c) Long Items

Long, awkward items, such as pipe, rolls of paper and plastic should be dumped at the toe of the face, placed parallel to the working face, and covered with regular waste. The dozer should be driven over these items slowly to prevent overturning.

d) Rubber Tires

Place rubber tires at the toe of the fill, spread them out, and cover them with other wastes. Tires are less likely to work their way to the surface if placed at the bottom of the cell. Do not try to compact unreduced rubber tires.

e) Large Metal Wastes

Metal wastes, such as pipes, rolls of cable, and wires should be placed directly at its position of disposal and covered by household or demolition wastes (bridged). This will prevent unnecessary machine damage and shutdown.

2. Low Density Wastes

Waste types such as synthetic fibers, loose plastic film or foam, and rubber and plastic scraps or shavings, require special handling. These materials present problems because they rebound after being run over by the dozer. Spread the lightweight material into 1 to 2 foot deep layers, and then cover it with regular waste, compacting as usual at base of cell. These wastes should be compacted until the operator can no longer detect that the surface of the waste layer is being depressed more than it is rebounding. The weight of the regular waste tends to keep the low-density material down.

3. Powdery Wastes

Wastes such as sawdust and other dusts also require special handling. These wastes are problems because they are stirred up by the equipment and blown by wind. Once in the air, they may be harmful to personnel if they are inhaled or contact the skin. Personnel not working in enclosed cabs should wear protective clothing and respirators if dust becomes airborne. Some powdery wastes may be wetted down with water from a water truck and then covered immediately with soil or regular refuse. This procedure will help reduce blowing and dusting of the powdery waste. If water is not available, cover the powdery wastes with soil or refuse to reduce blowing and dusting of the waste.

D . Maintenance of Completed Areas

1. Inspection of Completed Areas

A bi-weekly inspection of the berm walls and completed cell will be completed each month for signs of cracks and depressions due to settlement. Cracks and settlement will be filled and compacted back to the original grade

2. Groundwater Protection System

Due to the permafrost in the area, no groundwater protection system has been included.

3. Landfill Gas Assessment

Landfill gas is not expected as the deposited waste will be non-hazardous, non-organic and inert. Also, all chemicals will be diverted for proper hazardous waste disposal. Therefore a landfill gas collection system will not be installed in the landfill site.

4. Leachate Characteristics

Leachate is not expected as the waste to be deposited in the landfill will be relatively dry, inert and non-hazardous. Therefore no leachate collection system has been included in the design. In addition, a perimeter berm will be constructed surrounding the landfill site. This will redirect surface runoff originating upstream of the landfill site, thereby minimizing the amount of water which might infiltrate the deposited waste.

E. Traffic Control and Unloading of Waste

1. Proper Spotting and Traffic Control

a) Traffic Flow

Traffic should be kept moving at a safe steady rate to avoid backlogs and congestion working face. Drivers are to back to the toe of the slope before he/she starts to dump. The driver is to pull straight away slowly from the slope while s/he is dumping.

b) Aids to Traffic Control

Directional signs, pylons and barricades are to be provided to help control traffic and direct customers to unload the waste at the base of the cell and have them drive their vehicle straight out when unloading is complete. Ensure proper signage and barricades are in the required locations at the beginning of each day. Relocate signs and barricades as required at the end of each day so that they will be in place and ready for the next day's operation.

c) Separation of Vehicles

Due to the risk of dump trucks and trailers overturning, only one vehicle is to be unloaded at the face at a time, this includes vehicles being unloaded by hand.

d) Logging of Unloaded Wastes

A waste unloading logging station will be located in proximity of the working face. The operator of every vehicle that unloads any quantity of waste is required to log the specifics of the load – Date, time, waste type, vehicle type, approximate quantity, etc....

e) Load-on-Fire Procedures

Loads-on-fire are wastes that are either on fire or that are smouldering or smoking within a vehicle or when deposited at working face. All site personnel should be familiar with procedures for handling such loads. Refer to the Emergency Work Instruction in Section B of this manual for proper response procedures.

f) Prevention of Scavenging

Scavenging by employees, visitors and local people travelling through is not permitted. Scavenging in a waste pile is a safety hazard with a high risk of injury and is strictly prohibited

g) Site User Rules

Landfill staff should know all site user rules and watch for violations. User rules (Appendix C) and wastes acceptable for disposal in the landfill (Appendix A) are to be posted at the entrance to the landfill and at the working face. All violation of land fill user rules shall be recorded in the daily log by landfill staff and reported to the Site Manager.

h) Emergency Procedures

Site personnel shall be familiar with proper fire and accident procedures and are expected to know their role in all possible emergency situations. See the Emergency Work Instructions in Section B of this manual.

F. Landfill On-Site Roadways

1. Road Construction

On-site access roads for use as a thoroughfare for transporting waste to the working face shall only be constructed under the approval of the Camp Manager and according to engineered design specifications. Landfill maintenance access roads are only to be constructed under the approval of the Site Manager.

2. Road Maintenance

a) Maintenance of Gravel Roadways

Roadways that are made in native or filled soil and are heavily travelled required maintenance. These roads should be graded and re-compacted as required to re-establish proper road grades.

b) Filling of Areas Where Settlement Occurs

When all-weather roads are constructed on the tundra, settlement of the filled area may cause cracks to appear in a road or cause the slope of a road to change. Cracks should be filled with material that is compatible with the roadbed. For an area of a sloped road, where the slope has changed drastically, it should be built-up with material compatible with the roadway until the desired elevation is achieved.

c) Maintenance of Drainage Culverts

All drainage culverts should be kept free of obstructions and debris. All drainage crossings should be identified with staking prior to winter such that they can be found and opened in advance of freshet. Prior to the onset of freshet, all drainage culverts shall be opened and ready to accept water flow.

G. Inclement Weather

1. Preparation for Weather Conditions Affecting Landfill Operation

Wind, white out conditions caused by blowing storms in winter and spring freshet may have an impact on landfill operations. The following precautions shall be followed:

a) Wind

In preparation for wind storms, the working face shall be compacted and covered as practical to reduce width of the exposed face. Litter fences should be installed prior to windy weather and relocated as required.

b) White Out Conditions Caused by Winter Storms

Under severe white out condition caused by some winter storms, the Site Manager may declare the landfill temporarily closed if conditions at the landfill cannot be made safe to operate.

c) Freshet

Prior to the spring melt of freshet the site services supervisor will take the following precautions to minimize the impact of the water flow from freshet:

i. Ensure all culverts are cleared prior to freshet
ii. Remove all excess snow from the landfill pad and completed cell slope to minimize water accumulation on the pad.
iii. Install silt fencing or other control devices if required on drainage that contain silt as a result of landfill erosion

H. Surface Water Flow and Quality

Flowing surface water will be prevented from entering the landfill site by the construction of a berm along the upper end of the site (i.e. the berm constructed above for waste placement) and berms along the sides of the site. The landfill site area will be graded 0.5% to promote drainage away from the landfill and to prevent pooling of water within the landfill or against the berms.

Appropriate erosion and sediment control measures will be implemented as required through the use of silt fences, etc. Temporary sediment control measures will be used during all construction activities at the site.

I. Inspections and Reporting

a) Reporting

The *landfill daily unloading volume & operations log (see Appendix C)* is completed daily and logs waste volumes, compaction and cover application.

b) Routine Inspections

Records of all site operations, including inspections, maintenance, and monitoring will be recorded on designated forms and kept together in the Baffinland office (or

other on-site facility used for such purposes). This will be performed and maintained by the landfill Operator.

Routine visual inspections will be completed every two weeks on the *Mary River Project Landfills bi-weekly Inspection form* (See form attached below) by the Site Services Supervisor or designate for various components of the landfill, including:

- General site area
- Landfill berm and cover survey
- Litter control
- Storm water runoff control
- Vector attractants
- Wildlife observations
- Wildlife signs.

III. Landfill Safety Practices

A. General Safety Practices

1. Know Procedures

   All employees at the landfill are responsible for knowing the proper procedures for reporting accidents, injuries, and fires. Employees must know the procedure to be followed for each type of emergency and be aware of their particular role. Work Instructions for various situations are documented in the Work Instructions section of Part B of this manual.

2. Signage for Traffic Control and Direction

   Road boundaries and speed limits on each road shall be clearly posted.

3. Site User Rules

   Site user rules are available at the entrance to the landfill and at the working face. Employees are to watch for violations of site user rules and indicate those rules to violators, stressing that the rules are imposed to ensure the safety of people & equipment. Site User Rules are attached in Appendix C.

4. Level Dumping Area

   For safe operations, the dumping area shall be kept as flat as possible at all times and kept clear of debris.

B. Safety Precautions for Equipment Operators

1. Heavy Equipment Operation

   All mobile equipment in use at the landfill is to be operated in accordance with general Baffinland procedures associated with light truck and heavy equipment.

2. Keep Debris from Cab

   Keep operator's compartment, stepping points, and hand holds free from oil, grease, mud, loose objects, and trash.

3. Look in All Directions before Moving

   The landfill is a high traffic area - Protect personnel and other equipment in the area by looking to the front, rear, and sides before moving equipment. If the operator is unsure of surrounding conditions, he/she shall dismount and inspect the area.

