

February 5, 2021

Project Delivery Services (East) | Strategic Policy and Investment Directorate
Parks Canada | Government of Canada
630-105 McGill Street
Montreal, QC H2Y 2E7

Subject: **Hazardous Building Materials Report**
Georges Island National Historic Site, Halifax NS
Our ref.: 2000155.000

At the request of Parks Canada Agency (PCA), Englobe Corp. (Englobe) conducted additional asbestos and paint sampling on December 19, 2020 on select structures that were not previously sampled at the Georges Island National Historic site. The work was conducted to supplement information collected earlier in 2020, to facilitate expanded visitor access to buildings on Georges Island in the 2021 season. Englobe also quantified previously and newly identified asbestos containing materials (ACMs) and metals-based paint in select assets.

This report summarizes all the hazardous building material information gathered during the two 2020 field programs, as well as mould information gathered during the initial 2020 sampling program. This letter report should be read in conjunction with the previous report, entitled “Phase II ESA, IAQ and Hazmat” prepared by Englobe, dated May 2020. above noted report.

1 BACKGROUND

Englobe was commissioned by PCA to complete a Phase II Environmental Site Assessment (ESA), Indoor Air Quality (IAQ) Assessment and Hazmat Survey (report dated May 15, 2020) and a subsequent Human Health and Ecological Risk Assessment (report dated October 2020) at the Georges Island National Historic Site in advance of the 2020 opening season. Following the construction of a wharf and landing area, and a partial opening to the public in 2020, PCA reviewed options to offer an expanded visitor experience in 2021.

In advance of 2021 opening season, PCA sought professional services (Englobe) to screen additional assets (buildings and areas not included in previous assessments) for contamination, and further assess and quantify hazardous materials in select assets which were preliminarily assessed in advance of the 2020 season.

Additional sampling for ACMs and metals-based paint (as applicable to the building-specific risks) for the following areas was conducted during the December 19, 2020 site visit:

- 🏠 Guardroom and Jail Cells
- 🏠 Main Magazine
- 🏠 Lower Battery Guns
- 🏠 Ammunition Loading Depot (also known as Load Mine Store)
- 🏠 Connecting Up Shed Foundation
- 🏠 Case Store Foundation (also known as Coal Store Foundation)
- 🏠 Workshop
- 🏠 Cable Store Foundation

In addition, Englobe quantified any previously identified ACMs and metals based paint confirmed in the above-noted buildings, and quantified the previously identified hazardous building materials at the following buildings:

- 🏠 Married Officers Quarters
- 🏠 Field Forge Building
- 🏠 Artillery Stores
- 🏠 RML Laboratory

It is our understanding that abatement / remediation work was already completed at the Coal Shed and the tunnels (where lead containing black paint was removed from handrails). Further, the Dry Primer Store was already assessed and deemed not to contain hazardous materials or surface soil.

2 REGULATORY OVERVIEW

2.1 ASBESTOS

The current sampling program included the sampling of encountered building materials that were identified as having the potential to contain asbestos. These included brick mortar, parging cement, tar and caulking. Asbestos is generally classified as friable or non-friable. The term friable refers to a building material that can be reduced to dust by hand or moderate pressure, or any material that is already dust/debris. Friable ACMs pose a greater risk to workers and building users by releasing airborne asbestos fibres when disturbed.

Regulatory control of asbestos in the workplace is the responsibility of Nova Scotia Labour and Advanced Education (NSLAE) under the provision of the *Nova Scotia Occupational Health and Safety Act*, and the *Canada Occupational Safety and Health Regulation/SOR/86-304-Part X, Hazardous Substances*. For the purpose of managing worker exposure during building maintenance, renovation and demolition, NSLAE defines an ACM as "any material which contains at least 0.5% asbestos, and vermiculite which contains any amount of asbestos". The Act, Regulations and Codes of Practice have established procedures for safe monitoring and abatement as well as the responsibilities of the owner, employer and employee. Some of the Codes of Practice, Guidelines and Regulations pertaining to asbestos are presented below:

- 🏠 *Asbestos in the Workplace: A Guide to Removal of Friable Asbestos-Containing Material*, November 2013; and
- 🏠 *Asbestos in the Workplace: A Guide to Assessment & Management of Asbestos in the Workplace*, November 2013.

These should be referred to as a minimum. All work involving ACMs should be carried out by a suitably qualified asbestos abatement contractor.

Nova Scotia Environment (NSE) regulates the disposal of ACMs under the *Asbestos Waste Management Regulations*. Under the Regulations, “asbestos waste” refers to friable waste material containing fibres or asbestos dust in a concentration 1% by weight or greater. Asbestos is classified as a hazardous material under the *Transportation of Dangerous Goods Act* and has specific requirements for transfer (i.e. manifests, placards, etc.). All asbestos waste is to be disposed of at an approved municipal solid waste disposal site that will accept the waste.

These should be referred to as a minimum. All work involving ACMs should be carried out by a suitably qualified asbestos abatement contractor.

2.2 LEAD PAINT

The Surface Coating Materials Regulations under the Consumer Products Safety Act of Canada consider surfaces with a total lead concentration greater than 90 mg/kg as lead-containing. Any disturbance or removal of lead-containing painted materials that may generate lead dust or respirable aerosols will need to conform to the federal and provincial Occupational Health and Safety Regulations. All work should be carried out by individuals qualified to handle lead-containing materials and will require, as a minimum, workers to wear proper PPE (respirators, disposable clothing, etc.). Disposal of lead-containing construction debris is regulated provincially by NSE. The landfill disposal limit for materials with lead-based paint at 1,000 mg/kg of total lead content. Materials with a total lead content less than 1,000 mg/kg may be disposed at a C&D disposal site.

Materials with a total lead content greater than 1,000 mg/kg must undergo leachable lead analysis to determine the appropriate disposal method. If the leachable lead content of the material is 5 mg/L or greater, the material is considered a hazardous waste and is not approved for disposal at any site located in Nova Scotia. If the leachable lead content of the material is less than 5 mg/L, the material may be disposed at a Regional Solid Waste Landfill.

Materials with leachable lead concentrations greater than 5 mg/L must also be manifested as dangerous goods during transport under the federal TDGA Regulations. If materials are to be disposed of out-of-province, transportation must comply with the Interprovincial Movement of Hazardous Waste Regulations under the CEPA.

Where paint is well adhered to a metal substrate, the paint plus substrate can be sent for recycling at an approved metal recycling facility.

2.3 MERCURY PAINT

The Surface Coating Materials Regulations under the Consumer Products Safety Act of Canada consider surfaces with a total mercury concentration greater than 10 mg/kg as mercury-containing. Any disturbance or removal of mercury-containing painted materials that may generate mercury dust or respirable aerosols will need to conform to the federal and provincial Occupational Health and Safety Regulations. All work should be carried out by individuals qualified to handle lead-containing materials and will require, as a minimum, workers to wear proper PPE (respirators, disposable clothing, etc.).

Mercury-containing construction debris is regulated provincially through the NSE document Guidelines for Disposal of Contaminated Solids in Landfills (2005). This document defines a mercury-containing material as one with a mercury concentration above 10 mg/kg.

For disposal purposes, the NSE Guidelines for Disposal of Contaminated Solids in Landfills require materials with total mercury concentration exceeding 10 mg/kg undergo a leachate analysis. The disposal limit for leachable mercury is 0.1 mg/L. If the leachate exceeds the disposal limit, the paint must be disposed of at an approved hazardous waste facility. Currently, there are no hazardous waste facilities in Nova Scotia. Where paint is well adhered to the substrate, and has a concentration greater than 10 mg/kg but with a leachable mercury concentration below 0.1 mg/L, it can be disposed of at a C&D facility, with prior approval from the facility operator. Where paint is well adhered to a metal substrate, it can be sent for metal recycling.

2.4 MOULD

Mould affected materials should be removed following the Canadian Construction Association document Mould Guidelines for the Canadian Construction Industry (2018). This document provides three levels of remediation depending on the size or scale of the mould growth, as well as considerations for building demolition. Additional guidance on removal procedures is provided in:

- 🔗 *Fungal Contamination in Public Buildings: A Guide to Recognition and Management, Federal-Provincial Committee on Environmental and Occupational Health, June 1995;*
- 🔗 Mould Abatement Guidelines, Environmental Abatement Council of Ontario, 2010; and
- 🔗 Mould Remediation (Standard S520), Institute of Inspection, Cleaning and Restoration, 2015.

There are no provincial disposal guidelines for mould-impacted building materials. These materials may be disposed of at a C&D disposal site, provided they do not contain unacceptable levels of other hazardous materials (e.g. asbestos, lead-based paint, etc.).

3 SAMPLING PROGRAM METHODOLOGY

All fieldwork was completed on December 19, 2020 by Mr. Allain Thebeau, CET, and Lauren Bowser, Junior Project Professional, of Englobe. Eagle Beach Contractors Ltd. was retained directly by Englobe to transport all required equipment and personnel to and from Georges Island to complete the sampling program. Sample locations are identified on Figures 1a and 1b (Appendix A).

3.1 ASBESTOS

Samples were collected by penetrating the material through the entire thickness with either a clean knife or a clean hammer and chisel. Samples were placed in individual sample bags with zip-locks and labelled with the sample ID. For each sample collected, the type of material, location and general condition were noted. Personal protective equipment (PPE) was worn, as required.

