Environmental Monitoring Program – Sample Collection Training Program

Project Name
Water Licence Compliance

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Appendices

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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.

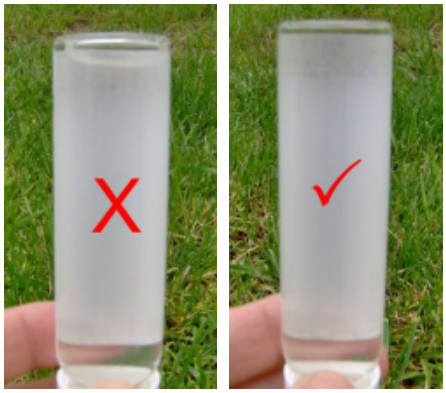
3 Avoiding Common Errors

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 Cape Dorset

Quality Assurance / Quality Control Plan

Project Name
Water Licence Compliance – Hamlet of Cape Dorset

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Hamlet of Cape Dorset

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Appendices

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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 Cape Dorset (Hamlet) is located on Dorset Island in the Hudson Straight (Figure 1, Appendix A).

The water supply for the Hamlet is Tee Lake located approximately 1 km south of the Hamlet. Water is conveyed to the truck fill station through a 1.3 km transmission main. Water is drawn into the pump house at Tee Lake via a single inclined shaft intake. The pump house contains heating equipment, provided to avoid freeze of the transmission water main linking the pump house and water treatment plant. The truck fill station is located adjacent to the Hamlet and is comprised of a truck fill station and water storage tank. This facility provides water treatment through chlorination, equipment for truck loading and freeze prevention for the water storage tank.

The 2001 Sewage Disposal Facility is comprised of a 3-tier series of lagoons and decant structures designed to contain sewage. The facility is located approximately 730 metres to the west of the community. It is located along a natural valley directly to the south east of the 2001 Sewage Disposal Facility and the solid waste facility. Sewage is disposed of at cell #1 and during the summer months naturally decants into cell #2, followed by cell #3, finally discharging to the environment from the outlet structure of sewage lagoon #3. During the winter months, when the decant and outlet structures are frozen, water is pumped from one sewage lagoon cell to the subsequent cell on an as required basis. Due to capacity issues, this sewage treatment facility sewage must be decanted during the winter months as the facility does not provided sufficient over winter storage to meet the requirements of the Hamlet.

The 2007 Sewage Disposal Facility is a single-cell sewage lagoon built in 2007. It was built in a natural valley between two hills. It was created through the construction of the main berm on the western limits of the sewage lagoon and a berm on the northeast corner, which is the location of the truck discharge point. The sewage treatment facility incorporates a natural wetlands located to the west of the facility, including Pee Lake, a wetlands and the rocky drop off referred to as the waterfalls in the water licence. There is a gravel access road traversing both sides of the rocky hills connecting and providing access to the lower berm. The sewage lagoon has never been commissioned due to concerns of leaking through the main berm.

The Emergency Sewage Disposal Facility is located approximately 500 m west of the town site along the access route to the solid waste site and the 2001 Sewage Disposal Facility. The facility is the old sewage lagoon and is currently maintained for use during adverse wind conditions, at which time the sewage discharge point for the 2001 Sewage Disposal Facility is non operational due to health and safety concerns for the operators.

The Solid Waste Disposal site is located approximately 700 m to the west of the Hamlet, adjacent to the 2001 Sewage Disposal Facility. A bulk metal waste dump is located along to the road to the 2001 Sewage Disposal Facility. It is approximately 300 m west of the town.

The Nunavut Water Board (NWB) issued a Class B Water Licence (3BM-CAP0810) to the Hamlet on March 7, 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 20 of Part H of the water licence issued to the Hamlet requires that the Hamlet submit to the NWB for approval, a Quality Assurance / Quality Control (QA/QC) Plan prepared in accordance with "*Quality Assurance (QA) and Quality Control (QC) Guidelines for use by Class "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 site, 2001 Sewage Disposal Facility, Emergency Sewage Disposal Facility, and 2007 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.

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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.

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2 Field Sampling

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

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- 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-CAP0810) by the NWB specifies twenty-four monitoring stations across the licensed facilities.

- Station CAP-1 is a raw water supply (from Tee Lake) volume monitoring location.
- Station CAP-2 is a run-off sampling location from the Solid Waste Disposal Facility.
- Station CAP-3 is a wastewater influent sampling location at the active (at the time of sampling) Wastewater Facility.
- Station CAP-4 is an effluent discharge sampling location from the 2001 Sewage Disposal Facility.
- Station CAP-5 is an effluent discharge sampling location from the Emergency Sewage Disposal Facility.
- Station CAP-6 is an effluent discharge sampling location from the 2007 Sewage Disposal Facility, at the Final Point of Control.
- Station CAP-7 is a wastewater influent sampling location to P-Lake.
- Station CAP-8 is a sampling location in the centre of P-Lake.
- Station CAP-9 is a sampling location midway between the centre of P-Lake (CAP-8) and the effluent discharge of P-Lake (CAP-10).

- Station CAP-10 is an effluent discharge sampling location from P-Lake (if flow is negligible a sample from the immediate upstream area within P-Lake shall be obtained).
- Station CAP-11 is an effluent discharge sampling location from the Wetland area.
- Station CAP-12 is a sampling location located at the top of the waterfall on the Wetland Pathway.
- Station CAP-13 is a sampling location located midway down the waterfall on the Wetland Pathway.
- Station CAP-14 is a sampling location located at the bottom of the cliff (Final Discharge Point).
- Station CAP-15 a Control Point sampling location (small lake) located between the Lagoon and Tee Lake.
- Station CAP-16 is a monitoring well located up gradient of the 2007 Sewage Disposal Facility.
- Station CAP-17 is Monitoring Well No. 1, located down gradient of the 2007 Sewage Disposal Facility.
- Station CAP-18 is Monitoring Well No. 2, located down gradient of the 2007 Sewage Disposal Facility.
- Station CAP-19 is a monitoring well located up gradient of the Solid Waste Disposal Facility.
- Station CAP-20 is a monitoring well located down gradient of the Solid Waste Disposal Facility.
- Stations CAP-21 to CAP-24 are thermistor stations.

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

Table 1 –Geographic Coordinates for the Monitoring Stations for NWB Licence 3BM-CAP0810

Monitoring Station	Latitude	Longitude
CAP-1	N 64° 13’ 30.4”	W 76° 32’ 53.2”
CAP-2	Not located	Not located
CAP-3	N 64° 13’ 40.8”	W 76° 34’ 29.5”
CAP-4	N 64° 13’ 44.9”	W 76° 34’ 42.4”
CAP-5	N 64° 13’ 49.3”	W 76° 34’ 23.7”
CAP-6	Not located	Not located
CAP-7	Not located	Not located
CAP-8	Not located	Not located
CAP-9	Not located	Not located
CAP-10	Not located	Not located
CAP-11	Not located	Not located
CAP-12	Not located	Not located
CAP-13	Not located	Not located
CAP-14	Not located	Not located
CAP-15	Not located	Not located
CAP-16	N 64° 13’ 17.2”	W 76° 33’ 45.5”
CAP-17	N 64° 13’ 12.2”	W 76° 33’ 59.8”
CAP-18	N 64° 13’ 14.2”	W 76° 34’ 00.2”
CAP-19	N 64° 13’ 47.5”	W 76° 33’ 53.8”
CAP-20	N 64° 13’ 59.4”	W 76° 34’ 06.5”
CAP-21	N 64° 13’ 17”	W 76° 33’ 45.5”
CAP-22	N 64° 13’ 14.3”	W 76° 33’ 58.4”
CAP-23	N 64° 13’ 13.5”	W 76° 33’ 57.8”
CAP-24	N 64° 13’ 12.2”	W 76° 33’ 57.3”

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 *Wastewater Sampling*

Wastewater influent samples are collected from the active sewage disposal facility (Station CAP-3) beginning one week prior to the proposed discharge date, once at the beginning of the discharge and weekly thereafter until the cessation of discharge. Wastewater influent samples are collected from the lagoon by immersing the sample bottle into the lagoon neck first to a depth of 5 to 10 cm (if possible). The sampling container is filled with influent wastewater and the sample bottle is raised neck first to prevent sample spillage.

Effluent discharge samples are collected from the 2001 Sewage Disposal Facility (Station CAP-4), following the same schedule and methodology described above for Station CAP-3.

Effluent discharge samples are collected from the Emergency Sewage Disposal Facility (Station CAP-5), following the same schedule and methodology described above for Station CAP-3.

Effluent discharge samples are collected from the Final Point of Control at the 2007 Sewage Disposal Facility (Station CAP-6), following the same schedule and methodology described above for Station CAP-3.

Wastewater influent samples are collected from P-Lake (Station CAP-7), following the same schedule and methodology described above for Station CAP-3.

Wastewater samples are collected from the centre of P-Lake (Station CAP-8), following the same schedule and methodology described above for Station CAP-3.

Wastewater samples are collected from a location (Station CAP-9) midway between the centre of P-Lake (Station CAP-8) and the effluent discharge of P Lake (Station CAP-10). These samples are collected following the same schedule and methodology described above for Station CAP-3.

Wastewater effluent discharge samples are collected from P-Lake (Station CAP-10). If flow is negligible, then the samples are collected from a location located immediately upstream within P-Lake. These samples are collected following the same schedule and methodology described above for Station CAP-3.

Wastewater effluent discharge samples are collected from the Wetland area (Station CAP-11), following the same schedule and methodology described above for Station CAP-3.

Wastewater effluent discharge samples are collected from the top of the waterfall on the Wetland Pathway (Station CAP-12), following the same schedule and methodology described above for Station CAP-3.

Wastewater effluent discharge samples are collected from midway down the waterfall on the Wetland Pathway (Station CAP-13), following the same schedule and methodology described above for Station CAP-3.

Wastewater effluent discharge samples are collected from the Final Discharge Point, located at the bottom of the cliff (Station CAP-14), following the same schedule and methodology described above for Station CAP-3.

Wastewater effluent discharge samples are collected from a Control Point (Station CAP-15) sampling location (small lake) located between the Lagoon and Tee Lake, following the same schedule and methodology described above for Station CAP-3.

2.2.3.2 *Landfill Runoff Sampling*

Landfill runoff is collected once monthly during periods of observed flow from Station CAP-2. Runoff samples are 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 filled with runoff and the sample bottle is raised neck first to prevent sample spillage.

2.2.3.3 *Groundwater Sampling*

Groundwater samples are collected from a monitoring well located up gradient of the 2007 Sewage Disposal Facility (Station CAP-16), as well as from Monitoring Well No. 1 (Station CAP-17) and Monitoring Well No. 2 (Station CAP-18), located down gradient of the 2007 Sewage Disposal Facility. Groundwater samples are collected once annually in the summer, prior to commencing discharge from the 2007 Sewage Disposal Facility, 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 (or bailers). 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.

Groundwater samples are collected from a monitoring well located up gradient of the Solid Waste Disposal Facility (Station CAP-19), as well as from a monitoring well located down gradient of the Solid Waste Disposal Facility (Station CAP-20). Groundwater samples are collected once annually in the summer, giving due consideration to adequate ground thaw and obtaining representative groundwater samples. Groundwater samples should be collected in the same manner as described above (i.e., for Stations CAP-16 to CAP-18).

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-CAP0810. 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-CAP0810 (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-CAP0810 – 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.

