Monitoring Program and Quality Assurance/Quality Control Plan Hamlet of Kugluktuk

Prepared by

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1.0 Introduction

The Hamlet of Kugluktuk (formerly known as Coppermine), is situated on Coronation Gulf at the mouth of the Coppermine River. The Hamlet is situated on a rocky area on the west side of the Coppermine River, at latitude 67°49'N, longitude 115°06'W. The Hamlet is predominately residential with a few small commercial establishments including a hotel, several construction contracting businesses, a grocery store, and a variety of other small businesses. Hunting and fishing in the traditional manner is still a prime occupation for many of the inhabitants. Community buildings include a high school, elementary school, arena, swimming pool, Hamlet office, public works yard, GN offices, and police station. The community has a population of approximately 1,585, with an approximate projected growth rate of 1.5 percent.

The Hamlet provides trucked water and sewage services, along with regular solid waste collection for the residents, businesses and institutions. The water, wastewater, and solid waste systems include the following facilities and services:

- A water treatment plant, which draws water from the Coppermine River and treats it by membrane filtration and chlorination
- Trucked water to holding tanks in each building
- A sewage lagoon which receives trucked sewage collected from holding tanks in each building
- Sewage treatment via an exfiltration lagoon to a wetland discharging north to the ocean
- A solid waste disposal facility, which includes a bulky metals disposal area, a contaminated soil pile, a waste oil and liquid waste storage area, and a storage area for batteries and other hazardous materials.

1.1 Purpose

The Sewage Treatment Facility and Solid Waste Management Facility operate under Nunavut Water Board License NWB3KUG0308 (the license) issued on November 20, 2003 and expires November 30, 2008. An amendment application is in progress. The license requires the Hamlet to conduct a monitoring program, which includes regular water quality sampling and reporting. The license requires a Monitoring and Quality Assurance/Quality Control Plan (QA/QC Plan). The QA/QC Plan has been prepared to achieve the following objectives:

- To ensure that the collection of all samples taken in the field follows procedures and controls in order to maintain a high quality, so that the results obtained represent both the physical and chemical nature of the water at the sampling locations

- To ensure best management practices (BMP) are used throughout the sampling program

- To ensure all samples are delivered promptly to an accredited laboratory for analysis.

This document describes the procedures and controls to be used by Hamlet operations staff when conducting environmental sampling under the monitoring program.

Although the QA/QC Plan is submitted to the Nunavut Water Board (NWB) as a condition of the water license, it is primarily intended to be read, understood, and implemented by Hamlet operations personnel responsible for environmental quality monitoring. The water license requires Hamlet personnel to adhere to these procedures, which should be applied to all water quality samples taken by the Hamlet.

Quality Assurance (QA) and Quality Control (QC) are important components of environmental management for the Hamlet of Kugluktuk.

This Monitoring Program and QA/QC Control Plan is referenced by the following O&M Plans:

- Solid Waste Management Facility Operation and Maintenance (O&M) Plan
- Sewage Treatment Facility Operation and Maintenance (O&M) Plan.

1.2 Quality Assurance and Quality Control

Quality Assurance is a set of operating principles that, if strictly followed during sample collection and analysis, will produce data of known and defensible quality (Wilson, 1995). As such, the accuracy of the analytical results can be stated with a high level of confidence. A high level of quality assurance can be achieved by applying the following principles:

- Personnel involved in water sampling and analysis are well trained

- Facilities and equipment required for sampling are suitable, well maintained, and always kept clean

- Standard procedures are developed and implemented for the collection, transportation and analysis of samples, based on recognized BMP

- Laboratory and field instruments are calibrated according to manufacturer's recommendations and good operating practices are implemented

- Supplies used for sampling and analysis are of consistent, high quality and are not expired

- Quality Control (QC) procedures are developed and implemented based on good operating practices to assess quality of analytical data and provide warning of unacceptable errors

- Remedial action is promptly implemented when deficiencies are identified

- Results of the monitoring program are reported in the Annual Report as required in the water license. The Annual Report must be submitted by March 31 of the following calendar year.

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

1.3 Lab Accreditation

All analyses shall be conducted in laboratories that are accredited by the Canadian Association of Environmental Analytical Laboratories (CAEAL) or an equivalent alternative approved by the NWB.

The following is the contact information for the Laboratory retained by the Hamlet of Kugluktuk to complete analysis:

Name of Laboratory Envirotest Laboratories (or other to be determined)
Address _____
_____
_____
Phone No. _____
Fax No. _____

The Hamlet shall notify the NWB, in writing, of the laboratory to be used to perform the analysis prior to collecting any samples under the monitoring program.

Analytical methods and accreditation are usually dictated by the guideline criteria being followed. In most cases, the guideline criteria is the Canadian Environmental Quality Guidelines (CCME, 2006). These guidelines specify bottles, hold times, preservatives, sampling protocols, as well as lab accreditation, and analytical methodologies. Prior to any sampling, this information should be reviewed to ensure consistency with regulation and standards.

2.0 Field Sampling

2.1 Sample Collection

Effluent and surface water sampling is conducted to provide the Hamlet with effective environmental management information and to monitor regulatory compliance.

Sample collection must follow the specifics dictated by the CAEAL laboratory selected to do the analysis. These should conform to the protocols outlined in the Canadian Environmental Quality Guidelines (CCME, 2006). Exact sampling protocols need to be confirmed for each sampling event. Staff training is a necessary component to ensure quality monitoring.

2.1.1 Sampling Location and Frequency

The monitoring program created by the water license includes specific requirements regarding sampling locations, sampling frequency, parameters to be analyzed, and effluent quality. At the time that the water license was issued in 2003, the sewage lagoon was intended to be the sole method of sewage treatment, and effluent samples collected at the point of discharge from the lagoon were required to meet prescribed water quality criteria. The new detailed design for the Sewage Treatment Facility and Solid Waste Management facility, as described in the Detailed Design Report. The sampling locations specified by the license have been modified to reflect the new design, as described below.

The new design includes a larger, lined sewage lagoon that will provide improved retention of solids by increasing sewage retention time. However, the sewage lagoon is no longer the final step in the treatment process. Sewage discharged from the lagoon will flow into Wetland Treatment Area where treatment will be completed. The wetland will consist of a network of small berms, ditches, and shallow ponds designed to maximize retention time and promote attenuation by natural processes. The monitoring program dictated by the water license includes four sampling locations labeled KUG-1 to KUG-4. As shown on Figure 1, the monitoring program for the new facilities includes:

- KUG-2A – Discharge from the Solid Water Management Facility water retention pond
- KUG-3A – New effluent drop off point from the sewage tanks
- KUG-4A – New effluent discharge point from the sewage lagoon
- WS-1 through WS-4 – Wetland Treatment Area monitoring points.

Because WS-4 is the final discharge point of the sewage treatment facilities, samples collected at this location will be required to meet the effluent quality standards prescribed by the water license. Samples collected at KUG-4, which is located at the discharge point of the lagoon, will no longer be required to meet the standard. However, water quality monitoring will continue at KUG-4A to assess the effectiveness of the primary treatment provided by the lagoon. The locations of KUG-2 to KUG-4 are shown on

Figure 1. Note that KUG-1 is located at the raw water supply intake at the Coppermine River.

The sampling schedule and list of monitoring parameters specified by the water license will remain unchanged. Samples collected at WS-1 through WS-4 will be sampled according to the same schedule and list of parameters as KUG-3A and KUG-4A. The Monitoring Program is summarized in Table 1. Sample locations are displayed in Figure 1.

Table 1: Surveillance Network Program for Water License NWB3KUG0308

Station	Description	Frequency	Analysis Requirements
KUG-1	Raw Water Supply Intake at the Coppermine River	As per the water license	This document applies to the Sewage Lagoon and Solid Waste Management Facility only. Monitoring requirements for the raw water supply system are provided elsewhere. Station KUG-1 is included here for completeness
KUG-2 (KUG-2A)	Effluent Discharge from Final Discharge Point of The Solid Waste Disposal facility	Monthly during discharge	• BOD • Faecal Coliforms • pH • Conductivity • Total Suspended Solids • Ammonia as Nitrogen • Nitrate and Nitrite • Oil and Grease (visual) • Total Phenols • Sulphate • Sodium • Potassium Magnesium • Calcium • Total Arsenic • Total Cadmium • Total Copper • Total Chromium • Total Iron • Total Lead • Total Mercury • Total Nickel • Total Zinc • Chloride • Total Hardness • Additional parameters, if there is a specific concern identified (i.e. VOC's, Petroleum Hydrocarbons, etc.)
KUG-3	Raw Sewage from Pump Out Truck	Ongoing	ÿ The Hamlet will measure and record the volume of all raw sewage offloaded at the facility. Monthly and annual totals will be reported in Annual Report ÿ Sampling as per KUG-2 ÿ Flow and discharge details recorded weekly
KUG-4 (KUG-4A)	Discharge from the Sewage Lagoon	Monthly from June to October	Same as KUG-2.
WS-1	Upper Part of Wetland Treatment Area	Monthly from June to October	Same as KUG-2

Station	Description	Frequency	Analysis Requirements
WS-2	Mid-Part of Wetland Treatment Area	Monthly from June to October	Same as KUG-2
WS-3	Lower Part of Wetland Treatment Area	Monthly from June to October	Same as KUG-2
WS-4	Final Discharge Point from Wetland Treatment Area to Coronation Gulf	Monthly from June to October	Same as KUG-2

The sampling stations will be clearly identified in the field by posted signs. All signs shall be in the Official Languages of Nunavut, and shall be located and maintained to the satisfaction of an Inspector. Each sampling location must have its Global Positioning System (GPS) coordinates determined. This task should be completed prior to the first sampling to be completed under this QA/QC Plan. Samples shall be taken at the same location on each sampling occasion, unless the Inspector has approved a new location.

Additional sampling and analysis may be requested by an Inspector.

2.1.2 Sample Planning

To understand what sample containers, sampling techniques, and preservation methods are required, Hamlet personnel first need to understand what parameters will be analyzed in the laboratory. A selected CAEL laboratory will be contacted and provided with the list of sampling parameters and comparative guidelines to be used. The lab will then supply the appropriate bottles with preservatives, chain of custody documents, and handling procedures. Table 2 is a summary of parameters required in the License, which are grouped according to their specific sampling requirements:

Table 2: Parameters Examined in NWB Water Licenses

Group	Description	Parameter
I	Microbiological	Biological Oxygen Demand (BOD) Fecal Coliform (FC)
II	General Water Chemistry	pH Conductivity Total Alkalinity Total Suspended Solids (TSS) Ammonia as Nitrogen (NH_3-N) Nitrate-Nitrite (NO_3-NO_2) Oil and Grease (OGG) (Visual) Sulphate (SO_4) Sodium (Na) Total Organic Carbon (TOC) Potassium (K) Magnesium (Mg) Calcium (Ca) *Total Hardness*

Group	Description	Parameter
		Chloride (Cl)
	Total Metals (except Mercury):	*Total Nickel (Ni)* *Total Aluminium (Al)* Total Arsenic (As) Total Cadmium (Cd) Total Copper (Cu) *Total Cobalt (Co)* Total Chromium (Cr) Total Iron (Fe) Total Lead (Pb) Total Manganese (Mg) Total Phosphorus (Total-P) Total Zinc (Zn)
III		Total Mercury (Hg)
IV		Total Phenols

Note: parameters in italics are not included in license, but should be sampled for completeness.

Specific sampling procedures for each parameter will be dictated by the CAEAL accredited laboratory, which should follow the protocols outlined in the Canadian Environmental Quality Guidelines (CCME, 2006) (Appendix B). It is recommended, that the laboratory pre-fill the sample collection bottles with the proper preservative to minimize error in the field.

All of the samples taken will be grab samples. Samples will normally be taken from natural lakes, streams, treatment ponds, or process streams. Where possible, samples shall be taken from just below the surface to avoid floating debris, which may contaminate the sample.

