Section 2
Information for the Water Licence Application

Information for the Water License Application for the Hamlet of Sanikiluaq

(1) Name and Mailing Address of Applicant/Licensee:

The Hamlet of Sanikiluaq
General Delivery
Sanikiluaq, Nunavut
X0A 0W0

Phone: 867-266-8874
Fax: 867-266-8903

(3) Location of Undertaking:

Sanikiluaq is located at 56°32'N latitude and 79°14'W longitude, 1024 air km south-west of Iqaluit and 1282 air km north-west of Montreal. It is situated on the northern end of Flaherty Island, a large central island of the Belcher Islands, which are in turn located in southern Hudson Bay, approximately 150 km west of the Quebec coastline.

The Hamlet rests in the Hudson Physiographic Region. Sedimentary and volcanic rocks of the Proterozoic Age account for the islands' formation.

The surficial material is dominantly glacial till, with bedrock exposures are common. Extensive granular beaches are the result of retreating and resurging ice movement from the Laurentide glacier. Glacial action is also responsible for the deposition of fine-grained sediments. Colluvial deposits are common along steeper slopes and limited alluvial deposits have been formed along streams.

The Hamlet is within the zone of widespread discontinuous permafrost. Most subsurface materials beneath a thin active zone are perennially frozen to a substantial depth.

Mosses and lichens appear in small patches. Soil cover consists of a layer of dark brown peat up to 150 mm in thickness.

July mean high and low temperatures are 25.6° C and 3.3° C. January mean high and low temperatures are -22.8° C and -42.8° C.

The Belcher Islands were sighted and noted by Henry Hudson in the 1690's. Robert Flaherty published the first recognizable map of the area during his explorations there (1914-16). The only exploration of the islands in the meantime has been by geologists and prospectors looking for iron.

Ungava Inuit from the Belcher Islands are noted for their use of the kayak and their capability as fishers. Sanikiluaq is the only permanent settlement on the Islands.

The economy is based on domestic fishing, hunting, and trapping. Renewable resources include fish, marine mammals, and game. Examples of non-renewable resources include iron ore and soft talc serpentine soapstone. The soapstone, quarried on Tukarak Island, is used locally and also exported.

Local artists have created carvings which are distinctively their own. Private sector developments include general retail, food and hotels.

Sanikiluaq gained Hamlet status on April 20, 1976.

(4) Description of Undertaking:

Water Supply and Treatment:

Prior to construction of the water pumping station in 1980, the Hamlet drew water from Sanikiluaq Lake year-round. Water was distributed by means of a 4500 L tank truck to individual tanks in each residence and building. The Lake, which is replenished by snow melt and rain, has a surface area of 139 ha, a depth of approximately 5 m and a volume estimated at 4.3 million m^3. Sanikiluaq Lake discharges to Eskimo Harbour by means of a short, turbulent stream, which passes through the Hamlet.

A new pumping station was constructed by the Department of Public Works to obtain water year-round from a greater depth than was possible directly from the tank truck. This also eliminated the need to keep an ice hole open in the winter.

The water intake screen is located 129 m from the lakeshore at a depth of 4.7 m. The intake is supported on a steel framework, which is driven into the soft bottom sediments to ensure that the screen is held approximately one metre above the bottom. Water velocity at the intake is insufficient to disturb the sediments below.

In October 1984, the screen was raised and set horizontally 1.2 m above the previous level. The lowest part of the original screen was 4.3 m below the water surface. This is now reduced to 3.1 m. Similarly, where the screen was originally 0.8 m above the bottom, this distance has now been increased to 1.9 m.

Water is delivered directly to the tank truck by manual control. At the pumphouse, a single hypochlorinator delivers measured doses of chlorine solution by single piston stroke to the discharge line several meters upstream from the flexible exterior discharge pipe. A 65% chlorine calcium hypochlorite powder is added to the solution tank and mixed with a propeller agitator. The chlorinator, controls, water meter, and delivery piping are all within the insulated truckfill building, sitting at the edge of the lake.

