Indian and Northern Affairs Canada
Affaires indiennes et du Nord Canada

Nunavut Regional Office
P.O. Box 2200
Iqaluit, NU, X0A 0H0

Date March 30, 2006

Phyllis Bealieu
Manger of Licensing
Nunavut Water Board
P.O. Box 119 Gjoa Haven,
Nunavut X0B 1J0 Canada

RE: Annual Report for Water Licence Number NWB 5EKA0406 Type B (FOX-C)

As per Clause 1 of PART B: GENERAL CONDITIONS of the above license, attached please find the required annual report.

If you have any questions or comments regarding this project, please do not hesitate to contact the Project Manager, Bob Martin at martinro@inac.gc.ca., or by telephone at (867) 979-7931.

Sincerely,

Natalie Plato
Director, Contaminated Sites
Building1553, P.O. Box 2200
Iqaluit, NU, X0A 0H0
Tel (867) 979-7934 Fax (867) 979-6445
Email: platon@inac.gc.ca
Indian and Northern Affairs Canada, Nunavut Regional Office

Attachments

Canada

ANNUAL REPORT

Water Licence No. NWB5EKA0406 TYPE "B"

EKALUGAD FJORD PROJECT

Report submitted to:

NUNAVUT WATER BOARD
by:

Indian and Northern Affairs Canada
Affaires indiennes et du Nord Canada

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QIKIQTAALUK CORPORATION

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QIKIQTAALUK ENVIRONMENTAL

March 2006

EXECUTIVE SUMMARY

As part of the Ekalugad Fjord clean up Project, Qikiqtaaluk Corporation (QC) holds, on behalf of Indian and Northen Affairs Canada (INAC), a Water Licence (NWB5EKA0406 TYPE "B") from the Nunavut Water Board. The annual report, in compliance with the licence, presents various information in the following sections:

a. Fresh Water Quantities
b. Sewage Water Quantities
c. Waste Discharge
d. Summary of Construction Work
e. Surveillance Network Program
f. Environmental Monitoring Program
g. Anticipated Work
h. Studies Requested
i. Unauthorized Discharges
j. Communication Exercises
k. Contingency Plan Revisions
l. Trenches and Sumps
m. Clean Up Procedures
n. Public Consultation
o. Concerns Addressed
p. Other Details
q. Inuktitut Executive Summaries

In reference to this annual report, several documents are appended. In summary, during the 2005 season all conditions of the Water Licence were complied with.

GENERAL CONDITIONS

As licensees, Qikiqtaaluk Corporation (QC) and Indian and Northen Affairs Canada (INAC) have implemented various procedures to comply with conditions described in the Water Licence (issued on June 12th, 2005) related to the Ekalugad Fjord Project. The following document summarises water use data and describes various activities conducted on-site as required by the General Conditions of the Permit.

A. Fresh Water Quantities

During the 2005 season only one load of water was taken to the camp. Only one load of water was needed because bottled water was used for drinking and food preparation and the toilets were not used. The fresh water was pumped from a small creek that passes under the road from the camp to the lake approximately 600 m along the road from the 2 beach POL reservoirs. During the work season fresh water was pumped from the creek into a 13,000 litre polyethylene tank mounted on a roll off platform. The tank was moved using a roll off truck and emptied into a polyethylene lined steel storage tank (26,500 litres) located in one of the main camp trailers. Fresh water was mainly used for showers, clothes washing and dishwashing. The following table presents the monthly and annual quantities of fresh water used for the project. Small amounts of fresh water was also used for dishwashing in the kitchen. Not all of the water brought to the main camp reservoir was used, and it was emptied onto the land at the end of the season.

Period	June	July	August	September
Water volume used (m^3)	0	0	0	10
Total volume (m^3)	10			

The permit stipulates that no more than 10 m^3 of fresh water per day be used. This requirement was met.

Work on the water supply system will be done next season when the camp setup is complete.

B. Sewage Water Quantities

Sewage water generated during the 2005 season consisted of grey water only. There were no toilets (cat holes were used) so no black water was generated. The grey water was discharged on the land more that 100 m away from any water body. Approximately 2,000 litres of grey water was generated since it was for use in the showers and washing clothes only. The remainder of the water in the camp reservoir was discharged on the land at the end of the season.

Period	June	July	August	September
Grey water volume generated (m^3)	0	0	0	2
Total volume (m^3)	2			

C. Waste Discharge

Solid waste produced during on-site activities was transferred to a covered metal vault outside the camp on a daily basis and incinerated using a Westland incinerator (model CY-120-FA). Solid waste mainly originated from the kitchen operations and from discarded packaging of materials and supplies. The following table presents the monthly and annual quantities of solid waste managed during the 2005 field season at Ekalugad Fjord. Estimates are based on the assumption that every person in the camp generated, on average, approximately 2.5 kg of solid waste per day.

Period	June	July	August	September
Waste generated (M.T.)	0	0	0	0.3
Total (M.T.)	0.3			

D. Summary of Construction Work

No construction work was carried out in 2005 as the camp was not able to be setup due to adverse weather and soil conditions.

E. Surveillance Network Program

The surveillance Network Program was not initiated in 2005 as remediation activities were not executed during the 2005 season

F. Environmental Monitoring Program

No environmental monitoring was carried out as remediation activities were not executed during the 2005 season

G. Anticipated Work

The tasks anticipated for the 2006 field season are listed below:

Mobilisation is scheduled for early June (date is weather dependent)

Camp setup will need to be completed

Camp will be setup on existing platform using wood blocks to level the trailers

GENERAL CONDITIONS

As licensees, Qikiqtaaluk Corporation (QC) and Indian and Northen Affairs Canada (INAC) have implemented various procedures to comply with conditions described in the Water Licence (issued on June 12th, 2005) related to the Ekalugad Fjord Project. The following document summarises water use data and describes various activities conducted on-site as required by the General Conditions of the Permit.

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Sewage Lagoon will need to be installed
Garage will have to be constructed

Road repairs

Road from the beach to the upper site needs to have washouts repaired and the surface upgraded to allow for heavy equipment operations
Repairs will have to start from the lake towards the beach
Then from the lake to the upper site once all of the snow has melted

Landfarm Construction & Operation

A Landfarm for treating soils contaminated with diesel fuel will be constructed
The landfarm will be lined and have berms and a water collection system to ensure that the contaminants stay inside the landfarm
Monitoring wells to be installed to check for leakage of the contamination

Lower Site Non-Hazardous Landfill

Berms to be constructed on existing ground surface
Waste to be placed in lifts with soil between each lift to reduce settlement
Monitoring wells to be installed to check for leakage

Lower Site Hazardous Waste Processing Area

To be setup near the Non-Hazardous Waste Landfill
Area will be used to:
- Sort, package, sample, and process hazardous waste materials; and
- Consolidate compatible liquids and sediments, package for shipment, and cleaning of barrels

All work will be done inside contained areas to reduce the chance of a spill
Will be moved to Mid-Station area once Beach and Lake work is complete

Debris Removal

Starting at the beach and proceeding to the lake area all visible debris will be collected using ATV's and trailers
All Non-Hazardous debris will be consolidated in the Non-Hazardous Landfill
Any Hazardous debris will be sorted at the Hazardous Waste Processing Area

Drums in the River

All visible drums to be removed from the river
This work will have to be done before August 7th to ensure there is no impact on fish migration
Work can be completed after September 7th when the fish have finished migrating
If any fish are seen in the river then work will stop immediately until the fish have moved on

Excavation of Beach diesel fuel contaminated soil

Soil contaminated with diesel fuel to be hauled to the landfarm for treatment

Beach Area Regrading

Small area at beach to be filled to match surrounding terrain after debris have been removed

Water Lake diesel fuel contaminated soil excavation

Soil contaminated with oil & grease to be excavated and hauled to the Beach Non-Hazardous Landfill

Regrading - Water Lake area

Small area at the Lake to be filled to match surrounding terrain after debris have been removed

Mid-Station Debris removal and drum processing

All visible debris will be collected using ATV's and trailers, and Heavy Equipment
All Non-Hazardous debris will be consolidated in the Non-Hazardous Landfill
Any Hazardous debris will be sorted at the Hazardous Waste Processing Area

Excavation of Mid-Station pad contaminated soil

Small area of diesel fuel contaminated soil to be excavated after debris removal from dump

Construction of the Mid-Station Non-Hazardous Waste Landfill

Landfill to contain all non-hazardous waste from the mid and upper stations
To be constructed once all contaminated soil has been excavated and debris have been removed

Mid station dump lobe B excavation

Debris and drums to be removed

Mid-Station regrading

Areas to have fill added to match surrounding terrain

In-situ Upper-Station Landfarm

Area around POL tanks to be remediated in place (this soil may be transported to the landfarm platform - to be decided after evaluation of all options is completed)

Building Demolition and PCB Amended Paint

Some of the Paint on the buildings contain PCB's
The buildings to be demolished that contain PCB amended paint will be cutup and placed in seacans for disposal offsite.
All non-hazardous building debris are to be placed in the Mid-Station Landfill

Asbestos Abatement

Asbestos will need to be removed from all site buildings before demolition

End of Season 2006

All work sites will be winterised

All equipment will be stored and winterised
Culverts will be removed
Camp Buildings will be closed and winterised

H. Studies Requested

No studies related to waste disposal, water use or reclamation were requested by the Board.

I. Unauthorized Discharges

No unauthorized discharges of liquid or solid waste were observed and/or recorded during the 2005 field season at Ekalugad Fjord.

J. Communication Exercises

All site workers (including sub-contractors) were instructed on camp rules and safety requirements. Fire safety and spill contingency plans were implemented.

K. Contingency Plan Revisions

Please see Appendix A for the revised spill contingency plan.

L. Trenches and Sumps

No new trenches or sumps were excavated during the 2005 season.

M. Site Activities

During the 2005 season, site activities included:

- First ship arrived at Ekalugad Fjord on August 26th, 2005
- First site visit was on August 31st, 2005
- Mobilisation to the site was on September 1st, 2005
- Setup of temporary construction camp
- Camp pad location was chosen
  - Approximately 3,000 m^3 needed to level area
- Road Repairs:
  - Three washouts needed to be repaired to access the borrow pit
  - Road surface was upgraded to allow for heavy equipment operations
- After 5 days of hauling and a one night of a fine misty rain the road could no longer be used due to road surface degradation
- The road surface was smoothed out using an excavator and a bull dozer for the winter
- All materials & equipment were moved up from the barging area out of the mud
- Buildings & sea cans were lifted out of the mud

- Drums of diesel fuel and gasoline could not be moved using loaders:
  - Some drums moved using the helicopter
  - Other drums transported using a platform installed on the front of the D6
- Second ship arrived at Ekalugad Fjord on October 17th, 2005

N. Public Consultation

March 2005: Community representatives came to Iqaluit and received training on how to do business with government. The representatives also attended the project bidders meeting and met companies interesting in participating in the project.

September 2005: QIA representatives were taken to the site;

September 2005: Local workers assisted on site in securing the equipment and materials for winter

O. Concerns Addressed

No concerns or deficiencies related to the project were addressed during this past year.

P. Other Details

No other details on water use or waste disposal were requested by the Board.

Q. Inuktitut Executive Summaries

The executive summary in Inuktitut of *Ekalugad Fjord Water Licence Annual Report 2005*, INAC/QC/Qikiqtaaluk Environmental Inc., is presented at the beginning of this report.

The following summaries in English and Inuktitut are presented in Appendix B:

English and Inuktitut executive summaries for the report "Archaeological Impact Assessment FOX-C Dew Line Site Remediation Program, Permit 05028A" Prepared for Jacques Whitford by FMA Heritage Resources Consultants Inc., October 2005

English and Inuktitut executive summaries for the report "Screening and Proposed Site Remediation at the Former FOX-C DEW Line Site at Ekalugad Fjord" , Nunavut, Jacques Whitford March 31st, 2005

English and Inuktitut executive summaries for the report " Human Health and Ecological Risk Assessment for CAM-F Dew Line Site, Sarcpa Lake" Jacques Whitford, February 4th, 2005

English and Inuktitut executive summaries for the report "Natural Environment of the FOX-C DEW Line Sit Ekalugad Fjord, Baffin Island, Jacques Whitford, October 2004

English and Inuktitut executive summaries for the report " Diesel Contaminated Soil at Ekalugad Fjord: the Landfarming Option" Analytical services Unit, Queens University, March 2006

APPENDIX A

REVISED SPILL CONTINGENCY PLAN

SPILL CONTINGENCY PLAN

Clean Up and Camp Service

FOX-C Dew Line Site

EKALUGAD FJORD PROJECT

Prepared for: Public Works and Government Services Canada
Environmental Services Western Region
10250 Jasper Avenue, 5th Floor
Edmonton, Alberta, T5J 1S6
Attention: Brad Thompson, P.Eng

Prepared by: Qikiqtaaluk Corporation
P.O. Box 1228
Iqaluit, Nunavut, X0A 0H0

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QIKIQTAALUK CORPORATION

July 2005 (revision 1: December 2005)

EXECUTIVE SUMMARY

The clean up activities at Ekalugad Fjord shall be conducted over a period of three years starting in August 2005. Investigations performed at this abandoned former Intermediate Dew Line station (FOX-C) located in the Canadian Arctic have demonstrated the extent of environmental problems from past occupation.

This document describes requirements for fuel spill emergency planning to be implemented during the clean up and camp service works. It includes:

a– Duties and Responsibilities
b– Fuel and Lube Requirements and Storage Capacity
c- Training and Drills
d- Material and Equipment
e- Emergency Procedures
f– Reporting Requirements

The Ekalugad Fjord Clean Up project mainly consists in the management of immediate health and environmental risk problems such as contaminated soils, PCB amended paint, asbestos, and barrel contents (POL products). It also involves the decommissioning of abandoned facilities including landfill closure. For the camp service project, a remote construction camp will be operated and managed to accommodate the working crew. Approximately 40 persons will occupy the camp over a 75 day period from July 1 to September 15.

This project is administered by Public Works and Government Services Canada (PWGSC), acting on behalf of the owner, Indian and Northern Affairs Canada (INAC). Following competitive tenders, the clean up and camp services projects were granted to Qikiqtaaluk Corporation, a company owned by the Qikiqtani Inuit Association (QIA), the Inuit birthright organization representing the Baffin region of Nunavut.

The Ekalugad Fjord Clean Up project shall provide employment and training benefits for Inuit. It shall also attenuate local inputs from pollution to the nearby communities, thereby protecting health and future of the Inuit.

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PREAMBLE

The Spill Contingency Plan shall be effective from August 2005 until October 2008, date to which the Ekalugad Fjord Clean Up and Camp Service Projects (61° 35' N and 60° 40' W) shall be completed.

The following formal distribution has been made of this Plan.

Harry Flaherty, Qikiqtaaluk Corporation, Iqaluit
Brad Thompson, PWGSC, Alberta
Robert Martin, INAC, Contaminated Sites Program, Iqaluit
Nunavut Water Board, Gjoe Haven

Additional copies and updates of this Plan may be obtained by writing to:

Philippe Simon, Ph.D., P.Eng.
Qikiqtaaluk Environmental Inc.
3333 Queen Mary road, suite 580
Montreal, PQ, H3V 1A2
psimon@qenv.ca

1-GENERAL

The spill emergency plan was developed to assist the Contractor in implementing measures to protect the environment and minimize impacts from spill events. It provides precise instructions to which all personnel shall be familiarized with during emergency situations. The Plan outlines procedures for responding to spills in a way to minimize potential health and safety hazards, environmental damage, and clean up costs.

The map presented on the following page shows the existing layout of the site. Ekalugad Fjord is located on the east coast of Baffin Island, Nunavut (68° 42' N, 68° 33' W), approximately 195 km south of Clyde River. The site (FOX-C) is about 1.5 km inland from the coast, on the south shore of Ekalugad Fjord. The operations station (upper site) is situated 770 m above sea level, overlooking the Fjord which discharges into Home Bay. The upper site contains areas of environmental concern such as patches of PCB and metal contaminated soil, four dumps, building materials contaminated with PCB amended paint and Asbestos (Module train), a POL drum storage area, and some 3,400 drums scattered on and around the site (some of which still contain POL products). Three buildings, two POL tanks and a collapsed antenna, which will have to be demolished, are also present on site.

The beaching area (lower site) is located in Qarmaralik Cove, about 3 km northwest of the upper site. From the beach, a gravel road leads to the fresh water lake area (lower site), located some 2.5 km away. The main environmental concern associated with the lower site are the 6,600 or so drums located in several caches and scattered along the road, the lake shore as well as in the river valley between the lake and the ocean. Some of these drums still contain POL products. The lower site also has potentially large volumes of hydrocarbon contaminated soils. Furthermore, there are 2 POL tanks and a refuelling pipeline to be demolished.

The upper site is located some 6.5 km from the beaching area by gravel road. The road which links the beach to the lake and to the upper site has been badly damaged by erosion throughout the years. In many places the road is impassable and will need repair.

The spill emergency plan insures that the Contractor will respect all applicable laws, regulations and requirements of federal and/or territorial authorities. The owner is acquiring all required permits, approvals and authorizations required for the project. The Contractor will comply with those permits and approvals obtained by the owner (INAC) to conduct this work. The Contractor will work in close collaboration with PWGSC and DIAND, and with all regulatory authorities to ensure full compliance

according to applicable federal or territorial laws, regulations and/or guidelines. The following documents shall be used as guidelines for spill containment:

- The *Canadian Environmental Protection Act* controls hazardous substances from their production and/or import, their consumption, storage and/or disposal. Furthermore, this act also includes procedures to handle specified levels of PCB contaminated materials, and requirements for PCB storage facilities.

- The *Fisheries Act* protects fish and their habitat from pollution, disturbance, or fish movement disturbances. Fisheries and Oceans Canada is responsible to review permit applications or restoration plans submitted by other agencies.

- The *Transportation of Dangerous Goods Act* and *Regulations* describe safety measures in the transportation of dangerous goods. The act applies to all handling of dangerous goods by any means of transport whether or not the goods originate from or are destined for any place(s) in Canada.

- The *Territorial Land Use Regulations* define regulatory measures to maintain appropriate environmental practices for any land use activities on territorial lands. These regulations require that land use permits be issued for such operations as the clean up work to be conducted at Ekalugad Fjord (use of heavy machinery, camp operation, use of explosives, construction of access roads, etc.).

- The *Guidelines for Preparation of Hazardous Material Spill Contingency Plans* describe parameters that should be considered in the development of hazardous material spill emergency plans. It also defines the information that should be incorporated into a comprehensive contingency plan.

- The *Code of Practice for Used Oil Management* defines appropriate environmental options for handling, storage, collection, recycling, transportation, reuse and/or disposal of used oils in Canada. It gives standard procedures to handle used oil generators. It also helps regulatory authorities to formulate provincial and/or regional strategies for used oil management.

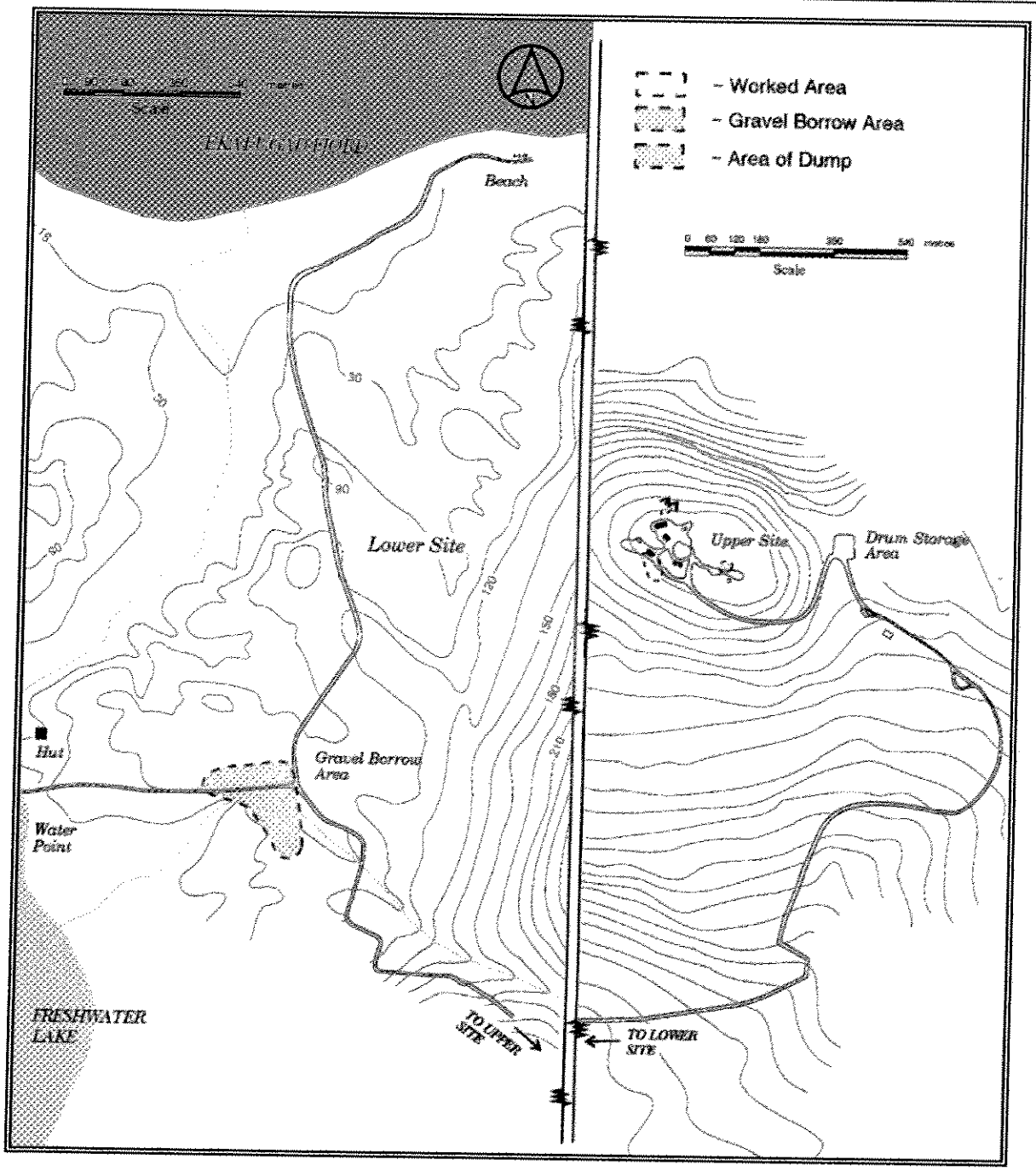


Figure-1: Ekalugad Fjord Project Site Layout
(courtesy of ESG)

- The *NWT Environmental Protection Act* governs the protection of the environment from contaminants. The act defines offenses and penalties as well as the powers of environmental inspectors.

- The *Code of Practice for Used Oil Management* defines appropriate environmental options for handling, storage, collection, recycling, transportation, reuse and/or disposal of used oils in Canada. It gives standard procedures to handle used oil generators. It also helps regulatory authorities to formulate provincial and/or regional strategies for used oil management.

- The *NWT Environmental Protection Act* governs the protection of the environment from contaminants. The act defines offenses and penalties as well as the powers of environmental inspectors.

- The *NWT Spill Contingency Planning and Reporting Regulations* describe requirements for spill reporting and emergency planning.

- The *Field Guide for Oil Spill Response in Arctic Waters* developed by the Emergency Prevention Preparedness and Response, a program of the Arctic Council, describes response methods and strategies for operations and provides technical support documentation.

2-FUEL AND LUBE REQUIREMENTS AND STORAGE CAPACITY

A variety of fuels, oils and other hazardous materials will be used during clean up activities at the Ekalugad Fjord site. The greatest volumes involved consist in diesel fuel. Other substances such as aviation fuel, lubricant oils, hydraulic fluid, antifreeze, fuel additives, gasoline, engine coolants, cleaning solvent (DIPSOL and SUPREX) are used but their volumes are small compared with diesel fuels. All these products are to be considered as potential environmental and safety hazards.

The following table summarizes the estimated quantities mobilized on site.

Table-1: Quantities of Petroleum Products stored on site

Liquids to be used	Estimated Volumes (Litres)
diesel fuel	356,640
Aviation Fuel (Jet A1)	41,000
Gasoline	10,250
Engine oil	4000
Transmission oil	1000
Differential oil	600
Hydraulic oil	1000
Coolant	600
DIPSOL	205
SUPREX	205

The MSDS of all these products are found in appendix 1. All petroleum products were delivered to the site (by marine shipment) in 205-Litre drums strapped on pallets. Once used, all these UN approved drums will be either sent back down south by marine shipping during site demobilization to the supplier to recover the deposit, or crushed and landfilled on site, if damaged. A variety of intermediate fuel tanks will also be used to:

- Supply the camp generator: 2 above ground fuel tanks having a capacity of 1360 litres each (i.e. 300 gal) located within the seacans in which gensets are installed. These fuel tanks will be filled from drums using a 12-Volt fuel pump (20gpm).

