CADUCEON™
ENVIRONMENTAL LABORATORIES
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December 18th, 2017

Bhabesh Roy
Government of Nunavut
PO BOX 379
Pond Inlet, NU
X0A 0S0

Dear Bhabesh Roy,

Caduceon Environmental Laboratories looks forward to aiding the Hamlet of Pangnirtung in their environmental analysis. Caduceon staff have reviewed the PDF document entitled *"Quality Assurance/Quality Control Plan Hamlet of Pangnirtung, Nunavut"* that was provided to our Ottawa Laboratory.

Our staff has read and understands the requirements found within this document and see no issues with providing you quality service and analysis. In addition, it has been noted that it is necessary all testing be completed by a CALA accredited Laboratory. Caduceon Environmental Laboratories are accredited for all of the parameters listed within the document with the exception of drinking water parameters 1) Alkyl Benzene Sulfonate (ABS) and 2) Carbon Chloroform Extract (CCE). We currently subcontract out Anionic Surfactants as MBAS (i.e. Methylene Blue Active Substances) to Niagara Analytical Laboratories in lieu of these 2 tests.

The most recent CALA Scopes of Accreditation for our Ottawa and Kingston Labs have been provided to you for your records. I have also included a partially completed Drinking Water submission form as per your request. In addition I have provided you with our most recent revision of CP-005 (Sample Bottle Requirements).

Should you require any further information please feel to contact me at the coordinates listed in my signature below.

Thank you for providing us with the opportunity to work with the Hamlet of Pangnirtung.

Regards,

Greg Clarkin, Lab Manager - Ottawa District
Caduceon Environmental Laboratories
Tel: (613) 526-0123
Fax: (613) 526-1244
E-mail: gclarkin@caduceonlabs.com

cc: Gord Murphy, Lab Supervisor
Rebecca Marshall, Customer Service Representative
Damien Gilbert, CEO

Quality Assurance / Quality Control Plan Hamlet of Pangnirtung, Pangnirtung, Nunavut

Project Name:
Water Licence Compliance – Hamlet of Pangnirtung

Type of Document:
Final

Project Number:
OTT-00204430-A0

Prepared By: Robert Renaud, M.Sc., P.Geo.

Reviewed By: Stephen Bliss, M.Sc.E., P.Eng.

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Date Submitted:
December 19, 2017

Hamlet of Pangnirtung

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Date Submitted:
December 19, 2017

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Appendices

1 Introduction

The purpose of this document is to provide guidance to ensure that the monitoring program samples collected from the Hamlet's water, wastewater and solid waste disposal facilities, are done so with a high degree of quality, in order to ensure that they accurately reflect the physical and chemical nature of the matrix being tested.

1.1 Background

The Hamlet of Pangnirtung (Hamlet) is located on Baffin Island at N66°08.82' and W65°42.07' on the south shore of the Pangnirtung Fiord. The population of Pangnirtung in 2017 is estimated to be 1,592 according to the Nunavut Bureau of Statistics. The estimated population of the community in 2035 would be approximately 2000. The Hamlet is primarily residential in nature with a few businesses (lodges, grocery stores, etc.), schools, and a fish processing plant (Pangnirtung Fisheries). Both fresh water and the wastewater are transported by trucks to and from the various buildings (i.e., there is no piped system within the community).

The Nunavut Water Board (NWB) issued a Class B Water Licence (No. 3BM-PAN1417) to the Hamlet on September 16, 2014. This QA/QC document is to fulfill the requirements for the application of a Class A Water Licence. The water licence governs water use and waste disposal within the Hamlet. A copy of the Class B Water Licence is provided in Appendix A.

1.2 Quality Assurance and Quality Control Monitoring

The Hamlet's Water Licence includes a monitoring program. The monitoring program species the locations of six (6) sampling locations, along with the analytical parameters to be tested. The following quality assurance (QA) and quality control (QC) program is to be implemented to ensure that the analytical results received are accurate and dependable. A QA/QC program is a system of documented checks that validate the reliability of the data collected regarding any given site. Quality Assurance is a system that ensures that quality control procedures are correctly performed and documented. Quality Control refers to the established procedures observed both in the field and in the laboratory, designed to ensure that the resulting end data meet intended quality objectives. The proposed program will verify compliance with regulations.

1.3 Definitions

The following definitions that are relevant to this plan include:

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

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

Trip Blank is a sample of clean water that was prepared by the analytical laboratory and shipped to the sample site in the cooler along with the empty sample bottles. This trip blank sample remains unopened and is transported back to the laboratory with the monitoring program samples. The trip blanks is analyzed by the laboratory along with the monitoring program samples. The purpose of the trip blank is the assess contamination introduced during shipping and field handling procedures.

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

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

2 Sampling for Regulatory Compliance

2.1 Sampling Locations

The Hamlet's Water Licence specifies six (6) monitoring locations. Table 2.1 provides a description of the sampling points, along with their coordinates.

Table 2.1 – Monitoring Locations

Monitoring Program Station Number and Coordinates	Description	Status
PAN-1 N66° 08.80', W65° 41.03'	Raw water supply intake at the Duval River	Active (Volume)
PAN-2 N66° 09.31', W65° 40.48'	Raw sewage from the pump-out truck	Active (Volume)
PAN-3 N66° 09.31', W65° 40.52'	Effluent from Waste Water Treatment Facility	Active (Quality)
PAN-4 N66° XX.XX', W65° XX.XX'	Run-off from Sludge Disposal Area	Active (Quality)
PAN-5 N66° 09.45', W65° 40.16'	Run-off from the Solid Waste Disposal Facility	Active (Quality)
PAN-6 N66° 09.48', W65° 39.73'	Run-off from Metals Storage Area	Active (Quality)

2.2 Sampling Frequency

The following outlines the Sampling Testing and Compliance requirements. Any other additional sampling during the year will be at the request of the regulatory agencies. Once collected, the samples will be shipped to the laboratory and analyzed using the same test/method/procedure.

The Hamlet is required to measure and record, in cubic metres, the daily, monthly and annual quantities of water pumped at Monitoring Program Stations PAN-1 and at the Truck-fill Station. The Hamlet is also required to measure and record, in cubic metres, the daily, monthly and annual quantities of raw sewage offloaded from trucks at Monitoring Program Station PAN-2.

Table 2.2 – Sampling Frequency

Monitoring Program Station Number	Description	Frequency
PAN-1	Raw water supply intake at the Duval River	No sampling – only daily, monthly, annual volume measurements
PAN-2	Raw sewage from the pump-out truck	No sampling – only daily, monthly, annual volume measurements
PAN-3	Effluent from Waste Water Treatment Facility	Monthly during operation and discharge of effluent.
PAN-4	Run-off from Sludge Disposal Area	Beginning, middle and near the end of discharge/run-off observed.
PAN-5	Run-off from the Solid Waste Disposal Facility	Beginning, middle and near the end of discharge/run-off observed.
PAN-6	Run-off from Metals Storage Area	Beginning, middle and near the end of discharge/run-off observed.

2.3 Sampling Parameters

2.3.1 Water Samples

The requirements for drinking water sample collection frequency, and analytical testing is provided below.

Microbiological Properties:

The current population of the community is less than 2000 but more than 500. Therefore, biweekly bacteria sampling is required. Samples will be collected from five locations: raw water, treated water and three different taps. Each sample bottle is to be filled up to 200 mL mark. The samples are forwarded to the GN-DOH lab in Iqaluit for testing and reporting.

Chemical Analysis:

As required by the Public Health Act, the Hamlet samples the raw water and treated water twice annually and the samples are forwarded to Caduceon Environmental Laboratories, a CALA accredited lab in Ottawa.

Samples collected from Monitoring Station PAN-1 and the Truck-Fill Station shall be analyzed for the following parameters:

- Alkyl benzene sulfonate (ABS)
- Arsenic (As)
- Barium (Ba)
- Cadmium (Cd)
- Carbon chloroform extract (CCE)
- Chloride (Cl)
- Chromium (hexavalent) (Cr^{6+})
- Copper (Cu)
- Cyanide (CN)
- Fluoride (F)
- Iron (Fe)
- Lead (Pb)
- Manganese (Mn)
- Nitrate (NO_3)
- Phenols
- Selenium (Se)
- Silver (Ag)
- Sulfate (SO_4)
- Total dissolved solids
- Zinc (Zn)

2.3.2 Wastewater and Leachate Samples Sampling Parameters for the Current Licence # 3BM-PAN1417

Samples collected from Monitoring Stations PAN-3, PAN-4, PAN-5, and PAN-6 shall be analyzed for the following parameters:

- Biochemical Oxygen Demand – BOD_5
- pH
- Total Suspended Solids
- Nitrate-Nitrite
- Chloride
- Sodium
- Magnesium
- Total Hardness
- Total Phenols
- Total Arsenic
- Total Cadmium
- Total Copper
- Total Iron
- Total Mercury
- Total Zinc
- Faecal Coliforms
- Conductivity
- Oil and Grease (visual)
- Ammonia Nitrogen
- Sulphate
- Potassium
- Calcium
- Total Alkalinity
- Total Manganese
- Total Aluminum
- Total Cobalt
- Total Chromium
- Total Lead
- Total Nickel
- Total Organic Carbon – TOC

2.4 Compliance Point (Part D.2) for Wastewater Effluent for Current Water Licence # 3BM-PAN1417

The water licence has set the final discharge from the WWTP (Monitoring Station PAN-3) as the compliance point as it is the last point of measurement and control. The effluent released from the WWTP must meet the criteria list in Table 2.4.

Table 2.4 – Effluent Quality Criteria

Parameter	Maximum Concentration of any Grab Sample
pH	Between 6 and 9
BOD_5	120 mg/L
Total Suspended Solids	180 mg/L
Faecal Coliforms	1 x 10^3 CFU/100 mL
Oil and Grease	No Visible Sheen

2.5 Sampling Procedures (Wastewater & Leachate)

All sampling, sample preservation and analyses is to be conducted in accordance with methods described in the current edition of *Standard Methods for the Examination of Water and Wastewater* (American Public Health Association, American Water Works Association, and Water Environment Federation, most current edition). Also, additional guidance can be obtained from the contract laboratory (accredited by the Canadian Association for Laboratory Accreditation).

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

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

2.6 Sampling Collection Wastewater & Leachate)

Refer to the *Wastewater Treatment Facility Process Operation Manual*, dated November 2014 for specific details related to Health and Safety considerations, facility components and processes, as well as monitoring and testing procedures.

2.6.1 Sampling Equipment

Dedicated latex or nitrile gloves (i.e., one pair per sample) are to be used during sample collection and sample handling. Monitoring program samples collected for analysis of selected chemical parameters are to be placed directly into new pre-cleaned, laboratory-supplied sample bottles. All monitoring samples are to be placed in clean coolers for transportation to the subcontract laboratory. The samples are transported/submitted under Chain of Custody documentation. Included on a Chain of Custody form is the client information, the sample information, the analyses requested, the relevant regulations, the turnaround time for the analytical results, comments, and temperature of the samples at the time they arrived in the laboratory. An example of a completed Chain of Custody form is included in Appendix C.

2.6.2 Sampling Containers

Samples for water, wastewater and leachate have their own set of containers. The following photographs indicate the containers in each kit. Specific sample bottle requirements are presented in Appendix B.

WATER

WASTEWATER

LEACHATE

2.6.3 Sampling Methods

All monitoring program samples will be collected by suitably-trained municipal staff. The following techniques are to be used (when possible) whenever grab samples are collected:

- If the sample is being collected from a surface water body, a tank or sump, the sample is to be collected from a location where there is good mixing and the sample will be representative. The sample is not to be skimmed from the surface, taken very close to the bottom, or near any sidewalls. The sample is to be taken from a middle zone, if possible, where there is good mixing and the geometry of the surface water channel or tank/sump and any equipment within will not affect the quality of the sample.
- If the sample is taken from a sample tap from a tank or pipe, care is to be taken to flush the sample line. The operator is to open the sample valve to flush the contents of the sample line into a container. This material is disposed of or returned to the process if possible. Immediately after flushing the line, the operator then collects the appropriate volume of sample in a separate container. The volume to be flushed prior to sampling will depend on the size of the line and distance between the sample valve and the main line/tank. Ideally, the entire volume of this sample line is to be flushed to ensure the collected sample is fresh and representative.
- If the treated water is collected from the end of water truck hose, allow flushing for a minimum 3 minutes before sampling. During sampling, reduce the flow through the nozzle.
- The monitoring program samples need to be shipped to the analytical laboratory for analysis immediately or as soon as practical after collecting the sample.
- Samples should always be collected in clean, laboratory-supplied bottles. If an intermediate sample collection container is used, it should be dry before sampling, and it should be thoroughly cleaned after each use.

2.7 Sample Handling

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

All sample containers are to be tightly sealed and properly labelled with the sample ID, date and time of sample collection, location of sample collection and parameters to be analyzed. The outside of the bottles are to be cleaned with soap and water after sampling and dried off prior to placing the samples in the cooler. The samples are to be stored on ice in a cooler until delivery to the laboratory. A chain of custody form is to be filled out completely and is used to track the samples and placed in the cooler with the samples, in a Ziplock bag. Keep the last page of the Chain of Custody and give it to the Hamlet Foreman for their records.

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

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

2.8 Quality Assurance and Quality Control Program

Cross contamination is a common source of error in sampling procedures. QC samples help identify when and how contamination might occur. There are various types of QC samples. For the purposes of the Water Licence monitoring program, EXP recommends the use of trip blanks.

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

3 Laboratory Analysis

3.1 Laboratory Accreditation

As indicated in the Guidelines, the Hamlet should use an analytical laboratory accredited by the Canadian Association for Laboratory Accreditation (CALA); formally known as the Canadian Association for Environmental Analytical Laboratories (CAEAL) for the Water Licence monitoring program. Appendix D includes a copy of the laboratory's CALA accreditation certificate and a list of the parameters for which they are certified.

Note that the GN-DOH does bacteria testing in their own lab in Iqaluit following their own guidelines.

3.2 Method Detection Limits

The method detection limits (MDLs) are provided on the contract laboratory's Certificates of Analysis.

3.3 Methodology

As indicated above, the contract laboratory is accredited by CALA for specific tests and complies with the requirements of ISO/IEC Standard 17025.

4 Reporting Requirements

As a condition of NWB Licence 3BM-PAN1417 (Appendix A), the Hamlet is required to submit an Annual Report to the NWB, no later than March 31st of the year following the calendar year reported. Among other requirements, the annual report is required to include tabular summaries of all analytical data generated under the Monitoring Program (compared to the Maximum Concentration of any Grab Sample – provided in Part D of the NWB Licence 3BM-PAN1417 – where applicable).

