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

Prepared by

Nuna Burnside Engineering and Environmental Ltd.
Building 764, Fred Coman Street, Iqaluit, NU X0A 0H0
Canada
15 Townline Orangeville ON L9W 3R4 Canada

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1.0 Introduction

1.1 Overview

This Operation and Maintenance Plan has been prepared to assist the Hamlet of Whale Cove in the operation of their Solid Waste Management Facility. The Operation and Maintenance Plan applies to the Solid Waste Management Facility after it has been rehabilitated according to the recommendations in the Solid Waste Management Facility Rehabilitation Plan (Nuna Burnside, 2008). The rehabilitation is expected to occur in 2009/2010 as funding becomes available.

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

- Landfill (also referred to as the Municipal Solid Waste Disposal Area)
- The Bulky Metals Area
- Household Hazardous Waste Depot
- Landfarm (approved and operated under NWB License 3BM-WCL02823, dated September 27, 2007).

1.2 Design, Construction, and Operation History

The original NWB License (#NWB3WHA0207) was issued September 2002 for 5 years. It expired in 2007. The application documents refer to a report entitled "*Whale Cove Sewage and Solid Waste Planning Study*", dated August 23, 2001, by Ferguson Simek Clark (FSC). A copy was not available for review. Design drawings provided by the GN display a proposed design and layout in roughly the location of the existing site. The site was reportedly constructed between 2003 and 2005. No as-built drawings or an O&M Plan are known to exist.

It is not clear how the site was selected, given its proximity to Hudson Bay, the problem with water seepage in the fill area and snow drifting. The site was originally constructed to be accessed from the base of a hill requiring up hill filling.

This is not an ideal location for a landfill site. It is too close to Hudson Bay (50 m), it has poor access requiring trucks to drive to the bottom of the hill and then up into the waste area (original design). There is very little cover material easily accessible. The site has no provision to bury bulky metals and did not include a hazardous waste storage area. No documentation or design drawings were available to address this issue. The fencing on the west side is not stable and regularly fills down.

There is no information available to indicate how the original designers planned to operate the site. There was no NWB license amendment submission for the site following its construction.

1.3 Maximizing the Use of the Site

In spite of the above noted issues, this O&M Plan has been created to maximize the effectiveness of the site from an environmental and O&M perspective until it is filled.

Recommendations have been made to locate a new site as soon as practical, to limit the waste mass placed in this location close to Hudson Bay.

September 2008 site conditions are shown in the photographs in Appendix E.

To maximize the use of the site, it is recommended that the site be rehabilitated, and design and O&M issues be addressed. This includes:

- Engineering, survey of site and surrounding area, including existing and proposed roads
- Liaison with the Hamlet as to their preferences
- Regrading the base contours to address water seepage and the strip overburden for stockpiling as cover
- Regrading and compacting the existing waste in place
- Repair fencing
- Construct an access road to the top (northeast) side of the site
- Construct a hazardous Waste Storage area
- Identity options to expand the site footprint
- Identify options for the disposal (burial) of bulky metals
- Cleanup the bulky metal area and dispose of non-bulky metal waste in the landfill
- Remove/cleanup the landfarm in the bulky metals area (it is not an appropriate location).

2.0 Hamlet Description

2.1 Infrastructure

The Hamlet of Whale Cove is located within the Kivalliq Region, Nunavut, at general latitude 62°11'N and general longitude 92°35'W. The Hamlet is located approximately 80 km south of Rankin Inlet (Figure 1).

The community has a population of approximately 353 (2006), with an approximate 3.18 percent projected growth rate. Hamlet infrastructure includes:

- A Water Supply Facility that draws water from Fish Lake and treats it as it fills water trucks
- Trucked water is supplied to holding tanks in each building
- A Sewage Treatment Facility consisting of a sewage lagoon that receives trucked sewage collected from holding tanks in each building and sewage treatment is via an exfiltration lagoon discharging to a 600 m long Wetland Treatment Area towards Hudson Bay
- A Solid Waste Management Facility, that includes a Municipal Solid Waste Disposal Area (landfill), a Bulky Metals Area, and a Landfarm
- A rock quarry beside landfill
- Diesel powered generators
- Barge landing area.

Key features of the community are shown on Figure 2.

The Hamlet of Whale Cove is predominately residential with a few small commercial establishments including a hotel and grocery store. Hunting and fishing in the traditional manner is still a prime occupation for many of the inhabitants. A layout of the entire community and infrastructure is displayed on Figure 2.

2.2 Climate

Whale Cove is affected by arctic air masses, and experiences a maritime arctic climate characterized by short cool summers, and long cold winters. The Whale Cove area receives an average of 34 cm of precipitation per year. July mean high and low temperatures are 13.6°C and 5.9°C, respectively. January mean high and low temperatures are -26.8°C and -33.9°C, respectively. Winds are generally north-west. (Environment Canada, 2008).

2.3 Geology and Morphology

Whale Cove is located on sheltered bay off of Hudson Bay. The terrain consists of grassy, boulder-strewn ground with overburden of sand and gravel with depths up to 1 m. A ridge of Precambrian rock 15 to 20 m in height surrounds the community. The Hamlet is located in a zone of continuous permafrost, which has an active layer of approximately 50 cm and 1 m (in poorly drained and well drained soils, respectively). A thin organic layer supports a limited growth of lichen and moss on the low-lying areas (FSC, 2001).

2.4 Nunavut Water Board License

The Solid Waste Management Facility operates under Nunavut Water Board License Number NWB3WHA0207, issued September 1, 2002. It expired August 31, 2007 (Appendix A).

An application for a renewal/amendment of the licence has been made. This O&M Plan has been prepared for the purposes of meeting the anticipated requirements of the new license.

Typically Water Licenses require:

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

2.5 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 human safety as the first priority.

2.6 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.

2.7 Design of the Solid Waste Management Facility

The layout of the facility, access road, Bulky Metals Area and adjacent Landfarm is displayed on Figure 3.

The Solid Waste Management Facility is located 1.1 km southeast of the community. The location of the Solid Waste Management Facility is displayed on Figure 2. A fenced in area for general solid waste disposal (landfill) is located on the north side of the access road. Beside this area on the Hudson's Bay side, is a rock quarry. On the south side of the access road is an area for Bulky Metals and a Landfarm (Figure 3).

A four metre containment berm is constructed in a NE-SW orientation across the lowest points of the landfill area between the solid waste fill area and the Bulky Metals Area to prevent impacted water from flowing into the Hudson's Bay.

Currently (2009) access is via the bottom of the site. In future (after site redevelopment as recommended), an access road will provide truck access to the east side of the landfill, located at the top of the hill. A drop off area will be located at the end of the road and a tipping face where the garbage is pushed into the landfill after sorting and burning. Beside the drop off area will be a burn pit. On the south side of the area is a fenced area for hazardous waste storage.

Figure 3 displays the layout of the Solid Waste Management facility. This area is off limits for all other landuses. Any landuse development in the surrounding area must be reviewed to ensure it does not conflict with site operations.

The development of the site is displayed in Figure 4 (year 1), Figure 5 (year 5), Figure 6 (year 10), and Figure 7 (year 15).

3.0 Operation and Maintenance

3.1 Overview

The Hamlet of Whale Cove Solid Waste Management facility consists of the following components:

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

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. In a natural attenuation landfill the discharge of contaminants is expected to occur at a rate that can be attenuated (broken down and diluted) by 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. These items are diverted to the Hazardous Waste Storage Area (Figure 11).

Figure 3 displays the layout of the Solid Waste Disposal Facility and surrounding area. Figures 4 through 7 shows the site in cross-section at it develops over time. Solid waste generation estimates are included on the table of waste quantity calculations in Appendix B. The table includes estimates of the current volume of waste in the landfill and projected waste generation for the next 15 years.

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

3.2 Material Arrival

Material will arrive at the facility either by a garbage compactor truck owned by the Hamlet or by private individual or company drop-off (Figure 8).

After Hamlet staff collects waste, the collection vehicles will progress to the landfill along the main road and turn onto the new access road that travels towards the top of the hill on the most east side of the site. Wastes will be tipped into the landfill 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 (Figure 11) or the Bulky Metals Area (Figure 3).

Members of the community may drop off materials directly at the facility. The public is required to place materials in the appropriate location; generally bulky metals within the Bulky Metals Area, wood in the wood pile, etc.

The layout of the site is displayed in Figure 3.

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

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 (based on the volume of the truck) on the Waste Placement Forms included as Appendix C. 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.

3.3 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 Area. The wood pile should be burned on occasion when quantities build up. Burning should take place when wind and climate conditions are favourable. Burning should only be done when the smoke will not drift towards the community or airport.

3.4 Bulky Metals Area

The Bulky Metals 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. At some point in the future it may be cost effective to back haul the metals to a scrap metal facility in the south, however for the foreseeable future bulk metals will be stored in the Hamlet.

Non-bulky metals (waste) is commonly disposed of in the Bulky Metals Area, so regular maintenance is required to keep it clean.

3.4.1 Regular Operation

Staff should inspect the Bulky Metals Storage 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. Vehicles 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. Appropriate signage will direct the segregation.

3.4.2 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 the landfill area. Alternatively they can be buried in an adjacent designated area (Figure 3).

3.5 Hazardous Waste Materials

Hazardous waste such as waste oil, paint and batteries are separated from the garbage and placed in the Hazardous Waste Storage Area located near the entrance gate on the south side of the access road (Figure 11). This area is designed for hazardous waste storage not disposal. It is expected that hazardous waste will be stored for a maximum of five years, which is sufficient time to build up a quantity for a cost effective back haul out of the Hamlet to a licensed receiver.

Regular Operation

The area will be operated using the following procedures:

- Any hazardous materials brought to the 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 for assessment
- 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 has accumulated
- Medical and biological wastes are stored at the nursing station and removed from the community
- Only persons with the appropriate skills and training are permitted to handle hazardous wastes.

In the event of a spill refer to the Environmental Emergency Contingency Plan (a separate document) for details on dealing with a spill of hazardous materials.

3.6 Landfill (Municipal Solid Waste Disposal Area)

The layout of the landfill is displayed on Figure 3. Operational procedures for the landfill are presented below:

3.6.1 Operation

Site operations include potentially hazardous practices such as burning and operation of heavy equipment (Figure 8). 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 at all times.

It has been indicated that the burning of clean burnable 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 procedures are to be followed:

- Burn only in the established burn area
- 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
- Drop off waste at the designated area at the end of the access road – Figure 8
- Conduct burning on a regular basis when climate conditions are favourable – Figure 8
- Scrape the burned waste off the drop off area and move it into the fill area – Figure 8
- Gradually build up waste layers across the fill area – Figure 9
- Close the fill area once final grades (maximum 3:1 slopes) are achieved – Figure 10
- Apply the final 600 mm of cover and stabilize the surface with cobbles – Figure 10.

The year 1 through 15 advancement contours are shown on Figures 4 though 7. 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.

3.6.2 Maintenance

Operations staff will perform weekly site inspections and maintenance. During these inspections, weekly site inspection forms (Appendix C) 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 following maintenance should be carried out monthly:

- 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 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 berms) 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 waste face where leachate is seeping if possible and ensure that leachate is being contained
- Control leachate through effective ditching and drainage control
- 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.

Inspection results and maintenance conducted shall be reported in the Annual Report.

Staff will place hazardous materials, such as oil or solvents into drums located in the Hazardous Waste Disposal 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).

3.6.3 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.

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 Supervisor. Complaints and the responses to complaints should be documented in the Annual Report for the site.

3.7 Landfarm Area

The landfarm area is located within the Bulky Metals Area of the Solid Waste Management Facility, and is contained within a berm (Figure 3). The landfarm has

monitoring wells outside of the bermed area installed in the Bulky Metals Area. Currently the landfarm is operated under a separate licence, 3BM-WCL0712. Operations and maintenance should follow the conditions of that licence.

3.8 Special Wastes

On occasion, the Hamlet may be faced with a waste material 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 facility. 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:

- Not accept the material
- Store it in the Hazardous Waste Storage Area (Figure 11)
- Designate special location in the waste disposal area for storage until a final decision as to its final disposal can be made.

3.9 Site Closure and Restoration

The closure plan for the landfill area is displayed on Figure 10. There is available land around the landfill which may permit site expansion and continued use beyond the current design. This will require a design modification and a NWB License amendment. Closure will include:

- Creation of an Abandonment and Restoration 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 3 displays a possible landfill expansion area. This option has not been "engineered" at this time and is only presented as a possibility that could be explored as the site reaches capacity. The same closure design can be used to cover the Bulky Metals Area and Landfarm once they have been cleaned out and are no longer required.

3.10 Reuse/Recycle

A reuse/recycle area has been established in the Bulky Metals Area. The Bulky Metals Area is used to segregate materials for landfilling and materials that may have future use. The Bulky Metals Area must be kept neat and organized for safety (i.e. do not pile up vehicles). It must be expected the public will access this area, so signage and regular

separation of materials will assist in reuse of materials. This O&M document gives guidance on how to operate and maintain the Bulky Waste Area and maximize reuse and recycling. This is an effective way to reduce landfilling and prevent scavenging in the landfill.

4.0 Contingency Measures

4.1 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.

4.1.1 Environmental Emergency Contingency Plan

A separate document entitled Environmental Emergency Contingency Plan, Hamlet of Whale Cove, 2008, has been prepared as part of a submission for renewal of the NWB license. Refer to that document for the response to spills and environmental contingencies.

4.1.2 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 C).

4.1.3 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 should be 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 C).

4.1.4 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 cobbles, blast rock, or other stabilizing materials.

