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Defence Construction Canada

Operation and Maintenance Plan
FOX-2, Longstaff Bluff DEW Line Site
1BR-LON0813

Prepared by:

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Revision Log

Revision #	Revised By	Date	Issue / Revision Description
1	EMS	Dec. 12, 2009	Draft
2	DC	January 6, 2009	Draft
3	EMS	March 3, 2009	Final Draft
4	EMS	March 18, 2009	Final

Table of Contents

List of Tables

Appendices

1. Introduction

1.1 Purpose

The purpose of the proposed project is to provide remedy for previous activities that occurred as a result of the operation of the former DEW Line site. Specifically, the clean up is to prevent the release of physical debris and/or contaminants into the environment. During the construction phase of the clean up, existing facilities no longer required for the operation of the NWS will be demolished. The demolition wastes will be segregated into hazardous and non-hazardous materials and disposed of appropriately. Contaminated soils identified during the field investigations will be excavated and properly disposed of in on-site engineered landfills or at off-site facilities if characterized as hazardous. Scattered surface debris and partially buried debris will also be collected and disposed. New landfills will be constructed to contain the non-hazardous contaminated soil and demolition waste generated during the clean up. Existing landfills within the site will be remediated, as required. Disturbed areas will be physically restored to a stable condition shaped to match the existing terrain. The detailed clean up program is provided in Section 5.

1.2 Location

The FOX-2, Longstaff Bluff DEW Line Site is on the south-western coast of Baffin Island, near the tip of the Baird Peninsula. The exact location is 68°53'49" N and 75°09'37" W. The station is located 15 km inland from the airstrip, on the southern end of a small peninsula jutting into Nauja Bay. The nearest community is Hall Beach, 245 km to the west.

1.3 Biophysical Information

1.3.1 Flora

Vegetation at the station area and other worked areas was sparse to continuous and consisted of wildflowers, grasses, sedges and moss, except in the sewage outfall and upper site landfill area. The vegetation cover in these areas was 70-90% and was dominated by mosses, grasses and sedges, willow, cotton grass, saxifrage, Arctic heather, Arctic poppies and mountain avens. The west beach area was heavily reworked and vegetation was sparse and consisted of moss, clumps of grass and sedges. At the east beach and airstrip area, 40-60% vegetative cover was present and consisted primarily of sedges, Arctic heather, willows, cotton grass and mountain avens.

1.3.2 Avifauna

A variety of birds are known to reside in the FOX-2 area and were observed by the field team in 2005 including ptarmingan, waterfowl (common eider, greater snow goose, lesser snow goose, tundra swan, brant, king eider, horned lark and old squaw) and shorebirds (snow buntings, plovers, gulls jaegers). Several ptarmigan families were noted at the upper site. Gulls and various types of plover, geese and snow buntings were also seen at the beach areas. Although the Ivory gull was not specifically identified during the site visit,

it is recognized that it is an endangered species and special attention should be paid to gulls during the clean up activities. The following raptors were not noted during the site visit; however, the Snowy Owl, Peregrine Falcon, Gyrfalcon and Rough-legged Hawks are known to occur in the region.

1.3.3 Terrestrial Fauna

Animals known to inhabit this region include barren-ground caribou, polar bears, Arctic fox, Arctic hare and lemmings. During the 2005 investigation, several caribou were observed around the site, as were lemmings, Arctic hare and an Arctic wolf. Specifically, caribou and Arctic hares frequented the station and airstrip area; the latter were also noted at the beach POL. Arctic foxes were observed near the airstrip and on the road that leads to the upper site, and a wolf was see around the airstrip area. Lemmings were present around the station area, as was evidenced by the presence of scat around the module train and in the sewage outfall. No polar bears were noted during the site visit.

1.3.4 Marine Mammals

A variety of marine mammals may be observed in the region of FOX-2. Beluga whales were sighted off-shore in 2005, as were ringed seals. Narwhal, bowhead whales, bearded seals and harp seals pass through Hudson Strait and summer in Foxe Basin. Walrus may follow this migration, or remain in Foxe Basin throughout the year. The following table provides a summary of those marine mammals.

1.3.5 Fish

Recreational fishing by former station personnel for arctic char was reported along the beach and at a small lake near the station.

