Nuna Burnside Engineering and Environmental Ltd.
Building 764, Fred Coman Street, Iqaluit NU XOA OHO
telephone (867) 975-2052 **fax** (867) 975-2053
15 Townline Orangeville ON L9W 3R4
telephone (519) 941-0342 **fax** (519) 941-8120
Email info@nunaburnside.com

NUNA BURNSIDE

December 23, 2008

Nunavut Water Board
P.O. Box 119
Gjoa Haven, Nunavut
XOE 1J0

Attention: **Ms. Phyllis Beaulieu**
Manager of Licensing

Re: **Hamlet of Arviat Water Licence NWB3ARV0308**
File No. N-O 15746

Dear Ms. Beaulieu,

The Hamlet of Arviat has retained Nuna Burnside Engineering and Environmental Ltd. (Nuna Burnside), to complete an application for the renewal of the Arviat Water Use and Waste Disposal Licence NWB3ARV0308 which expires December 31, 2008.

The application includes an update on all activities in the licence, including water supply intake, sewage collection and disposal and waste management and disposal. A summary of the activities has been provided in English. An Executive Summary in Inuktitut will be provided in the 2009. The Water License Application Supplementary Questionnaire for Municipalities is attached.

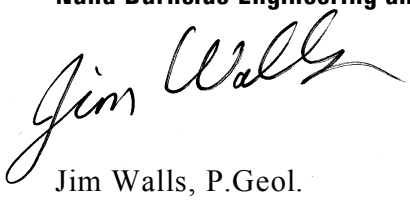
In addition to the application, we are in the process of preparing the following documents that will be submitted to the NWB upon completion:

- Hamlet of Arviat Annual Report for 2008
- Operations and Maintenance Plan for the Arviat Solid Waste Management Facility
- Operations and Maintenance Plan for the Arviat Sewage Treatment Facility
- Operations and Maintenance Plan for the Arviat Water Supply Facility
- An Environmental Emergency Contingency Plan for the Hamlet of Arviat
- An Environmental Monitoring Program and Quality Assurance/Quality Control Plan for Hamlet.

December 23, 2008

If you have any questions regarding the completion of these documents or the application feel free to contact me at 519-941-5331 ext. 272.
Yours truly,

Nuna Burnside Engineering and Environmental Ltd.



Jim Walls, P.Geol.

SC/JW:mm 081223_Beaulieu.doc 2008-12-23 1:26 PM

Attachments:

- Hamlet of Arviat Water Licence Application Form
- Executive Summary
- Hamlet of Arviat Water Licence Submission
- Hamlet of Arviat Water Licence Application Supplementary Questionnaire for Municipalities
- Cheque for application fee ($30).

Effective June 16, 2006

P.O. BOX 119
GJOA HAVEN, NU X0B 1J0
TEL: (867) 360-6338
FAX: (867) 360-6369

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NUNAVUT IMALIRIYIN KATIMAYINGI
NUNAVUT WATER BOARD
OFFICE DES EAUX DU NUNAVUT

WATER LICENCE
APPLICATION FORM

Application for: (check one)

☐ **New** ☒ **Renewal** ☐ **Amendment** ☐ **Assignment** ☐ **Cancellation**

LICENCE NO:
(for NWB use only)

1. NAME AND MAILING ADDRESS OF APPLICANT/LICENSEE

The Hamlet of Arviat
Arviat, Nunavut
X0C 0E0

Phone: (867) 857-2841
Fax: (867) 857-2519
e-mail: arviatsao@qiniq.com

2. ADDRESS OF CORPORATE OFFICE IN CANADA (if applicable)

N/A

Phone: _____
Fax: _____
e-mail: _____

3. LOCATION OF UNDERTAKING (describe and attach a topographical map, indicating the main components of the Undertaking)

Latitude: (61°6'30" N) Longitude: (94°3'31" W)
NTS Map Sheet No. 55 E/1 Scale: _____

4. DESCRIPTION OF UNDERTAKING (attach plans and drawings)

See attached additional information.

