



• **PARKS CANADA**

Hazardous Materials Assessment

Type of Document
Final Report

Project Name
Hawthorne Cottage
Civic No. 1 South Street
Brigus, Newfoundland and Labrador

Project Number
SJN-00239615-A0

Prepared by:

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Date Submitted
June 2017

PARKS CANADA

Hazardous Materials Assessment

Type of Document:
Final Report

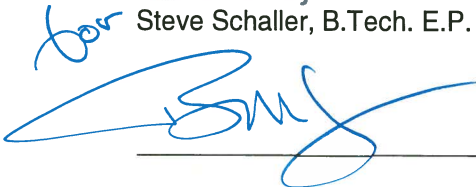
Project Name:
Hawthorne Cottage
Brigus, Newfoundland and Labrador

Project Number:
SJN-00239615-A0

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June 2017

Legal Notification

This report was prepared by **exp** Services Inc. for the account of the **Parks Canada**.

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1 INTRODUCTION

Acting at the request of *Parks Canada (PC)*, and in general accordance with our proposal dated April 13, 2017, **exp** Services Inc. (**exp**) has completed a Hazardous Materials Assessment (HMA) at Hawthorne Cottage, located at Civic No. 1 South Street, in Brigus, Newfoundland and Labrador. The purpose of this assessment was to determine the presence of potentially-hazardous building materials within those building elements proposed for restoration in an upcoming PC project.

2 SITE DESCRIPTION AND BACKGROUND

The subject site is located at Civic No. 1 South Street, in Brigus, Newfoundland and Labrador (refer to *Figure 1: Site Location Plan*, appended). The property contains a partial two-storey wood-frame residential dwelling (now a National Historic Site) with a stone/concrete foundation. It is understood that the original storey and one-half section of the building was constructed in 1830 before being moved to its current site in 1833-1834. The existing veranda was added to the west, north, and east sides of the original building in 1863. A two-storey section was added to the south side of the building in the late 1920s. A small single-storey porch was added to the south side of the building in recent years, possibly since *PC* took over responsibility for the site in the early 1990s. *PC* is in the planning stages for a restoration/maintenance project at Hawthorne Cottage. The proposed scope of work for the project will involve maintenance of the building shell and includes:

- replacement of all roofing
- re-pointing and/or replacement of the three chimneys
- scraping and painting of exterior wooden clapboard siding (replacement of any deteriorated boards and trim)
- replacement of the veranda columns and decking
- replacement of storm windows
- scraping and painting of windows (including removal/replacement of window putty/caulk).

Based on the above project SOW provide by *PC*, **exp** Services Inc. identified the following potential ACMs (which may be disturbed during the project) for sampling during this assessment: roofing materials, window putty, and chimney mortar. In the event that the work scope is expanded or other potential ACMs are encountered that have not been previously sampled, further sampling and analysis should be completed. Additionally, refurbishment of the building exterior may disturb painted surfaces which could contain lead, mercury and mould.

3 METHODOLOGY

The field survey was completed on May 10, 2017, by Mr. Cyril J. Pumphrey, B.Sc., B.E.S., P.Geo., with **exp** in St. John's, Newfoundland and Labrador. The field survey involved a sampling program of potentially-hazardous building materials which may be disturbed during the proposed restoration project, such as roofing materials (membrane, shingles and underlay), window putty, and chimney mortar for asbestos; flaking exterior paint for lead and mercury, and exterior paint flakes for mould. All sample locations are shown on *Figure 2: Sample Location Plan*. All asbestos samples were collected and placed in clean plastic zip-loc bags and shipped directly to *EMSL Canada Inc.* in Mississauga, Ontario for determination of asbestos content using *EPA 600/R-93/116 Method* using *Polarized Light Microscopy*. Paint samples were collected and placed in clean plastic zip-loc bags, labelled, and shipped to *Maxxam Analytics* lab in Bedford, Nova Scotia for lead/mercury determination by ICP-MS following ATL SOP 00058 (ref. EPA 6020A R1m). Suspect mould samples were collected in bulk (flaking paint substrate) and placed in clean plastic zip-loc bags, labelled, and shipped to *Sporometrics Inc.* lab in Toronto, Ontario for bulk fungal microscopic identification.

4 INVESTIGATION RESULTS

A detailed summary of observations and laboratory results pertaining to materials sampled is provided in *Table 4.1: Summary of Laboratory Results (Asbestos)*, *Table 4.2: Summary of Laboratory Results (Lead in Paint)*, *Table 4.3: Summary of Laboratory Results (Lead Paint Leachability)*, *Table 4.4: Summary of Laboratory Results (Mercury in Paint)*, and *Table 4.5: Summary of Laboratory Results (Bulk Mould)*. A photo album showing key features of the Site is included in the Appendix. Laboratory analysis certificates are also appended.

4.1 Asbestos-Containing Materials (ACMs)

4.1.2 Non-Friable and Potentially Friable Materials

Roofing Materials

Roofing materials were sampled from four distinct areas of the building, as follows:

Original Building:

The original building roof contained wooden shingles with a felt underlay. One sample (labelled HC-A2) of this felt underlay was collected and found to be non-asbestos.

Two-Storey Section:

The two-storey section of the building contained a layered membrane roof with tar and fibreboard. A cross-section (labelled HC-A1) of this roof was collected; the laboratory tested five distinct components (sub-samples) of this roof and all were found to be non-asbestos.

Single Storey Porch:

The single-storey porch section of the building contained a layered membrane roof with tar and fibreboard. A cross-section (labelled HC-A3) of this roof was collected; the laboratory tested three distinct components (sub-samples) of this roof and all were found to be non-asbestos.

Veranda:

The veranda roof was clad with asphalt shingles containing a felt/tar underlay. A section of this material (labelled HC-A4) was collected; the laboratory tested two sub-samples containing asphalt shingle with felt and tar. One of these sub-samples was found to be non-asbestos, while the other was found to be asbestos-containing with **2% Chrysotile Asbestos**. All roof cladding from the veranda should be considered as asbestos containing.

