

Appendix C:

AMEC Leachate Report - July 2016



15 August 2016
TF16076670

Ms. Lisa McFarlane
Environmental Specialist
Public Works and Government Services Canada
10 Barbers Hill,
P.O. Box 4600
St. John's, NL, A1C 5T2

Dear Ms. McFarlane,

RE: Lead Leachate Testing in Soil, Cape Spear Lightstation (DFRP No. 00358), Cape Spear, Newfoundland and Labrador - Final

1.0 INTRODUCTION

Amec Foster Wheeler Environment & Infrastructure (Amec Foster Wheeler) was retained by Public Works and Government Services Canada (PWGSC), on behalf of Fisheries and Oceans Canada (DFO), in July 2016 to conduct a soil sampling program for lead leachate analysis to determine disposal options for soil to be excavated and disposed during an upcoming remediation program a lightstation property in Cape Spear, located approximately 10 km east of St. John's, Newfoundland and Labrador (NL).

As part of an upcoming site remediation program, DFO is planning to excavate and transport lead impacted soils (refer to attached Figures 1 and 2) off-site for treatment/disposal. It was not known if the lead impacts in the soil were leachable and therefore a sampling program was required to determine if the lead impacts are leachable to aid in determination of disposal options.

1.1 Site Location and Background

The site is located at Cape Spear, roughly 10 km east of St. John's, NL. It is located adjacent to the Parks Canada Cape Spear National Historic Site. A large numbers of tourists visit the National Historic Site facilities and the lightstation, primarily during the summer months.

It is been reported that there are plans to transfer a portion of the site (i.e., approximately 689 m² near the light tower that includes the dwelling) to the Canadian Coast Guard (CCG) Alumni.

The site has undergone a number of Environmental Site Assessments (ESAs) and Risk Assessments since 1995, including the following:

- Environmental Audit/Baseline Assessment (PWGSC, 1995) as well as an untitled and undated report on soil impacts and contamination (estimated to be from the late 1990s).
- Environmental Site Assessment and Human Health and Ecological Risk Assessment, Cape Spear Lightstation, Cape Spear, NL (Jacques Whitford, 2007).
- Phase III ESA and update/validation study of the 2007 HHRA and ERA, Cape Spear Lightstation, Cape Spear, NL (Dillon Consulting, 2013a).
- Letter RE: Liabilities and Recommendations, Cape Spear Lightstation, Cape Spear, NL (Dillon Consulting, 2013b).
- Risk Management/Remediation Options Analysis for Lead Impacted Surface Soil at the Cape Spear Lightstation, Cape Spear, NL (Dillon Consulting, 2016).

It was concluded that there was a potential for unacceptable risks to site visitors (tourists) and site workers (i.e., DFO and/or CCG employees) from lead impacts identified in the soil near the dwelling, equipment building and shed. It was estimated that the areas of lead impacted soil in the dwelling area and the equipment building area were 16 m² and 82 m², respectively, for a total volume of 16 m³, assuming impacts from surface to 0.15 m below ground surface.

Dillon Consulting (Dillon) completed a remedial/risk management option analysis and concluded that removal of the lead impacted soil is the preferred remedial/risk management option. Once removed, it was recommended that clean backfill and sod should be used to replace excavated soil and reinstate the property to its original grade and condition.

2.0 SCOPE OF WORK

The scope of work for the disposal options analysis included the following:

- Collecting seven surface soil samples from the identified impacted areas for the analysis of lead leachate using the Toxicity Characteristic Leachate Procedure (TCLP) method.
- Assessing disposal options for the soil (landfill disposal, soil treatment facility) and completing a letter report outlining the findings and recommendations of the soil sampling and laboratory analytical programs (contained herein).

3.0 SELECTION OF APPLICABLE GUIDELINES

Lead leachate concentrations were compared to the guidelines outlined in the following document:

- Government of Newfoundland and Labrador, Department of Environment and Conservation (ENVC), Guidance Document for Leachable Toxic Waste, Testing and Disposal (GD-PPD-26.1), Schedule II Guidelines.

