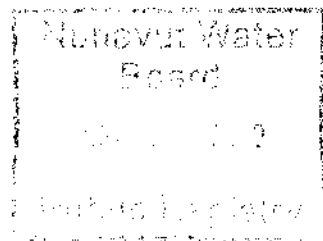


Hamlet of Gjoa Haven Water Licence Renewal Application

Submitted to the Nunavut Water Board

March 19, 2010



Hamlet of Gjoa Haven
Water Licence Renewal Application

09-2156-1900

Gary Strong - Project Manager

Submitted by
Dillon Consulting Limited
303 4920 – 47th Street
Yellowknife, NT X1A 2P1
Ph: (867) 920-4555
Fax: (867) 873-3328

TABLE OF CONTENTS

1	NAME AND MAILING ADDRESS OF APPLICANT.....	3
2	ADDRESS OF HEAD OFFICE IN CANADA IF INCORPORATED.....	3
3	LOCATION OF UNDERTAKING	3
4	DESCRIPTION OF UNDERTAKING	4
	4.1 WATER SUPPLY, TREATMENT AND DISTRIBUTION.....	4
	4.1.1 Raw Water Source, Quality and Pumps.....	4
	4.1.2 Water Treatment	5
	4.1.3 Water Storage and Distribution	5
	4.2 SEWAGE DISPOSAL.....	5
	4.2.1 Capacity of the Sewage Treatment Facility (m ³).....	6
	4.2.2 Sampling Results Taken from Sewage Treatment System.....	6
	4.3 SOLID WASTE DISPOSAL.....	8
	4.3.1 Water Quality Results of Leachate from Solid Waste Site.....	8
	4.3.2 Bulky Wastes	9
	4.3.3 Hazardous Waste Management	9
	4.3.4 Recycling Program	10
	4.3.5 Current Lifespan	10
5	TYPE OF UNDERTAKING	10
6	WATER USE.....	10
7	QUANTITY OF WATER INVOLVED	10
8	WASTE DEPOSITED	10
	8.1 WASTEWATER	10
	8.2 SOLID WASTE.....	11
9	OTHER PERSONS OR PROPERTIES AFFECTED	11
10	PREDICTED ENVIRONMENTAL IMPACTS AND PROPOSED MITIGATION.....	11
	10.1 POTENTIAL CUMULATIVE EFFECTS	11
	10.2 BUSINESS AND EMPLOYMENT OPPORTUNITIES	11
11	CONTRACTORS AND SUB-CONTRACTORS	13
12	STUDIES UNDERTAKEN TO DATE.....	13
13	PROPOSED TIME SCHEDULE	13
14	ADDITIONAL INFORMATION.....	13
15	REFERENCES	14

FIGURES

Figure 4-1. Effluent Quality Results Along Wetland (Based on Sampling Completed in August 2007, Source: Dillon Consulting Limited, 2008. "Gjoa Haven Waste Management Assessment")	7
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FIGURES (Appendix A)

Figure 1:	Location Plan of Existing Sewage Treatment Lagoons and Solid Waste Facility
Figure 2:	Site Plan of Existing Water Treatment Plant and Water Intake Locations

TABLES

Table 4.1: Summary of Sample Results Taken from Sewage Treatment System (SNP Monitoring Station GJO-4)	6
Table 7.1 - Projected Water Use Estimates for the Hamlet of Gjoa Haven	10

APPENDICES

APPENDIX A – Figures
APPENDIX B – Effluent Sampling Analyses Results from August 2009
APPENDIX C – Gjoa Haven Waste Management Assessment – Planning Report (Dillon Consulting Limited, 2008)

APPLICATION FOR LICENCE, AMENDMENT OF LICENCE, OR RENEWAL OF LICENCE

APPLICATION/LICENCE NO:
(amendment or renewal only)
NWB3GJO0409

1. NAME AND MAILING ADDRESS OF APPLICANT

2. ADDRESS OF HEAD OFFICE IN CANADA IF INCORPORATED

TELEPHONE:

N/A

Please refer to Section 1, page 3 of attached water licence application

TELEPHONE: _____ **FAX:** _____

3. LOCATION OF UNDERTAKING (describe and attach a map, indicating watercourses and location of any proposed waste deposits)

Latitude Longitude

Please refer to Section 3, page 3 of attached water licence application

See Appendix "A" for maps and locations

4. DESCRIPTION OF UNDERTAKING (describe and attach plans)

Water licence is required to (a) obtain water for consumption and (b) dispose of municipal sewage and solid waste.

