

Appendix "B" - Three (3) Marine Sediment Sampling Reports
(AECOM 2013; AMEC 2015 Letter; AMEC 2015)



**PWGSC PROJECT # R.056887.004
MARINE SEDIMENT SAMPLING PROGRAM
JUDIQUE (BAXTER'S COVE)
INVERNESS COUNTY, NOVA SCOTIA

FINAL REPORT**

Submitted to:
PWGSC
1713 Bedford Row
Halifax, Nova Scotia
B3J 3C9

Submitted by:
AECOM Canada Ltd.
164 Charlotte Street, Suite 2B
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January 2013

AECOM Project # 60272861



January 7, 2013

Rosalia Galante
PWGSC
1713 Bedford Row
Halifax, Nova Scotia
B3J 3C9

Dear Ms. Galante:

Re: Marine Sediment Sampling Program, Judique (Baxter's Cove), Inverness County, NS

AECOM Canada Ltd. (AECOM) is pleased to submit the enclosed Final Marine Sediment Sampling & Analysis Report, on work conducted in Judique (Baxter's Cove) Department of Fisheries and Oceans (DFO) Small Craft Harbour (SCH), in Inverness County, Nova Scotia. This Project has been completed under the Standing Offer Agreement whereby AECOM provides *Canadian Environmental Assessment Act* (CEAA) Assessment services to Public Works and Government Services Canada (PWGSC) (Standing Offer Contract # E0226-111592/002/PWD). A site visit was undertaken by AECOM and Connors Diving Services on July 31, 2012.

We trust this report meets your present requirements. Please contact the undersigned, should you have any questions or require additional details.

Sincerely,

Original Signed By

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Project Manager
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EXECUTIVE SUMMARY

Five (5) sediment samples and one (1) duplicate were collected by divers from Baxter's Cove, DFO SCH, located in Judique, Inverness County, NS. An additional four (4) samples and one (1) duplicate sample were collected by grab sample from a nearby historic disposal soil site (owner Ronald Graham, PID 50012517). The samples were submitted to Maxxam Analytics for detailed analyses. Results were compared to the Canadian Environmental Protection Act (CEPA) Disposal at Sea Regulations, CCME Soil Quality Guidelines (SQGs) for the Protection of Environment and Human Health in agricultural, residential/parkland, and commercial/industrial applications, Atlantic Risk-Based Corrective Action (RBCA) Tier 1 Version 2.0 Risk-Based Screening Levels (RBSLs), CCME Canadian Water Quality Guidelines (WQG) for the Protection of Aquatic Life and/or Health Canada Canadian Guideline for Drinking Water Quality (CGDWQ).

Based on the analytical results the following exceedances were noted:

- JQ-39, JQ-48 and JQ-90 exceeded the CCME Soil Quality Guidelines (SQG) for the Protection of Environmental Health Criteria (freshwater) for the parameter phenanthrene
- JQ-48 and JQ-90 exceeded the CCME Interim Soil Quality Criteria for the parameter pyrene
- JQ-48 and JQ-90 exceeded the CCME IACR (Drinking Water Check) value of 1 for the protection of human health (potable water) for all land use scenarios
- JQ-48 and JQ-90 exceeded the CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life (freshwater) for the parameter leachable phenanthrene
- JQ-90 exceeded the CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life (freshwater) for the parameter leachable anthracene

Table ES1: Exceedance Table – Harbour

Parameter/Guideline	Sample ID					
	JQ-39	JQ-39-DUP	JQ-48	JQ-90	JQ-99	JQ-120
CEPA	-	-	-	-	-	-
CCME Soil Quality Guidelines						
PAHs	•		•	•	-	-
Metals	-		-	-	-	-
PCBs	-		-	-	-	-
DDT	-		-	-	-	-
Atlantic RBCA Tier 1 Version 2.0 RBSLs	-		-	-	-	-
CCME Water Quality Guidelines						
Leachable PAHs			•	•		

Table ES2: Exceedance Table – Historic Disposed Soil

Parameter/Guideline	Sample ID				
	JQ-01	JQ-01-DUP	JQ-02	JQ-03	JQ-04
CEPA	-		-	-	-
CCME Soil Quality Guidelines					
PAHs	-		-	-	-
Metals	-		-	-	-
PCBs	-		-	-	-
DDT	-		-	-	-
Atlantic RBCA Tier 1 Version 2.0 RBSLs	-		-	-	-

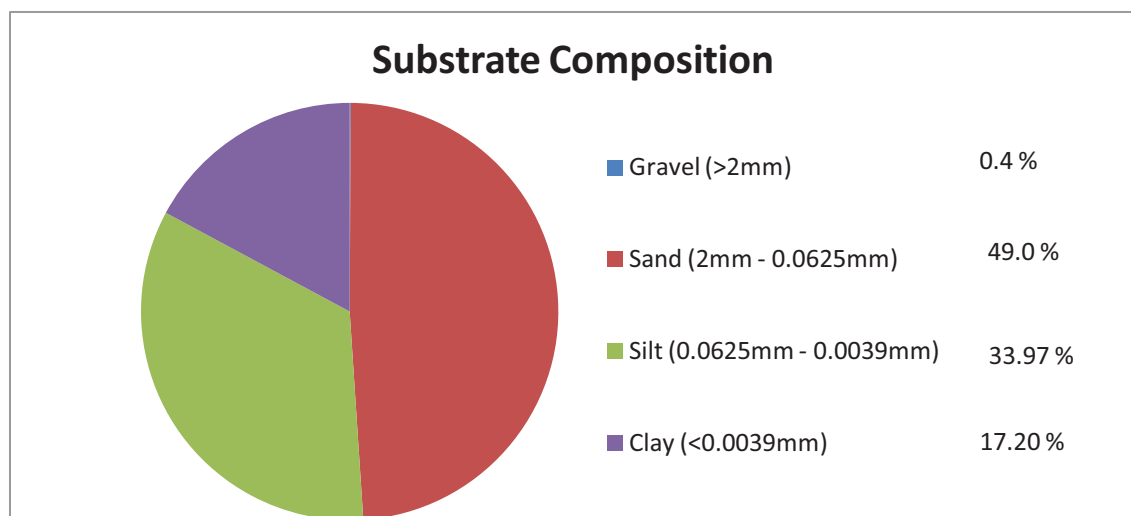


Figure ES1: Substrate Composition Averaged from Sampling Locations within Harbour

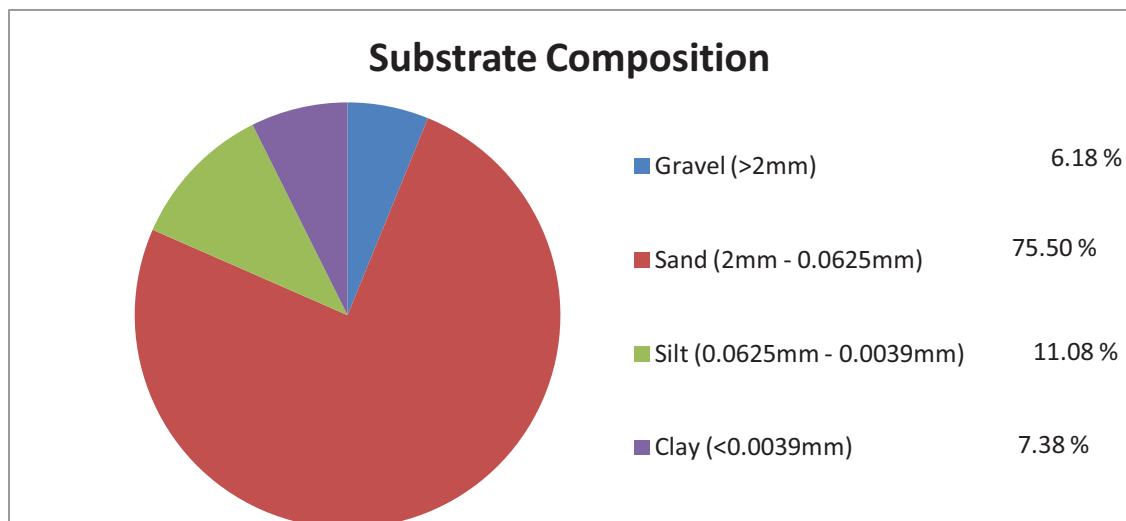


Figure ES2: Substrate Composition Summarized from Sampling Locations within Historic Disposal Pile

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1.0 INTRODUCTION

At the request of Public Works and Government Services Canada (PWGSC), five (5) stations were sampled within the footprint of the proposed dredging area at the Baxter's Cove Department of Fisheries and Oceans Small Craft Harbour (DFO-SCH) in Judique (Baxter's Cove), Inverness County, Nova Scotia on July 31, 2012. Four (4) additional composite samples were collected from the nearby historic soil disposal site, located across the gravel access road from the SCH.

2.0 SCOPE AND METHODOLOGY

2.1 Site Plan

The selection of sample stations followed guidance provided in the Environmental Protection Series: *Users Guide to the Application Form for Ocean Disposal* (Report EPS 1/MA/1 December 1995). A random approach was implemented for selecting the locations of sampling stations in the proposed dredging area of the SCH. The unstratified area was divided into square blocks where at least five times as many blocks as the number of stations required was used. An online random number generator program (www.random.org) was then used to derive the sampling locations within the proposed dredge area (Figure 2.1). A systematic approach was implemented for selecting the location of sampling stations in the historic dredge site: the area was divided into a four (4) by four (4) grid and one (1) composite sample was collected from each quadrant, with equal sample volume collected from each block within the quadrant.

A detailed program design was prepared by AECOM and submitted to PWGSC on July 23, 2012 for review and approval prior to field program implementation. The field program was scheduled upon acceptance of the design.

Sample collection, preparation, and analyses were conducted in accordance with Environment Canada's publication Guidance Document on *Collection and Preparation of Sediments for Physicochemical Characterization and Biological Testing*, December 1994. Connors Diving Services was retained to collect the sediment samples from within the harbour and AECOM personnel collected samples from the historic disposal site. The sample collection field program was completed in accordance with guidelines defined by provincial Occupational Health and Safety Standards.

2.2 Sample Collection

The marine sediment samples were collected by divers and the disposal soil samples were collected by grab sample at the selected sampling stations. The divers used a handheld Garmin Global Positioning System (GPS) to georeference the sampling location coordinates that were derived prior to field program initiation. The coordinates collected did not always accurately illustrate the actual sampling location. Various factors play into skewing GPS results: the unit was accurate within 6 to 8 m during sample collection (the approximate size of sample blocks),

one (1) significant digit was displayed on the GPS unit compared with three (3) in the sample plan, and coordinates were converted between UTM, degrees minutes second, and decimal degree systems. As such, the divers use visual clues such as landmarks (wharfs, break water etc.) to verify their sample location in the field.

The soil sampler used a handheld GPS to collect location coordinates from the disposal site. Approximate centre coordinates for each of the four (1) sample quadrants are listed in Section 2.3. MSSP field reports that were completed in the field during the sampling program are listed in Appendix A. A photo log is also provided in Appendix A.

AECOM and Connors Diving personnel visited the site on July 31, 2012 to collect samples and record pertinent information regarding the site and samples collected. Weather at the time of collection was mostly sunny, 25° C, without precipitation or significant winds. The submerged sediment was well covered with vegetation, but not so much as to interfere with sediment collection; no changes were made to the sampling locations. The dredge pile was a 20 m by 20 m oval pile of sparsely vegetated soft sediment; no interferences to sample collection were noted.

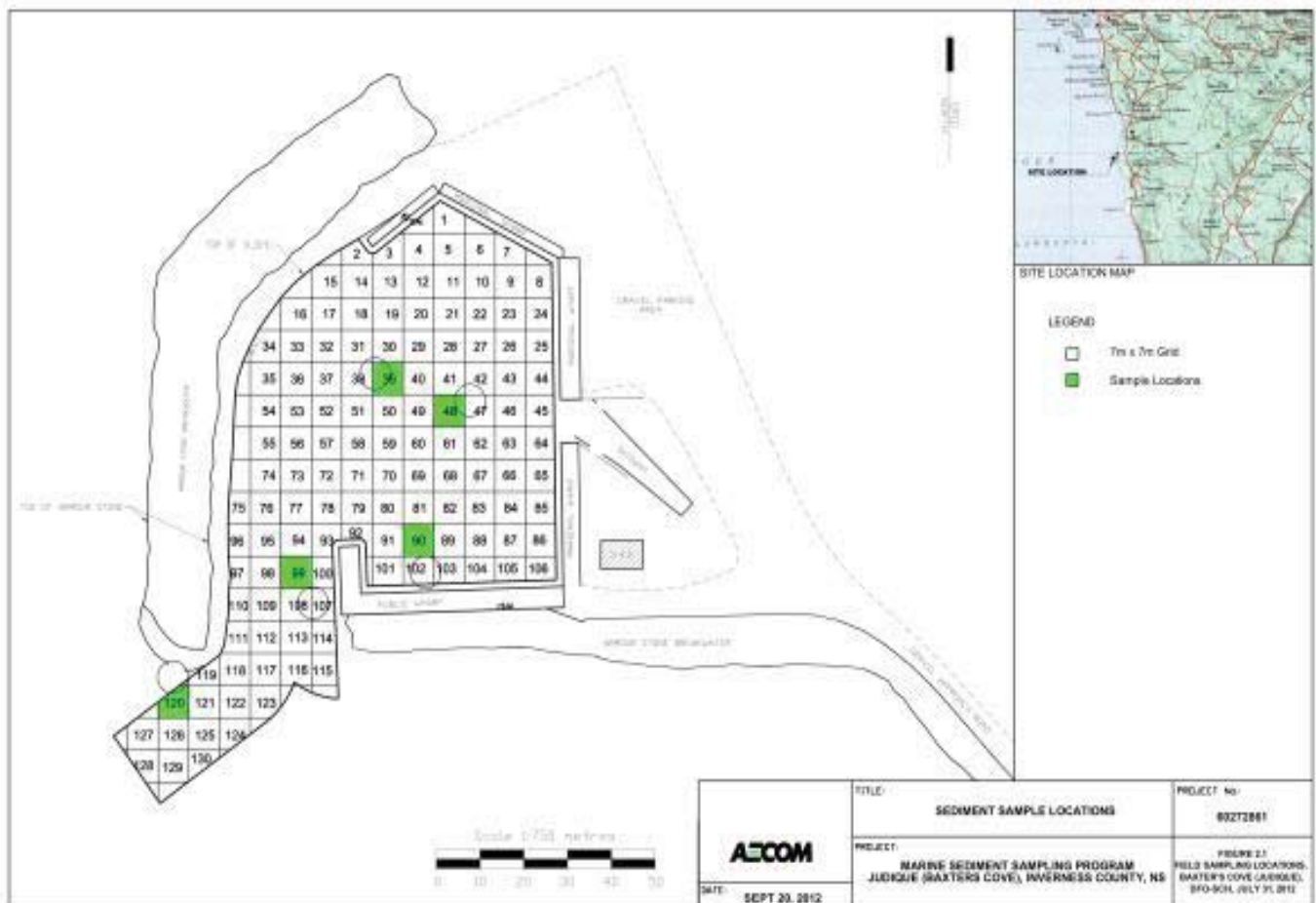


Figure 2.1: Field Sampling locations, Judique (Baxter's Cove) DFO-SCH, July 31, 2012



Figure 2.2: Field Sampling Locations, Disposal Site near Baxter's Cove, July 31, 2012

In order to facilitate the determination of all disposal options, the analytical sample results were compared to the following:

- *Canadian Environmental Protection Act* (CEPA) Disposal at Sea Regulations (formerly the Ocean Dumping Control Act) – Lower Level Screening Criteria.
- CCME Soil Quality Guidelines (SQGs) for the Protection of Environment and Human Health in agricultural, residential/parkland, and commercial/industrial applications.
- Atlantic Risk-Based Corrective Action (RBCA) Tier 1 Version 2.0 Risk-Based Screening Levels (RBSLs).
- CCME Canadian Water Quality Guidelines (WQG) for the Protection of Aquatic Life
- Health Canada Canadian Guideline for Drinking Water Quality (CGDWQ)

Table 2.1: Harbour Sample Coordinates

Sample ID	Sample Coordinates (decimal degrees, NAD 83)	
JQ-39	45.858111	-61.503444
JQ-48	45.858083	-61.503167
JQ-90	45.857722	-61.503306
JQ-99	45.857667	-61.503639
JQ-120	45.857528	-61.504056

Table 2.1: Historic Dredge Site Sample Coordinates

Sample ID	Sample Coordinates (decimal degrees, NAD 83)	
JQ-01	45.855139	-61.498778
JQ-02	45.855111	-61.498778
JQ-03	45.855056	-61.498722
JQ-04	45.855028	-61.498694

3.0 ANALYTICAL RESULTS

The analytical results of the marine sediment samples collected and analyzed from Baxter's Cove DFO SCH are summarized in Tables B.1 to B.10 (Appendix B) and discussed below.

Based on a review of the initial analytical results, it was decided through consultation with PWGSC that two (2) sediment samples JQ-48 and JQ-90 should undergo leachate analysis (Synthetic Precipitation Leaching Procedure [SPLP]; EPA Method 1312) for their exceedances of the CCME SQG for the Protection of Environment and Human Health. Results from these analyses were compared against the CCME Canadian WQG for the Protection of Aquatic Life and the Health Canada CGDWQ.

It is also of note that for the PAH and metals results, only those parameters for which there are established regulatory guidelines or those used in calculations are included in the tables. The complete set of analytical results, including laboratory QA/QC and Certificates of Analyses for all parameters tested, are provided in Appendix C.

3.1 PAH Concentrations

Total PAH levels are regulated at a value of less than or equal to 2.5 milligrams per kilogram (mg/kg) under CEPA in order to meet ocean disposal criteria. The CCME SQGs for the protection of human and environmental health stipulate guideline values for individual PAH compounds as well as the sum of individual PAH compounds for the calculation of Index of Additive Cancer Risk (IACR). A summary of the results compared to each of the referenced guidelines is provided in the following subsections.

Total PAH levels are regulated at a value of less than or equal to 2.5 milligrams per kilogram (mg/kg) under CEPA in order to meet ocean disposal criteria. The CCME SQGs for the protection of human and environmental health stipulate guideline values for individual PAH compounds as well as the sum of individual PAH compounds for the calculation of Index of Additive Cancer Risk (IACR). A summary of the results compared to each of the referenced guidelines for the harbour samples and the historic dredge site sample are provided in the following subsections.

3.1.1 Harbour Samples

CEPA Ocean Disposal Guideline

No sediment samples exceeded the CEPA Ocean Disposal Guideline for Total PAHs (Table B.1).

CCME SQGs – Human Health (Potable Water)

Sediment samples JQ-48 and JQ-90 exceeded the CCME IACR (Drinking Water Check) value of 1 or the CCME SQGs for the protection of human health (potable water) for all land use scenarios (Table B.1).

CCME SQG – Human Health (Direct Contact)

Guidance provided in the CCME Soil Quality Guidelines for the Protection of Environmental and Human Health (2008) indicates that for soil contaminated by coal tar or creosote mixtures, the calculated Benzo(a)pyrene TPE concentration for soil samples should be multiplied by an uncertainty factor (UF) of 3 prior to comparison with the SQGs for the protection of human health (direct contact) to account for carcinogenic potential of alkylated and other PAHs present for which a PEF does not currently exist, but which are likely to contribute to mixture carcinogenic potential.

Analytical results from the total extractable hydrocarbon (TEH) analysis revealed that creosote was not detected in two (2) of sediment samples analyzed. The lab was unable to confirm the presence of creosote in the remaining three (3) sediment samples. Results of all five (5) sediment samples fell below the CCME SQGs for the protection of human health (direct contact) for agricultural, residential/parkland, commercial and industrial land value of 5.3 mg/kg (Table B.1).

CCME SQGs – Environmental Health (Soil Contact), (Soil and Food Ingestion), and (Freshwater Life)

No sediment samples exceeded the CCME SQGs for the protection of environmental health (soil contact) and (soil and food ingestion).

Sediment samples JQ-39, JQ-48 and JQ-90 exceeded the CCME SQGs for the protection of environmental health (freshwater life) for all land use scenarios (Table B.1).

Leachate Discussion

CCME WQGs – Aquatic Life (Freshwater and Marine)

Sediment Samples JQ-48 and JQ-90 analyzed for leachate exceeded CCME WQGs for the Protection of Aquatic Life in freshwater environments for the parameter phenanthrene, JQ-90 also exceeded for the parameter anthracene. No exceedances of the CCME WQGs for the Protection of Aquatic Life in marine environments were noted (Table B.1b).

Health Canada CGDWQ (MAC and AO)

No sediment samples exceeded the CCME IACR (Drinking Water Check) value of 1.

No exceedances of Health Canada's CGDWQ were noted in the leachate samples analyzed (Table B.1b).

3.1.2 Historic Dredge Site Samples

CEPA Ocean Disposal Guideline

No soil samples exceeded the CEPA Ocean Disposal Guideline for Total PAHs (Table B.6).

CCME SQGs – Human Health (Potable Water)

No soil samples exceeded the CCME IACR (Drinking Water Check) value of 1 or the CCME SQGs for the protection of human health (potable water) for all land use scenarios (Table B.6)

CCME SQG – Human Health (Direct Contact)

Results of all four (4) sediment samples fell below the CCME SQGs for the protection of human health (direct contact) for agricultural, residential/parkland, commercial and industrial land value of 5.3 mg/kg (Table B.6). Analytical results from the total extractable hydrocarbon (TEH) analysis revealed that creosote was not detected in any of the four (4) of soil samples analyzed (Table B.6).