Freshwater Streams, Surface Drainage, and Wetlands

The samples shall be collected as close to the middle of the stream where water flows freely and is free of debris. Once in position, the sampler shall wait to allow any stirred sediment that occurred from entering the stream to settle or wash away. **The bottles shall not be rinsed. Prior to sampling for oil/grease, bacteria, and for any bottles containing preservative.** Sample bottles without preservatives shall be partially filled with the water to be sampled and rinsed with the lid in place at least three times. Rinse water shall be emptied downstream of the sampling point, so that stream sediments remain undisturbed.

If possible, bottles shall be submerged into the stream to a depth of approximately half the total stream depth, and allowed to fill with the mouth of the bottle facing upstream. Where the stream is too shallow for sample bottle to be filled completely, without disturbing bottom sediment of the streambed, the sampler may use a smaller container

that has been properly rinsed to transfer sample to the larger bottle. Do not use a smaller sample bottle containing preservatives.

When taking the sample, sufficient room shall be left to allow for the addition of preservatives, if required.

Lakes or Ponds

Surface sampling shall be collected using the same procedures as streams. Sample bottles shall be submerged to approximately 150 mm (6 inches) below the water surface.

Although not currently required under the Monitoring Program, information on water quality at various depths in lakes or ponds may be required. If an Inspector requests that this sampling be carried out, specific procedures shall be implemented in accordance with accepted sampling and good engineering practice.

Process Streams

When sampling a process stream (i.e. valve or pipe discharge) the sampler shall collect a grab sample or a set of composite samples over an extended period of time. In the case of sampling from a valve, valves shall be open and running for a least one-minute before taking the sample to ensure that a representative sample of the process stream is taken.

2.1.3 Sample Container Selection

Sample containers vary in size and material of construction depending on the specific type of analysis to be conducted. Sample containers to be used shall be obtained directly from the laboratory, which shall provide new containers to the Hamlet specific for the sampling program requested by the Hamlet. The laboratory will provide the correct sizes and types of bottles based on the parameters required. The Hamlet shall **contact the laboratory at least one month prior to the sampling event** in order to ensure that containers are available for sampling. Refer to Section 1.3 for laboratory contact information.

2.1.4 Field Sampling Log

The individual collecting the water sample shall record the following at the time of sampling:

- Date of sampling
- Time of sampling
- Weather conditions
- Monitoring Station Number (i.e. KUG-2, KUG-3, KUG-4, etc.)
- Results of any Field measurements
- Sampler shall also indicate if sample contained preservatives
- Any unusual conditions

- Any deviation from standard procedures.

Field sampling forms are included in Appendix C.

Laboratory supplied sample submission sheets should be filled out completely and Laboratory instructions followed carefully. Laboratory forms are included in Appendix D.

2.1.5 Field Measurements

No field measurements are required as part of the Hamlet sampling program, however, it is strongly recommended that the following parameters be sampled immediately on site using appropriate portable field equipment:

- pH
- Temperature
- Dissolved oxygen
- Total alkalinity
- Turbidity
- Chlorine residuals.

It is important that separate equipment be used to sample between potable water and non-potable water (i.e. surface water). Furthermore, all instruments, glassware, etc. should be cleaned between each sample following manufacturer's recommended guidelines and/or BMPs.

2.1.6 Sampling Procedures

The sampling procedures described in Table 3 shall be used to collect water samples appropriate to the sampling location.

General Procedures for Sample Collection

1. Protocols

General procedures for sample collection are outlined below. Different laboratories have slightly different bottle requirements and sample handling protocols. Sampling technicians must receive site specific training and laboratory procedures must take precedence over other protocols.

2. Sample Locations and Sampling Frequency

The sampling location and frequency has been carefully selected, and is part of site design and layout, as well as the Water Board License. Sampling will follow these

requirements. Diversions must be recorded and submitted to the Water Board for approval.

3. Preparation

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

4. Field Collection

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

5. Handling Storage and Transportation

Appropriate personal protective equipment (gloves, safety glasses, etc.) will be used when handling samples. Samples will be stored a 4ºC and protected from freezing until delivered to the laboratory. Chain of custody for sampling, storage, and delivery must be maintained. Laboratory sample sheets will be completed in accordance with laboratory protocols. See example in Appendix D.

6. Delivery to Laboratory

Samples will be delivered to the laboratory in the laboratory dictated method and within the hold times specified. Preplanning for rapid transport and delivery will usually be required.

2.1.7 Sample Identification

All samples collected are to be labeled according to standard identification procedures (Name of sampler, time and date of sampling, sample identifier, sampling method and type of sample). **Sample labels shall be water-resistant, and prepared prior to going into the field**.

The individual samples will be labelled with the following information:

- Sample ID #
- Sample name
- Date and time of collection
- Parameter to be analyzed
- Preservatives
- Project number identifier
- Bottle number 1 of ___.

See example Chain of Custody sheet in Appendix D.

2.1.8 Sample Preservation

In order to obtain good results from a sampling program, time is critical. All samples are to be shipped to the Laboratory that has been contracted to carry out the analysis the same day as they are collected. Samples must be protected from breakage, and shall be shipped in an insulated cooler that can be provided by the Laboratory. **If samples cannot be shipped until the next day, due to unavoidable events such as weather or mechanical problems with transport aircraft, all samples must be stored in a refrigerator at 4ºC**. Samples must not be frozen.

In all cases where samples cannot be delivered to the lab on the same day, specific preservatives must be added to the samples to prevent chemical changes that may alter the concentration of the parameters of interest. The samples must be preserved within two hours of sampling. Usually, samples can be preserved away from the field at the end of the site visit. In most cases, the laboratory can fill the bottles with preservative, and then ship them to the Hamlet to be filled and sent back for analysis. See examples of Laboratory Forms in Appendix D.

For the Hamlet of Kugluktuk, Table 3 provides the appropriate preservation methods for the parameters to be assessed.

Table 3: Sample Preservation

Type of Sample	Preservation Required
Group I Microbiological	Store in refrigerator at 4°C. Ship to Lab the same day as collected
Group II General Water Chemistry	Store in refrigerator at 4°C. Ship to Lab the same day as collected
Group II Total Metals (except mercury)	Acidify with 5 mL of <20 percent nitric acid. Store in refrigerator at 4°C. Ship to Lab the same day as collected
Group III Total Mercury	Acidify with 2 mL of 1:1 sulfuric acid and 5 percent potassium dichromate Store in refrigerator at 4°C. Ship to Lab the same day as collected
Group IV Total Phenols	Acidify with 4 mL of 1:1 sulfuric acid. Store in refrigerator at 4°C. Ship to Lab the same day as collected

Note: 1000 mL = 1 Liter

2.1.9 Sample Transportation

The main objective is to minimize any chemical changes to the sample between the time it is collected and delivery to the laboratory. Heat, light and agitation can all impact the water chemistry and the samples shall be protected from these effects.

Effluent and surface water samples shall be stored and transported at a temperature of 4ºC. Coolers and ice packs need to be available and are usually provided by the laboratory. Upon arrival at the laboratory, samples shall be refrigerated as soon as possible.

3.0 Sample QA/QC

3.1 Laboratory QA/QC

Most commercial laboratories undertake QA/QC procedures with the volume of sample sent for analysis. QA/QC Reports are usually provided with the Certificates of Analysis. The QA/QC protocols dictated by the lab accreditation and by the comparative criteria document (i.e. Canadian Environmental Quality Guidelines). Lab QA/QC procedures should include replicate analysis and spiked samples tested to confirm recovery is within acceptable levels.

3.2 Field QA/QC

To ensure that the monitoring program maintains acceptable quality control, field blanks and duplicate samples will be collected as per the Canadian Environmental Quality Guidelines. The following QA/QC samples will be collected:

- One field bank per sampling season
- One duplicate per sampling month (which should coincide with one per sampling event).

These samples are collected and analyzed for the same parameters as the monitoring program in the license as part of a quality control check on monitoring activities.

The field blanks shall accompany the sampler into the field, labeled as field blanks, preserved in the field and submitted to the laboratory with the field samples.

Replicate or duplicate samples involves collecting more than one sample at a given sampling station subject to specific analysis. Standard procedures used for the routine sampling shall be applied. The replicate or duplicate samples are useful in identifying problems with accuracy and sampling methods.

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

4.0 Monitoring Program Reporting

The laboratory will perform the analysis of all samples as outlined in the license. The results shall be received by the Hamlet within the time frame agreed to with the laboratory. The results shall contain the limits of detection used for analysis of each parameter as supplied by the laboratory.

The Hamlet may request clarification of the analysis by contacting the NWB Technical Advisor and a review of the analysis will be provided upon request.

The laboratory results are compared to the limits of the Water License for each parameter, and/or to other comparative criteria such as the Canadian Environment Quantity Guidelines. The results are reported to the NWB in the Annual Report. The content of the Annual Report and Guideline Criteria is outlined in the following documents:

- Solid Waste Management Facility O&M Plan
- Sewage Treatment Facility Operations and Maintenance (O&M) Plan.

All staff involved in sampling and reporting must have sufficient training to ensure the sampling program operates effectively.

5.0 Summary

An application for an amendment to the NWB license is currently in progress. The requirements of the license must be complied with, and this document should be updated to reflect additional requirements.

The monitoring program and the QA/QC plan is dependent on proper sampling protocols and laboratory analysis, followed by the appropriate assessment of the results. The exact protocols must be confirmed with the laboratory each sampling event. Training of sampling staff is mandatory to ensure that they can effectively liaise with the laboratory and conduct the sampling as per the laboratory specific protocols. The Canadian Environmental Quality Guidelines (CCME, 2006) should be followed, unless specific NWB license or Nunavut regulations specify otherwise.

This document should be updated annually and whenever there is a change to the NWB water license or new regulations are issued. Staff training must accompany the use of this document.

6.0 Glossary

Quality Assurance (QA): is the definitive program for laboratory operation that specifies the measures required to produce defensible data of known precision and accuracy. QA includes quality control and quality assessment activities.

Quality Control (QC): is a set of measures within a sample analysis methodology to assure that the process is in control.

Quality Assessment: is a process to determine the quality of the laboratory measurements through internal and external QC evaluations. It includes performance evaluation samples, laboratory inter-comparisons samples and performance audits.

7.0 References

Canadian Council of Ministers of the Environment (CCME), Canadian Environmental Quality Guidelines, Update 6.0, July 2006.

Nunavut Water Board. *Water License NWB3KUG0308*. Gjoa Haven, Nunavut.

Nunavut Water Board, September 2000, *Guidelines for the Discharge of Domestic Wastewater in Nunavut*.

Wilson, Neal. 1995. *Soil Water and Ground Water Sampling*. CRC Press: New York, USA.

Nuna Burnside Engineering and Environmental Ltd. (2007). *Solid Waste Management Facility Operations and Maintenance (O&M), Hamlet of Kugluktuk*.