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Appendix A: Figures

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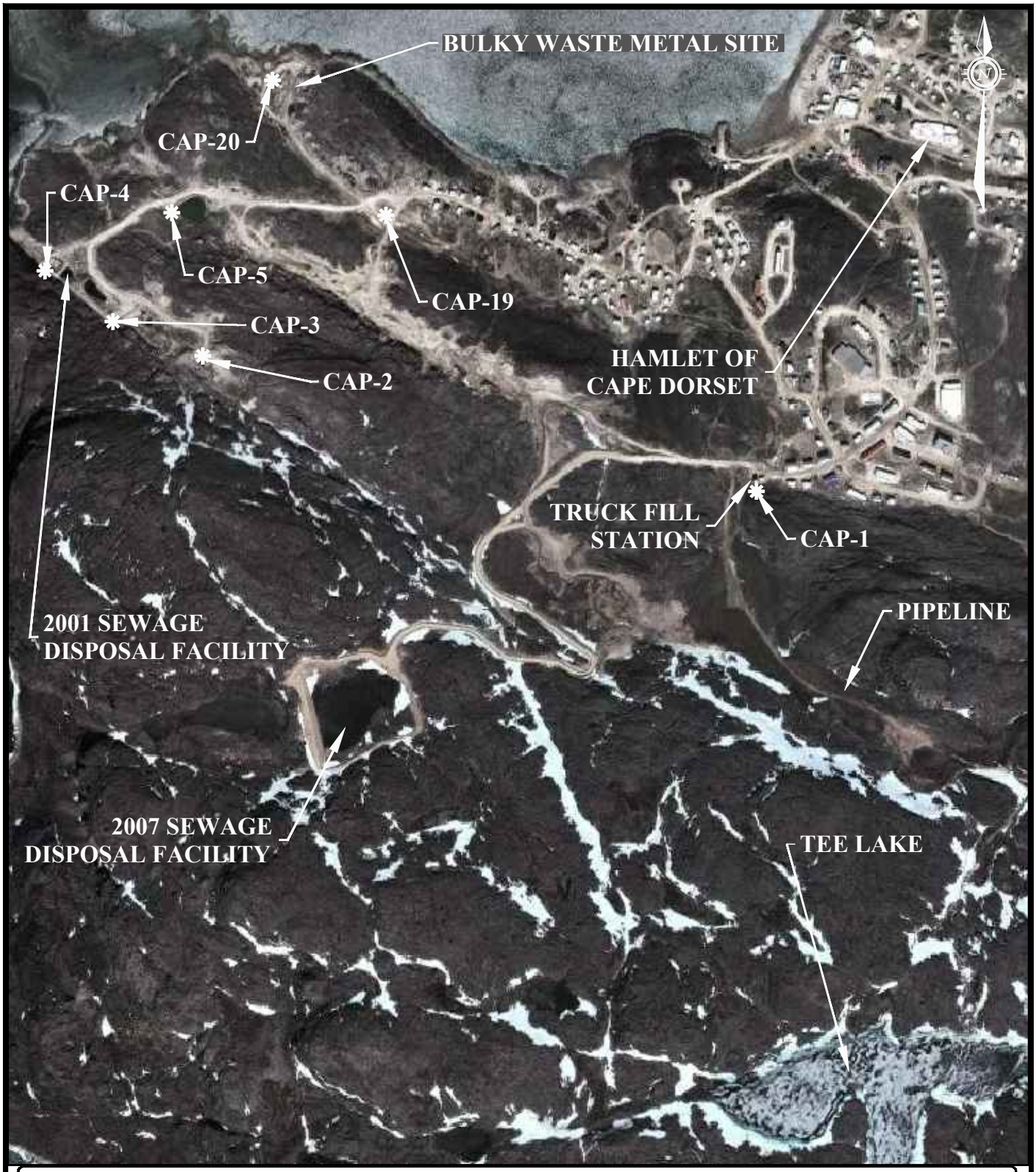
scale: NTS	CLIENT: CAPE DORSET, NUNAVUT	project no.: OTT-00209248-A0
date: 27/05/13	TITLE: LOCATION PLAN	FIG 01
drawn by: M.KELLEY		



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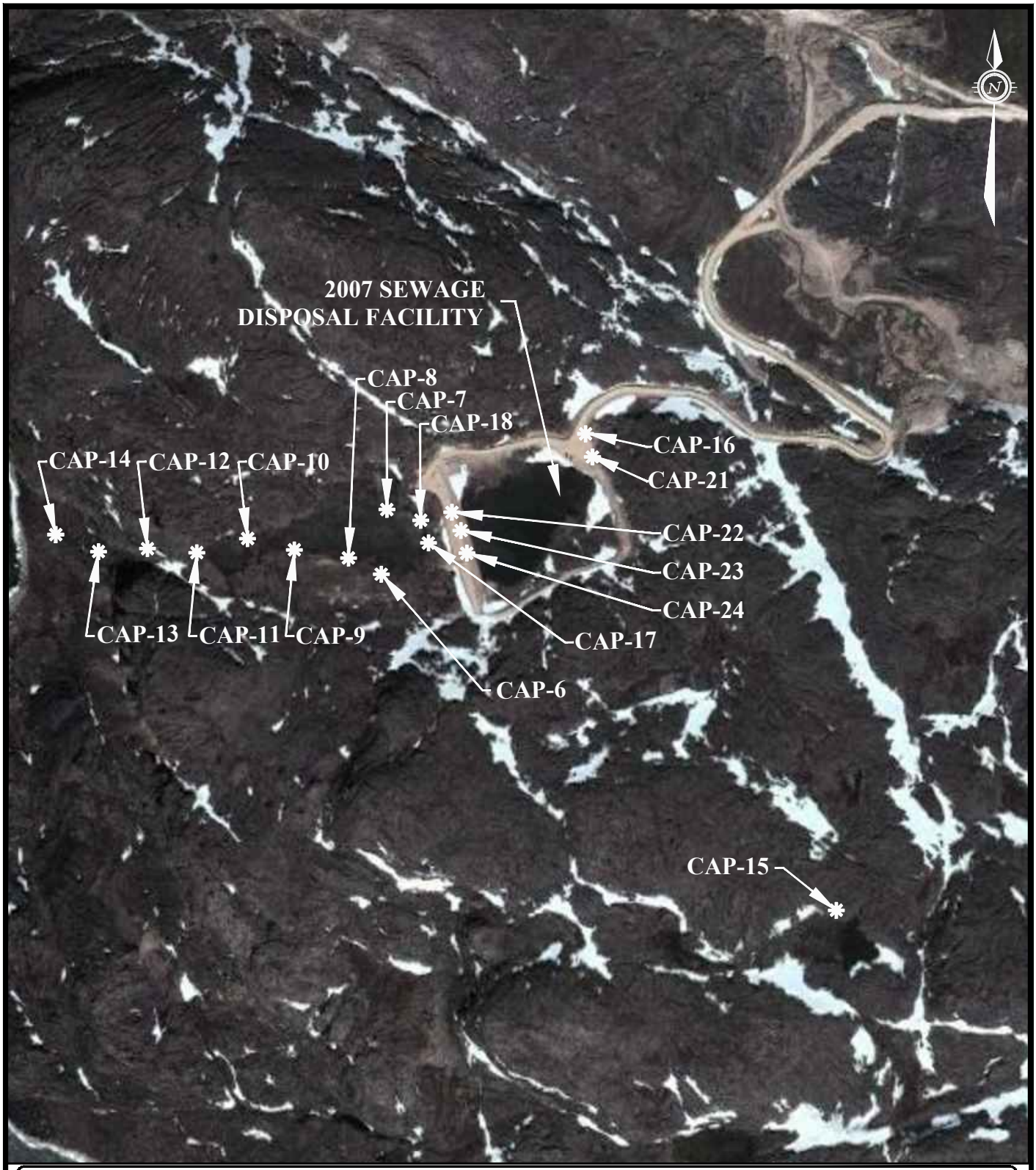
scale: NTS	CLIENT: CAPE DORSET, NUNAVUT	project no.: OTT-00209248-A0
date: 27/05/13		
drawn by: M.KELLEY	TITLE: MONITORING STATION LOCATIONS	FIG 02



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scale: NTS	CLIENT: CAPE DORSET	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 Cape Dorset's Water Licence

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Ministre des Affaires indiennes et
du Nord canadien et interlocuteur fédéral
auprès des Métis et des Indiens non inscrits

Minister of Indian Affairs and
Northern Development and Federal Interlocutor
for Métis and Non-Status Indians

Ottawa, Canada K1A 0H4

APR 21 2008

Mr. Thomas Kabloona
Interim Chair
Nunavut Water Board
PO Box 119
GJOA HAVEN NU X0B 1J0

Dear Mr. Kabloona:

This is in response to your letter of March 7, 2008, regarding water licence number 3BM-CAP0810 for the Hamlet of Cape Dorset, Nunavut, and the Nunavut Water Board's reasons for decision. I would like to thank the Nunavut Water Board for its work in the development of this licence.

I recognize the challenges faced by both the Nunavut Water Board and the joint proponents, the Government of Nunavut and the Hamlet of Cape Dorset, in finalizing the application for this licence, in the preparation for the public hearings, and in the drafting of this water licence. Moreover, I recognize the importance of improving Cape Dorset's sewage treatment infrastructure.

With this letter, I am approving water licence number 3BM-CAP0810 for the Hamlet of Cape Dorset. However, I would like to make some observations regarding two aspects of the water licence. In making this approval I have assumed that water licence number 3BM-CAP0810 renews then amends Cape Dorset's previous water licence number 3BM-CAP0207 which has expired. Indian and Northern Affairs Canada's enforcement activities will be based on this understanding. Additionally, conditions of licence number 3BM-CAP0810 (section 25.ii) could be interpreted to require departmental inspectors to evaluate the proponent's work in confirming the geotechnical assumptions made in the design of the wastewater facility for Cape Dorset. The limits of the Department's role in fulfilling such a condition would be to confirm whether the validation work required by the water licence is being conducted. Any evaluations of whether the project's design assumptions were accurate would be the role of the proponent.

.../2

Again, I thank the Nunavut Water Board for its efforts and energies in the development of the Hamlet of Cape Dorset water licence.

Sincerely,

Chuck Strahl

Encl:

c.c.: The Honourable Levinia Brown, MLA
His Worship Fred Schell

WATER LICENCE NO: 3BM-CAP0810

TABLE OF CONTENTS

ANNEX B

LICENCE 3BM-CAP0810

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 CAPE DORSET
(Licensee)

of **P.O. BOX 30, CAPE DORSET, NUNAVUT X0A 0C0**
(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-CAP0810**
Water Management Area	**NUNAVUT 05**
Location	**CAPE DORSET, NUNAVUT** **Latitude 64°14'N and Longitude 76°32'W**
Purpose	**WATER USE AND WASTE DISPOSAL**
Description	**MUNICIPAL UNDERTAKINGS**
Quantity of Water Not to Exceed	**70,000 CUBIC METRES ANNUALLY**
Date of Licence	**MARCH 7, 2008**
Expiry Date of Licence	**MARCH 1, 2010**

Thomas Kabloona,
Nunavut Water Board
A/Chair

APPROVED BY:

Minister of Indian and Northern Affairs Canada

DATE LICENCE APPROVED: APR 21 2008

PART A: SCOPE, DEFINITIONS AND ENFORCEMENT

1. Scope

a. This Licence allows for the use of water and the disposal of waste for municipal undertakings at the Hamlet of Cape Dorset, Nunavut (Latitude 64°14'N and Longitude 76°32'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

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

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

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

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

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

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

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

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

"**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**" means the discharge location point where the effluent from the 2007 Sewage Disposal Facilities enters fish habitat or fish bearing waters;

"**Final Point of Control**" means the discharge location at the 2007 Sewage Disposal Facilities August 27, 2007 submission prepared by Dillon Consulting including ten appendices, to be confirmed by an Inspector;

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

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

"**Grab Sample**" means 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**" includes the facilities licensed in 2001, 2004 and 2007;

"**Emergency Sewage Disposal Facility**" comprises the area designed to contain and treat sewage as described in the Water License Amendment Application filed by the Applicant on August 16, 2004, and illustrated on the "Cape Dorset Sewage Lagoon Rehabilitation Site Plan (August 2004)"

"**2001 Sewage Disposal Facilities**" comprises the Three Tier Lagoon which 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 April 19, 2001;

"**2007 Sewage Disposal Facilities**" comprises the engineered lagoon and decant structures constructed in 2007 and illustrated in the Record Drawings No.'s 100 and 101 of Project N-05-4319-3000 prepared by Dillon Consulting and submitted November 13, 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 April 19, 2001;

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

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

"**Waste Disposal Facilities**" means all facilities designated for the disposal of waste, and includes the 2001, 2004 and 2007 Sewage Disposal Facilities, Solid Waste Disposal Facilities, and Bagged Toilet Waste Disposal Facilities, as described in the Application for Water Licence filed by the Applicant on April 19, 2001 and subsequently in the application dated July 7, 2005;

"**Water Supply Facilities**" comprises the area and associated intake infrastructure at Tee Lake, as described in the Application for Water Licence filed by the Applicant on April 19, 2001;

3. Enforcement

i. 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*;

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

iii. 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.

iv. The Licensee shall, in relation to any application to renew or amend the Licence, have in place a Plan for Compliance approved by the Board in writing, to achieve full compliance with the conditions of this Licence, or a 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:

i. tabular summaries of all data generated under the Monitoring Program;
ii. the monthly and annual quantities in cubic metres of fresh water obtained from all sources;
iii. the monthly and annual quantities in cubic metres of each and all waste discharged;
iv. a summary of modifications and/or major maintenance work carried out on the Water Supply and Waste Disposal Facilities, including all associated structures and facilities;
v. a list of unauthorized discharges and summary of follow-up action taken;
vi. a summary of any abandonment and restoration work completed during the year and an outline of any work anticipated for the following year;
vii. a summary of any studies, reports and plans (i.e. Operations and Maintenance, Abandonment and Restoration, QA/QC) requested by the Board that relate to water use and waste disposal or reclamation, and a brief description of any future studies planned; and
viii. 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 submit to the Board, for approval in writing, within the lesser of ninety (90) days or 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.