4.0 METHODOLOGY

4.1 Soil Sampling

The surface soil sampling program consisted of collecting soil samples in the previously identified lead impacted areas at a depth of 0 - 0.15 meters below ground surface (mbgs). Soil samples were collected using a pre-cleaned hand spade, placed in pre-cleaned laboratory-supplied sample containers and stored inside a cooler with ice for shipment to the laboratory.

Seven surface soil samples (SS-1 to SS-7), plus one blind field duplicate sample (DUP-1, a blind field duplicate of SS-2), were collected throughout the site as shown on Figures 1 and 2, attached. The soil samples and accompanying chain of custody documentation were placed in a cooler and shipped to the Maxxam Analytics Inc. (Maxxam) laboratory in Bedford, Nova Scotia (NS) for lead leachate analyses, using the TCLP method. Maxxam meets the requirements of ISO/IEC Guide 25 (General Requirements for the Competence of Calibration and Testing Laboratories) and are accredited members of the Canadian Association for Laboratory Accreditation Inc. (CALA).

5.0 ANALYTICAL RESULTS

The analytical results for lead leachate in soil are presented in attached Table 1. Maxxam certificate of analysis (COAs) are also attached for reference.

The analytical results are summarized as follows:

- Lead leachate was detected in all soil samples analysed at concentrations ranging from 240 µg/L in SS-2 to 33,000 µg/L in SS-5.
- Lead leachate concentrations in soil samples SS-1, collected along the eastern side of the equipment building (22,000 µg/L) and SS-5, collected on the western side of the storage shed (33,000 µg/L) exceeded the hazardous waste guideline of 5,000 µg/L, and therefore, this material is considered hazardous waste when excavated and transported off-site.
- A blind field duplicate of SS-2 was collected (Dup-1) for quality assurance/quality control (QA/QC) purposes. The relative percent difference (RPD) between sample SS-2 and Dup-1 was calculated to be 15%, which is below the acceptable RPD of 100%, which indicates that the quality of the data is acceptable.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the analytical program, the following may be disposed of at an approved landfill facility (non-leachable), pending regulatory approval from the NL ENVC and Service NL and approval from the applicable municipal landfill operator:

- The lead impacted soil along the south/southwest side of the dwelling, with an estimated area of 15 m², and a volume of approximately 3 m³ (based on an impacted soil thickness of 0.15 m).
- The lead impacted soil between the equipment building and storage shed, with an estimated area of 51 m², and a volume of approximately 8 m³ (based on an impacted soil thickness of 0.15 m).

The following soil requires disposed of at an approved soil treatment facility (determined to be leachable):

- The lead impacted soil along the east side of the equipment building, with an estimated area of 18 m², and a volume of approximately 3 m³ (based on an impacted soil thickness of 0.15 m).
- The lead impacted soil to the west of the storage shed, with an estimated area of 10 m², and a volume of approximately 2 m³ (based on an impacted soil thickness of 0.15 m).
- The material must be handled and transported under the transportation of dangerous goods (TDG) act.

In summary, a total of 5 m³ of metals impacted soil is considered leachable and must be disposed at an approved soil treatment facility.

The non-leachable (landfill disposal) and leachable (soil treatment facility) areas are indicated on Figures 1 and 2, attached.

It is noted that Amec Foster Wheeler cannot expressly guarantee that surface and subsurface conditions between and beyond the sample locations do not vary from the results determined at the sample locations and compounds or materials other than those described could be present at the site.

7.0 REFERENCES

Atlantic PIRI, July 2012 (revised January 2015). Atlantic RBCA for Petroleum Impacted Sites in Atlantic Canada, Version 3, User Guidance, Atlantic Partnership in RBCA (Risk-Based Corrective Action) Implementation.

CCME, 2006. A Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines, Canadian Council of Ministers of the Environment.

CCME, 1999 and updates. Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health, Canadian Council of Ministers of the Environment.

