Environmental Monitoring Program – Sample Collection Training Program

Project Name
Water Licence Compliance

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August 13, 2013

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1 Introduction

The purpose of this document is to provide guidance/training on how to properly collect and submit water and waste water samples to ensure that the environmental monitoring program is undertaken with a high degree of quality, in order to ensure that the results accurately reflect the physical and chemical nature of the matrix being tested.

1.1 Background

The Government of Nunavut (GN) Department of Community & Government Services (CGS) has a mandate to assist the Hamlets in addressing non-compliance issues with their Nunavut Water Board (NWB) licences. The CGS mandate includes providing assistance in the following areas:

- Education and assistance with licence requirements, such as annual reports, monitoring etc.;
- Preparation of documentation such as Operation & Maintenance Manuals for spill contingency plans; and,
- Initiation of capital programs, such as fencing of the solid waste facilities.

Exp Services Inc. has been retained to provide engineering assistance to CGS in order to accomplish their water licence compliance mandate.

1.2 Monitoring and Regulatory Requirements

The Nunavut Water Board has responsibilities and powers over the use, management and regulation of inland water in Nunavut and its objectives are to provide for the conservation and utilization of waters in Nunavut in a manner that will provide the optimum benefits for the residents of Nunavut in particular and Canadians in general.

Under the conditions set forth in the "*Nunavut Waters and Nunavut Surface Rights Tribunal Act, (2002, c-10)*", the NWB regulates water use and waste disposal activities in Nunavut through the issuance of water licences. The water licences issued to communities in Nunavut impose various conditions, typically including the preparation of an Annual Report which summarizes all of the data gathered under the monitoring program, as well as a summary of modifications and/or major maintenance work carried out on the licensed facilities during the reporting year. The water licences issued by the NWB also typically include requirements to prepare other documents including, but not limited to, Operation and Maintenance manuals, Abandonment and Restoration plans, Quality Assurance and Quality Control manuals, and Spill Contingency plans.

The NWB water licences typically specify the number and locations of monitoring stations, the specific lists of chemical parameters to be measured, the frequency of sample collection, and the effluent quality standards.

1.3 Objectives

The objectives of this guidance/training plan are to: i) ensure that all aspects of the water and wastewater sampling program is undertaken in a correct and consistent manner; ii) ensure the reliability of the data collected during monitoring activities at the locations specified in the Hamlet's water licence, and iii) satisfy the requirement of the water licence.

1.4 Scope of Training Program

The scope of this training program includes the following topics:

1. A description of the environmental monitoring program sample types.
2. A description of the required pre-sampling activities.
3. A description of sampling safety concerns and the need for personal protective equipment.
4. A description of the sampling procedures specific to each sample type.
5. A description of sample care procedures.
6. A description of sample shipping and tracking procedures.
7. A description of common errors and tips to avoid them.

1.5 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 Field Sampling

2.1 Sampling Media

In order to comply with the current and potential future requirements of the Hamlet's NWB Water License, the following samples may need to be collected: i) surface water from the raw water supply lake; ii) surface water samples from creeks or ditches accepting wastewater effluent from the sewage lagoon; iii) surface water seepage from the landfill (if present); and/or, iv) groundwater samples from existing monitoring wells (if present). This training program will prepare the user to sample all of these potential scenarios. The sampling locations are shown in figures included in the attached Quality Assurance and Quality Control Plan.

2.2 Pre-Sampling Activities

2.2.1 Bottle Order and Shipment

At least two weeks before the upcoming environmental sampling event, send a request to the contract laboratory for the appropriate sample sets (bottles) for the required sampling test groups as specified in the Hamlet's NWB Water Licence (see Appendix B of the attached Quality Assurance and Quality Control Plan). Remember to request that a trip blank be prepared and sent along with the sample bottles.

Ensure that the bottle shipment has arrived from the contract laboratory in time for the sampling program and verify the integrity of all sampling containers. Report any missing or broken bottles to the contract laboratory as soon as possible, so that replacement bottles may be shipped.

2.2.2 Personal Protective Equipment

Ensure that the required personal protective equipment (PPE), such as latex gloves and safety glasses, is on hand before commencing the environmental monitoring program. Place an order for any required PPE that is missing well before the upcoming environmental sampling event to ensure a timely delivery.

2.2.3 Sampling Location Inspection

Perform an initial inspection of all routinely-monitored sampling locations before the commencement of the monitoring program. Make note of any equipment damage or conditions that may prevent, or alter, the collection of the environmental monitoring program samples.

2.2.4 Sampling Event Timing

Care should be exercised with respect to planning the timing of the environmental sampling event. In addition to respecting the sample collection timing conditions specified in the NWB water licence and the need for ensuring the timely procurement of the sample bottles and PPE, it is imperative to consider the flight schedules and air cargo drop-off times when planning when sampling events will occur. If possible, environmental samples should be collected and shipped to the contract laboratory on the same day. Certain test parameters, such as microbiological parameters, have very short hold times. Delays that occur in getting the samples to the contract laboratory may result in the spoilage of the samples and/or otherwise invalidating the analytical results. This could result in costly resampling, both economically and with respect to timing, and could possibly result in the Hamlet being in non-compliance with the terms of their NWB water licence.

It is understood, given flight schedules that the sampling activities cannot always occur on the same day as sample shipment. However, sample care procedures, outlined below in subsequent sections, should be applied.

2.3 Sampling Safety Concerns

Samples should be collected as close as possible to the same day and time during the specified months identified in the Water Licence. Needless to say, if the sampling day turns out to be very stormy, it would be well advised to sample the day before or after to ensure sampler safety and sampling accuracy. If however, sampling must be conducted in adverse conditions for whatever reason, it is important to have proper footwear and clothing to avoid slipping or falling during sampling – especially when sampling wastewater.

Due to potential health hazards associated with sewage handling and treatment, the following safety procedures should be obeyed in order to minimize health risks to personnel working in and around the wastewater facilities:

- Equipment is to be kept clean;
- Wear protective clothing such as latex gloves, and safety glasses at all times;
- Work clothes should not be worn home;
- Hands should be washed frequently, as a minimum before eating and after work;
- Personnel should receive appropriate vaccinations and ensure they are kept up-to-date; and
- Visit the Health Clinic for all injuries. When working with wastewater, the smallest cut or scratch is potentially dangerous.

Disposable latex gloves should be changed between sampling locations. The gloves not only protect the sampler from coming in contact with potentially harmful water (i.e. wastewater) but it also ensures the sample integrity by not permitting foreign material, substances, etc. from mixing with the sample. Safety glasses should also be worn to protect the eyes from splashing, especially important when sampling effluent from the sewage disposal facilities.

2.4 Sampling Procedures

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).

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 field sampling.
- Proper and timely shipment of samples to the laboratory.
- Timely delivery of samples to the laboratory from the air cargo facility.

2.5 Sampling Collection

Refer to the *Environmental Monitoring Program Checklist*, found in Appendix C of the attached Quality Assurance and Quality Control Plan, for specific details on the sampling locations, equipment to be used, and sampling methods. As a general recommendation, please refrain from using insect repellant, disinfection hand gel or other chemical products before and during sample collection. Also, please refrain from smoking during sample collection.

2.5.1 Locations

The water licence issued to the Hamlet by the Nunavut Water Board (NWB) specifies the locations of monitoring stations across the licensed facilities. Latitude and longitude coordinates for the monitoring stations are provided in the attached Quality Assurance and Quality Control Plan. Marker signs should indicate the exact sampling locations in the field. It is important that these signs be properly maintained to ensure that the sample locations remain unchanged.

2.5.2 Sampling Equipment

Dedicated latex or nitrile gloves (i.e., one pair per sample location) are to be used during sampling. When collecting a sample at a surface water location (fresh water or wastewater), it is important to do so in a safe manner. The proper use of sampling equipment can make the process safer. The use of a sampling pole to collect the sample can prevent the sampler having to reach and possibly lose their balance.

Any dedicated sampling equipment such as sampling poles (see photo on left for an example) are to be cleaned with soap and water after each sampling location to prevent cross-contamination. Other than the disposable gloves, a sampling pole to reach more difficult locations, and potentially polyethylene tubing and foot valves for groundwater sampling, no other sampling equipment is foreseen.

Environmental monitoring samples collected for analysis of selected chemical parameters are to be placed directly into new pre-cleaned, laboratory-supplied sample bottles. Do not rinse the sampling bottles since some bottles contain preservatives. It is very important to fill all bottles since some analyses require a large volume of water. All filled water samples are to be placed in clean coolers for transportation to the subcontract laboratory. The samples are transported/submitted under Chain of Custody documentation. Included on a Chain of Custody form is the client information, the sample information, the analyses requested, the relevant regulations, the turnaround time for the analytical results, comments, and temperature of the samples at the time they arrived in the laboratory. An example of a completed Chain of Custody form is included in Appendix D of the attached Quality Assurance and Quality Control Plan.

