APPENDIX B16 - LANDFILL DESIGN AND MANAGEMENT PLAN, VERSION 2 (MARCH. 2013)

AGNICO EAGLE

MEADOWBANK GOLD PROJECT

Landfill Design and Management Plan

In Accordance with Water License 2AM-MEA0815

Prepared by:
Agnico Eagle Mines Limited – Meadowbank Division

Version 2
March 2013

EXECUTIVE SUMMARY

This Landfill Design and Management Plan outlines the design of the current operational and a conceptual closure industrial waste landfill as part of Agnico Eagle Mines Limited's (AEM) Meadowbank Gold Project in Nunavut.

The current landfill (Landfill #1) is required for the disposal of non-salvageable, non-hazardous solid wastes from mining activities that cannot be incinerated. It is located on the Portage Rock Storage Facility and will consist of several sub landfills that evolve with the placement of waste rock. All of the sub-landfills will be identified and mapped.

The leachate from the landfill is very weak (diluted) or simply no existent due to the controls on materials placed in the landfill, and therefore specific leachate management is not considered. Any leachate is naturally drained into the Tailing Storage Facility

At the end of mine life, the landfill waste will be covered by 0.3 to 1 m thickness of rock fill, with an additional 4 m of coarse Non-PAG waste rock material. The final landfill slopes will be up to 50%. Drainage water will be managed under the [1]Mine Waste and Water Management Plan (MMC, 2007a) and 2012 Meadowbank Site Water Management Plan, (SNC Lavalin, 2013).

To meet NWB guidelines, an environmental overview effects assessment was conducted to characterize environmental resources and determine the anticipated environmental effects of the landfills. The primary potential environmental effects from landfill activities included leachate generation, windblown debris and habitat (vegetation) loss. Operation of the landfill has not shown any such environmental effects.

A conceptual closure industrial waste landfill will be located near the top of the Portage RSF and would serve the mine for the last two years of the mine closure. Demolition waste from the plant site removal / reclamation will be disposed of in Landfill #2.

[1] – This plan will have a revision in early 2013

IMPLEMENTATION SCHEDULE

As required by Water License 2AM-MEA0815, Part B, Item 16, the proposed implementation schedule for this Plan is outlined below.

This plan will be immediately implemented (March 2013) subject to any modifications proposed by the NWB as a result of the review and approval process**.**

DISTRIBUTION LIST

AEM – General Mine Manager

AEM – Environment Superintendent

AEM – Environmental Coordinator

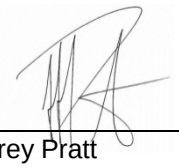
AEM – Engineering Superintendent

AEM – Mine Superintendent

AEM – Site Services Superintendent

DOCUMENT CONTROL

Version	Date (YMD)	Section	Page	Revision
1	08/10/08			Amalgamation of original report and supplementary documents (Golder Associates, Doc 562 – *Landfill Design and Management Supplementary Information* and AEM document – *Meadowbank Type A Water License – Response to Pre-Hearing Commitments*, Appendix I)
		4	11	Addition of testing protocol and incinerator criteria; Incorporation of Government of Nunavut Environmental Guidelines
		5	14	Addition of protocols for material placement in the landfills; Confirmation that there are no planned design changes as of October 2008 to Landfill #1 or Landfill #2
2	12/12/18	ALL	ALL	Comprehensive update of entire plan

Prepared By: 

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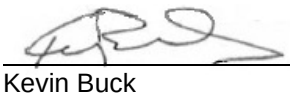
Approved by: 

Kevin Buck
Environmental Superintendent

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SECTION 1 • INTRODUCTION

1.1 PROJECT OVERVIEW

This Landfill Design and Management Plan (Plan) outlines the design, operation and closure for two solid waste landfills as part of the Agnico Eagle Mines Limited (AEM) Meadowbank Gold Project.

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-hazardous solid waste generated at the Meadowbank Mine;

2. To define acceptable/non-acceptable types of solid waste to be placed in the Meadowbank landfill; and

3. To define operating and monitoring requirements for the landfill.

This updated version of the Landfill Design and Management Plan was developed by Agnico Eagle Mines Limited – Meadowbank Division staff in March 2013 in concordance with the water license requirement. This document will supersede all of the previous Landfill Design and Management Plans created by AEM.

The Meadowbank Project operates under Water License 2AM-MEA0815 issued by the Nunavut Water Board on June 09, 2008 and signed into effect by the Minister of Indian and Northern Affairs Canada (now Aboriginal Affairs and Northern Development Canada) on July 10, 2008. The landfills are required for the disposal of non-salvageable, non-hazardous industrial wastes from standard mining activities that cannot be incinerated. The Plan was developed in accordance with the AEM Type A Water License from the Nunavut Water Board (NWB) to operate the mine.

Hazardous wastes will not be placed in the landfills. Management procedures for hazardous wastes are provided under a separate report – Hazardous Materials Management
Meadowbank Mine Site Baker Lake Facilities (Ver.2, March 2012). All other materials considered unsuitable for landfill deposition are packaged for shipment and disposal off site at a licensed facility.

To meet NWB guidelines, an environmental overview effects assessment was conducted to characterize environmental resources and determine the anticipated environmental effects of the landfills. Other applicable regulatory guidelines and criteria were also incorporated into this Plan, as discussed in Section 2.0.

The overall Meadowbank Gold Project description, landfill siting options and descriptions, and corresponding environmental overview approach are described in the sections below. The Meadowbank Gold Project facility layout is shown in Figure 1.

At the Meadowbank site and Baker Lake Marshalling Area, hazardous waste materials are stored in secure facilities until they can be backhauled for off-site recycling or disposal in an approved facility. AEM has registered as a Hazardous Waste Storage Facility with the Government of Nunavut Department of Environment; the Meadowbank site waste generator number is **NUG 100031**.

1.2 LANDFILL SITING

The landfills were positioned considering the following criteria:

- Drainage – sites that drain into areas where water will be collected and monitored as part of the overall mine plan are preferred.
- Avoid Ice Rich Soil Excavation – sites where bedrock is at relatively shallow depth are preferred.
- Disturbed Areas – sites that will be within or near areas that will be disturbed as part of the overall mine plan are preferred.
- Access – sites that are located close to existing access roads are preferred.

The first three criteria are recommendations from the Mine Site Reclamation Guidelines for the Northwest Territories (INAC, 2006).

Based on the above criteria, a landfill is planned at each of the two following locations:

- Landfill #1 is developed in the Portage RSF (Figure 2); This landfill consist of multiple sub landfills that are built and buried according to the evolution of the RSF. As the RSF evolves, the elevation and location of the sub landfills change.

and

- Landfill #2 will be developed at the top of the Portage RSF.

While the preferred landfill location is the top of the Portage RSF (minimizing the disturbed area), such a landfill would hinder waste rock placement during mining activities. Thus Landfill #1 will be developed first and serve as the non-hazardous waste disposal site for the life of operation. For the closure of the mine, Landfill #2 will serve as the non-hazardous waste disposal site.

SECTION 2 • REGULATORY SETTING

Waste management in Nunavut is regulated under the *Nunavut Public Health Act*, the *Nunavut Environmental Protection Act* and the federal *Environmental Protection Act*. In addition to mandatory requirements, a number of waste management guidelines are commonly used in the NWT 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, April 2003, on behalf of the Department of Municipal and Community Affairs, Government of Northwest Territories). While not all of the recommendations provided in this guideline are appropriate for the management of industrial waste such as those generated at a gold mine, those principles that are considered applicable have been adopted in the Plan.

In addition, the NWB guidelines *Mine Site Reclamation Guidelines for the Northwest Territories* (INAC 2006) were followed in this current document regarding specific landfill design and mitigation for impacts pertaining to waste. The recommendations from *Implications of Global Warming and the Precautionary Principle in Northern Mine Design and Closure* (BGC 2003) were also incorporated into this document, where appropriate.

SECTION 3 • PLAN FOR THE ON-SITE DISPOSAL OF SOLID WASTE

3.1 APPROACH

The strategy for the disposal of solid waste is to first identify and segregate acceptable disposal items from non-acceptable items. Acceptable items that can be disposed of at the on-site facility are those that are non-hazardous, non-organic, with a low leachate and heat generation potential. All other materials are either incinerated or hauled offsite. This strategy for limiting the materials that can be placed in the landfills greatly reduces the potential for leachate.

All solid wastes that may contain food waste, food packaging waste or other organic waste that could attract wildlife are incinerated in the site's purpose built incinerator (see the Meadowbank Incinerator Management Plan - Ver.4, Nov. 2012 for more detail). This includes all garbage from the camp, camp kitchen, site lunchrooms and offices. The ash from the incinerator are placed in a container (yellow roll off) and disposed of at the landfill. Incinerator ash samples are collected and tested for metals according to the Government of Nunavut Environmental Guideline for Industrial Waste Discharges (D of SD, 2002). Ash that does not meet these guidelines will be buried within the TSF.

The second part of the strategy is to concentrate disposal of solid waste at two landfills, Landfill #1 and Landfill #2. Landfill #1 is located in the Portage RSF. It consists of multiple sub landfills that are built and buried according to the evolution of the RSF. As the RSF evolves, the elevation and location of the sub landfills change. It will serve the mine for the life of operation. Landfill #2 will be located near the top of the Portage RSF and would serve the mine for mine closure. Demolition waste from the plant site removal / reclamation will be disposed of in Landfill #2.

