Iqaluit

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Monthly General Monitoring Report – July 2012

Nunavut Water Board Submission

Type of Document
Final

Project Name
Monthly General Monitoring Report – July 2012
Water License Monitoring Program
Iqaluit, Nunavut

Licence
3AM-IQA0611

Prepared By: Paul Clow

Reviewed By: Meagan Leach

City of Iqaluit
PO Box 460
Iqaluit, NU, X0A 0H0
Canada

Date Submitted
August 30, 2013

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Prepared By:
City of Iqaluit
PO Box 460
Iqaluit, NU, X0A 0H0
Canada
T: 867.979.5600
F: 867.979.5922
www.city.iqaluit.nu.ca

Date Submitted:
August 30, 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.

This report presents the results of the samples collected from the Water Treatment Plant (Influent), Wastewater Treatment Plant (effluent), and Sewage Sludge on July 25, 2012, and from the Landfill Runoff between July 17 to 19, 2012. The July 25, 2012 tests correspond with the scheduled June test set.

Based on the results of the environmental monitoring program for the month of July 2012, the following conclusions are provided:

- Parameters in the raw water entering the WTP were within the Canadian Drinking Water Standards (criteria).
- There were exceedances for BOD, ammonia, and several metals in the effluent from the WWTP.
- An upgrade of the WWTP to a secondary treatment facility is needed to achieve the effluent criteria in the City's Water Licence.
- Landfill runoff exceeded AECOM criteria for iron, and exceed CCME criteria for ammonia, copper, iron and zinc. However, the TSS was effectively reduced through the use of the Geotube bag during the decant. Further landfill run-off treatment is needed and is being planning in the City's upcoming 5-year Capital Plan.
- The City needs to update its sampling schedule to ensure that the missed parameters are included.

Table of Contents

Appendices

1 Introduction

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 Nunavut Water Board (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, 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 (see Figure 2, Appendix A).

The City's wastewater receives primary treatment at the wastewater treatment plant (WWTP) before being disposed in Frobisher Bay (Figure 3, Appendix A). 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 (Figure 4, Appendix A). 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 water licence issued to the City (3AM-IQA0611) by the NWB specifies nine monitoring stations across the licensed facilities (the WTP, WWTP), and West 40 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 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 (landfill run-off) from the final discharge point from the West 40 Landfill site, and
- Station IQA-09 is a sample of contaminated soil accepted at the West 40 Landfill site.

It should be noted that the landfill does not accept contaminated soil, therefore, Station IQA-09 is inactive. Station IQA-07 is also inactive because berms prevent surface water from entering the West 40 Landfill.

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 (see Appendix E), 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.

The City developed a sampling schedule to meet these monitoring requirements (see Appendix B for schedule used). Samples at IQA-08 and IQA-02 are to be completed during decants and were not specifically scheduled.

This report outlines the results of the analytical testing on the samples taken on July 25, 2012 for the WTP and WWTP and July 17-19, 2012 for the landfill runoff, which included the following test groups:

- Test A - Influent to the Water Treatment Plant (Station IQA-01)
- Test D - Effluent from the Wastewater Treatment Plant (Station IQA-04)
- Test F - Sludge from the Wastewater Treatment Plant (Station IQA-06)
- Landfill Surface Runoff in Retention Ponds (Station IQA-08)

It should be noted that the July 25, 2012 samples correspond with the scheduled June sample set.

2.1.2 Sampling Locations

The following table includes the Station IDs and the geographic coordinates for the four monitoring stations sampled during the month of July 2012.

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

Station ID	Description	Latitude*	Longitude*
IQA-01	Influent to the Water Treatment Plant	63°45'12" N	68°30'22" W
IQA-04	Effluent from the Wastewater Treatment Plant	63°44'43" N	68°32'20" W
IQA-06	Sludge Wastewater Treatment Plant	63°44'45" N	68°32'20" W
IQA-08	Landfill Runoff decanted from the Retention Pond through Geotube.	63°43'47" N	68°32'11" W

* NAD 83

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, a CALA accredited laboratory 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;
- 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.

The City of Iqaluit has a QA/QC Plan, which was developed in 2012 and finalized in 2013.

3 Effluent Quality Assessment

3.1 Assessment Criteria

The results for the influent to the Water Treatment Plant samples were compared to the Canadian Drinking Water Quality Objectives. The results for the treated wastewater samples were compared to the applicable assessment criteria are provided in Part E, Section 3 of the water licence (3AM-IQA0611). The landfill surface runoff sample results were compared to criteria recommended by AECOM in a report entitled *West 40 Landfill Drainage Management Review* (AECOM, 2011). All wastewater and landfill runoff was also compared to the Canadian Water Quality Guidelines for the Protection of Aquatic Life (CCME, 1999). The assessment of sludge was compared to criteria utilized by the Northwest Territories from the document entitled *A Review of the Current Canadian Legislative Framework for Wastewater Biosolids* (CCME, 2010).

3.2 Field Observations

No field observations were recorded.

3.3 Analytical Results

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

The following table indicated which tests or parameters are missing from the Schedule in Appendix B.

Table 3.1: Missing Samples or Parameters

Month	Test	Parameter/Sample missing
July samples (June test set)	A	FC, TC, ORP, OH, carbonate, tubidity
	D	TC, FC
	F	TC, FC, BOD, orthophosphate

3.3.1 Station IQA-01 (Influent to the Water Treatment Plant)

Based on the analytical results obtained for July 25, 2012 WTP influent sample, no exceedances to the Canadian Drinking Water Quality Objectives were measured. Detectable metal concentrations of copper, iron and manganese were measured at concentrations less than the Canadian Drinking Water Quality Objectives. The required total and fecal coliforms, oxygen reduction potential, hydroxide, carbonate and turbidity sampling was not completed.

3.3.2 Station IQA-04 (Effluent to the Wastewater Treatment Plant)

Based on the analytical results obtained for July 25, 2012 effluent sample, BOD exceeded the effluent criteria stipulated by the water licence. Ammonia, aluminum, copper and iron were elevated above the CCME criteria. The required total and fecal coliforms sampling was not completed.

3.3.3 Station IQA-06 (Sludge from the Wastewater Treatment Plant)

Based on the analytical results obtained for July 25, 2012 sludge sample, no exceedances of the Northwest Territories Biosolids criteria were measured. The required total and fecal coliforms, BOD, and orthophosphate sampling was not completed.

3.3.4 Station IQA-08 (Landfill Retention Pond)

Three samples were taken during a decant of the landfill's off-site retention pond (a sample was taken at the beginning, middle and end of the decant). The results show that TSS was effectively reduced through the use of the Geotube bag during the decant. Iron was measured above the AECOM criteria in each of the decant samples. In addition, ammonia, copper, iron, and zinc were measured above the CCME criteria.

3.4 Discussion

3.4.1 Station IQA-01 (Influent to the Water Treatment Plant)

No parameters in the raw water entering the water treatment plant were measured above Canadian Drinking Water Quality guidelines. However it was not possible to assess water quality based on total and faecal coliforms.

3.4.2 Station IQA-04 (Effluent to the Wastewater Treatment Plant)

The exceedances for BOD above the water licence criteria, as well as ammonia and several metals above CCME criteria represent a concern as this water is being discharged into the environment.

