MEMORANDUM

Date:	August 10, 2016
To:	Glenn Dempster, Project Manager, Fibreco Export Inc.
From:	Bonnie Marks, Project Manager, Hemmera
CC:	Darrell Desjardin & Chuck Jochems, Hemmera
File:	314-006.04A
Re:	Terminal Enhancement Project – Sediment Investigation & Dredge Plan

Attached to this memorandum are the Dredge Plan and Sediment Investigation Report which summarize the information requested under dredging in the VFPA Project & Environmental Review application submission requirements dated June 2, 2016 for Fibreco's Terminal Enhancement Project.

The conclusions of these document based on the sediment investigation results are:

- The top 0.3 m of sediments on the existing seabed within the proposed dredge prism have concentrations of metals (arsenic, cadmium, copper, and zinc), total polycyclic aromatic hydrocarbons (PAHs) and/or tri-butyl tine exceeding Disposal at Sea (DAS) criteria.
- An estimated 1,250 m^3 of contaminated sediments and wood fibre will be dredged in the first phase (Phase 1) and disposed of upland at an approved landfill facility due to concentrations of chloride and sodium exceeding provincial Contaminated Sites Regulation (CSR) industrial soil standards.
- Phase 1 of dredging would occur in the Fisheries and Oceans Canada (DFO) Fisheries window between August 15 and February 28.
- Subsequent to Phase 1 dredging and following confirmatory sediment sampling, a DAS Permit Application will be submitted to Environment and Climate Change Canada (EC) to allow for the remaining native dredged material, approximately 2,800 m^3, to be disposed at the Point Grey DAS site.
- Dredging of clean material (Phase 2) to be completed during the following annual DFO Fisheries window depending on timing of obtaining the DAS Permit.
- Dredging will be completed using a cable clamshell dredger in conjunction with a barge or a barge-mounted modified excavator.

MEMORANDUM

Date:	August 10, 2016
To:	Glenn Dempster, Fibreco
From:	Chuck Jochems, Darrell Desjardin, Hemmera
File:	315-006.04A
Re:	Dredge Plan and DAS Permitting Western portion of Shipping Berth, Parcel C of PMV Lease Plan No. 2012-194

1.0 INTRODUCTION

Hemmera Envirochem Inc. (Hemmera) was retained by Fibreco Export Inc. (Fibreco) to conduct a sediment investigation in the western extent of the water lot lease associated with its wood fibre terminal located at 1209 McKeen Avenue in North Vancouver, BC. The investigation included collecting sediment cores to characterize the seabed in anticipation of the dredge required to deepen the berth for Panamax vessels. It was determined based on the recent bathymetry survey of the water lot that likely only the western end of the shipping berth would require dredging as the depth of water is below 13.5 m chart datum.

2.0 PROJECT DREDGING SCOPE AND METHODOLOGY

The general scope and methodology of the dredge includes the following aspects:

- A confirmatory sediment sampling plan will be submitted to Environment and Climate Change Canada (EC) for approval, prior to initiating the contaminated sediment dredge;
- Dredge approximately 1,250 m^3 of contaminated sediment from a 4,840 m^2 dredge footprint for upland disposal. Much of this material will come from 75% of the western lobe and grading of the sediment slopes along the existing dock structure (see attached preliminary dredge prism, CWA Engineers Inc., File 15006-500-CE-001.dwg);
- Contaminated sediment dredging will be completed using a cable clamshell dredger or a barge-mounted excavator;
- Equipment includes a crane, 5 cubic yard (CY) clamshell, in conjunction with a spud barge or barge-mounted modified excavator with similar size bucket;
- Based on the sediment characterization data, remove a 0.3 to 0.5 m lift in consideration of the dredge unit's ability to cut within a 20 cm vertical tolerance;
- The dredged material will be dredged from within a silt curtain and placed on a flat scow where it will decant within the silt curtain area;

- Confirmatory sediment samples will be collected by Fraser Burrard Diving using scoops in soft sediment areas, as outlined in the approved sampling plan;
- A bathymetric survey will be completed in conjunction with the confirmatory sediment sampling to confirm the contaminated sediment has been removed;
- A Disposal-at-Sea (DAS) Permit Application will be submitted to EC to allow for the remaining native dredged material to be disposed at the Point Grey DAS site. The approximate quantity of the remaining dredge is 2,800 m^3; and,
- Dredging of the clean sandy sediment will be completed using as above, with the use of a cable clamshell dredger or a barge-mounted modified excavator.

3.0 CONTAMINANTS IDENTIFIED IN SURFACE SEDIMENTS

The contaminants identified in the upper 0.3 m of sediment include:

- Elevated cadmium and copper above DAS criteria;
- Occasional exceedances for arsenic, zinc, total polycyclic aromatic hydrocarbons (PAHs), and tri-butyl tin above DAS criteria; and,
- Elevated chloride and sodium above provincial CSR industrial soil standards for upland disposal.

A separate sediment investigation letter report dated July 25, 2016 documents the results of the sediment analysis.

4.0 PROJECT TIMING

The dredging will need to be completed in two phases given the presence of the upper contaminated layer. A DAS permit application can only be made to EC once removal of contaminated sediments has been confirmed and the subsequent results support relocation of clean sediments in compliance with applicable DAS criteria. The project schedule will involve:

- Contaminated sediment dredge planned for Fisheries and Oceans Canada (DFO) Fisheries window between August 15 and February 28;
- DAS Application to be submitted to EC within one month of completing the contaminated sediment removal and allow a minimum 6-month timeframe to obtain DAS permit after regulatory (Vancouver Fraser Port Authority (VFPA), Transport Canada and DFO) and First Nation consultation;
- Dredging of clean material to be completed during the following annual DFO Fisheries window; and,
- If delays are realized in obtaining the DAS Permit, then clean material dredging may extend beyond the DFO Fisheries window into the Fisheries Sensitive period with pre-approval from VFPA.

5.0 MITIGATION MEASURES FOR DREDGING WORK

Mitigation measures associated with the dredging of soft sediments will include, at a minimum:

- Dredging inside a silt curtain will be completed; and,
- Decanting sediment inside the silt curtain will also be done.

More details on recommended mitigation measures are provided in the Marine Habitat Assessment – Biophysical Survey for the Project dated August 2, 2016 and in the construction environmental management plan.

6.0 SEDIMENT DISPOSAL

Contaminated sediment not eligible for disposal at sea will require disposal under Provincial jurisdiction at an approved upland facility, which will likely include:

- Submit Waste Approval Application (WAA) for approval of contaminated sediment by licensed facility;
- Contaminated sediment will be towed via barge to a ramp along the Fraser River in Richmond or Delta for offloading, stabilization (likely with Portland cement), and transfer to trucks;
- Truck contaminated sediment to the Envirogreen Technologies Ltd. facility in Princeton, BC; and,
- Clean native material will be disposed of at the Point Grey site under a DAS permit from Environment Canada, under a subsequent phase of the dredge.

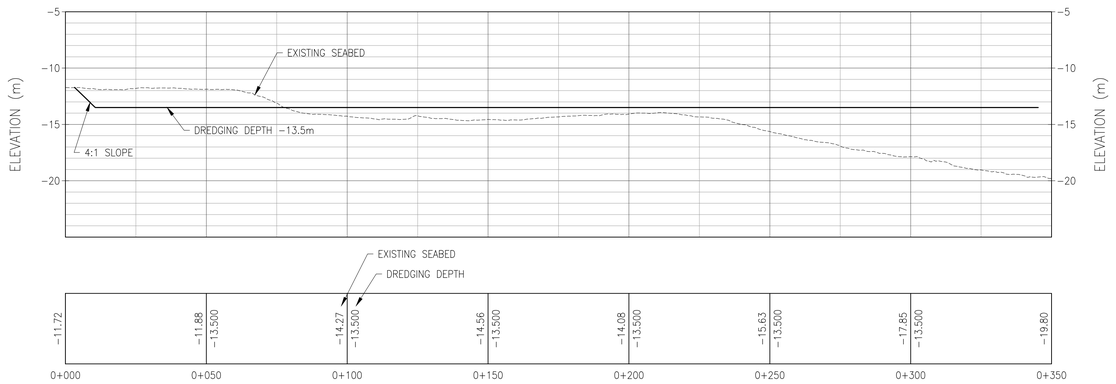
7.0 DISPOSAL AT SEA PERMITTING

Securing a (DAS permit will include the following steps:

- Prepare a Confirmatory Sediment Sampling plan for discussion and approval from EC;
- Arrange for EC staff to be present during confirmatory sediment sampling;
- Once removal of contaminated sediment has been confirmed, submit a DAS permit application to EC for review with the associated applicable fees;
- Receive review letter from EC indicating complete application package has been received;
- Go through consultation period with federal regulators and First Nations which can take up to 90 days;
- Await outcome and decision on DAS approval from consultation period;
- If EC approves of the application after consultations have closed, a draft DAS permit and Environmental Protection Plan (EPP) is then issued to the proponent for comment and once the EPP is signed, the DAS permit is translated for publishing on the Canadian Environmental Protection Act (CEPA) registry which can take up to seven days;

- If no significant public comments are received, the DAS permit becomes effective seven days after the date of being published on the CEPA registry;
- The proponent must also submit a Dredged Materials Disposal Plan to Environment Canada prior to disposing of any sediments at the DAS site; and,
- The proponent must also notify Environment Canada and Climate Change prior to loading and disposal under the terms of the DAS permit. During the term of a permit, operations may be subject to inspections by Environment and Climate Change Canada staff.

FIGURE



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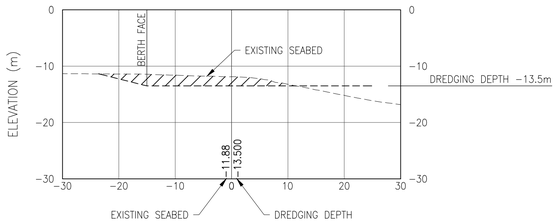

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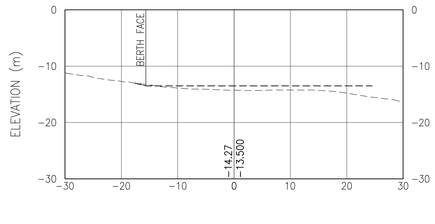

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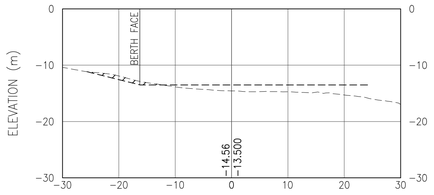

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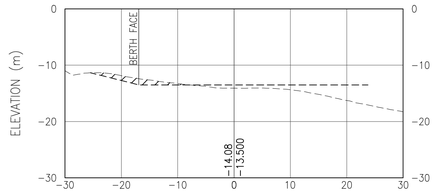

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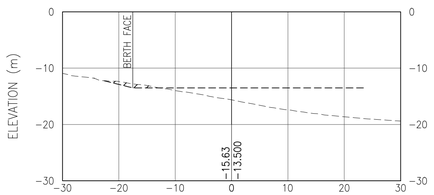

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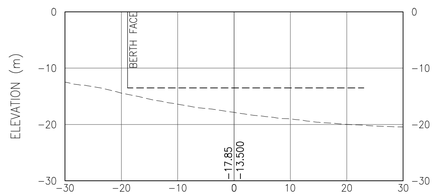

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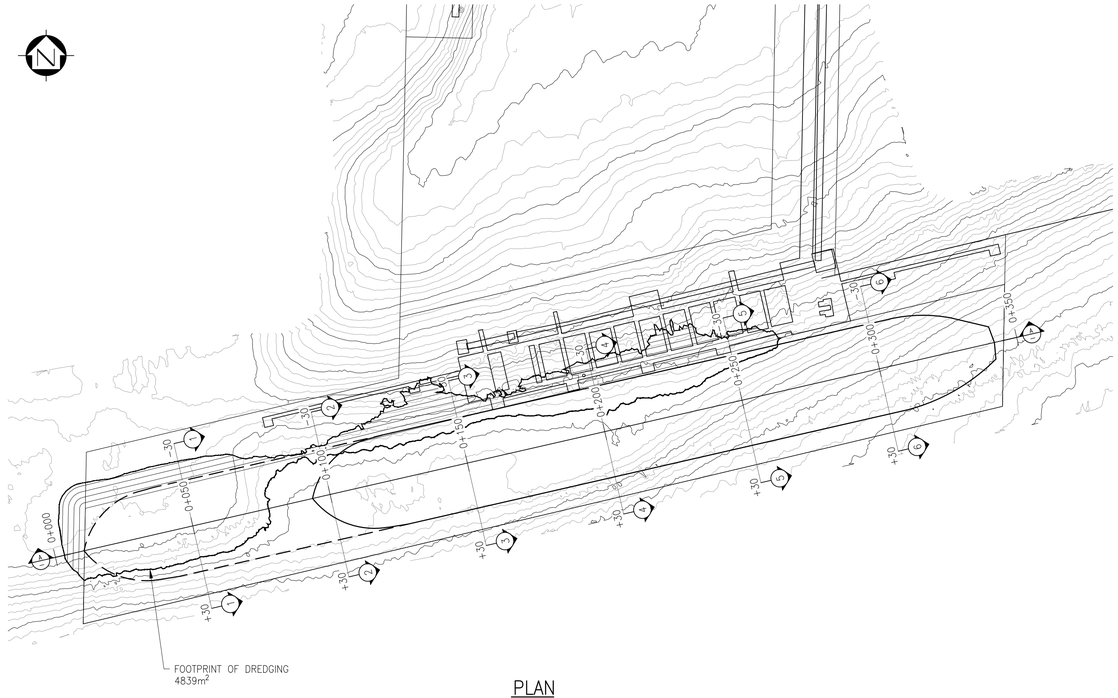

PLAN
1:1000

NOTE:
PRELIMINARY DREDGING VOLUME: 4062m³
ASSUMES SIDESLOPES OF 4:1 ALONG THE EDGES OF THE LOT BOUNDARY AND BERTH FACE.

PRELIMINARY
NOT FOR CONSTRUCTION

REF.	DWG. NUMBER	DESCRIPTION

REFERENCE DRAWINGS / DESIGN STANDARDS

FIBRECO

FIBRECO EXPORT INC.
1209 McKeen Ave.
North Vancouver, B.C.
V7P 3H9
TEL: (604) 980-6543
FAX: (604) 984-2593

CLIENT PROJECT No:

CWA ACAD FILE: 15006-500-CE-001.DWG

No.	YYYY-MM-DD	DESCRIPTION	DRAWN	DWG. CHECK	DESIGN	DESIGN CHECK	APPROVED
P1	2016-07-25	ISSUED FOR INFORMATION	WRB				

ISSUES / REVISIONS * HAND INITIALS ON FILE

CWA
www.cwaengineers.com

DRAWN BY: DRE SCALE:

FIBERCO EXPORT INC.

NORTH VANCOUVER, B.C.

DREDGING PLAN
DREDGE TO −13.5m

PROJECT No.	AREA	DEPT.	DWG. No.	REV.
15006	500	CE	001	P1

Hemmera Envirochem Inc.
18th Floor, 4730 Kingsway
Burnaby, BC V5H 0C6
T: 604.669.0424
F: 604.669.0430
hemmera.com

July 25, 2016
File: 315-006.04A

Fibreco Export Inc.
1209 McKeen Avenue
North Vancouver, BC V7P 3H9

Attn: Glenn Dempster, Project Manager

Dear Glenn,

Re: Sediment Investigation, Terminal Enhancement Project, North Vancouver

1.0 INTRODUCTION

Fibreco currently operates a wood chip and pellet distribution facility located at 1209 McKeen Avenue in North Vancouver, BC. The location of the Fibreco facility is shown on **Figure 1**. As part of their terminal enhancement project, Fibreco will be dredging a portion of the existing shipping berth in order to accommodate larger Panamax vessels. A portion of the dredged material may be eligible for Environment Canada's Disposal at Sea (DAS) program if sediment quality within the dredge prism meets DAS criteria.

A bathymetric survey was conducted in April 2015 by Vancouver Pile Driving Ltd. of North Vancouver, BC, to assist in determining dredge prism extents to accommodate for the Panamax vessels. The bathymetric survey is found in **Appendix A**. A preliminary sediment assessment was completed by Hemmera in June 2015 and identified sediment concentrations of heavy metals (including arsenic, cadmium, and copper), polycyclic aromatic hydrocarbons (PAHs) and/or tri-butyl tin (TBT) exceeding Environment Canada DAS criteria at various sampling locations (refer to Hemmera memo to Fibreco dated August 26, 2015). Samples were collected at depths between 0 and 0.20 m below sediment surface (bss). Based on the results of the 2015 sediment assessment, further investigation was recommended by Hemmera to delineate the sediment contamination laterally and vertically in order to determine if deeper sediments meet DAS criteria.

This Work was performed in accordance with Professional Services Agreement between Hemmera Envirochem Inc. (Hemmera) and Fibreco Export Inc. (Fibreco), dated May 19, 2016 (Contract). This Report has been prepared by Hemmera, based on fieldwork conducted by Hemmera, for sole benefit and use by Fibreco. In performing this Work, Hemmera has relied in good faith on information provided by others, and has assumed that the information provided by those individuals is both complete and accurate. This Work was performed to current industry standard practice for similar environmental work,

within the relevant jurisdiction and same locale. The findings presented herein should be considered within the context of the scope of work and project terms of reference; further, the findings are time sensitive and are considered valid only at the time the Report was produced. The conclusions and recommendations contained in this Report are based upon the applicable guidelines, regulations, and legislation existing at the time the Report was produced; any changes in the regulatory regime may alter the conclusions and/or recommendations.

2.0 REGULATORY FRAMEWORK

2.1 DISPOSAL AT SEA CRITERIA

The DAS criteria outlined in the DAS regulation (2001) is applicable for sediments being considered for DAS. This regulation contains four major groups of contaminants that are part of the National Action List: cadmium, mercury, polycyclic Aromatic Hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs). Other contaminants are subject to the Interim Sediment Quality Guidelines (ISQG) established by the Canadian Council for Ministers of the Environment (CCME).

In June of 2014, an alternate objective for copper was established verbally between Hemmera and Environment Canada because of naturally elevated copper concentrations within the Georgia Basin, which includes the Burrard Inlet. The alternative objective would be to compare the copper concentrations to the 95th percentile of the current sediment concentrations at the Point Grey DAS site. The current sediment data at Point Grey is documented in the "Compendium of Monitoring Activities at Disposal at Sea Sites in 2004-2005", dated March 2006. The 95th percentile copper concentration of 40.5 µg/g is therefore considered rather than the ISQG of 18.7 µg/g for copper. A standard for tributyltin (TBT) has been applied from the Puget Sound Dredge Disposal Analysis (PSDDA) criterion. A list of DAS Criteria is outlined in **Table A** below.

Table A Disposal at Sea Criteria

DAS parameter	DAS Criteria (mg/kg)
Arsenic	7.2
Cadmium	0.6
Chromium	52.3
Copper	40.5*
Lead	30.2
Mercury	0.75
Zinc	124
Total PAHs	2.5
Total PCBs	0.1
Tributyltin (TBT)	0.073**

* 95th percentile of sediment concentrations at Point Grey DAS site
** Puget Sound Dredge Disposal Analysis (PSDDA) criterion

2.2 STANDARDS FOR UPLAND DISPOSAL OF SEDIMENT

Dredged sediments exceeding DAS criteria for one or more contaminants require upland disposal. As such, these sediments are subject to standards defined in the BC Contaminated Sites Regulation (CSR) and Hazardous Waste Regulation (HWR) as prescribed by the BC Ministry of the Environment (MOE) to determine appropriate soil disposal location. For upland disposal purposes, the sediments are also subject to the CSR Schedule 7 – Standards Triggering Contaminated Soil Relocation Agreements, Column IV, Waste Disposal Prohibited Without Authorization (WDPWA or Schedule 7 Column IV).

3.0 OBJECTIVES AND SCOPE OF WORK

Hemmera conducted a two day sediment sampling program at Fibreco with the assistance of Fraser Burrard Diving Ltd (Fraser Burrard) on June 8 and 9, 2016. The objectives of the June 2016 sediment investigation were:

1. General horizontal and vertical delineation of sediment exceeding DAS criteria within the dredge prism; and,
2. Characterization of deeper sediment quality for DAS eligibility and dredge equipment suitability.

Nine predetermined sampling locations were targeted with one sediment core collected at each location as shown on **Figure 2**. Sediment cores were collected using 37 mm clear polycarbonate tubing driven using a hydraulic hammer. Photos from the sampling program are found in **Appendix B**. A detailed description of the sampling methodology is found in **Appendix C**.

4.0 RESULTS

The following subsections discuss the results of the June 2016 Sediment Investigation program.

4.1 SEDIMENT STRATIGRAPHY

Samples collected from the nine locations across the estimated dredge prism contained similar sediments. Sediments consisted of various sized sands and gravels with shell and wood waste at some locations. Detailed sediment logs are found in **Appendix D**.

4.2 WOOD WASTE PRESENCE

Wood waste was identified in five of the nine sampling locations during the June 2016 Sediment Investigation. Coordinates for each of the 2016 sampling locations along with wood waste presence is summarized in **Table 1** and on **Figure 3**.

4.3 ANALYTICAL PROGRAM

Sediment samples were first analyzed from the top 0.30 m and from 0.60 to 0.90 m to gain an understanding of surface and subsurface contaminant concentrations. These samples were analyzed for metals and total PAHs for the purpose of investigating DAS applicability. If the concentrations in the top sample exceeded the DAS criteria, but the deeper sample concentrations were below DAS criteria, the sample in between (0.30 to 0.60 m) was analyzed to confirm the extent of contamination vertically. The shallow sediments (from the top 0.30 m) with concentrations above DAS criteria required further analysis of sodium and chloride ions to investigate upland disposal options. Due to sample volume limitations, however, further analysis would not be possible for the samples from the top 0.30 m and since all sediments were collected from a marine environment, it was assumed that samples collected from 0.30 to 0.60 m and analyzed for sodium and chloride ions would be a good indication for the upper 0.30 m.

To determine if sediments below 0.30 m were in compliance with DAS criteria, tributyltin analysis was completed for samples collected from 0.60 to 0.90 m, and total organic carbon and grain size analysis were completed for samples below 0.90 m. The location and depths of the samples selected for these analyses were based on available sample volumes, and proposed dredge depth.

4.4 ANALYTICAL RESULTS

Six sediment samples collected in 2016 exceeded the DAS criteria for copper (A100, C1, D1, E1, F1 and H1), one of which also exceeded for cadmium (H1), and one also exceeded for zinc and total PAHs (A100). These results are similar to the 2015 sampling results. Analytical results for the samples collected during the 2015 and 2016 sediment sampling investigation compared to DAS criteria are summarized in **Table 2**.

Of the six samples collected in 2016 that exceeded DAS criteria, all but A100 were collected from the top 0.30 m of their respective cores. Sample A100 was a grab sample collected from approximately 1.1 to 1.2 m below the surface of the wood waste. This location contained too much wood waste to successfully drive a representative core, and a grab sample was intended to target sediments below the wood waste. This sample however, was composed primarily of wood waste with some soft sediments. The results for shallow samples collected from the top 0.30 m during both the 2015 and 2016 sediment investigations are shown on **Figure 4**.

Each of the five sampling locations from 2016 containing surface sediment samples with contaminant concentrations above DAS criteria, had deeper samples from 0.30 to 0.60 m bss and 0.6 to 0.9 m bss with concentrations of metals and PAHs less than the DAS criteria. Contamination has been delineated within the top 0.30 m across the dredge prism. Results of the deeper samples are shown on **Figures 5** and **6**. One sediment sample (G1) collected from the top 0.30 m at location G, located at the far western portion of the dredge prism, was below DAS criteria for all contaminants.

All analytical data from 2015 and 2016 sediment investigation were compared to BC CSR IL and Schedule 7 Column IV standards in **Appendix E**. The following sediment samples had concentrations exceeding the CSR Schedule 7 Column IV standards:

- Samples C2, D2, E2, F2 and H2 for sodium and chloride ions;
- Sample 3 for arsenic;
- Samples 6, A100, C1, D1 and H1 for copper; and,
- Samples A100 for zinc.

Certified Laboratory certificates are found in **Appendix F**.

5.0 CONCLUSIONS

Based on the analytical data from the samples collected during the June 2016 sediment investigation, it is concluded that concentrations of metals and PAHs exceeding DAS criteria are limited to the top 0.30 m of the existing sea bed in the area of the proposed dredging. This sediment is not eligible for DAS, and therefore upland disposal of this material is required at a permitted landfill given concentrations of sodium, chloride, arsenic, copper and zinc exceed the applicable CSR soil relocation and/or industrial standards. Deeper sediments below 0.30 m may be suitable for the BC DAS program at the Point Grey DAS Site.

We have appreciated the opportunity of working with you on this project and trust that this report is satisfactory to your requirements. Please feel free to contact the undersigned regarding any questions or further information that you may require.

Report prepared by:
Hemmera Envirochem Inc.

Jarrod Colburne, B.A.Sc., EIT
Junior Environmental Engineer
604.669.0424 (138)
jcolburne@hemmera.com

Report peer reviewed by:
Hemmera Envirochem Inc.