Please refer to Section 4, page 4 of attached water licence application for more details

5. TYPE OF UNDERTAKING

3. Municipal

6. WATER USE

To obtain water

Other (describe) _____

7. QUANTITY OF WATER INVOLVED (litres per second, litres per day or cubic meters per year, including both quantity to be used and quantity to be returned to source)

Licence Number NWB3GJO0409 currently restricts withdrawal from Swan Lake and/or Water Lake to no more than for the term of the Water Licence NWB3GJO0409.

Please refer to Section 7, page 10 of attached water licence application for more details

8. WASTE DEPOSITED (quantity, quality, treatment and disposal)

Please refer to Section 8, page 10 of attached water licence application

9. OTHER PERSONS OR PROPERTIES AFFECTED BY THIS UNDERTAKING (give name, mailing address and location; attach list if necessary)

Please refer to Section 9, page 11 of attached water licence application

10. PREDICTED ENVIRONMENTAL IMPACTS OF UNDERTAKING AND PROPOSED MITIGATION

Please refer to Section 10, page 11 of attached water licence application

Hamlet of Gjoa Haven
Water Licence Renewal Application

11. CONTRACTOR AND SUB-CONTRACTORS (names, addresses and functions)

Please refer to Section 11, page 13 of attached water licence application for details

12. STUDIES UNDERTAKEN TO DATE (attach list if necessary)

Please refer to Section 12, page 13 of attached water licence application

13. PROPOSED TIME SCHEDULE

Please refer to Section 13, page 13 of Attached water licence application for details

Start date: ONGOING Completion date: Ongoing until renewal of Water Licence

<i>Donald LeBlanc</i>	<i>Senior Admin Officer</i>	<i>Donald LeBlanc</i>	<i>April 21/2010</i>
NAME (Print)	TITLE (Print)	SIGNATURE	DATE

FOR OFFICE USE ONLY

APPLICATION FEE Amount: N/A for Municipalities Receipt No.: _____

WATER USE DEPOSIT Amount: N/A for Municipalities Receipt No.: _____

1 NAME AND MAILING ADDRESS OF APPLICANT

Hamlet of Gjoa Haven
Box 200
Gjoa Haven, NU
X0B 1J0
(867) 360-7141 (telephone)
(867) 360-6309 (fax)

Contact:

Mr. Don LeBlanc
Senior Administrative Officer

2 ADDRESS OF HEAD OFFICE IN CANADA IF INCORPORATED

Same as above

3 LOCATION OF UNDERTAKING

Geographic Location:

Latitude: 68°37'26" N

Longitude: 95°50'15" W

Community Background

The Hamlet of Gjoa Haven is located at 68°37' N latitude and 95°50' W longitude (according to Google Earth Pro, 2007), on the southern tip of King William Island, Kitikmeot Region, Nunavut. Topography consists mostly of sands and gravels with a continuous permafrost zone. Low lying vegetation such as mosses and lichens are predominant with hardy grasses found in some areas. Year round access to the Hamlet is limited to air travel, however, during the summer months freight may be brought in by sealift.

4 DESCRIPTION OF UNDERTAKING

The Hamlet of Gjoa Haven is applying for Renewal of Water Licence # NWB3GJO0409, which expired on January 31, 2009, for providing water delivery, sewage collection/disposal and solid waste management services to community residents. Water is drawn from Swan Lake for drinking water, sewage is deposited into the lagoon located approximately 1.5 km east from the town site, and solid waste is deposited at the community waste disposal site, located adjacent to the sewage lagoon. Further details are provided in the following sections.

