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## APPENDIX E: DESIGNATED SUBSTANCE SURVEY



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**BUILDINGS &  
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**IQALUIT RECEIVER SITE – EQUIPMENT BUILDING  
MOULD AND BUILDING ENVELOPE ASSESSMENT &  
DESIGNATED SUBSTANCE SURVEY**

Iqaluit, Nunavut

**PRODUCED FOR:** CANADIAN COAST GUARD

**PRODUCED BY:** CONCENTRIC ASSOCIATES INTERNATIONAL INCORPORATED

**CONCENTRIC REFERENCE NUMBER:** 16-6912

**DATE:** SEPTEMBER 7, 2016



## **EXECUTIVE SUMMARY**

Concentric Associates International Incorporated (Concentric) was retained by the Canadian Coast Guard (CCG) to conduct a mould assessment, building envelope assessment, and hazardous substance survey (HSS) for CCG's equipment building at the Iqaluit receiver site.

It was reported to Concentric that the equipment building was impacted with mould believed to be caused by a roof leak. Various building materials within the attic space were known to be water damaged and impacted with mould. In addition, laboratory results from an air quality report dated June 14, 2016 (provided by CCG) indicated the presence of elevated levels of airborne mould spores within the building.

According to CCG this building, which consists of a furnace room, generator room and radio room (see Photograph 1) is scheduled to be demolished in the fall of 2017.

A representative of Concentric attended the site on July 26<sup>th</sup> and 27<sup>th</sup>, 2016 to ascertain the extent of mould and water impacted building materials, and to determine the possible cause(s) of moisture intrusion into the building. A detailed visual inspection of the site was conducted and building materials samples were collected for laboratory analysis of hazardous substances.

Summarized below are the results of the site investigation and recommendations for:

- Preventing further moisture intrusion into the ceiling assembly of the building.
- Handling hazardous substances prior to onset of the demolition.

### **Building Envelope Assessment**

Numerous penetrations and other possible entryways for moisture were observed on the exterior of the building. These included holes or cavities around exterior components, deteriorated sealants and insulating foam, and missing roof flashing. To reduce moisture intrusion into the building, the following actions are recommended:

1. Seal flute openings with an appropriate sealant (e.g. silicone or polyurethane).
2. Install metal flashing on the north (where previously removed) and south sides of the roof.
3. Repair any penetrations in the metal cladding and ensure an adequate seal around the exterior components (e.g. flue and air vents, pipes, cables, etc.).
4. Install more efficient (i.e. longer) vent covers that will prevent entry of wind-driven snow during the winter months.

### **Mould Assessment**

Visible mould and water-damaged building materials were observed within the attic space of the radio room. Laboratory analysis of three tape lift samples collected from inside the test opening confirmed the presence of mould.



Numerous layers of building materials were present throughout the attic space. A thorough examination of mould-impacted areas, therefore, was not practical without an extensive destructive investigation. Based on the severity of water damage in the area observed, however, the extent of mould contamination and water damage is presumed to extend throughout the attic space.

It is recommended that the all porous mould impacted or water damaged building materials within the attic space be removed. Non-porous materials (eg. wood, metal sheeting etc.) may need to be removed and replaced if they cannot be adequately cleaned or the mould has effected its soundness. Alternately encapsulation of this area may be an option if the area can be adequately sealed and ventilation within the building is not compromised.

### **Designated Substance Survey**

#### Asbestos

Analytical results confirmed the presence of asbestos in cement board on the south and east walls of the furnace room.

Cement board is considered a non-friable material and can therefore be removed by a qualified contractor using the low or moderate risk abatement procedures (depending on removal methods) specified in section 5.2 of the *Northwest Territories and Nunavut Codes of Practice for Asbestos Abatement*.

#### Lead

Based on total lead analysis, lead was confirmed to be present in paint samples collected from the site; however, based on TCLP analysis it was determined that the lead content was below the regulatory limit for hazardous waste classification. Other lead-containing materials identified on site include lead acid batteries used for the generator and in emergency lights.

Nunavut's *Environmental Guideline for Waste Batteries* should be followed should the lead acid batteries be disposed of prior to demolition activities.

In addition, demolition activities may have the potential to create airborne lead. As such, necessary measures must be taken (e.g. by means of engineering controls, work practices and hygiene practices) to ensure that the exposure of a worker to airborne lead shall not exceed the occupational exposure limit (OEL), averaged over an 8-hour day, of 0.05 mg/m<sup>3</sup> as per the Nunavut Occupational Health and Safety Regulations (2016).

#### Mercury

Fluorescent lights were identified in the building. Fluorescent light tubes contain mercury vapour.

Recommendations: Prior to demolition activities, fluorescent lights should be carefully removed and re-used, recycled, or disposed of in accordance with Nunavut's *Environmental Guideline for Mercury-Containing Products and Waste Mercury* (2010).

#### Silica



Gypsum board, which may contain crystalline silica, was identified on the south and north walls of the generator room and hallway, respectively.

Demolition wastes containing silica must be handled, transported and disposed of according to applicable federal and territorial waste handling regulations.

Demolition activities have the potential to create airborne silica. As such, necessary measures must be taken (e.g. by means of engineering controls, work practices and hygiene practices) to ensure that the exposure of a worker to airborne silica shall not exceed the occupational exposure limit (OEL), averaged over an 8-hour day, of 0.05 mg/m<sup>3</sup> for quartz and cristobalite and 0.1 mg/m<sup>3</sup> for quartz/tripoli as per the Nunavut Occupational Health and Safety Regulations (2016).

#### Polychlorinated Biphenyls (PCBs)

Fluorescent light ballasts and electrical transformers may contain PCBs.

Prior to demolition activities, ballasts and transformer labels should be checked to confirm the presence of PCBs, otherwise they should be assumed to contain PCBs. All PCB-containing equipment should be packed and shipped for destruction or recycling according to Transport Canada's Transportation of Dangerous Goods Act.

#### Other Hazardous Substances

Numerous other potentially hazardous substances (or equipment containing hazardous substances) were noted during the survey, including three fuel tanks, oil canisters, paints and adhesives, and electrical and communication equipment. It is presumed that these substances or equipment be disposed of prior to demolition of the building. Any hazardous waste disposal should be completed according to applicable federal and territorial regulations and/or guidelines.



