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Hamlet of Repulse Bay

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1.0 Introduction

This Interim Operation and Maintenance Plan has been prepared to assist the Community of Repulse Bay in the operation of their Solid Waste Disposal Facility. It provides a description of the regular operating procedures as well as monitoring requirements.

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The Hamlet of Repulse Bay Solid Waste Disposal Facility consists of the following components:

- Y Landfill (also referred to as the Municipal Solid Waste Disposal Area)
- Υ The Bulky Metals Disposal Area
- Ÿ The Hazardous Waste Storage Area.

The facility has been in use for approximately 3 years. The facility does not have a Nunavut Water Board (NWB) license and no license application has been made to date.

The current design does not appear to meet Nunavut Water Board requirements, and as a result, this Operation and Maintenance Plan can only be considered "interim" until the site design meets NWB approval.

The current NWB license Number NWB3REP0409 allows for the use of water and disposal of waste for the Hamlet of Repulse Bay. The current landfill site is not included in the license.

A design for a new landfill in the location to the current site was prepared by Dillon Consulting in May 2002. No supporting documentation other than four design drawings were provided for review.

The site was constructed in 2003, and the constructed facility differs significantly from the Dillon design. No as-built drawings or any other documentation was available for review. No information was provided by the designer or contractor on how the site was to operate.

This Interim Operation and Maintenance Plan has been prepared as a temporary plan to assist Hamlet of Repulse Bay staff in operating the site until as built drawings are prepared, the design is reviewed, and modified (if required) and an application made to amend the Water Board license.

This operation and maintenance plan emphasizes the health and safety of site workers and the public as the item of foremost priority.

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1.1 Background

The Hamlet of Repulse Bay is located in the Kavalliq Region of Nunavut as shown on Figure 1.

The community has a population of approximately 738, with an approximate 3.5 percent projected growth rate. Community infrastructure includes:

- Ÿ A water truck fill station, which draws water from Nuviq Luktujuq
- Ÿ Trucked water to holding tanks in each building
- Ÿ A sewage lagoon which receives trucked sewage collected from holding tanks in each building
- Y Sewage treatment via an exfiltration lagoon to a wetland
- Y A Solid Waste Disposal Facility, which includes a Municipal Solid Waste Disposal Area, a Bulky Materials Disposal Area, and a Hazardous Waste Storage Area
- ÿ Several rock and sand quarries
- ÿ Diesel powered generators.

The Hamlet is predominately residential with a few small commercial establishments including a hotel, several construction contracting businesses, grocery store, and a variety of other small businesses. Hunting and fishing in the traditional manner is still a prime occupation for many of the inhabitants. Community buildings include an elementary school, Hamlet office, public works yard, GN offices, and police station.

1.1.1 Climate

The average rain fall at Repulse Bay is 15.6 cm and the average snow fall is 130.7 cm per year. The near high and low temperatures in July is 16.0 and 6.0 °C. In January the near high and low temperatures are -29.5 and -36.4 °C. Winds are generally from the north averaging 23.0 km/hr.

1.1.2 Geology and Morphology

The area of the solid waste disposal facility is dominated by bedrock ridges and glaciomarine deposits. Bedrock is mapped as Archean Granitoid, which also includes a variety of Precambrian rocks. Glacial and non-glacial over burden, including blanket deposits of sand and silt with mixed cobble and boulder, occour between outcrop ridges. Borrow areas with suitable material for use as landfill cover are located just north and east of the site.

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2.0 Operation and Maintenance

2.1 Overview

The Hamlet of Repulse Bay Solid Waste Management facility consists of two main components:

- γ Diversion consisting of
 - Wood pile
 - Bulk metals disposal area
 - Hazardous waste storage area
- ÿ Landfill.

The site was deigned and constructed as a natural attenuation landfill. It does not have a liner, so contaminants are able to reach from the water and enter the natural environment.

In order to protect the environment, the facility is designed to divert as much waste as possible from landfilling. This is especially important for hazardous wastes such as batteries, waste oil, waste antifreeze, and other materials that could harm the environment if landfilled.

Figure 2 displays the layout of the solid waste disposal facility and surrounding area. Figures 3 and 4 show the site in cross-section.

Site operations must comply with the Nunavut Safety Act, and with the health and safety of workers and the public as the first priority.

2.2 Material Arrival

Material will arrive at the facility mainly by a small dump garbage truck owned by the Hamlet or by private residential drop-off.

After Hamlet staff collect waste, the collection vehicles will progress to the landfill, where wastes will be tipped into the burn pile. After being tipped (or during collection), staff will perform an inspection of the waste to ensure that it does not contain visible hazardous waste or bulky metals. If such waste is noted, it will be segregated in the appropriate locations of the approved Hazardous Waste storage area or the Bulky Metals Disposal Area.