- Supply the different heavy equipments on the field: One 683 litre tank (150 gal) and two 1140 litres (250 gal) installed in the back of Ford F250 pick up trucks. These fuel tanks will be filled from drums using a 12-Volt fuel pump (20gpm). A 12-Volt fuel pump will also be used to transfer the fuel from these tanks for equipment reservoirs.

For all petroleum products stored in drums, the following storage facility is to be used:
The drum storage will be installed about mid way between the beach area and the water lake area, near borrow are #4, at distance away from highwater mark and traffic to comply with all conditions of permits (see figure 3 for location). Small berms will be constructed around the storage area (to contain spills from accidents), spill kits (see below) will be installed in the vicinity and restricted area/no smoking area placards will be posted. The area will be graded to have a smooth gravel pad prior to haul pallets from the beach (sealift unloading) to the storage area.

Hand operated pumps are to be used for fuel transfer operations with drums of gasoline, oils and lubricants.

3-DUTIES AND RESPONSIBILITIES

As part of the spill emergency response, the Contractor is responsible of implementing, through its site superintendent or its authorized representative, the following procedures:

a- To communicate immediately the spill event to the PWGSC official (immediately shall mean upon discovery).
b- To authorize the use of personnel and applicable equipment to contain the spill using the most reliable method.
c- To eliminate all fire hazards and potential ignition sources near the spill area.
d- To implement all required safety and security procedures at the site of the spill.
e- To eliminate the source of the spill or reduce the rate of discharge, if such procedures can be implemented with respect to health and safety requirements.
f- To contain the spill using the most appropriate methods for the situation (dykes, ditches, sorbent materials, containment booms and other barriers).
g- To evaluate the possibilities of recovering spilled chemicals.
h- To mobilize all available personnel, equipment and tools, as required.
i- To obtain assistance from PWGSC (through its official), from DIAND (the owner) and/or from Environment Canada, if required. To consult and, if required, request assistance from the Canadian Coast Guard and/or and Fisheries and Oceans

Canada if the spill affects water.

j- To obtain additional assistance by hiring northern residents from local communities and/or specialized spill response firms, if required.

k- To comply with all applicable guidelines and regulations.

l- To assess on a preliminary basis, environmental impacts on marine, freshwater and terrestrial wildlife and on the general ecosystem and then to communicate with relevant authorities.

m- To provide documentation for all events and actions.

n- To report the event to the GN Spill Report Line and to prepare and submit a written spill report using the appropriate form (see below for the list of information required for such submittals).

As part of the spill emergency response, the Site Superintendent is responsible for the implementation of the following procedures:

a- To ensure that appropriate resources required to respond and clean up the spill are made available.

b- To supervise containment, clean up and restoration operations.

c- To provide documentation for all events and actions.

d- To notify relevant government authorities.

The site superintendent, acting as the incident commander, will have authority over the following department/unit, each having a specific role for the spill response operations:

Table-2: Roles of Key personnel under the site superintendent for spill response

Department/Unit	Responsibility
Fire Chief	Ensure existing conditions do not present a fire/explosion hazard
Health & Safety Officer	Ensure spill response workers are not exposed to health and safety risks
Contractor's Site Engineer	Coordinate spill response methods and procedures
Medical / Rescue Unit	Provide assistance to victims (if required)
Spill Response Team Leader	Implement the containment and clean up activities
Containment Unit	Perform spill response
Clean up Unit	Conduct remediation

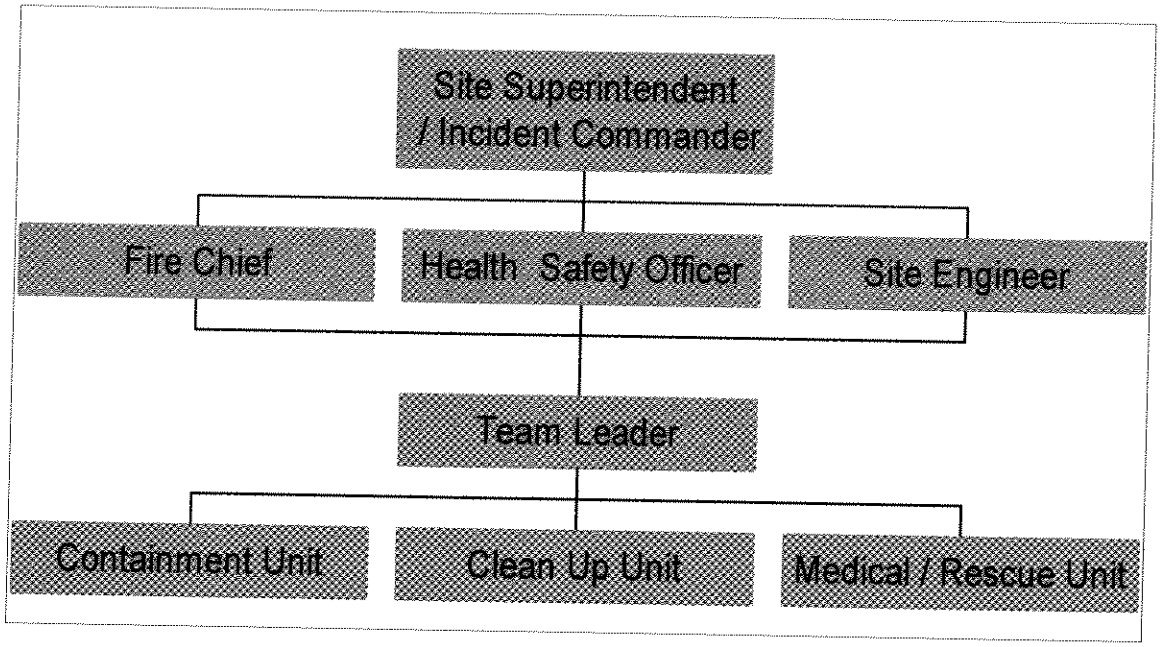


Figure-2: Emergency Response Team

Once a spill event is reported, the site superintendent, fire chief, health & safety officer and site engineer shall meet to establish a specific strategy for containing and controlling the spill and to initiate the clean up activities. They shall delegate a person - the Spill Response Team Leader - to oversee the implementation of the strategy. Members of the Ekalugad Fjord Fire / Rescue Team, under the direction of the Spill Response Team Leader shall then coordinate the activities of the Containment and Clean up Units. Figure-2 shows a graphic representation of the emergency team and chain of command.

Otherwise, the Contractor will ensure that any selected shipment company have prepared the contingency plans (emergency response plans {ERP}) required to face spill events, and that they can comply with all applicable regulations. The shipment company will be responsible to register their ERP, if required, with the Director General of the Transport of Dangerous Goods Directorate if materials identified for transport are exceeding volumes listed on schedule XII of the TDG regulations. The ERP shall contain information on the nature of risks from dangerous goods and contact names and numbers for emergency assistance.

If during transport, a spill of hazardous materials exceeds the volumes listed in Part 9, Table I of the TDG regulations, the shipment company authorities will have to immediately notify the relevant authorities using the contact lists defined in Table II of the same regulations. The shipment authority will also have to inform his/her employer, the owner of the transport vehicle, and the dangerous goods owner. The shipment authority's employer will then be required to submit a written report to the TDG Director General within 30 days following the spill event.

The Contractor will ensure that the selected shipment company reports the spill events, if those occur, using the appropriate spill response line. Quantities of substances which represent "a spill" are listed in schedule B of the NWT Spill Contingency and Reporting Regulation.

If a spills occurs on water during shipment of material, the shipment company will be responsible to deploy containment booms and recover as much fuel as possible with required and available equipment.

4-TRAINING AND DRILLS

All personnel on site shall be informed that any spill of fuel and/or hazardous liquids or solids, whatever the extent, has to be reported immediately to the site superintendent or his authorized representative.

The site superintendent and the health and safety officer shall select a group of 4 to 6 on-site workers to be assigned to spill containment in case of emergency. These persons shall be aware of available spill containment equipment, protective clothing and containers and shall be responsible to implement procedures and coordinate other workers if required. These persons shall also be aware that defensive actions and techniques employed will depend on a variety of factors. These include, but are not limited to:

a- type of pollutant;
b- degree of loss;
c- topography of the nearby area; and
d- proximity to water.

Also, they should know that the most common pollution incident potentially occurring at the Ekalugad Fjord site will probably be caused by fuel, oil or other hazardous fluid spills onto land or water resulting from:

a- human error during transfer operations of fuel from storage drums to day tanks;
b- rupture of lines, tanks or valves from accidental damage, deterioration or equipment

failure; and

c- leaks from fittings or valves.

Finally, the spill containment team shall be aware that, if a spill occurs, the protection of human health and safety shall be a priority. Even if emergency procedures are attempted to rapidly clean, contain and dispose released contaminants to minimize further environmental impact, human exposure during spill event is to be considered as a real concern and be prevented.

The Contractor site superintendent shall organize a drill with each rotating spill containment team near the beginning of each season. These drills shall mainly be used to determine the time required to mobilize equipment at the drum storage area.

5-MATERIAL AND EQUIPMENT

In order to prevent spills and provide an appropriate response in case of spill events, the Contractor maintains on-site appropriate equipment and material required. These equipment and materials are present on site. A list of spill prevention and spill containment equipment including protective clothing is presented below. Figure-3 presents the locations of hazardous material and spill kits on site.

5.1 Spill Prevention

The materials and equipment used for spill prevention are essentially related to waste oil incineration, temporary fuel tank inspection, and temporary containment basin construction:

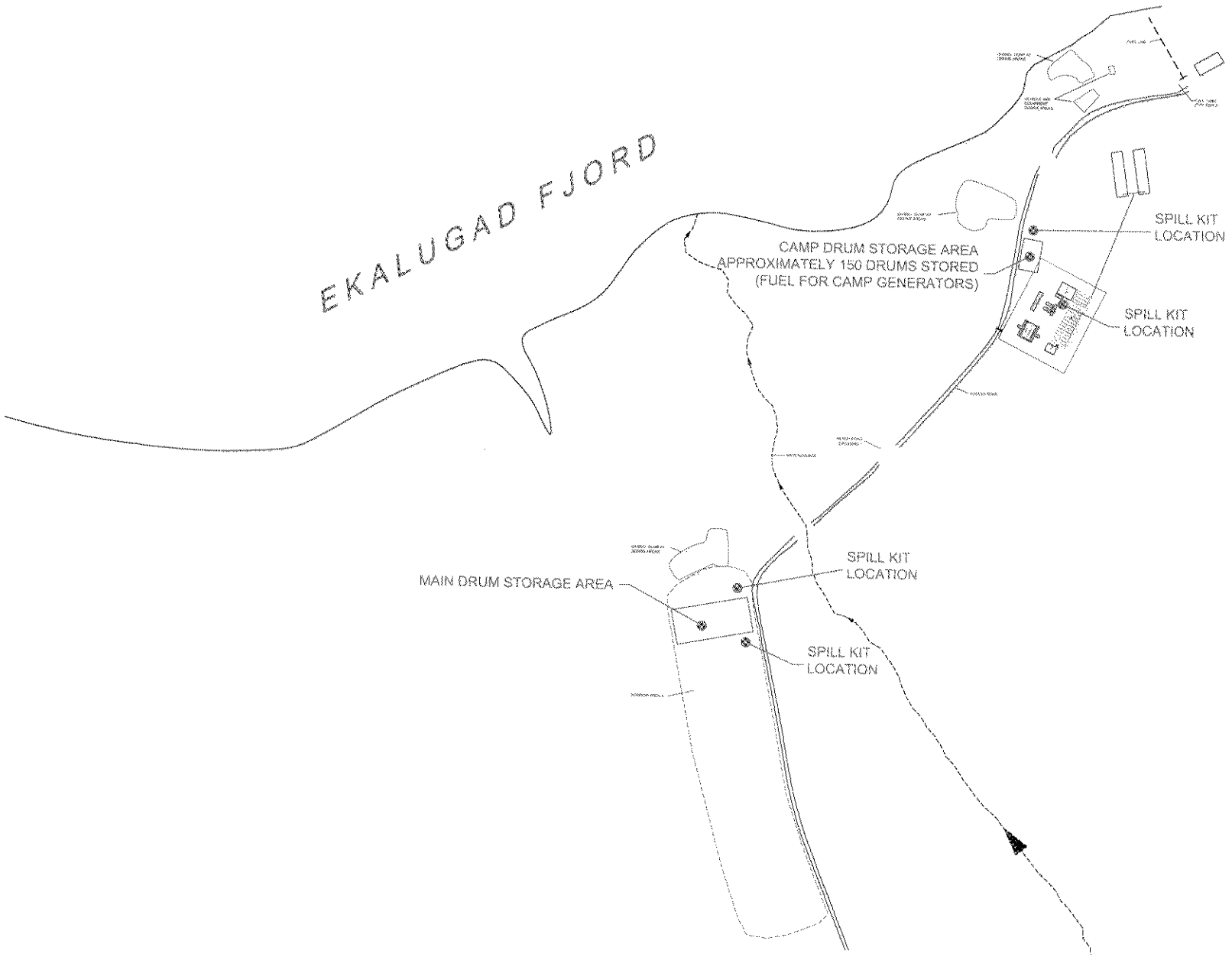
Qtt	*Description*
1	roll of HDPE geomembrane
2	Westland waste oil burner

5.2 Spill Containment

The material and equipment to be used for spill containment and emergency response including protective clothing are:

Qtt	*Description*
5	Containerized spill kits having 10 sorbent booms, 2 safety glasses. 2 Nitrile gloves, 100 sorbent sheets
10	Rolls of (38" x 144') sorbent sheets

5	100 metre long/8 inch diameter oil sorbent booms
1	Vacuum suction hose/tank installed on a trailer
2	1 ½" and 2" x 25 ft oil hose c/w kamlock fittings
10	Emergency eye wash station c/w saline solution
10	First aid kit
2	Case of disposable coveralls (50 per case)
2	Cat bulldozer (D6)
2	Cat excavators (320L and 322BL)
2	Cat integrated tool carriers (950 and IT38) c/w snow/gravel bucket, 4 ft forks, material handling arm
1	Cat dump trucks (D250)
3	Dump trucks (Mack and GMC)
1	Bobcat 763 skid loader
25	Fire extinguishers
4	Fire extinguishers, class ABC, 20 lbs dry chemical
1	high pressure air compressor c/w moisture separator, low pressure regulator, adaptor to recharge fire extinguishers and Scott paks
4	Scott air pak (Draeger)
8	spade nose shovels
1	Electric fuel pump - stationary 115 V, approx. 15 USGAL/min , explosion proof switch, water sediment filter
200	Leather work gloves
100	Rubber gloves
20	Nitrile gloves
15	Cartridge half mask respirator
1	Cartridge full face respirator
40	Organic vapour cartridges
120	Pre-filters and filter clips
500	Disposable dust masks
40	Rubber boots steel toe and shank
40	Safety goggles
100	Saranek & Tyvek suits


EKALUGAD FJORD
CAMP DRUM STORAGE AREA
APPROXIMATELY 150 DRUMS STORED
(FUEL FOR CAMP GENERATORS)
SPILL KIT
LOCATION
SPILL KIT
LOCATION
MAIN DRUM STORAGE AREA
SPILL KIT
LOCATION
SPILL KIT
LOCATION

6-SPILL RESPONSE PROCEDURES

Following a spill event, specific procedures shall be implemented by the person who first noticed the emergency situation. These procedures are as follows:

a- Immediately warn other personnel working near the spill area.

b- Evacuate the area if health and safety are judged to be threatened.

c- If not, take appropriate measures to stop, contain and identify the nature of the spill.

d- Report to the PWGSC site representative and the Contractor's site superintendent all relevant information concerning the spill event such as the type and volume of contaminant, the location and approximate size of the spill, the actions already taken to stop and contain the spill and all other observations including the presence of wildlife and meteorological conditions.

The spill clean up approaches shall be discussed with PWGSC and INAC. INAC will communicate with Environment Canada. The selected methods shall be based on criteria where the impacts on human health and safety, wildlife, land, water and other environmental parameters are minimized.

To manage a spill incident, some emergency clean up guidelines shall be followed by the Contractor when applicable. These incorporate some of the material previously described and include:

e- Sorbent materials will be used to contain the spill and/or to minimize its movement.

f- Appropriate protective clothing and other safety devices will be used to handle spilled materials.

g- When the spill occurs on land, dykes may be constructed to limit the spill movement providing granular material is sufficiently available. Snow dikes covered with an impermeable liner may also be used if snow still remains. Otherwise, containment booms will be installed in front of the plume and secured to make sure these sorbent barriers do not get saturated.

h- Any free product settled in ditches, trenches or any other ground cavities will be removed using equipment such as pumps, buckets or skimmers. Recovered fluids will be temporarily stored in appropriate containers.

i- Any spill areas will be cleaned up to an extent where land, water and other disturbed environmental systems are restored and the site is left as close as possible to its original state.

7-POTENTIAL SPILL ANALYSIS

As part of the analysis of potential spills, their fates and effects, three potential sources of spills have been identified for the Ekalugad Fjord clean up and camp service projects. The first is the drum storage area located at the middle site. The second is related to the management of scattered waste drums (to be cleaned up) located everywhere on-site. The third consists in the fuel delivery using fuel tanks on pick-up trucks. Each of these three sources are analysed in detail in the following pages.

7.1- Scenario #1: Drum Storage Area

The drum storage area will consist of a levelled pad where pallets will be staged/stockpiled. All pallets of drums will be somewhat independent and, therefore the spillage of one drum should not affect the others.

Two potential situations could occur that would cause a spill:
1) the accidental spillage of fuel during transfer into temporary tanks;
2) the rupture of drums, possibly from a violent impact caused by the collision of a vehicle or piece of heavy equipment.

In the first case, the spilled volume would be, at worst, 45 gallons, which represents the entire volume of one drum. In the other case, we can assume that the impact would occur at mid-height on two stacked pallets and, at worst, sixteen drums would be affected. Therefore the spilled volume should not exceed a total volume of 720 gallons.

In either case the spillage flowrate would be moderate to high and we can assume that the entire volume would be spilled within 15 to 20 minutes.

The general direction of migration would be along the natural drainage pathway. The high water mark is to be located minimum 100 metres down-gradient from the drum storage area. It is unlikely that the spilled fuel would reach the lake because the porous sandy soil along the way would soak up part of fuel, and also because the low slope will not allow for rapid flow of fuel, thereby providing enough time for the spill response procedures to take effect.

The spill would be communicated by the witness of the scene to the site superintendent, or in his absence, the assistant site superintendent. The latter would then go down the chain of command

and advise the appropriate persons of the immediate actions to be taken. Radio communication is to be used at all times on the site and key team members will carry a radio with them at all times.

The personnel responsibilities are outlined in previous sections of this document. The witness of the spill would be advised to try to stop the source of the spill, while waiting for backup help to arrive; his actions would be immediate. The Contractor site engineer would coordinate the spill response activities carried out by the containment unit. Members of this unit would be mobilized to the spill site. The drum storage area can be reached from any other area of the site within a maximum of 25 minutes.

Mobilization of containment equipment to the spill site can be carried out rapidly. A bulldozer and bucket loader will be present in close proximity and can reach the site of the spill within a matter of minutes. A sand and gravel pit is also located in the vicinity, if required for berm construction. Spill response kits containing sorbent material will be kept next to the drum storage location. Containment would be carried out by the construction of soil berms and the installation of sorbent booms. After containment, clean up equipment can be mobilized to the site. A list of equipment is presented in previous sections of this document.

Safety hazards associated with the spill event includes the risk of fire. This can be minimized by preventing personnel from smoking near the spill scene. Risks to personnel (from inhalation and dermal contact) can be prevented by the proper use of personnel protective equipment.

Measures and procedures to prevent such events from occurring include regular inspection of the drum storage area and containment system, and safety rules concerning the use of vehicles and heavy equipment on site, especially in close proximity of this area (*e.g.*, speed limits, training of heavy equipment operators, restricted area posting, safety orientation of workers, etc.).

7.2- Scenario #2: Management of Waste in Scattered Drums

Various abandoned fuel caches, waste drums and dumps potentially containing contaminated petroleum products and/or solvent are to be managed/remediated. During operations, the likelihood of spillage exists.

Two potential situations could occur that would cause a spill:
1) the sudden breakage of tank piping or fittings containing POL product during clean up;

2) the rupture of a drum/tank found in dumps, possibly from a violent impact caused by the collision of a vehicle or piece of heavy equipment.

Any incident causing the spillage of one drum or a remaining unknown small tanks, would bring the fuel to flow onto the surrounding area.

The rupture of unknown tanks during clean up operations might cause the loss of most significant volume, but based on previous investigations, this is unlikely. In this case, the spilled fluid would probably flow towards the natural cavity formed by the waste landfill which would serve as natural containment

In either case, it is most unlikely that any sensitive receptor would be impacted from the spills because of the fuel infiltrating into the soil and bedrock, as well as the rapidity of response measures.

The spill would be communicated by the witness of the scene to the site superintendent, or in his absence, the assistant site superintendent. The latter would then go down the chain of command and advise the appropriate persons of the immediate actions to be taken. Radio communication will be used at all times on the site and key team members will carry a radio with them at all times.

The personnel responsibilities are outlined in previous sections of this document. The witness of the spill would be advised to try to stop the source of the spill, while waiting for backup help to arrive; his actions would be immediate. The Contractor site engineer would coordinate the spill response activities carried out by the containment unit. Members of this unit would be mobilized to the impacted site. All impacted site can be reached from any other area of the site within a maximum of 25 minutes. Response to a spill at any clean up site would probably be more rapid when compared with potential impacts knowing that mitigating measures are to be implemented.

Mobilization of containment equipment to the spill site can be carried out rapidly. Bucket loaders and other heavy equipment shall be present in close proximity and can reach the site of the spill within a matter of minutes. Sand and gravel pits/stockpiles are also located in the vicinity, if required for berm construction. Spill response kits, sorbent material, pumps, hose and many other equipment are located in the storage warehouse nearby. Containment would be carried out by the construction of soil berms and the installation of sorbent booms. After containment, clean up equipment can be mobilized to the site. A list of equipment is presented in previous sections of this

document.

Safety hazards associated with the spill event includes the risk of fire. This can be minimized by preventing personnel from smoking near the spill scene. Risks to personnel (from inhalation and dermal contact) can be prevented by the proper use of personnel protective equipment.

Measures and procedures to prevent such events from occurring include training of staff (Hazwoper) and safety rules concerning the use of vehicles and heavy equipment on site, especially while in operations with waste/scattered drum handling, and landfill excavation (*e.g.*, speed limits, training of heavy equipment operators, etc.).

7.3- Scenario #3: Fuel Delivery

The fuel delivery operations (small tanks - 250-350 gal - installed on pick-up trucks) to supply fuel to heavy equipment and to carry fuel from the drum storage area to the upper site operations are carrying some risks of spillage.

Any accident involving the fuel delivery pick-up trucks could result in the loss of its entire volume of fuel. Such an accident could occur almost anywhere on site, any place the pick-up trucks have access to.

Heavy equipment works at least 30 metres away from any body of water. Therefore the fuel delivery should not ever get closer than 30 metres from bodies of water. Any fuel spill at that distance would not rapidly reach the receptor.

Any spills would be communicated by the witness of the scene to the site superintendent, or in his absence, the assistant site superintendent. The latter would then go down the chain of command and advise the appropriate persons of the immediate actions to be taken. Radio communication will be used at all times on the site and key team members will carry a radio with them at all times.

The personnel responsibilities are outlined in previous sections of this document. The witness of the spill would be advised to try to stop the source of the spill, while waiting for backup help to arrive; his actions would be immediate. The Contractor site engineer would coordinate the spill response activities carried out by the containment unit. Members of this unit would be mobilized to the spill area. All areas at Ekalugad Fjord can be reached from any other area of the site within a maximum of 15-25 minutes (once roads will all be repaired/maintained).

