Landfarm Design and Management Plan

Doris North Gold Mine

Nunavut

Submitted to:

Miramar Hope Bay Limited

North Vancouver, British Columbia

Submitted by:

AMEC Earth & Environmental,
a division of AMEC Americas Limited

Burnaby, BC

October 2006

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IMPORTANT NOTICE

This report was prepared exclusively for Miramar Hope Bay Limited by AMEC Earth & Environmental Limited, a wholly owned subsidiary of AMEC Americas Limited. The quality of information, conclusions and estimates contained herein is consistent with the level of effort involved in AMEC services and based on: i) information available at the time of preparation, ii) data supplied by outside sources, and iii) the assumptions, conditions and qualifications set forth in this report. This report is intended to be used by Miramar Hope Bay Limited, the Nunavut Water Board, the Kitikmeot Inuit Association and the regulatory agencies involved in reviewing the water license application for the Doris North Project only, subject to the terms and conditions of its contract with AMEC. Any other use of, or reliance on, this report by any other third party is at that party's sole risk.

EXECUTIVE SUMMARY

The Landfarm Design and Management Plan provides pre-construction information on contaminated soil and snow handling in a safe and environmentally sound manner at the Miramar Hope Bay Limited (MHBL) Doris North Gold Mine (Doris North) in Nunavut. This plan was developed in support of MHBL's application for a water licence from the Nunavut Water Board (NWB) to operate Doris North. Doris North is located on the Canadian mainland in the West Kitikmeot region of Nunavut approximately 110 km southwest of Cambridge Bay and 75 km northeast of Umingmaktok.

Landfarming is a form of bioremediation that uses naturally occurring micro-organisms (yeast, fungi or bacteria) to metabolize or break down petroleum hydrocarbons. Natural processes include volatilization, aeration, biodegradation and photolysis. End products are micro-organism protein, carbon dioxide and water. Stimulation of microbial growth and activity for hydrocarbon removal is accomplished primarily through the addition of air and nutrients (metabolism of hydrocarbons is mediated predominantly through aerobic microbes).

The proposed landfarm will be 50 m by 25 m constructed within quarry #2 and thus will be within a controlled drainage area. The landfarm will be bermed and underlain by a geomembrane to prevent leachate flows out of the facility. The design and proposed management are based on successful landfarms operated at the Boston and Windy exploration camps operated by MHBL.

No hazardous wastes other than petroleum-stained soil and snow will be placed in the landfarm. Only lighter fraction hydrocarbons (gasoline, jet fuel, diesel) contaminated soils and snow will be landfarmed. Heavy fraction contaminated soils and snow (e.g. motor oil) will be placed underground and encapsulated in permafrost.

Operation of the landfarm will be monitored and soils tested annually. Once clean, as shown by laboratory analysis, soils will be used for reclamation.

On closure any contaminants at the facility will be placed underground and encapsulated in permafrost.

1.0 INTRODUCTION

1.1 Overview

The Landfarm Design and Management Plan provides pre-construction information on how contaminated soil and snow will be handled in a safe and environmentally sound manner at the Miramar Hope Bay Limited (MHBL) Doris North Gold Mine (Doris North) in Nunavut. This plan was developed in support of MHBL's application for a water licence from the Nunavut Water Board (NWB) to operate Doris North.

Doris North is located on the Canadian mainland in the West Kitikmeot region of Nunavut approximately 110 km southwest of Cambridge Bay and 75 km northeast of Umingmaktok. The Project is located on Inuit Owned Land at 68 09' N x 106 40' W, 5 km south of the head of Roberts Bay, an extension of Melville Sound which connects with Bathurst Inlet about 80 km west of the Project.

Landfarming is a form of bioremediation that uses naturally occurring micro-organisms (yeast, fungi or bacteria) to metabolize or break down petroleum hydrocarbons. Natural processes include volatilization, aeration, biodegradation and photolysis. End products are micro-organism protein, carbon dioxide and water. Stimulation of microbial growth and activity for hydrocarbon removal is accomplished primarily through the addition of air and nutrients (metabolism of hydrocarbons is mediated predominantly through aerobic microbes).

The proposed landfarm is relatively small, consistent with the mine size and underground operations mode, but could be expanded if required. The design and proposed management are based on successful landfarms operated at the Boston and Windy exploration camps operated by MHBL.

No hazardous wastes other than petroleum-stained soil and snow will be placed in the landfarm. Management of hazardous wastes is discussed in the Hazardous Materials Management Plan for Doris North. Inert industrial wastes will also not be placed in the landfarm. Disposal of these wastes is discussed in the Landfill Design and Management Plan for Doris North.

1.2 Cross Reference to Plans and Procedures Quoted in the Landfarm Design and Management Plan

- MHBL Hazardous Materials Management Plan 2006
- MHBL Landfill Design and Management Plan 2006
- MHBL Reclamation and Closure Plan 2006

1.3 Responsibility

- Mine General Manager – The mine general manager has overall responsibility for this management plan and will be the party to provide the mine site resources to develop and manage the landfarm facility.
- Surface Superintendent – The mine's surface superintendent will have mine site responsibility for the implementation of this management plan and will provide the on-site resources to operate and manage the landfarm facility in accordance with the plan; conduct regular inspections of the landfarm; and provide input to the mine management team on modifications in design and operational procedures to improve operational performance of this facility.
- Site Maintenance Foreman – The site maintenance foremen will provides daily supervision to site operational personnel on the operation of the landfarm facility including but not limited to: turning of soil within the landfarm, treatment and removal of water and snow accumulations within the landarf as needed, and the removal of treated soil into the natural environment once cleared by the site's Environmental Manager.
- Environmental Manager – The site environmental manager has responsibility to: keep this management plan updated; provide technical expertise to the site operational personnel on the operation and maintenance of the landfarm; sampling of the contaminated soil and assessment of whether remediation has met applicable regulatory standards; provide operational personnel with direction as to when and where remediated soil should be moved to; conduct annual audit of the facility; and provide an audit report to Surface Superintendent and Mine General Manager.

2.0 APPLICABLE LEGISLATION

Both federal and territorial legislation regulates the management of hazardous materials in Nunavut. Copies of relevant legal documents will be kept on file at the mine site. Management and safety personnel will provide an overview of the applicable regulations to all employees as part of their orientation training and through ongoing training. The acts, regulations, and guidelines pertinent to the hazardous products that will be used at the Doris North project are listed below.