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## **1. INTRODUCTION**

Concentric Associates International Incorporated (Concentric) was retained by the Canadian Coast Guard (CCG) to conduct a mould assessment, building envelope assessment, and hazardous substance survey (HSS) for CCG's equipment building at the Iqaluit receiver site.

It was reported to Concentric that the equipment building was impacted with mould believed to be caused by a roof leak. Various building materials within the attic space were known to be water damaged and impacted with mould. In addition, laboratory results from an air quality report dated June 14, 2016 (provided by CCG) indicated the presence of elevated levels of airborne mould spores within the building.

According to CCG this building, which consists of a furnace room, generator room and radio room (see Photograph 1) is scheduled to be demolished in the fall of 2017.

## **2. SCOPE OF WORK**

The following scope of work was completed at the site:

### Mould and Building Envelope Assessments

- Visual assessment to identify the extent of water damaged and mould impacted building materials within the building that require remediation.
- Visual assessment of the building envelope to determine the source of the moisture intrusion into the building.

### Designated Substance Survey

In the absence of territorial guidelines or regulations outlining hazardous substances of concern to be assessed, Ontario Regulation 490/09 "Designated Substances", published by the Ontario Ministry of Labour provided a general framework for the HSS. This regulation defines the following eleven designated substances:

- Acrylonitrile
- Benzene
- Isocyanates
- Silica
- Arsenic
- Coke Oven Emissions
- Lead
- Vinyl Chloride
- Asbestos
- Ethylene Oxide
- Mercury

Polychlorinated Biphenyls (PCB's) and ozone depleting substances (ODS) are not currently listed as a designated substance under Ontario Regulation 490/09 "Designated Substances" however, PCBs and ODS containing materials were included in this HSS because they must be handled and disposed of in accordance with the Canadian Environmental Protection Act's "PCB's Regulations" and the Government of Nunavut's Environmental Guideline for ozone depleting substances (2011).

Given the use of the site, the HSS was limited to identifying asbestos, lead, mercury, silica, ODS, and PCBs in building materials and equipment. Coke oven emissions, acrylonitrile, arsenic, benzene, ethylene oxide, isocyanates, and vinyl chloride are not found in a typical building and were, therefore, not addressed during the HSS.



Building material sampling was conducted with the intent of identifying asbestos and lead. Other hazardous substances were identified visually.

The proposed HSS did include the following due to health hazard or inaccessibility to the surveyor:

- Components or wiring within motor control centers, breakers, motors, lights, etc.;
- Concrete leveling compound for floors;
- Insulation on or in high voltage wiring;
- Mechanical packing, ropes, gaskets, etc., and;
- Materials within confined spaces.

### **3. REGULATORY GUIDELINES AND FRAMEWORK**

The following regulations apply to this project:

- *The Occupational Health and Safety Regulations* (2016, as amended), Government of Nunavut
- *Consolidation of Safety Act* (2016, as amended), Government of Nunavut
- *Northwest Territories & Nunavut Asbestos Abatement Codes of Practice* (2012, as amended), Workers' Safety & Compensation Commission
- *Environmental Guideline for Waste Asbestos* (2011, as amended), Government of Nunavut
- *Environmental Guideline for Waste Lead and Lead Paint* (2014, as amended), Government of Nunavut
- *Environmental Guideline for Mercury-Containing Products and Waste Mercury* (2010, as amended), Government of Nunavut
- *Environmental Guideline for Waste Batteries* (2011, as amended), Government of Nunavut
- *PCB Regulations SOR/2008-273* (2015, as amended), Government of Canada

See **Appendix A** for further information on the aforementioned regulations and guidelines.

### **4. METHODS**

Site work was completed on July 26 and 27, 2015 by Mr. Randy Scott of Concentric.

#### **4.1 Mould and Building Envelope Assessment**

The mould and building envelope assessment included a visual examination of the building interior and exterior including (to the extent possible) the roof and ceiling assembly and attic space. Approximately eight feet of metal flashing was removed on the northeast corner of the building to allow for a visual inspection of the roof (Photograph 2).





The interior ceiling of the radio room was also examined. A test opening completed by others allowed for a limited visual inspection of the attic space (see Photograph 3).

In addition, to confirm the presence of mould, three tape-lift samples were collected for analysis for non-viable mould. A tape lift is a sticky sample medium—handled only by its ends—that is firmly pressed onto a surface to collect microbial propagules. The medium is then slowly and steadily lifted upwards and placed into a dedicated, labeled container. All three surface samples were collected from within the attic space and submitted to Paracel Laboratories Limited (Paracel) for analysis.

## **4.2 Designated Substance Survey**

The DSS included a systematic, room-by-room inspection of accessible areas of the site. Samples of materials suspected to contain asbestos or lead were collected and placed in sealed polyethylene bags with appropriate sample identifier labels. Each sample identifier was plotted on sketched floor plans, and detailed notes were recorded with respect to general building construction, condition of building materials, and other types of hazardous substances or equipment witnessed during the survey.

*Where possible, Concentric assessed all wall and ceiling layers. However, no significant openings were made in drywall, plaster, or concrete. Other hazardous substances may therefore exist between walls, above ceilings or in other enclosures or barriers that would not have been visible during the survey. Additionally, Concentric did not dismantle any mechanical or electrical equipment as part of this survey due to potential hazard to the surveyor.*

### **4.2.1 Asbestos**

According to the Government of Nunavut's Occupational Health and Safety Regulations, an employer shall identify and keep a written record of all friable exposed and non-exposed (accessible) asbestos-containing materials.

For the collection of potential asbestos-containing materials, sampling guidelines outlined in the *Northwest Territories and Nunavut Codes of Practice for Asbestos Abatement* were followed.

Nine (9) bulk material samples were collected and analyzed by Paracel for asbestos content via Polarized Light Microscopy (PLM) in accordance with EPA Method 600/R-93/116.

### **4.2.2 Lead**

For the collection of potential lead-containing materials, sampling guidelines outlined in the American Society of Testing and Materials (ASTM) Method E1729-05 (*Standard Practice for Field Collection of Dried Paint Samples for Subsequent Lead Determination*) were followed.

Six (6) paint samples were collected and analyzed by Paracel for total lead content by inductively coupled plasma optical emission spectrometry (ICP-OES).

### **4.2.3 Other Hazardous Substances**

All other hazardous substances were assessed for visually or by reviewing labelling.