The development of the two landfills minimize the area disturbed and the re-handling of waste. Landfills at the selected locations allow any leachate that may be generated to be collected, monitored and managed with seepage and runoff water from the Portage RSF. The leachate from the landfills is very weak or simply absent due to the controls on materials placed in the landfill and thus site specific landfill leachate management is not considered to be required. Any leachate that may become present would runoff into the Tailings Storage Facility which will be capped at the end of mine life.

Based on the above strategy, a liner is not required for the landfills, nor is any special monitoring being completed or foreseen to be recommended in the future. However, the landfills conform to the Type A Water License requirements and closure plan for each landfill site for orderly landfill development and to reduce the potential for windblown debris.

The Type A Water License requires the following landfill related monitoring:

- Part I, Item 10 stipulates that the monthly runoff/seepage flow from both Landfill #1 and #2 in cubic meters must be measured, recorded and reported to the Water Board

- Part I, Item 12 stipulates that the annual geotechnical inspection to be carried out by a geotechnical engineer between the months of July and September should include all earth works including the two landfill sites with the results being included in the report to the Water Board

- Part I, Item 15 stipulates that seepage and runoff from the landfills is to be observed at a minimum of once per quarter with the observations reported to the Water Board in the Water License annual report

3.2 ACCEPTABLE WASTE FOR LANDFILLING

The following materials are acceptable for disposal at the landfills:

- Plastic (except expanded polystyrene);
- Steel, copper, aluminum, iron (most of this metal is recycled);
- Wood;
- Fiberglass insulation;
- Fiberglass;
- Roofing;
- Cardboard
- Concrete;
- Carpet;
- Bricks;
- Ceramics;
- Rubber
- Empty caulking tubes;
- Hardened caulk;
- Clothing;
- Glass
- Wire;
- Small appliances (with batteries removed);
- Gyproc;
- Ash provided it has cooled to 60ºC or less and follows procedures laid out in the Incinerator Management Plan; and
- Vehicles and machinery provided all liquids, grease, batteries, and electronics have been removed (see Section 3.3.2 for more details on ozone depleting substances).

3.3 UNACCEPTABLE WASTE FOR LANDFILLING

Materials that are not listed above are unacceptable for placement at the landfills, unless approved in writing by the Meadowbank Environment Superintendent. These materials include:

- Organic matter including food, septic tank pumpings or sludge from waste water treatment, dead animals, paper;
- Food containers and wrappings, unless cleaned;
- Whole tires;
- Hazardous waste including mercury, medical waste, batteries, solvents, glues, ethylene glycol antifreeze, adhesives (except empty caulking tubes);
- Electronics;
- Light bulbs or Fluorescent Lamp Tube
- Petroleum products, including materials contaminated with petroleum products; and
- Expanded polystyrene.

In particular, organic matter is not accepted in the landfill, thus eliminating the attraction to carnivores and/or raptors. This is accomplished by requiring all personnel to dispose domestic waste in designated receptacles and by sending all collected domestic waste (e.g. from kitchens and living quarters) to the site incinerator.

3.3.1 Fluorescent Lamp Tubes

Fluorescent tubes contain mercury phosphor powder and traces of lead and cadmium, which are considered environmental contaminants under the Nunavut *Environmental Protection Act* (EPA). The only disposal method for fluorescent tubes is through an approved hazardous waste recycling or disposal facility (Government of Nunavut, Environmental Protection Service, 2003). The *Disposal Guidelines for Fluorescent Lamp Tubes* are included in Appendix A.

3.3.2 Ozone Depleting Substances

Ozone depleting substances (ODSs) include chlorofluorocarbons (CFCs) or halons and common sources include refrigeration equipment, air conditioning equipment, motor vehicle air conditioners and fire extinguishing equipment (Government of Nunavut, Environmental Protection Service, 2002b). These materials are hazardous in nature; consequently, all disposal of ODS take place at an approved facility.

3.4 TOTAL VOLUME OF WASTE

An estimate of waste volume is required to estimate the approximate size of the landfills; 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) of the landfill.

In 2011, the recorded amount of waste that went to the Landfill for disposal was 11, 185 m^3. For this reason we will assume that 78,295 m^3 will be required for the remaining 7 year life of the operating mine.

3.5 INCINERATOR ASH TESTING PROTOCOL

Please see the Incinerator Management Plan Ver.4 – 2012 for all information regarding the disposal of ash at the landfill.

SECTION 4 • LANDFILL LOCATION AND CONSTRUCTION

4.1 LANDFILL #1

The location of Landfill #1 is shown on Figure 2 in the northwest side of the Portage RSF. This landfill will serve as the solid waste disposal facility for the first 9 years of mine life. The design of Landfill #1 does not require imported materials or exacting survey data or measurement. This is due to the restriction on materials that can be landfilled and the location of the landfill within the catchment of the Portage RSF. These factors reduce the need for leachate collection or control or mitigation measures against vectors such as carnivores or raptors. Thus, the main environmental mitigation measure required is a wind screen to reduce windblown debris. As of March 2013, the Landfill #1 has evolved in sub landfills that are built and buried according to the evolution of the RSF. As the RSF evolves, the elevation and location of the sub landfills change.

The area to receive waste is bounded by a rock fill berm. The purpose of the rockfill berm is to act as a wind shield for the waste. The sub landfills have a rectangular shape with the length perpendicular to the prevailing wind direction so that much of the waste could be protected from wind by the rockfill berm.

Provided the materials that go into the incinerator are controlled to exclude all hazardous materials (*i.e.*, even small quantities of hazardous waste such as batteries are not disposed in the landfill), then the incinerator ash should be non-hazardous. As discussed in Section 3.5, an ash testing protocol has been implemented to ensure that the incinerator ash is suitable for disposal in the landfills.

4.1.1 Landfill #1 Protocol For Placement of Material

Wastes is disposed of directly on the ground and compacted with heavy equipment against the berm or existing row. When the sub landfill is either full of compacted waste or the RSF evolution causes the sub landfill to be moved, the waste is compacted and then covered with waste rock. A new sub landfill is then built including rockfill berm to act as a wind shield.

4.2 LANDFILL #2

Prior to the closure and covering of Landfill #1 by waste rock, Landfill #2 will be developed on top of the Portage RSF. Landfill #2 is currently estimated to be a 4 m deep depression in the top of the waste rock pile at the Portage RSF. The depression will be constructed by the waste rock trucks discharging their loads in a controlled manner such that the dimensions of the depression will be approximately as shown on Figure 3. The area to receive waste will be bounded on the northwest side by a 2 m high rockfill berm. The rockfill berm will act as a wind shield to reduce the amount of wind-blown debris, while providing material for intermediate cover of the landfill. Details and the exact location of Landfill #2 on top of the rock storage facility are not currently available because the Portage RSF will not reach a grade suitable for construction of the landfill until later in the mine life. The detailed design for Landfill #2 must be completed a minimum of one year prior to commissioning of the landfill. At that time, the required size of Landfill #2 will be calculated based on the actual rate of filling of Landfill #1 and the estimated amount of demolition material and decommissioned equipment that will need to be landfilled at the end of the mine life. As of March 2013, there are no planned changes to the general design of Landfill #2.

Waste will be placed to a maximum thickness of 4 m, after which it will be covered with a minimum of 0.3 m thickness of rock fill. This landfill should be provided with a capacity of 3,600 m^3, which is equivalent to 7 years of waste disposal at 500 m^3 / year, plus an allowance for waste from the demolition of the mine plant site. Thus, the base area of the depression is anticipated to measure about 30 m by 30 m.

4.2.1 Landfill #2 Protocol For Placement of Material

Materials destined for burial in the demolition landfill will be dismantled as safely and efficiently as possible, stacked in a stockpile and will then be cut by flame, hydraulic shears or saw, into manageable sizes for safe transport and placement in the demolition landfill. The demolition debris will be placed in compacted layers and then buried. Once compacted, waste rock will be placed on the debris to infill voids. Once a continuous layer of waste rock has covered the compacted debris then a final cover of a minimum of 4 m of Non Acid Generating Rock will be placed over the entire landfill area.

4.3 LEACHATE MANAGEMENT

The leachate from the landfills has a very low strength (dilute) or is simply absent due to controls on materials placed in the landfills, and thus site-specific landfill leachate management is not required. Any leachate generated by the landfill will naturally be directed to the Tailing Storage Facility. Due to the fact that the Portage RSF will cover Landfill #1 and #2, it is not proposed to have a separate water quality monitoring point for leachate.

4.4 LANDFILL ENCAPSULATION WITHIN THE PORTAGE RSF

The Portage Rock Storage Facility contains surplus quantities of waste rock from the Portage and Goose Island pits. A classification system is use to identify the use and storage for all mine rock[1]. Specifically, this system identify potentially acid generating (PAG) or non-acid generating (NPAG) rock types, as well as those with the potential to leach metals.

The Portage RSF is constructed as a cell, or series of cells, such that the interior of each cell is composed of PAG and/or ML waste rock, and the exterior of each cell is composed of NPAG waste rock. Thus, PAG and/or ML waste rock within the RSF is encapsulated within NPAG waste rock, thereby limiting its exposure to oxidizing agents such as air and water, and providing a buffer for any drainage from the interiors of the cells. The material within the Portage RSF freezes, which limits internal drainage as infiltrating water becomes frozen. As a further ARD control measure, the Portage RSF will be capped with a minimum 4 m thick layer of coarse acid-buffering ultramafic rock at closure.

