

Environmental Monitoring Training Manual Hamlet of Arviat

Prepared By:

Nuna Burnside Engineering and Environmental Ltd.
PO Box 879 Building 764, Fred Coman Way Iqaluit NU X0A 0H0
and
15 Townline Orangeville ON L9W 3R4

Prepared for:

Hamlet of Arviat

October 2010

File No: N-O 157460

The material in this report reflects best judgement in light of the information available at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Nuna Burnside Engineering and Environmental Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Table of Contents

1.0	Introduction.....	1
2.0	Overview of Sample Collection.....	2
3.0	Sampling Location and Frequency.....	3
4.0	Preparation for Sampling	5
4.1	Contact Laboratory	5
4.2	Sample Container Selection	5
5.0	Field Sample Collection	6
5.1	Field Equipment.....	6
5.2	Field Notes	6
5.3	Field Measurements	6
5.4	Sample Identification	7
5.5	Surface Water Sampling Procedures.....	7
5.6	Sample Preservation	8
5.7	Bioassay Toxicity Testing	8
6.0	Handling, Storage, and Transportation.....	10
7.0	Quality Control.....	12
7.1	Field Blanks.....	12
7.2	Replicate or Duplicate Samples.....	12
8.0	Water Volume and Water Level Measurements	13
9.0	Reporting.....	15
10.0	References	16

Table of Contents (Continued)**Tables**

Table 1	Water License Monitoring Program	3
---------	--	---

Figures

1	Water Supply Facility Monitoring Locations – Wolf River Intake
2	Sewage Disposal Facility Monitoring Locations
3	Solid Waste Management Facility Monitoring Locations – Landfill
4	Solid Waste Management Facility Monitoring Locations – Bulky Metals Waste Area
5	Solid Waste Management Facility Monitoring Locations – Hazardous Waste Storage Area

Appendices

A	Nunavut Water Board Licence – 3AM-ARV1015
B	Monitoring Location Photographs
C	Contact Information for CALAI Laboratories
D	Sample Containers, Preservation and Holding Times
E	Sample Chain of Custody Form
F	CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life
G	Nunavut Water Board Annual Report Form
H	Annual Report Template

1.0 Introduction

The Hamlet of Arviat provides water supply, wastewater disposal, and solid waste disposal services for the community. All Hamlets have a water licence issued by the Nunavut Water Board that allows them to take water for their water supply and dispose of their wastes. Each licence requires that a monitoring program is established to ensure that the environment is not impacted by the Hamlet operations. This document has been produced to act as a reference for the staff of the Hamlet when completing the required monitoring, sampling and reporting. This document should be reviewed and updated annually.

The current licence referenced in this report is NWB 3AM-ARV1015. This licence was issued by the NWB on August 23, 2010 and expires August 30, 2015. A copy of the licence is included in Appendix A.

It should be noted, that Nuna Burnside Engineering and Environmental Ltd. (Nuna Burnside), has been retained by Community and Government Services (CGS) of the Government of Nunavut (GN) on behalf of the Hamlet of Arviat, to complete work regarding the sewage disposal facility and solid waste management facility to meet the NWB licence requirements. This work will result in updates to the Operation and Maintenance Plans for the Water Supply, Sewage Disposal Facility and Solid Waste Management Facility. An updated Environmental Monitoring and QA/QC Plan and Environmental Contingency Plan will also be completed. The results of this work may alter the monitoring program and require that this document be updated.

2.0 Overview of Sample Collection

This manual will go over the following components of sample collection as part of the environmental monitoring program:

1. Sample Locations and Sampling Frequency

The location and frequency of each sampling option has been carefully selected, and is part of site design and layout, as well as the Water Board License. Sampling will follow their requirements. Diversions must be recorded and submitted to the Water Board for approval.

2. Preparation for Sampling

Approximately one month prior to the sampling event the laboratory will be notified and the required bottles, blanks, and materials assembled. Plans for rapid return of the samples prepared.

3. Sample Collection

At each sampling station the specified samples will be collected and field data recorded.

4. Handling, Storage and Transportation

Appropriate personal protective equipment (gloves, safety glasses, etc.) will be used when handling samples. Samples will be stored at 4°C and protected from freezing until delivered to the laboratory. Chain of custody for sampling, storage, and delivery must be maintained. Laboratory sample sheets will be filled in as per laboratory protocols. Samples will be delivered to the laboratory in the laboratory dictated method and within the hold times specified. Preplanning for rapid transport and delivery will usually be required.

5. Reporting

All laboratory results should be recorded and filed for submission with the NWB Annual Report.

3.0 Sampling Location and Frequency

Sampling locations and frequency of sampling are specified in the NWB licence and the Environmental Monitoring and QA/QC Plan.

The monitoring program included in the Arviat water license includes specific requirements regarding sampling locations, sampling frequency and parameters to be analyzed. The following monitoring program is outlined in the NWB water licence.

Table 1 Water License Monitoring Program

Station	Description	Frequency	Analysis Requirements
ARV-1	Raw water supply at the Wolf River Water Supply prior to treatment	Monthly and annual	Measure and record in cubic metres of water pumped from station
ARV-2	2a) Effluent discharge from the Final Discharge Point of the Solid Waste Disposal Facility 2b) Effluent from the discharge point of the New Solid Waste Disposal Facility	Water Quality	
		Water Quality: Monthly from May to August, Inclusive	<ul style="list-style-type: none"> BOD Faecal Coliforms pH Conductivity Total Suspended Solids Ammonia Nitrogen Nitrate-Nitrite Total Phenols Sulphate Oil and Grease (visual) Sodium Potassium Magnesium Calcium Total Arsenic Total Cadmium Total Copper Total Chromium Total Iron Total Lead Total Mercury Total Nickel Total Zinc
		Biotoxicity	
		Annually	<ul style="list-style-type: none"> Acute toxicity test: Rainbow Trout Acute toxicity test: Daphnia magna
ARV-3	Raw sewage at truck offload point	Monthly and annual	Measure and record in cubic metres the raw sewage offloaded from trucks
ARV-4	Effluent Discharge from Final Discharge Point of the Sewage Disposal Facilities	Water Quality: Monthly from May to August, Inclusive Biotoxicity: Annually	Same as ARV-2
ARV-5	Discharge from the Bulky Metal Waste Area	Monthly during periods of observed flow	Same as quality for ARV-2

Station	Description	Frequency	Analysis Requirements
ARV-6	Discharge from the Hazardous Waste Storage Area	Monthly during periods of observed flow	Same as ARV-2
ARV-7	Water level in Wolf Creek	Monthly during periods of open water	Water level measurements
ARV-8	Water level in Sewage Disposal Facility lagoon	Monthly during thawed conditions	Water level measurements
ARV-9	Sewage Sludge removed from the Sewage Disposal Facility	Monthly	Volume of sludge removed
ARV-10	Effluent from the Final Discharge Point of the Hydrocarbon Impacted Soil Storage and Treatment Facility	To be determined	To be determined
ARV-11	Effluent from discharge from dewatering contaminated soil areas	To be determined	To be determined

The sampling stations need to be clearly identified in the field by posted signs. All signs should be in the Official Languages of Nunavut and be maintained annually. Global Positioning System (GPS) coordinates for each sample location should be recorded.

Samples should be taken at the same location during each sampling event. Sample locations are shown in Figures 1 to 5. Photographs of the locations are shown in Appendix B. If you must move away from the specified sample location for any reason, the change should be documented in your field notes. The licence requires sampling to occur monthly during the months of May to August inclusive. For monthly analysis, it is preferred that sampling occurs at the same time of month each time.

Additional sampling and analysis may be requested by an INAC Inspector or the NWB.

4.0 Preparation for Sampling

4.1 Contact Laboratory

All analyses should be conducted by laboratories that are accredited by the Canadian Association for Laboratory Accreditation Inc. (CALAI) or an alternative accreditation approved by the NWB. A list of CALAI laboratories is included in Appendix C.

Ideally, the same laboratory will be used for sample analysis each sampling event, to ensure consistency in methodology and reporting. Although all accredited laboratory should be able to provide the same result for a particular sample, some variation is expected, which is why consistent laboratory services are recommended.

Analytical methods and accreditation are usually dictated by the guideline criteria being followed. In most cases, the guideline criteria are the Canadian Environmental Quality Guidelines (CCME, 2007). These guidelines specify bottles, hold times, preservatives, sampling protocols, as well as lab accreditation, and analytical methodologies. Prior to any sampling, this information should be reviewed to ensure consistency with regulation and standards.

4.2 Sample Container Selection

Sample containers vary in size and material depending on the specific type of analysis to be conducted. Sample containers to be used can be obtained directly from the laboratory. The laboratory will provide the correct sizes and types of bottles based on the parameters required. A table providing required sample containers and preservation for each required parameter is provided in Appendix D.

The laboratory should be contacted at least one month prior to the sampling event in order to ensure that containers are available for sampling. It would be best to order enough bottles for each sampling event to be completed in the current year. Make sure to request enough coolers for each sampling event. Plans for rapid return of the samples should also be prepared.

5.0 Field Sample Collection

5.1 Field Equipment

Before going out into the field make sure that you have the following equipment:

- Sample bottles
- Cooler
- Marker or pen for labelling bottles
- Field book for field notes
- Rubber boots or waders
- Latex disposable gloves for sampling
- Appropriate clothing for weather.

5.2 Field Notes

A field notebook should be taken out into the field during sampling. The following should be recorded at each sample location at the time of sampling:

- Date of sampling
- Time of sampling
- Weather conditions (Temperature, wind direction etc.)
- Monitoring Station Number (i.e. ARV-1, ARV-2, etc.)
- Results of any field measurements (temperature, pH, conductivity, etc.)
- Preservatives used for samples
- Any unusual conditions
- Any deviation from standard procedures.

When back in office, field notes should be photocopied and filed in the projects records.

5.3 Field Measurements

When collecting samples, field measurements should be recorded in your field notes. Field parameters can be collected using a simple water quality meter. The following parameters are typically recorded in the field during sampling:

- pH
- Temperature
- Conductivity.

Remember to rinse meter between sampling locations. Refer to manufacturer's recommended guidelines for maintenance and storage of instrument.

5.4 Sample Identification

All samples collected are to be labelled according to standard identification procedures (Name of sampler, time and date of sampling, sample identifier, sampling method and type of sample). Sample labels that are water-resistant are preferable. If possible prepare labels prior to going into the field. A permanent marker or pen works best for labelling samples. Do not use a pencil.

Each individual sample should be labelled with the following information:

- Sample ID #
- Monitoring Station Name (e.g. ARV-1)
- Date and time of collection
- Parameter to be analyzed
- Preservatives
- Project number identifier
- Bottle number 1 of ____.

5.5 Surface Water Sampling Procedures

When sampling from streams, creeks or wetlands the samples should be collected as close to the middle of the stream where water flows freely and is free of debris. Stand facing upstream so that the water is flowing toward you. After getting into position, wait to allow any stirred sediment that occurred from entering the stream to settle or wash away.

Fill the sample bottle partially with water and rinse with the lid in place. Empty the rinsed water downstream of the sampling point so that stream sediments remain undisturbed. Rinse bottle three times.

Do not rinse bottles when sampling for oil & grease, bacteria, or if bottles contain preservative.

Where possible, plunge bottles into the stream to a depth of approximately half the total stream depth, and allow it to fill with the mouth of the bottle facing upstream. Avoid floating debris that may contaminate the sample. If the stream is too shallow to allow for sample bottle to be filled completely, without disturbing bottom sediment of the streambed, you may use a smaller container that has been properly rinsed three times to transfer sample to the larger bottle. Do not use a smaller sample bottle containing preservatives.

When taking the sample, make sure to leave sufficient room to allow for the addition of preservatives, if required. If preservative is in bottle, make sure note to overflow bottle as this will dilute the preservative.

When sampling from lakes or ponds the same procedure as outline above may be used. Sample bottles shall be plunged to approximately 150 mm (6 inches) below the water surface.

Things to Note When Sampling

- Always wear clean disposable gloves. Change gloves between sample locations
- Do not smoke while sampling.

5.6 Sample Preservation

Some parameters require preservatives to prevent chemical changes that may alter the concentration of the parameters of interest.

In most cases the bottles provided by the lab will have the preservative in the bottle already. Some labs will provide the preservatives separately to be added after sample collection. Instructions for preserving should be provided by the lab. If they are not, contact the lab to get the proper volumes for the bottles they have provided. The samples must be preserved within two hours of sampling. Usually, samples can be preserved away from the field at the end of the site visit. Make sure that when handling preservatives, proper personal protection equipment is used including gloves and eye protection. Preservatives should also be stored according to label directions.

5.7 Bioassay Toxicity Testing

Acute toxicity testing for rainbow trout and *Daphnia magna* are required annually at ARV-2 and ARV-4. Samples are collected using 23 L pails with polyethylene liners.

The following steps should be completed when collecting this kind of sample:

- Place the polyethylene liner inside the 23 L bucket
- Rinse the liner with the sample to be collected three times, then fill completely
- If sample cannot be directly collected in the sample pail, a clean, non toxic container must be used for transferring the sample to the pail
- Rinse small clean container three times then pour into pail until liner is full
- Expel any trapped air before closing the liner with the cable tie
- Seal each bucket tightly with the lid provided
- Fill out the shipping label completely and attach to the pails (not to the lid)

October 2010

- Fill out the sample Chain-of-Custody (CofC) form making sure to include sample description (e.g. creek water), date and time of collection and the name (please print) and signature of the person(s) collecting the samples
- Indicate the analyses required (e.g. rainbow trout single concentration (SC) test)
- Ship the samples immediately to the laboratory.

The minimum sample volume requirement is one 23 L pail. One 23 L pail of water can be used for both the rainbow trout test and the Daphnia magna tests. The sample storage time is 5 days (max). It is advisable to ship/deliver the samples to the lab immediately after sampling to minimize the sample storage time (i.e. total time from collection of the sample to initiation of the test). For shipping, find a cooler that the pail will fit into. To ensure samples are kept cool, freezer packs or ice can be put inside the cooler or pail.

