GEOTECHNICAL INVESTIGATION REPORT
CORNWALL ISLAND REAR RANGE TOWER
CORNWALL ISLAND, ONTARIO

Report Reference No. 17-143
November 15, 2017

Prepared For:
Department of Fisheries and Oceans
520 Exmouth St.
Sarnia, ON
N7T 8B1

Prepared By:
Alston Associates
A Division of Terrapex Environmental Ltd.

Distribution:

Digital copy - Department of Fisheries and Oceans

20 Gurdwara Road, Unit 1
Ottawa, Ontario
K2E 8B3

telephone: (613) 745-6471
fax: (613) 745-0796
e-mail: alston.associates@alston.ca

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APPENDICES

1 INTRODUCTION

On behalf of the Department of Fisheries and Oceans (DFO) Mr. Bailey Humphrey authorized **Alston Associates** (**AA**) to carry out a geotechnical investigation for a new range tower that is proposed for construction at the location of the existing Rear Range Tower located in Cornwall Island, Ontario.

The Technical Requirements for Geotechnical Investigation prepared by the DFO stipulated that one (1) borehole be advanced in close proximity to the existing rear range tower and extended until suitable soil conditions are reached.

The purpose of this investigation was to characterize the subsurface soil and groundwater conditions at the location of the proposed structure, to determine the relevant geotechnical properties of encountered soils, and to provide recommendations pertaining to design of foundations and the implementation of the project as outlined above.

This report presents the results of the investigation performed in accordance with the general terms of reference outlined above and is intended for the guidance of the client and structural engineers only. It is assumed that the design will be in accordance with the applicable codes and standards.

2 SITE DESCRIPTION

The site is located at LL 165 Cornwall Rear Range on Cornwall Island, on the North side of Island Road, approximately 200 m East of Mohawk Road. The existing tower is located approximately 15 m north from the North edge of Island Road and is bordered by woodland to the north and west and by a residential property to the east.

The borehole is situated approximately 2.5 m east and 1.4 m north of the NE corner of the existing range tower; within the gravel laneway located to the east of the existing tower.

3 FIELDWORK AND LABORATORY TESTING

The fieldwork for this investigation was carried out on October 17, 2017. It consisted of one (1) borehole advanced by a drilling contractor commissioned by **AA**. The location of the borehole is shown on Drawing No. 1; Borehole Location Plan attached in Appendix B.

The ground surface elevation at the borehole location was referenced to the top rivet of the existing fire hydrant located 5.57 m north from the north edge of Island road; south of the existing range tower. The top of the fire hydrant was assigned an assumed elevation of 100.00 m.

The borehole was advanced with the use of hollow stem augers to a depth of 3.5 m below ground surface (mbgs). The presence of large boulders below 3.5 m depth prevented further advancement of the auger. Further advancement of the borehole was performed by coring. The borehole was cored to a depth of 3.96 mbgs followed by a Standard Penetration test (SPT). The split spoon sampler could not be advanced below

4.27 m due to the presence of another large boulder. Further advancement of the borehole was achieved through coring. The core barrel was advanced through intermittent boulders to a depth of 7.47 mbgs where the last split spoon sampler was advanced to a depth of 8.07 mbgs, and the borehole terminated at this depth.

Standard penetration tests (SPT) were carried out in the course of advancing the borehole to take representative soil samples and to measure penetration index (N-values) to characterize the condition of the various soil materials. The number of blows of the striking hammer required to drive the split spoon sampler to 300 mm depth was recorded and these are presented on the borehole logs as penetration index values. Results of the SPT are shown on the borehole log enclosed in Appendix C.

Groundwater level observations were made in the borehole during and upon completion of advancing the borehole.

The fieldwork was supervised by a senior geotechnical technician from this office who effected the drilling; sampling and in situ testing; observed groundwater conditions; and prepared field borehole log sheets.