Owing to their placement within the Portage RSF, the landfills are/will also become encapsulated within waste rock. Specifically,the slopes of the sub landfills are covered with an advancing waste rock layer during operations such that the sub landfills are covered by a minimum 0.3 to 1 m thickness of waste rock by the end of each sub landfill operations. AEM plans to use NPAG waste rock to surround and cover the landfills wherever practical. As noted above, a minimum 4 m thick layer of coarse acid-buffering ultramafic rock would also be placed over the landfill cover as part of planned closure activities for the Portage RSF.

[1] See Operational ARD/ML Testing and Sampling Plan

SECTION 5 • LANDFILL OPERATION

5.1 CONCEPTUAL OPERATIONS PLAN

The following is a conceptual plan for operating the landfills:

a) Materials Acceptable for Disposal

See Section 3.2.

b) Materials Not Acceptable for Disposal

See Section 3.3.

d) Site Development and Landfilling Method

The sub landfills are filled progressively in an orderly manner. Specifically, waste is placed at one end of the sub landfill at full height and then the active waste area progressively advances. Areas where the waste has been placed to full height and leveled are progressively covered by placement of a minimum 0.3 m thickness of rock fill on top of the waste.

e) Staffing and Equipment

The landfills do not require a full-time attendant. Roll off trucks haul waste to the landfills and a dozer is used to spread and level the waste.

f) Leachate Management

The leachate from the landfills is very weak (dilute) or simply absent due to the controls on materials placed in the landfills. Therefore, specific leachate management is not required.

g) Surface Water and Erosion Control

The slopes of the landfills are covered with rockfill, thus protecting them from erosion. Any water that may runoff from the RSF will flow to the TSF.

h) Inspections

The environmental department is conducting periodic inspections to ensure compliance with the permit and operation plan..

5.2 CONCEPTUAL CLOSURE PLAN

The following is a conceptual plan for closing the landfills:

a) Estimate of Total Waste Volumes, Tonnage and Life of Landfills

Upon closure, it is estimated that the landfills will have the volumes as described in Sections 4.1 and 4.2.

b) Final Cover Design

- The waste in the landfills will be covered by 0.3 to 1 m thickness of rockfill, covered with an additional 4 m thickness of coarse acid-buffering ultramafic waste rock material;
- The final landfill slopes will be up to 50%; and
- Drainage water, if present will be naturally directed to the Tailing

Storage Facility.

c) End use of Landfill After Closure

There is no planned end use of the landfills post-closure. They will become part of the waste rock storage facility.

d) Water Management

Contact water from the landfills in closure will continue to be managed under the Water Management Plan (SNC-Lavalin, 2013).

SECTION 6 • POTENTIAL ENVIRONMENTAL EFFECTS

The landfills are designed and built as part of the Portage RSF. The access road to the Rock Storage Facility is used to access the sub landfills considered as Landfill #1.. Access to Landfill #2 will also be by the access road to the Portage RSF.

Landfill activities that were identified to have potential effects on VECs include site preparation and construction, operations and closure.

Potential effects from the landfills on VECs were assessed as follows:

- Degradation of permafrost;
- Change in surface water and groundwater drainage patterns due to proposed landfill footprint (altered landscape);
- Change in groundwater and surface water quality from leachate percolation, leading to degradation of aquatic habitat;
- Change in air quality from dust and windblown debris;
- Loss of vegetation cover and terrestrial mammal habitat due to proposed landfill footprint;
- Attraction of predatory and small mammals to waste; and
- Loss of sites of heritage significance or traditional ways of life.

A number of mitigative measures, including management and monitoring plans, were implemented as part of the overall Meadowbank Gold Project and are also incorporated into landfill construction, operations and closure. The plans that set out detailed site-specific protection measures and procedures that serve to protect the VECs include:

- Water Management Plan (SNC Lavalin, 2013);
- Air Quality and Noise Management (Cumberland, 2005i) to be amended in 2013;
- Terrestrial Ecosystem Management (Cumberland, 2005);
- Hazardous Materials Management (AEM, 2012);
- Preliminary Closure and Reclamation Plan (AEM, 2008); and
- Water Quality and Flow Monitoring Plan (AEM, 2009) to be amended in 2013.

6.1 EFFECTS SUMMARY

The primary potential environmental effects from landfill activities included leachate generation, windblown debris and habitat (vegetation) loss. Given the effective implementation of mitigation plans, no residual environmental effects to VECs from construction, operation or closure of the landfills are anticipated. See summary below:

- The leachate that will be generated by the landfills is of very low strength (dilute) or simply absent due to restrictions on the materials that is placed in the landfills. Water drainage from the landfill area would naturally be directed to the Tailing Storage Facility and would be managed under the Water Quality and Flow Monitoring Plan (MMC, 2007b) during operations and closure.

- Rockfill berm act as a wind shield to reduce amount of windblown debris.

- Habitat loss is minimized because the landfills is designed and built within the footprint of the Portage RSF. With the implementation of terrestrial habitat reclamation strategies, the final surfaces of the landfills is graded to blend into the existing topography and enhance conditions for wildlife. Terrestrial habitat reclamation strategies will be incorporated as part of the Preliminary Closure and Reclamation Plan (MMC, 2007d), which include encouraging the regrowth of natural vegetation or revegetation to enhance re- establishment of vegetation communities, where warranted.

SECTION 7 • PLAN REVIEW AND CONTINUAL IMPROVEMENT

The Landfill Design and Management Plan will be reviewed annually by the Meadowbank Environmental Department in consultation with the engineering department, and updated every two years of operation. Improvements suggested through these reviews would be implemented in consultation with the Nunavut Water Board.

SECTION 8 • REFERENCES

BGC (BGC Engineering Incorporated), 2003. Implications of Global Warming and the Precautionary Principle in Northern Mine Design and Closure. Prepared for Indian and Northern Affairs Canada, March 27, 2003.

Cumberland Resources Ltd. 2006. Meadowbank Gold Project No-Net-Loss Plan (NNLP). Meadowbank EIS Support Document. Final Report November 2006.

Cumberland Resources Ltd., 2005a. Meadowbank Gold Project Final Environmental Impact Statement. Final Report October 2005.

Cumberland Resources Ltd., 2005b. Meadowbank Gold Project Baseline Physical Ecosystem. Meadowbank EIS Support Document. Final Report October 2005.

Cumberland Resources Ltd., 2005c. Meadowbank Gold Project Air Quality Impact Assessment. Meadowbank EIS Support Document. Final Report October 2005.

Cumberland Resources Ltd., 2005d. Meadowbank Gold Project Noise Impact Assessment. Meadowbank EIS Support Document. Final Report October 2005.

Cumberland Resources Ltd., 2005e. Meadowbank Gold Project Baseline Aquatic Ecosystem Report. Meadowbank EIS Support Document. Final Report October 2005.

Cumberland Resources Ltd., 2005f. Meadowbank Gold Project Baseline Fish Habitat. Meadowbank EIS Support Document. Final Report October 2005.

Cumberland Resources Ltd., 2005g. Meadowbank Gold Project Baseline Terrestrial Ecosystem. Meadowbank EIS Support Document. Final Report October 2005.

Cumberland Resources Ltd., 2005h. Meadowbank Gold Project Baseline Archaeology Report. Meadowbank EIS Support Document. Final Report October 2005.

Cumberland Resources Ltd., 2005i. Meadowbank Gold Project Baseline Traditional Knowledge Report. Meadowbank EIS Support Document. Final Report October 2005.

Cumberland Resources Ltd., 2005j. Meadowbank Gold Project Air Quality & Noise Management. Meadowbank EIS Support Document. Final Report October 2005.

Cumberland Resources Ltd. 2005k. Meadowbank Gold Project Aquatic Effects Management Program. Meadowbank EIS Support Document. Final Report October 2005.

Cumberland Resources Ltd., 2005l. Meadowbank Gold Project Metal Mining Effluent Regulations (MMER) Plan. Meadowbank EIS Support Document. Final Report October 2005.

Cumberland Resources Ltd., 2005m. Meadowbank Gold Project Terrestrial Ecosystem Management Plan. Meadowbank EIS Support Document. Final Report October 2005.

Cumberland Resources Ltd., 2005n. Meadowbank Gold Project Socioeconomic & Archaeology Management Plan. Meadowbank EIS Support Document. Final Report October 2005.

Department of Sustainable Development (D of SD), 2002. Environmental Guideline for Industrial Waste Discharges. January 2002.

Ferguson Simek Clark Engineers and Architects, 2003. Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the NWT. Prepared for Indian and Northern Affairs Canada, April 21, 2003.

Government of Nunavut, Environmental Protection Service, 2002a. Environmental Guideline for Waste Asbestos.

Government of Nunavut, Environmental Protection Service, 2002b. Environmental Guideline for Ozone Depleting Substances.

Government of Nunavut, Environmental Protection Service, 2003. Disposal Guidelines for Fluorescent Lamp Tubes.

INAC (Indian and Northern Affairs Canada), 2006. Mine Site Reclamation Guidelines for the Northwest Territories.

MMC (Meadowbank Mining Corporation), 2007a. Meadowbank Mine Waste and Water Management. Final Report August 2007.

MMC (Meadowbank Mining Corporation), 2007b. Water Quality and Flow Monitoring Plan. Final Report August 2007.

MMC (Meadowbank Mining Corporation), 2007c. Meadowbank Gold Project Hazardous Materials Management Plan. Final Report August 2007.

MMC (Meadowbank Mining Corporation), 2007d. Meadowbank Gold Project Preliminary Closure & Reclamation Plan. August 2007.

