Hamlet of Cape Dorset Metals Disposal Site Study

Cape Dorset, Nunavut

Final Report
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Prepared for:
The Hamlet of Cape Dorset

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Submitted by:
Concentric Associates International Incorporated

Executive Summary

The community of Cape Dorset is currently operating a metals waste disposal site. The Hamlet of Cape Dorset has expressed concern over the appearance, environmental impacts and public safety and health risks this site may pose. Regulators have expressed concern over the volume of waste at the site, the lack of segregation of materials, the presence of improperly stored hazardous wastes and the flow of surface runoff through the site.

All suggested options for managing the waste require a preparatory phase involving sorting of the waste, removing and disposing of hazardous materials, cutting up large items and compaction of the remaining materials into manageable sized bales to decrease transport costs and storage requirements.

The options considered include disposal at sea, disposal at a landfill, on-site storage and sealift backhaul. Disposal at sea and disposal at a landfill were determined to be cost-prohibitive and unacceptable from a community perspective. Furthermore, no practical locations for landfilling of the material are currently available. On-site storage was also rejected as this option merely defers the problem to a later date and does not satisfy the community's immediate concerns regarding the aesthetics of the site.

The recommended option, therefore, is sealift backhaul. It is suggested that a single season approach to disposal via sealift is adopted. A single season approach would require all equipment and crew to arrive in Cape Dorset with the first supply ship in late June (estimated) and ideally return on the last ship in late October (estimated). It is estimated that the project could be completed in 13-16 weeks at a cost of roughly $2,700,000 (rounded). Once the material is removed from the site, it is recommended that a Phase I/II site assessment be completed to determine the nature and extent of any contamination which may have resulted from the long-term storage of wastes at the site. Once completed, the site may then be restructured to accept future metal waste. Preliminary recommendations for future site management are provided below. If adopted, these will assist in bringing the Cape Dorset metals disposal site into compliance with the hamlets water license.

Site security in the form of an earthen berm, a gate at the main entrance and a site supervisor would provide viable control measures both in terms of access to the dump as well as managing the storage of different types of materials. Weekly inspections by the site supervisor would ensure that proper operational procedures were being followed and that the integrity of the berm was maintained.

A waste segregation protocol should be established in which materials are segregated at the time of disposal. This would facilitate processing and ensure that the maximum possible revenue is gained from the sale of the scrap metal. A schedule for the removal of the metal should be established based upon the rate of re-generation. Hazardous wastes should be handled and stored according to Government regulations and should be removed on an annual basis via sealift. Movement of surface water through the site should be minimized. This may be accomplished with the construction of an earthen berm and drainage ditches which surround the outer perimeter of the disposal area. A groundwater monitoring program involving annual sampling of

wells located both upgradient and downgradient of the metals disposal site should be established. In addition, a closure plan which outlines how the metals disposal site will be abandoned and the means by which it will be restored to its pre-use conditions should be prepared. Finally, an operations and maintenance manual for the metals disposal site should be created. This manual would be a valuable reference to ensure future operation of the site in an efficient and environmentally sound manner.

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Introduction

The community of Cape Dorset is currently operating a metals waste disposal site. The Hamlet of Cape Dorset has expressed concern over the appearance, environmental impacts and public safety and health risks this site may pose. Regulators have expressed concern over the volume of waste at the site, the lack of segregation of materials, the presence of improperly stored hazardous wastes and the flow of surface runoff through the site.

A previous study conducted by Dillon Consulting Limited (2003) involved the analysis Cape Dorset's municipal landfill and the metals waste disposal site. Dillon's objectives were to assess these facilities and to determine the means by which these sites might be upgraded and/or expanded to accommodate future waste materials that would be generated in the following 20 years.

The current study was conducted to assess the present state of the metals disposal site and to provide management options to address the Hamlets concerns and to bring the site into compliance with applicable environmental legislation. To achieve this objective, Concentric carried out the following scope of work:

1. Traveled to Cape Dorset to meet with the Hamlet council and the Mayor to discuss the history, background and possible remedial techniques to bring the metals waste disposal site into compliance with applicable environmental legislation.

2. Reviewed all known relevant information regarding the metals waste disposal site.

3. Surveyed the site to ascertain the amounts and types of materials present.

4. Identified the process or processes required to ensure that the metals disposal site meets environmental standards and guidelines.

5. Prepared the following report for the Hamlet Council and Government of Nunavut that summarizes findings from the above-noted tasks and provides associated recommendations.

1. Background

The Hamlet of Cape Dorset is located on Dorset Island near Fox Peninsula at the southwest tip of Baffin Island (Appendix A, Attachment 1, Project Location Map). The community has a population of approximately 1,236, over 90% of which are Inuit. Employment is related to the provision of basic consumer services and the export of native art. The community is supplied with basic services such as electricity which is regionally generated and also utilizes propane and petroleum products for fuel and home heating. The Hamlet is challenged by the local geography and climate, both of which create natural barriers to transportation services. The community imports many of its basic needs through annual re-supply via sealift during the summer months.

1.1. Physical Geography

Located within the Canadian Shield, the regional landscape consists of undulating, exposed bedrock. The area is dotted with small lakes and vegetation is composed of dwarf shrubs, sedges, grasses, mosses and lichens. Surficial materials where present, consist of sands, silts, clays and gravel (till). Cape Dorset is also located within the continuous permafrost zone.

1.1.1. Geology

Regional geology is comprised of Early Holocene/Wisconsinan till and Quaternary/Pre-Quaternary bedrock and rock weathering products. The till is comprised of silty sand with cobble- and boulder-sized igneous and metamorphic clasts. The bedrock and rock weathering products include outcrops and/or a discontinuous cover of rubble, boulders, gravel, sand and minor silt. The bedrock geology is variable and comprises numerous sub-divided classifications.

1.1.2. Hydrogeology

Cape Dorset is situated within a peri-glacial environment in which permafrost-influenced subsurface conditions do not support significant local or regional-sized aquifers. Localized areas of near-surface groundwater can be expected on a seasonal basis.

1.2. Site Description

1.2.1. Location

The metals disposal site is located roughly 0.5 km west of the Hamlet of Cape Dorset. It is accessed from a gravel lane which branches off the main road leading to the sewage lagoons and the municipal landfill (Appendix A, Attachment 2, Site Location). The site is situated adjacent to Telik Inlet with its northern border located within approximately 40 meters of the waters edge. The nearest residence is located approximately 125 meters east of the disposal site.

1.2.2. Site Plan

The waste at the metals disposal site may be divided into two main areas (Appendix A, Attachment 2, Site Location and Attachment 3, Site Survey). The first area (upper site) is located on the southern part of the site adjacent to the main road leading to the sewage lagoons and municipal landfill. The materials found in upper site are distributed among several moderately sized piles. Some segregation of the material has taken place in this area, but the majority of the piles are of mixed composition (Appendix B, Photograph 1).

The second main area (lower site) is located on the northern half of the site adjacent to Telik Inlet. Two large piles are located on the west side of the main access road. The remaining waste is distributed among several smaller piles present on the east side of the main access road. An approximately 1.5 meter high berm surrounds the entire northern edge of the lower site (Appendix B, Photograph 2). Materials in this area have been roughly sorted.

The upper and lower piles of waste are roughly 100 meters apart and are connected by the gravel access lane. Surficial drainage at the site is generally to the northeast towards Telik Inlet.

1.2.3. Existing Facilities

Existing facilities at the metals disposal site are minimal. There are no structures nor are there any mechanisms in place such as bins or signs which would assist in segregating the waste for recycling or other forms of waste management. Further, there are no measures in place for the containment or proper handling of any hazardous materials.

1.2.4. Site Access

The metals disposal site is currently completely open to the public. No fencing or signs are present on-site to restrict when the site may be accessed. At this time, there are no administrative controls in place that limit either the quantity or type of materials being dumped. There are also no restrictions regarding where on the site these materials may be deposited.

1.2.5. Current Community Involvement

Members of the community currently do not follow any firm rules or maintain any order when depositing materials at the dump. The situation could be improved with appropriate on-site management as well as public education. As has been noted in previous reports, the dump is generally not managed and items are left randomly at the site by Hamlet workers, Contractors and the public.

1.3. Site History

1.3.1. Age of the site

It is estimated based on the types of materials present on-site that the metals waste disposal site has been in operation for at least 30 years. Anecdotal evidence provided by Cape Dorset council members suggests that this site may have formerly been occupied by a community landfill. Aerial photographs were reviewed from the National Air Photo Library for the years 1969, 1972, 1983, 1987, 1989, and 1992 (Appendix C, Aerial Photographs). Results of the aerial photograph review are presented in **Table 1** below. A summary of the overall observations follows Table 1

Table 1: Aerial Photograph Review – Observations

Year	Photo No.	Observations
1969	A21180-73	Site appears to be vacant.
1972	A24735-62	A road is visible leading to what is the current-day metals disposal site. Small debris piles are scattered throughout both the upper and lower portions of the site.
1983	A26393-18	A large clearly visible debris pile is present on the upper portion of the site immediately adjacent to where the road for the disposal site branches off from the main road. A large cleared area is visible on the lower portion of the site although debris piles are not evident in this photo.
1987	A27162-102	Site is generally similar to the 1983 aerial photograph.
1989	A27464-14	Site is generally similar to the 1987 aerial photograph.
1992	A27863-94	A large clearly visible debris pile is present on the upper portion of the site immediately adjacent to where the lane leading to the disposal site branches off from the main road. A large cleared area is visible on the lower portion of the site as are several debris piles.

Based on the historical photographs, it appears that the site has been occupied by a waste disposal site since the early 1970s. Given the small scale of the photographs, it was not possible to distinguish whether the debris piles noted in the earlier photographs were associated with a former municipal landfill or were the beginnings of the current metals disposal site. Municipal waste therefore may be present on the metals site. Based on this and the long-term storage of metal waste, some of which may contain hazardous materials, it is recommended that a Phase I/II environmental site assessment be conducted. A Phase I/II assessment would determine both the nature and extent of any contamination that may be present at the metals disposal site.

1.3.2. Site Use

Historically the site has been used for about thirty years. Its use, however, has accelerated during the past twenty years as more consumer goods such as vehicles, refrigerators and electronics have made their way to the north. As these goods have passed their useful life, they have been dumped at the site in a random fashion. Materials dumped have been of mixed composition and have included items such as, cars, trucks, heavy machinery, structural steel, appliances, oil tanks, drums and tires. The hazardous materials associated with some of these including fluids from vehicles and CFC's from appliances, were likely not removed prior to the items being dumped at the site. Other hazardous items such as cans of paint and batteries have been left exposed at the site.

2. Regulatory Background

The management of solid waste within communities such as Cape Dorset is multi-jurisdictional. The day to day management of existing solid waste sites is, to a large extent, controlled at the community level. Regulatory oversight, however, is provided by various departments within both the territorial and federal governments.

The statutes regarding the management of solid waste are designed to ensure the protection of environmental quality and human health. The relevant statutes associated with the Cape Dorset metals disposal site include the following:

- Nunavut Environmental Protection Act (R.S.N.W.T. 1988, c.E-7)
- Nunavut Public Health Act (R.S.N.W.T. 1988, c.P-12).
- Nunavut Waters & Nunavut Surface Rights Tribunal Act (S.C. 2002, C. 10)

Nunavut Environmental Protection Act

The Government of Nunavut, Department of the Environment is responsible for upholding the Nunavut Environmental Protection Act (EPA) and hence regulating the disposal and management of solid waste. Subsection 5 of the Act states:

"Discharge of contaminants
5. (1) subject to subsection (3), no person shall discharge or permit the discharge of a contaminant into the environment".

There are no exceptions pursuant to Subsection (3) that apply to the Cape Dorset site.

Subsection 12 of the EPA deals with offenses and punishment. As noted in this section, anyone who is in contravention of section 5 is guilty of an offense. Numerous hazardous materials including, paint, batteries, CFCs and vehicle fluids are present at the Cape Dorset metals disposal site. These materials are not contained and some items such as the batteries and vehicle fluids were observed to be leaking directly on to the ground surface. The site, therefore, may be subject to censure by the Chief Environmental Protection officer. Concentric is not aware, however, of any orders that have been issued pursuant to subsection 5 that apply to the Cape Dorset site.

To facilitate compliance with the Nunavut Environmental Protection Act, seven guides have been developed by the Department of the Environment for materials (principally hazardous) considered contaminants under the Act. The guides are as follows:

- Guideline for the General Management of Hazardous Wastes in the NWT
- Environmental Guideline for Waste Batteries
- Environmental Guideline for Waste Paint
- Environmental Guideline for Waste Solvents
- Environmental Guideline for Antifreeze
- Environmental Guideline for Ozone Depleting Substances

- Environmental Guideline for Asbestos

These documents provide direction on the correct management of these materials. As noted above, numerous hazardous materials are present at the Cape Dorset metals dump. Based on a review of the guides, it appears that the management practices at the site may fall outside the guidelines presented in the above-noted documents and hence may be subject to enforcement.

Nunavut Public Health Act

In order to protect human health and safety, the Government of Nunavut, Department of Health and Social Services also plays a role in regulating solid waste sites. Subsection 25 (1) of the act states:

"25. (1) On the recommendation of the Minister, the Commissioner may make regulations that the Commissioner considers necessary for the prevention and mitigation of disease and the promotion and preservation of health in the Territories...may for this purpose make regulations

> (i) respecting the control of waste disposal grounds for the disposal of excreta and garbage;
>
> (q) respecting the prevention of the pollution, defilement, discoloration or fouling of lakes, streams, rivers, ponds, pools, springs and watercourses, so as to ensure their sanitary condition;
>
> (r) respecting the prevention, control and abatement of air pollution due to any cause;"

Based on the above, the Cape Dorset metals site could upon inspection, be subject to regulations constructed under the Nunavut Public Health Act.

Nunavut Waters & Nunavut Surface Rights Tribunal Act

Solid waste disposal may also come under the scrutiny of Indian and Northern Affairs Canada (INAC) who are responsible for enforcing water licences issued under the Nunavut Waters & Nunavut Surface Rights Tribunal Act (S.C. 2002, c. 10). A key component of any water licence is the analysis of solid waste disposal and its effects on the quality and quantity of inland waters. The Cape Dorset metals disposal site, therefore, may be subject to enforcement based on its water licence issued by INAC.

It is evident from the above discussion, that any strategies developed to deal with existing solid waste or its future management will necessarily involve input from various levels of government. The execution of such strategies, however, will likely rest at the community level.

2.1. Regulatory Reports

Two municipal water use inspection reports (January 15, 2001 and October 6, 2003) have been issued for Cape Dorset by Indian and Northern Affairs Canada. These reports, which were presented in a previous study issued by Dillon Consulting (2003), made note of several issues relating to the metals waste disposal site. Items of particular concern noted in the report included; lack of segregation of the materials, no containment of the hazardous materials, and no viable measures in place to contain runoff that flows into Telik Inlet from the dump site. Since these reports were issued, some segregation of materials has taken place and a berm has been constructed around the northern edge of the site to prevent surface runoff from entering Telik Inlet. Otherwise the site remains largely unchanged.

Indian and Northern Affairs Canada, Nunavut District Office was contacted for updated inspection reports. At the time this report was prepared, however, no response had been received. More recent inspection reports, therefore, may be available for future review and consideration.

3. Previous Studies

The Government of Nunavut previously commissioned studies to assess the environmental impact of solid waste management in the territory. A summary of two of these studies, one of which was specific to Cape Dorset, follow. It is noteworthy that the present report does not attempt to replicate either of these studies but rather makes reference to pertinent sections of them in order to provide relevant information.

3.1. Dillon Consulting – Cape Dorset Solid Waste Improvement Study

The Dillon Consulting Limited study was conducted in 2003 at the Cape Dorset site. This study involved the analysis of both the community municipal landfill and the metals waste disposal site. Dillon's objectives were to assess the disposal and storage facilities as well as to determine the means by which these sites might be upgraded and/or expanded to accommodate future waste materials that would be generated in the following 20 years.

With respect to the metals disposal site, Dillon suggested four potential options for managing the waste. These included storage of the material at its current location, removal of the waste to a landfill, disposing of the material at sea, or transport of the metal waste to the south where it could be sold for scrap. All of the proposed management options called for a reduction in the volume of scrap metal via shredding and/or compaction.

3.2. Environmental Protection Service - Management Options for End-of-Life Vehicles (ELVs) in Nunavut

A second study (2006) was prepared by the Environmental Protection Service of the Government of Nunavut. This study discussed both the current means of managing end of life vehicles (ELV's) as well as future management strategies for ELVs in several communities throughout Nunavut. Although the report focused solely on ELVs, the options presented could also be applied to other recyclable scrap metal such as that present in Cape Dorset. Disposal at sea and disposal in a landfill were presented in the report as potential options for managing the waste, but were discounted due either to high cost or lack of community support. The report focused, therefore, on the means by which the ELVs could be completely removed from the communities and shipped south for recycling.

In addition to the above, several other studies regarding scrap metal recycling in remote northern communities were reviewed. Relevant information from these was incorporated into the current report where applicable.

4. Site Characteristics

4.1. Geographic characteristics

The site is subject to extreme cold weather with sub-zero conditions typically lasting for between seven and eight months. These freezing temperatures have an impact on access to the dump for the purpose of compacting and removing materials as well as access to the region as a whole. The only viable way to import or export goods of any kind to or from the community is by way of the ocean. Accordingly, any attempts to remove materials would be restricted to a few summer months each year at best.

4.2. Waste Characteristics

Previously noted, the metals disposal site may be divided into two main areas, the upper site and the lower site (see Appendix A, Attachment 3, Site Survey and Appendix B, Photographs). Waste in the upper site represents approximately 25% of the total volume of materials in the metals dump. Items present in the upper site are largely unsorted and generally consist of mixed light metal. Heating oil tanks and drums, fiberglass tanks and metal pipes, however, have been segregated. Some miscellaneous vehicles, appliances, and general refuse are scattered about this area.

Waste contained in the lower site constitutes roughly 75% of the total volume. Over 40% of this in turn is found in two large piles situated on the west side of the lower site. The larger of the two is composed predominately of cars, trucks, and heavy commercial vehicles. The other consists of corrugated metal and mixed heavy and light steel. To the east of these two piles are several smaller waste piles the largest of which are composed of unsorted light metal, appliances, snowmobiles, tires and pipes. Other materials on-site in smaller quantities include steel ribbon, sheet metal shelves, electronics, mattresses, bicycles and general refuse.

In addition to the above, hazardous materials including partially full paint cans, vehicle batteries and vehicles fluids are present at the site. Chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HFCs) in refrigeration equipment present at the site may also be a concern. The majority of these types of wastes are located at the lower site although some are scattered throughout the upper site as well.

Some materials that are dumped on the site are affected by the freezing temperatures whilst others are not. Petroleum byproducts for example do not freeze they become a slow moving sludge in freezing conditions. Ethylene glycol, found in anti-freeze and windshield washer fluid also tend to thicken in sub-zero temperatures but do not entirely lose their liquid qualities, thereby presenting a year round environmental hazard.

4.3. Regulatory Oversight

There has been minimal regulatory oversight with no local policing of the dumpsite being evident. Various levels of government and legislative authorities have provided reports and commissioned studies both of which provided recommendations regarding the management of the site. As of this writing, however, only the most rudimentary recommendations have been implemented.

5. 2009 Site Visits

A visual inspection of the site was conducted by Concentric in July, 2009 followed by a second visit in August to conduct a detailed volumetric survey of the metals disposal site. The July inspection consisted of several site visits, the making of observational notes and meetings with community officials.

5.1. Meeting with Community Officials

Discussions were had with the Hamlet Environmental Committee and the Senior Administrative Officer, Mr. John Ivey. During our discussions, concern was expressed for the aesthetics of the site, the distance of the site from the tidal land bridge, the presence of improperly stored hazardous materials and the potential impacts of the site on aquatic life. The committee made it clear that their preference was for the complete removal of the metals from the dump site.

5.2. Site Inspection

During the July inspection of the metals disposal site, several issues of concern were noted. A section of the berm located directly north of the main pile of vehicles had been breached. Surface water was observed to be moving through the site towards Telik Inlet. Several vehicles were sitting in water and were leaking fluids into the water and on to the ground surface. Animal carcasses and potentially hazardous wastes including batteries, paint cans, and drums were scattered throughout the site (Appendix B, Photographs 13-16). During the three days that Concentric was in Cape Dorset, the berm was repaired and absorbent pads were placed beneath the leaking vehicles.

5.3. Earlier recommendations

Previous studies have made recommendations such as moving materials further from the high water line and building a berm. These two recommendations have been completed although the berm has since been breached (and subsequently repaired). Further recommendations have included segregating the waste into piles according to type and taking steps to facilitate recycling of certain types of material. While there have been some attempts at segregation, the task is far from complete and a recycling programme has yet to be implemented.

5.4. Site Survey

A survey of metals disposal site was conducted by Concentric in August of 2009 (see Appendix A, Attachment 3, Site Survey). The estimated total volume of waste at the site is 11,800 m^3. This is divided among the upper site which has a waste volume of roughly 3,000 m^3 and the lower site which has a volume of roughly 8,800 m^3.

Based on observations of the materials present on-site, the waste was classified into six categories with associated volumes. These are listed in Table 1 below.

Table 1: Estimated Volumes of Materials at the Cape Dorset Metals Disposal Site

Material Class	Estimated Volume (m^3)	Estimated Percentage of Total Volume
Vehicles (including snowmobiles)	2,900	25
Mixed Light Metal	6,300	54
Appliances	1,100	9
Oil Tanks and Barrels	600	5
Tires	400	3
Other	500	4
TOTAL	**11,800**	**100**

The total weight of the materials is estimated to be 2,100 metric tonnes. Estimates of the total tonnage at the site were calculated by cross referencing the current survey with data available from the Dillon report. The Dillon report estimated weight using a matrix that combined volume and estimates of content density. It is the adjustment of volume that provides a percentile basis for the estimation of weight. Concentric also independently calculated weight using data from its own volumetric survey and approximate material densities. An average of this value and the value determined by adjusting Dillon's data were used to obtain the estimate of total tonnage.

5.5. Current Waste Management Practices

At this time there are no viable or sustainable waste management practices or protocols in place nor are there any measures in place to inhibit random dumping at the site. Regulatory officials have already expressed concern over the volume of waste at the site, the lack of segregation and the presence of uncontained hazardous wastes. Community officials have expressed concern over the aesthetics of the site and its distance from the tidal land bridge. Although no orders are known to have been issued against the site, continuing with this modus operandi would likely be unacceptable from a regulatory perspective and merely defers the problem to a later date.

At the present time we are unaware of any concerns that have been expressed from regulators regarding the geographic location of the site. Storage of the waste at its current location, therefore, is a possibility. Certain immediate measures, however, would need to be implemented to satisfy the specific regulatory concerns noted above. These include:

- securing of the site by means of berms or fences (or a combination of the two)
- training of workers who may work at the site

- segregation of the waste so that like materials can be grouped together
- proper containment of the hazardous wastes
- disposal of non-metallic items at the local landfill
- a system of drainage installed to ensure that surface water is not moving through the disposal site and into Telik Inlet
- groundwater monitoring
- creation of an operations and maintenance manual
- creation of a closure plan

Even if the above measures are implemented, at some point, whether now or in the future, a plan will need to be introduced to reduce the volume of the existing waste as the dump surpasses its capacity. In addition, on-site storage of the waste in its current form, does not address the communities concerns of the aesthetics of the site and its distance from the tidal land bridge.

6. Waste Management Options

Options for managing the metal waste within Cape Dorset may involve removal, on-site storage, or a combination of the two. A discussion of potential options is discussed in the following sections.

6.1. Preparation of Material for Waste Removal

Prior to the removal of any of the metals material, whether to dump elsewhere or to backhaul, a major preparatory phase must be carried out. This would involve:

1. sorting the waste items;
2. removing and disposing of hazardous materials; and
3. compaction of materials into manageable sized bales.

Each of the waste removal options will require that the volume of waste is reduced in order to decrease transport costs and storage requirements. This reduction could best be achieved by using a portable baling machine. Rough estimates provided by an equipment recycling company have suggested that if the recyclable material is properly compacted and baled, the volume can be reduced by about 75%. Accordingly, it is estimated that the total volume can be reduced to approximately 3,000m^3 (rounded).

In general, sorting of the material would involve its separation in to three main groups, light metal that can be compacted; heavy metal items that must be sheared or torch-cut; and non-metallic items that may be disposed of in a landfill. Some management options such as disposal at sea (discussed in Section11.1.2) may involve an added level of segregation. Timing will be a critical issue due to the short season. Accordingly, sorting of the waste should take place when it can be most easily and economically accomplished. This may be prior to compacting the waste or in conjunction with the process. Hazardous wastes such as fluids in vehicles (fuel, lubricants, coolant, and windshield fluid) or drums, battery acid, paint, CFCs and possibly PCBs from items such as appliances and air-conditioning systems should be removed and dealt with according to government regulations. Removal of CFCs should be done by a licensed technician. In addition, tires should be removed from vehicles and fuel tanks properly decommissioned prior to compaction. These tasks are normally completed by recycling and salvage firms.

6.2. Disposal at Sea

Disposing of waste materials at sea is permitted in accordance with the Canadian Environmental Protection Act, 1999 (CEPA). The Act restricts what types of material may be disposed of and sets forth guidelines for its disposition. The disposal at sea program is administered by Environment Canada (EC) and is controlled by a system of permits obtained through EC and administered in accordance with the regulations provided under the CEPA. The application process is very complex and requires meticulous planning. A summary of the main requirements of the program as well as some of the most important considerations of this method of disposal are discussed below.

The disposal at sea program facilitates the dumping of a variety of "clean" material that is both environmentally and ecologically sound. The most common material being disposed of at sea is dredged sediment, making up roughly 90% of the material dumped in this way. However, bulky substances, including those "primarily composed of iron, steel, concrete or other similar matter", may also be disposed of providing that they will not have a significant adverse effect on the sea or seabed.

Assessment of the Proposed Disposal Site

A detailed description of the proposed disposal site must be undertaken. In general, less information will be required for pre-existing disposal sites if they have been used in the last 10 years. When this is not the case considerably more information must be provided. According to Mr. Mark Dahl, Ocean Disposal Specialist at Environment Canada (EC), no ocean disposal has taken place within Nunavut during the last 10 years. As such, an assessment of any proposed new site near Cape Dorset must include studies of the geological, chemical and biological characteristics of the ocean floor as well as the physical, chemical and biological characteristics of the water column. In addition, a description of the surrounding physical, biological and human environments must be included. To obtain the above information, long-term studies to acquire baseline data may be required.

Waste Characterization

According to the disposal at sea regulations, a detailed description and characterization of the waste must be provided. If the description and characterization is inadequate because its impact on human health and the environment cannot be assessed, then the application will be refused.

The waste characterization would include for example, the source, type, dimensions, previous uses, physical, chemical biochemical and biological properties of the material. In addition, it must be demonstrated that the materials to be disposed of are free of contaminants and floating debris.

According to EC official Mark Dahl, disposal of scrap metal has not been undertaken for some time. He added that typically this type of disposal is for large chunks of inert steel such as whole ships. He emphasized that the cleaning requirements are extremely stringent requiring for example, the removal of any fuels, lubricants, wiring, tires, batteries, fiberglass, engines and anything that may float or leach. Materials would then have to be steamed cleaned to remove any potential remaining contaminants. In Mr. Dahl's view, the cleaning costs would likely outweigh the cost of shipping the material off-site. He also felt that some of the waste at the Cape Dorset site (vehicles, appliances, heating oil tanks, drums etc.) would likely be rejected.

Environmental Assessment (EA)

The scope of the environmental assessment extends beyond the proposed dump site and gives consideration to other factors such as the impact or effects of the transportation process itself. The EA process would involve an assessment of the potential effects of the material at each stage of its disposal and the subsequent presence of the material on "human health, living resources, amenities, and other legitimate uses of the sea". This process provides the basis for approval or rejection of the disposal and for determining monitoring requirements.

Alternatives to Disposal at Sea

A key aspect of the disposal at sea application process is a risk assessment of potential alternatives for managing the waste. According to CEPA, applications to dispose of waste at sea must demonstrate that other waste management options such as re-use or off-site recycling have been considered and discounted. The permit will be refused if any other opportunities exist to manage the waste without endangering human health or the environment or incurring excessive costs.

Community Support

According to Mark Dahl, communities in the north have traditionally been opposed to disposing of substances at sea. In 1994 for example, a permit to dispose of scrap metal at sea near Lougheed Island was issued to Panarctic Oils Ltd. Despite Panarctic being on the brink of starting the project, the permit was rescinded due to public concern and no disposal of scrap took place.

Because disposal at sea is very rare in the north, there is a lack of studies from which comparative cost information can be drawn. The complex application process involving lengthy and detailed site studies and assessments, the stringent sorting and cleaning requirements and the cost of dealing with any waste which cannot be disposed of at sea will make this option cost prohibitive. Furthermore, it is very unlikely that this option would receive community support.

6.3. Burial of the Waste

A second option for managing the materials at Cape Dorset site is burial at a landfill. This process is regulated by the Environmental Protection Act. According to the Guideline for the General Management of Hazardous Waste (February 1998) "it is not acceptable for hazardous waste to be abandoned, poured down sewers, dumped on land or discarded at a landfill". If the scrap metal is to be land-filled all of the hazardous waste materials must be removed first. These materials include but are not limited to, batteries, oil-based paint, waste oil, solvents, fuel, propane tanks, CFCs, PCBs and electronic equipment. In addition, the preparatory steps discussed in section 11.1.1 would have to be undertaken to minimize the volume of material to be disposed of.

The most likely landfill location for disposal of the waste would be at the existing community dump. However, this site does not have the capacity to accommodate the volume of waste present at the metals disposal site. The second alternative for burial would be the creation of a landfill in the existing sewage lagoons that are eventually scheduled to be decommissioned. The process of creating a new landfill is complex and cost prohibitive. Proper design, management and maintenance are critical to minimize the environmental impact. Further, the licensing process itself is time-consuming and involved. Currently the sewage lagoons are in-use and although due to be decommissioned a date is yet unknown. Given the community's desire to expedite clean-up of the metals disposal site, the landfill option is not considered feasible at this time. In any case, cost estimates for landfill creation suggest that the cost/benefit would far outweigh those of the sealift backhaul protocol (discussed in section 11.1.4) making this option impractical from a cost perspective.

6.4. On-Site Storage

The potential management options noted above all involve removal or partial removal of the metal waste from its current location. Another consideration would be the storage of waste in its current location. If properly managed, this option would extend the life and the capacity of the dump. In order to satisfy the community's concern regarding the aesthetics of the dump site and as a means to control surface runoff from entering Telik Inlet, a containment berm could be constructed around the site. The material would have to undergo the same preparatory phase as discussed for the waste removal options. It may also be advisable to conduct a Phase I/II site assessment prior to restructuring the site to ensure that no on-site contamination requiring remediation is present. In addition, all items which cannot be compacted and baled such as mattresses, fiberglass tanks and general refuse would have to be transported to the local landfill. Although this is a potential option, it would not entirely resolve the community's concerns regarding the aesthetics of the site or the impaired access to the tidal land bridge. In addition, whether now or in the future, a plan will need to be implemented to ensure the abatement of materials as the dump surpasses its capacity. Over time the baled material stored on site would degenerate and the bales would fall apart creating the need for a second compaction process prior to ultimate removal.

6.5. Sealift Backhaul

Complete removal from the site is not only the method preferred by the Cape Dorset Environmental Committee but also the best all round resolution to the issue of the growing metals dump. If the metals waste is to be removed from the site, oceanic shipment is the only way to achieve that goal. No overland access is available and the landing strip is unable to accommodate large commercial aircraft.

Practical considerations include seasonal access to the site and labour to prepare materials for baling in addition to the actual baling process itself and the eventual shipping of the materials. Special consideration must be given to the hazardous wastes which must be prepared according to the Transport of Dangerous Goods ACT (TDG) prior to shipping. The whole project will be constrained by climactic conditions and could potentially take more than one season to fully implement.

6.5.1. Schedule

Single Season disposal:

To schedule a single season clean up would require an operation with precise timing. If something were to go wrong or cause a delay, the cost could rise quickly. This would involve having contractors ready to commence sorting and preparing materials as soon as the weather permits. It would also require having a baler and any other required equipment shipped as soon as conditions would allow thereby ensuring the longest possible time is available to deal with unforeseeable issues that may arise.

The material would need to be sorted, cleaned, baled, loaded and shipped between the time of the first sailing in late June and the final sailing in roughly early November.

Dual Season disposal:

In a dual season, phased, approach, the first season would be used to sort the materials, remove hazardous chemicals, and cut up large items in preparation for the second season of baling and shipping. Local labour could be trained to complete this phase or a contractor could be hired.

Although the dual season approach provides more flexibility in scheduling, discussions with recycling contractors have revealed that in salvage operations such as this, the scrap metal is typically sorted, processed (fluids drained etc.) and baled simultaneously. This is done to minimize time on-site and thereby cost.

Ontario based recycling firm Premier Recycling has estimated that with the appropriate equipment in place, the materials at the metals disposal site can be processed in three to four weeks. This timeline will be significantly extended once shipping, loading and unloading times are included.

Typically cargo being shipped to the north must arrive at the main terminal roughly two weeks prior to sailing. Average sail time from the main terminal to Cape Dorset is three weeks. According to Northern Sealink and Supply Inc. (NSSI) representative Maryam Faramarzi, each year three sailings roughly six weeks apart, are scheduled for Cape Dorset beginning in roughly late June. Given that the estimated time to complete the processing of the scrap metal is three to four weeks, it may be possible for the equipment to be sent to Cape Dorset on the first ship and it and the scrap metal returned on the second ship six weeks later. If this timeline cannot be met, the equipment and at least a partial crew may be required to wait until the third sailing in late October. In this situation, costs may be incurred for idle equipment and crew. Unloading time, time to transport the equipment back to its place of origin, and time to transport the metal to a recycling facility must also be considered.

Based on the above, it is estimated that the project could take anywhere from 13 to 22 weeks to complete. It is possible with appropriate planning and a favorable sealift schedule, that the project could be completed in 13-16 weeks.

6.5.2. Costs

The two major costs associated with this project are labor and shipping. Shipping costs are based on weight or volume, whichever produces higher revenue per cargo unit. Typically shipping costs for large items such as trucks or machinery are assessed on a volume basis. Based on 2009 rates provided by Northern Sealink and Supply Inc. (NSSI), the cost to ship non-containerized items from Ste-Catherines, Quebec to Cape Dorset is $350.80 per 1000 kg or 2.5 m^3. Backhaul (southbound) rates for 2009 are $228.02 per 1000 kg or 2.5 m^3. NSSI indicated that these rates are expected to increase by roughly 3% for 2010.

According to Premier Recycling, to complete the job efficiently, the following three main pieces of equipment would be required; excavator equipped with a shear for cutting up large items that cannot be baled, baler (Aljon model 580 CL) and mobile magnet. Based on 2009 pricing from NSSI, the approximate cost to ship these items to and from Cape Dorset is roughly $80,000 (based on volume). NSSI has suggested that the scrap metal once processed should be shipped on a pallet system rather than in containers. As noted in Section 6.4, the estimated quantity of recyclable material at the Cape Dorset metals site is roughly 2,100 metric tonnes. The cost to backhaul this material therefore, is roughly $479,000 (based on weight).

As noted above, the project is estimated to take 13 to 22 weeks complete. Premier has indicated that the daily rate for three crew members and the above-noted equipment is roughly $17,000/day. If an average completion time of 17.5 weeks is used, the approximate total cost for the project would be $2,082,500.

Some costs will be recovered from the sale of the scrap. The price of scrap metals was reported in some detail in the Government of Nunavut's report on ELVs discussed in Section 4.2. However, we have discovered that the price of scrap metal fluctuates considerably and for that reason we have decided to err on the conservative side. Although it may be higher, we believe that the average price of scrap metal would be approximately $.10 per pound or $200 per ton (this information was obtained from scrapmetalpricesandacutions.com). Using the estimated weight range of 2100 metric tonnes, a scrap value of approximately $420,000 was obtained.

Primary costs associated with sealift backhaul are summarized in Table 2 below.

Table 2: Cost Summary Estimates for Sealift Backhaul

Item	Estimated Cost
Shipping of equipment to Cape Dorset	$80,000
Labor and equipment fees	$2,082,500
Sealift backhaul of material	$479,000
Sale of scrap metal	-$420,000
Sub-Total	**$2,221,500**
Contingency @ 20%	$444,300
Total (excluding taxes)	**$2,665,800**

Note: the above table does not include; insurance for the equipment during shipment, accommodations costs for the crew, cost to transport the metal and hazardous wastes from the shipping terminal to a recycling/disposal facility, cost to dispose of the hazardous wastes and tires, or final site cleanup.

6.6. Recommendations

Once the material is removed from the site it would be worthwhile conducting a Phase II environmental assessment to determine nature and extent of any contamination which may have resulted from the long-term storage of wastes at this site. A Phase II assessment is also recommended given that there is anecdotal evidence of this site being the former location of the municipal landfill.

7. Recommendations for Future Site Management

Once the existing material has been removed from the metal disposal site and a cleanup completed, the site may be restructured to accept future metal waste. Short or long term on site storage necessitates a proper management and control strategy. The following represents some of the considerations for adequately managing the on-site storage and recycling process. These recommendations if carried out will assist in bringing the metals disposal site in to compliance with the Hamlet of Cape Dorset's water license (3BM-CAP0810).

7.1. Site Security

An earthen berm surrounding the site and a gate at the main entrance that restricts access would provide a viable control measure both in terms of access to the dump as well as managing the storage of different types of materials. To ensure no materials are dumped in or near Telik Inlet the berm should be should be constructed a minimum of 30 meters from the high water line. Signs indicating materials allowed or not allowed should be posted at the entrance and access to the site should be limited to certain times. When open, a site supervisor should be on hand to ensure the items get deposited in the correct locations and any hazardous components are dealt with immediately and in the correct manner.

7.2. Collection and Segregation

It is essential that future disposal at the site is conducted in a controlled manner. Waste should be segregated at the time of disposal to facilitate processing. According to the Guide for Recycling Scrap Metal from Nunavut and Northern Manitoba, one way to increase revenue from the sale of the scrap is to sort the material into ferrous and non-ferrous piles as non-ferrous metal is worth up to eight times more. The waste should be further sorted into like materials as items require different levels of processing and some are not acceptable for recycling. Covered bins could be used to segregate certain waste types and/or signs could be used to direct users to the appropriate disposal areas.

7.3. Hazardous Wastes

It is critical that all hazardous materials are dealt with correctly and efficiently. Whenever possible, hazardous materials should be stored in their original containers. When this not possible as for example with batteries and fluids drained from vehicles, containers that are sealable and leak proof such as drums provide a viable alternative. Containers must also be appropriately labeled. Typically in the north, batteries, paint cans and drums containing liquid waste are stored in secured sea cans. Attention must be given, however, to the storage of incompatible wastes. Information on storage and labeling requirements for specific wastes is available in seven guides developed by the Nunavut Environmental Protection Services (see Section 3). It should be noted that the removal of CFC's must be done by a licensed technician. Finally, hazardous wastes should be removed on an annual basis via sealift backhaul.

7.4. Surface Water Diversion

The movement of surface water through the site must be minimized to prevent potential contaminants from entering Telik Inlet. This can partially be accomplished with the construction of an earthen berm. The berm would play a dual role of providing site security and inhibiting the flow of surface water in to and out of the site. Additional diversion control measures such as drainage ditches will also be required to re-direct the flow of surface water around the site.

7.5. Groundwater Monitoring

Groundwater monitoring wells should be installed upgradient and down gradient of the metals disposal site. The upgradient monitoring wells will enable the collection of background data which may be used to assess levels of contaminants (if present) in groundwater collected downgradient of the site. Both well locations should be sampled annually for the water quality parameters outlined in Part H, Item 4 of Cape Dorset's water license.

7.6. Site Inspections

The metals disposal site should be inspected weekly to guarantee that proper operational conditions (as discussed above) exist at the site. Weekly inspections would also ensure that the integrity of the berm and drainage ditches had not been breached.

7.7. Waste Removal

A schedule for the removal of scrap metal could be established that is based upon the rate of material regeneration. A cooperative regional approach to recyclable waste management may provide a more cost effective alternative to a go it alone approach. If a cost sharing program were developed certain costs may be reduced. Another alternative approach that we have considered would be that of the Hamlet of Cape Dorset purchasing its own, smaller, compactor to process some of the scrap metal as part of an ongoing waste management protocol. The cost of a small auto/scrap metal baler would be in the range of $300,000 to $400,000.

7.8. Closure Plan

A closure plan should be prepared which outlines how the metals disposal site will be abandoned and the means by which it will be restored to its pre-use condition. This is required for the metals disposal site to be in compliance with the hamlets water license. This plan should describe the characteristics of the site, outline an implementation and completion schedule and provide a proposal identifying how the restoration costs will be financed.

7.9. Appointment and Training of Staff

Future management and administration of scrap metal recycling could offer training and employment opportunities for local members. Training could be provided in for example, hazardous waste management (including certification for CFC removal) and the proper techniques of preparing scrap metal for baling. In addition, personnel will be required to supervise the site when materials are being deposited and to conduct regular inspections.

7.10. Operations and Maintenance Manual

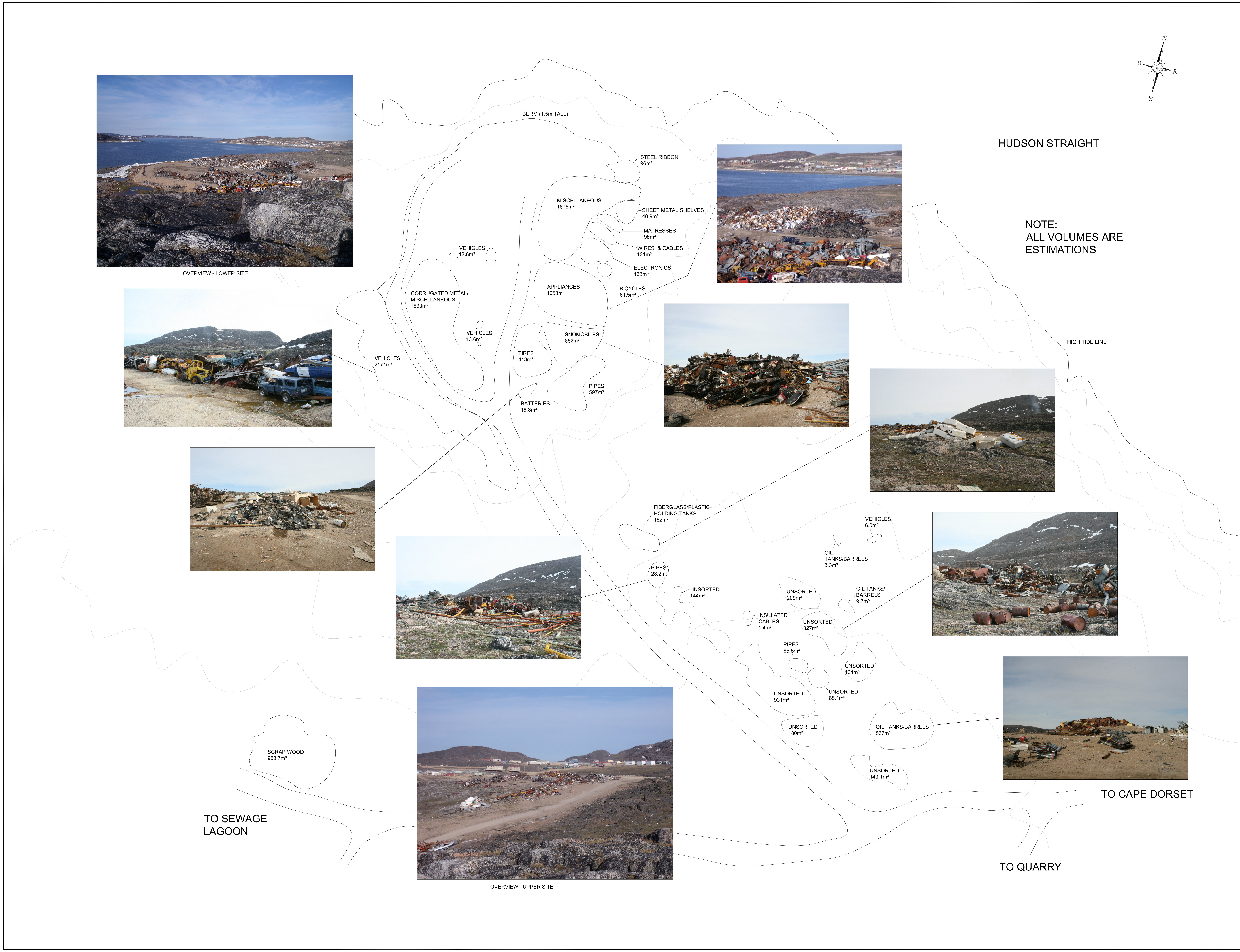
A requirement of the Hamlet of Cape Dorset's water license is the preparation of an operation and maintenance manual for the metals disposal site. This manual would outline operational procedures including but not limited to hours of operation, proper waste segregation techniques, hazardous waste management (including contaminated soil), emergency response procedures, groundwater sampling techniques and timetables and schedules and methods for the annual removal of scrap metal and stored hazardous wastes. The manual, therefore, would be a valuable reference to ensure that the future operation of the site is conducted in an efficient and environmentally sound manner.

APPENDIX A

Figures

CONCENTRIC ASSOCIATES INTERNATIONAL INCORPORATED OTTAWA 1-866-919-4530 · LONDON 1-866-919-4531 · IQALUIT 1-866-919-4533	CLIENT NAME: HAMLET OF CAPE DORSET PROJECT ADDRESS: CAPE DORSET, NUNAVUT	PROJECT NAME: CAPE DORSET METALS DISPOSAL SITE STUDY DRAWING TITLE: PROJECT LOCATION MAP	DESIGN: ES DRAWN: CY DATE: NOV/09 FILE No: 09-2605	SHEET No. ATT-1

CONCENTRIC ASSOCIATES INTERNATIONAL INCORPORATED OTTAWA 1-866-919-4530 LONDON 1-866-919-4531 IQALUIT 1-866-919-4533	CLIENT NAME: HAMLET OF CAPE DORSET PROJECT ADDRESS: CAPE DORSET, NUNAVUT	PROJECT NAME: CAPE DORSET METALS DISPOSAL SITE STUDY DRAWING TITLE: SITE LOCATION	DESIGN: ES DRAWN: CY DATE: NOV/09 FILE No: 09-2605	SHEET No. ATT-2



NO.	REVISION	DATE
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NOTES:

CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AND BE RESPONSIBLE FOR REPORTING ALL DISCREPANCIES TO OWNER AND/OR CONSULTANT PRIOR TO TENDER CLOSING

LATEST APPROVED DRAWINGS ONLY TO BE USED FOR CONSTRUCTION.

PRINTS ARE NOT TO BE SCALED.

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CLIENT DRIVEN RESULTS ORIENTED
EXPERIENCE THE DIFFERENCE

CLIENT NAME:
HAMLET OF CAPE DORSET

PROJECT ADDRESS:
CAPE DORSET, NUNAVUT

PROJECT NAME:
HAMLET OF CAPE DORSET METALS WASTE DISPOSAL SITE - FINAL REPORT

DRAWING TITLE:
ATTACHMENT 3 - SITE SURVEY

DESIGN:	RH	SCALE:	1:700
DRAWN:	LAK	DATE:	AUG/09
APPV'D:	RH	FILE No:	09-2605

SHEET No.
S1
1 OF 1

APPENDIX B

Site Photographs

Photograph 1: Looking southeast across the upper portion of the metals waste disposal site.

Photograph 2: Looking northeast across the lower portion of the metals waste disposal site towards the Hamlet of Cape Dorset. Note the berm surrounding the portion of the site adjacent to Telik Inlet.

Photograph 3: Looking southwest across the upper portion of the metals disposal site.

Photograph 4: Heating oil tanks and drums located in the upper site.

Photograph 5: Fiberglass tanks located in the upper site.

Photograph 6: Looking northeast across the lower portion of the metals waste disposal site.

Photograph 7: Looking southwest across the lower portion of the metals waste disposal site towards Telik Inlet.

Photograph 8: Large pile of assorted vehicles at the lower site. View is to the southwest.

Photograph 9: Large pile of mixed metal located directly opposite photograph 8 above. View is to the southeast.

Photograph 10: Mixed metal including white goods located in the lower site. View is to the southeast.

Photograph 11: Snowmobiles present at the lower site. View is to the east.

Photograph 12: Pipe present at the lower site. View is to the east.

Photograph 13: Uncontained and leaking batteries at the lower site. View is to the south.

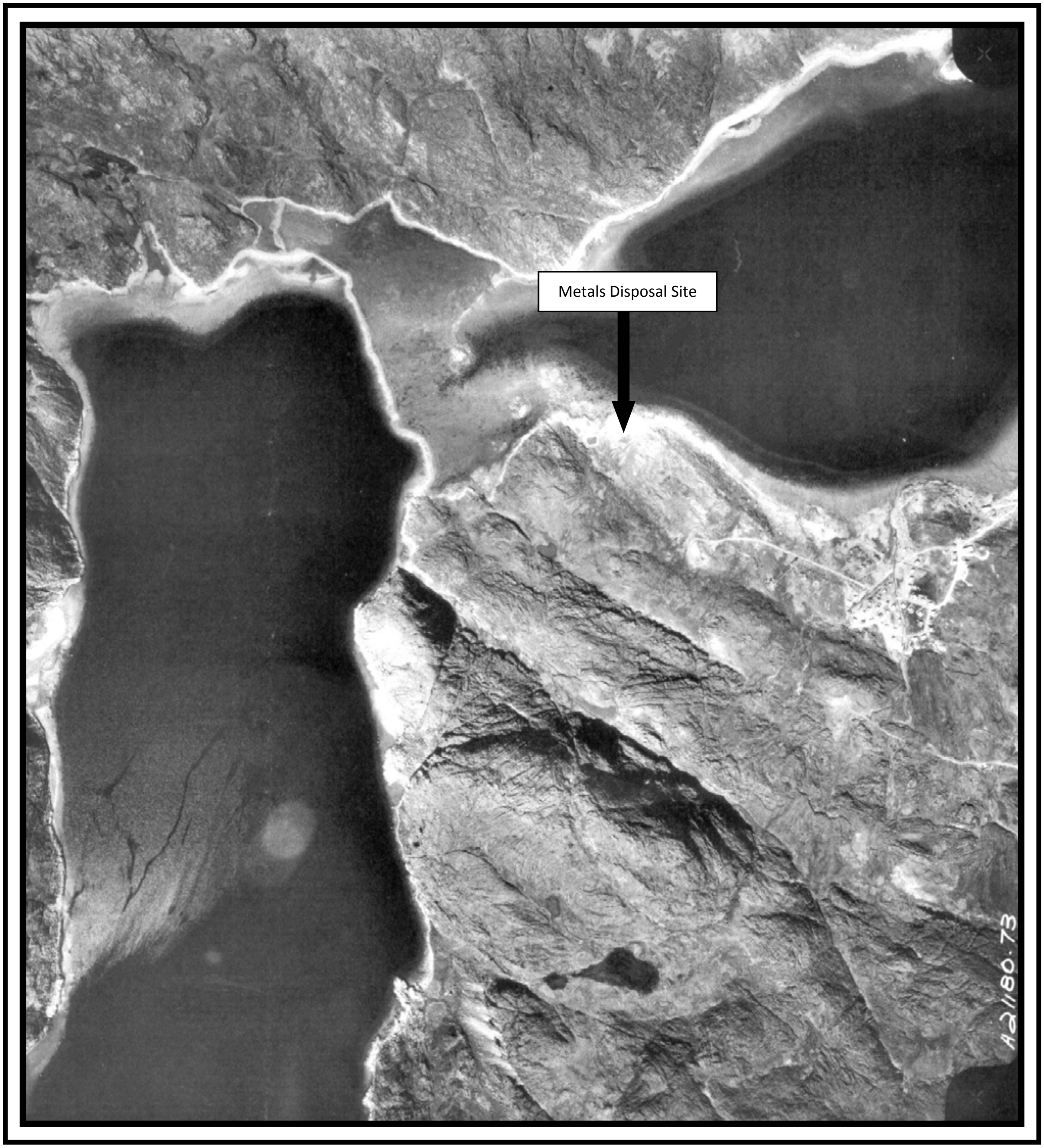
Photograph 14: Partially full paint cans present in the lower site.

Photograph 15: Possible transmission fluid leaking from vehicle.

Photograph 16: Possible transmission fluid leaking from vehicle.

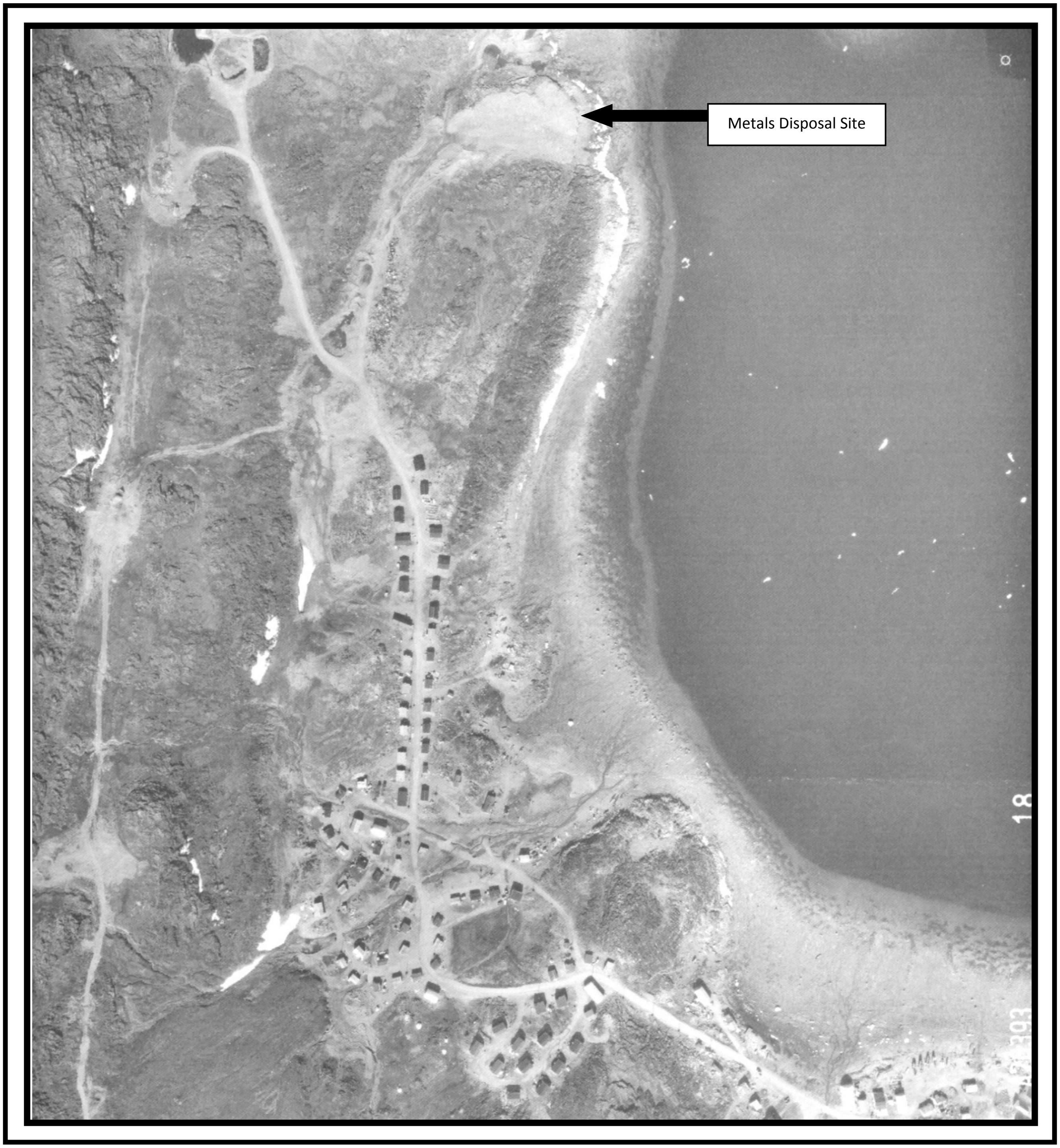
APPENDIX C

Aerial Photographs

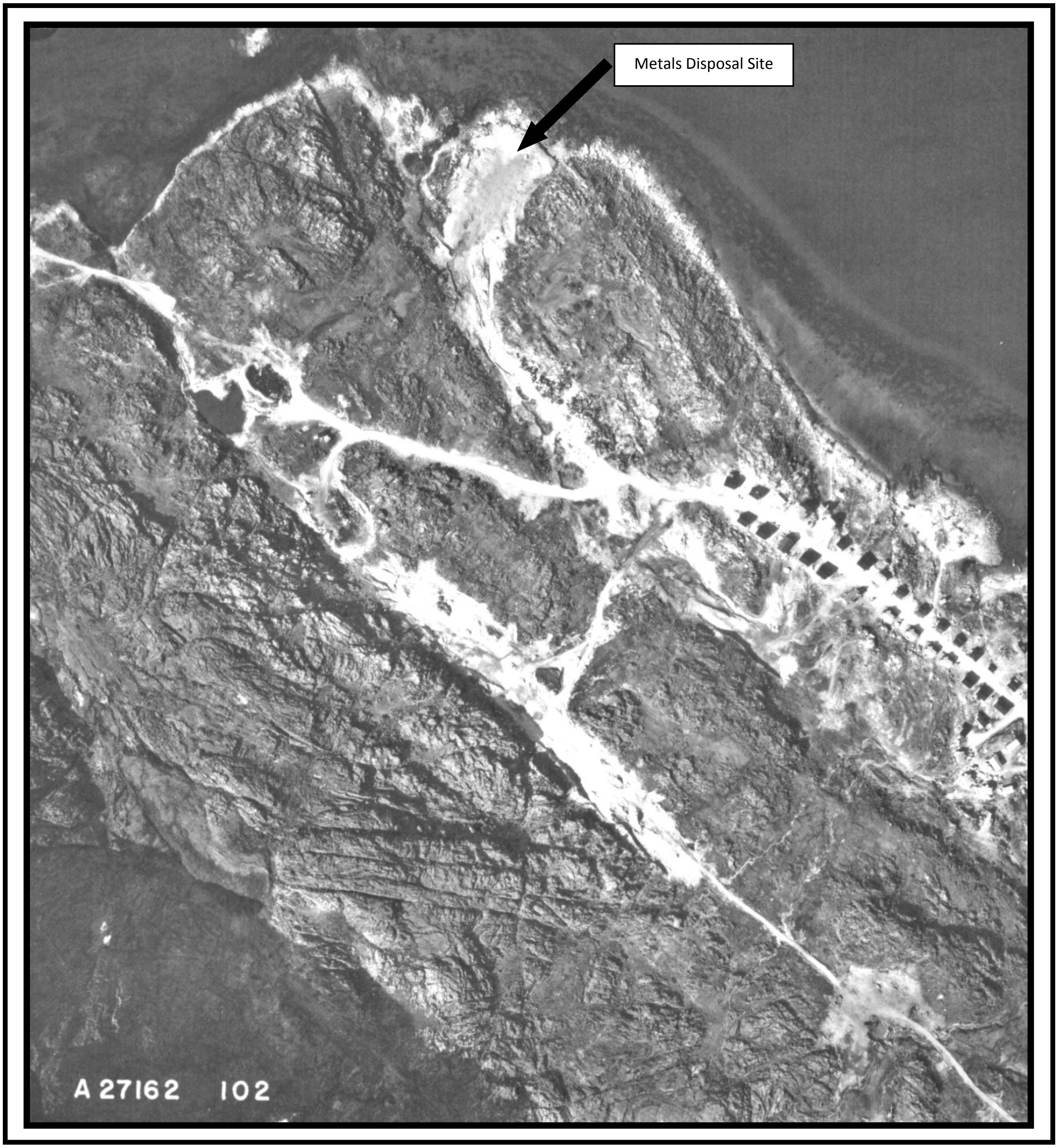


Photograph 1: 1969 Aerial Photograph – Cape Dorset Metals Disposal Site.

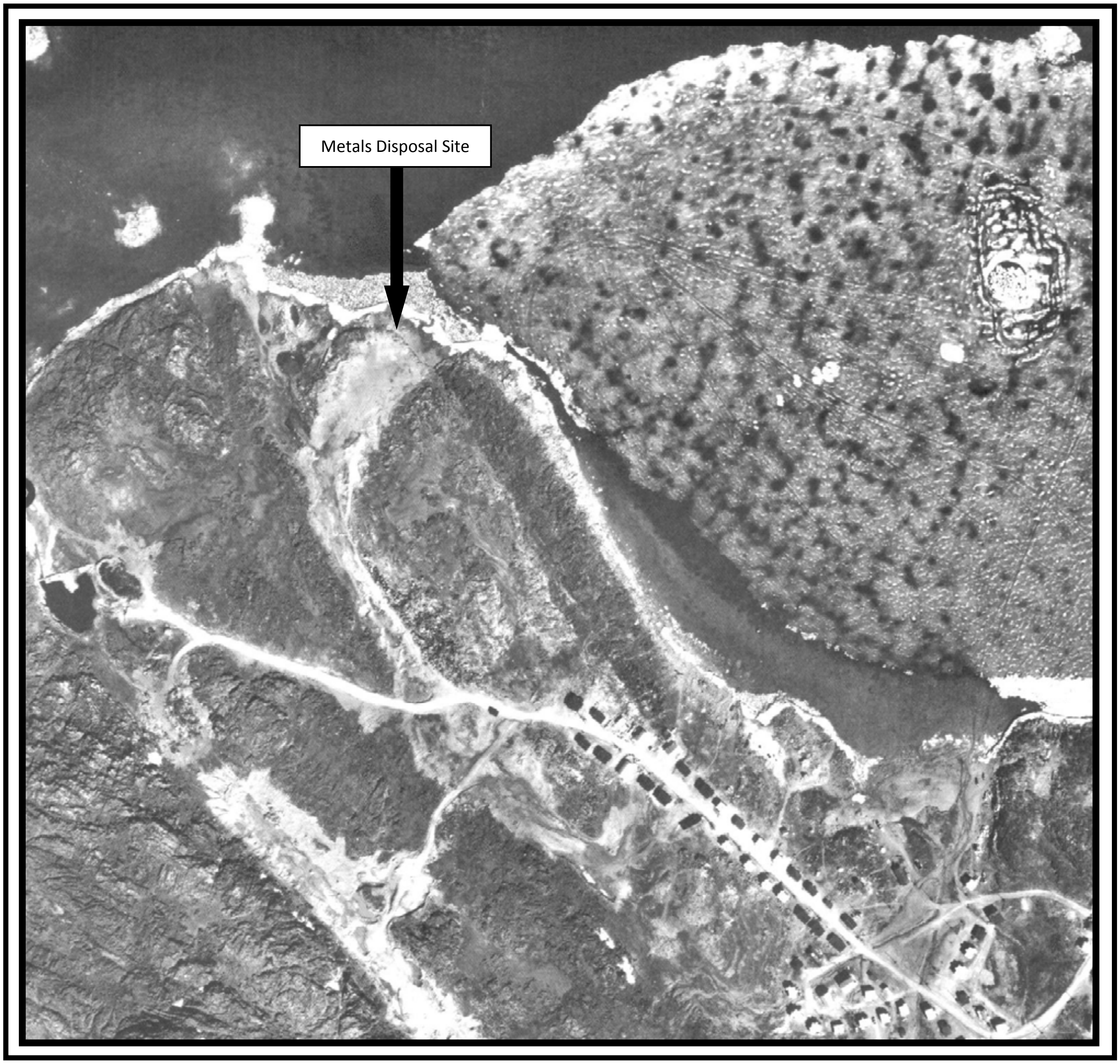
Photograph 2: 1972 Aerial Photograph – Cape Dorset Metals Disposal Site.



Photograph 3: 1983 Aerial Photograph – Cape Dorset Metals Disposal Site.



Photograph 4: 1987 Aerial Photograph – Cape Dorset Metals Disposal Site.



Photograph 5: 1989 Aerial Photograph – Cape Dorset Metals Disposal Site.

Photograph 6: 1992 Aerial Photograph – Cape Dorset Metals Disposal Site.

APPENDIX D

Reference Publications and Emails

References

1. "Cape Dorset Solid Waste Improvement Study – Draft Report", Dillon Consulting Limited (October 2003) for Government of Nunavut, Community Government & Transportation.

2. Environment Canada's Disposal at Sea Program website (October 2009), http://www.ec.gc.ca/seadisposal/main/index_e.htm

3. 'Environmental Guideline for Antifreeze", Environmental Protection Service, Department of Sustainable Development, Government of Nunavut (January 2002).

4. "Environmental Guideline for Asbestos", Environmental Protection Service, Department of Sustainable Development, Government of Nunavut (January 2002).

5. 'Environmental Guideline for Ozone Depleting Substances", Environmental Protection Service, Department of Sustainable Development, Government of Nunavut (January 2002).

6. "Environmental Guideline for Waste Batteries", Environmental Protection Service, Department of Sustainable Development, Government of Nunavut (January 2002).

7. "Environmental Guideline for Waste Paint", Environmental Protection Service, Department of Sustainable Development, Government of Nunavut (January 2002).

8. "Environmental Guideline for Waste Solvents", Environmental Protection Service, Department of Sustainable Development, Government of Nunavut (January 2002).

9. "Guideline for the General Management of Hazardous Waste in the NWT", Government of the Northwest Territories, Department of Environment and Natural Resources (1998).

10. "Management Options for End of Life Vehicles (ELVs) in Nunavut", Environmental Protection Service, Department of Environment, Government of Nunavut (February 2006).

11. Personal Communication, Mark Dahl, Ocean Disposal Specialist, Environmental Protection Operations, Environmental Stewardship Branch, Environment Canada (October, 2009).

12. Personal Communication, Morris Lindenbaum, Premier Recycling Timmins Ltd. (November 2009).

13. "Scrap Metal Recycling in Nunavut & Northern Manitoba", North Central Development (March 30, 2007) for Government of Canada Climate Change Mitigation Program Enhanced Recycling.

Government of Nunavut, Community Government & Transportation Cape Dorset Solid Waste Improvement Study – Draft Report

October 2003

Community Government & Transportation, GN
Attention: Sameh Elsayed

03-2191-1000
Submitted by
Dillon Consulting Limited

U:\PROJECTS\DRAFT\2003 Projects\032191 Cape Dorset Solid Waste\Report\FINALREPORT.wpd

October 28, 2003

Government of Nunavut
Department of Community Government and Transportation
Cape Dorset, NU
P.O. Box 490
Rankin Inlet, Nunavut, X0C 0G0

Attention: Mr. Sameh Elsayed,
Project Officer

Cape Dorset Solid Waste Management Study

Dear Mr. Elsayed:

Dillon Consulting Limited is pleased to provide you with the draft report for the above-mentioned study. This report is developed to allow your department and community to review the alternatives for the proposed facilities.

We trust that this report provides you with sufficient detail to receive comments on the report to allow us to finalize our work.

Yours sincerely,

Dillon Consulting Limited

Gary Strong, P.Eng.,

Project Manager

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1.0 INTRODUCTION

The community of Cape Dorset currently operates two solid waste disposal facilities – a bulky waste site and a modified landfill. The bulky waste site has been in operation for approximately 30 years and the community has raised concerns over the volume of waste that has accumulated and possiblity of environmental impacts.

The community landfill is a relatively small facility that has reportedly been in operation since the mid 1990's. The landfill has served the community well but it is nearing the end of it's useful life. In addition, there are a number of operational issues identified by the community about the current landfill site including runoff entering the site, debris control, and waste segregation practices.

The overall objective of this study is to assess the current facilities and to determine the feasibility of upgrading and/or expanding the sites to accommodate the projected 20 year waste volumes. Presented in this report is the scope of work, background review, community site visits, population projections and waste generation, system upgrade requirements, development and assessment of solid waste options, cost estimates, and recommendations.

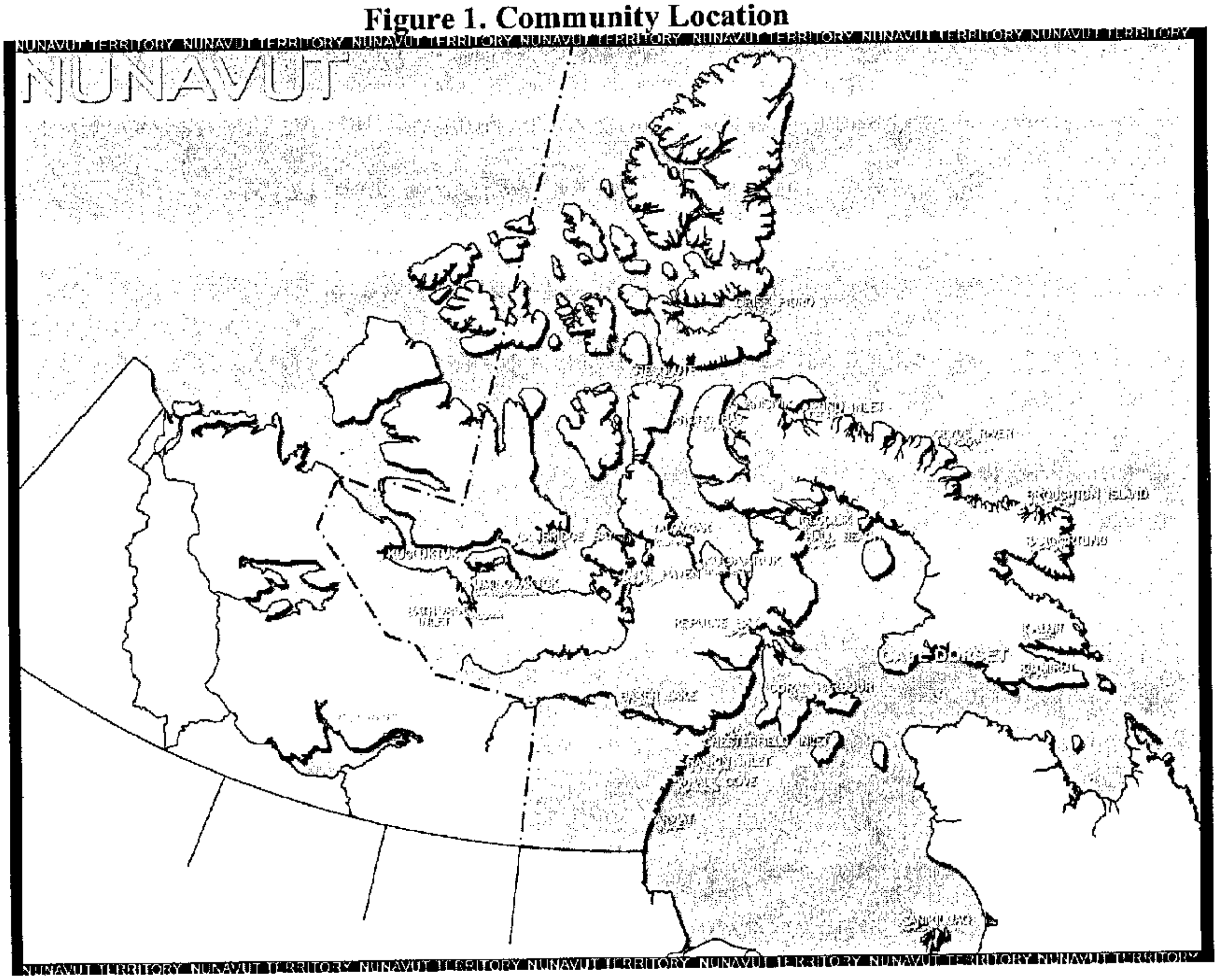
1.1 General

Cape Dorset is situated on Dorset Island off the southwest coast of Baffin Island. The community is located at approximately 64 deg 13' N 76 deg 31' W. The airstrip is located adjacent to the community at an elevation of 50 m. The community has the following services: health centre, diesel power generation, bulk fuel storage facility, Co-op and Northern Stores, government offices, school, recreational center, and annual re-supply sealift.

The local economy is based on carving, subsistence hunting, trapping, fishing, silk-screening and tourism. Vegetation and climate are typical of northern regions. The average annual rainfall is 144 mm, and the average annual snowfall is 296 cm. Mean July highs and lows are 11.2 C and 3.5 C, and mean January highs and lows are -21.7 C and -28.3 C respectively. Prevailing winds are generally from the north-west at an annual average of 14.4 km/h.

Local geology consists of mostly exposed bedrock. The local soil typically consists of gravels, cobbles, and coarse sand. A granular resource management plan was developed for Cape Dorset in 1998 and the plan recommended conservation of the granular resources. Cape Dorset is located within the continuous permafrost zone. The active layer ranges from about 0.6 to 0.75 m below the surface.

Figure 1. Community Location



1.2. Project Scope

The scope of work for this assignment, as set out in the Terms of Reference (Appendix A), included the following tasks:

- Survey and study the existing sites to determine the feasibility of upgrading / expanding the site to accommodate the projected 20 year volume.
- Develop a detailed plan for handling the existing bulky waste materials that will meet the legislative requirements of the Public Health Act
- Provide recommendations to reduce the volume of scrap metals to allow the bulky waste site to meet the projected 20 year volume.
- Assess the capacity of the existing landfill site and make recommendations for long term improvements.
- Assess the operational issues with the existing landfill site, including drainage, fencing, and waste segregation, and make recommendations for site improvements.
- Investigate the possibility of alternate sites to accommodate the projected 20 year volume
- Identify any other economically feasible solution.
- Prepare a report summarizing the findings and recommendations.

2.0 BACKGROUND

The following is a summary of the information collected as part of this study.

2.1 Topographic Mapping and Aerial Photographs

As part of a previous study completed for Community Government and Transportation on the waste management in Cape Dorset, Dillon used topographic mapping with which originated the Department of Municipal and Community Affairs, Government the community overlaid on aerial photos. This previous mapping was initially used as the basis for this study.

Subsequently modified, the GN provided Dillon with a topographic site survey which covered the area from the existing landfill and access road downslope to Tellik Inlet. Dillon merged the survey information with the existing MACA topographic mapping used in the 2001 study. Dillon would like to acknowledge the role of the GN in providing the new survey information.

2.2 Population Statistics

Population statistics including 20 year projections were obtained from the Nunavut Bureau of Statistics in order to estimate waste generation rates. Population projections are discussed in Section 4.0.

2.3 Regulatory Background

The disposal of solid waste is regulated under the Nunavut Public Health Act and the Nunavut Water Board. The community has a Water Licence from the Nunavut Water Board. The Water Licence covers the landfill site but does not include the bulky waste site. One of the conditions of the licence is annual water quality sampling downstream of the existing landfill. No records of any sampling were available from the community.

Indian and Northern Affairs Canada and the Nunavut Public Health Department were contacted to determine if they had any inspection reports on file that could be released. The following information was gathered and copies are included in Appendix B.

- **Indian and Northern Affairs Canada** – copy of an inspection letter dated January 15, 2001 related to the landfill and bulky waste sites in Cape Dorset. This inspection included the collection and analysis of leachate from both sites.

- **Nunavut Department of Health and Social Services** – copy of an inspection report dated February 16, 2001 related to the landfill site.
- **Indian and Northern Affairs Canada** – copy of an inspection letter dated October 7, 2003 related to the landfill and bulky waste sites in Cape Dorset. This inspection included the collection and analysis of leachate from the bulky waste site.

Environment Canada, Environment Protection (Iqaluit) was also contacted and they confirmed that they do not have any complaints or inspection records for either site. It is worth noting that the landfill drains to the same outfall site as the sewage lagoons and Environment Canada issued an Inspector's Directive march 25, 2002 related to sewage impacts on the marine environment.

Transport Canada Aerodrome Safety was also contacted to determine whether there are any documented concerns related to the proximity of the existing sites to the community airport. (awaiting a response).

The various inspection reports identified the following items of concern:

Bulky Waste Site:

- Large volume of accumulated waste;
- Waste spillage below the high water line on Tellik Inlet;
- Lack of segregation of hazardous wastes;
- Surface runoff entering the waste piles;

Landfill:

- Lack of any fencing or signage
- Excessive surface runoff entering the landfill and concerns over leachate production;
- Lack of segregation of hazardous waste and plastics;

2.5 Previous Reports

Dillon has completed a number of studies and letter reports for the GN related to sewage disposal in Cape Dorset. These reports are relevant to the current study since expansion of the sewage treatment facilities may encroach on land that may be needed for long-term landfill expansion.

The following reports were reviewed as background to this report:

- **Dillon Consulting Limited** - Sewage Facility Planning Study, Cape Dorset, Nunavut, , March 2001.
- **Dillon Consulting Limited** – Sewage Treatment Alternatives for the Hamlet of Cape Dorset, Nunavut, August 2003
- **Dillon Consulting Limited** - Cape Dorset Sewage Lagoon - Existing Site Expansion Cost Estimate, September, 2003

3.0 COMMUNITY SITE VISIT

The community site visit was conducted by Mr. Sameh Elsayed, Community Government and Transportation, and Mr. Colin Hansen of Dillon Consulting Limited. The site visit was completed during the period August 16-19 2003. The purpose of this section is to summarize the interviews with community officials, site locations and constraints, and findings from the site investigation.

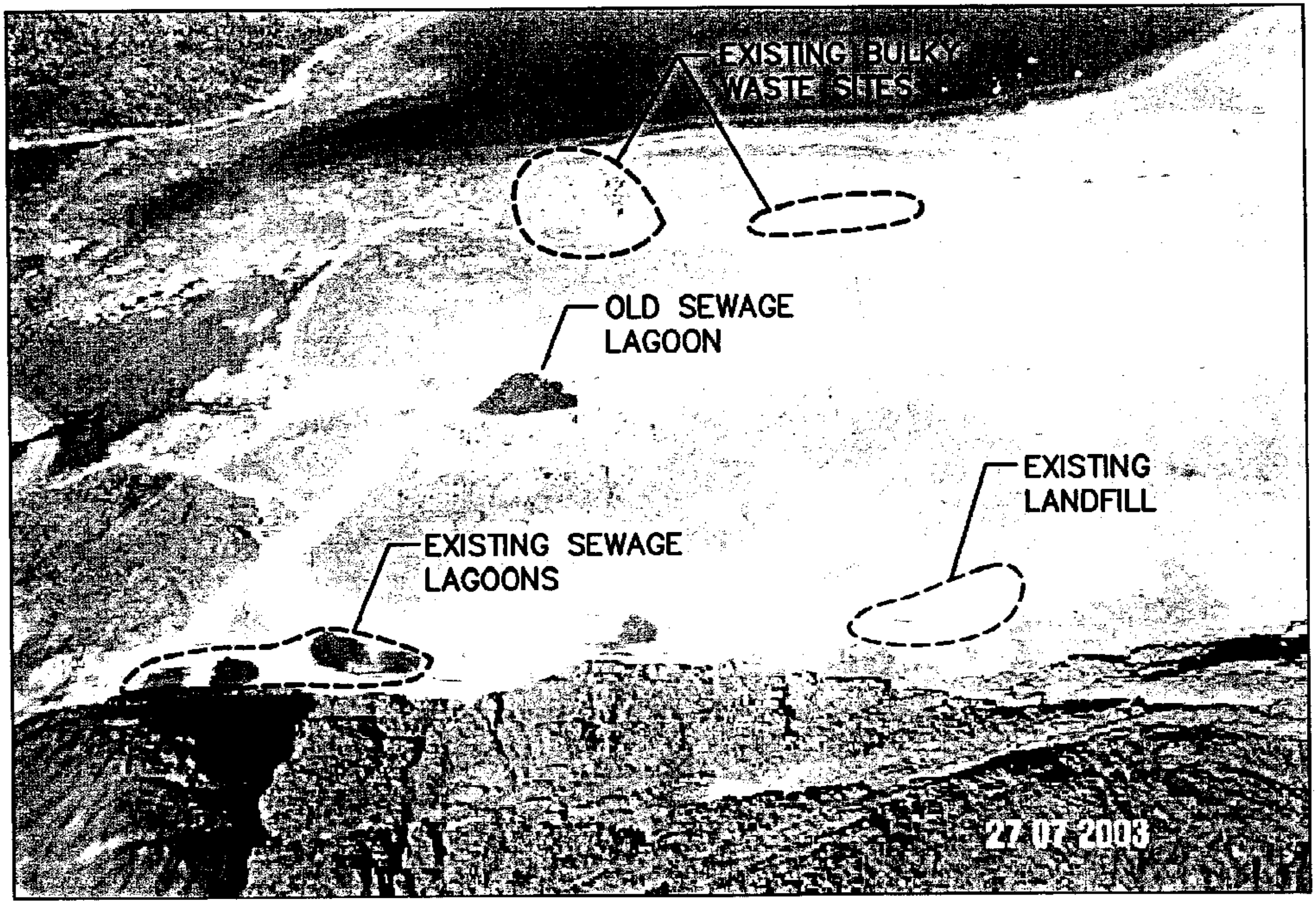
3.1 Site Locations and Constraints

The bulky waste site is located immediately west of the Hamlet and is accessed off the gravel road to the sewage lagoons and the landfill. There are three separate waste piles at the site, one on the upper part of the site and two at the lower part of the site adjacent to Tellik Inlet. The total extent of the site between the upper and lower waste piles is approximately 350 m. The nearest residences are within about 100 m of the upper waste pile. An aerial view of the site is shown in **Figure 2.**

The existing landfill is located southwest of the Hamlet. The landfill is not visible from the community and the haul distance is about 1 km from the community boundary. The landfill is situated in a narrow valley that slopes steeply to the west and therefore drains to Tellik Inlet. The existing 3-cell sewage lagoon system is located downslope from the landfill site. An aerial view of the site is shown in **Figure 2.**

Constraint mapping was used to determine whether the existing sites are in compliance with the regulations governing landfill sites, and in order to identify any other concerns with the current site locations. **Figure 3** shows the constraint mapping for the SWM sites. The buffer zones included on the map are:

- Transportation restrictions for airports, highways and marine activities;
- Drainage watershed boundary through the community;
- Community build up areas, and areas planned for community expansion;
- Water shed management areas for drinking water supplies;
- Exclusionary land use areas such as parks, recreational use areas, etc;
- Buffer zones to community activities. Typically a buffer zone respects the communities need to have the facility out of sight, and have the community not adversely impacted by odour;



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NO. / REVISIONS / DATE / BY		AERIAL VIEW EXISTING SOLID WASTE SITES	DRAWING NO. FIG 2	

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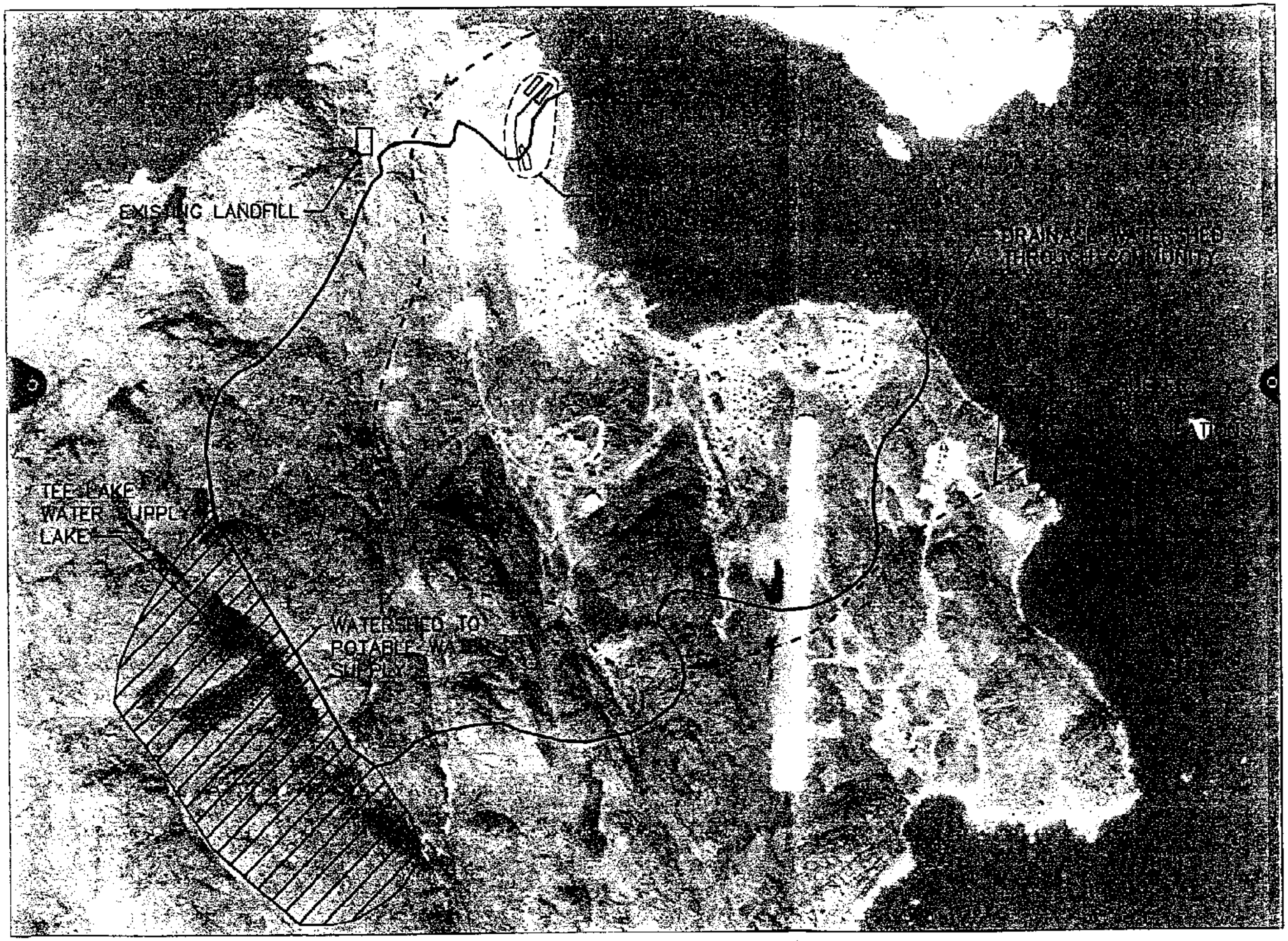


LEGEND

- 450 m BUFFER
- DRAINAGE WATERSHED THROUGH COMMUNITY
- WATERSHED TO POTABLE WATER SUPPLY

DILLON CONSULTING

CAPE DORSET NUNAVUT
SOLID WASTE IMPROVEMENT STUDY

CONSTRAINT MAPPING

Also shown on the map is the prevailing wind direction and common landmarks such as rivers, lakes, and other prominent physical features. The conclusions from the constraint mapping are as follows:

Bulky Waste Site:

- Two lower piles located outside the drainage watershed through the community
- Upper pile located partly inside the drainage watershed through the community.
- Relatively close to residential housing (within the 450m set back by the Health Act)
- Not in an area planned for community expansion.
- Adjacent to local point of interest (tidal land bridge to Malik Island).