Bonnie Marks, M.A.Sc., P.Eng., PMP
Project Director
604.669.0424 (439)
bmarks@hemmera.com

FIGURES

Terminal Enhancement Project -
Sediment Investigation
1209 McKeen Avenue, North Vancouver, BC

Site Location and Aerial View

Legend

- Fibreco owned land
- VFPA lease area

Notes

1. This map is not intended to be a “stand-alone” document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

Sources

- Aerial Image: District of North Vancouver, 2013
- Inset Basemap: ESRI World Topographic Map

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Metres

NAD 1983 UTM Zone 10N

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315-006.04A	Production Date: Jul 12, 2016	Figure 1

HEMMERA Fibreco Export Inc.

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Terminal Enhancement Project -
Sediment Investigation
1209 McKeen Avenue, North Vancouver, BC

Sediment Sample Locations

Legend
- Sediment Grab and Transect, 2015
- Core Sample, 2016
- Grab Sample, 2016
- Major Contour Line
- Minor Contour Line
- Estimated Dredge Prism
- Water Lot Boundary

Core Sample	X (m)	Y (m)
A	491943.8	5461724
B	491932.0	5461721
C	491890.3	5461695
D	491890.7	5461710
E	491871.0	5461706
F	491867.1	5461690
G	491849.5	5461691
H	491913.4	5461715
I	491945.3	5461718

Notes

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- Aerial Image: District of North Vancouver, 2013

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Metres

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315-006.04A	Production Date: Jul 13, 2016	Figure 2

HEMMERA Fibreco Export Inc.

Terminal Enhancement Project -
Sediment Investigation
1209 McKeen Avenue, North Vancouver, BC

Wood Waste Presence

Legend

- Sediment Grab and Transect, 2015
- Core Sample, 2016
- Grab Sample, 2016
- Major Contour Line
- Minor Contour Line
- Estimated Dredge Prism
- Water Lot Boundary

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Metres

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315-006.04A	Production Date: Jul 13, 2016	Figure 3

HEMMERA Fibreco Export Inc.

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Terminal Enhancement Project -
Sediment Investigation
1209 McKeen Avenue, North Vancouver, BC

Sample Results for 0 - 0.30 m

Legend

- Sediment Grab and Transect, 2015
- Core Sample, 2016
- Grab Sample, 2016
- Sample Concentration(s) below Disposal at Sea criteria
- Sample Concentration(s) above Disposal at Sea critera
- Major Contour Line
- Minor Contour Line
- Estimated Dredge Prism
- Water Lot Boundary

Core Sample	X (m)	Y (m)
A	491943.8	5461724
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0 10 20 30

Metres

NAD 1983 UTM Zone 10N

Page Size: 11" x 17"

315-006.04A	Production Date: Jul 13, 2016	Figure 4

HEMMERA Fibreco Export Inc.

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Terminal Enhancement Project -
Sediment Investigation
1209 McKeen Avenue, North Vancouver, BC

Sample Results for 0.30 - 0.60 m

Legend

- Sediment Grab and Transect, 2015
- Core Sample, 2016
- Grab Sample, 2016
- Sample Concentration(s) below Disposal at Sea Criteria
- Major Contour Line
- Minor Contour Line
- Estimated Dredge Prism
- Water Lot Boundary

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E	491871.0	5461706
F	491867.1	5461690
G	491849.5	5461691
H	491913.4	5461715
I	491945.3	5461718

Notes

1. This map is not intended to be a "stand-alone" document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

Sources

- Aerial Image: District of North Vancouver, 2013

N

1:500

0 10 20 30

Metres

NAD 1983 UTM Zone 10N

Page Size: 11" x 17"

315-006.04A	Production Date: Jul 13, 2016	Figure 5

HEMMERA Fibreco Export Inc.

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Terminal Enhancement Project -
Sediment Investigation
1209 McKeen Avenue, North Vancouver, BC

Sample Results for 0.60 - 0.90 m

Legend

- Sediment Grab and Transect, 2015
- Core Sample, 2016
- Grab Sample, 2016
- Sample Concentration(s) below Disposal at Sea Criteria
- Major Contour Line
- Minor Contour Line
- Estimated Dredge Prism
- Water Lot Boundary

Core Sample	X (m)	Y (m)
A	491943.8	5461724
B	491932.0	5461721
C	491890.3	5461695
D	491890.7	5461710
E	491871.0	5461706
F	491867.1	5461690
G	491849.5	5461691
H	491913.4	5461715
I	491945.3	5461718

Notes

1. This map is not intended to be a “stand-alone” document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

Sources

- Aerial Image: District of North Vancouver, 2013

N

1:500

0 10 20 30

Metres

NAD 1983 UTM Zone 10N

Page Size: 11" x 17"

315-006.04A	Production Date: Jul 13, 2016	Figure 6

HEMMERA Fibreco Export Inc.

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TABLES

Table 1: Sample location Coordinates and Wood Waste Presence
Fibreco Berth, North Vancouver, BC

Sample Location ID	Longitude	Latitude	Wood waste Present (Y/N)
1			Y
2			N
3			Y
4			Y
5			Y
6			Y
7			Y
A	491943.8	5461724	Y
B	491932	5461721	Y
C	491890.3	5461695	N
D	491890.7	5461710	Y
E	491871	5461706	N
F	491867.1	5461690	N
G	491849.5	5461691	N
H	491913.4	5461714.4	Y
I	491945.2	5461718.1	Y

Notes:

All sampling locations are accurate to 2 m

Table 2: Summary of 2015 and 2016 Sediment Results
Fibreco Berth, North Vancouver, BC

Sample ID	Sample Depth (cm)	Date Sampled	Arsenic (As) (mg/kg)	Cadmium (Cd) (mg/kg)	Chromium (Cr) (mg/kg)	Copper (Cu) (mg/kg)	Lead (Pb) (mg/kg)	Mercury (Hg) (mg/kg)	Zinc (Zn) (mg/kg)	Total PAHs (mg/kg)	Total PCBs (mg/kg)	TBT (mg/kg)	TOC (mg/kg)
DAS Criteria			7.2	0.6	52.3	40.5*	30.2	0.75	124	2.5	0.1	0.073**	-
SED01 0-20	0-20	10-Jun-15	2.95	0.26	16.1	**57.0**	8.77	<0.05	52.3	0.12	<0.02	-	-
SED02 0-20	0-20	10-Jun-15	3.01	0.25	16.0	37.6	6.96	<0.05	46.5	0.05	-	0.005	2,000
SED03 0-20	0-20	10-Jun-15	**19.9**	**1.32**	9.0	38.6	9.49	<0.05	45.4	0.79	-	-	-
SED04 0-20	0-20	10-Jun-15	2.41	0.27	20.3	**53.8**	7.58	<0.05	54.1	2.0	-	0.028	-
SED05 0-20	0-20	10-Jun-15	3.86	**0.61**	14.8	**62.0**	10.1	<0.05	62.1	1.1	<0.02	-	4,000
SED06 0-20	0-20	10-Jun-15	3.70	**0.67**	18.6	**99.2**	13.9	0.060	94.5	**3.7**	-	**0.152**	-
SED07 0-20	0-20	10-Jun-15	3.80	0.32	15.0	**52.9**	10.7	0.055	70.6	2.3	-	-	-
G1	0-30	08-Jun-16	1.96	0.20	15.9	34.8	4.63	<0.05	48.1	0.083	-	-	-
G3	60-90	08-Jun-16	0.85	0.10	10.3	12.4	1.22	<0.05	26.8	<0.001	-	-	-
G4	90-120	08-Jun-16	-	-	-	-	-	-	-	-	-	-	2,600
E1	0-30	08-Jun-16	2.75	0.37	14.3	**75.1**	8.68	<0.05	70.1	0.58	-	-	-
E2	30-60	08-Jun-16	-	-	-	10.2	-	-	-	-	-	-	-
E3	60-90	08-Jun-16	2.93	0.09	17.2	11.1	1.47	<0.05	26.3	<0.001	-	<0.001	-
E4	90-105	08-Jun-16	-	-	-	-	-	-	-	-	-	-	<500
F1	0-30	09-Jun-16	3.14	0.24	18.3	**48.5**	7.67	<0.05	49.3	0.16	-	-	-
F2	30-60	09-Jun-16	-	-	-	11.4	-	-	-	-	-	-	-
F3	60-90	09-Jun-16	2.01	0.14	14.0	13.8	2.16	<0.05	31	<0.001	-	-	-
F4	90-124	09-Jun-16	-	-	-	-	-	-	-	-	-	-	4,900
C1	0-30	09-Jun-16	3.07	0.41	19.2	**138.0**	19.1	<0.05	80.6	0.37	-	-	-
C2	30-60	09-Jun-16	-	0.10	-	12.9	-	-	-	-	-	-	-
C3	60-90	09-Jun-16	1.15	0.10	16.2	12.2	1.27	<0.05	25	<0.001	-	<0.001	-
C4	90-120	09-Jun-16	-	-	-	-	-	-	-	-	-	-	2,200
C5	120-150	09-Jun-16	0.93	0.12	12.7	12.6	1.68	<0.05	26.8	<0.001	-	-	-
D1	0-30	09-Jun-16	2.29	0.39	15.4	**110.0**	14.4	<0.05	74.5	0.088	-	-	-
D2	30-60	09-Jun-16	-	0.08	-	11.5	-	-	-	-	-	-	-
D3	60-90	09-Jun-16	1.20	0.09	14.2	12.3	1.43	<0.05	24.9	<0.001	-	<0.001	-
D4	90-107	09-Jun-16	-	-	-	-	-	-	-	-	-	-	<500
H1	0-30	09-Jun-16	3.37	**0.68**	17.0	**108.0**	16.1	<0.05	115	0.52	-	-	-
H2	30-60	09-Jun-16	-	0.13	-	20.5	-	-	-	-	-	-	-
H3	60-90	09-Jun-16	1.26	0.12	13.2	12.6	1.77	<0.05	26.8	0.0029	-	<0.001	-
A100	Grab	09-Jun-16	2.52	1.06	16.3	**127.0**	21.7	0.07	**154.0**	**3.9**	-	-	-

Notes:

'*' DAS criterion for copper based on 95th percentile concentration of sediment monitoring data from Point Grey DAS Site in 2004 / 2005

'**' Puget Sound Dredge Disposal Analysis (PSDDA) criterion

'-' Sample not analyzed for specified parameter

19.9 Sample concentration above DAS criterion

APPENDIX A
Bathymetric Survey

LEGEND:

CONTOUR LINES (0.5m CONTOUR INTERVAL)

SPOT SOUNDING (7.5m x7.5m generated grid)

VANCOUVER PILE DRIVING
MARINE GENERAL CONTRACTORS

NOTES:

1. SURVEY PERFORMED ON APRIL.15, 2015 BY V.P.D.L. SURVEY DEPARTMENT.
2. DATA COLLECTION PARAMETERS:
   VESSEL: ***STELLAR***
   HORIZONTAL POSITIONING: TRIMBLE R8 GNSS GPS RECEIVER WITH RTK CORRECTIONS FROM THE CAN-NET VRS SYSTEM.
   SOUNDING DATA: ODOM ES3 120° MULTIBEAM ECHO SOUNDER SYSTEM.
   HEADING SENSOR: HEMISPHERE CRESCENT VS110 DIRECTIONAL GPS WITH COR RECTIONS FROM THE CCG BEACON SYSTEM.
   MOTION SENSOR: SMC S-108 GYRO MOTION SENSOR.
3. SOUNDINGS ARE IN METRES AND REDUCED TO CHART DATUM (LLWLT=0m). Chart Datum is 3.0m Lower than Geodetic Datum
4. HORIZONTAL POSITIONS ARE REFERENCED TO NAD83 CSRS DATUM.
5. EXISTING STRUCTURES FOR REFERENCE ONLY.

REV.	DESCRIPTION	BY	DATE

JOB NAME: FIBRECO EXPORTS LTD.

LOCATION: NORTH VANCOUVER, BC

DESCRIPTION: BATHYMETRIC MONITOR

SURVEY BY: DH/WY | DRAWN BY: WY

SCALE: 1:1000

DATE: APRIL.17, 2015

JOB NUMBER	DWG.
3-15-008	80-01-007-P1

C:\Acad\3-15-008_Hydrographic Contracts\80-01-107_Fibreco Exports\80-01-107_Fibreco.dwg

APPENDIX B
Photographs

Photo 1: Fraser Burrard Diving Ltd. travelling to collect a sediment core. View facing southwest.

Photo 2: Sediment core processing area prepared with sample jars, stainless steel mixing bowls, nitrile gloves, and hand grinder and clean poly sheets to cut the core barrels. View facing north.

Photo 3: A core barrel filled with sediment.

Photo 4: Measuring a core barrel and marking 30 cm intervals.

Photo 5: A core barrel filled with sediment after being cut using a hand grinder.

Photo 6: The end of a core section with 2 cm of sediment from the end removed to reduce cross contamination from cutting.

Photo 7: Sediment placed in a bowl from a 30 cm segment of core. Sediment for this section consists of sand, some gravel and shell debris.

Photo 8: Sediment from location A, consisting of wood waste and soft sediment.

Photo 9: Pre labelled jars prepared to collect sample G3.

Photo 10: Used core barrels following cutting, soil extrusion and sampling.

APPENDIX C
Sampling Methodologies

1.0 FIELD METHODOLOGY

1.1 HEALTH & SAFETY

Prior to mobilizing to conduct field work, a site-specific Health and Safety Plan (HASP) was prepared to address contaminants which may be encountered during the field work and to outline the health and safety concerns associated with Site activities. A Health and Safety kick-off meeting was also held prior to the initiation of the field program. Prior to commencing work on-site each day, employees and sub-contractors held a health and safety tailgate meeting to review the potential hazards present on the Site and preventative safety controls.

1.2 SEDIMENT SAMPLE COLLECTION

Sample cores were collected by Fraser Burrard Diving Ltd of Delta, BC. Predetermined sample locations were located using a programmable GPS unit on the boat, and an anchor was set in place to keep the boat at the desired sample location. A diver mobilized a hydraulic hammer to the sea floor where wood waste, if present, was cleared to allow for core penetration of the soft sediments. The amount of wood waste was approximated to the best of the diver's ability and was subject to variation based on visibility conditions at the sea floor. A pre-labelled 1.8 m polycarbonate core was hammered into the sediment at each location until either full penetration, or refusal was reached. The hydraulic hammer was then removed, and a cap was placed on the top of the core to seal in the sediments. The core was then pulled up and out of the sediment, and a second cap was placed on the bottom of the core barrel, sealing in the targeted sediments.

Filled core barrels were delivered to Hemmera personnel on the foreshore at the Fibreco barge dock and associated gangway. Core barrels were carried manually to a dedicated processing area for sediment logging and sample collection. Once at the processing area, sediment cores were measured to assess sediment recovery. Marks were placed on the core barrel at 30 cm intervals starting from the top of the sediment surface, working down towards the bottom of the core. The top cap of the core barrel was then removed, and standing water above the top of the sediment was poured into a bucket and stored in a drum at the Site. The core was then cut at the 30 cm interval marks on the barrels using a hand grinder. The top and bottom 2 cm of each core segment was removed and stored in a bucket to reduce the chance of cross contamination associated with the grinder. Starting from the top 30 cm segment and working down towards the bottom, sediments were extruded into stainless steel mixing bowls and logged. Once logged, sediments were collected into pre-labelled glass sample containers supplied by Maxxam Analytics (Maxxam) of Burnaby, BC. Jars were filled until all sediments from each core segment were gone, typically one to three jars were filled.

Sample locations A and B were difficult to sample using the core barrels and hydraulic hammer because of the very soft sediments present, and the large amounts of wood waste. Multiple attempts were completed at each location, with minimal success, As a secondary sampling technique, divers were instructed to hand dig a hole through the wood debris and to collect a grab sample of soft sediment into a clean plastic zip-lock bag provided by Maxxam. Samples were collected from both A and B, however the divers were not able to fully penetrate through the wood waste, and samples consisted primarily of wood waste with some soft sediments mixed in.

1.3 QUALITY ASSURANCE / QUALITY CONTROL

Prewashed glass sample containers provided by Maxxam were pre labelled prior to sample collection to reduce the chance of sample mix-ups. A dedicated sample core barrel was used at each sampling location, and the sampler used a new pair of nitrile gloves in collecting each sample. Core barrels were cut a top a clean poly sheet to reduce the chance of cross contamination, or contamination from outside sources. After each use, the stainless steel mixing bowls were washed and decontaminated with alconox solution and deionized water. All samples were placed in a cooler with ice and delivered to Maxxam the day of collection accompanied by completed chain of custody forms. No duplicates were collected due to limited sample volume and not required for disposal purposes.

APPENDIX D
Sediment Logs

Location ID	Sample ID	Sample Type	Date Sampled	Depth Interval below sediment surface (cm)	Description	Analyzed? (Y/N)
A	A1	Core	08-Jun-16	0 to 22	**Wood waste-** some silt, dark grey/black, trace shell debris, one small aquatic insect (shrimp-like organism), trace sheen, sulfurous odour	N
	A100	Grab	09-Jun-16	107 to 121	**Wood waste** - trace fine grained sand and silt, black, strong sulfurous odour	Y
B	-	-	-	-	15 cm wood waste removed prior to driving core	-
	B1	Core	08-Jun-16	0 to 30	**Saw dust and wood waste -** some silt, black, trace sheen, sulfurous odour	N
	B2	Core	08-Jun-16	30 to 42	**Wood waste-** some silt, black, trace sheen, sulfurous odour	N
	B100	Grab	09-Jun-16	107 to 121	**Wood waste** - trace fine grained sand and silt, black, strong sulfurous odour	N
C	C1	Core	09-Jun-16	0 to 30	**Sand -** Fine grained, some medium grained, trace coarse grained, trace gravel (fine, subangular), some silt, dark grey to black, trace shell debris, sulfurous odour	Y
	C2	Core	09-Jun-16	30 to 60	**Sand** - Fine to medium grained, trace coarse grained, trace gravel (fine, subangular), grey, loose, trace shell debris	Y
	C3	Core	09-Jun-16	60 to 90	**Sand** - Fine to medium grained, trace coarse grained, trace gravel (fine, subangular), trace silt, grey, dense, trace shell debris	Y
	C4	Core	09-Jun-16	90 to 120	**Sand** - Fine grained, trace medium and coarse grained, trace gravel (fine, subangular), trace silt, grey, dense, trace shell debris	Y
	C5	Core	09-Jun-16	120 to 155	**Sand** - Fine grained, trace medium and coarse grained, trace gravel (fine, subangular), grey, loose, trace shell debris	Y
D	-	-	-	-	2 cm wood waste removed prior to driving core	-
	D1	Core	09-Jun-16	0 to 3	**Silt -** Black, very soft, sulfurous odour	Y
				3 to 30	**Sand** - Fine to medium grained, trace gravel (fine to coarse, subrounded to subangular), grey, loose, trace shell debris, sulfurous odour	
	D2	Core	09-Jun-16	30 to 60	**Sand** - fine to medium grained, trace coarse grained, grey, dense, trace shell debris, sulfurous odour, wood debris from 55-65 cm	Y
	D3	Core	09-Jun-16	60 to 90	**Sand** - Fine grained, trace medium and coarse grained, grey, medium dense, strong sulfurous odour, wood debris from 60-65 cm	Y
	D4	Core	09-Jun-16	90 to 107	**Sand -** Fine grained, trace medium and coarse grained, grey, mediume dense, trace wood debris	Y
E	E1	Core	08-Jun-16	0 to 10	**Sand and Silt -** Fine grained sand, grey, loose	Y
				10 to 30	**Sand** - Medium grained, trace fine and coarse grained, trace gravel (fine to coarse, subangular), grey, loose, trace shell debris	
	E2	Core	08-Jun-16	30 to 60	**Sand** - Medium grained, trace fine and coarse grained, trace gravel (fine to coarse, subangular), grey, loose, trace shell debris, light sulfurous odour	Y
	E3	Core	08-Jun-16	60 to 90	**Sand** - Medium grained (slightly larger grains than above), trace fine and coarse grains, some gravel (fine to coarse, subangular to subrounded), grey, loose, light sulfurous odour	Y
	E4	Core	08-Jun-16	90 to 105	**Sand** - Medium grained, trace fine and coarse grained, some gravel (fine to coarse, subrounded to subangular), grey, loose	Y

Location ID	Sample ID	Sample Type	Date Sampled	Depth Interval below sediment surface (cm)	Description	Analyzed? (Y/N)
F	F1	Core	09-Jun-16	0-30	**Sand** - fine to medium grained, trace coarse grained, trace gravel (fine, subangular), trace silt, grey, loose, trace shell debris, light sulfurous odour	Y
	F2	Core	09-Jun-16	30 to 60	**Sand** - Fine to medium grained, trace coarse grained, trace gravel (fine, subangular), trace silt, grey, loose, trace shell debris	Y
	F3	Core	09-Jun-16	60 to 90	**Sand** - Fine to medium grained, trace coarse grained, trace gravel (fine, subangular), trace silt, grey, loose, trace shell debris	Y
	F4	Core	09-Jun-16	90 to 124	**Sand** - Fine to medium grained, trace coarse grained, trace gravel (fine to coarse, subangular), trace to some silt, grey, loose, trace shell debris	Y
G	G1	Core	08-Jun-16	0 to 30	**Sand** - Fine to medium grained, trace coarse grained, trace gravel (fine, subangular), grey, loose, trace shell debris	Y
	G2	Core	08-Jun-16	30 to 60	**Sand** - Medium grained, trace fine and coarse grained, trace gravel (fine, subangular), grey, loose, trace shell debris	N
	G3	Core	08-Jun-16	60 to 90	**Sand** - Fine to medium grained, grey, trace shell debris and wood debris from 85-90 cm	Y
	G4	Core	08-Jun-16	90 to 120	**Sand** - Medium grained, trace fine and coarse grained, grey, loose, trace shell debris	Y
	G5	Core	08-Jun-16	120 to 138	**Sand** - Medium grained, some fine and coarse grained, trace gravel (fine, subangular), grey, loose, trace shell debris	N
H	-	-	-	-	30 cm wood waste removed prior to driving core	-
	H1	Core	09-Jun-16	0 to 30	**Wood waste** - Sandy (fine grained), some silt, black, loose, sulfurous odour	Y
	H2	Core	09-Jun-16	30 to 33	**Wood waste** - Sandy (fine grained), some silt, black, loose, sulfurous odour	Y
				33 to 60	**Sand** - Fine to medium grained, trace coarse grained, grey, loose, trace shell debris (large fragments), strong sulfurous odour	
	H3	Core	09-Jun-16	60 to 90	**Sand** - Fine to medium grained, trace coarse grained, grey, loose, trace shell debris and wood debris throughout, strong sulfurous odour	Y
	H4	Core	09-Jun-16	90 to 120	**Sand** - Medium grained, some fine grained, trace coarse grained, trace gravel (fine to coarse, subrounded to subangular) grey, loose, trace shell debris, large piece of wood towards centre of core, strong sulfurous odour	N
	H5	Core	09-Jun-16	120 to 135	**Sand** - Fine to medium grained, trace coarse grained, trace gravel (fine, subangular), trace silt, grey, loose, trace wood debris towards bottom	N
I	-	-	-	-	91 to 121 cm wood waste removed prior to driving core	-
	I1	Core	09-Jun-16	0 to 30	**Wood waste** - Some silt, black, loose, strong sulfurous odour	N
	I2	Core	09-Jun-16	30 to 60	**Sand** - Fine grained, trace gravel (fine, subrounded), trace silt, grey, loose, trace shell debris, some wood debris	N
	I3	Core	09-Jun-16	60 to 83	**Sand** - Fine to coarse grained, trace gravel (fine, subrounded), trace silt, light grey, loose, some shell debris	N

APPENDIX E
Analytical Tables

Appendix E: Sediment Analytical Results - Physical Data

	Location ID:	1	2	3	4	5	6	7	A	C					D			
	Sample ID:	SED01 0-20	SED02 0-20	SED03 0-20	SED04 0-20	SED05 0-20	SED06 0-20	SED07 0-20	A100	C1	C2	C3	C4	C5	D1	D2	D3	D4
	Date Sampled:	10/06/2015	10/06/2015	09/06/2015	09/06/2015	10/06/2015	10/06/2015	10/06/2015	09/06/2016	09/06/2016	09/06/2016	09/06/2016	09/06/2016	09/06/2016	09/06/2016	09/06/2016	09/06/2016	09/06/2016
	Sample Depth (m):	0.00-0.20	0.00-0.20	0.00-0.20	0.00-0.20	0.00-0.20	0.00-0.20	0.00-0.20	1.07-1.21	0.00-0.30	0.30-0.60	0.60-0.90	0.90-1.20	1.20-1.55	0.00-0.30	0.30-0.60	0.60-0.90	0.90-1.07
Parameter	**BCCSR IL** [3,4]	**BCCSR WDPWA** [3,5]																
Sample Depth, From (m)	-	-	0	0	0	0	0	0	0	1.07	0	0.3	0.6	0.9	1.2	0	0.3	0.6	0.9
Sample Depth, To (m)	-	-	0.2	0.2	0.2	0.2	0.2	0.2	0.2	1.21	0.3	0.6	0.9	1.2	1.55	0.3	0.6	0.9	1.07
Physical Tests																			
Moisture (%)	-	-	20	17	66	16	45	53	34	63	21	-	15	-	16	21	-	25	-
Saturation (%)	-	-	-	-	-	-	-	-	-	-	-	44.6	-	-	-	-	50	-	-
pH	-	-	8.38	8.51	7.09	8.68	8.26	8.24	8.02	7.87	8.43	8.67	8.7	-	8.63	8.27	8.47	8.26	-
Grain Size																			
% Sand by hydrometer (%)	-	-		-	-		-	-	-	-	-	-	-	72	-	-	-	-	83
% Silt by hydrometer (%)	-	-		-	-		-	-	-	-	-	-	-	4	-	-	-	-	2.5
Clay (%)	-	-		-	-		-	-	-	-	-	-	-	12	-	-	-	-	8.8
Gravel (%)	-	-		-	-		-	-	-	-	-	-	-	12	-	-	-	-	6.3