4.1 WATER SUPPLY, TREATMENT AND DISTRIBUTION

4.1.1 Raw Water Source, Quality and Pumps

Over several years, it has been noted that the quality of the water supply system has deteriorated. Between 2000 and 2002, the Government of Nunavut undertook studies to determine the best long-term water supply system for the community. The selected raw water source was determined to be Swan Lake located approximately 3.0 kilometres from the current water supply lake. To meet the requirements of the Fire Marshal with respect to Fire Flow and to meet the future community water demand, the GN planned to construct the following facilities (Dillon Consulting Limited, 2005):

- A water supply pipeline from Swan Lake to a new in-community water treatment and storage facility;
- An intake and pump station at Swan Lake;
- An in-town water treatment and pumphouse; and
- Upgrades to the access road to Swan Lake.

Water from the community is taken from Swan Lake and then transferred to a holding and storage tank located at the site of the old pumping station where it is treated with chlorine. The new building was completed in 2006 and was built to hold enough water for the community for 5 – 7 days.

The intake pumphouse is located at Swan Lake, the local raw water source, which is located approximately 3.4 km from the existing water treatment plant at Water Lake, on the edge of the Hamlet. The transmission main runs approximately 3.4km from the intake pumphouse to the water treatment plant at Water Lake.

4.1.2 Water Treatment

Water is treated with chlorine prior to distribution to community residents. A chlorination system is located in the pumping station.

There are 4 (four) major components in the water supply and treatment design for the community. Each system has several sub-systems. The four (4) major components are as follows;

- The Intake Pump House (IPH) and back-up truck fill station located at Swan Lake
- The water supply pipeline between Swan Lake and the in-town Water Treatment Plant (WTP)
- The WTP
- The Storage tanks located adjacent to the WTP

4.1.3 Water Storage and Distribution

The water storage tanks are:

- Located at the WTP.
- Tank size is 2 tanks each with a capacity of 203,000 litres.
- Tanks to have an inlet for incoming treated water and equalization pipe and valve between the tanks.
- Tanks to have an outlet for truckfill with pump & controls.
- Tanks to have an outlet to supply water for backwashing process.
- One tank to have an outlet with pump to supply water to the chlorine mixing area.
- Tanks to have an overflow that spill overflow water.

4.2 SEWAGE DISPOSAL

Currently sewage is collected from the community by a sewage truck and is then discharged into a single-cell sewage lagoon. The lagoon is located 1.5km from the community and has an approximate volume of 22,700m³. It is a circular shaped lagoon with a truck turnaround pad and decant structure.

Due to a section of the berm that had failed, a smaller secondary containment berm was constructed in 2008 to hold effluent that had leaked out of the lagoon. However, a section of the secondary containment berm has subsequently failed and effluent is seeping from the secondary cell into the surrounding environment.

A decant pipe was placed within the berm wall to allow for drainage of the effluent into the surrounding wetland. The lagoon relies on seepage through the berm wall as opposed to an annual decant event.

An un-engineered wetland is located immediately down stream of the lagoon, and provides treatment of the sewage. Ultimate discharge of the effluent is to the ocean approximately 1,200 m down stream of the lagoon.

4.2.1 Capacity of the Sewage Treatment Facility (m³)

The lagoon has an approximate volume of 22,700 m³.

4.2.2 Sampling Results Taken from Sewage Treatment System

The sewage treatment system at Gjoa Haven consists of an engineered lagoon cell and an un-engineered wetlands area. The following sample results, from samples taken in August 2009, show a sample of lagoon effluent that was taken from the small overflow pond (within the secondary containment berm) of the sewage lagoon. Based on these results fecal coliforms, BOD₅ and total suspended solids exceeded the water licence requirements during this time period. Please refer to Appendix B for the complete laboratory analysis report. The laboratory analysis report has results for SNP locations GJO-2 (solid waste leachate) and GJO-4 (sewage effluent). As well, the report has analysis results for FB (field blanks) and TB (travel blanks). These samples are taken to ensure that contamination of the samples does not occur due to travelling and field sampling methods or techniques.