2.5.3 Sampling Methods

Please see the Hamlet's NWB Water Licence or Appendix E of the attached Quality Assurance and Quality Control Plan for the Environmental Monitoring Program Schedule. In general, samples may need to be collected from: i) surface water from the raw water supply lake; ii) surface water samples from creeks or ditches accepting wastewater effluent from the sewage lagoon; iii) surface water seepage from the landfill (if present); and/or, iv) groundwater samples from existing monitoring wells (if present). The sampling method used for each of these scenarios will be discussed hereafter.

2.5.3.1 *Surface Water Sampling from Lakes or Lagoons*

Fresh water or wastewater samples collected from a standing body of water (i.e. lake or lagoon) may be required as per the current or future requirements of the Hamlet's NWB Water Licence. In this case, the samples should be collected as far from the shoreline as possible in order to obtain as representative a sample as possible. For better results, the use of an extended bottle sampler or sampling pole should be considered. In this case, the sample bottle is fastened to the sampling pole and extended out into the lake or lagoon where the bottle is slightly submerged below the surface of the lagoon and allowed to fill up before pulling it back and capping it. It is very important not to overfill the bottles since some have preservatives in them. Ideally, the bottles should be filled to approximately 2 to 5 cm (1 to 2 inches) from the top. The only exception to this is the two 50 ml glass bottles which need to be completely filled with no air bubbles (see Section 3.3). As previously mentioned in Section 2.5.2, the sampling pole will need to be washed with soap and water after each sampling location. Details on how to construct a proper sampling pole is included in Appendix B of this manual.

2.5.3.2 *Wastewater Effluent Sampling from Ditches, Streams and/or Creeks*

Effluent discharge samples need to be collected as per the requirements of the Hamlet's NWB Water Licence for Sewage Disposal. For effluent samples collected from fast moving water such as streams, creeks and/or rivers, the sample containers should be filled in a well-mixed section of the stream and as far from the shoreline as possible. In most cases, simply reaching out an arm's length should be sufficient but if more reach is considered necessary depending on sampling location, a sampling pole can be used similar to that described in Section 2.5.3.1. The sample bottle should be immersed into the receiving water body with the neck upwards and allowed to slowly fill so as to minimise the amount of sediment in the bottle. It is very important not to overfill the bottles since some have preservatives in them. Ideally, the bottles should be filled to approximately 2 to 5 cm (1 to 2 inches) from the top. The only exception to this is the two 50 ml glass bottles which need to be completely filled with no air bubbles (see Section 3.3).

2.5.3.3 *Landfill Runoff Sampling*

Effluent discharge samples from landfills may be required as per the current or future requirements of the Hamlet's NWB Water Licence for Waste Disposal Facilities. Landfill runoff samples should be collected from the receiving water filled ditch, stream or creek by immersing the sample bottle into the runoff stream with the neck upwards and allowed to slowly fill so as to minimise the amount of sediment in the bottle. It is very important not to overfill the bottles since some have preservatives in them. Ideally, the bottles should be filled to approximately 2 to 5 cm (1 to 2 inches) from the top. The only exception to this is the two 50 ml glass bottles which need to be completely filled with no air bubbles (see Section 3.3). Arm's length sampling should be more than sufficient for this type of sampling.

2.5.3.4 *Groundwater Sampling*

Where required by the Hamlet's NWB Water Licence, groundwater samples should be collected from the existing monitoring well network as specified in the water licence. Groundwater samples should be collected giving due consideration to adequate ground thaw and obtaining representative groundwater samples. Groundwater samples should be collected using dedicated sampling tubing with Waterra™ foot valves (see photo on right). It is very important not to overfill the bottles since some have preservatives in them. Ideally, the bottles should be filled to approximately 2 to 5 cm (1 to 2 inches) from the top. The only exception to this is the two 50 ml glass bottles which need to be completely filled with no air bubbles (see Section 3.3).

Well purging should not be undertaken due to the potential limited availability of groundwater in the monitoring wells. Instead, samples should be collected of all available groundwater present in the monitoring wells.

2.5.4 Quality Assurance and Quality Control Program

Cross contamination is a common source of error in sampling procedures. Quality Control (QC) samples help identify when and how contamination might occur. There are various types of QC samples. For the purposes of the Hamlet's environmental monitoring, **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.

2.6 Sample Care

All water samples are to be collected in laboratory-supplied containers with the proper preservative, where applicable. A complete list of parameter handling and preservatives can be found in Appendix C of the attached Quality Assurance and Quality Control Plan.

All sample containers are to be tightly sealed and properly labelled with the:

1. sample ID;
2. date and time of sample collection; and,
3. location of sample collection.

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 use of custody seals on the sample coolers is recommended. 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.

2.7 Sample Shipping and Tracking

See Section 2.6 for sampling handling and cooler packing instructions.

Call the contract laboratory before the samples are shipped to advise them of the upcoming shipment. Give them the air cargo waybill number so that they may track the shipment from their end.

Ensure all samples are shipped to the contract laboratory immediately after the completion of the environmental monitoring event to ensure that the hold times are respected for the various parameters. Samples should be shipped as priority cargo and kept in **refrigerated** storage, where possible (**never a freezer**), until loaded onto the airplane for departure. When completing the air cargo waybill, ensure that it is clear that the air cargo facility must hold the shipment at their facility in the destination city and notify the contract laboratory for pick-up.

Follow-up with the contract laboratory on the day after the samples were shipped to ensure that the samples were collected from the air cargo facility and received by the contract laboratory for analysis.

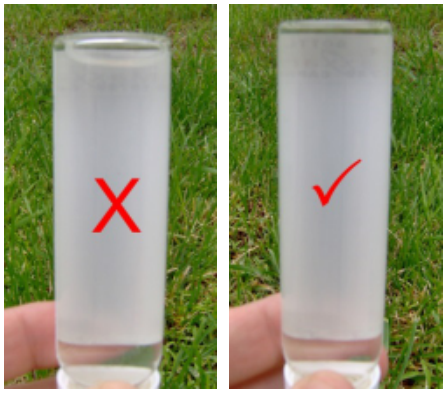
3 Avoiding Common Errors

Despite the use of rigorous sample collection and handling procedures, errors do occur. Listed below are several of the most common errors that occur during the completion of an Environmental Monitoring Program sampling event. Along with each of the common errors, tips for avoiding the error are also provided.

1. Obtaining an incomplete shipment of sampling bottles from the contract laboratory. This error may result from a misinterpretation of the sampling requirements provided in the Hamlet's water licence. Depending on the water licence, samples may need to be collected from more than one licenced facility at the same time (for example wastewater effluent from the sewage disposal facilities and landfill runoff). Often these sampling locations have different suites of chemical parameters to be analyzed. It is essential that the Hamlet staff requests bottles for the correct suite of chemical parameters for each sample to be collected. It is also essential that, at the time of the bottle order that the trip blank is ordered. It is also prudent to request more sampling containers than required in case of breakage. Despite the diligence of Hamlet staff during sample bottle ordering, sometimes the analytical laboratory does not ship the correct number of sampling bottles. The onus is on Hamlet staff to recognize this error and follow-up immediately with the contract laboratory, so that they may correct this error. Failure to do so in a timely manner may result in delays in sample collection and hence non-compliance with the monitoring requirements of the Hamlet's water licence.

2. Collecting samples from incorrect monitoring locations. While it is recommended that the same Hamlet staff members collect the environmental monitoring program samples from one sampling period to the next, sometimes staff substitutions are inevitable. Where sampling locations are not clearly designated with marker signs, it is possible that inconsistencies will occur in the actual location of sample collection, depending on who is doing the sampling. Such inconsistencies may bias the sampling results. As such, it is imperative that the sampling locations specified in the Hamlet's water licence are clearly demarcated with signs in order to avoid confusion as to the appropriate collection location by subsequent sample collectors.

3. Improper sampling technique. This manual and the on-site training program are intended to minimize the possibility that improper sampling techniques are used by Hamlet staff. Using improper sampling techniques may result in invalid sampling results or sample bias. For example, while collecting a surface water sample from a run-off or effluent creek or water course, extreme care should be given to preventing the collection of sediment along with the water sample. Sediment in the sample may bias the laboratory results. Another important example of improper sample collection technique is the presence of air bubbles (or headspace) in sample vials for analysis of volatile organic compounds (VOCs), petroleum hydrocarbons fraction 1 (PHC F1) or benzene, toluene, ethylbenzene and xylenes (BTEX). The sample vials should be flipped upside-down to check for bubbles. If a bubble covers the bottom the vial, it is necessary to resample (see photos at right). Failure to do so may result in data rejection and costly re-sampling at a later date. If incorrect sample bottles are used, this also may result in data rejection and costly re-sampling at a later date. The sample bottles can be specific to the



chemical parameters being analyzed due to limitations with respect to bottle size, bottle light transmittance, and chemical preservative used.

