	10.3		
0.075	5.8		

% Gravel:	6.4
% Sand:	88.3
% Silt/Clay	5.8

Comments: *The as received moisture content of the sample was determined to be 5.7%.*

Reporting of these test results constitutes a testing service only.
Engineering interpretation or evaluation of the test results is provided only on written request.

AMEC Earth & Environmental

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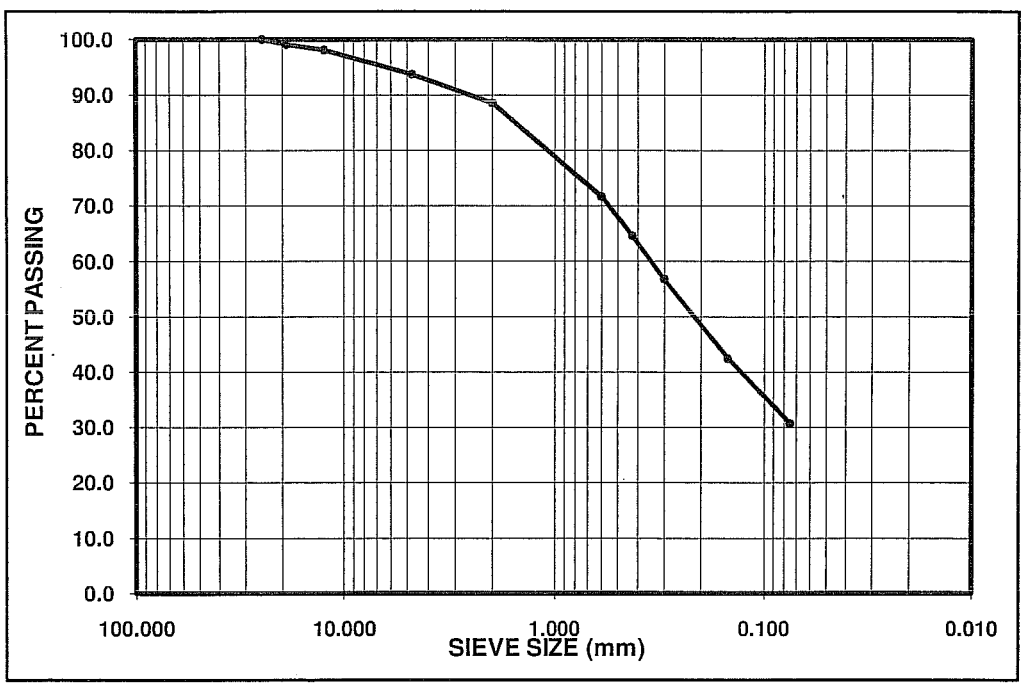
Tel. (709) 722-5062
Fax. (709) 722-5025

GRADATION ANALYSIS REPORT

Project No:	TF11076373	**Lab ID:**	3208
Project:	Wabush Airport - Geotech Investigation Wabush, NL	**Sample Type:**	Grab Sample
		Date Sampled:	25-Mar-11
Client:	PWGSC	**Date Tested:**	30-Mar-11
Sampled By:	I. Butt of AMEC	**Sample Description:**	Silty/Clayey Sand, trace Gravel
Sample ID:	TP1-SA2		
Sample Depth:	3.6 - 3.7m		



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
25.000	100.0		
19.000	99.1		
12.500	98.1		
4.750	93.7		
2.000	88.5		
0.600	71.7		
0.425	64.6		
0.300	56.8		
0.150	42.5		
0.075	30.8		

% Gravel:	6.3
% Sand:	62.9
% Silt/Clay	30.8

Comments: *The as received moisture content of the sample was determined to be 8.5%.*

Reporting of these test results constitutes a testing service only.
Engineering interpretation or evaluation of the test results is provided only on written request.

