Hamlet of Kugaaruk, NU Solid Waste Facility Operation and Maintenance Manual

Hamlet of Kugaaruk

October 27, 2010

Solid Waste Facility – Operation and Maintenance Manual

Community & Government Services, Government of Nunavut

05-4755

Gary Strong – Project Manager

Submitted by
Dillon Consulting Limited

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(In reply, please refer to)
Our File: 05-4755

October 27, 2010

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Attention: Sean Joseph, Technical Advisor

Re: Letter Dated February 23, 2010 Regarding Approval for the Hamlet of Kugaaruk Solid Waste Facility Operation and Maintenance Manual

Please find enclosed a revised Operation and Maintenance Manual for the Hamlet of Kugaaruk Solid Waste Facility. The revisions included in the Operation and Maintenance Manual for the Solid Waste Facility are in response to the comments received in the letter from the Nunavut Water Board dated February 23, 2010. This Operation and Maintenance Manual for the Solid Waste Facility was prepared on behalf of Community & Government Services, Government of Nunavut.

Listed below are the comments that were provided by the Nunavut Water Board and the corresponding sections of the revised Operation and Maintenance Manual for the Solid Waste Facility that address these comments:

1) Section 3.2.4 (Waste Barrels) referencing Environment Canada as being the appropriate contact for proper storage and crating containers must be removed; *Please refer to Section 3.3.4 (Waste Barrels, formerly Section 3.2.4).*

2) Historical information for the facility must be updated to include construction and commencing dates as well as dates additional upgrades or modifications, if any; *Please refer to Section 1.2 (Site Setting).*

3) Contact numbers and names of persons directly responsible for operating and maintaining the facility must be included; *Please refer to Section 8.1 (Contact Numbers).*

4) Appendix B should include Sampling and Annual Reporting; *Please refer to Appendix B (under Yearly Operational and Maintenance Procedures).*

5) Appendix J should refer to the Government of Nunavut, Environmental Protection; *Appendix J has been removed from this document.*

6) A section detailing Hazardous Waste Management should be included; *Please refer to Section 3.2 (Hazardous Waste Management).*

7) A detailed site map depicting the following must be included
   a. Location of the Solid Waste Facility
   b. Dimensions of the Facility
   c. Distance to water bodies and drainage paths
   d. Distance and bearing to the airport runway
   e. Prevailing wind; and
   f. Segregation of solid wastes into sections such as bulky waste, waste oil, honey bags, refuse area, hazardous waste and if applicable recyclables and reusable wastes.

Please refer to Appendix G – Map of Sewage Lagoon and Solid Waste Facilities

We hope this meets your requirements at this time. Should you have any questions or concerns regarding this submission, please contact me at your convenience, by email at gstrong@dillon.ca or by telephone at (867) 920-4555.

Sincerely,

DILLON CONSULTING LIMITED

Gary Strong, P. Eng.
Project Manager

GS/encl.

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1 INTRODUCTION

1.1 Purpose

The purpose of this manual is to assist the Hamlet of Kugaaruk personnel with the operation and maintenance of their solid waste facility. The manual has been developed according to the requirements of the Nunavut Water Board and is based on the *Guidelines for the Preparation of an Operation and Maintenance Manual for Sewage and Solid Waste Disposal Facilities in the Northwest Territories* (Duong and Kent, 1996).

1.2 Site Setting

The Hamlet of Kugaaruk is located 68.52° north latitude and 89.9° west longitude in central Nunavut. This places Kugaaruk along the east coast of Pelly Bay, which is roughly nine hundred and sixty kilometers (960 km) west of the capital of Iqaluit.

The annual snowfall in Kugaaruk is approximately 125 cm and the annual rainfall is approximately 11 cm. In January the daily mean temperature is approximately -33^0C while in July the daily mean temperature is approximately 6^0C. Freeze up usually occurs during the month of November but may happen as early as September or October while spring thaw usually happens around late May.

The solid waste facility is divided into two areas; general solid waste and a metals dump. The general solid waste area is located adjacent to the sewage lagoon. The metals dump is located approximately 0.5km south of the general solid waste site. Please refer to Figure 1-1 for the site locations.

Previous operational practices at the solid waste facility have led to disorganization of the site and improper disposal of waste. As well, no provisions had been made to collect, test, or treat leachate runoff from the site. Enhancements have been made to the site to improve disposal methods and encourage recycling within the community. Modifications to the solid waste and metal dump sites include installation of a chain linked fence around the perimeter of the solid waste site, sorting of wastes into various categories (general household waste, waste batteries, wood products, animal carcasses, hazardous wastes, metals, tires, vehicles, white goods and waste barrels), crating and removal of hazardous wastes from the Hamlet, incineration of waste oil, and construction of leachate drainage structures. Modifications to the sites began in 2007 and were completed in 2009. The following sections discuss in further detail the plan that has been implemented to organize, recycle and dispose of waste in the Hamlet of Kugaaruk.

**Image taken from Google Earth Pro, July 2008*

Figure 1-1. Site Map of Sewage Lagoon and Solid Waste Facilities

2 BACKGROUND

2.1 Design Data

The following sections describe the data used in the design of the solid waste facility.

2.1.1 Population Projections

Evaluation of the Hamlet's solid waste facility included examining the facility's capability to handle the Hamlet's waste for the next 20 years (2008 – 2028). To estimate the amount of waste generated by the community over the next 20 years, solid waste generation rates were determined using population projections obtained from the Nunavut Bureau of Statistics and Statistics Canada. Predicted population values until the year 2020 were provided by the Nunavut Bureau of Statistics. Population values beyond 2020 were predicted using the same growth rate as previous years (20 persons per year), and using a percentage growth rate (2.6%) as illustrated in Figure 2.1. The population for 2028 was predicted to be 1127 persons.

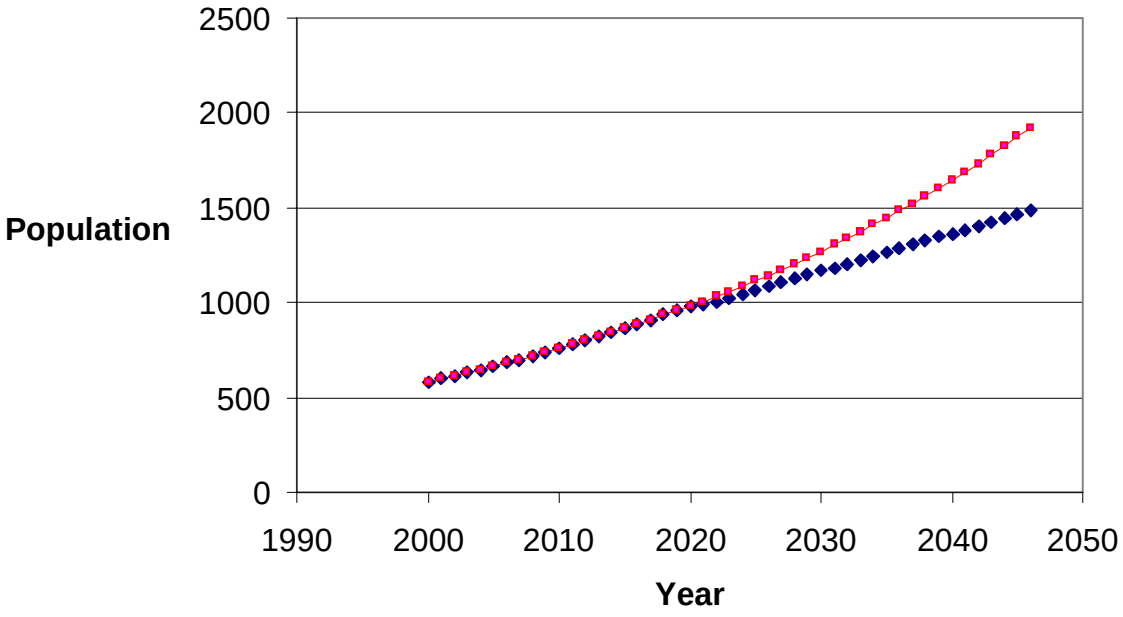


Figure 2-1. Population Projections for the Hamlet of Kugaaruk, NU

*Note: Data prior 2021 was provided by Nunavut Bureau of Statistics and data proceeding 2021 was predicted. Dark blue data points indicate data calculated using a growth rate of 20 persons per year. Red data points indicate data calculated using a percentage growth rate of 2.6%.

2.1.2 Solid Waste Generation Rates

Solid waste generation rates were estimated using generation rates of 0.014 m^3/c/d and 0.001 m^3/c/d for general refuse and school refuse respectively. These are the rates accepted by the Department of Municipal and Community Affairs, Government of the Northwest Territories for solid waste generation in northern communities. Based on Statistics Canada 2001 census data, the student population was estimated to be 37% of the total community population. Using both residential and school generated waste rates, the estimated total amount of refuse produced by the community from 2008 to 2028 is 117,728 m^3. Based on available space estimates for the Hamlet, the solid waste facility is able to handle the Hamlet's waste for next 20 years (Dillon Consulting Limited, 2006).

2.2 Solid Waste Collection and Disposal

Waste is collected and brought to the solid waste site by the Hamlet. Until 2007 there was no organized plan for the separation and segregation of waste. General household refuse was piled together at the solid waste site, while metal waste such as vehicles, heavy machinery, storage tanks, barrels and appliances were brought to the metals dump. Materials deposited at the metals dump were also not separated into appropriate piles. In 2008, the GN in cooperation with the community completed a solid waste site clean up, which included developing waste disposal areas for selected wastes. This is discussed in further detail below.

3 OPERATIONAL PROCEDURES

3.1 Waste Disposal

The purpose of the solid waste facility is to take waste from the Hamlet of Kugaaruk and dispose of it in a safe and environmentally conscious manner. The following sections describe what types of waste are acceptable and what types are unacceptable.

3.1.1 Acceptable Waste

The Site Operator will ensure that the landfill accepts only the materials that it has been designed to handle and that all waste is deposited in the designated areas. Any exceptions must be reviewed and approved by regulatory agencies.

The following items are acceptable for disposal in the landfill:

1. Non-recyclable plastic, metal, and paper wastes; packaging; cardboard; newsprint; food; rubber; leather; glass; wood; from residential, commercial or industrial premises
2. Animal and vegetable (organic) waste material
3. Sweepings, clothing and textiles, consumer electronics, and discarded household utensils
4. Furniture and major appliances
5. Non-salvageable metals
6. Tires
7. Construction & Demolition wastes (provided the waste is not a hazardous or banned material)

3.1.2 Non-accepted Waste

Wastes which present a danger at the solid waste facility, require special disposal techniques, or may interfere with the level of service to the public, are not acceptable for disposal. In some cases, wastes which are acceptable in small quantities may not be acceptable in large quantities from a single generator because they may cause the level of service to other users to deteriorate and cause handling problems at the site and increased environmental liability. To some extent, the acceptability of large quantity wastes must be at the Site Owner's discretion, depending on the ability to accommodate disposal without deterioration in the level of service. In cases where unacceptable wastes are identified, site staff will attempt to identify allowable management alternatives to material haulers.

All wastes which pose potential safety or environmental problems cannot be listed in their entirety. The Site Owner and site personnel in general must be wary of accepting wastes which could cause future operational problems and must watch for the inclusion of unacceptable wastes in regular loads of refuse.

The following items are not acceptable for disposal in the landfill:

1. Pathological and Pathogenic wastes
2. Radioactive wastes
3. Hazardous wastes

4. Asbestos
5. Batteries
6. Used oil
7. Any other materials not listed as acceptable or conditionally acceptable with the approval of the SAO

Of the above listed items, the following may be placed in specially designated areas of the landfill for storage until they can be shipped south by barge:

1. Hazardous wastes (eg. pesticides, insecticides, oil-based paint, anti-freeze, small flammable or explosive containers, mercury thermometers and switches)
2. Batteries
3. Used oil (must be placed in approved storage containers and stored in the designated area for hazardous waste)

The solid waste facility has been divided into sections for disposal of different types of waste. The sections located in the solid waste site are:

- General Household Waste
- Batteries
- Wood Products
- Animal Carcasses
- Hazardous Materials

3.1.3 General Household Waste

The Hamlet will continue to provide garbage pick up services for general household waste. Household waste will be collected and taken to the designated area for disposal. Waste will be disposed of in the landfill via the area method. A figure describing this method of disposal is shown below:

1. Build a 2m high berm in the general household waste disposal area. Dump collected general household waste in front of berm.
2. Drive over garbage 3 to 5 times to compact. Work garbage up the berm a little at a time to pack it.
3. Alternate between dumping and packing garbage until packed garbage is 2m high.
4. When finished compacting and piling garbage for the day, cover the pile immediately with a 300mm thick layer of granular cover material and compact.
5. Continue to pile garbage against the berm covering the garbage pile at the end of everyday. If during the day, the garbage pile reaches 3m in width, cover with a 300mm thick layer of granular material and continue packing garbage. Be sure to cover packed garbage at the end of the day.
6. When there is no more space available, cover the entire garbage pile with an extra 300mm thick layer of granular material. Compact and add more granular material until the top is level. Build a second berm on top of the garbage pile as shown.
7. Continue until no more space is available.
8. Pack a 600mm thick layer of granular material over the entire pile and compact. Dome the top of the pile to allow runoff of excess water from rain and snow.

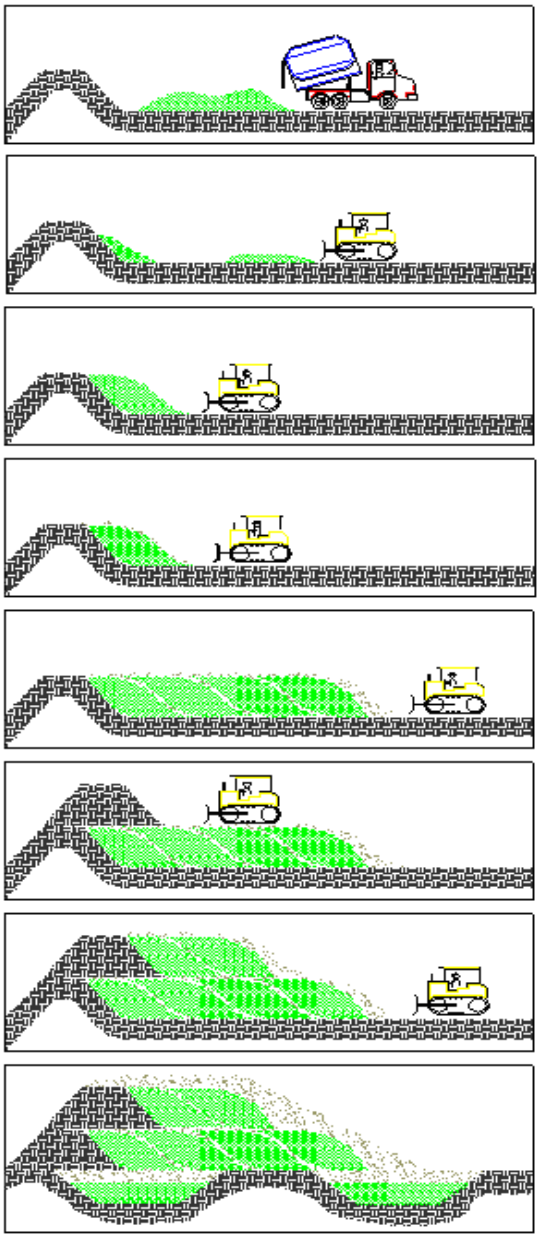


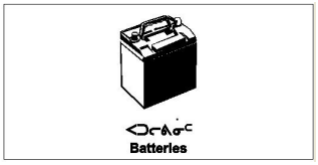
Figure 3-1. Area Method of Solid Waste Disposal in a Landfill

(Source: Kent, R., P. Marshall and L.Hawke. "Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the Northwest Territories", Produced for Municipal and Community Affairs, Government of the Northwest Territories, 2003.)

Since the landfill is in close proximity to the airport, measures must be taken to prevent attracting wildlife to the area. Compacted garbage must be covered with a 300mm thick layer of granular cover material at the end of each day. Compacting and breakage of garbage bags releases odours that will attract birds and other animals to the area. Therefore it is imperative that compacted garbage be covered immediately. As well the fence around the facility must be kept in good repair to prevent larger animals such as bears from

getting into the landfill. These animals (bears, wolves, foxes, birds, etc.) pose a threat to Hamlet crews working in and around the landfill and will also disrupt regular operations at the airport.

