

F A X

To: Mr. Gordon Wray Date: June 28, 2005
 Company: NWT Water Board Fax #: 1 867 765 0114

COPY	
BOARD	6
G. W.	1
E. A.	1
W. RES.	016.
NMDO	1
FILE	0714

From: Ken Johnson Ext. #: _____
 Address: **Earth Tech (Canada) Inc.** Sending from Fax #: _____
 17203 - 103 Avenue 780 - 488-2121
 Edmonton, AB T5S 1J4 Proj #: 69130

Subject: **Hamlet of Tuktoyaktuk Water Licence Renewal**
Clarification on Operation and Maintenance Documentation

cc: **(LANDFILL)** Fax # _____
 Fax # _____

**URGENT**

THIS IS YOUR ONLY COPY



ORIGINAL TO FOLLOW BY MAIL

ORIGINAL TO FOLLOW BY COURIER


Comments:

Dear Mr. Wray:

On behalf of the Hamlet of Tuktoyaktuk, we are submitting the attached operation and maintenance manual for the **Hamlet's landfill facility**.

If you have any questions on this report please do not hesitate to contact the undersigned at 780 453 0910.

Sincerely,


 Ken Johnson, M.A.Sc., P.Eng.
 Environmental Engineer



37
 If you do not receive _____ pages (including cover page),
 please call us as soon as possible @ 780-488-6800.

HAMLET OF TUKTOYAKTUK LANDFILL OPERATION AND MAINTENANCE MANUAL

Prepared by:

UMA Engineering Ltd.
Engineers, Planners & Surveyors
17007 - 107 Avenue
Edmonton, Alberta
T5S 1G3

DRAFT
September 30, 2000
5512-003-00-02

TABLE OF CONTENTS

1.0	INTRODUCTION	1-1
1.1	OBJECTIVE OF A SOLID WASTE DISPOSAL SYSTEM	1-1
1.2	SITE DESCRIPTION AND HISTORY	1-2
1.2.1	Site Description	1-2
1.2.2	Site History	1-2
1.3	REFERENCE INFORMATION	1-4
2.0	OPERATING REQUIREMENTS	2-1
2.1	GENERAL	2-1
2.2	LANDFILL ORGANIZATION	2-1
2.2.1	Configuration	2-2
2.2.2	Setbacks	2-2
2.2.3	Access Roads	2-2
2.2.4	Cover Material	2-3
2.2.5	Drainage Routing	2-3
2.2.6	Fence and Sign	2-3
2.3	FILLING PLAN AND RECORD KEEPING	2-4
2.4	EQUIPMENT FOR OPERATION AND MAINTENANCE	2-4
3.0	ENVIRONMENTAL CONTROL	3-1
3.1	NUISANCE CONTROL	3-1
3.2	SURFACE WATER MONITORING	3-1
4.0	OPERATING PROCEDURES	4-1
4.1	GENERAL	4-1
4.2	SITE SECURITY	4-1
4.3	EMERGENCY PROCEDURES	4-1
4.3.1	Uncontrolled Burning	4-1
4.3.2	Accidental Injury	4-1
4.3.3	Site Closure	4-2
4.4	NUISANCE AVOIDANCE	4-2
4.4.1	Litter Control	4-2
4.4.2	Noise	4-3
4.4.3	Dust	4-3
4.4.4	Snow Accumulation	4-3
4.4.5	Pest Control	4-4
4.4.6	Odours	4-4
4.4.7	Bird Control	4-4
4.5	FIRE SAFETY	4-5
4.5.1	Surface Fires	4-5
4.5.2	Subsurface Fires	4-5
4.6	HAZARDOUS WASTE MANAGEMENT	4-5
4.6.1	General	4-5
4.6.2	Hazardous Waste Collection	4-6
4.6.3	Hazardous Waste Storage	4-7
4.7	WASTE DISPOSAL	4-9
4.7.1	Tipping Face	4-9
4.7.2	Compaction of Waste	4-9
4.7.3	Cover Material	4-10
4.7.4	Burning	4-10
4.7.5	Waste Slope Stability	4-11

	4.7.6	Recycling.....	4-12
	4.7.7	Bulky Waste Area	4-12
4.8		LANDFILL MANAGEMENT	4-12
	4.8.1	General	4-12
	4.8.2	Surface Water Management.....	4-12
	4.8.3	Scavenging Management	4-12
	4.8.4	Spring Cleanup Operations.....	4-13
4.9		SITE RECORDS	4-13
	4.9.1	Site Monitoring.....	4-13
	4.9.2	Site Development	4-13
	4.9.3	Landfill Audit	4-13
	4.9.4	Activity Summary Report	4-14
4.10		SAFETY	4-14
5.0		MAINTENANCE	5-1
5.1		SITE EQUIPMENT.....	5-1
	5.1.1	Signs and Barricades	5-1
	5.1.2	Storage Containers.....	5-2
5.2		SITE INFRASTRUCTURE.....	5-2
	5.2.1	Roads	5-2
	5.2.2	Drainage.....	5-2
	5.2.3	Fencing	5-2
	5.2.4	Perimeter Berms	5-3
6.0		CLOSURE AND POST-CLOSURE	6-1
	6.1	GENERAL	6-1
	6.2	CLOSURE.....	6-1
	6.3	POST-CLOSURE	6-2

1.0 INTRODUCTION

The proper operation and maintenance of Tuktoyaktuk's solid waste landfill site are important components of the Hamlet's solid waste management system. It is recognized that inappropriate operation and maintenance may cause the landfill to become a source for potential health hazards and negative environmental impacts.

1.1 OBJECTIVE OF A SOLID WASTE DISPOSAL SYSTEM

The primary objective of the Tuktoyaktuk solid waste management system is to apply appropriate technology and procedures to dispose of Tuktoyaktuk's municipal solid waste. The application of appropriate technology is dependent upon the geology, terrain and climate of the area, as well as the technical and financial capabilities of the Hamlet. The appropriate technology will be applied to minimize the potential health and environmental hazards of the site. The appropriate technology is a modified landfill with controlled burning.

The following general requirements for minimizing air and water pollution, fire hazards, health and environmental hazards are addressed in this plan.

1. Minimize unsightly nuisances that can interfere with community life and development.
2. Minimize the possibility of polluting surface and ground waters through leachate and drainage control.
3. Control fire hazards during operational phases.
4. Control air pollution from smoke, dust and odour.
5. Minimize food sources that attract and harbour disease carrying bacteria, insects, and animals.