Federal

- Canadian Council of Ministers for the Environment (CCME) 2003 Guidelines for Contaminated Soils – Industrial Sites (attached in Appendix A)

Nunavut

- Consolidation of Environmental Protection Act (RSNWT 1988c E.7)
- Consolidation of the Environmental Rights Act RSNWT 1988 c83 2nd Supp)
- Fire Prevention Act and Regulations
- Environmental Guideline for General Management of Hazardous Waste

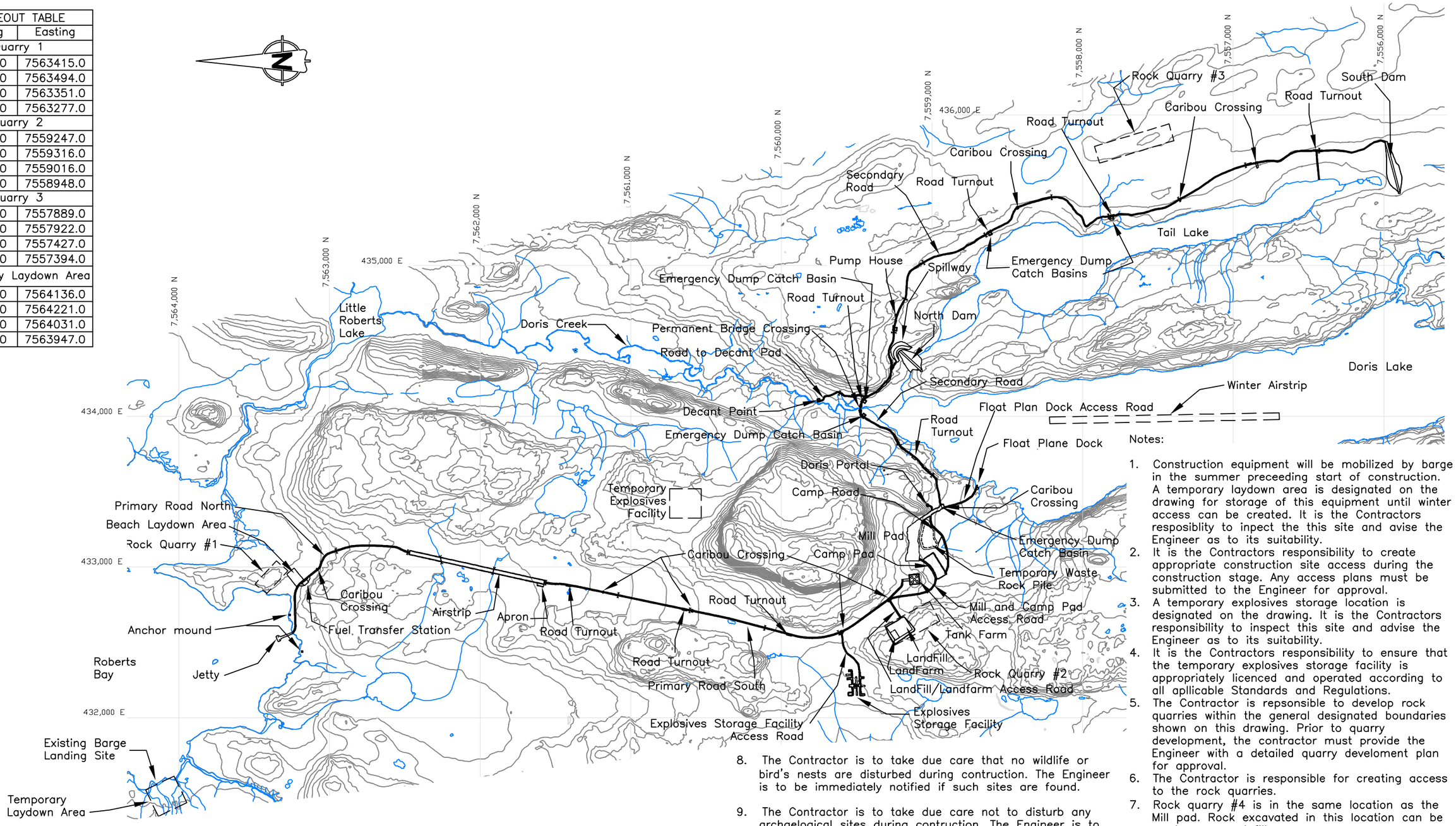
3.0 LOCATION AND CONSTRUCTION OF FACILITIES

The landfarm will be located adjacent to Quarry 2. Figure 1 shows the location of the Quarry at Doris North and Figure 2 is a site arrangement; Figure 3 shows a cross section of the facility.

The proposed landfarm will be an area 50 m by 25 m (1,250 m^2) located within the north end of Quarry 2. A pad of crushed quarry rock will be laid down to provide a bermed area for the landfarm. Finer crushed quarry rock will then be placed on the pad to provide a suitable bedding layer for the HDPE impervious liner. The HDPE geomembrane liner will be placed on the floor of the landfarm and continued up into a berm completely surrounding the area. Nominal specifications for the liner are 1.5 mm (60 mil) thickness. The liner will be placed by hand under the supervision of a qualified contractor. A ramp will be constructed of crushed rock to allow vehicles to enter and exit the landfarm without damaging the containment berm. More fine crushed rock will be placed on top of the liner to protect it from damage from vehicles delivering contaminated soils to the landfarm. The initial 15 cm cover will be placed by hand so as not to damage the liner. An additional approximately 30 cm of fine crushed rock will be placed with a small crawler or wheeled dozer. This will constitute initial construction. No vehicle with a tire pressure greater than 200 kPa will be allowed into the landfarm area once the liner is placed. Should heavier equipment be required to service the landfarm, additional fine crushed rock or soil will be placed over the HDPE liner prior to use of the area for soil decontamination.

The landfarm facility will not be fenced as it is located within the footprint of Quarry 2 and is thus isolated from the surrounding tundra.

STAKEOUT TABLE	
Northing	Easting
Quarry 1	
432825.0	7563415.0
432887.0	7563494.0
433040.0	7563351.0
432975.0	7563277.0
Quarry 2	
432482.0	7559247.0
432612.0	7559316.0
432772.0	7559016.0
432642.0	7558948.0
Quarry 3	
435680.0	7557889.0
435791.0	7557922.0
435939.0	7557427.0
435828.0	7557394.0
Temporary Laydown Area	
431346.0	7564136.0
431522.0	7564221.0
431613.0	7564031.0
431437.0	7563947.0



Notes:

1. Construction equipment will be mobilized by barge in the summer preceeding start of construction. A temporary laydown area is designated on the drawing for storage of this equipment until winter access can be created. It is the Contractors resposiblity to inpect the this site and avise the Engineer as to its suitability.
2. It is the Contractors responsibility to create appropriate construction site access during the construction stage. Any access plans must be submitted to the Engineer for approval.
3. A temporary explosives storage location is designated on the drawing. It is the Contractors responsibility to inspect this site and advise the Engineer as to its suitability.
4. It is the Contractors responsibility to ensure that the temporary explosives storage facility is appropriately licenced and operated according to all apllicable Standards and Regulations.
5. The Contractor is repsonsible to develop rock quarries within the general designated boundaries shown on this drawing. Prior to quarry development, the contractor must provide the Engineer with a detailed quarry develoment plan for approval.
6. The Contractor is responsible for creating access to the rock quarries.
7. Rock quarry #4 is in the same location as the Mill pad. Rock excavated in this location can be used as general fill.
8. The Contractor is to take due care that no wildlife or bird's nests are disturbed during contruction. The Engineer is to be immediately notified if such sites are found.
9. The Contractor is to take due care not to disturb any archaeological sites during contruction. The Engineer is to be immediately notified if such sites are found.

1:12500 0 200 400 600 800 1000 Metres

Note: Drawings plotted to half scale

DRAWING NO.	DRAWING TITLE	DRAWING NO.	DRAWING TITLE
REFERENCE DRAWINGS			

NO.	WATER LICENCE APPLICATION DESCRIPTION	CHK'D	APP'D	DATE
REVISIONS				

Stamped, signed and dated originals submitted to the Nunavut Water Board

PROFESSIONAL ENGINEERS STAMP

SRK Consulting Engineers and Scientists Vancouver

DESIGN:	DRAWN:	REVIEWED:
AT	JJH	EMR
CHECKED:	APPROVED:	DATE:
AT	EMR	Oct. 2006

FILE NAME: PLAN VIEW.dwg

MIRAMAR HOPE BAY LTD.

