

## **APPENDIX 'B'**

# **QA/QC Plan**

**Sewage Lagoon facility  
Hamlet of Taloyoak**

## 14.0 Introduction

The purpose of this QA/QC plan is to provide guidance to ensure that sewage facility is in compliance with requirements and environmental monitoring program of grab samples collected in the field are done with a high degree of quality to ensure the accurately reflect the physical and chemical nature of the matrix being tested.

### 14.1 Background

Hamlet of Taloyoak is located on the Boothia Peninsula within the Kitikmeot region of Nunavut, within a zone of continuous permafrost and situated on sand & gravel raised beaches with flat & rolling terrain with numerous lakes and ponds.

The lagoon system is located approximately 3.2 km from the community, with about 35,700 m<sup>3</sup> capacity. The primary cell receives raw sewage from trucked discharge and it stays in the primary cell for the winter. Upon spring / summer melt, effluent & water flows over a semi-submerged berm into the secondary cell, from where it naturally overflows onto wetland. The meandering wetland about 900 m, enriched with seasonal vegetation, helps effluent remediation process excellent before runs to ocean.

### 14.2 Objectives

This QA/QC plan is prepared in accordance with “Quality Assurance (QA) and Quality Control (QC) Guidelines for use by Class “B” Licensees in Collecting Representative Water Samples in the Field and for submission of a QA/QC Plan” (Department of Indian and Northern Affairs Canada, July 1996).

The objective of this QA/QC plan is to ensure the reliability of the monitoring activities of sampling specified in the identified stations and to satisfy the requirements of the water licence.

#### 14.2.1 Scope of Work

This QA/QC Plan covers the environmental monitoring undertaken at the sewage waste facility The following definitions that are relevant to this plan include:

**Quality Assurance:** is a system that ensures that quality control procedures are correctly performed.

**Quality Control:** refers to the established procedures observed both in the field and in the laboratory, designed to ensure that the resulting end data meet intended quality objectives.

**Trip Blank:** is a sample of clean water that was prepared by the analytical laboratory and shipped to the sample site in the cooler along with the empty sample bottles. This trip blank sample remains unopened and is transported back to the laboratory with the monitoring program samples. The trip blanks is

analyzed by the laboratory along with the monitoring program samples. The purpose of the trip blank is to assess contamination introduced during shipping and field handling procedures.

**CALA:** refers to the Canadian Association for Laboratory Accreditation, formally known as the Canadian Association for Environmental Analytical Laboratories (CAEAL).

**Chain of Custody Documentation:** refers to the documentation that accompanies samples sent to an analytical laboratory. It is a legal document which ensures that the sample taken at a specific site is the same sample received in the laboratory. It also provides information on the sample condition and integrity as received by the laboratory.

### 14.3 Sampling Procedures

All sampling, samples preservation and analyses are to be conducted in accordance with methods described in the manual, standard practice for northern weather and in the original or expired Water Licence. Procedure also remains in compliance with practice and guidance to CALA laboratory (here Taiga Laboratory in Yellowknife) approved for the Hamlet of Taloyoak.

To obtain meaningful results from the analyses, the following factors are of particular importance:

- Sample collection as per schedule and location of monitoring stations.
- Correct usage of container/sample bottle for parameter being tested.
- Correct labelling of sample bottles and filling out record/field sheet.
- Correct procedure for field sampling.
- Proper and timely shipment of samples to the laboratory.
- Timely delivery of samples to the laboratory from the air cargo facility.

### 14.4 Sampling Collection

Refer to the Environmental Monitoring Program Check list, details on the sampling locations, equipment and sampling methods.

#### **Locations:**

The water licence issued to the Hamlet by the NWB does not specify any monitoring locations. However, three monitoring locations are proposed in this plan.

- Station TAL-2 is an effluent discharge sampling location from the Sewage Disposal Facility.
- Station TAL-3 is run-off effluent sampling location from the Solid Waste Disposal Facilities.
- Station TAL-4 is a combined effluent discharge sampling location from the Sewage lagoon and solid waste run off before merging into Ocean.

The following table includes the geographic coordinates for the three monitoring stations.

