Defence Construction Canada
Construction de Défense Canada

Quality Assurance (QA) and Quality Control (QC) Plan
CFS Eureka (ERK), Nunavut

In support of the
Nunavut Water Board Licence
No. 3BC-ERK1015

September 2010

Prepared for:
1 Canadian Air Division,
Department of National Defence

Prepared by:
Environmental Services
Defence Construction Canada

Canada

Table of Contents

ACRONYMS ..... **ii**

1. INTRODUCTION **1**

2. SAMPLE COLLECTION **1**

2.1 Sampling Locations *1*

2.2 Sampling Equipment *2*

2.3 Sampling Methods *3*

3. SAMPLE HANDLING **3**

3.1 Preservation *3*

3.2 Sample Identification *4*

3.3 Transportation *4*

4. LAB ANALYSIS **5**

4.1 Lab Accreditation *5*

4.2 Detection Limits *5*

4.3 Methodology *5*

4.4 Reporting Requirements *6*

5. QA/QC PLAN REVIEW **7**

6. REFERENCES **7**

LIST OF APPENDICES

Appendix A: Figure 1: CFS Eureka Site Overview and Sampling Locations

Appendix B: Table 1: Parameter Considerations

Appendix C: Proof of Laboratory Accreditation - Taiga Environmental Laboratory and Exova

Appendix D: Confirmation of Laboratory Acceptance of QA/QC Plan

ACRONYMS

BOD	Biological Oxygen Demand
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
CFS	Canadian Forces Station
ERK	CFS Eureka
HAWS	High Arctic Weather Station
NWB	Nunavut Water Board
PAH	Polycyclic Aromatic Hydrocarbons
pH	Measure of acidity and alkalinity
QA	Quality Assurance
QC	Quality Control
SNP	Surveillance Network Program
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids

1. INTRODUCTION

This document has been prepared in response to the requirements of the Nunavut Water Board (NWB) for the submission of a Quality Assurance (QA) and Quality Control (QC) Plan, under Licence number 3BC-ERK1015, issued to the Department of National Defence (DND) on June 18, 2010. This new Class B Water Licence issued allows for the disposal of waste during operation and maintenance of Canadian Forces Station (CFS) Eureka ("Eureka"). Eureka is located on Slidre Fiord on the west coast of Ellesmere Island within the Qikiqtani Region of Nunavut (latitude 79°59'20"N / longitude 85°56'30"W).

Eureka has been operational since 1947 and was originally established as a High Arctic Weather Station, and is currently a remote camp maintained by DND as a military detachment and training area. Eureka is located approximately 2 km from the Eureka High Arctic Weather Station (HAWS) operated by Environment Canada. This station is only seasonally active during the summer months, which include June, July and August in the Arctic, and is used by DND, Environment Canada and arctic research projects (Polar Continental Shelf Project and the Polar Environment Atmospheric Research Laboratory). During the summer months the peak population is 35 people, and on average ranges between 20 to 25 people.

This document has been prepared in accordance with the *QA/QC Guidelines for Use by Class "B" Licensees in Collecting Representative Water Sample in the Field and for Submission of a QA/QC Plan*, published in 1996 by the Department of Indian and Northern Affairs Canada Water Resources Division and the Northwest Territories Water Board. As outlined in the Licence, five (5) monitoring stations shall be maintained at Eureka at the following locations: Sewage Treatment Facility, Landfarm Facility, Landfill, Battery Dump and Barrel Dump, for the purpose of assessing water quality. Implementation of this QA/QC Plan at Eureka is scheduled to commence in June 2011, as this station is only seasonally active.

2. SAMPLE COLLECTION

2.1 Sampling Locations

As part of the NWB Licence, the Surveillance Network Program (SNP) consists of five water monitoring stations at Eureka, which include:

a) ERK-1: Final Discharge Point of the Sewage Treatment Facility
b) ERK-2: Final Discharge Point of the Landfarm Facility
c) ERK-3: Runoff/leachate from the Landfill
d) ERK-4: Runoff/leachate from the Battery Dump
e) ERK-5: Runoff/leachate from the Barrel Dump

To date water monitoring has not been conducted at Eureka. Sampling locations were established by the NWB and listed above and identified on Figure 1 (Appendix A). The exact sampling locations will be identified at the commencement of the sampling program in 2011, and if feasible with assistance from an Inspector. GPS coordinates and photographic records of the

sampling locations will be documented, and locations will be identified using markers for consistency and repeatability in subsequent months and years.

Timing of Sampling
Timing of the collection of the water samples at Eureka is outlined in the requirements of the NWB Licence, which specify:

- ERK-1 shall be sampled prior to the release of effluent from the Sewage Treatment Plant;
- ERK-2 shall be sampled prior to the release of effluent from the Landfarm Facility; and,
- ERK-3-4-5 shall be sampled monthly during periods of runoff or seepage from the Landfill, Battery Dump and Barrel Dump.