Landfill Site:

- Site is located outside the 450 m buffer zone required by the health regulations.
- Located outside the drainage watershed through the community
- Located less than 3 km from the community airport

Discussion:

Assuming that the 450 m health buffer does not apply to metals dumps, the location of the existing bulky waste site is acceptable from the regulatory perspective. The Health Act refers to Sanitary Waste Site, which is defined as the regulators. Regulators have expressed concerns about the volume of waste at the site and potential environmental impacts from hydro carbons. Regulators have not requested that the site be closed. Community officials have not expressed concerns with the current site location, they have expressed concerns with the aesthetics of the site.

Alternate locations for the bulky waste were discussed with Community Government and Transportation. One potential site is located downslope of the existing landfill, however the site is not viable in the long term because the area will be required for landfill expansion, based on the kind of selection worth completed as part of the sewage studies.

<u>Conclusion: There is no available areas for future sites.</u>

Regarding the modified landfill site, the existing location meets the regulations, with one known exception. The site is less than 3 km from the airport. There are no indications that this is a problem for the airport authority or the community. The site is located relatively close to the drainage boundary through the community and this will become a consideration for the location of future landfill cells.

3.2 *Site Investigations*

3.2.1 Bulky Waste Site

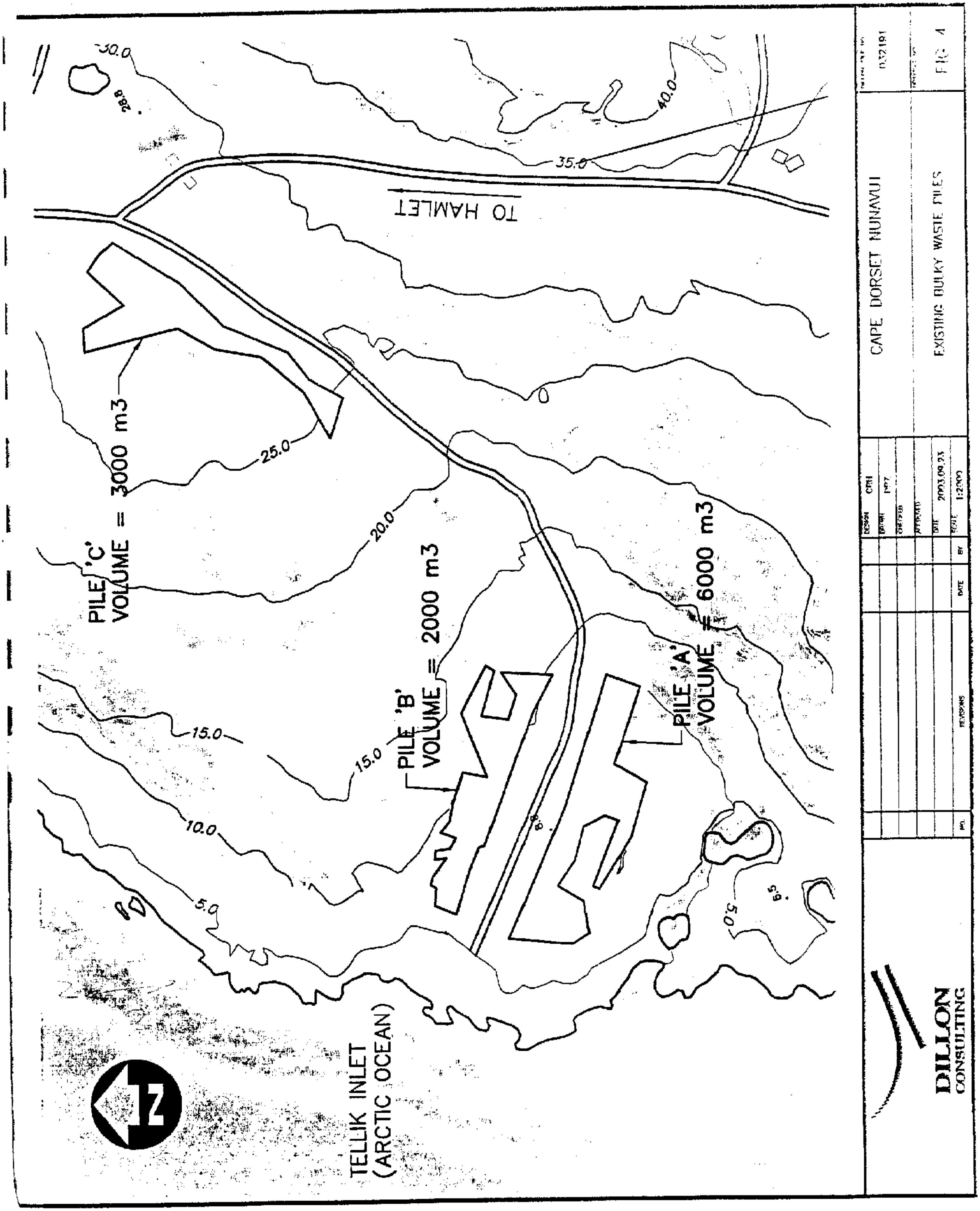
Dillon conducted a site investigation of the bulky waste site during the period August 16-19 2003. Photographs of the site were taken and are shown in Appendix C.

Based on the vintage of the abandoned vehicles at the site, it is estimated that the site has been in operation for about 30 years. The majority of the wastes are contained in three large piles, and these were designated Piles 'A', 'B', and 'C'. The locations of the piles are shown in **Figure 4**. The most common materials at the site are vehicles and structural steel, light scrap metals, culverts, metal water pipes, appliances, mattresses, tires, fuel drums, wood, and minor amounts of municipal refuse. Vehicle batteries, paint cans, and solvent containers were also scattered around the site. Site measurements were taken to estimate the waste volume and a preliminary waste characterization was completed based on visual observations of the waste piles.

The following provides a more detailed description of the waste piles.

- **Pile 'A'** is the largest of the three piles, and is located on the lower part of the site. The front of the pile has dimensions of 120 m long x 15-20 m wide x 4-5 m high. The rear part of the pile is less well organized and extends to the west into a natural depression. The total estimated in-place volume is 6,000 m^3. The wastes in this pile are packed relatively tightly compared to the other two piles.

- **Pile 'B'**: This pile is located opposite Pile 'A', on the right side of the access road as you approach the shoreline. This front of the pile has dimensions of about 110 m x 15 m x 3 m high. The most common items noted in this pile are light and heavy vehicles, light



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G:\CAD\032191\FIGURES\032191 FIG 4.DWG

scrap metal, appliances, and minor amounts of rubber tires and fuel drums. The estimated total volume of this pile is 2,000 m^3.

- **Pile 'C'**: This pile is located above Piles "A' and 'B' adjacent to the sewage lagoon access road. The front part of the pile has dimensions of about 120 m x 6 m x 2.5 m high. The rear part of the pile is not well organized and the waste is scattered over a large area in the direction of the community. The predominant material in this pile is light scrap metal, at about one half the total volume. The total volume of this pile is estimated at 3,000 m^3.

The estimated total volume for all three piles is 11,000 m^3. Based on visual observations of the waste piles the *approximate* proportion (by volume) of materials is as follows:

• Vehicles and Structural	23%
• Light Assorted Metals	48%
• Appliances/Mattresses/Fuel Drums	18%
• Combustibles / Other	11%
TOTAL	**100%**

The following deficiencies were noted with the current bulky waste site:

- Waste is scattered and unorganized
- Waste is lying in pools of water on the rear side of Pile 'A' ;
- Runoff from the access road is entering Pile 'A';
- There is no signage indicating the purpose of the facility or where different materials should be stored;
- Combustible wastes are mixed with metal wastes;
- Tires and fuel drums are not segregated;
- There are suspected hazardous wastes at the site; (vehicle fluids, drums, and batteries)

3.2.2 Landfill Site

Dillon conducted a site investigation of the landfill site during the period August 16-19 2003. Photographs of the site were taken and are shown in Appendix D. The landfill has an irregular shape and is entirely below the surrounding natural grade. Wastes are dumped close to t working face of the excavation and the face is worked using a loader from the hamlet. The older waste have a light layer of covered material.

Waste burning is completed as part of the faulty operation an irregular basis, timing is dependent on wind direction. This practice is not permitted under the GN's Department of Sustainable Development regulations only therefore the existing waste practices are not acceptable to the current regulations.

Deficiencies with the current landfill are as follows:

1) **Fencing and Signage:** The site is not fenced and debris is scattered beyond the perimeter of the site. There is no signage at the site.

2) **Drainage:** This is the most challenging issue with the current landfill. The landfill is located in an existing natural drainage channel and diversion ditches constructed in 2002 are only partially effective. The berm on the west side of the landfill has been breached by runoff and runoff flowings along the floor of the landfill. Runoff leaving the landfill flows overland to Tellik Inlet . The outfall location is approximately the same as for the sewage lagoons.

3) **Segregation:** If the community chooses to continue the practice of burning, plastics and hazardous wastes should segregated from the burn pile. An area of the landfill should be set aside for the storage of hazardous wastes such as paints or batteries. These wastes can be stored in metal or plastic drums on wood pallets. Signage should indicate the type of hazardous waste in each container.

3.3 Interviews with Community Officials

Discussions were held with the SAO, the deputy SAO, and the Director of Municipal Works to obtain the community perspective regarding both SWM sites. The community officials indicated the following:

Bulky Waste Site:

- The aesthetics of the current site are not acceptable. The concerns relate primarily to the visibility of the upper waste pile, waste spillage below the high water mark, and the proximity of the site to the tidal land bridge. The tidal land bridge is considered a local site of interest and tourists occasionally walk the shoreline adjacent to the bulky waste piles.

- The immediate priority for the community is removal of Pile 'C' to a less prominent location
- There is concern over hazardous wastes and the potential for site contamination.
- The community is not planning to expand in the direction of the bulky waste site
- The preferred clean-up option is to remove the wastes from the community
- The next preferred option was burial of the material, for example as fill material.
- The SAO suggested that resources could be pooled with other communities to share the cost of mobile crushing or shredding equipment to solidify the waste.

Landfill:

- Community officials did not express any concerns regarding the landfill, apart from occasional odours during burning operations.

4.0 POPULATION PROJECTIONS & WASTE GENERATION

4.1 Population Projections

The 20 year population projection for Cape Dorset is required in order to estimate the size of the solid waste facilities. Population projections from 2000 to 2020 were obtained from the Nunavut Bureau of Statistics. These numbers were then projected by Dillon to the year 2025. Table 4-1 presents the population projections.

Table 4-1 Population Projections

	Bureau of Statistics
1996 Population	1,118
1997 Population	1,144
1998 Population	1,159
1999 Population	1,190
2005 Population	1,354
2015 Population	1,662
2020 Population	1,029
2025 Population	2,012

1) Bureau of Statistics 20 year projections are based on 1996 census data.
2) Projected past 2020 is any last 5 year growth rate. *(P=F 1/(1+i)n=(1.93%)*

4.2 Bulky Waste Generation

There were no historical records available to confirm the volume of existing bulky wastes at the site, and there are no known empirical formulas which could be used to estimate the per capita waste generation rates for a community the size of Cape Dorset. The future bulky waste generation rates are therefore based on the existing waste volumes, with an appropriate adjustment factor to account for population growth. The following illustrates the calculations:

Average Annual Generation Rate = Total Volume / # Years
= 11,000 m^3 / 30 years
= 367 m^3/ year.

(superscript)
Population Growth Factor = Population 2005 = Population 202(1/(1+u)20, i=2.01%
= 1662 / 1354

20 Year Volume 367x24.296=
8, 900m^3
use (9,000m^3)

4.3 Municipal Waste Generation

To determine if the existing landfill site can be expanded or to identify alternate landfill sites, an approximate landfill footprint area was required. A solid waste landfill in the north is typically designed to accommodate 20 years of waste. Therefore the 20 year population projections and the average waste generation rate per capita were required in order to determine the size of the landfill facility. The Department of Municipal and Community Affairs (MACA) developed an equation based on population to estimate average waste quantities generated in northern communities. Dillon used this method to determine the cumulative waste quantity that would be produced in Cape Dorset over the next 20 years.

The yearly population projection and estimated volume of uncompacted waste is presented in Table 4-2. The volume of uncompacted waste that is expected to accumulate during the period 2005 – 2025 is 179,014 cubic meters.

Table 4-2 Waste Quantity Estimates

what is the difference between these 2 columns ~~[illegible]~~

Year	Population Projection	Annual Volume Solid Waste (m^3)	Uncompacted Cumulative Waste Volume (m^3)	Compacted Cumulative Waste	Compacted Cumulative Waste
2005	1,354	6,569	6,569	2,190	2,630
2006	1,382	6,738	13,306		
2007	1,412	6,920	20,226		
2008	1,441	7,096	27,322		
2009	1,471	7,280	34,602		
2010	1,501	7,464	42,066	14,000	16,800
2011	1,536	7,680	49,746		
2012	1,570	7,890	57,636		
2013	1,600	8,077	65,713		
2014	1,632	8,276	73,990		
2015	1,662	8,464	82,454	27,500	32,930
2016	1,692	8,653	91,107		
2017	1,726	8,867	99,974		
2018	1,757	9,063	109,037		
2019	1,793	9,292	118,329		
2020	1,829	9,521	127,850	42,600	51,100
2021*	1,865	9,751	137,601		
2022*	1,902	9,986	147,588		
2023*	1,939	10,227	157,815		
2024*	1,977	10,474	168,288		
2025*	**2,016**	**10,726**	**179,014**	**59,700**	**71,600**

* Population projections for years 2021-2025 where based on average yearly percentage increase from 2017 to 2020 (1.93%) provided by Bureau of Statistics.

4.2.3 Preliminary Solid Waste Facility Sizing

Preliminary size calculations for a modified landfill were conducted based on the following assumptions:

- The practice of burning to be discontinued, therefore a compaction ratio of 3:1 was assumed;
- majority of the storage to be below existing grade (minimal berm height of 1.0 meter)

- variable municipal waste height from 3 m to 5 m
- 1:1 side slopes in rock excavation
- ratio of waste to cover of 5:1;

The required landfill capacity for the 20 year waste volume and the cover soil is 71,600 m^3. The resulting active landfill area, including the area required for berms, is presented in Table 4-3. The required area depends on the final depth of waste that is selected.

Table 4-3 Preliminary Landfill Footprint Estimates

Height Waste & Soil (m)	Length (m)	Width (m)	Area (m^2)	Area (ha)	Volume (m^3)
3	170	170	28,900	2.89	72,084
4	**150**	**150**	**22,500**	**2.25**	**71,845**
5	137	137	18,769	1.88	72,042

Assuming an average waste depth of 4 m, Table 4-3 shows that the minimum parcel of land required for the 20 year waste volume is about 2.25 ha, not including a buffer zone.

required minimum footprint for this stockpile is about 190 m X 40 m. Additional space would be required to accommodate segregated waste piles which have been requested by INAC. This pile would extend uphill toward the current Pile 'C' location. While there are no technical or regulatory reasons why this cannot be done, the extent of the waste pile will complicate the management of the site and essentially defers the problem to a later time.

Case 2: Storage with Reduction of Existing Wastes: In this option it is assumed that the existing waste piles are shredded or otherwise compacted down to a total volume of 4,000 m^3. This volume is based on extensive discussions with the supplier of a portable shredding system. This reduces the total 20 year volume to 13,000 m^3. Actually if future waste is shredded prior to placing, the volume would be 7,300m^3 . The required minimum footprint for this stockpile is about 145 m X 40 m for the operation and 73m x 40m for later. This pile would not extend uphill toward Pile 'C' and would be contained in the lower part of the site.

The above calculations are intended to demonstrate that, apart from any regulatory criteria, the existing waste practices cannot continue indefinitely without negatively impacting the overall management of the site.

Regulatory Environment:

The Terms of Reference for this study indicated that the Environmental Health Officer has deemed " *the current method of managing bulky waste site is unacceptable under the Health Act*". Dillon was unable to contact the Environmental Health Officer (Phillip Reeve 867-975-4800) to discuss specific concerns with the site.

In addition, INAC has expressed concerns over the volume of waste at the site, leachate entering Tellik Inlet, and inadequate segregation of materials. The most recent INAC report (October 7 2003) states the following:

> **"The current state of the metals dump is unacceptable."**
>
> **"A clean up of the metal waste disposal site should include 1) segregation of materials, 2) containment of hazardous waste, 3) diversion of runoff and containment of precipitation to prevent contamination of Tellik Inlet".**

The report goes on to state that leachate exceeds the Canadian Environmental Quality Guideline for the Protection of Freshwater Aquatic Life for two parameters – iron and phenols. Although the bulky waste site does not drain to a freshwater environment, and although the test results do not suggest a heavily contaminated site, the recent report does point to increased regulatory attention at this site.

Although none of the above conditions forces the GN to take specific correction action, there is the risk that inaction will lead to even greater regulatory scrutiny and possible litigation. Given the recent inspection reports and the regulatory history with the site, it is suggested that a "do-nothing" option will not be acceptable to regulators.

Conclusion:

A "do-nothing" approach is not an option and the following *minimum* remedial actions must be undertaken:

- Dismantling and relocation of the existing waste piles;
- Segregation and consolidation of like wastes, e.g. tires, appliances, fuel drums.
- Storage of any hazardous materials in secure, marked containers. Alternatively the hazardous materials could be temporarily relocated to the existing landfill site.
- Construction of drainage control berms to divert runoff around the waste piles;

Based on these conclusions, Dillon developed four options for remediation of the existing site (see Section 5.2).

5.1.2 Landfill Site

Problems with the current landfill include long term capacity, and operational problems which have been raised by regulators. This section discusses the each of these problems and makes recommendations for remedial actions.

Site Capacity:

There were no record drawings or design calculations available for the current landfill. The total capacity of the landfill is estimated at 7,000 m3 based on the surveyed boundary and depth. The remaining volume is about 2,700 m3, or about 40% of the total capacity. The volume of waste in place is estimated at 4,300 m3 for an average accumulation rate of about 600 m3 /year for the past seven years (1997-2003). This accumulation rate is far less than 25% the theoretical rate using the MACA generation rates. Possible reasons for this difference are as follows:

- The waste likely contains a relatively high proportion of cardboard and food packaging which is readily degraded by burning.
- Refuse generation rates in Cape Dorset may be lower than predicted by theory.

Based on the theoretical waste volumes, the landfill can only remain in operation for one more year. However, given the historical accumulation rates, the landfill can remain in operation for a maximum of another 3 years.

Conclusion: The existing landfill is 60% full and a new landfill is required by 2006 at the latest.

Regulatory Environment:

In discussion with the regulatory agencies, in particular the Department of Sustainable Development (DSD), Government of Nunavut, the Nunavut Water Board (NWB), and the Department of Health and Social Services, Dillon understands that the practice of open burning may be banned by regulators in the near future. For this reason, the use of open burning will not be considered further in this assessment.

The Nunavut Department of Health and Social Services and INAC have requested improvements to the existing landfill. These improvements include the following:

- Fencing
- Signage
- Runoff Control
- Waste Segregation

Site improvements to address these specific concerns are in Section 5.4

5.2 Bulky Waste Site Improvements

Dillon developed options for remediation of the existing bulky waste site. The overall approach is based on the following assumptions 1) there are no alternate waste sites and the existing site must remain in operation for another 20 years, 2) that "do-nothing" is not an option for the handling of the existing wastes, and 3) the volume of the existing waste piles must be reduced in order to accommodate the future waste volumes. It is assumed that volume reduction will be achieved using a portable shredder.*It is understood that the GN is not in favor of purchasing a shredder and sharing the equipment among several communities.*Therefore we have assumed a contractor will either rent or lease the necessary equipment.

The purpose of this section is to describe each of the options, evaluate the options based on several criteria, and recommend the most viable method.

Option #1 – Storage On Site

In this option the existing bulky waste piles will be dismantled using heavy equipment. The existing waste volume of 11,000 m^3 will be reduced to about 4,000 m^3 using shredding or suitable compaction equipment. The shredded waste will be stored above ground and surrounded by containment berms. The 20 year waste volume of about 9,000 m^3 will be added to the shredded wastes and stored on the existing site.

Option #2 – Disposal to Landfill

In this option the existing bulky wastes would be shredded as per Option #1 and hauled to the existing landfill site. The existing landfill cannot accommodate the shredded waste volume and therefore this option will require the immediate construction of a new landfill. It is understood that the GN is not in favor of this concept, however this option has been included because it is a potential solution.

Option #3 – Disposal at Sea

In this option an application for a disposal permit would be made under Environment Canada's (EC) Disposal At Sea program. At sea disposal is relatively rare in the north. Recent examples include the disposal of musk ox carcasses off Sachs Harbour and dredged soils off of Churchill, Manitoba. Assuming a suitable disposal site could be located that did not threaten fisheries habitat, the wastes would be hauled over the sea ice and allowed to fall to the sea floor during the spring break-up.

Permissible items for ocean disposal include inert bulky items such as iron, steel, and concrete. EC officials were contacted regarding the feasibility of this option. Key issues with this option are the relatively complex application process, the need for site specific studies, preparation and cleaning of the waste prior to disposal, and the potential for community opposition. EC officials emphasized that contaminated items such as vehicles and snowmobiles would require cleaning to remove hazardous materials. Experience has shown this to be very costly to undertake. The estimated cost of the field studies and the permit application is $165,000. Correspondence from EC regarding this concept is included in Appendix F.

Option #4 – Sealift Backhaul

In this option, the existing wastes would be removed from the site by sea lift backhaul. Examples of communities where bulk removals of soils or other materials have occurred include Pond Inlet, Fort Albany in James Bay, and Saglek on the coast of Labrador. For Cape Dorset it is assumed this option will involve sea lift to Quebec where there are waste recyclers located near marine terminals. There may be other suitable waste handlers, for example in the Maritimes or Ontario.

A sea lift operator, Desgagnes Transarctik, was contacted to discuss shipping rates, material preparation, and options for storage containers. A Quebec scrap metal dealer was also contacted to confirm the salvage value of the metals, provided they are shipped to the south. Based on the site inspections and our discussions with the sea lift operator, the following work plan is required for this option:

- Dismantle and sort the existing wastes. Segregate metal from non-metals.
- Cut up heavy metal and flatten the vehicles. Place large metal items on wood pallets and secure with heavy strapping for sealift. The wood for the pallets needs to arrive on the first sea lift of the summer.
- Process the light metals, appliances, mattresses, tires, and crushed fuel drums to reduce the material volume. It is beyond the scope of this study to recommend specific equipment for this task.
- The processed material will be placed in open top steel containers. Alternatively, wood containers could be pre-fabricated in the south and shipped flat to Cape Dorset to

minimize the shipping cost. These containers would be assembled on site using local labour.

- Sealift the materials to Quebec.
- Haul the metals to a scrap metal dealer for salvage value.
- Haul the remaining materials to a suitable landfill.

5.3 Cost Estimates

Cost estimates were initiated during the site visit. Heavy equipment costs were discussed with a local contractor, as was the cost of providing labour. Tasks which are common to all three options are the requirement to dismantle the existing waste piles, shred the materials, and the need for a final site clean-up. Total cost estimates range from \$400,000 to \$1,400,000. The costs for each option are summarized in Table 5-1. Detailed cost estimates are in Appendix G.

Option #1 – Storage On Site

The cost estimate for this option is based on the following:

- Dismantling the existing waste piles (10 weeks at \$20,000 per week).
- Shredding the existing wastes with the exception of vehicles and large steel;
- Final site clean up. The scope of this work can only be determined once the existing waste piles are dismantled and signs of soil contamination can be assessed. For this report it was assumed that a shallow layer of soil will be removed from the site.

A cost summary for this option is shown in Table 5-1.

Option #2 – Disposal to Landfill

The cost estimate is based on the following:

- Dismantling the existing waste piles (10 weeks at \$20,000 per week).
- Shredding the existing wastes with the exception of vehicles and large steel;
- Hauling 4000 m^3 of waste to a new landfill adjacent to the existing landfill
- Landfill capital costs and closure costs. Unit costs of \$200 per m^3 were assumed based on landfill expansion cost estimates in this report.
- Final site clean up.

Option #3 – Disposal at Sea

Due to the lack of experience in Nunavut with this type of disposal method, a number of assumptions had to be made regarding the disposal site and waste volumes. In lieu of any site specific information it was assumed that a suitable disposal site can be located within 2.5 km of the bulky waste site. This assumption is entirely arbitrary and has not been discussed with regulators.

An assumption also had to be made regarding the proportion of material that could be made suitable for marine disposal. For this study it was assumed that 3,000 m^3 of material (75%) would be disposed at sea with the remaining 1,000 m^3 to be removed by sea lift backhaul. The costs were based on the following:

- Make application for Disposal Permit
- Dismantling the existing waste piles (10 weeks at $20,000 per week).
- Shredding the existing wastes with the exception of vehicles and large steel. Productivity estimates were based on a Shredmax shredder with a feed rate of 2 tonnes / hour.
- Clean and prepare the waste for ocean disposal (3,000 m^3). It was assumed that waste cleaning will require 4 weeks, and that some heavy equipment will be required for waste handling.
- Remove 1,000 m3 via sealift backhaul. The backhaul rate is $162 per revenue tonne or per 2.5 m3 of volume (2003 dollars).
- The scrap metål value was based on 250 tonnes of metal delivered to Quebec.
- Final site clean up.

Option #4 – Sealift Backhaul

A cost estimate for this option was prepared and is summarized in Table XX. The cost estimate is based on the following:

- Dismantling the existing waste piles (10 weeks at $20,000 per week).
- Shredding the existing wastes with the exception of vehicles and large steel. Productivity estimates were based on a Shredmax shredder with a feed rate of 2 tonnes / hour.
- The cost of supplying and shipping the shipping containers is a major item. Sea lift operators recommended using steel rectangular containers filled with stackable buckets to minimize the shipping volume. Unit costs with this method are approximately $60 per m3 of container volume. This item needs further discussion with sea lift operators to identify other options or cost savings.

- Remove 4,000 m^3 via sealift backhaul. The rate for sealift backhaul is $162 per revenue tonne or per 2.5 m^3 of volume (2003 dollars).
- The scrap metal value is estimated at $115,000, based on 1000 tonnes at $115 per tonne (Michelle Poulin, SNF Limited, 514-323-0333).
- Hauling and landfill disposal costs in Quebec are based on a lump sum amount of $40,000. Disposal costs will be higher if higher volumes of hazardous wastes are encountered.

Table 5-1: Cost Summary for Bulky Waste Options

Task	Option #1 Storage On Site	Option #2 - Disposal to Landfill	Option #3 Disposal at Sea	Option #4 Sealift Backhaul
Waste Segregation	$200,000	$200,000	$200,000	$200,000
Lease Shredder/Compactor	$50,000	$50,000	$50,000	$50,000
Operate Shredder	$64,000	$64,000	$64,000	$64,000
Local Landfill Cost		$850,000		
Permit Application			$165,000	
Ocean Disposal			$150,000	
Sealift Backhaul			~~$126,050~~	$579,200
Sale of Scrap Metal			-$28,750	-$115,000
Final Site Clean Up	$20,000	$20,000	$20,000	$20,000
Sub-Total	**$334,000**	**$1,184,000**	**$775,050**	**$798,200**
Contingency @ 20%	$66,800	$236,800	$155,010	$159,640
TOTAL (excl taxes)	**$400,800**	**$1,420,800**	**$930,000**	**$957,800**

The above table shows that the most economical option is Option #1 – Storage On Site. The most expensive option is Option #2 – Disposal to Landfill. The other two options are approximately the same cost.

5.4 Evaluation Criteria

Based on comments received from the community and the regulators, the issues were grouped into the following broad themes which can be used to evaluate the remediation options:

1) Cost
2) Community support
3) Regulatory Risk
4) Land Use Issues

Cost

The cost criteria is a quantitative method of comparing the disposal options.

Community Support

This criteria is based on the notion that the opinions expressed by the community are important and should be included in the evaluation process. The degree of community support reflects intangible aspects such as the site aesthetics, proximity to local points of interest, and their perception of environmental risks with each option.

Regulatory Support

Regulatory support is the third criteria that is considered in the evaluation. This criteria is intended to reflect the degree to which each option addresses the regulators concerns with the existing waste piles, as well as the risk of obtaining regulatory approval for waste disposal. The risk factor applies primarily to Option #3 – Disposal At Sea.

Land Use

This criteria reflects the fact that some of the options involve land use compromises to a greater extent than others. This is particularly true of the first two options, in which the wastes will remain on Dorset Island. The island is relatively small in area and the topography and local geology mean that economic disposal sites are at a premium. In particular, the area around the existing landfill may be required for future landfill expansion or for future sewage disposal facilities.

5.5 Option & Criteria Analysis

A matrix tool is helpful in identifying the importance and relevance of each criteria and how each option satisfies the criteria. A matrix is a decision making tool that is useful in assessing a variety of options against several competing criteria. As indicated on the attached matrix, the criteria are shown along the left side of the matrix and the disposal options are shown across the top of the matrix.

The preliminary step in the matrix analysis is to set the relative importance of each of the criteria. This method allows the identification of which criteria are of greater importance. Each criteria is assigned a rank between 1 and 10, determining how important each criteria is compared to the others, where 1 is the least important and 10 is the most important.

For each criteria, the options are defined by giving each a rating between 1 - 4, 1 being the worst options that satisfies a particular criteria, and 4 being the one that best satisfies a given criteria. This process is done one criteria at a time.

The product of the criteria rank and the option rank is the weighted score, and the sum of the weighted score for each option is the total weight for each option. **Hence, the option with the highest score is the one that best satisfies the criteria.**

Table 5-2 presents the results of the matrix developed by Dillon which ranks the waste disposal options.

Table 5-2– Options and Criteria Analysis

Criteria	WEIGHTING	Option #1 – Storage On Site	Option #2 – Removal to Landfill	Option #3 – Disposal At Sea	Option #4 – Sea Lift Backhaul
Cost	10	4	1	2.5	2.5
	SCORE	**40**	**10**	**25**	**25**
Community Support	9	2	3	1	4
	SCORE	**18**	**27**	**9**	**36**
Regulatory Support	5	2	3	1	4
	SCORE	**10**	**15**	**5**	**20**
Land Use	3	2	1	3	4
	SCORE	**6**	**3**	**9**	**12**
	TOTAL	**74**	**55**	**48**	**93**

The matrix analysis resulted in the following rankings:

1st place ranking - Option #4: Sea Lift Backhaul

2nd place ranking - Option #1: Storage On Site

3rd place ranking - Option #2: Removal to Landfill

4th place ranking - Option #3: Disposal At Sea

5.6 Discussion of Analysis Results

The following is a discussion of the results of the solid waste option rankings. Each criteria is discussed to indicate the rationale for the rankings.

Cost

The cost criteria was judged to be of first importance because the feasibility of each option is heavily tied to the overall cost.

The least expensive option was Option #1 – Storage On Site. This is not surprising given there are no costs for transporting the wastes to another location. The next least expensive options were Option #3 Disposal At Sea and Option #4 – Sea Lift Backhaul. There was less than $50,000 difference in the costs so these options were ranked a tie. The most expensive option was Option #2– Removal to Landfill because the unit cost for providing future landfill storage in Cape Dorset is relatively high.

Community Support

The option which scored the highest for community support is Option #4 – Sea Lift Backhaul. This option clearly addresses the immediate community concerns regarding aesthetics of the site and possible site contamination.

The next highest ranked option was Option #2– Removal to Landfill because again this option cleans up the existing site and provides a "fresh start". The third highest ranked option was Option #1 – Storage On Site because the aesthetics of combining the existing and future wastes was judged to only partially address community concerns. The fourth and final ranked option was Option #3 - Disposal At Sea. This option would require extensive public consultation to agree on a suitable disposal site, and communities in the north have historically opposed this concept for perceived environmental impact reasons. An example is Resolute Bay which opposed the disposal of drill pipe by Panarctic Exploration in the 1980's.

Regulatory Support

In terms of regulatory support, the highest ranked option was Option #4 – Sea Lift Backhaul. This option removes the wastes from the community, allows site contamination to be assessed, and allows the site to be re-organized to receive future wastes.

The next highest ranked option was Option #2– Removal to Landfill. While this option addresses many of same concerns as Option #4, it is judged to be somewhat less acceptable given the operational and drainage concerns with the existing landfill site. The next highest ranked option was Option #1 – Storage On Site because bulky waste management will generally be more challenging if the existing wastes remain on site. Regulators have also been advised by community officials that a site clean will be undertaken in the near future. The lowest ranked option was Option #3 - Disposal At Sea because obtaining regulatory approval for this options is much more complex than for the other options.

Land Use

Option #4 – Sea Lift Backhaul scored the highest for this criteria because this option does not impact local land or marine use. The next highest ranked option was Option #3 - Disposal At Sea because this option has no local land impacts and any marine impacts would likely be mitigated through proper site selection.

Option #1 – Storage On Site was ranked the next highest option because this option requires land area at the existing site and this compromises the capacity of the site to accept wastes in the long term. The lowest ranked option was Option #2 – Removal to Landfill because the space for landfill expansion is at a premium and it is understood that the GN prefers to reserve the land for municipal as opposed to bulky wastes.

5.7 LANDFILL SITE IMPROVEMENTS

5.7.1 Site Improvements

The following is a list of the proposed improvements to the existing modified landfill. The improvements are necessary to address operational concerns raised by regulators over the past three years.

1) Drainage:

The existing natural drainage mainly flows toward the southeast corner of the landfill. The runoff observed during the site visit is believed to be of both surface and subsurface origin. The subsurface flows most likely originate from within Kingnait Hill and significant flows were observed in rocks and cobbles at the base of the hill on a day with no rain. The existing drainage ditch is angled away from the base of the hill and is largely ineffective.

The proposed new drainage ditch location is shown in **Figure ~~5~~ 6**. The ditch will be constructed parallel to the south boundary of the landfill, and will extend about 80 m upslope toward the crest of the drainage divide. The ditch will be aligned approximately along the south edge of the landfill with a typical depth of 1.2 m. Due to the very soft ground conditions, the proximity to the waste pile, and the permeability of the existing soils, the ditch will be stabilized with geogrid reinforcement and lined with an impermeable liner. A cross section of the proposed ditch and liner system is shown in Figure ~~6~~. 5

Careful attention will be required to properly anchor the geogrid and the liner system, particularly at the upstream and downstream ends of the ditch. The outfall of the ditch will be armoured with rip rap erosion protection.

2) Fencing:

Chain link perimeter fencing is proposed around the current site as shown in **Figure 6.** The fence will be 1.8 m high and will terminate at the existing access road. The fence will visually define the site and minimize debris leaving the site. A gate is not recommended at the access road as the community is accustomed to 24/7 access and the gate would likely be a hindrance.

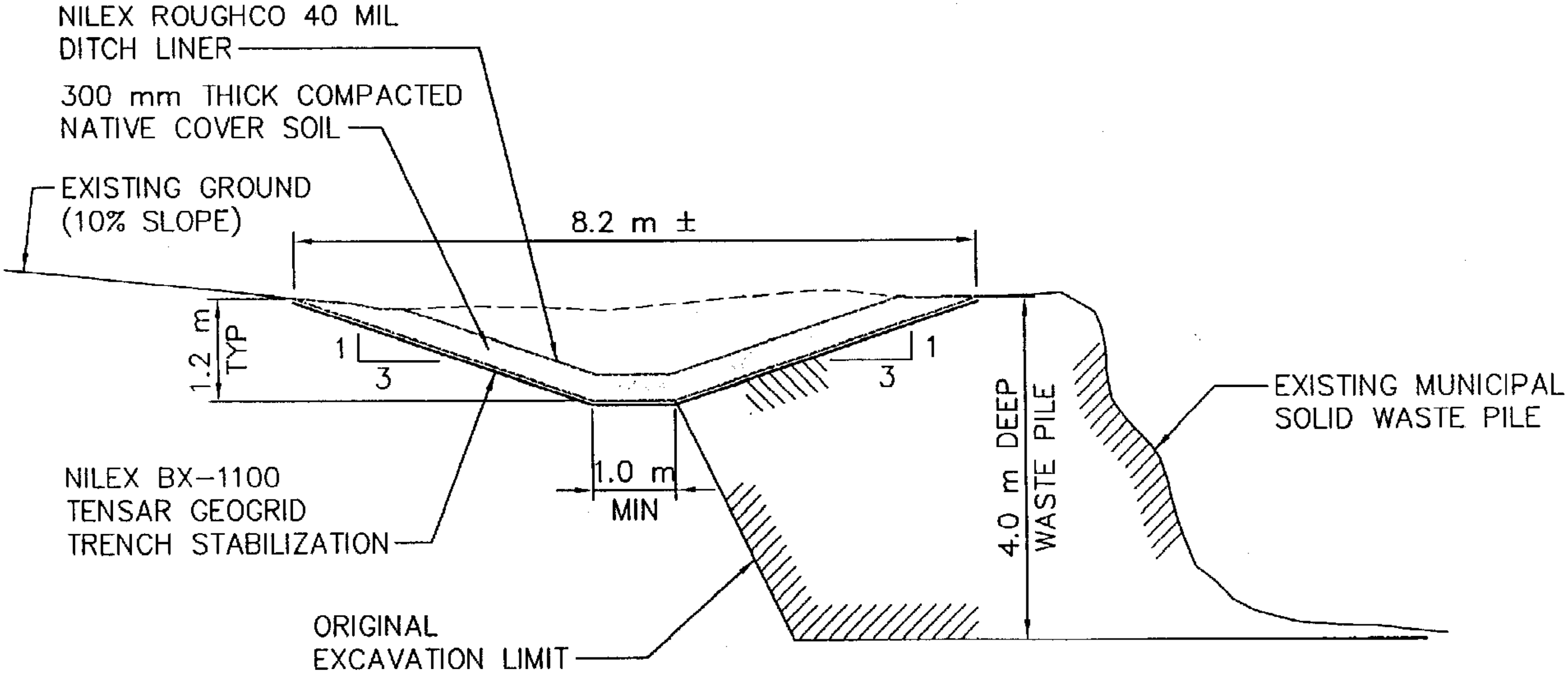
3) Signage:

A sign should be attached to the fence near the main entrance stating the purpose of the facility, operating hours if any, operational guidelines, and a list of prohibited wastes. Regulators have expressed concerns over the burning of plastics. Signage at the entrance and at 1-2 locations inside the landfill should indicate **" NO PLASTICS IN THE BURN PILE".**

4) Berm Repair: Once runoff is diverted around the site the gap in the west berm can be repaired. Approximately 1,000 m^3 of material will be required based on 2:1 side slopes.

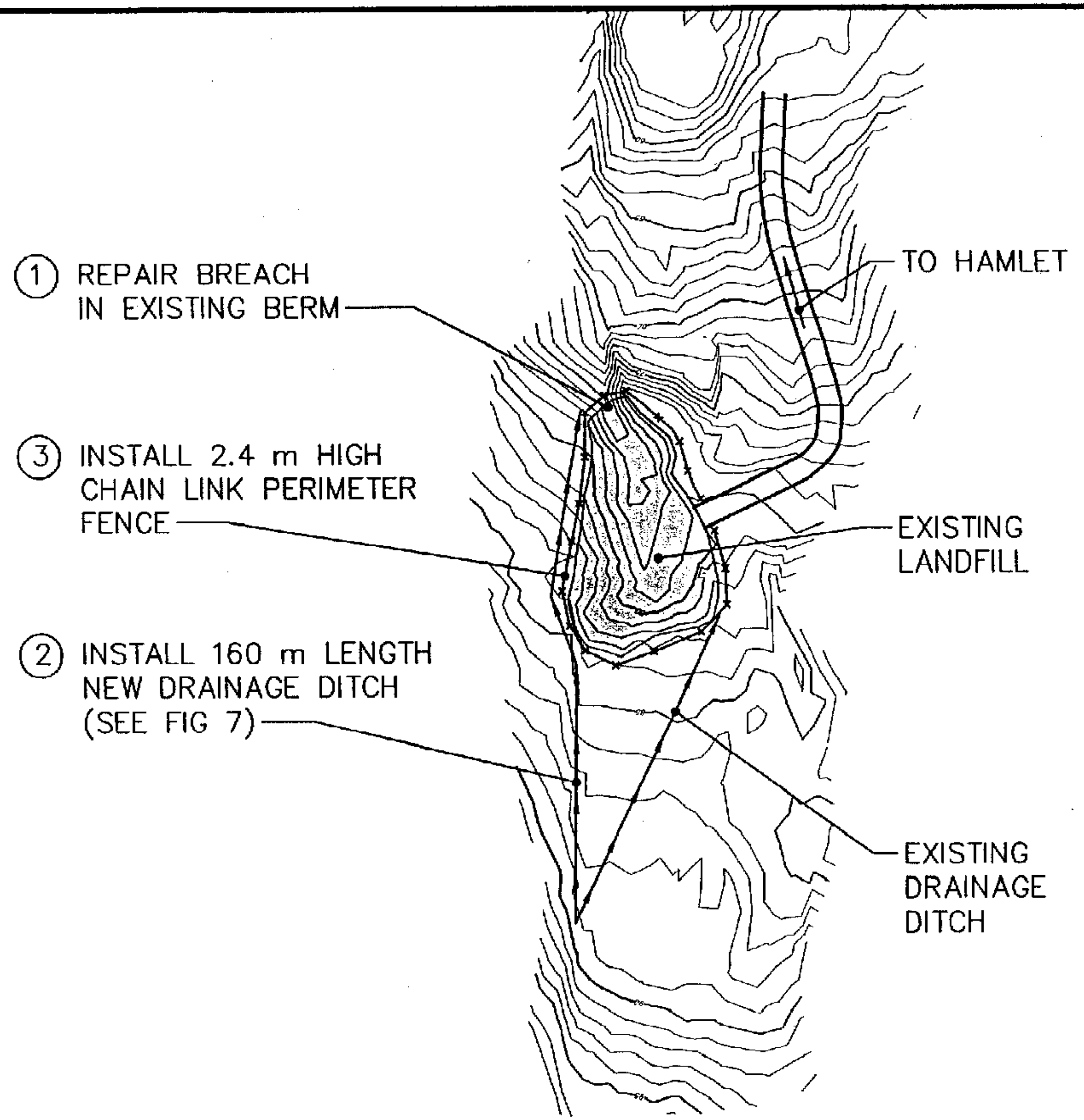
5.7.2 Cost Estimate

The total estimated capital costs for the site improvements is $135,000. The cost breakdown is included in Appendix G.



DETAIL 'A'

DILLON CONSULTING	NO. / REVISIONS / DATE / BY	DESIGN CRH DRAWN HAT CHECKED APPROVED DATE 2003.10.09 SCALE 1:75	CAPE DORSET NUNAVUT	DILLON FILE NO. 032191
			PROPOSED DRAINAGE DITCH	DRAWING NO. FIG 5



DILLON CONSULTING

NO.	REVISIONS	DATE	BY	DESIGN CRH	CAPE DORSET NUNAVUT
				DRAWN DRZ	DILLON FILE NO. 032191
				CHECKED	
				APPROVED	LANDFILL SITE IMPROVEMENTS
				DATE 2003.09.23	DRAWING NO. FIG 6
				SCALE 1:2000	

G:\CAD\032191\FIGURES\032191 FIG 6.DWG PLOT DATE: 2003.10.10 07:36 PLOT SCALE: 1:1 PS BY: 43HAT

6.0 LONG TERM SITE PLANS

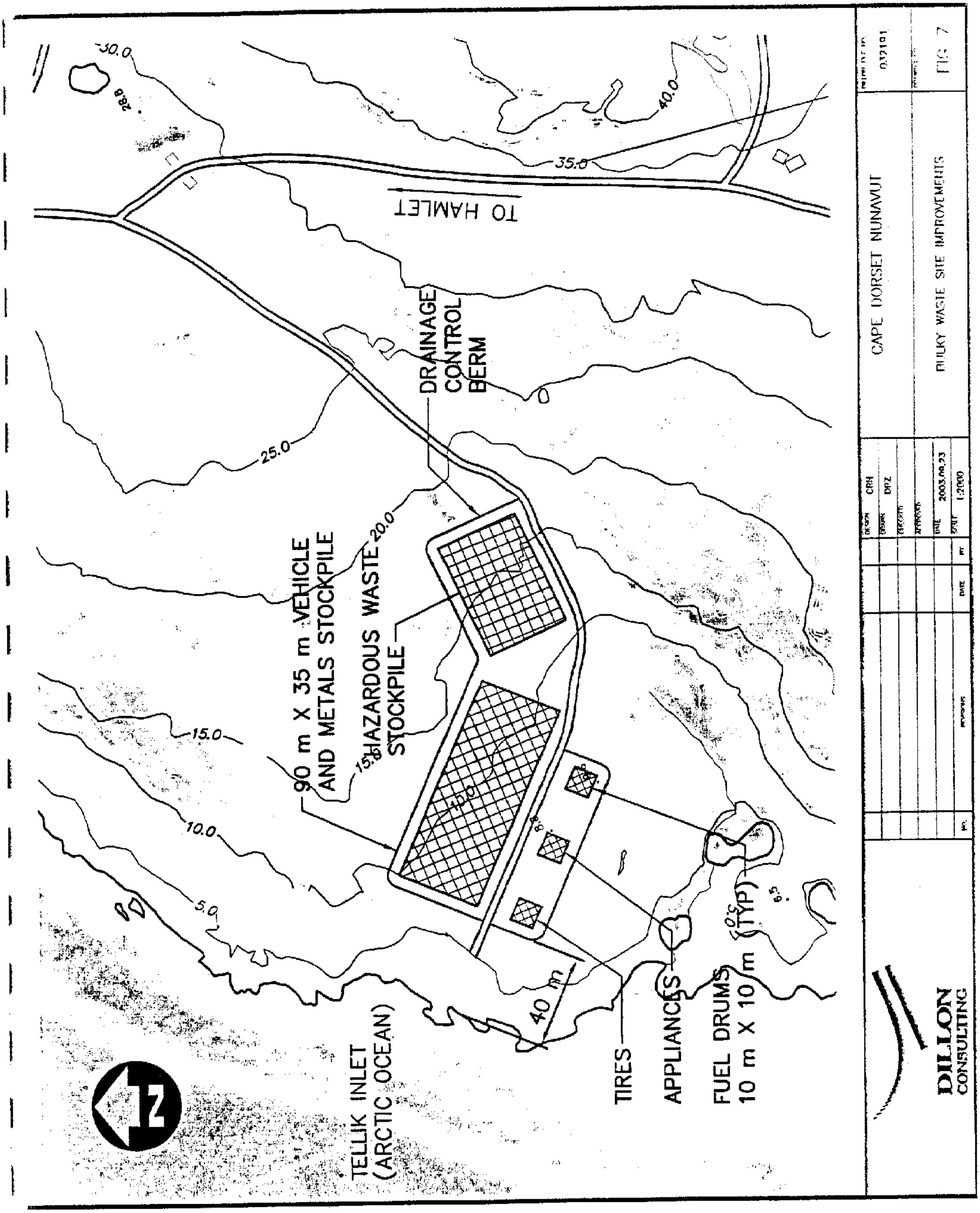
6.1 Bulky Waste Site Plan

Once the existing bulky waste piles are dismantled and any environmental contamination is addressed, the site can be re-organized to accept future bulky wastes. The proposed site layout assumes that future wastes will be segregated to a greater degree than in the past. This segregation is important to allow for flexibility in processing certain wastes which may be required under future, more stringent regulatory criteria. For example it is standard practice in the south to segregate hazardous waste, appliances, tires, and fuel drums because each material requires different handling.

For Cape Dorset it is assumed that the current site will remain in operation for the next twenty years. The site layout is governed by the need to contain wastes to the lower part of the site, to provide a set back from the shoreline of Tellik Inlet, and to ensure that excessive surface runoff does not enter the stockpile areas.

The proposed site plan is shown in Figure 7. Vehicles and assorted scrap metal will be stored near the current location of Pile 'B'. Assuming a stockpile size of 90 m X 35 m X 2.5 m high the ultimate storage volume is about 7,500 m, and this represents 75% of the 20 year volume. Hazardous waste such as batteries and paint and solvent cans will be temporarily stored adjacent to the metals stockpile. Optionally the hazardous wastes could be re-located inside the existing landfill, however the amount of space available may not make this practical. The old plastic water tanks on the site could be sawed in half and used as storage bins for some of the hazardous wastes. The storage sites will be surrounded by a 1.0 m high drainage control berm to divert runoff around the stockpiles. Other materials such as tires, appliances, and fuel drums will be segregated and stored opposite the permanent metals stockpile, as shown in Figure 7. Signage will inform users of the purpose of the facility, where different types of metals are to be stored, and materials that are prohibited.

Periodic monitoring of runoff from the site is recommended in future to confirm that the site is functioning as intended.



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G:\CAD\032191\FIGURES\032191 FIG 7.DWG

6.2 LANDFILL SITE PLAN

Dillon reviewed the applicable SWM technology options for long term disposal of municipal wastes. The preferred option was identified and an implementation plan was developed to accommodate the 20 year storage volume. The purpose of this section is to review the technology options and describe the proposed expansion plan.

6.2.1 Applicable Technology Review

There are several solid waste management (SWM) technologies available in which some are more suitable to a northern community than others. The open dump/landfill is the method which is most often used by communities in the north, however there is a transition toward engineered facilities which incorporate fencing, drainage controls, and waste segregation.

Proper management is essential in the operation of any disposal technology. An effective disposal system should provide a means of waste disposal without harming public health or the environment. The disposal system must also be acceptable to the residents of the community.

The following SWM alternatives were identified and evaluated for Cape Dorset:

- Modified Landfill
- Landfill with Open Burning
- Sanitary Landfill
- Incineration
- Baling

To select an appropriate technology, the criteria that guide the process would include capital cost minimization; operations and maintenance cost minimization; community acceptance; and regulatory agency acceptance.

Modified Landfill

The modified landfill is similar to an open dump/landfill. The difference is that the modified landfill requires careful planning and operation. A modified landfill is engineered from site selection to site closure. The site is selected, access road is constructed, berms and fencing may be constructed, disposal areas are identified, and cover materials are stockpiled. The wastes are disposed in predetermined areas, and compacted and covered more frequently than an open dump landfill to ensure efficient use of the site. There are separate areas within the site identified for bulky waste and hazardous waste disposal.

The modified landfill is appropriate for small populated communities where it is not feasible to have continuous supervision or dedicated equipment at the site. The modified landfill has reasonable capital and operating costs, involves minimal operation and supervision, and is more aesthetically pleasing and provides a better level of service than an open dump.

Landfill with Open Burning

This method of waste disposal is similar to an open dump/landfill however the waste is burned regularly to reduce the volume of waste. Waste is burned to extend the life of the landfill and to reduce windblown debris, and renders waste less accessible to birds and animals. Authorization for burning is the discretion of the community council however in recent years the Department of Health and Social Services and the Department of Sustainable Development have been urging communities to stop burning wastes.

Much of the waste in northern communities is combustible, however certain wastes are not. These wastes may pose a threat to the operator or community if not segregated from the burn pile. Burning also creates concerns due to the potential effects on the health of the operators and residents, and the environment.

Sanitary Landfill

The sanitary landfill is an engineered solid waste site which involves careful planning, supervision, and regularly scheduled compaction and covering of waste. The sanitary landfill is commonly used in the north.

Regular covering of wastes involves a volume of granular material. Due to the amount of supervision, equipment, and cover material required for sanitary landfilling, this method will not be considered further in this report.

Incineration

Incinerators burn municipal waste at high temperatures (650 C to 1600 C) reducing waste to inert ash. Municipal waste can be reduced in volume by approximately 85% and the resulting ash is disposed in a controlled landfill/ashfill.

Energy from incinerators can be used to heat houses or buildings by utilizing waste heat recovery. It is also possible to generate electricity from the heat produced by an incinerator using a boiler and steam turbine generator set.

Incinerators tend to be mechanically complex, require regular maintenance, and require an experienced/trained operator. In small communities, incineration also has a much higher capital and operating cost than landfilling as it requires:

- purchase and installation of the incinerator unit;
- construction of a building to house the unit and to temporarily store waste and ash;
- construction of an ash landfill;
- incinerator operator;
- fuel;
- replacement parts.

Due to the high costs and complexity, incineration is much less feasible in communities such as Cape Dorset where suitable land is available for a landfill. For these reasons incineration will not be considered further in this report.

Baling

Baling involves preprocessing waste to reduce volume. A baler machine located inside a building is used to hydraulically press the waste into compacted bales which are then tied with wire. The bales are then stacked in a landfill. Baling increases the life of a landfill and reduces the amount of cover material required.

Baling machines require an operator and regular maintenance. In small communities, baling has a much higher capital and operating cost than landfilling as it requires:

- purchase and installation of the baler unit;
- construction of a building to house the unit and to temporarily store waste;
- construction of a landfill;
- baler operator;
- fuel;
- replacement parts, etc.

Due to the high costs and increased complexity, baling is much less feasible in communities such as Cape Dorset where suitable land is available for a landfill. For these reasons baling will not be considered further in this report.

6.2.2 Recommended Disposal Method for Cape Dorset

The existing Cape Dorset landfill operates as a modified landfill, with open burning. It is recommended that the modified landfill method be adopted for the future landfills proposed in this report, for the following reasons:

- The existing modified landfill has served the community well.
- Modified landfill poses less of a threat to the environment than open dump/landfill. With modified landfilling the waste is placed in an organized manner and is compacted and covered which reduces risk of leaching from hazardous wastes, berms and fencing may be installed to mitigate against waste and runoff leaving the site.
- Modified landfilling is more economical than sanitary landfill, incineration, and baling.

One concern with the continued use of the modified landfill method in Cape Dorset is the existing site topography and bedrock outcrops. There will be a trend toward significantly higher disposal costs beyond about the 10 year horizon since the new cells will be constructed partly in via rock excavation. Therefore, it may be advisable to revisit the other disposal options in another 8- 10 years to identify potentially economic options.

6.2.3 Landfill Expansion Plan

The capacity in the existing landfill will be exhausted by 2006. The total required storage capacity over the 20 year horizon (2005-2025) is about 71,600 m^3. It was assumed that the storage will be constructed in phases, with a total of three new modified landfill cells being developed.

A preliminary location for the first new cell was identified during the site visit and will be located in an undisturbed area upslope (east) of the existing cell. The location of the second and third cells were identified by Dillon subsequent to the site visit and were based on an inspection of the new site contours.

The purpose of this section is to describe the conceptual design for the proposed cells, which have been designated Cells #2 to #4. The following general objectives govern the proposed designs:'

- Cells to be located, if possible, outside the drainage boundary for the community (see discussion below).
- Cell footprints to be clear of the existing sewage lagoon Cell #1.
- Berm heights to be minimized wherever possible to conserve locally available granular material.
- Existing access road to be used for as long as possible.
- Waste heights should generally not exceed 4.0 m, as this is the waste height in the current landfill and appears to be working well for the community.

The site layout and typical cross sections are in shown in Figures 8 and 9.

Landfill Cell #2

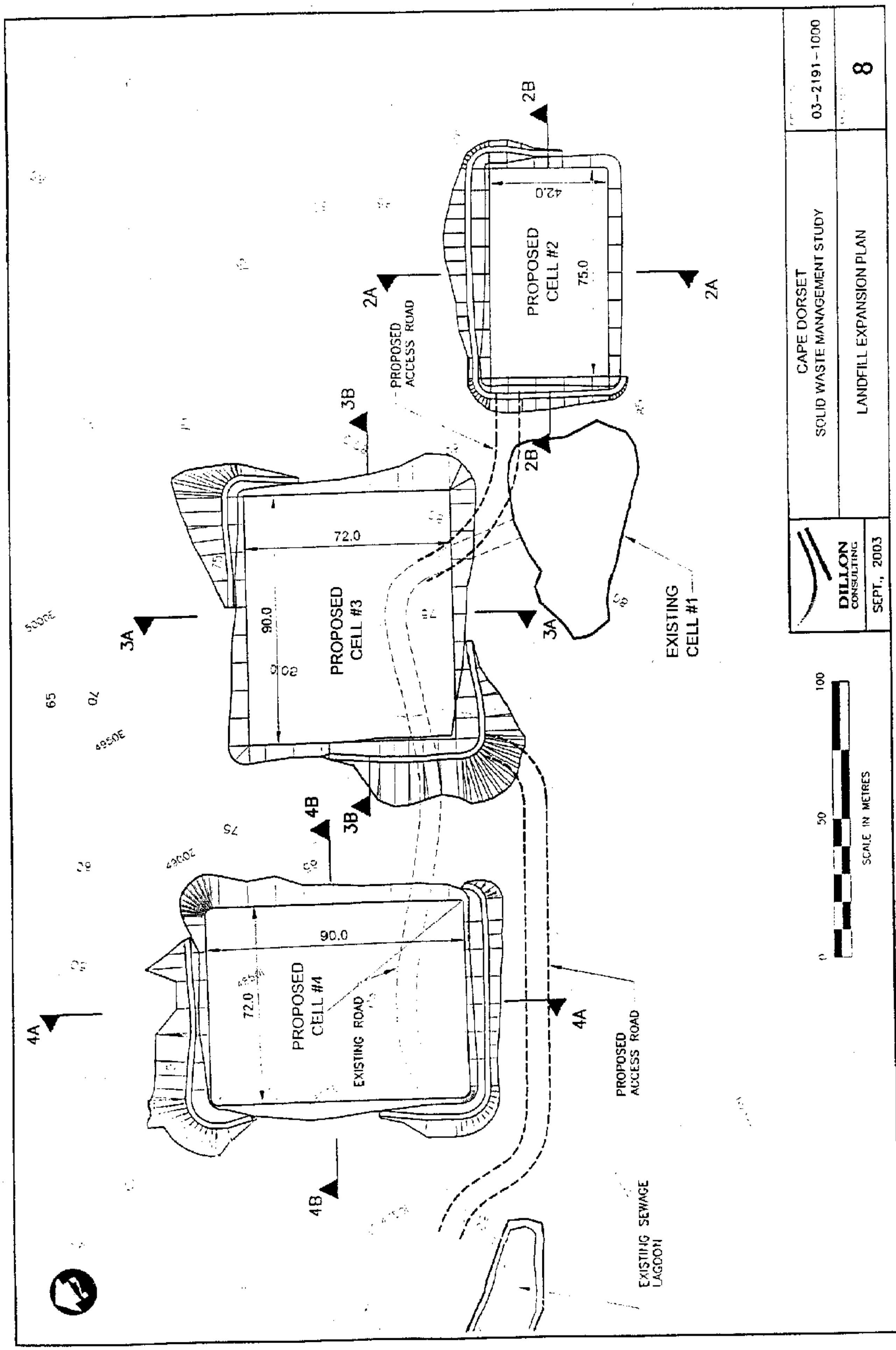
This cell will be located immediately upslope from the existing Cell #1. The granular resource report for Cape Dorset (GNWT publication - January 1998) indicates the area is an excellent source of granular material that could be used for future cover material. The cell layout was based on maximizing capacity while avoiding the bedrock outcrops at the high end of the site. Photographs of the proposed site location are shown in Appendix D.

The cell will be accessed via an 80 extension of the existing access road. The cell will have an outside area of 95 m X 62 m, and a total capacity of 14,500 m^3. The cell will have an operational life from 2005 – 2009, based on the theoretical waste volumes.

Cell #2 slightly encroaches on the community drainage boundary. Shifting the entire cell toward Kingnait Hill is not an option because buffer space has to remain for drainage control around the landfill. Options to mitigate this issue are either to decrease the cell width by 10-15 m or to install a geosynthetic liner inside the cell. For this report it was assumed for that a liner will be installed. This issue can be resolved during the detailed design phase.

The work plan is as follows:

- Strip and prepare the site
- Excavate the new cell below grade. Some rock excavation is expected at the upper end of the excavation.


PROPOSED CELL #2
75.0
42.0
2A
2B
PROPOSED ACCESS ROAD
PROPOSED CELL #3
72.0
90.0
3A
3B
EXISTING CELL #1
PROPOSED CELL #4
90.0
72.0
EXISTING ROAD
4A
4B
PROPOSED ACCESS ROAD
EXISTING SEWAGE LAGOON
SCALE IN METRES
0
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CAPE DORSET
SOLID WASTE MANAGEMENT STUDY
LANDFILL EXPANSION PLAN
03-2191-1000
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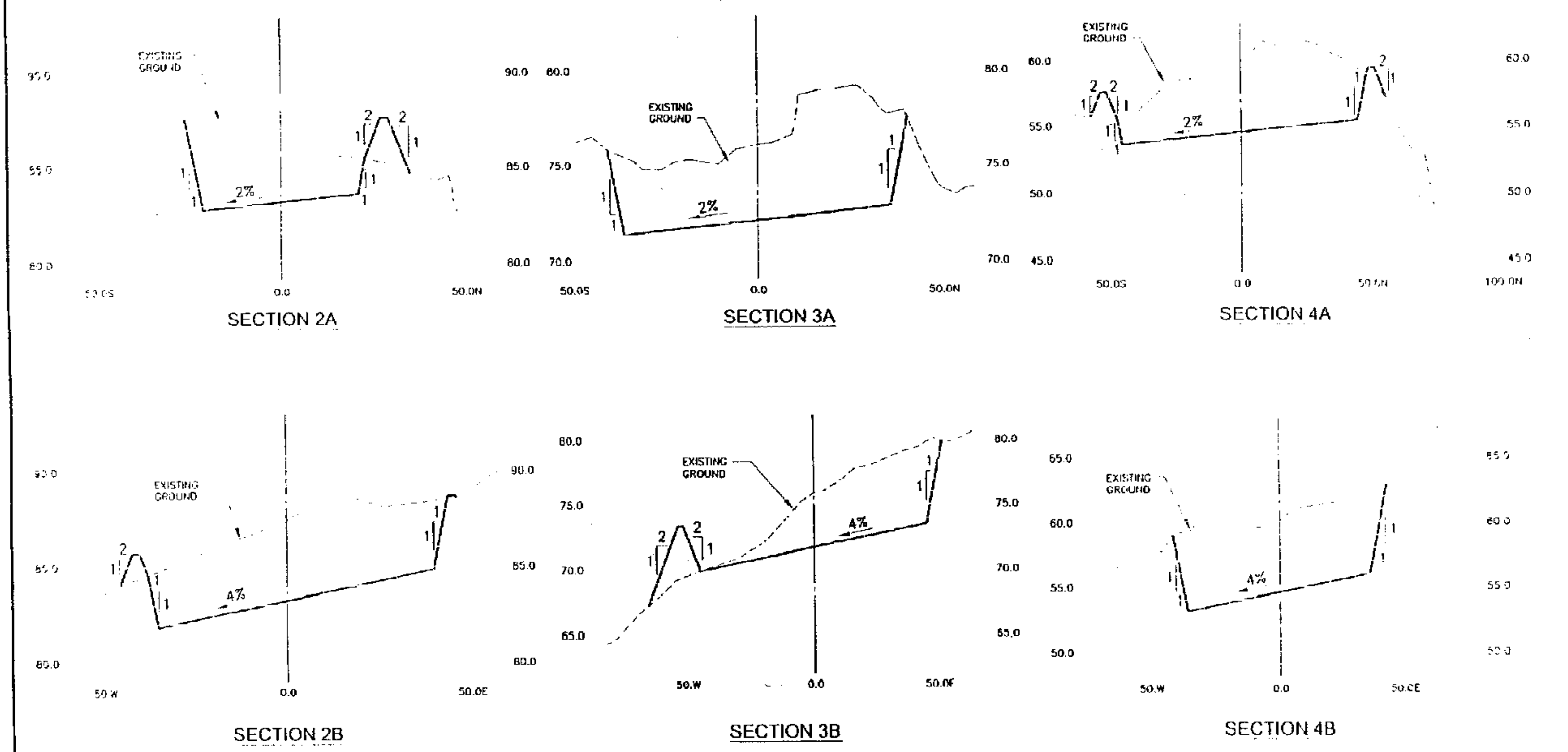
DILLON CONSULTING
SEPT., 2003



METRIC

CAPE DORSET
SOLID WASTE MANAGEMENT STUDY

PRELIMINARY LANDFILL CROSS SECTIONS

DILLON CONSULTING

OCT. 2003

03-2191-1000

9

- Install a geosynthetic liner including base material
- Construct drainage control berms with a minimum height of 1.0 m.
- Install chain link fencing around the cell.
- Extend the existing access road about 80 m into the floor of the new cell.
- Install signage

Capital and operating cost estimates are in Section 7.0.

Landfill Cell #3

This cell will be located immediately north of the existing landfill, and will be outside the community drainage boundary. The cell will have outside dimensions of 110m x 92m however some berms will extend outside this area. The cell storage capacity is 28,600 m^3 and this will result in an operational life from 2010 – 2017. The cell will be constructed over the existing access road and therefore a new road with a total length of about 200 m will be required.

The majority of the cell will be constructed in rock. Total rock excavation is estimated at 34,000 m^3 and total fill for the berm will be about 6,000 m3. It is assumed the excess material will be crushed and used as soil cover. The vertical profile of the proposed cell is shown in Figure 9.

The work plan is as follows:

- Strip and prepare the site
- Excavate the new cell, primarily in rock.
- Install a geosynthetic liner over granular base material
- Construct containment berms where the design is above existing grade
- Install perimeter chain link fencing
- Construct approximately 200 m of new access to the west corner of the new cell
- Install signage

Landfill Cell #4

This cell will be located northwest of Cell #3 and will utilize the same access road. The cell will be outside the community drainage boundary. The cell will have outside dimensions of 110 x 92 m however some berms will extend outside this area. The cell storage capacity is 28,600 m^3 and this will result in an operational life 2018 – 2025. Consideration was given to providing adequate clearance between the lagoon and the sewage truck turnaround .

The cell will be accessed using the same road as for Cell #3, with a minor extension. Cell #4 will be constructed primarily in rock with a maximum cut depth of about 7 m, based on a maximum floor slope of 4.0%. Total rock excavation is estimated at 36,100 m^3 and total fill for the berms will be about 12,000 m^3. Cross sections through the centre of the cell are shown **in Figure 9.**

The work plan is as follows:

- Strip and prepare the site
- Excavate the new cell, primarily in rock.
- Install a geosynthetic liner over granular base material
- Construct containment berms where the design is above existing grade
- Install perimeter chain link fencing
- Construct approximately 30 m of new access to the southwest corner of the new cell
- Install signage

Table 6-1 summarizes the conceptual design for the new cells.

Table 6-1 – Landfill Expansion Summary

	Outside Length	Outside Width	Area	Area	Volume
	(m)	(m)	(m^2)	(ha)	(m^3)
Cell #2	95.0	62.0	5,890	0.59	14,600
Cell #3	110.0	92.0	10,120	1.01	28,600
Cell #4	110.0	92.0	10,120	1.01	28,600
TOTAL			**26,130**	**2.61**	**71,800**

6.2.4 Schedules

Bulky Waste Site:

It is understood that the GN is planning to tender for the removal of bulky wastes over the coming winter. Assuming that the sea lift backhaul concept is adopted and the work is to be completed in one season, the sea lift containers will need to arrive on the first ship in July. This will allow approximately 12 weeks to segregate the wastes and place them in the sealift containers. Surficial soils may also need to be removed depending on site contamination.

Landfill Site:

The first priority is the improvements to the existing site, and it is understood that the GN will be ordering materials for arrival on the first sea lift of 2004.

Regarding the landfill expansion plan, the proposed designs are based on the following commission timetable:

- Cell #2 2005 – 2010
- Cell #3 2010 – 2017
- Cell #4 2018 - 2025

In reality, the commissioning of Cell #2 can most likely be delayed by 1-2 years based on the recent waste accumulation rates. Assuming that Cell #2 must be operational by 2007, detailed design and construction would span the period mid 2005 to late 2006.

7.0 COST ESTIMATES

This section provides the capital and operating cost estimates for both solid waste sites.

7.1 Capital Costs

This section provides a summary of the capital cost estimates for the permanent bulky waste site and for landfill expansion. The major capital costs include the following items:

Bulky Waste Site:
- Drainage Berm Construction
- Excavation of Ditches
- Signage

Landfill Sites:
- Access Roads
- Berm construction
- Excavation
- Geosynthetic Liner
- Drainage Control
- Fencing
- Final capping

Landfill closure costs were estimated assuming a total cover thickness of 900 mm over an area of 3000 m^2. The cover will consist of three layers – common cover material, a low permeability soil liner, and native cover material.

Table 7-1 provides a summary of estimated capital costs for design and construction of the proposed works. including an allowance of 15% for engineering design and 15% for construction contingency. These costs do not include GST or the cost of any land acquisition. These costs are for planning purposes only and must be refined during the design stages of the project. The detailed capital costs are presented in **Appendix H**.

Table 7-1 Capital Cost Summary

	Bulky Waste Site	Cell #1	Cell #2	Cell #3	Cell #4
Site Improvements		$135,000	N/A	N/A	N/A
Preparation and Stripping			$12,000	$20,000	$20,000
Access Road			$142,200	$248,200	$23,800
Berms, Excavation, and Liner			$441,000	$4,216,500	$4,616,500
Drainage/Fencing/Signage	$14,000		$91,500	$148,500	$142,500
Final Site Closure		$127,000	$230,000	$441,000	$441,000
Sub Total Cost	**$14,000**	**$262,000**	**$917,000**	**$5,074,000**	**$5,244,000**
Engineering/Contingency @ 30%	$4,000	$79,000	$275,100	$1,522,200	$1,573,200
TOTAL (excl. Taxes)	**$18,000**	**$340,000**	**$1,200,000**	**$6,600,000**	**$6,800,000**

The total capital cost for development of the five sites is $14,958,000.

7.2 Operating Costs

This section provides a summary of the yearly operating costs estimated for both sites. The operating costs include:

Bulky Waste Site

- Road maintenance including summer grading and winter snow clearing and sanding,
- Berm maintenance.

Landfills:

- Stock piling cover material,
- Compacting and covering wastes,
- Road maintenance including summer grading and winter snow clearing and sanding,
- Fence repair,
- Berm maintenance.

Table 7-2 provides a summary of estimated operating costs of the proposed waste disposal options, including an allowance of 20% for contingency. These costs are for planning purposes only and must be refined during the design stage of the project. These estimates do not include costs for waste collection. The detailed operating costs are presented in **Appendix H**.

Table 7-2 Operating Cost Summary

	Bulky Waste Site	Cell #1	Cell #2	Cell #3	Cell #4
Stock piling soil		$18,000	$20,000	$24,000	$30,000
Compacting and covering wastes		$25,000	$25,000	$30,000	$30,000
Road Maintenance	$48,000	$0	$12,000	$0	$0
Fence & Berm maintenance	$11,000	$0	$0	$14,000	$14,000
Subtotal:	**$59,000**	**$43,000**	**$57,000**	**$68,000**	**$74,000**
Contingency (20%)	$12,000	$9,000	$11,000	$14,000	$15,000
TOTAL:	**$71,000**	**$52,000**	**$68,000**	**$82,000**	**$89,000**

7.3 20 Year Cost Summary

In order to analyze the long term cost of these SWM options it is necessary to look at the overall cost over a period of time. Table 7-3 presents the long-term landfill cost summary for the 23 year period from 2003 – 2025. The Net Present Value was calculated assuming a discount rate of 8 %.

Table 7-3 20 Year Cost Summary

	Capital Cost	Annual O + M	Years in Service	Total O + M	Capital and Operating NPV @ 8%
Bulky Waste Site	$18,000	$71,000	20	$1,420,000	$730,000
Existing Cell #1	$340,000	$52,000	2	$104,000	$430,000
Cell #2	$1,200,000	$68,000	5	$340,000	$1,400,000
Cell #3	$6,600,000	$82,000	8	$656,000	$6,500,000
Cell #4	$6,800,000	$89,000	8	$712,000	$6,800,000
TOTAL	**$14,958,000**	**$362,000**		**$3,232,000**	**$15,860,000**

8.0 SUMMARY & RECOMMENDATIONS

This report examined the feasibility of upgrading and/or expanding the existing solid waste sites in Cape Dorset. The first site is a bulky waste site where a large volume of waste has accumulated over about 30 years. The second site is the existing modified landfill which has served the community well but which is nearing the end of it's useful life. For clarity this report was organized according to two broad tasks: 1) assessment and improvements to *existing* sites, and 2) long term site plans and implementation. The following summarizes the key findings from the study.

1) Existing Sites

Bulky Waste Site:
A site visit and interviews with community officials were conducted August 16-19, 2003. The estimated existing volume of bulky waste is 11,000 m^3. Community concerns are the site aesthetics and possible environmental impacts. Regulators have deemed the current site unacceptable and have focused on the lack of waste segregation, containment of hazardous wastes, and leachate production.

There are no alternate bulky waste sites and the current site must remain in operation. The capacity of the site was assessed based on storing the existing and the 20 year waste volumes. It was concluded that the site cannot accommodate these wastes while at the same time meeting regulatory objectives. Waste reduction or removal will be required.

Four options were developed for handling the existing wastes. All the options assume the existing waste volume is reduced to about 4,000 m^3 using shredding or other suitable equipment. One option assumes the wastes are stored on site. The other three options involve removal to the existing landfill, disposal at sea, or sea lift backhaul. Sea lift operators, regulators, and others were contacted regarding the feasibility of each of the options. The options were assessed using a matrix analysis table with four criteria:, cost, community support, regulatory support, and land use.

The highest ranking option was Option #4 – Sea Lift Backhaul, based on high community and regulatory support and median cost. The total cost for this option is estimated at about $960,000 based on a sea lift volume of 4,000 m^3.

Existing Landfill:
The existing landfill operates as a modified landfill with open burning. The site is not fenced, runoff enters the waste pile, and plastics are not segregated from the burn pile. Continued use of the existing site is recommended for it's remaining life. Improvements to the site with respect to drainage, signage and fencing are recommended.

2) Future (Long Term) Sites

Bulky Waste Site:

Landfill Site

Solid waste generation rates for the period 2005 – 2025 were estimated using the MACA waste generation formula. The total volume of compacted waste for this period is about 71,600 m3. This volume is based on the assumption that the practice of open burning will be discontinued in the near future based on the position of the DSD and Nunavut Health.

Solid Waste Technologies were reviewed and the current modified landfill method was recommended as the most viable for Cape Dorset.

A total of three new landfills are proposed in the vicinity of the current landfill. Capital and operating costs for the existing and the new cell were analyzed. The total capital cost for the three new cells is about $15,000,000.

The options for a long term site other than the existing location are limited or non-existent. As searching continued use of the existing area for bulky metal storage/disposal is recommended.

It must be recognized that, overtime, the accumulation of bulky metal will result in a situation simular to the current conditions and a further sea lift back haul will be required.

References

1) Gary W Heinke, PhD, P. Eng., Jeffrey Wong, "Guidelines for the Planning, Design, Operation, and Maintanance of Solid Waste Modified Landfill Sites in the Northwest Territories, GNWT, Department of Municipal and Community Affairs", 1990.

2) Gary W Heinke, PhD, P. Eng., Jeffrey Wong, "An Update of the Status of Solid Waste Management in Communities in the Northwest Territories, GNWT, Department of Municipal and Community Affairs", 1990.

3) Transmode Consultants, "Guidelines for the Siting of Solid Waste Disposal Sites in the Vicinity of Community Airports in the Northwest Territories, GNWT, Department of Municipal and Community Affairs", 1990.

4) American Society of Civil Engineers, "Cold Regions Utilities Monograph, Third Edition",1996.

APPENDIX A
Terms of Reference

Colin H

Nunavut

Request for Proposals

The Government of Nunavut (GN), Department of Community Government and Transportation is requesting Proposals from qualified proposers for the provisions of Engineering consulting services as outlined in this document.

Table of Contents

Standard Instructions to Proponents

July 18

1. Proposals must be received before 4:00 pm local time on ~~July 11, 2003~~ at:

Regional Director, Baffin Region
Government of Nunavut
Department of Community Government and Transportation

Delivered to Second floor, GNO Building
P. O. Box 330, Cape Dorset, NU, X0A 0C0

In care of: Sameh Elsayed, P.Eng.
Municipal Planning Engineer
Baffin Region
Telephone: *(867) 897 3616*
Fax: *(867) 897 3633/3632*

Proposals received after the exact time and date noted above will be rejected.

The original and (2) copies are to be submitted, quoting (*Cape Dorset Solid Waste Improvement)* on the outside of the envelope or package.

After the closing time, only the identity and addresses of the proponents will be posted.

2. The GN will not be responsible for any proposal that:
   - Does not indicate the Request for Proposal reference and proposer's name;
   - Is delivered to any address other than that provided above.

3. Facsimile transmitted proposals will be accepted under the following conditions:

   - the GN will not accept liability for any claim, demand or other actions for any reason should a facsimile transmission be interrupted, not received in its entirety, received after stated closing time and date, received by any other facsimile unit other than that stated herein, or for any other reasons;
   - the GN cannot guarantee the complete confidentiality of information contained in the proposal received by facsimile;
   - the proposer shall submit an original proposal and *(2)* copies to the address stated herein immediately following the transmission of the facsimile.

4. All questions or enquiries concerning this Request for Proposals must be in writing and be submitted to the address provided above no later than five (5) calendar days prior to the proposal deadline. Verbal responses to any enquiry cannot be relied upon and are not binding on either party. The GN contact for this project is:

Sameh Elsayed, P.Eng.
Municipal Planning Engineer.
Baffin Region, Cape Dorset.
Telephone: 867 897 3616,
Fax: 867 897 3633/3632.
e-mail: selsayed@gov.nu.ca

5. This is not a Request for Tenders or otherwise an offer. The GN is not bound to accept either the proposal which provides for the lowest cost or price to the GN, or any proposal of those submitted.

6. If a contract is to be awarded as a result of this request for proposals, it will be awarded to the proposer who is responsible and whose proposal provides the best potential value to the GN. Responsible means the capability in all respects to perform fully the contract requirements and the integrity and reliability to assure performance of the contract obligations.

7. Notice in writing to a proposer and the subsequent execution of a written agreement shall constitute the making of a contract. No proposer will acquire any legal or equitable rights or privileges whatever until the contract is signed.

8. The contract will be in the form of the standard "GN Architectural/Engineering Services Agreement" and it will contain the relevant provisions of this Request for Proposals, the accepted proposal as well as such other terms as may be mutually agreed upon, whether arising from the accepted proposal or as a result of any negotiations prior or subsequent thereto. The GN reserves the right to negotiate modifications with any proposer who has submitted a proposal.
   The standard GN Architectural/Engineering Services Agreement is attached.

9. In the event of any inconsistency between this Request for Proposal, and the ensuing contract, the contract shall govern.

10. The GN has the right to cancel this Request for Proposals at any time and to reissue it for any reason whatsoever, without incurring any liability and no proposer will have any claim against the GN as a consequence.

11. Any amendments made by the GN to the Request for Proposals will be issued in writing and sent to all who have received the documents.

12. The GN is not liable for any costs of preparation or presentation of proposals.

13. An evaluation committee will review each proposal. The GN reserves the exclusive right to determine the qualitative aspects of all proposals relative to the evaluation criteria.

14. Proposers may not amend their proposal after the closing date and time but may withdraw their proposal at any time prior to acceptance.

15. Proposals will be evaluated as soon as practicable after the closing time. No detail of any proposal will be made public except the names of all parties submitting proposals.

16. Provisions of the Government of Nunavut Nunavummi Nangminiqaqtunik Ikajuuti (NNI) Policy will be applied in the evaluation of all proposals.

17. The proposal and accompanying documentation submitted by the proposers are the property of the GN and will not be returned.

Terms of Reference

Background

The hamlet of Cape Dorset has a Solid Waste Disposal site as well as a metal dumpsite adjacent to the beach areas which are currently in operation. The existing solid waste facility in the hamlet of Cape Dorset requires consolidation and expansion to meet the 20-year demands.

During inspections of the community, the Environmental Health Officer has indicated that the current method of managing bulky metal waste is unacceptable (under the Health Act). As a result, a multi-year project is required to review options (planning) and implement an acceptable solution for the long term management of bulky metal wastes in the community and to meet the legislative requirements of the Health Act.

The metal dump site is adjacent to the beach and is not organized leading to scrap metal and old equipment spread all over the site. The study is to provide a detailed plan of how to handle the existing situation and to give directions on how to reduce the volume of the scrap metals and therefore increase the capacity of the dumpsite to meet the required 20-year capacity.

In addition, the community employs the typical Modified Landfill approach to solid waste management. This planning study will also assess the capacity of the existing site and make any recommendations for long term improvements.

The existing solid waste dump site is running out of capacity due to its fairly small size. Furthermore, frequently spring runoff finds its way through the dumpsite. A study is to be undertaken to outline the required works.

Scope of Work

The services of a consultant are required to provide a complete study of the best management options available for the hamlet of Cape Dorset including:

1) Survey and study the existing sites to determine the feasibility of upgrading/expanding these sites to accommodate the projected 20-year volume.

2) The possibility of a new alternate site(s) to accommodate the required 20-year volume.

3) Any other economically feasible solution.

The Engineering Services shall be delivered as described in Section E of the Standard GN Architectural / Engineering Services Agreement

Owner Supplied Services:

The GN will:
Provide copies of existing studies. Facilitate community visit and arrange for required information and local contacts.

Proposal Evaluation

Selection Methods

When an alternative is proposed regarding any specific requirement, it will be evaluated to ensure that the desired results will be achieved.

Proposers should be aware that certain mandatory requirements might have been set out in the Terms of Reference. Proposals that fail to provide these requirements will be deemed not responsible and will not be evaluated.

Rating

The evaluation team will utilize specific criteria to rate each proposal. Ratings will be confidential and no details will be released to any of the other proposers.

Each proposal will be evaluated using the standard "Architecture/Engineering Consultant Proposal Rating Schedule included as part of this proposal request." See Appendix "B"

Proposal Content

The following information should be provided in the proposal. This information will be utilised in evaluating each proposal submitted.

Project Team (Proposed Personnel)

The proposer is to describe the capability of the resources proposed to meet the requirements described in the terms of reference.
The proposal shall include brief resumes for the proposed sub consultants and project team members with a description indicating how, and in what ways the proposed resource satisfies the needs identified in the Request for Proposal.

Methodology

Describe how the proposer intends to achieve the project's objectives. Demonstrate understanding of the work involved, community input, budget schedule and other significant factors to be considered. It is expected that the methodology and schedule will demonstrate how the proponent will proceed and how much time each stage is expected to take.

Past Relevant Company Experience

Provide a short list of projects in which the Consultant and Sub consultants have performed similar work.

Schedule

How closely the proponent's schedule meets the project requirements in a logical manner delivering a quality service.

Fees and Expenses

The proposal must include cost information as follows:

A lump sum fixed fee for study, schematic design, design development and bidding phases.

A lump sum fixed fee for non-field expenses such as telephone, facsimile, courier, copy, photographic, postage, computer and tender document printing costs.

Cost details, daily rate schedule and per diem rates for project team members for out of office services. Provide a detailed proposal for out of office services.

Prices bid must be stated in actual dollars and cents expressed in Canadian funds.

The Government of Nunavut will pay the Goods and Services Tax (GST); however, include GST separately in your proposed pricing.

The proposal must include an estimated total contract amount.

Local and Nunavut

Identify the place of residence of each member of the team, their home office location and provide an estimate of the percentage of work that will be performed in Nunavut and the communities. Provide an estimate of the percentage of the total work for the project that will be completed by Nunavut businesses and businesses local in the subject community for the project.

Inuit Content

In compliance with Article 24 of the Nunavut Land Claim Agreement, the Government of Nunavut will provide consideration for the use of Inuit goods and services and labour. Proponents should describe fully the proposed Inuit content. This Inuit content will be the percentage of work for this project to be completed by Inuit firms listed on the registry of Inuit firms maintained by Nunavut Tunngavik (NTI), and the amount of Inuit employment created related to this project.

APPENDIX B
Background Information from Regulators

Department of Health & Social Services: Baffin
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Okoa Kavamat Monakhikakvilikiot Olasilikiot
Ministère de la Santé et des Services Sociaux
P.O. Box 1000; ᑎᑎᖅᑲᒃᑯᕕᒃ 1000; C.P. 1000
Iqaluit, NU ᐃᖃᓗᐃᑦ, ᓄᓇᕗᑦ X0A 0H0
Phone: ᐅᖃᓘᑦ: Fonla (867) 975-5700 Fax: ᓱᑲᔪᒃᑯᑦ: Faxkot:(867) 975-5705

February 16, 2001

FILE

Hayward Sims – SAO
Municipality of Cape Dorset
PO Box 30
Cape Dorset, NU
X0A 0C0

Dear Mr. Sims,

This report is to inform you of deficiencies noted during the February 12, 2001 Environmental Health Inspection of Cape Dorset's Municipal Facilities as per the *Public Health Act* and pursuant regulations.

Water Supply

1. Currently, the Municipality is measuring the level of "Total Chlorine" present in the drinking water; this is a measure of the amount of chlorine that has been added to the water. Section 16 (1) of the *Public Water Supply Regulations* requires the measurement of "Free Chlorine" in drinking water; this parameter measures the water's ability to disinfect. The Municipality must acquire different test chemicals so that free chlorine can be gauged. The concentration of free chlorine must always be maintained at 0.2 mg/l in drinking water to ensure its utmost safety.

2. A new supply line is required for the pump station. The necessary construction supplies are in place and the Environmental Health Office has received a copy of the proposed plans; the project should commence as soon as possible.

Sewage Disposal

3. Municipal sewage is being deposited in a small makeshift disposal pit; it appears that the sewage is then migrating under the road and can be seen pooling down toward the ocean's edge. Clearly, this situation is less then ideal. There appears to be little to no treatment of the sewage that is deposited into this system.

4. The two previous lagoon locations have been abandoned, as they were prone to wash out once the spring runoff begins. A new lagoon site should be sought as soon as possible; the existing set up is inadequate for the needs of Cape Dorset.

Landfill

5. The existing landfill site is situated in a fairly large depression; while this arrangement contains most of the lighter waste from being blown out of this location a fence must be erected to totally contain the area.

6. Only clean-burning organic waste (such as untreated wood, paper products, food, cardboard etc.) can be incinerated at the landfill. All other wastes, particularly hazardous waste, must be segregated and not burned.

Arena

7. Both washrooms have numerous wooden patches covering repairs on the walls. There must be no bare wood present in the washrooms, it cannot be effectively cleaned. The wood must be painted or finished so that it is smooth, tight and non-absorbent (easily cleaned).

8. Before the kitchen can be opened for food service it must be given a thorough cleaning. Liquid soap and paper towels must be supplied for hand-washing purposes.

Community Hall

9. Washroom walls are in need of repair and paint, there is quite a bit of graffiti on them. Liquid soap and paper towels must be provided at all times.

10. Before this kitchen is used for food service it must be given a thorough cleaning. including all fixtures and shelving.

If you have any questions or concerns about this report, please don't hesitate to contact me.

Yours truly,

Shaun Mackie
Environmental Health Officer
Nunavut Health and Social Services
Po Box 1000, Stn. 1046
Iqaluit, NU X0A 0H0
Tel: (867) 979-7654
Fax: (867) 979-7659
Email: smackie@gov.nu.ca

Philip Reeve, back Oct 14/03. '24
975-4800

OR Bruce Trotter l/m 16 oct/03
975-5764

cc.