Members of the community may drop off materials directly at the facility (mainly bulky metals) or hazardous wastes. The public should be encouraged to place materials in the appropriate location; generally bulky metals within the Bulky Metals Disposal Area, and hazardous waste in the Hazardous Waste Storage Area. Wood in the wood pile, etc.

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The layout of the site and waste diversion process is displayed on Figure 5.

The staff will record the number of trips to the Solid Waste Disposal Facility per day and estimate the approximate quantity in cubic metres on the Waste Placement Forms included as Appendix A. If waste is present on site that has been tipped by others, an estimate of the quantity shall be made and recorded. Records are to be delivered to the Hamlet office once per week, were they will be retained on file for inclusion in the Annual Report.

2.3 Wood

Burnable and wood materials that may have reusable value are placed in the wood pile in the waste diversion area (Figure 5). The wood pile should be burned on occasion when quantities build up. Burning should take place when wind and climate conditions are favourable.

2.4 Bulky Metals Disposal Area

2.4.1 Regular Operation

Staff should inspect the bulky metals disposal area on a regular basis to check for new materials. Fluids (oil, antifreeze) should be drained from vehicles, and if possible, batteries should be removed and transferred to the Hazardous Waste Storage Area. Bulky metals should then be tagged to indicate that they have been inspected and cleaned.

Bulky metals should be moved to the appropriate location to maximize segregation of the materials. These groupings can be developed by the operation staff based on needs and materials, but are anticipated to consist of tires, appliances, bicycles, ATV's, snowmobiles and miscellaneous debris.

2.4.2 Regular Maintenance

Although reuse of the material is possible, there are materials that will have no potential future life. It is recommended that periodically, (i.e., every 3 to 5 years), bulky metals with no further recyclable value be removed out and buried in a dedicated burial pit, developed to the east of the existing Bulky Metals Disposal Area. The location of the burial area is shown on Figure 2.

2.5 Hazardous Waste Storage Area

2.5.1 Operations

During regular operations work on the facility, any hazardous materials placed on site should be transferred to the storage area. Batteries must be stored upright. Oils, lubricants and antifreeze may be bulked together in common drums, preferably remaining

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in their original packaging. Unknown substances should remain in their package and placed into drums.

Only persons with the appropriate skills and training are permitted to handle hazardous wastes.

2.5.2 Maintenance

The area should be inspected on a regular basis for signs of spillage or leaks. Degraded containers (i.e., rusted drums) should be replaced as required.

When materials within the facility have accumulated to quantities that constitute a load, the Hamlet should arrange for them to be removed from site by a licensed hauler and who will remove them from the community and dispose of them in a licensed facility.

The area is currently unlined and has no spill control measures. Design upgrades are needed to meet NWB requirements.

2.6 Landfill

The layout of the landfill is displayed on Figure 2. No documentation was provided indicating how the designer of the site or the constructor of the site intended the site to operate. The operation of the site has been interpreted based on field findings. These operational procedures for the landfill are presented below:

2.6.1 Operation

Site operations include potentially hazardous practices such as burning and operation of heavy equipment. All work is to be conducted only by staff with the appropriate training to conduct the work safely. The health and safety of workers and the public takes precedence.

It has been indicated that the burning of waste is a necessity to prevent odour, eliminate flies, and to reduce potential problems with scavengers, such as bears and foxes (since the ability to cover waste is limited due to the short operational season). In order to minimize the potential for impacts from fires the following rules are to be followed:

- ÿ Burn only in the established burn area
- Y If possible, materials should not to be tipped directly onto burning or smoldering waste; it is preferable to not ignite the waste until it has all been collected for the day
- Ÿ Ensure that the weather is acceptable for burning. The following guidelines are recommended:
 - Wind speed should be checked. If loose paper or debris can be lifted and carried off site (moderate breezes or greater), burning shall be avoided

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- The wind direction should be checked, to ensure that smoke does not drift towards the Hamlet, or workers in the vicinity
- If heavy rain is present, burning should be avoided (as it may result in poor combustion and greater potential to generate by-products).

The site operators shall stay upwind of the fire at all times.

Prior to waste handling, the equipment operator will confirm that the waste is no longer hot or burning. As required, using a dozer or a loader, the ash and unburnt general municipal wastes will be pushed away from the burn pit and along the active face, observing the following operating principles:

- Ÿ All waste shall be removed from the tipping and burn areas
- Y The waste shall be pushed and spread along the disposal area at a maximum 3:1 grade (shallower grades result in the need for too much cover, steeper grades are typically not stable).

The operational procedures are as follows:

- ν Drop off of waste at the designated area at the end of the access road Figure 6
- Ϋ
 Conduct burning on a regular basis when climate conditions are favourable Figure 6
- Scrape the burned waste off the drop off area and move it into the fill area Figure 7
- Υ Compact and layer the waste 250 mm to 300 mm thick Figure 7
- ÿ Gradually build up waste layers across the fill area Figure 8
- Y Construct an additional berm once waste levels reach the height of the existing bermFigure 8
- Y Continue filling to achieve final site grades over the designed waste footprint Figure 9
- V Close the fill area once final grades (maximum 3:1) are achieved Figure 9
- γ Apply final 600 mm of cover and stabilize surface with cobbles Figure 9.

