Solid Waste Management Facility
Operation and Maintenance (O&M) Plan
Hamlet of Kugluktuk

Prepared by

Nuna Burnside Engineering and Environmental Ltd.
Box 175 Rankin Inlet NU X0C 0G0 Canada
15 Townline Orangeville ON L9W 3R4 Canada

March 2007

File No: N-O 09755

Table of Contents

1.0 Introduction 1
1.1 Hamlet Description 1
1.2 Climate 2
1.3 Geology and Morphology 2
1.4 Nunavut Water Board License 3
1.5 Health and Safety 3
1.6 Training 4
1.7 Detailed Design of the Solid Waste Management Facility 4

2.0 Operation and Maintenance 5
2.1 Overview 5
2.2 Material Arrival 5
2.3 Wood 6
2.4 Bulky Metals Disposal Area 6
2.5 Hazardous Waste Storage Area 7
2.6 Landfill (Municipal Solid Waste Disposal Area) 8
2.7 Landfarm Area 11
2.8 Special Wastes 14
2.9 Site Closure and Restoration 14
2.10 Reuse/Recycle 15

3.0 Contingency Measures 16
3.1 General Contingencies 16
3.1.1 Environmental Emergency Contingency Plan 16
3.1.2 Injuries 16
3.1.3 Fires 16
3.1.4 Erosion 16
3.2 Accumulation of Impacted Water 17

4.0 Solid Waste Management Facility Monitoring Procedures 18

5.0 Reporting 20

6.0 Summary 22

7.0 Reference Documents 23

Figures

1 Site Location
2 Key Features of Community
3 Regional View of Lagoon and Solid Waste Disposal Facility (Landfill)
4 Solid Waste Management Facility Details
5 Landfill Development Year 1
6 Landfill Development Year 5
7 Landfill Development Year 10
8 Landfill Development Year 15
9 Landfill Development Year 20
10 Bulky Materials Disposal Pit
11 Waste Diversion
12 Drop Off & Burning
13 Compaction
14 Progressive Waste Deposition
15 Final Grading and Closure
16 Sample Locations

Appendices

A Water Board License
B Site Forms
C Canadian Environmental Quality Guidelines
D Annual Monitoring Report Format

1.0 Introduction

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

The Hamlet of Kugluktuk Solid Waste Management Facility consists of the following components:

- Landfill (also referred to as the Municipal Solid Waste Disposal Area)
- The Bulky Materials Disposal Area
- The Landfarming Area
- The Hazardous Waste Storage Area.

The facility has been in use for approximately 15 years, and currently operates under Water Board License NWB3KUGO308 issued November 20, 2003. The license expires November 30, 2008. A copy is included in Appendix A.

1.1 Hamlet Description

The Hamlet of Kugluktuk (formerly known as Coppermine), is situated on Coronation Gulf at the mouth of the Coppermine River. The Hamlet is situated on a rocky area on the west side of the Coppermine River, at latitude 67°49'N, longitude 115°06'W, as shown on Figure 1.

The community has a population of approximately 1,585, with an approximate 1.5 percent projected growth rate. Community infrastructure includes:

- A water treatment plant, that draws water from the Coppermine River and stores it for treatment
- Trucked water to holding tanks in each building
- A sewage lagoon that receives trucked sewage collected from holding tanks in each building
- Sewage treatment via an exfiltration lagoon to a wetland discharging north to the ocean
- A Solid Waste Management Facility, that includes a Municipal Solid Waste Disposal Area, a Bulky Materials Disposal Area, a Hazardous Waste Storage Area and a Landfarm (all currently being upgraded)
- Several rock and sand quarries
- Diesel powered generators
- Two wind generators (one partially dismantled and the other currently off-line)
- Barge landing area.

Key features of the community are shown on Figure 2. The landfill and sewage lagoon locations are shown on Figure 3.

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 a high school, an elementary school, arena, swimming pool, Hamlet office, public works yard, GN offices, and police station.

1.2 Climate

Kugluktuk is affected by Arctic air masses, and experiences a maritime Arctic climate characterized by short cool summers, and long cold winters. The mean annual air temperature is -12°C. Monthly averages range from -31°C in February to 10°C in July. Kugluktuk receives about 249 mm of precipitation per year, of which 134 mm falls as rain between June and September. Prevailing winds are from the east in summer and from the southwest in winter. The mean wind speed is approximately 15 km/hr.

1.3 Geology and Morphology

The terrain surrounding Kugluktuk consists of coastal lowlands of sand and clay plains dotted with shallow lakes.

The ground surface consists of bedrock and glacial deposits. Boulder and cobbles cover some areas. Much of the surface is covered with turf consisting of various grasses, sedges, and moss underlain by a thin (10 cm to 30 cm) layer of topsoil and/or peat.

The land area around Kugluktuk is underlain by permafrost estimated at several hundred metres thick. There is no permafrost under major water bodies such as Coronation Gulf. A deep zone of non-permafrost probably exists as a talik beneath the Coppermine River. The depth of the active layer over most of the land area is dependent on vegetation cover, soil type, and moisture conditions. Test pitting in the vicinity of the sewage lagoon and landfill found the top of the permafrost in early October to be approximately 0.9 m below surface.

The bedrock in the area consists of Proterozoic fine grained sedimentary and meta-sedimentary (shale) of the Rae Group. These have been intruded by the Coronation Sills, which are composed primarily of granular gabbro.

A northeast trending ridge of bedrock dominates the topography from Heart Lake to the mouth of the Coppermine River. Both gabbro and shale have been quarried locally for construction materials.

The area is dominated by the effects of isostatic rebound following the last glaciation, and deposits related to the discharge of the Coppermine River. West of Kugluktuk (between the sewage lagoon and the ocean) is an area of raised beach ridges comprised of well sorted medium grained sand. More varied fine to coarse sediments are found in the Hamlet and along the west side of the Coppermine River. Sand is quarried at a pit located near the west end of the runway. Another area used for extraction of sandy construction material is located near the east end of the runway. A small clayey deposit has been identified on the south side of the runway and occasionally between beach ridges.

Most of the overburden material would be suitable as daily and interim landfill cover. Clay and silt materials would be suitable for final cover.

1.4 Nunavut Water Board License

The Solid Waste Management Facility operates under Nunavut Water Board License Number NWB3KUG0308, issued November 30, 2003. It expires November 30, 2008 (Appendix A).

An application for an amendment has been made, coincidental with work currently being conducted by Nuna Burnside, for the design of improvements to the sewage lagoon and Solid Waste Management Facility.

This O&M Plan has been prepared for the proposed changes to the Solid Waste Management Facility. Amendments to this document may be required once the Nunavut Water Board issues a revised license.

This O&M Plan includes items outlined in the requirements of the current license such as:

- Operation and Maintenance Plans
- Environmental Emergency Contingency Plan (Spill Contingency Plans) – separate document
- Monitoring Program and Quality Assurance/Quality Control Plan – separate document.

This O&M Plan should be updated when the amended NWB license is issued.

1.5 Health and Safety

Health and Safety of workers and the public is the first priority during the operation of the Solid Waste Management Facility. The requirements of the Nunavut Safety Act must be followed at all times. All actions and operations must be undertaken with safety as the first priority.

1.6 Training

Staff training is an important aspect of operating a Solid Waste Management Facility. Staff must be adequately trained to follow this O&M Plan and operate the facility. This O&M Plan depends on effective site specific training.

1.7 Detailed Design of the Solid Waste Management Facility

The location of the Solid Waste Management Facility is displayed on Figure 2. The layout of the facility, access road, and adjacent Sewage Treatment Facility is displayed on Figure 3.

The Solid Waste Management Facility is located on both sides of Coronation Drive. On the north side is the landfill (also referenced to as the Municipal Solid Waste Disposal Area), which includes the Landfarm and Hazardous Waste Storage Area. On the south side of the road is the Bulky Metals Disposal Area, which includes segregation of material for reuse and recycling. Design details are presented in Figure 4.

2.0 Operation and Maintenance

2.1 Overview

The Hamlet of Kugluktuk Solid Waste Management facility consists of three main components:

- Bulky Metals Disposal Area (which includes a recycling and reuse segregation area)
- Hazardous Waste Storage Area
- Landfill (solid waste disposal area).

The site is designed as a natural attenuation landfill. It does not have a liner, so small amounts contaminants are able to leach from the waste and enter the natural environment. The design also relies on permafrost gradually migrating into the waste at depth as it is covered over.

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 3 displays the layout of the solid waste disposal facility and surrounding area. Figures 5 through 9 shows the site in cross-section at it develops over time.

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

2.2 Material Arrival

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

After Hamlet staff collects 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. 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.

The layout of the site and the waste diversion process is displayed on Figure 11.

Effective placement of bilingual signage encourages diversion and directs the public to the appropriate areas within the facility (Figure 11).

As shown on Figure 11, materials are assessed prior to disposal in the landfill. If the material is something other than municipal solid waste, it is assessed according to the following criteria:

- Canadian Environmental Quality Guidelines
- Environmental Guideline for Industrial Waste Discharges.

If the material meets the industrial landuse criteria for disposal in the landfill, it is landfilled. If not, it must be treated (landfarmed) or stored as hazardous waste.

Suitability for landfarming will be based on the volume, type of contaminants, and concentration of contamination. A cost/benefit analysis is done to determine if landfarming is a better alternative than storage as hazardous waste and eventually shipped out of the community.

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 B. 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

Wood materials that may have reusable value are placed in the wood pile in the reuse/recycle area that is part of the Bulky Metals Disposal Area. 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

The Bulky Metals Disposal Area consists of a segregation area for reuse and recycling of materials such as metals, tires, vehicles, and equipment. Bulky metals are segregated and stockpiled until there is a sufficient quantity that warrants a burial event.

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, 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 materials.

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 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.

A detail of the pit for the burial of bulky metals at the Bulky Metals Disposal Area is displayed on Figure 10.

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 Hazardous Waste Storage Area. Batteries must be stored upright. Oils, lubricants and antifreeze may be bulked together in common drums, preferably remaining in their original packaging. Unknown substances should remain in their packages and placed into drums.

Hazardous wastes will be labelled and assigned for removal from the community to a licensed receiver in the south when the storage area nears capacity or when a cost effective volume to warrant shipping was accumulated. Based on historical accumulation notes, this is expected to be once every five years. One alternative to shipping oils, fuels and glycol is to bring in a portable incinerator to treat the materials on-site. An appropriately licensed contractor should be retained to conduct the work.

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 who will remove them from the community and dispose of them in a licensed facility.

The Hazardous Waste Storage Area is lined and contained in a berm.

If rainwater collects in the area it should be tested. If the quality is acceptable, it can be transferred to the sewage lagoon. If not, pre-treatment will be required. Treatment would be dependent on the type and concentrations of the contaminants. Refer to the Environmental Contingency Plan for details on assessment of hazardous materials. Sampling will be conducted, as needed, as outlined in the monitoring and QA/QC plan.

2.6 Landfill (Municipal Solid Waste Disposal Area)

The layout of the landfill is displayed on Figures 3 and 5. 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:

- Burn only in the established burn area
- 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
- 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
  - 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 deleterious 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 municipal wastes will be pushed away from the burn pit and along the active face, observing the following operating principles:

- All waste shall be removed from the tipping and burn areas

- 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:

- Divert hazardous material, bulky metals, and reusable/recyclable materials – Figure 11
- Drop off waste at the designated area at the end of the access road. This could be end dumped from a ramp or piled on the ground as conditions allow – Figure 12
- Conduct burning on a regular basis when climate conditions are favourable – Figure 12
- Scrape the burned waste off the drop off area and move it into the fill area – Figure 13
- Compact and layer the waste 250 mm to 300 mm thick – Figure 13
- Gradually build up waste layers across the fill area – Figure 14
- Construct an additional berm once waste levels reach the height of the existing berm – Figure 14
- Continue filling to achieve final site grades over the designed waste footprint – Figure 15
- Close the fill area once final grades (maximum 3:1 slopes) are achieved – Figure 15
- Apply the final 600 mm of cover and stabilize the surface with cobbles – Figure 15.

The year 1 through 20 advancement to contour is shown on Figures 5 though 9. The site is designed so landfill staff have the flexibility to progressively fill the landfill in different patterns that is most suitable to their equipment and preferences. For example, the landfill can be progressively filled from one side to the other in a side to side cell fashion.

2.6.2 Maintenance

Operations staff will perform weekly site inspections and maintenance. During these inspections, weekly site inspection forms (Appendix B) 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 roadways shall be maintained by snow clearing in the winter and grading in the summer, and repaired as necessary
- Ditches and drainage channels shall be inspected for erosion, and repaired as necessary
- Site warning signage, which identifies the boundaries of the Solid Waste Management Facility (which includes the landfill, Hazardous Waste Storage Area, and the Bulky Metals Disposal Area) shall be inspected, and repaired or replaced as necessary
- 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
- Litter that has accumulated against the fences shall be removed and placed into the landfill
- After rain events and following the spring thaw, the site shall be inspected for leachate breakout. If leachate breakouts are identified, cover the face if possible and ensure that leachate is being contained
- The berms and final cover at the landfill shall be inspected for erosion and settlement
- The fences 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 Hazardous Waste Storage Area. Materials should be left in their original container and placed into the drums, sorted according to contents (i.e., waste oils stored with oils, solvents with solvents, cleaners with cleaners). Drums will remain 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 must 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:

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

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

Complaints from the public should be recorded and reported to the Public Works foreman. Complaints and the responses to complaints should be documented in the Annual Report for the site.

2.7 Landfarm Area

2.7.1 Overview

The landfarm area is located within the Solid Waste Management Facility, and is contained within its berm and fencing. It is also enclosed with its own berms and access ramp (Figure 4). The landfarm is lined with an HDPE liner to protect the environment. The floor of the landfarm slopes slightly towards the end away from the access ramp, so any excess surface water will collect along the east berm creating a sump.

It is expected that the majority of the soils requiring landfarming will be impacted by petroleum hydrocarbons such as gasoline, diesel, heating oil, and lubricants.

Sewage sludge can also be placed in the landfarm for treatment if the quality of the sludge removed from the lagoon is unsuitable for direct placement as landfill cover.

The landfarm may be used to contain the sewage sludge while it dries and, with some treatment, bio-degradation of the sewage is possible.

The landfarm can be used in an active mode, which involves maintaining moisture and nutrients, regular tilling, and monitoring, or a more passive mode involving only occasional tilling and monitoring. This will be up to the Hamlet to decide which method is preferred.

2.7.2 Landfarm Operation

The following outlines the soil treatment operations and methods to prevent damage to the underlying liner. It is assumed that conventional construction equipment will be used and experienced operators will be conducting the soil mixing and moving operation.

- The impacted soil should be placed up to a maximum thickness of 0.6 m for treatment

- The facility will remain dormant over the winter periods until the ambient temperatures are favourable for treatment

- Low ground-pressure equipment (i.e., Bobcat; back-hoe) should be used to move the soil while operating inside the landfarm. Equipment should not travel directly on the liner until a minimum of 300 mm of impacted soil is placed. No sharp turning of equipment is allowed directly on the liner.

- Objects that have the potential to puncture the underlying liner, such as metals, sharp rocks, and scrap wood should be removed from the impacted soil before it is transported to the landfarm for treatment

- A small sump area should be left open along the east berm and not filled with impacted soil

- Liquid fertilizer should be sprayed over the impacted soil prior to soil turning and mixing. Site staff should determine the best type of fertilizer, the optimum concentration, and application quantity for the soil treatment. Spraying should not be conducted in windy conditions to prevent off site impacts

- The hydrocarbon impacted soil should be turned and mixed immediately after the fertilizer application. The soil is to be turned with an excavator to expose the soil from below. The mixing process should be conducted with care such that the underlying liner is not disturbed or damaged

- The impacted surface water and leachate collected from the collection sump (down slope berm face) should be stored temporarily in a tank. The liquid can be mixed with the impacted soil for treatment, provided the soil requires additional liquid for treatment. Soil moisture should be monitored to optimise and monitor the treatment process

- The excess leachate or surface water collected in the sump that will not be used in mixing with the soil can be stored in the Hazardous Waste Storage Area

- The liquid level shall be monitored to avoid overflow

- Any large accumulation of snow shall be removed as necessary, without removing any of the impacted soil, to prevent flooding or excessive soil moisture

- Mixing and turning of overly dry soil should be kept to a minimum to prevent dust generation

- The Environmental Contingency Plan should be implemented in the event of an environmental hazards (e.g. spill; liner damage, etc.)

- Site staff will have to undergo appropriate training and be provided with the appropriate personal protective equipment.

2.7.3 Landfarm Soil Monitoring

Approved industry standards and methods for sampling, shipping, and handling procedures must be followed to ensure that representative soil samples are taken, and

chemical integrity of the soil samples is maintained during transportation. A work plan including sampling frequency, sampling location, and sampling methods should be prepared and implemented prior to the operation. Soil samples may be taken once every month during the period of active soil treatment depending on the remedial program. A record of sampling and chemical analysis shall be maintained to monitor the performance of the treatment.

A health and safety plan should be developed specific for the work involving soil sampling and handling. The plan should include personal protective equipment and an emergency response plan.

Monitoring of the soil will be specific to the material emplaced (hydrocarbon impacted, sewage sludge, etc.).

2.7.4 Comparative Criteria

The Canadian Environmental Quality Guideline (CCME, 2006) are recommended as the most appropriate comparative criteria, to determine when landfarmed soil can be removed from the landfarm and used as cover material at the landfill. The Industrial landuse criteria as outlined in Chapter 7 for soil in the Canadian Environmental Quality Guidelines must be met in order for the soil to be placed in the landfill (Appendix C).

The following guideline criteria are the most typical hydrocarbon fraction thresholds that must be achieved in order to use the soil in the landfill.

Clean-up Criteria for Contaminated Soil at Landfarm

	Criteria (mg/kg)
Petroleum Hydrocarbon Fraction-1 (F1)	310
Petroleum Hydrocarbon Fraction-2 (F2)	760
Petroleum Hydrocarbon Fraction-3 (F3)	1700
Petroleum Hydrocarbon Fraction-4 (F4)	3300

2.7.5 Use of Landfarmed Soil

Depending on the type of contaminants and the clean-up criteria achieved by the landfarming process, the soils could be suitable for re-use as landfill cover. This assumes the material can meet the Canadian Environmental Quality Guidelines as outlined in Chapter 7 for Soil Industrial Landuse criteria, which are the threshold limits for disposal

in the landfill. Once this is achieved, the material can be used for interim cover or part of final cover.

2.7.6 Environmental Monitoring

The landfarm is within the Solid Waste Management Facility, so environmental monitoring of impacts will be conducted as part of the monitoring and reporting for the entire facility.

2.7.7 Reference Document for Landfarm

The Code of Practice for Land Treatment of Soil Containing Hydrocarbons (Alberta Environment, 2005), provides a good reference source for landfarms in the absence of Nunavut specific guidelines.

2.7.8 Landfarm Operation Training

As outlined herein, detailed operational procedures for the landfarm cannot be developed until there is a specific case of material requiring landfarming. Staff must receive the appropriate training in order to operate the landfarm effectively.

2.8 Special Wastes

On occasion, the Hamlet may be faced with determining if a waste material is of an unusual nature (contaminated soil, ship ballast, sand blasting waste, etc.). Since the landfill is designed and licensed to accept only municipal waste, an assessment process is followed to determine if the special waste is suitable for disposal at the site. As a general protocol, any solid material which meets the Canadian Environmental Quality Guidelines for Soil – Industrial landuse Criteria is likely acceptable. If the material cannot be sampled and tested in this fashion, outside expertise should be brought in to make an evaluation and recommendation to the Hamlet. When in doubt the safest practice is to store the material in the Hazardous Waste Storage Area, or if the quantity is too great in the landfarm area, as both areas are lined.

2.9 Site Closure and Restoration

The closure plan for the landfill area is displayed on Figure 9, assuming the site is filled in year 20. There is available land around the landfill which may permit site expansion and continued use beyond the current design. Post closure care will include:

- creation of a closure plan and post closure monitoring plan at least two years prior to closure, for which a new submission for a water license amendment will be required
- long term monitoring
- Surficial inspections and cover maintenance as required
- Restoration of the surface to match the surrounding natural tundra.

Figure 15 displays an alternative for continued use beyond year 20. Neither option has been "engineered" at this time. They are just presented as possibilities that could be explored as the site reaches capacity. The same closure design can be used to cover the hazardous waste storage areas and landfarm once they have been cleaned out and are no longer required. The closure plan for the bulky metals burial pit is shown in Figure 10. Each burial event will be conducted in the same fashion.

2.10 Reuse/Recycle

A reuse/recycle area has been established in the bulky metals area. Hamlet landfill staff have been operating it effectively and the current design includes continuing this practice. This is an effective way to reduce landfilling and prevent scavenging in the landfill.

3.0 Contingency Measures

3.1 General Contingencies

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.

3.1.1 Environmental Emergency Contingency Plan

A separate document entitled Environmental Contingency Plan, Hamlet of Kugluktuk, dated March 2007, was prepared as part of a submission for an amendment to the NWB license. Refer to that document for the response to spills and environmental contingencies.