Water Storage and Distribution:

Water is conveyed to the tank truck with an overhead pipe and flexible hose, which is mounted on the side of the truckfill building.

Individual residential water storage systems include large galvanized steel tanks equipped with centrifugal pumps and hydropneumatic tanks to provide for pressurized water flow. The tanks are filled by means of exterior fill and overflow pipes to which the Hamlet tank truck connects directly.

Water delivery is provided by the Hamlet, using a 1988 diesel water tank truck (4546 L) and a 1992 truck (6819 L). All water deliveries are metered.

Water Quality:

The 2001 INAC inspection report stated that concentrations of all tested parameters are well within the recommended levels.

Sewage Collection and Disposal:

Both bagged and pumpout sewage are collected by the Hamlet. A 1994 sewage truck (6819 L) and a 1993 sewage truck (6819 L) are used to collect pumpout sewage daily.

A stake truck is used to collect bagged sewage every second day. This same vehicle is used to collect solid wastes at other times.

An existing lake called Annak Lake is currently being used for sewage disposal. It is 2.9 km west of the Hamlet, has a surface area of two hectares and is 4.5 m deep at its deepest point with a mean depth of 1.9 m. The area of the lake is 21,600 m^2, while the area of honeybag disposal is 10,000 m^2.

Solid Waste Collection and Disposal:

Garbage is placed in wooden boxes by the roadside and collected three times per week using a 1987 Ford model F-310 stake truck. The spring clean-up is scheduled each June.

The fenced solid waste management site (360,000 m^2), located next to the sewage lagoon, is 2.9 km west of the Hamlet. The site has been in use for many years. Bulky wastes are disposed of at a separate site (250,000 m^2).

Wastes are burned at the disposal site when necessary. Covering of wastes is difficult since the ground consists of very hard clay soil, mixed with boulders. In the past, dynamite and bulldozers were used to dig trenches but this proved not to be cost-effective. Compaction of refuse is done by bulldozer as required.

(5) Type of Undertaking:

Municipal

(6) Water Use:

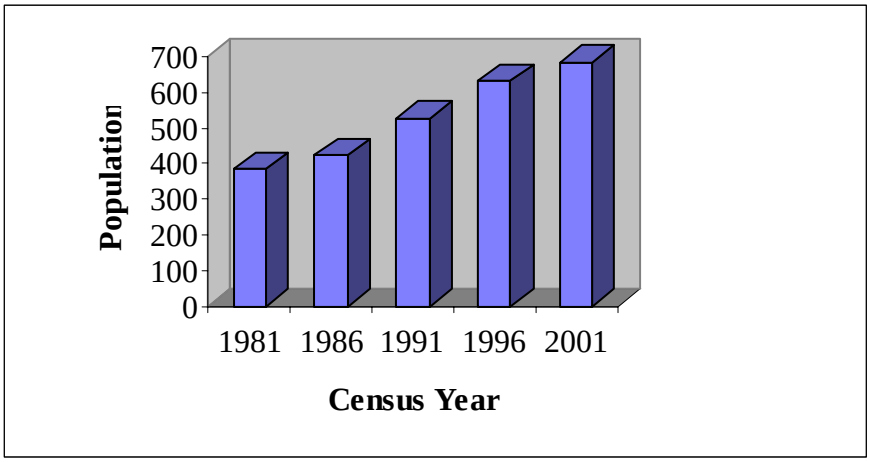
To obtain water, dispose waste

(7) Quantity of Water Involved:

Water Generation Projections:

The 2001 Census Report shows the increase in population of the Hamlet of Sanikiluaq between the census years of 1981 to 2001. Figure 1 illustrates this population increase. A per capita growth rate of 2.31% was determined from data found in "Nunavut: Community Population Projections 2000-2020".

Figure 1 - Population Increase in the Hamlet of Sanikiluaq



CG&T planning guidelines suggest that the increase in the projected per capita water use in a trucked service community should be modelled as follows:

(1) RWU x (1.0 + (0.0023 x Population)) **Population <2000**

The RWU or residential water use is estimated to be 90 litres per capita (Lpcd) for populations lower than 2000.