4. Safety Devices

   Proper safety devices, such as safety belts and roll over protection systems, must be installed on all equipment and maintained or replaced to original equipment manufacturer specifications.

5. Carry Blades Low

   Equipment attachments such as loader buckets and tractor blades should be set low to improve visibility and enhance breaking capability. Otherwise, collisions may occur, the vehicle may go over an embankment, or it may roll over.

6. Check Blind Areas

   Never push waste until you are sure that no person or equipment is in the blind area ahead of the refuse. If the operator is not sure of surrounding conditions, he/she shall dismount the equipment and personally inspect the area.

7. Maintain Adequate Clearance

   When pushing waste, maintain adequate clearance from ground personnel, patrons and other vehicles or obstructions to ensure that objects will not strike other equipment or persons. As a rule of thumb use 5 meters as a minimum safe distance to keep away from all people, vehicles, and equipment.

8. Constantly Check Work Area

   The operator must constantly check the work area for the location of other persons or equipment. Be especially cautious when several private vehicles are in the area. Remember that many site users are not familiar with the dangers of heavy equipment.

9. Operate Up and Down Slope

   Operate up and down slopes. Avoid side hill travel whenever possible to reduce the chance of rolling over.

10. Avoid Excessive Speed

    Operating conditions generally determine the speed of heavy equipment. Under no circumstances should heavy equipment be driven at excessive speeds or operated recklessly. Heavy equipment is difficult to control at high speeds and must only be operated at a speed that is safe for existing conditions.

11. Move Cautiously Over Bulky Objects

    When compacting or traversing bulky items, such as vehicles and utility poles, the operator must proceed with extreme caution to avoid tipping or sudden lurching movements.

12. No Scavenging

    Scavenging will not be permitted. Scavengers are subject to a number of potential injuries and possible death.

C. Personal Protection Equipment

Landfill staff is required to wear the standard Mary River Project personal protective equipment, including:

a) Hard hats,
b) Eye protection,
c) Work boots,
d) Work gloves,
e) Reflective vest

D. Emergency Contact Information

All emergencies shall be reported to the site services supervisor and Site Manager immediately.

Appendix A

Classification of Refuse

1. Acceptable Wastes

Non-Hazardous Solid Waste means a solid waste that is not a liquid and is not hazardous The following wastes are examples of Non-hazardous solid wastes acceptable for disposal at the Mary River Project Landfills:

a) Wood products (Clean untreated wood should be diverted to the Burn Area)
b) Plastics
c) Cardboard
d) Scrap Tires
e) Bulky waste such as heavy equipment, trucks, snowmobiles & appliances. These items will be drained of all fluids (oil, fuel, hydraulic fuel; ozone depleting substances must be removed by a licensed technician prior to disposal).
f) Concrete
g) Glass
h) Metal
i) non-toxic incinerator ash
j) Non-Hazardous Solid Spill Clean-up Material
k) Empty Container (as defined in this procedure)

2. Inert Wastes & Recyclable material

The following are examples of inert wastes that the Mary River Project Landfills will accept for disposal. However, these types of materials can generally be recycled and/or reused and it is better to divert this waste stream for reuse when applicable:

a) Clean fill dirt
b) Rock
c) Steel (suitable for reuse)
d) Pallets (suitable for reuse)

3. Hazardous Material / Unacceptable Wastes

There are six general types of materials that are unacceptable for disposal at the Mary River Project Landfills. They are:

a) Chemicals
b) Liquid Wastes including sewage
c) Radio-nuclides (Radioactive waste)
d) Batteries
e) Infections or medical waste
f) Electronic waste – TVs, computer CRTs (screens) and computer hard drives

In addition, Hazardous Wastes, including household hazardous wastes, are NOT accepted at the Mary River Project Landfills. The following list of waste, though not all inclusive, is considered hazardous:

a) All material regulated by the Transportation of Dangerous Goods Act,
b) All material requiring a Material Safety Data Sheet,
c) Paint,
d) Chemicals,
e) Solvents,
f) Propane tanks,
g) All pressurized gas cylinders,
h) Fuel drums (205 liter barrels) or other material/container previously containing fuel or other hydrocarbons,
i) Acids,
j) Waste oil,
k) Cleaning solvents,
l) Gasoline, diesel, Jet A and other Petroleum products,
m) Insecticides,
n) Lube Oil,
o) All heavy metals such as Beryllium, Cadmium, Mercury, etc.

Appendix B

Potential Pollutant Source and Best Management Practices Summary Table

Area	Activity	Pollutant Source	Pollutant	Best Management Practices
Landfill	General landfill operations	Soil Erosion	Sediment	- Maintain design slopes - Repair all berm & cover areas experiencing settling or erosion - No cuts permitted in to the tundra during landfill civil construction or operation - Silt fences installed at any drainage experiencing sediment from soil erosion
Landfill	Fuelling of heavy equipment	Diesel fuel	Diesel fuel	- Fuelling is completed in accordance with Baffinland fuelling procedure. - Personnel are trained on the procedure for fuelling
Landfill	Unloading waste at landfill	Improper segregation or direction of non-permitted wasted	Hazardous waste or non-permitted waste	- Baffinland Waste management system includes waste type source segregation - Landfill operations procedure contains requirement for waste inspection prior to unloading.
Landfill	Unloading waste at landfill	Hazardous material spill	Hazardous waste	- Baffinland Spill Response Plan in place to respond to spills
Landfill & surrounding area	General landfill operations	Landfill working face	Litter	Landfill operations manual contain best management practices including: - Minimizing active working face - Compaction & cover plan - Use of litter fences

Appendix C
Bi- Weekly Inspection Log Table

Mary River Landfill Bi-Weekly Inspection

Date: **Inspector:** **Role:**

Time:

Inspection	Y N N/A	Comments
General Site		
Access Roads in good condition?	Y N N/A	
Unloading area at working face is level?	Y N N/A	
User rules & classification of waste signs in good condition?	Y N N/A	
Is the tundra around the outside perimeter of the landfill berm stable?	Y N N/A	
Landfill Berm & Cover Survey		
Visible signs of settlement (low spots or poolling water)?	Y N N/A	
Visible cracks?	Y N N/A	
Visible signs of erosion from wind or runoff?	Y N N/A	
Does the most recent cell cover have 0.1 m on the face & 0.3 m on the deck	Y N N/A	
Cover material is stockpiled?	Y N N/A	
Litter Control		
Working face length is as small as practical & <12m?	Y N N/A	
Perimeter litter fences established	Y N N/A	
Working face litter fence established (at end of day operation)?	Y N N/A	
Are the litter fences capturing the litter?	Y N N/A	
Has the site been cleaned of litter in the last two weeks?	Y N N/A	
Storm water Runoff Control		
Is general water drainage working?	Y N N/A	
Are Culverts draining?	Y N N/A	
Are water flows silt free?	Y N N/A	

Inspection Description

Circle Y or N as appropriate, or N/A for any questions that are not applicable.

A “yes” answer generally denotes compliance with that requirement.

A "No" or "N/A" should be explained further in the comments

Survey of Vector Attractants at the Working Face

Attractants	Attractant Levels (cirlce one)				
Food	None	1 piece	2-5 pieces	6-10 pieces	>10 pieces
Food Packaging	None	1 piece	2-5 pieces	6-10 pieces	>10 pieces
Oil products containers	None	1 piece	2-5 pieces	6-10 pieces	>10 pieces
Oil contaminated waste	None	1 piece	2-5 pieces	6-10 pieces	>10 pieces
Aerosol cans	None	1 piece	2-5 pieces	6-10 pieces	>10 pieces
Batteries	None	1 piece	2-5 pieces	6-10 pieces	>10 pieces
Other _____	None	1 piece	2-5 pieces	6-10 pieces	>10 pieces
Other	None	1 piece	2-5 pieces	6-10 pieces	>10 pieces

Wildlife Observations

Species	#	Comments

Wildlife Signs (tracks, scats, borrow holes or chews)

Species	Type of sign	#	Comments

Additional Comments: _____

Daily Unloading Log Table

Baffinland Iron Mines Corporation

Baffinland Iron Mines Corporation

/ River Non-Hazardous Solid Waste Landfill Daily Unloading & Operations Log

Working Face - Status at End of Day
WF – Working Face, CW – Compacted Waste, C - Cover
Admin Use Only

Day of the Week: _____ **Date:** _____

			Volume Estimate								
			Vehicle					Other			
Time	**Source Location of Waste**	**General Description of Waste**	**Light Truck**	**Kenworth**	**Kenworth +Pup**	**%Full**	**Volume**	**Other Vehicle**	**Volume Estimate (m3/Cubes)**	**Driver's Name**	**Waste Unloading Approver's Name**
9:40 AM	Mary River Laydown Area	Scrap Wood			√	80%				John Smith	Site Services Supervisor
					Daily Totals:						

General Description Of Waste: Wood, Plastics, Cardboard, Scrap Tires, Bulky waste such as heavy equipment, trucks, snowmobiles & appliances, Concrete, Glass, Metal, non-toxic incinerator ash, Non-Hazardous Solid Spill Clean-up Material