4. Cross contamination of environmental samples. Where possible, dedicated sampling equipment should be used for each sampling location and/or type of sample. Sampling equipment that is shared between sampling locations may result in cross-contamination if extreme care is not used to ensure the equipment is thoroughly cleaned between uses.

5. Improper sample handling. It is essential that the sample bottle labels are properly completed to ensure proper sample tracking and reporting. The outside of the sample bottles should be clean and dry before packing in the coolers. The samples should be kept cool until receipt by the contract laboratory using loose ice. Do not over pack the coolers with samples. If loose ice is unavailable, freezer packs may be used, however since they are less efficient at keeping the samples cool, ensure that multiple freezer packs are included in each cooler. The contract laboratory will measure the temperature of the samples upon receipt and will flag samples that exceed 10ºC. Failure to keep the samples at less than 10ºC may result in data rejection and costly re-sampling at a later date.

6. Insufficient sample volume. It is very important to fill all sample bottles received from the laboratory. Failure to do so may result in an insufficient sample volume for the laboratory to analyze.

7. Rinsing or overfilling of bottles. It is important not to rinse or overfill the sample bottles before sampling since some bottles have preservatives in them which are essential for accurate analyses.

8. Incomplete Chain of Custody documentation. The Chain of Custody is a legal document that accompanies the samples. When transferring the possession of samples, the Hamlet staff relinquishing the samples and the contract laboratory receiving the samples must sign, date, and note the time on the record. In addition to recording the signatures, dates and times, the Chain of Custody includes many important fields such as the sample identifications, the sample types, the number of bottles, the analyses requested, and the turnaround time required. If any of these fields are not fully completed, this may result in confusion in the analytical laboratory and in delays in the reporting of the results.

9. Delays in sample shipment. Due to the remoteness of some Nunavut communities, air cargo shipping can be challenging. Delays between sample collection and sample analysis are common. In order to minimize the possibility of exceeding sample analysis hold times, sampling events should be planned carefully, considering cargo facility drop-off times and flight schedules. Sample coolers should be shipped as priority cargo.

4 References

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

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Appendix A:
Quality Assurance and Quality Control Plan

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Hamlet of Hall Beach

Quality Assurance / Quality Control Plan

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Appendix D: Completed Example of Chain of Custody Documentation
Appendix E: Environmental Monitoring Program Schedule
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1 Introduction

The purpose of this document is to provide guidance to ensure that environmental monitoring program samples collected in the field 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 Hall Beach (Hamlet) is located on the east shore of the Melville Peninsula, on the western shore of Foxe Basin (Figure 1, Appendix A). The population was estimated to be approximately 727 in 2012.

The water supply for the Hamlet is Water Supply Lake located approximately 2.5 km south of the Hamlet. A man-made water reservoir, filled from Water Supply Lake on a yearly basis, provides sufficient water supply to meet the Hamlet's needs over the winter. Water is taken from the reservoir via an inclined shaft intake which is equipped with a submersible pump located below the water level in the reservoir. The truck fill station provides water treatment through chlorination.

Wastewater generated in the community is disposed of at the Sewage Disposal Facility. The Sewage Disposal Facility is comprised of a two-celled sewage lagoon system located approximately 1.2 km to the north of the community. The two cells are unlined cells which are decanted seasonally to a natural wetland to the north of the site. The wetland provides addition treatment prior to the release of the effluent to the environment. Due to ongoing operational issues with Cell #1, the Hamlet primarily utilizes Cell #2 with more frequent decanting.

The current solid waste disposal site is located approximately 1.2 km to the north of the Hamlet adjacent to the sewage disposal facility. A separate area along the access road from the Hamlet is used a disposal site for wood waste.

The Nunavut Water Board (NWB) issued a Class B Water Licence (3BM-HAL0810) to the Hamlet on May 16, 2008. The water licence governs water use and waste disposal within the Hamlet. A copy of the Water Licence is provided in Appendix B.

1.2 Monitoring and Regulatory Requirement Program

Condition 1 of Part F of the water licence issued to the Hamlet requires that the Hamlet submit to the NWB for approval, an Operations and Maintenance Manual, which contains, among other requirements, a Monitoring Program Quality Assurance / Quality Control (QA/QC) Plan. This QA/QC Plan was prepared in accordance with "*Quality Assurance (QA) and Quality Control (QC) Guidelines for use by Class "B" Licensees in Collecting Representative Water Samples in the Field and for Submission of a QA/QC Plan"* (Department of Indian and Northern Affairs Canada, July 1996), herein referred to as "The Guidelines".

1.3 Objectives

The objectives of this QA/QC plan are to: i) to ensure the reliability of the data collected during monitoring activities at the locations specified in the Hamlet's water licence, and ii) satisfy the requirement of the water licence.

1.4 Scope of Work

This QA/QC Plan covers the environmental monitoring undertaken at the Hamlet's truck fill station, Solid Waste Disposal Facility, and, Sewage Disposal Facility (Figures 2 and 3).

1.5 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 Field Sampling

2.1 Sampling Procedures

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).

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 field sampling.
- Proper and timely shipment of samples to the laboratory.
- Timely delivery of samples to the laboratory from the air cargo facility.

2.2 Sampling Collection

Refer to the *Environmental Monitoring Program Checklist*, found in Appendix C for specific details on the sampling locations, equipment and sampling methods.

2.2.1 Locations

The water licence issued to the Hamlet (3BM-HAL0810) by the NWB specifies five monitoring stations (Figures 2 and 3) across the licensed facilities.

- Station HAL-1 is a raw water supply (from Water Supply Lake) volume monitoring location.
- Station HAL-2 is a run-off sampling location from the Solid Waste Disposal Facility.
- Station HAL-3 is a wastewater influent (raw sewage) volume monitoring location at the discharge point into the Sewage Disposal Facility.
- Station HAL-4 is an effluent discharge sampling location from the Sewage Disposal Facility.
- Station HAL-5 is a final effluent discharge sampling location prior to entering Foxe Basin.

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

Table 1 –Geographic Coordinates for the Monitoring Stations for NWB Licence 3BM-HAL0810

Monitoring Station	Latitude	Longitude
HAL-1	N 68° 45' 46.40"	W 81° 14' 05.47"
HAL-2	N 68° 48' 28.53"	W 81° 16' 22.88"
HAL-3 (cell #1)	N 68° 48' 15.96"	W 81° 15' 48.96"
HAL-3 (cell #2)	N 68° 48' 18.24"	W 81° 15' 52.98"
HAL-4	N 68° 48' 23.88"	W 81° 15' 46.20"
HAL-5	N 68° 49' 01.32"	W 81° 15' 50.40"

2.2.2 Sampling Equipment

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

Environmental monitoring samples collected for analysis of selected chemical parameters are to be placed directly into new pre-cleaned, laboratory-supplied sample bottles. All monitoring samples are to be placed in clean coolers for transportation to the subcontract laboratory. The samples are transported/submitted under Chain of Custody documentation. Included on a Chain of Custody form is the client information, the sample information, the analyses requested, the relevant regulations, the turnaround time for the analytical results, comments, and temperature of the samples at the time they arrived in the laboratory. An example of a completed Chain of Custody form is included in Appendix D.

2.2.3 Sampling Methods

Please see Appendix E for the Environmental Monitoring Program Schedule. As a general recommendation, please refrain from using insect repellant, disinfection hand gel or other chemical products before and during sample collection. Also, please refrain from smoking during sample collection.

2.2.3.1 *Landfill Runoff Sampling*

Landfill runoff is to be collected (at Station HAL-2) at the beginning, middle, and near the end of the season when flow is observed. Runoff samples are to be collected from the receiving water body by immersing the sample bottle into the runoff stream neck first to a depth of 5 to 10 cm (if possible). The sampling container is to be filled with runoff and the sample bottle is raised neck first to prevent sample spillage.

2.2.3.2 *Wastewater Effluent Sampling*

Effluent samples from the Sewage Disposal Facility (Station HAL-4) are collected from the receiving water body by immersing the sample bottle into the effluent stream neck first to a depth of 5 to 10 cm (if possible). The sampling container is filled with effluent and the sample bottle is raised neck first to prevent sample spillage. Effluent samples from the Final Effluent Discharge Point (Station HAL-5) are collected from the receiving water body in the same manner described above (i.e., for Station HAL-4).