Mobilization of containment equipment to the spill site can be carried out rapidly. Sorbent booms may be required to contain the oil slick and prevent further spreading or migration to any discharge stream; those are present at the middle site and the lower site. If the construction of an oil-water separator in the discharge stream is necessary, the following equipment and materials would be required: heavy equipment (loader or excavator), sand and gravel, piping, and tarp/geomembrane. All these equipment and materials could be mobilized within 20 to 30 minutes. If the fuel reaches the discharge stream, spill response measures may have to be implemented further down stream. After containment, clean up equipment will be mobilized to the area. A list of equipment is presented in previous sections of this document. However, due to the size of temporary fuel tanks used for delivery/supply, potential impact from spill are likely to be rapidly contained.

Safety hazards associated with the spill event includes the risk of fire. This can be minimized by preventing personnel from smoking near the spill scene. Risks to personnel (from inhalation and dermal contact) can be prevented by the proper use of personnel protective equipment.

Measures and procedures to prevent such events from occurring include regular safety rules concerning the use of vehicles site, especially in close proximity to sensitive areas (*e.g.,* speed limits, training of truck drivers, etc.).

8-REPORTING REQUIREMENTS

Spills will be immediately reported using the **24 Hour Spill Report Line (867) 920-8130 (NWT)**. Immediately shall mean upon discovery. Failure to report can lead to fines. A written spill report will then be prepared by the Contractor with the assistance of the Engineer and submitted to the PWGSC site representative and the Spill Report Line supervisor (see Appendix 2). This report will include:

a- date and time of the incident;
b- location or map coordinates and direction of spill movement if not at steady-state;
c- party responsible for the spill;
d- type and estimated quantities of spilled contaminant(s);
e- specific cause of the incident;
f- status of the spill indicating if spilled materials are still moving or now at steady-state;
g- approximate surface of contaminated area;
i- factors affecting spill or recovery such as temperature, wind, etc.;
j- status on containment actions indicating whether a) naturally, b) booms, dykes or

other, c) no containment has been implemented;

k- corrective action taken or proposed to clean, contain or dispose spilled material;

l- whether assistance is required and in what form;

m- whether the spill poses a hazard to persons or property (*i.e.,* fire, drinking water);

n- comments and recommendations;

o- name, position and employer of the person reporting the spill; and

p- name, position department of the person to whom the spill is reported.

Apart from reporting requirements, the Contractor, through its site superintendent, may require special assistance. These could be implemented for the following reasons:

.1 If assistance and coordination are required for spill response, Environment Canada (Nunavut Office) and the Environmental Protection Service of the Government of Nunavut can be contacted at:

Environment Canada	**(867) 979-6808**
GN Environmental Protection Service	**(867) 975-5910 or 975-5907**

.2 If medical assistance and coordination are required when injuries occurred during spill incident/spill response and/or critical incident stress is observed after an event, the Baffin Regional Hospital (general enquiries) shall be contacted at:

Baffin Regional Hospital	**(867) 979-7300**

Other emergency assistance numbers are found in the Ekalugad Project Clean Up and Camp Service Health and Safety Plan.

APPENDIX -1-

MSDS of pretroleum products and chemicals stored on site

Shell Canada Limited

Material Safety Data Sheet

Effective Date: 2006-11-07
Supersedes: 2002-11-05

Class B3 Combustible Liquid

Class D2B Other Toxic Effects - Skin Irritant

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT:	**LOW SULPHUR DIESEL CP-43**
SYNONYMS:	Diesel Automotive Gas Oil
PRODUCT USE:	Fuel Solvent
MSDS Number:	320-043

MANUFACTURER	**TELEPHONE NUMBERS**	
Shell Canada Limited	**Shell Emergency Number**	1-800-661-7378
P.O. Box 100, Station M	**CANUTEC 24 HOUR EMERGENCY NUMBER**	613-996-6666
400-4th Ave. S.W.		
Calgary, AB Canada	For general information:	1-800-661-1600
T2P 2H5	For MSDS information:	403-691-3582
	(From 7:30 to 4:30 Mountain Time)	403-691-2220

This MSDS was prepared by the Toxicology and Product Stewardship Section of Shell Canada Limited.

*An asterisk in the product name designates a trade mark(s) of Shell Canada Limited, used under license by Shell Canada Products.

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS Number	% Range	WHMIS Controlled
Fuels, Diesel, No. 2	68476-34-6	100	Yes

See Section 8 for Occupational Exposure Guidelines.

3. HAZARDS IDENTIFICATION

Physical Description: Liquid Clear To Yellow Hydrocarbon Odour

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.
Hazards:

Vapour concentrations above the recommended exposure level are irritating to the eyes and respiratory tract, may cause headaches and dizziness, are anesthetic and may have other central nervous system effects.
Combustible Liquid.
Irritating to skin.
Vapours are moderately irritating to the eyes.
Ingestion may result in vomiting. Avoid aspiration of vomitus into lungs as small quantities may result in aspiration pneumonitis.
Vapours are moderately irritating to the respiratory passages.

Handling: Eliminate all ignition sources.
Avoid prolonged exposure to vapours.
Wear suitable gloves and eye protection.
Bond and ground transfer containers and equipment to avoid static accumulation.
Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.

For further information on health effects, see Section 11

4. FIRST AID

Eyes: Flush eyes with water for at least 15 minutes while holding eyelids open. If irritation occurs and persists, obtain medical attention.

Skin: Wash contaminated skin with mild soap and water for 15 minutes. If irritation occurs and persists, obtain medical attention.

Ingestion: DO NOT INDUCE VOMITING! OBTAIN MEDICAL ATTENTION IMMEDIATELY. Guard against aspiration into lungs by having the individual turn on to their left side. If vomiting occurs spontaneously keep head below hips to prevent aspiration of liquid into the lungs. Do not give anything by mouth to an unconscious person.

Inhalation: Remove victim from further exposure and restore breathing, if required. Obtain medical attention.

Notes to Physician: The main hazard following accidental ingestion is aspiration of the liquid into the lungs producing chemical pneumonitis. If more than 2.0 mL/kg has been ingested, vomiting should be induced with supervision. If symptoms such as loss of gag reflex, convulsions or unconsciousness occur before vomiting, gastric lavage with a cuffed endotracheal tube should be considered.

5. FIRE FIGHTING MEASURES

Extinguishing Media: Dry Chemical
Carbon Dioxide
Foam
Water Fog

Firefighting Instructions: Caution - Combustible. Do not use a direct stream of water as it may spread fire. Do not enter confined fire space without adequate protective clothing and an approved positive pressure self-contained breathing apparatus. Vapour forms a flammable/explosive mixture with air between upper and lower flammable limits. Vapours may travel along ground and flashback along vapour trail may occur. Avoid inhalation of smoke. Product will float and can be reignited on surface of water. Delayed lung damage can be experienced after exposure to combustion products, sometimes hours after the exposure.

Hazardous Combustion Products: A complex mixture of airborne solid, liquid, particulates and gases will evolve when this material undergoes pyrolysis or combustion. Carbon dioxide, carbon monoxide and unidentified organic compounds may be formed upon combustion.

6. ACCIDENTAL RELEASE MEASURES

Issue warning "Combustible". Eliminate all ignition sources. Isolate hazard area and restrict access. Handling equipment must be grounded. Try to work upwind of spill. Avoid direct contact with material. Wear appropriate breathing apparatus (if applicable) and protective clothing. Stop leak only if safe to do so. Dike and contain land spills; contain water spills by booming. Use water fog to knock down vapours; contain runoff. Absorb residue or small spills with absorbent material and remove to non-leaking containers for disposal. Recommended materials: Clay or Sand Flush area with water to remove trace residue. Dispose of recovered material as noted under Disposal Considerations. Notify appropriate environmental agency(ies).

7. HANDLING AND STORAGE

Handling: Combustible. Avoid excessive heat, sparks, open flames and all other sources of ignition. Fixed equipment as well as transfer containers and equipment should be grounded to prevent accumulation of static charge. Vapours are heavier than air and will settle and collect in low areas and pits, displacing breathing air. Extinguish pilot lights, cigarettes and turn off other sources of ignition prior to use and until all vapours are gone. Vapours may accumulate and travel to distant ignition sources and flashback. Do not cut, drill, grind, weld or perform similar operations on or near containers. Empty containers are hazardous, may contain flammable/explosive dusts, residues or vapours. Do not pressurize drum containers to empty them. Wash with soap and water prior to eating, drinking, smoking, applying cosmetics or using toilet facilities. Launder contaminated clothing prior to reuse. Use good personal hygiene.

Storage: Store in a cool, dry, well ventilated area, away from heat and ignition sources. Keep container tightly closed.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

THE FOLLOWING INFORMATION, WHILE APPROPRIATE FOR THIS PRODUCT, IS GENERAL IN NATURE. THE SELECTION OF PERSONAL PROTECTIVE EQUIPMENT WILL VARY DEPENDING ON THE CONDITIONS OF USE.

OCCUPATIONAL EXPOSURE LIMITS (Current ACGIH TLV/TWA unless otherwise noted):

Diesel fuel, as total hydrocarbons: 100 mg/m3
Skin Notation: Absorption through skin, eyes and mucous membranes may contribute significantly to the total exposure.

Mechanical Ventilation: Concentrations in air should be maintained below the recommended threshold limit value if unprotected personnel are involved. Use explosion-proof ventilation as required to control vapour concentrations. Make up air should always be supplied to balance air exhausted (either generally or locally). For personnel entry into confined spaces (i.e. bulk storage tanks) a proper confined space entry procedure must be followed including ventilation and testing of tank atmosphere. Local ventilation recommended where mechanical ventilation is ineffective in controlling airborne concentrations below the recommended occupational exposure limit.

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection: Chemical safety goggles and/or full face shield to protect eyes and face. If product is handled such that it could be splashed into eyes, Provide an eyewash station in the area.

Skin Protection: Impervious gloves (viton, nitrile) should be worn at all times when handling this material. In confined spaces or where the risk of skin exposure is much higher, impervious clothing should be worn. Safety showers should be available for emergency use.

Respiratory Protection: If exposure exceeds occupational exposure limits, use an appropriate NIOSH-approved respirator. Use a NIOSH-approved chemical cartridge respirator with organic vapour cartridges or use a NIOSH-approved supplied-air respirator. For high airborne concentrations, use a NIOSH-approved supplied-air respirator, either self-contained or airline breathing apparatus, operated in positive pressure mode.

9. PHYSICAL DATA

Physical State:	Liquid
Appearance:	Clear To Yellow
Odour:	Hydrocarbon Odour
Odour Threshold:	Not available
Freezing/Pour Point:	Cloud Point-43 °C
Boiling Point:	150 - 330 °C
Density:	< 850 kg/m3 @ 15 °C
Vapour Density (Air = 1):	Not available
Vapour Pressure (absolute):	Not available
pH:	Not available
Flash Point:	Pensky-Martens CC > 40 °C
Lower Explosion Limit:	1 % (vol.)
Upper Explosion Limit:	6 % (vol.)
Autoignition Temperature:	250 °C
Viscosity:	1.3 - 2.1 cSt @ 40 °C
Evaporation Rate (n-BuAc = 1):	Not available
Partition Coefficient (log K_{ow}):	Not available
Water Solubility:	Insoluble
Other Solvents:	Hydrocarbon Solvents

10. STABILITY AND REACTIVITY

Chemically Stable:	Yes
Hazardous Polymerization:	No
Sensitive to Mechanical Impact:	No
Sensitive to Static Discharge:	Yes

Hazardous Decomposition Products:	Thermal decomposition products are highly dependent on combustion conditions.
Incompatible Materials:	Avoid strong oxidizing agents
Conditions of Reactivity:	Avoid excessive heat, open flames and all ignition sources

11. TOXICOLOGICAL INFORMATION

Ingredient (or Product if not specified)	Toxicological Data
Fuels, Diesel, No. 2	LD50 Dermal, Rabbit > 5000 mg/kg LD50 Oral, Rat > 9000 mg/kg

Routes of Exposure:	Exposure will most likely occur through skin contact or inhalation.
Irritancy:	This product is expected to be irritating to skin but is not predicted to be a skin sensitizer
Acute Toxicity:	Vapour concentrations above the recommended exposure level are irritating to the eyes and respiratory tract, may cause headaches and dizziness, are anesthetic and may have other central nervous system effects.
Chronic Effects:	Prolonged and repeated contact with skin can cause defatting and drying of the skin resulting in skin irritation and dermatitis. Prolonged exposure to high vapour concentration can cause headache, dizziness, nausea, blurred vision and central nervous system depression.
Pre-existing Conditions:	Pre-existing eye, skin and respiratory disorders may be aggravated by exposure to this product.
Carcinogenicity and Mutagenicity:	The International Agency for Research on Cancer (IARC) considers that this product is not classifiable as to its carcinogenicity to humans. Middle distillates have caused skin cancers in laboratory animals when applied repeatedly and left in place between applications. This effect is believed to be caused by the continuous irritation of the skin. Good personal hygiene should be maintained to avoid this risk. The American Conference of Governmental Industrial Hygienists (ACGIH) has classified this product as A3 - confirmed animal carcinogen with unknown relevance to humans.

12. ECOLOGICAL INFORMATION

Do not allow product or runoff from fire control to enter storm or sanitary sewers, lakes, rivers, streams, or public waterways. Block off drains and ditches. Provincial regulations require and federal regulations may require that environmental and/or other agencies be notified of a spill incident. Spill area must be cleaned and restored to original condition or to the satisfaction of authorities. May cause physical fouling of aquatic organisms.

Biodegradability:	Not readily biodegradable
Bioaccumulation:	Potential for bioaccumulation
Partition Coefficient (log K_{ow}):	Not available

Aquatic Toxicity

May be harmful to aquatic life.

Ingredient:	Toxicological Data
Fuels, Diesel, No. 2	EL50 - growth rate, Algae (72hr) 10 - 100 mg/L EL50, Daphnia Magna (48hr) 10 - 100 mg/L LL50 (WAF method), Rainbow Trout (96hr) 10 - 100 mg/L

Definition(s): LL and EL are the lethal loading concentration and effective loading concentration respectively. The concentration represents the amount of substance added to the system to obtain a toxic concentration. They replace the traditional LC and EC for low solubility substances.
WAF is the water accommodated fraction. A slightly soluble hydrocarbon is stirred into water and the insoluble portions are removed. The remaining solution is the water accommodated fraction.

13. DISPOSAL CONSIDERATIONS

Waste management priorities (depending on volumes and concentration of waste) are: 1. recycle (reprocess), 2. energy recovery (cement kilns, thermal power generation), 3. incineration, 4. disposal at a licenced waste disposal facility. Do not attempt to combust waste on site. Incinerate at a licenced waste disposal site with approval of environmental authority.

14. TRANSPORTATION INFORMATION

Canadian Road and Rail Shipping Classification:

UN Number	UN1202
Proper Shipping Name	DIESEL FUEL
Hazard Class	Class 3 Flammable Liquids
Packing Group	PG II
Additional Information	Not Regulated in Containers Less Than or Equal to 450 Litres.
Shipping Description	DIESEL FUEL, Class 3, UN1202, PG II Not Regulated in Containers Less Than or Equal to 450 Litres

15. REGULATORY INFORMATION

This product has been classified in accordance with the hazard criteria of the *Controlled Products Regulations* (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Class:	Class B3 Combustible Liquid Class D2B Other Toxic Effects Skin Irritant
DSL/NDSL Status:	This product, or all components, are listed on the Domestic Substances List, as required under the Canadian Environmental Protection Act
Other Regulatory Status:	No Canadian federal standards

16. ADDITIONAL INFORMATION

LABEL STATEMENTS

Hazard Statement :	Combustible Liquid. Irritating to skin.
Handling Statement:	Eliminate all ignition sources Avoid prolonged exposure to vapours. Wear suitable gloves and eye protection Bond and ground transfer containers and equipment to avoid static accumulation Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames
First Aid Statement :	Wash contaminated skin with soap and water Flush eyes with water. If overcome by vapours remove to fresh air Do not induce vomiting. Obtain medical attention
Revisions:	This MSDS has been reviewed and updated Changes have been made to: Section 1 Section 3 Section 5 Section 8 Section 9 Section 12

Shell Canada Limited

Material Safety Data Sheet

Effective Date: 2005-08-15
Supersedes: 2002-08-14

Class B3 Combustible Liquid

Class D2B Other Toxic Effects - Skin Irritant

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT:	SHELL JET A-1 WITH AIA
SYNONYMS:	Aviation Turbine Fuel (Kerosene Type) May contain anti icing additive (Diethylene Glycol Monomethyl Ether)
PRODUCT USE:	Fuel Solvent
MSDS Number:	142-017

MANUFACTURER
Shell Canada Limited
P.O. Box 100, Station M
400-4th Ave. S.W.
Calgary, AB Canada
T2P 2H5

TELEPHONE NUMBERS

Shell Emergency Number	1-800-661-7378
CANUTEC 24 HOUR EMERGENCY NUMBER	613-996-6666
For general information:	1-800-661-1600
For MSDS information:	403-691-3082
(From 7:00 to 4:30 Mountain Time)	403 691 2220

This MSDS was prepared by the Toxicology and Product Stewardship Section of Shell Canada Limited

*An asterisk in the product name designates a trade-mark(s) of Shell Canada Limited, used under license by Shell Canada Products

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS Number	% Range	WHMIS Controlled
Kerosene (Petroleum), Hydrodesulfurized	64742-81-0	60 - 100	Yes

See Section 8 for Occupational Exposure Guidelines

3. HAZARDS IDENTIFICATION

Physical Description: Liquid Bright Clear Hydrocarbon Odour

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation
Hazards:

Combustible Liquid.
Irritating to skin.
Vapours are moderately irritating to the eyes.
Ingestion may result in vomiting. Avoid aspiration of vomitus into lungs as small quantities may result in aspiration pneumonitis.
Vapours are moderately irritating to the respiratory passages.

Handling:
Eliminate all ignition sources.
Avoid prolonged exposure to vapours.
Wear suitable gloves and eye protection.
Bond and ground transfer containers and equipment to avoid static accumulation.
Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.

For further information on health effects, see Section 11.

4. FIRST AID

Eyes: Flush eyes with water for at least 15 minutes while holding eyelids open. If irritation occurs and persists, obtain medical attention.

Skin: Wash contaminated skin with mild soap and water for 15 minutes. If irritation occurs and persists, obtain medical attention.

Ingestion: DO NOT INDUCE VOMITING. OBTAIN MEDICAL ATTENTION IMMEDIATELY. Guard against aspiration into lungs by having the individual turn on to their left side. If vomiting occurs spontaneously keep head below hips to prevent aspiration of liquid into the lungs.

Inhalation: Remove victim from further exposure and restore breathing, if required. Obtain medical attention.

Notes to Physician: The main hazard following accidental ingestion is aspiration of the liquid into the lungs producing chemical pneumonitis. If more than 2.0 mL/kg has been ingested vomiting should be induced with supervision. If symptoms such as loss of gag reflex, convulsions or unconsciousness occur before vomiting, gastric lavage with a cuffed endotracheal tube should be considered.

5. FIRE FIGHTING MEASURES

Extinguishing Media: Carbon Dioxide
Foam
Dry Chemical
Water Fog

Firefighting Instructions: Caution - Combustible. Vapour forms a flammable/explosive mixture with air between upper and lower flammable limits. Vapours may travel along ground and flashback along vapour trail may occur. Product will float and can be reignited on surface of water. Do not use a direct stream of water as it may spread fire. Containers exposed to intense heat from fires should be cooled with water to prevent vapour pressure buildup which could result in container rupture. Container areas exposed to direct flame contact should be cooled with large quantities of water as needed to prevent weakening of container structure. Do not enter confined fire space without adequate protective clothing and an approved positive pressure self-contained breathing apparatus.

Hazardous Combustion Products:	A complex mixture of airborne solid, liquid particulates and gases will evolve when this material undergoes pyrolysis or combustion. Carbon dioxide carbon monoxide and unidentified organic compounds may be formed upon combustion.

6. ACCIDENTAL RELEASE MEASURES

Issue warning "Combustible". Eliminate all ignition sources. Isolate hazard area and restrict access. Handling equipment must be grounded. Try to work upwind of spill. Avoid direct contact with material. Wear appropriate breathing apparatus (if applicable) and protective clothing. Stop leak only if safe to do so. Dike and contain land spills; contain water spills by booming. Use water fog to knock down vapours, contain runoff. Absorb residue or small spills with absorbent material and remove to non-leaking containers for disposal. Recommended materials: Clay or Sand. Flush area with water to remove trace residue. Dispose of recovered material as noted under Disposal Considerations. Notify appropriate environmental agency(ies).

7. HANDLING AND STORAGE

Handling: Avoid excessive heat, sparks, open flames and all other sources of ignition. Fixed equipment as well as transfer containers and equipment should be grounded to prevent accumulation of static charge. Vapours are heavier than air and will settle and collect in low areas and pits, displacing breathing air. Extinguish pilot lights, cigarettes and turn off other sources of ignition prior to use and until all vapours are gone. Vapours may accumulate and travel to distant ignition sources and flashback. Do not cut, drill, grind, weld or perform similar operations on or near containers. Empty containers are hazardous, may contain flammable/explosive dusts, residues or vapours. Do not pressurize drum containers to empty them. Wash with soap and water prior to eating, drinking, smoking, applying cosmetics or using toilet facilities. Launder contaminated clothing prior to reuse. Use good personal hygiene. Combustible.

Storage: Store in a cool, dry, well ventilated area, away from heat and ignition sources. Keep container tightly closed.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

THE FOLLOWING INFORMATION, WHILE APPROPRIATE FOR THIS PRODUCT, IS GENERAL IN NATURE. THE SELECTION OF PERSONAL PROTECTIVE EQUIPMENT WILL VARY DEPENDING ON THE CONDITIONS OF USE.

OCCUPATIONAL EXPOSURE LIMITS (Current ACGIH TLV/TWA unless otherwise noted):

Kerosene/Jet fuels, as total hydrocarbon vapour (skin) : 200 mg/m3 (Application restricted to conditions in which there are negligible aerosol exposures)
Skin Notation: Absorption through skin, eyes and mucous membranes may contribute significantly to the total exposure.

Mechanical Ventilation:	Use explosion-proof ventilation as required to control vapour concentrations. Concentrations in air should be maintained below the recommended threshold limit value if unprotected personnel are involved. Local ventilation recommended where mechanical ventilation is ineffective in controlling airborne concentrations below the recommended occupational exposure limit. Make up air should always be supplied to balance air exhausted (either generally or locally). For personnel entry into confined spaces (i.e. bulk storage tanks) a proper confined space entry procedure must be followed including ventilation and testing of tank atmosphere.

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection:	Chemical safety goggles and/or full face shield to protect eyes and face if product is handled such that it could be splashed into eyes. Provide an eyewash station in the area.
Skin Protection:	Avoid contact with skin. Use protective clothing and gloves manufactured from nitrile. Safety showers should be available for emergency use.
Respiratory Protection:	Avoid breathing vapour or mists. If exposure has the potential to exceed occupational exposure limits, use an appropriate NIOSH approved respirator. Use a NIOSH-approved chemical cartridge respirator with organic vapour cartridges or use a NIOSH approved supplied-air respirator.

9. PHYSICAL DATA

Physical State:	Liquid
Appearance:	Bright Clear
Odour:	Hydrocarbon Odour
Odour Threshold:	Not available
Freezing/Pour Point:	Freeze Point < -47 °C
Boiling Point:	145 - 300 °C
Density:	775 - 840 kg/m3 @ 15 °C
Vapour Density (Air = 1):	Not available
Vapour Pressure (absolute):	1 - 1.4 kPa @ 37.8 °C
pH:	Not available
Flash Point:	Tag Closed Cup > 43 °C
Lower Explosion Limit:	0.7 % (vol.)
Upper Explosion Limit:	5 % (vol.)
Autoignition Temperature:	210 °C
Viscosity:	< 8 cSt @ -20 °C
Evaporation Rate (n-BuAc = 1):	Not available
Partition Coefficient (log K_{ow}):	3.3 - 6
Water Solubility:	Insoluble
Other Solvents:	Hydrocarbon Solvents

10. STABILITY AND REACTIVITY

Chemically Stable:	Yes
Hazardous Polymerization:	No
Sensitive to Mechanical Impact:	No
Sensitive to Static Discharge:	Yes
Hazardous Decomposition Products:	Thermal decomposition products are highly dependent on combustion conditions.
Incompatible Materials:	Avoid strong oxidizing agents.

Conditions of Reactivity: Avoid excessive heat, open flames and all ignition sources

11. TOXICOLOGICAL INFORMATION

Ingredient (or Product if not specified)	Toxicological Data
Kerosene (Petroleum), Hydrodesulfurized	LD50 Dermal Rabbit > 2000 mg/kg LD50 Oral Rat > 5000 mg/kg

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation

Irritancy: This product is expected to be irritating to skin but is not predicted to be a skin sensitizer.