Daily Grand Total:

Appendix D

Mary River Non-Hazardous Solid Waste Landfill

User Rules

1. All waste is to be inspected prior to dumping – Contact the Site Services Supervisor prior to delivery

2. No liquid or hazardous waste is accepted at this landfill

3. Vehicles shall follow posted speed limits and directions to unloading area - Unloading in other areas is strictly prohibited

4. Dump waste immediately behind the vehicle as close to the toe of the working face as possible

5. No Unloading by Rapid Acceleration or Deceleration

6. Each vehicle operator is to complete the unloading log for each load

7. No Scavenging is permitted

8. No open fires or the burning of waste is allowed on the site

9. All spills are to be stopped if safe to do so, and immediately reported to the Site Services Supervisor.

10. PPE required to be worn at landfill area

11. In case of Emergency – Immediately contact the Site Services Supervisor or Site Manager

Part B – Mary River Project Landfills Work Instructions

Part B focuses on work instructions and has been formatted to provide supervisors and their employees with a user-friendly method for access, training, and implementation of these procedures

Specific work instructions concerning landfill operations and emergencies and have been documented in order to establish standard policies and practices for the Operations staff. These topics will be reviewed periodically in routine safety meetings, which will allow operators to keep up-to-date on any changes in standard operations. Site services personnel are expected to be familiar and comply with the work instructions relating to their areas of responsibility.

Work Instructions

General Site Maintenance
Work Instructions

Landfills require general maintenance throughout the year in order to keep them orderly and clean. Much of this maintenance is in anticipation of permit requirements and seasonal weather changes

Guidelines:

1. Access roads on the site are to be maintained and graded to eliminate ruts and repaired to eliminate cracks and settling.

2. Maintain drainage, keep road culverts and landfill drainage free of debris.

3. Define critical landfill perimeter and spot locations with stakes and signs prior to winter to facilitate identification

Off-Road Vehicular Traffic
Work Instructions

"Off-Road" refers to any vehicle traveling off of any defined roadway or access-way or landfill pad, regardless of the road surface. Permitted roads are identified on the attached landfill plan and include the gravel access road and the landfill berm perimeter road.

- All off-road vehicular traffic is strictly prohibited without clearance from Mine Manager
- Prior approval is required for any vehicles engaging in off-road activities while on site
- New road construction is not permitted without approval from the Mary River Project Operations Manager

Benefit of Compliance to Instruction:

- Avoid disturbances and impacts to sensitive tundra

Dust Control
Work Instructions

1. Place dusty loads at the toe of the face of the trash and bridge over as quickly as possible.

Benefit of Compliance to Instruction:

- Creates a cleaner, safer work environment
- Ensures compliance with permit requirements and reduces the impact on the natural environment

Landfill Equipment Fluid Releases
Work Instructions

1. Complete a visual “walk around” inspection of all landfill motive equipment prior to starting. Inspect for damaged hoses and for puddles or stains from leaking fluids under your machine. If fluid leaks are evident, do not start equipment. Notify your Supervisor and the mechanic.

2. Periodically scan the equipment management system on the dashboard of the machine for flashing lights and warning horns that may indicate a system failure. Move to a safe area, stop and inspect the machine systems for leaks and malfunctions as necessary.

3. Routinely glance through the windows at the machine components that are susceptible to damage, for example, lift cylinders, hydraulic hoses, grease and oil seals. Listen as you operate your machine for unusual noises that may be an indication of a mechanical failure. If so, move to a safe area, stop the machine and notify your Supervisor and the mechanic.

4. As you make a “pass” in a forward direction and prepare to change direction, look over your shoulder and inspect the ground for streaks of oil or anti freeze. If leaks are observed, move machine to a safe area, shut machine down, contain spill using a bucket or pan and notify supervisor and mechanic.

5. All discharges of fluids from heavy equipment in the landfill are to be treated as a spill. All spills are to be addressed as per the Spill Response Plan. Key points are:
   - If safe to do so, stop the source of the spill.
   - Immediately report the spill to your supervisor.
   - For large spills initiate the Spill Response Plan.
   - Initiate cleanup of the spilt material using the emergency spill kits
   - Document the spill by the end of shift with a Spill Report Form – these are available from the Operations Department or your supervisor, provide spill report to Environment Department within 12 hrs.

Benefit of Compliance to Instruction:

• Regulatory Compliance

• Operator safety

• Environmental protection

Litter Control
Work Instructions

The control of litter is an essential part of our permit conditions and readily evident to all who drive by or onto the landfill. In an effort to maintain compliance with our permit and reduce the amount of time and effort required for this task the following procedures are to be followed:

Prevention of Litter at Working Face:

1. Minimize the length of the working face to reduce the size of the face exposed to wind. The maximum length of the exposed cell face shall not exceed 12 meters at any time.

2. Keep waste well confined at the working face to reduce the amount of waste susceptible to wind.

3. Deposit waste at the toe of the fill slope face and spread it upward.

4. Cover the compacted waste as soon as possible to minimize blowing litter

Control with Litter Fences

1. Position fences near the working face as wind and fill operations change.

2. Move or lengthen semi-permanent litter fences that are strung around the area to conform to filling operations and prevent migration of litter off the site.

Litter Pickup

1. Litter crews are to pick any litter off the fences to prevent the fence from being clogged and subject to overturning by the wind.

2. Promptly pick up any litter not trapped by the fences to prevent off-site migration.

Litter in Heavy Wind Conditions

1. Install litter fences prior to windy weather and relocate as required.

2. If lightweight material cannot be contained within the site, place intermediate cover over the material to prevent it from blowing.

Benefit of Compliance to Instruction:

- Compliance with operating permit
- Reduction in amount of litter migrating out of waste cell
- Minimize impact to native habitat
- Reduce the rework for picking up litter

Vector Control
Work Instructions

Vectors (any animals that carry diseases) are generally not present at a properly operated and maintained non-hazardous solid waste landfill (No domestic waste). The provisions of source segregation and waste inspection at the landfill prior unloading waste will safeguard against vector problems. Well-compacted wastes and cover material effectively prevent vectors from emerging or burrowing into waste materials. The following are basic guidelines to ensure proper vector control on site:

1. All waste is to be inspected at the landfill prior to unloading to confirm no domestic or food waste is present.
2. Maintain a narrow working face and cover all un-worked areas to minimize animal foraging at the site.
3. Cover waste on all unused slopes.
4. Ensure good compaction of the cover material to discourage animals from burrowing through it.
5. Keep equipment, storage and leisure areas free of debris and food waste to prevent vectors from establishing residence in or near areas where employees, support personnel work.

Benefit of Compliance to Instruction:

- Protects the health and safety of employees
- Eliminates potential exposure pathways to employees
- Reduces risk of contact with vectors and scavengers
- Maintains compliance with operating permit

Building and Equipment Fires
Work Instructions

Fire

1. Attempt to extinguish a small, controlled fire with equipment on site *WITHOUT* endangering yourself or other personnel. When in doubt, evacuate area and notify your supervisor & security immediately, providing all the required information (Your name, fire location, type, size etc…).

2. Keep all unauthorized people away from the area on fire.

3. Report the details of the fire in the *Special Occurrence Log* and, if applicable, complete an investigation report form (see your supervisor for these materials).

Benefit of Compliance to Instruction:

- Safety of all employee's is protected

Fire in Load
Work Instructions

Fire in Load refers to a vehicle load of wastes that are either on fire and/or smoldering or smoking prior to discharge to the landfill. All site personnel are expected to be familiar with the following procedures for handing such loads:

1. Direct the driver to dump the material in a clear area that is away from the fill face and clear of any vegetation and/or debris.

2. Notify your immediate Supervisor or the Site Manager of the fire.

3. Spread out the load and extinguish the fire with water or soil

4. Once fire is determined to be completely out, allow the material to remain in the cleared area for the remainder of the working day.

5. If no fire is detected at the end of the working day, place the load into the fill.

6. If fire is discovered after the load has been dumped at the working face, the equipment operator will push the material away from the face (if it is safe to do so) to a cleared area where it can be covered with soil or extinguished with water.

Benefit of Compliance to Instruction:

- Health & safety of employees is protected
- Reduce the risk of a landfill fire

Hazardous Materials Spill Response and Reporting Work Instructions

The responsibility for implementing this procedure begins with the person(s) responsible for the chemical spill (spill) or the first person(s) to discover the spill. They will be responsible for reporting the spill and completing cleanup actions (small spills) or requesting assistance for large spills.

Spill Reporting:

1. Report all spills of hazardous materials to your supervisor and the camp manager as soon as possible, regardless of the quantity of spilled material.

2. Be sure to provide the following information:

    • Type of spilled material
    • Quantity of spilled material
    • Location where spill occurred
    • Time and date the spill occurred
    • Description of the actions taken to contain and clean up the spilled material

3. The Site Services Supervisor will record the above information in the Log of Special Occurrences.

Spill Response:

All spills are to be addressed as per the Spill Response Plan. Key points are:

- If safe to do so, stop the source of the spill. Employees may attempt to contain the spill, provided their personal safety or the safety of others is not jeopardized by their actions
- Immediately report the spill to your supervisor.
- For large spills initiate the Spill Response Plan.
- Initiate cleanup of the spilt material using the emergency spill kits
- Document the spill by the end of shift with a Spill Report Form – these are available from the Operations Department or your supervisor, provide spill report to Environment Department within 12 hrs.