Appendix E: Sediment Analytical Results - Physical Data

	Location ID:		E				F				G			H		
	Sample ID:		E1	E2	E3	E4	F1	F2	F3	F4	G1	G3	G4	H1	H2	H3
	Date Sampled:		08/06/2016	08/06/2016	08/06/2016	08/06/2016	09/06/2016	09/06/2016	09/06/2016	09/06/2016	08/06/2016	08/06/2016	08/06/2016	09/06/2016	09/06/2016	09/06/2016
	Sample Depth (m):		0.00-0.30	0.30-0.60	0.60-0.90	0.90-1.05	0.00-0.30	0.30-0.60	0.60-0.90	0.90-1.24	0.00-0.30	0.60-0.90	0.90-1.20	0.00-0.30	0.30-0.60	0.60-0.90
Parameter	**BCCSR IL** [3,4]	**BCCSR WDPWA** [3,5]														
Sample Depth, From (m)	-	-	0	0.3	0.6	0.9	0	0.3	0.6	0.9	0	0.6	0.9	0	0.3	0.6
Sample Depth, To (m)	-	-	0.3	0.6	0.9	1.05	0.3	0.6	0.9	1.24	0.3	0.9	1.2	0.3	0.6	0.9
Physical Tests																
Moisture (%)	-	-	20	-	13	-	17	-	16	-	14	21	-	45	-	18
Saturation (%)	-	-	-	43.4	-	-	-	41.5	-	-	-	-	-	-	48.2	-
pH	-	-	8.35	8.71	8.63	-	8.39	8.59	8.64	-	8.53	8.52	-	7.85	8.46	8.43
Grain Size																
% Sand by hydrometer (%)	-	-	-	-	-	69	-	-	-	69	-	-	80	-	-	-
% Silt by hydrometer (%)	-	-	-	-	-	2.2	-	-	-	3.8	-	-	2.1	-	-	-
Clay (%)	-	-	-	-	-	<2.0	-	-	-	12	-	-	<2.0	-	-	-
Gravel (%)	-	-	-	-	-	27	-	-	-	16	-	-	17	-	-	-

Appendix E: Sediment Analytical Results - Metals and Inorganics

	Location ID:		1	2	3	4	5	6	7	A	C			
	Sample ID:		SED01 0-20	SED02 0-20	SED03 0-20	SED04 0-20	SED05 0-20	SED06 0-20	SED07 0-20	A100	C1	C2	C3	C5
	Date Sampled:		10/06/2015	10/06/2015	09/06/2015	09/06/2015	10/06/2015	10/06/2015	10/06/2015	09/06/2016	09/06/2016	09/06/2016	09/06/2016	09/06/2016
	Sample Depth (m):		0.00-0.20	0.00-0.20	0.00-0.20	0.00-0.20	0.00-0.20	0.00-0.20	0.00-0.20	1.07-1.21	0.00-0.30	0.30-0.60	0.60-0.90	1.20-1.55
Parameter	**BCCSR IL** [3,4]	**BCCSR WDPWA** [3,5]												
Sample Depth, From (m)	-	-	0	0	0	0	0	0	0	1.07	0	0.3	0.6	1.2
Sample Depth, To (m)	-	-	0.2	0.2	0.2	0.2	0.2	0.2	0.2	1.21	0.3	0.6	0.9	1.55
Field Tests														
pH	-	-	8.38	8.51	7.09	8.68	8.26	8.24	8.02	7.87	8.43	8.67	8.7	8.63
Total Inorganics														
Phosphorus	-	-	712	563	1170	732	937	1120	699	971	780	-	302	345
Saturated Paste														
Sodium ion	1000	1000	-	-	-	-	-	-	-	-	-	**1320**	-	-
Chloride ion	550	90	-	-	-	-	-	-	-	-	-	**2000**	-	-
Total Metals														
Aluminum	-	-	9470	8850	2430	8230	9530	11500	8930	8100	8920	-	8070	9660
Antimony	40 [6]	40	0.2	0.28	0.18	0.19	0.49	0.25	0.23	0.35	0.35	-	<0.10	<0.10
Arsenic	25 [7]	15	2.95	3.01	**19.9**	2.41	3.86	3.7	3.8	2.52	3.07	-	1.15	0.93
Barium	1500 [8]	400	25.6	23.6	23	21.4	27.1	40.8	28	52.6	29.8	-	31.3	28.1
Beryllium	8 [6]	8	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	-	<0.40	<0.40
Bismuth	-	-	<0.10	0.26	<0.10	<0.10	0.26	0.11	<0.10	0.1	<0.10	-	<0.10	<0.10
Cadmium	2-500 [9]	1.5	0.264	0.253	1.32	0.268	0.614	0.666	0.322	1.06	0.413	0.104	0.095	0.12
Calcium	-	-	5250	5840	9990	6880	15100	16500	5420	39800	7810	-	9930	9230
Chromium	60 [7]	60	16.1	16	9	20.3	14.8	18.6	15	16.3	19.2	-	16.2	12.7
Cobalt	300 [6]	300	4.65	4.61	1.71	4.43	4.6	5.66	5.03	4.6	4.86	-	4.61	4.42
Copper	90-250 [10]	90	57	37.6	38.6	53.8	62	**99.2**	52.9	**127**	**138**	12.9	12.2	12.6
Iron	-	-	16100	16200	6600	19700	15700	19100	15300	14300	18800	-	16000	14700
Lead	150-2000 [11]	100	8.77	6.96	9.49	7.58	10.1	13.9	10.7	21.7	19.1	-	1.27	1.68
Lithium	20000 [12]	-	15	12.3	<5.0	11.3	13.6	16.9	15.8	13.8	15.3	-	14.1	15.5
Magnesium	-	-	4360	3970	7030	3800	4600	6090	4250	4210	3780	-	3990	4280
Manganese	19000 [12]	-	175	150	43.1	160	164	199	167	151	163	-	169	168
Mercury	150 [8]	150	<0.050	<0.050	<0.050	<0.050	<0.050	0.06	0.055	0.07	<0.050	-	<0.050	<0.050
Molybdenum	40 [6]	40	2.96	0.85	6.43	0.99	2.23	3.09	2.65	5.28	3.2	-	0.92	1.04
Nickel	500 [6]	500	7.77	8.64	6.94	7.62	8.07	12.4	8.8	12.2	10.8	-	5.57	6.13
Potassium	-	-	1080	986	2360	901	1250	1740	1250	1370	1190	-	1020	1200
Selenium	10 [6]	10	<0.50	<0.50	2.1	<0.50	<0.50	<0.50	<0.50	0.51	<0.50	-	<0.50	<0.50
Silver	40 [6]	40	0.094	0.427	0.125	0.064	0.093	0.194	0.068	0.319	0.177	-	0.091	0.069
Sodium	-	-	2220	2560	35400	1690	4310	6970	2490	8470	2450	-	1830	2530
Strontium	100000 [12]	-	35.5	39	76.3	39.8	64.1	73.3	34.6	193	45.6	-	49	50.1
Thallium	-	-	0.075	0.095	0.066	0.111	0.125	0.158	<0.050	0.118	0.078	-	<0.050	0.056
Tin	300 [6]	300	0.23	0.28	1.1	0.22	1.19	0.88	0.37	1.76	0.39	-	<0.10	<0.10
Titanium	-	-	501	418	147	468	497	623	587	595	543	-	605	586
Uranium	200 [12]	-	1.01	0.663	1.44	0.734	1.01	1.38	1.05	1.4	1.54	-	0.396	0.432
Vanadium	-	-	46.9	55.3	22.7	73.6	40.9	47.5	45.5	41.3	66.3	-	58	47.7
Zinc	150-600 [13]	150	52.3	46.5	45.4	54.1	62.1	94.5	70.6	**154**	80.6	-	25	26.8
Zirconium	-	-	0.86	1.12	2.11	0.67	1.23	1.96	0.94	2.42	1.08	-	1.06	1.33

Appendix E: Sediment Analytical Results - Metals and Inorganics

	Location ID:		D			E			F			G		H		
	Sample ID:		D1	D2	D3	E1	E2	E3	F1	F2	F3	G1	G3	H1	H2	H3
	Date Sampled:		09/06/2016	09/06/2016	09/06/2016	08/06/2016	08/06/2016	08/06/2016	09/06/2016	09/06/2016	09/06/2016	08/06/2016	08/06/2016	09/06/2016	09/06/2016	09/06/2016
	Sample Depth (m):		0.00-0.30	0.30-0.60	0.60-0.90	0.00-0.30	0.30-0.60	0.60-0.90	0.00-0.30	0.30-0.60	0.60-0.90	0.00-0.30	0.60-0.90	0.00-0.30	0.30-0.60	0.60-0.90
Parameter	**BCCSR IL** [3,4]	**BCCSR WDPWA** [3,5]														
Sample Depth, From (m)	-	-	0	0.3	0.6	0	0.3	0.6	0	0.3	0.6	0	0.6	0	0.3	0.6
Sample Depth, To (m)	-	-	0.3	0.6	0.9	0.3	0.6	0.9	0.3	0.6	0.9	0.3	0.9	0.3	0.6	0.9
Field Tests																
pH	-	-	8.27	8.47	8.26	8.35	8.71	8.63	8.39	8.59	8.64	8.53	8.52	7.85	8.46	8.43
Total Inorganics																
Phosphorus	-	-	647	-	354	659	-	320	615	-	316	618	334	821	-	318
Saturated Paste																
Sodium ion	1000	1000	-	**1170**	-	-	955	-	-	**1540**	-	-	-	-	**1450**	-
Chloride ion	550	90	-	**1610**	-	-	**1560**	-	-	**2420**	-	-	-	-	**2190**	-
Total Metals																
Aluminum	-	-	9480	-	10000	9000	-	8650	8660	-	9210	7750	9660	9620	-	8070
Antimony	40 [6]	40	0.19	-	<0.10	0.36	-	<0.10	0.21	-	0.15	0.15	<0.10	0.31	-	<0.10
Arsenic	25 [7]	15	2.29	-	1.2	2.75	-	2.93	3.14	-	2.01	1.96	0.85	3.37	-	1.26
Barium	1500 [8]	400	29.1	-	27.6	28.5	-	27.7	29.3	-	31.8	23.1	29	28.3	-	26
Beryllium	8 [6]	8	<0.40	-	<0.40	<0.40	-	<0.40	<0.40	-	<0.40	<0.40	<0.40	<0.40	-	<0.40
Bismuth	-	-	<0.10	-	<0.10	<0.10	-	<0.10	<0.10	-	<0.10	<0.10	<0.10	<0.10	-	<0.10
Cadmium	2-500 [9]	1.5	0.39	0.077	0.093	0.374	-	0.086	0.237	-	0.142	0.2	0.095	0.675	0.128	0.119
Calcium	-	-	11800	-	9030	6850	-	8970	6290	-	11200	6830	11900	6720	-	6510
Chromium	60 [7]	60	15.4	-	14.2	14.3	-	17.2	18.3	-	14	15.9	10.3	17	-	13.2
Cobalt	300 [6]	300	4.62	-	4.54	4.51	-	5.05	5.14	-	5.5	4.4	4.45	4.69	-	4.42
Copper	90-250 [10]	90	**110**	11.5	12.3	75.1	10.2	11.1	48.5	11.4	13.8	34.8	12.4	**108**	20.5	12.6
Iron	-	-	15600	-	15800	16200	-	14400	17400	-	14600	16700	13400	17200	-	14800
Lead	150-2000 [11]	100	14.4	-	1.43	8.68	-	1.47	7.67	-	2.16	4.63	1.22	16.1	-	1.77
Lithium	20000 [12]	-	14.9	-	17.6	16.7	-	14.4	13.9	-	17.8	13.9	15.2	15.8	-	15.4
Magnesium	-	-	4250	-	4170	4060	-	4180	4130	-	5040	3140	4220	4130	-	3860
Manganese	19000 [12]	-	173	-	159	159	-	176	174	-	188	147	163	176	-	163
Mercury	150 [8]	150	<0.050	-	<0.050	<0.050	-	<0.050	<0.050	-	<0.050	<0.050	<0.050	<0.050	-	<0.050
Molybdenum	40 [6]	40	2.27	-	0.58	4.8	-	0.92	1.33	-	0.99	1.24	0.79	4.14	-	0.69
Nickel	500 [6]	500	7.59	-	5.37	7.83	-	6.16	8.91	-	7.89	8.06	4.66	8.59	-	5.19
Potassium	-	-	1250	-	1230	1110	-	1060	1090	-	1280	899	1300	1240	-	986
Selenium	10 [6]	10	<0.50	-	<0.50	<0.50	-	<0.50	<0.50	-	<0.50	<0.50	<0.50	<0.50	-	<0.50
Silver	40 [6]	40	0.154	-	0.056	0.121	-	<0.050	0.169	-	0.122	0.064	<0.050	0.345	-	0.054
Sodium	-	-	2540	-	2720	2630	-	1780	2390	-	2460	1880	2450	3470	-	2100
Strontium	100000 [12]	-	63.6	-	51.6	40.8	-	50.6	39.8	-	67.7	44.7	61.6	43.8	-	42.2
Thallium	-	-	0.081	-	<0.050	0.074	-	<0.050	0.101	-	0.091	0.057	<0.050	0.113	-	<0.050
Tin	300 [6]	300	0.28	-	<0.10	0.16	-	<0.10	0.17	-	<0.10	<0.10	<0.10	0.38	-	<0.10
Titanium	-	-	531	-	610	503	-	586	681	-	671	507	557	575	-	590
Uranium	200 [12]	-	0.92	-	0.414	1.03	-	0.541	0.856	-	0.632	0.666	0.385	1.3	-	0.426
Vanadium	-	-	47.4	-	48.9	49.6	-	49	64.5	-	41.9	65.9	40.8	49.6	-	50.1
Zinc	150-600 [13]	150	74.5	-	24.9	70.1	-	26.3	49.3	-	31	48.1	26.8	115	-	26.8
Zirconium	-	-	1.08	-	0.88	0.88	-	0.73	1.12	-	1.63	0.79	0.63	1.33	-	0.86

Appendix E: Sediment Analytical Results - Polycyclic Aromatic Hydrocarbons

		Location ID:	1	2	3	4	5	6	7
		Sample ID:	SED01 0-20	SED02 0-20	SED03 0-20	SED04 0-20	SED05 0-20	SED06 0-20	SED07 0-20
		Date Sampled:	10/06/2015	10/06/2015	09/06/2015	09/06/2015	10/06/2015	10/06/2015	10/06/2015
		Sample Depth (m):	0.00-0.20	0.00-0.20	0.00-0.20	0.00-0.20	0.00-0.20	0.00-0.20	0.00-0.20
Parameter	**BCCSR IL [3,4]**	**BCCSR WDPWA [3,5]**							
Sample Depth, From (m)	-	-	0	0	0	0	0	0	0
Sample Depth, To (m)	-	-	0.2	0.2	0.2	0.2	0.2	0.2	0.2
PAH									
2-Methylnaphthalene	-	-	0.0012	0.0015	0.0058	0.0026	0.0076	0.018	0.0056
Acenaphthene	-	-	0.0017	0.00097	0.033	0.015	0.027	0.064	0.019
Acenaphthylene	-	-	0.00087	0.0011	<0.0060	0.00059	0.0025	0.018	0.011
Anthracene	-	-	0.005	0.0027	0.038	0.043	0.045	0.15	0.038
Benzo(a)anthracene	10 [6]	10	0.0085	0.0034	0.048	0.26	0.076	0.33	0.29
Benzo(a)pyrene	10 [8]	10	0.016	0.0045	0.072	0.32	0.064	0.24	0.37
Benzo(b,j)fluoranthene	10 [6]	10	0.023	0.0069	0.15	0.42	0.11	0.4	0.51
Benzo(g,h,i)perylene	-	-	0.011	0.0036	0.025	0.26	0.034	0.1	0.18
Benzo(k)fluoranthene	10 [6]	10	0.0096	0.0024	0.05	0.13	0.036	0.15	0.18
Chrysene	-	-	0.0097	0.004	0.072	0.29	0.097	0.51	0.34
Dibenz(a,h)anthracene	10 [6]	10	0.0025	0.00073	0.012	0.054	0.0089	0.03	0.054
Fluoranthene	-	-	0.022	0.011	0.22	0.46	0.32	0.97	0.46
Fluorene	-	-	0.0019	0.0015	0.034	0.015	0.035	0.07	0.015
Indeno(1,2,3-c,d)pyrene	10 [6]	10	0.0092	0.0027	0.026	0.2	0.031	0.096	0.18
Naphthalene	50 [6]	50	0.0015	0.0027	0.0093	0.0033	0.013	0.016	0.0059
Phenanthrene	50 [6]	50	0.011	0.0046	0.1	0.17	0.15	0.5	0.14
Pyrene	100 [6]	100	0.039	0.013	0.14	0.38	0.21	0.75	0.55
Total HMW PAH's	-	-	0.097	0.036	0.56	1.7	0.77	2.8	2.1
Total LMW PAH's	-	-	0.023	0.015	0.22	0.25	0.28	0.83	0.23
Total PAH's	-	-	0.12	0.051	0.79	2	1.1	3.7	2.3
Benzo(a)pyrene Total Potency Equivalents	-	-	-	-	-	-	-	-	-
Benzo(a)pyrene Total Potency Equivalents (text)	-	-	<0.10	<0.10	0.11	0.48	0.1	0.38	0.54
Index of Additive Cancer Risk (text)	-	-	0.29	<0.10	1.7	5.5	1.4	5.5	6.6

Appendix E: Sediment Analytical Results - Polycyclic Aromatic Hydrocarbons

	Location ID:		A	C			D		E		F		G		H	
	Sample ID:		A100	C1	C3	C5	D1	D3	E1	E3	F1	F3	G1	G3	H1	H3
	Date Sampled:		09/06/2016	09/06/2016	09/06/2016	09/06/2016	09/06/2016	09/06/2016	08/06/2016	08/06/2016	09/06/2016	09/06/2016	08/06/2016	08/06/2016	09/06/2016	09/06/2016
	Sample Depth (m):		1.07-1.21	0.00-0.30	0.60-0.90	1.20-1.55	0.00-0.30	0.60-0.90	0.00-0.30	0.60-0.90	0.00-0.30	0.60-0.90	0.00-0.30	0.60-0.90	0.00-0.30	0.60-0.90
Parameter	**BCCSR IL [3,4]**	**BCCSR WDPWA [3,5]**														
Sample Depth, From (m)	-	-	1.07	0	0.6	1.2	0	0.6	0	0.6	0	0.6	0	0.6	0	0.6
Sample Depth, To (m)	-	-	1.21	0.3	0.9	1.55	0.3	0.9	0.3	0.9	0.3	0.9	0.3	0.9	0.3	0.9
PAH																
2-Methylnaphthalene	-	-	0.01	0.0056	<0.0010	<0.0010	0.0018	<0.0010	0.0054	<0.0010	0.0033	<0.0010	<0.0010	<0.0010	0.0062	<0.0010
Acenaphthene	-	-	0.023	0.0022	<0.00050	<0.00050	0.00063	<0.00050	0.0097	<0.00050	0.0029	<0.00050	0.0052	<0.00050	0.0098	<0.00050
Acenaphthylene	-	-	0.011	0.013	<0.00050	<0.00050	0.0013	<0.00050	0.0025	<0.00050	0.0048	<0.00050	0.0007	<0.00050	0.0035	<0.00050
Anthracene	-	-	0.26	0.03	<0.0010	<0.0010	0.0047	<0.0010	0.014	<0.0010	0.012	<0.0010	0.0087	<0.0010	0.024	<0.0010
Benzo(a)anthracene	10 [6]	10	0.29	0.019	<0.0010	<0.0010	0.0046	<0.0010	0.041	<0.0010	0.01	<0.0010	0.0042	<0.0010	0.024	<0.0010
Benzo(a)pyrene	10 [8]	10	0.15	0.066	<0.0010	<0.0010	0.0077	<0.0010	0.048	<0.0010	0.011	<0.0010	0.0026	<0.0010	0.027	<0.0010
Benzo(b,j)fluoranthene	10 [6]	10	0.28	0.12	<0.0010	<0.0010	0.015	<0.0010	0.075	<0.0010	0.021	<0.0010	0.0048	<0.0010	0.057	<0.0010
Benzo(g,h,i)perylene	-	-	0.056	0.024	<0.0020	<0.0020	0.0042	<0.0020	0.033	<0.0020	0.0087	<0.0020	<0.0020	<0.0020	0.013	<0.0020
Benzo(k)fluoranthene	10 [6]	10	0.082	0.034	<0.0010	<0.0010	0.0043	<0.0010	0.024	<0.0010	0.0054	<0.0010	0.0016	<0.0010	0.014	<0.0010
Chrysene	-	-	0.3	0.025	<0.0010	<0.0010	0.0062	<0.0010	0.059	<0.0010	0.011	<0.0010	0.0046	<0.0010	0.03	<0.0010
Dibenz(a,h)anthracene	10 [6]	10	0.018	0.0072	<0.00050	<0.00050	0.001	<0.00050	0.0075	<0.00050	0.0017	<0.00050	0.0007	<0.00050	0.0031	<0.00050
Fluoranthene	-	-	1.5	0.025	<0.0010	<0.0010	0.0091	<0.0010	0.13	<0.0010	0.028	<0.0010	0.017	<0.0010	0.094	<0.0010
Fluorene	-	-	0.03	0.0047	<0.0010	<0.0010	0.0014	<0.0010	0.013	<0.0010	0.0041	<0.0010	0.0052	<0.0010	0.015	<0.0010
Indeno(1,2,3-c,d)pyrene	10 [6]	10	0.055	0.023	<0.0020	<0.0020	0.0035	<0.0020	0.026	<0.0020	0.0064	<0.0020	<0.0020	<0.0020	0.011	<0.0020
Naphthalene	50 [6]	50	0.015	0.0057	<0.0010	<0.0010	0.0018	<0.0010	0.007	<0.0010	0.015	<0.0010	0.0055	<0.0010	0.0064	<0.0010
Phenanthrene	50 [6]	50	0.073	0.012	<0.0010	<0.0010	0.0033	<0.0010	0.1	<0.0010	0.011	<0.0010	0.0092	<0.0010	0.028	<0.0010
Pyrene	100 [6]	100	1.2	0.16	<0.0010	<0.0010	0.044	<0.0010	0.14	<0.0010	0.049	<0.0010	0.019	<0.0010	0.25	0.0029
Total HMW PAH's	-	-	3.5	0.3	<0.0010	<0.0010	0.073	<0.0010	0.43	<0.0010	0.11	<0.0010	0.048	<0.0010	0.42	0.0029
Total LMW PAH's	-	-	0.42	0.073	<0.0010	<0.0010	0.015	<0.0010	0.15	<0.0010	0.053	<0.0010	0.035	<0.0010	0.093	<0.0010
Total PAH's	-	-	3.9	0.37	<0.0010	<0.0010	0.088	<0.0010	0.58	<0.0010	0.16	<0.0010	0.083	<0.0010	0.52	0.0029
Benzo(a)pyrene Total Potency Equivalents	-	-	0.24	0.093	<0.010	<0.010	0.012	<0.010	0.073	<0.010	0.018	<0.010	<0.010	<0.010	0.041	<0.010
Benzo(a)pyrene Total Potency Equivalents (text)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Index of Additive Cancer Risk (text)	-	-	3.8	1.3	<0.10	<0.10	0.16	<0.10	0.95	<0.10	0.24	<0.10	<0.10	<0.10	0.62	<0.10

Appendix E: Sediment Analytical Results - Polychlorinated Biphenyls, Tributyltin and Total Organic Carbon