Documenting Non-Sampling Events
In the event that water samples are not successfully collected and submitted for analysis from the Landfarm (ERK-2), Landfill (ERK-3), Battery Dump (ERK-4) and/or the Barrel Dump (ERK-5) the following will be documented:

- Location(s) of the sampling attempts will be recorded (i.e., GPS coordinates, photographic records and the sampling locations will be identified on a map); and,
- Justification outlining why a sample was not successfully collected.

Attempted unsuccessful sampling event(s) and justification will be reported to the NWB in the Annual Report for Eureka.

2.2 Sampling Equipment

No specialized equipment will be required for the collection of water samples at Eureka. New sample bottles will be supplied by Taiga Environmental Laboratory (Taiga) and used for the collection of all water samples. Samples are not to be filtered.

The table below identifies the sample bottles necessary for each sampling round. Extra bottles will be requested for duplicate samples, field blanks and/or in case of breakage.

<table>
<tr><th>Sewage Treatment Facility (ERK-1)</th><th>Runoff/Leachate from Landfill/Dump (ERK-3-4-5)</th></tr>
<tr><td><u>4 Bottles</u>:
1 x routine (pH)
1 x nutrient (TSS)
1 x BOD (BOD)
1 x sterile (fecal coliforms)</td><td rowspan="3"><u>11 Bottles/Site</u>:
1 x 1L glass amber bottle (extractable HC for TPH)
1 x 1L glass amber bottle (PAHs)
1 x 1L glass amber bottle (Oil and Grease)
2 x 40 mL vials (F1, BTEX)
1 x BOD (BOD)
1 x routine (pH,NO2-N,NO3-N,Mg,Na,Ca,K, SO4,conductivity,alkalinity,hardness)
1 x nutrient (TSS, NH3)
1 x metals bottle (total As,Cu,Fe,Hg,Cd,Cr,Pb,Ni)
1 x 100 mL glass amber bottle (phenols)
1 x sterile (fecal coliform)</td></tr>
<tr><th>Landfarm Facility (ERK-2)</th></tr>
<tr><td><u>5 Bottles</u>:
2 x 40 mL vials (benzene,toluene,ethylbenzene)
1 x 300 mL metals bottle (lead)
1 x 1L glass amber bottle (Oil and Grease)
1 x 100 mL glass amber bottle (phenols)</td></tr>
</table>

2.3 Sampling Methods

Taiga provided the following methodology for the collection of the water samples:

Parameter	Instructions
Routine and Nutrients	1. Rinse bottle three (3) times with sample 2. Fill to top and cap bottle 3. Keep cool at 4°C
BOD	1. Rinse bottle three (3) times with sample 2. Fill to top and cap bottle 3. Keep cool at 4°C 4. Sample must be sent to laboratory within 24 hours
Microbiological (fecal coliforms)	**1. Do not rinse bottle** 2. Fill to top and cap bottle 3. Keep cool at 4°C 4. Sample must be sent to laboratory within 24 hours
Total Metals (including Lead)	1. Rinse bottle three (3) times with sample 2. Fill to near the top 3. Add contents of preservative vial (nitric acid) 4. Cap bottle and mix
Hexane Extractable Material (Oil and Grease)	**1. Do not rinse bottle** 2. Fill to shoulder of bottle 3. Add contents of preservative vial (sulphuric acid) 4. Cap bottle and mix
BTEX, THM and Purgeable Hydrocarbons	**1. Do not rinse bottle** 2. Fill bottle completely leaving **no** air bubbles 3. Keep cool at 4°C
Extractable Hydrocarbons (including PAH)	**1. Do not rinse bottle** 2. Fill to top and cap bottle 3. Keep cool at 4°C
Phenol	1. Rinse bottle three (3) times with sample 2. Fill to near top 3. Add contents of preservative vial (sulphuric acid) 4. Cap bottle and mix

Taiga Methodology: Date effective January 18, 2010

Refer to Table 1 (Appendix B) for additional laboratory considerations, including minimum sample size, rinsing, filtering and storage requirements for the parameters. Additionally, samples for ERK-1 and ERK-2 will be collected prior to the release of any effluent to demonstrate compliance with the criteria set out by the NWB (refer to Section 4.4B).

3. SAMPLE HANDLING

3.1 Preservation

Samples will be preserved in accordance with requirements identified by Taiga for the parameters to be analysed (refer to 2.3 Sampling Methods and Appendix B).

Preservatives nitric acid (HNO3) and sulphuric acid (H2SO4) are classified as Class 8 Dangerous Goods. Based on the quantity of preservative needed for sampling, these acids will be transported together in regular cargo as *dangerous goods in accepted quantities*. Nitric acid will be added to preserve lead and metals samples, and sulphuric acid will be added to preserve oil and grease, and phenols samples, immediately after the samples are collected.

Samples requiring analysis within 24 hours will be collected immediately prior to shipping. All samples will be stored on ice and kept cool at approximately 4°C prior to and during shipping.