2.6.2 Maintenance

Operations staff will perform weekly site inspection and maintenance. During these inspections, weekly site inspection forms (Appendix A) will be completed. These forms are designed to note the standard items requiring inspection and maintenance at the site, as well as other relevant information, such as weather. Health and safety concerns will also be noted. They are also used to document the response to any incidents that affect site operations such as accidents, injuries, fires, flooding, or chemical spills.

- The tipping area and necessary roadways shall be maintained by snow clearing in the winter and grading in the summer, and repaired as necessary
- v Ditches and drainage channels shall be inspected for erosion, and repaired as necessary

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- Site warning signage, which identifies the boundaries of the Solid Waste Disposal Facility (which includes the landfill, Hazardous Waste Storage Area, and the Bulky Metals Disposal Area) shall be inspected, and repaired or replaced as necessary
- Y Any airborne litter outside of the litter-control fences (which are located on top of the berm at the Facility) shall be removed, and deposited in the landfill
- Ÿ Litter that has accumulated against the fences shall be removed and placed into the landfill
- V After rain events and following the spring thaw, the site shall be inspected for leachate breakout. Cover the face if possible and ensure that leachate is being contained
- The berms and final cover at the Solid Waste Disposal Facility shall be inspected for erosion and settlement
- Ÿ The fences at the Solid Waste Disposal Facility shall be inspected for damage, and repaired as necessary.

All details of any repairs shall be reported in the Annual Report.

Staff will place hazardous materials, such as oil or solvents into drums located in the Household Hazardous Waste Area. Materials should be left in the original container and placed into the drums, sorted according to what is in the containers (i.e., waste oils stored with oils, solvents with solvents, cleaners with cleaners). Drums will remained sealed within the compound.

2.6.3 Health and Safety

Health and safety of the public and site staff is to be considered the first priority all the times.

Site staff should be trained to conduct their jobs on site safely and in accordance with the Nunavut Safety Act.

Close attention should be given to the unique hazards of this site including:

- ÿ Scavenging bears and other wildlife
- ÿ Open burning
- y Moving equipment
- ÿ Obscuring weather conditions
- Ÿ Hazardous materials (in the waste and in the storage area).

Staff must be aware of these issues and operate the site in a manner to protect other staff and the public.

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3.0 Facility Monitoring Procedures

Although the site does not have an Nunavut Water Board (NWB) license, regular monitoring of runoff from the Solid Waste Disposal Facility is required. The Monitoring Program is to include effluent samples collected from the water that naturally ponds below the face of the berm during the months on June to September, inclusive.

Currently it is recommended samples be collected from surface water locations as follows:

- ÿ Discharge from culvert
- ÿ Discharge from boulder seepage
- Y Selected locations down gradient.

Effluent samples collected shall be analyzed for the following parameters:

BOD Faecal Coliforms
pH Conductivity
Total Suspended Solids Ammonia Nitrogen
Nitrate-Nitrite Oil and Grease
Total Phanols Sulphate

Total Phenols Sulphate
Sodium Potassium
Magnesium Calcium

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

Total Zinc

In addition, any analytical parameters which are normally identified in the NWB water license, or by an Inspector (as defined in the *Nunavut Waters and Nunavut Surface Rights Tribunal Act*) shall be included.

A site log will be used to identify the locations of sampling and condition at the time of sampling. Samples will be submitted to a CAEAL accredited laboratory following laboratory directions for shipping handling, and sampling.

Results of analytical testing and monitoring are to be recorded on a regular basis by the staff. Copies of the analytical certificates and Chain of Custody forms are to be kept for future reference.

Monthly and annual quantities of solid waste offloaded will be estimated and recorded on the Waste Placement Form (Appendix A).

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It is expected that at some point in the future the monitoring procedures will be amended when the site is issued a NWB license.

3.1 Annual Report

An annual report shall be prepared for the site and submitted to the NWB. The report shall include:

- An overall description of the activities that occurred at the facility throughout the year, including both regular waste acceptance and annual shaping
- Ÿ An estimate of the quantity of material received at the site
- γ A description of any maintenance or improvements that were completed at the site throughout the year
- Ÿ A list of any complaints and actions taken to address them
- Ÿ Analytical testing results.

Reporting should be conducted as outlined herein until a NWB license is achieved, at which time the license requirements will dictate the reporting requirements.

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4.0 Contingency Measures

Contingency plans are designed so that site operators are prepared in the event of an accident or occurrence. The contingency measures described below are generic in nature since they must address a wide variety of issues.

4.1 Injuries

In the event of an injury to workers or members of the public:

- Ÿ Apply first aid
- ÿ Seek medical assistance, if necessary
- γ Report the injury to the supervisor
- Property Document the incident and all response measures on the Weekly Site Inspection Form and Supplementary Site Inspection Form (Appendix A).