The soil samples recovered from the borehole were transported to our laboratory for detailed examination and soil classification. Water content tests were conducted on all the soil samples retained from the borehole. The results of the classification and water content tests are presented on the borehole log sheet attached in Appendix C of this report.

Grain size analyses were carried out on two soil samples. The results of these tests are presented in Appendix D.

One soil sample retained from an approximate depth of 2.2 mbgs (Sample 4) was submitted to Paracel Laboratories Ltd. for determination of pH index as well as water-soluble sulphate content and its potential of attacking the subsurface concrete.

4 SUBSURFACE CONDITIONS

Full details of the subsurface conditions at the site are shown on the borehole log attached in Appendix C.

The following paragraphs present a commentary on the engineering properties of the various soil materials contacted in the borehole.

4.1 Granular

Approximately 200 mm thick layer of sand and gravel fill is present at the surface of the laneway.

4.2 Sand and Gravel

Below the granular layer, the uppermost stratum of the native soil profile consists of Sand and Gravel. The sand and gravel is light brown in colour and contains traces of silt and clay with occasional cobbles. It

extends to an approximate depth of 2.1 mbgs.

Standard penetration resistance in the sand and gravel unit measured N-values of 18 to 97; indicating a compact to very dense compactness condition. The higher N-value; 97, obtained near the base of this soil is likely the result of the split spoon sampler striking a large stone / cobble.

Grain size analyses carried out on a sample of the gravel and sand retained from depths between 0.2 to 2.1 mbgs revealed that the soil consists of 59% sand, 38% gravel, and 3% silt and clay. The test results are enclosed in Appendix D.

Based on the result of the gradation analysis, the Coefficient of Permeability (k) of the sand and gravel is estimated to be 10^{-1} cm/s; high permeability.

Our field observations revealed that the sand and gravel soil has a damp to moist appearance. The measured water content of the soil ranges from approximately 4 to 7% by weight.

4.3 Gravelly Sand

Below the sand and gravel, a deposit of gravelly sand soil is present. This deposit extends to an approximate depth of 4.1 mbgs.

Standard penetration tests in the gravelly sand unit measured N-values of 57 to 50 for 77 mm of penetration. The higher N-values are believed to have resulted from the split spoon striking a large stone. Based on the N-value, this soil unit is in a very dense compactness condition.

Our field observations revealed that the gravely sand soil is damp to wet. The measured water content of the soil approximates 3% to 7% by weight.

Sieve analysis carried out on a sample of the gravelly sand retained from an approximate depth of 2.5 mbgs, revealed that the soil consists of 75 % sand, 21 % fine gravel, and 4 % silt. The test results are enclosed in Appendix D.

Based on the result of the gradation analysis, the Coefficient of Permeability (k) of the gravelly sand is estimated to be $0.7x10^{-2}$ cm/s; high permeability.

4.4 Intermittent Boulders and Gravelly Sand

Below an approximate depth of 4.1 mbgs, the gravelly sand deposit is underlain by a stratum which contains larger boulders. Due do the frequency and diameter of the boulders it was not possible to advance the borehole by auguring, and a diamond drill was used to core through the boulders from depths of 4.1 to 7.5 mbgs. The collected rock cores indicate the boulders consist of limestone and a course water bearing layer may be present within this zone. Photographs of the rock cores collected are enclosed in Appendix D.

Below an approximate depth of 7.5 mbgs the intermittent boulder deposit is underlain by a layer of moist to wet, grey gravelly sand layer with traces of silt and clay. Standard penetration tests in the gravelly sand unit measured an N-value of 37; indicating a dense condition. The measured water content of the soil

approximates 16% by weight.

4.5 Groundwater

Observations made in the borehole during and upon completion of advancement revealed the occurrence of groundwater seepage into the open boreholes. The groundwater measurement in the open borehole is shown on the borehole log. Water was used during the coring process. Water was not observed in the soil samples recovered above a depth of 4.1 mbgs. The sample recovered at a depth of 7.5 mbgs was grey in colour and had a higher natural moisture content indicating the presence of water.