3.1.2 Injuries

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

- Apply first aid
- Seek medical assistance, if necessary
- Report the injury to the supervisor
- Document the incident and all response measures on the Weekly Waste Management Facility Inspection Form (Appendix D).

3.1.3 Fires

In the event of a fire, assess the situation. Do not attempt to fight a fire if it cannot be done safely. Standard fire fighting equipment that can manage most small fires is available in a shed near the Hazardous Waste Storage area. 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 B).

3.1.4 Erosion

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

3.2 Accumulation of Impacted Water

At some point, for a variety of reasons, impacted water may accumulate in the landfill, hazardous waste storage area or landfarm.

The water may or may not be impacted by leachate, hazardous wastes or contaminants from land farmed soil. Given the climate and current lack of issues with respect to accumulation of impacted water, this is not anticipated to be a significant problem, however, in the event this occurs, the following procedures will be followed:

- Collect samples as outlined in the Monitoring Program and QA/QC Program document
- Analyze samples for parameters of concern and compare the results to the recent criteria (Nunavut Guidelines, Canadian Water Quality Guidelines, etc.)
- Dispose of the water. Disposal options are dependent on the water quality and could include:
  - Transportation and disposal in the sewage lagoon – direct discharge to the environment is discouraged
  - Pre-treatment (filter, chemical, etc.) prior to discharge to the sewage lagoon
  - Containment and storage of hazardous waste.

4.0 Solid Waste Management Facility Monitoring Procedures

As outlined in the NWB water license, regular monitoring of runoff from the Solid Waste Management Facility is required. The Monitoring Program is to include effluent samples collected from the water collection pond during the months of June to September, if the pond requires discharging. Landfill impacts will also be assessed when sampling downgradient of the landfill as part of the Wetland Treatment Area sampling program as shown on Figure 16.

The monitoring program is outlined in detail in the Monitoring and QA/QC Plan, Hamlet of Kugluktuk (prepared as a separate document).

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 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 additional analytical parameters which are 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.

It is recognized that it may take some time for results to be received from the accredited laboratory. In the event that the water retention area fills to the invert, it should be inspected for odours, stain, or signs of visible impact (sheens, floating scum). The invert may be blocked to facilitate additional water accumulation in this case, until the results are received.

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.

Monitoring results will be compared to the Canadian Environmental Quality Guidelines (CCME, 2006), specifically the Chapter 4 Criteria for Water: Aquatic Life – Freshwater

(Appendix C). The water retention pond cannot be discharged unless the quality meets this criteria.

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

5.0 Reporting

The Nunavut Water Board License, Part B: General Conditions includes the requirement to file an Annual Report with the NWB no later than March 31st of the year following the calendar year reported, which shall include:

- Tabular summaries of all data generated under the "Monitoring Program"
- The monthly and annual quantities in cubic metres of fresh water obtained from all sources
- The monthly and annual quantities in cubic metres of each and all waste discharged
- A summary of modifications and/or major maintenance work carried out on the Water Supply and Waste Disposal Facilities, including all associated structures and facilities
- A list of unauthorized discharges and summary of follow-up action taken
- A summary of any abandonment and restoration work completed during the year and an outline of any work anticipated for the next year
- A summary of any studies, reports and plans (i.e. Operation and Maintenance, Abandonment and Restoration, QA/QC) requested by the Board that relate to waste disposal, water use or reclamation, and a brief description of any future studies planned
- Any other details on water use or waste disposal requested by the Board by November 1st of the year being reported.

The format of the NWB Annual Report is included in Appendix D.

The creation of the report can be greatly simplified by the regular filling in and handling of the Site Forms included in Appendix B. The forms include:

- Form 1 – Waste Placement Form – describing the day to day delivery of waste and site activities
- Form 2 – Weekly Waste Management Facility Inspection Form – to document the weekly inspection and observation of the site operation and infrastructure
- Form 3 – Solid Waste Planning – which provides a list of items to be discussed by the site foreman and Hamlet Council related to short term and long term solid waste decision making.

In addition to the context of these forms, there would be sampling information and analytical data. Using the forms and following the procedures provided herein should make submitting the annual monitoring report relatively straight forward.

6.0 Summary

This Operation and Maintenance Plan has been prepared for the Hamlet of Kugluktuk, to assist Hamlet staff to operate the Solid Waste Management Facility as effectively as possible, based on the design and construction layout.

A Solid Waste Planning form has been included in Appendix B, to allow the Hamlet to track and evaluate the various aspects of their Solid Waste Management Facility. The form is designed to be used by the site foreman and Hamlet Council, when evaluating and planning Solid Waste Management over both the short term (1 to 5 years) and long term (5 to 20 years). It will assist in identifying issues and developing the strategies and budgets to deal with them.

The site design and the Operation and Maintenance Plan has been prepared to allow operational flexibility, so site staff can maximize efficiency with the changing seasons and available equipment.

Appropriate training for site staff is necessary as part of the implementation of this O&M Plan. This document should be reviewed and updated annually, and whenever the NWB Water License is amended or new relevant legislation is issued.

7.0 Reference Documents

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

- Canadian Council of Ministers of the Environment (CCME), *Canadian Environmental Quality Guidelines,* Update 6.0, July 2006

- *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

- *Consolidation of General Sanitation Regulations* under the Public Health Act

- *Nunavut Safety Act*

- *Nunavut Waters and Nunavut Rights Tribunal Act*

- 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*
  - *Environmental Guideline for Industrial Waste Discharges*
  - *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*

- The following polices prepared by the Government of Nunavut:
  - *Waste Lead (Draft)*
  - *Policies Regarding Open Burning*
  - *Management of Fluorescent Lamp Tubes.*

- *Spill Contingency Planning and Reporting Regulations*, Government of the Northwest Territories, 1998.

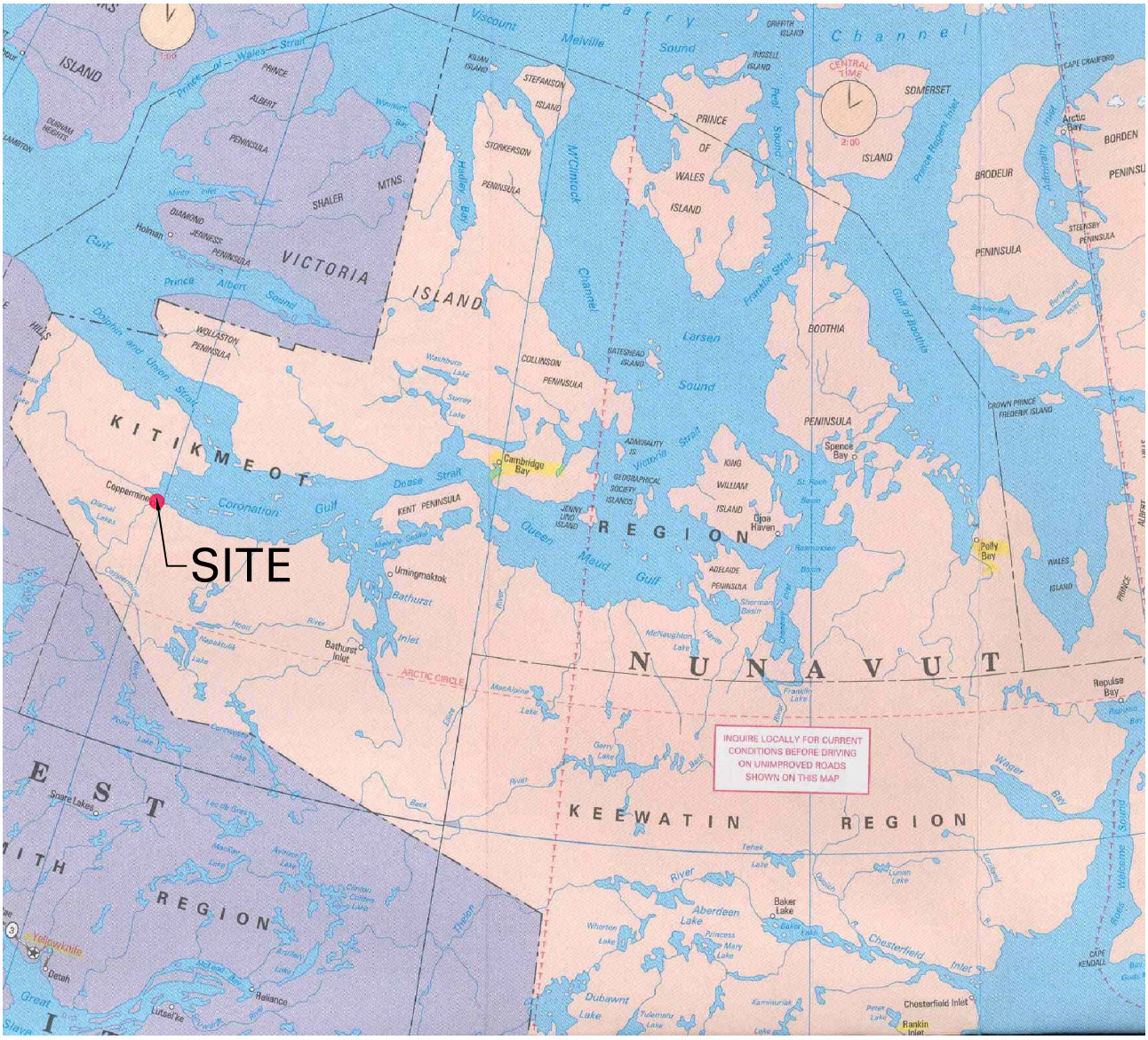
Hamlet specific documents include:

- The amended *Nunavut Water Board License* which may have additional specific requirements
- *Environmental Emergency Contingency Plan, Hamlet of Kugluktuk*
- *Monitoring Program and QA/QC Plan, Hamlet of Kugluktuk.*

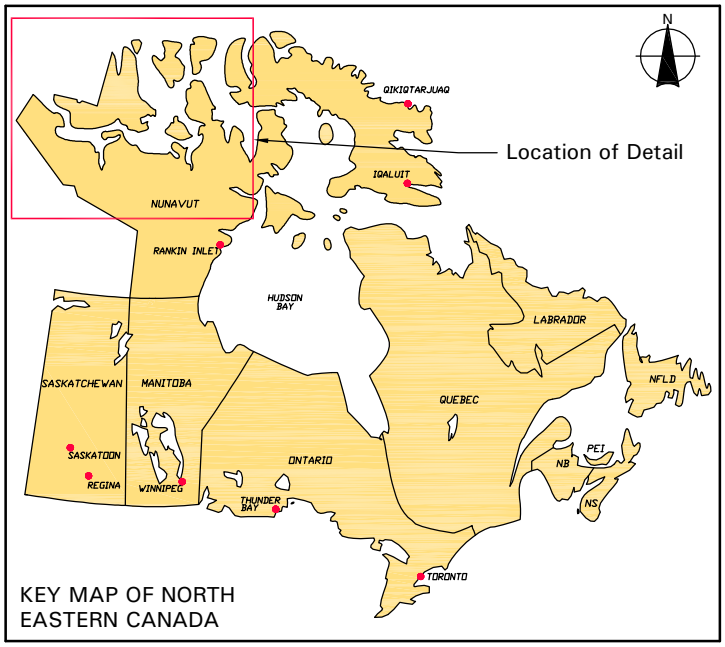
For the landfarm:

- *Code of Practice for Land Treatment of Soil Containing Hydrocarbon*s, Alberta Environment, October 2005.

Figures



Map Reference:
Map of Canada
Published by the CAA



KEY MAP OF NORTH EASTERN CANADA

FIGURE 1 - SITE LOCATION

THE HAMLET OF KUGLUKTUK, NUNAVUT

SOLID WASTE MANAGEMENT FACILITY OPERATION AND MAINTENANCE (O&M) PLAN - MARCH 2007

March 2007
Project Number: FE009754

Prepared by: J. Amsen

Verified by: J. Walls

FE009754 O&M SWF MARCH 2007 SL.DWG

FIGURE 2

HAMLET OF KUGLUKTUK

SOLID WASTE MANAGEMENT FACILITY OPERATION AND MAINTENANCE (O&M) PLAN - MARCH 2007

KEY FEATURES OF COMMUNITY

Image Platform: Quick Bird (Satellite)
Image Acquisition: 01 July, 2002
Spatial Resolution: 0.6m

N

0 200 400 600 800 1000 1200 1400 1600
Meters

1:20,000
March 2007
Project Number: FE009754

Projection: UTM Zone 16
Datum: NAD83

Prepared by: J. Amsen

Verified by: J. Walls

NUNA BURNSIDE

FE009754 O&M SWF MARCH 2007 COMMUNITY PLAN.dwg

FIGURE 3

HAMLET OF KUGLUKTUK

SOLID WASTE MANAGEMENT FACILITY OPERATION & MAINTENANCE (O&M) PLAN - MARCH 2007

REGIONAL VIEW OF SEWAGE LAGOON AND SOLID WASTE DISPOSAL FACILITY (LANDFILL)

Legend

KUG-2 — SURFACE WATER SAMPLING LOCATION *(To be replaced once new facilities are in place)*

WS-2 — WETLAND WATER SAMPLING LOCATION

KUG-2A — PROPOSED SURFACE WATER SAMPLING LOCATION *(For new facilities)*

OUTLINE OF WETLAND TREATMENT AREA (10 ha)

OUTLINE OF EXPANDED WETLAND TREATMENT AREA (5.1 ha)

OUTLINE OF POTENTIAL FUTURE WETLAND TREATMENT AREA *(If required)* (30 ha)

Image Platform: Quick Bird (Satellite)
Image Aquisition: 01 July, 2002
Spatial Resolution: 0.6m

N

0 20 40 60 80 100 120 140 160 180 200 220 240

Meters

1:3000
March 2007
Project Number: FEO-09754

Projection: UTM Zone 16
Datum: NAD83

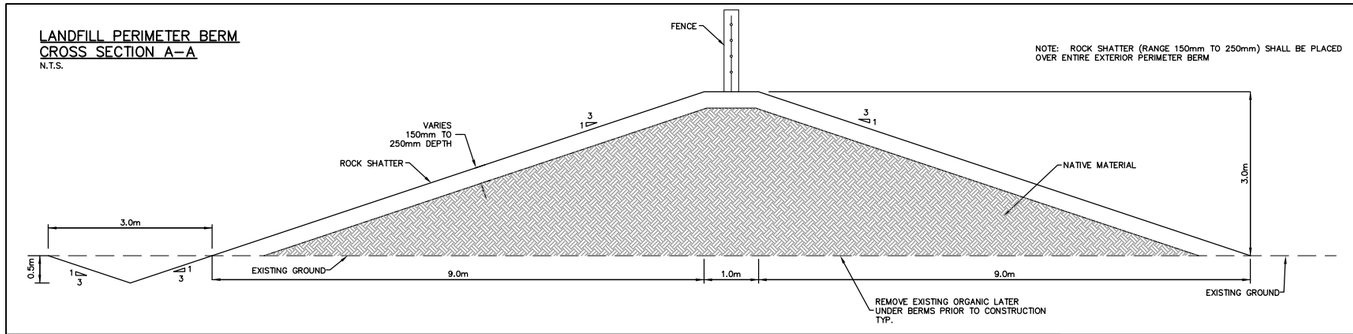
Prepared by: C. Reynolds

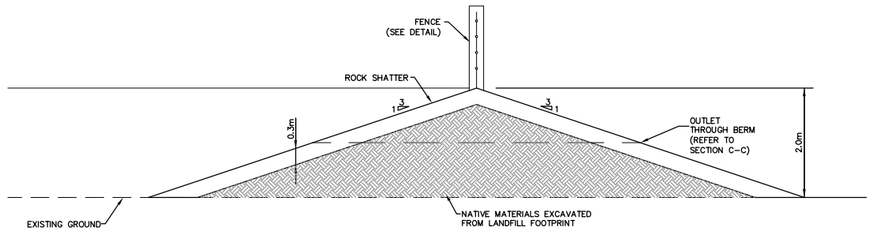
Verified by: J. Walls

NUNA BURNSIDE

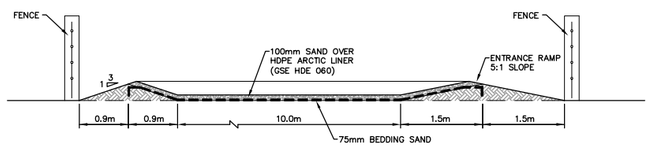
FEO09754 O&M SWF MARCH 2007 REGIONAL PLAN.dwg

LANDFILL PERIMETER BERM CROSS SECTION A–A
N.T.S.

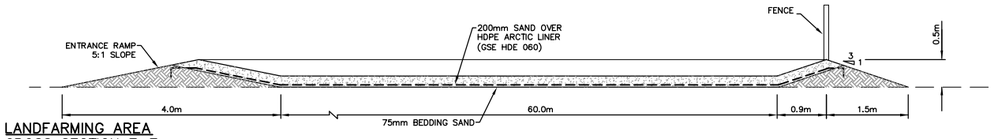




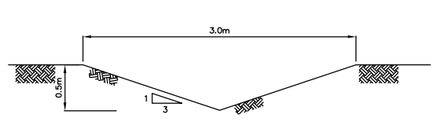
WATER RETENTION AREA CROSS SECTION B–B
N.T.S.



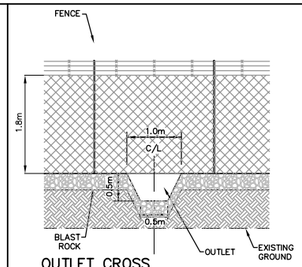
HAZARDOUS WASTE STORAGE AREA CROSS SECTION D–D
SCALE 1:50



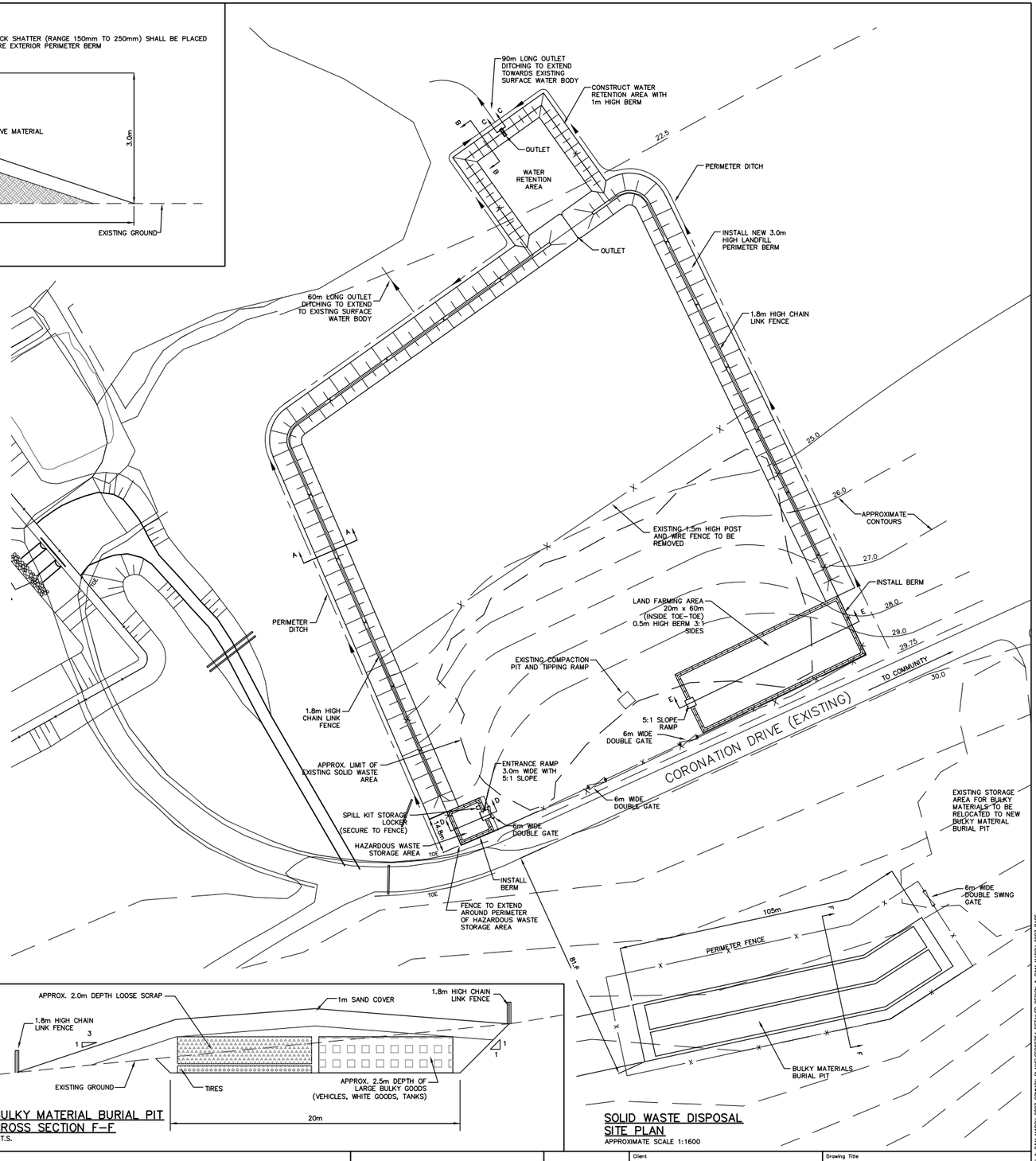
LANDFARMING AREA CROSS SECTION E–E
N.T.S.



