Cape Dorset Sewage Lagoon

Quality Assurance/Quality Control Plan

MAY 2016

HAMLET OF CAPE DORSET

BAFFIN REGION

NUNAVUT

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1.0 Introduction

The purpose of the QA/QC Plan of the Hamlet of Resolute Bay Water Licence is to ensure that samples taken in the field as part of the Monitoring Program will maintain a high quality, so as to accurately represent the physical and chemical nature of the samples being taken. It should also be noted that while minimum sampling requirements have been imposed, additional sampling may be requested by an inspector.

1.1 Background

Hamlet of Cape Dorset is situated on Dorset Island off the South coast of Baffin Island and located at 64°13'N and 76°31'W. The population in 2016 of the community is 1520. The community's water Licence, # 3BM-CAP 0810 –Type B, expired in 2010. Under this Licence, the community has a permit to withdraw 7000 cubic meters of water annually from the Tee Lake which is their designated potable water source. Water supply, Waste management and Wastewater treatment are the Environmental facilities under the Water Licence. This project proposal is for a water license renewal of License # 3BM-CAP 0810.

Water Supply: Tee Lake is the designated potable water source of the Hamlet of Cape Dorset. From the bathymetric surveys conducted by NRcan under climate change program in 2007, it shows that this lake is a sustainable source for the community. This lake is 1 km away from the Community.

Water Pipe Line and Truck-Fill Station (TFS): Water is transported from Tee Lake to the TFS by water transmission pipeline which is approximately one kilometer in length and was installed in 2002. It is a 75mm pre-insulated stainless steel pipe and is equipped with an internal electric heat tracing system. The water line includes submersible pump in the lake and a heater house with immersion heaters to warm the water prior to transmission to the storage tank located at the TFS. The existing truck-fill station with the adjacent storage tank of capacity 535 cubic meters was constructed in 1992. The facilities have largely remained unchanged during its service life.

Waste Management: The Community of Cape Dorset currently operates two solid waste disposal facilities-a bulky waste site and a municipal landfill. The bulky waste site has been in operation for about 30 years. Currently segregation of different types of wastes is being managed by the community.

The municipal landfill is a relatively small facility that has reportedly been in operation since the mid 1990's.The community recently fenced this site and is managing segregation well. They are burning light woods, paper etc. and covering with imported soil.

Wastewater Treatment: The community is treating their wastewater in the 3 cell lagoon located about 1 km southwest from the community. It was constructed in the mid 1990's and is located in a natural valley with drainage to the Telik Inlet of the Arctic Ocean. The lagoon cells are constructed in a terraced formation with sewage flowing from one cell to the next. Although designed to exfiltrate, culverts have since been installed within the upper portion of each berm to

accommodate overflow conditions and reduce the risk of berm failure. A culvert was also installed last year in the lower berm to control overflow.

At the current time, the rate of inflow to the lagoon system (sewage and natural run-off) exceeds the rate of exfiltration. Due to the location of the lagoon system, natural run-off further exasperates the issue of volumetric capacity required for the purposes of sewage treatment.

Prior to the construction of these 3 cell lagoon, a single cell lagoon located about 600m south west from the community was used for the sewage treatment. Discharge from this lagoon is also to the Arctic Ocean. The former sewage lagoon has a smaller capacity than that of the 3 cell lagoon. This lagoon has not been decommissioned because it is used in case of an emergency.

The berm failures and the winter overflows from the 3-cell lagoon were recurring problems which permitted sewage to enter Telik Inlet with a very little retention time. The Water Licence #NWB 3-CAP 0207 was granted to the Hamlet in September 2002 and this licence set out criteria for the performance of the 3 cell lagoon.

Following the EC's inspector directive under fisheries Act in March 2002, the P-lake sewage lagoon was initiated, expedited and finally built in 2007 and was licensed under Water Licence # 3BM-CAP0810 in 2008. The berm of this facility started leaking soon after this facility was planned to be commissioned. There are also safety concerns with the access road. Therefore this facility has not been used since it was built.

GN has hired Stantec consultant Inc. and is working towards an effective solution to address the access road concerns and the berm in order to commission the 2007 built P lake sewage Lagoon at the earliest possible time.

At this time, the 2007 built P-lake sewage Lagoon is excluded in the Water Licence renewal application.

1.2 Monitoring and Regulatory Requirement

Item 3 of Part H water licence requires that the Licensee shall conform to the Quality Assurance/Quality Control (QA/QC) Plan, which shall be provided to the licensee by the NWB within 6 months of the issuance of this licence.