Chronic Effects: Prolonged and repeated contact with skin can cause defatting and drying of the skin resulting in skin irritation and dermatitis. Prolonged exposure to high vapour concentration can cause headache, dizziness, nausea, blurred vision and central nervous system depression.

Pre-existing Conditions: Pre existing eye, skin and respiratory disorders may be aggravated by exposure to this product.

Carcinogenicity and Mutagenicity: The International Agency for Research on Cancer (IARC) considers that this product is not classifiable as to its carcinogenicity to humans. Middle distillates have caused skin cancers in laboratory animals when applied repeatedly and left in place between applications. This effect is believed to be caused by the continuous irritation of the skin. Good personal hygiene should be maintained to avoid this risk.

12. ECOLOGICAL INFORMATION

Do not allow product or runoff from fire control to enter storm or sanitary sewers, lakes, rivers, streams, or public waterways. Block off drains and ditches. Provincial regulations require and federal regulations may require that environmental and/or other agencies be notified of a spill incident. Spill area must be cleaned and restored to original condition or to the satisfaction of authorities. May cause physical fouling of aquatic organisms.

Biodegradability: Not readily biodegradable.
Rapid volatilization

Bioaccumulation: Potential for bioaccumulation

Partition Coefficient (log K_{ow}): 3.3 - 6

Aquatic Toxicity

Product is expected to be toxic to aquatic organisms

Ingredient:	Toxicological Data
Kerosene (Petroleum), Hydrodesulfurized	EL50 - growth rate (WAF method) Algae (72hr) 1 - 10 mg/L. EL50 (WAF method) Daphnia Magna (48hr) 1 - 10 mg/L. LL50 (WAF method) Rainbow Trout (96hr) 1 - 10 mg/L.

Definition(s): LL and EL are the lethal loading concentration and effective loading concentration respectively. The concentration represents the amount of substance added to the system to obtain a toxic concentration. They replace the traditional LC and EC for low solubility substances.
WAF is the water accommodated fraction. A slightly soluble hydrocarbon is stirred into water and the insoluble portions are removed. The remaining solution is the water accommodation fraction.

13. DISPOSAL CONSIDERATIONS

Waste management priorities (depending on volumes and concentration of waste) are: 1. recycle (reprocess), 2. energy recovery (cement kilns, thermal power generation), 3. incineration, 4. disposal at a licenced waste disposal facility. Do not attempt to combust waste on-site. Incinerate at a licenced waste disposal site with approval of environmental authority.

14. TRANSPORTATION INFORMATION

Canadian Road and Rail Shipping Classification:

UN Number	UN1863
Proper Shipping Name	FUEL, AVIATION, TURBINE ENGINE
Hazard Class	Class 3 Flammable Liquids
Packing Group	PG II
Additional Information	*Not Regulated in Containers Less Than or Equal to 450 Litres*
Shipping Description	FUEL, AVIATION, TURBINE ENGINE Class 3 UN1863 PG III Not Regulated in Containers Less Than or Equal to 450 Litres.

15. REGULATORY INFORMATION

This product has been classified in accordance with the hazard criteria of the *Controlled Products Regulations* (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Class:	Class B3 Combustible Liquid Class D2B Other Toxic Effects - Skin Irritant
DSL/NDSL Status:	This product, or all components, are listed on the Domestic Substances List, as required under the Canadian Environmental Protection Act.
Other Regulatory Status:	No Canadian federal standards.

16. ADDITIONAL INFORMATION

LABEL STATEMENTS
Hazard Statement : Combustible Liquid
Irritating to skin

Handling Statement: Eliminate all ignition sources
Avoid prolonged exposure to vapours.
Wear suitable gloves and eye protection
Bond and ground transfer containers and equipment to avoid static accumulation.
Empty containers are hazardous, may contain flammable / explosive dusts
liquid residue or vapours. Keep away from sparks and open flames.

First Aid Statement: Wash contaminated skin with soap and water
Flush eyes with water.
If overcome by vapours remove to fresh air
Do not induce vomiting.
Obtain medical attention

Revisions: This MSDS has been reviewed and updated.
Changes have been made to
Section 3
Section 4
Section 5
Section 7
Section 8
Section 9
Section 12
Section 14

Shell Canada Limited

Material Safety Data Sheet

Effective Date: 2005-07-26
Supersedes: 2002-06-14

Class B2 - Flammable Liquid

Class D2A - Other Toxic Effects - Carcinogen

Class D2B - Other Toxic Effects - Eye Irritant

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT	**REGULAR UNLEADED GASOLINE**
SYNONYMS	Automotive Fuel Petrol
PRODUCT USE	Fuel
MSDS Number	211-001

MANUFACTURER
Shell Canada Limited
P.O. Box 100, Station M
400-4th Ave. S.W.
Calgary, AB Canada
T2P 2H5

TELEPHONE NUMBERS

Shell Emergency Number	1-800-661-7378
CANUTEC 24 HOUR EMERGENCY NUMBER	613-996-6666
For general information	1-800-661-1800
For MSDS information:	403-691-3952
(From 7:30 to 4:30 Mountain Time)	403-691-2225

This MSDS was prepared by the Toxicology and Product Stewardship Section of Shell Canada Limited.

*An asterisk in the product name designates a trade-mark(s) of Shell Canada Limited, used under license by Shell Canada Products.

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS Number	% Range	WHMIS Controlled
Gasoline	86290-81-5	> 90	Yes
Ethyl Alcohol	64-17-5	0 - 10	Yes
Benzene	71-43-2	< 1.0	Yes

See Section 8 for Occupational Exposure Guidelines.

3. HAZARDS IDENTIFICATION

Physical Description: Liquid. Clear. Typical Gasoline Odour.

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.

Hazards:

Vapour concentrations above the recommended exposure level are irritating to the eyes and respiratory tract, may cause headaches and dizziness, are anesthetic and may have other central nervous system effects.
Flammable Liquid
Irritating to eyes
May cause cancer
Ingestion may result in vomiting. Avoid aspiration of vomitus into lungs as small quantities may result in aspiration pneumonitis.
May be absorbed by skin contact. Prolonged immersion in liquid may lead to chemical burns.

Handling:

Eliminate all ignition sources.
Wear suitable gloves and eye protection.
Bond and ground transfer containers and equipment to avoid static accumulation.
Avoid prolonged exposure to vapours.
Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.

For further information on health effects, see Section 11.

4. FIRST AID

Eyes: Flush eyes with water for at least 15 minutes while holding eyelids open. If irritation occurs and persists, obtain medical attention.

Skin: Wash contaminated skin with mild soap and water for 15 minutes. If irritation occurs and persists, obtain medical attention.

Ingestion: DO NOT INDUCE VOMITING! OBTAIN MEDICAL ATTENTION IMMEDIATELY. Guard against aspiration into lungs by having the individual turn on to their left side. If vomiting occurs spontaneously keep head below hips to prevent aspiration of liquid into the lungs.

Inhalation: Remove victim from further exposure and restore breathing, if required. Obtain medical attention.

Notes to Physician: The main hazard following accidental ingestion is aspiration of the liquid into the lungs producing chemical pneumonitis. If more than 2.0 mL/kg has been ingested, vomiting should be induced with supervision. If symptoms such as loss of gag reflex, convulsions or unconsciousness occur before vomiting, gastric lavage with a cuffed endotracheal tube should be considered.

5. FIRE FIGHTING MEASURES

Extinguishing Media:

Dry Chemical
Carbon Dioxide
Foam
Water Fog

Firefighting Instructions: Extremely flammable. Do not use water except as a fog. Product will float and can be reignited on surface of water. Vapour forms a flammable/explosive mixture with air between upper and lower flammable limits. Avoid breathing vapours. Avoid inhalation of smoke. Vapours may travel along ground and flashback along vapour trail may occur. Do not enter confined fire space without adequate protective clothing and an approved positive pressure self-contained breathing apparatus.

Hazardous Combustion Products: Carbon dioxide, carbon monoxide and unidentified organic compounds may be formed upon combustion.

6. ACCIDENTAL RELEASE MEASURES

Issue warning "Flammable". Eliminate all ignition sources. Isolate hazard area and restrict access. Handling equipment must be grounded. Try to work upwind of spill. Avoid direct contact with material. Wear appropriate breathing apparatus (if applicable) and protective clothing. Stop leak only if safe to do so. Dike and contain land spills; contain water spills by booming. Use water fog to knock down vapours, contain runoff. Absorb residue on small spills with absorbent material and remove to non-leaking containers for disposal. Recommended materials: Clay or Sand. Flush area with water to remove trace residue. Dispose of recovered material as noted under Disposal Considerations.

7. HANDLING AND STORAGE

Handling: Extremely flammable. Fixed equipment as well as transfer containers and equipment should be grounded to prevent accumulation of static charge. Avoid breathing vapours and prolonged or repeated contact with skin. Vapours may accumulate and travel to distant ignition sources and flashback. Do not use as a cleaning solvent. Never siphon by mouth. Empty containers are hazardous; may contain flammable/explosive dusts, residues or vapours. Do not cut, drill, grind, weld or perform similar operations on or near containers. Provide adequate ventilation. Launder contaminated clothing prior to reuse. Wash with soap and water prior to eating, drinking, smoking, applying cosmetics or using toilet facilities.

Storage: Store in a cool, dry, well ventilated area, away from heat and ignition sources. Protect against physical damage to containers.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

THE FOLLOWING INFORMATION, WHILE APPROPRIATE FOR THIS PRODUCT, IS GENERAL IN NATURE. THE SELECTION OF PERSONAL PROTECTIVE EQUIPMENT WILL VARY DEPENDING ON THE CONDITIONS OF USE.

OCCUPATIONAL EXPOSURE LIMITS (Current ACGIH TLV/TWA unless otherwise noted):

Gasoline: 300 ppm (STEL: 500 ppm)
Ethanol: 1000 ppm
Benzene (skin): 0.5 ppm (STEL: 2.5 ppm)
Skin Notation: Absorption through skin, eyes and mucous membranes may contribute significantly to the total exposure.

Mechanical Ventilation: Concentrations in air should be maintained below lower explosive limit at all times or below the recommended threshold limit value if unprotected personnel are involved. Use explosion-proof ventilation as required to control vapour concentrations. Make up air should always be supplied to balance air exhausted (either generally or locally). For personnel entry into confined spaces (i.e. bulk storage tanks) a proper confined space entry procedure must be followed including ventilation and testing of tank atmosphere.

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection:	Chemical safety goggles and/or full face shield to protect eyes and face, if product is handled such that it could be splashed into eyes. Provide an eyewash station in the area.
Skin Protection:	Avoid contact with skin. Use protective clothing and gloves manufactured from nitrile.
Respiratory Protection:	Avoid breathing vapour or mists. If exposure has the potential to exceed occupational exposure limits, use an appropriate NIOSH-approved respirator. For limited time exposures (< 1 hour) exceeding the OEL, use an organic vapour cartridge. For longer exposures or high concentrations, use a NIOSH-approved supplied-air respirator.

9. PHYSICAL DATA

Physical State:	Liquid
Appearance:	Clear
Odour:	Typical Gasoline Odour
Odour Threshold:	< 0.25 ppm
Freezing/Pour Point:	Not available
Boiling Point:	35 - 220 °C
Density:	720 - 780 kg/m3 @ 15 °C
Vapour Density (Air = 1):	3.5
Vapour Pressure (absolute):	< 107 kPa @ 38 °C
Specific Gravity (Water = 1):	0.74
pH:	Not applicable
Flash Point:	Tag Closed Cup -39 °C
Lower Explosion Limit:	1.4 % (vol.)
Upper Explosion Limit:	7.6 % (vol.)
Autoignition Temperature:	280 °C
Viscosity:	< 1 cSt @ 38 °C
Evaporation Rate (n-BuAc = 1):	Not available
Partition Coefficient (log K_{OW}):	2.3
Water Solubility:	Insoluble
Other Solvents:	Hydrocarbon Solvents
Formula:	C4 - C11

10. STABILITY AND REACTIVITY

Chemically Stable:	Yes
Hazardous Polymerization:	No
Sensitive to Mechanical Impact:	No
Sensitive to Static Discharge:	Yes
Incompatible Materials:	Avoid contact with strong oxidizing agents and acids.
Conditions of Reactivity:	Avoid excessive heat, open flames and all ignition sources.

11. TOXICOLOGICAL INFORMATION

Ingredient (or Product if not specified)	Toxicological Data
Gasoline	LD50 Dermal Rabbit > 5 mL/kg LD50 Oral Rat > 18 mL/kg

Ethyl Alcohol	LD50 Dermal Rabbit = 20000 mg/kg LD50 Oral Mouse = 3450 mg/kg LC50 Inhalation Rat = 20000 ppm for 10 hours LD50 Oral Rat = 7060 mg/kg
Benzene	LC50 Inhalation Rat = 13700 ppm for 4 hours LD50 Oral Rat = 930 - 5600 mg/kg

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.

Irritancy: Based on the ingredients, this product would be expected to be irritating to the eyes.

Acute Toxicity: Vapour concentrations above the recommended exposure level are irritating to the eyes and respiratory tract, may cause headaches and dizziness, are anaesthetic and may have other central nervous system effects.

Chronic Effects: Prolonged and repeated contact with skin can cause defatting and drying of the skin resulting in skin irritation and dermatitis. Prolonged exposure to high vapour concentration can cause headache, dizziness, nausea, blurred vision and central nervous system depression. Prolonged and repeated exposure may cause serious injury to blood forming organs, resulting in anemia and similar conditions.

Carcinogenicity and Mutagenicity: According to the International Agency for Research on Cancer (IARC) this product is considered to be possibly carcinogenic to humans. Epidemiological studies indicate that long term inhalation of benzene vapour can cause leukaemia in man. Benzene has also produced chromosomal aberrations in peripheral blood lymphocytes.

12. ECOLOGICAL INFORMATION

Do not allow product or runoff from fire control to enter storm or sanitary sewers, lakes, rivers, streams, or public waterways. Block off drains and ditches. Provincial regulations require and federal regulations may require that environmental and/or other agencies be notified of a spill incident. Spill area must be cleaned and restored to original condition or to the satisfaction of authorities.

Biodegradability: Not readily biodegradable.
Rapid volatilization.

Bioaccumulation: Potential for bioaccumulation

Partition Coefficient (log K_{ow}): 2.3

Aquatic Toxicity
May be harmful to aquatic life.

Ingredient:	Toxicological Data
Gasoline	EL50 growth rate (WAF method) Algae (72hr) 1 - 10 mg/L EL50 (WAF method) Daphnia Magna (48hr) 1 - 10 mg/L LL50 (WAF method) Rainbow Trout (96hr) 1 - 10 mg/L
Ethyl Alcohol	
Benzene	EL50 - growth rate Algae (72hr) 10 - 100 mg/l EL50 Daphnia Magna (48hr) 10 - 100 mg/L LL50 Rainbow Trout (96hr) 1 - 10 mg/L

13. DISPOSAL CONSIDERATIONS

Waste management priorities (depending on volumes and concentration of waste) are: 1. recycle (reprocess), 2. energy recovery (cement kilns, thermal power generation), 3. incineration 4. disposal at a licenced waste disposal facility. Do not attempt to combust waste on-site. Incinerate at a licenced waste disposal site with approval of environmental authority.

14. TRANSPORTATION INFORMATION

Canadian Road and Rail Shipping Classification:

UN Number	UN1203
Proper Shipping Name	GASOLINE
Hazard Class	Class 3 Flammable Liquids
Packing Group	PG II
Additional Information	Marine Pollutant
Shipping Description	GASOLINE Class 3 UN1203 PG II Marine Pollutant

15. REGULATORY INFORMATION

This product has been classified in accordance with the hazard criteria of the *Controlled Products Regulations* (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Class:	Class B2 Flammable Liquid Class D2A Other Toxic Effects - Carcinogen Class D2B Other Toxic Effects - Eye Irritant
DSL/NDSL Status:	This product, or all components, are listed on the Domestic Substances List, as required under the Canadian Environmental Protection Act. This product and/or all components are listed on the U.S. EPA TSCA inventory
Other Regulatory Status:	No Canadian federal standards.

16. ADDITIONAL INFORMATION

LABEL STATEMENTS

Hazard Statement:	Flammable Liquid. Irritating to eyes. May cause cancer.
Handling Statement:	Eliminate all ignition sources. Wear suitable gloves and eye protection. Bond and ground transfer containers and equipment to avoid static accumulation. Avoid prolonged exposure to vapours. Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.

First Aid Statement : Wash contaminated skin with soap and water.
Flush eyes with water
If overcome by vapours remove to fresh air
Do not induce vomiting
Obtain medical attention

Revisions: This MSDS has been reviewed and updated.
A WHMIS class has been added to this MSDS
The ingredients have changed. Other information may also be affected by that change.

MATERIAL SAFETY DATA SHEET

Magnus®

Product: DIPSOL

MAGNUS CHEMICALS LIMITED
1271 AMPERE
BOUCHERVILLE, QUEBEC, J4B 5Z5

EMERGENCY PHONE: 450-655-1344 FAX: 450-655-5428 (8:30 to 16:30)
(613) 996-6666 (CANUTEC)

1- PRODUCT INFORMATION:

Product Manufacturer: ..... MAGNUS CHEMICALS LIMITED
Product Identifier: ..... Dipsol
Product Use: ..... General use solvent for light paint-brush degreasing.

2- HAZARDOUS INGREDIENTS:

MATERIAL or COMPOUND:	C.A.S. No.:	PERCENT: W/W	THRESHOLD LIMIT VALUE (TLV) PPM:	mg/m3	LD50 oral, rat
Aliphatic naphtha	NAV	60-100	200	1250	NAV
Aromatic hydrocarbon	64742-94-5	15-40	100	550	> 500 mg/kg

NAP: Not Applicable, NAV: Not Available

3- PHYSICAL DATA:

Physical State: ..... Liquid.
Appearance and Odor: ..... Clear colorless liquid, citrus odor.
Odour Threshold: ..... Not available.
Specific Gravity: 0.813
Vapor Pressure: ..... 0.5 kpa at 38oC
Vapor Density: ..... 4.7-5.4 (air=1)
Evaporation Rate: ..... 0.04 (butyl acetate= 1)
Boiling Point: ..... 182 to 210oC
Freezing Point: ..... Not applicable.
pH: ..... Not applicable.
Coefficient of Water/Oil Distribution: .. Not available.
Percent Volatile: 100%
Solubility in Water: ..... Negligible.

4- FIRE AND EXPLOSION HAZARD DATA

Conditions of Flammability: ..... Temperature above flash point.
Extinguishing Media: ..... CO2, dry chemical, foam.
Flash Point and Method: ..... 60oC TCC
Flammable Limits - UEL: 6.0
Flammable Limits - LEL: 0.9
Auto-Ignition Temperature: ..... Not available.
Hazardous Combustion Product: ..... Carbon monoxide.
Sensitivity to Mechanical Impact / Static Discharge: Ground the container.
Unusual Fire And Explosion Hazards: ..... None known.

5- REACTIVITY DATA

Stability, If Not, Under Which Condition: Stable.
Incompatibility - Materials to Avoid: ... Oxidizer.
Hazardous Polymerization: ..... Will not occur.
Corrosion: ..... None known.
Hazardous Decomposition Products: ..... Not available.

6- PREVENTIVE MEASURES

Environmental Data: ..... Not available.
Handling: ..... Practice good industrial hygiene when handling this product.

Personal Protective Equipment:
- Eye Protection: ..... Safety glasses.
- Hand Protection: ..... Neoprene, gauntlet type.
- Respiratory Protective Equipment: .. When TLV is exceeded, an approuved respirator is advised.
- Other Protective Equipment: ..... Determined by the application.

Recommended Disposal: ..... Disposal should be in accordance with applicable regulations.
Spill Response: ..... Extinguish all ignition sources, Absorb with a commercial absorbent, Ventilate the area.
Storage Requirements: ..... Store in a well ventilated area, away from ignition source.
Ventilation Requirements: ..... Provide ventilation capable of maintaining emissions below the TLV.

7- TOXICOLOGICAL PROPERTIES

ROUTE OF ENTRY: ..... Eyes and skin contact. Inhalation.

7.1 - EFFECTS OF ACUTE EXPOSURE:

Eye Contact: ..... Possibility of a light irritation.
Skin Contact: ..... Possibility of a light irritation.
Inhalation: ..... In high concentration, may cause irritation.
Ingestion: ..... Low toxicity.

7.2 - EFFECTS OF CHRONIC EXPOSURE:

Carcinogenicity: ..... Not applicable.
Reproductive Toxicity: ..... Not applicable.
Teratogenicity: ..... Not applicable.
Mutagenicity: ..... Not applicable.
Synergistic Product: ..... Not available.
Sensitization: ..... Not available.

8- SUGGESTED FIRST AID

Eye Contact: ..... Rinse with plenty of water during at least 15 minutes.
Skin Contact: ..... Wash with soap and water.
Inhalation: ..... Remove victim to fresh air.
If Swallowed: ..... Do not induce vomiting.
Other First Aid: ..... Contact a physician.

Magnus®

Product: DIPSOL

9- ADDITIONAL INFORMATION

TDG Classification: ..... Not-regulated.
WHMIS Classification: B3

10- PREPARATION INFORMATION

Preparation: MAGNUS Industrial Hygiene Department TEL: 450-655-1344
FAX: 450-655-5428

Code. : 018294

Date of Preparation: 11/06/2004

MATERIAL SAFETY DATA SHEET

Magnus®

Product: SUPREX

MAGNUS CHEMICALS LIMITED
1271 AMPERE
BOUCHERVILLE, QUEBEC, J4B 5Z5

EMERGENCY PHONE: 450-655-1344 FAX: 450-655-5428 (8:30 to 16:30)
(613) 996-6666 (CANUTEC)

1- PRODUCT INFORMATION:

Product Manufacturer: ..... MAGNUS CHEMICALS LIMITED
Product Identifier: ..... Suprex
Product Use: ..... General purpose degreaser.

2- HAZARDOUS INGREDIENTS:

MATERIAL or COMPOUND:	C.A.S. No.:	PERCENT: W/W	THRESHOLD LIMIT VALUE (TLV) PPM:	mg/m3	LD50/LC50
Not applicable.					

NAP: Not Applicable, NAV: Not Available

3- PHYSICAL DATA:

Physical State: ..... Liquid.
Appearance and Odor: ..... Clear yellow liquid with a light pine odor.
Odour Threshold: ..... Not available.
Specific Gravity: 1.02
Vapor Pressure: ..... Not available.
Vapor Density: ..... Not available.
Evaporation Rate: ..... < 1 (butyl acetate = 1).
Boiling Point: ..... Near 100oC
Freezing Point: ..... Near 0oC
pH: ..... 11.7 (10% solution)
Coefficient of Water/Oil Distribution: .. Not available.
Percent Volatile: 84%
Solubility in Water: 100%

4- FIRE AND EXPLOSION HAZARD DATA

Conditions of Flammability: ..... None known.
Extinguishing Media: ..... Not applicable.
Flash Point and Method: ..... Not applicable.
Flammable Limits - UEL: ..... Not applicable.
Flammable Limits - LEL: ..... Not applicable.
Auto-Ignition Temperature: ..... Not applicable.
Hazardous Combustion Product: ..... Oxide of carbon.
Sensitivity to Mechanical Impact / Static Discharge: Not applicable.
Unusual Fire And Explosion Hazards: ..... None known.

5- REACTIVITY DATA

Stability, If Not, Under Which Condition: Stable.
Incompatibility - Materials to Avoid: ... Acid.
Hazardous Polymerization: ..... Will not occur.
Corrosion: ..... None known.
Hazardous Decomposition Products: ..... Not available.

6- PREVENTIVE MEASURES

Environmental Data: ..... Not available.
Handling: ..... Handle and open container with care.
Personal Protective Equipment:
- Eye Protection: ..... Safety glasses.
- Hand Protection: ..... Gloves if necessary.
- Respiratory Protective Equipment: .. Not normally necessary.
- Other Protective Equipment: ..... Not normally necessary.

Recommended Disposal: ..... Disposal should be in accordance with applicable regulations.
Spill Response: ..... Wash the area with water.
Storage Requirements: ..... Avoid freezing.
Ventilation Requirements: ..... Mechanical (general).

7- TOXICOLOGICAL PROPERTIES

ROUTE OF ENTRY: ..... Skin contact. Eye contact.