Chimney Mortar

Three of the existing chimneys are proposed for up-grade. The chimney associated with the two-storey section is in very bad condition and will be removed and replaced. One sample (labelled HC-A5) of mortar collected from this chimney was tested and found to be non-asbestos. The other two chimneys were found to be in better condition and could not be sampled without causing damage.

Window Putty

Most of the building windows contained putty. Seven samples (labelled HC-A6 through HC-A12, inclusive) of window putty were collected from the building windows (including one storm-window in storage in the basement) and all were found to be non-asbestos- containing.

Table 4.1 Summary of Laboratory Results (Asbestos) Hawthorne Cottage Brigus, Newfoundland and Labrador		
Sample ID.	Description	Results
HC-A1	Two-storey Section Roof Cross-Section – Silver Paint	No Asbestos Detected
HC-A1	Two-storey Section Roof Cross-Section – Tar Felt	No Asbestos Detected
HC-A1	Two-storey Section Roof Cross-Section – Fibre Board	No Asbestos Detected
HC-A1	Two-storey Section Roof Cross-Section – Tar	No Asbestos Detected
HC-A1	Two-storey Section Roof Cross-Section – Tar Felt 2	No Asbestos Detected
HC-A2	Original Section Roof – Felt Under Wood Shingles	No Asbestos Detected
HC-A3	Porch Roof Cross Section – Silver Paint	No Asbestos Detected
HC -A3	Porch Roof Cross Section – Tar Felts	No Asbestos Detected
HC -A3	Porch Roof Cross Section – Fibre Board	No Asbestos Detected
HC -A4	Veranda Roof - Shingle and Felt with Tar	No Asbestos Detected
HC -A4	Veranda Roof - Shingle and Felt with Tar	2 % Chrysotile Asbestos
HC -A5	Chimney Mortar (Two-storey Section)	No Asbestos Detected
HC-A6	Window Putty (Two-storey Section)	No Asbestos Detected
HC -A7	Window Putty (Original Section)	No Asbestos Detected
HC -A8	Storm Window Putty (Original Section)	No Asbestos Detected
HC -A9	Storm Window Putty (Original Section)	No Asbestos Detected
HC -A10	Window Putty (Storm Window-basement storage)	No Asbestos Detected
HC -A11	Window Putty (Original Section)	No Asbestos Detected
HC -A12	Window Putty (New Window – Two-storey Section)	No Asbestos Detected
Under Newfoundland and Labrador Regulation 111/94-Asbestos Abatement Regulations, 1998. Asbestos Material is defined as having > 1% Asbestos by Dry Weight.		

4.2 Lead

Potential sources of lead which may be disturbed by the proposed restoration project include painted surfaces, in particular siding, windows/trim, and veranda columns and decking. In the mid-1970s both Canada and the United States restricted the concentrations of lead that could be used in paints to 0.5% by weight (or 5000 mg/kg). In 2005 Health Canada further restricted the concentration of lead (to 0.06% by weight or 600 mg/kg) that could be used in paints to which children or pregnant women may be exposed, through the Surface Coating Material Regulations (SCMRs), under the Hazardous Products Act. This limit was further reduced in 2010 to 90 mg/kg.

Disposal of lead-containing construction debris is regulated Provincially through the *Management and Disposal of Construction, Abatement and Demolition Waste Containing Lead-Based Paint (Draft)* policy developed by the *Newfoundland and Labrador Department of Municipal Affairs and Environment (NLDME)*. This Policy indicates that the landfill disposal limit for lead-containing paint is 5000 mg/kg. In the case of paint with a lead concentration over 5000 mg/kg, leachability testing is required to determine disposal options. A lead leachability limit of 5 mg/L has been established to identify hazardous waste. Debris with a lead leachability less than 5 mg/L may be disposed-of at the local landfill, subject to operator approval. Debris with a lead leachability greater than 5 mg/L must be treated as a hazardous waste. For loose and peeling paint, this leachability testing must be completed on the paint itself; however, for paint-containing construction debris, the paint, plus the substrate, may be tested together to determine the associated leachability. The Policy includes other provisions for leachability testing on composite samples.

A total of 12 paint samples (labelled HC-P1 through HC-P12, inclusive) collected from the various building components (including siding, trim, windows, and veranda posts/ rails/decking) were submitted for laboratory analysis for lead, as indicated in *Table 4.2 Summary of Laboratory Results (Lead in Paint)*. Overall paint was observed to be in poor condition with local areas of excessive flaking and peeling. The wooden substrate showed deterioration and rot on parts of the veranda.

Eleven of the 12 paint samples collected were found to contain lead concentrations in excess of the threshold concentration considered acceptable for landfill disposal, with concentrations ranging from 2800 mg/kg to 75 000 mg/kg.

Table 4.2 Summary of Laboratory Results (Lead in Paint) Hawthorne Cottage – Brigus, Newfoundland and Labrador		
Sample ID.	Description	Results
HC-P1	Green Paint – (Storm Window)	25 000 mg/kg
HC-P2	White Paint – Two-storey Section (Clapboard)	14 000 mg/kg
HC-P2 Duplicate	Lab Duplicate of HC-P2	13 000 mg/kg
HC-P3	White Paint – Original Building (Clapboard)	57 000 mg/kg
HC-P4	White Paint – Porch (Clapboard)	29 000 mg/kg
HC-P5	Blue-Grey Paint – Porch (Trim)	23 000 mg/kg
HC-P6	Blue Grey Paint – Two-storey Section (Storm Window)	26 000 mg/kg
HC-P7	Blue Grey Paint – Veranda (Rail/Post)	11 000 mg/kg
HC-P8	Blue Grey Paint – Veranda (Rail/Post)	26 000 mg/kg
HC-P9	Grey Red Paint - Veranda (Deck)	25 000 mg/kg
HC-P10	Blue Grey Paint – Original Building (Entrance Panel)	75 000 mg/kg
HC-P11	Grey Paint – Veranda (Deck)	2800 mg/kg
HC-P12	White Paint – Two-storey Section (Trim)	56 000 mg/kg
Surface Coating Materials Regulations for lead = 90 mg/kg; Landfill disposal limit for lead = 5000 mg/kg in bulk sample/paint flakes or 5 mg/L where leachability analysis completed Nd = non-detect		

Since most of the paint samples contained lead in excess of the 5000 mg/kg threshold, follow-up leachability testing was completed on composite samples of the collected paint-only samples, as indicated in *Table 4.3 Summary of Laboratory Results (Lead Paint Leachability)*.