## **5. RESULTS**

The building consisted of three main rooms including a furnace room, generator room, and radio room. The building was wood framed with metal cladding. Interior finishes consisted of a mix of plywood and gypsum board walls and vinyl tile flooring.

The roof was a batten seam system edged with metal flashing. The roof assembly consisted of numerous layers including, from top to bottom, a metal roof deck; plywood roof sheathing; wood strapping; plywood; 2x4 joists and batt insulation; metal sheeting, plywood; wood joists and blocking; 1/4" painted plywood; and 1/8" panel board.

Results of the assessment are provide in sections 5.1 through 5.7. Sample locations are illustrated in Figure 1, **Appendix B**. Photographs taken during the site visit are presented in **Appendix C**. Laboratory Certificates of Analysis are provided in **Appendix D**.

### **5.1 Mould and Building Envelope Assessments**

A visual inspection of the attic space above the radio room confirmed the presence of mould impacted and water-damaged (i.e. rotted) building materials (see Photograph 9). Specifically, the plywood appeared to be in an advanced stage of rot and the insulation was deteriorated. Due to accessibility issues, only the area immediately adjacent to the test opening in the radio room was inspected. Complete delineation of the attic space was not possible without creating additional destructive openings. However, due to the age of the building and severity of the water damage observed, it is presumed that the majority of the attic space above the wood joists and blocking are water damaged and/or contaminated with mould.

Various potential entryways for moisture into the ceiling assembly were observed. Most notably, insulation and sealant in the flute openings of the roofing system were deteriorated (see Photograph 4) and may be an entryway for moisture into the building. Various other penetrations or cavities in the building exterior were witnessed during the inspection, including the following:

- A cavity under the base of flue chimney on the roof (see Photograph 5)
- Ventilation openings in the metal cladding (see Photograph 6)
- Ventilation hoods on the north and west sides of building (see Photograph 7)
- Penetration in the metal cladding on the north side of building (see Photograph 8)

#### **5.1.1 Surface Mould**

Mould was observed within the attic space of the building. In addition, analytical results (provided below) from the surface samples collected within the attic space confirmed the presence of mould.



**Table 1. Analytical Results for Surface Sampling**

<i>Sample ID</i>	<i>Microscopic Identification</i>	<i>Relative Amount<sup>1</sup></i>
M1	Hyaline mycelial fragments	High
	<i>Aspergillus/Penicillium</i> -like spore:	Low
	<i>Cladosporium</i> spores	Low
	Pigmented mycelia fragments	Low
	Unidentified spore	Low
M2	<i>Cladosporium</i> spores	Moderate
	Bacteria	Low
	Hyaline mycelia fragments	Low
	Unidentified spore	Low
M3	Bacteria	High
	Pigmented mycelia fragments	Moderate
	Ascospores	Low

<sup>1</sup>Relative Amount: Moderate = 11-100 propagules per mm<sup>2</sup>; High = > 101 propagules per mm<sup>2</sup>; Low = 2-10 propagules per mm<sup>2</sup>

The following website may be referenced for additional information on the above-noted propagules: [http://www.paracellabs.com/files/Species\\_Ecology\\_List.pdf](http://www.paracellabs.com/files/Species_Ecology_List.pdf).

## 5.2 Hazardous Substance Survey

### 5.2.1 Asbestos

The Government of Nunavut's Occupational Health and Safety Regulations state that an asbestos-containing material is that which contains 1% or more asbestos (by weight) as determined using microscopy, stereo and polarized light, with dispersion staining, in accordance with the National Institute for Occupational Safety and Health, *Manual of Analytical Methods, Method 9002, Issue 2 (as amended)*.

Materials sampled and their associated analytical results are presented below.

**Table 2. Analytical Results for Asbestos Content in Bulk Material Samples**

<i>Sample Material &amp; Location</i>	<i>Sample ID</i>	<i>Asbestos-Containing</i>
Vinyl floor tile throughout the building	A1, A2, A3	No
Gypsum board in the hallway and Generator Room	A4, A6, A9	No
Cement board in the Furnace Room (south and east walls)	A5, A7, A8	<b>Yes</b>

Cement board in the furnace room (Photograph 10) was confirmed to contain 20% chrysotile asbestos and 10% crocidolite asbestos.



### 5.2.2 Lead

According to the Government of Nunavut's *Environmental Guideline for Waste Lead and Lead Paint* (2014), the total lead concentration for waste disposal purposes must not exceed 100 mg/kg, otherwise the material is considered to be hazardous waste.

However, the guideline states that samples may be further analyzed using an accepted Toxicity Characteristic Leaching Procedure (TCLP). If the resulting leachate lead concentration is below 5.0 mg/L, the material is not deemed to be hazardous waste.

Based on the analytical results received on August 4, 2016, five of the six collected paint samples were confirmed to contain total lead above the regulatory guideline of 100 mg/kg. A summary of the results are presented below.

**Table 3. Lab Results for Total Lead Content in Paint Samples**

<i>Room</i>	<i>Paint Description</i>	<i>Sample ID</i>	<i>Total Lead Concentration</i>
<i>Generator</i>	White paint on south wall	L1	1210 µg/g
	White paint on plywood wall	L5	2580 µg/g
<i>Furnace</i>	White paint on south wall	L2	968 µg/g
	Green paint on south wall	L3	1250 µg/g
	Green paint on north wall	L4	1200 µg/g
<i>Radio</i>	Green paint on plywood ceiling (below paneling)	L6	42 µg/g

Note: µg/g and mg/kg are equivalent units

Samples which exceeded the regulatory limit of 100 mg/kg (Samples L1 – L5) were further analyzed via TCLP analysis to determine their lead leachate concentration. Results from the TCLP analysis are presented below.

**Table 4. Lab Results for Leachate Lead Content in Paint Samples**

<i>Sample ID</i>	<i>Leachate Lead Concentration</i>
L1	0.75 mg/L
L2	< 0.05 mg/L
L3	0.53 mg/L
L4	0.85 mg/L
L5	1.39 mg/L

In addition to the lead-containing paint samples, a large lead-acid battery was identified on the floor of the generator room. Emergency lighting, which also contains lead-acid batteries, was identified in the generator and radio rooms (see Photograph 12).



### **5.2.3 Mercury**

Fluorescent lights, which contain mercury vapor, were identified within the building (see Photograph 12).

### **5.2.4 Silica**

Gypsum board, which may contain crystalline silica, was identified on the south and north walls of the generator room and hallway, respectively.