7. 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.

8. 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.

9. 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.

10. 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

11. 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.

12. The Licensee shall ensure that any document(s) or correspondence submitted by the

Licensee to the Board, is received by the Board and maintain on file a copy of the acknowledgment of receipt issued by the Manager of Licensing.

13. 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 the Tee 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 70,000 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. Licensee shall locate areas designated for waste disposal at a minimum distance of thirty (30) metres from the ordinary high water mark of any water body such that the quality, quantity or flow of water is not impaired, unless otherwise approved by the Board in writing.

2. Subject to the conditions in the Licence regarding commissioning, the Licensee shall direct all Sewage to the 2007 Sewage Disposal Facilities or as otherwise approved by the Board in writing.

3. The Licensee shall provide notice to an Inspector at least ten (10) days prior to initiating any decant of the 2001 and 2007 Sewage Disposal Facilities.

4. All Effluent discharge from the 2001 Sewage Disposal Facility at Monitoring Program Station CAP-3 and the Emergency Sewage Disposal Facility at Monitoring Program

Station CAP-4, shall meet the following effluent quality limits:

Parameter	Maximum Average Concentration
BOD_5	120 mg/L
Total Suspended Solids	180 mg/L
Faecal Coliforms	1 x 10^4 CFU/100mL
Oil and grease	No visible sheen
pH	between 6 and 9

5. All Effluent discharged from the 2007 Sewage Disposal Facilities at Monitoring Program Station CAP-5 shall meet the following effluent quality limits:

Parameter	Maximum Average Concentration
BOD_5	80 mg/L
Total Suspended Solids	100 mg/L
Faecal Coliforms	1 x 10^4 CFU/100mL
Oil and grease	No visible sheen
pH	between 6 and 9

6. The Licensee shall maintain at all times, a freeboard of at least 1.0 metre, or as recommended by a qualified Geotechnical Engineer with notice in writing provided to the Board, for all dams, dykes or other structures intended to contain, withhold, divert or retain water or wastes.

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

8. All Effluent discharged from the 2007 Sewage Disposal Facility at the Final Discharge Point at Monitoring Station CAP-14 and effluent discharge from Monitoring Stations CAP-3 and CAP-4 prior to the point of entry at the ocean, , shall be demonstrated to be non-acutely toxic under the following tests to be conducted once annually, approximately mid-way through the discharge period:

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

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

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

10. The Licensee shall implement appropriate erosion and diversion control methods, to minimize surface water intrusion and leachate generation at the Solid Waste Storage Facility.

11. The Licensee shall segregate and securely 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.

PART E: CONDITIONS APPLYING TO MODIFICATION AND CONSTRUCTION

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

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

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

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

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

   iv. the Board has not rejected the proposed modifications.

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

4. The Licensee shall provide as-built plans and drawings of the Modifications referred to in this Part within ninety (90) days of completion of the Modification. These plans and

drawings shall be stamped by an Engineer.

5. The Licensee shall, within sixty (60) days of issuance of this Licence, provide a summary report along with revised stamped as-built plans and record drawings of the 2007 Sewage Disposal Facility, to reflect the clarifications and omissions identified through the Licence application review and detailed in the attached Schedule 1.

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

7. The Licensee shall ensure that sediment and erosion control measures are implemented prior to and maintained during the operation to prevent the release of sediment and minimize erosion during construction activities.

8. The Licensee shall designate an area for the deposition of excavated and stockpiled materials that is at least thirty (30) metres above the ordinary high water mark of any water body and in such a manner as to prevent sediment from entering any surrounding water body.

9. The Licensee shall ensure that both (a) fill material used in construction, and (b) that the ground to be constructed upon, are free of contaminants. If contaminated soils are identified, notification shall be made in the Licensee's annual report. All contaminated soils shall be treated and disposed of in accordance with Part F, Item 2, or as otherwise approved by the Board in writing.

PART F: CONDITIONS APPLYING TO OPERATION AND MAINTENANCE

1. The Licensee shall submit to the Board, for approval in writing, within ninety (90) days of issuance of the Licence and prior to commissioning of the 2007 Sewage Disposal Facilities, a revised *Operation and Maintenance Manual, Sewage Treatment System, Hamlet of Cape Dorset, November 7, 2007.* The revision shall include the requirements of Schedule 2.

2. The Licensee shall submit to the Board, for approval in writing, within ninety (90) days of issuance of the Licence, an Operation and Maintenance Manual for the Water Supply Facilities and the Solid Waste Disposal Facilities prepared in accordance with the *"Guidelines for Preparing an Operation and Maintenance Manual for Sewage and Solid Waste Disposal Facilities", October 1996.* The Plan shall include a specific section addressing waste management and the proper diversion and segregation of wastes, the storage, transport and disposal of hazardous wastes materials.

3. The Licensee shall implement the Manuals specified in Part F, Items 1 and 2, following approval in writing by the Board.

4. The Licensee shall provide notification in writing to the Board, in accordance with Part E, Item 2, of changes to the approved Operation and Maintenance Plan under Part F, Item 1, with respect to the wastewater storage and decanting operations and procedures. For any potential significant impact of such change to the geothermal regime within and under the berms or lagoon floor, notice shall be accompanied by the Geotechnical Engineer's supporting documentation and further geotechnical analysis.

5. An inspection of all engineered facilities related to the management of water and waste shall be carried out annually in July, by a Geotechnical Engineer in accordance with the Canadian Dam Association, Dam Safety Guidelines, November 2007, where applicable. This inspection shall include the access road alignment with respect to water resources and the diversion and passage of water through culverts. 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.

6. The Licensee shall perform a visual operations inspection of all engineered facilities related to the management of water and waste on a weekly basis or more frequently as requested by an Inspector, to assess the general operating conditions and integrity of the containment structures. The records of these inspections are to be maintained and made available to an Inspector upon request during the Licence term.

7. The Licensee shall review the Manual(s) referred to in this Part if there are changes in operation and/or technology and modify the Manual(s) accordingly. Revisions to the Board approved Manual(s) are to be submitted in the form of an Addendum to be included with the Annual Report under Part B, Item 1.

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

   i. employ the appropriate contingency plan as provided for in the Operation and Maintenance Manual;
   ii. report the incident immediately via the 24-Hour Spill Reporting Line at (867) 920-8130 and to the Inspector at (867) 975-4295; and
   iii. submit to the Inspector, a detailed report on each occurrence, no 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, RESTORATION AND CLOSURE

1. The Licensee shall submit to the Board, for approval in writing, within ninety (90) days of issuance of the Licence, a detailed Final Abandonment and Restoration Plan for the 2001 Sewage Disposal Facility and the Emergency Sewage Disposal Facility. The Plan should incorporate, where applicable, the appropriate sections as described in Part G, Item 2.

2. The Licensee shall submit to the Board, for approval in writing, within six (6) months of issuance of this Licence, a preliminary or conceptual Abandonment and Restoration Plan for the Hamlet of Cape Dorset, Water and Waste Disposal Facilities and all associated structures not covered under Part G, Item 1, with end objectives to return the site to pre-use conditions. The Plan shall include the following (where applicable):

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

3. The Licensee shall submit to the Board, for approval in writing, six (6) months prior to the planned decommissioning of any licensed facility and the construction of new facilities to replace existing ones, a Final Abandonment and Restoration Plan for the facilities being decommissioned.

4. The Licensee shall implement the Plan(s) specified in Part G, Item 1 and 3, following approval in writing by the Board.

5. The Licensee shall review the Plan(s) referred to in this Part if there are changes in operation and/or technology and modify the Plan accordingly. Revisions to the Board approved Plan(s) are to be submitted in the form of an Addendum to be included with the Annual Report under Part B, Item 1.

6. The Licensee shall carry out progressive reclamation of any components of the project no longer required for the Licensee's operations.

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

8. The Licensee shall complete all restoration work prior to the expiry of this Licence.

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
CAP-1	Raw Water supply prior to treatment	Active (Volume)
CAP-2	Runoff from the Solid Waste Disposal Facilities	Active
CAP-3	Influent of Wastewater to Wastewater Facilities (active at the time of sampling)	New
CAP-4	Effluent Discharge from the 2001 Sewage Disposal Facilities	Active (including volume)
CAP-5	Effluent discharge from the Emergency Sewage Disposal Facilities	Active (including volume)
CAP-6	Effluent discharge from the 2007 Sewage Disposal Facilities – Final Point of Control	Active (including volume)
CAP-7	Point of influent of wastewater to P-Lake	New
CAP-8	Centre of P-Lake	New
CAP-9	Location midway between the Centre of P-Lake (Station 8) and the effluent discharge of P-Lake	New

Monitoring Program Station Number	Description	Status
CAP-10	Effluent discharge from P-Lake; note, if flow is negligible a sample from the immediate upstream area within P-Lake shall be obtained	New
CAP-11	Effluent discharge from Wetland area	New
CAP-12	Wetland Pathway at the top of the waterfall	New
CAP-13	Wetland Pathway at mid-way down waterfall	New
CAP-14	Wetland Pathway at bottom of cliff – Final Discharge Point	
CAP-15	Control point using a small lake located between the Lagoon and Tee Lake	New
CAP-16	Monitoring well located up gradient of the 2007 Sewage Disposal Facility	New
CAP-17	Monitoring Well No.1 located down gradient of the 2007 Sewage Disposal Facility	New
CAP-18	Monitoring Well No.2 located down gradient of the 2007 Sewage Disposal Facility	New
CAP 19	Monitoring well located up gradient of the Solid Waste Disposal Facilities	New
CAP-20	Monitoring well located down gradient of the Solid Waste Disposal Facilities	New
CAP-21	Thermistor stations	Proposed with final description to be provided
CAP-22	As above	
CAP-23	As above	
CAP-24	As above	

2. The Licensee shall sample at Monitoring Program Stations CAP-3 through CAP-15 inclusive, one week prior to the proposed discharge date, once at the beginning of discharge and weekly thereafter until cessation of discharge. Samples shall be analyzed for the following parameters:

Biochemical Oxygen Demand (BOD_5)

Carbonaceous Biochemical Oxygen Demand ($CBOD_5$)
Total Suspended Solids
pH
Conductivity
Oil and Grease (visual)

Fecal Coliforms	
Nitrate-Nitrite	Ammonia Nitrogen
Total Phosphorus	Total Phenols
Magnesium	Calcium
Sodium	Potassium
Chloride	Sulphate
Total Hardness	Total Alkalinity

Total Trace Metals as determined by a standard ICP Scan (to include at a minimum, the following elements: Al, Sb, Ba, Be, Cd, Cr, Co, Cu, Fe, Pb, Li, Mn, Mo, Ni, Se, Sn, Sr, Tl, Ti, U, V, Zn),

Total Arsenic
Total Mercury
Total Organic Carbon (TOC)

3. If the discharge at Station CAP-4, CAP-5 or CAP-6 has been suspended for more than 48 hours and subsequently restarted, the sampling sequence described in Part H, Item 2 of the Monitoring Program shall be repeated for these Stations.

4. The Licensee shall sample monthly at Monitoring Program Station CAP-2 during periods of observed flow. Samples shall be analyzed for the following parameters:

BOD_5	Fecal Coliforms
pH	Conductivity
Total	Suspended Solids Ammonia Nitrogen
Nitrate-Nitrite	Oil and Grease
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

5. The Licensee shall report all results of non-acute toxicity testing as required under Part D, Item 8 within the Annual Report as per Part B, Item 1.