Table 4.3 Summary of Laboratory Results (Lead Paint Leachability) Hawthorne Cottage Brigus, Newfoundland and Labrador		
Sample ID.	Description	Results
Composite 1	Mixture of white paint samples HC-P3, HC-P4, and HC-P12.	90 mg/L
Composite 2	Mixture of deck paint samples HC-P9 and HC-P11.	41 mg/L
Composite 3	Mixture of blue-grey paint samples HC-P5, HC-P6, and HC-P10.	170 mg/L
Landfill disposal limit for lead = 5 mg/L where leachability analysis completed.		

The leachable lead concentration in the three composite samples tested ranged from **41 mg/L to 170 mg/L**; in each case the leachable lead concentration in the composite samples exceeded that which is considered acceptable for local landfill disposal. These paints therefore, will require treatment as hazardous waste.

4.3 Mercury

Potential sources of mercury which may be disturbed by the proposed restoration project include painted surfaces, in particular, siding, windows/trim, and veranda columns and decking. Based on an investigation by Consumer and Corporate Affairs Canada, and an assessment of potential health risks by Health and Welfare Canada, in 1991 the decision was made to eliminate the use of mercury compounds in indoor latex paints. The Canadian Paint and Coatings Association (CPCA) supported the withdrawal, and all Canadian manufacturers and formulators of the preservative voluntarily agreed to remove “interior uses” from their product labels. In 2010, Health Canada restricted the concentration of mercury (to 10 mg/kg) that could be used in paints that are applied on surface coatings to which children or pregnant women may be exposed. For purposes of determination of disposal options, mercury in paint results are compared to the Soil Quality Guidelines for Industrial Sites provided by the Canadian Council of Ministers of the Environment (CCME).

A total of 12 paint samples (labelled HC-P1 through HC-P12, inclusive) collected from the various building components (including siding, trim, windows, and veranda posts/ rails/decking) were submitted for laboratory analysis for mercury, as indicated in *Table 4.4 Summary of Laboratory Results (Mercury in Paint)*. Overall paint was observed to be in poor condition with local areas of excessive flaking and peeling. The wooden substrate showed deterioration and rot on parts of the veranda.

Mercury was detected in nine of the 12 paint samples collected at concentrations ranging from 1.5 mg/kg to 49 mg/kg. Four of the samples tested (HC-P3, HC-P4, HC-P9, and HC-P12) were found to have mercury concentrations above the 10 mg/kg threshold (as outlined by Health Canada). None of the sample results exceeded the threshold for that considered acceptable for landfill disposal. Mercury was not detected in samples HC-P1, HC-P5, or HC-P7.

Table 4.4 Summary of Laboratory Results (Mercury in Paint) Hawthorne Cottage Brigus, Newfoundland and Labrador		
Sample ID.	Description	Results
HC-P1	Green Paint – (Storm Window)	Nd
HC-P2	White Paint – Two-storey Section (Clapboard)	5.6 mg/kg
HC-P2 Duplicate	Lab Duplicate of HC-P2	6.0 mg/kg
HC-P3	White Paint – Original Building (Clapboard)	49 mg/kg
HC-P4	White Paint – Porch (Clapboard)	21 mg/kg
HC-P5	Blue-Grey Paint – Porch (Trim)	Nd
HC-P6	Blue Grey Paint – Two-storey Section (Storm Window)	1.6 mg/kg
HC-P7	Blue Grey Paint – Veranda (Rail/Post)	Nd
HC-P8	Blue Grey Paint – Veranda (Rail/Post)	1.8 mg/kg
HC-P9	Grey Red Paint - Veranda (Deck)	29 mg/kg
HC-P10	Blue Grey Paint – Original Building (Entrance Panel)	1.5 mg/kg
HC-P11	Grey Paint – Veranda (Deck)	10 mg/kg
HC-P12	White Paint – Two-storey Section (Trim)	25 mg/kg
Surface Coating Materials Regulations for mercury = 10 mg/kg; Landfill disposal limit for mercury = 50 mg/kg based on CCME Soil Quality Guidelines for Industrial Sites Nd = non-detect		

4.4 Mould

Suspect visible mould was noted on the exterior clapboard on the east side of the building. Two samples (labelled HC-M1 and HC-M2) of mould-impacted, flaking paint collected from the exterior cladding were submitted for laboratory analysis for bulk mould, as indicated in *Table 4.5 Summary of Laboratory Results (Bulk Mould)*.

Based on the laboratory testing, each of the samples had fungal growth indicated (*Cladosporium*). *Cladosporium* is a very common mould often found outdoors year round.

Safe work practices developed for removal/handling of the lead paint will adequately protect workers from any mould. Once the paint is removed, areas of the bare wood clapboard exhibiting traces of mould should be treated via chemical cleaning or

physical stripping via sanding. If the mould/moisture damage is found to be penetrating into the wood greater than 5 mm, then the material should be replaced to prevent reoccurrence. When re-painting, consideration should be given to using a paint with a mould inhibiting additive.

Table 4.5 Summary of Laboratory Results (Bulk Mould) Hawthorne Cottage Brigus, Newfoundland and Labrador		
Sample ID.	Description	Results
HC-M1	Suspect Mould on White Paint Flake - Cladding East Side	Fungal growth indicated (<i>Cladosporium</i>)
HC-M2	Suspect Mould on White Paint Flake – Cladding East Side	Fungal growth indicated (<i>Cladosporium</i>)

5 CONCLUSIONS/RECOMMENDATIONS

5.1 Asbestos-Containing Materials

ACMs were identified in the following materials:

- Roofing (asphalt shingle, felt with tar) in one sample (HC-A4) from the veranda roof.

All roofing materials (including asphalt shingles, felt and tar) from the veranda roof should be considered asbestos containing.

All ACMs must be removed and properly disposed-of by a licensed Asbestos Abatement Contractor prior to re-roofing.