TYPICAL PERIMETER DITCH DETAIL
SCALE NTS



OUTLET CROSS SECTION C–C
N.T.S.



SOLID WASTE DISPOSAL SITE PLAN
APPROXIMATE SCALE 1:1600

BULKY MATERIAL BURIAL PIT CROSS SECTION F–F
N.T.S.

No.	Issue / Revision	Date
1	Client Review and Approval	April 10, 2006
2	Client Review and Approval	June 26, 2006
3	Issued for tender	July 17, 2006
4	General Revisions – Client Review and Approval	March 21, 2007

NOTES:

1. ALL AREAS DISTURBED BY CONTRACTOR DURING CONSTRUCTION ACTIVITIES SHALL BE REINSTATED TO ORIGINAL CONDITION OR BETTER, BY THE CONTRACTOR.
2. CONTRACTOR SHALL LOAD, HAUL AND PLACE AS SHOWN EXISTING TIRES, BULKY GOODS AND LOOSE SCRAP FROM EXISTING STORAGE AREA TO BULKY MATERIALS BURIAL PIT.
3. TOPOGRAPHIC CONTOURS SHOWN ARE APPROXIMATE AND ARE DERIVED FROM REGIONAL TOPOGRAPHIC MAPS.

Nuna Burnside Engineering and Environmental Ltd.
Box 175, 25 Third Avenue, Rankin Inlet, NU.
telephone (867) 645-2762 **fax** (867) 645-2765
15 Townline, Orangeville, Ontario
telephone (519) 941-0342 **fax** (519) 941-8120
email info@nunaburnside.com
web www.nunaburnside.com

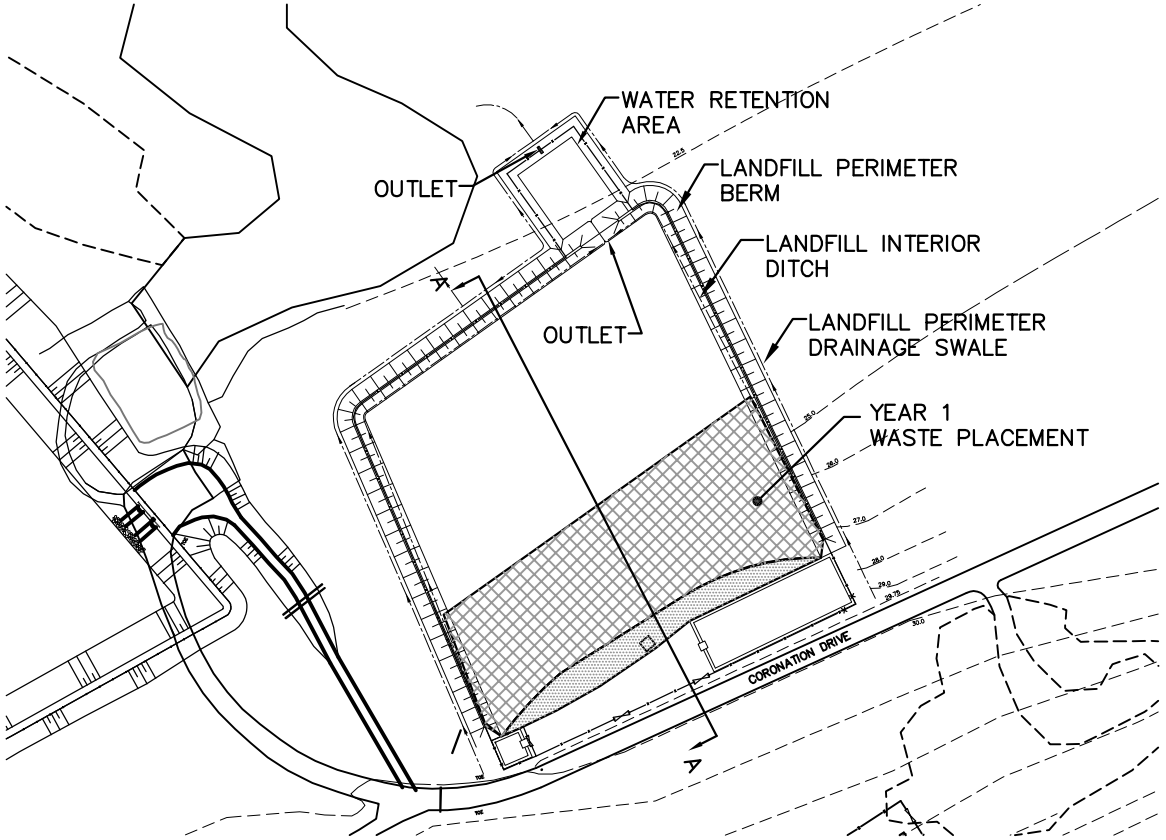
Client
GOVERNMENT OF NUNAVUT
PROJECT MANAGEMENT DIVISION
DEPARTMENT OF COMMUNITY AND GOVERNMENT SERVICES (CGS)
KITIMEOT REGION
P.O. BAG 200
CAMBRIDGE BAY, NUNAVUT
X0B 0C0

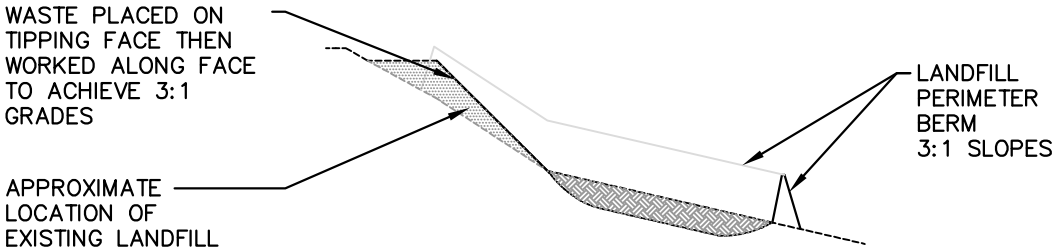
Drawing Title
THE HAMLET OF KUGLUKTUK

SOLID WASTE MANAGEMENT FACILITY O&M PLAN – MARCH 2007 DETAILS

Drawn By	Checked By	Drawing
T.T.	K. Hunter	
Scale: AS SHOWN	Nuna Burnside Project No.: N–0 09755.0	FIGURE 4
GN Project No.: 04–4406		

W:\csheppard\O&M SWF MARCH 2007\FE009754 O&M SWF MARCH 2007 BASE.dwg
W:\csheppard\DETAILED DESIGN & O&M MARCH 2007 COMMON PLANS\FE009754 DETAILED DESIGN & O&M MARCH 2007 BASE





CROSS SECTION A–A

FIGURE 5

HAMLET OF KUGLUKTUK

SOLID WASTE MANAGEMENT FACILITY OPERATION AND MAINTENANCE (O&M) PLAN - MARCH 2007

LANDFILL DEVELOPMENT YEAR 1

Legend

WASTE PLACEMENT

N

0 20 40 60 80 100 120 140 160 180 200 220 240

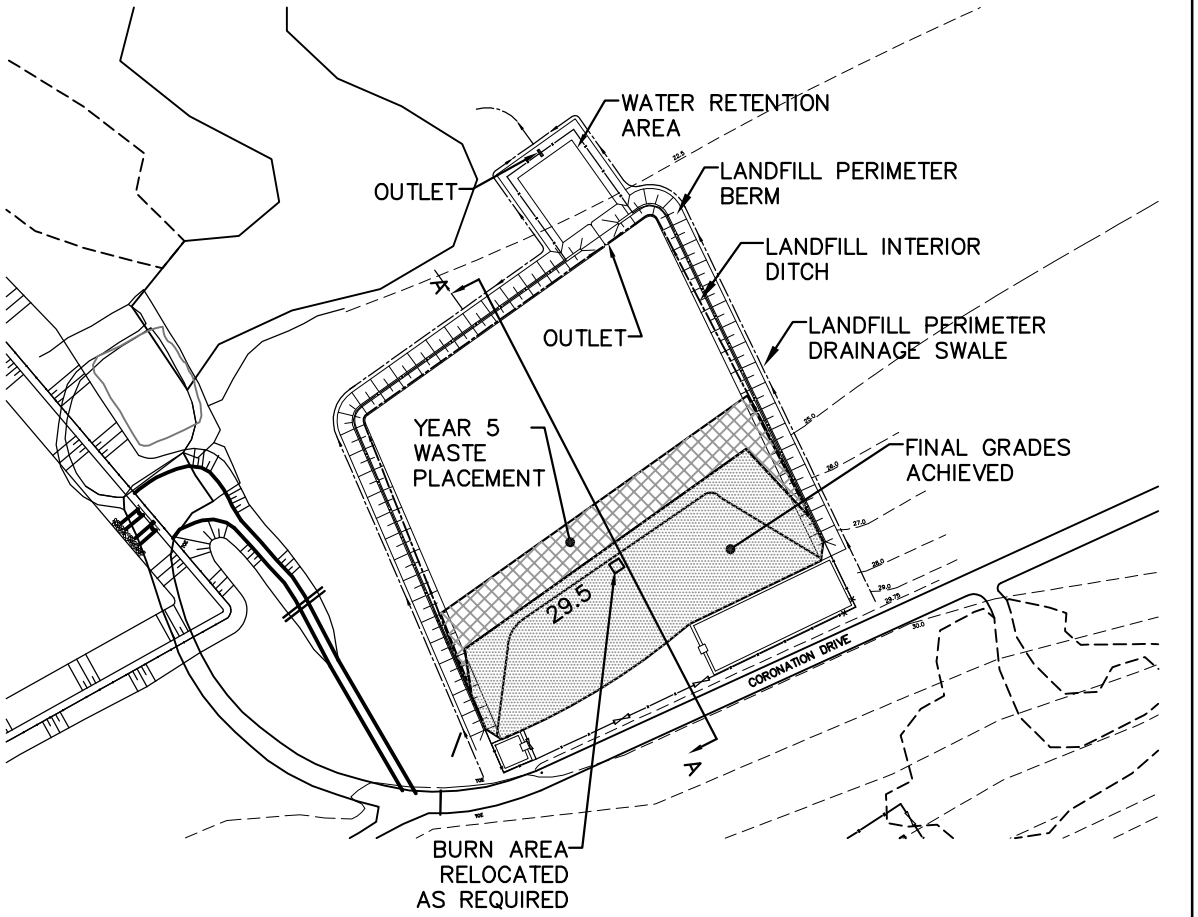
Metres

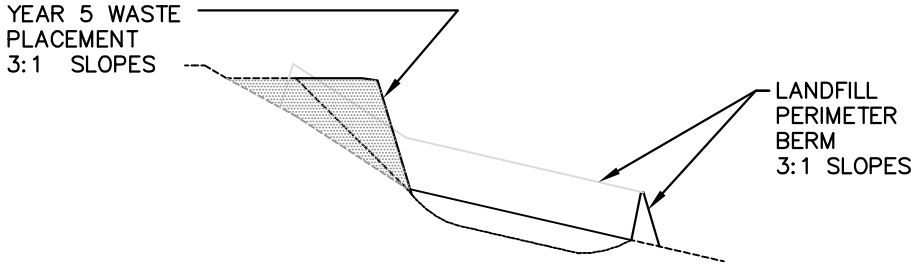
1:3000
March 2007
Project Number: FE009754

Prepared by: J. Amsen

Verified by: J. Walls

FE009754 O&M SWF MARCH 2007 LF DEV YR 1.DWG





CROSS SECTION A–A

FIGURE 6

HAMLET OF KUGLUKTUK

SOLID WASTE MANAGEMENT FACILITY OPERATION AND MAINTENANCE (O&M) PLAN - MARCH 2007

LANDFILL DEVELOPMENT YEAR 5

Legend

WASTE PLACEMENT

N

0 20 40 60 80 100 120 140 160 180 200 220 240

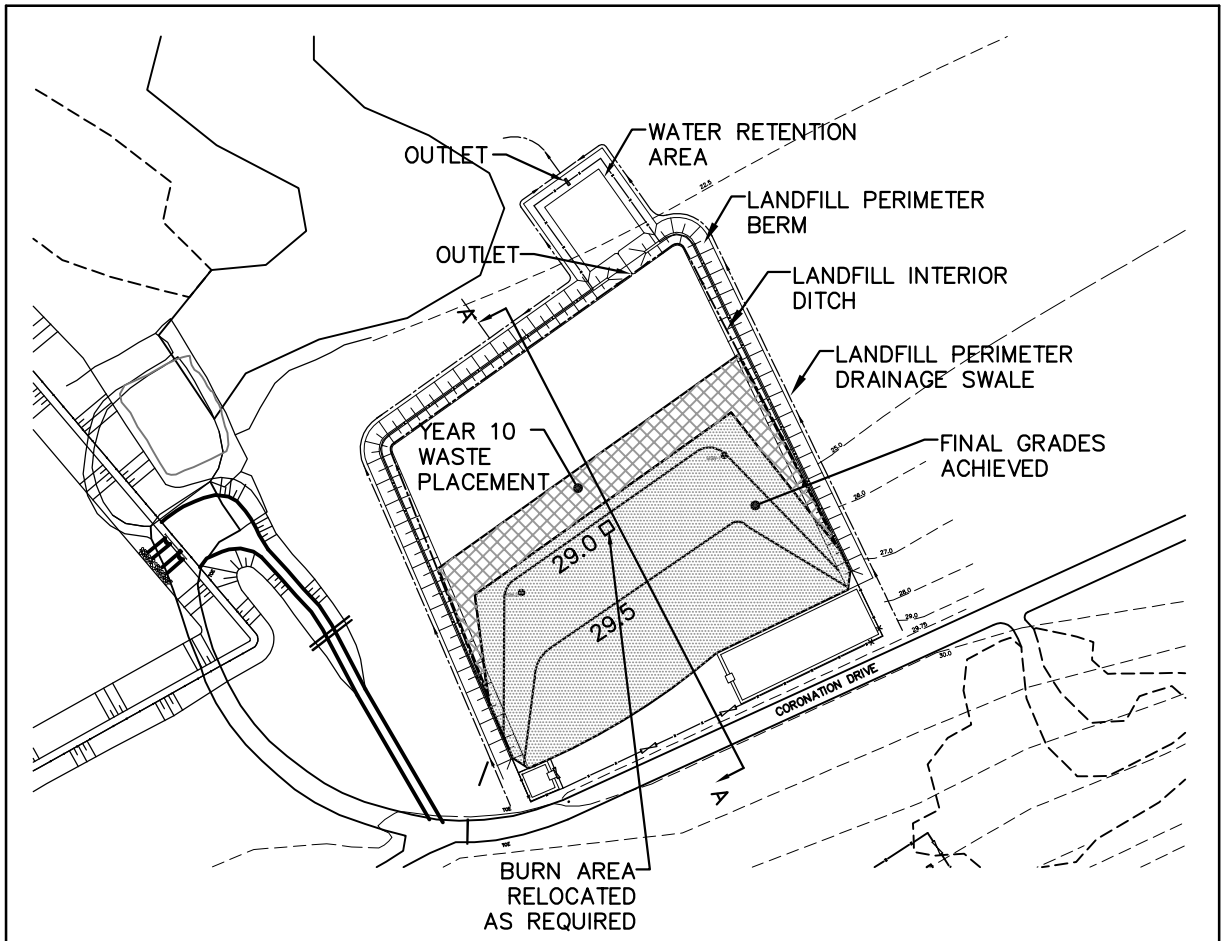
Metres

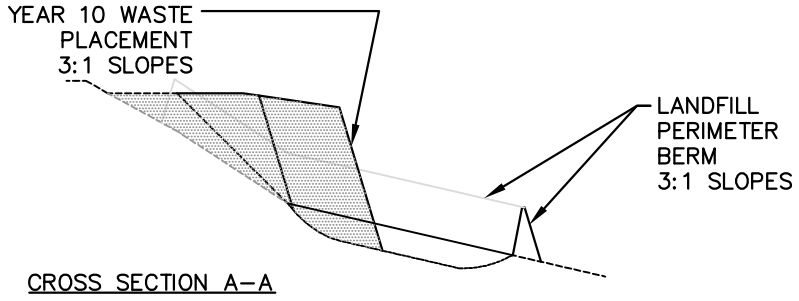
1:3000
March 2007
Project Number: FE009754

Prepared by: J. Amsen

Verified by: J. Walls

FE009754 O&M SWF MARCH 2007 LF DEV YR 5.DWG





CROSS SECTION A–A

FIGURE 7

HAMLET OF KUGLUKTUK

SOLID WASTE MANAGEMENT FACILITY OPERATION AND MAINTENANCE (O&M) PLAN - MARCH 2007

LANDFILL DEVELOPMENT YEAR 10

Legend

WASTE PLACEMENT

N

0 20 40 60 80 100 120 140 160 180 200 220 240

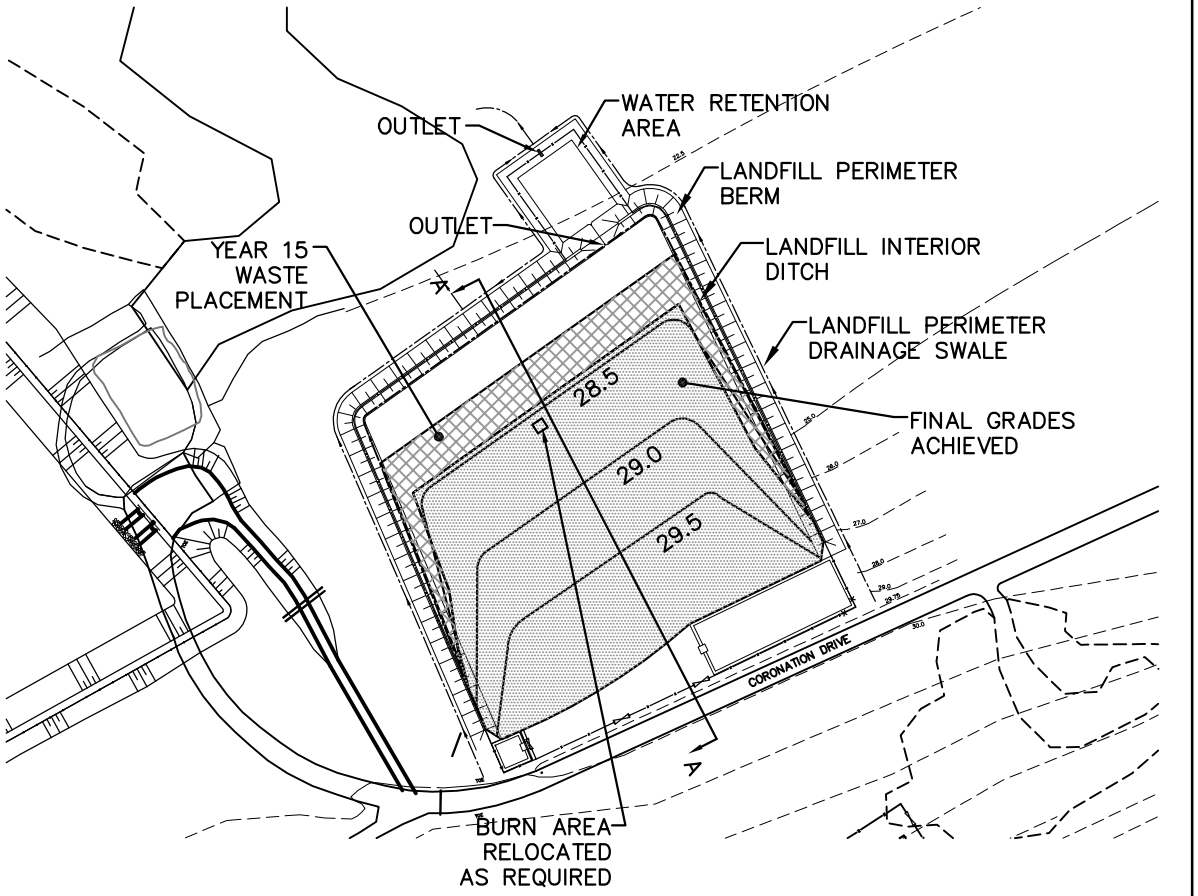
Meters

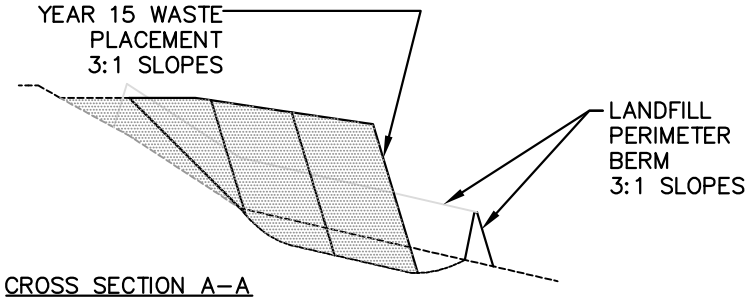
1:3000
March 2007
Project Number: FE009754