5. TYPE OF PRIMARY UNDERTAKING (A supplementary questionnaire **must** be submitted with the application for undertakings listed in **"bold"**)

☐ **Industrial**
☐ **Mining and Milling**(includes exploration/drilling)
☒ **Municipal** (includes camps/lodges)
☐ Power
☐ Agricultural
☐ **Conservation**
☐ Recreational
☐ **Miscellaneous** (describe below):

See Schedule II of *Northwest Territories Waters Regulations* for Description of Undertakings

6. WATER USE

- ☒ To obtain water
- ☐ To cross a watercourse
- ☐ To modify the bed or bank of a watercourse
- ☐ Flood control
- ☐ To divert a watercourse
- ☐ To alter the flow of , or store, water
- ☐ Other (describe):

7. QUANTITY OF WATER INVOLVED (cubic metres per day including both quantity to be used and quality to be returned to source)

Water use
- ☐ 100m^3/day or less
- ☒ Greater than 100m^3/day; if greater, indicate quantities to be used for each purpose (camp, drilling, etc.)

Water returned to source

_____ m^3/day

8. WASTE (for each type of waste describe: composition, quantity (cubic metres per day), methods of treatment and disposal, etc.)

- ☒ Sewage
- ☒ Solid Waste
- ☒ Hazardous
- ☒ Bulky Items/Scrap Metal
- ☐ Waste oil
- ☒ Greywater
- ☒ Sludges
- ☐ Other describe):

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

Land Use Permit

DIAND	☒ Yes	☐ No	If no, date expected _____
Regional Inuit Association	☒ Yes	☐ No	If no, date expected _____
Commissioner	☒ Yes	☐ No	If no, date expected _____

10. PREDICTED ENVIRONMENTAL IMPACTS OF UNDERTAKING AND PROPOSED MITIGATION MEASURES (direct, indirect, cumulative impacts, etc.)

see attached additional information.

NIRB Screening ☒ Yes ☐ No If no, date expected

11. INUIT WATER RIGHTS

Will the project or activity substantially affect the quality, quantity, or flow of water flowing through Inuit Owned Lands and the rights of Inuit under Article 20 of the Nunavut Land Claims Agreement?
No

If yes, has the applicant entered into an agreement with the Designated Inuit organization to pay compensation for any loss or damage that may be caused by the alteration. If no compensation agreement has been made, how will compensation be determined?

12. CONTRACTORS AND SUB-CONTRACTORS (name, address and functions)
None

13. STUDIES UNDERTAKEN TO DATE (list and attach copies of studies, reports, research, etc.)
See attached additional information.

14. THE FOLLOWING DOCUMENTS MUST BE INCLUDED WITH THE APPLICATION FOR THE REGULATORY PROCESS TO BEGIN

Supplementary Questionnaire (where applicable: see section 5) ☒ Yes ☐ No If no, date expected _____

Inuktitut and/or Inuinnaqtun/English Summary of Project ☒ Yes ☒ No If no, date expected January 2009

Application fee of $30.00 (Payee Receiver General for Canada) ☒ Yes ☐ No If no, date expected _____

Water Use fee of $30.00 (unless otherwise indicated in Section 9 of the *NWT Waters Regulations;* Payee Receiver General for Canada)
☐ Yes ☐ No If no, date expected _____

15. PROPOSED TIME SCHEDULE (unless otherwise indicated, the NWB will consider the application for a five (5) year term)
☐ one year or less (or) ☒ Multi Year

Start Date: 2009 Completion Date: 2014

Elwood Johnston	**Interim Senior Administrative Officer**		
Name (Print)	**Title (Print)**	**Signature**	**Date**

For Nunavut Water Board office use only

APPLICATION FEE **Amount: $_____** **Pay ID No.: _____**

WATER USE DEPOSIT **Amount: $_____** **Pay ID No.: _____**

Nunavut Water Board
P.O. Box 119
Gjoa Haven, Nunavut
X0E 1J0

Re: Water License Application for the Hamlet of Arviat

1. Name and Mailing Address of Applicant/Licensee

This application is being submitted on behalf of the Hamlet of Arviat, P.O. Box 150, Arviat, Nunavut, X0C 0E0 Telephone: (867)-857-2841 Fax: (867) 857-2519, Contact: Mr. Elwood Johnston, Interim SAO.

2. Address if Head Office in Canada if Incorporated

N/A.

3. Location of Undertaking

Arviat is located at (61°06'N, 94°03'W) on the western coastline of Hudson Bay, 225 km south of Rankin Inlet and 265 km north of Churchill, Manitoba (Figure 1). The community is situated on the northern shore of a peninsula that extends easterly into Hudson Bay.