Ln is the natural logarithm.

The water use is projected as follows:

- The current amount of water use was estimated to be 26,004,286 L annually. This corresponds to a per capita water use of 104.2 Lpcd.
- In the year 2008, the per capita water use would be 106.6 Lpcd corresponding to an annual water use of 31,231,044 L.

Therefore, the community is requesting an annual volume of 31,500,000 litres.

Table 1 - Water Use Projection for the Hamlet of Sanikiluaq

Planning Year	Calendar Year	Total Population	Projected Water Use (lpcd)	Projected Volume (litres/day)	Projected Volume (litres/year)
	2001	684	104.2	71,245	26,004,286
0	2002	700	104.5	73,119	26,688,527
	2003	716	104.8	75,048	27,392,478
	2004	733	105.2	77,032	28,116,778
	2005	749	105.5	79,074	28,862,086
	2006	767	105.9	81,176	29,629,088
5	2007	784	106.2	83,338	30,418,495
	2008	803	106.6	85,565	31,231,044
	2009	821	107.0	87,856	32,067,497
	2010	840	107.4	90,215	32,928,647
	2011	859	107.8	92,645	33,815,317
10	2012	879	108.2	95,146	34,728,357

(8) Waste Generated:

Sewage:

The volume for the year 2002 of sewage generated by the community of Sanikiluaq is 26,688,527 litres annually corresponding to the annual water use. In 2008, the annual volume of sewage generated by the Hamlet of Hall Beach is projected to be 31,231,044 litres.

Annak Lake, 2.9 km west of the Hamlet, is the treatment site area for both pumpout sewage and honeybags. Despite having only a two-hectare surface area, it is 4.5 m deep at its deepest point and has a mean depth of 1.9 m. The active area of the lake is 21,600 m². The lake has had gravel barriers installed to increase retention time and act as a permeable barrier at the discharge point. Annak Lake, minus sewage inputs, has an average retention time of 58 days from precipitation with out evaporation or transpiration. The hydrologic effect of dumping wastewater into the lake is minimal There is seasonal overland discharge to the ocean. According to the 2001 INAC inspection report there is extensive vegetation along the discharge path.

The area of honeybag disposal is 10,000 m².

Sewage Effluent Quality:

Effluent samples from the sewage lagoon fall within the *Municipal Wastewater Effluent Quality Guidelines*. INAC Inspection Report, 2002.

Greywater:

Greywater is collected with the liquid sewage and deposited in Annak Lake.

Solid Waste Treatment:

The solid waste management site is located next to the lagoon, 2.9 kilometres west of the Hamlet. It has a capacity of 360,000 m², while bulky wastes are disposed of at a separate 250,000 m² site.

Wastes at the site are burned as required and compacted by bulldozer. The burned waste is rarely covered due ground consistency of very hard clay soil, mixed with boulders. In the past, dynamite and bulldozers were used to dig trenches but this proved not to be cost-effective. Testing of effluent from a creek flowing out of the solid waste site indicate no major problems with water quality.

Solid Waste Volume Projections:

The types and quantities of materials in the Sanikiluaq waste stream available for reuse, recycling, recover and composting programs was estimated in by reviewing current information and by literature.

A recent solid waste composition study has not been conducted in Sanikiluaq. The literature provides an insight. The Heinke and Wong study (1989) used by MACA in their planning studies to determine waste volumes suggests a certain volume and mix of MSW. A study by Quay and Heinke (1992) in Inuvik, Tsiigehtchic, and Fort McPherson suggests similar waste stream mix shown in the table that follows.

Table 2 - Estimated Solid Waste Composition

Food Wastes	20.3 %
Cardboard	9.8 %
Newsprint	2.4 %
Other Paper Products	14.8 %
Cans	4.4 %
Other Metal Products	6.2 %
Plastic, Rubber, Leather	14.0 %
Glass, Ceramics	5.7 %
Textiles	3.8 %
Wood	9.9 %
Diapers	3.8 %
Dirt	4.9 %
	100.0 %

NAPP Protocol

The National Packaging Protocol is an initiative by CCME in 1992 to respond to municipalities and the public over the proliferation of disposable consumer packaging. While per capita consumption of new packaging has decreased overall in the south where the data was generated, the implications for the North and, specifically, for Sanikiluaq is not as clear.