5.2 Lead

Lead was detected above the SCMRs in all paint samples analysed. Further, the lead concentration in 11 of the 12 samples collected exceeded the traditional 5000 mg/kg threshold definition of lead-based paint (which is also pertinent with respect to landfill disposal). Lead leachate results from leachability testing done on three composite paint samples exceeded the applicable limits for landfill disposal of lead-paint debris. On this basis, all paint and painted materials removed from the building must be treated as a hazardous waste and disposed-of at an approved facility.

To prevent building occupants/site workers from receiving accidental lead exposure, appropriate protective measures/work procedures should be employed where workers involved in building renovations/maintenance are likely to significantly disturb lead paint surfaces. The methods used to remove the paint/painted materials should protect the workers, and ensure that the area is well-cleaned afterwards to prevent residual lead from being left in the dust on surfaces and equipment. The contractor should use appropriate methods, including, but not limited to enclosures, drop sheets, wetting techniques, and HEPA vacuuming, to ensure no dust is left behind after the removal. Direct contact is expected during the renovation. The contractor will be required to provide a safe work practice for employee protection that shall, at a minimum, include good personal hygiene (washing before eating, drinking, and smoking), dust control, and the use of P100 respirators if dust contact is likely. Depending on the methods of removal, the safe work practices may vary.

5.3 Mercury

Mercury was detected above the SCMRs in four of the paint samples analysed. None of the sample results exceeded the landfill disposal limit of 50 mg/kg, however, since the paints contain leachable lead, all paint and painted materials removed from the building must be treated as a hazardous waste and disposed-of at an approved facility.

Safe work practices/procedures employed to prevent building occupants/site workers from receiving accidental lead exposure, should also protect workers from accidental mercury exposure.

5.4 Mould

Active mould growth was confirmed on the painted clapboard at the east side of the building. It is expected that most of this mould will be removed incidentally during the scraping, removal, and disposal of paint from the exterior. Safe work practices/procedures employed to prevent building occupants/site workers from receiving accidental lead exposure, should also protect workers from accidental mould exposure. Once the paint is removed, areas of the bare wood clapboard exhibiting traces of mould should be treated via chemical cleaning or physical stripping via sanding. If the mould/moisture damage is found to be penetrating into the wood greater than 5 mm, then the material should be replaced. When re-painting, consideration should be given to using a paint with a mould-inhibiting additive.

6 LIMITATIONS

This report is based on data and information collected during the Hazardous Materials Assessment performed by **exp** Services Inc. It is based solely on the conditions at the Site encountered at the time of the site visit on May 10, 2017. **Exp** has prepared this report for the exclusive use of the Client in evaluating the Site at the time of **exp**'s assessment. **Exp** will not be responsible for the use of this report by any third party, or reliance on or any decision to be made based on it without the prior written consent of **exp**. **Exp** accepts no responsibility for damages, if any, by any third party because of decisions or actions based on this report.

The assessment of environmental conditions and possible hazards at the Site has been made using the results of laboratory analyses of discrete building material samples from a limited number of locations. The Site conditions between and beyond sampling locations have been inferred based on conditions observed at sample locations. Building conditions may vary from these sample locations. Additional study, including further building investigation, can reduce the inherent uncertainties associated with this type of study. However, it is never possible, even with exhaustive sampling and testing, to dismiss the possibility that contamination, hazardous materials, and regulated substance on parts of the Site, may remain undetected.

The services performed as described in this report were performed in a manner consistent with that level of care and skill normally exercised by other members of the engineering and science professions currently practicing under similar conditions, subject to the time limits and financial and physical constraints applicable to the services. No other warranty, expressed or implied, is made. No assurance is made regarding changes in conditions subsequent to the time of investigation. If new information is developed in future work, **exp** should be contacted to re-evaluate the conclusions of this report and to provide amendments as required.