The topography surrounding the Hamlet of Arviat is relatively flat with a sight rise when moving inland away from Hudson Bay. Local bedrock is generally overlain by glacial fluvial sediments. Arviat is located in the physiographic region of the Hudson Bay lowlands, characterized by low topographic relief, occasional bedrock outcrops and glacial and glacio-fluvial overburden sediments. Boulder fields and eskers are common. Approximately 20 to 30 percent of the land is shallow ponds with depths of 1 m or less. Land between the ponds is marshy, vegetated by grasses and sedges.

The closest climate station to Arviat is the Rankin Inlet Airport Weather Station. The Rankin Inlet area receives an average of 18.1 cm of rainfall and 107 cm of snowfall per annum. Mean annual precipitation totals 29.7 cm per annum. July mean high and low temperatures are 14.9^{o}C and 5.9^{o}C, respectively. January mean high and low temperatures are -28.3^{o}C and -35.5^{o}C, respectively. Winds are generally north-west, and average 23 km/h (Rankin Inlet Weather Station, Climate Normals 1991-2000, Environment Canada, 2008). Climate data is included in Appendix A.

4. Description of Undertaking

This application is for the renewal of a Nunavut Water Board License, NWB3ARV0308 that includes all municipal water intake, sewage disposal and waste disposal activities for the Hamlet of Arviat. The facilities that operate under the License include the Wolf River water intake pump house, water storage reservoirs and truck-fill station, sewage lagoon and solid waste management facilities (Figure 2).

Water Use

The Hamlet of Arviat currently receives water from the Wolf River water supply located 8.0 km southwest of the Hamlet. The interpreted drainage basin of Wolf River is shown in Figure 3. A pump house located beside Wolf River pumps from the river by an intake line located in a pool, approximately 4 metres deep (IEG, 2005) (Figure 4).

Water is pumped seasonally from the creek to two reservoirs located 1.5 km from the community (Figure 5). A 400 metre setback area around the reservoirs is identified in the Arviat Land Use Plan as protective development. The reservoirs are lined with an impermeable membrane. Cell one has a storage capacity of 87,000 m^3 and Cell two is 56,000 m^3 with a total storage of 145,000 m^3. Water is pumped to the reservoirs once a year, usually in August and takes between 27-30 days. Fluoride is added to the reservoirs just before they are full. During the winter time pumping from the reservoirs alternates monthly.

The truck fill station is located beside the reservoirs. Water delivery trucks deliver water to the community. When the trucks are filling, chlorine is injected into the water for disinfection.

Water requirements in 2006 were reported as 70,197 m^3. Utilizing the water demand formula developed by the Department of Municipal and Community Affairs (Government of the Northwest Territories), demand requirements for 2014 was calculated as approximately 83,700 m^3.

Sewage Treatment

Sewage collection is provided by the Hamlet. Each building has a sewage holding tank that is pumped out by the Hamlet's sewage pump out truck daily. Pump out sewage is treated at the community sewage treatment facility located approximately 2.8 km southeast of the Hamlet (Figure 6). The sewage treatment system consists of one sewage lagoon and a wetland treatment area.

There are three sewage lagoons in the Hamlet. The newest lagoon located closest to the ocean was commissioned in 2002. The two older lagoons are no longer in use.

The lagoon is decanted seasonally in June and September for 3 to 4 week periods. The sewage moves through the wetland treatment area towards Hudson Bay approximately 100 m from the lagoons' discharge point. The lagoon also seeps discharge at a slow continuous rate through the berm and into the wetland treatment area. The wetland wastewater treatment system utilizes complex physical and biological processes to treat the wastewater. A combination of sedimentation, absorption of pollutants in the surface soils, nutrient uptake by plants and oxidation of compounds by microorganisms are some of the processes that effect the treatment.

There are approximately 100 metres of Wetland Treatment Area between the current sewage lagoon and the ocean. Figure 6 illustrates the location of the lagoon and the surrounding drainage patterns.

Solid Waste

The Hamlet's solid waste disposal site is located adjacent to the sewage lagoons, approximately 2.8 km southeast of the community (Figure 7). Waste is segregated, with a generic landfill area and a bulky metal waste area. The Hamlet does not conduct burning. The total footprint of the landfill is 35,000 m^2 and the average depth of waste is 2 m.

The current landfill is approaching its useful life. In September 2008, Nuna Burnside was retained by the Hamlet to evaluate potential locations for a new municipal solid waste disposal site. A new location for the landfill site was selected by Nuna Burnside in October 2008 and approved by the Hamlet Council. The construction of the landfill is planned for the 2009.