4.2 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, 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 Environmental Monitoring Program and QA/QC Plan (separate document)
- It is recognized that it may take some time for results to be received from the accredited laboratory
- Analyze samples for parameters of concern and compare the results to the relevant Canadian Water Quality Guidelines
- If waiting for analytical results and the water retention area fills to the top of the culvert, it should be inspected for odours, stain, or signs of visible impact (sheens, floating scum). The culvert may be blocked to facilitate additional water accumulation, until the sampling results are received
- 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 if deemed to be hazardous waste
  - Direct discharge, if sampling results indicate no exceedances of discharge criteria
  - Pre-treatment (filter, chemical, etc.) prior to direct discharge providing the discharge meets the water quality guidelines.

5.0 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 should be completed as described in the Environmental Monitoring Program and QA/QC Plan (Nuna Burnside, 2008). Results of analytical testing and monitoring are to be recorded on a regular basis by the staff. Copies of the Certificates of Analysis and Chain of Custody forms are to be kept for future reference. Monthly and annual quantities of solid waste offloaded will be estimated and recorded on the Waste Placement Form (Appendix C).

6.0 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 regularly filling out the Site Forms included in Appendix C. 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 Management Facility Planning Form – which provides a list of items to be discussed by the Public Works Supervisor, SAD, and Hamlet Council related to short term and long term solid waste decision making.

In addition to these forms, there would be sampling information and analytical data. Using the forms and following the procedures provided herein should make submitting the NWB Annual Report relatively straight forward.

7.0 Summary

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

Safety of staff and the public is the first priority at all times.

The landfill was sited, designed, and constructed prior to the preparation of this O&M Plan. There is no record of an O&M Plan prepared by the original designer or constructor, and there is no documentation available indicating how they planned the facility to operate. This O&M Plan has been prepared to maximize the use of the site in the most safe and environmentally sound manner as possible.

A Solid Waste Planning form has been included in Appendix C, 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 Public Works Supervisor/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 15 years). It will assist in identifying issues and developing the strategies and budgets to deal with them.

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.

8.0 Reference Documents

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

- Canadian Council of Ministers of the Environment (CCME), 2007. *Canadian Water Quality Guidelines for the Protection of Aquatic Life: Summary table.* Updated September, 2007. In: Canadian environmental quality guidelines, 1999, Canadian Council of the Environment, Winnipeg

- *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

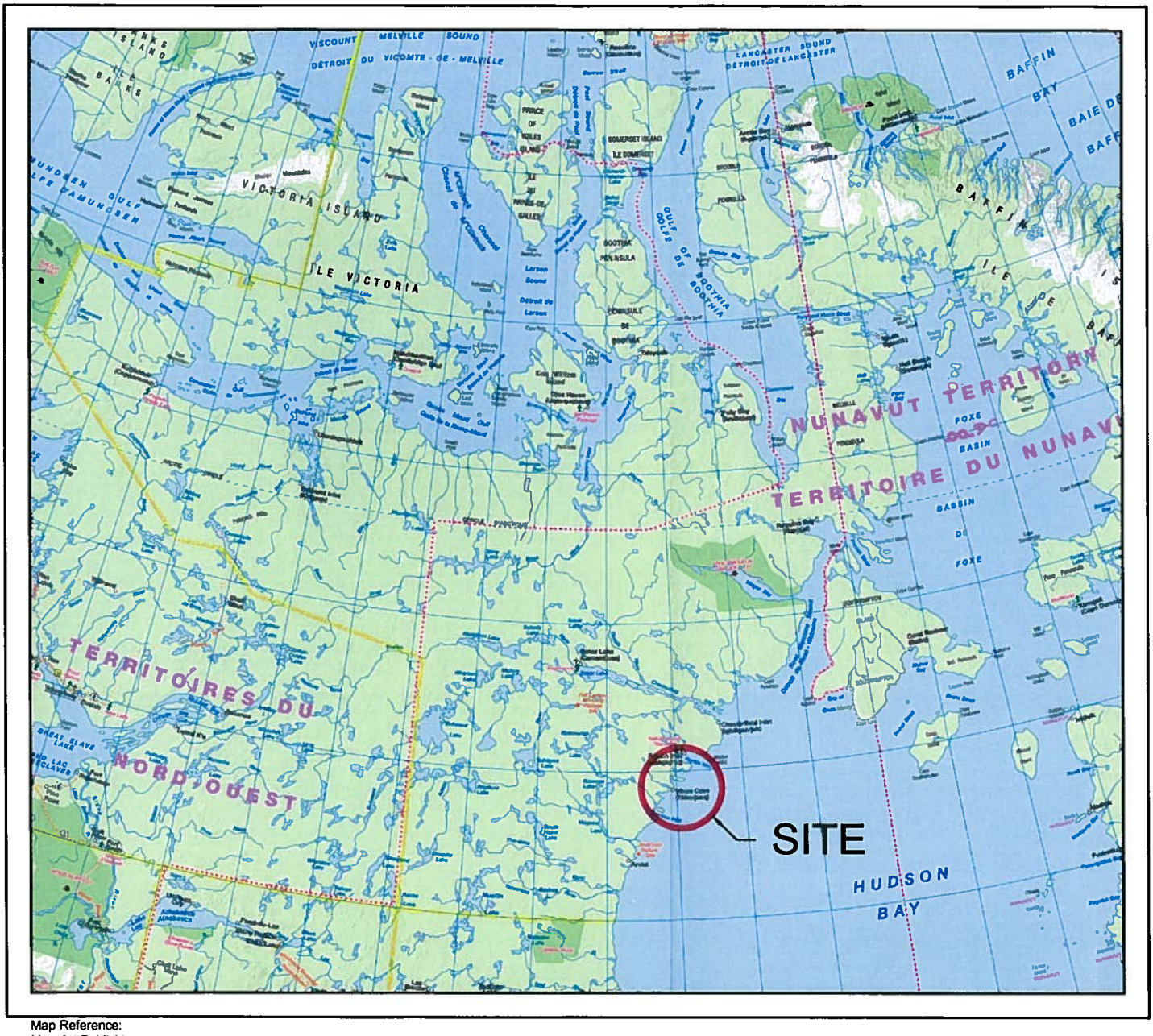
- Engineering drawings, *2001-1050*, dated March 2002 and *Upgrade to Solid Waste Disposal Site* dated 2003

- *Environmental Emergency Contingency Plan, Hamlet of Whale Cove,* Nuna Burnside Engineering and Environmental Ltd. (2008)

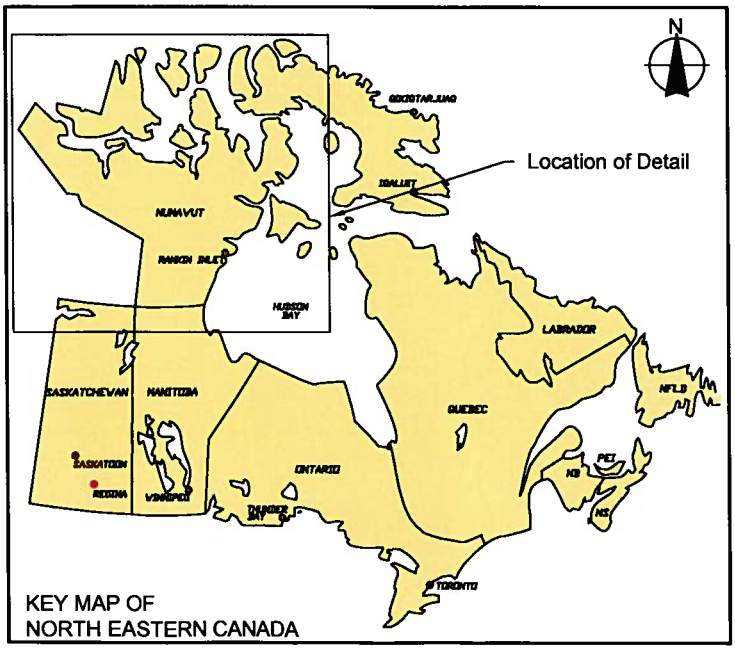
- *Monitoring Program and QA/QC Plan, Hamlet of Whale Cove*, Nuna Burnside Engineering and Environmental Ltd. (2008)

- *Canadian Climate Data 1985-2007, Whale Cove A Weather Station, Environment Canada.* <<*http://climate.weatheroffice.ec.gc.ca/climateData/monthlydata_e.html?timeframe=3&Prov=XX&StationID=1727&Year=2007&Month=1&Day=1*>>. *Accessed Nov 10, 2008.*

Figures



Map Reference:
Map Art Publishing



KEY MAP OF
NORTH EASTERN CANADA

FIGURE 1 - SITE LOCATION MAP

HAMLET OF WHALE COVE
WHALE COVE, NUNAVUT

SOLID WASTE MANAGEMENT FACILITY OPERATIONS & MAINTENACE PLAN

September 2008
Project Number: N-O14851

Prepared by: C. Sheppard

Verified by: J. Walls

BURNSIDE

14851 SOLID WASTE O&M PLAN SL.dwg

Plot Time: Nov 28, 2008 - 1:19pm

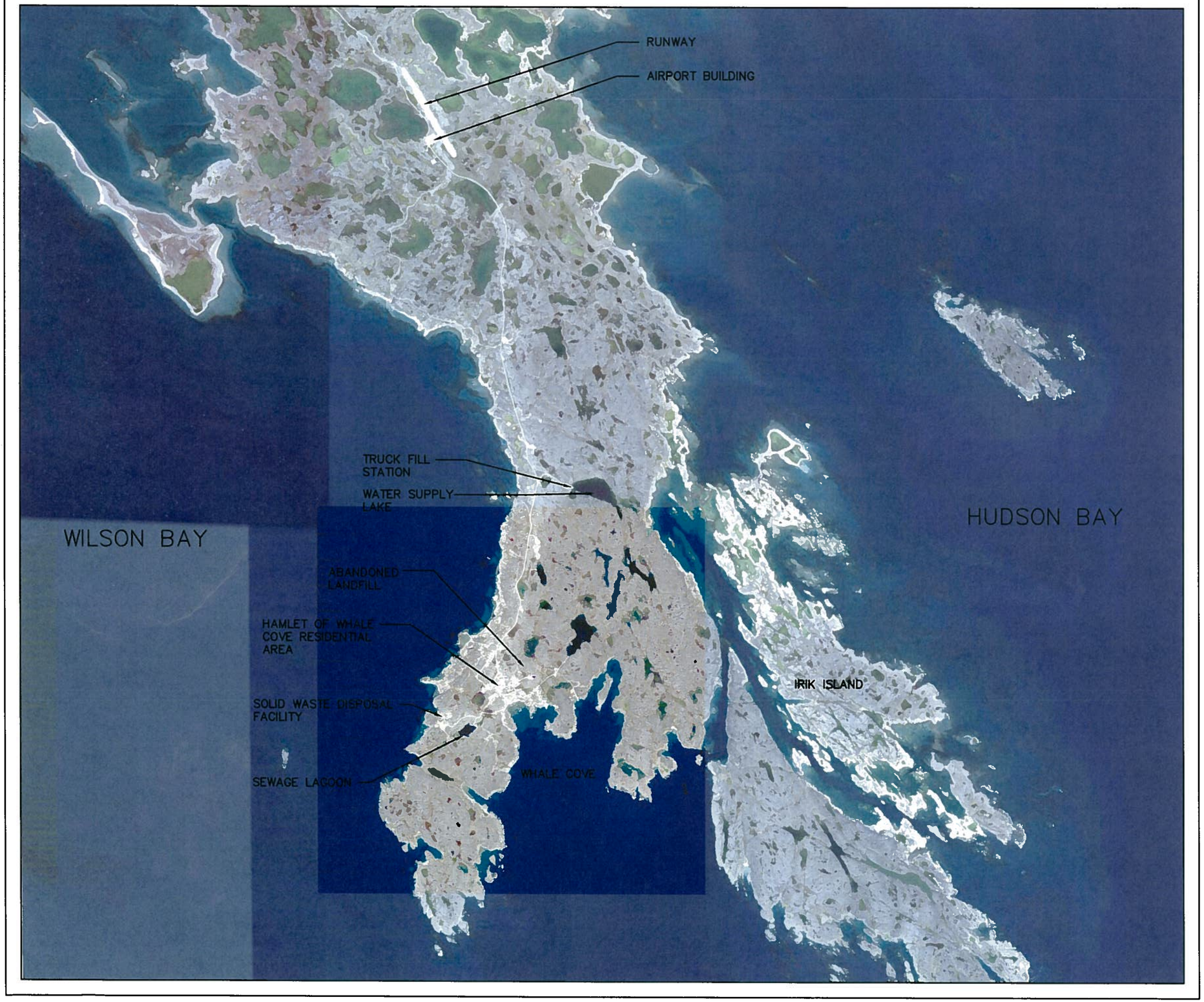


FIGURE 2

HAMLET OF WHALE COVE
WHALE COVE, NUNAVUT
SOLID WASTE MANAGEMENT FACILITY O&M PLAN

COMMUNITY PLAN

Satellite Image Source:
Background colour satellite image obtained from Google Earth Pro.