1.4 Contact List

Table 1 provides the contact names and numbers for personnel associated with the work at the FOX-2 site.

Table 1: Contact List

Company	Name & Position	Phone No.
Quantum Murray LP (Contractor)	Project Manager – Vijay Lanji	604-313-5685
Defence Construction Canada (representatives for the Department of National Defence)	Environmental Officer – Douglas Craig	613-998-7288
	Associate Project Manager – Steve Poaps	613-998-9529

2. Background

2.1 Location of Drinking Water Supply

Please see attached site plan for the location of the water supply lake at FOX-2.

2.2 Sewage Treatment and Disposal

As a minimum, the camp sewage will be directed to a two-cell lagoon situated a minimum of 100 metres from the camp, any natural drainage course and water bodies that support aquatic life. The sewage lagoons will be sized to provide an individual capacity for 50 days of wastewater storage or one half of the duration of the construction season, whichever is less. The maximum fluid depth shall not exceed one metre. The sewage effluent will be tested prior to discharge for the following parameters: Biological Oxygen Demand, Total Suspended Solids, Oil & Grease; Faecal Coliforms and pH. Greywater from camp operations will also be discharged into the sewage lagoon.

2.3 Solid Waste Management and Disposal

Domestic garbage will be incinerated in an enclosed container (typically a forced-air incinerator) and the residual waste buried in the Non-Hazardous Waste Landfill. Scrap metal will be crushed and buried in the Non-Hazardous Waste Landfill. All excess fuels, camp equipment and facilities will be removed from the site after completion of the clean up activities. Any hazardous wastes encountered during the clean up operations will be packaged and stored according to TDG Regulations prior to shipment to a southern disposal facility. Waste oil is included as hazardous waste.

2.4 History of Site

The FOX-2 site was constructed in the 1950's as part of the Distant Early Warning (DEW) Line, which provided radar surveillance of the northern approaches to North America. In March 1985, Canada and the United States agreed to modernize the North American Air Defence System by closing the remaining 21 DND DEW Line sites by the early 1990's, and build the North Warning System (NWS).

In 1992, the DEW Line Clean Up Protocol was developed by the Environmental Sciences Group (ESG) of the Royal Military College of Canada and was reviewed and approved by federal and territorial environmental officials. The protocol includes procedures for dealing with contaminated soil, waste oil, landfills, wastewater, debris and hazardous materials. In 1998, the Environmental Provisions of the Cooperation Agreement between DND and the NTI were implemented to provide the approach necessary to restore the sites to an environmentally safe condition and prevent the migration of contaminants into the Arctic food chain.

3. Sewage Lagoon

The lagoon is a constructed facility that is to provide an individual capacity for 50 days of wastewater storage or one half of the duration of the construction season, whichever is greater. Perimeter berms are to be constructed so that a minimum of 1 metre of freeboard is maintained. The berms shall be placed and compacted fill material in horizontal lifts not exceeding 300 mm in thickness to 95 percent Maximum Dry Density. Depth indicators are to be installed and maintained within each lagoon to enable visual monitoring of the fluid depths. At the completion of construction activities at the site, the temporary lagoon will be backfilled to provide a minimum of 500 mm granular fill over settled solids.

The location of the sewage lagoon at FOX-2 must be: a minimum of 100 m from the construction camp, Engineer's Office, and/or other temporary facilities; a minimum of 100 m from drainage paths; a minimum of 450 metres from water bodies supporting aquatic life; downwind of the construction camp based on the prevailing wind direction; and within the DND reserve.

Volumes of sewage are calculated based on the number of people in the camp. The current estimate is 60 people.

All sampling procedures for the sewage effluent are provided in the QA/QC Plan dated September 2008 and submitted to the Nunavut Water Board on November 21, 2008.

4. Non-Hazardous Waste Landfill

There will be two Non-Hazardous Waste (NHW) Landfills constructed at FOX-2 for the disposal of non-hazardous debris resulting from clean up operations. The Station NHW Landfill will be located directly southeast of the module train. A short access road will be required from the station area. The Airstrip NHW Landfill will be located 130 m north of the Hangar.