2.3 Sample Handling

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

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.

2.4 Quality Assurance and Quality Control Program

Cross contamination is a common source of error in sampling procedures. QC samples help identify when and how contamination might occur. There are various types of QC samples. For the purposes of the Hamlet's environmental monitoring, **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 monitoring program for NWB Licence 3BM-HAL0810. Appendix F includes a copy of the laboratory's CALA accreditation certificate and a list of the parameters for which they are certified.

3.2 Method Detection Limits

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

4 Reporting Requirements

4.1 General Submissions

As a condition of NWB Licence 3BM-HAL0810 (Appendix B), 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 Average Concentrations – provided in Part D of the NWB Licence 3BM-HAL0810 – where applicable).

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, 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: Figures

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scale: NTS	CLIENT: HALL BEACH, NUNAVUT	project no.: OTT-00209248-A0
date: 27/05/13	TITLE: LOCATION PLAN	FIG 01
drawn by: M.KELLEY		

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scale: NTS	CLIENT: HALL BEACH	project no.: OTT-00209248-A0
date: 27/05/13	TITLE: MONITORING STATION LOCATIONS	FIG 02
drawn by: M.KELLEY		

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scale: NTS	CLIENT: HALL BEACH	project no.: OTT-00209248-A0
date: 27/05/13	TITLE: MONITORING STATION LOCATIONS	FIG 03
drawn by: M.KELLEY		

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Appendix B:
Hamlet of Hall Beach's Water Licence

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NUNAVUT WATER BOARD
NUNAVUT IMALIRIYIN KATIMAYINGI
OFFICE DES EAUX DU NUNAVUT

File No.: 3BM-HAL0810

May 29, 2008

Mr. John Mabberi-Mudonyi
Acting SAO
Hamlet of Hall Beach
Box 3
Hall Beach, NU X0A 0K0
E-mail: sao_hbhamlet@qiniq.com

RE: NWB Licence No. 3BM-HAL0810

Dear Mr. Mabberi-Mudonyi;

Please find attached Licence No. 3BM-HAL0810 issued to the Hamlet of Hall Beach 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*. 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 will be in contravention of the *Nunavut Land Claims Agreement* (NLCA) and the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (NWNSRTA). 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 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 thirty (30) 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 acknowledged by the Manager of Licensing.

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

Sincerely,

Thomas Kabloona
A/Chief Executive Officer

TK/tla/dh

Enclosure: Licence No. 3BM-HAL0810
Comments from GN DoE and INAC

cc: Qikiqtani Distribution List

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NUNAVUT WATER BOARD
NUNAVUT IMALIRIYIN KATIMAYINGI
OFFICE DES EAUX DU NUNAVUT

DECISION

LICENCE NUMBER: 3BM-HAL0810

This is the decision of the Nunavut Water Board (NWB) with respect to an application for a Licence renewal received on February 25, 2008, made by:

Hamlet of Hall Beach

to allow for the use of water and disposal of waste for the Hamlet of Hall Beach, located within the Qikiqtani region of Nunavut. With respect to this application, the NWB gave notice to the public on March 14, 2008 that the Hamlet had filed an application for a water licence renewal.

DECISION

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

Licence Number 3BM-HAL0810 be issued subject to the terms and conditions contained therein. (Motion #: 2008-06)

SIGNED this 16th day of May, 2008 at Gjoa Haven, NU.

Thomas Kabloona
Acting Chief Executive Officer

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I. BACKGROUND

The Hamlet of Hall Beach has a population of approximately 700 people and is located at the coordinates of 68°46' north latitude and 81°13' west longitude on western shore of Foxe Basin within the Qikiqtani region of Nunavut. Hall Beach is located within a zone of continuous permafrost and is located on sand and gravel raised beaches with flat and gently rolling terrain containing numerous lakes and ponds.

Existing water use and waste disposal facilities include a freshwater intake pump and reservoir, sewage lagoon, solid waste disposal and hazardous waste storage.

II. PROCEDURAL HISTORY

The NWB issued a municipal water licence to the Hamlet of Hall Beach on January 9, 2003, to allow for the use of water and disposal of waste. Following an application by the Hamlet, the NWB issued an amendment to the Licence on April 24, 2007 approving the decommissioning of an abandoned sewage lagoon.

The Municipal Water Licence expired on March 31, 2008. The Government of Nunavut Department of Community and Government Services, on behalf of the Hamlet, submitted an application for water licence renewal to the NWB, which was received on February 25, 2008. Following a preliminary review of the application, the NWB concluded that it met the requirements of section 48(1) of the *Nunavut Waters and Surface Rights Tribunal Act* (the Act) and advised the Applicant and distribution list accordingly on March 14, 2008.

Information contained in the February 25, 2008 submission and distributed for review was as follows:

- Application cover letter
- Application summary;
- NWB Licence renewal application form;

The scope of the renewal application included ongoing operation of the existing Sewage Disposal Facility and Solid Waste Disposal Facility. No other information was presented to the NWB.

The Nunavut Water Board publicly posted notice of this application, in accordance with Section 55.1 of the Act and Article 13 of the *Nunavut Land Claims Agreement* (NLCA), on March 14, 2008. The assessment process included the referral of the application to a variety of Federal, Territorial and local organizations for their review and comment.

As no public concern was expressed, the NWB waived the requirement to hold a public hearing and proceeded with the application process.

The NWB received comments on the application from Indian and Northern Affairs Canada (INAC) and the Government of Nunavut Department of Environment (GN-DOE) on or prior to April 25, 2008.

Based upon the results of the detailed assessment, including consideration of any potential accidents, malfunctions, or impacts to water that the overall project might have in the area, the Board approved the application and has issued Licence 3BM-HAL0810.

III. ISSUES

Term of Licence

In accordance with Section 45 of the Act, the NWB may issue a licence for a term not exceeding twenty-five years. In determining an appropriate term of a water licence, the Board considers a number of factors, including, but not limited to, the results of INAC site inspections and the compliance record of the Applicant. In review of the previous water licence NWB3HAL0308 inspection reports, the NWB has noted that there were several issues of non-compliance and other related problems identified by the inspector, which include:

i. The Solid Waste Facility is unfenced and waste is not segregated;
ii. The Sewage Disposal Facility lacks sufficient holding time to treat sewage;
iii. Uncontrolled seepage from the lagoon;
iv. Improperly stored hazardous waste;
v. Uncontrolled runoff from the Solid Waste Disposal Facility; and
vi. Lack of annual reporting to the NWB.

In review of the application and the comments received from interested parties, there were no specific comments with respect to the Hamlet's request for a term of five (5) years for the Licence renewal. However, INAC recommended the following:

> INAC recommends that an extension of the current water license, retaining the current terms and conditions, if the Hamlet and Community and Government Services agree to bring the Hamlet into compliance with the current terms and conditions of the license for the current wastewater disposal facilities and water use in the community. This extension should be provided in order for the community and its technical support group to provide to the Board an amendment, a revised license application and/or a report dealing with compliance issues.

Having considered INAC's comments, the NWB has decided on a two (2) year term for the renewed Licence. The decision for a short duration was based on issues with non-compliance and is intended to send a clear message to the Hamlet and regulatory authorities that the Board will not passively encourage the Hamlet's failure to comply with the Licence conditions and

associated legal requirements. The Board fully expects the Hamlet to take immediate steps to come into full compliance with the Licence requirements for its existing facilities and to operate the Sewage Disposal Facility in accordance with the Licence. When the Hamlet submits an application to renew the Licence in approximately 20 months, the Board expects the Hamlet to be in full compliance with the licence. This short duration also permits the Board to increase its level of confidence that the facility is operating as it should. As per Part B, Item 10 of the Licence, the Licensee must submit a Plan for Compliance that clearly demonstrates how the Hamlet will achieve full compliance with the Licence conditions.

Annual Report

The NWB has imposed on the Licensee, the requirement to produce an Annual Report. These Reports are for the purpose of ensuring that the NWB has an accurate annual update of municipal activities during a calendar year. This information is maintained on the public registry and is available to interested parties upon request. A *"Standardized Form for Annual Reporting"* is to be used by the Licensee and is available from the NWB file transfer protocol (FTP) site under the Public Registry link at the NWB Website. Additional information may be submitted as required.
(ftp://nunavutwaterboard.org/ADMINISTRATION/Standardized%20Forms/).

Operational Plans

Appropriate Plans need to be developed to the satisfaction of the NWB for the operation and maintenance of the facilities, the protection of the environment with regard to potential spills through day-to-day operations, and abandonment and restoration of the sites.