All samples were analysed by stereomicroscopy at approximately 10-20X magnification to determine the types and relative amounts of the different fibres present. Representative fibres were then selected and examined using polarised light microscopy (PLM) and dispersion staining techniques at 40-100X magnification to determine the asbestos species present. All laboratory work was conducted by EMSL Analytics with a NVLAP accreditation, located in Mississauga Ontario. It should be noted where multiple layers were present in a sample, each distinct layer was analyzed separately. Laboratory certificate of analysis is attached.

3.2 PAINT

Samples were collected by scraping paint from the painted materials, consisting of either flaking paint or adhered to the substrate. The samples were placed in a sample bag with zip-locks and labelled with the sample ID. The type of material, location and general condition were note. Personal protective equipment (PPE) was worn, as required. The paint sample collected was analyzed by Bureau Veritas located in Bedford, Nova Scotia, for total lead and mercury, and leachable lead and mercury (where required) concentration. Laboratory certificate of analysis is attached.

4 RESULTS & RECOMMENDATIONS

All building materials sampled for asbestos and paint analysis are presented in Table 1 and Table 2 (Appendix B) and laboratory certificates of analysis are attached in Appendix C.

The asbestos containing materials and metals-based paint encountered during the current sampling program and previous site visit, along with recommendations for handling and disposal, are provided in Table 4-1 below and on the following pages. It is important to note that removal/handling procedures vary depending on a variety of factors including the manner in which the materials are removed (i.e. scraping vs. grinding), the types of tools used during removal and the amount of materials to be disturbed.

Table 4-1 Summary of Identified ACMs & Metals Containing Paint

Summary Table of Identified Hazardous Materials						
Building Name	Item Description	Sample Number	Sample Results	Location & Quantity	Recommendations	
					Handling	Disposal
Non-Friable Asbestos						
Artillery Store	Light grey caulking	AS-A6	2% Chrysotile asbestos	Artillery Store, around windows and door frame (50m)	<p>In Nova Scotia, <i>Asbestos Waste Management Regulations</i> and <i>Asbestos in the Workplace</i> guidance documents, under the NSLAE, must be followed during abatement activities to avoid worker exposure to asbestos fibres.</p> <p>Caulking considered non-friable materials and should be removed via Low-Risk (Type I) precautions, provided wetting techniques are implemented and the work is carried out by means of non-powered hand-held tools.</p> <p>If the materials are not wetted and are removed with non-powered hand-held tools (or powered tools that are attached to dust collecting devices with HEPA filters), Moderate-Risk (Type II) precautions should be followed.</p> <p>If the materials are removed with powered tools that are not attached to dust collecting devices with HEPA filters, Maximum High-Risk (Type III) precautions should be followed.</p>	<p>Asbestos is classified as a hazardous material under the <i>Transportation of Dangerous Goods Act</i> and has specific requirements for transfer (i.e. manifests, placards, etc.).</p> <p>Waste material may be disposed of at an approved disposal facility, with approval from the operator.</p>
Field Forge Building	Light grey caulking	FFB-A3	2% Chrysotile asbestos	Field Forge Building, exterior window frame (40m)		
RML Laboratory	Light grey caulking	RML-A4	2% Chrysotile asbestos	RML Laboratory, exterior plywood window cover (20m)		
Guardroom & Jail Cells	Light grey caulking	GHJ-A4	2% Chrysotile asbestos	Guardroom, entryway door and window frame (20m)		
Married Officers Quarters	Grey caulking	MQ-A5	2% Chrysotile asbestos	Married Officers Quarters, window frame of guard hut (60m)		
Jail Cells	Grey caulking	JC-A1	2% Chrysotile asbestos	Jail Cells, brick/wood window frame interface (15m)		
The Workshop	White - grey caulking	W-A4 & W-A6	1 - 2% Chrysotile asbestos	The Workshop, exterior, around door frame on brick (50m)		
Metals Containing Paint-Satisfies Landfill Disposal Guidelines						
Field Forge Building	Grey flaking paint on wood window frames, 80% poor condition	FFB-P1	600 mg/kg (Total Lead-Surface Coating)	Field Forge Building, interior wood window frame (5m ² total surface area)	Work on materials that contain lead paint must be undertaken in a manner so as to avoid generating fine particulate matter and/or fumes. Airborne lead and	These painted materials sampled do not require special consideration for disposal with respect to lead and/or

Summary Table of Identified Hazardous Materials

Building Name	Item Description	Sample Number	Sample Results	Location & Quantity	Recommendations	
					Handling	Disposal
	White flaking paint on brick wall, poor locally, good overall	FFB-P2	510 mg/kg (Total Lead-Surface Coating)	Field Forge Building, brick wall (115m ² total surface area)	mercury dust or fumes must not exceed the Time Weighted Average (TWA) exposure value of 0.05 mg/m ³ for lead and 0.025 mg/m ³ for mercury during the removal of paints and products containing any concentration of lead and mercury without the use of appropriate respiratory protection. Demolition work that may disturb lead-containing materials must follow the recommendations provided in the documents entitled <i>Code of Practice: Working with Inorganic Lead</i> , issued by NSLAE in June 2010, and <i>Guideline: Lead on Construction Projects</i> , issued by the Ontario Ministry of Labour in September 2004.	mercury and can be disposed of at an approved solid waste landfill or C&D waste disposal site that will accept the waste, except for those materials that contain asbestos.
RML Laboratory	White flaking paint on brick, poor locally, good overall	RML-P1	96 mg/kg (Total Lead-Surface Coating)	RML Laboratory, brick wall (145m ² total surface area)		
RML Laboratory	Black flaking paint on metal pipe, 60% poor condition	RML-P2	160 mg/kg (Total Lead-Surface Coating)	RML Laboratory, metal pipe (15m ² total surface area)		
Jail Cells	Black flaking paint on metal jail cell bars, 30 % poor condition	JC-P1	180 mg/kg (Total Lead-Surface Coating)	Jail Cells, metal cell bars (8m ² total surface area)	Work on materials that contain lead paint must be undertaken in a manner so as to avoid generating fine particulate matter and/or fumes. Airborne lead and mercury dust or fumes must not exceed the Time Weighted Average (TWA) exposure value of 0.05 mg/m ³ for lead and 0.025 mg/m ³ for mercury during the removal of paints and products containing any concentration of lead and mercury without the use of appropriate respiratory protection. Demolition work that may disturb lead-containing materials must follow the recommendations provided in the documents entitled	These painted materials sampled do not require special consideration for disposal with respect to lead and/or mercury and can be disposed of at an approved solid waste landfill or C&D waste disposal site that will accept the waste, except for those materials that contain asbestos.
	Jail Cells	White paint on brick walls, fair – poor condition.	JC-P2	1,800 mg/kg (Total Lead)		
Coal Shed	White flaking paint on parging cement, poor condition local, good overall	CS-P1	290 mg/kg (Total Lead)	Coal Shed, brick wall (290m ² total surface area)		
The Workshop	White paint on brick walls, fair – poor condition.	W-P1	1,000 mg/kg (Total Lead)	Workshop, brick wall (130m ² total surface area)		

Summary Table of Identified Hazardous Materials

Building Name	Item Description	Sample Number	Sample Results	Location & Quantity	Recommendations	
					Handling	Disposal
Loaded Mine Stores	Black flaking paint on metal brackets – poor condition	LMS-P1	240 mg/kg (Total Lead-Surface Coating)	Loaded mine store, exterior, metal brackets (25m ² total surface area)	<i>Code of Practice: Working with Inorganic Lead</i> , issued by NSLAE in June 2010, and <i>Guideline: Lead on Construction Projects</i> , issued by the Ontario Ministry of Labour in September 2004.	
	Black flaking paint on cannons and blast doors, poor condition	T-P3	800 mg/kg (Total Lead-Surface Coating)	Tunnel, south section (4 cannons and associated doors)		
	White paint on brick walls, fair – poor condition.	T-P4	300 mg/kg (Total Lead-Surface Coating)	Tunnel, near west tunnel entrance, wall (No Quantity Available)		
Tunnels	White paint on brick walls, fair – poor condition.	T-P6	400 mg/kg (Total Lead-Surface Coating)	Tunnel, south cannon battery area, wall (No Quantity Available)		
Metals Containing Paint-Exceeds Landfill Disposal Guidelines						
Artillery Store	White flaking paint, poor locally, good overall	AS-P1	38,000 mg/kg (Total Lead) <u>180 mg/L</u> (Leachable Lead)	Artillery Store, brick interior walls (170m ² total surface area)	Work on materials that contain lead and/or mercury paint must be undertaken in a manner so as to avoid generating fine particulate matter and/or fumes. Airborne lead and mercury dust or fumes must not exceed the Time Weighted Average (TWA) exposure value of 0.05 mg/m ³ for lead and 0.025 mg/m ³ for mercury during the removal of paints and products containing any concentration of lead and	Total lead was reported at a concentration of >1,000 mg/kg and the samples were re-submitted for lead leachate analysis. These materials are considered leachate hazardous and will require out-of-province disposal.
Guardroom	Grey flaking paint on wood door, door frame and window frames	GHJ-P3	15,000 mg/kg (Total Lead) <u>29 mg/L</u> (Leachable Lead)	Guardroom, door, door frame and window frames (3m ² total surface area)		