7.1 - EFFECTS OF ACUTE EXPOSURE:

Eye Contact: ..... Irritation.
Skin Contact: ..... Possibility of a light irritation.
Inhalation: ..... Negligible effects.
Ingestion: ..... Gastric discomfort.

7.2 - EFFECTS OF CHRONIC EXPOSURE:

Carcinogenicity: ..... Not applicable.
Reproductive Toxicity: ..... Not applicable.
Teratogenicity: ..... Not applicable.
Mutagenicity: ..... Not applicable.
Synergistic Product: ..... Not available.
Sensitization: ..... Not available.

8- SUGGESTED FIRST AID

Eye Contact: ..... Rinse with plenty of water.
Skin Contact: ..... Wash with plenty of water during at least 15 minutes.
Inhalation: ..... Remove victim to fresh air.
If Swallowed: ..... Drink plenty of water.
Other First Aid: ..... Contact a physician.

9- ADDITIONAL INFORMATION

TDG Classification: ..... Not regulated.
WHMIS Classification: ..... Not regulated.

10- PREPARATION INFORMATION

Preparation: MAGNUS Industrial Hygiene Department TEL: 450-655-1344
FAX: 450-655-5428

Code. : 030044

Date of Preparation: 05/31/2004

The opinions expressed herein are those of qualified experts within MAGNUS CHEMICALS LIMITED. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and of these opinions and the conditions of use of the product are not within the control of MAGNUS CHEMICALS LIMITED, it is the user's obligation to determine the conditions of safe use of the product.

LS07 / suprexa

APPENDIX -2-

Spill Contingency report

Spill Contingency Report

Information of Incident
Section A

Date of Incident _____ Time _____

Location _____

Coordinates: ☐° ☐' ☐" W
☐° ☐' ☐" N

Check the Direction of Spill Movement: N☐ NW☐ W☐ SW☐ S☐ SE☐ E☐ NE☐
(State the bearing if possible)

Bearing: _____ Rate of Movement: _____

Party Responsible for Spill _____

Type of Substance that Spilled _____

Estimated Quantity of Substance _____

Specific Cause of Incident
Section B

Please state the causes of the incident above in the following space provided

Status of Incident
Section C

Approximate surface area of contamination _____

List any factors affecting the spill such as: wind, temperature, etc.

Containmant Actions Taken:

- ☐ Occurred Naturally
- ☐ Booms used
- ☐ Dyke used
- ☐ No containment implemented
- ☐ Other (specify)

_____
_____

Action Proposed to Clean, Contain or Dispose of Spilled Substance

Spills should be immediately reported using the 24 Hour Spill Report Line: (867) 920-8130 (NWT)

Section D

Hazards of Spill
Section E

- ☐ Flammable
- ☐ Combustible
- ☐ Health hazard (specify)

_____

_____

- ☐ Corrosive
- ☐ Explosive
- ☐ Radioactive
- ☐ Other (specify)

_____

_____

Information if Assistance is Required
Section F

Organization

Contact Person

Contact Number Alternate Number

Hours of Operation:

Comments and Recommendations
Section G

Information on Person Making Report
Section H

Full Name ( ) - *Contact Number* *Position & Department*

Employer

Submitted to

Reporter's Signature Date

Spills should be immediately reported using the 24 Hour Spill Report Line: (867) 920-8130 (NWT)

APPENDIX B

SUMMARIES OF STUDIES COMPLETED IN 2005

1. English and Inuktitut executive summaries for the report "Archaeological Impact Assessment FOX-C Dew Line Site Remediation Program, Permit 05028A" Prepared for Jacques Whitford by FMA Heritage Resources Consultants Inc., October 2005

ᐊᐅᓪᓗᓯᓕᒃ ᑎᑎᕋᖏᑦ

ᑕᐃᓐᓇ ᐃᑦᑕᖅᓂᑕᕐᖅᑐᓪᓗᓂᑦᔪᑦ ᐊᑐᐃᓐᓇᐅᔨᓄᑦ ᐊᖅᑐᐃᓯᒪᓂᖅᓱ ᖃᐅᔨᓴᖅᑕᐅᓂᖅᓱ ᐃᓯᓚᓕᐅᖅᑐᖅ ᐱᖃᓗᓕᐅᖅᑐᖅ ᑕᒪᑐᒥᖅᓱ ᑐᓕᐃᒃᑯᑦ ᐃᓂᖅᓱ ᓴᓐᖏᑦ C (ᓴᖅᓴᓕ ᑕᓯᖅ). ᐃᓂᖅᓱ ᖃᓄᐃᓚᖅᓱᓂᖅᓱ ᖃᐹᓂᖅᑕᐅᓕᒥ ᑕᒪᑐᒧᖅᓱ ᐃᓂᖅᓱᓕᑦ 1:250,000 ᓄᓇᖅᓯᐊᑎᒍᑦ ᐱᖃᓗᖅᑕᐅᓕᐅᖅᑐᖅ ᖃᐅᔨᓴᖅᐊᖅᒪᑕ ᖃᓄᐃᓚᖅᓱᓂᖅᓱᓂᒃ ᐊᒪᓕᓗ ᐃᓂᖅᓱᓂᒃ ᖃᓄᐃᓚᖅᓱᓂᖅᓱᓂᕐᓂᕐᒪᑐᑦᓗᑐ ᐃᓂᖅᓱᓕᑦ ᐊᐱᒃᑐᖅᓯᒪᔪᓂ. ᐅᓇ ᓄᓇᖅᓱᓂ ᐃᓕᑦᑎᓇᓯᐊᖅᓂᖅ ᐱᓯᒪᓂᐊᖅᑐᖅ ᓄᓇᖅᓯᓂᒃ ᐱᑕᖃᒃᑐᖅᓂᒃ ᐊᒪᓕᓗ ᐊᖏᔪᖅ ᐱᓕᕆᔨᒃᑯᑦ ᓄᓇᖅᓂᒃ ᐊᓐᓂᑦᑐᖅ ᑕᐅᖅᓯᒪᓂᖅ ᐊᒪᓕᓗ <ᓴᐃᓴᐃᓂᐊᕐᒥᒃ ᓄᓇᖅᓂᒃ ᐊᓐᓄᓗᐊᓂ ᑕᒃᑯᐊ ᐃᓂᖅᖃᖏᕐᖅᓂᑕ.

ᐃᓂᖅᓱᑕ ᐊᒪᓕᓗ ᐊᑐᖅᑕᐅᓂᖅᓱ ᑕᐃᓐᓇ ᓴᓐᖏᑦ C ᓱᓕᐅᑎᖃᖅᖏᓐᓄᑦ ᐊᓐᓂᔨᒥᒃ ᓯᑯᐃᔨᓕᔨᖅᑐ. ᑕᓯᖅ ᓯᓚᕐᓂᓐᓂᓂ ᐃᓂᖅᓱᑕ ᐃᓂᒋᕐᐅᓕᓂᑦ ᖃᑕᐅᕐᓂᑦ ᓯᓚᑯᑕᐅᓯᒪᔨᑦ ᐊᐅᔨᓂᑦ ᐊᒪᓕᓗ ᐊᔨᓂᐸᓂᑦ ᓄᓇᔨᐅᑎᓄᑦ ᐊᖏᔪᓂᒋᐅᔨᓯᒪᔨᖅᑐᖅ ᐊᒪᓕᓗ ᖃᑕᐅᕐᓂᓕᖅᑐᑦᓯᑕᐅᔨᓯᒪᓕᒫᓂ. ᒪᓐᓇᐅᔨᖅ ᐱᑕᓱᑦᑎ ᖃᑕᐅᕐᓂᖃᖅᖏᓐᓂᑦ ᐊᐅᓂᒃᑯᑦ; ᓄᓇᖅᓱ ᓯᓂ ᖃᑕᐅᕐᓂᖃᖅᖏᓐᓂᕐᓂᒋᐅᔨᓯᒪᔨᖅᑐᖅ ᐊᒃᑐᐃᔨᒪᓐᓇᖅᓂᖃᖅᓂᖃᕐᓂᓂ ᔨᑯᑕᐅᔨᒪᓐᓇᖅᓂᑐᑎᓂᒃᓱᒃᓂᓂ ᐃᓂᖅᓱᓂᕐᓂᓐ. ᑕᒪᓐᓇ ᐊᒥᐊᒃᑯᐊ ᐊᓪᓚᓗᐊᓂ ᐃᓂᖅᓱᑕ ᓱᓕᐅᑎᖃᖅᖏᓐᓄᑦ, ᑕᓕᐅᖃᖅᓴᓂᑐᑎᓂᖅ ᑕᔨᖅᑐ ᐊᒪᓕᓗ ᐊᖏᔪᓂ ᑕᒪᖏᒃᑐ ᑕᐃᒪᓐᓇᐃᓕᓴᐅᔨᓯᒪᔨᖅᑐᑦ ᔨᑯᑎᓕᓗᑐᓂᒃ.

ᐃᑕᖅᓂᑕᖅᑐᑎᓂᒃ ᐅᓪᓚᔪᓐᓇᓂᑦ ᑕᐃᒪᓐᓇᐅᓕᖅᓯᑐᑎᐊᓂᑦ ᐃᓂᖅᓱᑕ ᓇᓂᕈᐅᓕᐅᖅᑐᑦ ᑕᐃᑲᓂ ᐅᐸᑦᔨᓕᓕᖅᑐᖅ ᓄᓇᒥ ᖃᐅᔨᓴᖅᓱᑎᓂᒃ ᓄᐊᕎᑎᑎᒃ ᓄᓇᖅᓂᒃ ᑐᓴᔨᓴᖅᑕᐅᔨᒪᓂᖅᓱᓂᓄᑦ ᓄᓇᖅᓂᒃᓴᖅᑕᐅᔨᒪᓂᖅᓱᓂᓄᑦ ᖃᓄᐃᓚᖅᓱᓂᖅᓱᓂᓄᑦ.

Executive Summary

An archaeological resources impact assessment was completed on DEW Line station FOX-C (Ekalugad Fjord). A site file search of the corresponding 1:250,000 NTS map sheets was completed to determine the nature and location of previously recorded sites in the region. The field study focused on areas of existing and proposed disturbances in area of the station.

Occupation and use of the FOX-C station has resulted in extensive disturbance. Lake shore locations associated with borrow areas were disturbed by grading and other vehicular traffic as well as borrow activities. Existing borrow areas have been largely disturbed surficially by grading; areas of additional borrow activity will not impact previously undisturbed areas. The remaining areas surrounding the station, freshwater lake and roads are all associated with disturbances.

No archaeological or historic sites were identified during the field reconnaissance in the areas of proposed activities.

2. English and Inuktitut executive summaries for the report "Screening and Proposed Site Remediation at the Former FOX-C DEW Line Site at Ekalugad Fjord" , Nunavut, Jacques Whitford March 31, 2005

ᓴᓇᕙᓕᓇᔨᒃᑯᑦ ᐊᒻᒪ ᒐᕙᒪᒃᑯᓐᓄᑦ ᐱᔨᑦᑎᕋᖅᑐᓕᕆᔨᒃᑯᑦ ᑲᓇᑕᒥ (PWGSC), ᐱᒍᔾᔨᓪᓗᑎᒃ ᐃᓄᓕᕆᔨᑐᖃᒃᑯᓐᓂ ᑲᓇᑕᒥ (INAC) ᐸᕐᓇᖓᒪᑕ ᐱᔭᕇᖅᓯᕙᒪᓪᓗᑎᒃ ᓴᓗᒻᒪᖅᓴᐅᕙᓪᓕᐊᓂᕐᒥᒃ ᐊᒻᒪ ᑕᐃᒪᐃᓐᓂᕆᓚᐅᖅᑕᖓᓄᑦ ᐅᑎᖅᑎᑦᑎᒐᓱᐊᖅᐸᓪᓕᐊᓂᕐᒥᒃ ᑕᐃᑲᓂ ᓈᓚᒃᕕᐅᖃᑦᑕᕐᓂᑯᐱᓂᕐᒥ ᐊᑎᖄᖅᑎᑕᐅᕙᓂ ᖄᓪᓗᓇᑎᑦ FOX-C ᕿᑭᖅᑖᓗᖕᒥ ᐃᓂᖄᖅᑐᒥ. ᐊᓪᓗᖅᐸᓪᓕᐊᓯᒪᕙᑦ ᓴᓗᒻᒪᖅᓴᕐᑕᐅᓂᖓ ᐱᔭᐅᕙᓪᓕᐊᓕᓚᐅᖅᓯᒪᕗᖅ ᑲᕙᓯᕙᒥᒃ 1985ᒥᓂ. ᓯᕗᓪᓕᖅᐹᖅ ᓴᓇᕙᓕᓇᔨᒃᑯᑦ ᐊᒻᒪ ᒐᕙᒪᒃᑯᓐᓄᑦ ᐱᔨᑦᑎᕋᖅᑐᓕᕆᔨᒃᑯᑦ ᑲᓇᑕᒥ ᓴᓗᒻᒪᖅᓴᐃᕙᓪᓕᐊᓂᖓ ᐱᒋᐊᕐᓂᖃᓚᐅᖅᐳᖅ ᓇᓗᓇᐃᔭᖅᓯᒪᑦᑎᐊᖅᑐᒥᒃ ᑎᑎᖅᑐᐃᕙᓪᓕᐊᓂᕐᒥᒃ ᐃᓂᖓᓗ ᑭᓱᖃᕐᒪᖔᑦ ᖃᓄᐃᑦᑐᖃᕐᒪᖔᑦ ᐊᒻᒪ ᓱᕈᕐᓇᖅᑐᑦ ᑕᐅᕙᖓᓂᒃᓴᔭᐅᖕᒋᑦᑐᓪᓗ ᑕᐃᑲᓂ ᖃᓄᐃᑦᑑᖕᒪᖔᑕ. ᐊᐃᑉᐸᖓᓂᓕ ᓴᓕᒻᒪᖅᓴᐃᕙᓪᓕᐊᓯᒋᐊᓕᓚᐅᖅᐳᑦ. ᐊᑐᖅᑕᐅᓪᓗᓂ ᐱᔭᕆᐊᖃᕐᓂᖏᑦ ᑕᐃᑲᓂ ᓄᓇᕗᑦ *ᓄᓇᑖᕈᑎᖓᑕ ᐊᖏᕈᑎᖓᓂ (NCLAH ᐊᒻᒪ ᑲᓇᑕᒥ ᐊᕙᑎᓕᕆᓂᕐᒧᑦ ᖃᐅᔨᓴᕐᓂᕐᒧᑦ ᐱᖁᔭᕐᔪᐊᖅ (CEAA),* ᓴᓗᒻᒪᖅᓴᐃᓂᕐᒧᑦ ᐱᓕᕆᐊᖑᕙᓪᓕᐊᓂᐊᖅᑐᑦ ᐸᕐᓇᒃᑕᐅᓯᒪᕙᑦ ᑕᐃᑯᓇ ᐊᕙᑎᓕᕆᓂᕐᒧᑦ ᓱᒃᑯᐃᓗᐊᕐᔪᖕᒋᒃᑲᓗᐊᕐᒪᖔᑕ ᖃᐅᔨᓴᖅᑕᐅᖃᕆᐊᖃᕆᕗᑦ.

ᓴᓗᒻᒪᖅᓴᖅᑕᐅᕙᓪᓕᐊᓂᖓ FOX-C ᐱᒋᐊᕐᕕᒃᓴᖃᖅᑎᑕᐅᖑᐊᖅᐳᖅ 2006ᒥ ᐱᔪᓐᓇᖅᑕᐅᓗᓂᓗ 2007-ᖑᓕᖅᐸᑦ. ᓅᑕᐅᕙᓪᓕᐊᓯᒋᐊᕐᓗᑎᒃ ᓯᑎᐱᕆ 2005ᒥ ᓅᑕᐅᕙᓪᓕᐊᕙᓐᓃᕐᓗᑎᓪᓗ ᓴᓗᒻᒪᖅᓴᖅᑕᐅᓪᓚᑦᑖᓯᒋᐊᕐᓗᑎᓪᓗ 2007 ᐅᑭᐅᖑᓂ. ᐱᓕᕆᐊᖑᓂᐊᖅᑐᑦ ᐃᔾᕙᖅ ᓄᓇ ᐲᔭᖅᑕᐅᕙᓪᓕᐊᓗᓂ/ᓴᓗᒻᒪᖅᑕᐅᕙᓪᓕᐊᓗᓂ; ᐊᒃᑕᕝᕕᕕᓂᖅ ᓴᓗᒻᒪᖅᑕᐅᕙᓪᓕᐊᓗᓂ, ᓄᐊᑕᐅᓗᑎᒃ ᐃᒋᑕᐅᓗᑎᓪᓗ ᐊᑦᑕᓇᖅᑐᑦ ᓱᕈᕐᓇᖅᑐᑦ ᐊᒻᒪ ᐅᓗᕆᐊᓇᓗᐊᖕᒋᑦᑐᑦ ᓴᓂᕈᕙᐃᑦ, ᓱᕋᑦᑎᔭᐅᓗᑎᓪᓗ ᐊᒻᒪ ᓄᖑᑎᖅᑕᐅᓗᑎᒃ ᑕᐃᑲᓂ ᐃᓪᓗᑐᖃᕕᓂᐅᕙᑦ.

ᓴᓗᒻᒪᖅᓴᐃᕙᓪᓕᐊᒍᑕᐅᓂᐊᖅᑐᑦ FOX-C-ᒥ ᐊᕙᑎᑦᑎᓐᓂ ᐱᕙᓪᓕᐊᖃᑎᖃᕐᓂᐊᖅᐳᑦ ᑕᒪᒃᑯᐊ ᐃᖕᒋᕐᕋᒍᑎᑦ ᑭᓯᓕᕆᔾᔪᑎᓪᓗ ᐳᕙᕐᕙᖕᒋᓐᓄᑦ ᐃᓯᐊᕿᓂᖕᒋᓐᓄᓗ, ᓴᓂᕐᓄᑦ, ᓄᓇᖓᑕᓗ ᖁᖓ ᐊᑐᖅᑕᐅᖃᑦᑕᕐᓗᓂ ᐊᒻᒪ ᓄᓇᓕᖕᓂᖕᒌᖅᓯᒪᕙᓂ ᖃᓂᒃᓴᖅᑐᓂ ᐃᖅᑲᓇᐃᔭᖅᑎᑦᑎᓂᒃᑯᑦ. ᑕᐃᒪᐃᔾᔪᕐᒋᓐᓂᖅᑕᐅᓪᓚᕆᒍᓐᓇᕐᒋᓚᕐᓗ ᐊᒻᒪ ᐅᖅᓱᐊᓗᖕᒥ ᐊᓯᖕᒋᓐᓂᓘᓐᓃᑦ ᓱᕈᕐᓇᖅᑐᓕᓐᓂ ᑯᕕᑐᐃᓐᓇᕆᐊᖅᐳᑦ. ᐱᓕᕆᐊᖅᓂᖓ ᒪᓕᓐᓂᐊᕐᒪᑦ ᐱᓕᕆᓂᖅᑎᐊᖅᓯᐊᕐᓂᕐᒧᑦ ᐊᑐᒐᕆᔭᐅᕙᑦᑐᓂ ᑲᓇᑕᐅᑉ ᐅᐊᖕᓇᖓᓂ ᐱᓕᕆᐊᖃᖅᑎᓪᓗᒋᑦ, ᑕᒪᒃᑯᓄᖓᓗ ᑯᕕᑦᑕᐃᓕᒪᓂᕐᒧᑦ ᑕᐃᒪᐃᒋᓯᑲᓪᓚᒃᑐᕕᓂᐅᒃᐸᑕ ᖃᓄᐃᓕᐅᕈᑕᐅᓂᒃᓴᖏᓐᓂ ᐸᕐᓇᐅᑎᖃᐃᓐᓇᕐᓂᐊᖅᑐᑦ ᐅᐸᓗᖓᐃᖅᓯᒪᑦᑎᐊᕐᓗᑎᒃ. ᐱᓕᕆᐊᖓ ᑑᕌᒐᖃᕐᓂᐊᖅᐳᖅ ᓴᓗᒻᒪᖅᓴᐃᓂᕐᒥᒃ ᐊᒻᒪ ᑕᐃᒪᐃᓐᓂᕆᓚᐅᖅᑕᖓᓄᑦ ᐅᑎᖅᑎᑦᑎᓇᓱᖕᓂᕐᒥ ᐱᐅᓯᕆᓚᐅᖅᑕᖓᓄᑦ. ᐱᓗᐊᖅᑐᒥᓪᓕ, ᓴᓗᒻᒪᖅᓴᖅᑕᐅᓂᖓ ᓅᑎᕆᓂᐊᖅᐳᖅ ᐊᐅᓚᑦᑎᓂᐊᖅᐳᓪᓗᓃᑦ ᐊᕙᑎᑦᑎᓐᓄᐊᖅᓯᕙᓪᓕᐊᖕᒋᖕᖓᕐᓂᕐᒧᑦ. ᐊᕙᑎᑦᑎᑦᑎᓐᓂ ᐊᒃᑐᐃᓂᖓ ᐱᓗᐊᖅᑎᑕᐅᑦᑕᐃᓕᒪᓂᐊᖅᐳᖅ ᐊᒃᑐᐃᓂᖓᓗ ᒥᑭᑦᑐᑎᑕᐅᑎᑕᐅᓇᓱᐊᕐᓂᐊᖅᐳᖅ. ᐱᓂᓕᕆᐊᖕᒋᑦᑕ ᐊᑲᐅᓂᖕᒋᑦ ᐃᖅᑲᓇᐃᔭᖅᑎᑦᑎᑲᐃᓐᓇᕐᓂᖅ ᓄᓇᓕᖕᓂᖕᒌᖅᑐᓂᒃ ᓴᓗᒻᒪᖅᓴᐃᕙᓪᓕᐊᓂᒃᑯᑦ.

EXECUTIVE SUMMARY

Public Works and Government Services Canada (PWGSC), on behalf of Indian and Northern Affairs Canada (INAC) is planning to complete the clean up and remediation of the former FOX-C Intermediate DEW Line Site on Baffin Island. Various stages of clean up of the site have been ongoing since 1985. The first phase of PWGSC's clean up and remediation consisted of a detailed site assessment and preliminary consolidation of existing wastes at the site. The second phase involves the remediation of the site. As required under the *Nunavut Land Claim Agreement* (*NLCA*) and the *Canadian Environmental Assessment Act* (*CEAA*), the remediation activities proposed for FOX-C must undergo an environmental screening.

The remediation at FOX-C is scheduled to begin in 2006 with completion in 2007. Mobilization activities will begin in September 2005 with demobilization to follow remediation activities in the winter of 2007. Activities will consist of contaminated soil excavation/remediation, dump area remediation, collection and disposal of hazardous and non-hazardous debris, and demolition and disposal of site facilities.

The remediation activities at FOX-C will interact with the environment through vehicle and machinery emissions, waste disposal, surface disturbance and the provision of employment to local inhabitants. There is also the potential for spills of fuel or hazardous materials. The activities will be carried out following standard good operating practices for northern Canada, with spill prevention practices and contingency plans in place. The objectives of the activities are to clean up and return sites to as close to natural conditions as is possible. Specifically, the remediation will mitigate and/or control the release of contaminants into the environment. The environmental effects of the activities are assessed as being of low magnitude and not significant. The activities will benefit the area through the short-term employment of local individuals and through the clean up of the site.

