QA/QC of Water Supply to the Hamlet of Arctic Bay in Baffin Region

The population of the Hamlet of Arctic Bay in 2010 is 916 and annual water consumption is 21,000 cubic meters. The source is the natural lake. Water is extracted to the Treatment Plant through an intake pipe. The intake line is heat traced with electric heating cables and for the case of the intake, the heating cable placed inside the pipe.

The plant was originally operated by a Generator. Now it is hooked up with Power line and the Generator is kept there as a standby emergency power supply.

Water is disinfected inside the Treatment plant with chlorine following the guidelines given to them by the Department of Health and Social Services of Government of Nunavut. Hamlet is responsible to supply safe drinking water to the community. The regular water quality is monitored by the hamlet and QA/QC is followed along with the Department of Health and Social Services.

Hamlet tests Chlorine residual contents in the water of each water truck before delivery to satisfy the National Drinking Water Guidelines. Five samples are collected from five different locations. Sample must be kept cold but not frozen and sent via the local health centre lab box to Iqlauit Environmental Health office lab . Hamlet follows the guidelines given to them by the Department of Health and Social Services for sampling, preservation, and shipping.

The Environmental health officers also sample at least twice annually from the field and ship the samples with them to the lab.

The Lab conducts testing on the microbiological parameters and finds the quality of water is always in good standing order.

The QA/QC plan and Procedure of the lab, sampling etc along with the hamlet is attached.

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Environmental Health

Guidelines for Drinking Water Delivery

An adequate supply of **safe** drinking water is important to ensure the good health and well-being of your community.

The following are guidelines for the safe delivery of drinking water:

1. A water delivery truck for the bulk delivery of drinking water must not be used for any other purpose, except with the prior written approval of a health officer.
2. All equipment on a water delivery truck which is in contact with drinking water, including but not limited to hoses, valves, couplers, fittings, nozzles and pumps, shall be constructed of materials that are suitable (e.g., corrosive resistant) for drinking water use; and shall be maintained in a clean and sanitary condition.
3. When a water truck intended to deliver potable water is stored in a garage or similar structure, it and any related water delivery equipment shall be kept in an area separated from any source of contamination, including any sewage transporting equipment.
4. When the water delivery truck is not in use, being cleaned, or drained dry;
   a) delivery hoses should be capped at both ends or as otherwise recommended by the hose manufacturer, and
   b) delivery hoses and related couplers fittings and nozzles shall be placed in the hose compartment.
5. Immediately prior to the first delivery of each day, the delivery hose nozzle and/or coupler shall be disinfected by spraying with a solution of 15 millilitres of household bleach (5.25% sodium hypochlorite) per litre of water (2.4 ounces per Imp. gallon) using a spray bottle or other similar device.
6. Should the water delivery nozzle and/or coupler come into contact with the ground or any other source of contamination, it shall immediately be cleaned of debris and then disinfected by spraying with a solution of 15 ml of household bleach (5.25% sodium hypochlorite) per litre of water (2.4 oz per Imp. gallon) using a spray bottle or other device.
7. Drinking water shall not be retained in a water delivery truck longer than 24 hours after the time of loading, upon which time any remaining water in the tank shall be drained; and shall not be used for drinking water.
8. An air gap must be maintained between the fill pipe and the water tank at all times.
9. All drinking water shall be chlorinated and shall have a **free chlorine residual concentration** of no less than **0.4 milligrams per litre (mg/L) at the time of loading** into the water delivery truck and a free chlorine residual concentration of no less than **0.2 mg/L at the time of delivery.**
10. A chlorine test kit must be available for the purpose of measuring chlorine residuals. **A free residual concentration of 0.2 mg/L must be measured from the delivery hose nozzle** after a thorough mixing of the chlorine and water **and** 20 minutes of contact time after the mixing.
11. The potable water hauler shall be trained and tested in the accepted method(s) of adding chlorine and testing for chlorine residuals and be familiar with the material safety data sheets (MSDS).
12. There shall be **no dipping** into the filled water tank for the purposes of obtaining a water sample for testing purposes.
13. Accurate records shall be maintained of raw water quality, finished water quality, and amounts of chemicals used.
14. Water samples must be collected and submitted once per month for bacteriological testing (see **Water Sampling** sheet attached). The following samples are recommended:
   a) 1 raw water sample (untreated source water)
   b) 1 sample from each water truck delivery hose

Please refer to the *Public Water Supply Regulations* pursuant to the *Public Health Act* for additional information.