CCME SQGs – Environmental Health (Soil Contact), (Soil and Food Ingestion), and (Freshwater Life)

No soil samples exceeded the CCME SQGs for the protection of environmental health (soil contact) and (soil and food ingestion) (Table B.6).

No soil samples exceeded the CCME SQGs for the protection of environmental health (freshwater life) for all land use scenarios (Table B.6).

3.2 Metal Concentrations

Sample results were compared to the established CEPA Ocean Disposal Guidelines and the former Environment Canada Interim Rejection Limits. The results were also compared to the CCME SQGs for agricultural, residential/parkland and commercial/ industrial applications for land disposal.

No sediment or soil samples exceeded the CEPA Ocean Disposal Guidelines.

No sediment or soil samples exceeded the CCME SQGs for agricultural, residential/parkland or commercial/industrial applications (Table B.2).

3.3 Petroleum Hydrocarbon Concentrations

Although no guidelines for petroleum hydrocarbons currently exist for marine sediment, the analytical BTEX results of the five (5) sediment samples and four (4) soil samples collected were compared to the Atlantic RBCA Tier 1 Version 2.0 RBSLs and CCME SQGs for various land use applications. Silica gel clean-up was requested and completed prior to analysis.

Modified TPH values reflect the sum of the individual carbon fractions that resembles gasoline, diesel #2, and lube oil. Based on the resemblance results provided by the laboratory, the analytical results for Modified TPH were compared against the corresponding Atlantic RBCA Tier 1 Version 2.0 RBSLs.

Individual carbon fractions were reported below laboratory detection limits for all four (4) soil samples, with the exception of C21 - <C32. The C21 - <C32 fraction was reported below the CCME SQG for F3 (C16 – C32). Baseline was reached at C32 for each soil sample.

Individual carbon fractions were reported below laboratory detection limits for two (2) sediment samples, JQ-99 and JQ-120. The remaining three (3) sediment samples returned results above detection limits for carbon fractions C16 - <C21 and C21 - <C32. The C21 - <C32 fraction was reported below the CCME SQG for F3 (C16 – C32). Baseline was reached at C32 for each sediment sample that returned results higher than laboratory detection limits.

BTEX was not detected in any of the sediment or soil samples collected (Table B.3 and B.8).

The modified TPH values did not exceed the Atlantic RBCA Tier 1 Version 2.0 RBSLs for any of the soil or sediment samples.

3.4 PCB Concentrations

Total PCB values are regulated at a value of less than or equal to 0.1 mg/kg under CEPA in order to meet ocean disposal criteria. The CCME SQGs for PCBs in agricultural, residential/parkland, and industrial/commercial applications are regulated at values of 0.5, 1.3, and 33.0 mg/kg, respectively.

No samples exceeded the CEPA ocean disposal guideline.

No samples exceeded the CCME SQGs for all land use applications (Table B.4 and B.9).

3.5 DDT Concentrations

Total DDT which refers to the sum of DDE, DDD, and DDT concentrations is regulated under the CCME SQGs for agricultural, residential/parkland, and commercial/industrial applications at values of 0.7, 0.7, and 12 mg/kg, respectively.

No samples exceeded the CCME SQGs for all land use applications (Table B.4).

3.6 Carbon Content

Marine sediment samples JQ-39, JQ-38, JQ-90, JQ-99 and JQ-120, showed total carbon contents ranging from 1.7 to 28 grams per kilogram (g/kg). Total organic carbon (TOC) was the predominant type, ranging from 0.4 to 24 g/kg, while total inorganic carbon (TIC) ranged from 1.3 to 3.9 g/kg (Table B.5 and B.10).

Disposal soil samples JQ-01, JQ-02, JQ-03 and JQ-04, showed total carbon contents ranging from 16 to 20 grams per kilogram (g/kg). TOC was the predominant type, ranging from 9 to 18 g/kg, while TIC ranged from below laboratory detection limits to 7.3 g/kg (Table B.5 and B.10).

3.7 Grain Size Distribution

Sediment composition is described in Figures 3.1 and 3.2, and Tables 3.1 and 3.2 below. Figure 3.1 illustrates the overall substrate composition from sampling locations within the harbour expressed as percentages to show the average grain size distribution within the proposed dredge area. Table 3.1 breaks down the sediment composition at each sampling location within the harbour. Figure 3.1 illustrates the overall substrate composition from sampling locations in the historic disposal site expressed as percentages to show the average grain size distribution within the proposed dredge area. Table 3.1 breaks down the sediment composition from each quadrant of the disposal pile.

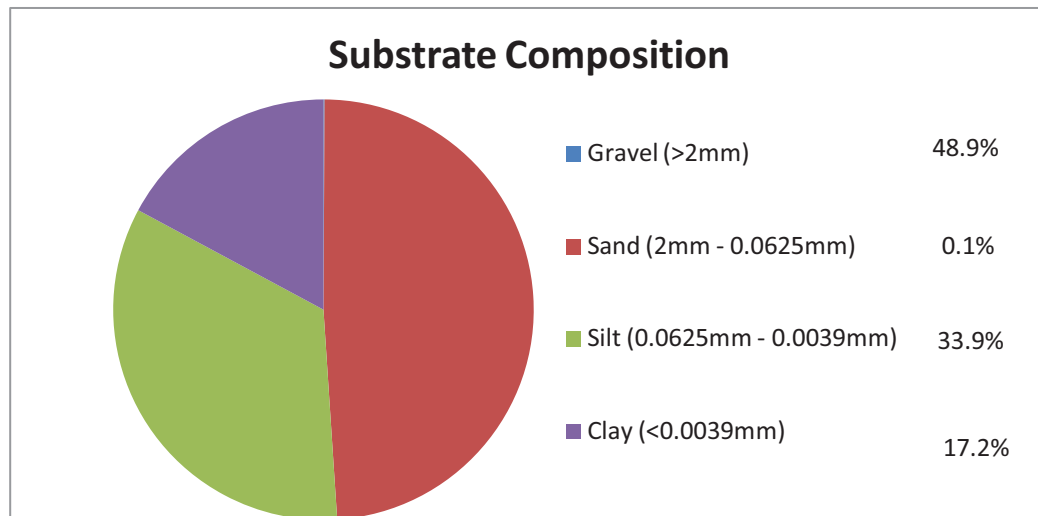


Figure 3.1: Substrate Composition Summarized from Sampling Locations within Harbour

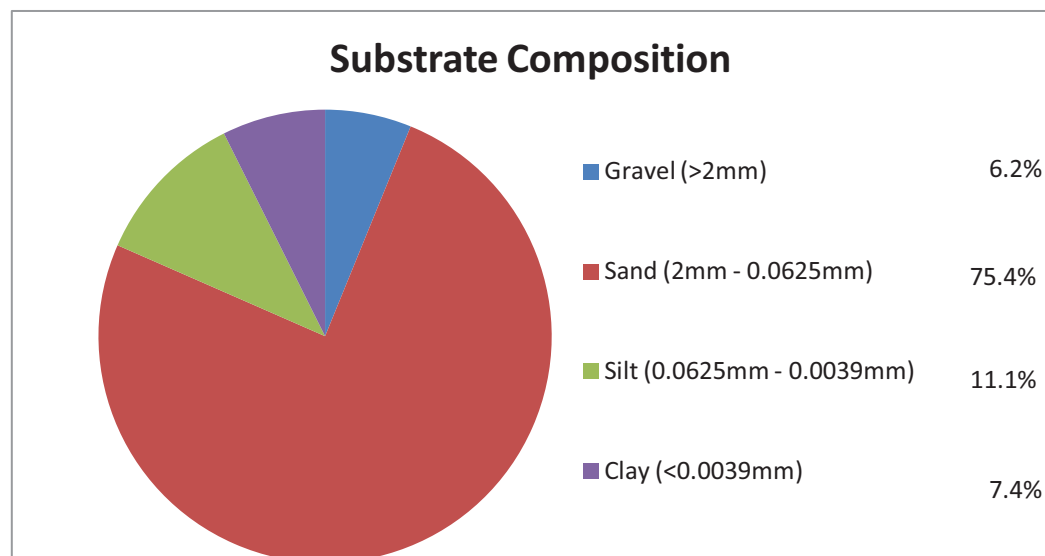


Figure 3.2: Substrate Composition Summarized from Sampling Locations within Disposal Site

Table 3.1: Dominant Sediment Types at Each Sample Location within Harbour

Sediment Distribution				
Sample ID	Primary Substrate	Secondary Substrate	Tertiary Substrate	Quaternary Substrate
JQ-39	Silt	Clay	Sand	Gravel
JQ-48	Silt	Caly	Sand	Gravel
JQ-90	Silt	Sand	Clay	Gravel
JQ-99	Sand	Silt	Clay	Gravel
JQ-120	Sand	Clay	Silt	Gravel

Table 3.2: Dominant Sediment Types at Quadrant at Disposal Site

Sediment Distribution				
Sample ID	Primary Substrate	Secondary Substrate	Tertiary Substrate	Quaternary Substrate
JQ-01	Sand	Gravel	Silt	Clay
JQ-02	Sand	Silt	Clay	Gravel
JQ-03	Sand	Silt	Clay	Gravel
JQ-04	Sand	Silt	Clay	Gravel

4.0 QUALITY ASSURANCE/QUALITY CONTROL

All samples collected were labelled on site using a waterproof marker with the date, sample site identifier, and sample number. The samples were placed upright on ice inside a cooler for safe storage and transport, and were hand-delivered to the laboratory following program completion. A copy of the Chain of Custody (COC) that accompanied the samples is provided in Appendix C. Additional samples were collected to safeguard against loss or damage during transport, and will be stored and refrigerated until the final report is received by PWGSC.

Sample collection, preparation, and analyses followed guidance provided in the afore-referenced Environment Canada document. Samples were analyzed by an accredited laboratory with CALA and/or ISO/IEC 17025 and are certified by the Standards Council of Canada (SCC) for each selected chemical analyses of this program. The complete set of analytical results, including laboratory QA/QC and Certificates of Analyses for all parameters tested, are provided in Appendix C.

The laboratory undertakes internal duplicate analyses for QA/QC purposes. Laboratory duplicate analyses were performed for total carbon, total organic carbon, grain size, metals, PAHs, leachable PAHs, BTEX, all fractions of petroleum hydrocarbons, and PCBs/DDT to meet internal QA/QC objectives for the marine sediment and historic disposal site samples submitted. No discrepancies were noted by the laboratory for the analyses performed.

To assess the quality of the analytical data, a review of the internal laboratory QA/QC results was completed and included a review of laboratory duplicate analyses, method blanks, surrogates, spike samples, and QA/QC standards. The following information applicable to this MSSP report's findings was noted:

Sediment

- OC Pesticide Analysis: Due to colour interferences, some samples required dilution. Detection limits were adjusted accordingly. Detection limits for some samples were adjusted for high moisture content.
- The recovery of the matrix spike and the spiked blank were within the acceptable laboratory QC limits.
- Detection limits were not elevated due to impacted results.

Soil

- Boron analysis for JQ-01: Elevated reporting limit due to instrument performance. Comment 2.
- Copper analysis for JQ-01: Poor RPD due to sample inhomogeneity. Comment 3.
- Elevated PAH RDL(s) due to matrix / co-extractive interference.
- Duplicate PAH analysis: results are outside acceptance limit due to possible sample inhomogeneity.
- OC Pesticide Analysis: Due to colour interferences, some samples required dilution. Detection limits were adjusted accordingly.
- The recovery of all other matrix spikes and the spiked blanks were within the acceptable laboratory QC limits.

A senior AECOM reviewer has reviewed this report prior to its release. The limitations of this document are provided in Appendix D.

5.0 CONCLUSION

The analytical results of the five (5) plus one (1) duplicate marine sediment samples collected and analyzed from the Baxter's Cove, DFO-SCH indicate JQ-39, JQ-48 and JQ-90 exceeded the CCME SQGs. The analytical results of the four (4) plus one (1) duplicate historic disposal site samples collected and analyzed indicate no exceedances.

6.0 CLOSING

This document has been prepared and reviewed by the following people:

Prepared by:

Reviewed by:

Original Signed By

Original Signed By

Kris Olson, B.Sc.
Field Technician

Jennifer Hood, B.Sc., PMP
Project Manager



**APPENDIX A
MSSP Field Report
and
Photo Log**

MSSP FIELD REPORT

Site: FAYE'S Cove	Location: JUDIQUE, NS	Date: 31 Aug July 2012
Sample Collector: MATT WALEN		Time: 1100
Recorder: COLF SCARFE / KRIS OLSON		Average Water Temperature (°C): 16
Collection Device: BUCKET (GRAB)	Type of Vessel: ZODIAC	

Site Description	
Air Temperature: 20 °C □ °F	Weather: SUNNY, CALM
Site Conditions: WARE, EASY ACCESS, MUCH VEGETATIVE COVER IN AREAS	Photographs Taken: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Observations:	

Sample Data				Latitude and Longitude ³	
Sample ID	Sediment Description ¹	Odour ²	Grab Depth (cm)	Flora/Fauna	
JQ-40	THICK BLACK MUCK	STRONG SULFUR	300 cm	SOME FEELEGRASS, KELP ETC	45° 51' 27.41" N 161° 30' 14" W
JQ-89	BLACK MUCK	BRIGHT SULFUR	300 cm	" " " "	45° 51' 29.21" N 161° 30' 12.4" W
JQ-90	BLACK MUCK	ALONE	"	THICK KELP, MUILT TRILFS	45° 51' 27.81" N 161° 30' 11.9" W
JQ-99	COARSE SAND	ALONE	"	SOME FEELEGRASS, KELP ETC	45° 51' 28.61" N 161° 30' 15" W
JQ-120	COARSE SAND	ALONE	"	" " " "	45° 51' 27.11" N 161° 30' 14.6" W

Additional Comments

Notes:
1. Sediment colour, gradient type, sediment type, texture and consistency, colour, presence of biota
2. Degree of odour (strong, slight, none)
3. Decimal degrees (DDD.dddd)

QUADRANT #1

Site:	DREDGE PILE	Location:	BAXTER'S CREEK, JUDITH RIVER	Date:	31 JULY 2012
Sample Collector:	KRIS OLSON (AFCOM)			Time:	1450 1235
Recorder:	KRIS OLSON (AFCOM)			Average Water Temperature (°C):	
Collection Device:	SHOVEL PAK, COMPOSITE SAMPLE	Type of Vessel:	N/A		

Site Description		Photographs Taken: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Air Temperature: 20°C	Weather: Sunny, calm		
Site Conditions: 2 ft x 3 ft grid, hard soft, loose sand. Easy digging			
Observations: 4 quadrants; 4 subsamples (Q1-Q4) per quadrant.			

Sample Data		Sediment Description ¹	Odour ²	Grab Depth (cm)	Flora/Fauna	Latitude and Longitude ³
LOCATION						
Q1-Q4	Q1	0-20cm L. BR. FINE SAND	SLIGHT PETROLEUM		NOIT SUPPHEICANT RUT	45° 51' 18.1" N 61° 29' 56.2" W
	Q2	20-40cm BL. FINE SAND	STRONG PETROLEUM	0-60 cm	FEW ROOTS / LEAVES	
	Q3	0-20cm L. BR. FINE SAND	SLIGHT PETROLEUM		FEW ROOTS / LEAVES	45° 51' 18.2" N 61° 29' 55.9" W
	Q4	20-40cm BL. FINE SAND	STRONG PETROLEUM	0-60 cm	THICK MAT (0-60 cm)	
	Q5	0-20cm L. BR. FINE SAND	SLIGHT PETROLEUM		NOIT SUPPHEICANT RUT	45° 51' 18.3" N 61° 29' 55.6" W
	Q6	20-40cm BL. FINE SAND	STRONG PETROLEUM	0-60 cm	FEW ROOTS / LEAVES	
	Q7	0-20cm L. BR. FINE SAND	SLIGHT PETROLEUM		FEW ROOTS / LEAVES	45° 51' 18.5" N 61° 29' 55.3" W
	Q8	20-40cm BL. FINE SAND	STRONG PETROLEUM	0-60 cm	THICK MAT (0-60 cm)	

Additional Comments

UNLESS OTHERWISE STATED, SAND WAS DRY.
GPS UNIT HAS ~6m ACCURACY (LARGER THAN EACH SUBQUADRANT). WILL LIKELY
GIVE INACCURATE RESULTS.

[illegible]

MSSP FIELD REPORT

QUADRANT #2

Site: DREDGE PILE	Location: BARTER'S DIVE, TIDALGATE NS	Date: 31 JULY 2012
Sample Collector: KRIS OLSON (AFCON)		Time: 1150
Recorder: KRIS OLSON (AFCON)		Average Water Temperature (°C): N/A
Collection Device: SHOVEL, PAUL (IMPROVISED GRAB)	Type of Vessel: N/A	

Site Description	
Air Temperature: 20°C ☐ °F	Weather: SUNNY, CALM
Photographs Taken: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Site Conditions: 2 dm x 3 dm GRID. HARE SOFT, LOOSE SAND. EASY DIGGING	
Observations: 4 QUADRANTS; 4 SUBSAMPLES (Q1-Q4) PER QUADRANT.	

Sample ID	Sediment Description ¹	Odour ²	Grab Depth (cm)	Flora/Fauna	Latitude and Longitude ³
JQ-Q1	Q1-20cm L.B. FINE SAND 20-60cm BL. FINE SAND	SLIGHT PETROLEUM STRONG PETROLEUM	0-60 cm	FEW ORGANICS (ROOTS, LEAVES, FLEA GR.) THROUGHOUT	45° 51' 18.4" N 61° 29' 56.1" W
JQ-Q2	Q2-20cm MIST L.B. FINE SAND 20-60cm MIST BL. FINE SAND	SLIGHT PETROLEUM STRONG PETROLEUM	0-60 cm	SOME ORGANICS (ROOTS, SPACES, FLEA GR.) THROUGHOUT	45° 51' 18.1" N 61° 29' 55.5" W
JQ-Q3	Q3-40cm L.B. FINE SAND 40-60cm BL. FINE SAND	SLIGHT PETROLEUM STRONG PETROLEUM	0-60 cm	FEW (MIST) SOME MIST GR. (MIST) LEAVES, FLEA GR.)	45° 51' 18.2" N 61° 29' 55.5" W
JQ-Q4	Q4-40cm L.B. FINE SAND 40-60cm BL. FINE SAND	SLIGHT PETROLEUM STRONG PETROLEUM	0-60 cm	FEW ORGANICS (ROOTS, LEAVES, FLEA GR.) THROUGHOUT	45° 51' 18.3" N 61° 29' 55.3" W

Additional Comments
UNLESS OTHERWISE STATED, SAND WAS DRY.
GPS UNIT HAS 4m ACCURACY (LARGER THAN EACH SUBQUADRANT), WILL LIKELY LEAD TO INACCURATE RESULTS

Notes:
1. Sediment colour, gradient type, sediment type, texture and consistency, colour, presence of biota
2. Degree of odour (strong, slight, none)
3. Decimal degrees (DDD.dddd)

MSSP FIELD REPORT

QUADRANT #3

Site: DREDGE PILE	Location: BAXTER'S DIVE, TIDALGATE AVS	Date: 31 JULY 2012
Sample Collector: KRIS OLSON (AFCEM)		Time: 1310
Recorder: KRIS OLSON (AFCEM)		Average Water Temperature (°C): N/A
Collection Device: SHOVEL, PAUL CHAMPAGNE GEAR	Type of Vessel: N/A	

Site Description	
Air Temperature: 20°C □ °F	Weather: SUNNY, CALM
Photographs Taken: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Site Conditions: 20m x 30m GRID, ARE SOFT, LOOSE SAND, EASY DIGGING	
Observations: 4 QUADRANTS, 4 SUBSAMPLES (Q1-Q4) PER QUADRANT.	

Sample ID	Sediment Description ¹	Odour ²	Grab Depth (cm)	Flora/Fauna	Latitude and Longitude ³
JQ-Φ3, Q1	Φ-20cm L.B. SAND, FINE SLIGHT PETROLEUM	STRONG PETROLEUM	Φ-60cm	FINE ORGANICS (ROOTS), LEAVES, EEL GRASS	45° 51' 17.8" N 61° 29' 56.1" W
JQ-Φ3, Q2	Φ-40cm L.B. SAND, FINE SLIGHT PETROLEUM	STRONG PETROLEUM	Φ-60cm	FINE ORGANICS (ROOTS), LEAVES, EEL GRASS, THALASSIA	45° 51' 17.8" N 61° 29' 55.7" W
JQ-Φ3, Q3	Φ-10cm L.B. SAND, FINE SLIGHT PETROLEUM	STRONG PETROLEUM	Φ-60cm	FINE ORGANICS (ROOTS), LEAVES, EEL GRASS, THALASSIA	45° 51' 18.1" N 61° 29' 55.1" W
JQ-Φ3, Q4	Φ-20cm L.B. SAND, FINE SLIGHT PETROLEUM	STRONG PETROLEUM	Φ-60cm	FINE ORGANICS (ROOTS), LEAVES, EEL GRASS, THALASSIA	45° 51' 18.2" N 61° 29' 55.0" W

Additional Comments
UNLESS OTHERWISE STATED, SAND WAS DRY
GPS UNIT HAS LOW ACCURACY (LARGER THAN SUBQUADRANTS) WILL LIKELY LEAD TO INACCURATE RESULTS.