N

0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0
Kilometers

1:50,000
November 2008
Project Number: N-O14851

Projection: UTM Zone 15
Datum: NAD83

Prepared by: C. Sheppard
Verified by: J. Walls

BURNSIDE

Revision #: 1

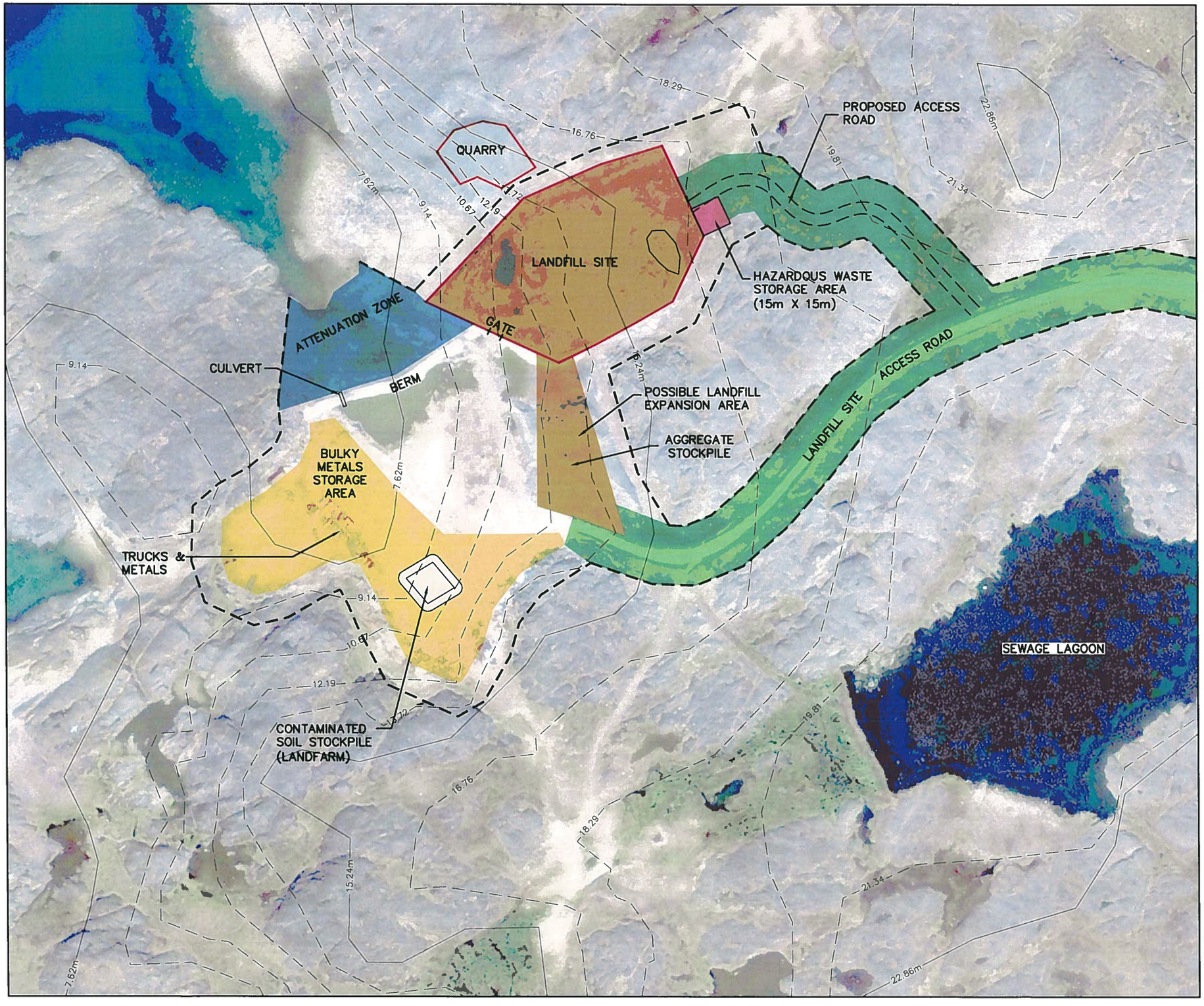
14851 SOLID WASTE O&M PLAN CP.dwg

Plot Time: Feb 03, 2009 - 10:51am

FIGURE 3

HAMLET OF WHALE COVE
WHALE COVE, NUNAVUT
SOLID WASTE MANAGEMENT FACILITY O&M PLAN

SOLID WASTE MANAGEMENT FACILITY



LEGEND

- LANDFILL SITE OUTLINE *(Approximate area = 8,868m²)*
- BEDROCK QUARRY OUTLINE
- 25 foot (7.62 m) CONTOUR LINES *(Obtained from the N.T.S. digital database)*
- 5 foot (1.52 m) INTERPOLATED CONTOUR LINES *(Interpolated from the N.T.S. 25m contours)*
- SOLID WASTE MANAGEMENT AREA
- SOLID WASTE FILL AREA
- ATTENUATION ZONE
- ACCESS ROAD AREA
- BULKY METALS STORAGE AREA
- HAZARDOUS WASTE STORAGE AREA

Satellite Image Source:
Background 2006 Quickbird satellite image obtained from the Government of Nunavut.

N

0 20 40 60 80 100 120 140 160
Meters

1:2,000
September 2008
Project Number: N-O14851

Projection: UTM Zone 15
Datum: NAD83

Prepared by: C. Sheppard

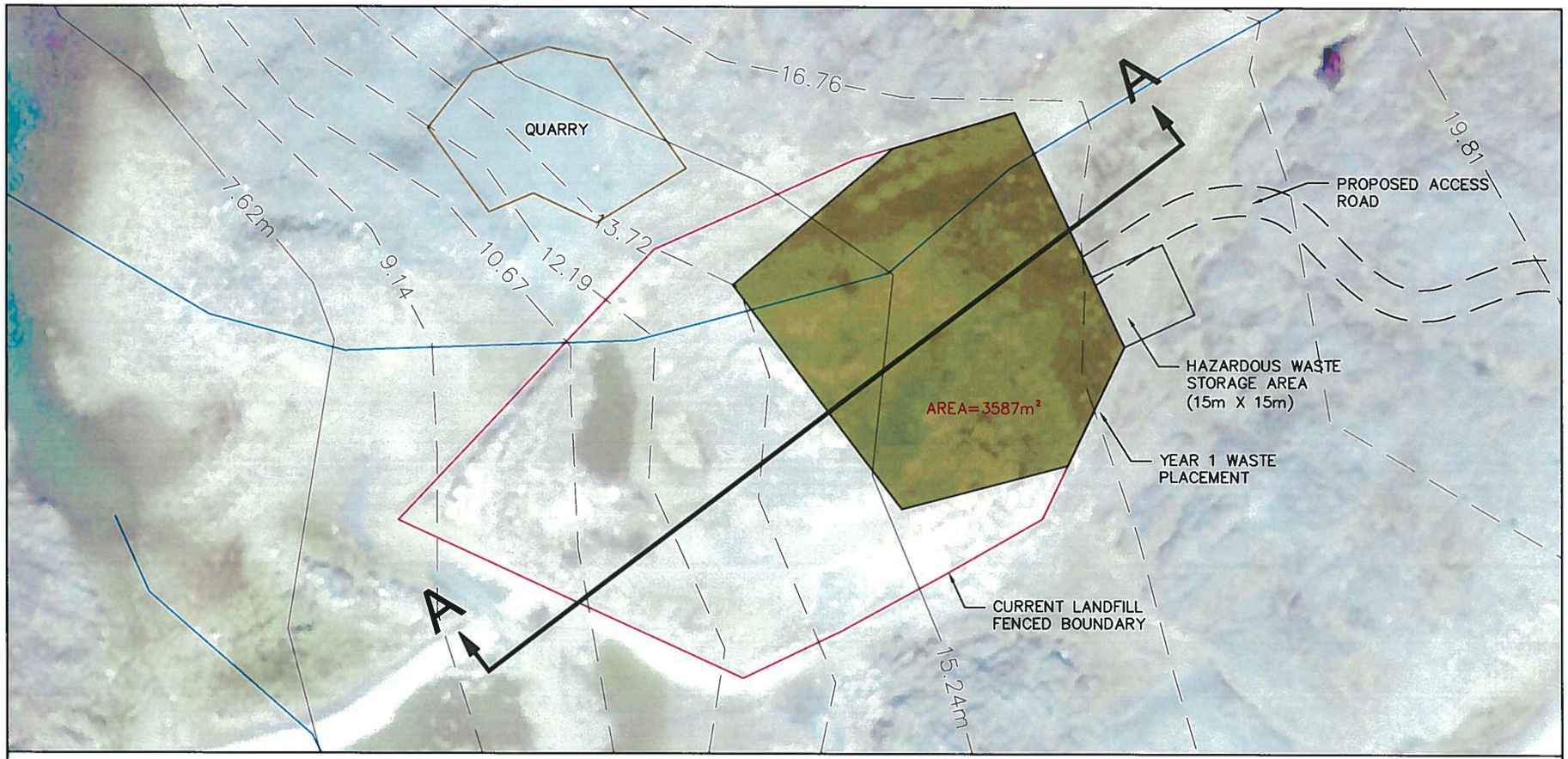
Verified by: J. Walls

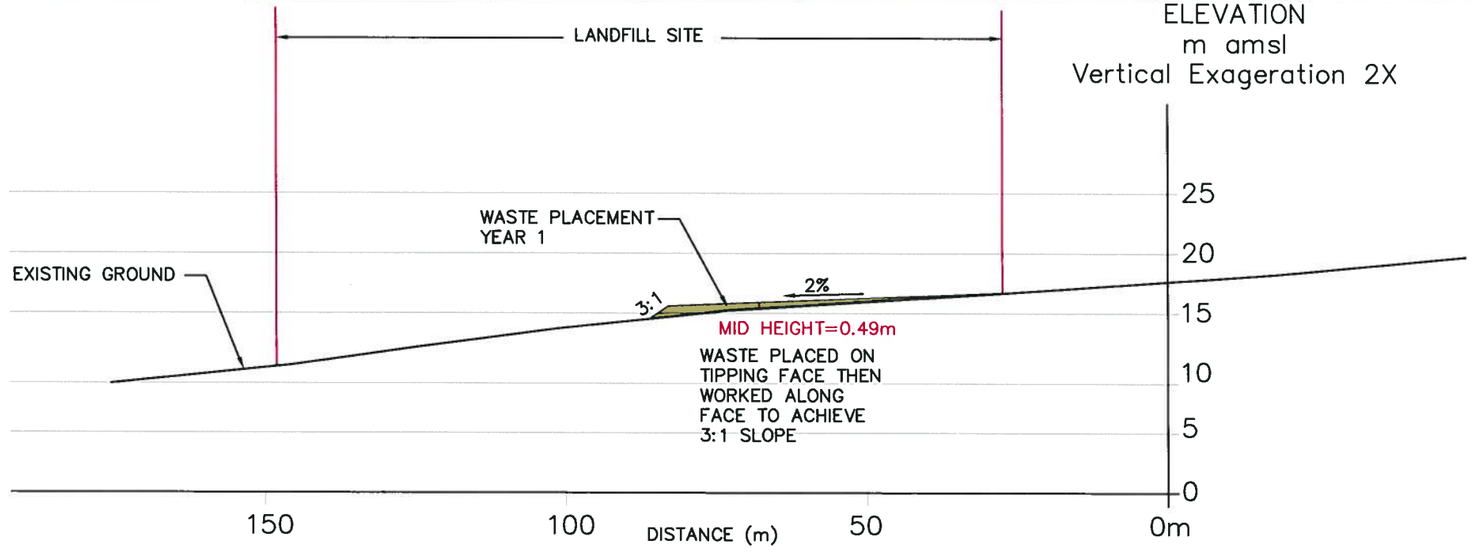
Nunn BURNSIDE

Revision #: 1

14851 SOLID WASTE O&M PLAN SWMF.dwg

Plot Time: Feb 04, 2009 - 2:09pm





CROSS SECTION A–A

FIGURE 4

HAMLET OF WHALE COVE
WHALE COVE, NUNAVUT
SOLID WASTE MANAGEMENT FACILITY O&M PLAN

LANDFILL DEVELOPMENT YEAR 1

LEGEND

- CURRENT LANDFILL FENCED BOUNDARY
- WASTE PLACEMENT - YEAR 1

NOTE:
- ASSUMES ACCESS ROAD COMPLETED TO TOP OF SITE
- ASSUMES BASE CONTOURS SHOWN INCLUDES CURRENT WASTE IN PLACE GRADED OVER THE ENTIRE SITE

Satellite Image Source:
Background 2006 Quickbird satellite image obtained from the Government of Nunavut.