The elevated readings are consistent with what was measured in June of 2012. This waste stream undergoes primary treatment only which cannot reduce the concentrations in those elevated parameters to the required levels.

The City is currently planning on upgrading the WWTP to a secondary treatment facility to meet the effluent criteria set out in its Water Licence. Design and planning work is expected to start in 2014 and the upgrades are expected to be complete by the end of 2018.

3.4.3 Station IQA-06 (Sludge from the Wastewater Treatment Plant)

Since no parameters were measured in excess of the Northwest Territories Biosolids criteria, there are no concerns raised with respect to environmental impairment during the month of July 2012. In 2009, the City completed a study which showed that the sludge can be effectively treated through a freeze-thaw dewatering and compost process at the landfill.

3.4.4 Station IQA-08 (Landfill Retention Pond)

The exceedances in the landfill run-off decanted from the retention pond represent a concern and indicate that further treatment is required. In 2011, the City completed a report titled *West 40 Landfill Drainage Management Review*, which examined treatment options to address elevated parameters in the landfill run-off. Based on the recommendations of this report, the City is planning to include run-off treatment in its up-coming 5-year Capital Plan.

4 Conclusions

Based on the results of the environmental monitoring program for the month of July 2012, the following conclusions are provided:

- Parameters in the raw water entering the WTP were within the Canadian Drinking Water Standards (criteria).
- There were exceedances for BOD, ammonia, and several metals in the effluent from the WWTP.
- An upgrade of the WWTP to a secondary treatment facility is needed to achieve the effluent criteria in the City's Water Licence.
- Landfill runoff exceeded AECOM criteria for iron, and exceed CCME criteria for ammonia, copper, iron and zinc. However, the TSS was effectively reduced through the use of the Geotube bag during the decant. Further landfill run-off treatment is needed and is being planning in the City's upcoming 5-year Capital Plan.
- The City needs to update its sampling schedule to ensure that the missed parameters are included.

5 References

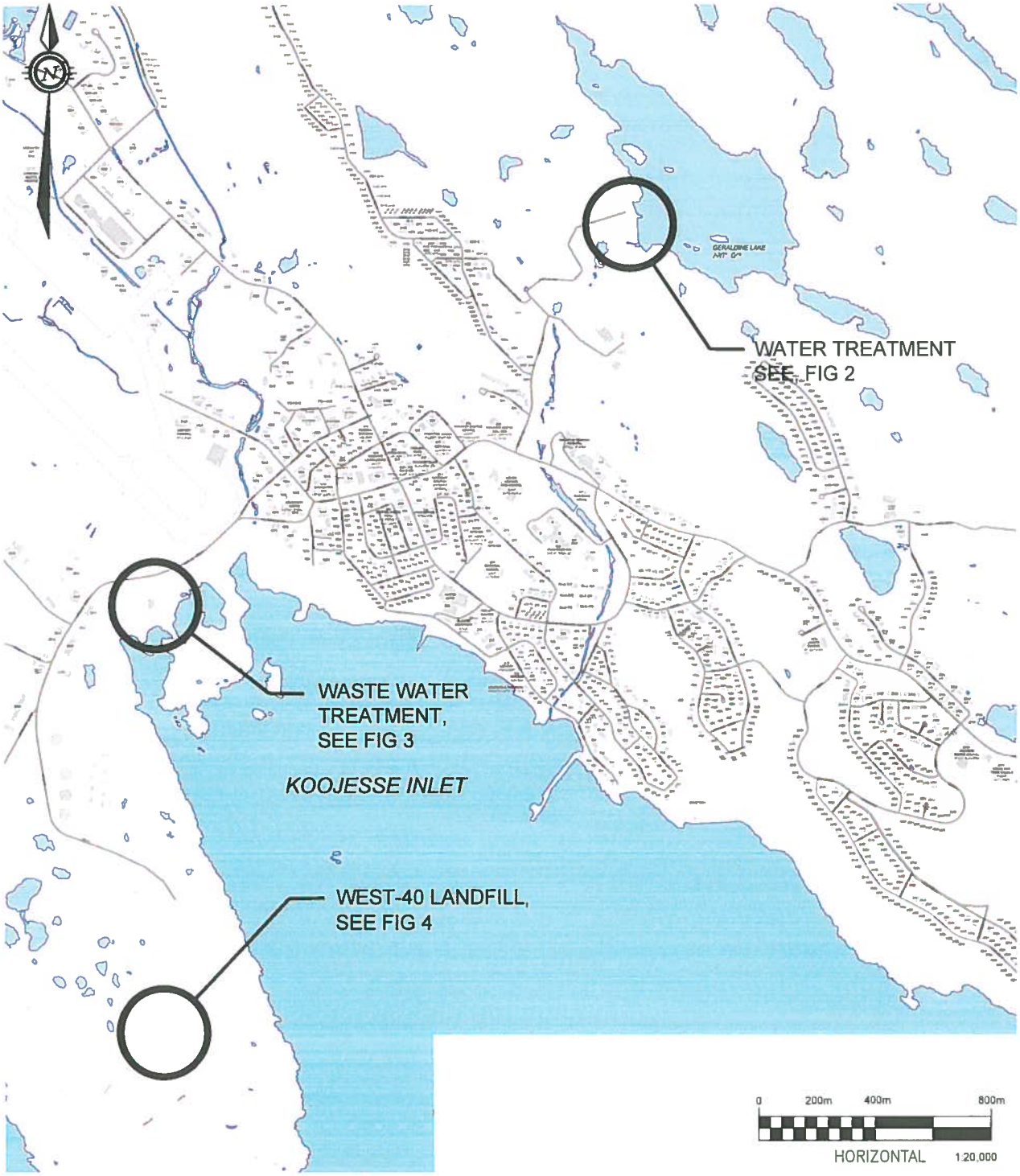
- AECOM, *City of Iqaluit West 40 Landfill Drainage Management Review*, Project Number 60221928, September 16, 2011.
- AECOM, *Iqaluit Sewage Sludge Management Composting Pilot Project Report*, Project Number 106787-03, March 31, 2009.
- Canadian Council of Ministers of the Environment (CCME), *Canadian Water Quality Guidelines for the Protection of Aquatic Life*, 1999.
- Canadian Council of Ministers of the Environment (CCME), *A Review of the Current Canadian Legislative Framework for Wastewater Biosolids*, 2010.
- **Exp** Services Inc., *City of Iqaluit - Quality Assurance / Quality Control Plan*, February 2013.
- Health Canada, *Guidelines for Canadian Drinking Water Quality*, 2012.
- Nunavut Water Board Licence (3AM-IQA0611), Issued May 15, 2006.