Summary Table of Identified Hazardous Materials						
Building Name	Item Description	Sample Number	Sample Results	Location & Quantity	Recommendations	
					Handling	Disposal
Married Officers Quarters	Grey flaking paint on white parging cement	MQ-P1	75,000 mg/kg (Total Lead) 1,200 mg/kg (Total Mercury) 31 mg/L (Leachable Lead)	Married Officers Quarters, brick wall (110m ² total surface area)	mercury without the use of appropriate respiratory protection. Demolition work that may disturb lead-containing materials must follow the recommendations provided in the documents entitled <i>Code of Practice: Working with Inorganic Lead</i> , issued by NSLAE in June 2010, and <i>Guideline: Lead on Construction Projects</i> , issued by the Ontario Ministry of Labour in September 2004.	
	Beige flaking paint on white parging cement	MQ-P2	72,000 mg/kg (Total Lead) 32 mg/L (Leachable Lead)	Married Officers Quarters, brick wall (145m ² total surface area)		
Tunnels	Black flaking paint on metal hand railing, poor condition	T-P1	2,400 mg/kg (Total Lead) 8.4 mg/L (Leachable Lead)	Tunnel, eastern section (Abated in 2020)		

Note:

¹ Nova Scotia Labour and Advanced Education (NSLAE) defines an ACM as “any material which contains at least 0.5% asbestos, and vermiculite which contains any amount of asbestos.

It should be noted that hazardous building materials identified in the main magazine and tunnels (specifically, painted surfaces in poor condition) could not be quantified due to complex design of the underground system and the varying coverage and condition of the paint. As such, photos of the tunnels showing paint samples T-P4 and T-P6 (white on brick walls) are included in Appendix D.

Mould

During the previous site visit, mould samples were collected from each of the following locations: the Coal Shed, the RML Laboratory, the Artillery Stores, the Field Forge Building, the Tunnels (three spatially distributed samples). A background/outside reference sample was also for comparison purposes. Laboratory analytical results for all air samples collected showed overall airborne mould spore loading levels, within each of the areas tested, greater than those found in the outside air. Apparent mould growth and water staining on wood structural beams, plywood finished walls and ceilings, and wood framing around windows and doors (specifically in the Field Forge Building) was noted. The eaves in most buildings appeared to be open which would allow for humidity and moisture infiltration. Laboratory analytical results combined with observations made on-site indicated the presence of mould amplification within the

buildings (Coal Shed, RML Laboratory, Artillery Stores, Field Forge Building and Tunnels), including particularly high mould concentrations in the Field Forge Building, and the detection of one species of mould (*Stachybotrys*) in the Coal Shed, RML Laboratory, Artillery Store and Tunnel East, which is a species that is not acceptable in buildings.

The buildings on Georges Island are not currently heated, air conditioned or mechanically ventilated, therefore these are not unexpected results. It is our recommendation that every spring (after the buildings have been standing closed and vacant for an extended period, and before they become occupied during the visitor season) the interior spaces should be thoroughly washed with a mould inhibitor. The cleaning work should be conducted in accordance with the Canadian Construction Association document Mould Guidelines for the Canadian Construction Industry (2018) and contractors qualified to complete the work.

5 QUALITY ASSURANCE (QA) / QUALITY CONTROL (QC)

Englobe conducted the hazardous materials survey following our standard operating procedures, including safe work practices and job procedures for the collection and handling of regulated materials. Sampling was conducted in accordance with all pertinent acts, regulations, codes, guidelines and standard practices.

All bulk asbestos samples were submitted under chain of custody to EMSL Laboratory located in Mississauga Ontario.

EMSL conducts analysis on asbestos bulk samples following the EPA 600/R-93/116 method for PLM analysis. PLM alignment, including proper illumination, objective centering, polarizer, analyzer and ocular alignment, refractive index liquid calibration and analyst calibration using known reference standards are all a part of EMSL calibration and standardization program for PLM analysis. In addition, EMSL has QA/QC procedures described in their Quality Assurance Manual. Sample analysis is subjected to 10% reanalysis for quality control. Re-preparation and re-analysis of samples is conducted by the same analyst and different analysts. Analysts are required to analyze samples of known standards.

One blind field duplicate asbestos sample was collected during the recent sampling program and labelled in a manner to prevent the laboratory from identifying its corresponding sample. The results of the bulk asbestos field duplicate samples are presented in Table 5-1.

Table 5-1 – Blind Field Duplicate Results – Bulk Asbestos

Sample ID	Original Result	Blind Field Duplicate ID	Duplicate Result
W-A4	2% Chrysotile asbestos	W-Dup	2% Chrysotile asbestos

Additional duplicates were collected during the previous sampling program. Based on the results of the QA/QC program, the test results are considered reliable and representative of encountered conditions.

6 REPORT USE AND CONDITIONS

The assessment was conducted in accordance with the agreed upon scope using the methodology set out in this report. The opinions in this report are given using generally accepted scientific judgment, principles, and practices; however, because of the inherent uncertainty in this process no guarantee of conclusion is intended or can be given.

The statements and conclusions presented in this report are professional opinions based on previously gathered information in early 2020 and our understanding of the planned expansion of visitor access for 2021.

This report was prepared for the exclusive use of Parks Canada. The scope of the services performed may not be appropriate to satisfy the needs of third parties. Any use which a third party makes of this report, or any reliance on or decisions made based on it, is the sole responsibility of the third party. Englobe accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

7 CLOSING

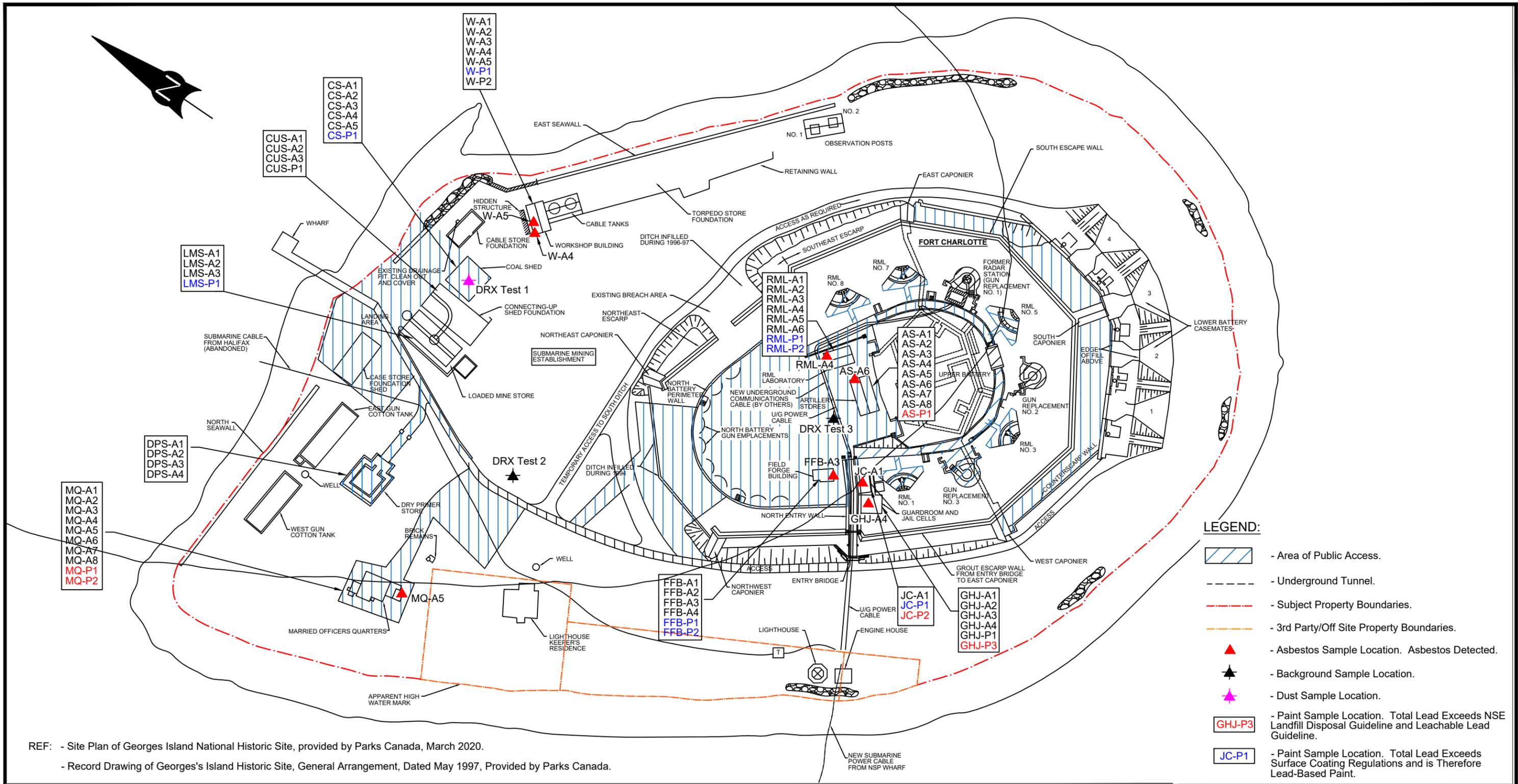
We trust this is to your satisfaction. If, however, additional information should be required, please communicate with the undersigned.