### **5.2.5 Polychlorinated Biphenyls (PCBs)**

PCBs may be present in the ballasts of fluorescent lights (see Photograph 11). Concentric did not disassemble these light tubes to review ballast labels due to potential hazards to the surveyor.

PCBs may also be present in transformers and control units in the generator and radio rooms.

### **5.2.6 Ozone Depleting Substances**

No ozone depleting substances were identified at the site.

### **5.2.7 Other Hazardous Substances**

Although outside the scope of this HSS, numerous other potentially hazardous substances (or equipment containing hazardous substances) were noted during the survey, including three fuel tanks, oil canisters, paints and adhesives, and electrical and communication equipment. It is presumed that these substances or equipment be disposed of prior to demolition of the building. Any hazardous waste disposal should be completed according to applicable federal and territorial regulations and/or guidelines.

## **6. RECOMMENDATIONS**

### **6.1 Building Envelope Assessment**

Numerous potential entryways for moisture into the building were observed. To reduce infiltration into the ceiling assembly of the building, the following actions are recommended:

1. Seal flute openings with sealant (e.g. silicone or polyurethane).
2. Install metal flashing on the north (where previously removed) and south sides of the roof.
3. Repair any penetrations in metal cladding and ensure an adequate seal around exterior components (e.g. flue and air vents, pipes, cables and electrical, etc.).
4. Install more efficient (i.e. longer) vent covers that will prevent entry of wind-driven snow during the winter season

*Note: The above recommendations are provided presuming the building is to be replaced within the following 12 – 18 months, as scheduled. Should the building not be replaced within this time frame, more extensive measures would be required.*



## **6.2 Mould Assessment**

Generally speaking, moulds can be found virtually everywhere and can grow on virtually any organic substance as long as moisture and oxygen are present. All persons are repeatedly exposed day after day to a wide variety of bioaerosols (airborne particles that are living or originate from living organisms) and most do not experience adverse health effects. However, some moulds can produce allergens that can trigger allergic reactions or asthma attacks; others are known to produce toxins and/or irritants.

Mould related guidelines have been formulated by the Federal Government and the American Industrial Hygiene Association. These guidelines indicate that microbial growth within a building is not acceptable. Moisture intrusion, visible mouldy, wet, or soiled surfaces must be remediated following an established protocol.

Mould at the site should be remediated following an established protocol such as the following:

- Institute of Inspection Cleaning and Restoration Certification (IICRC) S520, Standard Reference Guide for Professional Mold Remediation (2008).
- Mould Guidelines for the Canadian Construction Industry” published by the Canadian Construction Association (2004).

It is recommended that the all porous mould impacted or water damaged building materials within the attic space be removed. Non-porous materials (eg. wood, metal sheeting etc.) may need to be removed and replaced if it cannot be adequately cleaned or the mould has effected its soundness. Alternately encapsulation of this area may be an option if the area can be adequately sealed and ventilation within the building is not compromised.

## **6.3 Designated Substance Survey**

### **6.3.1 Asbestos**

Prior to demolition activities, all cement board within the furnace room should be removed and handled by a qualified contractor in accordance with the *Northwest Territories and Nunavut Codes of Practice for Asbestos Abatement*. Cement board is considered a non-friable material and can therefore be removed using the low risk abatement procedures specified in section 5.2 of the Code, provided the following criteria are met:

- The material is not cut, broken, sanded, or vibrated; or
- Non-powered hand tools designed to cut, drill, or abrade the material are used with water to control fiber release; and,
- The asbestos-containing materials are handled and transported in sealed containers.

If the material has to be cut, broken or otherwise damaged during removal without the use of water to control the release of asbestos fibers, moderate risk abatement procedures specified in section 5.3 of the Code should be followed.

Additionally, if the amount of cement board exceeds 10 kg, the employer should establish a safe work practice governing the storage, handling, use, and disposal of the asbestos.



Transportation and disposal of asbestos waste should be conducted in accordance with the Government of Nunavut's *Environmental Guideline for Waste Asbestos*.

### **6.3.2 Lead**

Demolition activities may have the potential to create airborne lead. As such, necessary measures must be taken (e.g. by means of engineering controls, work practices and hygiene practices) to ensure that the exposure of a worker to airborne lead shall not exceed the occupational exposure limit (OEL), averaged over an 8-hour day, of 0.05 mg/m<sup>3</sup> as per the Nunavut Occupational Health and Safety Regulations (2016).

Because all of the collected paint samples contained leachate lead concentrations below the regulatory limit of 5.0 mg/L, any paint waste from the site may be treated as non-hazardous waste and disposed of in a regular landfill.

Before demolition activities, the lead-acid batteries in the emergency lights and the large lead-acid battery on the floor of the Generator Room should be removed and either reused or handled, transported, and disposed of by a qualified contractor in accordance with the Government of Nunavut's *Environmental Guideline for Waste Batteries* (2011).

### **6.3.3 Mercury**

Prior to demolition activities, fluorescent lights should be carefully removed and re-used, recycled, or disposed of in accordance with Nunavut's *Environmental Guideline for Mercury-Containing Products and Waste Mercury* (2010).

### **6.3.4 Silica**

Demolition activities have the potential to create airborne silica. As such, necessary measures must be taken (e.g. by means of engineering controls, work practices and hygiene practices) to ensure that the exposure of a worker to airborne silica shall not exceed the occupational exposure limit (OEL), averaged over an 8-hour day, of 0.05 mg/m<sup>3</sup> for quartz and cristobalite and 0.1 mg/m<sup>3</sup> for quartz/tripoli as per the Nunavut Occupational Health and Safety Regulations (2016).

Demolition wastes containing silica must be handled, transported and disposed of according to applicable federal and territorial waste handling regulations.

### **6.3.5 Polychlorinated Biphenyls**

It is recommended that fluorescent light ballast labels be checked to confirm the presence of PCB containing components prior to removal and disposal. If ballasts are not clearly labeled as "non-PCB", they must be considered PCB-containing. Alternatively, the Environment Canada Publication titled *Identification of Lamp Ballasts Containing PCBs* (1991) may be referenced to (potentially) determine if unlabeled ballasts contain PCBs.

If the ballasts are labeled or identified as PCB-containing, they should be packed and shipped for destruction or recycling according to Transport Canada's Transportation of Dangerous Goods Act—this should include packing with an absorbent material and shipment to a licensed facility under proper chain of custody procedures.