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



exp Services Inc. www.exp.com
t: +1.613.688.1899 | f: +1.613.225.7337
2650 Queensview Drive, Suite 100
Ottawa, ON K2B 8H6, Canada

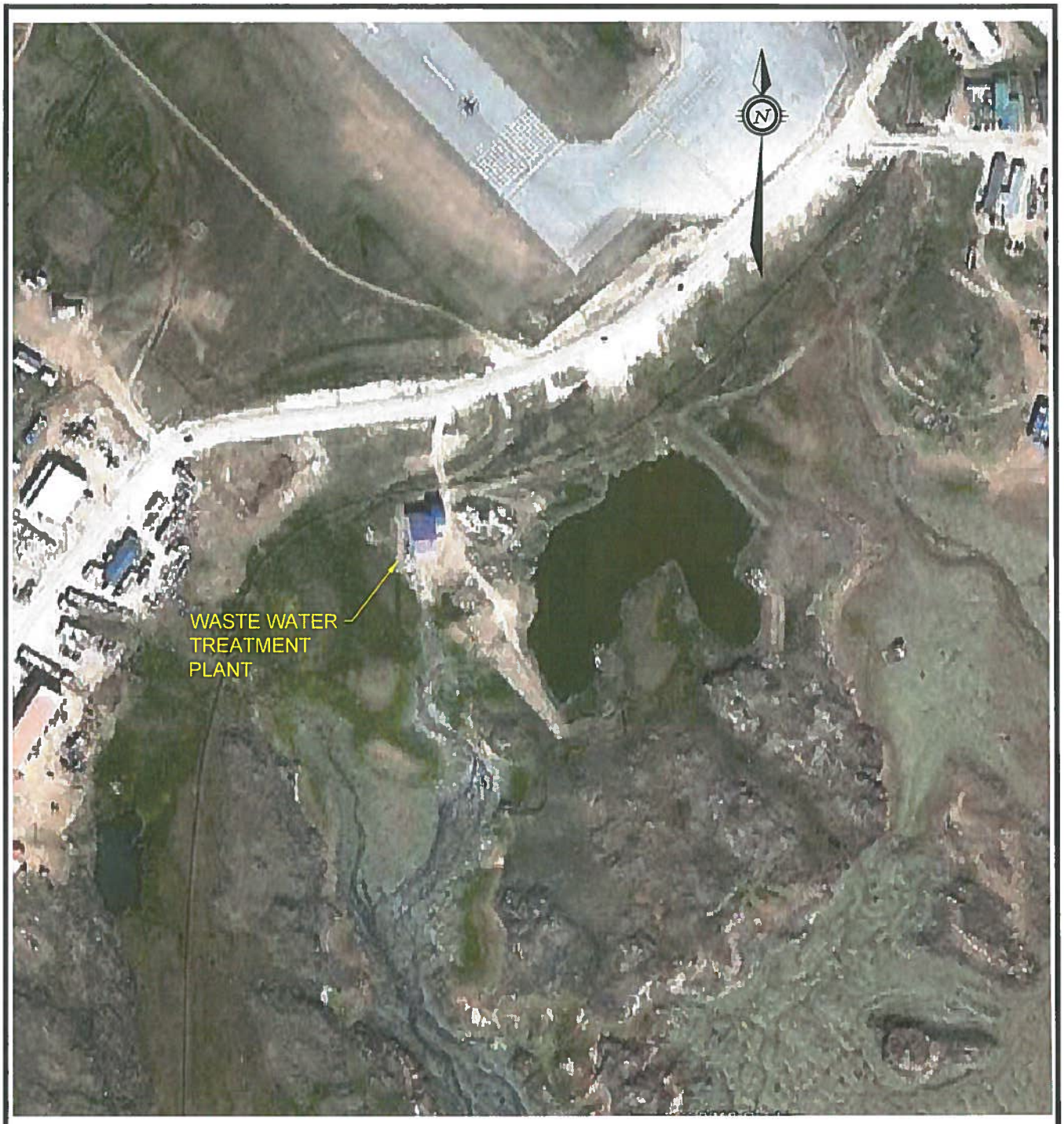
DATE: DEC. 2012	CLIENT: CITY OF IQALUIT	project no.: OTT-00210131-A0
DESIGN: R.R. / CHECKED: C.T.K.	TITLE: SITE LOCATION IQALUIT, NUNAVUT	scale: 1:20,000
DRAWN BY: M.N.		FIG 1

0 40m 80m 160m

HORIZONTAL 1:4000

exp Services Inc. www.exp.com
t: +1.613.688.1899 | f: +1.613.225.7337
2650 Queensview Drive, Suite 100
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



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HORIZONTAL 1:4000

exp Services Inc. **www.exp.com**
t: +1.613.688.1899 | f: +1.613.225.7337
2650 Queensview Drive, Suite 100
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 - WASTE WATER TREATMENT PLANT IQALUIT, NUNAVUT	FIG 3

exp Services Inc. www.exp.com
t: +1.613.688.1899 | f: +1.613.225.7337
2650 Queensview Drive, Suite 100
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 - WEST 40 LANDFILL IQALUIT, NUNAVUT	FIG 4

Appendix B:
Current Monitoring Program Test Dates

Test Order Dates

Date	Type of Test
February 1, 2012	Test D
April 1, 2012	Test C
June 1, 2012	Test A, D, F
July 1, 2012	Test A, F
August 1, 2012	Test A, B, E, F
September 1, 2012	Test A, F
October 1, 2012	Test C
December 1, 2012	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)
Acidity	BOD	BOD	BOD	BOD	Temperature
Alkalinity	Total Coliforms	Total Coliforms	Total Coliforms	Total Coliforms	Conductivity
Bicarbonate	Fecal Coliforms	Fecal Coliforms	Fecal Coliforms	Fecal Coliforms	pH
Carbonate	Ammonia Nitrogen	Ammonia Nitrogen	Ammonia Nitrogen	Ammonia Nitrogen	BOD
Chloride	Nitrate Nitrogen	Nitrate Nitrogen	Nitrate Nitrogen	Nitrate Nitrogen	Total Coliform
Conductivity	Nitrite Nitrogen	Nitrite Nitrogen	Nitrite Nitrogen	Nitrite Nitrogen	Fecal Coliform
Hardness	Total Phosphorus	Total Phosphorus	Total Phosphorus	Total Phosphorus	Ammonia
Hydroxide	Orthophosphate	Orthophosphate	Orthophosphate	Orthophosphate	Nitrate
ORP	Conductivity	Conductivity	Conductivity	Conductivity	Nitrite
Sulphate	Full Metals Scan		Full Metals Scan	Full Metals Scan	Total Phosphorus
TDS	Chlorinated Paraffins			Chlorinated Paraffins	Orthophosphate
TSS	LC50 Bioassay (R Trout)			LC50 Bioassay (R Trout)	ICP Metals Scan
TOC					Moisture in Solids
TIC					
Fecal Coliforms					
Total ICP Metals					
Dissolved ICP Metals					

Appendix C:
Analytical Summary Tables

Table 1: Raw Water Quality (WTP)
Nunavut Water Board Licence 3AM-IQA0611
City of Iqaluit