ENVC, November 2003. Leachable Toxic Waste, Testing and Disposal, GD-PPD-26.1, Government of Newfoundland and Labrador, Department of Environment and Conservation, Pollution Prevention Division.

8.0 CLOSURE

The findings of this assessment are based on the interpretation of data from a limited number of areas investigated and analytical results pertaining to specific samples. It is possible that materials exist which could not be reasonably identified within the scope of the sampling program or which were not apparent or accessible. This report is also subject to the further limitations attached.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of the third party. Should additional parties require reliance on this report, written authorization from Amec Foster Wheeler is required. With respect to third parties, Amec Foster Wheeler has no liability or responsibility for losses of any kind whatsoever, including direct or consequential financial effects on transactions or property values, or requirements for follow-up actions and costs. This report has been written using commercially reasonable best efforts consistent with the level and skill ordinarily exercised by members of the profession currently practicing under similar conditions.

Except when otherwise specified, Amec Foster Wheeler disclaims any obligation to update this report for events taking place, or with respect to information that becomes available to Amec Foster Wheeler after the time during which Amec Foster Wheeler completed the report.

In evaluating the property, Amec Foster Wheeler has relied in good faith on information provided by other individuals noted in this report. Amec Foster Wheeler has assumed that the information provided is factual and accurate. In addition, some of the findings in this report are based upon information provided by the current owner/occupant. Amec Foster Wheeler accepts no responsibility for any deficiency, misstatement or inaccuracy contained in this report as a result of omissions, misinterpretations or fraudulent acts of persons interviewed or contacted.

Amec Foster Wheeler makes no other representations whatsoever, including those concerning the legal significance of its findings, or as to other legal matters touched on in this report, including, but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and change. Such interpretations and regulatory changes should be reviewed with legal counsel.

We trust that the information presented in this report meets your current requirements. Should you have any questions, or concerns, please do not hesitate to contact the undersigned.

Yours sincerely,

**Amec Foster Wheeler Environment & Infrastructure,
a Division of Amec Foster Wheeler Americas Limited**

Prepared by:



Susan Barfoot, P.Eng.
Project Manager

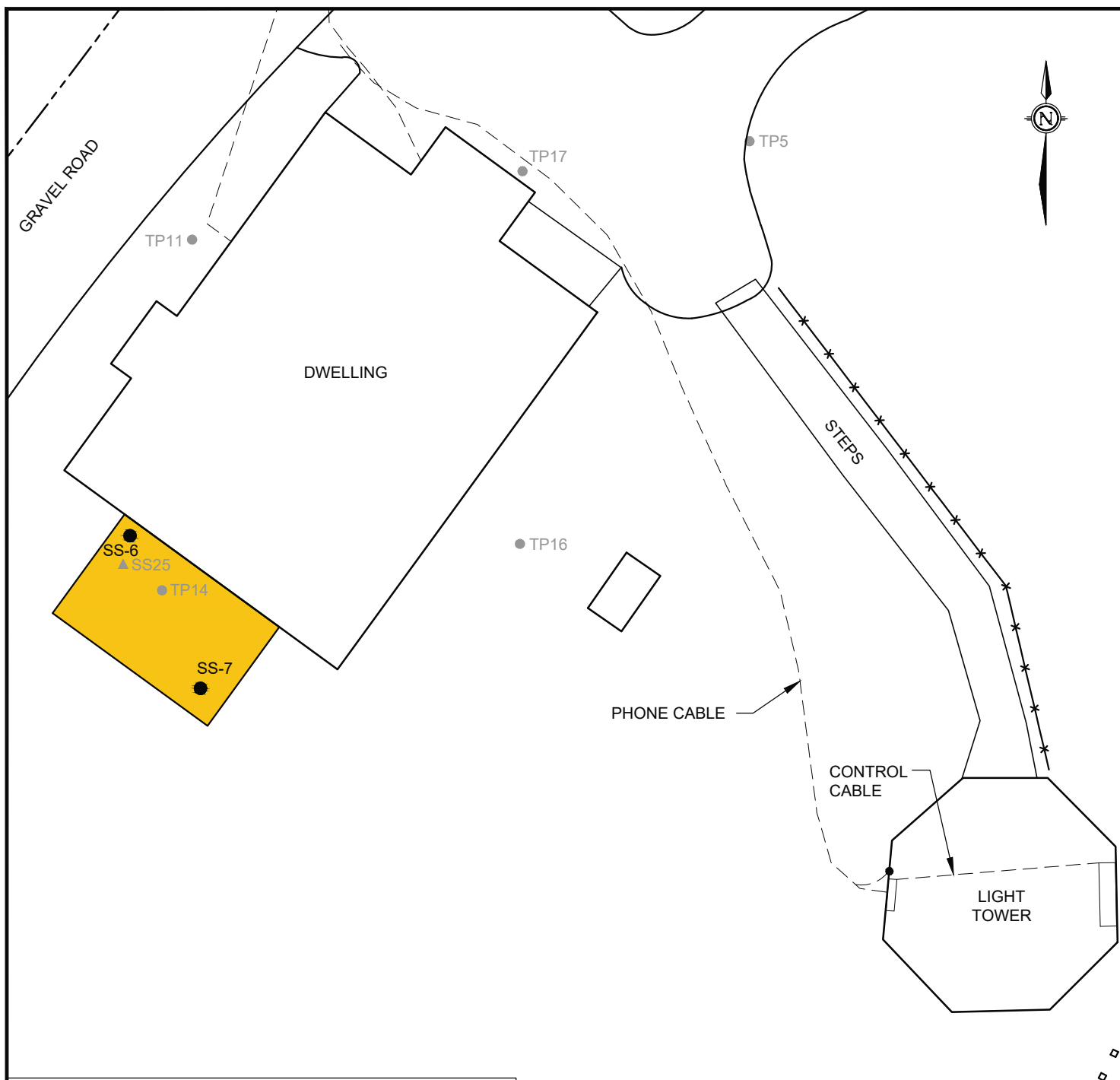
Reviewed by:



Gary Warren, M.A.Sc.
Senior Reviewer

Attachments



Figures 1 and 2, Proposed Remediation Areas.
Analytical Table 1
Certificate of Analysis
Limitations



LEGEND:

- ▲ SS25 SURFACE SOIL SAMPLES (JACQUES WHITFORD 2004)
- TP16 SURFACE SOIL SAMPLES (DILLON 2012)
- SS-# CURRENT SURFACE SOIL SAMPLE (AMEC FW 2016)
- Yellow Area NON-LEACHABLE LEAD IMPACTS TO BE REMEDIATED

0 1.5 3 6m
SCALE 1:150

 <p>Amec Foster Wheeler Environment & Infrastructure 133 Crosbie Road St. John's, NL A1B 4A5 709-722-7023</p>	<p>Date:</p> <p>August 2016</p>		<p>Project:</p> <p>Lead Leachate Testing In Soil Cape Spear Light Station Cape Spear, NL</p>		
	<p>Drawn by:</p> <p>T. Rideout</p>		<p>Title:</p> <p>Proposed Remediation Area (Dwelling) And Soil Sample Location</p>		
<p>Client:</p>  <p>Public Works and Government Services Canada</p> <p>Travaux publics et Services gouvernementaux Canada</p>	<p>Approved by:</p> <p>S. Barfoot</p>		<p>Scale:</p> <p>As Shown</p>	<p>Project No.:</p> <p>TF16076670</p>	<p>Figure No.:</p> <p>1</p>



LEGEND:

- ▲ SS11 SURFACE SOIL SAMPLES (JACQUES WHITFORD 2004)
- TP25 SURFACE SOIL SAMPLES (DILLON 2012)
- SS-# CURRENT SURFACE SOIL SAMPLE (AMEC FW 2016)
- NON-LEACHABLE LEAD IMPACTS TO BE REMEDIATED
- LEACHABLE LEAD IMPACTS TO BE REMEDIATED