A NHW Landfill is designed on the premise that it will contain non-hazardous materials only and will not generate leachate. Therefore, it is not necessary to eliminate all moisture migration into and out of the landfill. The NHW Landfill is also not designed to maintain the contents in a perennially frozen state.
The following materials may be disposed of in an NHW Landfills:

- Tier I and Type A hydrocarbon contaminated soil;
- Non-hazardous demolition debris;
- Non-hazardous site debris;
- Non-hazardous debris and Tier I soils excavated from landfills;
- Creosote treated timbers wrapped in polyethylene sheeting; and
- Double-bagged asbestos.

The NHW Landfills will consist of a perimeter containment berm and granular cover to minimize erosion and infiltration in order to provide long-term stability. The NHW Landfills will be established on native ground, stripped of any organic matter which will be stockpiled and used in the closure of the landfill. No base cover or liner is required for this landfill. Development and closure of an NHW Landfills includes the following work:

- Construction of exterior berms;
- Placement of Tier I contaminated soil and non-hazardous demolition waste and site debris in the landfill;
- Placement of Tier I contaminated soil and non-hazardous demolition waste and site debris in the landfill;
- Compaction of landfill debris;
- Placement and compaction of intermediate granular cover in the landfill;
- Placement and compaction of final granular cover over the landfill;
- Grading to promote drainage away from the landfill;
- Supply and installation of groundwater monitoring wells in and around the landfill as indicated on the drawings; and
- Survey of the location of asbestos and creosote-treated timbers.

5. Tier II Soil Disposal Facility

A Tier II Soil Disposal Facility will be located directly northeast of the station and covers an estimated area of 3600 m2 in a relatively undisturbed area, and is greater than 1 km distant from the ocean.

A Tier II Soil Disposal Facility is designed to contain contaminated soil exceeding Tier II Criteria. The design of this facility is based on the characteristics of the contaminants in the soils, the geothermal properties of the area, and the local permafrost regime. The design utilizes permafrost as the primary containment barrier. Both the Tier II contaminated soil and the wet, silty gravel perimeter berms are designed to be continuously frozen. A geothermal analysis was conducted to determine the time required for freezeback of the facility and the long-term geothermal regime of the facility. The thickness of the cover material was calculated to prevent thaw of the contaminated soil, even after 10 consecutive 1 in 100 warm years.

A high-density polyethylene (HDPE) liner is placed at the base and side slopes of the facility to provide secondary containment. The liner is chemically compatible with the contaminated soils and will prevent the potential movement of contaminants during the period required for permafrost aggradation. A second HDPE liner is to be placed over the contaminated soils and seamed to the base liner to prevent precipitation from percolating down through the cover fill and into the Tier II contaminated soils. The development and closure of the Tier II facility at FOX-2 will include the following work:

- Construction of exterior berms with saturated silty gravel;
- Supply and installation of HDPE liners;
- Placement of Tier II contaminated soils in the landfill;
- Placement and compaction of intermediate granular cover over the soil.
- Installation of the top HDPE liner;
- Placement and compaction of final granular cover on the landfill;
- Grading to promote drainage away from the landfill; and
- Supply and installation of thermistor strings and groundwater monitoring wells in and around the landfill.

During construction of this facility, the gradation, moisture content and compaction are monitored to ensure compliance with the design. It should be noted that water management during key trench construction will not be a concern as the facility is located in an area that is free of debris and soil contamination. Any water encountered will be pumped away from the area, without the requirement for testing.

6. Hazardous Waste Management

"Hazardous" waste materials are defined as waste materials that are designated as 'hazardous' under Nunavut or Federal legislation; or as 'dangerous goods' under the Transportation of Dangerous Goods Act (TDGA). The Canadian Environmental Protection Act (CEPA) regulates material containing PCBs at concentrations greater than 50 ppm. Specific hazardous materials may include: batteries, asbestos, fuel tank bottom sludges, solvents, PCB-containing fluids, fuels and lubricating oils, alcohols and glycols, and heavy metal contaminated liquids. Disposal requirements of these hazardous waste materials are presented in Table 2.