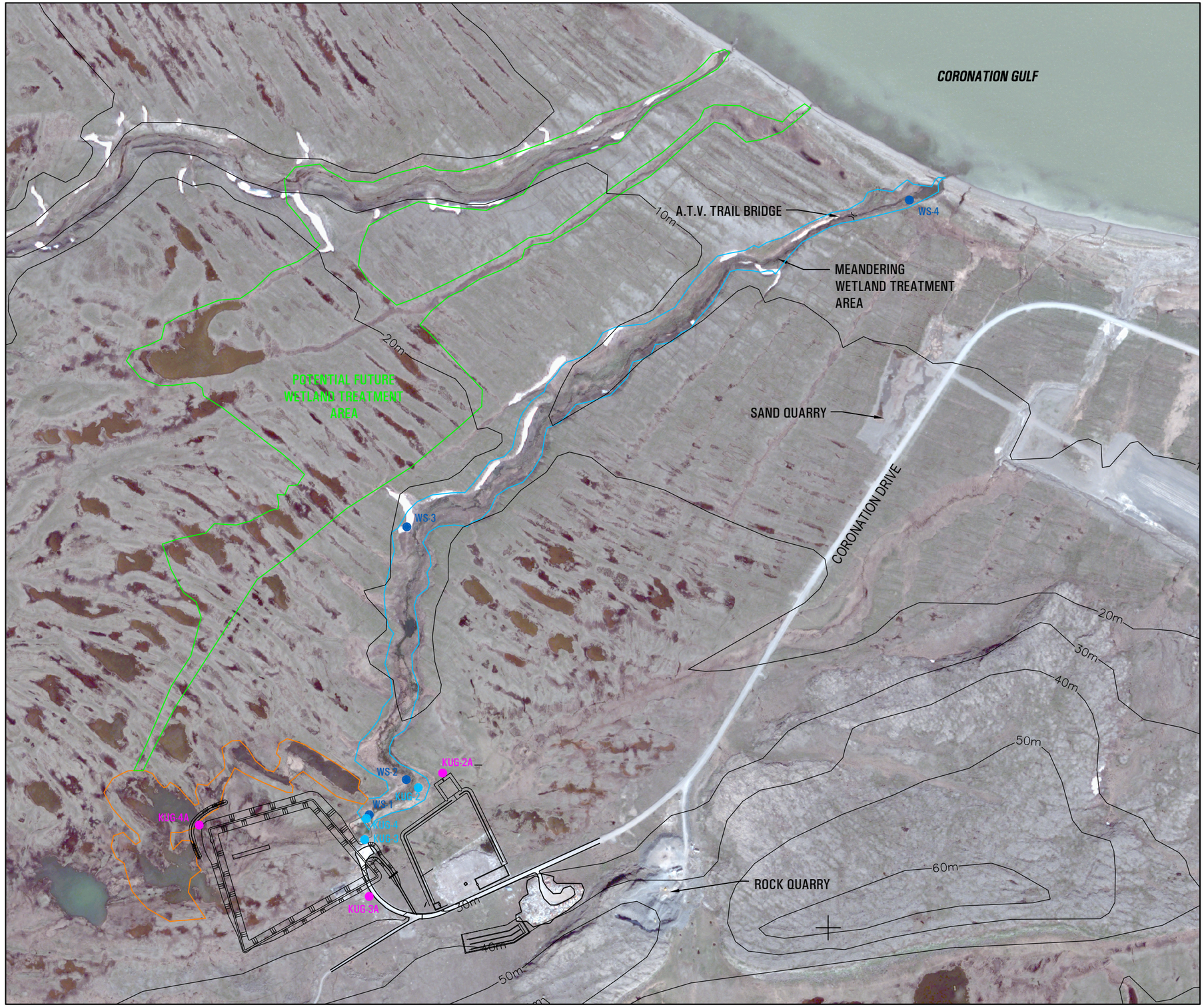
Nuna Burnside Engineering and Environmental Ltd. (2007). Sewage *Treatment Facility Operations and Maintenance (O&M), Hamlet of Kugluktuk*.

Figures

FIGURE 1

HAMLET OF KUGLUKTUK
MONITORING PROGRAM & Q & A CONTROL PLAN - MARCH 2007

SAMPLING LOCATIONS



Legend

- KUG-2 — SURFACE WATER SAMPLING LOCATION *(To be replaced once new facilities are in place)*
- WS-2 — WETLAND WATER SAMPLING LOCATION
- KUG-2A — PROPOSED SURFACE WATER SAMPLING LOCATION *(For new facilities)*
- 50m — EXISTING CONTOURS (m amsl) obtained from National Topographic Survey Digital Data Contour interval 10m
- OUTLINE OF WETLAND TREATMENT AREA (10 ha)
- OUTLINE OF EXPANDED WETLAND TREATMENT AREA (5.1 ha)
- OUTLINE OF POTENTIAL FUTURE WETLAND TREATMENT AREA *(If required)* (30 ha)

Image Platform: Quick Bird (Satellite)
Image Aquisition: 01 July, 2002
Spatial Resolution: 0.6m

N

0 100 200 300 400 500 600
Meters

1:7,500
March 2007
Project Number: FEO09754

Projection: UTM Zone 17
Datum: NAD83

Prepared by: C. Sheppard

Verified by: J. Walls

NUNA BURNSIDE

Revision #: 1

FEO09754 MONITORING PROGRAM MARCH 2007 SL.DWG

Appendix A
Nunavut Water Board Licence

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kNK5 wmoEp5 vtmpq
NUNAVUT WATER BOARD
NUNAVUT IMALIRIYIN KATIMAYINGI

DECISION

LICENCE NUMBER: NWB3KUG0308

This is the decision of the Nunavut Water Board (NWB) with respect to an application for a Licence dated July 15, 2003, made by:

Hamlet of Kugluktuk

to allow for the use of water and disposal of waste for the Hamlet at Kugluktuk, Nunavut. With respect to this application, the NWB gave notice to the public that the Hamlet had filed an application for a water licence.

DECISION

After having been satisfied that the application was exempt from the requirement for screening by the Nunavut Impact Review Board in accordance with S. 12.3.2 of the *Nunavut Land Claim Agreement* (NLCA), the NWB decided that the application could proceed through the regulatory process. After reviewing the submission of the Applicant and written comments expressed by interested parties, the NWB, having given due regard to the facts and circumstances, the merits of the submissions made to it and to the purpose, scope and intent of the *Nunavut Land Claims Agreement* and of the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (NWNSRTA), decided to waive the requirement to hold a public hearing and furthermore to delegate its authority to approve the application to the Chief Administrative Officer pursuant to S. 49(a) of the NWNSRTA and determined that:

Licence Number NWB3KUG0308 be issued subject to the terms and conditions contained therein. (Motion #: 2003-35)

SIGNED this 20th day of November 2003 at Gjoa Haven, NU.

Original signed by:

_____

Philippe di Pizzo
Chief Administrative Officer

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I. BACKGROUND

Kugluktuk is located immediately west of the mouth of the Coppermine River on Coronation Gulf at 67°50'N, 115°15'W, 595 air km north of Yellowknife. The Hamlet extends inland to cover a rocky knoll. The town site is underlain by Precambrian sedimentary and volcanic rock. Dolomite and shale, interspersed with volcanic rock, form steep outcrops in the vicinity of the settlement. The buildings along the shore are perched on consolidated beach deposits. Directly behind this ridge is a low, marshy area. There are numerous exposed bedrock surfaces in the community. Surficial deposits in the area include talus and deltaic deposits. The angular talus, derived primarily from the mechanical breakdown of dolerite, ranges in size from silt to boulders but is commonly found as course sand or fine gravel. Kugluktuk is underlain by permafrost. The thickness of the active layer ranges from less than 0.5 m to over 1 m in the sandy waterfront area. Permafrost features such as polygonal ground and thaw-related instability affect the raised delta surfaces and strongly influence their drainage characteristics. Grasses, sedges, heather, mosses, and lichens grow in limited soils. Willow and alder thickets are common in wetland depressions. Kugluktuk receives an average of 10.3 cm of rainfall and 100.7 cm of snowfall per year. Mean annual precipitation totals 20.2 cm. July mean high and low temperatures are 13.8° C and 5.6° C. The January mean high and low temperatures are -26.4° C and -33.8° C. The winds are generally south-west and annually average 16.6 km/h.

II. PROCEDURAL HISTORY

On July 15, 2003, an application for the renewal of water license N3L4-1526, was filed by Ferguson Simek Clark Environmental Consultants (Yellowknife) on behalf of the Hamlet of Kugluktuk. The previous water licence was issued by the Northwest Territories Water Board on 1 July 1998 and valid until June 30, 2003. In consideration of the application for renewal the Nunavut Water Board publicly posted notice of this application, in accordance with the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* S.55.1 and Article 13 of the *Nunavut Land Claims Agreement,* on July 23, 2003. An assessment of the Hamlet's request for a municipal water licence for water use and waste disposal activities within the Hamlet was then undertaken, so that the Board could make a fully informed decision on the merits of application. This assessment process included the referral of the application to a variety of Federal, Territorial and local organizations for their review and comment. As no public concern was expressed, the NWB waived the requirement to hold a public hearing for the application.

Based upon the results of the detailed assessment, which was completed, including consideration of any potential accidents, malfunctions, or cumulative environmental effects that the overall project might have in the area, the Board delegated to the Chief Administrative Officer authority to approve the application pursuant to S. 13.7.5 of the *Agreemen*t.

III. ISSUES

Term of the Licence

In accordance with the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* S. 45, the NWB may issue a licence for a term not exceeding twenty-five years. In determining an appropriate term of a water licence, the Board considers a number of factors, including the results of the annual Department of Indian Affairs and Northern Development (DIAND) site inspection and the compliance record of the Applicant. Specifically, the August 9, 2001 DIAND Inspection Report indicated that:

1. The Licensee has failed to produce Annual Reports from 1996-2001;
2. Water supply field pH , turbidity, and iron concentration exceeded the levels recommended in the *Guidelines for Canadian Drinking Water Quality*;
3. Sewage treatment system effluent concentrations of ammonia and phenol exceeded the levels recommended in the *Canadian Guidelines for the Protection of Freshwater Aquatic Life*;
4. Sewage treatment effluent contained noteworthy concentrations of faecal coliforms (1,470,000 CFU/100ml);
5. Solid waste disposal site effluent concentrations of iron and zinc exceeded the levels; and
6. The sewage treatment system effluent evidenced a significant toxicity, as determined by a MicroTox EC_{50} assessment.

Additionally, the NWB brings to the attention of the Licensee their failure to provide the Board with the as-built plans and drawings for the modifications to the Sewage Disposal Facilities, as required by Part D, Item 3 of Water License N7L4-1526. The Board requests that these as-built plans and drawings be forwarded by the Licensee within ninety (90) days following issuance of this license.

In review of the application, DIAND, has recommended a licence term of five (5) years. The NWB concurs that a term of five (5) years is appropriate, and will allow enough time for the Hamlet to establish a consistent compliance record with the terms and conditions of its licence. It will also ensure that sufficient time is given to permit the Licensee to develop, submit, and implement the plans required under its licence to the satisfaction of the NWB.

The NWB has imposed the requirement to produce an Annual Report. These Reports are for the purpose of ensuring that the NWB has an accurate annual update of municipal activities during a calendar year. This information is maintained on the public registry and is available to any interested parties upon request. The Licensee's attention is drawn to the attached standard form for completing the Annual Report (see Attachment I).

The NWB has also imposed on the Licensee the requirement to produce an Operations and Maintenance Manual for their sewage and solid waste operations. The purpose of an Operation and Maintenance Manual is to assist Hamlet staff in the proper operation and maintenance of their waste disposal facilities. The manual should demonstrate to the Nunavut Water Board that the Hamlet is

capable of operating and maintaining all waste disposal sites adequately. The Plan should be completed using the *Guidelines for the Preparation of an Operations and Maintenance Manual for Sewage and Solid Waste Disposal Facilities in the Northwest Territories* (Duong and Kent, 1996; see Attachment II).

Water Use

The Municipality currently receives water from Coppermine River. Water is treated using membrane filtration, which is accomplished in a twin train Harmsco filtration system, and stored in a 320 m^3 tank. The water receives a chlorine treatment prior to trucked-service distribution. Water consumption is projected to reach 53,475 m^3 *per annum* in 2003 and 60,533 m^3 *per annum* by 2008.

No serious concerns were raised by the parties in their written submissions as to the amount of water required by the Applicant or the manner in which this water will be used. Issues related to the quality of water produced by the present water treatment system were identified, but are currently being addressed by the Applicant and the Department of Community Government and Transportation, Government of Nunavut. DIAND has provided specific recommendations regarding volume usage limits, as well as recommending that the Applicant to be required to maintain a monitoring station at the water intake area KUG-1 in order to monitor the volume of water used. The Board concurs with these recommendations, and has set the terms and conditions in the water licence, which govern, water usage accordingly. The Board also recommends that the Hamlet and the Department of Community Government and Transportation take whatever steps are necessary to address the water quality issues identified in the August 9, 2001 DIAND Inspection Report.