3. English and Inuktitut executive summaries for the report " Human Health and Ecological Risk Assessment for CAM-F Dew Line Site, Sarcpa Lake" Jacques Whitford, February 4, 2005

ᐊᖓᔪᖅᑲᐅᑎᓄᑦ ᐅᓂᒃᑳᓯᔭᖅ

ᔫᓐ ᕿᑦᑐᐊᑦ ᓕᒥᑎᑦ (ᔫᓐ ᕿᑦᑐᐊᑦ) ᑭᓪᓕᓯᓂᐊᕐᓂᖃᓚᐅᕐᒪᑦ ᐃᓄᐃᑦ ᐋᓐᓂᐊᓂᖏᓐᓄᑦ ᐊᕙᑎᑦᑎᓐᓄᓗ ᐊᑦᑕᓇᖅᑎᒥᓂᖃᕐᒪᖔᑕᓘᓐᓃᑦ (HHERA) ᑕᐃᑲᓂ FOX-C (ᐃᖃᓗᒐᑦᓂ) ᓈᓚᒡᕿᕿᓂᕐᒥ ᕿᑭᖅᑖᓗᕐᒥ, ᓄᓇᕗᑦ. ᑐᑦᓯᓪᓗᐊᑕᓇᓚᐅᖅᑕᖓ ᑕᑯᒥᐊᖅᑕᐅᓂᖓᑕ ᖃᐅᔨᓴᖅᑕᐅᖁᓪᓗᑎᑦ ᐊᓯᖏᓐᓂ ᐃᒥᕈᔪᖕᓂ ᓱᕈᕐᓇᖅᑐᓂ ᐱᑕᖃᙱᒃᑲᓗᐊᕐᒪᖔᑦ ᓄᓇᐅᑉ ᖃᖓᓂ ᐃᒪᕈᔪᖕᓂᓗ ᐊᒻᒪᓗ ᐱᑕᖃᕐᐸᑦ ᐃᓄᖕᓄᑦ ᑕᐅᕙᖕᓯᒪᔫᓐᓂᑦ ᐊᕙᑎᖓᓄᑦ ᐊᑦᑕᓇᙱᒃᑲᓗᐊᕐᒪᖔᑦ ᐅᐸᒃᑕᐅᖃᑦᑕᕐᓂᖓᓄᑦ ᐃᓂᓕᔾᔪᐅᖃᑦᑕᕐᓂᖓᓄᓪᓗ ᓯᕗᓂᒃᓴᑦᑎᓐᓂ ᒫᓐᓇ ᑕᐃᒪᐃᓕᖓᑎᓪᓗᒍ ᐊᒻᒪᓗ ᓴᓗᒻᒪᖅᓴᖅᑕᐅᒌᖅᓯᒪᓕᖅᑎᓪᓗᒍ.

ᐃᖃᓗᒐᐅᑉ ᑕᓯᐅᔭᖓ ᑕᐅᕙᓃᑉᐳᖅ ᕿᑭᖅᑖᓗᑉ ᐅᐊᖕᓇᖓᑕ ᓯᓈᓂ, ᖃᐅᖕᓇᕐᔪᖅᑕᓕᐅᑉ ᐃᒃᐱᐊᕐᔪᖓᑕ ᐅᖓᑎᑦᑎᐊᖓᓂ. ᓈᓚᒡᕿᐅᖃᑦᑕᓚᐅᖅᓯᒪᔪᖅ ᖃᖃᒥᐅᓄᑦ (FOX-C) 1963-ᖑᕐᓱᖅᓂᖓᓂ.

ᖃᐅᔨᓴᕐᓂᐅᑉ ᒥᒃᓵᓄᑦ

ᒫᓐᓇ ᖃᐅᔨᓴᕐᓂᐅᔪᖅ ᑕᑯᐊᕐᓂᖃᓚᐅᖅᐳᖅ ᐃᓄᖕᓄᑦ ᐊᕙᑎᖓᓐᓃᑦᑐᓄᓪᓗ ᐊᑦᑕᕐᓇᕈᔾᔪᑎᒃ ᐱᑕᖃᙱᒃᑲᓗᐊᕐᒪᖔᑦ ᑕᐅᕙᓐᓇ FOX-C. ᐃᑲᔪᖅᓱᕐᑕᐅᕗᖅ ᓄᑖᓂ ᓱᕈᕐᓇᖅᑐᑦ ᒥᒃᓵᓄᑦ ᖃᐅᔨᒪᒍᑎᓂᒃ ᑕᐃᑲᓂ, ᐊᑐᖅᑕᐅᓪᓗᑎᒃ ᐱᖓᔪᖓᓂ ᐊᕙᑎᖓᑦᑕ ᖃᐅᔨᓴᕐᑕᐅᓂᖓ (Earth Tech 2004) ᖃᐅᔨᓴᖅᑕᐅᓪᓗᑎᒃ Hᐃᕐᕈᑳᐸᓐ, ᐊᒻᒪᓗ ᖃᐅᔨᓴᓯᖅᑐᓕᕆᔨᓄᑦ ᐸᓕᓴᐃᒃᓕᒃ ᐊᕈᒪᑎᒃ Hᐃᕐᕈᑳᐸᓐᖑᓂᕋᖅᑕᐃᑦ (PAH's), ᐲᓯᐲ (PCBs), ᐊᒻᒪᓗ ᐱᑕᖃᐃᓐᓇᕐᓂᑯᖏᑦᑐᑦ ᓄᓇᖓᓂ, ᐊᒻᒪᓗ ᐅᓄᓗᐊᖏᑦᑐᑦ ᐃᒪᕈᔪᖕᓂ ᓄᓇᒥ ᖃᐅᔨᓵᖑᓂᑯᓂ, ᑕᓯᕐᓂ ᐊᒻᒪ ᑰᑦ ᐃᖅᑲᕈᔪᖏᓐᓂ ᐊᒻᒪᓗ ᐃᖃᓗᖕᓂ. ᐅᓂᒃᑎᑕᐅᓯᒪᔪᓂ ᓄᓇᖑᓂᖒᖅᑐᓂᒃ ᖃᐅᔨᓴᕐᓂᖃᓚᐅᕆᕗᑦ. ERA-ᖑᔪᑦ ᐃᓱᒪᒋᔭᐅᓚᐅᕐᒪᑕ ᐊᔾᔨᒋᖏᑦᑐᓂ ᓄᐊᑦᑎᕕᐅᓂᖏᓐᓂ ᐊᒻᒪᓗ ᐊᑐᓕᖅᑎᑕᐅᓪᓗᑎᒃ ᓄᑖᑦ ᖃᐅᔨᒪᒍᑎᐅᔪᑦ, ᑕᐃᒃᑯᐊ ᓯᕗᓪᓕᕐᒥ ᖃᐅᔨᓴᕐᑕᐅᒍᑎᐅᓚᐅᖅᑐᑦ ᐊᑐᖅᑕᐅᓯᓐᓇᖅᑎᓪᓗᒋᑦ. HHRA ᖃᐅᔨᓴᖅᑕᐅᓚᐅᕆᕗᑦ ᐊᐃᑉᐸᖓᓂ ᑕᐃᑲᓂ ᓄᑖᒥ ᐱᖓᔪᖓᓂ ᑲᑎᖅᓱᕐᑕᐅᓚᐅᖅᑐᓂ ᖃᐃᑕᐅᓪᓗᑎᓪᓗ Earth Tech-ᑯᓐᓄᑦ (2004).

ᖃᐅᔨᒪᒍᑎᑦ ᑲᑎᖅᓱᕐᑕᐅᓂᖏᑦ

ᓄᓇᐅᑉ ᐃᒪᐅᓪᓗ ᖃᐅᔨᓴᕐᑕᐅᓂᖏᑦ ᐊᐃᑉᐸᖓᓂ ᐊᒻᒪᓗ ᐱᖓᔪᖓᓂ ᑕᑯᒥᐊᖅᑕᐅᓚᐅᕐᐳᑦ ᐊᑦᑕᓇᖅᑐᖃᐅᕐᒪᖔᑦ. ᐊᑦᑕᓇᕐᒪᖔᑦ ᐃᓄᖕᓄᑦ ᐊᕙᑎᖓᓐᓃᑦᑐᓄᓪᓗ, ᓄᓇᑐᐊᖓ ᖃᐅᔨᓴᕐᑕᐅᓚᐅᖅᐳᑦ ᓄᓇᐅᑉ ᖃᖓᓂ ᐊᒻᒧᑦ 10ᒥ 15 ᓴᓐᑎᒦᑕᓐᓄᑦ ᑕᐃᒫᓪᓗᐊᖑᑎᓪᓗᒋᑦ ᓴᖅᑭᔫᕈᓐᓇᕐᓂᖏᓐᓄᑦ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᓂᖃᓚᐅᖅᐳᑦ.

ᐱᓕᕆᐊᖓᑕ ᐊᐃᑉᐸᖓᓂ ᐱᖓᔪᖓᓂᓗ ᖃᐅᔨᓴᕐᕕᐅᓚᐅᕆᕗᑦ ᐃᓗᑐᓂᖏᑎᒍᑦ ᐊᒻᒪᓗ ᐊᐳᕐᓯᒐᑎᑉ ᐹᖅᓯᒐᑎᓪᓗ ᐊᒻᒪ/ᐅᑉᑭᓗ ᐅᖓᕙᕆᐊᖅᑕᐅᓂᖃᕐᒥᒃ ᓄᓇᐅᑉ ᐃᓗᐊᓄᑦ ᑎᑭᑦᑐᒍ 0.3 ᒦᑕᓐ (mbgs) ᐊᑐᖅᑎᑕᐅᓚᐅᖏᓚᑦ. ᑕᒪᒃᑯᐊ ᐊᑐᖅᑕᐅᓚᐅᖅᐳᑦ ᓄᓇᐅᑉ ᖃᖓ ᓴᖅᑭᔫᖅᑐᖅ ᐊᒻᒪᓗ ᐃᑭᐊᖓᓂ ᓄᓇᐅᖓ ᓱᕋᓗᐊᖅᓯᒪᖏᑦᑐᑦ.

ᐃᒥᕈᔪᓕᖕᓂ ᖃᐅᔨᓴᕐᓂᖅ ᐃᓱᒫᓗᓇᕈᔪᒃᑐᓂ ᐱᑕᖃᙱᒃᑲᓗᐊᕐᒪᖔᑦ (CoPCs)

CoPCs ᐃᓱᒪᒋᔭᐅᖃᓯᐅᔭᐅᓚᐅᕆᕗᑦ ᐃᒥᕈᔪᐃᑦ ᓇᓗᓇᐃᖅᑕᐅᓚᐅᖅᑐᑦ Earth Tech-ᑯᓐᓄᑦ ᐱᖓᔪᖓᓂ ᐱᓕᕆᐊᖓᑦᑕ ᐅᓂᒃᑳᖓᓂ ᖃᖏᖅᓯᔪᓂ ᐅᖓᑕᐅᔾᔨᔪᓂᕐᑑᓐᓂᑦ CCME ᐱᑕᖃᕐᓂᕆᔭᕆᐊᓕᖕᖑᓂ ᓄᓇᒥ ᐊᑐᐊᒐᐅᔪᓂ (CCME 1999). ᑕᒪᒃᑯᐊ ᐊᑐᐊᒐᐅᕙᒃᑐᑦ ᑐᖓᕕᖃᕐᒪᑕ ᐊᕙᑎᑦᑎᓐᓄᑦ ᐃᓄᖕᓄᑑᓐᓂᑦ ᖃᓂᒻᒪᓯᕈᔪᖕᓄᑦ ᓴᐳᒻᒥᓂᖃᕐᑯᓪᓗᒋᑦ ᐊᒻᒪᓗ ᓴᐳᒻᒥᑦᑎᒍᑎᒃᓴᒧᑦ ᖃᐅᔨᓇᐊᖓᕐᓂᖃᕐᓂᕐᒧᑦ ᑕᐃᑲᓂ ᐱᓕᕆᕕᐅᓂᐊᖅᑐᒥ. ᐃᓄᖕᓄᑦ ᐊᑦᑕᓇᖅᑲᓗᐊᕐᒪᖔᖓᓄᑦ, ᐃᒥᕈᔪᐃᑦ ᖃᐅᔨᓴᕐᕕᐅᓚᐅᕐᐳᑦ ᑕᒪᒃᑯᓄᖓ ᐃᓄᖕᓄᑦ ᐊᑦᑕᓇᖅᑲᓗᐊᕐᒪᖔᖓᑕ ᖃᐅᔨᓴᕈᑏᑦ ᐊᑐᐊᒐᖏᑦ ᐊᑐᖅᑕᐅᓪᓗᑎᒃ; ᐱᔪᒪᔭᐅᓂᖅᓴᐃᑦ ᒪᓕᒃᑕᐅᓪᓗᑎᒃ, ᑖᒃᑯᐊ ᐊᑐᐊᒐᐃᑦ ᒪᓕᒃᓯᒪᖕᒪᑕ ᑕᐃᒃᑯᓂᖓ ᐊᑐᐊᒐᕐᓂᒃ CCME (CCME 1999), ᑕᐃᑲᖕᖓᖅᓯᒪᔪᓂᒃ ᐱᓯᒪᔪᓂᒃ

ᐊᓐᑎᐅᓇᔪᒥ ᐊᖓᔪᖃᐅᕕᖓ ᐊᕙᑎᓕᕆᓂᕐᒧᑦ (OMOE 1996a), ᐅᑉᐸᓗᓐᓃᑦ ᐊᒥᐊᓕᒪᐃᑦ ᓄᓇᖓᓐᓂ ᐊᕙᑎᓕᕆᓂᕐᒧᑦ ᓴᐳᒻᒥᑎᓂᕐᒧᑦ ᑎᒥᐅᔪᖅ (US EPA).

ᑐᓐᖓᕕᒋᔭᐅᓪᓗᑎᒃ ᐃᓄᖕᓄᑦ ᖃᓂᒻᒪᒃᑎᑦᑎᔪᓐᓇᕐᓂᖓ ᑕᐃᒃᑯᐊ ᖃᐅᔨᓴᐅᑎᐅᔪᑦ ᒪᓕᒃᑐᒋᑦ, ᐃᒥᕈᔪᐃᑦ ᑕᐅᑯᖓ ᐃᓄᖕᓅᖅᑕᐅᔪᓐᓇᕐᑐᑦ ᑕᐃᑲᓂ ᖁᑦᑎᖕᓂᖅᓴᖓᓂ ᐅᑯᐊᓪᓗᑎᒃ ᖃᓪᓗᓈᑎᑐᑦ ᐊᑎᖃᖅᑐᑦ beryllium, copper, lead ᐊᒻᒪᓗ ᑲᑎᓪᓗᒋᑦ petroleum hydrocarbon (TPH) F2, F3 ᐊᒻᒪ F4 ᓈᓴᐅᑎᖏᑦ ᐊᕕᒃᑐᖅᓯᒪᔪᑦ. ᑕᐃᒃᑯᐊᓗ ᒥᑭᓐᓂᖅᓴᐃᑦ ᑕᐃᑲᓂ ᐅᑯᐊᖑᒋᓪᓗᑎᒃ beryllium ᐊᒻᒪᓗ ᑕᐃᓐᓇ TPH F3 ᐊᕕᒃᑐᖅᓯᒪᔪᖅ.

ᐃᒥᕈᔪᐃᑦ ᐊᕙᑎᖓᓅᕐᐸᓪᓕᐊᔪᓐᓇᖅᑐᑦ ᐅᑯᐊᖑᓚᐅᓇᓗᑦ F1 ᒥᑦ F4 TPH ᐊᕕᒃᓯᒪᓂᖏᑦ, phenanthrene, beryllium, copper, cadmium, chromium (total), copper, lead ᐊᒻᒪ zinc. ᑕᐃᒃᑯᐊᓴᐃᓐᓇᐃᑦᑕᐅᖅ ᑕᒪᒃᑮᓐᓄᑦ ᐱᔭᐅᔪᓐᓇᓚᐅᓇᓗᑦ ᐃᓂᒋᔭᐅᔪᕕᓂᕐᒥ ᑕᑉᐹᓂᕐᑐᒥ ᐊᒻᒪᓗ ᐊᑦᑎᖕᓂᖅᓴᒥ.

ᓴᖅᑭᔮᖅᑐᑦ ᐃᓗᓕᖏᑦ

ᖃᐅᔨᓴᕐᓂᖓ ᓇᓗᓇᐃᖅᑕᓯᒪᔪᖅ ᑕᐃᑲᓂ ᐃᓂᒋᔭᐅᔪᒥ ᐊᒻᒪᓗ ᖃᓂᒋᔮᖓᓂ ᖃᐅᔨᓴᕐᕕᐅᓪᓚᐅᖅᑐᒥᒃ ᑕᐃᑲᓂ FOX-ᑕᒥ, ᒪᕐᕉᓕᔭᐅᓪᓗᑎᒃ ᖃᐅᔨᓴᕐᕕᐅᓪᓚᐅᕐᒪᑕ: ᑕᑉᐹᓐᓂᖅᓴᖅ ᐊᒻᒪ ᐊᑦᑎᖕᓂᖅᓴᖅ.

ᑕᑉᐹᓐᓂᖅᓴᖅ

ᑭᓱᕈᓘᔭᐃᑦ ᑕᐃᑲᓂ ᑕᑉᐹᓐᓂᖅᓴᒥ ᐃᖏᕐᕋᔪᓐᓇᕐᑐᖅ ᐃᓪᓗ; ᓱᓇᒃᑯᑖᒃᑯᕕᒃ ᐊᒻᒪᓗ ᓄᓇᒃᑰᕈᑎᒃᑯᕕᑦ; ᐃᓄᖕᓄᑦ ᓇᔪᒪᕕᓂᖅ (ᐃᓂᒋᔭᕕᓂᖅ); ᐅᖅᓱᐊᓗᒃ, ᖃᓂᖅᑐᖅ, ᐅᖅᓱᕐᑎᕈᑎᑦ (POL) ᒥᓪᓗᐊᕐᕕᒃ; ᖃᕐᒪᖅ, ᑲᑖᒃᓯᒪᔪᖅ ᓇᐸᕈᑕᕕᓂᖅ ᓈᓚᒍᑎᓄᑦ; ᐅᖅᓱᐊᓗᖃᐅᑎᑦ; ᓯᕐᓗᐊᖅ; ᐊᒥᐊᕈᑎᒃᑯᕕᒃ; ᐊᒻᒪᓗ ᑎᓴᒪᑦ ᐊᒃᑕᕐᕖᑦ.

ᐊᑦᑎᖕᓂᖅᓴᒥ

ᐊᑦᑎᖕᓂᖅᓴᒦᑦᑐᑦ ᐃᒪᐃᑦᑐᖃᓪᓚᐅᖅᐳᖅ, ᕿᔪᖕᒥ ᓴᓇᓯᒪᔪᒥ ᖃᕐᒪᐅᔮᓕᐊᓇᓯᒪᔪᒥ; ᐅᖅᓱᐊᓗᖃᐅᑎᒥ; ᐊᒻᒪᓗ ᓯᕐᓗᐊᒥ. ᑕᒪᑐᒧᖓ ᐱᔪᑎᖅᑎᓪᓗᒍ HHERA-ᒥ, ᐊᑦᑎᖕᓂᖓᒦᑦᑐᖅ ᐃᓱᒪᒋᔭᐅᓪᓚᐅᕐᒪᑦ ᐃᒻᒪᖅ ᑕᒫᓂ ᐊᖏᓂᖃᕈᐊᒃᓴᖓᓂ 2 Hᐊᒃᑎᐊᒃ, ᑕᒪᓐᓇ ᐱᖃᓯᐅᑎᓯᒪᒋᐳᖅ ᓇᒥᕈᓘᔭᖅ ᐅᖅᓱᐊᓗᖃᐅᑎᑦ ᖃᑦᑕᐅᔭᐃᑦ ᓇᒥᑐᐃᓐᓈᖅᑐᑦ. ᖁᑦᑎᖕᓂᖅᓴᒥ ᐊᒃᑎᖕᓂᖅᓴᒥᓗ ᑲᑎᖓᔪᑦ ᐊᖁᒧᑦ ᐊᑐᓇᐊᓕᐊᓇᔭᐅᓯᒪᔪᒧᑦ.

ᐅᐊᓐᓇᖓᓃᓐᓂᖓᓄᑦ ᐊᒻᒪᓗ ᐃᓄᖕᓄᑦ ᐊᑐᖅᑕᐅᖃᑦᑕᖅᑐᑐᖃᕕᓂᐅᔪᓇᐅᓂᖓᓄᑦ ᐱᐅᓯᑐᖃᖓ ᐊᑐᕐᓗᒍ, ᑕᒪᒃᑯᐊ ᓄᓇᐅᑉ ᐊᑐᖅᑕᐅᖃᑦᑕᕐᓂᖓᓄᑦ (ᓄᓇᒥᔭᐅᓪᓗᓂ, ᒥᕐᖑᐃᕐᓯᕕᐅᓗᓂ, ᕿᓇᐅᔮᓕᐅᕋᓱᐊᕈᑕᐅᓗᓂ, ᐊᒻᒪᓗ ᓴᓇᕕᒃᓴᐅᓗᓂ) ᐃᓘᓐᓇᑎᒃ ᐊᖏᓪᓕᒋᐊᖅᑕᐅᓂᖃᓪᓚᐅᕐᐳᑦ ᐃᓚᓕᐅᑎᔭᐅᓯᒪᓕᖁᓪᓗᒍ ᐃᓄᖕᓄᑦ ᓄᓇᒥᔭᑐᖃᐅᖃᑦᑕᕐᓂᕕᓂᖓᓄᑦ. ᐃᓗᓕᖓ ᑭᓪᓕᓕᒫᖓᓗ ᑕᒪᑦᓱᒪ ᓄᓇᐅᑉ ᐅᖃᐅᓯᐅᓯᒪᓪᓚᒃᓯᒪᔪᑦ ᓛᓐᓄ ᓕ ᐊᒻᒪ ᑳᓐᑦᒃᓴ-ᑯᓐᓄᑦ (1998), ᐊᒻᒪ ᐋᖅᑭᒃᑕᐅᓪᓚᐅᕐᓯᒪᔪᑦ ᑐᑭᓯᒋᐊᕐᕕᐅᒪᐅᕐᑎᓪᓗᒥᑦ ᐃᓄᐃᑦ ᓄᓇᖃᖅᑐᑦ ᐅᑭᐅᖅᑕᖅᑐᑉ ᑲᓇᖓᓂ, ᕿᑭᖅᑖᓗᒃ ᑯᐊᐳᓃᓴᓐ ᐊᒻᒪᓗ ᐃᓄᓕᕆᔨᑐᖃᒃᑯᑦ.

ᒪᓐᓇ ᖃᐅᔨᓴᕐᓂᐅᔪᖅ ᑎᒍᐊᖅᓯᒪᓪᓚᐅᕐᒪᑦ ᐊᑐᖅᑕᐅᖃᑦᑕᖅᑐᑐᖃᕕᓂᐅᓂᖓ ᐃᖃᓗᒐᐅᑉ ᐃᓂᖓ, ᑕᐃᑲᓂ ᓛᓐᓄ ᓕ ᐊᒻᒪ ᑳᓐᑦᒃᓴ (1998). ᓄᓇᒥᔭᐅᖃᑦᑕᖅᓯᒪᔪᑐᖃᐅᓂᖓᓄᑦ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᓂᖓ ᐃᒪᐃᓕᖓᓪᓗᓂ ᐃᓄᖕᓄᑦ ᐃᓚᒋᓄᑦ ᓄᓇᒥᔭᐅᖃᑦᑕᖅᑎᓪᓗᒍ, ᑐᐱᖃᖅᓗᑎᒃ ᑎᑭᓗᒍ ᑕᖅᑭᑦ ᐱᖓᓱᓄᑦ. ᐃᓱᒪᒋᔭᐅᓪᓚᐅᕐᒪᑦ ᑕᐃᑲᓃᑎᓪᓗᒥᑦ ᐃᓄᐃᑦ ᐊᖑᓇᓱᒃᑲᑦᑕᓚᐅᕐᓂᖏᓐᓂ, ᐃᖃᓗᐊᖅᓯᒪᓪᓗᑎᒃᓗ ᐊᒻᒪ ᑭᓱᑐᐃᓐᓇᓂ ᐊᓐᓇᐅᒪᒍᑎᒃᓴᖏᓐᓂ ᓄᐊᑦᑎᓪᓗᑎᒃ. ᐃᓱᒪᒋᔭᐅᓚᐅᓇᓗ ᐃᒻᒪᖅ ᑕᐃᑲᓂ ᓄᓇᖃᖃᑦᑕᓚᐅᕐᓂᖏᓐᓂ ᐊᐳᑎᖃᖏᓐᓂᓕᒫᖓᓂ, ᑕᒪᐃᓐᓂᖓᓄᓪᓗ ᐃᓄᖕᓅᖅᓯᔪᐊᕐᓇᓂᖓ ᑕᒪᒃᑯᓄᖓᕈᔪᒃ ᑎᑭᐅᑎᓂᖃᕈᓐᓇᓪᓚᐅᕐᐳᖅ. ᑕᒪᒃᑯᓄᖓ ᐊᑐᐃᓐᓇᐅᕕᖃᕐᓂᖏᓐᓄᑦ ᐅᖃᐅᓯᐅᓯᒪᔪᑦ ᐃᓚᒃᑯᖅᑐᑦ ᐃᓗᐊᓂ 4.3, ᐊᒻᒪᓗ ᑕᐃᑲᓂ ᓖᑦᓄ ᓕ ᐊᒻᒪ ᑳᓐᑖᒃᓴ ᐅᓂᒃᑲᖓᓂ (1998).