Samples preservation is not needed if sample transport time is < 48 hours (i.e. arrival at laboratory within 48 hr). If transport time is >48 hours, samples must be kept at a temperature of 1 to 8°C. Samples should be shipped immediately to a certified toxicology lab (Appendix C).

6.0 Handling, Storage, and Transportation

The main objective of the sampler is to minimize any chemical changes to the sample between the time it is collected and delivery to the laboratory. Heat, light and agitation can all impact the water chemistry. To obtain good results from a sampling program, time is critical.

All samples should be shipped to the Laboratory that has been contracted to carry out the analysis the same day as they are collected. If samples cannot be shipped until the next day, due to unavoidable events such as weather or mechanical problems with transport aircraft, all samples must be stored in a refrigerator at 4°C. Samples must not be frozen.

- Effluent and surface water samples need to be stored and transported at a temperature of 4°C
- Use an insulated cooler and ice packs to keep samples at a temperature of 4°C. Coolers and ice packs are usually provided by the laboratory
- Samples must be protected from breakage. Glass bottles should be wrapped in bubble wrap.

Chain of Custody Form

A Chain of Custody (CofC) form is the form that tells the lab what samples have been shipped to them and what analysis is requested. It also provides key information to the lab such as date and time sampled and where the sample results are to be sent. Always include a chain of custody form with your samples. An example is provided in Appendix E. Retain a copy of chain of custody forms while samples are en route to lab. The lab will likely send confirmation that samples were received at lab. The chain of custody can then be filed in project records.

Transporting Samples by Courier

When you cannot deliver the samples to the lab by person and must depend on a courier to transport your samples it is imperative to pack the samples in a way that will prevent breakage or contamination during transport.

- Line an insulated cooler with a large garbage bag
- Place samples in cooler, each set of bottles in a sealed zip lock bag
- Avoid packing glass on glass. Glass bottles should be wrapped in bubble wrap
- Fill around samples with ice packs or a bag of ice
- Make sure that bottles are secure and will not move around with transport
- Tie garbage bag and put Chain of Custody form in zip lock bag on top

Environmental Monitoring Training Manual

October 2010

- Using packing tape, wrap the cooler several times
- Ensure that the shipping slip is visible and cannot be removed.

7.0 Quality Control

Quality Control (QC) is a set of specific procedures used to measure the quality of the data produced and correct deficiencies in the sampling or analyses, as they occur. Quality control is used by the analyst and sampler to achieve standards of measurement for the three principles components of quality: precision, accuracy and reliability.

Most commercial laboratories undertake QA/QC (quality assurance/quality control) procedures with the volume of sample sent for analysis. Reports are usually provided with the Certificates of Analysis. It is recommended that the suggested QA/QC protocols by the laboratory be followed.

To ensure that the monitoring program maintains accepted quality control, field blanks and duplicate samples may be suggested by the laboratory. These samples are collected and analyzed for the sample parameters as the monitoring program in the license as part of a quality control check on monitoring activities.

7.1 Field Blanks

Field Blanks are samples that the lab uses to identify any environmental impacts caused during sample collection or sample transportation. The lab will supply a bottle filled with distilled water. Take the field blank bottles into the field with you and open at the location you collect the sample. Label and preserve in the same place as your field samples. Submit the field blank with your samples and remember to include on the chain of custody.

7.2 Replicate or Duplicate Samples

Replicate or duplicate samples involve collecting more than one sample for a given sampling station subject to specific analysis. Standard procedures used for the routine sampling shall be applied. The replicate or duplicate samples are useful in identifying problems with accuracy and sampling methods. Make sure to record in your field book the location the duplicate sample was taken. Duplicates should be recorded on the Chain of Custody as Dup 1, Dup 2 etc. The time and location of sample should not be provided on the Chain of Custody.

Once per operating season for each active monitoring station a set of duplicate samples should be taken, representing as many of the routine analysis as possible. Where possible this should be carried out in conjunction with the sampling undertaken by an INAC Inspector.

8.0 Water Volume and Water Level Measurements

The NWB license includes measuring the monthly and annual volume of water pumped from Wolf Creek (ARV-1). This can be accomplished in several ways such as:

- Accurate recording of pump on and off times in a log, and periodic measurements of a timed discharge into a known volume (45 gal drum)
- Accurate measurements of the volume of the water reservoir and calculations of how much volume each cm of water level raise represents at various depths. As the level rises the volume pumped can be calculated.

The NWB license includes (ARV-7) monitoring the water level in Wolf River monthly during periods of open water. This can be accomplished by using a rod and level to measure the water level from the established datum on the front of the pumphouse skid.

The water level in the sewage lagoon (ARV-8) can be measured with a rod and level from the datum established on the truck stop plate at the discharge point. The photos in Appendix H show the locations of the sampling points and measuring points.

Measuring a water level from an established datum (fixed point of known elevation) can be easily accomplished using a rod and level as follows:

- Set up the level at a position where it can easily sight on the datum and the water to be measured
- Place the stadia rod on the datum and record the reading
- Place the stadia rod on the surface of the water and record the reading
- The datum elevation plus the datum stadia rod reading minus water level stadia rod reading will give the elevation of the water level.

A sample calculation is provided below:

$$E_{wl} = E_{bm} - (X_{wl} - X_{bm})$$

E_{bm} = Benchmark Elevation

X_{bm} = Reading at Benchmark

X_{wl} = Reading at water level

E_{wl} = Water Level Elevation

The datum bench mark elevations (metres above sea level) are as follows:

Environmental Monitoring Training Manual

October 2010

- Sewage lagoon, ARV-8 at the top of the north edge of the steel truck stop – 14.18 masl
- Wolf Creek, ARV-7 at the top of the southeast side skid of the pumphouse – 8.53 masl.

October 2010

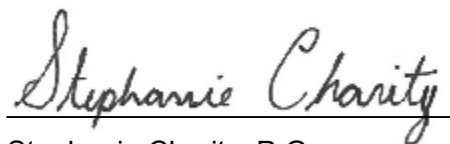
9.0 Reporting

The samples collected will be used for inclusion in the NWB Annual Report. All laboratory results should be sent to the Hamlet. The results will include the sample parameter and the limit of detection used for analysis. The laboratory results are compared to the limits of the Water Licence for each parameter, and/or to other comparative criteria such as the Canadian Environment Water Quality Guidelines. A copy of these guidelines is included in Appendix F. The results should be recorded and filed to use for preparation of the NWB Annual Report. A copy of the NWB Annual Report Form and a template report is included in Appendix G.

The content of the Annual Report and regulatory guideline criteria is outlined in the following documents:

- Solid Waste Management Facility Operations and Maintenance Plan
- Sewage Treatment Facility Operations and Maintenance Plan
- Water Supply Facility Operations and Maintenance Plan.

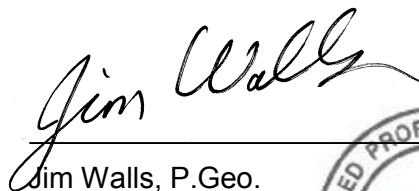
Respectfully Submitted:



Stephanie Charity, P.Geo.

December 24, 2010

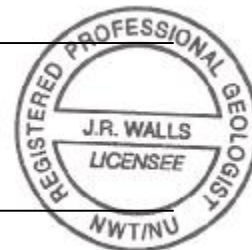
Date



Jim Walls, P.Geo.

December 24, 2010

Date



10.0 References

Addendum: Environmental Emergency Contingency Plan, Nuna Burnside Engineering and Environmental, December 2010.

Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil, Canadian Council of Ministers of the Environment, Winnipeg. May 1, 2001, Revised January 2008.

Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health: Summary Table, Updated September, 2007. In: Canadian Environmental Quality Guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg.

Canadian Water Quality Guidelines for the Protection of Aquatic Life: Summary Table, Updated September, 2007. In: Canadian Environmental Quality Guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg.

Environmental Monitoring and Quality Assurance and Quality Control Plan, Nuna Burnside Engineering and Environmental, December 2010.

Hamlet of Arviat Water License 3AM-ARV1015. Gjoa Haven, Nunavut. Nunavut Water Board. 23 Aug 2010.

Indian and Northern Affairs Canada, Inspection Report, Arviat, September 3, 2010.

Old Sewage Lagoons Abandonment and Restoration Plan, Nuna Burnside Engineering and Environmental, December 2010.

Sewage Disposal Facility Report, Nuna Burnside Engineering and Environmental, December 2010.

Solid Waste Management Report, Nuna Burnside Engineering and Environmental, December 2010.

Solid Waste Management Facility Abandonment and Restoration Plan, Nuna Burnside Engineering and Environmental, December 2010.

Wolf River Water Intake Impact Assessment, Nuna Burnside Engineering and Environmental, December 2010.

Figures



FIGURE 1

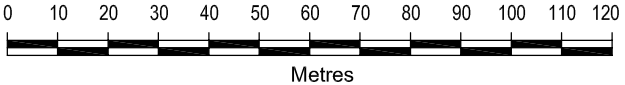
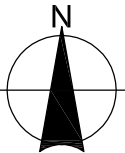
HAMLET OF ARVIAT
HAMLET OF ARVIAT, NUNAVUT
ENVIRONMENTAL MONITORING TRAINING MANUAL

WATER SUPPLY FACILITY
MONITORING LOCATIONS

LEGEND

- MONITORING STATION LOCATION
- ▶ WATER FLOW DIRECTION

Satellite Image Source:
Background colour satellite image obtained from Google Earth Pro. © Google Earth
Pro: Image © 2010 DigitalGlobe, Photo Date: July, 2006



1:1,500
October 2010
Project Number: N-015746
Prepared by: C. Dickie
Projection: UTM Zone 15
Datum: NAD83
Verified by: S. Charity





FIGURE 2

HAMLET OF ARVIAT
 HAMLET OF ARVIAT, NUNAVUT
 ENVIRONMENTAL MONITORING TRAINING MANUAL

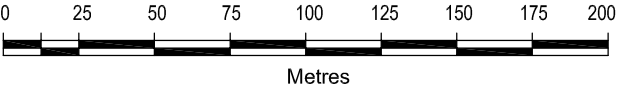
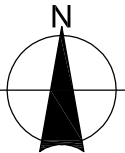
SEWAGE TREATMENT FACILITY
 MONITORING LOCATIONS

LEGEND

● MONITORING STATION LOCATION

Satellite Image Source:
 Quickbird Satellite Image ©Digital Globe Inc., Date 2008

Map Source:
 Background physical features obtained from the National Topographic Database Website.



1:2,500
 December 2010
 Project Number: N-015746

Projection: UTM Zone 15
 Datum: NAD83
 Verified by: J. Walls





FIGURE 3

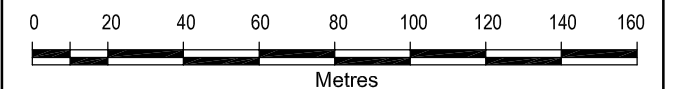
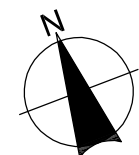
HAMLET OF ARVIAT
HAMLET OF ARVIAT, NUNAVUT
ENVIRONMENTAL MONITORING TRAINING MANUAL

SOLID WASTE MANAGEMENT FACILITY - MONITORING LOCATIONS - LANDFILL

LEGEND

● MONITORING STATION LOCATION

Satellite Image Source:
Quickbird Satellite Image ©Digital Globe Inc., Date 2008



1:2,000
December, 2010
Project Number: N-O157460

Projection: UTM Zone 15
Datum: NAD83

Prepared by: C. Dickie

Verified by: S. Charity

ᑎᓂᓂᓂ **BURNSIDE**



FIGURE 4

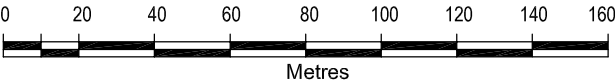
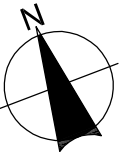
HAMLET OF ARVIAT
HAMLET OF ARVIAT, NUNAVUT
ENVIRONMENTAL MONITORING TRAINING MANUAL

SOLID WASTE MANAGEMENT
FACILITY - MONITORING
LOCATIONS - BULKY
METALS WASTE AREA

LEGEND

● MONITORING STATION LOCATION

Satellite Image Source:
Quickbird Satellite Image ©Digital Globe Inc., Date 2008



1:2,000
December, 2010
Project Number: N-O157460

Projection: UTM Zone 15
Datum: NAD83

Prepared by: C. Dickie

Verified by: S. Charity





FIGURE 5

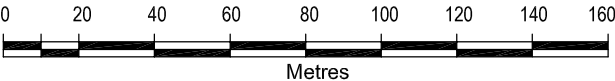
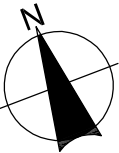
HAMLET OF ARVIAT
HAMLET OF ARVIAT, NUNAVUT
ENVIRONMENTAL MONITORING TRAINING MANUAL

SOLID WASTE MANAGEMENT
FACILITY - MONITORING
LOCATIONS - HAZARDOUS
WASTE STORAGE AREA

LEGEND

● MONITORING STATION LOCATION

Satellite Image Source:
Quickbird Satellite Image ©Digital Globe Inc., Date 2008



1:2,000
October, 2010
Project Number: N-O157460
Prepared by: C. Dickie
Projection: UTM Zone 15
Datum: NAD83
Verified by: S. Charity



Appendix A
Nunavut Water Board License
– 3AM-ARV1015



NUNAVUT WATER BOARD

WATER LICENCE NO: 3AM-ARV1015

Hamlet of Arviat, Nunavut



NUNAVUT WATER BOARD

LICENCE NO: 3AM-ARV1015

TABLE OF CONTENTS

WATER LICENCE No. 3AM-ARV1015	1
PART A: SCOPE, DEFINITIONS AND ENFORCEMENT	2
1. SCOPE	2
2. DEFINITIONS	2
3. ENFORCEMENT	5
PART B: GENERAL CONDITIONS	5
PART C: CONDITIONS APPLYING TO WATER USE AND MANAGEMENT	8
PART D: CONDITIONS APPLYING TO WASTE DISPOSAL AND MANAGEMENT	9
PART E: CONDITIONS APPLYING TO MODIFICATIONS AND CONSTRUCTION	11
PART F: CONDITIONS APPLYING TO OPERATIONS AND MAINTENACE	12
PART G: CONDITIONS APPLYING TO ABANDONMENT, RESTORATION AND CLOSURE	14
PART H: CONDITIONS APPLYING TO THE MONITORING PROGRAM	15



NUNAVUT WATER BOARD

WATER LICENCE No. 3AM-ARV1015

Pursuant to the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* and the *Agreement Between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada*, the Nunavut Water Board, hereinafter referred to as the Board, hereby grants to

HAMLET OF ARVIAT

(Licensee or Applicant)

ARVIAT, NUNAVUT X0C 0E0

(Mailing Address)

hereinafter called the Licensee, the right to alter, divert or otherwise use water or dispose of waste for a period subject to restrictions and conditions contained within this Licence:

Licence Number/Type: 3AM-ARV1015 TYPE "A"

Water Management Area: NUNAVUT 06

Location: ARVIAT, KIVALLIQ REGION, NUNAVUT
LATITUDE: 61° 06' 30" N, LONGITUDE: 94° 03' 31" W

Classification: MUNICIPAL UNDERTAKING

Purpose: DIRECT USE OF WATER AND DEPOSIT OF WASTE

Quantity of Water use not to Exceed: EIGHTY-SIX THOUSAND (86,000)
CUBIC METRES PER ANNUM

Date of Licence Issuance: AUGUST 23, 2010

Expiry of Licence: AUGUST 31, 2015

This Licence, issued and recorded at Gjoa Haven, Nunavut, includes and is subject to the annexed conditions.