Benefit of Compliance to Instruction:

- Employees are trained to safely respond to spills, minimizing the potential impact to personnel or the environment
- Spills documented in accordance with regulatory requirements
- Regulatory Agency notified in a timely manner

Subsurface Landfill Fires
Work Instructions

Warning signs may include:

- Smoke and/or heat waves emanating from cracks and/or fissures;
- Localized settlement (sinkholes up to several meters in diameter);
- The odor of burning plastic/refuse may be present

BEWARE!

*The surrounding area may not be stable. The rapid decomposition of refuse by burning may have created large voids underground.
*Fumes may be toxic!

Safety Procedures

1. If an area is suspected of having an underground fire, block further access to the area and keep people away. Make sure anyone near the suspected fire is notified and/or vacated as may be necessary. If flames are present above ground, immediately notify the site services supervisor and camp manager through radio dispatch. (Note: Pumping water into the ground may not stop the smoldering and will not prevent future fires. Smothering with dirt is the preferred option).

2. Try to stay upwind of any smoke and not breathe fumes, if any.

3. Secure the site with cones, barricades, survey ribbon, etc. If voids are suspected the ground may be unstable – Do not walk or use heavy equipment on the waste pile.

4. The site services supervisor, camp manager and other staff will evaluate the conditions and develop a plan to safely deal with the fire (almost always smothering with dirt).

5. Notify the Baffinland environment department to evaluate the incident and confirm the repair plan is in compliance with permits

6. Once the fire is extinguished and the situation secured, look for other cracks and/or depressions in the area and schedule their repair. (They could be the source of air that allowed the fire to start originally).

7. Complete repairs to the landfill structure. Note completion of work in site log along with fire location for future reference.

Benefit of Compliance to Procedure:

- Employee's safety protected
- Environment is protected

Annex 5

Landfarm Operation Information

- Hydrocarbon Impacted Soils Storage and Landfarm Facility Operations Maintenance and Monitoring Plan (EBA, 2010)

BAFFINLAND IRON MINES CORPORATION

PRELIMINARY HYDROCARBON IMPACTED SOILS STORAGE AND LANDFARM FACILITY
OPERATIONS, MAINTENANCE AND MONITORING PLAN
MILNE INLET, MARY RIVER PROJECT, NUNAVUT

SEPTMEMBER 2011
EBA FILE: E14101092
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1.0 INTRODUCTION

Baffinland Iron Mine Corporation (Baffinland) retained EBA, a Tetra Tech company (EBA) to evaluate hydrocarbon-impacted soils within the Milne Inlet lined bladder farm at the Mary River Project located in the Qikiqtani Region of Nunavut.

The original scope of work included post-decommissioning characterization of the hydrocarbon-impacted protective layer of sands in the bladder farm and the development of a soil remedial action plan. It was anticipated that the fuel-impacted soil would be treated with a landfarm to be constructed at Milne Inlet. Baffinland's requirements changed after the original work scope was developed, and the bladder farm remained in service through 2010. For this reason, the bermed soils were not characterized in 2010.

EBA's work scope for the 2010 period was modified to develop a preliminary landfarm design concept for Milne Inlet along with an operations and monitoring manual. A soil sampling and ground truthing program was conducted in the summer of 2011 to determine the volumes and concentrations of soil requiring treatment, to confirm the location of the facility, and to finalize the design details required to issue construction drawings. Preliminary design is based on the assumption that the petroleum hydrocarbon remediation objectives will be met within two to three treatment seasons.

The Milne Inlet landfarm will initially be used to treat sandy soils that were impacted by petroleum hydrocarbons when a fuel bladder ruptured in 2008. An estimated 8,000 L of Jet A diesel fuel was released into the lined containment berm. Contact water within the berm has been collected and treated since 2008, although no soil remediation has yet been conducted.

As per the Nunavut Water Board renewal of Baffinland's Licence No. 2BB-MRY0710, soils affected by hydrocarbons from normal fuel transfer procedures require treatment to meet the objectives included in the 2010 Government of Nunavut's Environmental Guideline for Site Remediation. Also, the Mary River Project Draft Environmental Impact Statement (December 2010) NIRB File No. 08MN053 indicates that a description of how petroleum-impacted soils will be handled on the site is required. Documents provided within the future application to amend the current Nunavut Water Board (NWB) license will consider the relevant Mining and Milling and Industrial Undertaking Hydrocarbon Impacted Soil Storage and Landfarm Treatment Facilities Supplemental Information Guidelines (2010, draft).

2.0 SITE DESCRIPTION

2.1 Project Location

The Milne Inlet facility is located on the northern end of Baffin Island, Nunavut at approximately 71 53' 03" N and 80 54' 12". The nearest communities are Pond Inlet, to the east of the site, and Arctic Bay, to the west. A key plan showing the location of the Milne Inlet Facility is Figure 1. Marine access and shipping through the construction phase and periodically during operation occurs seasonally through Milne Inlet and the existing Milne Inlet Tote Road provides access to the proposed Mary River mine site.

The current facilities at Milne Inlet include an airstrip with tarmack, docking facilities, fuel farm (75 fuel bladders with 113,560 L capacity each), temporary bulk sample ore stockpiles, Shanco Camp, an incinerator, a wastewater treatment facility, a polishing/waste stabilization pond, and laydown areas.

There are currently two alternative locations proposed for the landfarm facility (Figure 2). Both proposed locations are situated south of the camp, within till veneer areas along the tote road from Milne Inlet to Mary River. Proposed Site A is within an existing quarry area approximately 3 km along the tote road. Site A is advantageous because it is within a pre-disturbed area. Proposed Site B is closer, about 1 km from camp along the tote road, and offers an advantage of being less likely to accumulate large quantities of snow that would require treatment after melting in the spring.

Based on aerial photo interpretation, it appears that the aggregate materials in both locations would be suitable for the construction of a landfarm.

2.2 Authorizations

Much of the Mary River site and the land between Mary River and Milne Inlet is located on Inuit-owned land administered by the QIA. Existing permits include Type B Water License number 2BB-MRY0710 issued by the Nunavut Water Board (NWB), valid from February 20, 2007 to February 28, 2010, and extended by amendment to December 31, 2010. The Nunavut Impact and Review Board (NIRB) file number is 08MN053. NIRB is conducting ongoing review of the Mary River Project including the application for pre-development work planned for 2012, including the construction and operation of landfarm facilities.

3.0 MILNE INLET PRELIMINARY LANDFARM DESIGN

3.1 Design Intent

Sandy soils used as a protective layer over the liner system were affected when a fuel bladder at the Mine Inlet fuel facility ruptured on June 16, 2008 (Spill Report # 2008-347), spilling an estimated 8,000 L of Jet A fuel into the containment area. The concentrations of F1 to F4 fractions is unknown, but based on the nature of the fuel spill (Jet A), it is anticipated that the soils require treatment for the F2 and F3 petroleum hydrocarbon fraction.

Figure 3 provides the preliminary plan and sections of the purpose-built facility to treat these designated soils. The preliminary design will be finalized to accommodate the actual construction site topography, borrow material properties, and landfarm sizing requirements.

3.2 Landfarm Dimensions and Components

The landfarm is sized to accommodate an approximate 2,000 m^3 of soil, assuming a treatment soil depth of 0.3 m. Using these assumptions, the preliminary inner dimensions of the facility are 70 m by 100 m. The assumed berm height ranges from 1.3 m to 2.1 m above the natural ground, with a liner keyed in to the soils with at least 1 m of soil, as shown on Figure 3. The crest of the berms maintain a width of 3 m, and slopes will be 2H:1V or less, as shown on the drawings.

Depending on actual site conditions, the foundation base may be constructed directly by grading the natural ground. The proposed liner system consists of 60 mil textured HDPE between two layers of 12 oz. non-woven geotextile. The protective sand layer over the liner is 0.3 m. The less-impacted materials from the bladder farm may be re-used as the protective layer in the newly-constructed landfarm facility.

The final location, shape and overall size of the landfarm will be determined following the site characterization fieldwork to be completed during the summer of 2011. The landfarm access will be selected during the construction works.

3.3 Contact Water Containment

The foundation base will be sloped at 2% towards a sump with preliminary dimensions of 10 m by 70 m. The sump is designed to contain approximately 245 m^3 water, or approximately half the expected snowmelt volume. Based on the landfill dimensions and precipitation assumptions, a narrow strip of soils undergoing remediation adjacent to the sump may be saturated or have free standing water after the freshet. On this design basis, the maximum head on the liner is 1.0 m.