N

0 10 20 30 40 50 60 70 80
Metres

1:1,000
November 2008
Project Number: N-O14851

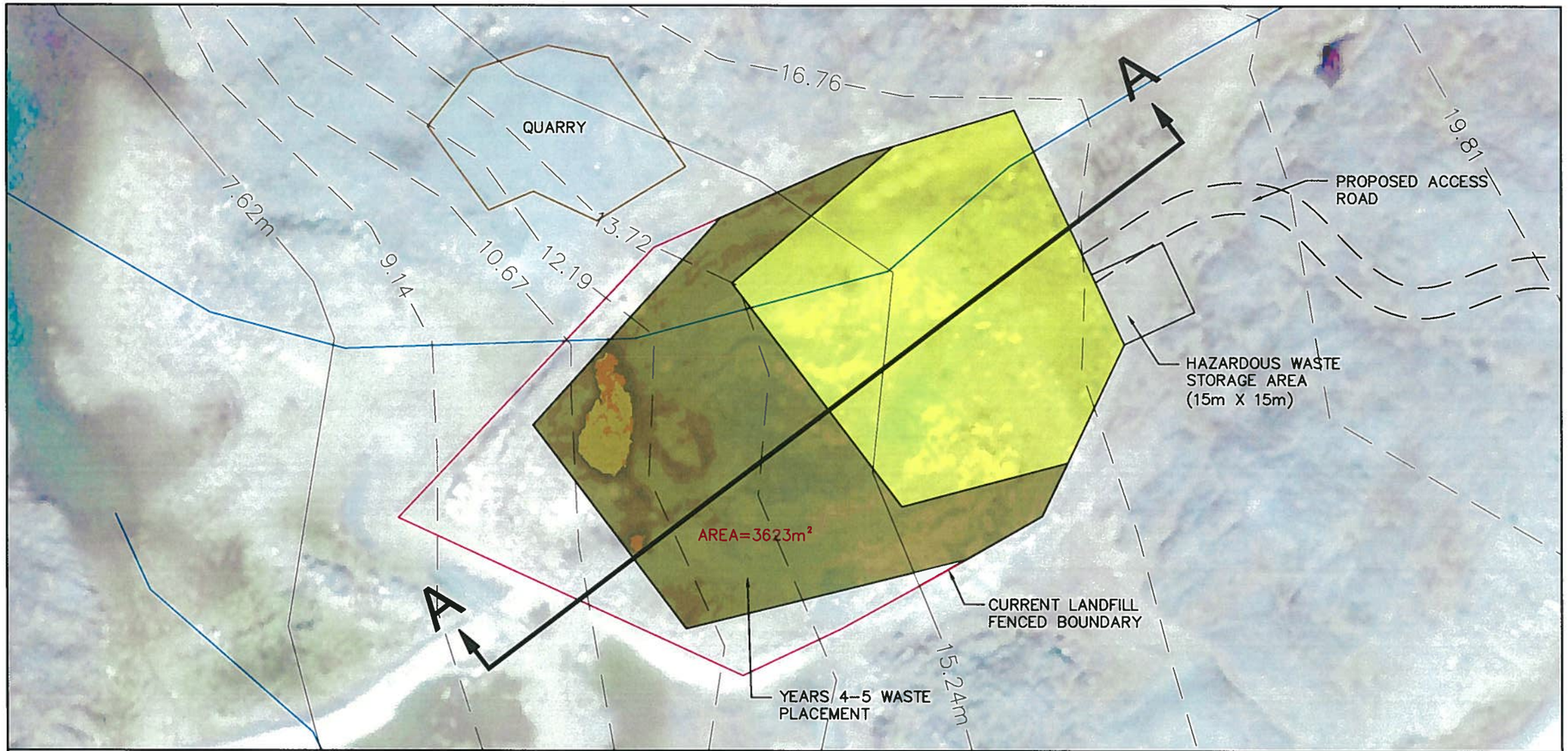
Projection: UTM Zone 15
Datum: NAD83

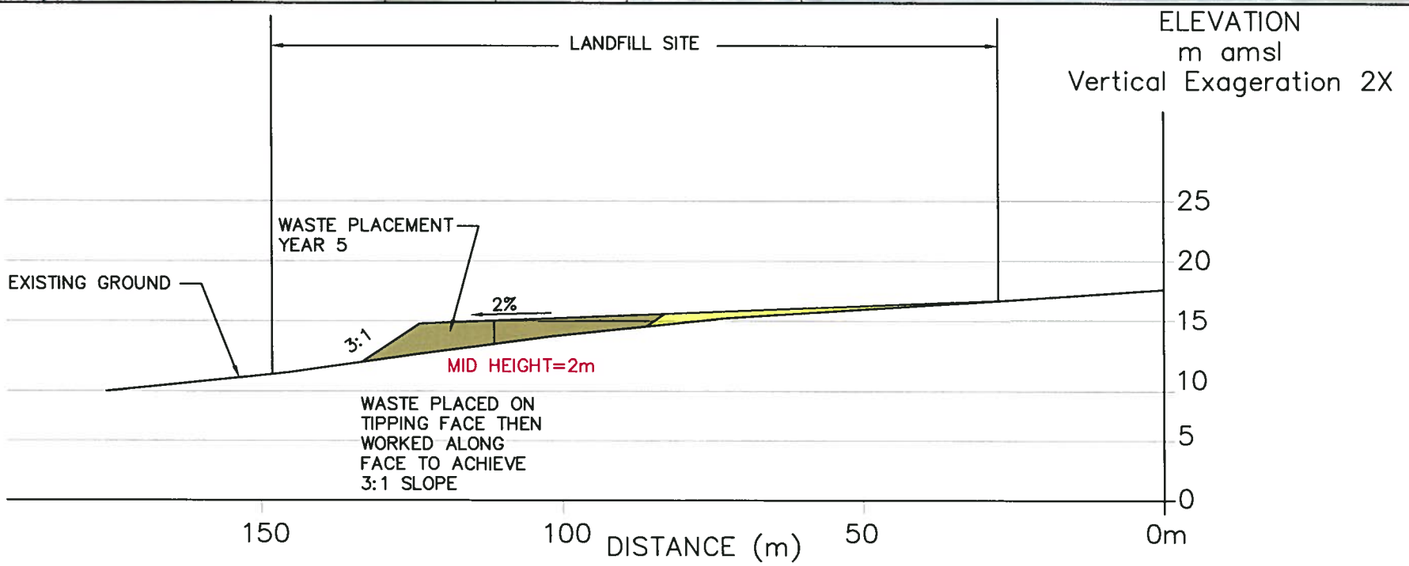
Prepared by: C. Sheppard
Verified by: J. Walls

NUNA BURNSIDE

14851 SOLID WASTE O&M PLAN LF DEV YR 1.dwg

Plot time: Feb 06, 2009-11:22am





CROSS SECTION A–A

FIGURE 5

HAMLET OF WHALE COVE

WHALE COVE, NUNAVUT

SOLID WASTE MANAGEMENT FACILITY O&M PLAN

LANDFILL DEVELOPMENT YEAR 5

LEGEND

- CURRENT LANDFILL FENCED BOUNDARY
- WASTE PLACEMENT - YEARS 2 - 5
- WASTE PLACEMENT IN PREVIOUS YEARS

Satellite Image Source:
Background 2006 Quickbird satellite image obtained from the Government of Nunavut.

N

0 10 20 30 40 50 60 70 80

Metres

1:1,000
November 2008
Project Number: N-014851

Projection: UTM Zone 15
Datum: NAD83

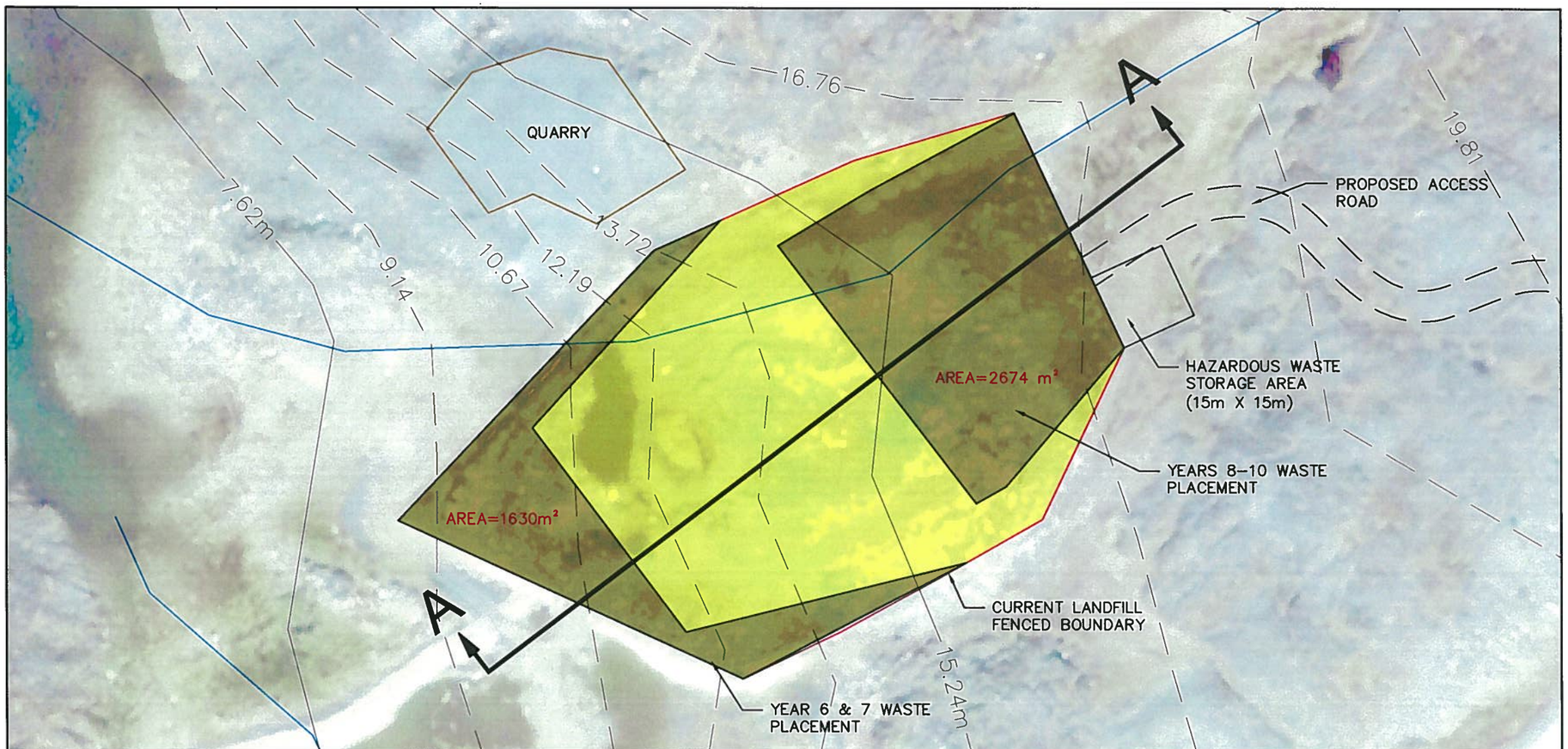
Prepared by: C. Sheppard

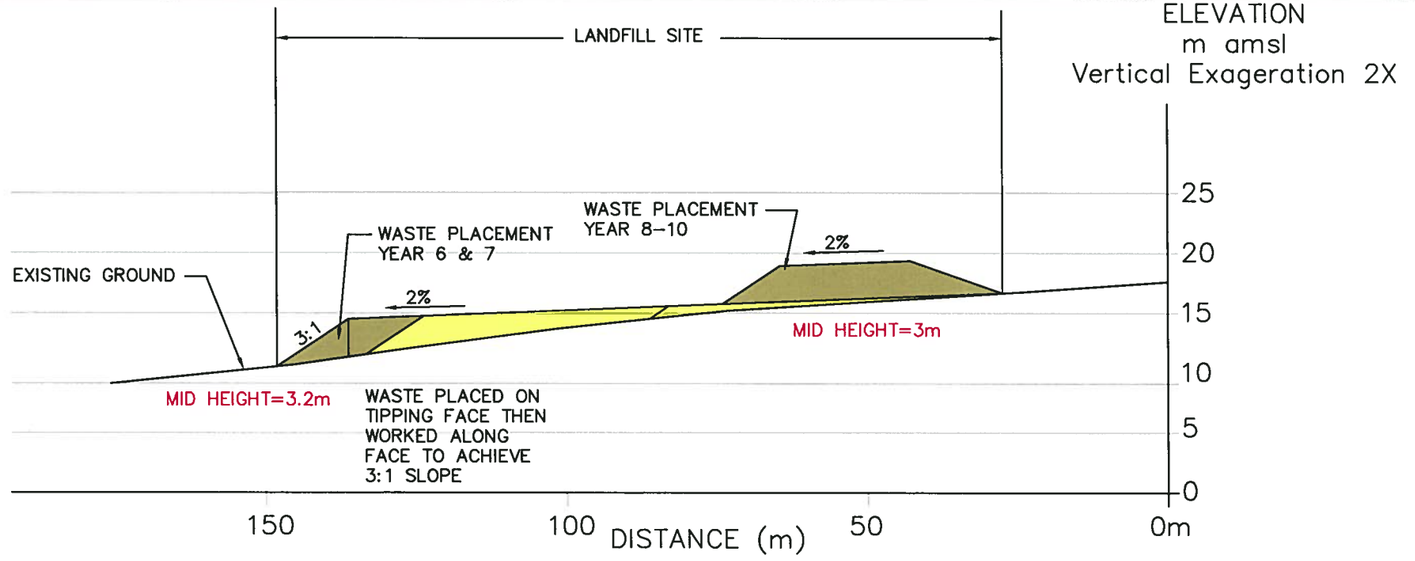
Verified by: J. Walls

BURNSIDE

14851 SOLID WASTE O&M PLAN LF DEV YR 5.dwg

Plot Time: Feb 06, 2009–11:58am





CROSS SECTION A–A

FIGURE 6

HAMLET OF WHALE COVE
WHALE COVE, NUNAVUT
SOLID WASTE MANAGEMENT FACILITY O&M PLAN

LANDFILL DEVELOPMENT YEAR 10

LEGEND

- CURRENT LANDFILL FENCED BOUNDARY
- WASTE PLACEMENT - YEARS 6 - 10
- WASTE PLACEMENT IN PREVIOUS YEARS

Satellite Image Source:
Background 2006 Quickbird satellite image obtained from the Government of Nunavut.

