City of Iqaluit

Quality Assurance / Quality Control Plan

Type of Document
Final

Project Name
Water Licence 3AM-IQA0611

Project Number
OTT-00210131-A0

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Reviewed By: Chris Kimmerly, M.Sc., P.Geo. (ON)

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Date Submitted
March, 2013

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Date Submitted:
March, 2013

Table of Contents

1 Introduction

1.1 Background

The City of Iqaluit overlooks Koojesse Inlet on the south coast of Baffin Island (Figure 1, Appendix A). Lake Geraldine supplies raw water to the City. During the spring and summer, runoff from the surrounding watershed fills the lake. Water is stored for over-winter consumption by a dam on Lake Geraldine. From the dam outfall, water is transmitted by gravity to the water treatment plant (WTP) where it is treated by UV, filtration, chlorination, and fluorination. Treated water is stored in two storage reservoirs located next to the WTP prior to entering the main distribution system.

The City's wastewater receives primary treatment at the wastewater treatment plant (WWTP) before being disposed in Frobisher Bay. The sewage lagoon is used as a backup facility only.

Landfill runoff is collected in the on-site detention ponds. The run-off is then pumped to the retention pond located across the road from the landfill. When the retention pond is decanted, a 4" pump is then connected to a Geotube dewatering bag and the retention pond is decanted through the Geotube.

The Nunavut Water Board (NWB) issued a Class A Water Licence (3AM-IQA0611) to the City on May 15, 2006. The water licence governs water use and waste disposal within the City. A copy of the Water Licence is provided in Appendix E.

1.2 Monitoring and Regulatory Requirement Program

Condition 7 of Part I of the water licence issued to the City requires that the City submit to the NWB for approval, a Quality Assurance / Quality Control (QA/QC) Plan prepared in accordance with "*Quality Assurance (QA) and Quality Control (QC) Guidelines for use by Class "A" Licensees in Meeting SNP Requirements and for Submission of a QA/QC Plan"* (Department of Indian and Northern Affairs Canada, 1996), herein referred to as "The Guidelines".

1.3 Definitions

Quality Assurance is a system that ensures that quality control procedures are correctly performed and documented.

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.

Guidelines – see Section 1.2 above.

1.4 Scope of QA/QC Plan

This QA/QC Plan covers the environmental monitoring undertaken at the City's water treatment plant (WTP), wastewater treatment plant (WWTP) and the West 40 Landfill site (Figure 1).

1.5 Objective of the QA/QC Plan

The objective of this QA/QC plan is to ensure the reliability of the data collected during monitoring activities at the WTP (Figure 2), WWTP (Figure 3), and West 40 Landfill (Figure 4).

2 Field Sampling

2.1 Field Measurements

Field measurements of various water quality parameters (including pH, temperature, conductivity and oxidation-reduction potential (ORP)) are recorded using a multi meter instrument. The instrument probes are calibrated prior to use following manufacturer's procedures using analytical grade reagents.

2.2 Sampling Procedures

All sampling, sample preservation and analyses is conducted in accordance with methods described in the current edition of "*Standard Methods for the Examination of Water and Wastewater*" (American Public Health Association, American Water Works Association, and Water Environment Federation, most current edition).

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

- Sample collection as per schedule and location.
- 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 (City controlled).
- Timely delivery of samples to the laboratory (not City controlled).

2.3 Sampling Collection

Refer to the checklists, found in Appendix B for specific details on the sampling locations, equipment and sampling methods.

2.3.1 Locations

The water licence issued to the City (3AM-IQA0611) by the NWB specifies nine monitoring stations across the licensed facilities (WTP, WWTP, and landfill). The City collects the monitoring program samples as per the schedule included in Appendix D.

- Station IQA-01 is a raw water supply (from Lake Geraldine) sampling location, prior to treatment at the WTP.
- Station IQA-02 is a wastewater sampling location at the final discharge point from the sewage lagoon.
- Station IQA-03 is a wastewater sampling location of the influent to the sewage lagoon.
- Station IQA-04 is a wastewater sampling location at the final discharge point from the WWTP.
- Station IQA-05 is a wastewater sampling location of the influent to the WWTP.
- Station IQA-06 is a sample of sludge from the WWTP.
- Station IQA-07 is a sample of surface water entering the West 40 Landfill site.

- Station IQA-08 is a sample of surface water from the final discharge point from the West 40 Landfill site.
- Station IQA-09 is a sample of contaminated soil accepted at the West 40 Landfill site.

The following table includes the geographic coordinates for the nine monitoring stations described above.

Table 1 –Geographic Coordinates for the Monitoring Stations for NWB Licence 3AM-IQA0611

Station ID	Latitude*	Longitude*
IQA-01	63°45'12'' N	68°30'22'' W
IQA-02	63°44'43'' N	68°32'18'' W
IQA-03	63°44'49'' N	68°32'09'' W
IQA-04	63°44'43'' N	68°32'20'' W
IQA-05	63°44'45'' N	68°32'20'' W
IQA-06	63°44'45'' N	68°32'20'' W
IQA-07	NA	NA
IQA-08	63°43'47'' N	68°32'11'' W
IQA-09	NA	NA

* NAD 83

2.3.2 Sampling Equipment

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

Environmental monitoring samples collected for analysis of selected chemical parameters are placed directly into new pre-cleaned, laboratory-supplied sample bottles. All monitoring samples are placed in clean coolers prior to and during transportation to the subcontract laboratory. The samples are transported/submitted under Chain of Custody documentation.

2.3.3 Sampling Methods

2.3.3.1 *Water and Wastewater Sampling*

Raw water samples are collected from the valve at the gravity intake pipe from the dam at Lake Geraldine, just as it enters the WTP. Samples of influent wastewater to the WWTP are collected from a valve located just before the wastewater enters the screw screen tanks. Effluent wastewater samples are collected from a valve located just after the wastewater passes through the Salnes filter.

2.3.3.2 *Sewage Sludge Sampling*

Sewage sludge collected in a trailer located beneath the filter room of the WWTP. Sewage sludge samples are collected directly from the trailer by immersing the sample bottle into the sludge neck first to a depth of 5 to 10 cm. The sampling container is filled with sludge and the sample bottle is raised neck first to prevent sample spillage.

2.3.3.3 *Landfill Runoff Sampling*

Landfill run-off is collected in the on-site detention ponds. The run-off is then pumped to the retention pond located across the road from the landfill. The landfill runoff sample bottles are filled with the discharge during the decanting period. When a Geotube is used, the samples are taken from the geotube discharge (after filtration). Three water samples are collected during each decant, including a sample at the start, mid-point and at the end.

2.4 Sample Handling

All water samples are collected in laboratory-supplied containers with the proper preservative, where applicable. A complete list of parameter handling and preservatives can be found in Appendix B.

All sample containers are 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 cleaned with soap and water after sampling and prior to placing the samples in the cooler. The samples are stored on ice in a cooler until delivery to the laboratory. A chain of custody form is filled out completely and is used to track the samples.

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.

2.5 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 including: blind duplicates, field blanks, and trip blanks. A blind duplicate is a duplicate sample that is not labelled as such. The purpose of the blind duplicate sample is to ensure analytical precision. A field blank is a sample of analyte free (i.e., clean) water poured into the container in the field, preserved and shipped to the laboratory with field samples and is analyzed along with field samples to check contamination from field conditions during sampling. A trip blank is a clean water sample that stays unopened and that remains with collected samples during transportation and is analyzed along with field samples to check residual contamination (i.e., to determine if cross contamination occurs during shipping).

Exp recommends the following number of quality control samples based on the number of samples collected:

- One trip blank per cooler.
- 10% blind duplicates.

If the total number of samples collected is less than five, include at a minimum, one blind duplicate.

3 Lab Analysis

3.1 Lab Accreditation

As previously indicated, the City of Iqaluit uses an analytical laboratory accredited by the Canadian Association for Laboratory Accreditation (CALA); formally known as the Canadian Association for Environmental Analytical Laboratories (CAEAL) in Ottawa, Ontario for the monitoring program for NWB Licence 3AM-IQA0611. Appendix C includes a copy of the laboratory's CALA accreditation certificate and a list of the parameters for which they are certified.

3.2 Detection Limits

Details on the calculation of the Method Detection Limits (MDLs) and the establishment of the Method Reporting Limits (MRLs) can be found in Appendix C.

3.3 Methodology

Current (2012) standard methodology is used by the contract laboratory. Details on the methods used can be found in the Accreditation documentation found in Appendix C.

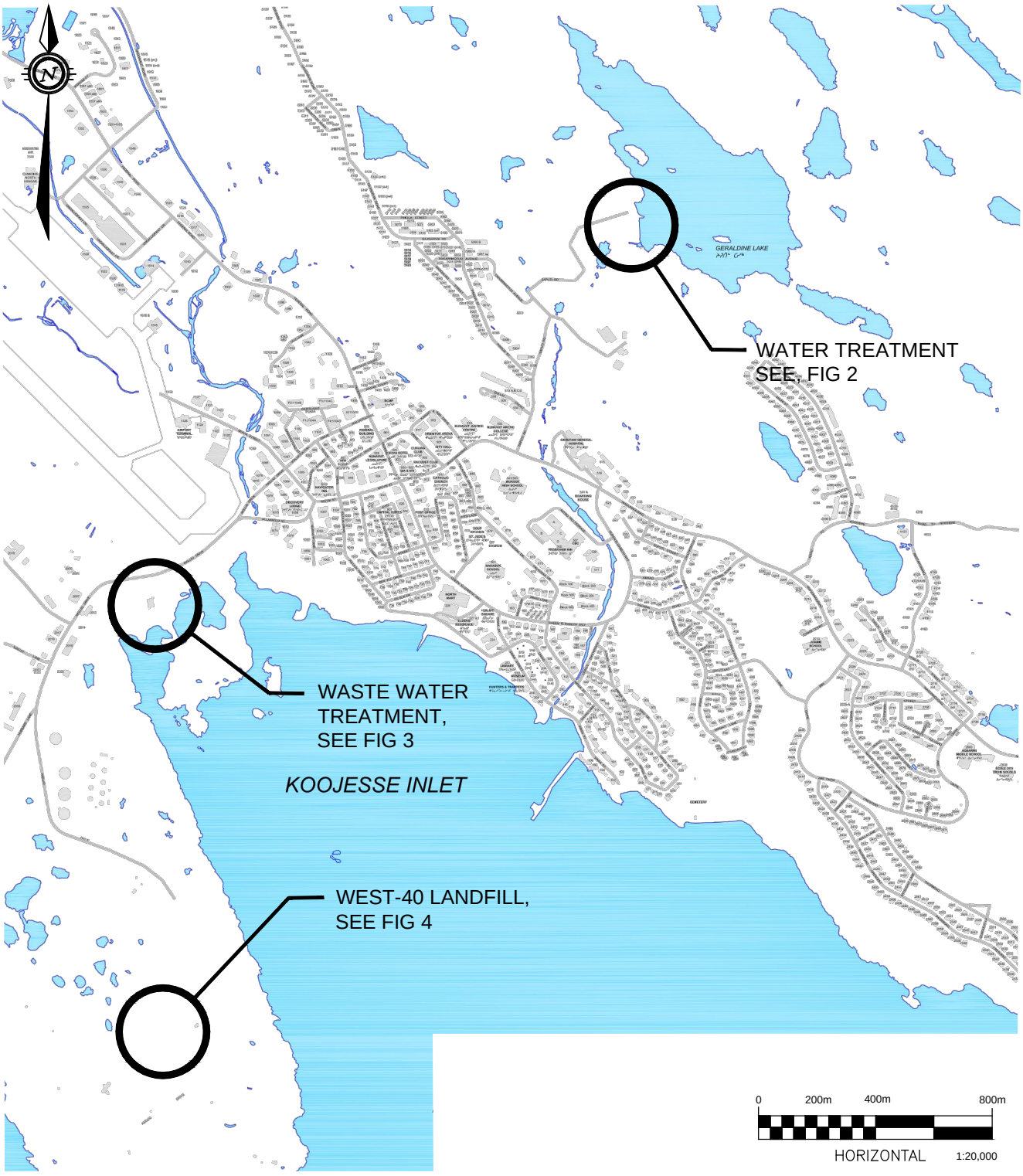
4 Reporting Requirements

4.1 General Submissions

As a condition of NWB Licence 3AM-IQA0611 (Appendix E), the City is required to submit a monthly general monitoring report to the NWB. The objective of this monthly general monitoring report is to document the environmental monitoring, pursuant to the NWB licence, undertaken by the City during the month. This monthly general monitoring report includes a description of the sampling locations, the test group parameters, all laboratory analytical data and an evaluation of compliance with the NWB licence conditions.

A copy of the monthly general monitoring report template is included in Appendix F. The monthly general monitoring report includes a description of the "Environmental Monitoring Sample Collection Program", including a listing of the monitoring stations that were sampled during the subject month. The field observations, if any, are presented and the analytical results are compared to the appropriate criteria and a general discussion of the results is presented.