1.2 SITE DESCRIPTION AND HISTORY

1.2.1 Site Description

The Tuktoyaktuk Solid Waste Disposal site is a large fenced-in facility on the Tuktoyaktuk Peninsula, approximately 3 km south of the Hamlet. It has been in operation since the early 1970s as a replacement to the dump formerly located at the end of the community airstrip. The facility covers an area of approximately 20 hectares, but not all of the area is currently in use.

The active areas at present are on the southwestern area of the site for bulky waste and on the northeastern area for domestic waste.

The northwestern corner was a disposal area for building trains formerly used at the oil exploration camps. The building trains have not been compacted and the local fire department occasionally uses them for fire-fighting practice.

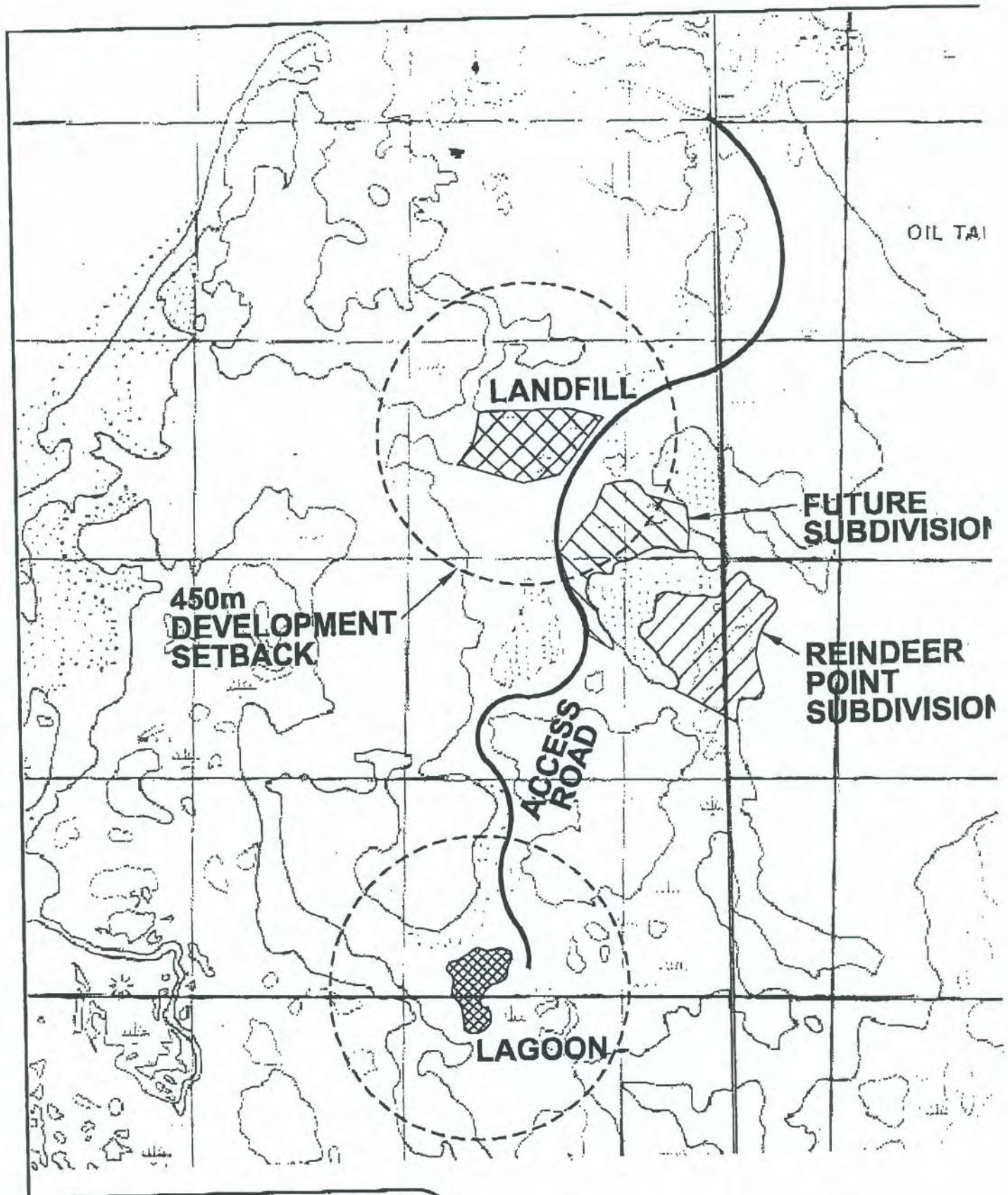
At the centre of the site, the vast majority of the surface area of the facility is covered by a lagoon. The lagoon water is retained on the eastern edge by a 150 m long gravel/clay berm. The shoreline of the lagoon is littered with debris.

The landfill is used as the disposal area for the Hamlet honeybags; in 1995 there were fewer than 25.

Wastes are dumped in these separate areas by the Hamlet collector, but there are no signs indicating where waste is to be disposed of, or what types of waste, if any, are prohibited at the landfill site. Scavenging of wastes at the landfill is also a common activity.

1.2.2 Site History

In the period from the 1970s to 1984, the disposal area was on the northern side of the facility. The area was covered with fill and left, but through erosion and freeze-thaw upheaval, some of the debris buried there has become exposed. As well, there has been uncontrolled dumping of debris of various descriptions throughout the entire fenced area, including this abandoned section. The southern edge has had very little