Yours truly,
Englobe Corp.



Elizabeth Rogers, B.Tech. (Env.), CET
Project Manager, Environmental Engineering

Appendix A Figures



- LEGEND:**
- Area of Public Access.
 - Underground Tunnel.
 - Subject Property Boundaries.
 - 3rd Party/Off Site Property Boundaries.
 - Asbestos Sample Location. Asbestos Detected.
 - Background Sample Location.
 - Dust Sample Location.
 - Paint Sample Location. Total Lead Exceeds NSE Landfill Disposal Guideline and Leachable Lead Guideline.
 - Paint Sample Location. Total Lead Exceeds Surface Coating Regulations and is Therefore Lead-Based Paint.

REF: - Site Plan of Georges Island National Historic Site, provided by Parks Canada, March 2020.
 - Record Drawing of Georges's Island Historic Site, General Arrangement, Dated May 1997, Provided by Parks Canada.

Parks Canada Agency



Englobe Corp.
 97 Troop Avenue
 Dartmouth, NS B3B 2A7
 902-468-6486

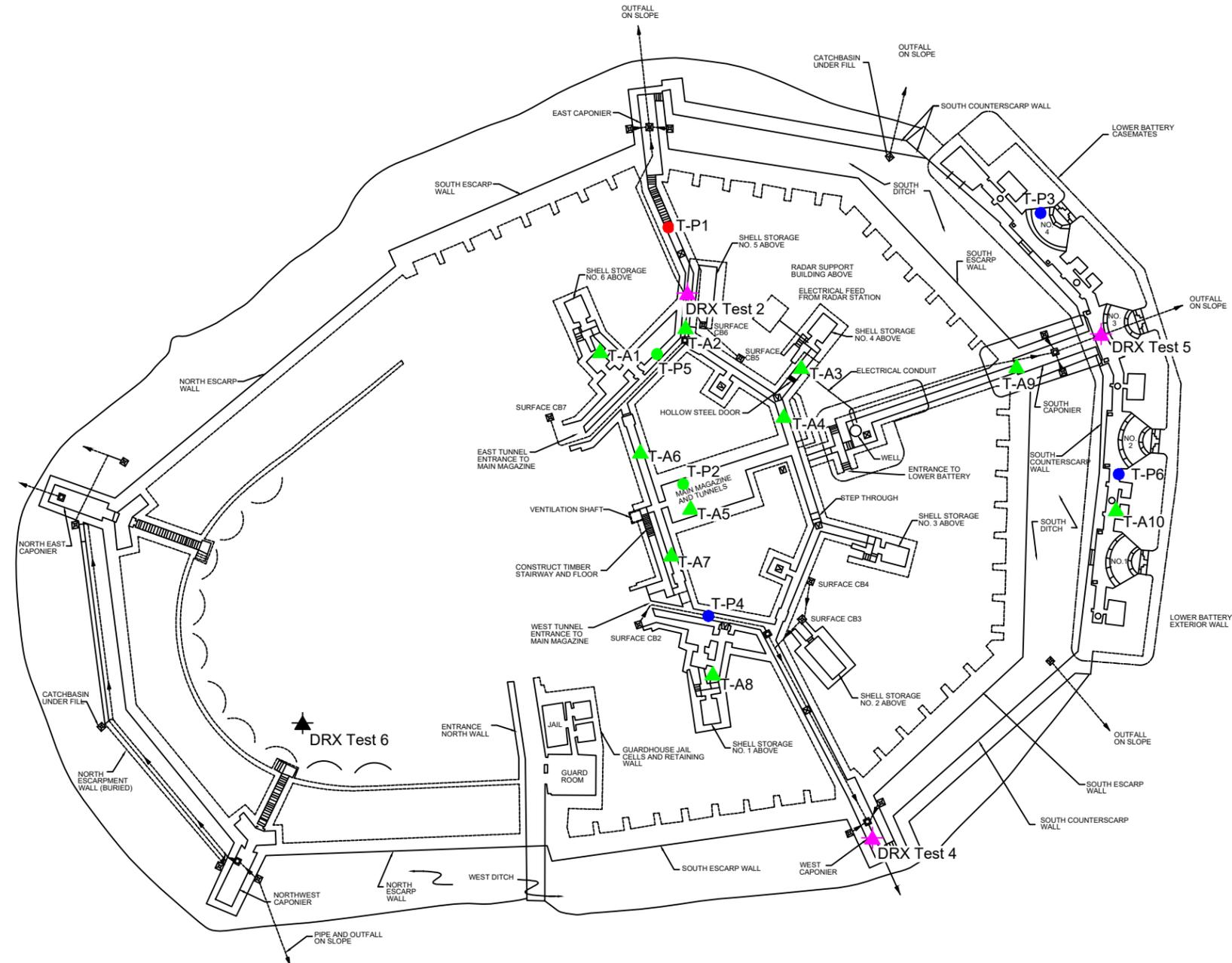
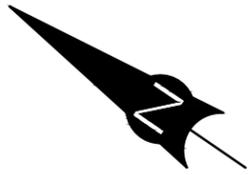
CONFIDENTIALITY STATEMENT. This document, protected by law, is the property of Englobe and is for the sole use of the intended purpose. Any distribution or modification, partial or total, is strictly prohibited without prior written approval from Englobe Corp.

Hazardous Building Materials Report

Georges Island National Historic Site
 Halifax, NS

Figure 1a: Site Plan Showing Sample Locations

No.	Version	Date	By	Verif	Appr.
		Feb. 2021	JJ	AH	DH
Discipline: Environment		Prepare by: AH		Verify by: AH	
Scale: 1:1,200		Draw by: JJ		Approval by: DH	
Date: February 2021		Figure no: 1a			
Page setup: Fig. 1a		Paper size: Previous paper size (17.00 x 11.00 inches)		Register no:	
Man.	Project	Otp	Project	Phase	Electronic ref.
148 2000155					



- LEGEND:**
- ★ - Background Sample Location.
 - ★ (pink) - Dust Sample Location.
 - ▲ (green) - Asbestos Sample Location. No Asbestos Detected.
 - ▲ (red) - Asbestos Sample Location. Asbestos Detected.
 - (green) - Paint Sample Location. Total Lead Satisfies Surface Coating Regulations and NSE Landfill Disposal Guideline.
 - (red) - Paint Sample Location. Total Lead Exceeds NSE Landfill Disposal Guideline and Leachable Lead Guideline.
 - (blue) - Paint Sample Location. Total Lead Exceeds Surface Coating Regulations and is Therefore Lead-Based Paint.

Parks Canada Agency



Englobe Corp.
 97 Troop Avenue
 Dartmouth, NS B3B 2A7
 902-468-6486

CONFIDENTIALITY STATEMENT. This document, protected by law, is the property of Englobe and is for the sole use of the intended purpose. Any distribution or modification, partial or total, is strictly prohibited without prior written approval from Englobe Corp.

Hazardous Building Materials Report

Georges Island National Historic Site
 Halifax, NS

Figure 1b: Site Plan Showing Sample Locations

No.	Version	Date	By	Verif	Appr.
		Feb. 2021	JJ	AH	DH
Discipline: Environment		Prepare by: AH		Verify by: AH	
Scale: 1:800		Draw by: JJ		Approval by: DH	
Date: February 2021		Figure no: 9b			
Page setup: Fig. 9b		Paper size: Previous paper size (17.00 x 11.00 inches)			
Man.	Project	Otp	Project	Phase	Electronic ref.
148	2000155				