Thomas Kabloona,
Nunavut Water Board
Chair

APPROVED
BY:

Minister of Indian and
Northern Affairs
Canada

DATE LICENCE APPROVED:

PART A: SCOPE, DEFINITIONS AND ENFORCEMENT

1. SCOPE

- a. This Licence allows for the use of Water and disposal of Waste including operation of a Water Supply Facility, Solid Waste Disposal Facility, Hazardous Waste Storage Area, Bulky Metals Area, and Sewage Disposal Facility; as well as construction and operation of a New Solid Waste Disposal Facility and/or Hydrocarbon Impacted Soil Storage and Treatment Facility, upon approval by the Board, by the Hamlet of Arviat, Nunavut for a municipal undertaking (Latitude 61° 06' 30" N and Longitude 94° 03' 31" W);
- b. This Licence is issued subject to conditions contained herein with respect to the taking of Water and the depositing of Waste of any type in any Waters or in any place under any conditions where such Waste or any other Waste that results from the deposits of such Waste may enter any Waters. Whenever new regulations are made or existing regulations are amended by the Governor in Council under the Act, or other statutes imposing more stringent conditions relating to the quantity, type or manner under which any such Waste may be so deposited, this Licence shall be deemed to be subject to such requirements; and
- c. Compliance with the terms and conditions of this Licence does not absolve the Licensee from responsibility for compliance with all applicable legislation, guidelines and directives.

2. DEFINITIONS

In this Licence, these definitions apply and changes may be made at the discretion of the Board.

“Act” means the *Nunavut Waters and Nunavut Surface Rights Tribunal Act*;

“Amendment” means a change to original terms and conditions of this Licence requiring correction, addition or deletion of specific terms and conditions of the Licence and/or modifications inconsistent with the terms of the set terms and conditions of the Licence;

“Analyst” means an Analyst designated by the Minister under Section 85 (1) of the Act;

“Applicant” means the Licensee;

“Appurtenant undertaking” means an undertaking in relation to which a use of Waters or a deposit of Waste is permitted by a licence issued by the Board;

“Board” means the Nunavut Water Board established under the *Nunavut Land Claims Agreement*;

“Bulky Metals Area” comprises the area and associated structures designed to contain bulky metal waste as described in the Application for Water Licence Renewal filed by the Applicant on January 5, 2009;

“Effluent” means treated or untreated liquid waste material that is discharged into the environment from a structure such as a settling pond or a treatment plant;

“Engineer” means a professional engineer registered to practice in Nunavut in accordance with the *Consolidation of Engineers and Geoscientists Act S. Nu 2008, c.2* and the *Engineering and Geoscience Professions Act S.N.W.T. 2006, c.16 Amended by S.N.W.T. 2009, c.12*;

“Final Discharge Point” in respect of an Effluent, means an identifiable discharge point of a facility beyond which the operator of the facility no longer exercises control over the quality of the Effluent;

“Freeboard” means the vertical distance between water line and the designed maximum operating height on the crest of a dam or dyke’s upstream slope;

“Geotechnical Engineer” means a professional engineer registered with the Northwest Territories and Nunavut Association of Professional Engineers and Geoscientists and whose principal field of specialization is with the engineering properties of earth materials in dealing with man-made structures and earthworks that will be built on a site. These can include shallow and deep foundations, retaining walls, dams, and embankments;

“Grab Sample” means a single Water or wastewater sample taken at a time and place representative of the total discharge;

“Greywater” means all liquid wastes from showers, baths, sinks, kitchens and domestic washing facilities, but does not include toilet wastes;

“Hazardous Waste” means waste classified as “hazardous” by Nunavut Territorial or Federal legislation, or as “dangerous goods” under the *Transportation of Dangerous Goods Act*;

“Hazardous Waste Storage Area” comprises the area and associated structures designed to contain Hazardous Waste as described in the Application for Water Licence Renewal filed by the Applicant on January 5, 2009;

“Hydrocarbon Impacted Soil Storage and Treatment Facility” means an area designed to treat Petroleum Hydrocarbon-Impacted Soil, as referred to in the Application for Water Licence Renewal filed by the Applicant on January 5, 2009;

“Inspector” means an Inspector designated by the Minister under Section 85 (1) of the Act;

“Licensee” means the holder of this Licence;

“Modification” means an alteration to a physical work that introduces a new structure or eliminates an existing structure and does not alter the purpose or function of the work, but does not include an expansion, and changes to the operating system that are consistent with the terms of this Licence and do not require amendment;

“Monitoring Program” means a monitoring program established to collect data on surface Water and groundwater quality, Waste and Waste deposition, to assess impacts to the freshwater aquatic environment of an appurtenant undertaking;

“New Solid Waste Disposal Facility” comprises the area and associated structures designed to contain solid waste as referred to in the Application for Water Licence Renewal filed by the Applicant on January 5, 2009;

“Nunavut Land Claims Agreement” (NLCA) means the “*Agreement Between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada*”, including its preamble and schedules, and any amendments to that agreement made pursuant to it;

“Petroleum Hydrocarbon Impacted Soil” means soil in which the primary petroleum product present, as determined by laboratory analysis consistent with that described in the *Canada-Wide Standards for Petroleum Hydrocarbons in Soil*, generally consists of fuel oil, diesel fuel, gasoline and/or jet fuel;

“Sewage” means all Toilet Wastes and Greywater;

“Sewage Disposal Facilities” comprises the area, including wetland and engineered lagoon designed to contain Sewage as described in the Application for Water Licence filed by the Applicant on September 2, 2003, and illustrated in Arviat Sewage Lagoon drawings prepared by FSC Architects and Engineers for Government of Nunavut, Job No. 507-340, FSC Project No. 2003-0440-003, Submission for Tender July 11th, 2003;

“Sewage Sludge” means the semi-solid Sewage material which settles at the bottom of the Sewage lagoon;

“Solid Waste Disposal Facilities” comprises the area and associated structures designed to contain solid waste as described in the Application for Water Licence filed by the Applicant on September 2, 2003;

“Toilet Wastes” means all human excreta and associated products, but does not include Greywater;

“Waste” means, as defined in section 4 of the Act, any substance that, by itself or in combination with other substances found in Water, would have the effect of altering the quality of any Water to which the substance is added to an extent that is detrimental to its use by people or by any animal, fish or plant, or any Water that would have that effect because of the quantity or concentration of the substances contained in it or because it has been treated or changed, by heat or other means;

“Waste Disposal Facilities” means all facilities designated for the disposal of Waste including the Sewage Disposal Facilities, Solid Waste Disposal Facilities, Hazardous Waste Storage Area, Bulky Metals Area, and upon approval by the Board, New Solid Waste Disposal Facility, and/or Hydrocarbon Impacted Soil Storage and Treatment Facility, as described in the Application for Water Licence Renewal filed by the Applicant on January 5, 2009;

“Water” means water as defined in section 4 of the Act;

“Water Supply Facilities” comprises the area and associated intake infrastructure at the Wolf River Water Supply, as described in the Application for Water Licence Renewal filed by the Applicant on January 5, 2009 and illustrated in Arviat Water Supply Filtration Upgrade drawings prepared by Dillon Consulting for Government of Nunavut Public Works and Services, Issued for Tender, April 2008, Project No. 078254; Figure 4 – Hamlet of Arviat Water Licence Submission Wolf River Water Intake drawing prepared by Nuna Burnside, December 2008, Project Number N-O15746;

“Work Plan” refers to the electronic document (letter) from Jim Walls, P.Geo., Nuna Burnside Engineering and Environmental Ltd., to Bryan Purdy, Government of Nunavut Community Government Services, Re: Work Plan to Address INAC, DFO, and NWB Licence Compliance Issues GN File 08-3025 Hamlet of Arviat, Nunavut File No. N-0 15746.1, dated June 23, 2010.

3. ENFORCEMENT

- a. Failure to comply with this Licence will be a violation of the Act, subjecting the Licensee to the enforcement measures and the penalties provided for in the Act.
- b. All inspection and enforcement services regarding this Licence will be provided by Inspectors appointed under the Act.
- c. For the purpose of enforcing this Licence and with respect to the use of Water and deposit or discharge of Waste by the Licensee, Inspectors appointed under the Act, hold all powers, privileges and protections that are conferred upon them by the Act or by other applicable law.

PART B: GENERAL CONDITIONS

1. This Licence incorporates a previously issued Type B licence, NWB3ARV0308, to the Hamlet of Arviat, which allowed for the use of water and disposal of waste.
2. In the event of a conflict between the previously issued Type B licences and this Type A Licence, the condition of this Type A Licence prevails.
3. The Licensee shall file an annual report with the Board for review, no later than March 31st

of the year following the calendar year being reported, which shall contain the following information collected during that period:

- a. Tabular summaries of all data generated under the Monitoring Program;
 - b. The monthly and annual quantities of freshwater obtained from all sources;
 - c. The monthly and annual quantities of Wastes removed for disposal from Water Supply Facilities and Waste Disposal Facilities;
 - d. A summary of modifications and/or major maintenance work carried out on Water Supply Facilities and Waste Disposal Facilities including all associated structures and facilities;
 - e. A list of unauthorized discharges and summary of follow-up actions taken;
 - f. Any revisions to approved plans and manuals as required by Part B, Item 12, submitted in the form of an addendum;
 - g. A summary of the status of implementation of the Work Plan, including an indication of the status of the funding required to carry out the Work Plan and an estimated timeframe for receipt of the necessary funding;
 - h. A fiscal update of the Licensee's funding commitments associated with all facilities governed by this Licence including all associated structures and facilities for the upcoming year and identifying shortfalls in such funding commitments for the previous year;
 - i. A summary of abandonment and restoration work completed during the year and an outline of any work anticipated for the next year;
 - j. A summary of any studies, reports and plans requested by the Board that relate to Waste disposal, Water use or reclamation, and a brief description of any future studies planned; and
 - k. Any other details on water use or waste disposal requested by the Board by November 1st of the year being reported.
4. The Licensee shall comply with the Monitoring Program described in this Licence and any Amendments to the Monitoring Program as may be made from time to time, pursuant to the conditions of this Licence.
 5. The Monitoring Program and compliance dates specified in the Licence may be modified at the discretion of the Board.
 6. Metres, devices or other such methods used for measuring the volumes of Water used and Waste discharged, shall be installed, operated and maintained by the Licensee to the satisfaction of an Inspector.
 7. The Licensee shall, within ninety (90) days after the first visit by the Inspector following approval of this Licence, post the necessary signs, to identify the stations of the Monitoring Program. All signage postings shall be in Inuktitut and English.
 8. The Licensee shall, for all plans submitted under this Licence, include a proposed timetable for implementation. Plans submitted, cannot be undertaken without subsequent written Board approval and direction. The Board may alter or modify a plan if necessary to

achieve the legislative objectives and will notify the Licensee in writing of acceptance, rejection or alteration of the plan.

9. In the event that a plan is not found acceptable to the Board, the Licensee shall, within thirty (30) days of notification by the Board, provide a revised version to the Board, for approval in writing.
10. The Licensee shall, for all plans submitted under this Licence, implement the plan as approved by the Board in writing.
11. Every plan to be carried out pursuant to the terms and conditions of this Licence shall become a part of this Licence, and any additional terms and conditions imposed upon approval of a plan by the Board become part of this Licence. All terms and conditions of the Licence should be contemplated in the development of a plan where appropriate.
12. The Licensee shall review the plans and manuals referred to in this Licence as required by changes in operation and/or technology and revise accordingly. Revisions to the plans or manuals are to be submitted in the form of an addendum to be included with the annual report required by Part B, Item 3, complete with a revisions list detailing where significant content changes are made.
13. The Licensee shall ensure a copy of this Licence is maintained at the municipal office and at the site of operation at all times.
14. Any communication with respect to this Licence shall be made in writing to the attention of:

Manager of Licensing
Nunavut Water Board
P. O. Box 119
Gjoa Haven, NU X0B 1J0
Telephone: (867) 360-6338
Fax: (867) 360-6369
Email: licensing@nunavutwaterboard.org

15. Any notice made to an Inspector shall be made in writing to the attention of:

Water Resources Officer
Nunavut District, Nunavut Region
P.O. Box 100
Iqaluit, NU X0A 0H0
Telephone: (867) 975-4295
Fax: (867) 979-6445

16. The Licensee shall submit one (1) paper copy and one (1) electronic copy of all reports, studies, and plans to the Board or as otherwise requested by the Board. Reports or studies submitted to the Board by the Licensee shall include an executive summary in English and

Inuktitut.