Prepared by: J. Amsen

Verified by: J. Walls

FE009754 O&M SWF MARCH 2007 LF DEV YR 10.DWG





CROSS SECTION A–A

FIGURE 8

HAMLET OF KUGLUKTUK

SOLID WASTE MANAGEMENT FACILITY OPERATION AND MAINTENANCE (O&M) PLAN - MARCH 2007

LANDFILL DEVELOPMENT YEAR 15

Legend

WASTE PLACEMENT

N

0 20 40 60 80 100 120 140 160 180 200 220 240

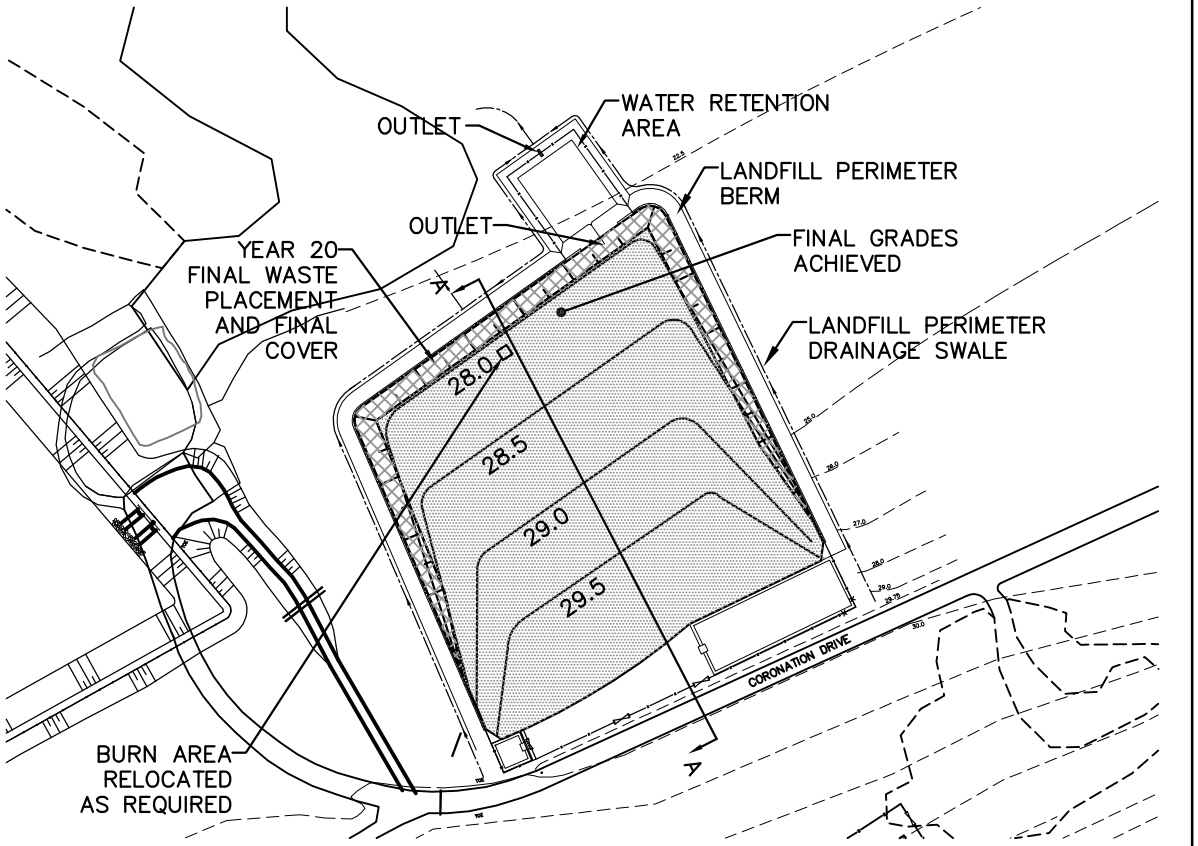
Meters

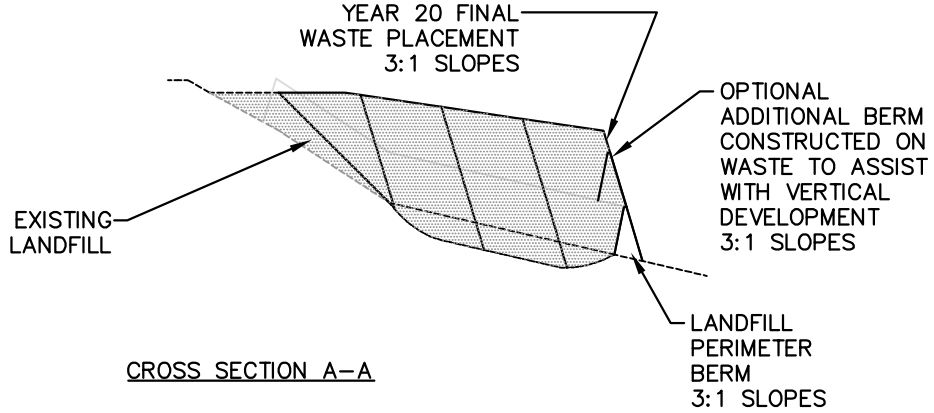
1:3000
March 2007
Project Number: FE009754

Prepared by: J. Amsen

Verified by: J. Walls

FE009754 O&M SWF MARCH 2007 LF DEV YR 15.DWG





CROSS SECTION A–A

FIGURE 9

HAMLET OF KUGLUKTUK

SOLID WASTE MANAGEMENT FACILITY OPERATION AND MAINTENANCE (O&M) PLAN - MARCH 2007

LANDFILL DEVELOPMENT YEAR 20

Legend

WASTE PLACEMENT

N

0 20 40 60 80 100 120 140 160 180 200 220 240

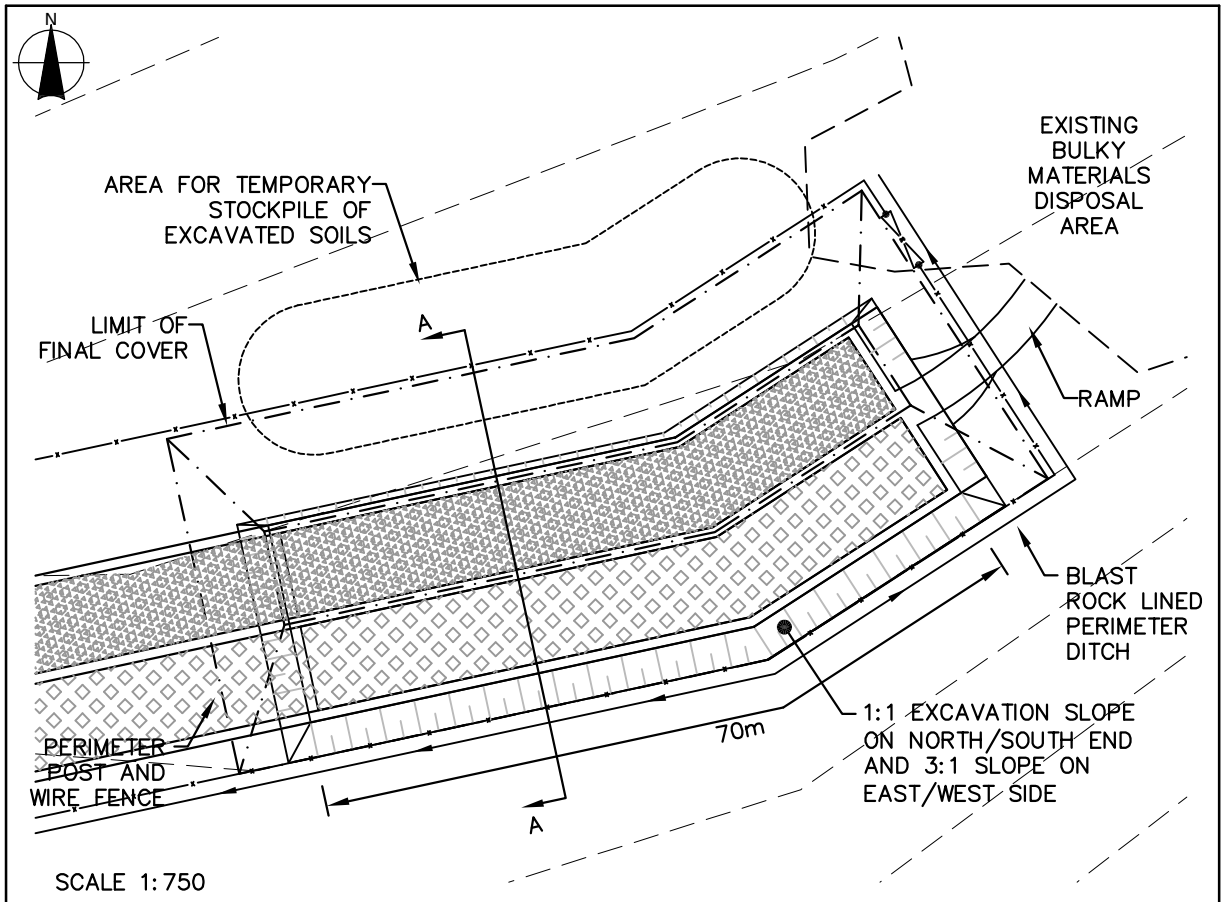
Meters

1:3000
March 2007
Project Number: FE009754

Prepared by: T. Thompson

Verified by: K. Hunter

FE009754 O&M SWF MARCH 2007 LF DEV YR 20.DWG



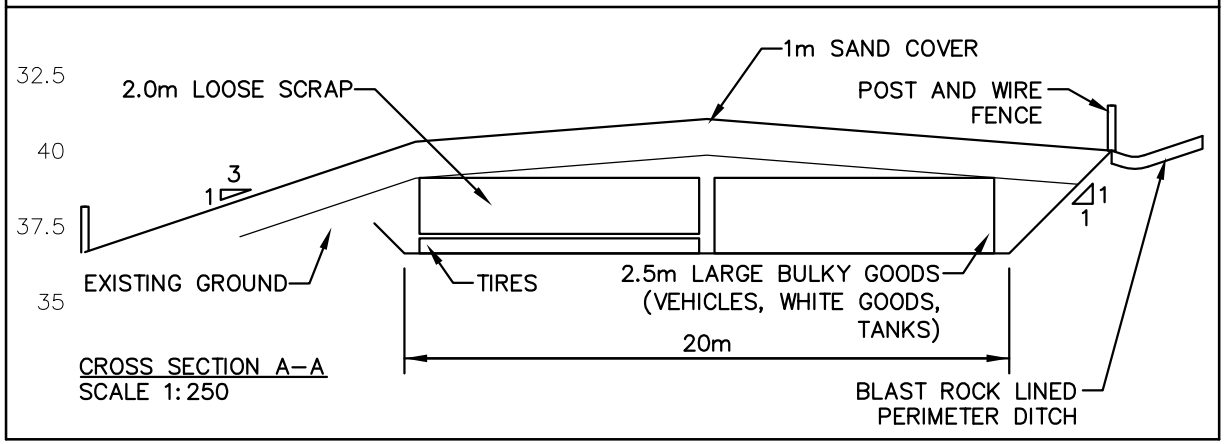


FIGURE 10

HAMLET OF KUGLUKTUK

SOLID WASTE MANAGEMENT FACILITY OPERATION AND MAINTENANCE (O&M) PLAN - MARCH 2007

BULKY MATERIALS DISPOSAL PIT

0 10 20 30 40 50 60

Metres

1:750

March 2007

Project Number: FE009754

Prepared by: J. Amsen

Verified by: J. Walls

FE009754 O&M SWF MARCH 2007 BULKY MATERIALS.DWG

FIGURE 11

HAMLET OF KUGLUKTUK

SOLID WASTE MANAGEMENT FACILITY

O&M PLAN - MARCH 2007

WASTE DIVERSION

WATER RETENTION AREA

LANDFILL

DROP OFF AND BURN AREA

HAZARDOUS WASTE STORAGE

LAND FARM

TO SEWAGE LAGOON

TO COMMUNITY

BULKY METALS BURIAL PIT

BULKY METALS AND REUSE / RECYCLING

NUNA BURNSIDE

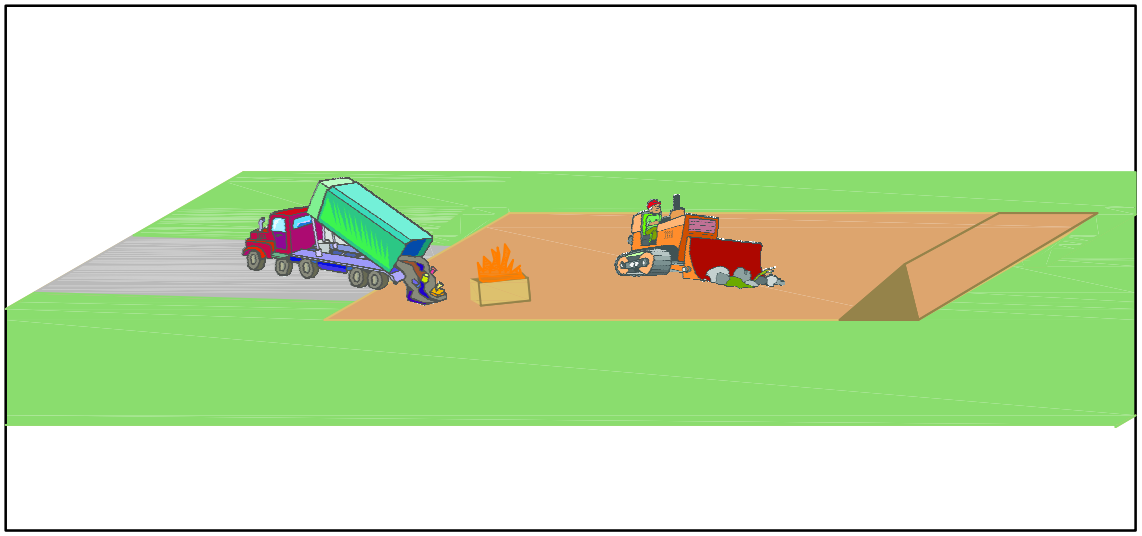
REVISION #:1

FEO09754 O&M SWF MARCH 2007 WASTE DIVERSION.DWG

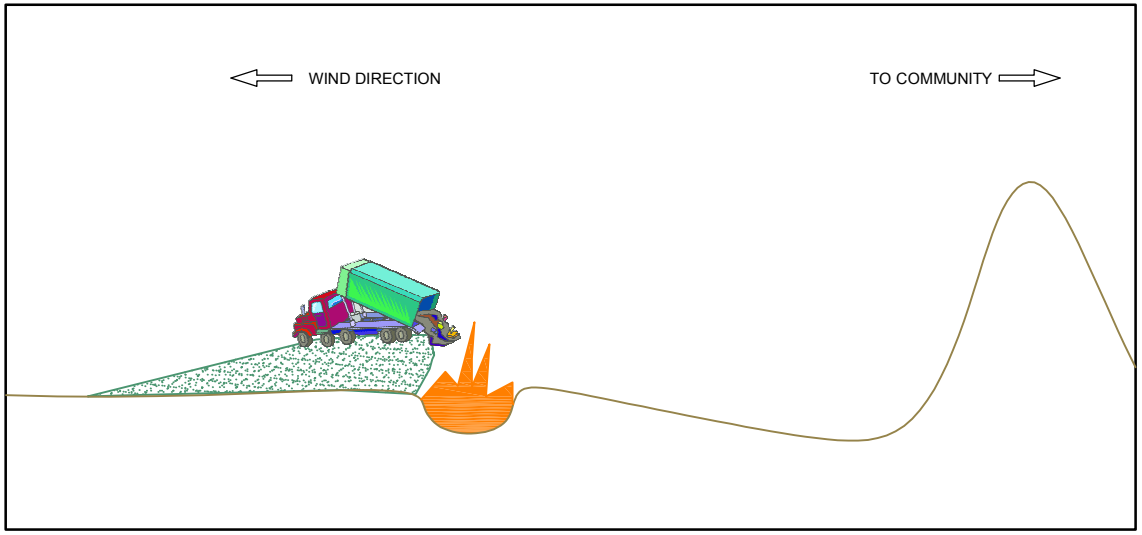
FIGURE 12

HAMLET OF KUGLUKTUK
SOLID WASTE MANAGEMENT FACILITY
O&M PLAN - MARCH 2007

DROP OFF & BURNING



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 PIT. BURNING IN BURN PIT SHOULD TAKE PLACE WHEN THE WIND IS NOT BLOWING TOWARDS THE COMMUNITY.

March 2007
Project Number: FEO09754

Prepared by: J. Amsen

Verified by: J. Walls

BURNSIDE

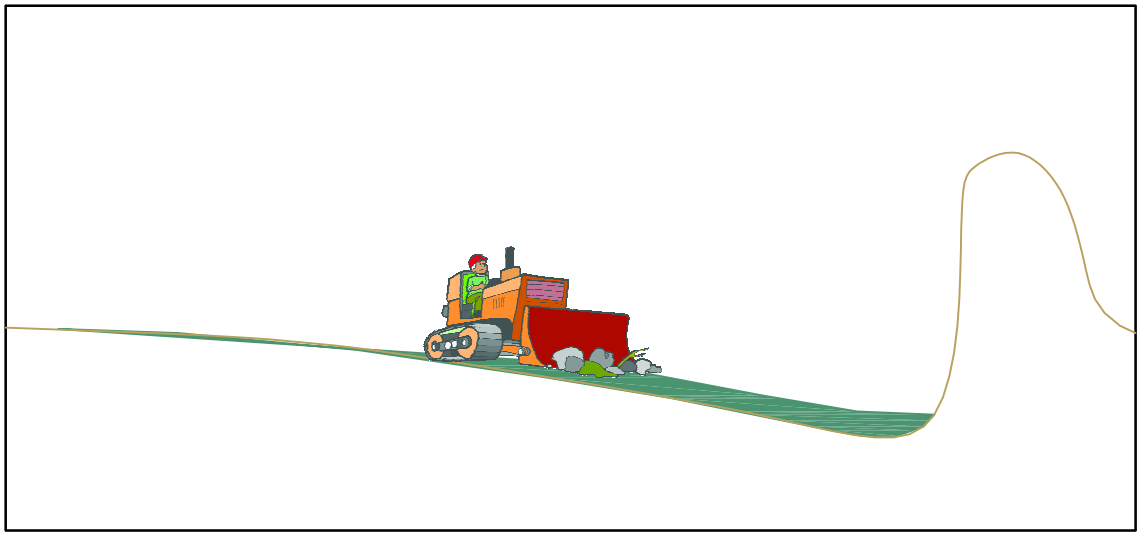
REVISION #: 1

FEO09754 O&M SWF MARCH 2007 DROP OFF.DWG

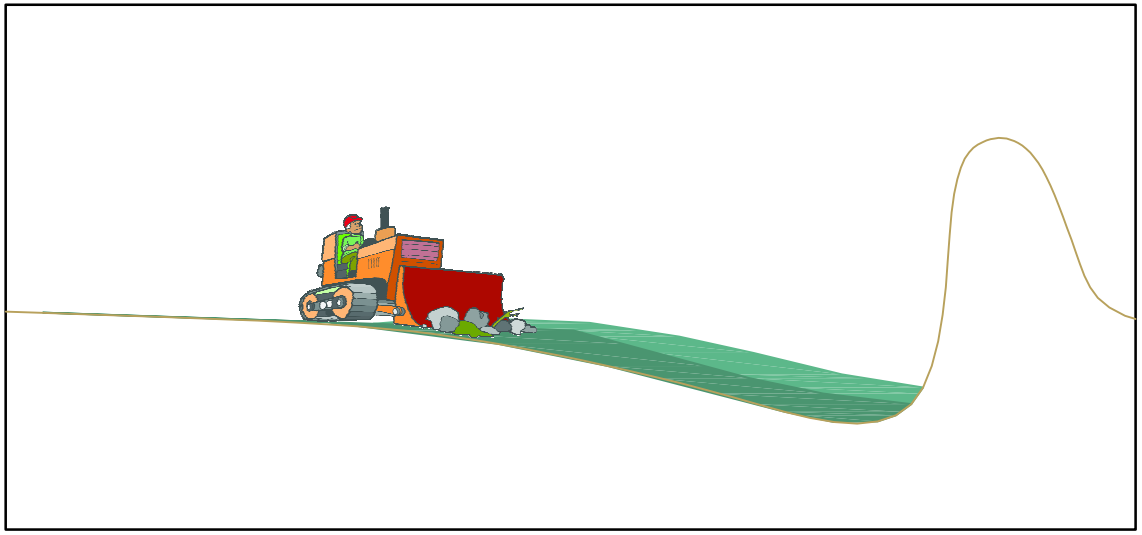
FIGURE 13

HAMLET OF KUGLUKTUK
SOLID WASTE MANAGEMENT FACILITY
O&M PLAN - MARCH 2007

COMPACTION



BURNED WASTE IS PUSHED ONTO THE FILL AREA.