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Drinking Water Disinfection

If you are drinking **raw water** from a lake, stream, or river, you should disinfect the water to kill any disease causing bacteria.

There are two simple ways to kill the bacteria:

Boiling and Chlorination

1. **Boiling:** Water must be heated to a rolling boil for at least 1 minute. If there is a flat taste, pouring the water back and forth between two clean containers will put air back into the water and make it taste better.

2. **Chlorination:** Mix household chlorine bleach with water.
   - Make sure your container is clean
   - Clear water is the best to use

CONVERSIONS			
WATER		CHLORINE BLEACH	
4.5 litres (L)	1 gallons (U.K.)	0.25 mL	5 drops
22.5 L	5 gal	1.25 mL	25 drops
45 L	10 gal	3 mL	0.5 tsp.
450 L	100 gal	25 mL	5 tsp.
2250 L	500 gal	125 mL	0.5 cup
4500 L	1000 gal	250 mL	1 cup
5625 L	1250 gal	313 mL	1.25 cups
6750 L	1500 gal	375 mL	1.5 cups
7875 L	1750 gal	438 mL	1.75 cups
9000 L	2000 gal	500 mL	2 cups

How to mix:

1. Add the bleach to the container.
2. Add water and mix well.
3. Let it sit for at least 20 minutes to allow the chlorine to kill any harmful organisms.

Chlorine smell: A chlorine smell indicates that the disinfectant is working. Leaving the water in a refrigerator for a few hours will remove the smell.
Chlorine taste: If after 20-30 minutes the water has a definite chlorine taste, you may have added too much chlorine bleach. For cloudy water containing sediment, increase the above amounts of bleach by one half.

For more information on drinking water disinfection, Please contact an Environmental Health Officer at (867) 975-4800.

CHLORINE MIXING INSTRUCTIONS FOR CALCIUM HYPOCHLORITE 65 %

1. Put on rubber apron, rubber gloves, and face sheild.
2. Read manufacturer's safety data sheet for Calcium Hypochlorite.
3. Close valves on tanks.
4. Fill mix tank on work bench with (120) litres of water.
5. Add four (4) kilo-gram (bottles) of calcium hypochlorite 65% to water.
6. Mix solution for two (2) hours.
7. Fill feed tank by opening valve at bottom of mix tank.
8. Rinse mix tank and agitator with water.
9. Reintroduce clear one inche pipe from mix tank in feed tank.
10. Test first truck of day for adequate chlorination by using HATCH Colorimeter test kit. Let the sample sit for 20 minutes then test for FREE CHLORINE per the manual. The chlorine dosage should read between 0.5 and and 1.0 mg/litres before delivery.
11. Adjust the stroke and/or rate of the injection pump to either increase or decrease the chlorine dosage if required.Retest FREE CHLORINE after adjusting the stroke and/or rate.

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CLEANING AND DISINFECTING WATER STORAGE TANKS

Instructions:

1. Drain any water from the tank.
2. Close any drains and add 5 gallons of warm water to the tank.
3. Add 2 cups of liquid household bleach (i.e. javex) for disinfection.
4. Using a new or clean brush (mop or long handled brush is recommended), thoroughly clean the entire inside.
5. Drain the tank and flush the interior with fresh (treated) water. Ensure all dirt, etc. has been removed.
6. Refill tank with treated water for storage and use.

NOTE:

Tank cleaning and disinfection is recommended once per year or more often if necessary.