					Lab I.D.	974525
					Sample Matrix	Water
					Sample Type	
					Sampling Date	25-Jul-12
					Sample I.D.	Raw
Group	Analyte	MRL	Units	CCME Water Quality Objectives	Guidelines for Canadian Drinking Water Quality	
General Chemistry and Nutrients	Hardness as CaC03	1	mg/L	NV	NV	12
	Total Dissolved Solids (TDS)	1	mg/L	NV	500 (AO)	25
	Acidity as CaC03	5	mg/L	NV	NV	<5
	Alkalinity as CaC03	5	mg/L	NV	NV	15
	Chloride	1	mg/L	0 (long term), 640 (short ter	250 (AO)	1
	Bicarbonate (HC03 as CaC03)	1	mg/L	NV	NV	15
	pH	1		6.5 - 9	6.5 - 8.5	6.76
	Sulphate (S04)	3	mg/L	NV	500 (AO)	3
	Total Organic Carbon (TOC)	0.5	mg/L	NV	NV	2.4
	Total Inorganic Carbon	2	mg/L	NV	NV	3.7
	Total Suspended Solids (TSS)	2	mg/L	NV	NV	<2
	Dissolved Reactive Phosphorus	0.01	mg/L	NV	NV	<0.01
Mercury	Mercury (Hg)	0.0001	mg/L	0.000026	NV	<0.0001
Metals	Silver (Ag)	0.0001	mg/L	0.0001	NV	<0.0001
	Aluminum (Al)	0.01	mg/L	0.1	0.1	<0.01
	Arsenic (As)	0.01	mg/L	0.005	0.01	<0.001
	Boron (B)	0.01/0.1	mg/L	NV	5	<0.01
	Barium (Ba)	0.01	mg/L	NV	1	<0.01
	Beryllium (Be)	0.0005	mg/L	NV	NV	<0.0005
	Calcium (Ca)	1	mg/L	NV	NV	5
	Cadmium (Cd)	0.0001	mg/L	0.000017	0.005	<0.0001
	Cobalt (Co)	0.0002	mg/L	NV	NV	<0.0002
	Chromium (Cr)	0.001	mg/L	<0.01	0.05	<0.001
	Copper (Cu)	0.001	mg/L	0.002	1 (AO)	0.003
	Iron (Fe)	0.03	mg/L	0.3	0.3 (AO)	0.05
	Potassium (K)	1	mg/L	NV	NV	<1
	Magnesium (Mg)	1	mg/L	NV	NV	<1
	Manganese (Mn)	0.01	mg/L	NV	0.05 (AO)	0.02
	Molybdenum (Mo)	0.005	mg/L	0.073	NV	<0.005
	Sodium (Na)	2	mg/L	NV	200 (AO)	<2
	Nickel (Ni)	0.005	mg/L	0.025	NV	<0.005
	Lead (Pb)	0.001	mg/L	0.001	0.01	<0.001
	Antimony (Sb)	0.0005	mg/L	NV	0.006	<0.0005
	Selenium (Se)	0.01	mg/L	0.001	0.01	<0.001
	Silicon (Si)	0.1	mg/L	NV	NV	0.6
	Strontium (Sr)	0.001	mg/L	NV	NV	0.011
	Titanium (Ti)	0.01	mg/L	NV	NV	<0.01
	Thallium (Tl)	0.0001	mg/L	0.0008	NV	<0.0001
	Vanadium (V)	0.001	mg/L	NV	NV	<0.001
	Zinc (Zn)	0.01	mg/L	0.03	5 (AO)	<0.01
Microbiology	Faecal Coliforms	0	ct/100mL	NV	0	NA
	Total Coliforms	0	ct/100mL	NV	0	NA

Notes:

Shaded	Exceeds Effluent Quality Criterion in Nunavut Water Board Licence 3AM-IQA0611
BOLD	Exceeds Canadian Drinking Water Guidelines
NV	No value listed in criteria
NA	Not Analyzed

Table 1: Effluent Water Quality (WWTP)
Nunavut Water Board Licence 3AM-IQA0611
City of Iqaluit

					Lab I.D.	965782	974524
					Sample Matrix	Wastewater	Wastewater
					Sample Type		
					Sampling Date	19-Jun-12	25-Jul-12
					Sample I.D.	City of Iqaluit	WWTP Effluent
Group	Analyte	MRL	Units	CCME Water Quality Objectives	Effluent Quality Criteria (Water Licence 3AM-IQA0611) Wastewater Treatment Plant		
General Chemistry and Nutrients	Total Suspended Solids	2	mg/L	NV	30 (Avg), 45 (Max)	NA	NA
	Alkalinity as CaC03	5	mg/L	NV	NV	NA	NA
	TKN	5	mg/L	NV	NV	NA	NA
	Nitrite (N-N02)	0.1	mg/L	0.06	NV	<0.1	<0.1
	Nitrate (N-N03)	0.1	mg/L	13	NV	<0.1	<0.1
	BOD5	1	mg/L	NV	30 (Avg), 45 (Max)	160	163
	COD	5	mg/L	NV	NV	NA	NA
	Ammonia (N-NH3)	0.02	mg/L	0.019	NV	**49.1**	**42.9**
	Orthophosphate (O-P04)	0.03	mg/L	NV	NV	14.6	11.7
	Total Phosphorus	0.01	mg/L	NV	NV	6.97	7.32
Mercury	Mercury (Hg)	0.0001	mg/L	0.000026	NV	NA	<0.0001
Metals	Silver (Ag)	0.0001	mg/L	0.0001	NV	NA	<0.01
	Aluminum (Al)	0.01	mg/L	0.1	NV	NA	**0.8**
	Arsenic (As)	0.01	mg/L	0.005	NV	NA	<0.05
	Boron (B)	0.01/0.1	mg/L	NV	NV	NA	0.1
	Barium (Ba)	0.01	mg/L	NV	NV	NA	0.02
	Beryllium (Be)	0.0005	mg/L	NV	NV	NA	<0.01
	Calcium (Ca)	1	mg/L	NV	NV	NA	24
	Cadmium (Cd)	0.0001	mg/L	0.000017	NV	NA	<0.01
	Cobalt (Co)	0.0002	mg/L	NV	NV	NA	<0.01
	Chromium (Cr)	0.001	mg/L	<0.01	NV	NA	<0.05
	Copper (Cu)	0.001	mg/L	0.002	NV	NA	**0.33**
	Iron (Fe)	0.03	mg/L	0.3	NV	NA	**0.7**
	Potassium (K)	1	mg/L	NV	NV	NA	16
	Magnesium (Mg)	1	mg/L	NV	NV	NA	11
	Manganese (Mn)	0.01	mg/L	NV	NV	NA	0.08
	Molybdenum (Mo)	0.005	mg/L	0.073	NV	NA	<0.01
	Sodium (Na)	2	mg/L	NV	NV	NA	30
	Nickel (Ni)	0.005	mg/L	0.025	NV	NA	<0.01
	Lead (Pb)	0.001	mg/L	0.001	NV	NA	<0.01
	Antimony (Sb)	0.0005	mg/L	NV	NV	NA	<0.01
	Selenium (Se)	0.01	mg/L	0.001	NV	NA	<0.05
	Silicon (Si)	0.1	mg/L	NV	NV	NA	4
	Strontium (Sr)	0.001	mg/L	NV	NV	NA	<0.05
	Titanium (Ti)	0.01	mg/L	NV	NV	NA	<0.1
	Thallium (Tl)	0.0001	mg/L	0.0008	NV	NA	<0.01
	Vanadium (V)	0.001	mg/L	NV	NV	NA	<0.05
	Zinc (Zn)	0.01	mg/L	0.03	NV	NA	0.18
Microbiology	Faecal Coliforms	0	ct/100mL	NV	NV	760000	NA
	Total Coliforms	0	ct/100mL	NV	NV	5300000	NA