The new site is located approximately 7 km northwest of the community (Figure 8). The proposed new landfill will consist of a general fill area, landfarm area and hazardous waste storage area. Nuna Burnside will be preparing a schematic design of the landfill in 2009. This will be submitted to the NWB when completed.

5. Type of Undertaking

The undertakings included in this application are classified as Municipal Undertakings.

6. Water Use

The water use in this license is to obtain water for the use by the Hamlet, as their primary water supply.

7. Quantity of Water Involved

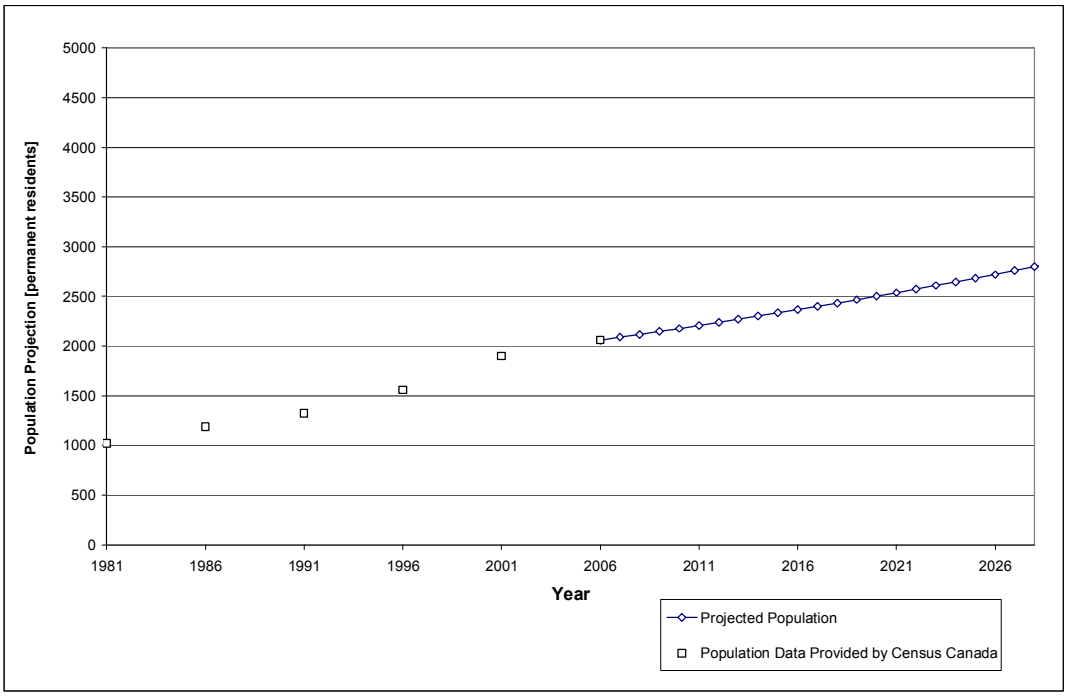
Using population numbers from Census Reports between the years 1981 and 2006 and average provincial growth rate projections from Statistics Canada (Statistics Canada, 2000), a growth rate of 1.4 percent was determined. Table 1 and Figure A show the projected population of the Hamlet for the next 10 years. Detailed calculations are shown in Appendix B.

Table 1: Population Projections

Year	Projected Population
2006	2060
2007	2089
2008	2119
2009	2149
2010	2180
2011	2211
2012	2242
2013	2274
2014	2306
2015	2339
2016	2372
2017	2406
2018	2440
2019	2475
2020	2510
2021	2546
2022	2582

Year	Projected Population
2023	2619
2024	2656
2025	2694
2026	2732
2027	2771
2028	2810
2029	2850

Figure A: Population Projections, Arviat Nunavut



The Municipal and Community Affairs (MACA) planning guidelines suggest that the increase in the projected per capita water use in a community of less than 2000 people should calculated using the following formulae. Although Arviat has a population greater than 2000, they are still on a truck distribution system and therefore this formula has been used.

RWU x (1.0 + (0.00023 x Population)

The RWU is the residential water use rate per capita. In the MACA guidelines it is assumed to be 90 L per capita. To fit the recorded water usage rates for the Hamlet, the RWU residential water use was modified to be 65 L per capita (Lpcd). This is a lower RWU than most communities however it has been confirmed that Arviat has a lower water use rate per capita than other communities. The same RWU was used in "Potable Water Supply Study" completed by IEG in 2005. The factor 0.00023 x population represents commercial and industrial water use.

This equation was used to produce projected water use requirements for the next 10 years (Table 2 and Figure B). Calculations are included in Appendix B.