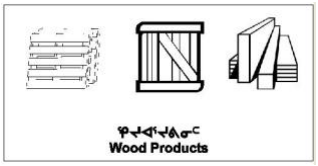
3.1.4 Waste Batteries



Car, ATV, snowmobile and other vehicle batteries are to be stored in the designated lined cells as indicated in the solid waste area. Batteries will be stored until they can be shipped to a southern facility for proper disposal. The most effective means of shipping is to send them on the annual barge that arrives in the community each fall. Batteries will be properly crated by Hamlet crews prior to shipment; therefore, crating material must be brought into Kugaaruk the year before shipping is scheduled to occur. Please refer to Section 3.2.1 for further instructions on waste battery management.

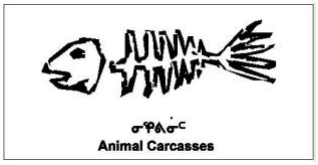
To date, the Hamlet has relied on its residents to bring their old batteries to the solid waste site. Hamlet crews will now organize a battery pick-up day where residents put their old batteries out for Hamlet crews to collect. This will be completed approximately one month prior to the scheduled shipping date. Hamlet crews will then have time to crate the batteries and they will not have to be stored in the landfill for an extended period of time.

3.1.5 Wood Products



Scrap wood products will be placed in the designated area inside the solid waste facility. Residents will be encouraged to deposit wood products they do not want in this area for recycling and reuse by others. Hamlet crews will also organize 2 or 3 scheduled pick-up days for wood products throughout the summer. Any wood products found within the landfill that are not placed in the appropriate pile will be removed promptly by Hamlet crews and placed in the wood products area.

3.1.6 Animal Carcasses



All animal carcasses are to be deposited in the marked pit within the fenced in area of the solid waste facility. The pit will be clearly labeled and a gravel pile to use for cover material will be stockpiled beside

it. Residents will be responsible for placing the carcasses in the pit and will be encouraged to cover them with the stockpiled gravel. Any carcass found within the landfill that has not been placed in the pit, will be removed and placed in the pit by Hamlet crews. Hamlet crews will also check each day that all carcasses have been covered with granular material. If the stockpiled material has been used up, Hamlet crews will gather more granular material and stockpile it next to the pit. Carcasses must be covered immediately as their odours will attract wildlife to the landfill.

3.1.7 Hazardous Material

Hazardous materials in Kugaaruk will consist mostly of household hazardous waste such as used oil, pesticides, insecticides, oil-based paint, mercury thermometers and switches, anti-freeze, propane tanks and small flammable or explosive containers. Three lined cells have been built specifically for the storage of hazardous materials. Similar to the waste batteries, hazardous materials will be stored for up to one year and then shipped to a southern facility for proper disposal. Residents and Hamlet crews are responsible for depositing their household hazardous materials into these cells. Properly trained Hamlet crews will be responsible for ensuring that any hazardous waste not stored in the appropriate cells in the landfill is placed in those cells. They will also be responsible for crating the material appropriately for shipment. See Section 3.4 for details on shipping arrangements.

3.2 Hazardous Waste Management

As described in Section 3.1.7, there are three areas designated for the storage of hazardous materials within the solid waste and metal dump sites. Each of these areas are bermed cells with a liner to prevent any liquid materials from seeping into the soil. Two of these areas are located in the municipal solid waste site and are designated for the storage of waste batteries and hazardous wastes. The third is located in the metals dump site and is intended for the storage of waste barrels.

Only properly trained personnel should handle these materials. Please contact the Workers' Safety Compensation Commission (toll free: 1-877-404-4407) for further information on obtaining proper training and certification to handle such materials.

3.2.1 Waste Batteries

Waste batteries include vehicle batteries from cars, trucks, snowmobiles, etc. Waste batteries are meant to be stored in the waste battery storage area temporarily, until they can be crated and shipped by barge to an appropriate disposal facility. Proper packaging and labels will be required prior to transport out of the Hamlet. The Site Operator should contact the Transportation of Dangerous Goods Northern Regional Office at 1-888-463-0521 to ensure that the batteries are properly crated and have the appropriate labels prior to shipping.

Please refer to the *Environmental Guideline for Waste Batteries* (Environmental Protection Service, Department of Sustainable Development, Government of Nunavut, 2002), located on the Department of Environment, Government of Nunavut website at http://env.gov.nu.ca/node/82#Guideline%20Documents for further instructions on the storage of waste batteries.

3.2.2 Hazardous Wastes

Hazardous wastes include waste such as paint, used oil and waste fuel, mercury thermometers and switches from household appliances, capacitors and ballasts, antifreeze, propane tanks, small flammable or explosive containers, etc. These items are to be stored within the designated storage berms located within the municipal solid waste site, until the wastes can be properly crated and shipped to an appropriate disposal facility. It is imperative that these wastes be kept separate from each other and that **NO** mixing of these materials is to occur. For further information specific to hazardous wastes, refer to the Department of Environment, Government of Nunavut website at:
http://env.gov.nu.ca/node/82#Guideline%20Documents.

Figure 3-2. Photo of Lined Cells for Storage of Hazardous Wastes

3.2.2.1 *Used Oil and Waste Fuel*

According to the *Used Oil and Waste Fuel Regulations Plain Language Guide* (Department of Environment and Natural Resources, Government of the Northwest Territories, 2003) used oil is defined as “any heavy, hydrocarbon-based lubricating oil that has become unsuitable for its original purpose”. Examples of used oil include crankcase oil, hydraulic fluid, automatic transmission fluid and gear oil (Department of Environment and Natural Resources, Government of the Northwest Territories, 2003). In the same document, waste fuel is defined as “flammable or combustible hydrocarbon that has become unsuitable for its original purpose”. Examples of waste fuel include gasoline, diesel fuel, furnace fuel,

aviation fuel, kerosene and naphtha (Department of Environment and Natural Resources, Government of the Northwest Territories, 2003). All barrels containing waste oils or fuels and all barrels that have not been properly cleaned (refer to Section 3.3.4), must be stored in the lined storage cell for waste barrels located in the metals dump site.

Some waste oils and fuels may be burned on-site in an approved incinerator. This task will be contracted out to a contractor trained in burning and disposing of waste oils and fuels. The contractor must be knowledgeable about what types of waste oils or fuels may be burned in the incinerator. Other waste oils/fuels not suitable for burning in the incinerator will be properly packaged for shipment to an approved disposal facility. The Site Operator should contact the Transportation of Dangerous Goods Northern Regional Office at 1-888-463-0521 to ensure that all waste oils/fuels are properly crated and have the appropriate labels prior to shipping.

The contractor is to bring in an approved incinerator to Kugaaruk and burn the waste oils and/or fuels appropriate for burning on-site. Any unknown waste oils or fuels will have to be tested by an approved laboratory to determine their composition prior to incineration or shipment out of the hamlet. For further information refer to the *Used Oil and Waste Fuel Regulations Plain Language Guide* located on the Department of Environment and Natural Resources, Government of the Northwest Territories website at http://www.enr.gov.nt.ca/_live/pages/wpPages/publications.aspx.

3.2.2.2 *Waste Solvents*

Waste solvents are liquids that are generally derived from petroleum or alcohol based products and may be flammable or toxic (Environmental Protection Service, Department of Sustainable Development, Government of Nunavut, 2002). They must be handled only by properly trained personnel. For further information please refer to the *Environmental Guideline for Waste Solvents* located on the Department of Environment, Government of Nunavut website at:
http://env.gov.nu.ca/node/82#Guideline%20Documents.

3.2.2.3 *Antifreeze*

Antifreeze is a liquid used to lower the freezing point of water. It must be handled and stored with care as it is a toxic compound. Antifreeze must not be disposed of in sewage lagoons as it may kill the bacteria responsible for the sewage treatment process (Environmental Protection Service, Department of Sustainable Development, Government of Nunavut, 2002). For further information please refer to the *Environmental Guideline for Waste Antifreeze* located on the Department of Environment, Government of Nunavut website at: http://env.gov.nu.ca/node/82#Guideline%20Documents.

3.2.2.4 *Paint*

Waste paint and paint products may be considered hazardous materials depending on the chemical properties of the paint and products (Environmental Protection Service, Department of Sustainable Development, Government of Nunavut, 2002). Waste paint and paint products should be stored in the designated hazardous waste storage berms away from other hazardous wastes. For further information

refer to the *Environmental Guideline for Waste Paint* located on the Department of Environment, Government of Nunavut website at: http://env.gov.nu.ca/node/82#Guideline%20Documents.

3.2.2.5 *Mercury Thermometers and Switches*

Mercury is a toxic heavy metal that is used in a number of household items such as freezers, washing machines, gas ranges, gas hot-water heaters, fluorescent lamps, etc. When these items are disposed of in a landfill, mercury may be released into the environment due to crushing of these items (Vermont Department of Environmental Conservation, Vermont Mercury Education & Reduction Campaign and Chittenden Solid Waste District, 2002). It is important that the parts of these appliances that contain mercury be removed prior to disposal in the landfill. For further information on the safe removal, handling and storage of items containing mercury please refer to the Vermont Department of Environmental Conservation, Mercury Education & Reduction Campaign website. This website contains information on a variety of mercury sources as well as a manual that illustrates how to remove mercury switches from various household appliances.

3.2.2.6 *Capacitors and Ballasts*

Capacitors are commonly found in electronic devices, appliances and power supply equipment. Ballasts for disposal are most commonly associated with fluorescent light fixtures. All capacitors and ballasts found in electronic devices, appliances and light fixtures must be removed prior to landfilling these items.

Removal of capacitors and ballasts found in construction/demolition projects are generally completed by contractors. Prior to 1980, capacitors and ballasts contained PCBs (PCB Disposal, 2008) which is a chemical that may have adverse affects on human health (Health Canada, 2005). The Hamlet should not accept these wastes from construction sites as it is the responsibility of the contractor to properly dispose of capacitors and ballasts. If a Site Operator observes such items or suspects that items within the solid waste facilities may contain capacitors or ballasts, contact the Environmental Protection Service, Department of Sustainable Development, Government of Nunavut at (867) 975-5900.

As for capacitors and ballasts contained in waste appliances, these items should be removed prior to landfilling and/or sending south for recycling. Southern recyclers will most likely require that all capacitors and ballasts are removed from these items prior to accepting them at their facilities. Ballasts and capacitors may be found in lights, starters in motors, starters in fridges and stoves, etc. However, because the community will be removing these items, the solid waste facility will need to register as a waste generator with Environment Canada.

Ballasts and capacitors should be stored in separate 45 gallon drums, kept in a secured location and protected from the weather. Workers removing these items should wear standard personal protective equipment including standard work gloves as an asphalt type paste may leak from these items. For further information on ballasts and capacitors please refer to the Canadian Electricity Association website http://www.electricity.ca/home.php.

3.2.2.7 *Propane Tanks*

Most household type propane cylinders use a vapour withdrawal system that works by withdrawing the propane vapour from the top of the cylinder. The propane vapour sits above the propane liquid within the cylinder, therefore these types of propane cylinders must always be stored and transported in a vertical position. If the cylinder is on its side or upside down, liquid propane may be drawn out of the cylinder and pose an extreme danger (Nova Scotia Department of Environment and Labour, 2006). These cylinders should always be stored outside, in a vertical position (not upside down), off the ground on a non-combustible base, and away from all possible sources of heat or ignition (Propane Gas Association of Canada, 2010). At the solid waste facilities, these cylinders should be stored within the bermed cell of the hazardous waste disposal area and away from other hazardous wastes.

Some propane cylinders however are designed for horizontal use and are to be stored and transported on their side (Nova Scotia Department of Environment and Labour, 2006; Propane Gas Association of Canada, 2010). If the Site Operator is unsure what type of cylinder is onsite, or for further information regarding safe disposal methods of propane cylinders and tanks contact the Propane Gas Association of Canada toll free at 1-877-784-4636.

3.2.2.8 *Ozone Depleting Substances*

Ozone depleting substances are chemicals that when released into the atmosphere, have a negative effect on the ozone layer. These chemicals are commonly found in refrigerators, freezers, automobile air conditioning units, air conditioning equipment, etc (Environmental Protection Service, Department of Sustainable Development, Government of Nunavut, 2002). When these items are ready to be landfilled, all ozone depleting substances must be removed from them. Ozone depleting substances should be removed only by a certified technician (Environmental Protection Service, Department of Sustainable Development, Government of Nunavut, 2002). If a certified technician is not available, the Hamlet should contact the Environmental Protection Service, Government of Nunavut to develop a plan for removal and disposal of ozone depleting substances from the landfill. For further information refer to the Environmental Guideline for Ozone Depleting Substances (Environmental Protection Service, Department of Sustainable Development, Government of Nunavut, 2002) located on the Department of Environment, Government of Nunavut website at:
http://env.gov.nu.ca/node/82#Guideline%20Documents.

3.2.3 Site Records

Site records of all hazardous materials collected and stored at the solid waste facilities must be completed and kept at the Hamlet office as well as the Hamlet garage. According to Duong and Kent (1996), the following items must be recorded in the site records:

- Dates of hazardous waste collection;
- Date, description, volume and generator of wastes placed in the compound;
- Method of storage;
- Name of carrier removing wastes from the compound; and

- Copies of the forms for Transport of Dangerous Goods from persons removing wastes from site.

An example record sheet is included in Appendix B of this manual.

3.2.4 Safety Procedures

Hazardous wastes may be dangerous and it is imperative that appropriate safety and handling procedures are followed for each type of waste. For information regarding the safe handling and disposal practices please refer to the Department of Environment, Government of Nunavut website http://env.gov.nu.ca/node/82#Guideline%20Documents and the Vermont Department of Environmental Conservation website http://www.mercvt.org/ or contact the Workers' Safety and Compensation Commission toll free 1-877-404-4407.

3.3 Metals Waste Site

The metal waste dump is located approximately 0.5km from the solid waste landfill and has also been divided into sections for various types of waste. These sections are:

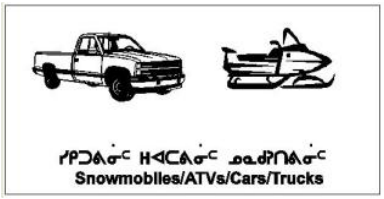
- White Goods (Appliances)
- Vehicles (Snowmobiles, ATVs, Cars, Trucks)
- Tires
- Waste Barrels
- General Metals

3.3.1 White Goods (Appliances)

White goods are larger household appliances such as fridges, freezers, stoves, washers, dryers and hot water heaters. These items will be placed in a separate pile so they can be shipped south for reclamation purposes. These appliances contain freon, mercury switches, ballasts and capacitors all of which must be removed once the appliance has been landfilled. Mercury switches, ballasts and capacitors are to be removed by Hamlet crews and placed in the in separate storage containers within the hazardous storage cell and shipped out of the hamlet with the other hazardous materials. Please refer to the Vermont Department of Environmental Conservation website http://www.mercvt.org/ for information on removing and storing mercury. For information on capacitors and ballasts, please refer to the Canadian Electricity Association website at:
http://www.electricity.ca/industryissues/environmental/pcbs.php?searchresult=1&sstring=Capacitors#response and the Government of Canada website at: http://www.chemicalsubstanceschimiques.gc.ca/fact-fait/pcb-bpc-eng.php. Freon must be removed by a certified technician trained for this task. The Hamlet will hire a contractor trained in the removal of freon from appliances to go to the Hamlet once per year and remove these substances from appliances stored in the bulky metals site. Prior to the contractor

arriving in Kugaaruk, Hamlet crews will ensure that all old appliances deposited in the landfill and bulky metals site have been moved to the White Goods storage location.