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

The QA/QC Plan covers the Environmental monitoring undertaken at the Water

Truck filling station, existing three cells sewage lagoon, emergency sewage lagoon, Land

fill site and metal dump site.

These facilities are as shown in the Site Plan as shown in **Appendix-A.**

1.6 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 blank is analyzed by the Laboratory along with the monitoring program samples. The purpose of the trip blank is to assess contamination introduced during shipping and field handling procedures.

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

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

2.0 Field Sampling

2.1 Sampling procedures

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 Waste water, or by such other methods approved by the Board. All analyses shall be performed in a Laboratory certified by the Canadian Association of Environmental Analytical Laboratories (CAEAL) or as otherwise approved by NWB.

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 labeling 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, found in **Appendix B** for the specific details on the sampling locations, equipment and sampling methods.

2.2.1 Monitoring Stations

The Water Licence issued to the Hamlet of Cape Dorset in 2008 has included the P lake sewage lagoon. The proposed renewal excludes the P lake sewage lagoon. Therefore QA/QC plan excludes the P lake sewage lagoon and its associated monitoring stations.

The following table shows the monitoring stations under the proposed renewal:

Monitoring Station		Latitude/Longitude
CAP-1	**Raw water supply prior to Treatment**	
CAP-2	**Runoff from the solid waste disposal facilities**	
CAP-3	**Influent of Waste water to Waste water Facilities**	
CAP-4	**Effluent discharge from the 2001 Sewage Disposal Facilities**	
CAP-5	**Effluent discharge from Emergency Sewage Disposal Facilities**	
CAP-18	**Monitoring well located up gradient of the Solid Waste Disposal Facilities**	
CAP-19	**Monitoring well located down gradient of the Solid Waste Disposal Facilities**	

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 -C.**

2.2.3 Sampling Methods

Please see **Appendix- B** 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

Waste water influent samples are collected from the active sewage disposal facility at station CAP-3. Wastewater influent samples are collected from the lagoon by immersing the sample bottle into the lagoon neck first to a depth of 0.20 to 0.50 m if possible). The sampling container is filled with influent waste water and the sample bottle is raised neck first to prevent sample spillage.

The Licensee shall advise an inspector at least ten (ten) days prior to initiating any decant of the Sewage Lagoon.

The Licensee shall sample at Monitoring Program Stations CAP-3 through CAP-5 inclusive, one week prior to the proposed discharge (decanting) date, once at the beginning of discharge and weekly thereafter until cessation of discharge. Samples shall be analyzed for the parameters listed in item 2 of Part H: Water Licence # NWB-CAP 0810.

2.3 Sample Handling

All water samples are to be collected in laboratory-supplied containers with the proper preservative where applicable. All sample containers are to be tightly sealed and properly labeled 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 zip lock 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 odors, 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, CGS recommends the use of trip blanks if and where applicable.

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

3.0 **Laboratory Analyses**

3.1 **Laboratory Accreditation**

As indicated in the Guidelines, the GN-ED&T 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 NWB –CAP 0810. Appendix B includes a copy of the laboratory's CALA accreditation certificate.

3.2 **Method Detection Limits**

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

4.0 **Reporting Requirements**

4.1 **General Submissions**

As a condition of NWB Licence # 3BM- CAP-0810, the Hamlet of Cape Dorset is required to submit an Annual Report to the NWB, no later than March 31st of the year following the calendar year reported which shall contain the information of item 1 of Part B of the Water Licence.
The Annual Lab results are attached with the Annual Report.

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.

exp Services Inc. (2013); QA/QC Plan for Cape Dorset, Kimmirut and Hall Beach

Appendices:

Appendix-A: Site Plan

Appendix-B: Environmental Monitoring Program Checklist, Summary of Sample Bottles requirements and Subcontract Laboratory Accreditation