Note: Upon the renewal of the Water Licence and the upgrading to a Type A Licence, the Hamlet will adhere to any additional testing and reporting requirements.

5 References

Quality Assurance (QA) and Quality Control (QC) Guidelines for use by Class "B" Licensees in Collecting Representative Water Samples in the Field and for Submission of a QA/QC Plan, Department of Indian and Northern Affairs Canada, Water Resources Division and the Northwest Territories Water Board, July 1996.

Quality Assurance (QA) and Quality Control (QC) Guidelines for use by Class "A" Licensees in Meeting SNP Requirements and for Submission of a QA/QC Plan, Department of Indian and Northern Affairs Canada, Water Resources Division and the Northwest Territories Water Board, July 1996.

Standard Methods for the Examination of Water and Wastewater, American Public Health Association, American Water Works Association, and Water Environment Federation, 22nd Edition, 2012.

Appendix A:
Hamlet of Pangnirtung's Water Licence

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NUNAVUT WATER BOARD
NUNAVUT IMALIRIYIN KATIMAYINGI
OFFICE DES EAUX DU NUNAVUT

NWB File No.: **3BM-PAN1417**

September 16, 2014

Karen Mellor, SAO
Hamlet of Pangnirtung, Baffin Region
P.O. Box 253,
Pangnirtung, NU X0A 0R0
Email: pang_sao@qiniq.com

Bhabesh Roy, M.A. Sc., P. Eng
Municipal Planning Engineer, GN-CGS
P.O. Box 379,
Pond Inlet, NU X0X 0S0
Email: broy@gov.nu.ca

RE: NWB Renewal/Amendment Licence No. 3BM-PAN1417

Dear Ms. Mellor and Mr. Roy:

Please find attached Licence No. **3BM-PAN1417** issued to the Hamlet of Pangnirtung by the Nunavut Water Board (NWB) pursuant to its authority under Article 13 of the *Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in Right of Canada* (*Nunavut Land Claims Agreement or NLCA*). The terms and conditions of the attached Licence related to water use and waste disposal are an integral part of this approval.

If the Licensee contemplates the renewal of this Licence, it is the responsibility of the Licensee to apply to the NWB for its renewal. The past performance of the Licensee, new documentation and information, and issues raised during a public hearing, if the NWB is required to hold one, will be used to determine the terms and conditions of the Licence renewal. Note that if the Licence expires before the NWB issues a new one, then water use and waste disposal must cease, or the Licensee may be in contravention of the *Nunavut Land Claims Agreement* and the *Nunavut Waters and Nunavut Surface Rights Tribunal Act*. However, the expiry or cancellation of a licence does not relieve the holder from any obligations imposed by the licence. The NWB recommends that an application for the renewal of this Licence be filed at least three months prior to the Licence expiry date.

If the Licensee contemplates or requires an amendment to this licence, the NWB may decide, in the public's interest, to hold a public hearing. The Licensee should submit applications for amendment as soon as possible to give the NWB sufficient time to go through the amendment process. The process and timing may vary depending on the scope of the amendment; however, a minimum of sixty (60) days is required from time of acceptance by the NWB. It is the responsibility of the Licensee to ensure that all application materials have been received and are acknowledged by the Manager of Licensing.

The NWB strongly recommends that the Licensee consult the comments received by interested persons on issues identified. This information is attached for your consideration.[1]

Sincerely,

Thomas Kabloona
Nunavut Water Board
Chair

TK/kk/mp

Enclosure: Licence No. **3BM-PAN1417**
Comments – AANDC

Cc: Qikiqtani Distribution List

[1] Aboriginal Affairs and Northern Development Canada (AANDC), September 8, 2014.

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DECISION

LICENCE NUMBER: 3BM-PAN1417

This is the decision of the Nunavut Water Board (NWB) with respect to a complete application dated July 29, 2014 for a renewal/amendment of a Water Licence made by:

HAMLET OF PANGNIRTUNG

to allow for the use of water and deposit of waste during municipal activities by the Hamlet of Pangnirtung located within the Qikiqtani Region, Nunavut, generally located at the geographical coordinates as follows:

Latitude: 66° 09' 00'' N and Longitude: 65° 40' 34'' W

DECISION

After having been satisfied that the application was for a project proposal located outside the boundaries of the two approved land use plans administered by the Nunavut Planning Commission (NPC)[1] and was exempt from the requirement for screening by the Nunavut Impact Review Board (NIRB)[2] pursuant to Schedule 12-1 of the *Nunavut Land Claims Agreement* (*NLCA*), the NWB decided that the application could proceed through the regulatory process. In accordance with S.55.1 of the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (*Act*) and Article 13 of the *NLCA*, public notice of the application was given and interested persons were invited to make representations to the NWB.

After reviewing the submission of the Applicant and considering the representations made by interested persons, 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 *NLCA* and of the *Act*, waived the requirement to hold a public hearing and determined that:

Licence No. 3BM-PAN0810 be renewed/amended as Licence No. 3BM-PAN1417 subject to the terms and conditions contained therein. (Motion #: 2014-B1-030)

Signed this 16th day of September 2014 at Gjoa Haven, NU.

Thomas Kabloona
Nunavut Water Board
Chair

TK/kk/mp

1 Nunavut Planning Commission Determination, dated August 12, 2014.
2 Nunavut Impact Review Board: Exempt from Screening Decision, dated August 11, 2014.

I. BACKGROUND

The Hamlet of Pangnirtung (Pangnirtung or the Hamlet) is located at Latitude 66° 09' 00'' N and Longitude: 65° 40' 34'' W, on the eastern shore of Baffin Island within the Qikiqtani Region of Nunavut, approximately 255km north of Iqaluit. The population of Pangnirtung in 2013 is estimated to be 1,512 according to the Nunavut Bureau of Statistics. The estimated population of the community in 2030 would be approximately 2000.

Pangnirtung is located within the continuous permafrost zone with a maximal local depth of annual thaw of the active layer up to 1-1.5m depending on the nature of the surface cover. Vegetation is typical for the Arctic tundra with hardy grasses, mosses and lichens in a thin organic layer on the surface. The weather is generally unpredictable throughout the year. Temperatures are harsh in the winter, where wind chill temperatures can be –50°C or below. Pangnirtung does experience periods of high winds. From Mid-November to Mid-February, Pangnirtung does not receive direct sunlight due to high coastal mountains. There is continuous daylight from April to mid-August. January mean high and low temperatures are -23°C and -30°C, respectively, and July mean high and low temperatures are 11°C and 5°C, respectively. The temperature in July and August usually averages between 5°C and 15°C. The annual snowfall is approximately 170mm and the annual rainfall is approximately 210mm.

Pangnirtung is one of only three Nunavut Communities with a fish processing plant and a robust Arctic Char and Greenlandic Turbot Fishery.

Water for municipal use is pumped from Duval River. Existing waste disposal facilities include a Waste Water Treatment Plant (WWTP) built in 2003 that has been modified from a rotating biological contactor to an activated sludge system. Solid waste from the Hamlet is currently disposed of in a landfill located approximately 800 metres from the edge of the Hamlet. The existing solid waste site has been determined to be inappropriately sited due to ecological concerns, odor and windblown litter, poorly operated and maintained, and is nearing its life capacity.

II. PROCEDURAL HISTORY

On **December 1, 2002**, the Nunavut Water Board ("NWB" or "Board") issued water licence NWB3PAN0207 to the Hamlet of Pangnirtung for the use of 100,000 m^3 *per year* water and waste disposal activities within the Hamlet. The licence expiry date was set at November 31, 2007. On June 10, 2008 the NWB received correspondence from Chief Medical Officer of Health (CMO) and Manager Field Operations, Nunavut Regional Office, Aboriginal Affairs and Northern development Canada (AANDC), which identified the collapse of Pangnirtung's bridge infrastructure due to flooding. Due to the failure of the bridge, the sewage trucks could no longer deliver sewage from homes and businesses to the WWTP. The discharge of sewage into the river was the only viable alternative to simply allow sewage holding tanks to accumulate and overflow in homes and businesses, which would constitute a health hazard for residents of the Hamlet.

The bridge collapse resulted in a temporary order from the CMO to dump sewage from the Hamlet of Pangnirtung directly into the Duval River downstream of the affected bridge. The temporary measure was effective June 10, 2008 for a 48 hour period.

On **June 12, 2008**, the NWB recommended to the AANDC Minister (Minister) that an emergency amendment be issued to the Hamlet regarding its expired licence NWB3PAN0207 to ensure that emergency measures were duly authorized as required by the *NWSRTA*. On June 16, 2008, the Minister consented to waiving the notice period to issue the emergency amendment as recommended by the NWB, effective immediately. Extensions to the emergency dumping measures into the Duval River were provided by the CMO on June 17 and June 20, 2008.

On **August 8, 2008**, the licence was renewed as licence 3BM-PAN0810, with the expiry date set at August 31, 2010, allowing the Hamlet to use 100,000 m^3 *per year* of water and dispose of waste at specific facilities within the Hamlet. The two (2) year Licence term was intended to *send a clear message to the Hamlet and regulatory authorities that the Board will not passively encourage the Hamlet's failures to comply with the Licence conditions and associated legal requirements*. The Board expected the Hamlet to *take immediate steps towards full compliance with all Licence requirements for its existing facilities*. *Upon submission of an application to renew the Licence in approximately twenty one (21) months, the Board expected the Hamlet to be in full compliance with the licence.* Part B, Item 10 of the Licence indicated *that the Licensee must submit a Plan for Compliance that clearly demonstrates how the Hamlet will achieve full compliance with the Licence conditions during this time period.*

On **October 19, 2011**, and re-submitted on **March 08, 2012**, the Board received an Application for the renewal of water licence 3BM-PAN0810 ("Licence") from the Government of Nunavut Department of Community Government Services (GN-CGS) on behalf of the Hamlet of Pangnirtung (Hamlet). The renewal Application was comprised of the following documents:

October 19, 2011 submissions:

- Cover Letter for renewal dated October 3, 2011;
- Completed Renewal Application form;
- 2010 Annual Report;
- Technical Summary in English and Inuktitut; and
- Plan for Compliance.

On March 8, 2012 additional submissions:

- 2011 Annual Report; and
- Plan for Compliance (updated).

On **April 5, 2012** the NWB informed the Licensee about deficiencies in the Application that needed to be addressed prior to proceeding with processing the renewal Application[1]. Clarifications were requested regarding the Plan for Compliance's short and long term plans for addressing a number of outstanding requirements of the licence.

1 Letter from Erik Skiby, NWB, to Ron Mongeau, Hamlet of Pangnirtung: Re: Application for Licence Renewal and Plan for Compliance, dated April 5, 2012.

On **October 3, 2012**, the NWB received the following additional information:

- Cover Letter dated November 2012;
- Pangnirtung Optimization of Drinking Water Supply – Project Schedule;
- Preliminary Schedule for the Pangnirtung Solid Waste Site Rehabilitation Oct 30, 2012; Pangnirtung, NU WWTP Upgrade Preliminary Project Schedule; and
- Plan for Compliance.

On **January 8, 2013**, the NWB advised the Licensee that these documents were received in hard copy, and some of them (Plan for Compliance) were unreadable due to wrong format and size[2]. The Licensee was advised to provide documents in electronic format for review.
After a number of correspondences (last one dated **March 31, 2014**[3]) between the NWB and the Licensee, on **April 2, 2014**, the following additional information was provided to the Board:

- Authorization Letter;
- Design Development Report – Optimization of Drinking Water Supply Pangnirtung, Nunavut GN-CGS Project #08-2009; and
- Letter from B. Roy, GN-CGS to P. Beaulieu, NWB: *Re: Hamlet of Pangnirtun: Water License #3BM-PAN0810 Application*.

On **April 24, 2014**[4], the NWB advised the Licensee that the application still does not meet the requirements of section 48(1) of the *Act*, and requested clarifications on issues raised or a Plan for Compliance that clearly demonstrates the measures the Licensee will undertake, including long/short term implementation schedules, to achieve full compliance with the conditions of this Licence, including the issues raised in the AANDC Inspector's *Reports*.

On **May-June, 2014**, the Board received the following additional information to be included within the Application:

- Letter from B. Roy, GN-CGS to P. Beaulieu, NWB and Justin Hack, AANDC: Re: Shut Down WWTP during Construction: Contingency Plan and Notice, dated May 1, 2014;
- Letter from B. Roy, GN-CGS to P. Beaulieu, NWB: Re: Shut Down WWTP during Construction: Contingency Plan and Notice, dated May 12, 2014;
- Letter from B. Roy, GN-CGS to P. Beaulieu, NWB: Re: Water Licence # 3BM-PAN0810 Renewal Application: Response to the letter of Mr. Erik Skiby, Assistant Technical Advisor, dated May 13, 2014;
- Water Licence Amendment Application, dated May 4, 2014;
- Pangnirtung Fish Waste Lagoon Decommissioning Plan, dated May 23, 2013;
- Operation and Maintenance Manual for Wastewater Treatment Plan Hamlet of Pangnirtung;
- Letter from B. Roy, GN-CGS to P. Beaulieu, NWB: Re: Hamlet of Pangnirtung Water Licence # 3BM-PAN0810 Renewal Application, dated May 19, 2014; and
- Solid Waste Operation and Maintenance Plan for Hamlet of Pangnirtung, dated June 2014.

2 Email from Phyllis Beaulieu, NWB, to Ron Mongeau, Hamlet of Pangnirtung: Re: Receipt of Documents Hard Copy only, dated January 8, 2013.
3 Email from Erik Skiby, NWB, to Roy Bhabesh, GN-CGS: Re: Status of Pangnirtung WL Application, dated March 31, 2014.
4 Letter from Erik Skiby, NWB, to Roy Bhabesh (GN-CGS) and Karen Mellor (Hamlet of Pangnirtung): Re: Response to additional information, dated April 24, 2014.

On **July 29, 2014**, the Board received additional information and clarification by Email of on-going/future activities from GN-CGS on behalf of Licensee that included the following information:

- Revised Water Licence Renewal Application, dated July 29, 2014; and
- Drinking Water Quality (July 2013) Preliminary Results Pangnirtung, NU, dated September 16, 2013; and

On August 8, 2014, following a preliminary internal technical review, the NWB concluded that the Application generally meets the requirements of section 48(1) of the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (NWNSRTA or Act) and forwarded notice of the Application to regulators, the council of the municipality most affected by the project, and other interested parties. All parties were invited to make representations to the NWB within thirty (30) days, by September 8, 2014. On September 8, 2014, comments were received from AANDC.