N

0 10 20 30 40 50 60 70 80
Metres

1:1,000
November 2008
Project Number: N-O14851

Projection: UTM Zone 15
Datum: NAD83

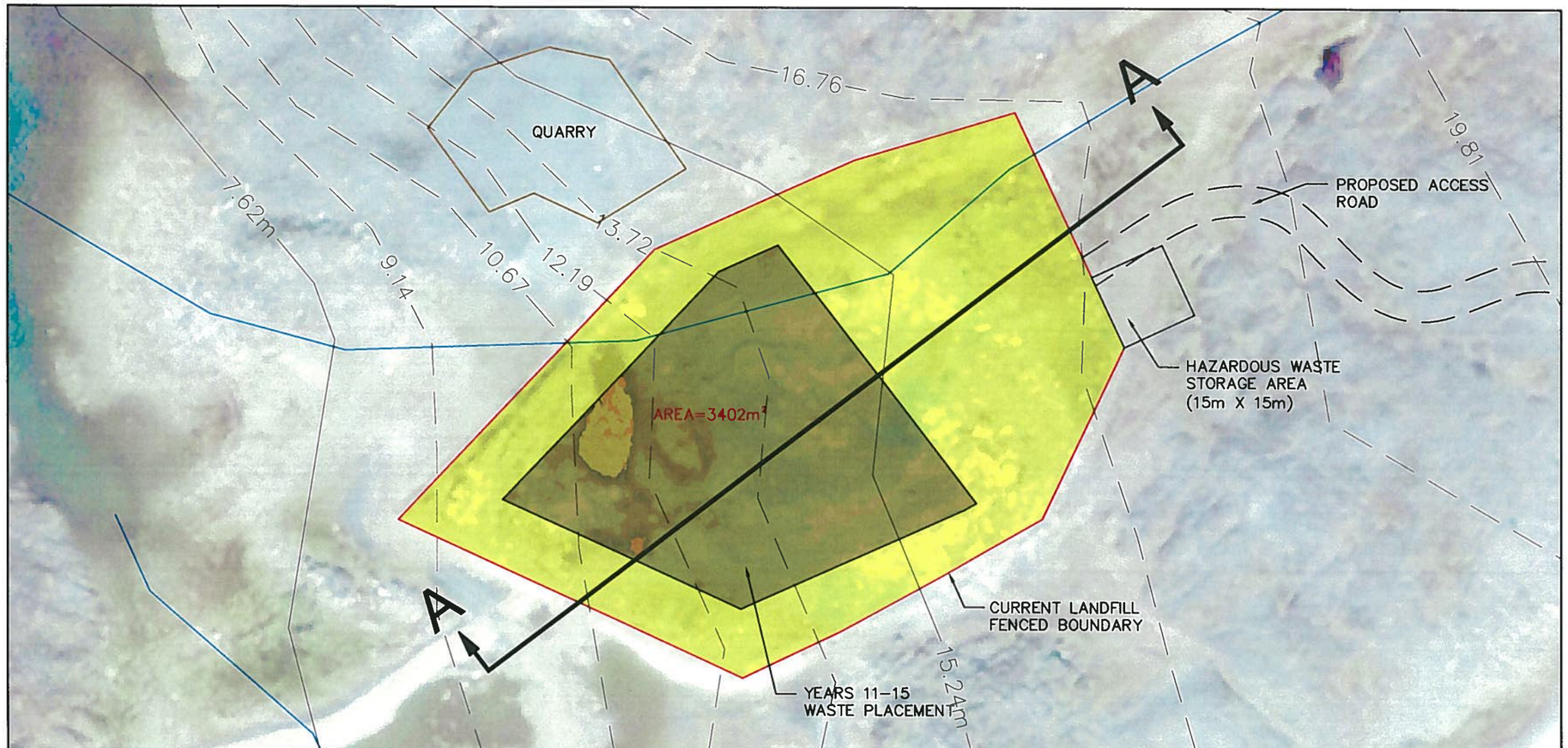
Prepared by: C. Sheppard

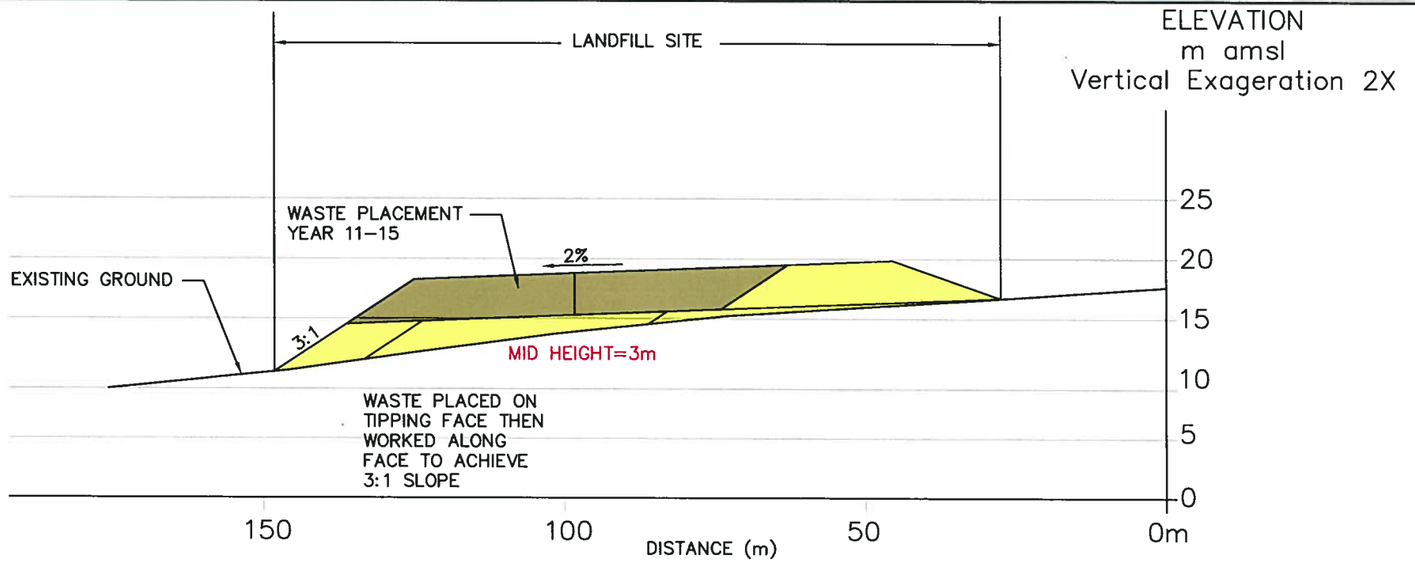
Verified by: J. Walls

NUNA BURNSIDE

14851 SOLID WASTE O&M PLAN LF DEV YR 10.dwg

Plot Time: Feb 06, 2009 - 11:57am





CROSS SECTION A–A

FIGURE 7

HAMLET OF WHALE COVE
WHALE COVE, NUNAVUT
SOLID WASTE MANAGEMENT FACILITY O&M PLAN

LANDFILL DEVELOPMENT YEAR 15

LEGEND

- CURRENT LANDFILL FENCED BOUNDARY
- WASTE PLACEMENT - YEARS 11 -15
- WASTE PLACEMENT IN PREVIOUS YEARS

Satellite Image Source:
Background 2006 Quickbird satellite image obtained from the Government of Nunavut.

N

0 10 20 30 40 50 60 70 80
Metres

1:1,000
November 2008
Project Number: N-O14851

Projection: UTM Zone 15
Datum: NAD83

Prepared by: C. Sheppard

Verified by: J. Walls

NUNA BURNSIDE

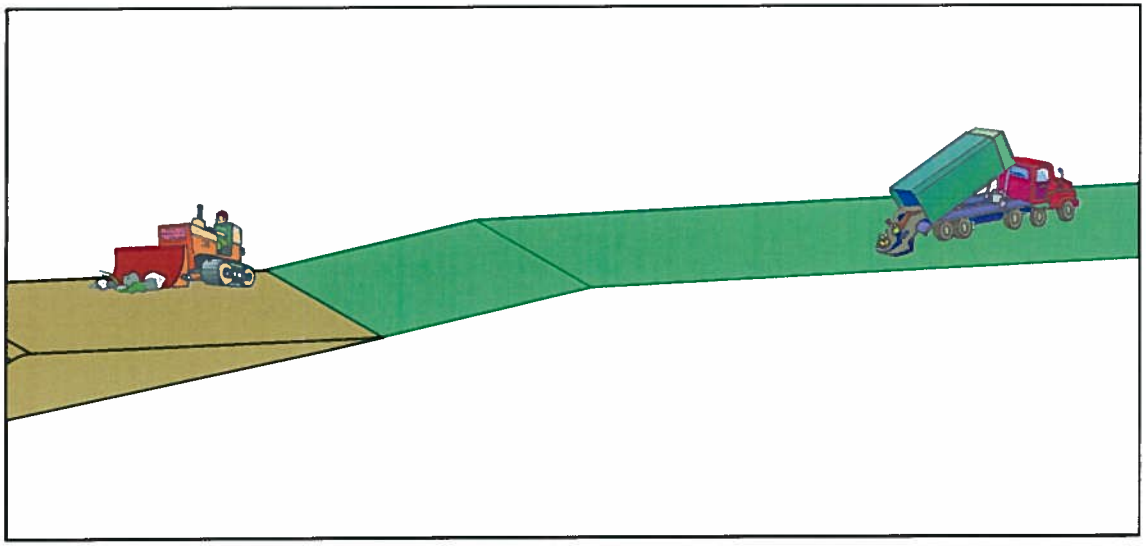
t4851 SOLID WASTE O&M PLAN LF DEV YR 15.dwg