ᓄᓇᐅᑉ ᐊᑐᖅᑕᐅᖃᑦᑕᕐᓂᖓᓄᑦ ᒪᓕᒃᓗᑎᒃ, ᐅᑯᐊ ᐃᓱᒪᒋᔭᐅᓪᓗᑎᒃ ᐋᖅᑭᒃᑕᐅᓪᓚᐅᕐᐳᑦ:

ᐃᓄᐃᑦ ᑎᒥᖏᓐᓄᑦ

ᐋᖅᑭᒃᑕᐅᓯᒪᔪᖅ ᐃᓄᐃᑦ ᑎᒥᖏᓐᓅᖅᑎᑦᑎᖏᓐᓂᖅᓴᐅᖁᓪᓗᒍ ᓄᓇᒥᖓᕐᒧᒥ ᑕᐃᑲᓂ ᐃᓗᓕᖏᑦᑕ ᑭᓪᓕᖏᑦ ᐃᒪᐃᓕᖓᕗᑦ:

ᐊᑐᖅᑕᐅᖃᑦᑕᖅᑐᑐᖃᐅᓂᖓᓅᖓᔪᑦ:

- ᐱᐊᕋᖅ ᑕᖅᑭᖃᖅᑐᖅ ᐱᖓᓲᔭᖅᑐᓄᑦ ᑎᑭᓪᓗᒍ ᑎᓴᒪᓂᒃ ᐅᑭᐅᖃᖅᑐᑦ ᑕᒪᒃᑯᓄᖓ ᐊᑐᐃᓐᓇᐅᕕᐅᖓᒪᑕ ᓄᓇᒥ ᐊᒃᑐᐊᖃᑦᑕᕐᓂᖏᓐᓄᑦ ᓱᕋᕐᓇᖅᑐᑦ ᖃᓪᓗᓈᑎᑐᑦ ᐊᑎᖃᖅᑐᑦ ᐃᒪᓐᓇ non-carcinogenic beryllium, ᑳᐳ, ᓴᕕᕋᔾᔭᖅ ᐊᒻᒪᓗ F3 TPH ᑑᕋᑦᑕᐅᑎᓕᖏᑦᑐᒃᑯᑦ ᐅᕝᑯᓪᒥᖅᓯᓂᖏᓐᓄᑦ ᓂᕆᓂᖏᓐᓄᑦ / ᐊᒃᑐᖅᓯᖃᑦᑕᕐᓂᖏᓐᓄᑦ / ᐳᔪᕐᓂ ᓯᐅᕋᔪᖕᓂᓗ ᓂᐅᖅᑕᕐᓂᖏᓐᓄᑦ ᐊᓂᖅᑎᕆᑎᓪᓗᒋᑦ ᐊᒻᒪ ᐊᒃᑐᖅᓯᖃᑦᑕᕐᓂᖏᓐᓄᑦ, ᐊᒻᒪᓗ ᓄᓇᒥᖕᖠᖅᑐᓂᒃ ᓂᕿᖃᑦᑕᕐᓂᖏᓐᓄᑦ (ᑐᒃᑐ, ᐅᑳᓖᒃ ᐊᒻᒪ ᐃᖃᓗᐃᑦ);

- ᐃᓄᒃ ᐊᕋᒍᑕᓖᑦ ᑕᐃᑯᖓᖃᑦᑕᕈᓂ ᐃᓅᓂᕐᒥᓂ ᐊᕋᒍᖃᓕᕐᓂᖓᓄᑦ 75ᓂ ᑕᒪᒃᑯᓂᖓ ᓴᖅᑮᔮᕕᐅᖓᒪᑦ beryllium, ᖃᐅᔨᒪᔪᐅᖏᒻᒪᑦ ᐋᓐᓂᐊᖅᑖᕐᓇᕐᓂᖓᓄᑦ ᑲᓐᓱᑖᕈᑕᐅᓲᒥᒃ ᑖᓐᓇ ᐊᑎᓕᒃ ᖃᐅᔨᒪᔪᐅᓪᓗᓂ carcinogen, ᑕᐃᑲᖓᓐᓇᕆᐅᖏᑦᑑᓕᓗᐊᖅ ᓂᕆᓂᖓᓄᑦ / ᐅᕙᓂᖓᑕ ᐊᒃᑐᖅᓯᖃᑦᑕᕐᓂᖓᓄᑦ / ᐳᔪᕐᓂ ᓂᐅᖃᑦᑕᕐᓂᖏᓐᓄᑦ ᐊᓂᖅᑎᕆᑎᓪᓗᒋᑦ, ᐃᒥᖃᑦᑕᕐᓂᖓᑎᒍᑦ ᐊᒃᑐᖅᓯᖃᑦᑕᕐᓂᖓᓄᓪᓗ ᑕᒪᒃᑯᓄᖓ ᐊᒻᒪ ᓄᓇᒥᖕᖠᖅᑐᓂ ᓂᕆᖃᑦᑕᕐᓂᖓᓄᑦ (ᑐᒃᑐ, ᐅᑲᓕᖅ, ᐃᖃᓗᒃ) ᐃᓅᓯᓕᒫᖓᓂ.

ᐊᕙᑎᖓᑦᑕ ᖃᓄᐃᓐᓂᖓᓂ

ᐊᑦᑕᓇᖅᑐᓄᑦ ᓴᖅᑮᔮᕕᐅᖃᑦᑕᕈᓐᓇᕐᓂᖓ ᓄᓇᒥ ᓱᕋᕐᓯᒪᔪᓂ ᖃᐅᔨᓴᕈᑕᐅᓪᓚᑎᓚᐅᕐᒪᑦ (ERA). ᑕᒪᒃᑯᓄᖓ ᐱᑕᖃᖅᑐᓄᑦ ᓴᕕᕋᔭᕈᔪᐃᑦ ᐱᔭᐅᑦᑕᐅᑎᓕᔪᓐᓇᕐᓂᖏᓐᓄᑦ ᓄᓇᒧᑦ, ᐊᒻᒪᓗ ᓂᕆᔭᐅᓗᑎᒃ ᑕᒪᒃᑯᓄᖓ ᓄᓇᒥᐅᑕᐅᔪᓄᑦ ᐱᕈᖅᑐᓄᑦ ᐆᒪᔪᓄᓪᓗ, ᐃᒥᖅᑕᐅᖃᑦᑕᕐᓂᖓᓄᑦ ᐃᒥᖅ, ᓂᕐᔪᑎᓄᑦ, ᐊᒻᒪᓗ ᐱᓱᒃᑐᓄᑦ ᓂᕐᔪᑎᓄᑦ. ᑕᒪᒃᑯᓄᖓ ᐊᖅᑯᑎᐅᔪᓐᓇᖅᑐᓄᑦ ᐊᖓᔪᖃᕕᐅᓂᖓ ᓂᕆᔭᐅᔪᓐᓇᖅᑐᑎᒍᑦ, ᐊᓂᖅᑎᕆᓂᒃᑯᑦ, ᐅᕙᓂᒃᑯᓪᓗ ᐊᒃᑐᐊᓯᖃᑦᑕᕐᓂᑯᑦ ᑕᒪᒃᑯᓄᖓ ᓄᓇᒦᑦᑐᓂᒃ ᐊᖅᑯᑕᐅᔪᓐᓇᖅᑐᐃᓐᓇᐅᖓᒪᑕ, ᑭᓯᐊᓂ ᐱᕐᔪᐊᕆᔭᐅᓗᐊᓚᐅᖏᓚᕐ, ᓂᕆᔭᐅᖃᑦᑕᕐᓂᖏᑦᑕ ᓴᓂᐊᓐᓂ ᑭᓯᐊᓂ ᑕᒪᒃᑎᒍᓇ ᓱᕐᓗ ᒥᖅᑯᒃᑯᑦ, ᓱᓗᖕᓄᑦ, ᐃᓱᒪᓚᓚᐅᕐᐳᖅ ᓱᕐᓗ ᐊᒃᑐᖅᓯᓚᓵᖕᓂᑐᐃᓐᓇᒃᑯᑦ ᐊᒻᒪ ᒥᐊᖅᓯᓂᒃᑯᑦ ᐊᓗᒃᓯᓂᖅᑐᑦ ᐃᓗᐊᓂᖃᑕᐅᓚᐅᖅᐳᖅ ᑕᐃᒃᑯᓄᖓ ᐱᔪᓴᕐᓂᖓᓄᑦ ᓂᕆᔪᑎᑐᑦ. ᑕᐃᒃᑯᐊ ᓂᕆᐊᖅᑕᐅᔪᑦ ᖃᐅᔨᓴᑦᑕᐅᖃᑦᑕᕐᓂᐊᕐᓗᑎᒃ ᑎᕆᒐᓂᐊᑦ, ᐅᑳᓖᑦ, ᐊᕿᒡᒋᑦ, ᐊᕕᓐᖓᐃᑦ, ᐅᒃᐱᒡᔪᐊᑦ, ᑎᑎᕋᓛᑦ, ᐊᒻᒪᓗ ᑐᒃᑐᐃᑦ. ᑕᒪᒃᑯᐊ ᐃᓱᒪᒋᔭᐅᖓᒪᑕ ᑕᐃᑲᓂ FOX-C ᖃᓂᒋᔭᖓᓂ ᑕᑯᔭᐅᓲᖑᓂᖏᓐᓂ. ᐊᓯᖏᓪᓗ ᐱᓪᓗᐊᑕᐅᔪᑦ ᐊᕙᑖᓂ ᐃᓚᐅᖃᑕᐅᔪᑦ (VECs) ᑕᐃᑳᓐᓇᓱᒋᔭᐅᓚᐅᕆᕗᑦ (ᐅᖃᐅᓯᐅᔪᑦ ᐃᓗᐊᓃᑦᑐᒥ 5.2.4) ᑭᓯᐊᓂ ᑖᒃᑯᐊ ᓂᕈᐊᖅᑕᐅᒪᐅᕐᒪᑕ ᓴᐳᔾᔨᓯᒪᔪᓐᓇᕐᓂᖏᓐᓂ ᑕᐃᑳᓂᑐᓕᒫᓂ.

ᐊᑦᑕᓇᕐᓂᖓᓄᑦ ᖃᓄᐃᓕᖓᓂᖏᑦ

ᑕᑉᐱᒃᑯᐊ ᐅᖃᐅᓯᐅᔪᑦ ᕿᒥᕈᔭᐅᓚᐅᕐᒪᑕ ᐊᒃᑐᖅᑕᐅᓚᔪᖑᐊᕐᓂᖏᓐᓂ ᐃᓄᖕᓄᑦ ᐊᒻᒪᓗ ᑕᐅᕗᓯᒪ ᐊᕙᑖᓂ ᐆᒪᔪᕈᔫᔪᓄᑦ, ᐅᑯᐊᓗ ᐃᒪᐃᓕᓚᔪᕋᓯᒋᔭᐅᓪᓗᑎᒃ:

- ᓄᓇᐅᑉ ᖁᖓᓂ ᐱᑕᖃᓗᐊᕐᓂᖏᑦ ᐃᒪᕈᔪᐃᑦ ᓇᓗᓇᐃᖅᑕᐅᔪᑦ ᐃᓄᖕᓅᖅᐸᓕᐊᔪᓐᓇᕐᓂᖏᓐᓄᑦ ᑕᒪᒃᑯᓄᖓ ᖃᓂᒃᓴᕐᓂᖏᓐᓄᑦ ᑎᑭᑕᐅᔪᓐᓇᕐᓂᖏᓐᓄᓗ ᐃᓗᐊᓃᖃᑕᐅᒍᑦ ᑕᐃᑲᓂ ᐊᑦᑕᓇᕐᓂᖏᓐᓄᑦ ᖃᐅᔨᓴᖅᑕᐅᓂᖓᑕ ᐃᓗᐊᓂ.

- ᓄᓇᐅᑉ ᖁᖓᓂ ᓴᖅᑮᔭᖅᑐᑦ ᐱᑕᖃᓗᐊᕐᓂᖏᑦ (EPCs) ᐃᒥᕈᔪᖕᓂ ᓱᕋᕐᓇᖅᑐᓕᖕᓂ ᓱᒃᑯᐃᔭᒃᓴᐅᓗᑎᒃ ᐃᓱᒪᒋᔭᐅᓂᖃᓗᐊᖏᓚᑦ ᐊᕙᑎᖓᓐᓄᑦ ᑕᐅᕗᓯᒪ ᑕᐃᒪᓐᓇ ᓴᖅᑮᓗᐊᖅᓯᒪᑎᓐᓇᒋᑦ ᐊᒻᒪᓗ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᒐᑦ ᑕᐃᑲᓂ ᐊᑦᑕᓴᖅᑐᑦ ᖃᐅᔨᓴᖅᑕᐅᓂᖏᑦᑕ ᐃᓗᐊᓂ.

ᓱᖃᐃᒻᒪ ᐃᓄᖕᓄᑦ ᐊᑦᑕᓇᓪᓚᓇᒃᑐᓂ ᐱᑕᖃᖏᓐᓂᖓᓄᑦ ᐊᑐᖅᑕᐅᓪᓗᓂ ᓴᖅᑮᔪᓗᐊᕐᑐᑦ ᓄᓇᒥ CoPC, ᑕᒪᑦᓱᒪ ᐃᓂᖓᑕ ᓈᒻᒪᒋᔭᐅᓕᕋᔭᕐᓂᖓᓄᑦ (SSTLs) ᐋᖅᑭᒃᓱᖅᑕᐅᓚᐅᕐᐳᑦ ᑖᒃᑯᓄᖓ ᐊᑑᖅᑕᐅᓂᓗᑎᑦ CoPC ᐊᕙᑎᖓᑕ ᐋᓐᓂᐊᖃᕐᓇᖏᑦᑐᓕᕆᓂᕐᒧᑦ ᐃᓗᓕᖏᓐᓂ ᑭᒡᓕᓕᐅᖅᑕᐅᓯᒪᔪᑦ ᐋᖅᑭᒃᓱᖅᑕᐅᓚᐅᖅᐳᑦ. ᑕᒪᒃᑯᐊ SSTLs ᓴᓂᓕᓃᓕᔭᐅᓪᓗᑎᒃ ᐃᓂᖓᑕ ᖃᓄᐃᓐᓂᖏᓐᓂ (EPCs and maximum concentrations).

ᓴᓗᒻᒪᖅᓴᖅᑕᐅᓂᖓ

ᓇᓗᓇᐃᖅᑕᐅᓯᒪᔪᖃᐅᖅᐳᖅ ᓴᓗᒻᒪᖅᓴᐃᕕᐅᓂᐊᖅᑐᓂᒃ "ᐆᓇᕐᓂᖏᓐᓂ" ᑕᐃᒃᑯᐊ ᐱᑕᖃᕐᕕᐅᓗᐊᕐᓂᖏᑦ ᑕᐃᒪᓐᓇ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᓪᓗᑎᒃ ᐱᓗᐊᖅᑐᒥᒃ ᑕᒪᒃᑯᓂᖓ CoPCs-ᖃᕐᓂᓗᐊᕐᓗᖏᑦ. ᑕᐃᒃᑯᐊ ᐃᓄᖕᓄᑦ ᐊᑦᑕᕐᓇᕐᓂᖃᓗᐊᖏᒃᑲᓗᐊᖅᑎᓪᓗᒋᑦ ᐅᕝᕙᓘᓐᓃᑦ ᐊᕙᑖᓄᑦ ᓱᕋᖅᑎᑦᑎᕙᓪᓕᐊᓗᐊᖏᒃᑲᓗᐊᖅᑎᓪᓗᒍ, ᓂᕈᐊᖅᑕᐅᒍᑎᖃᓚᐅᖅᐳᑦ ᐱᐅᓯᕙᓪᓕᐊᑎᑦᑎᔪᓐᓇᕐᓂᖓᓄᑦ ᐊᒻᒪᓗ ᑕᒪᒃᑯᐊ ᓴᖅᑭᔮᓗᐊᕐᑐᑦ ᓇᓗᓇᖏᑦᑐᓪᓗ ᐱᑕᖃᓗᐊᕐᓂᖏᑦ ᐲᖅᑕᐅᕐᑯᓪᓗᒋᑦ ᓄᖑᑎᖅᑕᐅᕐᑯᓪᓗᒋᓪᓗ. ᑕᐃᒃᑯᐊ ᐊᓪᒐᒃᑕᐅᓂᐊᖅᐳᑦ ᐊᒻᒪᓗ ᐲᖅᑕᐅᓗᑎᒃ ᑰᒻᕕᖃᕐᓂᖏᑦ ᐱᕕᐅᖃᑦᑕᕐᓂᖏᓪᓗ ᑕᒪᒃᑯᐊ ᑲᑕᒃᓯᒪᓂᖅᓴᐅᑎᓪᓗᒋᑦ ᕿᑦᑎᖕᓂᖅᓴᒦᑦᑐᑦ (ᓱᕋᕐᓯᒪᓗᐊᓂᖏᑦ) ᐃᒪᐃᓕᖓᑎᓪᓗᒋᑦ 41% (PCBs), 92% (TPH F2 fraction), 90% (ᑳᐳ) ᐊᒻᒪ 86% (lead). ᐃᓄᐃᑦ ᑎᒥᖓᓄᑦ ᐊᑦᑕᕐᓇᕐᓂᖏᑦ ᑕᑯᑎᑦᑎᕗᑦ ᐊᒃᐸᓯᒋᐊᖅᓯᒪᓂᖓᓂ ᓱᕋᕐᓇᕐᑐᖃᕐᓂᐅᔪᓂ. ᑕᒪᓐᓇ ᐋᖅᑭᒃᓯᒍᑕᐅᓚᐅᓇᕗᖅ ᐊᑦᑕᓇᖅᑑᑎᑦ ᓈᓴᐅᑎᑎᒍᑦ ᓇᓗᓇᐃᖅᑕᐅᓂᖏᓐᓄᑦ ᕿᑦᑎᖕᓂᖅᓴᒥ ᐃᒪᐃᓕᖓᓕᖅᑎᓪᓗᒍ 91% (TPH F2 fraction), 19% (ᑳᐳ) ᐊᒻᒪ 76% (ᓴᕕᕋᔭᒃᓴᖅ).

ᐃᓄᐃᑦ ᖃᓂᒻᒪᓯᕐᓄᑦ ᐊᒻᒪ ᐊᑦᑎᖓᓄᑦ ᐊᑦᑕᕐᓇᖅᑐᓕᕆᔨᖏᓐᓂᒃ ᖃᐅᔨᓴᖅᑕᐅᓂᖓ ᐃᖃᓗᒃᐅᑉ ᑕᓯᐅᔭᖓᓂ ᔫᓂ ᐱᖓᓱᑦ 2005
ᓈᓚᕝᕕᐱᓂᖕᒥ (DEW).
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EXECUTIVE SUMMARY

Jacques Whitford Limited (Jacques Whitford) performed a human health and ecological risk assessment (HHERA) of the FOX-C (Ekalugad Fjord) Distant Early Warning (DEW) line site on Baffin Island, Nunavut. The primary objective of this study was to evaluate whether known concentrations of chemicals in surface soil and water at the site would present a significant risk to human or ecological health based on future use of the property in its current condition and after remediation.

Ekalugad Fjord is located on the northern coast of Baffin Island, above Quarmaratalik Cove. The site was an intermediate DEW Line site (FOX-C) until 1963.

Study Background

The current study undertook a human and ecological risk assessment of the FOX-C site. It is supported by new contaminants data for the site, based on a Phase III Environmental Site Assessment (Earth Tech 2004) which included analysis for hydrocarbons, as well as polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and inorganic substances in soils, as well as a limited number of analyses for ground water, lake and river sediments, lake water and fish. A restricted number of background soil samples were also collected. The ERA considered a broad range of ecological receptors and incorporated the new data, while retaining the previously collected data for FOX-C. The HHRA also evaluated both Phase II and the newly generated Phase III data supplied and described by Earth Tech (2004).

Data Compilation

The soil and water sample data from the Phase II and Phase III sampling programs were screened for use in this risk assessment. For the purposes of the risk assessment for both human and ecological receptors, only soil samples that accurately reflect concentrations in the upper 10 to 15 cm from ground surface are relevant to potential exposures.

The Phase II and Phase III data were screened on the basis of depth and any sample that did not intersect the surface and/or extended to a depth of greater than 0.3 m below ground surface (mbgs) was excluded. This was done to ensure that the data used were representative of surface soil and not heavily influenced by subsurface soil characteristics.

Screening of Chemicals of Potential Concern (CoPCs)

CoPCs included for consideration were the chemicals identified by Earth Tech in their Phase III Reports as exceeding generic CCME soil quality guidelines (CCME 1999). Generic CCME guidelines may be based on either ecological or human health protection and provide a protective initial screening of the site data. For the human health risk assessment, these chemicals were screened specifically against human health based generic guidelines and for the ecological risk assessment, they were screened specifically against ecologically based generic guidelines. In order of preference, these guidelines are taken from CCME (CCME 1999),

Ontario Ministry of the Environment (OMOE 1996a), or the United States Environmental Protection Agency (US EPA).

Based on the human health based criteria screening, the chemicals carried forward to the quantitative human health risk assessment of the Upper Site were beryllium, copper, lead and total petroleum hydrocarbon (TPH) F2, F3 and F4 fractions. Those carried forward in the Lower Site HHRA included beryllium and the TPH F3 Fraction.

The chemicals carried forward in the ERA include the F1 to F4 TPH fractions, phenanthrene, beryllium, copper, cadmium, chromium (total), copper, lead and zinc. The same CoPCs were carried forward in the ERA for both the Upper and Lower Sites.

Exposure Scenarios

The study area is defined as the area including and surrounding the investigated areas at FOX-C, was divided into two distinct sites: the Upper Site and Lower Site.

Upper Site

Infrastructure at the Upper Site includes the module train; warehouse and garage; Inuit house (dormitory); petroleum, oil, lubricant (POL) pumphouse; quonset hut; collapsed communications antenna; POL tanks; storage shed; paint shed; and four dump sites.

Lower Site

The Lower Site includes a wooden hut; POL tanks; and storage shed. For the purposes of the HHERA, the area of the Lower Site was estimated to be 2 ha, which also includes the various areas where drums have been discarded around the site. The Lower and Upper Sites are connected by an access road.

Due to the northern location of the FOX-C and the probable use of the site by Inuit for traditional purposes, the conventional land use categories (residential, parkland, commercial, and industrial) were expanded to incorporate the traditional Inuit land use. The parameters of this land use are discussed in detail in Gartner Lee and Cantox (1998), and were developed after consultation with residents of the Eastern Arctic, the Quikiqtaaluk Corporation and DIAND.

The current assessment adopted the traditional land use for the FOX-C site, as set out by Gartner Lee and Cantox (1998). The traditional land use designation consists of Inuit families residing on the land, in tents for periods up to 3 months. It was assumed that during this period the Inuit engage in traditional hunting, fishing and gathering activities. It was also assumed that all time spent on site was in the non-snow covered months, which results in the most extensive exposure scenario for the human receptors. Detailed exposure values are discussed in Section 4.3, and in the Gartner Lee and Cantox report (1998).

Based on this land uses, the following conceptual models were developed:

Human Health

The conceptual model that forms the basis for the derivation of the human health soil quality site-specific threshold limits is as follows:

Traditional Site Use Scenario:

- A toddler aged six months to four years is exposed to surface soil contaminated with non-carcinogenic beryllium, copper, lead and the F3 TPH fraction by inadvertent ingestion / dermal contact / dust inhalation, water ingestion and dermal contact, and the ingestion of land foods (caribou, hare and fish);

- A person visits the site yearly from birth to 75 years of age and is exposed to beryllium, which is also a known carcinogen, by inadvertent ingestion / dermal contact / dust inhalation, water ingestion and dermal contact, and the ingestion of land foods (caribou, hare and Arctic charr) throughout their lifetime.

Ecological Health

The risks of exposure to contaminated soils were the focus of the ecological risk assessment (ERA). The potential exposure media for intake of metals included direct ingestion of soils, as well as metal uptake from eating terrestrial plant material, drinking water, ingesting terrestrial invertebrates, and terrestrial mammals. The major exposure pathway considered was ingestion. Inhalation and dermal absorption were also possible exposure pathways, but these were considered to be relatively minor by comparison to ingestion, and were not included as direct pathways in the ERA. Soil that adheres to fur or feathers is, for the most part, ingested by preening/licking activity and was included in the estimate of direct soil ingestion.