Electrical transformers on site should be assumed to contain PCBs (unless identified otherwise) and handled, transported, and disposed of according to the above recommendations.

## **7. GENERAL LIMITATIONS**

This report was prepared exclusively for the purposes, project and site location outlined in the report. The report is based on information provided to, or collected and/or obtained by Concentric as indicated in the report, and applies solely to site conditions existing at the time of the site assessment. Concentric's report represents a reasonable analysis and interpretation of available information within an agreed work scope, schedule and budget.

Concentric prepared this report for the sole benefit of the Canadian Coast Guard. The material in it reflects Concentric's best judgment in light of the information available to us at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions based upon it, are the responsibilities of such third parties. Concentric accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this report.

The services performed and outlined herein were based, in part, upon visual observations of the site. Our opinion cannot be extended to portions of the site that were unavailable for direct observation by objects or coverings at the time of our onsite review. It should be noted that no destructive investigations were performed in areas with concrete, or where there was no absolute access point. As such, it is possible that asbestos and other hazardous substances may exist between walls or other enclosures/barriers, which would not have been visible during the survey. Furthermore, inconsistencies in construction as well as later renovations, repairs and additions to the building may result in a deviation in the pattern of designated substance use within the building. As such, without viewing and sampling every building material, it is not possible to individually characterize every material present.

Observations at the site relating to asbestos and hazardous materials are described in this report. Where testing was performed, it was executed in accordance with our contract for these services. Other compounds or materials not tested for may be present.

The objective of this report was to survey the environmental conditions at the site, within the context of our contract, with respect to the existing regulations, and within the applicable jurisdiction. Compliance of past and current owners with applicable local, provincial and federal government laws and regulations was not included in our contract for services.

The conclusions of this report are based, in part, on the information provided by others, including any testing and analyses described in the report. The possibility remains that unexpected environmental conditions may be encountered at the site locations not explored. Should such an event occur, Concentric should be notified so that modifications to our conclusions can be made, as necessary.

This report has been prepared in accordance with generally accepted environmental study and/or engineering practices. No other warranties, expressed or implied, are made as to the professional services provided under the terms of our contract and inclusions in this report.





If you have any questions regarding the above, please do not hesitate to contact the undersigned.

Yours sincerely,

**CONCENTRIC ASSOCIATES INTERNATIONAL INCORPORATED**

A handwritten signature in blue ink that reads "Jesse Francisco".

Jesse Francisco  
Environmental Technologist

A handwritten signature in black ink that reads "Nancy Caldwell".

Nancy Caldwell B.A. (Hons.)  
Project Manager



**Appendix A**  
Regulatory and Guideline Framework



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### **The Occupational Health and Safety Regulations (2016, as amended), Government of Nunavut**

The Government of Nunavut's Occupational Health and Safety Regulations made under the Safety Act (2016, as amended) provides requirements to all industries regarding occupational health and safety in Nunavut. Part 24 and 25 of the regulation outlines the processes and appropriate measures for handling and/or working around asbestos and silica, respectively.

### **Consolidation of Safety Act (2016, as amended), Government of Nunavut**

The Nunavut Safety Act is a consolidation of both Nunavut and Northwest Territories' statutes. The act, in part, specifies the duties required by employers to protect the health and safety of their employees in the workplace. Specifically, Section 4 of the act dictates the need for employers to "take all reasonable precautions and adopt and carry out all reasonable techniques and procedures to ensure the health and safety of every person in his or her establishment".

### **Northwest Territories and Nunavut Asbestos Abatement Codes of Practice (2012, as amended), Workers' Safety & Compensation Commission**

The Asbestos Abatement Codes of Practice outlines the most appropriate techniques for the safe abatement of asbestos-containing materials. The code also provides general information about health hazards associated with asbestos exposure, as well as important criteria for contractors such as safe work procedures, inspection criteria, sampling guidance, applicable legislation, and competency profiles for those involved in the abatement process.

### **Environmental Guideline for Waste Asbestos (2011, as amended), Government of Nunavut**

This guideline provides the generator and contractors with information regarding asbestos waste management including appropriate procedures for handling, storage, transporting, and disposing of asbestos waste. For example, the guideline specifies the protocol for packaging/labeling asbestos waste in accordance with the Transportation of Dangerous Goods Act and Regulations.

### **Environmental Guideline for Waste Lead and Lead Paint (2014, as amended), Government of Nunavut**

This guideline provides information on the characteristics and possible effects of waste lead and lead paint on human health and the environment, and provides guidance on its proper containment, removal, storage, transportation and disposal.

### **Environmental Guideline for Mercury-Containing Products and Waste Mercury (2010, as amended), Government of Nunavut**

This guideline provides information on the risks, hazards and best management practices associated with various mercury containing products commonly used in Nunavut. It examines the characteristics and effects of mercury on the environment and human health, identifies non mercury alternatives for common products, and



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provides guidance on the proper cleanup, storage, transportation and disposal of mercury waste.