All health and safety related issues must be addressed in accordance with the Nunavut Safety Act.

4.2 Spills

Activities to be completed in the event of a spill would be outlined in the Hamlets Environmental Emergency Contingency Plan.

4.3 Fires

In the event of a fire, assess the situation. Do not attempt to fight a fire if it cannot be done safely. Call the Hamlet fire department. Alternatively, cover soils can be thrown onto the fire either by hand, or by using available equipment (i.e., bulldozer). Obtain help as necessary. Document the incident and all response measures on the Weekly Site Inspection Form and Supplementary Site Inspection Form (Appendix A).

4.4 Erosion

Erosion may become a problem if runoff rates exceed expectations or cover soils and vegetation is not well established for any reason. The preferred contingency measure for this is to repair the area of erosion with available materials.

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5.0 Reference Documents

The following documents provide a resource of information to deal with specific issues:

- Y Guidelines for the Planning, Design, Operations, and Maintenance of Modified Solid Waste Sites in the Northwest Territories, prepared by Northwest Territories, Municipal and Community Affairs
- Y Consolidation of General Sanitation Regulations under the Public Health Act
- Ÿ Nunavut Safety Act
- Nunavut Waters and Nunavut Rights Tribunal Act
- Ÿ The following guidelines prepared by the Department of Sustainable Development:
 - General Management of Hazardous Waste
 - Environmental Guidelines for Waste Antifreeze
 - Environmental Guidelines for Dust Suppression
 - General Management of Hazardous Wastes
 - Environmental Guidelines for Ozone Depleting Substances
 - Environmental Guidelines for Waste Asbestos
 - Environmental Guidelines for Waste Batteries
 - Environmental Guidelines for Waste Paint
 - Environmental Guidelines for Waste Solvent
- Ÿ The following polices prepared by the Government of Nunavut:
 - Waste Lead (Draft)
 - Policies Regarding Open Burning
 - Management of Fluorescent Lamp Tubes.

The Nunavut Water Board License will have specific requirements once one has been obtained for the site.

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6.0 Summary

This Interim Operation and Maintenance Plan have been prepared for the Hamlet of Repulse Bay, to assist Hamlet staff to operate the Solid Waste Disposal Facility as effectively as possible, based on the existing design and construction layout. The site is not licensed by the Nunavut Water Board, and therefore operates in contravention to the Nunavut Waters and Nunavut Surface Rights Tribunal Act. There is also no documentation available outlining how the original designers and the contractor (which significantly modified the design) intended the site to operate.

The Hamlet of Repulse Bay must address design deficiencies, and obtain a Nunavut Water Board license for the site as soon as possible.

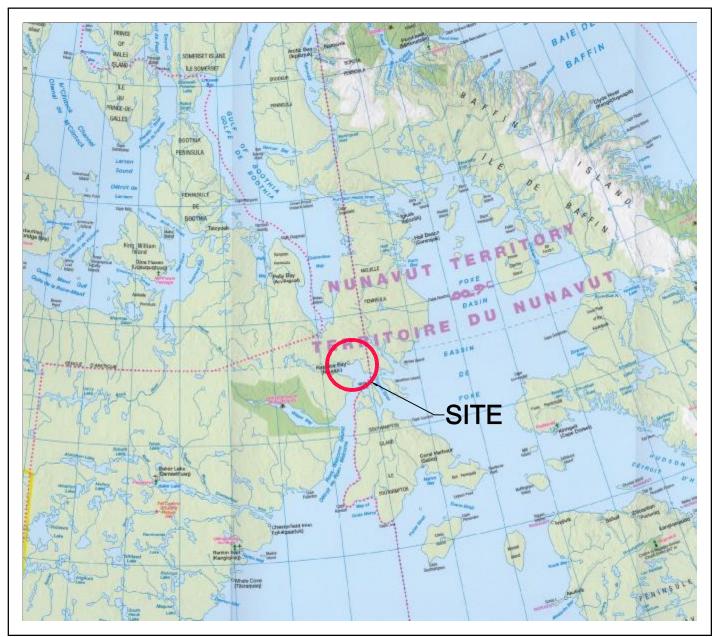
Training of site staff is an important component to solid waste management facility operations and maintenance. Site staff must receive job specific training in the operation and maintenance of the facility.