6. The Licensee shall install thermistors for the purpose of validating assumptions made in the geothermal analyses for the 2007 Sewage Disposal Facilities as recommended by the Geotechnical Engineer of record and agreed upon by the Licensee, subject to a minimum of three 20 to 25 metre deep thermistors installed in crest of the west berm and at least one thermistor of that depth in the east berm.

7. The results of thermistor monitoring required under Part II, Item 6, shall be submitted to the Board for approval in writing, prior to commissioning of the 2007 Sewage Disposal Facility. The results shall include an Engineer's Report, validating the assumptions of the geothermal analysis through adequate monitoring of the thermal regime for the East and West Berms and downstream foundations

8. The Licensee shall not commission the 2007 Sewage Disposal Facility until the requirements of Part H, Item 6 and Item 7 have been completed and approved.

9. The Licensee shall, within ninety (90) days of issuance of this Licence, provide a Temperature Monitoring Program and Implementation Plan for ongoing collection of ground temperatures within each berm structure and foundation of the 2007 Sewage Disposal Facility through the installation of thermistors. This Plan shall take into consideration the following:

    i. Locations of thermistors, to be incorporated into the Monitoring Station Table under Part H, Item 1;
    ii. Appropriate thermistor configuration, overall depth and spacing of bead locations to provide the level of data collection that will capture any extreme variations in temperature and provide the information needed to validate the assumptions made in the geothermal analysis.
    iii. The frequency of temperature readings shall be such to allow the determination of the maximum freeze and thaw of the berm and underlying native materials and provide adequate data for thermal modeling of the berms.
    iv. This frequency may be reviewed and adjusted upon collection of adequate data and as recommended by the Geotechnical Engineer in order to assess the berms through thermal modeling and provide an assessment with respect to berm stability and potential seepage.
    v. This information is to be reported along with the results of the annual geotechnical inspection as required under Part F, Item 6.
    vi. An implementation schedule that will allow collection of data for confirmation of core-trench freeze-back.

10. The Licensee shall implement the Plan specified in Part II, Item 9 following approval by the Board in writing.

11. The Licensee shall review the Plan(s) referred to in this Part if there are changes in operation and/or technology and modify the Plan accordingly. Revisions to the Board approved Plan(s) are to be submitted in the form of an Addendum to be included with the Annual Report under Part B, Item 1.

12. The Licensee shall install groundwater monitoring wells at the 2007 Sewage Disposal Facility to obtain at least one monitoring season of data prior to the expiry of the Licence. At least one groundwater monitoring well shall be located upstream of the 2007 Sewage Disposal Facility for background data collection, at least one groundwater monitoring well shall be located downstream of the landfill and at least one groundwater monitoring well shall be located downstream of the metals dump.

13. The Licensee shall sample at Monitoring Program Stations CAP-16, CAP-17 and CAP-18 once annually in the summer, prior to commencing discharge from the 2007 Sewage Disposal Facility, giving due consideration to adequate ground thaw and obtaining a representative groundwater sample. Samples shall be analyzed for parameters identified in Part H, Item 4.

14. The Licensee shall install groundwater monitoring at the Solid Waste Disposal Facilities wells to obtain at least one monitoring season of data prior to the expiry of the Licence, At lease one groundwater monitoring well shall be located upstream of the Solid Waste Disposal Facilities for background data collection and at least one groundwater monitoring well shall be located downstream of the Solid Waste Disposal Facilities .

15. The Licensee shall sample at Monitoring Program Stations CAP-19 and CAP-20 once annually in the summer season, giving due consideration to adequate ground thaw and obtaining a representative groundwater sample. Samples shall be analyzed for parameters identified in Part H, Item 4.

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

17. The Licensee shall measure and record in cubic metres (a) the monthly and annual quantities of raw sewage offloaded from trucks and the number of days of use for the 2001 Sewage Disposal Facility and the Emergency Sewage Disposal Facility, and (b) the monthly and annual quantities of raw sewage offloaded from trucks at the 2007 Sewage Disposal Facility.

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

19. The Licensee shall conduct additional sampling and analysis as may be requested by an Inspector.

20. The Licensee shall revise the "Guidelines for Wastewater Sampling, October 27, 2007" and submit to the Board for approval by an Analyst in writing a Quality Assurance/Quality Control (QA/QC) Plan for the Hamlet of Cape Dorset, within ninety (90) days of issuance of this Licence. The Plan shall use as a guide the document *"Quality Assurance and Quality Control Guidelines for use by Class "B" Licensees in Collection of Representative Water Samples in the Field, and for Submission of a QA/QC Plan, July 1996"*. The Plan shall address the use of field blanks, replicate sampling and certified reference material in order to assess accuracy, precision and field contamination.

21. The Licensee shall implement the Plan referred to in Part H, Item 20 following approval in writing by the Analyst.

22. 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.

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

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

25. Her Majesty in the right of Canada shall:
    i. Monitor the Licensee's installation of thermistors and notify the Board when the installation of thermistors is complete and in compliance with Part H, Item 6;
    ii. Monitor the Licensee's validation of the assumptions of the geothermal analysis through adequate monitoring of the thermal regime for the East and West Berms and downstream foundations under Part H, Item 7, and notify the Board when satisfied the assumptions of the geothermal analysis have been validated; and
    iii. Monitor the 2007 Waste Disposal Facility and notify the Board immediately if the Project is commissioned prior to the completion of i. and ii., or in contravention of any other condition of the Licence.

SCHEDULE 1 CONDITIONS APPLYING TO MODIFICATIONS AND CONSTRUCTION

List of drawing deficiencies identified by BGC for revision and submission.
Please refer to Technical Memorandum "Cape Dorset Sewage lagoon-Review of Final Submissions, January 8, 2008", or the final intervention memo dated January 8, 2008 for further clarification.

The record set of drawings fails to include a signature block for AMEC. It was noted that the original design drawings issued by Dillon in the December 21, 2006 design report, revision 5, marked "Issued for Construction" included a signature block "Reviewed by AMEC" on Drawing 111, which is the equivalent of Drawing 112 of the Record Drawings

1. At a minimum, AMEC is to provide a signature block for the following drawings:
   - Drawing 101- shows location of test pits carried out for geotechnical investigations.
   - Drawing 109- shows longitudinal geological sections along cut-off trench.
   - Drawing 110- shows typical earthworks sections for the access road and berm.
   - Drawing 112- shows lagoon berm sections

2. The as-built drawings must identify the areas where field changes were made from the original design drawings, preferably in the form of a revision bubble and a brief note in the revisions section of the title block.

List of Drawing alterations and request for rationale for the change.

Record drawing 100 - the alignment of the access roads between the East and West Berms, on the north and south sides of the lagoon was changed from the original design. The road berms were originally designed to deflect runoff from entering the lagoon.

3. Explanation is required as to the rationale for changing the alignment of the road berms and how the as-built berm details in the drawing prevents runoff from entering the lagoon.

Record Drawing 109 - there is up to 1m of unfrozen fill used to level the ground surface under both the East and West berms. This leveling course of material has not been shown as a separate zone in the berm sections presented in Record Drawing 112.

4. A description for record drawing 112 is required of the material used including grain size gradation curve.

Record Drawing 109 shows that the berm contours at the north end of the West Berm have been modified from the original design drawings. Crest widened from 4m to 25m to accommodate what appears to be a vehicle turnaround on the downstream side of the berm.

5. Additional as-built cross-sections of this area are to be provided along with geothermal analysis that there is sufficient fill thickness over the abutment to ensure that the GCL tie-in to the cut-off trench remains frozen.

Record Drawing 110 shows typical road sections. On July 30, 2007, the GN CGS provided a revised ditch detail for the road

6. This revised ditch detail is requested as part of the as-built drawing details for Drawing 110

7. Additional information is requested providing further details as to how seepage through the active zone under the berm will be prevented.

The Hamlet of Cape Dorset noted a problem during the October 1, 2007 Technical Meeting/Pre-Hearing, with seepage into the lagoon through the active zone with the as-constructed detail. Record Drawing 112 indicates that the material used to backfill the cut-off trench is a "Sand", the same material as used for the berm.

8. Further clarification is requested on how the issue of seepage is being resolved.

In the original Design Drawing 111, Detail 4 showed the liner embedment longitudinal section in the abutments. This Detail was absent from Record Drawing 112. The cut-off trench must extend sufficient distance into the abutment so that any "end-run" seepage through the active zone is prevented. It is not clear from the as-built information if the extent of the cut-off trench satisfies this criterion.

9. Therefore the as-built liner embedment details for the abutment areas of the East and West Berms are therefore requested to be included for Record Drawing 112.

In Record Drawing 112, the crest detail of the emergency overflow weir section was changed. This change notice was transmitted to the contractor by Dillon on July 21, 2007. The as-built detail shows the geo-web and the GCL in one layer, with no granular or other material between the two. Dillon initiated this modification to address a previous concern raised by BGC that water could seep under the GCL in the emergency spillway and potentially lift the liner. It is still not clear how the above modification prevents this problem from occurring.

10. Design change rationale is requested that provides an explanation as to the change from the original drawing, change to meet BGC's concern and then further change to what appears to be potentially inadequate construction.

SCHEDULE 2 CONDITIONS APPLYING TO MONITORING AND MAINTENANCE

A revised *Operation and Maintenance Manual, Sewage Treatment System, Hamlet of Cape Dorset, November 7, 2007* shall include the following requirements:

i. Expansion of Section 3.4.5 to include terms and conditions for the disposal of sludge as provided for in the Draft Guidelines for Discharge of Domestic Wastewater in Nunavut, 2000;

ii. Section 3.4.6 should include a description of the installation of thermistors required under Part H, Item 6, including the number, locations and depths of thermistor beads used to monitor the berms, and a description of the method and frequency of monitoring requirements;

iii. Section 3.4.6 should include a description of the installation of monitoring wells required under Part H, Item 7, including the number, locations and depths of thermistor beads used to monitor the berms, and a description of the method and frequency of monitoring requirements

iv. Description of the details of any repairs, upgrades and maintenance required for the use of part or all of the 2001 Sewage Disposal Facility or Emergency Sewage Disposal Facility;

v. Include a contingency plan for the operation of the 2007 Sewage Disposal Facility during periods where accessibility to the facility is limited and alternative measures are required for the handling of sewage. This may include operation and maintenance of any older facility or portion of, that would be retained as the contingency;

vi. Provision for the monitoring of effluent discharges from the 2001 Sewage Disposal Facility and the Emergency Sewage Disposal Facility;

vii. Inspection program for the 2001 Sewage Disposal Facility, the Emergency Sewage Disposal Facility and 2007 Sewage Disposal Facility, detailing the frequency and inspection requirements by the operator(s) of the facility;

viii. Appendix C of the O&M Manual to include forms to document the recommendations and follow up work required as a result of the annual geotechnical inspection.

ix. Section 4 – Spill Contingency Plan be revised to comprehensively address specific recommendations provided during the review process by GN DoE as follows:

   a. The date the contingency plan was prepared.
   b. The name and address of the person in charge, management or control. This is an on-site person responsible for managing the facility. This person would be initially responsible for clean-up activities.
   c. The name and address of the owner if different from the person in charge. This is the person ultimately responsible for the facility, usually the owner.
   d. The name, job title and 24 hour telephone number for the persons responsible for activating the contingency plan. This ensures the employee discovering the spill can activate a response and provides a 24 hour point of contact for the authority

investigating the spill.

e. A description of the facility including the location, size and storage capacity. This is important if persons are unfamiliar with the facility or area. The description could include a map and/or diagrams.

f. A site map that is intended to illustrate the facilities relationship to other areas that may be affected by the spill. The map should be to scale and be large enough to include the location of your facility, nearby buildings or facilities, roads, culverts, drainage patters, and any nearby bodies of water.

g. The steps to be taken to report, contain, and clean up and dispose of a contaminant in the case of a spill.
   1. Reporting: Notification of all parties involved. This can include internal and external reporting procedures as well as a copy of the spill report;
   2. Clean up: Removal of the contaminant from the environment, a detailed of actual containment and clean up techniques. (2 steps: contain and remediate; be aware of fire);
   3. Disposal: Is the treatment of the contaminant such that it is no longer a threat to the environment. Plans may include location of disposal sites approved to accept wastes, means of storage prior to disposal and other approvals required. (Waste Manifest document).

h. The means by which the contingency plan is activated. This should outline internal company procedures to activate appropriate response equipment and personnel.

i. A description of the training provided to employees to respond to a spill. A sound training program is necessary when dealing with an emergency situation.

j. An inventory and the location of response and clean up equipment available to implement the plan. This includes your equipment as well as any to be used by another person responding to the spill on your behalf.

k. SPILL KIT (FUEL)The kit can include but not limited to the following: shovel, pick-axe, drums, booms, absorbent pad/sheet, disposable protective gloves/coveralls, sorbent and containment materials, and disposal bags.

l. A list of local contractors or clean up specialists who may be called upon to assist in responding to spills. A list of emergency numbers such as fire, ambulance and police.

x. Section 4 – describe the measures to be implemented for a spill during the collection and transportation of wastewater. This spill response is to be expanded to include spill scenarios resulting from the leakage or failure of a containment structure for the Sewage Disposal Facilities; and

xi. Appendix B to include specific reference to monitoring stations and required frequency of sampling and the analyses required by the Licence.