Deposit of Waste

Sewage

The Hamlet of Kugluktuk utilizes a Sewage Disposal Facility approximately 5.0 km west of the Municipality. A gravel berm provides limited retention of sewage prior to discharge to an undefined wetland where it receives additional treatment prior to discharge to the marine environment. Specific comments relevant to sewage disposal operations in the Hamlet were provided by DIAND, and Environment Canada. Both DIAND and Environment Canada requested that the Applicant provide information to the NWB on how the Municipality plans to address the operational and environmental issues evidenced in the August 9, 2001 DIAND Inspection Report. Additionally, Environment Canada recommended that a minimum of 1 m of freeboard should be maintained at all retention structures, and that All Terrain Vehicle (ATV) traffic be restricted in the wetland area so as to prevent soil erosion and damage to vegetation from compromising the effectiveness of the wetland treatment of the sewage.

DIAND and Environment Canada also recommended that the Hamlet develop appropriate Operations and Maintenance and Spill Contingency Plans. Additionally, DIAND provided recommendations concerning effluent discharge criteria, which are consistent with the *Guidelines for the Discharge of*

Treated Municipal Wastewater in the Northwest Territories (Northwest Territories Water Board; 1992), as well as specific recommendations concerning the Monitoring Program.

The Board concurs with these recommendations, which are reflected in the terms and conditions of the Water Licence. The Monitoring Program is established to collect data on water quality to assess the effectiveness of treatment for protection of public health and to assess potential impacts to the environment associated with the municipal facilities. The Board also draws the attention of the Licensee to their requirements to implement the Quality Assurance/Quality Control (QA/QC) Plan to be provided by the NWB. The purpose of the QA/QC Plan is to ensure that samples taken in the field as part of the Monitoring Program will maintain a high quality, so as to accurately represent the physical and chemical nature of the samples being taken. It should also be noted that while minimum sampling requirements have been imposed, additional sampling may be requested by an Inspector.

Solid Waste

The Hamlet's solid waste management site is located approximately 4.5 km from the community. Waste is segregated, with a generic landfill area, a bulky wastes area, and a sealift container for hazardous wastes. Combustible wastes are burned regularly, and the landfill is compacted and covered on a yearly basis.

Recommendations relevant to solid waste disposal operations in the Hamlet were provided by DIAND and Environment Canada. Both DIAND and Environment Canada recommended that preventative measures be implemented to prevent standing water noted at the toe of the solid waste site from escaping the facility. Environment Canada also recommended that the Municipality undertake a waste composition study, which will assist the Municipality to plan for the long term waste disposal needs of the community. The Board concurs that the Hamlet should give serious consideration to this recommendation, and recommends that discussions be commenced with the Department of Community Government and Transportation to determine potential assistance which may be available to the Hamlet to undertake such a study.

DIAND and Environment Canada recommended that the Hamlet develop appropriate Operations and Maintenance and Spill Contingency Plans for their solid waste operations. DIAND and Environment Canada further recommended that the Hamlet segregate hazardous materials such as waste oils and batteries from municipal solid waste, and that these materials be disposed of off-site in an approved facility. DIAND and Environment Canada recommended the appropriate management of waste oil at the solid waste site, so as to prevent the deposition of hydrocarbons into water in contravention of the *Fisheries Act*. The Board concurs with these recommendations, which are reflected in the terms and conditions of the Water Licence. Additionally, both Environment Canada and DIAND recommended the installation of appropriate fencing at the bulky waste and hazardous waste disposal sites, so as to improve security on the sites. The Board concurs that the Hamlet should give serious consideration to this recommendation, and in the interim take whatever steps are practicable to implement this recommendation.

LICENCE NWB3KUG0308

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

HAMLET OF KUGLUKTUK

(Licensee)

of **KUGLUKTUK, NUNAVUT, X0E 0E0**

(Mailing Address)

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

Licence Number **NWB3KUG0308**

Water Management Area **NUNAVUT 05**

Location **KUGLUKTUK, NUNAVUT**

Purpose **WATER USE AND WASTE DISPOSAL**

Description **MUNICIPAL UNDERTAKINGS**

Quantity of Water Not to be Exceeded **64,000 CUBIC METRES ANNUALLY**

Date of Licence **NOVEMBER 20, 2003**

Expiry Date of Licence **NOVEMBER 30, 2008**

Dated this 20th of November 2003 at Gjoa Haven, NU.

Original signed by:

Philippe di Pizzo
Chief Administrative Officer

PART A: SCOPE AND DEFINITIONS

1. Scope

a. This Licence allows for the use of water and the disposal of waste for municipal undertakings at the Hamlet of Kugluktuk, Nunavut (67°50'N, 115°15'W);

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, upon promulgation of such Regulations, to be subject to such requirements; and;

c. Compliance with the terms and conditions of this Licence does not absolve the Licensee from responsibility for compliance with the requirements of all applicable Federal, Territorial and Municipal legislation.

2. Definitions

In this Licence: **NWB3KUG0308**

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

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

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

''Appurtenant undertaking'' means an undertaking in relation to which a use of waters or a deposit of waste is permitted by a licence issued by the Board;

"Average Concentration" means the arithmetic mean of the last four consecutive analytical results for contained in composite or grab samples collected from the Waste Disposal Facility's final discharge point;

"Average Concentration For Faecal Coliforms" means the geometric mean of the last four consecutive analytical results for faecal coliforms contained in composite or grab samples collected from the Waste Disposal Facility's final discharge point;

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

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

"Commercial Waste Water" means water and associated waste generated by the operation of a commercial enterprise, but does not include toilet wastes or greywater;

"Composite Sample" means a water or wastewater sample made up of four (4) samples taken at regular periods over a 24 hour period;

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

"Final Discharge Point" means an identifiable discharge point of a Waste Disposal Facility beyond which the Licensee no longer exercises care and control over the quality of the Effluent;

"Freeboard" means the vertical distance between water line and crest on a dam or dyke's upstream slope;

"Grab Sample" means a single water or wastewater sample taken at a time and place representative of the total discharge;

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

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

"Licensee" means the holder of this Licence;

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

"Monitoring Program" means a monitoring program established to collect data on surface water and groundwater quality to assess impacts to the freshwater aquatic environment of an appurtenant undertaking;

"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;

"Sewage" means all toilet wastes and greywater;

"Sewage Disposal Facilities" comprises the area and decant structures designed to contain and treat sewage as described in the Application for Water Licence filed by the Applicant on July 1, 2003 and illustrated in Drawing Nos. 2003-0060-EN1/2;

"Solid Waste Disposal Facilities" comprises the area and associated structures designed to contain solid waste as described in the Application for Water Licence filed by the Applicant on July 1, 2003 and illustrated in Drawing Nos. 2003-0060-EN1/2;

"Toilet Wastes" means all human excreta and associated products, but does not include greywater;

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

"Waste Disposal Facilities" means all facilities designated for the disposal of waste, and includes the Sewage Disposal Facilities and Solid Waste Disposal Facilities, as described in the Application for Water Licence filed by the Applicant on July 1, 2003, and illustrated in Drawing Nos. 2003-0060-EN1/2; and

"Water Supply Facilities" comprises the area and associated intake infrastructure at the Coppermine River, as described in the Application for Water Licence filed by the Applicant on July 1, 2003, and illustrated in Drawing Nos. 2003-0060-EN1/2.

PART B: GENERAL CONDITIONS

1. The Licensee shall file an Annual Report with the Board not later than March 31st of the year following the calendar year reported which shall contain the following information:

i. tabular summaries of all data generated under the "Monitoring Program";

ii. the monthly and annual quantities in cubic metres of fresh water obtained from all sources;

iii. the monthly and annual quantities in cubic metres of each and all waste discharged;

iv. a summary of modifications and/or major maintenance work carried out on the Water Supply and Waste Disposal Facilities, including all associated structures and facilities;

v. a list of unauthorized discharges and summary of follow-up action taken;

vi. a summary of any abandonment and restoration work completed during the year and an outline of any work anticipated for the next year;

vii. a summary of any studies, reports and plans (e.g., Operation and Maintenance, Abandonment and Restoration, QA/QC) requested by the Board that relate to waste disposal, water use or reclamation, and a brief description of any future studies planned;

viii. any other details on water use or waste disposal requested by the Board by November 1st of the year being reported; and

2. The Licensee shall comply with the "Monitoring Program" described in this Licence, and any amendments to the "Monitoring Program" as may be made from time to time, pursuant to the conditions of this Licence.

3. The "Monitoring Program" and compliance dates specified in the Licence may be modified at the discretion of the Board.

4. Meters, devices or other such methods used for measuring the volumes of water used and waste discharged shall be installed, operated and maintained by the Licensee to the satisfaction of an Inspector.

5. The Licensee shall, within ninety (90) days after the first visit of the Inspector, post the necessary signs, where possible, to identify the stations of the "Monitoring Program." All signage postings shall be in the Official Languages of Nunavut, and shall be located and maintained to the satisfaction of an Inspector.

6. The Licensee shall immediately report to the 24-Hour Spill Report Line (867-920-8130) any spills of Waste, which are reported to or observed by the Licensee, within the municipal boundaries or in the areas of the Water Supply or Waste Disposal Facilities.

7. The Licensee shall ensure a copy of this Licence is maintained at the municipal office at all times.

8. Any communication with respect to this Licence shall be made in writing to the attention of:

(i) Chief Administrative Officer:

Executive Director
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU X0B 1J0
Telephone: (867) 360-6338
Fax: (867) 360-6369

(ii) Inspector Contact:

Water Resources Officer
Nunavut District, Nunavut Region
P.O. Box 100
Iqaluit, NU X0A 0H0
Telephone: (867) 975-4298
Fax: (867) 979-6445

(iii) Analyst Contact:

Taiga Laboratories
Department of Indian and Northern Affairs
4601 - 52 Avenue, P.O. Box 1500
Yellowknife, NT X1A 2R3
Telephone: (867) 669-2781
Fax: (867) 669-2718

9. The Licensee shall submit one paper copy and one electronic copy of all reports, studies, and plans to the Board. Reports or studies submitted to the Board by the Licensee shall include a detailed executive summary in Inuktitut.

PART C: CONDITIONS APPLYING TO WATER USE

1. The Licensee shall obtain all fresh water from Coppermine River using the Water Supply Facilities or as otherwise approved by the Board.

2. The annual quantity of water used for all purposes shall not exceed 64,000 cubic metres.

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

4. The water intake hose used on the water pumps shall be equipped with a screen with a mesh size sufficient to ensure no entrainment of fish.

PART D: CONDITIONS APPLYING TO WASTE DISPOSAL

1. The Licensee shall direct all Sewage to the Sewage Disposal Facilities or as otherwise approved by the Board.

2. All Effluent discharged from the Sewage Disposal Facilities at Monitoring Station KUG-4 shall meet the following effluent quality standards:

Parameter	Maximum Average Concentration
Faecal Coliforms	1 x 10^6CFU/dl
BOD_5	120 mg/L
Total Suspended Solids	180 mg/L
Oil and grease	No visible sheen
pH	between 6 and 9

3. A Freeboard limit of 1.0 metre, or as recommended by a qualified geotechnical engineer and as approved by the Board, shall be maintained at all dams, dykes or structures intended to contain, withhold, divert or retain water or wastes.

4. The Licensee shall advise an Inspector at least ten (10) days prior to initiating any decant of the sewage lagoon.

5. The Sewage Disposal Facility shall be maintained and operated, to the satisfaction of an Inspector in such a manner as to prevent structural failure.

6. The Licensee shall dispose of and contain all solid wastes at the Solid Waste Disposal Facilities or as otherwise approved by the Board.

7. The Licensee shall implement measures to ensure waste from the Solid Waste Disposal Facility does not enter water.

8. The Licensee shall submit to the Board for review within six (6) months of the issuance of this license a report identifying each Final Discharge Point. The report shall at least include:

    a. Plans, specifications and a general description of each Final Discharge Point together with its specific geo-referenced location;

    b. A description of how each Final Discharge Point is designed and maintained.