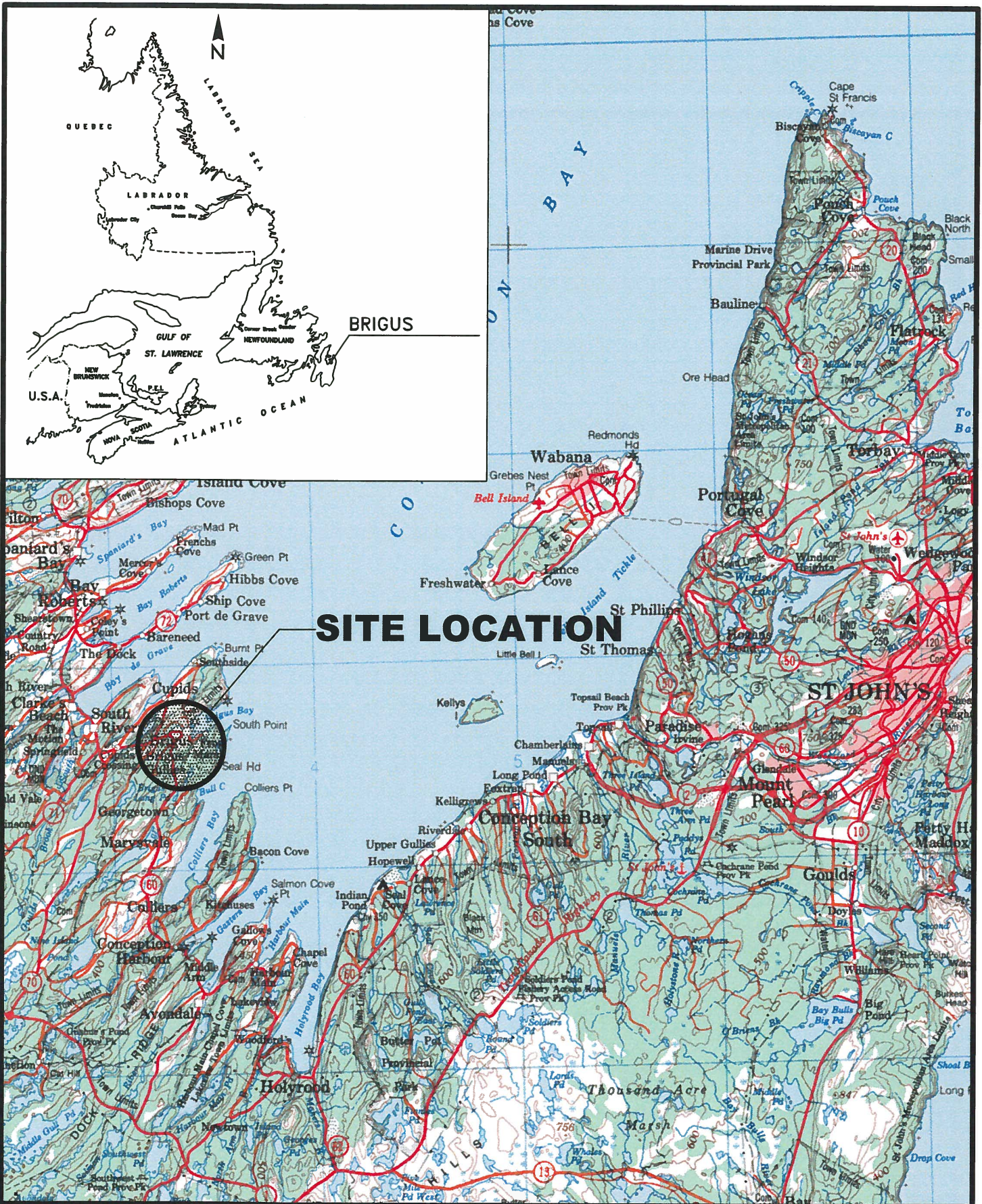
7 REFERENCES

- Newfoundland Regulation 111/98, Asbestos Abatement Regulations, 1998, under the Occupational Health and Safety Act.
- Newfoundland and Labrador Department of Environment and Conservation correspondence entitled; *Management and Disposal of Construction, Abatement and Demolition Waste Containing Lead-Based Paint (Draft)*.
- Newfoundland and Labrador Occupational Health and Safety Regulations under the Occupational Health and Safety Act.
- Newfoundland Department of Environment and Conservation Policy Directive GD-PPD-26.1: Leachable Toxic Waste, Testing and Disposal.
- Surface Coating Material Regulations (2005) under the Hazardous Products Act (1985).
- CCME Canadian Environmental Quality Guidelines.

APPENDIX



Figures 1 and 2



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Project Title
**HAZARDOUS MATERIALS ASSESSMENT
HAWTHORNE COTTAGE BRIGUS, NL**

Dwg. Title
SITE LOCATION PLAN

Drawn By:
R.J.P.
Dwg Standards
Ckd By:
Designed By:
C.J.P.
Design Checked
By:

Project No.
SJN-00239615-A0

Dwg. No.
FIGURE 1
Rev. No.



LEGEND

NOTE: SAMPLE HC-A10 & HC-P1 WERE COLLECTED FROM A STORM WINDOW THAT WAS IN STORAGE IN BASEMENT.

■

Designed By: C.J.P.

HAZARDOUS MATERIALS

Dwg. Title

Project No.

SJN-00239615-A0

Dwg. No.

FIGURE 2



Photo Album



Photo 1 – Looking east at Hawthorne Cottage



Photo 2 – Looking south at Hawthorne Cottage from South Street



Photo 3 – Looking west at Hawthorne Cottage



Photo 4 – Looking north at Hawthorne Cottage from Irish Town Road



Photo 5 – South side of the building with peeling paint (Sample HC-P2 from under window)



Photo 6 – Suspect mould on paint (Sample HC-P3) and on underlying clapboard



Photo 7 – Veranda section at northeast corner of building (note rot/deterioration and peeling paint) – Sample HC-P7



Photo 8 – Veranda deck at west side of building (note peeling/flaking paint)



Photo 9 – Mould growth on painted clapboard – east side of building



Photo 10 – Peeling paint on west side of building.



Laboratory Certificates

Your Project #: SJN-00239615-AO
Your C.O.C. #: D 16232

Attention: Cyril Pumphrey

exp Services Inc
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Suite 200
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Timing Data/Product (Procedure #5)
Applied by: Maxxam Analytics
Project No: SJN-00239615-AO
Reviewed by: CJP
Date Reviewed: May 31, 2017

Report Date: 2017/05/30
Report #: R4491852
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B797667

Received: 2017/05/12, 09:53

Sample Matrix: Paint
Samples Received: 15

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Metals Leach TCLP/CGSB extraction (1)	1	2017/05/26	2017/05/26	ATL SOP 00058	EPA 6020A R1 m
Metals Leach TCLP/CGSB extraction (1)	2	2017/05/26	2017/05/29	ATL SOP 00058	EPA 6020A R1 m
Metals Paint Acid Extr. ICPMS (1)	12	2017/05/16	2017/05/16	ATL SOP 00058	EPA 6020A R1 m
TCLP Inorganic extraction - pH (1)	3	N/A	2017/05/26	ATL SOP 00035	EPA 1311 m
TCLP Inorganic extraction - Weight (1)	3	N/A	2017/05/26	ATL SOP 00035	EPA 1311 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam 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.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam 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 Maxxam, unless otherwise agreed in writing.

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.

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.

(1) This test was performed by Maxxam Bedford

Your Project #: SJN-00239615-AO
Your C.O.C. #: D 16232

Attention: Cyril Pumphrey

exp Services Inc
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Suite 200
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Report Date: 2017/05/30
Report #: R4491852
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B797667

Received: 2017/05/12, 09:53

Encryption Key



Rachael Mansfield
Customer Service - Bedford
30 May 2017 10:46:53

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

=====

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 (PAINT)

Maxxam ID		EKO944		EKO951		EKO953		
Sampling Date		2017/05/10		2017/05/10		2017/05/10		
COC Number		D 16232		D 16232		D 16232		
	UNITS	COMPOSITE 1	RDL	COMPOSITE 2	RDL	COMPOSITE 3	RDL	QC Batch
Inorganics								
Sample Weight (as received)	g	74	N/A	73	N/A	23	N/A	4997915
Initial pH	N/A	5.0		4.9		4.9		4997921
Final pH	N/A	5.1		5.2		5.0		4997921
Metals								
Leachable Lead (Pb)	ug/L	90000	50	41000	5.0	170000	50	4999805
RDL = Reportable Detection Limit								
QC Batch = Quality Control Batch								
N/A = Not Applicable								