The receptors selected in the ERA are ermine, Arctic hare, ptarmigan, lemming, Snowy owl, Arctic Fox, and caribou. These receptors were considered to be representative of indigenous wildlife at the FOX-C site. Other valued ecosystem components (VECs) were considered for the sites (discussed in section 5.2.4) but these receptors were chosen to be protective of all VECs potentially on site.

Risk Characterization

The above-noted exposure scenarios were evaluated to identify the potential for adverse effects to human or ecological receptors, with the following outcomes:

- Surface soil maximums of the identified chemicals are not anticipated to produce adverse effects in human receptors under the exposure scenarios included in the risk assessment.

- Surface soil exposure point concentrations (EPCs) of the identified chemicals are not anticipated to produce adverse effects in ecological receptors under the exposure scenarios included in the risk assessment.

Because no human health risk was found using the maximum soils CoPC concentrations, Site specific target levels (SSTLs) were developed for each CoPC based on ecological health site-specific threshold limits developed in this risk assessment. The SSTLs were compared to current site conditions (EPCs and maximum concentrations).

Remediation

Specific localized areas have been identified as "hot spots" where concentrations of selected CoPCs were elevated. Even though, these areas do not pose a significant human or ecological risk, they were selected to be removed for aesthetic reasons as well as to remove any remaining and obvious soil stained/contaminated areas. These areas will be excavated and removed from contact of all receptors. The consequential removal of these selected areas resulted in drops of EPCs for human health for the top site (most contaminated) of 41% (PCBs), 92% (TPH F2 fraction), 90% (copper) and 86% (lead). The EPC for human health represents a drop in the maximum concentrations found on site. This resulted in a subsequent drop in the calculated total hazard quotients associated with the top site of 91% (TPH F2 fraction), 19% (copper) and 76% (lead).

4. English and Inuktitut executive summaries for the report "Natural Environment of the FOX-C DEW Line Sit Ekalugad Fjord, Baffin Island, Jacques Whitford, October 2004

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ᐊᕙᑎᓕᕆᓂᕐᒧᑦ Fox-C ᓈᓚᒃᕕᐅᖃᑦᑕᖅᑐᕕᓂᖅ, ᐃᖃᓗᒐᖅ ᑕᓯᐅᔭᖓᓂ, ᕿᑭᖅᑖᓗᖕᒥ

ABC62725.3 ᐊᒃᑑᕙ 2004

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ᐅᓇ ᐅᓂᒃᑳᖅ ᓇᓗᓇᐃᖅᓯᖕᒪᑦ ᖃᓄᐃᓕᖓᓂᕆᔭᖓᓂᒃ ᐃᓄᖕᓄᑦ ᐊᒃᑐᖅᑕᐅᓚᐅᖅᑎᓐᓇᒍ ᓈᓚᒃᕕᕕᓂᐅᔪᖅ Fox-C ᑕᑯᔭᖅᑐᖅᑕᐅᑎᓐᓇᒍ ᐊᒡᒌᓯ 26 ᐊᒻᒪ 27, 2004-ᖑᑎᓐᓇᒍ. ᐅᓂᒃᑳᒥ ᑕᕝᕙᓂ ᐆᒪᔪᐃᑦ ᓇᓗᓇᐃᖅᑕᐅᔪᑦ ᑕᑯᔭᕕᓂᐅᓂᖏᓐᓄᑦ ᑕᐃᑲᓃᓐᓂᑐᐊᖏᓐᓂ ᑕᑯᔭᐅᖃᑦᑕᓚᐅᖅᑐᓂᒃ ᐅᖃᖅᓯᒪᖕᒪᑕ ᑕᐅᕙᓐᓇ ᐅᐸᑦᑕᐅᓯᒪᑲᐃᓐᓇᑐᐃᓐᓇᖅᑎᓐᓇᒍ ᐊᒻᒪᓗ ᑐᖓᐅᔾᔨᓯᒪᑐᐃᓐᓇᓇᐊᓕᒃ ᐱᕈᖅᑐᓂᒃ ᓄᓇᕋᓂᒃᓗ ᑕᐃᑲᓃᑦᑐᓂᒃ, ᐊᓯᐅᔨᓕᒪᑦ ᐃᓗᐊᓂ ᐱᑕᖃᖃᑦᑕᖅᑐᓂᐅᒐᓗᐊᖅ. Fox-C ᓈᓚᒃᕕᕕᓂᖅ ᑕᐃᒪᓐᓇᓴᐃᓐᓇᐸᓗᐊᖅ ᕿᑭᖅᑖᓗᖕᒥ ᓄᓇᐅᔪᑦ ᑕᐃᒪᐃᓕᖓᒍᓯᖏᓐᓂ. ᓄᓇᖓᑕ ᖃᖓᓂᑦᑐᑦ Fox-C-ᒥ ᐊᔾᔨᒌᖏᑦᑑᕈᓘᔭᐅᑐᑦ ᑕᒪᒃᑯᓄᖓ ᓯᐸᐃᔭᕐᕕᐅᔫᖑᓪᓗᓂ ᐊᒻᒪ ᐃᖃᓗᒐᕐᓂ ᐱᑕᖃᐅᔫᖑᓪᓗᓂ ᐃᖃᓗᒃᐱᒃᓴᓂ, ᐊᔾᔨᒌᖏᑦᑑᑦᑕᐅᓪᓗᑎᒡᓗ ᐅᑭᐅᖅᑕᖅᑐᒥ ᐱᕈᖅᑐᐃᑦ ᓄᓇᕐᓗ. ᖃᓄᑐᐃᓐᓇᖅ ᐱᓕᕆᓂᐊᑐᐊᖅᐸᑕ ᐃᒪᓕᕆᔭᕆᐊᖃᕐᓗᑎᒃ ᑲᒪᒋᔭᐅᓂᖃᕆᐊᖃᕐᓂᐊᖅᐳᑦ ᑕᒪᒃᑯᐊ ᐃᖃᓗᒃᐲᑦ ᐱᑕᖃᕐᓂᖏᓐᓂ ᒥᑭᑦᑐᓛᖃᕐᕕᐅᔫᖑᓂᖓᓄ ᑕᓯᕐᒥ ᓇᖑᓗᒃᑕᐅᓗᐊᕐᑯᓇᒥᑦ ᐱᓇᓯᒡᕕᐅᔭᕆᐊᖃᕐᓯᔭᖅᐳᑦ ᐊᒻᒪᓗ ᑎᓯᕕᒥᖃᑦᑕᖅᑕᖏᑦ ᒪᔪᐊᓕᕐᖓᑕᓗ ᐊᖅᑯᑎᒋᔫᖏᑦ ᐊᓯᔾᔨᖅᑕᐅᓗᐊᖅᑕᐃᓕᖕᒥᓗᑎᒃ ᑰᑦ ᐃᖏᕐᕋᓂᖏᑦ ᑕᓯᓕᐊᓇᐊᕕᖏᓐᓗ. ᐱᖓᓱᑦ ᐆᒪᔪᐃᑦ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᓂᖅᐳᑦ ᐃᓱᒪᓗᓇᓚᒃᑐᒦᓐᓂᖏᓐᓄᑦ ᐆᒪᔪᐃᑦ ᐃᓱᒪᓗᓇᖅᑐᒦᑦᑐᑦ ᐱᖁᔭᖓᑕ ᐃᓗᐊᓂ ᐊᒻᒪᓗ ᑲᑎᒪᔨᕋᓛᓄᑦ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᔪᑦ ᐃᓱᒪᓗᓇᓚᒃᓴᓂᖏᓐᓂ ᑎᒃᑯᐊᖅᑕᐅᓯᒪᓪᓗᑎᒃ ᑲᓇᑕᒥ ᖃᐅᔨᒪᔭᐅᔪᑦ ᑕᐃᑯᖓᖃᑦᑕᕐᓂᖏᓐᓂ ᐊᖅᑯᓵᖅᓯᖃᑦᑕᕐᓂᖏᓐᓂᒎᓐᓂᑦ Fox-C ᐃᓂᖓᓂ ᐅᕝᕙᓘᓐᓃᑦ ᑕᐃᑲᓂᑲᐃᓐᓇᖃᑦᑕᔫᖑᔪᑦ ᐊᕐᕌᒍᑦ ᐃᓚᖓᓂ.

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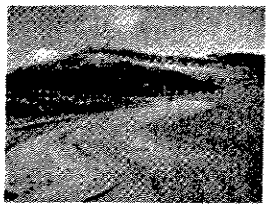
Fox-C-ᒥ.

ᑕᒪᒃᑯᐊ ᐃᓕᕆᓯᓐᓄᑦ ᓈᓚᒃᑐᒃᓴᐅᖕᒪᑕ ᑭᖑᕚᒪᔭᕆᓯᓐᓄᑦ. ᓱᓕᔪᖅᓴᑎᐊᖅᑐᓂ ᑐᓂᓯᔪᖅ,
ᔫᒃ ᕕᑯᐊᑦ ᓕᒥᑎᑦ
ᐊᑎᓕᐅᖅᑕᐅᔪᖅ ᓯᕗᓕᖅ ᐋᓕᕗ ᑯᕐᕆᓐᒧᑦ
ᐊᓕᕗ ᑯᕐᕆ, BSc. (Hons.) ᐆᒪᔪᓕᕆᔨ
(905) 474-7700

CLOSURE



Shoreline of freshwater lake.

This report describes the natural environment of the Fox-C site during a site visit on August 26 and 27, 2004. Species documented in this report are restricted to the time frame of the field investigation and may underestimate the flora and fauna which occupy the site during the year. The Fox-C DEW Line site is representative of arctic tundra regions located in the Arctic Cordillera of Baffin Island. Topography of the landscape at Fox-C is diverse creating many habitat niches for juvenile and adult Arctic Charr, and a variety of arctic flora and fauna. Any activities requiring in water works should be undertaken so as to minimize interaction with arctic charr in the freshwater lake and charr migrations in the river flowing from the freshwater lake. Three species having designations of Special Concern under the Species at Risk Act and The Committee on the Status of Endangered Wildlife in Canada are either known to occur at Fox-C or likely have distributions that would include areas of Fox-C during portions of the year.

River flowing towards Quarmaralik Cove showing topography of Fox-C.

We trust the above meets your present needs.

Respectfully Submitted,

JACQUES WHITFORD LIMITED

Original Signed By Oliver Curran

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Biologist
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***Original Signed By** Malcolm Stephenson*

Malcolm Stephenson, PhD.
Senior Reviewer

5. English and Inuktitut executive summaries for the report " Diesel Contaminated Soil at Ekalugad Fjord: the Landfarming Option" Analytical services Unit, Queens University, March 2006

ᐊᖓᔪᖅᑲᐅᑎᓄᑦ ᓇᐃᓪᓕᒋᐊᖅᓯᒪᔪᖅ

ᑖᓐᓇ ᐅᓂᒃᑳᓕᐊᖑᔪᖅ ᓇᓗᓇᐃᓇᖓᒪᑦ ᐱᓕᕆᐊᖑᓯᒪᔪᓂ ᐊᑐᖅᑕᐅᓚᐅᖅᑐᓂᒃ ᖃᐅᔨᒪᖅᑕᐅᓪᓗᓂ ᐱᓯᖅᑐᓄᑦ ᑳᓐᖓᖅᓱᕐᕕᐅᓗᓂ ᐱᓯᕐᓱᕕᐅᔪᓐᓇᑦᑕᕋᔭᕐᒪᖔᑦ ᐅᖅᓱᐊᓗᓯᔪᖃᕐᓂᐅᔪᑦ ᑕᐅᕙᓂ ᐃᖃᓗᒐᐅᑉ ᑕᓯᐅᔭᖓᓂ. ᐃᖃᓗᒐᐅᑉ ᑕᓯᐅᔭᖓ ᕿᑭᖅᑖᓗᑉ ᑲᓇᖕᓇᖓᑕ ᓯᓈᓂᒻᒪᑦ, ᓄᓇᕗᒥ, ᑕᐃᑲᓂᓗ ᓈᓚᒃᕕᐅᖅᑲᑦᑕᑲᐃᓐᓇᓚᐅᖅᓯᒪᔪᖅ ᖅᑲᒥᐅᒥᓂᕐᓄᑦ, /ᓕᐸᖅᕋᓄᓇᖓ ᑯᕕᖅᑕᕐᕕᐅᓂᑰᔪᖅ ᐅᖅᓱᐊᓗᓯᔭᓐᓄᑦ ᓄᐊᑕᐅᓚᐅᖅᓯᒪᕗᑦ ᐱᖓᓲᔭᖅᑐᓄᑦ ᓂᒡᓕᓇᖅᑐᖅᑲᐅᑎᓄᑦ ᐊᐅᓪᓚᖅᑎᑕᐅᓪᓗᑎᒡᓗ ᖃᐅᔨᓴᖅᑕᐅᕕᖕᒧᑦ ᕿᒥᕐᕈᓇᒃᑕᐅᑦᑎᐊᒃᑲᓐᓂᕐᓂᐊᕐᒪᑕ ᕿᕐᔪᒻᒥᒐᕐᕕᓕᖕᒥ ᑕᐃᑲᓂ ᑯᐃᓐᔅ ᔪᓃᕝᓯᑎᖓᑕ ᐃᓕᓐᓂᐊᕐᕕᒡᔪᐊᖓᓂ, ᑭᖓᔅᑕᓐ ᐊᓐᑎᐅᕆᔪᒥ. ᖃᐅᔨᓴᕐᕕᖕᒋᓐᓂ ᐱᖓᓲᓕᔭᐅᓚᐅᖅᐳᑦ ᐊᔾᔨᒌᒃᑎᑕᐅᒐᑎᒃ ᐅᓇᔪᖕᓂᖏᑦ ᑦᕋ, ᓐ ᕋ-ᒦᑎᓪᓗᒋᑦ ᐊᒻᒪᓗ 18ᒥ. ᐆᒃᑐᕋᐅᑕᐅᔪᖅ ᓵᓇᓯᒪᓂᖓ ᖃᓄᐃᓕᑦᑕᓯᑎᒃᑲᓐᓂᖏᑦᑕ ᑕᐃᑲᓂ ᓄᓇᒥ ᐱᓯᕕᐅᓇᓱᒍᓐᓇᕐᖁᓪᓗᒋᑦ ᐆᒪᒃᓴᐃᓪᓗᑎᒃ ᐊᒻᒪᓗ ᑕᒪᒃᑯᐊ ᐆᒪᔪᑎᒃᓴᐃᑦ ᓄᒃᑭᒃᓴᖅᑕᐅᔭᕐᒪᖔᑦ ᖃᐅᔨᓴᖅᑕᐅᓪᓗᑎᒃ ᓱᕐᓗ ᓂᐅᕐᓯᓗᑎᒃ ᐊᒻᒪᓗ ᓄᓇᖓ ᐃᒻᒥᓂᒃ ᓴᓗᒪᖅᓴᖅᓯᓇᕐᒪᖔᑦ. ᐃᓚᔭᐅᓚᐅᕆᓪᓗᑦ ᐱᓯᖅᓯᐊᑦ ᓂᕿᖏᓐᓂᒃ ᐊᒻᒪᓗ ᒧᒥᒃᑕᐅᑦᑕᓇᓪᓗᑎᒃ ᖃᖓᐅᓂᖓ ᐊᔾᔨᒌᒃᑕᖏᑦᑐᒥᒃ, ᑖᓕᒪᐅᓕᖅᑐᑎᒃ ᐊᔾᔩᖏᖏᑦᑐᑦ ᐅᓇᔪᖕᓂᖏᑦ ᐊᒻᒪᓗ ᒧᒥᒃᑎᑕᐅᑦᑕᕐᓂᖏᑦ. ᓂᕆᐅᓇᓚᐅᕐᒪᑦ ᑕᐃᒫᒃ ᐅᓇᔪᖕᓂᖓ ᐱᓪᓗᐊᑕᐅᓚᐅᖅᐳᖅ 18ᒥ ᐆᓇᕐᓂᓕᒃ ᓱᒃᑲᓂᖅᓴᒥᒃ ᓴᓗᒪᖅᓴᐅᐸᓪᓕᐊᓪᓗᓂ ᐅᖅᓱᐊᓗᓯᔭᓐᓂᑦ 8ᒥ 5ᒥᓗ ᐆᓇᓕᖅᑐᑦ ᓴᓂᐊᓐᓂ. ᑕᒪᐃᒃᑲᓗᐊᖅᑎᓪᓗᒍ, ᑕᐃᒃᑯᐊ ᐆᓇᔪᓗᐊᕐᖓᓂᖅᓴᐃᑦ ᑕᒫᒃᑕᐅᖅ ᓴᓗᒪᖅᓴᐃᓂᖅᑎᐊᓚᐅᓇᓱᑦ ᑕᒫᓪᓗᐊᓂᑦᑕᐅᖅ ᐅᓪᓗᑦ ᑎᓴᒪᑦᑎᑦ ᒧᒥᒃᑕᐅᑦᑕᖅᑎᓪᓗᒍ ᐊᒻᒪᓗ ᐆᒪᒍᑎᒃᓴᑦ ᓄᒃᑭᒃᓴᐅᑎᖏᓐᓂ (ᐱᓯᖅᓯᐊᑦ ᓂᕿᖏᓐᓂᑦ) ᐃᓪᓕᓇᔭᐅᑦᑕᖅᑎᓪᓗᒍ. 5-ᒥ ᐆᓇᔪᖅᓂᖅᑐᒥ, ᐱᓗᐊᖅᑐᒥᓕ, ᓂᐅᖅᑎᑕᐅᑦᑕᕐᓂᖓ ᐊᒃᓯᐊᓗᒃ ᐱᕚᓪᓕᕐᓂᖅᑲᓚᐅᖅᐳᖅ ᐊᒻᒪᓗ ᑕᑯᒃᓴᐅᑦᑎᐊᓚᐅᓇᓱᖅ ᐱᐅᓯᕚᓪᓕᐊᑦᑎᐊᕐᓂᖓ. ᑕᒪᒃᑯᐊ ᖃᐅᔨᒪᔪᑎᑦ ᐱᔭᐅᓚᐅᖅᑐᑦ ᖃᐅᔨᓴᕐᕕᖕᒥ ᖃᐅᔨᓴᖅᑕᐅᓂᖓᓐᓂ ᓇᓗᓇᐃᓇᖅ ᑕᐃᑲᓂ ᓄᓇᒥ ᐱᓯᖅᑐᓯᔪᐊᓐᓂ ᐱᖅᑎᑦᑎᐯᓪᓕᐊᓂᖅ ᐃᖃᓗᒐᐅᑉ ᑕᓯᐅᔭᖓ ᐊᑐᒐᒃᓴᐅᑦᑎᐊᕐᒪᑦ ᐊᒻᒪᓗ ᐅᖅᓱᐊᓗᒥᑦᑕᕐᓂᑯᓯᔪᐃᑦ ᓱᓯᖅᑕᐅᓂᑯᓪᓗ ᑕᐅᕙᓂ ᓴᓗᒪᖅᑕᐅᐸᓪᓕᐊᔭᓇᕐᓂᖏᓐᓂ. ᐃᓱᒪᓕᐅᕆᑕᐅᔪᖅ ᐊᑐᓕᕐᑯᔭᐅᓗᓂᓗ ᑕᐃᑲᓂ ᓄᓇᒥ ᐱᓯᖅᑐᓂᒃ ᐱᓯᖅᓱᕐᑯᓗᒋᑦ ᐊᑭᖓᒥᒡᕕᐅᓂᓪᓕᐊᑕᖏᓐᓂ, ᐳᖅᑐᓗᐊᖏᑦᑐᒥᓗ ᐊᒻᒪᓗ ᓂᒋᖓᒍᑦ ᓵᖓᓗᓂ. ᐱᓯᖅᓯᐊᑦ ᓂᕿᖏᓐᓂ ᐃᓕᓯᕕᖅᑕᑦᓱᑎᒃ ᐊᒻᒪᓗ ᓄᓇᖓ ᐱᓯᖅᓱᕕᒋᔭᐅᔪᖅ ᓯᕐᓚᖅ ᒧᒥᒃᑕᐅᓚᖓᑦᑕᕐᓱᓂ ᖃᐅᑕᒫᑦ. ᖃᐅᔨᓴᕐᕕᖕᒥ ᖃᐅᔨᓴᕐᓂᐅᓚᐅᖅᑐᑦ ᐊᑐᕐᓗᒋᑦ ᓱᖅᑯᐃᓇᕋᓗᐊᖅᑎᓪᓗᒍ ᓄᓇᐅᑉ ᐃᓗᐊᓂ ᖄᖓᓂᓗ ᓱᓯᖅᑎᖅᓯᒪᔪᑦ ᐅᖅᓱᐊᓗᒥᑦᑕᖅᓯᒪᔪᓪᓗ ᐅᓪᓗᑦ 100 ᐃᓗᐊᓂ ᑕᒪᐃᑦᑐᖅᑲᓯᓐᓂᓯᓐᓇᕐᓂᖏᓐᓂ, ᑕᒪᒃᑯᐊ ᓄᓇᐅᑉ ᑕᐅᕙᑦᓯᒪ ᖃᓄᐃᓐᓂᖏᑦ ᐃᓱᒪᒋᓪᓗᒋᑦ ᓱᕐᓗ ᓯᕿᒥᒥᒃ ᖃᓂᒃᓴᕐᓂᖓ ᑕᐅᕙᓂ ᐅᐊᓐᓇᖕᖓᓂ ᐃᓱᒪᒋᔭᐅᖕᒪᑦ ᐃᓪᒪᖃ ᓱᑲᐃᓐᓂᖅᓴᐅᔪᑕᐅᓂᐊᕆᐊᒃᓴᖓᓂ ᓄᓇᖓᑕ ᓴᓗᒪᖅᐸᓪᓕᐊᓂᒃᓴᖓᑕ. ᓲᖃᐃᓪᒪ ᑕᒪᒃᑯᐊ ᐱᔭᐅᓗᐊᖅᑎᓪᓗᒋᑦ ᑰᕕᐅᓗᑎᒃ ᒪᓴᓯᔪᖓᓪᓗ ᐊᑐᓯᓐᓃᖅᑎᑕᐅᓯᔪᑐᐃᓐᓇᓇᐊᖅᑲᓂᖏᓐᓄᑦ ᑕᒪᒃᑯᐊ ᓄᒃᑭᒍᑎᒃᓴᐅᑎᑕᐅᓇᓱᒃᑐᑦ ᐱᓯᖅᑐᓄᑦ ᓱᐸᓕᑭᐊᖑᓕᓯᓐᓇᕐᓂᖏᓐᓄᑦ, ᓄᓇᒥ ᑕᒪᐃᓕᐅᕐᕕᐅᓂᐊᖅᑐᒥᑦ ᐱᕆᐊᕐᕕᐅᑦᑎᐊᓯᓐᓇᖅᑐᒥᒃ ᓇᓂᓯᑦᑎᐊᓚᐅᖅᑎᓪᓗᒋᑦ ᑭᓯᐊᓂ ᑕᒪᓐᓇ ᑲᔪᓯᑎᑕᐅᓗᐊᕐᓂᐊᖅᐳᖅ.

EXECUTIVE SUMMARY

This report describes the work carried out to investigate the potential for landfarming the diesel contaminated soils at Ekalugad Fjord. Ekalugad Fjord is situated on the east coast of Baffin Island, Nunavut, and was the site of an intermediate DEW Line station, FOX-C. Diesel contaminated soils were collected in 6 coolers and transported to the Analytical Services Unit laboratory at Queen's University in Kingston, Ontario. Laboratory studies were set up at three different temperatures, 5 °C, 8 °C and 18 °C. The experimental design of the reactors attempted to simulate a landfarm and in particular looked at the contributions of aeration and bioremediation. The addition of fertilizer and the frequency of rotation were varied, resulting in five different soil treatments at the three temperatures. As was expected temperature was an important factor with the reactors at 18 °C remediating more diesel than the 8 °C or the 5 °C. However, at the colder temperatures the soils were successfully remediated with a rotation frequency of 4 days and the addition of fertilizer. At 5 °C, in particular, aeration improved results and clear evidence of bioremediation was observed. The data from the laboratory experiments indicate that landfarming at Ekalugad Fjord does have the potential to successfully remediate the diesel contaminated soils. It is recommended that the landfarm be set up in the warmest possible location, at low elevation and south facing. Fertilizer should be added and the landfarm tilled daily. Although the laboratory experiments indicate that the TPH concentration of the soil can be substantially reduced in approximately 100 days, field conditions such as the proximity of a glacier at this northern site are expected to reduce the rate of TPH remediation. Given the potential for washout of the soils, the landfarm should only proceed if an appropriate location can be found.