Doug Caughill – Municipality of Cape Dorset

Bob Wortman – Cape Dorset Housing Association

Doug Sitland – Community Government and Transportation

Wanda Joy – mat leave

INAC, Nunavut District Office
P. O. Box 100
Iqaluit, NU X0A 0H0

FAX TRANSMISSION

Date: October 7, 2003

To: **Fax:** (403) 215-8889
Craig Hansen
Dillon Consulting

From: Scott Stewart

Re: Cape Dorset Water Licence Inspection Report

Hello Craig,

This fax contains a copy of the Cape Dorset water licence inspection report for the inspection performed on July 21, 2003. If you have any questions or concerns please contact me.

Sincerely,

Scott Stewart
Water Resource Officer
INAC-Nunavut Field Operations
Ph:(867) 975-4289
Fax:(867) 979-6445

Indian and Northern Affairs Canada
www.inac.gc.ca
Affaires indiennes et du Nord Canada
www.ainc.gc.ca

Nunavut District Office
P.O. Box 100
Iqaluit, NU, X0A 0H0

Tel: (867) 975-4298
Fax:(867) 979-6445

Your file - Votre reference

Our file - Notre référence
NWB3CAP0207

October 6, 2003

Art Stewart
Senior Administrative Officer (SAO)
Hamlet of Cape Dorset
Cape Dorset, NU X0A 0C0
Ph: 867 897-8943
Fax: 867 897-8030

Re: July 21, 2003 Municipal Water Licence Inspection

I would like to thank the SAO, Art Stewart and Hamlet Foreman, Leon Nason for their time and assistance during the Hamlet of Cape Dorset Water Licence Inspection. We were required to work well past 5:00 pm and their patience and cooperation was greatly appreciated.

In the course of the inspection a number of concerns were identified relating to the Hamlet's sewage treatment and solid waste disposal. The potable water for the community is well monitored and the chlorination system is well maintained.

Water Supply (Cap-1)

In order to eliminate difficulties experienced with the pipeline between Tee Lake and the pumphouse (figure 1) a contractor was hired to build a replacement/back up pipeline. The new pipeline is now in place, however, Mr Nason expressed concern that the lack of galvanized hinges, exposed wires and inadequate allowance for shifting of the pipeline could significantly reduce its useful life. He felt that addressing these problems would greatly increase the longevity and functionality of the new pipeline.

Mr Nason took us to Tee Lake, the source of freshwater in Cape Dorset, where we discussed methods for protecting Tee lake from anthropogenic contamination. To this end, Mr Nason committed to remove garbage and old piping from the edge of Tee lake as well as to put up signage identifying Tee Lake as the freshwater source for the Hamlet of Cape Dorset.

Analysis of water samples from Tee Lake provided results within Guidelines for Canadian Drinking Water Quality, however the turbidity of the potable water in Tee Lake is equal to the Maximum Allowable Concentration according to the Guidelines for Canadian Drinking Water Quality (1.0 mg/l). High turbidity values

Canada

are a concern because they may reduce the effectiveness of chlorination in eliminating microbes harmful to human health.

The pumphouse and chlorination system are well maintained and Mr Nason is committed to maintaining daily records of water use and chlorine residual concentration in the water supply.

Solid waste disposal:
Metal Dump (CAP2)
The current state of the metal dump is unacceptable. There is no segregation of materials at the site (figure 6) and no containment of hazardous materials. Tires, solvent containers, dead animals and used 12V batteries were all visible at the site. No measures are in place to prevent contaminated runoff from flowing into Telik Inlet and water was visible seeping out of the metal dump. A sample of the seep was taken at coordinates N 64°13'36.1" W076°34'19.6" and preliminary results are attached to this report.

According to results obtained from Taiga Laboratory in Yellowknife; Iron with a concentration of 2253ug/L is much greater than the Canadian Environmental Quality Guideline for the Protection of Freshwater Aquatic Life (CEQGPAL, 300ug/L) but no guideline has yet been developed for Marine Aquatic Life. Phenols were measured at a concentration of 7.4 ug/l which also exceeds the Canadian Environmental Quality Guideline for the Protection of Freshwater Aquatic Life (4ug/l). The remainder of parameters measured were within Canadian Guidelines.

Art Stewart indicated that the metal dump is scheduled for clean up in the early fall of 2003. A clean up of the metal waste disposal sight should include (1) segregation of materials, (2) containment of hazardous waste, (3) diversion of run-off (4) and containment of precipitation to prevent contamination of Telik Inlet.

Burn and Bury Landfill
There is a significant amount of runoff passing through the landfill. This runoff along with precipitation, needs to be contained to ensure it does not carry contaminants into Telik Inlet. Currently, water running off the hills passes directly through the landfill before it continues on toward the Inlet. Signage needs to be put up identifying the landfill site and a fence needs to be built around the landfill to help contain waste.

Sewage Disposal (CAP3)
Single Cell Lagoon
The old single celled sewage lagoon was brought back into service because of the problems with the 3-celled sewage lagoon. However, there is a serious leak in the old lagoon and it's capacity is not sufficient to support the community. In an

effort to increase the lagoons retention time the municipality placed a row of three berms at the bottom of the lagoon between the leaking lagoon and Telik Inlet (figure 3). The berms have created some ponding and it is possible that they improve the quality of the sewage effluent before it reaches Telik Inlet but it is obviously not an acceptable solution to the problem. Water observed running into Telik Inlet is greyish and foamy with a noticeable odour. A considerable amount of algae is visible in the stream and grass is growing quite thickly below the berms almost all the way to Telik Inlet. The increased plant and algae growth is consistent with high nutrient content consistent with sewage effluent. Constantine Bodykevich advised Art Stewart that the flow needs to be stopped or at the very least, reduced significantly.

3-Cell Lagoon

The municipality has attempted to repair the three cell sewage lagoon but so far the repairs have not been effective (figure 4). There is a small leak from Cell one along the road which then flows into cell two from the northeast side. There is also a ditch on the opposite side of cell two that runs from an overflow culvert in cell one, parallel to cells two and three, before flowing down to Telik Inlet. There was only a slight trickle of water originating in the landfill but if cell one were operating effluent would run directly from cell one into Telik Inlet. According to Art Stewart the overflow culvert was designed to run into cell two but it did not appear to be working properly. Repairs on the berm and overflow culvert between cells two and three appeared to be near completion but the berm was still quite unconsolidated and I suspect that spring runoff will likely wash it away again.

Repairs have also been attempted on the final berm in cell three but effluent was still visible flowing from beneath the final berm into Telik Inlet. The Municipal Engineer, Sameh Elsayed suggested that the rapidly flowing water below cell three may be a result of an underground spring. This did not appear to be the case however, as the water was quite grey and foamy with algal growth on the rocks and a very strong odour that I would associate with sewage effluent.

Analysis performed by Taiga Laboratory in Yellowknife showed the water running below the final berm of the sewage lagoon to have some characteristics consistent with primary sewage effluent (Environment Canada website). The effluent was within the parameters of the water licence for the parameters tested but it is notable that time constraints prevented analysis for BOD and Fecal Coliforms, both required parameters in the water licence. Samples of the outflow showed that it was quite high in Cadmium 0.1ug/l (Canadian Water Quality Guidelines for the Protection of Aquatic Life of 0.12 ug/l) and Iron 6210 ug/l (no guideline) but Ammonia -Nitrogen (17.4 mg/l) and Phosphorous were quite low.

Non-compliance of the Act:
The municipality is aware that the current state of sewage treatment in the community is unacceptable. A comparison of the relative advantages of a mechanical treatment plant and a new sewage lagoon suggests that the three cell lagoon will be in service for at least another two years (Dillon Consulting 2003). The latest lagoon was improperly designed or constructed and the result has been a relatively constant discharge of sewage effluent into Telik Inlet. In addition, the old lagoon has been brought back into use and it does not have sufficient retention time or capacity to adequately treat the communities sewage.

As per the Water Licence issued to the Hamlet of Cape Dorset September 1, 2002; the Hamlet must provide an Operation and Maintenance Manual for operating and maintaining waste disposal sites. The Hamlet must also maintain, with appropriate signage, a Surveillance Network Program (SNP) involving monthly sampling of CAP-2 and CAP-3 between May 1 and August 31. The Hamlet of Cape Dorset must also develop a Quality Assurance/ Quality Control Plan to ensure that samples taken as part of the SNP maintain a high quality. Development of a new sewage treatment facility or simply decommissioning of the original sewage lagoon will require an Abandonment and Restoration Plan. As of yet, the Hamlet of Cape Dorset has not met these requirements.

I would also like to remind the licensee that an annual report providing detailed information on municipal activities pertaining to the Water Licence, must be provided to the Nunavut Water Board by March 31, 2004. Please find the outline for the annual report attached to this document.

Although the Hamlets main priority must be to ensure adequate sewage treatment for the community, I expect that the other outstanding requirements of the Water Licence will also be addressed. If you have any questions or concerns, please feel free to contact me.

Sincerely,

Scott Stewart

Scott Stewart
Water Resource Officer
INAC - Nunavut District Office
P.O. Box 100, Iqaluit, NU, X0A 0H0
(867) 975-4289
(867) 975-6445
stewarts@inac.gc.ca

References

Dillon Consulting. 2003. *Government of Nunavut Sewage Treatment Alternatives for the Hamlet of Cape Dorset, Nunavut.* Dillon Consulting Limited #2450, 101-6th Avenue SW Calgary, Alberta T2P 3P4.

Environment Canada website
http://www.ec.gc.ca/soer-ree/English/soer/MWWE1.cfm
Municipal Wastewater Effluents: What they are and what they contain. Url accessed October 1, 2003.

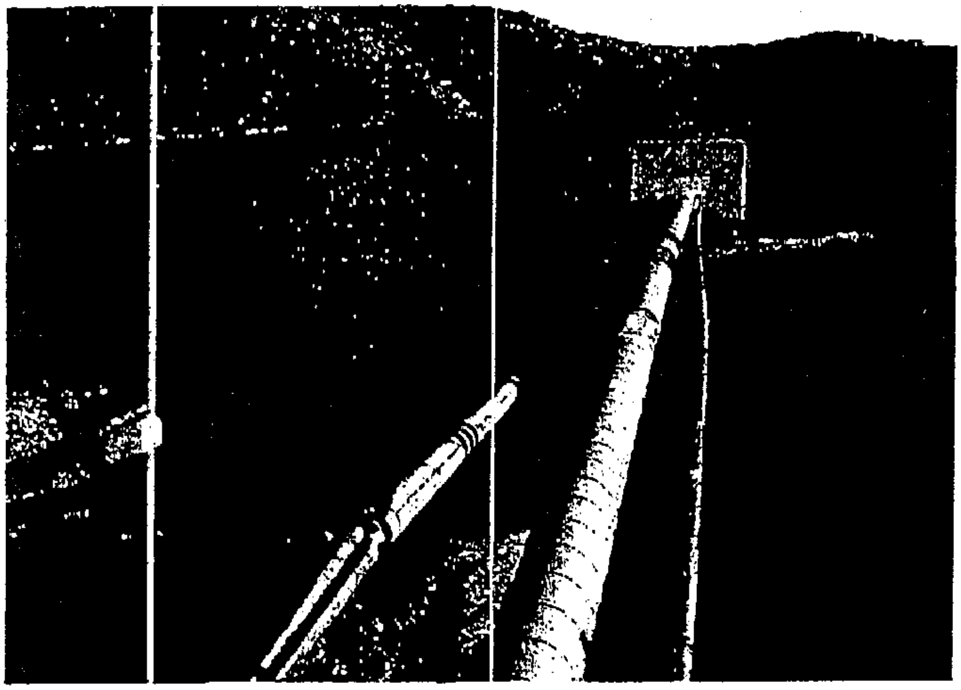

Figure 1.Cape Dorset pipeline running from Tee Lake to the municipal pumphouse.

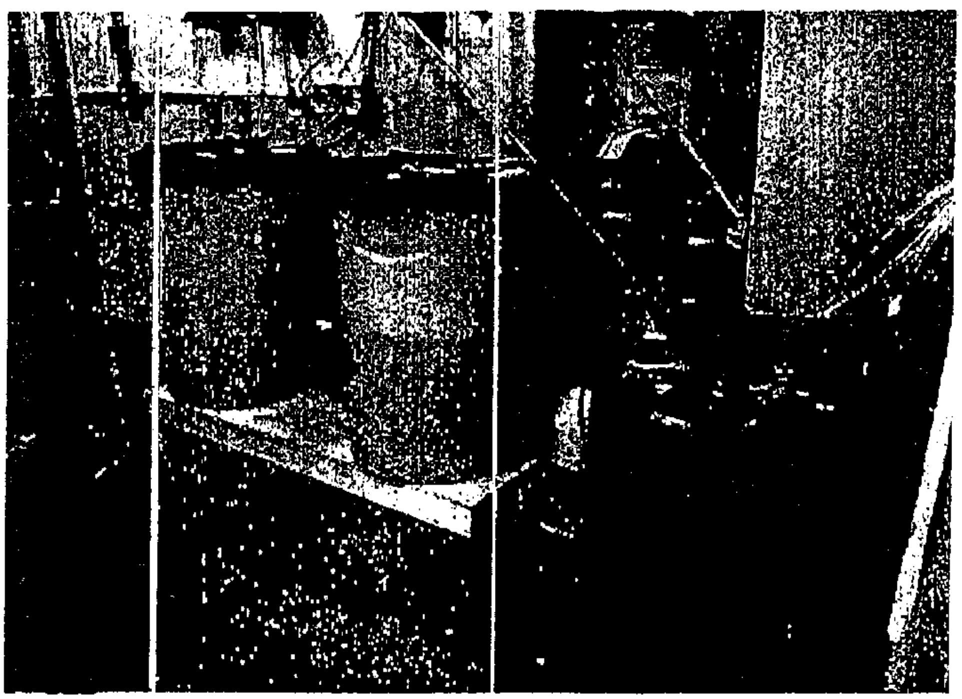

Figure 2. Chlorination system at the Cape Dorset pumphouse.

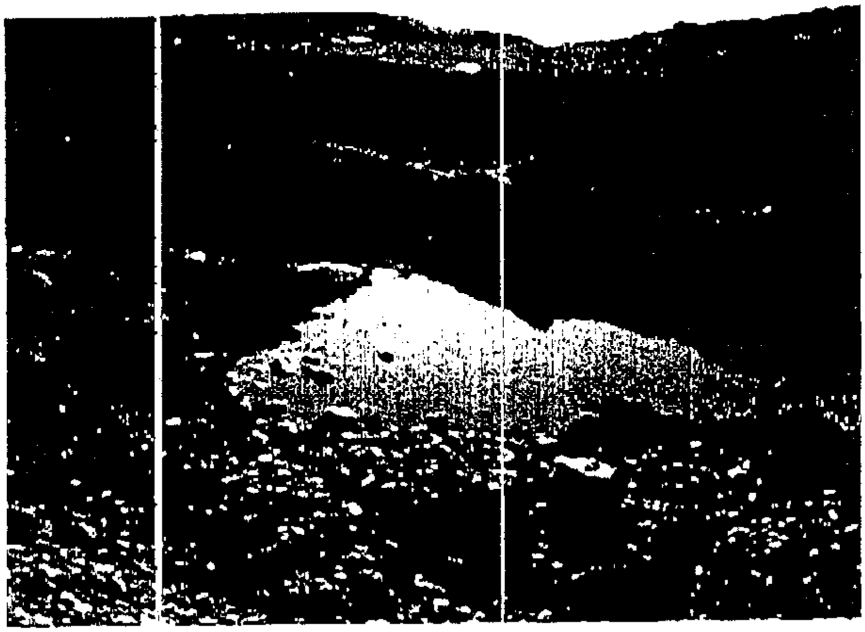

Figure 3. Berms placed between the old sewage lagoon in Cape Dorset and Telik Inlet to increase the lagoons "retention time".

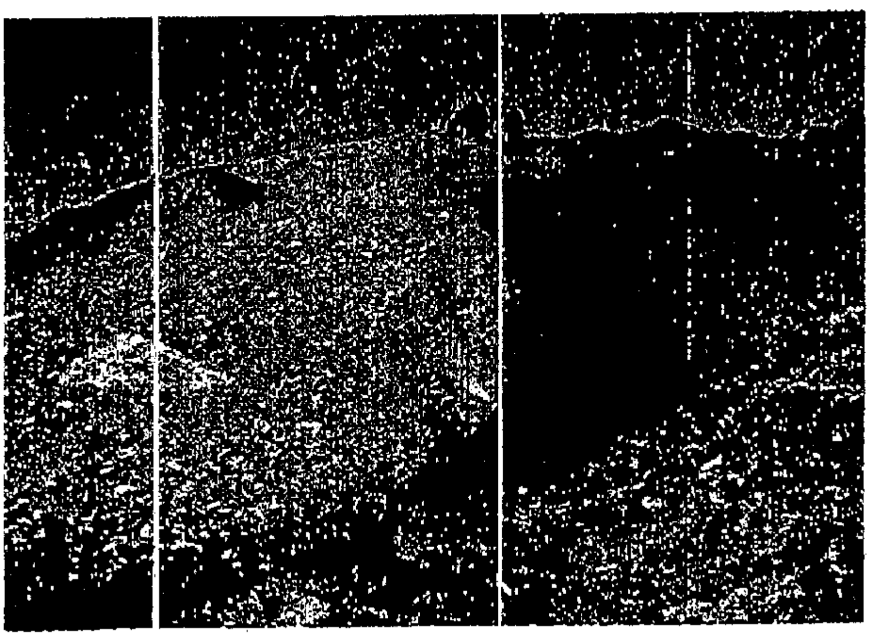

Figure 4. Attempted repairs to the 3rd cell in the Cape Dorset sewage lagoon.

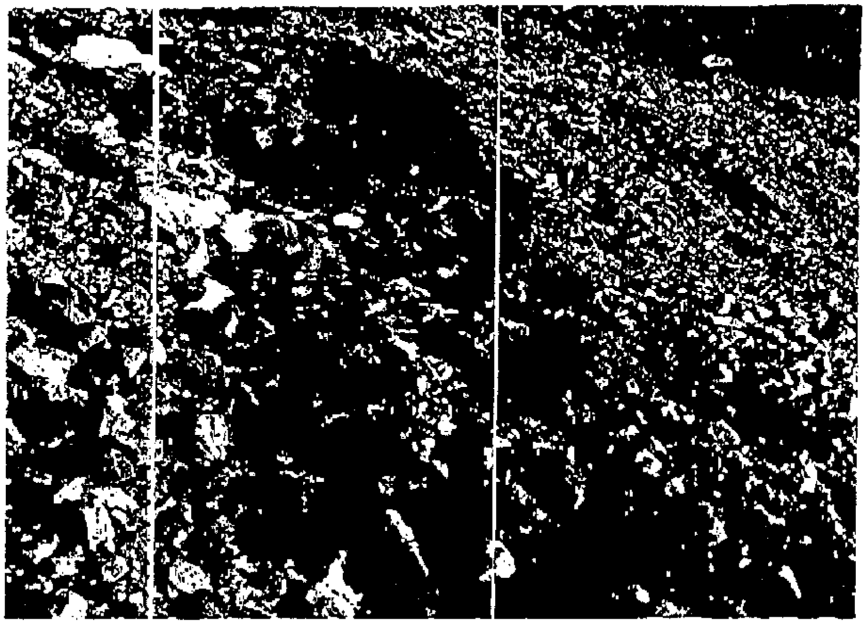

Figure 5. Flow observed below the 3rd cell in the Cape Dorset sewage lagoon.

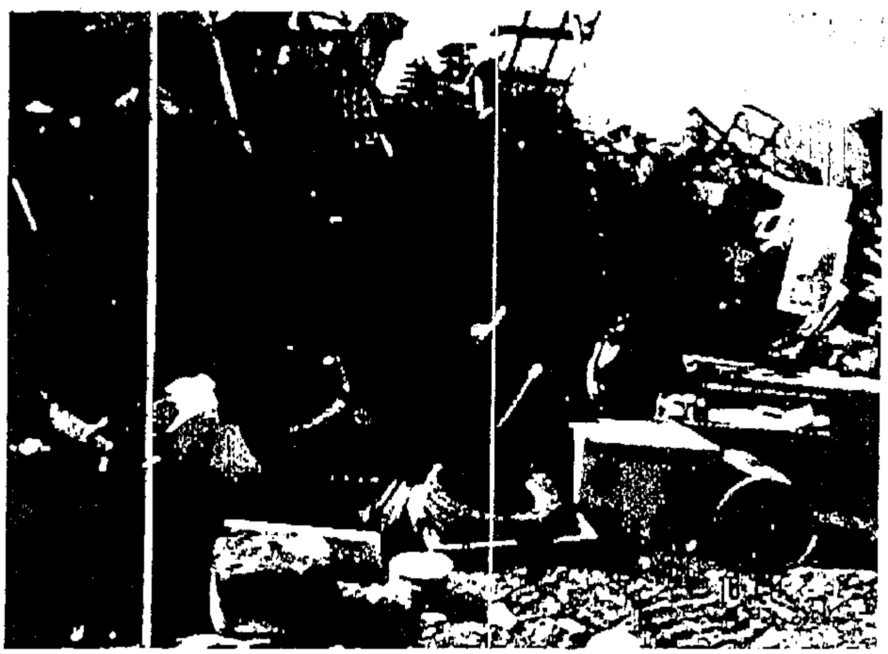

Figure 6. Unsegregated materials visible in the Cape Dorset Metal dump.

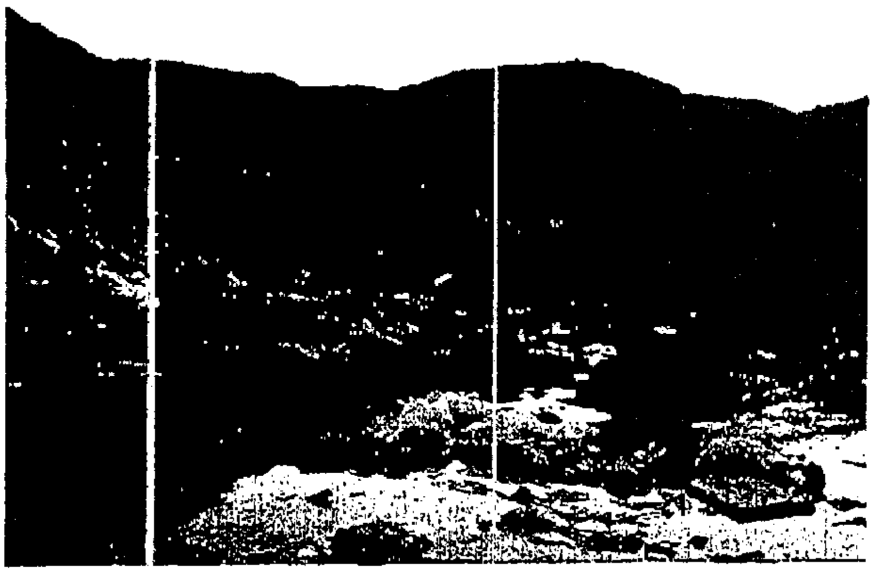

Figure 7. Runoff passing through the Cape Dorset landfill.

Indian and Northern Affairs Canada / Affaires indiennes et du Nord Canada

INAC, Nunavut District
P.O. Box 100
Iqaluit, NU
X0A 0H0

CANADA REMEMBERS
LE CANADA SE SOUVIENT
tel: (867) 975-4275
fax: (867) 979-6445

(unlicenced)

January 15, 2001.

Hayward Sims
Senior Administrative Officer
Municipality of Cape Dorset
P.O. Box 30
Cape Dorset, NU X0A 0C0

<u>September 5, 2000 Municipal Water Use Inspection - Report</u>

Firstly, I wish to thank Dan Holmes for the much appreciated time and assistance provided during the tour of the Municipality's water use and waste disposal facilities. Attached for your records is the Municipal Water Use Inspection Report pertaining to the September 5, 2000 inspection; although the water and waste operations appear generally well managed, definite concern stems from the state of the facilities themselves. As such, the following considerations were noted, and will need to be addressed:

- **Sewage waste disposal:** At the time of the inspection, the uppermost cell of the new sewage disposal facility was filled to capacity (figure 1), and effluent was decanting downslope (figure 2). As extensive spring runoff essentially rendered the second cell useless by washing out its berms (figure 3), sewage effluent from the first cell of the new sewage disposal facility (figure 4) basically flowed unhindered through the breached lower cell (figure 5), into receiving waters (figure 6). Nevertheless, the attached analytical results relating to the discharge from the new sewage disposal facility reveal relatively acceptable concentrations of tested parameters. However, due to the excessive springtime erosion along the current sewage and solid waste disposal valley, the Municipality had to temporarily revert to the old, undersized sewage lagoon (figure 7) although it admittedly provides very minimal effluent treatment prior to discharge (figure 8).

This being said, the Inspector strongly questions the viability of the new sewage disposal facility. Indeed, the recurring nature of runoff-related damage undeniably jeopardizes the effectiveness of the facility. Accordingly, it is the Inspector's belief that resources annually directed to patch up work might be more suitably allocated to the investigation of alternate long-term locations, or perhaps even technologies, of sewage treatment facilities appropriate for the Municipality. Thus, by copy of this letter to Community Government and Transportation (GC&T), the Inspector trusts that this avenue will at least be considered.

- Solid waste disposal: Much of the above erosion and runoff issues equally apply to the solid waste disposal facility situated within the same drainage valley. Although the wastepile is well compacted and covered, and household combustible waste appears to be burned on a regular basis (figure 9), concerns remain over the quantity of runoff flowing through the site and its implications in regards to leachate production (figure 10). However, the attached analytical results indicate that the sampled leachate from the solid waste disposal facility was, at the time of the inspection, relatively benign. On a side note, should erosion be successfully controlled, the instalment of a perimeter fence would further contain the waste within the facility, and likely minimize complications related to wildlife attraction.

In parallel, both condition and location of the bulky metal wastes disposal site are causes for concern, although the attached analytical results are not disturbing. Indeed, an impressive volume of bulky wastes, the toe of which lies below the high tide mark, is accumulated along a section of shoreline (figures 11-12). Further, hazardous material is simply discarded at the site, since no specific form of containment is provided. Consequently, the inspector commends the Municipality for recognizing the need to cleanup the site, and for taking appropriate steps in this direction; such as contacting the EcoAction community program towards the restoration of this and other waste disposal sites within municipal boundaries, and investigating with the Canadian Coast Guards the possibility of shipping out bulky metal wastes on sealift backhauls.

Below high tide
haz waste

- **Non-compliance of Act:** During the inspection, the importance of a Water licence was discussed, and the Inspector was under the impression that the Municipality would follow through by submitting an application to the Nunavut Water Board (NWB). However, to the Inspector's knowledge, the NWB has yet to receive such a document. Therefore, the Inspector wishes to reiterate that a Water licence is not a mere paperwork formality, but constitutes a legal requirement under both the *Northwest Territories Waters Act* and the *Nunavut Land Claims Agreement*. INAC and/or other implicated agencies can, if required, provide assistance for the completion of this process.

Please feel free to contact me at (867) 975-4298 or lavalleep@inac.gc.ca should any questions/comments arise.

Sincerely,

Philippe Lavallée
Water Resources Officer
INAC, Nunavut District

c.c. - Nunavut Water Board, Gjoa Haven
- CG&T, Iqaluit (Doug Sitland)
- Baffin Health & Social Services, Iqaluit (Bonnie Segal)
- EC Environmental Protection, Yellowknife (Anne Wilson)

[redacted]

APPENDIX C
Bulky Waste Site Photos

Photo No. 1: Pile 'A' View North East (CG & T Photo)

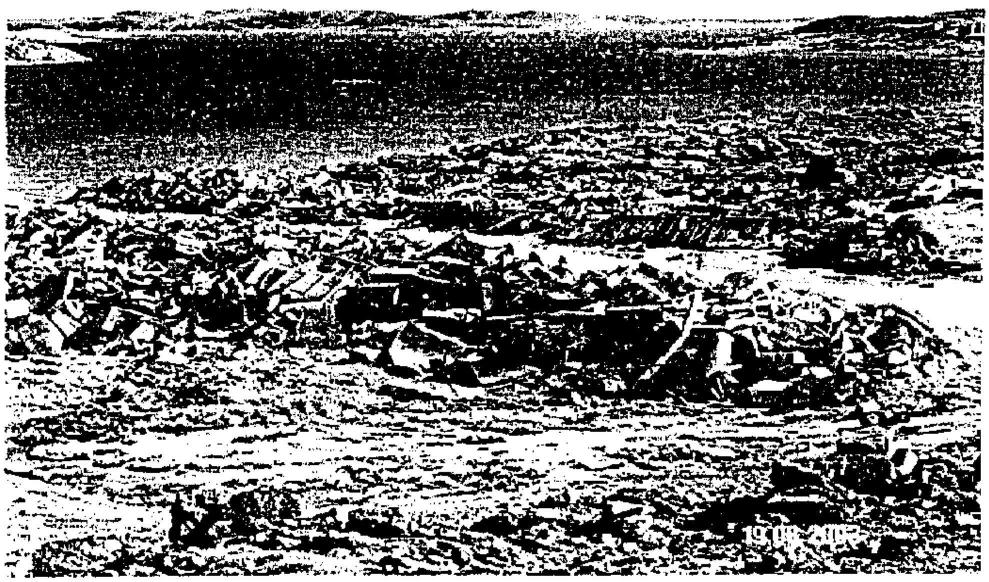

Photo No. 2: Pile 'A' In Foreground, Pile 'B' in Background (CG & T Photo)

DILLON CONSULTING	PROJECT CAPE DORSET SOLID WASTE MANAGEMENT STUDY	PROJECT NO. 032191
		DATE August 2003
	TITLE BULKY WASTE SITE PHOTOS	FIGURE NO

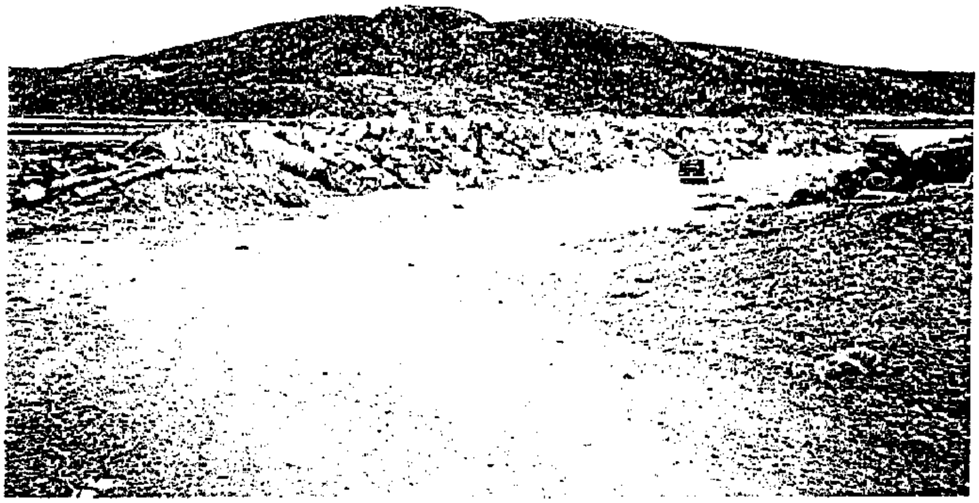

Photo No. 3: Pile 'A' View North

Photo No. 4: Pile 'A' View South West

DILLON CONSULTING	PROJECT CAPE DORSET SOLID WASTE MANAGEMENT STUDY	PROJECT NO. 032191
		DATE August 2003
	TITLE BULKY WASTE SITE PHOTOS	FIGURE NO

Photo No. 5: Pile 'A' View West

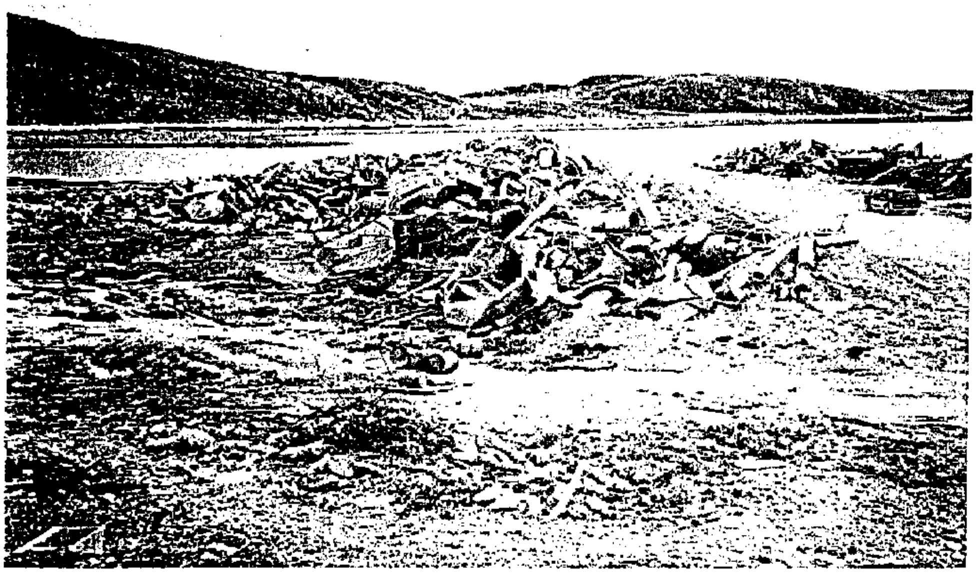

Photo No. 6: Pile 'A' View North

DILLON CONSULTING	PROJECT CAPE DORSET SOLID WASTE MANAGEMENT STUDY	PROJECT NO. 032191 DATE August 2003
	TITLE BULKY WASTE SITE PHOTOS	FIGURE NO.

Photo No. 7: Pile 'B' View North East

Photo No. 8: Pile 'B' View South

DILLON CONSULTING	PROJECT CAPE DORSET SOLID WASTE MANAGEMENT STUDY	PROJECT NO. 032191
		DATE August 2003
	TITLE BULKY WASTE SITE PHOTOS	FIGURE NO.

Photo No. 9: Pile 'B' Shoreline View West

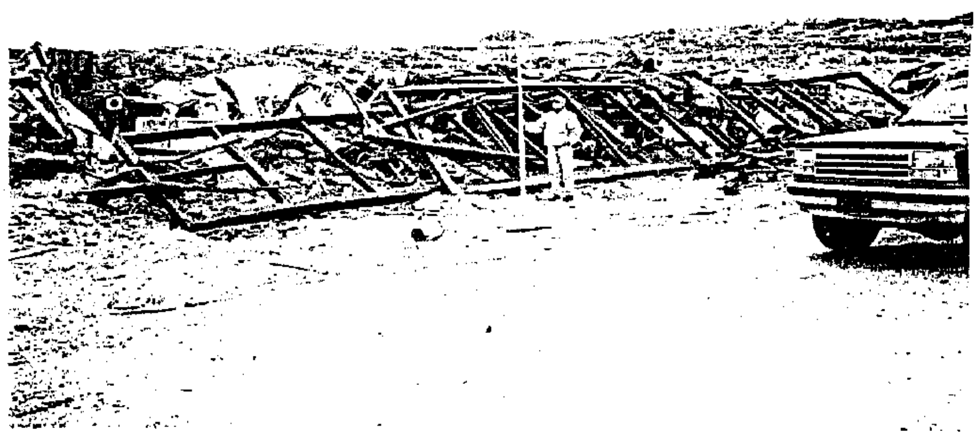

Photo No. 10: Pile 'B' - View South East of Structural Steel Waste

DILLON CONSULTING	PROJECT	PROJECT NO
	CAPE DORSET SOLID WASTE MANAGEMENT STUDY	032191
		DATE August 2003
	TITLE BULKY WASTE SITE PHOTOS	FIGURE NO

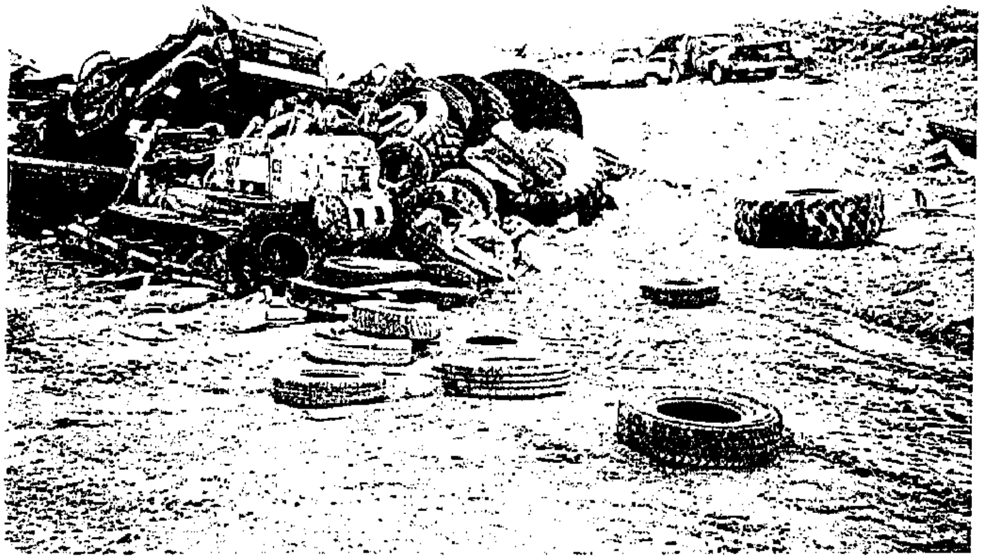

Photo No. 11: Pile 'B' Rubber Tires at South End

Photo No. 12: Pile 'B' Rear Side - View NW

DILLON CONSULTING	PROJECT CAPE DORSET SOLID WASTE MANAGEMENT STUDY	PROJECT NO. 032191
		DATE August 2003
	TITLE BULKY WASTE SITE PHOTOS	FIGURE NO

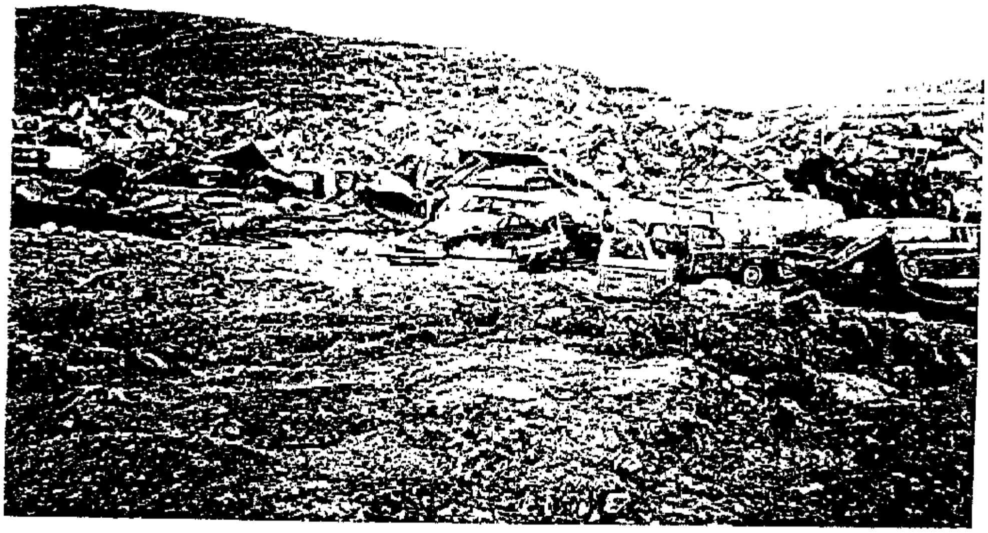

Photo No. 13: Pile 'B' Rear Side - View South West

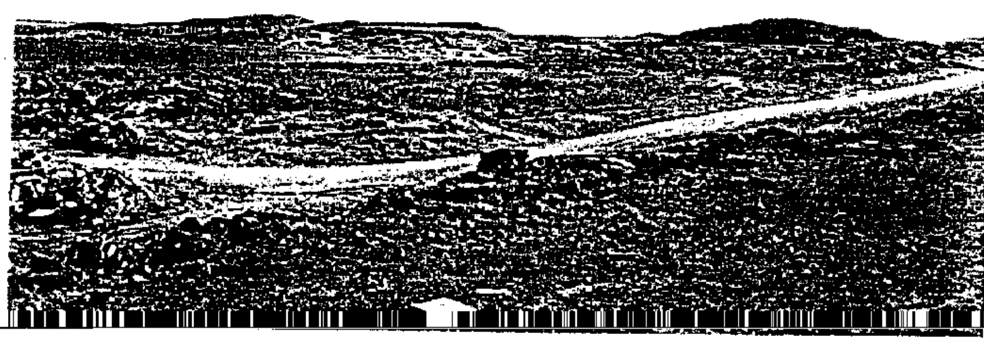

Photo No. 14: Proposed Permanent Bulky Waste Area (Between Piles 'B' and 'C' (CG & T Photo)

DILLON CONSULTING	PROJECT CAPE DORSET SOLID WASTE MANAGEMENT STUDY	PROJECT NO. 032191
		DATE August 2003
	TITLE BULKY WASTE SITE PHOTOS	FIGURE NO

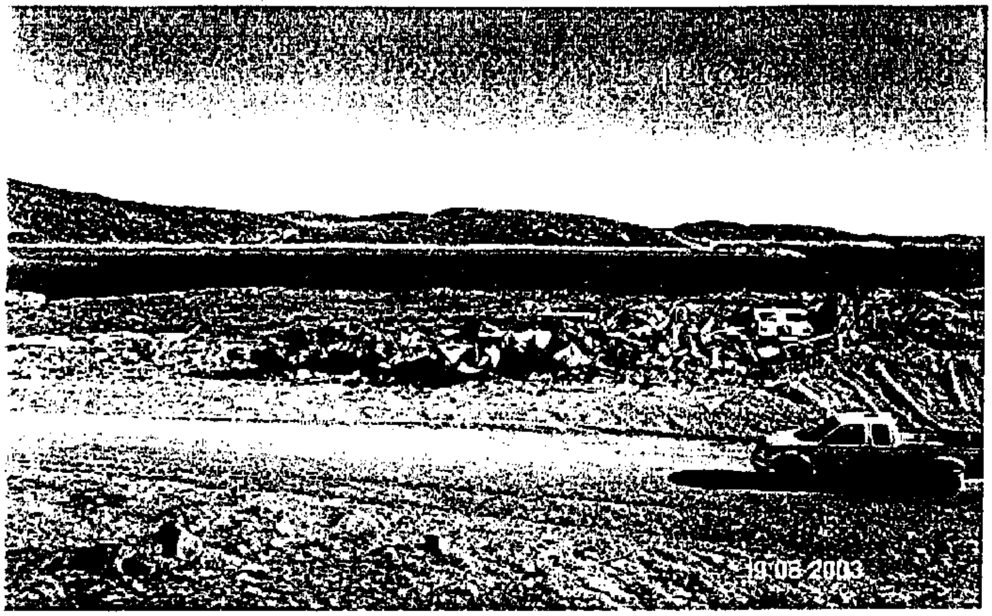

Photo No. 15: Pile 'C' Front Side - View North (CG & T Photo)

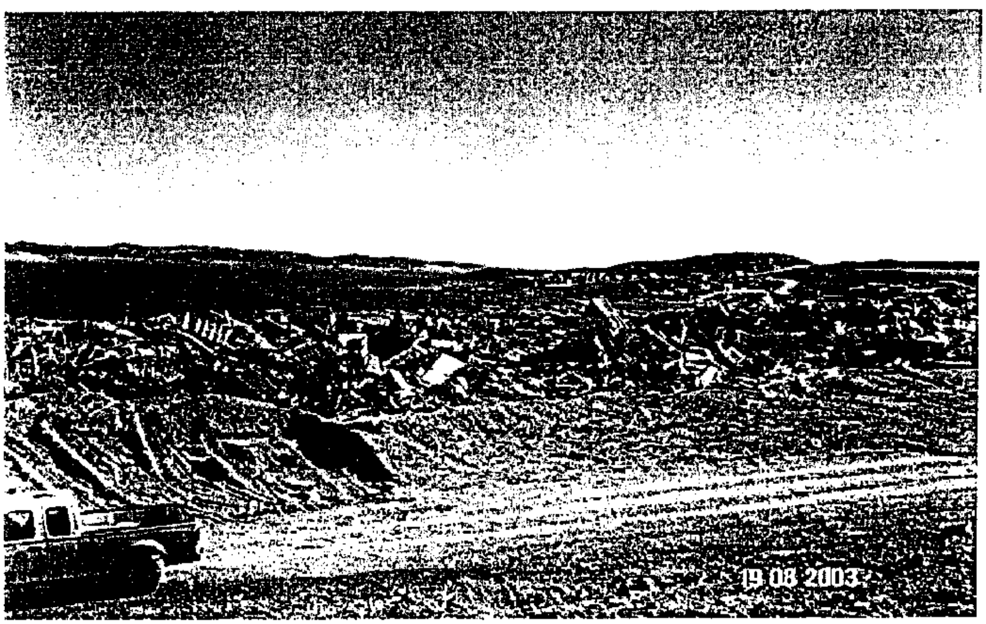

Photo No. 16: Pile 'C' Front Side - View East (CG & T Photo)

DILLON CONSULTING	PROJECT CAPE DORSET SOLID WASTE MANAGEMENT STUDY	PROJECT NO. 032191 DATE August 2003
	TITLE BULKY WASTE SITE PHOTOS	FIGURE NO

Photo No. 17: Pile C' Close Up North End

Photo No. 18: Pile 'C' Rear Side - View South East

DILLON CONSULTING	PROJECT CAPE DORSET SOLID WASTE MANAGEMENT STUDY	PROJECT NO. 032191 DATE August 2003
	TITLE BULKY WASTE SITE PHOTOS	FIGURE NO.

APPENDIX D
Landfill Site Photos

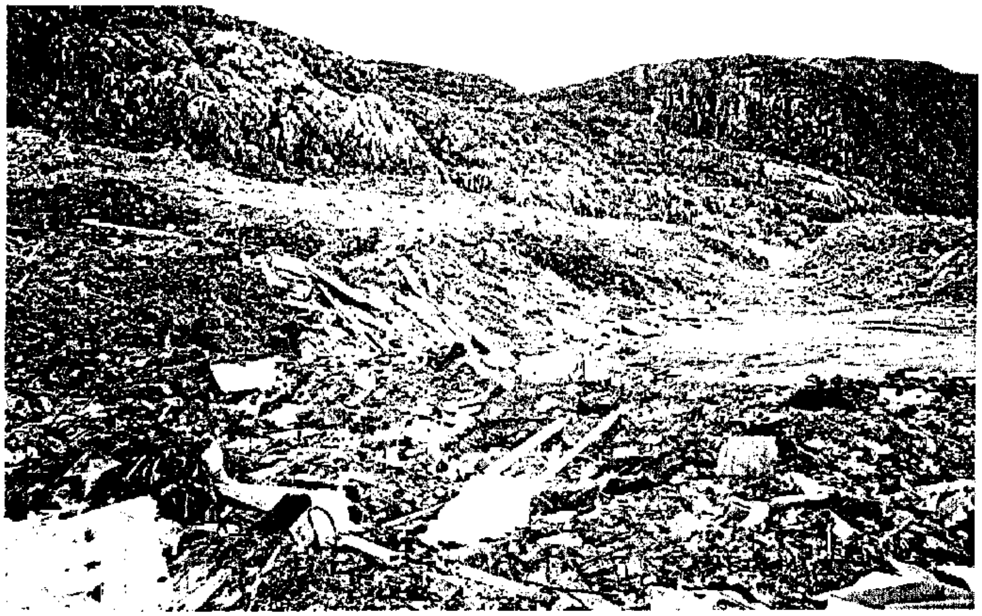

Photo No. 1: Cape Dorset Landfill View South West

Photo No. 2: Cape Dorset Landfill View South East

DILLON CONSULTING	PROJECT CAPE DORSET SOLID WASTE MANAGEMENT STUDY	PROJECT NO. 032191
		DATE August 2003
	TITLE MUNICIPAL LANDFILL	FIGURE NO.

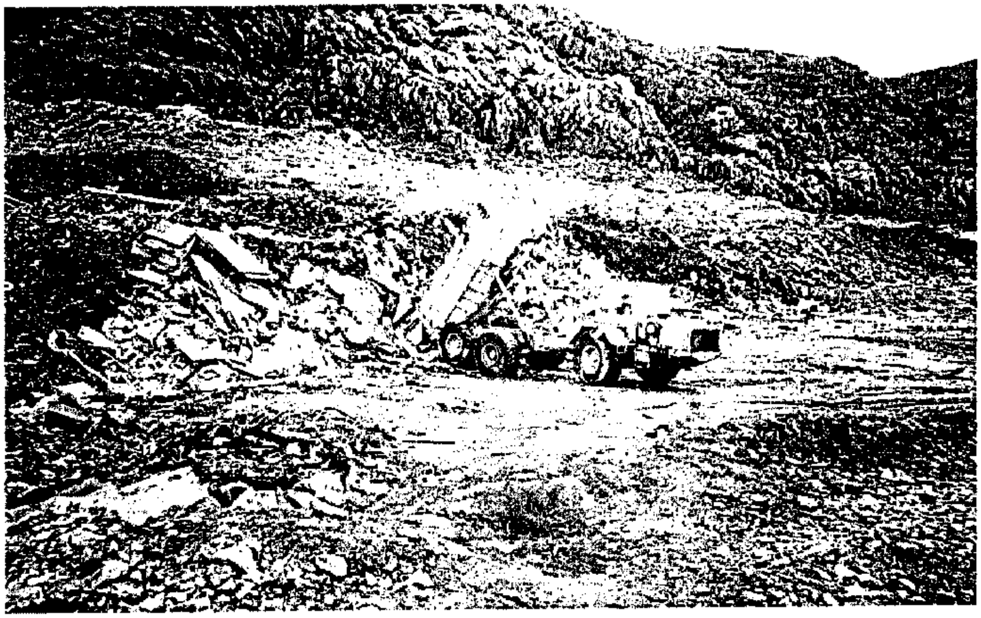

Photo No. 3: Cape Dorset Landfill - Working Face

Photo No. 4: Cape Dorset Landfill - Working Face

DILLON CONSULTING	PROJECT	CAPE DORSET SOLID WASTE MANAGEMENT STUDY	PROJECT NO. 032191
			DATE August 2003
	TITLE	MUNICIPAL LANDFILL	FIGURE NO.

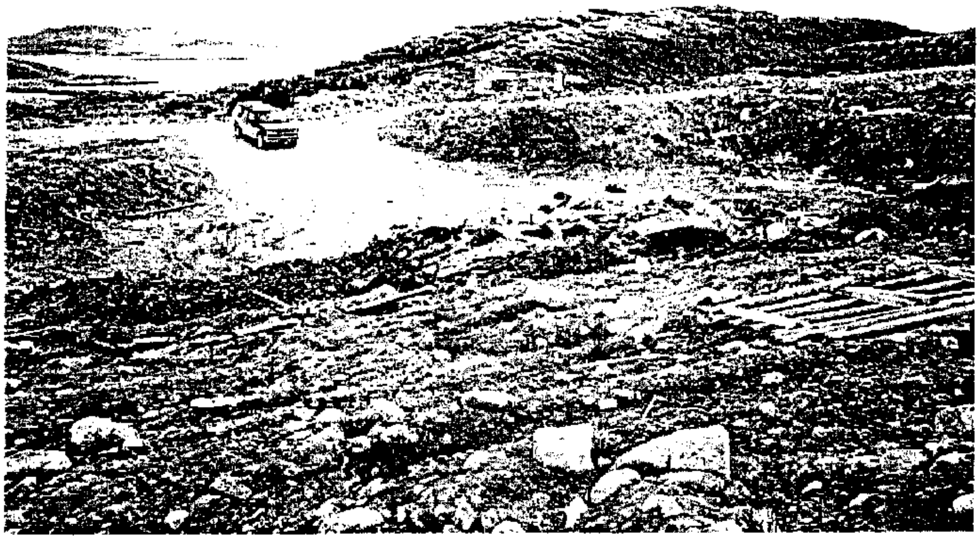

Photo No. 5: Cape Dorset Landfill - View North East

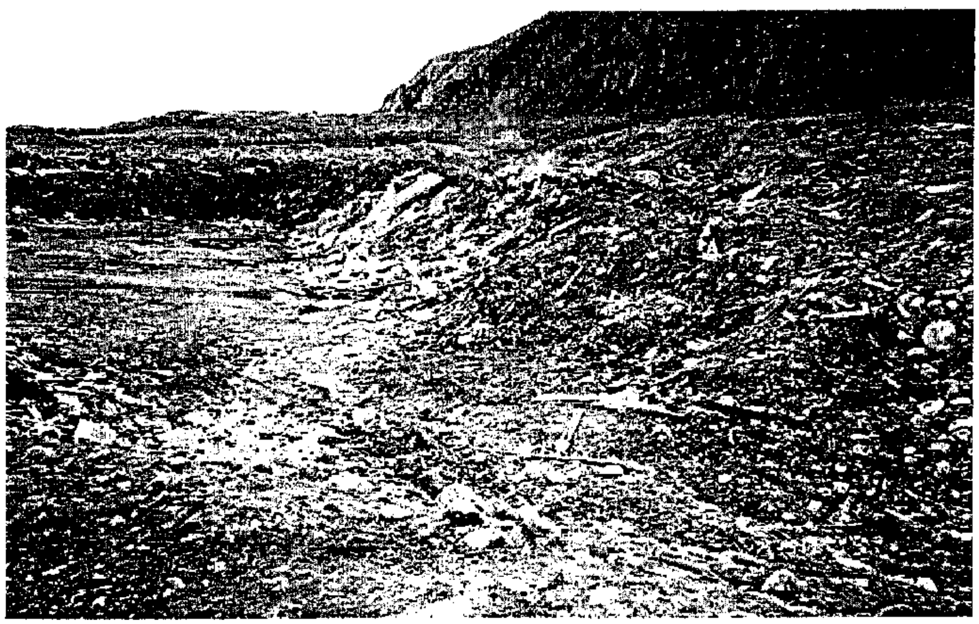

Photo No. 6: Cape Dorset Landfill - View East Toward Expamsion Area

DILLON CONSULTING	PROJECT CAPE DORSET SOLID WASTE MANAGEMENT STUDY	PROJECT NO. 032191 DATE August 2003
	TITLE MUNICIPAL LANDFILL	FIGURE NO.

Photo No. 7: Cape Dorset Landfill - View North West of Breached Berm

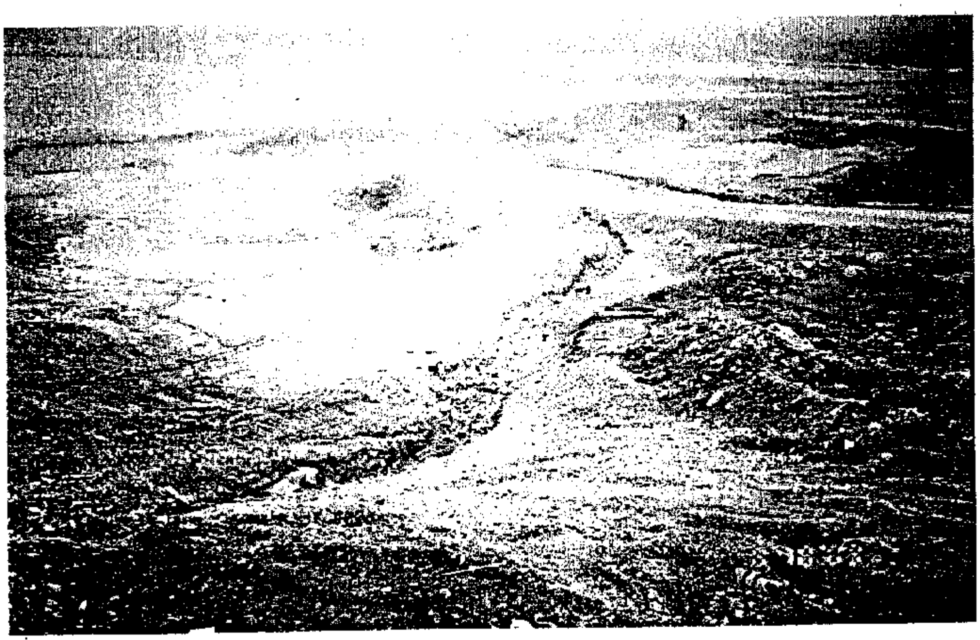

Photo No. 8: Cape Dorset Landfill - Drainage Channel Downstream ot Landfill

DILLON CONSULTING	PROJECT CAPE DORSET SOLID WASTE MANAGEMENT STUDY	PROJECT NO. 032191
		DATE August 2003
	TITLE MUNICIPAL LANDFILL	FIGURE NO.

Colin Hansen, P. Eng.
Dillon Consulting Limited
Suite 2450, 101 - 6 Ave. S.W.
Calgary T2P 3P4
phone 403 215 8880 ext.2238
fax 403 215 8889

APPENDIX E
Bulky Waste Volume Calculations

Cape Dorset Solid Waste
#032191-1000

Perliminary Waste Characterization
CAUTION - BASED ON OBSERVATIONS ON OUTSIDE OF THE WASTE PILES ONLY

	Vehicles & Heavy Steel	Light Metal	Appliances	Mattresses	Tires/Rubber	Fuel Drums	General Waste & Wood	Dirt/Other	
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	
PILE 'A'	11	47	14	6	3	5	13	1	100
PILE 'B'	66	18	8	0	3	1	3.0	1	100
PILE 'C'	26	52	6	1	3	5	3.0	4	100

	Bulk "As-Is" Volume	Assumed Vol Reduction	Sorted / Copacted Volume
	(m3)	(%)	(m3)
PILE 'A'	6,000	15	5100
PILE 'B'	2,000	40	1200
PILE 'C'	3,000	40	1800
TOTAL	11,000		8,100

5,000

SAY 8,000

Veh's Heavy Steel	23%	1,810
Light Metal	48%	3,854
Non-Metals	18%	1,462
Other (landfill)	11%	874
Total	100%	8,000

Waste Volumes (Based On Waste Characterization)

	Sorted Volume	Vehicles & Heavy Steel	Light Metal	Appliances	Mattresses	Tires/Rubber	Fuel Drums	General Waste & Wood	Dirt/Other	TOTAL
	(m3)	(m3)	(m3)	(m3)	(m3)	(m3)	(m3)	(m3)	(m3)	
PILE 'A'	5,000	550	2350	700	300	150	250	650	50	5000
PILE 'B'	1,200	792	216	96	0	36	12	36	12	1200
PILE 'C'	1,800	468	936	108	18	54	90	54	72	1800
TOTAL	8,000	1,810	3,502	904	318	240	352	740	134	8000
								6,058		
Without Shredder										
Bulk Density (lbs/cu. Yard)		600	150	110	150	250	90	124		
Bulk Density (kg/m3)		356	89	65	89	148	53	74		
Mass (tonnes)		644	312	59	28	36	19	54		1152
Total Metals (tonnes)		956							avg. density	144
With Shredder										
Volume Reduction Ratio		N/A	2.50	5.00	6.00	2.00	15.00	3.0		
Reduced Volume (m3)		1,810	1,401	181	53	120	23	247	3,835	
Bulk Density (lbs/cu. Yard)		600	375	850	450	500	1,410	372	2,025	
Bulk Density (kg/m3)		356	222	504	267	297	837	221		
Mass (tonnes)		644	312	91	14	36	20	54		1171
Total Metals (tonnes)		956							avg. density	305

Final Stockpile	
Length	90
Width	40
Bottom Area	3600
Height	2.5
Side Slope	0.5H:1V
Top Length	87.5
Top Width	37.5
Top Area	3281.25
Volume (m3)	8602

STORAGE ON SITE OPTION, (NOT RECOMMENDED)

REDUCED VOLUME WITH SHREDDER,

APPENDIX F

Environment Canada Correspondence RE:
Disposal At Sea Option

Sent: Tuesday, September 09, 2003 10:59 AM
To: mark.dahl@ec.gc.ca
Subject: Cape Dorset Bulky Waste Disposal

Further to our telephone conversation this morning, attached are site photos of the existing bulky waste site at Cape Dorset NU. The PDF is an aerial view of the site showing the approximate bulk volume of each pile. The estimated bulk volume of metals and vehicles is 7000 to 8000 m3. My questions are as follows:

1) The sea lift cost for the metals will be $300 to $400 k. Based on your experience what is the chance of ocean disposal costing less than this?

2) I understand that the application for ocean disposal must include a waste audit, a risk assessment of the alternatives, water column and current information at the proposed dump site, and monitoring. Based on your experience can you give me ballpark numbers for these items? My rough guesses are as follows:

Waste Audit: $20,000
Dump Site Study: $50,000 ??
Risk Assessment: $40,000 ??
Application (Pull it together): $20,000
Monitoring: $30,000

Total: $160,000 maybe $200,000 when all done ??

3) Water depth - how much is typically required?

4) Prohibited materials - what materials must be excluded? Appliances, tires, fuel drums ??

Thanks for your assistance.

Colin Hansen, P. Eng.
Dillon Consulting Limited
Suite 2450, 101 - 6 Ave. S.W.
Calgary T2P 3P4
phone 403 215 8880 ext.2238
fax 403 215 8889

From: "Dahl,Mark [Yel]" <Mark.Dahl@EC.GC.CA>
To: "'CHansen@dillon.ca'" <CHansen@dillon.ca>
Date: 9/22/2003 1:11:07 PM
Subject: cost of disposal

Collin,
Are you still considering Disposal at Sea?
If so here are is a bit of information for you.
notes:
As far as I know no communities in the north bury large volumes of bulky items. Most have solid waste sites but burial is too expensive. Oil and Gas companies used to bury a lot of stuff but they would have a hard time (read impossible) getting a permit these days.
A bit of history to put things in perspective:
In 1994 Panarctic wanted to dispose of some scrap drill pipe (~400 tonnes??) on Lougheed Island (then NWT now Nunavut). The permit was given and everything was set to go when public pressure from some of the Communities in the north pushed the Minister into rescinding the permit. The material is still sitting on Lougheed island and no end date is in site! I am not sure if that public sentiment would apply in this case given that it is a community that is applying BUT you should be aware that the traditional source of food is the sea for many of the people in the north so dumping stuff in the water is a sensitive issue.

how much would it cost to dispose of bulky material?:
This is a difficult question because some times getting the data for the application is relatively simple but for other proposals it is very costly. In the north you can spend a great deal of money to get very little. Case in point: it cost me $42k to get a bathymetric survey of the Churchill disposal site simply because they had to bring the boat and personnel in to do it. I do not think your survey would have to be that detailed but you can expect to spend lots of money if field work is involved. Basically you are looking at paying for the site assessment, material assessment, cleaning if required as well as loading and transport of materials to the disposal site

FYI The dew line site clean ups have had required the removal of substantial amounts of material via Sea Lift. This may be a possible source for shipping containers, In order to facilitate transport
Is the 100 k recovered from the sale of recycled material included in the 3-400k for backhauling?

Mark Dahl
(867)669-4734 | facsimile/télécopieur (867) 873-8185
mark.dahl@ec.gc.ca
Contaminants Biologist | Biologiste, Contaminants
Environmental Protection Branch |Service de la protection de l'environnement
Prairie and Northern Region | Région des Prairie et du Nord
Environment Canada | 301-5204 50th Ave, Yellowknife, NT, X1A 1E2
Environnement Canada | 301-5204 50e Ave, Yellowknife, T.N.-O, X1A 1E2
Government of Canada | Gouvernement du Canada

-----Original Message-----
From: Colin Hansen [mailto:CHansen@dillon.ca]

From: "Dahl,Mark [Yel]" <Mark.Dahl@EC.GC.CA>
To: 'Colin Hansen' <CHansen@dillon.ca>
Date: 9/9/2003 4:37:04 PM
Subject: RE: Cape Dorset Bulky Waste Disposal

Colin,
I have answered your questions in the order you asked them:
#1) I have not been in on the costing side of a disposal priject so I can't give you an estimate but I will ask some others in the national disposal at sea group what they estimate the cost would be. I will let you know.
#2) WRT the cost breakdown you sent:
As I mentioned on the phone only certain materials can be disposed of in the sea and the photos of the site clearly show that the material you have is a mix of acceptable and unacceptable materials. A large portion of it would not, under any circumstances, be allowed to be disposed of into the sea (appliances, tires, skidoo tracks, uncleaned barrels or tanks, insulation...etc.). Clearly a great deal of sorting would be required (costly labour).
Some of the stuff could probably be disposed of in it's present state (eg. clean scrap steel) BUT the majority of it would likely require some form of treatment before it would be acceptable for disposal. For example automobiles would have to be stripped of any materials that could/would float, all fluids would have to be drained and any parts containing leachable contaminants would have to be removed (eg batteries,electronics). Any required treatment would add to the costs of disposal. I note that you did not include the cost of sorting and/or cleaning of material prior to disposal into your estimate. I would think that both of these would cost a great deal of money and would push your overall cost of disposal higher than back hauling and recycling. If the costs of back hauling are even close to being equivelent to disposal at sea I would be unable to grant your * application because back hauling is a much more environmentally friendly option. One thing to note is that many of the costs of the disposal at sea option will be incurred whether 25% or 100% of the material is actually disposed of in the sea. The smaller the amount of material being disposed * of at sea will not necesarily result in savings therefore, the higher the cost per ton will be. Again this suggests that shipping it all south is probably the better option.
In the past we have not required monitoring of scrap metal/bulky material disposal sites because the material once on the bottom tends to be stable if the site is selected well.

#3) Disposal site water depth is highly variable in some cases the sites are in 200 metres of water while others are much shallower. A scrap metal site has to be deep enough to ensure that the disposed material would/could not interfere with other users of the sea. Not that it necessarily applies at Cape Dorset but the site would have to be deep enough to avoid interfering with ship traffic/fishing etc.

#4 Anything contaminated is prohibited unless it is cleaned. Anything that will have an environmental impact other than a physical one is prohibited. My first assessment would be to exclude appliances, tires, tracks, uncleaned uncrushed fuel drums but I will verify that tomorrow.

Like you I would figure that your cost of disposal at sea is going to meet

or exceed the cost the back hauling/recycling option.
With luck I will get a couple answers to outstanding questions tomorrow..
Hope some of this helps.

Mark Dahl
(867)669-4734 | facsimile/telecopieur (867) 873-8185
mark.dahl@ec.gc.ca
Contaminants Biologist | Biologiste, Contaminants
Environmental Protection Branch |Service de la protection de l'environnement
Prairie and Northern Region | Region des Prairie et du Nord
Environment Canada | 301-5204 50th Ave, Yellowknife, NT, X1A 1E2
Environnement Canada | 301-5204 50e Ave, Yellowknife, T.N.-O, X1A 1E2
Government of Canada | Gouvernement du Canada

-----Original Message-----
From: Colin Hansen [mailto:CHansen@dillon.ca]
Sent: Tuesday, September 09, 2003 10:59 AM
To: mark.dahl@ec.gc.ca
Subject: Cape Dorset Bulky Waste Disposal

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2) I understand that the application for ocean disposal must include a waste audit, a risk assessment of the alternatives, water column and current information at the proposed dump site, and monitoring. Based on your experience can you give me ballpark numbers for these items? My rough guesses are as follows:

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Dump Site Study: $50,000 ??
Risk Assessment: $40,000 ?? of alternatives
Application (Pull it together): $20,000
Monitoring: $30,000

Total: $160,000 maybe $200,000 when all done ??

3) Water depth - how much is typically required?

4) Prohibited materials - what materials must be excluded? Appliances, tires, fuel drums ??

Thanks for your assistance.

APPENDIX G
Capital Costs

Cape Dorset Solid Waste Study
File: 032191-1000

Bulky Waste Option #1 - Disposal On Existing Site
Cost Estimate

Description	Units	Quantity	Unit Price	Cost
Waste Segregation (1)	weeks	10	$20,000	$200,000
Lease Shredder/Compactor	L.S.	1	$50,000	$50,000
Shredder Operation (2)	days	40	$1,600	$64,000
Final Site Clean Up	weeks	1	$20,000	$20,000
TOTAL				**$334,000**
Contingency @ 20%				$66,800
TOTAL				**$400,800**
			say	$400,000

(1) Heavy Equipment Rates

	Rate($$/hr)	Hrs/Day	Total
CAT 330 Excavator	$275	8	$2,200
Tandem Truck	$150	4	$600
Loader	$150	2	$300
Dozer	$200	2	$400
Labourers 4 @ $20/hr each	$80	8	$640
		total	$4,140
		per week	$20,700

(2) Shredder Calculations

tonnes per hour	2
est total tonnes	500
hours	250
days @ 6 hours / day	42
hourly cost $$/hr	$200
daily cost	$1,600

Cape Dorset Solid Waste Study
File: 032191-1000

Bulky Waste Option #3 Disposal at Sea
Cost Estimate

Description	Units	Quantity	Unit Price	Cost
Permit Application				
Waste Audit	L.S.	1	$20,000	$20,000
Risk Assessement of Disposal Options	L.S.	1	$25,000	$25,000
Disposal Site Bathymetry Study	L.S.	1	$50,000	$50,000
Permit Application and Community Consultation	L.S.	1	$50,000	$50,000
Monitoring and Coordination	L.S.	1	$20,000	$20,000
Sub-Total				**$165,000**
Ocean Disposal @ 75%				
Waste Segregation (1)	weeks	10	$20,000	$200,000
Lease Shredder/Compactor	L.S.	1	$50,000	$50,000
Shredder Operation	days	40	$1,600	$64,000
Waste Cleaning	weeks	4	$10,000	$40,000
Prepare 2.5 km Ice Road to Disposal Site	weeks	1	$10,000	$10,000
Haul Waste to Ocean Site (2)	L.S.	1	$100,000	$100,000
Sub-Total				**$464,000**
Sea Lift Backhaul at 25%				
Purchase Or Lease Sealift Containers/Pallets	m3	1000	$60	$60,000
Prep Wastes for Sealift	weeks	1	$20,000	$20,000
Sealift to Quebec	m3	1000	$65	$64,800
Haulage and Disposal Costs @ Terminal	L.S.	1	$10,000	$10,000
Sale of Scrap Metal	tonnes	250	-$115	-$28,750
Sub-Total				**$126,050**
Final Site Clean Up	weeks	1	$20,000	**$20,000**
TOTAL				**$775,050**
Contingency @ 20%				$155,010
TOTAL				**$930,060**
			say	**$930,000**

(1)

	Rate($$/hr)	Hrs/Day	Total
CAT 330 Excavator	$275	8	$2,200
Tandem Truck	$150	4	$600
Loader	$150	2	$300
Dozer	$200	2	$400
Labourers 4 @ $20/hr each	$80	8	$640
		total	$4,140
		per week	$20,700

(2) Waste Haul Calculations

truck volume	8	m3
trips per hour @ assumed 5 km return	1	
volume per hour	8	m3
haul volume	3,000	m3
total hours	375	hours
total cost @ $150 / hour for truck	$56,250	
total cost @ $150 / hour for loader	$56,250	
total	$112,500	

Cape Dorset Solid Waste Study
File: 032191-1000

Bulky Waste Option #4 Sealift Backhaul
Cost Estimate

Description	Units	Quantity	Unit Price	Cost
Waste Sorting and Sealift				
Waste Segregation	weeks	10	$20,000	$200,000
Lease Shredder/Compactor	L.S.	1	$50,000	$50,000
Shredder Operation	days	40	$1,600	$64,000
Purchase Or Lease Sealift Containers/Pallets	m3	4000	$60	$240,000
Prep Wastes for Sealift	weeks	2	$20,000	$40,000
Sealift to Quebec	m3	4000	$65	$259,200
Haulage and Disposal Costs @ Terminal	L.S.	1	$40,000	$40,000
Sale of Scrap Metal	tonnes	1000	-$115	-$115,000
Sub-Total				**$778,200**
Final Site Clean Up	weeks	1	$20,000	$20,000
TOTAL				**$798,200**
Contingency @ 20%				$159,640
TOTAL				**$957,840**
			say	$960,000

579,200

(1)	Rate($$/hr)	Hrs/Day	Total
CAT 330 Excavator	$275	8	$2,200
Tandem Truck	$150	4	$600
Loader	$150	2	$300
Dozer	$200	2	$400
Labourers 4 @ $20/hr each	$80	8	$640
		total	$4,140
		per week	$20,700

Cape Dorset Solid Waste Study
File: 032191-1000

Bulky Waste Option #2 - Disposal to Landfill
Cost Estimate

Description	Units	Quantity	Unit Price	Cost
Waste Segregation (1)	weeks	10	$20,000	$200,000
Lease Shredder/Compactor	L.S.	1	$50,000	$50,000
Shredder Operation	days	40	$1,600	$64,000
Haul Waste to Landfill [2]	m3	4,000	$12.50	$50,000
Landill Capital Cost & Closure	m3	4,000	$200	$800,000
Final Site Clean Up	weeks	1	$20,000	$20,000
TOTAL				**$1,184,000**
Contingency @ 20%				$236,800
TOTAL				**$1,420,800**
			say	$1,400,000

(1) Heavy Equipment Rates

	Rate($$/hr)	Hrs/Day	Total
CAT 330 Excavator	$275	8	$2,200
Tandem Truck	$150	4	$600
Loader	$150	2	$300
Dozer	$200	2	$400
Labourers 4 @ $20/hr each	$80	8	$640
		total	$4,140
		per week	$20,700

(2) Waste Haul Calculations

truck volume	8	m3
trips per hour @ 2 km return	3	
volume per hour	24	m3
total hours @ 4000 m3	167	hours
truck @ $150 / hour	$25,000	
loader @ $150 / hour	$25,000	
total	$50,000	

CAPITAL COST ESTIMATE
Bulky Waste - Permanent Site

	Item	Units	Unit Cost	Quantity	Total Estimated Cost	Total Estimated Item Cost
	Site Improvements					
	Construct Low Berms	l.m.	$25.00	360	$9,000	
	Ditching For Drainage	l.m.	$25.00	100	$2,500	
	Signage	L.S.	2000	1	$2,000	
						$14,000
	SUBTOTAL COST:					**$14,000**
	Engineering/Contingency (30%)					$4,000
	TOTAL (nic applicable taxes)					**$18,000**

CAPITAL COST ESTIMATE
Existing Cell #1 - Site Improvements and Closure

	Item	Units	Unit Cost	Quantity	Total Estimated Cost	Total Estimated Item Cost
1	**Site Improvements**					
	0.1 Repair Berm at West End	m3	$40.00	1,000	$40,000	
	0.2 Chain Link Fencing (2.4 m) and Signage	l.m.	$250.00	250	$62,500	
	0.3 Lined Drainage Ditch	l.m.	$200.00	160	$32,000	
	0.4 Rip Rap on Ditch Outlet	m3	$30.00	20	$600	
						$135,000
	Final Site Closure					
2	0.1 Cover material (300 mm)	m3	$40.00	800	$32,000	
	0.2 Low permeability soil liner (300mm)	m2	$25.00	2,500	$62,500	
	0.3 Native cover material (300 mm)	m3	$40.00	800	$32,000	$127,000
	SUBTOTAL COST:					**$262,000**
	Engineering/Contingency (30%)					$79,000
	TOTAL (nic applicable taxes)					**$341,000**

say **$340,000**

CAPITAL COST ESTIMATE
Cell #2 - Access, Construction, and Closure

	Item	Units	Unit Cost	Quantity	Total Estimated Cost	Total Estimated Item Cost
1	**Modified Landfill with Berms & Fencing**					
	0.1 Preparation/Grading	m2	$2.00	6,000	$12,000	$12,000
	0.2 Access Road					
	Rock Excavation	m3	$100.00	1,000	$100,000	
	Class C supply and place (600 mm)	m3	$60.00	384	$23,000	
	Class B supply and place (250 mm)	m2	$20.00	640	$12,800	
	Class A supply and place (100 mm)	m2	$10.00	640	$6,400	$142,200
	03 Cell Construction					
	Berm Construction (common fill)	m3	$40.00	1,700	$68,000	
	Common Excavation	m3	$15.00	12,000	$180,000	
	Rock Excavation @ 10%	m3	$100.00	1,300	$130,000	
	Geosynthetic Liner	m2	$15.00	4,200	$63,000	$441,000
	.04 Miscellaneous Items					
	Ditching & Drainage	lm	$200.00	60	$12,000	
	Debris Fencing (2.4 m)	m	$250.00	314	$78,500	
	Access Controls/Signage	ls	$1,000.00	1	$1,000	$91,500
						$687,000
2	**Final Site Closure**					
	0.1 Cover material (300 mm)	m3	$40.00	1,410	$56,400	
	0.2 Low permeability soil liner (300mm)	m2	$25.00	4,700	$117,500	
	0.3 Native cover material (300 mm)	m3	$40.00	1,410	$56,400	**$230,000**
	TOTAL LANDFILL COST:					**$917,000**
	Engineering/Contingency (30%)					$275,100
	TOTAL (nic applicable taxes)					**$1,192,100**

say **$1,200,000**

CAPITAL COST ESTIMATE
Cell #3 - Access, Construction, and Closure

	Item	Units	Unit Cost	Quantity	Total Estimated Cost	Total Estimated Item Cost
1	**Modified Landfill with Berms & Fencing**					
	0.1 Preparation/Grading	m2	$2.00	10,000	$20,000	$20,000
	0.2 Access Road					
	Rock Excavation	m3	$100.00	0	$0	
	Common Fill supply and place (excess rock)	m3	$20.00	7,000	$140,000	
	Class C supply and place (600 mm)	m3	$60.00	984	$59,000	
	Class B supply and place (250 mm)	m2	$20.00	1,640	$32,800	
	Class A supply and place (100 mm)	m2	$10.00	1,640	$16,400	$248,200
	0.3 Cell Construction					
	Berm Construction (common fill)	m3	$40.00	12,000	$480,000	
	Common Excavation	m3	$15.00	0	$0	
	Geosynthetic Liner	m2	$15.00	9,100	$136,500	
	Rock Excavation	m3	$100.00	36,000	$3,600,000	$4,216,500
	0.4 Miscellaneous Items					
	Ditching & Drainage	lm	$200.00	200	$40,000	
	Debris Fencing (2.4 m)	m	$250.00	430	$107,500	
2	Access Controls/Signage	ls	$1,000.00	1	$1,000	$148,500
						$4,633,000
	Final Site Closure					
	0.1 Cover material (300 mm)	m3	$40.00	2,700	$108,000	
	0.2 Low permeability soil liner (300mm)	m2	$25.00	9,000	$225,000	
	0.3 Native cover material (300 mm)	m3	$40.00	2,700	$108,000	**$441,000**
	TOTAL LANDFILL COST:					**$5,074,000**
	Engineering/Contingency (30%)					$1,522,200
	TOTAL (nic applicable taxes)					**$6,596,200**

say **$6,600,000**

CAPITAL COST ESTIMATE
Cell #4 - Access, Construction, and Closure

	Item	Units	Unit Cost	Quantity	Total Estimated Cost	Total Estimated Item Cost
1	**Modified Landfill with Berms & Fencing**					
	0.1 Preparation/Grading	m2	$2.00	10,000	$20,000	$20,000
	0.2 Access Road					
	Rock Excavation	m3	$100.00	0	$0	
	Common Fill supply and place (excess rock)	m3	$20.00	400	$8,000	
	Class C supply and place (600 mm)	m3	$60.00	144	$8,600	
	Class B supply and place (250 mm)	m2	$20.00	240	$4,800	
	Class A supply and place (100 mm)	m2	$10.00	240	$2,400	$23,800
	0.3 Cell Construction					
	Berm Construction (common fill)	m3	$40.00	12,000	$480,000	
	Common Excavation	m3	$15.00	0	$0	
	Geosynthetic Liner	m2	$15.00	9,100	$136,500	
	Rock Excavation	m3	$100.00	40,000	$4,000,000	$4,616,500
	0.4 Miscellaneous Items					
	Ditching & Drainage	lm	$200.00	170	$34,000	
	Debris Fencing (2.4 m)	m	$250.00	430	$107,500	
	Access Controls/Signage	ls	$1,000.00	1	$1,000	$142,500
						$4,803,000
2	**Final Site Closure**					
	0.1 Cover material (300 mm)	m3	$40.00	2,700	$108,000	
	0.2 Low permeability soil liner (300mm)	m2	$25.00	9,000	$225,000	
	0.3 Native cover material (300 mm)	m3	$40.00	2,700	$108,000	**$441,000**
	TOTAL LANDFILL COST:					**$5,244,000**
	Engineering/Contingency (30%)					$1,573,200
	TOTAL (nic applicable taxes)					**$6,817,200**

say **$6,800,000**

Cape Dorset Solid Waste Improvements
CAPITAL COST SUMMARY

Item	Cell #1	Cell #2	Cell #3	Cell #4
Site Improvements	$135,000	N/A	N/A	N/A
Preparation and Stripping		$12,000	$20,000	$20,000
Access Road		$142,200	$248,200	$23,800
Berms, Excavation, and Liner		$441,000	$4,216,500	$4,616,500
Drainage/Fencing/Signage		$91,500	$148,500	$142,500
Final Site Closure	$127,000	$230,000	$441,000	$441,000
Sub Total Landfill Cost	**$262,000**	**$917,000**	**$5,074,000**	**$5,244,000**
Engineering/Contingency @ 30%	$79,000	$275,100	$1,522,200	$1,573,200
TOTAL (excl. Taxes)	**$340,000**	**$1,200,000**	**$6,600,000**	**$6,800,000**

Note: Totals rounded to nearest $10 K

$14,940,000

APPENDIX H
Operating Costs and Net Present Value

Cape Dorset Solid Waste Improvements

Cost Summary and Net Present Value

	Capital Cost	Annual O + M	Years in Service	Total O + M	Capital and Operating NPV @ 8%
Bulky Waste Site	$18,000	$71,000	20	$1,420,000	$730,000
Existing Cell #1	$340,000	$52,000	2	$104,000	$430,000
Cell #2	$1,200,000	$68,000	5	$340,000	$1,400,000
Cell #3	$6,600,000	$82,000	8	$656,000	$6,500,000
Cell #4	$6,800,000	$89,000	8	$712,000	$6,800,000
TOTAL	**$14,958,000**	**$362,000**		**$3,232,000**	**$15,860,000**

ANNUAL OPERATING COSTS
Bulky Waste - Permanent Site

	Item	Units	Unit Cost	Quantity	Total Estimated Cost	Total Estimated Item Cost
3	**Road Maintenance**					
	0.1 Grading - summer	m	$80	300	$24,000	
	0.2 Snow Removal & sanding	m	$80	300	$24,000	**$48,000**
4	**Berm Maintenance**	m	$30	360	$11,000	**$11,000**
	Subtotal all Items					**$59,000**
	Contingency (20%)					$12,000
	TOTAL ANNUAL O&M:					**$71,000**

ANNUAL OPERATING COSTS
Cell #1 Modified Landfill

	Item	Units	Unit Cost	Quantity	Total Estimated Cost	Total Estimated Item Cost
1	**Cover & Compaction**					
	0.1 Cover Material	m3	$40	450	$18,000	
	0.2 Costs for Cover & Compaction	ls	$25,000	1	$25,000	**$43,000**
2	**Fence Repair**	m	$0	250	$0	**$0**
3	**Road Maintenance**					
	0.1 Grading - summer	m	$80	0	$0	
	0.2 Snow Removal & sanding	m	$80	0	$0	**$0**
4	**Berm Maintenance**	m	$0	60	$0	**$0**
	Subtotal all Items					**$43,000**
	Contingency (20%)					$9,000
	TOTAL ANNUAL O&M:					**$52,000**

(

ANNUAL OPERATING COSTS
Cell #2 Modified Landfill

	Item	Units	Unit Cost	Quantity	Total Estimated Cost	Total Estimated Item Cost
1	**Cover & Compaction**					
	0.1 Cover Material (1)	m3	$40	500	$20,000	
	0.2 Costs for Cover & Compaction	ls	$25,000	1	$25,000	**$45,000**
2	**Fence Repair**	m	$0	314	$0	**$0**
3	**Road Maintenance**					
	0.1 Grading - summer	m	$80	80	$6,000	
	0.2 Snow Removal & sanding	m	$80	80	$6,000	**$12,000**
4	**Berm Maintenance**	m	$0	298	$0	**$0**
	Subtotal all Items					**$57,000**
	Contingency (20%)					**$11,000**
	TOTAL ANNUAL O&M:					**$68,000**

$0

(1) Assumed that excess cover material is available from Cell #2 excavation

ANNUAL OPERATING COSTS
Cell #3 Modified Landfill

	Item	Units	Unit Cost	Quantity	Total Estimated Cost	Total Estimated Item Cost	
1	**Cover & Compaction**						
	0.1 Cover Material	m3	$40	600	$24,000		
	0.2 Costs for Cover & Compaction	ls	$30,000	1	$30,000	**$54,000**	
2	**Fence Repair**	m	$5	430	$2,000	**$2,000**	
3	**Road Maintenance** [(1)]						
	0.1 Grading - summer	m	$80	0	$0		
	0.2 Snow Removal & sanding	m	$80	0	$0	**$0**	
4	**Berm Maintenance**	m	$30	392	$12,000	**$12,000**	$14,000
	Subtotal all Items					**$68,000**	
	Contingency (20%)					**$14,000**	
	TOTAL ANNUAL O&M:					**$82,000**	

(1) New Road will be shorter than existing road

ANNUAL OPERATING COSTS
Cell #4 Modified Landfill

	Item	Units	Unit Cost	Quantity	Total Estimated Cost	Total Estimated Item Cost	
1	**Cover & Compaction**						
	0.1 Cover Material	m3	$40	750	$30,000		
	0.2 Costs for Cover & Compaction	ls	$30,000	1	$30,000	**$60,000**	
2	**Fence Repair**	m	$5	430	$2,000	**$2,000**	
3	**Road Maintenance** [1]						
	0.1 Grading - summer	m	$80	0	$0		
	0.2 Snow Removal & sanding	m	$80	0	$0	**$0**	
4	**Berm Maintenance**	m	$30	392	$12,000	**$12,000**	$14,000
	Subtotal all Items					**$74,000**	
	Contingency (20%)					**$15,000**	
	TOTAL ANNUAL O&M:					**$89,000**	

(1) New road will be shorter than existing access road

Cape Dorset Solid Waste Improvements
Operating Cost Summary

	Cell #1	Cell #2	Cell #3	Cell #4
Stock piling soil	$18,000	$20,000	$24,000	$30,000
Compacting and covering wastes	$25,000	$25,000	$30,000	$30,000
Road Maintenance	$0	$12,000	$0	$0
Fence & Berm maintenance	$0	$0	$14,000	$14,000
Subtotal:	**$43,000**	**$57,000**	**$68,000**	**$74,000**
Contingency (20%)	$9,000	$11,000	$14,000	$15,000
TOTAL:	**$52,000**	**$68,000**	**$82,000**	**$89,000**

Appendix I

Population Data

ᓄᓇᕗᑦ: ᓄᓇᓖᑦ ᐃᓄᖏᑦᑕ ᐃᓄᕐᓂᖏᓐᓄᑦ ᓇᓚᐅᑦᑖᖅᓯᒪᔾᔪᑏᑦ

Nunavut: Community Population Projections

Le Nunavut: Projections pour la population par communautés

2000 – 2020

Nunavut Bureau of Statistics
Bag 800
Iqaluit, Nunavut X0A 0H0
www.stats.gov.nu.ca

ᓄᓇᕗᑦ: ᓄᓇᓖᑦ ᐃᓄᖏᑦᑕ ᐃᓄᕐᓂᖏᓐᓄᑦ ᓇᓚᐅᑦᑖᖅᓯᒪᔾᔪᑎᑦ

	2000	2005	2010	2015	2020
ᓄᓇᕗᑦ	27,688	31,317	35,114	39,335	43,824
ᐃᒃᐱᐊᕐᔪᒃ	730	819	916	1,019	1,094
ᐊᕐᕕᐊᑦ	1,690	1,929	2,198	2,517	2,855
ᖃᒪᓂᑦᑐᐊᖅ	1,470	1,624	1,777	1,957	2,148
ᕿᓐᖓᐅᑦ	X	X	X	X	X
ᐅᒥᖕᒪᒃᑐᖅ	X	X	X	X	X
ᐃᖃᓗᒃᑑᑦᑎᐊᖅ	1,418	1,581	1,752	1,939	2,137
ᑭᙵᐃᑦ	1,213	1,354	1,501	1,662	1,829
ᐃᒡᓗᓕᒑᕐᔪᒃ	372	420	476	528	583
ᑲᖏᖅᑐᒑᐱᒃ	771	867	982	1,095	1,214
ᓴᓪᓖᑦ	845	955	1,078	1,219	1,376
ᐅᖅᓱᖅᑑᖅ	984	1,084	1,173	1,290	1,435
ᐊᐅᔪᐃᑦᑐᖅ	145	147	155	165	173
ᓴᓂᕋᔭᒃ	635	734	829	934	1,052
ᐃᒡᓗᓕᒃ	1,379	1,562	1,736	1,922	2,131
ᐃᖃᓗᐃᑦ	4,762	5,606	6,477	7,456	8,391
ᑭᒻᒥᕈᑦ	450	506	573	636	706
ᑰᒑᕐᔪᒃ	582	664	756	867	979
ᖁᕐᓗᖅᑐᖅ	1,389	1,556	1,720	1,893	2,076
ᓇᓂᓯᕕᒃ	230	223	220	205	191
ᐸᖕᓂᖅᑑᖅ	1,506	1,687	1,870	2,074	2,280
ᒥᑦᑎᒪᑕᓕᒃ	1,314	1,532	1,761	1,999	2,233
ᕿᑭᖅᑕᕐᔪᐊᖅ	522	599	668	737	811
ᑲᖏᕿᓂᖅ	2,277	2,527	2,791	3,120	3,633
ᓇᐅᔮᑦ	615	702	797	903	1,012
ᖃᐅᓯᐅᑦᑐᖅ	243	253	263	275	288
ᓴᓂᑭᓗᐊᖅ	702	796	896	1,008	1,108
ᑕᓗᕐᔪᐊᖅ	804	904	1,016	1,147	1,294
ᑎᑭᕋᕐᔪᐊᖅ	312	351	397	442	491

ᑐᓴᕈᓴᑦ: ᐃᓄᐃᑦ ᐅᓄᕐᓂᖏᑦᑕ ᓇᓚᐅᑦᑖᖅᑕᐅᓂᖏᑦ ᓴᖅᑭᑕᐅᓚᐅᖅᑐᑦ ᑲᓇᑕᒥ ᓈᓴᖅᓯᒪᑭᐊᖃᖅᑐᓂᖓᓐᓂᒃᑯᑦ ᐊᒻᒪᓗ ᓄᓇᕗᑦ ᓈᓴᐃᓯᒪᕕᒃᑯᑦ ᐃᓚᐅᓪᓗᑎᒃ ᐃᓄᐃᓄᑦ ᐅᓄᕐᓂᖏᑦ ᓄᓇᖃᖅᑐᑦ ᓄᓇᓄᒥ ᐊᒻᒪᓗ ᐊᖏᕐᕋᖃᓐᖏᑦᑐᑦ ᓯᓚᑖᓂ ᑲᓇᑕᐅᑉ ᐊᐅᓪᓚᖅᓯᒪᕕᖏᓐᓂ. ᑕᐃᒪᐃᒻᒪᑦ, ᓄᓇᖃᒃᑲᐃᓐᓇᖅᐸᒃᑐᑦ ᓯᕗᓗ ᐃᒡᓗᓕᐅᖅᑎᑦ, ᐅᔾᔨᕐᓂᐊᕐᕕᖕᒦᑦᑐᓪᓗ ᐊᓯᖏᓪᓗ ᐃᓚᐅᑎᑕᐅᖏᑦᑐᑦ ᐃᓄᐃᑦ ᐅᓄᕐᓂᖏᑦᑕ ᓈᓴᖅᑕᐅᓯᒪᓂᖏᓐᓂ.