FIGURE 1 – OVERALL SITE PLAN

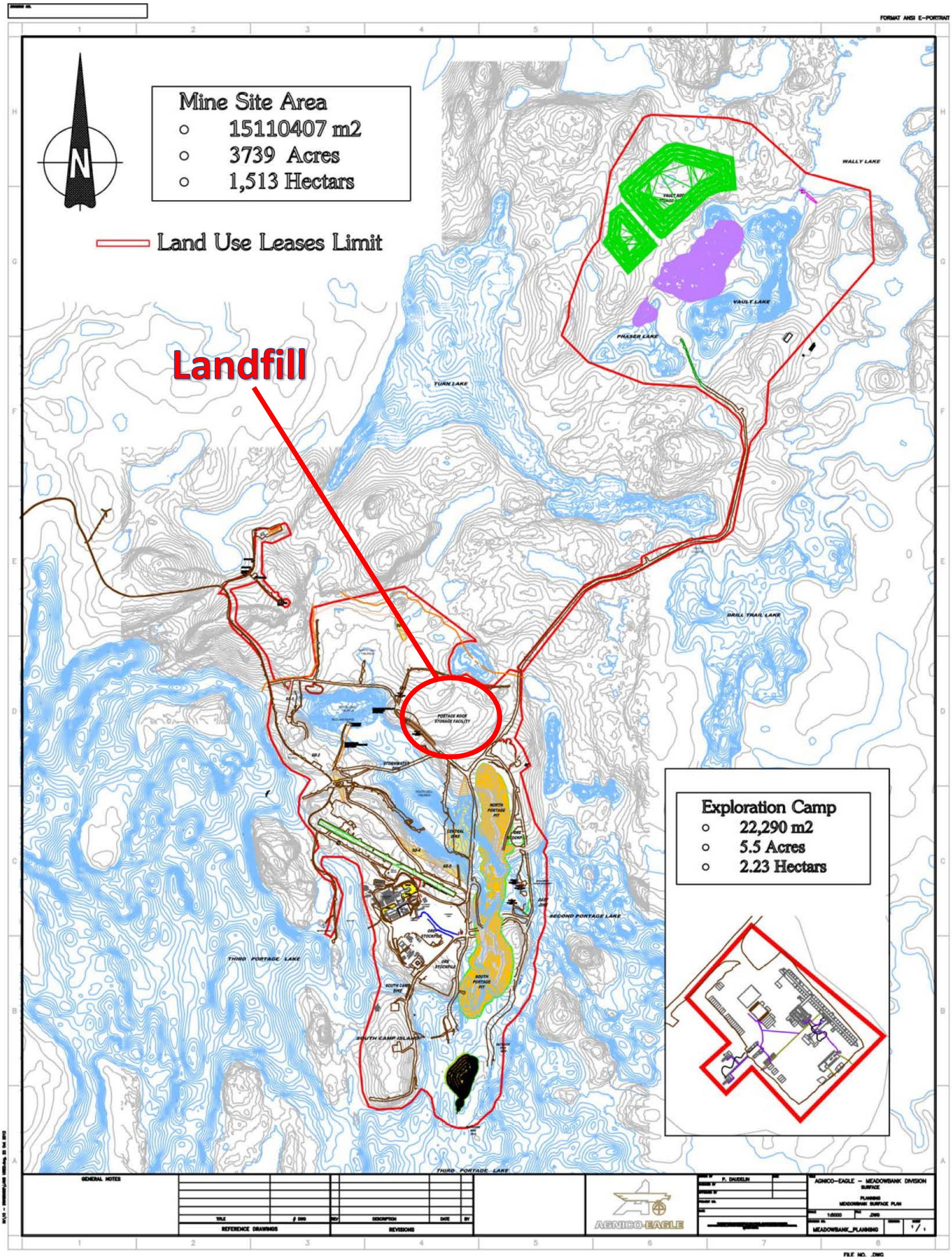
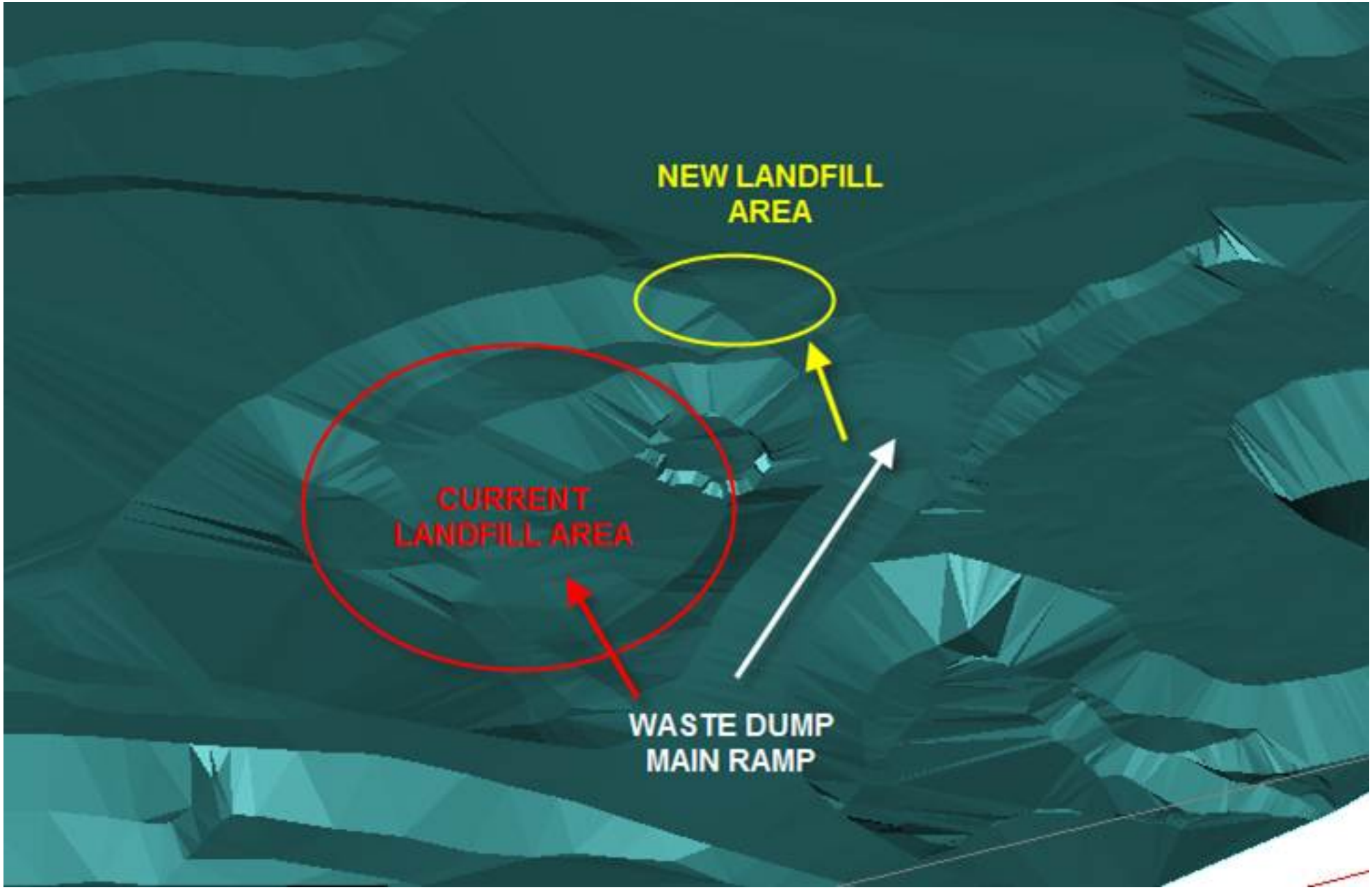