WASTE IS SPREAD OVER A SMALL AREA AND COMPACTED BY MAKING SEVERAL PASSES WITH THE EQUIPMENT. 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.

March 2007
Project Number: FEO09754

Prepared by: J. Amsen

Verified by: J. Walls

BURNSIDE

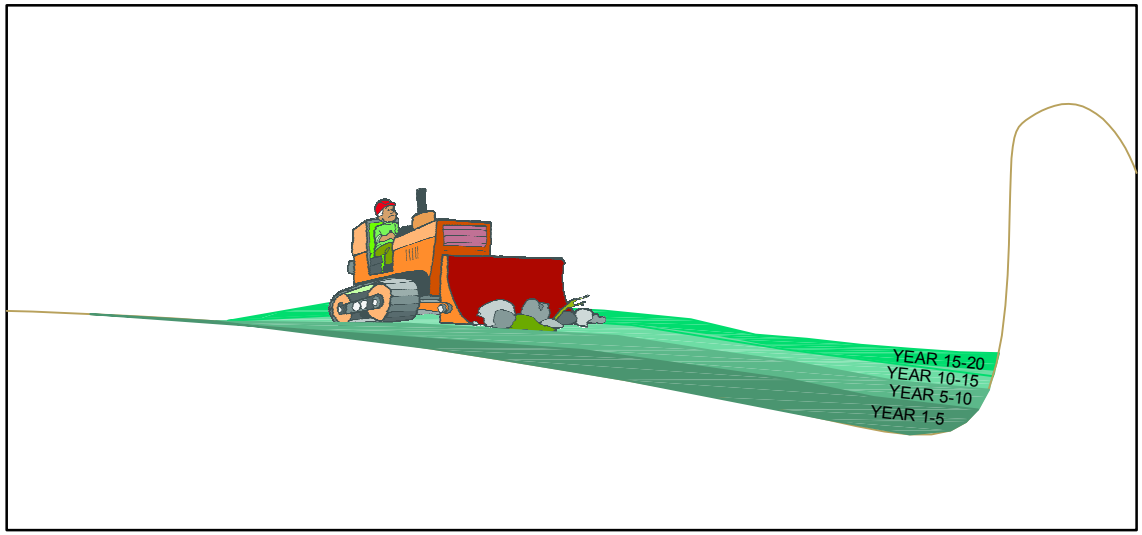
REVISION #: 1

FEO09754 O&M SWF MARCH 2007 COMPACTION.DWG

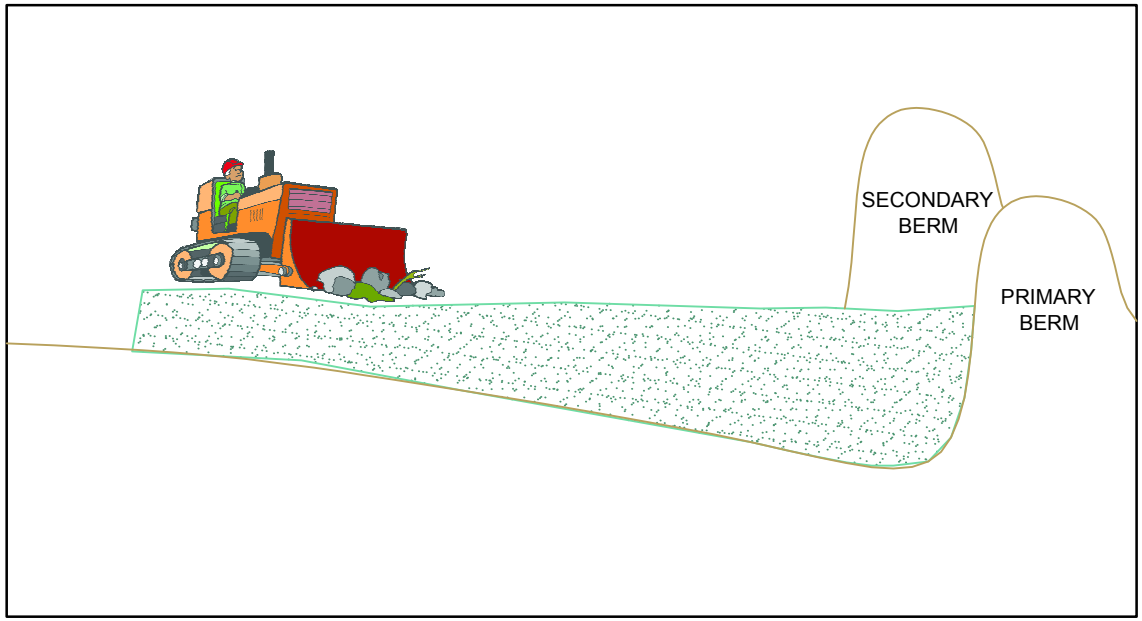
FIGURE 14

HAMLET OF KUGLUKTUK
SOLID WASTE MANAGEMENT FACILITY
O&M PLAN - MARCH 2007

PROGRESSIVE WASTE DEPOSITION



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



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

March 2007
Project Number: FEO09754

Prepared by: J. Amsen

Verified by: J. Walls

NUNA BURNSIDE

REVISION #: 1 FEO09754 O&M SWF MARCH 2007 PROGRESSIVE DEPOSITS.DWG

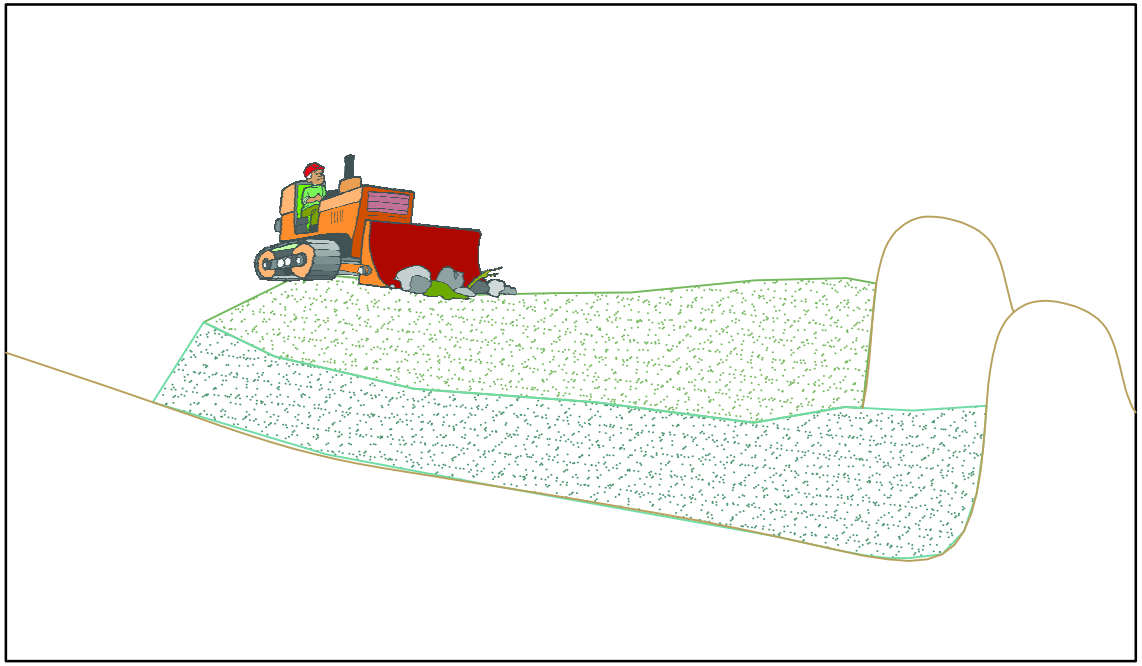


FIGURE 15

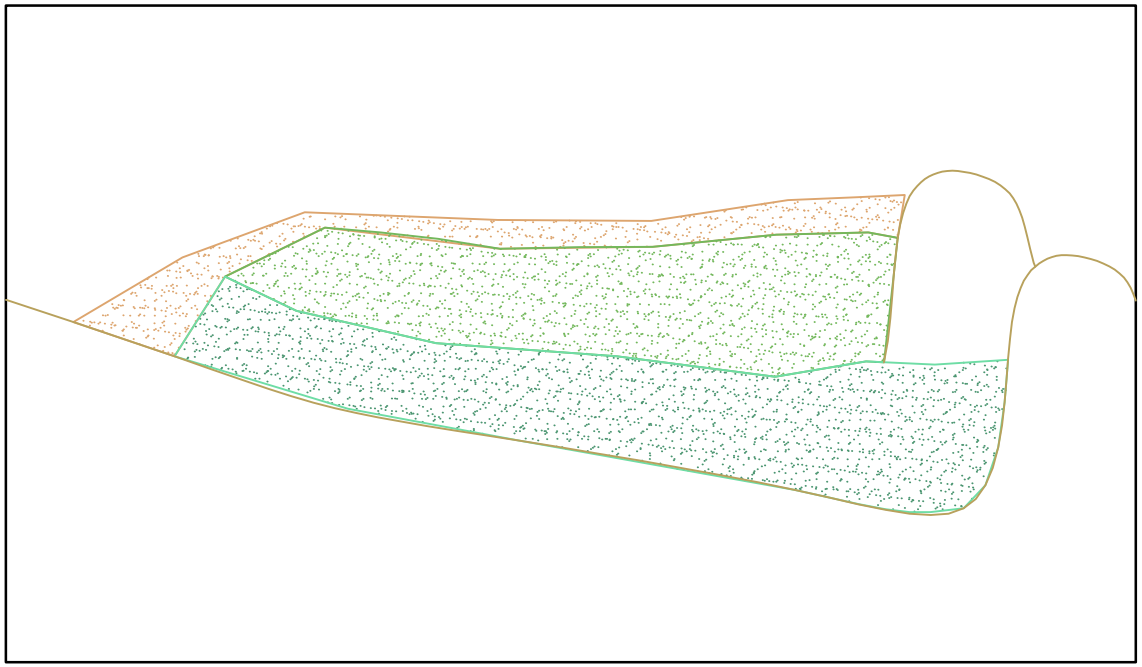
HAMLET OF REPULSE BAY

SOLID WASTE MANAGEMENT FACILITY

O&M PLAN - MARCH 2007

FINAL GRADING & CLOSURE

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



SITE CLOSURE WILL CONSIST OF 600mm OF THE MOST IMPERMEABLE 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.

March 2007
Project Number: FEO09754

Prepared by: J. Amsen

Verified by: J. Walls

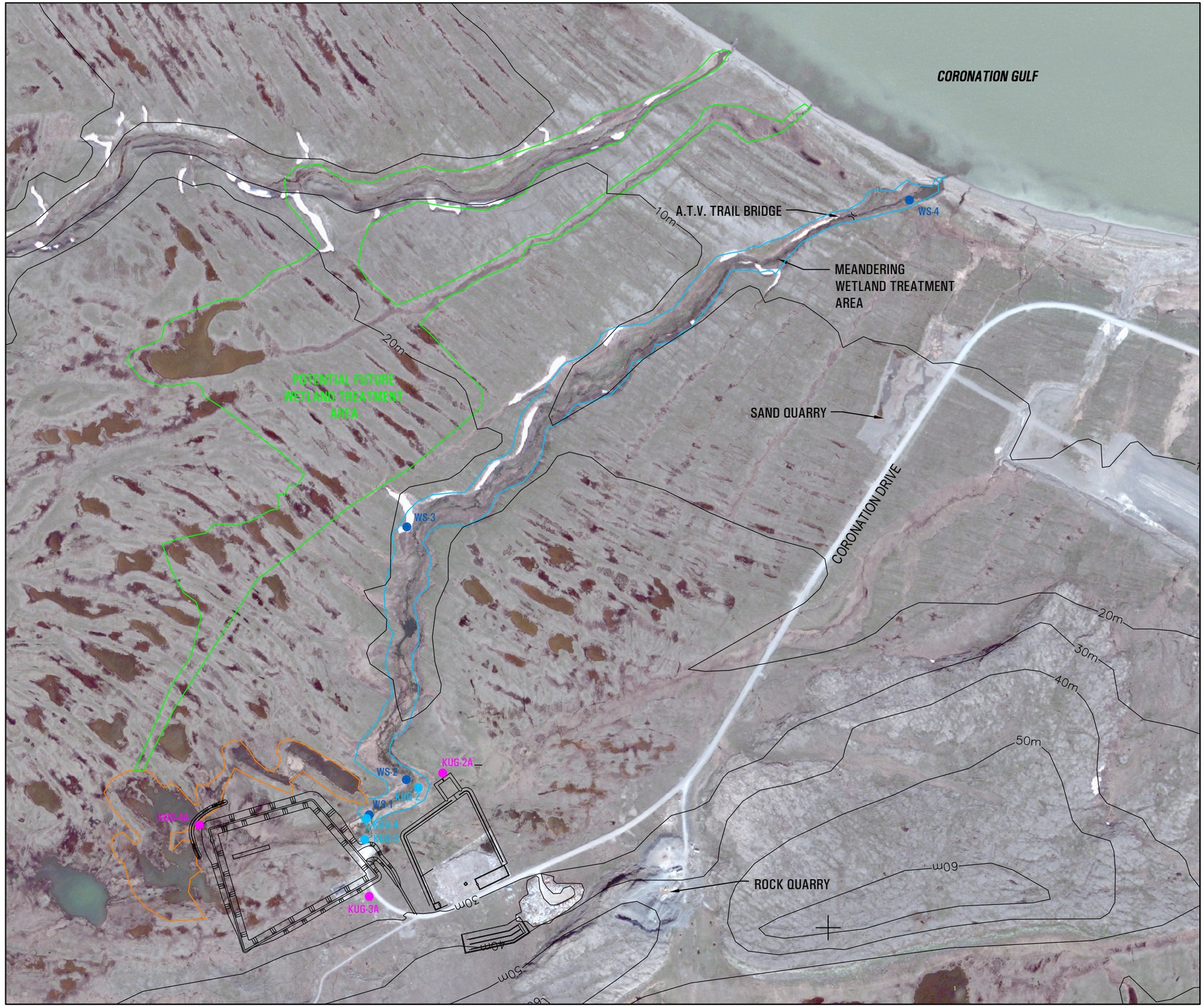
REVISION #: 1

FE0O9754 O&M SWF MARCH 2007 CLOSURE.DWG

FIGURE 16

HAMLET OF KUGLUKTUK
SOLID WASTE MANAGEMENT FACILITY OPERATION & MAINTENANCE (O&M) PLAN - MARCH 2007

SAMPLE LOCATIONS



Legend

- KUG-2 — SURFACE WATER SAMPLING LOCATION *(To be replaced once new facilities are in place)*
- WS-2 — WETLAND WATER SAMPLING LOCATION
- KUG-2A — PROPOSED SURFACE WATER SAMPLING LOCATION *(For new facilities)*
- 50m — EXISTING CONTOURS (m amsl) obtained from National Topographic Survey Digital Data Contour interval 10m
- OUTLINE OF WETLAND TREATMENT AREA (10 ha)
- OUTLINE OF EXPANDED WETLAND TREATMENT AREA (5.1 ha)
- OUTLINE OF POTENTIAL FUTURE WETLAND TREATMENT AREA *(If required)* (30 ha)

Image Platform: Quick Bird (Satellite)
Image Aquisition: 01 July, 2002
Spatial Resolution: 0.6m

N

0 100 200 300 400 500 600
Meters

1:7,500
March 2007
Project Number: FEO09754

Projection: UTM Zone 17
Datum: NAD83

Prepared by: C. Sheppard

Verified by: J. Walls

Nunn Burnside

Revision #: 1

FEO09754 O&M SWF MARCH 2007 SAMPLES.DWG

Appendix A
Water Board License

P.O. BOX 119
GJOA HAVEN, NU X0B 1J0
TEL: (867) 360-6338
FAX: (867) 360-6369

kNK5 wmoEp5 vtmpq
NUNAVUT WATER BOARD
NUNAVUT IMALIRIYIN KATIMAYINGI

DECISION

LICENCE NUMBER: NWB3KUG0308

This is the decision of the Nunavut Water Board (NWB) with respect to an application for a Licence dated July 15, 2003, made by:

Hamlet of Kugluktuk

to allow for the use of water and disposal of waste for the Hamlet at Kugluktuk, Nunavut. With respect to this application, the NWB gave notice to the public that the Hamlet had filed an application for a water licence.

DECISION

After having been satisfied that the application was exempt from the requirement for screening by the Nunavut Impact Review Board in accordance with S. 12.3.2 of the *Nunavut Land Claim Agreement* (NLCA), the NWB decided that the application could proceed through the regulatory process. After reviewing the submission of the Applicant and written comments expressed by interested parties, the NWB, having given due regard to the facts and circumstances, the merits of the submissions made to it and to the purpose, scope and intent of the *Nunavut Land Claims Agreement* and of the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (NWNSRTA), decided to waive the requirement to hold a public hearing and furthermore to delegate its authority to approve the application to the Chief Administrative Officer pursuant to S. 49(a) of the NWNSRTA and determined that:

Licence Number NWB3KUG0308 be issued subject to the terms and conditions contained therein. (Motion #: 2003-35)

SIGNED this 20th day of November 2003 at Gjoa Haven, NU.

Original signed by:

_____

Philippe di Pizzo
Chief Administrative Officer

TABLE OF CONTENTS

DECISION i
TABLE OF CONTENTS ii

I. BACKGROUND 1

II. PROCEDURALHISTORY……...1

III. ISSUES……1
A. Term of the Licence…….. .2
B. Water Use……...3
C. Deposit of Waste……...3

IV. LICENCE NWB3KUG0308 5
PART A: SCOPE AND DEFINITIONS 6
PART B: GENERAL CONDITIONS 8
PART C: CONDITIONS APPLYING TO WATER USE 11
PART D: CONDITIONS APPLYING TO WASTE DISPOSAL..... 11
PART E: CONDITIONS APPLYING TO MODIFICATIONS AND CONSTRUCTION 12
PART F: CONDITIONS APPLYING TO OPERATION AND MAINTENANCE..... 13
PART G: CONDITIONS APPLYING TO ABANDONMENT AND RESTORATION 14
PART H: CONDITIONS APPLYING TO THE MONITORING PROGRAM..... 15

I. BACKGROUND

Kugluktuk is located immediately west of the mouth of the Coppermine River on Coronation Gulf at 67°50'N, 115°15'W, 595 air km north of Yellowknife. The Hamlet extends inland to cover a rocky knoll. The town site is underlain by Precambrian sedimentary and volcanic rock. Dolomite and shale, interspersed with volcanic rock, form steep outcrops in the vicinity of the settlement. The buildings along the shore are perched on consolidated beach deposits. Directly behind this ridge is a low, marshy area. There are numerous exposed bedrock surfaces in the community. Surficial deposits in the area include talus and deltaic deposits. The angular talus, derived primarily from the mechanical breakdown of dolerite, ranges in size from silt to boulders but is commonly found as course sand or fine gravel. Kugluktuk is underlain by permafrost. The thickness of the active layer ranges from less than 0.5 m to over 1 m in the sandy waterfront area. Permafrost features such as polygonal ground and thaw-related instability affect the raised delta surfaces and strongly influence their drainage characteristics. Grasses, sedges, heather, mosses, and lichens grow in limited soils. Willow and alder thickets are common in wetland depressions. Kugluktuk receives an average of 10.3 cm of rainfall and 100.7 cm of snowfall per year. Mean annual precipitation totals 20.2 cm. July mean high and low temperatures are 13.8° C and 5.6° C. The January mean high and low temperatures are -26.4° C and -33.8° C. The winds are generally south-west and annually average 16.6 km/h.

II. PROCEDURAL HISTORY

On July 15, 2003, an application for the renewal of water license N3L4-1526, was filed by Ferguson Simek Clark Environmental Consultants (Yellowknife) on behalf of the Hamlet of Kugluktuk. The previous water licence was issued by the Northwest Territories Water Board on 1 July 1998 and valid until June 30, 2003. In consideration of the application for renewal the Nunavut Water Board publicly posted notice of this application, in accordance with the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* S.55.1 and Article 13 of the *Nunavut Land Claims Agreement,* on July 23, 2003. An assessment of the Hamlet's request for a municipal water licence for water use and waste disposal activities within the Hamlet was then undertaken, so that the Board could make a fully informed decision on the merits of application. This assessment process included the referral of the application to a variety of Federal, Territorial and local organizations for their review and comment. As no public concern was expressed, the NWB waived the requirement to hold a public hearing for the application.

Based upon the results of the detailed assessment, which was completed, including consideration of any potential accidents, malfunctions, or cumulative environmental effects that the overall project might have in the area, the Board delegated to the Chief Administrative Officer authority to approve the application pursuant to S. 13.7.5 of the *Agreemen*t.