Notes:
1. Sediment colour, gradient type, sediment type, texture and consistency, colour, presence of biota
2. Degree of odour (strong, slight, none)
3. Decimal degrees (DDD.dddd)

MSSP FIELD REPORT

QUADRANT #4

Site: DREDGE PILE	Location: BAXTER'S Cove, TURQUENOS	Date: 31 JULY 2012
Sample Collector: KRIS OLSON (AECOM)		Time: 1345
Recorder: KRIS OLSON (AECOM)		Average Water Temperature (°C): N/A
Collection Device: SHOVEL, PAUL, (IMMEDIATE GRAB)	Type of Vessel: N/A	

Site Description	
Air Temperature: 29°C <input type="checkbox"/> °F	Weather: SUNNY, CALM
Site Conditions: 20m x 30m GRID, HARE SOFT, LOOSE SAND, EASY DIGGING	Photographs Taken: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Observations: 4 QUADRANTS, 4 SUBSAMPLES (Q1-Q4) PER QUADRANT.	

Sample ID	Sediment Description ¹	Odour ²	Grab Depth (cm)	Flora/Fauna	Latitude and Longitude ³
JQ-Q4-Q1	0-20cm L.BE. FINE SAND	SLIGHT PETROLEUM	0-10cm	FEW ORGANICS (ROOTS, LEAVES, EELGRASS) THROUGHOUT	45° 51' 17.7"N 124° 55' 58" W
JQ-Q4-Q2	20-30cm L.BE. FINE SAND	STRONG PETROLEUM	0-10cm	FEW ORGANICS (ROOTS, LEAVES, EELGRASS) THROUGHOUT	45° 51' 17.8"N 124° 55' 58" W
JQ-Q4-Q3	30-40cm L.BE. FINE SAND	SLIGHT PETROLEUM	0-10cm	FEW ORGANICS (ROOTS, LEAVES, EELGRASS) THROUGHOUT	45° 51' 17.9"N 124° 55' 58" W
JQ-Q4-Q4	40-50cm L.BE. FINE SAND	STRONG PETROLEUM	0-10cm	FEW ORGANICS (ROOTS, LEAVES, EELGRASS) THROUGHOUT	45° 51' 18.1"N 124° 55' 58" W

Additional Comments	
- UNLESS OTHERWISE STATED, SAND WAS DRY	
- GPS UNIT HAS NO ACCURACY (LARGER THAN SUBQUADRANTS) WILL LIKELY LEAD TO INACCURATE RESULTS.	

Notes:	
1. Sediment colour, gradient type, sediment type, texture and consistency, colour, presence of biota	
2. Degree of odour (strong, slight, none)	
3. Decimal degrees (DDD.dddd)	



Photo 1: Northern Section of Harbour, Face Northeast



Photo 2: Central Section of Harbour – JQ-39, JQ-48, Face East



Photo 3: Central Section of Harbour – JQ-90, JQ-99, JQ-120, Face Southeast



Photo 4: Overview of Historic Disposal Site



Photo 5: JQ-01 Quadrant of Disposal Site Farthest North, Face East



Photo 6: JQ-02 Quadrant of Disposal Site, Face East



Photo 7: JQ-03 Quadrant of Disposal Site, Face East



Photo 8: JQ-04 Quadrant of Disposal Site, Face East



Photo 9: Typical Hole in Disposal Site – Dark Brown Sand 0-20 cm BGS, Black Sand 20-60 cm BGS

APPENDIX B

Analytical Summary Tables

Table B.1. PAH Results for Marine Sediments - Baxter's Cove DFO-SCH, Inverness County, Nova Scotia

Parameter	RDL	Units	Sample Identification and Date					CEPA Disposal at Sea Guidelines ¹	CCME Sediment Quality Guidelines ²		CCME Soil Quality Guidelines ³											
			JQ-39 -SED- 2012-07-31-1	JQ-48 -SED- 2012-07-31-1	JQ-90 -SED- 2012-07-31-1	JQ-99 -SED- 2012-07-31-1	JQ-120 -SED- 2012-07-31-1		Interim Sediment Quality Guidelines	Marine and Estuarine Probable Effects Levels	Human Health		Environmental Health			Interim Soil Quality Criteria						
											Potable Water		Direct Contact	Soil Contact		Soil and Food Ingestion	Freshwater Life	Agricultural/ Residential/ Parkland Land Uses	Residential/ Parkland Land Uses	Commercial/ Industrial Land Uses		
											Agricultural, Residential/ Parkland, Commercial and Industrial Land Uses	Agricultural, Residential/ Parkland, Commercial and Industrial Land Uses	Agricultural, Residential/ Parkland Land Uses	Commercial/ Industrial Land Uses	Agricultural, Residential/ Parkland and Industrial Land Uses	Agricultural, Residential/ Parkland, Commercial and Industrial						
Polycyclic Aromatic Hydrocarbon (PAH) Results																						
1-Methylpyrene	0.0050		<0.005	<0.005	0.013	<0.005	<0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
2-Methylpyrene	0.0050		<0.005	0.013	0.016	<0.005	<0.005	-	0.1202	0.201	-	-	-	-	-	-	-	-	-	-	-	
Acenaphthene	0.0050		<0.005	0.018	0.044	<0.005	<0.005	-	0.00671	0.0869	-	-	-	-	-	21.5	-	-	-	-	-	
Acenaphthylene	0.0050		<0.005	<0.005	<0.005	<0.005	<0.005	-	0.00567	0.128	-	-	-	-	-	3.20	-	-	-	-	-	
Anthracene	0.0050		0.021	0.047	0.047	<0.005	<0.005	-	0.0469	0.245	-	2.5	61.5	32	-	6.2	-	-	-	-	-	
Benzo(a)anthracene	0.0050		0.05	0.066	0.066	<0.005	<0.005	-	0.0748	0.693	-	-	-	-	-	6.2	-	-	-	-	-	
Benzo(a)pyrene	0.0050		0.021	0.039	0.048	<0.005	<0.005	-	0.0888	0.763	-	20	0.6	72	-	0.6	-	-	-	-	-	
Benzo(b)fluoranthene	0.0050		0.031	0.053	0.06	<0.005	<0.005	-	-	-	-	-	-	-	-	6.2	-	-	-	-	-	
Benzo(b)pyrene	0.0050		0.015	0.021	0.025	<0.005	<0.005	-	-	-	-	-	-	-	-	6.2	-	-	-	-	-	
Benzo(k)fluoranthene	0.0050	mg/kg	0.015	0.026	0.03	<0.005	<0.005	-	-	-	-	-	-	-	-	6.2	-	-	-	-	-	
Benzo(k)pyrene	0.0050		0.071	0.1	0.13	<0.005	<0.005	-	0.108	0.846	-	-	-	-	-	6.2	-	-	-	-	-	
Chrysene	0.0050		<0.005	<0.005	<0.005	<0.005	<0.005	-	0.00622	0.135	-	-	-	-	-	6.2	-	-	-	-	-	
Dibenz(a,h)anthracene	0.0050		0.13	0.25	0.29	0.0098	<0.005	-	0.113	1.494	-	50	15.4	180	-	15.4	-	-	-	-	-	
Fluoranthene	0.0050		<0.005	0.027	0.047	<0.005	<0.005	-	0.0212	0.144	-	-	-	-	-	15.4	-	-	-	-	-	
Fluorene	0.0050		0.013	0.02	0.025	<0.005	<0.005	-	-	-	-	-	-	-	-	8.8	-	-	-	-	-	
Indeno(1,2,3-cd)pyrene	0.0050		0.013	0.02	0.025	<0.005	<0.005	-	0.0346	0.391	-	-	-	-	-	8.8	-	-	-	-	-	
Naphthalene	0.0050		0.013	0.02	0.025	<0.005	<0.005	-	-	-	-	-	-	-	-	8.8	-	-	-	-	-	
Phenanthrene	0.0050		0.05	0.066	0.066	<0.005	<0.005	-	0.0867	0.544	-	-	-	-	-	43	-	-	-	-	-	
Pyrene	0.0050		0.08	0.14	0.18	0.0068	<0.005	-	0.153	1.398	-	-	-	-	-	7.7	-	-	-	-	-	
Total PAH			0.52	0.92	1.14	0.06	<0.005	2.5	-	-	-	-	-	-	-	-	-	-	-	-	-	
Index of Additive Cancer Risk (IACR)			0.64	1.46	1.62	0.07	<0.005	-	-	-	1	-	-	-	-	-	-	-	-	-	-	
Benzo(a)pyrene TPE (10 ⁻⁵)		mg/kg	0.04	0.06	0.08	0.01	<0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Creosote or Coal Tar source suspected/known?			Not able to confirm ⁴	Not able to confirm ⁴	Not able to confirm ⁴	No	No	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Uncertainty Factor Applied with UF		mg/kg						-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Benzo(a)pyrene TPE (10 ⁻⁵)								-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Notes:

- 1. Laboratory's reportable detection limit, ND = not detected above RDL
- 2. Laboratory's reportable detection limit, ND = not detected above RDL
- 3. Laboratory's reportable detection limit, ND = not detected above RDL
- 4. Laboratory's reportable detection limit, ND = not detected above RDL
- 5. Laboratory's reportable detection limit, ND = not detected above RDL
- 6. Laboratory's reportable detection limit, ND = not detected above RDL
- 7. Laboratory's reportable detection limit, ND = not detected above RDL
- 8. Laboratory's reportable detection limit, ND = not detected above RDL
- 9. Laboratory's reportable detection limit, ND = not detected above RDL
- 10. Laboratory's reportable detection limit, ND = not detected above RDL
- 11. Laboratory's reportable detection limit, ND = not detected above RDL
- 12. Laboratory's reportable detection limit, ND = not detected above RDL
- 13. Laboratory's reportable detection limit, ND = not detected above RDL
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- 17. Laboratory's reportable detection limit, ND = not detected above RDL
- 18. Laboratory's reportable detection limit, ND = not detected above RDL
- 19. Laboratory's reportable detection limit, ND = not detected above RDL
- 20. Laboratory's reportable detection limit, ND = not detected above RDL
- 21. Laboratory's reportable detection limit, ND = not detected above RDL
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- 30. Laboratory's reportable detection limit, ND = not detected above RDL
- 31. Laboratory's reportable detection limit, ND = not detected above RDL
- 32. Laboratory's reportable detection limit, ND = not detected above RDL
- 33. Laboratory's reportable detection limit, ND = not detected above RDL
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- 47. Laboratory's reportable detection limit, ND = not detected above RDL
- 48. Laboratory's reportable detection limit, ND = not detected above RDL
- 49. Laboratory's reportable detection limit, ND = not detected above RDL
- 50. Laboratory's reportable detection limit, ND = not detected above RDL
- 51. Laboratory's reportable detection limit, ND = not detected above RDL
- 52. Laboratory's reportable detection limit, ND = not detected above RDL
- 53. Laboratory's reportable detection limit, ND = not detected above RDL
- 54. Laboratory's reportable detection limit, ND = not detected above RDL
- 55. Laboratory's reportable detection limit, ND = not detected above RDL
- 56. Laboratory's reportable detection limit, ND = not detected above RDL
- 57. Laboratory's reportable detection limit, ND = not detected above RDL
- 58. Laboratory's reportable detection limit, ND = not detected above RDL
- 59. Laboratory's reportable detection limit, ND = not detected above RDL
- 60. Laboratory's reportable detection limit, ND = not detected above RDL
- 61. Laboratory's reportable detection limit, ND = not detected above RDL
- 62. Laboratory's reportable detection limit, ND = not detected above RDL
- 63. Laboratory's reportable detection limit, ND = not detected above RDL
- 64. Laboratory's reportable detection limit, ND = not detected above RDL
- 65. Laboratory's reportable detection limit, ND = not detected above RDL
- 66. Laboratory's reportable detection limit, ND = not detected above RDL
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- 75. Laboratory's reportable detection limit, ND = not detected above RDL
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- 81. Laboratory's reportable detection limit, ND = not detected above RDL
- 82. Laboratory's reportable detection limit, ND = not detected above RDL
- 83. Laboratory's reportable detection limit, ND = not detected above RDL
- 84. Laboratory's reportable detection limit, ND = not detected above RDL
- 85. Laboratory's reportable detection limit, ND = not detected above RDL
- 86. Laboratory's reportable detection limit, ND = not detected above RDL
- 87. Laboratory's reportable detection limit, ND = not detected above RDL
- 88. Laboratory's reportable detection limit, ND = not detected above RDL
- 89. Laboratory's reportable detection limit, ND = not detected above RDL
- 90. Laboratory's reportable detection limit, ND = not detected above RDL
- 91. Laboratory's reportable detection limit, ND = not detected above RDL
- 92. Laboratory's reportable detection limit, ND = not detected above RDL
- 93. Laboratory's reportable detection limit, ND = not detected above RDL
- 94. Laboratory's reportable detection limit, ND = not detected above RDL
- 95. Laboratory's reportable detection limit, ND = not detected above RDL
- 96. Laboratory's reportable detection limit, ND = not detected above RDL
- 97. Laboratory's reportable detection limit, ND = not detected above RDL
- 98. Laboratory's reportable detection limit, ND = not detected above RDL
- 99. Laboratory's reportable detection limit, ND = not detected above RDL
- 100. Laboratory's reportable detection limit, ND = not detected above RDL

Table B.1.b. PAH Results for the Leachate Samples- Baxter's Cove DFO-SCH , Inverness County, Nova Scotia

Parameter	RDL	Units	Sample Identification and Date		CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life¹		Health Canada Canadian Guideline for Drinking Water Quality²	
			JQ-48 -SED- 2012-07-31- 1	JQ-90 -SED- 2012-07-31-1	Freshwater	Marine	Maximum Acceptable Concentration	Aesthetic Objective
			31-Jul-12					
Leachable Polycyclic Aromatic Hydrocarbons (PAHs)								
1-Methylnaphthalene	0.01	ug/L	< 0.01	0.019	-	-	-	-
2-Methylnaphthalene	0.01		0.012	0.016	5.8	-	-	-
Acenaphthylene	0.005		0.046	0.17	-	-	-	-
Acenaphthene	0.005		< 0.005	< 0.005	0.012	-	-	-
Anthracene	0.005		0.015	0.028	0.018	-	-	-
Benzo(a)anthracene	0.005		< 0.005	< 0.005	0.015	-	-	-
Benzo(a)pyrene	0.005		< 0.005	< 0.005	-	-	0.01	-
Benzo(b)fluoranthene	0.005		< 0.005	< 0.005	-	-	-	-
Benzo(g,h,i)perylene	0.005		< 0.005	< 0.005	-	-	-	-
Benzo(j)fluoranthene	0.005		< 0.005	< 0.005	-	-	-	-
Benzo(k)fluoranthene	0.005		< 0.005	< 0.005	-	-	-	-
Chrysene	0.005		< 0.005	0.0052	-	-	-	-
Dibenz(a,h)anthracene	0.005		< 0.005	< 0.005	0.04	-	-	-
Fluoranthene	0.005		0.056	0.095	3	-	-	-
Fluorene	0.005		0.046	0.096	-	-	-	-
Indeno(1,2,3-cd)pyrene	0.005		< 0.005	< 0.005	1.1	-	-	-
Naphthalene	0.02		0.024	0.054	-	1.4	-	-
Perylene	0.005		< 0.005	< 0.005	0.4	-	-	-
Phenanthrene	0.005		0.065	0.059	0.025	-	-	-
Pyrene	0.005		0.034	0.054	3.4	-	-	-
IACR			ND	ND	ND			

Notes:

RDL = laboratory's reportable detection limit

'-' = no guideline available

Underline = indicates exceedance

Bold - indicates results that exceed CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life

1 - CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life (2011)

2. Health Canada Canadian Guideline for Drinking Water Quality (2012)

Table B.2. Metal Concentrations for Marine Sediments - Baxter's Cove DFO-SCH , Inverness County, Nova Scotia

Parameter	RDL	Units	Sample Identification and Date								CEPA Disposal at Sea Guidelines ¹	CCME Sediment Quality Guidelines ²		CCME Soil Quality Guidelines ³		
			July 31, 2012									Interim Sediment Quality Guidelines	Marine and Estuarine Probable Effects Levels	Agricultural	Residential/ Parkland	Commercial/ Industrial
			JQ-39 -SED- 2012-07-31-1	JQ-39 -SED- 2012-07-31-1- DUP	JQ-48 -SED- 2012-07-31-1	JQ-90 -SED- 2012-07-31-1	JQ-99 -SED- 2012-07-31-1	JQ-120 -SED- 2012-07-31-1								
Antimony	2.0	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	-	-	20	20	40	
Arsenic	2.0		5.8	6.4	6	5.7	2.1	<2.0	-	7.24	41.6	12	12	12		
Barium	5.0		110	140	130	100	48	67	-	-	-	750	500	2000		
Beryllium	2.0		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	-	-	4	4	8		
Cadmium	0.3		0.53	0.43	0.52	0.46	<0.3	<0.3	<0.3	0.6	0.7	4.2	1.4	10	22	
Chromium +6	0.2		<0.2	-	<0.2	<0.2	<0.2	<0.2	<0.2	-	-	-	0.4	0.4	1.4	
Chromium (Total)	2.0		19	22	21	19	5.7	3.7	-	52.3	160	64	64	87		
Cobalt	1.0		9.9	11	11	9.4	3.4	2.2	-	-	-	300	50	300		
Copper	2.0		22	27	25	25	5.4	<2.0	81	18.7	108	63	63	91		
Lead	0.5		19	21	20	18	5.3	3.4	66	30.2	112	70	140	260 / 600		
Mercury	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.75	0.13	0.7	6.6	6.6	24 / 50		
Molybdenum	2.0		4.6	4.4	3.8	4.4	<2.0	<2.0	-	-	-	5	10	40		
Nickel	2.0		22	24	25	21	6	3.4	-	-	-	50	50	50		
Selenium	1.0		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-	-	1	1	2.9		
Silver	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	20	20	40		
Thallium	0.1		0.22	0.2	0.19	0.18	<0.1	<0.1	-	-	-	1	1	1		
Tin	2.0		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	-	-	-	5	50	300		
Uranium	0.1		1.4	1.5	1.3	1.3	0.66	0.26	-	-	-	23	23	33 / 300		
Vanadium	2.0		26	28	27	25	10	9.1	-	-	-	130	130	130		
Zinc	5.0	74	83	82	74	25	16	160	124	271	200	200	360			

Notes:

RDL = laboratory's reportable detection limit; ND = not detected above RDL

*, - = no guideline available

1. ODCA National Guidelines for Monitoring Dredged and Excavated Material at Ocean Disposal Sites (1998)

2. Interim Sediment Quality Guidelines (ISQG) and Probable Effects Levels (PELs) for CCME Sediment Quality Guidelines for the Protection of Aquatic Life (1999)

3. CCME Metal Soil Quality Guidelines for the Protection of Environmental and Human Health (revised 2010)

Underline = indicates exceedance

Italic = indicates CCME Sediment Quality Guidelines Exceedance

Table B.3. BTEX/TPH Concentrations for Marine Sediments- (Harbour) DFO-SCH , (County), (Province)

Results Table for BTEX Compounds and Modified TPH													
Sample ID	Date	Units	BTEX Concentrations				Petroleum Hydrocarbon Fraction Concentrations						Resemblance
			Benzene	Toluene	Ethylbenzene	Xylenes	C6 - C10 (Less BTEX)	>C10 - C16	>C16 - C21	>C21 - <C32	C16 - <C32	Modified TPH (Less BTEX)	
JQ-39-SED-2012-07-31-1	July 31, 2012	mg/kg	< 0.005	< 0.025	< 0.01	< 0.05	< 2.5	< 10	25	38	63	62	Lube oil fraction
JQ-39-SED-2012-07-31-1-DUP			< 0.005	< 0.025	< 0.01	< 0.05	< 2.5	31	48	63	111	140	Lube oil fraction
JQ-48-SED-2012-07-31-1			< 0.005	< 0.025	< 0.01	< 0.05	< 2.5	< 10	41	88	129	130	Lube oil fraction
JQ-90-SED-2012-07-31-1			< 0.005	< 0.025	< 0.01	< 0.05	< 2.5	< 10	39	58	97	97	Lube oil fraction
JQ-99-SED-2012-07-31-1			< 0.005	< 0.025	< 0.01	< 0.05	< 2.5	< 10	< 15	< 15	< 15	< 15	< 15
JQ-120-SED-2012-07-31-1			< 0.005	< 0.025	< 0.01	< 0.05	< 2.5	< 10	< 10	< 15	< 15	< 15	Not applicable
RDL			0.005	0.025	0.01	0.05	2.5	10	10	15	15	15	
Reached Baseline at C32			Yes, where applicable										
Atlantic RBCA Tier I RBSLs for Soil ¹													
Residential	Potable	Coarse-grained	0.03	0.38	0.08	11	-	-	-	-	-	690	
	Fine-grained		0.01	0.08	0.02	2.3	-	-	-	-	-	970	
	Non-potable	Coarse-grained	0.16	14	58	17	-	-	-	-	-	690	
Commercial	Potable	Fine-grained	1.5	120	430	160	120	-	-	-	-	8300	
		Coarse-grained	0.03	0.38	0.08	11	-	-	-	-	-	10000	
		Fine-grained	0.01	0.08	0.02	2.3	-	-	-	-	-	4700	
	Non-potable	Coarse-grained	1.8	160	430	200	-	-	-	-	-	10000	
		Fine-grained	11	680	430	650	-	-	-	-	-	10000	
CCME Soil Quality Guidelines ²													
Agricultural Land Use	Surface	Coarse Soil	0.03 ³ (0.0095) ⁴	0.37	0.082	11	30 b	150	-	-	300	-	
	Fine Soil		0.0068 ^{3,4}	0.08	0.018	2.4	210 (170a)	150	-	-	1300	-	
	Subsoil	Coarse Soil					-	-	-	-	-	-	
Residential/ Parkland Use	Surface	Coarse Soil	0.03 ³ (0.0095) ⁴	0.37	0.082	11	30 b	150	-	-	300	-	
	Fine Soil		0.0068 ^{3,4}	0.08	0.018	2.4	210 (170a)	150	-	-	1300	-	
	Coarse Soil						-	-	-	-	-	-	
	Subsoil	Fine Soil					-	-	-	-	-	-	
Commercial/ Industrial Land Use	Surface	Coarse Soil	0.03 ^{3,4}	0.37	0.082	11	320 (240 a)	260	-	-	1700	-	
	Fine Soil		0.0068 ^{3,4}	0.08	0.018	2.4	320 (170 a)	260 (230 a)	-	-	2500	-	
	Subsoil	Coarse Soil					-	-	-	-	-	-	
		Fine Soil					-	-	-	-	-	-	