FIGURE 2 – LANDFILL #1 Location Plan



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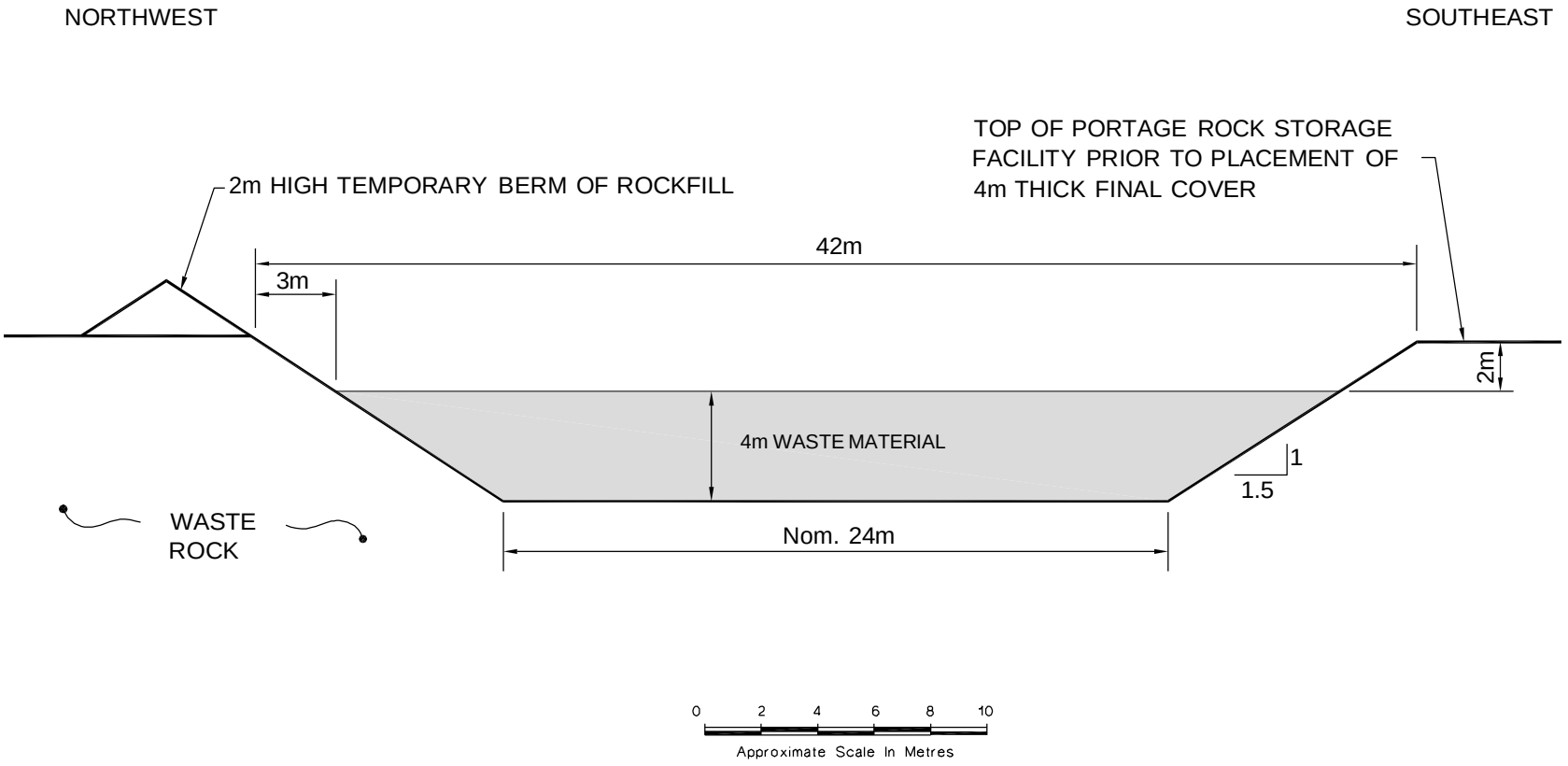

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FIGURE 3

Appendix A

Government of Nunavut Environmental Guidelines

Environmental Guideline for Ozone Depleting Substances

ENVIRONMENTAL GUIDELINE FOR Waste asbestos

Department of Sustainable Development
Environmental Protection Service

Nunavut

GUIDELINE: MANAGEMENT OF WASTE ASBESTOS

AS AMENDED BY:

USE OF GUIDELINE

A guideline is not law and is therefore not enforceable. It does however, assist an inspector to determine what action(s) may be required of him or her. Paragraph 2.2(c) of the *Environmental Protection Act* allows the Minister to "develop, co-ordinate and administer" guidelines. The Act [subsection 5(1)] makes it an offence to discharge a contaminant into the environment, subject to some exceptions [subsection 5(3)]. When a discharge occurs and it is inconsistent with the guidelines, the discharge is considered an unacceptable risk. The inspector may then consider issuing an order or laying an information.

A guideline allows for some leniency in applying the law. A court would probably be inclined to consider the application of a guideline favorably because the public is aware of the standards they are expected to meet.

This Guideline is not law.
It is prepared by Environmental Protection Service,
Department of Sustainable Development
Government of the Nunavut

January, 2002

Guideline for the Management of Waste Asbestos

January, 2002

GUIDELINE FOR THE MANAGEMENT OF WASTE ASBESTOS

1 Introduction

This guideline provides general information on the proper management of waste asbestos. Waste asbestos is a contaminant under the *Environmental Protection Act* (EPA) and must be managed as a hazardous waste.

Asbestos is a cancer causing substance. The public, workers, and the environment must be protected from any air-borne exposure to this material.

This guideline is specific to the management of waste asbestos and should be read in conjunction with the Guideline for the General Management of Hazardous Waste In Nunavut (referred to as the General Guideline). Section 2.2 of the EPA gives the Minister of Sustainable Development the authority to develop, coordinate and administer these guidelines.

1.1 Definitions

Asbestos — Magnesium silicate minerals that occur naturally in fibrous forms. The regulated (TDGR) asbestos types include: chrysotile, actinolite, anthopkyllite, tremolite (white), crocidolite (blue), amosite, mysorite (brown).

Friable waste material — A material which when dry can be crumbled, pulverized or reduced to powder by hand pressure.

Generator — The owner or person in charge, management or control of a hazardous waste at the time it is generated, or a facility that generates hazardous waste.

Transport authority — The regulations controlling the management of hazardous waste under that mode of transport. These include:

Road and rail - *Transportation of Dangerous Goods Act* (TDGA) *and Regulations* (TDGR)

Air - *International Civil Aviation Organization Technical Instruction* (ICAO)

Marine - *International Maritime Dangerous Goods Code* (IMDG).

Waste Asbestos — Asbestos which is no longer useable for its intended purpose and is intended for storage, recycling or disposal. It includes any type of material with greater than 1% asbestos by weight but not asbestos that is immersed or fixed in a natural or artificial binder or in included in a manufactured product.

1.2 Characteristics

Asbestos is a silicate mineral which is strong, flexible and resistant to heat and chemicals. Asbestos was used in a variety of materials including: fireproof fabrics, gaskets, electrical and heat insulation, chemical filters, brake lining, siding and concrete reinforcement.

1.3 Potential Effects

Respiratory exposure to asbestos particles and fibers causes cancer.

The fibrous nature of asbestos is a health concern. Friable asbestos readily floats in air and is easily inhaled. Due to the mineral nature it is not readily dissolved and may not be excreted from the body. If enough asbestos particles are taken into the respiratory tract cancer may develop.

Environmental and occupational exposure to asbestos is primarily from air-borne sources. This includes weathered or poorly maintained asbestos materials and particles from asbestos abatement (removal) projects. Natural exposures of asbestos (rock outcrops) and dust from vehicle brake pad wear are beyond the scope of this guideline.

2 Roles and Responsibilities

2.1 Environmental Protection Service

The Environmental Protection Service (EPS) of the Department of Sustainable Development is the Government of Nunavut's (GN) agency responsible for initiatives which control the discharge of contaminants and their impact on the environment. EPS is responsible for ensuring that environmentally acceptable management procedures, emission levels and disposal methods are maintained. EPS programs are applied primarily to Commissioner's Land, lands administered by municipal governments or GN undertakings. Legislative authority is provided by the *Environmental Protection Act* and *Pesticide Act.* Contact EPS for a listing of relevant regulations and guidelines.

2.2 Occupational Health and Safety

Worker protection from air-borne asbestos particles is regulated by the Prevention Services Division, Workers Compensation Board. The *Asbestos Safety Regulations,* under the *Safety Act,* require that employee exposure to hazardous air-borne asbestos be maintained below specified levels. The exposure levels correspond to the type of asbestos and the friability of the material. Contact the Prevention Services Division of the Worker's Compensation Board for the regulations and procedures required for the containment of asbestos dusts and worker protection.

2.3 Generators of Waste Asbestos

The responsibility for proper waste management rests with the generator and should be considered as part of the cost of doing business.

Waste asbestos is a hazardous waste. The owner (generator) of the asbestos is responsible for ensuring the waste asbestos is properly managed from the time it is generated to final disposal. Waste asbestos must be safely removed, handled, packaged, stored, transported, treated and/or disposed in accordance with this guideline and all applicable Acts and regulations.

2.4 Contractors

Contractors can manage waste asbestos on behalf of a generator. However, the generator is responsible for insuring that the waste management method complies with this guideline, the General Guideline and the requirements of other legislative authorities. (Including the *Asbestos Safety Regulations* under the *Safety Act* and the *Transportation of Dangerous Goods Act and Regulations* (TDGR) or other transport authority).

3 Waste Management

> **Minimizing or avoiding the creation of pollutants and wastes can be more effective in protecting the environment than treating them, or cleaning them up after they have been created.**
>
> **Canadian Council of Ministers of the Environment**

3.1 Pollution Prevention

Pollution prevention methods reduce or eliminate the creation of waste. Pollution control practices treat waste after it has been created. Pollution prevention opportunities for asbestos include the following:

Reduce

- Consider using less hazardous materials i.e.: fiberglass, metals, wherever possible. In some applications there is no replacement for asbestos.

Reuse

- Encapsulation of the existing asbestos by sealing with paint or an epoxy product, covering with paneling or other non-asbestos materials may be considered. The Prevention Services Division, Workers Compensation Board must be consulted prior to sealing areas that contain asbestos.

- Non-friable asbestos materials can be re-used (i.e.: fire-break asbestos cementous boards), to reduce replacement costs and extend the life of the product.

3.2 Storage

Waste storage is not a long term solution.

Store waste asbestos according to the following:

- Store in sealed, airtight containers and labeled "Asbestos" as directed by the *Asbestos Safety Regulations.*
- Use containers that are sound, sealable and not damaged or leaking.
- Label containers according to the requirements of the Work Site Hazardous Materials Information System (WHMIS) of the *Safety Act* or the relevant Transport Authority if transport to a disposal location is planned. (see Section 3.3 Transportation).
- Protect containers from the weather and physical damage.
- Storage should be in a secure area with controlled access.
- Train personnel in the safe use, storage and shipping procedures for waste asbestos. Only trained persons should have access to the storage area.