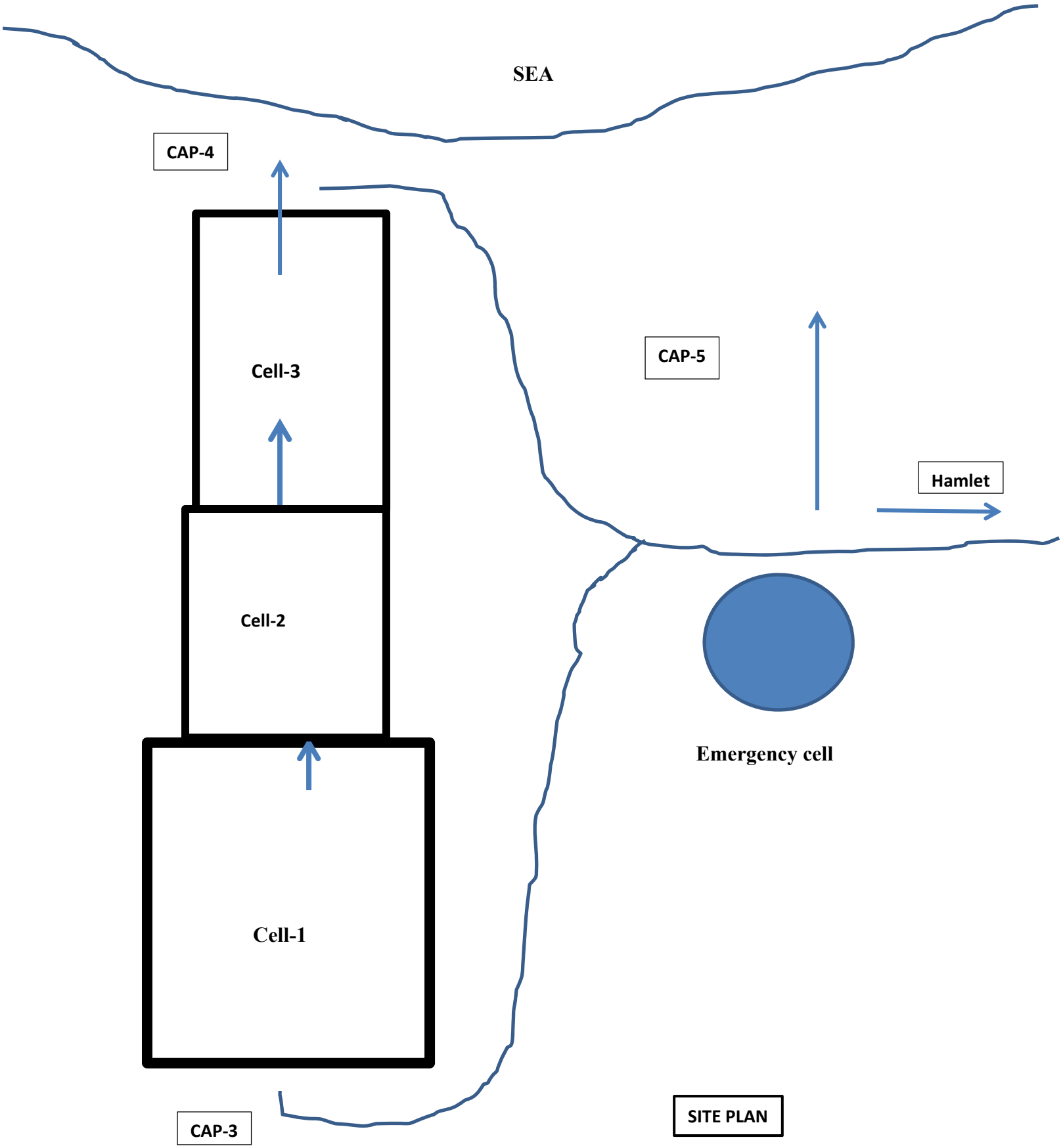
Appendix-C: Chain of Custody Form

Appendix-D: Guidelines for Sampling Program

Appendix-E: Lab Support Letter

APPENDIX- A

SITE PLAN


SEA
CAP-4
Cell-3
CAP-5
Hamlet
Cell-2
Emergency cell
Cell-1
CAP-3
SITE PLAN

APPENDIX-B

ENVIRONMENTAL MONITORING PROGRAM,

SAMPLE BOTTLE REQUIREMENTS

AND

LABORATORY ACCREDITATION

Hamlet of Cape Dorset Environment Monitoring Program, WL 3BM-CAP 0810

(QA/QC Plan)