P.O. BOX 119
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NUNAVUT IMALIRIYIN KATIMAYINGI
NUNAVUT WATER BOARD
OFFICE DES EAUX DU NUNAVUT

File No: 3BM-CAP0810

March 7, 2008

Honorable Chuck Strahl, P.C., M.P.
Minister of Indian Affairs & Northern Development
and Federal Interlocutor for Metis and Non-Status Indians
21st Floor, 10 Wellington
Gatineau, Quebec K1A 0H4

By Courier, Email and Regular Mail

Subject: Licence 3BM-CAP0810 – Cape Dorset, Nunavut

Dear Minister:

Please find enclosed an amended Licence 3BM-CAP0810 duly issued by the Nunavut Water Board (NWB).

The amendment to this Licence authorizes the Hamlet of Cape Dorset, to dispose of waste in relation the disposal, treatment and discharge of sewage effluent for municipal operations at Cape Dorset. This Type B Licence is being sent to you for your approval in accordance with Section 56(1) of the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (Act) as the Board determined pursuant to subsection 51(2) of the Act that it is in the public interest to hold a public hearing on the amendment application.

As set out in the Board's Reasons for Decision, attached for your information, this decision was particularly difficult for the Board. The Board has concluded that the current sewage lagoon system has failed. At the same time, construction of the new sewage lagoon was completed prior to the Public Hearing. The new sewage lagoon appears to have been built without environmental assessment, and certainly without this Board's regulatory review and approval.

Without the benefit of environmental assessment or regulatory direction, the evidence supports that the new sewage lagoon, has been built in a location with unfavourable geological characteristics; the integrity of the design is seriously questioned by technical reviewers; and the facility has not been constructed in accordance with construction drawings, omitting design elements essential to mitigating the design risks (i.e. thermistors installations). Furthermore, the new lagoon is accessible only by

a road that the Board believes is likely to prove unusable during winter months, forcing continued reliance on the existing lagoon.

While the new lagoon system poses serious risks, the Board is satisfied that with appropriate conditions these risks can be mitigated. Moreover, this is likely the only mechanism for the Hamlet to come into compliance with the Act and the terms of the Licence. Accordingly, the Board has decided that the optimum benefit for the residents of Nunavut is derived from a decision to issue the amendment to the Licence.

The Board's decision relies heavily on the need for mitigating risks posed by the new lagoon system and has set out corresponding conditions in the amended Licence, including specified responsibilities of the Her Majesty in right of Canada pursuant to 70(2) of the Act. The Board believes these conditions are essential to achieving optimum benefit for the residents of Nunavut and asks that the Minister approve this Licence only if INAC inspectors are committed to comply with the responsibilities specified in the Licence and pursuant to the Act.

Through the conditions set out in the Licence, the Board will carefully monitor the Hamlet's efforts to come into compliance with the Licence. If at any point the Board determines that future failure to comply with key conditions set out in the Licence such that the balance of the benefit to the residents of Nunavut changes, the Board is prepared to exercise its authority pursuant to clause 43(1)(c)(iii) of the Act to recommend cancellation of the licence if the Board determines it is in the public interest to do so.

If your office wishes to receive a full Records of Proceedings please contact our head office. The Licence is in your hands to be considered in accordance with section 56 of the *Nunavut Waters and Nunavut Surface Rights Tribunal Act*.

Please contact the undersigned in writing should you have any questions regarding this matter.

Sincerely,

Thomas Kabloona
A/Chair

Attachment: Licence No: 3BM-CAP0810 and Decision

c.c. Cape Dorset Distribution List
NWB Public Registry

WATER LICENCE NO: 3BM-CAP0810

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LICENCE 3BM-CAP0810

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 CAPE DORSET
(Licensee)

of **P.O. BOX 30, CAPE DORSET, NUNAVUT X0A 0C0**
(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-CAP0810**

Water Management Area **NUNAVUT 05**

Location **CAPE DORSET, NUNAVUT**
Latitude 64°14'N and Longitude 76°32'W

Purpose **WATER USE AND WASTE DISPOSAL**

Description **MUNICIPAL UNDERTAKINGS**

Quantity of Water Not to Exceed **70,000 CUBIC METRES ANNUALLY**

Date of Licence **MARCH 7, 2008**

Expiry Date of Licence **MARCH 1, 2010**

Thomas Kabloona,
Nunavut Water Board
A/Chair

APPROVED BY:

Minister of Indian and Northern Affairs Canada

DATE LICENCE APPROVED:

PART A: SCOPE, DEFINITIONS AND ENFORCEMENT

1. Scope

a. This Licence allows for the use of water and the disposal of waste for municipal undertakings at the Hamlet of Cape Dorset, Nunavut (Latitude 64°14'N and Longitude 76°32'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

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

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

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

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

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

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

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

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

"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" means the discharge location point where the effluent from the 2007 Sewage Disposal Facilities enters fish habitat or fish bearing waters;

"Final Point of Control" means the discharge location at the 2007 Sewage Disposal Facilities August 27, 2007 submission prepared by Dillon Consulting including ten appendices, to be confirmed by an Inspector;

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

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

"Grab Sample" means 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**" includes the facilities licensed in 2001, 2004 and 2007;

"**Emergency Sewage Disposal Facility**" comprises the area designed to contain and treat sewage as described in the Water License Amendment Application filed by the Applicant on August 16, 2004, and illustrated on the "Cape Dorset Sewage Lagoon Rehabilitation Site Plan (August 2004)"

"2001 Sewage Disposal Facilities" comprises the Three Tier Lagoon which 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 April 19, 2001;

"2007 Sewage Disposal Facilities" comprises the engineered lagoon and decant structures constructed in 2007 and illustrated in the Record Drawings No.'s 100 and 101 of Project N-05-4319-3000 prepared by Dillon Consulting and submitted November 13, 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 April 19, 2001;

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

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

"Waste Disposal Facilities" means all facilities designated for the disposal of waste, and includes the 2001, 2004 and 2007 Sewage Disposal Facilities, Solid Waste Disposal Facilities, and Bagged Toilet Waste Disposal Facilities, as described in the Application for Water Licence filed by the Applicant on April 19, 2001 and subsequently in the application dated July 7, 2005;

"Water Supply Facilities" comprises the area and associated intake infrastructure at Tee Lake, as described in the Application for Water Licence filed by the Applicant on April 19, 2001;

3. Enforcement

i. 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*;

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

iii. 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.

iv. The Licensee shall, in relation to any application to renew or amend the Licence, have in place a Plan for Compliance approved by the Board in writing, to achieve full compliance with the conditions of this Licence, or a 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:

i. tabular summaries of all data generated under the Monitoring Program;
ii. the monthly and annual quantities in cubic metres of fresh water obtained from all sources;
iii. the monthly and annual quantities in cubic metres of each and all waste discharged;
iv. a summary of modifications and/or major maintenance work carried out on the Water Supply and Waste Disposal Facilities, including all associated structures and facilities;
v. a list of unauthorized discharges and summary of follow-up action taken;
vi. a summary of any abandonment and restoration work completed during the year and an outline of any work anticipated for the following year;
vii. a summary of any studies, reports and plans (i.e. Operations and Maintenance, Abandonment and Restoration, QA/QC) requested by the Board that relate to water use and waste disposal or reclamation, and a brief description of any future studies planned; and
viii. 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 submit to the Board, for approval in writing, within the lesser of ninety (90) days or 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.

7. 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.

8. 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.

9. 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.

10. 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

11. 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.

12. The Licensee shall ensure that any document(s) or correspondence submitted by the

Licensee to the Board, is received by the Board and maintain on file a copy of the acknowledgment of receipt issued by the Manager of Licensing.

13. 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 the Tee 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 70,000 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. Licensee shall locate areas designated for waste disposal at a minimum distance of thirty (30) metres from the ordinary high water mark of any water body such that the quality, quantity or flow of water is not impaired, unless otherwise approved by the Board in writing.

2. Subject to the conditions in the Licence regarding commissioning, the Licensee shall direct all Sewage to the 2007 Sewage Disposal Facilities or as otherwise approved by the Board in writing.

3. The Licensee shall provide notice to an Inspector at least ten (10) days prior to initiating any decant of the 2001 and 2007 Sewage Disposal Facilities.

4. All Effluent discharge from the 2001 Sewage Disposal Facility at Monitoring Program Station CAP-3 and the Emergency Sewage Disposal Facility at Monitoring Program

Station CAP-4, shall meet the following effluent quality limits:

Parameter	Maximum Average Concentration
BOD_5	120 mg/L
Total Suspended Solids	180 mg/L
Faecal Coliforms	1 x 10^4 CFU/100mL
Oil and grease	No visible sheen
pH	between 6 and 9

5. All Effluent discharged from the 2007 Sewage Disposal Facilities at Monitoring Program Station CAP-5 shall meet the following effluent quality limits:

Parameter	Maximum Average Concentration
BOD_5	80 mg/L
Total Suspended Solids	100 mg/L
Faecal Coliforms	1 x 10^4 CFU/100mL
Oil and grease	No visible sheen
pH	between 6 and 9

6. The Licensee shall maintain at all times, a freeboard of at least 1.0 metre, or as recommended by a qualified Geotechnical Engineer with notice in writing provided to the Board, for all dams, dykes or other structures intended to contain, withhold, divert or retain water or wastes.

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

8. All Effluent discharged from the 2007 Sewage Disposal Facility at the Final Discharge Point at Monitoring Station CAP-14 and effluent discharge from Monitoring Stations CAP-3 and CAP-4 prior to the point of entry at the ocean, , shall be demonstrated to be non-acutely toxic under the following tests to be conducted once annually, approximately mid-way through the discharge period:

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

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

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

10. The Licensee shall implement appropriate erosion and diversion control methods, to minimize surface water intrusion and leachate generation at the Solid Waste Storage Facility.

11. The Licensee shall segregate and securely 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.

PART E: CONDITIONS APPLYING TO MODIFICATION AND CONSTRUCTION

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

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

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

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

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

   iv. the Board has not rejected the proposed modifications.

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

4. The Licensee shall provide as-built plans and drawings of the Modifications referred to in this Part within ninety (90) days of completion of the Modification. These plans and

drawings shall be stamped by an Engineer.

5. The Licensee shall, within sixty (60) days of issuance of this Licence, provide a summary report along with revised stamped as-built plans and record drawings of the 2007 Sewage Disposal Facility, to reflect the clarifications and omissions identified through the Licence application review and detailed in the attached Schedule 1.

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

7. The Licensee shall ensure that sediment and erosion control measures are implemented prior to and maintained during the operation to prevent the release of sediment and minimize erosion during construction activities.

8. The Licensee shall designate an area for the deposition of excavated and stockpiled materials that is at least thirty (30) metres above the ordinary high water mark of any water body and in such a manner as to prevent sediment from entering any surrounding water body.

9. The Licensee shall ensure that both (a) fill material used in construction, and (b) that the ground to be constructed upon, are free of contaminants. If contaminated soils are identified, notification shall be made in the Licensee's annual report. All contaminated soils shall be treated and disposed of in accordance with Part F, Item 2, or as otherwise approved by the Board in writing.