UMA Engineering Ltd.
Engineers, Planners & Surveyors

TUKTOYAKTUK, NWT LANDFILL LOCATION

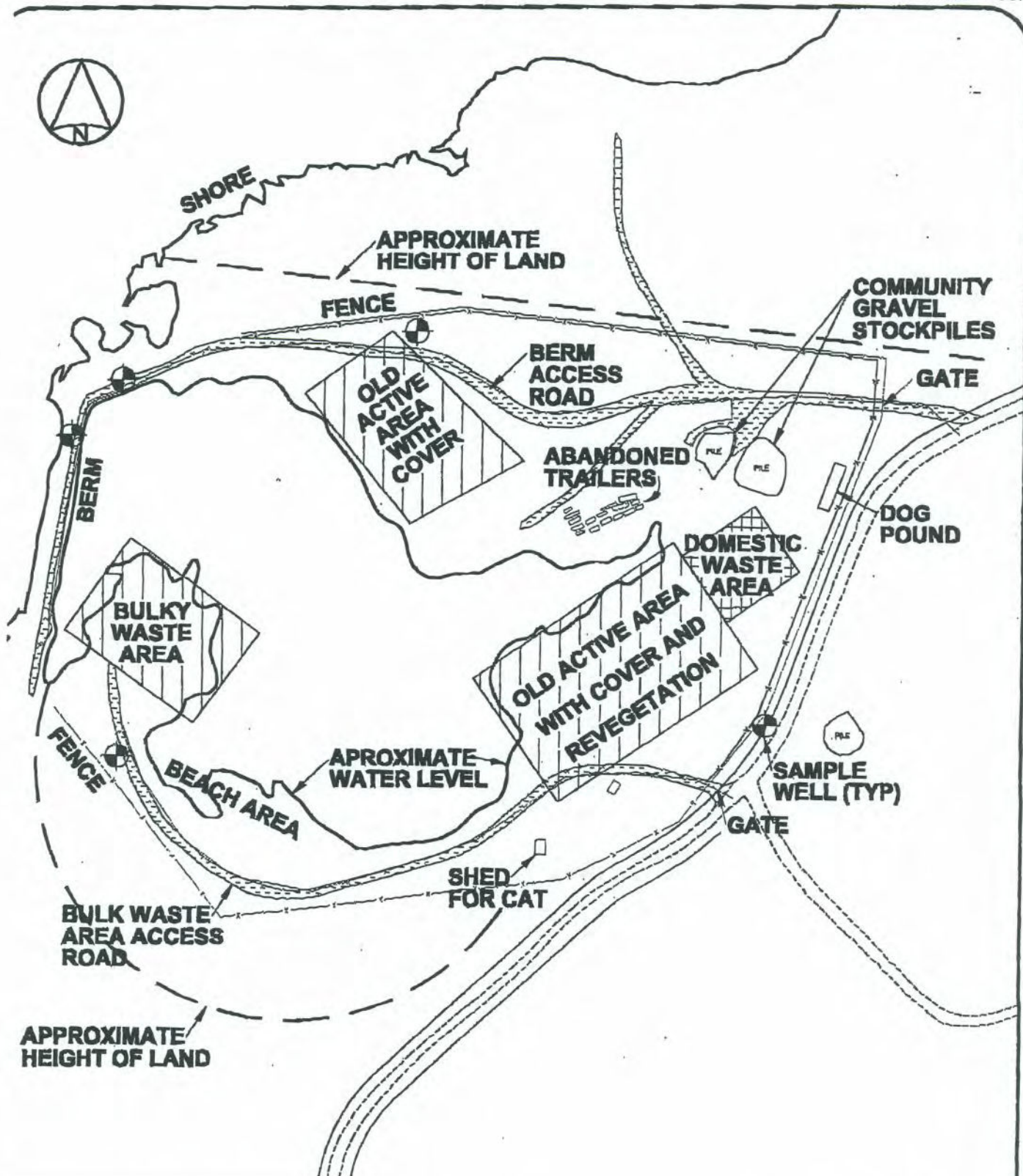
FILE: 5512-003-00-02
DWG: LAGN-MAP.DWG

DATE: AUG 21, 2000
BY: GH FOR: KRJ



www.umagroup.com





UMA Engineering Ltd.
Engineers, Planners & Surveyors

TUKTOYAKTUK, NWT LANDFILL SITE PLAN

FILE: 9512-003-00-02
DWG: DETAIL-1.DWG

DATE: SEP 25, 2000
BY: GH FOR: KRJ



WWW.UMAGROUP.COM



use as a disposal area. The southeastern corner contains a large pile of bulky waste, originally comprising of old cars, metal construction debris, but now interspersed with domestic litter such as old tires, small appliances, and household waste.

Dome, Esso, Imperial, Gulf and others have operated large-scale oil exploration projects in the southwestern Beaufort Sea since 1970. During its peak period of settlement, Tuktoyaktuk was home to as many as five of the associated base camps at any one time. By 1986 most of the large-scale projects had ended and only a few smaller operations remained.

Tuktoyaktuk was also the location of a DEW Line site. This military installation began operation in the late 1950s and was permanently closed in 1993. Many of these companies had used the municipal landfill in the Hamlet of Tuktoyaktuk to dispose of much of their waste. Most of the DEW Line waste as well as the domestic waste from the exploration base camps was placed in the landfill disposal area.

In 1986, a plan to improve the conditions of the facility was developed, which included an operation and management scheme to maintain these improvements. The plan consisted of filling in the areas prone to flooding with a layer of compacted debris to an elevation above sea level, and then covering the debris with fill. Future waste would then be placed in one area and at the end of each year, would be compacted, covered with 30 cm of fill and graded in such a way as to prevent flooding. It was recommended that separating the wastes into areas should continue, that the landfill should be secured, and that uncontrolled dumping should be prohibited.

In 1992, it was proposed to build an impermeable berm along the eastern side of the site, to prevent the ingress of storm tides and the outflow of landfill debris. The berm was intended to be high enough to prevent flooding under typical storm tide conditions. The Hamlet built the berm using community resources.

1.3 REFERENCE INFORMATION

The preparation of this operation and maintenance manual is based upon the following reference information.

1. "Guidelines for the Planning, Design, Operation and Maintenance of Solid Waste Modified Landfill Sites in the Northwest Territories." Volume II: Operation & Maintenance, Gary W. Heinke, Ph.D., P.Eng. & Jeffrey Wong.
2. "Guidelines for the Collection, Treatment & Disposal of Hazardous & Bulky Wastes in the Northwest Territories." P.L. Heeney & G.W. Heinke.