Solid Waste Management Facility_AA1040

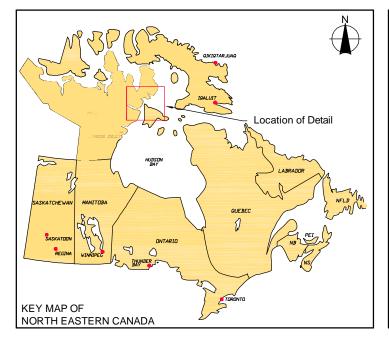
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Figures

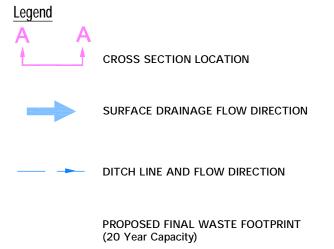


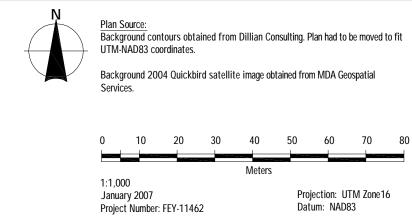
Map Reference: Map Art Publishing Ontario Road Atlas



HAMLET OF REPULSE BAY SOLID WASTE DISPOSAL FACILITY January 2007 Project Number: FEY11462 Prepared by: J. Amsen Verified by: J. Walls Revision #: 1 FEY11462 LF-REHAB EXIST CONDITIONS SLIDWG