Table 4.1: Summary of Sample Results Taken from Sewage Treatment System (SNP Monitoring Station GJO-4)

Parameter	Units	August 14, 2009	Licence Requirement
Fecal coliforms	CFU/100mL	1300	1000
pH	pH units	7.91	6 – 9
BOD ₅	mg/L	108	80
Total Suspended Solids	mg/L	181	100
Oil and Grease		NonVisual	No visible sheen

In August of 2007, samples were taken from five locations within the un-engineered wetlands area. Purpose of the sampling was to determine if the wetland was capable of treating sewage effluent flowing out of the lagoon due to the breach in the berm. The figure below represents the concentrations of fecal coliforms, BOD₅ and total suspended solids as effluent from the sewage lagoon flows through the wetland. Each dot on the graph represents a sampling location and each “x” represents the point where compliance for each parameter is achieved.

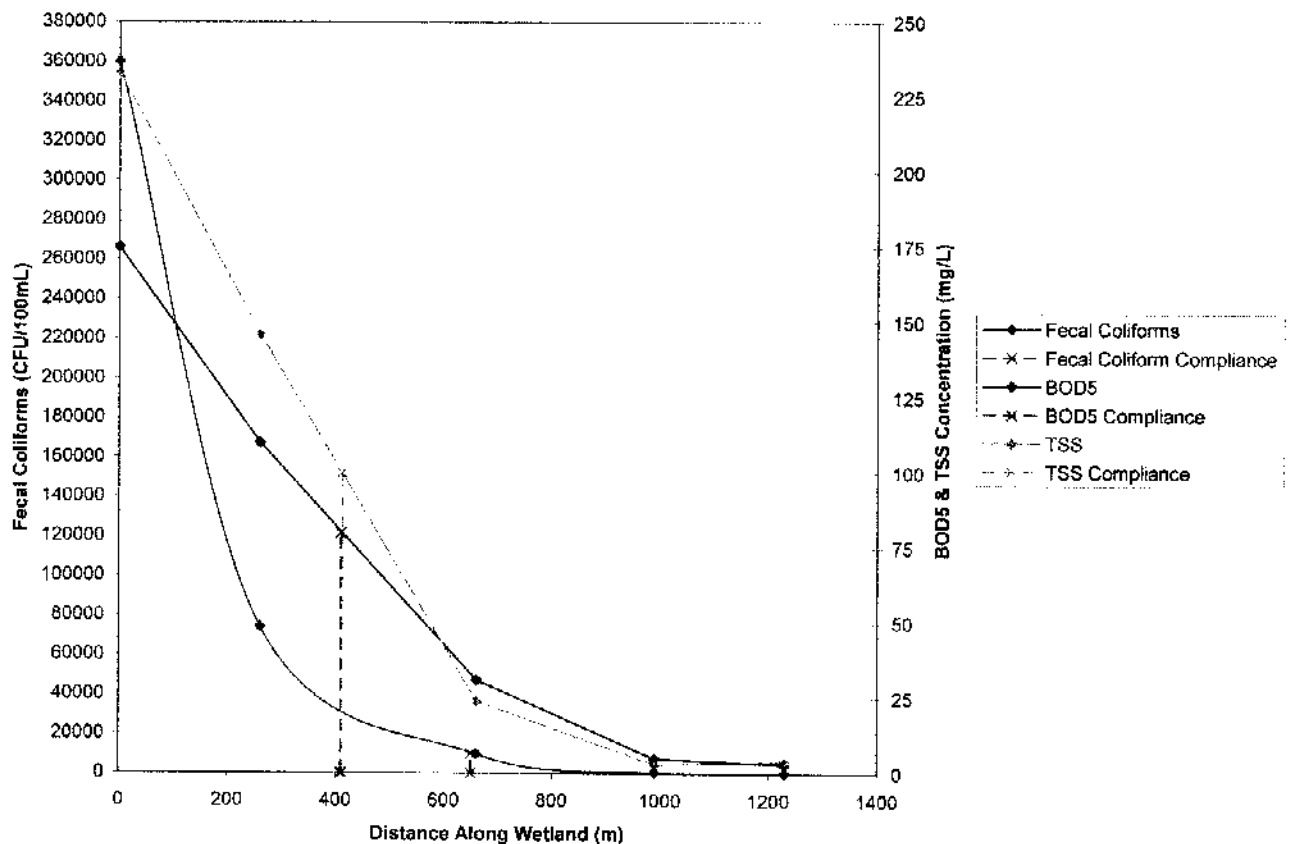


Figure 4-1. Effluent Quality Results Along Wetland (Based on Sampling Completed in August 2007, Source: Dillon Consulting Limited, 2008. "Gjoa Haven Waste Management Assessment")

As shown in the figure above, effluent concentrations of fecal coliforms, BOD₅ and total suspended solids dramatically decrease within the first 650m of the wetland. By the time the effluent reaches the discharge point to the ocean, concentrations of each of the three parameters are very low (fecal coliforms = 80 CFU/100mL, BOD₅ = 3 mg/L and total suspended solids = 4 mg/L).

Results concluded that at approximately 400m downstream of the lagoon breach, parameters BOD₅ and total suspended solids achieve the compliance points of 80 mg/L and 100 mg/L respectively as stated in the Hamlet's water licence. Fecal coliform compliance of 1×10^4 CFU/100mL was achieved at approximately 650m downstream of the lagoon breach. As the wetland is approximately 1,200m in length, there appears to be adequate space within the wetland to treat effluent to the compliance parameters stated in the Hamlet's water licence.

However, it must be noted that these samples were taken during late summer/early fall and therefore it is unknown what effect seasonal variations will have on the treatment efficacy of the wetland. Please refer

to Appendix C for a copy of the report "Gjoa Haven Waste Management Assessment" produced by Dillon Consulting Limited (2008) for further details.

4.3 SOLID WASTE DISPOSAL