2.0 OPERATING REQUIREMENTS

2.1 GENERAL

The solid waste landfill site for the Hamlet of Tuktoyaktuk has been developed in a manner illustrated in the "Landfill Site Plan". In order to provide separate areas for different types of wastes, future improvements will be undertaken as illustrated in "Landfill Site Improvements". In the future, separate disposal areas will be maintained as follows:

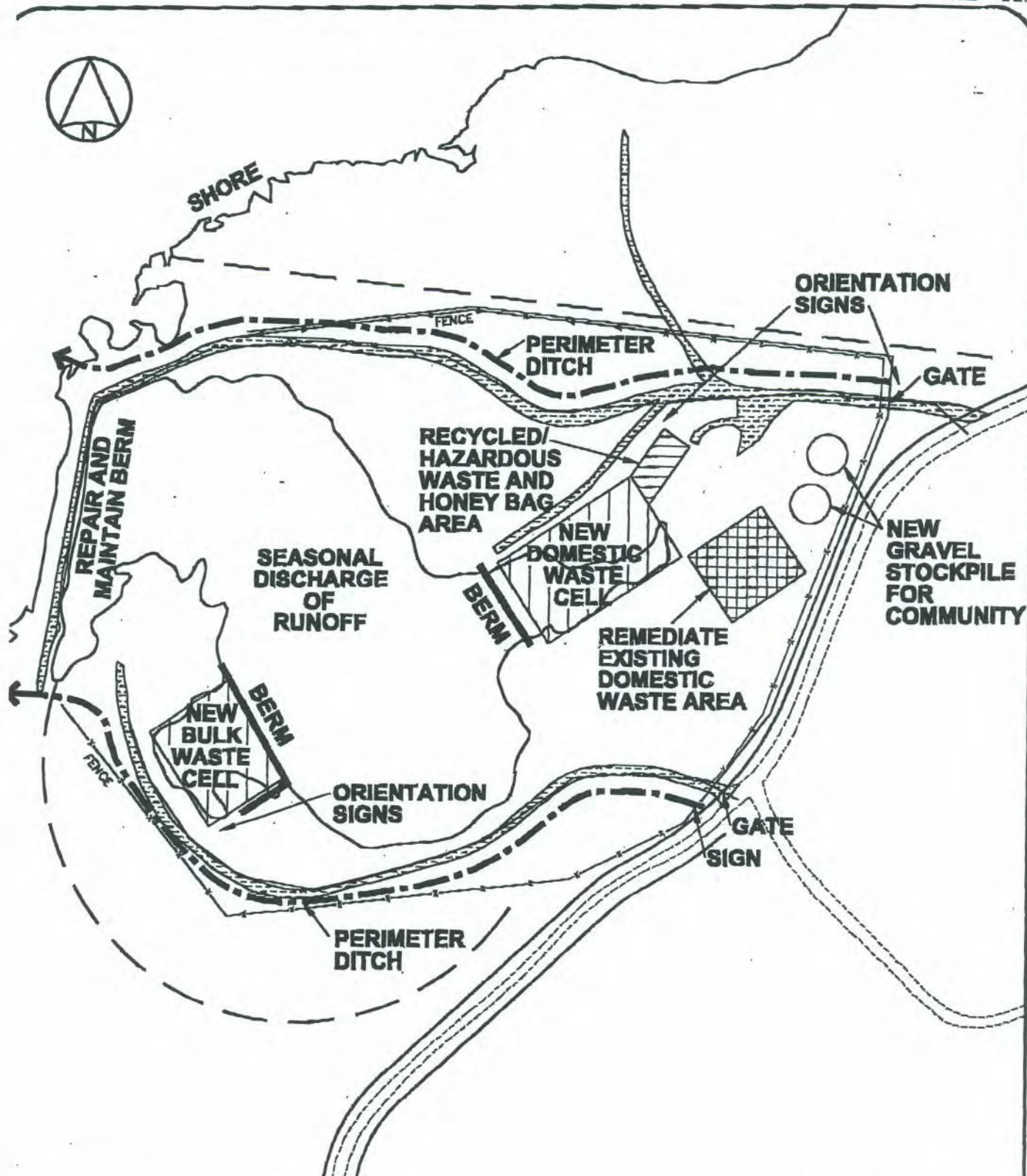
- Domestic waste disposal area: for disposal of non-hazardous household, institutional, commercial and construction wastes. Dead animals and other combustible wastes are also included.
- Bulky waste area: for disposal of large non-combustible items such as automobile, snowmobiles, appliances and metal tanks.
- Recyclable waste area: for storage of materials which may be part of the Hamlet's recycling program or material which may be salvageable by individuals with permission of the Hamlet.

Household hazardous waste containment will be accommodated at the site with designated offsite collection and disposal as well. Commercial and industrial hazardous waste will not be accommodated at the site.

2.2 LANDFILL ORGANIZATION

Future development of the landfill is to be carried out with careful consideration being given to measures that minimize the impact on the surrounding environment. In improving the general layout of the landfill the natural topography of the site is to be utilized as much as possible.

The landfill area is currently bounded by a security fence; normal traffic access is through the main entrance gate.



UMA Engineering Ltd.
Engineers, Planners & Surveyors

**TUKTOYAKTUK, NWT
LANDFILL SITE IMPROVEMENTS**

FILE: 5512-003-00-02
DWG: DETAIL-1.DWG

DATE: SEP 27, 2000
BY: GH FOR: KRJ



WWW.UMAGROUP.COM



**MAINTAIN
10 METRE
WORKING
FACE WITH
MOVABLE
BARRICADE**

**MOVABLE
BARRICADES**



NEW DOMESTIC WASTE CELL

+/- 50 metres

**WORKING AREA
1**

**WORKING AREA
2**

**WORKING AREA
3**

+/- 30 metres

+/- 30 metres

+/- 30 metres



BERM

UMA Engineering Ltd.
Engineers, Planners & Surveyors

**TUKTOYAKTUK, NWT
FUTURE LANDFILL ORGANIZATION**

FILE: 5512-003-00-02
DWG: DETAIL-2.DWG

DATE: SEP 27, 2000
BY: GH FOR: KRJ



WWW.UMAGROUP.COM



2.2.1 Configuration

The site will be configured for combustible and non-combustible waste disposal. Open burning of segregated combustible waste will be used as a means of volume reduction, therefore a separate large area has been set aside for this activity. Reusable wood waste may be segregated when possible.

Non-combustible bulky wastes will be directed to a bulky waste area.

Household hazardous waste storage may be permitted within the site. Appropriate means of storage and disposal for household hazardous waste will be developed by the Hamlet; commercial and industrial hazardous waste collection, storage and ultimate disposal will be the responsibility of the generator.

2.2.2 Setbacks

The setback criteria for the various features are based upon various guidelines, and in the absence of any regulatory guidelines, generally accepted guidelines.

- Human Habitation: the site maintains a minimum 450 metres from areas of human habitation (Department of Health Regulations).
- Recreation: Which are well beyond a generally accepted 300 m setback.
- Airport: The recommended minimum 3 km setback (MACA Guidelines) between a solid waste disposal site and an airport cannot be achieved on this site.
- Tank Farm: the burning area for the solid waste disposal site is approximately 300 metres from the perimeter fence of the tank farm.
- Access Road: a setback of 100 metres will be achievable between the site and the Reindeer Point road. This does conform to the 90 m setback suggested by the Department of Health.