Appendix A: Figures



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Ottawa, ON K2B 8H6, Canada

DATE: DEC. 2012	CLIENT: CITY OF IQALUIT	project no. OTT-00210131-A0
DESIGN: R.R. / CHECKED: C.T.K.	TITLE: SITE LOCATION IQALUIT, NUNAVUT	scale 1:20,000
DRAWN BY: M.N.		FIG 1

0 40m 80m 160m

HORIZONTAL 1:4000

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Ottawa, ON K2B 8H6, Canada

DATE: DEC. 2012	CLIENT: CITY OF IQALUIT	project no. OTT-00210131-A0
DESIGN: R.R. / CHECKED: C.T.K.		scale 1:4000
DRAWN BY: M.N.	TITLE: SITE LOCATION - WATER TREATMENT PLANT IQALUIT, NUNAVUT	FIG 2

0 40m 80m 160m

HORIZONTAL 1:4000

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DATE: DEC. 2012	CLIENT: CITY OF IQALUIT	project no.: OTT-00210131-A0
DESIGN: R.R. / CHECKED: C.T.K.		scale: 1:4000
DRAWN BY: M.N.	TITLE: SITE LOCATION - WASTE WATER TREATMENT PLANT IQALUIT, NUNAVUT	FIG 3

0 40m 80m 160m

HORIZONTAL 1:4000

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DATE: DEC. 2012	CLIENT: CITY OF IQALUIT	project no. OTT-00210131-A0
DESIGN: R.R. / CHECKED: C.T.K.		scale: 1:4000
DRAWN BY: M.N.	TITLE: SITE LOCATION - WEST 40 LANDFILL IQALUIT, NUNAVUT	FIG 4

Appendix B:
Environmental Monitoring Program Checklists, Summary of Sample Collection and Preservation

CITY OF IQALUIT
WATER TREATMENT PLANT MONITORING PROGRAM CHECKLIST

PRE-SAMPLING ACTIVITIES		
Bottle Order	At least two weeks before upcoming environmental sampling, send a request to the contract laboratory for the appropriate sample sets (bottles) for the required sampling test groups (see Table 2 of Schedule C of Nunavut Water Board Licence 3AM-IQA0611)	☐
Personal Protective Equipment	Ensure that the required personal protective equipment (PPE), such as latex gloves, is on hand before commencing the environmental monitoring program.	☐
Bottle Shipment	Ensure that the bottle shipment has arrived from the contract laboratory in time for the sampling program and verify the integrity of all sampling containers. Report any missing or broken bottles to the contract laboratory as soon as possible, so that replacement bottles may be shipped.	☐
Sampling Location Inspection	Perform an initial inspection of the sampling location before the commencement of the monitoring program. Make note of any equipment damage or conditions that may prevent the collection of the environmental monitoring program samples.	☐
GENERAL SAMPLING INSTRUCTIONS		
Prevention of Cross-Contamination	Ensure that any laboratory provided sampling instructions are strictly followed. Latex or nitrile gloves should be worn during sampling and should be replaced with fresh gloves after all sample containers are filled at each sampling location. Sampling equipment such as sampling poles should be cleaned with soap and water after each sample is collected to prevent cross-contamination.	☐
Sample Care	All sample containers should 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 should be cleaned with soap and water prior to placing the samples in the cooler. The samples should be stored on ice in a cooler until delivery to the laboratory. A chain of custody form should be filled out completely and be used to track the samples. Keep the last page and give it to the Foreman.	☐
WATER TREATMENT PLANT (IQA-01) SAMPLING INSTRUCTIONS		
Note	**Complete the list below by 9:30 AM to ensure that the sampling package can be shipped to Ottawa in the same day.**	☐
Step 1	Obtain the test kit from the Purchasing Department the day before sample collection.	☐
Step 2	Label all sample bottles with the sample ID, date and time of sample collection, location of sample collection and parameters to be analyzed.	☐
Step 3	Locate the valve on the intake pipe into the Water Treatment Plant (see Photo below).	☐
Step 4	Fill all sample bottles to top (no headspace). Ensure that the valve is fully closed after collecting the water sample.	☐
Step 5	Wipe clean the outside of the sample bottles before packing the samples in the cooler for shipment to the laboratory.	☐
Step 6	Use ice or freezer packs to ensure that the samples are maintained below 10°C in the cooler during shipment to the laboratory.	☐
Step 7	Complete the Chain of Custody form, keep the last page for the Foreman and put the form into the cooler with the samples. Place Custody seals across the lip of the cooler lid and ensure you sign and date the seals.	☐
Step 8	Return the sampling package to the Purchasing Department.	☐

POST-SAMPLING ACTIVITIES		
Sample Shipment	Ensure all samples are shipped to the contract laboratory by priority freight immediately after the completion of the environmental monitoring event to ensure that the hold times are respected for the various parameters. Follow-up with the contract laboratory on the day after the samples were shipped to ensure that the samples were collected from the air cargo facility and received by the contract laboratory for analysis.	☐
Analytical Results	Ensure that the analytical results for the environmental monitoring program samples are received within the specified turn-around time. Follow-up with the contract laboratory if the results are not provided as expected to ensure timely reporting to the Nunavut Water Board (as required by Water Licence 3AM-IQA0611).	☐

Checklist Performed By:

Name	Signature	Date

CITY OF IQALUIT
SEWAGE LAGOON MONITORING PROGRAM CHECKLIST

PRE-SAMPLING ACTIVITIES		
Bottle Order	At least two weeks before upcoming environmental sampling, send a request to the contract laboratory for the appropriate sample sets (bottles) for the required sampling test groups (see Table 2 of Schedule C of Nunavut Water Board Licence 3AM-IQA0611)	☐
Personal Protective Equipment	Ensure that the required personal protective equipment (PPE), such as latex gloves, is on hand before commencing the environmental monitoring program.	☐
Bottle Shipment	Ensure that the bottle shipment has arrived from the contract laboratory in time for the sampling program and verify the integrity of all sampling containers. Report any missing or broken bottles to the contract laboratory as soon as possible, so that replacement bottles may be shipped.	☐
Sampling Location Inspection	Perform an initial inspection of the sampling location before the commencement of the monitoring program. Make note of any equipment damage or conditions that may prevent the collection of the environmental monitoring program samples.	☐
GENERAL SAMPLING INSTRUCTIONS		
Prevention of Cross-Contamination	Ensure that any laboratory provided sampling instructions are strictly followed. Latex or nitrile gloves should be worn during sampling and should be replaced with fresh gloves after all sample containers are filled at each sampling location. Sampling equipment such as sampling poles should be cleaned with soap and water after each sample is collected to prevent cross-contamination.	☐
Sample Care	All sample containers should 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 should be cleaned with soap and water prior to placing the samples in the cooler. The samples should be stored on ice in a cooler until delivery to the laboratory. A chain of custody form should be filled out completely and be used to track the samples. Keep the last page and give it to the Foreman.	☐
SEWAGE LAGOON (IQA-02) SAMPLING INSTRUCTIONS		
Note	**Complete the list below by 9:30 AM to ensure that the sampling package can be shipped to Ottawa in the same day.**	☐
Step 1	Obtain the test kit from the Purchasing Department the day before sample collection.	☐
Step 2	Label all sample bottles with the sample ID, date and time of sample collection, location of sample collection and parameters to be analyzed.	☐
Step 3	Collect water samples from the final discharge of the sewage lagoon during emergency decants. Follow all applicable emergency procedures during decant process.	☐
Step 4	Fill all sample bottles to top (no headspace). Samples should be collected at the beginning, middle and end of each decant. Be sure to use fresh latex gloves for each sample (i.e., the beginning, middle and end of each decant).	☐
Step 5	Wipe clean the outside of the sample bottles before packing the samples in the cooler for shipment to the laboratory.	☐
Step 6	Use ice or freezer packs to ensure that the samples are maintained below 10°C in the cooler during shipment to the laboratory.	☐
Step 7	Complete the Chain of Custody form, keep the last page for the Foreman and put the form into the cooler with the samples. Place Custody seals across the lip of the cooler lid and ensure you sign and date the seals.	☐
Step 8	Return the sampling package to the Purchasing Department.	☐

POST-SAMPLING ACTIVITIES		
Sample Shipment	Ensure all samples are shipped to the contract laboratory by priority freight immediately after the completion of the environmental monitoring event to ensure that the hold times are respected for the various parameters. Follow-up with the contract laboratory on the day after the samples were shipped to ensure that the samples were collected from the air cargo facility and received by the contract laboratory for analysis.	☐
Analytical Results	Ensure that the analytical results for the environmental monitoring program samples are received within the specified turn-around time. Follow-up with the contract laboratory if the results are not provided as expected to ensure timely reporting to the Nunavut Water Board (as required by Water Licence 3AM-IQA0611).	☐

Checklist Performed By:

Name	Signature	Date

CITY OF IQALUIT
WWTP OUTFALL MONITORING PROGRAM CHECKLIST

PRE-SAMPLING ACTIVITIES		
Bottle Order	At least two weeks before upcoming environmental sampling, send a request to the contract laboratory for the appropriate sample sets (bottles) for the required sampling test groups (see Table 2 of Schedule C of Nunavut Water Board Licence 3AM-IQA0611)	☐
Personal Protective Equipment	Ensure that the required personal protective equipment (PPE), such as latex gloves, is on hand before commencing the environmental monitoring program.	☐
Bottle Shipment	Ensure that the bottle shipment has arrived from the contract laboratory in time for the sampling program and verify the integrity of all sampling containers. Report any missing or broken bottles to the contract laboratory as soon as possible, so that replacement bottles may be shipped.	☐
Sampling Location Inspection	Perform an initial inspection of the sampling location before the commencement of the monitoring program. Make note of any equipment damage or conditions that may prevent the collection of the environmental monitoring program samples.	☐
GENERAL SAMPLING INSTRUCTIONS		
Prevention of Cross-Contamination	Ensure that any laboratory provided sampling instructions are strictly followed. Latex or nitrile gloves should be worn during sampling and should be replaced with fresh gloves after all sample containers are filled at each sampling location. Sampling equipment such as sampling poles should be cleaned with soap and water after each sample is collected to prevent cross-contamination.	☐
Sample Care	All sample containers should 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 should be cleaned with soap and water prior to placing the samples in the cooler. The samples should be stored on ice in a cooler until delivery to the laboratory. A chain of custody form should be filled out completely and be used to track the samples. Keep the last page and give it to the Foreman.	☐
WASTEWATER TREATMENT PLANT OUTFALL (IQA-04) SAMPLING INSTRUCTIONS		
Note	**Complete the list below by 9:30 AM to ensure that the sampling package can be shipped to Ottawa in the same day.**	☐
Step 1	Obtain the test kit from the Purchasing Department the day before sample collection.	☐
Step 2	Label all sample bottles with the sample ID, date and time of sample collection, location of sample collection and parameters to be analyzed.	☐
Step 3	Collect water samples from the Wastewater Treatment Plant (WWTP) outfall.	☐
Step 4	Fill all sample bottles to top (no headspace).	☐
Step 5	Wipe clean the outside of the sample bottles before packing the samples in the cooler for shipment to the laboratory.	☐
Step 6	Use ice or freezer packs to ensure that the samples are maintained below 10°C in the cooler during shipment to the laboratory.	☐
Step 7	Complete the Chain of Custody form, keep the last page for the Foreman and put the form into the cooler with the samples. Place Custody seals across the lip of the cooler lid and ensure you sign and date the seals.	☐
Step 8	Return the sampling package to the Purchasing Department.	☐

POST-SAMPLING ACTIVITIES		
Sample Shipment	Ensure all samples are shipped to the contract laboratory by priority freight immediately after the completion of the environmental monitoring event to ensure that the hold times are respected for the various parameters. Follow-up with the contract laboratory on the day after the samples were shipped to ensure that the samples were collected from the air cargo facility and received by the contract laboratory for analysis.	☐
Analytical Results	Ensure that the analytical results for the environmental monitoring program samples are received within the specified turn-around time. Follow-up with the contract laboratory if the results are not provided as expected to ensure timely reporting to the Nunavut Water Board (as required by Water Licence 3AM-IQA0611).	☐

Checklist Performed By:

Name	Signature	Date

CITY OF IQALUIT
WWTP INFLUENT MONITORING PROGRAM CHECKLIST

PRE-SAMPLING ACTIVITIES		
Bottle Order	At least two weeks before upcoming environmental sampling, send a request to the contract laboratory for the appropriate sample sets (bottles) for the required sampling test groups (see Table 2 of Schedule C of Nunavut Water Board Licence 3AM-IQA0611)	☐
Personal Protective Equipment	Ensure that the required personal protective equipment (PPE), such as latex gloves, is on hand before commencing the environmental monitoring program.	☐
Bottle Shipment	Ensure that the bottle shipment has arrived from the contract laboratory in time for the sampling program and verify the integrity of all sampling containers. Report any missing or broken bottles to the contract laboratory as soon as possible, so that replacement bottles may be shipped.	☐
Sampling Location Inspection	Perform an initial inspection of the sampling location before the commencement of the monitoring program. Make note of any equipment damage or conditions that may prevent the collection of the environmental monitoring program samples.	☐
GENERAL SAMPLING INSTRUCTIONS		
Prevention of Cross-Contamination	Ensure that any laboratory provided sampling instructions are strictly followed. Latex or nitrile gloves should be worn during sampling and should be replaced with fresh gloves after all sample containers are filled at each sampling location. Sampling equipment such as sampling poles should be cleaned with soap and water after each sample is collected to prevent cross-contamination.	☐
Sample Care	All sample containers should 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 should be cleaned with soap and water prior to placing the samples in the cooler. The samples should be stored on ice in a cooler until delivery to the laboratory. A chain of custody form should be filled out completely and be used to track the samples. Keep the last page and give it to the Foreman.	☐
WASTEWATER TREATMENT PLANT INFLUENT (IQA-05) SAMPLING INSTRUCTIONS		
Note	**Complete the list below by 9:30 AM to ensure that the sampling package can be shipped to Ottawa in the same day.**	☐
Step 1	Obtain the test kit from the Purchasing Department the day before sample collection.	☐
Step 2	Label all sample bottles with the sample ID, date and time of sample collection, location of sample collection and parameters to be analyzed.	☐
Step 3	Locate the valve on the intake pipe into the Wastewater Treatment Plant (see Photo below).	☐
Step 4	Fill all sample bottles to top (no headspace). Ensure that the valve is fully closed after collecting the water sample.	☐
Step 5	Wipe clean the outside of the sample bottles before packing the samples in the cooler for shipment to the laboratory.	☐
Step 6	Use ice or freezer packs to ensure that the samples are maintained below 10°C in the cooler during shipment to the laboratory.	☐
Step 7	Complete the Chain of Custody form, keep the last page for the Foreman and put the form into the cooler with the samples. Place Custody seals across the lip of the cooler lid and ensure you sign and date the seals.	☐
Step 8	Return the sampling package to the Purchasing Department.	☐

POST-SAMPLING ACTIVITIES		
Sample Shipment	Ensure all samples are shipped to the contract laboratory by priority freight immediately after the completion of the environmental monitoring event to ensure that the hold times are respected for the various parameters. Follow-up with the contract laboratory on the day after the samples were shipped to ensure that the samples were collected from the air cargo facility and received by the contract laboratory for analysis.	☐
Analytical Results	Ensure that the analytical results for the environmental monitoring program samples are received within the specified turn-around time. Follow-up with the contract laboratory if the results are not provided as expected to ensure timely reporting to the Nunavut Water Board (as required by Water Licence 3AM-IQA0611).	☐

Checklist Performed By:

Name	Signature	Date

CITY OF IQALUIT
SEWAGE SLUDGE MONITORING PROGRAM CHECKLIST

PRE-SAMPLING ACTIVITIES		
Bottle Order	At least two weeks before upcoming environmental sampling, send a request to the contract laboratory for the appropriate sample sets (bottles) for the required sampling test groups (see Table 2 of Schedule C of Nunavut Water Board Licence 3AM-IQA0611)	☐
Personal Protective Equipment	Ensure that the required personal protective equipment (PPE), such as latex gloves, is on hand before commencing the environmental monitoring program.	☐
Bottle Shipment	Ensure that the bottle shipment has arrived from the contract laboratory in time for the sampling program and verify the integrity of all sampling containers. Report any missing or broken bottles to the contract laboratory as soon as possible, so that replacement bottles may be shipped.	☐
Sampling Location Inspection	Perform an initial inspection of the sampling location before the commencement of the monitoring program. Make note of any equipment damage or conditions that may prevent the collection of the environmental monitoring program samples.	☐
GENERAL SAMPLING INSTRUCTIONS		
Prevention of Cross-Contamination	Ensure that any laboratory provided sampling instructions are strictly followed. Latex or nitrile gloves should be worn during sampling and should be replaced with fresh gloves after all sample containers are filled at each sampling location. Sampling equipment such as sampling poles should be cleaned with soap and water after each sample is collected to prevent cross-contamination.	☐
Sample Care	All sample containers should 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 should be cleaned with soap and water prior to placing the samples in the cooler. The samples should be stored on ice in a cooler until delivery to the laboratory. A chain of custody form should be filled out completely and be used to track the samples. Keep the last page and give it to the Foreman.	☐
SEWAGE SLUDGE (IQA-06) SAMPLING INSTRUCTIONS		
Note	**Complete the list below by 9:30 AM to ensure that the sampling package can be shipped to Ottawa in the same day.**	☐
Step 1	Obtain the test kit from the Purchasing Department the day before sample collection.	☐
Step 2	Label all sample bottles with the sample ID, date and time of sample collection, location of sample collection and parameters to be analyzed.	☐
Step 3	Collect a sewage sludge sample directly from the trailer outside the Wastewater Treatment Plant (WWTP).	☐
Step 4	Fill all sample bottles to top (no headspace) by immersing the sample bottles into the sludge neck first to a depth of 5 to 10 cm. The sampling containers should be filled with sludge and the sample bottles should be raised neck first to prevent sample spillage.	☐
Step 5	Wipe clean the outside of the sample bottles before packing the samples in the cooler for shipment to the laboratory.	☐
Step 6	Use ice or freezer packs to ensure that the samples are maintained below 10°C in the cooler during shipment to the laboratory.	☐
Step 7	Complete the Chain of Custody form, keep the last page for the Foreman and put the form into the cooler with the samples. Place Custody seals across the lip of the cooler lid and ensure you sign and date the seals.	☐
Step 8	Return the sampling package to the Purchasing Department.	☐

POST-SAMPLING ACTIVITIES		
Sample Shipment	Ensure all samples are shipped to the contract laboratory by priority freight immediately after the completion of the environmental monitoring event to ensure that the hold times are respected for the various parameters. Follow-up with the contract laboratory on the day after the samples were shipped to ensure that the samples were collected from the air cargo facility and received by the contract laboratory for analysis.	☐
Analytical Results	Ensure that the analytical results for the environmental monitoring program samples are received within the specified turn-around time. Follow-up with the contract laboratory if the results are not provided as expected to ensure timely reporting to the Nunavut Water Board (as required by Water Licence 3AM-IQA0611).	☐

Checklist Performed By:

Name	Signature	Date

CITY OF IQALUIT
WEST 40 LANDFILL MONITORING PROGRAM CHECKLIST

PRE-SAMPLING ACTIVITIES		
Bottle Order	At least two weeks before upcoming environmental sampling, send a request to the contract laboratory for the appropriate sample sets (bottles) for the required sampling test groups (see Table 2 of Schedule C of Nunavut Water Board Licence 3AM-IQA0611)	☐
Personal Protective Equipment	Ensure that the required personal protective equipment (PPE), such as latex gloves, is on hand before commencing the environmental monitoring program.	☐
Bottle Shipment	Ensure that the bottle shipment has arrived from the contract laboratory in time for the sampling program and verify the integrity of all sampling containers. Report any missing or broken bottles to the contract laboratory as soon as possible, so that replacement bottles may be shipped.	☐
Sampling Location Inspection	Perform an initial inspection of the sampling location before the commencement of the monitoring program. Make note of any equipment damage or conditions that may prevent the collection of the environmental monitoring program samples.	☐
GENERAL SAMPLING INSTRUCTIONS		
Prevention of Cross-Contamination	Ensure that any laboratory provided sampling instructions are strictly followed. Latex or nitrile gloves should be worn during sampling and should be replaced with fresh gloves after all sample containers are filled at each sampling location. Sampling equipment such as sampling poles should be cleaned with soap and water after each sample is collected to prevent cross-contamination.	☐
Sample Care	All sample containers should 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 should be cleaned with soap and water prior to placing the samples in the cooler. The samples should be stored on ice in a cooler until delivery to the laboratory. A chain of custody form should be filled out completely and be used to track the samples. Keep the last page and give it to the Foreman.	☐
WEST 40 LANDFILL (IQA-08) SAMPLING INSTRUCTIONS		
Note	**Complete the list below by 9:30 AM to ensure that the sampling package can be shipped to Ottawa in the same day.**	☐
Step 1	Obtain the test kit from the Purchasing Department the day before sample collection.	☐
Step 2	Label all sample bottles with the sample ID, date and time of sample collection, location of sample collection and parameters to be analyzed.	☐
Step 3	Collect water samples from the discharge from the Geotube bag during decants.	☐
Step 4	Fill all sample bottles to top (no headspace). Samples should be collected at the beginning, middle and end of each decant. Be sure to use fresh latex gloves for each sample (i.e., the beginning, middle and end of each decant)..	☐
Step 5	Wipe clean the outside of the sample bottles before packing the samples in the cooler for shipment to the laboratory.	☐
Step 6	Use ice or freezer packs to ensure that the samples are maintained below 10°C in the cooler during shipment to the laboratory.	☐
Step 7	Complete the Chain of Custody form, keep the last page for the Foreman and put the form into the cooler with the samples. Place Custody seals across the lip of the cooler lid and ensure you sign and date the seals.	☐
Step 8	Return the sampling package to the Purchasing Department.	☐

POST-SAMPLING ACTIVITIES		
Sample Shipment	Ensure all samples are shipped to the contract laboratory by priority freight immediately after the completion of the environmental monitoring event to ensure that the hold times are respected for the various parameters. Follow-up with the contract laboratory on the day after the samples were shipped to ensure that the samples were collected from the air cargo facility and received by the contract laboratory for analysis.	☐
Analytical Results	Ensure that the analytical results for the environmental monitoring program samples are received within the specified turn-around time. Follow-up with the contract laboratory if the results are not provided as expected to ensure timely reporting to the Nunavut Water Board (as required by Water Licence 3AM-IQA0611).	☐

Checklist Performed By:

Name	Signature	Date

Sample Bottle Requirements

Water					
Parameter	**Bottle**	**Bottle Size (mL)**	**Preservative/Instructions**	**Store**	**Hold Time**
Acidity	P, G	250-1000		C	14d
Alkalinity	P, G	250-1000		C	7d
Anions	P, G	250-1000		C	7d
BOD5/CBOD5	P, G	1000		C	5d
Chlorine, residual	P, G	250-1000	No headspace	C	N.S.
Chromium VI	P	125	NaOH	C	24h
Chromium VI - O.Reg 153	P	125	(NH4)2SO4/NH4OH field filter for GW	C	28d
COD	A, TL	125	H2SO4 to pH < 2	C	28d
Colour	P, G	250-1000		C	7d
Conductivity	P, G	250-1000		C	14d
Cyanide, Total or Free	P	125	NaOH to pH > 12	C	14d
DOC/DIC	A, TL	125		C	28d
Hardness	P, G	250-1000			28d
HPLC Parameters	P	1000	Na2S2O3	C	14d
Mercury	P, G	125	HCl to pH < 2, field filter for GW or SW		14d
Metals, general	P	125	HNO3 to pH < 2, field filter for GW		28d
Microbiology	P, S	300	Na2S2O3, 100mL min. vol./parameter	C	48h
Minerals - Ca, Mg, Na, K	P, G	250-1000			28d
Nitrogen, Total Ammonia or TKN	P	125	H2SO4 to pH < 2	C	14d
OC Pesticides	A, TL	1000		C	14d
Oil & Grease	A, TL	1000		C	14d
OP Pesticides	A, TL	1000		C	14d
Petroleum Hydrocarbons - F1	A, ST	2 x 40	No headspace	C	7d
Petroleum Hydrocarbons - F2 - F4	A, TL	1000		C	7d
pH	P, G	250-1000	14-day hold time for DW/GW, 4-day for other	C	14d/4d
Phenols, colourmetric	A, TL	125	H2SO4 to pH < 2	C	28d
Phosphorus, dissolved reactive	P, G	250-1000	Field filter for GW or SW	C	28d
Phosphorus, total	P	125	H2SO4 to pH < 2	C	28d
Polychlorinated Biphenyls (PCBs)	A, TL	1000		C	14d
Semi-Volatiles, incl. PAH	A, TL	1000		C	14d
Solids	P, G	250-1000		C	28d
Sulphide	P	125	NaOH/zinc acetate to pH >9	C	14d
Triazine Herbicides	A, TL	1000		C	14d
Turbidity	P, G	250-1000		C	48h
Volatiles, BTEX, 624	A, ST	2 x 40	No headspace	C	7d
Soil/Solids					
Parameter	**Jar**	**Jar Size (mL)**	**Preservative**	**Store**	**Hold Time**
Agricultural Soil - Nutrients	P, G	250-1000			28d
Carbon, Organic - TOC	P, G	250		C	28d
Chromium VI	P, G	250			28d
Cyanide, Total and Free	P, G	250		C	14d
Hydrometer	P, G	500			28d
Mercury	P, G	250			28d
Metals, general	P, G	250			28d
TKN	P, G	250		C	14d
Nitrogen, Total Ammonia	P, G	250		C	28d
OC Pesticides	A, TL	250		C	14d
Oil & Grease	A, TL	250		C	14d
Petroleum Hydrocarbons - F1	A, ST	2 x 40 + 250	Methanol in glass vials, extra 250mL for moisture	C	14d
Petroleum Hydrocarbons - F2 - F4	A, TL	250		C	14d
pH	P, G	250			7d
Phosphorus, total or extractable	P, G	250		C	28d
Polychlorinated Biphenyls (PCBs)	A, TL	250		C	14d
Regulation 347/558 - Metals	A, TL	250			28d
Regulation 347/558 - PCBs	A, TL	250		C	14d
Regulation 347/558 - Semi-Volatiles	A, TL	250		C	14d
Regulation 347/558 - Volatiles	A, TL	250		C	14d
Semi-Volatiles, incl. PAH	A, TL	250		C	14d
Sieve Analysis	P, G	500			28d
Triazine Herbicides	A, TL	250		C	14d
Volatiles, BTEX, 624	A, ST	2 x 40 + 250	Methanol in glass vials, extra 250mL for moisture	C	14d

G=Glass P=Plastic A=Amber Glass TL=Teflon Lined ST=Septum Top S=Sterile C=Cold N.S=No Storage All volumes are listed in mL. Please contact the laboratory for parameters not listed. It is recommended that all samples be kept between 4 and 10°C to ensure sample integrity. Please do not freeze samples unless otherwise instructed. Bottles may be shared provided that the minimum sample volumes are met. Please contact the lab for further information.

Appendix C:
Subcontract Laboratory Accreditation & Supporting Documentation

Method Detection Limit (MDL)

The Method Detection Limit (MDL) is calculated based on procedures as published by the Ontario Ministry of Environment in various documents. The MDL is a statistically derived level where measured results above this value indicate the presence of an analyte with a specified probability (confidence limit) and assumes there are no known sources of error in identification or biases in measurement. The confidence limit for this determination is 99% and is used to determine the multiplication factor used from Student's t-tables. The t-value depends on the amount of data used for the MDL determination with 8 being the minimum number of replicates for the calculation. The MDL must initially be estimated by the analyst based on, but not limited to the following; instrument sensitivity (e.g. a concentration that corresponds to a signal to noise value of 3:1), instrumental reproducibility, analyte recovery, sample types (matrices/interference), anticipated analyte levels, and any applicable regulatory requirements.

Method Reporting Limit (MRL)

The Method Reporting Limit (MRL) is be established as the lowest practical level of quantification for an analyte. The value of the MRL will be established at a level equal to or greater than the MDL. At no time can the MRL be lower than the MDL. The MRL will be established based on, but not limited to the following criteria:

- MDL & IDL.
- Sample matrix.
- Instrument operating conditions – stability, sensitivity etc.
- End use of data – historical data considerations.
- Regulatory reporting requirements.
- Analytical considerations – multi-parameter scan vs. single-parameter method.
- Consistency between analytical techniques – e.g. IC vs. Electrode, ICP-MS vs. ICP-AES.
- Preparation procedures – analyte recovery etc.

The MRL will be set at a level between 1 and 10 times the MDL as required. The MRL must be a measurable quantity and will be verified by analysis of a standard solution at the level of the MRL on a regular basis, generally, but not limited to, weekly analysis. This solution will typically be lower than the lowest calibration standard used, which must be < 10X the MRL, but in some cases may be the lowest calibration standard. The frequency and acceptable deviation of the verification solution will be method dependent and will be included in the individual SOPs. Any results below the MRL will be reported as <MRL. There will be no further indicators of results that are below the MRL but above the MDL.

CALA
Canadian Association for Laboratory Accreditation Inc.