17. The Licensee shall ensure that any document(s) or correspondence submitted by the Licensee to the Board, is received by the Board and maintain on file a copy of the acknowledgment of receipt issued by the Manager of Licensing.
18. This Licence is assignable as provided for in Section 44 of the Act.
19. The expiry or cancellation of this Licence does not relieve the Licensee from any obligation imposed by the Licence, or any other regulatory requirement.
20. The Licensee shall file a Water Licence Renewal Application with the Board no later than September 1, 2014.

PART C: CONDITIONS APPLYING TO WATER USE AND MANAGEMENT

1. The Licensee shall obtain all freshwater from Wolf River at Monitoring Program Station ARV-1 as otherwise approved by the Board in writing.
2. The annual quantity of water used for all purposes shall not exceed eighty-six thousand (86,000) cubic metres per annum, or as otherwise approved by the Board in writing.
3. The Licensee shall equip all water intake hoses with a screen of an appropriate mesh size to ensure that fish are not entrained and shall withdraw Water at a rate such that fish do not become impinged on the screen.
4. The Licensee shall submit to the Board for approval in writing by December 31, 2010, as-built drawings stamped and signed by an Engineer confirming compliance with the DFO guideline "Freshwater Intake End of Pipe Fish Screen Guideline". The drawings shall include information regarding the operating capacity of the pump used and the intake screen size.
5. The Licensee shall not remove any material from below the ordinary high water mark of any Water body.
6. The Licensee shall not cause erosion to the banks of any body of Water and shall provide necessary controls to prevent such erosion.
7. Sediment and erosion control measures shall be implemented prior to and maintained during construction and operation to prevent entry of sediment into Water.
8. The Licensee shall submit to the Board for review by December 31, 2010, the Water balance assessment for Wolf River and an assessment of the potential effects of drawdown of Wolf River on the aquatic environment. The assessment shall include recommended mitigation measures and an implementation schedule.

9. The Licensee shall maintain the Water Supply Facilities to the satisfaction of the Inspector.

PART D: CONDITIONS APPLYING TO WASTE DISPOSAL AND MANAGEMENT

1. The Licensee shall direct all Sewage to the Sewage Disposal Facility.
2. All Effluent discharged from the Sewage Disposal Facilities at Monitoring Program Station ARV-4 shall not exceed the following Effluent quality limits, or as otherwise approved by the Board in writing:

Parameter	Maximum Concentration of any Grab Sample
Fecal Coliform	1×10^4 CFU/dl
BOD ₅	80 mg/l
Total Suspended Solids	100 mg/l
Oil and Grease	No visible sheen
pH	Between 6 and 9

3. A Freeboard limit of 1.0 metre, or as recommended by a qualified Geotechnical Engineer and as approved by the Board in writing, shall be maintained at all dams, dyke or structures intended to contain, withhold, divert or retain Water or Wastes.
4. The Licensee shall provide at least ten (10) days notification to an Inspector, prior to initiating any planned discharges from any Waste Disposal Facility.
5. The Licensee shall submit to the Board for approval in writing by December 31, 2010, a Sewage Disposal Facility Report. The Report shall include:
- As-built drawings and design plans of the Sewage Disposal Facility (including the lagoon and wetland) signed and stamped by an Engineer;
 - A preliminary discharge and wetland hydrology assessment;
 - The results of an inspection by a Geotechnical Engineer of the Sewage Disposal Facility lagoon including its berms and an evaluation of the impact of sewage seepage through the lagoon berms on the environment;
 - An evaluation of the long term impacts of the Sewage Disposal Facility on the environment;
 - A Sludge Management Plan that addresses sludge assessment and disposal methods. The Plan shall be incorporated in to the Sewage Disposal Facility Operations and Maintenance Manual referred to in Part F Item 1b;
 - Recommended measures to optimize the Sewage Disposal Facility; and
 - A schedule for implementing recommended measures.
6. The Licensee shall, prior to commissioning of the New Solid Waste Disposal Facility, or as otherwise approved by the Board in writing:

- a. Dispose of and contain all non-Hazardous, non-bulky metal, solid Waste at the Solid Waste Disposal Facility;
 - b. Dispose of and contain all bulky metal Waste at the Bulky Metals Area; and
 - c. Segregate and securely store all hazardous materials and Hazardous Waste within the Hazardous Waste Storage Area in a manner as to prevent the deposit of deleterious substances into any Water, until such a time that the materials have been removed for proper disposal at a licensed facility.
7. The Licensee shall not open burn plastics, wood treated with preservatives, electric wire, styrofoam, asbestos or painted wood to prevent the deposition of Waste materials of incomplete combustion and/or leachate from contaminated ash residual, from impacting any surrounding Waters, or as otherwise approved by the Board in writing.
8. The Licensee shall maintain records of all Waste removed from site and records of confirmation of proper disposal of removed Waste. These records shall be made available to an Inspector upon request.
9. The Licensee shall store and contain all Petroleum Hydrocarbon Impacted Soil in a manner as to prevent the deposit of deleterious substances into any Water.
10. The Licensee shall submit to the Board for approval in writing, at least sixty (60) days prior to the commissioning of a Hydrocarbon Impacted Soil Storage and Treatment Facility, a Hydrocarbon Impacted Soil Storage and Treatment Facility Management Plan including proposed Effluent quality limits for Monitoring Program Station ARV-10.
11. The Licensee shall dispose of all Effluent from contaminated soil areas and the Hydrocarbon Impacted Soil Storage and Treatment Facility, that exceed Effluent quality limits approved by the Board in Part D Item 14 (c) and Part D Item 10 respectively, off site at a licensed hazardous waste facility, or as otherwise approved by the Board in writing.
12. The discharge locations for all treated Effluents from the Hydrocarbon Impacted Soil Storage and Treatment Facility and contaminated soil areas shall be located at a minimum of thirty one (31) metres from the ordinary high water mark of any Water body and where direct or indirect flow into a Water body is not possible and no additional impacts are created.
13. The Licensee shall, prior to the removal of any treated soil from the Hydrocarbon Impacted Soil Storage and Treatment Facility, obtain written documentation from the Government of Nunavut Environmental Protection Service, confirming that the soils have been treated in accordance with the Government of Nunavut's "*Environmental Guideline for Contaminated Site Remediation, 2009*" for its intended use.
14. The Licensee shall submit to the Board for approval in writing by December 31, 2010, a Solid Waste Management Report. The Report shall include:

- a. As-built drawings of the Solid Waste Disposal Facility, Hazardous Waste Storage Area, and Bulky Metals Area, signed and stamped by an Engineer;
 - b. Capacity assessment of the Solid Waste Disposal Facility;
 - c. An inventory and assessment of contaminated soil and water at the Solid Waste Disposal Facility, Bulky Metals Area, and Hazardous Waste Storage Area, and a plan for the treatment and disposal of contaminated soil and water including proposed Effluent quality limits for Monitoring Program Station ARV-11;
 - d. Recommendations for Water and wastewater containment, treatment, and drainage control. This Plan shall be incorporated into the Solid Waste Disposal Facility Operations and Maintenance Plan referred to in Part F Item 2d.
 - e. Recommended measures to optimize solid waste management; and
 - f. A schedule for implementing recommended measures.
15. Licensee shall implement measures to ensure hazardous materials and/or leachate from the Waste Disposal Facilities does not enter Water.
 16. Licensee shall, annually between the months of June and September, undertake a geotechnical inspection to be carried out by a Geotechnical Engineer that takes into account all facilities intended to contain, withhold, divert or retain Water or Wastes. The inspection shall be conducted in accordance with the Canadian Dam Safety Guidelines, where applicable.
 17. The Licensee shall, within sixty (60) days of completion of the geotechnical inspection referred to in Part D, Item 16, submit to the Board for review, the Geotechnical Engineer's inspection Report. The Licensee shall include a cover letter outlining an implementation plan to address the recommendations of the Geotechnical Engineer.
 18. The Licensee shall maintain and operate all Water Supply Facilities and Waste Disposal Facilities in such a manner as to prevent structural failure.

PART E: CONDITIONS APPLYING TO MODIFICATIONS AND CONSTRUCTION

1. The Licensee shall, at least sixty (60) days prior to construction of the New Solid Waste Disposal Facility and/or the Hydrocarbon Impacted Soil Storage and Treatment Facility, or any dams, dykes or structures intended to contain, withhold, divert or retain Water or Wastes, submit to the Board, for approval in writing, final design Plans and construction drawings signed and stamped by an Engineer.
2. The Licensee shall obtained approval from the Board in writing prior to the construction of any dams, dykes or structures intended to contain, withhold, divert or retain Water or Wastes.
3. The Licensee may, without written approval from the Board, carry out Modifications provided that such Modifications are consistent with the terms of this Licence and the following requirements are met:

- a. The Licensee has notified the Board in writing of such proposed Modifications at least sixty (60) days prior to beginning the Modifications to include:
 - i. A description of the facilities and/or works to be constructed;
 - ii. The proposed location of the structure(s);
 - iii. Identification of any potential impacts to the receiving environment;
 - iv. A description of any monitoring required, including sampling locations, parameters measured and frequencies of sampling;
 - v. Schedule for construction;
 - vi. Drawings of engineered structures signed and stamped by an Engineer; and
 - vii. Proposed sediment and erosion control measures.
 - b. The proposed Modifications do not place the Licensee in contravention of the Licence or the Act;
 - c. The Board has not, within sixty (60) days following notification of the proposed Modifications, informed the Licensee that review of the proposal will require more than sixty (60) days; and
 - d. The Board has not rejected the proposed Modifications;
4. Modifications for which any of the conditions referred to above have not been met can be carried out only with approval from the Board in writing.
 5. The Licensee shall provide as-built plans and drawings of the construction and/or Modifications referred to in Part E of this Licence within ninety (90) days of completion of the Construction or Modification. These plans and drawings shall be signed and stamped by an Engineer.

PART F: CONDITIONS APPLYING TO OPERATIONS AND MAINTENANCE

1. The Licensee shall, within sixty (60) days following Board approval of the Sewage Disposal Facility Report referred to in Part D, Item 5, submit to the Board, for approval in writing, a revision to the Plan entitled "Sewage Treatment Facility Operation and Maintenance (O&M) Plan, Hamlet of Arviat" May 2009, revised May 2010, to address the following:
 - a. Requirements of the Licence;
 - b. Sludge Management Plan referred to in Part D Item 5e; and
 - c. Results of the Sewage Disposal Facility Report referred to in Part D Item 5.
2. The Licensee shall, within sixty (60) days following Board approval of the Solid Waste Disposal Facility Report referred to in Part D Item 14, submit to the Board, for approval in writing, a revision to the Plan entitled "Solid Waste Management Facility Operation and Maintenance (O&M) Plan, Hamlet of Arviat" January 2009, revised May 2010, to address the following:
 - a. Requirements of the Licence;
 - b. Bulky Waste Management Plan;

- c. Hazardous Waste Management Plan including Hazardous Waste containment and segregation measures, and procedures for the movement of Hazardous Waste;
 - d. Recommendations for Water and wastewater containment, treatment, and drainage control as referred to in Part D Item 14(d); and
 - e. Results of the Solid Waste Disposal Facility Report referred to in Part D Item 14.
3. The Licensee shall, at least three (3) months prior to commissioning the New Solid Waste Disposal Facility and/or Hydrocarbon Impacted Soil Storage and Treatment Facility, submit to the Board, for approval in writing, a revised Solid Waste Management Facility Operations and Maintenance (O&M) Plan referred to in Part F Item 2 to address the New Solid Waste Disposal Facility and/or Hydrocarbon Impacted Soil Storage and Treatment Facility.
 4. The Licensee shall, in preparation of the revised plan referred to in Part F, Item 3, consult Environment Canada for guidance related to Petroleum Hydrocarbon Impacted Soils storage and treatment facility design, siting, operation, monitoring, sampling and analytical methods, decommissioning and closure, as well as record keeping and reporting.
 5. The Licensee shall, by December 31, 2010, submit to the Board for review, an Addendum to the approved Plan entitled "Environmental Emergency Contingency Plan, Hamlet of Arviat" May 2009, revised May 2010, to address reviewers' comments including the following:
 - a. Procedures for the movement of Hazardous Waste;
 - b. Contact information for the Government of Nunavut Department of Environment Manager of Pollution; and
 - c. Detailed information regarding clean-up methods/procedures for spills on Water or ice.
 6. If, during the period of this Licence, an unauthorized discharge of Waste and or Effluent occurs, or if such discharge is foreseeable, the Licensee shall:
 - a. Employ as required, the approved Environmental Emergency Contingency Plan referred to in Part F Item 5;
 - b. Report the incident immediately via the 24-Hour Spill Reporting Line (867) 920-8130 and to the Inspector at (867) 975-4295; and
 - c. For each spill occurrence, submit a detailed report to the Inspector, no later than thirty (30) days after initially reporting the event, which includes the amount and type of spilled product, the GPS location of the spill, and the measures taken to contain, clean up and restore the spill site.

PART G: CONDITIONS APPLYING TO ABANDONMENT, RESTORATION AND CLOSURE

1. The Licensee shall, by December 31, 2010, submit to the Board, for review, an interim Abandonment and Restoration Plan for the Solid Waste Disposal Facility, Bulky Metals Area, Hazardous Waste Storage Area and any contaminated sites identified in the Solid Waste Management Report referred to in Part D Item 14 (c). The Plan shall incorporate, where applicable, the appropriate sections described in Part G Item 3.
2. The Licensee shall, by December 31, 2010, submit to the Board, for approval in writing, a Final Abandonment and Restoration Plan for the two abandoned sewage lagoons. The Plan shall incorporate, where applicable, the appropriate sections described in Part G Item 3.
3. The Licensee shall, at least six (6) months prior to abandoning any facilities or upon submission of final design drawings for the construction of new facilities to replace existing ones, submit to the Board, for approval in writing, a Final Abandonment and Restoration Plan for the facilities being decommissioned. The Plan shall incorporate, where applicable, information on the following:
 - a. Water intake facilities;
 - b. The water treatment and waste disposal sites and facilities;
 - c. Former dump sites;
 - d. Petroleum and chemical storage areas;
 - e. Any site affected by waste spills;
 - f. Leachate prevention;
 - g. An implementation and completion schedule;
 - h. Maps delineating all disturbed areas, and site facilities;
 - i. Consideration of altered drainage patterns;
 - j. Type and source of cover materials;
 - k. Future area use;
 - l. Hazardous Wastes; and
 - m. A proposal identifying measures by which restoration costs will be financed by the Licensee upon abandonment.
4. The Licensee shall carry out progressive reclamation of any Water Supply Facilities and Waste Disposal Facilities no longer required for the Licensee's operations.
5. In order to promote growth of vegetation and the needed microclimate for seed deposition, all disturbed surfaces shall be prepared by ripping, grading, or scarifying the surface to conform to the natural topography.
6. The Licensee shall, prior to the use of reclaimed soils that have been contaminated by hydrocarbons, or soils referred to in Part D, Item 14(c), consult with the Government of Nunavut, Department of Environment and obtain written confirmation that the soil meets

the objectives as outlined in the Government of Nunavut's *Environmental Guideline for Contaminated Site Remediation*, March 2009 (Revised).