Based on our observations of the water content of the soils, it is anticipated that groundwater is situated in the gravelly sand soil at an approximate depth of 7.5 mbgs.

It should be noted that groundwater levels are subject to seasonal fluctuations. A higher groundwater level condition will likely develop in the spring and following significant rainfall events.

4.6 Chemical Characterization of Sub-Soil

The results of the chemical analyses undertaken by Paracel Laboratories Ltd. on the soil sample retained from a depth of 2.2 m revealed that the pH index of the sample is 7.16. The water-soluble sulphate content of the soil sample is 0.0051 %.

The pH content of the tested sample has a weak alkalinity. The concentration of water-soluble sulphate content of the tested samples is below the CSA standard of 0.1% water-soluble sulphate (Table 12 CSA A23.1, Requirements for Concrete Subjected to Sulphate Attack). Special concrete mixes against sulphate attack is therefore not required for the sub-surface concrete foundation.

The certificate of Analysis provided by the analytical chemical testing laboratory is contained in Appendix 'E'.

5 DISCUSSION AND RECOMMENDATIONS

The following discussions and recommendations are based on the factual data obtained from this investigation and are intended for use by the client and their design engineers only.

Contractors bidding on this project or conducting work associated with this project should make their own interpretation of the factual data and/or carry out their own investigations.

The investigation has revealed that the soil stratigraphy at the borehole location consists of compact to very dense sand and gravel followed by layers of very dense gravelly sand, underlain by a layer of large cobbles and boulders, followed by dense gravelly sand.

On the basis of our fieldwork, laboratory tests and other pertinent information supplied by the client, the following comments and recommendations are made.

5.1 Excavation and Groundwater Control

Based on the field results, temporary excavations for foundations are not expected to pose any difficulty. Excavation of the soils at this site can be carried out with hydraulic excavators. Large cobbles are present in the sand and gravel and gravelly sand layers.

All excavation work must be carried out in accordance with the Occupational Health and Safety Act (OHSA). With respect to OHSA, the on-site sandy and gravelly soils are classified as Type 3 soil. Temporary excavations for slopes in Type 3 soil should not exceed 1.0 horizontal to 1.0 vertical. Locally, where loose soil is encountered, or within zones of persistent seepage (wet sand seams present in the sandy silt unit) at shallow depths, it will be necessary to flatten the side slopes to achieve stable conditions. Excavation side slopes should not be left exposed to inclement weather.

Where workers must enter excavations extending deeper than 1.2 m below grade, the excavation side-walls must be suitably sloped and/or braced in accordance with the Occupational Health and Safety Act and Regulation for Construction Projects.

Based on the results of the grain size analyses, the gravelly and sandy soils possess a high hydraulic conductivity. However, groundwater seepage is not expected to occur within the anticipated depth of foundation excavation.

On-site excavated soils may be reused as backfill material, provided their water content is within 3% of their optimum moisture contents as determined by Standard Proctor test, and the materials are effectively compacted with large vibratory compactors.

Measured water contents within the near surface sandy and gravelly materials ranged from approximately 3 to 7%. These water contents are generally close to the material's optimum moisture content.

5.2 Foundation Design

It is understood that the range tower is proposed for installation in the same location as the existing tower, in the vicinity of BH 1.

Conventional shallow spread footings may be utilized to support the proposed structure. Due to the presence of large cobbles and boulders, a deep foundation alternative is not feasible for the site.

The footings should be founded in the compact sand and gravel soil; designed for a net allowable bearing resistance at Serviceability Limit States (SLS) of 300 kPa, and a factored geotechnical bearing resistance at Ultimate Limit States (ULS) of 450 kPa, for vertical and centric loads. The total and differential settlements of foundations designed in accordance with the bearing resistance values recommended in the above sub-sections should not exceed the conventional limits of 25 mm and 19 mm respectively.

In order to provide protection to the foundation soil from freezing temperatures, a minimum soil cover of 1.6 m is required.