4.0 OPERATION AND MAINTENANCE PROCEDURES

4.1 Safety and Environmental Protection

In addition to adherence to Baffinland's Heath and Safety Plan, staff in charge of operating the landfarm must have valid WHMIS and TDG training and be trained in the procedures associated with landfarm operation, including the use of safety equipment (first aid supplies, eyewash station, fire extinguisher, spill response materials etc), emergency response procedures, soil tilling, record-keeping, soil and water sampling, and groundwater monitoring. It is recommended that activities involving contaminated soils be conducted under the supervision of site staff having a 40-hour Hazardous Waste Operations and Emergency Response Standard (HAZWOPER) or Canadian Hazardous Waste Workers Program.

Before work starts, personnel must be provided with a clear explanation as to the nature of the contamination and the specific personnel protective equipment required to complete the assigned tasks. Personnel should be trained how to decontaminate equipment and personal protective equipment. Personal hygiene, including showering at the end of the day and washing prior to eating, smoking, etc. is important after handling contaminated soils. Workers should be encouraged to watch for and immediately report any unsafe conditions, or to report any damage to the facility, especially any tears in the liner that could occur during operations such as tilling.

If the nature/degree of contamination is such that respiratory protection is required, the workers must be properly fit-tested prior to starting work at the facility. The selection of personal protective equipment is the responsibility of the site Occupational Hygienist, Corporate Safety Officer, or equivalent.

The facility must have warning signs posted in English and local dialect, both to prohibit the dumping of soil materials without the permission of the Site Manager, and to warn personnel of the dangers and risks posed by the facility (slip/trip, hydrocarbon-contaminated material, open water). The sump area should be clearly demarcated to avoid any personnel from breaking through ice at the start and end of the season, when snow cover may conceal the underlying thin ice.

4.2 Soil Acceptance Procedures

Rock fragments and cobble exceeding 100 mm in diameter should not be accepted in the landfarm. The soil originating from the bladder farm is anticipated to consist principally of sand and gravel.

Chemical acceptability criteria include the following parameters:

- Total petroleum hydrocarbons less than 4%,
- Electrical conductivity <4 dS/m; sodium adsorption ratio (SAR) <6,
- pH greater than 5 and less than 10, and
- CCME metals up to Tier 1 values or up to natural background concentrations.

4.3 Landfarming Operations

Landfarming is an ex situ bioremediation treatment that uses naturally-occurring microorganisms to metabolize or breakdown petroleum hydrocarbons in impacted soils. This is achieved by spreading contaminated soil in a thin layer across the landfarm area.

End products of bioremediation are microorganism protein, carbon dioxide and water. Stimulation of microbial growth and activity for hydrocarbon removal is accomplished primarily through the addition of air and nutrients. In a landfarm, the metabolism of hydrocarbon is mediated predominantly through aerobic microbes.

The effectiveness of landfarming depends on three main parameters:

- Soil characteristics; grain size, soil texture, bulk density, moisture content and permeability;
- Type of petroleum hydrocarbon; and
- Climatic conditions.

Climatic conditions including rainfall, snow, wind effects and temperature influence landfarm efficiency. Rain and snow melt will change the moisture content of the treated soil. Runoff and wind also has the potential to cause soil erosion.

The anticipated operational period of the landfarm will depend on the weather conditions, but it is anticipated to be from June to the end of September.

After excavation and transport of contaminated soil to the landfarm area, the soil should be dumped and spread with a front-end loader or bulldozer. The soil should be tilled as it is spread, continuing until all of the soil has been deposited to ensure that the material is well-mixed and aerated. Material placement should maintain a minimum 2 m offset from the inside berm toe.

Soils will be placed in a layer of approximately 0.3 m and should not exceed 0.45 m in any location. At the start of season, the soils should be evaluated for optimal nutrient, moisture and pH conditions. Microorganisms that degrade hydrocarbons require optimal quantities of water, oxygen, and macronutrients (carbon, nitrogen, hydrogen, oxygen, sulphur, phosphorus, potassium, and magnesium), and the soil pH should be between 6 and 8. In addition, excessive salt compounds reduce the osmotic

potential and can slow or even halt biodegradation. Salts that are harmful to biodegradation in excessive concentrations include sodium chloride as well as fertilizer amendments.

Most soil microorganisms that breakdown petroleum hydrocarbons on a landfarm require an aerobic environment. Tilling is conducted to aerate the soils and enhance microbial degradation. The landfarmed soil should be loose and moist. During the summer months, the soils should ideally be tilled every week.

Optimizing the moisture content will enhance biodegradation and to avoid dust generation. Very dry soils should not be tilled. If soils are excessively dry, the landfarm should be irrigated prior to tilling to increase the soil moisture content to 40% to 85% of the water-holding capacity.

Soils that are wet also do not benefit from tilling. Passing equipment over wet soils could compact the material. If the soil appears muddy, or sticks to the tires of the tilling equipment, it is too wet to process.

Tilling could damage the underlying liner so it should be carried out with care by an experience operator. Only tilling equipment should be permitted on the landfarm soil, and only during tilling. Trucks or other vehicles should not drive on the landfarm soil as this will pack the soil down making it difficult to handle, and may prolong the soil remediation timeframe.

During the winter months, soil can be stockpiled to minimize contact with freshet water, although the piles should be no higher than 5 m.

5.0 WATER MANAGEMENT PLAN

5.1 Plan Considerations

All irrigation water, precipitation and snowmelt that collects in the landfarm sump is considered contact water. Average monthly temperatures that are above 0°C occur between July and September, so it is expected that runoff will need to be managed for these three months of the year. Based on historical climate data for Pond Inlet, it is expected that 190 mm of precipitation will fall annually, approximately 50% of which will accumulate as snow. The preliminary landfarm design could accommodate over 4,000 m^3 of water while maintaining a minimum 0.5 m of freeboard.

The yearly monthly wind speed averages are between 5 and 6 m/s during the frost-free months, and the average monthly relative humidity is between 70% and 80%. Ignoring losses (evaporation) or gains to the landfarm (snow drifts), it is expected that approximately 1,150 m^3 of precipitation (snow and rain) will collect annually in the landfarm. The annual quantity of contact water may be higher depending on whether external irrigation water is required to maintain optimal soil moisture conditions during the period of active treatment. The sump is designed to contain approximately 245 m^3 of water, or approximately half the volume of the expected snowmelt.

5.2 Contact Water Recycling and Water Use Minimization Procedures

During the treatment process, contact water that accumulates in the sump may be recycled as irrigation water to add nutrient amendments, to increase soil moisture or to supress dust within the landfarm area during dry periods. Recycled water from the sump should preferably not contain any petroleum

hydrocarbon sheen, which could be removed by using absorbents, or avoided by drawing water from beneath the water surface.

Should external water inputs be required during the landfarm soil treatment operations, consumption of fresh water at Milne Inlet could be minimized by recycling water from other processes, such as waters from the sewage lagoon polishing cell or sewage sludge. Treated wastewater and/or sludge is potentially a valuable source of nutrients (especially nitrogen), and reclaimed water irrigation of the landfarm could reduce or possibly eliminate dry chemical nutrient amendment requirements. In addition to reducing freshwater consumption, recycling nutrients already available in treated sewage use benefits the environment by offsetting greenhouse gas emissions that otherwise would have been generated in the production and shipment of dry chemicals to site.

Such use of reclaimed water would require authorization from the NWB and other stakeholders, and is contingent on the chemistry of the proposed amendment (especially with respect to metals loadings) as well as the effectiveness of the amendment to achieve the remediation targets, such as through a bench-scale or plot tests. The proposed amendment would need prior characterization for suitability, including the COD:N:P ratios, metals, and routine chemistry parameters.

5.3 Contact Water Discharge

To maintain adequate freeboard and avoid flooding the soils undergoing treatment, the landfarm sump contact water should be removed prior to freeze up in September. Water that does not meet the discharge requirements provided in the amended Water Licence 2BB-MRY0710 requires treatment or off-site disposal. Nunavut Water Board (NWB) landfarm discharge limits for mine sites are provided in Section 7.3, as well as monthly testing of chemical parameters.

If reclaimed wastewater is used during the treatment process, the contact water discharge parameters may need to include BOD_5 and faecal coliforms in addition to the standard Water Licence discharge requirements.

After water analyses confirm the water is suitable for release and the AANDC Inspector has been notified of the intended discharge, the water will be released to a nearby Monitoring Station, the location of which will be confirmed on the as-built drawing. The landfarm Monitoring Station discharge point should be at least 30 m away from any surface waterbody, and water discharges should be conducted in a manner that avoids soil erosion.

6.0 SOIL QUALITY REMEDIATION OBJECTIVES

Remediation objectives for the F1 to F4 hydrocarbon fraction will depend on the subsequent use of the treated soils. As per the Nunavut Water Board renewal of Baffinland's Licence No. 2BB-MRY0710, soils affected by hydrocarbons from normal fuel transfer procedures require treatment to meet the objectives included in the 2010 Government of Nunavut's Environmental Guideline for Site Remediation. Industrial criteria are suitable if the treated soils are to remain in place until the landfarm is decommissioned or the term of the commercial lease expires. Without a site-specific risk assessment, agricultural/wildland Tier 1 F1 to F4 hydrocarbon criteria must be met if the soils are to be returned to the environment, or at such time that the commercial lease expires.

Soils that do not respond to bioremediation treatment may be disposed of off-site or, with prior approval, the materials could be used as intermediate fill within an engineered on-site facility (landfill).