3.3.2 Vehicles (Snowmobiles, ATVs, Cars, Trucks)

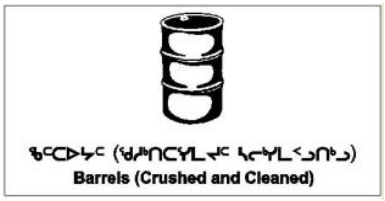


A separate area has been designated for storage of old vehicle frames and parts. This is to encourage residents to recycle parts from old vehicles for their own purposes. Prior to landfilling these items, the batteries must be removed and all fluids drained from vehicles. Hamlet crews will be responsible for checking landfilled vehicles to ensure all batteries and fluids are removed. If they are not, Hamlet crews will remove the batteries and place in the battery storage area. Hamlet crews will also drain all fluids, store in appropriate barrels and place in the hazardous materials storage area. Once per year, Hamlet crews are to remove pieces from the vehicle storage pile that are no longer useful or recyclable. These pieces can then be crushed and placed in the general metals pile.

3.3.3 Tires

Tires are not considered to be hazardous waste and so may be stored in the designated area of the metals waste site. However, they are quite flammable and burning of tires produces heavy toxic smoke which poses a serious health hazard to residents of the hamlet. Care must be taken to prevent fires within the metals dump site. Burying of tires is not necessary. Landfills that have buried tires in the past have found that through natural processes (such as freezing and thawing of the ground) tires have resurfaced (Murray, Depository Services Program, Government of Canada, 2002). Once the amount of used tires in the landfill becomes unmanageable, they will be shipped to a southern facility equipped to recycle old tires.

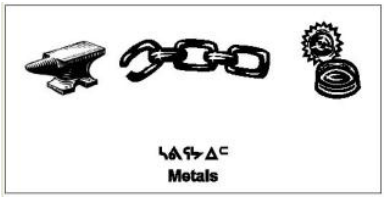
3.3.4 Waste Barrels



Waste barrels are to be cleaned and crushed before they are buried in the crushed barrel pile. Barrels that previously contained hazardous materials (fuel, oil, etc.) must be cleaned by one of the following methods: solvent rinsing, steam cleaning or high pressure rinsing with the use of the appropriate cleaning solvents. This may be completed by contracting a commercial cleaning company (Environmental Protection Division, Environment and Natural Resources, 2008). Prior to cleaning the barrels, liquids held

within the barrels must be identified by appropriate testing methods. Hazardous liquids must be stored in appropriate containers in the hazardous waste cells of the solid waste facility and crated to be shipped out appropriately. Please refer to Section 3.2.2.1 for further details.

3.3.5 General Metals



All other metal debris is to be placed in the general metals area. Metal scraps no longer useful for recycling purposes may be compacted and buried as per the area method. Useful metal material may be placed in this area separate from the non-useful material.

3.4 Shipping Arrangements

Shipping arrangements will have to be made with the Canadian Coast Guard to ship materials from Kugaaruk to Nanisivik. Once in Nanisivik, arrangements may be made with Nunavut Eastern Arctic Shipping or Nunavut Sealink and Supply (NSSI) to ship material to Valleyfield (Montreal).

Shipping this material will require special provisions from the Department of Environment with the Government of Nunavut. The Department of Environment must be contacted a number of months before the scheduled shipping date as they will need issue a manifest prior to shipping any hazardous waste material.

Contact Numbers for Shipping Companies:

Nunavut Eastern Arctic Shipping (NEAS)	1-877-225-6327
Nunavut Sealink and Supply (NSSI)	1-450-635-0833
Canadian Coast Guard	1-613-998-1585 or 1-613-993-0999

Once the material is received in Montreal, the hazardous waste can be brought to one of two locations that handle hazardous waste:

Stablex: 1-450-430-9230 in Blainville Quebec

Or

Clean Harbors: 1-450-691-9610 in Mercier Quebec

Arrangements will have to be made with either company to accept the shipment at their facility.

3.5 Signage

The solid waste facility must have a sign posted at the entrance to inform the public of the location of the landfill and the bulky metals site. This sign must have the following information:

- Site name
- Materials/wastes accepted for landfill and recycling
- Materials/wastes banned from the site
- Penalties

Signs identifying the locations of all waste management piles will be posted in the landfill and bulky metal waste facility. These signs will be erected by Hamlet personnel in the appropriate areas.

Figure 3-3. Signs to be placed in Landfill and Bulky Metals Facilities

3.6 Waste Inspection

The checking of waste entering the facility is crucial to the safe and correct operation of the landfill. The site operator should carry out random checks of the waste entering the facility and random waste inspection in the disposal area. The following methods are employed to minimize the quantity of unacceptable waste which is disposed at the site and to direct the waste hauler to the correct disposal area:

- Site operators will be watchful for unacceptable or potentially hazardous wastes during unloading;
- When personnel encounters suspect waste in the disposal area, landfilling shall cease until the material is segregated and appropriate action is taken;
- The Site Operator will inform the hauler that a random check is to be performed. If the hauler refuses, the vehicle will not be permitted entry to the site, and will be selected for a check on its next visit. The Site Operator will record as much information as possible about haulers who refuse a random check;
- The selected hauler will be directed to an area near the active landfill area that is separate from all other incoming waste. Prior to dumping, the driver of the inspected vehicle will confirm the absence of unacceptable materials. An inspector (the Site Operator or a delegate) will examine the load for hazardous or unacceptable wastes. Completion and results of the inspections shall also be noted in the daily checklist.

3.6.1 Handling Unacceptable Waste

Unacceptable wastes may be classified as non-hazardous, potentially hazardous or unacceptable, and, depending on the time of discovery, may or may not be associated with a known hauler. Once a waste is suspected to be hazardous or unacceptable, the onus is on the hauler to demonstrate otherwise, or remove the waste, at their expense. Repeat deliverers of unacceptable or hazardous wastes may be banned from the site at the discretion of and for a period determined by the SAO.

The site attendant will notify the SAO of anyone dumping unacceptable or rejected waste at the landfill site. The report shall contain the following information:

- Vehicle license number
- Type of vehicle
- Date and time of incident
- Name of offender, if possible
- Material dumped, or rejected

3.7 Site Personnel

3.7.1 Duties and Responsibilities

Senior Administrative Officer (SAO)

The Hamlet SAO is responsible for the overall operation of the landfill facility. The daily operation and maintenance of the landfill is the responsibility of the Public Works Foreman. Two or three people are employed by the Hamlet to operate the garbage collection vehicle.

The SAO reports directly to the Mayor and is responsible for the following:

- Supervises – Hamlet Crews

- Maintains Liaisons with: Clients (Private sector generators & Government agencies)
  Suppliers
  Nunavut Water Board

- The Hamlet SAO Shall:

1. Perform operations at the facility in accordance with the Landfill Operations & Maintenance Manual (latest approved version), applicable Engineering Drawings, the Operating Permit issued by the Nunavut Water Board;
2. Ensure that only acceptable wastes, as indicated on the approved list for disposal, are permitted at the site in consultation with regulatory agencies;
3. Prepare facility operating budgets and undertake staffing selections, and or contractors;
4. Communicate as required with regulatory agencies, including the forwarding of monitoring results;
5. Deal directly with the public, responding to disposal requests;
6. Coordinate site visits;
7. Maintain the environmental monitoring/sampling program;
8. Ensure that contractor receives required training;
9. Ensure that the site is maintained and operated in a clean and safe manner at all times, including regular collection of litter and compliance with Nunavut Safety Act and Regulations;
10. Coordinate the preparation of landfill areas for operation, and identifying the requirement for the establishment of surface water control measures.

Site Operator

The Site Operator is responsible for general site operation and maintenance requirements at the facility.

The Site Operator reports directly to the SAO and is responsible for the following:

- Supervises – Full-Time and Part-Time Assistants

- The Site Operator Shall:

1. Perform operations at the facility in accordance with the Landfill Operations & Maintenance Manual (latest approved version), applicable Engineering Drawings, and the Operating Permit issued by the Nunavut Water Board;
2. In consultation with the Site Owner, ensure that only acceptable wastes, as indicated on the approved list for disposal, are permitted at the site;
3. Prepare regularly scheduled reports (daily, weekly, monthly, annually) on progress and planning at the site;
4. Provide overall direction for daily site activities;
5. Conduct work in accordance with the Hamlet of Kugaaruk Occupation Health and Safety Program and Nunavut Safety Act and Regulations;
6. Be responsible for the operations and maintenance of the site machinery;
7. Make recommendations to the Site Owner for major and minor repair work required for site equipment as well as replacement of same;
8. Ensure that the site is maintained and operated in a clean and safe manner at all times, including regular collection of litter;
9. Ensure that solid waste is compacted and covered in accordance with the Landfill Operations & Maintenance Manual, burning of garbage is not allowed;
10. Coordinate snow removal and general maintenance for the access roads within the site and other areas as necessary;
11. Operate and maintain the surface water control structures and other site infrastructure;
12. Undertake site security checks, reporting any noted issues to the Site Owner;
13. Inspect the site access road on a regular basis to recover any accumulation of garbage or other debris;
14. In consultation with the Site Owner, maintain the completed portions of the landfill;
15. Ensure that adequate signage and traffic control devices are in place in coordination with the Site Owner;
16. Perform all duties related to the identification and recording of incoming vehicles, and inspection of incoming waste;
17. Answer incoming telephone calls and requests for information, directing such requests as required; and
18. Perform such other related duties as may be assigned from time to time by the Site Owner.

Site Assistants

The Site Assistants are responsible for tasks assigned to them by the Site Operator. These positions would typically address both ongoing and periodic general site operation and maintenance requirements.

The Site Assistants report directly to the Site Operator and is responsible for the following:

- The Site Assistants shall:

1. Perform duties as assigned by the Site Operator;
2. Conduct work in accordance with the Hamlet of Kugaaruk Occupation Health and Safety Program and Nunavut Safety Act and Regulations.

3.8 Personnel Training

The Hamlet is responsible for the training of staff. Solid Waste Facility staff should be trained to perform his or her job in a safe and environmentally responsible manner, in accordance with applicable regulations.

Given the nature of activities at the site, the SAO and Site Operator will serve as the facility's health and safety representative, and health and safety issues will be discussed as part of site meetings. All personnel should be familiar and abide by the Hamlet of Kugaaruk Occupation Health and Safety Program and Nunavut Safety Act and Regulations.

A review of this Operations and Maintenance Manual will be a prerequisite for any employee/contractor before being declared eligible for work at the landfill.

The contractor is required to comply with all laws and regulations affecting the execution of the work at the site, including all applicable Federal, Territorial and local laws and regulations pertaining to socio-economic and environmental matters.

4 MAINTENANCE PROCEDURES

Proper maintenance of a landfill is crucial to ensuring the efficient operation of all the components. Activities can be divided into two categories: storage/collection maintenance and site maintenance.

4.1 Storage Maintenance

As the first step in the waste collection process, residential and commercial storage containers should be adequately maintained. The following points should be considered:

- Private burning of wastes within the Hamlet boundaries should be discouraged as the smoke and fire hazards generally outweigh any benefit from reducing the volume of waste;
- Garbage containers should be covered to prevent wind blown debris from littering the community and to prevent animals from getting into the garbage;
- Bulky wastes should not be left in residential areas for long periods due to aesthetic and safety concerns.

4.2 Collection Maintenance

The waste collection vehicle should be maintained in good operating condition to ensure the collection service is not interrupted for extended periods. Other maintenance considerations include the following:

- The collection vehicle should be equipped with a shovel to clean up accidental spills during collection;
- The collection vehicle should be cleaned periodically.

4.3 Equipment Maintenance

Regular vehicle maintenance is to be performed on all Hamlet-owned equipment. This should include but is not limited to regular:

- oil changes
- fluid changes
- checking of tire pressure
- greasing
- brake pad replacement
- cleaning
- periodic maintenance requirements as set out by the equipment manufacturer

4.4 Building

The landfill operator building (Hamlet operation garage and garage where the garbage truck is stored) should be inspected regularly by the operator to observe signs of building deterioration or problems with heating, roof, etc. Any problems should be immediately reported to the SAO.

4.5 Fencing

A 1.8 m high fence is in place around the perimeter of the landfill. The fence serves the dual purpose of capturing wind-blown litter and restricting wildlife access to the facility. The fence must be regularly inspected and repairs must be completed as necessary to ensure that the fence remains in good condition. Large boulders have been placed along the front of the metals dump to delineate the start of the metal dumping area. This area should be inspected regularly to ensure that all metals waste is being disposed of in the designated areas.

4.6 Access Road Maintenance

The access road is gravel and approximately 500m long. Basic road maintenance is to be conducted as follows:

- At least twice per year, the road is to be graded to smooth and reshape the surface;
- During the winter, snow is to be removed to ensure unrestricted access to the site for the garbage collection vehicles.

4.7 Nuisance Control

4.7.1 Litter Control

Litter can be a significant problem at municipal solid waste disposal sites. Litter control is best accomplished by a combination of proper disposal operations, litter retaining fences, and a litter picking program. A clean, litter-free appearance will be maintained at the site at all times, not only for public relations, but also for efficient operation of the landfill. Poor litter control attracts unwanted scavengers and contributes to surface drainage problems by blocking ditches and culverts.

In summary, litter control measures shall include:

- Regular (weekly) covering of wastes in the active disposal area;
- Litter collection fencing located around the active fill area to catch blowing litter;
- A litter collection schedule shall be directed by the Site Operator;
- Litter on fencing, on site roadways, in ditches and adjacent properties shall be monitored and collected on a minimum monthly basis;
- Where possible, vegetation can be used as a screen to block wind.

4.7.2 Odour Control

Odours will be controlled at the facility by implementation of the following daily measures:

- Daily granular cover material shall be applied at the active disposal area;
- Routine site inspections to identify and eliminate localized surface water ponding and/or surface water drainage problems.

4.7.3 Bird Control

Solid waste disposal facilities attract birds due to the availability of food. This landfill facility is within the airport buffer zone and therefore bird control is very important. The landfill operators should make a daily note of how many birds are in and around the landfill. The intent of this is to keep a general record of bird populations and to determine whether the number of birds in and around the landfill is increasing or decreasing. Control measures to minimize the presence of birds shall include:

- Covering of compacted waste daily;
- Collecting litter;
- If this does not seem to minimize the amount of birds in the area then a noise device such as propane cannons and screechers may be required to discourage birds from the site.

4.8 Indiscriminate Dumping

Waste will be disposed at designated areas at the facility (bulky waste, wood products, tires, metals etc.) only. When indiscriminately dumped materials are discovered, they will be immediately relocated to the appropriate designated area.

4.9 Fire Maintenance

There is to be **NO** burning of waste at any time in the Solid Waste or Bulky Metals Facilities. There are no fire protection measures in place to prevent separate waste areas that must not be burned (eg. hazardous wastes, tires) from catching fire.

5 SAMPLING AND MONITORING PROGRAM

As per the conditions set out in the Hamlet's water licence, runoff from the solid waste facility as well as groundwater upstream and downstream of the facility and metals dump must be monitored each year during the spring and summer. The following sections describe in detail how the program must be completed.

5.1 Program Description

Figures 5-1 and 5-2 show the locations of the sampling points for the solid waste and metal dump sites. Samples should be taken at least once per year in the spring or early summer once everything has thawed and groundwater is flowing steadily. Sampling locations are marked on-site with signs stating the numbering code of the location.

**Image taken from Google Earth Pro, July 2008*

Figure 5-1. Sampling Locations for Solid Waste Facility

**Image taken from Google Earth Pro, July 2008*

Figure 5-2. Sampling Locations at Metal Dump Site

Table 5.1. GPS Locations of Sampling Points

Station	Latitude	Longitude
PEL-6	68° 31' 14.01" N	89° 49' 43.67" W
PEL-7	68° 31' 03.65" N	89° 49' 03.14" W
PEL-8-1	68° 31' 08.93" N	89° 49' 31.79" W
PEL-8-2	68° 31' 13.30" N	89° 49' 23.75" W
PEL-9-1	68° 30' 58.76" N	89° 49' 24.04" W
PEL-9-2	68° 30' 59.94" N	89° 49' 26.21" W
PEL-10-1	68° 31' 13.50" N	89° 49' 42.05" W
PEL-10-2	68° 31' 09.61" N	89° 49' 41.99" W

The water licence states that runoff from the solid waste facility must be tested each year during the spring and summer. Runoff should be tested at least once during this period; however, the Water Board may request that further sampling be completed. Runoff samples will be collected from sampling station PEL-6. The following is a list of parameters to be analyzed for the runoff sample.