ᑐᑭᓯᒋᐊᕈᑎᒃᓴᑦ ᐱᔭᐅᔪᖅᑦ (ᐃ) ᓄᓇᓕᖕᓂᑦ ᐃᓄᒃᑐᓂᒃ 50-ᓂᒃ ᑐᖓᑕᓂᒎᓐᓂᑦ ᐊᒻᒪᓗ (ᐅ) ᐋᖅᑭᒃᑕᐅᓯᒪᓐᖏᑦᑐᓄ ᓄᓇᐃᑦ -- ᑭᓯᐊᓂ ᐃᓚᐅᑎᑕᐅᔪᑦ ᓄᓇᕗᑦ ᐅᓄᕐᓂᖏᓐᓄᑦ.

ᓄᓇᕗᑦ: ᓄᓇᓖᑦ ᐃᓄᖏᑦᑕ ᐃᓄᐃᓐᓂᖏᓐᓄᑦ ᓇᓚᐅᑦᑖᖅᓯᒪᔾᔪᑎᑦ

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
ᓄᓇᕗᑦ	27,688	28,410	29,154	29,885	30,601	31,317	32,036	32,774	33,530	34,311	35,114
ᐃᒃᐱᐊᕐᔪᒃ	730	747	763	782	801	819	837	855	876	894	916
ᐊᕐᕕᐊᑦ	1,690	1,736	1,784	1,833	1,883	1,929	1,982	2,033	2,088	2,142	2,198
ᖃᒪᓂᑦᑐᐊᖅ	1,470	1,501	1,534	1,563	1,594	1,624	1,655	1,683	1,712	1,745	1,777
ᕿᙵᐅᑦ	X	X	X	X	X	X	X	X	X	X	X
ᐅᒥᖕᒪᒃᑑᖅ	X	X	X	X	X	X	X	X	X	X	X
ᐃᖃᓗᒃᑑᑦᑎᐊᖅ	1,418	1,449	1,484	1,517	1,550	1,581	1,609	1,642	1,679	1,715	1,752
ᑭᙵᐃᑦ	1,213	1,240	1,268	1,298	1,327	1,354	1,382	1,412	1,441	1,471	1,501
ᐃᒡᓗᓕᒑᕐᔪᒃ	372	382	391	401	409	420	431	443	452	465	476
ᑲᖏᖅᖢᒑᐱᒃ	771	789	812	830	848	867	890	913	937	959	982
ᓴᓪᓖᑦ	845	865	888	911	933	955	978	1,003	1,024	1,049	1,078
ᐅᖅᓱᖅᑑᖅ	984	1,005	1,023	1,045	1,063	1,084	1,102	1,117	1,136	1,154	1,173
ᐊᐅᔪᐃᑦᑐᖅ	145	146	147	146	146	147	149	151	151	153	155
ᓴᓂᕋᔭᒃ	635	656	677	696	714	734	754	771	790	810	829
ᐃᒡᓗᓕᒃ	1,379	1,417	1,456	1,495	1,529	1,562	1,594	1,627	1,660	1,701	1,736
ᐃᖃᓗᐃᑦ	4,762	4,930	5,108	5,278	5,438	5,606	5,768	5,936	6,108	6,289	6,477
ᑭᒻᒥᕈᑦ	450	461	474	485	496	506	519	530	546	560	573
ᑯᒑᕐᔪᒃ	582	601	616	631	648	664	682	701	719	737	756
ᖁᕐᓗᖅᑐᖅ	1,389	1,422	1,456	1,490	1,522	1,556	1,585	1,618	1,653	1,686	1,720
ᓇᓂᓯᕕᒃ	230	225	224	226	225	223	222	220	221	221	220
ᐸᖕᓂᖅᑑᖅ	1,506	1,539	1,575	1,613	1,651	1,687	1,722	1,756	1,792	1,831	1,870
ᒥᑦᑎᒪᑕᓕᒃ	1,314	1,361	1,405	1,443	1,489	1,532	1,574	1,624	1,668	1,714	1,761
ᕿᑭᖅᑕᕐᔪᐊᖅ	522	537	551	566	582	599	614	629	641	654	668
ᑲᖏᖅᖠᓂᖅ	2,277	2,327	2,376	2,432	2,483	2,527	2,576	2,629	2,683	2,734	2,791
ᓇᐅᔮᑦ	615	630	648	664	682	702	720	738	757	777	797
ᖃᐅᓯᐊᑦᑐᖅ	243	246	247	249	251	253	252	255	257	260	263
ᓴᓂᑭᓗᐊᖅ	702	722	740	758	776	796	816	834	853	873	896
ᑕᓗᕐᔪᐊᖅ	804	825	847	866	886	904	925	947	968	992	1,016
ᑎᑭᕋᕐᔪᐊᖅ	312	321	328	336	344	351	358	367	378	388	397

ᑐᓴᕐᓴᑦ: ᐃᓄᐃᑦ ᐅᓄᕐᓂᖏᑦᑕ ᓇᓚᐅᑦᓵᖅᑕᐅᓂᖏᑦ ᓴᖅᑭᑕᐅᓚᐅᖅᑐᑦ ᑲᓇᑕᒥ ᓈᓴᖅᓯᒪᒋᐊᖃᖅᑐᓕᕆᔨᒃᑯᑦ ᐊᒻᒪᓗ ᓄᓇᕗᑦ ᓈᓴᐃᓯᒪᕕᒃᑯᑦ ᐃᓚᐅᓪᓗᑎᒃ ᐃᓄᐃᓄᑦ ᐅᓄᕐᓂᖏᑦ ᓄᓇᖃᖅᑐᑦ ᓄᓇᓄᒥ ᐊᒻᒪᓗ ᐊᖏᕐᕋᖃᓐᖏᑦᑐᑦ ᓯᓚᑖᓂ ᑲᓇᑕᐅᑉ ᐊᐅᓪᓚᖅᓯᒪᕕᖕᒥᓂ. ᑕᐃᒪᐃᒻᒪᑦ, ᓄᓇᖃᖃᐃᓐᓇᖅᐸᒃᑐᑦ ᓱᕐᓗ ᐃᒡᓗᓕᒑᖅᑎᑦ, ᐅᔾᕈᕐᓂᐊᕐᕕᖕᒥᑦᑐᓪᓗ ᐊᓯᖏᓪᓗ ᐃᓚᐅᑎᑕᐅᓐᖏᑦᑐᑦ ᐃᓄᐃᑦ ᐅᓄᕐᓂᖏᑦᑕ ᓈᓴᖅᑕᐅᓯᒪᓂᖏᓐᓂ.

ᑐᑭᓯᒋᐊᕈᑎᒃᓴᑦ ᐱᔭᐅᔪᓐᓃᑦ (ᐃ) ᓄᓇᓕᖕᓂᑦ ᐃᓄᒃᑯᑦᓂᒃ 50-ᓂᒃ ᑐᖓᕕᓕᒻᒥᓂᑦ ᐊᒻᒪᓗ (ᐅ) ᐋᖅᑭᒃᑕᐅᓯᒪᓐᖏᑦᑐᑦ ᓄᓇᐃᑦ -- ᑭᓯᐊᓂ ᐃᓚᐅᑎᑕᐅᔪᑦ ᓄᓇᕗᑦ ᐅᓄᕐᓂᖏᓐᓄᑦ.

ᓄᓇᕗᑦ: ᓄᓇᓖᑦ ᐃᓄᖏᑦᑕ ᐃᓄᕐᓂᖏᓐᓄᑦ ᓇᓚᐅᑦᑖᖅᓯᒪᔾᔪᑏᑦ

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
ᓄᓇᕗᑦ	35,114	35,937	36,773	37,619	38,471	39,335	40,217	41,106	42,001	42,904	43,824
ᐃᒃᐱᐊᕐᔪᒃ	916	939	960	980	1,003	1,019	1,033	1,049	1,065	1,078	1,094
ᐊᕐᕕᐊᑦ	2,198	2,256	2,320	2,381	2,449	2,517	2,584	2,658	2,721	2,791	2,855
ᖃᒪᓂᑦᑐᐊᖅ	1,777	1,808	1,843	1,882	1,918	1,957	1,996	2,036	2,072	2,108	2,148
ᕿᓐᖓᐅᑦ	X	X	X	X	X	X	X	X	X	X	X
ᐅᒥᖕᒪᒃᑑᖅ	X	X	X	X	X	X	X	X	X	X	X
ᐃᖃᓗᒃᑑᑦᑎᐊᖅ	1,752	1,790	1,828	1,865	1,900	1,939	1,979	2,018	2,057	2,095	2,137
ᑭᙵᐃᑦ	1,501	1,536	1,570	1,600	1,632	1,662	1,692	1,726	1,757	1,793	1,829
ᐃᒡᓗᓕᒑᕐᔪᒃ	476	486	498	509	519	528	539	549	563	572	583
ᑲᖏᖅᖢᒑᐱᒃ	982	1,007	1,028	1,050	1,072	1,095	1,121	1,144	1,167	1,190	1,214
ᓴᓪᓖᑦ	1,078	1,101	1,128	1,158	1,187	1,219	1,250	1,281	1,312	1,345	1,376
ᐅᖅᓱᖅᑑᖅ	1,173	1,194	1,217	1,242	1,266	1,290	1,317	1,345	1,375	1,405	1,435
ᐊᐅᔪᐃᑦᑐᖅ	155	157	160	160	163	165	166	168	169	172	173
ᓴᓂᕋᔭᒃ	829	850	870	890	912	934	957	982	1,008	1,029	1,052
ᐃᒡᓗᓕᒃ	1,736	1,773	1,807	1,842	1,883	1,922	1,960	2,001	2,043	2,086	2,131
ᐃᖃᓗᐃᑦ	6,477	6,669	6,866	7,064	7,276	7,456	7,637	7,814	7,997	8,178	8,391
ᑭᒻᒥᕈᑦ	573	589	601	612	624	636	649	662	675	688	706
ᑯᒑᕐᔪᒃ	756	779	802	823	844	867	889	911	934	957	979
ᖁᕐᓗᖅᑑᖅ	1,720	1,760	1,793	1,827	1,859	1,893	1,928	1,965	2,000	2,041	2,076
ᓇᓂᓯᕕᒃ	220	218	215	215	209	205	202	200	196	195	191
ᐸᖕᓂᖅᑑᖅ	1,870	1,905	1,955	1,995	2,032	2,074	2,117	2,160	2,202	2,243	2,280
ᒥᑦᑎᒪᑕᓕᒃ	1,761	1,808	1,851	1,904	1,951	1,999	2,047	2,093	2,137	2,184	2,233
ᕿᑭᖅᑕᕐᔪᐊᖅ	668	683	697	711	724	737	752	765	780	795	811
ᑲᖏᖅᖠᓂᖅ	2,791	2,848	2,907	2,970	3,030	3,120	3,213	3,314	3,429	3,537	3,633
ᓇᐅᔮᑦ	797	818	838	858	881	903	928	949	970	990	1,012
ᖃᐅᓯᐅᑦᑐᖅ	263	266	269	270	272	275	279	281	283	287	288
ᓴᓂᑭᓗᐊᖅ	896	918	939	963	987	1,008	1,029	1,050	1,069	1,090	1,108
ᑕᓗᕐᔪᐊᖅ	1,016	1,039	1,065	1,094	1,119	1,147	1,179	1,209	1,236	1,265	1,294
ᑎᑭᕋᕐᔪᐊᖅ	397	405	412	422	432	442	450	458	469	481	491

ᑐᓴᒐᒃᓴᑦ: ᐃᓄᐃᑦ ᐅᓄᕐᓂᖏᑦᑕ ᓇᓚᐅᑦᓴᖅᑕᐅᓂᖏᑦ ᓴᖅᑭᑕᐅᓚᐅᖅᑐᑦ ᑲᓇᑕᒥ ᓈᓴᖅᓯᒪᔨᐊᖅᑐᖃᕐᓂᖓᓐᓂᒃ ᐊᒻᒪᓗ ᓄᓇᕗᑦ ᓈᓴᐃᓯᒪᕕᒃᑯᑦ ᐃᓚᐅᓐᓂᒃ ᐃᓄᐃᓄᑦ ᐅᓄᕐᓂᖏᑦ ᓄᓇᖃᖅᑐᑦ ᓄᓇᓄᒥ ᐊᒻᒪᓗ ᐊᖏᕐᕋᖃᖅᑐᑦ ᓯᓚᑖᓂ ᑲᓇᑕᐅᑉ ᐊᐅᓚᑦᓯᒪᕕᖓᓂ. ᑕᐃᒪᐃᒻᒪᑦ, ᓄᓇᖃᖃᐃᓐᓇᖅᐸᒃᑐᑦ ᔩᓱ ᐃᒡᓗᓕᐅᖅᑏᑦ, ᐅᔾᔨᕐᓇᕐᓂᐊᕐᕕᖕᒥᑦᑐᓐᓗ ᐊᓯᖏᓐᓗ ᐃᓚᐅᑎᑕᐅᖕᖏᑦᑐᑦ ᐃᓄᐃᑦ ᐅᓄᕐᓂᖏᑦᑕ ᓈᓴᖅᑕᐅᓯᒪᓂᖏᓐᓂ.

ᑐᑭᓯᒋᐊᕈᑎᒃᓴᑦ ᐱᔭᐅᔪᖃᑦ (ᐃ) ᓄᓇᓕᖕᓂᑦ ᐃᓄᒃᖃᖅᑐᓂᒃ 50-ᓂᒃ ᑐᖓᓕᓐᓄᖕᓃᑦ ᐊᒻᒪᓗ (ᐅ) ᐋᖅᑭᑦᑕᐅᓯᒪᙱᑦᑐᑦᓄ ᓄᓇᐃᑦ -- ᑭᓱᐊᓂ ᐃᓚᐅᑎᑕᐅᔪᑦ ᓄᓇᕗᑦ ᐅᓄᕐᓂᖏᓐᓄᑦ.

Nunavut: Community Population Projections

	2000	2005	2010	2015	2020
Nunavut	27,688	31,317	35,114	39,335	43,824
Arctic Bay	730	819	916	1,019	1,094
Arviat	1,690	1,929	2,198	2,517	2,855
Baker Lake	1,470	1,624	1,777	1,957	2,148
Bathurst Inlet	X	X	X	X	X
Bay Chimo	X	X	X	X	X
Cambridge Bay	1,418	1,581	1,752	1,939	2,137
Cape Dorset	1,213	1,354	1,501	1,662	1,829
Chesterfield Inlet	372	420	476	528	583
Clyde River	771	867	982	1,095	1,214
Coral Harbour	845	955	1,078	1,219	1,376
Gjoa Haven	984	1,084	1,173	1,290	1,435
Grise Ford	145	147	155	165	173
Hall Beach	635	734	829	934	1,052
Igloolik	1,379	1,562	1,736	1,922	2,131
Iqaluit	4,762	5,606	6,477	7,456	8,391
Kimmirut	450	506	573	636	706
Kugaaruk	582	664	756	867	979
Kugluktuk	1,389	1,556	1,720	1,893	2,076
Nanisivik	230	223	220	205	191
Pangnirtung	1,506	1,687	1,870	2,074	2,280
Pond Inlet	1,314	1,532	1,761	1,999	2,233
Qikiqtarjuaq	522	599	668	737	811
Rankin Inlet	2,277	2,527	2,791	3,120	3,633
Repulse Bay	615	702	797	903	1,012
Resolute Bay	243	253	263	275	288
Sanikiluaq	702	796	896	1,008	1,108
Taloyoak	804	904	1,016	1,147	1,294
Whale Cove	312	351	397	442	491

Notes: Population projections produced by Statistics Canada and the Nunavut Bureau of Statistics include people in the population who are residents of Nunavut and do NOT have a home elsewhere in Canada from which they are temporarily absent. Therefore, temporary residents such as construction crews, residents in mining camps, etc. are not included in the population projections.

Data are suppressed for (a) communities with a population of 100 or less and (b) 'unorganized areas' -- but they are included in the Nunavut total.

Nunavut: Community Population Projections

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Nunavut	27,688	28,410	29,154	29,885	30,601	31,317	32,036	32,774	33,530	34,311	35,114
Arctic Bay	730	747	763	782	801	819	837	855	876	894	916
Arviat	1,690	1,736	1,784	1,833	1,883	1,929	1,982	2,033	2,088	2,142	2,198
Baker Lake	1,470	1,501	1,534	1,563	1,594	1,624	1,655	1,683	1,712	1,745	1,777
Bathurst Inlet	X	X	X	X	X	X	X	X	X	X	X
Bay Chimo	X	X	X	X	X	X	X	X	X	X	X
Cambridge Bay	1,418	1,449	1,484	1,517	1,550	1,581	1,609	1,642	1,679	1,715	1,752
Cape Dorset	1,213	1,240	1,268	1,298	1,327	1,354	1,382	1,412	1,441	1,471	1,501
Chesterfield Inlet	372	382	391	401	409	420	431	443	452	465	476
Clyde River	771	789	812	830	848	867	890	913	937	959	982
Coral Harbour	845	865	888	911	933	955	978	1,003	1,024	1,049	1,078
Gjoa Haven	984	1,005	1,023	1,045	1,063	1,084	1,102	1,117	1,136	1,154	1,173
Grise Ford	145	146	147	146	146	147	149	151	151	153	155
Hall Beach	635	656	677	696	714	734	754	771	790	810	829
Igloolik	1,379	1,417	1,456	1,495	1,529	1,562	1,594	1,627	1,660	1,701	1,736
Iqaluit	4,762	4,930	5,108	5,278	5,438	5,606	5,768	5,936	6,108	6,289	6,477
Kimmirut	450	461	474	485	496	506	519	530	546	560	573
Kugaaruk	582	601	616	631	648	664	682	701	719	737	756
Kugluktuk	1,389	1,422	1,456	1,490	1,522	1,556	1,585	1,618	1,653	1,686	1,720
Nanisivik	230	225	224	226	225	223	222	220	221	221	220
Pangnirtung	1,506	1,539	1,575	1,613	1,651	1,687	1,722	1,756	1,792	1,831	1,870
Pond Inlet	1,314	1,361	1,405	1,443	1,489	1,532	1,574	1,624	1,668	1,714	1,761
Qikiqtarjuaq	522	537	551	566	582	599	614	629	641	654	668
Rankin Inlet	2,277	2,327	2,376	2,432	2,483	2,527	2,576	2,629	2,683	2,734	2,791
Repulse Bay	615	630	648	664	682	702	720	738	757	777	797
Resolute Bay	243	246	247	249	251	253	252	255	257	260	263
Sanikiluaq	702	722	740	758	776	796	816	834	853	873	896
Taloyoak	804	825	847	866	886	904	925	947	968	992	1,016
Whale Cove	312	321	328	336	344	351	358	367	378	388	397

Notes: Population projections produced by Statistics Canada and the Nunavut Bureau of Statistics include people in the population who are residents of Nunavut and do NOT have a home elsewhere in Canada from which they are temporarily absent. Therefore, temporary residents such as construction crews, residents in mining camps, etc. are not included in the population projections.

Data are suppressed for (a) communities with a population of 50 or less and (b) 'unorganized areas' -- but they are included in the Nunavut total.

Nunavut: Community Population Projections

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Nunavut	35,114	35,937	36,773	37,619	38,471	39,335	40,217	41,106	42,001	42,904	43,824
Arctic Bay	916	939	960	980	1,003	1,019	1,033	1,049	1,065	1,078	1,094
Arviat	2,198	2,256	2,320	2,381	2,449	2,517	2,584	2,658	2,721	2,791	2,855
Baker Lake	1,777	1,808	1,843	1,882	1,918	1,957	1,996	2,036	2,072	2,108	2,148
Bathurst Inlet	X	X	X	X	X	X	X	X	X	X	X
Bay Chimo	X	X	X	X	X	X	X	X	X	X	X
Cambridge Bay	1,752	1,790	1,828	1,865	1,900	1,939	1,979	2,018	2,057	2,095	2,137
Cape Dorset	1,501	1,536	1,570	1,600	1,632	1,662	1,692	1,726	1,757	1,793	1,829
Chesterfield Inlet	476	486	498	509	519	528	539	549	563	572	583
Clyde River	982	1,007	1,028	1,050	1,072	1,095	1,121	1,144	1,167	1,190	1,214
Coral Harbour	1,078	1,101	1,128	1,158	1,187	1,219	1,250	1,281	1,312	1,345	1,376
Gjoa Haven	1,173	1,194	1,217	1,242	1,266	1,290	1,317	1,345	1,375	1,405	1,435
Grise Ford	155	157	160	160	163	165	166	168	169	172	173
Hall Beach	829	850	870	890	912	934	957	982	1,008	1,029	1,052
Igloolik	1,736	1,773	1,807	1,842	1,883	1,922	1,960	2,001	2,043	2,086	2,131
Iqaluit	6,477	6,669	6,866	7,064	7,276	7,456	7,637	7,814	7,997	8,178	8,391
Kimmirut	573	589	601	612	624	636	649	662	675	688	706
Kugaaruk	756	779	802	823	844	867	889	911	934	957	979
Kugluktuk	1,720	1,760	1,793	1,827	1,859	1,893	1,928	1,965	2,000	2,041	2,076
Nanisivik	220	218	215	215	209	205	202	200	196	195	191
Pangnirtung	1,870	1,905	1,955	1,995	2,032	2,074	2,117	2,160	2,202	2,243	2,280
Pond Inlet	1,761	1,808	1,851	1,904	1,951	1,999	2,047	2,093	2,137	2,184	2,233
Qikiqtarjuaq	668	683	697	711	724	737	752	765	780	795	811
Rankin Inlet	2,791	2,848	2,907	2,970	3,030	3,120	3,213	3,314	3,429	3,537	3,633
Repulse Bay	797	818	838	858	881	903	928	949	970	990	1,012
Resolute Bay	263	266	269	270	272	275	279	281	283	287	288
Sanikiluaq	896	918	939	963	987	1,008	1,029	1,050	1,069	1,090	1,108
Taloyoak	1,016	1,039	1,065	1,094	1,119	1,147	1,179	1,209	1,236	1,265	1,294
Whale Cove	397	405	412	422	432	442	450	458	469	481	491

Notes: Population projections produced by Statistics Canada and the Nunavut Bureau of Statistics include people in the population who are residents of Nunavut and do NOT have a home elsewhere in Canada from which they are temporarily absent. Therefore, temporary residents such as construction crews, residents in mining camps, etc. are not included in the population projections.

Data are suppressed for (a) communities with a population of 50 or less and (b) 'unorganized areas' -- but they are included in the Nunavut total.

Le Nunavut: Projections pour la population par communautés

	2000	2005	2010	2015	2020
Nunavut	27,688	31,317	35,114	39,335	43,824
Arctic Bay	730	819	916	1,019	1,094
Arviat	1,690	1,929	2,198	2,517	2,855
Baker Lake	1,470	1,624	1,777	1,957	2,148
Bathurst Inlet	X	X	X	X	X
Bay Chimo	X	X	X	X	X
Cambridge Bay	1,418	1,581	1,752	1,939	2,137
Cape Dorset	1,213	1,354	1,501	1,662	1,829
Chesterfield Inlet	372	420	476	528	583
Clyde River	771	867	982	1,095	1,214
Coral Harbour	845	955	1,078	1,219	1,376
Gjoa Haven	984	1,084	1,173	1,290	1,435
Grise Ford	145	147	155	165	173
Hall Beach	635	734	829	934	1,052
Igloolik	1,379	1,562	1,736	1,922	2,131
Iqaluit	4,762	5,606	6,477	7,456	8,391
Kimmirut	450	506	573	636	706
Kugaaruk	582	664	756	867	979
Kugluktuk	1,389	1,556	1,720	1,893	2,076
Nanisivik	230	223	220	205	191
Pangnirtung	1,506	1,687	1,870	2,074	2,280
Pond Inlet	1,314	1,532	1,761	1,999	2,233
Qikiqtarjuaq	522	599	668	737	811
Rankin Inlet	2,277	2,527	2,791	3,120	3,633
Repulse Bay	615	702	797	903	1,012
Resolute Bay	243	253	263	275	288
Sanikiluaq	702	796	896	1,008	1,108
Taloyoak	804	904	1,016	1,147	1,294
Whale Cove	312	351	397	442	491

N.B. Les projections pour la population produites par Statistique Canada et le Bureau de la statistique du Nunavut comprennent des personnes qui sont résidentes du Nunavut et qui n'ont PAS de résidences ailleurs au Canada desquelles elles sont absentes. Il s'ensuit que les projections pour la population ne tiennent pas compte des résidents temporaires tels les membres d'une équipe de construction, les travailleurs des chantiers miniers, etc.

Les données sont supprimées pour (a) les communautés qui comptent moins de 50 habitants et (b) les régions "non-organisées". Par contre, le total pour le Nunavut tient compte de ces données.

Le Nunavut: Projections pour la population par communautés

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Nunavut	27,688	28,410	29,154	29,885	30,601	31,317	32,036	32,774	33,530	34,311	35,114
Arctic Bay	730	747	763	782	801	819	837	855	876	894	916
Arviat	1,690	1,736	1,784	1,833	1,883	1,929	1,982	2,033	2,088	2,142	2,198
Baker Lake	1,470	1,501	1,534	1,563	1,594	1,624	1,655	1,683	1,712	1,745	1,777
Bathurst Inlet	X	X	X	X	X	X	X	X	X	X	X
Bay Chimo	X	X	X	X	X	X	X	X	X	X	X
Cambridge Bay	1,418	1,449	1,484	1,517	1,550	1,581	1,609	1,642	1,679	1,715	1,752
Cape Dorset	1,213	1,240	1,268	1,298	1,327	1,354	1,382	1,412	1,441	1,471	1,501
Chesterfield Inlet	372	382	391	401	409	420	431	443	452	465	476
Clyde River	771	789	812	830	848	867	890	913	937	959	982
Coral Harbour	845	865	888	911	933	955	978	1,003	1,024	1,049	1,078
Gjoa Haven	984	1,005	1,023	1,045	1,063	1,084	1,102	1,117	1,136	1,154	1,173
Grise Ford	145	146	147	146	146	147	149	151	151	153	155
Hall Beach	635	656	677	696	714	734	754	771	790	810	829
Igloolik	1,379	1,417	1,456	1,495	1,529	1,562	1,594	1,627	1,660	1,701	1,736
Iqaluit	4,762	4,930	5,108	5,278	5,438	5,606	5,768	5,936	6,108	6,289	6,477
Kimmirut	450	461	474	485	496	506	519	530	546	560	573
Kugaaruk	582	601	616	631	648	664	682	701	719	737	756
Kugluktuk	1,389	1,422	1,456	1,490	1,522	1,556	1,585	1,618	1,653	1,686	1,720
Nanisivik	230	225	224	226	225	223	222	220	221	221	220
Pangnirtung	1,506	1,539	1,575	1,613	1,651	1,687	1,722	1,756	1,792	1,831	1,870
Pond Inlet	1,314	1,361	1,405	1,443	1,489	1,532	1,574	1,624	1,668	1,714	1,761
Qikiqtarjuaq	522	537	551	566	582	599	614	629	641	654	668
Rankin Inlet	2,277	2,327	2,376	2,432	2,483	2,527	2,576	2,629	2,683	2,734	2,791
Repulse Bay	615	630	648	664	682	702	720	738	757	777	797
Resolute Bay	243	246	247	249	251	253	252	255	257	260	263
Sanikiluaq	702	722	740	758	776	796	816	834	853	873	896
Taloyoak	804	825	847	866	886	904	925	947	968	992	1,016
Whale Cove	312	321	328	336	344	351	358	367	378	388	397

N.B. Les projections pour la population produites par Statistique Canada et le Bureau de la statistique du Nunavut comprennent des personnes qui sont résidentes du Nunavut et qui n'ont PAS de résidences ailleurs au Canada desquelles elles sont absentes. Il s'ensuit que les projections pour la population ne tiennent pas compte des résidents temporaires tels les membres d'une équipe de construction, les travailleurs des chantiers miniers, etc.

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	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
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Arctic Bay	916	939	960	980	1,003	1,019	1,033	1,049	1,065	1,078	1,094
Arviat	2,198	2,256	2,320	2,381	2,449	2,517	2,584	2,658	2,721	2,791	2,855
Baker Lake	1,777	1,808	1,843	1,882	1,918	1,957	1,996	2,036	2,072	2,108	2,148
Bathurst Inlet	X	X	X	X	X	X	X	X	X	X	X
Bay Chimo	X	X	X	X	X	X	X	X	X	X	X
Cambridge Bay	1,752	1,790	1,828	1,865	1,900	1,939	1,979	2,018	2,057	2,095	2,137
Cape Dorset	1,501	1,536	1,570	1,600	1,632	1,662	1,692	1,726	1,757	1,793	1,829
Chesterfield Inlet	476	486	498	509	519	528	539	549	563	572	583
Clyde River	982	1,007	1,028	1,050	1,072	1,095	1,121	1,144	1,167	1,190	1,214
Coral Harbour	1,078	1,101	1,128	1,158	1,187	1,219	1,250	1,281	1,312	1,345	1,376
Gjoa Haven	1,173	1,194	1,217	1,242	1,266	1,290	1,317	1,345	1,375	1,405	1,435
Grise Ford	155	157	160	160	163	165	166	168	169	172	173
Hall Beach	829	850	870	890	912	934	957	982	1,008	1,029	1,052
Igloolik	1,736	1,773	1,807	1,842	1,883	1,922	1,960	2,001	2,043	2,086	2,131
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Kugluktuk	1,720	1,760	1,793	1,827	1,859	1,893	1,928	1,965	2,000	2,041	2,076
Nanisivik	220	218	215	215	209	205	202	200	196	195	191
Pangnirtung	1,870	1,905	1,955	1,995	2,032	2,074	2,117	2,160	2,202	2,243	2,280
Pond Inlet	1,761	1,808	1,851	1,904	1,951	1,999	2,047	2,093	2,137	2,184	2,233
Qikiqtarjuaq	668	683	697	711	724	737	752	765	780	795	811
Rankin Inlet	2,791	2,848	2,907	2,970	3,030	3,120	3,213	3,314	3,429	3,537	3,633
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Sanikiluaq	896	918	939	963	987	1,008	1,029	1,050	1,069	1,090	1,108
Taloyoak	1,016	1,039	1,065	1,094	1,119	1,147	1,179	1,209	1,236	1,265	1,294
Whale Cove	397	405	412	422	432	442	450	458	469	481	491

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Les données sont supprimées pour (a) les communautés qui comptent moins de 50 habitants et (b) les régions "non-organisées". Par contre, le total pour le Nunavut tient compte de ces données.

Registration
SOR/2001-275 1 August, 2001

CANADIAN ENVIRONMENTAL PROTECTION ACT, 1999

Disposal at Sea Regulations

P.C. 2001-1353 1 August, 2001

Whereas, pursuant to subsection 332(1) of the *Canadian Environmental Protection Act, 1999*[a], the Minister of the Environment published in the *Canada Gazette*, Part I, on February 17, 2001, a copy of the proposed *Disposal at Sea Regulations*, substantially in the annexed form, and persons were given an opportunity to file comments with respect to the Regulations or to file a notice of objection requesting that a board of review be established and stating the reasons for the objection;

Therefore, Her Excellency the Governor General in Council, on the recommendation of the Minister of the Environment, pursuant to subsection 135(1) of the *Canadian Environmental Protection Act, 1999*[a], hereby makes the annexed *Disposal at Sea Regulations*.

DISPOSAL AT SEA REGULATIONS

INTERPRETATION

1. The definitions in this section apply in these Regulations.

“Act” means the *Canadian Environmental Protection Act, 1999*. (*Loi*)

“log-book” means the official log referred to in section 261 of the *Canada Shipping Act*. (*journal de bord*)

CONTENTS OF REPORT UNDER SUBSECTION 130(4) OF THE ACT

2. (1) A report under subsection 130(4) of the Act with respect to emergencies described in subsection 130(1) shall contain the following information:

(*a*) if the disposal is from a ship or a platform,

(i) the name of the ship or platform, the name of the master of the ship or the person in charge of the platform and the name and address of its owner, and

(ii) the port of registry, official number, if any, overall length, extreme breadth, overall height and deadweight tonnage of the ship or the platform;

(*b*) if the disposal is from an aircraft,

(i) the name of the pilot-in-command and the name and address of the aircraft’s owner, and

(ii) the type, model, serial number, nationality and registration marks of the aircraft and its maximum certificated take-off weight specified by its Certificate of Airworthiness;

(*c*) the last point of departure and the immediate destination of the ship or aircraft at the time at which the disposal occurred;

(*d*) the latitude and longitude of the disposal site and the depth of the sea at that place;

[a] S.C. 1999, c. 33

Enregistrement
DORS/2001-275 1 août 2001

LOI CANADIENNE SUR LA PROTECTION DE L’ENVIRONNEMENT (1999)

Règlement sur l’immersion en mer

C.P. 2001-1353 1 août 2001

Attendu que, conformément au paragraphe 332(1) de la *Loi canadienne sur la protection de l’environnement (1999)*[a], le ministre de l’Environnement a fait publier dans la *Gazette du Canada* Partie I, le 17 février 2001, le projet de règlement intitulé *Règlement sur l’immersion en mer*, conforme en substance au texte ci-après, et que les intéressés ont ainsi eu la possibilité de présenter leurs observations à cet égard ou un avis d’opposition motivé demandant la constitution d’une commission de révision,

À ces causes, sur recommandation du ministre de l’Environnement et en vertu du paragraphe 135(1) de la *Loi canadienne sur la protection de l’environnement (1999)*[a], Son Excellence la Gouverneure générale en conseil prend le *Règlement sur l’immersion en mer*, ci-après.

RÈGLEMENT SUR L’IMMERSION EN MER

DÉFINITIONS

1. Les définitions qui suivent s’appliquent au présent règlement.

« journal de bord » Le journal de bord réglementaire visé à l’article 261 de la *Loi sur la marine marchande du Canada*. (*log-book*)

« Loi » La *Loi canadienne sur la protection de l’environnement (1999)*. (*Act*)

CONTENU DU RAPPORT VISÉ AU PARAGRAPHE 130(4) DE LA LOI

2. (1) Le rapport visé au paragraphe 130(4) de la Loi — portant sur un cas d’urgence — doit comprendre les renseignements suivants :

a) lorsque l’immersion se fait à partir d’un navire ou d’une plate-forme :

(i) le nom du navire ou de la plate-forme, le nom du capitaine du navire ou du responsable de la plate-forme et les nom et adresse du propriétaire,

(ii) le port d’enregistrement, le numéro officiel, le cas échéant, la longueur hors tout, la largeur maximale, la hauteur hors tout et le port en lourd du navire ou de la plate-forme;

b) lorsque l’immersion se fait à partir d’un aéronef :

(i) le nom du commandant de bord de l’aéronef et les nom et adresse du propriétaire,

(ii) le type, le modèle, le numéro de série, la nationalité et les marques d’immatriculation de l’aéronef et la masse maximale homologuée au décollage dont fait état le certificat de navigabilité de l’aéronef;

c) le dernier point de départ et la prochaine destination du navire ou de l’aéronef au moment de l’immersion;

[a] L.C. 1999, ch. 33

(*e*) an extract of all portions of the log-book and manifests of the ship, platform or aircraft related to the emergency;

(*f*) a detailed description of the circumstances under which the substance was disposed of and the date and time of the disposal;

(*g*) a detailed description of the actions taken to minimize danger to human life and to the marine environment; and

(*h*) a description of the substance disposed of, including

(i) information on the composition and nature of the substance that is sufficient to permit the identification of the substance,

(ii) the quantity that was disposed of,

(iii) the form of the substance, namely, solid, liquid or gas, and the methods used to package and contain the substance, if any,

(iv) the trade name of the substance, if any, and

(v) an estimate of the time required for the substance to disappear below the surface of the water.

(2) The report shall be delivered to the enforcement officer designated for the area where the disposal occurs or to any other person designated by the Governor in Council and shall be submitted in written form or in an electronic format that is compatible with the one used by the addressee.

NATIONAL ACTION LIST

3. For the purposes of sections 9 and 10 of Schedule 6 to the Act, the National Action List mechanisms for screening waste or other matter shall consist of

(*a*) with respect to the Lower Level, an assessment of the concentration of specified substances in the waste or other matter; and

(*b*) with respect to the Upper Level, an assessment of biological responses.

MECHANISMS FOR SCREENING

4. Waste or other matter referred to in items 1 and 4 of Schedule 5 to the Act that contains any of the substances set out in column 1 of the table to this section, each at a concentration equal to or below the concentration set out in column 2, shall be considered to be below the Lower Level of the National Action List.

TABLE

LOWER LEVEL

Item	Column 1 Substances	Column 2 Concentration
	Metal	
1.	Cadmium and its compounds	0.6 mg/kg (dry weight)
2.	Mercury and its compounds	0.75 mg/kg (dry weight)
	Organic compounds	
3.	Total polycyclic aromatic hydrocarbons (PAHs)	2500 µg/kg (dry weight)
4.	Total polychlorinated biphenyls (PCBs)	100 µg/kg (dry weight)
	Other substances	
5.	Persistent plastics and other persistent synthetic materials in a comminuted form	4% by volume

d) la latitude et la longitude du lieu de l'immersion, ainsi que la profondeur de la mer à ce lieu;

e) les extraits du journal de bord et des manifestes du navire, de la plate-forme ou de l'aéronef qui portent sur le cas d'urgence;

f) un compte rendu détaillé des circonstances de l'immersion, ainsi que la date et l'heure de l'immersion;

g) un état détaillé des mesures prises pour réduire au minimum les risques d'atteinte à la vie humaine et au milieu marin;

h) une description de la substance immergée, notamment :

(i) les renseignements sur sa composition et sa nature qui suffisent à l'identifier,

(ii) la quantité immergée,

(iii) sa forme — solide, liquide ou gazeuse — et, le cas échéant, les méthodes d'emballage et de confinement,

(iv) son nom commercial, le cas échéant,

(v) le temps approximatif qu'elle a pris pour sombrer.

(2) Le rapport est remis à l'agent de l'autorité désigné pour la région où a eu lieu l'immersion ou à toute autre personne désignée par le gouverneur en conseil et est présenté par écrit ou en une forme électronique compatible avec celle du destinataire.

LISTE D'INTERVENTION NATIONALE

3. Pour l'application des articles 9 et 10 de l'annexe 6 de la Loi, les mécanismes de sélection des déchets ou autres matières propres à la liste d'intervention nationale sont les suivants :

a) quant au niveau inférieur, l'évaluation de la concentration de substances déterminées dans les déchets ou autres matières;

b) quant au niveau supérieur, l'évaluation des réactions biologiques.

MÉCANISMES DE SÉLECTION

4. Sont considérés comme se situant au-dessous du niveau inférieur de la liste d'intervention nationale les déchets et autres matières qui sont visés aux articles 1 et 4 de l'annexe 5 de la Loi et qui contiennent l'une ou l'autre des substances énumérées à la colonne 1 du tableau du présent article pourvu qu'aucune de celles-ci ne s'y retrouve en une concentration supérieure à celle prévue à la colonne 2.

TABLEAU

NIVEAU INFÉRIEUR

Article	Colonne 1 Substances	Colonne 2 Concentration
	Métaux	
1.	Cadmium et ses composés	0,6 mg/kg (poids à sec)
2.	Mercure et ses composés	0,75 mg/kg (poids à sec)
	Composés organiques	
3.	Hydrocarbures aromatiques polycycliques (HAP) totaux	2500 µg/kg (poids à sec)
4.	Biphényles polychlorés (BPC) totaux	100 µg/kg (poids à sec)
	Autres substances	
5.	Plastiques indestructibles et autres matières synthétiques persistantes (sous forme pulvérisée)	4 % par volume

5. (1) Waste or other matter referred to in section 4 that contains any of the substances set out in column 1 of the table to that section at a concentration above the concentration set out in column 2, shall be assessed using three marine or estuarine biological tests for sediment assessment, namely, an acute lethality test and

(*a*) two sub-lethal tests; or

(*b*) one sub-lethal and one bioaccumulation test.

(2) The acute lethality test shall be conducted using the test methodology entitled *Biological Test Method: Reference Method for Determining Acute Lethality of Sediment to Marine or Estuarine Anthropods* (Reference Method EPS 1/RM/35), December 1998, published by the Department of the Environment, as amended from time to time.

(3) The sub-lethal tests shall be conducted using any of the test methodologies set out in *Biological Test Method: Sublethal Toxicity Tests to Assess Sediments Intended for Disposal at Sea* (Report; EPS 1/RM/40), May 2001, published by the Department of the Environment, as amended from time to time.

(4) The bioaccumulation test shall be conducted using the test methodology entitled *Guidance Manual: Bedded Sediment Bioaccumulation Tests* (EPA/600/R-93/183), September 1993, published by the United States Environmental Protection Agency, as amended from time to time.

(5) The tests shall be performed, and their results interpreted, in accordance with generally accepted standards of good scientific practice at the time the tests are performed.

6. If the results of the three marine or estuarine biological tests set out in subsection 5(1) meet the criteria set out for those tests, the waste or other matter shall subsequently be considered to be below the Lower Level of the National Action List.

7. If the results of either the acute lethality test set out in subsection 5(1) or the two other tests set out in paragraph 5(1)(*a*) or (*b*) fail to meet the criteria set out for those tests, the waste or other matter shall be considered to be above the Upper Level of the National Action List.

8. If the results of the acute lethality test set out in subsection 5(1) and one of the tests set out in paragraph 5(1)(*a*) or (*b*) meet the criteria set out for those tests, the waste or other matter shall be considered to be below the Upper Level but above the Lower Level of the National Action List.

FEES

9. The fee that is to accompany an application for a permit referred to in section 127 or 128 of the Act is $2,500.

REPEAL

10. The *Ocean Dumping Regulations, 1988*[1] are repealed.

COMING INTO FORCE

11. These Regulations come into force on the day on which they are registered.

[1] SOR/89-500

5. (1) Les déchets et autres matières qui sont visés à l'article 4 et qui contiennent l'une ou l'autre des substances énumérées à la colonne 1 du tableau de cet article en une concentration supérieure à celle prévue à la colonne 2 doivent être soumis à trois tests biologiques marins ou estuariens visant à évaluer les sédiments, à savoir un test de létalité aiguë et :

a) soit deux tests de toxicité sublétale;

b) soit un test de toxicité sublétale et un test de bioaccumulation.

(2) Le test de létalité aiguë est effectué conformément à la *Méthode d'essai biologique : méthode de référence pour la détermination de la létalité aiguë d'un sédiment pour des amphipodes marins ou estuariens* (Méthode de référence SPE 1/RM/35), publiée en décembre 1998 par le ministère de l'Environnement, compte tenu de ses modifications successives.

(3) Les tests de toxicité sublétale sont effectués conformément à l'une ou l'autre des méthodes énumérées dans la *Méthode d'essai biologique : essais de toxicité sublétale en vue de l'évaluation des sédiments destinés à l'immersion en mer* (Rapport SPE 1/RM/40), publiée en mai 2001 par le ministère de l'Environnement, compte tenu de ses modifications successives.

(4) Le test de bioaccumulation est effectué conformément à la méthode intitulée *Guidance Manual: Bedded Sediment Bioaccumulation Tests* (Méthode de référence EPA/600/R-93/183), publiée en septembre 1993 par l'Environmental Protection Agency des États-Unis, compte tenu de ses modifications successives.

(5) Les test doivent être réalisés — et les résultats évalués — conformément aux normes généralement reconnues régissant les bonnes pratiques scientifiques au moment des tests.

6. Si les résultats des trois tests biologiques marins ou estuariens visés au paragraphe 5(1) satisfont aux critères établis pour ces tests, les déchets ou autres matières sont considérés par la suite comme se situant au-dessous du niveau inférieur de la liste d'intervention nationale.

7. Si les résultats soit du test de létalité aiguë prévu au paragraphe 5(1), soit des deux autres tests prévus aux alinéas 5(1)*a*) ou *b*) ne satisfont pas aux critères établis pour ces tests, les déchets ou autres matières sont considérés comme se situant au-dessus du niveau supérieur de la liste d'intervention nationale.

8. Si les résultats du test de létalité aiguë prévu au paragraphe 5(1) et l'un des deux autres tests prévus aux alinéas 5(1)*a*) ou *b*) satisfont aux critères établis pour ces tests, les déchets ou autres matières sont considérés comme se situant au-dessous du niveau supérieur et au-dessus du niveau inférieur de la liste d'intervention nationale.

DROITS

9. Pour l'application des articles 127 et 128 de la Loi, la demande de permis est accompagnée d'un droit de 2 500 $.

ABROGATION

10. Le *Règlement de 1988 sur l'immersion de déchets en mer*[1] est abrogé.

ENTRÉE EN VIGUEUR

11. Le présent règlement entre en vigueur à la date de son enregistrement.

[1] DORS/89-500

REGULATORY IMPACT ANALYSIS STATEMENT

(*This statement is not part of the Regulations.*)

Description

This statement describes the *Disposal at Sea Regulations* under the *Canadian Environmental Protection Act, 1999* (CEPA, 1999) which replace the *Ocean Dumping Regulations, 1988.*

Each year in Canada, two to three million tonnes of material are disposed of at sea. Most of this is dredged material that must be moved to keep shipping channels and harbours clear for navigation and commerce. Only those substances listed in the CEPA, 1999 may be considered for disposal at sea including, dredged material, fisheries waste, ships, inert matter, uncontaminated organic matter and bulky substances. Discharges from land or from normal ship operations (such as bilge water) are not considered disposal at sea, but are subject to other controls.

All disposal at sea is controlled federally by a system of permits issued under CEPA, 1999. The objective of the ocean disposal legislation under CEPA, 1999 and its regulations is to prevent marine pollution from the uncontrolled disposal of waste or other matter at sea. Permits are granted on a case-by-case basis after an application and review process. Permits typically govern timing, handling, storing, loading, placement at the disposal site, and monitoring requirements. The permit assessment phase involves public notice, an application that provides detailed data, a scientific review and payment of fees. This system has been in place since 1975 and was included in CEPA, 1988.

CEPA, 1999, by updating controls and provisions on disposal at sea, allowed Canada, in May 2000, to become the 10th country to accede to a new international agreement on the prevention of pollution from the disposal of wastes at sea called the *1996 Protocol to the London Convention 1972.*

CEPA, 1999 takes a precautionary approach to ocean disposal. It now includes on Schedule 5, as does the Protocol, a list of substances that may be disposed of at sea. By contrast, CEPA, 1988 required regulations to stipulate what could not be disposed at sea. A second change between the two Acts is that CEPA, 1999 requires the creation of a National Action List which establishes “levels” above which disposal would not be allowed to limit harm to the environment and human health.

The *Ocean Dumping Regulations*, *1988*, which had to be updated for CEPA, 1999, contained specific details on how to assess whether a waste can be disposed of at sea, what fees to pay for an application and what information to supply in a permit application or in a report following emergency disposal. The regulatory changes required to align to CEPA, 1999 were considered to be too significant for a simple roll-over of the 1988 regulations. In fact, however, the regulatory changes codify existing practices.

RÉSUMÉ DE L’ÉTUDE D’IMPACT DE LA RÉGLEMENTATION

(*Ce résumé ne fait pas partie du règlement.*)

Description

Ce résumé décrit le *Règlement sur l’immersion en mer,* aux termes de la *Loi canadienne sur la protection de l’environnement* (*1999)* LCPE, 1999, qui remplace le *Règlement de 1988 sur l’immersion de déchets en mer*.

On immerge chaque année, au Canada, deux à trois millions de tonnes de matières en mer. Il s’agit, en général, de déblais de dragage qu’il faut déplacer dans les chenaux et les ports afin de faciliter le commerce et la navigation. Seules les substances énumérées dans la (LCPE, 1999) peuvent être immergées en mer, dont les déblais de dragage, les déchets de poisson, les navires, les matières inertes, les matières organiques non contaminées et les substances en vrac. Les rejets provenant des activités terrestres ou résultant de l’opération normale d’un navire (eau de cale, par exemple) ne sont pas considérés comme des rejets en mer, mais sont néanmoins soumis à d’autres mesures de contrôle.

Tous les rejets en mer sont assujettis à un système fédéral d’octroi de permis délivrés en vertu de la LCPE, 1999. L’objectif de la LCPE, 1999 et de ses règlements sur l’immersion en mer est de prévenir la pollution des mers résultant de l’immersion non réglementée de déchets ou d’autres matières. La délivrance d’un permis se fait sur une base individuelle, à la suite de l’évaluation de la demande. Les permis délivrés régissent le moment, la manipulation, le stockage, le chargement et l’immersion des substances et fixent les exigences de surveillance. L’évaluation des demandes de permis comporte un avis public, une demande donnant de l’information détaillée, un examen scientifique et le paiement des droits. Ce système, en vigueur depuis 1975, existait dans la LCPE, 1988.

En mettant à jour les mesures de contrôle et les dispositions sur l’immersion en mer, la LCPE, 1999 a permis au Canada, en mai 2000, de devenir le dixième pays à accéder à un nouvel accord international sur la prévention de la pollution par l’immersion de déchets en mer, appelé le *Protocole de 1996 à la Convention de Londres de 1972*.

La LCPE, 1999 se fonde sur le principe de précaution en matière d’immersion en mer. Elle dresse, à l’annexe 5, à l’image du Protocole, la liste des substances que l’on peut immerger en mer. La LCPE, 1988, au contraire, demandait seulement que les règlements stipulent les substances à ne pas immerger en mer. Autre différence, la LCPE, 1999 exige l’établissement d’une liste d’intervention nationale qui fixe les « niveaux » au-dessus desquels les matières ne doivent pas être immergées, afin de limiter les dommages causés à l’environnement et à la santé humaine.

Le *Règlement de 1988 sur l’immersion de déchets en mer*, qui doit maintenant être mis à jour avec la LCPE, 1999, renferme des informations spécifiques sur la manière d’évaluer si un déchet peut être immergé en mer, les droits à payer pour une demande de permis et les renseignements qui doivent être inclus dans une demande de permis ou dans le rapport suivant une opération d’immersion d’urgence. Les modifications réglementaires nécessaires pour se conformer à la LCPE, 1999 étaient considérées comme trop importantes pour se contenter de reporter les règlements de 1988. En fait, les changements réglementaires permettent de codifier les pratiques actuelles.

The *Disposal at Sea Regulations* under Division 3, Part 7 of the CEPA, 1999 replace the *Ocean Dumping Regulations, 1988* under CEPA, 1988, with the exception of the permit application form. The Regulations also codify national policies (contained in Users Guide to the Application Form for Ocean Disposal, EPS 1/MA/1), in place since 1993-94 which explain how to assess waste or other matter for disposal at sea. The provisions for the permit application form are set out under separate Ministerial regulations called the *Regulations Respecting Applications for Permits for Disposal at Sea*.

Le *Règlement sur l'immersion en mer*, pris en vertu de la LCPE, 1999, partie 7, section 3, remplace le *Règlement de 1988 sur l'immersion de déchets en mer* en vertu de la LCPE, 1988, à l'exception de la formule de demande de permis. Le règlement vient également codifier les politiques nationales en place depuis 1993-1994 (incluses dans le Guide de l'utilisateur de la formule « Demande de permis (immersion en mer) », (SPE 1/MA/1) qui explique comment évaluer des déchets ou d'autres matières qu'on souhaite immerger en mer. Le règlement ministériel, *Règlement sur les demandes de permis pour l'immersion en mer*, régit la question des formules de demande de permis et leur contenu.

The *Disposal at Sea Regulations* are relevant to a specific group of government and non-government organizations (NGOs) interested in permits that are issued mainly for the disposal of dredged material (sediment moved to deepen shipping channels etc.) fisheries waste, or ships that cannot be recycled. Environmental non-government organizations (ENGOs) may be interested in assuring that disposal at sea is controlled in an environmentally defensible manner. Native groups may be interested in ensuring that ocean disposal will not impact their environment or activities. The Regulations are also relevant to ship masters that are forced to dispose of a substance at sea to avert a danger to human life or a ship.

Le *Règlement sur l'immersion en mer* s'applique à un groupe donné d'organismes gouvernementaux et d'organisations non gouvernementales (ONG) concernés par les permis délivrés principalement en vue de l'immersion de matériaux de dragage (sédiments déplacés pour creuser les voies de navigation, etc.), de déchets de poisson ou de navires qui ne peuvent pas être recyclés. Les organisations environnementales non gouvernementales (OENG) peuvent être intéressées à ce que l'immersion en mer soit soumise à des mesures antipollution de façon à respecter l'environnement. Les groupes autochtones peuvent être intéressés à s'assurer que l'immersion en mer sera sans effet sur leur environnement ou leurs activités. Le règlement s'applique aussi aux capitaines de navire qui sont obligés d'immerger en mer une substance pour éviter les menaces à la vie humaine ou à la sécurité du navire.

The Regulations do not introduce any substantive changes to current practices. Their aim is to bring existing regulation and policy together into a clear, transparent regulatory regime using language consistent with CEPA, 1999.

Le règlement n'apporte aucun changement important aux pratiques actuelles. Il vise à regrouper la réglementation et les politiques existantes en un seul régime réglementaire clair et transparent, faisant appel aux mêmes formulations que la LCPE, 1999.

Specifically, this is what has been done to make the new Regulations consistent: The application fee from the previous Regulations is rolled over without change. There are minor wording changes to the information required under section 130 (emergency disposal, or disposal for safety reasons) to make the language consistent with the new CEPA, 1999 and to clarify the information to be included in the report filed. Clarifications of the information include the depth at the emergency disposal site, the date and time of disposal, and the action taken to minimize the risk to health and the environment during emergency disposal.

En particulier, voici les changements apportés afin d'harmoniser le nouveau règlement. Le droit du règlement précédent, attaché à la demande, est reporté sans changement. On a apporté des modifications terminologiques mineures quant aux renseignements demandés en application de l'article 130 (immersion en cas d'urgence ou pour des raisons de sécurité), pour harmoniser le libellé du règlement avec le texte de la nouvelle LCPE, 1999 et pour clarifier l'information à inscrire dans le rapport. Cette clarification des renseignements inclut la profondeur du lieu d'immersion d'urgence, la date et l'heure de l'immersion et les mesures prises pour réduire les risques à la santé et à l'environnement durant une opération d'immersion d'urgence.

The provisions of CEPA, 1999 (Articles 9 and 10 of Schedule 6) require the development of a National Action List to evaluate waste or other matter being considered for disposal at sea. In selecting substances for inclusion on the National Action List, priority is given to substances that are toxic, persistent, bioaccumulative and emanating from human activities. The Regulations provide the required National Action List which is taken from the national policy on assessing wastes developed in 1993-94 and published in a national user's guide (EPS 1/MA/1). The National Action List is an evaluation process which uses chemical screening levels (Lower Level) to represent a level of no concern and marine toxicity tests and, where necessary, bioaccumulation tests to determine the level above which ocean disposal is prohibited (Upper Level).

Les dispositions de la LCPE, 1999 (à l'annexe 6, les articles 9 et 10) prévoient l'établissement d'une liste d'intervention nationale pour l'évaluation des déchets ou d'autres matières qu'on envisage d'immerger en mer. Dans le choix des substances à inscrire sur la liste d'intervention nationale, la priorité doit être donnée aux substances toxiques, persistantes et bioaccumulables d'origine anthropique. Le règlement contient la liste d'intervention nationale qui est issue de la politique nationale sur l'évaluation des déchets élaborée en 1993-1994 et publiée dans un guide national de l'utilisateur (SPE 1/MA/1). La liste d'intervention nationale est un processus d'évaluation qui prévoit des mécanismes de sélection des produits chimiques (niveau inférieur) représentant un niveau non préoccupant, ainsi que des essais de toxicité marine et, au besoin, des essais de bioaccumulation pour déterminer le seuil à partir duquel l'immersion en mer est interdite (niveau supérieur).

Alternatives

The consideration of alternatives to regulation was limited by several factors. Section 355.1 stipulates that regulations existing under CEPA, 1988 that are inconsistent with the CEPA, 1999 may remain in force for only two years from the day on which the new Act was assented to, and thus the provisions of the *Ocean Dumping Regulations, 1988* will cease to be in force as of September 14, 2001.

Using a voluntary approach was not appropriate as these practices have been regulated since 1975 and have proven effective. De-regulation would result in a weakening of environmental controls, particularly with respect to information requirements, and regulated levels as per the National Action List.

CEPA, 1999 allows that issues related to assessment and decision-making in Part 7, Division 3, be controlled under Governor in Council regulations, while an application form and its contents may be controlled under Ministerial regulations. The application form and its contents were proposed as Ministerial regulations.

For the remainder of the issues, the only appropriate alternative was to repeal the *Ocean Dumping Regulations, 1988* and create the *Disposal at Sea Regulations*.

Benefits and Costs

Costs

Private Sector:

No additional costs to the private sector will result from the Regulations as information to be submitted is practically the same as current regulations and current policy which has been in place since 1994. Minor wording changes to the information required under section 130 (emergency disposal, or disposal for safety reasons) have been made to make the language consistent with the new CEPA, 1999 and to clarify the information to be included in the report filed. Clarifications to information include the depth at the emergency disposal site, the date and time of disposal, and the action taken to minimize the risk to health and the environment during emergency disposal. As emergency disposals are very rare (less than one every five years) and the information added is basic, no cost consequences are foreseen.

The National Action List mechanisms for screening waste have been in place as policy since 1994. The concentration for specific chemical constituents have been in place since 1975 for cadmium and mercury and since 1994 for PAHs and PCBs. No new costs to applicants are foreseen.

The application fee has been in place since 1993 under the *Ocean Dumping Regulations, 1988* and is rolled-over unchanged. No new costs to applicants are foreseen.

Solutions envisagées

Plusieurs facteurs limitaient les solutions de rechange envisagées. Aux termes de l'article 355.1, qui stipule que les règlements en vigueur sous l'égide de la LCPE, 1988 qui ne sont pas cohérents avec la LCPE, 1999 ne peuvent demeurer exécutoires que pour une période de deux ans suivant la date de la sanction de la Loi, les dispositions du *Règlement de 1988 sur l'immersion de déchets en mer* deviendront donc caduques à compter du 14 septembre 2001.

Il était inopportun d'instaurer une méthode volontaire puisque ces pratiques sont réglementées depuis 1975 et ont prouvé leur efficacité. Une déréglementation entraînerait un affaiblissement des mesures de contrôle environnementales, particulièrement en ce qui touche les renseignements exigés et les niveaux réglementés en conformité avec la liste d'intervention nationale.

La LCPE, 1999 permet que les problèmes ayant trait à l'évaluation et à la prise de décisions, dans la section 3 de la partie 7, soient régis par un règlement pris par le gouverneur en conseil, alors qu'un règlement ministériel peut régir la question des formules de demande et leur contenu. La formule de demande et son contenu relèvent donc maintenant du pouvoir de réglementation ministériel.

Pour le reste des enjeux, la seule solution de rechange appropriée était d'abroger le *Règlement de 1988 sur l'immersion de déchets en mer* et de créer le *Règlement sur l'immersion en mer*.

Avantages et coûts

Coûts

Secteur privé :

Le règlement n'entraînera aucun coût supplémentaire pour le secteur privé, puisque les renseignements demandés sont pratiquement les mêmes que ceux requis par le règlement et la politique qui sont en place depuis 1994. On a apporté des modifications terminologiques mineures quant aux renseignements demandés en application de l'article 130 (immersion en cas d'urgence ou pour des raisons de sécurité), pour harmoniser le libellé du règlement avec le texte de la nouvelle LCPE, 1999 et pour clarifier l'information à inscrire dans le rapport. Cette clarification des renseignements inclut la profondeur du lieu d'immersion d'urgence, la date et l'heure de l'immersion et les mesures prises pour réduire les risques à la santé et à l'environnement durant une opération d'immersion d'urgence. Comme les immersions d'urgence sont très rares (moins d'une aux cinq ans) et puisque l'information demandée consiste en des renseignements de base, on ne prévoit aucune conséquence financière.

Les mécanismes prévus pour l'évaluation des déchets, sous l'égide de la liste d'intervention nationale, existent depuis 1994 sous forme de politique. Les concentrations applicables à certains composants chimiques spécifiques sont établies depuis 1975 pour le cadmium et le mercure et depuis 1994 pour les HAP et les BPC. On ne prévoit aucun coût supplémentaire pour les requérants.

Le droit de demande est en place depuis 1993, aux termes du *Règlement de 1988 sur l'immersion de déchets en mer* et est reporté sans modification. On ne prévoit aucun coût supplémentaire pour les requérants.

Federal:

The Department of the Environment's costs to administer the Regulations will not change. No change to the costs of other departments is foreseen.

Benefits

Private Sector:

The Regulations contribute to ensuring transparency, fairness and consistency by defining what is expected under an emergency report and how to assess material proposed for disposal at sea using a National Action List.

They consolidate existing policy and regulation into one package which provides stakeholders with a clearer regulatory regime for the protection of the marine environment and human health.

Federal:

The Regulations address modifications in language in CEPA, 1999, and assist in ensuring a fair and consistent assessment process for material to be disposed of at sea.

The Regulations, through the National Action List allow the Federal Government to meet its requirements under CEPA, 1999 and the *1996 Protocol to the London Convention 1972.*

Environment:

The Regulations will provide continued assurance that adequate information is provided to allow for the best follow-up action on emergency disposal, and greater assurance that material is assessed according to a precautionary approach which provides for the protection of the marine environment and human health.

Consultation

Over the last 10 years, extensive consultations have been held with federal and provincial government, industry, environmental and native groups, on the issues relating to these controls on disposal at sea. Consultations on the Regulations were also held in 1999 with the regulated community, who generally accepted that changes would not affect their current practices. Details of the consultations are below.

The Regulations have been anticipated for several years and consultation on their basic content began in 1991 with a general discussion paper on modifying the form and fees. A subsequent discussion paper on the other suggested changes was mailed in 1993 to about 600 individuals and organizations interested in disposal at sea issues. Stakeholders included federal and provincial government, industry, native groups and environmental groups. This mail-out was supplemented with stakeholder meetings held in Newfoundland, Nova Scotia, New Brunswick, Quebec, British Columbia and the Northwest Territories. Further discussion papers were mailed and consultation meetings were held in 1994 and 1997. In each of these consultations, the progress towards these planned regulatory changes were explained and comments were invited. Consultation reports responding to comments were generated and distributed to participants. Consultations were conducted in the spring and summer of 1999, following the preparation of the drafting instructions for these

Gouvernement fédéral :

Les coûts d'application du règlement demeureront inchangés pour le ministère de l'Environnement. On ne prévoit également aucune modification des coûts assumés par les autres ministères.

Avantages

Secteur privé :

Le règlement améliore la transparence, l'équité et l'homogénéité du processus en définissant les mesures à prendre en cas de signalement d'une urgence et comment évaluer les matières qu'on souhaite immerger, à l'aide d'une liste d'intervention nationale. Il fusionne le règlement et la politique existants en un seul régime réglementaire clair, visant à assurer la protection du milieu marin et de la santé humaine.

Gouvernement fédéral :

Les modifications réglementaires respectent la terminologie de la nouvelle LCPE, 1999 et contribuent à instaurer un processus d'évaluation équitable et cohérent pour les matières qu'on souhaite immerger en mer.

Le règlement, au moyen de la liste d'intervention nationale, permet au gouvernement fédéral d'honorer pleinement les obligations que lui confèrent la LCPE, 1999 et le *Protocole de 1996 de la Convention de Londres de 1972*.

Environnement :

Le règlement assurera en permanence la communication d'une information adéquate pour permettre la mise en place d'un suivi optimal aux immersions d'urgence et il contribuera davantage à assurer que les matières sont évaluées en vertu d'un principe de précaution visant à protéger le milieu marin et la santé humaine.

Consultations

Au cours des dix dernières années, de vastes consultations ont eu lieu avec les gouvernements fédéral et provinciaux, l'industrie et les groupes écologistes et autochtones sur les mesures de contrôle de l'immersion en mer. Des consultations sur le projet de règlement ont également eu lieu en 1999 auprès de la communauté réglementée, qui, dans l'ensemble, a constaté que les modifications ne toucheront pas ses pratiques actuelles. Les détails des consultations suivent.

Le règlement était attendue depuis plusieurs années; les consultations sur son contenu essentiel ont commencé en 1991, avec un document de travail général sur la modification de la formule et des droits de demande. Par la suite, en 1993, un document de travail sur les autres modifications suggérées a été posté à quelque 600 personnes et organisations s'intéressant à la problématique de l'immersion de déchets en mer. Parmi ces intervenants, on retrouve les gouvernements fédéral et provinciaux, l'industrie et les groupes autochtones et écologistes. Cet envoi a été étayé de rencontres avec les parties intéressées à Terre-Neuve, en Nouvelle-Écosse, au Nouveau-Brunswick, au Québec, en Colombie-Britannique et dans les Territoires du Nord-Ouest. En 1994 et en 1997, on a posté de nouveaux documents de travail et tenu de nouvelles rencontres de consultation, où l'on a exposé le degré d'avancement des modifications réglementaires envisagées et invité les intéressés à formuler des commentaires. Des rapports de consultation ont été produits et distribués aux participants. À la

Regulations. Major clients (dredgers and excavators from government and industry) were invited to consultation meetings, while a broader list of clients were offered copies of the proposed text for comment.

Comments received

Stakeholders provided mixed comments regarding the requirements of the National Action List. Larger volume applicants (Port Corporations, industry, Government clients who apply to dispose of more than 10,000 cubic metres of sediment or soil per year) generally had no objections to the assessment procedures. Some suggested that the process of using toxicity testing was helpful and beneficial, and allowed additional options over chemical testing alone.

Smaller volume applicants (those disposing of less than 10,000 cubic metres per year) continued to feel that the testing of a minimum of four chemical parameters, valid for up to four years, was excessive and requested that small volume users be exempt from testing under most circumstances. The Department of the Environment was unable to grant this request to deregulate, as smaller volumes do not necessarily mean reduced contamination and small projects in the vicinity of shipping docks or marinas may, in some cases, present greater risk than larger projects farther removed from human activity.

Although fees will not be increased from the 1993 levels, applicants, especially small volume clients, requested a reduction in the fees and a breakdown of costs. These fees were prescribed based partly on an estimate of the direct costs to the disposal at sea program for administering and assessing applications and publishing permits. Other factors were considered in setting the fee, such as:

- encouraging the use of reduction, recycling and reuse options;
- providing comparative pricing to other disposal options; and
- the desire to maintain disposal at sea as an affordable option when it is the environmentally preferable and practical alternative.

Assessment procedures for small and large volume applications are the same and thus maintaining a single fee for all applicants continues to appear the most reasonable option. Revenue generated by the application fee has averaged about $225,000 per year since 1993 and does not cover the direct costs of administering permit application assessment and publication. Direct costs are in the order of $425,000 per year. A decrease, in the fees or an increase to meet actual costs is not planned at this time.

Stakeholders had no comments regarding the emergency report requirements.

suite de la préparation des instructions pour la rédaction de ce règlement, on a mené des consultations au printemps et à l'été 1999. On a invité aux rencontres consultatives les principaux clients (personnes de l'industrie ou du gouvernement qui s'occupe de dragage ou d'excavation) et on a distribué aux autres clients une copie du texte proposé, pour commentaires.

Commentaires reçus

Les exigences de la liste d'intervention nationale ont suscité des commentaires mitigés de la part des intervenants. En général, les clients qui immergent des volumes abondants (les ports, l'industrie ou le gouvernement qui font des demandes de permis pour immerger plus de 10 000 mètres cubes annuellement) n'avaient aucune objection au processus d'évaluation. Certains ont jugé utile et avantageux le recours aux essais de toxicité, qui ouvrait la porte à d'autres options que les seuls essais chimiques.

Quant aux clients qui immergent des volumes plus faibles (moins de 10 000 mètres cubes annuellement), ils continuaient de juger excessive la nécessité de mener des essais sur un minimum de quatre paramètres chimiques, valides pour une période pouvant atteindre quatre ans, et ils ont demandé que les requêtes d'immersion de faibles volumes soient exemptées de cette exigence dans la majorité des situations. Le ministère de l'Environnement n'a pu agréer à cette demande de déréglementation, puisqu'un volume moindre n'est pas nécessairement synonyme de contamination moindre et que, dans certains cas, les opérations de moindre envergure, menées à proximité d'un quai de chargement ou d'une marina, peuvent être plus périlleuses que les opérations plus importantes, mais effectuées à plus grande distance de toute activité humaine.

Même si les droits ne seront pas majorés en regard des niveaux de 1993, les clients (spécialement ceux qui immergent de faibles volumes) ont demandé une baisse des droits et une ventilation des coûts. Ces droits avaient été déterminés en partie selon une évaluation des coûts directs engendrés, pour le programme d'immersion en mer, par l'administration et l'évaluation des requêtes et la publication des permis. D'autres facteurs avaient été pris en compte dans la détermination du droit, notamment :

- la promotion des options de réduction, de recyclage et de réemploi;
- la prestation de prix comparatifs en regard des autres options d'élimination;
- le désir de maintenir l'immersion en mer comme une option économiquement abordable lorsqu'elle constitue une solution pratique et écologiquement préférable.

Comme les méthodes d'évaluation demeurent les mêmes quel que soit le volume à immerger, le maintien d'un droit unique pour tous les requérants semble toujours l'option la plus raisonnable. Depuis 1993, les droits de demande ont produit en moyenne des recettes de 225 000 $ par année, ce qui ne couvre pas les coûts directs d'administration, d'évaluation des demandes de permis et de publication. Ces frais directs sont de l'ordre de 425 000 $ par année. Pour l'instant, on ne prévoit pas réduire les droits, ou encore les majorer afin de couvrir les frais réels.

Les intervenants n'ont formulé aucun commentaire concernant les exigences de signalement des cas d'urgence.

Upon publication in the *Canada Gazette*, Part I on February 17, 2001, the private sector and general public had 60 days to provide the Minister with comments which would be taken into consideration prior to the publication of the Regulations in the *Canada Gazette*, Part II.

No substantive comments on the Regulations were received from stakeholders during the comment period which ended April 19, 2001. Comments received by stakeholders were in the form of questions. Stakeholders asked for greater clarification about disposal at sea and CEPA, 1999 itself, which was provided. Commonly asked questions and their answers were posted on Environment Canada's Green Lane Web site.

The only comment of substance, came from program personnel during a February 2001 ocean disposal manager's meeting in Vancouver. Comments were about how the required toxicity test methods were identified in the Regulations. It was suggested that a clarification was needed to tell applicants which biological test methods they should use. The new legal wording lists tests by name so that the methods that are currently required will continue to be required. Slight translation revisions were also made to the Regulations to ensure consistency between the texts in both official languages.

Compliance and Enforcement

Since the Regulations are promulgated under the *Canadian Environmental Protection Act, 1999*, the Compliance and Enforcement Policy implemented under the Act will be applied by CEPA enforcement officers. The policy outlines measures designed to promote compliance, including education, information, promoting of technology development and consultation on the development of regulations.

When verifying compliance with these Regulations, CEPA enforcement officers will abide by the Compliance and Enforcement Policy, which also sets out the range of possible responses to violations: warnings, directions and environmental protection compliance orders issued by enforcement officers, ticketing, ministerial orders, injunctions, prosecution, and environmental protection alternative measures which are an alternative to a court trial after the laying of charges for a CEPA, 1999 offense. In addition, the policy explains when Environment Canada will resort to civil suits by the Crown for costs recovery.

If, inspection, investigation or following the report of a suspected violation, a CEPA enforcement officer confirms that a violation has been committed, the enforcement officer will select the appropriate response, based on the following criteria:

- Nature of the alleged violation: This includes consideration of the damage, the intent of the alleged violator, whether it is a repeat violation, and whether an attempt has been made to conceal information or otherwise subvert the objectives and requirements of the Act.
- Effectiveness in achieving the desired result with the alleged violator: The desired result is compliance within the shortest possible time and with no further repetition of the violation.

Après la publication du règlement dans la *Gazette du Canada* Partie I le 17 février 2001, le secteur privé et le grand public disposaient de 60 jours pour communiquer au ministre leurs commentaires, qui seront pris en compte avant la publication du règlement dans la *Gazette du Canada* Partie II.

Aucun commentaire important n'a été formulé concernant le règlement, durant la période de commentaires, qui s'est terminée le 19 avril 2001. Les commentaires reçus des intervenants étaient sous forme de questions. Les intervenants ont réclamé plus d'éclaircissements au sujet de l'immersion en mer et de la LCPE, 1999 en soi, et on a agréé à cette demande. Les questions les plus couramment demandées et leur réponses respectives ont été publiées sur la page Web d'Environnement Canada, La voie verte.

Les commentaires plus substantiels sont venus du personnel de programme formulés lors d'une rencontre des gestionnaires du domaine de l'immersion en mer, tenue à Vancouver en février 2001. Ces commentaires portaient sur la manière dont le règlement identifiait les méthodes requises pour réaliser les tests de toxicité. Il a été suggéré d'éclaircir pour les intervenants les méthodes d'essai biologique qu'ils doivent utilisées. Ainsi, le nouveau libellé juridique liste les tests par leur noms afin de s'assurer que les méthodes requises à l'heure actuelle continuent de l'être. Des révisions mineures ont été apportées à la traduction du règlement afin d'assurer une cohérence entre les textes, dans les deux langues officielles.

Respect et exécution

Puisque ce règlement est promulgué en vertu de la *Loi canadienne sur la protection de l'environnement de 1999*, la politique d'application et d'observation mise en oeuvre en vertu de la Loi sera appliquée par des agents de l'autorité. La politique indique les mesures à prendre pour promouvoir l'application de la Loi, ce qui comprend l'éducation et l'information, la promotion du développement technologique et la consultation sur l'élaboration du règlement.

Les agents de l'autorité préposés à l'application de la Loi devront, lorsqu'ils vérifieront la conformité au règlement, respecter la politique d'application et d'observation en vigueur, laquelle établit l'éventail d'interventions possibles aux infractions : avertissements, ordres des agents de l'autorité, ordres d'exécution en matière de protection de l'environnement, contraventions, arrêtés du ministre, injonctions, poursuites et mesures de rechange en matière de protection de l'environnement qui, suivant le dépôt d'accusations pour infraction à la LCPE, 1999, permettent un retour à la conformité négocié sans procès. De plus, la politique décrit les circonstances qui autorisent la Couronne à intenter des poursuites au civil pour le recouvrement de frais.

Si, à la suite d'une inspection, d'une enquête ou d'un rapport concernant une infraction présumée, un agent de l'autorité de la LCPE découvre qu'il y a eu infraction, celui-ci choisit l'intervention qui convient en se fondant sur les critères suivants :

- Nature de l'infraction présumée : il faut tenir compte notamment du préjudice, de l'intention du présumé contrevenant et déterminer s'il s'agit d'une récidive et si l'on essaie de dissimuler de l'information ou de contourner autrement les objectifs et les exigences de la Loi.
- Efficacité avec laquelle on atteint les résultats souhaités auprès du présumé contrevenant : on veut parvenir à l'application le plus rapidement possible et sans autre infraction. Il

Factors to be considered include the violator's history of compliance with the Act, willingness to cooperate with enforcement officials, and evidence of corrective action already taken.

- Consistency: enforcement officers will consider how similar situations have been handled in determining the measures to be taken to enforce the Act.

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faut tenir compte notamment des antécédents d'observation de la Loi par le contrevenant, de sa volonté de collaborer avec les responsables de l'application de la Loi et des preuves de mesures correctrices déjà prises.

- Uniformité : les agents de l'autorité tiendront compte de la façon dont on a traité les situations semblables lorsqu'ils décideront des mesures d'exécution à prendre.

Personnes-ressources

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ENVIRONMENTAL GUIDELINE
FOR
Waste antifreeze

Department of Sustainable Development
Environmental Protection Service
Nunavut

GUIDELINE: MANAGEMENT OF WASTE ANITFREEZE

AS AMENDED BY:

USE OF GUIDELINE

A guideline is not law and is therefore not enforceable. It does however, assist an inspector to determine what action(s) may be required of him or her. Paragraph 2.2(c) of the *Environmental Protection Act* allows the Minister to "develop, co-ordinate and administer" guidelines. The Act [subsection 5(1)] makes it an offence to discharge a contaminant into the environment, subject to some exceptions [subsection 5(3)]. When a discharge occurs and it is inconsistent with the guidelines, the discharge is considered an unacceptable risk. The Inspector may then consider issuing an order or laying an information.

A guideline allows for some leniency in applying the law. A court would probably be inclined to consider the application of a guideline favorably because the public is aware of the standards they are expected to meet.

This Guideline is not law.
It is prepared by Environmental Protection Service,
Department of Sustainable Development
Government of the Nunavut

January, 2002

Guideline for the Management of Waste Antifreeze

January, 2002

GUIDELINE FOR THE MANAGEMENT OF WASTE ANTIFREEZE

1 Introduction

This guideline provides general information on proper management of waste antifreeze. Waste antifreeze is a contaminant under the *Environmental Protection Act* (EPA) and must be managed as a hazardous waste.

Ethylene glycol and propylene glycol antifreeze are used to lower the freezing point of water. Ethylene glycol is used in the automotive sector. Propylene glycol is generally used in building heating systems. Both types of antifreeze have anti-foaming agents and corrosion inhibitors that are added to prevent the corrosion of metal.

This guideline is specific to the management of waste antifreeze and should be read in conjunction with the Guideline for the General Management of Hazardous Waste In Nunavut (referred to as the General Guideline). Section 2.2 of the EPA gives the Minister of Sustainable Development the authority to develop, coordinate and administer these guidelines.

1.1 Definitions

Antifreeze	A chemical additive that lowers the freezing point of water in cooling or heating systems. For the purpose of this guideline, antifreeze used in fuel systems is not included.
Generator	The owner or person in charge, management or control of a hazardous waste at the time it was generated, or a facility that generates hazardous waste.
Transport authority	The regulations controlling the management of hazardous waste under that mode of transport. These include: Road and rail - *Transportation of Dangerous Goods Act* (TDGA) *and Regulations* (TDGR) Air - *International Civil Aviation Organization Technical Instructions* (ICAO) Marine - *International Maritime Dangerous Goods Code* (IMDG).
Waste antifreeze	Antifreeze that is no longer useable for its intended purpose due to the build up of impurities or loss of original properties and is intended for storage, recycling or disposal.

1.2 Characteristics

Ethylene and propylene glycol are toxic by ingestion. Many of the corrosion and antifoaming inhibitors added to antifreeze are also toxic. In addition the coolant picks up wear metals from the engine and pipes (such as lead, phosphorous and cadmium) which are also toxic.

Mishandling and mismanagement of these wastes represent a hazard to people and the environment.

1.3 Potential Effects

Ethylene glycol is in widespread use in the automotive industry. As a toxic product, it must be handled with care to prevent accidental poisonings. **The lethal dose is 100 milliliters for adults and even less for children**. It is mildly toxic by skin contact and has a "sweet" taste that children and animals may find appealing. Improper storage of antifreeze has resulted in fatal poisonings.

Propylene glycol is also toxic and combustible and can react with other chemicals. It requires proper storage and handling. Eye contact should be avoided by wearing proper eye protection whenever it is handled.

Both ethylene and propylene glycol are water soluble. Improper disposal results in the contamination of drinking water, groundwater and land surfaces. Fish, aquatic animals and people can be poisoned.

If antifreeze is poured into a sewage lagoon in sufficient concentrations it may poison the bacteria responsible for sewage treatment. Improperly disposed antifreeze can result in the melting of permafrost which could affect building foundations. Proper care should be taken with all types of antifreeze.

2 Roles and Responsibilities

2.1 Environmental Protection Service

The Environmental Protection Service (EPS) of the Department of Sustainable Development is the Government of the Nunavut’s (GN) agency responsible for initiatives which control the discharge of contaminants and their impact on the environment. EPS is responsible for ensuring that environmentally acceptable management procedures, emission levels and disposal methods are maintained. EPS programs are applied primarily to Commissioner's Land, lands administered by municipal governments or GN undertakings. Legislative authority is provided by the *Environmental Protection Act* and the *Pesticide Act.* Contact EPS for a listing of relevant regulations and guidelines.

2.2 Generators of Waste Antifreeze

The responsibility for proper waste management rests with the generator and should be considered as part of the cost of doing business.

Every person who generates waste antifreeze is responsible for the proper management of these substances. Waste antifreeze must be safely handled, packaged, stored, transported, treated and/or disposed in accordance with this guideline.

3 Waste Management

Minimizing or avoiding the creation of pollutants and wastes can be more effective in protecting the environment than treating them, or cleaning them up after they have been created.

Canadian Council of Ministers of the Environment

3.1 Pollution Prevention

Pollution prevention methods reduce or eliminate the creation of waste. Pollution control options treat waste after it has been generated. Pollution prevention opportunities for antifreeze include the following:

Reduce

- Purchase only required amounts of antifreeze. Establish maintenance schedules that are consistent with the equipment manufacturers suggested replacement. Select antifreeze products that provide maximum life.

Reuse

- Collect antifreeze and return it to the cooling/heat system following maintenance or repair.
- Filtering and the use of additives to replenish lost antifreeze properties can extend its useful life.

Recycle

- Commercial companies recycle glycol on a fee for service basis. The major automobile manufacturers approve of recycled antifreeze for warrantee purposes. Glycol recyclers are available by contacting the waste management associations listed in Appendix B of the General Guideline.
- Purchase glycol distillation or reprocessing equipment to return antifreeze back to its original specifications. Suppliers of glycol distillation equipment are available by contacting the waste management associations listed in Appendix B of the General Guideline.
- Make an agreement with your supplier/distributor of antifreeze to return the waste antifreeze.

3.2 Storage

Store waste antifreeze according to the following:

- Use original containers, where possible, containers manufactured for the purpose or bulked into good quality 16 gauge or lower steel or plastic 205 Litre drums.
- Use containers that are sound, sealable and not damaged or leaking.
- Containers should be clearly labeled according to the requirements of the Work Place Hazardous Materials Information System (WHMIS) of the *Safety Act* or the relevant Transport Authority, if transport to a recycling or disposal facility is planned.
- Keep storage containers sealed or closed at all times.
- Protect storage containers from the weather and physical damage.
- Storage should be in a secure area with controlled access.
- Train personnel in the safe use, storage and shipping procedures for waste antifreeze. Only trained persons should have access to the storage area.

Wastes should be stored in such a manner as to prevent spills from entering sewer systems or the environment. Waste antifreeze should **NEVER** be stored with food or in used food containers such as bottles or cans, as it is toxic if ingested.

The short term storage of waste antifreeze is only acceptable as an interim measure to permit time for the collection of sufficient volumes for cost effective transport to a recycling or disposal facility.