2.2.3 Access Roads

Access for the site utilizes a 6 metre driving surface and turnaround areas. The access road is constructed with suitable granular material to provide an all-season driving surface for heavy equipment.

There will be some settlement of the waste in the cells and the gradients of the final cover must account for this.

6.3 POST-CLOSURE

Following completion of the facility the landfill must be maintained. This care will comprise the monitoring and maintenance on the final cover and the monitoring of the leachate (if any).

The final cover of the landfill cells must be maintained following closure. The surface is subject to erosion. More significantly the waste in the cells will settle differentially. This may cause ponding of surface water in moderate cases. It may result in a breach of the cover in severe cases.

The problems of waste settlement will be addressed by the separation of bulky items such as car bodies and washers from the waste stream and by the consistent compaction of the waste.

A small breach in the cover may give rise to large quantities of leachate being generated. It is important that any defects that are formed are remedied immediately as they are noticed.

Annual surveys will be carried out on known points to establish settlement patterns. This will assist in predicting future maintenance requirements.

2.2.4 Cover Material

Two types of cover may be used for the operation of the Tuktoyaktuk solid waste disposal site: primary cover, and intermediate cover. Primary cover will be a clean fill to reduce windblown material, and reduce attraction to the solid waste by animals. Primary cover may not be necessary because controlled burning will accomplish some of the objectives of primary cover.

Intermediate cover will be a clean granular fill used to create a drivable surface as the working face of the landfill advances.

2.2.5 Drainage Routing

An on-site drainage collection routing system will allow potentially contaminated water to be routed for a controlled discharge off site. The discharge will be controlled by pumping. Discharge will depend upon the discharge constraints of the regulatory agencies.

Containment berms are incorporated into the site on the west side of the site. These berms are designed to contain drainage within the solid waste disposal site.

An off site drainage routing system will allow surface drainage to be routed around the site.

2.2.6 Fence and Sign

The landfill site has a fence surrounding the site. Fencing of a solid waste disposal site is practical for a number of purposes. A fence will provide a barrier to windblown material and also control access to site, thereby improving site management.

Portable barricades may be used in the future in the vicinity of the operating areas of the landfill.

The site will also have instructional and directional signs.

2.3 FILLING PLAN AND RECORD KEEPING

The site operator will maintain records of the general description of the type of waste being deposited at the site.

2.4 EQUIPMENT FOR OPERATION AND MAINTENANCE

Proper and adequate equipment is essential in the efficient operation of the landfill. The Hamlet has equipment for spreading, compacting and covering of the landfill. The spreading, compacting and covering of a landfill may be accomplished with one machine.

- Collection vehicle: packer-truck.
- On site equipment: bulldozer equipped with a dozer blade or front-end loader or fork lift for bulky material. Equipment need not be on site on a full-time basis.

3.0 ENVIRONMENTAL CONTROL

3.1 NUISANCE CONTROL

The effects of any nuisance, such as dust, litter, noise, etc. will be minimized on the properties surrounding the landfill.

Dust will be controlled by the application of water to the on-site roads, on an as-required basis.

Blowing litter will be controlled by the proper use of portable barricades at the active dumping area and by perimeter fencing around the site. The mobile litter fences will be aligned according to the wind direction. The debris accumulated on the fences may be collected on a weekly basis to prevent migration onto adjacent properties. Collection of litter blown onto adjacent properties will also be undertaken.

The regular application and compaction of soil cover in addition to burning may discourage the feeding and proliferation of vectors such as birds, and insects. Stagnant water ponds, open ended barrels and accumulations of tires will not be permitted to prevent the breeding of mosquitoes. Should the number of birds on-site become excessive and a nuisance, a percussion bird-scare device may be employed.

Noise should not be a problem due to the buffer zone around the landfill.

The possibility of odours will be minimized by the immediate deposition of waste and the periodic burning, and the appropriate application of the primary cover.

3.2 SURFACE WATER MONITORING

Environmental monitoring is a very important component of the landfill operating plan. Sampling of surface water may be undertaken. The objective of the surface water monitoring program will be to detect any changes in surface water quality that may result from contaminated storm water run-off originating from the landfill site entering the surface drainage system.

The drainage control, routing and collection systems within the site are functional during the short summer season. During the winter months water movement is not a concern.

The surface water monitoring should satisfy the concerns of the various regulatory agencies with regular monitoring and reporting as deemed necessary by the agencies. The regulatory performance monitoring may only include the testing of the interior drainage (leachate) to determine the degree of contamination, if any. An appropriate means of controlling the drainage discharge may then be determined upon consultation with the regulatory agencies.

4.0 OPERATING PROCEDURES

4.1 GENERAL

The Operating Procedures for the facility has been prepared with the intent to not restrict the efficient operation of the facility but to provide a framework in which the facility can operate.

4.2 SITE SECURITY

The landfill will be secured with a chain link fence. The fence will manage access to the site.

4.3 EMERGENCY PROCEDURES

The following are the events in which non-routine operational responses may be anticipated:

- Uncontrolled burning
- Accidental injury
- Site closure

4.3.1 Uncontrolled Burning

In the event that uncontrolled burning takes place at the landfill, the Hamlet will assess the potential danger of the burning and contact the appropriate authority to control the fire as required.

The burning areas are located a sufficient distance away from fuel storage tanks not to be considered a hazard under normal operating conditions.

4.3.2 Accidental Injury

It is recognized that a landfill is a potentially unsafe working environment. The operation of the facility will incorporate a safe working practices.

If an accident occurs on the site, it should be reported it to the Hamlet for a decision on the appropriate response.

4.3.3 Site Closure

It may be necessary to close the facility for unscheduled periods. Reasons for closures include:

- Uncontrolled fires
- Hazardous waste spill
- Accidents
- Severe weather.

The decision to close the facility will be made by the Hamlet or by another appropriate authority, and appropriate notice to the public will be given.

4.4 NUISANCE AVOIDANCE

4.4.1 Litter Control

The control of litter is a priority in the operation of the landfill, however, litter will inevitably occur. Landfill operation will be directed towards minimizing the amount of litter generated.