Table 2: Hazardous Waste Material Disposal Requirements

Hazardous Waste Material	Disposal Requirement
Batteries Heavy metal contaminated organic liquids Liquids containing organic compounds with chlorine concentrations >1000 ppm Liquids containing organic compounds with PCB concentrations >2 ppm and <50 ppm	Off-site licensed treatment/disposal facility (by separate contract)
Fuel tank bottom sludges Fuels, lubricating oils, alcohols and glycols	Off-site licensed treatment/disposal facility (by separate contract) **OR** On-site incineration in accordance with the contract specifications
Liquids and solids containing organic compounds with PCB concentration >50 ppm	Off-site licensed treatment and disposal facility

Hazardous materials are placed in environmentally suitable containers (typically lined and braced sea-cans) at an approved containment facility on-site. A storage area is established and registered with Environment Canada. The hazardous materials are removed by sea-lift in accordance with the TDGA Regulations.

7. Emergency Responses

See Appendix B for the Emergency Response Plan from the contractor.

8. References

Northwest Territories, Municipal and Community Affairs Community Development. *Guidelines for the Preparation of an Operation and Maintenance Manual for Sewage and Solid Waste Disposal facilities in the Northwest Territories*. October 1996.

UMA Engineering Ltd., *Environmental Clean Up Study of 21 DEW Line Sites in Canada. Volume 19 FOX-2, Longstaff Bluff, NWT*. UMA Engineering Ltd., in association with Hardy BBT Limited and Jacques Whitford Group, 1991.

UMA Engineering Ltd., *Specifications for the Clean Up of the FOX-2, Longstaff Bluff DEW Line Site – Draft*. UMA Engineering Ltd., in association with Hatch, 2007.

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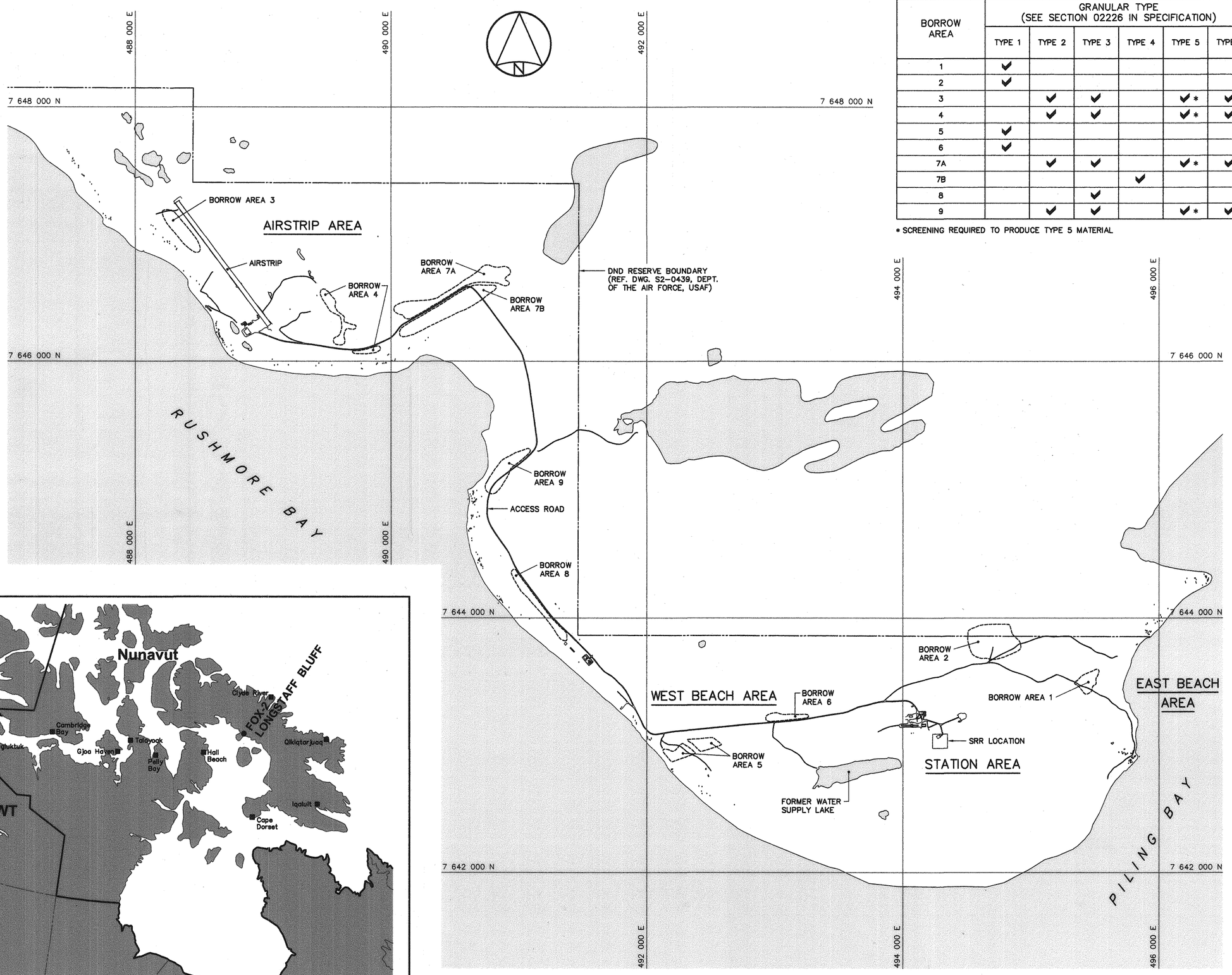
Appendix A