It is noted that the Licensee has not submitted an Operations and Maintenance (O&M) Plan to the NWB as required under the previous licence. The renewed Licence has therefore, included the requirement to provide O&M Manual to the NWB. The O7M Manual is to include the following in accordance with Part F, Item 1 of the Licence:

i. *Water Storage and Distribution Facility Operation and Maintenance (O&M) Plan*;
ii. *Sewage Disposal Facility Operation and Maintenance (O&M) Plan*;
iii. *Sewage Sludge Management Plan*;
iv. *Solid Waste Disposal Facility Operation and Maintenance (O&M) Plan*;
v. *Spill Contingency Plan; and*
vi. *Monitoring Program Quality Assurance/Quality Control Plan.*

The purpose of the O&M Manual noted above is to assist Hamlet staff in carrying out the procedures relating to their water distribution and waste disposal facilities. The O&M Manual should demonstrate to the NWB that the Hamlet is capable of operating and maintaining the infrastructure related to water use and waste disposal to meet the requirements of the Licence. The O&M Manual should be based, at a minimum on the various NWB-approved guidelines

available (i.e. *Guidelines for the Preparation of an Operations and Maintenance Manual for Sewage and Solid Waste Disposal Facilities in the Northwest Territories,* Duong and Kent, 1996) and other regulatory guidelines as deemed appropriate.

Water Use

The Hamlet of Hall Beach currently utilizes "Water Supply Lake" as a source of potable water with a maximum quantity of 35,000 cubic metres annually. No concerns were raised by the parties in their written submissions 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. The NWB has renewed the terms and conditions associated with water use by the Hamlet accordingly.

Sewage

The Hamlet of Hall Beach currently provides trucked sewage services for the Community's residents, businesses and institutions. Specific comments relevant to sewage disposal operations in the Hamlet were provided by GN-DOE and INAC.

As a standard condition for most water licenses involving municipal effluents the NWB has included acute toxicity testing as a Licence requirement under Part D, Item 6 prior to entering the receiving environment in Foxe Basin.

The NWB has added a requirement for a geotechnical inspection of the facilities to be carried out on an annual basis by a qualified engineer. This condition is consistent with other water licences issued in Nunavut.

INAC noted that a Spill Contingency Plan should be submitted to the NWB by the Licensee. The NWB concurs with this recommendation, and has imposed this requirement as part of the O&M Manual in the Licence.

Finally, as part of the Sewage Disposal Facility O&M Plan, the NWB requires that the Licensee include procedures and frequencies of inspections to be carried out to verify when there is flow from the Sewage Disposal Facility. Visual inspections to verify flow from the Sewage Disposal Facility are required to ensure that the monitoring program under Part D, Item 2 of the Licence is initiated at the appropriate time and that the Inspector is notified upon its commencement.

Solid Waste

The development of an O&M Plan for the Solid Waste Disposal Facility is required as part of the overall O&M Manual discussed above. The O&M Plan for the Solid Waste Disposal Facility should set out procedures for the segregation, storage and eventual removal for disposal of hazardous wastes, including waste oil, and should also address procedures for the incineration of solid waste.

The NWB notes the concern raised by INAC regarding leachate and/or runoff from the Solid Waste Disposal Facility and Sewage Disposal Facility entering the stream that runs along the length of both facilities. INAC provided a summary of water quality sample results taken in 2007 by the Inspector. Results indicate that runoff and/or leachate from the waste areas has entered the stream. The Licensee is reminded of its obligation to contain waste and dispose of waste in accordance with the terms and conditions of this Licence. Any issues of non-compliance are subject to the direction provided by the Inspector. The Licensee must contain runoff and leachate from the Solid Waste Disposal Facility so that it does not enter water. This requirement is also supported by the GN-DoE.

Abandonment and Restoration

To ensure that all existing end-of-life facilities are reclaimed in an appropriate manner, the NWB requires Licensees to submit an *Abandonment and Restoration Plan*. This Plan is to be submitted at least six (6) months prior to final closure of any licensed facility or upon submission of the final design drawings for the construction of new facilities to replace existing ones. The requirements for the Plan are outlined in Part G, Item 1 of this Licence.

IV. LICENCE 3BM-HAL0810

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 HALL BEACH
(Licensee)

of **P.O. Box 3 HALL BEACH, NUNAVUT X0A 0K0**
(Mailing Address)

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

Licence Number **3BM-HAL0810**

Water Management Area **NUNAVUT 06**

Location **HALL BEACH, NU (Latitude 68°46'N and Longitude 81°13'W)**

Purpose: **WATER USE AND WASTE DISPOSAL**

Description **MUNICIPAL UNDERTAKINGS**

Quantity of Water Not to Exceed **35,000 CUBIC METRES ANNUALLY**

Date of Licence **May 16, 2008**

Expiry Date of Licence **May 30, 2010**

Dated this 16th of May, 2008 at Gjoa Haven, NU.

Thomas Kabloona
Acting Chief Executive Officer

PART A: SCOPE AND DEFINITIONS

1. Scope

a. This Licence allows for the use of water and the disposal of waste for municipal undertakings at the Hamlet of Hall Beach, Qikiqtani Region, Nunavut (68°46' N; 81°13'W);

b. This Licence is issued subject to the conditions contained herein with respect to the taking of water and the depositing of waste of any type in any waters or in any place under any conditions where such waste or any other waste that results from the deposits of such waste may enter any waters. Whenever new Regulations are made or existing Regulations are amended by the Governor in Council under the Nunavut Waters and Nunavut Surface Rights Tribunal Act, or other statutes imposing more stringent conditions relating to the quantity or type of waste that may be so deposited or under which any such waste may be so deposited, this Licence shall be deemed, upon promulgation of such Regulations, to be subject to such requirements; and

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

2. Definitions

In this Licence: **3BM-HAL0810**

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

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

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

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

"Average Concentration" means the arithmetic mean of the last four consecutive analytical results for composite or grab samples collected from the monitoring stations identified in Part H;

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

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

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

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

"Final Discharge Point" in respect of an effluent means an identifiable discharge point of a facility beyond which the operator of the facility no longer exercises control over the quality of the effluent;

"Freeboard" means the vertical distance between water line and the designed maximum operating height on the crest of 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 a single water or wastewater sample taken at a time and place representative of the total discharge;

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

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

"Licensee" means the holder of this Licence;

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

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

"Nunavut Land Claims Agreement" (NLCA) means the "*Agreement Between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada*", including its preamble and schedules, and any amendments to that agreement made pursuant to it;

"Sewage" means all toilet wastes and greywater;

"Sewage Disposal Facilities" comprises the area and engineered lagoon and decant structures designed to contain sewage as described in the Application for Water Licence filed by the Applicant on January 9, 2003, and as modified pursuant to the amendment request granted by the NWB on April 24, 2007.

"Solid Waste Disposal Facilities" comprises the area and associated structures designed to contain solid waste (landfill site) as described in the Application for Water Licence filed by the Applicant on January 9, 2003;

"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 Supply Facilities" comprises the area and associated intake infrastructure at Water Supply Lake, as described in the Application for Water Licence filed by the Applicant on January 9, 2003.

3. Enforcement

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

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

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

d. The Licensee shall, in relation to any application to renew or amend the Licence, provide an updated Plan for Compliance as submitted pursuant to Part B, Item 10. The updated Plan for Compliance must be submitted at the time of Application, in order for the Application to be deemed complete.

PART B: GENERAL CONDITIONS

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

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

   b. the monthly and annual quantities in cubic metres of fresh water obtained at the Water Supply Facilities;

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

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

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

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

   g. Any updates or revisions for manuals and plans (i.e., *Operations and Maintenance Manual*) as required by changes in operation and/or technology;

   h. a summary of any studies or reports requested by the Board that relate to water use and waste disposal or restoration, and a brief description of any future studies planned; and

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

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

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

5. The Licensee shall, within ninety (90) days after the first visit by the Inspector following issuance of this Licence, post the necessary signs to identify the stations of the "Monitoring Program." All signage postings shall be in the Official Languages of Nunavut.

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

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

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

Inspector Contact:
Water Resources Officer
Nunavut District, Nunavut Region
P.O. Box 100
Iqaluit, NU X0A 0H0
Telephone: (867) 975-4295
Fax: (867) 979-6445

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

8. 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.

9. The Licensee shall ensure that all document(s) and correspondence submitted by the Licensee to the Board are received and acknowledged by the Manager of Licensing.

10. The Licensee shall submit to the Board for approval within the lesser of ninety (90) days or upon the filing of any application in relation to the Licence, a Plan for Compliance that clearly demonstrates the ways and means the Licensee will undertake to achieve full compliance with the conditions of this Licence. The Plan for Compliance must also address the potential for minimally treated sewage to enter the environment during periods when the wetland area may be frozen or otherwise not fully capable of treating sewage.