Sampling Station	GPS Location		Description	Comments
	Latitude	Longitude		
<b>TAL-1</b>	N 69° 32' 39"	W 93° 32' 05"	Raw Water supply at Water Lake	Volume of water collected from lake
<b>TAL-2</b>	N 69° 32' 38"	W 93° 35' 39"	Sewage outfall entry to wetland	Outside the lagoon , onto wetland
<b>TAL-3</b>	N 69° 32' 26"	W 93° 35' 22"	Solid waste discharge run-off	Outside the fenced area on wetland
<b>TAL-4</b>	N 69° 32' 22"	W 93° 35' 25"	Effluent Final discharge point before meeting ocean	Combined effluent at the end of wetland
<b>TAL-5</b>	N 69° 32' 23"	W 93° 34' 34"	Hazardous storage cell retention water	<b>New station.</b> Sample collect only when decanting requires

## 14.5 Sampling Equipment

Dedicated latex or nitrile gloves (i.e., one pair per sample) are to be used during sample handling. Dedicated sampling equipment such as sampling poles are to be cleaned with sanitizer and water after each sample is collected to prevent cross-contamination.

Environmental monitoring samples collected for analysis of selected chemical parameters are to be placed directly into new pre-cleaned, laboratory-supplied sample bottles. All monitoring samples are to be placed in clean coolers for transportation to the subcontract laboratory.

The samples are transported/submitted under Chain of Custody documentation. Included on a Chain of Custody form is the client information, the sample information, the analyses requested, the relevant regulations, the turnaround time for the analytical results, comments, and temperature of the samples at the time they arrived in the laboratory. An example of a completed Chain of Custody form is included in **Appendix D**.

## 14.6 Sampling Methods

As a general recommendation, please refrain from using insect repellent, disinfection hand gel or other chemical products before and during sample collection. Also, please refrain from smoking during sample collection.

### 14.6.1 Sewage wastewater effluent sampling

Effluent discharge is to be collected from the sewage discharge (Station TAL-2). Effluent samples are collected from the receiving water body by immersing the sample bottle into the water neck first to a depth of 5 to 10 cm. The sampling container is filled with effluent and the sample bottle is raised neck first to prevent sample spillage (Picture).

### 14.6.2 Combined effluent discharge and Solid waste run-off sampling

A sample of the combined effluent of sewage effluent discharge and solid waste run-off is to be collected once a month during periods of observed flow (July-Oct) from station TAL-4. The combined effluent discharge and runoff sample is to be collected from the receiving water body by immersing the sample bottle into the effluent runoff stream neck first to a depth of 5 to 10 cm (if possible). The sampling container is to be filled with effluent runoff and the sample bottle is raised neck first to prevent sample spillage (see Picture).



Sampling at station: TAL-2



Sampling at station: TAL-4

## 14.7 Sample Handling

All water samples are to be collected in laboratory-supplied containers with the proper preservative, where applicable. A complete list of parameter handling and preservatives can be found in this manual. All sample containers are to be tightly sealed and properly labelled with the sample ID, Date and Time of sample collection, location of sample collection and parameters to be analyzed. The outside of the bottles are to be cleaned with soft tissue after sampling and dried off prior to placing the samples in the cooler. Samples are to be stored on ice in a cooler until delivery to the laboratory. A chain of custody form is to be filled out completely and is used to track samples and placed in the cooler along with the samples, in a zip lock bag. Keep the last page of the Chain of Custody and give it to the Hamlet Foreman for their records.

The following checks are generally performed by the laboratory upon receipt:

- Verification of the integrity and condition of all sample coolers.
- Verification of the integrity and condition of all sample containers.
- Checks for leakage, cracked or broken closures or containers, evidence of grossly contaminated container exteriors or shipping cooler interiors, and obvious odours, etc.
- Verification of receipt of complete documentation for each container.
- Verification that sample identification numbers on sample transmittal forms corresponds to sample identification numbers on the sample containers.

Verifications that holding times were met and samples were kept cool during transit.

## 14.8 Quality Assurance and Quality Control Program

Cross contamination is a common source of error in sampling procedures. QC samples help identify when and how contamination might occur. There are various types of QC samples. For the purposes of the Hamlet's environmental monitoring, it is recommended the use of trip blanks.

It is essential to request a trip blank sample to be prepared when placing the bottle order with the contract laboratory

## 15.0 Laboratory Analysis

### Laboratory Accreditation

As indicated in the Guidelines, the Hamlet should use an analytical laboratory accredited by the Canadian Association for Laboratory Accreditation (CALA), formally known as the Canadian Association for Environmental Analytical Laboratories (CAEAL) for the monitoring program.