Overall Site Plan

POTENTIAL SOURCES FOR GRANULAR MATERIALS						
BORROW AREA	GRANULAR TYPE (SEE SECTION 02226 IN SPECIFICATION)					
	TYPE 1	TYPE 2	TYPE 3	TYPE 4	TYPE 5	TYPE 6
1	✔					
2	✔					
3		✔	✔		✔ *	✔
4		✔	✔		✔ *	✔
5	✔					
6	✔					
7A		✔	✔		✔ *	✔
7B				✔		
8			✔			
9		✔	✔		✔ *	✔

* SCREENING REQUIRED TO PRODUCE TYPE 5 MATERIAL



LOCATION OF LONGSTAFF BLUFF WITHIN NUNAVUT TERRITORY

N.T.S.

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 18N. ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL, RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ARCHAEOLOGICAL FEATURES LOCATED AS PER FINAL REPORT ON ARCHAEOLOGICAL MITIGATION STUDY AT FOX-2, LONGSTAFF BLUFF, BY THOMSON HERITAGE CONSULTANTS DATED MARCH 2006.
3. OCEAN SHORELINE DERIVED FROM AIR PHOTOS DATED 13/08/94.

Legend:

- BODY OF WATER
- APPROXIMATE EXTENT OF BORROW AREAS
- APPROXIMATE LOCATION OF PROPERTY BOUNDARIES
- ARCHAEOLOGICAL FEATURE

No.	DATE	REVISION	REVISION	APPR.

ASSOCIATION OF PROFESSIONAL ENGINEERS AND GEOSCIENTISTS NWT/NU
2007-10-03

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE – ECHELLE 250 125 0 250 500 750m

PROJECT – PROJET
FOX–2 LONGSTAFF BLUFF

DEW LINE CLEAN UP

TRADE – METIER	DATE
SITING	2007–10–02

SUBJECT – SUJET

OVERALL SITE PLAN

PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE TME/BWF		DES OFF AGENT CONCEPT
DRAWN DESSINE CAE		SECT HD CHEF SECT
CHECKED VERIFIE RRM		DES MGR GEST CONCEPT
COORDINATION SMS	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H–L133/1–9101–101

Canada

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Appendix B

Contractor Emergency Response Plan

18.0 EMERGENCY RESPONSE PLAN

18.1 Emergency Definition:

An emergency is any situation with the potential to affect the life, health or safety of any person, property or the environment.

18.2 Key Components of Emergency Response Plan:

Hazard Identification – to be prepared for all possible situations
Emergency Resources – identify various roles and designate persons and agencies
Communication System – identify and install a reliable system for location / site
Emergency Response Procedure – develop procedures for specific location / site
Communication of the Plan – educate workers of the plan during orientation and updates
Practical Exercises – to ensure all people assigned are able to complete roles
Debriefing and Post Incident Procedures – recovery systems / resources once the emergency response is completed

18.3 Emergency Response Coordination:

- The Emergency Coordination Centre will be the Quantum Murray LP site office.
- The onsite Emergency Response Coordinator will be the Site Health & Safety Coordinator.
- The offsite Emergency Response Coordinator will be Phil Lindner (604-833-9117).
- Quantum Murray LP will contact all relevant emergency response agencies prior to project commencement.
- Quantum Murray LP will coordinate all emergency response.
- If outside emergency response personnel are required (Ambulance, Police, Fire etc.), Quantum Murray LP will relinquish response coordination once outside response personnel are onsite and will then assist further emergency response.
- Onsite subcontractors must provide equipment and assistance if requested to do so by the emergency response personnel.