Based upon the results of the completed detailed assessment, including consideration of any potential accidents, malfunctions, or cumulative environmental effects that the overall project might have in the area, the Board has approved the application for the renewal of Licence No. 3BM-PAN0810 as Licence No. **3BM-PAN1417**.

III. ISSUES

Term of the Licence

In accordance with S. 45 of the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (NWNSRTA or the Act), the NWB may issue a licence for a term not exceeding twenty-five (25) years. In determining an appropriate term of a water licence, the Board considers a number of factors, including the results of the AANDC's annual site Inspection and the compliance record of the Applicant.

The Licensee has requested a five (5) year term for the renewal Licence (to expire in 2019). In their submission, AANDC - Water Resources Division (AANDC) recommended that the Licence be renewed for five (5) years.

The AANDC Inspection of August 17, 2011, identified longstanding Non-Compliance of the Act or Licence issues that were to be addressed by the Hamlet.

The NWB is fully aware of recurring non-Compliance issues with respect to the Act in the context of the Licence issued to the Hamlet. The NWB acknowledges, however, that some improvements have been made by the Licensee (i.e. actual Monitoring completed in 2013) during last year in trying to address the Non-Compliance issues and to reach the short-term compliance goals. However, the Board believes that a licence term of three (3) years will provide a realistic opportunity for the Licensee to prove to the Board that it can meet the long-term requirements as well as establish a consistent compliance record with respect to the requirement under the terms and conditions of its licence. The three (3) year renewal Licence will also ensure that sufficient time is given to permit the Licensee to develop, submit, and implement the plans required under its Licence with respect to the planned construction works

for the Wastewater Treatment Plant and construction of a new Water Truck-fill Station, expected by December 31, 2014 and by December 31, 2016, respectively.

The Hamlet's actual daily water use may be higher than 300 m^3 *per* day when filling the Water Storage Reservoir which could trigger a change of the Licence Type "B" to Type 'A" .The three (3) year term shall allow the Licensee to measure the daily water use during two (2) full years and help the Board to accurately determine the Type of Licence for the future renewal.

Annual Reports

As part of its obligations under this Licence, the Licensee is required to generate and submit to the Board for review, on an annual basis, a report that pertains to its undertakings and activities. The report is for the purpose of ensuring that the NWB has an accurate update of municipal activities during each calendar year. This information will be maintained on the public registry and will be available to any interested parties upon request. A "*Standardized Form for Annual Reporting*" is to be used by the Licensee and is available for use at the NWB's ftp site at:

http://www.nwb-oen.ca/public-registry

The Licensee is advised that the NWB *Standardized Form* could be supplemented by additional monitoring documentation and Licensee's annual reporting forms as advised by AANDC, The Licensee is required to submit all monitoring data with appropriate station identification to the NWB as a requirement of the Annual Report in Part B Item 1 of the licence. The Annual Report shall include all Monitoring Program results as per requirements included within Part H (Conditions applying to the Monitoring Program) of the Licence. The Licensee shall provide, with Annual Reports, all tabular summaries for monitoring program stations in addition to laboratory results. As stated by AANDC *these summaries should reference licensed monitoring program stations (e.g., PAN-X), effluent quality limits, and any exceedances*.

Water Use

The Hamlet currently receives its freshwater supply from the Duval River to the Water Storage Reservoir located approximatively 100m north of the River. Water is stored every summer from the end of May to the beginning of October for annual use. The rest of the time Duval River freezes up, and no flow occurs. A Water Storage Reservoir is filled each summer for annual storage. A water Truck-fill Station is built at the top of the northern berm of the Reservoir. In order to meet the demand for future population growth for the next 20 years a new Truck-fill Station is expected to be constructed to replace the existing one by December 31, 2016.

Under the expired licence, 100,000 m^3 of water per year was allocated, and although the Licensee has requested within the renewal application of May 21, 2014, 51,531 m^3 of water *per* year for all purposes, on July 29, 2014, the GN-CGS clarified with a revised application that 74,000 m^3 of water *per* year would be required.

No concerns were raised by the parties in their written submissions (AANDC) as to the amount of water required by the Hamlet, the manner in which it is obtained or in the manner in which this water will be used.

In review of the application, the NWB relied on the new Nunavut Waters Regulations (Regulations) issued on April 18, 2013 and the definition of "Use" provided by the *Act*. All water taken from the Duval River, main water source to fill the reservoir would qualify under the definition as "use of water". Therefore, having given due consideration to the information presented during the review, the NWB has determined that water extracted from the source water supply, for any purposes, is considered as a Use of water and that the Licensee is requested to daily measure directly on the source at Monitoring Program Station PAN-1 all freshwater used for all purposes.
The Licensee shall also measure on daily, monthly and annual basis all freshwater used for all purposes at the Truck-fill Station.

The Licensee is also advised that according to the Schedule 2 of Regulations any use of 300 m^3 or more *per* day and any use of waters related to the storage of 60,000 m^3 or more water would require a Type "A" Water Licence. The Board has, therefore, set the maximum water usage for all purposes specified in this Licence at 74,000 m^3 *per* year or up to 299 m^3 *per* day for filling of the reservoir.

Deposit of Waste

Sewage
The Hamlet currently provides trucked sewage services for the Community. Specific comments relevant to Waste Water Treatment Plant (WWTP) operations were provided by AANDC. AANDC noted that the WWTP Operation and Maintenance Plan (WWTP O&M Plan) should *be revised to provide a non-technical overview of its design and ability to satisfy (licensed) effluent discharge criteria. Details concerning the management of treated effluent and sludge as well as licensed monitoring program requirements should be included in the plan*. The revised WWTP O&M Plan should also include an Executive Summary for an overview of how the facilities are being operated, following with a Document Control Section to track document revisions. AANDC recommended also *developing sewage Sludge Treatment Program* to diminish the leachate generation from Sludge being bagged for disposal in the Solid Waste Disposal Facility.

AANDC Inspection of July 2011 indicated *that treatment plant continues to struggle with the volume of effluent input into the system.* It was also stated that *the practice of surface disposal of Sludge is contrary to the issued license and not acceptable to the Inspector, and Sludge and processing from the fish plant are to be buried as outlined in the now expired license.*
The NWB concurs with these recommendations, and has imposed requirements in the Licence with respect to the future revision of the WWTP O&M Plan to be submitted within the 2014 Annual Report. The WWTP O&M Plan shall be revised in accordance to the October 1996 Government of the Northwest Territories "Guidelines for the Preparation of an Operation and Maintenance Manual for Sewage and Solid Waste Disposal Facilities in the Northwest Territories" and shall include details on Sludge Treatment Program and the WWTP changes/upgrades that the Hamlet intents to complete by December 31, 2014. The Licensee shall make every effort to address all operational issues identified by Inspector.

Solid Waste

The June 2014 "Solid Waste Operation and Maintenance Plan for Hamlet of Pangnirtung" (SW O&M Plan) submitted as additional information within the Application states that Solid Waste generated in Pangnirtung includes: municipal Solid Waste generated in the community, sewage Sludge generated in the WWTP and fish waste generated at the fish plant. Solid waste from the Hamlet is currently disposed of in a landfill located approximately 800 metres from the edge of the Hamlet. The current landfill site (200m long and 65 m width),is a rectangular land area, is enclosed with 3m high steel fence all around. The SW O&M Plan states that the Community is currently managing an independent metal dump site located just opposite to the landfill site and this site is not fenced.

About 30% of the landfill area is designated for fish and sludge waste management. Offal from the fish processing plant was disposed of at the solid waste disposal facility until 2010. Fish plant management estimated that the plant operated for approximately 115 days/year and that 1.5 to 2 m^3 of fish waste was generated *per* day, or 230 m^3 per year. The GN and the fish plant were investigating alternative disposal methods for the fish waste (e.g. ocean dumping), which would remove the waste from the Hamlet's solid waste disposal stream.

Bagged Sludge is presently removed from the aerobic digester approximately one or two times *per* week. In its comment, AANDC stated that sludge can be treated prior to landfill disposal. *Treatment of sewage Sludge Program can be implemented (freeze/thaw dewatering of sludge on drying beds and the collection/further treatment of recovered leachate).* AANDC also stated that the Licensee *should ensure that non-contact water diversion measures are implemented at uphill of its Solid Waste Disposal Facility and bulky metals and hazardous waste storage areas to limit the volume of effluent requiring management*.

The July 2011 AANDC Inspection stated that *the Solid Waste management area requires proper segregation of Hazardous wastes into a lined containment area for storage, packaging for shipment off site is required*. It was also noted that a *new metals / vehicle storage area has been created outside the boundaries of the existing solid waste management area.*

The NWB concurs with AANDC recommendations, and advises the Licensee to make improvements to the sewage Sludge dewatering process at the WWTP as these improvements will reduce the water content of the Sludge, and therefore will reduce the volume of Sludge generated. The Board requires that the Hamlet give serious consideration to AANDC recommendations, and in the interim take whatever steps are practicable to prevent any impact to the environment.

From the Board's understanding, Hamlet's natural attenuation landfill is not lined and small amounts of contaminants can enter the surrounding environment to be naturally broken down. In this type of landfill, the rate that contaminants enter the environment is expected to occur at a rate such that contaminants can easily be broken down and the surrounding environment is not overwhelmed. Natural attenuation landfills also rely on permafrost aggrading into the covered waste cells of the landfill and eventually freezing them. However, as contaminants are able to freely enter the environment in this type of landfill, proper waste segregation is important to ensure harmful contaminants are kept out of the landfill.

To ensure that site runoff is properly managed so there is no impact to the natural environment in terms of contamination the Board has again included within the Monitoring Program Stations sampling of Monitoring Program Stations for the Landfill leachate/run-off from domestic waste dumping area (PAN-4) and from Sludge dumping area (PAN-5). The Board has also included an additional Monitoring Program Station (PAN-6) for the run-off from metal/vehicle dump area.

Operational Plans

Part F, Item 1 of expired 3BM-PAN0810 Licence required that the Licensee submit to the Board for approval within ninety (90) days of issuance of the Licence the following revised plans:

a. Water Distribution Facility Operation and Maintenance (O&M) Plan;
b. Waste Water Treatment Plant Operation and Maintenance (O&M) Plan;
c. Fish Process Plant Waste Management Plan;
d. Sewage Sludge and Screenings Management Plan;
e. Solid Waste Disposal Facility Operation and Maintenance (O&M) Plan;
f. Spill Contingency Plan; and
g. Monitoring Program Quality Assurance/Quality Control Plan (QA/QC Plan).

The following environmental management documents included with the Application were found acceptable by the Board:

- Operation and Maintenance Manual for Water Truck-fill Hamlet of Pangnirtung, completed in 1987 (WTS O&M Plan);
- Operation and Maintenance Manual for Waste Water Treatment Plant Hamlet of Pangnirtung (WWTP O&M Plan);
- Solid Waste Operation and Maintenance Plan for Hamlet of Pangnirtung, dated June 2014 (SW O&M Plan);
- Station Pangnirtung Fish Waste Lagoon Decommissioning Plan, dated May 23, 2013 (FWLD Plan);

However, under Part F, Item 1, the Licensee shall be required to submit to the Board for approval within the 2014 Annual Report, revised WTS O&M, WWTP O&M and SW O&M Plans to include the following:

- Executive Summaries;
- Document Control Section intending to track document revisions and providing document version, date, sections and pages, and summary of changes.
- The WWTP O&M Plan shall also include a non-technical overview of its design and ability to satisfy effluent discharge criteria incorporated in the Licence, details of Sludge Management / Treatment Program, and details of Monitoring Program requirements. The revised plan shall also include details related to WWTP changes/upgrades expected by end of 2014;
- The SW O&M Plan shall also include details of Monitoring Program Stations actual description, a schematic and a topographic map of appropriate scale detailing the landfilling areas, run-off from Sludge disposal area, and Monitoring Program Stations locations.

From the Board's understanding the Station Pangnirtung Fish Waste Lagoon Decommissioning Plan (FWLD Plan) is a conceptual interim plan. Therefore under Part G Item 1, the Licensee shall be required to submit a final decommissioning plan at least 6 months prior to abandoning this facility amongst other facilities.

The Board notes that a section of Spill Contingency Planning is included within the SW O&M Plan. AANDC stated that this Plan should be a *stand-alone document because hazardous material spills can occur in areas other than the Solid Waste Disposal Facility (e.g., municipal buildings and roads, oil and fuel storage tanks, quarry areas, etc.).* The NWB believes that a stand-alone Spill Contingency Plan that details spill responses and procedures for Water Supply, Sewage Disposal and Solid Waste Disposal Facilities Operations would facilitate the effective implementation of spill response measures by Hamlet staff. Therefore the Licensee shall be required to submit a stand-alone Spill Contingency Plan under Part F, Item 2.

Monitoring Program

Part H of the Licence details the environmental monitoring requirements. The Licensee included a request to amend the water licence by *deleting the item 3 (a and b) of Part D from the licence due to time constraint of sampling, shipping and getting the samples tested in time in this southern lab since there is no accredited lab in Nunavut.*

In addition to this request, the Licensee recommended *amending the Part F, Item 3 that requires an annual inspection of all engineered facilities related to the management of water and waste by a Geotechnical Engineer to allow the Licensee to perform an annual inspection of all engineered facilities related to the management of water and waste by the Regional Municipal Planning Engineer.*

Acute Lethality tests of treated municipal wastewater effluent are generally included within the water licenses by third Parties (Environment Canada (EC) or Fisheries and Oceans Canada (DFO)) request to ensure that the subsection 36 (3.) of Fisheries Act requirements are met. As the Board did not receive any objections from relevant Parties, and recognizing related time/logistical constraints, the Board has removed this requirement from the renewal Licence.

In its comment with respect to annual inspections to be completed by *Regional Municipal Planning Engineer*, AANDC stated that this is an acceptable proposal, and recommended that more stringent requirements be applied if it is determined that infrastructure pose higher environmental and/or health and safety risks. The Board concurs with this recommendation, and has amended this condition. Part F, Item 5 of the Licence includes a requirement of annual inspection of all engineered facilities related to the management of water and waste to be carried by an Engineer (Civil, Municipal or Geotechnical).

The SW O&M Plan states that the Community *manages an independent metal dump site located just opposite to the land fill site and this site is not fenced*. The NWB notes that there is no indication whether or not that metal dump area is lined. The July 2011 AANDC Inspection also stated that *new metals / vehicle storage area has been created outside the boundaries of the existing solid waste management area* that is not *covered under the existing/ now expired license and is a change to the operations of the Facilities within the community*.

The Board concurs with AANDC Inspection, and has included an additional Program Monitoring Station (PAN-6) for the contact water discharge (if the site is lined) or potential run-off from the metal damp unlined site. To prevent the contact water's spreading into the surrounding environment the Licensee shall ensure that a containment pond is created for the potential run-off and to facilitate the sampling.