It is anticipated that the tower will be subjected to appreciable uplift and lateral loads; vertical loads will be

small. The uplift resistance should be provided using the dead weight of the foundation as well as the soil weight above the footing(s). For design purposes, the unit weight of concrete may be taken as 24.5 kN/m^3; and backfill soil placed above the footing(s) is 21 kN/m^3. If increased uplift capacities are required, this may be achieved by increasing the weight (size) of the foundation.

The following un-factored soil parameter values may be used for the design of foundations installed in the gravel and sand unit:

bulk unit weight; γ - 21 kN/m^3
angle of internal friction; Φ'- 36°
active earth pressure coefficient – 0.26
passive earth pressure coefficient – 3.8

Due to variations in the compactness condition of the founding soils and/or disturbance and/or seasonal frost effects, all footing subgrade must be evaluated by the Geotechnical Engineer prior to placing foundation concrete to ensure that the soil exposed at the excavation base is consistent with the design geotechnical bearing resistance. If unstable subgrade conditions develop, the Geotechnical Engineer should be contacted in order to assess the conditions and make appropriate recommendations.

Rainwater or groundwater seepage entering the foundation excavation must be pumped away (not allowed to pond). The foundation subgrade soils should be protected from freezing, inundation and equipment traffic at all times.

AA recommends that footings placed on the exposed soil should be poured on the same day as they are excavated, after removal of all unsuitable founding materials and approval of the bearing surface. Alternatively, a concrete mud slab could be used to protect a bearing surface where footing construction is to be delayed. If construction proceeds during freezing weather conditions, adequate temporary frost protection for the footing bases and concrete must be provided.

6 LIMITATIONS OF REPORT

The Limitations of Report, as quoted in Appendix 'A', are an integral part of this report.

alston associates inc.
A Division of Terrrapex Environmental Ltd.

Rachel Herzog, C.Tech.
Project Manager

Vic Nersesian, P. Eng.
Vice president, Geotechnical Services

APPENDIX A

LIMITATIONS OF REPORT

Limitations of Report

The conclusions and recommendations in this report are based on information determined at the inspection location. Soil and groundwater conditions between and beyond the test hole may differ from those encountered at the test hole locations, and conditions may become apparent during construction which could not be detected or anticipated at the time of the soil investigation.

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 details of alignment and elevations stated in the report. Since all details of the design may not be known to us, in our analysis certain assumptions had to be made as set out in this report. The actual conditions may, however, vary from those assumed, in which case changes and modifications may be required to our recommendations.

This report was prepared for the Department of Fisheries and Oceans and the Canadian Coast Guard by Alston Associates. The material in it reflects Alston Associates judgement in light of the information available to it at the time of preparation. Any use which a Third Party makes of this report, or any reliance on decisions which the Third Party may make based on it, are the sole responsibility of such Third Parties.

We recommend, therefore, that we be retained during the final design stage to review the design drawings and to verify that they are consistent with our recommendations or the assumptions made in our analysis. We recommend also that we be retained during construction to confirm that the subsurface conditions throughout the site do not deviate materially from those encountered in the test holes. In cases where these recommendations are not followed, the company's responsibility is limited to accurately interpreting the conditions encountered at the test holes, only.

The comments given in this report on potential construction problems and possible methods are intended for the guidance of the design engineer, only. The number of inspection locations may not be sufficient to determine all the factors that may affect construction methods and costs. 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.