Notes:

BOLD	Exceeds CCME criteria
Shaded	Exceeds Effluent Quality Criterion in Nunavut Water Board Licence 3AM-IQA0611
NV	No value listed in criteria
NA	Not Analyzed

Table 1: Sludge Quality (WWTP)
Nunavut Water Board Licence 3AM-IQA0611
City of Iqaluit

				Lab I.D.	974526
				Sample Matrix	Sludge
				Sample Type	
				Sampling Date	25-Jul-12
				Sample I.D.	Sludge
Group	Analyte	MRL	Units	Northwest Territories Biosolids Criteria Water Quality Objectives	
General Chemistry and Nutrients	pH	1		NV	5.32
	Moisture	0.1	%	NV	76.4
	Nitrite (N-N02)	0.1	ug/g	NV	<1.0
	Nitrate (N-N03)	0.1	ug/g	NV	<25
	BOD5	1	ug/g	NV	NA
	Ammonia (N-NH3)	0.02	ug/g	NV	1600
	Total Phosphorus	0.01	ug/g	NV	2660
Mercury	Mercury (Hg)	0.0001	ug/g	5	<0.1
Metals	Silver (Ag)	0.0001	ug/g	NV	0.4
	Aluminum (Al)	0.01	ug/g	NV	1190
	Arsenic (As)	0.01	ug/g	75	<1
	Boron (B)	0.01/0.1	ug/g	NV	<5
	Barium (Ba)	0.01	ug/g	NV	17
	Beryllium (Be)	0.0005	ug/g	NV	<1
	Calcium (Ca)	1	ug/g	NV	6700
	Cadmium (Cd)	0.0001	ug/g	20	<0.5
	Cobalt (Co)	0.0002	ug/g	150	<1
	Chromium (Cr)	0.001	ug/g	1060	9
	Copper (Cu)	0.001	ug/g	760	298
	Iron (Fe)	0.03	ug/g	NV	4480
	Potassium (K)	1	ug/g	NV	800
	Magnesium (Mg)	1	ug/g	NV	1200
	Manganese (Mn)	0.01	ug/g	NV	54
	Molybdenum (Mo)	0.005	ug/g	20	2
	Sodium (Na)	2	ug/g	NV	300
	Nickel (Ni)	0.005	ug/g	180	6
	Lead (Pb)	0.001	ug/g	500	13
	Antimony (Sb)	0.0005	ug/g	NV	<1
	Selenium (Se)	0.01	ug/g	14	<1
	Silicon (Si)	0.1	ug/g	NV	12
	Strontium (Sr)	0.001	ug/g	NV	<1
	Thallium (Tl)	0.0001	ug/g	NV	<1
	Vanadiun (V)	0.001	ug/g	NV	5
	Zinc (Zn)	0.01	ug/g	1850	296
Microbiology	Faecal Coliforms	0	ct/g	<1000	NA
	Total Coliforms	0	ct/g	NV	NA

Notes:

BOLD	Exceeds the NWT Biosolids Criteria
NV	No value listed in criteria
NA	Not Analyzed

Table 1: Effluent Water Quality
Nunavut Water Board Licence 3AM-IQA0611
City of Iqaluit

					Lab I.D.	973100	973099	973879
					Sample Matrix	Water	Water	Water
					Sample Type	Landfill Runoff	Landfill Runoff	Landfill Runoff
					Sampling Date	17-Jul-12	18-Jul-12	19-Jul-12
					Sample I.D.	Retention Pond #1	Retention Pond #2	Retention Pond #3
Group	Analyte	MRL	Units	CCME Water Quality Objectives	AECOM Report Surface Runoff			
General Chemistry	pH	1		6.5 - 9	(6 - 9)	8.26	8.27	8.31
	Total Organic Carbon (TOC)	0.5	mg/L	NV	NV	20.3	23.1	20.7
	Total Suspended Solids	2	mg/L	NV	180	16	17	10
	Turbidity	0.1	NTU	NV	NV	10.5	8.9	8.2
Nutrients	BOD_5	1	mg/L	NV	120	8	10	5
	COD	5	mg/L	NV	NV	69	70	67
	Ammonia (N-NH_3)	0.02	mg/L	0.019	NV	**4.9**	**4.49**	**4.39**
	Total Kjeldahl Nitrogen	0.1	mg/L	NV	NV	7.9	7.25	7.04
	Total Phosphorus	0.01	mg/L	NV	NV	0.05	0.05	0.03
Mercury	Mercury (Hg)	0.0001	mg/L	0.000026	0.0006	<0.0001	<0.0001	<0.0001
Metals	Silver (Ag)	0.0001	mg/L	0.0001	0.1	<0.0001	<0.0001	<0.0001
	Aluminum (Al)	0.01	mg/L	0.1	2	0.02	0.03	0.03
	Arsenic (As)	0.01	mg/L	0.005	0.1	<0.01	<0.01	<0.01
	Boron (B)	0.01/0.1	mg/L	NV	5	0.98	1.1	0.96
	Barium (Ba)	0.01	mg/L	NV	1	0.02	0.02	0.02
	Beryllium (Be)	0.0005	mg/L	NV	NV	<0.0005	<0.0005	<0.0005
	Calcium (Ca)	1	mg/L	NV	NV	104	100	90
	Cadmium (Cd)	0.0001	mg/L	0.000017	10	<0.0001	<0.0001	<0.0001
	Cobalt (Co)	0.0002	mg/L	NV	0.5	0.0011	0.0011	0.0011
	Chromium (Cr)	0.001	mg/L	<0.01	0.1	0.004	0.003	0.004
	Copper (Cu)	0.001	mg/L	0.002	0.2	**0.006**	**0.006**	**0.006**
	Iron (Fe)	0.03	mg/L	0.3	0.3	**1.26**	**1.14**	**1.23**
	Potassium (K)	1	mg/L	NV	NV	32	100	30
	Magnesium (Mg)	1	mg/L	NV	NV	25	25	21
	Manganese (Mn)	0.01	mg/L	NV	0.05	0.46	0.39	0.41
	Molybdenum (Mo)	0.005	mg/L	0.073	0.2	<0.005	<0.005	<0.005
	Sodium (Na)	2	mg/L	NV	NV	186	181	153
	Nickel (Ni)	0.005	mg/L	0.025	0.3	0.011	0.011	0.011
	Lead (Pb)	0.001	mg/L	0.001	NV	<0.001	<0.001	<0.001
	Antimony (Sb)	0.0005	mg/L	NV	NV	0.0006	0.0007	0.0007
	Selenium (Se)	0.01	mg/L	0.001	0.05	<0.01	<0.01	<0.01
	Silicon (Si)	0.1	mg/L	NV	NV	2	2	1.8
	Strontium (Sr)	0.001	mg/L	NV	NV	0.554	0.567	0.594
	Titanium (Ti)	0.01	mg/L	NV	NV	<0.01	<0.01	<0.01
	Thallium (Tl)	0.0001	mg/L	0.0008	NV	<0.0001	<0.0001	<0.0001
	Vanadium (V)	0.001	mg/L	NV	NV	0.002	0.002	0.002
	Zinc (Zn)	0.01	mg/L	0.03	0.5	**0.24**	**0.2**	**0.19**
PCBs	Polychlorinated Biphenyls (PCBs)	0.1	µg/L	0.001	1	<0.1	<0.1	<0.1
VOC Surrogates	Toluene-d8	1	%	NV	NV	92	93	97
VOCs	Benzene	0.5	µg/L	370	0.37	<0.5	<0.5	<0.5
	Ethylbenzene	0.5	µg/L	90	0.09	<0.5	<0.5	<0.5
	m/p-xylene	0.5	µg/L	NV	NV	<0.5	<0.5	<0.5
	o-xylene	0.5	µg/L	NV	NV	<0.5	<0.5	<0.5
	Toluene	0.5	µg/L	2	0.002	<0.5	<0.5	<0.5
Microbiology	Faecal Coliforms	0	ct/100mL	NV	NV	<10	<10	0
	Total Coliforms	0	ct/100mL	NV	NV	70	200	63