3.2 Sample Identification

Samples collected will be labelled using consistent terminology, identifying the water monitoring station (corresponding to the facility), followed by the year, month and sample number. For example, ERK-1-2011-06-1 denotes a water sample collected for the Sewage Treatment Facility, in June 2011, and is the first sample collected for the month.

Similarly, blind duplicate samples collected will be labelled using consistent terminology, identifying the station, followed by the year, month and duplicate sample number. For example, ERK-2011-06-DUP1 denotes a blind duplicate water sample collected at Eureka, in June 2011, and is the first duplicated collected for the month. Trip and field blanks will be labelled as such.

At the time of collection, sample identification will be recorded in a field notebook for consistency in terminology, and to ensure the sample identifiers are unique. Sample labels will also include the following information: name of organization, time and date. Information provided on the sample labels will be clearly printed in permanent (i.e., waterproof) non-smear ink (marker or pen).

A Chain-of-Custody shall be completed for each sampling round and will accompany the samples to the laboratory.

3.3 Transportation

Samples will be packed appropriately (i.e., packed upright, immobile) in coolers, sealed and shipped to Yellowknife via 953731 NWT Limited air services. Samples are scheduled to be picked up on a scheduled basis (while the station is active), on the same flight as samples for the neighbouring Eureka HAWS.

Taiga will be immediately notified when the samples are in transit. Taiga will pick-up the shipment at the airport in order to start analysis as quickly as possible on samples with a maximum storage of 24 hours. A Chain-of-Custody will accompany the sample shipment and will clearly identify location of samples requiring immediate analysis.

4. LAB ANALYSIS

4.1 Lab Accreditation

Taiga (Yellowknife, NWT) and Exova (Calgary, AB) will analyze all samples collected in support of this licence. Taiga Environmental Laboratory is ISO/IEC 17025 accredited and is a member of the Canadian Association for Laboratory Accreditation Inc. (CALA). Taiga will subcontract TPH (extractable HC), PAHs, and phenols analysis to Exova. Exova is ISO/IEC 17025 accredited by the Standard Council of Canada. Refer to Appendix C for proof of laboratory accreditation to conduct analyses on each of the required sampling parameters.

4.2 Detection Limits

Laboratory detection limits for all parameters required by the NWB are identified in Table 1 (Appendix B). The laboratory shall report the detection limits of the methods used for the analysis of the samples.

4.3 Methodology

The laboratory sample analysis methodology will follow the methods outlined in the *Standard Methods for the Examination of Water and Wastewater* (2005) if not described below. Taiga and Exova provided the summaries below for the sample analysis methodologies to be used for BTEX, metals, oil and grease, phenols and PAH, and extractable hydrocarbons, differing from the *Standard Methods* (2005).

Metals in Water (EPA200.8) - Taiga
This method describes the multi-element determination of trace elements by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS). Sample material in solution is introduced by pneumatic nebulization via a spray chamber into a radio frequency argon plasma. Desolvation, atomization, and ionization create predominately singly-charged cations which are separated on the basis of their mass-to-charge ratio and quantitated by the use of a quadrupole mass spectrometer.

Oil and Grease (EPA1664:A) -Taiga
The extraction of oil and grease (hexane extractable material) from aqueous samples is performed by using solid phase extraction disks (SPE). The HEM residue is measured gravimetrically.

BTEX in Water (EPA8260:B) - Taiga and Exova
The extraction of BTEX is performed with a Purge and Trap System. The Purge and Trap works on the principle of degassing volatiles within an enclosed system with an inert gas. The volatiles (BTEX) are carried into an absorbing column where they are absorbed. At the end of the purge and trap cycle, the trap is desorbed by heat and back-flushed with inert gas, the volatile compounds are transferred into a gas chromatograph for analysis by Mass Selective Detector.

Phenols in Water (APHA5530:D) - Exova
The water sample is spiked with surrogates and the pH is raised to between 8.8 and 9.2. The chlorophenolics are converted in situ to acetates by the addition of acetic anhydride. After acetylation, the solution is extracted, concentrated, and an instrument standard is added. The extract is then analyzed on a GC/MS to separate the individual isomers for quantitation and qualitation.

PAH in Water (EPA8270C) - Exova
The water sample is spiked with surrogates, extracted and then cleaned up if needed. The PAH extract is then injected with internal standard and analyzed on a GC/MS to separate the individual isomers for quantitation and qualitation.

Extractable Hydrocarbon in Water (A108.0, Alta. Env, Aug. 1988) - Exova
The water sample is extracted with hexane. The organic fraction is selectively removed and an aliquot is analyzed using gas chromotography/flame ionization detection. Chromotographic conditions are described which permit the separation and measurement of the petroleum hydrocarbon types.

4.4 Reporting Requirements

Duplicates and Blanks
Duplicate samples and blanks shall be submitted to and analysed by the accredited laboratory to provide an internal (i.e., laboratory) and external (i.e., at time of sampling, shipping) QA/QC check to verify the reliability of the sample results. Duplicates samples shall be collected for approximately 10 percent of the samples. A duplicate sample is a repeat sample collected and handled using the same methods and submitted blindly for analysis. Based on the analytical results the laboratory will match the blind duplicate to the corresponding sample.