It should also be noted that while minimum sampling requirements have been imposed, additional sampling may be required upon request by an Inspector.

Quality Assurance / Quality Control Plan (QA/QC Plan)

The requirement to submit a Quality Assurance / Quality Control Plan (QA/QC Plan) is to provide the necessary checks and controls under the Licence for sampling, monitoring and reporting for Hamlet of Pangnirtung. The purpose of the QA/QC Plan is to ensure that samples taken in the field as part of the Monitoring Program will be of a high quality, so as to accurately represent the physical and chemical nature of the samples being taken. These procedures are generally developed from literature and guidelines, and are intended to promote good practices in environmental management.

The QA/QC Plan included within the SW O&M Plan is very general and does not include information about the laboratory accreditation pursuant to ISO/IEC Standard 17025.

The NWB has included a requirement to submit under Part H, Item 8 of the Licence, a "*Quality Assurance/Quality Control (QA/QC) Plan for the Hamlet Waste Water and Solid Waste Disposal Facility Monitoring Program*" prepared in accordance with the INAC *"Quality Assurance (QA) and Quality Control (QC) Guidelines for use by Class "B" Licensees in Collecting Representative Water Samples in the Field, 1996"*.

The QA/QC Plan shall be submitted to the Board with a current approval letter from an accredited lab and shall meet the requirements set out in Part H, Items 9 and 10.

NUNAVUT WATER BOARD
WATER LICENCE RENEWAL

Licence No. **3BM-PAN1417**

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 PANGNIRTUNG

(Licensee)

P.O BOX 253 PANGNIRTUNG, NUNAVUT, X0A 0R0

(Mailing Address)

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

Licence Number/Type:	3BM-PAN1417 TYPE "B"
Water Management Area:	NORTHERN CUMBERLAND SOUND (51)
Location:	HAMLET OF PANGNIRTUNG QIKIQTANI REGION, NUNAVUT
Classification:	MUNICIPAL UNDERTAKING
Purpose:	DIRECT WATER USE AND DEPOSIT OF WASTE
Quantity of Water use not to Exceed:	74,000 CUBIC METRES PER ANNUM OR MAXIMUM OF 299 CUBIC METRES PER DAY
Date of Licence Issuance:	SEPTEMBER 16, 2014
Expiry of Licence:	SEPTEMBER 15, 2017

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

Thomas Kabloona,
Nunavut Water Board, Chair

PART A: SCOPE, DEFINITIONS AND ENFORCEMENT

1. Scope

This Licence allows for the use of water and the deposit of waste for a Municipal undertaking classified as per Schedule 1 of the *Regulations* at the Hamlet of Pangnirtung in Qikiqtani Region, Nunavut (Latitude: 66° 09' 00'' N and Longitude: 65° 40' 34'' W).

a. 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

b. 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

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

"**Addendum**" means the supplemental text that is added to a full plan or report usually included at the end of the document and is not intended to require a full resubmission of the revised report;

"**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;

"**Appurtenant Undertaking**" means an undertaking in relation to which a use of water or a deposit of waste is permitted by a licence issued by the Board;

"Board" means the Nunavut Water Board established under the *Nunavut Land Claims Agreement* and the *Nunavut Waters and Nunavut Surface Rights Tribunal Act;*

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

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

"**Final Discharge Point**" 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;

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

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

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

"**High Water Mark**" means the usual or average level to which a body of water rises at its highest point and remains for sufficient time so as to change the characteristics of the land (ref. Department of Fisheries and Oceans Canada, Operational Statement: Mineral Exploration Activities);

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

"**Licensee**" means the holder of this Licence;

"Metal Storage Area" means the facilities designated for the disposal of metal/vehicles, as described in the Application for Water Licence renewal and associated documents filed by the Licensee on July 29, 2014;

"**Modification**" means an alteration to a physical work that introduces a new structure or eliminates an existing structure and does not alter the purpose or function of the work, but does not include an expansion;

"**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;

"**Regulations**" means the *Nunavut Waters Regulations SOR/2013-69 18th April, 2013*;

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

"**Sewage Disposal Facilities**" comprises existing Waste Water Treatment Plant as described in the Application for Water Licence renewal and associated documents filed by the Applicant on July 29, 2014;

"Solid Waste Disposal Facility" means the facilities designated for the disposal of solid waste, as described in the Application for Water Licence renewal and associated documents filed by the Licensee on July 29, 2014;

"**Spill Contingency Plan**" means a Plan developed to deal with unforeseen petroleum and hazardous materials events that may occur during the operations conducted under the Licence;

"**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;

"**Water**" **or** "**Waters**" means waters as defined in section 4 of the Act; and

"**Water Supply Facilities**" comprises the area and associated intake infrastructure at the Duval River, Water Storage Reservoir and Truck-fill Station, as described in the Application for Water Licence renewal and associated documents filed by the Applicant on July 29, 2014.

3. Enforcement

a. Failure to comply with this Licence will be a violation of the *Act*, subjecting the Licensee to the enforcement measures and the penalties provided for in the *Act*;

b. All inspection and enforcement services regarding this Licence will be provided by Inspectors appointed under the *Act*; and

c. For the purpose of enforcing this Licence and with respect to the use of water and deposit or discharge of waste by the Licensee, Inspectors appointed under the *Act*, hold all powers, privileges and protections that are conferred upon them by the *Act* or by other applicable law.

PART B: GENERAL CONDITIONS

1. The Licensee shall file an Annual Report on the Appurtenant Undertaking with the Board no later than March 31st of the year following the calendar year being reported, containing the following information:

   a. tabular summaries of all data generated under the "Monitoring Program";
   b. summary of modifications to the "Monitoring Program" in accordance with Part H, Item 12;
   c. the daily, monthly and annual quantities in cubic metres of freshwater obtained from all sources;
   d. the daily, monthly and annual quantities in cubic metres of each and all waste discharged; including the hazardous and non-hazardous waste accepted at the Solid Waste Facilities;
   e. a summary of modifications and/or major maintenance work and/or investigations carried out on the Water Supply and Waste Disposal Facilities, including all associated structures and facilities;
   f. a list of unauthorized discharges and summary of follow-up action taken;
   g. a summary of any abandonment and restoration work completed during the year and an outline of any work anticipated for the next year;
   h. Any updates or revisions for manuals and plans *(i.e., Operations and Maintenance, Abandonment and Restoration, QA/QC*) as required by changes in operation and/or technology;
   i. a summary of any studies, reports and plans requested by the Board that relate to waste disposal, water use or reclamation, and a brief description of any future studies planned;
   j. any other details on water use or waste disposal requested by the Board by November 1st of the year being reported.

2. The Licensee shall notify the NWB of any changes in operating plans or conditions associated with this project at least thirty (30) days prior to any such change.

3. 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.

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

5. The Licensee shall, install flow meters or other such devices, or implement suitable methods required for the measuring of water volumes as required under Part H, Item 2

6. The Licensee shall, 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.

7. The Licensee shall, immediately report to the 24-Hour Spill Report Line at (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.

8. The Licensee shall, in relation to any application to renew or amend the Licence, include a Plan for Compliance for Board approval, clearly demonstrating the measures the Licensee will undertake, including an implementation schedule, to achieve full compliance with the conditions of this Licence, including the issues raised in the Inspector's Reports.

9. The Licensee shall, for all Plans submitted under this Licence, include a proposed timetable for implementation. Plans submitted cannot be undertaken without subsequent written Board approval and/or direction. The Board may alter or modify a Plan if necessary to achieve the legislative objectives and will notify the Licensee in writing of acceptance, rejection or alteration of the Plan.

10. The Licensee shall, for all Plans submitted under this Licence, implement the Plan as approved by the Board in writing.

11. The Licensee shall review the Plans referred to in this Licence, as required by changes in operation and/or technology, and modify the Plan accordingly. Revisions to the Plans shall be submitted in the form of an Addendum to be included with the Annual Report.

12. Every Plan to be carried out pursuant to the terms and conditions of this Licence shall become a part of this Licence, and any additional terms and conditions imposed upon approval of a Plan by the Board become part of this Licence. All terms and conditions of the Licence should be contemplated in the development of a Plan where appropriate.

13. The Licensee shall ensure a copy of this Licence is maintained at the site of operations at all times. Any communication with respect to this Licence shall be made in writing to the attention of:

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

(b) Inspector Contact:

Manager of Field Operations, AANDC
Nunavut District, Nunavut Region
P.O. Box 100
Iqaluit, NU X0A 0H0
Telephone: (867) 975-4295
Fax: (867) 979-6445

14. 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.

15. The Licensee shall ensure that any document(s) or correspondence submitted by the Licensee to the NWB is received and acknowledged by the Manager of Licensing.

16. This Licence is assignable as provided for in Section 44 of the *Act*.

PART C: CONDITIONS APPLYING TO WATER USE

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

2. The annual quantity of water use for all purposes under this Licence shall not exceed seventy-four thousand (74,000) cubic metres per year or maximum of two hundred and ninety-nine (299) cubic metres per day.

3. Where the use of water is of a sufficient volume that the source Water body may be drawn down, the Licensee shall submit to the Board for approval in writing the following: the volume required a hydrological overview of the water body, details of impacts, and proposed mitigation measures.

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

5. The Licensee shall equip all water intake hoses with a screen of appropriate mesh size to ensure that fish are not entrained and shall withdraw water at a rate such that fish do not become impinged on the screen.

6. The Licensee shall not remove any material from below the ordinary High Water Mark of any water body unless approved by the Board in writing.

7. The Licensee shall not cause erosion to the banks of any body of water and shall provide necessary controls to prevent such erosion.

8. Sediment and erosion control measures shall be implemented prior to and maintained as required during Hamlet operations, to prevent entry of sediment into water.

PART D: CONDITIONS APPLYING TO WASTE DISPOSAL

1. The Licensee shall direct all Sewage to the Waste Water Treatment Plant or as otherwise approved by the Board in writing.

2. All Effluent discharged from the Waste Water Treatment Plant at Monitoring Program Station PAN-3 shall not exceed the following Effluent quality limits:

Parameter	Maximum Concentration of any Grab
PH	Between 6 and 9
BOD_5	120 mg/L
Total Suspended Solids	180mg/L
Faecal Coliforms	1×10^3 CFU/100mL
Oil and grease	No visible sheen

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

4. The Licensee shall dispose of and contain all Solid Wastes at the Solid Waste Disposal Facility or as otherwise approved by the Board in writing.

5. The Licensee shall segregate and store all hazardous materials and/or hazardous waste within the Solid Waste Disposal Facility in a manner as to prevent the deposit of deleterious substances into any water until such a time as proper disposal arrangements are made.

6. The Licensee shall segregate and store all metals/vehicles within the Metal Storage Area in a manner as to prevent the deposit of deleterious substances into any water until such a time as proper disposal arrangements are made.

7. The Licensee shall dispose of and contain all fish processing wastes at the Solid Waste Disposal Facility, in a pit excavated below the active layer-permafrost interface. Fish wastes deposited at the Solid Waste Disposal Facility shall be treated with lime, and covered with soil prior to the onset of the annual spring freshet and then weekly thereafter during June, July, August and September.

9. The Licensee shall implement measures to prevent hazardous materials and/or leachate from the Solid Waste Disposal Facility and Metal Storage Area from entering water.

10. The Licensee shall implement measures to control wind-blown litter at the Solid Waste Disposal Facility and Metal Storage Area.

11. The Licensee shall implement measures to control surface runoff from the Solid Waste Disposal Facility and Metal Storage Area.

PART E: CONDITIONS APPLYING TO MODIFICATION AND CONSTRUCTION

1. The Licensee shall submit to the Board for approval, for construction drawings stamped and signed by a qualified Engineer registered in Nunavut, sixty (60) days 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 consent from the Board, carry out Modifications to the Water Supply Facilities and Waste Disposal Facilities provided that such Modifications are consistent with the terms of this Licence and the following requirements are met:

    a. the Licensee has notified the Board in writing of such proposed Modifications at least sixty (60) days prior to beginning the Modifications;
    b. such Modifications do not place the Licensee in contravention of the Licence or the *Act*;
    c. the Board has not, during the sixty (60) days following notification of the proposed Modifications, informed the Licensee that review of the proposal will require more than sixty (60) days; and
    d. the Board has not rejected the proposed Modifications.

3. The Modifications for which all of the conditions referred to in Part E, Item 2(a) through (d), have not been met, may only be carried out upon written approval from the Board.

4. The Licensee shall, within ninety (90) days of completion of Modification or Construction of facilities and/or infrastructure associated with the project, submit to the Board a Construction Summary Report along with stamped as-built plans and drawings, providing explanation to reflect any deviations from for construction drawings taking into account construction and field decisions and how they may affect the performance of engineered facilities.

5. All activities shall be conducted in such a way as to minimize impacts on surface drainage and the Licensee shall immediately undertake any corrective measures in the event of any impacts on surface drainage.

6. The Licensee shall implement and maintain sediment and erosion control measures prior to and during activities carried out under this Part, to prevent impacts to water resulting from the release of sediment and to minimize erosion.

7. With respect to earthworks, the deposition of debris or sediment into or onto any water body is prohibited. These materials shall be disposed a distance of at least thirty-one (31) metres from the ordinary High Water Mark in such a fashion that they do not enter the water.

8. The Licensee shall use material that is free of contaminants for construction, operation, and maintenance activities and that is obtained from approved sources and has been demonstrated not to be potentially acid generating and metal leaching.

PART F: CONDITIONS APPLYING TO OPERATION AND MAINTENANCE

1. The Licensee shall submit to the Board approval, within the 2014 Annual Report, the following revised Operation Plans in accordance with the *"Guidelines for the Preparation of an Operation and Maintenance Manual for Sewage and Solid Waste Disposal Facilities in the Northwest Territories; 1996"*, to take into consideration at a minimum, comments received during the Application review process and any operational changes/upgrades of facilities:

    a. Water Supply Facilities Operation and Maintenance Plan;
    b. Waste Water Treatment Plant Operation and Maintenance Plan;
    c. Solid Waste Disposal Facility Operation and Maintenance Plan.

2. The Licensee shall submit to the Board for approval, within the 2014 Annual Report, a stand-alone Spill Contingency Plan that details spill responses and procedures for Water Supply, Sewage Disposal and Solid Waste Disposal Facilities Operations, in the format set out by the Consolidation of Spill Contingency Planning and Reporting Regulations R-068-93.

3. If the Plans referred to in Part F, Items 1 and 2 are not approved the Licensee shall make the necessary revisions and resubmit the Plan(s) within thirty (30) days following notification from the Board.