Notes:

Shaded	Exceeds AECOM criteria
BOLD	Exceeds CCME criteria
NV	No value listed in criteria
NA	Not Analyzed

Appendix D:
Laboratory Certificates of Analysis

EXOVA OTTAWA

Certificate of Analysis

Exova

Client: City of Iqaluit
PO Box 460
Iqaluit, NU
X0A 0H0
Attention: Mr. Paul Clow
PO#:
Invoice to: City of Iqaluit

Report Number: 1216084
Date Submitted: 2012-07-27
Date Reported: 2012-08-09
Project:
COC #: 154296

Dear Paul Clow:

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692).

Report Comments:

APPROVAL: _____

Lorna Wilson
Inorganic Laboratory Supervisor

Certificate of Analysis

Exova

Client: City of Iqaluit
PO Box 460
Iqaluit, NU
X0A 0H0
Attention: Mr. Paul Clow
PO#:
Invoice to: City of Iqaluit

Report Number: 1216084
Date Submitted: 2012-07-27
Date Reported: 2012-08-09
Project:
COC #: 154296

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.
					974526 Sludge - Sol 2012-07-25 Sludge
Agri. - Soil	N-NO2	1.0	ppm		<1.0
	N-NO3	25	ppm		<25
General Chemistry	Conductivity	5	uS/cm		1330
	Moisture	0.1	%		76.4
	pH	1.00			5.32
	Total Suspended Solids	2	mg/L		N/A
Mercury	Hg	0.1	ug/g		<0.1
Metals	Ag	0.2	ug/g		0.4
	Al	5	ug/g		1190
	As	1	ug/g		<1
	B	5	ug/g		<5
	Ba	1	ug/g		17
	Be	1	ug/g		<1
	Ca	100	ug/g		6700
	Cd	0.5	ug/g		<0.5
	Co	1	ug/g		<1
	Cr	1	ug/g		9
	Cu	1	ug/g		298
	Fe	5	ug/g		4480
	K	100	ug/g		800
	Mg	100	ug/g		1200
	Mn	1	ug/g		54
	Mo	1	ug/g		2
	Na	100	ug/g		300
	Ni	1	ug/g		6
	Pb	1	ug/g		13

Guideline = *** = Guideline Exceedence**

Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective.

Certificate of Analysis

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Attention: Mr. Paul Clow
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Invoice to: City of Iqaluit

Report Number: 1216084
Date Submitted: 2012-07-27
Date Reported: 2012-08-09
Project:
COC #: 154296

				Lab I.D.	974526
				Sample Matrix	Sludge - Sol
				Sample Type	
				Sampling Date	2012-07-25
				Sample I.D.	Sludge
Group	**Analyte**	**MRL**	**Units**	**Guideline**	
Metals	Sb	1	ug/g		<1
	Se	1	ug/g		<1
	Sr	1	ug/g		12
	Tl	1	ug/g		<1
	V	2	ug/g		5
	Zn	2	ug/g		296
Nutrients	BOD5	1	mg/L		N/A
	O-PO4	0.03	mg/L		N/A
	Total P	100	ug/g		2660
Others	N-NH3	100	ug/g		1600

Guideline = *** = Guideline Exceedence**
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Methods references and/or additional QA/QC information available on request.

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PO#:
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Report Number: 1216084
Date Submitted: 2012-07-27
Date Reported: 2012-08-09
Project:
COC #: 154296

Sample Comment Summary

Sample ID: 974526 Sludge TP, N-NH3 and TKN were analysed as received and reported on dried sample basis. Metals analysed and reported on a dry sample basis. O-PO4, BOD, TSS not available due to sample matrix. Sample was subcontracted for Boron analysis.

Guideline = *** = Guideline Exceedence**
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EXOVA OTTAWA

Certificate of Analysis

Exova

Client: City of Iqaluit
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Attention: Mr. Paul Clow
PO#:
Invoice to: City of Iqaluit

Report Number: 1216082
Date Submitted: 2012-07-27
Date Reported: 2012-08-03
Project:
COC #: 154297

Dear Paul Clow:

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692).

Report Comments:

APPROVAL: _____

Lorna Wilson
Inorganic Laboratory Supervisor

Client: City of Iqaluit
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Iqaluit, NU
X0A 0H0
Attention: Mr. Paul Clow
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Invoice to: City of Iqaluit

Report Number: 1216082
Date Submitted: 2012-07-27
Date Reported: 2012-08-03
Project:
COC #: 154297

				Lab I.D.	974524
				Sample Matrix	Wastewater
				Sample Type	
				Sampling Date	2012-07-25
				Sample I.D.	WWTP Effluent
Group	**Analyte**	**MRL**	**Units**	**Guideline**	
General Chemistry	Conductivity	5	uS/cm		615
	N-NO2	0.10	mg/L		<0.10
	N-NO3	0.10	mg/L		<0.10
Mercury	Hg	0.0001	mg/L		<0.0001
Metals	Ag	0.01	mg/L		<0.01
	Al	0.1	mg/L		0.8
	Aqua-Regia Digest		mg/L		y
	As	0.05	mg/L		<0.05
	B	0.1	mg/L		0.1
	Ba	0.01	mg/L		0.02
	Be	0.01	mg/L		<0.01
	Ca	1	mg/L		24
	Cd	0.01	mg/L		<0.01
	Co	0.01	mg/L		<0.01
	Cr	0.05	mg/L		<0.05
	Cu	0.01	mg/L		0.33
	Fe	0.1	mg/L		0.7
	K	1	mg/L		16
	Mg	1	mg/L		11
	Mn	0.01	mg/L		0.08
	Mo	0.01	mg/L		<0.01
	Na	2	mg/L		30
	Ni	0.01	mg/L		<0.01
	Pb	0.01	mg/L		<0.01
	Sb	0.01	mg/L		<0.01
	Se	0.05	mg/L		<0.05

Guideline = *** = Guideline Exceedence**

Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective.