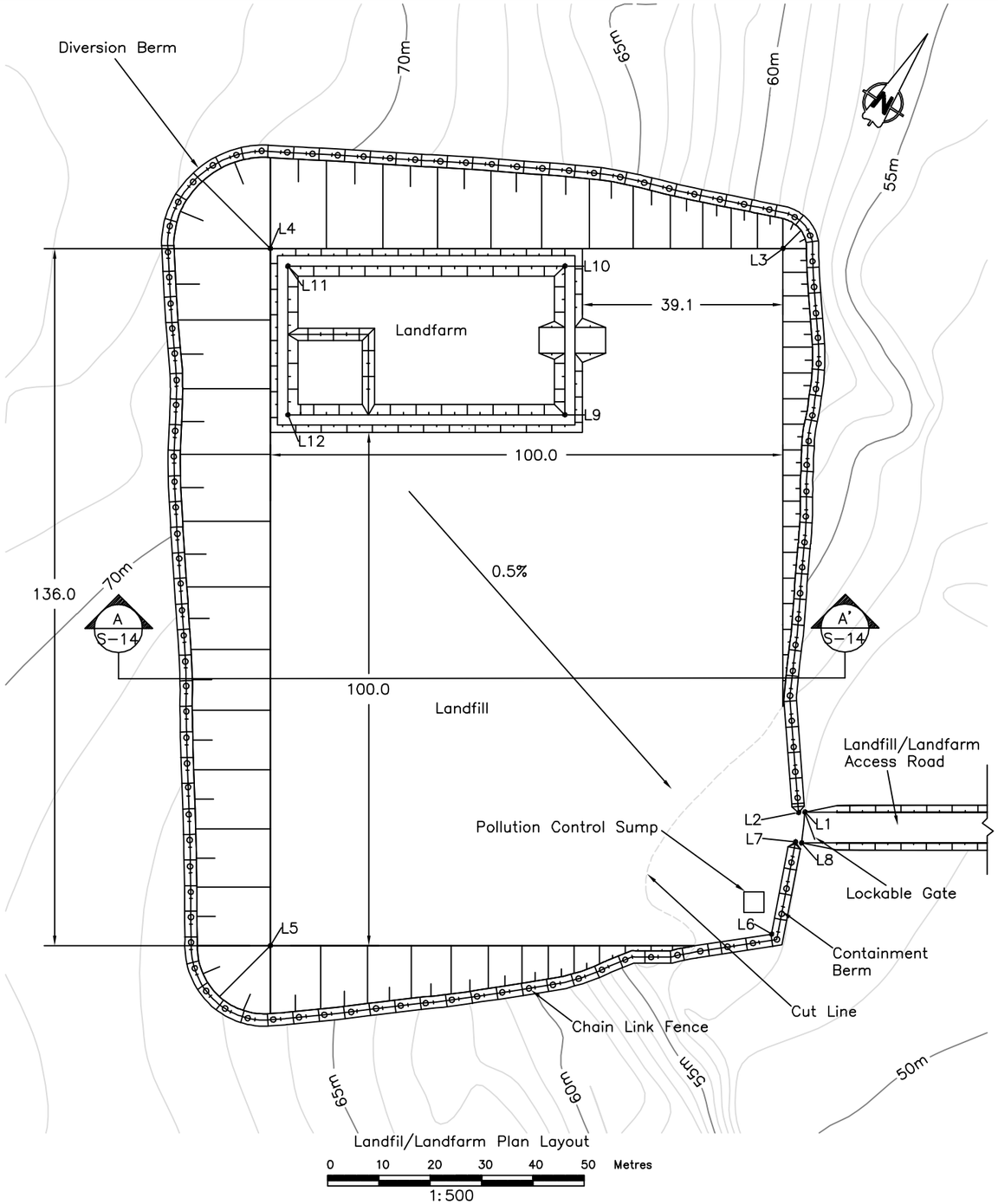
DORIS NORTH PROJECT
DETAILED DESIGN

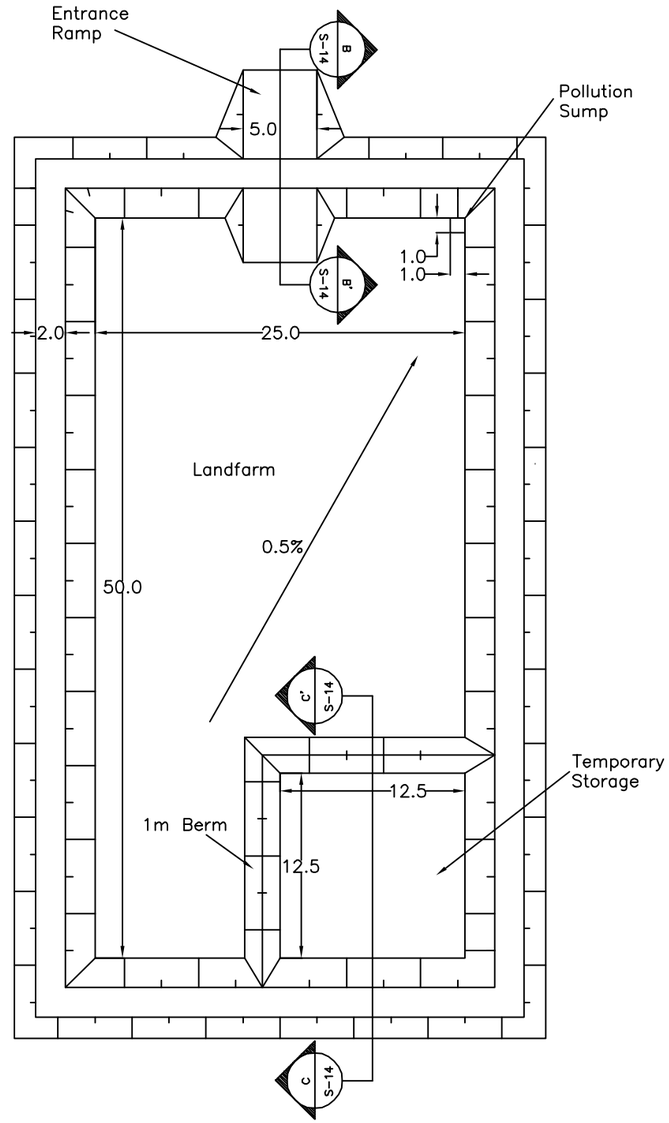
SRK JOB NO.: 1CM014.008

Doris North Project

DRAWING TITLE: FIGURE 1

DRAWING NO.	SHEET	REVISION NO.
G-02	2 OF 48	A





STAKE OUT TABLE			
POINT	EASTING	NORTHING	ELEV.
LANDFILL			
L1	432660.5	7559209.3	53.0
L2	432659.6	7559208.6	53.0
L3	432597.3	7559299.3	53.0
L4	432513.3	7559245.1	53.0
L5	432587.1	7559130.8	53.0
L6	432668.0	7559185.8	53.0
L7	432662.1	7559203.4	53.0
L8	432663.2	7559203.9	53.0
LANDFARM			
L9	432579.2	7559249.0	54.2
L10	432563.4	7559273.4	54.2
L11	432518.1	7559244.1	54.2
L12	432533.8	7559219.7	54.2

Notes:

1. The landfill and landfarm will be constructed in the developed quarry. The final configuration of the landfill be determined once the quarry development plan has been finalized.
2. The landfill and landfarm must be founded predominantly on bedrock. If, after excavation to the lines and grades indicated on this drawing, sufficient bedrock is not exposed, the Engineer will instruct the Contractor to lower the level of excavation.
3. A nominal leveling layer of Surfacing material will be spread over the exposed bedrock surface before proceeding with the landfarm construction.
4. The bedrock cut highwall for the landfill and landfarm must be inspected by a qualified geotechnical Engineer to ensure safe operation within the landfill/landfarm area.
5. The Contractor may have to over excavate overburden on the highwall crest to ensure slope stability. The Engineer will confirm the slope finishing details on site.