Notes:

'-' = No applicable guideline available

RDL = Reportable detection limit

1 - Atlantic RBCA Version 2 Reference Document for Petroleum Impacted Sites

2 - Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health, Update 7.0

Table B.4. PCB and DDT Analytical Results for Marine Sediments- Baxter's Cove DFO-SCH , Inverness County, Nova Scotia

Parameter	RDL ⁴	Units	Sample Identification and Date					CEPADisposal at Sea Guidelines ¹	CCME Sediment Quality Guidelines ²		CCME Soil Quality Guidelines ³		
			JQ-39 -SED- 2012-07-31-1	JQ-48 -SED- 2012-07-31-1	JQ-90 -SED- 2012-07-31-1	JQ-99 -SED- 2012-07-31-1	JQ-120 -SED- 2012-07-31-1		Interim Sediment Quality Guidelines	Marine and Estuarine Probable Effects Levels	Agricultural	Residential/ Parkland	Commercial/ Industrial
July 31, 2012													
Polychlorinated Biphenyl (PCB) Results													
Aroclor 1016		mg/kg	-	-	-	-	-	-	-	-	-	-	-
Aroclor 1221			-	-	-	-	-	-	-	-	-	-	-
Aroclor 1232			-	-	-	-	-	-	-	-	-	-	-
Aroclor 1242			-	-	-	-	-	-	-	-	-	-	-
Aroclor 1248			-	-	-	-	-	-	-	-	-	-	-
Aroclor 1254			-	-	-	-	-	-	0.0633	0.709	-	-	-
Aroclor 1260			-	-	-	-	-	-	-	-	-	-	-
Aroclor 1262			-	-	-	-	-	-	-	-	-	-	-
Aroclor 1268			-	-	-	-	-	-	-	-	-	-	
Total PCB Concentration	0.1		0.034	0.027	0.037	0.017	ND	100	0.0215	0.189	0.5	1.3	33
Dichloro-Diphenyl-Trichloroethane (DDT) Results													
o,p-DDE		mg/kg	< 0.00003	< 0.000006	< 0.000006	< 0.00001	< 0.000002	-	0.0027	0.374	-	-	-
p,p-DDE			< 0.00003	< 0.000006	< 0.000006	< 0.00001	< 0.000002	-	0.0027	0.374	-	-	-
p,p-DDD			< 0.00003	< 0.000006	< 0.000006	< 0.00001	< 0.000002	-	0.00122	0.00781	-	-	-
p,p-DDD			< 0.00003	< 0.000006	< 0.000006	< 0.00001	< 0.000002	-	0.00122	0.00781	-	-	-
o,p-DDT			< 0.00003	< 0.000006	< 0.000006	< 0.00001	< 0.000002	-	-	-	-	-	-
p,p-DDT			< 0.00003	< 0.000006	< 0.000006	< 0.00001	< 0.000002	-	-	-	-	-	-
p,p-DDT + p,p-DDT			< 0.00003	< 0.000006	< 0.000006	< 0.00001	< 0.000002	-	-	-	-	-	-
o,p-DDD +p,p-DDD			< 0.00003	< 0.000006	< 0.000006	< 0.00001	< 0.000002	-	-	-	-	-	-
o,p-DDE + p,p-DDE			< 0.00003	< 0.000006	< 0.000006	< 0.00001	< 0.000002	-	-	-	-	-	-
Total DDT (calculated)			< 0.00003	< 0.000006	< 0.000006	< 0.00001	< 0.000002	-	0.0019	0.00477	0.7	0.7	12

Notes:

RDL = laboratory's reportable detection limit

*, - = no guideline available

1. ODC's National Guidelines for Monitoring Dredged and Excavated Material at Ocean Disposal Sites (1998)

2. Interim Sediment Quality Guidelines (ISQG) and Probable Effects Levels (PELs) for CCME Sediment Quality Guidelines for the Protection of Aquatic Life (1999)

3. CCME Metal Soil Quality Guidelines for the Protection of Environmental and Human Health (revised 2010)

. RDL for pesticides for JQ-39 = 0.00003, JQ-99 = 0.00001, JQ-120=0.000002 (mg/kg)

Table B.5. TIC, TOC and Grain Size Analytical Results for Marine Sediments- Baxter's Cove DFO-SCH , Inverness County, Nova Scotia

Parameter	RDL	Units	Sample Identification and Date					
			JQ-39 -SED- 2012-07-31- 1	JQ-39 -SED- 2012-07-31- 1-DUP	JQ-48 -SED- 2012-07-31- 1	JQ-90 -SED- 2012-07-31- 1	JQ-99 -SED- 2012-07-31- 1	JQ-120 -SED- 2012-07-31- 1
			July 31, 2012					
Grain Size Results								
< PHI -4 (16 mm)	0.10	%	100	NA	100	100	100	100
< PHI -3 (8 mm)	0.10		100	NA	100	100	100	100
< PHI -2 (4 mm)	0.10		100	NA	100	100	100	100
< PHI -1 (2 mm)	0.10		100	NA	100	100	100	100
< PHI 0 (1/2 mm)	0.10		98	NA	99	99	100	99
< PHI +1 (1/4 mm)	0.10		97	NA	98	98	99	98
< PHI +2 (1/8 mm)	0.10		96	NA	97	92	85	70
< PHI +3 (1/16 mm)	0.10		93	NA	95	78	29	9.1
< PHI +4 (1/32 mm)	0.10		85	NA	89	67	11	2.9
< PHI +5 (1/32 mm)	0.10		72	NA	78	54	7.7	2.7
< PHI +6 (1/64 mm)	0.10		52	NA	56	42	6.1	2.5
< PHI +7 (1/128 mm)	0.10		33	NA	35	29	4.9	2.5
< PHI +8 (1/256 mm)	0.10		27	NA	28	24	4.5	2.5
< PHI +9 (1/512 mm)	0.10		21	NA	21	19	4.3	2.4
Gravel	0.10		< 0.1	NA	< 0.1	< 0.1	< 0.1	0.43
Sand	0.10	15	NA	11	33	89	97	
Silt	0.10	58	NA	62	43	6.5	0.37	
Clay	0.10	27	NA	28	24	4.5	2.5	
Other								
Total Organic Carbon (TOC)	0.2, 0.3, 0.4	g/kg	28	NA	28	27	7.9	1.7
Total Inorganic Caron (TIC)	0.2, 0.5	g/kg	3	NA	3.8	3.9	3	1.3
Total Carbon (TC)	0.2, 0.5	g/kg	28	NA	28	27	7.9	1.7
Moisture	1	%	53	58	58	55	25	18

Notes:

NA = Not Analyzed

RDL = laboratory's reportable detection limit

'-' = Parameter not analyzed

* PSA: Fraction PHI -1 contained one large rock.

Table B.7. Metal Concentrations for Soil - Baxter's Cove DFO-SCH , Inverness County, Nova Scotia

Parameter	RDL	Units	Sample Identification and Date						CEPA Disposal at Sea Guidelines ¹	CCME Sediment Quality Guidelines ²			CCME Soil Quality Guidelines ³		
			July 31, 2012							Interim Sediment Quality Guidelines	Marine and Estuarine Probable Effects Levels	Agricultural	Residential/ Parkland	Commercial/ Industrial	
JQ-01 -SL- 2012-07-31-1	JQ-01 -SL- 2012-07-31-1 DUP	JQ-02 -SL- 2012-07-31-1	JQ-03 -SL- 2012-07-31-1	JQ-04 -SL- 2012-07-31-1											
Antimony	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	-	-	-	-	20	20		
Arsenic	2.0	4.3	3.3	4.1	3.7	3.1	3.1	-	-	7.24	41.6	12	12		
Barium	5.0	50	37	61	46	36	36	-	-	-	-	750	500		
Beryllium	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	-	-	-	-	4	4		
Cadmium	0.30	0.31	< 0.3	0.34	0.35	< 0.3	< 0.3	0.6	0.6	0.7	4.2	1.4	10		
Chromium +6	0.20	< 0.2	-	< 0.2	< 0.2	< 0.2	< 0.2	-	-	-	-	0.4	0.4		
Chromium (Total)	2.0	8.1	6.7	7.9	7.1	5	5	-	-	52.3	160	64	64		
Cobalt	1.0	4.7	3.6	4.4	4	3.1	3.1	-	-	-	-	40	50		
Copper	2.0	8.3	6.2	8.1	7.1	5	5	81	81	18.7	108	63	63		
Lead	0.50	7.2	5.9	7.7	6.3	5.3	5.3	66	66	30.2	112	70	140		
Mercury	0.10	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.75	0.75	0.13	0.7	6.6	6.6		
Molybdenum	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	-	-	-	-	5	10		
Nickel	2.0	10	8.5	11	9.4	6.6	6.6	-	-	-	-	50	50		
Selenium	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	-	-	-	-	1	1		
Silver	0.50	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	-	20	20		
Thallium	0.10	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-	-	-	-	1	1		
Tin	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	-	-	-	-	5	50		
Uranium	0.10	0.66	0.48	0.69	0.64	0.45	0.45	-	-	-	-	23	23		
Vanadium	2.0	12	11	12	11	8.9	8.9	-	-	-	-	130	130		
Zinc	5.0	33	30	35	32	24	24	160	160	124	271	200	200		

Notes:

RDL = laboratory's reportable detection limit

',' = no guideline available

1. ODCA National Guidelines for Monitoring Dredged and Excavated Material at Ocean Disposal Sites (1998)

2. Interim Sediment Quality Guidelines (ISQG) and Probable Effects Levels (PELs) for CCME Sediment Quality Guidelines for the Protection of Aquatic Life (1999)

3. CCME Metal Soil Quality Guidelines for the Protection of Environmental and Human Health (revised 2010)

Table B.8. BTEX/TPH Concentrations for Soil- Baxter's Cove DFO-SCH , Inverness County, Nova Scotia

Results Table for BTEX Compounds and Modified TPH													
Sample ID	Date	Units	BTEX Concentrations				Petroleum Hydrocarbon Fraction Concentrations						Resemblance
			Benzene	Toluene	Ethylbenzene	Xylenes	C6 - C10 (Less BTEX)	>C10 - C16	>C16 - C21	>C21 - <C32	C16 - <C32	Modified TPH (Less BTEX)	
JQ-01-SL-2012-07-31-1	July 31, 2012	mg/kg	< 0.005	< 0.025	< 0.01	< 0.05	< 2.5	< 10	< 10	26	26	26	Lube oil fraction
JQ-02-SL-2012-07-31-1			< 0.005	< 0.025	< 0.01	< 0.05	< 2.5	< 10	< 10	26	26	26	Lube oil fraction
JQ-03-SL-2012-07-31-1			< 0.005	< 0.025	< 0.01	< 0.05	< 2.5	< 10	< 10	23	23	23	Lube oil fraction
JQ-04-SL-2012-07-31-1			< 0.005	< 0.025	< 0.01	< 0.05	< 2.5	< 10	< 10	26	26	26	Lube oil fraction
RDL			0.005	0.025	0.01	0.05	2.5	10	10	15	15	15	Lube oil fraction
Reached Baseline at C32			Yes										
Atlantic RBCA Tier I RBSLs for Soil ¹													
Residential	Potable	Coarse-grained	0.03	0.38	0.08	11	-	-	-	-	-	690	
		Fine-grained	0.01	0.08	0.02	2.3	-	-	-	-	-	970	
	Non-potable	Coarse-grained	0.16	14	58	17	-	-	-	-	-	690	
Commerical		Fine-grained	1.5	120	430	160	-	-	-	-	-	8300	
	Potable	Coarse-grained	0.03	0.38	0.08	11	-	-	-	-	-	10000	
		Fine-grained	0.01	0.08	0.02	2.3	-	-	-	-	-	4700	
	Non-potable	Coarse-grained	1.8	160	430	200	-	-	-	-	-	10000	
		Fine-grained	11	680	430	650	-	-	-	-	-	10000	
CCME Soil Quality Guidelines ²													
Agricultural Land Use	Surface	Coarse Soil	0.03 ³ (0.0095) ⁴	0.37	0.082	11	30 b	150	-	-	300	-	
		Fine Soil	0.0068 ^{3,a}	0.08	0.018	2.4	210 (170a)	150	-	-	1300	-	
	Subsoil	Coarse Soil	-	-	-	-	-	-	-	-	-	-	
Residential/ Parkland Use	Surface	Coarse Soil	0.03 ³ (0.0095) ⁴	0.37	0.082	11	30 b	150	-	-	300	-	
		Fine Soil	0.0068 ^{3,a}	0.08	0.018	2.4	210 (170a)	150	-	-	1300	-	
	Subsoil	Coarse Soil	-	-	-	-	-	-	-	-	-	-	
Commercial/ Industrial Land Use	Surface	Coarse Soil	0.03 ^{3,4}	0.37	0.082	11	320 (240 a)	260	-	-	1700	-	
		Fine Soil	0.0068 ^{3,a}	0.08	0.018	2.4	320 (170 a)	260 (230 a)	-	-	2500	-	
	Subsoil	Coarse Soil	-	-	-	-	-	-	-	-	-	-	
		Fine Soil	-	-	-	-	-	-	-	-	-	-	

1 - Atlantic RBCA Version 2 Reference Document for Petroleum Impacted Sites

2 - Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Update 7.0

3 - Guideline based on a 10⁻⁶ Incremental Risk – Surface (≤1.5m)

4 - Guideline based on a 10⁻⁶ Incremental Risk – Surface (≤1.5m)

a - for the protection of potable water where applicable

Table B.9. PCB and DDT Analytical Results for Soil- Baxter's Cove DFO-SCH , Inverness County, Nova Scotia

Parameter	RDL ⁴	Units	Sample Identification and Date				CEPA Disposal at Sea Guidelines ¹	CCME Sediment Quality Guidelines ²		CCME Soil Quality Guidelines ³			
			JQ-01 -SL- 2012-07-31-1	JQ-02 -SL- 2012-07-31-1	JQ-03 -SL- 2012-07-31-1	JQ-04 -SL- 2012-07-31-1		Interim Sediment Quality Guidelines	Marine and Estuarine Probable Effects Levels	Agricultural	Residential/ Parkland	Commercial/ Industrial	
July 31, 2012													
Polychlorinated Biphenyl (PCB) Results													
Aroclor 1016		mg/kg	-	-	-	-	-	-	-	-	-	-	-
Aroclor 1221			-	-	-	-	-	-	-	-	-	-	-
Aroclor 1232			-	-	-	-	-	-	-	-	-	-	-
Aroclor 1242			-	-	-	-	-	-	-	-	-	-	-
Aroclor 1248			-	-	-	-	-	-	-	-	-	-	-
Aroclor 1254			-	-	-	-	-	0.0633	0.709	-	-	-	-
Aroclor 1260			-	-	-	-	-	-	-	-	-	-	-
Aroclor 1262			-	-	-	-	-	-	-	-	-	-	-
Aroclor 1268		-	-	-	-	-	-	-	-	-	-	-	
Total PCB Concentration ⁵	0.01		0.018	0.017	0.014	0.014	0.014		0.0215	0.189	0.5	1.3	33
Dichloro-Diphenyl-Trichloroethane (DDT) Results													
o,p-DDE	0.000001	mg/kg	< 0.000002	< 0.000001	< 0.000001	< 0.000001	< 0.000001	< 0.000001	0.0027	0.374	-	-	-
p,p-DDE	0.000001		< 0.000002	< 0.000001	< 0.000001	< 0.000001	< 0.000001	< 0.000001	0.0027	0.374	-	-	-
o,p-DDD	0.000001		< 0.000002	< 0.000001	< 0.000001	< 0.000001	< 0.000001	< 0.000001	0.00122	0.00781	-	-	-
p,p-DDD	0.000001		< 0.000002	< 0.000001	< 0.000001	< 0.000001	< 0.000001	< 0.000001	0.00122	0.00781	-	-	-
o,p-DDT	0.000001		< 0.000002	< 0.000001	< 0.000001	< 0.000001	< 0.000001	< 0.000001	-	-	-	-	-
p,p-DDT	0.000001		< 0.000002	< 0.000001	< 0.000001	< 0.000001	< 0.000001	< 0.000001	-	-	-	-	-
o,p-DDT + p,p-DDT	0.000001		< 0.000002	< 0.000001	< 0.000001	< 0.000001	< 0.000001	< 0.000001	-	-	-	-	-
o,p-DDD +p,p-DDD	0.000001		< 0.000002	< 0.000001	< 0.000001	< 0.000001	< 0.000001	< 0.000001	-	-	-	-	-
o,p-DDD + p,p-DDE	0.000001	< 0.000002	< 0.000001	< 0.000001	< 0.000001	< 0.000001	< 0.000001	-	-	-	-	-	
Total DDT (calculated)			< 0.000002	< 0.000001	< 0.000001	< 0.000001	< 0.000001	< 0.000001	0.0019	0.00477	0.7	0.7	12

Notes:

RDL = laboratory's reportable detection limit

*,' = no guideline available

1. ODCA National Guidelines for Monitoring Dredged and Excavated Material at Ocean Disposal Sites (1998)

2. Interim Sediment Quality Guidelines (ISQG) and Probable Effects Levels (PELs) for CCME Sediment Quality Guidelines for the Protection of Aquatic Life (1999)

3. CCME Metal Soil Quality Guidelines for the Protection of Environmental and Human Health (revised 2010)

4. RDL for pesticides for JQ-01 was 0.000002 mg/kg

5. Detected as Aroclor 1260

Table B.10. TIC, TOC and Grain Size Analytical Results for Soil- Baxter's Cove DFO-SCH, Inverness County, Nova Scotia

Parameter	RDL	Units	Sample Identification and Date			
			JQ-01 -SL- 2012-07-31-1	JQ-02 -SL- 2012-07-31-1	JQ-03 -SL- 2012-07-31-1	JQ-04 -SL- 2012-07-31-1
			July 31, 2012			
Grain Size Results						
< PHI -4 (16 mm)	0.10	%	100	100	100	100
< PHI -3 (8 mm)	0.10		100	100	100	100
< PHI -2 (4 mm)	0.10		100	100	100	100
< PHI -1 (2 mm)	0.10		84*	96	99	97
< PHI 0 (1/2 mm)	0.10		82	94	97	95
< PHI +1 (1/4 mm)	0.10		80	93	95	94
< PHI +2 (1/8 mm)	0.10		54	63	63	63
< PHI +3 (1/16 mm)	0.10		27	29	25	21
< PHI +4 (1/32 mm)	0.10		20	22	18	14
< PHI +5 (1/32 mm)	0.10		17	18	15	12
< PHI +6 (1/64 mm)	0.10		12	14	12	9.4
< PHI +7 (1/128 mm)	0.10		8.4	9.8	8.5	7.3
< PHI +8 (1/256 mm)	0.10		7.4	8.5	7.2	6.4
< PHI +9 (1/512 mm)	0.10		5.9	6.3	5.7	5
Gravel	0.10		16	4	1.4	3.3
Sand	0.10		64	74	81	83
Silt	0.10		13	13	11	7.3
Clay	0.10		7.4	8.5	7.2	6.4
Other						
Total Organic Carbon (TOC)	0.2, 0.3, 0.4	g/kg	18	14	12	9.0
Total Inorganic Caron (TIC)	0.2, 0.5	g/kg	ND	5.8	7.3	6.8
Total Carbon (TC)	0.2, 0.5	g/kg	18	20	20	16
Moisture	1	%	28	29	22	26

* PSA: Fraction PHI -1 contained one large rock.

20 January, 2015

TV151205 (Phase JUDHBR)

Mr. Troy Young, B.Sc.
Environmental Specialist
Environmental Services
Public Works and Government Services Canada
1713 Bedford Row
Halifax, Nova Scotia
B3J 3C9

Re: Analytical Results Comparison to Nova Scotia Environmental Quality Standards for Sediment Samples Collected at Judique (Baxter's Cove) Fisheries and Oceans Canada – Small Craft Harbour, Inverness County, Nova Scotia

Dear Mr. Young:

AMEC Environment & Infrastructure, a division of AMEC Americas Limited (AMEC) is pleased to provide the results of analytical marine sediment sample results collected from the Judique (Baxter's Cove) Fisheries and Oceans Canada (DFO) – Small Craft Harbour (SCH) in Inverness County, Nova Scotia (NS) compared against the NS Environmental Quality Standards (EQS) as per your request on 7 January, 2015. Analytical results of samples collected by AECOM under a separate Public Works and Government Services (PWGSC) contract on 31 July, 2012 were used for the purposes of this guideline comparison exercise.

ANALYTICAL RESULTS COMPARED TO NS EQS SUMMARY

The analytical results of the marine sediment samples collected and analyzed from the Judique (Baxter's Cove) DFO-SCH as compared against NS EQS are summarized in Tables A.1 to A.5 (Attachment A) and discussed below. The analytical results of the soil samples collected and analyzed from this property location as compared against the NS EQS are summarized in Tables B.1 to B.4 (Attachment B) and are also discussed below.