Bottle Order	At least two weeks before upcoming environmental sampling, send a request to the contract laboratory for the appropriate sample sets (bottles) for the required sampling test groups (see conditions 2 of Part H of Nunavut Water Board Licence #NWB3YRB0308).	
Personal Procedure 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 bottles shipment has arrived from the laboratory in time for the sampling program and verify the integrity of all sampling containers. Report any missing bottles or broken bottles to the lab as soon as possible so that the replacement bottles may be shipped.	
Sampling Location Inspections	Perform an initial inspection of all the monitoring sampling program stations before the commencement of the monitoring program. Make sure 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 nitrite gloves should be worn during sampling and should be replaced with fresh gloves after all sampling containers are filled at each 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 refrain from smoking during sampling.	
Sample Care(including packing of Cooler)	All the sample containers should be tightly sealed and properly labeled with 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 Zip lock bag. Keep the last page of the chain of Custody and retain in the Hamlet garage for their records.	
	Sewage Disposal Facility	
Sampling Station CAP-3	This station was installed at truck sewage disposal station of Sewage Lagoon cell -1. Sampling will be conducted as specified in the Hamlet Water Licence # 3BM-CAP0810 to assess the raw sewage quality. The Licensee shall measure and record in cubic meters the monthly and annual quantities of sewage discharged at Monitoring Program Station CAP-3 for all purposes	
Sampling Station CAP-4	Effluent discharge will be collected at the sampling station CAP-4 following the direction of the Hamlet of Cape Dorset Water Licence # 3BM-CAP 0810 to assess the effluent quality.	
Sampling Station CAP-5	Effluent discharge is collected from the station CAP-5 of the Emergency Sewage Disposal Facility as specified in the Hamlet of Cape Dorset Water Licence # 3MB-CAP 0810.	

Name: **Signature:** **Date:**

Laboratory Accreditation & Supporting Documentation

CALA Directory of Laboratories

Canadian Association for

Laboratory Accreditation Inc.

Membership Number: 2644

Laboratory Name: **Caduceon Environmental Laboratories {Ottawa)**
Parentinstitution: 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

Note:

1. The Licensee shall sample monthly at Monitoring Station YRB-3 during the months of May to August, inclusive and analyze samples for the following parameters as indicated in the Water Licence.

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

2. The Licensee shall conform to the Quality Assurance and Quality Control (QA/QC) Plan attached.

APPENDIX-C

A CHAIN OF CUSTODY FORM

Hamlet of Cape Dorset Environment Monitoring Program, WL 3BM-CAP 0810

(QA/QC Plan)

CADUCEON ENVIRONMENTAL LABORATORIES — Client committed. Quality assured.

TESTING REQUIREMENTS

- ☐ O.Reg 153 — Table _____
- ☐ Surface Soil — ☐ Sub Surface Soil
- ☐ Yes ☐ No — Record of Site Condition
- ☐ Provincial Water Quality Objectives
- ☐ Sewer Use By-Law: _____

REPORT NUMBER (Lab Use)

Indicate Laboratory Samples are submitted to: Kingston ☐ Ottawa Ric☐ond Hill Windsor

Organization:	Address and Invoicing Address (if different)	
Contact:		
Tel:		
Fax:	Quote No.:	Project Name:
Email:	P.O. No.:	Additional Info:

LYSES REQUESTED (Print Test in B

Suspected Highly Contaminated

TURNAROUND SERVICE REQUESTED (see back page)

- ☐ Platinum — 200% Surcharge**
- ☐ Gold — 100% Surcharge
- ☐ Silver — 50% Surcharge
- ☐ Bronze — 25% Surcharge
- ☐ Standard — 5-7 days
- ■ Specific Date: _____

Are any samples to be submitted intended for Human Consumption under any Drinking Water Regulations? (If yes, submit all drinking water samples on a drinking water Chain of Custo

* 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 Oil = Oil

Lab No:	Sample Identification	S.P.L.	Sample Matrix *	Date Collected (yy-mm-dd)	Time Collected	Indicate Test For Each Sample ing A Check Mark In The Box Pro	✓	Field pH	Field Temp.	# Bottles/ Sample	Field Filtered(Y/N)
1											
2											
3											

SAMPLE SUBMISSION INFORMATION

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

SHIPPING INFORMATION

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

SAMPLE RECEIVING INFORMATION (LABORATORY USE ONLY)

Signature:

Time Received:

Laboratory Prepared Bo ☐ Yes ☐ No

Labeled by:

Laboratory Locations/Shipping Addresses

ston Lab - 285 Dalton Ave., Kingston, ON K7K 6Z1, Tel: (613) 544-2001 Fax: (613) 544-2770 Email: contactkingston@caduceonlabs
ttawa Lab - 2378 Holly Lane, Ottawa, ON K1V 7P1, Tel: (613) 526-0123 Fax: (613) 526-1244 Email: contactottawa@caduceonlabs.co
Hill Lab - #14-110 West Beaver Creek Rd., ON L4B 1J9, Tel: (289) 475-5442 Fax: (866) 562-1963 Email: contactrichmondhill@caduce
r Lab - #5-3201 Marentette Ave., Windsor, ON N8X 4G3, Tel: (519) 966-9541 Fax: (519) 966-9567 Email: contactwindsor@caduceonla