Field blanks and travel blanks will also be analysed. Field blanks will consist of bottling distilled water during the sampling round, using the sampling methods used to collect the water samples, to ensure reliability of the sampling method. Travel blanks consist of distilled water and are provided by the laboratory to accompany a shipment of sample bottles roundtrip to confirm the integrity of the samples was maintained.

NWB Effluent Standards
Analytical results of effluent discharged from the Sewage Treatment Facility and the Landfarm Facility will be reported against the following effluent quality standards provided by the NWB:

Parameter	Maximum Concentration of any Grab Sample
Sewage Treatment Facility (ERK-1)	
BOD_5	80 mg/L
Total Suspended Solids	70 mg/L
Fecal Coliforms	1 X 10^6 CFU/100mL
Oil and Grease	No visible sheen
pH	between 6 and 9
Landfarm Facility (ERK-2)	
Benzene (µg/L)	370
Toluene (µg/L)	2
Ethylbenzene (µg/L)	90
Lead (µg/L)	1
Oil and Grease (mg/L)	15 and no visible sheen
Phenols (µg/L)	20

Effluent standards provided by the NWB are consistent with the *Guidelines for the Discharge of Treated Municipal Wastewater in the Northwest Territories* (1992), or are consistent with other municipal licences.

5. QA/QC PLAN REVIEW

This document, *QA/QC Plan for CFS Eureka*, shall be reviewed annually to ensure that this plan remains current and consistently reflects the operations, activities and technology at CFS Eureka. Any revisions required to this document shall be submitted to the NWB in the form of an Addendum with supporting letter of approval from Taiga, and subsequently implemented. Changes to this plan will also be reflected in the Annual Report.

6. REFERENCES

Department of Indian and Northern Affairs Canada Water Resources Division and the Northwest Territories Water Board. *Quality Assurance (QA) and Quality Control (QC) Guidelines for Use by Class "B" Licensees in Collecting Representative Water Samples in the Field and for Submission of a QA/QC Plan.* July 1996.

Eaton, A., Clesceri, L., Rice, E., and A. Greenberg. *Standard Methods for the Examination of Water and Wastewater – 21st Edition.* 2005.

Nunavut Water Board. *Letter, RE: NWB Licence No. 3BC-ERK1015*. June 18, 2010.

Appendix A: CFS Eureka Site Overview and Sampling Locations

Defence Construction Canada
Construction de Défense Canada

Title:

CFS Eureka Site Overview and Sampling Locations

Project:

QA/QC Plan for Canadian Forces Station Eureka

Client:

Department of National Defence

Date:

September 2010

Figure:

Figure 1

LEGEND

	Monitoring Station Locations
ERK-1	Sewage Treatment Facility
ERK-2	Landfarm Facility
ERK-3	Landfill
ERK-4	Battery Dump
ERK-5	Barrel Dump

N
W E
S

Appendix B: Parameter Considerations

Table 1: Taiga Environmental Laboratory parameter considerations.