11. 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 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.

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

13. 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 condition 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.

14. This Licence is not assignable except as provided in Section 44 of the Act.

PART C: CONDITIONS APPLYING TO WATER USE

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

2. The annual quantity of water used for all purposes shall not exceed 35,000 cubic metres.

3. The Licensee shall equip all water intake hoses with a screen of an 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.

4. The Licensee shall not remove any material from below the ordinary high water mark of any water body unless otherwise approved by the Board in writing.

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

6. Sediment and erosion control measures shall be implemented prior to and maintained during the operation to prevent entry of sediment into water.

PART D: CONDITIONS APPLYING TO WASTE DISPOSAL

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

2. The Licensee shall provide notice to an Inspector annually when flow is observed from the sewage disposal facility and upon commencing the monitoring program at Monitoring Program Station HAL-4.

3. All Effluent discharged from the Sewage Disposal Facility at Monitoring Program Station HAL-4 shall meet the following Effluent quality standards:

Parameter	Maximum Average Concentration
BOD_5	120 mg/L
Total Suspended Solids	180 mg/L
Fecal Coliforms	1×10^6 CFU/100mL
Oil and Grease	No visible sheen
pH	between 6 and 9

4. The Licensee shall maintain at all times, a freeboard of at least 1.0 metre, or as recommended by a qualified geotechnical engineer and as approved by the Board in writing, for all dams, dykes or other structures intended to contain, withhold, divert or retain water or wastes.

5. The Sewage Disposal Facility shall be maintained and operated in such a manner as to prevent structural failure.

6. All Effluent discharged from the Sewage Disposal Facility (HAL-4), shall be demonstrated to be Not Acutely Toxic at Monitoring Program Station HAL-5 prior to entering Foxe Basin, under the following tests to be conducted once annually approximately mid-way through discharge:

   a. Acute lethality to Rainbow Trout, Oncorhynchus mykiss (as per Environment Canada's Environmental Protection Series Biological Test Method EPS/1/RM/13); and

   b. Acute lethality to the crustacean, Daphnia magna (as per Environment Canada's Environmental Protection Series Biological Test Method EPS/1/RM/14).

7. 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.

8. 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.

9. The Licensee shall implement measures to control wind-blown litter at the Solid Waste Disposal Facility.

PART E: CONDITIONS APPLYING TO MODIFICATION AND CONSTRUCTION

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

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

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

    b. these 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. Modifications for which all of the conditions referred to in Part E, Item 2, have not been met may be carried out only with written approval from the Board. The Licensee shall provide as-built plans and drawings of the Modifications referred to in this Licence within ninety (90) days of completion of the Modification. These plans and drawings shall be stamped by an Engineer.

4. 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

5. The Licensee shall implement sediment and erosion control measures prior to and during all activities carried out under this Part to prevent the release of sediment and minimize erosion.

PART F: CONDITIONS APPLYING TO OPERATION AND MAINTENANCE

1. The Licensee shall submit to the Board for approval, within ninety (90) days of issuance of the Licence, an Operations and Maintenance Manual prepared where appropriate, 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"*. The Manual shall take into consideration the comments received during the application review process and shall contain the following plans:

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

2. The Licensee shall review the O&M Manual referred to in Part F, Item 1 as required by changes in operation and/or technology and modify accordingly. Revisions are to be submitted in the form of an Addendum to be included with the Annual Report.

3. An inspection of all engineered facilities related to the management of water and waste shall be carried out annually in July or August by a Geotechnical Engineer. The engineer's report shall be submitted to the Board within sixty (60) days of the inspection, including a covering letter from the Licensee outlining an implementation plan addressing each of the Engineer's recommendations.

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

5. 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 appropriate contingency measures as approved under the Operation and Maintenance Manual for the Hamlet of Hall Beach;

b. report the incident immediately via the 24-Hour Spill Reporting Line at (867) 920-8130 and to the Inspector 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 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 upon submission of the final design drawings for 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. petroleum and chemical storage areas;
d. any site affected by waste spills;
e. leachate prevention;
f. an implementation schedule;
g. maps delineating all disturbed areas, and site facilities;
h. consideration of altered drainage patterns;
i. type and source of cover materials;
j. future area use;
k. hazardous wastes; and
l. a proposal identifying measures by which restoration costs will be financed by the Licensee upon abandonment.

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
HAL-1	Raw water supply intake at Water Supply Lake	Active (Volume)
HAL-2	Runoff from Solid Waste Disposal Facility	Active
HAL-3	Raw Sewage at discharge point into the Sewage Disposal Facility	Active (Volume)
HAL-4	Effluent discharged from Sewage Disposal Facility	Active

HAL-5	Final Effluent Discharge Point prior entering Foxe Basin	New

2. The Licensee shall sample at Monitoring Program Stations HAL-4 and HAL-5 upon providing notice to the inspector and every four weeks thereafter when flow is observed. Samples shall be analyzed for the following parameters:

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

3. The Licensee shall sample at Monitoring Program Station HAL-2 once annually during periods of runoff or seepage. Samples shall be analyzed for the following parameters:

TPH (Total Petroleum Hydrocarbons)
PAH (Polycyclic Aromatic Hydrocarbons)
BTEX (Benzene, Toluene, Ethylbenzene, Xylene)

BOD	Fecal Coliforms
pH	Conductivity
Total Suspended Solids	Oil and Grease
Nitrate-Nitrite	Ammonia Nitrogen
Total Phenols	Total Alkalinity
Total Hardness	Calcium
Magnesium	Potassium
Sodium	Sulphate
Total Arsenic	Total Cadmium
Total Copper	Total Chromium
Total Iron	Total Lead
Total Mercury	Total Nickel

4. The Licensee shall report all results of acute toxicity testing as required under Part D,

Item 6 within the Annual Report as per Part B, Item 1.

5. The Licensee shall measure and record, in cubic metres, the monthly and annual quantities of water pumped at Monitoring Program Station HAL-1, for all purposes.

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

7. The Licensee shall measure and record the annual quantities of sewage solids removed from the Sewage Disposal Facility. Details of the protocol for monitoring quantities of sewage sludge removed from the Sewage Disposal Facility shall be provided in the *Sewage Sludge Management Plan*, as part of the O&M Manual.

8. 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 requested by an Inspector.

9. Modifications to the Monitoring Program may be made only upon written approval from the NWB.

10. If, during the term of this Licence, additional Final Discharge Points are identified, the Licensee shall submit a report to include:

    a. Plans, specifications, geographic coordinates and a general description of each Final Discharge Point; and

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

11. 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.

12. All analyses shall be performed by a laboratory certified by the Canadian Association of Environmental Analytical Laboratories (CAEAL), or as otherwise approved by an Analyst.

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Appendix C:
Environmental Monitoring Program Checklist, Summary of Sample Bottle Requirements