Note: Drawings plotted to half scale

DRAWING NO.	DRAWING TITLE	DRAWING NO.	DRAWING TITLE
S-14	LANDFILL AND LANDFARM TYPICAL PLAN, SECTIONS		

REFERENCE DRAWINGS

NO.	DESCRIPTION	CHK'D	APP'D	DATE
A	WATER LICENSE APPLICATION			

REVISIONS

Stamped, signed and dated originals submitted to the Nunavut Water Board

PROFESSIONAL ENGINEERS STAMP

SRK Consulting
Engineers and Scientists
Vancouver

DESIGN:	DRAWN:	REVIEWED:
AT	JJH	EMR
CHECKED:	APPROVED:	DATE:
AT	EMR	Oct. 2006

FILE NAME: LANDFILL VIEW.dwg

MIRAMAR HOPE BAY LTD.

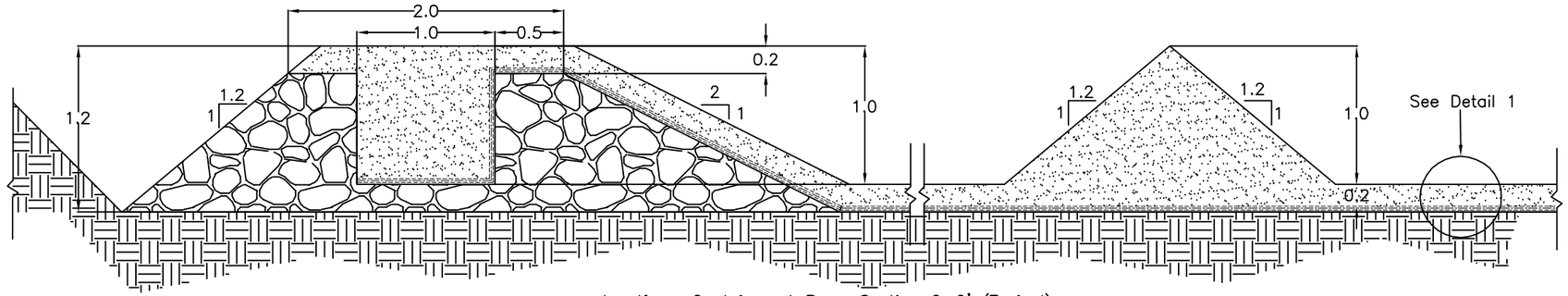
DORIS NORTH PROJECT
DETAILED DESIGN

SRK JOB NO.: 1CM014.008

Doris North Project

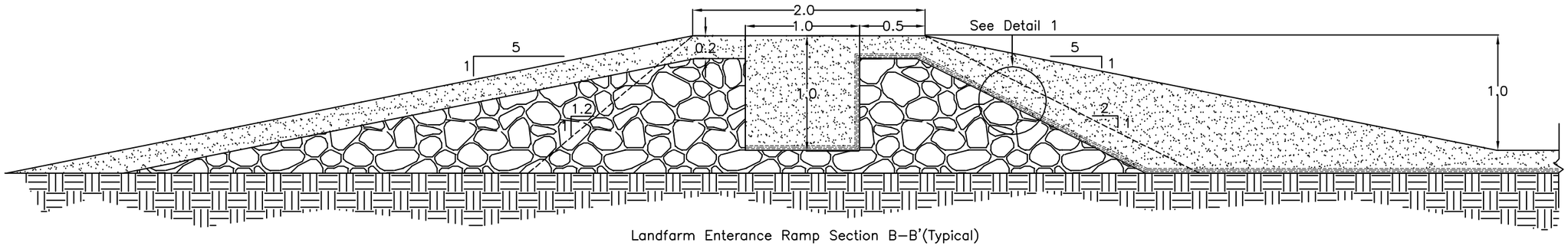
DRAWING TITLE:
Landfill and Landfarm Typical Plan, Sections and Details

DRAWING NO.	SHEET	REVISION NO.
2	21 OF 48	A



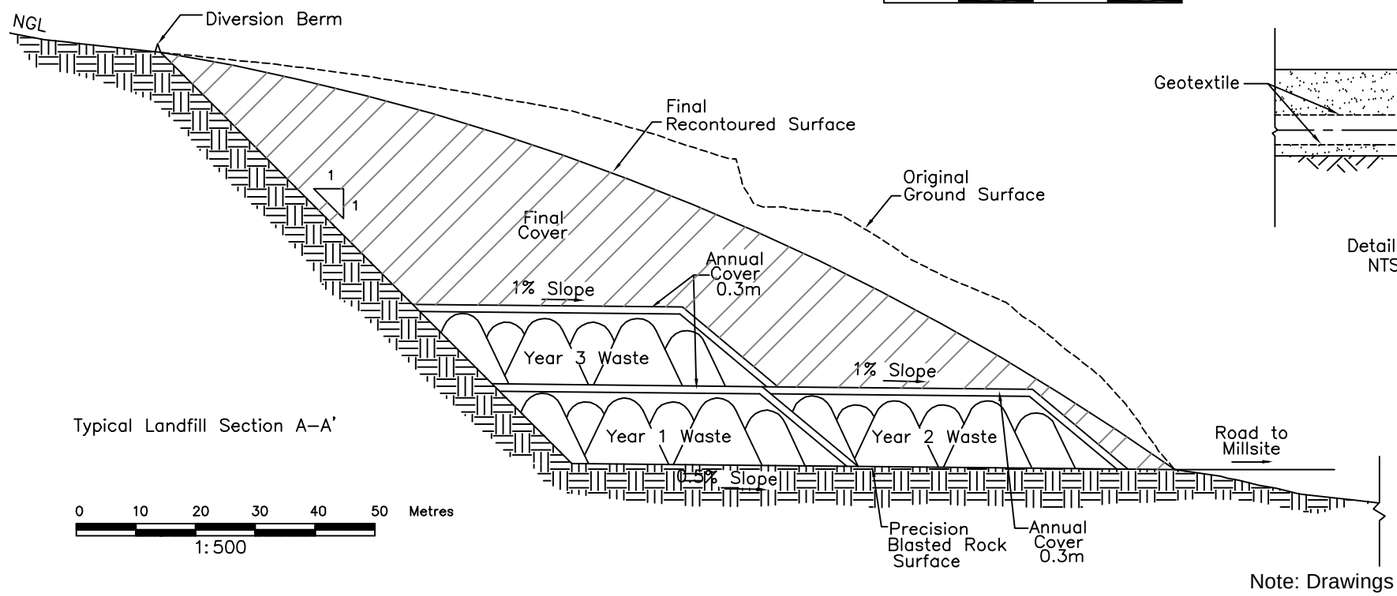
Landfarm Containment Berm Section C–C' (Typical)