Southern reductions were primarily a result of recycling, an opportunity not available in Sanikiluaq. It is assumed that packaging for shipping foodstuff and consumer products has increased proportionately with population.

However, southern data for post-consumer packaging has shown an increase for various "sectors" of between 100 to 200 percent over a 5-year period (1992-1996). These sectors include: accommodation, food & beverage, amusement, and recreational services; retail; aluminium packaging; plastic; and paper sacks and bags. This data may have a direct implication in Sanikiluaq for increased quantities of waste as the data may transfer directly to current disposal practices.

The classes, "Other paper products", "Cans", and "Plastic, Rubber, Leather" may represent the increasing sectors as per the NAPP data. These first two classes currently account for approximately 19.2% of the estimated waste stream in Sanikiluaq. If it can be assumed equal contribution from each waste in the third stream, then plastics account for an additional 5%. It appears then, increasing packaging impacts on approximately 24% of the waste stream. Assuming worst case, then, the 200% increase over 5 years is about 40% per year and causes an overall increase of approximately (40% of 24%) 10% per year. This value may over estimate the additional contribution and is unlikely to remain at this level during the entire planning horizon.

Regardless, it is prudent to assume some increase during the planning horizon not directly attributed to a population increase, assuming that recycling programs may not be cost-effective, or implemented in Sanikiluaq.

Therefore, a 1% increase in the overall garbage generation rate has been incorporated in the volume estimations.

The following assumptions were made to prepare this table:

- Per capita volume described by Heinke and Wong (1990) has been increasing at a rate of 1 % per year
- The per capita population growth rate of the Hamlet of Sanikiluaq is 2.31% per year.
- The waste density is 0.099 tonnes/m^3 (Bryant et al., 1996)

Table 3 - Solid Waste Projection estimates for the Community of Sanikiluaq

Planning Year	Calendar Year	Total Population	Projected Daily Rate (m3pcd)	Projected Daily Volume (m3/day)	Projected Daily Weight (tonnes)	Projected Annual Volume (m3/day)	Projected Annual Weight (tonnes)	Running Total (m3)
	2001	684	0.014	9.6	0.9	3495	346	346
0	2002	700	0.014	9.9	1.0	3612	358	704
	2003	716	0.014	10.2	1.0	3732	369	1073
	2004	733	0.014	10.6	1.0	3857	382	1455
	2005	749	0.015	10.9	1.1	3985	395	1849
	2006	767	0.015	11.3	1.1	4118	408	2257
5	2007	784	0.015	11.7	1.2	4255	421	2678
	2008	803	0.015	12.0	1.2	4397	435	3114
	2009	821	0.015	12.4	1.2	4544	450	3563
	2010	840	0.015	12.9	1.3	4695	465	4028
	2011	859	0.015	13.3	1.3	4851	480	4509
10	2012	879	0.016	13.7	1.4	5013	496	5005

Solid Waste Water Runoff Quality:

According to INAC's 2002 Inspection Report, samples taken from the creek behind the solid waste site indicate that tested parameters were within *Municipal Wastewater Effluent Quality Guidelines*.

Bulky Waste:

The community has a separate site for bulky wastes, which is 250,000m^2.

Honey Bag Pit:

A stake truck is used to collect honeybag refuse. They are deposited into a 10,000m^2 pit, adjacent to Annik Lake.

Hazardous Waste:

There is a sealift container at the landfill site for hazardous materials

Waste Oil:

Waste oil is burned in the hamlet's garage furnace.

(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

(12) Contractors and Sub-contractors:

None

(14) The following documents must be included with the application for the regulatory process to begin:

Supplementary Questionnaire (where applicable: see section 5)	Yes
Inuktitut/English Summary of Project	Yes
Application fee of $30.00 (c/o Receiver General for Canada)	Yes