The solid waste site is located 420 m down gradient from the lagoon. Please refer to Appendix A for a site map of the location.

There are no water bodies within the local vicinity of the solid waste disposal facility, except for the discharge drainage pattern from the sewage lagoon (un-engineered wetland). Leachate run-off from the solid waste site drains towards this drainage area and mixes with the lagoon effluent prior to draining towards the ocean. Some areas of ponding water have been noted in and around the solid waste site.

The solid waste site has two areas, one area is for general municipal waste and the second area is for bulky wastes. The general municipal waste area is fenced, but does not have a gate and so access to the site is not limited. Waste is piled and crushed within the fenced area. It is unknown whether the community burns the waste on a regular basis.

The second area is the metals dump area where items such as scrap vehicles, appliances, tires and other large items are disposed of. This area is located next to the municipal waste area and is not fenced. There is no segregation of items in this area.

4.3.1 Water Quality Results of Leachate from Solid Waste Site

The leachate samples were obtained from the wetland stream just downstream of the municipal waste and bulky waste site on August 14, 2009 (Appendix A, Figure 1). The Hamlet's water licence does not specify effluent quality standards for leachate from the solid waste facility. Therefore leachate sampling results were compared to the Canadian Environmental Quality Guidelines (CEQG) provided by the Canadian Council of Ministers of the Environment (CCME) in the table below.

As discussed in Section 4.2.2, sampling of the wetland was completed in August 2007. Leachate from the solid waste facility enters the wetland approximately half way (600 m downstream of the lagoon) between the lagoon and the ocean edge (Appendix A, Figure 1 – Sampling Site #1). As the compliance point was estimated to be 650 m downstream, leachate discharged into the wetland also appeared to receive treatment within the wetland. Unfortunately no samples were taken to analyse the metal parameters at each sampling point. Therefore, further sampling would be required to determine the amount of treatment that the wetland can provide with regards to removing metals from the effluent.