Figure B: Water Use Projections, Arviat Nunavut

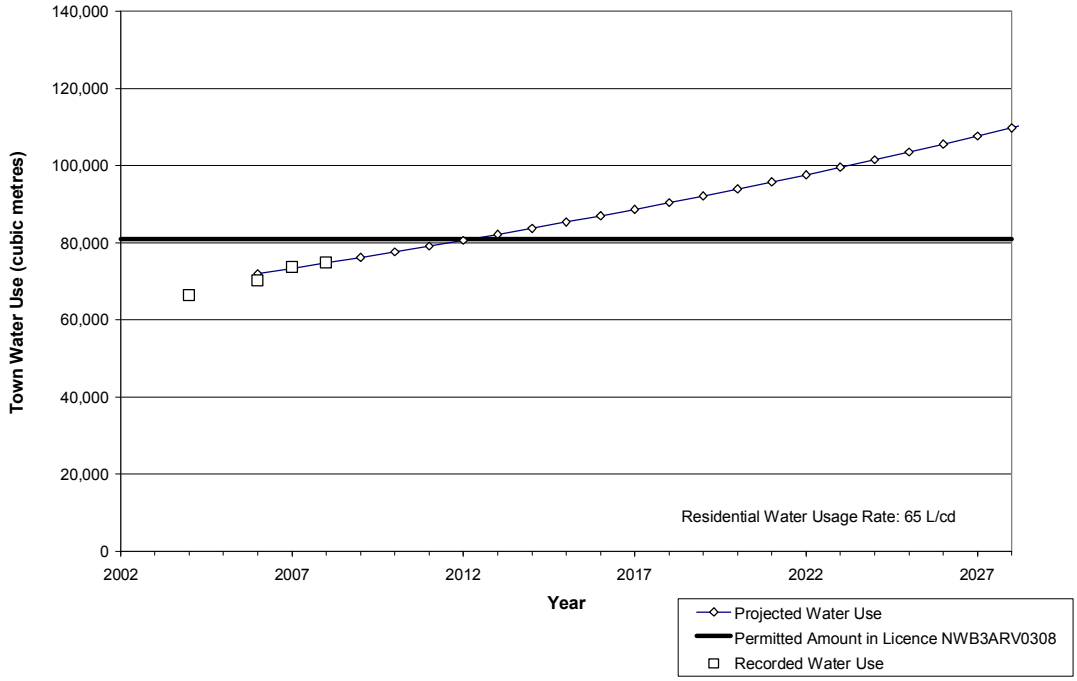


Table 2 indicates that in 2008 the annual consumption should be 74,775 m^3. The actual measured water consumption used in 2008 is 74,900 m^3. In 10 years the annual volume of water consumption for the community will be 90,376 m^3. The current license states that the allowable water use for the community is 81,000 m^3 per year. An allowable water use of 91,000 m^3 per year should provide enough water for the community for the next ten years.

Table 2: Projected Water Use Requirements

Year	Projected Population	Projected Daily Consumption m^3	Projected Annual Consumption m^3
2006	2060	197	72,030
2007	2089	201	73,374
2008	2119	205	74,775
2009	2149	209	76,185
2010	2180	213	77,653
2011	2211	217	79,131
2012	2242	221	80,620
2013	2274	225	82,168
2014	2306	229	83,727
2015	2339	234	85,346
2016	2372	238	86,977

Year	Projected Population	Projected Daily Consumption m^3	Projected Annual Consumption m^3
2017	2406	243	88,671
2018	2440	248	90,376

8. Waste

Sewage

The volume of sewage roughly corresponds to the annual water use of the Hamlet. The estimated volume of waste water for 2008 is 74,775 m^3. In 2018, the annual volume of sewage generated by the Hamlet of Arviat will be 90,376 m^3 (Appendix B).

Greywater

Greywater is collected with the liquid sewage and deposited in the sewage lagoon.

Sludges

Sludges generated from wastewater sink to the bottom of the sewage lagoon. The sludge has not interfered with the efficiency of the lagoon and has not been removed from the lagoon since commissioning of the lagoon in 2002. If the accumulated sludge interferes with the sewage treatment process the Hamlet may need to remove sludge from lagoon and transport it to an approved facility.

Solid Waste

Solid waste projections for the Hamlet are provided in Appendix B. The table is based on the Census 2006 population of 2,060 and a growth rate of 1.4 percent. The table assumes that 20 percent of the waste is combustible and the volume of waste is decrease by 30% after compaction. A new landfill is being built in 2009. The capacity of the new landfill will be designed for a 20 year period.