**Environmental Guideline for Waste Batteries (2011, as amended), Government of Nunavut**

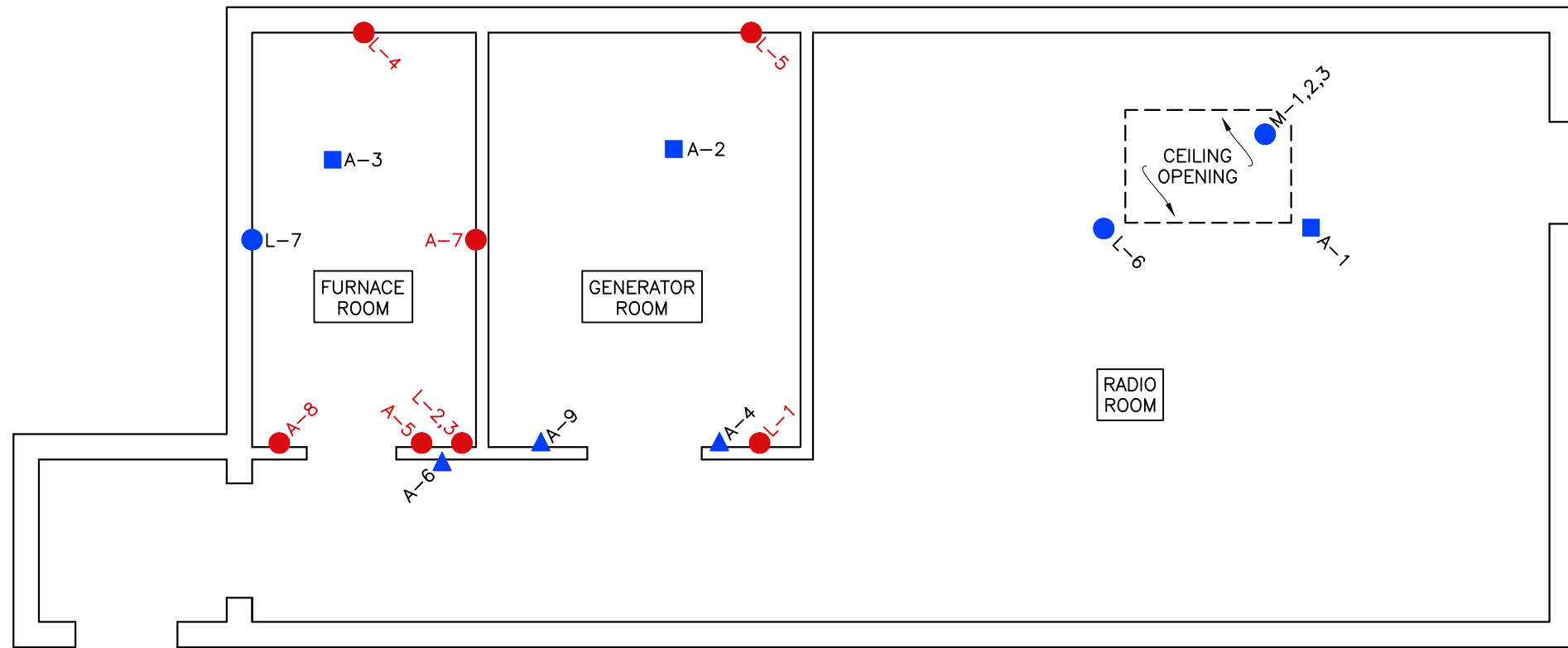
This guideline provides information on the types, uses and potential environmental and human health effects of waste batteries, as well as guidance on their proper storage, transportation and disposal.

**PCB Regulations SOR/2008-273 (2015, as amended), Government of Canada**

This regulation outlines related prohibitions, storage, labeling, etc. of PCBs in Canada. Section 5 states that no person shall release PCBs into the environment in excess of 2 mg/kg of liquid containing PCBs.



**Appendix B**  
Sample Location Maps



- LEGEND:**
- A-# - VINYL FLOOR TILE SAMPLE LOCATION
  - ▲ A-# - GYPSUM BOARD SAMPLE LOCATION
  - A-# - ASBESTOS CONTAINING CEMENT BOARD SAMPLE LOCATION
  - M-# - MOULD SAMPLE LOCATION
  - L-# - LEAD CONTAINING PAINT SAMPLE LOCATION
  - L-# - PAINT SAMPLE LOCATION

 **SAMPLE LOCATION PLAN**  
SCALE: 1:50



## **Appendix C** Photographs



**Photograph 1.** View of CCG's equipment building at the Iqaluit receiver site.



**Photograph 2.** View of the northeast corner of metal batten roof with flashing removed.





**Photograph 3.** View of test cut opening in the ceiling of the Radio room.



**Photograph 4.** View of deteriorating sealant and insulation in flute opening of roof.



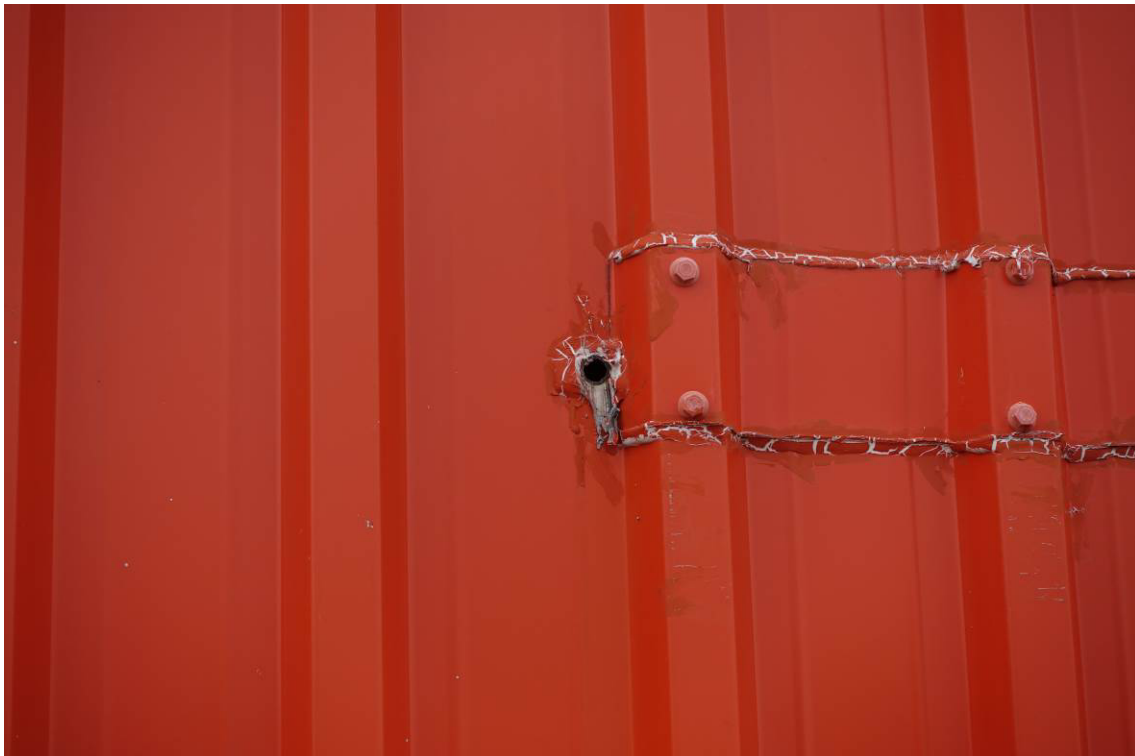
**Photograph 5.** View of the base of flue vent showing underlying cavity.