9. If, during the term of this Licence, additional Final Discharge Points are identified, the Licensee shall submit the information as required by Part D, Item 8 for each new Final Discharge Point within 30 days after the discharge point is identified and at least 60 days prior to depositing Effluent from the new Final Discharge Point and/or proposed changes are made to a Final Discharge Point.

PART E: CONDITIONS APPLYING TO MODIFICATION AND CONSTRUCTION

1. The Licensee shall submit to the Board for approval design drawings stamped by a qualified engineer registered in Nunavut prior to the construction of any dams, dykes or structures intended to contain, withhold, divert or retain water or wastes.

2. The Licensee may, without written approval from the Board, carry out modifications to the Water Supply and Waste Disposal Facilities provided that such modifications are consistent with the terms of this Licence and the following requirements are met:

    i. the Licensee has notified the Board in writing of such proposed modifications at least sixty (60) days prior to beginning the modifications;

    ii. said modifications do not place the Licensee in contravention of the Licence or the *Act*;

    iii. the Board has not, during the sixty (60) days following notification of the proposed modifications, informed the Licensee that review of the proposal will require more than sixty (60) days; and

    iv. the Board has not rejected the proposed modifications.

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

4. The Licensee shall provide as built plans/drawings of the modifications referred to in this Licence within ninety (90) days of completion of the modifications.

PART F: CONDITIONS APPLYING TO OPERATION AND MAINTENANCE

1. The Licensee shall, before March 31, 2004 submit to the Board for approval, a Plan for the Operation and Maintenance of the Sewage and Solid Waste Disposal Facilities in accordance with *"Guidelines for Preparing an Operation and Maintenance Manual for Sewage and Solid Waste Disposal Facilities"* (October 1996). This Plan shall specifically address the waste disposal and operational issues related to the Sewage Disposal Facility and the Solid Disposal Facility, which were identified in the August 9, 2001 DIAND Inspection Report.

2. The Licensee shall implement the Plan specified in Part F, Item 1 as and when approved by the Board.

3. The Licensee shall revise the Plan referred to in Part F, Item 1, if not acceptable to the Board. The revised Plan shall be submitted to the Board for approval within thirty (30) days of notification of the Board decision

4. If, during the period of this Licence, an unauthorized discharge of waste occurs, or if such a discharge is foreseeable, the Licensee shall:

    i. employ the appropriate contingency plan as provided for in the Operation Maintenance Plan;
    ii. report the incident immediately *via* the 24-Hour Spill Reporting Line at (867) 920-8130 and to an Inspector; and
    iii. submit to an Inspector a detailed report on each occurrence not later than thirty (30) days after initially reporting the event.

5. In the absence of a contingency plan contained within an approved Operation and Maintenance Plan, and should during the period of this Licence an unauthorized discharge of waste occur, or if such a discharge is foreseeable, the Licensee shall:

    i. take whatever steps are immediately practicable to protect human life, health and the environment;
    ii. without delay seek guidance from the Departments of Community Government and Transportation and Sustainable Development with regards to mitigation and remedial actions required to address the discharge;

ii. report the incident immediately *via* the 24-Hour Spill Reporting Line at (867) 920-8130 and to an Inspector; and
iii. submit to an Inspector a detailed report on each occurrence not later than thirty (30) days after initially reporting the event.

PART G: CONDITIONS APPLYING TO ABANDONMENT AND RESTORATION

1. The Licensee shall submit to the Board for approval an Abandonment and Restoration Plan at least six (6) months prior to abandoning any facilities and the construction of new facilities to replace existing ones. The Plan shall include, but not be limited to where applicable:

   i. water intake facilities;
   ii. the water treatment and waste disposal sites and facilities;
   iii. petroleum and chemical storage areas;
   iv. any site affected by waste spills;
   v. leachate prevention;
   vi. an implementation schedule;
   vii. maps delineating all disturbed areas, and site facilities;
   viii. consideration of altered drainage patterns;
   ix. type and source of cover materials;
   x. future area use;
   xi. hazardous wastes; and
   xii. a proposal identifying measures by which restoration costs will be financed by the Licensee upon abandonment.

2. The Licensee shall implement the plan specified in Part G, Item 1 as and when approved by the Board.

3. The Licensee shall revise the Plan referred to in Part G, Item 1 if not approved. The revised Plan shall be submitted to the Board for approval within thirty (30) days of receiving notification of the Board's decision.

4. The Licensee shall complete the restoration work within the time schedule specified in the Plan, or as subsequently revised and approved by the Board.

PART H: CONDITIONS APPLYING TO THE MONITORING PROGRAM

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

Monitoring Station	Description
KUG-1	Raw water supply at Coppermine River prior to treatment
KUG-2	Effluent discharge from the Final Discharge Point of the Solid Waste Disposal Facilities
KUG-3	Raw Sewage at truck offload point
KUG-4	Effluent discharge from the Final Discharge Point of the Sewage Disposal Facilities

2. The Licensee shall sample monthly at Monitoring Station KUG-2 and KUG-4 during the months of May to August, inclusive. Samples shall be analyzed for the following parameters:

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

3. The Licensee shall measure and record in cubic metres the monthly and annual quantities of water pumped from Monitoring Station KUG-1 for all purposes.

4. The Licensee shall measure and record in cubic metres the monthly and annual quantities of raw sewage offloaded from trucks at Monitoring Station KUG-3 for all purposes.

5. Additional sampling and analysis may be requested by an Inspector.

6. The Licensee shall conform to the Quality Assurance/Quality Control (QA/QC) Plan which shall be provided to the Licensee by the NWB within 60 days of the issuance of this licence.

7. All sampling, sample preservation and analyses shall be conducted in accordance with methods prescribed in the current edition of *Standard Methods for the Examination of Water and Wastewater*, or by such other methods approved by the Board.

8. All analyses shall be performed in a Canadian Association of Environmental Analytical Laboratories (CAEAL) Certified Laboratory, or as otherwise approved by an Analyst.

9. The Licensee shall measure and record the annual quantities of sewage solids removed from the Sewage Disposal Facility.

10. The Licensee shall, unless otherwise requested by an Inspector, include all of the data and information required by the "Monitoring Program" in the Licensee's Annual Report, as required *per* Part B, Item 1.

11. Modifications to the Monitoring Program may be made only upon written approval of the Chief Administrative Officer.

Appendix B
Canadian Environmental Quality Guidelines

Canadian Environmental Quality Guidelines

GUIDELINE AVAILABILITY TABLE

July 2006

The user is advised to consult the appropriate chapter and/or factsheet contained in the Canadian Environmental Quality Guidelines binder for specific information and implementation guidance pertaining to each environmental quality guideline. Guidelines are listed under chemical names, which are cross-referenced with common-names, abbreviations, and/or families of chemicals as appropriate.

	Chapter 1 Air	**Chapter 2** Water: Community		**Chapter 3** Water:	**Chapter 4** Water: Aquatic life		**Chapter 5** Water: Agriculture		**Chapter 6** Sediment		**Chapter 7** Soil				**Chapter 8** Tissue Residue
		MAC/IMAC	AO	Recreation & Aesthetics	Freshwater	Marine	Irrigation	Livestock	Freshwater	Marine	Agri.	Res./Park	Comm.	Ind.	
Acenaphthene [See Polycyclic aromatic hydrocarbons (PAHs)]															
Acenaphthylene [See Polycyclic aromatic hydrocarbons (PAHs)]															
Acridine [See Polycyclic aromatic hydrocarbons (PAHs)]															
Aesthetics				✓											
Aldicarb		✓			✓	✓	✓	✓							
Aldrin + Dieldrin		✓													
Algae, blue-green [See Cyanobacteria]															
Aliphatic chlorinated hydrocarbons (each)											✓	✓	✓	✓	
Aliphatics nonchlorinated (each)											✓				
Aluminum		✓			✓		✓	✓							
Ammonia (total)					✓										
Ammonia (un-ionized)					✓										
Aniline					✓										
Anthracene [See Polycyclic aromatic hydrocarbons (PAHs)]															
Antimony		✓									✓	✓	✓	✓	
Antimony-125		✓													
Aquatic plants				✓											
Aroclor 1254 [See Polychlorinated biphenyls (PCBs)]															
Arsenic		✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Atrazine		✓			✓		✓	✓							
Azinphos-methyl		✓													
Barium		✓									✓	✓	✓	✓	
Bendiocarb		✓													
Benz(a)anthracene [See Polycyclic aromatic hydrocarbons (PAHs)]															
Benzene		✓			✓	✓					✓	✓	✓	✓	

Canadian Environmental Quality Guidelines

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	Chapter 1 Air	**Chapter 2** Water: Community		**Chapter 3** Water:	**Chapter 4** Water: Aquatic life		**Chapter 5** Water: Agriculture		**Chapter 6** Sediment		**Chapter 7** Soil				**Chapter 8** Tissue Residue
		MAC/IMAC	AO	Recreation & Aesthetics	Freshwater	Marine	Irrigation	Livestock	Freshwater	Marine	Agri.	Res./Park	Comm.	Ind.	
Benzo(b)fluoranthene [See Polycyclic aromatic hydrocarbons (PAHs)]							✓	✓							
Benzo(k)fluoranthene [See Polycyclic aromatic hydrocarbons(PAHs)]															
Beryllium							✓	✓			✓	✓	✓	✓	
2,2-Bis(p-chlorophenyl)-1,1-dichloroethane [See DDD]															
2,2-Bis(p-chlorophenyl)-1,1,1-trichloroethane [See DDT]															
Blue-green algae [See Cyanobacteria]															
Boron		✓					✓	✓			✓				
Bromacil					✓		✓	✓							
Bromate		✓													
Bromoform [See Halogenated methanes, Tribromomethane]															
Bromoxynil		✓			✓		✓	✓							
Cadmium		✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Calcium								✓							
Captan					✓			✓							
Carbaryl		✓			✓	✓		✓							
Carbofuran		✓			✓			✓							
Carbon monoxide	✓														
Carbon tetrachloride [See Halogenated methanes, Tetrachloromethane]															
Cerium-141		✓													
Cerium-144		✓													
Cesium-134		✓													
Cesium-137		✓													
Chemical characteristics				✓											
Chloramines [See Reactive chlorine species]															
Chlordane								✓	✓	✓					

Canadian Environmental Quality Guidelines

GUIDELINE AVAILABILITY TABLE

July 2006

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	Chapter 1 Air	**Chapter 2** Water: Community		**Chapter 3** Water:	**Chapter 4** Water: Aquatic life		**Chapter 5** Water: Agriculture		**Chapter 6** Sediment		**Chapter 7** Soil				**Chapter 8** Tissue Residue
		MAC/IMAC	AO	Recreation & Aesthetics	Freshwater	Marine	Irrigation	Livestock	Freshwater	Marine	Agri.	Res./Park	Comm.	Ind.	
Chloride		✓													
Chlorinated benzenes															
Monochlorobenzene		✓	✓		✓	✓					✓	✓	✓	✓	
1,2-Dichlorobenzene		✓	✓		✓	✓					✓	✓	✓	✓	
1,3-Dichlorobenzene					✓						✓	✓	✓	✓	
1,4-Dichlorobenzene		✓	✓		✓						✓	✓	✓	✓	
1,2,3-Trichlorobenzene					✓						✓	✓	✓	✓	
1,2,4-Trichlorobenzene					✓	✓					✓	✓	✓	✓	
1,3,5-Trichlorobenzene											✓	✓	✓	✓	
1,2,3,4-Tetrachlorobenzene					✓						✓	✓	✓	✓	
1,2,3,5-Tetrachlorobenzene											✓	✓	✓	✓	
1,2,4,5-Tetrachlorobenzene											✓	✓	✓	✓	
Pentachlorobenzene					✓						✓	✓	✓	✓	
Hexachlorobenzene								✓			✓	✓	✓	✓	
Chlorinated ethanes															
1,1-Dichloroethane											✓	✓	✓	✓	
1,2-Dichloroethane		✓			✓			✓			✓	✓	✓	✓	
1,1,1-Trichloroethane											✓	✓	✓	✓	
1,1,2-Trichloroethane											✓	✓	✓	✓	
1,1,2,2-Tetrachlorethane											✓	✓	✓	✓	
Chlorinated ethenes															
Monochloroethene (Vinyl chloride)		✓									✓	✓	✓	✓	
1,1-Dichloroethene (Dichloroethylene)		✓									✓	✓	✓	✓	
1,2-Dichloroethene											✓	✓	✓	✓	
1,1,2-Trichloroethene (Trichloroethylene, TCE)		✓			✓			✓			✓	✓	✓	✓	
1,1,2,2-Tetrachloroethene (Tetrachloroethylene, PCE)		✓			✓						✓	✓	✓	✓	