		Location ID:	1	2	4	5	6									
		Sample ID:	SED01 0-20	SED02 0-20	SED04 0-20	SED05 0-20	SED06 0-20	C3	C4	D3	D4	E3	E4	F4	G4	H3
		Date Sampled:	10/06/2015	10/06/2015	09/06/2015	10/06/2015	10/06/2015	09/06/2016	09/06/2016	09/06/2016	09/06/2016	08/06/2016	08/06/2016	09/06/2016	08/06/2016	09/06/2016
		Sample Depth (m):	0.00-0.20	0.00-0.20	0.00-0.20	0.00-0.20	0.00-0.20	0.60-0.90	0.90-1.20	0.60-0.90	0.90-1.07	0.60-0.90	0.90-1.05	0.90-1.24	0.90-1.20	0.60-0.90
Parameter	**BCCSR IL** [3,4]	**BCCSR WDPWA** [3,5]														
Sample Depth, From (m)	-	-	0	0	0	0	0	0.6	0.9	0.6	0.9	0.6	0.9	0.9	0.9	0.6
Sample Depth, To (m)	-	-	0.2	0.2	0.2	0.2	0.2	0.9	1.2	0.9	1.07	0.9	1.05	1.24	1.2	0.9
PCB																
Aroclor 1242	50 [8]	50	<0.020	-	-	<0.020	-	-	-	-	-	-	-	-	-	-
Aroclor 1248	50 [8]	50	<0.020	-	-	<0.020	-	-	-	-	-	-	-	-	-	-
Aroclor 1254	50 [8]	50	<0.020	-	-	<0.020	-	-	-	-	-	-	-	-	-	-
Aroclor 1260	50 [8]	50	<0.020	-	-	<0.020	-	-	-	-	-	-	-	-	-	-
Total Polychlorinated Biphenyls	50 [14]	50	<0.020	-	-	<0.020	-	-	-	-	-	-	-	-	-	-
Organometallics																
Tributyltin	-	-	-	0.005	0.028	-	0.152	<0.001	-	<0.001	-	<0.001	-	-	-	<0.001
Organics																
Total Organic Carbon	-	-	-	2000	-	4000	-	-	2200	-	<500	-	<500	4900	2600	-

Notes

(1) All values are reported as µg/g unless otherwise noted
(2) - = No standard or not analyzed
(3) BCCSR = BC Environmental Management Act, Contaminated Sites Regulation, B.C. Reg. 375/96 - includes amendments up to B.C. Reg. 4/2014, January 31, 2014
(4) BCCSR IL = Schedules 4 (Generic) and/or 5 (Matrix), Column VI Industrial, and/or Schedule 10, Column IV, Commercial, Industrial Soil Standard
(5) BCCSR WDPWA = Schedule 7, Standards Triggering Contaminated Soil Relocation Agreements, Column IV, Waste Disposal Prohibited Without Authorization
(6) Schedule 4, Generic Numerical Soil Standards
(7) Schedule 5, Environmental Protection, Groundwater flow to surface water used by aquatic life, Marine
(8) Schedule 5, Environmental Protection, Toxicity to soil invertebrates and plants
(9) Cadmium varies with pH as follows for BCCSR IL, Schedule 5, Environmental Protection, Groundwater flow to surface water used by aquatic life, Marine:
2 if pH<7
3.5 if pH>=7 and pH<7.5
35 if pH>=7.5 and pH<8
200 if pH>=8
Otherwise, Schedule 5, Environmental Protection, Toxicity to soil invertebrates and plants applies (500 ug/g).
(10) Copper varies with pH as follows for BCCSR IL, Schedule 5, Environmental Protection, Groundwater flow to surface water used by aquatic life:
90 if pH<5
100 if pH>=5 and pH<5.5
200 if pH>=5.5 and pH<6
Otherwise, Schedule 5, Environmental Protection, Toxicity to soil invertebrates and plants applies (250 ug/g).
(11) Lead varies with pH as follows for BCCSR IL, Schedule 5, Environmental Protection, Groundwater flow to surface water used by aquatic life:
150 if pH<5.5
250 if pH>=5.5 and pH<6
Otherwise, Schedule 5, Environmental Protection, Toxicity to soil invertebrates and plants applies (2000 ug/g).
(12) Schedule 10, Generic Numerical Soil and Water Standards, Column IV, Commercial, Industrial Soil Standard
(13) Zinc varies with pH as follows for BCCSR IL, Schedule 5, Environmental Protection, Groundwater flow to surface water used by aquatic life, Marine:
150 if pH<6.5
300 if pH>=6.5 and pH<7
Otherwise, Schedule 5, Environmental Protection, Toxicity to soil invertebrates and plants applies (600 ug/g).
(14) Schedule 5, Human Health Protection, Intake of contaminated soil

APPENDIX F
Laboratory C

Maxxam
A Bureau Veritas Group Company

Success Through Science®

Your Project #: 315-006.04A
Your C.O.C. #: G116462, G116463

Attention:Lesley Knight

HEMMERA ENVIROCHEM INC.
18th Floor, 4730 Kingsway
Burnaby, BC
Canada V5H 0C6

Report Date: 2016/07/04
Report #: R2209620
Version: 3 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B645830
Received: 2016/06/08, 16:52

Sample Matrix: Sediment
Samples Received: 7

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Chloride (soluble)	1	2016/06/25	2016/06/27	BBY6SOP-00011	SM 22 4500-Cl- E m
Soluble Chloride Ion Calc. (mg/kg)	1	N/A	2016/06/28	BBY WI-00033	Auto Calc
Elements by ICPMS (total)	1	2016/06/13	2016/06/13	BBY7SOP-00017,	BC SALM,EPA 6020bR2m
Elements by ICPMS (total)	3	2016/06/14	2016/06/14	BBY7SOP-00017,	BC SALM,EPA 6020bR2m
Elements by ICPMS (total)	1	2016/06/27	2016/06/27	BBY7SOP-00017,	BC SALM,EPA 6020bR2m
Moisture	4	2016/06/11	2016/06/13	BBY8SOP-00017	BC MOE Lab Manual
Soluble Sodium Ion Calc. (mg/kg)	1	N/A	2016/06/27	BBY WI-00033	Auto Calc
Index of Additive Cancer Risk Calc.	4	N/A	2016/06/17	BBY WI-00033	Auto Calc
PAH in Soil by GC/MS Lowlevel (Extended)	4	2016/06/12	2016/06/16	BBY8SOP-00022	EPA 8270d R4 m
Total PAH and B(a)P Calculation	4	N/A	2016/06/17	BBY WI-00033	Auto Calc
pH (2:1 DI Water Extract)	1	2016/06/13	2016/06/13	BBY6SOP-00028	BCMOE BCLM Mar2005 m
pH (2:1 DI Water Extract)	3	2016/06/14	2016/06/14	BBY6SOP-00028	BCMOE BCLM Mar2005 m
pH (2:1 DI Water Extract)	1	2016/06/27	2016/06/27	BBY6SOP-00028	BCMOE BCLM Mar2005 m
Saturated Paste	1	2016/06/25	2016/06/25	BBY6SOP-00030	Carter 2nd 15.2.1 m
Soluble Cations (Ca,K,Mg,Na,S)	1	N/A	2016/06/27	BBY7SOP-00001 BBY7SOP-00018	EPA6020bR2m,6010cR3m
Texture by Hydrometer, incl Gravel (Wet)	2	N/A	2016/06/28	BBY6SOP-00051	Carter 2nd ed 55.3
Mono, Di, Tributyl Tin in Soil SubC (1)	1	N/A	2016/06/30		
TOC Soil Subcontract (2)	2	2016/06/30	2016/06/30		

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 Sub Vancouver to Pacific Rim
(2) This test was performed by Maxxam Ontario (From Burnaby)

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Your Project #: 315-006.04A
Your C.O.C. #: G116462, G116463

Attention:Lesley Knight

HEMMERA ENVIROCHEM INC.
18th Floor, 4730 Kingsway
Burnaby, BC
Canada V5H 0C6

Report Date: 2016/07/04
Report #: R2209620
Version: 3 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B645830
Received: 2016/06/08, 16:52

Encryption Key

Gail Pedersen
Project Manager
04 Jul 2016 14:25:16 -07:00

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Amandeep Nagra, Account Specialist
Email: ANagra@maxxam.ca
Phone# (604)639-2602

==========

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.

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Maxxam Job #: B645830
Report Date: 2016/07/04

HEMMERA ENVIROCHEM INC.
Client Project #: 315-006.04A

RESULTS OF CHEMICAL ANALYSES OF SEDIMENT

Maxxam ID		OU4136			OU4146		OU4147		
Sampling Date		2016/06/08 11:00			2016/06/08 14:36		2016/06/08 14:42		
COC Number		G116462			G116463		G116463		
	UNITS	**G4**	**RDL**	**QC Batch**	**E3**	**QC Batch**	**E4**	**RDL**	**QC Batch**
Parameter									
Subcontract Parameter	N/A	ATTACHED	N/A	8316688	ATTACHED	8316689	ATTACHED	N/A	8316688
Physical Properties									
% sand by hydrometer	%	80	2.0	8311611			69	2.0	8311611
% silt by hydrometer	%	2.1	2.0	8311611			2.2	2.0	8311611
Clay Content	%	<2.0	2.0	8311611			<2.0	2.0	8311611
Gravel	%	17	2.0	8311611			27	2.0	8311611

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B645830
Report Date: 2016/07/04

HEMMERA ENVIROCHEM INC.
Client Project #: 315-006.04A

PHYSICAL TESTING (SEDIMENT)

Maxxam ID		OU4133		OU4135	OU4141	OU4141		OU4146		
Sampling Date		2016/06/08 10:30		2016/06/08 10:48	2016/06/08 14:20	2016/06/08 14:20		2016/06/08 14:36		
COC Number		G116462		G116462	G116462	G116462		G116463		
	UNITS	**G1**	**QC Batch**	**G3**	**E1**	**E1 Lab-Dup**	**QC Batch**	**E3**	**RDL**	**QC Batch**
Physical Properties										
Moisture	%	14	8296270	21	20	21	8296283	13	0.30	8296270

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B645830
Report Date: 2016/07/04

HEMMERA ENVIROCHEM INC.
Client Project #: 315-006.04A

CSR/CCME METALS IN SOIL (SEDIMENT)

Maxxam ID		OU4133		OU4135	OU4141		OU4142		OU4146		
Sampling Date		2016/06/08 10:30		2016/06/08 10:48	2016/06/08 14:20		2016/06/08 14:30		2016/06/08 14:36		
COC Number		G116462		G116462	G116462		G116462		G116463		
	UNITS	**G1**	**QC Batch**	**G3**	**E1**	**QC Batch**	**E2**	**QC Batch**	**E3**	**RDL**	**QC Batch**
Physical Properties											
Soluble (2:1) pH	pH	8.53	8298388	8.52	8.35	8298201	8.71	8311610	8.63	N/A	8296993
Total Metals by ICPMS											
Total Aluminum (Al)	mg/kg	7750	8298366	9660	9000	8298199			8650	100	8296970
Total Antimony (Sb)	mg/kg	0.15	8298366	<0.10	0.36	8298199			<0.10	0.10	8296970
Total Arsenic (As)	mg/kg	1.96	8298366	0.85	2.75	8298199			2.93	0.50	8296970
Total Barium (Ba)	mg/kg	23.1	8298366	29.0	28.5	8298199			27.7	0.10	8296970
Total Beryllium (Be)	mg/kg	<0.40	8298366	<0.40	<0.40	8298199			<0.40	0.40	8296970
Total Bismuth (Bi)	mg/kg	<0.10	8298366	<0.10	<0.10	8298199			<0.10	0.10	8296970
Total Cadmium (Cd)	mg/kg	0.200	8298366	0.095	0.374	8298199			0.086	0.050	8296970
Total Calcium (Ca)	mg/kg	6830	8298366	11900	6850	8298199			8970	100	8296970
Total Chromium (Cr)	mg/kg	15.9	8298366	10.3	14.3	8298199			17.2	1.0	8296970
Total Cobalt (Co)	mg/kg	4.40	8298366	4.45	4.51	8298199			5.05	0.30	8296970
Total Copper (Cu)	mg/kg	34.8	8298366	12.4	75.1	8298199	10.2	8311608	11.1	0.50	8296970
Total Iron (Fe)	mg/kg	16700	8298366	13400	16200	8298199			14400	100	8296970
Total Lead (Pb)	mg/kg	4.63	8298366	1.22	8.68	8298199			1.47	0.10	8296970
Total Lithium (Li)	mg/kg	13.9	8298366	15.2	16.7	8298199			14.4	5.0	8296970
Total Magnesium (Mg)	mg/kg	3140	8298366	4220	4060	8298199			4180	100	8296970
Total Manganese (Mn)	mg/kg	147	8298366	163	159	8298199			176	0.20	8296970
Total Mercury (Hg)	mg/kg	<0.050	8298366	<0.050	<0.050	8298199			<0.050	0.050	8296970
Total Molybdenum (Mo)	mg/kg	1.24	8298366	0.79	4.80	8298199			0.92	0.10	8296970
Total Nickel (Ni)	mg/kg	8.06	8298366	4.66	7.83	8298199			6.16	0.80	8296970
Total Phosphorus (P)	mg/kg	618	8298366	334	659	8298199			320	10	8296970
Total Potassium (K)	mg/kg	899	8298366	1300	1110	8298199			1060	100	8296970
Total Selenium (Se)	mg/kg	<0.50	8298366	<0.50	<0.50	8298199			<0.50	0.50	8296970
Total Silver (Ag)	mg/kg	0.064	8298366	<0.050	0.121	8298199			<0.050	0.050	8296970
Total Sodium (Na)	mg/kg	1880	8298366	2450	2630	8298199			1780	100	8296970
Total Strontium (Sr)	mg/kg	44.7	8298366	61.6	40.8	8298199			50.6	0.10	8296970
Total Thallium (Tl)	mg/kg	0.057	8298366	<0.050	0.074	8298199			<0.050	0.050	8296970
Total Tin (Sn)	mg/kg	<0.10	8298366	<0.10	0.16	8298199			<0.10	0.10	8296970
Total Titanium (Ti)	mg/kg	507	8298366	557	503	8298199			586	1.0	8296970
Total Uranium (U)	mg/kg	0.666	8298366	0.385	1.03	8298199			0.541	0.050	8296970
Total Vanadium (V)	mg/kg	65.9	8298366	40.8	49.6	8298199			49.0	2.0	8296970

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B645830
Report Date: 2016/07/04

HEMMERA ENVIROCHEM INC.
Client Project #: 315-006.04A

CSR/CCME METALS IN SOIL (SEDIMENT)

Maxxam ID		OU4133		OU4135	OU4141		OU4142		OU4146		
Sampling Date		2016/06/08 10:30		2016/06/08 10:48	2016/06/08 14:20		2016/06/08 14:30		2016/06/08 14:36		
COC Number		G116462		G116462	G116462		G116462		G116463		
	UNITS	**G1**	**QC Batch**	**G3**	**E1**	**QC Batch**	**E2**	**QC Batch**	**E3**	**RDL**	**QC Batch**
Total Zinc (Zn)	mg/kg	48.1	8298366	26.8	70.1	8298199			26.3	1.0	8296970
Total Zirconium (Zr)	mg/kg	0.79	8298366	0.63	0.88	8298199			0.73	0.50	8296970
RDL = Reportable Detection Limit											

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HEMMERA ENVIROCHEM INC.
Client Project #: 315-006.04A

SOLUBLE SODIUM AND CHLORIDE IN SOIL (SEDIMENT)

Maxxam ID		OU4142		
Sampling Date		2016/06/08 14:30		
COC Number		G116462		
	UNITS	**E2**	**RDL**	**QC Batch**
ANIONS				
Soluble Chloride (Cl)	mg/L	3600 (1)	50	8312055
Calculated Parameters				
Soluble Chloride (Cl)	mg/kg	1560	22	8308680
Soluble Sodium (Na)	mg/kg	955	2.2	8308682
Soluble Parameters				
Saturation %	%	43.4	1.0	8310816
Soluble Sodium (Na)	mg/L	2200	5.0	8311852

RDL = Reportable Detection Limit

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

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Maxxam Job #: B645830
Report Date: 2016/07/04

HEMMERA ENVIROCHEM INC.
Client Project #: 315-006.04A

CCME PAH IN SEDIMENTS BY GC-MS (SEDIMENT)

Maxxam ID		OU4133	OU4133	OU4135	OU4141	OU4146		
Sampling Date		2016/06/08 10:30	2016/06/08 10:30	2016/06/08 10:48	2016/06/08 14:20	2016/06/08 14:36		
COC Number		G116462	G116462	G116462	G116462	G116463		
	UNITS	**G1**	**G1 Lab-Dup**	**G3**	**E1**	**E3**	**RDL**	**QC Batch**
Calculated Parameters								
Index of Additive Cancer Risk(IARC)	N/A	<0.10		<0.10	0.95	<0.10	0.10	8295391
Polycyclic Aromatics								
Naphthalene	mg/kg	0.0055 (1)	<0.0010	<0.0010	0.0070	<0.0010	0.0010	8302225
2-Methylnaphthalene	mg/kg	<0.0010	<0.0010	<0.0010	0.0054	<0.0010	0.0010	8302225
Acenaphthylene	mg/kg	0.00070	0.00093	<0.00050	0.0025	<0.00050	0.00050	8302225
Acenaphthene	mg/kg	0.0052 (1)	0.00058	<0.00050	0.0097	<0.00050	0.00050	8302225
Fluorene	mg/kg	0.0052 (1)	<0.0010	<0.0010	0.013	<0.0010	0.0010	8302225
Phenanthrene	mg/kg	0.0092	0.0056	<0.0010	0.10	<0.0010	0.0010	8302225
Anthracene	mg/kg	0.0087 (1)	0.0035	<0.0010	0.014	<0.0010	0.0010	8302225
Fluoranthene	mg/kg	0.017 (1)	0.0094 (2)	<0.0010	0.13	<0.0010	0.0010	8302225
Pyrene	mg/kg	0.019 (1)	0.011 (2)	<0.0010	0.14	<0.0010	0.0010	8302225
Benzo(a)anthracene	mg/kg	0.0042	0.0030	<0.0010	0.041	<0.0010	0.0010	8302225
Chrysene	mg/kg	0.0046	0.0044	<0.0010	0.059	<0.0010	0.0010	8302225
Benzo(b&j)fluoranthene	mg/kg	0.0048	0.0074	<0.0010	0.075	<0.0010	0.0010	8302225
Benzo(k)fluoranthene	mg/kg	0.0016	0.0024	<0.0010	0.024	<0.0010	0.0010	8302225
Benzo(a)pyrene	mg/kg	0.0026	0.0044	<0.0010	0.048	<0.0010	0.0010	8302225
Indeno(1,2,3-cd)pyrene	mg/kg	<0.0020	0.0026	<0.0020	0.026	<0.0020	0.0020	8302225
Dibenz(a,h)anthracene	mg/kg	0.00070	0.00093	<0.00050	0.0075	<0.00050	0.00050	8302225
Benzo(g,h,i)perylene	mg/kg	<0.0020	0.0030	<0.0020	0.033	<0.0020	0.0020	8302225
Low Molecular Weight PAH`s	mg/kg	0.035		<0.0010	0.15	<0.0010	0.0010	8295008
High Molecular Weight PAH`s	mg/kg	0.048		<0.0010	0.43	<0.0010	0.0010	8295008
Total PAH	mg/kg	0.083		<0.0010	0.58	<0.0010	0.0010	8295008
Benzo[a]pyrene equivalency	mg/kg	<0.010		<0.010	0.073	<0.010	0.010	8295008
Surrogate Recovery (%)								
D10-ANTHRACENE (sur.)	%	103	108	108	97	108		8302225
D8-ACENAPHTHYLENE (sur.)	%	77	79	80	78	81		8302225
D8-NAPHTHALENE (sur.)	%	69	69	71	69	70		8302225
TERPHENYL-D14 (sur.)	%	99	105	105	100	103		8302225

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
(1) Duplicate exceeds acceptance criteria due to sample matrix.
(2) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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Maxxam Job #: B645830
Report Date: 2016/07/04

HEMMERA ENVIROCHEM INC.
Client Project #: 315-006.04A

GENERAL COMMENTS

Revised Report (Version: 2): G4 analyzed for grain size and TOC, E2 analyzed for saturated paste NaCl , total copper, E3 analyzed fort TBT and E4 analyzed for grain size and TOC (GP5).

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B645830
Report Date: 2016/07/04

QUALITY ASSURANCE REPORT

HEMMERA ENVIROCHEM INC.
Client Project #: 315-006.04A

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8302225	D10-ANTHRACENE (sur.)	2016/06/16	97	60 - 130	108	60 - 130	108	%				
8302225	D8-ACENAPHTHYLENE (sur.)	2016/06/16	79	50 - 130	81	50 - 130	80	%				
8302225	D8-NAPHTHALENE (sur.)	2016/06/16	71	50 - 130	73	50 - 130	74	%				
8302225	TERPHENYL-D14 (sur.)	2016/06/16	97	60 - 130	105	60 - 130	105	%				
8296270	Moisture	2016/06/13					<0.30	%	2.2	20		
8296283	Moisture	2016/06/13					<0.30	%	5.9	20		
8296970	Total Aluminum (Al)	2016/06/13					<100	mg/kg	2.1	35	93	70 - 130
8296970	Total Antimony (Sb)	2016/06/13	103	75 - 125	88	75 - 125	<0.10	mg/kg	NC	30	110	70 - 130
8296970	Total Arsenic (As)	2016/06/13	93	75 - 125	86	75 - 125	<0.50	mg/kg	0.29	30	86	70 - 130
8296970	Total Barium (Ba)	2016/06/13	NC	75 - 125	88	75 - 125	<0.10	mg/kg	7.4	35	98	70 - 130
8296970	Total Beryllium (Be)	2016/06/13	100	75 - 125	90	75 - 125	<0.40	mg/kg	NC	30	124	70 - 130
8296970	Total Bismuth (Bi)	2016/06/13					<0.10	mg/kg	NC	30		
8296970	Total Cadmium (Cd)	2016/06/13	99	75 - 125	92	75 - 125	<0.050	mg/kg	NC	30	115	70 - 130
8296970	Total Calcium (Ca)	2016/06/13					<100	mg/kg	3.2	30	100	70 - 130
8296970	Total Chromium (Cr)	2016/06/13	92	75 - 125	92	75 - 125	<1.0	mg/kg	3.0	30	109	70 - 130
8296970	Total Cobalt (Co)	2016/06/13	96	75 - 125	95	75 - 125	<0.30	mg/kg	2.5	30	101	70 - 130
8296970	Total Copper (Cu)	2016/06/13	NC	75 - 125	93	75 - 125	<0.50	mg/kg	4.0	30	100	70 - 130
8296970	Total Iron (Fe)	2016/06/13					<100	mg/kg	0.61	30	98	70 - 130
8296970	Total Lead (Pb)	2016/06/13	102	75 - 125	93	75 - 125	<0.10	mg/kg	3.6	35	107	70 - 130
8296970	Total Lithium (Li)	2016/06/13	91	75 - 125	88	75 - 125	<5.0	mg/kg	NC	30	103	70 - 130
8296970	Total Magnesium (Mg)	2016/06/13					<100	mg/kg	1.4	30	106	70 - 130
8296970	Total Manganese (Mn)	2016/06/13	NC	75 - 125	94	75 - 125	<0.20	mg/kg	1.6	30	107	70 - 130
8296970	Total Mercury (Hg)	2016/06/13	106	75 - 125	90	75 - 125	<0.050	mg/kg	NC	35	97	70 - 130
8296970	Total Molybdenum (Mo)	2016/06/13	95	75 - 125	90	75 - 125	<0.10	mg/kg	1.1	35	107	70 - 130
8296970	Total Nickel (Ni)	2016/06/13	96	75 - 125	91	75 - 125	<0.80	mg/kg	11	30	106	70 - 130
8296970	Total Phosphorus (P)	2016/06/13					<10	mg/kg	2.2	30	95	70 - 130
8296970	Total Potassium (K)	2016/06/13					<100	mg/kg	6.5	35	94	70 - 130
8296970	Total Selenium (Se)	2016/06/13	98	75 - 125	91	75 - 125	<0.50	mg/kg	NC	30		
8296970	Total Silver (Ag)	2016/06/13	98	75 - 125	90	75 - 125	<0.050	mg/kg	NC	35	142 (1)	70 - 130
8296970	Total Sodium (Na)	2016/06/13					<100	mg/kg	3.6	35	96	70 - 130
8296970	Total Strontium (Sr)	2016/06/13	NC	75 - 125	86	75 - 125	<0.10	mg/kg	3.8	35	103	70 - 130
8296970	Total Thallium (Tl)	2016/06/13	95	75 - 125	91	75 - 125	<0.050	mg/kg	NC	30	96	70 - 130

Maxxam Job #: B645830
Report Date: 2016/07/04

QUALITY ASSURANCE REPORT(CONT'D)

