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2017 ANNUAL NUNAVUT WATER BOARD

REPORT FOR CAM-3

FOR THE

North Warning System

Contract # W8485-100224/001/NX

SOW Ref: 16.F.5.d

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Prepared for
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CHANGE HISTORY

This sheet is a record of each issue of this document. When the revised document is issued, the previous issue is automatically superseded.

Revision	Date	Author	Pages Changed	Reason for Change
1	21-Jan-2015	W. Wyman	All	Initial Document Release
2	12-Feb-2018	W. Wyman	All	Updated formatting

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EXECUTIVE SUMMARY IN ENGLISH FOLLOWS

3BC-SHE0919, $\Delta L \approx 10$ km, $\Delta t \approx 10$ s. The event occurred at ~ 10 km depth, with a magnitude of ~ 4.5 .

ΔΓ CDR L C R U B H A L d B ΔΓ B C C R A C. RCL-d C UU B NJ C A B CDR L R C B A C C C B ΔΓ C R B C P R A B R U B A C C A C C.



EXECUTIVE SUMMARY

This 2017 Annual Report for the Nunavut Water Board (NWB) has been prepared by Raytheon Canada Limited (RCL) for the Department of National Defence in order to meet the requirements of the licence issued 10 September 2009 3BC-SHE0919 – Type “B”, Part B “General Conditions”, paragraph 1. This report covers the period from 01 January to 31 December 2017.

RCL is the Operations and Maintenance (O&M) Contractor for the North Warning System (NWS) including CAM-3. CAM-3 is the unattended (unmanned) NWS radar site located at Shepherd Bay, Nunavut. The site is visited quarterly by RCL staff from CAM-M, Cambridge Bay, Nunavut to complete preventive maintenance and as required for other work.

In 2017, a total of 129.7 cubic meters was drawn from the water supply lake at CAM-3. This is below the annual maximum of 1,440 cubic meters allowed by the licence.

Samples of the water contained in the berms of fuel storage facilities was sent for laboratory analysis and confirmed to be within effluent quality limits of the NWB licence 3BC-SHE0919, Part D, item 10 before the water was pumped out of the berms.

Hazardous waste and waste oil from CAM-3 were sent to an approved hazardous waste disposal facility outside of Nunavut as required by the licence. The waste was sent to Clean Harbors, P.O. Box 390, Ryley, AB, T0B 4A0. The waste receiver number for Clean Harbors is ABR1092. The hazardous waste shipped from CAM-3 in 2017 consisted of 28 drums of assorted waste (oil, Jet A1 fuel and water mixture, etc.).

Non-hazardous domestic solid waste was disposed of through a contract with the Hamlet of Cambridge Bay at the local landfill. RCL has documented authorization from the community for receiving the waste.

One outdoor spill occurred at CAM-3 in 2017. The spill was:

NT-NU Spill Report # 17-234. On 01-Jul-2017, NWS Bulk Fuel Technician was informed that the helicopter engineer was performing routine maintenance on a helicopter at CAM-3 Shepherd Bay, Nunavut on 30-Jun-2017 when he spilled less than a litre of motor oil on the ground. The soil impacted by the motor oil was collected and containerized for off-site disposal. Clean up complete.

The Spill Contingency Plan was successfully implemented.

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1.0 INTRODUCTION

This 2017 Annual Report for the Nunavut Water Board (NWB) has been prepared by Raytheon Canada Limited (RCL) for the Department of National Defence in order to meet the requirements of the licence issued 10 September 2009 3BC-SHE0919 – Type “B”, Part B “General Conditions”, paragraph 1. This report covers the period from 01 January to 31 December 2017.

RCL is the Operations and Maintenance (O&M) Contractor for the North Warning System (NWS) including CAM-3. CAM-3 is an unattended (unmanned) North Warning System radar site located at Shepherd Bay, Nunavut. The site is visited quarterly for preventive maintenance inspections and as required for other work by RCL staff from CAM-M, Cambridge Bay, Nunavut.

