



AGNICO EAGLE

MELIADINE GOLD PROJECT

Landfill and Waste Management Plan

MARCH 2017

VERSION 5

6513-MPS-06

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EXECUTIVE SUMMARY

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (Project), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. The mine plan proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine.

This document presents the Landfill and Waste Management Plan (Plan) for the Project and forms a component of the documentation series produced for the Type A Water Licence Application. The Plan describes Agnico Eagle Mines Limited's (Agnico Eagle) strategies regarding waste management for the proposed Meliadine Gold Project (Project).

Reduce, reuse, and recycle initiatives will be developed at the Project to minimize the quantity of waste generated. Waste segregation will be used to capture wastes suitable for reuse or recycling, while at the same time ensuring that hazardous waste is managed appropriately.

A landfill will be required for the disposal of non-salvageable, non-hazardous, non-putrescible solid wastes from the construction, operation, and closure of the Project. The Project will be totally independent of, and will not use, municipal facilities or services for waste management.

The proposed landfill will be located within the Waste Rock Storage Facility 1 (WRSF 1) located to the southwest of the main mine infrastructure. The landfill will be filled progressively and in an orderly manner. An "area method" of dumping will be used such that materials will be dumped in rows and covered as required. Wastes will be disposed directly on the landfill floor and compacted with heavy equipment against the berm or an existing row of debris that was compacted earlier. Controlling the materials that can be placed in the landfill is a strategy aimed to reduce the concentration of constituents in potential leachate and to minimize the attraction of wildlife to the landfill. Landfill operation will also conform to best management practices to reduce the potential for windblown debris.

Leachate from the landfill is anticipated to be weak due to the controls placed on materials acceptable for landfilling. Moreover, drainage from the landfill is largely expected to freeze within the WRSF with little to none migrating to the water collection infrastructure placed around the WRSF. Annual landfill operation will also involve clearing of snow prior to spring melt. However, in the event there is leachate from the landfill due to periods of heavy rainfall or spring freshet, the runoff will be collected, controlled and treated, if necessary.

The landfill will be covered with a minimum 3.7 m of waste rock to isolate it from the environment and physically stabilize it.

EXECUTIVE SUMMARY	III
TABLE OF CONTENTS	IV
TABLES AND FIGURES	VI
DOCUMENT CONTROL.....	VII
ACRONYMS.....	VIII
UNITS	VIII
SECTION 1 • INTRODUCTION	1
1.1 PURPOSE AND SCOPE OF THE PLAN.....	1
1.2 LOCATION OF THE LANDFILL.....	2
1.3 LANDFILL DESIGN	2
1.4 LANDFILL SCHEDULE.....	5
SECTION 2 • RELATED DOCUMENTS.....	6
SECTION 3 • REGULATORY SETTING	7
SECTION 4 • WASTE MANAGEMENT APPROACH	8
4.1 REDUCE/RECYCLE/REUSE INITIATIVES	9
4.2 COLLECTION AND HANDLING OF WASTE	9
4.3 WASTE ACCEPTABLE FOR PLACEMENT IN LANDFILL.....	10
4.3.1 Waste Asbestos.....	11
4.4 WASTE UNACCEPTABLE FOR PLACEMENT IN LANDFILL	12
4.4.1 Fluorescent Lamp Tubes	12
4.4.2 Ozone Depleting Substances.....	12

4.5	TOTAL VOLUME OF WASTE	13
4.6	INCINERATOR ASH TESTING PROTOCOL	13
SECTION 5 • LANDFILL MANAGEMENT		14
5.1	SITE DEVELOPMENT AND LANDFILLING METHOD	14
5.2	STAFFING AND EQUIPMENT	15
5.3	LEACHATE MANAGEMENT	15
5.4	SURFACE WATER AND EROSION CONTROL	16
5.5	OPERATIONAL INSPECTIONS	16
SECTION 6 • TRAINING		17
SECTION 7 • CLOSURE PLAN		18
SECTION 8 • PLAN REVIEW AND UPDATE		19
REFERENCES.....		20
APPENDIX A • ENVIRONMENTAL GUIDELINE FOR WASTE ASBESTOS.....		22
APPENDIX B • ENVIRONMENTAL GUIDELINE FOR MERCURY-CONTAINING PRODUCTS AND WASTE MERCURY		23
APPENDIX C • ENVIRONMENTAL GUIDELINE FOR OZONE DEPLETING SUBSTANCES.....		24
APPENDIX D • ENVIRONMENTAL GUIDELINE FOR INDUSTRIAL WASTE DISCHARGES INTO MUNICIPAL SOLID WASTE AND SEWAGE TREATMENT FACILITIES		25

TABLES AND FIGURES

FIGURE 1-1 LANDFILL LOCATION FOR MELIADINE GOLD PROJECT.....3

FIGURE 1-2 TYPICAL SECTIONS FOR LANDFILL CLOSURE4

TABLE 4-1 ESTIMATED WASTE IN LANDFILL.....13

FIGURE 5-1 LANDFILL STAGE 1.....14

DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	November 2012			First draft of the Landfill and Waste Management Plan	John Witteman, Env. Consultant, Agnico Eagle
2	March 2013			Draft Environment Impact Statement re-submission; rebranding	
3	April 2014	1.3 1.4 4.3.1 4.5 5 6 7	2-3 3 11 13-14 16-17 18 19	Addressed commitments made during review of Draft Environmental Impact Statement: - Leachate management - Landfill schedule - Asbestos management - Records and reports - More details on Standard Operation Procedures - More details on best practices and training	John Witteman, Env. Consultant, Agnico Eagle
4	April 2015			Complete update to correspond with the Mine Plan	John Witteman, Env. Consultant, Agnico Eagle
5	February 2017	- 1.1 4.1 4.4.1 - - -	All Pages 1 9 12 Title Page 3 4	- Changed effective date from April 2015 to March 2017 - Added statement "Plan will have to be updated and submitted 90 days prior to landfill construction" - Removed statement "paper lunch bags will be replaced by sturdy metal or plastic lunch boxes" - Added ultraviolet lamp tubes to the section on fluorescent lamp tube disposal, as both contain mercury and will be disposed of in the same way - Changed April 2015 to March 2017 - Landfill Site Location diagram added - Typical Sections for Landfill Closure diagrams added	Justin MacMillan, Environmental Technician, Agnico Eagle

ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited
ARD/ML	Acid-Rock Drainage/Metal Leaching
CP1	Collection Pond 1
GN	Government of Nunavut
INAC	Indian and Northern Affairs Canada
NIRB	Nunavut Impact Review Board
Project	Meliadine Gold Project
WHMIS	Workplace Hazardous Materials Information System
WRSF	Waste Rock Storage Facility

UNITS

km	kilometre
m	metre
t	metric tonnes

SECTION 1 • INTRODUCTION

1.1 Purpose and Scope of the Plan

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (Project), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. Situated on the western shore of Hudson Bay, the proposed Project site is located on a peninsula between the east, south, and west basins of Meliadine Lake (63°1'23.8" N, 92°13'6.42"W), on Inuit Owned Lands. The Project is located within the Meliadine Lake watershed of the Wilson Water Management Area (Nunavut Water Regulations Schedule 4).

The mine plan proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine. The proposed mine will produce approximately 12.1 million tonnes (Mt) of ore, 31.8 Mt of waste rock, 7.4 Mt of overburden waste, and 12.1 Mt of tailings. There are four phases to the development of Tiriganiaq: just over 4 years construction (Q4 Year -5 to Year -1), 8 years mine operation (Year 1 to Year 8), 3 years closure (Year 9 to Year 11), and post-closure (Year 11 forwards).

The Landfill and Waste Management Plan (Plan) outlines the design, operation, and closure of a solid waste landfill as part of Agnico Eagle's proposed Project. It also highlights the waste segregation strategies that will be implemented to minimize the quantity of waste to be placed in the proposed landfill or incinerated. The Plan will have to be updated and submitted 90 days prior to permanent landfill construction.

The objectives of this Plan are summarized as follows:

1. To define the location, design, and operating procedures to be used in the landfill disposal of non-salvageable, non-hazardous, non-putrescible solid waste generated at the proposed mine.
2. To define acceptable/non-acceptable types of solid waste to be placed in the proposed landfill.
3. To describe plans to reduce/reuse/recycle Project wastes.
4. To define monitoring requirements for the proposed landfill.

A landfill is required for the disposal of non-salvageable, non-hazardous, non-putrescible solid industrial wastes that cannot be incinerated and that result from construction, operations, and closure of the Project. The proposed Project will be operated totally independent of, and will not use, any municipal facilities or services for waste management.

Hazardous wastes will not be placed in the proposed landfill. All hazardous materials will be packaged for shipment to a certified waste management company for treatment, recycling, and/or

disposal. The proposed Project also includes a landfarm to treat soils and rocks contaminated with hydrocarbons. The landfarm is described in the Landfarm Management Plan.

1.2 Location of the Landfill

The proposed landfill will be situated within the Waste Rock Storage Facility 1 (WRSF 1), which is located close to, and northeast of, the main mine infrastructure. The following criteria were considered in determining its location:

- Drainage – sites that will drain into areas where water will be collected and monitored as part of the overall site plan were preferred;
- Disturbed areas – sites within or near areas that will be disturbed as part of the future overall mine plan were preferred to minimise the environmental footprint of the Project;
- Access – sites located close to existing service or haul roads were preferred; and
- The landfill site had to be large enough to accommodate non-salvageable, non-hazardous, non-putrescible solid industrial wastes for the life of the Project, including the development of the other pits.

The first three criteria are recommendations from the *Mine Site Reclamation Guidelines for the Northwest Territories* (INAC 2007).

1.3 Landfill Design

The proposed landfill will not be a conventional landfill; it will be a controlled landfill where:

- Wastes will be segregated with liquids, hazardous and putrescible waste all being diverted away from the landfill (Section 4.3 and 4.4). The segregation of waste involves a major commitment by Agnico Eagle to educating all its employees and contractors in directing wastes to the proper waste collection bins.
- Waste management will include an incinerator where all organic, office waste, and any waste coming in contact with food is incinerated. Ash from the incineration process will be disposed of in the landfill (Section 4.6).
- Waste in the proposed landfill will not be scattered all over the floor of the landfill, but will be placed daily at the active working face where the waste can be leveled, compacted, and covered (Section 5).

The proposed landfill is planned to be located within the WRSF 1 as shown on Figure 1-1. The active WRSF 1 will set the bounds of the proposed landfill on its south and west sides, while berms will be constructed on the north and east sides of the landfill (see Figure 1-2). The purpose of the berms will be to confine the area for waste disposal and to act as a wind shield to reduce windblown debris. The landfill will be a rectangular shape with the length perpendicular to the prevailing wind direction so that much of the waste will be protected from wind by the berm.

INDUSTRIAL SITE PAD FOR PLANT SITE AND BUILDINGS

PROPOSED OPERATION LANDFILL (STAGE 1)

EXPLORATION LANDFILL (STAGE 1)

DP1-B

PROPOSED D-CP1

EVAPORATORS

P1 CONTAINMENT AREA

DP1-A

P2 CONTAINMENT AREA

DP2-A

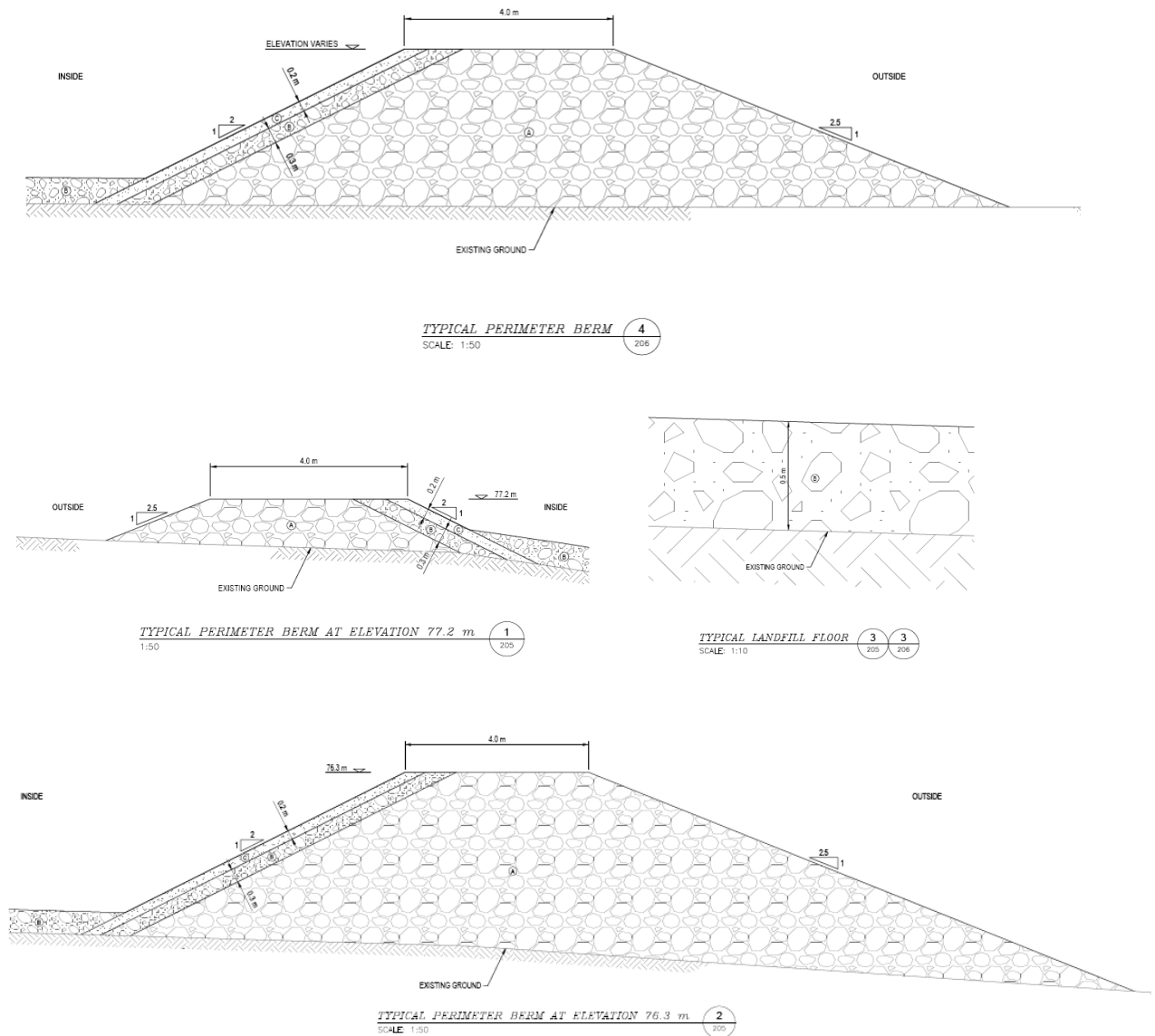
P3 CONTAINMENT AREA

DP3-A

ASH NORTH

SCALE 1:15,000

Figure 1-2 Typical Sections for Landfill Closure



Both the floor and the berm of the proposed landfill will be constructed with material (rockfill and/or waste rock) sourced from open pit stripping of Tiriganiaq Pit 1 or 2. The landfill floor will be approximately 1.2 m thick. The design of the berms will not assume that they will be in a frozen state or permanently impermeable to leakage. The final design will take into account berm and subgrade stability.

Due to the restriction on wastes that can be landfilled (see Section 4.3), and since the proposed landfill will be located within the WRSF 1, the quantity of leachate is expected to be minimal (if any), and of low ionic strength. The proposed landfill will nonetheless receive precipitation during the summer period, which could infiltrate the landfill before it can evaporate. In the event that leachate migrates from the landfill, it will be collected, monitored, and, if necessary, treated before being released to the receiving environment.

Closure design for the proposed landfill is described in Section 7 and illustrated in Figure 1-2. Based on the design strategy for the proposed landfill, and the management and operating procedures listed above, a liner is not considered necessary for the landfill.

1.4 Landfill Schedule

The proposed landfill will be used for the construction, operations, and closure phases. It will not be required for post-closure. The exploration landfill approved under water licence 2BB-MEL0914¹ will be used during the pre-development phase; this is until the proposed landfill for the mine has been constructed and becomes operational.

The schedule for the proposed landfill is as follows:

- Years -3 to -1: Construction of the landfill will occur directly after the placement of minimum 1.2 m of waste rock or rockfill to serve as a base or foundation. This will occur during the first year of construction, with commissioning of the landfill directly thereafter. This will allow non-salvageable, non-hazardous, non-putrescible solid construction waste to be placed in the landfill;
- Years 1 to 8: The landfill will be used continuously during operations;
- Years 9 to 11: The landfill will be one of the last parts of mine infrastructure to close. It is expected to be extensively used during closure for demolition waste and will remain operational until it is no longer needed.²

¹ Although approved by the Nunavut Water Board, this landfill has not been built as of March 2015.

² The incinerator will close before the landfill.

SECTION 2 • RELATED DOCUMENTS

Related documents include the following:

- Risk Management and Emergency Response Plan;
- Hazardous Materials Management Plan;
- Incineration Management Plan;
- Environmental Management and Protection Plan;
- Preliminary Closure and Reclamation Plan; and
- Occupational Health and Safety Plan (Agnico Eagle 2014).

The Landfill and Waste Management Plan is part of the Environmental Management and Protection Plan, which provides overarching environmental direction for the Project.

SECTION 3 • REGULATORY SETTING

Waste management in Nunavut is regulated under the *Nunavut Public Health Act*, the *Nunavut Environmental Protection Act*, the federal *Environmental Protection Act*, and the federal *Transport of Dangerous Goods Act*. Agnico Eagle will also be bound by the forthcoming terms and conditions of its commercial lease with the Kivalliq Inuit Association and its water licence from the Nunavut Water Board.

In addition to mandatory requirements, a number of waste management guidelines are commonly used in the Northwest Territories and Nunavut. The most recent of these was developed for municipal solid waste and is titled: “*Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the NWT*” (Ferguson Simek Clark 2003). *Environmental Guideline for Industrial Waste Discharge into Municipal Solid Waste and Sewage Treatment Facilities* (GN 2011c) were also used (Appendix D). While not all of the recommendations provided in these guidelines are appropriate for the management of industrial waste expected at the proposed Project, principles considered applicable have been adopted in this Plan.

In addition, the *Mine Site Reclamation Guidelines for the Northwest Territories* (INAC 2007) were followed regarding specific landfill design and mitigation for potential impacts pertaining to waste.

SECTION 4 • WASTE MANAGEMENT APPROACH

Waste³ at the proposed Project is divided into the following categories:

1. Domestic waste: general waste materials coming from the kitchen, cafeteria, lunch rooms, dormitories, and offices. Bins will be located in high traffic areas for segregating wastes destined for incineration, landfilling, or recycling.
2. Medical waste: medical waste generated in the first aid/health room will require special handling and will be placed in easily identifiable single use medical waste containers. Both the containers and its contents will be incinerated.
3. Industrial waste: waste arising from operations in the truck shops, process plant, emulsion plant, paste plant, and warehouses. Each work area will have specially marked bins for segregating waste for incineration, recycling, or disposal. Special bins or areas will be set aside for hazardous waste. Large bulky items that cannot be incinerated will be prepared for shipment south for recycling, or be cleaned of any hydrocarbon contamination and have the electronics removed before disposal in the landfill.
4. Sewage: wastewater from the accommodation complex will be treated in the Sewage Treatment Plant before being directed to Collection Pond 1 (CP1). Sewage sludge removed from the Sewage Treatment Plant will be added to the landfarm as nutrient amendment on an as needed basis. Excess sludge will be disposed of in the tailings storage facility.
5. Used oil and waste fuels: used engine oil, hydraulic fluids, and fuels that do not meet specifications for designated use. This does not include solvents or paints. The used oil and waste fuels will be used in waste oil burners if it is found acceptable. For more details on the used oil and waste fuels, refer to the Incineration Management Plan.
6. Incinerator ash: ash testing protocol developed by the Government of Nunavut in accordance with the *Nunavut Environmental Guideline for Industrial Waste Discharges* will be implemented to ensure that the incinerator ash is suitable for disposal in the landfill (GN 2012). Ash not meeting the guidelines will be packaged in drums to be sent to a certified waste management facility for appropriate treatment, recycling, and/or disposal, or will be buried within the dry stacked tailings.
7. Hazardous waste: refer to the Hazardous Materials Management Plan for details on how hazardous waste will be managed.

³ Tailings, waste rock, and overburden are also considered waste materials. The Mine Waste Management Plan provides details on these wastes.

4.1 Reduce/Recycle/Reuse Initiatives

Waste management begins by keeping all materials that can be economically recycled out of the waste stream destined for the landfill or incineration. The three R's of waste management - reduce, reuse, and recycle - will be encouraged within the waste management program.

Reduce, reuse, and recycle initiatives will be developed at the Project to minimize the quantity of waste incinerated or directed to the landfill. To support this initiative, operating procedures will be developed to maximize the volume of materials that are recycled and/or reused. This will include eliminating the use of disposable materials where possible, and segregating waste destined for reuse, and recycle alternatives.

Minimizing or avoiding the creation of pollutants and wastes can be more effective in protecting the environment than treating or cleaning them up after they have been created (Environment Canada 2003). Waste management for the proposed Project will include efforts directed at eliminating, where practicable, the use of disposable materials in everyday use, such as disposable cups, plates, and table ware. Workers will be encouraged to use ceramic mugs and stainless steel cutlery in the cafeteria or lunch rooms, and to carry personal drink containers or thermoses. Water will be recycled from CP1 for use in the mill with fresh water from Meliadine Lake only being used as makeup water. A tailings pond will not be constructed; instead, Dry Stack Tailings technology will be employed whereby tailings water will be reclaimed within the mill before the tailings are trucked for disposal. This will increase the volume of water available for recycling to the process. Low flush toilets and water saving showers heads will also be used throughout the facility to conserve water.

Recycle bins will be located in high traffic areas for small waste items such as alkaline and rechargeable batteries, obsolete computer equipment and supplies, and fluorescent light bulbs. Scrap metal will be collected on-site. These wastes will be packed for shipment off-site to licensed recycling depots.

All hazardous materials collected on-site will also be sent off-site to a licensed hazardous waste management company. Many of these materials end up being compatible with recycling after treatment. Examples include lead recovered from lead-acid batteries and oil filters becoming scrap metal after cleaning.

4.2 Collection and Handling of Waste

The strategy for the management of solid waste at the proposed Project will be to first identify and segregate acceptable disposal items from non-acceptable items. Within the acceptable disposal items, the second step will be to segregate those items that can be economically recycled from those that cannot. This segregation will be done at source by locating bins throughout the facilities for the collection of items suitable for recycling.

Waste will be generated and segregated in all buildings and will need to be collected and transported to the incinerator (waste management) building for final disposal or incineration. The Site Services Department will be responsible for the collection and transport of waste to the incinerator building.

All solid wastes that may contain medical waste from the Health Centre, food waste, food packaging waste, or other organic waste that could attract wildlife will be incinerated in the on-site incinerator. This will include all garbage from the accommodation complex, kitchen, lunchrooms, and offices. These will receive priority in being incinerated. Food wastes and wastes associated with food will be collected daily, at a minimum, and immediately transported to the incinerator building. This waste will not be allowed to remain unattended in vehicles at any time. The ash from the incinerator will be disposed of in the landfill.

The development of the proposed landfill will minimize the area required for waste storage and re-handling of waste. Acceptable items that will be disposed of in the landfill will be those that are solid, non-salvageable, non-hazardous, non-putrescible, with a low leachate and low heat generation potential. Controlling the materials that can be placed in the landfill is a strategy aiming at reducing the concentration of constituents in potential leachate. The proposed landfill will conform to best management practices allowing for orderly landfill development, which will reduce the potential for windblown debris.

Hazardous waste and materials that can be recycled will be appropriately packaged (as per regulations under the *Transport of Dangerous Goods Act*) to be sent off-site to a licensed hazardous waste management facility or recycling facility, respectively. Management of hazardous materials is covered in detail in the Hazardous Materials Management Plan.

4.3 Waste Acceptable for Placement in Landfill

The following materials will be acceptable for disposal in the proposed landfill:

- Plastic (except expanded polystyrene);
- Steel, copper, aluminum, iron;
- White goods;
- Wire;
- Wood;
- Fiberglass insulation;
- Fiberglass;
- Roofing;
- Asphalt;
- Concrete;
- Carpet;
- Bricks;

- Ceramics;
- Rubber;
- Empty caulking tubes;
- Hardened caulk;
- Clothing;
- Glass, including light bulbs (fluorescent bulbs will require special handling, see below for more details);
- Waste Asbestos (see below for more details);
- Small appliances (with batteries removed);
- Gyproc;
- Ash, provided it has cooled to 60 degrees Celsius or less;
- Vehicles and machinery provided all liquids, grease, batteries, and electronics have been removed; and
- Treated soils from landfarm.

4.3.1 Waste Asbestos⁴

Waste asbestos includes any type of material with greater than 1 % asbestos by weight (GN 2011a). Asbestos that has been immersed or fixed in a natural or artificial binder or included in a manufactured product is not considered waste asbestos; it is considered a hazardous waste and will be disposed of accordingly. Waste asbestos can either be backhauled off-site for disposal in an approved facility or it can be landfilled. The following are guidelines for landfilling waste asbestos:

- Immediate burial and cover with 0.5 m of cover material;
- Burial where it will not be disturbed; and
- Maintenance of the location on a map or diagram for future reference.

In addition to following the *Environmental Guideline for the General Management of Hazardous Waste* (GN 2010a), Agnico Eagle will adhere to the Government of Nunavut's (GN) *Environmental Guideline for Waste Asbestos* (GN 2011a). Before landfilling waste asbestos, Agnico Eagle will review the steps in this guideline with the GN.

The complete *Environmental Guideline for Waste Asbestos* (GN 2011a) and *Environmental Guideline for the General Management of Hazardous Waste* (GN 2010a) can be found in Appendix A and the Hazardous Materials Management Plan, respectively. All Government of Nunavut environmental guidelines can be accessed online at <http://env.gov.nu.ca/programareas/environmentprotection/legislation>.

⁴ It is unlikely that asbestos waste will result from mine operations. Agnico Eagle will avoid using asbestos wherever possible.

4.4 Waste Unacceptable for Placement in Landfill

Materials not listed in the previous section will be unacceptable for placement in the landfill, unless approved in writing by the Meliadine Environment Department. These materials include the following:

- Organic matter, including food, sludge from the Sewage Treatment Plant, dead animals, paper, cardboard;
- Food containers and wrappings, unless cleaned;
- Hazardous wastes including mercury, batteries, solvents, glues, ethylene glycol antifreeze, adhesives (except empty caulking tubes);
- Electronics;
- Materials that can be recycled economically;
- Petroleum products, including materials contaminated with petroleum products; and
- Expanded polystyrene.

In particular, organic matter will not be accepted in the landfill, thus eliminating the attraction of small mammals, carnivores, and/or raptors. This will be accomplished by requiring all personnel to dispose of domestic waste in designated receptacles and by sending all collected domestic waste (e.g., from kitchen, offices, and living quarters) to the on-site incinerator.

4.4.1 Fluorescent Lamp Tubes

Fluorescent tubes contain mercury phosphorus powder and traces of lead and cadmium, which are considered environmental contaminants under the Nunavut *Environmental Protection Act* (GN 2010b). The only disposal method for fluorescent tubes is through an approved hazardous waste recycling or disposal facility (GN 2003). Government of Nunavut guidelines on *Mercury-Containing Products and Waste Mercury* (GN 2010b) and *Environmental Guideline for the General Management of Hazardous Waste* (GN 2010a) are included in Appendix B and the Hazardous Materials Management Plan, respectively. These guidelines will be followed and wastes having mercury will be sent to a certified waste management company for treatment, recycling, and/or disposal.

Ultraviolet (UV) lamp tubes used in the wastewater and potable water treatment systems shall be disposed of in the same way as fluorescent lamp tubes, as they also contain mercury (vapour).

4.4.2 Ozone Depleting Substances

Ozone depleting substances include chlorofluorocarbons or halons. Common sources include refrigeration equipment, air conditioning equipment, motor vehicle air conditioners, and fire extinguishing equipment (GN 2011b). These materials are hazardous in nature; consequently, all disposal of ozone depleting substances will take place at an approved facility.

Any non-salvageable equipment containing ozone depleting substances will have the ozone depleting substances removed by a certified technician prior to disposal in the proposed landfill. The *Environmental Guideline for Ozone Depleting Substances* is included in Appendix C.

4.5 Total Volume of Waste

The number of people working on-site, and the activities occurring at the time, will have a direct bearing on the volume of waste destined for the proposed landfill, the incinerator, and the amount of materials removed from the waste stream for reuse and recycling. Also, purchasing policies that focus on reduced packaging will have a bearing on the volume of waste.

An estimate of waste volume is required to determine the appropriate size of the landfill. However, an exact waste volume is not a critical parameter in the design because of the flexibility of design to accommodate extensions (larger to accept more waste) or contractions (smaller to accept less waste) within WRSF 1.

Table 4-1 tabulates the estimated mass of waste destined for the landfill each year and cumulatively for the life of the Project. As mentioned earlier, the flexibility in the landfill design allows for greater flexibility in the landfill design and allows for increased volume in case more waste than estimated is generated. This ensures there will be enough room for all landfill waste for the life of the Project.

Table 4-1 Estimated Waste in Landfill

Project Phase	Waste Not Incinerated (t/year)	Ash From Incinerator (t/year)	Estimated Volume of Non-Hazardous Waste and Ash Produced (m ³ /year)	Approximate Treated Soil From Landfarm (m ³ /year)	Maximum Accumulated Waste Material in Landfill (m ³)
Construction	100	30	260	0	1,040
Operations	340	102	884	446	37,043
Closure	25	7.5	65	525	25,226
Total					63,309

As part of the larger waste management system, records will be kept of quantity of waste landfilled, the quantity of waste incinerated, type and quantity of materials recycled, and any analytical results. All this information will be submitted to regulators in an annual report.

4.6 Incinerator Ash Testing Protocol

Provided the materials that go into the incinerator are controlled to exclude all hazardous materials, then ash from the incineration process should be non-hazardous. An ash testing protocol, as described in Section 8.3 of the Incineration Management Plan, will be implemented to ensure that the incinerator ash is suitable for disposal in the proposed landfill.

SECTION 5 • LANDFILL MANAGEMENT

5.1 Site Development and Landfilling Method

The site for the proposed landfill will be prepared by first placing a foundation (or base) of 1.2 m of waste rock or and/or rockfill material directly on top of the natural ground to form a floor. A service road, accessible only to mine staff and Agnico Eagle's contractors, will connect the landfill to other mine infrastructure. Berms surrounding the facility on three sides will be built of waste rock and/or rockfill material. The design of the berms does not assume that they will be in a frozen state, or permanently impermeable to leakage. The berms will serve to confine the area for waste disposal and act as a wind shield to reduce windblown debris (Figure 5.1).

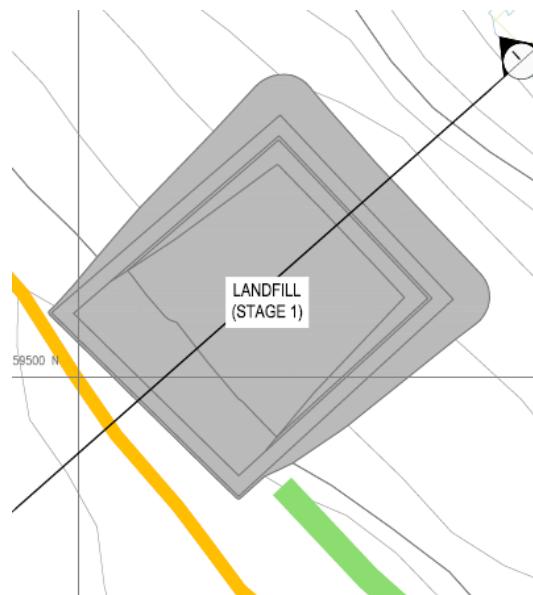


Figure 5-1 Landfill Stage 1

The Project's Site Services Department will be responsible for the operation and maintenance of the proposed landfill and will develop standard operating procedures for the same. The landfill will progressively be filled in an orderly manner. Specifically, waste will be placed to full height at one end of the proposed landfill and then the active waste area will progressively advance. An "area method" of dumping will be used such that materials will be dumped in rows and covered as required. Wastes will be deposited directly onto the landfill floor and compacted with heavy equipment against the berm or an existing row of debris that was compacted earlier.

Areas where the waste has been placed to full height, compacted and levelled will be progressively covered by placement of a minimum of 0.3 m thick of rock fill on top of the waste to reduce windblown debris.

Owing to its placement within the WRSF 1, the proposed landfill will become encapsulated within waste rock. Agnico Eagle plans to use waste rock to surround and cover the landfill. Upon closure, the entire landfill will be covered with 3.7 m of waste rock.

5.2 Staffing and Equipment

The Project's Site Services Department will collect all waste throughout the proposed mine site using trucks. Waste will be segregated at source with different waste streams following different paths. Trucks will haul waste destined for the proposed landfill and dump it at the working face where a dozer will be used to spread, level, and compact the waste.

Landfill operation will not require a full-time attendant as waste will only be delivered to the landfill for short periods each day.

5.3 Leachate Management

The leachate from the proposed landfill is anticipated to be of very low ionic strength (dilute) due to controls on materials to be placed in the landfill, and, as a result, site-specific landfill leachate management is not considered necessary.

In the event there is leachate from the landfill during periods of heavy rainfall or spring freshet, the runoff will be collected and directed to CP1⁵, where it will be controlled and, if necessary, treated before release to the receiving environment. During operations, wastewater in CP1 could also be recycled and sent to the mill for use in the process.

In the event that greater volumes of leachate, or leachate with high ionic strength, is found coming from the proposed landfill, an investigation would immediately be undertaken to determine the cause. This could lead to changes in the configuration and/or management of the landfill to further limit water coming in contact with landfill materials and/or modify the water management strategy in this area.

The toe of WRSF 1 will be visually inspected monthly during the open water season and, if required, samples of water found ponding on the natural ground below the proposed landfill will be collected and analysed. The collection of samples, their analysis and reporting of results are anticipated to be part of the Water Licence for the mine.

Because the proposed landfill will be located in an area with underlying permafrost (see Permafrost Thermal Regime Baseline Studies in Agnico Eagle 2014), deep groundwater contamination from potential landfill leachate is not anticipated.

⁵ Collection Pond 1 collects contact water runoff from a number of mine areas. For more details on CP1, refer to Water Management Plan.

5.4 Surface Water and Erosion Control

The slopes of the proposed landfill will be constructed of waste rock and should not be subject to erosion.

5.5 Operational Inspections

The Project's Environment Department will undertake periodic inspections of the landfill operations to verify compliance with applicable plans, including the condition of landfill works, evidence of erosion, excessive ponding or unusual landfill settlement, and adequacy of safety measures. The Environment Department will also visually inspect the toe of the WRSF 1 monthly during the open water season for leachate from the proposed landfill and, if present, collect samples for analysis.

SECTION 6 • TRAINING

All Agnico Eagle personnel and contractors working at the proposed Project site will be trained in waste management. This will be included in the site orientation upon arrival, which will include the identification of waste bins and dumpsters for the different categories of waste, where these are located, and the signage associated with each. Stewardship of the environment will be emphasized in that it is everybody's responsibility to properly dispose of waste, including wastes that can be recycled. This extends to ensuring wildlife does not have access to food or food wastes.

The success of the waste management system at the proposed mine site will be dependent on the proper disposal of all waste by all employees and contractors. Waste management training beyond the initial orientation will occur in each department. Environment department staff will reinforce proper waste segregation and disposal at various departmental meetings.

The Project's Site Services Department will have enhanced on-the-job waste management training as they will be collecting and processing all mine site waste. They will be trained in identifying misdirected waste, identifying where to dispose of it and in recommending where further waste management training is required on-site.

All maintenance staff must successfully complete equipment training before they can operate machinery and vehicles related to waste management on-site. Additionally, crews handling waste will be fully trained in safe work procedures. Training programs will include Workplace Hazardous Materials Information System (WHMIS) and Transportation of Dangerous Goods (TDG). Training completion and retraining will be documented and tracked by the Project's Human Resources Department.

SECTION 7 • CLOSURE PLAN

The proposed landfill is designed to be located within the WRSF 1. This location serves to minimize the area of surface disturbance, stabilize disturbed land surfaces against erosion, and return the land to a post-mining use that is chemically and physically stable, and consistent with past traditional pursuits and wildlife habitat. While waste rock will be disposed on land and in a manner that encourages total freezing. The design, operation, and/or closure of the WRSFs and landfill do not rely on total freezing. Any unacceptable leachate that is generated following closure of these facilities will be contained, collected, and/or treated, if necessary.

The following is a plan for closing the proposed landfill; more information is available in the Mine Preliminary Closure and Reclamation Plan:

a) Estimate of Total Waste Volume at Closure

Upon closure, it is estimated that the landfill will have a volume of approximately 63,000 m³ of waste.

b) Final Cover Design

The proposed landfill will be covered with a minimum of 3.7 m of waste rock, and should thereafter be stable. When finalizing the design for the cover, the need for thermistors to be installed will be evaluated. The cover surface will be left irregular so as to capture snow, windblown sediment, and plant seeds.

c) Water Management

Contact water from the proposed landfill at its closure will continue to be managed using best management practices in accordance with the Project's closure and reclamation plan.

SECTION 8 • PLAN REVIEW AND UPDATE

The Landfill and Waste Management Plan will be reviewed annually by the Meliadine Environment Department. This plan will be reviewed and updated on an annual basis, as required, to reflect changes in operations and/or technology. Improvements suggested through these reviews would be implemented in consultation with the Nunavut Water Board and Kivalliq Inuit Association.

REFERENCES

- Agnico Eagle (Agnico Eagle Mines Limited). 2014. Meliadine Gold Project, Nunavut. Final Environmental Impact Statement. Submitted to the Nunavut Impact Review Board. April 2014.
- Environment Canada. 2003. State of the Environment InfoBase, Environmental Indicator Series 2003. Available online: <http://www.ec.gc.ca>.
- Ferguson Simek Clark (Ferguson Simek Clark Engineers and Architects). 2003. Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the NWT. Report prepared for the Department of Municipal and Community Affairs, Government of Northwest Territories, April 2003.
- GN (Government of Nunavut). 2003. Disposal Guidelines for Fluorescent Lamp Tubes. Nunavut Department of Environment, Environmental Protection Service. Available online: <http://env.gov.nu.ca/sites/default/files/Fluorescent%20Lamp%20Tubes.pdf>
- GN. 2010a. Environmental Guideline for the General Management of Hazardous Waste. Nunavut Department of Environment, Environmental Protection Service. Available online: [http://env.gov.nu.ca/sites/default/files/Guideline%20-%20General%20Management%20of%20Hazardous%20Waste%20\(revised%20Oct%202010\).pdf](http://env.gov.nu.ca/sites/default/files/Guideline%20-%20General%20Management%20of%20Hazardous%20Waste%20(revised%20Oct%202010).pdf)
- GN. 2010b. Mercury-Containing Products and Waste Mercury. Nunavut Department of Environment, Environmental Protection Service. Available online: http://env.gov.nu.ca/sites/default/files/mercury-containing_products_and_waste_mercury_2010.pdf
- GN. 2011a. Environmental Guideline for Waste Asbestos. Nunavut Department of Environment, Environmental Protection Service. Available online: http://env.gov.nu.ca/sites/default/files/waste_asbestos_2011.pdf
- GN. 2011b. Environmental Guideline for Ozone Depleting Substances. Nunavut Department of Environment, Environmental Protection Service. Available online: http://env.gov.nu.ca/sites/default/files/ozone_depleting_substances_2011.pdf
- GN. 2011c. Environmental Guideline for Industrial Waste Discharges into Municipal Solid Waste and Sewage Treatment Facilities. Nunavut Department of Environment, Environmental Protection Service. Available online: http://env.gov.nu.ca/sites/default/files/industrial_waste_discharges_2011.pdf
- GN 2012. . Environmental Guideline for the Burning and Incineration of Solid Waste. Government of Nunavut, Department of Environment, Environmental Protection Service

INAC (Indian and Northern Affairs Canada). 2007. Mine Site Reclamation Guidelines for the Northwest Territories. Available online:

http://www.nwtwb.com/Downloads/MIne_Site_Reclamation_2007.pdf

APPENDIX A • ENVIRONMENTAL GUIDELINE FOR WASTE ASBESTOS

Environmental Guideline for Waste Asbestos



Department of Environment
Government of Nunavut

GUIDELINE: WASTE ASBESTOS

Original: January 2002

Revised: January 2011

This Guideline has been prepared by the Department of Environment's Environmental Protection Division and approved by the Minister of Environment under the authority of Section 2.2 of the *Environmental Protection Act*.

This Guideline is not an official statement of the law and is provided for guidance only. Its intent is to increase the awareness and understanding of the risks, hazards and best management practices associated with waste asbestos. This Guideline does not replace the need for the owner or person in charge, management or control of the waste to comply with all applicable legislation and to consult with Nunavut's Department of Environment, other regulatory authorities and qualified persons with expertise in the management of waste asbestos.

Copies of this Guideline are available upon request from:

Department of Environment
Government of Nunavut

P.O. Box 1000, Station 1360, Iqaluit, NU, X0A 0H0

Electronic version of the Guideline is available at <http://env.gov.nu.ca/programareas/environmentprotection>

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Right – Arun District Council, United Kingdom

Table of Contents

Introduction	1
1.1 Definitions	1
1.2 Roles and Responsibilities.....	2
1.2.1 Department of Environment	2
1.2.2 Generators of Waste Asbestos	3
1.2.3 Other Regulatory Agencies	3
Characteristics and Potential Effects of Asbestos	5
2.1 Characteristics	5
2.2 Potential Effects on Environment and Human Health	5
Waste Management	6
3.1 Pollution Prevention	6
3.2 Handling and Removal	6
3.3 Storage	7
3.4 Transportation	8
3.5 Disposal.....	9
Conclusion	10
References	11

Appendices

Appendix 1	Environmental Protection Act
Appendix 2	Safety Act: Asbestos Safety Regulations
Appendix 3	Asbestos Containing Materials
Appendix 4	Government and Industry Contacts

Introduction

Asbestos is the commercial term given to a group of silicate minerals that occur naturally in the environment. These minerals have separable long fibers that are heat resistant, strong and flexible enough to be woven or spun. Because of these characteristics, asbestos has been used in a wide range of manufactured products, mostly in building materials (i.e. roofing shingles, ceiling and floor tiles, wallboard, clapboard and asbestos cement products), friction products (i.e. automobile clutch, brake and transmission parts) and heat resistant insulation, fabrics, packaging, gaskets and coatings. Loose-fill vermiculite insulation may also contain small amounts of asbestos.

During the 1980s the health and safety risks associated with asbestos started to become known. As a result, the use of asbestos was banned or phased out throughout North America. Asbestos products may still be found when buildings are being renovated or demolished, or when carrying out repairs on older vehicles and electrical appliances.

Although asbestos is typically considered to be a human health hazard, the route of exposure is through breathing air and drinking water that contain the very small asbestos fibres. The *Environmental Guideline for Waste Asbestos* (the Guideline) provides information on the characteristics and potential environmental and human health effects of waste asbestos and guidance on its proper storage, handling and removal, transportation and disposal. It is not an official statement of the law. For further information and guidance, the owner or person in charge, management or control of waste asbestos is encouraged to review all applicable legislation and consult the Department of Environment, other regulatory agencies or qualified persons with expertise in the management of waste asbestos.

The *Environmental Protection Act* enables the Government of Nunavut to implement measures to preserve, protect and enhance the quality of the natural environment. Section 2.2 of the *Act* provides the Minister with authority to develop, coordinate, and administer the Guideline.

1.1 Definitions

<i>Asbestos</i>	A commercial term given to naturally occurring fibrous silicate minerals including crocidolite, amosite, chrysotile, fibrous anthophyllite, tremolite, actinolite and mysorite.
<i>Commissioner's Land</i>	Lands that have been transferred by Order-in-Council to the Government of Nunavut. This includes roadways and land subject to block land transfers. Most Commissioner's Land is located within municipalities.
<i>Contaminant</i>	Any noise, heat, vibration or substance and includes such other substance 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 to property.

<i>Dangerous Good</i>	Any product, substance or organism included by its nature or by the <i>Transportation of Dangerous Goods Regulations</i> in any of the classes listed in the schedule provided in the <i>Transportation of Dangerous Goods Act</i> .
<i>Environment</i>	The components of the Earth and includes (a) air, land and water, (b) all layers of the atmosphere, (c) all organic and inorganic matter and living organisms, and (d) the interacting natural systems that include components referred to in paragraphs (a) to (c) above.
<i>Friable Waste Asbestos</i>	Waste asbestos which can be crumbled by hand pressure when it is dry.
<i>Minister</i>	The Minister of Environment of the Government of Nunavut.
<i>Qualified Person</i>	A person who has an appropriate level of knowledge and experience in all relevant aspects of waste management.
<i>Responsible Party</i>	The owner or person in charge, management or control of the waste.
<i>Transport Authority</i>	The statute and regulations controlling the management of hazardous waste under that mode of transport. These include (a) Road and Rail - <i>Transportation of Dangerous Goods Act</i> (Canada) and <i>Regulations; Interprovincial Movement of Hazardous Waste Regulations and Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations</i> . (b) Air – <i>International Air Transport Association (IATA) Dangerous Goods Regulations</i> and <i>International Civil Aviation Organization (ICAO) Technical Instructions</i> ; and (c) Marine – <i>International Maritime Dangerous Goods Code (IMDG)</i> .
<i>Waste Asbestos</i>	A substance containing asbestos in a concentration greater than 1% by weight that is no longer wanted or is unusable for its intended purpose and is intended for storage or disposal. Waste asbestos does not include asbestos that is immersed or fixed in a natural or artificial binder.

1.2 Roles and Responsibilities

1.2.1 Department of Environment

The Environmental Protection Division is the key environmental agency responsible for ensuring parties properly manage waste asbestos and will provide advice and guidance on its management. Authority is derived from the *Environmental Protection Act*, which prohibits the discharge of contaminants to the environment and enables the Minister to undertake actions to ensure appropriate management measures are in place. Although programs and services are applied primarily to activities taking place on Commissioner's and municipal lands and to Government of Nunavut undertakings, the *Environmental Protection Act* may be applied to the whole of the territory where other controlling legislation, standards and guidelines do not exist. A complete listing of relevant legislation and guidelines can be

obtained by contacting the Department of Environment or by visiting the web site at <http://env.gov.nu.ca/programareas/environmentprotection>.

1.2.2 Generators of Waste Asbestos

The owner or person in charge, management or control of waste asbestos is known as the responsible party. In general, the responsible party must ensure asbestos is properly and safely managed from the time it is produced to its final disposal. This is referred to as managing the waste from cradle-to-grave. Information on the general management of hazardous waste in Nunavut, including generator, carrier and receiver responsibilities, can be obtained by referring to the *Environmental Guideline for the General Management of Hazardous Waste*.

Contractors may manage unwanted or waste asbestos on behalf of the responsible party. However, the responsible party remains liable for ensuring the method of management complies with all applicable statutes, regulations, standards, guidelines and local by-laws. If the contractor does not comply with the requirements of the *Environmental Protection Act* and is charged with a violation while managing the waste, the responsible party may also be charged.

1.2.3 Other Regulatory Agencies

Other regulatory agencies may have to be consulted regarding the management of waste asbestos as there may be other environmental or public and worker health and safety issues to consider.

Workers' Safety and Compensation Commission

The Workers' Safety and Compensation Commission is responsible for promoting and regulating worker and workplace health and safety in Nunavut. The Commission derives its authority from the *Workers' Compensation Act* and *Safety Act* which require an employer to maintain a safe workplace and ensure the safety and well being of workers. The *Asbestos Safety Regulations* provide specific requirements for the safe handling of asbestos in the workplace and for medical surveillance of workers.

Department of Community and Government Services

The Department of Community and Government Services is responsible under the *Commissioners' Lands Act* for the issuance of land leases, reserves, licenses and permits on Commissioner's Lands. The Department, in cooperation with communities, is also responsible for the planning and funding of municipal solid waste and sewage disposal facilities in most Nunavut communities.

Department of Health and Social Services

Activities related to the handling and management of waste asbestos may have an impact on public health. The Office of the Chief Medical Officer of Health and Regional Environmental Health Officers should be consulted regarding legislated requirements under the *Public Health Act*.

Department of Economic Development and Transportation

The Motor Vehicles Division of the Department of Economic Development and Transportation is responsible for the safe transport of hazardous waste and other dangerous goods by road through administration of the *Transportation of Dangerous Goods Act*. The Department is also responsible under the *Motor Vehicles Act* for driver licensing and various other vehicle and road safety matters.

Environment Canada

Environment Canada is responsible for administering the *Canadian Environmental Protection Act* (CEPA)¹ and for regulating the interprovincial and international movement of hazardous waste, including waste asbestos, under the *Interprovincial Movement of Hazardous Waste Regulations* and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*. Environment Canada is also responsible for administering the pollution prevention provisions of the federal *Fisheries Act*.

Indian and Northern Affairs Canada

Indian and Northern Affairs Canada is responsible under the *Territorial Lands Act* and *Nunavut Waters and Nunavut Surface Rights Tribunal Act* for the management of federal lands and waters, including the impact waste asbestos may have on the quality of these lands and waters.

Local Municipal Governments

The role of municipal governments is important in the proper local management of waste asbestos. Under the Nunavut Land Claims Agreement, municipalities are entitled to control their own municipal disposal sites. Unwanted waste may be deposited into municipal landfill sites and sewage lagoons only with the consent of the local government. The local fire department may also be called upon if a fire or other public safety issue involving asbestos is identified.

Co-management Boards and Agencies

Co-management boards and agencies established under the Nunavut Land Claims Agreement have broad authority for land use planning, impact assessment and the administration of land and water. Activities involving the management and disposal of waste asbestos may be controlled through the setting of terms and conditions in plans, permits and licenses issued by the Nunavut Water Board and other co-management boards and agencies.

¹ Asbestos is listed in Schedule 1 of the *Canadian Environmental Protection Act* as being a "Toxic Substance"

Characteristics and Potential Effects of Asbestos

2.1 Characteristics

Asbestos is a naturally occurring silicate mineral with several unusual properties. Its long flexible silky fibres are strong enough to be spun or woven into a variety of blanket-like products. It is resistant to high temperatures, chemical corrosion and wear. A poor conductor of electricity, asbestos also insulates well against heat and electricity. This combination of properties gives asbestos performance characteristics that are difficult to match and, as a result, it has been used in a wide range of manufactured products over the years including building materials (i.e. roofing shingles, ceiling and floor tiles, wallboard, clapboard and asbestos cement products), various automotive friction products (i.e. clutch, brake and transmission parts) as well as heat resistant insulation, fabrics, packaging, gaskets and coatings. Although asbestos use was either banned or largely phased out in North America starting in the mid 1980s, it can still be found in many older buildings, vehicles and appliances. Appendix 3 provides a listing of products that have been manufactured in the past using asbestos.

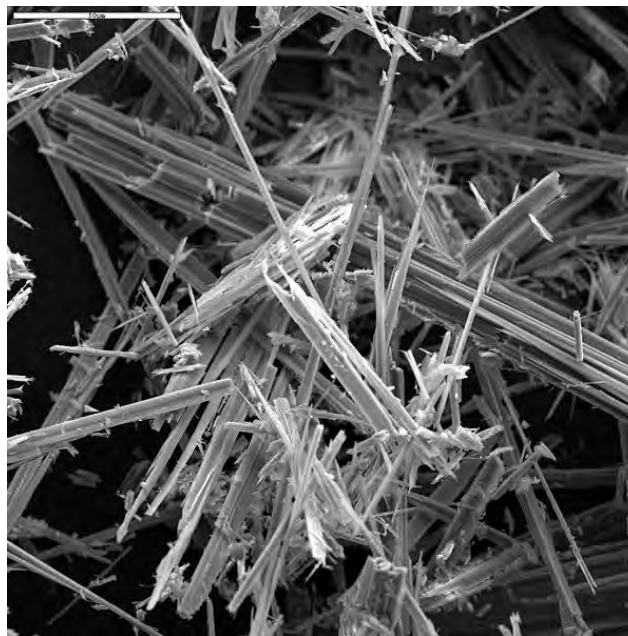


Figure 1 - Anthophyllite Asbestos Fibres
Source: Public Domain

2.2 Potential Effects on Environment and Human Health

Asbestos fibres are stable and do not break down into other compounds in soil, evaporate into air or dissolve in water. In other words, the basic silicate structure of the fibre remains largely intact in the environment. Small diameter fibres may remain suspended in air and water and be carried long distances while larger fibres tend to be deposited more quickly. Asbestos fibres are not able to move through soil.

Human exposure to asbestos occurs when the asbestos-containing material is disturbed in some way so as to release fibres into the air and water. Small amounts can also be released to the environment through the breakdown of natural deposits. Health risks occur when fibres are present in drinking water and in the air that people breathe. When inhaled, asbestos fibres can cause asbestosis (a scarring of the lungs which makes breathing difficult), lung cancer and mesothelioma (a rare cancer of the lining of the chest or abdominal cavity). The risk of contracting an asbestos related disease is greatest when fibre concentrations in the air are high and the exposure period is long, such as in the workplace. Smoking combined with asbestos inhalation also greatly increases the risk of lung cancer.

Waste Management

Minimizing or avoiding the creation of pollutants and wastes can be more effective in protecting the environment than treating or cleaning them up after they have been created.²

3.1 Pollution Prevention

Pollution prevention is a term used to describe methods and practices that minimize or eliminate the generation of waste. If asbestos is known to be present, removal of the asbestos material should only be undertaken by a qualified person and only when the material is beyond repair or, if it is in a building, when the building is undergoing renovation or demolition. Asbestos that is not disturbed or deteriorated does not, in general, pose a risk to human health and can be left alone.

Other pollution prevention opportunities for waste asbestos include:

- | | |
|---------------|--|
| <i>Reduce</i> | <ul style="list-style-type: none">• Replace asbestos-containing materials with less hazardous materials. A number of materials have been developed as replacements for asbestos in manufactured products including fiberglass, carbon and graphite fibres and PTFE (polytetra fluoroethylene). |
| <i>Reuse</i> | <ul style="list-style-type: none">• Encapsulate existing asbestos material by sealing with paint or an epoxy product or cover the material with paneling or other non-asbestos product. The Workers' Safety and Compensation Commission, Chief Medical Officer of Health and your Regional Environmental Health Officer must be consulted prior to encapsulating or sealing existing asbestos material.• Friable asbestos materials should never be reused for any purpose once it has been removed. Non-friable asbestos materials (i.e. asbestos cementous board) can only be re-used if it remains intact and unbroken. This will extend the life of the product and reduce replacement costs. |

Public and commercial building and home owners should keep an inventory of asbestos material so as to inform users, contractors and regulatory and municipal authorities in the event of renovation or demolition activities or an emergency (i.e. fire).

3.2 Handling and Removal

The safe handling and removal of asbestos requires a thorough understanding of the potential risks and knowledge of abatement measures. As long as the asbestos fibres remain enclosed or tightly bound in the material, the fibres will not be released to the air and there is no significant health risk. However, asbestos materials that are disturbed, broken or removed can result in the release of fibres if adequate safety measures are not in place. Unfortunately, simply looking at the material may not confirm whether asbestos is present. If in doubt, have the material analyzed by a qualified person.

Homeowners should contact the Chief Medical Health Officer or Regional Environmental Health Officer before handling material that contains asbestos. Check the material regularly for any sign of damage or wear and have renovations or asbestos removal carried out by a trained and qualified person.

² Source – Canadian Council of Ministers of the Environment.

The *Asbestos Safety Regulations* provide employers with specific requirements for the safe handling of asbestos in the workplace. The *Regulations* require that employers:

- Provide workers with protective respiratory equipment, clothing and eye protection.
- Enclose the work area and ventilate the air using filtering equipment.
- Post warning signs and notices.
- Soak the asbestos material through its entire thickness with water during its removal to minimize release of asbestos fibres.
- Thoroughly clean the work area each day.
- Place all asbestos material and debris in clearly labeled, sealed and airtight containers.
- Provide training to workers in the use of protective equipment, the safe handling and disposal of asbestos waste and health information on the potential effects of asbestos exposure.
- Pay and arrange for a medical examination upon the written request of a worker involved in handling and disposing of asbestos materials and waste.

Employers should consult the *Asbestos Safety Regulations* in order to obtain a complete description of the regulatory requirements. A consolidated copy of the current *Regulations* is provided in Appendix 2. The authoritative text can be obtained by contacting the Workers' Safety and Compensation Commission or by downloading a copy from the Department of Justice web site at <http://www.justice.gov.nu.ca/apps/search/docSearch.aspx>.

The handling and removal of asbestos should only be undertaken by trained and qualified persons. The names of qualified asbestos abatement companies can be obtained by contacting the Workers' Safety and Compensation Commission or the waste management exchanges and associations listed in Appendix 10 of the *Environmental Guideline for the General Management of Hazardous Waste*.

3.3 Storage

Storage refers to the maintenance of waste asbestos while awaiting its transport and disposal. Storage is not acceptable for the long-term management of waste asbestos except under extraordinary circumstances and should be considered as a temporary measure only.

Waste asbestos should be stored in the following manner:

- Store wet waste asbestos in airtight, non-leaking plastic or 16 gauge steel drums. Dry asbestos can be stored in 6 mil plastic bags sealed within non-reusable drums or a second 6 mil plastic bag. Containers should be tightly sealed when not in use to prevent release of asbestos fibres.
- Each container must be clearly labeled "ASBESTOS" in accordance with the *Asbestos Safety Regulations*. If waste asbestos is being stored in an institutional, commercial or industrial location or if the asbestos is being stored for transport, the containers must also be labeled in accordance with the *Workplace Hazardous Materials Information System* (WHMIS) and relevant Transport Authority.
- Place all labeled containers in a secure and clearly marked area.
- Containers should be located so as to be protected from the sun, weather and physical damage.
- Workers must be trained in the safe handling and shipping for waste asbestos, have access to material safety data sheets and be provided with personal protective equipment. Only trained personnel should have access to the designated storage area.

If a commercial facility is used to store hazardous waste for periods of 180 days or more or the quantity of asbestos and other waste on-site at any one time exceeds the criteria set out in the *Environmental Guideline for the General Management of Hazardous Waste*³, the facility must be registered with the Department of Environment as a hazardous waste management facility. Copies of registration forms are available at <http://env.gov.nu.ca/programareas/environmentprotection/forms-applications> or by contacting Nunavut's Department of Environment. Refer to the *Environmental Guideline for the General Management of Hazardous Waste* for additional information on the registration process.

3.4 Transportation

Friable waste asbestos should never be transported in bulk, but in storage containers as described in section 3.3 of the Guideline. The waste should be properly secured and transported within an enclosed vehicle or covered with a tarpaulin or net if transported in a vehicle that is not enclosed. A compaction type waste haulage vehicle must never be used to transport friable asbestos waste. Asbestos waste that is non-friable (i.e. asbestos that is immersed or fixed in a natural or artificial binder) does not need to be specially packaged for transport and disposal.

Under the federal *Interprovincial Movement of Hazardous Waste Regulations* and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*, no person may transport hazardous waste in Canada for the purpose of disposal or recycling in a quantity greater than five litres or five kilograms unless it is accompanied by a completed manifest. Manifest forms are available from Nunavut's Department of Environment and completion instructions are included on the reverse side of each manifest. Further information on manifesting can be obtained by referring to the *Environmental Guideline for the General Management of Hazardous Waste* or Environment Canada's *User's Guide for the Hazardous Waste Manifest*.

Friable waste asbestos is classified as a Class 9 Miscellaneous Waste by the *Transportation of Dangerous Goods Act*. The classification, packaging, labeling and placarding of this waste must conform to the federal and territorial *Transportation of Dangerous Goods Act* and *Regulations*. Schedule I of the *Regulations* classifies waste asbestos as follows:

Shipping Name:	WASTE Asbestos Blue (crocidolite)
	Classification: 9
	Product Identification Number: UN2212
	Packing Group: II
Shipping Name:	WASTE Asbestos Brown (amosite, mysorite)
	Classification: 9
	Product Identification Number: UN2212
	Packing Group: II
Shipping Name:	WASTE Asbestos White (chrysotile, actinolite, anthophyllite, tremolite)
	Classification: 9
	Product Identification Number: UN2590
	Packing Group: III

³ The criterion for Class 9 Miscellaneous Waste is 1000 kilograms or litres and the total aggregate quantity is 5000 kilograms or litres.

Non-friable asbestos is not a hazardous waste and does not need to be accompanied by a manifest.

The transport of waste asbestos by air must conform to the *International Air Transport Association (IATA) Dangerous Goods Regulations* and *International Civil Aviation Organization (ICAO) Technical Instructions*, while transport by marine must conform to the *International Marine Dangerous Goods Code*. Further information on transporting these materials can be obtained by contacting Transport Canada or by referring to the appropriate Transport Authority.

Hazardous waste generators, carriers and receivers operating in Nunavut must be registered with the Nunavut Department of Environment. A unique registration number is assigned to each registrant through the registration process, which enables completion of the manifest document. Copies of registration forms are available at <http://env.gov.nu.ca/programareas/environmentprotection/forms-applications> or by contacting Nunavut's Department of Environment. Refer to the *Environmental Guideline for the General Management of Hazardous Waste* for additional information on the registration process.

A listing of hazardous waste carriers, receivers and management facilities registered to operate in Nunavut is available by contacting Nunavut's Department of Environment.

3.5 Disposal

Friable waste asbestos may be disposed of at a municipal landfill site in Nunavut provided that authorization and approval has first been obtained from the local municipal government. The local municipal government must be registered with Nunavut's Department of Environment as a hazardous waste receiver before accepting the waste.

Upon arrival at the landfill site, the waste asbestos should immediately be buried and covered with at least 30 centimetres (one foot) of soil to ensure further direct contact with people and heavy equipment is avoided. Care should be taken to ensure the asbestos containment (i.e. plastics bags) is not broken or ruptured while being covered. A final cover of at least 60 centimetres (two feet) of soil should be placed over the waste asbestos within 24 hours. The excavation site should be separate from other disposal or burning activities and a sign erected so the asbestos is never disturbed. A detailed map or drawing of the excavation site location should also be maintained by the local municipal government for future reference.

Where friable asbestos is being unloaded for the purpose of disposal, the unloading must be carried out so that no loose asbestos waste or punctured, broken or leaking containers are landfilled. Any friable asbestos that is in a punctured, broken or leaking container must be repackaged in drums or two 6 mil plastic bags prior to its disposal.

Where local disposal of friable waste asbestos is not available, the asbestos should be transported for disposal by a registered hazardous waste carrier to a receiver or management facility that is registered to operate in Nunavut. A listing of hazardous waste carriers, receivers and management facilities is available by contacting Nunavut's Department of Environment. A listing of receivers and management facilities authorized to accept waste asbestos in other territories and provinces can be obtained by contacting the environment department in that jurisdiction or the Canadian waste exchanges and associations found in Schedule 10 of the *Environmental Guideline for the General Management of Hazardous Waste*.

Conclusion

Asbestos is a commercial term given to a group of fibrous silicate minerals that occur naturally in the environment. Because of its unique and unusual properties, asbestos has been used over the years in the manufacture of a wide range of products. These products include building materials, friction products, heat resistant insulation, fabrics, packaging, gaskets and various coatings. During the 1980s the human health and safety risks associated with asbestos started to become known. As a result, the use of asbestos was banned or phased out throughout North America. However, a variety of asbestos products may still be found when older buildings are being renovated or demolished, or when repairs are being carried out on older vehicles and electrical appliances. The *Environmental Guideline for Waste Asbestos* is an introduction to the management of asbestos. It provides information on the characteristics of asbestos, its possible effects on the environment and human health and guidance on its proper storage, handling and removal, transportation and disposal.

Familiarity with the Guideline does not replace the need for the owner or person in charge, management or control of waste asbestos to comply with all applicable federal and territorial legislation and municipal by-laws. The management of waste asbestos may also be controlled through permits and licenses issued by Nunavut's co-management boards, Indian and Northern Affairs Canada and other regulatory agencies. These permits and licenses must be complied with at all times.

For additional information on the management of waste asbestos, or to obtain a listing of available guidelines, go to the Department of Environment web site or contact the Department at:

Environmental Protection Division
Department of Environment
Government of Nunavut
Inuksugait Plaza, P.O. Box 1000, Station 1360
Iqaluit, Nunavut X0A 0H0

Telephone: (867) 975-7729

Fax: (867) 975-7739

Email: EnvironmentalProtection@gov.nu.ca

Website: <http://env.gov.nu.ca/programareas/environmentprotection>

References

Alberta Environment. Guidelines for the Disposal of Asbestos Waste, (1989).

<http://environment.gov.ab.ca/info/library/7247.pdf>

Environment Canada. Asbestos Webpage.

<http://www.ec.gc.ca/toxiques-toxics/Default.asp?lang=En&n=98E80CC6-1&xml=A183A275-6D44-4979-8C4F-371E7BF29B9F>

Environment Canada. Risk Evaluation Determining Whether Environmental Emergency Planning is Required Under the *Environmental Emergency Regulations* set under the *Canadian Environmental Protection Act 1999*.

<http://www.ec.gc.ca/publications/F55958A7-82AF-49ED-B20D-B48F6DC34FE2/Asbestos.pdf>

Government of Nunavut, Department of Environment. Environmental Guideline for the General Management of Hazardous Waste, (2010).

<http://env.gov.nu.ca/node/82#Guideline Documents>

Government of Nunavut, Department of Environment. Environmental Guideline for Waste Asbestos, (2002).

Government of Nunavut, Department of Justice. *Consolidation of Asbestos Safety Regulations*.

<http://www.justice.gov.nu.ca/apps/search/docSearch.aspx>.

Health Canada. Health Risks of Asbestos Webpage.

<http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/enviro/asbestos-amiante-eng.php>

Krytiuk Specialty Contracting Inc. What is Asbestos Webpage.

<http://ksccanada.com/21.html>

APPENDICES

APPENDIX 1 - ENVIRONMENTAL PROTECTION ACT

The following are excerpts from the *Environmental Protection Act*

1. "Contaminant" means any noise, heat, vibration or substance and includes such other substance 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 to property;

"Discharge" includes, but not so as to limit the meaning, any pumping, pouring, throwing, dumping, emitting, burning, spraying, spreading, leaking, spilling, or escaping;

"Environment" means the components of the Earth and includes

- (a) air, land and water,
- (b) all layers of the atmosphere,
- (c) all organic and inorganic matter and living organisms, and
- (d) the interacting natural systems that include components referred to in paragraphs (a) to (c).

"Inspector" means a person appointed under subsection 3(2) and includes the Chief Environmental Protection Officer.

- 2.2 The Minister may
 - (a) establish, operate and maintain stations to monitor the quality of the environment in the Territories;
 - (b) conduct research studies, conferences and training programs relating to contaminants and to the preservation, protection or enhancement of the environment;
 - (c) develop, co-ordinate and administer policies, standards, guidelines and codes of practice relating to the preservation, protection or enhancement of the environment;
 - (d) collect, publish and distribute information relating to contaminants and to the preservation, protection or enhancement of the environment:
3.
 - (1) The Minister shall appoint a Chief Environmental Protection Officer who shall administer and enforce this Act and the regulations.
 - (2) The Chief Environmental Protection Officer may appoint inspectors and shall specify in the appointment the powers that may be exercised and the duties that may be performed by the inspector under this Act and regulations.
5.
 - (1) Subject to subsection (3), no person shall discharge or permit the discharge of a contaminant into the environment.
 - (3) Subsection (1) does not apply where the person who discharged the contaminant or permitted the discharge of the contaminant establishes that
 - (a) the discharge is authorized by this Act or the regulations or by an order issued under this Act or the regulations;
 - (b) the contaminant has been used solely for domestic purposes and was discharged from within a dwelling house;
 - (c) the contaminant was discharged from the exhaust system of a vehicle;

- (d) the discharge of the contaminant resulted from the burning of leaves, foliage, wood, crops or stubble for domestic or agricultural purposes;
- (e) the discharge of the contaminant resulted from burning for land clearing or land grading;
- (f) the discharge of the contaminant resulted from a fire set by a public official for habitat management of silviculture purposes;
- (g) the contaminant was discharged for the purposes of combating a forest fire;
- (h) the contaminant is a soil particle or grit discharged in the course of agriculture or horticulture; or
- (i) the contaminant is a pesticide classified and labelled as "domestic" under the *Pest Control Products Regulations* (Canada).

(4) The exceptions set out in subsection (3) do not apply where a person discharges a contaminant that the inspector has reasonable grounds to believe is not usually associated with a discharge from the excepted activity.

- 5.1. Where a discharge of a contaminant into the environment in contravention of this Act or the regulations or the provisions of a permit or license issued under this Act or the regulations occurs or a reasonable likelihood of such a discharge exists, every person causing or contributing to the discharge or increasing the likelihood of such a discharge, and the owner or the person in charge, management or control of the contaminant before its discharge or likely discharge, shall immediately:
- (a) subject to any regulations, report the discharge or likely discharge to the person or office designated by the regulations;
 - (b) take all reasonable measures consistent with public safety to stop the discharge, repair any damage caused by the discharge and prevent or eliminate any danger to life, health, property or the environment that results or may be reasonably expected to result from the discharge or likely discharge; and
 - (c) make a reasonable effort to notify every member of the public who may be adversely affected by the discharge or likely discharge.
6. (1) Where an inspector believes on reasonable grounds that a discharge of a contaminant in contravention of this Act or the regulations or a provision of a permit or license issued under this Act or the regulations has occurred or is occurring, the inspector may issue an order requiring any person causing or contributing to the discharge or the owner or the person in charge, management or control of the contaminant to stop the discharge by the date named in the order.
7. (1) Notwithstanding section 6, where a person discharges or permits the discharge of a contaminant into the environment, an inspector may order that person to repair or remedy any injury or damage to the environment that results from the discharge.
- (2) Where a person fails or neglects to repair or remedy any injury or damage to the environment in accordance with an order made under subsection (1) or where immediate remedial measures are required to protect the environment, the Chief Environmental Protection Officer may cause to be carried out the measures that he or she considers necessary to repair or remedy an injury or damage to the environment that results from any discharge.

APPENDIX 2 – SAFETY ACT: ASBESTOS SAFETY REGULATIONS

This consolidation is not an official statement of the *Asbestos Safety Regulations*. It is a current consolidation prepared for convenience of reference only. The authoritative text of the *Regulations* should be obtained from the Northwest Territories and Nunavut Workers' Safety and Compensation Commission.

1. In these regulations,

"Asbestos" means crocidolite, amosite, chrysotile, fibrous anthophyllite, tremolite, actinolite or any mixture containing any of these minerals;

"Asbestos dust" means dust consisting of or containing asbestos fibres;

"Asbestos process" means the handling of materials containing asbestos and includes:

- (a) sawing, cutting, sanding or spraying materials,
- (b) repair or maintenance of materials,
- (c) cleaning or disposal of materials,
- (d) mixing or applying asbestos shorts, cements, grouts, putties or similar compounds,
- (e) storage or conveyance of materials.

2. These regulations apply to every establishment.

3. No person shall use crocidolite in any asbestos process.

4. No person shall apply, by spraying, insulation materials containing asbestos.

5. (1) An employer conducting an asbestos process shall:

- (a) provide each worker who may be exposed to asbestos with respiratory equipment designed for use in asbestos processes and that has been approved by the Canadian Standards Association;
- (b) provide each worker who may be exposed to asbestos with dustproof coveralls, gauntlets, eye protection and headgear;
- (c) ensure that, at all times during the asbestos process, ventilation and air filtering equipment is in operation and removing asbestos dust from the air;
- (d) enclose the work area to prevent the escape of asbestos dust;
- (e) post warning notices in prominent places indicating that an asbestos process is in progress;
- (f) ensure that, prior to disturbing any asbestos surface, the asbestos is soaked with water through its entire thickness;
- (g) where a safety officer is of the opinion that it is not practicable to comply with the requirements in paragraph (d), ensure that any asbestos surface is kept wet as it is being disturbed;
- (h) clean the work area surrounding an asbestos process thoroughly each day by vacuum equipment or a wet cleaning method approved by a safety officer; and
- (i) ensure that all asbestos materials, debris and dust are placed in sealed, airtight containers and clearly labeled "ASBESTOS".

(2) A safety officer may, in writing, exempt an employer from the requirements of paragraph 1(a) where the safety officer is of the opinion that the nature of the asbestos process is such that the employer cannot, practically, comply with the requirements.

(3) An employer providing equipment under subsection (1) shall dispose of the equipment after use or shall remove all traces of asbestos dust and shall store the equipment in an airtight container.

6. An employer conducting an asbestos process shall provide the following training to any worker who is likely to come in contact with asbestos:
 - (a) demonstration and instruction in the use of all protective equipment;
 - (b) the safe handling and proper disposal of waste asbestos;
 - (c) health education including information relating to pneumoconiosis, lung cancer, mesothelioma and the effects of smoking; and
 - (d) any other information a safety officer considers necessary.
7.
 - (1) Where an employer uses ventilation and air filtering equipment, the employer shall inspect and clean the equipment weekly.
 - (2) A safety officer may designate a person in the workplace to inspect any ventilation and air filtering equipment yearly to report to the employer on the condition of the equipment and the need for repair.
 - (3) An employer receiving a report recommending repair under subsection (2) shall complete the recommended repairs within 30 days of receipt of the report.
8. No person shall employ a minor where an asbestos process is being conducted unless
 - (a) the process is conducted under constant supervision; and
 - (b) the process has been inspected and approved by a safety officer.
9.
 - (1) Within 30 days of receipt of a written request for a medical examination by a worker involved in an asbestos process, an employer shall arrange and pay the full cost of an examination by a physician.
 - (2) The employer shall make arrangements for a medical examination that includes:
 - (a) a complete physical examination with special attention to the respiratory system;
 - (b) lung function tests including forced vital capacity and forced expiratory volume at one second; and
 - (c) any medical procedures considered necessary by the examining physician for the diagnosis of asbestos related illness.
 - (3) Upon written request by the Minister, a physician who has conducted an examination under subsection (2) shall provide the Minister with a report containing all information resulting from the examination.
 - (4) Every report provided under subsection (3) is a privileged communication of the person making it.

APPENDIX 3 – ASBESTOS CONTAINING MATERIALS

The following products have in the past been manufactured using asbestos. If in doubt, confirm with the product's manufacturer as to whether it is asbestos-free.

- Acoustical Plaster
- Base Flashing
- Breaching Insulation
- Cement Pipes
- Chalkboards
- Ductwork
- Electrical Panel Partitions
- Fire Blankets
- Fireproofing Materials
- Heating and Electrical Ducts
- Joint Compounds
- Packing Materials
- Roofing Shingles
- Taping Compounds (thermal)
- Wallboard
- Vinyl Floor Tile
- Adhesives
- Blown-in Insulation
- Caulking and Putties
- Cement Siding
- Construction Mastics and Adhesives
- Electrical Wiring Insulation
- Elevator Brake Shoes
- Fire Curtains
- Flexible Fabric Connections
- High Temperature Gaskets
- Laboratory Gloves
- Pipe Insulation
- Spackling Compounds
- Textured Paints and Coatings
- Vinyl Sheet Flooring
- Cooling Towers
- Asphalt Floor Tile
- Boiler Insulation
- Ceiling Tiles
- Cement Wallboard
- Decorative Plaster
- Electrical Cloth
- Elevator Equipment Panels
- Fire Doors
- Flooring Backing
- HVAC Duct Insulation
- Laboratory Hoods and Table Tops
- Roofing Felt
- Spray-Applied Insulation
- Thermal Paper Products
- Vinyl Wall Coverings

Source - Krytiuk Specialty Contracting Inc.

APPENDIX 4 – GOVERNMENT AND INDUSTRY CONTACTS

Government of Nunavut

Environmental Protection Division
Department of Environment
Inuksugait Plaza
P.O. Box 1000, Station 1360
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-7729 Fax: (867) 975-7739

Motor Vehicles Division
Department of Economic Development and
Transportation
P.O. Box 10
Gjoa Haven, Nunavut X0B 1J0
Telephone: (867) 360-4615 Fax: (867) 360-4619

Workers' Safety and Compensation Commission
P.O. Box 669
Baron Building/1091
Iqaluit, Nunavut X0A 0H0
Telephone: 1-877-404-4407 (toll free)
Fax: 1-866-979-8501

Department of Community and Government
Services (all Divisions)
P.O. Box 1000, Station 700
4th Floor, W.G. Brown Building
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-5400 Fax: (867) 975-5305

Office of Chief Medical Health Officer of Health
Department of Health and Social Services
P.O. Box 1000, Station 1000
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-5774 Fax: (867) 975-5755

Government of Canada

Indian and Northern Affairs – Nunavut Region
P.O. Box 2200
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-4500 Fax: (867) 975-4560

Environment Canada (NWT and Nunavut)
5019 52nd Street
Yellowknife, Northwest Territories X1A 1T5
Telephone: (867) 669-4730 Fax: (867) 873-8185

Department of Transport – Road, Rail, Marine, Air
P.O. Box 8550
344 Edmonton Street
Winnipeg, Manitoba R3C 1P6
Telephone: 1-888-463-0521 (toll free)
Fax: (204) 983-8992 Road, Rail and Marine
Fax: (204) 983-1734 Air

Industry

National Demolition Association
16 N. Franklin Street, Suite 203
Doylestown, Pennsylvania USA 18901-3536
Telephone: (215) 348-4949 Fax (215) 348-8422
Website: <http://www.demolitionassociation.com>

**APPENDIX B • ENVIRONMENTAL GUIDELINE FOR MERCURY-CONTAINING PRODUCTS AND
WASTE MERCURY**

Environmental Guideline for Mercury-Containing Products and Waste Mercury



Department of Environment
Government of Nunavut

GUIDELINE: MERCURY-CONTAINING PRODUCTS AND WASTE MERCURY

Original: November 2010

This Guideline has been prepared by the Department of Environment's Environmental Protection Division and approved by the Minister of Environment under the authority of Section 2.2 of the *Environmental Protection Act*.

This Guideline is not an official statement of the law and is provided for guidance only. Its intent is to increase the awareness and understanding of the risks, hazards and best management practices associated with common mercury-containing products and waste mercury. This Guideline does not replace the need for the owner or person in charge, management or control of the product or waste to comply with all applicable legislation and to consult with Nunavut's Department of Environment, other regulatory authorities and qualified persons with expertise in the management of mercury.

Copies of this Guideline are available upon request from:

Department of Environment
Government of Nunavut

P.O. Box 1000, Station 1360, Iqaluit, NU, X0A 0H0

Electronic version of the Guideline is available at <http://env.gov.nu.ca/programareas/environmentprotection>

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Top Right - California Department of Toxic Substances Control
Bottom Left - E. Paquin

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Table of Contents

Introduction	1
1.1 Definitions	1
1.2 Roles and Responsibilities	3
1.2.1 Department of Environment	3
1.2.2 Generators of Unwanted Mercury-Containing Products and Waste Mercury	3
1.2.3 Other Regulatory Agencies	3
Characteristics and Effects of Mercury	6
2.1 Effects on the Environment	6
2.2 Effects on Human Health	6
Waste Management	7
3.1 Pollution Prevention - Mercury-Containing Products and Non-Mercury Alternatives	7
3.1.1 Fluorescent and Other Lamps	7
3.1.2 Thermometers and other Measuring Devices	9
3.1.3 Thermostats	10
3.1.4 Batteries	11
3.1.5 Switches and Relays	12
3.1.6 Dental Amalgam	13
3.2 What to do if a Spill of Mercury Occurs	14
3.3 Storage	15
3.4 Transportation	16
3.5 Disposal	17
Conclusion	18
References	19

Appendices

- Appendix 1 Environmental Protection Act (1988)
- Appendix 2 Government Contacts

Introduction

Mercury is a naturally-occurring element that is found in soil, air and water around the world. It is constantly being released from natural sources such as volcanic eruptions and the weathering of soil and rock. It can exist as a gas or in a range of organic and inorganic forms that vary in toxicity and can cycle between the earth's land, water and air. Mercury is a persistent substance. If released into the atmosphere, it can remain airborne for long periods of time and be deposited in soil and water in the Canadian Arctic, an area with no significant local industrial sources of mercury. Almost all forms of mercury are toxic to some degree or can be converted through biological activity into the highly toxic organic form called methylmercury. Mercury may also build up, or bioaccumulate¹ and biomagnify², in living organisms. This results in animals such as predatory fish, fish-eating birds and mammals being at a higher risk of harm from mercury than those species which do not prey upon other organisms.

Mercury has been used for many years in a variety of consumer and industrial products because it is an excellent conductor of electricity and reacts predictably to changes in temperature and pressure. Common consumer and industrial products that can contain mercury include fluorescent lamps, thermometers and thermostats, batteries, dental amalgam, medical and other measuring devices, and electrical switches and relays. Although the use of mercury in these products has declined significantly over the past several decades, stockpiles of older mercury-containing products and the current technical requirements of products such as fluorescent lamps and specialized batteries suggests that the elimination of mercury use is not expected soon. For this reason, mercury-containing products must continue to be actively managed.

The Guideline for Mercury-Containing Products and Waste Mercury (the Guideline) provides information on the risks, hazards and best management practices associated with various mercury-containing products commonly used in Nunavut. It examines the characteristics and effects of mercury on the environment and human health, identifies non-mercury alternatives for common products and provides guidance on the proper cleanup, storage, transportation and disposal of unwanted mercury.

The *Environmental Protection Act* enables the Government of Nunavut to implement measures to preserve, protect and enhance the quality of the natural environment. Section 2.2 of the *Act* provides the Minister with authority to develop, coordinate, and administer the Guideline.

The Guideline is not an official statement of the law. For further information and guidance, the owner or person in charge, management or control of a mercury-containing product or waste mercury is encouraged to review all applicable legislation and consult the Department of Environment, other regulatory agencies or qualified persons with expertise in the management of mercury.

1.1 Definitions

<i>Commissioner's Land</i>	Lands that have been transferred by Order-in-Council to the Government of Nunavut. This includes roadways and land subject to block land transfers. Most Commissioner's Land is located within municipalities.
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¹ The accumulation over time of metals and other persistent substances within an organism from both biotic (i.e. other organisms) or abiotic (i.e. land, air and water) sources.

² The progressive buildup of metals or other persistent substances through successive trophic levels – meaning that it relates to the concentration ratio in the tissue of a predator as compared to that in its prey.

<i>Contaminant</i>	Any noise, heat, vibration or substance and includes such other substance 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 to property.
<i>Dangerous Good</i>	Any product, substance or organism included by its nature or by the Transportation of Dangerous Goods Regulations in any of the classes listed in the schedule provided in the <i>Transportation of Dangerous Goods Act</i> .
<i>Environment</i>	The components of the Earth and includes (a) air, land and water, (b) all layers of the atmosphere, (c) all organic and inorganic matter and living organisms, and (d) the interacting natural systems that include components referred to in paragraphs (a) to (c) above.
<i>Hazardous Waste</i>	A contaminant that is a dangerous good and is no longer wanted or is unusable for its original intended purpose and is intended for storage, recycling, treatment or disposal.
<i>Mercury-Containing Product</i>	A manufactured device or part of a device that contains elemental mercury which is integral to its function.
<i>Minister</i>	The Minister of Environment of the Government of Nunavut.
<i>Qualified Person</i>	A person who has an appropriate level of knowledge and experience in all relevant aspects of waste management.
<i>Responsible Party</i>	The owner or person in charge, management or control of the waste.
<i>Transport Authority</i>	The statute and regulations controlling the management of hazardous waste under that mode of transport. These include (a) Road and Rail - <i>Transportation of Dangerous Goods Act</i> (Canada) and <i>Regulations; Interprovincial Movement of Hazardous Waste Regulations</i> (CEPA) and <i>Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations</i> (CEPA). (b) Air – <i>International Air Transport Association (IATA) Dangerous Goods Regulations</i> and <i>International Civil Aviation Organization (ICAO) Technical Instructions</i> ; and (c) Marine – <i>International Maritime Dangerous Goods Code</i> (IMDG).
<i>Waste Mercury</i>	Mercury that is no longer wanted or is unusable for its intended purpose and is intended for storage, recycling, treatment or disposal.

1.2 Roles and Responsibilities

1.2.1 Department of Environment

The Department of Environment is the key environmental agency responsible for ensuring responsible parties properly manage unwanted mercury-containing products and waste mercury and will provide advice and guidance on its management, including proper disposal. Authority is derived from the *Environmental Protection Act*, which prohibits the discharge of contaminants to the environment and enables the Minister to undertake actions to ensure appropriate management measures are in place. Although programs and services are applied primarily to activities taking place on Commissioner's and municipal lands and to Government of Nunavut undertakings, the *Environmental Protection Act* may be applied to the whole of the territory where other controlling legislation, standards and guidelines do not exist. A complete listing of relevant legislation and guidelines can be obtained by contacting the Department of Environment or by visiting the web site at <http://env.gov.nu.ca/programareas/environmentprotection>.

1.2.2 Generators of Unwanted Mercury-Containing Products and Waste Mercury

The owner or person in charge, management or control of the unwanted mercury-containing product or waste mercury is known as the responsible party. In general, the responsible party must ensure the unwanted product and waste mercury is properly and safely managed from the time it is produced to its final disposal. This is referred to as managing the product and waste from cradle-to-grave. Information on the general management of hazardous waste in Nunavut, including generators, carriers and receivers, can be obtained by referring to the *Environmental Guideline for the General Management of Hazardous Waste*.

Contractors may manage unwanted mercury-containing products and waste mercury on behalf of the responsible party. However, the responsible party remains liable for ensuring the method of management complies with all applicable statutes, regulations, standards, guidelines and local by-laws. If the contractor does not comply with the requirements of the *Environmental Protection Act* and is charged with a violation while managing the waste, the responsible party may also be charged.

1.2.3 Other Regulatory Agencies

Other regulatory agencies may have to be consulted regarding the management of unwanted mercury-containing products and waste mercury as there may be other environmental or public and worker health and safety issues to consider.

Workers' Safety and Compensation Commission

The Workers' Safety and Compensation Commission is responsible for promoting and regulating worker and workplace health and safety in Nunavut. The Commission derives its authority from the *Workers' Compensation Act* and the *Safety Act*, both of which require an employer to maintain a safe workplace and ensure the safety and well being of workers.

Department of Community and Government Services

The Department of Community and Government Services is responsible under the *Commissioners' Lands Act* for the issuance of land leases, reserves, licenses and permits on Commissioner's Lands. The Department, in cooperation with communities, is also responsible for the planning and funding of municipal solid waste and sewage disposal facilities in most Nunavut communities.

Department of Health and Social Services

Activities related to the management of unwanted mercury-containing products and waste mercury may have an impact on public health. The Office of the Chief Medical Officer of Health and Regional Environmental Health Officers should be consulted regarding legislated requirements under the *Public Health Act*.

Department of Economic Development and Transportation

The Motor Vehicles Division is responsible for ensuring the safe transport of hazardous waste and other dangerous goods by road through administration of the *Transportation of Dangerous Goods Act*. The Department is also responsible under the *Motor Vehicles Act* for driver licensing and various other vehicle and road safety matters.

Environment Canada

Environment Canada is responsible for administering the *Canadian Environmental Protection Act* (CEPA). Mercury is listed as a Toxic Substance in Schedule I of CEPA and notices have been published in the Canada Gazette requiring the preparation and implementation of pollution prevention plans in regard to mercury releases from switches in end-of-life vehicles and dental amalgam waste. Environment Canada is also responsible for regulating international and interprovincial movement of hazardous waste, including unwanted mercury-containing products and waste mercury, under the *Interprovincial Movement of Hazardous Waste Regulations* and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*. Environment Canada is also responsible for administering the pollution prevention provisions of the federal *Fisheries Act*.

Indian and Northern Affairs Canada

Indian and Northern Affairs Canada is responsible under the *Territorial Lands Act* and *Nunavut Waters and Nunavut Surface Rights Tribunal Act* for the management of federal lands and waters in Nunavut, including the impact waste mercury may have on the quality of these lands and waters.

Local Municipal Governments

The role of municipal governments is important in the proper local management of unwanted mercury-containing products and waste mercury. Under the Nunavut Land Claims Agreement, municipalities are entitled to control their own municipal disposal sites. Unwanted waste may be deposited into municipal landfill sites and sewage lagoons only with the consent of the local government. The local fire department may also be called upon if a fire or other public safety issue is identified.

Co-management Boards and Agencies

Co-management boards and agencies established under the Nunavut Land Claims Agreement have broad authority for land use planning, impact assessment and the administration of land and water. Activities involving the management and disposal of unwanted mercury-containing products and waste mercury may be controlled through the setting of terms and conditions in plans, permits and licenses issued by the Nunavut Water Board and other co-management boards and agencies.

Characteristics and Effects of Mercury

Mercury is a naturally occurring element that can be released to the environment from natural sources or through human activities. Natural sources include the release of mercury from the Earth's crust through volcanic activity and the weathering of soil and rock. Human activities contribute to mercury levels in the environment primarily through the burning of coal and the burning and landfilling of products or waste that contain mercury.

Elemental mercury is a shiny, silver-white metal that is liquid at room temperature. It is a persistent element that can cycle between the earth's land, water and air for long periods of time. Through a process known as 'atmospheric mercury depletion events'³ relatively high concentrations of mercury are now being found in the Canadian Arctic, a region with no significant industrial sources of the metal.

Several forms of mercury occur naturally in the environment with microorganisms and natural processes being able to change the mercury from one form to another. The most common natural forms of mercury found in the environment are metallic mercury, mercuric sulphide, mercuric chloride, and the organic form methylmercury. Being an element, mercury cannot be broken down or degraded further into harmless substances.

2.1 Effects on the Environment

All forms of mercury can accumulate in organisms to some degree. Of most importance is methylmercury, which is a fat soluble compound that readily bioaccumulates in living organisms and biomagnifies up the food chain. This can result in methylmercury levels in edible freshwater and saltwater fish, aquatic mammals and predatory birds that are thousands of times greater than levels in the surrounding water. Wildlife exposed to these high levels of methylmercury is at risk of harm. Depending upon the species and level of exposure, harmful effects can include slower growth, reproductive failure, death and the development of abnormal behaviors that can affect survival rates.

As little as 25 milligrams (or 25 thousandths of a gram) of mercury, the amount contained in many common consumer products, can contaminate as much as one hundred thousand litres of water beyond the safe limits for the protection of aquatic life⁴.

2.2 Effects on Human Health

Mercury is a neurotoxin that can cause damage to the brain, central nervous system, kidney and lungs in humans. The severity of the toxic effect depends on the form and concentration of mercury and its route of exposure. Methylmercury readily enters the brain and can lead to health effects including personality changes, tremors, changes in vision, deafness, loss of muscle coordination and sensation, memory loss, intellectual impairment, and in extreme cases, death. Mercury can also cross the placental barrier of pregnant mothers affecting the fetus while in the womb. Affected children may exhibit reduced coordination and growth, lower intelligence and seizures.

³ 'Atmospheric mercury depletion events' occur when a series of photochemical reactions involving halogens convert gaseous elemental mercury to a more reactive form. This new form of mercury then adheres to dust and other particles in the atmosphere and is deposited in the Arctic, sub-Arctic and Antarctic regions.

⁴ The Canadian Council of Ministers of the Environment (CCME) has established 0.026 micrograms of inorganic mercury per litre of water as the water quality guideline for the protection of aquatic life.

Waste Management

Minimizing or avoiding the creation of pollutants and wastes can be more effective in protecting the environment than treating or cleaning them up after they have been created.⁵

Responsible waste management involves adopting methods and techniques that have been shown to prevent or reduce pollution. These policies, prohibitions of practices, maintenance and monitoring procedures can include reducing the amount of waste generated, reusing the waste for a different purpose or recycling the waste to produce a new product. Implementing these management practices is an effective way of reducing a person's costs, reducing pollution and reducing legal liabilities.

3.1 Pollution Prevention - Mercury-Containing Products and Non-Mercury Alternatives

Pollution prevention methods reduce or eliminate the creation of waste mercury. Scientific and technical advances in product manufacture and design have enabled the amount of mercury in many consumer, institutional, commercial and industrial products to be reduced or eliminated. In many cases, these non-mercury or low-mercury alternatives have the same performance characteristics and cost less to operate than the original mercury-containing product. The following sections introduce the common mercury-containing products used in Canada and their non-mercury alternatives.

3.1.1 Fluorescent and Other Lamps

Mercury is an essential element needed for the operation of most fluorescent, high intensity discharge and neon lamps. Light is produced when electricity passes through the lamp and excites the contained mercury vapour. The quantity of mercury in these lamps varies according to the type and size of the lamp. Table 1 describes the common types of mercury-containing lamps and their mercury content.

In recent years, industry has been able to reduce the amount of mercury in these lamps but, because it remains an essential element for the lamp's operation, small amounts of mercury continue to be used in their manufacture.

When fluorescent and other mercury-containing lamps burn out, much of the mercury tends to be absorbed by other lamp materials such as phosphorous and glass. However, a small amount of mercury still remains in vapour form, which can result in an inhalation hazard if the lamp is broken or crushed. Over 75% of the mercury used in lamps in Canada currently ends up in landfill sites.



Figure 1 - Compact Fluorescent Lamp Tube
Source – E. Paquin



Figure 2 - Linear Fluorescent Lamp Tube

⁵ Source – Canadian Council of Ministers of the Environment.

Table 1. Mercury-Containing Lamps

Lamp Type	Description and Use	Mercury Content⁶
Linear Fluorescent	Linear fluorescent lamps are sealed glass tubes that are between 2 and 8 feet in length and contain small amounts of mercury, an inert gas and phosphor powder coating the inside of the tube. The lamps are commonly used in offices, stores, warehouses and homes.	3 to 50 milligrams
Compact Fluorescent	Compact fluorescent lamps (CFL's) have the same characteristics as linear fluorescent lamps except the glass tube has been replaced with a compact coil. CFL's are designed to replace the traditional incandescent lamp and are becoming increasingly common in homes and offices.	1 to 25 milligrams
Mercury Vapour Discharge	Mercury vapour lamps consist of a glass envelope with a pinched quartz glass tube and several electrodes within. Mercury vapour is contained within the glass tube. The lamps are used for street and floodlighting applications. The emitted light has a bluish glow.	25 to 225 milligrams
High Pressure Sodium Vapour Discharge	High pressure sodium vapour lamps (70 to 1000 watts) have the same physical characteristics as mercury vapour discharge lamps except they contain solid sodium, mercury and a small amount of neon and argon gas. Low pressure sodium vapour lamps (35 to 180 watts) do not contain mercury. Both are high intensity discharge lamps used for street and floodlighting applications. The emitted light has a yellowish glow.	20 to 145 milligrams
Metal Halide	Metal halide lamps have the same physical characteristics as mercury and sodium vapour discharge lamps except they contain metal halides, mercury and argon gas. Sodium iodide and scandium iodide are commonly used as the metal halide. These lamps are used to light sporting facilities where a very bright light is required.	25 to 225 milligrams
Neon	Neon lamps are similar to fluorescent lamps except that the colour emitted depends on the mixture of gases and the colour of the glass. Although the term refers to all gas discharge bulbs using noble gases, only the red lamps use neon. Red neon lamps do not contain mercury. Other neon lamps use argon, mercury and phosphor to produce additional colours.	Varies by colour and size

Non-Mercury Alternatives

Fluorescent and high intensity discharge lamps are currently the most energy-efficient lamps available for their specific applications and similar energy-efficient alternatives are currently not commonly available. Using these lamps in place of incandescent bulbs reduces the overall amount of greenhouse gases and other contaminants emitted from electrical generating stations powered by fossil fuels because of the lamp's energy efficiency. High-efficiency, low-mercury content lamps should be

⁶ To assist in putting mercury content into the proper context, one Canadian penny weighs approximately 2300 milligrams.

purchased whenever possible. In some cases, light emitting diode (LED) lamps can be used to replace neon and other mercury-containing lamps, although LED lamps can be more costly and cannot be used in all applications.



Figure 3 – High Pressure Sodium Discharge Lamp



Figure 4 – Metal Halide Lamp



Figure 5 – Mercury Vapour Lamp

3.1.2 Thermometers and Other Measuring Devices

Mercury has been used in a variety of measuring devices because the liquid reacts predictably to changes in temperature and pressure. Table 2 describes various mercury-containing measuring devices that can be found in Nunavut. These devices can be found in homes, schools, laboratories, hospitals, nursing stations, as well as commercial and industrial facilities.

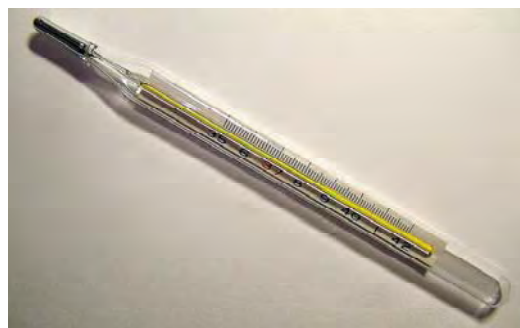


Figure 6 – Clinical Mercury Thermometer

Non-Mercury Alternatives

Various digital, mechanical and non-mercury liquid alternatives have been developed. Table 2 provides a list of several non-mercury alternatives for thermometers and other measuring devices. Availability, product effectiveness and relative cost should be considered when switching to a non-mercury alternative.



Figure 7 - Electronic Clinical Thermometers

Table 2. Mercury-Containing Measuring Devices

Device Type	Description and Use	Alternatives
Thermometer	Thermometers measure temperature. Held within a bulb at the base of the instrument, heat and cold causes the mercury to move up and down a thin tube where its position indicates the temperature. Various types of thermometers exist and can be found in homes, laboratories, schools and industries.	Digital, alcohol or spirit-filled thermometer
Barometer and Manometer	Barometers measure air pressure while manometers measure pressure differences. They consist of long tubes filled with mercury where air pressure causes the mercury to move up or down the tube. These devices are commonly used at airports and other weather stations.	Digital or aneroid barometer, digital manometer or needle bourdon gauge
Flowmeter	Flowmeters measure the rate of flow of gas, water and air streams. Although no longer manufactured, mercury-containing flowmeters are still used in water and sewage treatment plants, power stations and other industrial applications.	Digital or ball-actuated flowmeter
Hydrometer	Hydrometers measure the specific gravity and density of a liquid. They look similar to a thermometer except the bulb at the bottom is wider and weighted to keep the hydrometer upright when placed in a liquid. Hydrometers are commonly used in laboratories and in the production of alcohol.	Spirit filled hydrometer
Hygrometer	Hygrometers measure the moisture content of air. The most common type, the psychrometer, looks like a dual thermometer, one with a wet base and the other with a dry base. Hygrometers are used for weather forecasting.	Digital or spirit-filled psychrometer
Medical Devices	Examples of medical devices that contain mercury include: sphygmomanometers (measure blood pressure), esophageal dilators (open the patient's throat during surgery), and gastrointestinal tubes (removal of intestinal obstructions).	Aneroid or digital sphygmomanometer

3.1.3 Thermostats

Mercury-containing thermostats are used to control residential, commercial and institutional heating and cooling systems. These thermostats contain small glass containers, or ampoules, of mercury which act as temperature-sensitive tilt switches to automatically control the furnace or other device. Each ampoule generally contains three grams of mercury, with each thermostat having up to six ampoules depending upon its application.

**Figure 8 - Home Thermostat**

Thermostats that contain mercury can be identified by removing the front cover of the device and visually inspecting its contents. If there are glass ampoules inside that contain a shiny silver-white liquid, it is most likely mercury.

Non-Mercury Alternatives

Mercury-containing thermostats can be replaced using relatively inexpensive digital thermostats. Most modern digital thermostats are programmable, which enables temperature in a building to be automatically adjusted according to a predetermined schedule. This results in energy and cost savings.



Figure 9 - Touch Screen Digital Thermostat

3.1.4 Batteries

Since the late 1990's North American battery manufacturers have eliminated or significantly reduced the mercury found in batteries. The use of mercury in the common alkaline battery has been eliminated while small amounts of mercury – anywhere from 5 to 25 milligrams - continue to be used in the manufacture of several types of button-cell batteries⁷. Button-cell batteries are small, thin energy cells that are not rechargeable. They continue to be used in a wide variety of electronic devices because of their small size and steady voltage output. Table 3 describes the common button-cell batteries in use today.



Figure 10
Source – Vermont Department of Environmental Conservation

Table 3. Mercury-Containing Button-Cell Batteries

Battery Type	Common Uses
Zinc Air Miniature Batteries	Mostly used in hearing aids because of their high energy concentration and ability to continuously discharge energy. May also be used in small devices such as wristwatch pagers and ear speech processors.
Silver Oxide Button-Cell Batteries	Used in various devices such as hearing aids, watches, cameras and clocks. Silver oxide batteries may come in a large size as well as button-cell however, their manufacture is limited due to the price of silver.
Alkaline Manganese Oxide Button-Cell Batteries	Used in toys, calculators, remote control devices and cameras.

⁷ Gas can form in button-cell batteries because of the corrosion of zinc causing the battery to leak. Mercury suppresses this corrosion. Button-cell batteries can contain up to 0.005 grams of mercury in the insulating paper surrounding the battery, or mercury can be mixed in the battery anode itself.

Mercuric oxide batteries contain mercury as the electrode and are useful in applications that require a high energy density and steady voltage output. Although North American battery manufacturers discontinued production of these batteries in 1996, larger mercuric oxide batteries may still be used in applications such as military, medical and industrial equipment.

Non-Mercury Alternatives

Few mercury-free alternatives currently exist for button-cell batteries and those that do exist are generally considered to have reduced performance and a higher cost. Observing battery packaging and labeling is the best method for identifying mercury-free or mercury-reduced button-cell batteries. Electrical devices that can operate on standard 110 volt power supplies (i.e. smoke and carbon dioxide detectors) should be purchased where practical rather than battery-powered devices. The use of rechargeable batteries is also a good alternative to non-rechargeable batteries where the replacements are compatible with the device.

3.1.5 Switches and Relays

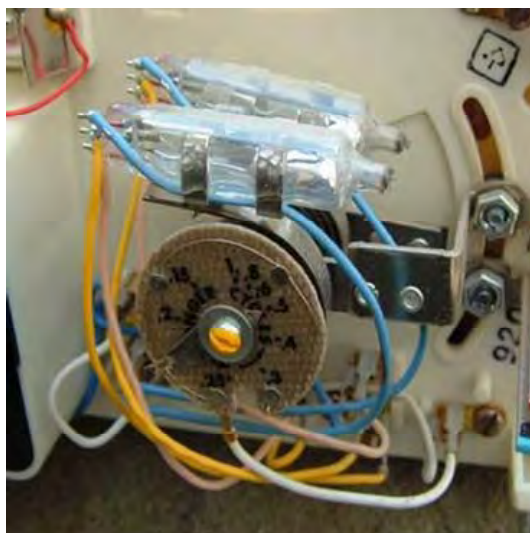


Figure 11 - Mercury-Containing Switches
Source – California Department of Toxic Substances Control

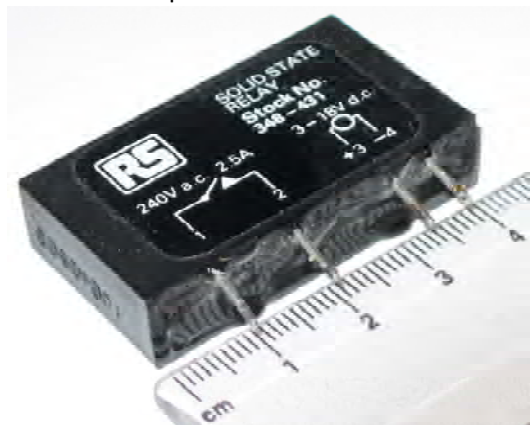


Figure 12 – Solid State Relay Switch

Switches are products that open or close an electrical circuit. When open, switches allow the electrical current to flow and when closed the circuit is broken and flow of current is stopped. Many older switches contain mercury because of the metallic liquid's excellent ability to conduct electricity. The most common consumer applications have been in tilt switches (i.e. older-model thermostats, hood and trunk lights on older-model vehicles) and float switches (i.e. boat bilge pumps).

Relays are products that open or close electrical contacts to control the operation of other electrical devices. They enable large electrical loads to be turned on or off by supplying relatively small currents to a control circuit.

Table 4 describes various mercury-containing switches and relays used in Canada and their available non-mercury alternatives.

Non-Mercury Alternatives

Mechanical and digital switches are widely available to replace mercury switches for all common applications. These vary in price depending on use and design. Not all non-mercury alternatives may be suitable for any one application without retrofit as electrical requirements must be strictly adhered to. If in doubt, the manufacturers or distributors of the specific equipment should be consulted.

Displacement and contactor relays are very specific for

their applications and non-mercury alternatives have generally not provided equal performance and reliability. Mercury wetted relays can be replaced by dry magnetic reed relays for most applications.

Table 4. Mercury-Containing Switches and Relays

Device Type	Description and Use	Alternatives
Float Switch	Float switches monitor liquid levels and are most commonly used in sump pumps. They are also used in boat bilge pumps, boilers, sewage treatment plants and pumping stations. The mercury is normally contained inside a sealed ampoule within a cylindrical outer casing.	Mechanical, optical, metallic ball, sonic or ultrasonic, pressure transmitter, alloy, thermal or capacitance float switches
Tilt Switch	Tilt switches are activated by a change in the switch position. They have been commonly used in older-model thermostats as well as applications that activate upon opening such as hood and trunk lights in older-model vehicles and chest freezers. Mercury tilt switches are typically small glass tubes with two electrical contacts at one end.	Metallic ball, electrolytic, mechanical, digital or capacitance tilt switches
Pressure Switch	Pressure switches are activated by a change in pressure. These switches have been used in HVAC systems, medical devices, automobiles (ABS brakes), appliances and other applications. Pressure switches are comprised of a diaphragm, piston or other pressure-response device coupled with a mercury ampoule.	Mechanical or digital switches
Temperature Switch	Temperature switches are activated by a change in temperature. These switches are used in a wide variety of applications including food warming trays, hot water boilers, ovens, sterilizers and heat exchangers. The switch is similar to a tilt switch and is usually attached to a temperature sensing device such as a bi-metallic strip.	Mechanical or digital switches
Relays	Relays are devices that open or close electrical control circuits to operate other devices in the same or different electrical circuit. They include displacement, contactor and wetted reed relays. Relays are commonly used in electronic circuit boards, commercial and industrial electric ranges and other cooking equipment.	Dry magnetic reed relays

3.1.6 Dental Amalgam

Dental amalgam is a mixture of metals that has been used for over 150 years to restore teeth. The metal mixture, commonly referred to as ‘silver fillings’, can consist of up to 50% mercury. Despite its use for many years, there is currently no evidence to suggest that mercury in dental amalgam is a risk to human health in the general population.

Mercury amalgam continues to be used for tooth restorations because of its durability, ease of use and low cost⁸. In the past, dentists mixed the amalgam on site using bulk mercury and metal powders. This practice resulted in a health risk to workers through physical contact with the elemental mercury and to the environment through spillage. Today, dental amalgam is purchased in pre-dosed amalgam capsules that come in different sizes.

In 2001, federal, provincial and territorial governments endorsed the *Canada-Wide Standard on Mercury for Dental Amalgam Waste* through the Canadian Council of Ministers of the Environment (CCME). The Standard called for dentists to apply 'best management practices' to achieve a 95% national reduction in mercury releases from dental amalgam by 2005. These practices include the installation, use and maintenance of International Organization for Standardization (ISO) certified amalgam separators, traps and filters to remove waste mercury from dental office wastewater. A report released in 2007 indicates that 70% of dentists operating in Canada were employing ISO certified amalgam separators (Environment Canada, 2007).

Non-Mercury Alternatives

There are several resin and composite materials that are substitutes for mercury amalgam. These include cast gold, bonded amalgam and dental ceramics. These alternatives are usually more costly than mercury amalgam fillings and may not be suitable for all procedures. Composite resins are tooth-coloured plastic materials often used to restore front teeth where a natural appearance is important. These resins can also be used as fillings on back teeth depending on the location and extent of tooth decay.

3.2 What to do if a Spill of Mercury Occurs

Cleanup actions must be started as soon as possible following a spill of mercury so workers and family members are not exposed to its hazards. When a thermometer or other liquid mercury-containing product is broken, the mercury will quickly form beads that accumulate in small pools and in the tiniest of spaces, making cleanup difficult. When a fluorescent or other mercury-containing lamp is broken or if mercury remains trapped (i.e. in tiny spaces, drains or soft surfaces such as carpet and furniture), mercury vapour is released directly to the air. Although mercury evaporates slowly at normal room temperature, dangerous levels of mercury vapour can build up in indoor air.

The following should be considered when cleaning up a spill of mercury:

- It can be very dangerous to touch liquid mercury directly or breathe mercury vapour. Immediately isolate the spill area by keeping people and pets away, closing all interior doors that lead to other rooms in the building and turning off heaters. Ventilate the area by turning on fans that vent directly to the outdoors and opening windows and exterior doors.
- Protect yourself by changing into old clothing and shoes that can be thrown away after clean up has been completed, removing all jewelry as mercury can adhere to metal and putting on gloves, preferably made of rubber, nitrile or latex.
- On a hard surface (i.e. linoleum, tile or concrete), push the mercury beads together using razor blades, stiff paper or cardboard, pick up the beads using a dustpan or stiff paper and carefully transfer the mercury into a wide-mouth container or plastic bag. Any remaining beads of

⁸ Approximately 1.3 tonnes of mercury in new filling material is placed each year in the mouths of Canadians (CCME, 2001).

mercury can be picked up using tape, cotton balls or a moist paper towel. All debris should be placed inside the container or bag and the lid sealed tightly with tape.

- On a soft surface (i.e. carpet, couch or clothing), it is best to cut out the contaminated materials and place them into a sealable container or plastic bag. If you're not willing to cut out the materials, use cotton balls, moist paper towel or an eye dropper to pick up the spilled mercury and place it, along with any debris, into the container or bag.
- When a fluorescent or other mercury-containing lamp is broken, quickly ventilate the area by turning on fans that vent to the outdoors and opening all windows and exterior doors. Leave the area for at least 30 minutes and then follow the instructions for the type of surface to be cleaned.
- In every case, place the sealed container or plastic bag containing the mercury and debris into another container or bag for additional protection against breakage and leakage.
- Wash your hands thoroughly and take a shower immediately after the cleanup.

Never allow people who are wearing clothing or shoes contaminated with mercury to walk around the building, never use a broom or ordinary vacuum cleaner to clean up mercury, never pour mercury down a drain and never launder mercury-contaminated clothing in a washing machine.

Mercury spill kits are commercially available from safety supply companies to assist in the cleanup of spilled mercury. Although convenient, these kits may be expensive and are not absolutely necessary to clean up a small contained spill of mercury, such as from a mercury switch or thermometer. The following are some commonly available items that can be used to construct a mercury spill kit: rubber gloves, goggles or other eye protection, flashlight, sponge or cotton balls, wide duct or masking tape, eye dropper or syringe without needle, stiff index cards, plastic containers with tight-fitting lids and plastic bags with zipper seals.

All spills of mercury must immediately be reported to the NWT/Nunavut 24-Hour Spill Report Line at (867) 920-8130 (toll free) or e-mailed to: spills@gov.nt.ca. Spill reporting forms are available on the Department of Environment's website: <http://env.gov.nu.ca/programareas/environmentprotection>

The local nursing station or health authority should also immediately be notified.

3.3 Storage

Storage refers to keeping unwanted material while awaiting its transport, recycling or disposal. Except under extraordinary circumstances, storage is not acceptable for the long-term management of unwanted mercury-containing products and waste mercury and should be considered as a temporary measure only.

Unwanted mercury-containing products and waste mercury should be stored in the following manner:

- If the packaging that was used to originally ship the product is available and the product is unbroken, place it in the packaging and seal the package securely with tape.
- If the original packaging is not available or if the mercury is from a spill, place the product or container containing the mercury and any cleanup materials and debris inside a larger metal or plastic container. Place kitty litter or other oil absorbent packing material around the product or

small container to protect it from breaking or sudden shock. Secure the larger container with a tight fitting lid or tape.

- Clearly label all storage containers as containing mercury according to the requirements of the *Workplace Hazardous Materials Information System* (WHMIS) and relevant Transport Authority.
- Place all labeled storage containers in a clearly marked designated area which is separate from other waste to prevent its disposal with normal garbage.
- If mercury-containing lamps are being stored, do not crush the lamps as crushing will release vapours that may pose health and environmental hazards. Broken lamps are a hazardous waste.

If the storage facility is used for commercial purposes to store hazardous waste for periods of 180 days or more or the quantity of waste stored on-site exceeds the criteria set out in the *Environmental Guideline for the General Management of Hazardous Waste*, the facility must be registered with the Department of Environment as a hazardous waste management facility⁹. Copies of registration forms are available at <http://env.gov.nu.ca/programareas/environmentprotection/forms-applications> or by contacting Nunavut's Department of Environment. Refer to the GN *Environmental Guideline for the General Management of Hazardous Waste* for additional information on the registration process.

3.4 Transportation

Unwanted mercury-containing products and waste mercury may be classified as a hazardous waste for the purposes of transportation depending upon the quantity of waste being transported for recycling or disposal. Under the federal *Interprovincial Movement of Hazardous Waste Regulations*, no person may transport waste mercury in Canada in a quantity greater than five kilograms or five litres unless it is accompanied by a completed manifest¹⁰. Manifesting requirements for the international transport of waste are controlled under the federal *Export and Import of Hazardous Waste and Recyclable Material Regulations*. Manifest forms are available from Nunavut's Department of Environment and completion instructions are included on the reverse side of each manifest. Further information on manifesting can be obtained by referring to Environment Canada's *User's Guide for the Hazardous Waste Manifest* or the *Environmental Guideline for the General Management of Hazardous Waste*.

The classification, packaging, labeling and placarding of mercury-containing products and waste mercury while being transported must conform to the federal and territorial *Transportation of Dangerous Goods Act and Regulations*. Schedule I of the *Regulations* classify waste mercury as follows¹¹:

Shipping Name:	WASTE Mercury
Classification:	8
Product Identification Number:	UN2809
Packing Group:	III

⁹ The criterion for Class 8 Corrosives is 1000 kilograms and the criterion for the aggregate quantity of hazardous waste is 5000 kilograms.

¹⁰ In response to the 2007 federal government direction on streamlining regulation in Canada, the alignment of definitions in the *Interprovincial Movement of Hazardous Waste Regulations* (IMHWR) and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations* (EIHWHRMR) is being undertaken by Environment Canada. Under the current proposal, the quantity of waste mercury requiring a manifest while being transported in Canada would be revised to less than 50 milliliters (ml) per shipment, which is the same as is currently required for international transport under the EIHWHRMR (Environment Canada, 2010).

¹¹ A wide variety of mercury-containing chemicals and compounds in addition to elemental mercury are available for use in Canada. Refer to Schedule I of the *Transportation of Dangerous Goods Regulations* for the specific classification, product identification number and packing group of these chemicals and compounds.

The transport of mercury-containing products and waste mercury by air must conform to the *International Air Transport Association (IATA) Dangerous Goods Regulations* and *International Civil Aviation Organization (ICAO) Technical Instructions*, while transport by marine must conform to the *International Marine Dangerous Goods Code*. Further information on transporting these materials can be obtained by contacting Transport Canada or the appropriate Transport Authority.

Hazardous waste generators, carriers and receivers operating in Nunavut must be registered with the Nunavut Department of Environment. A unique registration number is assigned to each registrant through the registration process, which enables completion of the manifest document. Copies of registration forms are available at <http://env.gov.nu.ca/programareas/environmentprotection/forms-applications> or by contacting Nunavut's Department of Environment. Refer to the *Environmental Guideline for the General Management of Hazardous Waste* for additional information on the registration process.

A listing of hazardous waste carriers, receivers and hazardous waste management facilities registered to operate in Nunavut is available by contacting Nunavut's Department of Environment.

3.5 Disposal

Municipal landfill sites and sewage lagoons in Canada have over the years become a major source of mercury to the environment. Unwanted mercury-containing products and waste mercury must never be thrown in the garbage and liquid mercury must never be poured down the drain¹².

Recycling and disposal options for unwanted mercury-containing products and waste mercury in Nunavut are limited. The majority of these materials are used in government, commercial, industrial and institutional facilities and any unwanted or end-of-life products should be safely stored until they can be transported to a registered hazardous waste receiver that is licensed to recycle or dispose of mercury. Names of Canadian recyclers and disposal companies are available by contacting the waste management exchanges and associations listed in Appendix 10 of the *Environmental Guideline for the General Management of Hazardous Waste*. Additional information on commercial processors of mercury-containing waste can be obtained through the following web site links:

- lamprecycle.org/ - The lamprecycle.org web site is an American resource of information on mercury-containing lamp recycling and lists several lamp recycling companies in Canada.
- www.almr.org/ - The Association of Lighting and Mercury Recyclers represents the majority of commercial processors of mercury-containing waste in the United States, some of which also operate in Canada.

Some Municipalities in Nunavut are starting to implementing programs aimed at collecting and safely storing unwanted or end-of-life fluorescent lamps and other mercury-containing products as part of their household garbage collection programs. Homeowners wishing to dispose of these wastes should contact their municipality for local disposal information.

¹² The *Guideline for Industrial Waste Discharges* prohibits the disposal of mercury in sewage lagoons and landfills if mercury is present in excess of 0.1 milligrams per litre (parts per million) based on leachate quality test results.

Conclusion

Mercury is a naturally occurring element that is found in soil, air and water around the world and which can take many different forms, some of which are harmful to humans and wildlife. Mercury has also been used for many years in a variety of consumer and industrial products because of its ability to conduct electricity and react predictably to changes in temperature and pressure. The Guideline is an introduction to the risks, hazards and best management practices associated with various mercury-containing products and waste mercury. It examines the characteristics and effects of mercury on the environment and human health, identifies non-mercury alternatives for common products and provides guidance on the proper cleanup of spilled mercury and the storage, transportation and disposal of unwanted products.

Familiarity with the Guideline does not replace the need for the owner or person in charge, management or control of mercury-containing products and waste mercury to comply with all applicable federal and territorial legislation and municipal by-laws. The management of these materials may also be controlled through permits and licenses issued by Nunavut's co-management boards, Indian and Northern Affairs Canada and other regulatory agencies. These permits and licenses must be complied with at all times.

For additional information on the management of mercury-containing products and waste mercury, or to obtain a complete listing of available guidelines, go to the Department of Environment web site or contact the Department at:

Environmental Protection Division
Department of Environment
Government of Nunavut
Inuksugait Plaza, P.O. Box 1000, Station 1360
Iqaluit, Nunavut X0A 0H0

Telephone: (867) 975-7729

Fax: (867) 975-7739

Email: EnvironmentalProtection@gov.nu.ca

Website: <http://env.gov.nu.ca/programareas/environmentprotection>

References

Canadian Council of Ministers of the Environment (CCME). Canada-Wide Standards for Mercury-Containing Lamps, (2001).

Canadian Council of Ministers of the Environment (CCME). Canada-Wide Standards on Mercury for Dental Amalgam Waste, (2001).

Canadian Council of Ministers of the Environment (CCME). Canadian Water Quality Guidelines for the Protection of Aquatic Life – Inorganic Mercury and Methylmercury, (2003).

Environment Canada. Mercury and the Environment Webpage - <http://www.ec.gc.ca/mercure-mercury/>.

Environment Canada. Past Consultations – Updating the Regulatory Framework for Transboundary Movement of Waste and Hazardous Recyclable Materials, (2010).

Environment Canada. Proposed Risk Management Instruments for Mercury-Containing Products Consultation Document, (2007).

Environment Canada. Risk Management Strategy for Mercury-Containing Products, (2006).

Government of Nunavut, Department of Environment. Environmental Guideline for Industrial Waste Discharges, (2002).

Government of Nunavut, Department of Environment. Environmental Guideline for the General Management of Hazardous Waste, (2010).

Minnesota Pollution Control Agency. Cleaning Up Spilled Mercury in the Home – Household Hazardous Waste Fact Sheet #4.43b. (2003).

Northeast Waste Management Officials Association (NEWMOA). Mercury-Added Products Fact Sheets Website - <http://www.newmoa.org/prevention/mercury/imerc/factsheets>.

United Nations Environment Programme (UNEP). Global Mercury Assessment, (2002).

United States Environmental Protection Agency (USEPA). Mercury Releases and Spills Website – <http://www.epa.gov/mercury/spills>.

APPENDICES

APPENDIX 1 - ENVIRONMENTAL PROTECTION ACT

The following are excerpts from the *Environmental Protection Act*

1. "Contaminant" means any noise, heat, vibration or substance and includes such other substance 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 to property;

"Discharge" includes, but not so as to limit the meaning, any pumping, pouring, throwing, dumping, emitting, burning, spraying, spreading, leaking, spilling, or escaping;

"Environment" means the components of the Earth and includes

- (a) air, land and water,
- (b) all layers of the atmosphere,
- (c) all organic and inorganic matter and living organisms, and
- (d) the interacting natural systems that include components referred to in paragraphs (a) to (c).

"Inspector" means a person appointed under subsection 3(2) and includes the Chief Environmental Protection Officer.

- 2.2 The Minister may
 - (a) establish, operate and maintain stations to monitor the quality of the environment in the Territories;
 - (b) conduct research studies, conferences and training programs relating to contaminants and to the preservation, protection or enhancement of the environment;
 - (c) develop, co-ordinate and administer policies, standards, guidelines and codes of practice relating to the preservation, protection or enhancement of the environment;
 - (d) collect, publish and distribute information relating to contaminants and to the preservation, protection or enhancement of the environment;
3.
 - (1) The Minister shall appoint a Chief Environmental Protection Officer who shall administer and enforce this Act and the regulations.
 - (2) The Chief Environmental Protection Officer may appoint inspectors and shall specify in the appointment the powers that may be exercised and the duties that may be performed by the inspector under this Act and regulations.
5.
 - (1) Subject to subsection (3), no person shall discharge or permit the discharge of a contaminant into the environment.
 - (3) Subsection (1) does not apply where the person who discharged the contaminant or permitted the discharge of the contaminant establishes that
 - (a) the discharge is authorized by this Act or the regulations or by an order issued under this Act or the regulations;
 - (b) the contaminant has been used solely for domestic purposes and was discharged from within a dwelling house;
 - (c) the contaminant was discharged from the exhaust system of a vehicle;

- (d) the discharge of the contaminant resulted from the burning of leaves, foliage, wood, crops or stubble for domestic or agricultural purposes;
- (e) the discharge of the contaminant resulted from burning for land clearing or land grading;
- (f) the discharge of the contaminant resulted from a fire set by a public official for habitat management of silviculture purposes;
- (g) the contaminant was discharged for the purposes of combating a forest fire;
- (h) the contaminant is a soil particle or grit discharged in the course of agriculture or horticulture; or
- (i) the contaminant is a pesticide classified and labelled as "domestic" under the *Pest Control Products Regulations* (Canada).

(4) The exceptions set out in subsection (3) do not apply where a person discharges a contaminant that the inspector has reasonable grounds to believe is not usually associated with a discharge from the excepted activity.

- 5.1. Where a discharge of a contaminant into the environment in contravention of this Act or the regulations or the provisions of a permit or license issued under this Act or the regulations occurs or a reasonable likelihood of such a discharge exists, every person causing or contributing to the discharge or increasing the likelihood of such a discharge, and the owner or the person in charge, management or control of the contaminant before its discharge or likely discharge, shall immediately:
- (a) subject to any regulations, report the discharge or likely discharge to the person or office designated by the regulations;
 - (b) take all reasonable measures consistent with public safety to stop the discharge, repair any damage caused by the discharge and prevent or eliminate any danger to life, health, property or the environment that results or may be reasonably expected to result from the discharge or likely discharge; and
 - (c) make a reasonable effort to notify every member of the public who may be adversely affected by the discharge or likely discharge.
6. (1) Where an inspector believes on reasonable grounds that a discharge of a contaminant in contravention of this Act or the regulations or a provision of a permit or license issued under this Act or the regulations has occurred or is occurring, the inspector may issue an order requiring any person causing or contributing to the discharge or the owner or the person in charge, management or control of the contaminant to stop the discharge by the date named in the order.
7. (1) Notwithstanding section 6, where a person discharges or permits the discharge of a contaminant into the environment, an inspector may order that person to repair or remedy any injury or damage to the environment that results from the discharge.
- (2) Where a person fails or neglects to repair or remedy any injury or damage to the environment in accordance with an order made under subsection (1) or where immediate remedial measures are required to protect the environment, the Chief Environmental Protection Officer may cause to be carried out the measures that he or she considers necessary to repair or remedy an injury or damage to the environment that results from any discharge.

APPENDIX 2 – GOVERNMENT CONTACTS

Government of Nunavut

Environmental Protection Division
Department of Environment
Inuksugait Plaza
P.O. Box 1000, Station 1360
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-7729 Fax: (867) 975-7739

Motor Vehicles Division
Department of Economic Development and
Transportation
P.O. Box 10
Gjoa Haven, Nunavut X0B 1J0
Telephone: (867) 360-4615 Fax: (867) 360-4619

Workers' Safety and Compensation Commission
P.O. Box 669
Baron Building/1091
Iqaluit, Nunavut X0A 0H0
Telephone: 1-877-404-4407 (toll free) Fax: 1-866-
979-8501

Department of Community and Government
Services (all Divisions)
P.O. Box 1000, Station 700
4th Floor, W.G. Brown Building
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-5400 Fax: (867) 975-5305

Office of Chief Medical Health Officer of Health
Department of Health and Social Services
P.O. Box 1000, Station 1000
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-5774 Fax: (867) 975-5755

Government of Canada

Indian and Northern Affairs – Nunavut Region
P.O. Box 2200
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-4500 Fax: (867) 975-4560

Environment Canada (NWT and Nunavut)
5019 52nd Street
Yellowknife, Northwest Territories X1A 1T5
Telephone: (867) 669-4730 Fax: (867) 873-8185

Department of Transport – Road, Rail, Marine, Air
P.O. Box 8550
344 Edmonton Street
Winnipeg, Manitoba R3C 1P6
Telephone: 1-888-463-0521 (toll free)
Fax: (204) 983-8992 Road, Rail and Marine only
Fax: (204) 983-1734 Air only

APPENDIX C • ENVIRONMENTAL GUIDELINE FOR OZONE DEPLETING SUBSTANCES

Environmental Guideline for Ozone Depleting Substances



Department of Environment
Government of Nunavut

GUIDELINE: OZONE DEPLETING SUBSTANCES

Original: January 2002

Revised: April 2011

This Guideline has been prepared by the Department of Environment's Environmental Protection Division and approved by the Minister of Environment under the authority of Section 2.2 of the *Environmental Protection Act*.

This Guideline is not an official statement of the law and is provided for guidance only. Its intent is to increase the awareness and understanding of the risks, hazards and best management practices associated with ozone depleting substances. This Guideline does not replace the need for the owner or person in charge, management or control of ozone depleting substances to comply with all applicable legislation and to consult with Nunavut's Department of Environment, other regulatory authorities and qualified persons with expertise in the management of these substances.

Copies of this Guideline are available upon request from:

Department of Environment
Government of Nunavut

P.O. Box 1000, Station 1360, Iqaluit, NU, X0A 0H0

Electronic version of the Guideline is available at <http://env.gov.nu.ca/programareas/environmentprotection>

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Table of Contents

Introduction	1
1.1 Definitions	1
1.2 Roles and Responsibilities	3
1.2.1 Department of Environment	3
1.2.2 Owners, Wholesalers, Retailers and Service Technicians	4
1.2.3 Other Regulatory Agencies	4
Characteristics and Impacts of Ozone Depleting Substances	6
2.1 Characteristics	6
2.2 Impacts	7
The Management of Ozone Depleting Substances	9
3.1 Phase-Out Objectives and Approaches	9
3.2 Releases to the Environment	10
3.3 Recovery, Reclamation and Disposal	11
3.3.1 Stationary Refrigeration and Air Conditioning Systems	11
3.3.2 Mobile Air Conditioning Systems and Chillers	12
3.3.3 Fire Extinguishing Equipment	13
3.4 Transportation	13
3.5 Certification and Awareness Training	15
3.6 Labeling and Record Keeping	15
3.7 Sales Records	15
Conclusion	16
References	17

Appendices

- Appendix 1 Environmental Protection Act
- Appendix 2 Government and Industry Contacts

Introduction

A layer of colourless gas known as “ozone” surrounding the earth helps to filter the sun’s harmful ultraviolet radiation from reaching the planet’s surface. This layer is located in the stratosphere eight to ten kilometres above the earth. Scientific evidence shows that this ozone is being destroyed, and therefore this protective layer is becoming thinner, because of manufactured chlorofluorocarbons, halons and other similar substances being released into the air. These substances are commonly referred to as ‘ozone depleting substances’.

As one of the early signatories to the *Montreal Protocol on Substances that Deplete the Ozone Layer*, Canada is committed to protecting the earth’s ozone layer from further deterioration. The Protocol, developed in 1989 under the auspices of the United Nations Environmental Programme, provides a coordinated international response to the global problem of ozone depletion.

Canada’s *National Action Plan for the Environmental Control of Ozone Depleting Substances and their Halocarbon Alternatives* was initially endorsed in 1998 through the Canadian Council of Ministers of the Environment (CCME) in response to Canada’s commitments under the Montreal Protocol. The Action Plan is a national framework under which federal, provincial and territorial governments commit to implementing an ozone layer protection program focused on chlorofluorocarbons. The Action Plan was updated in 2001 to include all ozone depleting substances.

The original *Environmental Guideline for Ozone Depleting Substances*, which was approved by the Government of the Northwest Territories in 1999 and subsequently adopted by the Government of Nunavut in 2002, represented the Government’s initial response to the National Action Plan. This version of the *Environmental Guideline for Ozone Depleting Substances* (the Guideline) provides updated information on the most common ozone depleting substances and their replacements, the impacts of ozone depletion and best practices respecting the phase-out, recovery, reuse and disposal of these substances. It focuses on the refrigeration, air conditioning and fire protection sectors, although ozone depleting substances have been used by many other sectors in Canada. The Guideline does not address the production, import or export of new or recovered ozone depleting substances as these activities are controlled under regulations administered by Environment Canada. It is not an official statement of the law. For further information and guidance, the owner or person in charge, management or control of an ozone depleting substance is encouraged to review all applicable legislation and consult the Department of Environment, other regulatory agencies or qualified persons with expertise in the management of these substances.

The *Environmental Protection Act* enables the Government of Nunavut to implement measures to preserve, protect and enhance the quality of the natural environment. Section 2.2 of the *Act* provides the Minister with authority to develop, coordinate, and administer the Guideline.

1.1 Definitions

Air Conditioning and Refrigeration Equipment

Equipment used to remove heat from one medium or another using an inert gas (i.e. ozone depleting substance). The Equipment may be stationary (i.e. building air conditioner, commercial or household refrigerator) or mobile (i.e. vehicle air conditioner).

<i>Certified Service Technician</i>	A person who is qualified to service air conditioning, refrigeration or fire extinguishing equipment through the successful completion of an environmental awareness course for ozone depleting substances approved by Environment Canada.
<i>Commissioner's Land</i>	Lands that have been transferred by Order-in-Council to the Government of Nunavut. This includes roadways and land subject to block land transfers. Most Commissioner's Land is located within municipalities.
<i>Contaminant</i>	Any noise, heat, vibration or substance and includes such other substance 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 to property.
<i>Dangerous Good</i>	Any product, substance or organism included by its nature or by the <i>Transportation of Dangerous Goods Regulations</i> in any of the classes listed in the schedule provided in the <i>Transportation of Dangerous Goods Act</i> .
<i>Environment</i>	The components of the Earth and includes (a) air, land and water, (b) all layers of the atmosphere, (c) all organic and inorganic matter and living organisms, and (d) the interacting natural systems that include components referred to in paragraphs (a) to (c) above.
<i>Fire Extinguishing Equipment</i>	A handheld, wheeled or fixed unit or system that is designed to control or extinguish a fire.
<i>Minister</i>	The Minister of Environment of the Government of Nunavut.
<i>Motor Vehicle Air Conditioner</i>	A mechanical vapour compression refrigerant system on a motor vehicle that is designed to provide cooling for the passenger compartment.
<i>Ozone</i>	A colourless gas containing three atoms of oxygen (O ³). In the upper atmosphere, ozone absorbs ultraviolet radiation thereby preventing the radiation from reaching the surface of the earth. In the lower atmosphere (i.e. near the surface of the earth), ozone is one of the detrimental component of urban smog.
<i>Ozone Depleting Substance</i>	A chlorofluorocarbon, hydrochlorofluorocarbon, halon or other substance that is sufficiently stable to reach the stratosphere and has the potential of reacting with and destroying ozone.
<i>Qualified Person</i>	A person who has an appropriate level of knowledge and experience in all relevant aspects of waste management.

<i>Reclamation</i>	The cleaning of recovered ozone depleting substances by filtering, drying, distillation or chemical treatment to meet or exceed industry-accepted reuse standards.
<i>Recovery</i>	The transfer of an ozone depleting substance into a container that is not part of the system from which the substance is transferred.
<i>Recycle</i>	The reuse of recovered ozone depletion substances by transferring the substance back into similar equipment after servicing.
<i>Refillable Container</i>	A container that meets the requirements of Transport Canada and is approved for multiple use.
<i>Responsible Party</i>	The owner, vendor or service technician in charge, management or control of the ozone depleting substance.
<i>Servicing</i>	Repairing, maintaining or adjusting a component of air conditioning, refrigeration or fire extinguishing equipment.
<i>Transport Authority</i>	The statute and regulations controlling the management of hazardous waste under that mode of transport. These include (a) Road and Rail - <i>Transportation of Dangerous Goods Act</i> (Canada) and <i>Regulations; Interprovincial Movement of Hazardous Waste Regulations</i> and <i>Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations</i>. (b) Air – <i>International Air Transport Association (IATA) Dangerous Goods Regulations</i> and <i>International Civil Aviation Organization (ICAO) Technical Instructions</i>; and (c) Marine – <i>International Maritime Dangerous Goods Code (IMDG)</i>.

1.2 Roles and Responsibilities

1.2.1 Department of Environment

The Environmental Protection Division is the key territorial government agency responsible for ensuring parties properly manage ozone depleting substances. Authority is derived from the *Environmental Protection Act*, which prohibits the discharge of contaminants to the environment and enables the Minister to undertake actions to ensure appropriate management measures are in place. Although programs and services are applied primarily to activities taking place on Commissioner's and municipal lands and to Government of Nunavut undertakings, the *Environmental Protection Act* may be applied to the whole of the territory where other controlling legislation, standards and guidelines do not exist. A complete listing of relevant legislation and guidelines can be obtained by contacting the Department of Environment or by visiting the web site at:

<http://env.gov.nu.ca/programareas/environmentprotection>.

1.2.2 Owners, Wholesalers, Retailers and Service Technicians

Owners, wholesalers, retailers and service technicians in charge, management or control of an ozone depleting substance are considered to be the responsible party. The responsible party must ensure the substance is properly and safely managed from the time it is purchased to its final destruction so as to prevent its release to the environment.

Building, equipment and vehicle owners need to be aware of the presence of ozone depleting substances in their air conditioning, refrigeration and fire extinguishing equipment. Equipment that may be leaking or discharging these substances into the air must immediately be taken out of service, the leak stopped and the discharge reported to the Nunavut/NWT 24-Hour Spill Report Line at (867) 920-8130 (refer to table 3 on page 11 of the Guideline). Owners may also be affected by the phase-out of ozone depleting substances in Canada and should develop a plan for replacing the ozone depleting substance with an acceptable alternative.

Wholesalers and retailers of ozone depleting substances, other than where the substance is an integral part of the equipment, should sell replacement substances only to companies that employ certified service technicians.

A service technician may become certified by successfully completing an environmental awareness course for ozone depleting substances that is approved by Environment Canada. Only certified service technicians should maintain and repair air conditioning, refrigeration and fire extinguishing equipment that contain ozone depleting substances. Technicians should immediately advise the owner when they become aware of leaking equipment and the equipment must not be refilled or put back into service until the necessary repairs are completed.

Contractors may manage ozone depleting substances on behalf of the responsible party. However, the responsible party remains liable for ensuring the method of management complies with all applicable statutes, regulations, standards, guidelines and local by-laws. If the contractor does not comply with the requirements of the *Environmental Protection Act* and is charged with a violation while managing the ozone depleting substance, the responsible party may also be charged.

1.2.3 Other Regulatory Agencies

Other regulatory agencies may have to be consulted regarding the management of ozone depleting substances as there may be other environmental or public and worker health and safety issues to consider.

Environment Canada

Environment Canada is responsible for controlling the import, manufacture, use in some cases, sale and export of ozone depleting substances through the federal *Ozone-depleting Substances Regulations* and *Federal Halocarbon Regulations* which have been adopted under the *Canadian Environmental Protection Act*. Environment Canada is also responsible for regulating the international and interprovincial movement of hazardous waste under the *Interprovincial Movement of Hazardous Waste Regulations* and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*.

Department of Community and Government Services

The Office of the Fire Marshal in the Department of Community and Government Services is responsible under the *Fire Prevention Act*, National Fire Code and National Building Code for ensuring adequate fire prevention and response measures are in place. The Department, in cooperation with communities, is also responsible for the planning and funding of municipal solid waste and sewage disposal facilities in most Nunavut communities.

Workers' Safety and Compensation Commission

The Workers' Safety and Compensation Commission is responsible for promoting and regulating worker and workplace health and safety in Nunavut. The Commission derives its authority from the *Workers' Compensation Act* and *Safety Act* which require an employer to maintain a safe workplace and ensure the safety and well being of workers.

Department of Health and Social Services

Activities related to the management of ozone depleting substances may have an impact on public health. The Office of the Chief Medical Officer of Health and Regional Environmental Health Officers should be consulted regarding legislated requirements under the *Public Health Act*.

Department of Economic Development and Transportation

The Motor Vehicles Division is responsible for ensuring the safe transport of hazardous waste and other dangerous goods by road through administration of the *Transportation of Dangerous Goods Act*. The Department is also responsible under the *Motor Vehicles Act* for driver licensing and various other vehicle and road safety matters.

Local Municipal Governments

The role of municipal governments is important in the proper local management of unwanted ozone depleting substances and equipment and vehicles that contain these substances. Under the Nunavut Land Claims Agreement, municipalities are entitled to control their own municipal disposal sites. Unwanted waste may be deposited into municipal landfill sites only with the consent of the local government. The local fire department may also be called upon if a fire or other public safety issue is identified.

Co-management Boards and Agencies

Co-management boards and agencies established under the Nunavut Land Claims Agreement have broad authority for land use planning, impact assessment and the administration of land and water. Activities involving the management and disposal of ozone depleting substances may be controlled through the setting of terms and conditions in plans, permits and licenses issued by the Nunavut Water Board and other co-management boards and agencies.

Characteristics and Impacts of Ozone Depleting Substances

2.1 Characteristics

Ozone depleting substances generally contain a combination of chlorine, fluorine, bromine, carbon and hydrogen and are often referred to by the general term 'halocarbons'. Although each has its own unique chemical characteristics, ozone depleting substances are described as having low toxicity, low boiling points and low flammability. These characteristics have resulted in their wide use as refrigerants, fire extinguishing agents, blowing agents in manufacturing foam, propellants in aerosols and medical applications, and degreasing solvents.

Many halocarbons are highly effective in breaking down ozone. Unlike many other substances that are released into the atmosphere, ozone depleting substances are not 'washed' back to Earth by precipitation or destroyed by other chemicals but can remain in the atmosphere for several decades or more. This enables the substances to drift upward into the stratosphere where ultraviolet radiation from the sun releases the chlorine or bromine atoms which, in turn, destroy stratospheric ozone. Many ozone depleting substances are also powerful greenhouse gases with a much higher potential to enhance the greenhouse effect than carbon dioxide and methane.

Table 1 describes the characteristics of many common ozone depleting substances.

Ozone depleting substances are broadly grouped into the following categories, depending upon their molecular structures.

<i>Chlorofluorocarbons</i>	Chlorofluorocarbons, or CFCs, contain chlorine, fluorine and carbon atoms. First developed in the 1920s, they began to replace ammonia as a refrigerant gas in the 1930s and as an aerosol propellant in the 1940s. By the 1980s they were widely used as coolants in refrigerators and air conditioners, solvents in degreasers and cleaners, and as blowing agents in the production of foam.
<i>Halons</i>	Halons contain bromine, chlorine, fluorine and carbon atoms. The characteristics of halons make them very effective for extinguishing fires and are suitable for all types of fire extinguishing equipment ranging from industrial total flooding equipment to hand-held fire extinguishers popular for home or office use.
<i>Hydrochlorofluorocarbons</i>	Hydrochlorofluorocarbons, or HCFCs, contain chlorine, fluorine, hydrogen and carbon atoms. HCFCs have been developed for use as transitional or temporary replacements for CFCs because the hydrogen atom makes them less stable and therefore less damaging to the ozone layer. HCFCs are used mainly for foam blowing, refrigeration and air conditioning, solvent cleaning and, to a lesser extent, aerosols and fire protection.

Table 1.

		Classification under Transportation of Dangerous Goods Regulations	ODP^a	GWP^b	Life Time^c
Chlorofluorocarbons (CFC's)					
CFC-11	Trichlorofluoromethane	Not restricted under TDG	1.0	4600	45
CFC-12	Dichlorofluoromethane	UN 1029 Class 2.2 Non-flammable Gas	1.0	10600	100
CFC-113	Trichlorofluoroethane	Not restricted under TDG	0.8	6000	85
CFC-114	Dichlorotetrafluoroethane	Not restricted under TDG	1.0	9800	300
CFC-115	Chloropentafluoroethane	UN 1020 Class 2.2 Non-flammable Gas	0.6	7200	1700
All other chlorofluorocarbons		Consult TDGA for classification			
Halons (Bromofluorocarbons)					
Halon 1011	Bromochloromethane	Un 1887 Class 6.1 Toxic Substance	0.12	-	-
Halon 1211	Bromochlorodifluoromethane	Not restricted under TDG	3.0	1300	11
Halon 1301	Bromotrifluoromethane	Un 1009 Class 2.2 Non-flammable Gas	10.0	6900	65
Halon 2402	Dibromotetrafluoroethane	Not restricted under TDG	6.0	-	-
All other halons		Consult TDGA for classification			
Hydrochlorofluorocarbons (HCFC's)					
HCFC-22	Chlorodifluoromethane	Un 1018 Class 2.2 Non-flammable Gas	0.055	1700	11
HCFC-123	Dichlorotrifluoroethane	Not restricted under TDG	0.02	-	1
HCFC-124	Chlorotetrafluoroethane	UN 3297 Class 2.2 Non-flammable Gas	0.022	620	6
HCFC-141b	Dichlorofluoroethane	Not restricted under TDG	0.11	700	9
HCFC-142b	Chlorodifluoroethane	Not restricted under TDG	0.065	2400	18
HCFC-225ca	Dichloropentafluoropropane	Not restricted under TDG	0.025	-	2
HCFC-225cb	Dichloropentafluoropropane	Not restricted under TDG	0.033	-	6
All other hydrochlorofluorocarbons		Consult TDGA for classification			

- a. 'Ozone Depleting Potential' is a measure of the capability of a chemical to destroy ozone. It is measured against CFC-11 which has an ozone depleting potential of one (1.0). As an example, one molecule of Halon 1301 has the potential to destroy ten times more ozone than one molecule of CFC-11.
- b. 'Global Warming Potential' is a measure of the warming effect that the emission of a gas has on the atmosphere. It is measured as a factor relative to carbon dioxide (CO₂) which has a global warming potential of one (1.0). As an example, one molecule of CFC-11 has the potential to warm the atmosphere 4600 times more than one molecule of carbon dioxide.
- c. 'Life time' is the number of years it takes for the substance to break down in the lower atmosphere.

2.2 Impacts

Ozone is very effective in absorbing ultraviolet radiation in the stratosphere. Its depletion, or thinning, allows more of this high-energy radiation to reach the Earth's surface. Releases of halocarbons, particularly chlorofluorocarbons and halons, enable photochemical reactions¹ to take place in the stratosphere that destroy the ultraviolet radiation-shielding layer of ozone.

Increased exposure to ultraviolet radiation by humans can lead to an increase in sunburn, skin cancer, eye cataracts, weakening of the immune system and aging of the skin (i.e. the skin becomes drier and

¹ The most important reaction is the photo-induced breaking of the carbon-chlorine or carbon-bromine bond. Once released, the radical chlorine and bromine atoms catalyze the conversion of ozone (O₃) into oxygen (O₂).

looses elasticity). Ecosystem impacts can also occur. This begins at the bottom of the food chain where plankton populations in the ocean have been reduced by increased ultraviolet radiation. Damage and impacts to vegetation, food crops, wildlife and domestic animals can also occur.

The atmospheric impact of ozone depleting substances is not limited solely to the reduction of ozone. Many of these substances are also powerful greenhouse gases with much higher 'global warming potentials' than carbon dioxide and methane.

The Management of Ozone Depleting Substances

Minimizing or avoiding the creation of pollutants and wastes can be more effective in protecting the environment than treating or cleaning them up after they have been created.²

In the past, the refrigeration, air conditioning and fire protection sectors have incorporated ozone depleting substances as critical components in their equipment and processes. Although a large portion of Canada's ozone depleting substances consumption has been eliminated in recent years, a significant quantity remains in use or storage. Many of the same ozone depleting substances used by the commercial, industrial and institutional sectors were also used in domestic applications (i.e. household refrigerators, freezers, vehicle air conditioners). An inventory completed for the Government of the Northwest Territories in 1992 confirmed that approximately three-quarters of the ozone depleting substances in use in the Northwest Territories and Nunavut at that time were accounted for by the commercial, industrial and institutional sectors. As a result, this section focuses on the use of ozone depleting substances by the commercial, industrial and institutional refrigeration, air conditioning and fire extinguishing sectors in Nunavut. References are made to domestic sector use where appropriate.

3.1 Phase-out Objectives and Approaches

The overall strategy in Canada has been to eliminate the manufacture, import and export of ozone depleting substances and to phase-out their sale and use as suitable replacements become available. Several substances have been identified as being suitable replacements for chlorofluorocarbons in refrigeration and air conditioning equipment including hydrochlorofluorocarbons and hydrofluorocarbons. Unfortunately, these replacements are not totally benign (i.e. some are very powerful greenhouse gases) and an active approach to controlling their sale and use continues to be necessary.

Under the federal *Ozone-depleting Substances Regulations*, no person may use, sell or offer for sale halons in Canada. The Nunavut Office of the Fire Marshal should be consulted on suitable replacements for halon systems when the servicing, recharging or replacement of existing equipment is being considered³.

Table 2 describes the phase-out objectives and approaches that apply to these ozone depleting substances in refrigeration, air conditioning and fire extinguishing equipment in Nunavut along with their primary replacement, hydrochlorofluorocarbons. The phase-out objectives and approaches described in the table are consistent with those outlined in *Canada's Strategy to Accelerate the Phase-Out of CFC and Halon Uses and to Dispose of Surplus Stocks 2001* and the federal *Ozone-depleting Substances Regulations*.

² Source – Canadian Council of Ministers of the Environment.

³ The United States Environmental Protection Agency periodically updates a list of acceptable alternatives to halons and other ozone depleting substances. The listing can be downloaded at <http://www.epa.gov/ozone/snap/lists/index.html#halons>.

Table 2. Phase-out Objectives

Objective	Phase-Out Date
Refilling or replacement of chlorofluorocarbon-containing small (< 5 horsepower), medium, (5-30 horsepower) and large (>30 horsepower) commercial, industrial or institutional refrigeration and air conditioning equipment with a suitable alternative.	September 2011 or next service
Refilling or replacement of chlorofluorocarbon-containing mobile air conditioning equipment with a suitable alternative.	September 2011 or next service
Refilling or replacement of chlorofluorocarbon-containing mobile commercial and industrial refrigeration and chiller equipment with a suitable alternative.	September 2011 or next service
Refilling or replacement of halon-containing handheld or wheeled fire extinguishing equipment with a suitable alternative, except for critical uses ^a .	September 2011 or next service
Refilling or replacement of halon-containing fixed fire extinguishing equipment with a suitable alternative, except for critical uses ^a .	September 2011 or next service
Use and sale of hydrochlorofluorocarbons, except dichlorotrifluoroethane (HCFC-123).	January 2020
Use and sale of dichlorotrifluoroethane (HCFC-123).	January 2030

a. 'Critical use' for halons only include fire extinguishing equipment in military equipment.

3.2 Releases to the Environment

Ozone depleting substances must not be released to the environment. Equipment owners, managers and service technicians should be made aware of the environmental and human health impacts of ozone depleting substance emissions and the use of alternatives. To prevent releases from occurring, compressors, condensers, evaporators, piping and all associated equipment fitted to them need to be thoroughly inspected according to manufacturers' specifications, or at least twice each year if no specifications exist. These inspections should be incorporated into the facilities' regular maintenance plan.

Leaking equipment must not be 'recharged' with an ozone depleting substance until all necessary repairs have been completed by a certified service technician.

Spills or releases of ozone depleting substances must be immediately reported to the Nunavut/NWT 24-Hour Spill Report Line by phoning (867) 920-8130 in accordance with Schedule B of the *Spill Contingency Planning and Reporting Regulations*. Table 3 describes the minimum reportable quantities for ozone depleting substances as described in Schedule B.

Table 3. Minimum Reportable Quantities Following a Release

Ozone Depleting Substance	Minimum Reportable Quantity
CFC-12, CFC-15, HCFC-22, HCFC-124, Halon 1301 ^a	Any release from a container with a capacity greater than one hundred (100) litres
Halon 1011 ^b	5 litres or 5 kilograms
All other ozone depleting substances	100 litres or 100 kilograms

a. Transportation of Dangerous Goods Class 2.2 Non-flammable Gas

b. Transportation of Dangerous Goods Class 6.1 Toxic Substance

3.3 Recovery, Reclamation and Disposal

Table 2 describes the phase-out objectives of ozone depleting substances currently in use in Nunavut. Owners of fire extinguishing equipment and commercial, industrial or institutional mobile and stationary refrigeration and air conditioning equipment should either replace existing chlorofluorocarbons and halons with acceptable alternatives by September 2011 or during the next scheduled equipment service, or provide the Department of Environment with a suitable phase-out plan for the substance.

3.3.1 Stationary Refrigeration and Air Conditioning Systems

All compressor rooms housing stationary refrigeration and air conditioning systems should have refrigerant detectors and alarms installed in accordance with the Canadian Standards Association publication *B-52 – Mechanical Refrigeration Code* to detect refrigerant leaks and emissions. A refrigerant level greater than 10 parts per million in the compressor room is an indication that one or more of the systems is leaking. While refrigerant alarms are important, they are not substitutes for the physical leak testing of the system itself, which should take place a minimum of one time each year. Leak testing should also immediately be undertaken upon finding that a refrigeration or air conditioning system appears to be short of refrigerant. Any leak must be repaired prior to the system being recharged with refrigerant or put back into service. Chlorofluorocarbons must not be used to 'top up' a system. Recommendations on acceptable alternative refrigerants should be sought from the equipment's manufacturer.

Refrigerant must be recovered during the servicing of equipment to avoid its venting or release to the atmosphere. All recovery equipment should meet the Air-Conditioning, Heating and Refrigeration Institute (AHRI) *Standard 740 – Refrigerant Recovery/Recycling Equipment* or the Underwriters' of Canada (ULC) *Standard C1058.5-2004 - Halon and Halocarbon Clean Agent Recovery and Reconditioning Equipment*.

Only refillable containers may be used to store recovered refrigerants. These containers are less likely to leak and their use eliminates emissions caused by the disposal of throwaway or recyclable containers. All containers must meet the specifications listed in the *Transportation of Dangerous Goods Act* and be labeled in accordance with the *Workplace Hazardous Materials Information System (WHMIS)*.

The venting or release of refrigerants to the atmosphere for the purposes of disposal is unacceptable. Chlorofluorocarbons that are recovered from equipment must be returned to the original supplier, an independent reclaimer or licensed disposal facility for destruction. Contact Refrigerant Management Canada⁴ (RMC) by telephone at 1-866-622-0209 or by email at rmc@hrai.ca for information on the nearest reclaimer or licensed disposal facility. Only hydrochlorofluorocarbons and hydrofluorocarbons may be reclaimed to their original properties and used to 'top up' or recharge refrigeration and air conditioning equipment.

Unwanted refrigeration and air conditioning equipment must be completely emptied of refrigerant by a certified service technician prior to its disposal. A weatherproof notice should be permanently attached to the equipment stating the date of servicing, name of the certified technician and servicing company, and a statement confirming the equipment no longer contains refrigerant. Household refrigeration and air conditioning equipment is exempt from this requirement as long as it is disposed of in a separate area of the landfill specifically set aside for the disposal of 'white goods'. Local municipal governments are encouraged to use certified service technicians to recover the refrigerant from stored 'white goods' when quantities warrant.

Additional design and service practices are described in Environment Canada's *Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems*.

3.3.2 Mobile Air Conditioning Systems and Chillers

The basic principles outlined in section 3.3.1 also apply to mobile air conditioners and chillers containing chlorofluorocarbons – recovery of the refrigerant during the installation, operation and servicing of equipment; avoiding the venting of refrigerants to the atmosphere; use of refillable containers to store recovered refrigerants; and servicing by certified service technicians.

Newer-model vehicle air conditioners and chillers already contain alternative non-chlorofluorocarbon refrigerants while older vehicles are likely to still contain CFC-12. The servicing of a motor vehicle air conditioner should be undertaken by a certified service technician in accordance with the Society of Automotive Engineers publication *SAE J1661 – Procedures for Retrofitting CFC-12 (R-12) Mobile Air-Conditioning Systems to HFC-134a (R-134a)* and *SAE J1989 - Recommended Service Procedure for the Containment of CFC-12 (R-12)*. Owners and service technicians should refer to the manufacturers' specifications when choosing a replacement refrigerant.

All motor vehicle air conditioning systems and chiller refrigerant must be recovered before the vehicle is wrecked or scrapped. A certified service technician who is trained in the safe handling of refrigerants should remove the refrigerant, transfer it to a suitable refillable and labeled container, and arrange to have it transported to the original supplier, an independent reclaimer or licensed disposal facility for destruction. A personal motor vehicle delivered to a landfill by its owner is exempt from this requirement as long as the vehicle is disposed of in a separate area of the landfill specifically set aside for this purpose. Local municipal governments are encouraged to use certified service technicians to recover refrigerants from discarded vehicles when quantities warrant.

⁴ RMC is a not-for-profit corporation established by the Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI) to ensure the responsible disposal of surplus ozone depleting substances from refrigeration and air conditioning equipment. The program is an EcoLogo™ certified program.

Additional design and service practices for mobile air conditioners and chillers are described in Environment Canada's *Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems*.

3.3.3 Fire Extinguishing Equipment

The basic principles outlined in section 3.3.1 also apply to halon fire extinguishing equipment - recovery of the extinguishant during servicing and decommissioning; avoiding release of halons during training and equipment testing; use of refillable containers to store recovered halons; and servicing by certified service technicians.

Owners of fire extinguishing equipment that contain halons should develop a management plan in accordance with the phase-out objectives described in Table 2. Fire extinguishing equipment may not be recharged with halons in Canada except for use in military applications. Owners should contact the Underwriters' Laboratories of Canada (ULC) for information on the nearest reclaimer or licensed disposal facility. The Office of the Fire Marshal should also be consulted on suitable replacement fire extinguishing equipment when decommissioning halon systems.

Existing halon equipment must be properly maintained for as long it remains in service in order to avoid releases to the environment and to ensure the facility or asset is not without adequate fire protection. The training of personnel and testing of equipment must not result in any release of halons. Alternative procedures, such as video demonstrations and the use of halon stimulants, should be used to achieve the same testing and training objectives.

The servicing and decommissioning of halon fire extinguishing equipment must only be undertaken by a certified service technician. All equipment and servicing procedures must comply with Underwriters' Laboratories of Canada *Standard ULC/ORD-C1058.5-2004: Halon and Halocarbon Clean Agent Recovery and Reconditioning Equipment* and the *Standard ULC/ORD-C1058.18-2004: The Servicing of Halon and Clean Agent Extinguishing Systems*.

The venting or release of halons to the atmosphere for the purposes of disposal is unacceptable and must be avoided. Should a release occur, it must immediately be reported to the Nunavut/NWT 24-Hour Spill Report Line at (867) 920-8130.

Additional design and service practices for fire extinguishing equipment containing halons are described in Environment Canada's *Environmental Code of Practice on Halons*.

3.4 Transportation

Under the federal *Ozone-depleting Substances Regulations*, any person wishing to import or export a controlled ozone depleting substance must first obtain a permit from Environment Canada. In addition, several ozone depleting substances are classified as either Class 2.2 or 6.1 dangerous goods under the *Transportation of Dangerous Goods Act* and must be transported in accordance to this Section.

Under the federal *Interprovincial Movement of Hazardous Waste Regulations* and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*, no person may transport waste dangerous goods in Canada for the purpose of disposal or recycling in a quantity greater than five kilograms or five litres unless it is accompanied by a completed manifest. Manifest forms are available

from Nunavut's Department of Environment and completion instructions are included on the reverse side of each manifest. Further information on manifesting can be obtained by referring to the *Environmental Guideline for the General Management of Hazardous Waste* or Environment Canada's *User's Guide for the Hazardous Waste Manifest*.

The classification, packaging, labeling and placarding of several ozone depleting substances must conform to the federal and territorial *Transportation of Dangerous Goods Act* and *Regulations* while the substances are being transported. Schedule I of the *Regulations* classify these substances as follows:

Shipping Name:	WASTE Bromotrifluoromethane; or Refrigerant Gas R-13b1
	Classification: 2.2
	Product Identification Number: UN1009
Shipping Name:	WASTE Chlorodifluoromethane; or Refrigerant Gas R-22
	Classification: 2.2
	Product Identification Number: UN1018
Shipping Name:	WASTE Chloropentafluoroethane; or Refrigerant Gas R-115
	Classification: 2.2
	Product Identification Number: UN1020
Shipping Name:	WASTE Dichlorofluoromethane; or Refrigerant Gas R-21
	Classification: 2.2
	Product Identification Number: UN1029
Shipping Name:	WASTE Bromochloromethane
	Classification: 6.1
	Product Identification Number: UN1887
	Packing Group: III
Shipping Name:	WASTE Ethylene Oxide and Chlorotetrafluoroethane Mixture
	Classification: 2.2
	Product Identification Number: UN3297

The transport of ozone depleting substances by air must conform to the *International Air Transport Association (IATA) Dangerous Goods Regulations* and *International Civil Aviation Organization (ICAO) Technical Instructions*, while transport by marine must conform to the *International Marine Dangerous Goods Code*. Further information on transporting these substances can be obtained by contacting Transport Canada or referring to the appropriate Transport Authority.

Hazardous waste generators, carriers and receivers operating in Nunavut must be registered with the Nunavut Department of Environment. A unique registration number is assigned to each registrant through the registration process, which enables completion of the manifest document. Copies of registration forms are available at <http://env.gov.nu.ca/programareas/environmentprotection/forms-applications> or by contacting Nunavut's Department of Environment. Refer to the *Environmental Guideline for the General Management of Hazardous Waste* for additional information on the registration process.

A listing of hazardous waste carriers, receivers and management facilities registered to operate in Nunavut is available by contacting Nunavut's Department of Environment.

3.5 Certification and Awareness Training

Only certified service technicians may service refrigeration, air conditioning and fire extinguishing equipment containing an ozone depleting substance. To achieve certification, a technician must successfully complete an environmental awareness training course approved by Environment Canada. A card indicating completion of training should be carried by the certified service technician at all times. Completion of training only enables the person to handle ozone depleting substances as provided in the Guideline and is not evidence of qualifications to otherwise service refrigeration, air conditioning or fire extinguishing equipment.

Only certified service technicians may purchase or possess an ozone depleting substance for the purpose of servicing equipment that already contains an ozone depleting substance. Companies employing certified service technicians must maintain records indicating the name, training date and qualifications of employees who are certified to service ozone depleting substance-containing equipment.

3.6 Labeling and Record Keeping

Each piece of refrigeration, air conditioning and fire extinguishing equipment containing an ozone depleting substance must be permanently labeled with the quantity and type of ozone depleting substance contained within that equipment. The label must be amended if the equipment has been 'evacuated' of ozone depleting substances or if the equipment is recharged with a different refrigerant or extinguishant.

An up-to-date service record should be maintained in close proximity to equipment containing ozone depleting substances, or with the owner of the facility. The record should include servicing dates, name of servicing company and certified technician, details on leak testing and detection, quantities of substances recovered or re-charged, and any other information pertinent to the servicing, operation and maintenance of the equipment. The record must be retained for the operating life of the equipment and be made available for inspection upon the request of an Inspector appointed under the *Environmental Protection Act*.

3.7 Sales Records

Any person who sells an ozone depleting substance, except where the substance is a component of another product, should maintain a sales record indicating the type of ozone depleting substance sold, the date of sale, the name of the person who purchased the substance and the name of that person's business. Only persons who are certified service technicians should purchase ozone depleting substances, except where the substance is a component of another product.

Conclusion

The *National Action Plan for the Environmental Control of Ozone Depleting Substances and their Halocarbon Alternatives* commits federal, provincial and territorial governments to implement an ozone layer protection program focused on all ozone depleting substances. The *Environmental Guideline for Ozone Depleting Substances* represents the Government of Nunavut's updated response to the National Action Plan. The Guideline focuses on the industrial, commercial and institutional refrigeration, air conditioning and fire protection sectors, although it is recognized that ozone depleting substances can still be found in older-model household refrigerators and freezers and older-model vehicle air conditioners and chillers. The Guideline provides information on the most common ozone depleting substances and their replacement, the impacts of ozone depletion and best practices respecting the phase-out, recovery, reuse and disposal of these substances.

Familiarity with the Guideline does not replace the need for the owner or person in charge, management or control of ozone depleting substances to comply with all applicable federal and territorial legislation and municipal by-laws. The management of these substances may also be controlled through permits and licenses issued by Nunavut's co-management boards, Indian and Northern Affairs Canada and other regulatory agencies. These permits and licenses must be complied with at all times.

For additional information on the management of ozone depleting substances, or to obtain a complete listing of guidelines, go to the Department of Environment web site or contact the Department at:

Environmental Protection Division
Department of Environment
Government of Nunavut
Inuksugait Plaza, P.O. Box 1000, Station 1360
Iqaluit, Nunavut X0A 0H0

Telephone: (867) 975-7729

Fax: (867) 975-7739

Email: EnvironmentalProtection@gov.nu.ca

Website: <http://env.gov.nu.ca/programareas/environmentprotection>

References

Air-Conditioning, Heating and Refrigeration Institute (AHRI). Standard 740 – Refrigerant Recovery/Recycling Equipment. 1998 or latest edition.

http://www.ahrinet.org/App_Content/ahri/files/standards%20pdfs/AHRI%20standards%20pdfs/AHRI%20740_1998.pdf

Canadian Council of Ministers of the Environment (CCME). Canada's Strategy to Accelerate the Phase-Out of CFC and Halon Uses and to Dispose of the Surplus Stocks. 2001.

http://www.ccme.ca/assets/pdf/cfc_halons_dspslstrtg_e.pdf

Canadian Council of Ministers of the Environment (CCME). National Action Plan for the Environmental Control of Ozone-Depleting Substances (ODS) and their Halocarbon Alternatives. 2001.

http://www.ccme.ca/assets/pdf/nap_update_e.pdf

Canadian Standards Association (CSA). B-52 – Mechanical Refrigeration Code. Latest Edition. Available for purchase online.

<http://shop.csa.ca/en/canada/pressure-vessels/b52-package/invnt/27022582005/>

Environment Canada. Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems. 1996.

<http://www.ec.gc.ca/Publications/906B38B7-BB63-43A3-9EAA-D9DB17063F94%5CEnvironmentalCOPforElimination.pdf>

Environment Canada. Environmental Code of Practice on Halons. 1996.

<http://www.ec.gc.ca/Publications/default.asp?lang=En&xml=FCE2BFE2-56F5-4252-A329-CCB03DF2DAFF>

Environment Canada. Ozone-Depleting Substances Website.

<http://www.ec.gc.ca/ozone/default.asp?lang=En&n=D57A0006-1>

Environment Canada. *Ozone-Depleting Substances Regulations, 1998 (SOR/99-7)*.

<http://www.ec.gc.ca/lcpe-cepa/eng/regulations/detailReg.cfm?intReg=15>

Government of Canada, Department of Justice. *Federal Halocarbon Regulations, 2003*.

<http://laws.justice.gc.ca/eng/regulations/SOR-2003-289/index.html>

Government of Nunavut, Department of Environment. Environmental Guideline for the General Management of Hazardous Waste. 2010.

<http://env.gov.nu.ca/node/82#Guideline Documents>

Government of Nunavut, Department of Environment. Environmental Guideline for the Management of Ozone Depleting Substances. 2002.

Government of Nunavut, Department of Environment. *Spill Contingency Planning and Reporting Regulations, 1993 (R-068-93)*.

<http://env.gov.nu.ca/sites/default/files/Spill%20Planning%20and%20Reporting%20Regs.pdf>

Government of the Northwest Territories, Department of Renewable Resources. Report on Ozone Depleting Substances in the Northwest Territories. 1992. Currently out of print.

Government of Yukon, Department of Environment. *Ozone Depleting Substances and Other Halocarbon Regulations, 2000 (O.I.C. 2000/127)*.

Society of Automotive Engineers (SAE). J1661: Procedure Retrofitting CFC-12 (R-12) Mobile Air-Conditioning Systems to HFC-134a (R-134a). 1998. Available for purchase online.
http://standards.sae.org/j1661_199811

Society of Automotive Engineers (SAE). J1989: Recommended Service Procedure for the Containment of CFC-12 (R-12). 1998. Available for purchase online.
http://standards.sae.org/j1989_199811

Underwriters' Laboratories of Canada. ULC/ORD-C1058.18-2004: The Servicing of Halon and Clean Agent Extinguishing Systems. Available for purchase online.

Underwriters' Laboratories of Canada. ULC/ORD-C1058.5-2004: Halon and Halocarbon Clean Agent Recovery and Reconditioning Equipment. Available for purchase online.

APPENDICES

APPENDIX 1 - ENVIRONMENTAL PROTECTION ACT

The following are excerpts from the *Environmental Protection Act*

1. "Contaminant" means any noise, heat, vibration or substance and includes such other substance 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 to property;

"Discharge" includes, but not so as to limit the meaning, any pumping, pouring, throwing, dumping, emitting, burning, spraying, spreading, leaking, spilling, or escaping;

"Environment" means the components of the Earth and includes

 - (a) air, land and water,
 - (b) all layers of the atmosphere,
 - (c) all organic and inorganic matter and living organisms, and
 - (d) the interacting natural systems that include components referred to in paragraphs (a) to (c).

"Inspector" means a person appointed under subsection 3(2) and includes the Chief Environmental Protection Officer.
- 2.2 The Minister may
 - (a) establish, operate and maintain stations to monitor the quality of the environment in the Territories;
 - (b) conduct research studies, conferences and training programs relating to contaminants and to the preservation, protection or enhancement of the environment;
 - (c) develop, co-ordinate and administer policies, standards, guidelines and codes of practice relating to the preservation, protection or enhancement of the environment;
 - (d) collect, publish and distribute information relating to contaminants and to the preservation, protection or enhancement of the environment;
3. (1) The Minister shall appoint a Chief Environmental Protection Officer who shall administer and enforce this Act and the regulations.

(2) The Chief Environmental Protection Officer may appoint inspectors and shall specify in the appointment the powers that may be exercised and the duties that may be performed by the inspector under this Act and regulations.
5. (1) Subject to subsection (3), no person shall discharge or permit the discharge of a contaminant into the environment.

(3) Subsection (1) does not apply where the person who discharged the contaminant or permitted the discharge of the contaminant establishes that

 - (a) the discharge is authorized by this Act or the regulations or by an order issued under this Act or the regulations;
 - (b) the contaminant has been used solely for domestic purposes and was discharged from within a dwelling house;
 - (c) the contaminant was discharged from the exhaust system of a vehicle;

- (d) the discharge of the contaminant resulted from the burning of leaves, foliage, wood, crops or stubble for domestic or agricultural purposes;
- (e) the discharge of the contaminant resulted from burning for land clearing or land grading;
- (f) the discharge of the contaminant resulted from a fire set by a public official for habitat management of silviculture purposes;
- (g) the contaminant was discharged for the purposes of combating a forest fire;
- (h) the contaminant is a soil particle or grit discharged in the course of agriculture or horticulture; or
- (i) the contaminant is a pesticide classified and labelled as "domestic" under the *Pest Control Products Regulations* (Canada).

(4) The exceptions set out in subsection (3) do not apply where a person discharges a contaminant that the inspector has reasonable grounds to believe is not usually associated with a discharge from the excepted activity.

- 5.1. Where a discharge of a contaminant into the environment in contravention of this Act or the regulations or the provisions of a permit or license issued under this Act or the regulations occurs or a reasonable likelihood of such a discharge exists, every person causing or contributing to the discharge or increasing the likelihood of such a discharge, and the owner or the person in charge, management or control of the contaminant before its discharge or likely discharge, shall immediately:
- (a) subject to any regulations, report the discharge or likely discharge to the person or office designated by the regulations;
 - (b) take all reasonable measures consistent with public safety to stop the discharge, repair any damage caused by the discharge and prevent or eliminate any danger to life, health, property or the environment that results or may be reasonably expected to result from the discharge or likely discharge; and
 - (c) make a reasonable effort to notify every member of the public who may be adversely affected by the discharge or likely discharge.
6. (1) Where an inspector believes on reasonable grounds that a discharge of a contaminant in contravention of this Act or the regulations or a provision of a permit or license issued under this Act or the regulations has occurred or is occurring, the inspector may issue an order requiring any person causing or contributing to the discharge or the owner or the person in charge, management or control of the contaminant to stop the discharge by the date named in the order.
7. (1) Notwithstanding section 6, where a person discharges or permits the discharge of a contaminant into the environment, an inspector may order that person to repair or remedy any injury or damage to the environment that results from the discharge.
- (2) Where a person fails or neglects to repair or remedy any injury or damage to the environment in accordance with an order made under subsection (1) or where immediate remedial measures are required to protect the environment, the Chief Environmental Protection Officer may cause to be carried out the measures that he or she considers necessary to repair or remedy an injury or damage to the environment that results from any discharge.

APPENDIX 2 – GOVERNMENT AND INDUSTRY CONTACTS

Government of Nunavut

Environmental Protection Division
Department of Environment
Inuksugait Plaza
P.O. Box 1000, Station 1360
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-7729 Fax: (867) 975-7739

Workers' Safety and Compensation Commission
P.O. Box 669
Baron Building/1091
Iqaluit, Nunavut X0A 0H0
Telephone: 1-877-404-4407 (toll free)
Fax: 1-866-979-8501

Office of Chief Medical Health Officer of Health
Department of Health and Social Services
P.O. Box 1000, Station 1000
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-5774 Fax: (867) 975-5755

Government of Canada

Indian and Northern Affairs – Nunavut Region
P.O. Box 2200
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-4500 Fax: (867) 975-4560

Environment Canada (NWT and Nunavut)
5019 52nd Street
Yellowknife, Northwest Territories X1A 1T5
Telephone: (867) 669-4730 Fax: (867) 873-8185

Industry

The Heating, Refrigeration and Air Conditioning
Institute of Canada (HRAI)
2800 Skymark Avenue, Building 1, Suite 201
Mississauga, Ontario L4W 5A6
Telephone: 1-800-267-2231 (toll free)
<http://www.hrai.ca>

Motor Vehicles Division
Department of Economic Development and
Transportation
P.O. Box 10
Gjoa Haven, Nunavut X0B 1J0
Telephone: (867) 360-4615 Fax: (867) 360-4619

Department of Community and Government
Services (all Divisions)
P.O. Box 1000, Station 700
4th Floor, W.G. Brown Building
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-5400 Fax: (867) 975-5305

Department of Transport – Road, Rail, Marine, Air
P.O. Box 8550
344 Edmonton Street
Winnipeg, Manitoba R3C 1P6
Telephone: 1-888-463-0521 (toll free)
Fax: (204) 983-8992 Road, Rail and Marine
Fax: (204) 983-1734 Air

Refrigerant Management Canada (RMC)
<http://www.refrigerantmanagement.ca>

Underwriters' Laboratories of Canada
7 Underwriters Road
Toronto, Ontario M1R 3A9
Telephone: (866) 937-3852 Fax: (416) 757-8727
Email: customerservice@ulc.ca

**APPENDIX D • ENVIRONMENTAL GUIDELINE FOR INDUSTRIAL WASTE DISCHARGES INTO
MUNICIPAL SOLID WASTE AND SEWAGE TREATMENT FACILITIES**

Environmental Guideline for Industrial Waste Discharges into Municipal Solid Waste and Sewage Treatment Facilities



Department of Environment
Government of Nunavut

GUIDELINE: INDUSTRIAL WASTE DISCHARGES

Original: January 2002

Revised: April 2011

This Guideline has been prepared by the Department of Environment's Environmental Protection Division and approved by the Minister of Environment under the authority of Section 2.2 of the *Environmental Protection Act*.

This Guideline is not an official statement of the law and is provided for guidance only. Its intent is to increase the awareness and understanding of the risks, hazards and best management practices associated with industrial waste. This Guideline does not replace the need for the owner or person in charge, management or control of industrial waste to comply with all applicable legislation and to consult with Nunavut's Department of Environment, other regulatory authorities and qualified persons with expertise in the management of this waste.

Copies of this Guideline are available upon request from:

Department of Environment
Government of Nunavut

P.O. Box 1000, Station 1360, Iqaluit, NU, X0A 0H0

Electronic version of the Guideline is available at <http://env.gov.nu.ca/programareas/environmentprotection>

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Bottom – John Tyman. "Inuit: People of the Arctic"

Table of Contents

Introduction	1
1.1 Definitions	1
1.2 Roles and Responsibilities.....	3
1.2.1 Department of Environment	3
1.2.2 Generators of Industrial Waste	3
1.2.3 Other Regulatory Agencies	4
Waste Management	6
2.1 Process Effluent	7
2.2 Process Residuals	9
2.3 Non-Point Source Discharges	9
Conclusion	10
References	11

Appendices

- Appendix 1 Environmental Protection Act
- Appendix 2 Government and Other Contacts

Introduction

Waste is produced by a wide variety of industrial, commercial and institutional operations in Nunavut. Much of this waste can be safely disposed of in landfills (i.e. food and packaging waste) and sewage treatment facilities (i.e. toilet waste) operated and maintained by local municipal governments. These municipal facilities may not however, accept all types of waste because of their design (i.e. the absence of groundwater collection and treatment at landfills) or because the introduction of contaminants may be harmful to bacteria that decompose the waste. The disposal of hazardous waste may also make it difficult for municipalities to comply with the terms and conditions contained in water licenses issued to them by the Nunavut Water Board.

The *Environmental Guideline for Industrial Waste Discharges into Municipal Solid Waste and Sewage Treatment Facilities* (the Guideline) provides guidance on the local management and disposal of waste from industrial, commercial and institutional operations. Specifically, it establishes limits on the type of waste that can be disposed of into municipal waste management facilities. It does not establish limits on discharges from facilities licensed through the Nunavut Water Board. The Guideline is not an official statement of the law. For further information and guidance, the owner or person in charge, management or control of industrial waste is encouraged to review all applicable legislation and consult the Department of Environment, other regulatory agencies or qualified persons with expertise in the management of waste.

The *Environmental Protection Act* enables the Government of Nunavut to implement measures to preserve, protect and enhance the quality of the natural environment. Section 2.2 of the *Act* provides the Minister with authority to develop, coordinate, and administer the Guideline.

1.1 Definitions

<i>Commissioner's Land</i>	Lands that have been transferred by Order-in-Council to the Government of Nunavut. This includes roadways and land subject to block land transfers. Most Commissioner's Land is located within municipalities.
<i>Composite Sample</i>	A collection of three or more individual samples of equal volume, equal weight or sized proportionally to the flow of the liquid being sampled that are taken at regular intervals over a period of time.
<i>Contaminant</i>	Any noise, heat, vibration or substance and includes such other substance 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 to property.
<i>Dangerous Good</i>	Any product, substance or organism included by its nature or by the <i>Transportation of Dangerous Goods Regulations</i> in any of the classes listed in the Schedule provided in the <i>Transportation of Dangerous Goods Act</i> .

<i>Environment</i>	The components of the Earth and includes (a) air, land and water, (b) all layers of the atmosphere, (c) all organic and inorganic matter and living organisms, and (d) the interacting natural systems that include components referred to in paragraphs (a) to (c) above.
<i>Hazardous Waste</i>	A contaminant that is a dangerous good and is no longer wanted or is unusable for its original intended purpose and is intended for storage, recycling, treatment or disposal.
<i>Industrial Operation</i>	An operation involved in the manufacturing, processing or provision of goods and services, including commercial and institutional operations.
<i>Landfilling</i>	The intentional depositing or placement of waste in or on land for the purposes of disposal.
<i>Leachate</i>	Effluent containing contaminants that is produced by water or other liquids flowing or percolating through a waste.
<i>Minister</i>	The Minister of Environment of the Government of Nunavut.
<i>Non-Point Source Discharge</i>	A non-specific or diffuse source of effluent entering the environment including run-off from an industrial compound or storage yard.
<i>Process Effluent</i>	Water mixed with treated or untreated waste that is discharged from an industrial operation.
<i>Process Residuals</i>	Solid, semi-solid or sludge waste resulting from an industrial operation.
<i>Qualified Person</i>	A person who has an appropriate level of knowledge and experience in all relevant aspects of waste management.
<i>Responsible Party</i>	The owner or person in charge, management or control of the waste.
<i>Sewage Treatment System</i>	A system for the collecting, conveying, pumping, treating and disposing of blackwater (water containing fecal matter and urine waste) and greywater (water drained from sinks, showers, kitchens and laundry facilities).
<i>Solid Waste</i>	Unwanted solid materials discarded from a household (i.e. single or multiple residential dwellings, other similar permanent or temporary dwellings), institutional (i.e. schools, government facilities, hospitals and health centres), commercial (i.e. stores, restaurants) or industrial (i.e. mineral, oil and gas exploration and development) facility. For clarity, solid waste does not include biomedical waste, hazardous waste or sewage sludge.

<i>Standard Methods</i>	A procedure set out in <i>Standard Methods for the Examination of Water and Wastewater</i> published jointly by the American Public Health Association, American Water Works Association and Water Pollution Control Federation, current at the date of testing.
<i>Toxicity Characteristic Leaching Procedure</i>	A testing procedure designed to determine the mobility of both organic and inorganic parameters in solid, semi-solid and sludge waste. The procedure is determined by United States Environmental Protection Agency (USEPA) Test Method 1311 and is intended to simulate the characteristics a waste may exhibit when disposed of in a landfill.

1.2 Roles and Responsibilities

1.2.1 Department of Environment

The Environmental Protection Division is the key environmental agency responsible for ensuring parties properly manage industrial waste and will provide advice and guidance on its management. Authority is derived from the *Environmental Protection Act*, which prohibits the discharge of contaminants to the environment and enables the Minister to undertake actions to ensure appropriate management measures are in place. Although programs and services are applied primarily to activities taking place on Commissioner's and municipal lands and to Government of Nunavut undertakings, the *Environmental Protection Act* may be applied to the whole of the territory where other controlling legislation, standards and guidelines do not exist. A complete listing of relevant legislation and guidelines can be obtained by contacting the Department of Environment or by visiting the web site at:

<http://env.gov.nu.ca/programareas/environmentprotection>.

1.2.2 Generators of Industrial Waste

Industrial waste must be properly and safely managed from the time it is produced to its final disposal – or in other words from cradle to grave. The owner or person in charge, management or control of the industrial waste is known as the responsible party. The responsible party must determine the nature of the waste, including whether it is hazardous or non-hazardous, before the waste can be disposed of in a municipal solid waste landfill or sewage treatment facility. If the waste exceeds the criteria established in the Guideline, the waste must be managed as a hazardous waste. Further information on the management of hazardous waste in Nunavut, including generator, carrier and receiver responsibilities, can be obtained by referring to the *Environmental Guideline for the General Management of Hazardous Waste* or specific guidelines that have been developed for the major types of waste.

Contractors may manage industrial waste on behalf of the responsible party. However, the responsible party remains liable for ensuring the method of management complies with all applicable statutes, regulations, standards, guidelines and local by-laws. If the contractor does not comply with the requirements of the *Environmental Protection Act* and is charged with a violation while managing the waste, the responsible party may also be charged.

1.2.3 Other Regulatory Agencies

Other regulatory agencies may have to be consulted regarding the management of industrial waste as other environmental or public and worker health and safety issues may also need to be considered.

Workers' Safety and Compensation Commission

The Workers' Safety and Compensation Commission is responsible for promoting and regulating worker and workplace health and safety in Nunavut. The Commission derives its authority from the *Workers' Compensation Act* and *Safety Act* which require an employer to maintain a safe workplace and ensure the safety and well being of workers.

Department of Community and Government Services

The Department of Community and Government Services is responsible under the *Commissioners' Lands Act* for the issuance of land leases, reserves, licenses and permits on Commissioner's Lands. The Department, in cooperation with communities, is also responsible for the planning and funding of municipal solid waste landfills and sewage treatment facilities in most Nunavut communities.

Department of Health and Social Services

Activities related to the management of industrial waste may have an impact on public health. The Office of the Chief Medical Officer of Health and Regional Environmental Health Officers should be consulted regarding legislated requirements under the *Public Health Act*.

Department of Economic Development and Transportation

The Motor Vehicles Division is responsible for ensuring the safe transport of hazardous waste and other dangerous goods by road through administration of the *Transportation of Dangerous Goods Act*. The Department is also responsible under the *Motor Vehicles Act* for driver licensing and various other vehicle and road safety matters.

Environment Canada

Environment Canada is responsible for administering the *Canadian Environmental Protection Act* and for regulating the interprovincial and international movement of hazardous waste under the *Interprovincial Movement of Hazardous Waste Regulations* and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*. Environment Canada is also responsible for administering the pollution prevention provisions of the federal *Fisheries Act*.

Indian and Northern Affairs Canada

Indian and Northern Affairs Canada is responsible under the *Territorial Lands Act* and *Nunavut Waters and Nunavut Surface Rights Tribunal Act* for the management of federal lands and waters in Nunavut, including the impact industrial waste may have on the quality of these lands and waters.

Local Municipal Governments

The role of municipal governments is important in the proper local management of industrial waste. Under the Nunavut Land Claims Agreement, municipalities are entitled to control their own municipal solid waste and sewage treatment facilities. Unwanted waste may be deposited into municipal waste facilities only with the consent of the local government. The local fire department may also be called upon if a fire or other public safety issue is identified.

Co-management Boards and Agencies

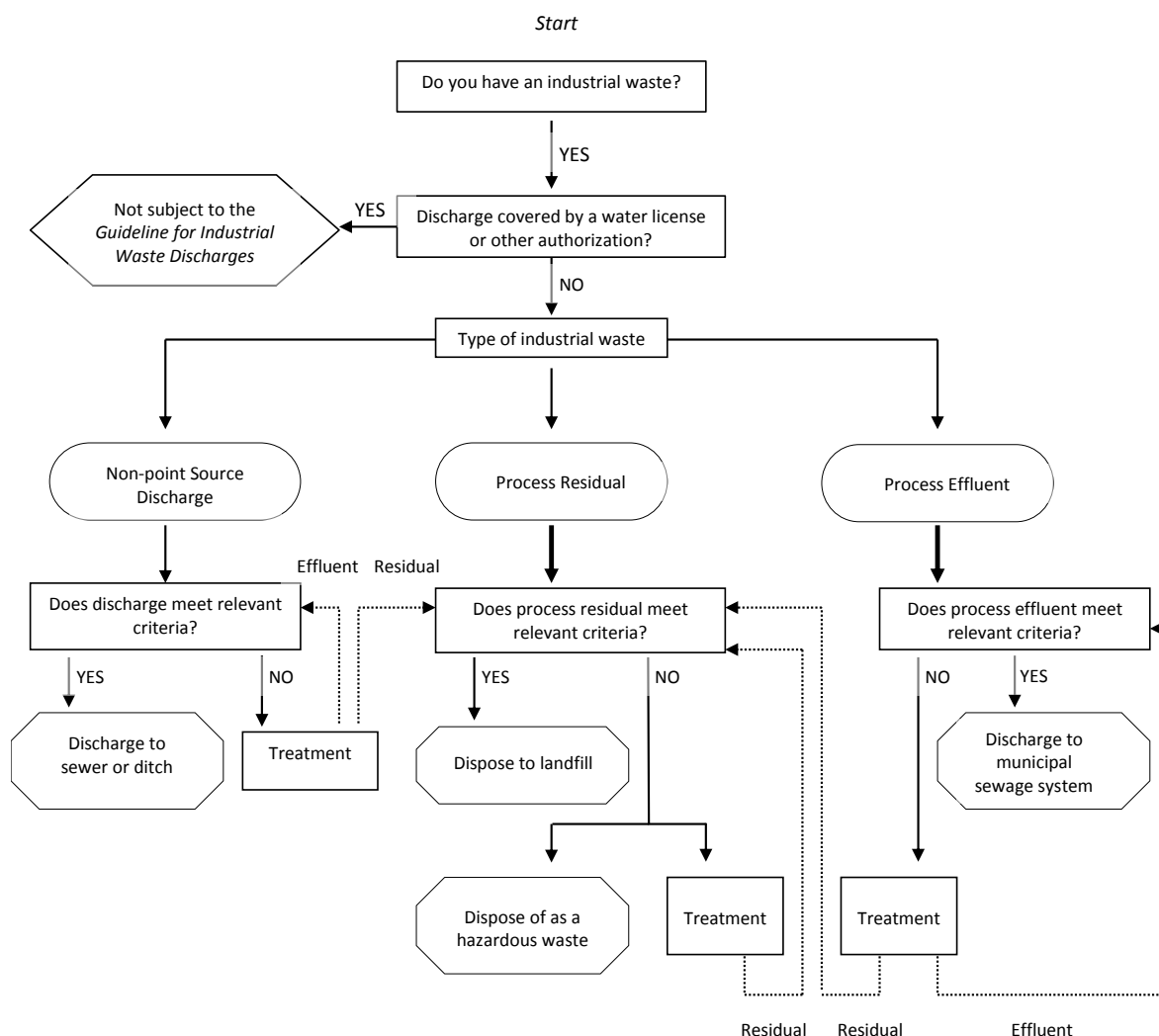
Co-management boards and agencies established under the Nunavut Land Claims Agreement have broad authority for land use planning, impact assessment and the administration of land and water. Activities involving the management and disposal of industrial waste may be controlled through the setting of terms and conditions in plans, permits and licenses issued by the Nunavut Water Board and other co-management boards and agencies.

Waste Management

Proper waste management simply makes good sense. Minimizing or eliminating the generation of hazardous and other industrial waste helps to reduce the hazards and costs associated with its handling, storage, transport, recycling, treatment and disposal. It also reduces the impacts waste could have on the environment, human and worker health and safety and reduces the global emission of greenhouse gases by minimizing the use of raw materials.

Once an industrial waste is created, the generator is responsible for its safe management from cradle-to-grave. Waste generators can prevent pollution and reduce costs by implementing proper waste reduction, reuse and recycling programs through changes to operational procedures, maintenance practices and raw material use. Treating and disposing of waste should be considered only when reuse and recycling options are not available or practical.

The following flowchart illustrates the decision process for managing industrial waste for treatment and disposal.



Sections 2.1, 2.2 and 2.3 do not apply to industrial wastes where a regulation or guideline governing that waste already exists, or where the waste is subject to an existing water license, land use permit, land lease or other authorization. A complete listing of guidelines can be obtained by contacting the Department of Environment or by visiting the web site at:

<http://env.gov.nu.ca/programareas/environmentprotection>.

Should a generator request a variance to any of the requirements established below, an assessment describing the anticipated effects of disposing the waste into a municipal sewage treatment system or landfill must be provided to the Nunavut Department of Environment and local municipal government. The assessment must indicate that a level of environmental protection equivalent to complying with the Guideline is being provided.

2.1 Process Effluent

Process effluent is water mixed with treated or untreated waste discharged from an industrial operation. For the purpose of the Guideline, process effluent does not include toilet waste and liquid from showers, baths, sinks and kitchens unless the liquid contains a contaminant that is not usually associated with that source (i.e. used antifreeze poured down a drain).

Process effluent that meets all the criteria established in Column 1 of Table 1 may be discharged to a municipal sewage treatment system with the consent of the local municipal government. Effluent that exceeds one or more of the criteria is a hazardous waste and either requires treatment to comply with the criteria or must be managed in accordance with the *Environmental Guideline for the General Management of Hazardous Waste*. Any residuals or sludge from the treatment of process effluent is subject to the standards established for process residuals – refer to Section 2.2.

All sampling, sample handling and chemical testing of process effluent must be consistent with accepted practices. Where a sample is required to determine the characteristics of the effluent, the sample must be a composite sample. Composite samples are obtained by combining three or more individual grab samples of equal volume, equal weight or sized proportionally to the flow of the liquid being sampled taken at regular intervals over a period of time, normally 24 hours. This ensures the collected liquid is representative of the process effluent. Chemical testing should be conducted by laboratories that have been formally recognized as competent to perform the specified tests by the Canadian Association of Environmental Analytical Laboratories (CAEAL)¹. Chemical parameters should be tested using the appropriate analytical method as contained in the most recent edition of *Standard Methods for the Examination of Water and Wastewater* or other recognized testing methods (i.e. Canadian General Standards Board). Generators may use their knowledge of the effluent to reduce the number of parameters tested.

Generators wanting to discharge process effluent on commissioner's Land other than to a municipal sewage treatment system must first contact the Nunavut Department of Environment and local municipal government.

¹ CAEAL is a non-profit organization dedicated to raising the level of competency, consistency, capability and communication within environmental testing laboratories in Canada. Members of CAEAL voluntarily participate in programs of proficiency testing and accreditation.

Table 1. Criteria for Process Effluents, Process Residuals and Non-Point Source Discharges

Substance	Criteria (mg/L)		
	Column 1 Process Effluent	Column 2 Process Residuals ^a	Column 3 Non-Point Source Discharge
Aluminum	50	NC	1
Ammonia	NC	NC	10
Arsenic	1	2.5	1
Barium	5	100	1
Biochemical Oxygen Demand (BCOD)	500	NC	15
Cadmium	2	0.5	0.1
Carbon Tetrachloride (tetrachloromethane)	NC	0.5	NC
Chlorides	1500	NC	NC
Chlorine	NC	NC	1
Chromium	5	5	0.1
Copper	5	NC	1
Cyanide	2	NC	0.1
Fluoride	10	NC	2
Iron	50	NC	1
Lead	5	5	0.05
Mercury	0.1	0.1	0.0006
Methyl Ethyl Ketone	NC	200	NC
Nickel	5	NC	1
Non-aqueous Phase Liquids	NC	NC	Non-Visible Sheen
Oil and Grease	150	NC	15
pH Range	6.5 to 10.5	NC	6.0 to 10.5
Phenolic Compounds	1	NC	0.02
Phosphorous	100	NC	1
Polychlorinated Biphenyls (PCBs)	NC	50 ^b	NC
Polychlorinated Dibenzo Dioxins and Furans	NC	0.0000015 I-TEQ ^c	NC
Selenium	NC	1	NC
Silver	5	5	0.1
Sulphates	1500	NC	NC
Sulphides	2	NC	NC
Suspended Solids	600	NC	15
Tetrachloroethylene	NC	3	NC
Tin	5	NC	1
Trihalomethanes (Total)	NC	10	NC
Uranium	NC	10	NC
Vinyl Chloride	NC	0.2	NC
Zinc	5	500	0.5

NC No criteria has been adopted for this substance

a. Refer to the *Canadian Environmental Protection Act (CEPA) Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations - Schedule 6* for criteria regulating other process residuals.

b. Based on concentration by mass.

c. International Toxicity Equivalents.

2.2 Process Residuals

A process residual is any solid, semi-solid or sludge waste produced from an operation that is involved in the manufacturing, processing or provision of goods and services, including commercial and institutional operations.

Process residuals that meet the criteria established in Column 2 of Table 1 may be disposed of in a municipal landfill with the consent of the local municipal government. Process residuals that exceed one or more of the criteria are considered to be a hazardous waste and either requires treatment or management in accordance with the *Environmental Guideline for the General Management of Hazardous Waste*. The treatment of process residuals may result in a significantly different waste. Any liquid or solid waste resulting from the treatment of a process residual is subject to the criteria established in Column 1 and 2 of Table 1 to determine whether it is suitable for disposal in the local sewage treatment facility or landfill.

The recommended leachate testing procedure for process residuals is Method 1311 Toxicity Characteristic Leaching Procedure (TCLP) as described in the United States Environmental Protection Agency Regulation 40CFR261. This testing method is designed to determine the acceptability of landfilling process residuals by simulating leaching characteristics the waste may exhibit when disposed of. Any leachate extract collected must then be tested using the appropriate analytical method contained in the most recent edition of *Standard Methods for the Examination of Water and Wastewater*. All testing procedures should be undertaken by a CAEAL recognized laboratory. Knowledge of the industrial process may reduce the number of parameters needed to be tested.

Nunavut's Department of Environment should be contacted by the generator if an alternative leaching procedure or chemical test is proposed.

2.3 Non-Point Source Discharges

A non-point source discharge is the release of wastewater from a diffuse source, such as run-off from an industrial compound or storage yard to an adjacent property, drainage ditch, stream or waterbody. Where a non-point source discharge is already covered by a water license issued by the Nunavut Water Board, the effluent criteria established through the license are to be complied with. The criteria established in Column 3 of Table 1 apply only where no license, permit or authorization has previously been issued for the discharge.

A non-point source discharge that meets the criteria established in Column 3 of Table 1 may be discharged directly to the environment with the consent of the local municipal government. Where one or more of the criteria are exceeded, the discharge must immediately be stopped, the discharge reported to the Nunavut/NWT 24-Hour Spill Report Line at (867) 920-8130, and the run-off contained for treatment and disposal. Any collected run-off may be disposed of in the local sewage treatment system where the criteria established in Column 1 of Table 1 are met, and with the consent of the local municipal government.

All sampling, handling and chemical testing of run-off must be consistent with accepted practices. Composite samples should be obtained where possible and chemical testing procedures undertaken by a CAEAL recognized laboratory.

Conclusion

Industrial, commercial and institutional operations in Nunavut produce a wide variety of wastes that require disposal. Much of this waste can be safely disposed of in landfills (i.e. food and packaging waste) and sewage treatment facilities (i.e. toilet waste) while others are hazardous and require treatment prior to disposal. The *Environmental Guideline for Industrial Waste Discharges into Municipal Solid Waste and Sewage Treatment Facilities* establishes limits on industrial waste that can be disposed of into municipal waste facilities in Nunavut.

Familiarity with the Guideline does not replace the need for the owner or person in charge, management or control of an industrial waste to comply with all applicable federal and territorial legislation and municipal by-laws. The management of these wastes may also be controlled through permits and licenses issued by Nunavut's co-management boards, the Nunavut Water Board, Indian and Northern Affairs Canada and other regulatory agencies. These permits and licenses must be complied with at all times.

For additional information on the management of industrial waste, or to obtain a listing of available guidelines, go to the Department of Environment web site or contact the Department at:

Environmental Protection Division
Department of Environment
Government of Nunavut
Inuksugait Plaza, P.O. Box 1000, Station 1360
Iqaluit, Nunavut X0A 0H0

Telephone: (867) 975-7729

Fax: (867) 975-7739

Email: EnvironmentalProtection@gov.nu.ca

Website: <http://env.gov.nu.ca/programareas/environmentprotection>

References

American Public Health Association, American Water Works Association and Water Environment Federation. Standard Methods for the Examination of Water and Wastewater. Latest Edition.
<http://www.standardmethods.org/>

Government of Alberta, Department of Environment. Alberta User Guide for Waste Managers.
<http://www.environment.gov.ab.ca/info/library/7423.pdf>

Government of Canada, Department of Justice. *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*.
<http://www.ec.gc.ca/lcpe-cepa/eng/regulations/detailReg.cfm?intReg=84>

Government of Nunavut, Department of Environment. Environmental Guideline for the General Management of Hazardous Waste. 2010.
<http://env.gov.nu.ca/node/82#Guideline Documents>

Government of Nunavut, Department of Environment. Environmental Guideline for Industrial Waste Discharge in Nunavut. 2002.

Government of the Northwest Territories, Department of Municipal and Community Affairs. Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the Northwest Territories. 2003.
http://www.enr.gov.nt.ca/live/documents/content/solidwaste_guidelines.pdf

United States Environmental Protection Agency. Method 1311 – Toxicity Characteristic Leaching Procedure.
<http://www.epa.gov/osw/hazard/testmethods/sw846/pdfs/1311.pdf>

APPENDICES

APPENDIX 1 - ENVIRONMENTAL PROTECTION ACT

The following are excerpts from the *Environmental Protection Act*

1. "Contaminant" means any noise, heat, vibration or substance and includes such other substance 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 to property;

"Discharge" includes, but not so as to limit the meaning, any pumping, pouring, throwing, dumping, emitting, burning, spraying, spreading, leaking, spilling, or escaping;

"Environment" means the components of the Earth and includes

- (a) air, land and water,
- (b) all layers of the atmosphere,
- (c) all organic and inorganic matter and living organisms, and
- (d) the interacting natural systems that include components referred to in paragraphs (a) to (c).

"Inspector" means a person appointed under subsection 3(2) and includes the Chief Environmental Protection Officer.

- 2.2 The Minister may
 - (a) establish, operate and maintain stations to monitor the quality of the environment in the Territories;
 - (b) conduct research studies, conferences and training programs relating to contaminants and to the preservation, protection or enhancement of the environment;
 - (c) develop, co-ordinate and administer policies, standards, guidelines and codes of practice relating to the preservation, protection or enhancement of the environment;
 - (d) collect, publish and distribute information relating to contaminants and to the preservation, protection or enhancement of the environment:
3. (1) The Minister shall appoint a Chief Environmental Protection Officer who shall administer and enforce this Act and the regulations.

(2) The Chief Environmental Protection Officer may appoint inspectors and shall specify in the appointment the powers that may be exercised and the duties that may be performed by the inspector under this Act and regulations.
5. (1) Subject to subsection (3), no person shall discharge or permit the discharge of a contaminant into the environment.

(3) Subsection (1) does not apply where the person who discharged the contaminant or permitted the discharge of the contaminant establishes that
 - (a) the discharge is authorized by this Act or the regulations or by an order issued under this Act or the regulations;
 - (b) the contaminant has been used solely for domestic purposes and was discharged from within a dwelling house;
 - (c) the contaminant was discharged from the exhaust system of a vehicle;
 - (d) the discharge of the contaminant resulted from the burning of leaves, foliage, wood, crops or stubble for domestic or agricultural purposes;

- (e) the discharge of the contaminant resulted from burning for land clearing or land grading;
- (f) the discharge of the contaminant resulted from a fire set by a public official for habitat management of silviculture purposes;
- (g) the contaminant was discharged for the purposes of combating a forest fire;
- (h) the contaminant is a soil particle or grit discharged in the course of agriculture or horticulture; or
- (i) the contaminant is a pesticide classified and labelled as "domestic" under the *Pest Control Products Regulations* (Canada).

(4) The exceptions set out in subsection (3) do not apply where a person discharges a contaminant that the inspector has reasonable grounds to believe is not usually associated with a discharge from the excepted activity.

- 5.1. Where a discharge of a contaminant into the environment in contravention of this Act or the regulations or the provisions of a permit or license issued under this Act or the regulations occurs or a reasonable likelihood of such a discharge exists, every person causing or contributing to the discharge or increasing the likelihood of such a discharge, and the owner or the person in charge, management or control of the contaminant before its discharge or likely discharge, shall immediately:
- (a) subject to any regulations, report the discharge or likely discharge to the person or office designated by the regulations;
 - (b) take all reasonable measures consistent with public safety to stop the discharge, repair any damage caused by the discharge and prevent or eliminate any danger to life, health, property or the environment that results or may be reasonably expected to result from the discharge or likely discharge; and
 - (c) make a reasonable effort to notify every member of the public who may be adversely affected by the discharge or likely discharge.
6. (1) Where an inspector believes on reasonable grounds that a discharge of a contaminant in contravention of this Act or the regulations or a provision of a permit or license issued under this Act or the regulations has occurred or is occurring, the inspector may issue an order requiring any person causing or contributing to the discharge or the owner or the person in charge, management or control of the contaminant to stop the discharge by the date named in the order.
7. (1) Notwithstanding section 6, where a person discharges or permits the discharge of a contaminant into the environment, an inspector may order that person to repair or remedy any injury or damage to the environment that results from the discharge.
- (2) Where a person fails or neglects to repair or remedy any injury or damage to the environment in accordance with an order made under subsection (1) or where immediate remedial measures are required to protect the environment, the Chief Environmental Protection Officer may cause to be carried out the measures that he or she considers necessary to repair or remedy an injury or damage to the environment that results from any discharge.

APPENDIX 2 – GOVERNMENT AND OTHER CONTACTS

Government of Nunavut

Environmental Protection Division
Department of Environment
Inuksugait Plaza
P.O. Box 1000, Station 1360
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-7729 Fax: (867) 975-7739

Motor Vehicles Division
Department of Economic Development and
Transportation
P.O. Box 10
Gjoa Haven, Nunavut X0B 1J0
Telephone: (867) 360-4615 Fax: (867) 360-4619

Workers' Safety and Compensation Commission
P.O. Box 669
Baron Building/1091
Iqaluit, Nunavut X0A 0H0
Telephone: 1-877-404-4407 (toll free)
Fax: 1-866-979-8501

Department of Community and Government
Services (all Divisions)
P.O. Box 1000, Station 700
4th Floor, W.G. Brown Building
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-5400 Fax: (867) 975-5305

Office of Chief Medical Health Officer of Health
Department of Health and Social Services
P.O. Box 1000, Station 1000
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-5774 Fax: (867) 975-5755

Government of Canada

Indian and Northern Affairs – Nunavut Region
P.O. Box 2200
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-4500 Fax: (867) 975-4560

Environment Canada (NWT and Nunavut)
5019 52nd Street
Yellowknife, Northwest Territories X1A 1T5
Telephone: (867) 669-4730 Fax: (867) 873-8185

Department of Transport – Road, Rail, Marine, Air
P.O. Box 8550
344 Edmonton Street
Winnipeg, Manitoba R3C 1P6
Telephone: 1-888-463-0521 (toll free)
Fax: (204) 983-8992 Road, Rail and Marine
Fax: (204) 983-1734 Air

Other Contacts

Nunavut Water Board
P.O. Box 110
Gjoa Haven, Nunavut X0B 1J0
Telephone: (867) 360-6338 Fax: (867) 360-6369

Canadian Association for Environmental Analytical
Laboratories
300-265 Carling Avenue
Ottawa, Ontario K1S 2E1
Telephone: (613) 233-5300 Fax: (613) 233-5500