HEMMERA ENVIROCHEM INC.
Client Project #: 315-006.04A

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8296970	Total Tin (Sn)	2016/06/13	92	75 - 125	84	75 - 125	<0.10	mg/kg	NC	35	91	70 - 130
8296970	Total Titanium (Ti)	2016/06/13	NC	75 - 125	89	75 - 125	<1.0	mg/kg	1.8	35		
8296970	Total Uranium (U)	2016/06/13	96	75 - 125	89	75 - 125	<0.050	mg/kg	3.8	30	106	70 - 130
8296970	Total Vanadium (V)	2016/06/13	NC	75 - 125	90	75 - 125	<2.0	mg/kg	4.9	30	102	70 - 130
8296970	Total Zinc (Zn)	2016/06/13	NC	75 - 125	95	75 - 125	<1.0	mg/kg	8.3	30	104	70 - 130
8296970	Total Zirconium (Zr)	2016/06/13					<0.50	mg/kg	NC	30		
8296993	Soluble (2:1) pH	2016/06/13			100	97 - 103			0.48	N/A		
8298199	Total Aluminum (Al)	2016/06/14					<100	mg/kg	1.6	35	100	70 - 130
8298199	Total Antimony (Sb)	2016/06/14	91	75 - 125	98	75 - 125	<0.10	mg/kg	NC	30	103	70 - 130
8298199	Total Arsenic (As)	2016/06/14	NC	75 - 125	93	75 - 125	<0.50	mg/kg	3.5	30	73	70 - 130
8298199	Total Barium (Ba)	2016/06/14	94	75 - 125	102	75 - 125	<0.10	mg/kg	16	35	100	70 - 130
8298199	Total Beryllium (Be)	2016/06/14	92	75 - 125	97	75 - 125	<0.40	mg/kg	NC	30	99	70 - 130
8298199	Total Bismuth (Bi)	2016/06/14					<0.10	mg/kg	13	30		
8298199	Total Cadmium (Cd)	2016/06/14	93	75 - 125	104	75 - 125	<0.050	mg/kg	NC	30	121	70 - 130
8298199	Total Calcium (Ca)	2016/06/14					<100	mg/kg	0.69	30	100	70 - 130
8298199	Total Chromium (Cr)	2016/06/14	93	75 - 125	98	75 - 125	<1.0	mg/kg	2.6	30	102	70 - 130
8298199	Total Cobalt (Co)	2016/06/14	NC	75 - 125	98	75 - 125	<0.30	mg/kg	23	30	96	70 - 130
8298199	Total Copper (Cu)	2016/06/14	NC	75 - 125	101	75 - 125	<0.50	mg/kg	16	30	99	70 - 130
8298199	Total Iron (Fe)	2016/06/14					<100	mg/kg	0.73	30	99	70 - 130
8298199	Total Lead (Pb)	2016/06/14	98	75 - 125	105	75 - 125	<0.10	mg/kg	23	35	106	70 - 130
8298199	Total Lithium (Li)	2016/06/14	95	75 - 125	99	75 - 125	<5.0	mg/kg	NC	30	99	70 - 130
8298199	Total Magnesium (Mg)	2016/06/14					<100	mg/kg	6.7	30	102	70 - 130
8298199	Total Manganese (Mn)	2016/06/14	NC	75 - 125	99	75 - 125	<0.20	mg/kg	0.13	30	99	70 - 130
8298199	Total Mercury (Hg)	2016/06/14	106	75 - 125	106	75 - 125	<0.050	mg/kg	NC	35	107	70 - 130
8298199	Total Molybdenum (Mo)	2016/06/14	110	75 - 125	102	75 - 125	<0.10	mg/kg	18	35	115	70 - 130
8298199	Total Nickel (Ni)	2016/06/14	94	75 - 125	99	75 - 125	<0.80	mg/kg	5.7	30	108	70 - 130
8298199	Total Phosphorus (P)	2016/06/14					<10	mg/kg	13	30	94	70 - 130
8298199	Total Potassium (K)	2016/06/14					<100	mg/kg	11	35	95	70 - 130
8298199	Total Selenium (Se)	2016/06/14	93	75 - 125	98	75 - 125	<0.50	mg/kg	NC	30		
8298199	Total Silver (Ag)	2016/06/14	90	75 - 125	100	75 - 125	<0.050	mg/kg	NC	35	88	70 - 130
8298199	Total Sodium (Na)	2016/06/14					<100	mg/kg	2.5	35	93	70 - 130
8298199	Total Strontium (Sr)	2016/06/14	NC	75 - 125	98	75 - 125	<0.10	mg/kg	1.1	35	103	70 - 130

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8298199	Total Thallium (Tl)	2016/06/14	96	75 - 125	104	75 - 125	<0.050	mg/kg	NC	30	89	70 - 130
8298199	Total Tin (Sn)	2016/06/14	92	75 - 125	92	75 - 125	<0.10	mg/kg	11	35	94	70 - 130
8298199	Total Titanium (Ti)	2016/06/14	NC	75 - 125	95	75 - 125	<1.0	mg/kg	0.28	35		
8298199	Total Uranium (U)	2016/06/14	97	75 - 125	103	75 - 125	<0.050	mg/kg	27	30	109	70 - 130
8298199	Total Vanadium (V)	2016/06/14	NC	75 - 125	97	75 - 125	<2.0	mg/kg	0.82	30	96	70 - 130
8298199	Total Zinc (Zn)	2016/06/14	NC	75 - 125	98	75 - 125	<1.0	mg/kg	14	30	97	70 - 130
8298199	Total Zirconium (Zr)	2016/06/14					<0.50	mg/kg	NC	30		
8298201	Soluble (2:1) pH	2016/06/14			101	97 - 103			1.1	N/A		
8298366	Total Aluminum (Al)	2016/06/14					<100	mg/kg	4.1	35	99	70 - 130
8298366	Total Antimony (Sb)	2016/06/14	97	75 - 125	94	75 - 125	<0.10	mg/kg	NC	30	129	70 - 130
8298366	Total Arsenic (As)	2016/06/14	95	75 - 125	94	75 - 125	<0.50	mg/kg	NC	30	81	70 - 130
8298366	Total Barium (Ba)	2016/06/14	NC	75 - 125	102	75 - 125	0.12, RDL=0.10	mg/kg	10	35	99	70 - 130
8298366	Total Beryllium (Be)	2016/06/14	99	75 - 125	102	75 - 125	<0.40	mg/kg	NC	30	92	70 - 130
8298366	Total Bismuth (Bi)	2016/06/14					<0.10	mg/kg	NC	30		
8298366	Total Cadmium (Cd)	2016/06/14	101	75 - 125	103	75 - 125	<0.050	mg/kg	NC	30	113	70 - 130
8298366	Total Calcium (Ca)	2016/06/14					<100	mg/kg	7.1	30	100	70 - 130
8298366	Total Chromium (Cr)	2016/06/14	92	75 - 125	98	75 - 125	<1.0	mg/kg	23	30	101	70 - 130
8298366	Total Cobalt (Co)	2016/06/14	91	75 - 125	98	75 - 125	<0.30	mg/kg	22	30	93	70 - 130
8298366	Total Copper (Cu)	2016/06/14	94	75 - 125	101	75 - 125	<0.50	mg/kg	11	30	99	70 - 130
8298366	Total Iron (Fe)	2016/06/14					<100	mg/kg	17	30	99	70 - 130
8298366	Total Lead (Pb)	2016/06/14	98	75 - 125	107	75 - 125	<0.10	mg/kg	6.4	35	112	70 - 130
8298366	Total Lithium (Li)	2016/06/14	100	75 - 125	101	75 - 125	<5.0	mg/kg	NC	30	103	70 - 130
8298366	Total Magnesium (Mg)	2016/06/14					<100	mg/kg	3.2	30	101	70 - 130
8298366	Total Manganese (Mn)	2016/06/14	NC	75 - 125	101	75 - 125	<0.20	mg/kg	3.2	30	99	70 - 130
8298366	Total Mercury (Hg)	2016/06/14	103	75 - 125	100	75 - 125	<0.050	mg/kg	NC	35	99	70 - 130
8298366	Total Molybdenum (Mo)	2016/06/14	116	75 - 125	101	75 - 125	<0.10	mg/kg	NC	35	133 (2)	70 - 130
8298366	Total Nickel (Ni)	2016/06/14	98	75 - 125	100	75 - 125	<0.80	mg/kg	0.91	30	103	70 - 130
8298366	Total Phosphorus (P)	2016/06/14					<10	mg/kg	2.2	30	95	70 - 130
8298366	Total Potassium (K)	2016/06/14					<100	mg/kg	10	35	94	70 - 130
8298366	Total Selenium (Se)	2016/06/14	97	75 - 125	100	75 - 125	<0.50	mg/kg	NC	30		
8298366	Total Silver (Ag)	2016/06/14	97	75 - 125	104	75 - 125	<0.050	mg/kg	NC	35	94	70 - 130

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8298366	Total Sodium (Na)	2016/06/14					<100	mg/kg	NC	35	91	70 - 130
8298366	Total Strontium (Sr)	2016/06/14	NC	75 - 125	100	75 - 125	<0.10	mg/kg	31	35	105	70 - 130
8298366	Total Thallium (Tl)	2016/06/14	98	75 - 125	105	75 - 125	<0.050	mg/kg	NC	30	92	70 - 130
8298366	Total Tin (Sn)	2016/06/14	97	75 - 125	91	75 - 125	<0.10	mg/kg	NC	35	97	70 - 130
8298366	Total Titanium (Ti)	2016/06/14	NC	75 - 125	95	75 - 125	<1.0	mg/kg	11	35		
8298366	Total Uranium (U)	2016/06/14	102	75 - 125	104	75 - 125	<0.050	mg/kg	0.68	30	103	70 - 130
8298366	Total Vanadium (V)	2016/06/14	97	75 - 125	97	75 - 125	<2.0	mg/kg	12	30	97	70 - 130
8298366	Total Zinc (Zn)	2016/06/14	91	75 - 125	101	75 - 125	<1.0	mg/kg	9.7	30	100	70 - 130
8298366	Total Zirconium (Zr)	2016/06/14					<0.50	mg/kg	1.0	30		
8298388	Soluble (2:1) pH	2016/06/14			100	97 - 103			0.22	N/A		
8302225	2-Methylnaphthalene	2016/06/16	102	50 - 130	71	50 - 130	<0.0010	mg/kg	NC	50		
8302225	Acenaphthene	2016/06/16	119	50 - 130	81	50 - 130	<0.00050	mg/kg	NC	50		
8302225	Acenaphthylene	2016/06/16	103	50 - 130	69	50 - 130	<0.00050	mg/kg	NC	50		
8302225	Anthracene	2016/06/16	132 (3)	60 - 130	92	60 - 130	<0.0010	mg/kg	NC	50		
8302225	Benzo(a)anthracene	2016/06/16	110	60 - 130	71	60 - 130	<0.0010	mg/kg	NC	50		
8302225	Benzo(a)pyrene	2016/06/16	111	60 - 130	73	60 - 130	<0.0010	mg/kg	NC	50		
8302225	Benzo(b&j)fluoranthene	2016/06/16	109	60 - 130	74	60 - 130	<0.0010	mg/kg	NC	50		
8302225	Benzo(g,h,i)perylene	2016/06/16	113	60 - 130	78	60 - 130	<0.0020	mg/kg	NC	50		
8302225	Benzo(k)fluoranthene	2016/06/16	104	60 - 130	71	60 - 130	<0.0010	mg/kg	NC	50		
8302225	Chrysene	2016/06/16	112	60 - 130	79	60 - 130	<0.0010	mg/kg	NC	50		
8302225	Dibenz(a,h)anthracene	2016/06/16	118	60 - 130	76	60 - 130	<0.00050	mg/kg	NC	50		
8302225	Fluoranthene	2016/06/16	118	60 - 130	82	60 - 130	<0.0010	mg/kg	57 (3)	50		
8302225	Fluorene	2016/06/16	111	50 - 130	74	50 - 130	<0.0010	mg/kg	NC	50		
8302225	Indeno(1,2,3-cd)pyrene	2016/06/16	118	60 - 130	81	60 - 130	<0.0020	mg/kg	NC	50		
8302225	Naphthalene	2016/06/16	90	50 - 130	60	50 - 130	<0.0010	mg/kg	NC	50		
8302225	Phenanthrene	2016/06/16	96	60 - 130	69	60 - 130	<0.0010	mg/kg	49	50		
8302225	Pyrene	2016/06/16	121	60 - 130	86	60 - 130	<0.0010	mg/kg	54 (3)	50		
8310816	Saturation %	2016/06/25					<1.0	%	0.050	30	104	75 - 125
8311608	Total Copper (Cu)	2016/06/27	NC	75 - 125	96	75 - 125	<0.50	mg/kg	0.75	30	89	70 - 130
8311610	Soluble (2:1) pH	2016/06/27			101	97 - 103			1.6	N/A		
8311611	% sand by hydrometer	2016/06/28							0.46	35	101	90 - 110
8311611	% silt by hydrometer	2016/06/28							NC	35		

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8311611	Clay Content	2016/06/28							NC	35		
8311611	Gravel	2016/06/28							NC	35		
8311852	Soluble Sodium (Na)	2016/06/27					<5.0	mg/L			94	75 - 125
8312055	Soluble Chloride (Cl)	2016/06/27	NC	75 - 125	102	80 - 120	<5.0	mg/L			104	75 - 125

N/A = Not Applicable

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

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

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

(1) Reference Material exceeds acceptance limits for Ag. 10% of analytes failure in multielement scan is allowed.

(2) Reference Matrial exceeds acceptance criteria for Mo. 10% of analytes failure in multielement scan is allowed

(3) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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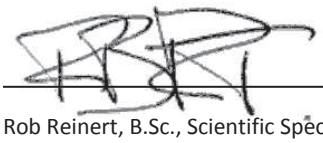
Maxxam Job #: B645830
Report Date: 2016/07/04

HEMMERA ENVIROCHEM INC.
Client Project #: 315-006.04A

VALIDATION SIGNATURE PAGE

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



Rob Reinert, B.Sc., Scientific Specialist

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.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam
A Bureau Veritas Group Company

Updated CoC B645830 1/2

CHAIN OF CUSTODY RECORD

G116462

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5. Toll Free (800) 665-8566

BBY FCD-00077/05

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Invoice Information	Report Information (if differs from invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: Hemmera	Company Name: SAME	Quotation #:	☑ Regular TAT 5 days (Most analyses)
Contact Name: Lesley Knight / Bonnie Mah	Contact Name:	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: 15th Floor - 4730 Kingsway Burnaby BC, V5H 0C6	Address: PC:	Project #: 335-006.04A	Rush TAT (Surcharges will be applied) ☐ Same Day ☐ 2 Days ☐ 1 Day ☐ 3 Days
Phone: 604 669 0424	Phone: jcolburne	Site Location:	Date Required:
Email: lknight@hemmera.com	Email: bmahs @hemmera.com	Site #:	Rush Confirmation #:
		Sampled By: JC	

Regulatory Criteria	Special Instructions
☑ BC CSR Soil ☐ BC CSR Water ☑ CCME (Specify) ☐ Other (Specify) Soil / Sediment ☐ Drinking Water ☐ BC Water Quality	☐ Return Cooler ☐ Ship Sample Bottles (Please Specify)

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYSE
1	G1	2016/06/08	10:30	Sediment	2.5	✓
2	G2		10:40		2.5	✓
3	G3		10:48		2.5	✓
4	G4		11:00		2.5	✓
5	G5		11:08		2.5	✓
6	A1		11:50		2	✓
7	B1		13:20		2.5	✓
8	B2		13:25		1	✓
9	C1		14:20		2.5	✓
10	C2		14:30		2.5	✓

LABORATORY USE ONLY

CUSTODY SEAL Y / N (Present / Intact)

COOLER TEMPERATURES: 8.4.9

COOLING MEDIA PRESENT Y / N

COMMENTS

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Jarrod Colburne	2016/06/08	16:52	[illegible]	2016/06/08	16:52	

COC-1020

Maxxam
A Bureau Veritas Group Company

Updated CoC

CHAIN OF CUSTODY RECORD

B645830 G116463 2/2

BBY FCD-00077/05
Page 2 of 2

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5. Toll Free (800) 665-8566

Invoice Information
Company Name: Hemmera
Contact Name: Lesley Knight/Bonnie Morr
Address: 18th Floor 4730 Kingsway, Burnaby BC PC: V5H 0C6
Phone: 604 669 0424
Email: lknight@hemmera.com

Report Information (if differs from invoice)
Company Name: Same
Contact Name:
Address: PC:
Phone: jcolburne } @hemmera.com
Email: bmarks

Project Information (where applicable)
Quotation #:
P.O. #/ AFE#:
Project #: 315-006.04A
Site Location:
Site #:
Sampled By: JC

Turnaround Time (TAT) Required
☑ Regular TAT 5 days (Most analyses)
PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Rush TAT (Surcharges will be applied)
☐ Same Day ☐ 2 Days
☐ 1 Day ☐ 3 Days
Date Required:
Rush Confirmation #:

Regulatory Criteria
☑ BC CSR Soil ☐ BC CSR Water
☑ CCME (Specify) soil/sediment ☐ Other (Specify)
☐ Drinking Water ☐ BC Water Quality

Special Instructions
☐ Return Cooler
☐ Ship Sample Bottles (Please Specify)

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	PAH	Total Metals	# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE
1	E3	2016/06/08	14:36	sediment	X	X	1.5	X
2	E4	↓	14:42	↓			1.5	X
3								
4								
5								
6								
7								
8								
9								
10								

LABORATORY USE ONLY
CUSTODY SEAL Y / (N) — Present / Intact
COOLER TEMPERATURES: 8, 9, 9
COOLING MEDIA PRESENT (Y) / N
COMMENTS

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Jarrod Colburne JC	296/06/08	16:52	JUVATNNE ROY	2016/06/08	16:52	

COC-1020

Your Project #: B645830
Your C.O.C. #: na, 1

Attention:Amandeep Nagra

Maxxam Analytics
4606 Canada Way
Burnaby, BC
V5G 1K5

Report Date: 2016/06/30
Report #: R4048039
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6D0695
Received: 2016/06/24, 09:25

Sample Matrix: SEDIMENT
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Total Organic Carbon in Soil	2	N/A	2016/06/29	CAM SOP-00468	BCMOE TOC Aug 2014

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.

Encryption Key

Ashton Gibson
Project Manager
30 Jun 2016 17:35:44 -04:00

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Ema Gitej, Senior Project Manager
Email: EGitej@maxxam.ca
Phone# (905)817-5829

==========

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.

Maxxam Job #: B6D0695
Report Date: 2016/06/30

Maxxam Analytics
Client Project #: B645830

RESULTS OF ANALYSES OF SEDIMENT

Maxxam ID		CPE533	CPE534		
Sampling Date		2016/06/08 11:00	2016/06/08 14:42		
COC Number		1	1		
	UNITS	OU4136\G4	OU4147\E4	RDL	QC Batch
Total Organic Carbon	mg/kg	2600	<500	500	4558200

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B6D0695
Report Date: 2016/06/30

Maxxam Analytics
Client Project #: B645830

TEST SUMMARY

Maxxam ID: CPE533
Sample ID: OU4136\G4
Matrix: SEDIMENT

Collected: 2016/06/08
Shipped:
Received: 2016/06/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Organic Carbon in Soil	COMB	4558200	N/A	2016/06/29	Bramdeo Motiram

Maxxam ID: CPE534
Sample ID: OU4147\E4
Matrix: SEDIMENT

Collected: 2016/06/08
Shipped:
Received: 2016/06/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Organic Carbon in Soil	COMB	4558200	N/A	2016/06/29	Bramdeo Motiram

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

GENERAL COMMENTS

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

Package 1	3.7°C

Results relate only to the items tested.

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Maxxam Job #: B6D0695
Report Date: 2016/06/30

QUALITY ASSURANCE REPORT

Maxxam Analytics
Client Project #: B645830

			Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
4558200	Total Organic Carbon	2016/06/29	<500	mg/kg	0.91	35	108	75 - 125

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

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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

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Maxxam Job #: B6D0695
Report Date: 2016/06/30

Maxxam Analytics
Client Project #: B645830

VALIDATION SIGNATURE PAGE

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

Cristina Carriere

Cristina Carriere, Scientific Services

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.

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SAMPLE RECEIPT FORM / CHEMICAL ANALYSIS FORM

FILE #: PR161845

CLIENT: Maxxam Analytics
4606 Canada Way
Burnaby, BC
V5G 1K5

Phone: (604) 734-7276
Fax: (604) 731-2386
Email: ANagra@maxxam.ca

RECEIVED BY: J. Wiebe
CONDITION: okay, 8.8°C

DATE/TIME: June 23, 2016 (2:20 p.m.)

# of Containers	Sample Type	Sample (Client Codes)	Lab Codes	Test Requested
		Job B645830		
1	Sediment	OU4146-02R\E3	PR161845	TBT

STORAGE: Stored at <-10°C.

ANALYTES: HRGC/HRMS analysis for tributyltin (TBT).

SPECIAL INSTRUCTIONS: None.

METHODOLOGY

Reference Method: TBT: in house, SOP LAB04

Data summarized in Data Report Attached

Report sent to: Amandeep Nagra Date: July 4, 2016

Comments: Results relate only to items tested.

Digitally signed by David Hope
DN: c=CA, st=BC, l=Surrey, o=Pacific Rim Laboratories Inc., cn=David Hope, email=dave@pacificrimlabs.com
Date: 2016.07.04 12:13:46 -07'00'

David Hope PChem, CEO

DATA REPORT

Client: Maxxam Analytics
Contact: Amandeep Nagra

Date Extracted: 24-Jun-16
Date Analysed: 28-Jun-16

	Client ID:	OU4146-02R\E3					BLANK
	PRL ID:	PR161845					TB160528B
Compound	**DL µg/g**	**µg/g**					**µg/g**
Tributyltin Chloride	0.001	ND					ND
Dibutyltin dichloride	0.001	ND					ND
Monobutyltin trichloride	0.001	ND					ND

Compound	**DL µg/g**	**µg/g**					**µg/g**
TBT^{+}	0.001	ND					ND
DBT^{++}	0.001	ND					ND
MBT^{+++}	0.001	ND					ND
Surrogate Recoveries (%)							
Tributyltin - d27		90					91

ND - none detected

Acronyms used in reporting organotins:

TBT = Tributyltin
DBT = Dibutyltin
MBT = Monobutyltin
TBTCl = Tributyltin chloride
DBTCl = Dibutyltin dichloride
MBTCl = Monobutyltin trichloride

This method analyzes organotin derivatives in water, sediment and biota. The method cannot determine which organotin salt is present in the sample, therefore all data is quantified in terms of organotin chlorides and expressed as cation equivalents (TBT^{+}, DBT^{++}, MBT^{+++}).

In sea water and under normal conditions, TBT exists as three species (hydroxide, chloride, and carbonate), which remain in equilibrium. At pH values less than 7.0, the predominate forms are $Bu_3SnOH_2^{+}$ and Bu_3SnCl, at pH 8, they are Bu_3SnCl, Bu_3SnOH, and $Bu_3SnCO_3^{-}$, and at pH values above 10, Bu_3SnOH and $Bu_3SnCO_3^{-}$ predominate.
Source: http://www.inchem.org/documents/ehc/ehc/ehc116.htm#SectionNumber:1.1

TBT data has been reported in many conventions over the years. To convert to other units, use the multipliers below.