PART F: CONDITIONS APPLYING TO OPERATION AND MAINTENANCE

1. The Licensee shall submit to the Board, for approval in writing, within ninety (90) days of issuance of the Licence and prior to commissioning of the 2007 Sewage Disposal Facilities, a revised *Operation and Maintenance Manual, Sewage Treatment System, Hamlet of Cape Dorset, November 7, 2007.* The revision shall include the requirements of Schedule 2.

2. The Licensee shall submit to the Board, for approval in writing, within ninety (90) days of issuance of the Licence, an Operation and Maintenance Manual for the Water Supply Facilities and the Solid Waste Disposal Facilities prepared in accordance with the *"Guidelines for Preparing an Operation and Maintenance Manual for Sewage and Solid Waste Disposal Facilities", October 1996.* The Plan shall include a specific section addressing waste management and the proper diversion and segregation of wastes, the storage, transport and disposal of hazardous wastes materials.

3. The Licensee shall implement the Manuals specified in Part F, Items 1 and 2, following approval in writing by the Board.

4. The Licensee shall provide notification in writing to the Board, in accordance with Part E, Item 2, of changes to the approved Operation and Maintenance Plan under Part F, Item 1, with respect to the wastewater storage and decanting operations and procedures. For any potential significant impact of such change to the geothermal regime within and under the berms or lagoon floor, notice shall be accompanied by the Geotechnical Engineer's supporting documentation and further geotechnical analysis.

5. An inspection of all engineered facilities related to the management of water and waste shall be carried out annually in July, by a Geotechnical Engineer in accordance with the Canadian Dam Association, Dam Safety Guidelines, November 2007, where applicable. This inspection shall include the access road alignment with respect to water resources and the diversion and passage of water through culverts. 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.

6. The Licensee shall perform a visual operations inspection of all engineered facilities related to the management of water and waste on a weekly basis or more frequently as requested by an Inspector, to assess the general operating conditions and integrity of the containment structures. The records of these inspections are to be maintained and made available to an Inspector upon request during the Licence term.

7. The Licensee shall review the Manual(s) referred to in this Part if there are changes in operation and/or technology and modify the Manual(s) accordingly. Revisions to the Board approved Manual(s) are to be submitted in the form of an Addendum to be included with the Annual Report under Part B, Item 1.

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

   i. employ the appropriate contingency plan as provided for in the Operation and Maintenance Manual;
   ii. report the incident immediately via the 24-Hour Spill Reporting Line at (867) 920-8130 and to the Inspector at (867) 975-4295; and
   iii. submit to the Inspector, a detailed report on each occurrence, no 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, RESTORATION AND CLOSURE

1. The Licensee shall submit to the Board, for approval in writing, within ninety (90) days of issuance of the Licence, a detailed Final Abandonment and Restoration Plan for the 2001 Sewage Disposal Facility and the Emergency Sewage Disposal Facility. The Plan should incorporate, where applicable, the appropriate sections as described in Part G, Item 2.

2. The Licensee shall submit to the Board, for approval in writing, within six (6) months of issuance of this Licence, a preliminary or conceptual Abandonment and Restoration Plan for the Hamlet of Cape Dorset, Water and Waste Disposal Facilities and all associated structures not covered under Part G, Item 1, with end objectives to return the site to pre-use conditions. The Plan shall include the following (where applicable):

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

3. The Licensee shall submit to the Board, for approval in writing, six (6) months prior to the planned decommissioning of any licensed facility and the construction of new facilities to replace existing ones, a Final Abandonment and Restoration Plan for the facilities being decommissioned.

4. The Licensee shall implement the Plan(s) specified in Part G, Item 1 and 3, following approval in writing by the Board.

5. The Licensee shall review the Plan(s) referred to in this Part if there are changes in operation and/or technology and modify the Plan accordingly. Revisions to the Board approved Plan(s) are to be submitted in the form of an Addendum to be included with the Annual Report under Part B, Item 1.

6. The Licensee shall carry out progressive reclamation of any components of the project no longer required for the Licensee's operations.

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

8. The Licensee shall complete all restoration work prior to the expiry of this Licence.

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
CAP-1	Raw Water supply prior to treatment	Active (Volume)
CAP-2	Runoff from the Solid Waste Disposal Facilities	Active
CAP-3	Influent of Wastewater to Wastewater Facilities (active at the time of sampling)	New
CAP-4	Effluent Discharge from the 2001 Sewage Disposal Facilities	Active (including volume)
CAP-5	Effluent discharge from the Emergency Sewage Disposal Facilities	Active (including volume)
CAP-6	Effluent discharge from the 2007 Sewage Disposal Facilities – Final Point of Control	Active (including volume)
CAP-7	Point of influent of wastewater to P-Lake	New
CAP-8	Centre of P-Lake	New
CAP-9	Location midway between the Centre of P-Lake (Station 8) and the effluent discharge of P-Lake	New

Monitoring Program Station Number	Description	Status
CAP-10	Effluent discharge from P-Lake; note, if flow is negligible a sample from the immediate upstream area within P-Lake shall be obtained	New
CAP-11	Effluent discharge from Wetland area	New
CAP-12	Wetland Pathway at the top of the waterfall	New
CAP-13	Wetland Pathway at mid-way down waterfall	New
CAP-14	Wetland Pathway at bottom of cliff – Final Discharge Point	
CAP-15	Control point using a small lake located between the Lagoon and Tee Lake	New
CAP-16	Monitoring well located up gradient of the 2007 Sewage Disposal Facility	New
CAP-17	Monitoring Well No.1 located down gradient of the 2007 Sewage Disposal Facility	New
CAP-18	Monitoring Well No.2 located down gradient of the 2007 Sewage Disposal Facility	New
CAP 19	Monitoring well located up gradient of the Solid Waste Disposal Facilities	New
CAP-20	Monitoring well located down gradient of the Solid Waste Disposal Facilities	New
CAP-21	Thermistor stations	Proposed with final description to be provided
CAP-22	As above	
CAP-23	As above	
CAP-24	As above	

2. The Licensee shall sample at Monitoring Program Stations CAP-3 through CAP-15 inclusive, one week prior to the proposed discharge date, once at the beginning of discharge and weekly thereafter until cessation of discharge. Samples shall be analyzed for the following parameters:

Biochemical Oxygen Demand (BOD_5)

Carbonaceous Biochemical Oxygen Demand ($CBOD_5$)
Total Suspended Solids
pH
Conductivity
Oil and Grease (visual)

Fecal Coliforms
Nitrate-Nitrite
Ammonia Nitrogen
Total Phosphorus
Total Phenols
Magnesium
Calcium
Sodium
Potassium
Chloride
Sulphate
Total Hardness
Total Alkalinity

Total Trace Metals as determined by a standard ICP Scan (to include at a minimum, the following elements: Al, Sb, Ba, Be, Cd, Cr, Co, Cu, Fe, Pb, Li, Mn, Mo, Ni, Se, Sn, Sr, Tl, Ti, U, V, Zn),

Total Arsenic
Total Mercury
Total Organic Carbon (TOC)

3. If the discharge at Station CAP-4, CAP-5 or CAP-6 has been suspended for more than 48 hours and subsequently restarted, the sampling sequence described in Part H, Item 2 of the Monitoring Program shall be repeated for these Stations.

4. The Licensee shall sample monthly at Monitoring Program Station CAP-2 during periods of observed flow. Samples shall be analyzed for the following parameters:

BOD_5	Fecal Coliforms
pH	Conductivity
Total	Suspended Solids Ammonia Nitrogen
Nitrate-Nitrite	Oil and Grease
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

5. The Licensee shall report all results of non-acute toxicity testing as required under Part D, Item 8 within the Annual Report as per Part B, Item 1.

6. The Licensee shall install thermistors for the purpose of validating assumptions made in the geothermal analyses for the 2007 Sewage Disposal Facilities as recommended by the Geotechnical Engineer of record and agreed upon by the Licensee, subject to a minimum of three 20 to 25 metre deep thermistors installed in crest of the west berm and at least one thermistor of that depth in the east berm.

7. The results of thermistor monitoring required under Part H, Item 6, shall be submitted to the Board for approval in writing, prior to commissioning of the 2007 Sewage Disposal Facility. The results shall include an Engineer's Report, validating the assumptions of the geothermal analysis through adequate monitoring of the thermal regime for the East and West Berms and downstream foundations

8. The Licensee shall not commission the 2007 Sewage Disposal Facility until the requirements of Part H, Item 6 and Item 7 have been completed and approved.

9. The Licensee shall, within ninety (90) days of issuance of this Licence, provide a Temperature Monitoring Program and Implementation Plan for ongoing collection of ground temperatures within each berm structure and foundation of the 2007 Sewage Disposal Facility through the installation of thermistors. This Plan shall take into consideration the following:

    i. Locations of thermistors, to be incorporated into the Monitoring Station Table under Part H, Item 1;
    ii. Appropriate thermistor configuration, overall depth and spacing of bead locations to provide the level of data collection that will capture any extreme variations in temperature and provide the information needed to validate the assumptions made in the geothermal analysis.
    iii. The frequency of temperature readings shall be such to allow the determination of the maximum freeze and thaw of the berm and underlying native materials and provide adequate data for thermal modeling of the berms.
    iv. This frequency may be reviewed and adjusted upon collection of adequate data and as recommended by the Geotechnical Engineer in order to assess the berms through thermal modeling and provide an assessment with respect to berm stability and potential seepage.
    v. This information is to be reported along with the results of the annual geotechnical inspection as required under Part F, Item 6.
    vi. An implementation schedule that will allow collection of data for confirmation of core-trench freeze-back.

10. The Licensee shall implement the Plan specified in Part H, Item 9 following approval by the Board in writing.

11. The Licensee shall review the Plan(s) referred to in this Part if there are changes in operation and/or technology and modify the Plan accordingly. Revisions to the Board approved Plan(s) are to be submitted in the form of an Addendum to be included with the Annual Report under Part B, Item 1.

12. The Licensee shall install groundwater monitoring wells at the 2007 Sewage Disposal Facility to obtain at least one monitoring season of data prior to the expiry of the Licence. At least one groundwater monitoring well shall be located upstream of the 2007 Sewage Disposal Facility for background data collection, at least one groundwater monitoring well shall be located downstream of the landfill and at least one groundwater monitoring well shall be located downstream of the metals dump.

13. The Licensee shall sample at Monitoring Program Stations CAP-16, CAP-17 and CAP-18 once annually in the summer, prior to commencing discharge from the 2007 Sewage Disposal Facility, giving due consideration to adequate ground thaw and obtaining a representative groundwater sample. Samples shall be analyzed for parameters identified in Part H, Item 4.

14. The Licensee shall install groundwater monitoring at the Solid Waste Disposal Facilities wells to obtain at least one monitoring season of data prior to the expiry of the Licence, At lease one groundwater monitoring well shall be located upstream of the Solid Waste Disposal Facilities for background data collection and at least one groundwater monitoring well shall be located downstream of the Solid Waste Disposal Facilities .

15. The Licensee shall sample at Monitoring Program Stations CAP-19 and CAP-20 once annually in the summer season, giving due consideration to adequate ground thaw and obtaining a representative groundwater sample. Samples shall be analyzed for parameters identified in Part H, Item 4.

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

17. The Licensee shall measure and record in cubic metres (a) the monthly and annual quantities of raw sewage offloaded from trucks and the number of days of use for the 2001 Sewage Disposal Facility and the Emergency Sewage Disposal Facility, and (b) the monthly and annual quantities of raw sewage offloaded from trucks at the 2007 Sewage Disposal Facility.

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

19. The Licensee shall conduct additional sampling and analysis as may be requested by an Inspector.

20. The Licensee shall revise the "Guidelines for Wastewater Sampling, October 27, 2007" and submit to the Board for approval by an Analyst in writing a Quality Assurance/Quality Control (QA/QC) Plan for the Hamlet of Cape Dorset, within ninety (90) days of issuance of this Licence. The Plan shall use as a guide the document *"Quality Assurance and Quality Control Guidelines for use by Class "B" Licensees in Collection of Representative Water Samples in the Field, and for Submission of a QA/QC Plan, July 1996"*. The Plan shall address the use of field blanks, replicate sampling and certified reference material in order to assess accuracy, precision and field contamination.