Certificate of Analysis

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Report Number: 1216082
Date Submitted: 2012-07-27
Date Reported: 2012-08-03
Project:
COC #: 154297

				Lab I.D.	974524
				Sample Matrix	Wastewater
				Sample Type	
				Sampling Date	2012-07-25
				Sample I.D.	WWTP Effluent
Group	**Analyte**	**MRL**	**Units**	**Guideline**	
Metals	Si	1	mg/L		4
	Sr	0.05	mg/L		<0.05
	Ti	0.1	mg/L		<0.1
	Tl	0.01	mg/L		<0.01
	V	0.05	mg/L		<0.05
	Zn	0.05	mg/L		0.18
Nutrients	BOD5	1	mg/L		163
	N-NH3	2.0	mg/L		42.9
	O-PO4	0.03	mg/L		11.7
	Total P	0.01	mg/L		7.32

Guideline = *** = Guideline Exceedence**

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Certificate of Analysis

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Report Number: 1216082
Date Submitted: 2012-07-27
Date Reported: 2012-08-03
Project:
COC #: 154297

Sample Comment Summary

Sample ID: 974524 WWTP Effluent	Metals analysis performed on aqua-regia digest of sample material except for Boron, Titanium and Silicon.

Guideline = *** = Guideline Exceedence**

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Methods references and/or additional QA/QC information available on request.

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EXOVA OTTAWA

Certificate of Analysis

Exova

Client: City of Iqaluit
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Report Number: 1216083
Date Submitted: 2012-07-27
Date Reported: 2012-08-07
Project:
COC #: 154296

Dear Paul Clow:

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692).

Report Comments:

APPROVAL: _____

Lorna Wilson
Inorganic Laboratory Supervisor

Certificate of Analysis

Client: City of Iqaluit
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Iqaluit, NU
X0A 0H0
Attention: Mr. Paul Clow
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Report Number: 1216083
Date Submitted: 2012-07-27
Date Reported: 2012-08-07
Project:
COC #: 154296

Group	Analyte	MRL	Units	Guideline	Lab I.D. / Sample Matrix / Sample Type / Sampling Date / Sample I.D.
					974525 / Water / / 2012-07-25 / Raw
Calculations	Hardness as CaCO3	1	mg/L	OG-100	12
	TDS (COND - CALC)	1	mg/L	AO-500	25
General Chemistry	Acidity as CaCO3	5	mg/L		<5
	Alkalinity as CaCO3	5	mg/L	OG-500	15
	Cl	1	mg/L	AO-250	1
	CO3 as CaCO3	1	mg/L		N/A-PH
	Conductivity	5	uS/cm		38
	HCO3 as CaCO3	1	mg/L		15
	OH	0.01	mg/L		N/A-PH
	pH	1.00		6.5-8.5	6.76
	SO4	3	mg/L	AO-500	3
	TOC	0.5	mg/L		2.4
	Total Inorganic Carbon	2.0	mg/L		3.7
	Total Suspended Solids	2	mg/L		<2
Mercury	Hg	0.0001	mg/L	MAC-0.001	<0.0001
Metals	Ag	0.0001	mg/L		<0.0001
	Al	0.01	mg/L	OG-0.1	<0.01
	As	0.001	mg/L	IMAC-0.025	<0.001
	B	0.01	mg/L	IMAC-5.0	<0.01
	Ba	0.01	mg/L	MAC-1.0	<0.01
	Be	0.0005	mg/L		<0.0005
	Ca	1	mg/L		5
	Cd	0.0001	mg/L	MAC-0.005	<0.0001
	Co	0.0002	mg/L		<0.0002
	Cr	0.001	mg/L	MAC-0.05	<0.001
	Cu	0.001	mg/L	AO-1.0	0.003

Guideline = ODWSOG *** = Guideline Exceedence**

Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

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Client: City of Iqaluit
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Iqaluit, NU
X0A 0H0
Attention: Mr. Paul Clow
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Invoice to: City of Iqaluit

Report Number: 1216083
Date Submitted: 2012-07-27
Date Reported: 2012-08-07
Project:
COC #: 154296

				Lab I.D.	974525
				Sample Matrix	Water
				Sample Type	
				Sampling Date	2012-07-25
				Sample I.D.	Raw
Group	**Analyte**	**MRL**	**Units**	**Guideline**	
Metals	Fe	0.03	mg/L	AO-0.3	0.05
	K	1	mg/L		<1
	Mg	1	mg/L		<1
	Mn	0.01	mg/L	AO-0.05	0.02
	Mo	0.005	mg/L		<0.005
	Na	2	mg/L	AO-200	<2
	Ni	0.005	mg/L		<0.005
	Pb	0.001	mg/L	MAC-0.010	<0.001
	Sb	0.0005	mg/L	IMAC-0.006	<0.0005
	Se	0.001	mg/L	MAC-0.01	<0.001
	Si	0.1	mg/L		0.6
	Sr	0.001	mg/L		0.011
	Ti	0.01	mg/L		<0.01
	Tl	0.0001	mg/L		<0.0001
	V	0.001	mg/L		<0.001
	Zn	0.01	mg/L	AO-5.0	<0.01
Nutrients	Dissolved Reactive Phosphorus	0.01	mg/L		<0.01

Guideline = ODWSOG *** = Guideline Exceedence**
Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective.

Client: City of Iqaluit
PO Box 460
Iqaluit, NU
X0A 0H0
Attention: Mr. Paul Clow
PO#:
Invoice to: City of Iqaluit

Report Number: 1216083
Date Submitted: 2012-07-27
Date Reported: 2012-08-07
Project:
COC #: 154296

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 0 **Analysis Date** 2012-08-07 **Method** SM 2320B			
CO3 as CaCO3			
Hardness as CaCO3			
HCO3 as CaCO3			
OH			
TDS (COND - CALC)			
Run No 235936 **Analysis Date** 2012-07-30 **Method** M SM3112B-3500B			
Hg	<0.0001 mg/L	99	70-130
Run No 235949 **Analysis Date** 2012-07-30 **Method** SM 2320B			
Alkalinity as CaCO3	<5 mg/L	102	95-105
Conductivity	<5 uS/cm	100	95-105
pH	5.74	100	90-110
Run No 235972 **Analysis Date** 2012-07-31 **Method** M SM3120B-3500C			
Ca	<1 mg/L	99	80-120
K	<1 mg/L	103	80-120

Guideline = ODWSOG *** = Guideline Exceedence**
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Project:
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QC Summary

Analyte	Blank	QC % Rec	QC Limits
Mg	<1 mg/L	95	80-120
Na	<2 mg/L	100	80-120
Run No 236005 **Analysis Date** 2012-07-31 **Method** SM 4110C			
Cl	<1 mg/L	99	90-110
SO4	<3 mg/L	107	90-110
Run No 236012 **Analysis Date** 2012-07-31 **Method** EPA 200.8			
Ag	<0.0001 mg/L	97	89-111
Al	<0.01 mg/L	100	90-110
As	<0.001 mg/L	108	81-119
B	<0.01 mg/L	94	81-119
Ba	<0.01 mg/L	99	91-109
Be	<0.0005 mg/L	97	82-118
Cd	<0.0001 mg/L	101	86-114
Co	<0.0002 mg/L	102	88-112
Cr	<0.001 mg/L	101	89-111
Cu	<0.001 mg/L	104	86-114
Fe	<0.03 mg/L	98	88-112

Guideline = ODWSOG *** = Guideline Exceedence**
Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective.