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HAMLET OF HALL BEACH
ENVIRONMENTAL MONITORING PROGRAM CHECKLIST

PRE-SAMPLING ACTIVITIES		
Bottle Order	At least two weeks before upcoming environmental sampling (see Environmental Monitoring Program Schedule in Appendix E), send a request to the contract laboratory for the appropriate sample sets (bottles) for the required sampling test groups (see Conditions 2 and 3 of Part H of Nunavut Water Board Licence 3BM-HAL0810)	☐
Personal Protective Equipment	Ensure that the required personal protective equipment (PPE), such as latex gloves, is on hand before commencing the environmental monitoring program.	☐
Bottle Shipment	Ensure that the bottle shipment has arrived from the contract laboratory in time for the sampling program and verify the integrity of all sampling containers. Report any missing or broken bottles to the contract laboratory as soon as possible, so that replacement bottles may be shipped.	☐
Sampling Location Inspections	Perform an initial inspection of all routinely-monitored sampling locations before the commencement of the monitoring program. Make note of any equipment damage or conditions that may prevent the collection of the environmental monitoring program samples.	☐
GENERAL SAMPLING INSTRUCTIONS		
Prevention of Cross-Contamination	Ensure that any laboratory provided sampling instructions are strictly followed. Latex or nitrile gloves should be worn during sampling and should be replaced with fresh gloves after all sample containers are filled at each sampling location. Dedicated sampling equipment such as sampling poles should be cleaned with soap and water after each sample is collected to prevent cross-contamination. As a general recommendation, please refrain from using insect repellant, disinfection hand gel or other chemical products before and during sample collection. Also, please refrain from smoking during sample collection.	☐
Sample Care (including Packing of Cooler)	All sample containers should be tightly sealed and properly labelled with the sample ID, date and time of sample collection, location of sample collection and parameters to be analyzed. The outside of the bottles should be cleaned with soap and water and dried prior to placing the samples in the cooler. The samples should be stored on ice in a cooler until delivery to the laboratory. A chain of custody form should be filled out completely and be used to track the samples 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.	☐
RAW WATER SUPPLY		
Sampling Station HAL-1	Station HAL-1 (see Figure 2) is a raw water supply (from Water Supply Lake) volume monitoring location. The water licence does not require the collection of any water samples from this location. Measure and record (in m^3) the monthly and annual quantities of water pumped from Station HAL-1.	☐
SOLID WASTE DISPOSAL FACILITY		
Sampling Station HAL-2	Landfill runoff is collected once annually during periods of runoff or seepage (see Schedule in Appendix E for timing and list of parameters to be sampled). Runoff samples are collected from the receiving water body (see Figure 3) by immersing the sample bottle into the runoff stream neck first to a depth of 5 to 10 cm (if possible). The sampling container is filled with runoff and the sample bottle is raised neck first to prevent sample spillage.	☐
SEWAGE DISPOSAL FACILITY		
Sampling Station HAL-4	Effluent discharge is collected from the Sewage Disposal Facility upon providing notice to the inspector and every four weeks thereafter when flow is observed (see Schedule in Appendix E for timing and list of parameters to be sampled). Effluent samples are collected from the receiving water body (see Figure 3) by immersing the sample bottle into the effluent stream neck first to a depth of 5 to 10 cm (if possible). The sampling container is filled with effluent and the sample bottle is raised neck first to prevent sample spillage.	☐
Sampling Station HAL-5	Effluent discharge is collected from the Final Effluent Discharge Point upon providing notice to the inspector and every four weeks thereafter when flow is observed (see Schedule in Appendix E for	☐

	timing and list of parameters to be sampled). Effluent samples are collected from the receiving water body (see Figure 3) by immersing the sample bottle into the effluent stream neck first to a depth of 5 to 10 cm (if possible). The sampling container is filled with effluent and the sample bottle is raised neck first to prevent sample spillage.	
POST-SAMPLING ACTIVITIES		
Sample Shipment	See **Sample Care** section for sampling handling and cooler packing instructions. Ensure all samples are shipped to the contract laboratory immediately after the completion of the environmental monitoring event to ensure that the hold times are respected for the various parameters. Follow-up with the contract laboratory on the day after the samples were shipped to ensure that the samples were collected from the air cargo facility and received by the contract laboratory for analysis.	☐
Analytical Results	Ensure that the analytical results for the environmental monitoring program samples are received within the specified turn-around time. Follow-up with the contract laboratory if the results are not provided as expected to ensure timely reporting to the Nunavut Water Board (as required by Water Licence 3BM-HAL0810).	☐

Checklist Performed By:

Name	Signature	Date

Sample Bottle Requirements for Parameters Listed in Conditions 2 & 3 of Part H of Nunavut Water Board Licence No. 3BM-HAL0810

Parameter	Recommended Sample Container	Preservative	Hold Time
Alkalinity	250 mL plastic	None	14 days
Anions (Br, Cl, F, NO_3, NO_2, PO_4, SO_4)	250 mL plastic	None	5/28 Days
Biochemical Oxygen Demand (BOD_5)	500 mL plastic	None	4 days
Carbon, Total Organic (TOC)	250 mL plastic	H_2SO_4 (pH < 2)	10 days
Conductivity	250 mL plastic	None	28 days
Dissolved ICPMS, ICP Metals	250 mL plastic	None - if not field filtering	60 days
Total ICPMS, ICP Metals - NOT FILTERED	250 mL plastic	HNO_3 (pH < 2)	30 days
Nitrogen - Ammonia (NH_3 - N) / Total Kjeldahl Nitrogen (TKN)	250 mL plastic	H_2SO_4 (pH < 2)	10 days
Phenolics - Total	120 mL amber glass	H_2SO_4 (pH < 2)	30 days
Solids - (TS, TSS, TDS)	500 mL plastic	None	7 days
Microbiological (incl. faecal coliforms)	300 mL plastic - Sterilized	$Na_2S_2O_3$	48 hours
Total Hardness	500 mL plastic	None	28 days
Total Petroleum Hydrocarbons (TPH)	2 x 500 mL amber glass	$NaHSO_4$ (pH < 2)	40 days
	3 x 40 mL clear glass septum vial	$NaHSO_4$ (pH < 2)	14 days
BTEX (benzene, toluene, ethylbenzene, xylenes)	3 x 40 mL clear glass septum vial	$NaHSO_4$ (pH < 2)	14 days
Polycyclic Aromatic Hydrocarbons (PAH)	2 x 500 mL amber glass	None	14 days

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Appendix D:
Completed Example of Chain of Custody Documentation

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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: _____
- [x] Other: CCME

Turnaround Time Requested

Rush 24 Hr	[ ]	100% Surcharge	
Rush 48 Hr	[ ]	50% Surcharge	
Rush 72 Hr	[ ]	25% Surcharge	
5-7 Day	[x]	Standard	

Specific Date: _____

Organization: EXP SERVICES INC	Address and Invoicing Address (if different): 100 - 2650 Queensview Dr. Ottawa, ON K2B 8H6
Contact: Robert Renaud	
Tel: 613-688-1899	
Fax: 613-225-7337	Quote No.:
Email: robert.renaud@exp.com	P.O. No.:
	Project Name: OTT-00209248-A0
	Additional Info: Waybill # 245-45556615

REPORT NUMBER:

Lab No.	Sample Identification	Sample Matrix *	Date Collected (yy-mm-dd)	Time Collected	Alkalinity, pH	Ammonia-N, Toc	BOD	Anions - Cl, NO2/NO3	Fecal Coliforms	Phenols	Total Metals, Hg	TSS, Conductivity	Hardness (CaCO3)	Field pH	Field Temp.	# Bottles/ Sample	Field Filtered(Y/N)
	KIM-8	SW	13-07-23	11:00	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–	8	N

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

Sample Submission Information

- Sampled By (print): Rob Renaud
- Submitted By (print): Rob Renaud
- Signature: Rob Renaud
- Date(yy-mm-dd): 13-07-23 Time: 12:00

Shipping Information

- [x] Courier (Client account)
- [ ] Courier (Caduceon account)
- [ ] Drop Off
- [ ] Caduceon (Pick-up)

Reporting and Invoicing

- Invoice for Shipping: [ ]
- # of Pieces: 1
- [ ] Fax Results
- [x] Email Results
- [x] Invoice by Email
- [ ] Invoice by Mail

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 15189

White: Lab Copy / Yellow: Invoicing Copy / Pink: Client Copy

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Appendix E:
Environmental Monitoring Program Schedule

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Hall Beach Monitoring Program Schedule
Nunavut Water Board Licence No. 3BM-HAL0810

Monitoring	Location	Month												
Station ID	Description	January	February	March	April	May	June	July	August	September	October	November	December	Annual
HAL-1	Raw water supply intake at Water Supply Lake	V	V	V	V	V	V	V	V	V	V	V	V	V
HAL-2	Runoff from Solid Waste Disposal Facility						LR[1]	LR[1]	LR[1]					
HAL-3	Raw sewage at discharge point into Sewage Disposal Facility	V	V	V	V	V	V	V	V	V	V	V	V	V
HAL-4	Effluent discharged from Sewage Disposal Facility						WW[2]	WW[2]	WW[2]	WW[2]				
HAL-5	Final Effluent Discharge Point prior to entering Foxe Basin						WW[2]	WW[2]	WW[2]	WW[2]				

Test Groups		
V	Volume (m^3)	
LR	Landfill Runoff	(Total Petroleum Hydrocarbons (TPH), Polycyclic Aromatic Hydrocarbons (PAH), benzene, toluene, ethylbenzene, xylenes (BTEX), Biochemical Oxygen Demand (BOD_5), pH, Total Suspended Solids (TSS), nitrate-nitrite, total phenols, total hardness, magnesium, sodium, total arsenic, total copper, total iron, total mercury, faecal coliforms, conductivity, oil & grease (visual), ammonia nitrogen, total alkalinity, calcium, potassium, sulphate, total cadmium, total chromium, total lead, total nickel)
WW	Wastewater Effluent	(Biochemical Oxygen Demand (BOD_5), Total Suspended Solids (TSS), conductivity, oil & grease (visual), magnesium, sodium, chloride, total hardness, ammonia nitrogen, total cadmium, total cobalt, total chromium, total copper, total aluminum, total mercury, faecal coliforms, pH, nitrate-nitrite, total phenols, calcium, potassium, sulphate, total alkalinity, total zinc, total iron, total manganese, total nickel, total lead, total arsenic, total organic carbon (TOC))

[1] Sample only once annually during periods of runoff or seepage.