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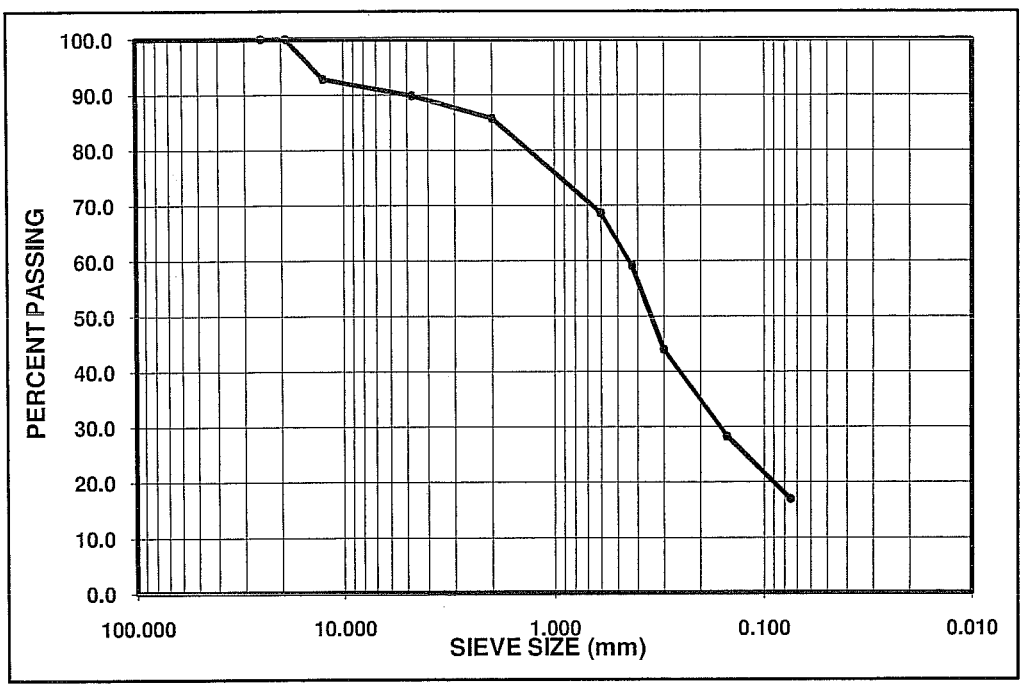
GRADATION ANALYSIS REPORT

Project No:	TF11076373	**Lab ID:**	3211
Project:	Wabush Airport - Geotech Investigation Wabush, NL	**Sample Type:**	Grab Sample
		Date Sampled:	25-Mar-11
Client:	PWGSC	**Date Tested:**	30-Mar-11
Sampled By:	I. Butt of AMEC	**Sample Description:**	Sand, some Silt/Clay, trace Gravel
Sample ID:	TP3-SA1		
Sample Depth:	3.6 - 3.7m		



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
25.000	100.0		
19.000	100.0		
12.500	92.8		
4.750	89.8		
2.000	85.7		
0.600	68.6		
0.425	59.1		
0.300	44.0		
0.150	28.3		
0.075	17.0		

% Gravel:	10.2
% Sand:	72.8
% Silt/Clay	17.0

Comments: *The as received moisture content of the sample was determined to be 6.3%.*

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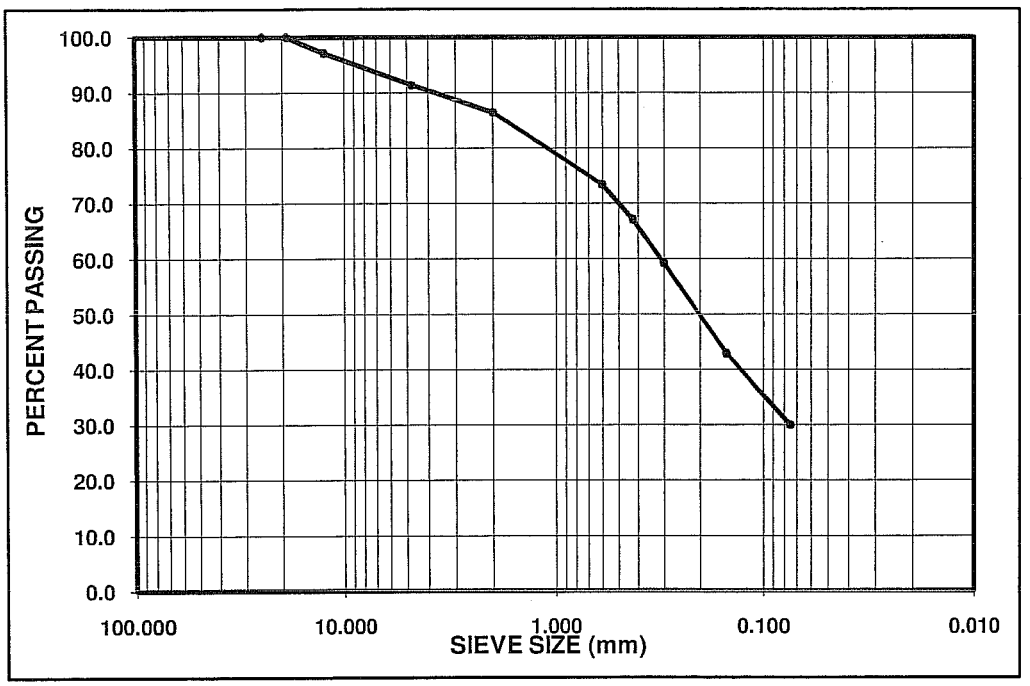
GRADATION ANALYSIS REPORT