Plot Time: Feb 06, 2009–11:48am

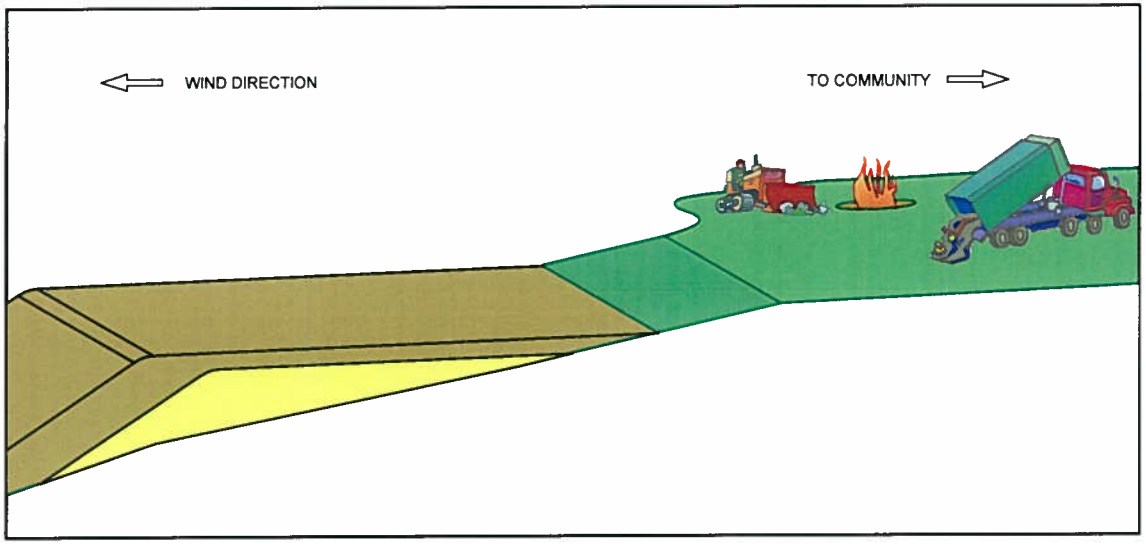
FIGURE 8

HAMLET OF WHALE COVE
WHALE COVE, NUNAVUT
SOLID WASTE MANAGEMENT FACILITY O&M PLAN

DROP OFF & BURNING



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



WOOD, CARDBOARD & BURNABLE MATERIALS ARE PUSHED INTO THE BURN PILE

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

OTHER WASTE IS PUSHED OVER THE TIPPING FACE

November 2008
Project Number: N-O14851

Prepared by: C. Sheppard

Verified by: J. Walls

BURNSIDE

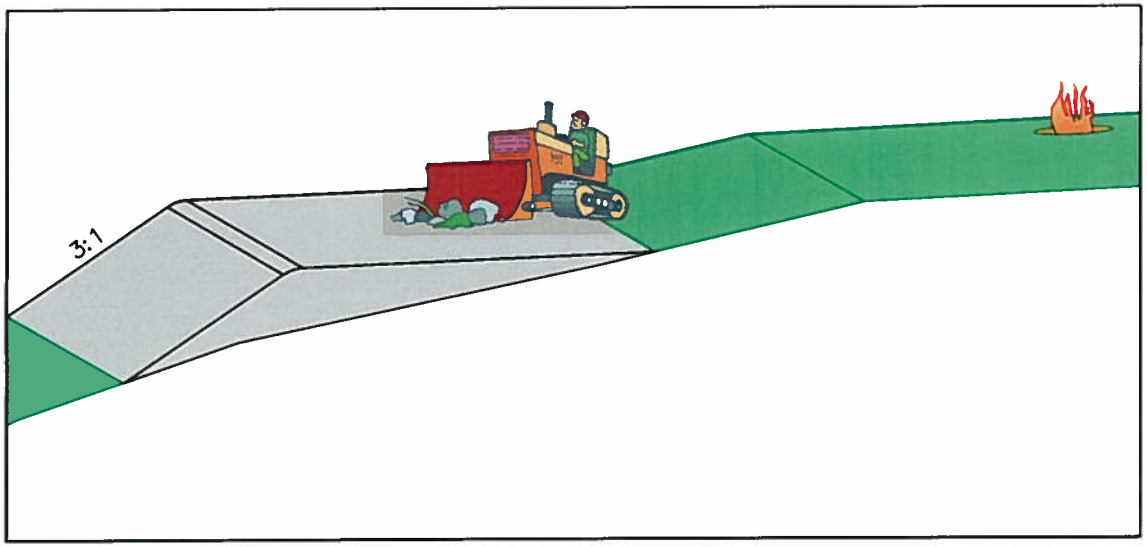
REVISION #: 1

14851 SOLID WASTE O&M PLAN DROP OFF.DWG

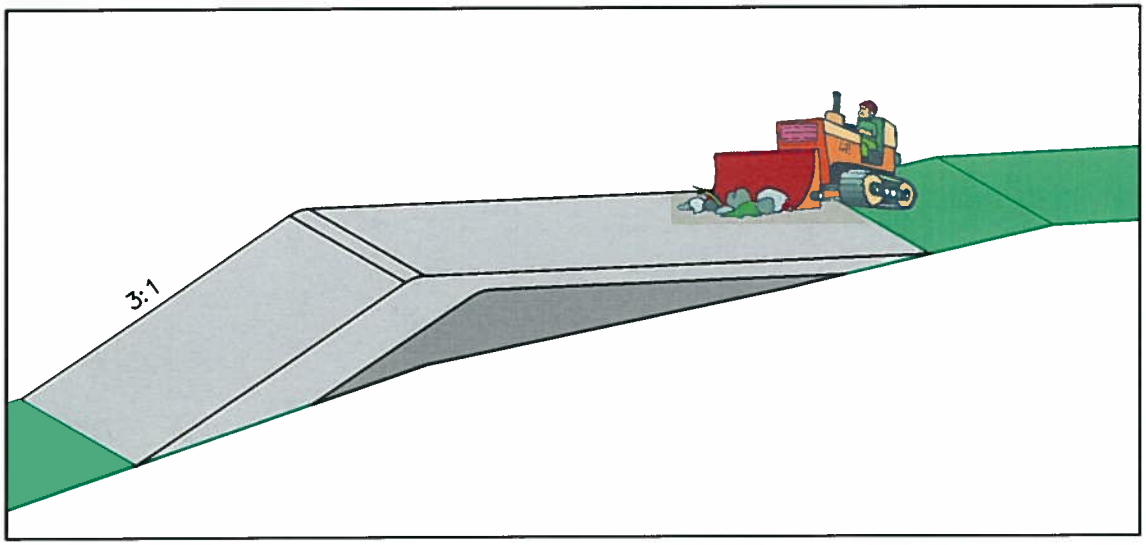
FIGURE 9

HAMLET OF WHALE COVE
WHALE COVE, NUNAVUT
SOLID WASTE MANAGEMENT FACILITY O&M PLAN

COMPACTION



BURNED WASTE IS PUSHED ONTO THE FILL AREA.



WASTE IS SPREAD OVER A SMALL AREA AND COMPACTED BY MAKING SEVERAL PASSES WITH THE 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 (cell) HAS BEEN FILLED PRIOR TO ADVANCING THE TIPPING FACE.

0.3m COVER BASE FOR ADVANCING

November 2008
Project Number: N-O14851

Prepared by: C. Sheppard

Verified by: J. Walls

BURNSIDE

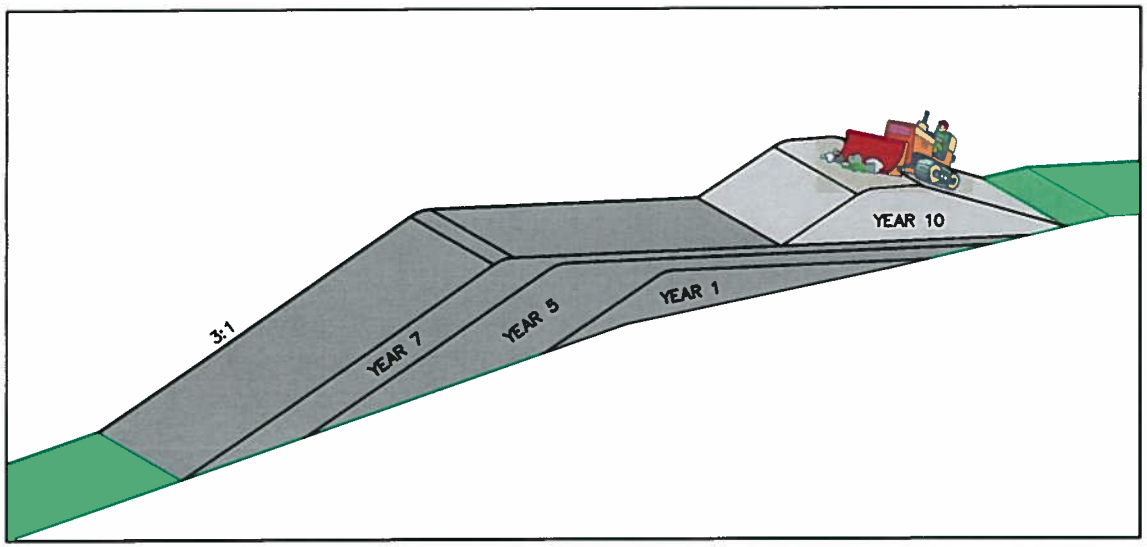
REVISION #: 1

14851 SOLID WASTE O&M PLAN COMPACTION.DWG

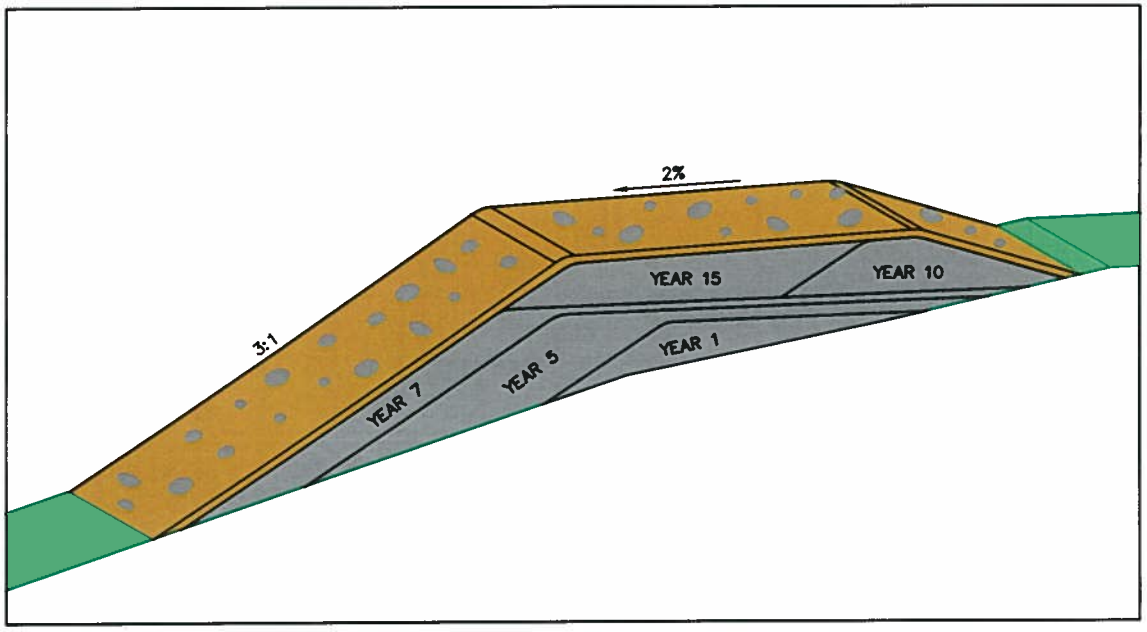
FIGURE 10

HAMLET OF WHALE COVE
WHALE COVE, NUNAVUT
SOLID WASTE MANAGEMENT FACILITY O&M PLAN

PROGRESSIVE WASTE DEPOSITION & FINAL GRADING & CLOSURE



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



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 AVAILABLE . MAXIMUM SLOPE 3:1. THE SURFACE CAN BE STABILIZED WITH COBBLES AND ROCK TO RESEMBLE THE APPEARANCE AND CONDITION OF THE SURROUNDING TUNDRA.

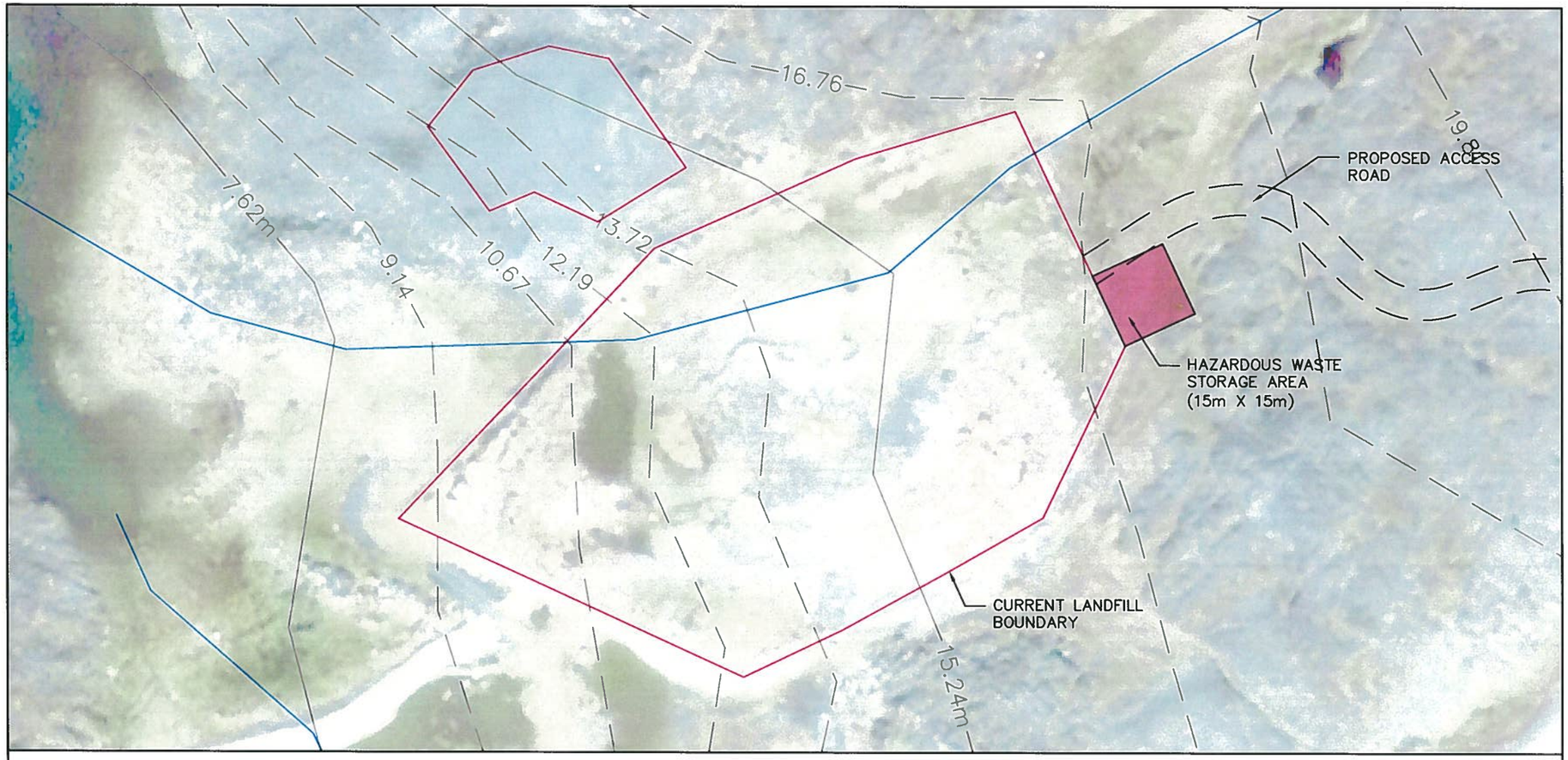
November 2008
Project Number: N-O14851

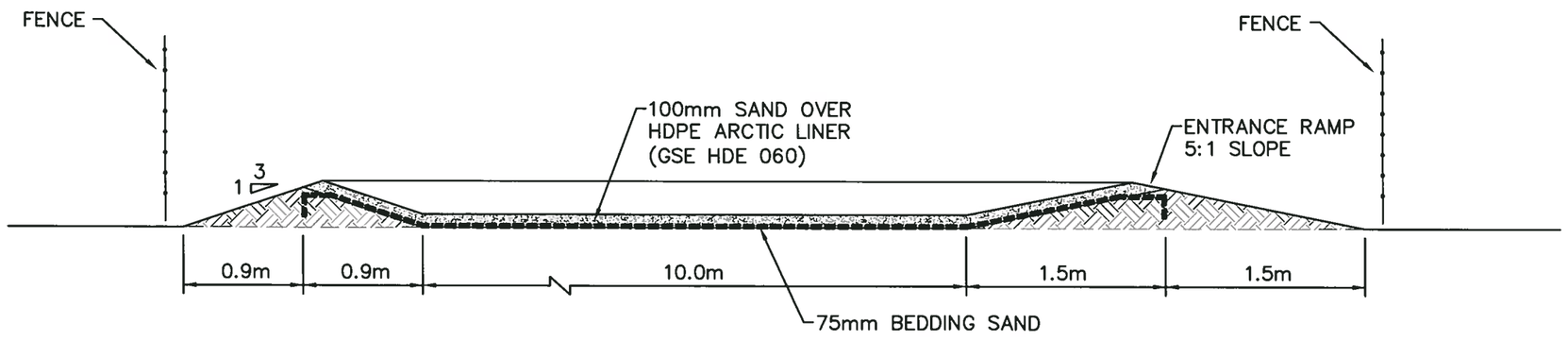
Prepared by: C. Sheppard

Verified by: J. Walls

BURNSIDE

REVISION #: 1 14851 SOLID WASTE O&M PLAN PROGRESSIVE DEPOSITS.DWG





HAZARDOUS WASTE AREA TO INCLUDE:
1. SPILL KIT STORAGE LOCKER (SECURED TO FENCE)
2. 6m WIDE DOUBLE GATE
3. ENTRANCE RAMP 3.0m WIDE WITH 5:1 SLOPE

HAZARDOUS WASTE STORAGE AREA CROSS SECTION

FIGURE 11

HAMLET OF WHALE COVE
WHALE COVE, NUNAVUT
SOLID WASTE MANAGEMENT FACILITY O&M PLAN

HAZARDOUS WASTE STORAGE AREA

LEGEND

HAZARDOUS WASTE AREA

Satellite Image Source:
Background 2006 Quickbird satellite image obtained from the Government of Nunavut.