1.1 Report Details

Licensee: Department of National Defence, Government of Canada
Licence: 3BC-SHE0919 – Type “B”
Location: CAM-3 North Warning System Site, Shepherd Bay, Kitikmeot Region, Nunavut
Report Prepared by: Raytheon Canada Limited, 15-Mar-2018
Time period covered: 01 January to 31 December 2017

2.0 WATER USE

A total of 129.7 cubic meters (m^3) was drawn from the water supply lake. This is below the annual maximum of 1,440 m^3 allowed by the licence. See Table 2-1 for the volume of raw water drawn at CAM-3 in 2017.

Table 2-1: Monthly Raw Water Usage at CAM-3 in 2017

Month	Raw water usage (m^3)
January	0
February	0
March	0
April	0
May	0.0
June	0.0
July	0.0
August	19.1
September	110.6
October	0
November	0
December	0
TOTAL	129.7

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3.0 HAZARDOUS WASTE AND WASTE OIL DISPOSAL

Hazardous waste and waste oil were sent to an approved hazardous waste disposal facility outside of Nunavut as required by the licence. The waste was sent to Clean Harbors, P.O. Box 390, Ryley, AB, T0B 4A0. The waste receiver number for Clean Harbors is ABR1092.

See Table 3-1 for the list of items sent for disposal.

See Annex A for the shipping documents including the completed movement documents for waste regulated under the Transportation of Dangerous Goods Regulations (TDGR) and NWS Manifests for non-regulated waste. The hazardous waste shipped from CAM-3 in 2017 consisted of 28 drums of assorted waste (oil, Jet A1 fuel and water mixture, etc.).

Table 3-1: Hazardous Waste and Waste Oil Sent for Disposal from CAM-3 in 2017

Description, TDG shipping name	Quantity	Movement Document or Manifest #
Waste Jet A1 fuel and water mixture	10 Drums	Movement Document 2581516-8
Waste fuel, aviation, turbine engine mixture		
Waste Jet A1 fuel fuel filters	1 Drum	Movement Document 2581516-8
Waste solids containing flammable liquids, not otherwise specified (n.o.s) (fuel, aviation, turbine engine)		
Waste Jet A1 fuel soaked sorbent	1 Drum	Movement Document 2581516-8
Waste solids containing flammable liquids, n.o.s (fuel, aviation, turbine engine)		
Waste oily rags	4 Drums	Movement Document 2581516-8
Waste solids containing flammable liquids, n.o.s (fuel, aviation, turbine engine)		
Batteries, wet, filled with acid	1 Crate	Movement Document 2581516-8
Waste oil	12 Drums	NWS Manifest 37175, 37176, 37177
Not TDG regulated		

4.0 NON-HAZARDOUS SOLID WASTE DISPOSAL

Non-hazardous domestic solid waste was flown from CAM-3 to CAM-M and disposed of through a contract with the Municipality of Cambridge Bay at the local landfill. RCL has documented authorization from the community for receiving the waste.

See Table 4-1 for the quantity of waste generated.

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Table 4-1: Non-hazardous Domestic Solid Waste Sent for Disposal from CAM-3 in 2017

Month	Waste Generated (kg)
January	143
February	0
March	0
April	0
May	0
June	0
July	127
August	0
September	159
October	91
November	0
December	0
TOTAL	520

5.0 MONITORING PROGRAM

In 2017, a monitoring program was implemented at CAM-3 as required by the water licence, Part I. The monitoring program included the following:

1. Volume of raw water drawn from the water Supply Lake (SHE-1). The raw water monitoring information is shown in **Section 2.0 Water Use**. The volume of water drawn was within the limit stated in the water licence.
2. Quality of sewage discharged from the final discharge point of the sewage disposal facility (SHE-2). The location of the sewage effluent outfall is shown in **Annex B**, including coordinates. A sump for the sewage outfall was constructed in 2010.