Two means of litter prevention will be adopted as a minimum:

- All loads entering or moving on the site will be covered to inhibit litter.
- At the tipping face; a moveable barricade will be placed adjacent to active tipping cells to catch wind blown litter. The barricades will be positioned in accordance with the direction of litter travel.

The barricades will be periodically cleared of litter. Additionally, any litter by-passing these nets and screens and landing off-site will be also be collected periodically.

4.4.2 Noise

The landfill is located well away from the public, therefore noise is not considered to be a problem for the site.

4.4.3 Dust

The generation of dust will be minimized at all times.

Controlling dust in the solid waste disposal may be difficult. The heavy traffic may create dust problems within the site because of dry road material; watering the road surface may reduce dust, but it may also increase runoff within the site if not used proper quantity. Site experience must be used regarding the quantity of water applied to the access road to reduce dust. A road treatment such as calcium chloride may also be used to stabilize the road surface.

All loads entering or travelling on the site will be covered to prevent dust or litter, and vehicles will be confined to designated haul roads.

4.4.4 Snow Accumulation

Snow accumulation can be a problem for day to day operation, as well as long term effectiveness for solid waste disposal sites in the arctic. Snow accumulation may hinder day to day access to a site because of snow drifting. Snow disposal within the site may require some organization to avoid conflicts between snow disposal areas and active waste disposal areas.

Snow accumulation within the solid waste itself may reduce the volume available on site for disposal. Snow may mix with the solid waste and remain frozen once the waste is covered. The use of burning for the site improvements will greatly reduce the likelihood of snow accumulation and a small burning area, will further reduce any snow accumulation because of the concentrated heat of combustion.

Drifting snow and frozen ground may interfere with the operation of a landfill site. The following operating activities may improve winter operation:

- Portable snow fencing may be used in addition to the normal peripheral fencing to prevent drifting snow from interfering with the operations.
- Cover material should be stock piled for winter use.

4.4.5 Pest Control

The operation of the landfill will be directed to ensure that the presence of vermin, insects and other pests on the landfill is limited.

Occurrence of pests will be minimized by the adequate compaction, burning and sufficient covering of waste at the end of each working day. The operation will minimize both the time that any material that is attractive to pests is exposed, and the volume of any void space in which pests can live.

4.4.6 Odours

The operation of the landfill will be directed to minimize the odour from waste. Odours will be minimized by ensuring the immediate deposition of waste delivery, the adequate compaction of deposited waste and the provision of primary cover material.

The odours associated with burning will be managed by use of favourable wind directions during burning activities.

4.4.7 Bird Control

The operation of the landfill will be directed to minimize the nuisance due to the presence of birds. Bird control will be facilitated by prompt burning and placing of waste on delivery, the adequate compaction of waste and the provision of primary cover material.

Special bird control measures are not required at present. If birds on the site become a nuisance, they may be controlled by means of a bird scarer, or other suitable means, to be decided by the Hamlet. As part of the decision, daily operations will be reviewed to examine the reasons for the increase in activity.

4.5 FIRE SAFETY

4.5.1 Surface Fires

If fire spreads rapidly beyond the control limit, the area involved will be cordoned off and the vicinity evacuated.

The Fire Department Officer in attendance will be furnished with all known information and given assistance if required. Prior contact will be made with the Fire Department to ensure they are aware of the nature of the landfill operations.

The cause of any such fires will be investigated and steps taken to prevent any recurrence. A record will be kept of any such incident, giving details of the actions taken.

4.5.2 Subsurface Fires

Subsurface fires will be assessed for danger and may be treated as an emergency; the Fire Department will be notified immediately if the fire is considered to be an emergency.

If a subsurface fire is suspected, it will be investigated immediately by excavation. If a fire is confirmed, remedial action will depend on the depth and extent. It may be possible to excavate the burning materials and extinguish them on the surface. Other measures to extinguish fires may require the isolation of the burning waste with cut-off trenches and flooding the area with water.

4.6 HAZARDOUS WASTE MANAGEMENT

4.6.1 General

Household hazardous waste is waste generated by households. Typical household hazardous wastes include: pesticides, photography wastes, paint, solvents, nonspecific flammable liquids, corrosive cleaners, batteries, pool chemicals, used oil, oil filters, and other toxic materials of unknown origin.

Management of household hazardous waste has become a concern as municipalities become aware that even small quantities of hazardous wastes can cause groundwater or air pollution when disposed of in landfills.

4.6.2 Hazardous Waste Collection

Tuktoyaktuk's hazardous waste program will begin with the generation of support from community leaders, business, and service organizations and residents. Effective and positive communication will serve to educate community leaders of the potential long-term liabilities associated with improper disposal of even small quantities of hazardous waste, such as costly site remediation of contaminated soil and groundwater. Service organizations and citizen groups can be particularly helpful in garnering the support of waste generators, which is critical for the success of any household hazardous waste management program development. A community committee on hazardous waste will facilitate support of these efforts.

The program will consist of a series of collections, one in the spring and one in the fall, during which citizens will bring their household hazardous waste to designated areas for collection and preparation for disposal. A designated drop off spot will be available year round at the landfill site. The collection event will last 1 day. After several collection events, over a period of 2-4 years, the accumulated waste will require ultimate disposal. Hamlet staff will be trained for hazardous waste handling.

Advertising by the Hamlet of the collection event will begin a minimum of 30 days prior to each collection event. Public service announcements on radio and in the newspaper are effective means of informing the public that a household hazardous waste collection event is coming. The advertisements give the location of the event as well as the dates and the time of day for bringing the wastes to the site. Advertising is also an opportunity to provide the residents with information to help them determine what materials are hazardous prior to the event.

A household hazardous waste collection event will be held in an area which is easily accessible to the public. The collection event should be organized in such a manner that citizens can drive their vehicles through an area and have the wastes unloaded for them. Citizens should be encouraged to stay in their vehicles to avoid time delays, congestion, and safety problems. When the wastes are unloaded the vehicles must have easy access back to the entrance road.

As vehicles enter the area, they will be greeted individually. Also, while the vehicles are waiting for unloading, the drivers can complete questionnaires on things such as estimated quantity of household waste, suggestions for improvement of the collection program, and demographics or other information which may be useful for maintaining interest in the household hazardous waste management program.

A household hazardous waste management program draws much of its strength from informed and concerned citizens. Providing the citizenry with facts and figures that support the need for minimization of waste generation, recycling of those wastes that must be generated, and proper disposal of those wastes that must receive treatment, go a long way toward maintaining support for the program. A good focus of educational efforts is on the youth in the community, as they can take their environmentally friendly ideas with them into adulthood. Also, many times children are the first to convince parents that new ideas in waste reduction are appropriate.