**Summary results from APPENDIX- 'E'****Table: Summary of Leachate Sampling Results (SNP Monitoring Station)**

Sewage and solid waste effluent samples collected on Aug 22, 2013

Parameter	MAC	units	July 05, 2013		Aug 22, 2013	
	Limits		TAL-2	TAL-4	TAL-2	TAL-3
Alkalinity		mg/L	275	201	202	217
Conductivity		µS/cm	950	803	802	1070
p <sup>H</sup>	6-9		7.46	7.90	8.65	7.56
TSS		mg/L	30	<3	115	42
Ammonia as N <sub>2</sub>		mg/L	15.8	0.10	1.20	0.31
BOD		mg/L	18	<2	58	29
CBOD		mg/L	15	<2	56	29
Nitrate as N <sub>2</sub>		mg/L	0.24	0.48	0.24	0.69
Nitrite as N <sub>2</sub>		mg/L	0.08	0.07		
Calcium		mg/L	55.8	58.2	50.3	76.2
chloride		mg/L	93.6	99.9	109	144
Hardness		mg/L	241	259	233	351
Magnesium		mg/L	24.7	27.7	26	39.1
Potassium		mg/L	15.1	7.5	16.1	9.9
Sodium		mg/L	70.3	69.2	81.5	98.3
Sulphate		mg/L	51	60	57	136
Fecal Coliform		CFU/100mL			1970	TNTC
Oil and Gas	5000	µg/L	Invis.	Invis.	Invis.	Invis.
Aluminium		µg/L	38	<5	63	32
Arsenic	100	µg/L	0.5	0.4	2.3	2.2
Cadmium	10	µg/L	<0.1	<0.1	<0.1	<0.1
Chromium	100	µg/L	0.4	0.4	1.0	3.0
Cobalt	50	µg/L	<0.1	<0.1	<0.1	<0.1
Copper	200	µg/L	9.8	0.6	6.5	38
Iron		µg/L	88	224	146	856
Lead	50	µg/L	<0.1	<0.1	0.2	<0.1
Manganese		µg/L	27.3	21.7	26.5	51.1
Nickel	200	µg/L	1.2	0.8	2.1	2.5
Zinc	500	µg/L	10	<5	10	6

## 16.0 Facility Inspection

The SAO or MSM of the Hamlet will direct the Lagoon facility operation team in carrying regular or as required inspection of the facility. The sewage collection team usually maintain a log sheet in their daily operation of vehicles and sewage collection, transportation and discharge. Partly the operator will carry visual inspection of the discharge area and access road. The Forman or MSM will maintain those log sheet and record for annual report.

### 16.1 Inspection of sewage lagoon and components

Daily: A brief check of the lagoon shall be done daily when raw sewage discharge into the lagoon. Site and weather conditions shall be noted, as well as any activities carried out that day.

Weekly: During snow-free period in summer and fall, integrity of main components (discharge chute, flute tie and support, pad) of the sewage lagoon system should be inspected. A report shall be filed, noting the date and any issues identified. The truck discharge point and surrounding area should be examined weekly for signs of cracking, sliding or other operational issues.

The truck discharge system consists of discharge chute laid on a slope for conveying sewage from the truck discharge into the primary cell. The chute is anchored at the top and bottom of the slope. A pressure treated timber wheel stop and steel bumper posts are provided to control the position of the trucks during discharge. The timber wheel stop and steel bumper posts should be inspected regularly for any signs of damage or instability.

During open water periods, the water level in the lagoon should be observed and recorded.

### 16.2 Sewage Colour

The variations in the colour of sewage during open water periods can be an important indicator of a sewage lagoon system performance. The following list provides frequently observed sewage colours and associated performance indicators:

- *Dark Green* – Good. high pH and high dissolved oxygen (DO).
- *Dull Green to Yellow* – Not very good. pH dropping, DO dropping, and blue-green algae are becoming established.
- *Grey to Black* – Very bad. Lagoon anaerobic.
- *Tan to Brown* – Okay if caused by a type of algae bloom. Not good if due to silt or bank erosion.



- *Red or Pink* – Indicates presence of sulphur bacteria (anaerobic conditions) or presence of red algae (aerobic conditions).

Lagoon colour shall be noted during the weekly inspections. If the lagoon colour indicates poor performance (dull green to yellow, grey to black and red or pink) the Hamlet shall consult with the NWB to determine appropriate remedial actions. Sewage of this colour is not ready for discharge to ocean.

### **16.3 Reporting Requirements**

As a condition of NWB Licence the Hamlet is required to submit an Annual Report to the NWB, no later than March 31<sup>st</sup> of the year following the calendar year reported. Among other requirements, the annual report is required to include tabular summaries of all analytical data generated under the Monitoring Program.