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

5. An inspection of all engineered facilities related to the management of water and waste shall be carried out by an Engineer (Civil, Municipal or Geotechnical) annually and before commissioning any facility. The Engineer's report shall be submitted to the Board within sixty (60) days of the inspection, including a Cover Letter from the Licensee outlining an implementation plan addressing each of the Engineer's recommendations.

6. The Licensee shall perform more frequent inspections of the engineered facilities at the request of an Inspector.

7. The Licensee shall review the Plans referred to in this Part as required by changes in operation and/or technology and modify the Plan accordingly. Revisions to the Plan are to be submitted in the form of an Addendum to be included with the Annual Report, unless directed otherwise by an Inspector.

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

a. employ the appropriately approved Spill Contingency Plan for the Hamlet of Pangnirtung. Take whatever steps are immediately practicable to protect human life, health and the environment;
b. report the incident immediately via the 24-Hour Spill Reporting Line at (867) 920-8130 and to the AANDC Manager of Field Operations at (867) 975-4295; and
c. submit to the Inspector, a detailed report on each occurrence, not later than thirty (30) days after initially reporting the event, that provides the necessary information on the location (including the GPS coordinates), initial response action, remediation/clean-up, status of response (ongoing, complete), proposed disposal options for dealing with contaminated materials and any preventative measures to be implemented.

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 or the construction of new facilities to replace existing ones. Where applicable, the Plan shall include information on the following:

   a. water intake facilities;
   b. the water treatment and waste disposal sites and facilities;
   c. solid waste facility;
   d. metal storage area;
   d. petroleum and chemical storage areas;
   e. any site affected by waste spills;
   f. leachate prevention;
   g. an implementation schedule;
   h. maps delineating all disturbed areas, and site facilities;
   i. consideration of altered drainage patterns;
   j. type and source of cover materials;
   k. future area use;
   l. hazardous wastes; and
   m. a proposal identifying measures by which restoration costs will be financed by the Licensee upon abandonment.

2. If the Plan referred to in Part G, Item 1 is not approved, the Licensee shall make the necessary revisions and resubmit the Plan within thirty (30) days following notification from the Board.

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

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

5. Areas that have been contaminated by hydrocarbons shall be reclaimed to meet objectives as outlined in the Government of Nunavut's Environmental Guideline for Site Remediation, January 2002. The use of reclaimed soils for the purpose of back fill or general site grading may be carried out only upon consultation and approval by the Government of Nunavut, Department of Environment and an Inspector.

PART H: CONDITIONS APPLYING TO THE MONITORING PROGRAM

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

Monitoring Program Station Number	Description	Status
PAN-1	Raw Water supply intake at the Duval River	Active (Volume)
PAN-2	Raw Sewage from pump-out truck	New (Volume)
PAN-3	Effluent from Waste Water Treatment Facility	Active (Quality)
PAN-4	Run-off from Sludge Disposal Area	Active (Quality)
PAN-5	Run-off from the Solid Waste Disposal Facility	Active (Quality)
PAN-6	Run-off from Metals Storage Area	New (Quality)

2. The Licensee shall measure and record in cubic metres, the daily, monthly and annual quantities of water pumped at Monitoring Program Stations PAN-1 and at the Truck-fill Station, for all purposes.
3. The Licensee shall measure and record in cubic metres the daily, monthly and annual quantities of raw sewage offloaded from trucks at Monitoring Program Station PAN-2 for all purposes.

4. The Licensee shall sample at Monitoring Program Station PAN-3 monthly during operation and discharge of Effluent. Samples shall be analyzed for the following parameters:

Biochemical Oxygen Demand - BOD	Faecal Coliforms
pH	Conductivity
Total Suspended Solids	Oil and Grease (visual)
Nitrate-Nitrite	Ammonia Nitrogen
Chloride	Sulphate
Sodium	Potassium
Magnesium	Calcium
Total Hardness	Total Alkalinity
Total Phenols	Total Manganese
Total Arsenic	Total Aluminum
Total Cadmium	Total Cobalt
Total Copper	Total Chromium

Total Iron	Total Lead
Total Mercury	Total Nickel
Total Zinc	Total Organic Carbon - TOC

5. The Licensee shall sample at Monitoring Program Stations PAN-4, PAN-5 and PAN-6 once at the beginning, middle and near the end of discharge/run-off observed. Samples shall be analyzed for the parameters listed in Part H, Item 4:

6. The Licensee shall measure and record the annual quantities of sewage solids removed from the Waste Water Treatment Plant along with the treatment/storage/disposal provided.

7. Additional monitoring stations, sampling and analysis may be requested by an Inspector.

8. The Licensee shall submit to the Board for review, within the 2014 Annual Report, a Quality Assurance/Quality Control Plan that conforms to the guidance document *Quality Assurance (QA) and Quality Control (QC) Guidelines For Use by Class "B" Licensees in Collecting Representative Water Samples in the Field and for Submission of a QAQC Plan* INAC (1996). The Plan shall be acceptable to an accredited laboratory and include a covering letter from the accredited laboratory confirming acceptance of the Plan for analyses to be performed under the Licence.

9. 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 in writing.

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

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

12. Modifications to the Monitoring Program including the Monitoring Program Stations and parameters may be made only upon written approval of the Board.

13. The Licensee shall submit to the Board for review and approval, within six (6) months of the issuance of this licence, a report identifying any additional Final Discharge Point from the Waste Water Treatment Plant. The report shall include at a minimum:

    a. Plans, specifications, geographic coordinates and a general description of each Final Discharge Point and direction of flow;
    b. A description of how each Final Discharge Point is designed and maintained, if required; and
    c. A description of the receiving environment.

Appendix B:
Summary of Sample Bottle Requirements

Appendix B1 – General Bottle Requirements

Appendix A: Individual Parameters for Water Analysis (see Appendix D for O.Reg. 153/04 requirements)

Parameter	Sample Containers		Minimum	Preservative	Storage	Holding Times		
	Size mL)	Type	Volume (mL)		Conditions	Caduceon	EPA/SM(Reg.)	MOE
GENERAL CHEMISTRY, PHYSICAL PROPERTIES								
Alkalinity	500	P	50	None	1	7d	14d/14d	7d
Ammonia (NH_3)	125	P or G	50	pH <2 H_2SO_4/None	1	28d/3d	28d/28d	10d
BOD_5/$CBOD_5$	500	P	300	None	1	4d	48h/48h	4d
Bromide	500	P	50	None	1	28d	-	-
Chloride	500	P	50	None	1	28 d	28d/28d	30d
COD	125, 250	P or G	50	pH<2 H_2SO_4	1	28 d	28d/28d	30d
Colour	500	P	100	None	1	48h/7d	48h/48h	7d
Conductivity	500	P	100	None	1	4d	28d/28d	4d
Cyanide (free)	125	P	50	pH >12 NaOH	1, in dark	7d	- /14 d	7d(MISA)
Cyanide (total)	125	P	50	pH >12 NaOH	1	6 m	14d/14d	6 m
Fluoride	500	P	50	None	1	28d	28d/28d	30d
Hardness	250	P	100	pH<2 HNO_3	2	28d	6m/6m	28d
Lead (O.Reg 243, O.Reg 170)	1000	P	1000	pH<2 HNO_3	2	60d	6m/6m	60d
Mercury	125	G,AG, P	100	pH<2 HCl , or $K_2Cr_2O_7$ + HNO_3	2	7d	28d/-	14d, 7d(MISA)
Metals- except Mercury	125	P	100	pH<2 HNO_3	2	60d	6m/6m	60d
Nitrate (N)	500	P	50	None	1	7d	48h/48h	7d
Nitrite (N)	500	P	50	None	1	7d	48h/48h	7d
Nitrate-Nitrite (N)	500	P	50	None	1	7d	48h/48h	7d
Nitrogen (Total Kjeldahl)	125, 250	P or G	100	pH<2 H_2SO_4	1	28d	28d/-	-
Organic Carbon, Dissolved (DOC)	125	G or P	40	Field filter + pH <2 H_2SO_4 / None	1	28d/7d	-	-
Organic Carbon, Total (TOC)	125	G or P	40	pH<2 H_2SO_4	1	28d	28d/28d	-
Oil & Grease, Total, A/V/Mineral	1000	G	1000	HCl/None	1	28d/7d	28d/28d	7d(MISA)
pH	500	P	100	None	1	4d	Imm./Imm.	4d/asap(MISA)
Phenolics (4-aap) *	60, 120	AG	50	pH<2 H_2SO_4	1	28d	28d/28d	30d(MISA)
Phosphate, dissolved (P)	125	P	50	Filter, analyze ASAP/pH<2 H_2SO_4	1	48h/28d	48h/-	-
Phosphorus, total	125	P or G	100	pH<2 H_2SO_4	1	28d	28d/-	30d(MISA)
Solids (TS,TSS,TDS,VS,VSS)	500	P	500	None	1	7d	7d/2-7d	7d(MISA)
Silica	125	P	100	pH<2 HNO_3	2	28d	28d/-	-
Sulphide (S^{2-} , H_2S)	125	P or G	100	2N zinc acetate + pH>9 NaOH	1	7d	7d/7d	7d(MISA)
Sulfate	500	P	50	None	1	28d	28d/28d	30d(MISA)
Turbidity	500	P	100	analyze ASAP	1	48h/7d	48h/48h	48h(MISA)

MICROBIOLOGICAL								
Coliforms, Total, Fecal, Escherichia	300, 250	SP	100 (per test)	None, $Na_2S_2O_3$(chlorinated)	1	48h	-/30h	48h/24h(MISA)
Background	300, 250	SP	100	None, $Na_2S_2O_3$(chlorinated)	1	48h	-/30h	48h
Heterotrophic Plate Count	300, 250	SP	50	None, $Na_2S_2O_3$(chlorinated)	1	48h	-/24h	48h
Fecal Streptococcus	300, 250	SP	100	None, $Na_2S_2O_3$(chlorinated)	1	48h	-/24h	48h
Pseudomonas	300, 250	SP	100	None, $Na_2S_2O_3$(chlorinated)	1	48h	-/24h	48h
Iron Reducing Bacteria	300, 250	SP	100	None	1	48h	-	-
Chlorophyll-a	1000	AG	1000	None, Wrap in Aluminum Foil	1, in dark	30d	- /30d	-
ORGANICS								
Diquat/Paraquat	1000	P	250	None, $Na_2S_2O_3$(chlorinated)	1	14dpre/20dpost	7dpre/21dpost	20d
Glyphosate	1000	P	50	None, $Na_2S_2O_3$(chlorinated)	1	14d	14d	20d
Glycols	40	GV	40	None	1	7d	-	-
OC Pesticides	1000	AG	1000	None, $Na_2S_2O_3$(chlorinated)	1	10dpre/40dpost	14dpre/30dpost	42d
PAH's	1000	AG	1000 (x2)	None	1	14dpre/40dpost	14dpre/30dpost	35d
PCB's	1000	AG	1000	None, $Na_2S_2O_3$(chlorinated)	1	10dpre/40dpost	14dpre/30dpost	42d
PHC (F1)	40	AGV	40 (x2)	$NaHSO_4$, HCl, None	1	14d	-	7d
PHC (F2-F4)	1000	AG	1000	$NaHSO_4$, None	1	14d	-	14dpre/7dpost
Phenols by GC/MS	1000	AG	1000	None	1	7dpre/ 30dpost	14dpre/30dpost	20d/30d(MISA)
SVOC (Acid, Base/Neutral Ext.)	1000	AG	1000 (x2)	None	1	14dpre/40dpost	14dpre/30dpost	30d
VOC's	40	AGV	40 (x2)	$NaHSO_4$, $Na_2S_2O_3$(chlorinated), HCl, None	1	7 to 14d	14d/14d	14d, 7to14(MISA)
SUBCONTRACTED PARAMETERS								
Dioxins/Furans	1000	AG	1000	None	1	30d	30d	
Formaldehyde	1000	AG	1000	None	1	7d		
NDMA	1000	AG	1000 (x2)	None	1	10d		10 d
NTA	1000	AG	100	None	1	30d		30 d
Radionuclides (Gross Alpha, Beta and Tritium)	1000	P	1000	None / HNO_3	1	10d / 6m		
Radionuclide (ODWS Table 3)	1000	P	1000 (x3)	None / HNO_3	1	10d / 6m		

Sample Container Codes:

P = Plastic, either HDPE or PETE

G = Glass, GV = Glass Vial

AG = Amber Glass, AGV = Amber Glass Vial,

SP = Sterile Plastic

* Teflon-lined phenate free cap

Storage Conditions Codes:

1 = 4 ± 3°C

2 = Room Temperature (if preserved)

d = days

m = months

Imm = Immediate

Appendix B: Soil Sample Analysis/General (see Appendix D for O.Reg. 153/04 requirements)

Parameter	Sample Containers		Minimum Volume (mL)	Preservative	Storage Conditions	Holding Times		
	Size (mL)	Type				Caduceon	EPA	MOE
PHC (F2-F4)	180	AGJ	180	None	1	7 d	-	14 d
BTEX/PHC (F1)	100	AGJ	50	None	1	7 d	-	7 d
VOC's	100	AGJ	50	None	1	7 d	14 d	7 to 14 d
Metals (including mercury)	180	AGJ	180	None	2	28 d	28 d	Indefinite
Inorganic General	180	AGJ	180	None	2	see individual	see individual	see individual
Oil & Grease	180	AGJ	180	None	1	28 d	-	-
Nutrients (TOC,TP,TKN)	180	AGJ	180	None	2	28 d	-	-
Anions	180	AGJ	180	None	2	28 d	-	-
Semivolatiles	180	AGJ	180	None	1	see individual	see individual	see individual
Pesticides	180	AGJ	180	None	1	see individual	see individual	see individual

Sample Container Codes:
AGJ = Amber Glass Jar

Storage Conditions Codes:
1 = 4 ± 3°C
2 = Room Temperature

Indefinite = indefinite when dried
individual = individual parameter test method
d = days m = months

Appendix C: Bottles required for Regulatory Ontario Drinking Water Submissions

Parameter	Bottle	Sampling	Storage
THM's	Two - 40 mL VOC amber glass vials, $Na_2S_2O_3$ added	Fill slowly and completely - no air bubbles present	4 ± 3ºC
Fluoride, Nitrate and Nitrite	125 mL HDPE, 250 mL HDPE or 500mL PETE, no preservative (4°C)	Grab	4 ± 3ºC

Schedule 23, Sodium, Lead (Distribution): Inorganic Parameters

Parameter	Bottle	Sampling	Storage
Metals	125 mL HDPE, HNO_3 added	No rinsing. Be careful of acid preservative	Room temperature
Mercury	125 mL HDPE, $K_2Cr_2O_7$ + HNO_3 or pH<2 HCl	No rinsing. Be careful of acid preservative	4 ± 3ºC