No sewage samples were taken in 2017. As such, **Annex C: Analysis of Discharged Sewage Effluent** has been left blank.

3. Quality of the water contained in the berms of fuel storage facilities prior to discharge (SHE-3) was analyzed and confirmed within the effluent quality limits listed in the water licence, Part D. The coordinates and the results of the analysis are shown in **Annex D: Location of Bermed Fuel Storage Facilities and Analysis of Berm Water**. All samples met the effluent requirements of the water licence, Part D.

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6.0 SPILLS (UNAUTHORIZED DISCHARGES)

Date, NT-NU Spill #	Product	Quantity	Cause and follow-up action	On-site location
01-Jul-2017, Spill # 17-234	Oil	1 L	<p>On 01Jul2017 NWS Bulk Fuel Technician was informed that the helicopter engineer was performing routine maintenance on a helicopter at CAM-3 Shepherd Bay, Nunavut on 30Jun2017 when he spilled less than a litre of motor oil on the ground.</p> <p>The soil impacted by the motor oil was collected and containerized for off-site disposal. Clean up complete.</p>	Helipad (68°47'34"N, 93°26'22"W)

The Spill Contingency Plan was successfully implemented.

7.0 REVISIONS TO THE SPILL CONTINGENCY PLAN

There were no revisions to the Spill Contingency Plan in 2017.

8.0 PROGRESSIVE RECLAMATION WORK UNDERTAKEN

No progressive reclamation work was undertaken in 2017.

9.0 ACRONYMS

Table 9-1: Acronyms

Acronym	Definition
n.o.s.	Not Otherwise Specified
NWB	Nunavut Water Board
NWS	North Warning System
O&M	Operations and Maintenance
PCB	Polychlorinated Biphenyl
RCL	Raytheon Canada Limited
TDGR	Transportation of Dangerous Goods Regulations

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ANNEX A: HAZARDOUS WASTE AND WASTE OIL DISPOSAL IN 2017

The 2017 Movement Documents for TDG Regulated waste and NWS Manifests for non-TDG Regulated waste described in Table 3-1 are below.

**MOVEMENT DOCUMENT / MANIFEST
DOCUMENT DE MOUVEMENT / MANIFESTE**

This Movement document manifest conforme to all federal and provincial transport and environmental legislation.
Ce document de mouvement manifeste est conforme aux législations fédérale et provinciale sur l'environnement et le transport.

Generator / consignor Producteur / expéditeur		Registration No. / Provincial ID No. N° d'immatriculation - d'id. provincial		1	
Company name / Nom de l'entreprise DND C/o Raytheon Canada Limited		Carrier / Transporteur Fathen Party		Registration No. / Provincial ID No. N° d'immatriculation - d'id. provincial	
Mailing address / Adresse postale 2212 Wing, Bldg 109, Hornet Heights, ON P0A 1P4		Mailing address / Adresse postale 300-758 Hartansell Dr. N. Van EC V0A 2E7		23	
City / Ville E-mail / Courrier électronique		City / Ville E-mail / Courrier électronique		Reference No. of other document(s) (mandat(s)) used / N° de référence des autres documents de renvoi/mandat(s) utilisés	
Postal code / Code postal NWS LRR CAM-3		Postal code / Code postal info@fathenparty.ca		Registration No. / N° de l'immatriculation Tel. No. / N° de tél. 08754942012810	
Shipping address / Adresse du lieu de l'expédition SHEPHERD BAY NU		Shipping address / Adresse du lieu de l'expédition Clean Harbours ABR1D89		Registration No. / N° de l'immatriculation Tel. No. / N° de tél. 08754942012810	
Intended Receiver / consignee Récepteur/destinataire prévu Clean Harbours		2 Registration No. / Provincial ID No. N° d'immatriculation - d'id. provincial ABR1D89		23	
Mailing address / Adresse postale Clean Harbours, PO Box 390, Ryton AB T0B 4A0		Carrier identification / Company that has received, holds or transported interests from the producer/consignor, for la partie A et pour la partie B, à laquelle il a été remis, tenu ou transporté par la partie A et pour la partie B, et contre Attestation du transporteur : l'attache écrit reçoit les documents ou marchandises envoyés par le producteur/ expéditeur en vue de leur livraison au récepteur/ destinataire, tel qu'il est figuré à la partie A et que les renseignements indiqués à la partie B sont exacts et complets		Port of entry Port d'entrée Intentional use only Intentionnellement utilisée Name of authorized person (print) Nom de l'agent autorisé (imprimerie): Nils Gran Tel. No. / N° de tél. 6043149678	
Receiving site address / Adresse du lieu de destination Ryley		24		25	
Ryley		25		26	
Ryley		26		27	
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Ryley		328</td			