SEDIMENT SAMPLES

Polycyclic Aromatic Hydrocarbons (PAHs)

- **Sediment Environments**

Two leachate samples (JQ-48-SED-2012-07-31-1 and JQ-90-SED-2012-07-31-1) exceeded the NS EQS for Surface Water (Freshwater) for three individual PAH compounds (anthracene, fluoranthene, and pyrene). The NS EQS for Surface Water (Marine) was also exceeded for pyrene in these two samples (Table A.2).

Metals

- **Land-Based Sites**

Four samples (JQ-39-SED-2012-07-31-1 and its duplicate JQ-39-SED-2012-07-31-1-DUP, JQ-48-SED-2012-07-31-1, and JQ-90-SED-2012-07-31-1) exceeded the NS EQS for agricultural, residential/parkland, and commercial land use applications for iron (Table A.3).

Petroleum Hydrocarbons

- **Sediment Environment**

Four samples (JQ-39-SED-2012-07-31-1 and its duplicate JQ-39-SED-2012-07-31-1-DUP, JQ-48-SED-2012-07-31-1, and JQ-90-SED-2012-07-31-1) exceeded the NS EQS (Freshwater and Marine) with modified total petroleum hydrocarbon concentrations (less benzene, toluene, ethylbenzene, and xylene) above 43 mg/kg (Table A.4).

Dichloro-Diphenyl-Trichloroethane (DDT)

- **Sediment Environments**

The laboratory detection limits for total dichloro-diphenyl-trichloroethane (DDT) of 0.0060 to 0.030 mg/kg exceeded the NS EQS for Sediment Environments (Freshwater and Marine) of 0.00477 mg/kg, therefore comparison against this guideline is not possible (Table A.5).

SOIL SAMPLES

Dichloro-Diphenyl-Trichloroethane (DDT)

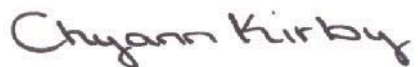
- **Sediment Environments**

The laboratory detection limits for total DDT of 0.010 mg/kg exceeded the NS EQS for Sediment Environments (Freshwater and Marine) of 0.00477 mg/kg, therefore comparison against this guideline is not possible (Table B.4).

CLOSING

We trust that the information contained in this letter meets your requirements. Please do not hesitate to contact us, if you have any questions regarding the above.

Prepared by:



Chyann Kirby, B.Sc., EP, PTech
Project Manager /
Intermediate Project Professional

Reviewed by:



Kerry Higgins, B.Sc., EP
NB/PE Operations Manager /
Senior Project Professional

ATTACHMENT A
Analytical Summary Tables – Sediment Samples

Table A.1 PAH Results for Marine Sediments - Baxter's Cove DFO-SCH, Inverness County, NS

Parameter	RDL	Units	Sample Identification and Date					Nova Scotia Environmental Quality Standards															
			Sediment Environment					Potable Site					Non-Potable Site										
			JQ-39-SED- 2012-07-31-1	JQ-48-SED- 2012-07-31-1	JQ-90-SED- 2012-07-31-1	JQ-99-SED- 2012-07-31-1	JQ-120-SED- 2012-07-31-1	Freshwater		Marine		Fine-Grained Soil			Coarse-Grained Soil			Fine-Grained Soil			Coarse-Grained Soil		
								Agricultural Land Use	Residential/ Parkland Land Use	Commercial and Industrial Land Uses	Agricultural Land Use	Residential/ Parkland Land Use	Commercial and Industrial Land Uses	Agricultural Land Use	Residential/ Parkland Land Use	Commercial and Industrial Land Uses	Agricultural Land Use	Residential/ Parkland Land Use	Commercial and Industrial Land Uses	Agricultural Land Use	Residential/ Parkland Land Use	Commercial and Industrial Land Uses	
Polycyclic Aromatic Hydrocarbon (PAH) Results																							
1-Methylnaphthalene	0.0050		<0.0050	<0.0050	0.013	<0.0050	<0.0050	0.201	0.201	42	42	42	30	30	30	72	72	560	560				
2-Methylnaphthalene	0.0050		<0.0050	<0.0050	0.016	<0.0050	<0.0050	0.201	0.201	42	42	42	30	30	30	72	72	560	560				
Acenaphthene	0.0050		<0.0050	0.018	0.044	<0.0050	<0.0050	0.0889	0.0889	21.5	5300	8000	21.5	3900	8000	21.5	3900	8000	8000				
Acenaphthylene	0.0050		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.128	0.128	32	32	32	4.5	4.5	23	33	4.5	96	66				
Anthracene	0.0050		0.021	0.047	0.047	<0.0050	<0.0050	0.245	0.245	2.5	24000	37000	2.5	24000	37000	2.5	24000	37000	37000				
Benzo(a)anthracene	0.0050		0.050	0.075	0.086	<0.0050	<0.0050	0.385	0.693	0.63			0.5			0.63							
Benzo(a)pyrene	0.0050		0.021	0.039	0.048	<0.0050	<0.0050	0.782	0.763	0.6			0.6			0.6							
Benzo(b)fluoranthene	0.0050		0.031	0.053	0.060	<0.0050	<0.0050	13.4	4.5	6.2			6.2			6.2							
Benzo(k)fluoranthene	0.0050		0.046	0.08	0.092	0.005	0.005																
Benzo(g,h,i)perylene	0.0050		0.015	0.021	0.026	<0.0050	<0.0050	3.2	3.2	8.3			6.6			8.3							
Benzo(j)fluoranthene	0.0050		0.015	0.027	0.032	<0.0050	<0.0050	13.4	4.5	6.2			6.2			6.2							
Chrysene	0.0050		0.075	0.10	0.13	<0.0050	<0.0050	0.862	0.846	6.2			6.2			6.2							
Dibenz(a,h)anthracene	0.0050		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.135	0.135														
Fluoranthene	0.0050		0.13	0.25	0.29	0.0088	<0.0050	2.395	1.494	15.4	3500	5300	15.4	3500	5300	15.4	3500	5300	5300				
Fluorene	0.0050		<0.0050	0.027	0.047	<0.0050	<0.0050	0.144	0.144	15.4	2700	4100	15.4	2700	4100	15.4	2700	4100	4100				
Indeno(1,2,3-cd)pyrene	0.0050		0.013	0.020	0.025	<0.0050	<0.0050	3.2	0.88	0.48			0.38			0.48							
Naphthalene	0.0050		0.013	0.020	0.025	<0.0050	<0.0050	0.391	0.391	0.75	28	28	0.6	2.2	25	0.75	51	370	25				
Pyrene	0.0050		0.069	0.070	0.082	0.012	<0.0050	0.515	0.544	7.8	17	24	6.2	17	17	7.8							
Phenanthrene	0.0050		0.050	0.068	0.076	0.0090	<0.0050	0.875	1.398	7.7	2100	3200	7.7	2100	3200	7.7	2100	3200	3200				
Pyrene	0.0050		0.080	0.14	0.18	0.0068	<0.0050	0.875	1.398	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3				
Benzo(a)pyrene TPE (10 ⁵)			0.037	0.063	0.075	0.006	0.006																
Creosote or Coal Tar source suspected/known?	yes/no		Unknown	Unknown	Unknown	No	No																
Uncertainty Factor Applied	yes/no		Yes	Yes	Yes	No	No																
Benzo(a)pyrene TPE (10 ⁵) with UF	mg/kg		0.11	0.19	0.23	Not Applicable	Not Applicable			5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3				

NOTE(S):
 All results below the laboratory detection limit were divided by 2 prior to further calculations.
 Total Potency Equivalent (TPE) based on an incremental lifetime cancer risk (ILCR) of 1 in 100,000 (10⁻⁵).
 Benzo(a)pyrene TPE (10⁵) = Sum of PAH concentration multiplied by their respective Benzo(a)pyrene Potency Equivalency Factors: ((Benz(a)anthracene)*0.1) + ((Benz(a)pyrene)*0.1) + ((Benz(a)fluoranthene)*0.1) + ((Benz(a)fluoranthene)*0.1) + ((Chrysene)*0.01) + ((Indeno(1,2,3-cd)pyrene)*0.1).
 Benzo(a)pyrene TPE Uncertainty Factor = 3.
 Light values indicate results below detection limit.

Table A.2 PAH Results for Leachate Samples - Baxter's Cove DFO-SCH, Inverness County, NS

Nova Scotia Environmental Quality Standards														
Sample Identification and Date				Surface Water		Groundwater								
				Freshwater		Marine	Potable	Non-Potable						
JQ-48-SED-2012 07-31-1		JQ-90-SED-2012 07-31-1					Coarse- and Fine-Grained Soils		Fine-Grained Soils		Coarse-Grained Soils			
Parameter	RDL	Units	31-Jul-12											
Leachable Polycyclic Aromatic Hydrocarbons (PAHs)														
1-Methylnaphthalene	0.010	ug/L	<0.010	0.019	2	1	12	35000	150000	6200	38000			
2-Methylnaphthalene	0.010		0.012	0.016	2	2	12	35000	150000	6200	38000			
Acenaphthene	0.0050		0.046	0.17	5.8	6	1400							
Acenaphthylene	0.0050		<0.0050	<0.0050	4.6	6	4.5	120	1700	36	750			
Anthracene	0.0050		0.015	0.028	0.012									
Benz(a)anthracene	0.0050		<0.0050	<0.0050	0.018									
Benzo(a)pyrene	0.0050		<0.0050	<0.0050	0.015	0.01	0.01							
Benzo(b)fluoranthene	0.0050		<0.0050	<0.0050	0.48									
Benzo(g,h,i)perylene	0.0050		<0.0050	<0.0050	0.17									
Benzo(j)fluoranthene	0.0050		<0.0050	<0.0050	0.48									
Benzo(k)fluoranthene	0.0050		<0.0050	<0.0050	0.48									
Chrysene	0.0050		<0.0050	0.0052	1.4	0.1								
Dibenz(a,h)anthracene	0.0050		<0.0050	<0.0050	0.26									
Fluoranthene	0.0050		0.056	0.095	0.04	11								
Fluorene	0.0050		0.046	0.096	3	12	940							
Indeno(1,2,3-cd)pyrene	0.0050		<0.0050	<0.0050	0.21									
Naphthalene	0.0050	0.024	0.054	1.1	1.4	470	14000		600	7000				
Perylene	0.0050	<0.0050	<0.0050											
Phenanthrene	0.0050	0.065	0.059	0.4	4.6									
Pyrene	0.0050	0.034	0.054	0.025	0.02	710								

NOTE(S):

Yellow highlighted values indicate exceedance of NS EQS for Surface Water (Freshwater).

Underlined values indicate exceedance of NS EQS for Surface Water (Marine).

Table A.3 Metal Results for Marine Sediments - Baxter's Cove DFO-SCH, Inverness County, NS

Parameter	RDL	Units	Sample Identification and Date							Nova Scotia Environmental Quality Standards					
			31-Jul-12							Sediment Environment		Potable and Non-Potable Sites with Coarse- and Fine-Grained Soils			
			JQ-39-SED-2012-07-31-1	JQ-39-SED-2012-07-31-1-DUP	JQ-48-SED-2012-07-31-1	JQ-90-SED-2012-07-31-1	JQ-99-SED-2012-07-31-1	JQ-120-SED-2012-07-31-1	Freshwater	Marine	Agricultural Land Use	Residential/Parkland Land Use	Commercial Land Use	Industrial Land Use	
Aluminum	10	11000	12000	12000	11000	3400	2300			15400	15400	15400	198000		
Antimony	2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	25	7.5	7.5	63	63		
Arsenic	2.0	5.8	6.4	6.0	5.7	2.1	<2.0	<2.0	17	41.6	17	31	31		
Barium	5.0	110	140	130	100	48	67			400	10000	15000	140000		
Beryllium	2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0			5	38	320		
Boron (Total)	5.0	43	30	32	38	12	<5.0			4300	4300	24000	24000		
Boron (Hot Water Soluble)		Not Analyzed	Not Analyzed	Not Analyzed	Not Analyzed	Not Analyzed	Not Analyzed			2					
Cadmium	0.30	0.53	0.43	0.52	0.46	<0.30	<0.30	3.5	4.2	1.4	14	49	192		
Chromium (Hexavalent)	0.2	<0.2	Not Analyzed	<0.2	<0.2	<0.2	<0.2			0.4	160	1300	1300		
Chromium (Total)	2.0	19	22	21	19	5.7	3.7	90	160	52	220	630	2300		
Cobalt	1.0	9.9	11	11	9.4	3.4	2.2	20	22	20	22	250	250		
Copper	2.0	22	27	25	25	5.4	<2.0	197	108	63	1100	4000	16000		
Cyanide (Total)		Not Analyzed	Not Analyzed	Not Analyzed	Not Analyzed	Not Analyzed	Not Analyzed			0.9	29	110	420		
Iron	50	21000	25000	25000	21000	7400	5800	43766		11000	11000	11000	144000		
Lead	0.50	19	21	20	18	5.3	3.4	91.3	112	70	140	260	740		
Manganese	2.0	290	300	340	280	150	130	1100							
Mercury (Total)	0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.486	0.7	6.6	6.6	24	99		
Methylmercury		Not Analyzed	Not Analyzed	Not Analyzed	Not Analyzed	Not Analyzed	Not Analyzed			1	1.6	1.6	20		
Molybdenum	2.0	4.6	4.4	3.8	4.4	<2.0	<2.0			40	110	1200	1200		
Nickel	2.0	22	24	25	21	6.0	3.4	75		50	330	2200	2200		
Selenium	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2		1	80	125	1135		
Silver	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1	2.2	20	77	490	490		
Strontium	5.0	37	33	38	40	14	9.2			9400	9400	9400	122000		
Thallium	0.10	0.22	0.20	0.19	0.18	<0.10	<0.10			1	1	1	1		
Tin	2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0			5	9400	9400	122000		
Uranium	0.10	1.4	1.5	1.3	1.3	0.66	0.26			23	23	33	300		
Vanadium	2.0	26	28	27	25	10	9.1			39	39	160	160		
Zinc	5.0	74	83	82	74	25	16	315	271	200	5600	47000	47000		

NOTE(S):

Underlined values indicate exceedance of NS EQS for Agricultural Land Use.

Italicized values indicate exceedance of NS EQS for Residential/Parkland Land Use.

Light blue border values indicate exceedance of NS EQS for Commercial Land Use.

Light values indicate results below detection limit.

Table A.4 BTEX/TPH Results for Marine Sediments - Baxter's Cove DFO-SCH, Inverness County, NS

Sample ID	Date	Units	BTEX Concentrations				Petroleum Hydrocarbon Fraction Concentrations						Reached Baseline at C32	Resemblance	Methyl Tert Butyl Ether (MTBE)
			Benzene	Toluene	Ethylbenzene	Xylene	C ₆ -C ₁₀	C ₁₀ -C ₁₆	C ₁₆ -C ₂₁	C ₂₁ -C ₃₂	Modified TPH (Less BTEX)	Total TPH			
JQ-39-2012-07-31-1	31-Jul-12	mg/kg	<0.0050	<0.025	<0.010	<0.050	<2.5	<10	25	38	<u>62</u>		Yes	One Product in Fuel/Lube Range, Lube Oil Fraction.	
JQ-39-2012-07-31-1-DUP			<0.0050	<0.025	<0.010	<0.050	<2.5	31	48	63	<u>140</u>		Yes	One Product in Fuel/Lube Range, Lube Oil Fraction.	
JQ-48-2012-07-31-1			<0.0050	<0.025	<0.010	<0.050	<2.5	<10	41	88	<u>130</u>		Yes	One Product in Fuel/Lube Range, Lube Oil Fraction.	
JQ-90-2012-07-31-1			<0.0050	<0.025	<0.010	<0.050	<2.5	<10	39	58	<u>97</u>		Yes	One Product in Fuel/Lube Range, Lube Oil Fraction.	
JQ-99-2012-07-31-1			<0.0050	<0.025	<0.010	<0.050	<2.5	<10	<10	<10	<15		Not Applicable	No Resemblance	
JQ-120-2012-07-31-1			<0.0050	<0.025	<0.010	<0.050	<2.5	<10	<10	<10	<15		Not Applicable	No Resemblance	
RDL			0.0050	0.025	0.010	0.050	2.5	10	10	15	15	Total TPH			
Guidelines															
Nova Scotia Environmental Quality Standards															
Soils															
Agricultural Land Use	Potable	Coarse-Grained Soil	0.042	0.35	0.065	8.8	74	150	150	300	300				0.05
	Fine-Grained Soil	0.094	0.74	0.13	0.13	22	210	150	1300	1300	1300				0.05
Non-Potable	Coarse-Grained Soil	0.99	75	30	30	8.8	74	150	300	300	300				0.05
	Fine-Grained Soil	2.3	10000	120	120	65	210	150	1300	1300	1300				1.1
Residential/ Parkland Land Use	Potable	Coarse-Grained Soil	0.042	0.35	0.065	8.8	74	270	1100	1100	1100				0.05
	Fine-Grained Soil	0.094	0.74	0.13	0.13	22	1900	4700	10000	10000	10000				0.05
Non-Potable	Coarse-Grained Soil	0.99	77	30	30	8.8	74	270	1100	1100	1100				0.05
	Fine-Grained Soil	2.3	10000	9300	210	210	2100	8600	10000	10000	10000				1.1
Commercial and Industrial Land Uses	Potable	Coarse-Grained Soil	0.042	0.35	0.065	11	870	1800	10000	10000	10000				0.062
	Fine-Grained Soil	0.094	0.74	0.13	0.13	22	1900	4700	10000	10000	10000				0.05
Sediment	Coarse-Grained Soil	2.5	10000	10000	110	870	4000	10000	10000	10000	10000				0.57
	Fine-Grained Soil	33	10000	10000	10000	10000	10000	10000	10000	10000	10000				7.4
Sediment Environment															
NOTE(S):	Sediment Environment	Freshwater	1.2	1.4	1.2	1.3	15	25	43	43	43	500			
		Marine	1.2	1.4	1.2	1.3	15	25	43	43	43	500			

Yellow highlighted values indicate exceedance of NS EQS for Surface Water (Freshwater).

Underlined values indicate exceedance of NS EQS for Surface Water (Marine).

Light values indicate results below detection limit.

Table A.3 PCB and DDT Results for Marine Sediments - Baxter's Cove DFO-SCH, Inverness County, NS

Parameter	RDL	Units	Sample Identification and Date					Nova Scotia Environmental Quality Standards																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
			31-Jul-12					Sediment Environment		Potable Site				Non-Potable Site																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
								Freshwater	Marine	Fine-Grained Soils		Coarse-Grained Soils		Residential/ Parkland Land Use		Commercial Land Use		Industrial Land Use		Residential/ Parkland Land Use		Commercial Land Use		Industrial Land Use																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
										Agricultural Land Use	Residential/ Parkland Land Use	Commercial Land Use	Industrial Land Use	Agricultural Land Use	Residential/ Parkland Land Use	Commercial Land Use	Industrial Land Use	Agricultural Land Use	Residential/ Parkland Land Use	Commercial Land Use	Industrial Land Use	Agricultural Land Use	Residential/ Parkland Land Use	Commercial Land Use	Industrial Land Use																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
			JQ-39-SED-2012-07-31-1	JQ-48-SED-2012-07-31-1	JQ-90-SED-2012-07-31-1	JQ-99-SED-2012-07-31-1	JQ-120-SED-2012-07-31-1																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														

NOTE(S):

All results below the laboratory detection limit were divided by 2 prior to further calculations.

Yellow highlight indicate underdetermined exceedance of NS EQS for Sediment Environments (Freshwater and/or Marine) as laboratory reporting limit is above guideline.

Light values indicate results below detection limit.