CALA Directory of Laboratories

Membership Number: 2644
Laboratory Name: Caduceon Environmental Laboratories (Ottawa)
Parent Institution: Caduceon Enterprises Inc.
Address: 2378 Holly Lane Ottawa ON K1V 7P1
Contact: Mr. Greg Clarkin
Phone: (613) 526-0123
Fax: (613) 526-1244
Email: gclarkin@caduceonlabs.com

Standard: Conforms with requirements of ISO/IEC 17025
Clients Served:
Revised On: December 18, 2012
Valid To: March 31, 2014

Scope of Accreditation

Air (Inorganic)
Metals - Air Filter (012)
D-ICP-02; modified from APHA 3120 B
ICP - DIGESTION
Cadmium
Chromium
Cobalt
Copper
Iron
Lead
Manganese
Molybdenum
Nickel
Zinc

Air (Inorganic)
Total Suspended Particulates - Air Filter (018)
A-TSP-01; modified from MOEE E3288A
GRAVIMETRIC
Total Suspended Particulates

Dustfall
Total/Insoluble Dustfall - Dustfall (020)
A-DF-01; modified from MOEE DF-E3043A
FILTRATION - GRAVIMETRIC
Insoluble Dustfall
Total Dustfall

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

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

Fluoride Candles
Fluoride - Candles (019)
A-FISE-01; modified from MOEE FSIE-1983D
DIGESTION - ISE
Fluoride

Oil (Organic)
Polychlorinated Biphenyls (PCB) - Oil (040)
C-PCB-01; modified from EPA 8081
GC/ECD - EXTRACTION
Aroclor 1248

Solids (Inorganic)
Anions - Soils, Biosolids (069)
A-IC-01; modified from APHA 4110 C
ION CHROMATOGRAPHY - EXTRACTION
Chloride
Nitrate
Nitrite
Sulphate

Solids (Inorganic)
Boron (Hot Water Soluble) - Soil (098)
D-ICP-02; MOE-LaSB E3470
ICP/AES - EXTRACTION
Boron

Solids (Inorganic)
Extractable Anions - Leachate (090)
A-IC-01; modified from EPA 1311, APHA 4110-C
ION CHROMATOGRAPHY - TCLP
Nitrate
Nitrite

Solids (Inorganic)
Extractable Metals - Leachate (091)
D-ICP-01; modified from EPA 1311/APHA 3120 B
ICP/AES - TCLP
Barium
Beryllium
Boron
Cadmium
Chromium
Lead
Nickel
Silver
Zinc

Solids (Inorganic)
Extractable Metals - Leachate (092)
D-ICPMS-01; modified from EPA 1311/EPA 200.8
ICP/MS - TCLP
Antimony
Selenium
Uranium

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Solids (Inorganic)
Extractable Metals - Leachate (093)
D-HG-02; modified from EPA 1311/SM 3112 B
COLD VAPOUR AA - TCLP
Mercury

Solids (Inorganic)
Flash Point - Soil, Solid Waste (096)
C-FPCC-01; modified FROM ASTM D93-10
CLOSED CUP FLASH POINT TESTER
Flashpoint

Solids (Inorganic)
Hexavalent Chromium - Soil (094)
D-CRVI-02; modified from EPA 3060A EPA 7196 A
COLORIMETRIC - MANUAL
Chromium (VI)

Solids (Inorganic)
Mercury - Soil, Solid Biosolids (017)
D-HG-01; modified from EPA 7471A
COLD VAPOUR AA - DIGESTION
Mercury

Solids (Inorganic)
Metals - Soil, Solid Biosolids (015)
D-ICP-02; modified from EPA 6010
ICP/OES - DIGESTION
Aluminum
Antimony
Arsenic
Barium
Beryllium
Boron
Cadmium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Magnesium
Manganese
Molybdenum
Nickel
Potassium
Silver
Sodium
Strontium
Tin
Titanium
Tungsten
Vanadium
Zinc

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Solids (Inorganic)
Total Metals - Soils, Biosolids (070)
D-ICPMS-01; modified from EPA 6020
ICP/MS - DIGESTION
Silver
Thallium
Uranium

Solids (Organic)
Extractable Volatile Organic Compounds (VOC) - Leachate (089)
C-VOC-01; modified from EPA SW-846 METHOD 1311, 5030/8260
GC/MS - PURGE AND TRAP - TCLP
1,1-Dichloroethylene
1,2-Dichlorobenzene
1,2-Dichloroethane
1,4-Dichlorobenzene
Benzene
Carbon tetrachloride
Chlorobenzene
Dichloromethane
Methyl ethyl ketone
Tetrachloroethylene
Trichloroethylene
Vinyl chloride

Solids (Organic)
Petroleum Hydrocarbons (PHC) - Soil (075)
C-PHCS-01; modified from CCME CWS REF. METHOD & MOE E3398
GC/FID - EXTRACTION
F2: C10-C16
F3: C16-C34
F4: C34-C50

Solids (Organic)
Petroleum Hydrocarbons (PHC) - Soil (097)
C-PHCS-01; modified from CCME CWS REF. METHOD & MOE E3398
GRAVIMETRIC
F4: Gravimetric

Solids (Organic)
Polychlorinated Biphenyls (PCB) - Soil (053)
C-PCB-02; modified from EPA 8000/8081
GC/ECD - EXTRACTION
Aroclor 1248

Solids (Organic)
Volatile Organic Compounds (VOC) - Soil (063)
C-VOC-02; modified from EPA 8260
GC/MS - PURGE AND TRAP
1,1 - Dichloropropene
1,1-Dichloroethane
1,1-dichloroethylene
1,1,1-Trichloroethane
1,1,1,2 - Tetrachloroethane
1,1,2-Trichloroethane
1,1,2,2-Tetrachloroethane
1,2 - Dibromo - 3 - chloropropane
1,2-dichlorobenzene

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1,2-dichloroethane
1,2-Dichloropropane
1,2,3 - Trichlorobenzene
1,2,3 - Trichloropropane
1,2,4 - Trichlorobenzene
1,2,4 - Trimethylbenzene
1,3 - Dichloropropane
1,3-Dichlorobenzene
1,3,5 -Trimethylbenzene
1,4-dichlorobenzene
2 - Chlorotoluene
2 - Hexanone (MBK)
2,2 - Dichloropropane
4 - Chlorotoluene
Acetone (2-Propanone)
Benzene
Bromobenzene
Bromodichloromethane
Bromoform
Bromomethane
Carbon Tetrachloride
Chlorobenzene
Chlorodibromomethane
Chloroethane
Chloroform
Chloromethane
cis-1,2-Dichloroethylene
cis-1,3-Dichloropropene
Dibromomethane
Dichlorodifluoromethane
Dichloromethane
Ethylbenzene
Ethylene Dibromide
Hexachlorobutadiene
Hexane
Isopropylbenzene
Isopropyltoluene
m/p-xylene
Methyl Ethyl Ketone
Methyl isobutyl Ketone
Methyl t-butyl ether
n - Butylbenzene
Naphthalene
o-xylene
Propylbenzene
sec - Butylbenzene
Styrene
tert - Butylbenzene
Tetrachloroethylene
Toluene
trans-1,2-Dichloroethylene
trans-1,3-Dichloropropene
Trichloroethylene

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Trichlorofluoromethane
Vinyl Chloride

Solids (Organic)
Volatile Petroleum Hydrocarbons (VPH) - Soil (073)
C-GRO-01; modified from CCME CWS REF. METHOD & MOE E3398
GC/FID - PURGE AND TRAP
F1: C6-C10

Water (Inorganic) OSDWA †
Alkalinity - Water (088)
A-ALK-03; modified from APHA 2320 B
AUTO TITRIMETRIC
Alkalinity (pH 4.5)

Water (Inorganic) OSDWA †
Ammonia - Water, Wastewater, Liquid Biosolids (055)
A-NH3-01; modified from MOEE RNDNP-E3364, SDNP-E3366
AUTO COLOR
Ammonia
Ammonia - Nitrogen

Water (Inorganic) OSDWA †
Anions - Water, Wastewater, Liquid Biosolids (002)
A-IC-01; modified from APHA 4110 C
ION CHROMATOGRAPHY
Bromide
Chloride
Fluoride
Nitrate
Nitrite
Sulfate

Water (Inorganic) OSDWA †
Biochemical Oxygen Demand (BOD) - Water (008)
C-BOD-01; modified from APHA 5210 B
D.O. METER
BOD (5 day)
CBOD (5 day)

Water (Inorganic) OSDWA †
Carbon - Water (054)
C-OC-01; modified from APHA 5310C, EPA 415.1
IR-UV-PERSULFATE
Organic Carbon

Water (Inorganic) OSDWA †
Chemical Oxygen Demand (COD) - Water (083)
C-COD-01; modified from APHA 5220 D
COLORIMETRIC
COD

Water (Inorganic) OSDWA †
Colour - Water (027)
A-COL-01; modified from APHA 2120 C
SPECTROPHOTOMETRIC
True Colour

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Water (Inorganic) OSDWA †
Conductivity - Water (003)
A-COND-01; modified from APHA 2510 B
CONDUCTIVITY METER
Conductivity (25°C)

Water (Inorganic) OSDWA †
Conductivity - Water (087)
A-COND-02; modified from APHA 2510 B
AUTO CONDUCTIVITY METER
Conductivity (25°C)

Water (Inorganic) OSDWA †
Dissolved and Extractable Metals - Water (004)
D-ICP-01; modified from APHA 3120 B
ICP
Aluminum
Barium
Beryllium
Bismuth
Boron
Cadmium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Lithium
Magnesium
Manganese
Molybdenum
Nickel
Potassium
Silicon
Silver
Sodium
Strontium
Tin
Titanium
Tungsten
Vanadium
Yttrium
Zinc
Zirconium

Water (Inorganic) OSDWA †
Dissolved Metals - Water (049)
D-ICPMS-01; modified from EPA 200.8
ICP/MS
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium

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Cobalt
Copper
Lead
Molybdenum
Selenium
Silver
Thallium
Uranium
Vanadium

Water (Inorganic)
Hexavalent Chromium - Water (095)
D-CRVI-01; modified from MOE - HEXCR-E3056
COLORIMETRIC - MANUAL
Chromium (VI)

Water (Inorganic) OSDWA †
Mercury - Water, Wastewater (025)
D-HG-02; modified from APHA 3112 B
COLD VAPOUR AA - DIGESTION
Mercury

Water (Inorganic) OSDWA †
Nitrogen - Water, Wastewater, Liquid Biosolids (033)
A-TKN-01; modified from MOEE RTNP-E3367
AUTO COLOR - DIGESTION
Total Kjeldahl Nitrogen

Water (Inorganic) OSDWA †
pH - Water (005)
A-pH-01; modified from APHA 4500 H
pH METER
pH

Water (Inorganic) OSDWA †
pH - Water (086)
A-pH-02; modified from APHA 4500H+ B
AUTO - pH METER
pH

Water (Inorganic) OSDWA †
Phenols - Water (056)
C-PHEN-01; modified from MOE ROPHEN-E3179
AUTO, 4-AAP
Total Phenolics

Water (Inorganic) OSDWA †
Phosphate - Water (058)
A-PO4-01; modified from MOEE RNDNP-E3364, SDNP-E3366
AUTO COLOR
Phosphate

Water (Inorganic)
Total Metals - Water, Wastewater, Liquid Biosolids (067)
D-ICP-01; modified from APHA 3120 B
ICP/AES - DIGESTION
Aluminum
Antimony
Arsenic
Barium

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Beryllium
Bismuth
Boron
Cadmium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Lithium
Magnesium
Manganese
Molybdenum
Nickel
Potassium
Silver
Sodium
Strontium
Tin
Titanium
Tungsten
Vanadium
Yttrium
Zinc
Zirconium

Water (Inorganic)
Total Metals - Water, Wastewater, Liquid Biosolids (071)
D-ICPMS-01; modified from EPA 6020
ICP/MS - DIGESTION
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Copper
Lead
Molybdenum
Selenium
Silver
Vanadium

Water (Inorganic) OSDWA †
Total Phosphorus - Water, Wastewater, Liquid Biosolids (057)
A-TP-01; modified from MOEE RTNP-E3367
AUTO COLOR - DIGESTION
Total Phosphorus

Water (Inorganic) OSDWA †
Total Suspended Solids (TSS) - Water (009)
A-TSS-01; modified from APHA 2540 D
GRAVIMETRIC
Total Suspended Solids

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Water (Inorganic) OSDWA †
Turbidity - Water (026)
A-TURB-01; modified from APHA 2130 B
NEPHELOMETRY
Turbidity

Water (Microbiology) OSDWA †
Coliforms - Water (050)
B-ECTC-01; modified from MICROMFDC-E3407
MEMBRANE FILTRATION (DC)
Background Bacteria
Escherichia coli (E. coli)
Total Coliforms

Water (Microbiology) OSDWA †
Escherichia coli (E. coli) - Water (010)
B-MFEC-01; modified from MFMICRO-E3371
MEMBRANE FILTRATION (EC)
Escherichia coli (E. coli)

Water (Microbiology) OSDWA †
Fecal (Thermotolerant) Coliforms - Water (065)
B-MFFC-01; modified from MFMICRO-E3371
MEMBRANE FILTRATION (mFC)
Fecal (Thermotolerant) Coliforms

Water (Microbiology) OSDWA †
Heterotrophic Plate Count (HPC) - Water (021)
B-HPC-01; modified from APHA 9215 C
SPREAD PLATE
Heterotrophic Plate Count (HPC)

Water (Microbiology) OSDWA †
Total Coliforms - Water (066)
B-MFTC-01; modified from MFMICRO-E3371
MEMBRANE FILTRATION (mENDO)
Background Counts
Total Coliforms

Water (Organic) OSDWA †
Glycols - Water (085)
C-GLYCOL-01; modified from EPA 8015 B
DIRECT INJECTION GC-FID
Diethylene Glycol
Ethylene Glycol
Propylene Glycol

Water (Organic) OSDWA †
Petroleum Hydrocarbons (PHC) - Water (072)
C-GRO-01; modified from MOE E3421
GC/FID - PURGE AND TRAP
F1: C6-C10

Water (Organic) OSDWA †
Petroleum Hydrocarbons (PHC) - Water (074)
C-PHCW-02; modified from MOE E3421
GC/FID - EXTRACTION
F2: C10-C16
F3: C16-C34
F4: C34-C50

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Water (Organic) OSDWA †

Volatile Organic Compounds (VOC) - Water (041)

C-VOC-01; modified from EPA 8260 and 5030

GC/MS - PURGE AND TRAP

1,1-Dichloroethane
1,1-dichloroethylene
1,1-Dichloropropene
1,1,1-Trichloroethane
1,1,1,2-Tetrachloroethane
1,1,2-Trichloroethane
1,1,2,2-Tetrachloroethane
1,2-Dibromo-3-chloropropane
1,2-dichlorobenzene
1,2-dichloroethane
1,2-Dichloropropane
1,2,3-Trichlorobenzene
1,2,3-Trichloropropane
1,2,4-Trichlorobenzene
1,2,4-Trimethylbenzene
1,3-Dichlorobenzene
1,3-Dichloropropane
1,3,5-Trimethylbenzene
1,4-dichlorobenzene
2-Chlorotoluene
2,2-Dichloropropane
4-Chlorotoluene
4-Isopropyl Toluene
Acetone (2-Propanone)
Benzene
Bromobenzene
Bromodichloromethane
Bromoform
Carbon Tetrachloride
Chlorobenzene
Chlorodibromomethane
Chloroform
Chloromethane
cis-1,2-Dichloroethylene
cis-1,3-Dichloropropene
Dibromomethane
Dichlorodifluoromethane
Dichloromethane
Ethylbenzene
Ethylene Dibromide
Hexachlorobutadiene
Isopropyl Benzene
m/p-xylene
Methyl Ethyl Ketone
Methyl isobutyl Ketone
Methyl t-butyl ether
n-Butylbenzene
n-Propylbenzene
Naphthalene

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o-xylene
Sec-Butylbenzene
Styrene
tert-Butylbenzene
Tetrachloroethylene
Toluene
trans-1,2-Dichloroethylene
trans-1,3-Dichloropropene
Trichloroethylene
Trichlorofluoromethane
Vinyl Chloride

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Ministry of the Environment

Laboratory Licensing and Inspection Program

125 Resources Rd.
Etobicoke ON M9P 3V6
Tel: (416) 235-6311
Fax: (416) 235-6312

Ministère de l'Environnement

Programme de délivrance des permis et d'inspection des laboratoires

125, Chemin Resources
Etobicoke ON M9P 3V6
Tél: (416) 235-6311
Téléc: (416) 235-6312

Ontario

Drinking-Water Testing Licence

Under the Drinking-Water Testing Services Regulation, O. Reg. 248/03 and the Safe Drinking Water Act, 2002

Licence #: 2232
This supercedes licence issued: Jan 08, 2010
Licensee: Caduceon Enterprises Inc.