1:20 0 5 10 15 20 Metres



Landfarm Enterance Ramp Section B–B'(Typical)

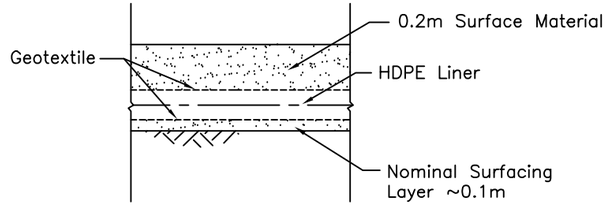
1:20 0 5 10 15 20 Metres



Typical Landfill Section A–A'

0 10 20 30 40 50 Metres

1:500



Detail 1
NTS

Note: Drawings plotted to half scale

Notes:

1. The Contractor is to take due care so as not to damage the liner during construction. Special temporary liner protection measures must be taken in the event that construction equipment must pass over a liner before the final protective cover has been placed. The Engineer is to be notified of these occurrences.
2. Modifications to the liner tuck trench will be allowed if equipment access is a problem. The details of any such modifications must be presented to the Engineer for approval.
3. The Contractor will be responsible to keep the landfill and landfarm area free of snow and ice during the construction period.

DRAWING NO.	DRAWING TITLE	DRAWING NO.	DRAWING TITLE
S-13	LANDFILL AND LANDFARM TYPICAL PLAN, SECTIONS		

REFERENCE DRAWINGS

NO.	DESCRIPTION	CHK'D	APP'D	DATE
A	WATER LICENSE APPLICATION			

REVISIONS

Stamped, signed and dated originals submitted to the Nunavut Water Board

PROFESSIONAL ENGINEERS STAMP

SRK Consulting Engineers and Scientists Vancouver

DESIGN:	DRAWN:	REVIEWED:
AT	JJH	EMR
CHECKED:	APPROVED:	DATE:
AT	EMR	Oct. 2006

FILE NAME: LANDFILL VIEW.dwg

MIRAMAR HOPE BAY LTD.

DORIS NORTH PROJECT
DETAILED DESIGN

SRK JOB NO.: 1CM014.008

Doris North Project

DRAWING TITLE:

Landfill and Landfarm Typical Section and Details

DRAWING NO.	SHEET	REVISION NO.
3	22 OF 48	A

Dwg Ref: Site-Plan® Key-S13.dwg

Landfarm Operation

A mixture of ammonium nitrate and corn cobs will be used as a bacterial medium and mixed with the contaminated soil as it is placed within the landfarm. This medium has proven to have worked successfully at the nearby Boston and Windy exploration camps over the 2005 and 2006 summer seasons. The bioremediation medium will be added as needed during the biodegradation process. Soil containing petroleum products will be spread uniformly over the surface of the prepared area. The contaminated soil will be incorporated into the top 15 to 20 cm of the soil, either manually or with a tiller or disc harrow if large quantities of contaminated soil must be treated. Soils will be tilled monthly when dry enough over the summer period (June to September) to ensure adequate aeration.

The average hydrocarbon fuel content in the soil will be kept below 5% by mixing clean and contaminated soil if necessary. Ekati experience has been that lighter fraction hydrocarbons readily biodegrade, but that heavy fraction oils do not. Thus soils contaminated with hydrocarbons heavier than diesel will be place underground in mined out areas where they will be encapsulated by permafrost.

Soils must be kept moist with a target soil moisture content of 15 to 30%; water will be applied where necessary and soil moisture content monitored to help ensure it stays within the acceptable range. Soil will be also be watered, if required, to prevent dust generation; saturation will be avoided.

Any standing water in the landfarm will be passed through an oil-water “filter” style separator prior to release to the environment (a similar unit is in operation at the Boston and Windy Camp landfarm facilities). Normally, water should be absorbed by landfarm soil.

A screening protocol will be established prior to operation of the landfarm to help ensure appropriate materials are placed in the landfarm. Only those soils and snow contaminated with light hydrocarbon fraction products will be landfarmed. Soils contaminated with heavy fraction hydrocarbons, such as motor or hydraulic oils, will be segregated and taken underground. Snow contaminated with such hydrocarbons will be placed in the tailings pond if a small volume (to be determined by the Environment Manager) or segregated in an area where, when the snow melts, it can be passed through an oil-water separator prior to release to the environment.

The landfarm site will be used throughout mine life and after closure, as required. Soil hydrocarbon concentrations will be monitored annually to ascertain the point where soils are no longer considered contaminated, based on CCME (2003) guidelines. There are no CCME guidelines for density of soil sampling in landfarms. The landfarm will be divided into quadrants, and sampled with a target density of one composite of ten samples per 25 m^3 to adequately characterize the soil’s hydrocarbon levels. Experience has shown this to sufficient when soils have been well mixed during the decontamination process. Decontaminated soils will then be used for reclamation purposes. Ultimate degradation rates are site-specific and cannot be predicted.

4.0 LANDFARM MANAGEMENT

4.1 General

The focus of management of the landfarm will be safety and environmental responsibility. Employees working in the landfarm will be trained prior to commencement of work so that they are aware of the health and safety risks associated with the landfarm.

4.2 Health and Safety

There are four primary exposure pathways to chemicals within the landfarm:

1. inhalation;
2. ingestion;
3. skin contact; and
4. eye contact.

Since the facility is outside and concentrations of contaminants will be generally relatively low, inhalation exposure is not likely to be problematic. In special circumstances where contamination is heavy, respirators can be worn to scrub the air of volatile organics. Ingestion, under normal circumstances is very unlikely.

Skin contact will be prevented by issuing suitable personal protective equipment to employees working in the landfarm. Personal protective equipment suitable for petroleum hydrocarbons is listed in the MSDS for petroleum products (attached in Appendix B) that may be transferred to the landfarm in contaminated soil or snow and summarized in Table 1.

Eye contact is unlikely under normal circumstances. Where hand work is to be carried out in the landfarm with the risk of eye contact, protective goggles will be required.

Table 1: Guidelines for Safe Handling of Contaminated Soil and Snow

Personal Protection	
Ventilation	Use adequate ventilation (normally assured at the landfarm due to being outdoors).
Respiratory protection	Not generally required unless needed to prevent respiratory irritation. Use organic cartridge respirator per MSDS recommendations.
Eye protection	For splash protection, use chemical goggles and face shield
Skin protection	Use gloves resistant to the material being used, i.e., neoprene or nitrile rubber. Use protective garments to prevent excessive skin contact.
Health Hazard Data	
Acute effects of overexposure	Eye: May cause mild irritation, with stinging and redness of eyes.
	Skin: May cause severe irritation. Repeated or prolonged contact may cause defatting of the skin, resulting in dermatitis. Dermal LD50 for diesel fuel is >5 mg/kg (rabbit).
	Inhalation: May cause irritation to nose, throat or lungs. Headache, nausea, dizziness, unconsciousness may occur.
	Ingestion: Swallowing small amounts is not likely to produce harmful effects. Ingestion of larger amounts may produce abdominal pail, nausea and vomiting. Aspiration into lungs can produce severe lung damage and is a medical emergency.