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		MAC/IMAC	AO	Recreation & Aesthetics	Freshwater	Marine	Irrigation	Livestock	Freshwater	Marine	Agri.	Res./Park	Comm.	Ind.	
Chlorinated methanes [See Halogenated methanes]															
Chlorinated phenols															
Monochlorophenols					✓						✓	✓	✓	✓	
Dichlorophenols					✓						✓	✓	✓	✓	
2,4-Dichlorophenol		✓	✓								✓	✓	✓	✓	
Trichlorophenols					✓						✓	✓	✓	✓	
2,4,6-Trichlorophenol		✓	✓								✓	✓	✓	✓	
Tetrachlorophenols					✓						✓	✓	✓	✓	
2,3,4,6-Tetrachlorophenol		✓	✓								✓	✓	✓	✓	
Pentachlorophenol (PCP)		✓	✓		✓						✓	✓	✓	✓	
Chlorinated propane (1,2-dichloropropane)											✓	✓	✓	✓	
Chlorinated propene (1,2-dichloropropene (cis and trans))											✓	✓	✓	✓	
Chlorine, reactive [See Reactive chlorine species]															
Chloroform [See Halogenated methanes, Trichloromethane]															
4-Chloro-2-methyl phenoxy acetic acid [See MCPA]															
Chlorothalonil					✓	✓	✓	✓							
Chlorpyrifos		✓			✓	✓		✓							
Chromium		✓							✓	✓	✓	✓	✓	✓	
Trivalent chromium (Cr(III))					✓	✓	✓	✓							
Hexavalent chromium (Cr(VI))					✓	✓	✓	✓			✓	✓	✓	✓	
Chrysene [See Polycyclic aromatic hydrocarbons (PAHs)]															
Clarity				✓											
Cobalt							✓	✓			✓	✓	✓	✓	
Cobalt-60		✓													
Coliforms, fecal (Escherichia coli)		✓		✓			✓								
Coliforms, total		✓					✓								

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		MAC/IMAC	AO	Recreation & Aesthetics	Freshwater	Marine	Irrigation	Livestock	Freshwater	Marine	Agri.	Res./Park	Comm.	Ind.	
Coliphages				✓											
Colour			✓		✓	✓		✓							
Conductivity											✓	✓	✓	✓	
Copper			✓		✓		✓	✓	✓	✓	✓	✓	✓	✓	
Cyanazine		✓			✓		✓	✓							
Cyanide		✓			✓						✓	✓	✓	✓	
Cyanobacteria (Blue-green algae)				✓				✓							
Cyanobacterial toxins (as Microcystin - LR)		✓													
2,4-D [See 2,4-Dichlorophenoxyacetic acid]					✓	✓	✓	✓							
DDAC (Didecyl dimethyl ammonium chloride)					✓										
DDD (2,2-Bis (p-chlorophenyl)-1,1-dichloroethane; Dichloro diphenyl dichloroethane)									✓	✓					✓
DDE (1,1-Dichloro-2,2-bis(p-chlorophenyl)-ethene), Diphenyl dichloro ethylene									✓	✓					✓
DDT (2,2-Bis(p-chlorophenyl)-1,1,1-trichloroethane; Dichloro diphenyl trichloroethane)									✓	✓	✓	✓	✓	✓	✓
Debris						✓									
Deltamethrin					✓			✓							
Deposited bedload sediment [See Total particulate matter]															
Diazinon		✓													
Dibenz(a,h)anthracene [See Polycyclic aromatic hydrocarbons (PAHs)]															
Dibromochloromethane [See Halogenated methanes]															
Di-n-butyl phthalate [See Phthalate esters]															
Dicamba		✓			✓		✓	✓							
Dichlorobenzene [See Chlorinated benzenes]															
Dichlorobromomethane [See Halogenated methanes]															
1,1-Dichloro-2,2-bis(p-chlorophenyl)-ethene [See DDE]															
Dichloro diphenyl dichloroethane [See DDD]															

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		MAC/IMAC	AO	Recreation & Aesthetics	Freshwater	Marine	Irrigation	Livestock	Freshwater	Marine	Agri.	Res./Park	Comm.	Ind.	
Dichloro diphenyl trichloroethane [See DDT]															
Dichloroethane [See Chlorinated ethanes]															
Dichloroethene [See Chlorinated ethenes]															
Dichloroethylene [See Chlorinated ethenes, 1,1-Dichloroethene]															
Dichloromethane [See Halogenated methanes]															
Dichlorophenols [See Chlorinated phenols]															
2,4-Dichlorophenoxyacetic acid (2,4-D) [See also Phenoxy herbicides]		✓			✓	✓	✓	✓							
1,2-dichloropropane [See chlorinated propane]															
1,2-dichloropropene [See chlorinated propene]															
Diclofop-methyl		✓			✓		✓	✓							
Didecyl dimethyl ammonium chloride [See DDAC]															
Dieldrin									✓	✓					
Dieldrin + Aldrin [See Aldrin + Dieldrin]															
Diethylene glycol [See Glycols]															
Di(2-ethylhexyl) phthalate [See Phthalate esters]															
Diisopropanolamine (DIPA)					✓		✓				✓	✓	✓	✓	
Dimethoate		✓			✓			✓							
Di-n-butyl phthalate [See Phthalate esters]															
Di-n-octyl phthalate [See Phthalate esters]															
Dinoseb		✓			✓		✓	✓							
Diphenyl dichloro ethylene [See DDE]															
Diquat		✓													
Dissolved gas supersaturation					✓	✓									
Dissolved oxygen [See Oxygen, dissolved]															
Dissolved solids [See Total dissolved solids]															
Diuron		✓													
Endosulfan					✓										

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		MAC/IMAC	AO	Recreation & Aesthetics	Freshwater	Marine	Irrigation	Livestock	Freshwater	Marine	Agri.	Res./Park	Comm.	Ind.	
Endrin									✓	✓					
Enterococci				✓											
Escherichia coli [See Coliforms, fecal]															
Ethylbenzene			✓		✓	✓		✓			✓	✓	✓	✓	
Ethylene glycol [See Glycols]															
Fecal coliforms [See Coliforms, fecal]															
Fluoranthene [See Polycyclic aromatic hydrocarbons (PAHs)]															
Fluorene [See Polycyclic aromatic hydrocarbons (PAHs)]															
Fluoride		✓					✓	✓			✓	✓	✓	✓	
Inorganic fluorides					✓	✓									
Glycols															
Ethylene glycol					✓						✓	✓	✓	✓	
Diethylene glycol															
Propylene glycol					✓						✓	✓	✓	✓	
Glyphosate		✓			✓			✓							
Grease and oil [See Oil and grease]															
Halogenated methanes															
Monochloromethane (Methyl chloride)															
Dichloromethane (Methylene chloride)		✓			✓			✓			✓	✓	✓	✓	
Trichloromethane (Chloroform)					✓			✓			✓	✓	✓	✓	
Tetrachloromethane (Carbon tetrachloride)		✓			✓			✓			✓	✓	✓	✓	
Monobromomethane (Methyl bromide)															
Tribromomethane (Bromoform)								✓							
Dichlorobromomethane								✓							
Dibromochloromethane								✓							
Trihalomethanes (total)		✓													
HCBD [See Hexachlorobutadiene]															

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		MAC/IMAC	AO	Recreation & Aesthetics	Freshwater	Marine	Irrigation	Livestock	Freshwater	Marine	Agri.	Res./Park	Comm.	Ind.	
Heptachlor (Heptachlor epoxide)									✓	✓					
Hexachlorobenzene [See Chlorinated benzenes]															
Hexachlorobutadiene (HCBD)					✓										
Hexachlorocyclohexane [See Lindane]															
Hydrogen fluoride	✓														
Hypochlorous acid [See Reactive chlorine species]															
Indeno(1,2,3-c,d)pyrene [See Polycyclic aromatic hydrocarbons (PAHs)]															
Inorganic fluorides [See Fluoride]															
Iodine-125		✓													
Iodine-131		✓													
3-Iodo-2-propynyl butyl carbamate [See IPBC]															
IPBC (3-Iodo-2-propynyl butyl carbamate)					✓										
Iron			✓		✓		✓								
Iron-59		✓													
Lead		✓			✓		✓	✓	✓	✓	✓	✓	✓	✓	
Lead-210		✓													
Lindane (Hexachlorocyclohexane)					✓			✓	✓	✓	✓				
Linuron					✓		✓								
Lithium							✓								
Malathion		✓													
Manganese			✓				✓								
Manganese-54		✓													
MCPA (4-Chloro-2-methyl phenoxy acetic acid; 2-Methyl-4-chloro phenoxy acetic acid)					✓	✓	✓	✓							
Mercury		✓						✓	✓	✓	✓	✓	✓	✓	
Inorganic mercury					✓	✓									
Methylmercury					✓										✓

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		MAC/IMAC	AO	Recreation & Aesthetics	Freshwater	Marine	Irrigation	Livestock	Freshwater	Marine	Agri.	Res./Park	Comm.	Ind.	
Methoxychlor		✓													
Methyl bromide [See Halogenated methanes, Monobromomethane]															
Methyl chloride [See Halogenated methanes, Monochloromethane]															
2-Methyl-4-chloro phenoxy acetic acid [See MCPA]															
Methylene chloride [See Halogenated methanes, Dichloromethane]															
2-Methylnaphthalene [See Polycyclic aromatic hydrocarbons (PAHs)]															
Methyl tertiary-butyl ether [See MTBE]					✓	✓									
Metolachlor		✓			✓		✓	✓							
Metribuzin		✓			✓		✓	✓							
Molybdenum					✓		✓	✓			✓	✓	✓	✓	
Molybdenum-99		✓													
Monobromomethane [See Halogenated methanes]															
Monochloramine [See Reactive chlorine species]															
Monochlorobenzene [See Chlorinated benzenes]															
Monochloroethene [See Chlorinated ethenes]															
Monochloromethane [See Halogenated methanes]															
Monochlorophenols [See Chlorinated phenols]															
MTBE (Methyl tertiary-butyl ether)					✓	✓									
Naphthalene [See Polycyclic aromatic hydrocarbons (PAHs)]															
Nickel					✓		✓	✓			✓	✓	✓	✓	
Niobium-95		✓													
Nitrate		✓			✓	✓									
Nitrate + Nitrite								✓							
Nitrilotriacetic acid (NTA)		✓													
Nitrite		✓			✓			✓							

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		MAC/IMAC	AO	Recreation & Aesthetics	Freshwater	Marine	Irrigation	Livestock	Freshwater	Marine	Agri.	Res./Park	Comm.	Ind.	
Nitrite + Nitrate [See Nitrate + Nitrite]															
Nitrogen dioxide	✓														
Nonylphenol and its ethoxylates					✓	✓			✓	✓	✓	✓	✓	✓	
NTA [See Nitrilotriacetic acid]															
Nuisance organisms				✓											
Odour															
Oil and grease [See Canada-wide Standard for Petroleum Hydrocarbons in Soil]				✓											
Organotins															
Tributyltin					✓	✓		✓							
Tricyclohexyltin								✓							
Triphenyltin					✓			✓							
Oxygen, dissolved					✓	✓									
Ozone	✓														
PAHs [See Polycyclic aromatic hydrocarbons (PAHs)]															
Paraquat (as dichloride)		✓													
Parathion		✓													
Particulate matter <2.5 µm (PM <2.5)	✓														
Particulate matter <10 µm (PM <10)	✓														
Pathogens (aquatic)				✓											
PCBs [See Polychlorinated biphenyls (PCBs)]															
PCDD/Fs [See Polychlorinated dibenzo-p-dioxins/dibenzo furans]															
PCE [See Chlorinated ethenes, 1,1,2,2-Tetrachloroethene]															
PCP [See Chlorinated phenols, Pentachlorophenol]															
Pentachlorobenzene [See Chlorinated benzenes]															
Pentachlorophenol [See Chlorinated phenols]															
Permethrin					✓	✓									