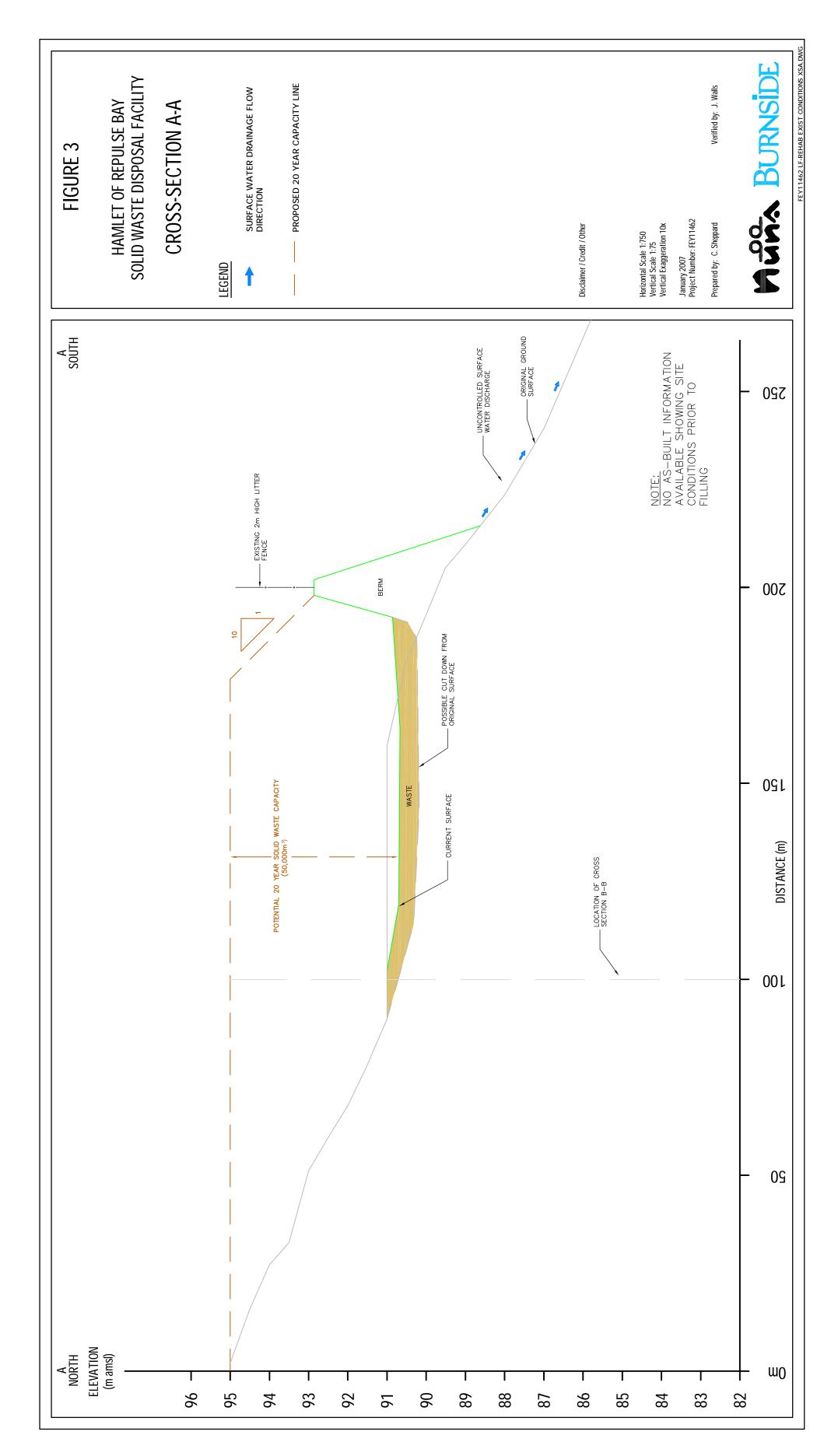


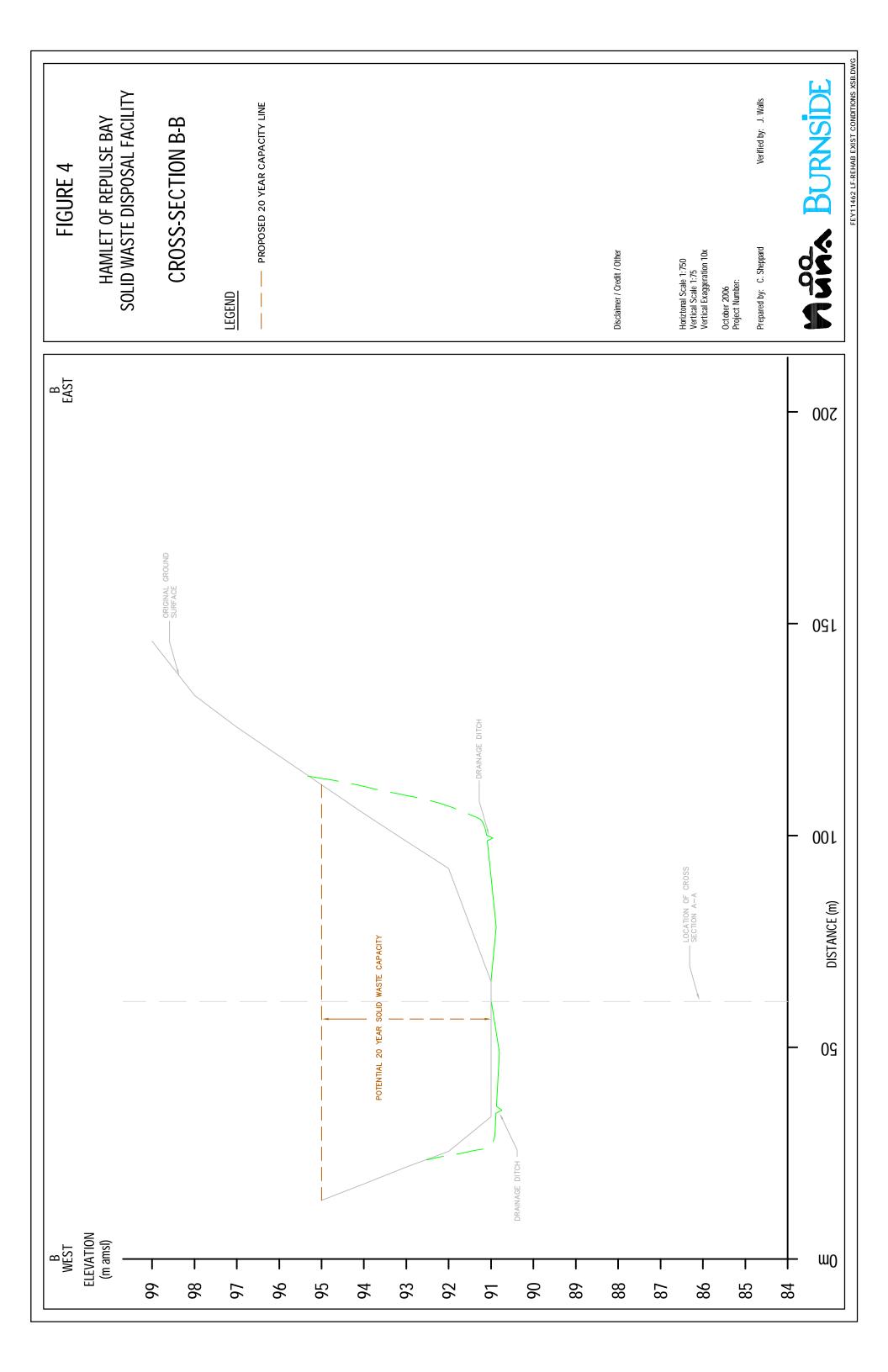
Prepared by: C. Sheppard

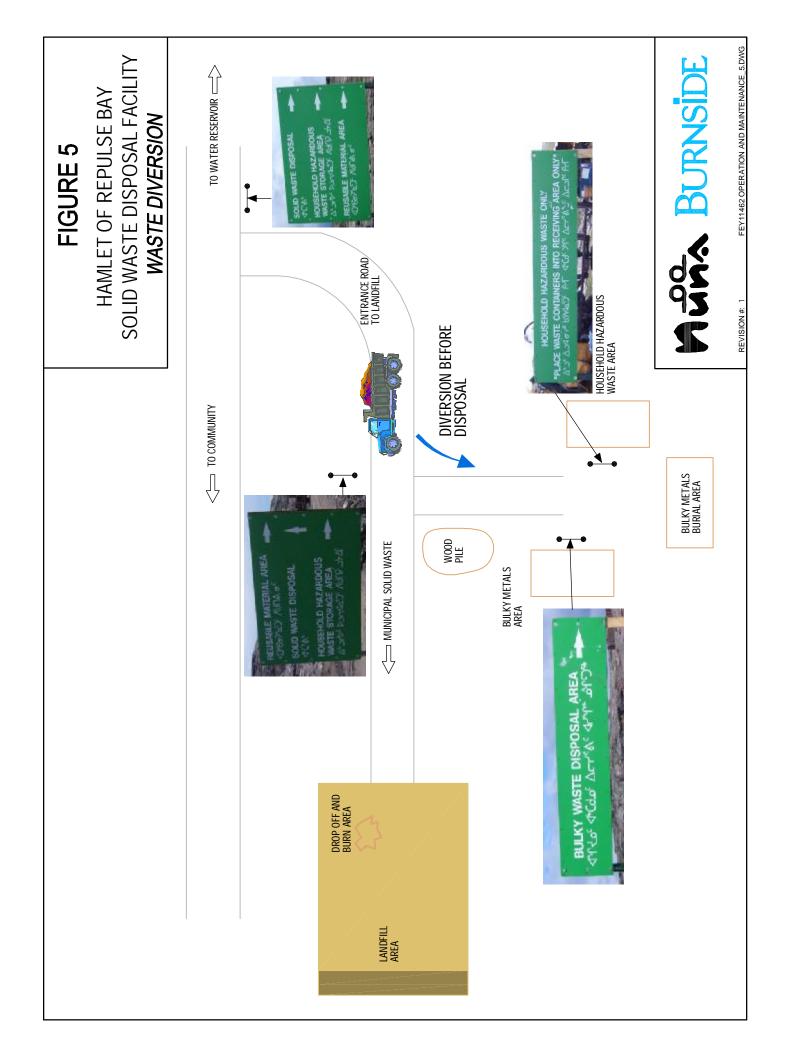
Verified by: J. Walls

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FEY11462 LF-REHAB EXIST CONDITIONS SP.DWG







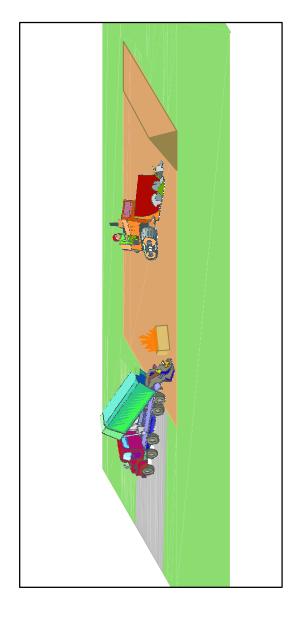
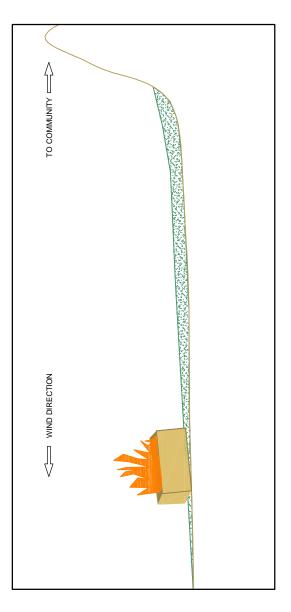


FIGURE 6

SOLID WASTE DISPOSAL FACILITY DROP OFF AND BURNING HAMLET OF REPULSE BAY

MUNICIPAL WASTE IS DUMPED IN THE DROP OFF AREA. THE GARBAGE TRUCK SHOULD NOT DRIVE ONTO AREAS WITH EXPOSED WASTE THAT COULD DAMAGE THE TIRES.