To convert	To:	Multiply by:
Tributyltin chloride	As Sn	0.3647
Tributyltin chloride	As TBTO	0.9760
Tributyltin chloride	As TBT^{+}	0.8911
Dibutyltin dichloride	As Sn	0.3907
Dibutyltin dichloride	As TBTO	0.9110
Dibutyltin dichloride	As DBT^{++}	0.7666
Dibutyltin dichloride	As TBT^{+}	0.9546
Monobutyltin trichloride	As Sn	0.4207
Monobutyltin trichloride	As TBTO	0.8461
Monobutyltin trichloride	As MBT^{+++}	0.6231
Monobutyltin trichloride	As TBT^{+}	1.0279
As Sn	As TBTO	2.8097

Acceptable recoveries for Tributyltin surrogate standards

Sediment/biota	TBT d_{27} 20-150%
Water	TBT d_{27} 10-130%

Your Project #: 315-006.04A
Your C.O.C. #: G116464, G116465, G116466

Attention:Lesley Knight

HEMMERA ENVIROCHEM INC.
18th Floor, 4730 Kingsway
Burnaby, BC
Canada V5H 0C6

Report Date: 2016/07/04
Report #: R2209623
Version: 3 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B646263
Received: 2016/06/09, 17:08

Sample Matrix: Sediment
Samples Received: 17

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Chloride (soluble)	4	2016/06/25	2016/06/27	BBY6SOP-00011	SM 22 4500-Cl- E m
Soluble Chloride Ion Calc. (mg/kg)	4	N/A	2016/06/28	BBY WI-00033	Auto Calc
Elements by ICPMS (total)	4	2016/06/13	2016/06/13	BBY7SOP-00017,	BC SALM,EPA 6020bR2m
Elements by ICPMS (total)	6	2016/06/14	2016/06/14	BBY7SOP-00017,	BC SALM,EPA 6020bR2m
Elements by ICPMS (total)	4	2016/06/27	2016/06/27	BBY7SOP-00017,	BC SALM,EPA 6020bR2m
Moisture	10	2016/06/11	2016/06/13	BBY8SOP-00017	BC MOE Lab Manual
Soluble Sodium Ion Calc. (mg/kg)	4	N/A	2016/06/27	BBY WI-00033	Auto Calc
Index of Additive Cancer Risk Calc.	10	N/A	2016/06/17	BBY WI-00033	Auto Calc
PAH in Soil by GC/MS Lowlevel (Extended)	10	2016/06/12	2016/06/17	BBY8SOP-00022	EPA 8270d R4 m
Total PAH and B(a)P Calculation	10	N/A	2016/06/17	BBY WI-00033	Auto Calc
pH (2:1 DI Water Extract)	4	2016/06/13	2016/06/13	BBY6SOP-00028	BCMOE BCLM Mar2005 m
pH (2:1 DI Water Extract)	6	2016/06/14	2016/06/14	BBY6SOP-00028	BCMOE BCLM Mar2005 m
pH (2:1 DI Water Extract)	4	2016/06/27	2016/06/27	BBY6SOP-00028	BCMOE BCLM Mar2005 m
Saturated Paste	4	2016/06/25	2016/06/25	BBY6SOP-00030	Carter 2nd 15.2.1 m
Soluble Cations (Ca,K,Mg,Na,S)	4	N/A	2016/06/27	BBY7SOP-00001 BBY7SOP-00018	EPA6020bR2m,6010cR3m
Texture by Hydrometer, incl Gravel (Wet)	3	N/A	2016/06/29	BBY6SOP-00051	Carter 2nd ed 55.3
Mono, Di, Tributyl Tin in Soil SubC (1)	3	N/A	2016/06/30		
TOC Soil Subcontract (2)	3	2016/06/30	2016/06/30		

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 Sub Vancouver to Pacific Rim
(2) This test was performed by Maxxam Ontario (From Burnaby)

Your Project #: 315-006.04A
Your C.O.C. #: G116464, G116465, G116466

Attention:Lesley Knight

HEMMERA ENVIROCHEM INC.
18th Floor, 4730 Kingsway
Burnaby, BC
Canada V5H 0C6

Report Date: 2016/07/04
Report #: R2209623
Version: 3 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B646263
Received: 2016/06/09, 17:08

Encryption Key

Gail Pedersen
Project Manager
04 Jul 2016 14:24:09 -07:00

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Amandeep Nagra, Account Specialist
Email: ANagra@maxxam.ca
Phone# (604)639-2602

==========

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Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B646263
Report Date: 2016/07/04

HEMMERA ENVIROCHEM INC.
Client Project #: 315-006.04A
Sampler Initials: JC

RESULTS OF CHEMICAL ANALYSES OF SEDIMENT

Maxxam ID		OU6737			OU6740		OU6741		
Sampling Date		2016/06/09 10:15			2016/06/09 10:50		2016/06/09 11:00		
COC Number		G116464			G116464		G116464		
	UNITS	**F4**	**RDL**	**QC Batch**	**C3**	**QC Batch**	**C4**	**RDL**	**QC Batch**
Parameter									
Subcontract Parameter	N/A	ATTACHED	N/A	8316810	ATTACHED	8316811	ATTACHED	N/A	8316810
Physical Properties									
% sand by hydrometer	%	69	2.0	8312866			72	2.0	8312866
% silt by hydrometer	%	3.8	2.0	8312866			4.0	2.0	8312866
Clay Content	%	12	2.0	8312866			12	2.0	8312866
Gravel	%	16	2.0	8312866			12	2.0	8312866

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam ID		OU6745		OU6746			OU6749	
Sampling Date		2016/06/09 11:43		2016/06/09 11:50			2016/06/09 12:46	
COC Number		G116465		G116465			G116465	
	UNITS	**D3**	**QC Batch**	**D4**	**RDL**	**QC Batch**	**H3**	**QC Batch**
Parameter								
Subcontract Parameter	N/A	ATTACHED	8316811	ATTACHED	N/A	8316810	ATTACHED	8316811
Physical Properties								
% sand by hydrometer	%			83	2.0	8312866		
% silt by hydrometer	%			2.5	2.0	8312866		
Clay Content	%			8.8	2.0	8312866		
Gravel	%			6.3	2.0	8312866		

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B646263
Report Date: 2016/07/04

HEMMERA ENVIROCHEM INC.
Client Project #: 315-006.04A
Sampler Initials: JC

PHYSICAL TESTING (SEDIMENT)

Maxxam ID		OU6734	OU6736	OU6738	OU6740	OU6742	OU6743	OU6745		
Sampling Date		2016/06/09 09:55	2016/06/09 10:08	2016/06/09 10:30	2016/06/09 10:50	2016/06/09 11:05	2016/06/09 11:28	2016/06/09 11:43		
COC Number		G116464	G116464	G116464	G116464	G116464	G116464	G116465		
	UNITS	**F1**	**F3**	**C1**	**C3**	**C5**	**D1**	**D3**	**RDL**	**QC Batch**
Physical Properties										
Moisture	%	17	16	21	15	16	21	25	0.30	8296283
RDL = Reportable Detection Limit										

Maxxam ID		OU6747	OU6749	OU6755		
Sampling Date		2016/06/09 12:30	2016/06/09 12:46	2016/06/09 14:29		
COC Number		G116465	G116465	G116466		
	UNITS	**H1**	**H3**	**A100**	**RDL**	**QC Batch**
Physical Properties						
Moisture	%	45	18	63	0.30	8296283
RDL = Reportable Detection Limit						

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B646263
Report Date: 2016/07/04

HEMMERA ENVIROCHEM INC.
Client Project #: 315-006.04A
Sampler Initials: JC

CSR/CCME METALS IN SOIL (SEDIMENT)

Maxxam ID		OU6734	OU6734		OU6735		OU6736		OU6738		
Sampling Date		2016/06/09 09:55	2016/06/09 09:55		2016/06/09 10:02		2016/06/09 10:08		2016/06/09 10:30		
COC Number		G116464	G116464		G116464		G116464		G116464		
	UNITS	**F1**	**F1 Lab-Dup**	**QC Batch**	**F2**	**QC Batch**	**F3**	**QC Batch**	**C1**	**RDL**	**QC Batch**
Physical Properties											
Soluble (2:1) pH	pH	8.39	8.43	8296993	8.59	8311632	8.64	8296993	8.43	N/A	8298201
Total Metals by ICPMS											
Total Aluminum (Al)	mg/kg	8660	8840	8296970			9210	8296970	8920	100	8298199
Total Antimony (Sb)	mg/kg	0.21	0.22	8296970			0.15	8296970	0.35	0.10	8298199
Total Arsenic (As)	mg/kg	3.14	3.13	8296970			2.01	8296970	3.07	0.50	8298199
Total Barium (Ba)	mg/kg	29.3	27.2	8296970			31.8	8296970	29.8	0.10	8298199
Total Beryllium (Be)	mg/kg	<0.40	<0.40	8296970			<0.40	8296970	<0.40	0.40	8298199
Total Bismuth (Bi)	mg/kg	<0.10	<0.10	8296970			<0.10	8296970	<0.10	0.10	8298199
Total Cadmium (Cd)	mg/kg	0.237	0.237	8296970			0.142	8296970	0.413	0.050	8298199
Total Calcium (Ca)	mg/kg	6290	6500	8296970			11200	8296970	7810	100	8298199
Total Chromium (Cr)	mg/kg	18.3	18.8	8296970			14.0	8296970	19.2	1.0	8298199
Total Cobalt (Co)	mg/kg	5.14	5.01	8296970			5.50	8296970	4.86	0.30	8298199
Total Copper (Cu)	mg/kg	48.5	46.6	8296970	11.4	8311631	13.8	8296970	138	0.50	8298199
Total Iron (Fe)	mg/kg	17400	17300	8296970			14600	8296970	18800	100	8298199
Total Lead (Pb)	mg/kg	7.67	7.95	8296970			2.16	8296970	19.1	0.10	8298199
Total Lithium (Li)	mg/kg	13.9	14.2	8296970			17.8	8296970	15.3	5.0	8298199
Total Magnesium (Mg)	mg/kg	4130	4190	8296970			5040	8296970	3780	100	8298199
Total Manganese (Mn)	mg/kg	174	177	8296970			188	8296970	163	0.20	8298199
Total Mercury (Hg)	mg/kg	<0.050	<0.050	8296970			<0.050	8296970	<0.050	0.050	8298199
Total Molybdenum (Mo)	mg/kg	1.33	1.32	8296970			0.99	8296970	3.20	0.10	8298199
Total Nickel (Ni)	mg/kg	8.91	7.99	8296970			7.89	8296970	10.8	0.80	8298199
Total Phosphorus (P)	mg/kg	615	629	8296970			316	8296970	780	10	8298199
Total Potassium (K)	mg/kg	1090	1020	8296970			1280	8296970	1190	100	8298199
Total Selenium (Se)	mg/kg	<0.50	<0.50	8296970			<0.50	8296970	<0.50	0.50	8298199
Total Silver (Ag)	mg/kg	0.169	0.187	8296970			0.122	8296970	0.177	0.050	8298199
Total Sodium (Na)	mg/kg	2390	2480	8296970			2460	8296970	2450	100	8298199
Total Strontium (Sr)	mg/kg	39.8	41.4	8296970			67.7	8296970	45.6	0.10	8298199
Total Thallium (Tl)	mg/kg	0.101	0.098	8296970			0.091	8296970	0.078	0.050	8298199
Total Tin (Sn)	mg/kg	0.17	0.18	8296970			<0.10	8296970	0.39	0.10	8298199
Total Titanium (Ti)	mg/kg	681	693	8296970			671	8296970	543	1.0	8298199
Total Uranium (U)	mg/kg	0.856	0.824	8296970			0.632	8296970	1.54	0.050	8298199

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B646263
Report Date: 2016/07/04

HEMMERA ENVIROCHEM INC.
Client Project #: 315-006.04A
Sampler Initials: JC

CSR/CCME METALS IN SOIL (SEDIMENT)

Maxxam ID		OU6734	OU6734		OU6735		OU6736		OU6738		
Sampling Date		2016/06/09 09:55	2016/06/09 09:55		2016/06/09 10:02		2016/06/09 10:08		2016/06/09 10:30		
COC Number		G116464	G116464		G116464		G116464		G116464		
	UNITS	**F1**	**F1 Lab-Dup**	**QC Batch**	**F2**	**QC Batch**	**F3**	**QC Batch**	**C1**	**RDL**	**QC Batch**
Total Vanadium (V)	mg/kg	64.5	61.4	8296970			41.9	8296970	66.3	2.0	8298199
Total Zinc (Zn)	mg/kg	49.3	53.6	8296970			31.0	8296970	80.6	1.0	8298199
Total Zirconium (Zr)	mg/kg	1.12	1.12	8296970			1.63	8296970	1.08	0.50	8298199

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B646263
Report Date: 2016/07/04

HEMMERA ENVIROCHEM INC.
Client Project #: 315-006.04A
Sampler Initials: JC

CSR/CCME METALS IN SOIL (SEDIMENT)

Maxxam ID		OU6739		OU6740	OU6740		OU6742	OU6743		
Sampling Date		2016/06/09 10:40		2016/06/09 10:50	2016/06/09 10:50		2016/06/09 11:05	2016/06/09 11:28		
COC Number		G116464		G116464	G116464		G116464	G116464		
	UNITS	**C2**	**QC Batch**	**C3**	**C3 Lab-Dup**	**QC Batch**	**C5**	**D1**	**RDL**	**QC Batch**
Physical Properties										
Soluble (2:1) pH	pH	8.67	8311610	8.70	8.75	8296965	8.63	8.27	N/A	8298201
Total Metals by ICPMS										
Total Aluminum (Al)	mg/kg			8070	9320	8296959	9660	9480	100	8298199
Total Antimony (Sb)	mg/kg			<0.10	<0.10	8296959	<0.10	0.19	0.10	8298199
Total Arsenic (As)	mg/kg			1.15	1.45	8296959	0.93	2.29	0.50	8298199
Total Barium (Ba)	mg/kg			31.3	32.7	8296959	28.1	29.1	0.10	8298199
Total Beryllium (Be)	mg/kg			<0.40	<0.40	8296959	<0.40	<0.40	0.40	8298199
Total Bismuth (Bi)	mg/kg			<0.10	<0.10	8296959	<0.10	<0.10	0.10	8298199
Total Cadmium (Cd)	mg/kg	0.104	8311608	0.095	0.118	8296959	0.120	0.390	0.050	8298199
Total Calcium (Ca)	mg/kg			9930	9140	8296959	9230	11800	100	8298199
Total Chromium (Cr)	mg/kg			16.2	16.2	8296959	12.7	15.4	1.0	8298199
Total Cobalt (Co)	mg/kg			4.61	5.34	8296959	4.42	4.62	0.30	8298199
Total Copper (Cu)	mg/kg	12.9	8311608	12.2	12.5	8296959	12.6	110	0.50	8298199
Total Iron (Fe)	mg/kg			16000	16100	8296959	14700	15600	100	8298199
Total Lead (Pb)	mg/kg			1.27	1.29	8296959	1.68	14.4	0.10	8298199
Total Lithium (Li)	mg/kg			14.1	15.1	8296959	15.5	14.9	5.0	8298199
Total Magnesium (Mg)	mg/kg			3990	4660	8296959	4280	4250	100	8298199
Total Manganese (Mn)	mg/kg			169	194	8296959	168	173	0.20	8298199
Total Mercury (Hg)	mg/kg			<0.050	<0.050	8296959	<0.050	<0.050	0.050	8298199
Total Molybdenum (Mo)	mg/kg			0.92	0.96	8296959	1.04	2.27	0.10	8298199
Total Nickel (Ni)	mg/kg			5.57	6.31	8296959	6.13	7.59	0.80	8298199
Total Phosphorus (P)	mg/kg			302	361	8296959	345	647	10	8298199
Total Potassium (K)	mg/kg			1020	1250	8296959	1200	1250	100	8298199
Total Selenium (Se)	mg/kg			<0.50	<0.50	8296959	<0.50	<0.50	0.50	8298199
Total Silver (Ag)	mg/kg			0.091	0.125	8296959	0.069	0.154	0.050	8298199
Total Sodium (Na)	mg/kg			1830	1970	8296959	2530	2540	100	8298199
Total Strontium (Sr)	mg/kg			49.0	62.4	8296959	50.1	63.6	0.10	8298199
Total Thallium (Tl)	mg/kg			<0.050	0.057	8296959	0.056	0.081	0.050	8298199
Total Tin (Sn)	mg/kg			<0.10	<0.10	8296959	<0.10	0.28	0.10	8298199
Total Titanium (Ti)	mg/kg			605	690	8296959	586	531	1.0	8298199
Total Uranium (U)	mg/kg			0.396	0.444	8296959	0.432	0.920	0.050	8298199

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

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Maxxam Job #: B646263
Report Date: 2016/07/04

HEMMERA ENVIROCHEM INC.
Client Project #: 315-006.04A
Sampler Initials: JC

CSR/CCME METALS IN SOIL (SEDIMENT)

Maxxam ID		OU6739		OU6740	OU6740		OU6742	OU6743		
Sampling Date		2016/06/09 10:40		2016/06/09 10:50	2016/06/09 10:50		2016/06/09 11:05	2016/06/09 11:28		
COC Number		G116464		G116464	G116464		G116464	G116464		
	UNITS	**C2**	**QC Batch**	**C3**	**C3 Lab-Dup**	**QC Batch**	**C5**	**D1**	**RDL**	**QC Batch**
Total Vanadium (V)	mg/kg			58.0	56.9	8296959	47.7	47.4	2.0	8298199
Total Zinc (Zn)	mg/kg			25.0	28.7	8296959	26.8	74.5	1.0	8298199
Total Zirconium (Zr)	mg/kg			1.06	1.02	8296959	1.33	1.08	0.50	8298199

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

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HEMMERA ENVIROCHEM INC.
Client Project #: 315-006.04A
Sampler Initials: JC

CSR/CCME METALS IN SOIL (SEDIMENT)

Maxxam ID		OU6744	OU6744		OU6745	OU6747		OU6748		
Sampling Date		2016/06/09 11:38	2016/06/09 11:38		2016/06/09 11:43	2016/06/09 12:30		2016/06/09 12:40		
COC Number		G116465	G116465		G116465	G116465		G116465		
	UNITS	**D2**	**D2 Lab-Dup**	**QC Batch**	**D3**	**H1**	**QC Batch**	**H2**	**RDL**	**QC Batch**
Physical Properties										
Soluble (2:1) pH	pH	8.47	8.47	8311632	8.26	7.85	8298201	8.46	N/A	8311632
Total Metals by ICPMS										
Total Aluminum (Al)	mg/kg				10000	9620	8298199		100	
Total Antimony (Sb)	mg/kg				<0.10	0.31	8298199		0.10	
Total Arsenic (As)	mg/kg				1.20	3.37	8298199		0.50	
Total Barium (Ba)	mg/kg				27.6	28.3	8298199		0.10	
Total Beryllium (Be)	mg/kg				<0.40	<0.40	8298199		0.40	
Total Bismuth (Bi)	mg/kg				<0.10	<0.10	8298199		0.10	
Total Cadmium (Cd)	mg/kg	0.077	0.114	8311631	0.093	0.675	8298199	0.128	0.050	8311631
Total Calcium (Ca)	mg/kg				9030	6720	8298199		100	
Total Chromium (Cr)	mg/kg				14.2	17.0	8298199		1.0	
Total Cobalt (Co)	mg/kg				4.54	4.69	8298199		0.30	
Total Copper (Cu)	mg/kg	11.5	11.8	8311631	12.3	108	8298199	20.5	0.50	8311631
Total Iron (Fe)	mg/kg				15800	17200	8298199		100	
Total Lead (Pb)	mg/kg				1.43	16.1	8298199		0.10	
Total Lithium (Li)	mg/kg				17.6	15.8	8298199		5.0	
Total Magnesium (Mg)	mg/kg				4170	4130	8298199		100	
Total Manganese (Mn)	mg/kg				159	176	8298199		0.20	
Total Mercury (Hg)	mg/kg				<0.050	<0.050	8298199		0.050	
Total Molybdenum (Mo)	mg/kg				0.58	4.14	8298199		0.10	
Total Nickel (Ni)	mg/kg				5.37	8.59	8298199		0.80	
Total Phosphorus (P)	mg/kg				354	821	8298199		10	
Total Potassium (K)	mg/kg				1230	1240	8298199		100	
Total Selenium (Se)	mg/kg				<0.50	<0.50	8298199		0.50	
Total Silver (Ag)	mg/kg				0.056	0.345	8298199		0.050	
Total Sodium (Na)	mg/kg				2720	3470	8298199		100	
Total Strontium (Sr)	mg/kg				51.6	43.8	8298199		0.10	
Total Thallium (Tl)	mg/kg				<0.050	0.113	8298199		0.050	
Total Tin (Sn)	mg/kg				<0.10	0.38	8298199		0.10	
Total Titanium (Ti)	mg/kg				610	575	8298199		1.0	
Total Uranium (U)	mg/kg				0.414	1.30	8298199		0.050	

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

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HEMMERA ENVIROCHEM INC.
Client Project #: 315-006.04A
Sampler Initials: JC

CSR/CCME METALS IN SOIL (SEDIMENT)

Maxxam ID		OU6744	OU6744		OU6745	OU6747		OU6748		
Sampling Date		2016/06/09 11:38	2016/06/09 11:38		2016/06/09 11:43	2016/06/09 12:30		2016/06/09 12:40		
COC Number		G116465	G116465		G116465	G116465		G116465		
	UNITS	**D2**	**D2 Lab-Dup**	**QC Batch**	**D3**	**H1**	**QC Batch**	**H2**	**RDL**	**QC Batch**
Total Vanadium (V)	mg/kg				48.9	49.6	8298199		2.0	
Total Zinc (Zn)	mg/kg				24.9	115	8298199		1.0	
Total Zirconium (Zr)	mg/kg				0.88	1.33	8298199		0.50	

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

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HEMMERA ENVIROCHEM INC.
Client Project #: 315-006.04A
Sampler Initials: JC

CSR/CCME METALS IN SOIL (SEDIMENT)

Maxxam ID		OU6749		OU6755		
Sampling Date		2016/06/09 12:46		2016/06/09 14:29		
COC Number		G116465		G116466		
	UNITS	**H3**	**QC Batch**	**A100**	**RDL**	**QC Batch**
Physical Properties						
Soluble (2:1) pH	pH	8.43	8296993	7.87	N/A	8298388
Total Metals by ICPMS						
Total Aluminum (Al)	mg/kg	8070	8296970	8100	100	8298366
Total Antimony (Sb)	mg/kg	<0.10	8296970	0.35	0.10	8298366
Total Arsenic (As)	mg/kg	1.26	8296970	2.52	0.50	8298366
Total Barium (Ba)	mg/kg	26.0	8296970	52.6	0.10	8298366
Total Beryllium (Be)	mg/kg	<0.40	8296970	<0.40	0.40	8298366
Total Bismuth (Bi)	mg/kg	<0.10	8296970	0.10	0.10	8298366
Total Cadmium (Cd)	mg/kg	0.119	8296970	1.06	0.050	8298366
Total Calcium (Ca)	mg/kg	6510	8296970	39800	100	8298366
Total Chromium (Cr)	mg/kg	13.2	8296970	16.3	1.0	8298366
Total Cobalt (Co)	mg/kg	4.42	8296970	4.60	0.30	8298366
Total Copper (Cu)	mg/kg	12.6	8296970	127	0.50	8298366
Total Iron (Fe)	mg/kg	14800	8296970	14300	100	8298366
Total Lead (Pb)	mg/kg	1.77	8296970	21.7	0.10	8298366
Total Lithium (Li)	mg/kg	15.4	8296970	13.8	5.0	8298366
Total Magnesium (Mg)	mg/kg	3860	8296970	4210	100	8298366
Total Manganese (Mn)	mg/kg	163	8296970	151	0.20	8298366
Total Mercury (Hg)	mg/kg	<0.050	8296970	0.070	0.050	8298366
Total Molybdenum (Mo)	mg/kg	0.69	8296970	5.28	0.10	8298366
Total Nickel (Ni)	mg/kg	5.19	8296970	12.2	0.80	8298366
Total Phosphorus (P)	mg/kg	318	8296970	971	10	8298366
Total Potassium (K)	mg/kg	986	8296970	1370	100	8298366
Total Selenium (Se)	mg/kg	<0.50	8296970	0.51	0.50	8298366
Total Silver (Ag)	mg/kg	0.054	8296970	0.319	0.050	8298366
Total Sodium (Na)	mg/kg	2100	8296970	8470	100	8298366
Total Strontium (Sr)	mg/kg	42.2	8296970	193	0.10	8298366
Total Thallium (Tl)	mg/kg	<0.050	8296970	0.118	0.050	8298366
Total Tin (Sn)	mg/kg	<0.10	8296970	1.76	0.10	8298366
Total Titanium (Ti)	mg/kg	590	8296970	595	1.0	8298366
Total Uranium (U)	mg/kg	0.426	8296970	1.40	0.050	8298366

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Job #: B646263
Report Date: 2016/07/04

HEMMERA ENVIROCHEM INC.
Client Project #: 315-006.04A
Sampler Initials: JC

CSR/CCME METALS IN SOIL (SEDIMENT)

Maxxam ID		OU6749		OU6755		
Sampling Date		2016/06/09 12:46		2016/06/09 14:29		
COC Number		G116465		G116466		
	UNITS	**H3**	**QC Batch**	**A100**	**RDL**	**QC Batch**
Total Vanadium (V)	mg/kg	50.1	8296970	41.3	2.0	8298366
Total Zinc (Zn)	mg/kg	26.8	8296970	154	1.0	8298366
Total Zirconium (Zr)	mg/kg	0.86	8296970	2.42	0.50	8298366
RDL = Reportable Detection Limit						

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HEMMERA ENVIROCHEM INC.
Client Project #: 315-006.04A
Sampler Initials: JC

SOLUBLE SODIUM AND CHLORIDE IN SOIL (SEDIMENT)

Maxxam ID		OU6735		OU6739		OU6744		OU6748		
Sampling Date		2016/06/09 10:02		2016/06/09 10:40		2016/06/09 11:38		2016/06/09 12:40		
COC Number		G116464		G116464		G116465		G116465		
	UNITS	**F2**	**RDL**	**C2**	**RDL**	**D2**	**RDL**	**H2**	**RDL**	**QC Batch**
ANIONS										
Soluble Chloride (Cl)	mg/L	5830 (1)	50	4480 (1)	50	3220 (1)	50	4540 (1)	50	8312055
Calculated Parameters										
Soluble Chloride (Cl)	mg/kg	2420	21	2000	22	1610	25	2190	24	8308680
Soluble Sodium (Na)	mg/kg	1540	2.1	1320	2.2	1170	2.5	1450	2.4	8308682
Soluble Parameters										
Saturation %	%	41.5	1.0	44.6	1.0	50.0	1.0	48.2	1.0	8310816
Soluble Sodium (Na)	mg/L	3720	5.0	2960	5.0	2330	5.0	3000	5.0	8311852

RDL = Reportable Detection Limit
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

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Client Project #: 315-006.04A
Sampler Initials: JC

CCME PAH IN SEDIMENTS BY GC-MS (SEDIMENT)