Appendix B Asbestos and Paint Analysis

TABLE 1: ASBESTOS BULK SAMPLE RESULTS BY POLARIZED LIGHT MICROSCOPY

GEORGES ISLAND NATIONAL HISTORIC SITE, HALIFAX, NOVA SCOTIA

ENGBLOBE PROJECT NO. 2000155

SAMPLE ID	SAMPLE DESCRIPTION	SAMPLE LOCATION	ASBESTOS CONTENT	FRIABLE
Artillery Stores				
AS-A1	Brick Mortar	Artillery Store, wall	None Detected	-
Dup 1	Brick Mortar	Artillery Store, wall	None Detected	-
AS-A2	Brick Mortar	Artillery Store, wall	None Detected	-
AS-A3	White Parging Cement	Artillery Store, wall	None Detected	-
AS-A4	Dust/Debris	Artillery Store, floor gutter	None Detected	-
AS-A5	Grey Parging Cement	Artillery Store, floor near chimney clean-out	None Detected	-
AS-A6	Light Grey Caulking	Artillery Store, around windows	2% Chrysotile	Non-Friable
AS-A7	Off White Caulking	Artillery Store, top of door frame	None Detected	-
AS-A8	Brick Mortar	Artillery Store, building exterior	None Detected	-
Field Forge Building				
FFB-A1	Brick Mortar	Field Forge Building, wall	None Detected	-
FFB-A2	White Parging Cement	Field Forge Building, wall	None Detected	-
FFB-A3	Light Grey Caulking	Field Forge Building, exterior window frame	2% Chrysotile	Non-Friable
FFB-A4	Brick Mortar	Field Forge Building, exterior wall	None Detected	-
RML Laboratory				
RML-A1	Brick Mortar	RML Laboratory, wall	None Detected	-
RML-A2	Concrete Texture Coating	RML Laboratory, over brick wall	None Detected	-
RML-A3	White Parging Cement	RML Laboratory, wall	None Detected	-
RML-A4	Light Grey Caulking	RML Laboratory, exterior plywood window cover	2% Chrysotile	Non-Friable
RML-A5	White Caulking	RML Laboratory, window frame base	None Detected	-
RML-A6	Concrete Texture Coating	RML Laboratory, brick wall exterior	None Detected	-
Guardroom and Jail Cells				
JC-A1	Grey Caulking	Jail cells, brick/wood window frame interface	2% Chrysotile	Non-Friable
GHJ-A1	White Parging Cement	Guardroom, wall	None Detected	-
	Plaster Base	Guardroom, wall	None Detected	-
GHJ-A2	White Parging Cement	Jail cells, wall	None Detected	-
GHJ-A3	Brick Mortar	Guardroom, wall	None Detected	-
GHJ-A4	Light Grey Caulking	Guardroom, entryway door	2% Chrysotile	Non-Friable
Dup3	Light Grey Caulking	Guardroom, entryway door	2% Chrysotile	Non-Friable
Married Officers Quarters				
MQ-A1	Parging Cement	Married Officers Quarters, chimney	None Detected	-
MQ-A2	Brick Mortar	Married Officers Quarters, wall	None Detected	-
MQ-A3	White Parging Cement	Married Officers Quarters, brick wall	None Detected	-

TABLE 1: ASBESTOS BULK SAMPLE RESULTS BY POLARIZED LIGHT MICROSCOPY

GEORGES ISLAND NATIONAL HISTORIC SITE, HALIFAX, NOVA SCOTIA

ENGBLOBE PROJECT NO. 2000155

SAMPLE ID	SAMPLE DESCRIPTION	SAMPLE LOCATION	ASBESTOS CONTENT	FRIABLE
Dup2	White Parging Cement	Married Officers Quarters, brick wall	None Detected	-
MQ-A4	White/grey Caulking	Married Officers Quarters, around window frame, interior	None Detected	-
MQ-A5	Grey Caulking	Married Officers Quarters, window frame of guard hut	2% Chrysotile	Non-Friable
MQ-A6	Grey Parging Cement	Married Officers Quarters, patch on brick of guard hut	None Detected	-
MQ-A7	White Parging Cement	Married Officers Quarters, brick wall	None Detected	-
MQ-A8	White Caulking	Married Officers Quarters, door/brick interface	None Detected	-
Dry Primer Store				
DPS-A1	Asphalt/Tar	Dry Primer Store, flooring material	None Detected	-
DPS-A2	Grey/Beige Parging Cement	Dry Primer Store, wall	None Detected	-
DPS-A3	Grey Brick Mortar	Dry Primer Store, wall	None Detected	-
DPS-A4	Asphalt/Tar	Dry Primer Store, floor near base of wall	None Detected	-
Coal Shed				
CS-A1	Grey Caulking	Coal Shed, brick/window frame interface	None Detected	-
CS-A2	Brick Mortar	Coal Shed, wall	None Detected	-
CS-A3	White Parging Cement	Coal Shed, brick wall	None Detected	-
CS-A4	Brick Mortar	Coal Shed, brick exterior	None Detected	-
CS-A5	White Caulking	Coal Shed, brick/wood window interface	None Detected	-
Tunnels				
T-A1	White Parging Cement	Tunnel, eastern section, stone wall	None Detected	-
T-A2	Grey Parging Cement	Tunnel, eastern section, stone wall	None Detected	-
T-A3	Grey Parging Cement	Tunnel, central section, brick wall	None Detected	-
T-A4	Brick Mortar	Tunnel, central section, brick wall	0.25% Chrysotile	-
T-A5	White Parging Cement	Main Magazine, central section, brick wall	None Detected	-
T-A6	White Parging Cement	Tunnel, central section, stone wall	None Detected	-
T-A7	Beige Parging Cement	Tunnel, central section, stone wall	None Detected	-
T-A8	White Parging Cement	Tunnel, west section, wall	None Detected	-
T-A9	White Parging Cement	Tunnel, south tunnel, wall	None Detected	-
T-A10	Brick Mortar	Tunnel, south tunnel, wall	None Detected	-
Connecting Up Shed				
CUS-A1	Tar	Connecting Up Shed, concrete pad floor	None Detected	-
	Concrete	Connecting Up Shed, concrete pad floor	None Detected	-

TABLE 1: ASBESTOS BULK SAMPLE RESULTS BY POLARIZED LIGHT MICROSCOPY

GEORGES ISLAND NATIONAL HISTORIC SITE, HALIFAX, NOVA SCOTIA

ENGLUBE PROJECT NO. 2000155

SAMPLE ID	SAMPLE DESCRIPTION	SAMPLE LOCATION	ASBESTOS CONTENT	FRIABLE
CUS-A2	Brick mortar	Connecting Up Shed, perimeter wall, exterior	None Detected	-
CUS-A3	White Caulking	Connecting Up Shed, grey wood framed structure, wood frame-panel interface	None Detected	-
The Workshop				
W-A1	Brick Mortar	The Workshop, wall	None Detected	-
W-A2	White Parging Cement	The Workshop, wall	None Detected	-
	Brick Mortar	The Workshop, wall	None Detected	-
W-A3	Mortar	The Workshop, mortar around chimney cleanout hatch	None Detected	-
W-A4	White/Grey Caulking	The Workshop, exterior, around door frame on brick	2% Chrysotile	Non-Friable
W-Dup	Duplicate of W-A4	Duplicate of W-A4	2% Chrysotile	Non-Friable
W-A5	White Caulking	The Workshop, wood/brick doorframe interface	1% Chrysotile	Non-Friable
Loaded Mines Store				
LMS-A1	Brick Mortar	Loaded Mines Store, wall	None Detected	-
LMS-A2	Tar	Loaded Mines Store, metal bracket	None Detected	-
LMS-A3	Brick Mortar Debris	Loaded Mines Store, debris on ground	None Detected	-

Notes: **Value** – Values in bold indicate asbestos in sample greater than 0.5%.

TABLE 2: TOTAL AND LEACHABLE METALS IN PAINT
 GEORGES ISLAND NATIONAL HISTORIC SITE, HALIFAX, NOVA SCOTIA
 ENGLOBE PROJECT NO. 2000155

SAMPLE ID	SAMPLE DESCRIPTION / CONDITION	SAMPLE LOCATION	TOTAL METALS (MG/KG)		LEACHABLE (MG/L)	
			LEAD	MERCURY	LEAD	MERCURY
AS-P1	White flaking paint on brick wall, poor locally, good overall	Artillery Store, brick wall	<u>38000</u>	<1.0	180	-
FFB-P1	Grey flaking paint on wood window frames, 80% poor condition	Field Forge Building, interior wood window frame	<u>600</u>	<1.0	-	-
FFB-P2	White flaking paint on brick wall, poor locally, good overall	Field Forge Building, brick wall	<u>510</u>	<1.0	-	-
RML-P1	White flaking paint on brick, poor locally, good overall	RML Laboratory, brick wall	<u>96</u>	<1.0	-	-
RML-P2	Black flaking paint on metal pipe, 60% poor condition	RML Laboratory, metal pipe	<u>160</u>	<1.0	-	-
JC-P1	Black flaking paint on metal jail cell bars, 30 % poor condition	Jail cells, metal cell bars	<u>180</u>	2.3	-	-
JC-P2	White paint on brick walls, fair – poor condition.	Jail cells, brick wall	<u>1800</u>	<1.0	0.022	-
GHJ-P1	White paint and plaster substrate, poor condition locally	Guardroom, wall	13	<1.0	-	-
GHJ-P3	Grey flaking paint on wood door frame	Guardroom, door frame	<u>15000</u>	4.7	29	-
MQ-P1	Grey flaking paint on white parging cement	Married Officers Quarters, brick wall	<u>75000</u>	1200	31	0.00077
MQ-P2	Beige flaking paint on white parging cement	Married Officers Quarters, brick wall	<u>72000</u>	1.2	32	-
CS-P1	White flaking paint on parging cement, poor condition local, good overall	Coal Shed, brick wall	<u>290</u>	1.6	-	-
T-P1	Black flaking paint on metal hand railing, poor condition	Tunnel, eastern section	<u>2400</u>	<1.0	8.4	-

TABLE 2: TOTAL AND LEACHABLE METALS IN PAINT
 GEORGES ISLAND NATIONAL HISTORIC SITE, HALIFAX, NOVA SCOTIA
 ENGLOBE PROJECT NO. 2000155

T-P2	White flaking paint on parging cement, poor locally, good overall	Main Magazine, central section, wall	70	<1.0	-	-
T-P3	Black flaking paint on cannon, poor condition	Tunnel, south section	800	<1.0	-	-
T-P4	White paint on brick walls, fair – poor condition.	Tunnel, near west tunnel entrance, wall	300	<1.0	-	-
T-P5	White paint on brick walls, fair – poor condition.	Tunnel, near east tunnel entrance, wall	83	<1.0	-	-
T-P6	White paint on brick walls, fair – poor condition.	Tunnel, south cannon battery area, wall	400	<1.0	-	-
W-P1	White paint on brick walls, fair – poor condition.	Workshop, room 1, brick wall	1000	-	-	-
W-P2	Grey paint adhered to wood door frame, fair condition	Workshop, exterior, wood door frame	20	<1.0	-	-
LMS-P1	Black flaking paint on metal brackets – poor condition	Loaded mine store, exterior, metal brackets	240	2.8	-	-
CUS-P1	Grey paint adhered to wood door frame, fair condition	Connecting up shed foundation, exterior, wood frames	70	<1.0	-	-
Disposal Guidelines:			90¹/1000²	10¹/10²	5²	0.1²

Notes:

Black values exceed NSE Disposal criteria.