Parameter	Container	Minimum Amount	Rinse	Filter	Preservation	Maximum Storage Recommendation	Detection Limit	Method	Accredited
Sewage Treatment Facility (ERK-1)									
BOD5	300mL plastic	100mL	3 times	n/a	keep cool at 4°C	2 days	2 mg/L	SM5210:B	Yes
TSS	750mL plastic	50mL	3 times	n/a	keep cool at 4°C	7 days	3 mg/L	SM2540:D	Yes
Fecal Coliforms	500mL plastic	100mL	No	n/a	keep cool at 4°C	1 day	1 CFU/100mL	SM9222:D	Yes
pH	500mL plastic	50mL	3 times	n/a	keep cool at 4°C	1 day	n/a	SM4500-H:B	Yes
Landfarm Facility (ERK-2)									
Benzene	40mL glass vial	2x40mL	No	n/a	keep cool at 4°C	14 days	0.001 mg/L	EPA8260:B	Yes*
Toluene	40mL glass vial	2x40mL	No	n/a	keep cool at 4°C	14 days	0.001 mg/L	EPA8260:B	Yes*
Ethylbenzene	40mL glass vial	2x40mL	No	n/a	keep cool at 4°C	14 days	0.001 mg/L	EPA8260:B	Yes*
Lead	300mL plastic	50mL	3 times	n/a	5mL 1:3 HNO3	180 days after preservation	0.1 ug/L	EPA8200.8	Yes
Oil and Grease	1L amber glass	1000mL	No	n/a	4mL 1:3 H2SO4	28 days after preservation	2.0 mg/L	EPA1664:A	Yes
Phenols	100mL amber glass	20mL	No	n/a	1mL 50% H2SO4	28 days after preservation	0.001 mg/L	APHA5530:D	Yes*
Runoff and Leachate from Landfill (ERK-3), Battery Dump (ERK-4), Barrel Dump (ERK-5)									
TPH									
Extractable HC	1L amber	1000mL	No	n/a	keep cool at 4°C	14 days	0.2 mg/L	EPA8015B	Yes*
F1, BTEX	40mL glass vial	2x40mL	No	n/a	keep cool at 4°C	14 days	0.005 mg/L	EPA8260:B	Yes
PAH	1L amber glass	1000mL	No	n/a	keep cool at 4°C	7 days; 40 days extract	Refer to Table 2	EPA8270C	Yes*
BTEX	40mL glass vial	2x40mL	No	n/a	keep cool at 4°C	14 days	0.005 mg/L	EPA8260:B	Yes
BOD5	300mL plastic	100mL	3 times	n/a	keep cool at 4°C	2 days	2 mg/L	SM5210:B	Yes
pH	500mL plastic	50mL	3 times	n/a	keep cool at 4°C	1 day	n/a	SM4500-H:B	Yes
TSS	750mL plastic	50mL	3 times	n/a	keep cool at 4°C	7 days	3 mg/L	SM2540:D	Yes
Nitrate-Nitrite	500mL plastic	5mL	3 times	n/a	keep cool at 4°C	2 days	0.01 mg/L	SM4110:B	Yes
Total Phenols	100mL amber glass	20mL	No	n/a	1mL 50% H2SO4	28 days after preservation	0.001 mg/L	APHA5530:D	Yes*
Total Hardness	500mL plastic	5mL	3 times	n/a	keep cool at 4°C	7 days	0.7 mg/L	SM2340:B	Yes
Magnesium	500mL plastic	5mL	3 times	n/a	keep cool at 4°C	7 days	0.1 mg/L	SM4110:B	Yes
Sodium	500mL plastic	5mL	3 times	n/a	keep cool at 4°C	7 days	0.1 mg/L	SM4110:B	Yes
Total Arsenic	300mL plastic	50mL	3 times	n/a	5mL 1:3 HNO3	180 days after preservation	0.2 ug/L	EPA200.8	Yes
Total Copper	300mL plastic	50mL	3 times	n/a	5mL 1:3 HNO3	180 days after preservation	0.2 ug/L	EPA200.8	Yes
Total Iron	300mL plastic	50mL	3 times	n/a	5mL 1:3 HNO3	180 days after preservation	5 ug/L	EPA200.8	Yes
Total Mercury	300mL plastic	50mL	3 times	n/a	5mL 1:3 HNO3	180 days after preservation	0.01 ug/L	EPA200.8	Yes

Parameter	Container	Minimum Amount	Rinse	Filter	Preservation	Maximum Storage Recommendation	Detection Limit	Method	Accredited
Fecal Coliforms	500mL plastic	100mL	No	n/a	keep cool at 4°C	1 day	1 CFU/100mL	SM9222:D	Yes
Conductivity	500mL plastic	50mL	3 times	n/a	keep cool at 4°C	28 days	0.4 uS/cm	SM2510:B	Yes
Oil and Grease	1L amber glass	1000mL	No	n/a	4mL 1:3 H2SO4	28 days after preservation	2.0 mg/L	EPA1664:A	Yes
Ammonia Nitrogen	750mL plastic	90mL	3 times	n/a	keep cool at 4°C	28 days after lab preservation	0.01 mg/L	SM4500-NH3:G	Yes
Total Alkalinity	500mL plastic	50mL	3 times	n/a	keep cool at 4°C	1 day	0.4 mg/L	SM2320:B	Yes
Calcium	500mL plastic	5mL	3 times	n/a	keep cool at 4°C	7 days	0.1 mg/L	SM4110:B	Yes
Potassium	500mL plastic	5mL	3 times	n/a	keep cool at 4°C	7 days	0.1 mg/L	SM4110:B	Yes
Sulphate	500mL plastic	5mL	3 times	n/a	keep cool at 4°C	2 days	1 mg/L	SM4110:B	Yes
Total Cadium	300mL plastic	50mL	3 times	n/a	5mL 1:3 HNO3	180 days after preservation	0.05 ug/L	EPA200.8	Yes
Total Chromium	300mL plastic	50mL	3 times	n/a	5mL 1:3 HNO3	180 days after preservation	0.1 ug/L	EPA200.8	Yes
Total Lead	300mL plastic	50mL	3 times	n/a	5mL 1:3 HNO3	180 days after preservation	0.1 ug/L	EPA200.8	Yes
Total Nickel	300mL plastic	50mL	3 times	n/a	5mL 1:3 HNO3	180 days after preservation	0.1 ug/L	EPA200.8	Yes

NOTES: * Analysis subcontracted to Exova, Calgary laboratory accredited for Benzene, Toluene, Ethylbenzene, Phenols, TPH – Extractable HC, and PAH.

Table 2: Exova PAH detection limits.