N

0 10 20 30 40 50 60 70 80
Metres

1:1,000
November 2008
Project Number: N-O14851

Projection: UTM Zone 15
Datum: NAD83

Prepared by: C. Sheppard

Verified by: J. Walls

BURNSIDE

14851 SOLID WASTE O&M PLAN HAZARDOUS.dwg

Plot time: Feb 05, 2009 - 10:31am

BURNSIDE

Appendix A
Nunavut Water Board License

P.O. Box 119
Gjoa Haven, NU X0B 1J0
Tel: (867) 360-6338
Fax: (867) 360-6369

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NUNAVUT WATER BOARD
NUNAVUT IMALIRIYIN KATIMAYINGI

File No: NWB3WHA0207

September 18, 2002

Imalda Angooteluk
Senior Administrative Officer
Hamlet of Whale Cove
P.O. Box 120
Whale Cove, Nunavut X0C 0J0
Email: hamwhale@arctic.ca

RE: NWB Licence No. NWB3WHA0207

Dear Imalda:

Please find attached Licence No. NWB3WHA0207 issued to the Hamlet of Whale Cove by the Nunavut Water Board **(Motion #: 2002-10)** pursuant to its authority under Article 13 of the *Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in Right of Canada*. The terms and conditions of the attached Licence related to water use and waste disposal are an integral part of this approval.

Sincerely,

Philippe di Pizzo
Executive Director

Enclosure: Licence No. **NWB3WHA0207**

cc: Paul Smith, DIAND Iqaluit
C. Bodykevich, DIAND Inspector
Tongola Sandy, KIA
Gladys Joudrey, NIRB
Josee Gallipeau, NWMBoard
P. Pacholek, EC
P. Partridge, DSD
J. DeGroot, DFO

P.O. Box 119
Gjoa Haven, NU X0B 1J0
Tel: (867) 360-6338
Fax: (867) 360-6369

ᓄᓇᕗᑦ ᐃᒪᓕᕆᔨᑦ ᑲᑎᒪᔨᖏ
NUNAVUT WATER BOARD
NUNAVUT IMALIRIYIN KATIMAYINGI

DECISION

LICENCE NUMBER: NWB3WHA0207

This is the decision of the Nunavut Water Board (NWB) with respect to an application for a Licence dated 02 April 2002, made by:

Hamlet of Whale Cove

to allow for the use of water and disposal of waste for the Hamlet at Whale Cove, 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 go 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 NWB3WHA0207 be issued subject to the terms and conditions contained therein. (Motion #: 2002-10)

SIGNED this ______ day of September, 2002 at Gjoa Haven, NU.

Philippe di Pizzo
Chief Administrative Officer

Chief Administrative Officer

TABLE OF CONTENTS

I. INTRODUCTION

Following an application filed by the Hamlet of Whale Cove on April 2, 2002 to the Nunavut Water Board, the Board conducted an initial assessment of the Hamlet's request for a municipal water licence for water use and waste disposal activities within the Hamlet. The assessment was conducted so that the Nunavut Water Board could make a fully informed decision on the application. The application was referred for review and comments to Federal, Territorial and local organizations. Based upon the results of this initial assessment and the technical review, including consideration of any potential accidents, malfunctions, or cumulative environmental effects that the overall project might have in the area, the Board concluded that this application was complete and could go through the regulatory process.

In accordance with the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* S. 55.1 and Article 13 of the *Nunavut Land Claims Agreement*, public notice of the application was posted. No public concerns were expressed, and the NWB waived the requirement to hold a public hearing for the application. Authority to approve the application was delegated to the Chief Administrative Officer pursuant to S. 13.7.5 of the *Agreement*. After considering and reviewing the comments submitted by interested parties, the NWB has issued licence NWB3WHA0207.

II. GENERAL CONSIDERATIONS

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. The NWB believes that a term of five years is appropriate. Because this is the first licence issued to the Hamlet by the Nunavut Water Board, a 5-year licence will allow enough time for the Hamlet to establish a consistent compliance record. The 5-year licence will allow the Licensee to properly carry out the terms and conditions of the licence and to ensure that sufficient time is given to permit the Licensee to develop, submit, and implement the plans required under the licence to the satisfaction of the NWB.

Annual Report

The requirements imposed on the Licensee in this licence 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. Refer to attached standard form for completing Annual Report (see Attachment I).

Regulated Parameters

Effluent quality criteria imposed in this Licence are consistent with the *Guidelines for the Discharge of Treated Municipal Wastewater in the Northwest Territories* (Northwest Territories Water Board; 1992), and follow advice received from both the Department of Indian and Northern Affairs and Environment Canada.

Operation and Maintenance Manual (O&M)

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 s and Maintenance Manual for Sewage and Solid Waste Disposal Facilities in the Northwest Territories* (Duong and Kent, 1996; see Attachment II).

Abandonment and Restoration (A&R)

To ensure that all future abandoned facilities are reclaimed in an appropriate manner, the NWB has imposed the requirement for the submission of Abandonment and Restoration Plans. These plans should be submitted when the Licensee files preliminary design drawings for the construction of new facilities to replace existing ones.

Surveillance Network Program

The Surveillance Network Program (SNP) is a monitoring program 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. As this is the first Municipal Water Licence issued to the Hamlet by the Board, minimum requirements have been imposed, but additional sampling may be required by an Inspector.

Quality Assurance/Quality Control (QA/QC) Plan

The requirements to develop a QA/QC Plan imposed on the Licensee in this licence are for the purpose of ensuring the NWB that samples taken in the field as part of the SNP will maintain a high quality, so as to accurately represent the physical and chemical nature of the samples being taken.

LICENCE NWB3WHA0207

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 WHALE COVE
(Licensee)

of **WHALE COVE, NUNAVUT, X0C 0J0**
(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 **NWB3WHA0207**

Water Management Area **NUNAVUT 05**

Location **WHALE COVE, NUNAVUT**

Purpose **WATER USE AND WASTE DISPOSAL**

Description **MUNICIPAL UNDERTAKINGS**

Quantity of Water Not to be Exceeded **30,000 CUBIC METRES ANNUALLY**

Date of Licence **SEPTEMBER 1, 2002**

Expiry Date of Licence **AUGUST 31, 2007**

Dated this ____ of September 2002 at Gjoa Haven, NU.

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 Whale Cove, Nunavut (62°11'N, 92°35'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: **NWB3WHA0207**

"**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 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 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;

"**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;

"**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;

"**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 engineered lagoon and decant structures designed to contain sewage as described in the Application for Water Licence filed by the Applicant on April 2, 2002;

"**Solid Waste Disposal Facilities**" comprises the area and associated structures designed to contain solid waste (landfill site) as described in the Application for Water Licence filed by the Applicant on April 2, 2002;

"**Surveillance Network Program**" means a monitoring program established to collect data on surface water and groundwater quality to assess impacts to the environment of an appurtenant undertaking.

"**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, Solid Waste Disposal Facilities, and Bagged Toilet Waste Disposal Facilities, as described in the Application for Water Licence filed by the Applicant on April 2, 2002; and

"**Water Supply Facilities**" comprises the area and associated intake infrastructure at Fish Lake, as described in the Application for Water Licence filed by the Applicant on April 2, 2002.

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 "Surveillance Network 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 "Surveillance Network Program" described in this Licence, and any amendments to the "Surveillance Network Program" as may be made from time to time, pursuant to the conditions of this Licence.

3. The "Surveillance Network 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 "Surveillance Network 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 and at the site of operation at all times. 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

8. 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 Fish Lake 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 30,000 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 piped and pumpout Sewage to the Sewage Disposal Facilities or as otherwise approved by the Board.

2. All Effluent discharged from the Sewage Disposal Facilities at "Surveillance Network Program" Station Number WHA-3 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 dykes and earthfill structures associated with the Sewage Disposal Facilities.

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

5. The sewage lagoon shall be maintained and operated in such a manner as to prevent structural failure.

6. The Licensee shall maintain the Sewage Disposal Facilities to the satisfaction of an Inspector.

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

8. The Licensee shall implement measures to ensure hazardous materials and/or leachate from the Solid Waste Disposal Facility does not enter water.

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 the 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 September 1, 2003 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).

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 and 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.

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 SURVEILLANCE NETWORK PROGRAM

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

Station Number	Description
WHA-1	Raw Water supply prior to treatment
WHA-2	Runoff from the Solid Waste Disposal Facilities
WHA-3	Effluent discharge from the Sewage Disposal Facilities

2. The Licensee shall sample monthly at Surveillance Stations WHA-2 and WHA-3 during the months of May to August, inclusive.

3. The Licensee shall analyze samples collected at Station Number WHA-2 and WHA-3 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	

4. Additional sampling and analysis may be requested by an Inspector;

5. 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;

6. 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;

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

8. The Licensee shall measure and record in cubic metres the monthly and annual quantities of water pumped from Surveillance Network Program Station Number WHA-1 for all purposes;

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 "Surveillance Network Program" in the Licensee's Annual Report, as required *per* Part B, Item 1; and

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

BURNSIDE

Appendix B
Waste Quantity Calculations

Waste Quantity Calculations, Hamlet of Whale Cove

Planning Year	Calendar Year	Projected Population [people]	Annual Volume of Solid Waste [m^3]	Cumulative Volume of Solid Waste [m^3]	Annual Volume of Combustible Solid Waste [m^3]	Annual Volume of Combustible Solid Waste After Burning [m^3]	Annual Volume of Uncombustible Solid Waste [m^3]	Total Annual Volume of Uncombustible and Combusted (Burned) Solid Waste [m^3]	Annual Volume of Cover Material [m^3]	Total Annual Volume of Waste and Cover Material [m^3]	Cumulative Landfill Volume [m3]
0	2009	370	1890.7	7384.0	1588.2	1270.6	302.5	1573.1	125.8	1698.9	2,700
1	2010	376	1921.4	9305.4	1613.9	1291.2	307.4	1598.6	127.9	1726.5	4,426
2	2011	382	1952.0	11257.4	1639.7	1311.8	312.3	1624.1	129.9	1754.0	6,180
3	2012	388	1982.7	13240.1	1665.5	1332.4	317.2	1649.6	132.0	1781.6	7,962
4	2013	394	2013.3	15253.4	1691.2	1353.0	322.1	1675.1	134.0	1809.1	9,771
5	2014	400	2044.0	17297.4	1717.0	1373.6	327.0	1700.6	136.0	1836.7	11,608
6	2015	406	2074.7	19372.1	1742.7	1394.2	331.9	1726.1	138.1	1864.2	13,472
7	2016	412	2105.3	21477.4	1768.5	1414.8	336.9	1751.6	140.1	1891.8	15,364
8	2017	418	2136.0	23613.4	1794.2	1435.4	341.8	1777.1	142.2	1919.3	17,283
9	2018	424	2166.6	25780.0	1820.0	1456.0	346.7	1802.6	144.2	1946.9	19,230
10	2019	430	2197.3	27977.3	1845.7	1476.6	351.6	1828.2	146.3	1974.4	21,204
11	2020	437	2233.1	30210.4	1875.8	1500.6	357.3	1857.9	148.6	2006.5	23,211
12	2021	444	2268.8	32479.2	1905.8	1524.7	363.0	1887.7	151.0	2038.7	25,250
13	2022	451	2304.6	34783.8	1935.9	1548.7	368.7	1917.4	153.4	2070.8	27,320
14	2023	458	2340.4	37124.2	1965.9	1572.7	374.5	1947.2	155.8	2103.0	29,423
15	2024	465	2376.2	39500.4	1996.0	1596.8	380.2	1977.0	158.2	2135.1	31,558

Notes

Based upon a waste generation rate of 0.014m^3 per capita per day (NWT-MACA)
Percentage remaining after burning 80%
No compaction is taking place at landfill
Cover material required calculated as 8% of fill added
Cumulative Landfill Volume starts in 2009, assuming volume after rehabilitation as 2700 m^3

Estimated Volume of Waste in Fill Area After Rehabilitation

Volume of Waste in Landfill Year 0 (2009)	2000
Volume of Waste Outside of Landfill Area that Needs to be Put into Landfill Area	500
Volume of Cover Needed	200
Total Volume of Waste in Fill Area After Rehabilitation (2007)	2700

Appendix C
Site Forms

Form 1
Waste Placement Form
Hamlet of Whale Cove

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 Landfill Inspection Form
Hamlet of Whale Cove

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 Management Facility Planning Form
Hamlet of Whale Cove

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 D
Annual Monitoring Report Format

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:

Appendix E
Photographs

Photo 1: Access road to landfill. Looking SW.

Photo 2: Truck entrance and gate to solid waste fill area.