7. The Licensee shall complete the restoration work within the time schedule specified in an approved Abandonment and Restoration Plan, or as subsequently revised and approved by the Board in writing.
8. The Licensee shall complete all restoration work prior to the expiry of this Licence.

PART H: CONDITIONS APPLYING TO THE MONITORING PROGRAM

1. The Licensee shall maintain Monitoring Program Stations at the following locations:

Station Number	Description	Frequency	Status
ARV-1	Raw water supply at Wolf River prior to treatment.	Monthly	Active (Volume)
ARV-2a	Effluent from the discharge point of the Solid Waste Disposal Facility.	<u>Quality</u> Monthly during the months of May to August and prior to discharge of accumulated impacted water. <u>Acute Toxicity</u> Annually	Active (Quality and Acute Toxicity)
ARV-2b	Effluent from the discharge point of the New Solid Waste Disposal Facility.	<u>Quality</u> Monthly during the months of May to August and prior to discharge of accumulated impacted water. <u>Acute Toxicity</u> Annually	Active (Quality and Acute Toxicity)
ARV-3	Raw Sewage at truck offload point.	Monthly	Not active

ARV-4	Effluent from the discharge point of the Sewage Disposal Facility (end of Wetland).	<u>Quality</u> Monthly during the months of May to August. <u>Acute Toxicity</u> Annually	Active (Quality and Acute Toxicity)
ARV-5	Discharge from the Bulky Metal Waste Area.	Monthly during periods of observed flow.	New (Quality)
ARV-6	Discharge from the Hazardous Waste Storage Area.	Monthly during periods of observed flow.	New (Quality)
ARV-7	Water level in Wolf River.	Monthly during periods of open water.	New (Water level)
ARV-8	Water level in Sewage Disposal Facility lagoon.	Monthly during thawed conditions.	New (Sewage level)
ARV-9	Sewage Sludge removed from the Sewage Disposal Facility.	Monthly	New (Volume)
ARV-10	Effluent from the Final Discharge Point of the Hydrocarbon Impacted Soil Storage and Treatment Facility	To be determined in accordance with Part D Item 10	New (To be determined in accordance with Part D Item 10)
ARV-11	Effluent discharge from dewatering contaminated soil areas.	To be determined in accordance with Part D Item 14 (c)	New (To be determined in accordance with Part D Item 14 (c))

2. The Licensee shall, by December 31, 2010, maintain a water level Monitoring Program Station (ARV-7) at Wolf River.
3. The Licensee shall, by December 31, 2010, maintain a lagoon level Monitoring Program Station (ARV-8) at the Sewage Disposal Facility.
4. The Licensee shall provide the GPS co-ordinates (in degrees, minutes and seconds of latitude and longitude) of all locations where sources of Water are utilized for all purposes and at all Monitoring Program Stations.
5. The Licensee shall confirm the locations and GPS coordinates for all Monitoring Program Stations referred to in Part H Item 1 with an Inspector.

6. The Licensee shall determine the locations and GPS coordinates of any additional Monitoring Program Stations required for any new Waste Disposal Facilities with an Inspector.
7. The Licensee shall measure and record in cubic metres, the monthly and annual quantities of Water extracted for all purposes at Monitoring Program Station ARV-1.
8. The Licensee shall carry out, at a minimum, weekly inspections at Monitoring Program Stations ARV-2a, ARV-5, ARV-6, and Station ARV-2b upon commissioning of the New Solid Waste Disposal Facility, from May to August inclusive, to identify Effluent or Water flow in order to fulfill the monitoring requirements of Part H, Item 9. A record of inspections shall be retained and made available to an Inspector upon request.
9. The Licensee shall sample monthly at Monitoring Program Stations ARV-2a, ARV-4, ARV-5, ARV-6, and Station ARV-2b upon commissioning of the New Solid Waste Disposal Facility, during the months of May to August, inclusive. Samples shall be analyzed for the following parameters:

BOD ₅	Faecal Coliforms
pH	Conductivity
Total Suspended Solids	Ammonia Nitrogen
Nitrate – Nitrite	Oil and Grease (visual)
Total Phenols	Sulphate
Sodium	Potassium
Magnesium	Calcium
Total Arsenic	Total Cadmium
Total Copper	Total Chromium
Total Iron	Total Lead
Total Mercury	Total Nickel
Total Zinc	Total Phosphorous

10. The Licensee shall conduct the following acute toxicity tests at Monitoring Program Stations ARV-2a and ARV-4, and Station ARV-2b upon commissioning of the New Solid Waste Disposal Facility, once annually between June and September, approximately mid-way through the discharge period:
 - a. Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout (Reference Method EPS 1/RM/13), July 1990, published by the Department of the Environment, as amended in December 2000, and as may be further amended from time to time
 - b. Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Daphnia magna (Reference Method EPS 1/RM/14), July 1990, published by the Department of the Environment, as amended in December 2000, and as may be further amended from time to time.

11. The Licensee shall, when flow volumes at Monitoring Program Stations ARV- 2a, ARV- 2b and ARV-4 are not sufficient to conduct the tests required by Part H Item 10, collect samples upstream where adequate flow volume exists.
12. The Licensee shall record water elevation monthly, during open water at Monitoring Program Station ARV-7.
13. The Licensee shall record water elevations monthly during thawed conditions at Monitoring Program Station ARV-8.
14. The Licensee shall measure and record in cubic metres the monthly and annual quantities of Sewage sludge removed from the Sewage Disposal Facility at Monitoring Program Station ARV-9.
15. The Licensee shall submit to the Board for review, by December 31, 2010 a revision to the approved Plan entitled “Environmental Monitoring Program and Quality Assurance/Quality Control (QA/QC) Plan, Hamlet of Arviat” May 2009, revised May 2010, to address the following:
 - a. All monitoring requirements listed under Part H of the Licence;
 - b. A covering letter from an accredited laboratory confirming acceptance of the Quality Assurance/ Quality Control (QA/QC) Plan for analyses to be performed under this Licence as required under Part H, Item 17.
16. The Licensee shall, at least six (60) days prior to commissioning the New Solid Waste Disposal Facility and/or Hydrocarbon Impacted Soil Storage and Treatment Facility, submit to the Board, for approval in writing, a revision to the Environmental Monitoring Program and Quality Assurance/Quality Control (QA/QC) Plan, referred to in Part H Item 15, to address the New Solid Waste Disposal Facility and/or Hydrocarbon Impacted Soil Storage and Treatment Facility.
17. The Licensee shall annually review the QA/QC Plan referred to in Part H, Item 15 and modify it as necessary. The revised QA/QC Plan shall be submitted to the Board for review, accompanied by a current approval letter from an accredited lab and shall meet the standards as set out in Part H, Item 20 and Part H, Item 21 of the Licence.
18. The Licensee shall measure and record the volume of all contaminated soil, from all locations entering the Hydrocarbon Impacted Soil Storage and Treatment Facility.
19. The Licensee shall assess and record the concentration of Petroleum Hydrocarbon Impacted Soil entering any Hydrocarbon Impacted Soil Storage and Treatment Facility from all sources, as per the CCME *Canada-Wide Standard for Petroleum Hydrocarbons (PHC) in Soil, User Guide, January 2008*.

20. All sampling, sample preservation and analyses shall be conducted in accordance with methods prescribed in the current edition of *Standard Methods for the Examination of Water and Wastewater*, or by such other methods approved by the Board.
21. All analyses shall be performed in a laboratory accredited according to ISO/IEC Standard 17025. The accreditation shall be current and in good standing.
22. The Licensee shall include all of the data and information required by the Monitoring Program in the Licensee's Annual Report, as required per Part B, Item 3(a) or as otherwise requested by an Inspector.
23. Modifications to the Monitoring Program may be made only upon written request and subsequent approval of the Board in writing.

provide the findings with recommendations by December 31, 2010⁸⁵ as well as the commitments outlined in the Licensee's Work Plan.⁸⁶

Specifically, Part D Item 5 of the Licence requires the Licensee to submit to the Board for approval in writing by December 31, 2010 a Sewage Disposal Facility Report. The Report shall include:

- a. As-built drawings and design plans of the Sewage Disposal Facility (including the lagoon and wetland) signed and stamped by an Engineer;
- b. A preliminary discharge and wetland hydrology assessment;
- c. The results of an inspection by a Geotechnical Engineer of the Sewage Disposal Facility lagoon including its berms and an evaluation of the impact of sewage seepage through the lagoon berms on the environment;
- d. An evaluation of the long term impacts of the Sewage Disposal Facility on the environment;
- e. A Sludge Management Plan that addresses sludge assessment and disposal methods. The Plan shall be incorporated in to the Sewage Disposal Facility Operations and Maintenance Manual;
- f. Recommended measures to optimize the Sewage Disposal Facility; and
- g. A schedule for implementing recommended measures.

Solid Waste including Bulky Metal Waste and Hazardous Waste

As identified by INAC⁸⁷ at the Hearing, the Hamlet operates a Bulky Metal Waste Area and Hazardous Waste Storage area in addition to the Solid Waste Disposal Facility, and these areas are not addressed in the expired licence NWB3ARV0308. To address this issue, the Board requires the Licensee as a condition in Part D Item 6 of the Licence to, unless otherwise approved by the Board in writing:

- a. Dispose of and contain all non-hazardous, non-bulky metal, solid waste at the Solid Waste Disposal Facility;
- b. Dispose of and contain all bulky metal waste at the Bulky Metals Area; and
- c. Segregate and securely store all hazardous materials and Hazardous Waste within the Hazardous Waste Storage Area in a manner as to prevent the deposit of deleterious substances into any water, until such a time that the materials have been removed for proper disposal at a licensed facility.

To address the issues presented by parties regarding solid waste disposal including management of contaminated soils⁸⁸, and runoff management⁸⁹, the Board accepts the Licensee's request to include conditions in the Licence to conduct studies and provide the

⁸⁵ Transcript, Jim Walls, Nuna Burnside, at p. 35-36, lines 22-11.

⁸⁶ Exhibits 3 and 4, Work Plan to Address INAC, DFO and NWB License Compliance Issues, from Jim Walls to Bryan Purdy, dated June 23, 2010.

⁸⁷ Transcript, Ian Parsons, INAC, at p. 76 -77, lines 15-8

⁸⁸ Transcript, Ian Parson, INAC, at p. 76-77, lines 21-2 and Paula Smith, INAC, at p. 92-93, lines 26-13.

⁸⁹ Transcript, Ian Parsons, INAC, at p. 76, lines 5-8 and Paula Smith, EC, at p. 92, lines 10-23.

Appendix B

Monitoring Location Photographs

Water Supply Facility



ARV-1 - Raw water supply at Wolf River prior to treatment.
Notes: Record volume of flow pumped from intake (ARV-1).



ARV-7 - Water level in Wolf River.
Notes: Survey water level from SE corner of pumphouse (Benchmark).

Solid Waste Disposal Facility



Ponded water outside landfill discharge point.



ARV-2a - Effluent from discharge point of the Solid Waste Disposal Facility.
Notes: Water quality sample taken in front of culvert.



ARV-5 - Discharge from Bulky Metal Waste Area.
Notes: Water quality sample.



ARV-6 - Discharge from Hazardous Waste Storage Area.
Notes: Water quality sample.

Sewage Disposal Facility



ARV-3 - Raw sewage at truck off load point.



ARV-9 - Sewage sludge removed from the Sewage Disposal Facility.
Notes: Volume of sludge removed.



ARV-8 - Water level in Sewage Disposal Facility lagoon.

Notes: Survey water level based on back east corner top of offload block (Benchmark).



Level set up to survey benchmark and water level of sewage lagoon.



ARV-4 - Effluent from the discharge point of the Sewage Disposal Facility.
Notes: Water quality sample.