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		MAC/IMAC	AO	Recreation & Aesthetics	Freshwater	Marine	Irrigation	Livestock	Freshwater	Marine	Agri.	Res./Park	Comm.	Ind.	
pH			✓	✓	✓	✓					✓	✓	✓	✓	
Phenanthrene [See Polycyclic aromatic hydrocarbons (PAHs)]															
Phenolic compounds, nonchlorinated											✓	✓	✓	✓	
Phenols					✓			✓			✓	✓	✓	✓	
Phenoxy herbicides					✓			✓							
Phorate		✓													
Phosphorus					✓										
Phthalic acid esters (each)											✓				
Phthalate esters															
Di-n-butyl phthalate					✓										
Di(2-ethylhexyl) phthalate					✓										
Di-n-octyl phthalate															
Picloram		✓			✓			✓							
PM <2.5 [See Particulate matter <2.5 µm]															
PM <10 [See Particulate matter <10 µm]															
Polychlorinated biphenyls (PCBs)									✓	✓	✓	✓	✓	✓	✓
Aroclor 1254									✓	✓					
Polychlorinated dibenzo-p-dioxins/dibenzo furans (PCDD/Fs)									✓	✓	✓	✓	✓	✓	✓
Polycyclic aromatic hydrocarbons (PAHs)															
Acenaphthene					✓				✓	✓					
Acenaphthylene									✓	✓					
Acridine					✓										
Anthracene					✓				✓	✓					
Benzo(a)anthracene					✓				✓	✓	✓	✓	✓	✓	
Benzo(a)pyrene		✓			✓				✓	✓	✓	✓	✓	✓	
Benzo(b)fluoranthene											✓	✓	✓	✓	

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		MAC/IMAC	AO	Recreation & Aesthetics	Freshwater	Marine	Irrigation	Livestock	Freshwater	Marine	Agri.	Res./Park	Comm.	Ind.	
Benzo(k)fluoranthene											✓	✓	✓	✓	
Chrysene									✓	✓					
Dibenz(a,h)anthracene									✓	✓	✓	✓	✓	✓	
Fluoranthene					✓				✓	✓					
Fluorene					✓				✓	✓					
Indeno(1,2,3-c,d)pyrene											✓	✓	✓	✓	
2-Methylnaphthalene									✓	✓					
Naphthalene					✓	✓			✓	✓	✓	✓	✓	✓	
Phenanthrene					✓				✓	✓	✓	✓	✓	✓	
Pyrene					✓				✓	✓	✓	✓	✓	✓	
Quinoline					✓						✓				
Propylene glycol [See Glycols]															
Pyrene [See Polycyclic aromatic hydrocarbons (PAHs)]															
Quinoline [See Polycyclic aromatic hydrocarbons (PAHs)]															
Radium-224		✓													
Radium-226		✓													
Radium-228		✓													
Reactive chlorine species (Hypochlorous acid and monochloramine)					✓	✓									
Chloramines		✓													
Ruthenium-103		✓													
Ruthenium-106		✓													
Salinity						✓									
Selenium		✓			✓		✓	✓			✓	✓	✓	✓	
Silver					✓						✓	✓	✓	✓	
Simazine		✓			✓		✓	✓							
Sodium			✓												

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		MAC/IMAC	AO	Recreation & Aesthetics	Freshwater	Marine	Irrigation	Livestock	Freshwater	Marine	Agri.	Res./Park	Comm.	Ind.	
Sodium adsorption ratio											✓	✓	✓	✓	
Streambed substrate [See Total particulate matter]															
Strontium-90		✓													
Styrene					✓						✓	✓	✓	✓	
Sulphate			✓					✓							
Sulphide (asH2S)			✓												
Sulfolane					✓		✓				✓	✓	✓	✓	
Sulphur dioxide	✓														
Sulphur (elemental)											✓				
Suspended particulates [See Total suspended particulates]															
Suspended sediments [See Total particulate matter]															
Taste															
TCE [See Chlorinated ethenes, 1,1,2-Trichloroethene]															
Tebuthiuron					✓		✓	✓							
Temperature			✓	✓	✓	✓									
Terbufos			✓												
Tetrachlorobenzene [See Chlorinated benzenes]															
Tetrachloroethane [See Chlorinated ethanes]															
Tetrachloroethene [See Chlorinated ethenes]															
Tetrachloroethylene [See Chlorinated ethenes, 1,1,2,2-Tetrachloroethene]															
Tetrachloromethane [See Halogenated methanes]															
Tetrachlorophenols [See Chlorinated phenols]															
Thallium					✓						✓	✓	✓	✓	
Thiophene											✓				
Thorium-228		✓													
Thorium-230		✓													
Thorium-232		✓													

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	Chapter 1 Air	**Chapter 2** Water: Community		**Chapter 3** Water:	**Chapter 4** Water: Aquatic life		**Chapter 5** Water: Agriculture		**Chapter 6** Sediment		**Chapter 7** Soil				**Chapter 8** Tissue Residue
		MAC/IMAC	AO	Recreation & Aesthetics	Freshwater	Marine	Irrigation	Livestock	Freshwater	Marine	Agri.	Res./Park	Comm.	Ind.	
Thorium-234		✓													
Tin											✓	✓	✓	✓	
Toluene			✓		✓	✓		✓			✓	✓	✓	✓	
Total dissolved solids			✓				✓	✓							
Total particulate matter															
Deposited bedload sediment					✓	✓									
Streambed substrate					✓	✓									
Suspended sediments					✓	✓									
Turbidity		✓	✓	✓	✓	✓									
Total petroleum hydrocarbons [See oil and grease]															
Total suspended particulates	✓														
Toxaphene									✓	✓					✓
Triallate					✓			✓							
Tribromomethane [See Halogenated methanes]															
Tributyltin [See Organotins]															
Trichlorobenzene [See Chlorinated benzenes]															
Trichloroethane [See Chlorinated ethanes]															
Trichloroethene [See Chlorinated ethenes]															
Trichloroethylene [See Chlorinated ethenes, 1,1,2-Trichloroethene]															
Trichloromethane [See Halogenated methanes]															
Trichlorophenol [See Chlorinated phenols]															
Tricyclohexyltin [See Organotins]															
Trifluralin		✓			✓			✓							
Trihalomethanes [See Halogenated methanes]															
Triphenyltin [See Organotins]															
Tritium		✓													
Turbidity [See Total particulate matter]															
Uranium		✓					✓	✓							

Canadian Environmental Quality Guidelines

GUIDELINE AVAILABILITY TABLE

July 2006

The user is advised to consult the appropriate chapter and/or factsheet contained in the Canadian Environmental Quality Guidelines binder for specific information and implementation guidance pertaining to each environmental quality guideline. Guidelines are listed under chemical names, which are cross-referenced with common-names, abbreviations, and/or families of chemicals as appropriate.

	Chapter 1 Air	**Chapter 2** Water: Community		**Chapter 3** Water:	**Chapter 4** Water: Aquatic life		**Chapter 5** Water: Agriculture		**Chapter 6** Sediment		**Chapter 7** Soil				**Chapter 8** Tissue Residue
		MAC/IMAC	AO	Recreation & Aesthetics	Freshwater	Marine	Irrigation	Livestock	Freshwater	Marine	Agri.	Res./Park	Comm.	Ind.	
Uranium-234		✓													
Uranium-235		✓													
Uranium-238		✓													
Vanadium							✓	✓			✓	✓	✓	✓	
Vinyl chloride [See Chlorinated ethenes, Monochloroethene]															
Waterborne pathogens				✓											
Xylene			✓								✓	✓	✓	✓	
Zinc			✓		✓		✓	✓	✓	✓	✓	✓	✓	✓	
Zinc-65		✓													
Zirconium-95		✓													

NOTE

Chapter 1: Canadian National Ambient Air Quality Objectives
Chapter 2: Guidelines for Canadian Drinking Water Quality; MAC: Maximum Acceptable Concentration; IMAC: Interim Maximum Acceptable Concentration: AO: Aesthetic Objective
Chapter 3: Guidelines for Canadian Recreational Water Quality
Chapter 4: Canadian Water Quality Guidelines for the Protection of Aquatic Life
Chapter 5: Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses
Chapter 6: Canadian Sediment Quality Guidelines for the Protection of Aquatic Life
Chapter 7: Canadian Soil Quality Guidelines for the Protection of Human and/or Environmental Health; Agri.: Agricultural land uses; Res./Park: Residential/Parkland uses; Comm.: Commercial land uses; Ind.: Industrial land uses.
Chapter 8: Canadian Tissue Residue Guidelines for the Protection of Wildlife Consumers of Aquatic Biota

Appendix C
Field Sampling Forms

Form 1
Field Sampling Log
Hamlet of Kugluktuk

Date	**Time**	**Sample Location**	**Number**	**Sampler**
Weather			**Sample Type**	

Protocol Check List	
☐ Laboratory Supplied Bottles	☐ GPS Locations Required
☐ Preservatives	☐ Laboratory Instructions
☐ Gloves and Personal Protective Equipment	☐ Review Health and Safety
☐ Extension Pole if Needed	☐ Camera
☐ Field instruments Calibrated	☐ Tape Measure
☐ Sufficient Time to Deliver Samples Within Hold Times	☐ Flow Velocity Meter
☐ Chain of Custody Prepared	☐ Other:

Sample Station Details	
System Description (dimensions, vegetation, odours, etc.)	**Describe, Sketch, and/or Photograph**
Flow Measurements	
Vegetation	

Field Readings	**Instrument**	**Sample Description (colour, odours, etc.)**
Temperature		
Ph		
Conductivity		
Do		
Other		

Sample Collection			
Collection Method			
Bottle Filling Method			
Sample Collected From (mid stream at mid-depth etc.)			
QA/QC (duplicate, field banks, lab QA/QC requested)			
Sample Vessel Details			
Bottle Size	**Type**	**Preservative**	**Parameters to be Analyzed**
Comments and Details			

Form 2
Monitoring Program Planning Form
Hamlet of Kugluktuk

Purpose: This form provides a list of items to be considered when planning and conducting the monitoring programs.