APPENDIX-D

Guide Lines for Water and Wastewater Sampling

Drinking water:

Monthly Sampling: (Bacteria analysis)

1. Collect five samples (**200 ml each**) from five different locations and send to Iqaluit Health Lab though your local health center. One of the five samples should be raw water sample.
   Once in a month for Resolute Bay. These samples are tested in Iqaluit GN-DOE Lab.

Annual Sampling: (Microbiological and Chemical Analysis)

2. Send samples to Caducean Environmental Lab, Ottawa, Ontario.
   Caducean Environmental Lab
   Gord Murphy/Rebecca Marshall, Lab Supervisor
   2378 Holly Lane
   Ottawa, ON, K1V 7V1
   Ph-613-526-0123
   Fax-613-526-1244

Precautions of Sampling:

1. Be careful not to let the mouth of the bottle or lid touch anything including sampler's fingers.
2. Do not overfill the bottle or rinse out
3. Fill the bottle to the 200ml line from water tap, valve or water truck delivery hose nozzle. When sampling from a water tap, remove screen, aerator or other attachment from tap and allow the cold water to run for 2-3 minutes before collecting. Do not dip into the filled water truck tank to take a sample.
4. Ensure each bottle label information is filled for:
   - Date and time sample was taken
   - Sample point location
   - Sampler's name
5. Persons' name and contact address where to send sample Test results and invoice.
6. Samples must arrive at the Labs either Iqaluit or Ottawa within 24 hrs. from the time of sampling.

Wastewater:

1. Collect monthly samples from May to August from the Monitoring Station YRB-3.
2. Collect monthly samples from May to August from the Monitoring Station YRB-1.
3. Collect monthly raw samples from May to August from the truck discharge station YRB-2.

Sample bottles specifications for Wastewater

All the wastewater samples will be sent to Caduceon Lab, Ottawa, ON.

Waste Water - 8 bottles per sample / Cooler.
2 Pet 500 ml
1 O& G 1000 ml
1Metals red Cap 125 ml
1 TKN/TP Yellow 125 ml
1 Phenol Glass 125 ml
1 300 ml Bacteria
2 TOC 40 ml x 2

Raw or Treated Drinking Water 7 Bottles per sample/Cooler
1 L amber 1000 ml for surfactants
1Metals red Cap 125 ml
1 Phenol Glass 125 ml
1 GWC clear 500 ml
2 x 250 ml TSS Raw and Treated
1 Green cap CN 125 ml

Precautions of sampling:

1. Use hand gloves
2. Ensure each bottle level information is filled:
1. Date and time sample taken
2. Location with GPS coordinates
3. Sampler's name
4. Person's name and contact information where to send sample Test Results and invoice.

5. Samples must be arrived Ottawa Lab within 24 hours from the time of sampling.

APPENDIX-E

LAB SUPPORT LETTER

C A D U C E O N™
ENVIRONMENTAL LABORATORIES
Client *committed. Quality assured.*

April 7, 2016

Bhabesh Roy
Government of Nunavut
PO BOX 379
Pond Inlet, NU
XOA OSO

Dear Bhabesh Roy,

Caduceon Environmental Laboratories looks forward to aiding Hamlet of Resolute Bay in their environmental analysis. The Caduceon staff has reviewed the PDF document entitled *" QA/QC for the Wastewater Treatment Facility of Resolute Bay"* that was provided to our Ottawa Laboratory.

Our staff has read and understands the requirements found within this document and see no issues with providing you quality service and analysis. In addition, it has been noted that it is necessary all testing be completed under GALA accreditation. Caduceon Environmental Laboratories are accredited for all of the parameters listed within the document.

I believe you have already been provided with our GALA Scopes of Accreditation for your records. Should you require any further information please call either Gord Murphy (Lab Supervisor) or myself (Greg Clarkin, Lab Manager) at the Ottawa office and we will be more than happy to help you out.

Again, thanks for the opportunity to work with the Hamlet of Resolute Bay.

Regards,

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

cc: Gord Murphy, Lab Supervisor
Damien Gilbert, CEO