III. ISSUES

Term of the Licence

In accordance with the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* S. 45, the NWB may issue a licence for a term not exceeding twenty-five years. In determining an appropriate term of a water licence, the Board considers a number of factors, including the results of the annual Department of Indian Affairs and Northern Development (DIAND) site inspection and the compliance record of the Applicant. Specifically, the August 9, 2001 DIAND Inspection Report indicated that:

1. The Licensee has failed to produce Annual Reports from 1996-2001;
2. Water supply field pH , turbidity, and iron concentration exceeded the levels recommended in the *Guidelines for Canadian Drinking Water Quality*;
3. Sewage treatment system effluent concentrations of ammonia and phenol exceeded the levels recommended in the *Canadian Guidelines for the Protection of Freshwater Aquatic Life*;
4. Sewage treatment effluent contained noteworthy concentrations of faecal coliforms (1,470,000 CFU/100ml);
5. Solid waste disposal site effluent concentrations of iron and zinc exceeded the levels; and
6. The sewage treatment system effluent evidenced a significant toxicity, as determined by a MicroTox EC_{50} assessment.

Additionally, the NWB brings to the attention of the Licensee their failure to provide the Board with the as-built plans and drawings for the modifications to the Sewage Disposal Facilities, as required by Part D, Item 3 of Water License N7L4-1526. The Board requests that these as-built plans and drawings be forwarded by the Licensee within ninety (90) days following issuance of this license.

In review of the application, DIAND, has recommended a licence term of five (5) years. The NWB concurs that a term of five (5) years is appropriate, and will allow enough time for the Hamlet to establish a consistent compliance record with the terms and conditions of its licence. It will also ensure that sufficient time is given to permit the Licensee to develop, submit, and implement the plans required under its licence to the satisfaction of the NWB.

The NWB has imposed the requirement to produce an Annual Report. These Reports are for the purpose of ensuring that the NWB has an accurate annual update of municipal activities during a calendar year. This information is maintained on the public registry and is available to any interested parties upon request. The Licensee's attention is drawn to the attached standard form for completing the Annual Report (see Attachment I).

The NWB has also imposed on the Licensee the requirement to produce an Operations and Maintenance Manual for their sewage and solid waste operations. The purpose of an Operation and Maintenance Manual is to assist Hamlet staff in the proper operation and maintenance of their waste disposal facilities. The manual should demonstrate to the Nunavut Water Board that the Hamlet is

capable of operating and maintaining all waste disposal sites adequately. The Plan should be completed using the *Guidelines for the Preparation of an Operations and Maintenance Manual for Sewage and Solid Waste Disposal Facilities in the Northwest Territories* (Duong and Kent, 1996; see Attachment II).

Water Use

The Municipality currently receives water from Coppermine River. Water is treated using membrane filtration, which is accomplished in a twin train Harmsco filtration system, and stored in a 320 m^3 tank. The water receives a chlorine treatment prior to trucked-service distribution. Water consumption is projected to reach 53,475 m^3 *per annum* in 2003 and 60,533 m^3 *per annum* by 2008.

No serious concerns were raised by the parties in their written submissions as to the amount of water required by the Applicant or the manner in which this water will be used. Issues related to the quality of water produced by the present water treatment system were identified, but are currently being addressed by the Applicant and the Department of Community Government and Transportation, Government of Nunavut. DIAND has provided specific recommendations regarding volume usage limits, as well as recommending that the Applicant to be required to maintain a monitoring station at the water intake area KUG-1 in order to monitor the volume of water used. The Board concurs with these recommendations, and has set the terms and conditions in the water licence, which govern, water usage accordingly. The Board also recommends that the Hamlet and the Department of Community Government and Transportation take whatever steps are necessary to address the water quality issues identified in the August 9, 2001 DIAND Inspection Report.

Deposit of Waste

Sewage

The Hamlet of Kugluktuk utilizes a Sewage Disposal Facility approximately 5.0 km west of the Municipality. A gravel berm provides limited retention of sewage prior to discharge to an undefined wetland where it receives additional treatment prior to discharge to the marine environment. Specific comments relevant to sewage disposal operations in the Hamlet were provided by DIAND, and Environment Canada. Both DIAND and Environment Canada requested that the Applicant provide information to the NWB on how the Municipality plans to address the operational and environmental issues evidenced in the August 9, 2001 DIAND Inspection Report. Additionally, Environment Canada recommended that a minimum of 1 m of freeboard should be maintained at all retention structures, and that All Terrain Vehicle (ATV) traffic be restricted in the wetland area so as to prevent soil erosion and damage to vegetation from compromising the effectiveness of the wetland treatment of the sewage.

DIAND and Environment Canada also recommended that the Hamlet develop appropriate Operations and Maintenance and Spill Contingency Plans. Additionally, DIAND provided recommendations concerning effluent discharge criteria, which are consistent with the *Guidelines for the Discharge of*

Treated Municipal Wastewater in the Northwest Territories (Northwest Territories Water Board; 1992), as well as specific recommendations concerning the Monitoring Program.

The Board concurs with these recommendations, which are reflected in the terms and conditions of the Water Licence. The Monitoring Program is established to collect data on water quality to assess the effectiveness of treatment for protection of public health and to assess potential impacts to the environment associated with the municipal facilities. The Board also draws the attention of the Licensee to their requirements to implement the Quality Assurance/Quality Control (QA/QC) Plan to be provided by the NWB. The purpose of the QA/QC Plan is to ensure that samples taken in the field as part of the Monitoring Program will maintain a high quality, so as to accurately represent the physical and chemical nature of the samples being taken. It should also be noted that while minimum sampling requirements have been imposed, additional sampling may be requested by an Inspector.

Solid Waste

The Hamlet's solid waste management site is located approximately 4.5 km from the community. Waste is segregated, with a generic landfill area, a bulky wastes area, and a sealift container for hazardous wastes. Combustible wastes are burned regularly, and the landfill is compacted and covered on a yearly basis.

Recommendations relevant to solid waste disposal operations in the Hamlet were provided by DIAND and Environment Canada. Both DIAND and Environment Canada recommended that preventative measures be implemented to prevent standing water noted at the toe of the solid waste site from escaping the facility. Environment Canada also recommended that the Municipality undertake a waste composition study, which will assist the Municipality to plan for the long term waste disposal needs of the community. The Board concurs that the Hamlet should give serious consideration to this recommendation, and recommends that discussions be commenced with the Department of Community Government and Transportation to determine potential assistance which may be available to the Hamlet to undertake such a study.

DIAND and Environment Canada recommended that the Hamlet develop appropriate Operations and Maintenance and Spill Contingency Plans for their solid waste operations. DIAND and Environment Canada further recommended that the Hamlet segregate hazardous materials such as waste oils and batteries from municipal solid waste, and that these materials be disposed of off-site in an approved facility. DIAND and Environment Canada recommended the appropriate management of waste oil at the solid waste site, so as to prevent the deposition of hydrocarbons into water in contravention of the *Fisheries Act*. The Board concurs with these recommendations, which are reflected in the terms and conditions of the Water Licence. Additionally, both Environment Canada and DIAND recommended the installation of appropriate fencing at the bulky waste and hazardous waste disposal sites, so as to improve security on the sites. The Board concurs that the Hamlet should give serious consideration to this recommendation, and in the interim take whatever steps are practicable to implement this recommendation.

LICENCE NWB3KUG0308

Pursuant to the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* and the *Agreement Between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in Right of Canada*, the Nunavut Water Board, hereinafter referred to as the Board, hereby grants to

HAMLET OF KUGLUKTUK

(Licensee)

of **KUGLUKTUK, NUNAVUT, X0E 0E0**

(Mailing Address)

hereinafter called the Licensee, the right to alter, divert or otherwise use water for a period subject to restrictions and conditions contained within this licence:

Licence Number **NWB3KUG0308**

Water Management Area **NUNAVUT 05**

Location **KUGLUKTUK, NUNAVUT**

Purpose **WATER USE AND WASTE DISPOSAL**

Description **MUNICIPAL UNDERTAKINGS**

Quantity of Water Not to be Exceeded **64,000 CUBIC METRES ANNUALLY**

Date of Licence **NOVEMBER 20, 2003**

Expiry Date of Licence **NOVEMBER 30, 2008**

Dated this 20th of November 2003 at Gjoa Haven, NU.

Original signed by:

Philippe di Pizzo
Chief Administrative Officer

PART A: SCOPE AND DEFINITIONS

1. Scope

a. This Licence allows for the use of water and the disposal of waste for municipal undertakings at the Hamlet of Kugluktuk, Nunavut (67°50'N, 115°15'W);

b. This Licence is issued subject to the conditions contained herein with respect to the taking of water and the depositing of waste of any type in any waters or in any place under any conditions where such waste or any other waste that results from the deposits of such waste may enter any waters. Whenever new Regulations are made or existing Regulations are amended by the Governor in Council under the *Nunavut Waters and Nunavut Surface Rights Tribunal Act*, or other statutes imposing more stringent conditions relating to the quantity or type of waste that may be so deposited or under which any such waste may be so deposited, this Licence shall be deemed, upon promulgation of such Regulations, to be subject to such requirements; and;

c. Compliance with the terms and conditions of this Licence does not absolve the Licensee from responsibility for compliance with the requirements of all applicable Federal, Territorial and Municipal legislation.

2. Definitions

In this Licence: **NWB3KUG0308**

"Act" means the *Nunavut Waters and Nunavut Surface Rights Tribunal Act;*

"Amendment" means a change to original terms and conditions of this licence requiring correction, addition or deletion of specific terms and conditions of the licence; modifications inconsistent with the terms of the set terms and conditions of the Licence;

"Analyst" means an Analyst designated by the Minister under Section 85 (1) of the *Act*;

''Appurtenant undertaking'' means an undertaking in relation to which a use of waters or a deposit of waste is permitted by a licence issued by the Board;

"Average Concentration" means the arithmetic mean of the last four consecutive analytical results for contained in composite or grab samples collected from the Waste Disposal Facility's final discharge point;

"Average Concentration For Faecal Coliforms" means the geometric mean of the last four consecutive analytical results for faecal coliforms contained in composite or grab samples collected from the Waste Disposal Facility's final discharge point;

"Board" means the Nunavut Water Board established under the *Nunavut Land Claims Agreement*;

"Chief Administrative Officer" means the Executive Director of the Nunavut Water Board;

"Commercial Waste Water" means water and associated waste generated by the operation of a commercial enterprise, but does not include toilet wastes or greywater;

"Composite Sample" means a water or wastewater sample made up of four (4) samples taken at regular periods over a 24 hour period;

"Effluent" means treated or untreated liquid waste material that is discharged into the environment from a structure such as a settling pond or a treatment plant;

"Final Discharge Point" means an identifiable discharge point of a Waste Disposal Facility beyond which the Licensee no longer exercises care and control over the quality of the Effluent;

"Freeboard" means the vertical distance between water line and crest on a dam or dyke's upstream slope;

"Grab Sample" means a single water or wastewater sample taken at a time and place representative of the total discharge;

"Greywater" means all liquid wastes from showers, baths, sinks, kitchens and domestic washing facilities, but does not include toilet wastes;

"Inspector" means an Inspector designated by the Minister under Section 85 (1) of the *Act*;

"Licensee" means the holder of this Licence;

"Modification" means an alteration to a physical work that introduces new structure or eliminates an existing structure and does not alter the purpose or function of the work, but does not include an expansion, and changes to the operating system that are consistent with the terms of this Licence and do not require amendment;

"Monitoring Program" means a monitoring program established to collect data on surface water and groundwater quality to assess impacts to the freshwater aquatic environment of an appurtenant undertaking;

"Nunavut Land Claims Agreement" (NLCA) means the "*Agreement Between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in Right of Canada*", including its preamble and schedules, and any amendments to that agreement made pursuant to it;

"Sewage" means all toilet wastes and greywater;

"Sewage Disposal Facilities" comprises the area and decant structures designed to contain and treat sewage as described in the Application for Water Licence filed by the Applicant on July 1, 2003 and illustrated in Drawing Nos. 2003-0060-EN1/2;

"Solid Waste Disposal Facilities" comprises the area and associated structures designed to contain solid waste as described in the Application for Water Licence filed by the Applicant on July 1, 2003 and illustrated in Drawing Nos. 2003-0060-EN1/2;

"Toilet Wastes" means all human excreta and associated products, but does not include greywater;

"Waste" means, as defined in S.4 of the *Act*, any substance that, by itself or in combination with other substances found in water, would have the effect of altering the quality of any water to which the substance is added to an extent that is detrimental to its use by people or by any animal, fish or plant, or any water that would have that effect because of the quantity or concentration of the substances contained in it or because it has been treated or changed, by heat or other means;

"Waste Disposal Facilities" means all facilities designated for the disposal of waste, and includes the Sewage Disposal Facilities and Solid Waste Disposal Facilities, as described in the Application for Water Licence filed by the Applicant on July 1, 2003, and illustrated in Drawing Nos. 2003-0060-EN1/2; and

"Water Supply Facilities" comprises the area and associated intake infrastructure at the Coppermine River, as described in the Application for Water Licence filed by the Applicant on July 1, 2003, and illustrated in Drawing Nos. 2003-0060-EN1/2.

PART B: GENERAL CONDITIONS

1. The Licensee shall file an Annual Report with the Board not later than March 31st of the year following the calendar year reported which shall contain the following information:

i. tabular summaries of all data generated under the "Monitoring Program";

ii. the monthly and annual quantities in cubic metres of fresh water obtained from all sources;

iii. the monthly and annual quantities in cubic metres of each and all waste discharged;

iv. a summary of modifications and/or major maintenance work carried out on the Water Supply and Waste Disposal Facilities, including all associated structures and facilities;

v. a list of unauthorized discharges and summary of follow-up action taken;

vi. a summary of any abandonment and restoration work completed during the year and an outline of any work anticipated for the next year;

vii. a summary of any studies, reports and plans (e.g., Operation and Maintenance, Abandonment and Restoration, QA/QC) requested by the Board that relate to waste disposal, water use or reclamation, and a brief description of any future studies planned;

viii. any other details on water use or waste disposal requested by the Board by November 1st of the year being reported; and

2. The Licensee shall comply with the "Monitoring Program" described in this Licence, and any amendments to the "Monitoring Program" as may be made from time to time, pursuant to the conditions of this Licence.

3. The "Monitoring Program" and compliance dates specified in the Licence may be modified at the discretion of the Board.

4. Meters, devices or other such methods used for measuring the volumes of water used and waste discharged shall be installed, operated and maintained by the Licensee to the satisfaction of an Inspector.

5. The Licensee shall, within ninety (90) days after the first visit of the Inspector, post the necessary signs, where possible, to identify the stations of the "Monitoring Program." All signage postings shall be in the Official Languages of Nunavut, and shall be located and maintained to the satisfaction of an Inspector.

6. The Licensee shall immediately report to the 24-Hour Spill Report Line (867-920-8130) any spills of Waste, which are reported to or observed by the Licensee, within the municipal boundaries or in the areas of the Water Supply or Waste Disposal Facilities.

7. The Licensee shall ensure a copy of this Licence is maintained at the municipal office at all times.

8. Any communication with respect to this Licence shall be made in writing to the attention of:

(i) Chief Administrative Officer:

Executive Director
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU X0B 1J0
Telephone: (867) 360-6338
Fax: (867) 360-6369

(ii) Inspector Contact:

Water Resources Officer
Nunavut District, Nunavut Region
P.O. Box 100
Iqaluit, NU X0A 0H0
Telephone: (867) 975-4298
Fax: (867) 979-6445

(iii) Analyst Contact:

Taiga Laboratories
Department of Indian and Northern Affairs
4601 - 52 Avenue, P.O. Box 1500
Yellowknife, NT X1A 2R3
Telephone: (867) 669-2781
Fax: (867) 669-2718

9. The Licensee shall submit one paper copy and one electronic copy of all reports, studies, and plans to the Board. Reports or studies submitted to the Board by the Licensee shall include a detailed executive summary in Inuktitut.

PART C: CONDITIONS APPLYING TO WATER USE

1. The Licensee shall obtain all fresh water from Coppermine River using the Water Supply Facilities or as otherwise approved by the Board.

2. The annual quantity of water used for all purposes shall not exceed 64,000 cubic metres.

3. The Licensee shall maintain the Water Supply Facilities to the satisfaction of the Inspector.

4. The water intake hose used on the water pumps shall be equipped with a screen with a mesh size sufficient to ensure no entrainment of fish.

PART D: CONDITIONS APPLYING TO WASTE DISPOSAL

1. The Licensee shall direct all Sewage to the Sewage Disposal Facilities or as otherwise approved by the Board.

2. All Effluent discharged from the Sewage Disposal Facilities at Monitoring Station KUG-4 shall meet the following effluent quality standards:

Parameter	Maximum Average Concentration
Faecal Coliforms	1 x 10^6CFU/dl
BOD_5	120 mg/L
Total Suspended Solids	180 mg/L
Oil and grease	No visible sheen
pH	between 6 and 9

3. A Freeboard limit of 1.0 metre, or as recommended by a qualified geotechnical engineer and as approved by the Board, shall be maintained at all dams, dykes or structures intended to contain, withhold, divert or retain water or wastes.

4. The Licensee shall advise an Inspector at least ten (10) days prior to initiating any decant of the sewage lagoon.

5. The Sewage Disposal Facility shall be maintained and operated, to the satisfaction of an Inspector in such a manner as to prevent structural failure.

6. The Licensee shall dispose of and contain all solid wastes at the Solid Waste Disposal Facilities or as otherwise approved by the Board.

7. The Licensee shall implement measures to ensure waste from the Solid Waste Disposal Facility does not enter water.

8. The Licensee shall submit to the Board for review within six (6) months of the issuance of this license a report identifying each Final Discharge Point. The report shall at least include:

    a. Plans, specifications and a general description of each Final Discharge Point together with its specific geo-referenced location;

    b. A description of how each Final Discharge Point is designed and maintained.

9. If, during the term of this Licence, additional Final Discharge Points are identified, the Licensee shall submit the information as required by Part D, Item 8 for each new Final Discharge Point within 30 days after the discharge point is identified and at least 60 days prior to depositing Effluent from the new Final Discharge Point and/or proposed changes are made to a Final Discharge Point.

PART E: CONDITIONS APPLYING TO MODIFICATION AND CONSTRUCTION

1. The Licensee shall submit to the Board for approval design drawings stamped by a qualified engineer registered in Nunavut prior to the construction of any dams, dykes or structures intended to contain, withhold, divert or retain water or wastes.

2. The Licensee may, without written approval from the Board, carry out modifications to the Water Supply and Waste Disposal Facilities provided that such modifications are consistent with the terms of this Licence and the following requirements are met:

    i. the Licensee has notified the Board in writing of such proposed modifications at least sixty (60) days prior to beginning the modifications;

    ii. said modifications do not place the Licensee in contravention of the Licence or the *Act*;

    iii. the Board has not, during the sixty (60) days following notification of the proposed modifications, informed the Licensee that review of the proposal will require more than sixty (60) days; and

    iv. the Board has not rejected the proposed modifications.

3. Modifications for which all of the conditions referred to in Part E, Item 1, have not been met may be carried out only with written approval from the Board.

4. The Licensee shall provide as built plans/drawings of the modifications referred to in this Licence within ninety (90) days of completion of the modifications.

PART F: CONDITIONS APPLYING TO OPERATION AND MAINTENANCE

1. The Licensee shall, before March 31, 2004 submit to the Board for approval, a Plan for the Operation and Maintenance of the Sewage and Solid Waste Disposal Facilities in accordance with *"Guidelines for Preparing an Operation and Maintenance Manual for Sewage and Solid Waste Disposal Facilities"* (October 1996). This Plan shall specifically address the waste disposal and operational issues related to the Sewage Disposal Facility and the Solid Disposal Facility, which were identified in the August 9, 2001 DIAND Inspection Report.

2. The Licensee shall implement the Plan specified in Part F, Item 1 as and when approved by the Board.

3. The Licensee shall revise the Plan referred to in Part F, Item 1, if not acceptable to the Board. The revised Plan shall be submitted to the Board for approval within thirty (30) days of notification of the Board decision

4. If, during the period of this Licence, an unauthorized discharge of waste occurs, or if such a discharge is foreseeable, the Licensee shall:

    i. employ the appropriate contingency plan as provided for in the Operation Maintenance Plan;
    ii. report the incident immediately *via* the 24-Hour Spill Reporting Line at (867) 920-8130 and to an Inspector; and
    iii. submit to an Inspector a detailed report on each occurrence not later than thirty (30) days after initially reporting the event.

5. In the absence of a contingency plan contained within an approved Operation and Maintenance Plan, and should during the period of this Licence an unauthorized discharge of waste occur, or if such a discharge is foreseeable, the Licensee shall:

    i. take whatever steps are immediately practicable to protect human life, health and the environment;
    ii. without delay seek guidance from the Departments of Community Government and Transportation and Sustainable Development with regards to mitigation and remedial actions required to address the discharge;

ii. report the incident immediately *via* the 24-Hour Spill Reporting Line at (867) 920-8130 and to an Inspector; and
iii. submit to an Inspector a detailed report on each occurrence not later than thirty (30) days after initially reporting the event.