7.0 MONITORING PROGRAM

7.1 Soil Sampling

Soil sampling will be conducted to determine acceptability criteria, to monitor the progress of soil remediation, and to verify that soils meet the remediation objectives at the end of treatment.

Chemical analyses for soil acceptance at the landfarm were listed in Section 4.2. For the designated soils, analysis of F1 to F4 hydrocarbon fractions will not be required if sufficient data density is obtained during the soils characterization. Soil bulk density, moisture content, field capacity, and nutrients (nitrogen, phosphorus) are also required testing parameters.

Unless the soils are chemically unsuitable for bacteriological growth, it is highly unlikely that there will not be sufficient microorganisms in the accepted soil to initiate effective bioremediation. For this reason, heterotrophic plate count analyses are generally not necessary.

Soil sampling to verify interim treatment includes the CCME F1 to F4 soil fraction and soil nutrients. Periodic measurement of hydrocarbon vapour emissions by measuring headspace, using a small quantity of soil and a photoionization detector (PID), is a useful indicator of the progress of remediation but should not be substituted for remediation verification sampling.

Soil sampling to verify the completion of the treatment process includes the CCME F1 to F4 soil fraction. Testing for metals is not required at the end of remediation since soils will be tested prior to acceptance at the landfarm, and any landfarm treatment inputs will have known chemistry.

Other soil sample parameters may be added, such as poly-aromatic hydrocarbons (PAH), if the landfarm is retained after the two-year remediation program, or for treatment of other types of hydrocarbon-impacted materials.

7.2 Contact Water Sampling

During the frost-free months, and only if contact water is present in the sump, one or two sets of water samples will be collected and submitted to an accredited laboratory and for the analysis of the following parameters:

- Oil and grease and visual observations of sheen
- F1 and F2 hydrocarbon fraction and BTEX
- Phenols
- Dissolved nutrients: ammonia, nitrate, nitrite, phosphate
- Total nutrients: total phosphorus, total kjeldahl nitrogen
- Solids: total suspended solids, total dissolved solids

- Major Ions/Anions: calcium, magnesium, sodium, potassium; hardness, chloride, sulphate
- Routine chemistry pH, alkalinity, conductivity
- Metals: CCME list including As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mo, Ni, Sb, Se, Ag, Tl, Sn, V, Zn, Hg
- Routine Physical : turbidity, temperature

Parameters including temperature, pH, TDS, and electrical conductivity are to be measured in the field as well as the laboratory.

Other water sample parameters may be added, such as PAH, if the landfarm is retained after the remediation program, for treatment of hydrocarbon-impacted materials that do not originate from the fuel bladder farm.

7.3 Contact Water Discharge Limits

Contingent on the acceptance proposed landfarm and future amendment of the Water Licence, the proposed contact water discharge limits at the additional Monitoring Program Station are as follows:

Parameter	Maximum Concentration of any Grab Sample (mg/L)
pH	6.0-9.5
Total Suspended Solids	15
Oil and Grease	15 and no visible sheen
Total lead	0.001
Benzene	0.370
Toluene	0.002
Ethylbenzene	0.090

Depending on the design life of the landfarm, the installation of permanent groundwater monitoring facilities may be warranted. Alternately, temporary drive point (sand point) wells may be installed in the unconsolidated material using a hardened drive point and a screen (perforated pipe). The point is hammered into the ground, usually with a tripod and "driver" (weighted pipe that is repeatedly dropped).

Experience in similar latitudes in the Arctic indicates that free water will not be available for sampling until mid to late August. Groundwater will be monitored once per year in two downgadient and one upgradient location.

Water samples are to be collected and submitted to an accredited laboratory for the analysis of the following parameters

- F1 and F2 hydrocarbon fraction and BTEX
- Dissolved nutrients: ammonia, nitrate, nitrite, phosphate
- Total nutrients: total phosphorus, total kjeldahl nitrogen
- Solids: total suspended solids, total dissolved solids

- Major ions/anions: calcium, magnesium, sodium, potassium; hardness, chloride, sulphate
- Routine chemistry: pH, alkalinity, conductivity
- Routine physical : turbidity, temperature

Parameters including temperature, pH, TDS, and electrical conductivity are to be measured in the field as well as the laboratory.

7.4 QA/QC

The general quality assurance and quality control are to follow *QA/QC Guidelines for Use by Class "B" Licensees in Meeting SNP Requirements* (INAC, 1996). All samples are to be collected using best industry practices and shall be submitted under a Chain-of-Custody protocol. Sampling protocols adhered to include the following:

- Disposable sampling gloves to be worn during the collection of samples, and discarded between sampling events. Sampling tools are to be decontaminated between sampling points.
- Any sampling and inspection events should be documented in field notes including identification of the person conducting the work. It is beneficial to photograph any work that is conducted.
- For small batches of soil samples (less than 10 samples), at least one blind duplicate should be analyzed per batch of samples. For larger batches of soil samples (greater than 10 samples), 10% duplicates should be analyzed. For groundwater samples, a blind duplicate and field blank sample should be collected and analyzed with each batch of samples tested.
- Samples collected for laboratory analysis are to be placed in coolers and transported to the laboratory via courier.
- Sample holding times are to be adhered to, and water samples are to be preserved for specific analyses.
- All water and soil samples are to be collected in laboratory-supplied bottles and jars, and analyzed at a Canadian Association of Environmental Analytical Laboratories (CAEAL) accredited laboratory. All analytical reports are to include QA/QC reports.

7.5 Summary of Inspections and Reporting

Table 2 provides a summary of inspections and reporting associated with the operation of the landfarm:

Table 2: Monitoring Summary and Documentation

Item	Purpose	Frequency	Type of Record(s)
Landfarm Treatment Operations Inspection	Record keeping of treatment operations and berm performance for due diligence.	Once per day during spring freshet and after rainfall events. Weekly at other times.	• Inspection checklist and field notes including date, weather, facility condition including, any repairs required, odour noted, quantity of water in sump and amount of freeboard. • Record of berm performance with emphasis on observations of cracking or any signs of instability. • Check soils to see if they are too dry or too wet to till. • Record of any unauthorized discharges and follow-up action taken. • Photographic record.
Soil Sampling for Soils Acceptance at Facility	To determine if soils are acceptable for treatment at facility.	For this purpose-built facility, only one time per year at the start of season. Otherwise as circumstances require.	• Soils origin and associated spill report number, • Field notes including frequency of sampling, soil texture, moisture content, colour, odour. • Laboratory-issued reports including QA/QC • Summary tabulation of results. • Documentation of fate of rejected soils. • Record of any treatability tests done.

Table 2: Monitoring Summary and Documentation

Item	Purpose	Frequency	Type of Record(s)
Soil Sampling for Remediation Progress Monitoring	To provide interim indications of how remediation is progressing.	Monthly during the frost-free months.	• Field notes and sketch of location/depth of samples taken. • Photographic record. • Laboratory-issued reports including QA/QC and chain of custody. • Summary tabulation of results. • Analysis of percent removal of hydrocarbon constituent treated and treatment time, evaluation should include weather information, soil texture and soil moisture.
Soil Sampling for Verification of Remediation	To determine if remedial objectives have been met.	For this purpose-built facility, only one time per year at the end of season. Otherwise as circumstances require.	• Field notes and sketch of location/depth of samples taken. • Photographic record. • Laboratory-issued reports including QA/QC • Summary tabulation of results. • Analysis of percent removal of hydrocarbon constituent treated and treatment time. • Documentation of fate of treated soils. • Annual quantities in cubic metres of all soil and types of contaminants.
Contact Water Sampling During Remediation	Due diligence operations monitoring.	One or two times per treatment season	• Field notes and observations made at time of sampling. • Laboratory-issued reports including QA/QC and summary tabulation of results.
Contact Water Sampling prior to Discharge	To conform to Water License Requirements.	As required prior to discharge.	• Document notification of INAC Inspector (written notification at least 10 days prior to discharge). • Record depth of water in sump. • Calculate approximate water volume to be discharged. • Laboratory-issued reports including QA/QC and summary tabulation of results.
Groundwater Monitoring and Sampling	Date, time, weather, water level, in-well parameters (temperature, pH, electrical conductivity), visual observations of water colour and turbidity, odour.	Water sampling one time per year, between mid-August to mid-September.	• Laboratory-issued reports including QA/QC and summary tabulation of results, trend analysis (after a minimum of four years of data, if applicable).

Table 2: Monitoring Summary and Documentation

Item	Purpose	Frequency	Type of Record(s)
Construction Summary Report	As-built and construction report as per Water Licence.	Submit to Nunavut Water Board within 90 days of completion of construction	• Construction field notes and observations • Record and as-built drawings • Monitoring well installation details. • Summary of any geotechnical testing, compaction, moisture content, particle size analysis.
Site Safety Inspections	To identify any new or previously unnoticed physical/chemical hazards.	Monthly, or when conditions change, or when an unsafe condition is reported by a worker.	• Any unsafe condition/near-miss/incident reports and records. • Any unsafe conditions reported by workers must be reported to the Site Manager immediately for prompt action.
Geotechnical Inspection	To ensure facility has not been degraded or damaged, and to identify any maintenance requirements.	Annually	• Inspection of geotechnical performance of facility. • Document recommendations of any repair/maintenance work. • Record of any repair work made to the facility.