First Aid and Emergency Procedures	
Eye	Flush eyes with running water for at least 15 minutes. If irritation or adverse symptoms develop, seek medical attention.
Skin	Immediately wash skin with soap and water for at least fifteen minutes. If irritation or adverse symptoms develop, seek medical attention.
Inhalation	Remove from exposure. If breathing is difficult, give oxygen. If breathing ceases, administer artificial respiration followed by oxygen. Seek immediate medical attention.
Ingestion	Do not induce vomiting. Seek immediate medical attention.
Fire	
Fire extinguishing media	Dry chemical, foam, or carbon dioxide.

4.3 Environmental Control

The geomembrane and berm under the landfarm will ensure that all leachate is captured within the facility. No water from the landfarm will flow directly to the surrounding environment. Further, the landfarm will be placed in a controlled drainage area (Quarry 2) where any accidental release can be captured and treated.

A record will be kept of the amount of contaminated soil and snow placed in the landfarm by environmental staff. The landfarm will be monitored weekly during summer months by environmental staff to ensure proper operating conditions of soil moisture and aeration, i.e., moisture content between 15 and 30%, uncompacted soil. Soil samples will be collected and tested for BTEX and CCME PHA's. Monitor records will be kept by the Environmental Manager and reported as required.

Any repairs to the landfarm facility will be noted during weekly inspections if not reported separately by mine services staff. Repairs will be effected promptly. The nature of the repairs required and when repairs were completed will be recorded in the landfarm log.

Any unauthorized use of the facility noted on inspections will be reported to the Surface Superintendent and Mine General Manager and, if required, will be discussed at Health and Safety Committee meetings.

Equipment used in the landfarming operation will be cleaned off within the landfarm area prior to exiting to ensure that contaminated soil is not transferred away from the landfarm on the wheels and other parts of this equipment. Any standing water in the landfarm will be passed through an oil-water filter style separator prior to discharge to the environment.

4.4 Landfarm Closure

The landfarm will be decommissioned when the mine is closed, or some time period after closure, depending on requirements for its use on closure. Remediated soils that test clean (based on CCME industrial guidelines) will be used for reclamation. Soils that are contaminated, and the underlying fine crushed rock from the landfarm will be placed underground at the time of landfarm decommissioning and be encapsulated by permafrost. The HDPE geomembrane will be cleaned, cut up and disposed of in the non-hazardous landfill. Bedding rockfill (below the geomembrane) will be tested for presence of petroleum

hydrocarbons, and if clean, used for reclamation of the adjacent landfill but, if not, placed underground as well. The site will be levelled consistent with other reclamation activities at the mine. Further details can be found in the Reclamation and Closure Plan.

5.0 LIMITATIONS AND CLOSURE

This report was prepared exclusively for Miramar Hope Bay Limited by AMEC Earth & Environmental Limited, a wholly owned subsidiary of AMEC Americas Limited. The quality of information, conclusions and estimates contained herein is consistent with the level of effort involved in AMEC services and based on: i) information available at the time of preparation, ii) data supplied by outside sources, and iii) the assumptions, conditions and qualifications set forth in this report. This report is intended to be used by Miramar Hope Bay Limited, the Nunavut Water Board, the Kitikmeot Inuit Association and the regulatory agencies involved in reviewing the water license application for the Doris North Project only, subject to the terms and conditions of its contract with AMEC. Any other use of, or reliance on, this report by any other third party is at that party's sole risk.

REFERENCES

MHBL. 2006. Landfill Design and Management Plan. Plan produced for Miramar Hope Bay Limited by AMEC Earth & Environmental, October 2006.

MHBL. 2006. Hazardous Materials Management Procedures.

MHBL. 2006. Mine Closure and Reclamation Plan. Plan produced by Miramar Hope Bay Limited, October 2006

APPENDIX A
CCME 2003 Guidelines for Contaminated Soils – Industrial Sites

Parameter	Industrial Guideline (mg/kg)
Arsenic	12
Barium	2000
Benzene	5
Chromium (Cr^{6+})	1.4
Copper	91
Ethylbenzene	20
Ethylene glycol	960
Lead	600
Mercury	50
Nickel	50
Benzo(*a*)pyrene	0.7
Naphthalene	22
Zinc	360

APPENDIX B
MSDS

Material Safety Data Sheet for #2 Diesel

Definition of terms

1. Chemical Product

MSDS Number: U7770

MSDS Date: 01-31-99

Product Name: #2 Diesel Fuel

24 Hour Emergency Phone: (210) 979-8346
Transportation Emergencies: Call Chemtrec at 1-800-424-9300
MSDS Assistance: (210) 592-4593

Distributors Name and Address:

T.W. Brown Oil Co., Inc.
1857 Knoll Drive
Ventura, California 93003

Chemical Name: #2 Diesel Fuel **Cas Number:** 68476-34-6

Synonyms/Common Names: This Material Safety Data Sheet applies to the following product descriptions for Hazard Communication purposes only. Technical specifications vary greatly depending on the product, and are not reflected in this document. Consult specification sheets for technical information.

California Air Resources Board (Carb) Diesel Fuel- On-road, Off-Road, Tax Exempt blends
Premium Diesel Fuel- Low-Sulfur, High-sulfur, On-Road, Off-Road, Tax Exempt blends
#2 Distillate- Low-Sulfur, High-sulfur, On-Road, Off-Road, Tax Exempt blends
#2 Diesel Fuel- Low-Sulfur, High-sulfur, On-Road, Off-Road, Tax Exempt blends
#2 Fuel Oil- Low-Sulfur, High-sulfur, On-Road, Off-Road, Tax Exempt blends

2. Composition, Information On Ingredients

Product Use: This product is intended for use as a fuel in engines and heaters designed for diesel fuels, and for use in engineered processes. Use in other applicatiions may result in higher exposures and require additional controls, such as local exhaust ventilation and personal protective equipment.

Description: #2 Diesel is a complex mixture of hydrocarbons from a variety of chemical processes blended to meet standardized product specifications. Composition varies greatly and includes C9 to C20 hydrocarbons with a boiling range of about 325-675 degrees F. The following is a non-exhaustive list of common components, typical percentage ranges in product, and occupational exposure limits for each.

Material Safety Data Sheet for #2 Diesel

Component or Material Name	%	CAS Number	ACGIH Limits TLV -- STEL -- Units	OSHA Exposure Limits PEL -- STEL -- C/P -- Units
Cat cracked distillate, light	0-100	64741-59-9	100 -- NA -- mg/m3	N/A -- N/A -- N/A -- N/A
Hydrotreated distillate, middle	0-100	64742-46-7	100 -- NA -- mg/m3	N/A -- N/A -- N/A -- N/A
Hydrotreated distillate, light	0-100	64742-47-8	100 -- NA -- mg/m3	N/A -- N/A -- N/A -- N/A
Gas oil, light	0-100	64741-44-2	100 -- NA -- mg/m3	N/A -- N/A -- N/A -- N/A

3. Hazards Identification

Health Hazard Data:

1. The major effect of exposure to this product is giddiness, headache, central nervous system depression; possible irritation of eyes, nose, and lungs; and dermal irritation. Signs of kidney and liver damage may be delayed. Pulmonary irritation secondary to exhalation fo solvent.