Bulky Metals

Bulky metals are separated from the solid waste and stored at the Metal Waste Storage Area located north of the landfill. The area is used to store old vehicles, machinery, appliances, tanks and other large metal items.

Hazardous Waste

The Hamlet currently segregates hazardous waste to the waste oil storage area located at the public works yard. A constructed hazardous waste area will be built at the new proposed Solid Waste Management Facility.

9. Persons or Properties Affected by this Undertaking

There are no persons or properties affected by this undertaking. A land use permit was completed by the DIAND.

10. Predicted Environmental Impacts of Undertaking and Proposed Mitigation

There are no predicted environmental impacts for the undertakings.

11. Inuit Water Rights

The project or activity will not substantially affect the quality, quantity, or flow of water flowing through Inuit Owned Lands and the rights of Inuit under Article 20 of the Nunavut Land Claims Agreement.

12. Contractors and Sub-Contractors

None.

13. Studies Undertaken To Date

Potable Water Supply Study, Arviat, NU, IEG Environmental, December 2005.

Design Concept for Arviat Sewage Lagoon Design, FSC Architects & Engineers, May 2003.

Environmental Investigations of Current and Former Dump Sites Arviat N.W.T. EBA Engineering Consulting Limited, November 1995.

Selection of a New Municipal Solid Waste Disposal Site and Access Road, Arviat, Nunavut, Nuna Burnside Engineering and Environmental Ltd. October 2008.

14. Attachments

The following are attached with this document:

- Figures
  1. Site Location Map
  2. Community Plan
  3. Major Drainage Basins
  4. Wolf River Water Intake
  5. Water Reservoirs

6. Sewage Lagoons
7. Existing Landfill
8. Proposed Landfill Site

- Appendices
  A Climate Data
  B Water and Waste Calculation Tables

- Water License Application Supplementary Questionnaire for Municipalities

- Executive Summary of Project.

15. Proposed Time Schedule

We propose that the license be a 5 year license starting immediately upon approval.

16. References

Environment Canada, 2008. Canadian Climate Normals 1971-2000, Rankin Inlet A Weather Station, Environment Canada. <http://climate.weatheroffice.ec.gc.ca/climate_normals/results_e.html?StnID=1721&autofwd=1>. Accessed Nov 10, 2008.

Statistics Canada, 2000. Population Projections for Canada, Provinces and Territories 2000 – 2026.

Executive Summary

Application for a Nunavut Water Board License, Hamlet of Arviat

Executive Summary

Enclosed is an application submitted on behalf of the Hamlet of Arviat, for a renewal of the water license NWB3ARV0308. The Hamlet is seeking a 5 year renewal of this license. This license includes all water intake, sewage disposal and waste disposal activities for the Hamlet of Arviat. The facilities include the Wolf River Water Intake Pump House, Arviat water reservoirs and truck-fill station, the Arviat sewage lagoons, and the Solid Waste Management Facility (landfill, bulky wastes, and related infrastructure). The proposed license will be valid from issuance (approximately January 2009) for 5 years until December 2014.

The Hamlet of Arviat provides trucked water supply, sewage disposal, and solid waste removal to the community.

The supply is obtained from Wolf River, located approximately 8.0 km southwest of the Hamlet. Water is pumped from the river seasonally and transported to the community water reservoirs. Water from the reservoirs is pumped into a truckfill station, where it is treated by chlorine injection prior to being pumped via an overhead arm into water trucks.

A Hamlet sewage truck pumps out the sewage holding tanks in each building. The sewage is trucked to a sewage lagoon approximately 2.8 km southwest from the Hamlet. The lagoon is decanted seasonally releasing the sewage to flow into a 100 m long wetland downgradient and towards Hudson Bay.

Solid waste is collected by the Hamlet garbage contractor truck from each building, and is trucked to the solid waste management facility approximately 2.8 km from the community. A separate bulky metals waste area is located 0.7 km north of the landfill area. The bulky metals area includes segregation of various materials such as tires, white goods, and vehicles. Waste oil and hazardous waste are collected at the public works yard.

The license application includes recommended conditions for monitoring. A new solid waste management facility will be commissioned during the term of this licence for which amendments to the monitoring program may be required.

Overall, the water supply, sewage disposal, and solid waste management facility will not substantially impact the quality, quantity, or flow out rates through Inuit owned lands.