8.0 CLOSURE

We trust this report meets your present requirements. Should you have any questions or comments, please contact the undersigned at your convenience.

EBA, A Tetra Tech Company

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Signature
Date Sept 13/2011
PERMIT NUMBER: P 018
The Association of Professional Engineers, Geologists and Geophysicists of the NWT / NU

REFERENCES

Aker Kvaerner Ltd., 2008, Definitive Feasibility Study, Mary River Iron Ore Project Northern Baffin Island, Nunavut Yellowknife, Northwest Territories. Project Number 179710

Canadian Council of Ministers of the Environment, 1993. Guidance Manual on Sampling, Analysis and Data Management for Contaminated Sites, Volume I: Main Report and Volume II: Analytical Method Summaries. Winnipeg, Manitoba.

Canadian Council of Ministers of the Environment, 1999, Canadian Environmental Quality Guidelines, Winnipeg, Manitoba.

Canadian Council of Ministers of the Environment, 2008, Canada-Wide Standards for Petroleum Hydrocarbons in Soil (CWS-PHC). Winnipeg, Manitoba.

Environment Canada, 2002, Metal Mining Effluent Regulations under the Fisheries Act, P.C. 2002-987 June 6, 2002.

Ferguson, Simek Clark Engineers & Architects, 2003, Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the Northwest Territories. April 21, 2003. Technical Report of the

Government of the Nunavut, 2002, Guideline: General Management of Hazardous Waste in Nunavut. Department of Environment.

Government of the Nunavut, 2009, Environmental Guideline for Contaminated Site Remediation. Department of Environment.

Roger, Pamela, 2005, cold climate Bioremediation: A Review of Field Case Histories. Department of Civil & Environmental Engineering, University of Alberta.

Science Applications International Corporation (SAIC), 2006, Federal Guidelines for Landfarming Petroleum Hydrocarbon Contaminated Soils. Environment Canada. SAIC Canada Project Number 11953.B.S08, CM Number: 0011659.

FIGURES

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WATER

ᑕᒪᐃᐅᓕᖅ ᓄᓇᖅ
CAMP LOCATION

ᓄᓇᓕᒃ
COMMUNITY

ᐊᖏᓂᖅ
(ᓇᓕᐅᑦᑎᓪᓗᒍᓄᖅ) 40 20 0 40 80 120 160 200 ᑭᓪᓕᑦ
SCALE (APPROX.) km

NOTES
BASED ON DRAWING PROVIDED BY BAFFINLAND IRON MINES CORPORATION

CLIENT
Baffinland Iron Mines Corporation

Hydrocarbon Impacted Soils Storage and Landfarm Facility

Site Location Plan

PROJECT NO.	DWN	CKD	REV
E14101092	RH	DF	0

OFFICE	DATE
EDM	September 13, 2011

eba A TETRA TECH COMPANY

Figure 1

NOTES
BASED ON 2005 AERIAL PHOTOGRAPH

0 250
Scale: 1: 5 000 (metres)

CLIENT
Baffinland Iron Mines Corporation

eba A TETRA TECH COMPANY

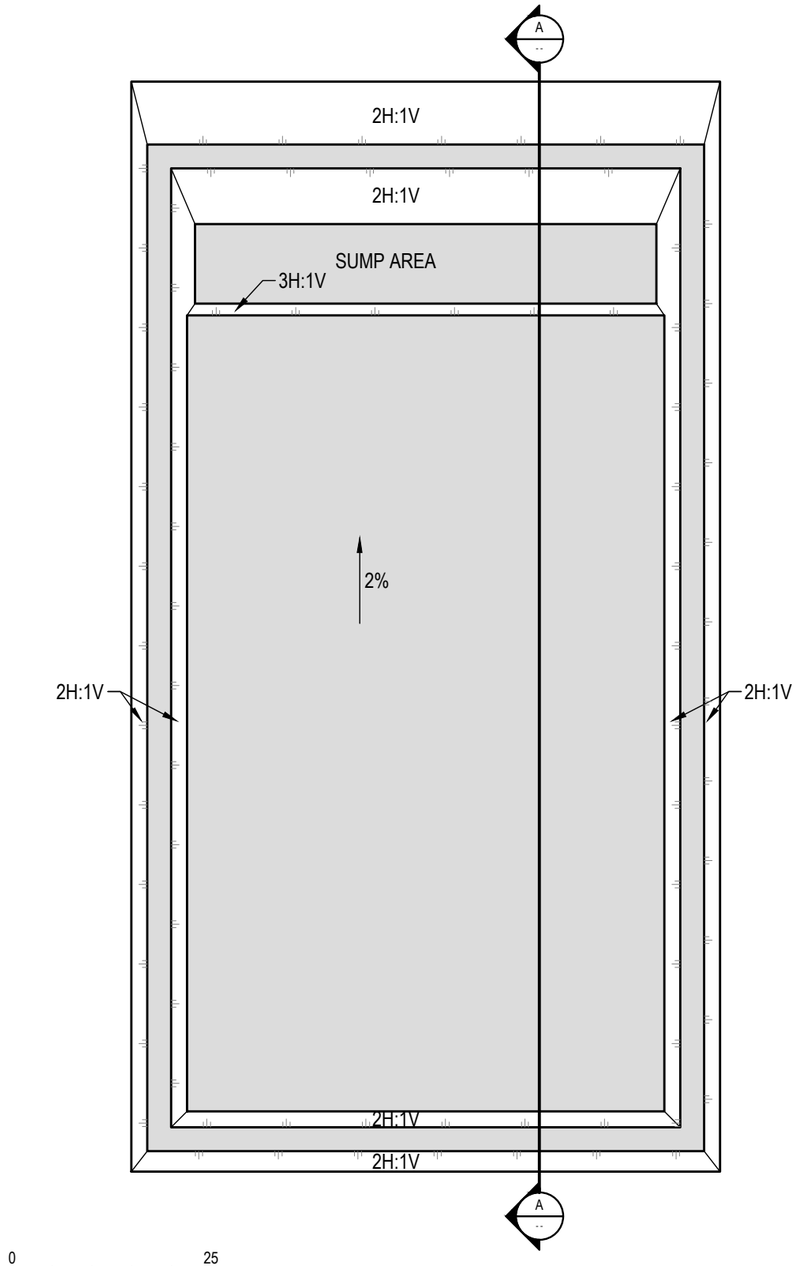
Hydrocarbon Impacted Soils Storage and Landfarm Facility