APPENDIX B

DRAWING NO. 1: BOREHOLE LOCATION PLAN

alston associates
geotechnical division of TERRAPEX

BOREHOLE LOCATION PLAN

CORNWALL ISLAND REAR RANGE
CORNWALL, ONTARIO

CLIENT
DEPARTMENT OF
FISHERIES AND OCEANS

0 10m 20m
(APPROXIMATE)

LEGEND

BOREHOLE

SOURCE: ONTARIO MINISTRY OF NATURAL RESOURCES AND FORESTRY; MAKE A TOPOGRAPHIC MAP;

PROJECT #	17-143
SCALE	AS SHOWN
DATE	NOVEMBER 2017
DRAWN	SF
CHECKED	
DRAWING #	DRAWING 1

APPENDIX C

BOREHOLE LOG SHEETS

CLIENT: Department of Fisheries and Oceans	METHOD: Split Sampling		**BH No.: 1**
PROJECT: Cornwall Island Rear Range Tower	PROJECT ENGINEER: VN	ELEV. (m) 100.246	
LOCATION: Island Road, Cornwall Island	NORTHING:	EASTING:	PROJECT NO.: 17-143

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

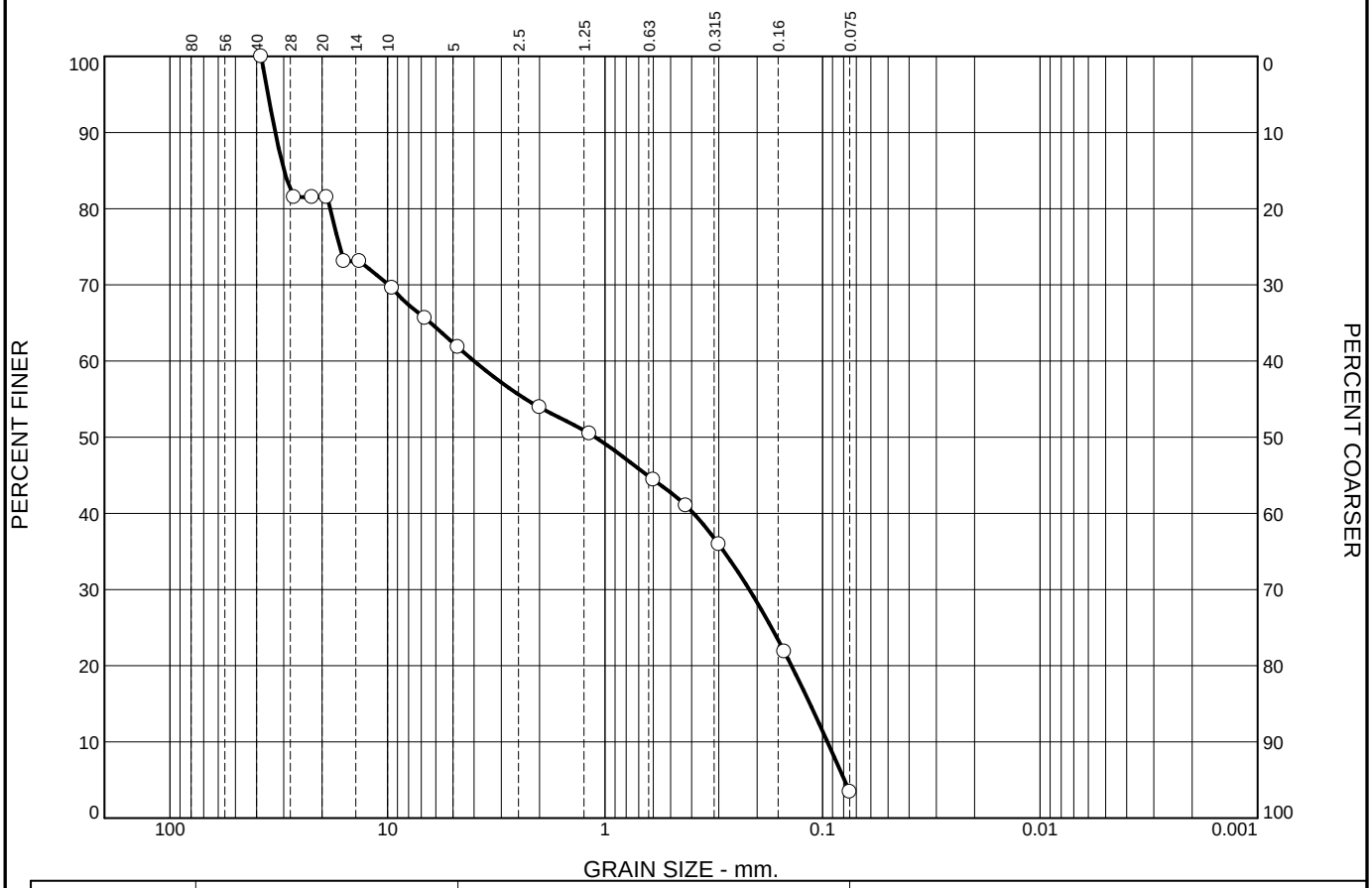
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) / N-Value (Blows/300mm)	Water Content (%) PL W.C. LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		200 mm GRAVEL some SAND	0	100	18	4	1		18		Upon completion of the borehole the sidewalls had caved in at 2.98 mbgs. Water was used to coring process and may have affected the stability of the sidewalls as well as the observed water level.
		dense damp, light brown SAND and GRAVEL trace silt ----- very dense	0.5 1 1.5	99.5 99	46	7	2		46		
			2	98.5	97	4	3		97		
		very dense, damp, brown GRAVELLY SAND trace silt	2.5 3 3.5	98 97.5 97	57 50/77	3 7	4 5		57 50/77		spoon bouncing
			4	96.5	50/127		6		50/127		Spoon Bouncing
		intermittent BOULDERS	4.5 5 5.5 6 6.5 7	96 95.5 95 94.5 94 93.5 93							unable to advance augurs through boulders, cored until able to split spoon sample.
		dense, moist, grey GRAVELLY SAND trace silt	7.5 8	92.5	37	16	7		37		
		END OF BOREHOLE									