Appendix C
Contact Information for CALAI
Laboratories

Contact Information for Canadian Association for Laboratory Accreditation Inc. (CALAI) Laboratories

Services	Laboratory	Lab Location	Shipping Address	Contact Information
Water and Soil Quality Analysis	ALS Lavoboratory Group - Environmental Divisiotn	Winnepeg	1329 Niakwa Road East, Unit 12 Winnipeg, MB R2J 3T4	Phone: (204) 255-9720 Fax: (204) 255-9721
		Yellowknife	75 Con Road, Yellowknife, NWT X1A 2M1	Phone: (861) 766-5308 Fax: (867) 920-4238
	Taiga Environmental Laboratory	Yellowknife	4601-52 Avenue, Yellowknife, NWT X1A 2R3	Phone: (867) 669-2788 Fax: (867) 699-2718
	AGAT Laboratories Limited	Mississauga	5835 Coopers Avenue, Mississauga, ON L4Z 1Y2	Phone: (905) 501-9998 or 1-800-856-6261 Fax: (905) 501-0589
Environmental Toxicology Analysis	AquaTox Testing and Consulting Inc.	Guelph	11B Nicholas Beaver Rd, R.R.3, Guelph, ON N1H 6H9	Phone: (519) 763-4412 Fax: (519) 763-4419

Appendix D
Sample Containers, Preservation and
Holding Times

Sample Containers, Preservation and Holding Times

Parameter	Sample Container	Preservation	Holding Time
Faecal Coliforms (FC)	250 mL Sterilized Plastic	Sodium Thiosulfate	30 Hours
Biological Oxygen Demand (BOD ₅)	500 mL Plastic	None	4 Days
Electrical Conductivity (EC)	500 mL Plastic	None	14 days
pH	500 mL Plastic	None	4 days
Total Suspended Solids (TSS)	500 mL Plastic	None	7 days
Sodium	500 mL Plastic	None	28 days
Potassium	500 mL Plastic	None	28 days
Magnesium	500 mL Plastic	None	28 days
Calcium	500 mL Plastic	None	28 days
Sulphate (SO ₄)	500 mL Plastic	None	28 days
Total Phosphorus	120 mL Plastic	Sulfuric Acid	30 Hours
Total Copper	120 mL Plastic	Nitric Acid	30 Days
Total Iron	120 mL Plastic	Nitric Acid	30 Days
Total Lead	120 mL Plastic	Nitric Acid	30 Days
Total Nickel	120 mL Plastic	Nitric Acid	30 Days
Total Zinc	120 mL Plastic	Nitric Acid	30 Days
Total Arsenic	120 mL Plastic	Nitric Acid	30 Days
Total Chromium	120 mL Plastic	Nitric Acid	30 Days
Total Cadmium	120 mL Plastic	Nitric Acid	30 Days
Total Mercury	120 mL Glass	HNO ₃ and Cr_2O_7	28 days
Nitrate-Nitrogen	250 mL Plastic	None	5 Days
Nitrite-Nitrogen	250 mL Plastic	None	5 Days
Ammonium Nitrogen (NH ₃)	120 mL Plastic	Sulfuric Acid (H ₂ SO ₄)	30 Days
T N (Total kjeldahl Nitrogen)	250 mL Glass	Sulfuric Acid (H ₂ SO ₄)	10 Days
Organic Nitrogen	250 mL Glass	Sulfuric Acid (H ₂ SO ₄)	10 Days
Total Phenols	120 mL Glass	Sulfuric Acid (H ₂ SO ₄)	30 days
Total Oil and Grease	1000 mL Glass	Hydrochloric Acid (HCl)	28 Days
CCME F1	40 mL Glass Vials (x3)	Sodium Bisulfate	7 days
CCME F2-F4	1000 mL Amber Glass	None	14 days
BTEX	40 mL Glass Vials (x3)	Sodium Bisulfate	7 days
VOCs	40 mL Glass Vials (x3)	Sodium Bisulfate	14 days
PAHs	1000 mL Amber Glass	None	20 days

Above is description of bottles ordered from AGAT Laboratories, a different lab may provide different bottles and hold times.

Appendix E

Sample Chain of Custody Form

[illegible]

Appendix F
CCME Canadian Water Quality
Guidelines for the Protection of
Aquatic Life



Canadian Water Quality Guidelines for the Protection of Aquatic Life

SUMMARY TABLE

Update 7.0
September 2007

Summary of Canadian water quality guidelines for the protection of aquatic life.

Parameter ^a	Freshwater		Marine	
	Concentration ($\mu\text{g}\cdot\text{L}^{-1}$)	Date ^b	Concentration ($\mu\text{g}\cdot\text{L}^{-1}$)	Date ^b
Acenaphthene [See Polycyclic aromatic hydrocarbons (PAHs)]				
Acridine [See Polycyclic aromatic hydrocarbons (PAHs)]				
Aldicarb	1 ^c	1993	0.15 ^c	1993
Aldrin + Dieldrin ^d	-0.004 ^{e,f}	1987		
Aluminium ^d	5–100 ^g	1987		
Ammonia (total)	see factsheet	2001		
Ammonia (un-ionized)	19 ^h	2001		
Aniline	2.2 ⁱ	1993	Insufficient data	1993
Anthracene [See Polycyclic aromatic hydrocarbons (PAHs)]				
Arsenic ^j	5.0 ^k	1997	12.5 ^c	1997
Atrazine	1.8 ^j	1989		
Benz(a)anthracene [See Polycyclic aromatic hydrocarbons (PAHs)]				
Benzene ^j	370 ^{c, k}	1999	110 ^c	1999
Benzo(a)pyrene [See Polycyclic aromatic hydrocarbons (PAHs)]				
2,2-Bis(p-chlorophenyl)-1,1,1-trichloroethane [See DDT (total)]				
Bromacil	5.0 ^{e,i}	1997	Insufficient data	1997
Bromoform [See Halogenated methanes, Tribromomethane]				
Bromoxynil	5.0 ^j	1993	Insufficient data	1993
Cadmium	0.017 ^{c,l}	1996	0.12 ⁱ	1996
Captan	1.3 ^c	1991		
Carbaryl	0.20 ⁱ	1997	0.32 ^{c,i}	1997
Carbofuran	1.8 ^j	1989		
Carbon tetrachloride [See Halogenated methanes, Tetrachloromethane]				
Chlordane ^d	-0.006 ^{e,f}	1987		
Chlorinated benzenes				
Monochlorobenzene	1.3 ^{c,k}	1997	25 ^{c,k}	1997
1,2-Dichlorobenzene	0.70 ^{c,k}	1997	42 ^{c,k}	1997
1,3-Dichlorobenzene	150 ^{c,k}	1997	Insufficient data ^k	1997
1,4-Dichlorobenzene	26 ^{c,k}	1997	Insufficient data ^k	1997
1,2,3-Trichlorobenzene	8.0 ^{c,k}	1997	Insufficient data ^k	1997
1,2,4-Trichlorobenzene	24 ^{c,k}	1997	5.4 ^{c,k}	1997
1,3,5-Trichlorobenzene ^d	Insufficient data ^k	1997	Insufficient data ^k	1997

Continued.

SUMMARY TABLE
**Canadian Water Quality Guidelines
for the Protection of Aquatic Life**
Update 7.0

Parameter ^a	Freshwater		Marine	
	Concentration (µg·L ⁻¹)	Date ^b	Concentration (µg·L ⁻¹)	Date ^b
Chlorinated benzenes—Continued				
1,2,3,4-Tetrachlorobenzene	1.8 ^{c,k}	1997	Insufficient data ^k	1997
1,2,3,5-Tetrachlorobenzene ^d	Insufficient data ^k	1997	Insufficient data ^k	1997
1,2,4,5-Tetrachlorobenzene ^d	Insufficient data ^k	1997	Insufficient data ^k	1997
Pentachlorobenzene	6.0 ^{c,k}	1997	Insufficient data ^k	1997
Hexachlorobenzene ^d	Insufficient data ^{e,f,k}	1997	Insufficient data ^k	1997
Chlorinated ethanes				
1,2-Dichloroethane	100 ^{e,i}	1991	Insufficient data	1991
1,1,1-Trichloroethane	Insufficient data	1991	Insufficient data	1991
1,1,2,2-Tetrachloroethane	Insufficient data	1991	Insufficient data	1991
Chlorinated ethenes				
1,1,2-Trichloroethene (Trichloroethylene; TCE)	21 ^{e,i}	1991	Insufficient data	1991
1,1,2,2-Tetrachloroethene (Tetrachloroethylene; PCE)	111 ^{e,i}	1993	Insufficient data	1993
Chlorinated methanes				
[See Halogenated methanes]				
Chlorinated phenols ^d				
Monochlorophenols	7	1987		
Dichlorophenols	0.2	1987		
Trichlorophenols	18	1987		
Tetrachlorophenols	1	1987		
Pentachlorophenol (PCP)	0.5	1987		
Chlorine, reactive [See Reactive chlorine species]				
Chloroform [See Halogenated methanes, Trichloromethane]				
4-Chloro-2-methyl phenoxy acetic acid [See MCPA]				
Chlorothalonil	0.18 ^c	1994	0.36 ^c	1994
Chlorpyrifos	0.0035	1997	0.002 ^c	1997
Chromium				
Trivalent chromium (Cr(III))	8.9 ^{c,k}	1997	56 ^{c,k}	1997
Hexavalent chromium (Cr(VI))	1.0 ^k	1997	1.5 ^k	1997
Chrysene [See Polycyclic aromatic hydrocarbons (PAHs)]				
Colour	Narrative	1999	Narrative	1999
Copper ^d	2–4 ^m	1987		
Cyanazine	2.0 ^{c,i}	1990		
Cyanide ^d	5 (as free CN)	1987		
DDAC (Didecyl dimethyl ammonium chloride)	1.5 ^c	1999	Insufficient data	1999
DDT (total) ^d (2,2-Bis(p-chlorophenyl)-1,1,1-trichloroethane; dichloro diphenyl trichloroethane)	0.004 ^{e,f}	1987		
Debris (litter/settleable matter)			Narrative ^c	1996

Continued.

Parameter ^a	Freshwater		Marine	
	Concentration ($\mu\text{g}\cdot\text{L}^{-1}$)	Date ^b	Concentration ($\mu\text{g}\cdot\text{L}^{-1}$)	Date ^b
Deltamethrin	0.0004	1997	Insufficient data	1997
Deposited bedload sediment [See Total particulate matter]				
Dibromochloromethane [See Halogenated methanes]				
Dicamba	10 ^{c,i}	1993		
Dichlorobenzene [See Chlorinated benzenes]				
Dichlorobromomethane [See Halogenated methanes]				
Dichloro diphenyl trichloroethane [See DDT (total)]				
Dichloroethane [See Chlorinated ethanes]				
Dichloroethylene [See Chlorinated ethanes, 1,2-Dichloroethane]				
Dichloromethane [See Halogenated methanes]				
Dichlorophenols [See Chlorinated phenols]				
2,4-Dichlorophenoxyacetic acid [see Phenoxy herbicides]				
Diclofop-methyl	6.1	1993		
Didecyl dimethyl ammonium chloride [See DDAC]				
Diethylene glycol [See Glycols]				
Di(2-ethylhexyl) phthalate [See Phthalate esters]				
Diisopropanolamine (DIPA) ^{aa}	1600 ^c	2005	Insufficient data	2005
Dimethoate	6.2 ^c	1993	Insufficient data	1993
Di- <i>n</i> -butyl phthalate [See Phthalate esters]				
Di- <i>n</i> -octyl phthalate [See Phthalate esters]				
Dinoseb	0.05	1992		
Dissolved gas supersaturation	Narrative	1999	Narrative	1999
Dissolved oxygen	5500–9500 ^{k,n}	1999	>8000 and Narrative ^{c,k}	1996
Endosulfan ^d	0.02	1987		
Endrin ^d	0.0023 ^{e,f}	1987		
Ethylbenzene ^j	90 ^{c,k}	1996	25 ^{c,k}	1996
Ethylene glycol [See Glycols]				
Fluoranthene [See Polycyclic aromatic hydrocarbons (PAHs)]				
Fluorene [See Polycyclic aromatic hydrocarbons (PAHs)]				
Glycols				
Ethylene glycol	192 000 ^k	1997	Insufficient data	1997
Diethylene glycol	Insufficient data ^k	1997	Insufficient data	1997
Propylene glycol	500 000 ^k	1997	Insufficient data	1997
Glyphosate	65 ^c	1989		

Continued.

SUMMARY TABLE

Canadian Water Quality Guidelines for the Protection of Aquatic Life

Update 7.0

Parameter ^a	Freshwater		Marine	
	Concentration (µg·L ⁻¹)	Date ^b	Concentration (µg·L ⁻¹)	Date ^b
Halogenated methanes				
Monochloromethane (Methyl chloride) ^d	Insufficient data	1992	Insufficient data	1992
Dichloromethane (Methylene chloride)	98.1 ^{c,i}	1992	Insufficient data	1992
Trichloromethane (Chloroform)	1.8 ^{c,i}	1992	Insufficient data	1992
Tetrachloromethane (Carbon tetrachloride)	13.3 ^{c,i}	1992	Insufficient data	1992
Monobromomethane (Methyl bromide) ^d	Insufficient data	1992	Insufficient data	1992
Tribromomethane (Bromoform) ^d	Insufficient data	1992	Insufficient data	1992
Dibromochloromethane ^d	Insufficient data	1992	Insufficient data	1992
Dichlorobromomethane ^d	Insufficient data	1992	Insufficient data	1992
HCBd [See Hexachlorobutadiene (HCBd)]				
Heptachlor (Heptachlor epoxide) ^d	0.01 ^{e,f}	1987		
Hexachlorobenzene [See Chlorinated benzenes]				
Hexachlorobutadiene (HCBd)	1.3 ^{c, k}	1999		
Hexachlorocyclohexane (Lindane) ^d	0.01	1987		
Hypochlorous acid [See Reactive chlorine species]				
Imidacloprid ^{aa}	0.23 ^c	2007	0.65 ^c	2007
Inorganic fluorides	120 ^c	2002		
3-Iodo-2-propynyl butyl carbamate [See IPBC]				
IPBC (3-Iodo-2-propynyl butyl carbamate)	1.9 ^c	1999		
Iron ^d	300	1987		
Leach ^d	1.7 ^o	1987		
Lindane [See Hexachlorocyclohexane]				
Linuron	7.0 ^c	1995	Insufficient data	1995
MCPA (4-Chloro-2-methyl phenoxy acetic acid; 2-methyl-4-chloro phenoxy acetic acid)	2.6 ^c	1995	4.2 ^c	1995
Mercury ^v				
Inorganic Mercury ^v	0.026	2003	0.016 ^{c,w}	2003
Methylmercury ^v	0.004 ^{c,w}	2003		
Methyl bromide [See Halogenated methanes, Monobromomethane]				
Methyl chloride [See Halogenated methanes, Monochloromethane]				
2-Methyl-4-chloro phenoxy acetic acid [See MCPA]				
Methylene chloride [See Halogenated methanes, Dichloromethane]				
Methyl tertiary-butyl ether [See MTBE]				
Metolachlor	7.8 ^c	1991		
Metribuzin	1.0 ^c	1990		
Molybdenum ^j	73 ^c	1999		
Monobromomethane [See Halogenated methanes]				
Monochloramine [See Reactive chlorine species]				

Continued.