Schedule 15.1 (O.Reg. 170) & O.Reg. 243 (Schools, Private Schools & Day Nurseries)

Parameter	Bottle	Sampling	Storage
Lead	1000 mL HDPE, HNO_3 added	No rinsing. Be careful of acid preservative	Room temperature

Schedule 24: Organic Parameters

Parameter	Bottle	Sampling	Storage
VOC's	Two - 40 mL VOC amber glass vials, $Na_2S_2O_3$ added	Fill slowly and completely - no air bubbles present	4 ± 3ºC
Pesticides	**2**- 1 L Amber Glass, no preservative – **Pest MS,** **1** - 1 L HDPE, $Na_2S_2O_3$ added - **Diquat, Paraquat & Glyphosate** **2** - 1 L Amber Glass, no preservative – **OC Pesticides**	Grab	4 ± 3ºC

Appendix D: Parameters for Water Analysis required for O.Reg 153/04 (amended July 01, 2011)

Parameter	Sample Containers		Minimum	Preservative	Storage	Holding Times		
	Size (mL)	Type	Volume (mL)		Conditions	Caduceon	MOE	Comments
GENERAL CHEMISTRY, PHYSICAL PROPERTIES								
Chloride	500	P	50	None	1	28 d	28d	
Conductivity	500	P	100	None	1	4d	28d	
Cyanide (wad)	125	P	50	Field filter + pH >12 NaOH	1	14d	14d	must be field preserved
Hexavalent Chromium (CrVI)	125	P	50	Field filter + buffer/NaOH to pH 9 - 10	1	28d	28d	must be preserved to pH 9.3 – 9.7 within 24hrs of sampling
Mercury	125	G,AG	100	Field filter + pH<2 HCl	2	28d	28d	must be field preserved
Methyl Mercury	125	G,AG	100	pH<2 HCl, $K_2Cr_2O_7$ + HNO_3	1	28d	28d	Do not Filter must be field preserved
Metals- except Mercury	125	P	100	Field filter + pH<2 HNO_3	2	60d	60d	must be field preserved
pH	500	P	100	None	1	4d	28d	
ORGANICS								
OC Pesticides	1000	AG	1000	None	1	14d	14d	
PAH's	1000	AG	1000	None	1	14d	14d	
PCB's	1000	AG	1000	None	1	14d	14d	
PHC (F1)	40	AGV	40 (x2)	pH<2 $NaHSO_4$, HCl / None	1	14d / 7d	14d / 7d	
PHC (F2-F4)	1000	AG	1000	pH<2 $NaHSO_4$, HCl / None	1	40d / 7d	40d / 7d	
Chlorophenols by GC/MS	1000	AG	1000	None	1	14d	14d	
SVOC (Acid, Base/Neutral Ext.)	1000	AG	1000	None	1	14d	14d	
VOCs/THMs/BTEX	40	GV,AGV	40 (x2)	pH<2 $NaHSO_4$, HCl / None	1	14d / 7d	14d / 7d	
Dioxins/Furans	1000	AG	1000	None	1	indefinite	indefinite	

Sample Container Codes:
P = Plastic, either HDPE or PETE
G = Glass, GV = Glass Vial
AG = Amber Glass, AGV = Amber Glass Vial,
SP = Sterile Plastic
* Teflon-lined phenate free cap

Storage Conditions Codes:
1 = 4 ± 3°C
2 = Room Temperature (if preserved)

d = days
m = months
Imm = Immediate

Appendix E: Parameters for Soil Analysis required for O.Reg 153/04 (amended July 01, 2011)

Parameter	Sample Containers		Minimum	Preservative	Storage	Holding Times		
	Size (mL)	Type	Volume (mL)		Conditions	Caduceon	MOE	Comments
GENERAL CHEMISTRY, PHYSICAL PROPERTIES								
Chloride	180	AGJ	180	None	1	30d	30d	indefinite when dried
Conductivity	180	AGJ	180	None	1	30d	30d	indefinite when dried
Cyanide (wad)	180	AGJ *	180	Protect from Light	1	14d	14d	
Fraction Organic Carbon (FOC)	180	AGJ *	180	None	1	28d	28d	indefinite when dried
Hexavalent Chromium	180	AGJ	180	None	1	30d	30d	
Mercury	180	AGJ	180	None	1	28d	28 d	
Methyl Mercury	180	AGJ	180	None	1	28d	28 d	
Metals- except Mercury	180	AGJ	180	None	1	180d	180 d	indefinite when dried
pH	180	AGJ	180	None	1	30d	30d	indefinite when dried
ORGANICS								
OC Pesticides	180	AGJ *	180	None	1	60d	60d	
PAH's	180	AGJ *	180	None	1	60d	60d	
PCB's	180	AGJ *	180	None	1	indefinite	indefinite	
PHC (F1) **	40	GV	40 (x2)	Methanol (preweighed) [a]	1	14d	14d	
PHC (F2-F4)	180	AGJ *	180	None	1	14d	14d	
Chlorophenols by GC/MS	180	AGJ *	180	None	1	60d	60d	
SVOC (Acid, Base/Neutral Ext.)	180	AGJ *	180	None	1	60d	60d	
VOCs/THMs/BTEX **	40	GV	40 (x2)	Methanol (preweighed) [a]	1	14d	14d	
Dioxins/Furans	180	AGJ *	180	None	1	indefinite	indefinite	

Sample Container Codes:
AGJ = Amber Glass Jar
G = Glass, GV = Glass Vial
AG = Amber Glass, AGV = Amber Glass Vial,
SP = Sterile Plastic
* Teflon-lined phenate free cap
** Include one (1) Terracore sampler for each sample

Storage Conditions Codes:
1 = 4 ± 3°C
2 = Room Temperature

[a] $NaHSO_4$ for bromomethane

d = days
m = months
Imm = Immediate

Appendix B2 – Water

Raw & Treated Water Samples Bottles Include:

1. 1 L clear, no preservative
2. 500 mL clear plastic, no preservative
3. Green cap for CN, 12 N NAON preservative
4. Purple cap for Cr-VI, NAON preservative
5. Red cap for Metals bottle, HNO_3 Nitric Acid preservative
6. 125 mL amber for Phenolics, H_2SO_4 Sulphuric Acid preservative
7. Round 250 mL plastic for Bacteria, $Na_2S_2O_3$ Sodium thiosulfate preservative to offset effects of chlorination
8. 40 mL Vial for DOC, should be field filtered, H_2SO_4 preservative

Appendix B3 – Wastewater

Wastewater Samples Bottles Include:

1. 1 L amber HCL preservative
2. Red cap for Metals bottle, HNO_3 Nitric Acid preservative
3. 125 mL amber for Phenolics, H_2SO_4 Sulphuric Acid preservative
4. Round 250 mL plastic for Bacteria, $Na_2S_2O_3$ Sodium thiosulfate preservative to offset effects of chlorination
5. 2 x 500 mL clear plastic no preservative
6. 1 Yellow cap for TKN/TP, H_2SO_4 Sulphuric Acid preservative

Appendix B4 - Leachate

Leachate Samples Bottles Include:

1. 3 x 1 L amber:
   1 for O&G, HCL preservative,
   1 for PHC F_2-F_4, no preservative, and,
   1 for SVOC-4, no preservative
2. Red cap for Metals bottle, HNO_3 Nitric Acid preservative
3. 125 mL amber for Phenolics, H_2SO_4 Sulphuric Acid preservative
4. Round 250 mL plastic for Bacteria, $Na_2S_2O_3$ Sodium thiosulfate preservative to offset effects of chlorination
5. 2 x 500 mL clear plastic, no preservative
6. 1 Yellow cap for TKN/TP, H_2SO_4 Sulphuric Acid preservative
7. 3 x 40 ml Vial for PHC F_1 and BTEX

Appendix C:
Completed Example of Chain of Custody Documentation

DRINKING WATER SUBMISSION FORM

CADUCEON ENVIRONMENTAL LABORATORIES
Client committed. Quality assured.

Indicate Laboratory or Depot Samples are Submitted to
☐ Kingston ■ Ottawa ☐ Richmond Hill ☐ Windsor ☐ Barrie ☐ London

DRINKING WATER FACILITY CLASSIFICATION

☐ Municipal	☐ Non-Municipal	☐ Reg. 170/03
☐ Large	☐ Small	☐ Reg. 318/08 & 319/08
☐ Residential	☐ Non-Residential	☐ Reg. 243/07
☐ Seasonal	☐ Year-Round	☐ Private Well Water
■ Other: _____		

REPORT NUMBER (Lab Use)

Organization: Hamlet of Pangnirtung	**Waterworks Address:** Hamlet of Pangnirtung, PO Box 253, Pangnirtung, NU, X0A 0R0	**Invoicing Address (if different):**
Contact:		
Tel: 867-473-8953 **Fax:** 867-473-8832		
After Hours Tel: **Public Health Unit:**	**Waterworks No.:**	**Project Name/No.:**
Email: pang_sao@qiniq.com	**Quote No.:** P16_Nunavut	**P.O. No.:**

ANALYSES REQUESTED

Microbiological					Chemical						Other		
Fl, Cl, NO3, SO4	As, Ba, Cd, Cu, Fe, Pb	Mn, Se, Ag and Zn	Cr(VI)	TDS (Calc from Cond)	DOC	Surfactants							

TURNAROUND TIME REQUESTED

Summary of Surcharges ***
☐ Platinum 200% - same day**
☐ Gold 100% - 24 Hour
☐ Silver 50% - 48 Hours
☐ Bronze 25% - 72 Hours
■ Standard 5-7 days
☐ Specific Date: _____

* Sample Matrix Legend: TW = Treated Water, DW = Distribution Water, GW = Raw Groundwater, SW = Raw Surface Water, UGW = Untreated Groundwater (Drinking Water/Distribution)
GUDI = Groundwater under the influence of surface water, PR = Plumbing Residential, PNR = Plumbing Non-Residential ** Fastest possible TAT achievable (same day if applicable) *** See Caduceon General Turnaround Time Terms

Lab No.	Sample Source and/or Sample Identification	S.P.L.	Sample Matrix *	Date Collected (yy-mm-dd)	Time Collected	Adverse Resample	Indicate Test For Each Sample By Using A Check Mark In The Box Provided													Chlorine Free	Chlorine Total	# Bottles/ Sample
	PAN-1						x	x	x	x	x	x	x									
	Truck-Fill Station						x	x	x	x	x	x	x									

Has Lab Service Notification (LSN) Form been completed & submitted to the MOE/PHU? ☐ Yes ☐ No ☐ Not Applicable
Laboratory Analysis will not commence until all Notification information is received and the Submission form is appropriately completed

SAMPLE SUBMISSION INFORMATION

	Sampled by:	Submitted by:
Print:		
Sign:		
	Date (yy-mm-dd)/Time:	Date (yy-mm-dd)/Time:

SHIPPING INFORMATION

Courier (Client account)	■	Invoice	☐
Courier (Caduceon account)	☐	# of Pieces	
Drop Off	☐		
Caduceon (Pick-up)	☐		

REPORTING / INVOICING

Report by Fax	☐
Report by Email	■
Invoice by Email	■
Invoice by Mail	☐

SAMPLE RECEIVING INFORMATION (LABORATORY USE ONLY)

Received By (print): Signature:
Date Received (yy-mm-dd): Time Received:
Laboratory Prepared Bottles: ☐ Yes ☐ No
Sample Temperature °C: Labeled by:

Comments:

GENERAL TERMS, CONDITIONS AND SAMPLING INFORMATION GUIDE

CADUCEON ENVIRONMENTAL LABORATORIES
Client committed. Quality assured.

Sample Acceptance

Caduceon Enterprises is a commercial testing laboratory specializing in environmental analyses of samples including, but not limited to the following:
Drinking Water, Groundwater, Surface Water, Wastewater and/or Industrial Process Water/Effluents, Liquid and Solid Sludge, Soil and Sediment, Oil (limited types).

Caduceon does not accept samples including but not limited to the following matrices unless otherwise prearranged with an authorized Caduceon representative:
Human or Animal Tissue, Unprocessed Human or Animal Waste, Food or Beverage (other than Drinking Water), Unknown solids and liquids, Vegetation, Hazardous Waste, Highly contaminated samples (which cause process and instrument complications).

Samples submitted to Caduceon without proper designation are subject to supplementary charges, but not limited to the following:
Sample Disposal Fees, Process and Handling Fees, Instrument Maintenance and Refurbishment Fees (parts and labour).

Chain of Custody Forms must be completed with all required information. Analyses of samples will not commence until all required information is received. Receipt of samples will only occur at this time.
Samples must be submitted in Caduceon sampling containers and/or acceptable alternatives with appropriate preservatives (if required).
Samples must be received at the laboratory within required sample holding times. If samples require RUSH analyses based on sample holding times, surcharges may apply. See Turnaround Time Terms and Conditions.

Turnaround Time

Platinum Service – 200% Surcharge (minimum)** Fastest possible Turnaround Time available and/or achievable, same day service or does not meet one of the other listed categories. Subject to additional fees for weekend and/or after hours service.
Gold Service – 100% Surcharge Samples received prior to 2 p.m. will be reported by 5 p.m. on the next business day from the day of receipt. Samples received after 2 p.m. will be reported by 12 p.m. on the second business day from the day of receipt.
Silver Service - 50% Surcharge Samples received prior to 2 p.m. will be reported by 5 p.m. on the second business day from the day of receipt. Samples received after 2 p.m. will be reported by 12 p.m. on the third business day from the day of receipt.
Bronze Service - 25% Surcharge Samples received prior to 2 p.m. will be reported by 5 p.m. on the third business day from the day of receipt. Samples received after 2 p.m. will be reported by 12 p.m. on the fourth business day from the day of receipt.
Standard Service – No Surcharge 5- 7 business days from the time of receipt. Note: Samples received after 2 p.m. are considered received the next business day.
Note: If the specific level of Turnaround Time requested is not met the next level of service achieved will be surcharged accordingly. This is at the sole discretion of the laboratory.