	LOGGED BY: RH	DRILLING DATE: October 17, 2017
	REVIEWED BY: VN	Page 1 of 1

APPENDIX D

LABORATORY TEST RESULTS

Grain Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	18	20	8	13	38	3	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			29.8781	4.0021	1.1087	0.2173	0.1143	0.0950	0.12	42.14

Material Description	USCS	AASHTO
○ SAND and GRAVEL, trace silt	SP	

Project No. 17-143 **Client:** Department of Fisheries and Oceans

Project: Cornwall Island Rear Range Tower

○ **Sample Number:** BH1 sample 3

Remarks:

○Tested on October 18, 2017

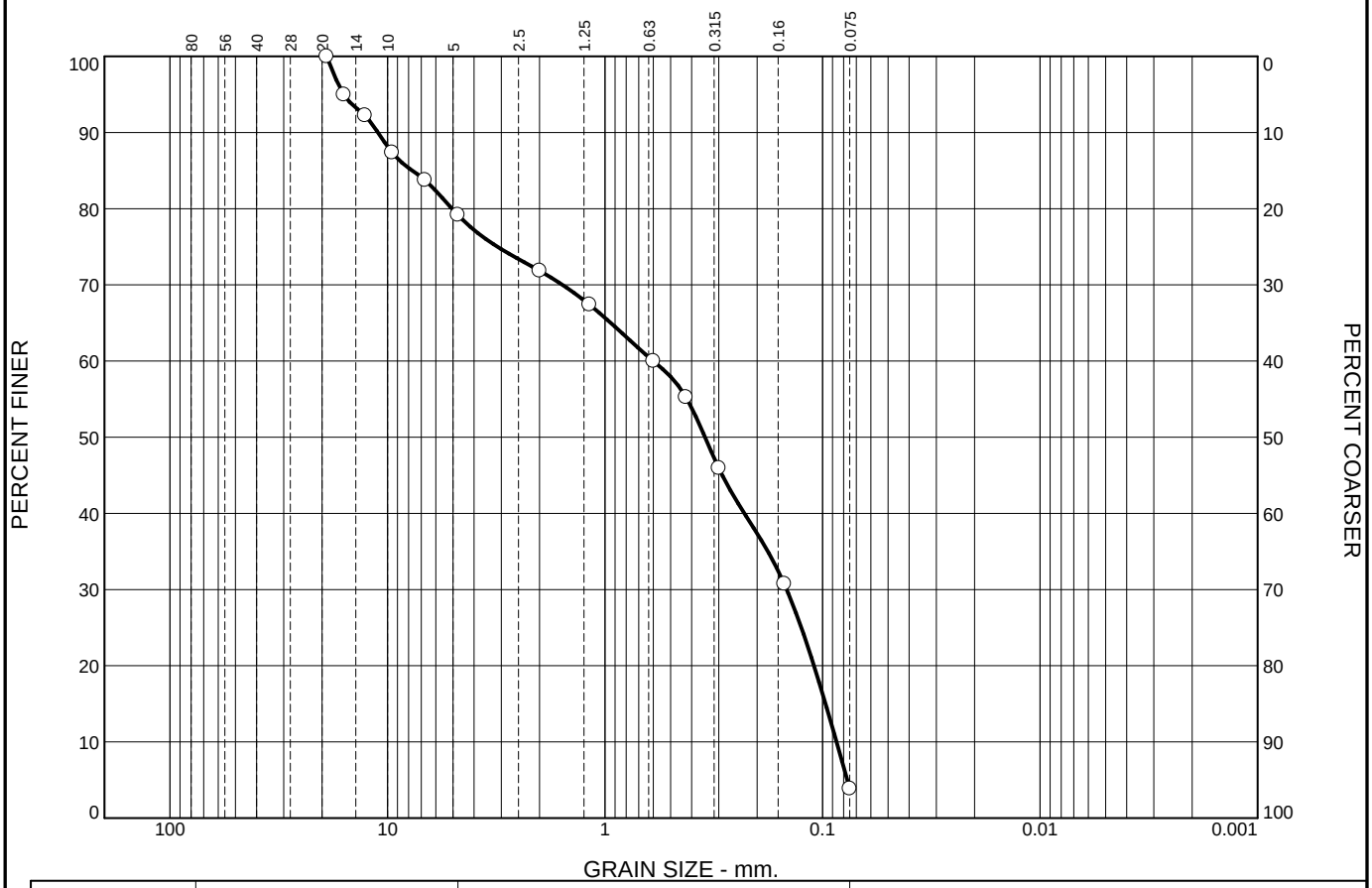
Alston Associates

Geotechnical Division of Terrapex

Figure F1G

Tested By: RH

Grain Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	0	21	7	17	51	4	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			7.6930	0.6005	0.3471	0.1461	0.0969	0.0862	0.41	6.96

Material Description	USCS	AASHTO
○ GRAVELLY SAND, trace silt	SP	

Project No. 17-143 **Client:** Department of Fisheries and Oceans

Project: Cornwall Island Rear Range Tower

○ **Sample Number:** BH 1 sample 4

Remarks:

○Tested on October

Alston Associates

Geotechnical Division of Terrapex

Figure F2G

Tested By: RH

APPENDIX E

ANALYTICAL LABORATORY RESULTS

PARACEL LABORATORIES LTD.
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300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

Terrapex Environmental Ltd. (Ottawa)

100-2700 Lancaster Rd.
Ottawa, ON K1B 4T7
Attn: Rachel Herzog

Client PO:
Project: 17 143
Custody: 110555

Report Date: 20-Oct-2017
Order Date: 18-Oct-2017

Order #: 1742313

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1742313-01	BH 1/4

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Terrapex Environmental Ltd. (Ottawa)
Client PO:

Report Date: 20-Oct-2017
Order Date: 18-Oct-2017
Project Description: 17 143

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Anions	EPA 300.1 - IC, water extraction	19-Oct-17	19-Oct-17
pH, soil	EPA 150.1 - pH probe @ 25 °C, CaCl buffered ext.	18-Oct-17	18-Oct-17
Solids, %	Gravimetric, calculation	18-Oct-17	18-Oct-17