WASTE IS BURNED IN AN OPEN PILE OR WITHIN A BURN BIN. BURNING SHOULD TAKE PLACE WHEN THE WIND IS NOT BLOWING TOWARDS THE COMMUNITY.

Project Number: FEY11462 January 2007

Prepared by: J. Amsen

Verified by: J. Walls



FLANSIDE BURNSIDE

REVISION #: 1

FEY11462 OPERATION AND MAINTENANCE_1.DWG

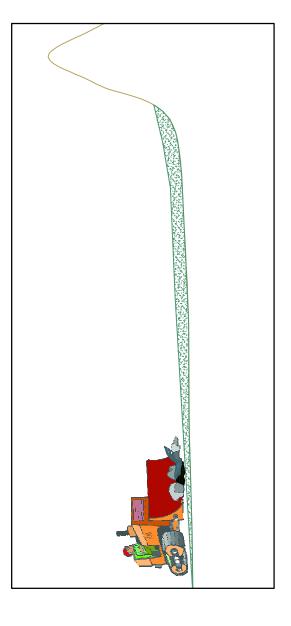
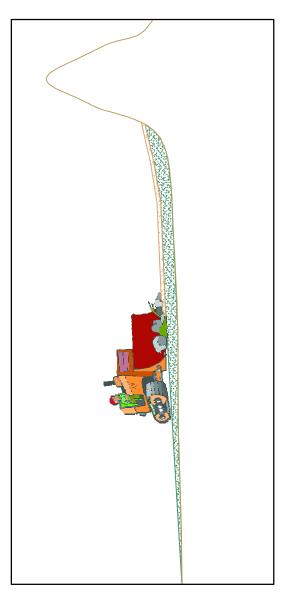


FIGURE 7

HAMLET OF REPULSE BAY OPERATION AND MAINTAINENCE PLAN COMPACTION

BURNED WASTE IS PUSHED ONTO THE FILL AREA.