Payment

By submission of samples and signing of the chain of custody you agree to Caduceon's Payment Terns and Conditions. (See Caduceon website for details www.caduceonlabs.com)

Ontario Drinking Water Sampling Requirements

Parameter	Sample Containers		Minimum Volume (mL)	Preservative	Storage Conditions	Holding Times
	Size (mL)	Type				
Treated & Distribution Samples						
Item 1: Total Colifoms (& Background Colonies), *Esherichia coli* (E.coli), Heterotrophic Plate Count	200	SP	100 per test	$Na_2S_2O_3$	1	48h
Raw Samples						
Item 2: Total Colifoms (& Background Colonies), *Esherichia coli* (E.coli)	200	SP	100 per test	$Na_2S_2O_3$	1	48h
Treated						
Item 3: Nitrate and Nitrite as N (quarterly)	500	P	50	None	1	7d
Item 5: Schedule 23: Inorganic Parameters (As, Ba, B, Cd, Cr, Hg, Sb, Se, U)	125	P, Red Cap	100	HNO_3	1	60d
	125	G	100	$K_2Cr_2O_7 + HNO_3$	1	14d
Item 6: Schedule 24: Semivolatile & Volatile Organics (Pesticides, Herbicides, PCB's, Benzo(a)pyrene) & MCPA	1000	AG	1000(x5)	None, 1 x $Na_2S_2O_3$	1	14dpre/14dpost/40dpost
	1000	P	1000	$Na_2S_2O_3$	1	20dpre/36dpost
	40	AGV	40	$Na_2S_2O_3$ (No Headspace)		14d
Item 7: Fluoride (can be sampled with Item 3)	500	P	100	None	1	30d
Item 8: Sodium (can be sampled with Item 5)	125	P, Red Cap	100	HNO_3	1	60d
Distribution						
Item 4: Trihalomethanes or,	40	AGV	40(x2)	$Na_2S_2O_3$ (No Headspace)	1	14d
HAA's (quarterly if chlorination system used)	40	AGV	40(x2)	NH_4Cl	1	28d
Item 9a: Lead	125	P, Red Cap	100	HNO_3	1	60d
Item 9b: Alkalinity	120	P	50	None	1	14d
Item 10: Lead (plumbing)	1000	P	1000(x2)	HNO_3	1	60d

Sample Container Codes:
P = Plastic, either HDPE or PETE
G = Glass
AG = Amber Glass, AGV = Amber Glass Vial,
SP = Sterile Plastic

Storage Conditions Codes:
1 = 4 ± 3°C

Holding Time Codes:
h = hours
d = days
dpre = days pre extraction
dpost = days post extraction

Holding times are summarized for convenience purposes and are to be used only as a guide. Please consult the official regulations to ensure the appropriate holding times are followed.

Laboratory & Depot Locations/Shipping Addresses

Kingston Lab - 285 Dalton Ave., Kingston, ON K7K 6Z1, Tel: (613) 544-2001 Fax: (613) 544-2770 Email: contactkingston@caduceonlabs.com
Ottawa Lab - 2378 Holly Lane, Ottawa, ON K1V 7P1, Tel: (613) 526-0123 Fax: (613) 526-1244 Email: contactottawa@caduceonlabs.com
Richmond Hill Lab - #14-110 West Beaver Creek Rd., ON L4B 1J9, Tel: (289) 475-5442 Fax: (866) 562-1963 Email: contactrichmondhill@caduceonlabs.com
Windsor Lab - #5-3201 Marentette Ave., Windsor, ON N8X 4G3, Tel: (519) 966-9541 Fax: (519) 966-9567 Email: contactwindsor@caduceonlabs.com
Barrie Lab - 112 Commerce Park Drive, Unit L, Barrie, ON L4N 8W8, Tel: (705) 252-5743 Fax: (705) 252-5746 Email: contactbarrie@caduceonlabs.com
London Depot - #1-600 Newbold St., London, ON N6E 2T7, Tel: (519) 601-1833 Fax: (519) 601-1833 Email: contactlondon@caduceonlabs.com

CADUCEON™
ENVIRONMENTAL LABORATORIES
Client committed. Quality assured.

- ☐ O.Reg 153/04 (1__ 2__ 3__ 4__ 5__ 6__)
- ☐ MISA Guidelines
- ☐ Provincial Water Quality Objectives
- ☐ Sewer Use By-Law: _____
- ☐ ODWS (Non Regulatory)
- ☐ O.Reg 558 Leachate Analysis
- Disposal Site: _____
- ☑ Other: CCME

Turnaround Time Requested

Rush 24 Hr	☐ 100% Surcharge
Rush 48 Hr	☐ 50% Surcharge
Rush 72 Hr	☐ 25% Surcharge
5-7 Day	☑ Standard
Specific Date:	

Organization: Hamlet of Pangnirtung
Contact: Billy Qaqasiq
Tel: 867-473-8951
Fax: 867-473-8832
Email: pang_stp@qiniq.com

Address and Invoicing Address (if different): P.O. Box 253, Pangnirtung, NU X0A 0R0

Quote No.:
Project Name:
P.O. No.:
Additional Info: Waybill No. _____

REPORT NUMBER:

Lab No.	Sample Identification	Sample Matrix *	Date Collected (yy-mm-dd)	Time Collected	BOD	Faecal Coliforms	pH, Conductivity	TSS	Nitrate-Nitrite	Ammonia-N	Total Metals, Hg	Anions-Cl, SO4	Na, K, Ca, Mg	Phenols	Alkalinity	Hardness	TOC	Field pH	Field Temp.	# Bottles/ Sample	Field Filtered(Y/N)
	PAN-3	WW	14-12-23	9:00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	-	6	N

Indicate Test For Each Sample By Using A Check Mark In The Box Provided

Sample Submission Information

Sampled By (print): Billy Qaqasiq
Submitted By (print): Billy Qaqasiq
Signature: ⇐
Date(yy-mm-dd): 14-12-23 Time: 10:00

Shipping Information

- ☑ Courier (Client account)
- ☐ Courier (Caduceon account)
- ☐ Drop Off
- ☐ Caduceon (Pick-up)

Reporting and Invoicing

- ☐ Invoice for Shipping
- ☐ Fax Results
- ☑ Email Results
- ☑ Invoice by Email
- ☐ Invoice by Mail

# of Pieces: 1

LABORATORY USE ONLY

Received By (print): Signature:
Date(yy-mm-dd) Received: Time Received:
Comments: Laboratory Prepared Bottles: ☐ YES ☐ NO

* Sample Matrix Legend: WW=Waste Water SW=Surface Water GW=Groundwater LS=Liquid Sludge SS=Solid Sludge S=Soil Sed=Sediment PC=Paint Chips F=Filter

Laboratory Locations/Shipping Addresses
Kingston Lab - 285 Dalton Ave., Kingston, ON K7K 6Z1, Tel: (613) 544-2001 Fax: (613) 544-2770 Email: contactkingston@caduceonlabs.com
Ottawa Lab - 2378 Holly Lane, Ottawa, ON K1V 7P1, Tel: (613) 526-0123 Fax: (613) 526-1244 Email: contactottawa@caduceonlabs.com
Peterborough Lab - #206-160 Charlotte St., Peterborough, ON K9J 2T8, Tel: (705) 748-1506 Fax: (705) 748-6514 Email: contactpeterborough@caduceonlabs.com
Windsor Lab - #5-3201 Marentette Ave., Windsor, ON N8X 4G3, Tel: (519) 966-9541 Fax: (519) 966-9567 Email: contactwindsor@caduceonlabs.com
Moncton Lab - 150 Lutz St., Moncton, NB E1C 5E9, Tel: (506) 855-6472 Fax: (506) 855-8294 Email: contactmoncton@caduceonlabs.com

C 15192

Appendix D:
Subcontract Laboratory Accreditation

CALA
Canadian Association for Laboratory Accreditation Inc.

CALA Directory of Laboratories

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

Standard: Conforms with requirements of ISO/IEC 17025
Clients Served:
Revised On: November 1, 2017
Valid To: August 16, 2019

Scope of Accreditation

Air (Inorganic)
Metals - Air Filter (012)
D-ICP-02; modified from SM 3120 B
ICP - DIGESTION
Cadmium
Copper
Lead
Zinc

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

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

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

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

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Soil/Solid Biosolids
Inorganic Ammonia - Soil, Solid Biosolids (105)
A-NH3-01; modified from MOEE RNDNP - E3364/SDNP-E3366
AUTO COLOR
Total Ammonia

Soil/Solid Biosolids
Inorganic Nitrogen - Soil, Solid Biosolids (106)
A-TKN-01; modified from MOE NPSED E3116
AUTO COLOR - DIGESTION
Total Kjeldahl Nitrogen (TKN)

Soil/Solid Biosolids
Inorganic Phosphorus - Soil, Solid Biosolids (107)
A-TP-01; modified from MOE NPSED E3116
AUTO COLOR - DIGESTION
Total Phosphorus

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

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

Solids (Inorganic)
Conductivity - Soil, Sediments (099)
A-COND-03; modified from SM 2510 B and MOECC-LSB E 3530
CONDUCTIVITY METER - EXTRACTION
Conductivity

Solids (Inorganic)
Extractable Anions - Leachate [100% SOLID SAMPLES ONLY] (090)
A-IC-01; EPA 1311 (LEACH) and modified from SM 4110 C (ANALYSIS)
ION CHROMATOGRAPHY - TCLP
Nitrate
Nitrite

Solids (Inorganic)
Extractable Metals - Leachate [100% SOLID SAMPLES ONLY] (091)
D-ICP-01; EPA 1311 (LEACH) and modified from EPA SM 3120 B (ANALYSIS)
ICP/AES - TCLP
Arsenic
Barium
Beryllium
Boron
Cadmium
Chromium
Lead
Nickel
Silver

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Zinc

Solids (Inorganic)
Extractable Metals - Leachate [100% SOLID SAMPLES ONLY] (092)
D-ICPMS-01; EPA 1311 (LEACH) and modified from EPA 200.8 (ANALYSIS)
ICP/MS - TCLP
Antimony
Arsenic
Selenium
Uranium

Solids (Inorganic)
Extractable Metals - Leachate [100% SOLID SAMPLES ONLY] (093)
D-HG-02; EPA 1311 (LEACH) and modified from SM 3112B (ANALYSIS)
COLD VAPOUR AA - TCLP
Mercury

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

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

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

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

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Sodium
Strontium
Tin
Titanium
Tungsten
Vanadium
Zinc

Solids (Inorganic)
pH - Soil, Sediment, Solid Sludge (100)
A-pH-03; modified from SM 4500 H and MOECC-LSB E 3530
pH METER - EXTRACTION
pH

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

Solids (Organic)
Extractable Volatile Organic Compounds (VOC) - Leachate [100% SOLID SAMPLES ONLY] (089)
C-VOC-01; EPA SW-846 1311 (LEACH) and modified from EPA SW-846 5030 and EPA SW-846 8260 (ANALYSIS)
GC/MS - PURGE AND TRAP - TCLP
1,1-Dichloroethylene
1,2-Dichlorobenzene
1,2-Dichloroethane
1,4-Dichlorobenzene
Benzene
Carbon tetrachloride
Chlorobenzene
Chloroform
Dichloromethane
Methyl ethyl ketone
Tetrachloroethylene
Trichloroethylene
Vinyl chloride

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

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

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

Trichlorofluoromethane
Vinyl chloride

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

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

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

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

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

Water (Inorganic) OSDWA †
Carbon - Water (054)
C-OC-01; modified from SM 5310C and EPA 415.2
IR-UV-PERSULFATE
Organic Carbon

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

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

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

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

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

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

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

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Cobalt
Copper
Lead
Molybdenum
Selenium
Silver
Thallium
Uranium
Vanadium

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

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

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

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

Water (Inorganic) OSDWA †
pH - Water, Wastewater, Liquid Biosolids (005)
A-pH-01; modified from SM 4500 H
pH METER
pH

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Water (Organic) OSDWA †
Petroleum Hydrocarbons (PHC) - Water (072)
C-GROw-02; modified from MOE E3421
GC/FID - PURGE AND TRAP
F1: C6-C10

Water (Organic) OSDWA †
Volatile Organic Compounds (VOC) - Water (041)
C-VOC-02; modified from EPA 8260 and 5030
GC/MS - PURGE AND TRAP
1,1-Dichloroethane
1,1-dichloroethylene
1,1-Dichloropropene

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

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Tetrachloroethylene
Toluene
trans-1,2-Dichloroethylene
trans-1,3-Dichloropropene
Trichloroethylene
Trichlorofluoromethane
Vinyl Chloride

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CALA
Canadian Association for Laboratory Accreditation Inc.

CALA Directory of Laboratories

Membership Number: 2728
Laboratory Name: Caduceon Environmental Laboratories (Kingston)
Parent Institution: Caduceon Enterprises Inc.
Address: 285 Dalton Ave. Kingston ON K7K 6Z1
Contact: Ms. Michelle Dubien
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Email: mdubien@caduceonlabs.com

Standard: Conforms with requirements of ISO/IEC 17025
Clients Served:
Revised On: September 27, 2017
Valid To: June 22, 2019

Scope of Accreditation

Oil (Organic)
Polychlorinated Biphenyls (PCB) - Oil (081)
PCB-002; modified from EPA 8082A
GC/ECD - EXTRACTION
Aroclor 1242
Aroclor 1248
Aroclor 1254
Aroclor 1260
Total PCB

Soil (Organic)
Polychlorinated Biphenyls (PCB) - Soil (080)
PCB-003; modified from EPA 8082A
GC/ECD - EXTRACTION
Aroclor 1242
Aroclor 1248
Aroclor 1254
Aroclor 1260
Total PCB

Solids
Total Ammonia - Soil, Solids, Biosolids (083)
NH3-001; modified from MOEE 3116
AUTO COLOR
Total Ammonia

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Solids (Inorganic)
Conductivity - Solids (077)
COND-003; modified from MOE E3138
CONDUCTIVITY METER
Conductivity

Solids (Inorganic)
Cyanide - Soil (074)
CN-001; modified from EPA 9012B
COLORIMETRIC - WATER EXTRACTION
Cyanide (Total)
Free Cyanide

Solids (Inorganic)
Extractable Cyanide - Solid Waste [100% SOLID MATRICES ONLY] (061)
CN-001; EPA 1311 (LEACH) and modified from SM4500 CN-E (ANALYSIS)
COLORIMETRIC - TCLP
Cyanide (WAD)

Solids (Inorganic)
Extractable Fluoride - Solid Waste [100% SOLID MATRICES ONLY] (062)
F-001; EPA 1311 (LEACH) and modified from SM 4500-F, D (ANALYSIS)
SPADNS-TCLP
Fluoride

Solids (Inorganic)
Oil and Grease - Soil (049)
O & G-001; modified from SM 5520 B, F
GRAVIMETRIC
Animal/Vegetable Oil and Grease
Mineral Oil and Grease
Total Oil and Grease

Solids (Inorganic)
pH - Soil (056)
pH-001/pH-003; modified from MOECC PHSOIL-E3137
pH METER
pH