ELEMENTS BY ATOMIC SPECTROSCOPY (PAINT)

Maxxam ID		EJK343	EJK344	EJK344	EJK345	EJK346	EJK347	EJK348		
Sampling Date		2017/05/10	2017/05/10	2017/05/10	2017/05/10	2017/05/10	2017/05/10	2017/05/10		
COC Number		D 16232	D 16232	D 16232	D 16232	D 16232	D 16232	D 16232		
	UNITS	HC-P1	HC-P2	HC-P2 Lab-Dup	HC-P3	HC-P4	HC-P5	HC-P6	RDL	QC Batch

Metals										
Acid Extractable Lead (Pb)	mg/kg	25000	14000	13000	57000	29000	23000	26000	5.0	4984697
Acid Extractable Mercury (Hg)	mg/kg	ND	5.6	6.0	49	21	ND	1.6	1.0	4984697
RDL = Reportable Detection Limit										
QC Batch = Quality Control Batch										
Lab-Dup = Laboratory Initiated Duplicate										
ND = Not detected										

Maxxam ID		EJK349	EJK350	EJK351	EJK352	EJK353	EJK354		
Sampling Date		2017/05/10	2017/05/10	2017/05/10	2017/05/10	2017/05/10	2017/05/10		
COC Number		D 16232	D 16232	D 16232	D 16232	D 16232	D 16232		
	UNITS	HC-P7	HC-P8	HC-P9	HC-P10	HC-P11	HC-P12	RDL	QC Batch

Metals									
Acid Extractable Lead (Pb)	mg/kg	11000	26000	25000	75000	2800	56000	5.0	4984697
Acid Extractable Mercury (Hg)	mg/kg	ND	1.8	29	1.5	10	25	1.0	4984697
RDL = Reportable Detection Limit									
QC Batch = Quality Control Batch									
ND = Not detected									

GENERAL COMMENTS

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

Package 1	21.4°C
-----------	--------

Revised report to include additional TCLP + Lead analysis on the following composite samples as per C. Pumphrey:

Composite 1: HC-P3, HC-P4 and HC-P12

Composite 2: HC-P9 and HC-P11

Composite 3: HC-P10, HC-P5 and HC-P6

2017/05/18 RMN

Sample EKO944 [COMPOSITE 1] : : Reduced sample weight used for leachate procedure due to insufficient sample. All extraction ratios maintained. Minimal impact on sample data quality.

Sample EKO951 [COMPOSITE 2] : : Reduced sample weight used for leachate procedure due to insufficient sample. All extraction ratios maintained. Minimal impact on sample data quality.

Sample EKO953 [COMPOSITE 3] : : Reduced sample weight used for leachate procedure due to insufficient sample. All extraction ratios maintained. Minimal impact on sample data quality.

Results relate only to the items tested.

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4984697	BAN	Matrix Spike [EJK344-01]	Acid Extractable Lead (Pb)	2017/05/16		NC	%	75 - 125
			Acid Extractable Mercury (Hg)	2017/05/16		110	%	75 - 125
4984697	BAN	Spiked Blank	Acid Extractable Lead (Pb)	2017/05/16		96	%	75 - 125
			Acid Extractable Mercury (Hg)	2017/05/16		99	%	75 - 125
4984697	BAN	Method Blank	Acid Extractable Lead (Pb)	2017/05/16	ND, RDL=5.0		mg/kg	
			Acid Extractable Mercury (Hg)	2017/05/16	ND, RDL=1.0		mg/kg	
4984697	BAN	RPD [EJK344-01]	Acid Extractable Lead (Pb)	2017/05/16	6.2		%	35
			Acid Extractable Mercury (Hg)	2017/05/16	6.6		%	35
4997915	CCR	Method Blank	Sample Weight (as received)	2017/05/26	NA		g	
4999805	BAN	Matrix Spike [EKO953-00]	Leachable Lead (Pb)	2017/05/29		NC	%	75 - 125
4999805	BAN	Spiked Blank	Leachable Lead (Pb)	2017/05/26		96	%	N/A
4999805	BAN	Method Blank	Leachable Lead (Pb)	2017/05/26	ND, RDL=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.

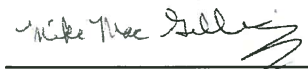
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

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)

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.