2. NIOSH recommends that whole diesel engine exhaust be regarded as a potential occupational carcinogen. Follow OSHA and NSHA rules where diesel engine exhaust fumes may be generated.

3. A life time skin painting study by the American Petroleum Institute has shown that similar naphtha products with a boiling range of 350-700 degrees F usually produce skin tumors and/ or skin cancers in laboratory mice. Only a weak to moderate response occurred. The effect to humans has not been determined.

4. Positive results at 2.0 ml/kg and 6.0 ml/kg noted in mutagenesis studies via in-vivo bone marrow cytogenetics assay in rats.

5. Kerosene is classified as a severe skin irritant. Mutation data has been reported for kerosene products. Hydrotreated kerosene is listed as being probably carcinogenic to humans with limited evidence in humans and sufficient evidence in experimental animals.

Hazards of Combustion Products: Carbon monoxide and carbon dioxide can be found in the combustion products of this product and other forms of hydrocarbon combustion. Carbon monoxide in moderate concentrations can cause symptoms of headache, nausea, vomiting, increased cardiac output, and confusion. Exposure to higher concentrations of carbon monoxide can cause loss of consciousness, heart damage, brain damage, and/or death. Exposure to high concentrations of carbon dioxide can cause simple asphyxiation by displacing available oxygen. Combustion of this and other similar materials should only be carried out in well ventilated areas.

AMOCO OIL -- JET FUEL JP-4 - TURBINE FUEL, AVIATION
MATERIAL SAFETY DATA SHEET
NSN: 9130002568613
Manufacturer's CAGE: 15958
Part No. Indicator: B
Part Number/Trade Name: JET FUEL JP-4

General Information

Item Name: TURBINE FUEL, AVIATION
Company's Name: AMOCO OIL CO
Company's Street: 200 E RANDOLPH DR MC 1408
Company's City: CHICAGO
Company's State: IL
Company's Country: US
Company's Zip Code: 60601-6401
Company's Emerg Ph #: 800-447-8735 (HEALTH)
Company's Info Ph #: 312-856-3907
Record No. For Safety Entry: 022
Tot Safety Entries This Stk#: 063
Status: FE
Date MSDS Prepared: 24SEP93
Safety Data Review Date: 29SEP94
Supply Item Manager: CX
MSDS Preparer's Name: G. I. BRESNICK
MSDS Serial Number: BNBZX
Specification Number: MIL-T-5624
Spec Type, Grade, Class: GRADE JP-4
Hazard Characteristic Code: F2
Unit Of Issue: GL
Unit Of Issue Container Qty: BULK
Type Of Container: NOT KNOWN
Net Unit Weight: NOT KNOWN

Ingredients/Identity Information

Proprietary: NO
Ingredient: JET FUEL JP-4 (A WIDE BOILING ALIPHATIC AND AROMATIC DISTILLATE) SEE THE FOLLOWING IDENTIFIABLE COMPONENTS.
Ingredient Sequence Number: 01
Percent: 100
NIOSH (RTECS) Number: NY9340000
OSHA PEL: NOT ESTABLISHED
ACGIH TLV: NOT ESTABLISHED
Other Recommended Limit: USAF 8HR TWA 200 PPM

Proprietary: NO
Ingredient: TOLUENE (SARA III)

Ingredient Sequence Number: 02
Percent: 22 %
NIOSH (RTECS) Number: XS5250000
CAS Number: 108-88-3
OSHA PEL: 200 PPM/150 STEL
ACGIH TLV: 50 PPM; 9293
Other Recommended Limit: NONE SPECIFIED

Proprietary: NO
Ingredient: XYLENES (O-,M-,P- ISOMERS) (SARA III)
Ingredient Sequence Number: 03
Percent: 10 %
NIOSH (RTECS) Number: ZE2100000
CAS Number: 1330-20-7
OSHA PEL: 100 PPM/150 STEL
ACGIH TLV: 100 PPM/150STEL;9192
Other Recommended Limit: NONE SPECIFIED

Proprietary: NO
Ingredient: ETHYL BENZENE (SARA III)
Ingredient Sequence Number: 04
Percent: 2 %
NIOSH (RTECS) Number: DA0700000
CAS Number: 100-41-4
OSHA PEL: 100 PPM/125 STEL
ACGIH TLV: 100 PPM/125STEL 9192
Other Recommended Limit: NONE SPECIFIED

Proprietary: NO
Ingredient: BENZENE (SARA III)
Ingredient Sequence Number: 05
Percent: 4 %
NIOSH (RTECS) Number: CY1400000
CAS Number: 71-43-2
OSHA PEL: 1PPM/5STEL;1910.1028
ACGIH TLV: 10 PPM; A2; 9192
Other Recommended Limit: NONE SPECIFIED

Proprietary: NO
Ingredient: CYCLOHEXANE (SARA III)
Ingredient Sequence Number: 06
Percent: 5 %
NIOSH (RTECS) Number: GU6300000
CAS Number: 110-82-7
OSHA PEL: 300 PPM
ACGIH TLV: 300 PPM, 9192
Other Recommended Limit: NONE SPECIFIED

Proprietary: NO
Ingredient: METHYL TERT-BUTYL ETHER (SARA III)
Ingredient Sequence Number: 07
Percent: 7 %
NIOSH (RTECS) Number: KN5250000
CAS Number: 1634-04-4
OSHA PEL: NOT ESTABLISHED
ACGIH TLV: NOT ESTABLISHED
Other Recommended Limit: NONE SPECIFIED

Physical/Chemical Characteristics

Appearance And Odor: COLORLESS LIQUID, FUEL OIL ODOR
Boiling Point: 250-549F
Melting Point: NOT GIVEN
Vapor Pressure (MM Hg/70 F): 2-3 PSI
Vapor Density (Air=1): NOT GIVEN
Specific Gravity: 0.75 -0.8
Decomposition Temperature: UNKNOWN
Evaporation Rate And Ref: NOT GIVEN
Solubility In Water: NEGLIGIBLE
Corrosion Rate (IPY): UNKNOWN
Autoignition Temperature: 468F

Fire and Explosion Hazard Data

Flash Point: -10F,-23C
Flash Point Method: CC
Lower Explosive Limit: 1.3 %
Upper Explosive Limit: 8 %
Extinguishing Media: AGENTS APPROVED FOR CLASS B HAZARDS (DRY CHEMICAL, CARBON DIOXIDE, HALOGENATED AGENTS, FOAM, STEAM) AND WATER FOG.
Special Fire Fighting Proc: FIRE FIGHTERS SHOULD USE NIOSH APPROVED SCBA & FULL PROTECTIVE EQUIPMENT WHEN FIGHTING CHEMICAL FIRE. USE WATER SPRAY TO COOL NEARBY CONTAINERS EXPOSED TO FIRE.
Unusual Fire And Expl Hazrds: DO NOT USE DIRECT STREAM OF WATER ON FIRE. TOXIC GASES ARE RELEASED DURING COMBUSTION. VAPOR MAY EXPLODE IF IGNITED IN ENCLOSED AREA.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): HEAT, OPEN FLAME, SPARKS
Materials To Avoid: STRONG OXIDIZING AGENTS
Hazardous Decomp Products: CARBON MONOXIDE, CARBON DIOXIDE, UNIDENTIFIED ORGANIC COMPOUNDS.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NONE. WILL NOT OCCUR.