ATTACHMENT B
Analytical Summary Tables – Soil Samples

Table B.1 PAH Results for Soil - Baxter's Cove DFO-SCH, Inverness County, NS

Parameter	RDL	Units	Sample Identification and Date				Nova Scotia Environmental Quality Standards																
			31-Jul-12				Sediment Environment		Potable Site				Non-Potable Site										
									Fine-Grained Soil		Coarse-Grained Soil		Fine-Grained Soil		Coarse-Grained Soil								
									Agricultural Land Use	Residential/Parkland Land Use	Commercial and Industrial Land Uses	Agricultural Land Use	Residential/Parkland Land Uses	Commercial and Industrial Land Uses	Agricultural Land Use	Residential/Parkland Land Uses	Commercial and Industrial Land Uses						
			JQ-01-SL-2012 07-31-1	JQ-02-SL-2012 07-31-1	JQ-03-SL-2012 07-31-1	JQ-04-SL-2012 07-31-1																	
Polycyclic Aromatic Hydrocarbon (PAH) Results																							
1-Methylnaphthalene	0.0050		<0.0050	<0.0050	<0.0050	0.0094	<0.0050	<0.0050	<0.0050	0.201	0.201	0.201	0.201	42	42	42	42	30	30	72	72	560	560
2-Methylnaphthalene	0.0050		<0.0050	<0.0050	<0.0050	0.0094	<0.0050	<0.0050	<0.0050	0.201	0.201	0.201	0.201	42	42	42	42	30	30	72	72	560	560
Acenaphthene	0.0050		<0.0050	<0.0050	<0.0050	0.0094	<0.0050	<0.0050	<0.0050	0.0899	0.0899	0.0899	0.0899	21.5	5300	8000	21.5	3900	8000	21.5	3900	8000	8000
Acenaphthylene	0.0050		<0.0050	<0.0050	<0.0050	0.0071	<0.0050	<0.0050	<0.0050	0.128	0.128	0.128	0.128	32	24000	37000	32	4.5	33	4.5	3900	8000	8000
Anthracene	0.0050		<0.0050	<0.0050	<0.0050	0.0078	<0.0050	<0.0050	<0.0050	0.245	0.245	0.245	0.245	25	24000	37000	23	4.5	96	4.5	2700	37000	37000
Benzo(a)anthracene	0.0050		<0.0050	<0.0050	<0.0050	0.0078	<0.0050	<0.0050	<0.0050	0.385	0.385	0.385	0.385	0.63	0.63	0.63	0.63	24000	37000	0.63	24000	37000	37000
Benzo(b)fluoranthene	0.0050		<0.0050	<0.0050	<0.0050	0.0078	<0.0050	<0.0050	<0.0050	0.782	0.782	0.782	0.782	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Benzo(g,h)perylene	0.0050		<0.0050	<0.0050	<0.0050	0.0078	<0.0050	<0.0050	<0.0050	13.4	13.4	13.4	13.4	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2
Benzo(k)fluoranthene	0.0050		<0.0050	<0.0050	<0.0050	0.0078	<0.0050	<0.0050	<0.0050	3.2	3.2	3.2	3.2	8.3	8.3	8.3	8.3	6.2	6.2	6.2	6.2	6.2	6.2
Chrysene	0.0050	mg/kg	<0.0050	<0.0050	<0.0050	0.0094	<0.0050	<0.0050	<0.0050	13.4	13.4	13.4	13.4	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2
Dibenz(a,h)anthracene	0.0050	0.010-0.0050	0.019	<0.0050	<0.0050	0.019	<0.0050	<0.0050	<0.0050	0.862	0.862	0.862	0.862	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2
Fluoranthene	0.0050	0.0050	0.022	0.019	0.018	0.018	0.018	0.018	0.018	0.135	0.135	0.135	0.135	15.4	3500	5300	15.4	3500	5300	15.4	3500	5300	5300
Fluorene	0.0050	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	2.355	2.355	2.355	2.355	15.4	2700	4100	15.4	2700	4100	15.4	2700	4100	4100
Indeno(1,2,3-cd)pyrene	0.0050	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.88	0.88	0.88	0.88	0.48	0.48	0.48	0.48	0.38	0.38	0.38	0.38	0.38	0.38
Naphthalene	0.0050	0.0050	<0.0050	0.0076	0.016	0.015	0.015	0.015	0.015	0.391	0.391	0.391	0.391	0.75	28	28	28	25	25	370	0.6	2.2	25
Perylene	0.0050	0.0050	0.016	0.016	0.016	0.015	0.015	0.015	0.015	0.16	0.16	0.16	0.16	7.8	17	24	17	17	17	7.8	6.2	6.2	6.2
Phenanthrene	0.0050	0.0050	0.015	0.015	0.014	0.011	0.011	0.011	0.011	0.515	0.515	0.515	0.515	7.8	17	24	17	17	17	7.8	6.2	6.2	6.2
Pyrene	0.0050	0.0050	0.014	0.012	0.013	0.010	0.010	0.010	0.010	0.875	0.875	1.398	1.398	7.7	2100	3200	7.7	2100	3200	7.7	2100	3200	3200
Benzo(a)pyrene TPE (10 ⁵)		mg/kg	0.007	0.006	0.006	0.006	0.006	0.006	0.006					5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
Cresote or Coal Tar source suspected/krown?		yes/no	No	No	No	No	No	No	No														
Uncertainty Factor Applied		yes/no	No	No	No	No	No	No	No														
Benzo(a)pyrene TPE (10 ⁵) with UF		mg/kg	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3

NOTE(S):
 Total Potency Equivalent (TPE) based on an incremental lifetime cancer risk (LCR) of 1 in 100,000 (10⁻⁵).
 Benzo(a)pyrene TPE (10⁵) = Sum of PAH concentration multiplied by their respective Benzo(a)pyrene Potency Equivalency Factors: (Benz(a)anthracene)*0.1 + (Benz(b)fluoranthene)*0.1 + (Benz(g,h)perylene)*0.1 + (Benz(k)fluoranthene)*0.1 + (Chrysene)*0.01 + (Dibenz(a,h)anthracene)*1 + (Indeno(1,2,3-cd)pyrene)*1.
 Benzo(a)pyrene TPE Uncertainty Factor = 3.
 Light values indicate results below detection limit.

Table B.2 Metal Results for Soil - Baxter's Cove DFO-SCH, Inverness County, NS

Parameter	RDL	Units	Sample Identification and Date					Nova Scotia Environmental Quality Standards					
								Sediment Environment		Potable and Non-Potable Sites with Coarse- and Fine-Grained Soils			
			JQ-01-SL-2012 07-31-1	JQ-01-SL-2012 07-31-1-DUP	JQ-02-SL-2012 07-31-1	JQ-03-SL-2012 07-31-1	JQ-04-SL-2012 07-31-1	Freshwater	Marine	Agricultural Land Use	Residential/ Parkland Land Use	Commercial Land Use	Industrial Land Use
Aluminum	10	4400	3600	4400	3900	3000				15400	15400	15400	198000
Antimony	2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	25		7.5	7.5	63	63
Arsenic	2.0	4.3	3.3	4.1	3.7	3.1	3.1	17	41.6	17	31	31	31
Barium	5.0	50	37	61	46	36				400	10000	15000	140000
Beryllium	2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0			5	38	320	320
Boron (Total)	20	<20	<20	<20	<20	<20	<20			4300	4300	24000	24000
Boron (Hot Water Soluble)		Not Analyzed	Not Analyzed	Not Analyzed	Not Analyzed	Not Analyzed				2			
Cadmium	0.30	<0.30	0.34	0.35	<0.30	<0.30	<0.30	3.5	4.2	1.4	14	49	192
Chromium (Hexavalent)	0.2	<0.2	Not Analyzed	<0.2	<0.2	<0.2	<0.2			0.4	160	1300	1300
Chromium (Total)	2.0	8.1	6.7	7.9	7.1	5.0	5.0	90	160	52	220	630	2300
Cobalt	1.0	4.7	3.6	4.4	4.0	3.1	3.1			20	22	250	250
Copper	2.0	8.3	6.2	8.1	7.1	5.0	5.0	197	108	63	1100	4000	16000
Cyanide (Total)		Not Analyzed	Not Analyzed	Not Analyzed	Not Analyzed	Not Analyzed				0.9	29	110	420
Iron	50	10000	8600	10000	9100	6900		43766		11000	11000	11000	144000
Lead	0.50	7.2	5.9	7.7	6.3	5.3	5.3	91.3	112	70	140	260	740
Manganese	2.0	170	140	170	160	130		1100					
Mercury (Total)	0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.486	0.7	6.6	6.6	24	99
Methylmercury		Not Analyzed	Not Analyzed	Not Analyzed	Not Analyzed	Not Analyzed				1	1.6	1.6	20
Molybdenum	2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0			40	110	1200	1200
Nickel	2.0	10	8.5	11	9.4	6.6	6.6	75		50	330	2200	2200
Selenium	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2		1	80	125	1135
Silver	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1	2.2	20	77	490	490
Strontium	5.0	70	48	77	78	65				9400	9400	9400	122000
Thallium	0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10			1	1	1	1
Tin	2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0			5	9400	9400	122000
Uranium	0.10	0.66	0.48	0.69	0.64	0.45	0.45			23	23	33	300
Vanadium	2.0	12	11	12	11	8.9				39	39	160	160
Zinc	5.0	33	30	35	32	24		315	271	200	5600	47000	47000

NOTE(S):

Light values indicate results below detection limit.

Table B.3 BTEX/TPH Results for Soil - Baxter's Cove DFO-SCH, Inverness County, NS

Sample ID			Date	Units	BTEX Concentrations				Petroleum Hydrocarbon Fraction Concentrations						Total TPH	Reached Baseline at C32	Resemblance	Methyl Tertiary Butyl Ether (MTBE)
					Benzene	Toluene	Ethylbenzene	Xylene	C ₆ -C ₁₀	C ₁₀ -C ₁₆	C ₁₆ -C ₂₁	C ₂₁ -C ₃₂	Modified TPH (Less BTEX)					
JQ-01-SL-2012-07-31-1		31-Jul-12		mg/kg	<0.0050	<0.025	<0.010	<0.050	<2.5	<10	<10	26	26		Yes	Lube Oil Fraction.		
JQ-02-SL-2012-07-31-1					<0.0050	<0.025	<0.010	<0.050	<2.5	<10	<10	26	26		Yes	Lube Oil Fraction.		
JQ-03-SL-2012-07-31-1					<0.0050	<0.025	<0.010	<0.050	<2.5	<10	<10	23	23		Yes	Lube Oil Fraction.		
JQ-04-SL-2012-07-31-1					<0.0050	<0.025	<0.010	<0.050	<2.5	<10	<10	26	26		Yes	Lube Oil Fraction.		
RDL					0.0050	0.025	0.010	0.050	2.5	10	10	15	15					
Guidelines					Benzene	Toluene	Ethylbenzene	Xylene	Gasoline	Diesel / No. 2 Fuel Oil	No. 6 Oil/ Lube Oil	Modified TPH (Less BTEX)	Total TPH					
Nova Scotia Environmental Quality Standards																		
Soils																		
Agricultural Land Use	Potable	Coarse-Grained Soil	0.042	0.35	0.065	8.8	74	150	300	300	300						0.05	
		Fine-Grained Soil	0.094	0.74	0.13	22	210	150	1300	1300	1300						0.05	
	Non-Potable	Coarse-Grained Soil	0.99	75	30	8.8	74	150	300	300	300						0.05	
Residential/ Parkland Land Use	Potable	Fine-Grained Soil	2.3	10000	120	65	210	150	1300	1300	1300						1.1	
		Coarse-Grained Soil	0.042	0.35	0.065	8.8	74	270	1100	1100	1100						0.05	
	Non-Potable	Fine-Grained Soil	0.094	0.74	0.13	22	1900	4700	10000	10000	10000						0.05	
Commercial and Industrial Land Uses	Potable	Coarse-Grained Soil	2.3	10000	9300	210	2100	8600	10000	10000	10000						0.05	
		Fine-Grained Soil	0.042	0.35	0.065	11	870	1800	10000	10000	10000						1.1	
	Non-Potable	Coarse-Grained Soil	0.094	0.74	0.13	22	1900	4700	10000	10000	10000						0.062	
Sediment		Coarse-Grained Soil	2.5	10000	10000	110	870	4000	10000	10000	10000						0.57	
		Fine-Grained Soil	33	10000	10000	10000	10000	10000	10000	10000	10000						7.4	
Sediment Environment		Freshwater Marine	1.2	1.4	1.2	1.3	15	25	43	43	43							
			1.2	1.4	1.2	1.3	15	25	43	43	43							

NOTE(S):

Light values indicate results below detection limit.

Table B.4 PCB and DDT Results for Soil - Baxter's Cove DFO-SCH, Inverness County, NS

Parameter	RDL	Units	Sample Identification and Date				Nova Scotia Environmental Quality Standards																							
			31-Jul-12				Potable Site							Non-Potable Site																
			JQ-01-SL-2012-07-31-1		JQ-02-SL-2012-07-31-1		JQ-03-SL-2012-07-31-1		JQ-04-SL-2012-07-31-1		Sediment Environment			Fine-Grained Soils				Coarse-Grained Soils			Fine-Grained Soils				Coarse-Grained Soils					
			Freshwater		Marine		Agricultural Land Use		Residential/ Parkland Land Use		Commercial Land Use		Industrial Land Use		Agricultural Land Use		Residential/ Parkland Land Use		Commercial Land Use		Industrial Land Use		Agricultural Land Use		Residential/ Parkland Land Use		Commercial Land Use		Industrial Land Use	
Polychlorinated Biphenyl (PCB) Results		mg/kg	0.018	0.017	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	
PCB Concentration		mg/kg																												
Dichloro-Diphenyl-Trichloroethane (DDT) Results		mg/kg	<0.0020	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
p,p'-DDE		mg/kg	<0.0020	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
p,p'-DDD		mg/kg	<0.0020	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
p,p'-DDT		mg/kg	<0.0020	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
p,p'-DDT + p,p'-DDT		mg/kg	<0.0020	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
p,p'-DDD + p,p'-DDD		mg/kg	<0.0020	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
p,p'-DDE + p,p'-DDE		mg/kg	<0.0020	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total DDT		mg/kg	<0.0020	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010

NOTE(S):

All results below the laboratory detection limit were divided by 2 prior to further calculations.

Yellow Highlight indicate undetermined, exceedance of NS EQS for Sediment Environments (Freshwater and/or Marine) as laboratory reporting limit is above guideline.

Light values indicate results below detection limit.



**PWGSC PROJECT #R.070368.006
MARINE SEDIMENT SAMPLING PROGRAM
Judique (Baxters Cove) DFO-SCH
Judique, Nova Scotia**

FINAL REPORT

Submitted to:
Public Works and Government Services Canada
Halifax, Nova Scotia

Submitted by:
**Amec Foster Wheeler Environment & Infrastructure,
a Division of Amec Foster Wheeler Americas Limited**
Dartmouth, Nova Scotia

March 2015

TV141222



6 March, 2015

TV141222

Mr. Troy Young, B.Sc.
Environmental Specialist
Environmental Services
Public Works and Government Services Canada
1713 Bedford Row
Halifax, Nova Scotia
B3J 3C9

Dear Mr. Young:

**Re: Marine Sediment Sampling Program at the Judique (Baxters Cove) Fisheries and Oceans
Small Craft Harbour, Nova Scotia - Final Report**

Amec Foster Wheeler Environment & Infrastructure, a Division of Amec Foster Wheeler Americas Limited, is pleased to provide Public Works and Government Services Canada the findings of a Marine Sediment Sampling Program undertaken at the Judique (Baxters Cove) Fisheries and Oceans Canada - Small Craft Harbour in Nova Scotia.

Amec Foster Wheeler appreciates the opportunity to provide services to your organization. Please do not hesitate to call if you have any questions regarding this, or any other matter.

Respectfully submitted,

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EXECUTIVE SUMMARY

Two (2) sediment samples were collected within the Judique (Baxters Cove) Fisheries and Oceans Canada (DFO) - Small Craft Harbour (SCH) in Nova Scotia on 8 December, 2014. The samples were submitted to AGAT Laboratories for detailed analyses. Results were compared to the *Canadian Environmental Protection Act* (CEPA) Disposal at Sea Lower Level Screening Criteria; Canadian Council of Ministers of the Environment (CCME) Soil Quality Guidelines (SQGs) for the Protection of Environment and Human Health (1999a); Atlantic Risk-Based Corrective Action (RBCA) Tier 1 Version 3.0 Risk-Based Screening Levels (RBSLs) and Sediment Ecological Screening Levels (SESLs) for the Protection of Freshwater and Marine Aquatic Life (2012); Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (1992); and Nova Scotia Tier 1 Environmental Quality Standards (EQS) (2013). Table ES1, below, reports the summarized guideline exceedance results of the sediment analysis for the field program. Figure ES1 (below) depicts the summarized substrate composition for the samples collected from the Judique (Baxters Cove) DFO-SCH.

Table ES1 Sediment Analysis Guideline Exceedance Table

Guideline / Parameter	Sample ID	
	JB-4	JB-21
CEPA Disposal at Sea – Lower Level Screening Criteria		
PAHs ¹	-	-
Metals	-	-
PCBs ²	-	-
CCME SQGs		
PAHs	-	-
Metals	-	-
BTEX ³	-	-
PCBs	-	-
DDT ⁴	-	-
Atlantic RBCA Tier 1 Version 3.0 RBSLs and SESLs		
BTEX	-	-
TPH ⁵	-	-
Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills		
PAHs	-	-
Metals	-	●
BTEX	-	-
PCBs	-	-
Nova Scotia Tier 1 EQS		
PAHs	-	-
Metals	-	-
BTEX	-	-
TPH	-	-
PCBs	-	-

Notes:

“-” indicates no exceedance

“●” indicates exceedance

1 – PAH - polycyclic aromatic hydrocarbon

2 – PCB - polychlorinated biphenyl

3 – BTEX - benzene, toluene, ethylbenzene, and xylene

4 – DDT - dichloro-diphenyl-trichloroethane

5 – TPH - total petroleum hydrocarbons

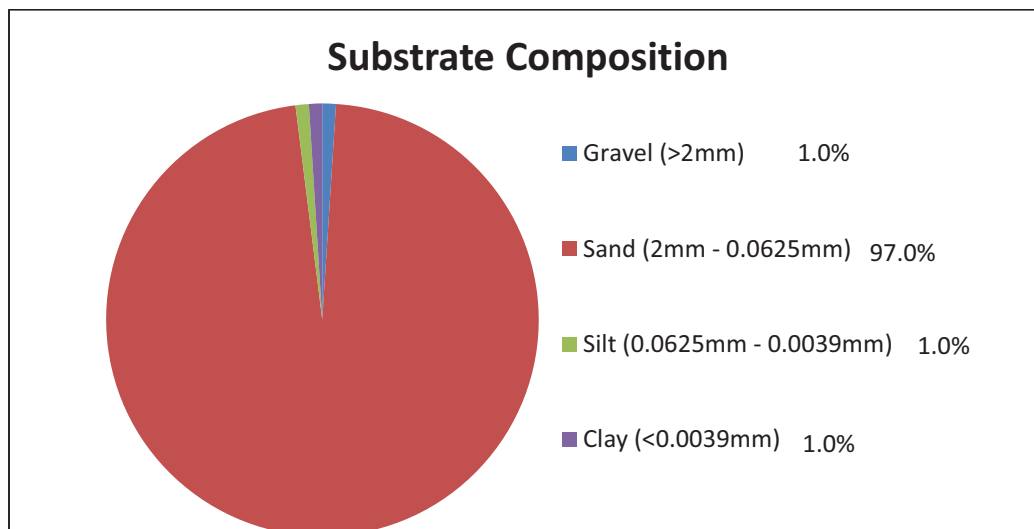


Figure ES1 Substrate Composition Averaged from Sampling Locations at the Judique (Baxters Cove) DFO-SCH, Nova Scotia

Based on the results of the sediment analysis, one (1) sample was submitted for Synthetic Precipitation Leaching Procedure (SPLP) leachate analysis for boron. Results from this sample were compared to the CCME Canadian Water Quality Guidelines (WQGs) for the Protection of Aquatic Life (1999b); Health Canada Canadian Guidelines for Drinking Water Quality (CGDWQ) (2014); Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (1992); and Nova Scotia Tier 1 EQS (2013). Table ES2, below, reports the summarized guideline exceedance results for the leachate analyses completed on the sediment sample.

Table ES2 Leachate Analysis Guideline Exceedance Table

Guideline / Parameter	Sample ID
	JB-21
CCME WQGs for the Protection of Aquatic Life	
Metals	-
Health Canada CGDWQ	
Metals	-
Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills	
Metals	-
Nova Scotia Tier 1 EQS	
Metals	-

Notes:
 “-” indicates no exceedance

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1.0 INTRODUCTION

At the request of Public Works and Government Services Canada (PWGSC), two (2) stations were sampled within the footprint of the proposed dredging area at the Judique (Baxters Cove) Fisheries and Oceans (DFO) - Small Craft Harbour (SCH) on 8 December 2014.

2.0 SCOPE AND METHODOLOGY

2.1 Site Plan

The selection of sample stations for the Marine Sediment Sampling Program (MSSP) followed guidance provided in the Environmental Protection Series: *Users Guide to the Application Form for Ocean Disposal* (Environment Canada, 1995), whereby a random approach was implemented for the location of sampling stations in the proposed dredge area of the SCH. The unstratified area was divided into square blocks where at least five times as many blocks as the number of stations required was used (minimum of 30 blocks). A random number generator software program was used to derive the sampling locations within this dredge area (Figure 2.1).

A detailed program design was prepared by Amec Foster Wheeler Environment & Infrastructure, a Division of Amec Foster Wheeler Americas Limited (Amec Foster Wheeler) and submitted to PWGSC on 28 November 2014 for review and approval prior to field program implementation.

Sample collection, preparation, and analyses were conducted in accordance with Environment Canada's publication *Guidance Document on Collection and Preparation of Sediments for Physicochemical Characterization and Biological Testing* (1994). Connors Diving Services Limited was retained to collect the sediment samples. The sample collection field program was completed in accordance with guidelines defined by provincial Occupational Health and Safety Standards.

2.2 Sample Collection and Analysis

The marine sediment samples were collected by divers at the selected sampling stations. A handheld Garmin Global Positioning System (GPS) was used to georeference the sampling location coordinates that were derived prior to field program initiation. Sample station coordinates are listed in Figure 2.1. Appendix A is comprised of a collection of photos taken of the sample locations during the field program.

Duplicate samples were collected from all stations to safeguard against loss or damage during transport. All samples were then stored in the laboratory-supplied jars and kept in a cooler on until the field program was completed. Upon completion of the field program, the samples were chilled and delivered to the laboratory for select chemical analyses. The duplicate sediment samples were refrigerated and stored at the Amec Foster Wheeler office in Dartmouth, Nova Scotia.