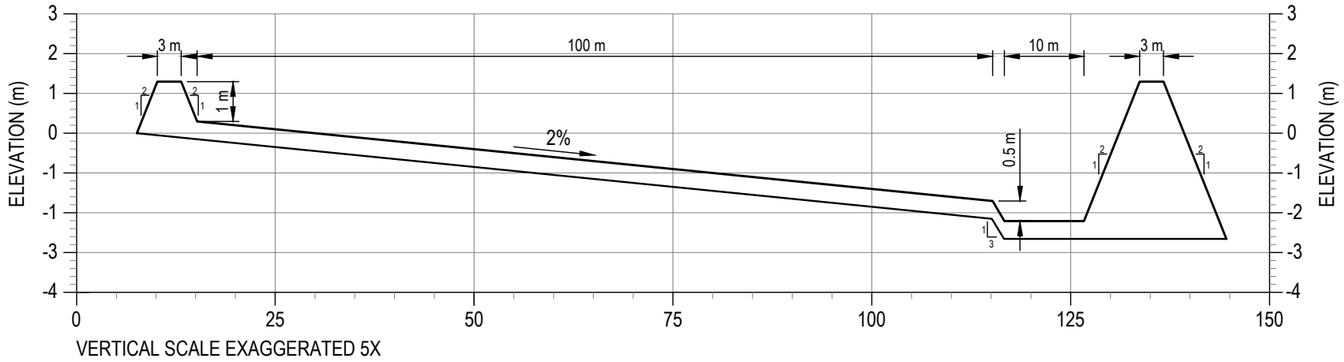
Proposed Landfarm Locations

PROJECT NO.	DWN	CKD	REV
E14101092	RH	DF	0

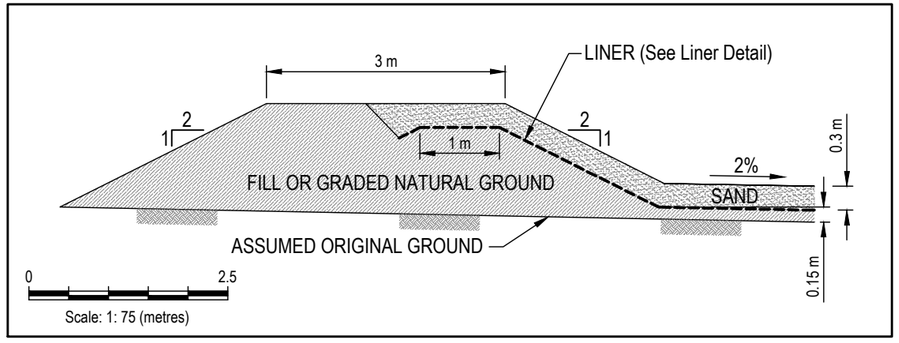
OFFICE	DATE
EDM	September 13, 2011

Figure 2

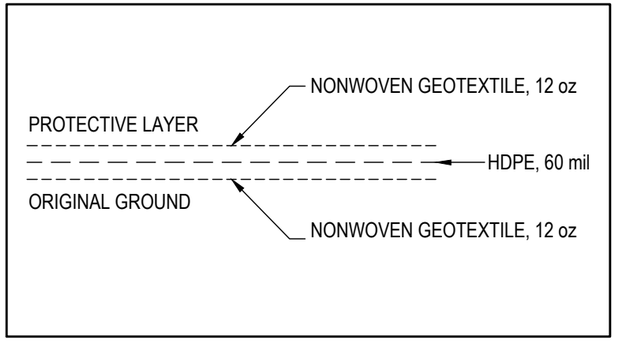




SECTION A



TYPICAL SECTION DETAIL



LINER DETAIL

NOT FOR CONSTRUCTION

NOTES
BERM HEIGHTS AND GRADES TO BE ADJUSTED BASED ON ACTUAL TOPOGRAPHY

CLIENT
Baffinland Iron Mines Corporation

Hydrocarbon Impacted Soils Storage and Landfarm Facility

Preliminary Design of Landfarm Facility

eba A TETRA TECH COMPANY

PROJECT NO.	DWN	CKD	REV
E14101092	RH	DF	0

OFFICE	DATE
EDM	September 13, 2011

Figure 3

APPENDIX A

APPENDIX A EBA'S GENERAL CONDITIONS

GENERAL CONDITIONS

GEOTECHNICAL REPORT

This report incorporates and is subject to these “General Conditions”.

1.0 USE OF REPORT AND OWNERSHIP

This geotechnical report pertains to a specific site, a specific development and a specific scope of work. It is not applicable to any other sites nor should it be relied upon for types of development other than that to which it refers. Any variation from the site or development would necessitate a supplementary geotechnical assessment.

This report and the recommendations contained in it are intended for the sole use of EBA’s Client. EBA does not accept any responsibility for the accuracy of any of the data, the analyses or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than EBA’s Client unless otherwise authorized in writing by EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of EBA. Additional copies of the report, if required, may be obtained upon request.

2.0 ALTERNATE REPORT FORMAT

Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA’s instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of EBA’s instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except EBA. EBA’s instruments of professional service will be used only and exactly as submitted by EBA.

Electronic files submitted by EBA have been prepared and submitted using specific software and hardware systems. EBA makes no representation about the compatibility of these files with the Client’s current or future software and hardware systems.

3.0 ENVIRONMENTAL AND REGULATORY ISSUES

Unless stipulated in the report, EBA has not been retained to investigate, address or consider and has not investigated, addressed or considered any environmental or regulatory issues associated with development on the subject site.

4.0 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

Classification and identification of soils and rocks are based upon commonly accepted systems and methods employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from the system or method prevail, they are specifically mentioned.

Classification and identification of geological units are judgmental in nature as to both type and condition. EBA does not warrant conditions represented herein as exact, but infers accuracy only to the extent that is common in practice.

Where subsurface conditions encountered during development are different from those described in this report, qualified geotechnical personnel should revisit the site and review recommendations in light of the actual conditions encountered.

5.0 LOGS OF TESTHOLES

The testhole logs are a compilation of conditions and classification of soils and rocks as obtained from field observations and laboratory testing of selected samples. Soil and rock zones have been interpreted. Change from one geological zone to the other, indicated on the logs as a distinct line, can be, in fact, transitional. The extent of transition is interpretive. Any circumstance which requires precise definition of soil or rock zone transition elevations may require further investigation and review.

6.0 STRATIGRAPHIC AND GEOLOGICAL INFORMATION

The stratigraphic and geological information indicated on drawings contained in this report are inferred from logs of test holes and/or soil/rock exposures. Stratigraphy is known only at the locations of the test hole or exposure. Actual geology and stratigraphy between test holes and/or exposures may vary from that shown on these drawings. Natural variations in geological conditions are inherent and are a function of the historic environment. EBA does not represent the conditions illustrated as exact but recognizes that variations will exist. Where knowledge of more precise locations of geological units is necessary, additional investigation and review may be necessary.

7.0 PROTECTION OF EXPOSED GROUND

Excavation and construction operations expose geological materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance which can cause severe deterioration. Unless otherwise specifically indicated in this report, the walls and floors of excavations must be protected from the elements, particularly moisture, desiccation, frost action and construction traffic.

8.0 SUPPORT OF ADJACENT GROUND AND STRUCTURES

Unless otherwise specifically advised, support of ground and structures adjacent to the anticipated construction and preservation of adjacent ground and structures from the adverse impact of construction activity is required.

9.0 INFLUENCE OF CONSTRUCTION ACTIVITY

There is a direct correlation between construction activity and structural performance of adjacent buildings and other installations. The influence of all anticipated construction activities should be considered by the contractor, owner, architect and prime engineer in consultation with a geotechnical engineer when the final design and construction techniques are known.

10.0 OBSERVATIONS DURING CONSTRUCTION

Because of the nature of geological deposits, the judgmental nature of geotechnical engineering, as well as the potential of adverse circumstances arising from construction activity, observations during site preparation, excavation and construction should be carried out by a geotechnical engineer. These observations may then serve as the basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein.

11.0 DRAINAGE SYSTEMS

Where temporary or permanent drainage systems are installed within or around a structure, the systems which will be installed must protect the structure from loss of ground due to internal erosion and must be designed so as to assure continued performance of the drains. Specific design detail of such systems should be developed or reviewed by the geotechnical engineer. Unless otherwise specified, it is a condition of this report that effective temporary and permanent drainage systems are required and that they must be considered in relation to project purpose and function.

12.0 BEARING CAPACITY

Design bearing capacities, loads and allowable stresses quoted in this report relate to a specific soil or rock type and condition. Construction activity and environmental circumstances can materially change the condition of soil or rock. The elevation at which a soil or rock type occurs is variable. It is a requirement of this report that structural elements be founded in and/or upon geological materials of the type and in the condition assumed. Sufficient observations should be made by qualified geotechnical personnel during construction to assure that the soil and/or rock conditions assumed in this report in fact exist at the site.

13.0 SAMPLES

EBA will retain all soil and rock samples for 30 days after this report is issued. Further storage or transfer of samples can be made at the Client's expense upon written request, otherwise samples will be discarded.

14.0 INFORMATION PROVIDED TO EBA BY OTHERS

During the performance of the work and the preparation of the report, EBA may rely on information provided by persons other than the Client. While EBA endeavours to verify the accuracy of such information when instructed to do so by the Client, EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

Annex 6

Waste Sorting Guidelines

Baffinland
Iron Mines Corporation

WASTE SORTING GUIDELINES

Why sort waste?

To protect the health and safety of site personnel.

To minimize contamination, wildlife attraction, and other adverse environmental impacts.

Where to sort waste?

Workplaces and the Waste Sorting Area, located next to the incinerator.

Who should sort waste?

Everyone.

All who manage, handle, store and/or dispose of any of the materials mentioned in these guidelines.

- ➡ *All employees and contractors generating the waste are responsible for ensuring that it is labelled and sorted correctly.*
- ➡ *Employees and contractors are also responsible for contacting Site Services Manager on channel 2 when waste containers are full and ready for pick-up.*
- ➡ *For unusual or hard to segregate waste types, please contact the Environment Office.*

INCINERATOR WASTE

Disposal Instructions

Indoors: Black garbage bags in rubbermaid waste bins.

Outdoors: Black garbage bags in 45 gal. drums, consolidation in steel containers with lid.

Acceptable Waste

Cardboard
Food Scraps
Oily Rags
Paper
Scrap Wood
Small Plastic

LANDFILL WASTE

Disposal Instructions

Outdoors: Steel Containers.

Access to the landfill is for Authorized Personnel Only. Landfill Operators should refer to the landfill user rules for more information.

Acceptable Waste

Concrete
Corrugated Cardboard
Empty Clean Container
Glass
Metal
Bulky Wastes (after approval by Environment Office)
Wood Products

HAZARDOUS WASTE

Waste Type	Disposal Instructions
Absorbent (used)	White Quatrex or overpack drums
Aerosol Cans	Labelled bins outside bathrooms; overpack drums outdoors
Antifreeze	Cubes or drums (closed top)
Batteries (AA, 9V, etc)	Labelled bins outside bathrooms
Batteries (vehicle)	Black Quatrex
Contaminated Soils	White Quatrex or overpack drums
Contaminated Water	Drums (closed top)
Electronic Waste	White Quatrex
Fluorescent Bulbs	20L pails outside bathrooms
Mixed Waste Containers	White Quatrex (antifreeze, grease, oil and polymer)
Waste Fuel	Drums (closed top)
Waste Grease	Overpack drums
Waste Oil	Cubes or drums (closed top)
Waste Oil Filters	Drums (open top)