Photo 3: Water ponding in fill area

Photo 4: Garbage in Landfill Area.

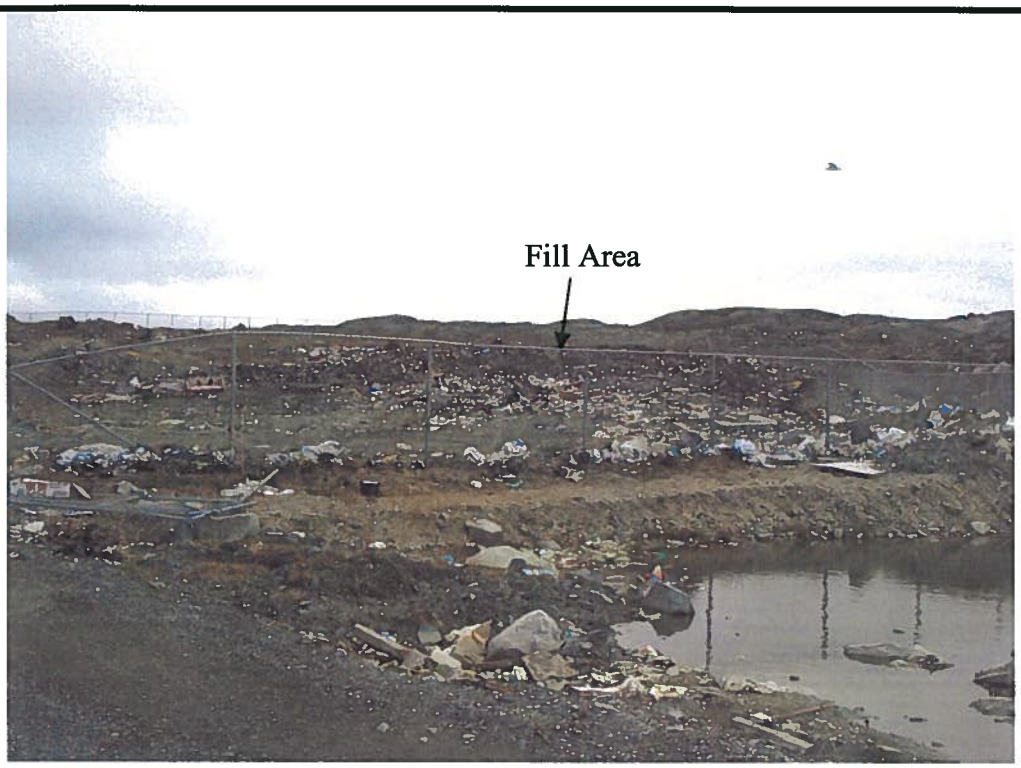

Photo 5: Active fill area. Looking NE

Photo 6: Active fill area and burn pile. Looking NE.

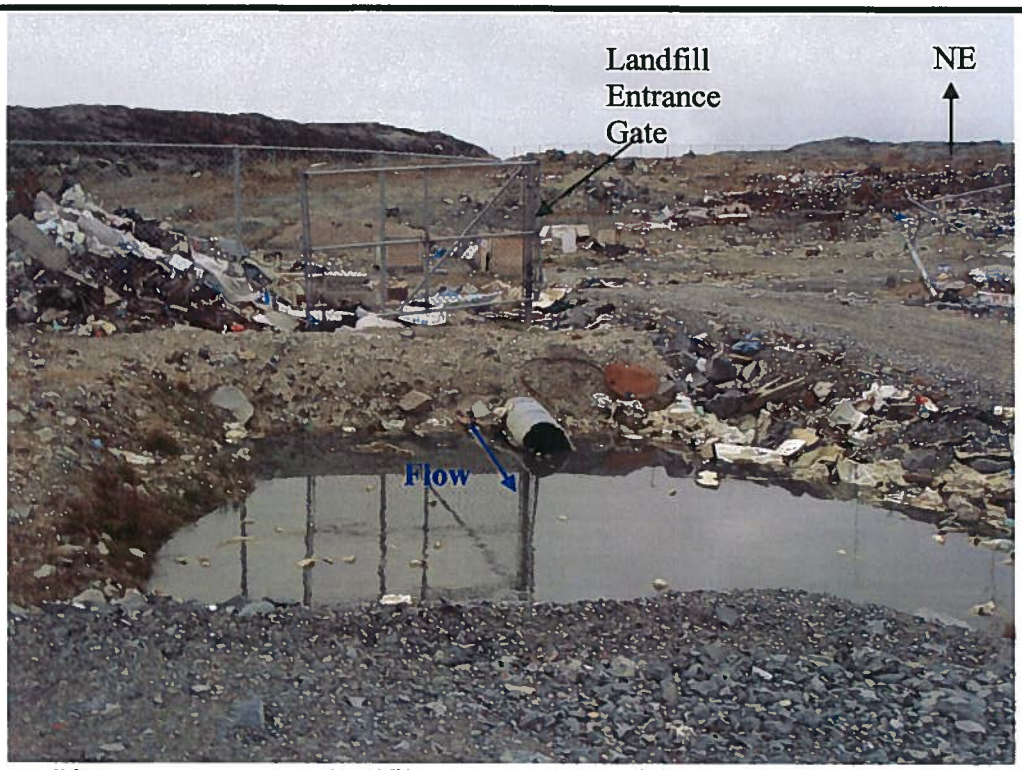

Photo 7: Entrance to landfill area, culvert draining water out of landfill

Photo 8: Water ponding outside of landfill area, LF-1. Looking West.

Photo 9: Broken fence on north side of landfill

Photo 10: Barrels in ground securing fence posts heaved out of ground

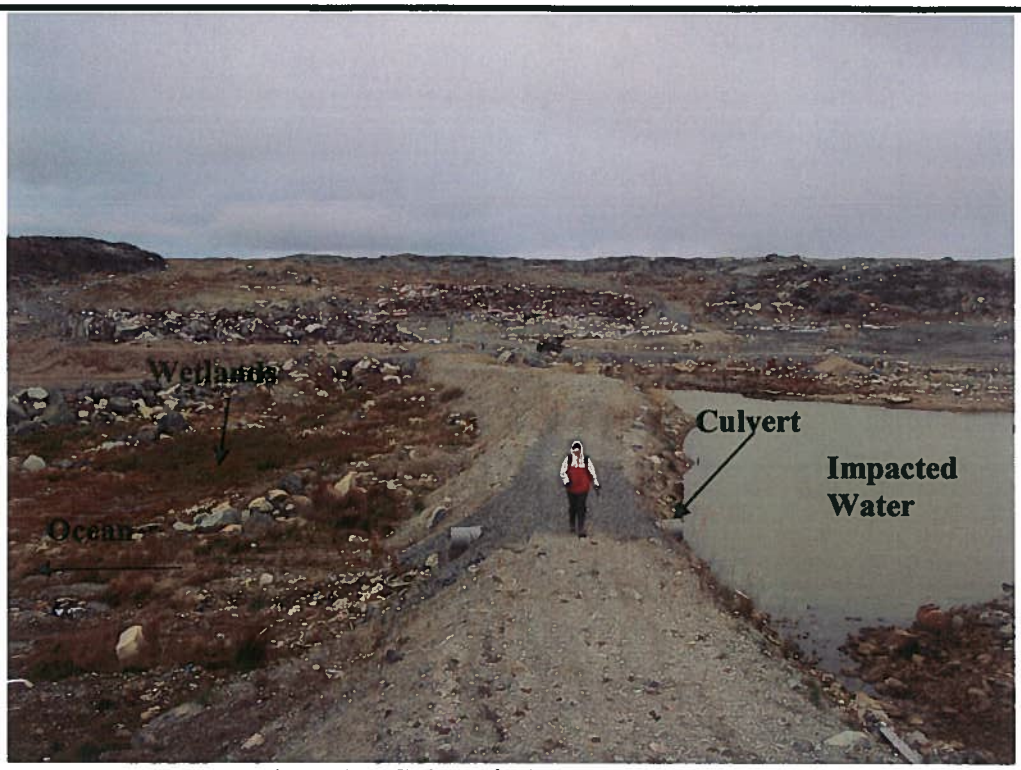

Photo 12: Culvert in berm. Looking NE

Photo 13: Landfill discharge towards ocean. Looking NW

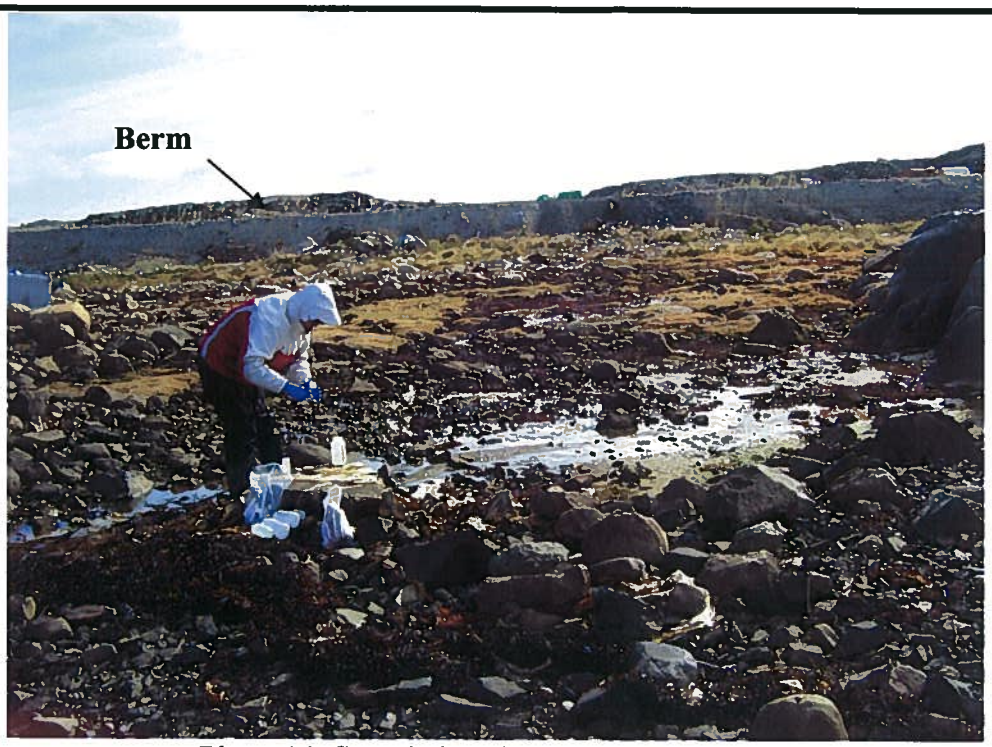

Photo 14: Sample location LF-2. Looking SE.

Photo 15: Bulky Waste Disposal Area

Photo 16: Metal Waste Pile

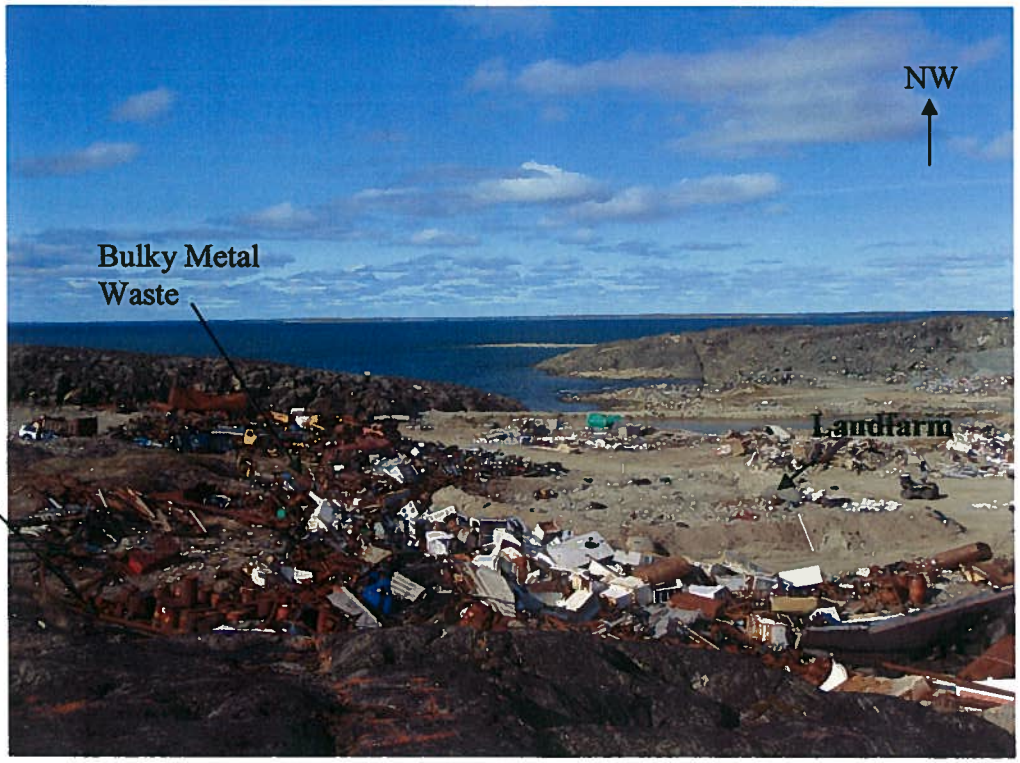

Photo 17: Bulky Waste Storage Area

Photo 18: Landfarm with paint cans, batteries, garbage scattered.

Photo 19: Berm around landfarm with liner showing through and metal waste overflowing onto landfarm.

Photo 20: Monitoring well installed at landfarm

Photo 21: Second monitoring well installed at landfarm