The short term storage of waste asbestos is only acceptable as an interim measure to permit time for the collection of sufficient volumes for cost effective transport to a disposal facility.

Storage of waste asbestos in quantities greater than 1000 kilograms for a period greater than 180 days requires the site to be a registered hazardous waste storage facility. Consult the General Guideline or contact EPS for application procedures.

3.3 Transportation

The transport of waste asbestos requires proper classification, packaging, labeling and documentation as required by the transport authority (air, marine, rail, road). Requirements for waste generators and carriers are detailed in the General Guideline.

Special Provisions 37 and 44 of TDGR are two exemptions for road transport of waste asbestos. These provisions allow for the substitution of a shipping document for the hazardous waste manifest, and, provided the shipping name and product identification number appear on the outer package or small container, labels are not required.

The shipping document must include the following information and should be mailed or sent by facsimile to EPS:

- Date of consignment
- Consignor identification, mark or signature
- Shipping name
- Product Identification Number
- Quantity

For road transportation purposes, waste asbestos can be classified in the following ways, depending on the type of asbestos.

Shipping Name: **Waste White Asbestos**
P. 1. N.: UN 2590
Classification: 9.1
Packing Group: 111
Special provisions: 37,44

Shipping Name: **Waste Blue Asbestos**
P.I.N.: UN 2212
Classification: 9.1
Packing Group: 111
Special provisions: 37,44

Shipping Name: **Waste Brown Asbestos**
P.I.N.: UN 2212
Classification: 9.1
Packing Group: 111
Special provisions: 37,44

Further consultation with the transport authority is recommended.

Generator numbers, waste manifests and registered hazardous waste carrier lists are available from the Environmental Protection Service.

3.4 Asbestos Abatement

Prevention of asbestos fibre release into the air is the primary objective of all asbestos abatement projects.

The removal of asbestos materials requires a thorough understanding of the potential hazards and knowledge of measures available to prevent worker, public and environmental exposure to asbestos fibers.

The *Asbestos Safety Regulations* require that employers conducting an asbestos removal project provide the following training to workers who are likely to come in contact with asbestos:

(a) demonstration and instruction in the use of all protective equipment;
(b) the safe handling and disposal of waste asbestos;
(c) health education including information relating to pneumoconiosis, lung cancer and the effects of smoking; and,
(d) any other information a safety officer considers necessary.

Other requirements, such as soaking the asbestos with water through its entire thickness prior to disturbing are designed for safety purposes.

Materials containing non-friable asbestos, such as asbestos cementous board (used as building siding), ceiling tiles, linoleum, tar papers, are generally non-hazardous if they remain intact. However, if these are broken or shredded, asbestos fibers may be released into the air. Minimal safety apparel is required when proper handling procedures are exercised. Contact the Prevention Services Division, Workers Compensation Board, for more information on worker protection or to obtain a copy of the regulations.

The names and location of asbestos training centers are available by contacting the waste management associations listed in Appendix B of the General Guideline.

3.5 Disposal

Two options are available for the disposal of waste asbestos.

Burial at the local landfill. Approval for local landfill disposal must be obtained from the municipal authority. Acceptance of the asbestos materials by the local authority must be confirmed to EPS by telephone or in writing. This ensures that the municipality is registered as a receiver of waste asbestos.

At the landfill, the waste asbestos shall be immediately buried and covered with one half meter of cover material (two feet). Cover materials can be locally available soils, refuse or other materials provided the asbestos containment is not ruptured. If a landfill practices open burning, waste asbestos should be placed in a dedicated trench isolated from the burning. The excavated soils from the trench should then be used to cover the asbestos to the required depth.

In addition:

-the excavation must be isolated from future burning activities.
-the asbestos waste should be buried where it will not be disturbed.
-the location of the asbestos should be maintained on a map or diagram of the property by the municipal authority for future reference.

The second disposal option for asbestos is to contract a registered waste management company. These companies can be contacted through their associations listed in Appendix II of the General Guideline.

Consideration will be given to proposals for alternate disposal methods that provide a level of environmental protection equivalent to complying with this guideline. The Environmental Protection Service may approve the method, subject to conditions.

4 Conclusion

This guideline presents a brief introduction into the management of waste asbestos. It is intended as a source of basic information and should be read in conjunction with the Guideline for the General Management of Hazardous Waste in Nunavut.

For more information contact:

1) Environmental Protection Service
   Department of Sustainable Development
   P.O. Box 1000, Station 1195
   Iqaluit, Nunavut, X0A 0H0
   Phone: (867) 975-5900; Fax (867) 975-5990

2) Motor Vehicle Division
   Department of Community Government and Transportation
   P.O. Box 207
   Gjoa Haven, Nunavut, X0E 1J0
   Phone (867) 360-4614 Fax (867) 360-4619

3) Prevention Services Division
   Workers' Compensation Board
   P.O. Box 669
   Iqaluit, Nunavut, X0A 0H0
   Phone: (867) 979-8500; Fax: (867) 979-8501
   (867) 873-7468 (accident report); Fax: (867) 873-0262
   1-800-661-0792

If you would like to be placed on a mailing list to receive guideline amendments or for public consultation on Environmental Protection Service legislation please fill this out and mail or fax to:

Environmental Protection Service
Department of Sustainable Development
P.O. Box 1000, Station 1195
Iqaluit, Nunavut, X0A 0H0
Fax: (867) 979-5990

Users of this guide are encouraged to report any errors, misspellings, etc. contained within, to EPS at the above address

Mailing List for Environmental Protection Service Information

Name: _____

Title: _____

Address: _____

_____

Phone / Fax Number: _____

Disposal Guidelines for Fluorescent Lamp Tubes

Fluorescent tubes contain mercury phosphor powder and traces of lead and cadmium. These chemicals are environmental contaminants under the Nunavut *Environmental Protection Act* (EPA).

The only disposal method for fluorescent tubes is through an approved hazardous waste recycling or disposal company. The *Guideline for Industrial Waste Discharges* prohibits landfill disposal if mercury is present in excess of 0.2 mg/Litre (parts per million) based on leachate quality test results.

Provided the fluorescent tubes are not broken and are packaged in their original shipping box, no special requirements are needed for transport purposes; transport, as a hazardous waste is not necessary. Nevertheless, if the fluorescent tubes are broken, compliance with the *Guideline for the General Management of Hazardous Waste* and *Transportation of Dangerous Goods Regulations* is required. Also, special handling and safety procedures are required to prevent worker exposure to mercury. The Nunavut *Safety Act* and *General Safety Regulations* is the legislative authority. To ensure worker safety when handling mercury, contact a Safety Officer at the Prevention Services Division.

Recycling and Disposal Services:

- Sorci Industries, Langly BC; tel: (604) 857-5588, fax: (604) 857-5775
- RFL, Coteau-du Lac, PQ; tel: 1-800-567-8027 or (514) 345-0066, fax: (514) 763-0072
- Electro Waste 2002Ltd., Gloucester, ON, tel: (613) 744-6659, fax (613) 744-5981
- Environmental Services Association of Alberta, tel: 1-800-661-9278 or (403) 439-6363, fax: (403) 439-4249

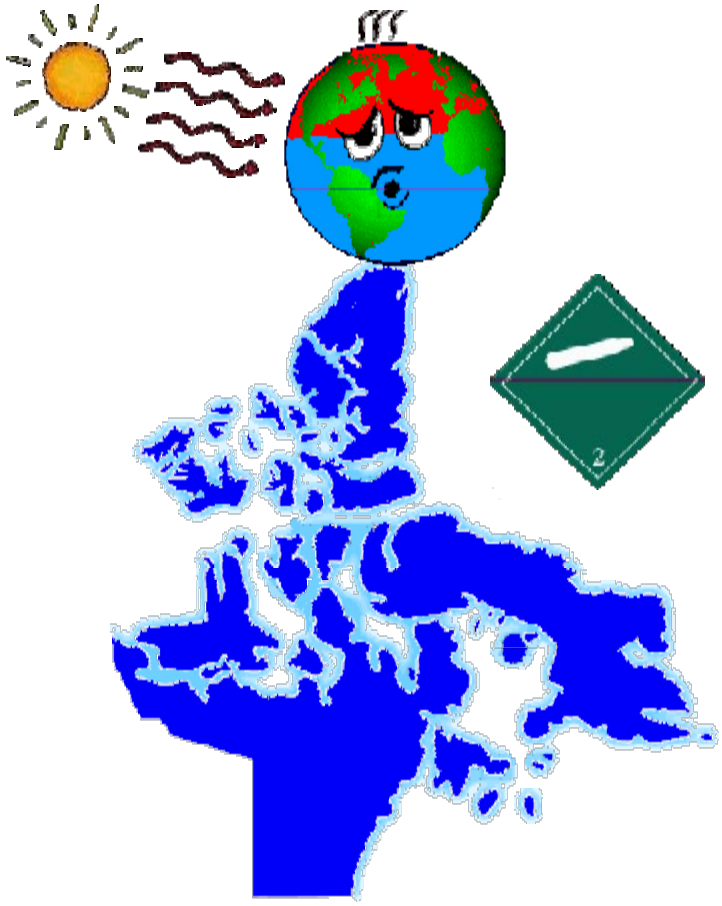
For more information contact:

1) Environmental Protection Service
   Department of Sustainable Development
   Government of Nunavut,
   P.O. Box 1000, Station 1195, 3rd Floor W. Brown Building,
   Iqaluit, NU X0A 0H0, Telephone (867) 975-5900 or Fax (867) 975-5990

2) Motor Vehicle Division
   Department of Transportation
   P.O. Box 1000, Station 775, Iqaluit, NU X0A 0H0,
   Telephone: (867) 975-5380 or Fax: (867) 975-5385

3) Prevention Services Division
   Workers Compensation Board
   P.O. Box 669, Iqaluit, NU X0A 0H0,
   Tel: (867) 979-8500 or 1-877-404-4407 or Fax:.(867) 979-8501

ENVI RONMENTAL GUIDELINE
FOR
OZONE DEPLETI NG SUBSTANCES



Department of Sustainable Development
Environmental Protection Service

Nunavut

GUIDELINE: MANAGEMENT OF OZONE DEPLETING SUBSTANCES

AS AMENDED BY:

USE OF GUIDELINE

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Department of Sustainable Development
Government of the Nunavut

.