18.4 Emergency Response Transportation:

Emergency transport from site will be by fixed wing aircraft or helicopter, as appropriate.

18.5 Emergency Response Contact List

PROJECT	FOX-2, Longstaff Bluff, Nunavut	
SITE LOCATION		
NEAREST MEDICAL SERVICES		
NEAREST HOSPITAL	Main Switchboard Emergency Unit	
AIR MEDIVAC	Arctic Sunwest Adlair Aviation Air Tindi First Air Great Slave Helicopters Canadian Helicopters	(876) 873-4464 (867) 873-5161 (867) 669-8200 (867) 669-6618 (867) 873-2081 (867) 669-0779
POLICE –		
WCB – 24 Hour Accident Report Line	Yellowknife Iqaluit	1-800-661-0792 1-800-404-4407
NWT 24 Hour Spill Report Line	(867) 9208130	
Yellowknife Wildlife Emergency Line	(867) 873-7181	
DCC - Project Manager		
QMLP - Project Manager		

QMLP - Site Superintendent	
QMLP - Emergency Response Coordinator	Phil Linder (604-833-9117)
QMLP Environmental Occupational Health & Safety Mgr. BG Region	Dan Sinclair (604) 837-2267

18.6 Emergency Response Procedures

- STOP work and sound alarm (one long blow on the emergency siren).
- All work must stop immediately.
- Provide immediate and appropriate FIRST RESPONSE if you able to and ONLY if it is safe to do so (e.g. administer first aid to worker, extinguish fire, stop product flow, etc.).
- Call police, ambulance, fire fighters, hospital, etc., as per Contact List.
- All workers must assemble at the designated muster station (unless they are involved in FIRST RESPONSE activities).
- Workers assembled at the designated muster station must complete a head count to ensure every worker onsite is accounted for and evacuated safely. Workers must not leave the muster station until a head count has been completed and they have been instructed to do so.
- Cordon off the incident area
- Eliminate or mitigate hazards at the incident area
- Initiate and coordinate emergency response
- Contact appropriate emergency response personnel, authorities, and project management
- Complete incident investigation report as soon as possible
- Forward incident report to appropriate authorities and project management
- Implement appropriate investigation findings and review findings with workers

The following persons shall assist Quantum Murray LP when an emergency has been declared:

Name	Company

In the event of a serious emergency (sounding of the emergency siren), the above personnel shall ensure that workers are accounted for and assembled at the muster station.

18.7 Emergency Response Review:

The Site Superintendent will conduct a review of the circumstances and emergency response at the conclusion of an emergency situation.

18.8 Emergency Response Recovery:

The recovery process, or what happens after the emergency activity has been completed, is frequently given very little thought.

Many of the emergency tasks may be handled by people who are not accustomed to handling emergencies. People may have seen their work partners and friends very badly injured and suffering great pain.

The memories of the accident and the condition of the injured may have a very detrimental and lasting effect on the people involved in the accident and on the emergency crew.

Once the emergency is over, the attitude should not be “Okay, let’s get back to work” or “Let’s go home.” Some of the people involved may need professional assistance in order to get their mind back on what they are doing. The Health and Safety Coordinator will interact with and observe site personnel and if there are indications of shock or other signs of concern, professional assistance will be sought.

All site personnel will be required to acknowledge that they have read and understand the Emergency Plan and are familiar with its provisions, as per the example below.

Please sign and return to Health & Safety Coordinator (HSC). Refer to QHS # 34.

Name *(print clearly)*	**Company** *(print clearly)*	**Date**	**First Aid Training** **Yes** / **No**

EXAMPLE ONLY

Refer to QHS # 34