21. The Licensee shall implement the Plan referred to in Part H, Item 20 following approval in writing by the Analyst.

22. 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.

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

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

25. Her Majesty in the right of Canada shall:
    i. Monitor the Licensee's installation of thermistors and notify the Board when the installation of thermistors is complete and in compliance with Part H, Item 6;
    ii. Monitor the Licensee's validation of the assumptions of the geothermal analysis through adequate monitoring of the thermal regime for the East and West Berms and downstream foundations under Part H, Item 7, and notify the Board when satisfied the assumptions of the geothermal analysis have been validated; and
    iii. Monitor the 2007 Waste Disposal Facility and notify the Board immediately if the Project is commissioned prior to the completion of i. and ii., or in contravention of any other condition of the Licence.

SCHEDULE 1 CONDITIONS APPLYING TO MODIFICATIONS AND CONSTRUCTION

List of drawing deficiencies identified by BGC for revision and submission.
Please refer to Technical Memorandum "Cape Dorset Sewage lagoon-Review of Final Submissions, January 8, 2008", or the final intervention memo dated January 8, 2008 for further clarification.

The record set of drawings fails to include a signature block for AMEC. It was noted that the original design drawings issued by Dillon in the December 21, 2006 design report, revision 5, marked "Issued for Construction" included a signature block "Reviewed by AMEC" on Drawing 111, which is the equivalent of Drawing 112 of the Record Drawings

1. At a minimum, AMEC is to provide a signature block for the following drawings:

- Drawing 101- shows location of test pits carried out for geotechnical investigations.
- Drawing 109- shows longitudinal geological sections along cut-off trench.
- Drawing 110- shows typical earthworks sections for the access road and berm.
- Drawing 112- shows lagoon berm sections

2. The as-built drawings must identify the areas where field changes were made from the original design drawings, preferably in the form of a revision bubble and a brief note in the revisions section of the title block.

List of Drawing alterations and request for rationale for the change.

Record drawing 100 – the alignment of the access roads between the East and West Berms, on the north and south sides of the lagoon was changed from the original design. The road berms were originally designed to deflect runoff from entering the lagoon.

3. Explanation is required as to the rationale for changing the alignment of the road berms and how the as-built berm details in the drawing prevents runoff from entering the lagoon.

Record Drawing 109 – there is up to 1m of unfrozen fill used to level the ground surface under both the East and West berms. This leveling course of material has not been shown as a separate zone in the berm sections presented in Record Drawing 112.

4. A description for record drawing 112 is required of the material used including grain size gradation curve.

Record Drawing 109 – shows that the berm contours at the north end of the West Berm have been modified from the original design drawings. Crest widened from 4m to 25m to accommodate what appears to be a vehicle turnaround on the downstream side of the berm.

5. Additional as-built cross-sections of this area are to be provided along with geothermal analysis that there is sufficient fill thickness over the abutment to ensure that the GCL tie-in to the cut-off trench remains frozen.

Record Drawing 110 shows typical road sections. On July 30, 2007, the GN CGS provided a revised ditch detail for the road

6. This revised ditch detail is requested as part of the as-built drawing details for Drawing 110

7. Additional information is requested providing further details as to how seepage through the active zone under the berm will be prevented.

The Hamlet of Cape Dorset noted a problem during the October 1, 2007 Technical Meeting/Pre-Hearing, with seepage into the lagoon through the active zone with the as-constructed detail. Record Drawing 112 indicates that the material used to backfill the cut-off trench is a "Sand", the same material as used for the berm.

8. Further clarification is requested on how the issue of seepage is being resolved.

In the original Design Drawing 111, Detail 4 showed the liner embedment longitudinal section in the abutments. This Detail was absent from Record Drawing 112. The cut-off trench must extend sufficient distance into the abutment so that any "end-run" seepage through the active zone is prevented. It is not clear from the as-built information if the extent of the cut-off trench satisfies this criterion.

9. Therefore the as-built liner embedment details for the abutment areas of the East and West Berms are therefore requested to be included for Record Drawing 112.

In Record Drawing 112, the crest detail of the emergency overflow weir section was changed. This change notice was transmitted to the contractor by Dillon on July 21, 2007. The as-built detail shows the geo-web and the GCL in one layer, with no granular or other material between the two. Dillon initiated this modification to address a previous concern raised by BGC that water could seep under the GCL in the emergency spillway and potentially lift the liner. It is still not clear how the above modification prevents this problem from occurring.

10. Design change rationale is requested that provides an explanation as to the change from the original drawing, change to meet BGC's concern and then further change to what appears to be potentially inadequate construction.

SCHEDULE 2 CONDITIONS APPLYING TO MONITORING AND MAINTENANCE

A revised *Operation and Maintenance Manual, Sewage Treatment System, Hamlet of Cape Dorset, November 7, 2007* shall include the following requirements:

i. Expansion of Section 3.4.5 to include terms and conditions for the disposal of sludge as provided for in the Draft Guidelines for Discharge of Domestic Wastewater in Nunavut, 2000;
ii. Section 3.4.6 should include a description of the installation of thermistors required under Part H, Item 6, including the number, locations and depths of thermistor beads used to monitor the berms, and a description of the method and frequency of monitoring requirements;
iii. Section 3.4.6 should include a description of the installation of monitoring wells required under Part H, Item 7, including the number, locations and depths of thermistor beads used to monitor the berms, and a description of the method and frequency of monitoring requirements
iv. Description of the details of any repairs, upgrades and maintenance required for the use of part or all of the 2001 Sewage Disposal Facility or Emergency Sewage Disposal Facility;
v. Include a contingency plan for the operation of the 2007 Sewage Disposal Facility during periods where accessibility to the facility is limited and alternative measures are required for the handling of sewage. This may include operation and maintenance of any older facility or portion of, that would be retained as the contingency;
vi. Provision for the monitoring of effluent discharges from the 2001 Sewage Disposal Facility and the Emergency Sewage Disposal Facility;
vii. Inspection program for the 2001 Sewage Disposal Facility, the Emergency Sewage Disposal Facility and 2007 Sewage Disposal Facility, detailing the frequency and inspection requirements by the operator(s) of the facility;
viii. Appendix C of the O&M Manual to include forms to document the recommendations and follow up work required as a result of the annual geotechnical inspection.
ix. Section 4 – Spill Contingency Plan be revised to comprehensively address specific recommendations provided during the review process by GN DoE as follows:

    a. The date the contingency plan was prepared.
    b. The name and address of the person in charge, management or control. This is an on-site person responsible for managing the facility. This person would be initially responsible for clean-up activities.
    c. The name and address of the owner if different from the person in charge. This is the person ultimately responsible for the facility, usually the owner.
    d. The name, job title and 24 hour telephone number for the persons responsible for activating the contingency plan. This ensures the employee discovering the spill can activate a response and provides a 24 hour point of contact for the authority

investigating the spill.

e. A description of the facility including the location, size and storage capacity. This is important if persons are unfamiliar with the facility or area. The description could include a map and/or diagrams.

f. A site map that is intended to illustrate the facilities relationship to other areas that may be affected by the spill. The map should be to scale and be large enough to include the location of your facility, nearby buildings or facilities, roads, culverts, drainage patters, and any nearby bodies of water.

g. The steps to be taken to report, contain, and clean up and dispose of a contaminant in the case of a spill.
    1. Reporting: Notification of all parties involved. This can include internal and external reporting procedures as well as a copy of the spill report;
    2. Clean up: Removal of the contaminant from the environment, a detailed of actual containment and clean up techniques. (2 steps: contain and remediate; be aware of fire);
    3. Disposal: Is the treatment of the contaminant such that it is no longer a threat to the environment. Plans may include location of disposal sites approved to accept wastes, means of storage prior to disposal and other approvals required. (Waste Manifest document).

h. The means by which the contingency plan is activated. This should outline internal company procedures to activate appropriate response equipment and personnel.

i. A description of the training provided to employees to respond to a spill. A sound training program is necessary when dealing with an emergency situation.

j. An inventory and the location of response and clean up equipment available to implement the plan. This includes your equipment as well as any to be used by another person responding to the spill on your behalf.

k. SPILL KIT (FUEL)The kit can include but not limited to the following: shovel, pick-axe, drums, booms, absorbent pad/sheet, disposable protective gloves/coveralls, sorbent and containment materials, and disposal bags.

l. A list of local contractors or clean up specialists who may be called upon to assist in responding to spills. A list of emergency numbers such as fire, ambulance and police.

x. Section 4 – describe the measures to be implemented for a spill during the collection and transportation of wastewater. This spill response is to be expanded to include spill scenarios resulting from the leakage or failure of a containment structure for the Sewage Disposal Facilities; and

xi. Appendix B to include specific reference to monitoring stations and required frequency of sampling and the analyses required by the Licence.

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

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HAMLET OF CAPE DORSET
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 & 4 of Part H of Nunavut Water Board Licence 3BM-CAP0810)	☐
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 CAP-1	Station CAP-1 (see Figure 2) is a raw water supply (from Tee 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 CAP-1.	☐
SOLID WASTE DISPOSAL FACILITIES		
Sampling Station CAP-2	Landfill runoff is collected once monthly during periods of observed flow (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 2) 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.	☐
Sampling Station CAP-19	A groundwater sample is collected from a monitoring well located up gradient of the Solid Waste Disposal Facility (see Figure 2) once annually in the summer (see Schedule in Appendix E for timing and list of parameters to be sampled), giving due consideration to adequate ground thaw and obtaining a representative groundwater sample. The groundwater sample should be collected using dedicated sampling tubing with a Waterra™ foot valve (or bailer). Well purging should not be undertaken due to the potential limited availability of groundwater in the monitoring well. Instead, a sample should be collected of all available groundwater present in the monitoring well.	☐
Sampling Station CAP-20	A groundwater sample is collected from a monitoring well located down gradient of the Solid Waste Disposal Facility (see Figure 2) once annually in the summer (see Schedule in Appendix E for timing and list of parameters to be sampled), giving due consideration to adequate ground thaw and	☐

	obtaining a representative groundwater sample. The groundwater sample should be collected using dedicated sampling tubing with a Waterra™ foot valve (or bailer). Well purging should not be undertaken due to the potential limited availability of groundwater in the monitoring well. Instead, a sample should be collected of all available groundwater present in the monitoring well.	
ACTIVE SEWAGE DISPOSAL FACILITY		
Sampling Station CAP-3	Wastewater influent samples are collected from the active sewage disposal facility (see Figure 2) beginning one week prior to the proposed discharge date, once at the beginning of the discharge and weekly thereafter until the cessation of discharge (see Schedule in Appendix E for timing and list of parameters to be sampled). Wastewater influent samples are collected from the lagoon by immersing the sample bottle into the lagoon neck first to a depth of 5 to 10 cm (if possible). The sampling container is filled with influent wastewater and the sample bottle is raised neck first to prevent sample spillage.	☐
2001 SEWAGE DISPOSAL FACILITIES		
Sampling Station CAP-4	Effluent discharge samples are collected from the 2001 Sewage Disposal Facility (see Figure 2), beginning one week prior to the proposed discharge date, once at the beginning of the discharge and weekly thereafter until the cessation of discharge (see Schedule in Appendix E for timing and list of parameters to be sampled). Wastewater effluent samples 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 wastewater and the sample bottle is raised neck first to prevent sample spillage.	☐
EMERGENCY SEWAGE DISPOSAL FACILITIES		
Sampling Station CAP-5	Effluent discharge samples are collected from the Emergency Sewage Disposal Facility (see Figure 2), beginning one week prior to the proposed discharge date, once at the beginning of the discharge and weekly thereafter until the cessation of discharge (see Schedule in Appendix E for timing and list of parameters to be sampled). Wastewater effluent samples 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 wastewater and the sample bottle is raised neck first to prevent sample spillage.	☐
2007 SEWAGE DISPOSAL FACILITIES		
Sampling Station CAP-6	Effluent discharge samples are collected from the Final Point of Control at the 2007 Sewage Disposal Facility (see Figure 3), beginning one week prior to the proposed discharge date, once at the beginning of the discharge and weekly thereafter until the cessation of discharge (see Schedule in Appendix E for timing and list of parameters to be sampled). Wastewater effluent samples 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 wastewater and the sample bottle is raised neck first to prevent sample spillage.	☐
Sampling Station CAP-7	Wastewater influent samples are collected from P-Lake (see Figure 3), beginning one week prior to the proposed discharge date, once at the beginning of the discharge and weekly thereafter until the cessation of discharge (see Schedule in Appendix E for timing and list of parameters to be sampled). Wastewater influent samples are collected from P-Lake by immersing the sample bottle into P-Lake neck first to a depth of 5 to 10 cm (if possible). The sampling container is filled with influent wastewater and the sample bottle is raised neck first to prevent sample spillage.	☐
Sampling Station CAP-8	Wastewater samples are collected from the centre of P-Lake (see Figure 3), beginning one week prior to the proposed discharge date, once at the beginning of the discharge and weekly thereafter until the cessation of discharge (see Schedule in Appendix E for timing and list of parameters to be sampled). Wastewater samples are collected from P-Lake by immersing the sample bottle into P-Lake neck first to a depth of 5 to 10 cm (if possible). The sampling container is filled with wastewater and the sample bottle is raised neck first to prevent sample spillage.	☐
Sampling Station CAP-9	Wastewater samples are collected from a location midway between the centre of P-Lake (Station CAP-8) and the effluent discharge of P Lake (Station CAP-10), beginning one week prior to the proposed discharge date, once at the beginning of the discharge and weekly thereafter until the cessation of discharge (see Schedule in Appendix E for timing and list of parameters to be sampled). Wastewater samples are collected from P-Lake (see Figure 3) by immersing the sample bottle into P-	☐