Storage of glycol in quantities greater than 1000 litres for a period greater than 180 days requires the site to be registered as a hazardous waste storage facility. Consult the General Guideline or contact EPS for application procedures.

3.3 Transportation

The transport of waste antifreeze requires proper classification, packaging, labeling and manifesting as required by the transport authority (air, marine, rail, road). Specific requirements for waste generators and carriers are detailed in the General Guideline.

Generator numbers, waste manifests and registered hazardous waste carrier lists are available from the Environmental Protection Service. Contacts for recycling or disposal companies are available by contacting the waste management associations listed in Appendix II of the General Guideline.

For road transportation purposes, waste antifreeze can be classified in the following way, depending on the type of antifreeze.

Shipping Name: **Waste Poisonous Liquids, N.O.S.**
Subsidiary Name: Ethylene glycol mixture, or
Propylene glycol mixture
P.I.N.: UN2810
Classification: 6.1, 9.2
Packing Group II, 111
Special Provisions 102,109

Further consultation with the transport authority is recommended.

3.4 Disposal

The preferred method for disposal of bulk waste antifreeze is shipping to a registered recycling or disposal facility. Containers that are suitable for transporting waste antifreeze include 205 litre steel and plastic drums that are in good condition. Contacts for these recycling or disposal companies are available by contacting the waste management associations listed in Appendix II of the General Guideline.

Do not landfill antifreeze, especially in landfills which employ permafrost as a protective barrier. Do NOT dump waste antifreeze down the sewer or drain because it can destroy the bacteria responsible for sewage treatment and contaminate ground and surface waters.

Household quantities of waste antifreeze may be accepted at "Household Hazardous Waste Days" locations operated by the municipality.

Disposal of glycols in an industrial incinerator, with supplied air, adequate temperatures and retention time, may be approved by EPS if the costs and distances to a recycler are prohibitive.

Consideration will be given to proposals for alternate management methods that provide a level of environmental protection equivalent to complying with this guideline. EPS may approve the method, subject to conditions.

4 Conclusion

This guideline presents a brief introduction into the management of waste antifreeze. It is intended as a source of basic information and should be read in conjunction with the Guideline for the General Management of Hazardous Waste in Nunavut.

For more information contact:

1) Environmental Protection Service
Department of Sustainable Development
P.O. Box 1000, Station 1195
Iqaluit, Nunavut, X0A 0H0
Phone: (867) 975-5900; Fax: (867) 975-5990

2) Motor Vehicle Division
Department of Community Government and Transportation
P.O. Box 1000, Station 775
Iqaluit, Nunavut, X0A 0H0
Phone: (867) 975-5380; Fax: (867) 975-5385

3) Prevention Services Division
Workers' Compensation Board
P.O. Box 669
Iqaluit, Nunavut, X0A 0H0
Phone: (867) 979-8500; Fax: (867) 979-8501
(867) 873-7468 (accident report); Fax: (867) 873-0262
1-800-661-0792

If you would like to be placed on a mailing list to receive guideline amendments or for public consultation on Environmental Protection Service legislation please fill this out and mail or fax to:

Environmental Protection Service
Department of Sustainable Development
P.O. Box 1000, Station 1195
Iqaluit, Nunavut, X0A 0H0
Fax: (867) 979-5990

Users of this guide are encouraged to report any errors, misspellings, etc. contained within, to EPS at the above address.

Mailing List for Environmental Protection Service Information

Name: ______________________________

Title: ______________________________

Address : ______________________________

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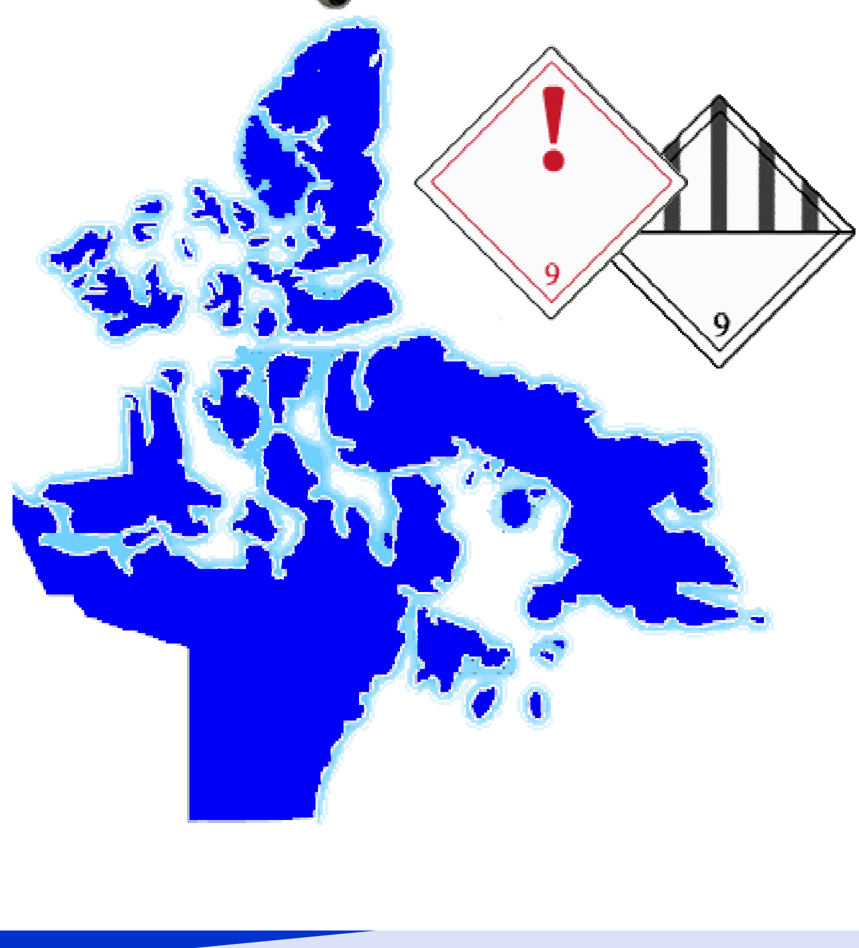
Phone / Fax Number: ______________________________

ENVIRONMENTAL GUIDELINE FOR Waste asbestos



Department of Sustainable Development
Environmental Protection Service
Nunavut

GUIDELINE: MANAGEMENT OF WASTE ASBESTOS

AS AMENDED BY:

USE OF GUIDELINE

A guideline is not law and is therefore not enforceable. It does however, assist an inspector to determine what action(s) may be required of him or her. Paragraph 2.2(c) of the *Environmental Protection Act* allows the Minister to "develop, co-ordinate and administer" guidelines. The Act [subsection 5(1)] makes it an offence to discharge a contaminant into the environment, subject to some exceptions [subsection 5(3)]. When a discharge occurs and it is inconsistent with the guidelines, the discharge is considered an unacceptable risk. The inspector may then consider issuing an order or laying an information.

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January, 2002

Guideline for the Management of Waste Asbestos

January, 2002

GUIDELINE FOR THE MANAGEMENT OF WASTE ASBESTOS

1 Introduction

This guideline provides general information on the proper management of waste asbestos. Waste asbestos is a contaminant under the *Environmental Protection Act* (EPA) and must be managed as a hazardous waste.

Asbestos is a cancer causing substance. The public, workers, and the environment must be protected from any air-borne exposure to this material.

This guideline is specific to the management of waste asbestos and should be read in conjunction with the Guideline for the General Management of Hazardous Waste In Nunavut (referred to as the General Guideline). Section 2.2 of the EPA gives the Minister of Sustainable Development the authority to develop, coordinate and administer these guidelines.

1.1 Definitions

Asbestos — Magnesium silicate minerals that occur naturally in fibrous forms. The regulated (TDGR) asbestos types include: chrysotile, actinolite, anthopkyllite, tremolite (white), crocidolite (blue), amosite, mysorite (brown).

Friable waste material — A material which when dry can be crumbled, pulverized or reduced to powder by hand pressure.

Generator — The owner or person in charge, management or control of a hazardous waste at the time it is generated, or a facility that generates hazardous waste.

Transport authority — The regulations controlling the management of hazardous waste under that mode of transport. These include:

Road and rail - *Transportation of Dangerous Goods Act* (TDGA) *and Regulations* (TDGR)

Air - *International Civil Aviation Organization Technical Instruction* (ICAO)

Marine - *International Maritime Dangerous Goods Code* (IMDG).

Waste Asbestos — Asbestos which is no longer useable for its intended purpose and is intended for storage, recycling or disposal. It includes any type of material with greater than 1% asbestos by weight but not asbestos that is immersed or fixed in a natural or artificial binder or in included in a manufactured product.

1.2 Characteristics

Asbestos is a silicate mineral which is strong, flexible and resistant to heat and chemicals. Asbestos was used in a variety of materials including: fireproof fabrics, gaskets, electrical and heat insulation, chemical filters, brake lining, siding and concrete reinforcement.

1.3 Potential Effects

Respiratory exposure to asbestos particles and fibers causes cancer.

The fibrous nature of asbestos is a health concern. Friable asbestos readily floats in air and is easily inhaled. Due to the mineral nature it is not readily dissolved and may not be excreted from the body. If enough asbestos particles are taken into the respiratory tract cancer may develop.

Environmental and occupational exposure to asbestos is primarily from air-borne sources. This includes weathered or poorly maintained asbestos materials and particles from asbestos abatement (removal) projects. Natural exposures of asbestos (rock outcrops) and dust from vehicle brake pad wear are beyond the scope of this guideline.

2 Roles and Responsibilities

2.1 Environmental Protection Service

The Environmental Protection Service (EPS) of the Department of Sustainable Development is the Government of Nunavut’s (GN) agency responsible for initiatives which control the discharge of contaminants and their impact on the environment. EPS is responsible for ensuring that environmentally acceptable management procedures, emission levels and disposal methods are maintained. EPS programs are applied primarily to Commissioner's Land, lands administered by municipal governments or GN undertakings. Legislative authority is provided by the *Environmental Protection Act* and *Pesticide Act.* Contact EPS for a listing of relevant regulations and guidelines.

2.2 Occupational Health and Safety

Worker protection from air-borne asbestos particles is regulated by the Prevention Services Division, Workers Compensation Board. The *Asbestos Safety Regulations,* under the *Safety Act,* require that employee exposure to hazardous air-borne asbestos be maintained below specified levels. The exposure levels correspond to the type of asbestos and the friability of the material. Contact the Prevention Services Division of the Worker’s Compensation Board for the regulations and procedures required for the containment of asbestos dusts and worker protection.

2.3 Generators of Waste Asbestos

The responsibility for proper waste management rests with the generator and should be considered as part of the cost of doing business.

Waste asbestos is a hazardous waste. The owner (generator) of the asbestos is responsible for ensuring the waste asbestos is properly managed from the time it is generated to final disposal. Waste asbestos must be safely removed, handled, packaged, stored, transported, treated and/or disposed in accordance with this guideline and all applicable Acts and regulations.

2.4 Contractors

Contractors can manage waste asbestos on behalf of a generator. However, the generator is responsible for insuring that the waste management method complies with this guideline, the General Guideline and the requirements of other legislative authorities. (Including the *Asbestos Safety Regulations* under the *Safety Act* and the *Transportation of Dangerous Goods Act and Regulations* (TDGR) or other transport authority).

3 Waste Management

> **Minimizing or avoiding the creation of pollutants and wastes can be more effective in protecting the environment than treating them, or cleaning them up after they have been created.**
>
> **Canadian Council of Ministers of the Environment**

3.1 Pollution Prevention

Pollution prevention methods reduce or eliminate the creation of waste. Pollution control practices treat waste after it has been created. Pollution prevention opportunities for asbestos include the following:

Reduce

- Consider using less hazardous materials i.e.: fiberglass, metals, wherever possible. In some applications there is no replacement for asbestos.

Reuse

- Encapsulation of the existing asbestos by sealing with paint or an epoxy product, covering with paneling or other non-asbestos materials may be considered. The Prevention Services Division, Workers Compensation Board must be consulted prior to sealing areas that contain asbestos.

- Non-friable asbestos materials can be re-used (i.e.: fire-break asbestos cementous boards), to reduce replacement costs and extend the life of the product.

3.2 Storage

Waste storage is not a long term solution.

Store waste asbestos according to the following:

- Store in sealed, airtight containers and labeled "Asbestos" as directed by the *Asbestos Safety Regulations.*
- Use containers that are sound, sealable and not damaged or leaking.
- Label containers according to the requirements of the Work Site Hazardous Materials Information System (WHMIS) of the *Safety Act* or the relevant Transport Authority if transport to a disposal location is planned. (see Section 3.3 Transportation).
- Protect containers from the weather and physical damage.
- Storage should be in a secure area with controlled access.
- Train personnel in the safe use, storage and shipping procedures for waste asbestos. Only trained persons should have access to the storage area.

The short term storage of waste asbestos is only acceptable as an interim measure to permit time for the collection of sufficient volumes for cost effective transport to a disposal facility.

Storage of waste asbestos in quantities greater than 1000 kilograms for a period greater than 180 days requires the site to be a registered hazardous waste storage facility. Consult the General Guideline or contact EPS for application procedures.

3.3 Transportation

The transport of waste asbestos requires proper classification, packaging, labeling and documentation as required by the transport authority (air, marine, rail, road). Requirements for waste generators and carriers are detailed in the General Guideline.

Special Provisions 37 and 44 of TDGR are two exemptions for road transport of waste asbestos. These provisions allow for the substitution of a shipping document for the hazardous waste manifest, and, provided the shipping name and product identification number appear on the outer package or small container, labels are not required.

The shipping document must include the following information and should be mailed or sent by facsimile to EPS:

- Date of consignment
- Consignor identification, mark or signature
- Shipping name
- Product Identification Number
- Quantity

For road transportation purposes, waste asbestos can be classified in the following ways, depending on the type of asbestos.

<u>Shipping Name</u>: **Waste White Asbestos**
P. 1. N.: UN 2590
Classification: 9.1
Packing Group: 111
Special provisions: 37,44

<u>Shipping Name:</u> **Waste Blue Asbestos**
P.I.N.: UN 2212
Classification: 9.1
Packing Group: 111
Special provisions: 37,44

<u>Shipping Name:</u> **Waste Brown Asbestos**
P.I.N.: UN 2212
Classification: 9.1
Packing Group: 111
Special provisions: 37,44

Further consultation with the transport authority is recommended.

Generator numbers, waste manifests and registered hazardous waste carrier lists are available from the Environmental Protection Service.

3.4 Asbestos Abatement

> **Prevention of asbestos fibre release into the air is the primary objective of all asbestos abatement projects.**

The removal of asbestos materials requires a thorough understanding of the potential hazards and knowledge of measures available to prevent worker, public and environmental exposure to asbestos fibers.

The *Asbestos Safety Regulations* require that employers conducting an asbestos removal project provide the following training to workers who are likely to come in contact with asbestos:

(a) demonstration and instruction in the use of all protective equipment;
(b) the safe handling and disposal of waste asbestos;
(c) health education including information relating to pneumoconiosis, lung cancer and the effects of smoking; and,
(d) any other information a safety officer considers necessary.

Other requirements, such as soaking the asbestos with water through its entire thickness prior to disturbing are designed for safety purposes.

Materials containing non-friable asbestos, such as asbestos cementous board (used as building siding), ceiling tiles, linoleum, tar papers, are generally non-hazardous if they remain intact. However, if these are broken or shredded, asbestos fibers may be released into the air. Minimal safety apparel is required when proper handling procedures are exercised. Contact the Prevention Services Division, Workers Compensation Board, for more information on worker protection or to obtain a copy of the regulations.

The names and location of asbestos training centers are available by contacting the waste management associations listed in Appendix B of the General Guideline.

3.5 Disposal

Two options are available for the disposal of waste asbestos.

Burial at the local landfill. Approval for local landfill disposal must be obtained from the municipal authority. Acceptance of the asbestos materials by the local authority must be confirmed to EPS by telephone or in writing. This ensures that the municipality is registered as a receiver of waste asbestos.

At the landfill, the waste asbestos shall be immediately buried and covered with one half meter of cover material (two feet). Cover materials can be locally available soils, refuse or other materials provided the asbestos containment is not ruptured. If a landfill practices open burning, waste asbestos should be placed in a dedicated trench isolated from the burning. The excavated soils from the trench should then be used to cover the asbestos to the required depth.

In addition:

-the excavation must be isolated from future burning activities.
-the asbestos waste should be buried where it will not be disturbed.
-the location of the asbestos should be maintained on a map or diagram of the property by the municipal authority for future reference.

The second disposal option for asbestos is to contract a registered waste management company. These companies can be contacted through their associations listed in Appendix II of the General Guideline.

Consideration will be given to proposals for alternate disposal methods that provide a level of environmental protection equivalent to complying with this guideline. The Environmental Protection Service may approve the method, subject to conditions.

4 Conclusion

This guideline presents a brief introduction into the management of waste asbestos. It is intended as a source of basic information and should be read in conjunction with the Guideline for the General Management of Hazardous Waste in Nunavut.

For more information contact:

1) Environmental Protection Service
   Department of Sustainable Development
   P.O. Box 1000, Station 1195
   Iqaluit, Nunavut, X0A 0H0
   Phone: (867) 975-5900; Fax (867) 975-5990

2) Motor Vehicle Division
   Department of Community Government and Transportation
   P.O. Box 207
   Gjoa Haven, Nunavut, X0E 1J0
   Phone (867) 360-4614 Fax (867) 360-4619

3) Prevention Services Division
   Workers' Compensation Board
   P.O. Box 669
   Iqaluit, Nunavut, X0A 0H0
   Phone: (867) 979-8500; Fax: (867) 979-8501
   (867) 873-7468 (accident report); Fax: (867) 873-0262
   1-800-661-0792

If you would like to be placed on a mailing list to receive guideline amendments or for public consultation on Environmental Protection Service legislation please fill this out and mail or fax to:

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Department of Sustainable Development
P.O. Box 1000, Station 1195
Iqaluit, Nunavut, X0A 0H0
Fax: (867) 979-5990

Users of this guide are encouraged to report any errors, misspellings, etc. contained within, to EPS at the above address

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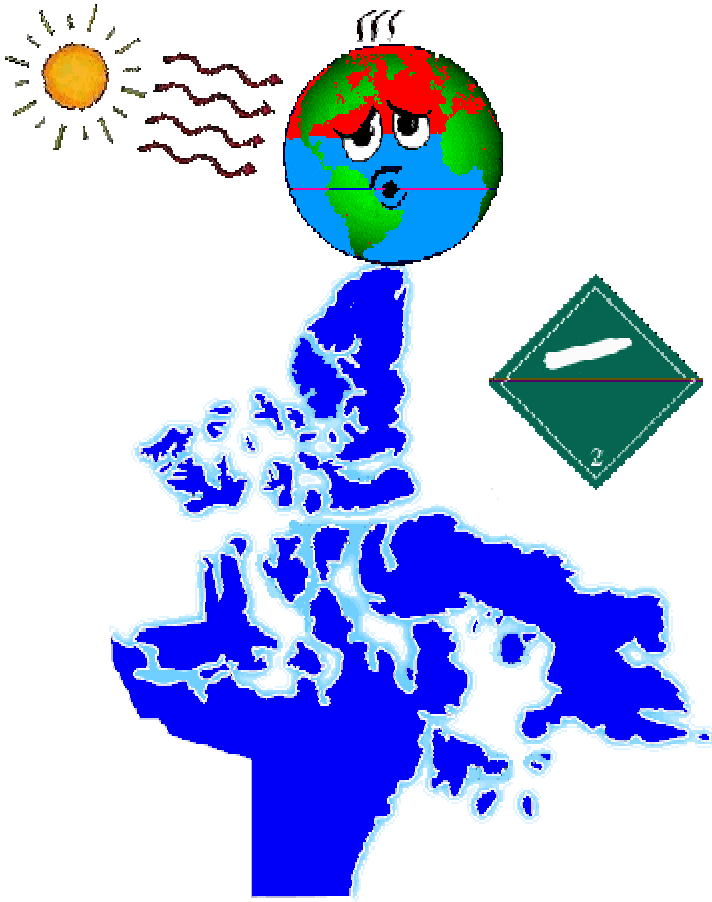
ENVIRONMENTAL GUIDELINE FOR OZONE DEPLETING SUBSTANCES



Department of Sustainable Development
Environmental Protection Service

GUIDELINE: MANAGEMENT OF OZONE DEPLETING SUBSTANCES

AS AMENDED BY:

USE OF GUIDELINE

A guideline is not law and is therefore not enforceable. It does however, assist an inspector to determine what action(s) may be required of him. Paragraph 2.2(c) of the Environmental Protection Act allows the Minister to develop, co-ordinate and administer guidelines. The Act [subsection 5(1)] makes it an offence to discharge a contaminant into the environment, subject to some exceptions [subsection 5(3)]. When a discharge occurs and it is inconsistent with the guidelines, the discharge is considered an unacceptable risk. The inspector may then consider issuing an order or laying an information.

A guideline allows for some leniency in applying the law. A court would probably be inclined to consider the application of guideline favourably because the public is aware of the standards they are expected to meet.

This Guideline is not law.
It is prepared by Environmental Protection Service,
Department of Sustainable Development
Government of the Nunavut

.

January, 2002

Guideline for Ozone Depleting Substances (ODSs)

January, 2002

GUIDELINE FOR OZONE DEPLETING SUBSTANCES (ODSs)

1 Introduction

The stratospheric ozone layer helps filter the sun's harmful ultraviolet (UV) radiation from the earth. Increased UV radiation harms human health and damages animal and plant life. Evidence shows that the main causes of ozone depletion are the releases of manufactured chlorofluorocarbons (CFC's), halons and a few other chemicals into the atmosphere. Hence, these materials are known as ozone depleting substances (ODSs). As one of 134 nations ratifying the Montreal Protocol, an international agreement to protect the ozone layer, Canada is committed to eliminating releases of ODSs.

The intent of this guideline is to assist in the management of ozone depleting substances in Nunavut. This guideline provides requirements and direction regarding the release, servicing, training, record keeping, labelling and disposal of equipment containing ODSs. For the purposes of this guideline, ozone depleting substances include certain air conditioning and refrigerant agents as well as substances contained in certain fire extinguishing equipment. The guideline targets commercial applications which account for 78% of the total sum of stored, leaked and consumed ozone depleting substances in the NWT and Nunavut. The total quantity of ODSs in the NWT and Nunavut amounts to over 65 tonnes.

The *Guideline for Ozone Depleting Substances* does not cover the production, importing or exporting of new, unused ODSs. These activities are controlled under federal regulations by Environment Canada.

This publication is a general guideline affecting the use of ozone depleting substances in Nunavut. Section 2.2 of the *Environmental Protection Act* (EPA) gives the Minister of Sustainable Development the authority to develop, coordinate and administer guidelines. This guideline complements existing acts and regulations that should be consulted for interpretation and application.

1.1 Definitions

Air conditioning or Refrigeration equipment	Heat pump, air conditioning, or refrigeration equipment including any motor vehicle air conditioners which contain an ozone depleting substance.
Certified service technician	A technician who is otherwise qualified to service ODS containing equipment and has successfully completed an environmental awareness course for ozone depleting substances certified by Environment Canada.
Code of Practice	The Environment Canada publication entitled *Code of Practice for the Reduction of Chloroflurocarbon Emissions from Refrigeration and Air Conditioning Systems* (EPS/1/RA/1 March 1991, original date) and subsequent updates.
Fire extinguishing equipment	A portable or fixed unit or system used to extinguish fire, that contains an ozone depleting substance.

Motor vehicle air conditioner	An air conditioning system on a motor vehicle which is a mechanical vapour compression refrigerant system that provides cooling for the passenger compartment of the vehicle and contains an ozone depleting substance as a refrigerant.
Ozone depleting substance (ODS)	A chlorofluorocarbon, halon or any other substance listed in Schedule I of this guideline that has the potential to destroy ozone in the stratosphere.
Portable fire extinguisher	A hand-held or wheeled fire extinguisher containing an ozone depleting substance.
Recover	Collecting an ozone depleting substance in a container which is not regularly a component of the system from which the ODS was removed.
Recycle	Restoring a recovered ozone depleting substance to acceptable purity levels by filtering, drying or distilling.
Servicing	The act of repairing, maintaining or adjusting a component of fire extinguishing, air conditioning, or refrigeration equipment, where the component contains an ozone depleting substance.

2 Roles & Responsibilities

2.1 Environmental Protection Service

The Department of Sustainable Development, Environmental Protection Service (EPS) is responsible for initiatives which control the discharge of contaminants and reduce the impact on the natural environment. EPS is responsible for ensuring that waste management procedures, emission levels and environmentally acceptable disposal methods are maintained. Contact EPS for a listing of relevant regulations and guidelines.

A waste manifest form must accompany ODSs recovered from commercial equipment if moved off site for storage, recycling or disposal. For further information on hazardous waste manifesting please refer to the *Guideline for the General Management of Hazardous Waste in Nunavut* or contact EPS. Registration numbers and waste manifest forms are available by contacting EPS.

2.2 Other Regulatory Agencies

Environment Canada under the Canadian Environmental Protection Act's *Chlorofluorocarbon Regulations* (SOR/90-127), *Ozone-depleting Substances Regulations* (SOR/94-408) and *Ozone-depleting Substances Products Regulations* (SOR/90-584) control the import, manufacture, use, sale and export of bulk chlorofluorocarbons, hydrobromofluorocarbons, halons, carbon tetrachloride and methyl chloroform. These regulations reflect Canada's international commitments under the Montreal Protocol to eliminate production and consumption of ozone depleting substances.

The Nunavut Department of Community Government and Transportation, through the Office of the Fire Marshal is involved with ODSs because several types of fire extinguishing equipment contain halons.

2.3 Owners

Building/facility owners may be affected by phase-outs of ozone depleting substances. ODSs are most often found in air conditioning or refrigeration equipment or as halons in fire extinguishing systems. Owners have the responsibility to prevent releases of ODS from equipment.

Automobile owners must not ignore leaky air conditioning equipment containing ODS.

Owners of fire extinguishing equipment containing a halon should be aware of the presence of an ODS in the equipment. Replacement halons are no longer being manufactured or imported into Canada. As a result, these owners should consider plans to phase out the use of halon containing fire extinguishing equipment.

2.4 Service Technicians

Certified service technicians should be hired to repair leaks or damages to equipment containing the ODS as quickly as possible. Service technicians should not fill leaking equipment. Technicians must use proper recovery/recycling equipment and methods to prevent the release of the ODS into the environment. Section 3.5 of this guideline provides additional information on servicing. The technician should inform the building owner when they become aware of leaking equipment.

Automobile service technicians have similar responsibilities to those described above. Only certified technicians should repair leaks to automobile air conditioning equipment.

2.5 Vendors of ODSs

Vendors who sell ODSs other than as part of equipment also have a role in the management of these materials. Vendors are responsible for selling ODSs to only certified technicians. Vendors are encouraged to ensure industry stewardship of ODS refrigerants and fire extinguishing equipment.

3 Standards

The following sections outline the requirements for managing ODSs substances in Nunavut.

3.1 Release of ODS

ODS releases should not be allowed. The following are the major sources of ODSs in Nunavut;

- refrigeration equipment, including some indoor ice making equipment
- air conditioning equipment
- motor vehicle air conditioners
- fire extinguishing equipment

- equipment used in the recovery, recycling or storage of an ODS

Careful attention should be paid when handling these pieces of equipment. Any leaks in equipment should be repaired before adding an ODS. When servicing, testing or discarding fire extinguishing, air conditioning or refrigeration equipment the certified technician should recover the ODS for reuse or recycling.

Small communities where certified service technicians are not generally available may contact EPS for assistance on developing a plan to properly handle ODS containing equipment including discarded refrigerators and freezers.

3.1.1 Reported Release

The following release limits are in accordance with the *Environmental Protection Act's* *Spill Contingency Planning and Reporting Regulations*.

Any release of an ODS listed in Schedule I of this guideline, and classified as a class 2 (compressed gas), under *Transportation of Dangerous Goods Regulations* (TDGR) from containers with a capacity greater than 100L, must be reported immediately to the 24 Hour Spill Report Line by calling (867) 920-8130.

Similarly, a release of 5L or greater of an ODS listed in Schedule I of this guideline, and classified as a class 6 (poisonous substance), under TDGR, must be reported immediately to the 24 Hour Spill Report Line by calling (867) 920-8130.

3.2 Servicing Certification

Only certified technicians should service air conditioning, fire extinguishing, refrigeration or motor vehicle air conditioner equipment. To become certified, a service technician shall successfully complete an environmental awareness course for ozone depleting substances certified by Environment Canada[1]. Only a certified technician may purchase or possess an ozone depleting substance for the purpose of servicing equipment containing an ODS. Companies employing service technicians will maintain records indicating which employees are certified to service ODS containing equipment.

3.3 Sales Record

If a certified technician purchases an ODS other than as a component in another product, the vendor will require the certified technician to sign an acknowledgement of receipt of the ODS. The vendor should keep a sales record indicating the type of ODS, the date of sale, as well as the name and company of the certified technician.

3.4 Record Keeping and Labelling

All persons who service refrigeration, fire extinguishing or air conditioning equipment with an ozone

[1] For environmental awareness certification in NWT and Nunavut contact Aurora College, Thebacha campus. Contact the Environmental Protection Service for a listing of courses elsewhere.

depleting substance should keep an accurate log of the particulars of the event including quantities, date, name of business and certified technician involved. The record should be tabled chronologically and be made available for inspection by an inspector under the *Environmental Protection Act*. All information and records referred to in this guideline should be maintained for a period of two years.

All new equipment imported into, installed or sold in Nunavut that contains an ODS should be clearly labelled with the quantity and type of ODS contained in the equipment.

All vendors and service companies who are required to maintain records are requested to initially provide the Environmental Protection Service (EPS) in writing, the name and mailing address of the company as well as a contact name.

3.5 Servicing

Any technician who services refrigeration, fire extinguishing or air conditioning equipment should do so in accordance with the Code of Practice and this guideline. An ozone depleting substance should never be used for the purposes of leak testing refrigeration or air conditioning equipment. Technicians servicing air conditioning or refrigeration equipment should use equipment that can recover and contain an ODS. Recovery and recycling equipment should meet or exceed minimum performance standards set out in Schedule II.

3.6 Disposal of Refrigeration Equipment

Any equipment that contains an ozone depleting substance should be serviced by a certified technician, and the CFCs or HCFCs removed prior to disposal. Technicians should place a notice on the piece of equipment stating; the date of the service, the certified technician and company name as well as an indication that the equipment no longer contains refrigerant.

Household refrigeration equipment delivered to a municipal solid waste landfill is exempt from requiring removal of ODSs providing the landfill has a separate area identified and prepared for storage of this equipment. Municipalities are encouraged to bring in certified technicians to remove ODSs from stored equipment when quantities warrant. Remote, isolated, small communities where certified service technicians are not generally available may contact EPS for assistance on developing a plan to properly manage ODS containing equipment including discarded refrigerators and freezers.

3.7 Motor Vehicle Air Conditioners

Servicing a motor vehicle air conditioner requires the technician to follow the methods set out in the *Code of Practice and the Society of Automotive Engineers (SAE) Standard J-1989*. A motor vehicle cannot be discarded unless the ozone depleting substance used as a refrigerant in the air conditioner is recovered. Any motor vehicle delivered to a municipal solid waste landfill is exempted from requiring removal of ODSs providing the landfill has a separate area identified and prepared for storage of this equipment. Municipalities are encouraged to bring in certified technicians to remove ODSs from stored equipment when quantities warrant.

3.8 Fire Extinguishing Equipment

Fire extinguishing equipment cannot be disposed of unless the ODS is recovered. Recovered halons can be used to provide recharge quantities to existing systems. The Underwriters' Laboratories of Canada (ULC) has published two standards that address halon recycling; *Servicing of Halon Extinguishing Systems* and *Halon Recovery and Re-conditioning Equipment*.

It is recommended that a person who owns fire extinguishing equipment that contains more than 40 kgs of an ODS should evaluate alternatives. They should prepare a management plan to eliminate the use of halons. Environment Canada's *Environmental Code of Practice on Halons* can be used as a guide in developing a halon management plan.

The Montreal Protocol required a phase-out of halon production and consumption by January 1,1994. However, the Montreal Protocol allows the continued trade of recycled halons, i.e. those produced before January 1,1994.

Owners of portable fire extinguishers, including marine and household systems, containing an ODS are encouraged to be to be taken out of service and sales stopped by December 31,1996.

4 Conclusion

This document is intended as a source of basic information about the issues involved in the management of ozone depleting substances. It does not replace the existing legislation which is referenced in the guideline. If you have any questions or concerns please contact the appropriate agency before proceeding.

1. Environmental Protection Service
   Department of Sustainable Development
   P.O. Box 1000, Station 1195
   Iqaluit, Nunavut, X0A 0H0
   Phone: (867) 975-5900; Fax: (867) 975-5990

2. Office of the Fire Marshal
   Department of Community Government and Transportation
   P.O. Box 1000, Station 700
   Iqaluit, Nunavut, X0A 0H0
   Phone (867) 975-5316; Fax (867) 979-4221

3. Environmental Protection Branch
   Environment Canada
   P.O. Box 1870
   Iqaluit, Nunavut, X0A 0H0
   Phone: (867) 979-3660; Fax: (867) 975-4645

4. Commercial Chemicals Evaluation Branch
   Environment Canada
   351 St. Joseph Blvd.
   Hull, PQ, K1A 0H3
   Phone (819) 953-1675; Fax (819) 953-4936

5. The Heating, Refrigerating and Air Institute of Canada (HRAI)
   5045 Orbiter Drive, Bldg. 11, Suite 300
   Mississauga, ON, L4W 4Y4
   Phone: 1-800-661-3369

6. Manitoba Ozone Protection Industry Association Inc. (MOPIA)
19-1110 Henderson Highway
Winnipeg, MB, R2G 1L1
Phone (204) 338-0804; Fax (204) 338-0810

5 Bibliography

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Society of Automotive Engineers (SAE), *Standard J-1989.*

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Underwriters Laboratories of Canada (ULC), *The Servicing of Halon Extinguishing Systems*, ULC/ORD-C1058.18-1993.

Appendix A

SCHEDULE I

OZONE DEPLETING SUBSTANCES

1. Chlorofluorocarbons (CFC's)

a)

CFC-11	trichlorofluoromethane	Not restricted under TDG
CFC-12	dichlorofluoromethane	TDG class 2.2 Non-flammable gas
CFC-113	trichlorotrifluoroethane	Not restricted under TDG
CFC-114	dichlorotetrafluoroethane	TDG class 2.2 Non-flammable gas
CFC-115	chloropentafluoroethane	TDG class 2.2 Non-flammable gas

b) All other CFC's. Consult TDGA for classification.

c) All isomers and mixtures containing any of the above.

2. Hydrochlorofluorocarbons (HCFC's)

a)

HCFC-22	chlorodifluoromethane	TDG class 2.2 Non-flammable gas
HCFC-123	dichlorotrifluoroethane	Not restricted under TDG
HCFC-124	chlorotetrafluoroetane	TDG class 2.2 Non-flammable gas

b) All other HCFC's not specifically listed. Consult TDGA for classification.

c) All isomers and mixtures containing any if the above.

3. Bromofluorocarbons (Halons)

a)

Halon-1211	bromochlorodifluoromethane	Not restricted under TDG
Halon-1301	bromotrifluoromethane	TDG class 2.2 Non-flammable gas
Halon-2402	dibromotetrafluoroethane	Not restricted under TDG

b) All other halons not specifically listed. Consult TDGA for classification.

c) All isomers and mixtures containing any of the above.

4. Chlorocarbons

a)

Trichloroethane or methyl chloroform	TDG class 6.1 Poison
Carbon tetrachloride	TDG class 6.1 Poison

b) All isomers and mixtures containing any of the above.

Appendix B

SCHEDULE II

PERFORMANCE STANDARDS FOR ODS RECYCLING OR RECOVERY AND RECYCLING DEVICES

1. Devices for the recovery and recycling of an ozone depleting substance designed to be used with the type of air conditioning or refrigeration equipment listed in Column I of Table 1 must, during normal operation, be capable of ensuring removal of the refrigerant from the equipment being serviced by reducing the system pressure, below atmosphere, to the level listed in Column II of Table 1 opposite the type of equipment.

Table 1

COLUMN I		COLUMN II
	INCHES OF MERCURY (VACUUM)	MICROMETERS OF MERCURY (ABSOLUTE PRESSURE)
Very high pressure equipment	0	760000
High pressure equipment with a charge of 23 kg or less	10	506000
High pressure equipment with a charge of more than 23 kgs	20	252000
Intermediate pressure equipment	25	125000
Low pressure equipment	29	23000

2. Devices for recovery or recovery and recycling intended for use with small appliances that contain an ozone depleting substance in their cooling system such as household refrigerants, or household freezers must recover a minimum of 90 % of the refrigerant in the cooling system of the appliance. Devices for recovery and recycling intended for use with small appliances that do not have an operational compressor must recover a minimum of 80% of the refrigerant in the cooling system of the appliance.

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Environmental Protection Service
Department of Sustainable Development
P.O. Box 1000, Station 1195
Iqaluit, Nunavut, X0A 0H0
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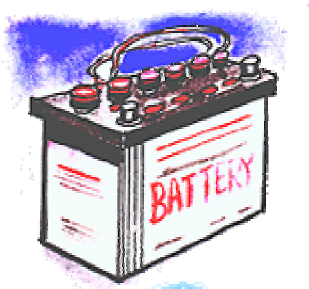
ENVIRONMENTAL GUIDELINE FOR Waste batteries



Department of Sustainable Development
Environmental Protection Service

Nunavut

GUIDELINE: MANAGEMENT OF WASTE BATTERIES

AS AMENDED BY:

USE OF GUIDELINE

A guideline is not law and is therefore not enforceable. It does however, assist an inspector to determine what action(s) may be required of him or her. Paragraph 2.2(c) of the *Environmental Protection Act* allows to Minister to "develop, co-ordinate, and administer" guidelines. The Act [subsection 5(1)] makes it an offence to discharge a contaminant into the environment, subject to some exceptions [subsection 5(3)]. When a discharge occurs and it is inconsistent with the guidelines, the discharge is considered an unacceptable risk. The inspector may then consider issuing an order or laying an information.

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This Guideline is not law.
It is prepared by Environmental Protection Service,
Department of Sustainable Development
Government of the Nunavut

January, 2002

Guideline for the Management of Waste Batteries

GUIDELINE FOR THE MANAGEMENT OF WASTE BATTERIES

1 Introduction

This guideline provides general information on the proper management of waste batteries. Waste batteries are a contaminant under the *Environmental Protection Act* (EPA) and must be managed as a hazardous waste.

Storage batteries are a source of direct electric current produced by reaction of the chemicals in the battery. In rechargeable batteries, the chemical reaction is reversible and therefore they can be recharged many times. Eventually however, even the best rechargeable batteries reach the end of their useful life and become wastes. All batteries contain a corrosive liquid or semi-liquid electrolyte that is either a strong acid or a strong base. In addition, batteries contain metals, such as cadmium, lead, lithium and potassium, which generally are toxic and persist in the environment.

This guideline addresses lead acid batteries and rechargeable batteries. Lead batteries (i.e. car batteries) contain sulphuric acid and lead. Rechargeable batteries (i.e. industrial forklift, radio and transmitter batteries) usually contain either potassium hydroxide or nickel cadmium.

Batteries in domestic products like radios and flash lights, (examples: AAA to D cells, 6 or 9 volt consumer batteries) are not included in this guideline. Button batteries however, may contain mercury, cadmium and silver and should be dropped off at "Household Hazardous Waste Days" locations operated by the municipality.

This guideline is specific to the management of waste batteries and should be read in conjunction with the Guideline for the General Management of Hazardous Waste in Nunavut (referred to as the General Guideline). Section 2.2 of the EPA gives the Minister of Sustainable Development the authority to develop, coordinate and administer these guidelines.

1.1 Definitions

Generator	The owner or person in charge, management or control of a hazardous waste at the time it is generated or a facility that generates hazardous waste.
Transport authority	The regulations controlling the management of hazardous waste under that mode of transport. These include:
	Road and rail - *Transportation of Dangerous Goods Act* (TDGA) *and Regulations* (TDGR)
	Air - *International Civil Aviation Organization Technical Instructions* (ICAO)
	Marine - *International Maritime Dangerous Goods Code* (IMDG).

Waste batteries	A general term used to describe spent electrical storage batteries which are no longer useful for their intended purpose and are intended for storage, recycling, treatment or disposal. Examples of waste battery types include: lead acid; potassium hydroxide; nickel cadmium. For the purpose of this guideline, waste batteries do not include dry cell size MA to D, 6 or 9-volt domestic batteries.

1.2 Characteristics

Hazards from waste batteries are associated with improper handling and disposal. Improper handling can release corrosive fluids that can cause chemical burns and damage to a wide variety of materials. Metals in batteries, including lead, mercury and cadmium, are toxic and bioaccumulate in plants and animals. They also persist in the environment.

1.3 Potential Effects

Improper handling of waste batteries can result in the spillage of corrosive materials. The corrosive materials contain dissolved metals that are toxic to plants and animals. Improper disposal of batteries in landfill sites may result in the release of corrosive fluids and dissolved metals into groundwater and the environment.

2 Roles and Responsibilities

2.1 Environmental Protection Service

The Environmental Protection Service (EPS) of the Department of Sustainable Development is the Government of Nunavut's (GN) agency responsible for initiatives which control the discharge of contaminants and their impact on the environment. EPS is responsible for ensuring that environmentally acceptable management procedures, emission levels and disposal methods are maintained. EPS programs are applied primarily to Commissioner's Land, lands administered by municipal governments or GN undertakings. Legislative authority is provided by the *Environmental Protection Act* and *Pesticide Act.* Contact EPS for a listing of relevant regulations and guidelines.

2.2 Generators

> **The responsibility for proper waste management rests with the generator and should be considered as part of the cost of doing business.**

Every person who generates waste batteries is responsible for the proper management of these materials. Waste batteries must be safely handled, packaged, stored, transported, treated and/or disposed in accordance with this guideline and all applicable Acts and regulations.

3 Waste Management

> **Minimizing or avoiding the creation of pollutants and wastes can be more effective in protecting the environment than treating them, or cleaning them up after they have been created.**
>
> **Canadian Council of Ministers of the Environment**

3.1 Pollution Prevention

Pollution prevention methods reduce or eliminate the generation of waste products. Pollution control options treat waste after it has been created. Pollution prevention strategies for batteries include the following:

Reduce

- Maintain and protect batteries to prevent damage and charge loss.
- Test batteries prior to disposal to confirm the battery is spent.
- Replace non-rechargeable batteries with rechargeable batteries where possible.

Recycling

- Service batteries to extend the life.
- Send spent batteries to recyclers. (Recyclers reduce a battery into its component parts and produce new batteries or manufacture other products. The component parts include; metal, plastics and liquid components of the battery.)
- Make an agreement with your supplier/distributor of batteries to return the waste batteries.

3.2 Storage

> **Battery storage is not a long term solution.**

Store waste batteries according to the following:

- Use containers that are sound, sealable and not damaged or leaking.
- Bulk into good quality 16 gauge or lower gauge metal or plastic 205 Litre drums, or other form of containment, as appropriate.
- Label containers according to the requirements of the Work Site Hazardous Materials Information System (WHMIS) of the *Safety Act* or the relevant Transport Authority, if transport is planned.
- Keep the containers sealed or closed at all times.
- Protect from the weather and physical damage.
- Use wooden pallets to keep the containers and batteries off the ground during storage and transport.
- Storage should be in a secure area with controlled access.
- Train personnel in the safe use, storage and shipping procedures for waste batteries. Only trained persons should have access to the storage area.

Temporary storage of waste batteries is only acceptable as an interim measure to permit time for the collection of sufficient volumes for cost effective transport to a recycler or disposal facility. Storage of batteries in quantities greater than 1000 kilograms for a period greater than 180 days requires registration of the site as a hazardous waste storage facility. Consult the General Guideline or contact EPS for application procedures.

3.3 Transportation

The transportation of waste batteries to a recycling, treatment, disposal or management facility requires the proper classification packaging, labeling and manifests for the specific transport authority (air, marine, rail, road). Specific requirements for waste generators and carriers are detailed in the General Guideline.

The following are examples of battery packaging requirements for road transport:

Singles - Secure batteries upright in a leak proof plastic container or a polyethylene bag and tie securely.

By the Drum - Stack batteries upright inside the drum and separate by a layer of adsorbent material, cardboard or plywood. The drums can be metal or plastic but must be maintained in an upright position and sealed during transport.

By the Pallet - Waste batteries should be fastened to the pallet by nylon straps or other secure means. Place batteries on a leak proof polyethylene containment liner which is folded over the batteries to form a sealed system. Do not stack batteries more than two high and separate the two layers with cardboard or plywood.

For road transportation purposes, waste batteries can be classified in the following ways, depending on the type of battery.

Shipping Name: **Battery, dry, containing potassium hydroxide solid**
Classification 8
P.I.N.: UN3028
Packing Group III, or

Shipping Name: **Battery, wet, filled with acid**
Classification 8
P.I.N.: UN2794
Packing Group III, or

Shipping Name: **Battery, wet, filled with alkali**
Classification 8
P.I.N.: UN2795
Packing Group III, or

Shipping Name: **Battery, wet, non-spillable**
Classification 8
P.I.N.: UN2800
Packing Group III.

Further consultation with the transport authority is recommended.

Generator, Carrier and Receiver numbers, waste manifests and registered hazardous waste carrier lists are available from the Environmental Protection Service.

3.4 Disposal

> **The long term goal for the management of waste batteries is 100% recycling.**

Bulk batteries for transportation and ship to a registered recycling or disposal facility. The battery industry is currently expanding its product stewardship program and are accepting waste batteries through distributors for recycling. Contacts for recycling or disposal companies are available by contacting the waste management associations listed in Appendix II of the General Guideline.

Consideration will be given to proposals for alternate disposal methods that provide a level of environmental protection equivalent to complying with this guideline. EPS may approve the method, subject to conditions.

4 Conclusions

This guideline presents a brief introduction into the management of waste batteries. It is intended as a source of basic information and should be read in conjunction with the Guideline for the General Management of Hazardous Waste in Nunavut.

For more information contact:

1) Environmental Protection Service
Department of Sustainable Development
P.O. Box 1000, Station 1195
Iqaluit, Nunavut, X0A 0H0
Phone: (867) 975-5900; Fax: (867) 975-5990

2) Motor Vehicle Division
Department of Community Government and Transportation
P.O. Box 1000, Station 775
Iqaluit, Nunavut, X0A 0H0
Phone: (867) 975-5380; Fax: (867) 975-5385

3) Prevention Services Division
Workers' Compensation Board
P.O. Box 669
Iqaluit, Nunavut, X0A 0H0
Phone: (867) 979-8500; Fax: (867) 979-8501
(867) 873-7468 (accident report); Fax: (867) 873-0262
1-800-661-0792

If you would like to be placed on a mailing list to receive guideline amendments or for public consultation on Environmental Protection Service legislation please fill this out and mail or fax to:

Environmental Protection Service
Department of Sustainable Development
P.O. Box 1000, Station 1195
Iqaluit, Nunavut, X0A 0H0
Fax: (867) 979-5990

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Address : ______________________________

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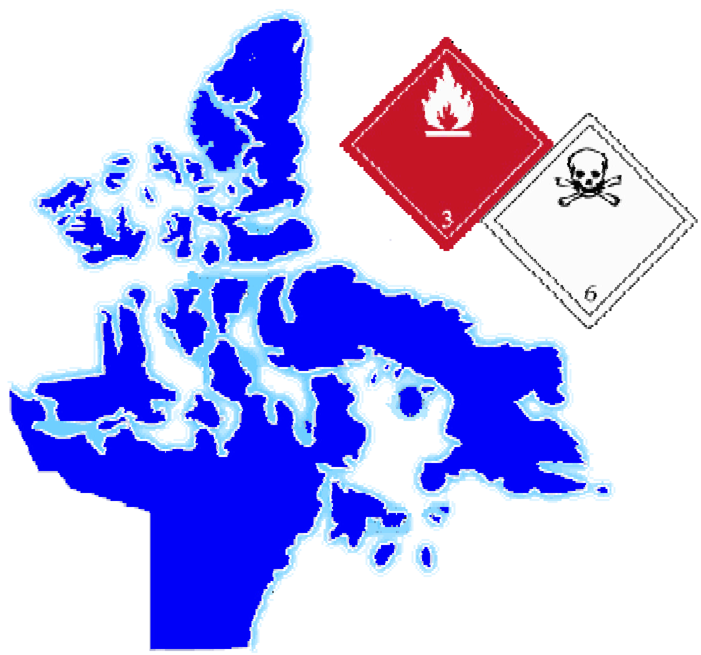
Phone / Fax Number: ______________________________

ENVIRONMENTAL GUIDELINE
FOR
Waste Paint



Department of Sustainable Development
Environmental Protection Service

Nunavut

GUIDELINE: MANGEMENT OF WASTE PAINT

AS AMENDED BY:

USE OF GUIDELINE

A guideline is not law and is therefore not enforceable. It does however, assist an inspector to determine what action(s) may be required of him or her. Paragraph 22(c) of the *Environmental Protection Act* allows the Minister to "develop, co-ordinate, and administer" guidelines. The Act [subsection 5(1)] makes it an offence to discharge a contaminant into the environment, subject to some exceptions [subsection 5(3)]. When a discharge occurs and it is inconsistent with the guidelines, the discharge is considered an unacceptable risk. The inspector may then consider issuing an order or laying an information.

A guideline allows for some leniency in applying the law. A court would probably be inclined to consider the application of a guideline favorably because the public is aware of the standards they are expected to meet.

January, 2002

Guideline for the Management of Waste Paint

January, 2002

GUIDELINE FOR THE MANAGEMENT OF WASTE PAINT

1 Introduction

This guideline provides general information on proper management of waste paint. Waste paint is a contaminant under the *Environmental Protection Act* (EPA) and must be managed as a hazardous waste.

Paints are used to protect a surface from corrosion, oxidation, or other type of deterioration and to provide decorative effects. Alkyd paints and specialty coatings contain solvents and other chemicals that are corrosive, flammable, reactive and toxic. Recently the use of lead in modern household paint has been restricted by federal legislation. For the management of lead paint removed from steel or other structures, refer to the Guideline for the Management of Waste Lead.

This guideline is specific to the management of waste paint and should be read in conjunction with the Guideline for the General Management of Hazardous Waste in Nunavut (referred to as the General Guideline). Section 2.2 of the Act gives the Minister of Sustainable Development the authority to develop, coordinate and administer these guidelines.

1.1 Definitions

Alkyd paint	Oil based paint.
Generator	The owner or person in charge, management or control of a hazardous waste at the time it was generated, or a facility that generates hazardous waste.
Latex paint	Water based paint.
Paint	A uniformly dispersed mixture having a viscosity ranging from a thin liquid to a semi-solid paste consisting of: (1) drying oil, synthetic resin or binder; (2) a solvent or thinner; (3) and organic or inorganic pigment.
Specialty coatings	A group of modern chemical compounds designed for protecting materials under exacting conditions such as chemical tank linings, concrete coating at sewage treatment plants and other industrial applications. Examples include: acrylic, asphaltic, epoxy, flexible ceramic, phenolic, polyester, polyurethane, vinyl ester.
Transport authority	The regulations controlling the management of hazardous waste under that mode of transport. These include: Road and rail - *Transportation of Dangerous Goods Act* (TDGA) *and Regulations* (TDGR)

Air - *International Civil Aviation Organization Technical Instructions* (ICAO)
Marine - *International Maritime Dangerous Goods Code* (IMDG).

Waste paint Alkyd, latex or specialty coatings which are no longer used for its original purpose and is intended for storage, recycling or disposal but does not include dried paint or dried paint chips.

1.2 Characteristics

Alkyd paints contain oil and solvents which are toxic and flammable. Cleaning of painting equipment requires the use of solvents which have the same hazardous properties as alkyd paint. Solvent management procedures are provided in the Guideline for the Management of Waste Solvents.

Latex paints are nonflammable and offer ease of application. They generally do not have a disagreeable odor and can be used on both interior and exterior surfaces. Paint brushes and other tools are easily cleaned up with soap and water. Latex paint wastes are not hazardous wastes and can be disposed into most sewage treatment systems or landfills. Depending on the location, municipal approvals may be required.

Specialty paints and coatings are gaining greater acceptance and becoming common place in the paint industry. These new generation paints are derived from chemical compositions that can withstand extreme environment and temperature conditions. Many specialty coatings are a two-component mix; a base and a hardener. Epoxy coatings are one example. The hazard characteristics (TDGR Classification) of specialty coatings are identified on the Material Safety Data Sheets (MSDS) provided by the manufacturer. These should be reviewed prior to use of the product.

1.3 Potential Effects

The oils and solvents in alkyd paints and specialty coatings are toxic. If released into the environment they have the potential to contaminate drinking water supplies, groundwater and can be toxic to plants and aquatic animals. Water contaminated by paints and the solvents used to clean painting tools can also contaminate drinking water supplies and other areas of the environment.

Vapors released from alkyd paint are toxic to humans if inhaled over a long period of time in high enough concentrations. These vapors have the potential to start a fire if exposed to a spark or flame and support a fire once started because they are flammable.

Specialty coatings, especially two-component systems, may also be toxic, flammable, reactive or corrosive. Handling and safety procedures should be in accordance with the MSDS.

2 Roles and Responsibilities

2.1 Environmental Protection Service

The Environmental Protection Service of the Department of Sustainable Development is the Government of the Nunavut's (GN) agency responsible for initiatives which control the discharge of contaminants and their impact on the environment. EPS is responsible for ensuring that environmentally acceptable management procedures, emission levels and disposal methods are maintained. EPS programs are applied primarily to Commissioner's Land, lands administered by municipal governments or GN undertakings. Legislative authority is provided by the *Environmental Protection Act* and *Pesticide* Act. Contact EPS for a listing of relevant regulations and guidelines.

2.2 Generators

> **The responsibility for proper waste management rests with the generator and should be considered as part of the cost of doing business.**

Every person who generates waste paint is responsible for the proper management of these substances. Waste paint must be safely handled, packaged, stored, transported, treated and/or disposed in accordance with this guideline and all applicable Acts and regulations.

3 Waste Management

> **Minimizing or avoiding the creation of pollutants and wastes can be more effective in protecting the environment than treating them, or cleaning them up after they have been created.**
>
> **Canadian Council of Ministers of the Environment**

3.1 Pollution Prevention

Pollution prevention methods reduce or eliminate the generation of waste. Pollution control practices treat waste after it has been generated. Pollution prevention strategies for paint include the following:

Reduce
- Purchase the correct amount of paint for the size of the job to minimize leftover excess paint.
- Train staff in proper painting techniques to improve painting efficiencies.
- Use water-based or latex paints instead of more toxic alkyd paints.
- Use powder coats instead of liquid paints where applicable.

Recycle
- Mix compatible paint leftovers as a utility blend.
- Make excess paints available for use by others.
- Bulk compatible paints in appropriate containers and transport to approved paint recyclers.
- Make an agreement with your supplier/distributor of paint to return the unused paint.

3.2 Storage

Waste storage is not a long term solution.

Store waste paint according to the following:

- Use original containers where possible, containers manufactured for the purpose or bulk paint into 16 gauge or lower steel or plastic drums.
- Use containers that are sound, sealable and not damaged or leaking.
- Label containers according to the requirements of the Work Site Hazardous Materials Information System (WHMIS) of the *Safety Act,* or the relevant Transport Authority if transport to a recycling or disposal facility is planned. (see Section 3.3 Transportation)
- Keep the containers sealed or closed at all times.
- Containers must be protected from the weather and physical damage.
- Train personnel in the safe use, storage and shipping procedures for waste paint. Only trained persons should have access to the storage area.

The storage of waste paint is only acceptable as an interim measure to permit time for the collection of sufficient volumes for cost effective transport to a recycling or disposal facility.

Storage of waste paint in quantities greater than 1000 kilograms for a period greater than 180 days requires the site to be registered as a hazardous waste storage facility. Consult the General Guideline or contact EPS for application procedures.

3.3 Transportation

This section applies to all paints and coatings classified as dangerous goods under TDGR, specifically alkyd paints and specialty coatings. Latex paints are not included in this section.

The transportation of waste paint to an approved recycling, treatment, disposal or management facility requires proper classification, packaging, labeling and manifesting as required by the transport authority (air, road, rail, marine). Specific requirements for waste generators and carriers are detailed in the General Guideline.

For road transportation purposes, waste paint can be classified in the following ways, depending on the type of paint.

Shipping Name: **Waste Paint (or Waste Paint Related Materials)**
Classification: Class 3
P.I.N.: UN1263
Packaging Group: II or III
Special Provision 108

Shipping Name: **Waste Paint (or Waste Paint Related Materials)**
Classification: Class 8
P.I.N.: UN3066
Packaging Group: II or III
Special Provision 108

Further consultation with the transport authority is recommended.

Generator numbers, waste manifests and registered hazardous waste carrier lists are available from the Environmental Protection Service.

3.4 Disposal

Regardless of the type of paint, using it for the intended purpose is the preferred management method.

Domestic waste paint and specialty coatings may be accepted for exchange at community "Household Hazardous Waste Day" locations operated by the municipality. The paint industry is currently expanding its product stewardship program and is accepting waste paints for recycling into new paint products. Approved paint recyclers are available by contacting the Canadian Paint and Coatings Association listed at the end of this guideline.

The best disposal option for waste alkyd and specialty paint is to bulk it in good quality 205 litre steel or plastic drums, in a condition suitable for shipping. List it with a waste exchange or send it to a registered recycling or disposal facility. Contacts for recycling and disposal companies are available by contacting the waste management associations listed in Appendix II of the General Guideline.

Less than 5 litres of alkyd paint can be allowed to dry fully and taken to the landfill. Fully dried out quantities of latex paints may be disposed of at a landfill or placed in the garbage for collection.

Paint can be air dried by spreading it out on a board, plastic sheet or other flat surface until all the liquid has evaporated. Dry paint outdoors in a well ventilated area. For safety purposes open flames must not be present. Prevent children, pets or wildlife from coming into contact with the paint.

Management of specialty coatings is determined by the hazard characteristics of each product as identified in the MSDS. For two-component products, special neutralizing agents or procedures may be required. Due to the chemical nature of specialty coatings, the manufacturer or a waste management company should be consulted for the disposal options. EPS may approve the method, subject to conditions.

Consideration will be given to proposals for alternate management methods that provide a level of environmental protection equivalent to complying with this guideline. The EPS may approve the method, subject to conditions.

4 Conclusion

This guideline presents a brief introduction into the management of waste paint. It is intended as a source of basic information and should be read in conjunction with the Guideline for the General Management of Hazardous Waste in Nunavut.

For more information contact:

1) Canadian Paint & Coatings Association
9900 Kavendish Blvd. Suite 103
St. Laurent PQ H4M 2V2
Phone: (514) 745-2611; Fax: (514) 745-2031

2) Environmental Protection Service
Department of Sustainable Development
P.O. Box 1000, Station 1195
Iqaluit, Nunavut, X0A 0H0
Phone: (867) 975-5900; Fax: (867) 975-5990

3) Motor Vehicle Division
Department of Community Government and Transportation
P.O. Box 1000, Station 775
Iqaluit, Nunavut, X0A 0H0
Phone: (867) 975-5380 Fax: (867) 975-5385

4) Prevention Services Division
Workers' Compensation Board
P.O. Box 669
Iqaluit, Nunavut, X0A 0H0
Phone: (867) 979-8500; Fax: (867) 979-8501
(867) 873-7468 (accident report); Fax: (867) 873-0262
1-800-661-0792

5) Steel Structures Painting Council
40 - 24th Street
Pittsburgh, PA 15222
United States of America
Phone: (412) 281-2331; Fax: (867) 281-9992

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Environmental Protection Service
Department of Sustainable Development
P.O. Box 1000, Station 1195
Iqaluit, Nunavut, X0A 0H0
Fax: (867) 975-5990

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ENVIRONMENTAL GUIDELINE FOR Waste solvents

Department of Sustainable Development
Environmental Protection Service

Nunavut

GUIDELINE: MANAGEMENT OF WASTE SOLVENTS

AS AMENDED BY:

USE OF GUIDELINE

A guideline is not law and is therefore not enforceable. it does however, assist an inspector to determine what action(s) may be required of him or her. Paragraph 2.2(c) of the *Environmental Protection Act* allows the Minister to "develop, co-ordinate, and administer" guidelines. The Act [subsection 5(1)] makes it an offence to discharge a contaminant into the environment, subject to some exceptions [subsection 5(3)]. When a discharge occurs and it is inconsistent with the guidelines, the discharge is considered an unacceptable risk. The inspector may then consider issuing an order or laying an information.

A guideline allows for some leniency in applying the law. A court would probably be inclined to consider the application of a guideline favorably because the public is aware of the standards they are expected to meet.

This Consolidation is not Law.
It is prepared by Environmental Protection Service,
Department of Sustainable Development
Government of the Nunavut

January, 2002

Guideline for the Management of Waste Solvents

GUIDELINE FOR THE MANAGEMENT OF WASTE SOLVENTS

1 Introduction

This guideline provides general information on proper management of waste solvents. Waste solvents are a contaminant under the *Environmental Protection Act* (EPA) and must be managed as a hazardous waste.

Solvents can dissolve other substances (solute) and form a uniformly dispersed mixture (solution). The major uses include paint and coatings (paints, varnishes, and lacquers), industrial cleaners, printing inks, extractive processes and pharmaceuticals. Solvents are generally produced from petroleum or alcohol feedstock. Many solvents are flammable and toxic; substances that can contribute to fire hazards and the contamination of air and water.

This guideline is specific to the management of waste solvents and should be read in conjunction with the Guideline for the General Management of Hazardous Waste in Nunavut (referred to as the General Guideline). Section 2.2 of the EPA gives the Minister of Sustainable Development the authority to develop, coordinate and administer these guidelines.

1.1 Definitions

Flash Point	The lowest temperature at which a flammable liquid produces a sufficient amount of vapor to ignite with a spark.
Fumes	Vapors of organic liquids.
Generator	The owner or person in charge, management or control of a hazardous waste at the time it is generated, or a facility that generates hazardous waste.
Solvent	Alcohol or petroleum based liquids capable of dissolving another substance (solute) to form a uniformly dispersed mixture (solution) at the molecular level.
Transport authority	The regulations controlling the management of hazardous waste under that mode of transport. These include: Road and rail - *Transportation of Dangerous Goods Act* (TDGA) *and Regulations* (TDGR) Air - *International Civil Aviation Organization Technical Instructions* (ICAO) Marine - *International Maritime Dangerous Goods Code* (IMDG).
Vapor	An air dispersion of molecules of a substance that is liquid or solid in its normal state (at standard temperature and pressure).

Vapor pressure The pressure characteristic at any given temperature of a vapor in equilibrium with its liquid or solid form. (Usually expressed in millimeters of mercury, mm Hg)

1.2 Characteristics

Solvents are flammable and toxic chemical liquids. Most solvents are derived from petroleum or alcohol based feedstock. Some are more flammable than others because of differences in vapor pressure. Solvents are toxic by ingestion, skin contact, and vapor inhalation. Solvent vapors can also deprive the lungs of oxygen.

Solvent vapors, if they originate from flammable solvents, can explode. If the vapor is present in air at concentrations higher than the lower explosive limit (LEL) and lower than the upper explosive limit (UEL), there is the potential for an explosion if a spark or static charge is present. Depending on the type of solvent the vapor may be explosive in air at concentrations as low as one percent.

1.3 Potential Effects

Numerous human health disorders are attributed to solvent exposures. Long term or chronic exposure to specific types of solvents can damage vital organs and affect the human immune system.

Improperly managed solvents can harm or kill plants, wildlife and aquatic life. Water contaminated by solvents can adversely affect a community water supply system and the health of the community.

Chlorinated solvents bioaccumulate and are difficult to destroy. Chlorinated solvents are commonly found in cleaning and degreasing operations and the refrigeration industry. Over-use and improper management of chlorinated solvents has resulted in damage to the global ozone layer. Waste solvents require responsible management.

2 Roles and Responsibilities

2.1 Environmental Protection Service

The Environmental Protection Service (EPS) of the Department of Sustainable Development is the Government of the Nunavut's (GN) agency responsible for initiatives which control the discharge of contaminants and their impact on the environment. EPS is responsible for ensuring that environmentally acceptable management procedures, emission levels and disposal methods are maintained. EPS programs are applied primarily to Commissioner's Land, lands administered by municipal governments or GN undertakings. Legislative authority is provided by the *Environmental Protection Act* and *Pesticide* Act. Contact EPS for a listing of relevant regulations and guidelines.

2.2 Generators

> **The responsibility for proper waste management rests with the generator and should be considered as part of the cost of doing business**.

Any person who generates waste solvents is responsible for the proper management of these substances. Waste solvents must be safely handled, packaged, stored, transported, treated and/or disposed in accordance with this guideline.

3 Waste Management

> **Minimizing or avoiding the creation of pollutants and wastes can be more effective in protecting the environment than treating them, or cleaning them up after they have been created.**
>
> **Canadian Council of Ministers of the Environment**

3.1 Pollution Prevention

Pollution prevention methods reduce or eliminate the generation of waste. Pollution control procedures treat waste after it has been generated. Pollution prevention strategies for solvents include the following:

Reduce

- Develop inventory control methods and ensure quantities of materials are completely utilized.
- Substitute less hazardous chemicals.

Reuse

- Participate in national, provincial or territorial waste exchange programs.
- Establish exchange accounts with approved solvent recyclers.
- Develop small scale recycling options (de: filtering, decanting, solvent distillation).

Recycling

- Make an agreement with your supplier/distributor of solvent to return the waste solvent.

3.2 Storage

> **Storage is not a long term solution.**

Store waste solvents according to the following:

- In the original containers, where possible, or in containers manufactured for this purpose of storing hazardous waste. Use containers that are sound, sealable and not damaged.
- Bulk into good quality 16 gauge or lower steel or plastic drums.
- The containers should be sealed or closed at all times.

- Label containers according to the requirements of the Work Site Hazardous Materials Information System (WHMIS) of the *Safety Act* or the relevant Transport Authority if transport to a disposal location is planned. (see Section 3.3 Transportation).
- Protect containers from the weather and physical damage.
- Storage should be in a secure area with controlled access.
- Train personnel in the safe use, storage and shipping procedures for solvents. Only trained persons should have access to the storage area.

Wastes should be stored to prevent spills from entering sewer systems or the environment. Waste solvents should **NEVER** be stored in used food containers such as bottles or cans.

The storage of waste solvents is only acceptable as an interim measure to permit time for the collection of sufficient volumes for cost effective transport to a recycler or disposal facility.

Storage of waste solvents in quantities greater than 1000 litres, for a period greater than 180 days requires registration as a hazardous waste storage facility. Consult the General Guideline or contact EPS for application procedures.

3.3 Transportation

Waste solvents transported to a recycling, treatment, storage or disposal facility must be properly classified, packaged, labeled and manifested as required by the transport authority (air, road, rail, marine). Specific requirements for waste generators are detailed in the General Guideline.

For road transportation purposes, waste solvents can be classified in the following ways, depending on the type of solvent.

Shipping Name:	**Waste Naphtha, Petroleum** **Classification: 3** **P.I.N.: UN1256** **Packaging Group: I, II,III**
Shipping Name:	**Waste Flammable Liquids, N.O.S.** **Classification: 3** **P.I.N.: UN1993** **Packaging Group: I, II,III**

Chlorinated, brominated and other halogenated solvents require shipping names specific to the solvent. Consultation with the transport authority is recommended.

Generator numbers, waste manifests and registered hazardous waste carrier lists are available from the Environmental Protection Service.

3.4 Disposal

Compatible solvents should be bulked for transportation and shipped to a registered recycling or disposal facility. Contacts for recycling or disposal companies are available by contacting the waste management associations listed in Appendix II of the General Guideline.

Consideration will be given to proposals for alternate management methods that provide a level of environmental protection equivalent to complying with this guideline. EPS may approve the method, subject to conditions.

4 Conclusion

This guideline presents a brief introduction into the management of waste solvent. It is intended as a source of basic information and should be read in conjunction with the Guideline for the General Management of Hazardous Waste in Nunavut. Please contact the appropriate agency before proceeding.

For more information contact:

1) Environmental Protection Service
Department of Sustainable Development
P.O. Box 1000, Station 1195
Iqaluit, Nunavut, X0A 0H0
Phone: (867) 975-5900; Fax: (867) 975-5990

2) Motor Vehicle Division
Department of Community Government and Transportation
P.O. Box 1000, Station 775
Iqaluit, Nunavut, X0A 0H0
Phone: (867) 975-5380; Fax: (867) 975-5385

3) Prevention Services Division
Workers' Compensation Board
P.O. Box 669
Iqaluit, Nunavut, X0A 0H0
Phone: (867) 979-8500; Fax: (867) 979-8501
(867) 873-7468 (accident report); Fax: (867) 873-0262
1-800-661-0792

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P.O. Box 1000, Station 1195
Iqaluit, Nunavut, X0A 0H0
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ENVIRONMENTAL GUIDELINE FOR General management of Hazardous waste

Department of Sustainable Development
Environmental Protection Service
Nunavut

GUIDELINE: GENERAL MANAGEMENT OF HAZARDOUS WASTE IN NUNAVUT

AS AMENDED BY:

USE OF GUIDELINE

A guideline is not law and is therefore not enforceable. It does however, assist an inspector to determine what action(s) may be required of him or her. Paragraph 2.2(c) of the *Environmental Protection Act* allows the Minister to "develop, co-ordinate and administer" guidelines. The Act [subsection 5(1)] makes it an offence to discharge a contaminant into the environment, subject to some exceptions [subsection 5(3)]. When a discharge occurs and it is inconsistent with the guidelines, the discharge is considered an unacceptable risk. The inspector may then consider issuing an order or laying an information.

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This Guideline is not law.
It is prepared by Environmental Protection Service,
Department of Sustainable Development
Government of the Nunavut

January, 2002

Guideline for the General Management of Hazardous Waste in Nunavut

GUIDELINE FOR THE GENERAL MANAGEMENT OF HAZARDOUS WASTE IN NUNAVUT

1 Introduction

Waste is produced in the normal course of operation of any industrial, commercial or institutional operation. Because of their chemical, physical or biological properties, some wastes are more dangerous than others. These are known as a hazardous waste and require special handling and disposal to prevent impact on human health and the environment.

This guideline has been developed by the Environmental Protection Service of the Department of Sustainable Development. Its intent is to:

- provide information for the proper management of hazardous waste in Nunavut,
- increase awareness of hazardous waste in Nunavut, and
- establish a "cradle to grave" monitoring system for hazardous waste from generation to final disposal.

Section 2.2 of the *Environmental Protection Act* (EPA) gives the Minister of Sustainable Development of the Government of Nunavut (GN) the authority to develop, coordinate and administer guidelines. This guideline complements existing acts and regulations concerning hazardous waste which should be consulted for interpretation and application. Section 2.5 of the guideline provides additional information on regulatory roles and responsibilities.

This guideline is for the general management of hazardous waste and should be read in conjunction with applicable specific hazardous waste guidelines. Contact the Environmental Protection Service for a listing of these guidelines.

1.1 Definitions

Carrier	Any person engaged in the transport of hazardous waste whether or not for hire or reward.
Commercial	Actions undertaken for hire or reward.
Commissioner's Land	Lands in Nunavut that have been transferred by Order in-Council to the Government of Nunavut. This includes highways, block land transfers and most lands within municipalities.
Consignor	A person who offers a consignment of hazardous waste for transport.
Contaminant	Any noise, heat, vibration or substance and includes such other substances as the Minister may prescribe that, where discharged into the environment, (a) endangers the health, safety or welfare of persons, (b) interferes or is likely to interfere with normal enjoyment of life or property, (c) endangers the health of animal life, or

d) causes or is likely to cause damage to plant life or property.
Environmental Protection Act

Dangerous goods Any product, substance or organism included by its nature or by the *Transportation of Dangerous Goods Regulations* (TDGR) in any of the classes listed in the schedule provided in the *Transportation of Dangerous Goods Act* (TDGA).
Transportation of Dangerous Goods Act (Canada)

Empty container A 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. This does not include containers which previously contained mercury or class 2.3, 5.1, or 6.1 materials of TDGR.

Generator The owner or person in charge, management or control of a hazardous waste at the time it is generated or a facility that generates hazardous waste.

Hazardous waste A contaminant which is a dangerous good that is no longer used for its original purpose and is intended for recycling, treatment, disposal or storage.

A hazardous waste does not include a contaminant that is:
(a) household in origin;
(b) included in class 1, Explosives or class 7, Radioactive materials of TDGR;
(c) exempted as a small quantity;
(d) an empty container; or
(e) intended for disposal in a sewage system or by landfilling that meet the applicable standards set out in schedules I, III or IV of the Guideline for Industrial Waste Discharges in Nunavut.

Hazardous waste management facility A facility which is used for the collection, storage, treatment, recycling or disposal of hazardous waste.

Incompatible waste Hazardous wastes which, when in contact with one another or other substances under normal conditions of storage or transportation, could react to produce heat, gas, fire, explosion, corrosive substances or toxic substances.

Landfilling The deposit of waste, on land, as described in the GN Department of Community Government and Transportation's document Guidelines for the Planning,Design, Operation & Maintenance of Solid Waste Modified Landfill Sites in the Northwest Territories.

Long term storage The storage of hazardous waste for a period of 180 days or more but does not include materials in transit.

Manage To handle, transport, store, recycle, treat, destroy or dispose of hazardous waste.

Receiver	A person to whom a quantity of hazardous waste is being or intended to be transported. Also referred to as a consignee.
Sewage system	A system for the collection, transmission, treatment or disposal of any liquid waste containing animal, vegetable, mineral, human or chemical matter in solution or in suspension.
Small quantity	Hazardous waste that is generated in an amount that is less than 5 kilograms per month if a solid or 5 litres per month if a liquid; and where the total quantity accumulated at any one time does not exceed 5 kilograms or 5 litres. This does not apply to wastes that are mercury or in classes 2.3, 5.1 or 6.1 of TDGR. These wastes must be generated in an amount less than 1 kilogram per month if a solid or 1 litre per month if a liquid; and where the total quantity accumulated at any one time does not exceed 1 kilogram or 1 litre.
Transport authority	The regulations controlling the management of hazardous waste under that mode of transport. These include: Road and rail - *Transportation of Dangerous Goods Act* (TDGA) *and Regulations* (TDGR). Air - *International Civil Aviation Organization Technical Instructions* (ICAO). Marine - *International Maritime Dangerous Goods Code* (IMDG).
TDGA/TDGR	The *Transportation of Dangerous Goods Act and Regulations* (Canada).
Treatment or Treat	The handling or processing of a hazardous waste in such a manner as to change the physical, chemical or biological character or composition of the hazardous waste in order to eliminate or reduce: (a) one or more environmental hazard of the waste; and/or (b) the volume.

2 Roles and Responsibilities

2.1 Environmental Protection Service

The Environmental Protection Service (EPS) of the Department of Sustainable Development is the Government of Nunavut's (GN) agency responsible for initiatives which control the discharge of contaminants and their impact on the natural environment. EPS is responsible for ensuring that environmentally acceptable management procedures, emission levels and disposal methods are maintained. By practice EPS programs are applied primarily to Commissioner's Land, lands administered by municipal governments or GN undertakings. Legislative authority is provided by the *Environmental Protection Act* (EPA) and *Pesticide Act.* Contact EPS for a listing of relevant regulations and guidelines.

EPS monitors the movement of hazardous waste from the generator to final disposal through use of a tracking document called a waste manifest. A waste manifest form must accompany all hazardous waste in transit regardless of the means of transport. In order to complete the manifesting requirements, all parties (the generator, carrier, receiver) must be registered by EPS and the registration number entered in the appropriate location on the waste manifest form. Registration numbers and waste manifest forms are available from EPS.

Under the EPA, the *Spill Contingency Planning and Reporting Regulations* set the standards for reporting spills of contaminants and preparing spill contingency plans.

2.2 Generators of Hazardous Waste

> **The responsibility for proper waste management rests with the generator and should be considered part of the cost of doing business.**

The generator is ultimately responsible for ensuring hazardous waste will be properly managed from the time it is generated to final disposal. Waste must be properly stored, transported, treated and disposed. Contractors can manage waste on behalf of the generator however, the generator is responsible for ensuring, in advance, that the waste management method is acceptable.

In general, the generator is responsible for the following:

- Classifying, labeling and storing the hazardous waste properly.
- If waste is to be transported off site the generator should:
  - register as a generator of hazardous waste;
  - ensure a waste manifest is properly completed and accompanies the shipment and
  - ensure the waste is transported by a registered hazardous waste carrier to a registered receiver.
- Registering their hazardous waste management facility, if required.
- Ensuring the proper disposal of hazardous waste by an acceptable method.
- Ensuring workers are trained in the management of hazardous waste including emergency response in the event of a discharge.
- Complying with all other regulatory requirements for hazardous waste management including transportation, occupational health and public health.

2.3 Carriers of Hazardous Waste

Carriers must be registered with EPS prior to transporting hazardous waste. Hazardous waste must be transported in accordance with the appropriate transport authority: *Transportation of Dangerous Goods Regulations* (TDGR); *International Civil Aviation Organization* (ICAO) or *International Maritime Dangerous Goods Code* (IMDG). TDGR requires that drivers be trained in the aspects of transporting dangerous goods related to their assigned duties.

2.4 Receivers of Hazardous Waste

Receivers (consignees) of hazardous waste in Nunavut must be registered with EPS as a receiver. The operator of a hazardous waste management facility in Nunavut may be required to register the facility with EPS. Section 3.4 provides information on registering a hazardous waste management facility.

2.5 Other Regulatory Agencies

The following agencies are involved in activities relevant to hazardous waste management in Nunavut:

The Transportation-Motor Vehicles Division of the GN Department of Community Government and Transportation is responsible for administering the *Transportation of Dangerous Goods Act and Regulations* (Canada). The Department is also responsible for driver, vehicle and load safety under additional transport legislation.

Under the *Safety Act, Occupational Health and Safety Regulations* address the safety of workers and the work place. The Act states that the employer shall maintain their establishment and take all reasonable precautions to ensure the safety and health of every person in the establishment. The Regulations also prescribe standards for protective clothing and equipment to be used by workers. *Work Site Hazardous Materials Information System Regulations* (WHMIS) were adopted to ensure employee training and safe storage and handling of controlled products at the employer's work site. Consultation with a Safety Officer from the Prevention Services Division of the Workers' Compensation Board is the responsibility of every waste generator or employer.

The Office of the Fire Marshal has authority over the storage of flammable, combustible and hazardous materials under the National Fire Code. Consult with the GN Department of Community Government and Transportation's regional Fire Marshal or your community Fire Chief.

Waste management activities may affect public health. Environmental Health Officers of the regional Public Health Boards should be consulted regarding requirements under the *Public Health Act.*

The GN Department of Community Government and Transportation (CG&T) administers Commissioner's Lands. CG&T's responsibility includes the granting of leases, licences and land use permits on these lands and is also involved in the planning, funding, operation and maintenance of municipal infrastructure such as landfills and sewage treatment systems.

Indian and Northern Affairs Canada is responsible for hazardous waste management on federal lands through the *Territorial Lands Act* and *NWT/Nunavut Waters Act.*

Environment Canada is responsible for the management of hazardous waste from federal facilities and lands under the *Canadian Environmental Protection Act* (CEPA). CEPA regulates the release to the environment and storage of polychlorinated biphenyls (PCBs) under the *Chlorobiphenyls Regulation, Storage of PCB Material Regulations, and Federal Mobile PCB Treatment and Destruction Regulations.* Because they regulate these areas, sections 3.2, 3.3, 3.4 and 4.4 of this guideline do not apply to PCBs. International shipments of waste dangerous goods are monitored under the *Export and Import of Hazardous Waste Regulations and the PCB Waste Export Regulations.*

The National Energy Board regulates frontier exploration, drilling, production and inter-jurisdictional transmission in the oil and gas industry. The management of land based drill sumps is in conjunction with the appropriate land regulator.

Natural Resources Canada has the authority to administer explosives under the *Explosive Act.* Canadian Nuclear Safety Commission (formerly the Atomic Energy Control Board) administers the handling and disposal of radioactive materials in Canada and licenses institutions and companies to possess and use radioactive materials.

Under land claim agreements, renewable resource management institutions have been given broad authority for land use planning, impact assessment, and administration of land and water activities in settlement areas outside municipal boundaries. Through the setting of terms and conditions in licensing and permitting procedures, such institutions will have authority over waste disposal.

Figure 1 provides a flow chart to assist in determining the primary regulatory contact for hazardous waste management. Contact the Environmental Protection Service if assistance is required.

3 Storage and Management of Hazardous Waste

3.1 General

The definition of hazardous waste in this guideline incorporates the term "dangerous goods" which is defined in the Transportation of *Dangerous Goods Act* (Canada). The Transportation of Dangerous Goods Regulations (TDGR) has a system for classifying dangerous goods. Because the term "dangerous goods" is used in the definition of hazardous waste, the classification system used in TDGR can be applied to hazardous waste. Appendix A indicates the 9 chemical classes used.

Hazardous waste must not be mixed or diluted with any substance or divided into smaller quantities to avoid meeting the definition of a hazardous waste.

Figure 2 is a flow chart illustrating the decision process for managing a hazardous waste under this guideline.

3.2 General Requirements for Storage Containers

Hazardous waste should be stored in containers according to the following:

- In the original containers, where possible, or in containers manufactured for the purpose of storing hazardous waste. The containers must be sound, sealable and not damaged or leaking. The Transport Authority regulates container specifications.
- Clearly labelled according to the requirements of the Work Site Hazardous Materials Information System (WHMIS) of the *Safety Act* or the relevant Transport Authority, if transport is planned.
- Bulked into 16 gauge or equivalent metal or plastic 205 litre drums, as appropriate.
- The containers should be sealed or closed at all times, unless in use.

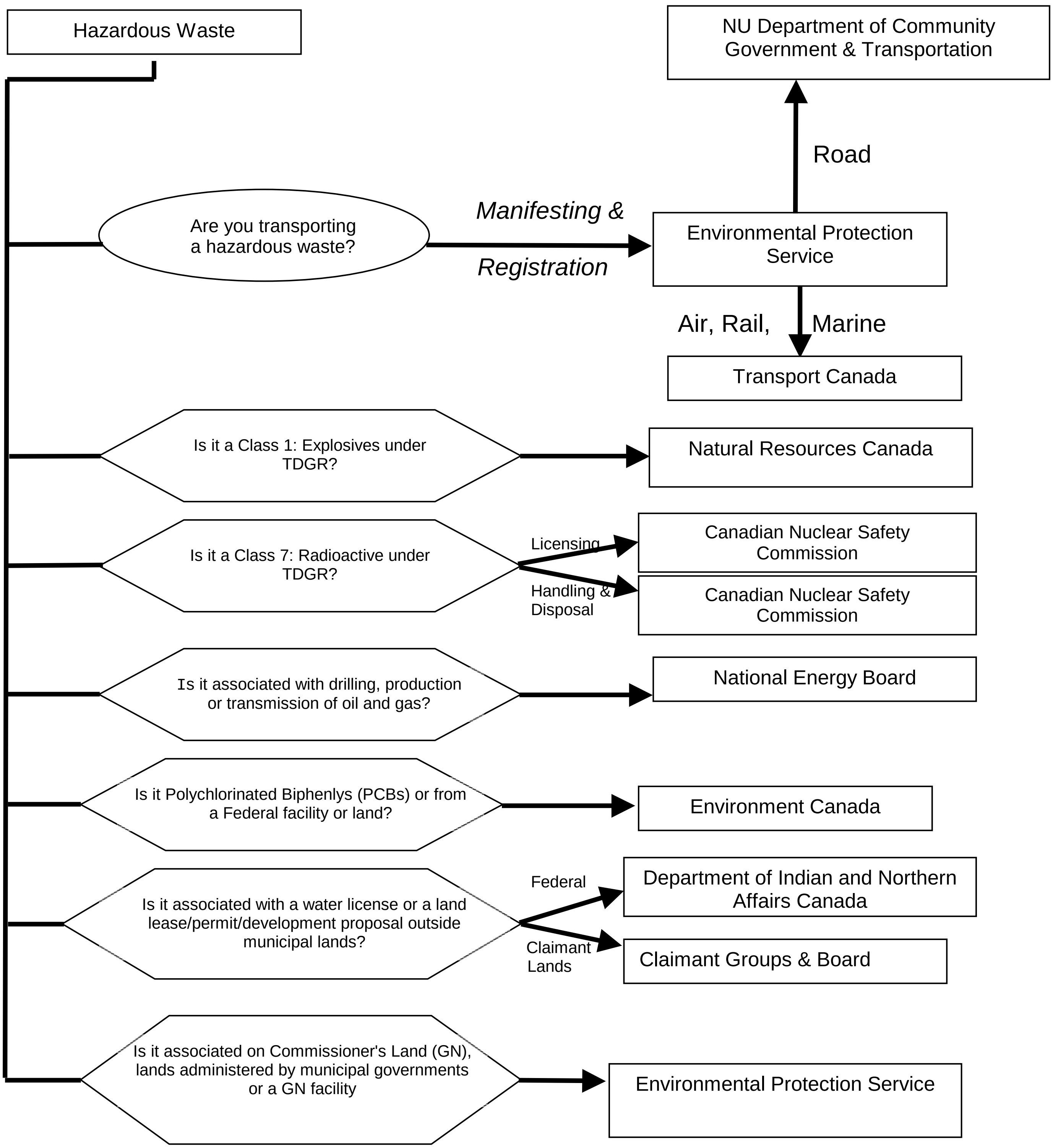


Figure 1: Primary Regulatory Contact for Hazardous Waste Management

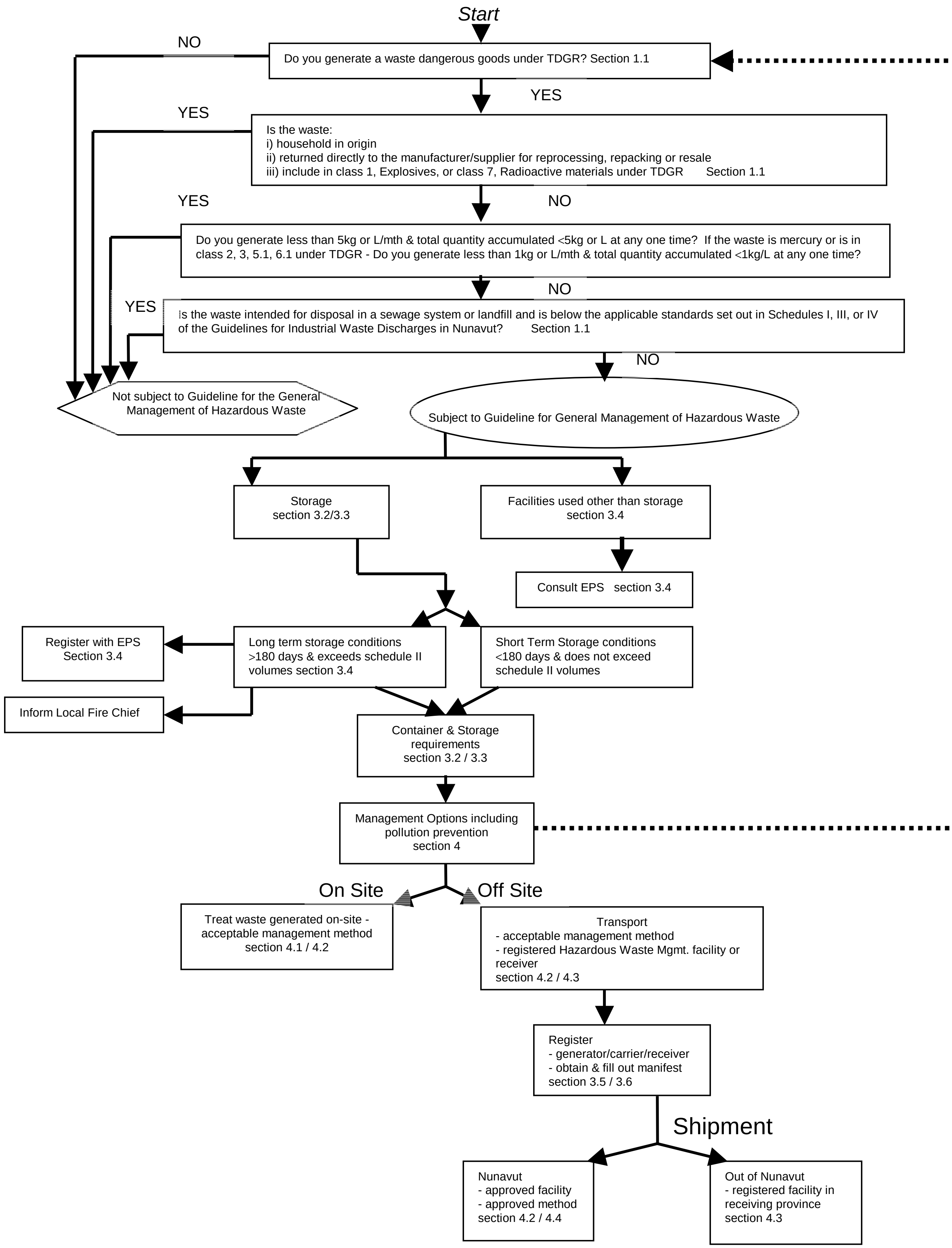


Figure 2: Decision Flow Chart for Managing a Hazardous Waste

3.3 General Requirements for Storage Facilities

The storage of hazardous waste is not an acceptable long term waste management solution.

Hazardous waste must be stored in a safe and secure manner In general, hazardous waste should be stored according to the following:

- Drainage into and from the site is controlled to prevent spills or leaks from leaving the site and to prevent run off from entering the site.
- Incompatible wastes are segregated by chemical compatibility to ensure safety of the public, workers and facility.
- In a secure area with controlled access. Only persons authorized to enter and trained waste handling procedures should have access to the storage site.
- Regular Inspections are performed and recorded. Containers are placed so that each container can be inspected for signs of leaks or deterioration. Leaking or deteriorated containers should be removed and their contents transferred to a sound container.
- Maintain a record of the type and amount of waste in storage.
- Storage sites have emergency response equipment appropriate for the hazardous waste stored on site.
- Where the site is to be used for long term storage and the amount of waste in storage exceeds the quantity requirements set out in Schedule I, the site should be registered in accordance with Section 3.4 of this guideline.
- Storage sites are expected to meet all local bylaw and zoning requirements. It is recommended that the local Fire Chief be advised of the storage facility and its content for emergency planning and response purposes.

3.4 Registering a Hazardous Waste Management Facility

Hazardous waste management facilities may require registration with the Environmental Protection Service.

<u>Storage Facility:</u>

A storage facility can be a building, locker, compound or area used to store hazardous waste. A storage facility should be registered with EPS if:

- the facility is used or is intended for the storage of hazardous waste for a period of 180 days or more, and
- quantities to be stored exceed the quantities set out in Schedule I for individual waste classes or if the aggregate quantity for all classes of waste stored exceed 5000 Kg/L.

When registering a storage facility the following information should be provided:

- Company name, address, phone number and contact person, including position.
- Location and description of the facility.
- Expected types, quantities and method of storage of the hazardous waste.
- Approvals required to operate and occupy the land for that purpose.

This information should also be provided to the local Fire Chief for emergency planning and response purposes.

Management Facility other than Storage:

Hazardous waste management facilities, other than a storage facility, which manage hazardous waste for commercial purposes require registration with EPS prior to operation. These include facilities which treat, reprocess, consolidate, destroy or recycle hazardous waste. When registering a facility the following information should be provided:

- Company name, address, phone number and contact person, including position.
- Location and description of the facility.
- A description of the waste management activities to be conducted.
- Expected types, quantities and method of storage of the hazardous waste.
- Approvals required to operate and occupy the land for that purpose.

The information requirements for an environmental review of a hazardous waste management facility may be found in the Environmental Information Guide For Industrial Projects on Commissioners Lands. The Guide provides the information requirements for relevant GN agencies to review the environmental impacts of a project. A proponent should review the Guide and contact EPS before making a submission.

3.5 Registering Hazardous Waste Generators, Carriers and Receivers

If hazardous waste is to be transported off site, the generator, carrier and receiver must be registered with EPS. Once registered, an identification number will be assigned which is required to complete the waste manifest under TDGR. A carrier or receiver may either be registered in Nunavut or in the province or territory in which the company is based.

The following information should be provided when applying for a registration number:

Generator:

- Company name, address, phone number and contact person, including position.
- Location and description of the activity taking place which results in the generation of the hazardous waste.
- Expected type, quantity and method of storage of hazardous waste.

Carrier:

- Company name, address, phone number and contact person, including position.
- Proof of transport liability insurance.
- Operating authority for transport in Nunavut.
- Confirmation that the company meets the training requirements of the transport authority.

Receiver:

- Company name, address, phone number and contact person, including position.
- Location and description of the management facilities and activities for hazardous waste.
- Expected type, quantity and method of storage of hazardous waste.

3.6 Waste Manifest Requirements

The *Transportation of Dangerous Good Regulations* require that a completed hazardous waste manifest form accompany shipments of hazardous waste. Manifests are available from EPS.

The completed manifest form provides:

- Detailed information on the types and amounts of hazardous waste shipped;
- A record of the firms or individuals involved in the shipment; and
- Information on the storage, treatment or disposal of the waste and confirmation that they reached their intended final destination.

The Generator (Consignor), Carrier and Receiver (Consignee) must each complete their portion of the manifest. The information provided on the manifest as well as other TDGR requirements (i.e.: labeling and placarding) are also intended to assist first responders (police, ambulance, fire fighters) with hazard information should a transportation accident occur.

Waste manifest completion instructions are provided on the reverse side of each manifest. Further assistance in completing a waste manifest may be obtained by referring to the User's Guide for the Hazardous Waste Manifest produced by Environment Canada or by contacting the Department of Community Government and Transportation-Motor Vehicles Division.

4 Waste Management

Waste management is intended to reduce or eliminate the effects of waste on the environment, to provide for public and worker safety and to maximize the efficient use of resources. Once hazardous waste has been created the proper treatment and disposal can be expensive. While it is the responsibility of the waste generator to pay for all disposal costs, various waste management options are available to reduce the cost and volume of waste requiring treatment. A more effective and proactive management practice is to eliminate or reduce the generation of the waste. This is referred to as pollution prevention.

> **Minimizing or avoiding the creation of pollutants and waste can be more effective in protecting the environment than treating them, or cleaning them up after they have been created.**
>
> **Canadian Council of Ministers of the Environment**

4.1 Pollution Prevention

Pollution prevention methods are designed to eliminate the creation of waste. Whereas pollution control options treat waste after it has been created, pollution prevention measures avoid the creation of waste.

Waste generators in Nunavut can reduce costs and prevent pollution by implementing reduction, reuse and recycling programs through changes in operational procedures, maintenance practices and raw material usage. An overall waste management plan should incorporate these ideas.

1. Reduce

   The aim of reduction is to eliminate the production of a hazardous waste by using raw materials more efficiently. Methods of reduction include substitution or reduction of a raw material, production redesign, process changes, and improved maintenance activities. Methods which are technically and economically practical in any given situation should be used to reduce or eliminate waste streams.

2. Reuse and Recycle

   Reusing or recycling hazardous waste in operating processes within the generating facility is another means of pollution prevention. Alternatively other users may be found to reuse the material that would otherwise require treatment or disposal. The Department of Sustainable Development encourages the reuse and recycling of hazardous waste in the following ways:

   (a) Waste exchanges and associations offer some opportunity for the reuse or recycle of waste. Waste exchanges put potential users of waste materials in contact with waste generators. Appendix B lists a number of waste material exchanges and management associations.

   (b) Recycle programs are in place for some hazardous wastes such as waste oil, waste fuels and solvents. For information on recycling programs, contact the waste management associations in Appendix B or EPS.

4.2 Treatment or Disposal

It is not acceptable for hazardous waste to be abandoned, poured down sewers, dumped on land or discarded at a landfill.

Treating hazardous waste to reduce or eliminate their hazard is the final option after implementing appropriate pollution prevention options. It is the responsibility of the generator to treat or dispose of their hazardous waste properly. Although a discussion of treatment and disposal methods is beyond the scope of this guideline, the following are general points for consideration:

- The generator is required to determine and follow the proper management method for their waste. Sources of assistance include:

- the manufacturer’s Material Safety Data Sheet (MSDS) provided with the raw materials.
- the manufacturer.
- complying with this guideline and other relevant legislation.
- waste management consultants and associations.

- **Open burning of hazardous waste is not acceptable.**

- Treated hazardous waste may be directed for landfilling or to a municipal sewage system providing that the standards outlined in the <u>Guideline for Industrial Waste Discharges in Nunavut</u> are met. The municipal authority and the facility's water licence should also be consulted.

- Different types of hazardous wastes should not be mixed together in the same container. It is important to control the quality of any waste to ensure it can be recycled or disposed of properly. Contaminating wastes with other wastes may prevent reuse/recycling options and increase disposal costs.

- Hazardous waste containers must be properly managed. Containers should be emptied, to the greatest extent possible, using regular handling procedures, or by triple rinsing with an appropriate cleaning agent. They should be rendered unusable by puncturing or crushing prior to disposal. This is especially of concern for containers which could eventually be used for water or food storage. Rinsings must be managed according to their waste characteristics.

4.3 Disposal Outside of Nunavut

Hazardous waste can be sent to a hazardous waste management facility outside of Nunavut if the receiving facility is registered in the receiving province or territory and is approved to manage that waste.

Environment Canada monitors international shipments through the *Export and Import of Hazardous Waste Regulations* (EIHW) of CEPA. The International Basel Convention on the Control of Transboundary Movements of Hazardous Waste and their Disposal controls the shipment of hazardous waste across international borders. Contact Environment Canada when considering international shipments.

A list of Canadian waste management facilities is available by contacting the associations representing the waste industries. These associations are listed in Appendix B.

4.4 Alternative Management Methods

EPS will give consideration to proposals for alternate management methods that provide an equivalent level of environmental protection to those identified in this guideline.

5 Conclusion

This guideline presents a brief introduction into the management of hazardous waste. It is intended as a source of basic information about the issues involved in the management of hazardous waste. It does not replace the existing legislation which is referenced in the guideline. Please contact the appropriate agency before proceeding. For more information contact:

1. Environmental Protection Service
Department of Sustainable Development
P.O. Box 1000, Station 1195
Iqaluit, Nunavut, X0A 0H0
Phone: (867) 975-5900; Fax: (867) 975-5990

2. Motor Vehicles Division
Department of Community Government and Transportation, Headquarters
Government of Nunavut
P.O. Box 207
Gjoa Haven, Nunavut, X0E 1J0
Phone (867) 360-4614; Fax (867) 360-4619

3. Prevention Services Division
Workers' Compensation Board
P.O. Box 669
Iqaluit, Nunavut, X0A 0H0
Phone: (867) 979-8500; Fax: (867) 979-8501
(867) 873-7468 (accident report); Fax: (867) 873-0262
1-800-661-0792

4. Office of the Fire Marshal (Nunavut Emergency Services Division)
Department of Community Government and Transportation
P.O. Box 1000, Station 700
Iqaluit, Nunavut, X0A 0H0
Phone: (867) 975-5316; Fax: (867) 979-4221

5 Community Development Division
Department of Community Government and Transportation
P.O. Box 1000
Iqaluit, Nunavut, X0A 0H0
Phone: (867) 975-5339; Fax: (867) 979-5811

6. Department of Health and Social Services
P.O. Box 1000, Station 1000
Iqaluit, Nunavut, X0A 0H0
Phone: (867) 979-5766; Fax: (867) 979-5780

7. Indian and Northern Affairs Canada
P.O. Box 2200
Iqaluit, Nunavut, X0A 0H0
Phone: (867) 975-4500; Fax: (867) 975-4560

8. Environmental Protection Branch
Environment Canada
P.O. Box 1870
Iqaluit, Nunavut, X0A 0H0
Phone: (867) 979-3660; Fax: (867) 975-4645

9. Environment Branch
National Energy Board
444 - 7th Avenue SW
Calgary, AB, T2P 0X8
Phone: (403) 292-4800; Fax: (403) 292-5503

10. Explosives Division, Western Region
Natural Resources Canada
244755 Lake Bonavista Drive
Calgary, AB, T2J 0N3
Phone: (403) 292-4766; Fax: (403) 292-4689

11. Western Regional Office
Canadian Nuclear Safety Commission
850, 220 - 4th Avenue SE
Calgary, AB T2G 4X3
Phone: (403) 292-5181; Fax: (403) 292-8985
Radiation Emergency (24 Hour) (613) 995-0479

Schedule 1: Registration Volumes

Minimum quantity of hazardous waste[1] necessary for registration as a Hazardous Waste Storage Facility.

Waste Classification TDG		Quantity[2] (Kg or L)
1	Explosives	50[3]
2.1	Compressed Gas (flammable)	500[4]
2.2	Compressed Gas (non-corrosive, non-flammable non-toxic)	5000[4]
2.3	Compressed Gas (toxic)	200[4]
2.4	Compressed Gas (corrosive)	500[4]
3.1	Flammable Liquids (flash point <-18°C)	1000
3.2	Flammable Liquids (flash point >-18°C)	2000
3.3	Flammable Liquids (flash point >23°C <61°C)	4000
4.1	Flammable Solids	5000
4.2	Spontaneously Combustible Solids	1000
4.3	Solids which React Violently with Water	500
5.1	Oxidizing Substances	1000
5.2	Organic Peroxides	50
6.1	Poisonous Substances	1000
6.2	Infectious Substances	500[4]
7	Radioactive	any amount[3]
8	Corrosive Substances	1000
9.1	Miscellaneous	1000
9.2	Environmentally Hazardous	50[5]
9.3	Dangerous Waste	5000
	Total Aggregate Quantity of Hazardous Waste	5000

[1] This applies to hazardous waste and not dangerous goods.
[2] Quality refers to liquids when the amount is expressed in liters (L) and solids when expressed in kilograms (kg).
[3] Controlled under the authority of the Federal *Explosives Act* or *Atomic Energy Control Act*.
[4] Total liquid volume capacity of the container.
5 PCB Storage is regulated by Environment Canada under the *Canadian Environmental Protection Act*.

6 Bibliography

Government of Alberta, Alberta Environmental Protection - Alberta User Guide for Waste Managers, Edmonton, (1996).

Government of Nunavut, Department of Sustainable Development - Guideline for Industrial Waste Discharge, Iqaluit, (2002).

Government of Nunavut, Department of Sustainable Development - Environmental Information Guide For Industrial Projects, Iqaluit, (2002).

Heinke, G. and Wong, J., Guidelines for the Planning. Design. Operation & Maintenance of Solid Waste Modified Landfill Sites in the NWT, Volume 1 & 2. Department of Municipal and Community Affairs, Yellowknife, (1990).

NWT Water Board, Northwest Territories Waters Act, Canadian Gazette Part II, Vol.127, No.13, (1993).

Appendix A: Dangerous Goods Classifications

Class 1: Explosives[1]

Class 2: Compressed Gases
Division 2.1: Flammable Gases
Division 2.2: Non-Flammable Gases
Division 2.3: Poison Gases
Division 2.4: Corrosive Gases

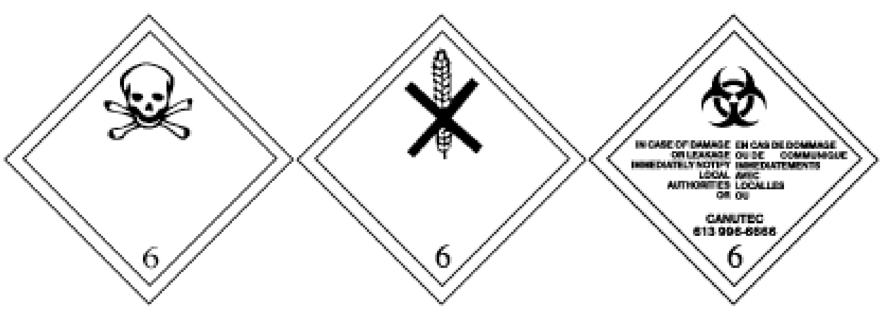
Class 3: Flammable Liquids
Division 3.1: Flash Point < -1 8°C
Division 3.2: Flash Point > -1 8°C and < 23°C
Division 3.3: Flash Point > 23°C and < 61°C

[1] Class 1 and 7 are regulated under federal legislation and not subject to this guideline.

Class 4: Flammable Solids, Substances Liable To Spontaneous Combustion, Dangerous When Wet
Division 4.1: Flammable Solids
Division 4.2: Spontaneously Combustible
Division 4.3: Dangerous When Wet

Class 5: Oxidizers, Organic Peroxides
Division 5.1: Oxidizers
Division 5.2: Organic Peroxides

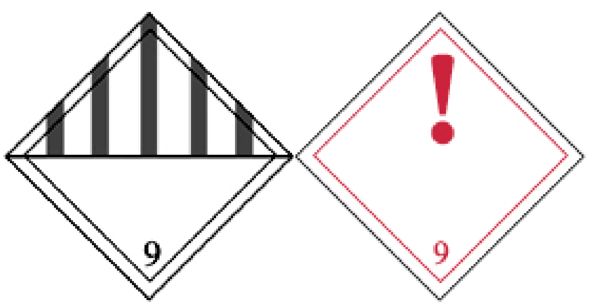
Class 6: Poisonous, Infectious Substances
Division 6.1: Poisonous
Division 6.2: Infectious Substances



Class 7: Radioactive Materials[1]

Class 8: Corrosives

Class 9: Miscellaneous Dangerous Goods
Division 9.1: Miscellaneous Dangerous Goods
Division 9.2: Hazardous to the Environment
Division 9.3: Dangerous Wastes



Appendix B: Waste Exchanges and Associations

Exchanges

Alberta Action on Waste	1-800-463-6326 (780) 427-6982
British Columbia Waste Exchange	(604) 732-9253
Canadian Chemical Exchange	(450) 436-2525 1-800-561-6511
Ontario Waste Exchange	(416) 778-4199
Quebec Waste Materials Exchange	(418) 643-0394
Saskatchewan Waste Materials Exchange	(306) 931-3242

Associations

Assn. Quebecoise des Techniques de L'eau	(514) 874-3700 Fax
Canadian Chemical Producers Association - Chemical Referral Centre	(613) 237-6215
Canadian Water & Wastewater Association	(613) 747-0524
Environmental Services Association of Alberta	1-800-661-9278 (780) 429-6363
Northern Territories Water and Waste Association	(867) 920-8081
Ontario Waste Management Association	(905) 791-9500
Water Environment Association of Ontario	(905) 726-1300 1-888-355-1300
Western Canada Water & Wastewater Association	1-877-283-2003

If you would like to be placed on a mailing list to receive guideline amendments or for public consultation on Environmental Protection Service legislation please fill this out and mail or fax to:

Environmental Protection Service
Department of Sustainable Development
P.O. Box 1000, Station 1195
Iqaluit, Nunavut, X0A 0H0
Fax: (867) 979-5990

Users of this guide are encouraged to report any errors, misspellings, etc. contained within, to EPS at the above address.

Mailing List for Environmental Protection Service Information

Name: ________________________________

Title: ________________________________

Address : ________________________________

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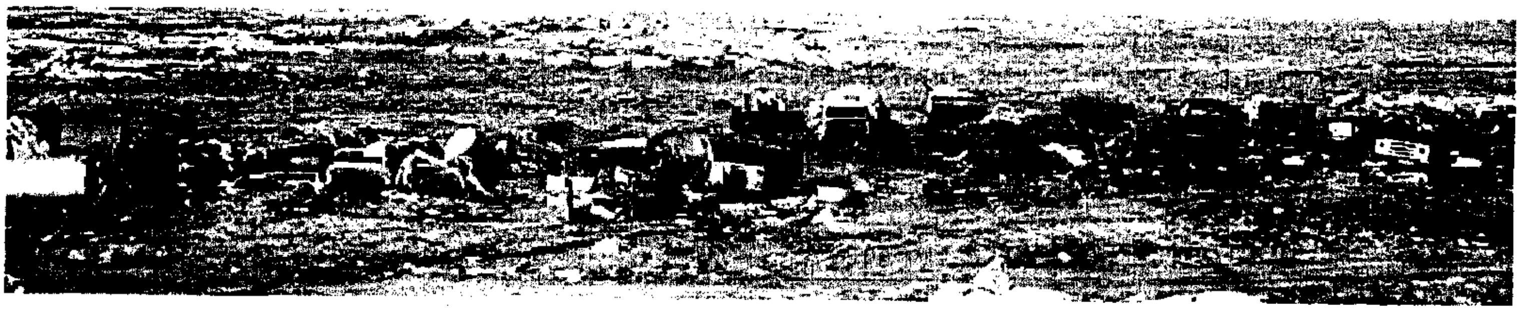
Phone / Fax Number: ________________________

MANAGEMENT OPTIONS FOR END-OF-LIFE VEHICLES (ELVs) IN NUNAVUT



Environmental Protection Service
Department of Environment
Government of Nunavut

Iqaluit, Nunavut
X0A 0H0

February 2006

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Nunavut

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This report was prepared under contract by Tantalus Services Inc. for the Department of the Environment, the Government of Nunavut with inputs from the Department of Community and Government Services, to address the management options of end-of-life vehicles (ELVs) in Nunavut.

Executive Summary

In PINASUAQTAVUT: 2004 - 2009 the Government of Nunavut (GN) reconfirms its commitment to the four objectives set in 1999. One item under the objective of INUUQATIGIITTIARNIQ: HEALTHY COMMUNITIES is "Explore the repatriation of used vehicles out of Nunavut" with Departments of Environment (DOE), and Community and Government Services (C&GS), as the responsible departments.

This report was prepared by the Government of Nunavut, DOE, with input from C&GS and Economic Development and Transportation (ED&T), to address **management options for end-of-life vehicles (ELVs) in Nunavut**. ELVs refer to vehicles that cannot be driven anymore for various reasons. The report focuses on the repatriation of ELVs; however, the discussion is applicable to used vehicles and other recyclable metal.

The objective of this project was to describe:

1. Current management practices of ELVs in Nunavut;
2. Possible options to repatriate ELVs out of Nunavut; and
3. Other management options of ELVs that may be applicable in Nunavut.

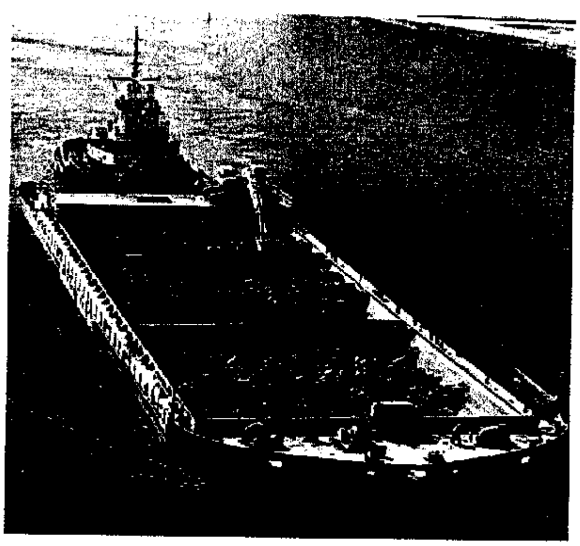
The following terms used in the report are defined as follows:

Used Vehicles: Vehicles that are still road-worthy;

Whole ELVs: ELVs that are not compacted (flattened) and still containing hazardous materials (i.e. waste oil & fluids, gas tanks, gasoline, battery, and tires);

Green ELVs: Compacted ELVs with hazardous materials removed;

Ultra - Green ELVs: ELVs that are flattened with hazardous and non-metal materials removed (i.e. waste oil, fluids, gas tanks, gasoline, battery, tires, and all plastics).



A tug-barge carries scrap metal from Mckeil Marine Ltd.

Automobiles are ranked at the top for recyclability. By weight, 76% of an average car's content is recycled, and cars have the highest recycling rate for mass produced articles. In Nunavut, this resource is not recognized due to several barriers; one key obstacle is the high cost of shipping. Increasing concern, however, about the state of the local environment and the commitment to improve waste management in the communities has made recycling more viable.

Markets for ELVs are the most critical factor in the success of any recycling program. It is the end users of recyclable materials that specify is that will be purchased. These requirements influence the collection, processing and other aspects of a recycling program.

In identifying vehicle repatriation options, key criteria focused on changing responsibilities within the public and private sectors, and changing marine shipping methods. These options are described as:

Option 1: Government Preparation and Repatriation
 Option 1a: Government Repatriation via Barge Charter
 Option 1b: Government Repatriation via Back-Haul

Option 2: Government Preparation and Private Repatriation
 Option 2a: Southern Business Repatriation with Government Assistance
 Option 2b: Nunavut Business Repatriation with Government Assistance

Option 3: Private Preparation and Repatriation
 Option 3a: Nunavut Private Industry Repatriation

The options identified include:

Option	**Government Preparation and Repatriation**		**Government Preparation and Private Repatriation**		**Private Preparation And Repatriation**
Implementation Methods	**Option 1a:**	**Option 1b:**	**Option 2a:**	**Option 2b:**	**Option 3a:**
Description	Government responsible for preparation, processing and shipping of ELVs.		Government responsible for preparation, and businesses responsible for shipping. Processing can be done by either depending on negotiation.		Scrap yard responsible for preparation, processing and shipping of ELVs.
GN Role	C&GS - implement ELVs management and associated activities. DOE - regulator/inspector. ED&T - limited involvement. E&IA - develop partnerships with other jurisdictions as required.		C&GS - implement ELVs management activities and assist Hamlets in contract negotiation. DOE - regulator/inspector ED&T - provide funding and training opportunities. E&IA - develop partnerships with other jurisdictions as required.		C&GS - assist land use and hazardous material management at Hamlet landfills. DOE - develop legislation and perform regulatory Functions. ED&T - provide funding and training opportunities.
Partners	GN & Hamlets Other jurisdictions		GN & Hamlets Southern shipping companies Southern scrap dealers/brokers Other jurisdictions	GN & Hamlets Local shipping companies Local recyclers Other jurisdictions	GN & Hamlets Scrap dealers/brokers

Preparation refers to the collection/centralization and storage of metals, and processing refers to the shredding, compacting and baling of materials. The removal of hazardous materials is optional depending on implementation methods; it can be done during the preparation or processing stage or carried out by the end-purchaser.

Key requirements and benefits to repatriate ELVs in Nunavut include:

- GN has a role in each option from assisting with funding to providing leadership. Other key partners include the Hamlets and residents.
- Development and implementation of legislative and policy tools for recycling and repatriation of ELVs.
- Incorporation of training and employment opportunities at the community and possibly regional level.
- Investment in improved waste management at the community and regional level.
- Clean up the environment and extend the "life" of landfills.

The key disadvantage to all of the options is the high cost of shipping, equipment purchase and/or rental, and labour. Only a feasibility level review/study will be able to provide an evaluation of potential income and costs associated with a particular option. Shipping expenses are the largest identifiable costs, ranging from $430/ELV (green) to $1,500/ELV (whole). To prepare and process green ELVs, it would cost approximately $630/ELV based on the Kivalliq pilot project, and such costs could vary drastically depending on the scrap metal volume and implementation methods. The value of ELVs can also range from $100/ELV (whole) to $110/ELV (green) and can change significantly depending on the demand of scrap metal.

Iqaluit landfill (metal dump section) from H. Yeh

Steps that could be incorporated to improve overall costs include:

1. Efficient Implementation Plan:
   - Expand the scope of recyclable metal to include more than ELVs (i.e. recycle household appliances, aluminum cans, etc.);
   - Use an appropriate and economical shipping methods;
   - Set up regional recycling centers.
2. Cooperation between Key Partners:
   - Cooperation within GN (i.e. incorporate recycling initiatives in GN shipping contracts);
   - Cooperation with other governments (Hamlets and other jurisdictions);
   - Cooperation between government and private sectors.
3. Legislation Implementations:

- Develop and implement policies, based on "polluter-pays" principles. Possible options would include import fees, annual registration fees, and/or tipping fees.

There are other management options available to consider in addition to repatriation. These include permanent disposal in landfills or at sea.

Landfilling of ELVs would require decontaminating, compacting and hauling the materials to landfills. Due to the relatively large volume of this waste type, this option may require the expansion of existing landfills or the construction of new landfill facilities in some communities. Difficult to find site, expensive to construct + maintain.

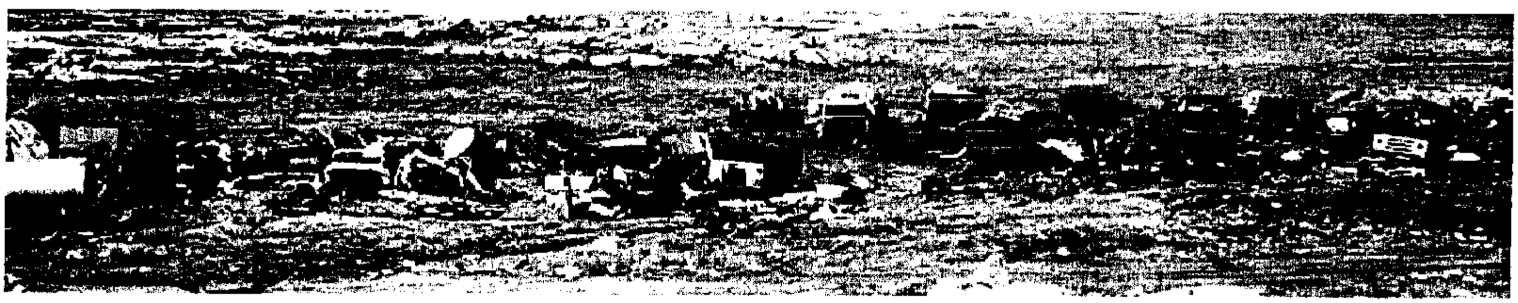
Disposal at sea would divert bulky ELVs from landfill facilities, thus extending the "life" of the landfill sites; this method, however, has very rarely been used in recent years. This is due to a relatively complex application and approval process, the need for site specific studies to support applications, and the extensive preparation and decontamination of materials before deposition in the ocean.

Key recommendations:

- *Implement improved hazardous waste management within the communities to support ELV recycling.*

- *Complete an assessment of current metal management practices and an estimation of available metal types and volumes within individual communities.*

- *Complete a study to identify the preferred ELV repatriation option, including the development and implementation of pilot projects.*



ELV disposal site at Coral Harbour from Emerge Environmental Information Solutions

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1.0 Introduction

The first Government of Nunavut prepared a long-term plan for the development of the territory. This plan envisioned what life in Nunavut will be like in the year 2020. It outlined four major goals to be pursued, guiding principles and specific actions. In **PINASUAQTAVUT: 2004 - 2009** the GN reconfirms its commitment to the four goals:

- Inuuqatigiittiarniq: Healthy Communities
- Pijarnirniqsat Katujjiqatigiittiarnirlu: Simplicity and Unity
- Namminiq Makitajunnarniq: Self- Reliance
- Ilippallianginnarniq: Continuing Learning

In addition to defining these goals, the government outlined specific objectives to be accomplished during the first five years, guided by the principles adopted by the first government, and increasingly by Inuit societal values applied through Inuit Qaujimajatuqangit

The goal INUUQATIGIITTIARNIQ: HEALTHY COMMUNITIES depends on the health of each of its physical, social, economic and cultural communities. Included in the objectives under this goal is "Explore the repatriation of used vehicles" with Departments of Environment (DOE) and Community and Government Services (C&GS), as the responsible departments. DOE has taken the initiative to conduct a study to address the **management options for end-of-life vehicles (ELVs) in Nunavut**, with inputs from Economic Development and Transportation (ED&T) and C&GS. The report focuses on the repatriation of ELVs; however, the discussion is applicable to used vehicles and other recyclable metal.

The report will focus on-road motor vehicles (e.g. cars and trucks) that are removed from service in Nunavut because of either their end-of-life (due to age or accident) or end-of-service (due to lack of mechanics that are able to repair vehicles and/or the availability of replacement parts in communities). Although off-road vehicles have not been directly addressed in this report, discussions presented below could also include this sector (e.g. snowmobiles and ATVs) as well as other recyclable scrap metal. This report, however, will focus primarily on the repatriation options for on-road ELVs.

The objective of this project was to identify:

1. Current management practice of ELVs in Nunavut;
2. Possible options to repatriate used vehicles and ELVs out of Nunavut; and
3. Other management options of ELVs that may be applicable in Nunavut.

This report has been divided into sections corresponding to the above objectives.

1.1 Definitions

For this report, definitions that are applicable to Nunavut have been created. These include:

Used vehicles:	still road-worthy
Whole ELVs:	ELVs that are not flattened and hazardous materials not removed
Green ELVs:	ELVs that are flattened and hazardous materials removed (i.e. waste oil/fluid, battery, and tires)
Ultra - Green ELVs:	ELVs that are flattened and all non-metal materials removed (i.e. waste oil, fluids, battery, and tires, and all plastics)

Areas in the text have been identified where these definitions differ from what is being used in other jurisdictions.

1.2 Background Information

1.2.1 The Auto Recycling Story

Across Canada, automotive recycling plays a necessary and crucial role in the efficient and ecological disposal of inoperative motor vehicles. These operations are sometimes known as auto wreckers and automotive recyclers reuse parts and/or sections of motor vehicles, including domestic and foreign cars, light and heavy-duty trucks, buses and motorcycles. This process consists of dismantling of vehicles for parts resale and separating unused materials for recycling purposes.

The groups involved in vehicle recycling include:

- Auto Recyclers: The primary business is the sale of used auto parts, with materials recovery as a secondary product. Fluid collection and recovery is an integral part of the recycling process of each vehicle;
- Salvage Yard: The primary business is metal recovery for recycling purposes. The sale of used parts from this process is a secondary benefit of the operation. Fluids are recovered from parts when parts are removed for resale;
- Scrap Metal Dealers/Junkyards: The focus of these operations is metal recovery for the purpose of recycling. Fluids are generally not recovered as part of their operation, but are collected for appropriate disposal;
- Car Dealers, Body shops and Tow Trucks: The primary operation of business is the collection of used vehicles for sale as road vehicles, for spare parts or for recycling;
- Other Vehicular Activities: "Backyard mechanics" carry out small vehicular repairs that include both personal and profitable activities. Also included in these activities are auto thieves; the sale of used vehicles and parts.

Vehicles are taken off the road for two reasons: End-of-Life and Insurance write-off as a result of an accident. In the first situation the removal from service is based on the age of the vehicle, and for this reason the parts from older vehicles are substantially less valuable. The second situation usually occurs as a result of an accident; these vehicles may be younger, and parts may be newer making such vehicles more valuable. The above groups are usually more interested in vehicles from the latter situation as these have more reusable components with value.

Automobiles rank at the top for recyclability both in content and rate. By weight, 76% of an average car's content is recycled, and it has the highest recycling rate for a mass produced article (References 2, 4, 6).

Vehicles' recycling is comprised of three features:

- Pre-treatment: Drainage of operating fluids and the removal of hazardous materials;
- Parts Re-use: Dismantling of parts and other re-usable components;
- Recycling of Materials: Preparation of the remaining materials for recycling purposes.

Pre-treatment
Preparation of a vehicle for dismantling is vital to proper recycling. The process includes the drainage of operating fluids such as oil, coolant, refrigerant and fuel, and the removal of the battery and tires. It is critical that the draining and proper collection of fluids is performed to prevent any soil and water contamination.

The average volume of operating fluids in a car is approximately 20-40 litres (References 2, 4), and includes:

» Engine Oil
» Transmission Oil
» Final Drive Oil
» Steering Gear Oil
» Coolant
» Windshield Fluid
» Fuel

Once the fluids and other materials have been removed, they are re-used or disposed of in an environmentally appropriate manner. For example:

- Oils and Greases: Reused by the auto recycler or removed to a licensed recycling facility.
- Coolant, Fuel, Windshield Fluid: Reused by the auto recycler, sold to their customers, or disposed of in a licensed facility.
- CFCs, HCFCs: All air-conditioning systems are evacuated by a licenced technician. The used refrigerant is sold to a licensed buyer for re-use.
- Gas Tanks: Drained, punctured and recycled as re-usable metal.

- Battery: This component is either re-sold to a licensed recycling facility or disposed of in a licensed facility.
- Tires: Good quality tires are sold domestically or exported. The remaining are reused as a fuel source, used as noise and/or energy absorbing components, or disposed of in stockpiles.

Parts Re-use

Depending on their condition and sales potential, parts and components are dismantled, reconditioned as required and sold to customers. These parts could include whole or partial front and rear ends, internal accessories (e.g. seats, panels, dashboards, audio systems, gauges), body panels, engine components, transmission, wheels, and glass.

Typically, an auto recycler produces a computer-generated information sheet for each vehicle as it comes into the yard. This ranges from a site specific tracking system to "off-the-shelf" computer programs and web-based linkages. These sheets with all parts on a vehicle, complete with all possible options allowing for a very precise inventory description and inventory control. Each vehicle is given a stock number, and all parts from a particular vehicle utilize that same stock number together with the part number. This allows the computer to track sales by make, model and year of each vehicle.

Used auto parts play a significant role in keeping the cost of repairs down --not only for consumers but also for insurance companies. On average, a used part is approximately 50% cheaper (Reference 2, 5) than a new part of like kind and quality (LKQ), so when parts are available and utilized, the cost of repairs and therefore the cost of insurance is kept to a minimum. Some parts that cannot be re-used are collected and sold for refurbishing and re-use. These include engines, engine components, transmissions, radiators, catalytic converters, electrical components, front- and rear-end and suspension. In the United States, it is estimated that by utilizing used parts, the auto recycling industry saves an estimated 85 million barrels of oil that would otherwise be used in the manufacture of new replacement parts (Reference 2).

1.2.2 Recycling of Materials

Once all fluids have been drained, and parts have been removed, the automotive recycler employs the services of an automobile crusher to compact the vehicle hulk to minimize space. These flattened hulks are shipped to shredders which pulverize the ELV into fist-sized pieces in minutes. The valuable ferrous and non-ferrous metal and other components are separated magnetically with the use of complex flotation systems. The non-metallic components (rubber, plastics, fabric, dirt, foam and glass) are called Auto Shredder Residue (ASR) or fluff. These materials are generally landfilled in many parts of North America, in some jurisdictions as hazardous material. In Europe, ASR is labeled as hazardous materials and incinerated (Reference 6). In general, 225 kg of non-recyclable materials are produced per car.

Average Vehicle Makeup (Reference 2, 6):

- Ferrous metal: Sheet steel, steel and cast iron = 70%
- Non-ferrous metal: Aluminum, copper and zinc = 6%
- Total Recycled Materials: = 76%
- ASR (Non-Recycled): = 24%

1.3 Benefits and Challenges to ELV Recycling in Nunavut

In determining the options for managing ELVs it is important to understand what an ELV is worth when it is removed from the road. In general, an ELV value can be stated as the difference between the possible income (from selling the used parts and the scrap metal) and the costs associated with recovering the value. This is generally stated as:

ELV value is:

Used Part Sales + Metal Recovery

Minus

Towing + Fluid Recovery + Tire Removal + Crushing + Overhead + Shipping

Generally, in other jurisdictions within Canada vehicles delivered to either a used-car dealer or to an auto recycler have a positive value; that is the potential income generated will be more than the anticipated costs. For Nunavut, the key considerations to determine the ELV value will be driven by the scrap metal price which is presently relatively low when compared to the high shipping costs and the high capital and operating costs for baling/shredding equipment.

The following sections summarize the possible benefits and challenges to ELV recycling in Nunavut. Key considerations presented in the above equation are addressed.

1.3.1 Types of Recyclable Metal Materials

Types of recyclable metal materials that may be available in Nunavut communities include:

- Heating oil steel tanks
- Scrap metal (building material, steel rods, pipes, etc), and water and sewage tanks
- Household appliances ("white goods")
- Used cars, trucks, heavy equipment, snowmobiles and ATVs
- Wood
- Tires
- Barrels (205 litres)
- Toilets and bathtubs
- Construction, renovation and demolition materials
- Large steel tanks

Although this list may seem extensive, it is not feasible to recycle all the above materials due to associated transportation and transformation costs. Because of size, environmental factors and resale value, the focus of recycling efforts should be on the recycling of used vehicles, scrap metal, barrels, steel tanks, and household appliances. Most of the other items listed above have poor, to no resale, value and would require substantial transportation/transformation (i.e. associated costs) to increase their values. However, some wastes listed above (e.g. wood and demolition wastes) may have potential local re-use values within communities.

The average market value of various types of metal is presented in Table 1 to illustrate the potential worth of ELVs and other recyclable metal. These prices can vary significantly from one month to the next because of changing market demand. In general, non-ferrous metal are much more valuable than ferrous metal.

Table 1: Market Value of Various Types of Metal

TYPE OF SCRAP METAL		AVERAGE PRICE * (CAD$)
Non-ferrous metal:	Old mixed Aluminum (e.g. aluminum cans)	$0.40/lb or $800/ton
	Scrap Copper	$1.85/lb or $3,700/ton
	Mixed Brass & Bronze	$1.16/lb or 2,320/ton
Ferrous Metal:		
	Motor blocks	$250/ton
	Whole ELVs/white goods	$100/ton**
	Green ELVs/white goods	$110/ton
	Ultra Green ELVs	$150/ton

Notes:
*based on personal communication with the industry (Reference 13 and 31), and Recycling Index at www.recyclexchange.com/exchange/index.html, December 2005 (reference 7) converting USD to CAD assuming exchange rate of 0.8
** recent quotes have indicated that whole ELVs (with fluids, tires, batteries) have a value of $100 per ton near Montreal including pick-up service at a port in Ste-Catherine near Montreal. (Reference 13 and 31).

Mixed green scrap metal (ELVs and white goods with hazardous material and tires removed) currently have a value of $110 CDN/ton within the Canadian market (Reference 18 and 19), and whole ELVs (with fluids, tires, batteries not removed) have a value of $100 per ton in Montreal (including the pick-up service at a port) quoted by Globe Metal (Reference 13 and 31).

1.3.2 Nunavut Communities and Recyclable Metal Management

Until recently, landfill management included the separation of wastes and open burning in an informal manner. This led to management through separation in different areas of the facilities; one for all scrap metal, large appliances, barrels, and used vehicles, and another is for used batteries and tires.

Landfill management has improved through the development and implementation of more formal plans. Separation and segregation are occurring within some municipal landfills; however, without other management options these landfills are quickly reaching their storage capacity. Recycling will provide an opportunity to extend the life of landfill facilities and reduce the accumulation of hazardous materials. It also provides additional economic opportunities and local job creation.

Nunavut communities are geographically isolated, and there are no vehicle recyclers currently in the territory. There are, however, individual case-by-case sources of used parts and used vehicles stored within communities (e.g. mechanics shops and auto dealerships).

Most of the metal in communities is centralized at landfill sites with some dispersed throughout the communities. Generally, the recyclable metal is not segregated. Iqaluit, however, currently separates the metal into two piles: ELVs and household appliances.

There is no detailed inventory on the types and quantities of recyclable metal within Nunavut's municipal landfills and communities. A 2002 waste audit for Iqaluit estimated the annual metal (ferrous and non-ferrous) waste was 257 tons per year (reference 11). A Kativik Regional Government Study (reference 19) indicates that without a detailed inventory or pilot projects, there is approximately 350kg to 2000kg of recyclable metal (mainly scrap metal) per person that is available in Northern Quebec. Based on this information, the potential scrap metal accumulation within Nunavut communities is presented in Table 2. Where available, estimates of metal quantities from individual studies and inventories completed in a limited number of communities are also presented in Table 2.

Table 2: Estimated Recyclable Metal Quantity in Nunavut

Region	Community	Population[1]	Scrap Quantity (tons) based on population		Scrap Quantity (tons) based on site inventory*
			Minimum	Maximum	
Baffin	Arctic Bay	730	281	1,606	
	Cape Dorset	1,210	466	2,662	880tons or 8,000 cubic meters[2]
	Clyde River	810	312	1,782	
	Grise Fiord	145	56	319	
	Hall Beach	635	244	1,397	
	Igloolik	1,380	531	3,036	
	Iqaluit	6,000	2,310	13,200	

Table 2 (continued): Estimated Recyclable Metal Quantity in Nunavut

Region	Community	Population[1]	Scrap Quantity (tons) based on population		Scrap Quantity (tons) based on site inventory*
			Minimum	Maximum	
Baffin (continued)	Kimmirut	450	173	990	
	Pangnirtung	1,510	581	3,322	
	Pond Inlet	1,310	504	2,882	
	Qikiqtarjuaq	520	200	1,144	
	Resolute	215	83	473	
	Sanikiluaq	720	277	1,584	
Kivalliq	Arviat	1,700	655	3,740	
	Baker Lake	1,470	566	3,234	
	Chesterfield Inlet	370	142	814	
	Coral Harbour	760	293	1,672	500[3]
	Rankin Inlet	2,280	878	5,016	700[3]
	Repulse Bay	615	237	1,353	
	Whale Cove	310	119	682	
Kitikmeot	Cambridge Bay	1,420	547	3,124	
	Gjoa Haven	985	379	2,167	
	Kugluktuk	1,350	520	2,970	
	Pelly Bay	580	223	1,276	
	Taloyoak	800	308	1,760	
	Umingmaktok/ Bathurst Inlet	35	13	77	
Total		28,310	10,899	62,282	

Notes:

1. From Statistics Canada 2001 Census
2. The figure is based on "Cape Dorset Solid Waste Improvement Study", and is prepared for C&GS, GN, by Dillon Consulting Ltd., October 2003 (reference 16)
3. The figure is obtained from "Scrap Metal Recycling in Remote Northern Communities: a Pilot Project Implementation Plan." For the Government of Manitoba and the Government of Nunavut prepared by Earthbound Environmental Inc., January 2003 (reference 17). Rankin was originally estimated at 800 tons, but for the past two years, about 100 tons was repatriated.

Given the broad range of potential recyclable metal presented in Table 2, individual communities would need further studies to accurately confirm available metal volume and type. This would be best accomplished through pilot projects in order to inventory current metal management practices and to estimate available metal types and volumes.

> *It is recommended that an inventory be completed that would outline current metal management, and would estimate available metal types and volumes within individual communities.*

It is also important to consider options for future scrap metal recycling. The estimates presented in Table 2 represent scrap metal currently available for recycling. Communities, however, will continue to accumulate metal wastes contributing further to existing metal quantities within their boundaries. For example, road motor vehicle registration has been increasing since Nunavut's creation in 1999, and with time there will be increasing number of scrap cars/vehicles in the communities. Anecdotal information (Reference 10) suggests that the three larger communities (Cambridge Bay, Rankin Inlet and Iqaluit) have the highest annual rates.

Table 3: Vehicle Registrations in Nunavut*

YEAR	1999	2000	2001	2002	2003	2004	2005**
Total, vehicle registrations	3,948	3,932	4,626	4,542	4,427	4,290	5,184
Total, road motor vehicle registrations	2,501	2,735	3,075	3,258	3,307	3,329	
Vehicles weighing less than 4,500 kilograms	2,105	2,326	2,645	2,793	2,874	2,927	
Vehicles weighing 4,500 kilograms to 14,999 kilograms	262	251	251	271	240	213	
Vehicles weighing 15,000 kilograms or more	101	121	129	142	135	130	
Buses	11	15	15	15	14	14	
Motorcycles and mopeds	22	23	33	35	41	44	
Trailers	70	74	102	81	71	75	
Off-road, construction, farm vehicles	1,378	1,123	1,450	1,202	1,049	885	

*source Statistics Canada (Reference 8)
** division of total vehicle registrations is unavailable at the time of this report (Reference 10).

1.3.3 Shipping Costs

There are two types of sealift vessels that service the Canadian Arctic: cargo (motor) vessels and tug-barges. Cargo vessels are typically better equipped for ice-crushing and have barges for off-loading/loading. Tug-barges are not as ideal for traveling through ice, particularly in the east and, therefore, the shipping time frame for tug-barges in the High Arctic is shorter than the motor vessels. Currently, the GN has contracts with only cargo (motor) vessels (current contracts expire on March 31, 2006).

The shipping routes are separated into 5 regions: **southern Baffin** (Iqaluit, Cape Dorset, Kimmurut and Pangnirtung), **High Arctic** (Qikiqtarjuaq, Clyde River, Pond Inlet, Nanisivik, Pelly Bay, Arctic Bay, Grise Fjord and Resolute Bay) , **Foxe Basin** (Repulse Bay, Igloolik and Hall Beach), **Kivalliq** (Sanikiluaq, Arviat, Whale Cove, Rankin Inlet, Chesterfield Inlet, Baker Lake and Coral Harbour)and **western Arctic** (Taloyoak, Gjoa Haven, Cambridge Bay, Bathurst Inlet and Kuglutuk). Note that Kugaaruk (Pelly Bay) is serviced via Nanisivik.

Nunavut Eastern Arctic Shipping (NEAS) and Nunavut Sealift and Supply Inc (NSSI) currently have contracts with GN, and they service southern Baffin, High Arctic, Kivalliq and Foxe Basin via motor vessels. Desgagnes Transarctik Inc. which owns part of NSSI, operates tug-barges. The traveling route of these 3 companies is to Montreal along the Labrador coast and St Lawrence River.

The western Arctic is serviced by Northern Transportation Company Ltd. (NTCL), via tug barges that ship to Hay River, NWT which is accessible by road to either Red Deer or Edmonton. The Kivalliq Region is serviced by Kivalliq Marine, via barges that ship to Churchill, Manitoba. Access out of Churchill includes rail (Churchill to Selkirk) or rail/truck service via Gardewine (rail from Churchill to Thompson, then switch to trucks to Selkirk). Note that NTCL and Kivalliq Marine do not currently have standing offer agreements/contracts with the GN.

The sailing time period for all regions is from July to September with a few exceptions. Communities south of Pangnirtung, sailing time can be extended to October, and communities in the High Arctic have a shorter sailing time period from August to September.

Shipping costs depend on the type of vessel, route and cargo. Section 3.0 and Appendix A to C present hypothetical calculations to reflect the differences in shipping costs attributed to vessel type, route and cargo.

1.3.4 Other Considerations that Affect ELV Value in Nunavut

Community Infrastructure

All communities have road access from landfills to the shore that would be suitable for heavy machinery operation, which would aid ELV and machinery transportation. The distance between landfill and shore in most of the communities is relatively close, ranging from 1 to 4 km. There are a few exceptions (e.g. Coral Harbour which is 6.5km).

The majority of the communities do not have appropriate docks and docking facilities for loading and unloading (except for communities in Kivalliq region), loading and unloading are operated on the beach. In Rankin Inlet, the community has a barge port (not a deep-water port) whereas Coral Harbour has a causeway where barges can dock.

Of particular note with respect to community infrastructure is the limited capabilities in regard to hazardous waste management as part of the overall waste management activities. It has already been noted that preparation of a vehicle for dismantling is vital to proper recycling. This includes the drainage of operating fluids such as oil, coolant, refrigerant and fuel, the separation of hazardous substances (e.g. mercury switches) and the removal of the gas tank, battery and tires. It is critical that the draining and proper collection of fluids is performed to prevent any contamination of the surrounding environment. Currently, Iqaluit and Rankin Inlet are the only two communities that are removing hazardous materials from ELVs.

It is recommended that improved hazardous waste management within the communities be implemented to support ELV recycling.

Human and Financial Resources

One challenge that faces every community in Nunavut is finding and retaining trained staff in waste management, including hazardous waste management. Although efforts have been undertaken by the GN and communities to train staff, development and implementation of proper waste management plans is a challenge for many communities due to funding limitations.

Currently Iqaluit is the only tax-based community: the rest of the communities are not contributing towards taxation regimes such as property and municipal taxes. As a result, many hamlets are struggling with costs that are necessary for maintaining and improving community infrastructure and facilities. Hamlets increasingly rely on the territorial and federal governments for funding. Coral Harbour for example intended to participate in the repatriation of ELVs and other recyclable metal in the Kivalliq Pilot Project, but due to lack of funding and the transportation requirements (long distance) from the dump to shore, the Hamlet decided not to participate in 2004. *

Recycling ELVs and scrap metal also involves the purchase and operation of transformation equipment (e.g. shredders and balers). This equipment will represent a significant capital investment for any community and will require trained staff to operate and maintain. Together with necessary equipment and trained staff it will be essential to have a large fenced space and enclosed heated buildings within the community for the purpose of housing, maintaining and operating the equipment, storage of ELVs and preparing the various materials for shipping. *

It is recommended that recycling projects be supported through financial and training opportunities at the community level.

1.4 Summary of the Potential to Recycling Metal Material in Nunavut

Nunavut communities are small in population, distributed over a large area, and connected only by air all year and by sea during the 3-4 month ice free period.

Key barriers to recycling scrap metal in Nunavut include:

- High transportation costs to ship materials to end-markets and the relatively low value of most scrap metal
- High costs of purchasing and shipping baling equipment
- High costs to operate crushing, shredding and baling equipment
- Lack of trained personnel to operate these specialized equipment
- Lack of sound waste management practices in some communities
- Recycling has traditionally been a low priority for many people and communities

*

It is recommended that improved hazardous waste management within the communities be implemented to support ELV recycling.

Human and Financial Resources

One challenge that faces every community in Nunavut is finding and retaining trained staff in waste management, including hazardous waste management. Although efforts have been undertaken by the GN and communities to train staff, development and implementation of proper waste management plans is a challenge for many communities due to funding limitations.

Currently Iqaluit is the only tax-based community: the rest of the communities are not contributing towards taxation regimes such as property and municipal taxes. As a result, many hamlets are struggling with costs that are necessary for maintaining and improving community infrastructure and facilities. Hamlets increasingly rely on the territorial and federal governments for funding. Coral Harbour for example intended to participate in the repatriation of ELVs and other recyclable metal in the Kivalliq Pilot Project, but due to lack of funding and the transportation requirements (long distance) from the dump to shore, the Hamlet decided not to participate in 2004.

Recycling ELVs and scrap metal also involves the purchase and operation of transformation equipment (e.g. shredders and balers). This equipment will represent a significant capital investment for any community and will require trained staff to operate and maintain. Together with necessary equipment and trained staff it will be essential to have a large fenced space and enclosed heated buildings within the community for the purpose of housing, maintaining and operating the equipment, storage of ELVs and preparing the various materials for shipping.

It is recommended that recycling projects be supported through financial and training opportunities at the community level.

1.4 Summary of the Potential to Recycling Metal Material in Nunavut

Nunavut communities are small in population, distributed over a large area, and connected only by air all year and by sea during the 3-4 month ice free period.

Key barriers to recycling scrap metal in Nunavut include:

- High transportation costs to ship materials to end-markets and the relatively low value of most scrap metal
- High costs of purchasing and shipping baling equipment
- High costs to operate crushing, shredding and baling equipment
- Lack of trained personnel to operate these specialized equipment
- Lack of sound waste management practices in some communities
- Recycling has traditionally been a low priority for many people and communities

Key factors contributing to making recycling more viable include:

- Increasing concern about the state of local environment
- Increasing awareness and education regarding the effects of hazardous and non-hazardous wastes in the community and surrounding environment
- Commitment towards improving waste management practices by all levels of government
- Government ensuring adequate human resources and training
- Commitment of financial resources to support recycling activities
- Possibility of extending the "life" of landfill sites

2.0 Regulatory Framework

In general, there are no regulatory or policy tools in the Government of Nunavut that address recycling. Recycling, however, has a role in solid waste management and the following presents a brief discussion of the regulatory framework that applies to Nunavut.

Under the Nunavut Land Claim Agreement, Article 14 defines what municipal lands are, who owns them and how they are to be managed. It is under this Agreement that the municipal corporations have responsibility in the ownership and management of lands within municipal boundaries. This includes solid waste management collection and the management of landfill facilities. In Nunavut, there are 25 communities each having its own landfill facility.

For the most part, the details of solid waste management are left to the discretion of the communities with the dependence on a permitting process that allows activities to be fully considered before permit approval and the enforcement of existing terms and conditions of the individual licences. New facilities, or expansion of existing facilities, undergo an environmental assessment under the Nunavut Impact Review Board (NIRB) and permitting through the Nunavut Water Board (NWB). In general, these permits/licences are issued after a proposal is submitted and undergoes a review by stakeholders and public hearings. Currently, there are 22 NWB water licences (Class "B" licences) issued to Nunavut communities; those without licences at present include Iqaluit and Baker Lake.

Any water use, or deposit of waste into water, requires a water licence issued by the Nunavut Water Board (NWB) under the *Nunavut Waters & Nunavut Surface Rights Tribunal Act*. Solid waste management is a component of any application to the NWB and undergoes a review process. To aid in developing these management plans, as required by the NWB, guidelines are available to proponents. Kent, Marshall and Hawke (2003) is the updated version of the Heike and Wong (1992) "Guidelines for the Planning, Design, Operation and Maintenance of Solid Waste Sites" (References 14, 15). These guidelines incorporate segregation of waste streams (e.g. household, metal and wood) and appropriate hazardous material handling and disposal. Although written for the NWT, these guidelines have proven applicable to Nunavut as well.

Solid waste management within the communities has an associated level of regulatory compliance required to protect human health and environment quality. For this reason, inspection and enforcement can fall to different departments within various levels of government. For example, Indian and Northern Affairs (INAC) are responsible for inspection and enforcement of water licences issued by the NWB. The Government of Nunavut, Department of Environment (GN-DOE) has a responsibility under the *Nunavut Environmental Protection Act* to monitor landfill management and ensure environmental protection. To ensure compliance with this Act, the GN-DOE has developed 14 guideline documents to assist principally with hazardous material management and spills response. The Government of Nunavut, Department of Health and Social Services, also has a role in inspecting landfill management practice since protecting human health is a key consideration in landfill operation and scavenging by residents is a common practice.

Reg Staff

Development of a repatriation of ELVs program would involve input from different levels of government due to various regulatory requirements. However, implementation of the ELV repatriation would be operated by the community and/or GN. Once operational, mandate and legislation infers that the GN-DOE role would remain regulatory (i.e. inspecting and ensuring compliance with legislation and licences) and the lead department(s) to assist in the implementation would be GN-C&GS and/or GN-ED&T.

In considering recycling of scrap metal and repatriation of ELVs, the organizations and departments listed above would play key roles in any development and implementation of the program. Other departments/agencies may also have a role in protecting human health and environmental quality depending on the scope and project details (e.g. Fisheries and Oceans, Transport Canada, and Environment, Nunavut Tunngavik Inc and Regional Inuit Organizations).

> *It is recommended that the responsible GN department(s) complete appropriate consultations and develop applicable policies to address both scrap metal and the repatriation of ELVs*

2.1 Policy Considerations

Current policies for sea transport include contracts with limited number of service providers to certain regions of Nunavut. Although this may guarantee costs and services, it may limit shipping options in recycling projects.

Could Dorset is going charter?

The government needs to take recycling into consideration in its negotiations with shipping companies because current back-haul shipping rate (65% of regular north-bound rate; Reference 13) is too costly to repatriate ELVs and other recyclable metal. For example, a longer term shipping contract or more shipping routes can be given to a shipping company in exchange of free back-haul shipping of recyclable metal. Another possibility is that the GN could offer shipping companies free recyclable metal in exchange for free shipping.

The current shipping contracts expire in March 2006, and it is recommended that negotiations for new contracts should consider the needs for recycling/ repatriation and the disposal of associated hazardous wastes.

3.0 Vehicle Repatriation Options

3.1 Repatriation Options

Markets for ELVs are the most critical factor in the success of any recycling program. The markets—all end users of recyclable materials—to which recyclable materials are sold for revenue are critically important as they specify types, quantities, and quality of materials that will be purchased. These requirements fundamentally influence processing, collection, and all aspects of a recycling program's operation.

A second factor that affects the success of a recycling program is the consistent quality and quantity of material. Whereas a waste manager who is a service provider, with a responsibility to collect waste and keep citizens satisfied with the service, a recycling manager must also provide quality feed-stock to an industrial process, and ensure clean and consistent volumes of useable materials.

In identifying vehicle repatriation options key criteria focused on 1. changing responsibilities within the public and private sectors and 2. selected end markets These options are described as:

Option A: recyclable material is hauled directly to a consumer (i.e. steel mill) where it is used in industrial process;

Option B: recyclable material is hauled to an intermediary (i.e. a broker or dealer) who processes it to a specification and hauls it to a mill;

Option C: have an intermediary pick up recyclable materials, and process and ship the materials to a mill; and

Option D: adopt a regional approach with private businesses decontaminating and storing materials to feed into a larger regional processing centre that process materials and haul them to the market.

Due to the limited development of a private industry for recycling in Nunavut and current Government mandates, option A and D are not feasible at this time. They may become more feasible as waste management expands to include recycling, and the private sector develops sufficiently to support recycling activities. For this reason, Option D is included in the following discussion as it represents the current situation in other Canadian jurisdictions.

Further discussion in this section will address the possible options to repatriate ELVs and are referred to as the following:

Option 1 - Government Preparation and Repatriation
Option 2 - Government Preparation and Private Repatriation
Option 3 - Private Preparation and Repatriation

Under each of these options there exists various methods of implementation that would repatriate ELVs, however, only those implementation approaches that are currently feasible in Nunavut are discussed in the following. Each option is examined by presenting a brief description, partners, benefits, and disadvantages. Costs are presented as a first order estimate under each option. <u>It is important to note that these discussions about costs are not to be considered as a feasibility level review of the options.</u> These first order estimates are provided to indicate the range of investment dollars to implement the repatriation option.

It should also be noted that although the focus of this report is the repatriation of ELVs, any actions implemented should also include other recyclable scrap metal. This is because it would be impractical and uneconomical to repatriate ELVs alone.

3.2 Option 1: Government Preparation and Repatriation

The premise of this option is that the GN will ensure that the ELVs are properly collected and prepared for recycling and shipped to southern based markets (dealers/brokers). In this case, preparation could range from shipping whole vehicles without hazardous material removed and no shredding/crushing to shipping "green" vehicles with hazardous material removed and volume reduction measures (flattening/crushing/baling).

Under this option any implementation methods will require the individual communities to be involved. They are responsible for waste management in the communities and are the key to ensure the proper separation, preparation and management of ELVs.

Once the ELVs are separated and prepared, shipping methods can vary. It is feasible at this time for the GN to consider:

<u>Option 1a:</u> Government Repatriation via Barge Charter
<u>Option 1b</u>: Government Repatriation via Back-Haul

There are several similarities between these two options. The key similarity is that the GN, most likely through C&GS, would need to invest in the communities to implement appropriate waste management activities, and trained staff, to support ELV separation and preparation at the community level. Their role would also support contract needs to ship ELVs to external markets and represent the GN in these contracts and payment. The role of ED&T would be limited, and DOE would act as a regulator inspecting and enforcing any terms and conditions of permits/licences.

There is also an opportunity for the GN to work with other jurisdictions implementing similar recycling programs. This would principally be to reduce shipping costs by combining available metal, and reduce costs of equipment purchase by sharing of equipment. It would also be advantageous to run co-operative shipping programs with Northern Quebec, Northern Manitoba and NWT. Such partnerships may be established through Memoranda of Understanding, and/or Agreements that could be negotiated by GN's Department of Executive and Intergovernmental Affairs (EIA) with other jurisdictions.

Furthermore, in implementing the repatriation under this option there may be a benefit to establish regional metal management centres. In this case, the hamlets would prepare the ELVs, and then these would be shipped, by the GN, to a GN managed regional storage area. The GN would then deliver them to southern based dealers/brokers from this centre. However, it does affect shipping costs as it requires movement from the community to the regional centre.

The benefits of this option, regardless of implementation methods, include improved waste management within the community not only of metal wastes, but of hazardous material as well. The removal of the scrap metal will result in the local environmental clean-up and may extend the life of the existing landfill by reducing disposal of metal within these facilities. There may also be employment and training opportunities within communities to address metal recycling and hazardous waste management.

The main disadvantage to this option is that currently very few communities have the necessary facilities and trained staff to properly prepare and store ELVs and scrap metal for recycling. Associated with this, is that higher priority issues within communities has resulted in recycling being a low priority for many.

The second main disadvantage to any implementation method under this option is costs. There would need to be both a financial and human resource commitment to improve waste management to ensure that the appropriate requirements are developed and implemented. Costs to ship under these two options may differ and is presented under each section in the following.

3.2.1 Option 1a: Government Repatriation via Barge Charter

Method: Repatriation of ELVs by tug-barge would be justified when there is sufficient scrap metal accumulated in one or more communities. This could be coordinated with metal prices such as when they are sufficiently high in order to maximize potential income. To maximize volume of metal to be shipped it would be beneficial to include several communities for collection and have compacted, green ELVs available for shipping. ELVs and other scrap metal are then shipped via a tug-barge and can be sold to scrap brokers/dealers at either the dock in eastern Canada or at a scrap centre in central or western Canada from which it is transported by road and/or rail to end-markets for re-use.

Under this option all ELVs, white goods and other recyclable metal to be shipped will require removal of all hazardous materials and compacted to maximize the shipping load. It will also require a secured location within the community to store the prepared ELVs until a sufficient quantity has accumulated.

Benefits: In addition to those benefits noted above under this general option, the most significant benefit is the flexibility of shipping - both schedule and availability. Costs are also affected by the possibility of increasing volume of material to ship when compared to the potential capacity of cargo back-hauls.

Communities in Nunavut are currently familiar with tug-barge service because of annual re-supply activities. For this reason, developing and implementing an ELV repatriation can incorporate familiar shipping procedures and routes.

Disadvantages/Challenges: In addition to those disadvantages listed above under this option, the largest disadvantage of this implementation approach is the capital and operating costs of volume reduction (e.g. shredders, balers) equipment. Tied to this is the lack of trained personnel to maintain and operate the equipment.

Cost: In order to overcome the barrier of high transportation costs to ship material to end-markets and relatively low value of most scrap metal, this implementation option allows for a maximum quantity of material to be shipped at one time, thus reducing the shipping costs per ton.

3.2.2 Option 1b: Government Repatriation via Back-Haul

Methods: Repatriation of ELVs by cargo ship during back-haul shipping would also be justified when there is sufficient scrap metal accumulated in one or more communities, and when metal prices are sufficiently high to maximize potential income. In this implementation option, however, the ELVs could be prepared in two manners for shipping. The first would require collection of "green" ELVs hauled in containers and the second would require collection of "whole" ELVs. The recyclable material is then sold to scrap brokers/dealers at either the dock in eastern Canada or at a scrap centre in central or western Canada from which it is transported by road and/or rail to end-markets for re-use.

Benefits: The benefits of this implementation option are those noted above under this general option.

Communities in Nunavut are currently familiar with cargo service because of annual re-supply activities. For this reason, developing and implementing an ELV repatriation can incorporate familiar shipping procedures and routes.

Disadvantages/Challenges: In addition to those disadvantages listed above under this option, the largest disadvantage of this implementation approach is the capital and operating costs of volume reduction (e.g. shredders, balers) equipment and containers.

Tied to this is the lack of trained personnel to maintain and operate the volume reduction equipment.

These challenges may be overcome by shipping whole ELVs (no removal of hazardous material and tires) and not reducing volumes, however, this will minimize the volume of material that can be shipped and reduce the value of the ELV.

Cost: In order to overcome the barrier of high costs of purchasing and shipping baling equipment, high costs to operate crushing, shredding and baling equipment, and lack of trained personnel to operate these specialized equipment, shipping whole ELVs could be an option. In addition, there will be limited costs associated with the removal of hazardous wastes from ELVs. Furthermore, the value of whole ELVs is about the same as the green ELVs, which is worth about $100/ton (including pick-up service at a Montreal port). However, this would potentially be at a higher expense as the shipping rate would be based on a per-car basis (e.g. $1500/vehicle) rather than by weight unless the back-haul rate of whole ELVs can be re-negotiated.

If green ELVs are placed in containers and shipped, the cost would vary depending on the negotiated back-haul rate. For a large-scaled repatriation such as the one proposed in Nunavik, a feasibility study considered four scenarios based on a range in the quantity of recyclable metal and hazardous material to be included. The range was determined based on desktop estimates of available scrap metal to visual estimates from specific communities and extrapolating determined quantities to communities not visited. This study considered a range of material to be repatriated of 3,700 to 27,000 tons, estimated to cost $5.55 to $9.95 million dollars in a 10-year plan. The corresponding cost per ton range is $1,500 to $370. This range in cost is mainly due to the variation in total metal quantity repatriated; that is, the more the metal recycled, the less the cost per ton. The cost also includes the capital purchase of volume reduction equipment (about $1,000,000 including the purchase of a baler, loader, and associated equipment needs) and hazardous waste management. For a smaller scaled repatriation (i.e. repatriate 3 major communities in Nunavut), the cost per ton is approximately $1,000. See details in Appendix B.

3.3 Option 2: Government Preparation and Private Repatriation

The premise of this option is that the GN will ensure that the ELVs are properly prepared for recycling, and the recycler takes delivery/ownership of the material at the landfill facility. In this case, the recycler is then responsible for shipping ELVs out of Nunavut to end-markets. However, the recyclers can also be involved in processing ELVs depending on negotiation between both sides.

Under this option any implementation method will require the individual communities to be involved. Community governments are responsible for waste management in the communities and are the key to ensure proper separation, preparation and management of ELVs.

Once the ELVs are separated and prepared, marketing to a broker/dealer can vary. It is feasible at this time for the GN to consider:

Option 2a: Southern Business Repatriation with Government Assistance

Option 2b: Nunavut Business Repatriation with Government Assistance

There are several similarities between these two options. The key similarity is that the GN, most likely through C&GS, would need to invest in the communities to implement appropriate waste management activities, to train staff, and to support ELV separation and preparation at the community level. Their role would also be to support marketing and contract needs to sell the ELVs. It is anticipated, however, that any income generated from the sale of ELVs under this scenario would be paid to the community. This income could assist with on-going recycling efforts. The role of ED&T would be to providing funding and training opportunities to the private sector to support the development of recycling companies. DOE would carry out a regulatory role, inspecting and enforcing any terms and conditions of permits/licences and administering the EPA.

In implementing repatriation ~~under this option there may be a benefit to establish~~ regional metal management centres. In this case, the hamlets would prepare the ELVs, and then they would be shipped, by the GN, to regionally-based storage areas. The dealer/broker would then take possession of the ELVs at the regional centres. This does affect shipping costs, however, as it requires movement from the community to the regional centres.

The benefits of this option, regardless of implementation methods, include the fact that the government would not be a sole responsible party. In addition, there would be improved waste management within the community not only of metal wastes, but of hazardous materials as well. The removal of the scrap metal will result in the local environmental clean-up and may extend the life of the existing landfill by reducing the disposal of metal within these facilities. There may also be employment and training opportunities within communities to address metal recycling and hazardous waste management within individual communities and within possible regional storage centres.

The main disadvantage to this option is that currently very few communities have the necessary facilities and trained staff to properly prepare and store ELVs and scrap metal wastes for recycling. Associated with this, is that higher priority issues within communities has resulted in recycling being a low priority for many.

The second main disadvantage to this option is costs. There would need to have both financial and human resource commitments to improve waste management to ensure that the appropriate requirements are developed and implemented. Additional costs may also be realized in either the expansion of existing facilities or creating new facilities to be the regional storage centres. As discussed previously, this would involve developing a project description and permitting/licensing through the NIRB and NWB process in addition to any negotiations with landowners, community members, the government, and Inuit Organizations.

3.2.1 Option 2a: Southern Business Repatriation with Government Assistance

Method: Under this implementation approach the GN and Hamlet would be responsible for the collection, segregation, and the storage of the ELVs and the removal of hazardous wastes (if required for transportation and/or market). The dealers/brokers would take possession of the ELVs in the community, prepare for shipping and arrange shipment from the community to end-market. Preparation for shipping would be determined by the purchaser, however, it is anticipated that it would include removal of hazardous material that would be handled, transported and disposed according to the hamlet waste management activities. However, if the shipping companies were the recyclers, it may be advantageous to back-haul whole instead of green ELVs to a Montreal port as a scrap yard can buy the materials at a good price ($100/ton) on dock.

There are a variety of southern-based private companies that could be approached regarding repatriation of ELVs. These include:

- Broker/dealer purchases material and removes from the community.
- Provide free access for broker/dealer to whole and/or green ELVs. These would principally be broker/dealers with access to their own tug-barges.
- Current shipping companies that service Nunavut communities may have an interest in expanding their service to include recycling investment. This would occur as part of their back-haul trips which would include the removal of available ELVs and scrap metal as they leave Nunavut.

There are various other existing and potential private sectors that could be approached to consider repatriation of ELVs from Nunavut. Scrap metal dealers such as Newco Metal (see Case Studies section), Humbert Metal (see Appendix C for its repatriation proposal) and Eco-Centre Arthur-Gagnon have shown an interest in recycling in Nunavut. Key considerations that would make this more feasible to the private sector consist of including other recyclable metal and white goods with ELVs, having sufficient metal quantity available, and hoping that scrap metal prices justify repatriation.

Benefits: In addition to the environmental and training benefits noted above under the general discussion of this option, the key benefit to this implementation method is that the GN and Hamlet administration would not be responsible for shipping and for ELV preparation activities. This scenario has proven successful in Happy Valley-Goose Bay where a scrap dealer is invited to process and ship the metal free of charge in exchange of free scrap metal (see Case Studies section).

Disadvantages/Challenges: In addition to those disadvantages listed above under this option, a key disadvantage is the reliance on private sector to repatriate the ELVs. Their interest in these activities would be difficult if shipping costs exceed potential income from scrap metal sales. To engage southern-based industry may require the GN to consider either direct subsidy programs to help support shipping costs, or indirect subsidy programs (e.g. provide "free" metal to interested parties such as brokers/dealers or shipping companies).

Cost: Under this implementation, cost to the GN would be determined by the negotiated terms with the dealer/broker. Often the level of preparation for the ELVs is dictated by the dealer/broker requirements (e.g. removal of hazardous material, volume reduction) and shipping needs.

This option overcomes many of the barriers to recycling scrap metal in Nunavut. The GN would avoid the high transportation costs to ship material to end-markets and potentially the high costs of purchasing and shipping baling equipment and their associated operating costs. This scenario also allows for the use of an existing private sector that has the necessary trained personnel and infrastructure. The costs to engage the private firms in the short term, however, may include direct and indirect subsidies.

3.2.2 Option 2b: Nunavut Business Repatriation with Government Assistance

Method: This implementation option is similar to that above, however, rather than being southern-based it incorporates Nunavut-based private sector.

Under this implementation approach the GN and Hamlet would be responsible for the collection, segregation, and the storage of the ELVs and potentially the removal of hazardous wastes. The dealers/brokers would take possession of the ELVs in the community, prepare for shipping and arrange shipment from the community to end-market. Preparation for shipping would be determined by the purchaser, however, it is anticipated that it would include removal of hazardous material that would be handled, transported and disposed of according to the hamlet waste management activities.

A key consideration to make this more feasible to the private sector will require other recyclable metal and white goods be included with ELVs, sufficient metal quantity is available, and scrap metal price justifies the repatriation.

Benefits: In addition to the environmental and training benefits noted above under the general discussion of this option, the key benefit to this implementation method is that the GN and Hamlet administration are not responsible for shipping and potentially not responsible for ELV preparation activities.

It also supports the development and expansion of a private sector recycling industry in Nunavut. Such investment at the community level would increase local employment, diversify local economy, develop trained workers, and establish permanent recyclers within Nunavut.

Disadvantages/Challenges: In addition to those disadvantages listed above under this option, a key disadvantage is the reliance on private sector to repatriate the ELVs. At the moment, there are a limited number of companies based in Nunavut engaged in the collection, management and transportation of recyclable material. Their interest in these activities would be difficult if shipping costs exceed potential income from scrap metal sales. To engage them may require the GN to consider either direct subsidy programs to help setup businesses and support shipping costs, or indirect subsidy programs (e.g. provide "free" metal to interested parties such as brokers/dealers or shipping companies).

Cost: This option overcomes many of the barriers to recycling scrap metal in Nunavut and helps diversify the local economy. The GN would avoid the high transportation costs to ship material to end-markets and potentially the high costs of purchasing and shipping baling equipment and their associated operating costs. However, the costs of supporting the development of the private sector, with the appropriate trained personnel and infrastructure, may require substantial direct and indirect subsidies. Note that Arctic Express Ltd. based in Iqaluit has shown some interest in assisting the government cleaning up the environment by back-hauling recyclables in their empty containers down south in exchange of free recyclables.

Under this implementation method, cost to the GN would be determined by the negotiated terms with the dealer/broker and that would include the level of preparation for the ELVs and shipping needs.

3.3 Private Preparation and Repatriation

The premise of this option is that ELV and metal recycling is operated entirely by private companies. In this situation the contractor ensures that the ELVs are properly prepared for recycling and shipped to southern markets. The management of ELVs and other scrap metal would then become the responsibility of the private sector and not the Hamlet government.

This implementation method is found in other Canadian jurisdictions (for example, Ontario, British Columbia, and Newfoundland) where the collection, preparation and marketing of ELVs are conducted by the private sector. The role of the government within these jurisdictions has been to establish necessary legislation and policy tools to provide the direction, public education, awareness campaigns and subsidy programs to support the implementation of changing rules and regulations, and the development of a private sector. Each jurisdiction has been unique in its implementation of ELV recycling efforts, and the following generic description is presented at this time for the GN to consider:

Option 3a: Nunavut Scrap Dealer Repatriation

The role of the GN under this option would be to provide legislation and regulations that outline the policy direction for recycling. In developing such policy tools, every stakeholder department is typically involved, and external and public consultations are conducted. It is anticipated that DOE would lead the development of these legislative requirements as the issue is related to environmental protection. DOE would also act as a regulator administering the EPA and inspecting and enforcing any terms and conditions of permits/licences issued to a scrap metal dealership/management centre. C&GS involvement would be limited to assisting the community with its management of land use within its boundaries and managing hazardous materials at the landfill facility.

The role of ED&T would be to provide funding and training opportunities to the private sector to support the development of recycling companies.

In implementing repatriation under this option there may be a benefit to establishing regional metal management centres. In this case, the contractor would separate the ELVs and then ship these to regional preparation and storage areas. The contractor would then ship the ELVs and metal from the regional centres to the southern markets. This option, however, does affect shipping costs as it requires movement from the community to the regional centre.

3.3.1 Option 3a: Nunavut Private Industry Repatriation

Method: Implementation of this method would require the establishment of permanent scrap metal yards within Nunavut communities. All recyclable metal would be sent to scrap dealers, and the dealers will deal with the processing and the shipping. The management of hazardous materials will likely be the responsibility of the hamlet landfill facility. However, as the implementation of more recycling occurs, activities may ultimately become a private-based endeavor.

Benefits: The benefits of this option include improved waste management within the community not only of metal wastes, but of hazardous material as well. The private company is then responsible for the proper management and recycling of hazardous material and metal/ELVs. As a non-government party, there may also be funding opportunities (e.g. federal programs) available that are currently inaccessible by government departments.

For the community, removal of the scrap metal will result in local environmental clean-up and may extend the life of the existing landfill by reducing disposal of metal within these facilities. There may also be employment and training opportunities to address metal recycling and hazardous waste management within individual communities and possibly within regional storage centres.

This option also provides a long-term investment in the communities to support appropriate waste management that incorporates recycling and will limit the Government's direct involvement in recycling.

Disadvantages/Challenges The main disadvantage to this option is that there are currently limited established private companies in Nunavut that can address ELV/metal recycling. These established businesses, where available, would require assistance in expanding their current operations to recycle ELVs/scrap metal. Currently, the only recycling facility in Nunavut is Southeast Nunavut, and the company has recycled aluminum cans, in the order of 15 to 20 tons per year, for approximately 10 years in Iqaluit. The business crushes, bales and ships the materials to southern markets via containers on cargo back-haul trips. It is the shipping costs that determine the feasibility and continuation of this operation, and at this time, this operation is not sustainable.

The second main disadvantage to this option is costs. Financial assistance to establish and support these private companies would be needed particularly if expansion of existing facilities or creating new facilities (at the local and regional level) is needed.

Cost: Establishing this industry in Nunavut would initially require substantial financial commitments from the GN and developing and enforcing necessary legislative and policy tools. Establishing this industry could potentially require assistance with business startup and maintenance, equipment and facility purchase and operation, shipping subsidies and personnel training. Ultimately, however, this option represents a long-term investment for both the private party and the government, and will ultimately depend on their negotiations.

3.4 Comparison of Options

To facilitate comparison between the options, Table 4 summarizes the discussion of this section.

There are several similarities between the options with the differences being changing parties responsible to implement appropriate waste management actions in order to make available the ELVs for recycling and shipping to southern markets. The GN and hamlets have a role in each option that vary from providing funding (e.g. business support, training and waste management initiatives) to providing leadership by being an active party responsible for ELV management (e.g. ELV waste management and shipping). All options will require the GN to develop legislative and policy tools to incorporate recycling and repatriation of ELVs.

Initially, all the approaches may require subsidy from the government, but as the private recycling sector becomes more established, and recycling is expanded to include other recyclables, the entire repatriation operation may become more self-sufficient with minimal subsidy.

Key partners to all options are various GN departments, the Hamlet administration and residents. Implementing of any option will only succeed if it is accepted in the community; typically, any initiative of this nature also requires a "champion(s)" within the community to ensure its success. Successful implementation will also require a shift in perspective to recognizing the resource potential of ELVs and other recyclable metal and not just another waste product to manage and dispose. Other jurisdictions (for example, British Columbia and Newfoundland) have included outreach and awareness campaigns in conjunction with the implementation of changing recycling requirements.

> *It is recommended that a public education and awareness campaign be developed and implemented as part of ELV repatriation implementation plan.*

There is also the strong potential to develop and strengthen relationships with other Canadian jurisdictions. Several have initiated recycling programs in their remote communities (for example Northern Manitoba and Northern Quebec) that could be the basis for inclusion of Nunavut programs.

All of the options incorporate training and employment opportunities at the community and possibly regional level. There is also a necessary investment in improved waste management at the community and regional level. This investment may also include the development/expansion of a private recycling industry; however, initially public involvement is necessary to ensure the successful implementation of ELV repatriation.

Improved waste management at the community and regional level will lead to a reduction in the potential for environmental contamination (ground and water) by hazardous material and metal releases. An important benefit to all of the options is the local environmental clean-up that will result from improved waste management with the separation of metal and hazardous material from the general waste stream. This may ultimately extend the "life" of existing landfill facilities by reducing the metal waste being disposed. The local environment will also be improved by the "unsightliness" of abandoned ELVs and scrap metal material in and around communities.

It is anticipated that the general view would be that the GN be the lead on any initiative in the short term and input from other groups would help target communities/regions for additional pilot projects.

The key disadvantage to all of these options is the costs. Each has its own costs associated with it and the next section presents a general discussion on this issue. Also in the following sections is a discussion of other possible income sources (i.e. recycling funds) to offset costs of ELV repatriation.

> *It is recommended that a study be completed to identify the preferred ELV repatriation option. This would be based on input from all levels of government, Inuit Organizations, private industry, Elders, Youth and the general public to assess economic feasibility, social benefits/implications and sustainability for each option.*
>
> *As part of identifying preferred ELV repatriation option, pilot projects should be developed and implemented.*
>
> *As part of identifying preferred ELV repatriation option, appropriate measures to handle, store, and dispose of hazardous material and non-metallic components should be developed and implemented.*

Table 4: Comparison of Options

Option	Government Preparation and Repatriation		Government Preparation and Private Repatriation		Private Preparation And Repatriation
Implementation Methods	Option 1a: Gov. Repatriation via Barge Charter	Option 1b: Gov. Repatriation via Back-Haul	Option 2a: Southern Business Repatriation with Gov. Assistance	Option 2b: Nunavut Business Repatriation with Gov. Assistance	Option 3a: Nunavut Scrap Dealer Repatriation
Description	Government responsible for preparation, processing and shipping of ELVs.		Government responsible for preparation, and businesses responsible for shipping. Processing can be done by either depending on negotiation.		Scrap yard responsible for preparation, processing and shipping of ELVs.
GN Role	C&GS - implement waste management activities, and associated activities. DOE - regulator/inspector. ED&T - limited involvement. E&IA - develop partnerships with other jurisdictions as required.		C&GS - implement waste management activities and assist Hamlets in contract negotiation. DOE - regulator/inspector ED&T - providing funding and training opportunities.		C&GS - assist land use and hazardous material management at Hamlet landfills. DOE - develop legislation and act as regulators. ED&T - providing funding and training opportunities.
Key Partners	GN & Hamlets		GN & Hamlets Private Industry		GN & Hamlets Private Industry
Potential Partners	Other Jurisdictions Northern Quebec/Manitoba have initiated efforts to repatriate ELVs and other metals.		Other Jurisdictions Northern Quebec/Manitoba have initiated efforts to repatriate ELVs and other metals.		
Joint Projects	Recycle other metals along with ELVs. Establish regional recycling centres.		Recycle other metals along with ELVs. Establish regional recycling centres.		Recycle other metals along with ELVs. Establish regional centres.

Table 4 (continued): Comparison of Options

Implementation Methods	Option 1a: Barge Charter	Option 1b: Back-haul	Option 2a: Southern Business	Option 2b: Local Business	Option 3a: Scrap Dealer
Benefits	Improve waste management. Local environmental clean-up. Extend landfill life span. Employment and training opportunities.		Improve waste management. Local environmental clean-up. Extend landfill life span. Employment and training opportunities. Government not responsible for shipping, and possibly ELV preparation activities.		Improve waste management. Local environmental clean-up. Extend landfill life span. Employment opportunities. Government not responsible for the ELV recycling. Funding opportunities available to non-government organizations. Establish a permanent scrap yard in Nunavut.
	Flexibility of shipping - schedule and availability.	If backhaul rate reduced, backhauling "whole" ELVs down south can be a very viable option.	Can use business's trained personnel and infrastructure.	Establish permanent recyclers in Nunavut hence diversify local economy.	
Disadvantages	Lack of sound waste management. Limited equipment and storage in Hamlet. Low priority in recycling in the north. High cost of equipment and labour.		Lack of sound waste management. Limited equipment and storage in Hamlet. Low priority in recycling in the north. Reliance on business for repatriation.		Lack of established recycling industry and where established, will require assistance in expanding their current operations to recycle ELVs/scrap metals.
				Few businesses in Nunavut engaged in recycling.	
Costs	Maximize shipping quantities to reduce shipping costs per ton. Will be costly as tug-barge rental is pricy.	Allows for shipping without compacting. However, this may lead to higher shipping rate on a per-car basis.	Avoids high transportation costs and associated costs of preparation. However, the costs to engage the private firms may include direct and indirect subsidies.	Avoids high transportation costs and associated costs of preparation. However, the costs of developing the private sector, may require substantial direct and indirect subsidies.	Avoids high transportation costs and associated costs of preparation. Long term investment and commitment to recycling However, the costs of developing the private sector, may require substantial direct and indirect.

3.5 Cost and ELV Repatriation

Cost is the important consideration in any of the options presented in the above sections. These costs can include (in no particular order):

- Transportation (shipping, road and rail);
- Volume reduction equipment (i.e. compactors, shredders and balers) purchase/rental and their associated operation;
- Labour and training;
- Improving waste and hazardous material management with the communities;
- Waste management site improvements and/or expansion; new site development;
- Subsidy programs;
- Legislation and other policy tool development and implementation;
- Public education and awareness;
- And many more direct and indirect costs depending on the implementation option selected.

There are suggested efficiencies that could be considered to assist in the reduction of the most significant barrier - the high cost of transportation. These include developing an efficient implementation plan, conducting programs in partnerships, and developing and implementing legislation and policy tools to support ELV repatriation.

It is recommended that in developing a repatriation plan, efficiencies are considered to reduce high transportation costs.

3.5.1 Efficient Implementation Plan:

1. Expand the scope of recyclable metal to be repatriated

There are multiple benefits to repatriate other recyclable metal in addition to ELVs including tapping into higher value scrap metal (e.g. white goods) thus increasing scrap metal volumes and the overall value of materials. It also reduces shipping costs per ton (i.e. as scrap metal quantity increases, shipping rate per ton decreases). Furthermore, ELVs can be used to contain loose metal during processing/shipping.

Expanding the scope of metal to be repatriated also includes expanding the number of communities to be included.

2. Use an appropriate and economical shipping method

Back-Haul Shipping: it is necessary to negotiate with shipping companies to further reduce back-haul shipping rate for repatriation to be feasible (the current back-haul rate which is 65% of the regular rate, is still too costly). Presented in Appendix B is a hypothetical situation in which 100 tons of green ELVs are repatriated from each of 3 major communities (Iqaluit, Rankin Inlet and Cambridge Bay) assuming the implementation of the Government Preparation - Government Repatriation option (option 1b). The total cost is estimated to be $289,700 (or almost $1000/ton).

Tug-Barge Charter: Typically the volume of materials carried by this shipping method would be larger that the cargo vessel and. As a result, the cost per ton would be lower than the back-haul shipping costs. Appendix C presents the hypothetical scenario of Government Preparation – Private Repatriation option (option 2a) in which 10,000 tons of ELVs and other recyclable metal can be repatriated from entire Nunavut at an estimated cost of $346/ton, rather than $1,000/ton via back-haul shipping.

3. Set up regional recycling centers
There are benefits to establishing regional centers to store and process all the ELVs if shipping costs between communities and the regional centres are reasonable. These central locations would require the purchase/rental of regionally based volume reduction equipment, and would maximize ELV and other recyclable metal collection and preparation. Limitations to the regional approach is that transportation costs between the communities may be too high, and that establishing the centre may require permitting and licensing requirement for a new and/or an expanding existing facility.

3.5.2 Cooperation between Key Partners:

1. Cooperation within GN
Without clear legislation and policy outlining roles and responsibilities within the GN, there is a higher potential for inefficiencies to occur. The GN should improve fiscal and human resources by developing a clear policy and an implementation strategy and plan for repatriating ELVs. There is also an opportunity to outline overall waste management within the communities and provide direction to improve hazardous waste management, and ELV and scrap metal management.

It will also improve ELV repatriation to have current policies and procedures reflecting the needs for recycling efforts (e.g. contracts with shipping companies should consider recycling/waste management issues).

2. Cooperation with other governments and jurisdictions
Hamlet administration and residents must be engaged in the development and implementation process of any ELV repatriation option in order for it to succeed. The "buy-in" would ensure that ELV and scrap metal wastes are appropriately managed, prepared and stored within the community. ELV repatriation into the recycling market is very dependent on providing a consistent quality and quantity of materials.

There are also efficiencies realized by partnering with other jurisdictions (e.g. Quebec, Manitoba and Northwest Territories) that are repatriating or are interested in repatriating ELVs. The benefits of these partnerships include the sharing of equipment and personnel and, in particular, the sharing of shipping cost; shipping cost per ton can be reduced as the quantity of metal increases.

3. Cooperation between government and private sectors
Efficiencies can be realized by using the existing privately-based recycling market in the south and, in the long-term, can support the development of a Nunavut-based recycling

industry. This may require the need of a "marketing" plan to raise awareness to the existing potential in Nunavut and may also provide investment/expansion incentives to existing Nunavut companies.

3.5.3 Legislation Implementations:

In addition to establishing internal policy direction, efficiencies may be realized by developing and implementing other recycling/hazardous waste management legislation and regulations. In other jurisdictions these are typically based on "polluters-pay" principles and make consumers, waste producers, manufacturers and importers responsible for the wastes they produce. These can generate income sources that may be used to offset ELV management and repatriation cost. It is very important that all the income be funneled in one place and be used to finance recycling, rather than other purposes. Section 4.0 presents a summary of possible considerations.

3.6 Summary of the Possible Repatriation Options for ELVs in Nunavut

Markets for ELVs are the most critical factor in the success of any recycling program. The markets—all end users of recyclable materials—to which recyclable materials are sold for revenue are critically important as they specify types, quantities, and quality of materials that will be purchased. These requirements fundamentally influence processing, collection, and all aspects of a recycling program's operation.

A second factor that affects the success of a recycling program is the consistent quality and quantity of material. Whereas a waste manager is a service provider, with a responsibility to collect waste and keep citizens satisfied with service, a recycling manager must also provide quality feed-stock to an industrial process, ensuring clean, consistent volumes of useable material.

In identifying vehicle repatriation options key criteria focused on changing responsibilities within the public and private sectors, and changing marine shipping methods. These options are described as:

- Option 1 - Government Preparation and Repatriation
  - Option 1a: Government Repatriation via Barge Charter
  - Option 1b: Government Repatriation via Back-Haul
- Option 2 - Government Preparation and Private Repatriation
  - Option 2a: Southern Business Repatriation with Government Assistance
  - Option 2b: Nunavut Business Repatriation with Government Assistance
- Option 3 - Private Preparation and Repatriation
  - Option 3a: Nunavut Private Industry

Key similarities and benefits to all the options to repatriating ELVs in Nunavut include:

- GN has a role in each option that varies from providing funding (e.g. business support, training and waste management initiatives) to providing leadership by being an active party responsible for ELV management (e.g. ELV waste management and shipping).

- Require development and implementation of legislative and policy tools to incorporate recycling and repatriation of ELVs.
- Initially, all the approaches may require subsidy from the government, but as the private recycling sector becomes more established, and recycling is expanded to include other recyclables, the entire repatriation operation may become more self-sufficient with minimal subsidy.
- Key partners to all options are the GN, the Hamlet administration, and residents. Successful implementation will also require a shift in perspective to recognizing the resource potential of ELVs and other recyclable metal and not just another waste product to manage and dispose.
- There is potential to develop and strengthen relationships with other Canadian jurisdictions and combine repatriating programs.
- Incorporate training and employment opportunities at the community and possibly regional level.
- Require investment in improved waste management at the community and regional level. Improved waste management at the community and regional level will lead to a reduction in the potential for environmental contamination (ground and water) by hazardous material and metal releases.
- Local environmental clean-up will result from improved waste management with the separation of metal and hazardous material from the general waste stream.
- Extend the "life" of existing landfill facilities by reducing the metal waste being disposed.

The key disadvantage to all of these options is the costs. There are suggested efficiencies that could be incorporated to improve the feasibility of any of the options. These include:

- Efficient Implementation Plan:
  - Expand the scope of recyclable metal to be repatriated
  - Use an appropriate and economical shipping method:
  - Set up regional recycling centers:

- Cooperation between Key Partners:
  - Cooperation within GN
  - Cooperation with other governments and jurisdictions
  - Cooperation between government and private sectors

- Legislation Implementations:
  - Develop and implement policies, based on "polluter-pay" principles, and make consumers, waste producers, manufacturers and importers responsible for the wastes they produce. Possible options are import fees, annual registration fees, and tipping fees.

4.0 Funding Opportunities

As presented, key barriers to recycling scrap metal in Nunavut include the high transportation costs to ship scrap metal to end-markets, relatively low values of most scrap metal, and the high capital investment of equipment. Given these costs, the GN may consider developing and implementing programs to generate funds to support ELV recycling efforts. The types of programs described in the following are based on programs in other jurisdictions that have been used to help finance waste management and recycling.

4.1 Recycling Fee

"One-time" Fee

Several jurisdictions have established a fee that is collected when items are imported and registered. For example, this fee could be set up as a "one-time" charge for every new vehicle brought into Nunavut.

Based on information presented, annual increase in road motor vehicle registrations is:

YEAR	1999	2000	2001	2002	2003	2004
Total, road motor vehicle registrations	2,501	2,735	3,075	3,258	3,307	3,329
Change from previous year to current		234	340	183	49	22

If, for example, a "recycling fee" was established per vehicle, then there would be corresponding revenue per vehicle shipped into Nunavut each year. If for example the fee was $1500 per vehicle (backhaul cost of a whole ELV), then the potential income for 2004 could be $33,000. This income represents a significant contribution to improve waste management and training within the communities.

This program could also be expanded to include other recyclable metal (e.g. household appliances, computers, off-road ELVs and heavy equipment). However, there is limited, to no information regarding the importation of some of these items into Nunavut at this time.

In considering this approach to generate income, it will be important to understand the potential change in the number of vehicles coming into Nunavut in the future. Given the information above, the overall trend is an increase in the number of vehicles. However, the change from year to year is decreasing.

Annual Fee

Another possible implementation of a "recycling fee" would be its inclusion in the annual registration renewal fee. This type of fee has not been used elsewhere to support recycling efforts, except in Iceland where it was introduced in 2002. However, this type of annual renewal fee has been used as an incentive to reduce vehicle use in order to improve air quality and reduce greenhouse gas emissions. In general, these fees have not been successful in reducing vehicle type, or overall use; vehicle use is much more sensitive to the price of fuel than to the applicable fees/taxes.

In either recycling fee case, it will be important to understand the registration situation of the vehicles. If, for example, the GN, municipal government and crown corporations hold the majority of road vehicle registrations in Nunavut, then an important question will be if they are exempt from either one-time or annual fees. If they are exempt, income is further reduced.

Another consideration in either case is the collection and management of any one-time or annual fees. Fees collected at the motor vehicle offices typically goes to the general revenue of the government. In order to target this income to specific communities and/or projects related to ELVs repatriation and other metal removal would require policy and procedure revisions.

4.2 Tipping Fee

Several jurisdictions in Canada (for example, British Columbia, Ontario, Manitoba, Quebec and Atlantic Canada) have established a tipping fee that is collected when items, including ELVs, scrap metal and white goods, are brought to the landfill for disposal. The fee in general is to help with any special handling and disposal costs at the landfill. These fees are charged on either a "per ton" or "per item" basis.

Iqaluit implemented a tipping fee system for construction/demolition materials in 2002 and is the only community in Nunavut to have this system. The Iqaluit landfill is charging businesses (not residents) for disposal of vehicles (i.e. $50 per passenger vehicle), and $5 for the disposal of a truck load of materials. The city is considering increasing the tipping fees. The current proposed plan is to charge $30 per car battery, $15 per tire and $60 per end-of-life snowmobile. The plan also proposes to double waste collection fees for businesses, and to ban accepting ELVs at the landfill. However, there is a concern that there will be abandonment of various bulky materials in town if the new plan is carried out.

The success of any tipping fee system depends on your perspective. From the landfill operation, it may be successful as the intent is to generate an income. However, from an individual's perspective it may not be seen as successful. In the latter situation, the tipping costs are typically passed on to the consumer, thus increasing overall costs to the individual. As a result, in an effort to minimize costs/losses, there may be an increase in abandonment and the illegal disposal of materials. Other jurisdictions have addressed abandonment and the illegal dumping by implementing incentive programs. For example, a community may offer no tipping fees for one day per year or may distribute gift certificates from local businesses for every derelict vehicle brought to the landfill.

An important benefit to the tipping fee system is that the income goes directly to the hamlet/municipality that can be targeted to waste management.

5.0 Case Studies

Recycling is difficult in northern regions primarily due to the high transport costs of materials to markets in southern Canada. The small volume of recyclable materials, lack of local markets and shipping distances are some of the challenges facing the development of recycling programs in small northern communities. Within these communities, salvage areas and used-parts are the primary method of recycling.

Small-scale recycling projects have been implemented and are presented in the following studies. The summary provides a description of the project, key partners and any joint projects that may have be conducted at the same time as ELVs. Also included is a brief description of the "lessons learned" and costs for these projects.

This section has provided a summary of case studies of ELVs transported to external markets that are applicable to Nunavut communities due to similar geographic and economic development levels. These include:

- Management Practice of ELVs in Nunavut and Kivalliq Pilot Project
- Katydid Scrap metal and Hazardous Waste Management
- Labrador: Happy Valley - Goose Bay
- Iceland - ELV Directive and ELV Recycling

5.1 Management Practice of ELVs in Nunavut and Kivalliq Pilot Project

Key Sources:

"Scrap Metal Recycling in Remote Northern Communities: A Pilot project Implementation Plan". Earthbound Environmental (January 2003) for Aboriginal & Northern Affairs (Government of Manitoba) and Government of Nunavut.

"Northern Scrap Metal Recycling Project - PHASE II, Interim Report", North Central Development (November 2004) for Manitoba Conservation Waste Reduction and Pollution Prevention Fund.

"Kivalliq Pilot Project: the Repatriation of End-of-Life Vehicles and Scrap Metal", Department of Environment (January 2006) for the Government of Nunavut.

Description:

There has not been any management of ELVs/scrap metal and associated hazardous waste management in Nunavut besides centralizing the metal at metal disposal sites in some communities. As a result, in 2003, the Governments of Manitoba and Nunavut contracted Earthbound Environmental Inc. to develop a plan to implement a scrap metal recycling project in two communities in Northern Manitoba and two in Nunavut. The primary goals of the pilot project are to:

1) Clean up the scrap metal that has accumulated in the communities included in the study;

2) Develop and test options for overcoming barriers to cost-effectively recycle scrap metal in northern and remote communities; and
3) Demonstrate the job creation potential of establishing viable scrap recycling initiatives.

The pilot project includes the collection, baling and shipping to an end market of the scrap metal accumulated in Gillam (Manitoba), Churchill (Manitoba), Rankin Inlet (Nunavut) and Coral Harbour (Nunavut). The steps to develop the pilot project plan included site visits, interviews and meetings with stakeholders and information search on other recycling projects implemented in northern/remote communities. Another key activity in developing the plan was the shipping of a sample load from Rankin Inlet in 2002. Key components of the plan include recognizing the regional perspective of this recycling project (i.e. they are all linked along a single transportation corridor connecting southern Manitoba to Nunavut) and focusing the end market to Mandak Metal/MRM Gerdau in Manitoba.

The pilot project was to consider available scrap metal products including large items made of various types of metal (e.g. derelict cars, appliances, snowmobiles, outboard motors, etc) and miscellaneous non-ferrous and ferrous loose scrap (e.g. aluminum siding, metal shelving, copper pipes, etc.). The pilot project plan was also to examine the possibility of segregating the high value metal (e.g. copper and aluminum metal) to enhance overall revenue generated. A key component of the pilot plan was the equipment and personnel needs, roles and responsibilities, transportation methods and routes, and associated costs for each of these components.

For Rankin Inlet, it was estimated that 800 tons of scrap metal were available within the local waste management area and around the municipal boundaries. The project included collection of this material, either packed in containers or large items were placed on deck, and shipped to Churchill by barge where it was baled and transported to Selkirk by rail. In addition, hazardous materials such as waste oil and fluids, battery and tires were removed from ELVs. The pilot project also included the consideration of recycling aluminum cans due to the higher value.

Within Coral Harbour, it was estimated 500 tons of scrap metal were available. Collection, transportation and staffing activities were similar to Rankin Inlet activities. Unfortunately, due to the lack of funding, Coral Harbour did not participate in the implementation - i.e. no scrap metal has been removed.

Planning and preparation for implementing the pilot project plan finished in 2003, and the pilot project was conducted during 2004 and 2005. In Rankin Inlet, three local residents were employed to coordinate the collection and preparation of scrap metal materials to one central location. Preparation included the separation of white goods and from the ELVs because of their higher value. ELVs were prepared in the community by draining the oil (delivered to the waste oil burner), coolant (stored in designated container until disposal at an appropriate facility is possible) and removing batteries (stored until disposal at an appropriate facility possible). White goods with refrigerants were prepared by removing Freon (stored until disposal at appropriate facility possible). Small items (e.g. metal barrels) were crushed in Rankin, and larger items (e.g. ELVs) were prepared and crushed in Churchill. The recyclable metal were shipped unbaled to Churchill by barges, then transported by rail to Thompson and then to Selkirk by trucks.

In 2004, 47.6 tons were removed in one shipment from Rankin Inlet including 3 trucks, 29 passenger vehicles and snowmobile body parts. In 2005, a total of 46.6 tons were removed in two shipments (34.6 tons and 12 tons) including 35 passenger vehicles, 5 trucks, metal barrels and loose scrap metal. Coral Harbour has not participated in the pilot project to date, and available scrap metal remains in the community.

Partners:

The development and implementation of this pilot project included:

- All levels of government within Nunavut. For example, GN and Rankin Inlet Hamlet Administration provided key contributions of staff and funding to support the development and implementation of the pilot project. Funding was also provided by the Federal Government.
- Government of Manitoba supplied assistance directly by providing expertise and funding specific to this pilot project and indirectly because of their support of recycling initiatives in Northern Manitoba.
- Private Sector. A significant contribution was made in the plan development and implementation by transportation companies (marine, rail and road shipping), existing scrap metal recycling businesses, and end-users of recyclable materials.

Joint projects:

The pilot project incorporated the recycling of all scrap metal including ELVs. The volumes actually moved include 13 ELVs as part of the 2002 sample load. In 2004, 47.6 tons were removed in one shipment from Rankin Inlet including 3 trucks, 29 passenger vehicles and snowmobile body parts. In 2005, a total of 46.6 tons were removed in two shipments (34.6 tons and 12 tons) including 35 passenger vehicles, 5 trucks, metal barrels and loose scrap metal. Coral Harbour has not participated in the pilot project to date, and available scrap metal remains in the community.

Lessons learned and costs:

An important lesson learned during the 2002 sample project was that backhauling unbaled material on flat deck trailers is not feasible due to the difficulty of keeping the load stable and secure. The 2003 feasibility study incorporates this finding in developing the pilot project plan.

The 2003 estimated costs and revenues for the Rankin Inlet and Coral Harbour pilot project are summarized in table 5.1. The actual costs from the 2004 and 2005 phases are presented in Table 5.1 as well. Please note that the figures for Coral Harbour remain an estimate as they did not participate. Experience from this project has shown that the net cost per ton is approximately $914/ton meaning that for every ton handled, it cost $914 more to repatriate than realized income.

Table 5: Estimated Costs and Revenues for Rankin Inlet and Coral Harbour Scrap Metal Recycling Project

Communities		Rankin Inlet (2003 estimate)	Rankin Inlet (2004/05 actual)	Coral Harbour (2003 estimate)
Available Scrap Metal Quantity		800 tons	94.2 tons	500 tons
Costs	Total local staff costs	$26,000	$18,521	$26,000
	Local coordination, equipment & supplies, and baling	$66,690	$40,437 *	$44,325
	Shipping	$92,429	$29,164	$59,643
Total Cost per ton		**$232/ton**	**$935/ton**	**$261/ton**
Revenue		$60,000	$1,991**	$39,000
Projected Net Cost per Ton		**$157/ton**	**$914/ton**	**$183/ton**

*The actual repatriation cost in 2004 and 2005 does not include the cost of coordination effort that took place in Rankin Inlet and Manitoba.
** The low revenue from the metal sale was due to the fact that in 2005, a processing/shipping contractor offered a reduced price for the baling and transportation services in exchange of free scrap metal. Revenue noted is from 2004.

In general, implementing the pilot project indicated that the higher than expected costs were the greatest challenge identified. Note that equipment/ machine rental, and the shipping cost were the two main expenditures. Recommendations to reduce the costs to repatriate scrap metal include:

- Consider purchasing equipment and machinery on a regional basis rather then renting;
- Increase total shipping load;
- Develop and implement "user-pay" legislation and by-laws to help support waste management facility operations. This may include vehicle owners being responsible for hazardous material disposal, and tipping fees for heavy-duty equipment disposal;
- Establish a recycling fund to collect and centralize recycling fees from all recyclables; and
- Increase possible revenue by collecting and recycling high-valued metal (e.g. aluminum cans).

5.2 Kativik Scrap metal and Hazardous Waste Management

Key Sources:

"Feasibility Study for Recycling of Scrap metal and Hazardous Waste in Nunavik", Pesca Environnement (2004) for the Kativik Regional Government.

"Recommendations for Residual Material Management in Nunavik", PESCA Environnement (2004) for Kativik Environmental Advisory Committee.

Description:

In 2004, the Kativik Regional Government contracted Pesca Environnement to develop a feasibility study to assess the viability of a project to recover valuable non-degradable scrap metal (i.e. scrap metal) and hazardous wastes from waste landfills and other sites in Nunavik communities. The primary goals of the feasibility study were to:

- Extend the operational life of the existing landfill facilities;
- Minimize environmental impacts from hazardous wastes;
- Seek potential revenue from scrap metal; and
- Provide employment opportunities in communities.

In developing the feasibility study, Pesca considered the costs to collect, prepare, ship available scrap metal via cargo ships to Montreal, and to collect and treat all types of hazardous wastes within the communities. The steps to develop the pilot project plan included site visits (to two communities - Inukjuak and Kuujjuaraapik), reviewing waste management area licences/permits, interviews and meetings with stakeholders, and information search on current management practices in Nunavik communities.

The feasibility study is based on recycling all available scrap metal products including ELVs. The feasibility study also considered the collection and appropriate management of all hazardous materials in the individual community including those from ELVs. The study identified potential available scrap metal, hazardous materials and potential revenue in comparison with equipment and personnel needs, roles and responsibilities, transportation method and route, and their associated costs. Also considered in the study, in addition to human resources, are safety and training requirements. This was identified as an important component because of the working conditions within landfill facilities and the specialized training required for the identification, handling and transportation of hazardous materials.

Recommendations made within the feasibility study for recycling scrap metal include:

1) Complete an inventory within each community to better identify available scrap metal and hazardous materials;
2) Complete a pilot project to better evaluate the quantity of scrap metal and hazardous wastes that can be recuperated from Nunavik communities. This would focus on 2-3 communities and would include sorting, baling and shipping of

available scrap metal. The estimated costs for the pilot project in Inukjuak is $450,000; and

3) Refine proposed 10-year work schedule to remove all scrap metal and hazardous materials from all fourteen Nunavik communities based on pilot project reports. The feasibility study presents capital expenditures of $990,000 for equipment, and an annual operating cost ranging from $520,000 to $1,120,000 (including one-tenth of equipment cost representing a distribution of the capital costs over the ten year period) with the total costs depending on the total tons of scrap metal and hazardous materials collected and shipped.

Recommendations made within the feasibility study for hazardous waste management include:

1) Establishing a management plan for used oils. It is estimated that Nunavik has 175,000 litres of used oil presently, and an estimated 28,000 litres produced each year that represents an important source of energy that could be realized using a used oil furnace;
2) Supply each community with a hazardous waste container and establish a permanent hazardous waste collection site with trained staff. These materials are then centrally located, properly managed in the community, and available for shipping and appropriate disposal/recycling every four years.

Partners:

The feasibility study was completed on behalf of the Kativik Regional Government. The recommendations of the study include the development and implementation of an integrated recycling management plan that incorporates local public participation. Once an integrated recycling management plan is available, it will need to be accepted by the local authorities and will involve local contributions to implement successfully. Further, the financial resource needed to successfully implement the plan would involve various stakeholders.

Joint projects:

The feasibility study incorporates the recycling of all scrap metal (including ELVs) and hazardous materials. Further recommendations are based on the inclusion of all scrap metal and hazardous materials within the Nunavik communities.

Lessons learned and costs:

An important lesson learned in completing the feasibility study is the need for appropriate hazardous waste management plans to reduce environmental impacts. A second lesson learned is that the value of the scrap metal is sensitive to marine shipping costs and the total weight of scrap metal available for recycling.

5.3 Labrador: Happy Valley - Goose Bay

Key Sources:

Personal Communication, H. Yeh, December 6, 2005.

"Recycling and Reuse Guide ", Department of Environment, Government of Newfoundland and Labrador, Version 1, April, 2002

Description:

Waste reduction, recycling and reuse (the 3 R's) form one of the baseline principles in the improved management of wastes in Newfoundland and Labrador. In response to this commitment, the Government of Newfoundland and Labrador, in the early 2000's, implemented revised legislation, regulation and policy tools to support waste diversion efforts. The goal of these efforts is to promote and expand waste recycling and reuse alternatives, and to better manage the proper disposal of all forms of wastes, including hazardous materials. Establishing waste diversion policies, that incorporates maximizing recycling, results in the development of a private sector that can manage ELVs, white goods and other recyclable metal.

One example that is applicable to Nunavut communities is the ELV/metal recycling efforts within Happy Valley-Goose Bay. In this community of 8,000 residents, recyclable metal are separated and stored in a central facility managed by the municipal government. There are incentive programs in place to encourage residents to deposit ELVs in the facility.

The community has entered into an agreement with Newco Metal & Auto Recycling, a ferrous and non-ferrous scrap metal recycling firm based in St. John's, Newfoundland. When an appropriate amount of metal has accumulated to warrant feasible removal and recycling, Newco will process and prepare the ELVs, white goods and other scrap metal and ship the metal to the end-market during the summer months using the tug-barge transportation. Material removed (e.g. fluids, batteries, tires, Freon) from the vehicles, white goods etc remains in the community for appropriate storage, handling and disposal. The agreement allows Newco to pay the town $500 annually for the free access to the metal. Newco has expressed an interest in expanding its market and exploring the potential ELV/scrap metal repatriation from Nunavut. Further communication and negotiation will be required.

Partners

Partners in this example include the Municipal Government of Happy Valley-Goose Bay and the private firm, Newco Metal & Auto Recycling. The Provincial government has indirectly been involved by initiating rules and regulations that promote waste diversion and reuse/recycling.

Joint projects:
The success of this program is based on the inclusion of all potential scrap metal that may be recyclable (including ELVs). The agreement does not include hazardous materials and their management; this item remains with the Municipality.

Lessons learned and costs:
The removal of scrap metal is entirely dependant on the scrap dealer and, in some years, when scrap metal prices were low, the scrap was not removed. This has required the need for additional storage space within the community for accumulated scrap metal. This system has been completed for approximately 10 years to everyone's satisfaction.

The cost associated with this management is minimal except for the maintenance and operation of storage area(s) within the municipal landfill site.

5.4: Iceland - ELV Directive and ELV Recycling

Key Sources:
"End of Life Vehicle recycling in the European Union", Kanari, N. Pineau, J.L and Shallari, S., Journal of Minerals, Metal and Materials, August 2003.

"Generation of Waste from end-of-life vehicles", Indicator Fact Sheet (Term 2002 11a EU (WMF13), European Environment Agency, March 2003.

"Waste Management in Iceland", February 2005,
http://English.ust.is/media/ljosmyndir/mengur/Waste_Management_in_Iceland_1_feb_05.pdf

Personal Communication, H. Yeh, December 6, 2005.

Description:
Member countries of the European Union (EU) agreed in 2000 to a new legislation that prevents the environmental impacts of ELV disposal. The objective of the ELV Directive is to prevent wastes from end-of-life vehicles, and to promote the collection, re-use and recycling of their components to protect the environment. The Directive sets clear quantified targets for reuse, recycling and recovery of vehicles and their components and pushes producers to manufacture new vehicles also with a view to their recyclability.

The rate of re-use and recovery must be increased to 85% by average weight per vehicle by year 2006, and to 95% by 2015. The use of lead, mercury, cadmium and hexavalent chromium will be prohibited in materials and components in vehicles put on the market after 1 July 2003. Member States must set up collection systems for end-of-life vehicles and ensure that all vehicles are transferred to authorized treatment facilities.

The last holder of an end-of-life vehicle will be able to dispose it free of charge ("free take-back" principle). Similar laws are being proposed and implemented in other parts of the world, for example, USA (California), Japan and China.

Waste management in Iceland has evolved over the past three decades. In the 1970's open pit burning of all wastes was common; this was revised in the 1990's to the more controlled burning (i.e. in concrete boxes) at low temperature to prevent wastes from blowing away. Burning was gradually stopped into the 2000's as it became more unacceptable, and the preferred management of wastes became landfilling. With the change to landfilling, recycling became more of an option in order to divert wastes from permanent disposal.

With the incorporation of more and more recycling into waste management, a private sector gradually developed (subject to licensing laws) to establish a collection and storage system for the public and businesses to dispose of their wastes. In response to EU commitments, Iceland has made further moves to advance the waste management including the one associated with ELVs.

In 2003, Iceland introduced a new legislation (law 55/2003) targeted to more stringent waste management. The objective of this law is to decrease the quantity of wastes generated, increase recycling and recovery, and reduce the quantity of wastes deposited in landfills. With this new Waste Management Law, was an associated regulation (738/2003) that provides for a ban on the landfilling of scrap metal including end-of-life vehicles, liquid wastes, hazardous wastes, contagious and radioactive medical wastes and tires. The deadline for compliance is 2009; except for tires, which are banned effectively in July 2006.

It was anticipated that in response to the new waste law and regulations, the costs of waste management would increase. Law 55/2003 provides for measures to allow tracking of compliance with the legislation, effectiveness of the various programs and costs in order to ensure unimpaired funding in the future. Legislation passed in 2003 (Law 162/2002) also enacted the Icelandic Recycling Fund. This recycling fee is levied on the products itemized in the law i.e. hazardous waste, end-of-life vehicles (also subject to a "return" fee), composite packaging (drink boxes), farm silage film and tires in order to finance their collection, transport, recycling, recovery or disposal. It is anticipated that additional waste types will be added to the list of products requiring recycle fees.

In addition to a recycling fee, ELVs in Iceland are subject to a deposit system (Law 162/2002). The registered owner is required to pay an annual fee (approximately \$20CDN) as part of the registration fee. This is levied every year from the time the vehicle is first registered until it is officially de-registered.

Partners:
The ELV management in Iceland is part of a national plan to improve overall waste management. Partners within this waste management plan vary depending on their role, their responsibility and the commodity under consideration. There are too many to identify within this report, however, the general approach is "cradle-to-grave" inferring that managing of end-of-life waste products starts with the manufacturers and goes through consumers, to waste management, and then to reuse/recycle markets. Legislation has been established to provide direction and appropriate measures for Iceland waste management, tracking measures to ensure compliance and successful implementation, and finally, to obtain the identification and commitment of appropriate financial resources.

Joint projects:
The Waste management in Iceland includes ELVs as part of the metal recycling and hazardous waste management initiatives. For this reason, there are several joint projects associated (e.g. container and white goods recycling) with ELV recycling.

Lessons learned and costs:
Implementation of the overall waste management plan is still in its infancy in Iceland. In particular, the first round of ELV compliance commitments is slated until January 2006. Until sufficient time has passed and reporting requirements met, it will be difficult to assess the lessons learned and the associated costs.

6.0 Other Management Options

6.1 Disposal

6.1.1 Landfilling

Key Sources:

"Cape Dorset Solid Waste Improvement Study – Draft Report", Dillon Consulting Limited (October 2003) for Government of Nunavut, Community Government & Transportation

"Final Draft Report #2: Rae-Edzo MSW Site Planning Phase 2", Ferguson Simek Clark Architects & Engineers (August 2003) for: Government of the Northwest Territories, Department of Public Work & Services

Description:
In this option ELV wastes would be decontaminated, compacted and then hauled to an existing, or new, landfill facility for burial. Due to the relatively large volume of this waste

type, this option may require the construction of new facilities to accommodate the bulky wastes in some communities.

Advantages/Disadvantages:
Advantages to this option are to improve the environmental outlook of the communities, and improve the hazardous material management practice by removing the contaminants from ELVs and other recyclable metal.

Disadvantages to maintaining the current practices include:
- Without waste diversion in place many landfills in communities will reach their capacity sooner. This is already seen in communities such as Iqaluit, Kugluktuk and Cape Dorset where population growth has exceeded landfill design capacity and new facilities are needed;
- As landfills reach capacity, there is likely to be an increased "unsightliness" to the local environment due to abandoned ELVs and scrap metal material in and around communities.

Recent work in Cape Dorset (Reference 17) to expand the existing landfill facility provides some insight on the cost to improve and expand a community landfill in Nunavut. The cost estimate is based on the following:
- Dismantling the existing waste piles and compacting using locally available equipment;
- Hauling 8000 m^3 (or approximately 880 tons) of wastes to the landfill;
- Landfill capital costs and closure costs. Unit costs of $200 per m^3 were assumed based on landfill expansion cost estimates in this report;
- Final clean up of the bulky waste site via stripping a shallow layer of soil from the surface and disposing of in the landfill.

The estimated cost for this option is $2.3 millions dollars (or $2,600/ton); note however, that this is an existing licensed facility (i.e. operated under NWB water licence).

To develop and licence a new facility may require screening and review by NIRB under the Nunavut Environmental Impact Assessment (NEIA) process, as well as a review and licensing by NWB. Costs would rise significantly if opening a new facility needs to include the following:
- Capital cost of constructing a new site (i.e. access road, etc.). Based on a feasibility study conducted for the GNWT, the cost of constructing a new landfill in Rae-Edzo including the cost of operation and maintenance for 20 years is approximately $2.14 millions of dollars. The landfill capacity is about 5,000 m^3 and would contain approximately 840 tons of compacted materials (Reference 32).
- Feasibility studies to identify a best location;
- Long-term (several years) environmental monitoring to establish baseline conditions for such things as water quality, water quantity, wildlife, vegetation and permafrost conditions;
- Engineering design and planning;

- Environmental Impact Statement that outlines potential impacts, mitigation measures and residual impacts. Also, an important component is the risk assessment;
- Water Licence application needs that require detail operating and management plans, including monitoring and spill contingency;
- Closure plan. An important component of the NEIA and water licensing processes is the ultimate closure plan for the site. This plan identifies how the site will be managed when operations cease that will be the basis of determining financial bonding/security needs under the NWB water licence;
- Consultations with general public, regulators and other stakeholders.

Much of this additional work is typically completed by external expertise available in both Nunavut and southern jurisdictions.

6.1.2 Ocean Disposal

Key Sources:

"Selection of An Area in the Canadian Beaufort Sea for Disposal of Inert Bulky Materials such as Scrap Metal: An Assessment of Options", Environment Canada, September 1986.

Personal communication between the Department of Environment, the Government of Nunavut and Environment Canada, Northwest Territories, January 17, 2006.

"Analysis of Ocean Disposal in the Northwest Territories", Resource Futures International (April 1994) for Government of the Northwest Territories: Department of Renewable Resources.

Environment Canada's Disposal at Sea Program website, December 2005, http://www.ec.gc.ca/seadisposal/regs/gic_reg_g2_e.html.

"Cape Dorset Solid Waste Improvement Study – Draft Report", Dillon Consulting Limited (October 2003) for Government of Nunavut, Community Government & Transportation

Description:
In this option an application for a disposal permit would be made under Environment Canada's (EC) Disposal At Sea program in Yellowknife. At sea disposal is relatively rare in the north, and there has not been a case of ocean disposal of scrap metals taking place in Nunavut in the past 10 years (Reference 28). Assuming a suitable disposal site could be located that did not threaten a biologically important habitat, interfere with other resources users and/or pose a danger for shipping or navigation purposes, the wastes would be hauled over the sea ice and allowed to fall to the sea floor during the spring break-up.

Advantages/Disadvantages:
Permissible items for ocean disposal include inert bulky items such as iron and steel as these metals do not appear to have toxic effects in the ocean water. In addition, as iron is an essential micronutrient for marine organisms, and iron is deficient in Arctic water, the release of the iron can potentially enhance the marine life (Reference 29). The advantage is that these bulky items are diverted from the landfill facility, thus extending the "life" of the site.

Disadvantages to ocean disposal include:

- Relatively complex application process. The application process is extensive and includes a risk assessment, environmental assessment, a field study of the proposed disposal site, and a waste audit. In addition, the application has to show that other management or disposal methods do not prove to be feasible and/or viable (Reference 30);
- Feasibility studies to identify best locations for a disposal site;
- The need for site specific studies to support applications as there are no designated ocean disposal sites for scrap metal. These may be longer term studies (several years) to identify baseline environmental conditions;
- Preparation and cleaning of the waste prior to disposal. Contaminated items such as vehicles and snowmobiles would require extensive cleaning, at significant cost, prior to disposal;
- The cost of barging the metal from land to an ocean disposal site. Based on the ocean disposal study in Beaufort Sea in 1986 (1986 dollars), the base cost is $21,000. Plus for every 50 km, there is an additional cost of $7,000 for a round trip (100 km) (Reference 27);
- Socially unacceptable and potential for opposition. Ocean disposal is very rare in Arctic waters and has faced opposition from community, jurisdictional and national residents, and non-government organizations;
- Addressing these disadvantages will add significant costs to this option.

Recent work in Cape Dorset (Reference 17) also considered the option to dispose of some material in the sea. Only approximate costs could be estimated for this option due to the lack of experience with this option and the uncertainty regarding the location of the disposal site. An assumption also had to be made regarding the proportion of material that could be made suitable for marine disposal. It was assumed that 4000 m^3 of material (50%) would be disposed at sea with the remaining 4000 m^3 to be removed by sea lift backhaul. The 8,000 m^3 of metal is approximately 880 tons. The costs were based on the following:

- Dismantling, sorting, and cleaning the waste is estimated to require 12 weeks at a weekly cost of $20,000
- The rate for sealift backhaul is $162 per revenue tonne or per 2.5 m^3 of volume (2003 dollars). ~648,000
- The cost of supplying and shipping the open topped shipping containers is a major item. Sea lift operators recommended using steel rectangular containers filled with

+40000 = $240,000

stackable buckets to minimize the shipping volume. The unit cost using this method is about $60 per m^3 of storage. The cost for the large wood pallets was estimated at 1/3 the cost of the open top containers.

- The scrap metal value was neglected for this option due to uncertainty over the volume that would be sea lifted.

The estimated cost for this option is $1.23 million dollars (or $1,400/ton); note however that this is an existing licensed facility (i.e. operated under NWB water licence) and incorporates a repatriation of a volume of material.

6.2 Summary of Other Management Options

This report has provided a summary of other management options applicable to Nunavut. These include permanent disposal in landfills or at sea.

Although landfilling has its benefits, the major disadvantage is the high cost that is associated with creating a new landfill or expanding an existing one when a current landfill capacity is being reached.

Disposal at sea would divert bulky items from the landfill facility, thus extending the "life" of the site; however this method has very rarely been used in recent years. This is due to a relatively complex application and approval process. It also requires site specific studies to support application, and requires preparation and decontamination of materials before deposition in the sea. It is also an activity not supported by the communities.

7.0 Recommendations

Recommendations have been highlighted throughout the document and are compiled in the following.

It is recommended that an inventory be completed that would outline current metal management, estimate available metal types and volumes within individual communities.

It is recommended that improved hazardous waste management within the communities be implemented to support ELV recycling.

It is recommended that recycling projects be supported through financial and training opportunities at the community level.

It is recommended that the responsible GN department(s) complete appropriate consultations and develop applicable policies to address the repatriation of both scrap metal and ELVs

The current shipping contracts expire in March 2006, and negotiations for new contracts should consider the needs for recycling/repatriation and the disposal of associated hazardous wastes.

It is recommended that a public education and awareness campaign be developed and implemented as part of ELV repatriation options.

It is recommended that a study be completed to identify the preferred ELV repatriation option. This would be based on input from all levels of government, Inuit Organizations, private industry, Elders, Youth and the general public to assess economic feasibility, social benefits/implications and sustainability for each option.

As part of identifying preferred ELV repatriation option, pilot projects should be developed and implemented.

As part of identifying preferred ELV repatriation option, appropriate measures to handle, store, and dispose of hazardous material and non-metallic components should be developed and implemented.

It is recommended that in developing a repatriation plan, efficiencies are considered to reduce high transportation costs.

8.0 Key Sources of Information

8.1 Referenced in Report

1) "Environmental Protection for the Automotive Recycling Industry in British Columbia, Volume 1- Best Management Practices, Volume 2- Technical Pollution Prevention Guide, Volume 3- Code of Practice", E1-Rayes Environmental Corp. (March 1996) for the Fraser Pollution Abatement Office, Environment Canada.

2) "Shifting into High Gear, The Benefits of Pollution Prevention Practices in the Automotive Aftermarket", Automotive Industries Association of Canada, February 2004.

3) "Management of End-of-Life Vehicles (ELVs) in Ontario; Report, proceedings and draft Recommendations on the RCO Roles and Responsibilities Forum, April 28, 1999, Recycling Council of Ontario, September, 1999, www.rco.on.ca/research/proceedings/elv.html

4) "The Auto Recycling Story", Ontario Automotive Recyclers Association, www.oara.com/story.shtml

5) "Bathing the Junkyard Dog: An Examination into Sustainable Automobile Recycling Facility Development", Ontario Automotive Recyclers Association, www.oara.com/articles_view.php

6) "Getting the Lead Out, Impacts of and Alternatives for Automotive Lead Uses", July 2003, Environmental Defence, Ecology Center, Clean Car Campaign.

7) Canada's Waste Recycling Marketplace, http://www.recyclexchange.com/, December 2005

8) "Motor Vehicle Registration for Nunavut 1999 - 2004", CANSIM (Canadian Statistics), November 2005.

9) Personal communication H. Yeh, November 17, 2005

10) Personal communication H. Yeh, November 21, 2005

11) Personal communication H. Yeh, November 23, 2005

12) Personal Communication, H. Yeh, December 6, 2005.

13) Personal communication H. Yeh, December 13, 2005

14) Personal communication H. Yeh, January 22, 2006

15)"Background Report, Updating the Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the NWT", FSC Architects & Engineers (April 2003) for: Government of the Northwest Territories, Department of Municipal and Community Affairs

16)"Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the NWT", Ferguson Simek Clark Architects & Engineers (April 2003) for: Government of the Northwest Territories, Department of Municipal and Community Affairs

17)"Cape Dorset Solid Waste Improvement Study – Draft Report", Dillon Consulting Limited (October 2003) for Government of Nunavut, Community Government & Transportation

18)"Scrap Metal Recycling in Remote Northern Communities. A Pilot project Implementation Plan". Earthbound Environmental (January 2003) for Aboriginal & Northern Affairs (Government of Manitoba) and The Government of Nunavut.

19)"Northern Scrap Metal Recycling Project - PHASE II, Interim Report", North Central Development (November 2004) for Manitoba Conservation Waste Reduction and Pollution Prevention Fund.

20)"Feasibility Study for Recycling of Scrap metal and Hazardous Waste in Nunavik", Pesca Environnement (2004) for the Kativik Regional Government.

21)"Recommendations for Residual Material Management in Nunavik", PESCA Environnement (2004) for Kativik Environmental Advisory Committee.

22)"Kivalliq Pilot Project: the Repatriation of End-of-Life Vehicles and Scrap Metal", Department of Environment (January 2006) for the Government of Nunavut.

23)"Recycling and Reuse Guide ", Department of Environment, Government of Newfoundland and Labrador, Version 1, April, 2002

24)"End of Life Vehicle recycling in the European Union", Kanari, N. Pineau, J.L and Shallari, S., Journal of Minerals, Metal and Materials, August 2003.

25)"Generation of Waste from end-of-life vehicles", Indicator Fact Sheet (Term 2002 11a EU (WMF13), European Environment Agency, March 2003.

26)"Waste Management in Iceland", February 2005, http://English.ust.is/media/ljosmyndir/mengur/Waste_Management_in_Iceland_1_feb_05.pdf

27)"Selection of An Area in the Canadian Beaufort Sea for Disposal of Inert Bulky Materials such as Scrap Metal: An Assessment of Options", Environment Canada, September 1986.

28) Personal communication between the Department of Environment, the Governmne of Nunavut and Environment Canada, Northwest Territories, January 17, 2006.

29) "Analysis of Ocean Disposal in the Northwest Territories", Resource Futures International (April 1994) for Government of the Northwest Territories: Department of Renewable Resources.

30) Environment Canada's Disposal at Sea Program website, December 2005, http://www.ec.gc.ca/seadisposal/regs/gic_reg_g2_e.html.

31) Personal communication H. Yeh, January, 2006

32) "Final Draft Report #2: Rae-Edzo MSW Site Planning Phase 2", Ferguson Simek Clark Architects & Engineers (August 2003) for: Government of the Northwest Territories, Department of Public Work & Services

8.2 Other Sources of Information

"Thermal Recycling Options for ASR", Michael Day, Recycling Technology Newsletter at CANMET - MMSL, January 1998 issue, www.nrcan.gc.ca/mms/canmet-mtb/mmsl-lmsm/rnet/autoarte.htm

"Auto Fluff", Frank Wagner, Recycling Technology Newsletter at CANMET - MMSL, May 1996 issue, www.nrcan.gc.ca/mms/canmet-mtb/mmsl-lmsm/rnet/autoarte.htm

"Drive towards compliance, Recycling end-of-life vehicles in an enlarged EU", Recycling World, July 2005

Appendix A - Shipping Cost

Source: GN-DOE, 2005

Marine shipping can be completed by using either a tug-barge or cargo container ships. The information below provides shipping cost for tug-barge charter, and for back-haul shipping.

Option 1: Tug-Barge Charter Cost [1]

Tug size	2,200 Ton (2,000 metric tonne)	4,400 Ton (4,000 metric tonne)	9,350 Ton (8,500 metric tonne)
Rental	$10,000/day	$11,000/day	$11,500/day
Fuel -traveling [2]	$3,300/day	$3,960/day	$5,280/day
-anchoring [2]	$ 660/day	$ 660/day	$ 990/day

Note:

1. The estimated cost is based on quotes of towing companies such as Atlanic Towing Ltd, McKeil Marine Ltd, and so on.
2. The fuel consumption by a tug-barge varies between traveling and anchoring, loaded and unloaded barges, and sizes of barges:

	2,200 t	4,400 t	9,350 t
Fuel need: Traveling Anchoring	 5 ton/day 1 ton/day	 6 ton/day 1 ton/day	 8 ton/day 1.5 ton/day
Fuel cost:	$660/ton		

3. The tug-barge charter does not include costs such as port/docking cost.

Option 2: Back-Haul Shipping Cost[1]

Route 1: From the north to Montreal

	South Baffin	Kivalliq/Foxe Basin	High Arctic
NSSI	$2,611/container or $261/ton	$3,472/container or $347/ton	$3,414/container or $341/ton
NEAS	$2,897/container or $290/ton	$3,807/container or $381/ton	$3,749/container or $375/ton

Route 2: From Kivalliq to Churchill, then to Southern Manitoba (i.e. Selkirk)

Kivalliq (i.e.Rankin) to Churchill	Churchill to Selkirk	Total Cost: Rankin to Selkirk
Kivalliq Marine $216/ton	$ 3,000/trailer or $150/ton	$366/ton

Route 3: From Western Arctic to Hay River (NWT) then to Red Deer (Alberta)

Western Arctic (i.e. Kugluktuk)	Hay River to Red Deer	Total Cost: W. Arctic to Red Deer
$606/ton(NTCL)	$2,000/trailer or $91/ton	$697/ton

Note:

1. *The rates quoted above are shipping via containers, and the rates include the rental cost of containers or trailers. A sea container can contain approximately 10 tons. Note that shipping without containers would be subject to either volume or weight measurement depending on which measurement generates more revenue for shipping companies, except for NTCL shipping company that shipping cost calculated is always based on weight.*
2. *Gardewine uses both rail and truck services for the transportation from Churchill to Selkirk, and the rate is quoted per trailer (contain about 20 baled tons). The rate also includes the transportation from barge to the churchill dump for baling.*
3. *Kivalliq Marine charged $9,951 for shipping of 46 tons of recyclable metal in 2004.*
4. *From Hay River to Red Deer, the rate is $2,000 per trailer (22 tons).*
5. *NTCL charges $29.55/100LB, which comes to $591/ton. For a 20' container, $104/month (for a one-year lease) or $5/day. Assuming one-month rental is required for each shipping, container rental would cost $15/ton ($5*30d/10ton).*

Option 2: Back-Haul Shipping Cost (Summary)

	South Baffin	High Arctic	Kivalliq/ Foxe Basin	Western Arctic
Shipping [1] via Containers	\$275/ton [2]	\$358/ton [2]	\$365/ton [4]	\$697/ton [3]
Shipping without Containers	\$1,500/car [5]	\$1,500/car [5]	\$1,500/car [5]	\$591/ton [6]

Note:

1. *The shipping cost per ton is derived from the cost per container, assuming each container contains 10 tons of materials. The average shipping cost per ton via containers across Nunavut is \$424: (275+358+365+697)/4.*
2. *The shipping in those regions is via cargo ships to Montreal.*
3. *The shipping in western Arctic to Hay River, NWT, is only available by barges.*
4. *The shipping in Kivalliq can be done via barges to Churchill (then to southern Manitoba), or via cargo ships to Montreal.*
5. *Shipping of whole ELVs would cost approximately \$1,500 per passenger car or pick-up truck. But for heavy machinery, it would cost \$3,500-4,000 for south Baffin region, and \$4,500-5,000 for Kivalliq, Foxe Basin and High Arctic regions. This estimate is provided by NSSI shipping company.*
6. *The shipping of whole ELVs or heavy machineries (not in containers) is calculated by weight, which is approximately \$29.55/100LB, not by per-car-basis. The estimate is provided by NTCL.*

Appendix B – Cost Estimate of Green ELV Repatriation in Nunavut via Back-Haul Shipping

Source: GN-DOE

In order to estimate the ELV repatriation cost in Nunavut, the general equation presented earlier will be used. This was stated as: Preparation/processing cost[2] + Shipping cost[3] – Used part sales[4] – Metal Recovery[5].

	Iqaluit	Rankin Inlet	Cambridge Bay	Total
Preparation/Processing ($630/ton * 100ton)	$63,000	$63,000	$63,000	$189,000
Shipping	$27,500 ($275/t * 100t)	$36,500 ($365/t * 100t)	$69,700 ($697/t * 100t)	$133,700
Revenue ($110/ton * 110ton)	($11,000)	($11,000)	($11,000)	($33,000)
Total	$79,500	$88,500	$121,700	**$289,700**
Cost per Ton	$795	$885	$1,217	**$966**

Note:

1. *Recycling ELVs would focus efforts within larger communities. For this exercise it is assumed only 3 communities will be targeted for recycling efforts - Iqaluit, Rankin Inlet and Cambridge Bay. For comparison, it is assumed that all 3 communities have 100 ELVs each available for recycling.*
2. *The preparation/processing cost is $630/ton based on the Kivalliq pilot project.*
3. *The back-haul shipping rate with container rental for Iqaluit, Rankin Inlet and Cambridge Bay is $275/ton, $365/ton, and $697/ton respectively.*
4. *Motor Vehicle officers indicated that the majority of ELVs at landfills do not possess valuable used parts as the parts tend to be utilized by local mechanics or individuals within communities.*
5. *Green ELVs (with oil/fluids, batteries, and tires) are valued at $110/ton.*
6. *A green ELV (passenger vehicles or truck) weighs about 1 ton or 2000 lb.*
7. *It is assumed that each shipping container can contain 10 ELVs (or 10 tons).*

Appendix C - Cost Estimate of Scrap Metal Repatriation for Entire Nunavut via Tug-Barge Charter

Source: Humber Metal Ltd.

Repatriation Cost of Scrap Metal for Entire Nunavut

	Total (21 wks)
Labor (15 workers)	$ 847,246.05
Equipment:	
Excavators	$ 163,096.50
Trucks (2)	$ 63,000.00
Bailer (Metal)	$ 176,400.00
Landing Craft	$ 367,500.00
Tug and Barge	$1,690,500.00
Fuel:	
Tug Fuel	$ 641,067.00
Equipment Fuel	$ 464,583.63
Misc:	$ 150,000.00
Revenue: $110/ton * 10,000 ton	($1,100,000.00)
Total:	**$ 3,463,392.55 or ($346/ ton)**

Note:

1. *This cost estimate was proposed by Humber Metal Ltd., and is only intended for a reference. A more detailed study would be required to obtain a more accurate figure. The estimate is for the repatriation of 10,000 tons of ELVs and other recyclable metal that are assumed available in Nunavut.*
2. *The project would take approximately 147 days (~5months).*
3. *Would work 24 hr/day; should be able to process ~200 tons/day with 15 workers.*
4. *Landing craft is for landing a crusher on shore.*
5. *Tug/Barge: $11,500/day for a 8,500 ton load capacity barge (a 350' flat-topped barge).*

Appendix D - Industry and Government Contact Information

Source: GN-DOE

1. Environmental Consulting Firm

Dillon Consulting Ltd. Contact: Gary Strong PH: (867) 979-6712 Note: Dillon conducted various solid waste management studies for the Government of Nunavut.	**Emerge Environmental Information Solutions** (used to be Earthbound) Contact: Rick Penner PH: (204) 772-7239 or 774-0372 EM: rpenner@emergeknowledge.com Note: Emerge proposed an implementation plan for the Kivalliq/Manitoba scrap metal recycling project in 2003.

2. Government & Non-Profit Organizations Contact

Kativik Regional Government (KRG) Contact: Michael Barrett PH: (819) 964-2961 EM: mbarrett@krg.ca Note: KRG in Nunavik is interested in scrap metal recycling among other recyclables	**North Central Development (NCD)** Contact: Laura Finlay PH: (204) 677-1494 EM: lfinlay@northcentraldevelopment.ca Note: NCD was coordinating Kivalliq/Manitoba scrap metal recycling pilot project between Kivalliq region and northern Manitoba between 2002-present.

3. Miscellaneous

Directory of Recyclers: http://www.ccebj-jbace.ca/francais/publications/recycleurs/Recyclers-Directory.pdf Note: The directory provides contact information of recyclers in Quebec that recycle various recyclables (from scrap metals, paper, plastics and so on)

4. Potential Partners

Arctic Express Ltd. Contact: Ed Laraques (CEO) PH: (867) 979-0067 Note: This courier is interested in shipping recyclables down south with their empty containers.	Southeast Nunavut Contact: Bryan Hellwig PH: (867) 979-6495 or 979-6444 Note: The company has been recycling aluminum cans in Iqaluit for about 10 years.

5. Scrap Metal Buyers

Gerdau Ameristeel/Mandak Metals, Manitoba Web: http://www.ameristeel.com/index.cfm Note: Gerdau operates a mill in Selkirk, Manitoba, and Mandak collects/processes scrap metals in Selkirk.	**Globe Metal Recycling Scrap Yard**, Quebec Contact: Jeff Soloman PH: (450) 635-9397 ext. 27 or 638-1732 EM: jeff@globemetal.com Web: www.globemetal.com
Quebec Metal Recycle Inc. (SNF), Quebec Contact: Norman Trottier PH: 1(800) 465-9818 EM: ntrottier@snf.ca Web: www.snf.ca	

6. Scrap Dealers

Rightway Recycler, Manitoba Contact: George Kopec PH: (204) 772-7239 or 774-0372 Note: Rightway crushed and baled vehicles for the Manitoba/Kivilliq scrap metal recycling project in Churchill, and it was also involved in the shipment of scrap metals by rail and trucks.	**Humber Metals Ltd.**, Newfoundland Contact: Frank Compagnon PH: (709) 632-8715 EM: frank_compagnon@msn.com
Newco Metal & Auto Recycling, Newfoundland Contact: Yvon Champaign & Paul Abbott PH: (450) 468-5983; Champaign or(709) 753-3070 EM: newco@nf.aibn.com	**Eco-Centre Arthur-Gagnon**, Quebec Contact: Jack Landry or Gail Weir PH: (819) 797-6614 ext. 225 or 763-5796 EM: weir_gail@hotmail.com
Trans-Metal, Quebec Contact: Mr. Villeneuve or Angela Villeneuve PH:1(866) 732-0283or (819) 732-0283 or 727-4604 EM: angelavilleneuve@hotmail.com	

7. Shipping Companies (At Sea)

Kivalliq Marine (used to be Moosenee) Contact: Marc Cool PH: (204) 675-8148 EM: mcool.paytahpuninc@onlink.net Web: http://www.kivalliqmarine.com/id2.html Note: Deal with Kivalliq region.	**NEAS** (Nunavut Eastern Arctic Shipping) Contact: Paul Ghaleb PH: 1(877) 225-6327 EM: pghaleb@nanuk.ca Web: http://www.neas.ca/en/contact.html Note: Deal with all regions except Kitikmeot region.
NSSI (Nunavut Sealink and Supply Inc.) Contact: Daniel Desgagnes PH: (450) 635-0833 EM: daniel.desgagnes@transarctik.desgagnes.com Web:http://www.arcticsealift.com/en/index.cfm http://www.groupedesgagnes.com/en/home/4.cfm Note: Deal with all regions except Kitikmeot region. NSSI is a partnership between Transport Desgagnes and Arctic Co-operatives Ltd.	**NTCL** (Northern Transportation Company Ltd) Contact: Joan Jensen PH: (867) 874-5121 EM: jjensen@ntcl.com Web: http://www.ntcl.com/ Note: Deal with only Kitikmeot in the past; may expand to other regions.

8. Shipping Companies (On Land)

CN Rail Contact: Ted Wheaton PH: 1(888) 668-4626 EM: ted.wheaton@cn.ca Note: Rail transportation from Churchill to southern Manitoba.	**Gardewine North** Contact: Jim Farel PH: (204) 778-9916 or 778-8311 Note: Deal with northern Manitoba; transportation via rail and trucks.
Omni Trax Co. Contact: Erise Thorton PH: (204) 953-3682 Note: Deal with shoreline rail transportation that is not covered by CN Rail.	**Rightway Recyclers** Contact: George Kopec PH: (204) 770-3813 Note: Deal with northern Manitoba; transportation via rail and trucks.

9. Steel Mill

General Scrap Partnership, Manitoba Contact: Sebastian Lau PH: (204) 943-0563 EM: sametco@genscrap.com Web: www.genscrap.com	**Gerdau Ameristeel/Mandak Metals**, Manitoba Contact: Yuan Wang PH: (204) 482-3241 EM: info@mrmsteel.com Web: http://www.ameristeel.com/index.cfm www.mrmsteel.com Note: Gerdau operates a mill in Selkirk, Manitoba, and Mandak collects/processes scrap metal
Great-West Metal Ltd., Manitoba PH: (204) 942-2451	

10. Towing Marine (i.e. Barge Rental)

Atlantic Towing Ltd. Contact: Jill Blackmore PH: (902) 494-5405 or 494-5400 EM: blackmore.jill@atlantow.com Web: www.atlantictowing.com	**Coastal Shipping** Contact: Dennis White PH: (709) 579-6127 EM: dwhite@woodwards.nf.ca
Cooper Barging EM: michaelc@cooperservices.ca	**Legrow's Marine Services Ltd.** PH: (902) 465-4161
McKeil Marine Contact: Alan Brigden PH: (514) 640-4970 or 346-4966 EM: abrigden@mckeil.com Web: www.mckeil.com	**Miller Shipping Ltd.** PH: (709) 754-4543
Secunda Marine Services Ltd. Contact: Chris Pitts PH: (902) 465-3400 EM: chrisp@secunda.com Web: www.secunda.com	

From: Dahl,Mark [Wpg] [Mark.Dahl@EC.GC.CA]
Sent: Friday, October 30, 2009 10:32 AM
To: nancy@concentriceng.com
Cc: Taillefer,David [NCR]; SEA-MER [NCR]; Ogilvie,Carey [Yel]
Subject: RE: Disposal At Sea Enquiry
Ms. Caldwell,

Though no ocean disposal of scrap metal has taken place in in Nunavut within the last 10 years the following information may be of use to you:

Historical activity:
- In 1994 a permit to dispose of scrap metal at sea was issued to Panarctic Oils Ltd.. The proposed disposal site was near Lougheed Island but the permit was rescinded due to public concern and no disposal of scrap took place.
- The only disposal at sea permit issued in Nunavut during the last 10 years was for the on-ice disposal of salt at the Hope Bay Mining project in Roberts Bay Nunavut. Ultimately the disposal did not take place as the Proponent found an alternate use for the salt so the permit was not used.

Current activity:
- The Department of Fisheries and Oceans (Small Craft Harbours) is in the process of expanding the harbour at Pangnirtung on Baffin Island. The project will likely involve the disposal of dredge spoil at sea in 2010 or 2011. The proponent has not submitted a Disposal at Sea permit application yet and no the disposal site has not been identified.

Please contact me if you require any further information.

Mark Dahl
EAMD,
Environment Canada
Tel - 204 983 4815
Fax - 204 983 0960

From: L'Heureux,Sylviane [NCR] **On Behalf Of** SEA-MER [NCR]
Sent: Thursday, October 29, 2009 2:50 PM
To: Dahl,Mark [Wpg]
Cc: Taillefer,David [NCR]
Subject: FW: Disposal At Sea Enquiry

Hi Mark,

this is a request we have received on our website. I have looked them up to see who they were, I have attached their website address: http://www.concentriceng.com/
You can reply directly to Mrs. Caldwell with a cc to sea-mer@ec.gc.ca for my files.

thanks
Sylviane

From: Nancy Caldwell [mailto:nancy@concentriceng.com]
Sent: Thursday, October 29, 2009 3:26 PM
To: SEA-MER [NCR]
Subject: Disposal At Sea Enquiry

Can you please tell me if there are any existing disposal sites in Nunavut and if so if they have been used within the past 10 years? I am particularly interested in sites in which scrap metal may have been disposed of.

Kind regards,
Nancy

Nancy Caldwell
700 Richmond Street, Suite 104
London, Ontario
N6A 5C7
P: 519-452-7700
F: 519-452-1712
C: 519-495-2437
www.concentriceng.com

Concentric Associates International Incorporated small

From: Premier Recycling Timmins [premier@persona.ca]
Sent: Friday, November 27, 2009 2:44 PM
To: nancy@concentriceng.com
Subject: FW: Scrap metal site in Nunavut

Nancy,

The dimension of the two pieces of equipment you require:

The excavator with the attached shear is about 9'x30' with a height of about 11'. It weighs about 70,000 lbs.

The mobile magnet is a log loader (Serco 200) equipped with a hydraulic generator, grapple and magnet mounted onto a tandem truck (International 7400). The size is about 8'x30' with a height of about 12.5'. It weighs about 50,000lbs.

The vehicles will be prepared before being bailed as per MOE specs. The CFC from the refridgerators will be drained.

Hope this helps...

Jennifer Vachon-Cloutier
Premier Recycling Timmins Ltd
705-268-7415

-----Original Message-----

From: Nancy Caldwell [mailto:nancy@concentriceng.com]
Sent: Friday, November 27, 2009 1:17 PM
To: 'Premier Recycling Timmins'
Subject: RE: Scrap metal site in Nunavut

Hi Morris,

Can you give me both dimensions and weight of the excavator equipped with shear and the mobile magnet so I may determine shipping costs? What does the magnet come attached to?

Thank you,

Nancy

Nancy Caldwell
P: 519-452-7700
F: 519-452-1712
C: 519-495-2437
www.concentriceng.com

Concentric Associates International Incorporated

From: Premier Recycling Timmins [mailto:premier@persona.ca]
Sent: November 27, 2009 10:17 AM
To: nancy@concentriceng.com
Subject: FW: Scrap metal site in Nunavut

Hi Nancy,

There are no shipping routes from Timmins to Cape Dorset. We would have to go through Quebec as you mentioned.

For your next question regarding the cost, the key is how quick can you get us to Cape Dorset and back once the job is complete. Our rate is about $17,000 a day from the time the equipment and crew leave our location (Timmins) to the time they return to our location (Timmins).

If you have any further questions, please don't hesitate to ask.

Regards,

Morris Lindenbaum
Premier Recycling Timmins Ltd.
705-268-7415
705-365-8425

----- Original Message -----

From: Premier Recycling Timmins <mailto:premier@persona.ca>
To: MORRIS <mailto:morris_premier@persona.ca>
Sent: Friday, November 27, 2009 9:48 AM
Subject: FW: Scrap metal site in Nunavut

From: Nancy Caldwell [mailto:nancy@concentriceng.com]
Sent: Thursday, November 26, 2009 9:22 AM
To: 'Premier Recycling Timmins'
Subject: RE: Scrap metal site in Nunavut

Thank for all the information Morris, it is extremely helpful. Is there a shipping route from your location to Cape Dorset? I only looked into shipping routes from Quebec to Cape Dorset.

You indicated that you could provide us with a quote in the future.

Would it be possible for you to provide us now, with a range of what you think it might cost to do the job? We are not asking for any sort of official quote.

Kind regards,

Nancy

Nancy Caldwell
P: 519-452-7700
F: 519-452-1712
C: 519-495-2437
www.concentriceng.com
Concentric Associates International Incorporated

From: Premier Recycling Timmins [mailto:premier@persona.ca]
Sent: November 25, 2009 12:09 PM
To: nancy@concentriceng.com
Subject: FW: Scrap metal site in Nunavut

Hi Nancy,

Thank you for all the additional information you provided us with.

Based on the pictures of the job site, this is a straightforward job that can be processed within 3-4 weeks. Using a shear to prepare the material allows us to complete the job in a fraction of the time.

We are not prepared to rent or lease out our equipment. In order for our equipment to be used, it must be completed by Premier Recycling personnel only.

We can quote you a price in the future using our equipment and our men to do the job. We suggest sending three pieces of equipment, one pick-up truck and 3 crew members.   Our crew members are all fully trained to operate all pieces of equipment as well as torch cutting. They can also do most equipment troubleshooting and repairs in case of breakdown.

Floating of the equipment from our location in Timmins to the job site be done and paid by others as well as all accommodations during the course of the job (we can do all this but it would be much more costly).

The three pieces of equipment that we will be sending are:

- Excavator equipped with shear
- Al-Jon 580 Bailer with tractor

- Mobile magnet

We will also be sending pick-up truck, cutting torches, and if needed oxygen and propane.

Fuel to be provided and paid by others. We will need approximately 750 litres of fuel daily.

The processed material at the current market price has a value of approximately $400,000-500,000 in either Montreal or Hamilton provided the estimated tonnage is correct. However we do not know what the cost of shipping will be from the job site to market. We will buy the material in its final destination whether be Montreal or Hamilton.

We can arrange for the tires to be disposed off. We can load them into the ship and have them delivered to the same scrap destination. Once at the destination, they can be picked up and delivered to appropriate recyclers. The cost from this point (Hamilton or Montreal) is about $5.00 per car tire and $20 per truck tire.

If we reach an agreement, we will need roughly four months notice prior to commencing the job in order to schedule the equipment and ensure all maintenance of the equipment is complete.

We are committing about 1.5 million dollars of assets plus qualified people to the project therefore we have no doubt that this project will be completed in a timely and safe manner.

I look forward to further discussing with you the possibilities of this project.

Regards,

Morris Lindenbaum

Premier Recycling Timmins Ltd.
705-268-7415
705-365-8425

From: Nancy Caldwell [mailto:nancy@concentriceng.com]

Sent: Monday, November 23, 2009 9:46 AM

To: 'Premier Recycling Timmins'

Subject: RE: Scrap metal site in Nunavut

Hi Morris,

Thank you for taking the time to write regarding the project in Nunavut. I don't know how much Dave has told you, but Concentric has been hired to provide management options for Cape Dorset's metal disposal site.

At the moment the project is in its very initial stages and we don't know yet what management option the local government will decide upon although our recommendation is to bale the material and ship it south to be sold. I am quite sure that this is the option the government will go with and as such we are trying to come up with some very preliminary pricing. Cape Dorset is located off the south coast of Baffin Island; it can only be reached by sea or air (small plane). Any equipment, therefore, will have to be taken in by boat. The season is very short - first boat in is in July, they come again in August and late October/early November.

The details of the project are as follows:

Volume of material present (not all of this is metal) = 11800 cubic meters

Estimated weight of scrap metal only - 2100 metric tonnes

Cost to ship a baler in (eg. Aljon 580CL) to Dorset is about $40,000

Cost for diesel (there is a source in Dorset) = roughly $1.30 - 1.40/L

Equipment already present in town (one contractor only) = excavator, dump truck, front end loader.

Labour costs are roughly $20 for unskilled and $25-30 for skilled.

Anywhere from $125-$300/hour for equipment plus operator (these figures might be a bit low)

Shipping costs are done by weight or volume whichever costs more.

Cost to ship south is $228/1000kg or 2.5 cubic meters. Northbound is

$250/tonne/2.5 m3. This is shipping WITHOUT using a container.

I'm looking for a rough breakdown of costs, materials, and time which would include:

1. Cost and time to segregate and prep the waste (drain fluids, torch-cut large pieces, etc.).

· How long would this take?

· What machinery would be required?

· I think that bringing up a shear might be beyond the scope of this project (cost) so the larger stuff may have to be torch-cut.

· How many people would be needed for this phase and what would be a rough hourly rate for the labor?

2. Cost to lease/rent a baler and time required.

· How long would it take to bale all the material (6 weeks)?

· Cost to lease/rent a baler large enough to bale whole cars (engine in).

· Cost for a baler that can do everything but the big stuff such as cars.

3. Cost to operate the baler?

· Per hour or per day?

I have separated it out into a prep phase and then a baling phase (although I know they are often just done together) because I'm not sure it can be done in one season. The prep may have to be done in one season and the baling and shipping out of the metal during the next season. You would know better given your experience.

Other questions:

1. Would you take care of the shipping of the metal and transport to a recycler in addition to the sorting/baling?

2. Would you take care of seeing that the hazardous materials and for example tires were shipped south and disposed of?

3. Do you normally keep the scrap and profits from the sale (to offset cost)?

I guess a one stop shop would be ideal where you would come in process the metal and associated hazardous wastes and then manage their removal and disposal. I don't know what you have done in the past so I will be interested to hear what you think of the project!

I have attached pictures of the site as well as a volumetric survey that we conducted this summer (showing approximate volumes of each type of material). I realize it might be easier to discuss over the phone but thought I would give you some detail upfront to ponder.

I look forward to hearing from you.

Kind regards,

Nancy

Nancy Caldwell

P: 519-452-7700
F: 519-452-1712
C: 519-495-2437
www.concentriceng.com
Concentric Associates International Incorporated

From: Premier Recycling Timmins [mailto:premier@persona.ca]
Sent: November 20, 2009 4:15 PM
To: nancy@concentriceng.com
Subject: FW: Scrap metal site in Nunavut

Hi Nancy,

We were contacted by Dave Little from Al-Jon to look into scrap clean up job in Nunavut.

Over the years, we have specialized in remote area jobs such Moosonee, Moose Factory etc. We are fully equipped with mobile equipment including mobile bailer, shear, magnet and various trucks. We are located in Timmins, ON and serving the area between Thunder Bay through to North Bay.

If you require further information, please feel free to contact our office at 705-268-7415 or premier@personca.ca

Morris Lindenbaum
Premier Recycling Timmins Ltd.
705-268-7415Â

From: David Little [dlittle@aljon.com]
Sent: Tuesday, November 03, 2009 11:38 AM
To: Nancy Caldwell
Cc: Curt Spry
Subject: RE: Scrap metal site in Nunavut

Hi Nancy

We did some calculations and some guesstimates on info you have supplied. As you can imagine this type of measurement is a very inexact science so we need to use a range of volume reduction rather than specific numbers.

Using a 580CL to bale complete cars (engine, transmission, wheels, etc) you can count on a volume reduction of 85-90%. Recall our discussion on removing batteries, gas and gas tanks, mercury switches.

Using 580CL 0n loose tin and appliances you can count on a volume reductions of 75-90% depending on what it is you are baling.

In looking at the pictures I see material that you would not be able to bale such as excavators, heavy tanks etc. This would need to be either sheared or torch cut into +/- 3 ft. lengths.

I am working with our distributor in Montreal to see if he has someone who will take on the overall clean-up project. Would like to discuss some details with you when you have some time.

Thanks

David Little
International Sales Manager
Al-Jon Manufacturing LLC
15075 Al-Jon Avenue
Ottumwa, Iowa 52501 USA
Phone: +1 641 455 5635
Cell: +1 612 845 8164
Email: dlittle@aljon.com
Web: www.aljon.com

Keeping it Simple ... Building it Strong

-----Original Message-----
From: Nancy Caldwell [mailto:nancy@concentriceng.com]
Sent: Friday, October 30, 2009 9:56 AM
To: David Little
Subject: RE: Scrap metal site in Nunavut

Heh Dave,

What kind of percentage volume reduction do you typically get with say the 580 CL? I know this would be material dependent, but just an average for cars and miscellaneous scrap would be very helpful. If I have 11000 cubic meters of material that is compactable what would I get it down to roughly?

Also what would you say is the average volume of a bale (I realize the length various so am just asking for an estimate)?

I was looking at the specs for the 580 CL and using bale size was trying to figure out the above but again with only volume it's hard.

Nancy Caldwell
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C: 519-495-2437
www.concentriceng.com

From: Faramarzi Maryam [maryam.faramarzi@transarctik.desgagnes.com]
Sent: Tuesday, November 03, 2009 3:07 PM
To: Nancy Caldwell
Subject: RE: Cost to ship compactor
Hi,

Now I get 175 m³!! But you know what to do now, right? Anyways I just printed the schematics. Haven't had the chance to look at it yet. Not that I would understand anything anyways, but I should forward it to François.

Let me know fi there is anything else. Don't worry about bothering, it is my job!

Have a great rest of the afternoon.

Maryam Faramarzi

7

Desgagnés Transarctik Inc. / Taqramut Transport Inc.

Nunavut Sealink & Supply Inc.

6565 Hebert Blvd, suite 201

Ste-Catherine (Quebec) J5C 1B5

Phone: (450) 635-0833, toll free 1 (866) 732-5438

Fax: (450) 635-5126, toll free 1 (866) 638-4534

e-mail: maryam.faramarzI@transarctik.desgagnes.com

website: www.arcticsealift.com

De : Nancy Caldwell [mailto:nancy@concentriceng.com]
Envoyé : 3 novembre 2009 15:02
À : Faramarzi Maryam
Objet : Re: Cost to ship compactor

I think we may have got our wires crossed with the dimensions. From the schematics I think the height would be about 162 inches not 490.

Thank you :-)

Nancy

2009/11/3 Faramarzi Maryam <maryam.faramarzi@transarctik.desgagnes.com>
Hello Nancy

Let me tell you that we always take whichever method that produces the higher value. As per the dimensions you gave me, I got 520.95 m³. (636 in x 102 in x 490 in)
Then you have to multiply that with $350.80 and divide by 2.5. Unless I have the dimensions all wrong.

We only deliver to the beach. You will have to make your own arrangements for delivery from the beach to the site.

Let me know if you are still unsure of pricing.

Thanks

Maryam Faramarzi

7

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e-mail: maryam.faramarzI@transarctik.desgagnes.com

website: www.arcticsealift.com

De : Nancy Caldwell [mailto:nancy@concentriceng.com]
Envoyé : 3 novembre 2009 14:38
À : Faramarzi Maryam
Objet : Cost to ship compactor

Hi again Marayam,

Sorry to bother you again. I was trying to figure out how you came up with the figure of $73000 to ship the larger of the two compactors we were discussing. If the machine is 42 tonnes (or 42000 kg) would you not just multiply 42 by $350.80 = $14 733.60.

Or...looking at the schematic for the 580XL I figure it's 16m L x 2.6m W x 4 m H = 172 cubic meters. 172 cubic meters should I think cost $24 166.50 to ship. Correct?

When would you charge by weight and when by volume since the cost is different?

Sorry, I'm don't quite understand how the pricing works yet.

Nancy

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SCRAP METAL RECYCLING in NUNAVUT & NORTHERN MANITOBA

Collection and Recovery Action Plan
March 30, 2007

FINAL REPORT

Prepared for:

Canada

Government of Canada
Climate Change Mitigation Program
Enhanced Recycling

Prepared by:

North Central Development

North Central Development

Table of Contents

1. Executive Summary

In September of 2006, North Central Development Corporation (NCD) completed the *Northern Scrap Metal Recycling Pilot Project.* This involved coordination of the sorting, baling, and movement of scrap metal in three northern communities in Manitoba and Nunavut. The project generated interest in scrap metal removal from various other northern communities who want to implement similar recycling initiatives. In addition, 11 recommendations were presented for future considerations by communities and organizations that continue to recycle scrap metal in the north.

As research on climate change has continued to grow, a commitment to further explore ways to reduce greenhouse gas emissions (GHGs) has become a goal for the federal government. Natural Resources Canada initiated several partnerships across Canada to strategically develop a comprehensive regional plan to reduce GHGs through the removal of scrap metal from Canada's north. NCD was identified as one of these partners to develop this strategic plan for Manitoba's North and Nunavut. As a result, this "Collection and Recovery Action Plan" was developed. The primary goal of the Action Plan was to determine both short and long term plans to identify a cost effective and feasible method for removing and transporting scrap metal in the north.

Given the vast area in northern Manitoba and Nunavut, the first step was to identify specific geographic regions that would allow accurate analysis. Shared transportation links between the Kivalliq Region of Nunavut and the northern Bayline communities created a good fit for a regional approach. In the Kivalliq Region, seven communities along the Hudson Bay in Nunavut share a seasonal barge route from north to the mainland at Churchill, Manitoba. In northern Manitoba, nine communities are situated along the Hudson Bay Rail Line that connects these northern communities to the south. A unique aspect of all these communities is that they are small and somewhat isolated. With only a few exceptions, these communities are not accessible by all season roads. They rely on train and barge schedules and inclement weather negatively impacts travel outside the region. Additionally, small communities lack the resources to individually participate in recycling projects. A regional approach using shared transportation routes allows northern participation in removal of historical and ongoing scrap metal.

The Action Plan process consisted of four objectives:

1) To quantify the extent of metals stockpiled in selected remote and northern communities of Northern Manitoba and Nunavut.
2) Determine schedule of routine "build-up" of scrap metal in community landfills.
3) Develop a plan of action for collecting scrap metal throughout the target area both in the short and long terms.
4) Assemble a group of dedicated individuals (and organizations) to guide the project and to help recruit support for the scrap recovery initiative from the public and private sectors in both Manitoba and Nunavut.

The first step in creating the Action Plan was to formalize an advisory committee. The advisory committee consisted of individuals from various sectors including Manitoba Metals, OmniTRAX, Aboriginal Northern Affairs, the Government of Nunuavut, Natural Resources Canada, Thompson Recycling Centre, and community/hamlet representatives.

The next step was to collect data through site visits, interviews and meetings, and review previous studies and reports. Scrap metal inventories were taken, with assessments completed of each community's capabilities.

Consultations with communities, transportation companies and others involved in the process revealed two key factors:

1) Recycling scrap metal generates far more expense than revenue.
2) Few northern communities are adequately educated or trained to deal with scrap metal.

In order to overcome these obstacles, a regional approach to reduce costs and increase revenues, and to educate, train and build capacity within communities, has been presented. This includes partnerships between government, private sector and the public. Components of this approach include:

- Communities training other communities
- The private sector providing services as well as training within communities
- Sharing of equipment
- Coordinating transportation schedules
- Generating revenue through legislation. I.e. implementation of levies
- Creating a Northern Scrap Metal Stewardship Board
- Building awareness and gaining public support through regional campaigns.

It has been determined that the build-up of scrap metal in the Kivalliq and Bayline regions is significant, though impossible to determine exact amounts because of the regretful practice of burying it. Removal of historical stockpiles will collectively result in a significant reduction of greenhouse gas emissions. In addition, an ongoing plan to remove constant build up proves to further reduce GHGs, clean up the north and instill pride in our northern communities.

2. Introduction

2.1 Background on Recycling Scrap Metal in the North

The 2004/2005 Pilot Project coordinated by NCD (please see **Attachment A** for background information and Board of Directors Listing) was able to successfully remove 2200 tons of scrap metal from 3 northern communities, Rankin Inlet (Nunavut), Churchill (Manitoba) and Gillam (Manitoba). From the recommendations of the pilot project, geographical distance was identified as a barrier in successful and profitable recovery of scrap metal stockpiles. As moving costs are prohibitive, it was recommended a regional approach regarding coordination of transportation schedules and costs be adopted.

Nunavut:
The Nunavut territory is comprised of several regions, one of which is the Kivalliq Region. This region includes seven hamlets along the west coast of the Hudson Bay which all share a direct transport link to Churchill Manitoba via the barge. There are two barge companies that service this region, Northern Transportation Company Limited (NTCL) and Desgagnes Transarctik Inc. The barges operate between July and September, bringing in supplies to the hamlets. They often return empty which provides an opportunity to send scrap metal out on what is called a "back-haul" rate. This rate is less expensive than the regular rates and can benefit both the hamlets as well as the shipping companies.

As of 2007, Rankin Inlet is the only community in the Kivalliq Region that has sent scrap metal out. Although there has been interest from the other hamlets, in particular Baker Lake and Coral Harbour, they lack the resources to do so.

In February 2006, the Government of Nunavut's Department of Environment released a study called "Management Options for End-Of-Life Vehicles (ELVs) in Nunavut". There were 10 recommendations made from this study, one of which was to complete an inventory that would outline current waste metal management, estimate available metal types and volumes within communities. While working on the "Collection and Recovery Action Plan", NCD was able to partner with the Government of Nunavut (GN) in completing an inventory of the Kivalliq Region. The partnership created has been beneficial to both organizations and it is apparent that the Government of Nunavut is committed to continuing efforts to not only remove scrap metal from the north, but also establish an overall Waste Management System that includes all types of recycling.

Northern Manitoba:
Northern Manitoba is comprised of many small communities with several different transportation networks. While many communities have year round road access, there are many that only have "winter roads" that are open for six to eight weeks in January and February, or no roads at all. These communities rely on rail and air for transportation. OmniTRAX owns the rail line from Churchill to the Pas, and CN from the Pas to Selkirk. There are nine Bayline communities that share this direct transport link to Selkirk, Manitoba where the scrap metal processing plant is. It is for this reason that these nine communities were chosen to be a part of the "Collection and Recovery Action Plan." However, five of the communities have year round road access, and another three have winter road access. Therefore, sending scrap metal by rail from all of these communities is not the only option.

Seven of the nine communities have had a scrap metal clean up at different times. During the Pilot Project of 2004/2005 Churchill and Gillam participated and successfully removed 2,154 tons of scrap material. In the other communities, a scrap dealer has either come to the community seeking scrap, or the community has contacted them to do a cleanup. This involves no cost to the community, with the value of the scrap acting as financial incentive. Larger communities are sometimes paid a certain amount per tonne, depending upon market conditions. Fluctuations in scrap metal value and transportation costs determines private sector interest; enough scrap metal must exist in an area to make it worthwhile. Small communities may not generate enough scrap to entice the scrap metal dealer to remove it, especially with increased distance to travel. It is for these reasons that a regional approach has been recommended.

Four of the nine communities are overseen by Aboriginal Northern Affairs (ANA) that have been involved in the “ANA Scrap Metal Recycling Pilot Project Phase 1.” This Pilot Project has determined that there is potentially enough scrap material to bring in a scrap dealer, with the addition of privately owned derelict vehicles located throughout the town to accumulated scrap metal at the landfill. ANA has submitted a proposal to provide funding to communities to assist them in the collection of derelict vehicles from local residents. Financial incentives are necessary as community residents see a value in their old vehicles and are not willing to give them up without compensation. A partnership between ANA and NCD has been created since both organizations required inventories for their projects. NCD was able to provide inventories for two of the communities involved with ANA.

2.2 Benefits of Recycling Scrap Metal

There are several important benefits that can result from implementing scrap metal recycling. The benefits include environmental harm reduction, economic development, improvement in waste management practices and a public engaged through education.

Environmental Improvement

Communities that implement scrap metal recycling programs will no longer be littered with scrap metal, which will provide ecological and environmental health benefits. Removing scrap metal, derelict cars, and white goods in particular, will protect surface water, ground water, and soil quality by preventing potential spills of fuels, lubricants and coolants. The natural environment will be improved aesthetically by cleaning littered scrap metal. Greenhouse gas emissions (GHGs) will be reduced, resulting in beneficial climate change impacts. The following chart shows the potential GHG savings that could result from scrap metal recycling in the north.

Table 1
Estimated GHG emission reductions

SCENARIO	**SCRAP** (In tonnes or tonnes/yr)	**MUNICIPALITIES & POPULATION**	**Net GHG SAVINGS** (In tonnes CO2e or tonnes CO2e/yr
Cleanup from Pilot Project 2004/2005	2,004 tonnes	*Nunavut*: Rankin Inlet *Manitoba:* Churchill Gillam Total Population (low)= 4,802	**2,472 Tonnes CO2e**
Estimated amount for one-time removal of historical stockpiles (2010)	13,000 tonnes/yr (diversion rate of 250 kg scrap metal/person/yr)	***Nunavut**:* Rankin Inlet, Coral Harbour, Baker Lake ***Manitoba***: Churchill, Gillam, Ilford/War Lake First Nation, Pikwitonei, Thicket Portage, Wabowden, The Pas/RM of Kelsey (includes Cormorant), Opaskwayak Cree Nation, Snow Lake, Flin Flon and Cranberry Portage area, Thompson area, Nelson House, Norway House and Norway House Cree Nation. Total Population (medium) = 50,891	**16,037 Tonnes CO2e/yr**

Note 1: Revised from "Greenhouse Gas Measurement Results" in *Scrap Metal Recycling in Remote Northern Communities*: *Final Report.* North Central Development - March 2006

Economic Development

The main benefits of a scrap metal recycling project in terms of economic development are:

1) Potential for job creation in the communities that implement scrap metal recycling programs.
2) Local project workers will gain training and work experience in scrap metal salvaging and potentially the operation of a recycled materials program. This will provide project workers with valuable and marketable skills.
3) Improved community aesthetics will contribute to making communities more attractive to tourism.
4) Backhaul loads for transport companies create opportunities for communities to take advantage of reduced rates and for the transport companies to generate further revenue, as well as reflecting good public relations and environmental stewardship.