Client: City of Iqaluit
PO Box 460
Iqaluit, NU
X0A 0H0
Attention: Mr. Paul Clow
PO#:
Invoice to: City of Iqaluit

Report Number: 1216083
Date Submitted: 2012-07-27
Date Reported: 2012-08-07
Project:
COC #: 154296

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Mn	<0.01 mg/L	99	91-109
Mo	<0.005 mg/L	101	84-116
Ni	<0.005 mg/L	100	92-108
Pb	<0.001 mg/L	100	89-111
Sb	<0.0005 mg/L	106	77-123
Se	<0.001 mg/L	100	77-123
Sr	<0.001 mg/L	101	91-109
Ti	<0.01 mg/L	95	88-112
Tl	<0.0001 mg/L	101	88-112
V	<0.001 mg/L	100	88-112
Zn	<0.01 mg/L	102	89-111
Run No 236026 **Analysis Date** 2001-01-00 **Method** C SM4500-PF			
Dissolved Reactive Phosphorus	<0.01 mg/L	101	89-111
Run No 236101 **Analysis Date** 2012-08-02 **Method** EPA 200.8			
Si	<0.1 mg/L		
Run No 236124 **Analysis Date** 2012-08-02 **Method** SM 2310B			
Acidity as CaCO3	<5 mg/L		

Guideline = ODWSOG *** = Guideline Exceedence**

Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective.

Client: City of Iqaluit
PO Box 460
Iqaluit, NU
X0A 0H0
Attention: Mr. Paul Clow
PO#:
Invoice to: City of Iqaluit

Report Number: 1216083
Date Submitted: 2012-07-27
Date Reported: 2012-08-07
Project:
COC #: 154296

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 236140 **Analysis Date** 2012-08-02 **Method** C SM5310C			
TOC	<0.5 mg/L	98	84-116
Total Inorganic Carbon			85-115
Run No 236178 **Analysis Date** 2012-08-03 **Method** C SM2540			
Total Suspended Solids	<2 mg/L	103	90-110

Guideline = ODWSOG *** = Guideline Exceedence**

Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective.

Exova Accutest

CHAIN OF COSTODY

154297

☐ 146 Colonnade Rd., Unit 8, Ottawa, ON K2E 7Y1, Ph: (613) 727-5692 Fax: (613) 727-5222

☐ 608 Norris Court, Kingston, ON K7P 2R9, Ph: (613) 634-9307 Fax: (613) 634-9308

☐ 380 Vansickle Rd., Unit 630, St. Catharines, ON L2R 6P7, Ph: (905) 680-8887 Fax: (905) 680-4256

LABORATORY USE ONLY
Report #: 120033

Company Name: City of Iqaluit
Address: PO Box 460
Report Attention: Paul Clow
City/Prov: Iqaluit NU
Postal Code: X0A 0H0
Phone: 867 979 6363 Ext: 233
Project #:
* Quotation #: 120093
* Waterworks Name: WWT Plant
* Waterworks Number:

☐ Fax Results to:
☐ E-mail Results to:
☐ Copy of Results to:
☐ *The sample results from this submission will form part of a formal record of site condition (RSC) under O. Reg. 153/04*

Invoice to:
(if different from above)

SAMPLE ANALYSIS REQUIRED

⇦ Indicate: F=Filtered or P=Preserved

Sample ID	* Date/Time Collected	Sample Matrix (i.e. Water, Soil, Paint)	* MOE/MOH Reportable? Y = Yes N = No	# of Containers	** Service Required R=Rush S=Standard	See Attached	Bact - TC/FC						Criteria Required (i.e. Reg. 153, CCME, PWQO etc.) Include sub-categories if appropriate	Laboratory Identification
WWTP Effluent		WW	N	5		✓								974120

Notes:

Sampled By: Print: Pat Wolfe Sig: Pat Wolfe	Date/Time: 9 AM 25 07 12	Relinquished By: Print: Sig:	Date/Time:	Comments	Cooler Temp (°C) on Receipt: 19
Work Authorized By (signature): Print: Sig:	Date/Time:	Received By Lab: Print: Sig:	Date/Time: Jly 27/12 13:00		

* Indicates a required field. If not complete, analysis will proceed only on verification of missing information. A quotation number is required, if one was provided.
** There may be surcharges applied to "Rush" service. Please check with lab prior to submission of samples for rush analysis to confirm availability and pricing.

AFCOCR.2

Copies: White - Laboratory, Yellow - With Report, Pink - Sampler

CHAIN OF CUSTODY

154296

EXOVA Accutest

☐ 146 Colonnade Rd., Unit 8, Ottawa, ON K2E 7Y1, Ph: (613) 727-5692 Fax: (613) 727-5222

☐ 608 Norris Court, Kingston, ON K7P 2R9, Ph: (613) 634-9307 Fax: (613) 634-9308

☐ 380 Vansickle Rd., Unit 630, St. Catharines, ON L2R 6P7, Ph: (905) 680-8887 Fax: (905) 680-4256

LABORATORY USE ONLY
Report# 131004

Company Name: City of Iqaluit
Report Attention: Paul Clow
Phone: 867 979 6363 Ext: 233
Waterworks Name: Iqaluit Water treatment Plant

Address: Po Box 460
City/Prov: Iqaluit N.U. Postal Code: X0A 0H0
Project #
Quotation #: 120094
Waterworks Number:

☐ Fax Results to: 867 979 8542
☐ E-mail Results to:
☐ Copy of Results to:
☐ *The sample results from this submission will form part of a formal record of site condition (RSC) under O. Reg. 153/04*

Invoice to:
(if different from above)

SAMPLE ANALYSIS REQUIRED

⇦ Indicate: F=Filtered or P=Preserved

Sample ID	* Date/Time Collected	Sample Matrix (i.e. Water, Soil, Paint)	* MOE/MOH Reportable? Y = Yes N = No	# of Containers	** Service Required R=Rush S=Standard	See Attached BAC TT	Criteria Required (i.e. Reg. 153, SCME, PWQO etc.) Indicate sub-categories if appropriate	Laboratory Identification
Raw water		W		6	S			
Sludge				5				

Notes:

Sampled By:
Print: R Brouillet Sig: Date/Time: 08/07/25/12 9AM
Work Authorized By (signature): Date/Time:
Print: Sig:
Relinquished By: Print: Sig: Date/Time:
Received By Lab: Print: Sig: Date/Time: 7/11/12 15:00
Comments
Cooler Temp (°C) on Receipt: 19

* Indicates a required field. If not complete, analysis will proceed only on verification of missing information. A quotation number is required, if one was provided.
** There may be surcharges applied to "Rush" service. Please check with lab prior to submission of samples for rush analysis to confirm availability and pricing.

Appendix E:
City of Iqaluit's Water Licence

P.O. Box 119
Gjoa Haven, NU X0B 1J0 ᓄᓇᕗᑦ ᐃᒪᓕᕆᔩᑦ ᑲᑎᒪᔩᖏ
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-IAQ0611 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 oC NTU
Effluent **E**	Total Suspended Solids (TSS), Temperature (field), Conductivity (field and lab), pH (field and lab)	mg/L oC 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