



# **QA/QC PLAN FOR BERM WATER SAMPLING AT CAM-M, CAM-3, FOX-M, FOX-3, AND DYE-M**

Contract # W8485-100224/001/NX

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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 When the revised document is issued, the previous issue is automatically superseded.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	15-Oct-2018	W. Wyman	All	New Document



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## 1.0 INTRODUCTION

The North Warning System consists of a sequence of radar sites operating across the northern and eastern coasts of Canada from the Yukon in the west to the southern Labrador coast in the east. The North Warning System (NWS) is linked to the North Warning System Control Centre (NWSCC) located in Canadian Forces Base (CFB) North Bay, Ontario via the Long Haul Communications Network (LHCN), a satellite communications network.

There are a total of eleven (11) Long Range Radar (LRR) sites in the Canadian NWS. They are situated in the arctic region of Canada extending from Shingle Point, Yukon on the west to Cartwright, Labrador on the east coast and provide high level radar coverage. Two of these sites, located at Cambridge Bay, Nunavut and Hall Beach, Nunavut, have radar and support sites combined in one facility. These sites are referred to as LRR/LSS stations and are each staffed by approximately ten people. The remaining nine sites are not permanently staffed, they are operated via remote monitor & control and local automation. The LRR site facilities consist of building groups which include: accommodations, technical services, power generation system, fuel tank farms, radar towers, satellite ground terminals, weather compounds, helipads, roads, and beach fuel tanks.

There are six LRR sites located in Nunavut that have Nunavut Water Board (NWB) licences. Some bulk fuel storage tanks at the six sites are surrounded by berms. Water from precipitation accumulates in the berms and must be pumped out to prevent damage to the fuel tanks. The NWS site BAF-3 has been excluded from this plan as there are no berms around bulk fuel storage areas that are in operation.

Water samples are taken from each berm. The sampling point is inside the berm and the final discharge point of the bermed fuel storage facility is just outside of the berm.

Berm locations listed are in



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Table 1-1 and are shown in Appendix A.



**Table 1-1: NWS Berms on NWB Sites, including location**

NWS Site	NWB Licence	Monitoring Station <sup>1</sup>	Berm	Berm Location on-site	Berm coordinates	
					North	West
CAM-M	3BC-CAM0919	CDL-3	CAM W22A	Summit	69° 7'2.76"N	105° 7'2.69"W
			CAM W20B&C	Airstrip	69° 6'12.01"N	105° 7'36.60"W
			CAM W22C & W20D	Beach	69° 6'11.41"N	105° 5'50.26"W
CAM-3	3BC-SHE0919	SHE-3	SHE W22A	Summit	68°47'42.00"N	93°26'19.58"W
			SHE W22C&D	Beach	68°48'7.82"N	93°36'50.12"W
FOX-M	3BC-FOH0919	FOH-3	HAL W22A	Summit	68°45'42.24"N	81°13'25.04"W
			HAL W22B	Summit	68°45'43.00"N	81°13'27.27"W
			HAL W20D&E	Airstrip	68°46'15.85"N	81°13'58.33"W
			HAL W20B	Beach	68°46'23.93"N	81°12'51.11"W
			HAL W20F	Beach	68°46'23.75"N	81°12'46.12"W
FOX-3	8BC-FOD1828	FOD-3	DEW W20D&E	Airstrip	68°37'24.90"N	71° 8'5.62"W
			DEW W22A&B	Summit	68°39'5.43"N	71°14'3.23"W
			DEW W22C&D	Summit	68°39'3.67"N	71°13'49.97"W
			DEW W22E <sup>2</sup>	Airstrip	68°37'26.59"N	71°8'23.67"W
DYE-M	3BC-DYE0919	DYE-3	DYE W20A	Summit	66°40'0.13"N	61°21'25.76"W
			DYE W22K,J,I &W20B	Summit	66°39'53.59"N	61°21'23.78"W

## 1.1 Purpose

This QA/QC plan applies to the five sites listed in

<sup>1</sup> Final Discharge Point of Bermed Fuel Storage Facility

<sup>2</sup> Tank W22E was demolished in 2012 and the berm was left intact.



Table 1-1 at the monitoring stations for the final discharge point of each bermed fuel storage facility. It has been prepared to ensure that discharged water is not impacted by hydrocarbons. If required, sampling, sample preservation, and analyses are done in accordance with methods in the current edition of the Standard Methods for the Examination of Water and Wastewater as required by the Nunavut Water Board Water Licences listed above.

See Appendix B for a decision tree on the type of sampling that will be conducted. See Appendix C for the Discharge Criteria that the lab will be analyzing to.

## 1.2 Review

This plan shall be reviewed annually by Raytheon Canada Limited (RCL) and will be updated as required. Updated plans will be submitted to the NWB with an approval letter from a laboratory accredited to ISO/IEC Standard 17025.

## 2.0 EQUIPMENT

The field screening will be completed using hydrocarbon test strips.