Health Hazard Data

LD50-LC50 Mixture: NOT GIVEN FOR PRODUCT AS A WHOLE
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: NO
Health Haz Acute And Chronic: MAY BE MILDLY IRRITATING TO THE EYES. PROLONGED OR REPEATED CONTACT MAY CAUSE DERMATITIS. VAPORS MAY IRRITATE THE NOSE, THROAT AND UPPER RESPIRATORY TRACTAND CAUSE CENTRAL NERVOUS SYSTEM DEPRESSION. ASPIRATION HAZARD.
Carcinogenicity - NTP: YES
Carcinogenicity - IARC: YES
Carcinogenicity - OSHA: YES
Explanation Carcinogenicity: CONTAINS Benzene [71-43-2] WHICH IS LISTED BY NTP AND IARC AND REGULATED BY OSHA AS A CARCINOGEN.
Signs/Symptoms Of Overexp: EYE IRRITATION, SKIN IRRITATION, DERMATITIS, UPPER RESPIRATORY TRACT IRRITATION, NAUSEA, VOMITING, DIARRHEA, HEADACHES, DIZZINESS, DROWSINESS.
Med Cond Aggravated By Exp: PRE-EXISTING SKIN AND/OR RESPIRATORY DISORDERS MAY BE AGGRAVATED BY EXPOSURE TO THIS PRODUCT.
Emergency/First Aid Proc: EYES: FLUSH WITH WATER FOR 15 MINUTES WHILE HOLDING EYELIDS OPEN. GET MEDICAL ATTENTION. SKIN: REMOVE CONTAMINATED CLOTHING. WASH WITH SOAP AND WATER. IF IRRITATION PERSISTS, GET MEDICAL ATTENTION. INHALATION: REMOVE TO FRESH AIR. RESTORE BREATHING. GET MEDICAL ATTENTION. INGESTION: DO NOT INDUCE VOMITING. GET MEDICAL ATTENTION.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: ELIMINATE SOURCES OF IGNITION. EVACUATE AREA. WEAR PROPER PERSONAL PROTECTIVE EQUIPMENT. CONTAIN SPILL. STOP LEAK IF CAN DO SO WITHOUT RISK. ABSORB LIQUID WITH SUITABLE ABSORBENT MATERIAL. COLLECT FOR DISPOSAL.
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: PREVENT WASTE FROM CONTAMINATING SURROUNDING ENVIRONMENT. DISCARD ANY PRODUCT, RESIDUE, DISPOSAL CONTAINER OR LINER IN ACCORDANCE WITH ALL FEDERAL, STATE AND LOCAL REGULATIONS.
Precautions-Handling/Storing: STORE IN A FLAMMABLE LIQUIDS AREA. STORE AWAY FROM HEAT, IGNITION SOURCES AND OPEN FLAMES IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE AND LOCAL RULES
Other Precautions: AVOID SKIN CONTACT. LAUNDER CONTAMINATED CLOTHING BEFORE REUSE.

Control Measures

Respiratory Protection: AVOID BREATHING VAPOR AND/OR MIST. USE WITH ADEQUATE VENTILATION. IF VENTILATION IS INADEQUATE, USE NIOSH/MSHA CERTIFIED RESPIRATOR WHICH WILL PROTECT AGAINST ORGANIC VAPOR/MIST.

Ventilation: LOCAL EXHAUST AND MECHANICAL (GENERAL) VENTILATION TO MAINTAIN EXPOSURE LEVELS.
Protective Gloves: IMPERVIOUS
Eye Protection: SAFETY GLASSES OR GOGGLES
Other Protective Equipment: PROTECTIVE CLOTHING AS REQUIRED TO AVOID SKIN CONTACT. AN EMERGENCY EYE WASH STATION AND SHOWER SHOULD BE AVAILABLE.
Work Hygienic Practices: WASH WITH SOAP AND WATER AFTER HANDLING PRODUCT AND BEFORE EATING DRINKING OR SMOKING.
Suppl. Safety & Health Data: NONE SPECIFIED BY MANUFACTURER.

Transportation Data

Trans Data Review Date: 93222
DOT PSN Code: GNZ
DOT Proper Shipping Name: FUEL, AVIATION, TURBINE ENGINE
DOT Class: 3
DOT ID Number: UN1863
DOT Pack Group: II
DOT Label: FLAMMABLE LIQUID
IMO PSN Code: HNV
IMO Proper Shipping Name: FUEL, AVIATION, TURBINE ENGINE
IMO Regulations Page Number: 3271
IMO UN Number: 1863
IMO UN Class: 3.2
IMO Subsidiary Risk Label: -
IATA PSN Code: MMA
IATA UN ID Number: 1863
IATA Proper Shipping Name: FUEL, AVIATION, TURBINE ENGINE
IATA UN Class: 3
IATA Label: FLAMMABLE LIQUID
AFI PSN Code: MMA
AFI Prop. Shipping Name: FUEL, AVIATION, TURBINE ENGINE
AFI Class: 3
AFI ID Number: UN1863
AFI Pack Group: II
AFI Basic Pac Ref: 7-7

Disposal Data

Label Data

Label Required: YES
Technical Review Date: 06JUL92
MFR Label Number: UNKNOWN
Label Status: F
Common Name: TURBINE FUEL, AVIATION JP-4
Chronic Hazard: YES

Signal Word: DANGER!
Acute Health Hazard-Moderate: X
Contact Hazard-Slight: X
Fire Hazard-Severe: X
Reactivity Hazard-None: X
Special Hazard Precautions: EYE/SKIN/RESPIRATORY TRACT:IRRITATION. MOST HAZARDOUS IS EXPOSURE TO AIRBORNE MIST OR OTHER ASPIRATION INTO THE LUNGS. ONCE INTO THE LUNGS, THIS MATERIAL IS VERY DIFFICULT TO REMOVE AND CAN CAUSE DEATH. PROLONGED AND REPEATED EXPOSURES CAN CAUSE DAMAGES TO THE LIVER, KIDNEYS AND CENTRAL NERVOUS SYSTEM. THIS MATERIAL CONTAINS BENZENE, A KNOWN CARCINOGEN. STORE IN A COOL, DRY, WELL VENTILATED AREA AWAY FROM SOURCES OF IGNITION OR OXIDIZERS. KEEP CONTAINER CLOSED WHEN NOT IN USE. PROTECT FROM DAMAGE. FIRST AID: AVOID VOMITING. EYES/SKIN:REMOVE CONTAMINATED CLOTHING & FLUSH WITH WATER FOR 15 MINUTES. GET MEDICAL ATTENTION.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: AMOCO OIL CO
Label Street: 200 E RANDOLPH DR MC 1408
Label City: CHICAGO
Label State: IL
Label Zip Code: 60601-6401
Label Country: US
Label Emergency Number: 800-447-8735/800-424-9300 CHEMTREC