CHAIN OF CUSTODY RECORD

COC #: **D 16232** Page 1 of 1

Invoice Information Company Name: _____ Contact Name: _____ Address: _____ Postal Code: _____ Phone: _____ Fax: _____ Email: _____		Report Information (if differs from invoice) Company Name: <u>exp Services Inc.</u> Contact Name: <u>Cyril Pumphrey</u> Address: <u>60 Pippy Place Suite 200</u> Postal Code: _____ Phone: <u>709.579.2027</u> Fax: _____ Email: <u>cyril.pumphrey@exp.com</u>		Project Information (where applicable) Quotation #: _____ P.O. #/ A/E/R: _____ Project ID: <u>STN-00239615-A0</u> Site Location: _____ Site #: _____ Sampled By: <u>CJP</u>		Turnaround Time (TAT) Required <input checked="" type="checkbox"/> Regular TAT (5 business days) Most analyses: PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS <input type="checkbox"/> RUSH please specify date (Surcharges will be applied) Date Required: _____ Rush Confirmation # _____																																																														
Laboratory Use Only <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td colspan="2">CUSTODY SEAL</td> <td colspan="2">COOLER TEMPERATURES</td> <td>AVERAGE TEMP</td> <td>INTEGRITY</td> </tr> <tr> <td>Precast</td> <td>Intact</td> <td>21.1</td> <td>21.8</td> <td>21.2</td> <td>YES <input checked="" type="checkbox"/></td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td>Integrity Checked By: <u>M</u></td> </tr> </table>			CUSTODY SEAL		COOLER TEMPERATURES		AVERAGE TEMP	INTEGRITY	Precast	Intact	21.1	21.8	21.2	YES <input checked="" type="checkbox"/>						Integrity Checked By: <u>M</u>	Analysis Requested <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td rowspan="2">FIELD FILTERED & PRESERVED</td> <td rowspan="2">Lab Titration Required</td> <td rowspan="2">ACN-30 (CARCLE) TOTAL / DISSOLVED</td> <td rowspan="2">ACN-100 (CARCLE) TOTAL / DISSOLVED</td> <td rowspan="2">Metals (Water)</td> <td rowspan="2">Metals (Soil)</td> <td colspan="10">Analysis Requested</td> </tr> <tr> <td>Metals (Water)</td> <td>Metals (Soil)</td> <td>Metals (Water)</td> <td>Metals (Soil)</td> <td>Metals (Water)</td> <td>Metals (Soil)</td> <td>Metals (Water)</td> <td>Metals (Soil)</td> <td>Metals (Water)</td> <td>Metals (Soil)</td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </table>					FIELD FILTERED & PRESERVED	Lab Titration Required	ACN-30 (CARCLE) TOTAL / DISSOLVED	ACN-100 (CARCLE) TOTAL / DISSOLVED	Metals (Water)	Metals (Soil)	Analysis Requested										Metals (Water)	Metals (Soil)	Metals (Water)	Metals (Soil)	Metals (Water)	Metals (Soil)	Metals (Water)	Metals (Soil)	Metals (Water)	Metals (Soil)																	
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RELINQUISHED BY: (Signature/Print) <u>Cyril Pumphrey</u>			DATE: (YYYY/MM/DD) <u>2017/05/11</u>		TIME: (HH:MM) <u>8:30 a.m.</u>																																																															
RECEIVED BY: (Signature/Print) <u>Chamara Wimala</u>			DATE: (YYYY/MM/DD) <u>2017/05/11</u>		TIME: (HH:MM) <u>10:35</u>																																																															

White: Maxxam

Pink: Client



EMSL Canada Inc.

2756 Slough Street Mississauga, ON L9T 5N4
 Phone/Fax: 289-997-4602 / (289) 997-4607
<http://www.EMSL.com> / torontolab@emsl.com

EMSL Canada Order 551705487
 Customer ID: 55EXPR34
 Customer PO: 00239615
 Project ID:

Attn: Cyril J. Pumphrey
 EXP Services, Inc.
 60 Pippy Place
 Suite 200
 Saint John's, NL A1B 4H7
Proj: SJN-00239615-AO

Incoming Data/Product (Procedure #5)
Supplied by: EMSL Canada Inc.
Project No: SJN-00239615-AO
Reviewed by: CJP
Date Reviewed: May 31, 2017

Phone: (709) 579-2027
Fax:
Collected: 5/10/2017
Received: 5/12/2017
Analyzed: 5/19/2017

Summary Test Report for Asbestos Analysis via EPA 600/R-93/116

Client Sample ID: HC-A1-Silver Paint

Lab Sample ID: 551705487-0001

Sample Description: Roofing

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	5/19/2017	Silver	0%	100%	None Detected	sample bag labeled "HC-A2"

Client Sample ID: HC-A1-Tar Felt

Lab Sample ID: 551705487-0001A

Sample Description: Roofing

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	5/19/2017	Black	20%	80%	None Detected	sample bag labeled "HC-A2"

Client Sample ID: HC-A1-fibre board

Lab Sample ID: 551705487-0001B

Sample Description: Roofing

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	5/19/2017	Brown	90%	10%	None Detected	sample bag labeled "HC-A2"

Client Sample ID: HC-A1-Tar

Lab Sample ID: 551705487-0001C

Sample Description: Roofing

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	5/19/2017	Black	0%	100%	None Detected	sample bag labeled "HC-A2"

Client Sample ID: HC-A1-Tar Felt 2

Lab Sample ID: 551705487-0001D

Sample Description: Roofing

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	5/19/2017	Black	15%	85%	None Detected	sample bag labeled "HC-A2"

Client Sample ID: HC-A2

Lab Sample ID: 551705487-0002

Sample Description: Roofing felt

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	5/19/2017	Black	45%	55%	None Detected	sample bag labeled "HC-A1"

Client Sample ID: HC-A3-Silver Paint

Lab Sample ID: 551705487-0003

Sample Description: Multilayered roof membrane

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	5/19/2017	Silver	0%	100%	None Detected	



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EMSL Canada Order 551705487
Customer ID: 55EXPR34
Customer PO: 00239615
Project ID:

Summary Test Report for Asbestos Analysis via EPA 600/R-93/116

Client Sample ID: HC-A3-Tar Felts

Lab Sample ID: 551705487-0003A

Sample Description: Multilayered roof membrane

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	5/19/2017	Black	20%	80%	None Detected	

Client Sample ID: HC-A3-Fiber Board

Lab Sample ID: 551705487-0003B

Sample Description: Multilayered roof membrane

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	5/19/2017	Brown	90%	10%	None Detected	

Client Sample ID: HC-A4-Shingle

Lab Sample ID: 551705487-0004

Sample Description: Shingle & felt w/tar

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	5/19/2017	Black/Green	10%	90%	None Detected	

Client Sample ID: HC-A4-Tar

Lab Sample ID: 551705487-0004A

Sample Description: Shingle & felt w/tar

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	5/19/2017	Black	0%	98%	2% Chrysotile	

Client Sample ID: HC-A5

Lab Sample ID: 551705487-0005

Sample Description: Mortar (chimney)

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	5/19/2017	Gray	0%	100%	None Detected	

Client Sample ID: HC-A6

Lab Sample ID: 551705487-0006

Sample Description: Window putty

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	5/19/2017	Gray	0%	100%	None Detected	

Client Sample ID: HC-A7

Lab Sample ID: 551705487-0007

Sample Description: Window putty

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	5/19/2017	Beige	0%	100%	None Detected	

Client Sample ID: HC-A8

Lab Sample ID: 551705487-0008

Sample Description: Window putty

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	5/19/2017	Beige	0%	100%	None Detected	



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EMSL Canada Order 551705487
Customer ID: 55EXPR34
Customer PO: 00239615
Project ID:

Summary Test Report for Asbestos Analysis via EPA 600/R-93/116

Client Sample ID: HC-A9

Lab Sample ID: 551705487-0009

Sample Description: Window putty

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	5/19/2017	Beige	0%	100%	None Detected	

Client Sample ID: HC-A10

Lab Sample ID: 551705487-0010

Sample Description: Window putty

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	5/19/2017	Beige	0%	100%	None Detected	

Client Sample ID: HC-A11

Lab Sample ID: 551705487-0011

Sample Description: Window putty

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	5/19/2017	Beige	0%	100%	None Detected	

Client Sample ID: HC-A12

Lab Sample ID: 551705487-0012

Sample Description: Window putty

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	5/19/2017	White	0%	100%	None Detected	

Analyst(s):

Natalie D'Amico PLM (19)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

Samples analyzed by EPA 600/R-93/116 consistent with NLR 111/98. The estimated limit of detection for non-detect samples is <0.1%. Due to magnification limitations inherent in PLM, asbestos fibers in dimensions below the resolution capability of PLM may not be detected. The above test report relates only to the items tested and may not be reproduced in any form without the express written approval of EMSL Analytical, Inc. EMSL's liability is limited to the cost of analysis. 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 or any agency of the US Government.

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

Initial report from: 05/19/2017 16:39:32



Sporometrics Inc.

219 Dufferin Street, Suite 20C, Toronto, ON M6K 1Y9 - t.416-516-1660 - f.416-516-1670 - www.sporometrics.com

RESULTS OF LABORATORY ANALYSES:

JOB NO. 28242.00

To:	Cyril Pumphrey	Date of report:	2017/05/19
Company:	exp Services Inc.	Date of sampling:	2017/05/10
Client Project:	SJN-00239615-A0	Analyst:	Susan Du
Client Address:	60 Pippy Place - Suite 200, St. John's NL A1B4H7	Date Received:	2017/05/12

BULK / TAPELIFT / BIOTAPE SAMPLE NO.:	HC-M1	HC-M2	-	-	-	-
Location:	Exterior Paint - possible mould	Exterior Paint - possible mould				
Serial #:	N/A	N/A				
Expiry date:	N/A	N/A				
FUNGAL IDENTIFICATION: ^a	ELEMENTS:	MICROSCOPIC OBSERVATIONS ^b (RATING ^c):				
Cladosporium NOS	mycelia	3+	3+			
	spores	3+	3+			
OTHER OBSERVATIONS:						
background rating		2+	2+			
FUNGAL GROWTH INDICATED? ^d :		Y	Y			

AIHA LAP, LLC LAB NO: 171117

Samples were received in satisfactory condition and tested in accordance with SOP 5.4.1.1.3. These results relate only to the samples tested.

^a NOS = not otherwise specified.

^b Mounted in lactofuchsin / lactic acid, or other medium as required, with 50-100 fields examined in bright field microscopy at 400x magnification.

^c - = not detected; tr = 10⁰ - 10¹ elements in total; 1+ = 10⁰ - 10¹ elements in each of ~25% fields; 2+ = 10¹ - 10² elements in each of ~50% fields; 3+ = 10² - 10³ elements in each of ~75% fields; 4+ => 75% fields obscured.

^d Possibility of fungal growth *in situ* based on microscopic observations; Y = yes; N = no; ? = ambiguous. For explanation please refer to the final page of this report.

END OF REPORT

Examined By

Released By

Incoming Data/Product (Procedure #5)
 Supplied by: Sporometrics
 Project No: SJN-00239615-A0
 Reviewed by: CJP
 Date Reviewed: May 31, 2017

Susan Du

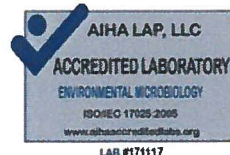


Susan Du, MSc

Mike Saleh, MHSc

Analyst

Analyst





RESULTS OF LABORATORY ANALYSES:

JOB NO. 28242.00

To:	Cyril Pumphrey	Date of report:	2017/05/19
Company:	exp Services Inc.	Date of sampling:	2017/05/10
Client Project:	SJN-00239615-A0	Analyst:	Susan Du
Client Address:	60 Pippy Place - Suite 200, St. John's NL A1B4H7	Date Received:	2017/05/12

Guidance on the interpretation of microscopic findings Samples of bulk materials as well as tape lift samples from potentially contaminated surfaces may be examined microscopically to assess the potential of these materials to be supporting fungal growth and serving as indoor fungal amplification sites. Guidelines on indoor microbial contamination proposed by Health Canada (HC. 1995. Indoor air quality in office buildings: A technical guide. Federal-Provincial Advisory Committee on Environmental and Occupational Health. Ottawa: Environmental Health Directorate 93-EHD-166 rev.) state unambiguously that indoor, active fungal growth sites are unacceptable regardless of the extent to which these amplifiers impact on the indoor airborne spore-load. Fungal spores are commonly borne on air currents and settle on flat surfaces as a matter of course. Thus, the observation of fungal spores alone is insufficient to characterize a specimen as a growth site. This judgment primarily requires the microscopic visualization of fungal filaments ("hyphae", or *en masse*, "mycelia"). Additionally, the identification of different kinds of fungi usually requires the observation of spores (e.g. conidia, ascospores, etc.) along with the organs responsible for their production (e.g. conidiophores, ascomata, etc.). However, the latter rarely persist long after the spores have been produced, making definitive identification difficult or impossible in aged specimens. The rating system used by Sporometrics to score the frequency of structures observed microscopically is based on a 5-point assessment of 50-100 microscopic fields, usually taken at 400 x magnification. This system uses the following rating criteria:

Descriptor	Criteria (based on 50-100 fields)	Interpretation of growth <i>in situ</i> according to observations:	
		Spores alone	Spores and spore-bearing structures or mycelia
tr	10 ⁰ -10 ¹ elements in total	growth not indicated	growth not indicated
1+	10 ⁰ -10 ¹ elements per ~25% fields	unclear	growth indicated
2+	10 ¹ -10 ² elements per ~50% fields	growth indicated	growth indicated
3+	10 ² -10 ³ elements per ~75% fields	growth indicated	growth indicated
4+	> 75% fields obscured by elements	growth indicated	growth indicated