Figure 1: Movement Document 2581516-8

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SHIPPING MANIFEST

Suite 3000, 400 Cooper Street, Ottawa, ON K2P 2H8

NON NEGOTIABLE

Filled By: AELLIOTT	Date: Aug 18, 2017 7:58 PM	TCN-37175		
Ship To: CLEAN HARBORS CANADA INC. PO BOX 390 RYLEY, AB, T0B 4A0 CA 780-663-3828		From: CAM-3, SHEPHERD BAY, DND Storeroom Raytheon Canada Limited, NWS LSS Cambridge Bay, P.O. Bag 1050 Cambridge Bay, NU, X0B 0C0 867-983-2112	Priority 0	
Attention: Carrier: MANITOULIN 009360		Attention: Routing: SHIP TO CONSIGNEE	Waybill #: 23519423	Total Pcs. 1 PALLET
QTY Order	Type Line Item Weight	Description	WO or PO	B/Code or S/N
4	748 kg	2002406 WASTE - OIL, 45 GAL	1.62 M3	NON-REGULATED WASTE: 4 DRUMS ON 1 PALLET: ASSETS: 336093 339422 342232 332531
NOTE: All claims related to this shipment have to be filled with Raytheon within 45 hours of receipt.				
Received By:		Date		
Received By:		Date		

Figure 2: NWS Shipping Manifest TCN-37175



SHIPPING MANIFEST

Suite 3000, 400 Cooper Street, Ottawa, ON K2P 2H8

NON NEGOTIABLE

Filled By: AELLIOTT	Date: Aug 18, 2017 8:32 PM	TCN-37176		
Ship To: CLEAN HARBORS CANADA INC. PO BOX 390 RYLEY, AB, T0B 4A0 CA 780-663-3828		From: CAM-3, SHEPHERD BAY, DND Storeroom Raytheon Canada Limited, NWS LSS Cambridge Bay, P.O. Bag 1050 Cambridge Bay, NU, X0B 0C0 867-983-2112	Priority 0	
Attention: Carrier: MANITOULIN 009360		Attention: Routing: SHIP TO CONSIGNEE	Waybill #: 23518423	Total Pcs. 1 PALLET
QTY Order	Type Line Item Weight	Description	WO or PO	Remarks
4	DRUM 832	2002406 WASTE - OIL, 45 GAL KG	1.62 M3	NON-REGULATED WASTE: 4 DRUMS ON 1 PALLET: ASSETS: 339483 342231 334942 334943
NOTE: All claims related to this shipment have to be filled with Raytheon within 45 hours of receipt.				
Received By:		Date		
Received By:		Date		