**Photograph 6.** View of ventilation opening in the metal cladding.



**Photograph 7.** Small vent hoods on the north and west sides of the building.



**Photograph 8.** Small penetration in the metal cladding of the building.



**Photograph 9.** View of rotted wood and mould-contamination in the attic space.



**Photograph 10.** Asbestos-containing cement board walls in the furnace room.



**Photograph 11.** View of the generator room showing emergency lighting and fluorescent light tubes with potentially PCB containing ballasts.



**Appendix D**  
Laboratory Certificates of Analysis

## Certificate of Analysis

### Concentric Associates International Inc. (Ottawa)

2327 St. Laurent Blvd., Unit 100  
Ottawa, ON K1G 4J8  
Attn: Randy Scott

Client PO:  
Project: 16-6912E  
Custody: 17530

Report Date: 8-Aug-2016  
Order Date: 2-Aug-2016

**Order #: 1632112**

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

Parcel ID	Client ID
1632112-01	A1 Radio Rm Floor
1632112-02	A2 Generator Rm Floor
1632112-03	A3 Furnace Rm Floor
1632112-04	A4 Southwall, Generator Rm Floor (Gypsum)
1632112-05	A6 Northwall, Main Hallway (Gypsum)
1632112-06	A9 Southwall, Generator Room (Gypsum)
1632112-07	A5 Southwall, Furnace Room
1632112-08	A7 Eastwall, Furnace Room
1632112-09	A8 Southwall, Furnace Rm
1632112-10	A4 Southwall, Generator Rm Floor (Paper)
1632112-11	A6 Northwall, Main Hallway (Paper)
1632112-12	A9 Southwall, Generator Room (Paper)

Approved By:



Emma Diaz  
Senior Analyst

Any use of these results implies your agreement that our total liability in connection with this work, however arising, shall be limited to the amount paid by you for this work, and that our employees or agents shall not under any circumstances be liable to you in connection with this work.

Certificate of Analysis

Report Date: 08-Aug-2016

Client: Concentric Associates International Inc. (Ottawa)

Order Date: 2-Aug-2016

Client PO:

Project Description: 16-6912E

**Asbestos, PLM Visual Estimation \*\*MDL - 1.0%\*\***

Parcel I.D.	Sample Date	Layers Analyzed	Colour	Description	Asbestos Detected:	Material Identification	% Content
1632112-01	26-Jul-16	sample homogenized	Brown	Floor Tile	No	<b>Client ID: A1 Radio Rm Floor</b> [AS-PRE] Non-Fibers	100
1632112-02	26-Jul-16	sample homogenized	Brown	Floor Tile	No	<b>Client ID: A2 Generator Rm Floor</b> [AS-PRE] Non-Fibers	100
1632112-03	26-Jul-16	sample homogenized	Brown	Floor Tile	No	<b>Client ID: A3 Furnace Rm Floor</b> [AS-PRE] Non-Fibers	100
1632112-04	26-Jul-16	sample homogenized	Brown	Gypsum	No	<b>Client ID: A4 Southwall, Generator Rm Floor (Gypsum)</b> Cellulose MMVF Non-Fibers	1 5 94
1632112-05	26-Jul-16	sample homogenized	Brown	Gypsum	No	<b>Client ID: A6 Northwall, Main Hallway (Gypsum)</b> Cellulose MMVF Non-Fibers	1 5 94
1632112-06	26-Jul-16	sample homogenized	Brown	Gypsum	No	<b>Client ID: A9 Southwall, Generator Room (Gypsum)</b> Cellulose MMVF Non-Fibers	1 5 94
1632112-07	26-Jul-16	sample homogenized	Grey	Cement Board	Yes	<b>Client ID: A5 Southwall, Furnace Room</b> Chrysotile Crocidolite Non-Fibers	20 10 70
1632112-08	26-Jul-16					<b>Client ID: A7 Eastwall, Furnace Room</b> not analyzed	
1632112-09	26-Jul-16					<b>Client ID: A8 Southwall, Furnace Rm</b> not analyzed	
1632112-10	26-Jul-16	sample homogenized	Brown	Paper	No	<b>Client ID: A4 Southwall, Generator Rm Floor (Paper)</b> [AS-PRE] Cellulose MMVF Non-Fibers	90 1 9
1632112-11	26-Jul-16	sample homogenized	Brown	Paper	No	<b>Client ID: A6 Northwall, Main Hallway (Paper)</b> [AS-PRE] Cellulose Non-Fibers	90 10



Certificate of Analysis

Report Date: 08-Aug-2016

Client: **Concentric Associates International Inc. (Ottawa)**

Order Date: 2-Aug-2016

Client PO:

Project Description: **16-6912E**

**Asbestos, PLM Visual Estimation    \*\*MDL - 1.0%\*\***

Parcel I.D.	Sample Date	Layers Analyzed	Colour	Description	Asbestos Detected:	Material Identification	% Content
1632112-12	26-Jul-16	sample homogenized	Brown	Paper	No	<b>Client ID: A9 Southwall, Generator Room (Paper)</b> [AS-PRE]	
						Cellulose	90
						Non-Fibers	10

\* MMVF: Man Made Vitreous Fibers: Fiberglass, Mineral Wool, Rockwool, Glasswool

\*\* Analytes in bold indicate asbestos mineral content.

**Analysis Summary Table**

Analysis	Method Reference/Description	Lab Location	NVLAP Lab Code *	Analysis Date
Asbestos, PLM Visual Estimation	by EPA 600/R-93/116	Ottawa West Lab	200812-0	3-Aug-16

\* Reference to the NVLAP term does not permit the user of this report to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

**Qualifier Notes**

Sample Qualifiers :

AS-PRE: Due to the difficult nature of the bulk sample (interfering fibers/binders), additional NOB preparation was required prior to analysis

**Work Order Revisions / Comments**

None

## Certificate of Analysis

### Concentric Associates International Inc. (Ottawa)

2327 St. Laurent Blvd., Unit 100  
Ottawa, ON K1G 4J8  
Attn: Randy Scott

Client PO: 16-6912E  
Project: 16-6912E  
Custody: 28238

Report Date: 4-Aug-2016  
Order Date: 2-Aug-2016

**Order #: 1632017**

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

Parcel ID	Client ID
1632017-01	L1-South Wall, Generator Room
1632017-02	L2-South (Inner) Wall, Furnace Room
1632017-03	L3-South (Outer) Wall, Furnace Room
1632017-04	L4-North Wall, Furnace Room
1632017-05	L5-North Wall, Generator Room
1632017-06	L6-Ceiling, Radio Room

Approved By:



Mark Foto, M.Sc.  
Lab Supervisor

Any use of these results implies your agreement that our total liability in connection with this work, however arising shall be limited to the amount paid by you for this work, and that our employees or agents shall not under circumstances be liable to you in connection with this work

Certificate of Analysis  
Client: **Concentric Associates International Inc. (Ottawa)**  
Client PO: 16-6912E

Report Date: 04-Aug-2016  
Order Date: 2-Aug-2016  
Project Description: 16-6912E

**Analysis Summary Table**

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Metals, ICP-OES	based on MOE E3470, ICP-OES	3-Aug-16	3-Aug-16

**Sample and QC Qualifiers Notes**

1- QM-07 : The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on other acceptable QC.