January, 2002

Guideline for Ozone Depleting Substances (ODSs)

January, 2002

GUIDELINE FOR OZONE DEPLETING SUBSTANCES (ODSs)

1 Introduction

The stratospheric ozone layer helps filter the sun's harmful ultraviolet (UV) radiation from the earth. Increased UV radiation harms human health and damages animal and plant life. Evidence shows that the main causes of ozone depletion are the releases of manufactured chlorofluorocarbons (CFC's), halons and a few other chemicals into the atmosphere. Hence, these materials are known as ozone depleting substances (ODSs). As one of 134 nations ratifying the Montreal Protocol, an international agreement to protect the ozone layer, Canada is committed to eliminating releases of ODSs.

The intent of this guideline is to assist in the management of ozone depleting substances in Nunavut. This guideline provides requirements and direction regarding the release, servicing, training, record keeping, labelling and disposal of equipment containing ODSs. For the purposes of this guideline, ozone depleting substances include certain air conditioning and refrigerant agents as well as substances contained in certain fire extinguishing equipment. The guideline targets commercial applications which account for 78% of the total sum of stored, leaked and consumed ozone depleting substances in the NWT and Nunavut. The total quantity of ODSs in the NWT and Nunavut amounts to over 65 tonnes.

The *Guideline for Ozone Depleting Substances* does not cover the production, importing or exporting of new, unused ODSs. These activities are controlled under federal regulations by Environment Canada.

This publication is a general guideline affecting the use of ozone depleting substances in Nunavut. Section 2.2 of the *Environmental Protection Act* (EPA) gives the Minister of Sustainable Development the authority to develop, coordinate and administer guidelines. This guideline complements existing acts and regulations that should be consulted for interpretation and application.

1.1 Definitions

Air conditioning or Refrigeration equipment	Heat pump, air conditioning, or refrigeration equipment including any motor vehicle air conditioners which contain an ozone depleting substance.
Certified service technician	A technician who is otherwise qualified to service ODS containing equipment and has successfully completed an environmental awareness course for ozone depleting substances certified by Environment Canada.
Code of Practice	The Environment Canada publication entitled *Code of Practice for the Reduction of Chloroflurocarbon Emissions from Refrigeration and Air Conditioning Systems* (EPS/1/RA/1 March 1991, original date) and subsequent updates.
Fire extinguishing equipment	A portable or fixed unit or system used to extinguish fire, that contains an ozone depleting substance.

Motor vehicle air conditioner	An air conditioning system on a motor vehicle which is a mechanical vapour compression refrigerant system that provides cooling for the passenger compartment of the vehicle and contains an ozone depleting substance as a refrigerant.
Ozone depleting substance (ODS)	A chlorofluorocarbon, halon or any other substance listed in Schedule I of this guideline that has the potential to destroy ozone in the stratosphere.
Portable fire extinguisher	A hand-held or wheeled fire extinguisher containing an ozone depleting substance.
Recover	Collecting an ozone depleting substance in a container which is not regularly a component of the system from which the ODS was removed.
Recycle	Restoring a recovered ozone depleting substance to acceptable purity levels by filtering, drying or distilling.
Servicing	The act of repairing, maintaining or adjusting a component of fire extinguishing, air conditioning, or refrigeration equipment, where the component contains an ozone depleting substance.

2 Roles & Responsibilities

2.1 Environmental Protection Service

The Department of Sustainable Development, Environmental Protection Service (EPS) is responsible for initiatives which control the discharge of contaminants and reduce the impact on the natural environment. EPS is responsible for ensuring that waste management procedures, emission levels and environmentally acceptable disposal methods are maintained. Contact EPS for a listing of relevant regulations and guidelines.

A waste manifest form must accompany ODSs recovered from commercial equipment if moved off site for storage, recycling or disposal. For further information on hazardous waste manifesting please refer to the *Guideline for the General Management of Hazardous Waste in Nunavut* or contact EPS. Registration numbers and waste manifest forms are available by contacting EPS.

2.2 Other Regulatory Agencies

Environment Canada under the Canadian Environmental Protection Act's *Chlorofluorocarbon Regulations* (SOR/90-127), *Ozone-depleting Substances Regulations* (SOR/94-408) and *Ozone-depleting Substances Products Regulations* (SOR/90-584) control the import, manufacture, use, sale

and export of bulk chlorofluorocarbons, hydrobromofluorocarbons, halons, carbon tetrachloride and methyl chloroform. These regulations reflect Canada's international commitments under the Montreal Protocol to eliminate production and consumption of ozone depleting substances.

The Nunavut Department of Community Government and Transportation, through the Office of the Fire Marshal is involved with ODSs because several types of fire extinguishing equipment contain halons.

2.3 Owners

Building/facility owners may be affected by phase-outs of ozone depleting substances. ODSs are most often found in air conditioning or refrigeration equipment or as halons in fire extinguishing systems. Owners have the responsibility to prevent releases of ODS from equipment.

Automobile owners must not ignore leaky air conditioning equipment containing ODS.

Owners of fire extinguishing equipment containing a halon should be aware of the presence of an ODS in the equipment. Replacement halons are no longer being manufactured or imported into Canada. As a result, these owners should consider plans to phase out the use of halon containing fire extinguishing equipment.

2.4 Service Technicians

Certified service technicians should be hired to repair leaks or damages to equipment containing the ODS as quickly as possible. Service technicians should not fill leaking equipment. Technicians must use proper recovery/recycling equipment and methods to prevent the release of the ODS into the environment. Section 3.5 of this guideline provides additional information on servicing. The technician should inform the building owner when they become aware of leaking equipment.

Automobile service technicians have similar responsibilities to those described above. Only certified technicians should repair leaks to automobile air conditioning equipment.

2.5 Vendors of ODSs

Vendors who sell ODSs other than as part of equipment also have a role in the management of these materials. Vendors are responsible for selling ODSs to only certified technicians. Vendors are encouraged to ensure industry stewardship of ODS refrigerants and fire extinguishing equipment.

3 Standards

The following sections outline the requirements for managing ODSs substances in Nunavut.

3.1 Release of ODS

ODS releases should not be allowed. The following are the major sources of ODSs in Nunavut;

- refrigeration equipment, including some indoor ice making equipment
- air conditioning equipment
- motor vehicle air conditioners
- fire extinguishing equipment

- equipment used in the recovery, recycling or storage of an ODS

Careful attention should be paid when handling these pieces of equipment. Any leaks in equipment should be repaired before adding an ODS. When servicing, testing or discarding fire extinguishing, air conditioning or refrigeration equipment the certified technician should recover the ODS for reuse or recycling.

Small communities where certified service technicians are not generally available may contact EPS for assistance on developing a plan to properly handle ODS containing equipment including discarded refrigerators and freezers.

3.1.1 Reported Release

The following release limits are in accordance with the *Environmental Protection Act's Spill Contingency Planning and Reporting Regulations*.

Any release of an ODS listed in Schedule I of this guideline, and classified as a class 2 (compressed gas), under *Transportation of Dangerous Goods Regulations* (TDGR) from containers with a capacity greater than 100L, must be reported immediately to the 24 Hour Spill Report Line by calling (867) 920-8130.

Similarly, a release of 5L or greater of an ODS listed in Schedule I of this guideline, and classified as a class 6 (poisonous substance), under TDGR, must be reported immediately to the 24 Hour Spill Report Line by calling (867) 920-8130.

3.2 Servicing Certification

Only certified technicians should service air conditioning, fire extinguishing, refrigeration or motor vehicle air conditioner equipment. To become certified, a service technician shall successfully complete an environmental awareness course for ozone depleting substances certified by Environment Canada[1]. Only a certified technician may purchase or possess an ozone depleting substance for the purpose of servicing equipment containing an ODS. Companies employing service technicians will maintain records indicating which employees are certified to service ODS containing equipment.

3.3 Sales Record

If a certified technician purchases an ODS other than as a component in another product, the vendor will require the certified technician to sign an acknowledgement of receipt of the ODS. The vendor should keep a sales record indicating the type of ODS, the date of sale, as well as the name and company of the certified technician.

3.4 Record Keeping and Labelling

All persons who service refrigeration, fire extinguishing or air conditioning equipment with an ozone

[1] For environmental awareness certification in NWT and Nunavut contact Aurora College, Thebacha campus. Contact the Environmental Protection Service for a listing of courses elsewhere.

depleting substance should keep an accurate log of the particulars of the event including quantities, date, name of business and certified technician involved. The record should be tabled chronologically and be made available for inspection by an inspector under the *Environmental Protection Act*. All information and records referred to in this guideline should be maintained for a period of two years.