Located at: 2378 Holly Lane
Ottawa ON K1V 7P1
Canada

The licensee is authorized to conduct the following drinking-water tests at the laboratory:

Class: Inorganic	Technique : Sub-Technique
4AAP-phenolics	Colourimetry-automated
Lab Method Code: C-PHEN-01	
Alkalinity	Titrimetry-Automated titration Method
Lab Method Code: A-ALK-03	
Alkalinity	Colourimetry-Auto, pH 4.5
Lab Method Code: A-ALK-02	
Aluminum	ICP-AES, (Total)
Lab Method Code: D-ICP-01	
Antimony	ICP-MS, (Total)
Lab Method Code: D-ICPMS-01	
Arsenic	ICP-MS, (Total)
Lab Method Code: D-ICPMS-01	
Barium	ICP-AES, (Total)
Lab Method Code: D-ICP-01	
Barium	ICP-MS, (Total)
Lab Method Code: D-ICPMS-01	
Beryllium	ICP-MS, (Total)
Lab Method Code: D-ICPMS-01	
Beryllium	ICP-AES, (Total)
Lab Method Code: D-ICP-01	

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Inorganic	Technique / Méth. Technique
Bismuth	ICP-AES, (Total)
Lab Method Code: D-ICP-01	
Boron	ICP-AES, (Total)
Lab Method Code: D-ICP-01	
Bromide	IC
Lab Method Code: A-IC-01	
Cadmium	ICP-MS, (Total)
Lab Method Code: D-ICPMS-01	
Calcium	ICP-AES, (Total)
Lab Method Code: D-ICP-01	
Carbon; dissolved organic	Colourimetry-UV, automated
Lab Method Code: C-OC-01	
Carbon; total organic	Colourimetry-UV, automated
Lab Method Code: C-OC-01	
Chloride	IC
Lab Method Code: A-IC-01	
Chromium	ICP-MS, (Total)
Lab Method Code: D-ICPMS-01	
Chromium	ICP-AES, (Total)
Lab Method Code: D-ICP-01	
Cobalt	ICP-MS, (Total)
Lab Method Code: D-ICPMS-01	
Cobalt	ICP-AES, (Total)
Lab Method Code: D-ICP-01	
Copper	ICP-MS, (Total)
Lab Method Code: D-ICPMS-01	
Copper	ICP-AES, (Total)
Lab Method Code: D-ICP-01	
Fluoride	IC
Lab Method Code: A-IC-01	

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Class: Inorganic	Technique / Sub-Technique
Iron **Lab Method Code:** D-ICP-01	ICP-AES, (Total)
Lead **Lab Method Code:** D-ICPMS-01	ICP-MS, (Total)
Lithium **Lab Method Code:** D-ICP-01	ICP-AES, (Total)
Magnesium **Lab Method Code:** D-ICP-01	ICP-AES, (Total)
Manganese **Lab Method Code:** D-ICP-01	ICP-AES, (Total)
Mercury **Lab Method Code:** D-HG-02	AA-Flameless, Cold Vapour
Molybdenum **Lab Method Code:** D-ICP-01	ICP-AES, (Total)
Molybdenum **Lab Method Code:** D-ICPMS-01	ICP-MS, (Total)
Nickel **Lab Method Code:** D-ICP-01	ICP-AES, (Total)
Nitrate (as nitrogen) **Lab Method Code:** A-IC-01	IC
Nitrite (as nitrogen) **Lab Method Code:** A-IC-01	IC
Nitrogen; ammonia+ammonium **Lab Method Code:** A-NH3-01	Colourimetry-automated
Nitrogen; nitrate+nitrite **Lab Method Code:** A-IC-01	Calculation
Nitrogen; total Kjeldahl **Lab Method Code:** A-TKN-01	Colourimetry-automated
o-Phosphate **Lab Method Code:** A-PO4-01	Colourimetry-automated

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Inorganic	
Organic nitrogen	Calculation
Lab Method Code: A-TKN-01	
Phosphorus	Colourimetry-Automated, (Total)
Lab Method Code: A-TP-01	
Potassium	ICP-AES, (Total)
Lab Method Code: D-ICP-01	
Selenium	ICP-MS, (Total)
Lab Method Code: D-ICPMS-01	
Silica	Calculation
Lab Method Code: D-ICP-01	
Silicon	ICP-AES, (Total)
Lab Method Code: D-ICP-01	
Silver	ICP-MS, (Total)
Lab Method Code: D-ICPMS-01	
Sodium	ICP-AES, (Total)
Lab Method Code: D-ICP-01	
Strontium	ICP-AES, (Total)
Lab Method Code: D-ICP-01	
Sulphate	IC
Lab Method Code: A-IC-01	
Thallium	ICP-MS, (Total)
Lab Method Code: D-ICPMS-01	
Tin	ICP-AES, (Total)
Lab Method Code: D-ICP-01	
Titanium	ICP-AES, (Total)
Lab Method Code: D-ICP-01	
Tungsten	ICP-AES, (Total)
Lab Method Code: D-ICP-01	
Uranium	ICP-MS, (Total)
Lab Method Code: D-ICPMS-01	

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Inorganic	Technique - Sub-Technique
Vanadium	ICP-MS, (Total)
Lab Method Code: D-ICPMS-01	
Vanadium	ICP-AES, (Total)
Lab Method Code: D-ICP-01	
Yttrium	ICP-AES, (Total)
Lab Method Code: D-ICP-01	
Zinc	ICP-AES, (Total)
Lab Method Code: D-ICP-01	
Zirconium	ICP-AES, (Total)
Lab Method Code: D-ICP-01	

Microbiological	Technique - Sub-Technique
E. coli	MF-DC
Lab Method Code: B-ECTC-01	
E. coli	MF-ec broth
Lab Method Code: B-MFEC-01	
Fecal coliforms	MF-mFC
Lab Method Code: B-MFFC-01	
HPC	Spread Plate
Lab Method Code: B-HPC-01	
Total coliform	MF-DC
Lab Method Code: B-ECTC-01	
Total coliform	MF-mEndo
Lab Method Code: B-MFTC-01	
Total coliform background	MF-mEndo
Lab Method Code: B-MFTC-01	
Total coliform background	MF-DC
Lab Method Code: B-ECTC-01	

Organic	Technique - Sub-Technique
1,1,1,2-tetrachloroethane	PTGC-MS
Lab Method Code: C-VOC-01	

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Class: Organic	Technique - Sub-Technique
1,1,1-trichloroethane	PTGC-MS
Lab Method Code: C-VOC-01	
1,1,2,2-tetrachloroethane	PTGC-MS
Lab Method Code: C-VOC-01	
1,1,2-trichloroethane	PTGC-MS
Lab Method Code: C-VOC-01	
1,1-dichloroethane	PTGC-MS
Lab Method Code: C-VOC-01	
1,1-dichloroethene	PTGC-MS
Lab Method Code: C-VOC-01	
1,2,4-trichlorobenzene	PTGC-MS
Lab Method Code: C-VOC-01	
1,2-dibromoethane	PTGC-MS
Lab Method Code: C-VOC-01	
1,2-dichlorobenzene	PTGC-MS
Lab Method Code: C-VOC-01	
1,2-dichloroethane	PTGC-MS
Lab Method Code: C-VOC-01	
1,2-dichloropropane	PTGC-MS
Lab Method Code: C-VOC-01	
1,3-dichlorobenzene	PTGC-MS
Lab Method Code: C-VOC-01	
1,4-dichlorobenzene	PTGC-MS
Lab Method Code: C-VOC-01	
1,4-dichlorobenzene	PTGC-MS
Lab Method Code: C-VOC-01	
Benzene	PTGC-MS
Lab Method Code: C-VOC-01	
Bromobenzene	PTGC-MS
Lab Method Code: C-VOC-01	

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Class: Organic	Technique - Sub-Technique
Bromodichloromethane **Lab Method Code:** C-VOC-01	PTGC-MS
Bromoform **Lab Method Code:** C-VOC-01	PTGC-MS
Carbon tetrachloride **Lab Method Code:** C-VOC-01	PTGC-MS
Chloroform **Lab Method Code:** C-VOC-01	PTGC-MS
cis-1,2-dichloroethene **Lab Method Code:** C-VOC-01	PTGC-MS
cis-1,3-dichloropropene **Lab Method Code:** C-VOC-01	PTGC-MS
Dibromochloromethane **Lab Method Code:** C-VOC-01	PTGC-MS
Dichloromethane **Lab Method Code:** C-VOC-01	PTGC-MS
Diethylene glycol **Lab Method Code:** C-GLYCOL-01	GC-FID - Direct Injection
Ethylbenzene **Lab Method Code:** C-VOC-01	PTGC-MS
Ethylene glycol **Lab Method Code:** C-GLYCOL-01	GC-FID - Direct Injection
Extractable petroleum hydrocarbons (F2: C10 to C16) **Lab Method Code:** C-PHCW-02	GC-FID - Extraction
Extractable petroleum hydrocarbons (F3: C16 to C34) **Lab Method Code:** C-PHCW-02	GC-FID - Extraction
Extractable petroleum hydrocarbons (F4: C34 to C50) **Lab Method Code:** C-PHCW-02	GC-FID - Extraction
m/p-Xylene **Lab Method Code:** C-VOC-01	PTGC-MS

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Class: Organic	Technique - Sub-Technique:
Monochlorobenzene **Lab Method Code:** C-VOC-01	PTGC-MS
Naphthalene **Lab Method Code:** C-VOC-01	PTGC-MS
o-Xylene **Lab Method Code:** C-VOC-01	PTGC-MS
Petroleum hydrocarbons (F1: C6 to C10) **Lab Method Code:** C-GRO-01	PTGC-FID
Propylene glycol **Lab Method Code:** C-GLYCOL-01	GC-FID - Direct Injection
Styrene **Lab Method Code:** C-VOC-01	PTGC-MS
Tetrachloroethylene **Lab Method Code:** C-VOC-01	PTGC-MS
Toluene **Lab Method Code:** C-VOC-01	PTGC-MS
trans-1,2-dichloroethene **Lab Method Code:** C-VOC-01	PTGC-MS
trans-1,3-dichloropropene **Lab Method Code:** C-VOC-01	PTGC-MS
Trichloroethylene **Lab Method Code:** C-VOC-01	PTGC-MS
Trihalomethanes; total **Lab Method Code:** C-VOC-01	Calculation
Vinyl chloride **Lab Method Code:** C-VOC-01	PTGC-MS
Xylene; total **Lab Method Code:** C-VOC-01	Calculation
Class: **Physical/Others**	Technique - Sub-Technique:

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Ontario

Physical/Others	Technique - Sub-Technique
BOD (5 Day)	Meter-D.O. Meter
Lab Method Code: C-BOD-01	
CBOD (5 Day)	Meter-D.O. Meter
Lab Method Code: C-BOD-01	
COD	Colourimetry
Lab Method Code: C-COD-01	
Conductivity	Meter-Auto conductivity Meter
Lab Method Code: A-COND-02	
Conductivity	Meter
Lab Method Code: A-COND-01	
Hardness (as CaCO3)	Calculation-ICP
Lab Method Code: D-ICP-01	
pH	Meter-Auto - pH Meter
Lab Method Code: A-pH-02	
pH	Meter
Lab Method Code: A-pH-01	
Solids; total suspended	Gravimetry
Lab Method Code: A-TSS-01	
True colour	Spectrophotometric
Lab Method Code: A-COL-01	
Turbidity	Nephelometry
Lab Method Code: A-TURB-01	

Subject to the following terms and conditions:
Terms and conditions are specified in Appendix 1.

Expiry Date: 2013/09/30

Feb 2/10

Date Issued

Director

Ontario Ministry of the Environment
Ministère de l'Environnement

Certificate of Drinking Water Testing Licence
Certificat du permis d'analyse de l'eau potable

Made under O. Reg. 248/03, the Drinking-Water Testing Services regulation under the *Safe Drinking Water Act, 2002*
Établi en vertu du règlement sur les services d'analyse de l'eau potable (Règl. de l'Ont. 248/03) pris en application de la Loi de 2002 sur la salubrité de l'eau potable

This is to certify that
Nous attestons par la présente que

Caduceon Environmental Laboratories - Kingston
285 Dalton Avenue, Kingston ON K7M 6Z1

Having met the requirements under the *Safe Drinking Water Act, 2002*, and the Drinking-Water Testing Services regulation, O. Reg. 248/03, is issued this Certificate of Drinking Water Testing Licence.

ayant satisfait aux prescriptions de la Loi de 2002 sur la salubrité de l'eau potable *et du règlement sur les services d'analyse de l'eau potable (Règl. de l'Ont. 248/03) est admissible à recevoir le présent certificat.*

This laboratory is licensed to carry out drinking water testing for specific parameters within the following classes.

Ce laboratoire est autorisé à analyser des paramètres précis de l'eau potable dans les catégories indiquées ci-dessous.