**Sample Data Revisions**

None

**Work Order Revisions/Comments:**

None

**Other Report Notes:**

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

Certificate of Analysis  
 Client: **Concentric Associates International Inc. (Ottawa)**  
 Client PO: 16-6912E

Report Date: 04-Aug-2016  
 Order Date: 2-Aug-2016  
 Project Description: 16-6912E

### Sample Results

Lead				Matrix: Paint	
				Sample Date: 26-Jul-16	
Paracel ID	Client ID	Units	MDL	Result	
1632017-01	L1-South Wall, Generator Room	ug/g	20	1210	
1632017-02	L2-South (Inner) Wall, Furnace Room	ug/g	20	968	
1632017-03	L3-South (Outer) Wall, Furnace Room	ug/g	20	1250	
1632017-04	L4-North Wall, Furnace Room	ug/g	20	1200	
1632017-05	L5-North Wall, Generator Room	ug/g	20	2580	
1632017-06	L6-Ceiling, Radio Room	ug/g	20	42	

### Laboratory Internal QA/QC

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Matrix Blank</b>									
Lead	ND	20	ug/g						
<b>Matrix Duplicate</b>									
Lead	2350	20	ug/g	2550			8.2	30	
<b>Matrix Spike</b>									
Lead	1430		ug/L	1280	61.1	70-130			QM-07

## Certificate of Analysis

### Concentric Associates International Inc. (Ottawa)

2327 St. Laurent Blvd., Unit 100  
Ottawa, ON K1G 4J8  
Attn: Jesse Francisco

Client PO: 16-6912E  
Project: 16-6912E  
Custody: 28238

Report Date: 11-Aug-2016  
Order Date: 9-Aug-2016

**Order #: 1633147**

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

Parcel ID	Client ID
1633147-01	L1-South Wall, Generator Room
1633147-02	L2-South (Inner) Wall, Furnace Room
1633147-03	L3-South (Outer) Wall, Furnace Room
1633147-04	L4-North Wall, Furnace Room
1633147-05	L5-North Wall, Generator Room

Approved By:



Mark Foto, M.Sc.  
Lab Supervisor

Certificate of Analysis  
Client: **Concentric Associates International Inc. (Ottawa)**  
Client PO: 16-6912E

Report Date: 11-Aug-2016  
Order Date: 9-Aug-2016  
Project Description: 16-6912E

### Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Metals, ICP-MS	EPA 6020 - Digestion - ICP-MS	11-Aug-16	11-Aug-16
Solids, %	Gravimetric, calculation	10-Aug-16	10-Aug-16

Certificate of Analysis  
 Client: **Concentric Associates International Inc. (Ottawa)**  
 Client PO: 16-6912E

Report Date: 11-Aug-2016  
 Order Date: 9-Aug-2016  
 Project Description: 16-6912E

<b>Client ID:</b>	L1-South Wall, Generator Room	L2-South (Inner) Wall, Furnace Room	L3-South (Outer) Wall, Furnace Room	L4-North Wall, Furnace Room
<b>Sample Date:</b>	26-Jul-16	26-Jul-16	26-Jul-16	26-Jul-16
<b>Sample ID:</b>	1633147-01	1633147-02	1633147-03	1633147-04
<b>MDL/Units</b>	Paint	Paint	Paint	Paint

**Physical Characteristics**

% Solids	0.1 % by Wt.	100	100	100	100
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**EPA 1311 - TCLP Leachate Inorganics**

Lead	0.05 mg/L	0.75	<0.05	0.53	0.85
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<b>Client ID:</b>	L5-North Wall, Generator Room	-	-	-
<b>Sample Date:</b>	26-Jul-16	-	-	-
<b>Sample ID:</b>	1633147-05	-	-	-
<b>MDL/Units</b>	Paint	-	-	-

**Physical Characteristics**

% Solids	0.1 % by Wt.	100	-	-	-
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**EPA 1311 - TCLP Leachate Inorganics**

Lead	0.05 mg/L	1.39	-	-	-
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Certificate of Analysis  
 Client: **Concentric Associates International Inc. (Ottawa)**  
 Client PO: 16-6912E

Report Date: 11-Aug-2016  
 Order Date: 9-Aug-2016  
 Project Description: **16-6912E**

**Method Quality Control: Blank**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>EPA 1311 - TCLP Leachate Inorganics</b>									
Lead	ND	0.05	mg/L						



Certificate of Analysis  
 Client: **Concentric Associates International Inc. (Ottawa)**  
 Client PO: 16-6912E

Report Date: 11-Aug-2016  
 Order Date: 9-Aug-2016  
 Project Description: **16-6912E**

**Method Quality Control: Duplicate**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>EPA 1311 - TCLP Leachate Inorganics</b>									
Lead	0.610	0.05	mg/L	0.657			7.4	32	
<b>Physical Characteristics</b>									
% Solids	91.0	0.1	% by Wt.	91.0			0.0	25	

Certificate of Analysis  
 Client: **Concentric Associates International Inc. (Ottawa)**  
 Client PO: 16-6912E

Report Date: 11-Aug-2016  
 Order Date: 9-Aug-2016  
**Project Description: 16-6912E**

**Method Quality Control: Spike**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>EPA 1311 - TCLP Leachate Inorganics</b>									
Lead	49.2		ug/L	ND	98.4	77-126			

Certificate of Analysis  
**Client: Concentric Associates International Inc. (Ottawa)**  
**Client PO: 16-6912E**

Report Date: 11-Aug-2016  
Order Date: 9-Aug-2016  
**Project Description: 16-6912E**

**Qualifier Notes:**

None

**Sample Data Revisions**

None

**Work Order Revisions / Comments:**

None

**Other Report Notes:**

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

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