Underlined values exceed Surface Coating Regulations

¹ Surface Coating Materials Regulations under the Consumer Products Safety Act of Canada (2016)

² Guidelines for Disposal of Contaminated Solids in Landfills (2005).

Appendix C Laboratory Certificates



EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: (289) 997-4602 / (289) 997-4607
<http://www.EMSL.com> / torontolab@emsl.com

EMSL Canada Order 552017023
Customer ID: 55MARI77
Customer PO: 13525
Project ID:

Attn: Christina Caldwell
Englobe Corp.
97 Troop Avenue
Dartmouth, NS B3B 2A7
Phone: (902) 468-6486
Fax: (902) 468-4919
Collected: 12/19/2020
Received: 12/23/2020
Analyzed: 12/31/2020
Proj: Parks Canada / 2000155.000

Test Report: Asbestos Analysis of Bulk Materials for Nova Scotia Code of Practice Section 66 OHS Act - Asbestos in the Workplace via EPA600/R-93/116 Method

Client Sample ID: LMS-A1 **Lab Sample ID:** 552017023-0001

Sample Description: Brick Mortar

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	12/31/2020	Gray	0.0%	100.0%	None Detected	

Client Sample ID: LMS-A2 **Lab Sample ID:** 552017023-0002

Sample Description: Tar on Metal Frame

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	12/31/2020	Black	0.0%	100.0%	None Detected	

Client Sample ID: LMS-A3 **Lab Sample ID:** 552017023-0003

Sample Description: Brick Mortar Debris

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	12/31/2020	Gray	0.0%	100.0%	None Detected	

Client Sample ID: W-A1 **Lab Sample ID:** 552017023-0004

Sample Description: Brick Mortar

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	12/31/2020	Gray	0.0%	100.0%	None Detected	

Client Sample ID: W-A2-Coating **Lab Sample ID:** 552017023-0005

Sample Description: White Coating on brick

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	12/31/2020	White	0.0%	100.0%	None Detected	

Client Sample ID: W-A2-Mortar **Lab Sample ID:** 552017023-0005A

Sample Description: White Coating on brick

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	12/31/2020	Gray	0.0%	100.0%	None Detected	

Client Sample ID: W-A3 **Lab Sample ID:** 552017023-0006

Sample Description: Chimney Hatch Mortar

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	12/31/2020	Gray	0.0%	100.0%	None Detected	



EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: (289) 997-4602 / (289) 997-4607
<http://www.EMSL.com> / torontolab@emsl.com

EMSL Canada Order 552017023
Customer ID: 55MARI77
Customer PO: 13525
Project ID:

Test Report: Asbestos Analysis of Bulk Materials for Nova Scotia Code of Practice Section 66 OHS Act - Asbestos in the Workplace via EPA600/R-93/116 Method

Client Sample ID: W-A4 **Lab Sample ID:** 552017023-0007
Sample Description: White/Grey Caulking

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	12/31/2020	Gray	0.0%	98.0%	2% Chrysotile	

Client Sample ID: W-A5 **Lab Sample ID:** 552017023-0008
Sample Description: White Caulking

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	12/31/2020	Gray/White	0.0%	99.0%	1% Chrysotile	

Client Sample ID: DUP-1 **Lab Sample ID:** 552017023-0009
Sample Description: Caulking

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	12/31/2020	Gray	0.0%	98.0%	2% Chrysotile	

Client Sample ID: CUS-A1-Tar **Lab Sample ID:** 552017023-0010
Sample Description: Conate / tar on foundation floor

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	12/31/2020	Black	0.0%	100.0%	None Detected	

Client Sample ID: CUS-A1-Mortar **Lab Sample ID:** 552017023-0010A
Sample Description: Conate / tar on foundation floor

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	12/31/2020	Gray	0.0%	100.0%	None Detected	

Client Sample ID: CUS-A2 **Lab Sample ID:** 552017023-0011
Sample Description: Brick Mortar

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	12/31/2020	Gray	0.0%	100.0%	None Detected	

Client Sample ID: CUS-A3 **Lab Sample ID:** 552017023-0012
Sample Description: White caulking

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	12/31/2020	Gray/White	0.0%	100.0%	None Detected	

Client Sample ID: JC-A1 **Lab Sample ID:** 552017023-0013
Sample Description: Grey caulking

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	12/31/2020	Gray	0.0%	98.0%	2% Chrysotile	



EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: (289) 997-4602 / (289) 997-4607
<http://www.EMSL.com> / torontolab@emsl.com

EMSL Canada Order 552017023
Customer ID: 55MARI77
Customer PO: 13525
Project ID:

**Test Report: Asbestos Analysis of Bulk Materials for Nova Scotia Code of Practice Section 66 OHS
Act - Asbestos in the Workplace via EPA600/R-93/116 Method**

Analyst(s):

Kira Ramphal PLM (15)

Reviewed and approved by:

Matthew Davis or other approved signatory
or Other Approved Signatory

None Detected = <0.1%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency or the U.S. Government

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 12/31/202016:01:18



Your P.O. #: 13524
 Your Project #: 2000155.000
 Site Location: GEORGES ISLAND
 Your C.O.C. #: n/a

Attention: Doreen Chenard

Englobe Corp
 97 Troop Ave
 Dartmouth, NS
 CANADA B3B 2A7

Report Date: 2020/12/29
 Report #: R6465824
 Version: 3 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BV LABS JOB #: C0Y0471

Received: 2020/12/21, 10:48

Sample Matrix: Paint
 # Samples Received: 7

Analyses	Quantity	Date	Date	Laboratory Method	Analytical Method
		Extracted	Analyzed		
Metals Paint Acid Extr. ICPMS	7	2020/12/23	2020/12/24	ATL SOP 00058	EPA 6020B R2 m

Sample Matrix: Solid
 # Samples Received: 2

Analyses	Quantity	Date	Date	Laboratory Method	Analytical Method
		Extracted	Analyzed		
Metals Bulk Acid Extr. ICPMS	2	2020/12/23	2020/12/24	ATL SOP 00058	EPA 6020B R2 m

Remarks:

Bureau Veritas Laboratories are accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by BV Labs are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in BV Labs profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and BV Labs in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

BV Labs liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by BV Labs, unless otherwise agreed in writing. BV Labs is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by BV Labs, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

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.



Your P.O. #: 13524
Your Project #: 2000155.000
Site Location: GEORGES ISLAND
Your C.O.C. #: n/a

Attention: Doreen Chenard

Englobe Corp
97 Troop Ave
Dartmouth, NS
CANADA B3B 2A7

Report Date: 2020/12/29
Report #: R6465824
Version: 3 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BV LABS JOB #: C0Y0471
Received: 2020/12/21, 10:48

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Keri Mackay, Customer Experience Team Lead
Email: Keri.MACKAY@bvlabs.com
Phone# (902)420-0203 Ext:294

=====
BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



**BUREAU
VERITAS**

BV Labs Job #: COY0471
Report Date: 2020/12/29

Englobe Corp
Client Project #: 2000155.000
Site Location: GEORGES ISLAND
Your P.O. #: 13524
Sampler Initials: AT

ELEMENTS BY ATOMIC SPECTROSCOPY (PAINT)

BV Labs ID		OLX541	OLX543	OLX545	OLX546	OLX547	OLX548	OLX548		
Sampling Date		2020/12/19	2020/12/19	2020/12/19	2020/12/19	2020/12/19	2020/12/19	2020/12/19		
COC Number		n/a	n/a	n/a	n/a	n/a	n/a	n/a		
	UNITS	LMS-P1	W-P1	JC-P1	JC-P2	T-P4	T-P5	T-P5 Lab-Dup	RDL	QC Batch

Metals										
Acid Extractable Lead (Pb)	mg/kg	240	1000	180	1800	300	83	77	5.0	7124362
Acid Extractable Mercury (Hg)	mg/kg	2.8	<1.0	2.3	<1.0	<1.0	<1.0	<1.0	1.0	7124362

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

BV Labs ID		OLX549		
Sampling Date		2020/12/19		
COC Number		n/a		
	UNITS	T-P6	RDL	QC Batch
Metals				
Acid Extractable Lead (Pb)	mg/kg	400	5.0	7124362
Acid Extractable Mercury (Hg)	mg/kg	<1.0	1.0	7124362
RDL = Reportable Detection Limit QC Batch = Quality Control Batch				



BUREAU
VERITAS

BV Labs Job #: COY0471
Report Date: 2020/12/29

Englobe Corp
Client Project #: 2000155.000
Site Location: GEORGES ISLAND
Your P.O. #: 13524
Sampler Initials: AT

ELEMENTS BY ATOMIC SPECTROSCOPY (SOLID)

BV Labs ID		OLX542	OLX544	OLX544		
Sampling Date		2020/12/19	2020/12/19	2020/12/19		
COC Number		n/a	n/a	n/a		
	UNITS	CUS-P1	W-P2	W-P2 Lab-Dup	RDL	QC Batch
Metals						
Acid Extractable Lead (Pb)	mg/kg	70	20	19	5.0	7124371
Acid Extractable Mercury (Hg)	mg/kg	<1.0	<1.0	<1.0	1.0	7124371
RDL = Reportable Detection Limit						
QC Batch = Quality Control Batch						
Lab-Dup = Laboratory Initiated Duplicate						



BUREAU
VERITAS

BV Labs Job #: COY0471
Report Date: 2020/12/29

Englobe Corp
Client Project #: 2000155.000
Site Location: GEORGES ISLAND
Your P.O. #: 13524
Sampler Initials: AT

GENERAL COMMENTS

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

Package 1	14.7°C
-----------	--------

Revised Report: Mercury added to all samples as per request from Christina C. 2020/12/29 HWS.