	MICROBIOLOGICAL / MICROBIOLOGIQUE	PHYSICAL/OTHER / PROPRIÉTÉS PHYSIQUES ET AUTRES	ORGANIC CHEMICAL / PRODUITS CHIMIQUES ORGANIQUES	INORGANIC CHEMICAL / PRODUITS CHIMIQUES INORGANIQUES
Year 1: / *1re année :*	Valid Until / Valide jusqu'au	Valid Until / Valide jusqu'au	Valid Until / Valide jusqu'au	Valid Until / Valide jusqu'au
Year 2: / *2e année :*	Valid Until / Valide jusqu'au: illegible	Valid Until / Valide jusqu'au: illegible	Valid Until / Valide jusqu'au: illegible	Valid Until / Valide jusqu'au: illegible
Year 3: / *3e année:*	Valid Until / Valide jusqu'au: illegible	Valid Until / Valide jusqu'au: illegible	Valid Until / Valide jusqu'au: illegible	Valid Until / Valide jusqu'au: illegible
Year 4: / *4e année :*	Valid Until / Valide jusqu'au: 2012/09/28	Valid Until / Valide jusqu'au: 2012/09/28	Valid Until / Valide jusqu'au: 2012/09/28	Valid Until / Valide jusqu'au: 2012/09/28
Year 5: / *5e année :*	Valid Until / Valide jusqu'au: 09/30/2013	Valid Until / Valide jusqu'au: 09/30/2013	Valid Until / Valide jusqu'au: 09/30/2013	Valid Until / Valide jusqu'au: 09/30/2013

Director, Laboratory Services Branch
Directeur, Direction des services de laboratoire

Signature of Laboratory Owner
Signature du propriétaire du laboratoire

Laboratory Licence No. / *Numéro du permis du laboratoire*	Date Issued / *Date de délivrance*
2250	Sep 17, 2008

1830 (09/03)

Appendix D:
Monitoring Program Sampling Schedule

Test Order Dates

Date	Type of Test
February	Test D
April	Test C
June	Test A, D, F
July	Test A, F
August	Test A, B, E, F,G
September	Test A, F
October	Test C
December	Test D

Tests

Test A (WTP)	Test B (WWTP Inn)	Test C (WWTP Eff)	Test D (WWTP Eff)	Test E (WWTP Eff)	Test F (Sludge)	Test G (Landfill Runoff)
Acidity	BOD	BOD	BOD	BOD	Temperature	**Detention Ponds**
Alkalinity	Total Coliforms	Total Coliforms	Total Coliforms	Total Coliforms	Conductivity	pH
Bicarbonate	Fecal Coliforms	Fecal Coliforms	Fecal Coliforms	Fecal Coliforms	pH	Turbidity
Carbonate	Ammonia Nitrogen	Ammonia Nitrogen	Ammonia Nitrogen	Ammonia Nitrogen	TSS	TSS
Chloride	Nitrate Nitrogen	Nitrate Nitrogen	Nitrate Nitrogen	Nitrate Nitrogen	BOD	BOD5
Conductivity	Nitrite Nitrogen	Nitrite Nitrogen	Nitrite Nitrogen	Nitrite Nitrogen	Total Coliform	COD
Total Hardness	Total Phosphorus	Total Phosphorus	Total Phosphorus	Total Phosphorus	Fecal Coliform	TOC
Hydroxide	Orthophosphate	Orthophosphate	Orthophosphate	Orthophosphate	Ammonia	**Retention Pond**
ORP	Conductivity	Conductivity	Conductivity	Conductivity	Nitrate	pH
Sulphate	TSS	TSS	TSS	TSS	Nitrite	Turbidity
TDS	pH	pH	pH	pH	Total Phosphorus	TSS
TSS	Full Metals Scan		Full Metals Scan	Full Metals Scan	Orthophosphate	BOD5
TOC	Chlorinated Paraffins			Chlorinated Paraffins	ICP Metals Scan	COD
TIC	LC50 Bioassay (R Trout)			LC50 Bioassay (R Trout)		TOC
Total ICP Metals						Ammonia Nitrogen
Dissolved ICP Metals						TKN
Fecal Coliform						Total Phosphorous
pH						Full Metal Scan + Hg
Turbidity						Total Coliform
						Fecal Coliform
						BTEX
						PCBs

Appendix E:
City of Iqaluit's Water Licence

P.O. Box 119
Gjoa Haven, NU X0B 1J0 ᓄᓇᕗᑦ ᐃᒪᓕᕆᔨᒃᑯᑦ ᑲᑎᒪᔨᖏᑦ
Tel: (867) 360-6338
Fax: (867) 360-6369
NUNAVUT WATER BOARD
NUNAVUT IMALIRIYIN KATIMAYINGI

May 15, 2006

File No: 3AM-IQA0611

By Courier, Email and Regular Mail

Honourable Jim Prentice
Minister
Indian and Northern Affairs Canada
Ottawa ON K1A 0H0

Subject: License No. 3AM-IQA0611

Dear Mr. Prentice,

Please find enclosed Licence 3AM-IQA0611 duly issued by the Nunavut Water Board (NWB). Reasons for Decision are also attached for your information. As per Section 56(1) of the Nunavut Waters and Nunavut Surface Rights Tribunal Act, the issuance of this Licence is subject to your approval.

Please contact me should you have any questions regarding this licence.

Sincerely,

Lootie Toomasie
Chair

Attachment: Reasons for Decision

c.c. City of Iqaluit
Distribution List - Qikiqtani
NWB Public Registry

NUNAVUT WATER BOARD WATER LICENCE

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

City of Iqaluit
(Licensee)

P.O. Box 460
Iqaluit, NU X0A 0H0
(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-IQA0611 TYPE "A"
Water Management Area:	NUNAVUT 05
Location:	NUNAVUT
Classification of Undertaking:	MUNICIPAL UNDERTAKING
Description:	WATER USE AND WASTE DISPOSAL
Quantity of Water not to be Exceeded:	1,100,000 CUBIC METRES ANNUALLY
Date of Issuance of Licence:	MAY 15, 2006
Expiry of Licence:	MAY 15, 2011

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

Lootie Toomasie
Chairman

APPROVED BY: **Minister of Indian and Northern Affairs Canada**

EFFECTIVE DATE OF LICENCE:

PART A: SCOPE, DEFINITIONS AND ENFORCEMENT

1. Scope

a. This Licence entitles the City of Iqaluit (the "Licensee"), to use water and dispose of waste associated for municipal undertakings as summarized below.

The Licensee may conduct activities at the City of Iqaluit, Nunavut, (63°45' N, 68°31' W) including:

Water Use

i. Use, management and protection of the Lake Geraldine drainage basin;
ii. Raising of the Lake Geraldine dam by 2.0 m to meet over-winter storage capacity;
iii. Extension of the two berms adjacent to the Lake Geraldine dam and construction of a new berm to the south of the Lake Geraldine dam;

Solid Waste Management

iv. Landfill expansion into the northern adjacent site in the West 40 Landfill site;
v. Management and protection of waters surrounding the West 40 Landfill site;
vi. Management, collection, and monitoring of leachate from the West 40 Landfill site and adjacent Sludge Management Facility;
vii. Improved drainage works at the West 40 Landfill site;
viii. Management and operation of current and future solid waste facilities;
ix. Closure and restoration of current landfills and waste disposal sites;

Wastewater Management

x. Upgrading, maintenance, operation and monitoring of the Sewage Lagoon;
xi. Construction, operation, maintenance and monitoring of a Wastewater Treatment Plant;
xii. Construction, operation, maintenance, and monitoring of a Sludge Management Facility;
xiii. Closure and restoration of the Sewage Lagoon; and
xiv. Contingency measures for wastewater and landfill management.

b. This Licence is issued subject to the 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 *Nunavut Waters and Nunavut Surface Rights Tribunal Act*, or other statutes imposing more stringent conditions relating to the quantity or type of waste that may be so deposited or under which any such waste may be so deposited, this Licence shall be deemed to be subject to such requirements.

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

Please refer to Schedule A

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; and

d. The Inspector shall undertake the following:
    i. Sixty 60 days following receipt of the Licensees Annual report submitted in accordance with Part B, Item 1, the Inspector shall submit to the Board an annual report which will include, among other things:
        1. Compliance with all conditions of this Licence;
        2. Monitoring as identified in Schedule C;
        3. Emergency discharges authorized in accordance with Part E, Item 18 and 19;
        4. Unauthorized discharges report and notification received in accordance with Part H, Item 5 (c); and
        5. Any additional details the Inspector deems relevant in accordance with Part A, Item 3(c).

PART B: GENERAL CONDITIONS

1. The Licensee shall file an Annual Report with the Board no later than March 31 for the year following the calendar year being reported. The Annual Report shall be developed in accordance with Schedule B.

2. The Licensee shall keep a copy of this Licence at City Hall, the Water Supply Facility and Waste Disposal Facilities at all times.

3. The Licensee shall file an application for Licence renewal one (1) year prior to the expiry of this Licence. In addition to the application, the Licensee shall include:

a. Complete water balance for Lake Geraldine prepared by an Engineer; and
b. Assessment of recharge needs for long term water demands.

4. Any communication with respect to this Licence shall be made in writing and shall reference the Licence number and the specific term and condition, 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@nwb.nunavut.ca

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

Water Resources Officer
Nunavut District Office
Indian and Northern Affairs Canada
P.O. Box 100
Iqaluit, NU X0A 0H0
Telephone: (867) 975-4298
Fax: (867) 979-6445

6. The Licensee shall submit one (1) electronic and one (1) signed paper copy of all reports, studies, and plans to the Board unless otherwise requested by the Board. Reports or studies submitted to the Board by the Licensee shall include a detailed executive summary in English and Inuktitut.

7. It is the responsibility of the Licensee to ensure that the receipt of any documents or correspondence submitted by the Licensee to the Board is properly acknowledged by the Manager of Licensing.

PART C: CONDITIONS APPLYING TO SECURITY

1. The Licensee is not required to post security for this undertaking.

PART D: CONDITIONS APPLYING TO WATER USE AND WATER MANAGEMENT PLANS

1. The Licensee is authorized to use water for municipal purposes from Lake Geraldine or as otherwise approved by the Board.

2. The total annual quantity of water used for all purposes from Lake Geraldine shall not exceed 1,100,000 m^3 or as otherwise approved by the Board.

3. The Licensee shall equip the water intake(s) with a screen with a mesh size sufficient such that no entrainment of fish can occur.

4. The Licensee shall ensure that the rate of water withdrawal is such that fish do not become impinged on the screen.

5. The Licensee shall undertake a Dam Safety Inspection of the Lake Geraldine Reservoir between July and September bi-annually starting in 2008. A final report shall be submitted to the Board for review no later than 60 days following the site inspection and include a cover letter from the Licensee indicating how and when recommendations and/or deficiencies identified in the Inspection Report will be addressed.

6. The Licensee shall take steps necessary to prevent and mitigate erosion and the release of sediment into water flowing into and from Lake Geraldine.

PART E: CONDITIONS APPLYING TO WASTE DISPOSAL AND WASTE MANAGEMENT PLANS

Wastewater

1. The Licensee is authorized to use the Sewage Lagoon to treat and dispose of municipal wastewater until the Wastewater Treatment Plant is commissioned, or as otherwise approved by the Board.

2. The Licensee shall provide at least ten (10) days written notice to an Inspector and the Board prior to any planned discharges from the Sewage Lagoon.

3. The Licensee shall ensure that any discharges from the Wastewater Treatment Facilities meet the following Effluent quality criteria:

   a. Until notification is provided in accordance with Part E, Item 3(d), all discharges by the Licensee from the Sewage Lagoon at monitoring Station Number IQA-01 shall comply with the following effluent quality criteria:

      All Effluent discharges shall have a pH between 6 and 9.

Parameter	Maximum Average Concentration	Maximum Concentration of Any Grab Sample
Biological Oxygen Demand (5 day) - BOD_5	120 mg/L	180 mg/L
Total Suspended Solid	180 mg/L	270 mg/L
Oil and Grease	No visible sheen	

   b. All discharges by the Licensee from the Wastewater Treatment Plant at monitoring Station Number IQA-02 shall comply with the following Effluent quality criteria:

      All Effluent discharges shall have a pH between 6 and 9.

Parameter	Maximum Average Concentration	Maximum Concentration of Any Grab Sample
Biological Oxygen Demand (5 day) - BOD_5	30 mg/L	45
Total Suspended Solid	30 mg/L	45
Oil and Grease	No visible sheen	

c. All surface runoff during construction of any facilities designed to withhold, divert, or retain water or wastewater shall comply with the following criteria:

All Effluent discharges shall have a pH between 6 and 9.

Parameter	Maximum Average Concentration	Maximum Concentration of Any Grab Sample
Total Suspended Solids –TSS	50.0 mg/L	100.0 mg/L

d. The Licensee shall confirm compliance as part of the commissioning phase for the Wastewater Treatment Plant. Upon completion of commissioning, final results and notification of intent shall be made in writing to the Inspector.

4. Undiluted Effluent shall be non-acutely toxic under the "Rainbow Trout, *Oncorhynchus mykiss* (as per Environment Canada's Environmental Protection Series Biological Test Method EPS/1/RM/13)".

5. Upon commissioning of the Wastewater Treatment Plant, the Sewage Lagoon shall be considered as a back up facility only. Any discharges from the back-up Sewage Lagoon shall be considered emergency discharges and shall require authorization from an Inspector in accordance with Part E, Item 20 and 21.

6. The Licensee shall submit to the Board for approval an Operation and Maintenance Manual for the Wastewater Treatment Facilities by December 31, 2007. The manual shall be prepared in accordance with the "*Guidelines for the Preparation of an Operation and Maintenance Manual for Sewage and Solid Waste Disposal Facilities in the Northwest Territories* (GNWT 1996)". The manual shall also cover the operation and maintenance of the Sludge Management Facility.

7. The Licensee shall submit to the Board for approval the "Final Assessment of the Sludge Management Pilot Project', completed by an Engineer, within 30 days following notification in accordance with Part E, Item 3(d).

8. The Licensee shall undertake a Dam Safety Inspection of the Sewage Lagoon, completed by an Engineer, once before October 31, 2006, then between July and September bi-annually starting in 2008 until notification has been provided in accordance with Part E Item 3(d). A final report shall be submitted to the Board for review no later than 60 days following the site inspection and include a cover letter from the Licensee indicating how and when recommendations and/or deficiencies identified in the Inspection Report will be addressed.

Solid Waste

9. The Licensee shall dispose of and contain all municipal solid waste at the West 40 Landfill site or as otherwise approved by the Board.

10. The Licensee shall submit to the Board for review by March 31, 2010, a Long-term Solid

Waste Management Plan. The plan shall include, but not limited to, the following:
a. Options for solid waste disposal and discussion of preferred alternative; and
b. Selection of a site for solid waste disposal.

11. The Licensee shall implement the approved "Revision 2-City of Iqaluit Solid Waste Facility Operation and Maintenance Manual (April 2005)" upon the effective date of this Licence.

12. The Licensee shall review all Operation and Maintenance Manuals annually and revise them as necessary to reflect changes due to best practices in operation and technology. Any proposed changes to the manual shall be submitted to the Board for approval. Proposed changes shall be submitted as an addendum to the approved manual as part of the Annual Report requirement Part B, Item 1.

13. In the event that any plan, manual, or report referred to in this Part is not approved by the Board, the Licensee shall provide a revised version to the Board within 30 days of notification by the Board.

14. Further to Part E, Item 13, the Licensee shall implement the documents referred to in this Part as and when approved by the Board.

15. The Licensee shall submit an addendum to the manual referred to in Part E, Item 11 that will include details for contaminated soils and hazardous waste, including, but not limited to: types, volumes ultimate disposal, emergency response, thresholds, and maximum amounts accepted to the facility.