Improvement in Waste Management Practices

Local waste management practices will be improved through the implementation of a scrap metal recycling project. Improved practices will include:

1) The implementation of guidelines for future management of scrap metal

2) Identification, separation and the proper disposal of hazardous wastes
3) The establishment of designated collection sites
4) The separation of recyclable materials from non-recyclable waste
5) The coordination of recovery operations

Public engaged through education

Increased awareness, promotion and education of environmental concerns regarding scrap metals allows individuals, communities and regions to critically assess the need for scrap metal recycling. Participation allows a heightened sense of environmental responsibility, ownership, and “buy-in;” all of which are necessary components in successful recycling programs.

2.3 Overview of Recycling Scrap Metal Process

Recommended process presently utilized in communities that recycle scrap metal.

Figure 1
Scrap Metal Recycling Process

Designated areas for different types of scrap is established at a collection / drop-off site

↓

Throughout the year, scrap metal is dropped off in these designated sites

↓

Trained workers sort ferrous and non-ferrous items & securely store valuable materials until transported

↓

Trained workers prepare materials: prohibited items are removed, refrigerants are decommissioned, objects containing hazardous materials are dealt with according to regulations, large and heavy objects are cut into smaller pieces

↓

Materials are compacted (crushed and baled), or are transported to a centre where they can be crushed and baled

↓

Prepared materials are sent to the processing plant where they are shredded, melted down, and made into new products

2.4 Key Barriers and Possible Solutions

While examining potential scrap metal recycling programs for northern communities, several key barriers have been identified. The following is a list of those barriers as well as potential solutions recommended by those involved with the process.

Table 2: Barriers & Solutions

Key Barrier	Possible Solution
High transportation costs	• Transportation companies require an efficient loading and unloading process: materials are prepared for handling facilitation (in containers, or crushed and baled). • Create loading area to the end of accessing prepared materials to utilize back haul opportunities. • Establish a regular schedule for removal of scrap and create a long-term contract with transport companies • Partner with government or industry on contracts with transportation companies • Nurture relationships with transport companies
Lack of funds	• Create a fund for recycling costs by charging levies, import fees, annual registration fees, tipping fees, etc. • Sort ferrous and non-ferrous metals, remove catalytic converters and recycle pop cans to create more revenue • Create inter-sectoral partnerships
Lack of community "buy-in"	• Awareness, education and training campaign leads to sense of responsibility, ability to evoke change and environmental ownership • Create jobs within communities • Financial incentives to allow environmental responsibility without incurring debt
Lack of coordination	• Establish Regional Recycling Centers • Hire a Regional (Northern Bayline communities and Kivalliq Region) Recycling Coordinator

3. Objectives

The overall goal of the "Collection and Recovery Action Plan" was to identify a cost effective and feasible method of removing and transporting accumulated scrap metal from the selected communities of Nunavut and Northern Manitoba. In order to do this, four objectives were identified:

1. To quantify the extent of metals stockpiled in selected remote and northern communities of Northern Manitoba and Nunavut.
2. Determine schedule of routine "build-up" of scrap metal in community landfills.
3. Develop a plan of action for collecting scrap metal throughout the target area both in the short and long terms.
4. Assemble a group of dedicated individuals and organizations to guide the project and to help recruit support for the scrap recovery initiative from the public and private sectors in both Manitoba and Nunavut.

Options for training key people in communities on the preparation of scrap materials were examined and it was hoped that training could occur as part of this project. Due to the short time frame, training was not completed. However, a training plan is included as **Attachment B** for future consideration.

4. Approach

4.1 Collecting Information

The information necessary to develop this plan was collected by the following:

1) Site visits were conducted in all seven hamlets of the Kivalliq Region of Nunavut by the coordinator of this project and the Director of Environment and his assistant (Govt. of Nunavut). The coordinator of this project visited six of the nine Bayline communities. During the visits, information was gathered by taking pictures and making calculations at all of the sites where scrap metal was collected. Information was also gathered by interviewing people within the community who are involved in the process of waste management. The coordinator of this project visited the scrap processing plant in Selkirk, Manitoba that is owned by Manitoba Metals (Gerdau Ameristeel). While there, she received training on the processes involved with recycling scrap metal and was instructed in how to make calculations when doing inventories in communities.

2) Interviews and meetings with a wide variety of relevant people were conducted. Manitoba Metals, Lynn Lake Salvage, and the Hamlet of Rankin Inlet provided much resource and support.

3) Relevant documents were reviewed.

4.2 Assembling Steering Committee

- The Steering Committee was assembled by contacting previous stakeholders of the 2004/2005 Pilot Project.
- Other interested parties were invited to participate
- Conference calls allowed the sharing of information and resources.

- Partnerships created included the Government of Nunavut and CFNCD conducting site visits together and Aboriginal Northern Affairs and CFNCD sharing inventory lists and information.

Please see **Attachment C** for List of Members and Contact Information

4.3 Recruiting Support and Creating Awareness

- Interviews conducted with CBC Radio and the Kivalliq News.
- CFNCD made presentation on "The Collection and Recovery Plan" during Kivalliq Chamber of Commerce meeting
- Presentation done while receiving Environmental Award for CFNCD involvement in 2004/2005 Pilot Project at the Kivalliq Chamber of Commerce, with approximately 50 key regional stakeholders in attendance.
- Contact established with two mining companies to the end of partnering in efforts to remove scrap metal.
- Provision of "Guide to Recycling Scrap Metal" manuals and DVD's to interested parties.

5. Key Players

5.1 Scrap Dealer/Processing Plant

Manitoba Metals (formerly known as Mandek Metals) sit on the Steering Committee, operate a scrap metal processing plant in Selkirk, Manitoba and are involved in the removal of scrap metal from communities. The company has been involved with NCD in the scrap metal projects since 2004/2005 project. Manitoba Metals has provided excellent resources in terms of advice, information and training.

5.2 Transportation Companies

Transport Degagnes provides a barge service to the seven communities of the Kivalliq Region and would be the transport company that would take the scrap metal from each hamlet to Churchill MB. They were able to provide quotes on prices and were an excellent resource.

The Northern Transportation Company Ltd. (NTCL) is another shipping company that could also transport scrap metal. Although contact was made, quotes were not provided at this time.

Kivalliq Marine is responsible for the Port of Churchill. They were involved in the Pilot Project of 2004/2005 and provided the shipping services from Rankin Inlet. They no longer provide transportation for the Kivalliq communities but they are now responsible for the loading and unloading of all cargoes in Churchill. They have indicated that they may provide services free of charge if the materials were well prepared and easy to handle. They would help with the unloading from the barge and then the re-loading to train or truck (if held at local holding site).

OmniTRAX provides rail service from Churchill to The Pas (this part of the track is called the Hudson Bay Railway). They were involved in the Pilot Project of 2004/2005 and moved almost 2200 tons of scrap metal from Churchill to Thompson. The rail track does run all of the way from

Churchill to Selkirk where the processing plant is. However, at The Pas ownership changes over to **CN Rail.** Contact has not been made with CN at this time (this information was learned late in the project and there was not time to pursue this).

Gardewine North trucking company was involved in the Pilot Project of 2004/2005. They were responsible for moving the scrap from the barge (coming from Rankin) to the storage site in Churchill. They also transported metal from Gillam and Thompson to Selkirk. They have been an excellent resource in this project.

5.3 Regional Transfer Sites

Churchill was involved in the Pilot Project of 2004/2005 not only as a community removing its own scrap metal, but also as a storage, processing and transfer site for the metal being brought in from Nunavut. The Town of Churchill committed significant human resources and expertise from their public works manager. The public works department played a lead role in the management of the project and offered technical and practical advice to North Central Development. They contributed more than $20,000 of in-kind services to the project and have indicated that they are willing to discuss continuing to be a staging area. There are however some concerns that need to be addressed such as:

- A secure site needs to be developed and the Town would need additional funds in order to provide this.
- Regulatory hurdles need to be identified and resolved.
- Any extra expenses incurred would need to be covered by the scrap metal program (such as equipment rental if the Town equipment is unavailable).

Thompson is often referred to as the "Hub-of-the North" because it is a regional centre that provides many services to several outlying communities. It is the third largest city in Manitoba and is the largest of the northern communities. The Thompson Recycling Centre (TRC) acts as a regional centre where communities can send their household recyclables for further processing (crushing and baling). Thompson could potentially become a staging area for scrap metal as well. The TRC has indicated that although they are not able to provide this service right now, in the future it may be an option. The Local Government District of Mystery Lake (LGD) oversees the Thompson landfill site where Thompson's scrap metal is stored. They are willing to discuss becoming a staging ground for scrap but will need more comprehensive details. Dumpage fees would need to be paid for storing materials, and materials would need to be prepared, processed and removed on a regular basis.

5.4 Government Agencies and Funders

Major funding and resources were provided by Natural Resources Canada, with monetary contributions by Manitoba Conservation, Waste Reduction and Pollution Prevention Fund (WRAPP). CFNDC provided the coordination of the project based on previous experience and continuing commitment to environmental initiatives. Other contributors in terms of partnering, resource sharing and information were provided by the Government of Nunavut and Aboriginal Northern Affairs. Funding and resources for the 2004/2005 Pilot Project, which provided the framework for this Action Plan, was provided by the above, Indian and Northern Affairs (INAC), EcoAction, Human Resource and Social Development Canada, Shell Environment Fund and Green Manitoba. For descriptions of past, present and potential project contributors, please see **Attachment D.**

5.5 Private Industry

Starfield Resources and **Shear Minerals Ltd.** are two mining companies with interests in Nunavut who could be potential partners in the establishment of a scrap metal recycling program. Contact has been established with both companies and the “Guide to Recycling Scrap Metal” manual and DVD have been provided.

5.6 Steering Committee

The **Scrap Metal Steering Committee** is a group of dedicated individuals and organizations who have guided and supported the scrap metal recovery initiatives. The combined knowledge and expertise of group members makes it a valuable resource for anyone interested in scrap metal recycling. Please see Attachment C for participant list and contact information.

Please see **Attachment E** for a list of contact information for Key Players

6. Nunavet Hamlet Details

6.1 Map of Kivalliq Region

Figure 2: Map of Kivalliq Region

6.2

Table 3
Hamlet Assessments Overview

(Please see Document: *NRCan Hamlet Assessments Overview Table 3*)

6.3 Notes to Table 3: Overview of Hamlets Involved

Arviat

Population: 2300
Accessibility: Plane, summer barge, winter cat trains
Recycling Programs: No formal, paper is recycled and sent out on Calm Air backhaul flights. Pop can recycling was done for 1 ½ years but discontinued due to lack of sustainability.
Landfill Site Management: Two landfill sites, with one located ½ mile from loading dock that is for metals. Metals are not separated, no current practice for proper disposal of fluids or decommissioning refrigerants. The hamlet burns used oil, resulting in 300-400 fuel barrels that have been crushed with lids on. Arviat is in the process of preparing a new landfill site with proper waste segregation.
Available Scrap Metal Recycling Resources: A mechanic and several other contractors are potential resources with the provision of training. Refrigerant technician would have to be brought in. Although the hamlet doesn't have the ability to crush and bale materials, equipment is available to move, load and unload scrap metal. Limited financial resources necessitates funding or incentives. The "Guide to Recycling Scrap Metal" manual and DVD has been provided as a resource.

Whale Cove

Population: 350
Accessibility: Airplane, summer barge, winter cat trains
Recycling Programs: While no recycling programs exist, used oil is sent out of the hamlet periodically. Fuel barrels are reused as waste containers.
Landfill Site Management: The hamlet is beginning to collect and separate metals but there are still five separate scrap metal locations. Vehicles have been separated and moved to a new site and batteries and hazardous waste are kept separate at the landfill site.
Available Scrap Metal Recycling Resources: With no mechanics or contractors in the community, training is imperative. A refrigerant technician would have to be brought in. Equipment is available for loading and unloading except for a flatbed, which may be provided by the barge. Limited financial resources necessitate funding or incentives. The "Guide to Recycling Scrap Metal" manual and DVD has been provided as a resource.

Rankin Inlet

Population: 3000
Accessibility: Airplane, summer barge and winter cat trains.
Recycling Programs: Rankin Inlet participated in the Pilot Project of 2004/2005 and successfully removed 106 tons of scrap metal. This consisted mostly of vehicles and big machinery. The hamlet uses a recycled oil burner, with used oil stored in the community garage.
Landfill Site Management: Metals are separated from other waste but not segregated by metal type. There are six areas with accumulated scrap metal in town, with white goods having been

buried and capped. Refrigerants have not been decommissioned. The hamlet continues to collect and prepare scrap for removal and presently have materials on the beach ready for loading (2007). It is estimated that there are approximately 70 vehicles per year (70 tons) that can be sent out for recycling. Major fuel usage in mining development has led to accumulation of approximately 6000 fuel barrels. Lids have been removed using an air chisel and a set of nibblers, requiring a time amount of ten minutes per barrel.

Available Scrap Metal Recycling Resources: An ongoing commitment to recycling scrap metal is evidenced by the contribution of equipment and services by the hamlet. Experience has been gained through previous projects. The equipment and ability to prepare scrap metal for removal exists, with the exception of that required for crushing and baling. Also, a refrigeration technician is not available. A barrel crusher, modified after having been vandalized, is available in the community with the two mining companies Shear Minerals and Starfield Resources having offered the capital costs to purchase a new one. The establishment of pop-can and other recycling programs and outside funding is currently being explored. Future potential resources include mining companies offsetting costs involved in barrel removal, the purchase or rental of a logger/baler for regional use, and increased community participation through the training and employment of local individuals.

Chesterfield Inlet

Population: 350

Accessibility: Airplane, summer barge, winter cat trains

Recycling Programs: There are no recycling programs in the community; however, used oils and transmission fluids are collected and stored in barrels and sent out on the barge for recycling.

Landfill Site Management: Scrap metal has been collected and separated into white goods, vehicles, snowmobiles and fuel barrels at the site, two miles from the loading dock. Vehicles have not been prepared and refrigerants have not been decommissioned. Barrels are used as waste containers, and build-up at the landfill site is not large at a number of 56.

Available Scrap Metal Recycling Resources: Equipment is available for loading and unloading, with a flatbed in the community until September 2007. Crushing to date has been done rather inefficiently using a front-end loader. A foreman and mechanics are potential resources for scrap metal preparation with the provision of training. A refrigerant technician would have to be brought in. Limited financial resources necessitate funding or incentives. The “Guide to Recycling Scrap Metal” manual and DVD has been provided as a resource.

Baker Lake

Population: 1500

Accessibility:

Recycling Programs: No scrap metal recycling has been done, with an unknown amount buried in unknown locations. The high school has a pop-can recycling program. Old batteries have been stored.

Landfill Site Management: Hazardous wastes are stored in 45-gallon barrels on pallets at the landfill site. There are four sites where scrap metal has been collected, with the scrap metal at the main site having been separated into barrels, white goods, vehicles and batteries. The scrap at the main site is somewhat separated into four areas: barrels, white goods, vehicles, and batteries. Vehicles have not been prepared and refrigerants have not been decommissioned. At this point there approximately 700 barrels are at the main site, but there is potential for many more due to the new mining activity in the area; one new gold mine will be opening for sure, and a potential uranium mine could open in 6-7 years.

Available Scrap Metal Recycling Resources:
Equipment for loading and unloading is available, as is a barrel crusher and experienced operators. Two contractors are available, and the mining companies Shear Metals and Starfield Resources have indicated strong interest in scrap metal removal partnerships. Training would be required as well as some financial assistance or incentive. Also, a technician would be needed to decommission the refrigerants. The hamlet has been given the "Guide to Recycling Scrap Metal" manual and DVD.

<u>Coral Harbour</u>

Population: 937
Accessibility: Airplane and summer barge.
Recycling Programs: No scrap metal has been recycled with an estimated 300 tons buried. Barrels are reused as waste containers.
Landfill Site Management: There are five sites with accumulated scrap metal. Landfill site was relocated three years ago, with scrap metal relocated to the new site. Scrap metal is separated and somewhat segregated. Hazardous wastes are stored in barrels and there is a retention pond which is an environmental concern. There is no large accumulation of fuel barrels due to reuse. 4 different sites
Available Scrap Metal Recycling Resources: The hamlet has big equipment for loading, unloading and transporting scrap metal. Crushing and logging/baling equipment is not available. Human resources include a mechanic, apprentice mechanic and a contractor who could, with training, provide preparation and transportation of scrap metal to loading area. A technician would be needed to decommission the refrigerants. The Senior Administrative Officer (SAO) is a community champion who advocates scrap metal recycling. An application for funds has been submitted to the Government of Nunavut for $20,000 to remove scrap metal. Public Works is willing to pick up white goods throughout the community and deliver them to the main site. The "Guide to Recycling Scrap Metal" manual and DVD was provided to the hamlet.

<u>Repulse Bay</u>

Population: 700
Accessibility: Airplane, summer barge, winter cat trains
Recycling Programs: There are no formal recycling programs in Repulse Bay and less than five years ago vehicles and big equipment were cut up and buried. A hazardous waste storage shed has been erected and three years ago 40-60 barrels of used oil was shipped to Montreal for recycling via the barge. When the mineral explorations companies have full or half full barrels, they take them with them when they leave. Extra fuel barrels are reused by the community for post signs or for garbage containers.
Landfill Site Management: Scrap metal is kept at the landfill site and is somewhat separated into the three main areas of vehicles, ATV's, and white goods.
Available Scrap Metal Recycling Resources:
Large equipment for loading and unloading is available, with the exception of a flatbed trailer. The barge generally has one available for hamlet use. Crushing and logging/baling equipment is not available. Human resources include two mechanics as well as a contractor who could, with training, provide preparation and transportation of scrap metal to loading area. Training would be required as well as some financial assistance or incentive. Also, a technician would be needed to decommission the refrigerants. The hamlet has been given the "Guide to Recycling Scrap Metal" manual and DVD.

Please see Attachment F for Hamlet Contact Information

6.4

Table 4
Hamlet Scrap Metal Inventory List

Please see Document *"NRCan Table 4"*

Please see Attachment G for GPS Locations of Scrap Metal in the Kivalliq Region

7. Nunavut Action Plan: Short and Long Term Plans

7.1

Table 5
Overview of Short-term and Long-term Plans

Recycling Process	Short-term	Long-term
Coordination	• Secure funding for a Regional Scrap Metal Coordinator (ideally for 3 years minimum)	• Establish a permanent position for a Regional Recycling Coordinator who oversees a complete recycling program (Scrap, household, tires, used oil, hazardous waste)
Training	• Rankin Inlet employee trained in scrap preparation now trains employees in other hamlets. Guide to Recycling Scrap & DVD are used as resource materials **OR** Scrap metal co. provides services • Refrigerant technician hired to decommission items	• Establish a training program for Recycling/Waste Managers offered through the Arctic College (8 week program). Manager then oversees and trains Hamlet employees on an on-going basis **OR** Scrap metal co. is contracted on a permanent basis • Refrigerant technician (resident of Nunavut) is trained and contracted on a permanent basis to serve the Kivalliq Region.
Designated areas for collection	• Collection sites already established are used • Hamlet oversees pickup of items from homes and private property	• Collection site established at port

Sorting Ferrous/Nonferrous and storing securely	• Locked storage building is identified and used for storing valuable parts and non-ferrous items	• Locked storage building located at the port is used for storing valuable parts and non-ferrous items
Preparing materials a) Vehicles	• local mechanic drains fluids and removes prohibited items, as well as valuable parts. • Fluids are disposed of using system in place • Salvaging of parts by community members	• Local mechanic or trained hamlet employees drain fluid and remove prohibited items, as well as valuable parts. • A complete Hazardous Waste system is established and fluids are disposed of using this system • Salvaged parts are stored and made available to community members
b) Barrels	• Barrel lids are removed and crushed using system in place	• Proper equipment is used to remove lids and crush barrels • Establish system so that companies responsible for bringing in barrels pay for complete cost of removal
c) Refrigerants	• Refrigerant technician hired to decommission items	• Refrigerant technician (resident of Nunavut) is trained and contracted on an ongoing basis to serve the Kivalliq Region.
d) bulky items	• Are cut to a size that makes	• Are cut to a size that makes transporting

e) tanks	transporting possible • Prepare following guidelines indicated by Manitoba Metals (need large opening or can be cut in half and used as container for loose items)	possible • Prepare following guidelines indicated by Manitoba Metals (need large opening or can be cut in half and used as container for loose items)
Preparing for transport a) crushing, baling b) containers	• send uncrushed and unbaled **OR** a scrap dealer brings up the equipment to properly crush and bale • loose materials are put into Sea Cans, used tanks, crates, or vehicles	• a logger/baler is rented or bought for use between the 7 hamlets of the Kivalliq Region. Materials are crushed and baled right at loading dock site. • items that cannot be crushed and baled are put into Sea Cans, used tanks, or crates
Transporting to loading site	• items are loaded onto a flatbed trailer (barge can provide one if community does not have) and brought to loading dock	• items are already at loading dock
Loading on barge	• hamlet workers or scrap dealer helps barge employees load using hamlet and/or barge equipment	• hamlet workers or scrap dealer helps barge employees load using hamlet and/or barge equipment
Transport to Churchill	• materials are brought to Churchill by barge on backhaul rates negotiated each season	• Materials are brought to Churchill by barge on backhaul rates that have been negotiated for a 3-5 year term

Transport & Storage in Churchill	• Materials are unloaded from barge (Kivalliq Marine) and are transported by Gardewine Truck to scrap metal storage site • Materials are stored at existing scrap metal site	• Materials are unloaded from barge (Kivalliq Marine) and are loaded directly onto train cars or are left at storage site until train is able to transport • A secure site is established at the port for storing materials
Further preparation a) crushing, baling	• in Churchill, scrap dealer uses logger/baler to prepare materials for transport to processing plant	• no further preparation needed.
Loading on train	• Town of Churchill or scrap dealer loads baled materials onto train	• Kivalliq Marine loads materials onto train
Transport to processing plant	• Materials are transported to Thompson where they are unloaded and put onto Gardewine Truck for transport to processing plant in Selkirk Manitoba.	• An on-going backhaul rate is established with OmniTRAX so that materials can be transported directly from Churchill to processing plant in Selkirk Manitoba.
Other Considerations: i) Timelines	• Year 1:prep materials and transfer to loading area • Year 2: load materials and transport as barge has room available, store in Churchill • Year 3: crush and bale, transport to	• On-going system is established so that when there is enough to justify a load it can be transported to Churchill

	Selkirk	
ii) Funding	• Seek government funding as well as private sector funding/donation	• Establish a levy system
iii) Partnerships	• Continue working with partnerships that have been formed between government agencies, hamlets, and private sectors	• Establish long-term partnerships especially amongst key players
iv) Steering Committee/ Stewardship Board	• Continuation of Scrap Metal Steering Committee to provide input and support of projects	• Establish a Stewardship Board to oversee the distribution of levy funds and provide resources and support
v) Household Recycling	• Is presently in early stages of development. Establish pop can recycling to help cover costs of scrap metal recycling.	• Establish Recycling Program that includes all recycling
vi) Media & Public support/awareness	• Continue to inform media (Kivalliq News, CBC Radio) of project developments	• Establish an on-going promotional/awareness campaign throughout the Kivalliq Region to create public support

7.2 Notes to Table 5

Short term in Regular Font
Long term in Italics

Coordination
In order to successfully remove scrap metal on a regional basis, it is essential that there be someone who can coordinate the project. Coordination will include training, close liaison with each of the hamlets on timelines for the preparation of the scrap, seeking additional funding, establishing good relations with the transportation and mining companies, and general project management. A three-year coordination position is important to the end of the project being overseen from start to finish.

In the long-term, a permanent position should be established for a Regional Recycling Coordinator who can actively administer a complete recycling program.

Training

Because of Rankin Inlet's participation in the Pilot Project of 2004/2005, local capacity for collecting, preparing and load scrap metal exists. With some additional training, potentially provided in-kind by Manitoba Metals, Rankin Inlet would have the ability to train others on a regional level. (See Attachment B for contact information). Ideally, someone from Rankin Inlet would receive training and travel to the other interested hamlets to "kick-start" their clean-up and provide hands-on training. Coordination is required to address training logistics in terms of potential trainees, equipment availability, etc. The trainer would spend two days in each hamlet and would begin by using the DVD and the "Guide to Recycling Scrap Metal" as presentation and resource material. Safety issues and concerns would be discussed. An overview of the processes involved would be presented and would include identification of metals, proper preparation of derelict vehicles and other machinery, handling procedures, hazardous materials handling, and first aid and emergency procedures. The rest of that day and the next would be spent at the landfill site sorting ferrous from non-ferrous items, preparing vehicles, snowmobiles, and ATV's, cutting up large items, setting aside fridges for decommissioning, etc. This would give the trainees an overview of what needs to be done and they would continue the process over the course of the summer.

Additional Comments:

1) The Government of Nunavut has put out an Expression of Interest (Spring 2007) for scrap metal removal. If a successful contract is completed, potential exists for contractor to provide on-site training during removal process. By building local capacity in scrap metal removal, the potential for long-term sustainability is increased.

In the long-term, waste management needs to become a part of every communities infrastructure. Courses and certifications should be available through post-secondary education. For example, courses could be offered at the College for Waste Management Specialists or Recycling Coordinators. The need for proper waste management is an ongoing concern and we need to ensure that communities are equipped to deal with this need.

Collection
The most salient factor regarding cost effectiveness in centralizing scrap metal is limiting the number of times the scrap is handled. Most of the hamlets presently have more than one scrap site.

Preparing at present sites and moving it from there to a “new” centralized site close to the barge loading area would be the most cost and time efficient method. The hamlets will need to determine whether it is best to also crush the materials where they are by bringing the logger/baler to each site once it arrives via the barge, or keep the logger/baler at the new site by the loading area and bring the materials there to be crushed and baled. All of the hamlets also have scrap throughout the community that is privately owned. A one-week scrap pickup schedule could be set, advertised by notices displayed throughout the hamlet. As this scrap is being collected, it should be brought to the new site for preparation.

In order to reduce the amount of handling of the scrap metal (which in turn reduces overall costs), the long-term plan is to establish a collection site that is close to the loading dock. When the logger/baler arrives, it will be unloaded from the barge to the site close by and when operations are completed, the machinery can be easily re-loaded onto the barge and taken to the next community.

Sorting and Storing

Although all of the hamlets have scrap metal piles that are somewhat separated, further sorting is required. Sorting nonferrous metals out from the ferrous metals is one way to increase revenue from the sale of the scrap. Non-ferrous metals are worth significantly more than ferrous metal. To prevent theft, a secure storage facility needs to be identified before sorting though, so that the non-ferrous can be safely stored until it can be sent out. White goods and hazardous wastes need to be set aside and dealt with according to government regulation. Large bulky items will need to be cut up, barrels will need to have the lids taken off, tanks will need openings so they can be inspected, and vehicles will need to have fluids drained and prohibited items removed. Therefore, there will need to be seven different piles:

1) non-ferrous items such as aluminum and copper
2) general ferrous scrap that can easily be baled
3) white goods such as refrigerators (these should be handled with care so that the coolant lines are not ruptured, and placed upright in rows so that the backs are accessible for decommissioning)
4) items with hazardous wastes
5) large, bulky items
6) barrels and tanks
7) vehicles, including snowmobiles and ATV’s.

Signs need to be clearly posted indicating which items go where so that the general public can help keep the site organized.

In the long-term, the secure storage facility should be close to the new site that is established by the loading area. It should also be determined whether or not the site should be gated so that there is some control over what is deposited there.

Preparation of Materials

White goods will need to be decommissioned by a certified technician. Unfortunately, most white goods that are left at the landfill sites become so banged up that there is nothing left to decommission. However, a certified technician still needs to look at each one and will attach a tag showing that there are no refrigerants in the item. Preliminary preparation would therefore include a refrigerant technician being hired to decommission white goods in each hamlet.

In the long-term a Nunavummiut should be trained and contracted on an ongoing basis to decommission refrigerants for the region. A government employee who travels regularly to the hamlets for other business could be utilized to keep costs down. This would also ensure refrigerants are decommissioned in a timely fashion to prevent Freon leakage.
Hazardous wastes need to be dealt with according to the process already in place or at the very least will need to be put into storage barrels until a system is in place.

In the long term a Hazardous Waste System needs to be established on a regional basis by examination of other successful regional systems.

Large, bulky items will need to be cut up. Since this is done using torches, approval might be needed from territorial officials beforehand. In consideration that Baker Lake and Rankin Inlet have experience and a system in place for barrel preparation, a best practices model may already be established.

Although the other communities do not have barrel-crushing equipment, it probably isn't necessary at this time since only Baker Lake and Rankin Inlet have a large number of barrels coming in. It is, however, important that a system be established that makes companies financially responsible for covering the full recycling cost of the barrels and any other scrap metal they bring in to the north.

All of the communities have tanks that will need to have openings in or be cut in half and used as storage containers. Vehicles need to be prepared by either the mechanic or the trained worker following the procedures outlined during the initial training. An important point to consider is allowing for salvaging of parts on vehicles, snowmobiles, and ATV's by community members (the metal dump is often referred to as the north's Canadian Tire). A notice could be posted before sorting begins stating that anyone wanting parts should remove them during a certain time frame. It could be an issue however if people take valuable parts which could be sold (such as catalytic converters) rather than parts they might need for making repairs. The hamlets would need to develop a policy regarding this.

In the long-term it might be best to have the hamlet salvage the vehicles and have assorted parts available for community members to use.

It has been determined that it is not feasible to try and transport materials that have not been crushed and baled, especially vehicles. There were problems with this during the Pilot Project of 2004/2005 and the barge company has recommended that cars and small vehicles be compressed so that shipping is easy and economical. When examining the costs, it has been estimated that to transport 421 vehicles by barge just to Churchill will cost from $420,000 to $630,000 (each vehicle costs between $1000-$1500 to ship whole). If this same number of vehicles was crushed and baled, it would cost approximately $84,000 ($200/ton and each vehicle is approximately 1 ton). The present practice of using "Cats" is problematic in both being hard on the equipment and improper crushing. Transport problems result because the final scrap piece is long and awkward. For these reasons, it makes sense to bring the needed equipment to the communities so that materials can be properly prepared for transporting.

In the long term it might be best to purchase a logger/baler that can be shared amongst the participating communities. Manitoba Metals sometimes has used ones for sale that cost under $100,000. Even with the initial expense of purchasing and then transporting and maintaining the equipment, it will still be less expensive than paying for the shipping of whole vehicles.

Baker Lake and Rankin Inlet are able to crush the barrels because they have a barrel crusher. Loose materials need to be put in containers such as sea cans, old tanks, or crates. It is important that there be good communication between the hamlets and the barge company concerning how the materials need to be prepared and packaged in order to transport them. The loading and unloading process needs to be as easy and convenient as possible for the transportation companies.

Transporting to Loading Site

Materials need to be transported from the present collection sites to the new site that will be established by the loading area. If determined that items cannot be left by the dock, materials will still need to be brought to the barge when loading can be done. Materials will be loaded onto a flatbed trailer using a front-end loader with forklifts. All of the hamlets either own this equipment or have access to it.

It is highly recommended that a site be established beside the loading area. As other sites are cleaned up and people begin using the new site, the need to transport the scrap from the collection site to the barge will be eliminated.

Transport to Selkirk via Churchill and Thompson

During the second or third summer of the project, rates will be negotiated with the transportation companies. Materials will be sent out by barge on backhauls when space is available. Items will be loaded onto the barge by hamlet employees and/or barge employees using the big equipment available from the hamlet or the barge company. When the materials arrive in Churchill, Kivalliq Marine will unload them directly to the train cars. Back haul rates will probably not be available for the train transport since many of the train cars going to Churchill cannot have scrap metal put into them for their return trip (e.g. grain cars). However, costs can be kept down by ensuring there are full loads of compacted materials. Churchill's recyclables can be included to top up loads to make them full. Ideally, materials could be sent directly from Churchill to Manitoba Metals' processing plant in Selkirk. Increased expense may be offset by convenience with less handling and coordination. It would be less expensive to send materials by train to Thompson, Manitoba where they would be unloaded from the train and put onto trucks by Gardewine North. Good coordination would ensure that Gardewine North could take the loads to Selkirk on backhaul rates when they arrive from Churchill (i.e. we don't want to have to store materials in Thompson while waiting for backhauls with Gardewine North). Success will be entirely dependent upon excellent coordination.

The long-term sustainability of the scrap metal project will be largely determined by the ability to lower the costs of transporting items. It is imperative that the process be as efficient as possible for the transportation companies. In the long-term, a negotiated price with the railways should be considered to the end of materials sent directly from Churchill by train to the processing plant. Long-term contracts should be negotiated, with precedence having been set by governmental-company on-going contracts in existence. A possibility is a government department agreeing to a longer term contract in exchange for free back-haul of recyclable material. Another option is to offer the transportation companies free recyclable metal in exchange for free transportation. Direct experience, with trial and error, will lead to development of best practices for scrap metal recycling in the north.

7.3

Table 6
Action Plan Timelines

Summer Year 1	Training Collection to sites Sorting Preparing
Winter Year 1	Negotiate for scrap dealer services with logger/baler for Summer Year 2. Coordinate scheduling and determine rates with OmniTRAX, CN Rail, and Gardewine North for possible transport in Summer Year 2.
Early Summer Year 2 **Later Summer Year 2**	Logger/baler and Scrap Dealer to Communities Further Training/ Crushing and Baling Transfer to loading area site If time allows, loading to Barge Transport to Selkirk via Churchill and Thompson
Winter Year 2	Continue to coordinate scheduling and rates with transport companies for removal from communities unable to complete in Late Summer Year 2
Summer Year 3	Transport to Selkirk via Churchill and Thompson

7.4 Scrap Metal Transportation Budget Projections: Step 1

Cost estimates only include transportation. Other costs not included are handling fees at transfer sites, possible storage fees, training, human resources, scrap dealer fees, equipment rentals and transporting, coordinator fees and GST.

Table 7
Nunavut to Churchill by barge* (Note 1)

Items	Weight or number of units	Cost (back haul)per ton or unit	Total Estimated Cost
Vehicles	421 units	$200 each (crushed and baled)	$ 84,200
Big trucks/equipment	41 units	$4,500 each	$ 184,500
Large tanks	14 units	$4,500 each	$ 63,000
Crates/ sea cans/ bundles • Motors • Snowmobiles • Tanks • Barrels	244 tons	$200/ton or $2000 per sea can (sea can holds max. of 11 tons)	$ 48,800

• White goods • Culverts			
Crates/ sea cans/ bundles • Misc. items	216 tons	$ 200/ton or $2000 per sea can (sea can holds max. of 11 tons)	$ 43,200
		TOTAL COST	**$423,700**

Note 1: Information from estimate quote from Desgagne Transport and Rankin Inlet's previous cost.

Tons of material to move = 1095. Cost per ton = $387.

Another option for Nunavut could be to transport materials to Ste. Catherine's, Quebec. There is a processing plant less than 1 kilometer from the port where the barge docks. Costs and logistics of this have not been determined.

7.5 Scrap Metal Transportation Budget Projections: Step 2, Option 1

Table 8
Churchill to Selkirk by train* (Note 1)

Items	**Weight or number of units**	**Cost per ton or unit (regular rates)**	**Total Estimated Cost**
Churchill to The Pas* (Note 2)	1095 tons = 12 gondola cars (allow 10 extra cars for awkward items that cannot be compacted) 12+ 10 = 22 gondola cars	$2430 + GST/ gondola car (can hold 90 tons) Train car lease @ $35/day/car (7days)	$ 53, 460 $ 5,390
The Pas to Selkirk* (Note 3)	22 gondola cars	$ 3500/car	$ 77,000
		TOTAL COST	**$ 135,850**

Note1: Does not include Churchill's materials
Note 2: Estimate quote from OmniTRAX in The Pas
Note 3: Estimate based on 2006 cost of a previous load OmniTRAX had sent through CN. CN was not able to provide a quote at this time.

Tons of material to move = 1095. Cost per ton=$124

7.6 Scrap Metal Transportation Budget Projections: Step 2, Option 2

Table 9
Churchill to Selkirk through Thompson

Items	Weight or number of units	Cost (back haul)per ton or unit	Total Estimated Cost
Churchill to Thompson (train)* Note 1	22 gondola cars	$ 1862/car + GST Train car lease @ $35/day/car (7days)	$ 40,964 $ 5,390
Thompson to Selkirk (truck)* Note 2	1095 tons but allow 10 extra loads for awkward materials 22 tons=$800/load (53 ft. trailer)* Note 3	$ 800/load X 60 = $ 48,000	$ 48,000
		TOTAL COST	**$ 94,354**

Note 1: Estimated quote from OmniTRAX in The Pas, Manitoba
Note 2: Estimated backhaul rates from Gardewine North in Thompson, Manitoba
Note 3: Super B trucks can hold 44 tons and the cost is $1,000.00 a load. This is a better choice if backhaul is available at time of movement.

Tons of material to move=1095 Cost per ton=$86

7.7 Total Transportation costs from Nunavut to Selkirk

Table 10
Option Comparisons

OPTION 1 Nunavut >Churchill>Selkirk	OPTION 2 Nunavut>Churchill>Thompson>Selkirk
423,700 + 135,850 = $559,550 ($511/ton)	423,700 + 94,354=$ 518,054 ($473/ton)

Estimated Revenues = 1095 tons X $130/ton (based on Manitoba Metals estimate, not including extra revenue from non-ferrous or reusable items) = **$ 142,350**

Revenues – Expenses (option # 1) = $ 142,350 - $559,550 =- $417,200
Revenues – Expenses (option #2) = $ 142,350 - $ 518,054 = - $375,704

Other costs include training, human resources, scrap dealer fees, equipment rentals, coordinator fees, and handling fees. These cost estimates require further investigation.

7.8 Funding and Partnerships

Per Table 10, expenses involved in northern scrap metal recycling exceed generated revenues. Funding from government agencies will need to be secured before the project can proceed. Commitments must also be made by the hamlets regarding possible in-kind contributions. Hamlets should also be responsible for seeking additional funding. This will ensure that the hamlets are committed to the project and that there is community buy-in. The mining companies need to be approached to discuss what commitments they are able to make. Partnerships that have been formed between government agencies, hamlets, and private sectors are important because a scrap metal program requires the concerted effort of all resources.

In the long-term, additional revenues must be generated in order to cover the costs of recycling. Policies based on "polluter-pays" principles need to be developed and implemented. Possible options would include levies, import fees, annual registration fees, and/ or tipping fees. Another idea is to implement Extended Producer Responsibility (EPR) that involves item returned to manufacturer for recycling.

7.9 Household Recycling

Revenue collected from recycled pop cans could offset the costs of recycling scrap metal. For example, in Rankin Inlet, 2.5 million pop cans and 1.6 million beer cans are brought into the community each year. 33,000 cans can be crushed into a 1.4m cube that weighs 1000 lbs. As of February 2007, aluminum was worth .80 per pound, with one baled cube of aluminum cans selling for $800 ($1600/ton), compared to $130 / ton for scrap metal. Other immediate benefits include diverting a huge amount of "garbage" from the landfill site.

In the long-term, a complete Regional Recycling Program needs to be implemented throughout Nunavut.

7.10 Steering Committee

The established steering committee would continue with its involvement of the project. The coordinator of the project would work closely with the committee for informational resources. Meetings would be called as needed.

In the long term a Stewardship Board will be needed to oversee the distribution of levy funds and to provide resources and support.

7.11 Public Support and Awareness

People need to feel the benefits of a scrap metal recycling program on a personal level. Community culture must be considered; with some people seeing scrap metal as valuable and resenting it's removal. Some people are supportive of hiring outside help to remove the scrap and others feel that local jobs should be given to local people. Individual hamlets need to decide on what the best approach is for building cohesion and gaining support.

Awareness campaigns can help to educate community members of the benefits of recycling. The coordinator of the project should work with the hamlets and with other initiatives to promote scrap metal recycling throughout the region. CBC Radio and the Kivalliq News have been following the Scrap Metal Project since it began and communication between the coordinator and the media needs to be on-going.

8. Manitoba Bayline Community Details

Figure 3: Map of Manitoba Bayline Communities

➡ Geographic point at which scrap metal ceases to generate acceptable levels of revenue for the private sector.

8.2

Table 11
Communities Assessments Overview

Please see Document "*NRCan Table 11*"

8.3 Notes to Table 11

Churchill

Population: 1000
Accessibility: Airplane, rail
Recycling Programs: Churchill recycled over 2000 tons of scrap metal during the Pilot Project of 2004/2005. A household recycling program has been on-going for the past 10 years with a high participation rate. However, there have been some financial difficulties with transporting materials so presently recyclables are being collected and stored, but not transported.
Landfill Site Management: The landfill site closed November 2005 and garbage is now stored at the L-5 buildings. Scrap metal is stored outside of the buildings and is segregated into separate piles. During the Pilot Project of 2004/2005, a scrap dealer brought the needed equipment to the site and did all of the preparation including sorting, preparing vehicles, decommissioning refrigerants, crushing and baling, and transporting materials to the processing plant.
Available Scrap Metal Recycling Resources: With additional training, Churchill has the capacity to do the initial scrap metal preparation (not crushing/baling) as well as transfer and store the materials that are shipped in from Nunavut. The Town is willing to discuss what needs to be established in order for them to do this on both a short-term and a long-term basis (regulations, gated site, costs, etc.). There is no refrigerant technician. Additional funding is necessary to facilitate the scrap dealer being brought in with equipment to crush and bale the materials.

Gillam

Population: 989
Accessibility: Airplane, rail, year round road
Recycling Programs: Gillam presently runs a successful household recycling program with regular transporting of materials to the Thompson Recycling Centre. Gillam successfully removed 16 tons of scrap metal during the Pilot Project of 2004/2005. They do not however have a hazardous waste program
Landfill Site Management: The landfill site has a segregated area for scrap metal.
Available Scrap Metal Recycling Resources: Employees assisted the scrap dealer with the last cleanup and therefore have experience. However, additional training is required in the initial processes of preparing scrap metal. The town does not have the equipment for crushing/baling. The scrap dealer would need to continue to provide services and additional funding would be necessary to cover the expenses. There is not a refrigerant technician so someone would need to be brought in.

Ilford/War Lake First Nation

Population: 143
Accessibility: Airplane, rail, winter road

Recycling Programs: none
Landfill Site Management: Ilford's scrap metal was cleaned up approximately three years ago (2003/2004) by Lynn Lake Salvage. Band employees took an inventory of scrap metal in the summer of 200, however, this information was not made available for this project.
Available Scrap Metal Recycling Resources: Information unavailable at this time.

Thompson

Population: 15,000
Accessibility: Airplane, rail, year-round road access
Recycling Programs: Thompson has a complete recycling program which includes household recyclables, batteries, tires and hazardous wastes.
Landfill Site Management: The site has a gated entrance and there is a fee for bringing in materials. Scrap metal is segregated into separate piles and refrigerants must be decommissioned before they are allowed in at the site.
Available Scrap Metal Recycling Resources: Every 2-3 years the scrap dealer from the south cleans up the scrap. There is not presently a contract or set schedule on an on-going basis. The Thompson Recycling Centre contacts any one of the scrap dealers to make arrangements when there is a sufficient amount of scrap. The ability to have a scrap dealer come up to Thompson is dependent on several factors such as the value of the scrap and the price of gas (transportation prices). The scrap dealer completes preparation of materials but with additional training, employees at the Thompson Recycling Centre could provide this service. There is no equipment in Thompson for crushing/baling. There is a refrigerant technician in Thompson.

Pikwitonei

Population: 140
Accessibility: Airplane, rail, winter road
Recycling Programs: There is no formal recycling program, however, in past summers, Natural Resources has recycled plastics. There is no hazardous waste program.
Landfill Site Management: The landfill site has a separate area where scrap metal is deposited. The scrap is mixed and no materials have been prepared (decommissioning, fluids removed from vehicles, etc.) for removal. There are some derelict vehicles throughout the community. Pikwitonei is one of the communities that may be targeted for ANA's Pilot Project. There is an old sawmill site where scrap has also accumulated but it was not accessible at the time of the community visit.
Available Scrap Metal Recycling Resources: The community only has a front end loader with a bucket (no forklifts) and a snowplow, both of which are used at the airport. There is a contractor who has big equipment that might be available. A refrigerant technician and scrap dealer with crushing/baling equipment needs to be brought in. Preparation of the scrap needs to be done during the summer months so that it is ready when the scrap dealer brings the crushing/baling equipment in the winter (winter roads only). Training is imperative, especially since there are no mechanics in the community.

Thicket Portage

Population: 150
Accessibility: Airplane, rail, winter road
Recycling Programs: There is presently no recycling program in Thicket Portage. Thicket Portage participated in the 2005 recycling project which was overseen by North Central Development. A Local Recycling Coordinator (LRC) was hired for the year. The LRC focused on

educating community members about recycling and one load of recyclables was transported to the Thompson Recycling Centre. Unfortunately, when the funding for the LRC position ended, so did the recycling program. There is not a hazardous waste program.
Landfill Site Management: At the landfill site there is a separate area for scrap metal and the materials are somewhat separated (vehicles, white goods, miscellaneous). Throughout the community there are vehicles, snowmobiles and white goods as well. Thicket Portage is another community that may be targeted for ANA's Pilot Project.
Available Scrap Metal Recycling Resources: There is not a mechanic in town but there are people who work on machines and could be trained in preparing vehicles as well as other scrap materials. Thicket Portage does not have big equipment except for at the airport where there is a front end loader, a grater and a 3 ton truck. There is not a flatbed trailer. The scrap dealer with a crusher/baler would need to be brought in during the winter (winter road only). Therefore it would be essential that community workers are trained and able to prepare the materials during the summer months.

Wabowden

Population: 563
Accessibility: Rail, year round road access
Recycling Programs: In the past, Wabowden has had a recycling program but unfortunately when government funding ended, the town was not able to continue the program. They do have a recycling trailer depot that is full and they are working towards bringing it to Thompson to be emptied. There is interest in re-establishing the program, but funds are not yet in place. There is no hazardous waste program. Scrap metal is cleaned up regularly by the scrap dealer.
Landfill Site Management: A new gated site is expected to open in the summer of 2007. This will help ensure that people from nearby areas do not bring their materials to the site (in the past, people who do not want to pay to deposit items at the Thompson site have instead taken them to the Wabowden site.) The old site has metals segregated but are not prepared.
Available Scrap Metal Recycling Resources: The scrap dealer presently comes in to do cleanups while in the area (cleaning Thompson). There is no refrigerant technician but there is a mechanic. For the long term, training for employees would be beneficial so that the scrap metal could be prepared before the scrap dealer arrives (especially if he is coming up during the winter to clean up the communities that only have winter road access).

The Pas

Population: 13,000
Accessibility: Airplane, rail, year round road access
Recycling Programs: The Pas has a complete recycling program which includes household materials, hazardous wastes, used oils, batteries and tires. Scrap metal is cleaned up every 2-3 years.
Landfill Site Management: The Pas has a gated site and items are segregated into piles of tires, white goods, assorted metals, and household garbage. Refrigerants are decommissioned before they are allowed at the site. There is a hazardous waste program.
Available Scrap Metal Recycling Resources: Vehicles are taken to an auto wrecker and therefore no vehicles are at the landfill site. There is a refrigerant technician in town and the scrap dealer provides all the other services. The Pas does have the equipment and human resources to prepare the scrap if further training was offered. However, at this time, the services of the scrap

dealer eliminates the need for the town to deal with the scrap metal (they do not pay for services, but instead the value of the scrap is the “pay” for the dealer).

Opaskwayak Cree Nation (OCN)

Population: 2500
Accessibility: Airplane, rail, year round road access
Recycling Programs: OCN has access to The Pas’ recycling program but does not presently utilize it except for hazardous waste disposal. The scrap metal is cleaned up every 2-3 years by the scrap dealer.
Landfill Site Management: Although signs are posted for separation of scrap items, most scrap materials are mixed throughout landfill site. Refrigerants are not decommissioned.
Available Scrap Metal Resources: Vehicles are taken to an auto wrecker in The Pas and therefore no vehicles are at the landfill site. There is a refrigerant technician in The Pas. OCN does have the equipment and human resources to prepare the scrap if further training and funding was available. However, at this time the scrap dealer is able to provide services that do not cost the community anything (the value of the scrap is the dealers “pay”.

Please see **Attachment H** for Manitoba Bayline Communities Contact List.

8.4

Table 12
Communities Scrap Metal Inventories List

	Ilford	Thicket	Pikwitonei	TOTAL #	Calculations	Total Tons
Cars/trucks		40 dump 20 town	8 dump 4 town	72	1 ton each	72
3 ton truck			1	1	2.5 tons each	2.5
Firetruck			1	1	5 tons each	5
Snowmobiles		20 town	20	40	450 lbs	9
Hot water tanks		2		2	80 lbs	.15
Tank 1000 gal		1		1	400 lbs	.25
Metal tanks (100 gal)						
Culverts 10 ft. long		6		6	150 lbs	.5
Barrels 45 gal		15		15	30 lbs. each	.25
White goods		30 throughout town				
Misc. put in 45 ft truck		2 (white goods included here)	2 (white goods included)	4	One truck full = approx. 20 tons crushed materials	80
TOTAL		**105**	**65**			**Approx 170**

9. Manitoba Bayline Action Plan: Short and Long Term

9.1

Table 13
Overview of Short and Long Term Plans

Recycling Process	Short-term	Long-term
Coordination	Secure funding for a Regional Scrap Metal Coordinator (ideally for 3 yrs. Minimum)	Establish a permanent position for a Regional Recycling Coordinator who oversees a complete recycling program (based out of the Thompson Recycling Centre)
Training	Thompson Recycling Centre employee receives training in how small communities need to collect, sort, and prepare their scrap before the scrap dealer arrives. This person becomes the "trainer" for other northern communities.	Establish a training program of Recycling/ Waste management through the University College of the North, or through apprenticeship program with the Thompson Recycling Centre
Designated areas for collection	Collection sites already established are used. If sorting by the community includes ferrous from non-ferrous, then a storage space for non-ferrous items needs to be identified. Encourage residents to remove items on private property and dispose of at metal site. Incentives may be offered (ANA Pilot Project).	Improve system by establishing segregated areas for different items Secure storage space used for valuable materials. Regionally, create awareness and support for removing scrap metal through campaigns.
Sorting	Trained local staff will sort into separate piles: vehicles, white goods, misc. and possibly ferrous, nonferrous. Prohibited items such as propane tanks will be set aside. Scrap dealer will complete any other sorting with hired local help	Separate piles will be maintained and sorted on a regular basis by trained staff.
Preparing materials a) Vehicles	Trained staff drain fluids and remove prohibited items, as	Trained local staff will do

	well as valuable parts	
b) Hazardous Wastes	Fluids are put into barrels/containers for storage until they can be transferred for removal during northern Manitoba Hazardous Waste Annual Cleanup.	A comprehensive and complete Hazardous Waste System is established and fluids are disposed of using this system.
c) Refrigerants	Technician hired to decommission items	Technician hired to decommission items
d) Bulky items	Trained local staff cut to a size (using proper equipment) that makes transporting possible	same
e) Tanks	Trained local staff prepare following guidelines indicated by Manitoba Metals (need large opening)	same
Preparing for Transport a) Crushing, baling	Scrap dealer brings in necessary equipment to properly crush and bale. Local staff receives training during operations.	Scrap dealer brings in necessary equipment to properly crush and bale. Local trained staff assists.
b) Misc. items	Scrap dealer prepares items not crushed and baled for transport (e.g. puts in containers)	Trained local staff prepare items not crushed and baled for transport (e.g. puts in containers)
Loading	Scrap dealer, local employees load materials onto truck	Scrap dealer, local employees load materials onto truck/train.
Transport to processing plant	Scrap dealer transports materials to Selkirk.	Scrap dealer transports materials to Selkirk.

Other Considerations: i. Timelines	Summer 1: sort and prepare materials, cover piles with tarp to keep snow off. Winter 1: Keep area around piles cleared for easy truck access When winter roads open in Jan/Feb hire scrap dealer to come in.	Organize cleanup for every 3-5 years.
ii) Funding	Seek government funding	Establish a levy system/fund
iii) Partnerships	Continue working with partnerships that have been formed between government agencies, communities, and private sectors.	Establish long-term partnerships especially amongst key players
iv) Steering Committee/ Stewardship Board	Continuation of Scrap Metal Steering Committee to provide input and support of projects	Establish a Stewardship Board to oversee the distribution of levy funds and provide resources and support
iv) Household Recycling	Communities with programs continue Provide resources such as the "Beginner's Guide to Setting up a Recycling Program" to communities without program	Establish recycling programs that include all recycling
v) Media and Public Support/Awareness	Inform media of project developments	Establish an on-going promotional/awareness campaign throughout Northern Manitoba to create public support

9.2 Notes to Table 13

Short term in regular font
Long Term in Italics

Coordination

In order to successfully remove scrap metal on a regional basis, it is essential that a regional project coordinator be put in place. Coordination will include setting up training and working with each of the hamlets on timelines for the preparation of the scrap, seeking additional funding, establishing good relations with key partners, and overseeing the whole process of the project. In selecting a coordinator it is important that the position be at least for three years so that the short-term plan of the project can at least be overseen from start to finish.

In the long-term, a permanent position should be established for a Regional Recycling Coordinator who can oversee a complete recycling program. Ideally, this position would fall under the Thompson Recycling Centre.

Training

One of the advantages that northern Manitoba has over Nunavut is that of road access (and being closer to the processing plant in Selkirk). Because of this, the scrap dealer makes regular visits to several of the communities. Therefore, there is a cleanup process that the communities are satisfied with. It is not necessary for these communities to deal with scrap metal except for providing a collection site (The Pas, Opaskwayak, Thompson, Wabowden). There are however, three communities that only have winter road access for approximately six to eight weeks. These are small communities that do not have a lot of scrap metal to entice a dealer to go out of his way, down a winter road, to get there. It would also be difficult for a dealer to prepare materials in the middle of winter, especially if they are covered under the snow. These three communities, Thicket Portage, Pikwitonei, and Ilford would benefit the most by the provision of training in the preparation of scrap metal. The ideal scenario would see someone from the Thompson Recycling Centre trained as a “trainer” who could teach other northern Manitoba communities how to collect and prepare scrap metal. Ideas for how this training could be provided include having the trainer go to the communities and help “kick-start” the process (use the DVD and the “Guide to Recycling Scrap Metal” as presentation and resource material and then do hands-on training at the metal site), or have the “trainees” visit a site that is being cleaned up by Manitoba Metals to see how the process is done. During training, safety issues and concerns would be discussed. An overview of the processes involved would be presented and would include identification of metals, proper preparation of derelict vehicles and other machinery, handling procedures, hazardous materials handling, and first aid and emergency procedures. During the summer months, trained employees could collect and prepare the scrap, and cover it with tarps so that it is ready for a scrap dealer to crush and bale during the winter.

For the long term, other communities are also interested in having employees trained in the handling of scrap. The “trainer” from the Thompson Recycling Centre could provide this. For overall Recycling/Waste Management, a certification program could be established through the University College of the North, or an apprenticeship program at the Thompson Recycling Centre could be made available.

Collection

All of the communities involved have an area for scrap metal at the landfill site that is easily accessible for trucks and equipment (communities with winter roads need to ensure that plowing is done). These sites would continue to be used[1]. For communities that are sorting the ferrous and nonferrous, a storage space needs to be identified so that valuable items are kept safe. Items need to be collected from individuals throughout the community and an incentive program, such as the one ANA has proposed, may be needed.

Collection sites need to be well marked so that residents know where to put items. Several communities have certain hours that the site is open and have a locked gate. This allows for having an employee present to make sure people put items in the right place. However, a locked gate can also mean that people will begin to dump things outside of the site. A separate area where fridges can be stored side by side needs to be established so that proper decommissioning can occur.

Residents need to become educated about the benefits of recycling scrap metal so that they not only will happily give up their "old junk", but they will support the efforts of those involved. Education and awareness campaigns should be promoted on a regional level.

Sorting, Storing and Preparing Materials

During the summer months, trained employees in Thicket Portage, Pikwitonei, and Ilford would make sure items are sorted into proper piles. Nonferrous materials would be stored and prohibited items would be removed and set aside. A technician from Thompson would be hired to decommission the refrigerants. Fluids would be drained from vehicles and would be put into barrels until they could be disposed of properly. Bulky items would be cut to a size that would make them acceptable for transport and tanks would be prepared following guidelines provided during training. Before snowfall, items would be covered with tarps to keep the snow off.

In the long term plan, communities who want to, could have a local job position for doing these tasks rather than the scrap dealer. The plan would also ensure that all of the communities are participating fully in the Northern Manitoba Hazardous Waste Annual Cleanup.

Working With the Scrap Dealer

Manitoba Metals is willing to collect all scrap metal from northern Manitoba, providing it generates a profit. Generally, once they go past The Pas, profits begin to decline rapidly due to geographic distance. However, if there is enough scrap in an area (at least 1000 tons) it can be worth their while to go there. In summary, cleanup of several small communities needs to occur on the same trip. Good coordination means that the north can be cleaned up in one trip from the scrap dealer. As the dealer goes further north, pre-negotiated financial incentives or subsidies would need to be given. In the short-term, government funding would pay for this.

The scrap dealer would bring in the necessary equipment to crush and bale materials. The scrap dealer would put items that cannot be put through this process into containers or bundles.

[1] Consideration was given to having a collection site along the rail line. However, communities are not equipped to load materials to the train. As well, the rail line is a tourist route and a scrap pile along the line would not reflect the beauty of the north.

All materials would be loaded onto the trucks and transported to the processing plant in Selkirk. While local staff is assisting, they would also be receiving further training.

In the long term, money generated from the levies would be used to subsidize scrap metal programs in the north.

For a potential schedule See Section 10: *Recommendations: Putting It All Together*.

9.3

Table 14
Action Plan Timelines

COMMUNITY	POPULATION	DATE OF LAST CLEANUP	PLANNED DATE OF NEXT SCHEDULED CLEANUP	ESTIMATED AMOUNT OF SCRAP in TONS
Ilford	150	2003	Feb. 2009	22.5
Thicket Portage	150	none	Feb. 2009	112.5* (Note 1)
Pikwitonei	140	none	Feb. 2009	72* (Note 2)
Thompson	15,000	April 2007	Spring 2009	750
Wabowden	560	April 2007	Spring 2009	28
The Pas	13,000	April 2007	Spring 2009	650
Opaskwayak	2500	April 2007	Spring 2009	125
Churchill	1000	Sept. 2006	Spring 2009	75
Gillam	1000	2004	Spring 2009	125
TOTAL	33,500			**1960 TONS**

Note 1: Estimates of scrap calculated at 50 / lbs / person / year since last cleanup
Note 2: Estimates of scrap calculated at 50 lbs / person / year & inventory 2007

9.4 Scrap Metal Transportation Budget Projections: Step 1

Cost estimates only include transportation. Other costs not included are handling fees at transfer sites, possible storage fees, training, human resources, scrap dealer fees, equipment rentals and transporting, coordinator fees and GST.

Table 15
Communities to Thompson* (Note 1)

Items	Weight or number of units	Cost per ton or unit	Total Estimated Cost
Pikwitonei to Thompson (truck)* (Note 2)	72 tons (4 truck loads)	1 truck load (holds 22 tons)= $800/load	$ 3,200
Thicket Portage to Thompson (truck)	113 tons (5 truck loads)	1 truck load (holds 22 tons) = $800/load	$ 4,000
Ilford to Thompson (truck)	22 tons (1 truck loads)	1 truck load (holds 22 tons) = $1000/load	$ 1,000
Churchill to Thompson (train)* (Note 3)	75 tons (1 gondola car)	$1862 + GST/gondola car (holds 90 tons) Train car lease@ $35/day X 7 days	$ 2,000 $ 245
		TOTAL COST	**$ 10,445**

Note 1: Communities included in the cost estimates are only those that the scrap dealer would not normally go to. i.e. Thompson, Wabowden, The Pas and Opaskwayak already have the scrap dealer coming in and covering all costs. The scrap dealer also takes all revenues from scrap sales.
Note 2: Estimate quote from Gardewine North in Thompson, Manitoba
Note 3: Estimate quote from OmniTRAX in The Pas, Manitoba

Amount of scrap = 282 tons   Total cost per ton = $37

9.5 Scrap Metal Transportation Budget Projections: Step 2

Table 16
Thompson to Selkirk

Items	Weight or number of units	Cost (back haul)per ton or unit	Total Estimated Cost
Thompson to Selkirk (materials from small communities)	282 tons (13 regular truck loads) **OR** 282 tons (6.5 super B truck loads)	1 truck load (holds 22 tons) = $850/load **OR** 1 truck load (holds 44 tons) = $1000/load	$ 11,050 **OR** $ 6,500
Gillam to Selkirk	125 tons (6 truck loads)	1 truck load (holds 22 tons)= $1200/load	$7,200
		TOTAL COST	**$ 18,250 (using regular truck)**

			$ 13,700 (using super B)

Amount of scrap = 407 tons
Cost per ton= $45 (using regular truck)
Cost per ton= $34 (using super B truck)

TOTAL COST = 10,445 + 18,250 = $28,695 (*using regular truck*) **= $71/ton**
10,200 + 13,700 = $23,900 (*using super B, dependent upon availability*)
= $59/ton

Estimated Revenues= 407 tons X $130/ton (based on Manitoba Metals estimate, not including extra revenue from non-ferrous or reusable items) = **$ 52,910**

Revenues – Expenses (using regular truck) = $ 52,910 - $28,695 =$ 24,215

OR

Revenues – Expenses (using Super B) = $ 52,910 - $ 13,700 = - $ 39,210

9.6 Funding and Partnerships

The transportation costs alone do not exceed the revenues generated from the sale of the scrap. However, expenses exceed generated revenue once the costs of preparation and processing are factored in. Funding from government agencies will need to be secured before the project can proceed. Commitments must also be made by the communities involved regarding how much in-kind assistance they are able and willing to give to the project. Communities should also be responsible for seeking additional funding. This level of commitment will reflect community buy-in. Partnerships that have been formed between government agencies, communities, and private sectors are important, as a comprehensive scrap metal program requires the efforts and resources of many people and organizations.

In the long-term, additional revenues must be generated in order to cover the costs of recycling. Policies based on "polluter-pays" principles need to be developed and implemented. Possible options would include levies, import fees, annual registration fees, and dumping fees. Another idea is to implement Extended Producer Responsibility (EPR). This translates into the recyclable item being returned to the manufacturer, who then manages the recycling of that product.

9.7 Household Recycling

Successful recycling programs have been established in The Pas, Thompson, Churchill, and Gillam. The communities of Thicket Portage, Ilford, Pikwitonei, Wabowden and Opaskwayak do not currently have recycling programs. A best practices manual has been developed to try to help northern communities with very limited resources begin a recycling program. Northern communities are being encouraged to start small, even if it is just one item such as pop cans. Revenues generated from the sale of aluminum pop cans could help offset the costs of scrap metal removal.

In the long-term, a complete Regional Recycling Program needs to be implemented throughout northern Manitoba.

9.8 Steering Committee/Stewardship Board

The established steering committee would continue with its involvement of the project. The coordinator of the project would work closely with the committee and seek their assistance for guidance and support. Meetings would be called as needed.

In the long term a Stewardship Board will be needed to oversee the distribution of levy funds and to provide resources and support.

9.9 Public Support and Awareness

People need to feel the benefits of a scrap metal recycling program on a personal level. In other words, if they ask themselves “What’s in it for me?” they need to be able to answer the question with a positive answer. For some people, having a cleaner community by getting rid of “old junk” lying around in their yards is enough of an incentive to gain their support. For others, they might see their “old junk” as valuable and will resent someone taking it away. Some people would be supportive of hiring outside help to remove the scrap whereas others may feel that local jobs should be given to local people. Individual communities need to decide on what the best approach is for gaining support.
Awareness campaigns can help to educate community members of the benefits of recycling. The coordinator of the project should work with the communities and with other initiatives to promote scrap metal recycling throughout the region.

10. Recommendations: Putting it all together

The following outlines a scenario that includes the key recommendations of:

1) A regional approach to scrap metal removal
2) The necessity of training provision
3) The importance of on-going education and awareness campaigns
4) The need for legislation of levies to secure sustainable scrap metal removal practices
5) The establishment of Stewardship Board to manage levy funds

Spring 2008: Regional Coordinator hired, education/awareness campaign, partnerships with communities established, begin investigating legislative process and identify key players, re-establish steering committee

May 2008: training offered

Summer 2008: communities/hamlets do collection and preparation

Winter 2008: coordinator works with transportation companies and scrap metal dealer on details of removal, assessment of summer collection and preparation process, begin lobbying with governments for levy legislation, continuation of steering committee, begin planning training for Feb. 2009.

February 2009: scrap dealer and equipment arrive in northern Manitoba, education and awareness campaign in preparation of community cleanups, encourage residents to give up “old junk”

Thicket Portage, Pikwitonei, Ilford are cleaned up while winter roads are open and materials sent by truck to Selkirk, training occurs while scrap dealer is in communities

February to June 2009: Cleanup of The Pas, Opaskwayak, Wabowden, Thompson, and possibly other communities in the area such as Norway House and Cross Lake. Materials are sent by truck to Selkirk

June 2009: Gillam is cleaned up and materials sent by truck to Selkirk.
Churchill is cleaned up but baled items stay at storage site.

July 2009: equipment is loaded onto barge and brought to Rankin Inlet for cleanup

July/August 2009: scrap dealer and equipment goes to participating hamlets and does cleanup. Materials are sent by barge on back hauls as there is space keeping in mind that once in Churchill, a full gondola car for the train can hold 90 tons. Coordinator will make sure that full cars are taking materials and Churchill’s material will be used to top up any cars that are not full.

Throughout the process, further training by the scrap dealer will be occurring in communities, continue education and awareness campaigns, legislation process should be well underway.

By **September 2009**, scrap dealer and equipment will leave the north. If successful, this process will be repeated in 2-3 years, regional campaign to celebrate accomplishments and to continue to build support for legislative changes.

Summer 2010: remaining prepared items in Nunavut that were not able to go out on barge the previous summer are sent out, levy legislation in place and Stewardship Board established to manage funds. By the next cleanup in 2012, there should be some funds to provide subsidies to communities for removing scrap metal (therefore less government money will be used). Gradually, levy funds will cover the expenses of removing recyclable scrap from communities.

11. Conclusion

It has been determined that the removal of both historical and routine build up of scrap metal from the Nunavut Kivalliq Region and the Manitoba Bayline Region is feasible, providing key factors are considered. One of these involves the provision of education and training to the end of identification and mentorship of community champions. Regional coordination is also an imperative, as is the implementation of adequate programs - backed by legislation and funding. Finally, long-term partnerships and having the support and guidance of major stakeholders under the auspices of the steering committee are crucial components of sustainable scrap metal programs in the north.

The Action Plan outlines the specific steps towards feasibly removing scrap metal for recycling in the south. It has been determined that, due to transportation, preparation and handling fees, etc., it isn't profitable for a business to perform these services in the north without the provision of extra funds to cover the higher expenses. Therefore, government must initially consider funding provision until a levy system can be implemented. The levy system would transfer the expense of recycling to either the consumer or the manufacturer of the product, leading to sustainability in northern scrap metal removal.

The implementation of a permanent scrap metal recycling system in Northern Manitoba and Nunavut will provide several long-term benefits including economic development, improvement in waste management practices, cleaner and safer communities, and a reduction in greenhouse gas emissions. Through recycling program replication, more communities throughout the country will also benefit, and an overall reduction of GHGs in Canada will be realized.

12. Photo Gallery

Scrap tanks - Coral Harbour, Kivalliq Region

Scrap barrels - Rankin Inlet, Kivalliq Region

Hazardous waste storage facility – Repulse Bay, Kivalliq Region

Mixed materials – Whale Cove, Kivalliq Region

Scrap metal tanks - Coral Harbour, Kivalliq Region

Scrap vehicles – Repulse Bay, Kivalliq Region

Attachment A:
Background of North Central Development

North Central Development commenced operations in May 1997 as a not-for-profit community economic development organization. The organization provides services to 17 communities in Northern Manitoba, encompassing an area of 138,000 square kilometres with a population of approximately 35,000. A volunteer Board of Directors provides direction to Management of the Corporation. North Central Development is divided into the three operating areas of Administration, Community Development and Business Development.

North Central Development is a proactive Community Futures organization and has many successful initiatives, which have had wide spread and long lasting effects on the economic environment of the North Central region. The Board of Directors consists of a representative from each of the 17 communities. Of the 17 communities, 7 are First Nation, 7 are Metis communities and 3 are urban industrial communities. All run along the Bayline from Norway House in the south up to Churchill in the North. The board governs through three main committees: the executive, who meets weekly, and the business development and the community development who meet monthly or more often as deemed necessary.

North Central Development's involvement in community economic development is intense and the scope of developmental areas is all-inclusive. The Corporation relies upon its well-established network of partners in delivering proposed projects.

Executive Committee:

Chairperson:	Glen Flett, Norway House Community Council
Vice-Chairperson:	Sam Saunders, York Landing First Nation
Secretary:	Adrian Degroot, Thompson
Treasurer:	Frances McIvor, Wabowden Community Council

Community Development Committee:

Adrian Degroot	Thompson, Manitoba
Glen Flett	Norway House Community Council
Frances McIvor	Wabowden Community Council
Darlene Beck	Cross Lake Community Council
Dennis Dwyer	Wabowden
Craig Hanley	Thompson
Kate Geiger	Thompson

Business Development Committee:

Frances McIvor	Wabowden Community Council
Glen Flett	Norway House
Roxanne Chan	Churchill
Sam Saunders	York Landing First Nation
Darryl Wastesicoot	York Landing First Nation
Judy Kolada	Thompson

Other Board Members:

Ryan Castel	Cross Lake First Nation
	Fox Lake First Nation
Albert McTavish	Gillam
Jim Chornoby	Ilford Community Council
Wayne Spence	Nelson House Community Council
Marcel Moody	Nelson House First Nation
	Norway House Cree Nation
Angeline Flett	Pikwitonei Community Council
Norman Flett	Split Lake Cree Nation
Frank Dorion	Thicket Portage Community Council
Philip Morris	War Lake First Nation

Attachment B:
Proposed Training Program

An integral component of scrap metal removal in the North involves building local capacity to prepare stockpiles for removal. To this end, North Central Development (NCD) recommends a “Train the Trainer” program to build this necessary skill in the Bayline communities of Northern Manitoba and the Kivalliq region of Nunavut.

The program involves training one person from each of the above regions to enable him/her to then transfer this skill at a local level by means of provision of training individuals in the communities.

NCD has explored a number of training options in partnership with Hugh Billingham of Gredeau Ameri-Steel, commonly known as Manitoba Metals. The on-site, hands-on training that Manitoba Metals can provide would be a valuable skill set in future considerations for scrap removal in the North. Unfortunately, due to scheduling conflicts and a tight timeframe, this training could not take place before March 31, 2007.

Specifically, the “Train the Trainer” program involves hands-on training provided in-kind by Manitoba Metals. One individual from Rankin Inlet and one from the Thompson area would travel to Selkirk, Manitoba to learn how to identify, sort and prepare scrap metal stockpiles for removal. These people would then provide training in the communities of Coral Harbour and Baker Lake in the Nunavut region and Thicket Portage and Pikwitonei in the Manitoba Bayline communities. Once trained, individuals in the respective communities could then provide further training at a local and regional level. This leads to greater awareness, a sense of ownership and responsibility to environmental issues and local capacity built to prepare stockpiles for removal. As indicated in the final report, local ability to have stockpiles prepared when the scrap removal company arrives is of key importance.

See Excel spreadsheet “*Financial Report template training*” for training budget.

Attachment C:
Steering Committee Contact List

NAME	ORGANIZATION / COMMUNITY	PHONE	FAX	E-MAIL
Rob Sinclair	Natural Resources Canada (NRCAN)	613-947-3729	613-943-8450	rsinclai@NRCan.gc.ca
Earle Baddaloo	Dept. of Environment Govt.of Nunavut	867-975-7729	867-975-7742	EBaddaloo@GOV.NU.CA
Laura Kowmuk	Govt. of Nunavut	867-645-8458		LKowmuk1@GOV.NU.CA
Bobby Oolooyuk	Community and Government Services, Rankin Inlet	867-645-8123	867-645-8197	BOolooyuk@GOV.NU.CA
Arnie Brown	Hamlet of Rankin Inlet	867-645-2895	867-645-2146	arnieb@qiniq.com
Rod Mackenzie	Town of Churchill	204-675-8871	204-675-2934	rodm@mts.net
Jackie Clayton	Town of Gillam	204-652-2121		towncao@gillamnet.com
Paul Doolan	Aboriginal and Northern Affairs	204-945-2161	204-948-2389	PDoolan@gov.mb.ca
David Chadwick	Aboriginal and Northern Affairs	204-945-1165	204-945-8374	dchadwick@leg.gov.mb.ca
Hugh Billingham	Gerdeau Ameristeel	204-482-6701 1-800-665-0445	204-482-8241	hbillingham@gerdeauameristeel.com
Deborah Spicer	Omnitrax	403-209-3101		dspicer@omnitrax.com
Brad Salamandyk	Thompson Recycling Centre	204-677-7991	204-778-7844	trec@mts.net
Michelle Pruder	North Central Development	204-677-3479	204-778-5626	pruder@mts.net
Leslie Tucker	North Central Development	204-677-1496	204-778-5672	ltucker@northcentraldevelopment.ca
Bryan Purdy	Govt of Nunavut	867-645-8159		BPurdy@gov.nu.ca
Robert Connelly	Govt. of Nunavut	867-645-5067	867-645-2346	RConnelly@GOV.NU.CA
Loretta McGinnis	Opaskwayak Cree Nation	204-627-7181 888-763-1566 ext181		loretta.mcginnis@opaskwayak.ca
Joey Barnes	Lynn Lake Salvage	204-356-8846		kingofobsolete@xplornet.com

Attachment D:
Present, Past and Potential Project Contributors

Natural Resources Canada (NRCAN) is the main funder of this project as well as the Pilot Project of 2004/2005. Their goal is to create a sustainable scrap metal recovery and removal program throughout the nation to reduce GHG's significantly by 2010.

Manitoba Conservation has contributed funds to this project as well as the Pilot Project of 2004/2005 through its Waste Reduction and Pollution Prevention Fund **(WRAPP)**. The WRAPP fund supports projects that focus on waste reduction, pollution prevention, and integrated waste management practices.

The Government of Nunavut is in the early stages of developing and implementing both a household recycling program and a scrap metal recovery and removal program. They are especially interested in addressing the issue of the excess fuel barrels that have accumulated in some of the hamlets. They were able to contribute to this project by sharing information and resources, as well as by sharing the travel costs associated with gathering the inventory lists.

Community Futures North Central Development has been the leader for the Pilot Project of 2004/2005 as well as for the development of this "Action Plan". They have previously created training tools ("Guide to Recycling Scrap Metal" and the accompanying DVD) and have made these available to northern communities. They continue to provide information, resource and support to those communities wanting to establish or continue recycling programs.

Aboriginal Northern Affairs (ANA) is a provincial government agency that oversees non-status communities in Manitoba. They have been involved in both the Pilot Project of 2004/2005 and the Action Plan Project and have recently begun their own scrap metal recovery program. As members of the steering committee they have been able to share information and provide sound advice concerning scrap metal and the communities ANA serves.

Indian and Northern Affairs (INAC) is a federal government agency that oversees and provides funding to status First Nations communities. In the past, they have provided funds for the hiring of Local Recycling Coordinators in several northern First Nation communities. They could be a possible source of revenue for further community environmental projects.

EcoAction is an Environmental Canada federal program that provides financial support to community groups for action-oriented projects that have measurable, positive impacts on the environment. They were a main funder for the Pilot Project of 2004/2005.

Human Resource and Social Development Canada is a federal government agency that in past recycling and scrap metal projects has provided funding through its programs aimed at job creation and skill development.

Shell Environmental Fund provides financial support for grass-roots, action-oriented projects that improve and protect the Canadian environment. They have provided funding to several northern Manitoba communities for recycling projects.

Green Manitoba is a new provincial agency (April 1, 2006) created to develop and implement key programs that will foster environmental innovation and community development.

Attachment E:
Key Player Contact Information

Scrap Dealer /Processing Plant

Gerdeau Ameristeel/ Manitoba Metals Contact: Hugh Billingham, Senior Account Manager P.O. Box 334-1 Railway St. Selkirk, MB R1A 2B3 Phone : 800-665-0445 (toll free) OR 204-482-6701, ext. 103 e-mail : hbillingham@gerdeauameristeel.com

Transportation Companies

Transport Desgagnes Contact: Daniel Desgagnes Phone : 866-732-5438 e-mail : daniel.desgagnes@ transarctik.desgagnes.com	**Northern Transportation Company Limited (NTCL)** Contact: Christopher Cote 611 Paunna Place, P.O. Box 1240 Iqaluit, Nunavut X0A 0H0 Phone : 867-979-6825 e-mail : ccote@ntcl.com
Kivalliq Marine Contact: Marc Cool Phone : 204-675-8148 e-mail : mcool.paytahpuninc@ onlink.net	**OmniTRAX** Contact: Deborah Spicer Phone : 403-209-3101 e-mail : dspicer@omnitrax.com
CN Rail Contact: Ted Wheaton Phone : 888-668-4626 e-mail : ted.wheaton@cn.ca	**Gardewine North** Contact: Jim Farrell Phone : 204-778-8314 e-mail : gardtho@mts.net

Regional Transfer Sites

Churchill Contact: Town of Churchill Rick Chorneykno Phone : 204-675-8871 e-mail : pworks@mts.net	**Thompson** Contact: Local Government District Jack Burton Phone : 204-677-4075 e-mail : lgdmystlake@mts.net

	Contact: Thompson Recycling Centre Brad Salamandyk Phone : 204-677-7991 e-mail : trec@mts.net

Government Agencies and Funders

Natural Resources Canada (NRCAN) Contact: Rob Sinclair Phone : 613-947-3729 e-mail : rsinclai@NRCan.gc.ca	**Manitoba Conservation Pollution Prevention Branch (WRAPP)** Address: 160-123 Main St. Winnipeg, MB R3C 1A5 Phone : 204-945-8443 800-282-8069 Website : www.gov.mb.ca/conservation/pollution prevention/wrapp/index.html
Government of Nunavut Department of Environment Contact: Earle Baddaloo P.O. Box 1000, Station1360 Iqaluit, Nunavut X0A 0H0 Phone : 867-975-7729 e-mail : EBaddaloo@GOV.NU.CA	**North Central Development** Contact: Leslie Tucker P.O. Box 1208, 3 Station Rd. Thompson,MB R8N 1P1 Phone : 204-677-1496 888-847-7878 e-mail : ltucker@ northcentraldevelopment.ca
Aboriginal Northern Affairs Contact: Paul Doolan Phone : 204-945-2161 e-mail : PDoolan@gov.mb.ca Contact: David Chadwick Phone : 204-945-1165 e-mail : dchadwick@leg.gov.mb.ca	**Indian and Northern Affairs** www.ainc-inac.gc.ca/ro/index-eng.asp **Nunavut Regional Office** P.O. Box 2200 Iqaluit, NU X0A 0H0 Phone: 867-975-4500 **Manitoba Regional Office** 365 Hargrave St.

	Winnipeg, Manitoba R3B 3A3 Phone: 800-567-9604
Environment Canada EcoAction 150-123 Main St. Winnipeg, MB R3C 4W2 Phone: 800-263-0595 Website: www.on.ec.gc.ca/funding_e.html	**Human Resource and Social Development Canada (HRSDC)** www.hrsdc.gc.ca **Thompson Service Canada Centre** 3 Station Rd. Thompson, MB R8N 0N3 Phone: 800-622-6232 **Rankin Inlet Service Canada Centre** P.O. Box 97 Rankin Inlet, NU X0C 0G0 Phone: 867-645-4074
Shell Environmental Fund www.shellenvironmentalfund Phone: 403-691-2071 e-mail: admin-sef@shell.com	**Green Manitoba** www.greenmanitoba.ca Main Floor, 270 North Osborne St. Winnipeg, MB R3C 1V7 Phone: 204-945-3268 866-460-3118

Private Industry

Starfield Resources Contact: Denise Lockett #1002, 1433 Beach Ave. Vancouver, B.C. V6G 1Y3 Phone: 604-685-4767 e-mail: lockettda@telus.net	**Shear Minerals** www.shearminerals.com Contact: Pamela Strand Suite 200, 9797-45 Ave. Edmonton, AB Phone: 780-435-0045 e-mail: pstrand@compusmart.ab.ca

Media

CBC Radio

Contact: Marija Dumancic CBC North Nunavut Box 130 Rankin Inlet, NU X0C 0G0 Phone: 867-645-2244 e-mail: marija_dumancic@cbc.ca

Training and Resources

Nunavut Arctic College Kivalliq Campus P.O. Bag 002 Rankin Inlet, NU X0C 0G0 Contact: David Ittinuar Phone : 867-645-5503 e-mail : dittinuar@nac.nu.ca	**Refrigerant Management Association** www.hrai.ca Contact: Warren Heeley Phone : 905-602-4700 e-mail : Warren.heeley@hrai.ca
Vehicle Preparation www.carheaven.ca/ www.autorecyclers.ca/ www.cleanairfoundation.org/switchout/	

Attachment F:
Hamlet Contact List: Kivalliq Region

HAMLET	NAME	JOB TITLE	PHONE	E-MAIL
Arviat	Cary Merritt	Senior Administrative Officer (SAO)	867-857-2841	arviatsao@qiniq.com
Baker Lake	Gary Perkison	Operations Manager	867-793-2874	
Chesterfield Inlet	Harry Aggark	Foreman	867-898-9951 867-898-9926 867-898-9929	jax_gilbert@qiniq.com
Coral Harbour	Ron Ladd	SAO	867-925-8867	munch@qiniq.com
Rankin Inlet	Arnie Brown	Public Works Superintendent	867-645-2895 867-645-2146 (fax)	arnieb@qiniq.com
Repulse Bay	Grant Scott Johnnie	Acting SAO Conservation Officer	867-462-9952 867-462-4002	 repulsewildlife@qiniq.com
Whale Cove	Clayton Croucher	SAO	867-896-9961	saowc@qiniq.com
Kivalliq Region	Earle Baddaloo	Director of Environment	867-975-7729 867-975-7742 (fax)	EBaddaloo@GOV.NU.CA

Attachment G:
GPS Locations of Scrap Metal in the Kivalliq Region

Baker Lake

Transport Canada Site: N64° 18.913'; W095° 58.094'
Four Barrel sites each about 100'X100'X5'

Hamlet Vehicle Site; Baker Lake Contracting Service: N64° 19.043'; W095° 59.314'
40 vehicles; 12 tanks; mixed scrap covering 60'X300'

Landfill has five sites: N64° 19.735'; W095° 59.860'
46 vehicles; 15 tanks; old skidoos; 300 Barrels; tires

Site: N64° 18.833; W095° 59.350
13 Skidoos; 5 tanks; 1 crane

Chesterfield Inlet

Site: N63° 20.737'; W090° 45.112'
Waste oil – 53 barrels; white metal; 50 vehicles;

Parking Lot (local Contractor): N63° 20.450'; W090° 43.328'

Arviat

Metal Dump: N61° 05.778'; W94° 03.270';

Municipal Dump: N61° 05.305'; W094° 03111';

Rankin Inlet

Site by Nanuk:N62° 48.649; W092° 04.778';
7tanks; water truck; tractor; hydraulic press; 4 vehicles; 25 barrels; scrap;

M&T Site: N63° 48.734'; W092° 64.618'
5 tractors; 2 floats; Truck Cab ; 5 vehicles; 3 tanks; steel sled; barge;

Dock Area: N62° 47.986'; W092° 05.445';
30 vehicles;

Before Dump: N62° 48.173'; W092° 04.740';
2000 Barrels;

Dump: N62° 48.058'; W092° 04.840';
Consists of three areas; many, many barrels;

Johnson's Cove: N62° 48.875'; W092° 04.272';
Old vehicles; tanks; skidoos;

Repulse Bay

Old Metal Dump: N66° 31.662'; W086° 13.480';
13 Tanks; white metal; 20 drums; scrap metal; 50 old skidoos;

Metal Dump: N66° 32.934'; W86° 14.684';
5 vehicles; 25 skidoos; ATVs;

Coral Harbour

US Army: N64° 11.361'; W083° 20.674';
7 tanks; 12 vehicles; 400 barrels; 3 tractors;

Coral Dump and Metal: N64° 09.625'; W083° 11.629';
40 vehicles; 50 skidoos;

Hamlet Municipal Garage: N64° 8.606'; W083° 15.120';

Barge Docking Area: N64° 8.138'; W083° 15.120';

Whale Cove

New Dump: N62° 10.113'; W092° 35.734';
28 vehicles; 5 trucks; 75 skidoos; fuel tank; 45 fridges and stoves;

Old Dump: N62° 10.461'; W092° 34.171';
Truck; loader; barrels; old metal;

Attachment H:
Manitoba Bayline Community Contact List

COMMUNITY	NAME	JOB TITLE	PHONE	E-MAIL
Churchill	Rick Chorneyko	Public Works	204-675-8871	pworks@mts.net
Gillam	Jackie Clayton	Chief Administrative Officer (CAO)	204-652-2121	towncao@gillam.net
Thompson	Brad Salamandyk Jack Burton	Manager of Thompson Recycling Centre Local Government District	204-677-7991 204-677-4075	trec@mts.net lgdmystlake@mts.net
Ilford	Alfred Laliberty	Administrator	204-288-4366	
Thicket Portage	Joanne Pronteau	Clerk	204-286-3296	tpcc3@hotmail.com
Pikwitonei	Wayne Laubmann	Clerk	204-458-2420	pikcc@mts.net
Wabowden	Sessie Jonasson	Administrator	204-689-2165	
The Pas	Nelson Fulford	Public Works	204-627-1100	nelsonf@ townofthepas.ca
Opaskwayak Cree Nation	Loretta McGinnis Zacc Moore William Dorian	Youth Employment Community Works Landfill Site Manager	888-763-1566 Ext. 181 204-627-7050 204-623-7083	loretta.mcginnis@ opaskwayak.ca Zacc.moore@ Opaskwayak.ca

Attachment I:
Key Sources of Information

1) "Manitoba Options for End-of-Life Vehicles (ELV's) in Nunavut
Environmental Protection Service, Department of Environment, Government of Nunavut (February 2006)

2) "Scrap Metal Recycling in Remote Northern Communities – A Pilot Implementation Project- Final Report"
North Central Development for EcoAction (March 2006)

3) "Guide for Recycling Scrap Metal from Northern Manitoba and Nunavut"
earthbound environment inc. for North Central Development

4) "Scrap Metal Recycling in Remote Northern Communities – A Pilot Project Implementation Plan
earthbound environment inc. for Aboriginal Northern Affairs and the Government of Nunavut

5) Manitoba Metals- personal communication between Michelle Pruder (North Central Development) and Hugh Billingham

6) Hamlet of Rankin Inlet-personal communication between Michelle Pruder and Arnie Brown

7) Lynn Lake Salvage-personal communication between Michelle Pruder and Joey Barnes

8) Aboriginal Northern Affairs- personal communication between Michelle Pruder and Paul Doolan

9) Government of Nunavut, Department of Environment- personal communication between Michelle Pruder and Earle Baddaloo

Attachment J:
Action Plan Project Budget

Please see spreadsheet “NRCan Project Financials”