4.6.3 Hazardous Waste Storage

There are several factors to consider when storing hazardous waste, these factors include compatibility, segregation, ventilation, climate/environment, handling, security, labelling, and record keeping.

- **Compatibility**

The compatibility between different types of wastes must always be considered before storage. The compatibility of wastes with their containers must be considered. For example, acids should not be stored in steel drums, and some hydrocarbons cannot be safely stored in plastic. The compatibility of wastes with nearby materials and equipment is also very important, particularly when dealing with flammable wastes.

- **Segregation**

The final destination of wastes should always be considered before storage. If recovery may be possible in the future, wastes should be stored in a manner that will allow such recovery.

- **Ventilation**

Hazardous wastes should be well ventilated. Highly volatile organics in particular can present a serious health hazard in storage. If possible, most wastes should be stored outside in sheds which provide free air movement.

- **Climate/Environment**

Not all hazardous wastes should be stored outside. For example, flammable waste stored outside in drums during a hot summer can build up pressure and damage the container. Wastes with a high water content can experience freeze/thaw cycles and eventually crack and leak.

If stored outside, containers should be covered by a roof or tarpaulin, and preferably placed on a impermeable base. This prevents contact of rainwater and soil, keeps of the direct sunlight, and makes clean-up of any spills or leaks easier and cheaper. The area should be curbed or diked to collect spills, leaks and precipitation. This containment area should be capable of holding at least 10-15% of the total volume of the stored product.

- **Handling**

The WHMIS (Workplace Hazardous Material Information Sheet) guidelines should be followed in all cases when handling hazardous materials. These guidelines are legally enforceable through Canada.

- **Security**

Security precautions are necessary to avoid theft, accidental discharge or harm to the public.

- **Record Keeping**

Records must be maintained to achieve safe hazardous waste storage. If quantities and types of wastes are not recorded, serious problems may result in the future. Care should be taken to ensure that containers remain properly labelled during the entire time in Storage.

4.7 WASTE DISPOSAL

4.7.1 Tipping Face

A well defined tipping face will be provided. The width of the tipping face will be in keeping with the number of vehicles likely to be at the tipping face at any time. Waste will be placed at the brow of the tipping face, unless there are valid reasons otherwise.

At the tipping face, vehicles using different means of unloading may be segregated to reduce the turnaround time of each vehicle at the discretion of the landfill operator. Signs will be provided to ensure that any designated tipping areas for different vehicles and waste types, such as soil cover, are clearly defined. Signage will be provided at the tipping face to direct vehicles to safely approach. This will also minimize waste deposited on the ground surface.

The slope angle of the tipping face in each cell will be no steeper than 1(V) on 5(H). Uncompacted faces will not be allowed to develop.

The active areas of a solid waste disposal site should be as small as possible. This is important in providing a manageable and safe disposal site for the public and operating staff. The area for combustible wastes requires particular attention because of the potential hazards of a large fire.

Minimizing the active areas of the solid waste disposal site will also reduce the exposure of the wastes to water within the site, and reduce the potential contamination of water within the site.

4.7.2 Compaction of Waste

Compaction of waste will be undertaken to fulfil the following objectives:

- Maximize waste density, thereby ensuring the optimum use of the available air space.
- Minimize primary cover requirements.
- Reduce problems of infestation by vermin, flies, pests and birds.
- Assist in the reduction of odour.

On a regular basis the waste should be spread into a layer with a bulldozer equipped with a blade or bucket and then compacted by running the bulldozer over it several times.

After compaction each layer should be no more than about 2.5 m thick. The compacted waste should be covered with suitable cover material.

The need for compaction for the proposed site development is minimal because of the proposed volume reduction by burning of combustible wastes. Some compaction may be necessary as the working face of the disposal areas advance from the access road in order to prepare a drivable area for vehicles. This compaction could be accomplished by heavy equipment such as a bulldozer.

4.7.3 Cover Material

The waste will be deposited within a series of defined cells in order to ensure concentration of disposal operations. Materials for cover will be stored separately from the waste.

The cover will be considered satisfactory if the following criteria are met:

- Minimum thickness of 150 mm.
- The waste is bound in place and does not cause odour or litter nuisance. In order to conserve airspace, maximum use will be made of on-site materials.

Stockpiles of cover material will be established adjacent to the landfill area. Separate stockpiles will be formed of clean cover materials and of suitable materials segregated from the incoming waste stream.

The covering layer should be at least 0.15 m thick for intermediate cover and at least 0.3 m thick for the final cover. Each layer of solid waste and cover material should have a slight slope so water can drain.

4.7.4 Burning

At the beginning of each day, the combustible wastes in the refuse disposal area may be burned if the winds are favourable.

Fire control is an important part of the operation of the solid waste disposal site. In order to further reduce the risk of fire at the tank farm site from sparks created by combustion at the solid waste disposal site, an operating protocol will be identified and utilized during periods of higher risk for the tank. These periods would include:

1. Filling of the tank.
2. A site spill.
3. Venting of the tank during high wind.

A protocol will be established so that the Hamlet is advised of the tank filling, and burning on the site is temporarily suspended during this period.

A spill on the tank farm site would be contained by the containment berm, but this open fuel would be at a greater risk of combustion. A protocol will also be established so that burning on the solid waste disposal site is temporarily suspended until the spill is cleaned up.

Venting of the tank during a high wind may be potential problem, however this may be an infrequent occurrence depending upon the vapour pressure of the fuel.

Further burning control practices will include:

1. An attendant on the site while the fire is in its initial stages and periodic inspection.
2. A minimum buffer zone of 5 m around the combustion area.
3. Maintaining a reasonably small combustion area.
4. Restricted public access to the burning area.

4.7.5 Waste Slope Stability

The maximum angle for waste slopes will be 5(H) on 1(V) (11°) for active areas. This slope accommodates equipment access for spreading and compacting.

The maximum angle of any slopes will be 1.5 (H) on 1 (V) (37°). These slopes may comprise a temporary condition during the opening of a cell.

4.7.6 Recycling

Recycling within the site may entail salvaging of certain construction materials brought to the site for disposal. This material may be reused by the Hamlet or other groups authorized by the Hamlet. Additional recycling operations may also be feasible at some time in the future.