Project No:	TF11076373	**Lab ID:**	3209
Project:	Wabush Airport - Geotech Investigation Wabush, NL	**Sample Type:**	Grab Sample
		Date Sampled:	25-Mar-11
Client:	PWGSC	**Date Tested:**	30-Mar-11
Sampled By:	I. Butt of AMEC	**Sample Description:**	Silty/ Clayey Sand, trace Gravel
Sample ID:	TP3-SA2		
Sample Depth:	4.2 - 4.3m		



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
25.000	100.0		
19.000	100.0		
12.500	97.1		
4.750	91.3		
2.000	86.4		
0.600	73.4		
0.425	67.1		
0.300	59.2		
0.150	42.9		
0.075	30.0		

% Gravel:	8.7
% Sand:	61.3
% Silt/Clay	30.0

Comments: *The as received moisture content of the sample was determined to be 9.1%.*

Reporting of these test results constitutes a testing service only.
Engineering interpretation or evaluation of the test results is provided only on written request.

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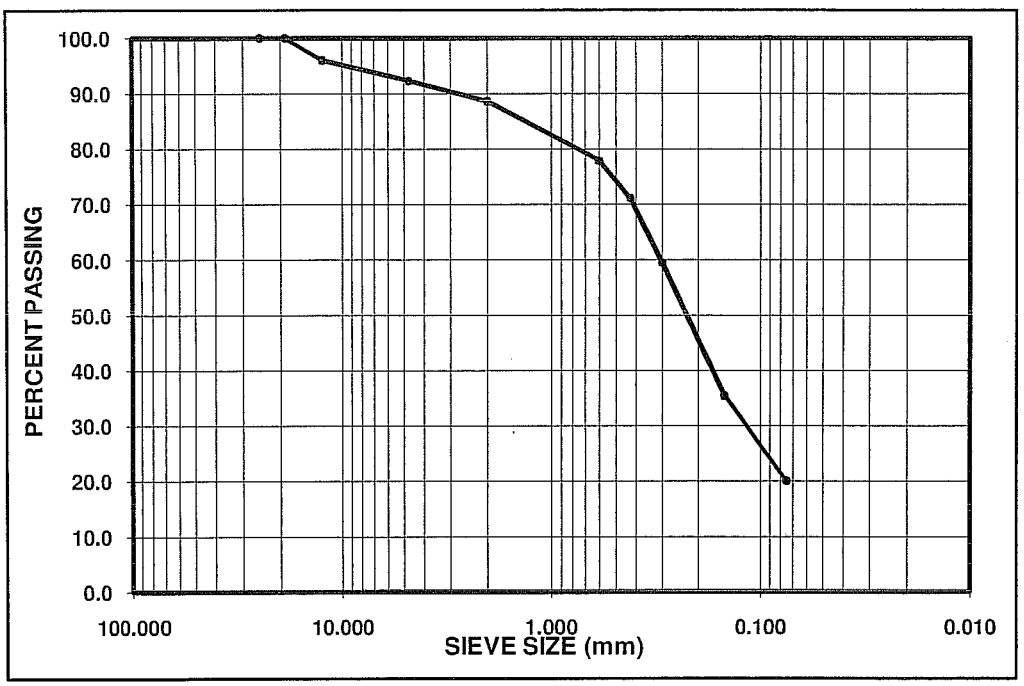
GRADATION ANALYSIS REPORT