Maxxam ID		OU6734	OU6736	OU6738	OU6740	OU6742	OU6743		
Sampling Date		2016/06/09 09:55	2016/06/09 10:08	2016/06/09 10:30	2016/06/09 10:50	2016/06/09 11:05	2016/06/09 11:28		
COC Number		G116464	G116464	G116464	G116464	G116464	G116464		
	UNITS	**F1**	**F3**	**C1**	**C3**	**C5**	**D1**	**RDL**	**QC Batch**
Calculated Parameters									
Index of Additive Cancer Risk(IARC)	N/A	0.24	<0.10	1.3	<0.10	<0.10	0.16	0.10	8295391
Polycyclic Aromatics									
Naphthalene	mg/kg	0.015	<0.0010	0.0057	<0.0010	<0.0010	0.0018	0.0010	8302225
2-Methylnaphthalene	mg/kg	0.0033	<0.0010	0.0056	<0.0010	<0.0010	0.0018	0.0010	8302225
Acenaphthylene	mg/kg	0.0048	<0.00050	0.013	<0.00050	<0.00050	0.0013	0.00050	8302225
Acenaphthene	mg/kg	0.0029	<0.00050	0.0022	<0.00050	<0.00050	0.00063	0.00050	8302225
Fluorene	mg/kg	0.0041	<0.0010	0.0047	<0.0010	<0.0010	0.0014	0.0010	8302225
Phenanthrene	mg/kg	0.011	<0.0010	0.012	<0.0010	<0.0010	0.0033	0.0010	8302225
Anthracene	mg/kg	0.012	<0.0010	0.030	<0.0010	<0.0010	0.0047	0.0010	8302225
Fluoranthene	mg/kg	0.028	<0.0010	0.025	<0.0010	<0.0010	0.0091	0.0010	8302225
Pyrene	mg/kg	0.049	<0.0010	0.16	<0.0010	<0.0010	0.044	0.0010	8302225
Benzo(a)anthracene	mg/kg	0.010	<0.0010	0.019	<0.0010	<0.0010	0.0046	0.0010	8302225
Chrysene	mg/kg	0.011	<0.0010	0.025	<0.0010	<0.0010	0.0062	0.0010	8302225
Benzo(b&j)fluoranthene	mg/kg	0.021	<0.0010	0.12	<0.0010	<0.0010	0.015	0.0010	8302225
Benzo(k)fluoranthene	mg/kg	0.0054	<0.0010	0.034	<0.0010	<0.0010	0.0043	0.0010	8302225
Benzo(a)pyrene	mg/kg	0.011	<0.0010	0.066	<0.0010	<0.0010	0.0077	0.0010	8302225
Indeno(1,2,3-cd)pyrene	mg/kg	0.0064	<0.0020	0.023	<0.0020	<0.0020	0.0035	0.0020	8302225
Dibenz(a,h)anthracene	mg/kg	0.0017	<0.00050	0.0072	<0.00050	<0.00050	0.0010	0.00050	8302225
Benzo(g,h,i)perylene	mg/kg	0.0087	<0.0020	0.024	<0.0020	<0.0020	0.0042	0.0020	8302225
Low Molecular Weight PAH`s	mg/kg	0.053	<0.0010	0.073	<0.0010	<0.0010	0.015	0.0010	8295008
High Molecular Weight PAH`s	mg/kg	0.11	<0.0010	0.30	<0.0010	<0.0010	0.073	0.0010	8295008
Total PAH	mg/kg	0.16	<0.0010	0.37	<0.0010	<0.0010	0.088	0.0010	8295008
Benzo[a]pyrene equivalency	mg/kg	0.018	<0.010	0.093	<0.010	<0.010	0.012	0.010	8295008
Surrogate Recovery (%)									
D10-ANTHRACENE (sur.)	%	106	107	108	106	108	96		8302225
D8-ACENAPHTHYLENE (sur.)	%	78	81	80	83	77	73		8302225
D8-NAPHTHALENE (sur.)	%	67	69	69	70	67	66		8302225
TERPHENYL-D14 (sur.)	%	99	103	103	103	101	98		8302225

RDL = Reportable Detection Limit

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HEMMERA ENVIROCHEM INC.
Client Project #: 315-006.04A
Sampler Initials: JC

CCME PAH IN SEDIMENTS BY GC-MS (SEDIMENT)

Maxxam ID		OU6745	OU6747	OU6749		OU6755		
Sampling Date		2016/06/09 11:43	2016/06/09 12:30	2016/06/09 12:46		2016/06/09 14:29		
COC Number		G116465	G116465	G116465		G116466		
	UNITS	**D3**	**H1**	**H3**	**RDL**	**A100**	**RDL**	**QC Batch**
Calculated Parameters								
Index of Additive Cancer Risk(IARC)	N/A	<0.10	0.62	<0.10	0.10	3.8	0.10	8295391
Polycyclic Aromatics								
Naphthalene	mg/kg	<0.0010	0.0064	<0.0010	0.0010	0.015 (1)	0.0023	8302225
2-Methylnaphthalene	mg/kg	<0.0010	0.0062	<0.0010	0.0010	0.010 (1)	0.0023	8302225
Acenaphthylene	mg/kg	<0.00050	0.0035	<0.00050	0.00050	0.011 (1)	0.0012	8302225
Acenaphthene	mg/kg	<0.00050	0.0098	<0.00050	0.00050	0.023 (1)	0.0012	8302225
Fluorene	mg/kg	<0.0010	0.015	<0.0010	0.0010	0.030 (1)	0.0023	8302225
Phenanthrene	mg/kg	<0.0010	0.028	<0.0010	0.0010	0.073 (1)	0.0023	8302225
Anthracene	mg/kg	<0.0010	0.024	<0.0010	0.0010	0.26 (1)	0.0023	8302225
Fluoranthene	mg/kg	<0.0010	0.094	<0.0010	0.0010	1.5 (1)	0.0023	8302225
Pyrene	mg/kg	<0.0010	0.25	0.0029	0.0010	1.2 (1)	0.0023	8302225
Benzo(a)anthracene	mg/kg	<0.0010	0.024	<0.0010	0.0010	0.29 (1)	0.0023	8302225
Chrysene	mg/kg	<0.0010	0.030	<0.0010	0.0010	0.30 (1)	0.0023	8302225
Benzo(b&j)fluoranthene	mg/kg	<0.0010	0.057	<0.0010	0.0010	0.28 (1)	0.0023	8302225
Benzo(k)fluoranthene	mg/kg	<0.0010	0.014	<0.0010	0.0010	0.082 (1)	0.0023	8302225
Benzo(a)pyrene	mg/kg	<0.0010	0.027	<0.0010	0.0010	0.15 (1)	0.0023	8302225
Indeno(1,2,3-cd)pyrene	mg/kg	<0.0020	0.011	<0.0020	0.0020	0.055 (1)	0.0046	8302225
Dibenz(a,h)anthracene	mg/kg	<0.00050	0.0031	<0.00050	0.00050	0.018 (1)	0.0012	8302225
Benzo(g,h,i)perylene	mg/kg	<0.0020	0.013	<0.0020	0.0020	0.056 (1)	0.0046	8302225
Low Molecular Weight PAH`s	mg/kg	<0.0010	0.093	<0.0010	0.0010	0.42	0.0023	8295008
High Molecular Weight PAH`s	mg/kg	<0.0010	0.42	0.0029	0.0010	3.5	0.0023	8295008
Total PAH	mg/kg	<0.0010	0.52	0.0029	0.0010	3.9	0.0023	8295008
Benzo[a]pyrene equivalency	mg/kg	<0.010	0.041	<0.010	0.010	0.24	0.010	8295008
Surrogate Recovery (%)								
D10-ANTHRACENE (sur.)	%	106	100	108		94		8302225
D8-ACENAPHTHYLENE (sur.)	%	76	79	80		68		8302225
D8-NAPHTHALENE (sur.)	%	67	69	69		68		8302225
TERPHENYL-D14 (sur.)	%	101	98	104		91		8302225

RDL = Reportable Detection Limit
(1) Detection limits raised due to high moisture content, sample contains => 50% moisture.

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HEMMERA ENVIROCHEM INC.
Client Project #: 315-006.04A
Sampler Initials: JC

GENERAL COMMENTS

Revised Report (Version: 2): F2 analyzed for saturated paste NaCl, total copper, F4 analyzed for grain size and TOC, C2 analyzed for saturated paste NaCl, total cadmium and copper, C3 analyzed for TBT, C4 analyzed for grain size and TOC, D2 analyzed for saturated paste NaCl, total cadmium and copper, D3 analyzed for TBT, D4 analyzed for grain size and TOC, H2 analyzed for saturated paste NaCl, total cadmium and copper, H3 analyzed for TBT (GP5).

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

HEMMERA ENVIROCHEM INC.
Client Project #: 315-006.04A
Sampler Initials: JC

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8302225	D10-ANTHRACENE (sur.)	2016/06/16	97	60 - 130	108	60 - 130	108	%				
8302225	D8-ACENAPHTHYLENE (sur.)	2016/06/16	79	50 - 130	81	50 - 130	80	%				
8302225	D8-NAPHTHALENE (sur.)	2016/06/16	71	50 - 130	73	50 - 130	74	%				
8302225	TERPHENYL-D14 (sur.)	2016/06/16	97	60 - 130	105	60 - 130	105	%				
8296283	Moisture	2016/06/13					<0.30	%	5.9	20		
8296959	Total Aluminum (Al)	2016/06/13					<100	mg/kg	14	35	104	70 - 130
8296959	Total Antimony (Sb)	2016/06/13	97	75 - 125	94	75 - 125	<0.10	mg/kg	NC	30	116	70 - 130
8296959	Total Arsenic (As)	2016/06/13	87	75 - 125	88	75 - 125	<0.50	mg/kg	NC	30	77	70 - 130
8296959	Total Barium (Ba)	2016/06/13	NC	75 - 125	93	75 - 125	<0.10	mg/kg	4.4	35	98	70 - 130
8296959	Total Beryllium (Be)	2016/06/13	93	75 - 125	95	75 - 125	<0.40	mg/kg	NC	30	112	70 - 130
8296959	Total Bismuth (Bi)	2016/06/13					<0.10	mg/kg	NC	30		
8296959	Total Cadmium (Cd)	2016/06/13	93	75 - 125	95	75 - 125	<0.050	mg/kg	NC	30	125	70 - 130
8296959	Total Calcium (Ca)	2016/06/13					<100	mg/kg	8.3	30	100	70 - 130
8296959	Total Chromium (Cr)	2016/06/13	87	75 - 125	97	75 - 125	<1.0	mg/kg	0.013	30	102	70 - 130
8296959	Total Cobalt (Co)	2016/06/13	94	75 - 125	97	75 - 125	<0.30	mg/kg	15	30	95	70 - 130
8296959	Total Copper (Cu)	2016/06/13	90	75 - 125	95	75 - 125	<0.50	mg/kg	2.0	30	103	70 - 130
8296959	Total Iron (Fe)	2016/06/13					<100	mg/kg	0.25	30	100	70 - 130
8296959	Total Lead (Pb)	2016/06/13	91	75 - 125	95	75 - 125	<0.10	mg/kg	1.6	35	110	70 - 130
8296959	Total Lithium (Li)	2016/06/13	92	75 - 125	92	75 - 125	<5.0	mg/kg	NC	30	104	70 - 130
8296959	Total Magnesium (Mg)	2016/06/13					<100	mg/kg	15	30	102	70 - 130
8296959	Total Manganese (Mn)	2016/06/13	NC	75 - 125	98	75 - 125	<0.20	mg/kg	14	30	101	70 - 130
8296959	Total Mercury (Hg)	2016/06/13	99	75 - 125	98	75 - 125	<0.050	mg/kg	NC	35	90	70 - 130
8296959	Total Molybdenum (Mo)	2016/06/13	101	75 - 125	92	75 - 125	<0.10	mg/kg	4.0	35	113	70 - 130
8296959	Total Nickel (Ni)	2016/06/13	91	75 - 125	94	75 - 125	<0.80	mg/kg	12	30	104	70 - 130
8296959	Total Phosphorus (P)	2016/06/13					<10	mg/kg	18	30	95	70 - 130
8296959	Total Potassium (K)	2016/06/13					<100	mg/kg	20	35	93	70 - 130
8296959	Total Selenium (Se)	2016/06/13	92	75 - 125	93	75 - 125	<0.50	mg/kg	NC	30		
8296959	Total Silver (Ag)	2016/06/13	86	75 - 125	94	75 - 125	<0.050	mg/kg	NC	35	111	70 - 130
8296959	Total Sodium (Na)	2016/06/13					<100	mg/kg	7.5	35	93	70 - 130
8296959	Total Strontium (Sr)	2016/06/13	NC	75 - 125	90	75 - 125	<0.10	mg/kg	24	35	105	70 - 130
8296959	Total Thallium (Tl)	2016/06/13	89	75 - 125	95	75 - 125	<0.050	mg/kg	NC	30	89	70 - 130

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QUALITY ASSURANCE REPORT(CONT'D)

HEMMERA ENVIROCHEM INC.
Client Project #: 315-006.04A
Sampler Initials: JC

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8296959	Total Tin (Sn)	2016/06/13	96	75 - 125	89	75 - 125	<0.10	mg/kg	NC	35	101	70 - 130
8296959	Total Titanium (Ti)	2016/06/13	NC	75 - 125	94	75 - 125	<1.0	mg/kg	13	35		
8296959	Total Uranium (U)	2016/06/13	91	75 - 125	92	75 - 125	<0.050	mg/kg	11	30	98	70 - 130
8296959	Total Vanadium (V)	2016/06/13	NC	75 - 125	96	75 - 125	<2.0	mg/kg	1.9	30	101	70 - 130
8296959	Total Zinc (Zn)	2016/06/13	NC	75 - 125	99	75 - 125	<1.0	mg/kg	14	30	98	70 - 130
8296959	Total Zirconium (Zr)	2016/06/13					<0.50	mg/kg	NC	30		
8296965	Soluble (2:1) pH	2016/06/13			100	97 - 103			0.57	N/A		
8296970	Total Aluminum (Al)	2016/06/13					<100	mg/kg	2.1	35	93	70 - 130
8296970	Total Antimony (Sb)	2016/06/13	103	75 - 125	88	75 - 125	<0.10	mg/kg	NC	30	110	70 - 130
8296970	Total Arsenic (As)	2016/06/13	93	75 - 125	86	75 - 125	<0.50	mg/kg	0.29	30	86	70 - 130
8296970	Total Barium (Ba)	2016/06/13	NC	75 - 125	88	75 - 125	<0.10	mg/kg	7.4	35	98	70 - 130
8296970	Total Beryllium (Be)	2016/06/13	100	75 - 125	90	75 - 125	<0.40	mg/kg	NC	30	124	70 - 130
8296970	Total Bismuth (Bi)	2016/06/13					<0.10	mg/kg	NC	30		
8296970	Total Cadmium (Cd)	2016/06/13	99	75 - 125	92	75 - 125	<0.050	mg/kg	NC	30	115	70 - 130
8296970	Total Calcium (Ca)	2016/06/13					<100	mg/kg	3.2	30	100	70 - 130
8296970	Total Chromium (Cr)	2016/06/13	92	75 - 125	92	75 - 125	<1.0	mg/kg	3.0	30	109	70 - 130
8296970	Total Cobalt (Co)	2016/06/13	96	75 - 125	95	75 - 125	<0.30	mg/kg	2.5	30	101	70 - 130
8296970	Total Copper (Cu)	2016/06/13	NC	75 - 125	93	75 - 125	<0.50	mg/kg	4.0	30	100	70 - 130
8296970	Total Iron (Fe)	2016/06/13					<100	mg/kg	0.61	30	98	70 - 130
8296970	Total Lead (Pb)	2016/06/13	102	75 - 125	93	75 - 125	<0.10	mg/kg	3.6	35	107	70 - 130
8296970	Total Lithium (Li)	2016/06/13	91	75 - 125	88	75 - 125	<5.0	mg/kg	NC	30	103	70 - 130
8296970	Total Magnesium (Mg)	2016/06/13					<100	mg/kg	1.4	30	106	70 - 130
8296970	Total Manganese (Mn)	2016/06/13	NC	75 - 125	94	75 - 125	<0.20	mg/kg	1.6	30	107	70 - 130
8296970	Total Mercury (Hg)	2016/06/13	106	75 - 125	90	75 - 125	<0.050	mg/kg	NC	35	97	70 - 130
8296970	Total Molybdenum (Mo)	2016/06/13	95	75 - 125	90	75 - 125	<0.10	mg/kg	1.1	35	107	70 - 130
8296970	Total Nickel (Ni)	2016/06/13	96	75 - 125	91	75 - 125	<0.80	mg/kg	11	30	106	70 - 130
8296970	Total Phosphorus (P)	2016/06/13					<10	mg/kg	2.2	30	95	70 - 130
8296970	Total Potassium (K)	2016/06/13					<100	mg/kg	6.5	35	94	70 - 130
8296970	Total Selenium (Se)	2016/06/13	98	75 - 125	91	75 - 125	<0.50	mg/kg	NC	30		
8296970	Total Silver (Ag)	2016/06/13	98	75 - 125	90	75 - 125	<0.050	mg/kg	NC	35	142 (1)	70 - 130
8296970	Total Sodium (Na)	2016/06/13					<100	mg/kg	3.6	35	96	70 - 130

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QUALITY ASSURANCE REPORT(CONT'D)

HEMMERA ENVIROCHEM INC.
Client Project #: 315-006.04A
Sampler Initials: JC

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8296970	Total Strontium (Sr)	2016/06/13	NC	75 - 125	86	75 - 125	<0.10	mg/kg	3.8	35	103	70 - 130
8296970	Total Thallium (Tl)	2016/06/13	95	75 - 125	91	75 - 125	<0.050	mg/kg	NC	30	96	70 - 130
8296970	Total Tin (Sn)	2016/06/13	92	75 - 125	84	75 - 125	<0.10	mg/kg	NC	35	91	70 - 130
8296970	Total Titanium (Ti)	2016/06/13	NC	75 - 125	89	75 - 125	<1.0	mg/kg	1.8	35		
8296970	Total Uranium (U)	2016/06/13	96	75 - 125	89	75 - 125	<0.050	mg/kg	3.8	30	106	70 - 130
8296970	Total Vanadium (V)	2016/06/13	NC	75 - 125	90	75 - 125	<2.0	mg/kg	4.9	30	102	70 - 130
8296970	Total Zinc (Zn)	2016/06/13	NC	75 - 125	95	75 - 125	<1.0	mg/kg	8.3	30	104	70 - 130
8296970	Total Zirconium (Zr)	2016/06/13					<0.50	mg/kg	NC	30		
8296993	Soluble (2:1) pH	2016/06/13			100	97 - 103			0.48	N/A		
8298199	Total Aluminum (Al)	2016/06/14					<100	mg/kg	1.6	35	100	70 - 130
8298199	Total Antimony (Sb)	2016/06/14	91	75 - 125	98	75 - 125	<0.10	mg/kg	NC	30	103	70 - 130
8298199	Total Arsenic (As)	2016/06/14	NC	75 - 125	93	75 - 125	<0.50	mg/kg	3.5	30	73	70 - 130
8298199	Total Barium (Ba)	2016/06/14	94	75 - 125	102	75 - 125	<0.10	mg/kg	16	35	100	70 - 130
8298199	Total Beryllium (Be)	2016/06/14	92	75 - 125	97	75 - 125	<0.40	mg/kg	NC	30	99	70 - 130
8298199	Total Bismuth (Bi)	2016/06/14					<0.10	mg/kg	13	30		
8298199	Total Cadmium (Cd)	2016/06/14	93	75 - 125	104	75 - 125	<0.050	mg/kg	NC	30	121	70 - 130
8298199	Total Calcium (Ca)	2016/06/14					<100	mg/kg	0.69	30	100	70 - 130
8298199	Total Chromium (Cr)	2016/06/14	93	75 - 125	98	75 - 125	<1.0	mg/kg	2.6	30	102	70 - 130
8298199	Total Cobalt (Co)	2016/06/14	NC	75 - 125	98	75 - 125	<0.30	mg/kg	23	30	96	70 - 130
8298199	Total Copper (Cu)	2016/06/14	NC	75 - 125	101	75 - 125	<0.50	mg/kg	16	30	99	70 - 130
8298199	Total Iron (Fe)	2016/06/14					<100	mg/kg	0.73	30	99	70 - 130
8298199	Total Lead (Pb)	2016/06/14	98	75 - 125	105	75 - 125	<0.10	mg/kg	23	35	106	70 - 130
8298199	Total Lithium (Li)	2016/06/14	95	75 - 125	99	75 - 125	<5.0	mg/kg	NC	30	99	70 - 130
8298199	Total Magnesium (Mg)	2016/06/14					<100	mg/kg	6.7	30	102	70 - 130
8298199	Total Manganese (Mn)	2016/06/14	NC	75 - 125	99	75 - 125	<0.20	mg/kg	0.13	30	99	70 - 130
8298199	Total Mercury (Hg)	2016/06/14	106	75 - 125	106	75 - 125	<0.050	mg/kg	NC	35	107	70 - 130
8298199	Total Molybdenum (Mo)	2016/06/14	110	75 - 125	102	75 - 125	<0.10	mg/kg	18	35	115	70 - 130
8298199	Total Nickel (Ni)	2016/06/14	94	75 - 125	99	75 - 125	<0.80	mg/kg	5.7	30	108	70 - 130
8298199	Total Phosphorus (P)	2016/06/14					<10	mg/kg	13	30	94	70 - 130
8298199	Total Potassium (K)	2016/06/14					<100	mg/kg	11	35	95	70 - 130
8298199	Total Selenium (Se)	2016/06/14	93	75 - 125	98	75 - 125	<0.50	mg/kg	NC	30		

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QUALITY ASSURANCE REPORT(CONT'D)

HEMMERA ENVIROCHEM INC.
Client Project #: 315-006.04A
Sampler Initials: JC

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8298199	Total Silver (Ag)	2016/06/14	90	75 - 125	100	75 - 125	<0.050	mg/kg	NC	35	88	70 - 130
8298199	Total Sodium (Na)	2016/06/14					<100	mg/kg	2.5	35	93	70 - 130
8298199	Total Strontium (Sr)	2016/06/14	NC	75 - 125	98	75 - 125	<0.10	mg/kg	1.1	35	103	70 - 130
8298199	Total Thallium (Tl)	2016/06/14	96	75 - 125	104	75 - 125	<0.050	mg/kg	NC	30	89	70 - 130
8298199	Total Tin (Sn)	2016/06/14	92	75 - 125	92	75 - 125	<0.10	mg/kg	11	35	94	70 - 130
8298199	Total Titanium (Ti)	2016/06/14	NC	75 - 125	95	75 - 125	<1.0	mg/kg	0.28	35		
8298199	Total Uranium (U)	2016/06/14	97	75 - 125	103	75 - 125	<0.050	mg/kg	27	30	109	70 - 130
8298199	Total Vanadium (V)	2016/06/14	NC	75 - 125	97	75 - 125	<2.0	mg/kg	0.82	30	96	70 - 130
8298199	Total Zinc (Zn)	2016/06/14	NC	75 - 125	98	75 - 125	<1.0	mg/kg	14	30	97	70 - 130
8298199	Total Zirconium (Zr)	2016/06/14					<0.50	mg/kg	NC	30		
8298201	Soluble (2:1) pH	2016/06/14			101	97 - 103			1.1	N/A		
8298366	Total Aluminum (Al)	2016/06/14					<100	mg/kg	4.1	35	99	70 - 130
8298366	Total Antimony (Sb)	2016/06/14	97	75 - 125	94	75 - 125	<0.10	mg/kg	NC	30	129	70 - 130
8298366	Total Arsenic (As)	2016/06/14	95	75 - 125	94	75 - 125	<0.50	mg/kg	NC	30	81	70 - 130
8298366	Total Barium (Ba)	2016/06/14	NC	75 - 125	102	75 - 125	0.12, RDL=0.10	mg/kg	10	35	99	70 - 130
8298366	Total Beryllium (Be)	2016/06/14	99	75 - 125	102	75 - 125	<0.40	mg/kg	NC	30	92	70 - 130
8298366	Total Bismuth (Bi)	2016/06/14					<0.10	mg/kg	NC	30		
8298366	Total Cadmium (Cd)	2016/06/14	101	75 - 125	103	75 - 125	<0.050	mg/kg	NC	30	113	70 - 130
8298366	Total Calcium (Ca)	2016/06/14					<100	mg/kg	7.1	30	100	70 - 130
8298366	Total Chromium (Cr)	2016/06/14	92	75 - 125	98	75 - 125	<1.0	mg/kg	23	30	101	70 - 130
8298366	Total Cobalt (Co)	2016/06/14	91	75 - 125	98	75 - 125	<0.30	mg/kg	22	30	93	70 - 130
8298366	Total Copper (Cu)	2016/06/14	94	75 - 125	101	75 - 125	<0.50	mg/kg	11	30	99	70 - 130
8298366	Total Iron (Fe)	2016/06/14					<100	mg/kg	17	30	99	70 - 130
8298366	Total Lead (Pb)	2016/06/14	98	75 - 125	107	75 - 125	<0.10	mg/kg	6.4	35	112	70 - 130
8298366	Total Lithium (Li)	2016/06/14	100	75 - 125	101	75 - 125	<5.0	mg/kg	NC	30	103	70 - 130
8298366	Total Magnesium (Mg)	2016/06/14					<100	mg/kg	3.2	30	101	70 - 130
8298366	Total Manganese (Mn)	2016/06/14	NC	75 - 125	101	75 - 125	<0.20	mg/kg	3.2	30	99	70 - 130
8298366	Total Mercury (Hg)	2016/06/14	103	75 - 125	100	75 - 125	<0.050	mg/kg	NC	35	99	70 - 130
8298366	Total Molybdenum (Mo)	2016/06/14	116	75 - 125	101	75 - 125	<0.10	mg/kg	NC	35	133 (2)	70 - 130
8298366	Total Nickel (Ni)	2016/06/14	98	75 - 125	100	75 - 125	<0.80	mg/kg	0.91	30	103	70 - 130