Figure 3: NWS Shipping Manifest TCN-37176

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SOW Ref: 16.F.5.d



SHIPPING MANIFEST

Suite 3000, 400 Cooper Street, Ottawa, ON K2P 2H8

NON NEGOTIABLE

Filled By: AELLIOTT		Date: Aug 18, 2017 8:38 PM	TCN-37177		
Ship To: CLEAN HARBORS CANADA INC. PO BOX 390 RYLEY, AB, T0B 4A0 CA 780-663-3828		From: CAM-3, SHEPHERD BAY, DND Storeroom Raytheon Canada Limited, NWS LSS Cambridge Bay, P.O. Bag 1050 Cambridge Bay, NU, X0B 0C0 867-983-2112			Priority 0
Attention:		Attention:			AELLIOTT
Carrier: MANITOULIN 009360		Routing: SHIP TO CONSIGNEE			Waybill #: 23519423 Total Pcs. 1 PALLET Total Weight: 764 KG
QTY Order	Type Line Weight	Item Description	WO or PO B/Code or S/N	Remarks	
4	DRUM KG	764 2002406 WASTE - OIL, 45 GAL	1.40 M3	NON-REGULATED WASTE: 4 DRUMS ON 1 PALLET: ASSETS: 342353 342351 342352 332529	
NOTE: All claims related to this shipment have to be filed with Raytheon within 45 hours of receipt.					
Received By:			Date		
Received By:			Date		

Figure 4: NWS Shipping Manifest TCN-37177

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SOW Ref: 16.F.5.d

ANNEX B: SEWAGE EFFLUENT OUTFALL (CDL-2) LOCATION WITH COORDINATES



Coordinates of sewage outfall: 68°47'40"N, 93°26'28.17"W

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SOW Ref: 16.F.5.d

ANNEX C: ANALYSIS OF DISCHARGED SEWAGE EFFLUENT

This Annex has been left blank because there are no results to report.

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ANNEX D: LOCATION OF BERMED FUEL STORAGE FACILITIES AND ANALYSIS OF BERM WATER¹

Table D-1: Analysis of Berm Water at CAM-3 in 2017

Berm	Maximum concentration of any grab sample (ug/L)	SHE W22A	SHE W22C&D
Location on-site		Summit	Beach
Discharge Latitude ²		68°47'42.00"N	68°48'7.82"N
Discharge Longitude		93°26'19.58"W	93°36'50.12"W
Date		12-Jun-17	12-Jun-17
pH (pH Units)	6 to 9	7.94	7.59
Oil and Grease (ug/L)	5000	<1000	<1000
Arsenic (total) (ug/L)	100	<20	<20
Cadmium (dissolved) (ug/L)	10	<0.1	<0.1
Chromium (dissolved) (ug/L)	100	2	<1
Cobalt (dissolved) (ug/L)	50	<0.2	<0.2
Copper (dissolved) (ug/L)	200	16	3
Lead (dissolved) (ug/L)	50	<1	<1
Mercury (total) (ug/L)	0.6	<0.1	<0.1
Nickel (dissolved) (ug/L)	200	<5	<5
PCB (total) (ug/L)	1000	<0.1	<0.1
Phenols (ug/L)	20	1	<1
Zinc (total) (ug/L)	500	<40	<40
Benzene (ug/L)	370	<0.5	<0.5
Toluene (ug/L)	2	<0.5	<0.5
Ethyl benzene (ug/L)	90	<0.5	<0.5

¹ Effluent from bermed fuel storage facilities.

² Final discharge point of bermed fuel storage facility

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SOW Ref: 16.F.5.d



Certificate of Analysis

Client: Raytheon Canada Limited Ottawa
400 Cooper St.
Ottawa, ON
K2P 2H8
Attention: Mr. Will Wyman
PO#: 16-02610-OT
Invoice to: Raytheon Canada Limited Ottawa

Report Number: 1709752
Date Submitted: 2017-06-16
Date Reported: 2017-06-23
Project: CAM-3 BERM SAMPLE
COC #: 176796

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.
General Chemistry	pH	1.00		7.94	1298745 Water
Metals	Aqua-Regia Digest			Y	2017-06-12 SHE-W-22A
	As	0.02	mg/L	<0.02	
	Hg	0.0001	mg/L	<0.0001	
	Zn	0.04	mg/L	<0.04	
Oil & Grease	Oil & Grease - Total	1	mg/L	<1	
PCBs	Polychlorinated Biphenyls (PCBs)	0.1	ug/L	<0.1	
Subcontract	Phenols	0.001	mg/L	0.001	
VOCs	Benzene	0.5	ug/L	<0.5	
	Ethylbenzene	0.5	ug/L	<0.5	
	Toluene	0.5	ug/L	<0.5	
VOCs Surrogates (%)	Toluene-d8	0	%	111	