Parameter ^a	Freshwater		Marine	
	Concentration (µg·L ⁻¹)	Date ^b	Concentration (µg·L ⁻¹)	Date ^b
Monochlorobenzene [See Chlorinated benzenes]				
Monochloromethane [See Halogenated methanes]				
Monochlorophenols [See Chlorinated phenols]				
MTBE (methyl <i>tertiary</i> -butyl ether)	10 000 ^c	2003	5 000 ^c	2003
Naphthalene [See Polycyclic aromatic hydrocarbons (PAHs)]				
Nickel ^d	25–150 ^p	1987		
Nitrate	13 000 ^{c,u,y}	2003	16 000 ^{c,u,y}	2003
Nitrite ^d	60 ^z	1987		
Nonylphenol and its ethoxylates	1.0 ^{e,t}	2002	0.7 ^{e,t}	2002
Nutrients	Guidance Framework ^x	2004	Guidance Framework ^{aa,bb}	2007
Organotins				
Tributyltin	0.008 ^c	1992	0.001 ^c	1992
Tricyclohexyltin	Insufficient data	1992	Insufficient data	1992
Triphenyltin	0.022 ^{e,i}	1992	Insufficient data	1992
Oxygen, dissolved [See Dissolved oxygen]				
PAHs [See Polycyclic aromatic hydrocarbons (PAHs)]				
PCBs [See Polychlorinated biphenyls (PCBs)(total)]				
PCE [See Chlorinated ethenes, 1,1,2,2-Tetrachloroethene]				
PCP [See Chlorinated phenols, Pentachlorophenol]				
Pentachlorobenzene [See Chlorinated benzenes]				
Pentachlorophenol [See Chlorinated phenols]				
Pernethrin ^{aa}	0.004 ^c	2006	0.001 ^c	2006
pH ^d	6.5–9	1987	7.0–8.7 and Narrative	1996
Phenanthrene [See Polycyclic aromatic hydrocarbons (PAHs)]				
Phenols (mono- & dihydric)	4.0 ^k	1999		
Phenoxy herbicides ^{d, q}	4.0	1987		
Phosphorus	Guidance Framework ^x	2004	Guidance Framework ^{bb}	2007
Phthalate esters				
Di- <i>n</i> -butyl phthalate	19 ^c	1993	Insufficient data	1993
Di(2-ethylhexyl) phthalate	16 ^c	1993	Insufficient data	1993
Di- <i>n</i> -octyl phthalate	Insufficient data	1993	Insufficient data	1993
Picloram	29 ^c	1990		
Polychlorinated biphenyls (PCBs) (total) ^d	0.001 ^{e,f}	1987	0.01 ^{e,f}	1991

Continued.

SUMMARY TABLE

Canadian Water Quality Guidelines for the Protection of Aquatic Life

Update 7.0

Parameter ^a	Freshwater		Marine	
	Concentration (µg·L ⁻¹)	Date ^b	Concentration (µg·L ⁻¹)	Date ^b
Polycyclic aromatic hydrocarbons (PAHs)				
Acenaphthene	5.8 ^c	1999	Insufficient data	1999
Acridine	4.4 ^c	1999	Insufficient data	1999
Anthracene	0.012 ^c	1999	Insufficient data	1999
Benz(a)anthracene	0.018 ^c	1999	Insufficient data	1999
Benzo(a)pyrene	0.015 ^c	1999	Insufficient data	1999
Chrysene	Insufficient data	1999	Insufficient data	1999
Fluoranthene	0.04 ^c	1999	Insufficient data	1999
Fluorene	3.0 ^c	1999	Insufficient data	1999
Naphthalene	1.1 ^c	1999	1.4 ^c	1999
Phenanthrene	0.4 ^c	1999	Insufficient data	1999
Pyrene	0.025 ^c	1999	Insufficient data	1999
Quinoline	3.4 ^c	1999	Insufficient data	1999
Propylene glycol [See Glycols]				
Pyrene [See Polycyclic aromatic hydrocarbons (PAHs)]				
Quinoline [See Polycyclic aromatic hydrocarbons (PAHs)]				
Reactive chlorine species (hypochlorous acid and monochloramine)	0.5 and Narrative	1999	0.5 and Narrative	1999
Salinity			<10‰ fluctuation ^c	1996
Selenium ^d	1.0	1987		
Silver ^d	0.1	1987		
Simazine	10	1991		
Streambed substrate [See Total particulate matter]				
Styrene	72 ^c	1999		
Sulfolane ^{aa}	50 000 ^c	2005	Insufficient data	2005
Suspended sediments [See Total particulate matter]				
TCE [See Chlorinated ethenes, 1,1,2-Trichloroethene]				
Tebuthiuron	1.6 ^c	1995	Insufficient data	1995
Temperature	Narrative ^s	1987	Not to exceed ±1°C and Narrative ^c	1996
Tetrachlorobenzene [See Chlorinated benzenes]				
Tetrachloroethane [See Chlorinated ethanes]				
Tetrachloroethene [See Chlorinated ethenes]				
Tetrachloroethylene [See Chlorinated ethenes, 1,1,2,2-Tetrachloroethene]				

Continued.

Parameter ^a	Freshwater		Marine	
	Concentration ($\mu\text{g}\cdot\text{L}^{-1}$)	Date ^b	Concentration ($\mu\text{g}\cdot\text{L}^{-1}$)	Date ^b
Tetrachloromethane [See Halogenated methanes]				
Tetrachlorophenols [See Chlorinated phenols]				
Thallium ^j	0.8	1999		
Toluene	2.0 ^{c,j,k}	1996	215 ^{c,k}	1996
Total particulate matter				
Deposited bedload sediment	Insufficient data	1999	Insufficient data	1999
Streambed substrate	Narrative	1999	Narrative	1999
Suspended sediments	Narrative	1999	Narrative	1999
Turbidity	Narrative	1999	Narrative	1999
Toxaphene ^d	0.008 ^{e,f}	1987		
Triallate	0.24 ^c	1992		
Tribromomethane [See Halogenated methanes]				
Tributyltin [See Organotins]				
Trichlorobenzene [See Chlorinated benzenes]				
Trichloroethane [See Chlorinated ethanes]				
Trichloroethene [See Chlorinated ethenes]				
Trichloroethylene [See Chlorinated ethenes, 1,1,2-Trichloroethene]				
Trichloromethane [See Halogenated methanes]				
Trichlorophenols [See Chlorinated phenols]				
Tricyclohexyltin [See Organotins]				
Trifluralin	0.20 ⁱ	1993		
Triphenyltin [See Organotins]				
Turbidity [See Total particulate matter]				
Zinc ^d	30	1987		

^aUnless otherwise indicated, supporting documents are available from the National Guidelines and Standards Office, Environment Canada.

^bThe guidelines dated 1987 have been carried over from *Canadian Water Quality Guidelines* (CCREM 1987) and no fact sheet was prepared. The guidelines dated 1989 to 1997 were developed and initially published in CCREM 1987 as appendixes on the date indicated. They are published as fact sheets in this document. Other guidelines dated 1997 and those dated 1999 are published for the first time in this document.

^cInterim guideline.

^dNo fact sheet created. For more information on this guideline, please refer to *Canadian Water Quality Guidelines* (CCREM 1987).

^eThis guideline (originally published in *Canadian Water Quality Guidelines* [CCREM 1987 + Appendixes] in 1987 or 1991 [PCBs in marine waters]) is no longer recommended and the value is withdrawn. A water quality guideline is not recommended. Environmental exposure is predominantly via sediment, soil, and/or tissue, therefore, the reader is referred to the respective guidelines for these media.

^fThis substance meets the criteria for Track 1 substances under the national CCME Policy for the Management of Toxic Substances (PMTS) (i.e., persistent, bioaccumulative, primarily the result of human activity, and CEPA-toxic or equivalent), and should be subject to virtual elimination strategies. Guidelines can serve as action levels or interim management objectives towards virtual elimination.

^gAluminium guideline = $5 \mu\text{g}\cdot\text{L}^{-1}$ at pH <6.5
= $100 \mu\text{g}\cdot\text{L}^{-1}$ at pH ≥6.5

^hAmmonia guideline: Expressed as μg unionized ammonia- L^{-1} . This would be equivalent to $15.2 \mu\text{g}$ ammonia-nitrogen- L^{-1} . Guideline for total ammonia is temperature and pH dependent, please consult factsheet for more information.

ⁱGuideline value slightly modified from CCREM 1987 + Appendixes due to re-evaluation of the significant figures.

^jThe technical document for the guideline is available from the Ontario Ministry of the Environment.

^kSubstance has been re-evaluated since CCREM 1987 + Appendixes. Either a new guideline has been derived or insufficient data existed to derive a new guideline.

SUMMARY TABLE

Canadian Water Quality Guidelines for the Protection of Aquatic Life

Update 7.0

^lCadmium guideline = $10^{(0.86[\log(\text{hardness})] - 3.2)}$

^mCopper guideline = 2 µg·L⁻¹ at a water hardness of 0–120 mg·L⁻¹ (soft to medium) as CaCO₃
= 3 µg·L⁻¹ at a water hardness of 120–180 mg·L⁻¹ (hard) as CaCO₃
= 4 µg·L⁻¹ at a water hardness >180 mg·L⁻¹ (very hard) as CaCO₃

ⁿDissolved oxygen for warm-water biota: early life stages = 6000 µg·L⁻¹
other life stages = 5500 µg·L⁻¹
for cold-water biota: early life stages = 9500 µg·L⁻¹
other life stages = 6500 µg·L⁻¹

^oLead guideline = 1 µg·L⁻¹ at a water hardness of 0–60 mg·L⁻¹ (soft) as CaCO₃
= 2 µg·L⁻¹ at a water hardness of 60–120 mg·L⁻¹ (medium) as CaCO₃
= 4 µg·L⁻¹ at a water hardness of 120–180 mg·L⁻¹ (hard) as CaCO₃
= 7 µg·L⁻¹ at a water hardness >180 mg·L⁻¹ (very hard) as CaCO₃

^pNickel guideline = 25 µg·L⁻¹ at a water hardness of 0–60 mg·L⁻¹ (soft) as CaCO₃
= 65 µg·L⁻¹ at a water hardness of 60–120 mg·L⁻¹ (medium) as CaCO₃
= 110 µg·L⁻¹ at a water hardness of 120–180 mg·L⁻¹ (hard) as CaCO₃
= 150 µg·L⁻¹ at a water hardness >180 mg·L⁻¹ (very hard) as CaCO₃

^qThe guideline of 4.0 µg·L⁻¹ for phenoxy herbicides is based on data for ester formulations of 2,4-dichlorophenoxyacetic acid.

^rThe technical document for the guideline is available from British Columbia Ministry of Environment, Lands and Parks.

^sTemperature: (for more information, see CCREM 1987)

Thermal Stratification: Thermal additions to receiving waters should be such that thermal stratification and subsequent turnover dates are not altered from those existing prior to the addition of heat from artificial origins.

Maximum Weekly Average Temperature: Thermal additions to receiving waters should be such that the maximum weekly average temperature is not exceeded.

Short-term Exposure to Extreme Temperature: Thermal additions to receiving waters should be such that the short-term exposures to maximum temperatures are not exceeded. Exposures should not be so lengthy or frequent as to adversely affect the important species

^tExpressed on a TEQ basis using NP TEFs, see Table 2 in factsheet.

^uFor protection from direct toxic effects; the guidelines do not consider indirect effects due to eutrophication.

^vMay not prevent accumulation of methylmercury in aquatic life, therefore, may not protect wildlife that consume aquatic life; see factsheet for details. Consult also the appropriate Canadian Tissue Residue Guideline for the Protection of Wildlife Consumers of Aquatic Biota.

^wMay not fully protect higher trophic level fish; see factsheet for details.

^xCanadian Guidance Framework for Phosphorus is for developing phosphorus guidelines (does not provide guidance on other freshwater nutrients). It provides Trigger Ranges for Total Phosphorus (see Guidance Framework for Phosphorus factsheet):

ultra-oligotrophic <4 µg·L⁻¹
oligotrophic 4–10 µg·L⁻¹
mesotrophic 10–20 µg·L⁻¹
meso-eutrophic 20–35 µg·L⁻¹
eutrophic 35–100 µg·L⁻¹
hyper-eutrophic >100 µg·L⁻¹

^yGuidelines are expressed in µg nitrate·L⁻¹. These values are equivalent to 2900 µg nitrate-nitrogen·L⁻¹, and 3600 µg nitrate-nitrogen·L⁻¹, for freshwater and marine respectively.

^zGuideline is expressed as µg nitrite-nitrogen·L⁻¹. This value is equivalent to 197 µg nitrite·L⁻¹.

^{aa}Supporting documents are available from the Canadian Council of Ministers of the Environment at http://www.ccmee.ca/publications/ceqg_reqe.html?category_id=125

^{bb}The Canadian Guidance Framework for the Management of Nearshore Marine Systems is for developing nutrient (phosphorus and nitrogen) guidelines for nearshore marine systems. Refer to factsheet for details

Reference

CCREM (Canadian Council of Resource and Environment Ministers). 1987. Canadian water quality guidelines. Prepared by the Task Force on Water Quality Guidelines.

Reference listing:

Canadian Council of Ministers of the Environment. 2007. Canadian water quality guidelines for the protection of aquatic life: Summary table. Updated September, 2007. In: Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg.

For further scientific information, contact:

Environment Canada
National Guidelines and Standards Office
351 St. Joseph Blvd.
Gatineau, Quebec, K1A 0H3
Phone: (819) 953-1550
Facsimile: (819) 956-5602
E-mail: ceqg-rcqe@ec.gc.ca
Internet: <http://www.ec.gc.ca/ceqg-rcqe>

For additional copies, contact:

CCME Documents
Toll Free: (800) 805-3025
www.ccme.ca

Aussi disponible en français

Appendix G
Nunavut Water Board Annual Report
Form

NWB Annual Report

Year being reported:

Select



License No:

Issued Date:

Expiry Date:

Project Name:

Licensee:

Mailing Address:

Name of Company filing Annual Report (if different from Name of Licensee please clarify relationship between the two entities, if applicable):

General Background Information on the Project (*optional):

License Requirements: the licensee must provide the following information in accordance with

Select



Select



A summary report of water use and waste disposal activities, including, but not limited to: methods of obtaining water; sewage and greywater management; drill waste management; solid and hazardous waste management.