Project No:	TF11076373	**Lab ID:**	3210
Project:	Wabush Airport - Geotech Investigation Wabush, NL	**Sample Type:**	Grab Sample
		Date Sampled:	25-Mar-11
Client:	PWGSC	**Date Tested:**	30-Mar-11
Sampled By:	I. Butt of AMEC	**Sample Description:**	Sand, some Silt/Clay, trace Gravel
Sample ID:	TP4-SA1		
Sample Depth:	4.5 - 4.6m		



SIEVE SIZE (mm)	PERCENT PASSING	GRADING LIMITS	
25.000	100.0		
19.000	100.0		
12.500	96.0		
4.750	92.3		
2.000	88.6		
0.600	77.9		
0.425	71.1		
0.300	59.5		
0.150	35.5		
0.075	20.1		

% Gravel:	7.7
% Sand:	72.2
% Silt/Clay	20.1

Comments: *The as received moisture content of the sample was determined to be 6.7%.*

Reporting of these test results constitutes a testing service only.
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APPENDIX D

RADON ANALYSIS LABORATORY RESULTS

LEX SCIENTIFIC INC.

SOLUTIONS
FOR A WORKING WORLD

April 28, 2011

ANALYTICAL REPORT

Radon Emanating Ra-226 Concentration from Soil
LEX File #: 08110437
Project Name: TF11076373

Ms. Aisha Hyde
AMEC Earth & Environmental
P.O. Box 13216 133 Crosbie Rd
St. John's, NL, A1B 4A5

Dear Ms. Hyde:

On April 1, 2011, LEX Scientific Inc. received one soil sample for radon analysis.

The requested work has been completed and the results are contained in this report.

If you have any questions about this report, please do not hesitate to contact me.

Yours sincerely,

German Leal, B.Sc.
Laboratory Manager

Attachment

2 Quebec Street, Suite 204 Guelph, Ontario N1H 2T3
Phone: 519.824.7082 Fax: 519.824.5784 Toll Free: 1.800.824.7082
e-mail: admin@lexscientific.com Website: www.lexscientific.com

Methods

The analysis was performed according to measurement of radon emanating Ra-226 concentration (RnERaC) in the soil by using a passive E-Perm® Electret ion chamber. (RnERaC) is the concentration of the portion of RA-226 in the soil which is effectively emitting radon.

Results

Table 1: Results of Radon Emanating Ra-226 concentration from soil.

Sample ID	RnERaC (pCi/g)
TP-1-SA1	0.066

Analyst

APPENDIX E

LIMITATIONS

AMEC Earth & Environmental

LIMITATIONS OF REPORT

The conclusions and recommendations given in this report are based on information determined at the test locations. The information contained herein in no way reflects on the environmental aspects of the project, unless otherwise stated. Subsurface and groundwater conditions between and beyond the test locations may differ from those encountered at the test locations, and conditions may become apparent during construction, which could not be detected or anticipated the time of the site investigation. It is recommended practice that the Geotechnical Consultant be retained during construction to confirm that the subsurface conditions throughout the site do not deviate materially from those encountered at the test locations. The elevations used in this report are primarily to establish relative elevation differences between the test locations and should not be used for other purposes, such as grading, excavating, planning development, etc.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report. Since all details of the design may not be known, we recommend that we be retained during the final stage to verify that the design is consistent with our recommendations, and that assumptions made in our analysis are valid.

Any comments made in this report on potential construction problems and possible methods are intended only for guidance of the designer. The number of test locations may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of superficial fill and organic layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work. This work has been undertaken in accordance with normally accepted geotechnical engineering practices. No other warranty is expressed or implied.

Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibility of such third parties. AMEC Earth & Environmental Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

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