Sample OLX546 [JC-P2] : Moisture value reported is a visual estimate for calculation purposes.

Results relate only to the items tested.



BUREAU
VERITAS

BV Labs Job #: COY0471
Report Date: 2020/12/29

Englobe Corp
Client Project #: 2000155.000
Site Location: GEORGES ISLAND
Your P.O. #: 13524
Sampler Initials: AT

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
7124362	BAN	Matrix Spike [OLX548-01]	Acid Extractable Lead (Pb)	2020/12/24		NC	%	75 - 125
			Acid Extractable Mercury (Hg)	2020/12/24		99	%	75 - 125
7124362	BAN	Spiked Blank	Acid Extractable Lead (Pb)	2020/12/24		99	%	75 - 125
			Acid Extractable Mercury (Hg)	2020/12/24		106	%	75 - 125
7124362	BAN	Method Blank	Acid Extractable Lead (Pb)	2020/12/24	<5.0		mg/kg	
			Acid Extractable Mercury (Hg)	2020/12/24	<1.0		mg/kg	
7124362	BAN	RPD [OLX548-01]	Acid Extractable Lead (Pb)	2020/12/24	7.9		%	35
			Acid Extractable Mercury (Hg)	2020/12/24	NC		%	35
7124371	BAN	Matrix Spike [OLX544-01]	Acid Extractable Lead (Pb)	2020/12/24		116	%	75 - 125
			Acid Extractable Mercury (Hg)	2020/12/24		104	%	75 - 125
7124371	BAN	Spiked Blank	Acid Extractable Lead (Pb)	2020/12/24		99	%	75 - 125
			Acid Extractable Mercury (Hg)	2020/12/24		106	%	75 - 125
7124371	BAN	Method Blank	Acid Extractable Lead (Pb)	2020/12/24	<5.0		mg/kg	
			Acid Extractable Mercury (Hg)	2020/12/24	<1.0		mg/kg	
7124371	BAN	RPD [OLX544-01]	Acid Extractable Lead (Pb)	2020/12/24	4.4		%	35
			Acid Extractable Mercury (Hg)	2020/12/24	NC		%	35

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.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).



BUREAU
VERITAS

BV Labs Job #: COY0471
Report Date: 2020/12/29

Englobe Corp
Client Project #: 2000155.000
Site Location: GEORGES ISLAND
Your P.O. #: 13524
Sampler Initials: AT

VALIDATION SIGNATURE PAGE

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

A handwritten signature in black ink that reads 'Mike MacGillivray'.

Mike MacGillivray, Scientific Specialist (Inorganics)

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



Your P.O. #: 13524
 Your Project #: 2000155.000
 Site Location: GEORGES ISLAND
 Your C.O.C. #: n/a

Attention: Doreen Chenard

Englobe Corp
 97 Troop Ave
 Dartmouth, NS
 CANADA B3B 2A7

Report Date: 2021/01/06
 Report #: R6471835
 Version: 4 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BV LABS JOB #: COY0471

Received: 2020/12/21, 10:48

Sample Matrix: Paint
 # Samples Received: 7

Analyses	Quantity	Date	Date	Laboratory Method	Analytical Method
		Extracted	Analyzed		
CGSB extraction - Init and Final pH	1	N/A	2021/01/05	ATL SOP 00034	CGSB 164-GP-1 MP m
CGSB extraction - volume of extractant	1	N/A	2021/01/05	ATL SOP 00034	CGSB 164-GP-1 MP m
CGSB extraction - Dry Weight	1	N/A	2021/01/05	ATL SOP 00034	CGSB 164-GP-1 MP m
Metals Leach TCLP/CGSB extraction	1	2021/01/05	2021/01/05	ATL SOP 00058	EPA 6020B R2 m
Metals Paint Acid Extr. ICPMS	7	2020/12/23	2020/12/24	ATL SOP 00058	EPA 6020B R2 m
Moisture	1	N/A	2020/12/29	ATL SOP 00001	OMOE Handbook 1983 m

Sample Matrix: Solid
 # Samples Received: 2

Analyses	Quantity	Date	Date	Laboratory Method	Analytical Method
		Extracted	Analyzed		
Metals Bulk Acid Extr. ICPMS	2	2020/12/23	2020/12/24	ATL SOP 00058	EPA 6020B R2 m

Remarks:

Bureau Veritas Laboratories are accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by BV Labs are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in BV Labs profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and BV Labs in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

BV Labs liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by BV Labs, unless otherwise agreed in writing. BV Labs is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by BV Labs, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

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.



Your P.O. #: 13524
Your Project #: 2000155.000
Site Location: GEORGES ISLAND
Your C.O.C. #: n/a

Attention: Doreen Chenard

Englobe Corp
97 Troop Ave
Dartmouth, NS
CANADA B3B 2A7

Report Date: 2021/01/06
Report #: R6471835
Version: 4 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BV LABS JOB #: C0Y0471
Received: 2020/12/21, 10:48

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Keri Mackay, Customer Experience Team Lead
Email: Keri.MACKAY@bvlabs.com
Phone# (902)420-0203 Ext:294

=====
BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



BUREAU
VERITAS

BV Labs Job #: COY0471
Report Date: 2021/01/06

Englobe Corp
Client Project #: 2000155.000
Site Location: GEORGES ISLAND
Your P.O. #: 13524
Sampler Initials: AT

CGSB LEACHATE + LEAD (PAINT)

BV Labs ID		OLX546		
Sampling Date		2020/12/19		
COC Number		n/a		
	UNITS	JC-P2	RDL	QC Batch
Charge/Prep Analysis				
Dry Weight	g	50	0.010	7134024
Volume of Acetic Acid	mL/L	200	N/A	7134026
Inorganics				
Moisture	%	<5.0 (1)	5.0	7129369
Initial pH	N/A	10	N/A	7134025
Final pH	N/A	6.5	N/A	7134025
Metals				
Leachable Lead (Pb)	ug/L	22	5.0	7135453
RDL = Reportable Detection Limit QC Batch = Quality Control Batch N/A = Not Applicable (1) Moisture value reported is a visual estimate for calculation purposes.				



BUREAU
VERITAS

BV Labs Job #: COY0471
Report Date: 2021/01/06

Englobe Corp
Client Project #: 2000155.000
Site Location: GEORGES ISLAND
Your P.O. #: 13524
Sampler Initials: AT

ELEMENTS BY ATOMIC SPECTROSCOPY (PAINT)

BV Labs ID		OLX541	OLX543	OLX545	OLX546	OLX547	OLX548	OLX548		
Sampling Date		2020/12/19	2020/12/19	2020/12/19	2020/12/19	2020/12/19	2020/12/19	2020/12/19		
COC Number		n/a	n/a	n/a	n/a	n/a	n/a	n/a		
	UNITS	LMS-P1	W-P1	JC-P1	JC-P2	T-P4	T-P5	T-P5 Lab-Dup	RDL	QC Batch

Metals										
Acid Extractable Lead (Pb)	mg/kg	240	1000	180	1800	300	83	77	5.0	7124362
Acid Extractable Mercury (Hg)	mg/kg	2.8	<1.0	2.3	<1.0	<1.0	<1.0	<1.0	1.0	7124362

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

BV Labs ID		OLX549		
Sampling Date		2020/12/19		
COC Number		n/a		
	UNITS	T-P6	RDL	QC Batch
Metals				
Acid Extractable Lead (Pb)	mg/kg	400	5.0	7124362
Acid Extractable Mercury (Hg)	mg/kg	<1.0	1.0	7124362
RDL = Reportable Detection Limit QC Batch = Quality Control Batch				



BUREAU
VERITAS

BV Labs Job #: COY0471
Report Date: 2021/01/06

Englobe Corp
Client Project #: 2000155.000
Site Location: GEORGES ISLAND
Your P.O. #: 13524
Sampler Initials: AT

ELEMENTS BY ATOMIC SPECTROSCOPY (SOLID)

BV Labs ID		OLX542	OLX544	OLX544		
Sampling Date		2020/12/19	2020/12/19	2020/12/19		
COC Number		n/a	n/a	n/a		
	UNITS	CUS-P1	W-P2	W-P2 Lab-Dup	RDL	QC Batch
Metals						
Acid Extractable Lead (Pb)	mg/kg	70	20	19	5.0	7124371
Acid Extractable Mercury (Hg)	mg/kg	<1.0	<1.0	<1.0	1.0	7124371
RDL = Reportable Detection Limit						
QC Batch = Quality Control Batch						
Lab-Dup = Laboratory Initiated Duplicate						



BUREAU
VERITAS

BV Labs Job #: COY0471

Report Date: 2021/01/06

Englobe Corp

Client Project #: 2000155.000

Site Location: GEORGES ISLAND

Your P.O. #: 13524

Sampler Initials: AT

GENERAL COMMENTS

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

Package 1	14.7°C
-----------	--------

Revised Report: Mercury added to all samples as per request from Christina C. 2020/12/29 HWS.