Parameter	Detection Limit
Naphthalene	0.1 ug/L
Acenaphthylene	0.1 ug/L
Acenapthene	0.1 ug/L
Fluorene	0.1 ug/L
Phenanthrene	0.1 ug/L
Anthracene	0.005 ug/L
Pyrene	0.01 ug/L
Benzo(a)anthracene	0.01 ug/L
Chrysene	0.1 ug/L
Benzo(b)fluoranthene	0.1 ug/L
Benzo(k)fluoranthene	0.1 ug/L
Benzo(a)pyrene	0.008 ug/L
Indeno(123-cd)pyrene	0.05 ug/L
Dibenzo(ah)anthracene	0.05 ug/L
Benzo(ghi)perylene	0.05 ug/L

Appendix C: Proof of Laboratory Accreditation - Taiga Environmental Laboratory and Exova

CALA
Canadian Association for Laboratory Accreditation Inc.

CALA Directory of Laboratories

Membership Number: 2635
Laboratory Name: Taiga Environmental Laboratory
Parent Institution: Department of Indian and Northern Affairs Canada
Address: 4601 - 52nd Avenue Yellowknife NT X1A 2R3
Contact: Ms. Angelique Ruzindana
Phone: (867) 669-2781
Fax: (867) 669-2718
Email: angelique.ruzindana@inac-ainc.gc.ca

Standard: Conforms with requirements of ISO/IEC 17025
Clients Served: All Interested Parties
Revised On: September 8, 2010
Valid To: April 14, 2013

Scope of Accreditation

Solids (Inorganic)
Metals - Soil, Sediment (079)
TEL 061; based on EPA SW-846 METHOD 3050 A
ICP/MS

Aluminum	
Antimony	
Arsenic	
Barium	
Beryllium	
Boron	
Cadmium	
Calcium	
Chromium	
Cobalt	
Copper	
Iron	
Lead	
Lithium	((Parameter suspended on 9/8/2010))
Magnesium	
Manganese	
Mercury	
Molybdenum	
Nickel	
Potassium	

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at http://www.cala.ca/cala_directories.html

Selenium ((Parameter suspended on 9/8/2010))
Sodium
Strontium
Tin
Titanium
Uranium
Vanadium
Zinc

Solids (Inorganic)
Moisture - Soil (030)
TEL007; CWS-PHC CCME Tier 1
GRAVIMETRIC
Moisture

Solids (Organic)
BTEX - Soil (072)
TEL 038; based on USEPA 5030 B, 602, 502.2
GC/MS - PURGE AND TRAP
Benzene
Ethylbenzene
m/p-xylene
o-xylene
Toluene

Solids (Organic)
Petroleum Hydrocarbons (PHC) - Soil (073)
TEL 057; based on USEPA SW 846 METHODS 3500 B, 3541, 3630 C, 8100, 8310
GC/FID - PURGE AND TRAP
F2: C10-C16
F3: C16-C34
F4: C34-C50

Solids (Organic)
Petroleum Hydrocarbons (PHC) - Soil (075)
TEL 046; based on US EPA SW-846 METHODS 5030, 8000, 8015, 8260 B
SOXTHERM EXTRACTION - GRAVIMETRIC
F4: Gravimetric

Solids (Organic)
Polycyclic Aromatic Hydrocarbons (PAH) - Soil (071)
TEL 047; based on USEPA SW 846 METHODS 3500 B, 3541, 3630 C, 8100, 8310
GC/MS - EXTRACTION
Acenaphthene
Acenaphthylene
Anthracene

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at http://www.cala.ca/cala_directories.html

Benzo (a) anthracene
Benzo (a) pyrene
Benzo (b) fluoranthene
Benzo (g,h,i) perylene
Benzo (k) fluoranthene
Chrysene
Dibenzo (a,h) anthracene
Fluoranthene
Fluorene
Indeno (1,2,3 - cd) pyrene
Naphthalene
Phenanthrene
Pyrene

Solids (Organic)
Purgeable Hydrocarbons- Soil (074)
TEL 056; CWS-PHC CCME TIER 1
GC/FID - PURGE AND TRAP
F1: C6-C10

Water (Inorganic)
Alkalinity - Water (066)
TEL 060:PC TITRATE; based on SM 2320 A, B
AUTO TITRIMETRIC
Alkalinity (pH 4.5)

Water (Inorganic)
Ammonia - Water (022)
TEL013; based on SM 4500-NH3 G
AUTO COLOR
Ammonia

Water (Inorganic)
Anions - Water (059)
TEL 055; based on SM 4110 B
ION CHROMATOGRAPHY
Chloride
Fluoride
Nitrate
Nitrite
Sulfate

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Water (Inorganic)
Biochemical Oxygen Demand (BOD) - Water (004)
TEL 019; based on SM 5210 A, B
D.O. METER
BOD (5 day)
CBOD (5 day)

Water (Inorganic)
Carbon - Water (029)
TEL033; based on SM 5310 B
INFRARED
Organic Carbon