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SUPER-CHLORINATION PROCEDURES FOR WATER TRUCKS

To ensure safe drinking water, follow the procedures outlined below at least twice a year or as required:

1. If there is excessive rust present in the interior, please ensure that this rust is scraped out.
2. The interior should then be rinsed in order to remove particles of rust.
3. Fill tank with water and add 1 gallon of 5% chlorine bleach (Javex) per 1000 gallons of water.
4. If possible, drive the truck around town to allow for proper mixing and to ensure the surface area in the interior is superchlorinated.
5. Let this solution stand for 12-24 hours to ensure proper contact time for super-chlorination.
6. Drain truck completely and fill with drinking water.
7. Contact the Environmental Health Officer to submit a water sample for bacterial analysis.

NOTE:

Ensure that during the super-chlorination procedure the hose is also filled with chlorinated water for complete sanitation.

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TAKING CARE OF WATER STORAGE TANKS

Taking sanitary care of water storage tanks helps to protect your family's good health and safeguard the well-being of the entire community.

Important Things To Know In Caring For Water Storage Tanks:

1. People can become very sick from drinking water from a tank contaminated with bacteria, viruses, or parasites.

2. To prevent tanks from being contaminated:

   - Keep the tank clean both inside and out at all times.
   - Keep the lid of the tank on and tight at all times.
   - Use only the tap to obtain water.
   - Do not use a dipper or cup to scoop water from the tank. (Bacteria on the dipper can stay in the tank and grow there.)
   - Do not store things on top of the water tank.
   - CLEAN your water tank at least once a year or more often as required.

3. If you are not sure how to clean your tank properly, contact your Environmental Health Officer or local Community Health Representative for more information.

4. If your water tank is in poor condition, contact your Housing Association about obtaining a new one.

REMEMBER:

Odd tastes or smells from the water in your water tank may mean that it has been contaminated with bacteria. Don't take chances, have your tank cleaned out regularly.

To disinfect drinking water from a lake, river, stream, snow, or ice source, make sure you BOIL THE WATER FOR AT LEAST 1 MINUTE to kill any harmful bacteria, viruses, or parasites.

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Environmental Health

WATER SAMPLING

1. Samples must be submitted at least once per month. Please send a sample from each water truck, one from the water storage tank(if applicable), a raw water sample, and one from any public building (school, health center etc.)

2. When sampling, be careful not to let the mouth of the bottle or lid touch anything including the sampler's <u>fingers</u> as they are often contaminated with bacteria.

3. Fill the bottle to the 200 mL line from a 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** <u>dip</u> into the filled water truck tank to take a sample.

4. **Do not** <u>overfill</u> the bottle or <u>rinse it out</u> as it has been treated with sodium thiosulphate that will spill out with excess water. This chemical combines with your free chlorine – disabling it and preserving any bacteria present.

5. Ensure each attached sample form includes:
    a. Date and time sample was taken.
    b. Sample point location (e.g. Community X water truck # 3).
    c. Name of person who took the sample.
    d. Where to send sample results.

6. Sample <u>must be kept cold but not frozen</u> and may be sent via the health centre lab box if they can spare the space. You will have to discuss this possibility with the Nurse In Charge to obtain approval for this. Otherwise, it is the water plant operator's responsibility to ensure the samples are transported under refrigeration to:

    Environmental Health Department
    Health and Social Services, Baffin
    P.O. Box 1000, Station 1046
    Iqaluit, NU X0A 0H0

7. Samples **<u>must</u>** arrive at the Environmental Health Office within 24 hours of sampling otherwise the results may not be accurate. Please fax or phone notice to the Environmental Health Officer when you are sending samples.

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Environmental Health

WATER PROCESSING PROCEDURE

Weekly:

1. Clean all glassware with soap and warm water. Rinse well with warm water. Rinse again with distilled water
2. Dust the lamps and reflectors of the UV sterilizer. **Ensure that the power is off**.
3. Clean and Disinfect countertop.