Results relate only to the items tested.



BUREAU
VERITAS

BV Labs Job #: COY0471
Report Date: 2021/01/06

Englobe Corp
Client Project #: 2000155.000
Site Location: GEORGES ISLAND
Your P.O. #: 13524
Sampler Initials: AT

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
7124362	BAN	Matrix Spike [OLX548-01]	Acid Extractable Lead (Pb)	2020/12/24		NC	%	75 - 125
			Acid Extractable Mercury (Hg)	2020/12/24		99	%	75 - 125
7124362	BAN	Spiked Blank	Acid Extractable Lead (Pb)	2020/12/24		99	%	75 - 125
			Acid Extractable Mercury (Hg)	2020/12/24		106	%	75 - 125
7124362	BAN	Method Blank	Acid Extractable Lead (Pb)	2020/12/24	<5.0		mg/kg	
			Acid Extractable Mercury (Hg)	2020/12/24	<1.0		mg/kg	
7124362	BAN	RPD [OLX548-01]	Acid Extractable Lead (Pb)	2020/12/24	7.9		%	35
			Acid Extractable Mercury (Hg)	2020/12/24	NC		%	35
7124371	BAN	Matrix Spike [OLX544-01]	Acid Extractable Lead (Pb)	2020/12/24		116	%	75 - 125
			Acid Extractable Mercury (Hg)	2020/12/24		104	%	75 - 125
7124371	BAN	Spiked Blank	Acid Extractable Lead (Pb)	2020/12/24		99	%	75 - 125
			Acid Extractable Mercury (Hg)	2020/12/24		106	%	75 - 125
7124371	BAN	Method Blank	Acid Extractable Lead (Pb)	2020/12/24	<5.0		mg/kg	
			Acid Extractable Mercury (Hg)	2020/12/24	<1.0		mg/kg	
7124371	BAN	RPD [OLX544-01]	Acid Extractable Lead (Pb)	2020/12/24	4.4		%	35
			Acid Extractable Mercury (Hg)	2020/12/24	NC		%	35
7134024	EPU	Method Blank	Dry Weight	2021/01/05	NA, RDL=0.010		g	
7134025	EPU	Method Blank	Initial pH	2021/01/05	5.0		N/A	
			Final pH	2021/01/05	5.0		N/A	
7134026	EPU	Method Blank	Volume of Acetic Acid	2021/01/05	0.0		mL/L	
7135453	MLB	Matrix Spike [OLX546-01]	Leachable Lead (Pb)	2021/01/05		101	%	75 - 125
7135453	MLB	Spiked Blank	Leachable Lead (Pb)	2021/01/05		101	%	75 - 125
7135453	MLB	Method Blank	Leachable Lead (Pb)	2021/01/05	<5.0		ug/L	

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.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).



BUREAU
VERITAS

BV Labs Job #: COY0471
Report Date: 2021/01/06

Englobe Corp
Client Project #: 2000155.000
Site Location: GEORGES ISLAND
Your P.O. #: 13524
Sampler Initials: AT

VALIDATION SIGNATURE PAGE

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

Eric Dearman, Scientific Specialist

Mike MacGillivray, Scientific Specialist (Inorganics)

Rosemarie MacDonald, Scientific Specialist (Organics)

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Appendix D Photographs



PHOTO 1 — East to West Tunnel, showing white paint in poor condition (note how the condition of the paint varies)

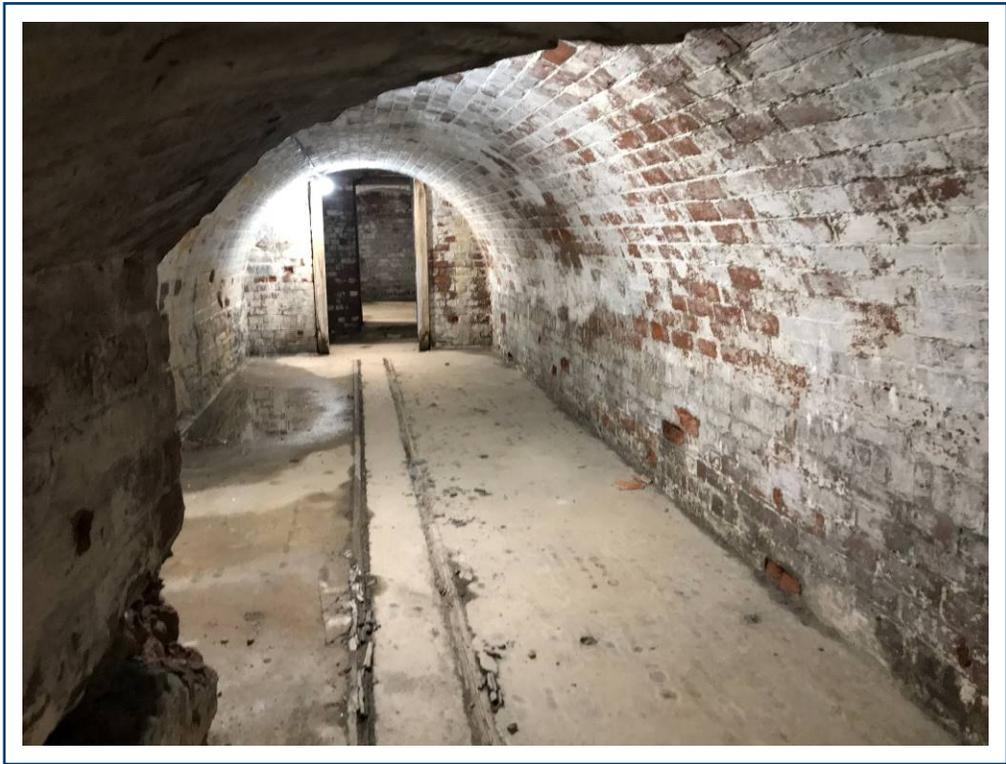


PHOTO 2 — East to West Tunnel, showing white paint in poor condition (note how the condition of the paint varies)



PHOTO 3 — Lower Battery South, note the painted black cannon.

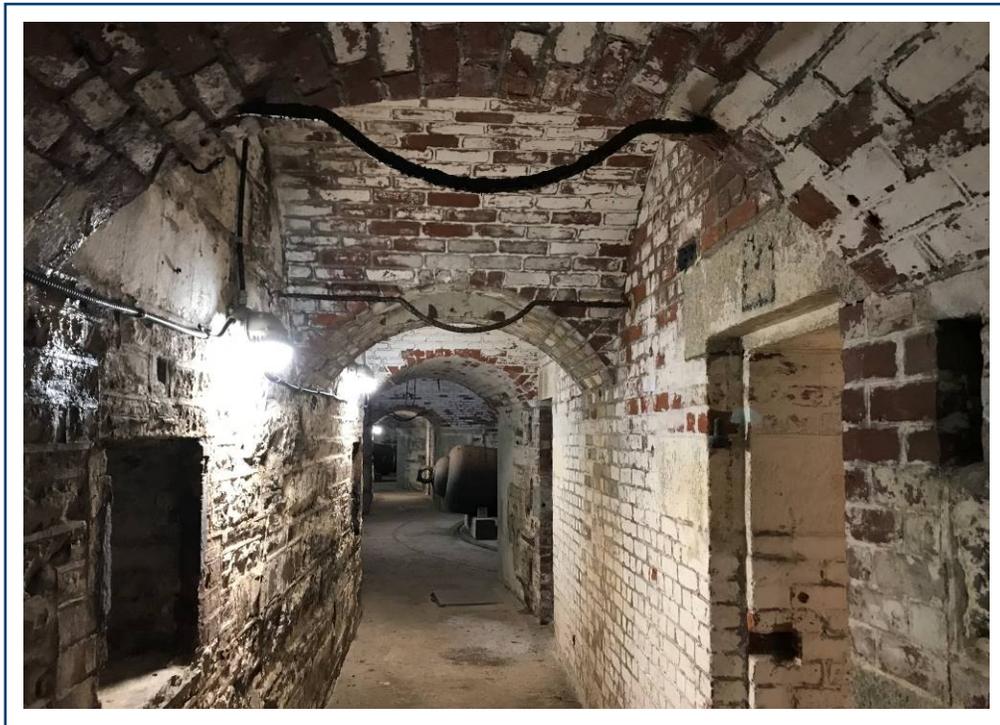


PHOTO 4 — Lower Battery South showing white paint in poor condition (note how the condition of the paint varies)