Table 5.2. Parameters to be Analyzed at Station PEL-6

BOD (Biochemical Oxygen Demand)
pH
Total Suspended Solids
Nitrate-Nitrite
Total Phenols
Total Hardness
Magnesium
Sodium
Total Arsenic
Total Copper
Total Iron
Total Mercury
Fecal Coliforms
Conductivity
Oil and Grease
Ammonia Nitrogen
Total Alkalinity
Calcium
Potassium
Sulphate
Total Cadmium
Total Chromium
Total Lead
Total Nickel
TPH (Total Petroleum Hydrocarbons)
PAH (Polycyclic Aromatic Hydrocarbons)
BTEX (Benzene, Toluene, Ethylbenzene, Xylene)

The Water Board has also requested that groundwater monitoring wells be installed to measure contaminants in the groundwater upstream and downstream of the solid waste facilities. Two monitoring wells are to be installed upstream of the general solid waste site and two are to be installed downstream of this site. These stations are labeled PEL-8-1, PEL-8-2, PEL-10-1 and PEL-10-2 respectively. At the metals dump site, one monitoring well is to be installed upstream of the site, and two wells are to be installed downstream of the site. These stations are labeled PEL-7, PEL-9-1 and PEL-9-2 respectively. Samples should be collected at a minimum of once per year or as directed by the Water Board. The following table is a list of parameters to be analyzed from each sampling site.

Table 5.3. Sampling Parameters for PEL-7, PEL-8-1, PEL-8-2, PEL-9-1, PEL-9-2, PEL-10-1 and PEL-10-2

BOD (Biochemical Oxygen Demand)
pH
Total Suspended Solids
Nitrate-Nitrite
Total Phenols
Total Hardness
Magnesium
Sodium
Total Arsenic
Total Copper
Total Iron
Total Mercury
Fecal Coliforms
Conductivity
Oil and Grease
Ammonia Nitrogen
Total Alkalinity
Calcium
Potassium
Sulphate
Total Cadmium
Total Chromium
Total Lead
Total Nickel
TPH (Total Petroleum Hydrocarbons)
PAH (Polycyclic Aromatic Hydrocarbons)
BTEX (Benzene, Toluene, Ethylbenzene, Xylene)

All sampling, sample preservation and analysis is to be performed in accordance with methods approved by the Nunavut Water Board. All analysis must be completed in a Canadian Association of Environmental Analytical Laboratories (CAEAL) Certified Laboratory. Note that an example of one laboratory's sampling instructions is provided in Appendix E.

5.1.1 Record of Sampling Events

It is the responsibility of the Hamlet to file an Annual Report to the Nunavut Water Board no later than March 31st following the reported year. Appendix C contains a sample form pertaining to the monitoring program of the solid waste and metal dump facilities. This form is to be filled out and included in the Annual Report as documented in the Operation and Maintenance Manual for the Kugaaruk Sewage Treatment Facility.

5.2 Quality Assurance/Quality Control Plan for Solid Waste Monitoring Program

The Quality Assurance/Quality Control (QA/QC) Plan for sampling of the Solid Waste Treatment Facility has been developed using general QA/QC procedures. The plan includes sample collection procedures for grab samples collected from open water as well as samples collected from groundwater wells. Further detailed instruction may be required from the laboratory selected to perform analysis on the samples. Hamlet personnel responsible for sample collection are also responsible for contacting the lab prior to sample collection to ensure they have the proper instructions. They must also obtain a certificate from the lab stating that the lab is certified as a CAEAL Laboratory. Information in developing this plan was taken from *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, Water Resource Division and the Northwest Territories Water Board, July 1996); *Wastewater Sampling Instructions, Kitikmeot Region* (IEG Environmental, July 2005); and *Groundwater Well Sampling* (United States Environmental Protection Agency, January 1995).

5.2.1 Sample Collection

Please refer to Appendix D for instructions on collecting water samples.

5.2.2 Lab Analysis

Once the lab has received the samples, they will begin processing them. A report stating all results as well as the detection limits will be produced and sent to the Hamlet Office. The report will also state any problems that may have occurred during analysis of the samples.

6 SITE RECORDS

Copies of records pertaining to operation and maintenance of the solid waste and metals dump facilities should be kept at both the Hamlet Office and the Hamlet's Maintenance Garage. Information that must be included in these records (as per Guidelines for the Preparation of an Operation and Maintenance Manual for Sewage and Solid Waste Facilities in the Northwest Territories, Duong and Kent, 1996) includes the following:

- Volumes of any effluent discharged to the environment through an accidental spill;
- Estimated volume of waste collected and the generator of the waste (eg. Residential) (both monthly and annually);
- Details of any maintenance undertaken at site;
- Record sheets;
- Visits by regulatory authorities;
- Copies of sampling and analysis reports of the groundwater monitoring wells and runoff from the solid waste facility;
- Copies of annual reports submitted to the NWB;
- Copy of the Hamlet's water licence;
- Copies of all manuals pertaining to the operation and maintenance of the Sewage Lagoon and Wetland Treatment Facility (i.e. Operation and Maintenance Manual, QA/QC Plan, Spill Contingency Plan, Abandonment and Restoration Plan, Sludge Management Plan); and
- Copies of spill reports and related regulations.

7 SAFETY PROCEDURES

The following safety procedures should be obeyed in order to minimize health risks to personnel working in and around the wastewater and solid waste facilities:

- Equipment is to be kept clean;
- Protective clothing such as gloves and boots should be worn at all times;
- Work clothes must be kept in a designated change room and employees are to change into them when they arrive for work. Work clothes must NOT be worn home. The Hamlet's PW&S Maintenance Garage should be equipped with laundry facilities to wash work coveralls onsite;
- Hands to be washed frequently; as a minimum before eating and after work; and
- Personnel should receive appropriate vaccinations and ensure they are kept up-to-date. Please contact the Department of Health for a list of the appropriate vaccinations.

8 SITE ACCESS CONTROL

8.1 Contact Numbers

Contacts of those responsible for overseeing the operation and maintenance of the solid waste and metal dump facilities are as follows:

Contact Name	Office Contact Number	24 hr Contact Number
Andre Larabie (SAO)	(867) 769-6281	(867) 769-7277
Chris Mann (ASAO)	(867) 769-6281	(867) 769-7006
Gaetan Apsaktaun, Public Works Foreman	(867) 769-6131	not available

8.2 Site Access

Access to the solid waste and metal dump facilities will be open year round to the public. The solid waste facility is enclosed with a fence and an unlocked gate. This is to prevent wildlife from entering the site, however allows access for residents to drop off waste that is not picked up on a regular basis by the Hamlet. A watchman fence will be constructed at the entrance to the metals dump facility to mark the starting location of the facility. There will not be a gate so access will be available to the public at all times. The purpose of this is to encourage residents to bring their waste to the site as well as to recycle items from the facility that may be of use.

9 EMERGENCY RESPONSE

The Hamlet must be able to respond efficiently and effectively to all possible emergencies that may be encountered in the operation of the Hamlet's facilities. These include, but are not limited to fuel, chemical and wastewater spills as well as fires. Due to the nature of the Hamlet's facilities, burning or spillage of unknown or hazardous materials may occur. Only personnel who are properly trained to deal with these situations should respond to such emergencies.

Personnel must familiarize themselves with the emergency preparedness plans before an accident or emergency occurs. Copies of these plans must be kept in all sewage and solid waste disposal vehicles as well as in all common work areas. The following sections list contact numbers and outline procedures to follow in the event of an emergency.

9.1 Emergency Contact Numbers

The following is a list of contact numbers in the case of an emergency:

Fire Department:	(867) 769-7222
RCMP Detachment:	(867) 769-1111
24 Hour Spill Response Line:	(867) 920-8130

9.2 Spill Contingency Plan

A spill contingency plan has been created for activities associated with Hamlet operations including the water treatment plant, sewage lagoon, solid waste facility, and storage and handling of hazardous materials. A copy of the plan may be found in the Hamlet office and the PW&S Maintenance Garage. Hamlet personnel must familiarize themselves with the plan in order to respond quickly and effectively in the event of a spill.

9.3 Fire Response Plan

The Hamlet Fire Department is responsible for creating a contingency plan to deal with fires in the Hamlet. As burning of waste may produce harmful gases, special precautions should be taken when responding to fires in and around the solid waste facility. In the event of an uncontrolled fire in the Hamlet, the following steps should be taken:

- Immediately evacuate the area and go to the Hamlet's meeting place;
- Keep everyone including Hamlet personnel up-wind from the source; and
- Contact the Hamlet Fire Department at (867) 769-7222.

9.4 Bear Safety

Solid Waste Facilities are an attractant for a number of wildlife species, especially bears. For this reason, it is imperative that all personnel working in and around the solid waste site be properly trained in bear safety. For information on polar bear safety please refer to the following website:

http://dsp-psd.pwgsc.gc.ca/Collection/R62-342-2001E.pdf or contact Parks Canada, Western Arctic Field Unit at (867) 777-8800 or Auyuittuq and Quttinirpaaq National Parks at (867) 473-8828. For information on black bear and grizzly bear safety please refer to the Department of Environment and Natural Resources, Government of the Northwest Territories website: http://www.enr.gov.nt.ca/_live/pages/wpPages/Home.aspx.

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APPENDIX A

Kugaaruk Water Licence

P.O. Box 119
Gjoa Haven, NU X0B 1J0
Tel: (867) 360-6338
Fax: (867) 360-6369

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NUNAVUT WATER BOARD
NUNAVUT IMALIRIYIN KATIMAYINGI
OFFICE DES EAUX DU NUNAVUT

DECISION

LICENCE NUMBER: 3BM-PEL0712

This is the decision of the Nunavut Water Board (NWB) with respect to an application for a Licence amendment and renewal originally received May 31, 2006, made by:

Hamlet of Kugaaruk

to allow for the use of water and disposal of waste for the Hamlet of Kugaaruk, located within the Kitikmeot Region, Nunavut. With respect to this application, the NWB gave notice to the public that the Hamlet had filed an application for a water licence.

DECISION

After having been satisfied that the application was exempt from the requirement for screening by the Nunavut Impact Review Board in accordance with S. 12.3.2 of the *Nunavut Land Claim Agreement* (NLCA), the NWB decided that the application could proceed through the regulatory process. After reviewing the full submission of the Applicant and written comments expressed by interested parties, the NWB, having given due regard to the facts and circumstances, the merits of the submissions made to it and to the purpose, scope and intent of the *NLCA* and of the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (NWNSRTA), decided to waive the requirement to hold a public hearing and determined that:

Licence Number 3BM-PEL0712 be issued subject to the terms and conditions contained therein. (Motion #: 2007-24)

SIGNED this 7th day of September, 2007 at Gjoa Haven, NU.

Original signed by:

_____

Thomas Kabloona
Acting Chief Executive Officer

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I. BACKGROUND

The Hamlet of Kugaaruk is located 68°32' north latitude and 89°49' west longitude in central Nunavut, within the Kitikmeot Region. This places Kugaaruk along the east coast of Pelly Bay, which is roughly nine hundred and sixty kilometers (960 km) west of the capital of Iqaluit. The annual snowfall in Kugaaruk is approximately 125 cm and the annual rainfall is approximately 11 cm. In January the daily mean temperatures is approximately minus 33^0C while in July the daily mean temperature is approximately plus 6^0C. Freeze up usually occurs during the month of November but may happen as early as September or October while spring thaw usually happens between late May and June.

II. PROCEDURAL HISTORY

On May 31, 2006, an application for the amendment and renewal of water licence NWB3PEL9803 was filed by Dillon Consulting Ltd.(Dillon), Yellowknife, NT, on behalf of the Hamlet of Kugaaruk. The Hamlet of Kugaaruk is applying for the renewal of its Water License, which was issued on November 1, 1998 and expired on October 31, 2003. The scope of the application included the planned upgrades to the sewage (lagoon) and solid waste disposal facilities (improved fencing).

An initial assessment of the Hamlet's application for water use and waste disposal activities within the Hamlet was undertaken, so that the Board could make a fully informed decision on the merits of application. An internal technical assessment was completed and a request for additional information and clarification was made by the NWB on November 14, 2006. The response to this request and to comments received from interested parties on an initial request in May, 2007, was received on July 19, 2007.

Information contained in the July 19, 2007 submission and distributed for review was as follows:

- Detailed Design Phase II (July, 2007; Dillon Consulting Ltd.), with the following Appendices
  - Appendix A: Stamped Design Drawings
  - Appendix B: Population Statistics
  - Appendix C: Laboratory Analyses
  - Appendix D: Sample Tables of Contents (Spill Contingency, O&M)
  - Appendix E: NWB letter of November 14, 2006
  - Appendix F: Laboratory Analysis & INAC inspection
  - Appendix G: Letters from Hamlet & from NWB
  - Appendix H: Community poster
  - Appendix I: GCL specification sheet
  - Appendix J: Letters from INAC, Env. Can., GN Dept of Env.
- Response to the NWB letter of November 14, 2006
- GN/Dillon response (Questions 1-3)

- AMEC response (Questions 4-14)
- GN response to previous INAC, Environment Canada, and GN-DOE comments

The Nunavut Water Board publicly posted notice of this application, in accordance with the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* S. 55.1 and Article 13 of the *Nunavut Land Claims Agreement*, on May 7, 2007. This assessment process included the referral of the application to a variety of Federal, Territorial and local organizations for their review and comment. The additional information received on July 19, 2007 from the Department of Community and Government Services, Government of Nunavut on behalf of the Hamlet, containing information prepared by Dillon, was forwarded to the parties for additional review on July 24, 2007.

As no public concern was expressed, the NWB waived the requirement to hold a public hearing and proceeded with the application process.

Based upon the results of the detailed assessment, including consideration of any potential accidents, malfunctions, or impacts to water, that the overall project might have in the area, the Board approved the application and has issued Licence 3BM-PEL0712.

III. ISSUES

Term of the Licence, Reporting, Manual and Plan Submissions

In accordance with the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* S. 45, the NWB may issue a licence for a term not exceeding twenty-five years. In determining an appropriate term of a water licence, the Board considers a number of factors, including, but not limited to, the results of the Department of Indian Affairs and Northern Development (INAC) site inspections and the compliance record of the Applicant. In review of the previous water licence NWB3PEL9803, the NWB has noted that there were several issues of non-compliance with conditions contained therein. The issues varied throughout the duration of the Licence, however re-occurring items were significant and as follows:

i. The Licensee did not include in Annual Reports, the water quality results for monitoring under Schedule 1: Surveillance Network Program;
ii. The Licensee did not submit an Operations and Maintenance Plan during the Licence term; and
iii. Based on Inspectors sample results, effluent standards regarding Biochemical Oxygen Demand, Suspended Solids and Fecal Coliforms were not met.

Term of Licence

In review of the application and the comments received from interested persons, there were no objections to the Applicants request for a term of five (5) years for the Licence renewal. The NWB concurs that a term of five (5) years is appropriate, and will allow enough time for the Hamlet to establish a consistent compliance record with the terms and conditions of its licence. Appropriate Plans need to be developed to the satisfaction of the NWB for the operation and maintenance of the facilities as well as for the protection of the environment with regard to potential spills through day-to-day operations.

Annual Report

The NWB has imposed on the Licensee, the requirement to produce an Annual Report. These Reports are for the purpose of ensuring that the NWB has an accurate annual update of municipal activities during a calendar year. This information is maintained on the public registry and is available to interested parties upon request. A *"Standardized Form for Annual Reporting"* is to be used by the Licensee and is available from the NWB file transfer protocol (FTP) site under the Public Registry link at the NWB Website.

Operational Plans

The NWB recognizes the significant efforts put forward by the Licensee within the renewal application. It is noted, however, that the Licensee has not submitted an Operations and Maintenance (O&M) Plan or an Environmental Emergency Contingency Plan with the Application for Renewal of Licence, filed with the Board on May 31, 2006 or in its follow-up submissions. This Licence has therefore, included the requirement to provide to the NWB the following Plans, as identified within the Licence:

i. *Water Distribution Facility Operation and Maintenance (O&M) Plan*;
ii. *Sewage Treatment Facility Operation and Maintenance (O&M) Plan*;
iii. *Solid Waste Facility Operation and Maintenance (O&M) Plan*;
iv. *Environmental Emergency Contingency Plan For Water, Sewage and Solid Waste Operations in the Hamlet of Kugaaruk, Nunavu*t; and the
v. *Monitoring Program Quality Assurance/Quality Control Plan*

The purpose of the *Plans* noted above is to assist Hamlet staff in the proper operation and maintenance of their water distribution and waste disposal facilities. The *Plans* should demonstrate to the Nunavut Water Board that the Hamlet is capable of operating and maintaining the infrastructure related to water use and waste disposal adequately and to meet the requirements of the Licence. The Plans should be based, at a minimum on the various NWB-approved guidelines available (i.e. *Guidelines for the Preparation of an Operations and Maintenance Manual for Sewage and Solid Waste Disposal Facilities in the Northwest Territories*, Duong and Kent, 1996) and other regulatory guidelines as deemed appropriate.

The purpose of the Monitoring Program, the *Quality Assurance/Quality Control (QA/QC) Plan* 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 sampling requirements have been imposed, additional sampling may be requested by an Inspector.

Water Use

The Hamlet of Kugaaruk currently utilizes the Kugajuk River as a source of potable water. The intake for the Hamlet's Water Supply Facility is located approximately one kilometer (1 km) upriver from the community. The intake consists of two (2) one hundred and fifty two millimeter (152 mm) submerged lines that extend from the shore approximately fifteen meters (15 m) along the bottom of the river. The two intake lines travel up from the shoreline about ten meters (10 m) where they enter the Water Supply Facility truck fill station. Water is transferred by submersible pump to the distribution vehicles following chlorine treatment, and is then distributed to the community by truck. Water consumption in 2006 was reported to be 23,507 m^3. Projected water use in 2012 is reported to be 31,205 m^3. The amount of water use requested by the Applicant for the term of the Licence is 35,000 cubic metres per year.

No concerns were raised by the parties in their written submissions as to the amount of water required by the Applicant, the manner in which it is obtained or in the manner in which this water will be used. The NWB has determined that the increase in water use volume requested within this application will not substantially affect the quality, quantity or flow of waters, and has set the terms and conditions associated with water use by the Hamlet accordingly.

Deposit of Waste

Sewage

The Hamlet of Kugaaruk currently provides trucked sewage services for the Community's residents, businesses and institutions. The Sewage Treatment Facility, operated by the Hamlet of Kugaaruk is located approximately 1.0 km from the Hamlet. Sewage is collected by vacuum truck from customer holding tanks and discharged to the sewage lagoon located to the east of the community, north of the Access Road and adjacent to the solid waste disposal facility. The Hamlet currently utilizes a two cell facultative lagoon system that began operating about 14 years ago. The original lagoon was designed as a single cell. The second cell was only constructed later as an ad hoc addition to the system by Hamlet crews and has little capacity. The system developed leaks and attempts were made to reinforce the berms surrounding the cells in the summer of 2004. Subsequent to the repairs, the leaking was reduced however the effluent continues to leak from the system at an elevated rate. Dillon Consulting made an initial site visit to the community in July 2005 to assess the breaches in the lagoon berms and to test the quality of the effluent being discharged into the ocean.

Upgrading of the current sewage lagoon system has been applied for within the current application

for amendment and renewal, to provide annual sewage treatment for the Hamlet for the projected twenty (20) year period.

Sewage effluent from the new lagoon system will be discharged as before, annually overland through a Wetland Treatment Area to the Final Discharge Point approximately one hundred and sixty meters (160 m) at the ocean shoreline. The wetland is contained by rock outcroppings on both sides. The change in elevation is roughly seventeen meters (17 m) and consists of multiple channels with three or four ponding areas.

Discharge from this upgraded facility is planned to take place annually, weather dependent, from July until October.

During the construction phase, a packaged two stage temporary sewage treatment system is to be used to treat the Hamlet wastewater while the Lagoon is being completed. This system is expected to provide treatment well above primary treatment, and will be close to secondary sewage treatment (TSS and BOD_5 below 45 mg/L). This system will be subject to the same effluent quality criteria as the lagoon system and will be required to comply under Part D, Item 3.

Specific comments relevant to sewage disposal operations in the Hamlet were provided by GN-DOE, INAC and Environment Canada.

Environment Canada noted that any effluent discharged must be in compliance with Section 36(3) of the Fisheries Act. The Department of the Environment (GN) also noted the requirements that effluent quality meet applicable legislative requirements. Monitoring of the Sewage Lagoon effluent (Sewage Disposal Facility) was requested, by both Parties, in order to assess the treatment efficiency within the wetland treatment area. The NWB concurs with this and has included monitoring requirements for the Sewage Lagoon. In order to effectively monitor these effluents for compliance purposes, the NWB has imposed acute toxicity testing as a licence requirement under Part D, Item 10.

Both the Department of the Environment (GN) and Environment Canada noted that maintenance should include removal and disposal of sewage sludge. Environment Canada recommended that prior to de-sludging occurring, the Licensee submit for approval a Sewage Sludge Management Plan that clearly outlines the chemical composition of the sludge, and how sludge will be stored, treated and eventually disposed of. The NWB concurs with this recommendation, and has imposed this requirement in Part F, Item 1(ii).

The NWB recognizes the need to determine the treatment efficiencies of the wetland treatment over a suggested period of 5 years. In order to provide the additional design data required to adequately assess the system, a Wetland Treatment Area Assessment Report is to be developed that will provide the criteria needed in order to properly assess the efficiency of the system over time. Verification of assumed flow pattern, residence time and determination of a focal point of release for the Final

Discharge Point are all needed in order to demonstrate the effectiveness of the system. This requirement is detailed in Part D, Item 7.

In considering that the Licence term has been set to five (5) years, and in allowing for the construction of the facilities, the Board has determined that a future treatment efficiency of the Wetland Treatment Area be assessed in year 5 of this Licence. For future planning a further assessment may be considered by the Board in an application for Licence renewal.

Both the Department of the Environment (GN) and Environment Canada noted that an Environmental Emergency Contingency Plan for Water, Sewage and Solid Waste Operations in the Hamlet of Kugaaruk, Nunavut has not yet been prepared, and submitted to the NWB by the Licensee. Both Parties recommended that the Licensee develop this Plan as soon as possible, and submit it to the NWB for approval. The NWB concurs with this recommendation, and has imposed this requirement in Part F, Item 2

Solid Waste

The Hamlet's Solid Waste Facility is located southeast of the sewage treatment lagoon, approximately 2.3 km east of the community, north of the Access Road. Waste is collected by the Hamlet and transported to the waste disposal facility. The bulky metal/hazardous waste storage area is locate approximately half a kilometer (500m) southeast of the sewage lagoon and landfill sites. The information submitted to the NWB has indicated that the storage of these materials is in need of clean-up, planning, design and implementation. Recommendations have been provided to the GN by Dillon within the additional information received July 10, 2007, however no formal plan has been developed to address this issue. The development of an Operations and Maintenance Plan for the Solid Waste Disposal Facility will be required to set out procedures for the segregation, storage and eventual removal for disposal of hazardous wastes.

Environment Canada noted in their comments, the requirement for a Solid Waste Disposal Facility Operation and Maintenance (O&M) Plan, which reflects a commitment to waste reduction and proper handling of hazardous waste. The NWB notes that a Plan for this facility has not yet been prepared and submitted to the Board.

Accordingly, this Plan has been requested under Part F, Item 1 to ensure the Plan is current and takes into consideration concerns presented during the review of the Application, including any incineration planned at the Solid Waste Disposal Facility.

Additionally, in their comments regarding the disposal of solid wastes, the Department of the Environment (GN) recommended that groundwater monitoring wells be installed downstream of the solid waste landfill and the existing metals dump area. Although diversion ditches or berms are commonly installed around landfills to redirect surface runoff, groundwater monitoring wells are intended to help verify that historical contaminants which may be present in the landfill are not

migrating off site as a result of precipitation or snowmelt. The NWB concurs with this recommendation and has specifically requested that the inclusion of groundwater monitoring be addressed in the Solid Waste Disposal Facility's Operation and Maintenance Plan as presented in Part F, Item 1.

Abandonment and Restoration

To ensure that all future abandoned facilities are reclaimed in an appropriate manner, the NWB requires Licensees to submit an *Abandonment and Restoration Plan*. This plan is to be submitted at least six (6) months prior to final closure of Licenced facilities or upon submission of the final design drawings for the construction of new facilities to replace existing ones. The requirements for the Plan are outlined in Part G of this License. The NWB encourages the Licensee to undertake progressive reclamation on sites where possible.

IV. LICENCE 3BM-PEL0712

Pursuant to the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* and the *Agreement Between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in Right of Canada*, the Nunavut Water Board, hereinafter referred to as the Board, hereby grants to

HAMLET OF KUGAARUK

(Licensee)

of **P.O. BOX 205, KUGAARUK, NUNAVUT X0B 1K0**

(Mailing Address)

hereinafter called the Licensee, the right to alter, divert or otherwise use water for a period subject to restrictions and conditions contained within this licence:

Licence Number **3BM-PEL0712**

Water Management Area **NUNAVUT 07**

Location **KUGAARUK, NUNAVUT (Latitude 68°32'N and Longitude 89°49'W**

Purpose **WATER USE AND WASTE DISPOSAL**

Description **MUNICIPAL UNDERTAKINGS**

Quantity of Water Not to Exceed **35,000 CUBIC METRES ANNUALLY**

Date of Licence **September 7, 2007**

Expiry Date of Licence **December 31, 2012**

Dated this 7th of September 2007 at Gjoa Haven, NU.

Original signed by:

Thomas Kabloona
Acting Chief Executive Officer

PART A: SCOPE AND DEFINITIONS

1. Scope

a. This Licence allows for the use of water and the disposal of waste for municipal undertakings at the Hamlet of Kugaaruk, Kitikmeot Region, Nunavut (68°31' N; 89°54'W);

b. This Licence is issued subject to the conditions contained herein with respect to the taking of water and the depositing of waste of any type in any waters or in any place under any conditions where such waste or any other waste that results from the deposits of such waste may enter any waters. Whenever new Regulations are made or existing Regulations are amended by the Governor in Council under the *Nunavut Waters and Nunavut Surface Rights Tribunal Act*, or other statutes imposing more stringent conditions relating to the quantity or type of waste that may be so deposited or under which any such waste may be so deposited, this Licence shall be deemed, upon promulgation of such Regulations, to be subject to such requirements; and;

c. Compliance with the terms and conditions of this Licence does not absolve the Licensee from responsibility for compliance with the requirements of all applicable Federal, Territorial and Municipal legislation.

2. Definitions

In this Licence: **3BM-PEL0712**

"Act" means the *Nunavut Waters and Nunavut Surface Rights Tribunal Act;*

"Amendment" means a change to original terms and conditions of this licence requiring correction, addition or deletion of specific terms and conditions of the licence; modifications inconsistent with the terms of the set terms and conditions of the Licence;

"Analyst" means an Analyst designated by the Minister under Section 85 (1) of the *Act*;

''Appurtenant undertaking'' means an undertaking in relation to which a use of waters or a deposit of waste is permitted by a licence issued by the Board;

"Average Concentration" means the arithmetic mean of the last four consecutive analytical results for composite or grab samples collected from the monitoring stations identified in Part H;

"Board" means the Nunavut Water Board established under the *Nunavut Land Claims*

Agreement;

"Chief Administrative Officer" means the Executive Director of the Nunavut Water Board;

"Commercial Waste Water" means water and associated waste generated by the operation of a commercial enterprise, but does not include toilet wastes or greywater;

"Composite Sample" means a water or wastewater sample made up of four (4) samples taken at regular periods over a 24 hour period;

"Effluent" means treated or untreated liquid waste material that is discharged into the environment from a structure such as a settling pond or a treatment plant;

"**Engineer**" means a professional engineer registered to practice in Nunavut in accordance with the *Engineering, Geological and Geophysical Act (Nunavut)* S.N.W.T. 1998, c.38, s.5;

"Final Discharge Point" means the discharge location at the Sewage Disposal Facility as described in the Final Design Report, to be confirmed through on-site investigation and approval by an Inspector under Part D, Items 3 and 9;

"Freeboard" means the vertical distance between water line and the designed maximum operating height on the crest of a dam or dyke's upstream slope;

"Geotechnical Engineer" means a professional engineer registered with the Association of Professional Engineers, Geologist and Geophysicists of Nunavut and whose principal field of specialization with the engineering properties of earth materials in dealing with man-made structures and earthworks that will be built on a site. These can include shallow and deep foundations, retaining walls, dams, and embankments;

"Grab Sample" means a single water or wastewater sample taken at a time and place representative of the total discharge;

"Greywater" means all liquid wastes from showers, baths, sinks, kitchens and domestic washing facilities, but does not include toilet wastes;

"Inspector" means an Inspector designated by the Minister under Section 85 (1) of the *Act*;

"Licensee" means the holder of this Licence;

"Modification" means an alteration to a physical work that introduces new structure or eliminates an existing structure and does not alter the purpose or function of the work, but does not include an expansion, and changes to the operating system that are consistent with the terms of this Licence and do not require amendment;

"Monitoring Program" means a monitoring program established to collect data on surface water and groundwater quality to assess impacts to the freshwater aquatic environment of an appurtenant undertaking;

"Nunavut Land Claims Agreement" (NLCA) means the "*Agreement Between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada*", including its preamble and schedules, and any amendments to that agreement made pursuant to it;

"Sewage" means all toilet wastes and greywater;

"Sewage Disposal Facilities" comprises the engineered lagoon and decant structures designed to contain and treat sewage as described in the Application for Water Licence filed by the Applicant on May 31, 2006 along with the additional information and final design drawings, signed and stamped submitted July, 2007;

"Solid Waste Disposal Facilities" means the facilities designated for the disposal of solid waste, as described in the Application for Water Licence filed by the Licensee on May 31, 2006 along with the additional information and final design drawings, signed and stamped submitted July, 2007;

"Toilet Wastes" means all human excreta and associated products, but does not include greywater;

"Waste" means, as defined in S.4 of the *Act*, any substance that, by itself or in combination with other substances found in water, would have the effect of altering the quality of any water to which the substance is added to an extent that is detrimental to its use by people or by any animal, fish or plant, or any water that would have that effect because of the quantity or concentration of the substances contained in it or because it has been treated or changed, by heat or other means;

"Water Supply Facilities" comprises the area and associated intake infrastructure at the Kugajuk River, as described in the Application for Water Licence filed by the Licensee on May 31, 2006;

"Wetland Treatment Area" comprises the area of land immediately downstream of the Waste Water Treatment Facility (Sewage Lagoon), to the Final Discharge Point approximately one hundred and sixty meters (160 m) down to the ocean shoreline as described in the Application for Water Licence filed by the Applicant on May 31, 2006.

PART B: GENERAL CONDITIONS

1. The Licensee shall file an Annual Report with the Board not later than March 31st of the year following the calendar year reported which shall contain the following information:

   i. tabular summaries of all data generated under the "Monitoring Program";

   ii. the monthly and annual quantities in cubic metres of fresh water obtained from the Water Supply Facilities;

   iii. the monthly and annual quantities in cubic metres of each and all waste discharged;

   iv. a summary of modifications and/or major maintenance work carried out on the Water Supply and Waste Disposal Facilities, including all associated structures and facilities;

   v. a list of unauthorized discharges and summary of follow-up action taken;

   vi. a summary of any abandonment and restoration work completed during the year and an outline of any work anticipated for the next year;

   vii. Any updates or revisions for manuals and plans (i.e., *Operations and Maintenance, Abandonment and Restoration, QA/QC*) as required by changes in operation and/or technology;

   viii. a summary of any studies or reports requested by the Board that relate to water use and waste disposal or reclamation, and a brief description of any future studies planned;

   ix. any other details on water use or waste disposal requested by the Board by November 1st of the year being reported; and

2. The Licensee shall comply with the "Monitoring Program" described in this Licence, and any amendments to the "Monitoring Program" as may be made from time to time, pursuant to the conditions of this Licence.

3. The "Monitoring Program" and compliance dates specified in the Licence may be modified at the discretion of the Board.

4. Meters, devices or other such methods used for measuring the volumes of water used and waste discharged shall be installed, operated and maintained by the Licensee to the satisfaction of an Inspector.

5. The Licensee shall, within ninety (90) days after the first visit by the Inspector following

issuance of this Licence, post the necessary signs, where possible, to identify the stations of the "Monitoring Program." All signage postings shall be in the Official Languages of Nunavut, and shall be located and maintained to the satisfaction of an Inspector.

6. The Licensee shall immediately report to the 24-Hour Spill Report Line (867-920-8130) any spills of Waste, which are reported to, or observed by the Licensee, within the municipal boundaries or in the areas of the Water Supply or Waste Disposal Facilities.

7. The Licensee shall ensure a copy of this Licence is maintained at the Municipal Office at all times. Any communication with respect to this Licence shall be made in writing to the attention of:

(i) Manager of Licensing:

Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU X0B 1J0
Telephone: (867) 360-6338
Fax: (867) 360-6369
Email: licensing@nunavutwaterboard.org

(ii) Inspector Contact:

Water Resources Officer
Nunavut District, Nunavut Region
P.O. Box 100
Iqaluit, NU X0A 0H0
Telephone: (867) 975-4295
Fax: (867) 979-6445

(iii) Analyst Contact:

Taiga Laboratories
Department of Indian and Northern Affairs
4601 – 52 Avenue, P.O. Box 1500
Yellowknife, NT X1A 2R3
Telephone: (867) 669-2781
Fax: (867) 669-2718

8. The Licensee shall submit one paper copy and one electronic copy of all reports, studies, and plans to the Board. Reports or studies submitted to the Board by the Licensee shall include a detailed executive summary in Inuktitut.

9. The Licensee shall ensure that any document(s) or correspondence submitted by the Licensee to the Board is received and acknowledged by the Manager of Licensing.

10. This Licence is not assignable except as provided in Section 44 of the Act.

PART C: CONDITIONS APPLYING TO WATER USE

1. The Licensee shall obtain all fresh water from the Kugajuk River using the Water Supply Facilities or as otherwise approved by the Board.

2. The annual quantity of water used for all purposes shall not exceed 35,000 cubic metres.

3. The Licensee shall maintain the Water Supply Facilities to the satisfaction of the Inspector.

4. The Licensee shall equip all water intake hoses with a screen of an appropriate mesh size to ensure that fish are not entrained and shall withdraw water at a rate such that fish do not become impinged on the screen.

PART D: CONDITIONS APPLYING TO WASTE DISPOSAL

1. The Licensee shall direct all Sewage to the Sewage Disposal Facilities or as otherwise approved by the Board.

2. The Licensee shall provide notice to an Inspector at least ten (10) days prior to initiating any decant of the Sewage Disposal Facilities.

3. All Effluent discharged from the Sewage Disposal Facilities at Monitoring Program Station PEL-3 shall meet the following effluent quality standards:

Parameter	Maximum Average Concentration
BOD_5	120 mg/L
Total Suspended Solids	180 mg/L
Faecal Coliforms	1×10^4 CFU/100mL
Oil and grease	No visible sheen
pH	between 6 and 9

4. The Licensee shall maintain at all times, a freeboard of at least 1.0 metre, or as recommended by a qualified geotechnical engineer and as approved by the Board, for all dams, dykes or other structures intended to contain, withhold, divert or retain water or wastes.

5. The Sewage Disposal Facility shall be maintained and operated, to the satisfaction of an Inspector in such a manner as to prevent structural failure.

6. The Licensee shall provide to the Board for approval, prior to the commissioning of the Enhanced Wetland Treatment Area as an integral component of the sewage treatment or within ninety (90) days of completion, whichever occurs first, a Wetland Treatment Area assessment that includes, but is not limited to:

   i. Final, as built plans/drawings that have been signed, stamped and sealed by an Engineer, of the Wetland Treatment Area that include but are not limited to a topographical map, cross and longitudinal sections of the treatment area indicating anticipated flow patterns;

   ii. Identify the Final Discharge Point as required to complete monitoring requirements under Part D, Item 9;

   iii. An ecological/vegetative assessment of the area to be used, including a prediction of the time required to achieve the effluent quality as described in the Application for Water Licence renewal filed by the Licensee on May 31, 2006; and

   iv. A Description of the gradient, holding capacity, and verification of the total area utilized which has been predicted as required to attain the proposed effluent quality, describing any discrepancies and the affects it will have on the predictive model outcome along with contingencies.

7. The Licensee shall notify the Board and the Inspector, at least sixty (60) days prior to the commissioning of the Wetland Treatment Area for sewage treatment.

8. Upon commissioning of the Wetland Treatment Area, all effluent discharges from the Wetland Treatment Area at its Final Discharge Point, Monitoring Program Station PEL-4 shall meet the following effluent quality standards:

Parameter	**Maximum Average Concentration**
BOD_5	45 mg/L
Total Suspended Solids	45 mg/L
Faecal Coliforms	(1×10^4 CFU/100ml)
Oil and grease	No visible sheen
pH	between 6 and 9

9. All Effluent discharged from the Wetland Treatment Area Final Discharge Point (PEL-4), shall be demonstrated to be Not Acutely Toxic under the following tests to be conducted once annually approximately mid-way through discharge:

    i. Acute lethality to Rainbow Trout, *Oncorhynchus mykiss* (as per Environment Canada's Environmental Protection Series Biological Test Method EPS/1/RM/13); and

    ii. Acute lethality to the crustacean, *Daphnia magna* (as per Environment Canada's Environmental Protection Series Biological Test Method EPS/1/RM/14).

10. The Licensee shall dispose of and contain all solid wastes at the Solid Waste Disposal Facilities or as otherwise approved by the Board.

11. The Licensee shall segregate and store all hazardous materials and/or hazardous waste within the Solid Waste Disposal Facility in a manner as to prevent the deposit of deleterious substances into any water until such a time as proper disposal arrangements are made.

PART E: CONDITIONS APPLYING TO MODIFICATION AND CONSTRUCTION

1. The Licensee shall submit to the Board for approval, design drawings stamped by a qualified engineer registered in Nunavut, prior to the construction of any dams, dykes or structures intended to contain, withhold, divert or retain water or wastes.

2. The Licensee may, without written approval from the Board, carry out modifications to the Water Supply and Waste Disposal Facilities provided that such modifications are consistent with the terms of this Licence and the following requirements are met:

    i. the Licensee has notified the Board in writing of such proposed modifications at least sixty (60) days prior to beginning the modifications;
    ii. these modifications do not place the Licensee in contravention of the Licence or the Act;
    iii. the Board has not, during the sixty (60) days following notification of the proposed modifications, informed the Licensee that review of the proposal will require more than sixty (60) days; and
    iv. the Board has not rejected the proposed modifications.

3. Modifications for which all of the conditions referred to in Part E, Item 2, have not been met may be carried out only with written approval from the Board. The Licensee shall provide as-built plans and drawings of the Modifications referred to in this Licence within ninety (90) days of completion of the Modification. These plans and drawings shall be stamped by an Engineer.

4. All activities shall be conducted in such a way as to minimize impacts on surface drainage and the Licensee shall immediately undertake any corrective measures in the event of any impacts on surface drainage

5. The Licensee shall ensure that sediment and erosion control measures are implemented prior to and maintained during the operation to prevent the release of sediment and minimize erosion.

6. The Licensee shall designate an area for the deposition of excavated and stockpiled materials that is at least thirty (30) metres above the ordinary high water mark of any water body and in such a manner as to prevent sediment from entering any surrounding water body.

7. All activities shall be conducted in such a way as to minimize impacts on surface drainage and the Licensee shall immediately undertake any corrective measures in the event of any impacts on surface drainage.

8. The Licensee shall ensure that all fill material used in construction and that the ground to be constructed upon, is free of contaminants. If contaminated soils are identified, notification shall be made in the Licensee's annual report. All contaminated soils shall be treated and disposed of as approved by the Board.

9. The Licensee shall provide a Final Construction Report, within ninety (90) days of completion of the construction, outlining any alteration or deviation from the Final Design and Specifications, which will include, but not be limited to, as built plans/drawings that have been signed, stamped and sealed by an Engineer, of the upgrades to the Sewage Disposal Facilities and Solid Waste Disposal Facilities as described in the Application for Water Licence renewal filed by the Licensee on May 31, 2006 and the additional information submitted on July 10, 2007.

PART F: CONDITIONS APPLYING TO OPERATION AND MAINTENANCE

1. The Licensee shall submit to the Board for approval, within ninety (90) days of issuance of the Licence, the following operations and maintenance manuals prepared where appropriate, in accordance with the *"Guidelines for the Preparation of an Operation and Maintenance Manual for Sewage and Solid Waste Disposal Facilities in the Northwest Territories; 1996"*. These Manuals shall take into consideration, at a minimum, the comments received during the application review process and any necessary changes to be consistent with this Licence:

   i "*Water Collection and Distribution Operation and Maintenance (O&M) Manual*";
   ii "*Sewage Treatment Facility Operation and Maintenance (O&M) Manual*". This Plan shall also include a Sewage Sludge Management Plan that will specifically address, but not be limited to, characterization of the sludge, identifying the chemical

composition of the sludge and how the sludge will be stored, treated and eventually disposed of ; and

iii "*Solid Waste Disposal Facility Operation and Maintenance (O&M) Manual*". In addition to the guidelines, the Licensee shall include a design, implementation and monitoring schedule for the placement of monitoring wells at the Solid Waste Disposal Facility.

2. The Licensee shall submit to the Board for approval within ninety (90) days of issuance of the Licence, an Environmental Emergency Contingency Plan For Water, Sewage and Solid Waste Operations in the Hamlet of Kugaaruk, Nunavut" for any upsets, breakages or malfunctions that may occur as a result of operating these facilities. This Plan is to take into consideration at a minimum, the comments received during the Application review process and any applicable guidance documents approved by the NWB.

3. If the Manuals or Plans referred to in this Part are not approved, the Licensee shall make the necessary revisions and resubmit the Manual(s) or Plan within thirty (30) days following notification from the Board.

4. The Licensee shall implement the Manuals and Plan specified in this Part as and when approved by the Board.

5. The Licensee shall review the Manuals and Plan referred to in this Part as required by changes in operation and/or technology and modify accordingly. Revisions are to be submitted in the form of an Addendum to be included with the Annual Report, unless directed otherwise by an Inspector

6. An inspection of all engineered facilities related to the management of water and waste shall be carried out annually in July or August by a Geotechnical Engineer. The engineer's report shall be submitted to the Board within sixty (60) days of the inspection, including a covering letter from the Licensee outlining an implementation plan addressing each of the Engineer's recommendations.

7. The Licensee shall perform more frequent inspections of the engineered facilities at the request of an Inspector.

8. If, during the period of this Licence, an unauthorized discharge of waste occurs, or if such a discharge is foreseeable, the Licensee shall:

i. employ the appropriately approved contingency plan for the Hamlet of Kugaaruk;
ii. report the incident immediately via the 24-Hour Spill Reporting Line at (867) 920-8130 and to the Inspector at (867) 975-4295; and
iii. submit to the Inspector, a detailed report on each occurrence, not later than thirty (30) days after initially reporting the event, that provides the necessary information on the

location (including the GPS coordinates), initial response action, remediation/clean-up, status of response (ongoing, complete), propose disposal options for dealing with contaminated materials and preventative measures to be implemented.

PART G: CONDITIONS APPLYING TO ABANDONMENT AND RESTORATION

1. The Licensee shall submit to the Board for approval an *Abandonment and Restoration Plan* at least six (6) months prior to abandoning any facilities or the construction of new facilities to replace existing ones. The Plan shall include, but not be limited to: (where applicable)

   i. water intake facilities;
   ii. the water treatment and waste disposal sites and facilities;
   iii. petroleum and chemical storage areas;
   iv. any site affected by waste spills;
   v. leachate prevention;
   vi. an implementation schedule;
   vii. maps delineating all disturbed areas, and site facilities;
   viii. consideration of altered drainage patterns;
   ix. type and source of cover materials;
   x. future area use;
   xi. hazardous wastes; and
   xii. a proposal identifying measures by which restoration costs will be financed by the Licensee upon abandonment.

2. If the Plan referred to in Part G, Item 1 is not approved, the Licensee shall make the necessary revisions and resubmit the Plan within thirty (30) days following notification from the Board.

3. The Licensee shall implement the plan specified in Part G, Item 1 as and when approved by the Board.

4. The Licensee shall complete the restoration work within the time schedule specified in the Plan, or as subsequently revised and approved by the Board.

PART H: CONDITIONS APPLYING TO THE MONITORING PROGRAM

1. The Licensee shall maintain Monitoring Program Stations at the following locations:

Monitoring Program Station Number	Description	Status
PEL-1	Raw water supply intake at the Kugajuk	Active

	River	(Volume)
PEL-2	Raw Sewage from pump-out truck	Active (Volume)
PEL-3	Discharge from the Sewage Disposal Facilities at the controlled point of release following treatment; including the Temporary Packaged Sewage Treatment Plant operation during construction	Active
PEL-4	Final Discharge Point of the Wetland Treatment Area	New
PEL-5	Ocean water five (5) metres from point where effluent enters ocean	New
PEL-6	Run-off from the Solid Waste Disposal Facility	Active
PEL-7	Monitoring well located up gradient of the Solid Waste Disposal Facilities	New
PEL-8-1	Monitoring well located down gradient of the Solid Waste Disposal Facilities	New
PEL-8-2	Monitoring well located down gradient of the Solid Waste Disposal Facilities	New

2. The Licensee shall sample at Monitoring Program Stations PEL-3, PEL-4 and PEL-5 once at the beginning, middle and near the end of discharge. Samples shall be analyzed for the following parameters:

Biochemical Oxygen Demand - BOD	Faecal Coliforms
Total Suspended Solids	pH
Conductivity	Nitrate-Nitrite
Oil and Grease (visual)	Total Phenols
Magnesium	Calcium
Sodium	Potassium
Chloride	Sulphate
Total Hardness	Total Alkalinity
Ammonia Nitrogen	Total Zinc
Total Cadmium	Total Iron
Total Cobalt	Total Manganese
Total Chromium	Total Nickel
Total Copper	Total Lead

Total Aluminum	Total Arsenic
Total Mercury	Total Organic Carbon (TOC)

3. The Licensee shall sample at Monitoring Program Station PEL-6 annually during periods of runoff or seepage. Samples shall be analyzed for the following parameters:

TPH (Total Petroleum Hydrocarbons)	
PAH (Polycyclic Aromatic Hydrocarbons)	
BTEX (Benzene, Toluene, Ethylbenzene, Xylene)	
BOD	Faecal Coliforms
pH	Conductivity
TotalSuspended Solids	Oil and Grease
Nitrate-Nitrite	Ammonia Nitrogen
Total Phenols	Total Alkalinity
Total Hardness	Calcium
Magnesium	Potassium
Sodium	Sulphate
Total Arsenic	Total Cadmium
Total Copper	Total Chromium
Total Iron	Total Lead
Total Mercury	Total Nickel

4. The Licensee shall install groundwater monitoring wells at the Solid Waste Disposal Facilities in accordance with the proposal set out in the Solid Waste Disposal Facility's Operation and Maintenance Plan, as approved by the Board. At a minimum, these wells shall be located with at least one upstream of the facility for background data collection and at least two downstream of the landfill.

5. Upon installation of any monitoring wells, the Licensee shall sample at Monitoring Program Stations PEL-7, PEL-8-1 and PEL-8-2, and any other locations as determined by the SWDF O&M Plan, giving due consideration to adequate ground thaw and obtaining a representative groundwater sample. Samples shall be analyzed for the following parameters:

BOD	Faecal Coliforms
pH	Conductivity
Total	Suspended Solids Ammonia
Nitrogen	
Nitrate-Nitrite	Oil and Grease
Total Phenols	Total Alkalinity
Total Hardness	Calcium
Magnesium	Potassium

Sodium	Sulphate
Total Arsenic	Total Cadmium
Total Copper	Total Chromium
Total Iron	Total Lead
Total Mercury	Total Nickel

TPH (Total Petroleum Hydrocarbons)
PAH (Polycyclic Aromatic Hydrocarbons)
BTEX (Benzene, Toluene, Ethylbenzene, Xylene)

6. The Licensee shall report all results of acute toxicity testing as required under Part D, Item 9 within the Annual Report as per Part B, Item 1.

7. The Licensee shall measure and record in cubic metres, the monthly and annual quantities of water pumped at Monitoring Program Station PEL-1, for all purposes.

8. The Licensee shall measure and record in cubic metres the monthly and annual quantities of raw sewage offloaded from trucks at Monitoring Program Station PEL-2 for all purposes.

9. Additional monitoring stations, sampling and analysis may be requested by an Inspector.

10. The Licensee shall submit to the Board, for approval within ninety (90) days of issuance of the Licence, a "*Quality Assurance/Quality Control (QA/QC) Plan for the Hamlet Sewage Lagoon and Solid Waste Disposal Facility Monitoring Program*" prepared in accordance with the INAC *"Quality Assurance (QA) and Quality Control (QC) Guidelines for use by Class "B" Licensees in Collecting Representative Water Samples in the Field, 1996"*.

11. The Plan shall to take into consideration comments received during the Application review process.

12. If the Plan referred to in Part H, Item 10 is not approved, the Licensee shall make the necessary revisions and resubmit the Plan within thirty (30) days following notification from the Board.

13. The Licensee shall implement the Plan referred to in Part H, Item 10 as and when approved by the Board.

14. 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 Wastewater*, or by such other methods approved by the Board.

15. All analyses shall be performed in a Canadian Association of Environmental Analytical Laboratories (CAEAL) Certified Laboratory, or as otherwise approved by an Analyst.

16. The Licensee shall measure and record the annual quantities of sewage solids removed from the Sewage Disposal Facility.

17. The Licensee shall include all of the data and information required by the “Monitoring Program” in the Licensee's Annual Report, as required *per* Part B, Item 1, or as requested by an Inspector.

APPENDIX B

Operational and Maintenance Summary Checklist

OPERATIONAL AND MAINTENANCE SUMMARY CHECKLIST

Daily

- Collect waste from the Hamlet and transport to the landfill
- Cover compacted waste as required
- Ensure all wastes are disposed of and stay in designated areas
- Clean up any spills immediately
- Clear snow from roads and disposal areas as required
- Record number of bird and wildlife sightings on and around site
- Record O & M information

Weekly

- Pick up windblown materials which have migrated past the boundaries of the landfill
- Record O & M information
- Cover refuse as required

Monthly

- Grade and maintain access roads if required
- Record O & M information

Yearly

- Cover refuse in the spring and fall
- Review O & M records to assist in planning for the upcoming year
- Construct new berm for waste disposal during the summer months if required for the upcoming year
- Performing sampling at stations PEL-6, PEL-7, PEL-8-1, PEL-8-2, PEL-9-1, PEL-9-2, PEL-10-1 and PEL-10-2 once per year or as directed by the Nunavut Water Board
- Complete Annual Report (See Appendix C) and submit to the Nunavut Water Board by March 31 of each year

APPENDIX C

Solid Waste Facility Annual Sampling Report Form

ANNUAL REPORT
FOR THE HAMLET OF KUGAARUK

YEAR BEING REPORTED:_____

The following information is compiled pursuant to the requirements of Part B, Item 1 of Water Licence 3BM-PEL0712 issued to the Hamlet of Kugaaruk.

i)- iii) tabular summaries of all data generated under the "Monitoring Program"; monthly and annual quantities in cubic metres of freshwater obtained from all sources; monthly and annual quantities in cubic metres of each and all wastes discharged;

Attached are results for Monitoring station PEL-1 and PEL-2, as well as detailed chemical, physical and biological analysis required at PEL-3-1, PEL-3-2, PEL-4 and PEL-5 (for the months of July to October, inclusive)

Month Reported	Quantity of Water Obtained from all sources	Quantity of Sewage Waste Discharged
January		
February		
March		
April		
May		
June		
July		
August		
September		
October		
November		
December		
ANNUAL TOTAL		

Please indicate volumes in cubic metres - 1 cubic meter equals 1000 litres

iv. a summary of modifications and/or major maintenance work carried out on the Water Supply and Waste Disposal Facilities, including all associated structures and facilities;

v. a list of unauthorized discharges and summary of follow-up action taken;

vi. a summary of any abandonment and restoration work completed during the year and an outline of any work anticipated for the next year;

vii. a summary of any studies requested by the Board that relate to waste disposal, water use or reclamation, and a brief description of any future studies planned;

viii. any other details on water use or waste disposal requested by the Board by November 1st of the year being reported; and

ix. updates or revisions to the approved Operation and Maintenance Plans (ie. O&M Manual, Abandonment and Restoration Plan, QA/QC, etc.).

ADDITIONAL INFORMATION THAT THE LICENSEE DEEMS USEFUL:

FOLLOW-UP REGARDING INSPECTION/COMPLIANCE CONCERNS:

Record of Sampling Data for Kugaaruk Solid Waste and Metals Dump Facilites
Year:
Estimated amount of solid waste deposited in the landfill over the year (m^3):

Parameters	PEL-6	PEL-7	PEL-8-1	PEL-8-2	PEL-9-1	PEL-9-2	PEL-10-1	PEL-10-2
BOD (Biochemical Oxygen Demand)								
pH								
Total Suspended Solids								
Ammonia Nitrogen								
Nitrate-Nitrite								
Total Phenols								
Total Hardness								
Magnesium								
Fecal Coliforms								
Conductivity								
Oil and Grease								
Total Alkalinity								
Calcium								
Potassium								
Sodium								
Total Arsenic								
Total Copper								
Total Iron								
Total Mercury								
Sulphate								
Total Cadmium								
Total Chromium								
Total Lead								
Total Nickel								
TPH (Total Petroleum Hydrocarbons)								
PAH (Polycyclic Aromatic Hydrocarbons)								
BTEX (Benzene, Toluene, Ethlybenzene, Xylene)								

*Note: Be sure to indicate units of measurement

APPENDIX D

Sample Collection Instructions

1 Sample Collection

1.1 Preparing for Sample Collection

Samples are to be collected from the marked Surveillance Network Program (SNP) locations. Each location has been marked with a sign and location number as well as located with GPS coordinates. Please refer to Figure 5-1 and Figure 5-2 for a map of the SNP locations and Table 5-1 for GPS coordinates. It is the responsibility of the Hamlet to maintain these markers in good condition.

Before collecting samples, follow the list of instructions below:

1. Contact the lab and ask where their lab is located. Tell them 8 sets of sampling bottles and equipment are required to test the following list of parameters. As well ask for field blanks. These are jars of deionized water that travel with the field samples to determine if there is any possible contamination from traveling and handling methods. Also ask them for an instruction sheet for collecting the samples. An example of an instruction sheet can be found in Appendix B.

Table 1.1. Parameters to be Tested During Water Sampling Program

BOD (Biochemical Oxygen Demand)
pH
Total Suspended Solids
Ammonia Nitrogen
Nitrate-Nitrite
Total Phenols
Total Hardness
Magnesium
Fecal Coliforms
Conductivity
Oil and Grease
Total Alkalinity
Calcium
Potassium
Sodium
Total Arsenic
Total Copper
Total Iron
Total Mercury
Sulphate
Total Cadmium
Total Chromium
Total Lead
Total Nickel
TPH (Total Petroleum Hydrocarbons)
PAH (Polycyclic Aromatic Hydrocarbons)
BTEX (Benzene, Toluene, Ethlybenzene, Xylene)

2. Contact the airport and find out what time the samples must be dropped off in order to make the flight to the city where they are being sent. The samples should be collected shortly before they are shipped. For example, if the samples must be at the airport by 2:00pm, the samples should be collected that morning. Make sure that there is enough time to collect and package all samples for transport. This is important because the samples must be at the lab within 24 hours from the time they are collected, otherwise they are no longer good for analysis.

3. The sampler should familiarize themselves with the locations in Figure 3-2 and Figure 3-3 and walk to each location prior to sampling to ensure the samples are taken from the correct locations.

Once the sampling bottles and equipment have been received from the lab, gather the following items prior to sample collection:

1. Sample bottles;
2. Preservatives;
3. Coolers that the bottles and preservatives were sent in;
4. Field blanks;
5. Disposable bailers for sampling in groundwater monitoring wells (these can be ordered from Groundwater Monitoring Products Ltd. (780) 907-5375);
6. Nylon line to tie to bailers;
7. Cloth rope and weight (such as a plumb bob);
8. Plastic sheeting to protect sample bottles and equipment from ground contamination;
9. Clean 5 gallon bucket, marked with measuring gradations;
10. Chain of custody forms (also called COCs);
11. Permanent marker to mark on bottles;
12. Pen to fill out chain of custody forms;
13. Nitrile gloves;
14. Packing tape;
15. Ice packs;
16. Shipping label to send samples back to the lab.

Once everything has been gathered, determine which day the samples will be collected. Be sure to check the flight schedule for that day and call the lab to ask if they are able to pick up the samples at the airport when they arrive.

1.2 Instructions for Sample Collection

Follow these instructions to collect samples from the solid waste treatment facility:

1. Place ice packs in freezer the night before sampling.
2. In the morning, place ice packs and other equipment into coolers and load into vehicle. Make sure that the field blanks are in the cooler as well.
3. Drive to site and park in a safe spot away from traffic. DO NOT park on the truck turn around pad for the sewage lagoon.

1.2.1 Groundwater Monitoring Well Sampling

4. Take coolers and equipment to sample location PEL-7.
5. Put on a pair of nitrile gloves.
6. Place a plastic sheet on the ground around the monitoring well.
7. Record in field book the date, time, sampling location and note any damage that can be seen on the well.
8. Remove the well cap and place beside the well.
9. Measure the depth of water in the well:
    a. Tie the weight to the end of the cloth rope;
    b. Lower weight and rope into the well until the weight just touches the bottom of the well;
    c. Pull the weight and rope out of the well and measure the distance of the rope that is wet (from the weight to the top of the watermark on the rope);
    d. This is the water depth in the well.
10. Calculate the volume of water in the well:
    a. Measure the diameter of the groundwater well;
    b. Find the appropriate conversion factor based on the well diameter from the following table:

Table 1.2. Conversion Factors for Specific Well Diameters

Diameter of Groundwater Well (inches)	Conversion Factor (gal/ft)
2"	0.1632
3"	0.3672
4"	0.6528
6"	1.4688

**Data taken from Groundwater Well Sampling, US EPA, 1995*

    c. Calculate the volume of water in the well using the following equation:

Water Volume in Well = Depth of Water X Conversion Factor

Example: If the well diameter is 4”(inches) and the measured depth of water (using the rope) is 2’(feet); then the volume of water would equal:

Water Volume in Well = 2ft X 0.6528 gal/ft
= 1.31 gal

d. Determine the amount of water to be purged from the well prior to sampling; take the calculated water volume and multiply by 3. From the above example:

1.31 gal X 3 = 3.93 gal of water to be purged from the well prior to sampling

***Important Note: The amount of water purged from the well will rely on how fast the well refills with water. If the well does not refill at a fast rate, samples will have to be taken using the first amount of water taken from the well. This is not ideal as water that has been sitting in the well may be stagnant and not representative of the actual groundwater flowing through the site.**

11. Tie a nylon line to the top of the bailer.
12. Slowly lower the bailer into the well until completely submerged. Disturb the water as little as possible, as turbulence in the water will cause sediment to be suspended in the sample.
13. Once bailer has filled with water, slowly raise out of the well and empty contents into the clean 5 gallon bucket.
14. Continue until the calculated well volume has been removed from the well.
15. Wait 1 minute and measure the water level in the well. A new, dry piece of rope will be needed for this. If the water level has returned to the original level, continue removing water until 3 times the calculated volume has been removed. If the water level has not returned, wait 5 minutes and check the water level again. If the water level still has not returned, fill the sample bottles using the water placed in the bucket.

**Groundwater monitoring well sampling methods taken from Groundwater Well Sampling, United States Environmental Protection Agency, 1995.*

1.2.2 Filling the Sample Bottles

16. Take out bottles needed to sample at this location and place beside the cooler. DO NOT OPEN THE BOTTLES.
17. Select the bottles NOT requiring or containing preservatives and put aside.
18. Take the bottles requiring or containing preservatives and sample these first.
19. Carefully unscrew the cover and pour water from the top of the bailer (or if the bailer has a sampling spout use this) into the sample jar. If the bottle contains preservatives already, be sure not to tip or overfill the bottle as the preservatives will be washed out. Fill to the shoulder of the bottle. To add preservatives (if not already in the bottle) take a vile with the same colour dot as the dot on the cover of the sample bottle and carefully pour contents into the sample bottle. Screw the cover on tightly and mix by gently tipping the bottle back and forth.

20. If using water from the bucket to sample, gently tip the sample jar into the bucket being careful not to washout any preservatives that may already be in the bottle. Fill to shoulder of jar (add preservative if necessary) and screw cap on tightly.
21. Label the bottle with the sampling location number (PEL-7), your name, date, time of collection and preservative added. Make sure to use a waterproof/permanent marker to label the bottles. Place filled sample jar in cooler.
22. Continue until all preserved samples have been taken.
23. Now fill the bottles not requiring preservatives. Take the first bottle, unscrew the cover and rinse with water from the sampling location. Discard the rinsing water away from the sampling location. Rinse the bottle three times.
24. Fill bottle to shoulder and screw cover on tightly. Label and place in cooler.
25. Continue until the rest of the bottles have been filled.
26. Take off nitrile gloves and dispose in garbage bag.
27. Collect cooler and move to sampling location PEL-8-2. Repeat steps 4 to 26.
28. Collect cooler and move to sampling location PEL-8-1. Repeat steps 4 to 26.
29. Collect cooler and move to sampling location PEL-9-1. Repeat steps 4 to 26.
30. Collect cooler and move to sampling location PEL-9-2. Repeat steps 4 to 26.
31. Collect cooler and move to sampling location PEL-10-1. Repeat steps 4 to 26.
32. Collect cooler and move to sampling location PEL-10-2. Repeat steps 4 to 26.
33. Collect cooler and move to sampling location PEL-6. Samples taken from PEL-6 are not from a groundwater monitoring well. Samples are to be taken from runoff flowing from the drainage outfall structure located west of the solid waste facility. Samples are to be taken using the same methods as described in steps 16 to 24, except the use of a bailer is not required. Sample jars may be placed directly into the runoff stream and filled being careful not to wash out any preservatives.
34. Once all samples have been collected and labeled, pack into coolers tightly with ice packs to limit movement during shipping.
35. Fill out the chain of custody form. An example of a filled out form can be found in Appendix C.
36. Place form in a sealable freezer bag, seal and put in the cooler with samples. Tape up the cooler with packing tape. Tape shipping label to top of cooler and bring to the airport.
37. Fill out the shipping forms for sending the cooler to the lab and check that the plane will be on time.
38. Call the lab and tell them that the samples are on the way and give them the flight information.

As part of QA/QC testing, a second set of samples should be taken from one of the sampling points. This means filling two sets of sampling bottles from the same location. This second set of samples is to verify that sample results are accurate and that sampling methods are consistent. It may be difficult to obtain enough water from the monitoring wells to fill two complete sets of sample jars. Therefore a second set should be taken at PEL-6 where this is not an issue. If it is determined that enough water can be obtained from one of the monitoring wells, a second sample set may be taken from that well.

APPENDIX E

Sampling Instructions from Taiga Laboratory

Taiga Environmental Laboratory
4601 52nd Avenue – Yellowknife, NT X1A 2R3
Phone: (867) 669-2788 Fax: (867) 669-2718 Email: taiga@inac-ainc.gc.ca

Water Sampling Instructions — Collecting the Sample

Step One: Prior to sampling, ensure you have obtained all the sampling equipment you require, such as the proper bottles, filtration devices, *etc.* Refer to the Taiga's Water Sampling Instructions – Ordering Bottles. If there are any questions or concerns, do not hesitate to contact the laboratory. Please have your water license (if applicable) available before contacting the laboratory to ensure proper bottles are ordered. **Note: you may need more than one bottle per sampling site.**

Step Two: Check your local departure flight schedule to Yellowknife for the day you plan to take your samples. Samples should be shipped to the Laboratory **as soon as possible** after collection. Time your sampling so that the samples can be shipped out by plane as soon as possible.

Step Three: Follow the sampling instructions on the back of this sheet for each bottle type. Package bottles in a cooler and send to the laboratory. If your require microbiological tests, such as Total Coliforms, E. coli., Fecal Coliforms, BOD, *etc.*, please contact the laboratory with the collection date and time, the Airline name, the waybill number and the expected time of arrival.

Safety Issues: Wear appropriate gloves when collecting any sample to avoid contamination and possible exposure to unhealthy substances. The sample preservatives provided by the Laboratory are corrosive and will cause a burning sensation on the skin. If you should spill any on your skin or clothes, rinse the area **immediately** with lots of cool water. Call a doctor should the burning sensation continue.

Taiga Environmental Laboratory

4601 52nd Avenue – Yellowknife, NT X1A 2R3

Phone: (867) 669-2788 Fax: (867) 669-2718 Email: taiga@inac-ainc.gc.ca

Water Sampling Instructions

Collecting the Sample

Parameter Group		Marking	Preservative	Instructions
●	Routine	GREEN	Keep cool at 4°C	1. Rinse bottle three (3) times with sample 2. Fill to top and cap bottle.
●	Nutrients	BLACK	Keep cool at 4°C	
●	Biochemical Oxygen Demand (BOD)	PURPLE	Keep cool at 4°C	1. Rinse bottle three (3) times with sample 2. Fill to top and cap bottle. 3. Sample must be sent to laboratory within 24 hours
■	Microbiological	STERILE	Sodium thiosulphate and Keep cool at 4°C	1. **DO NOT RINSE BOTTLE** 2. Fill to top and cap bottle. 3. Sample must be sent to laboratory within 24 hours
●	Total Metals	RED	5mL of 1:3 nitric acid in RED-dot vials	1. Rinse bottle three (3) times with sample 2. Fill to near the top. 3. Add contents of preservative vial 4. Cap bottle and mix.
●	Dissolved Metals	RED	5mL of 1:3 nitric acid in RED-dot vials	1. **Filter Sample with 0.45 µm Cellulose Acetate filter** 2. Rinse bottle three (3) times with **filtrate** 3. Fill to near the top. 4. Add contents of preservative vial 5. Cap bottle and mix.
●	Hexane Extractable Material (HEM) (also known as Oil and Grease)	YELLOW	4mL 1:1 sulphuric acid in YELLOW-dot vial	1. **DO NOT RINSE BOTTLE** 2. Fill to shoulder of bottle. 3. Add contents of preservative vial 4. Cap bottle and mix
	BTEX, THM & Purgeable Hydrocarbons	40 mL CLEAR GLASS W/ WHITE LID	Keep cool at 4°C	1. **DO NOT RINSE BOTTLE** 2. Fill bottle completely leaving **NO** air bubbles
	Extractable Hydrocarbons	1 L AMBER GLASS W/ WHITE LID	Keep cool at 4°C	1. **DO NOT RINSE BOTTLE** 2. Fill to top and cap bottle.
●	Cyanide	BLUE	1mL of 6N sodium hydroxide	1. Rinse bottle three (3) times with sample 2. Fill to near the top. 3. Add contents of preservative vial 4. Cap bottle and mix.
●	Thiocyanate	ORANGE	2ml of 25% sulphuric acid	
P	Phenol	YELLOW with P	2mL of 20% sulphuric acid	
S	Sulphide	ORANGE with S	2mL of 25% zinc acetate	
R	Radionuclide	RED with R	25mL of 17.5% nitric acid	
	Chlorophyll A	1L BROWN PLASTIC BOTTLE	Keep cool at 4°C	1. Rinse bottle three (3) times with sample 2. Fill to top and cap bottle. 3. Sample must be sent to laboratory within 24 hours

APPENDIX F

Sample COC Form for Taiga Laboratory

TAIGA ENVIRONMENTAL LABORATORY
LABORATOIRE ENVIRONNEMENTAL TAIGA
4601 – 52 Avenue, P.O. Box 1500, Yellowknife, NT, X1A 2R3
Tel: (867) 669-2788 • Fax: (867) 669-2718
www.taiga.gc.ca

Batch No. :

Send Results & Invoice to:
(Please notify if results or invoice are to be sent to different locations)

Company/Agency: Hamlet of Kugaaruk
Address: Hamlet Office
City/Town: Kugaaruk Province/Territory: NU
Postal Code: X0B 1K0
Phone: (867) 769-6281 Fax: (867) 769-6069
E-mail:
Signature :

Client Project No: SNP-Solid waste Facilities
Date collected:
Time collected:
Sampler:
Location: Kugaaruk Solid Waste Facilities
Rush Required: ☐Yes ☐No (Surcharge applies, please check with Laboratory for price and availability)
Note: *Analysis may be subcontracted without prior notice.*

Date Received: Received By:
Comments:
(Laboratory use only)

-WATER SAMPLES –

Sample Type (freshwater, sewage, wastewater, potable , groundwater, salt water, *etc*)	Landfill Leachate	Landfill Leachate	Landfill Leachate
Client Sample ID (As it should appear on final report)	PEL-6	PEL-7	PEL-8-1
Taiga Sample ID (Laboratory use only)			

[√] PLEASE CHECK PARAMETERS REQUESTED BELOW:

	Bottle Type and Parameter			
Routine	pH, Conductivity, Alkalinity	pH Cond Alk	pH Cond Alk	pH Cond Alk
	Individual Anions Suite ☐	Cl SO_4 F NO_2-N NO_3-N	Cl SO_4 F NO_2-N NO_3-N	Cl SO_4 F NO_2-N NO_3-N
	Total Nitrite (NO_2) + Nitrate (NO_3)	$NO_2 + NO_3$-N	$NO_2 + NO_3$-N	$NO_2 + NO_3$-N
	Individual Cations Suite ☐	Ca Mg Na K	Ca Mg Na K	Ca Mg Na K
	Hardness (Calculated)	Hardness	Hardness	Hardness
	Reactive Silica	SiO_2	SiO_2	SiO_2
	Color	Apparent True	Apparent True	Apparent True
	Laboratory use only	Rec'd: Y N	Rec'd: Y N	Rec'd: Y N
Nutrients	Chemical Oxygen Demand	COD	COD	COD
	Nitrogen: Total, Dissolved	TN DN	TN DN	TN DN
	Turbidity	Turbidity	Turbidity	Turbidity
	Total Suspended Solids, Dissolved Solids	TSS TDS	TSS TDS	TSS TDS
	Ammonia	NH_3	NH_3	NH_3-N
	Phosphorus: Total, Dissolved, Ortho	TP DP OP	TP DP OP	TP DP OP
	Carbon: Total, Dissolved	TOC DOC	TOC DOC	TOC DOC
	Chlorine: Total, Residual	T. Cl R. Cl	T. Cl R. Cl	T. Cl R. Cl
	Visible Oil and Grease	Visible	Visible	Visible
	Laboratory use only	Received : Y N	Received : Y N	Received : Y N
Sterile	Fecal Coliforms (FC)	FC	FC	FC
	Total Coliforms (TC), E. Coli (EC)	TC EC	TC EC	TC EC
	Fecal Streptococcus (FS)	FS	FS	FS
	Laboratory use only	Received: Y N T: ____°C Sterile container: Y N	Received: Y N T: ____°C Sterile container: Y N	Received: Y N T: ____°C Sterile container: Y N
	Biological Oxygen Demand	BOD	BOD	BOD
	Laboratory use only	Received: Y N T: ____°C	Received: Y N T: ____°C	Received: Y N T: ____°C
Metals	Please indicate if sample is preserved and/or filtered	Pres ☐ Filt ☐ Pres ☐	Pres ☐ Filt ☐ Pres ☐	Pres ☐ Filt ☐ Pres ☐
	ICP-MS(1): Cd, Cr, Cu, Co, Mn, Ni, Pb, Zn, Fe	Total Dissolved	Total Dissolved	Total Dissolved
	ICP-MS(2): 25 element scan includes As (not included: B, Bi, Hg, Sn)	Total Dissolved	Total Dissolved	Total Dissolved
	Individual Metals by ICP-MS (please circle each metal): Ag, Al, As, B, Ba, Be, Bi, Cd, Co, Cr, Cs, Cu, Fe, Hg, Li, Mn, Mo, Ni, Pb, Rb, Sb, Se, Sn, Sr, Ti, Tl, U, V, Zn	Total Dissolved	Total Dissolved	Total Dissolved
	Laboratory use only	TM rec'd: Y N DM rec'd: Y N	TM rec'd: Y N DM rec'd: Y N	TM rec'd: Y N DM rec'd: Y N
	Hexane Extractable Material (O&G)	HEM	HEM	HEM
	Laboratory use only	Rec'd: Y N Pres: Y N	Rec'd: Y N Pres: Y N	Rec'd: Y N Pres: Y N
	BTEX, Purgeable HC (40mL x 2 vials)	BTEX Purg HC	BTEX Purg HC	BTEX Purg HC
	Extractable HC (1L amber glass bottle)	Ext HC	Ext HC	Ext HC
	Trihalomethanes (40 mL x 2 vials)	THM	THM	THM
	Laboratory use only	Vial rec'd: Y N Ext rec'd: Y N	Vial rec'd: Y N Ext rec'd: Y N	Vial rec'd: Y N Ext rec'd: Y N
	Other: *see special request form*	Total Phenols, PAH	Total Phenols, PAH	Total Phenols, PAH

For safety purposes, please disclose any contaminants (e.g. heavy metals, cyanide, etc.) that may be present at high levels and pose a risk to human health:

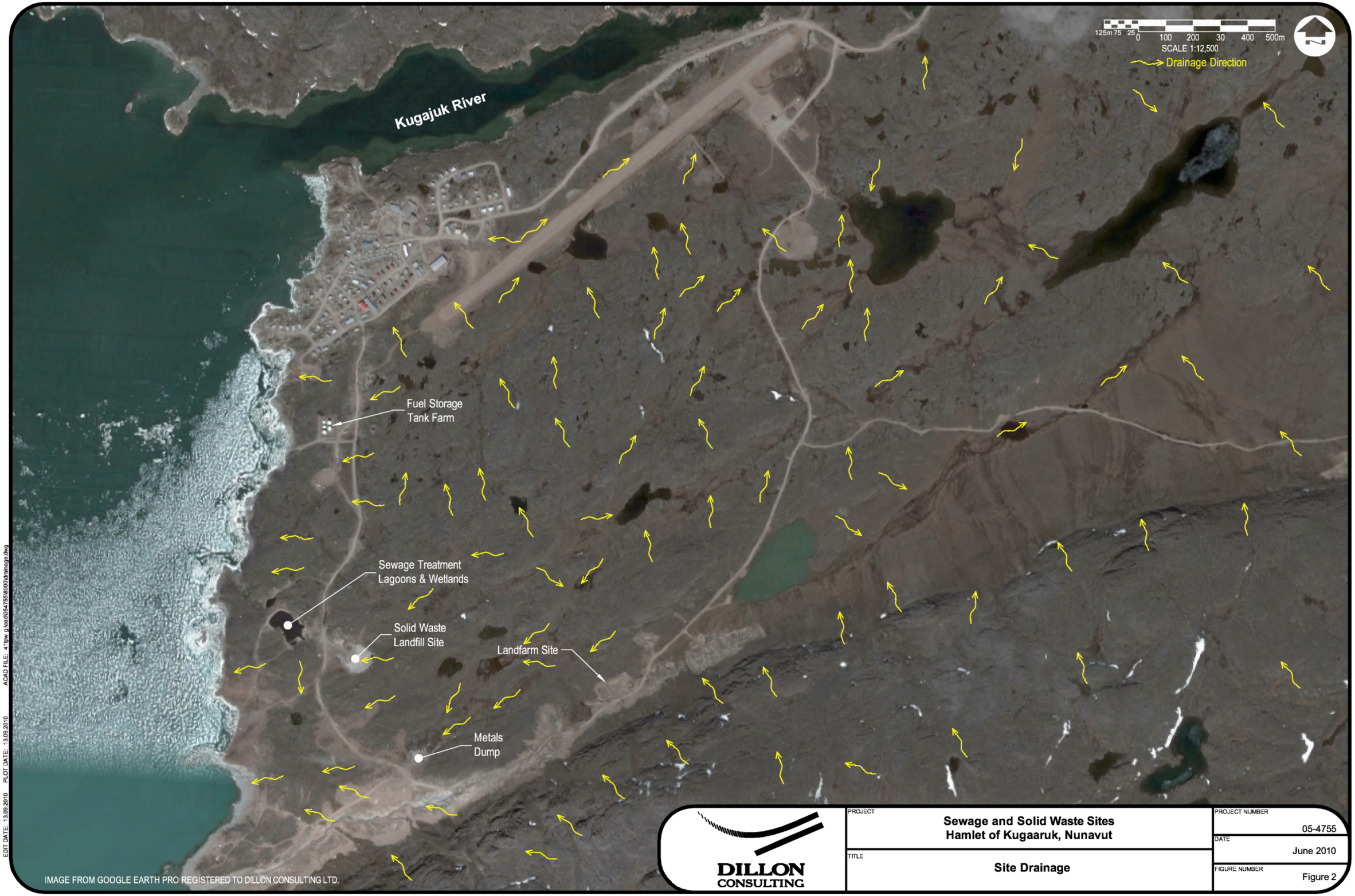
APPENDIX G

Map of Sewage Lagoon and Solid Waste Facilities

DILLON CONSULTING

PROJECT	PROJECT NUMBER
Sewage and Solid Waste Sites Hamlet of Kugaaruk, Nunavut	05-4755
	DATE June 2010
TITLE Site Locations	FIGURE NUMBER Figure 1

EDIT DATE: 22.09.2010 PLOT DATE: 23.09.2010 ACAD FILE: 41tpw g:\cad\054755\8000\drainage.dwg



EDIT DATE: 13.09.2010 PLOT DATE: 13.09.2010 ACAD FILE: 4"dpw g:\cad\05-4755\9800\drainage.dwg

DILLON CONSULTING

PROJECT	**Sewage and Solid Waste Sites Hamlet of Kugaaruk, Nunavut**
TITLE	**Site Drainage**
PROJECT NUMBER	05-4755
DATE	June 2010
FIGURE NUMBER	Figure 2

DILLON CONSULTING

PROJECT: Sewage and Solid Waste Sites
Hamlet of Kugaaruk, Nunavut

TITLE: SNP and Waste Area Locations

PROJECT NUMBER: 05-4755

DATE: June 2010

FIGURE NUMBER: Figure 3

ACAD FILE: 4:\tpw g:\cad\0547555\8000\metalsdump.dwg PLOT DATE: 11.06.2010 EDIT DATE: 11.06.2010

25m 20 15 10 5 0 10 20 30 40 50m
SCALE 1:1,500

Note:
Location of all features is approximate and based on the best information available at the time of drawing production. Locations should be verified in field.

Snowmobiles/ATV
Cars/Trucks

Buried Crushed
Fuel Tanks

Buried
Iron

Buried
Sheet
Metal

PEL-7

7,603,200mN

Buried Crushed Drums

Buried Sheet Metal

White Goods
(Appliances)

Buried Iron

Snowmobiles

Large Fuel Tank

Large Tractor
and Truck

Tires

Large Tractor, Grader
and Truck

PEL-9-2

METALS DUMP

Metals Storage

Buried Crushed
Stoves

7,603,100mN

PEL-9-1

Drainage Outfall

Crushed Barrel
Storage Area

Buried Crushed
Sewage Tanks

7,603,000mN

384,500mE

384,600mE

384,700mE

IMAGE FROM GOOGLE EARTH PRO REGISTERED TO DILLON CONSULTING LTD.

EDIT DATE: 11.06.2010 PLOT DATE: 11.06.2010 ACAD FILE: 4:\fpw g:\cad\05475598000\metalsdump.dwg

DILLON CONSULTING

PROJECT	Sewage and Solid Waste Sites Hamlet of Kugaaruk, Nunavut
TITLE	Site Locations and Drainage
PROJECT NUMBER	05-4755
DATE	June 2010
FIGURE NUMBER	Figure 4