The Berm Water Testing Kit is a cooler which contains:

- a Chain of Custody form which includes an area for the sample analysis request;
- cold packs; and
- sample bottles (including bubble pack for glass bottles) provided by the laboratory. The sample bottles are listed in Table 2-1 below.

The sample bottles are clean and free of contaminants.

Table 2-1: Sample bottle requirements

Bottle	Parameters	Sampling	Storage Instructions
1 liter amber glass (no preservative)	Oil & Grease (total)	Grab	Keep cool. Return to the laboratory within 7 days of sampling.
2 x 40 ml VOC vials	BTE	Fill slowly and completely – no air bubbles present.	Keep cool. Holding time is 14 days.

## 3.0 PROCEDURE

### 3.1 Field Screening

If there has not been a spill in the berm since the last lab sample, the water can be tested in the field with hydrocarbon test strips.

1. Wet a test strip in each corner of the berm.
2. Place each test strip on the laminated “Test Strip Card”, See Appendix D for card template.
3. With all of the test strips in place, take a photo of the Test Strip Card with the tank and LOCID in the background. Use a camera that date stamps its photos.
4. Email the photo to [NWS\\_Results@raytheon.com](mailto:NWS_Results@raytheon.com) and to the internal distribution list “IIS NWS Environment”.
5. Await authorization to discharge.



### 3.2 Lab Analysis

If there has been a spill in a berm since the last lab analysis, RCL will raise a Work Order to have the berm water sampled and analysed by a lab. If the field screening indicates the presence of hydrocarbons, the berm water will be sampled and analysed by a lab.

1. Co-ordinate taking the samples with the air cargo flight schedule to minimize sample storage time.
2. The day before sampling, get the cold packs from the berm water testing kit and place in freezer overnight.
3. The day of sampling, gather these items at the sampling point:
  - a. eye protection (safety glasses or goggles);
  - b. acid- resistant gloves;
  - c. filled portable eye wash or source of water to flush eyes;
  - d. Berm Water Testing Kit from Logistics;
  - e. plastic bag (garbage bag is acceptable); and
  - f. permanent marker.
4. With permanent marker, mark each bottle with its parameter. Mark each bottle with site, unique sample # (include tank ID), time, and date.
5. Put on PPE. Have eye wash/water source within reach in case acid preservative splashes.
6. Fill and cap all bottles in kit as described in Table 2-1. Note: Don't rinse the bottles before collecting the sample.
7. Wrap glass bottles with bubble pack from kit.
8. Pack bottles carefully in garbage bag and place in cooler. Add cold packs. Add cushioning material if required.
9. Complete Chain of Custody form. See attached example. Keep the pink sampler copy. Place the remaining copies in the cooler.
10. Seal cooler with packing tape and air freight as soon as possible to the laboratory. If any delay, keep samples cool (4 °C.).

### 4.0 ANALYSIS

The laboratory is accredited to ISO/IEC Standard 17025. The laboratory has an established QA/QC program for the analyses required under this water licence.

### 5.0 RESULTS

Results are emailed to [nws\\_results@raytheon.com](mailto:nws_results@raytheon.com).





## 6.0 ACRONYMS

Table 6-1: Acronyms

Acronym	Definition
BTE	Benzene, Toluene, and Ethylbenzene
CFB	Canadian Forces Base
DND	Department of National Defence
H <sub>2</sub> SO <sub>4</sub>	Sulfuric acid
HNO <sub>3</sub>	Nitric acid
IEC	International Electrotechnical Commission
ISO	International Standards Organization
K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub>	Potassium dichromate
LRR	Long Range Radar
LSS	Logistics Support Site
NWB	Nunavut Water Board
NWS	North Warning System
NWSCC	North Warning System Control Centre
PCBs	Polychlorinated Biphenyls
pH	a measure of acidity and alkalinity of a solution
PPE	Personal Protective Equipment
QA/QC	Quality Assurance / Quality Control
RCL	Raytheon Canada Limited
VOC	Volatile Organic Compound

**APPENDIX A: BERM LOCATION MAPS****Figure 1: CAM-M Berm Locations****Figure 2: CAM-3 Berm Locations****UNCONTROLLED WHEN PRINTED**





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Figure 3: FOX-M Berm Locations

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Figure 4: FOX-3 Berm Locations





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Figure 5: DYE-M Berm Locations

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## APPENDIX B: SAMPLING DECISION TREE