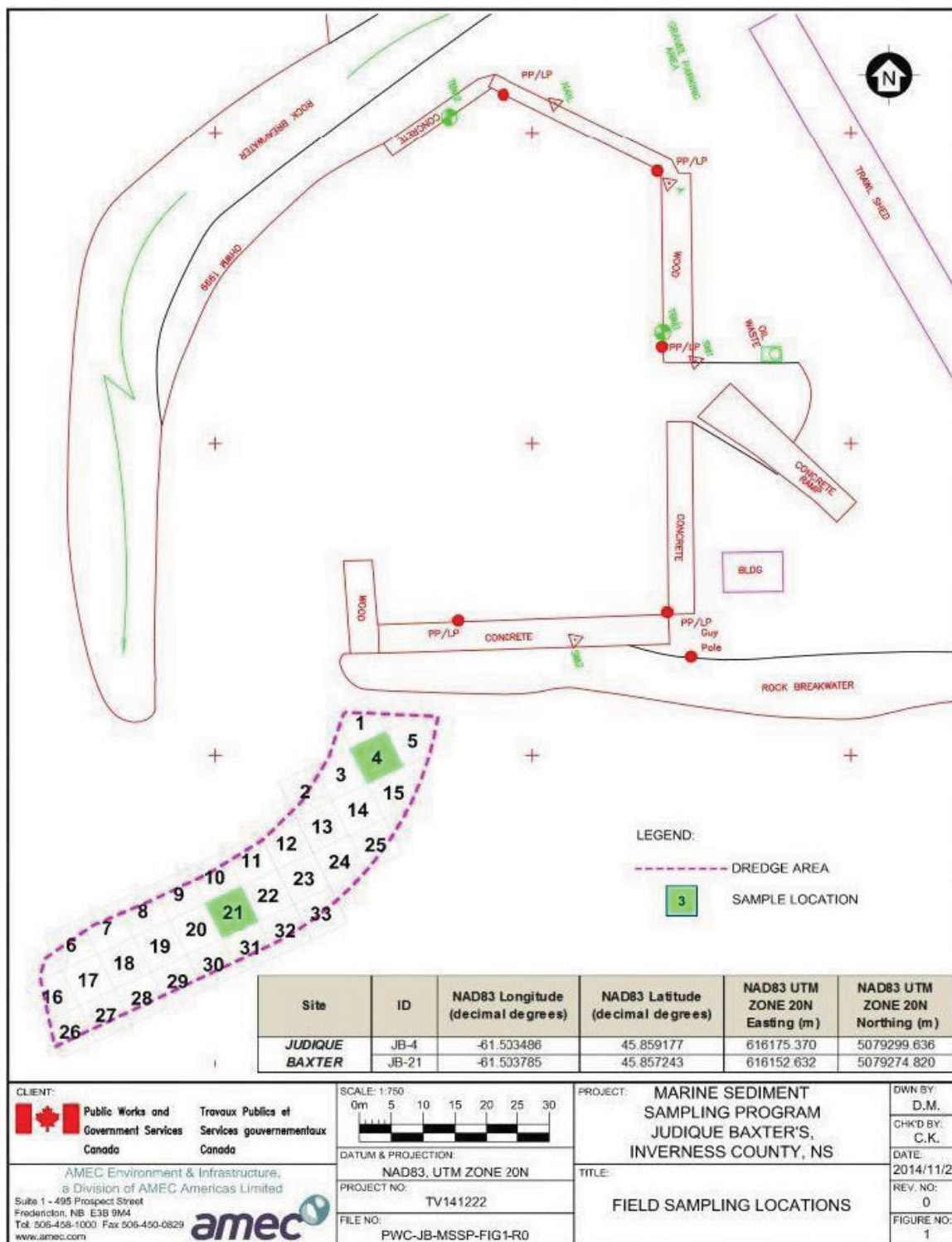


Figure 2.1 Sampling Locations at the Judique (Baxters Cove) DFO-SCH (8 December 2014)

AGAT Laboratories (AGAT) in Dartmouth, Nova Scotia, an accredited laboratory with the Canadian Association for Laboratory Accreditation (CALA) and ISO/IEC 17025 certified for all of the analyses required for this Project, was engaged to conduct the laboratory analyses. At the request of PWGSC, the samples were submitted for the typical ocean and land disposal suite of parameters which includes ICP 23 metals scan plus mercury, hexavalent chromium, tin, hot water soluble boron, and low level selenium; low level polycyclic aromatic hydrocarbons (PAHs); total inorganic and total organic carbon (TIC/TOC); total polychlorinated biphenyls (PCBs); total dichloro-diphenyl-trichloroethane (DDT); low level benzene, toluene, ethylbenzene, and xylene (BTEX); total petroleum hydrocarbons (TPHs), including a qualitative assessment for presence/absence of creosote; and grain size. Silica gel clean up was completed for all samples analyzed for petroleum hydrocarbons and a return to baseline at C32 was verified.

The requirement for Synthetic Precipitation Leaching Procedure (SPLP) Leachate (Environmental Protection Agency (EPA), *Methodology 1312*) was determined in conjunction with PWGSC upon receipt and review of initial sample results (EPA, 1994). This analysis was performed for select samples with parameters exceeding applicable guidelines.

3.0 ANALYTICAL RESULTS

The analytical results of the marine sediment samples collected and analysed from the Judique (Baxters Cove) DFO-SCH are summarized in Tables B.1 to B.10 (Appendix B) and discussed below. The complete set of analytical results, including laboratory Quality Assurance/Quality Control (QA/QC) and Certificates of Analyses for all parameters tested, are provided in Appendix C.

In order to facilitate the determination of all disposal options, the tabulated analytical sample results were compared to the following, where applicable:

- *Canadian Environmental Protection Act* (CEPA) Disposal at Sea Regulations (formerly the *Ocean Dumping Control Act*) – Lower Level Screening Criteria.
- Canadian Council of Ministers of the Environment (CCME) Sediment Quality Guidelines - Interim Sediment Quality Guidelines (ISQGs) and Marine and Estuarine Probable Effects Levels (PELs) (1999c).
- CCME Soil Quality Guidelines (SQGs) for the Protection of Environment and Human Health in agricultural, residential/parkland, and commercial/industrial applications (1999a).
- Atlantic Risk-Based Corrective Action (RBCA) Tier 1 Version 3.0 Risk-Based Screening Levels (RBSLs) and Sediment Ecological Screening Levels (SESLs) for the Protection of Freshwater and Marine Aquatic Life (2012).
- Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (1992).
- Nova Scotia Tier 1 Environmental Quality Standards (EQS) (2013).
- CCME Water Quality Guidelines (WQGs) (1999b).
- Health Canada's Canadian Guidelines for Drinking Water Quality (CGDWQ) (2014).

Results as compared to the afore-noted guidelines, with the exception of the CCME Sediment Quality Guidelines (ISQGs and PELs), are discussed further in this report.

3.1 PAH Concentrations

PAHs were not detected in either of the samples collected at the Judique (Baxters Cove) DFO-SCH. No exceedances of the CEPA Disposal at Sea Screening Criteria - Lower Level, CCME SQGs - Human Health (Potable Water) and (Direct Contact), CCME SQGs - Environmental Health (Soil Contact), (Soil and Food Ingestion), and (Freshwater Life), Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (1992) or Nova Scotia Tier 1 EQS were noted in either of the samples (Tables B.1 and B.2).

3.2 Metal Concentrations

CEPA Disposal at Sea Screening Criteria - Lower Level

No exceedances of the CEPA Disposal at Sea Lower Level Screening Criteria were noted in the two samples collected (Table B.3).

CCME SQGs

Neither of the two samples collected in the area to be dredged exceeded the CCME SQGs for any land use applications (Table B.3).

Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (1992)

One of the two samples collected (JB-21) exceeded the Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills for boron (Table B.4).

Nova Scotia Tier 1 EQS

No exceedances of the Nova Scotia Tier 1 EQS for Sediment Environments (Freshwater and Marine) or soils (Potable and Non-potable sites, all land use applications) were noted in the two samples collected (Table B.4).

SPLP Metals Leachate Results

One samples (JB-21) was submitted for SPLP metals leachate analysis for boron only, based on the noted guideline exceedance and discussions with PWGSC.

CCME WQGs for the Protection of Aquatic Life (Freshwater and Marine)

No exceedance of the CCME WQGs for the Protection of Aquatic Life (Freshwater) for boron was noted in the leachate sample (Table B.5).

Health Canada CGDWQ (Maximum Acceptable Concentration and Aesthetic Objective)

The Health Canada CGDWQ (Maximum Acceptable Concentration) for boron was not exceeded in sample JB-21 (Table B.5).

Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (1992)

No exceedance of the Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (1992) for boron was noted in the leachate sample (Table B.5).

Nova Scotia Tier 1 EQS

No exceedances of the Nova Scotia Tier 1 EQS for Surface Water (Freshwater and Marine) and for Groundwater (potable) for boron were noted in sample JB-21 (Table B.5).

3.3 Petroleum Hydrocarbon Concentrations

Modified TPH values reflect the sum of the individual carbon fractions that resembles gasoline, diesel #2, and lube oil. Neither BTEX nor TPH were detected in either of the samples collected at the Judique (Baxters Cove) DFO-SCH. Both samples reached baseline at C₃₂ (Tables B.6 and B.7).

No exceedances of the Atlantic RBCA Tier 1 Version 3.0 RBSLs and SESLs for the Protection of Freshwater and Marine Aquatic Life, CCME SQGs, Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills, or Nova Scotia Tier 1 EQS were noted in either of the samples collected (Tables B.6 and B.7).

3.4 PCBs Concentrations

PCBs were not detected in either of the samples collected at the Judique (Baxters Cove) DFO-SCH and no exceedances of the CEPA Disposal at Sea Lower Level Screening Criteria, CCME SQGs for all land use applications, Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills, or Nova Scotia Tier 1 EQS were noted in the samples collected (Tables B.8 and B.9).

3.5 DDT Concentrations

Total DDT refers to the sum of dichlorodiphenyldichloroethylene (DDE), dichlorodiphenyldichloroethane (DDD), and DDT. Neither DDE, DDD, or DDT were detected in either of the samples collected at the Judique (Baxters Cove) DFO-SCH and no exceedances of the CEPA Disposal at Sea Lower Level Screening Criteria, CCME SQGs for all land use applications, Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills, or Nova Scotia Tier 1 EQS were noted in either of the samples collected (Tables B.8 and B.9).

3.6 Carbon Content

Samples collected from the Judique (Baxters Cove) DFO-SCH showed total carbon content ranging from 0.15 to 0.30 grams per kilogram (g/kg) (Table B.10). TOC was not detected in either sample, while TIC ranged from not detected in sample JB-4 to 0.22 g/kg in sample JB-21 (Table B.10).

3.7 Grain Size Distribution

Sediment composition is described in Figure 3.1 and Table 3.1 below, and in Table B.10. Figure 3.1 illustrates the overall sediment composition from the samples collected within the SCH, expressed as percentages to show the average grain size distributions. Table 3.1 breaks down the sediment composition at each sampling location.

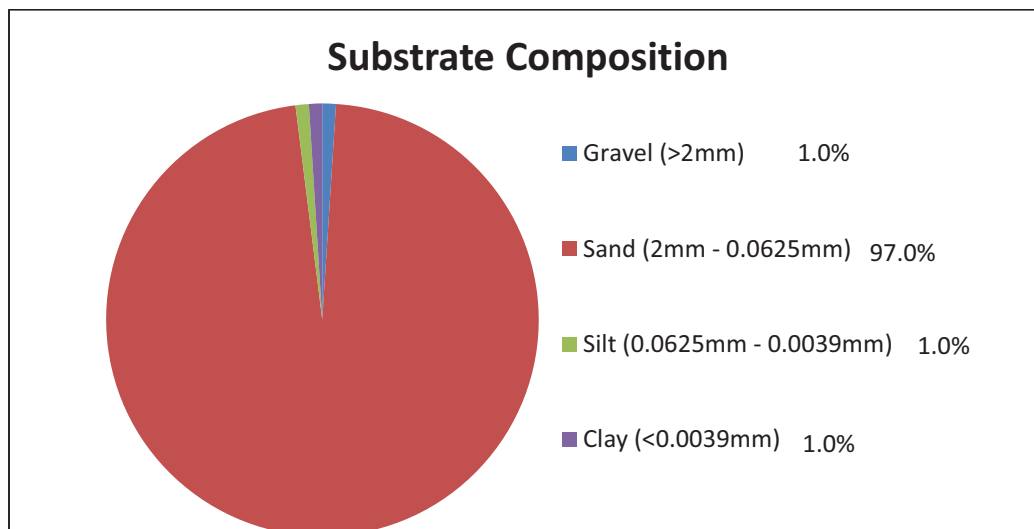


Figure 3.1 Substrate Composition Averaged from Sampling Locations at the Judique (Baxters Cove) DFO-SCH, Nova Scotia

Table 3.1 Dominant Sediment Types at Each Sample Location

Sample ID	Sediment Distribution			
	Primary Substrate	Secondary Substrate	Tertiary Substrate	Quaternary Substrate
JB-4	Sand	Silt / Clay	-	-
JB-21	Sand	Gravel	Silt / Clay	-

Notes:
 "-" indicates none detected.

4.0 BENTHIC PHOTOGRAPH DESCRIPTION

A series of underwater photographs were collected at each of the sampling locations that show the substrate and any flora and fauna at the site. Photographs are presented in Appendix A and characterization of the photographs collected at each of the sampling locations is provided below.

Sample Station JB-4

The substrate appears to be predominantly sand. Shell hache is present, but otherwise the photos are devoid of flora or fauna.

Sample Station JB-21

The substrate appears to be predominantly sand. Shell hache is present, but otherwise the photos are devoid of flora or fauna.

5.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

All samples collected were labelled on site using a waterproof marker with the date, sample site identifier, and sample number. The samples were placed upright on ice inside a cooler for safe storage and transport, and were delivered to the laboratory following program completion. A copy of the Chain of Custody (COC) that accompanied the samples is provided in Appendix C.

Additional samples were collected to safeguard against loss or damage during transport, and will be stored and refrigerated until the PWGSC Project Manager provides approval to dispose/destroy the samples.

Sample collection, preparation, and analyses followed guidance provided in the afore-referenced Environment Canada document. Samples were analyzed by an accredited laboratory with CALA and/or ISO/IEC 17025 and are certified by the Standards Council of Canada (SCC) for each selected chemical analyses of this program. The complete set of analytical results, including laboratory QA/QC and Certificates of Analyses for all parameters tested, are provided in Appendix C.

The laboratory undertakes internal duplicate analyses for QA/QC purposes. Laboratory duplicate analyses were performed on all of the parameters analyzed for this program to meet internal QA/QC objectives for the Judique (Baxters Cove) samples submitted. No discrepancies were noted by the laboratory for the analyses performed.

To assess the quality of the analytical data, a review of the internal laboratory QA/QC results was completed and included a review of laboratory duplicate analyses, method blanks, surrogates, spike samples, and QA/QC standards. This review did not reveal any information or discrepancies that may affect the analytical results of the Judique (Baxters Cove) samples.

A senior Amec Foster Wheeler reviewer has reviewed this report prior to its release. The limitations of this document are provided in Appendix D.

6.0 CONCLUSION

The analytical results of the ten samples collected and analysed from the Judique (Baxters Cove) DFO-SCH indicate exceedance of only the Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills for one marine sediment sample (JB-21) for boron. Leachate results identified no exceedances of any regulatory guidelines.

7.0 CLOSING

This document has been prepared and reviewed by the following people:

Prepared by:



Maureen Cameron-MacMillan, M.Sc.
Technical Support /
Intermediate Project Professional

Reviewed by:



Kerry Higgins, B.Sc., EP
NB/PE Operations Manager /
Senior Project Professional

8.0 REFERENCES

- Atlantic Risk-Based Corrective Action (RBCA). 2012. Atlantic RBCA (Risk-Based Corrective Action), for Petroleum Impacted Sites in Atlantic Canada Tier I Version 3, User Guidance. Issued on, July 2012. Available online at: http://www.atlanticrbca.com/data_eng/ATLANTIC_RBCA_User_Guidance_v3_July_2012doc_final.pdf.
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- Health Canada. 2014. Guidelines for Canadian Drinking Water Quality – Summary Table. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch, Health Canada, Ottawa, Ontario. Available on-line at: http://www.hc-sc.gc.ca/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/sum_guide-res_recom-eng.pdf.
- Nova Scotia Department of Environment. 2013. Notification of Contamination Protocol.
- Nova Scotia Environment and Labour (NSEL). 1992. Guidelines for Disposal of Contaminated Solids in Landfills.



APPENDIX A

Photo Log

General Site Photos



Looking west from wharf toward end of breakwater



Looking northeast toward middle of harbour.

Sample Station JB-4



The substrate appears to be predominantly sand. Shell hache is present, but otherwise the photos are devoid of flora or fauna.

Sample Station JB-21



The substrate appears to be predominantly sand. Shell hache is present, but otherwise the photos are devoid of flora or fauna.



APPENDIX B

Analytical Summary Tables

Table B.1 PAH Results for Marine Sediments as Compared to Federal Criteria - Judique (Baxters Cove) DFO-SCH, Antigonish County, Nova Scotia

Parameter	RDL	Units	Sample Identification and Date		CEPA Disposal at Sea Screening Criteria - Lower Level	CCME Sediment Quality Guidelines			CCME Soil Quality Guidelines													
						Probable Effects Levels		Human Health		Environmental Health												
			Interim Sediment Quality Guidelines			Freshwater		Marine		Potable Water	Direct Contact	Soil Contact		Soil and Food	Freshwater Life							
			Freshwater							Marine				Agricultural/ Residential/ Parkland, Commercial and Industrial Land Uses	Agricultural/ Residential/ Parkland, Commercial and Industrial Land Uses	Agricultural and Residential/ Parkland Industrial Land Uses	Agricultural and Residential/ Parkland Industrial Land Uses					
Polycyclic Aromatic Hydrocarbon (PAH) Results																						
1-Methylnaphthalene	0.05		<0.05	<0.05																		
2-Methylnaphthalene	0.02		<0.02	<0.02																		
Acenaphthene	0.00671		<0.00671	<0.00671																		
Acenaphthylene	0.005		<0.005	<0.005																		
Anthracene	0.04		<0.04	<0.04																		
Benz(a)anthracene	0.01		<0.01	<0.01																		
Benz(a)pyrene	0.01		<0.01	<0.01																		
Benz(b)fluoranthene	0.05		<0.05	<0.05																		
Benz(b+)-fluoranthene	0.1		<0.1	<0.1																		
Benz(g,h,i)perylene	0.01		<0.01	<0.01																		
Benz(j)fluoranthene	Calculation		<0.1	<0.1																		
Benz(k)fluoranthene	0.01		<0.01	<0.01																		
Chrysene	0.01		<0.01	<0.01																		
Dibenz(a,h)anthracene	0.006		<0.006	<0.006																		
Fluoranthene	0.05		<0.05	<0.05																		
Fluorene	0.02		<0.02	<0.02																		
Indeno(1,2,3-cd)pyrene	0.01		<0.01	<0.01																		
Naphthalene	0.01		<0.01	<0.01																		
Perylene	0.05		<0.05	<0.05																		
Phenanthrene	0.04		<0.04	<0.04																		
Pyrene	0.05		<0.05	<0.05																		
Total PAH	0.5		<0.5	<0.5	2.5																	
Index of Additive Cancer Risk (IACR)	Calculation	None	0.51	0.51																		
Benzo(a)pyrene TPE (10 ⁻⁶)	Calculation	mg/kg	0.0146	0.0146																		
Creosote or Coal Tar source suspected/known?	yes/no		No	No																		
Uncertainty Factor Applied	yes/no		No	No																		
Benzo(a)pyrene TPE (10 ⁻⁶) with UF	Calculation	mg/kg	Not Applicable	Not Applicable																		

NOTE(S):

All results below the laboratory detection limit were divided by 2 prior to further calculations.

Total PAH calculation based on the sum of 16 individual PAH compounds (acenaphthene, acenaphthylene, anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluorene, fluoranthene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene) as per guidance from Environment Canada, 2009.

Additive Cancer Risk (IACR) = (Benz(a)anthracene)/0.33mg/kg + (Benz(a)pyrene)/0.37mg/kg + ((Benz(b+)-fluoranthene)/0.16mg/kg) + ((Benz(g,h,i)perylene)/6.8mg/kg) + ((Benz(k)fluoranthene)/0.034mg/kg) + ((Chrysene)/2.1mg/kg) + ((Dibenz(a,h)anthracene)/0.23mg/kg) + ((Indeno(1,2,3-c-d)pyrene)/2.7mg/kg).

Total Potency Equivalent (TPE) based on an incremental lifetime cancer risk (ILCR) of 1 in 100,000 (10⁻⁵).

Benzo(a)pyrene TPE (10⁻⁵) = Sum of PAH concentration multiplied by their respective Benzo(a)pyrene Potency Equivalency Factors: ((Benz(a)anthracene)*0.1) + ((Benz(a)pyrene)*1) + ((Benz(b+)-fluoranthene)*0.1) + ((Benz(k)fluoranthene)*0.1) + ((Benz(g,h,i)perylene)*0.01) + ((Dibenz(a,h)anthracene)*1) + ((Indeno(1,2,3-c-d)pyrene)*0.1).

Benzo(a)pyrene TPE Uncertainty Factor = 3.

Light values indicate results below detection limit.