Water (Inorganic)
Cations - Water (042)
TEL055; based on SM 4110 B
ION CHROMATOGRAPHY
Calcium
Magnesium
Potassium
Sodium

Water (Inorganic)
Chemical Oxygen Demand (COD) - Water (061)
TEL 016; based on SM 5220 D
REFLUX - COLORIMETRIC
COD

Water (Inorganic)
Chlorine - Water (078)
TEL049; based on SM 4500-Cl G
HACH
Free Chlorine
Total Chlorine

Water (Inorganic)
Colour - Water (063)
TEL 051; based on SM 2120 C
HACH - SPECTROPHOTOMETRIC
Apparent Color
True Color

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Water (Inorganic)
Colour - Water (083)
TEL 064; based on SM 2120 C
SPECTROPHOTOMETRIC - PC TITRATE
Apparent Colour
True Colour

Water (Inorganic)
Conductivity - Water (068)
TEL 059:PC TITRATE; based on SM 2510 B
AUTO CONDUCTIVITY METER
Conductivity (25°C)

Water (Inorganic)
Dissolved Metals - Water (013)
TEL035; based on US EPA 200.8
ICP/MS
Aluminum
Antimony
Arsenic
Barium
Beryllium
Boron
Cadmium
Cesium
Chromium
Cobalt
Copper
Iron
Lead
Lithium
Manganese
Molybdenum
Nickel
Rubidium
Selenium
Silver
Strontium
Thallium
Tin
Titanium
Uranium
Vanadium
Zinc

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Water (Inorganic)
Hexane Extractable Material (Oil and Grease) - Water (060)
TEL 024: HEM AND SGT-HEM; based on US EPA 1664 A, REVISION A
SOLID PHASE EXTRACTION
Mineral Oil and Grease
Total Oil and Grease

Water (Inorganic)
Mercury - Water (080)
TEL 062; based on EPA 245.7
ATOMIC FLUORESCENCE MERCURY ANALYSIS SYSTEM
Mercury

Water (Inorganic)
pH - Water (067)
TEL 058:PC TITRATE; based on SM 4500-H+ A, B
AUTO - pH METER
pH

Water (Inorganic)
Phosphate - Water (040)
TEL015; based on SM 4500-P D
AUTO COLOR
Phosphate

Water (Inorganic)
Phosphorus - Water (009)
TEL015; based on SM 4500-P B, D
AUTO COLOR - DIGESTION
Dissolved Phosphorus
Total Phosphorus

Water (Inorganic)
Reactive Silica - Water (007)
TEL012; based on SM 4500-SiO2 F
AUTO COLOR
Reactive Silica

Water (Inorganic)
Solids - Water (011)
TEL008, TEL009; based on SM 2540 C, D
GRAVIMETRIC
Total Dissolved Solids
Total Suspended Solids

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Water (Inorganic)
Total and Dissolved Nitrogen - Water (086)
TEL 066; based on ISO/TR 11905:1997(E) and ASTM D 5176-91
PYROLYSIS AND CHEMILUMINESCENCE DETECTION
Dissolved Nitrogen
Total Nitrogen

Water (Inorganic)
Total Metals - Water (054)
TEL035; based on US EPA 200.8
ICP/MS
Aluminum
Arsenic
Barium
Beryllium
Boron
Cadmium
Cesium
Chromium
Cobalt
Copper
Iron
Lead
Lithium
Manganese
Mercury
Molybdenum
Nickel
Rubidium
Selenium
Silver
Strontium
Thallium
Tin
Titanium
Uranium
Vanadium
Zinc

Water (Inorganic)
Turbidity - Water (028)
TEL006; based on SM 2130 B
NEPHELOMETRY
Turbidity

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Water (Inorganic)
Turbidity - Water (082)
TEL 065; based on SM 2130 B
NEPHELOMETRY - PC TITRATE
Turbidity (Parameter suspended on 5/18/2010)

Water (Microbiology)
Coliforms - Water (045)
TEL053; based on IDEXX QUANTI-TRAY
MOST PROBABLE NUMBER (QUANTI-TRAY)
Escherichia coli (E. coli)
Total Coliforms

Water (Microbiology)
Fecal Coliforms - Water (041)
TEL017; based on SM 9222 D
MEMBRANE FILTRATION (mFC)
Fecal (Thermotolerant) Coliforms

Water (Microbiology)
Fecal streptococcus - Water (055)
TEL053; based on IDEXX QUANTI-TRAY
MOST PROBABLE NUMBER (QUANTI-TRAY)
Fecal Streptococcus

Water (Organic)
BTEX - Water (070)
TEL 037 (BTEX); based on USEPA METHOD 5030 B, 602, 502.2
GC/MS - PURGE AND TRAP
Benzene
Ethylbenzene
m/p-xylene
o-xylene
Toluene

Water (Organic)
Trihalomethanes (THM) - Water (077)
TEL039 (THM); based on USEPA 5030 B, 602, 502.2
GC/MS - PURGE AND TRAP
Bromodichloromethane
Bromoform
Chlorodibromomethane
Chloroform