PART G: CONDITIONS APPLYING TO ABANDONMENT AND RESTORATION

1. The Licensee shall submit to the Board for approval an Abandonment and Restoration Plan at least six (6) months prior to abandoning any facilities and the construction of new facilities to replace existing ones. The Plan shall include, but not be limited to where applicable:

   i. water intake facilities;
   ii. the water treatment and waste disposal sites and facilities;
   iii. petroleum and chemical storage areas;
   iv. any site affected by waste spills;
   v. leachate prevention;
   vi. an implementation schedule;
   vii. maps delineating all disturbed areas, and site facilities;
   viii. consideration of altered drainage patterns;
   ix. type and source of cover materials;
   x. future area use;
   xi. hazardous wastes; and
   xii. a proposal identifying measures by which restoration costs will be financed by the Licensee upon abandonment.

2. The Licensee shall implement the plan specified in Part G, Item 1 as and when approved by the Board.

3. The Licensee shall revise the Plan referred to in Part G, Item 1 if not approved. The revised Plan shall be submitted to the Board for approval within thirty (30) days of receiving notification of the Board's decision.

4. The Licensee shall complete the restoration work within the time schedule specified in the Plan, or as subsequently revised and approved by the Board.

PART H: CONDITIONS APPLYING TO THE MONITORING PROGRAM

1. The Licensee shall maintain Monitoring Stations at the following locations:

Monitoring Station	Description
KUG-1	Raw water supply at Coppermine River prior to treatment
KUG-2	Effluent discharge from the Final Discharge Point of the Solid Waste Disposal Facilities
KUG-3	Raw Sewage at truck offload point
KUG-4	Effluent discharge from the Final Discharge Point of the Sewage Disposal Facilities

2. The Licensee shall sample monthly at Monitoring Station KUG-2 and KUG-4 during the months of May to August, inclusive. Samples shall be analyzed for the following parameters:

BOD	Faecal Coliforms
pH	Conductivity
Total Suspended Solids	Ammonia Nitrogen
Nitrate-Nitrite	Oil and Grease (visual)
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	

3. The Licensee shall measure and record in cubic metres the monthly and annual quantities of water pumped from Monitoring Station KUG-1 for all purposes.

4. The Licensee shall measure and record in cubic metres the monthly and annual quantities of raw sewage offloaded from trucks at Monitoring Station KUG-3 for all purposes.

5. Additional sampling and analysis may be requested by an Inspector.

6. The Licensee shall conform to the Quality Assurance/Quality Control (QA/QC) Plan which shall be provided to the Licensee by the NWB within 60 days of the issuance of this licence.

7. All sampling, sample preservation and analyses shall be conducted in accordance with methods prescribed in the current edition of *Standard Methods for the Examination of Water and Wastewater*, or by such other methods approved by the Board.

8. All analyses shall be performed in a Canadian Association of Environmental Analytical Laboratories (CAEAL) Certified Laboratory, or as otherwise approved by an Analyst.

9. The Licensee shall measure and record the annual quantities of sewage solids removed from the Sewage Disposal Facility.

10. The Licensee shall, unless otherwise requested by an Inspector, include all of the data and information required by the "Monitoring Program" in the Licensee's Annual Report, as required *per* Part B, Item 1.

11. Modifications to the Monitoring Program may be made only upon written approval of the Chief Administrative Officer.

Appendix B

Site Forms

Form 1
Waste Placement Form
Hamlet of Kugluktuk

Time Period			Waste Delivered by Hamlet Staff		Waste Delivered by Others	Total (m^3)	Waste Activities (i.e. burning, compacting, covering, etc.)	Staff Initials
From	To	Number of Days	Number of Loads	Estimated Quantity (m^3)	Estimated Quantity (m^3)	Volume		
Totals								

Form 2
Weekly Waste Management Facility Inspection Form
Hamlet of Kugluktuk

Inspected By: _____ Date: _____

Wind Direction: _____ Temperature: _____

Precipitation: _____ Ground Cover: _____

Issues and Conditions	Description/Condition/Problems	Action/Maintenance Required
Health and Safety (dangers and concerns)		
Wildlife		
Entrance Road and Site Roads (condition, ditches, snow, surface, etc.)		
Signs		
Litter (fences, on site, off site, etc.)		
Berms and Fences		
Waste Diversion Area		

Issues and Conditions	Description/Condition/Problems	Action/Maintenance Required
Bulky Metals		
Hazardous Waste Storage		
Landfill Area		
Waste Drop Off		
Burning		
Waste Placement and Compaction		
Waste Materials (hazardous wastes, damaged materials, etc.)		
Cover Material (stockpile, exposed waste, etc.)		
Waste Compaction and Placement		

Issues and Conditions	Description/Condition/Problems	Action/Maintenance Required
Surface Drainage (water flow, erosion, waste in ditches, etc.)		
Leachate Seepage from Waste		
Environmental Impacts (litter on tundra, impacted water escaping site, etc.)		
Equipment (garbage trunk, loader, bulldozer, dump truck, etc.)		
Cell/Layer Construction (slopes, cover, etc.)		
Site Planning		
Other Issues and Concerns		

Form 3
Solid Waste Planning
Hamlet of Kugluktuk

Prepared By: _____

Date: _____

Solid Waste Planning Issue	Current Operations	To Do Items and Schedule
Health and Safety		
Site Inspection Results/Concerns		
Waste Placement and Filling Summary		
Hazardous Waste Storage Summary		
Bulky Metals Summary		
Environmental Monitoring		

Solid Waste Planning Issue	Current Operations	To Do Items and Schedule
Annual Reporting		
Nunavut Water Board License Requirements		
Staffing		
Equipment		
Costs		
Other Issues/Concerns		

Appendix C
Canadian Environmental Quality Guidelines

Canadian Environmental Quality Guidelines

GUIDELINE AVAILABILITY TABLE

July 2006

The user is advised to consult the appropriate chapter and/or factsheet contained in the Canadian Environmental Quality Guidelines binder for specific information and implementation guidance pertaining to each environmental quality guideline. Guidelines are listed under chemical names, which are cross-referenced with common-names, abbreviations, and/or families of chemicals as appropriate.

	Chapter 1 Air	**Chapter 2** Water: Community		**Chapter 3** Water:	**Chapter 4** Water: Aquatic life		**Chapter 5** Water: Agriculture		**Chapter 6** Sediment		**Chapter 7** Soil				**Chapter 8** Tissue Residue
		MAC/IMAC	AO	Recreation & Aesthetics	Freshwater	Marine	Irrigation	Livestock	Freshwater	Marine	Agri.	Res./Park	Comm.	Ind.	
Acenaphthene [See Polycyclic aromatic hydrocarbons (PAHs)]															
Acenaphthylene [See Polycyclic aromatic hydrocarbons (PAHs)]															
Acridine [See Polycyclic aromatic hydrocarbons (PAHs)]															
Aesthetics				✓											
Aldicarb		✓			✓	✓	✓	✓							
Aldrin + Dieldrin		✓													
Algae, blue-green [See Cyanobacteria]															
Aliphatic chlorinated hydrocarbons (each)											✓	✓	✓	✓	
Aliphatics nonchlorinated (each)											✓				
Aluminum		✓			✓		✓	✓							
Ammonia (total)					✓										
Ammonia (un-ionized)					✓										
Aniline					✓										
Anthracene [See Polycyclic aromatic hydrocarbons (PAHs)]															
Antimony		✓									✓	✓	✓	✓	
Antimony-125		✓													
Aquatic plants				✓											
Aroclor 1254 [See Polychlorinated biphenyls (PCBs)]															
Arsenic		✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Atrazine		✓			✓		✓	✓							
Azinphos-methyl		✓													
Barium		✓									✓	✓	✓	✓	
Bendiocarb		✓													
Benz(a)anthracene [See Polycyclic aromatic hydrocarbons (PAHs)]															
Benzene		✓			✓	✓					✓	✓	✓	✓	

Canadian Environmental Quality Guidelines

GUIDELINE AVAILABILITY TABLE

July 2006

The user is advised to consult the appropriate chapter and/or factsheet contained in the Canadian Environmental Quality Guidelines binder for specific information and implementation guidance pertaining to each environmental quality guideline. Guidelines are listed under chemical names, which are cross-referenced with common-names, abbreviations, and/or families of chemicals as appropriate.

	Chapter 1 Air	**Chapter 2** Water: Community		**Chapter 3** Water:	**Chapter 4** Water: Aquatic life		**Chapter 5** Water: Agriculture		**Chapter 6** Sediment		**Chapter 7** Soil				**Chapter 8** Tissue Residue
		MAC/IMAC	AO	Recreation & Aesthetics	Freshwater	Marine	Irrigation	Livestock	Freshwater	Marine	Agri.	Res./Park	Comm.	Ind.	
Benzo(b)fluoranthene [See Polycyclic aromatic hydrocarbons (PAHs)]							✓	✓							
Benzo(k)fluoranthene [See Polycyclic aromatic hydrocarbons(PAHs)]															
Beryllium							✓	✓			✓	✓	✓	✓	
2,2-Bis(p-chlorophenyl)-1,1-dichloroethane [See DDD]															
2,2-Bis(p-chlorophenyl)-1,1,1-trichloroethane [See DDT]															
Blue-green algae [See Cyanobacteria]															
Boron		✓					✓	✓			✓				
Bromacil					✓		✓	✓							
Bromate		✓													
Bromoform [See Halogenated methanes, Tribromomethane]															
Bromoxynil		✓			✓		✓	✓							
Cadmium		✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Calcium								✓							
Captan					✓			✓							
Carbaryl		✓			✓	✓		✓							
Carbofuran		✓			✓			✓							
Carbon monoxide	✓														
Carbon tetrachloride [See Halogenated methanes, Tetrachloromethane]															
Cerium-141		✓													
Cerium-144		✓													
Cesium-134		✓													
Cesium-137		✓													
Chemical characteristics				✓											
Chloramines [See Reactive chlorine species]															
Chlordane								✓	✓	✓					

Canadian Environmental Quality Guidelines

GUIDELINE AVAILABILITY TABLE

July 2006

The user is advised to consult the appropriate chapter and/or factsheet contained in the Canadian Environmental Quality Guidelines binder for specific information and implementation guidance pertaining to each environmental quality guideline. Guidelines are listed under chemical names, which are cross-referenced with common-names, abbreviations, and/or families of chemicals as appropriate.

	Chapter 1 Air	**Chapter 2** Water: Community		**Chapter 3** Water:	**Chapter 4** Water: Aquatic life		**Chapter 5** Water: Agriculture		**Chapter 6** Sediment		**Chapter 7** Soil				**Chapter 8** Tissue Residue
		MAC/IMAC	AO	Recreation & Aesthetics	Freshwater	Marine	Irrigation	Livestock	Freshwater	Marine	Agri.	Res./Park	Comm.	Ind.	
Chloride		✓													
Chlorinated benzenes															
Monochlorobenzene		✓	✓		✓	✓					✓	✓	✓	✓	
1,2-Dichlorobenzene		✓	✓		✓	✓					✓	✓	✓	✓	
1,3-Dichlorobenzene					✓						✓	✓	✓	✓	
1,4-Dichlorobenzene		✓	✓		✓						✓	✓	✓	✓	
1,2,3-Trichlorobenzene					✓						✓	✓	✓	✓	
1,2,4-Trichlorobenzene					✓	✓					✓	✓	✓	✓	
1,3,5-Trichlorobenzene											✓	✓	✓	✓	
1,2,3,4-Tetrachlorobenzene					✓						✓	✓	✓	✓	
1,2,3,5-Tetrachlorobenzene											✓	✓	✓	✓	
1,2,4,5-Tetrachlorobenzene											✓	✓	✓	✓	
Pentachlorobenzene					✓						✓	✓	✓	✓	
Hexachlorobenzene								✓			✓	✓	✓	✓	
Chlorinated ethanes															
1,1-Dichloroethane											✓	✓	✓	✓	
1,2-Dichloroethane		✓			✓			✓			✓	✓	✓	✓	
1,1,1-Trichloroethane											✓	✓	✓	✓	
1,1,2-Trichloroethane											✓	✓	✓	✓	
1,1,2,2-Tetrachlorethane											✓	✓	✓	✓	
Chlorinated ethenes															
Monochloroethene (Vinyl chloride)		✓									✓	✓	✓	✓	
1,1-Dichloroethene (Dichloroethylene)		✓									✓	✓	✓	✓	
1,2-Dichloroethene											✓	✓	✓	✓	
1,1,2-Trichloroethene (Trichloroethylene, TCE)		✓			✓			✓			✓	✓	✓	✓	
1,1,2,2-Tetrachloroethene (Tetrachloroethylene, PCE)		✓			✓						✓	✓	✓	✓	

Canadian Environmental Quality Guidelines

GUIDELINE AVAILABILITY TABLE

July 2006

The user is advised to consult the appropriate chapter and/or factsheet contained in the Canadian Environmental Quality Guidelines binder for specific information and implementation guidance pertaining to each environmental quality guideline. Guidelines are listed under chemical names, which are cross-referenced with common-names, abbreviations, and/or families of chemicals as appropriate.

	Chapter 1 Air	**Chapter 2** Water: Community		**Chapter 3** Water:	**Chapter 4** Water: Aquatic life		**Chapter 5** Water: Agriculture		**Chapter 6** Sediment		**Chapter 7** Soil				**Chapter 8** Tissue Residue
		MAC/IMAC	AO	Recreation & Aesthetics	Freshwater	Marine	Irrigation	Livestock	Freshwater	Marine	Agri.	Res./Park	Comm.	Ind.	
Chlorinated methanes [See Halogenated methanes]															
Chlorinated phenols															
Monochlorophenols					✓						✓	✓	✓	✓	
Dichlorophenols					✓						✓	✓	✓	✓	
2,4-Dichlorophenol		✓	✓								✓	✓	✓	✓	
Trichlorophenols					✓						✓	✓	✓	✓	
2,4,6-Trichlorophenol		✓	✓								✓	✓	✓	✓	
Tetrachlorophenols					✓						✓	✓	✓	✓	
2,3,4,6-Tetrachlorophenol		✓	✓								✓	✓	✓	✓	
Pentachlorophenol (PCP)		✓	✓		✓						✓	✓	✓	✓	
Chlorinated propane (1,2-dichloropropane)											✓	✓	✓	✓	
Chlorinated propene (1,2-dichloropropene (cis and trans))											✓	✓	✓	✓	
Chlorine, reactive [See Reactive chlorine species]															
Chloroform [See Halogenated methanes, Trichloromethane]															
4-Chloro-2-methyl phenoxy acetic acid [See MCPA]															
Chlorothalonil					✓	✓	✓	✓							
Chlorpyrifos		✓			✓	✓		✓							
Chromium		✓							✓	✓	✓	✓	✓	✓	
Trivalent chromium (Cr(III))					✓	✓	✓	✓							
Hexavalent chromium (Cr(VI))					✓	✓	✓	✓			✓	✓	✓	✓	
Chrysene [See Polycyclic aromatic hydrocarbons (PAHs)]															
Clarity				✓											
Cobalt							✓	✓			✓	✓	✓	✓	
Cobalt-60		✓													
Coliforms, fecal (Escherichia coli)		✓		✓			✓								
Coliforms, total		✓					✓								

Canadian Environmental Quality Guidelines

GUIDELINE AVAILABILITY TABLE

July 2006

The user is advised to consult the appropriate chapter and/or factsheet contained in the Canadian Environmental Quality Guidelines binder for specific information and implementation guidance pertaining to each environmental quality guideline. Guidelines are listed under chemical names, which are cross-referenced with common-names, abbreviations, and/or families of chemicals as appropriate.

	Chapter 1 Air	**Chapter 2** Water: Community		**Chapter 3** Water:	**Chapter 4** Water: Aquatic life		**Chapter 5** Water: Agriculture		**Chapter 6** Sediment		**Chapter 7** Soil				**Chapter 8** Tissue Residue
		MAC/IMAC	AO	Recreation & Aesthetics	Freshwater	Marine	Irrigation	Livestock	Freshwater	Marine	Agri.	Res./Park	Comm.	Ind.	
Coliphages				✓											
Colour			✓		✓	✓		✓							
Conductivity											✓	✓	✓	✓	
Copper			✓		✓		✓	✓	✓	✓	✓	✓	✓	✓	
Cyanazine		✓			✓		✓	✓							
Cyanide		✓			✓						✓	✓	✓	✓	
Cyanobacteria (Blue-green algae)				✓				✓							
Cyanobacterial toxins (as Microcystin - LR)		✓													
2,4-D [See 2,4-Dichlorophenoxyacetic acid]					✓	✓	✓	✓							
DDAC (Didecyl dimethyl ammonium chloride)					✓										
DDD (2,2-Bis (p-chlorophenyl)-1,1-dichloroethane; Dichloro diphenyl dichloroethane)									✓	✓					✓
DDE (1,1-Dichloro-2,2-bis(p-chlorophenyl)-ethene), Diphenyl dichloro ethylene									✓	✓					✓
DDT (2,2-Bis(p-chlorophenyl)-1,1,1-trichloroethane; Dichloro diphenyl trichloroethane)									✓	✓	✓	✓	✓	✓	✓
Debris						✓									
Deltamethrin					✓			✓							
Deposited bedload sediment [See Total particulate matter]															
Diazinon		✓													
Dibenz(a,h)anthracene [See Polycyclic aromatic hydrocarbons (PAHs)]															
Dibromochloromethane [See Halogenated methanes]															
Di-n-butyl phthalate [See Phthalate esters]															
Dicamba		✓			✓		✓	✓							
Dichlorobenzene [See Chlorinated benzenes]															
Dichlorobromomethane [See Halogenated methanes]															
1,1-Dichloro-2,2-bis(p-chlorophenyl)-ethene [See DDE]															
Dichloro diphenyl dichloroethane [See DDD]															

Canadian Environmental Quality Guidelines

GUIDELINE AVAILABILITY TABLE

July 2006

The user is advised to consult the appropriate chapter and/or factsheet contained in the Canadian Environmental Quality Guidelines binder for specific information and implementation guidance pertaining to each environmental quality guideline. Guidelines are listed under chemical names, which are cross-referenced with common-names, abbreviations, and/or families of chemicals as appropriate.

	Chapter 1 Air	**Chapter 2** Water: Community		**Chapter 3** Water:	**Chapter 4** Water: Aquatic life		**Chapter 5** Water: Agriculture		**Chapter 6** Sediment		**Chapter 7** Soil				**Chapter 8** Tissue Residue
		MAC/IMAC	AO	Recreation & Aesthetics	Freshwater	Marine	Irrigation	Livestock	Freshwater	Marine	Agri.	Res./Park	Comm.	Ind.	
Dichloro diphenyl trichloroethane [See DDT]															
Dichloroethane [See Chlorinated ethanes]															
Dichloroethene [See Chlorinated ethenes]															
Dichloroethylene [See Chlorinated ethenes, 1,1-Dichloroethene]															
Dichloromethane [See Halogenated methanes]															
Dichlorophenols [See Chlorinated phenols]															
2,4-Dichlorophenoxyacetic acid (2,4-D) [See also Phenoxy herbicides]		✓			✓	✓	✓	✓							
1,2-dichloropropane [See chlorinated propane]															
1,2-dichloropropene [See chlorinated propene]															
Diclofop-methyl		✓			✓		✓	✓							
Didecyl dimethyl ammonium chloride [See DDAC]															
Dieldrin									✓	✓					
Dieldrin + Aldrin [See Aldrin + Dieldrin]															
Diethylene glycol [See Glycols]															
Di(2-ethylhexyl) phthalate [See Phthalate esters]															
Diisopropanolamine (DIPA)					✓		✓				✓	✓	✓	✓	
Dimethoate		✓			✓			✓							
Di-n-butyl phthalate [See Phthalate esters]															
Di-n-octyl phthalate [See Phthalate esters]															
Dinoseb		✓			✓		✓	✓							
Diphenyl dichloro ethylene [See DDE]															
Diquat		✓													
Dissolved gas supersaturation					✓	✓									
Dissolved oxygen [See Oxygen, dissolved]															
Dissolved solids [See Total dissolved solids]															
Diuron		✓													
Endosulfan					✓										

Canadian Environmental Quality Guidelines

GUIDELINE AVAILABILITY TABLE

July 2006

The user is advised to consult the appropriate chapter and/or factsheet contained in the Canadian Environmental Quality Guidelines binder for specific information and implementation guidance pertaining to each environmental quality guideline. Guidelines are listed under chemical names, which are cross-referenced with common-names, abbreviations, and/or families of chemicals as appropriate.