Item	Issue/Concern/To Do	Assigned To	Comments
Water Board License			
Other Regulatory Requirements			
DIAND Inspector			
Staff Training			
Field Equipment			
Laboratory Supplies			
Health and Safety Supplies			
Sampling Locations and Frequency			
Field Collection			
Handling and Storage			
Chain of Custody			
Delivery to Laboratory			

Item	Issue/Concern/To Do	Assigned To	Comments
Field Notes and Results			
Laboratory Analysis			
QA/QC			
Comparison of Results to Regulatory and License Criteria			
Action if Criteria Exceeded			
Annual Reporting			
Other Issues:			

Appendix D
Laboratory Forms

Order# BR17035 | **Bottle Request Form** | **September 28 2005**

Account #:	10526	**Company:**	INUVIALUIT ENVIRONMENTAL & GEC
Order Taken By:	SWATSON	**Client Contact:**	SARAH DANDO
Expected Date:	29-SEP-05 00:00	**Address:**	PO BOX 673 5013 51 AVE
Order Priority:	R		
Ship/Pickup Inst:	COURIER		
Waybill Number:		**Job Number:**	sarah.dando@ieg.ca
Lab to fill order:	ED	**City/Province:**	YELLOWKNIFE NT
Prepared Date:		**Postal Code:**	X1A 2N5
Prepared By:	**Initials:**	**Phone Number:**	867 920 4065
Checked By:		**Fax Number:**	867 873 2377

	Qty	Type	Analysis	Color	Container	Preservatives	Handling	Instructions #
☑	10	IN/WT	Metals	Blue	250 mL P.E.T.E. (widemouth)	5 mL 20% Nitric Acid	Cool to 4 Degrees C	13, 23
☑	10	IN/WT	Phenols	Fl Red	100 mL Amber Glass Bottle	1 mL 1:1 H2 SO4	Cool to 4 Degrees C	3, 11
☑	10	IN/WT	BOD		1 L Polyethylene (widemouth)	No Preservative	Cool to 4 Degrees C	3,8, 27
☑	10	IN/WT	Routine		500 mL Polyethylene	No Preservative	Cool to 4 Degrees C	3, 8
☑	10	IN/WT	Oil & Grease	Yellow	1 L Amber Bottle (widemouth)	2 mL 1:1 HCl	Cool to 4 Degrees C	12
☑	10	IN/WT	Nutrients	Purple	500 mL Polyethylene	2 mL 1:1 H2SO4	Cool to 4 Degrees C	11
☑	10	IN/WT	Bacteriological	Dark green	250 mL Sterilized Plastic	Sodium Thiosulfate	Cool to 4 Degrees C	5,9
☐	3	XX	1 ice pack			No Preservative		

Comments:

Please note the "Instructions #" above for the sample containers shipped to you.

Instructions #	Guideline
3	Keep cool (4oC).
5	CAUTION: preservative already in container
8	No preservative.
9	Sodium Thiosulphate (Na2O3S2): irritant- in case of contact with skin, rinse affected area several times with cold water.
11	Sulfuric acid (H2SO4): oxidizer/corrosive-in case of contact with skin, rinse affected area with excess cold water.
12	Hydrochloric acid (HCl): highly toxic/corrosive-in case of contact with skin, rinse affected area with excess cold water.
13	Nitric acid (HNO3): highly toxic/corrosive- in case of contact with skin, rinse affected area with excess cold water.
23	Total Metals: acidify in the field without filtering, further digested in the laboratory.
23	Extractable metals: acidify in the field without filtering.
23	Dissolved Metals: filter in the field, then acidify.
27	Submit samples to the laboratory IMMEDIATELY after sampling.

ETL EnviroTest LABORATORIES

CHAIN OF CUSTODY / ANALYTICAL REQUEST FORM

CANADA TOLL FREE 1-800-668-9878

WWW.ENVIROTEST.COM

COC # 231056

Pg.____of____.

REPORT TO:	**DATE:**
COMPANY: Nuna Borreide Engineering	**REPORT DISTRIBUTION** ALL FINAL RESULTS WILL BE MAILED
CONTACT: Jim Walls	EMAIL____ FAX____
ADDRESS: 15 Townline Orangeville	EMAIL 1:
	EMAIL 2:
PHONE: FAX:	DIGITAL EMAIL:
CELLPHONE:	SELECT: pdf___ digital___ both___
INVOICE TO: SAME Y / N	JOB #
COMPANY:	
CONTACT:	PO/AFE:
ADDRESS:	
	LSD:
PHONE: FAX:	QUOTE #

LAB WORK ORDER #

SERVICE REQUESTED

- ☐ REGULAR SERVICE (DEFAULT)
- ☐ PRIORITY SERVICE (50% SURCHARGE)
- ☐ EMERGENCY SERVICE (100% SURCHARGE)

ANALYSIS REQUEST

INDICATE BOTTLES: FILTERED/PRESERVED (F/P) ▶

SAMPLE ID	SAMPLING LOCATION	SAMPLED BY / DATE / TIME	SAMPLING METHOD	SAMPLE TYPE	HAZARDOUS ?	NUMBER OF CONTAINERS	HIGHLY CONTAMINATED ?	LAB SAMPLE #

GUIDELINES / REGULATIONS

SPECIAL INSTRUCTIONS / NATURE OF HAZARDOUS MATERIAL

SAMPLE CONDITION

- ☐ FROZEN
- ☐ COLD
- ☐ AMBIENT

MEAN TEMPERATURE

Failure to complete all portions of this form may delay analysis. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the reverse of the white report copy.

RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:	SAMPLE CONDITION ACCEPTABLE UPON RECEIPT ? (Y/N)
RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:	

REFER TO BACK PAGE FOR SAMPLING INFORMATION & REGIONAL LOCATIONS WHITE - REPORT COPY, PINK - FILE COPY, YELLOW - CLIENT COPY GENF04.01

325023251-03003

Fill in the company name and address here. The contact name will appear on the analysis report.

Fill in the invoicing information if the invoice is to be sent to a different contact, company or address.

Indicate the level of service that you need.

The lab will assign a unique identifier to each of your files for easy tracking and reference.

...identifying your samples ... or highly contaminated helps us process your samples quickly and efficiently and helps protect lab staff.

ETL Enviro-Test Laboratories

CHAIN OF CUSTODY / ANALYTICAL REQUEST FORM

CANADA TOLL FREE 1-800-668-9878

WWW.ENVIROTEST.COM

DATE: 1 JANUARY 2004

LAB WORK ORDER #

REPORT TO:
COMPANY: ACME CONSULTING INC.
CONTACT: JOE SMITH
ADDRESS: 123 MAIN STREET
EDMONTON, AB T6K 0P1
PHONE: (780) 555-1234 FAX: (780) 555-5678

INVOICE TO: SAME Y / N
COMPANY: ABC ENERGY COMPANY
CONTACT: JANE DOE
ADDRESS: 588 PINEWOOD DRIVE
EDMONTON, AB T5L 4E3
PHONE: (780) 555-9123 FAX: (780) 555-8542

REPORT DISTRIBUTION: ALL FINAL RESULTS WILL BE MAILED
EMAIL: YES FAX: YES
EMAIL 1: JOESMITH@ACME.CA
EMAIL 2: _____
SELECT: pdf: YES digital ___ both ___

INDICATE BOTTLES: FILTERED/PRESERVED (F/P)

JOB # 001-423-569-8553
PO / AFE: 2003-5678
LSD: 17-64-43-21-W5M
QUOTE # Q5033

Your Job #, PO, LSD and Quote # go here. They will appear on the analysis report & invoice.

SERVICE REQUESTED

- [x] REGULAR SERVICE (DEFAULT)
- [ ] PRIORITY SERVICE (50% SURCHARGE)
- [ ] EMERGENCY SERVICE (100% SURCHARGE)

ANALYSIS REQUEST

SAMPLE ID	SAMPLING LOCATION	SAMPLED BY / DATE / TIME	SAMPLING METHOD	SAMPLE TYPE	MET-TOT-LOW	ROU	P-TOTAL	BTX,TVH,TEH,GCMS	PB-MUST-DIS	PSA-MUST	GLYCOL	FCC-MF		HAZARDOUS ? (Y/N)	NUMBER OF CONTAINERS	HIGHLY CONTAMINATED ? (Y/N)	LAB SAMPLE #
NW DYKE 1-8	BIG LAKE	YZ / 31-DEC-03 / 1315	GRAB	WATER	✓	✓	✓		✓	✓	✓	✓		✓			

Your name of your sample goes here. This will appear on your analysis report.

The sampling location helps to deliniate which samples came from where.

The date and time the samples were taken will appear on the report. They are also important to determine if hold times are expired.

The test code determines which analysis is requested. The codes can be found in the ETL Price Guide or by asking ETL staff. General parameters can also be listed here.

The lab sample # uniquely identifies each of your samples. i.e. L113456-3

These notes are important and should be read and understood. Any questions can be answered by ETL staff.

Details specifing which regulation or guidelines that your samples require can aid ETL staff in giving you the appropriate analysis.

Any special instructions or the nature of the hazardous contaminates should be detailed here to aid ETL staff in processing your samples quickly and efficiently.

NOTES & CONDITIONS:

1. Quote number must be provided to ensure proper pricing.
2. Turnaround times will vary dependent on complexity of analysis & Lab workload at time of submission. Please contact the Lab to confirm turnaround time.
3. All hazardous samples submitted must be labeled to comply with WHMIS and TDG regulations. This must include the nature of the hazard, as well as a contact name & phone number that the Lab can contact for further information.

NOTE: Failure to properly complete all portions of this form may delay analysis

GUIDELINES/REGULATIONS

SPECIAL INSTRUCTIONS / NATURE OF HAZARDOUS MATERIAL

SAMPLE CONDITION

Records who sent the samples and when.

Records when the samples arrived at the lab and who received them.

Details of the sample's condition upon arrival.

- [ ] FROZEN
- [x] COLD
- [ ] AMBIENT

MEAN TEMPERATURE

RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:	SAMPLE CONDITION ACCEPTABLE UPON RECEIPT ?

SAMPLING INSTRUCTIONS REFERENCE SHEET

Please note the " Sampling Instructions # " for the sample containers shipped to you. Find the corresponding number on this page and follow the general directions.

SAMPLING INSTRUCTION NUMBER	SAMPLING INSTRUCTION, HANDLING AND / OR PRESERVATIVE HAZARD INFORMATION
1	Sample in triplicate
2	No headspace
3	Keep cool (4°C)
4	Keep frozen
5	Caution: preservative already in container
6	Add preservative to 1/2 full bottle (avoid skin contact). Fill bottle and avoid headspace. Invert the bottle 3 times to mix. Check for headspace – add more water if necessary.
7	Fill container to capacity, wipe off threads and cap tightly
8	No preservative
9	Sodium thiosulphate: irritant - in case of contact with skin, rinse affected area several times with cold water.
10	Ascorbic acid: no hazard.
11	Sulfuric acid: oxidizer/corrosive – in case of contact with skin, rinse affected area with excess cold water.
12	Hydrochloric acid: highly toxic/corrosive - in case of contact with skin, rinse affected area with excess cold water.
13	Nitric acid: highly toxic/oxidizer – in case of contact with skin, rinse affected area with excess cold water.
15	Sodium hydroxide: corrosive/toxic – in case of contact with skin, rinse affected area with excess cold water.
16	Zinc acetate: toxic - in case of contact with skin, rinse affected area several times with cold water.
17	$MnSO_4$ - Manganous Sulphate: toxic - in case of contact with skin, rinse affected area several times with cold water.
18	KOH - Potassium hydroxide: corrosive/toxic - in case of contact with skin, rinse affected area with excess cold water.
19	Alkaline iodide azide: corrosive/toxic - in case of contact with skin, rinse affected area with excess cold water.
20	Liquid nitrogen: extremely cold! – in case of contact with skin, warm gently, seek medical attention in case of frost bite.
21	Dissolved oxygen: 1. Fill the bod bottle with sample until just overflowing. If sampling from a line under pressure, extend line to bottom of sample bottle 2. Insert the bod bottle stopper through the excess water into the bottle, ensuring that no air bubbles are trapped inside. Pour off excess water from rim of the bottle. 3. Add the contents from 1 pillow of manganous sulfate (reagent #1), cap and mix by inverting at least 10 times. Add the contents from 1 pillow of alkaline iodide azide (reagent #2), cap and mix. 4. A brown coloured floc will form 5. Transport to lab immediately, avoiding direct sunlight and extreme temperature changes during transport 6. Upon arrival at the laboratory, the sample will be acidified 7. Always notify the laboratory, preferably at least 1 day in advance, exactly when you will be bringing in the samples, as they must be acidified and titrated immediately after receiving. Preserved samples are stable up to 6 hours only!
22	Add the zinc acetate to an almost full bottle, cap and shake, then add the sodium hydroxide and shake.
23	Dissolved metals - filter in field, then acidify Extractable metals - acidify in field without filtering Total metals - acidify in field without filtering, further digested in laboratory.
24	Filter sample in the field, then acidify
25	Filter sample in the field for dissolved species
26	Upon receipt by the lab, sample will be filtered, then preserved
27	Submit samples to lab immediately after sampling