	Lake neck first to a depth of 5 to 10 cm (if possible). The sampling container is filled with wastewater and the sample bottle is raised neck first to prevent sample spillage.	
Sampling Station CAP-10	Wastewater effluent discharge samples are collected from P-Lake (see Figure 3). If flow is negligible, then the samples are collected from a location located immediately upstream within P-Lake. These samples are collected beginning one week prior to the proposed discharge date, once at the beginning of the discharge and weekly thereafter until the cessation of discharge (see Schedule in Appendix E for timing and list of parameters to be sampled). Wastewater effluent samples are collected from the receiving water body by immersing the sample bottle into water body neck first to a depth of 5 to 10 cm (if possible). The sampling container is filled with effluent wastewater and the sample bottle is raised neck first to prevent sample spillage.	☐
Sampling Station CAP-11	Wastewater effluent discharge samples are collected from the Wetland area (see Figure 3) beginning one week prior to the proposed discharge date, once at the beginning of the discharge and weekly thereafter until the cessation of discharge (see Schedule in Appendix E for timing and list of parameters to be sampled). Wastewater effluent samples are collected from the wetland by immersing the sample bottle into the wetland neck first to a depth of 5 to 10 cm (if possible). The sampling container is filled with effluent wastewater and the sample bottle is raised neck first to prevent sample spillage.	☐
Sampling Station CAP-12	Wastewater effluent discharge samples are collected from the top of the waterfall on the Wetland Pathway (see Figure 3) beginning one week prior to the proposed discharge date, once at the beginning of the discharge and weekly thereafter until the cessation of discharge (see Schedule in Appendix E for timing and list of parameters to be sampled). Wastewater effluent discharge samples are collected from the waterfall by immersing the sample bottle into the waterfall neck first to a depth of 5 to 10 cm (if possible). The sampling container is filled with effluent discharge wastewater and the sample bottle is raised neck first to prevent sample spillage.	☐
Sampling Station CAP-13	Wastewater effluent discharge samples are collected from midway down the waterfall on the Wetland Pathway (see Figure 3) beginning one week prior to the proposed discharge date, once at the beginning of the discharge and weekly thereafter until the cessation of discharge (see Schedule in Appendix E for timing and list of parameters to be sampled). Wastewater effluent discharge samples are collected from the waterfall by immersing the sample bottle into the waterfall neck first to a depth of 5 to 10 cm (if possible). The sampling container is filled with effluent discharge wastewater and the sample bottle is raised neck first to prevent sample spillage.	☐
Sampling Station CAP-14	Wastewater effluent discharge samples are collected from the Final Discharge Point (see Figure 3), located at the bottom of the cliff, beginning one week prior to the proposed discharge date, once at the beginning of the discharge and weekly thereafter until the cessation of discharge (see Schedule in Appendix E for timing and list of parameters to be sampled). Wastewater effluent discharge samples are collected from the water body by immersing the sample bottle into the water body neck first to a depth of 5 to 10 cm (if possible). The sampling container is filled with effluent discharge wastewater and the sample bottle is raised neck first to prevent sample spillage.	☐
Sampling Station CAP-15	Wastewater effluent discharge samples are collected from a Control Point sampling location (small lake) located between the Lagoon and Tee Lake (see Figure 3), beginning one week prior to the proposed discharge date, once at the beginning of the discharge and weekly thereafter until the cessation of discharge (see Schedule in Appendix E for timing and list of parameters to be sampled). Wastewater effluent discharge samples are collected from the lake by immersing the sample bottle into the lake neck first to a depth of 5 to 10 cm (if possible). The sampling container is filled with effluent discharge wastewater and the sample bottle is raised neck first to prevent sample spillage.	☐
Sampling Station CAP-16	A groundwater sample is collected from a monitoring well located up gradient of the 2007 Sewage Disposal Facility (see Figure 3) once annually in the summer, prior to commencing discharge from the 2007 Sewage Disposal Facility, giving due consideration to adequate ground thaw and obtaining a representative groundwater sample (see Schedule in Appendix E for timing and list of parameters to be sampled). The groundwater sample should be collected using dedicated sampling tubing with a Waterra™ foot valve (or bailer). Well purging should not be undertaken due to the potential limited availability of groundwater in the monitoring well. Instead, a sample should be collected of all available groundwater present in the monitoring well.	☐
Sampling Station CAP-17	A groundwater sample is collected from Monitoring Well No.1 located down gradient of the 2007 Sewage Disposal Facility (see Figure 3) once annually in the summer, prior to commencing	☐

	discharge from the 2007 Sewage Disposal Facility, giving due consideration to adequate ground thaw and obtaining a representative groundwater sample (see Schedule in Appendix E for timing and list of parameters to be sampled). The groundwater sample should be collected using dedicated sampling tubing with a Waterra™ foot valve (or bailer). Well purging should not be undertaken due to the potential limited availability of groundwater in the monitoring well. Instead, a sample should be collected of all available groundwater present in the monitoring well.	
Sampling Station CAP-18	A groundwater sample is collected from Monitoring Well No.2 located down gradient of the 2007 Sewage Disposal Facility (see Figure 3) once annually in the summer, prior to commencing discharge from the 2007 Sewage Disposal Facility, giving due consideration to adequate ground thaw and obtaining a representative groundwater sample (see Schedule in Appendix E for timing and list of parameters to be sampled). The groundwater sample should be collected using dedicated sampling tubing with a Waterra™ foot valve (or bailer). Well purging should not be undertaken due to the potential limited availability of groundwater in the monitoring well. Instead, a sample should be collected of all available groundwater present in the monitoring well.	☐
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-CAP0810).	☐

Checklist Performed By:

Name	Signature	Date

Sample Bottle Requirements for Parameters Listed in Conditions 2 & 4 of Part H of Nunavut Water Board Licence No. 3BM-CAP0810

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
Carbonaceous Biochemical Oxygen Demand ($CBOD_5$)	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

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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

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

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Appendix E:
Environmental Monitoring Program Schedule

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Cape Dorset Monitoring Program Schedule
Nunavut Water Board Licence No. 3BM-CAP0810

Monitoring	Location	Month												
Station ID	Description	January	February	March	April	May	June	July	August	September	October	November	December	Annual
CAP-1	Raw water supply from Tee Lake	V	V	V	V	V	V	V	V	V	V	V	V	V
CAP-2	Runoff from Solid Waste Disposal Facilities					LR[1]	LR[1]	LR[1]	LR[1]	LR[1]				
CAP-3	Influent of Wastewater to Wastewater Facilities (active at the time of sampling)					WW[2]	WW[2]	WW[2]	WW[2]	WW[2]				
CAP-4	Effluent discharge from the 2001 Sewage Disposal Facilities	V	V	V	V	V, WW[2]	V, WW[2]	V, WW[2]	V, WW[2]	V, WW[2]	V	V	V	V
CAP-5	Effluent discharge from the Emergency Sewage Disposal Facilities	V	V	V	V	V, WW[2]	V, WW[2]	V, WW[2]	V, WW[2]	V, WW[2]	V	V	V	V
CAP-6	Effluent discharge from the 2007 Sewage Disposal Facilities - Final Point of Control	V	V	V	V	V, WW[2]	V, WW[2]	V, WW[2]	V, WW[2]	V, WW[2]	V	V	V	V
CAP-7	Point of influent of wastewater to P-Lake					WW[2]	WW[2]	WW[2]	WW[2]	WW[2]				
CAP-8	Centre of P-Lake					WW[2]	WW[2]	WW[2]	WW[2]	WW[2]				
CAP-9	Location midway between the Centre of P-Lake (Station 8) and the effluent discharge of P-Lake					WW[2]	WW[2]	WW[2]	WW[2]	WW[2]				
CAP-10	Effluent discharge from P-Lake (note: if flow is negligible a sample from the immediate upstream area within P-Lake shall be obtained)					WW[2]	WW[2]	WW[2]	WW[2]	WW[2]				
CAP-11	Effluent discharge from Wetland Area					WW[2]	WW[2]	WW[2]	WW[2]	WW[2]				
CAP-12	Wetland Pathway at the top of the waterfall					WW[2]	WW[2]	WW[2]	WW[2]	WW[2]				
CAP-13	Wetland Pathway at mid-way down waterfall					WW[2]	WW[2]	WW[2]	WW[2]	WW[2]				
CAP-14	Wetland Pathway at bottom of cliff - Final Discharge Point					WW[2]	WW[2]	WW[2]	WW[2]	WW[2]				
CAP-15	Control point using a small lake located between the Lagoon and Tee Lake					WW[2]	WW[2]	WW[2]	WW[2]	WW[2]				
CAP-16	Monitoring well located up gradient of the 2007 Sewage Disposal Facility								GW[3]					
CAP-17	Monitoring Well No. 1 located down gradient of the 2007 Sewage Disposal Facility								GW[3]					
CAP-18	Monitoring Well No. 2 located down gradient of the 2007 Sewage Disposal Facility								GW[3]					
CAP-19	Monitoring well located up gradient of the Solid Waste Disposal Facilities								GW[3]					

Cape Dorset Monitoring Program Schedule
Nunavut Water Board Licence No. 3BM-CAP0810

Monitoring	Location	Month												
Station ID	Description	January	February	March	April	May	June	July	August	September	October	November	December	Annual
CAP-20	Monitoring well located down gradient of the Solid Waste Disposal Facilities								GW[3]					
CAP-21	Thermistor Station													
CAP-22	Thermistor Station													
CAP-23	Thermistor Station													
CAP-24	Thermistor Station													

Test Groups		
V	Volume (m^3)	
LR	Landfill Runoff	(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, ammonia nitrogen, oil & grease (visual), total alkalinity, calcium, potassium, sulphate, total cadmium, total chromium, total lead, total nickel)
WW	Wastewater Effluent	(Biochemical Oxygen Demand (BOD_5), Carbonaceous Biochemical Oxygen Demand ($CBOD_5$), Total Suspended Solids (TSS), pH, conductivity, oil & grease (visual), faecal coliforms, nitrate-nitrite, total phosphorus, magnesium, sodium, chloride, total hardness, ammonia nitrogen, total phenols, calcium, potassium, sulphate, total alkalinity, total trace metals (including Al, Sb, Ba, Be, Cd, Cr, Co, Cu, Fe, Pb, Li, Mn, Mo, Ni, Se, Sn, Sr, Tl, Ti, U, V, Zn), total arsenic, total mercury, Total Organic Carbon (TOC))
GW	Groundwater	(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, ammonia nitrogen, oil & grease (visual), total alkalinity, calcium, potassium, sulphate, total cadmium, total chromium, total lead, total nickel)

[1] Sample monthly during periods of observed flow.

[2] TBD by operational staff - samples to be collected one week prior to proposed discharge date, once at the beginning of discharge and weekly thereafter until cessation of discharge.

[3] Once annually in the summer, given due consideration to adequate ground thaw and obtaining a representative groundwater sample.

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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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

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

† "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

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.