	Chapter 1 Air	**Chapter 2** Water: Community		**Chapter 3** Water:	**Chapter 4** Water: Aquatic life		**Chapter 5** Water: Agriculture		**Chapter 6** Sediment		**Chapter 7** Soil				**Chapter 8** Tissue Residue
		MAC/IMAC	AO	Recreation & Aesthetics	Freshwater	Marine	Irrigation	Livestock	Freshwater	Marine	Agri.	Res./Park	Comm.	Ind.	
Endrin									✓	✓					
Enterococci				✓											
Escherichia coli [See Coliforms, fecal]															
Ethylbenzene			✓		✓	✓		✓			✓	✓	✓	✓	
Ethylene glycol [See Glycols]															
Fecal coliforms [See Coliforms, fecal]															
Fluoranthene [See Polycyclic aromatic hydrocarbons (PAHs)]															
Fluorene [See Polycyclic aromatic hydrocarbons (PAHs)]															
Fluoride		✓					✓	✓			✓	✓	✓	✓	
Inorganic fluorides					✓	✓									
Glycols															
Ethylene glycol					✓						✓	✓	✓	✓	
Diethylene glycol															
Propylene glycol					✓						✓	✓	✓	✓	
Glyphosate		✓			✓			✓							
Grease and oil [See Oil and grease]															
Halogenated methanes															
Monochloromethane (Methyl chloride)															
Dichloromethane (Methylene chloride)		✓			✓			✓			✓	✓	✓	✓	
Trichloromethane (Chloroform)					✓			✓			✓	✓	✓	✓	
Tetrachloromethane (Carbon tetrachloride)		✓			✓			✓			✓	✓	✓	✓	
Monobromomethane (Methyl bromide)															
Tribromomethane (Bromoform)								✓							
Dichlorobromomethane								✓							
Dibromochloromethane								✓							
Trihalomethanes (total)		✓													
HCBD [See Hexachlorobutadiene]															

The user is advised to consult the appropriate chapter and/or factsheet contained in the Canadian Environmental Quality Guidelines binder for specific information and implementation guidance pertaining to each environmental quality guideline. Guidelines are listed under chemical names, which are cross-referenced with common-names, abbreviations, and/or families of chemicals as appropriate.

	Chapter 1 Air	**Chapter 2** Water: Community		**Chapter 3** Water:	**Chapter 4** Water: Aquatic life		**Chapter 5** Water: Agriculture		**Chapter 6** Sediment		**Chapter 7** Soil				**Chapter 8** Tissue Residue
		MAC/IMAC	AO	Recreation & Aesthetics	Freshwater	Marine	Irrigation	Livestock	Freshwater	Marine	Agri.	Res./Park	Comm.	Ind.	
Heptachlor (Heptachlor epoxide)									✓	✓					
Hexachlorobenzene [See Chlorinated benzenes]															
Hexachlorobutadiene (HCBD)					✓										
Hexachlorocyclohexane [See Lindane]															
Hydrogen fluoride	✓														
Hypochlorous acid [See Reactive chlorine species]															
Indeno(1,2,3-c,d)pyrene [See Polycyclic aromatic hydrocarbons (PAHs)]															
Inorganic fluorides [See Fluoride]															
Iodine-125		✓													
Iodine-131		✓													
3-Iodo-2-propynyl butyl carbamate [See IPBC]															
IPBC (3-Iodo-2-propynyl butyl carbamate)					✓										
Iron			✓		✓		✓								
Iron-59		✓													
Lead		✓			✓		✓	✓	✓	✓	✓	✓	✓	✓	
Lead-210		✓													
Lindane (Hexachlorocyclohexane)					✓			✓	✓	✓	✓				
Linuron					✓		✓								
Lithium							✓								
Malathion		✓													
Manganese			✓				✓								
Manganese-54		✓													
MCPA (4-Chloro-2-methyl phenoxy acetic acid; 2-Methyl-4-chloro phenoxy acetic acid)					✓	✓	✓	✓							
Mercury		✓						✓	✓	✓	✓	✓	✓	✓	
Inorganic mercury					✓	✓									
Methylmercury					✓										✓

Canadian Environmental Quality Guidelines

GUIDELINE AVAILABILITY TABLE

July 2006

The user is advised to consult the appropriate chapter and/or factsheet contained in the Canadian Environmental Quality Guidelines binder for specific information and implementation guidance pertaining to each environmental quality guideline. Guidelines are listed under chemical names, which are cross-referenced with common-names, abbreviations, and/or families of chemicals as appropriate.

	Chapter 1 Air	**Chapter 2** Water: Community		**Chapter 3** Water:	**Chapter 4** Water: Aquatic life		**Chapter 5** Water: Agriculture		**Chapter 6** Sediment		**Chapter 7** Soil				**Chapter 8** Tissue Residue
		MAC/IMAC	AO	Recreation & Aesthetics	Freshwater	Marine	Irrigation	Livestock	Freshwater	Marine	Agri.	Res./Park	Comm.	Ind.	
Methoxychlor		✓													
Methyl bromide [See Halogenated methanes, Monobromomethane]															
Methyl chloride [See Halogenated methanes, Monochloromethane]															
2-Methyl-4-chloro phenoxy acetic acid [See MCPA]															
Methylene chloride [See Halogenated methanes, Dichloromethane]															
2-Methylnaphthalene [See Polycyclic aromatic hydrocarbons (PAHs)]															
Methyl tertiary-butyl ether [See MTBE]					✓	✓									
Metolachlor		✓			✓		✓	✓							
Metribuzin		✓			✓		✓	✓							
Molybdenum					✓		✓	✓			✓	✓	✓	✓	
Molybdenum-99		✓													
Monobromomethane [See Halogenated methanes]															
Monochloramine [See Reactive chlorine species]															
Monochlorobenzene [See Chlorinated benzenes]															
Monochloroethene [See Chlorinated ethenes]															
Monochloromethane [See Halogenated methanes]															
Monochlorophenols [See Chlorinated phenols]															
MTBE (Methyl tertiary-butyl ether)					✓	✓									
Naphthalene [See Polycyclic aromatic hydrocarbons (PAHs)]															
Nickel					✓		✓	✓			✓	✓	✓	✓	
Niobium-95		✓													
Nitrate		✓			✓	✓									
Nitrate + Nitrite								✓							
Nitrilotriacetic acid (NTA)		✓													
Nitrite		✓			✓			✓							

Canadian Environmental Quality Guidelines

GUIDELINE AVAILABILITY TABLE

July 2006

The user is advised to consult the appropriate chapter and/or factsheet contained in the Canadian Environmental Quality Guidelines binder for specific information and implementation guidance pertaining to each environmental quality guideline. Guidelines are listed under chemical names, which are cross-referenced with common-names, abbreviations, and/or families of chemicals as appropriate.

	Chapter 1 Air	**Chapter 2** Water: Community		**Chapter 3** Water:	**Chapter 4** Water: Aquatic life		**Chapter 5** Water: Agriculture		**Chapter 6** Sediment		**Chapter 7** Soil				**Chapter 8** Tissue Residue
		MAC/IMAC	AO	Recreation & Aesthetics	Freshwater	Marine	Irrigation	Livestock	Freshwater	Marine	Agri.	Res./Park	Comm.	Ind.	
Nitrite + Nitrate [See Nitrate + Nitrite]															
Nitrogen dioxide	✓														
Nonylphenol and its ethoxylates					✓	✓			✓	✓	✓	✓	✓	✓	
NTA [See Nitrilotriacetic acid]															
Nuisance organisms				✓											
Odour															
Oil and grease [See Canada-wide Standard for Petroleum Hydrocarbons in Soil]				✓											
Organotins															
Tributyltin					✓	✓		✓							
Tricyclohexyltin								✓							
Triphenyltin					✓			✓							
Oxygen, dissolved					✓	✓									
Ozone	✓														
PAHs [See Polycyclic aromatic hydrocarbons (PAHs)]															
Paraquat (as dichloride)		✓													
Parathion		✓													
Particulate matter <2.5 µm (PM <2.5)	✓														
Particulate matter <10 µm (PM <10)	✓														
Pathogens (aquatic)				✓											
PCBs [See Polychlorinated biphenyls (PCBs)]															
PCDD/Fs [See Polychlorinated dibenzo-p-dioxins/dibenzo furans]															
PCE [See Chlorinated ethenes, 1,1,2,2-Tetrachloroethene]															
PCP [See Chlorinated phenols, Pentachlorophenol]															
Pentachlorobenzene [See Chlorinated benzenes]															
Pentachlorophenol [See Chlorinated phenols]															
Permethrin					✓	✓									

Canadian Environmental Quality Guidelines

GUIDELINE AVAILABILITY TABLE

July 2006

The user is advised to consult the appropriate chapter and/or factsheet contained in the Canadian Environmental Quality Guidelines binder for specific information and implementation guidance pertaining to each environmental quality guideline. Guidelines are listed under chemical names, which are cross-referenced with common-names, abbreviations, and/or families of chemicals as appropriate.

	Chapter 1 Air	**Chapter 2** Water: Community		**Chapter 3** Water:	**Chapter 4** Water: Aquatic life		**Chapter 5** Water: Agriculture		**Chapter 6** Sediment		**Chapter 7** Soil				**Chapter 8** Tissue Residue
		MAC/IMAC	AO	Recreation & Aesthetics	Freshwater	Marine	Irrigation	Livestock	Freshwater	Marine	Agri.	Res./Park	Comm.	Ind.	
pH			✓	✓	✓	✓					✓	✓	✓	✓	
Phenanthrene [See Polycyclic aromatic hydrocarbons (PAHs)]															
Phenolic compounds, nonchlorinated											✓	✓	✓	✓	
Phenols					✓			✓			✓	✓	✓	✓	
Phenoxy herbicides					✓			✓							
Phorate		✓													
Phosphorus					✓										
Phthalic acid esters (each)											✓				
Phthalate esters															
Di-n-butyl phthalate					✓										
Di(2-ethylhexyl) phthalate					✓										
Di-n-octyl phthalate															
Picloram		✓			✓			✓							
PM <2.5 [See Particulate matter <2.5 µm]															
PM <10 [See Particulate matter <10 µm]															
Polychlorinated biphenyls (PCBs)									✓	✓	✓	✓	✓	✓	✓
Aroclor 1254									✓	✓					
Polychlorinated dibenzo-p-dioxins/dibenzo furans (PCDD/Fs)									✓	✓	✓	✓	✓	✓	✓
Polycyclic aromatic hydrocarbons (PAHs)															
Acenaphthene					✓				✓	✓					
Acenaphthylene									✓	✓					
Acridine					✓										
Anthracene					✓				✓	✓					
Benzo(a)anthracene					✓				✓	✓	✓	✓	✓	✓	
Benzo(a)pyrene		✓			✓				✓	✓	✓	✓	✓	✓	
Benzo(b)fluoranthene											✓	✓	✓	✓	

Canadian Environmental Quality Guidelines

GUIDELINE AVAILABILITY TABLE

July 2006

The user is advised to consult the appropriate chapter and/or factsheet contained in the Canadian Environmental Quality Guidelines binder for specific information and implementation guidance pertaining to each environmental quality guideline. Guidelines are listed under chemical names, which are cross-referenced with common-names, abbreviations, and/or families of chemicals as appropriate.

	Chapter 1 Air	**Chapter 2** Water: Community		**Chapter 3** Water:	**Chapter 4** Water: Aquatic life		**Chapter 5** Water: Agriculture		**Chapter 6** Sediment		**Chapter 7** Soil				**Chapter 8** Tissue Residue
		MAC/IMAC	AO	Recreation & Aesthetics	Freshwater	Marine	Irrigation	Livestock	Freshwater	Marine	Agri.	Res./Park	Comm.	Ind.	
Benzo(k)fluoranthene											✓	✓	✓	✓	
Chrysene									✓	✓					
Dibenz(a,h)anthracene									✓	✓	✓	✓	✓	✓	
Fluoranthene					✓				✓	✓					
Fluorene					✓				✓	✓					
Indeno(1,2,3-c,d)pyrene											✓	✓	✓	✓	
2-Methylnaphthalene									✓	✓					
Naphthalene					✓	✓			✓	✓	✓	✓	✓	✓	
Phenanthrene					✓				✓	✓	✓	✓	✓	✓	
Pyrene					✓				✓	✓	✓	✓	✓	✓	
Quinoline					✓						✓				
Propylene glycol [See Glycols]															
Pyrene [See Polycyclic aromatic hydrocarbons (PAHs)]															
Quinoline [See Polycyclic aromatic hydrocarbons (PAHs)]															
Radium-224		✓													
Radium-226		✓													
Radium-228		✓													
Reactive chlorine species (Hypochlorous acid and monochloramine)					✓	✓									
Chloramines		✓													
Ruthenium-103		✓													
Ruthenium-106		✓													
Salinity						✓									
Selenium		✓			✓		✓	✓			✓	✓	✓	✓	
Silver					✓						✓	✓	✓	✓	
Simazine		✓			✓		✓	✓							
Sodium			✓												

The user is advised to consult the appropriate chapter and/or factsheet contained in the Canadian Environmental Quality Guidelines binder for specific information and implementation guidance pertaining to each environmental quality guideline. Guidelines are listed under chemical names, which are cross-referenced with common-names, abbreviations, and/or families of chemicals as appropriate.

	Chapter 1 Air	Chapter 2 Water: Community		Chapter 3 Water:	Chapter 4 Water: Aquatic life		Chapter 5 Water: Agriculture		Chapter 6 Sediment		Chapter 7 Soil				Chapter 8 Tissue Residue
		MAC/IMAC	AO	Recreation & Aesthetics	Freshwater	Marine	Irrigation	Livestock	Freshwater	Marine	Agri.	Res./Park	Comm.	Ind.	
Sodium adsorption ratio											✓	✓	✓	✓	
Streambed substrate [See Total particulate matter]															
Strontium-90		✓													
Styrene					✓						✓	✓	✓	✓	
Sulphate			✓					✓							
Sulphide (asH2S)			✓												
Sulfolane					✓		✓				✓	✓	✓	✓	
Sulphur dioxide	✓														
Sulphur (elemental)											✓				
Suspended particulates [See Total suspended particulates]															
Suspended sediments [See Total particulate matter]															
Taste															
TCE [See Chlorinated ethenes, 1,1,2-Trichloroethene]															
Tebuthiuron					✓		✓	✓							
Temperature			✓	✓	✓	✓									
Terbufos			✓												
Tetrachlorobenzene [See Chlorinated benzenes]															
Tetrachloroethane [See Chlorinated ethanes]															
Tetrachloroethene [See Chlorinated ethenes]															
Tetrachloroethylene [See Chlorinated ethenes, 1,1,2,2-Tetrachloroethene]															
Tetrachloromethane [See Halogenated methanes]															
Tetrachlorophenols [See Chlorinated phenols]															
Thallium					✓						✓	✓	✓	✓	
Thiophene											✓				
Thorium-228		✓													
Thorium-230		✓													
Thorium-232		✓													

Canadian Environmental Quality Guidelines

GUIDELINE AVAILABILITY TABLE

July 2006

The user is advised to consult the appropriate chapter and/or factsheet contained in the Canadian Environmental Quality Guidelines binder for specific information and implementation guidance pertaining to each environmental quality guideline. Guidelines are listed under chemical names, which are cross-referenced with common-names, abbreviations, and/or families of chemicals as appropriate.

	Chapter 1 Air	**Chapter 2** Water: Community		**Chapter 3** Water:	**Chapter 4** Water: Aquatic life		**Chapter 5** Water: Agriculture		**Chapter 6** Sediment		**Chapter 7** Soil				**Chapter 8** Tissue Residue
		MAC/IMAC	AO	Recreation & Aesthetics	Freshwater	Marine	Irrigation	Livestock	Freshwater	Marine	Agri.	Res./Park	Comm.	Ind.	
Thorium-234		✓													
Tin											✓	✓	✓	✓	
Toluene			✓		✓	✓		✓			✓	✓	✓	✓	
Total dissolved solids			✓				✓	✓							
Total particulate matter															
Deposited bedload sediment					✓	✓									
Streambed substrate					✓	✓									
Suspended sediments					✓	✓									
Turbidity		✓	✓	✓	✓	✓									
Total petroleum hydrocarbons [See oil and grease]															
Total suspended particulates	✓														
Toxaphene									✓	✓					✓
Triallate					✓			✓							
Tribromomethane [See Halogenated methanes]															
Tributyltin [See Organotins]															
Trichlorobenzene [See Chlorinated benzenes]															
Trichloroethane [See Chlorinated ethanes]															
Trichloroethene [See Chlorinated ethenes]															
Trichloroethylene [See Chlorinated ethenes, 1,1,2-Trichloroethene]															
Trichloromethane [See Halogenated methanes]															
Trichlorophenol [See Chlorinated phenols]															
Tricyclohexyltin [See Organotins]															
Trifluralin		✓			✓			✓							
Trihalomethanes [See Halogenated methanes]															
Triphenyltin [See Organotins]															
Tritium		✓													
Turbidity [See Total particulate matter]															
Uranium		✓					✓	✓							

Canadian Environmental Quality Guidelines

GUIDELINE AVAILABILITY TABLE

July 2006

The user is advised to consult the appropriate chapter and/or factsheet contained in the Canadian Environmental Quality Guidelines binder for specific information and implementation guidance pertaining to each environmental quality guideline. Guidelines are listed under chemical names, which are cross-referenced with common-names, abbreviations, and/or families of chemicals as appropriate.

	Chapter 1 Air	**Chapter 2** Water: Community		**Chapter 3** Water:	**Chapter 4** Water: Aquatic life		**Chapter 5** Water: Agriculture		**Chapter 6** Sediment		**Chapter 7** Soil				**Chapter 8** Tissue Residue
		MAC/IMAC	AO	Recreation & Aesthetics	Freshwater	Marine	Irrigation	Livestock	Freshwater	Marine	Agri.	Res./Park	Comm.	Ind.	
Uranium-234		✓													
Uranium-235		✓													
Uranium-238		✓													
Vanadium							✓	✓			✓	✓	✓	✓	
Vinyl chloride [See Chlorinated ethenes, Monochloroethene]															
Waterborne pathogens				✓											
Xylene			✓								✓	✓	✓	✓	
Zinc			✓		✓		✓	✓	✓	✓	✓	✓	✓	✓	
Zinc-65		✓													
Zirconium-95		✓													

NOTE

Chapter 1: Canadian National Ambient Air Quality Objectives
Chapter 2: Guidelines for Canadian Drinking Water Quality; MAC: Maximum Acceptable Concentration; IMAC: Interim Maximum Acceptable Concentration: AO: Aesthetic Objective
Chapter 3: Guidelines for Canadian Recreational Water Quality
Chapter 4: Canadian Water Quality Guidelines for the Protection of Aquatic Life
Chapter 5: Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses
Chapter 6: Canadian Sediment Quality Guidelines for the Protection of Aquatic Life
Chapter 7: Canadian Soil Quality Guidelines for the Protection of Human and/or Environmental Health; Agri.: Agricultural land uses; Res./Park: Residential/Parkland uses; Comm.: Commercial land uses; Ind.: Industrial land uses.
Chapter 8: Canadian Tissue Residue Guidelines for the Protection of Wildlife Consumers of Aquatic Biota

Appendix D
Annual Monitoring Report

NWB Annual Report **Year being reported:** Select

License No: **Issued Date:**
Expiry Date:

Project Name:

Licensee:

Mailing Address:

Name of Company filing Annual Report (if different from Name of Licensee please clarify relationship between the two entities, if applicable):

General Background Information on the Project (*optional):

Licence Requirements: the licensee must provide the following information in accodance with

Select Select

A summary report of water use and waste disposal activities, including, but not limited to: methods of obtaining water; sewage and greywater management; drill waste management; solid and hazardous waste management.

Water Source(s):
Water Quantity:
- Quantity Allowable Domestic (cu.m)
- Actual Quantity Used Domestic (cu.m)
- Quantity Allowable Drilling (cu.m)
- Total Quantity Used Drilling (cu.m)

Waste Management and/or Disposal
- ☐ Solid Waste Disposal
- ☐ Sewage
- ☐ Drill Waste
- ☐ Greywater
- ☐ Hazardous
- ☐ Other:

Additional Details:

A list of unauthorized discharges and a summary of follow-up actions taken.

Spill No.: (as reported to the Spill Hot-line)
Date of Spill:
Date of Notification to an Inspector:
Additional Details: (impacts to water, mitigation measures, short/long term monitoring, etc)

Revisions to the Spill Contingency Plan

Select

Additional Details:

Revisions to the Abandonment and Restoration Plan

Select

Additional Details:

Progressive Reclamation Work Undertaken

Additional Details (i.e., work completed and future works proposed)

Results of the Monitoring Program including:

The GPS Co-ordinates (in degrees, minutes and seconds of latitude and longitude) of each location where sources of water are utilized;

Select

Additional Details:

The GPS Co-ordinates (in degrees, minutes and seconds of latitude and longitude) of each location where wastes associated with the licence are deposited;

Select

Additional Details:

Results of any additional sampling and/or analysis that was requested by an Inspector

Select

Additional Details: (date of request, analysis of results, data attached, etc)

Any other details on water use or waste disposal requested by the Board by November 1 of the year being reported.

Select

Additional Details: (Attached or provided below)

Any responses or follow-up actions on inspection/compliance reports

Select

Additional Details: (Dates of Report, Follow-up by the Licensee)

Any additional comments or information for the Board to consider

Date Submitted:		
Submitted/Prepared by:		
Contact Information:	**Tel:**	
	Fax:	
	email:	