Table B.2 PAH Results for Marine Sediments as Compared to Provincial Criteria - Judique (Baxters Cove) DFO-SCH, Antigonish County, Nova Scotia

Parameter	RDL	Units	Sample Identification and Date		Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (1992)	Sediment Environment		Nova Scotia Tier 1 Environmental Quality Standards								
								Potable Site			Non-Potable Site					
								Fine-Grained Soil			Coarse-Grained Soil					
			Agricultural Land Use	Residential/ Parkland Land Use		Commercial and Industrial Land Uses	Agricultural Land Use	Residential/ Parkland Land Uses	Commercial and Industrial Land Uses	Agricultural Land Use	Residential/ Parkland Land Uses	Commercial and Industrial Land Uses				
JB-4	JB-21	8 December, 2014		Freshwater		Marine										
Polycyclic Aromatic Hydrocarbon (PAH) Results																
1-Methylnaphthalene	0.05		<0.05	<0.05	10	0.201	0.201	42	42	30	30	30	72	72	560	560
2-Methylnaphthalene	0.02		<0.02	<0.02	10	0.201	0.201	42	42	30	30	30	72	72	560	560
Acenaphthene	0.06671		<0.06671	<0.06671	10	0.0869	0.0869	21.5	5300	8000	8000	8000	21.5	5300	8000	8000
Acenaphthylene	0.006		<0.006	<0.006	10	0.128	0.128	32	32	4.5	4.5	23	33	33	98	68
Anthracene	0.04		<0.04	<0.04	10	0.245	0.245	2.5	24000	37000	37000	37000	2.5	24000	37000	37000
Benzo(a)anthracene	0.01		<0.01	<0.01	10	0.385	0.683	0.63		0.5	0.6	0.5	0.63	0.5	0.6	
Benzo(b)pyrene	0.01		<0.01	<0.01	10	0.782	0.783	0.6		0.6	0.6	0.6	0.6	0.6	0.6	
Benzo(k)fluoranthene	0.05		<0.05	<0.05	10	13.4	4.5	6.2		6.2	6.2	6.2	6.2	6.2	6.2	
Benzo(b)fluoranthene	<0.1		<0.1	<0.1	10	3.2	3.2	8.3		6.6	6.6	6.6	8.3	6.6	6.6	
Benzo(g,h,i)perylene	0.01		<0.01	<0.01	10	13.4	4.5	6.2		6.2	6.2	6.2	6.2	6.2	6.2	
Benzo(j)fluoranthene	Calculation		<0.1	<0.1	10	13.4	4.5	6.2		6.2	6.2	6.2	6.2	6.2	6.2	
Benzo(k)fluoranthene	0.01		<0.01	<0.01	10	13.4	4.5	6.2		6.2	6.2	6.2	6.2	6.2	6.2	
Chrysene	0.01		<0.01	<0.01	10	0.862		6.2		6.2			6.2			
Dibenz(a,h)anthracene	0.006		<0.006	<0.006	10	0.135	0.135									
Fluoranthene	0.05		<0.05	<0.05	10	2.355	1.484	15.4	3500	5300	5300	5300	15.4	3500	5300	5300
Fluorene	0.02		<0.02	<0.02	10	0.144	0.144	15.4	2700	4100	4100	4100	15.4	2700	4100	4100
Indeno(1,2,3-cd)pyrene	0.01		<0.01	<0.01	10	3.2	0.88	0.48		0.38	0.38	0.38	0.48	0.38	0.38	
Indeno(1,2,3-cd)pyrene	0.01		<0.01	<0.01	10	0.391	0.391	0.75	28	0.6	25	25	0.75	0.6	2.2	25
Perylene	0.05		<0.05	<0.05	10											
Phenanthrene	0.04		<0.04	<0.04	10	0.515	0.544	7.8	17	24	17	17	7.8		6.2	
Pyrene	0.05		<0.05	<0.05	10	0.875	1.388	7.7	2100	3200	7.7	2100	7.7	2100	3200	3200
Total PAH	0.5		<0.5	<0.5	50											
Benzo(e)pyrene TPE (10 ⁴)	Calculation		0.0146	0.0146				5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
Cresols or Coal Tar source suspected/known?	yes/no		No	No												
Uncertainty Factor Applied	yes/no		No	No												
Benzo(a)pyrene TPE (10 ⁵) with	Calculation		Not Applicable	Not Applicable				5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3

Table B.3 Metal Results for Marine Sediments as Compared to Federal Criteria - Judique (Baxters Cove) DFO-SCH, Antigonish County, Nova Scotia

Parameter	RDL	Units	Sample Identification and Date		CEPA Disposal at Sea Screening Criteria - Lower Level	CCME Sediment Quality Guidelines				CCME Soil Quality Guidelines						
			JB-4	JB-21		Interim Sediment Quality Guidelines		Probable Effects Levels		Agricultural Land Use	Residential/ Parkland Land Use	Commercial Land Use	Industrial Land Use			
						Freshwater	Marine	Freshwater	Marine							
Aluminum	10	1990	2710													
Antimony	1	<1	<1									20	20			40
Arsenic	1	1	2									12	12			12
Barium	5	8	277				5.9	7.24								2000
Beryllium	2	<2	<2													8
Boron (Total)	2	2	3													
Boron (Hot Water Soluble)	0.10	1.26	1.37													
Cadmium	0.3	<0.3	<0.3		0.6		0.6	0.7								
Chromium (Hexavalent)	0.4	<0.4	<0.4													
Chromium (Total)	2	2	4				37.3	52.3								
Cobalt	1	1	2													
Copper	2	<2	3	81*			35.7	18.7								
Iron	50	3200	4860													
Lead	0.5	2.5	3.6	66*			35.0	30.2								
Manganese	2	76	140													
Mercury (Total)	0.05	<0.05	<0.05	0.75			0.17	0.13								
Molybdenum	2	<2	<2													
Nickel	2	2	3													
Selenium	1	<1	<1													
Silver	0.5	<0.5	<0.5													
Strontium	5	8	14													
Thallium	0.1	<0.1	<0.1													
Tin	2	4	4													
Uranium	0.1	0.2	0.3													
Vanadium	2	5	9													
Zinc	5	13	19	160*			123	124								

NOTE(S):

Li, Environment Canada, pers. comm., June 2002).

Light values indicate results below detection limit.

Table B.4 Metal Results for Marine Sediments as Compared to Provincial Criteria - Judique (Baxters Cove) DFO-SCH, Antigonish County, Nova Scotia

Parameter	RDL	Units	Sample Identification and Date		Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (1992)	Nova Scotia Tier 1 Environmental Quality Standards							
						Sediment Environment		Potable and Non-Potable Sites with Coarse- and Fine-Grained Soils					
								Freshwater	Marine	Agricultural Land Use	Residential/ Parkland Land Use	Commercial Land Use	Industrial Land Use
			JB-4	JB-21									
			8 December, 2014										
Aluminum	10	mg/kg	1990		2710				15400	15400	15400	15400	198000
Antimony	1		<1	<1	40	25		7.5	7.5	63	63		
Arsenic	1				50	17	41.6	17	31	31	31		
Barium	5				2000				400	10000	15000	140000	
Beryllium	2				<2	8			5	38	320	320	
Boron (Total)	2				3	2			4300	4300	24000	24000	
Boron (Hot Water Soluble)	0.10				1.37				2				
Cadmium	0.3				<0.3	20	3.5	4.2	1.4	14	49	192	
Chromium (Hexavalent)	0.4				<0.4	8			0.4	160	1300	1300	
Chromium (Total)	2				4	800	90	160	52	220	630	2300	
Cobalt	1				2	300			20	22	250	250	
Copper	2				<2	500	197	108	63	1100	4000	16000	
Iron	50				4860		43766		11000	11000	11000	144000	
Lead	0.5				3.6	1000	91.3	112	70	140	260	740	
Manganese	2				140		1100						
Mercury (Total)	0.05				<0.05	10	0.486	0.7	6.6	6.6	24	99	
Molybdenum	2				<2	40			40	110	1200	1200	
Nickel	2				3	500	75		50	330	2200	2200	
Selenium	1				<1	10	2		1	80	125	1135	
Silver	0.5				<0.5	40	1	2.2	20	77	490	490	
Strontium	5				14				9400	9400	9400	122000	
Thallium	0.1				<0.1	1			1	1	1	1	
Tin	2				4	300			5	9400	9400	122000	
Uranium	0.1				0.2	200	0.3		23	23	33	300	
Vanadium	2				9	200			39	39	160	160	
Zinc	5				13	1500	315	271	200	5600	47000	47000	

NOTE(S):

Light values indicate results below detection limit.

Yellow highlight indicates exceedance of Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (1992).

Table B.5 Metal Results for Leachate Samples as Compared to Federal and Provincial Criteria - Judique (Baxters Cove) DFO-SCH, Antigonish County, Nova Scotia

Table 2-10 - Maximum Recommended Concentration (MRC) for Leachable Metals in Groundwater, Surface Water, and Sediment													
Parameter	RDL	Units	Sample Identification and Date	CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life		Health Canada Guidelines for Canadian Drinking Water Quality		Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (1992)	Nova Scotia Tier 1 Environmental Quality Standards				
			JB-21								Surface Water		Groundwater
			8 December, 2014	Freshwater	Marine	Maximum Acceptable Concentration	Aesthetic Objective	Freshwater	Marine	Potable with Fine- and Coarse-Grained Soils	Non-Potable with Fine- and Coarse-Grained Soils		
Agricultural/Residential and Commercial/Industrial Land Uses													
Leachable Metals													
Boron	50	ug/L	90	1500 - 29000		5000		500000	1200	1200	5000		

NOTE(S):

NA = Not Applicable as analysis not requested.

Boron: CCME CWQG for the Protection of Freshwater Aquatic Life = 29000 ug/L (short-term); 1500 ug/L (long-term).

Table B.6 BTEX/TPH Results for Marine Sediments as Compared to Federal Criteria - Judique (Baxters Cove) DFO-SCH, Antigonish County, Nova Scotia

Sample ID	Date	Units	BTEX Concentrations				Petroleum Hydrocarbon Fraction Concentrations					Reached Baseline at C32	Resemblance	FOC
			Benzene	Toluene	Ethylbenzene	Xylene	C ₆ -C ₁₀	C ₁₀ -C ₁₆	C ₁₆ -C ₂₁	C ₂₁ -C ₃₂	Modified TPH (Less BTEX)			
JB-4	8 December, 2014	mg/kg	<0.005	<0.04	<0.01	<0.05	<3	<15	<15	<15	<20	Yes	No Resemblance	0.002
JB-21			<0.005	<0.04	<0.01	<0.05	<3	<15	<15	<15	<20	Yes	No Resemblance	0.002
RDL			0.005	0.04	0.01	0.05	3	15	15	15	20			
Guidelines														
Atlantic RBCA Tier I Version 3.0														
Risk-Based Screening Levels for Soil														
Agricultural/ Residential Land Use	Potable		0.042	0.35	0.065	8.8	74	270	1100					
	Fine-Grained Soil		0.094	0.74	0.13	22	1900	4700	10000					
Non-Potable	Coarse-Grained Soil		0.099	77	30	8.8	74	270	1100					
	Fine-Grained Soil		2.3	10000	9300	210	2100	8600	10000					
Commercial/ Industrial Land Use	Coarse-Grained Soil		0.042	0.35	0.065	11	870	1800	10000					
	Fine-Grained Soil		0.094	0.74	0.13	22	1900	4700	10000					
Non-Potable	Coarse-Grained Soil		2.5	10000	10000	110	870	4000	10000					
	Fine-Grained Soil		33	10000	10000	10000	10000	10000	10000					
Residential Saturation	Coarse-Grained Soil		890	450	240	340	TBD	TBD	TBD					
	Fine-Grained Soil		1000	480	250	360	TBD	TBD	TBD					
Sediment Ecological Screening Levels for the Protection of Freshwater and Marine Aquatic Life														
Sediment Type (based on standard FOC = 0.01)	Typical		1.2	1.4	1.2	1.3	15	25	43					
	Other		5.4	6.1	5	5.5	67	110	190					
CCME Soil Quality Guidelines														
Agricultural, Residential/ Parkland, Commercial, and Industrial Land Uses	Surface		0.03	0.37	0.082	11.0								
	Fine-Grained Soil		0.0068	0.08	0.018	2.4								
Subsoil	Coarse-Grained Soil		0.03	0.37	0.082	11.0								
	Fine-Grained Soil		0.0068	0.08	0.018	2.4								

NOTE(S):
 Fraction of Organic Content (FOC) = g-carbon/g-soil
 CCME Soil Quality Guidelines for benzene based on an incremental lifetime cancer risk (ILCR) of 1 in 100,000 (10⁻⁵).
 Light values indicate results below detection limit.

Table B.7 BTEX/TPH Results for Marine Sediments as Compared to Provincial Criteria - Judique (Baxters Cove) DFO-SCH, Antigonish County, Nova Scotia

Sample ID		Date	Units	BTEX Concentrations				Petroleum Hydrocarbon Fraction Concentrations					Reached Baseline at C32	Resemblance
				Benzene	Toluene	Ethylbenzene	Xylene	C ₆ -C ₁₀	C ₁₀ -C ₁₆	C ₁₆ -C ₂₁	C ₂₁ -C ₃₂	Modified TPH (Less BTEX)		
JB-4	8 December, 2014	mg/kg	<0.005	<0.04	<0.01	<0.05	<3	<15	<15	<15	<20	Yes	No Resemblance	
JB-21			<0.005	<0.04	<0.01	<0.05	<3	<15	<15	<15	<20	Yes	No Resemblance	
RDL			0.005	0.04	0.01	0.05	3	15	15	20				
Guidelines			Benzene	Toluene	Ethylbenzene	Xylene	Gasoline	Diesel / No. 2 Fuel Oil		No. 6 Oil/ Lube Oil	Modified TPH (Less BTEX)			
Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (1992)														
			5	30	50	50								
Nova Scotia Tier 1 Environmental Quality Standards														
Sediment														
Sediment Environment		Freshwater		1.2	1.4	1.2	1.3	15	25		43			
		Marine		1.2	1.4	1.2	1.3	15	25		43			
Soils														
Agricultural Land Use	Potable	Coarse-Grained Soil		0.042	0.35	0.065	8.8	74	150		300			
	Non-Potable	Fine-Grained Soil		0.094	0.74	0.13	22	210	150		1300			
		Coarse-Grained Soil		0.99	75	30	8.8	74	150		300			
Residential/ Parkland Land Use	Potable	Fine-Grained Soil		2.3	10000	120	65	210	150		1300			
		Coarse-Grained Soil		0.042	0.35	0.065	8.8	74	270		1100			
	Non-Potable	Fine-Grained Soil		0.094	0.74	0.13	22	1900	4700		10000			
		Coarse-Grained Soil		0.99	77	30	8.8	74	270		1100			
Commercial and Industrial Land Uses	Potable	Fine-Grained Soil		2.3	10000	9300	210	2100	8600		10000			
		Coarse-Grained Soil		0.042	0.35	0.065	11	870	1800		10000			
	Non-Potable	Fine-Grained Soil		0.094	0.74	0.13	22	1900	4700		10000			
		Coarse-Grained Soil		2.5	10000	10000	110	870	4000		10000			
		Fine-Grained Soil		33	10000	10000	10000	10000	10000		10000			

NOTE(S):

Light values indicate results below detection limit.

Table B.8 PCB and DDT Results for Marine Sediments as Compared to Federal Criteria - Judique (Baxters Cove) DFO-SCH, Antigonish County, Nova Scotia

Table E-3 - PCB and DDT Results for Marine Sediments as Compared to Federal Criteria - Guidelines													
Parameter	RDL	Units	Sample Identification and Date			CEPA Disposal at Sea Screening Criteria - Lower Level	CCME Sediment Quality Guidelines				CCME Soil Quality Guidelines		
			JB-4	JB-21	8 December, 2014		Interim Sediment Quality Guidelines		Marine and Estuarine Probable Effects Levels		Agricultural Land Use	Residential/ Parkland Land Use	Commercial/ Industrial Land Use
							Freshwater	Marine	Freshwater	Marine			
Polychlorinated Biphenyl (PCB) Results													
Aroclor 1016	0.1		<0.1	<0.1									
Aroclor 1221	0.1		<0.1	<0.1									
Aroclor 1232	0.1		<0.1	<0.1									
Aroclor 1242	0.1		<0.1	<0.1									
Aroclor 1248	0.1		<0.1	<0.1									
Aroclor 1254	0.0633	mg/kg	<0.0633	<0.0633		0.060	0.0633	0.340	0.709				
Aroclor 1260	0.1		<0.1	<0.1									
Aroclor 1262	0.1		<0.1	<0.1									
Aroclor 1268	0.1		<0.1	<0.1									
Dieldrin	0.0007		<0.0007	<0.0007		0.00285	0.00071	0.00667	0.0043				
Total PCB Concentration	0.0215		<0.0215	<0.0215	0.1	0.0341	0.0215	0.277	0.189	0.5	1.3	33	
Dichloro-Diphenyl-Trichloroethane (DDT) Results													
o,p-DDE	0.001		<0.001	<0.001									
p,p-DDE	0.001		<0.001	<0.001									
o,p-DDD	0.001		<0.001	<0.001									
p,p-DDD	0.001		<0.001	<0.001									
o,p-DDT	0.001		<0.001	<0.001									
p,p-DDT	0.001		<0.001	<0.001									
o,p-DDT + p,p-DDT	0.001		<0.001	<0.001		0.00119	0.00119	0.00477	0.00477				
o,p-DDD +p,p-DDD	0.001		<0.001	<0.001		0.00354	0.00122	0.00851	0.00781				
o,p-DDE + p,p-DDE	0.001		<0.001	<0.001		0.00142	0.00207	0.00675	0.37400				
Total DDT (calculated)	0.001		<0.001	<0.001						0.7	0.7	12	

NOTE(S):

Light values indicate results below detection limit.

Table B.9 PCB and DDT Results for Marine Sediments as Compared to Provincial Criteria - Judique (Baxters Cove) DFO-SCH, Antigonish County, Nova Scotia

Parameter	RDL	Units	Sample Identification and Date		Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (1992)	Sediment Environment		Nova Scotia Tier 1 Environmental Quality Standards														
								Potable Site				Non-Potable Site										
			JB-4	JB-21		Freshwater	Marine	Fine-Grained Soils				Coarse-Grained Soils				Agricultural Land Use	Industrial Land Use	Commercial Grained Soils	Fine-Grained Soils		Coarse-Grained Soils	
			8 December, 2014					Agricultural Land Use	Residential/Parkland Land Use	Commercial Land Use	Industrial Land Use	Agricultural Land Use	Residential/Parkland Land Use	Commercial Land Use	Industrial Land Use				Agricultural Land Use	Residential/Parkland Land Use	Commercial Land Use	Industrial Land Use
						Polychlorinated Biphenyl (PCB) Results																
Aroclor 1016	0.1		<0.1	<0.1																		
Aroclor 1221	0.1		<0.1	<0.1																		
Aroclor 1232	0.1		<0.1	<0.1																		
Aroclor 1242	0.1		<0.1	<0.1																		
Aroclor 1248	0.1		<0.1	<0.1																		
Aroclor 1254	0.0633	mg/kg	<0.0633	<0.0633																		
Aroclor 1260	0.1		<0.1	<0.1																		
Aroclor 1262	0.1		<0.1	<0.1																		
Aroclor 1268	0.1		<0.1	<0.1																		
Dieldrin	0.007		<0.007	<0.007																		
Total PCB Concentration	0.0215		<0.0215	<0.0215	50	0.0687	0.0043	0.065	1.3	22	0.59	0.59	0.59	0.44	1.1	0.055	0.44	3.4	5.1			
Dichloro-Diphenyl-Trichloroethane (DDT) Results																						
o,p'-DDE	0.001		<0.001	<0.001																		
p,p'-DDE	0.001		<0.001	<0.001																		
o,p'-DDD	0.001		<0.001	<0.001																		
p,p'-DDD	0.001		<0.001	<0.001																		
o,p'-DDT	0.001		<0.001	<0.001																		
p,p'-DDT	0.001		<0.001	<0.001																		
o,p'-DDT + p,p'-DDT	0.001		<0.001	<0.001																		
o,p'-DDD + p,p'-DDD	0.001		<0.001	<0.001																		
o,p'-DDE + p,p'-DDE	0.001		<0.001	<0.001																		
Total DDT (calculated)	0.001		<0.001	<0.001		0.00477	0.00477	0.7	220	340	1600	0.7	220	340	1600	0.7	220	340	1600			

NOTE(S):

Light values indicate results below detection limit.

Table B.10 Grain Size and Carbon Content Results for Marine Sediments - Judique (Baxters Cove) DFO-SCH, Antigonish County, Nova Scotia

Parameter	RDL	Units	Sample Identification and Date	
			JB-4	JB-21
			8 December, 2014	
Grain Size Results				
< PHI -4 (12.5 mm)	0.1	%	100	100
< PHI -3 (9.5 mm)	0.1		100	100
< PHI -2 (4.75 mm)	0.1		100	100
< PHI -1 (2 mm)	0.1		100	97.6
< PHI 0 (1 mm)	0.1		98.7	97.1
< PHI +1 (1/2 mm)	0.1		95.5	95.7
< PHI +2 (1/4 mm)	0.1		15.4	56.8
< PHI +3 (1/8 mm)	0.1		2.1	6.4
< PHI +4 (1/16 mm)	0.1		1.7	2
< PHI +5 (1/32 mm)	0.1		1.6	2
< PHI +6 (1/64 mm)	0.1		1.6	2
< PHI +7 (1/128 mm)	0.1		1.5	1.6
< PHI +8 (1/256 mm)	0.1		1.3	1.3
< PHI +9 (1/512 mm)	0.1		1.3	1.3
Gravel	1		<1	2
Sand	1	98	96	
Silt	1	1	1	
Clay	1	1	1	
Other				
Total Organic Carbon (TOC)	0.15	g/kg	<0.15	<0.15
Total Inorganic Carbon (TIC)	0.15	g/kg	<0.15	0.22
Total Carbon (TC)	Calculation	g/kg	0.15	0.30

NOTE(S):

All results below the laboratory detection limit were divided by 2 prior to further calculations.

Light values indicate results below detection limit.

Public Works and Government Services Canada
Marine Sediment Sampling Program
Judique (Baxters Cove) DFO-SCH, Nova Scotia
March 2015

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