Certificate of Analysis

Client: Terrapex Environmental Ltd. (Ottawa)

Client PO:

Report Date: 20-Oct-2017

Order Date: 18-Oct-2017

Project Description: 17 143

	Client ID:	BH 1/4	-	-	-
	Sample Date:	17-Oct-17	-	-	-
	Sample ID:	1742313-01	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	91.2	-	-	-
General Inorganics					
pH	0.05 pH Units	7.16	-	-	-
Anions					
Sulphate	5 ug/g dry	51	-	-	-

Certificate of Analysis
Client: Terrapex Environmental Ltd. (Ottawa)
Client PO:

Report Date: 20-Oct-2017
Order Date: 18-Oct-2017
Project Description: 17 143

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Sulphate	ND	5	ug/g						

Certificate of Analysis
Client: Terrapex Environmental Ltd. (Ottawa)
Client PO:

Report Date: 20-Oct-2017
Order Date: 18-Oct-2017
Project Description: 17 143

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Sulphate	52.6	5	ug/g dry	51.1			2.9	20	
General Inorganics									
pH	7.53	0.05	pH Units	7.53			0.0	10	
Physical Characteristics									
% Solids	78.8	0.1	% by Wt.	80.1			1.7	25	

Certificate of Analysis
Client: Terrapex Environmental Ltd. (Ottawa)
Client PO:

Report Date: 20-Oct-2017
Order Date: 18-Oct-2017
Project Description: 17 143

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Sulphate	153	5	ug/g	51.1	102	78-111			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.

Soil results are reported on a dry weight basis when the units are denoted with 'dry'.
Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

Paracel ID: 1742313

PARACEL LABORATORIES LTD.

Head Office
300-2319 St. Laurent Blvd.
Ottawa, Ontario K1G 4J8
p: 1-800-749-1947
e: paracel@paracellabs.com

Chain of Custody
(Lab Use Only)
№ 110555

Page 1 of 1

Client Name: Terrapex Environmental	Project Reference: 17143
Contact Name: Rachel Herzog	Quote #
Address: 100-2700 Lancaster Road, Ottawa, ON.	PO #
Telephone: 613-552-5208	Email Address: r.herzog@alston.ca

Turnaround Time:
☐ 1 Day ☐ 3 Day
☐ 2 Day ☒ Regular
Date Required: _____

Criteria: ☒ O. Reg. 153/04 (As Amended) Table _ ☐ RSC Filing ☐ O. Reg. 558/00 ☐ PWQO ☐ CCME ☐ SUB (Storm) ☐ SUB (Sanitary) Municipality: _____ ☐ Other: _____

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analyses

	Paracel Order Number: 1742313 / Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	pH + SO4						
1	BH1/4	S		1	Oct 17, 2017	12 pm								✓			250 mL			✓
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Walkin

Relinquished By (Sign):	Received by Driver/Depot:	Received at Lab:	Verified By: Rachel subject
Relinquished By (Print): Keesa Staffe	Date/Time:	Date/Time: Oct 18/17	Date/Time: Oct 18/17.
Date/Time: 18 Oct 17 10:19 am	Temperature: _____ °C	Temperature: 8.4 °C 10:18	pH Verified [ ] By: N/A 1:26.

APPENDIX F

PHOTOGRAPHIC LOG

TERRAPEX	PHOTOGRAPHIC LOG		Page 1 of 3
Client: DFO	**Date: October 17, 2017**		**Project No**: 17-143

Photo No: 1

Description:

- Standing on Island Road in front of range tower, looking north.

Client: DFO	**Date: October 17, 2017**		**Project No**: 17-143

Photo No: **2**	
Description: • Standing in gravel access road, behind Borehole 1, looking South.	

Client: DFO	**Date: October 17, 2017**		**Project No**: 17-143

Photo No: **3**

Description:

- Core box of cobbles/boulders retrieved from rock coring