Guideline = * = Guideline Exceedence
All analysis completed in Ottawa, Ontario (unless otherwise indicated by ** which indicates analysis was completed in Mississauga, Ontario).
Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

146 Colonnade Rd. Unit 8, Ottawa, ON K2E 7Y1

Page 2 of 5

Figure 5: SHE W22A berm water laboratory results page 1 of 2 (June 2017)



Certificate of Analysis

Client: Raytheon Canada Limited Ottawa
400 Cooper St.
Ottawa, ON
K2P 2H8
Attention: Mr. Will Wyman
PO#: 16-02610-OT
Invoice to: Raytheon Canada Limited Ottawa

Report Number: 1709754
Date Submitted: 2017-06-16
Date Reported: 2017-06-23
Project: CAM-3 BERM SAMPLE
COC #: 176796

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.
Metals	Cd	0.0001	mg/L	<0.0001	1298747 Water
	Co	0.0002	mg/L	<0.0002	2017-06-12 SHW-W-22A - Dissolved
	Cr	0.001	mg/L	0.002	
	Cu	0.001	mg/L	0.016	
	Ni	0.005	mg/L	<0.005	
	Pb	0.001	mg/L	<0.001	

Figure 6: SHE W22A berm water laboratory results page 2 of 2 (June 2017)

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SOW Ref: 16.F.5.d



Certificate of Analysis

Client: Raytheon Canada Limited Ottawa

400 Cooper St.

Ottawa, ON

K2P 2H8

Attention: Mr. Will Wyman

PO#:

Invoice to: Raytheon Canada Limited Ottawa

Report Number: 1709751
Date Submitted: 2017-06-16
Date Reported: 2017-06-23
Project: CAM-3 BERM SAMPLE
COC #: 170391

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.
General Chemistry	pH	1.00			1298744 Water 2017-06-12 SHE-W22C/W22D
Metals	Aqua-Regia Digest				
	As	0.02	mg/L	<0.02	
	Hg	0.0001	mg/L	<0.0001	
	Zn	0.04	mg/L	<0.04	
Oil & Grease	Oil & Grease - Total	1	mg/L	<1	
PCBs	Polychlorinated Biphenyls (PCBs)	0.1	ug/L	<0.1	
Subcontract	Phenols	0.001	mg/L	<0.001	
VOCs	Benzene	0.5	ug/L	<0.5	
	Ethylbenzene	0.5	ug/L	<0.5	
	Toluene	0.5	ug/L	<0.5	
VOCs Surrogates (%)	Toluene-d8	0	%		107

Guideline = * = Guideline Exceedence
All analysis completed in Ottawa, Ontario (unless otherwise indicated by ** which indicates analysis was completed in Mississauga, Ontario).
Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

146 Colonnade Rd. Unit 8, Ottawa, ON K2E 7Y1

Page 2 of 5

Figure 7: SHE W22C&D berm water laboratory results page 1 of 2 (June 2017)



Certificate of Analysis

Client: Raytheon Canada Limited Ottawa

400 Cooper St.

Ottawa, ON

K2P 2H8

Attention: Mr. Will Wyman

PO#:

Invoice to: Raytheon Canada Limited Ottawa

Report Number: 1709753
Date Submitted: 2017-06-16
Date Reported: 2017-06-23
Project: CAM-3 BERM SAMPLE
COC #: 170391

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.
Metals	Cd	0.0001	mg/L		
	Co	0.0002	mg/L		
	Cr	0.001	mg/L		
	Cu	0.001	mg/L		
	Ni	0.005	mg/L		
	Pb	0.001	mg/L		

Figure 8: SHE W22C&D berm water laboratory results page 2 of 2 (June 2017)

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