Solids (Inorganic)
Total Kjeldahl Nitrogen (TKN) - Soil, Solids, Biosolids (078)
TPTKN-001; modified from MOE E3116
AUTO COLOR - DIGESTION
Total Kjeldahl Nitrogen (TKN)

Solids (Inorganic)
Total Phosphorus - Soils, Solid Biosolids (079)
TPTKN-001; modified from MOE E3116
AUTO COLOR - DIGESTION
Total Phosphorus

Solids (Organic)
Base Neutral Acid Extractables (BNA) - Soil (048)
NAB-S-001; modified from EPA 525.2 and EPA 8270D
GC/MS - EXTRACTION
1+2-Methylnaphthalene (Calculation)
1-Methylnaphthalene
1,1-Biphenyl
1,2,4-Trichlorobenzene
2-Chlorophenol

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2-Methylnaphthalene
2,4+2,6-Dinitrotoluene (Calculation)
2,4-Dimethylphenol
2,4-Dinitrophenol
2,4-Dinitrotoluene
2,4,5-Trichlorophenol
2,6-Dinitrotoluene
3,3'-Dichlorobenzidine
Acenaphthene
Acenaphthylene
Alachlor
Aldicarb
Anthracene
Atrazine
Atrazine, desethyl
Azinphos-methyl
Bendiocarb
Benzo (a) anthracene
Benzo (a) pyrene
Benzo (b) fluoranthene
Benzo (g,h,i) perylene
Benzo (k) fluoranthene
Bis(2-chloroethyl) ether
Bis(2-chloroisopropyl) ether
Bis(2-ethylhexyl) phthalate
Bromoxynil
Carbaryl
Carbofuran
Chlorpyrifos ethyl
Chrysene
Cyanazine
Di-n-butyl phthalate
Diazinon
Dibenzo (a,h) anthracene
Dicamba
Dichlorophenol, 2,4-
Dichlorophenoxy acetic acid, 2,4-
Diclofop-methyl
Diethyl phthalate
Dimethoate
Dimethyl phthalate
Dinoseb
Diuron
Fluoranthene
Fluorene
Hexachloroethane
Indeno (1,2,3 - cd) pyrene
Malathion
Metolachlor
Metribuzin
Naphthalene
p-Chloroaniline
Parathion-ethyl

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Pentachlorophenol
Phenanthrene
Phenol
Phorate
Picloram
Prometryne
Pyrene
Simazine
Temephos
Terbufos
Tetrachlorophenol, 2,4,5,6-
Total PAHs (Calculation)
Triallate
Trichlorophenol, 2,4,6-
Trichlorophenoxy acetic acid, 2,4,5-
Trifluralin

Solids (Organic)
Base Neutral Acid Extractables (BNA) - Solid Waste [100% SOLID MATRICES ONLY] (060)
NAB-W-001; EPA 1311 (LEACH) and modified from EPA 8270D (ANALYSIS)
GC/MS - TCLP
2,3,4,6-Tetrachlorophenol
2,4-Dichlorophenol
2,4-Dinitrotoluene
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol
3/4-Methylphenol
Benzo(a)pyrene
Cresols (total)
Hexachlorobenzene
Hexachlorobutadiene
Hexachloroethane
Nitrobenzene
Pentachlorophenol
Pyridine

Solids (Organic)
Chlorinated Pesticides - Soil (076)
PESTCL-002; modified from EPA 8081B and EPA 8082A
GC/ECD - EXTRACTION
Aldrin
Aldrin + Dieldrin
alpha-BHC
alpha-Chlordane
beta-BHC
DDT + metabolites
Dieldrin
Endosulfan I
Endosulfan I/II
Endosulfan II
Endosulfan Sulfate
Endrin
gamma-BHC (Lindane)
gamma-Chlordane
Heptachlor

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Heptachlor epoxide
Hexachlorobenzene
Hexachlorobutadiene
Hexachloroethane
Methoxychlor
Mirex
o,p'-DDD
o,p'-DDE
o,p'-DDT
Oxychlordane
p,p'-DDD
p,p'-DDE
pp'-DDT
Total DDD
Total DDE
Total DDT

Solids (Organic)
Petroleum Hydrocarbons (PHC) - Soil (046)
PHC-S-001; CCME and MOEE TPH E3398
GC/FID - EXTRACTION
F2: C10-C16
F3: C16-C34
F4: C34-C50

Solids (Organic)
Petroleum Hydrocarbons (PHC) - Soil (058)
PHC-S-001; CCME CWS REFERENCE METHOD
GRAVIMETRIC
F4: Gravimetric

Solids (Organic)
Total Petroleum Hydrocarbons (TPH) - Soil (018)
TPH EXT - 002; modified from MOEE TPH-E3398
SONICATION GC/FID - EXTRACTION
Diesel Range Organics C10-C24
Heavy Oils: C24-C50
TPH C10-C50

Water (Inorganic) OSDWA †
Alkalinity - Water (008)
ALK 001; modified from SM 2320 B
TITRIMETRIC
Alkalinity (pH 4.5)
Bicarbonate
Carbonate

Water (Inorganic) OSDWA †
Alkalinity - Water (065)
ALK-002; modified from SM 2320 B
AUTO TITRIMETRIC
Alkalinity (pH 4.5)
Bicarbonate
Carbonate

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Water (Inorganic) OSDWA †
Ammonia + Ammonium - Water, Wastewater, Liquid Biosolids (025)
NH3-001; modified from SM 4500-NH3-H
AUTO COLOR
Ammonia
Unionized Ammonia

Water (Inorganic) OSDWA †
Biochemical Oxygen Demand (BOD) - Water (054)
BOD-001; modified from SM 5210 B
D.O. METER
BOD (5 day)
CBOD (5 day)

Water (Inorganic) OSDWA †
Colour - Water (013)
COL 001; modified from SM 2120 C
COLORIMETRIC
True Colour

Water (Inorganic) OSDWA †
Conductivity - Water (010)
COND 001; modified from SM 2510 B
CONDUCTIVITY METER
Conductivity (25°C)

Water (Inorganic) OSDWA †
Conductivity - Water (067)
COND-002; modified from SM 2510 B
AUTO CONDUCTIVITY METER
Conductivity (25°C)

Water (Inorganic) OSDWA †
Cyanide - Water (006)
CN 001; modified from SM 4500 CN-E
AUTO COLOR - DISTILLATION
Cyanide (SAD)
Free Cyanide

Water (Inorganic) OSDWA †
Oil and Grease - Water (047)
O & G-001; modified from SM 5520 B, F
GRAVIMETRIC
Animal/Vegetable Oil and Grease
Mineral Oil and Grease
Total Oil and Grease

Water (Inorganic) OSDWA †
pH - Water (009)
PH 001; modified from SM 4500 H+B
pH - METER
pH

Water (Inorganic) OSDWA †
pH - Water (066)
pH-002; modified from SM 4500H+ B
AUTO - pH METER
pH

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Water (Inorganic) OSDWA †
Phosphate - Water (033)
DRP-001; modified from SM 4500-P, E
COLOR
Phosphate

Water (Inorganic) OSDWA †
Solids - Water, Liquid Sludge (026)
TSS-001/TS-001; modified from SM 2540 B, D, E
GRAVIMETRIC
Total Solids
Total Suspended Solids
Total Volatile Solids
Volatile Suspended Solids

Water (Inorganic) OSDWA †
Sulphide - Water (036)
H2S-001; modified from SM 4500-S2-D
COLORIMETRIC
Sulfide

Water (Inorganic) OSDWA †
Tannin and Lignin - Water (085)
TAN-001; SM 5550
AUTO COLOR
Tannin and Lignin

Water (Inorganic) OSDWA †
Total Kjeldahl Nitrogen (TKN) - Water, Wastewater, Liquid Biosolids (016)
TPTKN 001; modified from MOEE STKNP-E3199A.1
AUTO COLOR - DIGESTION
Organic Nitrogen
Total Kjeldahl Nitrogen

Water (Inorganic) OSDWA †
Total Phosphorus - Water, Wastewater, Liquid Biosolids (042)
TPTKN 001; modified from MOE STKNP-E3199A.I
AUTO COLOR - DIGESTION
Total Phosphorus

Water (Inorganic) OSDWA †
Turbidity - Water (014)
TURB 001; modified from SM 2130 B
TURBIDIMETRIC
Turbidity

Water (Microbiology) OSDWA †
Coliforms - Water (035)
ECTC-001; modified from MOE DC MEDIUM MICROMFDC-E3407
MEMBRANE FILTRATION (DC)
Background
Escherichia coli (E. coli)
Total Coliforms

Water (Microbiology) OSDWA †
Escherichia coli (E. coli) - Water (002)
EC 001; modified from SM 9222 D
MEMBRANE FILTRATION (mTEC-XGLUC)
Escherichia coli (E. coli)

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Water (Microbiology) OSDWA †
Fecal (Thermotolerant) Coliforms - Water (044)
FC-001; modified from SM 9222 D
MEMBRANE FILTRATION (mTEC) WITH INDICATOR
Fecal (Thermotolerant) Coliforms

Water (Microbiology) OSDWA †
Fecal Streptococci - Water (003)
FS 001; modified from SM 9230 C
MEMBRANE FILTRATION
Fecal streptococci

Water (Microbiology) OSDWA †
Heterotrophic Plate Count (HPC) - Water (001)
HPC 001; modified from SM 9215 D
MEMBRANE FILTRATION
Heterotrophic Plate Count (HPC)

Water (Microbiology) OSDWA †
Total Coliforms - Water (043)
TC 001; modified from SM 9222 B
MEMBRANE FILTRATION (mENDO)
Background Counts
Total Coliforms

Water (Organic)
2-methyl-4-chlorophenoxyacetic acid (MCPA) - Water (084)
HERB-001; modified from EPA 515.1
GC/MS
MCPA

Water (Organic) OSDWA †
Base Neutral Acid Extractables (BNA) - Water (030)
NAB-W-001; modified from EPA 8270D
GC/MS
1+2-Methylnaphthalene (Calculation)
1-Methylnaphthalene
1,1-Biphenyl
1,2-Dichlorobenzene
1,2,4-Trichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
2-Chloronaphthalene
2-Chlorophenol
2-Methylnaphthalene
2-Methylphenol
2-Nitrophenol
2,3,4,6-tetrachlorophenol
2,4+2,6-Dinitrotoluene (Calculation)
2,4-dichlorophenol
2,4-dichlorophenoxyacetic acid
2,4-Dimethylphenol
2,4-Dinitrophenol
2,4-Dinitrotoluene
2,4,5-Trichlorophenol
2,4,5-trichlorophenoxyacetic acid
2,4,6-trichlorophenol
2,6-Dinitrotoluene

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3,3-Dichlorobenzidine
4-Bromophenyl phenyl ether
4-Chloro-3-methyl phenol
4-Chloroaniline
4-Chlorophenyl phenyl ether
4-Methylphenol
4-Nitrophenol
4,6-Dinitro-2-methylphenol
Acenaphthene
Acenaphthylene
Alachlor
Aldicarb
Anthracene
Atrazine
Azinphos-methyl
Azobenzene
Bendiocarb
Benzo (a) anthracene
Benzo (a) pyrene
Benzo (b) fluoranthene
Benzo (g,h,i) perylene
Benzo (k) fluoranthene
Bis(2-chloroethoxy)methane
Bis(2-chloroethyl) ether
Bis(2-chloroisopropyl) ether
Bis(2-ethylhexyl) phthalate
Bromoxynil
Butlybenzyl phthalate
Carbaryl
Carbazole
Carbofuran
Chlorpyrifos (ethyl)
Chrysene
Cyanazine
Desethyl atrazine
Di-n-butyl phthalate
Di-n-octyl phthalate
Diazinon
Dibenzo (a,h) anthracene
Dibenzofuran
Dicamba
Diclofop-methyl (as free acid)
Diethyl phthalate
Dimethoate
Dimethyl phthalate
Dinoseb
Diuron
Fluoranthene
Fluorene
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane

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Indeno (1,2,3 - cd) pyrene
Isophorone
Malathion
Metolachlor
Metribuzin
N-Nitrosodi-n-propylamine
N-Nitrosodiphenylamine
Naphthalene
Nitrobenzene
Parathion (ethyl)
Pentachlorophenol
Phenanthrene
Phenol
Phorate
Picloram
Prometryne
Pyrene
Simazine
Temephos
Terbufos
Total PAH
Triallate
Trifluralin

Water (Organic) OSDWA †
Diquat and Paraquat - Water (028)
HPLCDIQ-001; modified from EPA 549.2
HPLC
Diquat
Paraquat

Water (Organic) OSDWA †
Glyphosate - Water (031)
GLYPH-002; modified from EPA 547
DIRECT INJECTION HPLC
Glyphosate

Water (Organic) OSDWA †
Pesticides and Polychlorinated Biphenyls (PCB) - Water (027)
PESTCL-001/PCB-001; modified from EPA 8081 and EPA 8082A
GC/ECD - EXTRACTION
A -BHC
Aldrin
Aldrin + Dieldrin
alpha-Chlordane
beta-BHC
DDT + metabolites (Calculation)
delta-BHC
Dieldrin
Endosulfan I
Endosulfan I/II
Endosulfan II
Endosulfan Sulfate
Endrin
Endrin Aldehyde
Endrin Ketone

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gamma-Chlordane
Heptachlor
Heptachlor Epoxide
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
Lindane (gamma-BHC)
Methoxychlor
Mirex
o,p' - DDT
o,p'-DDD
o,p'-DDE
Oxychlordane
p,p' - DDT
p,p'-DDD
p,p'-DDE
Total DDD (Calculation)
Total DDE (Calculation)
Total DDT (Calculation)
Total PCB

Water (Organic) OSDWA †
Petroleum Hydrocarbons (PHC) - Water (050)
PHC-W-001; modified from MOEE TPM E3397A, E 3398
GC/FID - EXTRACTION
F2: C10-C16
F3: C16-C34
F4: C34-C50

Water (Organic) OSDWA †
Petroleum Hydrocarbons (PHC) - Water (059)
PHC-W-001; MOE E3421
GRAVIMETRIC
F4: Gravimetric

Water (Organic)
Polychlorinated Biphenyls (PCB) - Water (082)
PCB-001, PESTCL-001; modified from EPA 8081 AND EPAS 8082 A
GC/ECD - EXTRACTION
Aroclor 1242
Aroclor 1248
Aroclor 1254
Aroclor 1260
Total PCB

Water (Organic) OSDWA †
Total Petroleum Hydrocarbons (TPH) - Water (019)
TPH EXT - 002; modified from MOEE E 3421
GC/FID - LIQUID EXTRACTION
Diesel Range Organics C10-C24
Heavy Oils: C24-C50
TPH C10-C50

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