Table 4-2: Summary of Leachate Sampling Results (SNP Monitoring Station GJO-2)

Parameter	Units	Sample Results August 14, 2009	CEQG
BOD	mg/L	<2	
pH	pH units	7.67	7.0 - 8.7
Total Suspended Solids	mg/L	8	
Nitrate-Nitrite	mg/L	1.30	
Total Phenols	mg/L	<0.001	
Sodium	mg/L	45.1	
Magnesium	mg/L	33.3	
Total Arsenic	ug/L	2.2	12.5
Total Copper	ug/L	2.9	
Total Iron	ug/L	553	
Total Mercury	ug/L	<0.01	0.016
Total Zinc	ug/L	<5	
Fecal Coliforms	CFU/100ml	10	
Conductivity	uS/cm	614	
Ammonia as Nitrogen	mg/L	1.99	
Oil and Grease		NonVisual	
Sulphate	mg/L	19	
Potassium	mg/L	6.1	
Calcium	mg/L	43.1	
Total Cadmium	ug/L	<0.01	0.12
Total Chromium	ug/L	0.2	58/1.5 ¹
Total Lead	ug/L	0.2	
Total Nickel	ug/L	3.7	

¹ Trivalent chromium (Cr(III))/Hexavalent chromium (Cr(VI))

Based on results in the table above, no parameters have exceeded the Canadian Environmental Quality Guidelines.

4.3.2 Bulky Wastes

Bulky waste is stored outside of the fenced area immediately adjacent to the landfill.

4.3.3 Hazardous Waste Management

There is no hazardous waste management system in place. Most hazardous materials are stored in the metals dump area and are not segregated from other wastes within this area. There are no measures for appropriate storage and disposal of these items.

4.3.4 Recycling Program

Currently, the Hamlet does not operate a recycling program.

4.3.5 Current Lifespan

In order to determine the existing lifespan of the solid waste facility, a study must be completed. There are currently no plans to complete this type of study.

5 TYPE OF UNDERTAKING

3 – Municipal

6 WATER USE

To obtain water for use as potable water.

7 QUANTITY OF WATER INVOLVED

Information regarding the current quantity of water used by the Hamlet has been requested. To date, this information has not been made available. However, based on population estimates retrieved from the Nunavut Bureau of Statistics (Retrieved March 3, 2010), projected water use estimates have been developed. The table below reports the water use estimates from 2005 to 2030. The Hamlet's water licence states that the water withdrawal limit is 62,000m³ annually. Based on the projected water use estimates, the Hamlet will reach its annual withdrawal limit by 2025.

Table 7.1 - Projected Water Use Estimates for the Hamlet of Gjoa Haven

Year	Population	Water Use (m³/year)
2005	1,092	44,882
2010	1,109	48,172
2015	1,126	52,506
2020	1,143	56,950
2025	1,160	61,502
2030	1,177	66,164

8 WASTE DEPOSITED

8.1 WASTEWATER

Information regarding the current quantity of wastewater produced by the Hamlet has been requested. To date, this information has not been made available.

8.2 SOLID WASTE

Information regarding the current quantity of solid waste that is produced by the Hamlet has been requested. To date, this information has not been made available.

9 OTHER PERSONS OR PROPERTIES AFFECTED

Not Applicable

10 PREDICTED ENVIRONMENTAL IMPACTS AND PROPOSED MITIGATION

10.1 POTENTIAL CUMULATIVE EFFECTS

- **Waste Accumulation:** Wastes will continue to accumulate at the waste disposal site until measures have been taken to clean up and properly segregate the solid waste facility. Leachate will also continue to drain from the site into the surrounding environment as no measures to collect and treat run-off from the site have been implemented. Currently there are no plans to go ahead with a site remediation project.
- **Habitat Reduction:** Continued operation of the current water treatment facility and the waste disposal facility (sewage lagoon and solid waste site) will have little effect on natural habitat reduction. When the current sites reach capacity, new sites will need to be chosen, and the current sites will be reclaimed. Continual monitoring, responsible operation of the site and increased recycling efforts will lessen the need for site expansion.
- **Wildlife:** Animals are attracted to the waste disposal site due to the smell. In particular:
 - Bears
 - Rabbits
 - Wolves
 - Ravens
 - Fox
 - Other birds (summer nesting)