WASTE IS SPREAD OVER A SMALL AREA AND COMPACTED BY MAKING SEVERAL PASSES WITH THE EQUIPTMENT. LAYERS SHOULD BE 250mm TO 300mm (10 TO 12 inches) FOR OPTIMAL WASTE COMPACTION. 50mm TO 100mm (2 TO 4 inches) OF COVER SOIL IS ADDED WHEN AN AREA (cellular layer) HAS BEEN FILLED.

January 2007 Project Number: FEY11462

Prepared by: J. Amsen

Verified by: J. Walls



REVISION #: 1

FEY11462 OPERATION AND MAINTENANCE_2.DWG

YEAR 10-15 **YEAR 5-10**

FIGURE 8

PROGRESSIVE WASTE DEPOSITIVE **OPERATION AND MAINTENCE PLAN** HAMLET OF REPULSE BAY

ACROSS THE SITE IN COMPACTED LAYERS MAINTAINING AN EVEN WORKABLE SLOPE NEVER EXCEEDING 3:1 WASTE IS BUILT UP PROGRESSIVELY

HEIGHT OF THE INITIAL BERM ANOTHER BERM CAN BE CONSTRUCTED AND FILLING CAN CONTINUE. TO EXTEND SITE LIFE BEYOND THE

SECONDARY BERM

January 2007 Project Number: FEY11462

Prepared by: J. Amsen

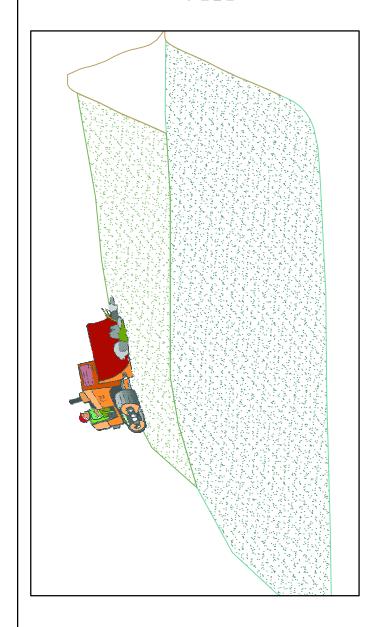
PRIMARY BERM

Verified by: J. Walls

FLANSIDE BURNSIDE

REVISION #: 1

FEY11462 OPERATION AND MAINTENANCE_3.DWG



OPERATION AND MAINTENCE PLAN FINAL GRADING AND CLOSURE HAMLET OF REPULSE BAY FIGURE 9

THIS PROCESS CAN CONTINUE
PROVIDED ENGINEERING REVIEWS ARE
DONE TO CONFIRM STABILITY AND
ENVIRONMENTEAL CONDITIONS.

SITE CLOSURE WILL CONSIST OF 600mm OF THE MOST IMPERMIABLE COVER SOIL LOCALLY AVALIBLE. MAXIMUM SLOPE 3:1. THE SURFACE CAN BE STABILIZED WITH COBBLES AND ROCK TO RESEMBLE THE APPERANCE AND CONDITION OF THE SURROUNDING TUNDRA.

Project Number: FEY11462 January 2007

Prepared by: J. Amsen

Verified by: J. Walls

FLANSIDE BURNSIDE

REVISION #: 1

FEY11462 OPERATION AND MAINTENANCE_4.DWG



Appendix A Site Forms

Hamlet of Repulse Bay Weekly Landfill Inspection Form

Inspected by:I		_Date:			
Wind direction:		_Temperature:			
Precipitation: Ground cover:		_Ground cover:			
			YES	NO	
1.	Is roadway and truck pad clear of snow	??			
2.	Does roadway require grading?				
3.	Is there visible erosion on the berms?				
4.	Is all signage visible and in tact?				
5.	Is there litter on the fences?				
6.	Is there evidence of leachate break-out	from the face of the landfill?			
7.	Are fences in good condition?				
8.	Has there been any evidence of scavenge	ging?			
9.	Is there water accumulating in the Water	er Retention Area			
10.	Has any hazardous material been incorp	porated into the waste pile?			
11.	Does the waste require placement into	the landfill?			
12.	Are there any problems on the site?				
13.	Other Issues and Notes				

Hamlet of Repulse Bay Waste Placement Form

Date	Quantity Present upon arrival (m³)	Quantity Delivered (m³)	Number of Trips	Additional Activities (i.e., burning, tipping over edge, maintenance)	Initials