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QUALITY ASSURANCE REPORT(CONT'D)

HEMMERA ENVIROCHEM INC.
Client Project #: 315-006.04A
Sampler Initials: JC

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8298366	Total Phosphorus (P)	2016/06/14					<10	mg/kg	2.2	30	95	70 - 130
8298366	Total Potassium (K)	2016/06/14					<100	mg/kg	10	35	94	70 - 130
8298366	Total Selenium (Se)	2016/06/14	97	75 - 125	100	75 - 125	<0.50	mg/kg	NC	30		
8298366	Total Silver (Ag)	2016/06/14	97	75 - 125	104	75 - 125	<0.050	mg/kg	NC	35	94	70 - 130
8298366	Total Sodium (Na)	2016/06/14					<100	mg/kg	NC	35	91	70 - 130
8298366	Total Strontium (Sr)	2016/06/14	NC	75 - 125	100	75 - 125	<0.10	mg/kg	31	35	105	70 - 130
8298366	Total Thallium (Tl)	2016/06/14	98	75 - 125	105	75 - 125	<0.050	mg/kg	NC	30	92	70 - 130
8298366	Total Tin (Sn)	2016/06/14	97	75 - 125	91	75 - 125	<0.10	mg/kg	NC	35	97	70 - 130
8298366	Total Titanium (Ti)	2016/06/14	NC	75 - 125	95	75 - 125	<1.0	mg/kg	11	35		
8298366	Total Uranium (U)	2016/06/14	102	75 - 125	104	75 - 125	<0.050	mg/kg	0.68	30	103	70 - 130
8298366	Total Vanadium (V)	2016/06/14	97	75 - 125	97	75 - 125	<2.0	mg/kg	12	30	97	70 - 130
8298366	Total Zinc (Zn)	2016/06/14	91	75 - 125	101	75 - 125	<1.0	mg/kg	9.7	30	100	70 - 130
8298366	Total Zirconium (Zr)	2016/06/14					<0.50	mg/kg	1.0	30		
8298388	Soluble (2:1) pH	2016/06/14			100	97 - 103			0.22	N/A		
8302225	2-Methylnaphthalene	2016/06/16	102	50 - 130	71	50 - 130	<0.0010	mg/kg	NC	50		
8302225	Acenaphthene	2016/06/16	119	50 - 130	81	50 - 130	<0.00050	mg/kg	NC	50		
8302225	Acenaphthylene	2016/06/16	103	50 - 130	69	50 - 130	<0.00050	mg/kg	NC	50		
8302225	Anthracene	2016/06/16	132 (3)	60 - 130	92	60 - 130	<0.0010	mg/kg	NC	50		
8302225	Benzo(a)anthracene	2016/06/16	110	60 - 130	71	60 - 130	<0.0010	mg/kg	NC	50		
8302225	Benzo(a)pyrene	2016/06/16	111	60 - 130	73	60 - 130	<0.0010	mg/kg	NC	50		
8302225	Benzo(b&j)fluoranthene	2016/06/16	109	60 - 130	74	60 - 130	<0.0010	mg/kg	NC	50		
8302225	Benzo(g,h,i)perylene	2016/06/16	113	60 - 130	78	60 - 130	<0.0020	mg/kg	NC	50		
8302225	Benzo(k)fluoranthene	2016/06/16	104	60 - 130	71	60 - 130	<0.0010	mg/kg	NC	50		
8302225	Chrysene	2016/06/16	112	60 - 130	79	60 - 130	<0.0010	mg/kg	NC	50		
8302225	Dibenz(a,h)anthracene	2016/06/16	118	60 - 130	76	60 - 130	<0.00050	mg/kg	NC	50		
8302225	Fluoranthene	2016/06/16	118	60 - 130	82	60 - 130	<0.0010	mg/kg	57 (3)	50		
8302225	Fluorene	2016/06/16	111	50 - 130	74	50 - 130	<0.0010	mg/kg	NC	50		
8302225	Indeno(1,2,3-cd)pyrene	2016/06/16	118	60 - 130	81	60 - 130	<0.0020	mg/kg	NC	50		
8302225	Naphthalene	2016/06/16	90	50 - 130	60	50 - 130	<0.0010	mg/kg	NC	50		
8302225	Phenanthrene	2016/06/16	96	60 - 130	69	60 - 130	<0.0010	mg/kg	49	50		
8302225	Pyrene	2016/06/16	121	60 - 130	86	60 - 130	<0.0010	mg/kg	54 (3)	50		

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Maxxam Job #: B646263
Report Date: 2016/07/04

QUALITY ASSURANCE REPORT(CONT'D)

HEMMERA ENVIROCHEM INC.
Client Project #: 315-006.04A
Sampler Initials: JC

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8310816	Saturation %	2016/06/25					<1.0	%	0.050	30	104	75 - 125
8311608	Total Cadmium (Cd)	2016/06/27	102	75 - 125	102	75 - 125	<0.050	mg/kg	NC	30	107	70 - 130
8311608	Total Copper (Cu)	2016/06/27	NC	75 - 125	96	75 - 125	<0.50	mg/kg	0.75	30	89	70 - 130
8311610	Soluble (2:1) pH	2016/06/27			101	97 - 103			1.6	N/A		
8311631	Total Cadmium (Cd)	2016/06/27	101	75 - 125	101	75 - 125	<0.050	mg/kg	NC	30	119	70 - 130
8311631	Total Copper (Cu)	2016/06/27	92	75 - 125	99	75 - 125	<0.50	mg/kg	1.9	30	100	70 - 130
8311632	Soluble (2:1) pH	2016/06/27			100	97 - 103			0	N/A		
8311852	Soluble Sodium (Na)	2016/06/27					<5.0	mg/L			94	75 - 125
8312055	Soluble Chloride (Cl)	2016/06/27	NC	75 - 125	102	80 - 120	<5.0	mg/L			104	75 - 125
8312866	% sand by hydrometer	2016/06/29							0.73	35	95	90 - 110
8312866	% silt by hydrometer	2016/06/29							NC	35		
8312866	Clay Content	2016/06/29							NC	35		
8312866	Gravel	2016/06/29							NC	35		

N/A = Not Applicable

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

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

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

(1) Reference Material exceeds acceptance limits for Ag. 10% of analytes failure in multielement scan is allowed.

(2) Reference Matrial exceeds acceptance criteria for Mo. 10% of analytes failure in multielement scan is allowed

(3) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

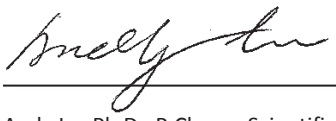
Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B646263
Report Date: 2016/07/04

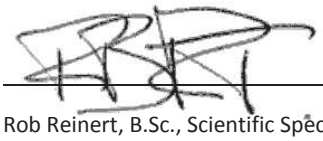
HEMMERA ENVIROCHEM INC.
Client Project #: 315-006.04A
Sampler Initials: JC

VALIDATION SIGNATURE PAGE

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



Andy Lu, Ph.D., P.Chem., Scientific Specialist



Rob Reinert, B.Sc., Scientific Specialist

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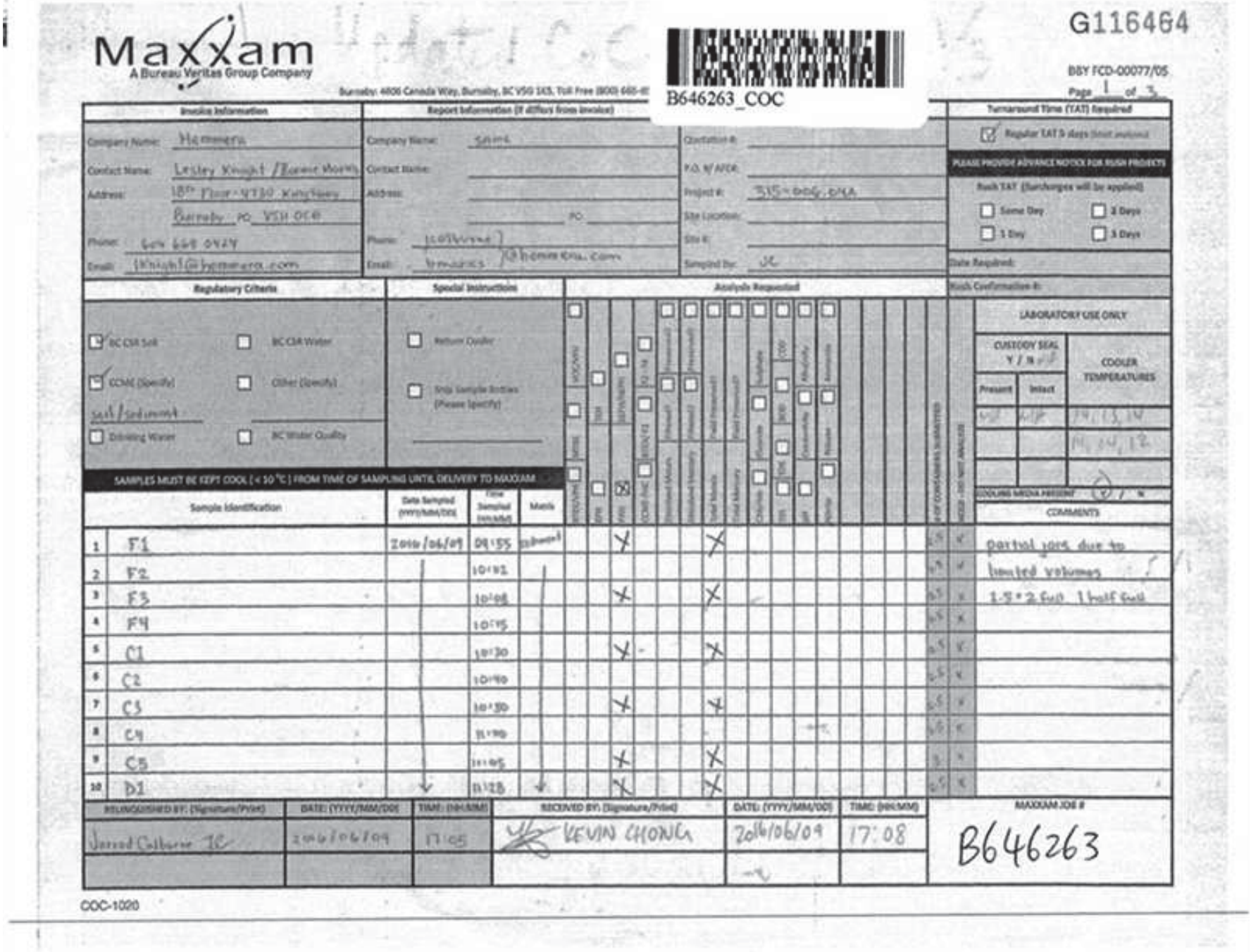

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B646263_COC

G116464

BBY FCD-00077/05

Page 1 of 3

Invoice Information

Company Name: Hatch
Contact Name: Lesley Knight / Karen Morris
Address: 18th Floor - 4720 Kingsway
Burnaby BC V5H 0C6
Phone: 604 668 0424
Email: lknight@hatch.com

Report Information (if differs from invoice)

Company Name: Same
Contact Name:
Address: PO:
Phone:
Email: kmorris@hatch.com

Quotation #:
P.O. #/ AFE#:
Project #: 315-0006.044
Site Location:
Site #:
Sampled By: JC

Turnaround Time (TAT) Required

☑ Regular TAT 5 days (most analyses)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Rush TAT (Surcharges will be applied)
☐ Same Day ☐ 2 Days
☐ 1 Day ☐ 3 Days

Date Required:
Rush Confirmation #:

Regulatory Criteria

☐ BC CSR Soil ☐ BC CSR Water
☑ CCME (Specify) ☐ Other (Specify)
soil/sediment
☐ Drinking Water ☐ BC Water Quality

Special Instructions

☐ Return Cooler
☐ Ship Sample Bottles (Please Specify)

Analysis Requested

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

LABORATORY USE ONLY

CUSTODY SEAL Y / N — Present / Intact
COOLER TEMPERATURES

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# OF CONTAINERS SUBMITTED	FIELD - TO BE ANALYZED	COMMENTS
1	F1	2016/06/09	09:55	Sediment	2	Y	partial jars due to
2	F2		10:02		2	Y	limited volumes
3	F3		10:08		2	Y	1-5*2.5ml 1 half full
4	F4		10:15		2	Y	
5	C1		10:30		2	Y	
6	C2		10:40		2	Y	
7	C3		10:50		2	Y	
8	C4		11:00		2	Y	
9	C5		11:05		2	Y	
10	D1		11:28		2	Y	

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Jarrod Colborne JC	2016/06/09	17:05	KEVIN CHONG	2016/06/09	17:08

MAXXAM JOB #
B646263

COC-1020

Maxxam
A Bureau Veritas Group Company

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5, Toll Free (BC

B646263_COC

G116465

BBY FCD-00077/05

Page 2 of 3

Invoice Information	Report Information (if differs from invoice)		Turnaround Time (TAT) Required
Company Name: Hemmera	Company Name:	Quotation #:	☑ Regular TAT 5 days (most analyses)
Contact Name: Lesley Knight / Bonnie Morin	Contact Name:	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: 18th Floor 4330 Kingsway Burnaby BC V5H 0C6	Address: PO	Project #: 315-0106.04/A	Rush TAT (Surcharges will be applied) ☐ Same Day ☐ 2 Days ☐ 1 Day ☐ 3 Days
Phone: 604 669 0424	Phone: jcolborne	Site Location:	Date Required:
Email: lknight@hemmera.com	Email: bmorin jcolborne@hemmera.com	Site #: Sampled By: JC	Rush Confirmation #:

Regulatory Criteria	Special Instructions
☑ BC CSR Soil ☐ BC CSR Water ☑ CCME (Specify) soil/sediment ☐ Other (Specify) ☐ Drinking Water ☐ BC Water Quality	☐ Return Cooler ☐ Ship Sample Bottles (Please Specify)

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of Containers Submitted	Hold - DO NOT ANALYZE
1	D2	2016/06/09	11:38	sediment	3	X
2	D3		11:43		3	X
3	DH		11:50		3	X
4	H1		12:30		3	X
5	H2		12:40		3	X
6	H3		12:46		3	X
7	H4		12:55		3	X
8	H5		13:00		3	X
9	I1		13:05		2	X
10	I2		14:12		3	X

LABORATORY USE ONLY

CUSTODY SEAL Y / N — Present / Intact — COOLER TEMPERATURES

COOLING MEDIA PRESENT: Y / N

COMMENTS

1 partial jars due to limited volumes
3 2.5 x 2 full 1 half full
7 2 full soil 1 half full sand debris

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Jarrod Colborne JC	2016/06/09	17:05	KEVIN CHONG	2016/06/10	17:01	B646263

COC-1020

Maxxam
A Bureau Veritas Group Company

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5. Toll Free (800) 66[illegible]

B646263_COC

G116466

BBY FCD-00077/05
Page 3 of 3

Invoice Information

Company Name: Hemmera
Contact Name: Lesley Knight / Eamonn Marks
Address: 18th Floor - 4730 Kingsway, Burnaby PC: V5H 0C6
Phone: 604 669 0424
Email: lknight@hemmera.com

Report Information (if differs from invoice)

Company Name: SAME
Contact Name:
Address:
PC:
Phone: jcolburne }
Email: emarks } @hemmera.com

P.O. #/AFE#:
Project #: 315-006-04A
Site Location:
Site #:
Sampled By: JC

Turnaround Time (TAT) Required

☑ Regular TAT 5 days (Most analyses)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Rush TAT (Surcharges will be applied)
☐ Same Day ☐ 2 Days
☐ 1 Day ☐ 3 Days

Date Required:
Rush Confirmation #:

Regulatory Criteria

☑ BC CSR Soil ☐ BC CSR Water
☑ CCME (Specify) ☐ Other (Specify)
Soil / sediment
☐ Drinking Water ☐ BC Water Quality

Special Instructions

☐ Return Cooler
☐ Ship Sample Bottles (Please Specify)

Analysis Requested

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

#	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	Analysis Requested	# of Containers Submitted	Hold - Do Not Analyze	Comments
1	13	2016/06/04	14:16	sediment		2	X	
2	A100	↓	14:29	↓	X X	5	X	4 jar + 1 bag
3	B100		14:36			5	X	4 jar + 1 bag
4								
5								
6								
7								
8								
9								
10								

Laboratory Use Only

Custody Seal Y / N		Cooler Temperatures
Present	Intact	
NP	NP	14, 15, 14
		10, 14, 12

Cooling Media Present: Y / N

Relinquished By: (Signature/Print)	Date: (YYYY/MM/DD)	Time: (HH:MM)	Received By: (Signature/Print)	Date: (YYYY/MM/DD)	Time: (HH:MM)	Maxxam Job #
Jarrod Colburne JC	2016/06/04	17:05	Kevin Chong	2016/06/04	17:08	B646263

COC-1020

Maxxam
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Your P.O. #: N/A
Your Project #: B646263
Your C.O.C. #: na

Maxxam Analytics
4606 Canada Way
Burnaby, BC
V5G 1K5

Report Date: 2016/06/30
Report #: R4048038
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6D0681
Received: 2016/06/24, 09:25

Sample Matrix: SEDIMENT
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Total Organic Carbon in Soil	3	N/A	2016/06/29	CAM SOP-00468	BCMOE TOC Aug 2014

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.

Encryption Key

Ashton Gibson
Project Manager
30 Jun 2016 17:36:04 -04:00

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Ema Gitej, Senior Project Manager
Email: EGitej@maxxam.ca
Phone# (905)817-5829

==========

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Maxxam Job #: B6D0681
Report Date: 2016/06/30

Maxxam Analytics
Client Project #: B646263
Your P.O. #: N/A

RESULTS OF ANALYSES OF SEDIMENT

Maxxam ID		CPE469	CPE469	CPE470	CPE471		
Sampling Date		2016/06/09 10:15	2016/06/09 10:15	2016/06/09 11:00	2016/06/09 11:50		
COC Number		na	na	na	na		
	UNITS	OU6737\F4	OU6737\F4 Lab-Dup	OU6741\C4	OU6746\D4	RDL	QC Batch
Total Organic Carbon	mg/kg	4900	4800	2200	<500	500	4558200

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

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Maxxam Job #: B6D0681
Report Date: 2016/06/30

Maxxam Analytics
Client Project #: B646263
Your P.O. #: N/A

TEST SUMMARY

Maxxam ID: CPE469
Sample ID: OU6737\F4
Matrix: SEDIMENT

Collected: 2016/06/09
Shipped:
Received: 2016/06/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Organic Carbon in Soil	COMB	4558200	N/A	2016/06/29	Bramdeo Motiram

Maxxam ID: CPE469 Dup
Sample ID: OU6737\F4
Matrix: SEDIMENT

Collected: 2016/06/09
Shipped:
Received: 2016/06/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Organic Carbon in Soil	COMB	4558200	N/A	2016/06/29	Bramdeo Motiram

Maxxam ID: CPE470
Sample ID: OU6741\C4
Matrix: SEDIMENT

Collected: 2016/06/09
Shipped:
Received: 2016/06/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Organic Carbon in Soil	COMB	4558200	N/A	2016/06/29	Bramdeo Motiram

Maxxam ID: CPE471
Sample ID: OU6746\D4
Matrix: SEDIMENT

Collected: 2016/06/09
Shipped:
Received: 2016/06/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Organic Carbon in Soil	COMB	4558200	N/A	2016/06/29	Bramdeo Motiram

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Maxxam Job #: B6D0681
Report Date: 2016/06/30

Maxxam Analytics
Client Project #: B646263
Your P.O. #: N/A

GENERAL COMMENTS

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

Package 1	3.7°C

Results relate only to the items tested.

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Maxxam Job #: B6D0681
Report Date: 2016/06/30

QUALITY ASSURANCE REPORT

Maxxam Analytics
Client Project #: B646263
Your P.O. #: N/A

			Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
4558200	Total Organic Carbon	2016/06/29	<500	mg/kg	0.91	35	108	75 - 125

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

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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

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Maxxam Job #: B6D0681
Report Date: 2016/06/30

Maxxam Analytics
Client Project #: B646263
Your P.O. #: N/A

VALIDATION SIGNATURE PAGE

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

Cristina Carriere

Cristina Carriere, Scientific Services

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.

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SAMPLE RECEIPT FORM / CHEMICAL ANALYSIS FORM

FILE #: PR161846

CLIENT: Maxxam Analytics
4606 Canada Way
Burnaby, BC
V5G 1K5

Phone: (604) 734-7276
Fax: (604) 731-2386
Email: ANagra@maxxam.ca

RECEIVED BY: J. Wiebe
CONDITION: okay, 19.0°C

DATE/TIME: June 23, 2016 (3:15 p.m.)

# of Containers	Sample Type	Sample (Client Codes)	Lab Codes	Test Requested
		Job B646263		
1	Sediment	OU6740-02R\C3	PR161846	TBT
1	Sediment	OU6745-02R\D3	PR161847	TBT
1	Sediment	OU6749-02R\H3	PR161848	TBT

STORAGE: Stored at <-10°C.

ANALYTES: HRGC/HRMS analysis for tributyltin (TBT).

SPECIAL INSTRUCTIONS: None.

METHODOLOGY

Reference Method: TBT: in house, SOP LAB04

Data summarized in Data Report Attached

Report sent to: Amandeep Nagra Date: July 4, 2016

Comments: Results relate only to items tested.

Digitally signed by David Hope
DN: c=CA, st=BC, l=Surrey, o=Pacific Rim Laboratories Inc., cn=David Hope, email=dave@pacificrimlabs.com
Date: 2016.07.04 12:14:08 -07'00'

David Hope PChem, CEO

DATA REPORT

Client: Maxxam Analytics
Contact: Amandeep Nagra

Date Extracted: 24-Jun-16
Date Analysed: 28-Jun-16

	Client ID:	OU6740-02R\C3	OU6745-02R\D3	OU6749-02R\H3			BLANK
	PRL ID:	PR161846	PR161847	PR161848			TB160528B
Compound	**DL µg/g**	**µg/g**	**µg/g**	**µg/g**			**µg/g**
Tributyltin Chloride	0.001	ND	ND	ND			ND
Dibutyltin dichloride	0.001	ND	ND	ND			ND
Monobutyltin trichloride	0.001	ND	ND	ND			ND

Compound	**DL µg/g**	**µg/g**	**µg/g**	**µg/g**			**µg/g**
TBT^{+}	0.001	ND	ND	ND			ND
DBT^{++}	0.001	ND	ND	ND			ND
MBT^{+++}	0.001	ND	ND	ND			ND
Surrogate Recoveries (%)							
Tributyltin - d27		81	90	88			91

ND - none detected

Acronyms used in reporting organotins:

TBT = Tributyltin
DBT = Dibutyltin
MBT = Monobutyltin
TBTCl = Tributyltin chloride
DBTCl = Dibutyltin dichloride
MBTCl = Monobutyltin trichloride

This method analyzes organotin derivatives in water, sediment and biota. The method cannot determine which organotin salt is present in the sample, therefore all data is quantified in terms of organotin chlorides and expressed as cation equivalents (TBT^{+}, DBT^{++}, MBT^{+++}).

In sea water and under normal conditions, TBT exists as three species (hydroxide, chloride, and carbonate), which remain in equilibrium. At pH values less than 7.0, the predominate forms are $Bu_3SnOH_2^{+}$ and Bu_3SnCl, at pH 8, they are Bu_3SnCl, Bu_3SnOH, and $Bu_3SnCO_3^{-}$, and at pH values above 10, Bu_3SnOH and $Bu_3SnCO_3^{-}$ predominate.
Source: http://www.inchem.org/documents/ehc/ehc/ehc116.htm#SectionNumber:1.1

TBT data has been reported in many conventions over the years. To convert to other units, use the multipliers below.

To convert	To:	Multiply by:
Tributyltin chloride	As Sn	0.3647
Tributyltin chloride	As TBTO	0.9760
Tributyltin chloride	As TBT^{+}	0.8911
Dibutyltin dichloride	As Sn	0.3907
Dibutyltin dichloride	As TBTO	0.9110
Dibutyltin dichloride	As DBT^{++}	0.7666
Dibutyltin dichloride	As TBT^{+}	0.9546
Monobutyltin trichloride	As Sn	0.4207
Monobutyltin trichloride	As TBTO	0.8461
Monobutyltin trichloride	As MBT^{+++}	0.6231
Monobutyltin trichloride	As TBT^{+}	1.0279
As Sn	As TBTO	2.8097

Acceptable recoveries for Tributyltin surrogate standards

Sediment/biota	TBT d_{27} 20-150%
Water	TBT d_{27} 10-130%