0 1.5 3 6m
SCALE 1:150



 Amec Foster Wheeler Environment & Infrastructure 133 Crosbie Road St. John's, NL A1B 4A5 709-722-7023	Date: August 2016	Project: Lead Leachate Testing In Soil Cape Spear Light Station Cape Spear, NL		
	Drawn by: T. Rideout	Title: Proposed Remediation Area (Equipment Building) And Soil Sample Locations		
	Approved by: S. Barfoot	Scale: As Shown	Project No.: TF16076670	Figure No.: 2
Client:  Public Works and Government Services Canada Travaux publics et Services gouvernementaux Canada				

Table 1: Metals Leachate in Soil, Cape Spear

LAB ID	ANALYTICAL DATA										GUIDELINES
SAMPLE ID	CST473	CST474	CST480	DUP-1	DUP-1 Lab-Dup	CST475	CST476	CST477	CST478	CST479	NL Leachable Toxic Waste Schedule II*
SAMPLE DEPTH (mbgs)	SS-1	SS-2	DUP-1	DUP-1	DUP-1 Lab-Dup	SS-3	SS-4	SS-5	SS-6	SS-7	
DATE	0 - 0.05 19-Jul-16	0 - 0.05 19-Jul-16	0 - 0.05 19-Jul-16	0 - 0.05 19-Jul-16	0 - 0.05 19-Jul-16	0 - 0.05 19-Jul-16	0 - 0.05 19-Jul-16	0 - 0.05 19-Jul-16	0 - 0.05 19-Jul-16	0 - 0.05 19-Jul-16	
Parameter	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Leachable Lead (Pb)	22,000	240	280	290	860	2,200	33,000	1,500	290	5000	

Notes:

mbgs = metres below ground surface

RDL: Reportable Detection Limit

* NL Department of Environment and Conservation Guidance Document "Leachable Toxic Waste, Testing and Disposal", November, 2003, Schedule II Guidelines

Concentration exceeds the applicable guideline and is therefore considered leachable

Dup -1 is a blind field duplicate of sample SS-2

Your Project #: TF16076669
Site Location: CAPE SPEAR
Your C.O.C. #: D 16847

Attention: Susan Barfoot

AMEC Foster Wheeler Environment & Infrastructure
PO Box 13216
133 Crosbie Rd, Suite 202
St John's, NL
CANADA A1B 4A5

Report Date: 2016/07/25
Report #: R4080154
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6F0726

Received: 2016/07/20, 09:28

Sample Matrix: Soil
Samples Received: 8

Analyses	Date		Date Analyzed	Laboratory Method	Reference
	Quantity	Extracted			
Metals Leach TCLP/CGSB extraction (1)	8	2016/07/22	2016/07/23	ATL SOP 00058	EPA 6020A R1 m
TCLP Inorganic extraction - pH (1)	8	N/A	2016/07/21	ATL SOP 00035	EPA 1311 m
TCLP Inorganic extraction - Weight (1)	8	N/A	2016/07/21	ATL SOP 00035	EPA 1311 m

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam Bedford

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Michelle Hill, Project Manager

Email: MHill@maxxam.ca

Phone# (902)420-0203 Ext:289

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This report has been generated and distributed using a secure automated process.

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

ATLANTIC TCLP LEACHATE + LEAD (SOIL)

Maxxam ID		CST473	CST474	CST475	CST476	CST477	CST478	CST479		
Sampling Date		2016/07/19	2016/07/19	2016/07/19	2016/07/19	2016/07/19	2016/07/19	2016/07/19		
COC Number		D 16847	D 16847	D 16847	D 16847	D 16847	D 16847	D 16847		
	UNITS	SS-1	SS-2	SS-3	SS-4	SS-5	SS-6	SS-7	RDL	QC Batch
Inorganics										
Sample Weight (as received)	g	100	100	100	100	100	100	100	N/A	4586600
Initial pH	N/A	5.0	5.0	4.9	4.9	4.9	4.9	4.9		4586604
Final pH	N/A	5.2	5.2	4.9	4.9	4.9	4.9	4.9		4586604
Metals										
Leachable Lead (Pb)	ug/L	22000	240	860	2200	33000	1500	290	5.0	4589397
RDL = Reportable Detection Limit										
QC Batch = Quality Control Batch										
N/A = Not Applicable										