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Standards Council of Canada
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SCOPE OF ACCREDITATION

Exova Canada Inc.
CALGARY LABORATORY
Bay 5, 2712 - 37th Avenue N.E.
Calgary, AB
T1Y 5L3

Accredited Laboratory No. 272
(Conforms with requirements of CAN-P-1585, CAN-P-1587 , CAN-P-4E (ISO/IEC 17025:2005))

CONTACT:	Ms. Genevieve Denis
TEL:	(403) 291-2022
FAX:	(403) 291-2021
EMAIL:	genevieve.denis@exova.com
CLIENTS SERVED:	All interested parties.
FIELDS OF TESTING:	Biological, Chemical/Physical
PROGRAM SPECIALTY AREA:	AGRICULTURE INPUTS, FOOD, ANIMAL HEALTH AND PLANT PROTECTION , Environmental
ISSUED ON:	2010-05-17
VALID TO:	2014-07-02

(PAH - Water)

TM PAH001-50; based on EPA 3510 C/8270 C/3611B	Analysis of Polynuclear Aromatic Hydrocarbons (PAH's) in Water by GC/MS
	2-Methylnaphthalene
	Acenaphthene
	Acenaphthylene
	Acridine
	Anthracene
	Benzo (a) anthracene
	Benzo (a) pyrene
	Benzo (b) fluoranthene
	Benzo (g,h,i) perylene
	Benzo (j) fluoranthene
	Benzo (k) fluoranthene
	Chrysene
	Dibenzo (a,h) anthracene
	Fluoranthene
	Fluorene
	Indeno (1,2,3 - cd) pyrene
	Naphthalene
	Phenanthrene
	Pyrene
	Quinoline

(BTEX - Water)

TM BTX004-50; based on EPA 5035/8260B/8021B	B.T.E.X. and F1 in Water Samples by MSD/FID
	Benzene
	Ethylbenzene
	m/p-Xylene
	o-Xylene
	Toluene

(Petroleum Hydrocarbons (PHC) - Water)

TM CCME 003-50: Based on AENV A 108.0	CCME Petroleum Hydrocarbons in Water
	F2: (C10-C16)
	F3: (C16-C34)

(Phenols - Water)

TM PCP001-50; based on EPA 8041/1653/8270	Analysis of Chlorinated Phenolics in Water by In Situ Acetylation and GC/MS 2,3 Dichlorophenol 2,3,4 Trichlorophenol 2,3,4,5-Tetrachlorophenol 2,3,4,6-Tetrachlorophenol 2,3,5 Trichlorophenol 2,3,5,6-Tetrachlorophenol 2,3,6 Trichlorophenol 2,4,5-Trichlorophenol 2,4,6-Trichlorophenol 2,4-Dichlorophenol 2,5&2,6 Dichlorophenol 2-Chlorophenol 3,4 Dichlorocatechol 3,4 Dichlorophenol 3,4,5 Trichlorocatechol 3,4,5 Trichloroguaiacol 3,4,5 Trichlorophenol 3,4-Dichloroguaiacol 3,5 Dichlorophenol 3-Chlorophenol 4-Chloro-3-methylphenol 4-Chlorocatechol 4-Chloroguaiacol 4-Chlorophenol Pentachlorophenol Tetrachlorocatechol Tetrachloroguaiacol

Appendix D: Confirmation of Laboratory Acceptance of QA/QC Plan

Indian and Northern Affairs Canada
www.inac.gc.ca

Affaires indiennes et du Nord Canada
www.ainc.gc.ca

P. O. Box 1500
Yellowknife, NT X1A 2R3

Your file - Votre référence

Our file - Notre référence
Licence # 3BC-ERK1015

September 15, 2010

Alexis Johnson
Environmental Project Coordinator
Real Property and Environment/National Capital Region
Defence Construction Canada
161 Laurier Avenue, Suite 300
Ottawa, ON, K1P 5J2

Dear Ms Johnson :

Re: Quality Assurance and Quality Control (QA/QC) Plan
Nunavut Water Board "B" Type Water Licence No. 3BC-ERK1015
Slidre Fiord, Ellesmere Island
Qikiqtani, NUNAVUT

Submitted : September 13, 2010
Reviewed : September 15, 2010.

Thank you for the submission of the Quality Assurance and Quality Control Plan prepared by Defence Construction Canada, as per the SNP outlined in the Nunavut Water Board issued Water Use Licence 3BC-ERK1015 to Department of National Defence. The Water Monitoring stations located at Eureka Camp will be operational in 2011.

Upon review, it has been found that the plan is complete. Approval of the plan is hereby granted.
Should you require further information, please do not hesitate to contact me at (867) 669-2781.

Sincerely,

Angelique Ruzindana, M.Sc., Ph.D
Analyst Under the
Northwest Territories and Nunavut Waters Act

cc : Phyllis Beaulieu, Nunavut Water Board

Canada