16. The Licensee shall collect and contain all leachate within the West 40 Landfill.

17. At least 90 days prior to any proposed release, discharge or transfer of leachate from the West 40 Landfill, the Licensee shall submit to the Board for approval a report prepared by an Engineer that will include at minimum a discussion of available treatment options, proposed discharge criteria in relation to the proposed discharge location(s) and discharge volumes, and a monitoring programme.

18. The Inspector may authorize an emergency discharge if the Licensee submits to the Inspector, at least 15 days prior to the planned discharge, the following:
a. Reason for discharge;
b. Identification of the Final Discharge Point;
c. Proposed sampling and analysis; and
d. Proposed mitigation measures.

19. For any emergency discharge authorized by the Inspector, the Licensee shall submit to the Board and to the Inspector a report that includes, among other things, an analysis of results of the emergency discharge in the Monthly monitoring report required by Part I, Item 11.

PART F: CONDITIONS APPLYING TO CONSTRUCTION

General

1. The Licensee shall insure that any material used in construction is free of contaminants such that it will not cause detrimental or significant effects to water.

2. The Licensee shall maintain shoreline stability during construction.

3. All final designs and drawings shall be qualified by an Engineer confirming that:
   a. The works are designed under sound engineering principles;
   b. Design limitations are understood and communicated within the report; and
   c. All measures will be taken to minimize impact to water.

4. The Licensee shall, within 90 days of completion of any structure designed to contain, withhold, divert or retain waters or wastes, submit to the Board for approval, a construction report prepared by an Engineer that shall include as-built drawings, documentation of field decisions that deviate from original plans, and any data used to support these decisions.

5. The Licensee shall ensure that all construction of engineered structures will be supervised and field-checked by an Engineer in such a manner that the project specification can be enforced and, where required, the quality control measures can be followed. The Licensee shall also ensure that the construction records of all engineered structures are maintained and made available at the request of the Board and/or an Inspector.

6. During construction and excavation, if contamination of surface and/or ground water is encountered, the Licensee shall notify the Inspector immediately and implement the Spill Contingency Plan.

Water Supply

7. The Licensee shall takes steps necessary to prevent and mitigate erosion and the release of sediment into water flowing into and from Lake Geraldine during construction of the new berms and expansion of the Lake Geraldine dam.

8. The Licensee shall submit to the Board for approval, the final design and drawings by an Engineer, within 30 days of the effective date of the Licence, for the Lake Geraldine Raw Water Storage Phase II. The Licensee shall ensure that such facilities are designed and constructed to engineering standards such that at a minimum they comply with the Canadian Dam Safety Guidelines. The Design shall be qualified in accordance with Part F, Item 3.

9. The Licensee shall undertake a dam safety review of the Lake Geraldine Raw Water Storage Phase II Upgrade, completed by an Engineer, in accordance with the Canadian Dam Safety Guidelines prior to October 31, 2006. The final report shall be submitted to the Board for review no later than 60 days following the safety review and shall include a cover letter from the Licensee indicating how and when recommendations or deficiencies identified in the safety review will be addressed.

Solid Waste

10. The Licensee shall submit to the Board for approval, within 30 days of the effective date of the Licence, a Drainage Improvement and Management Design and drawings prepared by an Engineer for all operations in the West 40 Landfill site. The Design shall be qualified in accordance with Part F, Item 3.

11. The Licensee shall submit to the Board for approval, within 30 days of the effective date of the Licence, the Final Design for the West 40 Landfill Northern Expansion and drawings by an Engineer. The Design shall be qualified in accordance with Part F, Item 3.

12. The Licensee shall submit to the Board for approval, within 60 days of the effective date of the Licence, the Final Design for the Sludge Management Facility and drawings by an Engineer. The Design shall be qualified in accordance with Part F, Item 3.

Wastewater

13. The Licensee shall submit to the Board for approval, within 30 days of the effective date of this Licence, the Final Design for the Rehabilitation of the West Berm of the Sewage Lagoon prepared by an Engineer, and an implementation schedule for the recommendations of the Dam Safety Inspection (2005). The Design shall be qualified in accordance with Part F, Item 3.

14. The Licensee shall submit to the Board for review, within 10 days of the effective date of the Licence, the Final Design for Phase I of the Wastewater Treatment Plant stamped by an Engineer and qualified in accordance with Part F, Item 3, and As-built drawings.

PART G: CONDITIONS APPLYING TO MODIFICATIONS

1. The Licensee may, without written consent from the Board, carry out Modifications to the Water Supply Facilities and Waste Disposal Facilities 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 60 days prior to beginning the Modifications;

    b. such Modifications do not place the Licensee in contravention of the Licence or the *Act*;

    c. the Board has not, during the 60 days following notification of the proposed Modifications, informed the Licensee that review of the proposal will require more than 60 days; and

    d. The Board has not rejected the proposed Modifications.

2. Modifications for which all of the conditions referred to in Part G, Item 1 have not been met can be carried out only with written approval from the Board.

3. The Licensee shall provide as-built plans and drawings of the Modifications referred to in this Licence within 90 days of completion of the Modification. These plans and drawings shall be stamped by an Engineer.

PART H: CONDITIONS APPLYING TO CONTINGENCY PLANNING

1. The Licensee shall implement the approved "*City of Iqaluit Spill Contingency Plan (Updated Dillon 2004),*" upon the effective date of this Licence.

2. The Licensee shall implement the approved "*Sewage Lift Station Contingency Plan (Dillon 2003)*" upon the effective date of this Licence.

3. In accordance with Part H, Item 4, the Licensee shall submit an addendum to reflect any changes in operation of the new Wastewater Treatment Plant and Sludge Management Facility.

4. The Licensee shall review the Contingency Plans annually and revise them as necessary to reflect changes in operation and technology. Any proposed changes to the plans shall be submitted to the Board for approval. Proposed changes may be submitted as addenda to the approved plans as part of the Annual Report requirement Part B, Item 2.

5. If, during the period of this Licence, an unauthorized discharge of Waste and/or Effluent occurs, or if such a discharge is foreseeable, the Licensee shall:

    a. Employ the appropriate Contingency Plan;

    b. Report the incident immediately via the 24-Hour Spill Reporting Line (867) 920-8130; and

    c. Submit to an Inspector a detailed written report on each occurrence no later than thirty (30) days after initially reporting to the Spill Reporting Line.

PART I: CONDITIONS APPLYING TO MONITORING

General

1. The Licensee shall install meters or such devices, or use such methods for measuring the volumes or flow of Water used and Effluent discharged. The meters and measuring devices or methods shall be operated and maintained to the satisfaction of an Inspector.

2. The Licensee shall maintain the necessary signs to identify the stations of the Monitoring Program to the satisfaction of an Inspector.

3. The Licensee shall collect the samples referred to in this Part without delay. If at any time, the period specified for collecting samples was extended due to unforeseen circumstances, safety concerns or access problems and render the collection of samples impracticable, the Licensee shall notify an Inspector of the circumstances.

4. The Licensee shall submit to the Board for approval a Monitoring Program for the water supply, Wastewater Treatment Plant, and West 40 Landfill site, including the Sludge Management Facilities. The Program shall include, but not be limited to, the requirements listed in Schedule C.
   a. The monitoring program for Lake Geraldine shall be submitted 30 days from the effective date of this Licence;
   b. The monitoring program for the Wastewater Treatment Plant shall be submitted 60 days following notification of commissioning; and
   c. The monitoring program for the entire West 40 Landfill site shall be submitted no later than March 31, 2007.

5. All analyses shall be conducted as described in the most recent edition of "*Standard Methods for the Examination of Water and Wastewater*", or by such other methods as approved by the Board.

6. All laboratory analyses shall be performed at a laboratory accredited according to ISO/IEC Standard 17025. The accreditation shall be current and in good standing.

7. The Licensee shall submit to the Board for approval, within 90 days of the effective date of this License, a Quality Assurance/Quality Control (QA/QC) Plan prepared in accordance with "*Quality Assurance (QA) and Quality Control(QC) Guidelines For Use By Class "A" Licensees in Meeting SNP Requirements and for Submission of a QA/QC Plan (INAC, 1996)*".

8. In the event that the plan and/or monitoring program(s) referred to in this Part are not approved by the Board, the Licensee shall provide a revised version to the Board for review within 30 days of notification by the Board.

9. The Licensee shall implement the plans and monitoring programs referred to in this Part as and when approved by the Board.

10. The Licensee shall annually review the approved plans and monitoring programs referred to in this Part and modify them as necessary. Any proposed changes shall be submitted to the Board for approval. Proposed changes may be submitted as addenda to the approved plans or programs as part of the Annual Report requirement Part B, Item 1.

11. The Licensee shall, within 60 days following the month being reported, submit to the Board a "Monthly General Monitoring Report" of all data and information required under Schedule C, including the results of the QA/QC program.

12. There should be at least one inspection of all facilities defined within the scope of this license annually between July and September. The Inspector shall submit a detailed inspection report with supporting photographs and sampling results as required under Schedule C to the Board no later than 90 days following the date of inspection.

13. Additional monitoring may be requested by the Board and/or the Inspector.

14. The Licensee shall increase sampling frequency if results of such sampling indicate that the Effluent Quality Requirements provided in Part C have been exceeded, or as

requested by the Board or directed by an Inspector.

15. The Monitoring Criteria and compliance dates specified in the Licence may be modified at the discretion of the Board and do not constitute an application for amendment as defined in the *Act.*

PART J: CONDITIONS APPLYING TO ABANDONMENT AND RESTORATION

1. The Licensee shall submit to the Board for review, within 90 days of the effective date of the Licence, a conceptual Abandonment and Restoration Plan for the West 40 Landfill site prepared in accordance with industry best practices.

2. The Plan referred to in Part J, Item 1 shall be updated annually and submitted in accordance with Part B, Item 1.

3. The Licensee shall submit to the Board for approval, one year prior to expiry of this Licence or one year before the West 40 Landfill site will reach capacity, a Final Abandonment and Restoration Plan prepared by an Engineer in accordance with industry best practices.

4. Further to Part J, Item 1 and 3, the Conceptual and Final Abandonment and Restoration Plans shall include, among other things, a presentation of data and a discussion of environment conditions existing before the use of the site by the Licensee as a municipal landfill, as well as remediation objectives.

5. In the event that the Plan referred to in Part J, Item 1, is not approved by the Board, the Licensee shall provide a revision to the Board for review within 30 days of notification by the Board.

6. The Licensee shall implement the Plan referred to in Part J, Item 1 as and when approved by the Board.

7. The Licensee shall notify the Board in writing of its intent to proceed with final closure of any water use or waste disposal facility within the scope of this Licence at least one year prior to implementation of final closure.

8. Further to this Part, the Licensee shall submit to the Board for approval 6 months following notification of final closure, a Final Abandonment and Restoration Plan completed by an Engineer in accordance with Part F, Item 3.

SCHEDULES

The following schedules provide instructive details to the conditions appearing in more general terms in the main body of the Licence and are spelled out in this format for greater clarity.

Schedule A - Definitions

In this Licence: 3AM-IQA0611

"**Act**" means the *Nunavut Waters and Nunavut Surface Rights Tribunal Act*;

"**Amendment**" means a change to any terms and condition of this Licence, through application to the NWB, requiring correction, addition or deletion of specific terms and conditions of the Licence except for Schedule C;

"Bioassay" means the test to determine acute toxicity under the "Rainbow Trout, *Oncorhynchus mykiss* (as per Environment Canada's Environmental Protection Series Biological Test Method EPS/1/RM/13)";

"**Board**" means the Nunavut Water Board established under Article 13 the *Nunavut Land Claims Agreement* and under Section 14 of the *Act*;

"**Chief Administrative Officer**" means the Executive Director of the Nunavut Water Board;

"**Construction**" means any activities undertaken to construct or build any component of, or associated with, the water and waste disposal facilities within the City of Iqaluit;

"**Compliance**" means effluent must comply with the Licence effluent quality criteria. Compliance is defined as follows:

a) the arithmetic mean of all parameters measured in the last four (4) samples collected in the same season shall not exceed the effluent quality criteria;
b) of the samples referred to in (a) above, three (3) shall not exceed the effluent quality criteria; and
c) of the samples referred to in (a) above, no sample shall exceed one hundred and fifty (150) percent of the effluent quality criteria; and.

"**Dam Safety Guidelines**" means the *Canadian Dam Association (CDA) Dam Safety Guidelines (DSG), January 1999* or subsequent approved editions;

"**Deleterious Substance**" means a substance as defined in Section 34(1) of the *Fisheries Act;*

"**Deposit**" means the placement of solids materials on land or in water;

"**Discharge**" means the release of any water or waste to the receiving environment;

"**Drainage Basin**" means a geographical area determined by the watershed limits of the systems of water, including surface and underground water, flowing into a common terminus;

"**Effective Date of Licence**" means the date on which the Minister of Indian and Northern Affairs Canada approves the Licence;

"**Effluent**" means the liquid discharge from all site water or waste management facilities;

"**Engineer**" means a professional engineer registered to practice in Nunavut in accordance with the *Engineering, Geological and Geophysical Act (Nunavut)* S.N.W.T. 1998, c.38, s.5 with the ability to stamp, sign and appropriately qualify the design and its limitations;

"**Final Discharge Point**" means the final point of control for any discharge of effluent;

"Lake Geraldine Reservoir" means the infrastructure required for extraction, storage, of water for the City of Iqaluit;

"**Grab Sample**" means an undiluted quantity of material collected at a particular time and place that may be representative of the total substance being sampled at the time and place it was collected;

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

"**Licence**" means this Type "A" Water Licence 3AM-IQA0611, issued by the Nunavut Water Board in accordance with the *Act*, to City of Iqaluit;

"**Licensee**" means to whom Licence 3AM-IQA0611 is issued to or assigned;

"Maximum Average Concentration" means the average concentration of any four consecutively collected samples taken from the identical sampling location and taken during any given timeframe;

"**Minister**" means the Minister of Indian and Northern Affairs Canada;

"**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;

"**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;

"**Reclamation**" means the process of converting disturbed land back to its former or other productive use;

"**Receiving Environment**" means both the aquatic and terrestrial environments that receive any discharge;

"**Regulations**" means the *Northwest Territories Water Regulations SOR/93-303 8 June, 1993*.