4.7.7 Bulky Waste Area

Bulky wastes are deposited in a separate area. These wastes do not need to be covered, however, fill material will be required to advance the driving service of the bulky waste area.

Stacking and collapsing of cars, barrels and appliances will be undertaken where possible. Hazardous materials associated with bulky waste such as fuel will be removed prior to placement.

4.8 LANDFILL MANAGEMENT

4.8.1 General

The philosophy of the management of the landfill will be of prevention rather than cure. The essence of the approach is to anticipate where problems may occur in the future and to prevent their occurrence.

4.8.2 Surface Water Management

Surface water will be controlled within the site to minimize the possibility of discharging contaminated runoff. Steps have been taken to intercept water course outside the landfill using ditches.

4.8.3 Scavenging Management

Scavenging by local residents should be controlled at the disposal site. Uncontrolled scavenging is dangerous and unnecessary. Controlled access will minimize this problem, in addition to on site separation by the landfill operator.

4.8.4 Spring Cleanup Operations

Once a year, after the snow has melted, the Hamlet will organize a spring clean-up to collect loose waste around the landfill that has accumulated and was once buried by the previous winter snow.

4.9 SITE RECORDS

4.9.1 Site Monitoring

The environment surrounding the landfill is subject to monitoring by the Hamlet, the NWT Water Board and the Inuvik Region Health Board. These records will be maintained in a current state at the site and the Hamlet office. The monitoring data will be shared to all these parties as it becomes available.

Samples of surface runoff from within the site may be taken on a periodic basis during the summer months.

4.9.2 Site Development

Weekly records of the progress of the landfill will be maintained. These will chart the progress of the landfill within the planned development of each landfill cell.

An annual topographic survey of the landfill will be undertaken to provide a continuous record of site usage and to assess the site utilization. The development will also be photo documented.

4.9.3 Landfill Audit

An audit of landfill operations will be undertaken by the Hamlet annually. This will include a record of the following:

Access Routes/Signs	Noise	Width of Tipping Face	Safety
Gates and Fencing	On-Site Drainage	Primary Cover	Site Records
Waste Handling	Waste Types	Tidiness	Previous Audit Information
Bulky Items	Equipment Storage	Fires	Complaints
Litter Control	Waste Handling Equipment	Disposal Operation	Leachate
Birds	Depth of Tipping Face	Segregation	Dust
Odour			

The Hamlet will remedy any part of the operations which is not in accordance with the Operating Plan, or accepted good standards for landfill operations.

4.9.4 Activity Summary Report

A bimonthly Summary Report will be compiled by the landfill operator. The report will include the following information:

- Location of active landfilling area and the activities related to cell filling.
- Summary of the weather for the month.
- Summary of site maintenance and litter control activities.
- Summary of infractions and problems and the measures undertaken to resolve.
- Summary of Surveillance Network Point (SNP) sampling.

4.10 SAFETY

A specific safety plan is incorporated into the operation to cover issues including:

- Personal Safety Equipment
- Occupational Health and Safety Requirements
- Emergency Procedures.

The operator has the responsibility to ensure that all aspects of solid waste disposal are conducted safely.

5.0 MAINTENANCE

The maintenance of the following site facilities will be conducted on a routine basis:

- signs and barricades
- storage containers
- roads
- drainage
- fencing
- perimeter berms.

The inspection maintenance of the following site facilities will be conducted on a routine basis according to a Schedule of Maintenance that is relevant to each aspect of the operation:

- site equipment (signs, barricades, building, storage containers); and
- site infrastructure (roads, drainage, fencing, berms).

This aspect of the solid waste disposal system is frequently neglected in most NWT communities. The maintenance aspect is one of the most important components of an solid waste disposal site.

5.1 SITE EQUIPMENT

5.1.1 Signs and Barricades

Signs within and adjacent to the site should be inspected by the operator on a monthly basis. Signs should be inspected for wear and breakage of the mounting systems and wear of sign lettering. Any signs requiring repairs should be reported to the Hamlet so that repair may be undertaken.

Site barricades should be inspected on a monthly basis and the need for repairs should be reported to the Hamlet.

5.1.2 Storage Containers

The operator should inspect the exterior of the storage containers on a biweekly basis to observe and record any signs of deterioration and advise the Supervisor of observations.

5.2 SITE INFRASTRUCTURE

5.2.1 Roads

The access road for the solid waste disposal site should be maintained properly at all times. The frequent use of heavy equipment may cause the road to deteriorate significantly. Adequate road maintenance should include the following points:

- Potholes can be filled with stockpiled material.
- Roads should be reshaped as required to provide proper drainage.
- Snow should be removed as necessary and deposited in the south cell.
- Wastes fallen from the collection vehicle during hauling should be collected from the roads and surrounding areas.
- In dry weather roads should be sprayed with water to control dust.
- A good granular base should be maintained on the road.

5.2.2 Drainage

Drainage from the disposal site should be checked monthly from June through October to ensure that blockages have not developed in the swales. Any blockages or ponding should be recorded and reported to the Hamlet by the operator.

5.2.3 Fencing

The operator should examine the fencing for holes and check fence posts for frost heave. Wind blown material should be removed from the fence to reduce wind loading and improve the appearance of the site.

5.2.4 Perimeter Berms

The perimeter berms of the landfill site should be inspected on a monthly basis from May through October. Any signs of erosion to the berms should be recorded and reported to the Hamlet.

6.0 CLOSURE AND POST-CLOSURE

6.1 GENERAL

The landfill will have a finite life; closure will be a part of the everyday operating of the facility and it is to be considered as part of the routine working practices.

6.2 CLOSURE

The facility will be constructed, operated and restored as a containment landfill, an integral part of which is the final cover. The final cover will be silts placed over the area of active cells.

The final cover is required to perform as follows:

- Minimize infiltration of surface water and precipitation.
- Contain the waste from exposure.
- Provide a medium for planting and vegetation of the site.

A multi-layer configuration is used for cover in which each layer has a distinct purpose. The first layer, closest to the waste, should consist of a granular material which is used to grade the site to provide positive drainage off the surface (a minimum 3% slope).

The final cover will comprise the following as a minimum:

- 300 mm thickness of compacted silt material.
- Positive gradients from all points on the landfill.
- Vegetative cover if possible.

The vegetation serves to stabilize the final cover from erosion and to assist in minimizing infiltration by evapotranspiration. The plants selected will be a shallow rooting variety that will not compromise the low permeability layer.