[2] Upon providing notice to the inspector and every four weeks thereafter when flow is observed.

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Appendix F:
Subcontract Laboratory Accreditation & Supporting Documentation

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CALA
Canadian Association for Laboratory Accreditation Inc.

CALA Directory of Laboratories

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

Standard: Conforms with requirements of ISO/IEC 17025
Clients Served:
Revised On: May 9, 2013
Valid To: October 25, 2015

Scope of Accreditation

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

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

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

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

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

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

Oil (Organic)
Polychlorinated Biphenyls (PCB) - Oil (040)
C-PCB-01; modified from EPA 8081
GC/ECD - EXTRACTION
Aroclor 1242
Aroclor 1248
Aroclor 1254
Aroclor 1260

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

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

Solids (Inorganic)
Conductivity - Soil, Sediments (099)
A-CONDO-03; SM 2510 B & MOE-LaSB E 3138
CONDUCTIVITY METER - EXTRACTION
Conductivity

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

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

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

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

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

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

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

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

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Tin
Titanium
Tungsten
Vanadium
Zinc

Solids (Inorganic)
pH - Soil, Sediment, Solid Sludge (100)
A-pH-03; SM 4500 H & MOE-LaSB E3137
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 (089)
C-VOC-01; modified from EPA SW-846 METHOD 1311, 5030/8260
GC/MS - PURGE AND TRAP - TCLP
1,1-Dichloroethylene
1,2-Dichlorobenzene
1,2-Dichloroethane
1,4-Dichlorobenzene
Benzene
Carbon tetrachloride
Chlorobenzene
Chloroform
Dichloromethane
Methyl ethyl ketone
Tetrachloroethylene
Trichloroethylene
Vinyl chloride

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

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

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Solids (Organic)
Polychlorinated Biphenyls (PCB) - Soil (053)
C-PCB-02; modified from EPA 8000/8081
GC/ECD - EXTRACTION
Aroclor 1242
Aroclor 1248
Aroclor 1254
Aroclor 1260

Solids (Organic)
Volatile Organic Compounds (VOC) - Soil (063)
C-VOC-02; modified from EPA 8260
GC/MS - PURGE AND TRAP
1,1 - Dichloropropene
1,1-Dichloroethane
1,1-dichloroethylene
1,1,1-Trichloroethane
1,1,1,2 - Tetrachloroethane
1,1,2-Trichloroethane
1,1,2,2-Tetrachloroethane
1,2 - Dibromo - 3 - chloropropane
1,2-dichlorobenzene
1,2-dichloroethane
1,2-Dichloropropane
1,2,3 - Trichlorobenzene
1,2,3 - Trichloropropane
1,2,4 - Trichlorobenzene
1,2,4 - Trimethylbenzene
1,3 - Dichloropropane
1,3-Dichlorobenzene
1,3,5 -Trimethylbenzene
1,4-dichlorobenzene
2 - Chlorotoluene
2 - Hexanone (MBK)
2,2 - Dichloropropane
4 - Chlorotoluene
Acetone (2-Propanone)
Benzene
Bromobenzene
Bromodichloromethane
Bromoform
Bromomethane
Carbon Tetrachloride
Chlorobenzene
Chlorodibromomethane
Chloroethane
Chloroform
Chloromethane
cis-1,2-Dichloroethylene
cis-1,3-Dichloropropene
Dibromomethane
Dichlorodifluoromethane
Dichloromethane
Ethylbenzene

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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
Trichlorofluoromethane
Vinyl Chloride

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

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

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

Water (Inorganic)
Ammonia - Water, Wastewater, Liquid Biosolids (103)
A-NH3-01; modified from MOEE RNDNP-E3364, SDNP-E3366
COLORIMETRIC - DISCRETE
Ammonia

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

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Sulfate

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

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

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

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

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

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

Water (Inorganic) OSDWA †
Dissolved and Extractable Metals - Water (004)
D-ICP-01; modified from APHA 3120 B
ICP
Aluminum
Barium
Beryllium
Bismuth
Boron
Cadmium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Lithium
Magnesium
Manganese
Molybdenum

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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
Cobalt
Copper
Lead
Molybdenum
Selenium
Silver
Thallium
Uranium
Vanadium

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

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

Water (Inorganic)
Nitrate + Nitrite - Water (102)
A-NO23-01; modified from SM 4500-NO3-F
COLORIMETRIC - DISCRETE ANALYZER
Nitrate plus Nitrite

Water (Inorganic)
Nitrite - Water (101)
A-NO2-01; modified from SM 4500-NO2-B
COLORIMETRIC - DISCRETE ANALYZER
Nitrite

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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)
Orthophosphate - Water (104)
A-PO4-01; modified from MOEE RNDNP-E3364, SDNP-E3366
COLORIMETRIC - DISCRETE
Phosphate

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

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

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

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

Water (Inorganic)
Total Metals - Water, Wastewater, Liquid Biosolids (067)
D-ICP-01; modified from APHA 3120 B
ICP/AES - DIGESTION
Aluminum
Antimony
Arsenic
Barium
Beryllium
Bismuth
Boron
Cadmium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Lithium
Magnesium
Manganese
Molybdenum

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Nickel
Potassium
Silver
Sodium
Strontium
Tin
Titanium
Tungsten
Vanadium
Yttrium
Zinc
Zirconium

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

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

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

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

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

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

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

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

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

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

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

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

Water (Organic) OSDWA †
Volatile Organic Compounds (VOC) - Water (041)
C-VOC-01; modified from EPA 8260 and 5030
GC/MS - PURGE AND TRAP
1,1-Dichloroethane
1,1-dichloroethylene
1,1-Dichloropropene
1,1,1-Trichloroethane
1,1,1,2-Tetrachloroethane
1,1,2-Trichloroethane
1,1,2,2-Tetrachloroethane
1,2-Dibromo-3-chloropropane

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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-Isopropyl Toluene
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
Isopropyl Benzene
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
Tetrachloroethylene
Toluene
trans-1,2-Dichloroethylene
trans-1,3-Dichloropropene
Trichloroethylene

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Trichlorofluoromethane
Vinyl Chloride

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Appendix B:
Sampling Pole Construction Instructions

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How to Make a Sampling Pole

Sampling the water at your lake or pond can be a relaxing and rewarding experience. However, occasionally you can be faced with a very frustrating, or even dangerous situation, if sampling sites are located in especially hard-to-reach areas. Often, tributaries flow in areas that are either obstructed by vegetation, surrounded by unstable and unsafe footing, or simply unpleasant to venture into. If you have ever been faced with one of these arduous sampling tasks, you may benefit from using a sampling pole!

Normally, to sample a tributary, a big white bottle is filled by scooping surface water from a flowing area of a stream. This requires the volunteer to crouch on the stream bank, or to step into the waters of the tributary. Ideally, this task should be relatively simple and safe. Often times, however, this can mean climbing down steep embankments, crawling on dam structures, or balancing on slippery rocks. In these cases, a sampling pole can be used to help reach appropriate sampling areas without putting oneself in a dangerous or unpleasant situation. A sampling pole simply acts as an extension of the sampler's arm, since the sampling bottle is attached to the end of the pole. Tributary water can then be scooped into the bottle from a much greater distance than if using the normal method.

If you often find yourself in precarious tributary sampling situations, DES suggests that you consider using a sampling pole to assist you during your monthly sampling events. This helpful tool can be bought; however, it is easy to construct and can make your sampling job a much more pleasant experience! Just follow these simple instructions, as adapted from the Massachusetts Department of Environmental Protection (MADEP).

Materials:

- Aluminum extension pole that extends 4' to 8' is recommended. Available in most hardware or home centers, usually used for window washing or painting.
- One-handed C Clamp (quick release), which will hold a 3 ½" sample bottle
- 2 bolts
- 2 steel washers
- 2 neoprene washers
- Friction tape
- Waterproof glue
- Drill
- Screwdriver
- Pliers

Instructions:

1. If there is a threaded end on the aluminum pole, remove it (a drill should work).
2. Drill two holes through the end of the pole and the clamp handle, making sure to match them up so they can be connected. Be careful to drill your holes through the clamp handle WITHOUT the release lever.
3. Attach the clamp to the pole using the nuts, bolts and washers. The neoprene washers should be in contact with the plastic clamp handle to prevent cracking as the bolts are tightened.
4. Add a drop of waterproof glue to the end of each nut (if you are not using lock washers).
5. Finish by adding friction tape to the inside of the clamp's jaws to prevent the bottle from slipping.