Maxxam ID		CST480	CST480		
Sampling Date		2016/07/19	2016/07/19		
COC Number		D 16847	D 16847		
	UNITS	DUP-1	DUP-1 Lab-Dup	RDL	QC Batch
Inorganics					
Sample Weight (as received)	g	100	100	N/A	4586600
Initial pH	N/A	4.9	4.9		4586604
Final pH	N/A	5.1	5.1		4586604
Metals					
Leachable Lead (Pb)	ug/L	280	290	5.0	4589397
RDL = Reportable Detection Limit					
QC Batch = Quality Control Batch					
Lab-Dup = Laboratory Initiated Duplicate					
N/A = Not Applicable					

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	23.8°C
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Results relate only to the items tested.

QUALITY ASSURANCE REPORT

AMEC Foster Wheeler Environment & Infrastructure
Client Project #: TF16076669
Site Location: CAPE SPEAR
Sampler Initials: SD

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
4586600	Sample Weight (as received)	2016/07/21					NA	g	0.22	N/A
4589397	Leachable Lead (Pb)	2016/07/23	99	75 - 125	100	80 - 120	<5.0	ug/L	2.9	35

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

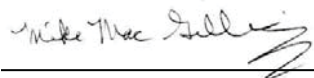
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Mike MacGillivray, Scientific Specialist (Inorganics)

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

[illegible]

Pink: Client

White: Maxxam

LIMITATIONS

1. The work performed in this report was carried out in accordance with the Standard Terms of Conditions made part of our contract. The conclusions presented herein are based solely upon the scope of services and time and budgetary limitations described in our contract.
2. The report was prepared in accordance with generally accepted environmental study and/or engineering practices for the exclusive use of DFO and PWGSC. No other warranties, either expressed or implied, are made as to the professional services provided under the terms of our contract and included in this report.
3. Third party information reviewed and used to develop the opinions and conclusions contained in this report is assumed to be complete and correct. This information was used in good faith and Amec Foster Wheeler does not accept any responsibility for deficiencies, misinterpretation or incompleteness of the information contained in documents prepared by third parties.
4. The services performed and outlined in this report were based, in part, upon visual observations of the site and attendant structures. Our opinion cannot be extended to portions of the site which were unavailable for direct observation, reasonably beyond our control.
5. The objective of this report was to assess environmental conditions at the site, within the context of our contract and existing environmental regulations within the applicable jurisdiction. Evaluating compliance of past or future owners with applicable local, provincial and federal government laws and regulations was not included in our contract for services.
6. Our observations relating to the condition of environmental media at the site are described in this report. It should be noted that compounds or materials other than those described could be present in the site environment.
7. The findings and conclusions presented in this report are based exclusively on the field parameters measured and the chemical parameters tested at specific locations. It should be recognized that subsurface conditions between and beyond the sample locations may vary. Amec Foster Wheeler cannot expressly guarantee that subsurface conditions between and beyond the sample locations do not vary from the results determined at the sample locations. Notwithstanding these limitations, this report is believed to provide a reasonable representation of site conditions at the date of issue.
8. The contents of this report are based on the information collected during the monitoring and investigation activities, our understanding of the actual site conditions, and our professional opinion according to the information available at the time of preparation of this report. This report gives a professional opinion and, by consequence, no guarantee is attached to the conclusions or expert advice depicted in this report. This report does not provide a legal opinion in regards to Regulations and applicable Laws.
9. Any use of this report by a third party and any decision made based on the information contained in this report by the third party is the sole responsibility of the third party. Amec Foster Wheeler will not accept any responsibility for damages resulting from a decision or an action made by a third party based on the information contained in this report.