Daily:

1. Fill in "Daily temperature logs" to ensure equipment is operating effectively.
2. Check lamps of UV sterilizer to ensure they are functioning. Fill in the "UV Sterilizer Log". Turn UV sterilizer on for 5 minutes at start of sampling.
3. Label plates to be incubated.
4. Lift plate lids with one hand and add **m-ColiBlue24 Broth** with the other hand. Shake broth **6 times** before adding it to the plate. Replace the lid.
5. Put filter holder bases in manifolds. With tweezers, place filter papers on the holders. Be careful not to touch filter papers with your fingers.
6. Place funnels on the bases and clamp securely.
7. Run a blank prior to first sample using **100ml** of distilled water.
8. Shake water samples **25-30 times** before adding **100ml** of water to funnel. Ensure manifold valves for funnels in use are open.
9. Start pump and run until funnels are empty. Shut off.
10. Remove clamps and funnels. Remove filter papers with tweezers and place into plate. Do not touch center of filter papers with fingers or tweezers and keep lid of plate closed until placing filter.
11. Place filter holder bases and funnels in UV sterilizer. Turn on for **2 minutes** before processing the next samples.
12. Place plates upside-down in incubator for **24 hours**. Ensure temperature of the incubator is **35^0C $\underline{+}$ 0.5 ^{0}C.** Fill in "Incubator Log "
13. Turn off UV sterilizer.
14. Fill in the number of samples processed on "Sample Tracking Log".
15. Read samples in **24 hours**.

Blue Colonies = E. coli
Red colonies = Total Coliforms

Monthly:

1. Unplug lamps of the UV sterilizer and clean the bulbs.
2. Clean and Disinfect the refrigerator.
3. Clean and Disinfect incubator.

chlorine

Drinking Water Chlorination Test Results

The chlorine pump is set at 90, fixed rate % is set at ____________

Reading has to be between 0.10 and 0.50 (idealy, it should be between 0.30 and 0.40)

Date	Name of Tester	Start Time of Testing	Truck #	Reading	% Adjusted to	New Reading	Finish Time of Testing

Community Water Sample Submission 2010

Community	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
Arctic Bay												
Cape Dorset												
Clyde River												
Grise Fiord												
Hall Beach												
Igloolik												
Iqaluit												
Kimmirut												
Pangnirtung												
Pond Inlet												
Qikiqtarjuaq												
Resolute Bay												
Iqaluit Pool												
Frob Hot Tub												
Cape Dorset Pool												
Pang Pool												

UV Sterilizer Log

November 2010

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
UV Lamps Replaced																															
UV Lamps Functioning																															
Corrective Action Taken																															
Cleaning Conducted																															
Initial																															

December 2010

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
UV Lamps Replaced																															
UV Lamps Functioning																															
Corrective Action Taken																															
Cleaning Conducted																															
Initial																															

Sample Tracking Log

January 2010

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Number of Water Samples Processed																															

Feb-10

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28			
Number of Water Samples Processed																															

March 2010

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Number of Water Samples Processed																															

April 2010

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
Number of Water Samples Processed																															

Daily Temperature Log - Refrigerator

January 2010

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Temperature above 4°C																															
Temperature = 0°C to 4°C																															
Temperature below 0°C																															
Corrective Action Taken																															
Cleaning Conducted																															
Initial																															

Notes:

February 2010

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28			
Temperature above 4°C																															
Temperature = 0°C to 4°C																															
Temperature below 0°C																															
Corrective Action Taken																															
Cleaning Conducted																															
Initial																															

Notes:

Daily Temperature Log - Incubator

January 2010

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Temperature above 35°C																															
Temperature = 35°C ± 0.5°C																															
Temperature below 35°C																															
Corrective Action Taken																															
Cleaning Conducted																															
Initial																															

Notes:

February 2010

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28			
Temperature above 35°C																															
Temperature = 35°C ± 0.5°C																															
Temperature below 35°C																															
Corrective Action Taken																															
Cleaning Conducted																															
Initial																															

Notes: