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

Hamlet of Kugaaruk

October 6, 2009

 $Solid\ Waste\ Facility-Operation\ and\ Maintenance\ Manual$ 

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 6, 2009



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Nunavut Water Board P.O. Box 119 Gjoa Haven, NU X0B 1J0

Attention: Phyllis Beaulieu, Manager of Licensing

Re: Operation and Maintenance Manual for Hamlet of Kugaaruk Solid Waste Facility

Dear Ms. Beaulieu:

Please find enclosed a copy of the Operation and Maintenance Manual for the Kugaaruk Solid Waste Facility for your review. This manual is part of the Hamlet's commitment to comply with the current water licence (Licence Number: 3BM-PEL0712) as issued by the Nunavut Water Board. Please do not hesitate to contact me at (867) 920-4555 should you require further information.

Yours truly,

Dillon Consulting Limited

Gary Strong, P.Eng.

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  $-33^{\circ}$ C while in July the daily mean temperature is approximately  $6^{\circ}$ C. 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 practice of the facility has led to disorganization of the site and improper disposal methods of waste. As well, no provisions had been made to test, collect or treat leachate runoff from the site. Enhancements have been made to the site to improve disposal methods as well as encourage recycling within the community. 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.

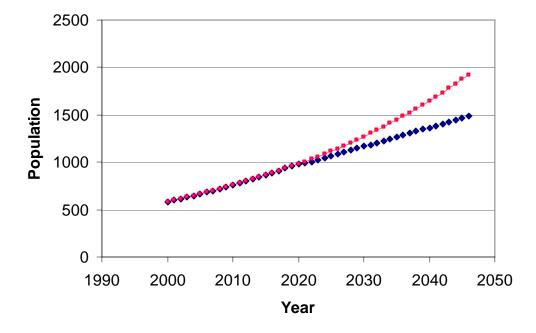


Figure 2-1. Population Projections for the Hamlet of Kugaaruk, NU

<sup>\*</sup>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 m³/c/d and 0.001 m³/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 m³. 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
- 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:

- 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.

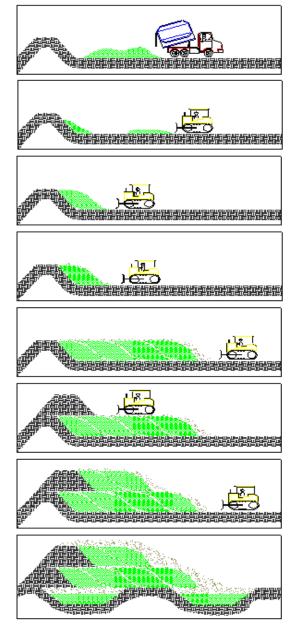
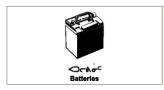


Figure 3-1. Area Method of Solid Waste Disposal in a Landfill

(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.

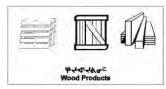
### 3.1.4 Waste Batteries



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 hamlet 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.

Currently, the Hamlet relies 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 and any small flammable or explosive containers. Three lined cells have been built specifically for the storage of hazardous material. Similar to the waste batteries, hazardous material will be stored for up to one year and then shipped to a southern facility for proper disposal. Residents 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 3.3 for details on shipping arrangements.

Waste oil and fuels will be burned in an approved incinerator. This task will be contracted out to a local contractor trained in burning and disposing of waste fuels. The contractor is to bring in an approved incinerator to Kugaaruk and burn the waste oils on-site. However, any unknown waste oils will have to be tested by an approved laboratory to determine their composition prior to incineration or shipment out of the hamlet.

#### 3.2 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

### 3.2.1 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 hazardous storage cell and shipped out of the hamlet with the other hazardous materials. Please refer to Appendix G and Appendix H for instructions on removing

mercury switches, capacitors and ballasts. 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.

### 3.2.2 Vehicles (Snowmobiles, ATVs, Cars, Trucks)



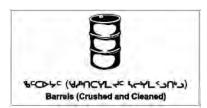
A separate area has been designated for storage of old vehicle frames and parts. This is to encourage residents to recycle parts from old vehicles for their own purposes. Prior to landfilling these items, the batteries must be removed and all fluids drained from vehicles. Hamlet crews will be responsible 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.

#### **3.2.3** 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.

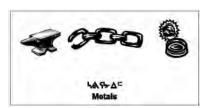
#### 3.2.4 Waste Barrels



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 (Refer to Appendix J). 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 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 contact Environment Canada to order the proper storage and crating containers.

### 3.2.5 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.

# 3.3 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.

### 3.4 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.

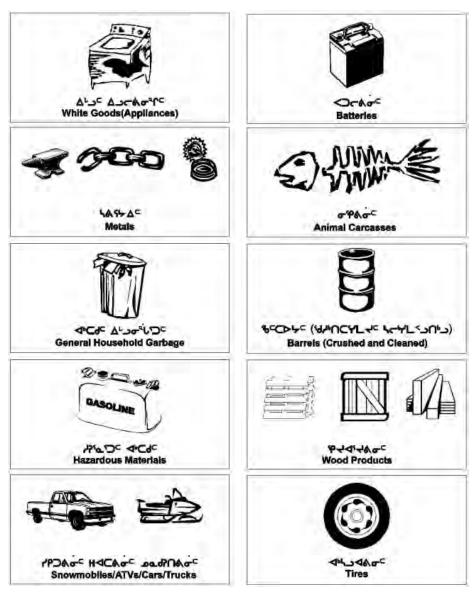


Figure 3-2. Signs to be placed in Landfill and Bulky Metals Facilities

# 3.5 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.

### 3.5.1 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

#### 3.6 Site Personnel

## 3.6.1 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.

# 3.7 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

#### Solid Waste Facility – Hamlet of Kugaaruk, NU

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.

### **5.1.1** 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

POD (Picchemical Ovugan Demand)
BOD (Biochemical Oxygen Demand) pH
1
Total Suspended Solids
Nitrate-Nitrite
Total Phenois
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)
рН
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.

### **5.1.2** 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 31<sup>st</sup> 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 are (Guidelines for the Preparation of an Operation and Maintenance Manual for Sewage and Solid Waste Facilities in the Northwest Territories, Duong and Kent, 1996):

- 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;
- Wear protective clothing such as gloves and boots 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

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.

### 8.1 Contact Numbers

Contacts of those responsible for overseeing the operation and maintenance of the lagoon are as follows:

Senior Administrative Officer: (867) 769-6281 Public Works Foreman: (867) 769-6131

#### 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.

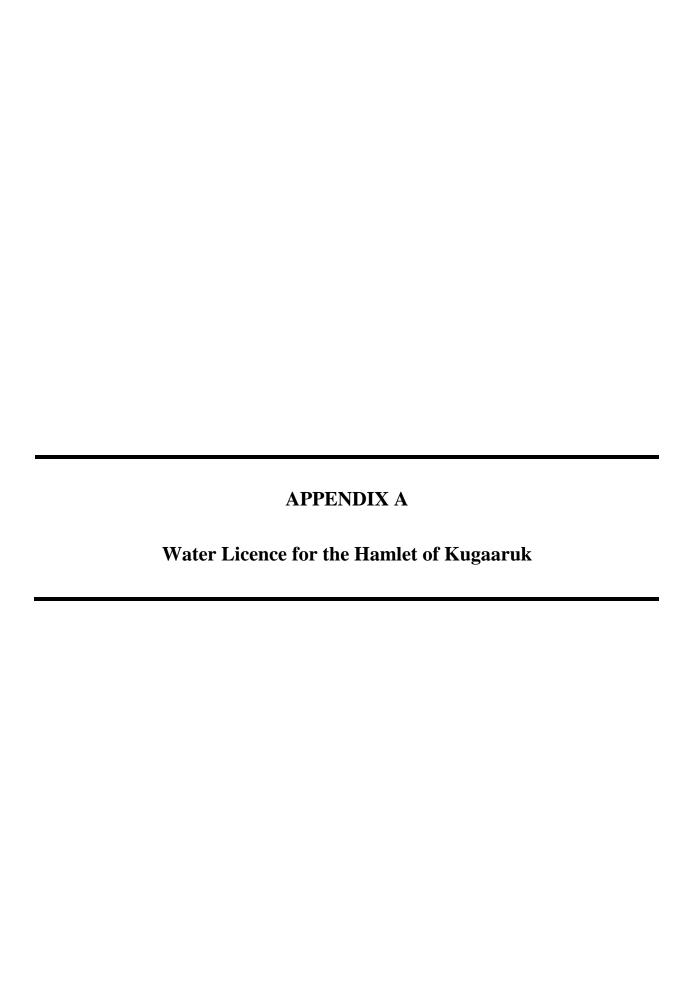
#### 9.4 Bear Safety

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. Please refer to Appendix I for documents relating to bear safety.

#### 10 REFERENCES

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- 12. Parks Canada. "Safety in Polar Bear Country", Obtained November 2008. <a href="http://dsp-psd.pwgsc.gc.ca/Collection/R62-342-2001E.pdf">http://dsp-psd.pwgsc.gc.ca/Collection/R62-342-2001E.pdf</a>
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- 14. PCB Disposal. "PCB Capacitors", Obtained November 2008. http://www.pcbdisposalinc.com/images/pdfs/Capacitors.pdf
- 15. United States Environmental Protection Agency. "Groundwater Well Sampling", January 1995. <a href="http://www.ecy.wa.gov/programs/eap/qa/docs/QAPPtool/Mod7%20EPA%20SOPs/Groundwater/Sampling/ERTSOP2007%20Groundwater%20Sampling.pdf">http://www.ecy.wa.gov/programs/eap/qa/docs/QAPPtool/Mod7%20EPA%20SOPs/Groundwater/Sampling/ERTSOP2007%20Groundwater%20Sampling.pdf</a>
- 16. Wildlife Division, Department of Environment and Natural Resources. "Safety in Grizzly and Black Bear Country", Obtained November 2008. http://www.nwtwildlife.com/Publications/safetyinbearcountry/safety.htm





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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)

Original signe	d hv						
SIGNED this	7 <sup>th</sup>	day of Se	eptember,	2007 at	Gjoa I	Haven,	NU.

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°C while in July the daily mean temperature is approximately plus 6°C. 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
  - o Appendix A: Stamped Design Drawings
  - o Appendix B: Population Statistics
  - o Appendix C: Laboratory Analyses
  - o Appendix D: Sample Tables of Contents (Spill Contingency, O&M)
  - o Appendix E: NWB letter of November 14, 2006
  - o Appendix F: Laboratory Analysis & INAC inspection
  - o Appendix G: Letters from Hamlet & from NWB
  - o Appendix H: Community poster
  - o Appendix I: GCL specification sheet
  - o 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, Nunavut; 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 m³. Projected water use in 2012 is reported to be 31,205 m³. 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<sub>5</sub> 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

	Н	IAMLET OF KUGAARUK
	(Licensee)	
of	P.O. BOX 205	, KUGAARUK, NUNAVUT X0B 1K0
	(Mailing Address)	
	alled the Licensee, the rig	ght to alter, divert or otherwise use water for a period subject to ithin this licence:
Licence Num	nber	3BM-PEL0712
Water Manag	gamant Arag	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 V	Water Not to Exceed	35,000 CUBIC METRES ANNUALLY
Date of Licer	nce	September 7, 2007
Expiry Date	of Licence	December 31, 2012
Dated this	<u>7<sup>th</sup></u> of September 2007 a	at Gjoa Haven, NU.
Original sign	ned by:	
Thomas Kab Acting Chief	loona 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;
- "<u>Effluent</u>" 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 31<sup>st</sup> 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 1<sup>st</sup> 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: <u>licensing@nunavutwaterboard.org</u>

#### (ii) Inspector Contact:

Water Resources Officer Nunavut District, Nunavut Region

P.O. Box 100

Igaluit, 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:

	Maximum Average	
Parameter	Concentration	
BOD <sub>5</sub>	120 mg/L	
Total Suspended Solids	180 mg/L	
Faecal Coliforms	1 x 10 <sup>4</sup> 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	$(1 \times 10^4 \text{ CFU/100ml})$		
Oil and grease	No visible sheen		
pН	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 License 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 Licensee 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
- "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/cleanup, 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:

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

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	pН
Conductivity	Nitrate-Nitrite
Oil and Grease (visual)	<b>Total Phenols</b>
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 ArsenicTotal CadmiumTotal CopperTotal ChromiumTotal IronTotal LeadTotal MercuryTotal 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

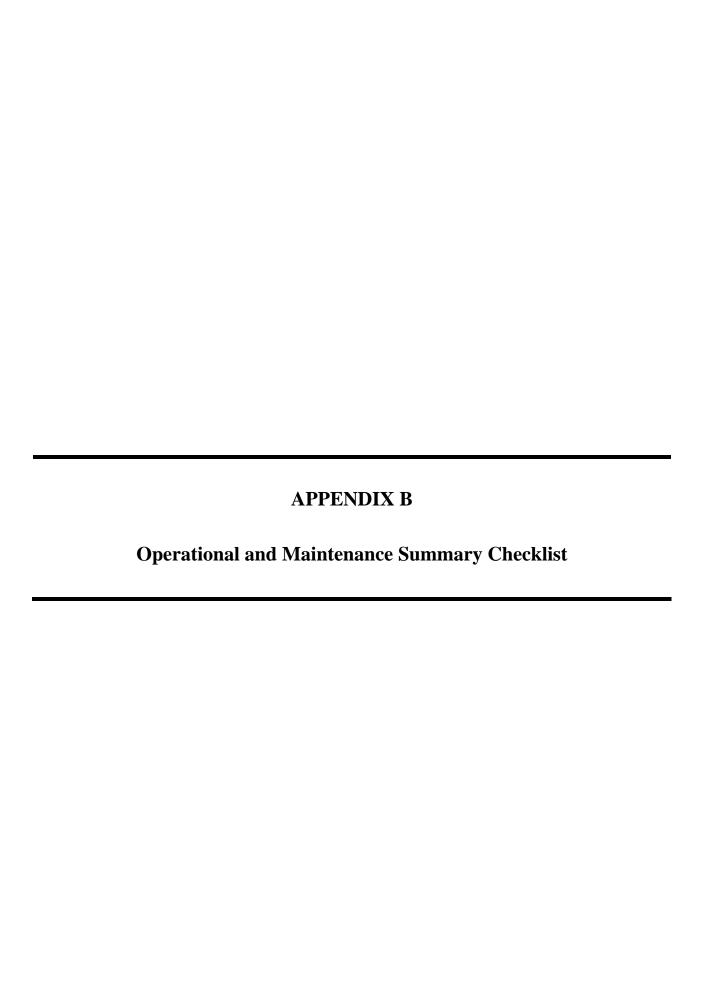
Total Hardness Calcium Magnesium Potassium Sodium Sulphate
Total Arsenic Total Cadmium

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.



#### 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

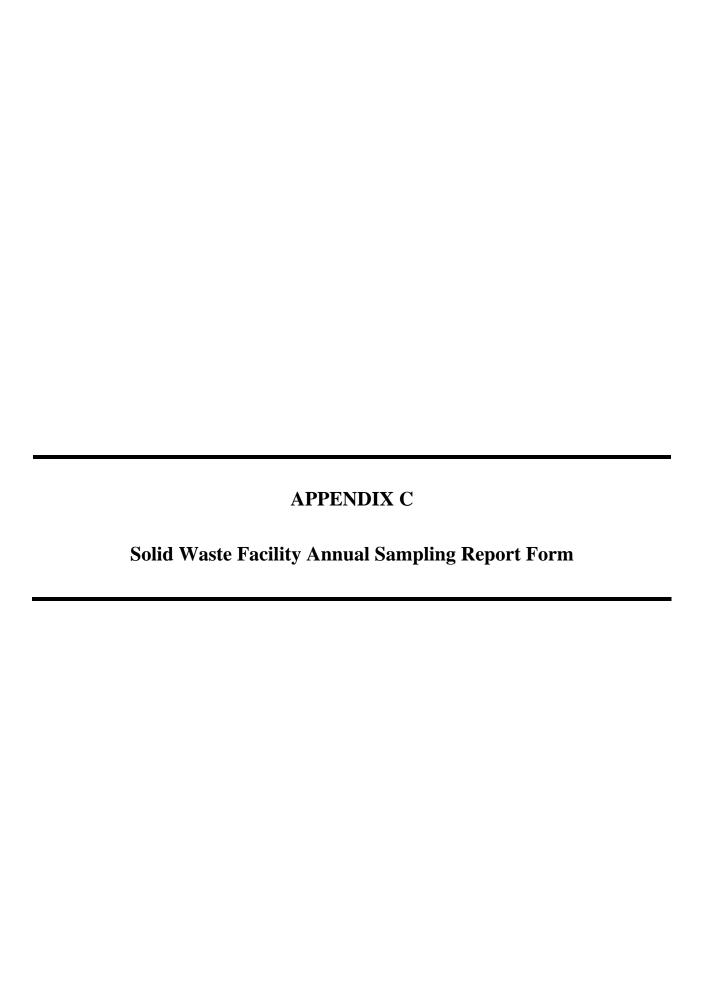
- Pick up windblown materials which have migrated past the boundaries of the landfill
- Record O & M information
- Cover refuse as required

# **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



# 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<sup>3</sup>):

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)								
рН								
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)								

<sup>\*</sup>Note: Be sure to indicate units of measurement

# ANNUAL REPORT FOR THE HAMLET OF KUGAARUK

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

YEAR BEING REPORTED:\_\_\_\_\_

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		

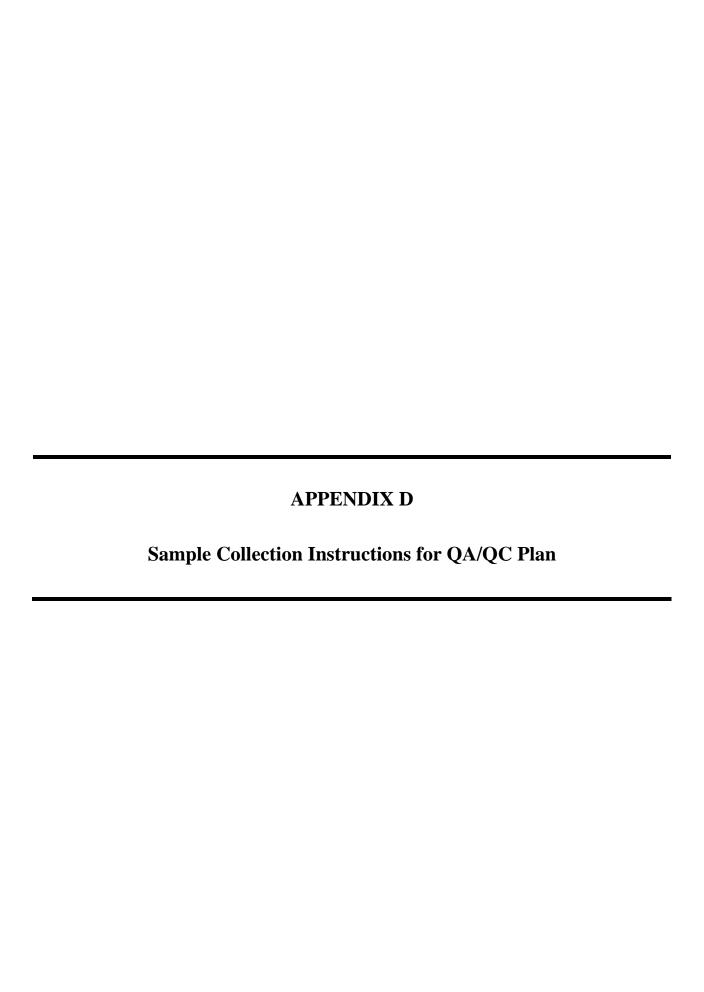
# ANNUAL REPORT FOR THE HAMLET OF KUGAARUK

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

# ANNUAL REPORT FOR THE HAMLET OF KUGAARUK

ix	updates or revisions to the approved Operation and Maintenance Plans (ie. O&M Manual, Abandonment and Restoration Plan, QA/QC, etc.).
ADDI	TIONAL INFORMATION THAT THE LICENSEE DEEMS USEFUL:
FOLI	LOW-UP REGARDING INSPECTION/COMPLIANCE CONCERNS:



#### 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 travel blanks and 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 E.

**Table 1.1. Parameters to be Tested During Water Sampling Program** 

BOD (Biochemical Oxygen Demand)			
Hq			
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)			

- 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 samplers should familiarize themselves with the locations in Figure 5-1 and Figure 5-2 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 travel blanks (travel blanks will be filled with deionized water in the laboratory before you receive them) and field blanks (will need to be filled with deionized water in the field during sampling) 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. Fill the field blanks with deionized water.
- 7. Place a plastic sheet on the ground around the monitoring well.
- 8. Record in field book the date, time, sampling location and note any damage that can be seen on the well.
- 9. Remove the well cap and place beside the well.
- 10. 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.
- 11. 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

<sup>\*</sup>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 = 
$$2 \text{ft } \times 0.6528 \text{ gal/ft}$$
  
=  $1.31 \text{ gal}$ 

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.

- 12. Tie a nylon line to the top of the bailer.
- 13. 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.
- 14. Once bailer has filled with water, slowly raise out of the well and empty contents into the clean 5 gallon bucket.
- 15. Continue until the calculated well volume has been removed from the well.
- 16. 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.

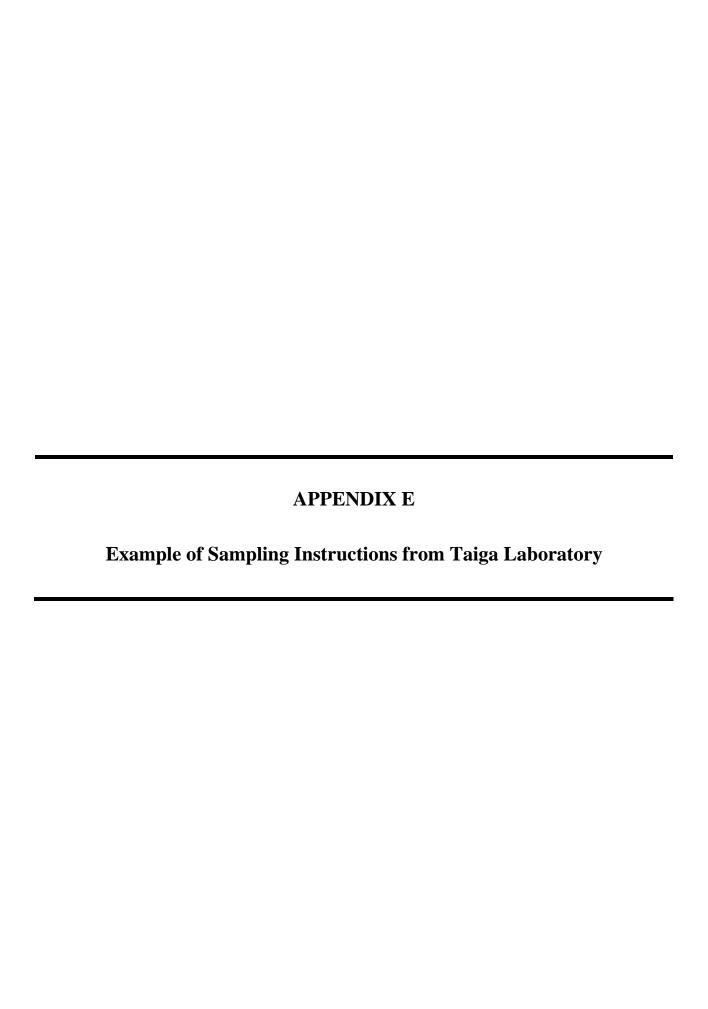
### **1.2.2** Filling the Sample Bottles

- 17. Take out bottles needed to sample at this location and place beside the cooler. DO NOT OPEN THE BOTTLES.
- 18. Select the bottles NOT requiring or containing preservatives and put aside.
- 19. Take the bottles requiring or containing preservatives and sample these first.
- 20. Please note that some bottles MUST be rinsed and some bottles MUST NOT be rinsed. Please refer to the water sampling instructions provided by the laboratory that sent the sample bottles to determine if the bottle requires rinsing. If rinsing is required, rinse bottle with sample water from the bailer and discard rinse water away from the sampling location. Rinse the bottle three times. If

the bottle must not be rinsed, 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 as directed by the water sampling instructions provided by the laboratory that sent the sample bottles. To add preservatives (if not already in the bottle) refer to the water sampling instructions provided by the laboratory that sent the sample bottles to determine which preservative to add to the sample. Carefully pour contents into the sample bottle. Screw the cover on tightly and mix by gently tipping the bottle back and forth.

- 21. 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 as directed by the water sampling instructions provided by the laboratory that sent the sample bottles (add preservative if necessary) and screw cap on tightly.
- 22. 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.
- 23. Continue until all preserved samples have been taken.
- 24. Now fill the bottles not requiring preservatives. Refer to the water sampling instructions provided by the laboratory that sent the sample bottles to determine which bottles need to be rinsed.
- 25. Fill bottles as directed in the water sampling instructions provided by the laboratory that sent the sample bottles and screw cover on tightly. Label and place in cooler.
- 26. Continue until the rest of the bottles have been filled.
- 27. Take off nitrile gloves and dispose in garbage bag.
- 28. Collect cooler and move to sampling location PEL-8-2. Repeat steps 4 to 27.
- 29. Collect cooler and move to sampling location PEL-8-1. Repeat steps 4 to 27.
- 30. Collect cooler and move to sampling location PEL-9-1. Repeat steps 4 to 27.
- 31. Collect cooler and move to sampling location PEL-9-2. Repeat steps 4 to 27.
- 32. Collect cooler and move to sampling location PEL-10-1. Repeat steps 4 to 27.
- 33. Collect cooler and move to sampling location PEL-10-2. Repeat steps 4 to 27.
- 34. 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 17 to 27, 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.
- 35. Once all samples have been collected and labeled, pack into coolers tightly with ice packs to limit movement during shipping.
- 36. Fill out the chain of custody form. An example of a filled out form can be found in Appendix C.
- 37. 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.
- 38. Fill out the shipping forms for sending the cooler to the lab and check that the plane will be on time.
- 39. 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.





# Taiga Environmental Laboratory

4601 52<sup>nd</sup> 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:

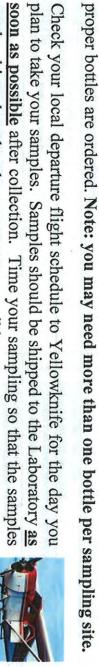
concerns, do not hesitate to contact the laboratory. Please have your water require, such as the proper bottles, filtration devices, etc. Refer to the Taiga's Prior to sampling, ensure you have obtained all the sampling equipment you license (if applicable) available before contacting the laboratory to ensure Water Sampling Instructions - Ordering Bottles. If there are any questions or



Step Two:

9

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



Step Three:

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



Safety Issues:

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



Taiga Environmental Laboratory

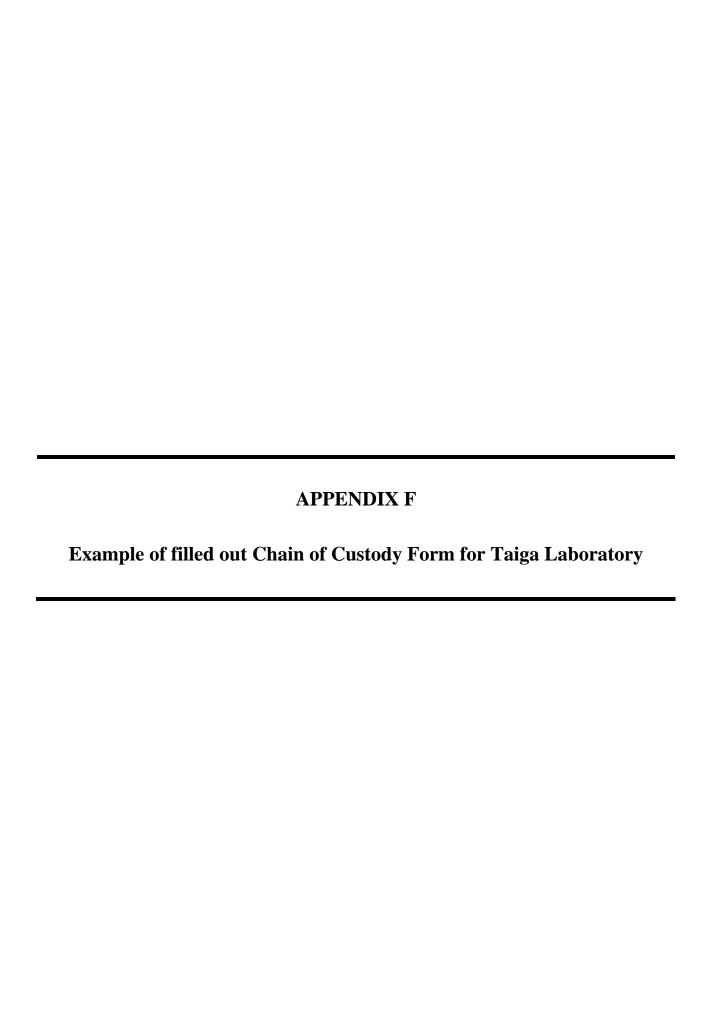
4601 52<sup>nd</sup> Avenue – Yellowknife, NT X1A 2R3

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# Water Sampling Instructions

# Collecting the Sample

	8	8	P	•	•			0	•	•			•	•	Pa
Chlorophyll A	Radionuclide	Sulphide	Phenol	Thiocyanate	Cyanide	Extractable Hydrocarbons	BTEX, THM & Purgeable Hydrocarbons	Hexane Extractable Material (HEM) (also known as Oil and Grease)	Dissolved Metals	Total Metals	Microbiological	Biochemical Oxygen Demand (BOD)	Nutrients	Routine	Parameter Group
IL BROWN PLASTIC BOTTLE	RED with R	ORANGE with S	YELLOW with P	ORANGE	BLUE	1 L AMBER GLASS W/ WHITE LID	40 mL CLEAR GLASS W/ WHITE LID	YELLOW	RED	RED	STERILE	PURPLE	BLACK	GREEN	Marking
Keep cool at 4°C	25mL of 17.5% nitric acid	2mL of 25% zinc acetate	2mL of 20% sulphuric acid	2ml of 25% sulphuric acid	1mL of 6N sodium hydroxide	Keep cool at 4°C	Keep cool at 4°C	4mL 1:1 sulphuric acid in YELLOW-dot vial	5mL of 1:3 nitric acid in RED-dot vials	5mL of 1:3 nitric acid in RED-dot vials	Sodium thiosulphate and Keep cool at 4°C	Keep cool at 4°C	Keep cool at 4°C	Keep cool at 4°C	Preservative
<ol> <li>Rinse bottle three (3) times with sample</li> <li>Fill to top and cap bottle.</li> <li>Sample must be sent to laboratory within 24 hours</li> </ol>	The sampling amount you see the	4. Cap bottle and mix.	<ul><li>2. Fill to near the top.</li><li>3. Add contents of preservative vial</li></ul>	Rinse bottle three (3) times with sample	The state of the s	DO NOT RINSE BOTTLE     Fill to top and cap bottle.	<ol> <li>DO NOT RINSE BOTTLE</li> <li>Fill bottle completely leaving NO air bubbles</li> </ol>	<ol> <li>DO NOT RINSE BOTTLE</li> <li>Fill to shoulder of bottle.</li> <li>Add contents of preservative vial</li> <li>Cap bottle and mix</li> </ol>	<ol> <li>Filter Sample with 0.45 µm Cellulose Acetate filter</li> <li>Rinse bottle three (3) times with filtrate</li> <li>Fill to near the top.</li> <li>Add contents of preservative vial</li> <li>Cap bottle and mix.</li> </ol>	<ol> <li>Rinse bottle three (3) times with sample</li> <li>Fill to near the top.</li> <li>Add contents of preservative vial</li> <li>Cap bottle and mix.</li> </ol>	<ol> <li>DO NOT RINSE BOTTLE</li> <li>Fill to top and cap bottle.</li> <li>Sample must be sent to laboratory within 24 hours</li> </ol>	<ol> <li>Rinse bottle three (3) times with sample</li> <li>Fill to top and cap bottle.</li> <li>Sample must be sent to laboratory within 24 hours</li> </ol>	2. Fill to top and cap bottle.	Rinse bottle three (3) times with sample	Instructions





## TAIGA ENVIRONMENTAL LABORATORY LABORATOIRE ENVIRONNEMENTAL TAIGA

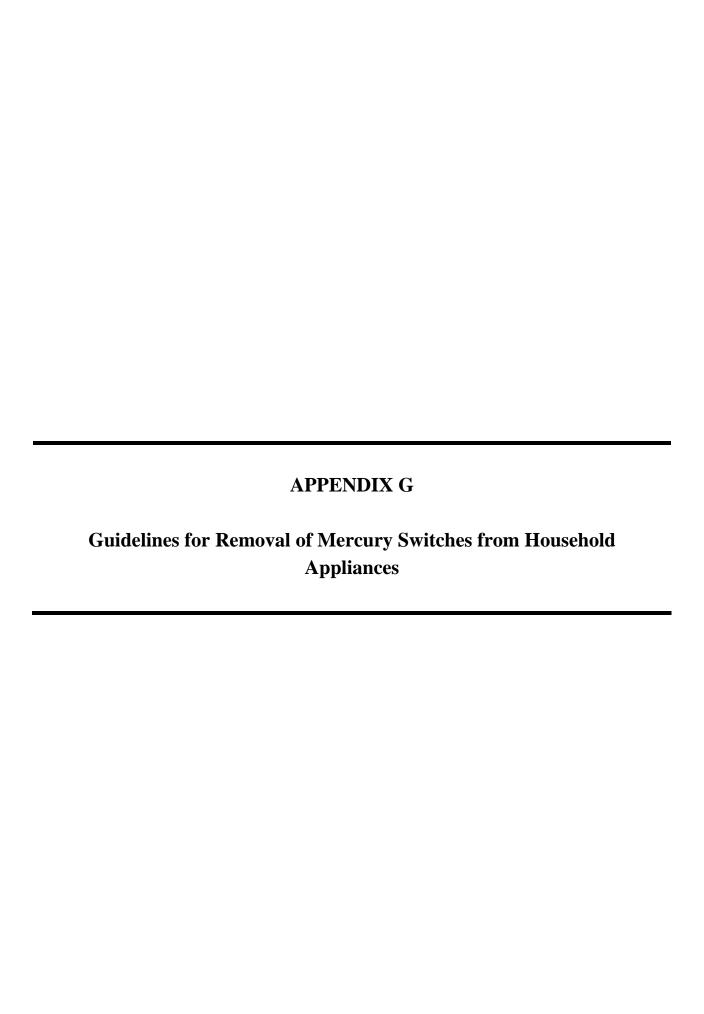
4601 – 52 Avenue, P.O. Box 1500, Yellowknife, NT, X1A 2R3

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 diffe	erent locations)	Clien	Client Project No: SNP-Solid waste Facilities					
	2	1 1	Date collected:					
Company/Agency: Hamlet of			Time collected:					
Address: Hamlet Office		1 500000						
		Samp	Sampler:					
City/Town: Kunaruk Province/	Cerritory: NU	Loca	tion: Kugar	aruk Sol	ia wast	e Pacilities		
Postal Code: XOB IKO		Rush	Required: $\square$	Yes No (Surch	arge applies, pleas atory for price and	se check with d availability)		
Phone: (867) 769-628/ Fax: (8)	67) 769-6069	Note	: Analysis may	be subcontrac	ted without pri	or notice.		
E-mail:		Date		Re				
Signature :		Com	ments:					
Signature:		(Labo	ratory use only)					
	-WATER	SAMPL	ES –					
Sample Type (freshwater, sewage, wastewater, potable, groundwater, salt water, etc)	landfill le	eachate	Landfill	Leachate	Landfi	11 Leachat		
Client Sample ID  (As it should appear on final report)			PEL		PEL-	8-1		
Taiga Sample ID (Laboratory use only)								
Bottle Type and Parameter	[√]PLEA	SE CHEC		TERS REQUE	STED BELO	W:		
pH, Conductivity, Alkalinity	pH Cond	Alk	pH Cor		pH) Coi			
Individual Anions Suite B	Cl SO <sub>4</sub> F NO <sub>2</sub> -N		$Cl (SO_4) F NO_2 + NO$		$(NO_2 + 1)$			
Total Nitrite (NO <sub>2</sub> ) + Nitrate (NO <sub>3</sub> ) Individual Cations Suite □	$(NO_2 + NO_3 - 1)$ $(Ca)$ $(Mg)$ $(Na)$			Na K	Ca Mg			
Hardness (Calculated)	Hardness		Hard	ness	Hard	ness		
Reactive Silica	SiO <sub>2</sub>		SiC		SiC			
Color		True	Apparent	True	Apparent Rec'd: Y N	True		
Laboratory use only	Rec'd: Y N		Rec'd: Y N	0	CO	D		
Chemical Oxygen Demand	COD	DN	TN	DN	TN	DN		
Nitrogen: Total, Dissolved  Turbidity	Turbidity	DIN	Turbi	dity	Turbi			
Total Suspended Solids, Dissolved Solids	TSS	TDS	TSS	TDS	TSS	TDS		
Ammonia	TP DP			H <sub>3</sub> ) P OP		P OP		
Phosphorus: Total, Dissolved, Ortho		OP OOC	TP D TOC	DOC	TOC	DOC		
Carbon: Total, Dissolved Chlorine: Total, Residual		R. Cl	T. CI	R. CI	T. CI	R. Cl		
Visible Oil and Grease	Visible		Visil	ole	Visi	N		
Laboratory use only	Received: Y N		Received: Y		Received: Y	_		
Fecal Coliforms (FC)	FC		(F	9	Œ	O		
Total Coliforms (TC), E. Coli (EC)	TC	EC	TC	EC	TC	EC		
Fecal Streptococcus (FS)	FS	°C	Received: Y	S N T: °C	Received: Y	S N T: °C		
Laboratory use only	Received: Y N T: Sterile container: Y N		Sterile container		Sterile container	Y N		
Biological Oxygen Demand	BOD			OD		OD		
Laboratory use only	Received: Y N T:	°C	Received: Y N	T:°C	Received: Y N	T:°C		
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 Di	ssolved	Total	Dissolved	Total	Dissolved		
ICP-MS(2): 25 element scan includes As (not included: B, Bi, Hg, Sn) Individual Metals by ICP-MS	Total Di	ssolved	Total	Dissolved	Total	Dissolved		
(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 Di	ssolved	Total	Dissolved	Total	Dissolved		
Laboratory use only	TM rec'd: Y N DM r	ec'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	22 22	HE			EM		
Laboratory use only		s: Y N	Rec'd: Y N	Pres: Y N	Rec'd: Y N	Pres: Y N		
BTEX, Purgeable HC (40mL x 2 vials) Extractable HC (1L amber glass bottle)	BTEX P	urg HC	BTEX	Purg HC	BTEX	Purg HO		
Trihalomethanes (40 mL x 2 vials)	THM			IM		łM		
Laboratory use only	Vial rec'd: Y N Ext r	ec'd: Y N	Vial rec'd: Y N	THE RESERVE THE PERSON NAMED IN COLUMN TWO IS NOT THE OWNER, THE PERSON NAMED IN COLUMN TWO IS NOT THE OWNER,	Vial rec'd: Y N	Ext rec'd: Y N		
Other: see special request form	Total Phenols,		Total Pher	ols, PAH	Total Phe	nols, PAH		
For safety purposes, please disclose any contami		ls, cyanide, e	etc.)					
that may be present at high levels and pose a risk	. to numan nealth:							



# HOUSEHOLD APPLIANCE MERCURY SWITCH REMOVAL MANUAL

**SPRING 2002** 







### PRODUCED BY:







Special Thanks to the following people and organizations for help in the development of this manual;

Gary Winnie of the Chittenden Solid Waste District (CSWD), Gary Hobbs of the Addison County Solid Waste District (ACSWD), The Northeast Kingdom Waste Management District (NEKWMD), The Association of Home Appliance Manufactures (AHAM), Purdue University, and the Vermont Recycling & Hazardous Waste Coordinators Networks.

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### **REFERENCES**

### 1.0 INTRODUCTION

Mercury (Hg) is one of the most widespread, persistent and toxic contaminants in our environment. Its incorporation into many products and its emission from combustion processes has resulted in well documented instances of population poisonings, high level occupational exposures, and worldwide, chronic, low-level environmental exposures. About two-thirds of the mercury in the atmosphere comes from human sources such as coal burning power plants and incinerators, and one-third from natural sources such as volcanoes and forest fires. The amount of mercury flowing into our lakes is between two and four times what flowed into them 100 years ago<sup>8</sup>.

In the environment, mercury is found in various forms and complexes. Atmospheric mercury mixes with rain and snow and falls into lakes, rivers and watersheds. Once mercury enters a waterway, natural processes convert a small proportion of it to methyl mercury. Methyl mercury, one organic form of mercury, can accumulate up the food chain in lakes, ponds and reservoirs which results in high concentrations in predatory fish.

When certain mercury-tainted fish are consumed by humans, the levels of mercury can impair development of the nervous system in the fetus and in young children, affecting sensory, motor and cognitive functions, and resulting in such problems as difficulty in learning to read and inability to concentrate. Vermont's relatively pristine waters have not been spared from this regional and global problem. In addition to fish consumption advisories that recommend limiting consumption of certain fish in certain bodies of water, recent studies have shown that 12 percent of Vermont's lakes have sufficient mercury in their food chains to put common loons at considerable risk of toxic effects.

In order to prevent the continued release and build-up of mercury (in all forms) in the environment, many states including Vermont are currently working towards eliminating major sources of mercury releases. The Governors of the New England States and the Premiers of the Eastern Canadian Provinces have endorsed a regional goal of "the virtual elimination of the discharge of mercury into the environment" from man-made sources. Vermont has addressed mercury elimination through its Mercury Education and Reduction Campaign (MERC), which has included thermometer exchanges, school clean-outs, retailer and contractor mailings, dairy manometer exchanges, pharmacy pledges and various other outreach efforts to remove mercury from the solid waste stream.

One of Vermont's other efforts is the removal of mercury from discarded household appliances or "white goods". Many of these white goods, which are currently being collected for their scrap metal value, contain mercury switches and thermocouples. Mercury was used in household appliances due to it being a highly reliable means for electrical switching in varied temperature and moisture conditions<sup>4</sup>.

When "white goods" are processed for scrap metal, mercury may be released to the environment. In fact, when white goods are processed (shredded) for scrap metal, there are three distinct by-products. These are classified into ferrous, non-ferrous metallic and nonmetallic components<sup>1</sup>. It is the "fluff" or non-metallic components that many of the hazardous constituents in household appliances adhere to, including mercury<sup>2</sup>. These hazardous components are then available to be released either through smokestack emissions at smelters, incinerators or through landfill leachate from intact products or ash from their incineration<sup>1</sup>. The diagram on the following page details how mercury cycles through the environment.

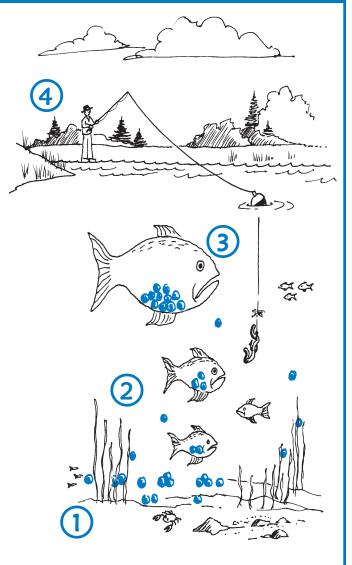
## How Does Mercury Get Into Fish?

Once in a lake or river, mercury is converted to methylmercury by bacteria and other processes. Fish absorb methylmercury from their food and from water as it passes over their gills. Mercury is tightly bound to proteins in all fish tissue, including muscle. There is no method of cooking or cleaning fish that will reduce the amount of mercury in a meal.

Methylmercury accumulates as you move up the food chain:

- 1. Methylmercury in the water and sediment is taken up by tiny animals and plants known as plankton.
- 2. Small fishes eat large quantities of plankton over time.
- Large predatory fish consume many smaller fish, accumulating methylmercury in their tissues. The older and larger the fish, the greater the potential for high mercury levels in their bodies.
- Fish are caught and eaten by humans and animals, causing methylmercury to accumulate in their tissues.

The State of Vermont Fish Contaminant Monitoring Program has been monitoring the



• = represents methylmercury

levels of mercury in fish tissue since 1987. Measureable concentrations have been observed in 95% of the samples collected from lakes and rivers across the state. The highest amounts of mercury are generally found in older fish of species which consume other fishes. The species which contain the greatest amounts of mercury are walleye from Lake Champlain, smallmouth bass, and chain pickerel. The lowest mercury levels are found in pumpkinseed sunfish, brown bullhead, and brook trout from streams. The Vermont Department of Health has issued a fish consumption advisory which recommends that fewer meals be consumed of species with greater than average mercury levels. The advisory is also more protective of women of child-bearing age and children under age 7. For more information on consumption advisories call the Department of Health toll-free at 1-800-439-8550.

The purpose of this manual is to address the removal of mercury switches and thermocouples prior to appliances being processed for their scrap metal. By educating individuals on how to remove mercury prior to metal reclamation, we all can help manage mercury wastes properly and keep mercury out of the environment.

### 2.0 REGULATORY BACKGROUND

Mercury is an environmental concern because it is a heavy metal that can accumulate in living tissues and cause adverse health effects. When a mercury containing device is disposed of in a landfill or incinerator, the mercury in it can escape to contaminate air, soil, surface water and ground water. For a number of years, the Vermont Department of Health has issued health advisories warning people to limit consumption of freshwater fish caught in Vermont due to elevated levels of mercury in some fish species. When mercury is spilled in the home or workplace, the silvery liquid metal can evaporate and be breathed in by everyone in the building. Mercury affects the human brain, spinal cord, kidneys and liver. It affects the ability to feel, see, taste and move. Long term exposure can result in symptoms that get progressively worse and lead to personality changes, stupor and coma.

Mercury is intentionally added to many familiar products. Some of these include:

- > flourescent and high intensity discharge (HID) lights
- > certain types of thermometers and thermostats
- > heat sensors for gas pilot lights
- > tilt switches in automobiles and appliances
- > silent wall switches and electric relays
- vacuum gauges, barometers and manometers

For the last 20 years, mercury-containing waste from business, industry and institutions has been considered a hazardous waste because it often fails standard EPA toxicity test limits. More recently, a less restrictive waste handling option has been added to both state and federal hazardous waste regulations for certain mercury-containing wastes. These wastes are called "Universal Wastes" because they are equally likely to come from either regulated or unregulated sources. Only thermostats and hazardous waste (mercury-containing) lamps are currently listed as Universal Wastes. Wastes that are listed as "Universal Wastes" have reduced requirements for reporting, handling and storage (See Vermont Hazardous Waste Management Regulations, Subchapter 9, *Universal Waste Management Standards* for more information.). By having less restrictions on mercury-added product management, proper management can be easily facilitated.

The Vermont Agency of Natural resources is in the process of revising its "Universal Waste" rule to include all categories of mercury-added products. In the interim, to facilitate removal of as many of these products as possible from the solid waste stream and promote proper management of the collected mercury, these waste materials may be handled under existing provisions of the Vermont Hazardous Waste Management Regulations (See Subchapter 9, *Universal Waste Management Standards*) in the same manner as "Universal Waste Thermostats".

In 1998, the Vermont legislature passed a bill to decrease the amount of mercury in the State's solid waste. Under one provision of the bill, labeled mercury-added products are required to be separated

from the trash and are banned from landfill disposal. After March 1, 2000, all mercury-added products are required to be labeled under Vermont Law. Municipalities and Solid Waste Districts are required to provide collection programs for these materials. The Vermont law applies equally to households, farms, businesses and industries. The following mercury-added products are banned from landfill disposal and/or are required to be labeled in Vermont:

- > thermostats or thermometers
- > switches individually or part of other products
- > medical or scientific instruments
- > electric relays or other electric devices
- > lamps
- batteries, other than button cells

### **HOW TO USE THIS MANUAL**

### This manual covers:

- > the purpose of mercury in particular appliances
- > its location and use
- > how to safely and properly remove it
- > how to safely store mercury-added products
- > the proper methods of disposal or recycling
- ➤ mercury spill clean-up
- > lists of hazardous waste transporters, mercury recyclers and spill clean-up firms

Since we are constantly discovering additional products with mercury-added components, this manual remains a work in progress. Please let us know of any additional products that you feel should be added to this manual.

### 3.0 HOUSEHOLD APPLIANCE MERCURY REMOVAL

**Safety Note:** Proper personal protective equipment should be used at all times (i.e, safety glasses, gloves, tyvek suit and in the event of a spill a respirator and mercury cartridges). In addition, spill equipment and storage material should be on-hand prior to any mercury-added device removal.

All appliances should be unplugged from an electrical outlet prior to any mercury switch removal. Appliances that have had these devices removed should be disabled to prevent future use (i.e, cut the electrical cord, or disable the gas feed line). All appliances that have had their mercury switches removed should be handled as scrap metal for recycling (not to be reused as a home appliance). All other hazardous components must be properly removed and disposed of (including but not limited to chlorofluorocarbons (CFCs) and polychlorinated biphenyls (PCBs) prior to scrap metal recycling.

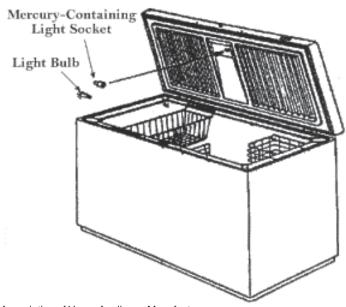
In case a switch breaks during the removal process, please follow the mercury spill clean-up instructions on page 20.

**Note:** Once these mercury-added products are removed, proper handling, storage and disposal are described on page 19 and in Appendix E.

### 3.1 Chest Freezers

Some chest freezers are made with a mercury switch inside the freezer cover light socket (see Figure below). The mercury engages two contact points when the lid is opened thus completing the electrical circuit and turning on the light. All freezer manufacturers have stopped using mercury as a switching mechanism and begun using a mechanical switch by January 1, 2000. If there is no visible push button switch mechanism, the freezer is likely to have a lid mercury tilt switch<sup>3</sup>.

Chest Freezer with Mercury-Containing Light Socket.



Reprinted with permission from the Association of Home Appliance Manufacturers, Appliance Recycling Information Center, Bulletin #8, Mercury in Home Appliances.

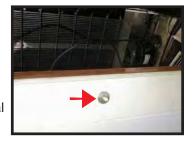
The following procedure should be used for removal of the mercury tilt switch.

### CHEST FREEZER MERCURY SWITCH REMOVAL

# ESTIMATED REMOVAL TIME: 1-5 MINUTES

### STEP 1.

Open the freezer lid and look for a manual switch, similar to the one shown above. If it has a manual switch, the appliance can be handled as scrap metal (after removal of CFCs).



### STEP 2.

Locate the light socket on the underside of the lid (on some freezers you may have to remove a plastic light cover).



If there is no manual switch, proceed to STEP 2.

### STEP 3.

Remove the light bulb and properly discard.



STEP 4.

Remove the plastic housing (either by unscrewing it or breaking it off).



### STEP 5.

Gently pull the light socket out of its mounting bracket (due to some lights having an in line mercury switch see Reference Photo 2 below).



STEP 6.

Cut or remove the attached wires.



STEP 7.

Remove and properly dispose of the entire light socket.



**REFERENCE PHOTO 1.** 

Assorted mercury freezer switches for disposal.



**REFERENCE PHOTO 2.** 

Chest freezer light with an inline mercury switch (glass ampule).



### 3.2 Washing Machines

Mercury switches were used in a small number of washing machines manufactured prior to 1972 because of their ability to reliably function in a high-moisture environment. Most washing machines with mercury switches will have passed through the recycling stream by 2010. Mercury switches were used for two different applications in washing machines, both of these uses were for consumer protection.

One application of the mercury switch was used to detect a lid opening and engage a brake to quickly stop the washer drum from moving. This feature is particularly important when the washer is in a spin cycle because it reduces the risk of a consumer being injured by reaching into a spinning basket. This switch is located between the washer tub and the cover for the tub area of the washer and is activated when the lid of the washer is lifted.

Another use for mercury switches in washing machines was in the dynamic stabilizing system to prevent a severe out-of-balance condition (only on certain models). This switch worked by breaking the circuit when the washing machine was severely out of balance. This switch is located on the back of certain washing machine models and is activated when the washing machine is severely out of balance.

These switches can be identified and removed using the following procedures.

### WASHING MACHINE MERCURY SWITCH REMOVAL

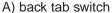
# ESTIMATED REMOVAL TIME: 5-10 MINUTES

### STEP 1.

Open the lid on the washer and look for a non-mercury mechanical switch. These switches come in various sizes, shapes and locations. You should also be able to hear an audible "click" when a mechanical switch engages and disengages (with the opening and closing of the lid). If there is no mechanical switch continue to STEP 2. Photos A and B are examples of non-mercury mechanical switches.

Non-mercury mechanical switch examples:







B) front tab switch.

Once you have determined that there is no mechanical switch, the following procedure can be used to remove the mercury switch.

### STEP 2.

Pry off the top of the washing machine as shown in figure a. or remove any fasteners from the lid as shown in figure b.





STEP 3.
On the underside of the lid, attached to the lid mounting rod, is an encapsulated mercury switch.



**STEP 4.**Remove the switch from the bracket.



**STEP 5.**Cut or remove any attached wires.



**STEP 6.** Properly dispose of the entire washing machine mercury switch.



**ESTIMATED REMOVAL** G

TIME: 5-10 MINUTES

Another use for mercury switches in washing machines was in the dynamic stabilizing system to prevent a severe out-of-balance condition (only on certain models). Only through removal can you distinguish between a manual switch and a mercury switch. The mercury will be visible.

### SEVERE OUT-OF-BALANCE SWITCH REMOVAL

STEP 1. Locate the dynamic stabilizing switch on the back of the washing machine.



STEP 2. Remove the fastening bolts.

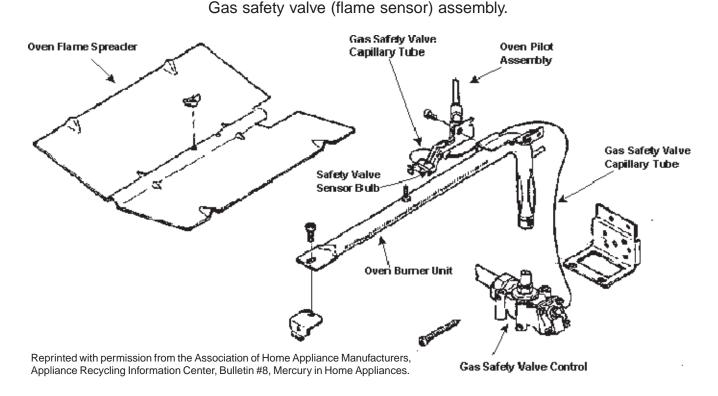


STEP 3. Disconnect the attached wires and properly dispose of the switch.



### 3.3 Gas Ranges

Gas ranges are ignited using either an electronic ignition system or a pilot-light. Pilot-light ranges require a mechanical safety device to detect whether the pilot-light is on and shut off the supply of gas to the burner when the pilot-light is not burning. Otherwise, the potential exists for a dangerous quantity of gas to build up in the oven. The diagram on the following page depicts the mercury containing control device on the gas burner assembly.



The gas burner is located beneath the oven cavity in the broiler pan. (Note: All appliances manufactured after March 1, 2000 should be labeled if they incorporate a mercury-containing device.) Gas ranges contain many temperature sensing probes and switches. The following procedure shows you how to distinguish the non-mercury probes and switches from the mercury switches (many times within the same appliance). Many of your stainless steel safety valve capillary tubes and sensor bulbs are mercury-containing devices while copper safety valve capillary tubes and sensor bulbs are non-mercury containing devices. As a general rule, magnetic metals are mercury-containing probes while non-magnetic metals are non-mercury containing probes. This may be difficult to distinguish with baked on food. What may appear copper maybe stainless steel coated with baked on food. Removal of any baked on food maybe necessary prior to determining metal type.

Temperature capillary tubes and bulbs found within ovens or below upper burners are usually copper probes. A copper probe is good indication of a non-mercury containing device. These capillary tubes and bulbs are instead filled with an oil or sodium-potassium mixture. Photos A thru D on the following page show some examples of non-mercury probes.

### NON-MERCURY TEMPERATURE PROBES

These photos are examples of non-mercury temperature probes in a gas range and oven. Photos A and B show the top view of a gas range after the burner surface has been removed. Note that these capillary tubes and bulbs start at the temperature control knob.

Photos C and D show the oven control temperature capillary tubes and bulbs (top of the oven cavity) which continue from the oven control knob into the oven cavity.









If you have determined that the gas oven capillary tubes and bulbs are mercury containing, the following procedure can be used to identify and remove the mercury gas safety valve control assembly.

## GAS RANGE MERCURY GAS SAFETY VALVE CONTROL ASSEMBLY REMOVAL PROCEDURE

### STEP 1.

Remove the broiler pan drawer.



### STEP 2.

Once the drawer is removed you can view the burner assembly inside.



**ESTIMATED REMOVAL** ©

TIME: 15-20 MINUTES

### STEP 3.

When viewing the burner assembly, the small capillary tube (pointed out) is indicative of a mercury sensor switch.



### STEP 3A.

Burner assemblies without a capillary tube but instead with an electronic pilot flame sensor (identifiable by the two wires) are **non-mercury**.



### STEP 3B.

For gas ranges with a bracket covering the pilot, simply bend the bracket out of the way to view the wires indicating an electronic pilot sensor (non-mercury sensor).



Ranges without a capillary tube can be sent to scrap metal after making sure there is no fluorescent backlighting (see STEP 16) or PCBs.

For ranges with a capillary tube, proceed to STEP 4.

### STEP 4.

If you have a capillary tube (like the one in the photo), you will now have to remove the burner assembly, valve and all attached gas fittings.



### STEP 5.

Start by removing the key (sometimes a screw or a pressure fit) holding the burner assembly in.



### STEP 6.

With the burner assembly loose, **proceed to STEP** 7.



STEP 7.

Disconnect the gas feed line by loosening the fitting or cutting the gas line.



### STEP 8.

Disconnect the pilot gas feed line by loosening or cutting (there may sometimes be two feed lines).



STEP 9.

Remove the two screws holding the gas safety valve control in place.



### **STEP 10.**

The entire burner assembly and valve are now ready to be removed. Note there is no screw or pin holding the oven burner unit, this is an example of a pressure fitting oven burner unit.



### **STEP 11.**

Gas range with the oven burner unit and gas safety valve control removed.



### **STEP 12.**

The removed oven burner unit and gas safety valve control.



### **STEP 13.**

Remove the screw holding the gas safety valve control and gas safety valve capillary tube and bulb to the oven pilot assembly.



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**STEP 14.** 

Carefully pull the gas safety valve capillary tube and safety valve sensor bulb back through the bracket.



### **STEP 15.**

The entire gas safety valve control, gas safety valve capillary tube and safety valve sensor bulb are now ready for proper disposal. **Proceed to STEP 16**.



EXAMPLES OF SOME MERCURY GAS SAFETY VALVE CONTROLS, CAPILLARIES AND BULBS

Photos A & B show complete mercury gas safety valve control, capillary and bulb. Photo C shows a gas auto pilot probe.







### GAS RANGE FLUORESCENT BACKLIGHTING REMOVAL

### **STEP 16.**

Prior to disposal, all stoves should be inspected to make sure that there is no fluorescent backlighting or PCBs. Some backlighting contains fluorescents and PCBs that come in various shapes and sizes (in addition to the one shown in the photos) and should be carefully removed and disposed of properly.







### 3.4 Gas Hot Water Heaters

Although all the current literature states that mercury was not used in residential hot-water heaters, the following procedure has been included to help prevent any mercury-added thermocouples from entering the waste stream and eventually the environment. Use the following procedure to properly identify and remove any mercury-containing thermocouples (usually commercial hot-water heaters of 100 gallons or more).

### GAS HOT WATER HEATER MERCURY THERMOCOUPLE REMOVAL

ESTIMATED REMOVAL TIME: 5-10 MINUTES

**STEP 1.**Locate the temperature control unit.



STEP 2.

Determine if there is an electronic flame sensor (determined by the presence of wires) or if there is a mercury thermocouple.



STEP 3. Use a magnet to determine if it is indeed a mercury probe (non-magnetic probes are non-mercury).



STEP 4.

If the probe is mercury, simply remove the bottom of the heater and loosen the nut attaching the probe. Then properly dispose of the mercury thermocouple.

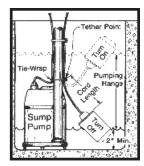


PHOTO A.
A non-mercury
temperature probe. Notice
that this probe is copper,
which is a good indication
of a non-mercury
containing device.



### 3.5 Sump and Bilge Pumps

Another use for mercury was as a switch in sump and bilge pumps. This switch, which functioned very reliably in the high moisture environment, turned on and off based on the corresponding water level (see sump pump diagram at right). As the water level rises, so does the float ball and wire (a wire attached to the float is a good indication of a mercury sump pump) which would then tilt the mercury switch, completing the electrical circuit that turns on the pump. As the water level receded the electrical circuit would then be broken and the pump would turn off.



Basic sump pump operation (mercury switch). Reprinted with permission from Purdue University.

### SUMP PUMP MERCURY REMOVAL



A mercury-free sump pump. Notice the metal guide and no attached wires.

The sump pump on the left is an example of a mechanical sump pump. This pump works on the same principle that as the float ball rises up with the water it would turn on the pump (mechanical switch) and when the water recedes it would sink down with the water and shut the pump off. As can be seen in the photo on the left, a metal guide is used instead of a wire. This is a good indication of a non-mercury sump pump.





Sump pump float containing mercury.

**ESTIMATED REMOVAL** 

TIME: 1-2 MINUTES

Once you have determined whether or not it is a mercury sump pump, the wire attaching the float can simply be cut and the whole float properly disposed of (see photo at right).

### **BILGE PUMP MERCURY REMOVAL**



Bilge pump containing mercury.

Bilge pumps work on the same principle as a sump pump. By rotating on a stationary point (see drawing on right) with the fluctuations in water level either up or down, the bilge pump would turn on or off. Several of the newer models use this method with a rolling steel ball instead of mercury to complete the electrical circuit. This can be determined by simply shaking the bilge pump. A steel ball bearing will be easily discerned from liquid mercury.



Automatic switch bilge pump.

Once you have determined it is a mercury bilge pump, you can simply remove the entire pump and properly dispose of.

### 4.0 MERCURY HANDLING, STORAGE AND DISPOSAL

Once mercury devices are removed, they should be properly handled, stored and disposed of. The handling, storage and disposal protocols covered below are a best management strategy for individuals or businesses (non-profit and for profit) that generate less than 11,000 pounds of universal waste at anytime (all universal wastes combined). Individuals or businesses who will be generating more than 11,000 pounds should refer to Subchapter 9, the Universal Waste Management Standards in the State of Vermont Hazardous Waste Management Regulations.

Included for your convenience are two fact sheets, **Appendix E - Waste Mercury Containing Switches and Devices** and **Appendix F - Flourescent Lamps**, which summarize handling, storage and disposal requirements for these products.

### 4.1 Handling

A mercury-containing switch or product should always be handled in a way that will prevent breakage. Also when removing mercury or mercury-added components from a product do so only over or in a containment device that will collect and contain any mercury released in the event of a mercury-added product breaking. Be sure to keep spill clean-up kits (See Section 5, Mercury Spill Clean-up) and equipment readily available and always ensure that there is adequate ventilation. *Any spilled mercury or any contaminated clean-up materials must be handled as a hazardous waste. For large spill clean-ups (more than 1 or 2 tablespoons) a firm specializing in mercury clean-up should be acquired (see Appendix B).* Anyone handling mercury or mercury-added products should use proper personal protective equipment (latex gloves, tyvek suit, safety glasses and a respirator with mercury cartridges if cleaning up a mercury spill) and be thoroughly familiar with proper mercury handling and emergency procedures (See Appendix E - Waste Mercury Containing Switches and Devices Factsheet).

### 4.2 Storage

All mercury-containing switches or products must be stored in containers that will prevent any breakage or leakage. These containers must be closed, structurally sound and compatible with the mercury-added products being stored. All containers of mercury-added products must be properly labeled with one of the following; "Universal Waste- Mercury-added Product(s)", or "Waste Mercury-added product(s)" or "Used Mercury-added products" and stored for no more than one year.

### 4.3 Disposal

Properly contained and labeled mercury-added products can be disposed of in three possible disposal routes. These are:

- > Disposal through a local Solid Waste District, Alliance or Municipality. This is usually done through Household Hazardous Waste Collection events or facilities (see Appendix A for a list of Solid Waste Districts, Alliances and Municipalities).
- > Disposal through a hazardous waste transporter (see Appendix C).
- ➤ Disposal through a mercury recycler (see Appendix D).

### 5.0 MERCURY SPILL CLEAN-UP

### **MERCURY SPILL KIT**

At a minimum you should have the following supplies in the event of a mercury spill. Those removing and collecting mercury on a continued basis should consider adding a commercially available spill kit to these items.

- > index cards
- respirator with mercury vapor cartridges
- ➤ sulfur powder
- > flashlight
- > rubber squeegee
- > zinc or copper flakes
- > tape
- > Ziploc plastic bags
- > paper towels
- > plastic dust pan
- > wide mouth plastic container with cover
- > plastic trash bags
- > latex gloves

**Note:** Most spill/safety equipment suppliers have complete spill kits for purchase. Contact the Agency of Natural Resources for purchasing information.

### EMERGENCY MERCURY SPILL CLEAN-UP PROCEDURE

This clean-up procedure is only intended for small mercury spills. If the spill involves more than one or two tablespoons of free mercury or the material has splattered over a sizeable area, is in cracks and crevices or other difficult to clean places, or is on a non-disposable porous item such as wall to wall carpeting or upholstery, we recommend you retain an environmental firm with the equipment and expertise to perform the cleanup (see Appendix B) and call the Vermont Spills Hotline at 1-800-641-5005.

- A) Wear latex gloves to prevent skin contact. Keep your hands away from your face-especially your eyes, nose and mouth. *Before beginning any spill clean-up make sure that the area is adequately ventilated or you have a respirator with mercury vapor cartridges*.
- B) Carefully pick up any broken pieces of glass (**NEVER SWEEP OR VACUUM MERCURY**). Place them on a paper towel or tissue. Wrap or fold the paper towel, and place into a leak-tight plastic bag or sealable plastic container.
- C) Sprinkle sulfur powder on the spill area to control mercury vapors. Then, working from the outside of the spill area toward the center, push small mercury beads together with a card, stiff paper, or squeegee to form larger droplets. Put droplets into a leak-tight plastic bag or plastic container.

- D) Use the sticky side of a two-inch (or wider) duct or masking tape to pick up any remaining glass or mercury beads. Pay special attention to cracks and crevices. Place tape and debris in a leak-tight plastic bag or sealable plastic container.
- E) Use a flashlight to look all around the spill area. The light will reflect off the shiny mercury beads and make it easier to see them.
- F) Sprinkle sulfur powder on the spill area after cleaning up beads of mercury; a color change from yellow to brown indicates that mercury is still present and more cleanup is needed.
- G) Sprinkle zinc flakes or copper flakes (available at hardware stores) to amalgamate any small amounts of mercury which remain.
- H) When finished, carefully remove latex gloves and place them in a leak-tight plastic bag or sealable plastic container. Do not touch the glove fingertips or parts that may have come in contact with mercury. Place all the closed containers in a double plastic bag and tie the opening. Properly dispose through a hazardous waste transporter, mercury recycler (see Appendix C) or call your Solid Waste District, Alliance or Municipality (see Appendix A).
- I) Thoroughly clean your hands and body. **Never wash contaminated clothing in a washing machine or remove contaminated clothing or apparel from a spill site. This will help prevent further site contamination**. These should also be properly disposed of.

### **APPENDIX A**

### **VERMONT SOLID WASTE DISTRICTS, ALLIANCES AND MUNICIPALITIES**

### ADDISON COUNTY SOLID WASTE MANAGEMENT DISTRICT

P.O. Box 573, Route 7 South Middlebury, VT 05753 (802) 388-2333

Fax: 388-0037

email: acswmd@acswmd.org Website: www.acswmd.org

### Participating Towns:

Addison, Bridport, Cornwall, Ferrisburg, Goshen, Leicester, Lincoln, Middlebury, Monkton, New Haven, Orwell, Panton, Ripton, Shorebam, Starksboro, Vergennes, Waltham, Weybridge, Whiting

### BENNINGTON REGIONAL PLANNING COMMISSION

Box 342

Arlington, VT 05250 (802) 375-9964 Fax: 375-1561

### Participating Towns:

Arlington\*, Dorset\*, Manchester\*, Pownal\*\*, Rupert, Sandgate\*, Shaftsbury\*\*, Stamford, Sunderland

\* town works closely with BRPC

### **Town Contacts:**

Pownal: Steffan Strohmaier, Pownal Town Office, P.O. Box 411, Pownal VT 05261 Tel# 823-7757. Shaftsbury: Dennis McCarthy, Asst. to Sel. Bd., P.O. Box 409, Shaftsbury VT 05262 Tel #442-4043.

### CENTRAL VERMONT SOLID WASTE MANAGEMENT DISTRICT

137 Barre Street Montpelier, VT 05602 (802) 229-9383 or 1-800-730-9475

Fax: 229-1318

email: fieldprograms@cvswmd.com

### Participating Towns:

Barre City, Barre Town, Berlin, Bradford, Cabot, Calais, Chelsea, East Montpelier, Hardwick, Marshfield, Middlesex, Montpelier, Northfield, Orange, Plainfield, Roxbury, Tunbridge, Walden, Washington, Williamstown, Woodbury

<sup>\*\*</sup> send mailings directly to town contact

### CHITTENDEN SOLID WASTE DISTRICT

1021 Redmond Road Williston, VT 05495 (802) 872-8100

Fax: 878-5787

Recycling Hotline: 872-8111 E-mail: info@cswd.net

### <u>Participating Towns:</u>

Bolton, Burlington, Charlotte, Colchester, Essex, Essex Junction, Hinesburg, Huntington, Jericho, Milton, Richmond, St. George, Shelburne, South Burlington, Westford, Williston, Winooski

### GREATER UPPER VALLEY SOLID WASTE MANAGEMENT DISTRICT

96 Mill St. P.O. Box 58

North Hartland, VT 05052-0058

(802) 296-3688 Fax: 281-7088

E-mail: guvswd@valley.net

### **Participating Towns:**

Bridgewater, Hartland, Norwich, Pomfret, Sharon, Strafford, Thetford, Vershire, West Fairlee, Woodstock

### JOINT MUNICIPAL SURVEY COMMITTEE/SOLID WASTE ALTERNATIVE COMMITTEE

87 Halls Pond Road Salem, NY 12865 (518) 9702

email: pam@starlitridge.com

### **Participating Towns:**

Benson, Chittenden, Fair Haven, Middletown Springs, Pawlet, Rutland Town, Shrewsbury, Sudbury, Tinmouth, West Haven

### LAMOILLE REGIONAL SOLID WASTE MANAGEMENT DISTRICT

29 Sunset Drive Morrisville VT 05661-9788 (802) 888-7317

(802) 888-7317 Fax: 888-6507

email: info@Irswmd.org

### Participating Towns:

Belvidere, Cambridge, Craftsbury, Eden, Elmore, Hyde Park, Johnson, Morristown, Stowe, Waterville, Wolcott, Worcester

### **LONDONDERRY GROUP**

Londonderry Recycling Coordinator P.O. Box 118 South Londonderry, VT 05148 (802) 824-6304

### **Participating Towns:**

Langrove, Londonderry, Peru, Weston, Windham.

### MAD RIVER SOLID WASTE ALLIANCE

P.O. Box 210

Waterbury Center, VT 05677

(802) 244-7373

Fax: (802) 244-7570 Email: malterport@aol.com

### Participating Towns:

Duxbury, Fayston, Moretown, Waitsfield, Warren, Waterbury.

### NORTHEAST KINGDOM WASTE MANAGEMENT DISTRICT

P.O. Box 1075

Lyndonville, VT 05851

(802) 626-3532 or 800-734-4602

Fax: 626-3519

email: progmgr@nekwmd.org

### Participating Towns:

Averill, Averys Gore, Barnet, Bloomfield, Brighton, Brunswick, Concord, Danville, East Haven, Ferdinand, Granby, Groton, Guildhall, Holland, Lewis, Lunenburg, Lyndon, Maidstone, Morgan, Newark, Peacham, Ryegate, Sheffield, Stannard, Victory, Waterford, Warren Gore, Warners Grant, Westmore, Wheelock.

### NORTHWEST VERMONT SOLID WASTE MANAGEMENT DISTRICT

10-12 Kingman Street P.O. Box 1547 St. Albans, VT 05478 (802) 524-5986

Fax: 524-5987

email: nwswdps@adelphia.net

### Participating Towns:

Alburg, Bakersfield, Berkshire, Enosburg, Fairfield, Fletcher, Isle LaMotte, Montgomery, Richford, St. Albans City, Sheldon, South Hero.

### **RUTLAND COUNTY SOLID WASTE DISTRICT**

2 Green Hill Lane Rutland, VT 05701-5915 (802) 775-7209

Fax: 773-5796

E-mail: rcswd@rcswd.com Recycling Hot Line: 773-4083

### <u>Participating Towns:</u>

Brandon, Castleton, Clarendon, Danby, Hubbardton, Ira, Mendon, Mt. Tabor, Pittsford, Poultney, Proctor, Rutland City, Sherburne, Wallingford, Wells, West Rutland.

### SOUTHERN WINDSOR/WINDHAM COUNTY SOLID WASTE MANAGEMENT DISTRICT

c/o NH/VT Solid Waste Project 130 Pleasant Street suite #3 Claremont, NH 03743 (603) 543-1201

Fax: (603) 542-5727

### Participating Towns:

Andover, Baltimore, Cavendish, Chester, Grafton, Ludlow, Plymouth, Reading, Rockingham, Springfield, Weathersfield, Westminster, West Windsor, Windsor.

### WHITE RIVER ALLIANCE

c/o Del Cloud Bethel Town Manager RR 1 Box 335 Bethel, VT 05032 (802) 234-9340 Fax: (802) 234-6840

### **Participating Towns:**

Barnard, Bethel, Hancock, Pittsfield, Rochester, Royalton, Stockbridge.

### WINDHAM SOLID WASTE MANAGEMENT DISTRICT

327 Old Ferry Road Brattleboro, VT 05301 (802) 257-0272

Fax: 257-5122

### <u>Participating Towns:</u>

Brattleboro, Brookline, Dover, Dummerston, Guilford, Halifax, Jamaica, Marlboro, Newfane, Putney, Readsboro, Townshend, Vernon, Whitingham, Wilmington.

### **OTHER CONTACTS**

Towns not listed in any of these Solid Waste Districts or Alliances should contact their town clerk, town offices or the Vermont Agency of Natural Resources for more information on proper disposal of Hazardous Waste.

### **APPENDIX B**

### MERCURY CLEAN-UP PROFESSIONALS

The following is a partial list of companies that offer remediation (clean-ups/elimination, etc.) concerning air quality related situations. This list is not a recommendation or endorsement by the Vermont Agency of Natural Resources.

Key: L=liquid mercury

M=microbial (mold, mildew, fungus, and/or bacterial)

O=odors (post fire, etc.)

C=chemical F=fuel

### Clean Harbors Env. Services, Inc.

Offices also near Concord, NH and Boston, MA (1-800-OILTANK)
32 Basik Road
Glenmount, NY 12077
(518) 434-0149
Key- (M,O,L,C,F)

### **Environmental Products & Service**

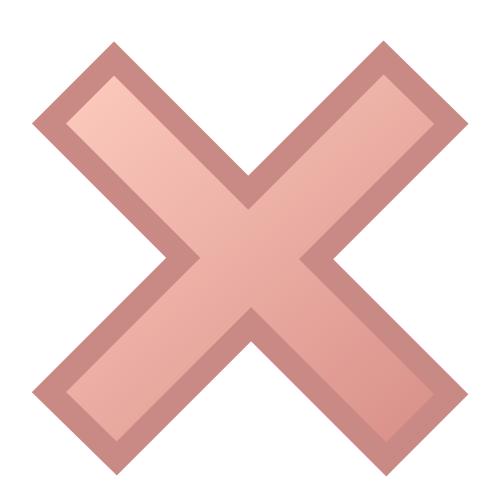
2 Flynn Avenue Burlington, VT 05401 (802) 862-1212 or (1-800-THETANK) FAX-(802)860-7445 (24 hr, 7/day/upc full cleanup response) Key- (L,C,F,M)

### **Seacoast Ocean Services/SOS**

36 Custom House Wharf Portland, Maine 04101 (800) 339-2111 or (207) 774-2111 FAX (207) 774-7240 Email: servoprovt@aow.com Key- (M,O,L,C,F)

### Twin State Environmental Corp.

34 Roosevelt Highway Colchester, VT 05446 (802) 654-8663 FAX (802) 654-8667 Email: tsec@together.net Key- (L,C,F)



# APPENDIX C

### HAZARDOUS WASTE TRANSPORTERS

The following is a partial list of companies that offer hazardous waste transportation. This list is not a recommendation or endorsement by the Vermont Agency of Natural Resources.

### APTUS Inc.

21750 Cedar Avenue P.O. Box 550 Lakeville, MN 55044

Contact: Bruce Burnièce (612) 469-3475

### Clean Harbors Environmental Services

35 Commerce Street #9 Williston, VT 05495

Contact: Cathy McNamara (802) 651-0558

### **ENPRO Services Inc.**

12 Mulliken Way Newburyport, MA 01950

Contact: Larry Bouchard (978) 465-1595

# **Environmental Hazards Management Inc.**

P.O. Box 785

Williston, VT 05495

Contact: Ken Morton (802) 862-4537

# **Environmental Products & Services of VT**

2 Flynn Avenue Burlington, VT 05401

Contact: Donald Melander (802) 862-1212

### **Heritage Environmental Services**

2 Avenue D

Williston, VT 05495

Contact: Kendra Demarest (802) 860-1200

### **North Country Environmental Services**

11 Mill Street Barre, VT 05461

Contact: David Barchard (802) 479-5299

# Safety Kleen Corp.

221 Sutton Street North Andover, MA 01845 Contact: Brenda Leonardo

# **Total Waste Management**

142 River Road Newington, NH 03801

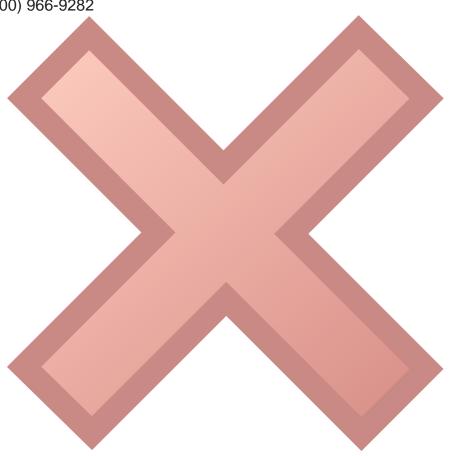
Contact: Kevin Schmit (800) 345-4525

# **Triumvirate Environmental Inc.**

P.O. Box 136

Boston, MA 02143-0003

Contact: Jeff Plotts (800) 966-9282



# APPENDIX D

### **MERCURY RECYCLERS**

The following is a partial list of mercury recyclers that accept all mercury-added products. This list is not a recommendation or endorsement by the Vermont Agency of Natural Resources.

### **Adrow Chemical**

2 Lines Ave.

Wanaque, NJ 07465 Phone: (201) 839-2372

Contact: Bill Delaney or Frank Bindhammer

# Bethlehem Apparatus

890 Front St., P.O. Box Y Hellertown, PA 18055 Phone: (610) 838-7034 Contact: John Boyle

### Mercury Refining Co.

1218 Central Avenue Albany, NY 12205 Phone: (518) 459-0820 Contact: Aaron Mars

### Advance Env. Recycling Corp.

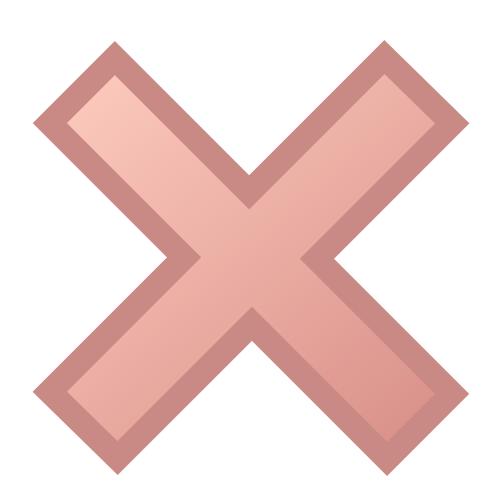
2591 Mitchell Ave. Allentown, PA 18103 Phone: (800) 554-2372

### **Environmental Enterprises, Inc.**

10163 Cincinnati-Dayton Rd. Cincinnati, OH 45241 Phone: (800) 722-2818

### Mercury Waste Solutions, Inc.

21211 Durand Avenue Union Grove, WI 53182 Phone: (800) 741-3343 Contact: Zach Unruh



# APPENDIX E



**Vermont Department of Environmental Conservation** 103 South Main Street Waterbury, VT 05671 http://www.anr.state.vt.us/dec/dec.htm

November, 2000

# Fluorescent Lamps: **Handling and Disposal Guidelines**

### Fluorescent and HID Lamps:

Fluorescent and HID lamps contain mercury, a highly toxic heavy metal. When lamps are broken or thrown in the trash, mercury is released to the environment. Even the small amount of mercury-laden phosphor powder contained in lamps can damage our lakes and streams and poison fish and wildlife. It is due to this toxicity of the mercury contained in lamps, that there are restrictions (limits) on their disposal.

In Vermont, the following types of lamps should not be placed in the trash:

#### Fluorescent Lamps

- full size fluorescents
- compact fluorescents

High Intensity Discharge (HID) Lamps

- mercury vapor lamps
- metal halide lamps
- sodium lamps

# Why Use Fluorescent and HID Lamps?

Using energy-efficient lighting makes good sense because:

- Fluorescent and HID lamps last longer
- Use less electricity than incandescent lamps and therefore:
  - Cost less to run
  - Result in less air pollution emitted from coalburning power plants.

### **Vermont Law Requires:**

- Proper labeling of mercury-added products.
- Towns and Solid Waste Districts to implement a program to collect mercury-added consumer products and to inform the public about them.
- Proper disposal.

# **General Recycling Guide for Fluorescent Lamps:**

Here are a few precautions to take with Fluorescent and HID lamps after they have burned out:

- Do not break or crush lamps because mercury will be released.
- To avoid breaking the lamps, package them carefully when storing and transporting them. **DO NOT TAPE THEM TOGETHER!**
- Contact your local Town Manager or Solid Waste District (listed on the back of sheet) or the Agency of Natural Resources for information on the recycling program for Fluorescent and HID lamps in your area.
- If lamps are accidentally broken, follow the clean-up procedure below.

### Lamp Breakage Clean-up Procedure

- Keep all people and pets away from breakage area so that mercury powder is not tracked into other areas.
- 2 Keep the area well ventilated.
- 3 Assemble the necessary supplies before cleaning up: Latex gloves, tweezers, tape, and a puncture resistant container.
- Using the latex gloves, carefully pick up any broken glass and place in a puncture resistant container. Tweezers may be needed to safely pick up broken glass. Tape can also be used to pick up any remaining small pieces of glass and powder residue still located on the spill surface. DO NOT VACUUM.
- **5** After clean-up is complete, place the contaminated clean-up equipment along with any other material that came in contact with the mercury powder into the puncture resistant container or a sealable plastic bag.
- Contact your local Town Manager, Solid Waste District or the Agency of Natural Resources for waste management options.

For additional information contact: **Environmental Assistance Division** tele: 802-241-3589 fax: 802-241-3273

e-mail: ead@dec.anr.state.vt.us

web site: http://www.anr.state.vt.us/dec/ead/eadhome.htm

# Fluorescent Lamp Management Q&A for Businesses & Municipalities

# Should I crush my lamps?

No, crushing mercury-containing lamps may pose health and environmental risks when mercury vapors are released. Lamps should be stored in ways that avoid breakage.

# How should I store mercury-containing lamps?

- Place used lamps in packaging functionally equivalent to that used to ship new lamps.
- Seal full packages with tape (**Do not tape lamps together**).
- Label packages with any one of the following phrases:
  - "Waste Mercury-Containing Lamp(s)"
  - "Used Mercury-Containing Lamp(s)"
  - "Universal Waste Mercury-Containing Lamp(s)"
- Store packages of lamps no more than five (5) feet high.
- Store packages for no more than one year.
- Store packages of waste mercury-containing lamps in a storage area identified by a sign that is clearly visible and has a label that includes the words: "Waste Mercury-Containing Lamps".

### What if a mercury-containing lamp breaks?

Once a lamp is broken, it is considered a hazardous waste and should not be thrown in the trash. First allow the area to ventilate for 15 minutes. Then transfer any damaged or broken mercury-containing lamps and residue to a closed compatible container labeled "Hazardous Waste" (with a description of the contents). Once properly contained and labeled, the broken lamps and residue should be stored on an impervious surface within a structure that sheds rain and snow.

# How should we train workers who handle waste lamps?

All employees who handle or manage mercury-containing products shall be informed of proper handling and emergency procedures.

# Do I need any permits for transporting my own waste fluorescent and HID lamps?

No, only commercial haulers of waste lamps need to get a waste transporter's permit or certification.

# What are the disposal options for mercury-containing lamps?

- Recycling through a Municipal or Solid Waste District Household Hazardous Waste collection program,
- 2 Direct shipment to a lamp recycler or,
- 3 Shipment through a hazardous waste transporter.

# Where can I get additional information?

Additional information can be found by:

- Contacting your local Town Manager (if not in a Solid Waste District).
- Contacting your local Solid Waste District (see the list at right)
- Contacting the Agency of Natural Resources:
  - Waste Management Division (802) 241-3888
  - Environmental Assistance Division (802) 241-3589
- Accessing the following website http://www.anr.state.vt.us/dec/waste.htm
- Reviewing Subchapter 9 of the Vermont Hazardous Waste Regulations (accessible through the above website)

# **Vermont Solid Waste Districts**

ADDISON COUNTY SOLID WASTE DISTRICT (802) 388-2333

BENNINGTON REGIONAL PLANNING COMMISSION (802) 375-2576

CENTRAL VERMONT SOLID WASTE DISTRICT 1-800-730-9475 OR (802) 229-9383

> CHITTENDEN SOLID WASTE DISTRICT (802) 872-8111

GREATER UPPER VALLEY SOLID WASTE DISTRICT (802) 296-3688

LAMOILLE REGIONAL SOLID WASTE DISTRICT (802) 888-7317

MAD RIVER SOLID WASTE ALLIANCE (802) 244-7373

NORTHEAST KINGDOM WASTE MANAGEMENT DISTRICT 1-800-734-4602 OR (802) 626-3532

> NORTHWEST VERMONT SOLID WASTE DISTRICT (802) 524-5986

SOUTHERN WINDSOR/ WINDHAM COUNTY SOLID WASTE MGMT DISTRICT (603) 543-1201 OR (802) 885-5827

RUTLAND COUNTY SOLID WASTE DISTRICT (802) 775-7209 OR 802-773-4083

RUTLAND NON-DISTRICT TOWNS JMSC/SWAC (802) 235-2710

> WHITE RIVER ALLIANCE (802) 234-9340

WINDHAM SOLID WASTE DISTRICT (802) 257-0272

# APPENDIX F



# **Environmental Fact Sheet**

Vermont Department of Environmental Conservation 103 South Main Street Waterbury, VT 05671 http://www.anr.state.vt.us/dec/dec.htm

VTDEC Publication #EA-1002

July, 2001

# Waste Mercury-Added Devices: Handling and Disposal Guidelines

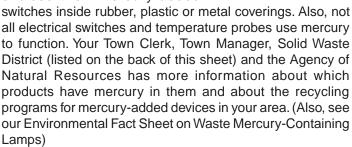
# Thermometers, Silent Switches and Temperature Probes

In addition to thermometers, mercury has been used for many years in electrical products. A moving drop of mercury is used to open or close electrical circuits in devices like thermostats, silent wall switches, sump pumps, and the tilt switches in automobiles, chest freezers, washing machines, and space heaters. Mercury is a naturally occurring heavy metal which at room temperature takes the form of a silvery

liquid. When a mercury-containing device is broken or thrown in the trash, mercury is released to the environment. Even a small amount of mercury can damage our lakes and streams and poison fish and wildlife. It is because of mercury's toxicity that restrictions (limits) have been placed on how and where mercury-added products are disposed.

# Recognizing a Mercury-Added Device Is Not Always Easy

Although it is easy to see the silvery mercury in the bulb of a thermometer or the glass tilt switch of a home thermostat, most mercury containing devices enclose their mercury-added



### **Vermont Law Requires...**

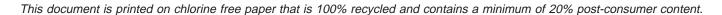
- Proper labeling of mercury-added products.
- Towns and Solid Waste Districts to offer programs to collect mercury-added consumer products and to inform the public about them.
- Proper disposal, **NOT** IN THE TRASH!

# General Recycling Guidelines Do not break, crush or take apart a m

- Do not break, crush or take apart a mercury-added switch or device because mercury will be released.
- To avoid breaking the devices, package them carefully in individually sealed plastic bags placed inside larger sealable containers before storing or transporting them.
- Contact your Town Clerk, local Solid Waste District (listed on the back of this sheet) or the Agency of Natural Resources for information about recycling programs for mercury-added devices in your area.
- Contact local heating and air conditioning contractors or wholesalers about free thermostat take-back available through the Thermostat Recycling Corporation.
- If a mercury-added device is accidentally broken, use the following clean-up procedure.

# Mercury Spill Cleanup Procedure DO NOT SWEEP OR VACUUM MERCURY!

- Keep all people and pets away from the breakage area so that mercury is not tracked elsewhere.
- Weep the area well ventilated by opening windows and shutting off the heat or air conditioning.
- Collect the necessary supplies before cleaning up: latex gloves, stiff paper or cards, paper towels or tissues, wide masking or duct tape, a leak-tight plastic bag or sealable container, a small plastic scoop or eye dropper.
- Wearing the gloves, carefully pick up any broken glass or pieces of the device. Place on a paper towel or tissue. Wrap or fold the paper towel and place it in a leak-tight plastic bag or sealable container.
- Working from the edge of the spill towards the center, use a card or stiff paper to push small beads of mercury into larger droplets. Push the droplets into a plastic scoop or pick them up with an eye dropper. Place the mercury in a leak-tight plastic bag or sealable container.
- Use the sticky side of masking or duct tape to pick up remaining bits of glass or mercury beads. Put the tape, debris, gloves and cleanup equipment in a leak-tight plastic bag or sealable container.
- Contact your Town Clerk, Solid Waste District or the Agency of Natural Resources about how to dispose of mercury spill cleanup materials.



# Mercury-Added Device Management Q & A for Businesses and Municipalities

### How should I handle mercury-added devices?

Mercury-added switches and devices are often removable components found inside much larger appliances. Once the switch or component has been removed from the larger product, the component should not be disassembled further. If need be, it should be stored in an individually sealed plastic bag placed inside a larger sealable container to avoid breakage. Direct exposure to mercury metal may pose health and environmental risks when mercury vapors are released.

### Is every waste mercury-added product a hazardous waste?

When taken by itself, a mercury-added switch would exhibit the hazardous waste characteristic of toxicity for mercury. However, the hazardous waste regulations which apply to the proper handling and disposal of a mercury-added component do not automatically extend to the larger products containing them. For example, a mercury-added hood or trunk light switch does not turn the whole car into a hazardous waste.

# May waste mercury-added products or devices be handled as something other than a hazardous waste?

Yes. Both Vermont and federal hazardous waste regulations already contain provisions to simplify the handling and recycling of waste mercury-added thermostats and lamps. These are called "Universal Wastes". Under current Vermont Waste Management Division policy, the terms of these provisions have been extended to all fabricated mercury-added products, switches, and devices that are not presently listed as so-called "Universal Wastes".

### What if a mercury-added device breaks?

At a minimum, the device, the released mercury and cleanup debris should be sealed in a plastic bag and transferred to a closed compatible container labeled "Hazardous Waste" (with a description of the contents) and managed as a hazardous waste.

### What should we tell workers who handle waste mercury-added products?

All employees who handle or manage mercury-added products should be informed of the proper handling and emergency procedures for these products and for mercury.

#### What are the disposal options for mercury-added devices?

- Recycling through a Municipal or Solid Waste District's Household Hazardous Waste collection program.
- Thermostats only Recycling by heating, ventilation and air conditioning wholesalers participating in the free thermostat take-back sponsored by the Thermostat Recycling Corporation.
- O Direct shipment as "Universal Waste" to a mercury recycling facility.
- Shipment through a hazardous waste transporter to a proper destination facility.

#### Where can I get additional information?

- Contact your Town Clerk or Town Manager (if not in a Solid Waste District)
- Contact your Solid Waste District (see list to the right or the Agency web site below)
- Contact the Vermont Agency of Natural Resources:
  - Waste Management Division (802) 241-3888 (Hazardous/Universal Wastes)
  - Environmental Assistance Division (802) 241-3589 (Mercury-Added Products) or, on the web at: www.anr.state.vt.us/dec/waste.htm or www.mercvt.org
- Also, see our "Waste Mercury Containing Lamps" and "Universal Waste" Fact Sheets
- Review the Vermont Hazardous Waste Management Regulations in Subchapter 9: Universal Waste Management Standards. (also available on the Agency of Natural Resources website above)

# Vermont Solid Waste Districts

ADDISON COUNTY SOLID WASTE DISTRICT (802) 388-2333

BENNINGTON REGIONAL PLANNING COMMISSION (802) 375-2576

CENTRAL VERMONT SOLID WASTE DISTRICT 1-800-730-9475 OR (802) 229-9383

> CHITTENDEN SOLID WASTE DISTRICT (802) 872-8111

GREATER UPPER VALLEY SOLID WASTE DISTRICT (802) 296-3688

LAMOILLE REGIONAL SOLID WASTE DISTRICT (802) 888-7317

MAD RIVER SOLID WASTE ALLIANCE (802) 244-7373

NORTHEAST KINGDOM WASTE MANAGEMENT DISTRICT 1-800-734-4602 OR (802) 626-3532

> NORTHWEST VERMONT SOLID WASTE DISTRICT (802) 524-5986

SOUTHERN WINDSOR/ WINDHAM COUNTY SOLID WASTE MGMT DISTRICT (603) 543-1201 OR (802) 885-5827

RUTLAND COUNTY SOLID WASTE DISTRICT (802) 775-7209 OR 802-773-4083

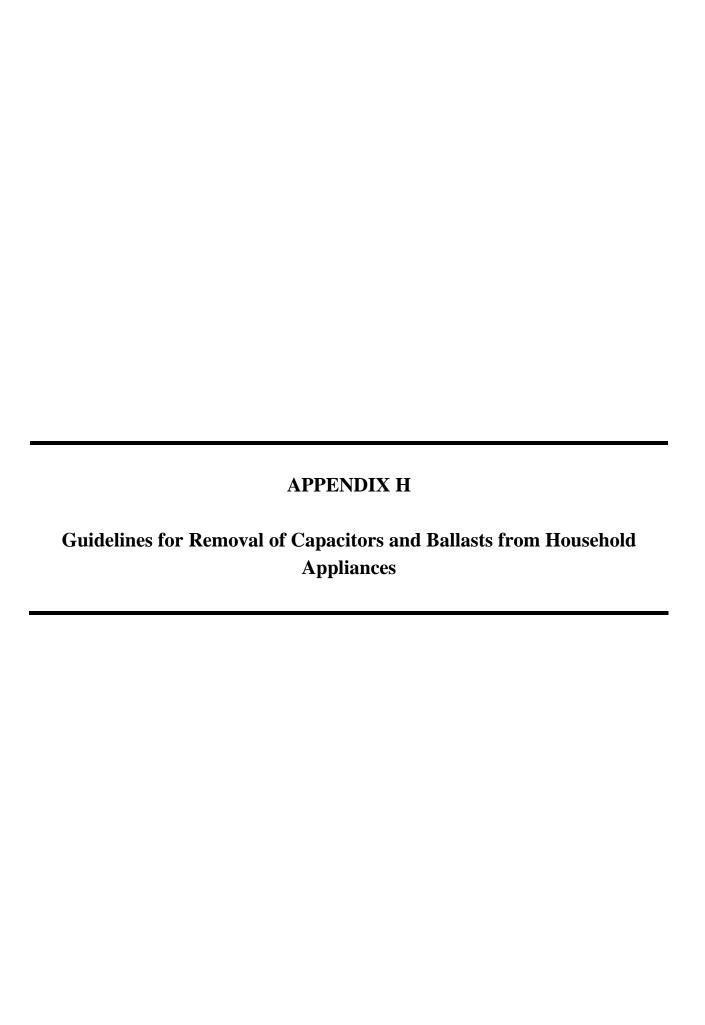
> RUTLAND NON-DISTRICT TOWNS JMSC/SWAC (802) 235-2710

> > WHITE RIVER ALLIANCE (802) 234-9340

WINDHAM SOLID WASTE DISTRICT (802) 257-0272

# **REFERENCES**

- 1. <u>Discussion Paper: Management of Hard to Handle Wastes in Vermont</u>. Vermont Agency of Natural Resources. May 1998.
- Managing Problem Materials Generated by Discarded Appliances and Vehicles. Report to Northeast Waste Management Officials' Association. Prepared by DPRA Incorporated. September 1994.
- 3. <u>Fact Sheet: Mercury Applications in Major Appliances and Heating/Cooling Systems</u>. Minnesota Office of Environmental Compliance. April 13, 1998.
- 4. <u>Info Bulletin #8: Mercury in Home Appliances</u>. Appliance Recycling Information Center. August 1998.
- 5. <u>Fact Sheet: Did You Know that the Vermont Legislature has Banned Some Wastes from Landfills?</u> Vermont Agency of Natural Resources. October 1992.
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# **PCB CAPACITORS**

#### **Definition**

A capacitor is a passive electronic component that stores energy in the form of an *electrostatic field*. In its simplest form, a capacitor consists of two conducting plates separated by an insulating material called the dielectric. Capacitance is directly proportional to the surface areas of the plates and is inversely proportional to the plates' separation. Capacitance also depends on the *dielectric constant* of the dielectric material separating the plates. The standard units of Capacitance include the farad (F), microfarad ( $\mu$ F where 1  $\mu$ F =  $10^{-6}$  F), the nanofarad ( $\mu$ F where 1  $\mu$ F =  $10^{-12}$  F).

### **PCB Capacitors**

Prior to 1980, virtually all capacitors in service were PCB containing due to the superior dielectic strength of PCBs. PCB capacitors are most often rectangular in shape and can be found mostly in indoor but occasionally outdoor locations.





However, there are also PCB-containing capacitors that are cylindrical in shape.



The federal government has kept inventory records of in-service PCB capacitors and askarel transformers and has requested that PCB owners label this equipment with "OR" serialized stickers.



The large OR stickers would be placed on transformers and the smaller ones would be used for labelling capacitors.





### Removal, Storage and Disposal

Many PCB owners are taking steps to replace all in service PCB equipment including capacitors.





Prior to Swan Hills being open for PCB destruction, PCB owners were storing capacitors. However, the ways in which capacitors were handled and stored varied widely. In some cases, capacitors were abused, mishandled and stored improperly. Leaking capacitors, such as the ones shown below, can cause gross contamination of the containment tray as well as drums, transformers, pallets and anything else being stored in the tray. Also, cleanup costs to reduce residual PCB levels to the MOE's acceptable concentration of  $< 10 \, \mu g/100 \, \text{cm}^2$  could be very expensive.





PCB capacitors that are thrown into bins with other PCB waste will have to be separated from such waste prior to being removed from the site for disposal. The exercise of dividing PCB waste into compatible types is necessary since the disposal costs/kg vary considerably from one waste type to another. Also, depending on the type of PCB waste, they may be treated at a number of different transfer stations or destruction facilities.





Storage of leaking capacitors in plastic drums is not a good practice because it is a requirement under the PCB regulations that all PCB solids be placed in 18-gauge steel drums and thus, when the capacitors are removed from site for disposal, they will have to be re-packaged at additional cost and the plastic drums will have to be disposed of as PCB waste.



Leaking capacitors should be stored in proper open-top drums with lid, ring and secure bolt.





If the PCB capacitors are in good shape and show no signs of leakage, PCB owners have the option of palletizing and banding them.



This technique will allow for the removal of more capacitors at one time, facilitate the use of a fork truck for moving loads and will permit efficient use of space in storage containers and on trucks when the capacitors are removed from site for disposal.



In some cases, PCB owners load PCB containers directly into large containers without palletizing them first.



In these cases, when the capacitors are to be removed from site for disposal, they have to be removed one at a time, placed on pallets and banded before loading on the truck. This adds significant costs to the site service charges.





If a client does not mind if the container in which the capacitors are stored is also removed from site to the disposal facility, capacitors may be loaded on trucks in sizable steel boxes. However, the costs for disposal are based on the weight of the capacitors and the container. The large heavy-gauge steel containers will contribute to a significant increase in disposal costs.



### **Capacitors at Scrap Yards**

Although it is the scrap dealer's responsibility to refuse any PCB waste, it is also the Generator's responsibility "Cradle-to-Grave" for their PCB wastes. It is important not to send PCB capacitors to scrap yards in the hope that they won't know what they are; the Generator may end up being partially responsible for site remediation costs.



In some cases, PCB capacitors are discarded with obsolete electronic equipment that goes unnoticed by the scrap yard.



### **Capacitor Fire**

In the event of a fire involving PCB capacitors, high-level PCBs (several hundred thousand ppm) may be released into the fire. PCB Disposal has had experience dealing with the cleanup following a fire involving 8 small capacitors in a transformer switchgear room.



The pressure build up in the capacitors caused 5 of eight of the capacitors to explode and release their PCB contents.



The high-level PCB liquid was released into the switchgear and the cable trench below. The staining was significant even though the actual volume of liquid was relatively small.



Following sampling and analysis, it was confirmed that not only were there extremely high levels of PCBs but there were significant concentrations of dibenzofuran contamination as well.

CI
CI
CI
CI
$$C_{12}$$
 $H_{8-n}CI_{n}O$ 
 $n = 4-8$ 

2,3,7,8-tetrachlorodibenzofuran

During the entire decontamination process, workers were equipped with proper personal protective equipment. Tyvec suits and gloves were placed in the drums with other debris at the end of each day for disposal as PCB waste.



#### **Capacitors in Ballasts**

Small capacitors are internal components in ballasts and although the amount of PCB liquid is relatively small (few millilitres), the concentration of PCBs is very high; in the range of several hundred thousand parts per million.





It is therefore important to keep in mind that when ballasts are involved in a fire, the contents of the capacitors inside the ballasts may rupture and release their contents into the zone of combustion.





High temperatures and oxygen may convert the PCBs into dibenzofurans and, depending on the conditions, perhaps even dioxins.

CI 
$$C_{12}$$
  $H_{8-n}$   $CI_n$   $O_2$   $CI_n$   $O_2$   $O_3$   $O_4$   $O_5$   $O_7$   $O_8$   $O_9$   $O_9$ 

2,3,7,8-tetrachloro-dibenzo-p-dioxin

Recall that TCDD is the most potent teratogenic and carcinogenic chemical known. The chance of a PCB fire and the extreme health and environmental threats it represents, not to mention huge cleanup costs, are good reasons to remove your PCB equipment from service as soon as possible.

### **NOTE:**

Under the new federal PCB Regulations passed on September 5, 2008 and published in the Canada Gazette September 17, 2008, all in-service PCB capacitors, excluding those in ballasts, must be removed from service by December 31, 2009.

For more information see "New PCB Regulations".



# **PCB BALLASTS**

Ballasts come in all shapes, sizes and weights. The most common ballasts encountered for disposal as PCB wastes are found associated with fluorescent lights. Their function is to maintain a constant current through the electrical system and they are normally mounted on the light fixture between the fluorescent tubes and are protected by a metal cover plate.



The typical ballast contains a reactor core/coil assembly, a thermal protector (switch) and a capacitor, held in place by an asphalt-silica mixture (ASM), which performs a dual role function of heat transfer and moisture barrier.





Although the capacitor is the component that contains PCBs, the ASM has been found to be PCB-contaminated in some cases to several thousand ppm (mg/kg) either from the manufacturing process or from a leaking capacitor.





The capacitor contains approximately 17 ml (1.3 oz) of liquid PCBs with approximately half of this fluid absorbed by several layers of paper inside the capacitor. The risk of PCB leakage is quite low due to the construction of the capacitor.

During the past several years, many organizations have conducted ballast retrofit projects involving identification, removal and disposal of PCB ballasts.



Due to the fact that there were so many companies that manufactured ballasts, it is a challenge to properly identify PCB versus non-PCB ballasts. The following chart provides some information regarding a few of the most common ballast manufacturers and how PCB ballasts can be identified for replacement. Ballasts not included on the list should be considered to contain PCBs if they were manufactured prior to July 1, 1980. For comparison, see Table 2 at the end of this section.

**Table 1. Ballast Identification** 

Manufacturer	Date Code	Catalogue Code
Aerovox - Canada	AE 7806 or lower code no.	Fifth unit is 'F'
Aerovox - USA	AH 7806 or lower code no.	Fifth unit is 'F'
Allason		
Fluorescent lamps		Lower than 'LL'
HID lamps containing capacitors	Type number lacks "N"	
CGE	7706 and lower	Ends in T or TW
GE (U.S.A.)		Ends in other than E or W
Philips		
Fluorescent lamp		
Ballasts 1278 or lower	Not marked "NON-PCB"	
HID ballasts		Marked "PCB"
Sola Canada		Contains 'ACA'
Sola - USA	Lower than: 79L311EG	
Universal	Lower than L78	Marked "No-PCB"
Westinghouse	Same as CGE	Same as CGE

Where applicable, only the portions of the codes indicated in the schedule in bold-face are important in determining if the product contains PCBs. Identification may require disassembly of fluorescent lamp ballasts or other lighting systems such as High Intensity Discharge (HID) systems which contain capacitors that are open to view. Aerovox codes are located on labels attached to capacitors.

The following GE ballast is identifiable as a PCB ballast based on the T at the end of the serial number code on the label.



Sometimes ballast labels are difficult or impossible to read or have been removed altogether. It should be assumed that they are PCB type if they appear to be of the same vintage as the other ballasts in the lights or based on the age of the building, that is, older than 1980.



Removal of ballasts can be accomplished using a small stepladder when the ceilings are low enough. However, in some cases light fixtures can be several feet off the ground and will required some kind of lifting device to reach them.



It is important for all employees required to handle PCB containing ballasts to be completely aware of the procedures for the removal and storage including associated safety precautions and the use of safety equipment.

However, in our experience, many contractors do not employ safe ballast handling practices. For example the piling of light fixtures up to 10 feet or more can be problematic when fixtures shift, slide or roll off.



An area designated for storing ballasts removed from fixtures should be identified prior to a job and all workers should be required to follow proper handling procedures. The following is a summary of the procedures that have been developed and implemented by several groups for the removal and storage of fluorescent light ballasts containing PCB's.

- 1. All ballasts to be removed must be disconnected from the main power source prior to commencing removal. Electrical lock-out procedures will apply.
- 2. Light fixtures and ballasts are to be visually inspected for leaks prior to disconnect/removal from the light fixture.
- 3. Employees removing ballasts from the fixtures are to wear disposable protective gloves and protective eye equipment to avoid contact with any leaking asphalt-silica mixture. When ballasts are leaking the asphalt-silica mixture, the employee will wear nitrile gloves in addition to the disposable gloves.
- 4. When removing ballasts the immediate area is to be clear of any other persons.
- Removed ballasts are to be placed in plastic bags and sealed. The sealed bags will then be placed into an 18-gauge open-top drum packed with vermiculite or other suitable sorbent.
- 6. Any leakage of the asphalt-silica mixture from the ballast is to be cleaned using a hydrocarbon solvent, the cleaning clothes are to be packaged in plastic bags, and placed into the storage container with the ballasts. During this cleaning process the employee will wear both disposable gloves and nitrile gloves to protect their hands. Disposable coveralls will also be provided for this clean up procedure.
- 7. In the event of skin contact with either the asphalt-silica mixture or PCBs, thoroughly wash the contacted area with soap and water.

- 8. Should any asphalt-silica mixture come in contact with the employee's clothing, the clothing is to be removed and washed as soon as possible.
- 9. Employees will be expected to follow proper hygiene practices when handling ballasts.

At demolition sites, it is a common practice to place ballasts on pallets for later loading into drums for removal from site.



When working indoors, many contractors will place ballasts in the same boxes the non-PCB ballasts came in. This practice just adds to the work when ballasts are later removed, otherwise the boxes add unnecessary weight that will be reflected in higher disposal costs.



When retrofit projects involve replacement of entire light fixtures, the PCB ballasts may be piled up while still in the fixtures, prior to their removal, containment and transportation off site for disposal.





Prior to sorting, sometimes ballasts are stored on shelving units. This is OK if the ballasts are not leaking, if there are not too many of them and if the sorting is done expeditiously.



For maximum efficiency, PCB ballasts should be placed in proper 18-gauge open-top drums with ring and bolt.



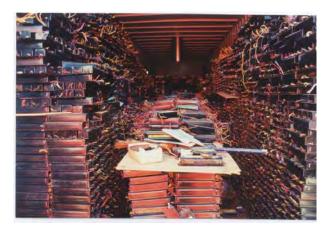


Alternatively, if ballasts are not leaking, they can be placed in metal crates that can be stacked and easily handled by fork trucks.





If ballasts are not stored properly, they can represent a potential safety risk, especially if they are stacked too high. In one instance, 30,000 ballasts were stacked to the ceiling in a 40-ft container.



If 1,400 nine-inch fluorescent ballasts weigh approximately one metric tonne (2,200~kg), a collapse of part of a wall could literally crush someone to death. PCB Disposal was able to safely un-stack the ballasts, load them into drums and remove them from site for disposal.

### **Miscellaneous Ballasts**

The following photos will serve to demonstrate several other types of PCB ballasts that are found in commercial and industrial facilities.









**Table 2. Identification of Ballasts** 

Company	PCB Identifier Code	
Aerovox Incorporated Canada	<ol> <li>Four number code on capacitor label. The first two numbers are the year and the last two are the month (e.g., January 1980 = 8001). PCBs are present up to and including June 1978 (7806).</li> <li>Six digit letter and number code stamped on capacitor. PCBs are present if the fifth digit is "F".</li> </ol>	
Advance Ballasts (supplied by Phillips)	Three or four digit number code on the ballast cover. The first one or two numbers indicate the month and the last two numbers are the year. PCBs are present up to and including 1978.	
Allanson Division of Jannock Ltd.	Two letter code on ballast plate. The first letter is the month, starting with "A" for January and the second letter is the year, starting with "A" for 1969 (e.g., February 1972 = BD). PCBs are present up to and including December 1980 (LL).	
Canadian General Electric	<ol> <li>Seven letter and number digit code on ballast name plate. PCBs are absent if one of the two final letters is "E" and likely present if it is "T".</li> <li>Four number code on ballast housing. The first two numbers, when reversed, are the year (e.g., 1976 = 67) and the last two numbers are the month. PCBs are present up to and including March 1978 (8703).</li> </ol>	
Westinghouse Canada	Same as for Canadian General Electric (above).	
Magnatex Polygon	Letter and number code on the ballast. The last four numbers represent the year and the month. PCBs may be present up to and including June 1980 (June 1980 = 8006). PCBs are present in capacitors made in 1978-79 unless there is a green "NO PCB" sticker on the ballast label.	
Magnatex Universal Manufacturing (USA)	Three digit letter and number code on ballast cover. The first letter is the month (A = January) and the last two numbers are the year. PCBs are present up to and including December 1978 (L78). PCBs are absent if "N" follows the code.	
Phillips Electronics	Coding system changed in 1980. Units made after early 1979 are marked as being free of PCBs.	

	l .
	Treat units not marked "PCB free" and those that have digit code ending with 79 or earlier as containing PCBs.
Sola Canada	Three digit letter and number code on ballast label. The first letter is the month $(A = January)$ and the last two numbers are the year. PCBs are present up to and including December 1979 (L79).
Sola Electric (USA)	Eight digit letter and number code on ballast name plate. The first two numbers are the year. Assume PCBs are present up to and including December 1979.
Other Manufacturers	Assume PCBs are present if the unit is not marked "PCB Free" or not clearly dated 1980 or later.
High Intensity Discharge Lamps	Allanson Division of Jannock Ltd. Puts "N" before the code if PCBs are absent. Others are usually marked "PCB" or "No PCB". Assume PCBs are present if the label is not marked otherwise. Holophane Canada Inc. puts "BAA" before its three digit code number on capacitors with PCBs. Sola Canada marks PCB capacitors with a code beginning "ACA".

Based on what PCB Disposal has seen at hundreds of sites over the years, not all contractors are able to separate PCB from non-PCB ballasts. In some cases, drums that had been identified as containing PCB ballasts actually contained 33% non-PCB ballasts.



When substantial numbers of non-PCB ballasts are removed for disposal as PCB waste, this can add several hundreds and even thousands of extra dollars to the disposal cost. It is therefore important to ensure that all contractors are well experience in ballast identification.



As an option, ballasts can be stored on pallets and left for sorting by the PCB disposal company.



Although it was a common practice to break down ballasts into their component parts on site, this activity is now accomplished at the various transfer stations. The copper coils and capacitor inside ballasts is insulated with asphalt-silica mixture (ASM).



When the ASM is removed, the capacitor and copper coils are revealed.



The value in the ballast is obviously the copper coils which are recovered and sent away for recycling.



### **NOTE**

Under the new federal PCB Regulations passed on September 5, 2008 and published in the Canada Gazette September 17, 2008, ballasts are exempt from the deadlines that are imposed on in-service askarel transformers and PCB capacitors that must be removed and disposed of by December 31, 2009. All PCB ballasts are to be removed from service by Dec 31, 2025.

For more information see "New PCB Regulations".



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### **DEADLINE DEC 31, 2009**

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"I would not hesitate to reccommend PCB Disposal to anyone who has PCB management disposal and destruction issues to deal with." Richard Sobhraj,

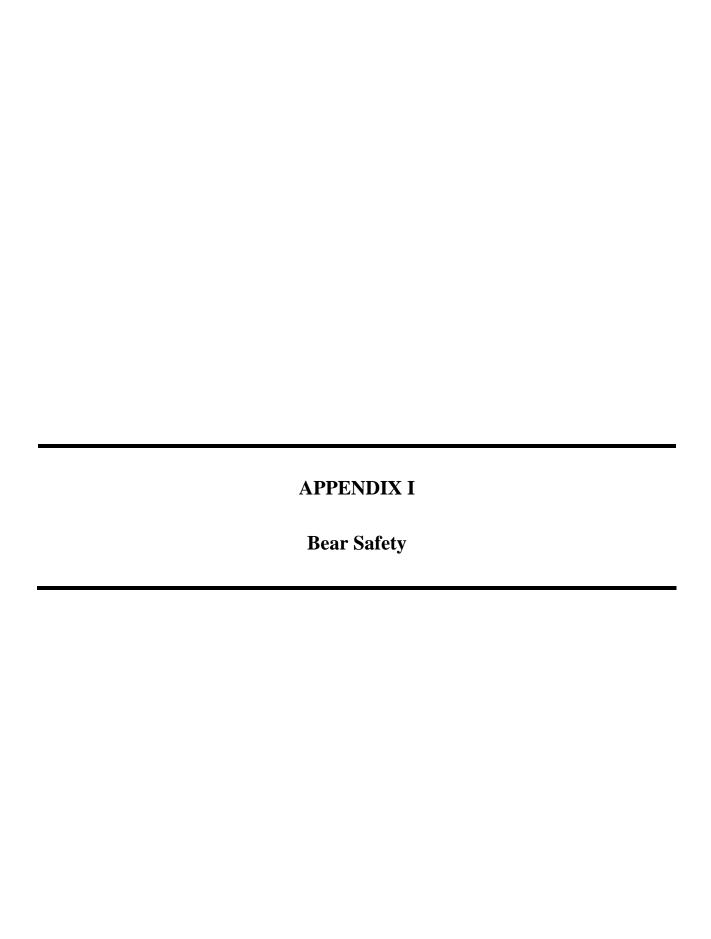
Mche, CET
Electrical Maintenance
Department
Exhibition Place



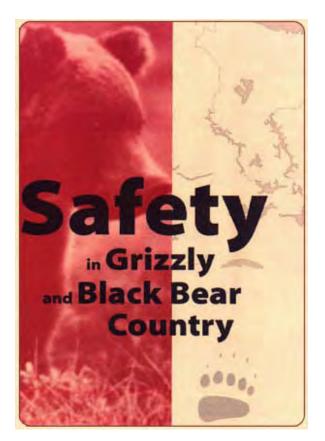








# Safety in Grizzly and Black Bear Country



Residents and visitors to the Northwest Territories are very fortunate to be able to share the land with an abundance of wildlife in one of the most undisturbed natural settings in the country.

Bears, like all wildlife resources, are not only an important part of our northern ecosystems; they are also an essential part of the cultural and economic well-being of northern residents. For many people, seeing a bear is a highlight of their wilderness experience. However, as long as people and bears occupy the same land, there will be unplanned encounters.

This document contains basic precautions and safety tips to keep in mind while you are in bear country. Be aware that varying geographic conditions may limit the actions you are able to take.

# The Nature of Bears

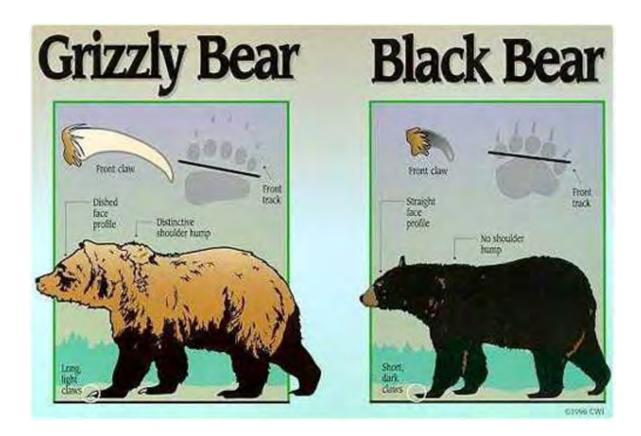
### Description

Black bears are sometimes confused with grizzly bears because the two species may appear similar in size, and both vary in colour from black to brown, cinnamon or blond. The two species can be distinguished by several physical features.

Grizzlies have a stout, chunky build, a prominent shoulder hump, a massive head with an upturned muzzle or "dishface," and long claws (about 6-8 cm). Adult male grizzlies average 150-215 kg in the Mackenzie Mountains, but can weigh more than 300 kg in areas of the NWT where the growing season is longer and food supplies more abundant.

Black bears have a smaller, less robust build, flat or straight shoulders, a straight muzzle, and short, curved claws. Adult males average 100-150 kg, but can weigh more than 275 kg. In both species, females are smaller than males.

The typical lumbering gait and occasionally comic antics of bears are deceptive: they are capable of enormous feats of strength and they can run much faster than people can. Both species also swim well. Black bears and young grizzlies can climb trees, but adult grizzlies usually will not. All bears rely on their excellent sense of smell to find food and identify danger. They rely less on hearing and eyesight, although those senses are also well-developed.



# **Habits**

Grizzly bears and black bears are both omnivorous. That is, they eat whatever is available. They rely mainly on vegetation, such as roots, grass and berries, but also eat fish, remains of dead animals, insects, small mammals such as ground squirrels, prey on moose, muskox and caribou.

Food availability influences the seasonal distribution of grizzly and black bears. Bears use different habitats at different times of the year to take advantage of abundant, energy-rich food supplies as they become available. In the mountains, for instance, grizzlies move to different elevations as new vegetation emerges. Grizzlies and black bears are generally dormant during the winter months. They usually enter dens in October or November, and emerge in April or May. However, a bear may leave its den early during warm winters or if it is disturbed. Up to four (but usually two) squirrel-size cubs are born in the den in midwinter.

# **Avoiding Problems**

#### **Problem Bears**

Problems can occur whenever bears and people occupy the same area. You can encounter a bear by chance, or because the bear is attracted to your activity. Bears are curious, and often investigate a strange object, smell, or noise. They also have a tremendous and constant drive to find as much nutritious food as they can during their time out of the den. These two traits, coupled with a bear's remarkable sense of smell, often lead bears to areas of human activity. The outcome of a bear's visit to a camp or community will influence its future behavior. If it does not find food, it may not return once its curiosity has been satisfied. If it successfully obtains food from a human source - such as a garbage dump, backpack, or unclean camp - it begins to associate food with anything human, and investigate areas used by humans whether or not food is actually

detected. A bear will gradually lose its tendency to avoid people as it learns to associate them with food. It may become bold and aggressive.

Once started, the habits of problem bears are difficult to break. It is your responsibility as a visitor in bear country to ensure that your actions do not encourage those habits. It is unfortunate, but a problem bear is often destroyed.

### **General Conduct**

Safety is everyone's responsibility - it is not a job that can be delegated to someone else and then forgotten about. The actions of each individual affect the safety of everyone else.

Remember these simple rules:

- 1. Be alert at all times.
- 2. Respect all bears they can be dangerous.
- 3. Never approach a bear for any reason.
- 4. Never feed bears or other wildlife.
- 5. Have a plan of action for dealing with bears and be sure everyone understands it.

You can reduce your chances of encountering a bear by taking these precautions:

- Travel in groups and only during daylight hours.
- Tell someone where you are going and when you expect to return.
- Know the types of areas bears use at different times of the year. Avoid those areas or be very cautious when traveling through them.
- Be alert and aware of your surroundings. Think ahead and be prepared. In open terrain, use binoculars to look ahead for bears. If you see a bear at a distance, take action to avoid surprising it.
- Watch for bear signs such as: tracks; droppings which contain vegetation, berries, or hair; claw marks or stripped bark on trees; torn up stumps or rotten logs; and upturned earth.
- Never approach a fresh kill. Be cautious of loose piles of dirt, branches and vegetation. They may hide a carcass which a bear has cached, and the bear may be resting nearby to protect it.
- Carry food in airtight or bear-proof containers and avoid carrying foods with strong smells.
- Make noise where visibility is limited. Announcing your presence may help you avoid surprising
  a bear. You can sing, shout or talk loudly. Some people carry noisemakers such as bells or air
  horns. However, do not become overconfident noise may be masked by sounds such as wind
  or water, or may go unnoticed by a bear that is busy eating.
- Avoid taking a pet dog. If you must take your dog, keep it on a leash at all times.
- Do not carry articles that have a strong artificial smell and avoid wearing scented cosmetics.
- Menstruating women should try to minimize odours through careful personal hygiene, use of internal sanitary protection and burning sanitary materials in a hot fire.
- Carry bear deterrents. A 12-gauge shotgun is recommended it can fire some deterrents as well as slugs and buckshot (SSG).

# Warning Systems

Surprise is a common factor in bear encounters, and can result in property damage, human injury and bear deaths. It is difficult to act calmly if you are awakened by a bear's growl. Such close encounters can be prevented by using a warning system which will sound an alarm when a bear enters camp.



# Trip-wire Fence

A trip-wire system is ideal for small camps, and is especially useful for camps which must be frequently moved. It is lightweight, portable, inexpensive, easy to use, and effective. It consists of a fence of electrical wire around the camp perimeter, and an alarm system which wounds when the fence is broken. The wire may be strung through any convenient support, such as extra tent poles, gas cans, trees, or makeshift posts.

# Dogs

A dog can be an effective means of preventing surprise encounters with bears, provided care is taken in choosing and handling the dog. Be sure to use dogs which are alert, experienced with bears, and known to bark at the sight or scent of bears. An inexperienced dog (which includes most pets) that does not warn of a bear's approach is a hazard. A dog should be tied up - a roaming dog may attract a bear and

run back to your site with the bear in pursuit. A dog must be responsive to its master or handler at all times, even when excited.

There are some risks involved in using dogs. Even experienced dogs have been known to sleep through a bear's approach and awaken too late to give warning. Some dogs seem to attract or enrage some bears. Any dog used to detect bears risks being mauled.

### Limitations

Keep in mind that warning systems are effective only if properly cared for, and any system can unexpectedly fail. You should never become unconcerned about bears or reduce efforts to prevent attracting them, even with a proven system in place. Also, remember that a warning system is not likely to chase away a bear. It will improve your safety only if you respond to every warning.

## **Deterrents**

Every person who works or travels in bear country should have ready access to some means of deterring or chasing away a bear. However, do not let access to deterrents make you overconfident. No deterrent is completely effective against every bear in every situation. Carry a backup firearm just in case. Use deterrents with caution, as many are potentially dangerous.

## Chemical Repellents

(Commonly referred to as "pepper spray.") Tests have shown these will stop a charging bear if sprayed into the bear's eyes, nose and mouth. Chemical repellents have limitations - short range, difficulty of accurate delivery if a person is excited, and their potential for abuse. Practice with the particular type you are using so that you are familiar with its characteristics.

#### Noise

Warning shots and noisemakers are commonly-used deterrents. However, they are not always effective. They scare some bears, but other bears ignore them. Noisemakers include: cracker shells (fired from a 12-gauge shotgun); Thunderflashes (hand-thrown); and air horns. Never fire a warning shot or cracker shell directly at a bear. Shoot in the air to the side of the animal. A wounded bear is very dangerous. Place cracker shells and Thunderflashes between you and the bear. An explosion behind the bear may scare it toward you. Bird-scaring/flare cartridges are fired from a flare pistol, and explode with a bright flash as well as loud noise. They are inexpensive, portable, and generally more reliable than other noisemakers.

#### Vehicles

Trucks, snowmobiles, ATV's, and helicopters have been used to chase away bears. Sometimes, starting and revving the engine is enough. Do not chase a bear with a vehicle for any reason other than personal protection, and do not overdo it. Allow the bear to maintain a steady trot. If the bear is stumbling or crashing through bushes, you are too close.

#### Electric Fences

If your camp will be located in one place for a period of time, consider setting up an electric fence. It can deliver a high-power jolt to any bear that touches it. Electric fences have been used effectively to keep black and grizzly bears out of garbage dumps, construction camps, outfitting and exploration camps.

An electric fence intended for protection against bears must meet certain construction specifications in order to be effective. It also requires regular and careful maintenance.

#### Rubber Bullets

These are fired from a 12-gauge shotgun. Renewable Resource Officers can provide information on where to obtain them and their proper use.

## **Firearms**

It's advisable to have ready access to a firearm in camp, and to carry one when you travel in bear country. A 12-gauge shotgun, or a rifle of .30-06 caliber or comparable power, are suitable weapons for protection against bears. Rubber bullets or cracker shells should be fired before resorting to the use of rifled slugs or large buckshot (SSG). Remember, only shoot a bear as a last resort.

It is very important to be able to handle and shoot your weapon, and be able to use it under pressure. Practice regularly and know the rules of firearm safety.

If you lack skills or confidence, check with local wildlife or law enforcement agencies about the availability of firearms training courses.

Keep the gun or rifle clean and guard against condensation, which may cause rust, freeze the mechanism, or form an ice plug in the barrel. In low temperatures, avoid storing a firearm in a heated location. Keep it in a canvas (not vinyl) case in an unheated porch or within easy reach outside a building or tent. Make sure everyone knows where it is and when and how to use it.

## **Firearm Safety**

Each year, there are firearm accidents in the Northwest Territories as a result of ignorance, carelessness, or both. **TREAT ALL FIREARMS WITH RESPECT!**All firearms can be deadly when handled carelessly.

### REMEMBER THE TEN COMMANDMENTS OF FIREARM SAFETY:

- 1. Treat every firearm as though it is loaded.
- 2. Always control the muzzle of your firearm.
- Be sure of your target and beyond.
- 4. Never shoot at a hard surface, including water.
- 5. Never point a firearm at anything you don't want to shoot.
- 6. Never climb, run or jump with a loaded firearm.
- 7. Lock up firearms and ammunition separately.
- 8. Be sure the barrel is clear of obstructions.
- 9. Unload firearms when not in use.
- 10. Avoid alcohol before and during a hunt.

## **Encountering a Bear**

#### The Bear's Behavior

A bear's reaction to you will be influenced by many factors, and is therefore never entirely predictable. Given the opportunity, bears usually avoid people. Some bears are more dangerous or aggressive than others. Old or wounded bears may be in pain or starving. They may aggressively seek food from people if they are unable to obtain enough on their own. Any bear that has become accustomed to people and shows no fear of them is dangerous.

Every bear defends a critical space. The size of the space varies with each bear and each situation: it may be a few metres or a hundred metres. Intrusion into this space is considered a threat and may provoke an attack. All female bears aggressively defend their cubs. If a female with cubs is surprised at close range, or separated from her cubs she is likely to charge.

Bears also aggressively defend their food, and are often reluctant to leave it until it is all eaten.



In some cases, a bear that is threatened may engage in displays intended to scare away an opponent. These may include huffing, panting, hissing or growling; looking directly at you, sometimes with lowered head or ears laid back; slapping one or both feet on the ground; jawpopping; or charging to within several metres, then stopping suddenly or veering to the side. Threat displays may be followed by an attack, but may end with the bear walking or running away.

A bear standing on its hind legs is probably trying to pick up your scent and figure out what you are. It may sniff the air or swing its head from side to side. Bears do not charge on their hind legs.



Most grizzlies avoid contact with humans if possible. However, there is good reason for their reputation for ferocity. If cornered, threatened, or surprised, the grizzly can be very aggressive, and will usually stand its ground or charge.

Black bears are often less aggressive and flee from danger. However, because they are more curious and adaptable than grizzlies, they quickly become accustomed to human activity, and may develop aggressive food-seeking habits which make them dangerous. Therefore, treat all black bears with caution. In a very few cases, a bear has stalked a person that it apparently considered potential prey. Although such incidents are rare, you should know the difference between the behavior of a hunting bear, and the behavior of a threatened bear.

A hunting bear does not bother with displays and shows no signs of annoyance or fear. It may approach you directly at a fast walk or turn, follow you, or circle carefully, making cautious approaches.

## Your Behavior

The thought of facing a bear can be frightening. However, bears rarely attack a person on sight, and only a very small percentage of charges result in serious injury or death. You are more likely to be injured in a car accident than by a bear.

There is always a possibility you may surprise a bear at close range, or encounter a problem bear which is not afraid of people. There is no guaranteed formula for reacting to a bear encounter because every encounter is unique. There are, however, guidelines which may help. Most are based on good judgment, common sense, and familiarity with bear behavior.

## Guidelines when Encountering a Bear

- Stop, stand still, and stay calm.
- If the bear is aware of you, help it identify you as a person. It may leave.
   Staying upwind will help it to smell you. Talk in low tones and slowly wave your arms.
- Do not run from a bear unless you are sure you can reach a safe place before the bear catches up. Running may cause the bear to chase you, and a bear is faster than you are.
- Always leave a bear an open avenue of escape.
- If you see a bear at a distance, alert the bear to your presence. Quietly walk back the way you came or make a wide detour around the bear. Do not come between a bear and its cubs.
- If time, distance and circumstances permit, try to scare the bear away by firing warning shots, flare cartridges or noisemakers.
- In a close encounter, stand still and assess the situation. Do not shout or make sudden movements which might provoke the bear, and avoid direct eye contact.
   At 50 metres, even if the bear is displaying threat behavior, there is probably still time for you to avoid an encounter.
- Back away slowly. Only leave behind an article of clothing or gear if the bear is still trying to identify you. This will not work if the bear is following you. Leave food or an article of clothing only as a last resort.
- Climb a tree if one is available. You will have to climb higher than four metres grizzlies can reach that high. Remember that black bears can also climb trees.
- If the bear is very close (30 metres), it is usually best to stand your ground. Be prepared to shoot if you are carrying a firearm.

## If a Bear Charges

A bear charges at high speed on all four legs. Many charges are bluffs. Bears often stop or veer to the side at the last minute. However, if contact appears unavoidable, you have three options: shoot to kill if you have a gun; play dead if you are attacked by a grizzly; or fight back if attacked by a black bear.

## Shooting a Bear

The right moment to squeeze the trigger depends on your nerve, experience with a firearm, and how fast the bear is approaching. The decision can be made only by the person facing the bear, and must be made quickly.

An accurate shot fired at close range has a greater chance of killing a bear than one fired from farther away. The first shot is the most important. If you must kill a bear, aim for the shoulder if the bear is broadside, or the back of the neck between the shoulders if the bear is facing you. Avoid head shots - they often do not kill a bear. Do not stop to check the results of your shot. Keep firing until the bear is still. Try to kill the bear cleanly and quickly - a wounded bear is very dangerous.

## Playing Dead

Playing dead may prevent serious injury if you are attacked by a grizzly bear. Do not play dead during a black bear attack or if a grizzly bear is treating you as prey. Playing dead will help protect your vital areas, and the bear may leave if you appear harmless. There are two recommended positions:

lie on your side, curled into a ball, legs drawn tightly to your chest, hands clasped behind your neck;

lie flat on the ground, face down, fingers intertwined behind your neck.

Stay in these positions even if moved. Do not resist or struggle - it may intensify the attack. Look around cautiously, and be sure the bear is gone before moving.

### Fighting Back

If a black bear attacks you or a grizzly bear shows signs that it considers you prey, and you do not have a firearm, do not play dead. Act aggressively. Defend yourself with whatever means are available. You want to appear dominant and frighten the bear. Jump up and down, shout, and wave your arms. It may help to raise your jacket or pack to make you look bigger.

## The Law

If you kill a bear in self-defense, you must report the kill to the nearest Renewable Resource Officer as soon as possible. In most cases, an Officer will come to the site and take possession of the bear. If an Officer is not immediately available, you should skin the bear, leaving the claws attached. Preserve the hide by salting it and storing it in a cool dry place, or freezing it. It is an offence to allow the hide to spoil. The hide becomes the property of the government and must be turned in, along with the skull (or lower jaw), to a Renewable Resource Officer at the first opportunity. Proof of sex should be turned in, especially for grizzly bears. You may not keep any part of a bear killed in self-defense.



## For More Information

Department of Resources, Wildlife and Economic Development Government of the Northwest Territories Box 1320 Yellowknife, NT X1A 2L9

Local offices: Aklavik	(Area Code 867)
Baker Lake	978-2248
	793-2944
Deline	589-3421
Fort Good Hope	598-2271
Fort Liard	770-4311
Fort McPherson	952-2200
Fort Providence	699-3002
Fort Resolution	394-4596
Fort Simpson	695-2231
Fort Smith	872-6434
Hay River	874-6702
Inuvik	777-7308
Kugluktuk	982-7250
Lutsel K'e	370-3141
Norman Wells	587-2310
Rae-Edzo	392-6511
Rankin Inlet	645-5037
Tulita	588-3441
Tuktoyaktuk	977-2350
Yellowknife	873-7184

# READINGS SUGGESTED

# **more** Polar Bears

Polar bears are the largest land carnivore in North America. An adult male typically weighs 300-450 kg, stretching 3 metres from nose to tail. They are strong, fast, agile, on land or ice, and are expert swimmers and divers. Their sense of smell is exceptional, their eyesight comparable to a human's. Polar bears are naturally curious, not fearless as they have been labelled. They are shy and prefer to avoid confrontations with humans and other polar bears. Their primary prey is the ringed seal but they will also prey on birds, eggs, small mammals, and even humans. They also scavenge anything from beached whales to human garbage. In the heat of summer, polar bears may appear slow and docile, but they are capable of moving swiftly and with purpose.

This pamphlet was developed for National Parks in the Arctic. Polar bears in the Hudson's Bay area have different adaptations and behaviour. If you plan on visiting Wapusk National Park, ask for further information at: (204) 675-8863 or wapusk np @pch.gc.ca

**CREDIT:** Bromley, Marianne. 1996. Safety in Polar Bear Country. Northwest Territories Renewable Resources, Yellowknife, NWT. 24 pp.

Bromley, Marianne. 1996. Safety in Polar Bear Country. Northwest Territories Renewable Resources, Yellowknife, 24 pp.

Canadian Wildlife Service. Hinterland Who's Who. http://www.cws-scf.ec.gc.ca/hwwfap/plbear/pbear.html

Stirling, I. 1988. *Polar Bears*. University of Michigan Press. Available in soft cover from Fitzhenry and Whiteside, Markam, ON. 220 pp.

# Polar Bear

Nanug, the great white bear, is found in many of Canada's northern national parks and in some national historic sites. Whenever bears and people occupy the same area, conflict can arise. Polar bears and people have coexisted for thousands of years but contact between the two must be minimised to continue this legacy. Successful polar bear conservation requires your co-operation.

For your safety, and the safety of the bears, learn about safe travel in polar bear country and take **precautions.** By choosing to travel in polar bear country you not only accept the associated risks, but also the responsibility to alter your plans, actions and attitudes to accommodate these magnificent animals.

Report all polar bear sightings and signs to park staff, as soon as possible.

## For more information:

**Auyuittuq and Quttinirpaaq** National Parks

Box 353

Pangnirtung, Nunavut XOA ORO

PHONE: **867.473.8828** 

E-MAIL: Nunavut\_Info@pch.gc.ca

Sirmilik National Park

**Box 300** 

Pond Inlet, Nunavut XOA OSO

PHONE: **867.899.8092** E-MAIL: Sirmilik.info@pch.gc.ca

**Parks Canada Western Arctic Field Unit** Box 1840

Inuvik, NT XOE OTO

PHONE: **867.777.8800** E-MAIL: Inuvik info@pch.gc.ca

**Margo Supplies** 

A supplier of bear deterrents and warning devices.

http://www.wildlife-mgmt.com/ beardeterrents.htm

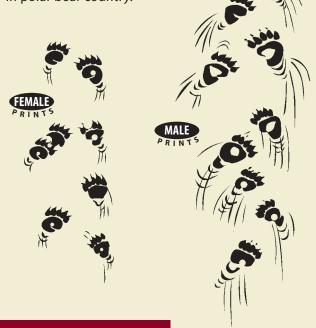




## **Safety in Polar Bear Country**

## Each encounter with a polar bear is unique.

Good judgement, common sense and familiarity with polar bear behaviour are required in all situations. This pamphlet provides guidelines for avoiding and dealing with polar bear encounters. For your safety and the safety of the bears, please read this pamphlet carefully and seriously consider the risks involved with travel in polar bear country.



Polar bear behaviour is very different from that of grizzly and black bears.

Polar bears are predators, primarily hunting seals, while grizzlies and black bears mostly eat plants. As predators, polar bears will investigate humans, their camps and may even consider humans as a food source.

# avoidingmencounter

## Ask Parks Canada staff about current bear activity.

Some areas may be closed due to bear activity; obey written and oral warnings.

### Be alert and aware of your surroundings.

Scan all around with binoculars at regular intervals. Be vigilant! Watch for signs such as tracks, droppings, diggings, wildlife carcasses and polar bear dens.

## Travel in daylight and avoid areas of restricted visibility.

Be especially careful in areas along the coast, where a polar bear may be hidden behind boulders, pressure ridges (pushed up sea ice), driftwood or vegetation.

## Travel in groups and stay together to increase your safety.

The larger the group the greater the chances of deterring a bear.

#### Never approach a bear for any reason.

Every bear defends a "critical space", which varies with each bear and each situation: it may be a few metres or a hundred metres. Intrusion within this space is considered a threat and may provoke an attack.

## Never approach a fresh kill or carcass as polar bears will defend their food.

Adult polar bears will often only eat the fat of seals and other kills, but other bears may scavenge from these carcasses.

#### Never feed bears or any wildlife.

A bear that finds food from a human source begins to associate humans with food. This can result in the bear losing its natural tendency to avoid people and becoming persistent in its search for human food. The consequences for you and the bear can be serious. A bear that associates food with humans is more likely to injure people and these bears may have to be relocated or killed.

## Pack out all garbage and use sealed bags and containers or bear-proof canisters to store food and garbage.

## Eliminate or reduce odours from yourself and your camp.

Avoid using scented soaps and cosmetics and avoid bringing strong smelling foods.

## Consider hiring a guide if you are uncertain about your ability to deal with polar bears.

Ask about their experience, how they will avoid encountering a polar bear and about plans of action should you encounter a bear. A larger group can also increase safety, ask about the size of group.

## **Choosing a Safe Campsite**

## Avoid bear feeding areas.

A polar bear's primary food source is seal so these species are often found in the same places.

- In fall, winter and early spring most polar bears are on the sea ice hunting seals by the floe edge, open water leads and along pressure ridges. Bears and seals can also be found in places where the ice is thin or cracked, such as tide cracks in land-fast ice or at toes of glaciers. Seals can more easily maintain breathing holes in these areas.
- In early spring, females with cubs tend to hunt along pressure ridges and cracks in land-fast ice (particularly in bays) where seal birthing dens are found.
- During the ice-free summer season, when polar bears are forced ashore, they generally hunt and scavenge along coastlines, beaches and rocky islands near the coast.

#### Stay away from polar bear den sites.

Unlike other bears, there is no time when all polar bears are inactive in dens.

- Maternity dens are excavated by pregnant females in snow drifts on leeward (wind protected) slopes of coastal hills and valleys. In the Baffin Region, dens can be found at high elevations on snowfields and glaciers. Maternity dens are occupied from fall to early spring. The dens are inconspicuous, however, bear tracks leading to and from the site in early autumn or late spring or ventilation holes can indicate their presence.
- Temporary dens are excavated in snow drifts or pressure ridges by polar bears (males, females and females with cubs) that are active over the winter. The dens can be used as resting places or as temporary shelter from bad weather. They can be used from a few days to several months.
- Summer retreat dens are excavated during the open water season in the remaining snow banks or into the permafrost. These can also be at higher elevations on snowfields and glaciers or the valleys leading up to them. Male and female bears of all age groups use them to keep cool and avoid insect

# handlingmencounter

# Before your trip, discuss possible plans of action for dealing with bears in a variety of circumstances and be sure everyone understands.

The actions of each individual either contribute to or detract from the safety of everyone else.

#### Stay calm and assess the situation.

What is the bear doing? What is the bear's behaviour?

#### If a bear does not know you are there:

- quietly back away and leave the area either in the direction you came or make a wide detour around the bear. Do not run, move quickly or make motions that might attract the bear's attention.
- stay downwind, if possible, so the bear cannot smell you and detect your presence.
- · keep an eye on the bear.

## If a bear knows you are there and shows signs of being curious, such as:

- · moving slowly with frequent stops,
- · standing on hind legs and sniffing the air,
- holding its head high with ears forward or to the side,
- · moving its head from side to side, or
- trying to catch your scent by circling downwind and approaching from behind.

#### THEN:

- help it to identify you as a human,
- wave your arms over your head and talk in low tones,
- move slowly upwind of the bear so it can get your scent.

If the hear has been surprised at class

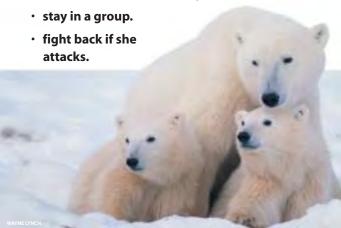
#### If a bear charges:

• stand your ground and be prepared to fight!
Bluff charges are rare.

#### Never get between a bear and her cubs.

If a female with cubs is surprised at close range or separated from her cubs she will likely attack to defend her cubs.

· leave the area immediately.



Always leave an escape route for the bear.

Carry deterrents and know how to use them.

Report all polar bear sightings and signs to park staff.

## deterrents

Reducing the threat posed by a polar bear during an interaction may be difficult. Non-lethal deterrents have been developed for black and grizzly bears but they have not been thoroughly tested on polar bears and, therefore, they cannot be depended on to ensure safety. **The best way** 

harassment.

## Avoid camping on beaches, islands, along coastlines and on "bear highways".

- Before making camp, look around for tracks.
- Polar bears often travel along coastlines using points of land and rocky islets near the coast to navigate.
- In the summer, blowing sea ice may transport polar bears into coastal areas. Avoid areas where the pack ice is blowing in to shore.
- Valleys and passes are often used to cross peninsulas and to move from one valley to another.
- Polar bears travel and hunt along the edges of ice floes.

## Camp inland on a butte or bluff with a good view of surrounding terrain.

Avoid areas where bears might hide, such as blind corners, snow banks, pressure ridges and other visual impediments.

## Set up tents in a line rather than a circle and maintain at least 5 metres between them.

If a bear comes into camp, it will not feel surrounded and will have an avenue of escape without feeling threatened.

### Do not sleep in the open without a tent.

You may look like a seal and polar bears are very curious. People sleeping in the open have been attacked.

## Cook at least 50 metres from your sleeping area in a place visible from your tent.

Strain food particles from dishwater and store with garbage. Dump dishwater at least 50 metres from your sleeping area, rivers, streams and lakes.

## Store food and garbage in bear-proof containers or sealed bags and containers secured under rocks within view of your tent.

Placing pots on top may serve as an alarm. If you have a warning system, store your food within its perimeter. DO NOT store food inside your tent.

Bury human waste under rocks at least 50 metres from your sleeping area or pack it out.

## range or shows signs of being agitated or threatened, such as:

- huffing, panting, hissing, growling or jawsnapping,
- · stamping its feet,
- staring directly at a person, or
- lowering its head with ears laid back.

#### THEN:

- act non-threatening. Do not shout or make sudden movements, which might provoke the bear. Never huff or hiss as this can cause a polar bear to charge.
- avoid direct eye contact.
- back away slowly. DO NOT RUN.
- · be prepared to use deterrents.

## If the bear shows signs of stalking or hunting you, such as:

- · following you or circling you,
- · approaching directly, intently and unafraid,
- · returning after being scared away, or
- · appears wounded, old or thin.

#### THEN:

- fight back! Use any potential weapon, group together and make loud noises.
- · DO NOT RUN.
- be prepared to use deterrents.

hem.

Any potential weapon should be considered, such as skis, poles, rocks, blocks of ice or even knives.

**Stay together as a group.** This can be a deterrent and actions, such as making noise, jumping, waving arms, throwing things, may help to drive a polar bear away.

## **Commercial deterrents:**

- **Noisemakers** including air horns, pistol and pen launched bear bangers may scare a bear away.
- Pepper spray may work on polar bears, but has not been thoroughly tested. Be aware that pepper spray does not work when cold. Also be aware of wind direction to avoid having the spray blow into your face.
- Know how and when to use these deterrents and practice beforehand.
- Availability of commercial deterrents is limited in the north, most will have to be purchased elsewhere and transported as dangerous goods.
- · Contact Parks Canada for more information.

In National Parks of Canada it is unlawful to possess a firearm without a permit. The exception to this regulation is for beneficiaries of the Inuvialuit Final Agreement and Nunavut Land Claim Agreement; they may carry firearms when engaged in traditional activities within National Parks in their land claim area.

## warningsystems

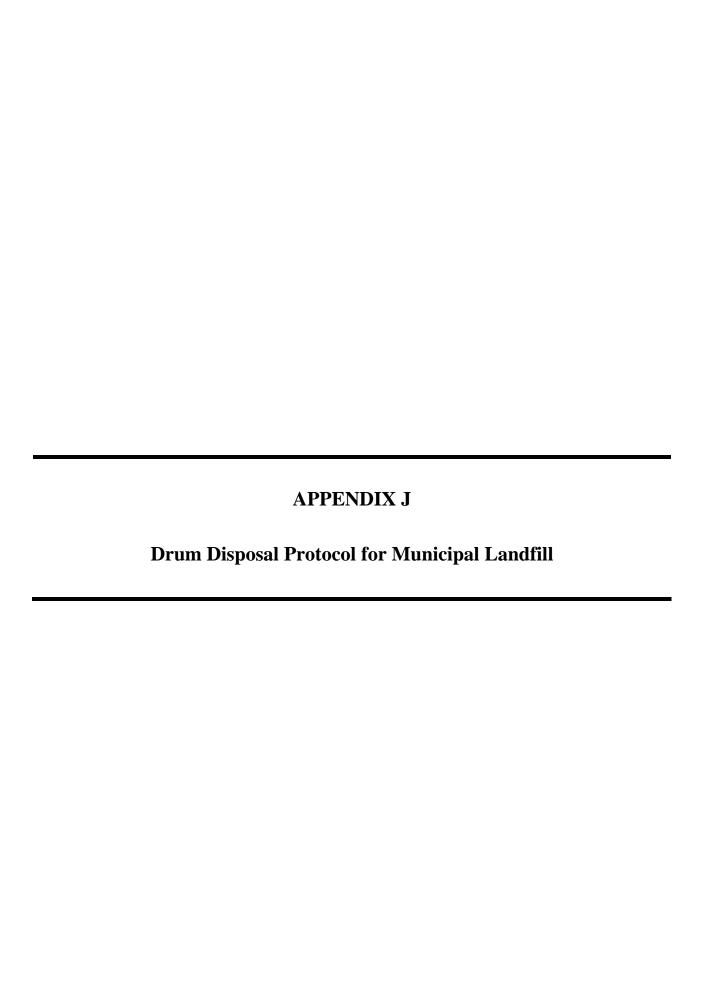
Set up a portable trip-wire or motion detector alarm system around your tent to alert you if a polar bear approaches your camp. Before leaving home, contact Parks Canada for more information.

You may wish to take a dog, but only one that has proven experience with polar bears. Several dogs

are better than one. Know how to handle them. Keep them staked so they cannot run to you for protection and stake them downwind from your sleeping area. Be sure to clean up any dog food leftovers. Dogs must be under control at all times within national parks to avoid wildlife harassment.

**Designate a bear monitor** to keep watch if a polar bear might be nearby. Consider moving your camp if there is a bear in the area.

Report ALL polar bear sightings and signs to park staff, as soon as possible.



## Drum Disposal Protocol For Municipal Landfill

Commercial and institutional supplies, as well as fuel, arrive in the north in drums or in bulk containers. Most containers are recyclable but rising fuel and transport cost generally means that unwanted drums or unusable tanks are taken to the local landfill for disposal.

Landfills in the NWT are not designed to receive liquid waste. Precipitation in the form of rain and snow do dissolve waste and create leachate which percolates down through the soils. If chemical or fuel residues have been deposited in the landfill surface and ground water could become contaminated.

The attached guide provides the requirements for acceptance of drums and tanks at municipal landfill. The municipal authority must also provide approval prior to landfill disposal.

All large containers and tanks that previously held Dangerous Goods are required to be emptied and cleaned prior to landfill disposal or returned to manufacturers or recyclers. These containers are hazardous and must be handled accordingly.

The *NWT Environmental Protection Act* prohibits the release of contaminants into the environment. Liquids are not allowed into landfills in the NWT.

Further information on landfill design and operation refer to the Guidelines for the Planning, Design, Operations and Maintenance of Modified Landfills in the NWT, Department of Municipal and Community Affairs. This document is on the ENR website. For further information contact Environmental Protection Division at 873-7654 or visit their website at http://www.enr.gov.nt.ca/eps/leg.htm.

#### DRUM AND TANK CLEANING FOR MUNICIPAL DISPOSAL

#### Definitions:

Small container - containers with a liquid capacity of 205 litres or less Large container - containers with a liquid capacity greater than 205 litres Empty container - A small container that has been emptied, to the greatest extent possible, using regular handling procedures, but it's contents shall not exceed 1% of the container's original capacity or 2 litres, whichever is less.

#### **Small Containers**

Small containers taken to landfill for disposal should be emptied to the greatest extent possible, using regular handling procedures. Containers that previously held dangerous goods should be crushed or be pierced to prevent reuse.

Barrels containing only rust and sediment shall be treated as empty containers.

#### Tanks and Large Containers

If approved for landfill disposal by municipal authorities, tanks and large containers that previously held Dangerous Goods must be cleaned to remove all residuals. Cleaning can be undertaken by contracting commercial cleaning companies to undertake one of the following procedures, solvent rinsing, steam cleaning or high pressure rinsing with appropriate cleaning agents.

The risings are hazardous waste and must be collected and managed according to their characteristics (i.e. flammable, corrosive, acidic, etc.). The Guideline for the General Management of Hazardous Waste in the NWT details the requirements for management of these wastes.

Petroleum product container rinsing may be acceptable for treatment at municipal or commercial landfarms designed to treat hydrocarbon contaminated soils. These landfarms generally operate on a fee for service basis.

For further information contact Environmental Protection Division, Environment and Natural Resources at 873-7654 or visit the website at <a href="http://www.enr.gov.nt.ca/eps">http://www.enr.gov.nt.ca/eps</a>.