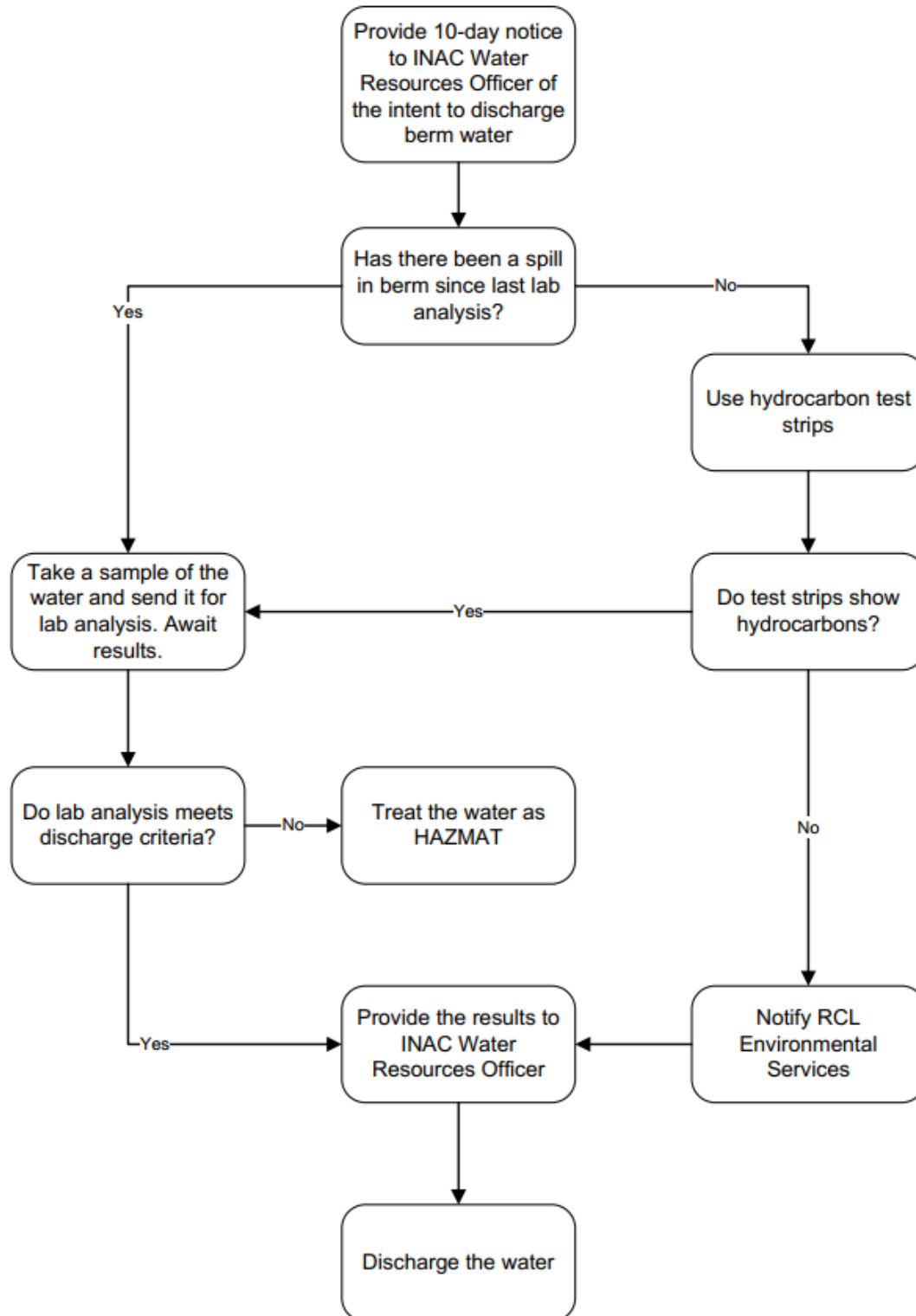


Figure 6: Berm water sampling decision tree



## APPENDIX C: WATER DISCHARGE CRITERIA

Table C-1: Wastewater Discharge Criteria

Parameter	Maximum Concentration of any Grab Sample (µg/L)
Oil and Grease	5000
Benzene	370
Toluene	2
Ethylbenzene	90



## APPENDIX D: HYDROCARBON TEST STRIP CARD

Site: \_\_\_\_\_

Test strip 1	Test strip 2	Test strip 3	Test strip 4
Colour Key from test strip kit			





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## APPENDIX E: EXAMPLE COMPLETED CHAIN OF CUSTODY FORM

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## APPENDIX F: LETTER OF APPROVAL FROM ACCREDITED LABORATORY



October 15, 2018

Mr. Will Wyman  
Raytheon Canada Limited  
Suite 3000  
400 Cooper St.  
Ottawa, ON K2P 2H8

Re: PLN-EHS-13 Berm Water Sampling QAQC Plan

Dear Mr. Wyman,

Please note that we have reviewed Raytheon's QAQC plan, dated October 4, 2018, for the program noted above and accept it as written.

Through the Canadian Association of Laboratory Accreditation (CALA), Eurofins Environment Testing Canada is accredited to ISO 17025 specific parameters. From a laboratory standpoint, we are committed to fulfill the QAQC requirements as outlined in your plan.

Let me know if you require any additional input or need copies of our accreditation certificates.

Regards,

Scott Clark B.A Hon  
Project Manager  
Eurofins Environment Testing Canada

Note: The draft document submitted to the laboratory for review and approval was dated 04-Oct-2018.

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