"**Sewage**" means all toilet wastes and greywater;

"**Sewage Lagoon**" means a facility and associated structures designed to treat sewage in the City of Iqaluit since 1978;

"Sludge Management Facility" means the facility for the disposal and treatment of sludges generated by the Wastewater Treatment Plant;

"**Surface Drainage**" means all surface waters resulting from the flow over, through or out of an operations area and is collected by means of engineered structures;

"**Use**" means use as defined in section 4 of the *Act*;

"**Waste**" means waste as defined in section 4 of the *Act*;

"**Wastewater**" means the water generated by site activities or originates on-site that requires treatment or any other water management activity;

"Wastewater Treatment Facilities" means the Sewage Lagoon and the Wastewater Treatment Plant;

"**Wastewater Treatment Plant** " means the engineered system designed for the containment and treatment of sewage for the City of Iqaluit located adjacent to the Sewage Lagoon;

"**Water**" means water as defined in section 4 of the *Act*;

"**Water Licence Application**" means, for the purposes of this License, the totality of the NWB Public Register opened as a result of the filing of the application dated January 2004;

"**Water Treatment Plant**" means the engineered system designed for the treatment of raw water from Lake Geraldine Reservoir for the City of Iqaluit;

"**West 40 Landfill**" means a facility, designed to permanently contain inert solid waste materials, in operation at the time of application (2004), the West 40 Landfill Northern Expansion and the Sludge Management Facility; and

"**West 40 Landfill Northern Expansion**" means the facility designed to permanently contain inert solid waste materials located adjacent to the West 40 Landfill.

Schedule B - General Conditions

1. The Annual Report referred to in Part B, Item 1 shall include the following:

    a. The monthly and annual quantities in cubic metres of water obtained from Lake Geraldine;
    b. The monthly and annual quantities in cubic metres of any discharges from the Wastewater Treatment Facilities;
    c. The monthly and annual quantities in cubic metres of sludge removed from the Wastewater Treatment Plant;
    d. A summary report which includes all data and information generated under the Monitoring Program, including the QA/QC program, in an electronic and printed format acceptable to the Board;
    e. A summary of construction activities conducted;
    f. A summary of any modification and/or major maintenance work and/or demolition work carried out and any associated structures;
    g. A summary of all work carried out under the Managements Plans in accordance with this Licence;
    h. A progress report and revisions (if applicable) to any studies requested by the Board that relate to waste management, water use or reclamation and a brief description of any future studies planned by the Licensee including, an executive summary in terms understandable to the general public, translated into Inuktitut;
    i. Any addendums to the approved Contingency Plans and the approved Operation and Maintenance Manuals;
    j. A list and description including volumes, Spill Report Line identification number of all un-authorized discharges, spills and summaries of follow-up action taken;
    k. Any revisions to approved Closure and Reclamation Plan(s);
    l. A summary of any closure and reclamation work undertaken and an outline of any work anticipated for the next year, including any changes to implementation and scheduling;
    m. A summary of actions taken to address concerns or deficiencies listed in the inspection reports and/or compliance reports filed by an Inspector;
    n. Update on implementation of recommendation(s) from any Dam Safety Inspection and/or Review;
    o. A brief update on the implementation plan of all facilities within the scope of this Licence including projected implementation and status of Phase II of the Wastewater Treatment Plant; and
    p. Any details on water use or waste disposal requested by the Board by November 1st of the year being reported.

Schedule C - Conditions Applying to Monitoring

1. The Monitoring Plan, referred to in Part I, Item 4 of the Licence, shall include, but not necessarily be limited to, the following:

Table 1 - Water Quality Parameters

Test Group	Analytical Parameters	Measurement Units
Routine - **R**	Alkalinity, Acidity, Chloride, Carbonate, Bicarbonate, Total Hardness, Hydroxide, Sulphate, Total Suspended Solids (TSS), Total Dissolved Solids (TDS**)** Total Organic Carbon (TOC), Total Inorganic (TIC) pH (field and lab) ORP (field) Conductivity (field and lab) Temperature (field) Turbidity	mg/L pH units mV uS/cm $_{o}$C NTU
Effluent **E**	Total Suspended Solids (TSS), Temperature (field), Conductivity (field and lab), pH (field and lab)	mg/L $_{o}$C uS/cm pH units
Site Specific **SS**	Chlorinated Paraffins, LC50 Bioassay	ng/L
ICP- ICP Metals Scan (Total) metal scan that shall include at a minimum	Al, Sb, As, Ba, Be, Cd, Cr, Co, Cu, Fe, Pb, Li, Mn, Mo, Ni, Se, Sn, Ag, Sr, Tl, Ti, U, V, Zn, Hg	mg/L
Nutrients – **N**	Ammonia-N, Nitrate-N, Nitrite-N Total Phosphorus, Orthophosphate	mg N/L mg/L
Biological –**B**	Biochemical Oxygen Demand Total and Fecal Coliform	mg/L CFU/100mL (colony forming units)
Potable Water - **PW**	Fecal Coliform ICP Metals (Total and dissolved) Total Suspended Solids –TSS	CFU/100mL mg/L mg/L
Soil - **S**	Total PCB, Fractional Hydrocarbon, BTEX (Benzene, Toluene, Ethylbenzene and Xylene)	mg/L

Table 2[1] - Water Quality Monitoring Criteria

Station	Location	Phase	Test Group Water Chemistry (refer to Table 1)	Frequency[2]	Flow Measurement	Frequency	Responsible Party[3]
IQA-01	Raw Water Supply from Lake Geraldine Reservoir at the Water Treatment Plant Prior to Treatment	Operation	R, PW	MO	Yes	M	L
			R, PW	A			I
IQA-01(#)	To be provided in accordance with Part I, Item 4 for Lake Geraldine water levels.						L
IQA-02	Final Discharge Point from the Sewage Lagoon	Operation	B, N, E	BiM	Yes	M	L
			ICP, SS	A			L
			B, N, E, ICP, SS	A			I
IQA-03	Influent to the Sewage Lagoon	Operation	B, N, E, ICP, SS	A			L
IQA-04	Final Discharge Point from the Wastewater Treatment Plant	Operation	B, N, E	BiM	Yes	M	L
			ICP	Q			L
			SS	A			L
			B, N, E, ICP, SS	A			I
IQA-05	Influent to the Wastewater Treatment Plant	Operation	B, N, E, ICP, SS	A			L
IQA-06	Sludge at the Wastewater Treatment Plant	Operation	B, E, N, ICP	M	Yes	M	L
IQA-07	Surface Water entering the West 40 Landfill site	To be provided in accordance with Part I, Item 4					L
IQA-08	Final Discharge Point from the West 40 Landfill	To be provided in accordance with Part E, Item 17					L
		To be provided by the Board following compliance with Part E, Item 17					I
IQA-08(#)	To be provided in accordance with Part E, Item 17, Part F, Item 10, and Part I, Item 4 for the entire West 40 Landfill area						L
IQA -09	Contaminated soils accepted at the West 40 Landfill site	Operation	ICP, S	A			I

[1] Table 2 may be modified by the Board and re-issued where necessary. Re-issuance is not considered an Amendment to the application or Licence as defined in the *Act.*
[2] Frequency: MO=monthly during open water season; BiM=Bi-monthly, Q = Quarterly, A = Annually
[3] Responsible Party: I = Inspector, L = Licensee

Appendix F:
Monthly Monitoring Report Template

- # Nunavut Water Board

Monthly General Monitoring Report – January 2013

Type of Document
Final

Project Name
Monthly General Monitoring Report – January 2013
Water License Monitoring Program
Iqaluit, Nunavut

Licence
3AM-IQA0611

Prepared By: Paul Clow, P.Eng.

Reviewed By: Meagan Leach, P.Eng.

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PO Box 460
Iqaluit, NU, X0A 0H0
Canada

Date Submitted
March 31, 2013

Nunavut Water Board

Monthly General Monitoring Report – January 2013

Type of Document:
Final

Project Name:
Monthly General Monitoring Report – January 2013
Water License Monitoring Program
Iqaluit, Nunavut

Licence:
3AM-IQA0611

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Date Submitted:
March 31, 2013

Executive Summary

As a condition of Nunavut Water Board (NWB) Licence 3AM-IQA0611, the City of Iqaluit (City) is required to submit a monthly general monitoring report to the NWB.

The objective of this monthly general monitoring report is to document the environmental monitoring, pursuant to the NWB Licence 3AM-IQA0611, undertaken by the City during the month. This monthly general monitoring report includes a description of the sampling locations, the test group parameters, all laboratory analytical data and an evaluation of compliance with the NWB licence conditions.

Conclusions

Based on the results of the environmental monitoring program for the month of XXXXX, the following conclusions are provided:

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Table of Contents

Appendices

1 Introduction

As a condition of Nunavut Water Board (NWB) Licence 3AM-IQA0611 (see Appendix D), the City of Iqaluit (City) is required to submit a monthly general monitoring report to the NWB.

1.1 Site Description

The City of Iqaluit overlooks Koojesse Inlet on the south coast of Baffin Island (Figure 1, Appendix A). Lake Geraldine supplies raw water to the City. During the spring and summer, water flows fills the lake from the surrounding watershed. Water is stored for over-winter consumption by a dam on Lake Geraldine. From the dam outfall, water is transmitted by gravity to the water treatment plant (WTP) where it is treated by sand filtration, chlorination, and lime stabilization. Treated water is stored in clear wells, filtered water tanks, and a main storage reservoir at the plant prior to entering the main distribution system (see Figure 2, Appendix A).

The City's waste water receives primary treatment at the waste water treatment plant (WWTP) before being disposed in Frobisher Bay (Figure 3, Appendix A). The sewage lagoon provides additional storage when needed.

Landfill runoff is collected in the on-site detention ponds. The run-off is then pumped to the retention pond located across the road from the landfill (Figure 4, Appendix A). A 4" pump is then connected to a Geotube dewatering bag and the retention pond is decanted.

The water licence issued to the City (3AM-IQA0611) by the NWB specifies nine monitoring stations across the licensed facilities (i.e., the WTP, the WWTP) and the West 40 Landfill (landfill)).

- Station IQA-01 is a raw water supply (from Lake Geraldine) sampling location, prior to treatment at the WTP.
- Station IQA-02 is a waste water sampling location at the final discharge point from the sewage lagoon.
- Station IQA-03 is a waste water sampling location of the influent to the sewage lagoon.
- Station IQA-04 is a waste water sampling location at the final discharge point from the WWTP.
- Station IQA-05 is a waste water sampling location of the influent to the WWTP.
- Station IQA-06 is a sample of sludge from the WWTP.
- Station IQA-07 is a sample of surface water entering the West 40 Landfill site.
- Station IQA-08 is a sample of surface water from the final discharge point from the West 40 Landfill site.
- Station IQA-09 is a sample of contaminated soil accepted at the West 40 Landfill site.

1.2 Project Objectives

The objective of this monthly general monitoring report is to document the environmental monitoring, pursuant to the NWB Licence 3AM-IQA0611, undertaken by the City during the month. This monthly general monitoring report includes a description of the sampling locations, the test group parameters, all laboratory analytical data and an evaluation of compliance with the NWB licence conditions.

1.3 Scope of Work

The environmental monitoring program consisted of the following general tasks:

- Completion of environmental sampling and laboratory submission; and,
- Data compilation, interpretation and reporting.

2 Methodology

2.1 Environmental Monitoring Sample Collection Program

2.1.1 Water Quality Parameters

The City's NWB-issued licence (3AM-IQA0611) specifies which water quality parameters must be measured and in what frequency they must be measured during the environmental monitoring program.

Table 1 of Schedule C of the Water Licence 3AM-IQA0611 identifies the various groups of analytical parameters that must be measured for the various sample types (e.g., routine, influent, effluent, potable water, etc.). Table 2 of Schedule C of the water licence specifies the analytical test groups, frequency of sampling and responsible party for each of the monitoring stations.

This report outlines the results of the analytical testing undertaken during the month of XXXXX, which included the following test groups:

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2.1.2 Sampling Locations

The following table includes the Station Ids and the geographic coordinates for the XX monitoring stations sampled during the month of XXXXXX.

Table 1 –Geographic Coordinates for the Monitoring Stations for NWB Licence 3AM-IQA0611

Station ID	Latitude*	Longitude*
IQA-01	63°45'12" N	68°30'22" W
IQA-02	63°44'43" N	68°32'18" W
IQA-03	63°44'49" N	68°32'09" W
IQA-04	63°44'43" N	68°32'20" W
IQA-05	63°44'45" N	68°32'20" W

IQA-06	63°44'45" N	68°32'20" W
IQA-07	NA	NA
IQA-08	63°43'47" N	68°32'11" W
IQA-09	NA	NA

* NAD 83

(remove any sampling locations not sampled during the reported month – as per Schedule C of NWB Licence 3AM-IQA0611)

Refer to the "*City of Iqaluit - Quality Assurance / Quality Control Plan*", prepared by **exp** Services Inc., and dated February 2013, for additional details regarding the locations of the sampling points.

2.1.3 Laboratory Submission

All environmental monitoring samples were submitted to Exova for analysis of the parameters listed in Section 2.1.1 (above).

A quality assurance (QA) and quality control (QC) program was also implemented to ensure that the analytical results received are accurate and dependable. A QA/QC program is a system of documented checks that validate the reliability of the data collected regarding any given site. Quality Assurance is a system that ensures that quality control procedures are correctly performed and documented. 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. The QA/QC program incorporated the following components:

- Prevention of cross-contamination;
- Proper field note-taking procedures;
- Sampling containers, preservation and hold times;
- Sampling, packaging and transport;
- Sample identification requirements;
- Chain of custody;
- Sample transmittal documentation;
- Initial check of samples and documentation; and,
- Verification of the integrity and condition of all sample coolers.

3 Effluent Quality Assessment

3.1 Assessment Criteria

The applicable assessment criteria are provided in Part E, Section 3 of the water licence (3AM-IQA0611).

3.2 Field Observations

3.3 Analytical Results

A summary of the analytical results obtained from previous environmental monitoring and the current monitoring program is presented in Appendix B, along with the applicable assessment criteria. The laboratory Certificates of Analysis from the current round of sampling are presented in Appendix C.

Based on the analytical results obtained for the monitoring event for the month of XXXXX, no exceedances the applicable assessment criteria were measured. Detectable concentrations of X, Y and Z were measured at concentrations less than the applicable assessment criteria at location, IQA-XX. The analytical results for all other monitoring locations reveal no concentrations above the method detection limits (MDLs) for the measured parameters.

3.4 Discussion

Compare the results obtained this month with that obtained from previous sampling rounds in order to discuss any process upsets, trends in the data, need for procedural changes or additional monitoring, etc.

4 Conclusions

Based on the results of the environmental monitoring program for the month of XXXXX, the following conclusions are provided:

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5 References

6 Limitations

This report has been prepared for and is intended for the exclusive use of the Nunavut Water Board. The contents of this report should not be relied upon by any other party without the expressed written consent of the City of Iqaluit. The findings are considered to be representative of site conditions at the time of environmental monitoring.

We trust this report is satisfactory for your purposes. If you have any questions regarding our submission, please do not hesitate to contact this office.

Appendix A: Figures

Appendix B:
Analytical Summary Tables

Appendix C:
Laboratory Certificates of Analysis

Appendix D:
City of Iqaluit's Water Licence