Water Source(s):

Water Quantity:

Quantity Allowable Domestic (cu.m)

Actual Quantity Used Domestic (cu.m)

Quantity Allowable Drilling (cu.m)

Total Quantity Used Drilling (cu.m)

Waste Management and/or Disposal

☐ Solid Waste Disposal

☐ Sewage

☐ Drill Waste

☐ Greywater

☐ Hazardous

☐ Other:

Additional Details:

A list of unauthorized discharges and a summary of follow-up actions taken.

Spill No.: (as reported to the Spill Hot-line)

Date of Spill:

Date of Notification to an Inspector:

Additional Details: (impacts to water, mitigation measures, short/long term monitoring, etc)

Revisions to the Spill Contingency Plan

Select

Additional Details:

Revisions to the Abandonment and Restoration Plan

Select

Additional Details:

Progressive Reclamation Work Undertaken

Additional Details (i.e., work completed and future works proposed)

Results of the Monitoring Program including:

The GPS Co-ordinates (in degrees, minutes and seconds of latitude and longitude) of each location where sources of water are utilized;

Select

Additional Details:

The GPS Co-ordinates (in degrees, minutes and seconds of latitude and longitude) of each location where wastes associated with the license are deposited;

Select

Additional Details:

Results of any additional sampling and/or analysis that was requested by an Inspector

Select ▼

Additional Details: (date of request, analysis of results, data attached, etc)

--

Any other details on water use or waste disposal requested by the Board by November 1 of the year being reported.

Select ▼

Additional Details: (Attached or provided below)

--

Any responses or follow-up actions on inspection/compliance reports

Select ▼

Additional Details: (Dates of Report, Follow-up by the Licensee)

--

Any additional comments or information for the Board to consider

--

Date Submitted:

--

Submitted/Prepared by:

--

Contact Information:

Tel:

--

Fax:

--

email:

--

Appendix H
Annual Report Template



Annual Report – Example Template

**Hamlet of Arviat
Arviat Water Use and Waste Disposal
Water Licence 3AM-ARV1015**

Table of Contents

1.0	General Background Information	1
2.0	Summary of Water and Waste Disposal Activities	2
2.1	Water Use.....	2
2.2	Sewage Collection and Disposal.....	2
2.3	Solid Waste Management Facility.....	2
3.0	Summary of Unauthorized Discharges or Spills	4
4.0	Revisions to Spill Contingency Plan and/or Abandonment and Restoration Plan.....	5
5.0	Progressive Reclamation Work	6
6.0	Monitoring Program	7
7.0	Monitoring Results	9
7.1	Water Supply Facility	9
7.2	Wastewater Treatment Facility.....	10
7.3	Solid Waste Management Facility.....	13
8.0	INAC Inspection Reports.....	14
9.0	Other Information	15

Tables

Table 1	Monitoring Program for Water License 3AM-ARV1015.....	7
Table 2	Monthly Volumes of Water Used by Hamlet of Arviat (ARV-1).....	9
Table 3	Wolf River Water Levels (ARV-7)	10
Table 4	Volume of Sewage Discharge into Lagoon (ARV-3)	11
Table 5	Sewage Lagoon Water Levels (ARV-8).....	12
Table 6	Sewage Sludge Removal Records (ARV-9)	12

Appendices

A	Nunavut Water License – 3AM-ARV1015
B	Annual Monitoring Report Form
C	Sample Results
D	CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life
E	INAC Inspection Report
F	Other Information

Annual Report – Example Template

Arviat Water Use and Waste Disposal
Water Licence 3AM-ARV1015

This is an example template provided for training purposes. Refer to previous annual report submissions to see examples.

1.0 General Background Information

On behalf of the Hamlet of Arviat, this report has been prepared as the Annual Report as required by the Nunavut Water Board Water License 3AM-ARV1015, issued August 23, 2010 (Appendix A). The report accompanies the Nunavut Water Board Annual Report Form (Appendix B).

The Hamlet of Arviat is located within the Kivalliq Region, Nunavut, at general latitude 61°6'N and general longitude 94°3'W. The Community is located approximately 225 km south of Rankin Inlet and 265 km north of Churchill Manitoba.

The Hamlet of Arviat, Water and Waste Disposal license 3AM-ARV1015 includes activities for municipal water intake, sewage disposal and waste disposal activities. As part of these activities the following facilities are operated:

- Wolf River Intake and Pump House
- Arviat Water Reservoirs and Truck Fill Station
- Arviat Waste Water Sewage Lagoon
- Arviat Solid Waste Management Facility.

2.0 Summary of Water and Waste Disposal Activities

2.1 Water Use

The Hamlet of Arviat currently receives water from the Wolf River water supply located 8.0 km southwest of the Hamlet. A pump house located beside Wolf River pumps from the river seasonally to fill the community's two water reservoirs. Water from the reservoirs is pumped into water trucks and distributed to the community. Currently water is treated by chlorine injection when water is pumped into trucks.

For the year [REDACTED], the total annual volume of water used by the Hamlet of Arviat was [REDACTED] m³.

The total allowable amount as stated in the licence is 86,000 m³ per year.

2.2 Sewage Collection and Disposal

Sewage collection is provided by the Hamlet. Each building has a sewage holding tank that is pumped out by the Hamlet's sewage pump out truck as needed. Pump out sewage is treated at the community sewage lagoon located approximately 2.8 km southeast of the Hamlet.

The sewage treatment system consists of a sewage lagoon and a wetland treatment area. The lagoon discharges into the wetland at a slow continuous rate during the growing season to make room for the following year's sewage. The sewage travels through the wetland treatment area and eventually discharges into Hudson Bay.

The volume of sewage waste water roughly corresponds to the annual water use of the Hamlet. Therefore approximately [REDACTED] m³ of sewage is estimated to have been discharged into the sewage lagoon in [REDACTED].

Describe any issues with lagoon.

2.3 Solid Waste Management Facility

The Hamlet of Arviat Solid Waste Management Facility consists of the following components:

- Landfill (also referred to as the Municipal Solid Waste Disposal Area)
- Bulky Metals Waste Area located north of the fill area
- Hazardous Waste Storage Area (currently next to the Hamlet garage).

Annual Report – Example Template

Arviat Water Use and Waste Disposal
Water Licence 3AM-ARV1015

The bulky waste area is used to dispose of vehicles, heavy equipment, 45 gallon drums and other metal wastes. Material not confirmed to be acceptable for the landfill or the Bulky Metal area, are stored in the Hazardous Waste Storage area. This includes drums of waste oil, anti-freeze, paint and old car batteries. All other municipal waste is disposed of in the municipal landfill. Solid waste in the community is collected by a garbage compactor truck and deposited in the community landfill located 2.8 km south-east of the community.

Describe any maintenance and improvements to landfill, bulky metals waste area or hazardous waste storage area.

Describe any issues with landfill.

Annual Report – Example Template

Arviat Water Use and Waste Disposal
Water Licence 3AM-ARV1015

3.0 Summary of Unauthorized Discharges or Spills

Describe any spills or unauthorized discharges that occurred in year. Provide reference reports if available. If none, delete section.

Annual Report – Example Template

Arviat Water Use and Waste Disposal
Water Licence 3AM-ARV1015

4.0 Revisions to Spill Contingency Plan and/or Abandonment and Restoration Plan

Provide reference to any changes applied to Spill Contingency Plan or Abandonment and Restoration Plans. If none, delete section.

Annual Report – Example Template

Arviat Water Use and Waste Disposal
Water Licence 3AM-ARV1015

5.0 Progressive Reclamation Work

Describe any reclamation work completed and reference applicable reports. If none, delete section.

6.0 Monitoring Program

The monitoring program included in the water license provides specific requirements regarding sampling locations, sampling frequency, parameters to be analyzed and effluent quality. The requirements are summarized in Table 1.

Table 1 Monitoring Program Stations for Water License 3AM-ARV1015

Station	Description	Frequency	Analysis Requirements
ARV-1	Raw water supply at the Wolf River Water Supply prior to treatment	Monthly and annual	Measure and record in cubic metres of water pumped from station
ARV-2	ARV-2a Sampling of effluent discharge from the Final Discharge Point of the Solid Waste Disposal Facility ARV-2b Sampling of effluent from the discharge point of the New Solid Waste Disposal Facility	<i>Water Quality</i>	
		Monthly from May to August, Inclusive	<ul style="list-style-type: none"> BOD Faecal Coliforms pH Conductivity Total Suspended Solids Ammonia Nitrogen Nitrate-Nitrite Total Phenols Sulphate Oil and Grease (visual) Sodium Potassium Magnesium Calcium Total Arsenic Total Cadmium Total Copper Total Chromium Total Iron Total Lead Total Mercury Total Nickel Total Zinc
		<i>Acute Toxicity</i>	
		Annually	<ul style="list-style-type: none"> Acute toxicity test: Rainbow Trout Acute toxicity test: Daphnia magna
ARV-3	Raw sewage at truck offload point	Monthly and annual	Measure and record in cubic metres the raw sewage offloaded from trucks
ARV-4	Sampling of Effluent Discharge from Final Discharge Point of the Sewage Disposal Facilities	Water Quality: Monthly from May to August, Inclusive Toxicity: Annually	Same as ARV-2

Annual Report – Example Template

Arviat Water Use and Waste Disposal
Water Licence 3AM-ARV1015

Station	Description	Frequency	Analysis Requirements
ARV-5	Sampling of discharge from the Bulky Metal Waste Area	Monthly during periods of observed flow	Same water quality parameters as ARV-2
ARV-6	Sampling of Discharge from the Hazardous Waste Storage Area	Monthly during periods of observed flow	Same water quality parameters as ARV-2
ARV-7	Water level in Wolf River	Monthly during periods of open water	Water level measurements
ARV-8	Water level in Sewage Disposal Facility lagoon	Monthly during thawed conditions	Water level measurements
ARV-9	Sewage Sludge removed from the Sewage Disposal Facility	Monthly	Record monthly and annual volumes of sludge (m ³) removed
ARV-10	Sampling of Effluent from the Final Discharge Point of the Hydrocarbon Impacted Soil Storage and Treatment Facility	To be determined	To be determined
ARV-11	Sampling of Effluent from discharge from dewatering contaminated soil areas	To be determined	To be determined

7.0 Monitoring Results

7.1 Water Supply Facility

Monitoring of water volumes from ARV-1 have been recorded by the Hamlet on a monthly basis. Table 2 provides the volumes recorded and total annual quantity of water used for the year .

Table 2 Monthly Volumes of Water Used by Hamlet of Arviat (ARV-1)

Month	Volume of Water Used (m ³)
January	
February	
March	
April	
May	
June	
July	
August	
September	
October	
November	

Month	Volume of Water Used (m ³)
December	
Total	

Water levels at the Wolf River intake are measured from a reference point located at the pumphouse (ARV-7) during periods of open water. Table 3 provides the monthly water levels recorded at Wolf River (ARV-7) during periods of open water.

Table 3 Wolf River Water Levels (ARV-7)

Date	Water Level (metres below measuring point)	Water Level (metres above sea level)

Describe any upgrades or maintenance made to water supply facilities.

7.2 Wastewater Treatment Facility

Water samples were taken from the discharge point of the Sewage Disposal Facility (ARV-4) during the months of May to August inclusive. Laboratory results are provided in Appendix C.

Describe any exceedences of the effluent quality limits provided in the licence or CCME Water Quality Guidelines for Protection of Aquatic Life (Appendix D).

The volume of raw sewage discharged at the truck offload point was recorded monthly (ARV-3). These volumes are estimated based on the water use of the community during the month. A summary is provided in Table 4.

Table 4 Volume of Sewage Discharge into Lagoon (ARV-3)

Month	Volume of Sewage (m³)
January	
February	
March	
April	
May	
June	
July	
August	
September	
October	
November	
December	
Total	

Water levels at the Sewage Disposal Facility lagoon were measured monthly from a reference point identified as ARV-8 during thawed conditions. Table 5 provides the monthly water levels recorded at ARV-8 during thawed conditions.

Annual Report – Example Template

Arviat Water Use and Waste Disposal
Water Licence 3AM-ARV1015

Table 5 Sewage Lagoon Water Levels (ARV-8)

Date	Water Level (metres below measuring point)	Water Level (metres above sea level)

Sewage sludge removed from the sewage disposal facility was recorded on a monthly basis. A summary is provided in Table 6.

Table 6 Sewage Sludge Removal Records (ARV-9)

Month	Volume of Sludge Removed (m³)
January	
February	
March	
April	
May	
June	
July	
August	
September	

Annual Report – Example Template

Arviat Water Use and Waste Disposal
Water Licence 3AM-ARV1015

Month	Volume of Sludge Removed (m ³)
October	
November	
December	
Total	

7.3 Solid Waste Management Facility

Water samples were taken from the discharge point of the Solid Waste Disposal Facility (ARV-2a) during the months of May to August inclusive. Water quality sampling was also conducted monthly for discharge from the bulky metal waste area (ARV-5) and the hazardous waste storage area (ARV-6), during periods of observed flow. Laboratory results are provided in Appendix C.

Describe any exceedences of the CCME Water Quality Guidelines for Protection of Aquatic Life (Appendix D).

Annual Report – Example Template

Arviat Water Use and Waste Disposal
Water Licence 3AM-ARV1015

8.0 INAC Inspection Reports

The most recent inspection report from INAC was written on . A copy of the report is included in Appendix E.

Describe any compliance issues identified in report.

Describe actions or future actions to address issues identified in report.

Annual Report – Example Template

Arviat Water Use and Waste Disposal
Water Licence 3AM-ARV1015

9.0 Other Information

Include other information in Appendix F.

Appendix A

Nunavut Water License – 3AM-ARV1015

Appendix B

Annual Monitoring Report Form

Appendix C

Sample Results

Appendix D
CCME Canadian Water Quality
Guidelines for the Protection of
Aquatic Life

Appendix E
INAC Inspection Report

Appendix F

Other Information