All new equipment imported into, installed or sold in Nunavut that contains an ODS should be clearly labelled with the quantity and type of ODS contained in the equipment.

All vendors and service companies who are required to maintain records are requested to initially provide the Environmental Protection Service (EPS) in writing, the name and mailing address of the company as well as a contact name.

3.5 Servicing

Any technician who services refrigeration, fire extinguishing or air conditioning equipment should do so in accordance with the Code of Practice and this guideline. An ozone depleting substance should never be used for the purposes of leak testing refrigeration or air conditioning equipment. Technicians servicing air conditioning or refrigeration equipment should use equipment that can recover and contain an ODS. Recovery and recycling equipment should meet or exceed minimum performance standards set out in Schedule II.

3.6 Disposal of Refrigeration Equipment

Any equipment that contains an ozone depleting substance should be serviced by a certified technician, and the CFCs or HCFCs removed prior to disposal. Technicians should place a notice on the piece of equipment stating; the date of the service, the certified technician and company name as well as an indication that the equipment no longer contains refrigerant.

Household refrigeration equipment delivered to a municipal solid waste landfill is exempt from requiring removal of ODSs providing the landfill has a separate area identified and prepared for storage of this equipment. Municipalities are encouraged to bring in certified technicians to remove ODSs from stored equipment when quantities warrant. Remote, isolated, small communities where certified service technicians are not generally available may contact EPS for assistance on developing a plan to properly manage ODS containing equipment including discarded refrigerators and freezers.

3.7 Motor Vehicle Air Conditioners

Servicing a motor vehicle air conditioner requires the technician to follow the methods set out in the *Code of Practice and the Society of Automotive Engineers (SAE) Standard J-1989*. A motor vehicle cannot be discarded unless the ozone depleting substance used as a refrigerant in the air conditioner is recovered. Any motor vehicle delivered to a municipal solid waste landfill is exempted from requiring removal of ODSs providing the landfill has a separate area identified and prepared for storage of this equipment. Municipalities are encouraged to bring in certified technicians to remove ODSs from stored equipment when quantities warrant.

3.8 Fire Extinguishing Equipment

Fire extinguishing equipment cannot be disposed of unless the ODS is recovered. Recovered halons

can be used to provide recharge quantities to existing systems. The Underwriters' Laboratories of Canada (ULC) has published two standards that address halon recycling; *Servicing of Halon Extinguishing Systems* and *Halon Recovery and Re-conditioning Equipment*.

It is recommended that a person who owns fire extinguishing equipment that contains more than 40 kgs of an ODS should evaluate alternatives. They should prepare a management plan to eliminate the use of halons. Environment Canada's *Environmental Code of Practice on Halons* can be used as a guide in developing a halon management plan.

The Montreal Protocol required a phase-out of halon production and consumption by January 1,1994. However, the Montreal Protocol allows the continued trade of recycled halons, i.e. those produced before January 1,1994.

Owners of portable fire extinguishers, including marine and household systems, containing an ODS are encouraged to be to be taken out of service and sales stopped by December 31,1996.

4 Conclusion

This document is intended as a source of basic information about the issues involved in the management of ozone depleting substances. It does not replace the existing legislation which is referenced in the guideline. If you have any questions or concerns please contact the appropriate agency before proceeding.

1. Environmental Protection Service
   Department of Sustainable Development
   P.O. Box 1000, Station 1195
   Iqaluit, Nunavut, X0A 0H0
   Phone: (867) 975-5900; Fax: (867) 975-5990

2. Office of the Fire Marshal
   Department of Community Government and Transportation
   P.O. Box 1000, Station 700
   Iqaluit, Nunavut, X0A 0H0
   Phone (867) 975-5316; Fax (867) 979-4221

3. Environmental Protection Branch
   Environment Canada
   P.O. Box 1870
   Iqaluit, Nunavut, X0A 0H0
   Phone: (867) 979-3660; Fax: (867) 975-4645

4. Commercial Chemicals Evaluation Branch
   Environment Canada
   351 St. Joseph Blvd.
   Hull, PQ, K1A 0H3
   Phone (819) 953-1675; Fax (819) 953-4936

5. The Heating, Refrigerating and Air Institute of Canada (HRAI)
   5045 Orbiter Drive, Bldg. 11, Suite 300
   Mississauga, ON, L4W 4Y4
   Phone: 1-800-661-3369

6. Manitoba Ozone Protection Industry Association Inc. (MOPIA)
19-1110 Henderson Highway
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5 Bibliography

B.C. Environment, *Ozone Depleting Substances & You*, Victoria, BC, Air Resources Branch,(1994).

Environment Canada, *Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems*, Ottawa, ON, (1996).

Environment Canada, *Environmental Code of Practice on Halons*, Ottawa, ON, (1995).

New Brunswick Department of the Environment, *Status Report on the Ozone Depleting Substances Regulation*, Fredericton, NB, Air Quality Section, (1994).

Government of Nunavut, *General Guideline for the Management of Hazardous Wastes*, Iqaluit, Nunavut, Environmental Protection Service, Department of Sustainable Development, (2002).

Government of Nunavut, *Ozone Depleting Substances in Nunavut*, Iqaluit, Nunavut, Environmental Protection Service, Department of Sustainable Development, (2002).

Government of Ontario, *Ozone Depleting Substances - Reg.356, Refrigerants-Reg.189*, Toronto, ON, Queen's Printer of Ontario, (1994).

Government of Prince Edward Island, *Ozone Depleting Substances and Replacement Regulations*, Charlottetown, P.E.I., Environmental Protection Service, Department of Environmental Resources, (1994).

Government of the Yukon, *Ozone Depleting Substances & Other Halocarbons Regulations* , Whitehorse, YT, Environmental Protection & Assessment Branch, Department of Renewable Resources, (2000).

Society of Automotive Engineers (SAE), *Standard J-1989.*

Underwriters Laboratories of Canada (ULC), *Halon Recovery and Reconditioning Equipment*, ULC/0RD-C1058.5-1993.

Underwriters Laboratories of Canada (ULC), *The Servicing of Halon Extinguishing Systems* , ULC/ORD-C1058.18-1993.

Appendix A

SCHEDULE I

OZONE DEPLETING SUBSTANCES

1. Chlorofluorocarbons (CFC's)

a)	CFC-11	trichlorofluoromethane	Not restricted under TDG
	CFC-12	dichlorofluoromethane	TDG class 2.2 Non-flammable gas
	CFC-113	trichlorotrifluoroethane	Not restricted under TDG
	CFC-114	dichlorotetrafluoroethane	TDG class 2.2 Non-flammable gas
	CFC-115	chloropentafluoroethane	TDG class 2.2 Non-flammable gas

b) All other CFC's. Consult TDGA for classification.

c) All isomers and mixtures containing any of the above.

2. Hydrochlorofluorocarbons (HCFC's)

a)	HCFC-22	chlorodifluoromethane	TDG class 2.2 Non-flammable gas
	HCFC-123	dichlorotrifluoroethane	Not restricted under TDG
	HCFC-124	chlorotetrafluoroetane	TDG class 2.2 Non-flammable gas

b) All other HCFC's not specifically listed. Consult TDGA for classification.

c) All isomers and mixtures containing any if the above.

3. Bromofluorocarbons (Halons)

a)	Halon-1211	bromochlorodifluoromethane	Not restricted under TDG
	Halon-1301	bromotrifluoromethane	TDG class 2.2 Non-flammable gas
	Halon-2402	dibromotetrafluoroethane	Not restricted under TDG

b) All other halons not specifically listed. Consult TDGA for classification.

c) All isomers and mixtures containing any of the above.

4. Chlorocarbons

a)	Trichloroethane or methyl chloroform	TDG class 6.1 Poison
	Carbon tetrachloride	TDG class 6.1 Poison

b) All isomers and mixtures containing any of the above.

Appendix B

SCHEDULE II

PERFORMANCE STANDARDS FOR ODS RECYCLING OR RECOVERY AND RECYCLING DEVICES

1. Devices for the recovery and recycling of an ozone depleting substance designed to be used with the type of air conditioning or refrigeration equipment listed in Column I of Table 1 must, during normal operation, be capable of ensuring removal of the refrigerant from the equipment being serviced by reducing the system pressure, below atmosphere, to the level listed in Column II of Table 1 opposite the type of equipment.

Table 1

COLUMN I		COLUMN II
	INCHES OF MERCURY (VACUUM)	MICROMETERS OF MERCURY (ABSOLUTE PRESSURE)
Very high pressure equipment	0	760000
High pressure equipment with a charge of 23 kg or less	10	506000
High pressure equipment with a charge of more than 23 kgs	20	252000
Intermediate pressure equipment	25	125000
Low pressure equipment	29	23000

2. Devices for recovery or recovery and recycling intended for use with small appliances that contain an ozone depleting substance in their cooling system such as household refrigerants, or household freezers must recover a minimum of 90 % of the refrigerant in the cooling system of the appliance. Devices for recovery and recycling intended for use with small appliances that do not have an operational compressor must recover a minimum of 80% of the refrigerant in the cooling system of the appliance.

If you would like to be placed on a mailing list to receive guideline amendments or for public consultation on Environmental Protection Service legislation please fill this out and mail or fax to:

Environmental Protection Service
Department of Sustainable Development
P.O. Box 1000, Station 1195
Iqaluit, Nunavut, X0A 0H0
Fax: (867) 975-5990

Users of this guide are encouraged to report any errors, misspellings, etc. contained within, to EPS at the above address.

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