10.2 BUSINESS AND EMPLOYMENT OPPORTUNITIES

The operation of the both the water treatment facility and the waste disposal facility create jobs for community members. Positions such as the following are required:

- Maintenance Foreman
- Water Treatment Operator
- Works Foreman
- Truck drivers (water, sewage and solid waste)

These positions are currently held by community members. No new jobs will be created; however, there may be opportunities for community members to receive further training to help with their jobs. As an example, training to upgrade mathematical skills or training for a Small Systems Certification course. These types of educational opportunities provide benefits that extend beyond the immediate job situation and benefit others in the community as well.

Due to the small scale, non-industrial nature of the operation in Gjoa Haven, the water supply facility and waste disposal sites do not result in other potential social effects such as health effects. It is unlikely that there will be any effects on traditional land uses, though during seasons when residents are out on the land it means a less busy time for operators of the facilities mentioned.

Public consultation regarding potential changes to the water supply system or the waste disposal system may need to occur occasionally due to legislative requirements, Water Board Hearings (if requested) or due to community concern regarding a particular issue. If it takes place, this consultation may provide an opportunity for residents to voice opinions or concerns in a meaningful way and to interact with regulators or other agencies that may not always hear community feedback. This may also foster a sense of empowerment within the community.

Similarly, information such as Traditional Knowledge may be required to make decisions regarding changes to any of the water or waste facilities. If this were the case, the sharing of this knowledge would provide excellent, valuable insight into the decision-making process and would recognize the contribution of local community members while giving them a chance to be a part of a solution or change.

11 CONTRACTORS AND SUB-CONTRACTORS

Not Applicable.

12 STUDIES UNDERTAKEN TO DATE

As discussed in Section 4.2.2, a study was completed by Dillon Consulting Limited to determine the potential of using the un-engineered wetland system as part of the wastewater treatment system. Please refer to Appendix C for a copy of the report.

13 PROPOSED TIME SCHEDULE

The current lifespan of the water treatment plant is estimated to be 20 years (from date of commissioning, in 2005). As no studies have been completed on the sewage lagoon or solid waste facilities, it is difficult to determine the lifespan of both facilities.

14 ADDITIONAL INFORMATION

There is no additional information at this time.

15 REFERENCES

1. Dillon Consulting Limited, 2005. *Water Treatment Plant, Gjoa Haven, NU – Operation and Maintenance Manual*. Prepared for Community and Government Services, Government of Nunavut, Cambridge Bay, NU.
2. Dillon Consulting Limited, 2008. *Gjoa Haven Waste Management Assessment*. Prepared for Community and Government Services, Government of Nunavut, Cambridge Bay, NU.
3. Google Earth Professional. (2010). [Computer program].
4. Heinke, G.W., Smith D.W., Finch G.R., 1988. *Guidelines for the Planning, Design, Operation and Maintenance of Wastewater Lagoon Systems in the Northwest Territories, Vol. 1 and 2*. Prepared for the Department of Municipal and Community Affairs, Government of the NWT, Yellowknife, NWT.
5. Kent, R., Marshall, P., Hawke, L., 2003. *Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the Northwest Territories*. Prepared for the Department of Municipal and Community Affairs, Government of the NWT, Yellowknife, NWT.
6. Nunavut Water Board. "Hamlet of Gjoa Haven Water Licence, Licence Number: NWB3GJO0409", December 2003.
7. Nunavut Bureau of Statistics (2010). *Nunavut population estimates by region and community, 1996-2008 (2 tables)*. Retrieved March 3, 2010 from <http://www.gov.nu.ca/eia/stats/population.html>.