

Defence Construction Canada

Water Use License Amendment and Renewal FOX-2, Longstaff Bluff Landfill Monitoring

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Project Number:

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Date:

July 2013

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1. Post Construction Monitoring Program

1.1 Introduction

The FOX-2 Longstaff Bluff DEW Line site is located on the southwestern coast of Baffin Island, near the tip of the Baird Peninsula. The exact location is 68° 53' 49" north latitude and 75° 09' 37" longitude. 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 with charter aircraft and a full range of commercial and public services available is Hall Beach, 245 km to the west.

1.2 Background

FOX-2 was originally a main site within the original DEW Line system and was decommissioned in 1991. A Short Range Radar (SRR) station occupies a site approximately 300 m southeast of the former station area. NWS holds a reserve on this area, and an area at the Beach POL where SRR fuel tanks are located. The cleanup included the closure and remediation of five existing landfills. A new landfill for the disposal of non-hazardous wastes generated from demolition and collection of site debris was constructed. In addition, a DCC Tier II Disposal Facility was constructed for disposal of Tier II contaminated soil. The existing and new landfills, as shown on the overall site plan, Figure FOX-2.1, include:

- Airstrip West Landfill (not shown, completely excavated)
- Airstrip Landfill (not shown, completely excavated)
- Airstrip Camp Landfill Lobe A
- Hangar Non-Hazardous Waste Landfill (new)
- West Landfill Lobe E
- Tier II Disposal Facility (new)
- Upper Site Landfill Lobe A

The Department of National Defence (DND), in cooperation with Nunavut Tunngavik Incorporated (NTI), developed a landfill monitoring plan to address post closure monitoring requirements for the landfills at the DEW Line Sites (Appendix B). Defence Construction Canada (DCC) is managing the cleanup and monitoring programs on behalf of DND.

The objective of the landfill monitoring program is to collect sufficient information to assess the performance of the landfills from a geotechnical and environmental perspective. The landfill monitoring plan specifies the requirements for visual inspection, and chemical and thermal monitoring of landfills at the DEW Line sites under DND's jurisdiction.

Table 1 provides the landfill monitoring schedule for the FOX-2 site.

Table 1- MONITORING SCHEDULE – FOX-2 Longstff Bluff

No. of Years After Construction	Monitoring Event Number	Year
Prior to/During:	Baseline	2005, 2009-2011
1	1	2012
2	2	2013
3	3	2014
4	4	2015

5	5	2016
7	6	2018
10	7	2021
15	8	2026
25	9	2036

1.3 Program Components

The post-construction landfill monitoring program consists of four main components to measure the performance of the landfills, depending on the remediation plan for each landfill. These components are visual, soil, groundwater and thermal monitoring. Details on each of the monitoring components are provided below.

1.3.1 Visual Monitoring

The physical condition of each landfill is inspected in accordance with the Visual Inspection Checklist provided in the Environmental Provisions of the NTI-DND Agreement. Documented observations include evidence of settlement, ponding, frost action, erosion, and lateral movement, as well as sloughing of berms, and thermal contraction cracks. Documentation of observations is supported using hand drawn sketches, as applicable. Photographic Records are provided to document the general condition of the landfill and to substantiate all recorded observations.

1.3.2 Soil Monitoring

Baseline conditions refer to existing soil chemistry at the landfill area prior to and during remediation. The baseline landfill monitoring program consists of two phases: samples collected as part of the landfill assessment program which determined whether the landfill posed a potential environmental risk, and samples collected during the construction/closure of the landfill. The results of subsequent landfill monitoring events are compared to baseline and background values to evaluate any potential changes in environmental conditions.

As part of the baseline sampling program, soil samples are collected in areas upgradient and downgradient of each landfill. Upgradient samples are targeted to areas near the landfill, but not influenced by migration of contaminants through the landfill. Upgradient samples are meant to be representative of contaminant input conditions to the landfill and serve as the primary basis upon which to compare the downgradient contaminant concentrations.

Downgradient soil samples are collected at surface/shallow depths from designated areas at the toe of each landfill and from areas of preferential drainage. These soil samples are collected and analyzed to document whether there has been migration of contaminants from the landfill area. Although contaminants are primarily transported in water (surface and groundwater), they have a tendency to adsorb to soil particles the water is migrating through. Therefore the soil still retains information regarding the historical input of contaminants.

Analytical results of soil samples collected downgradient of landfills are compared to contaminant concentrations of samples collected upgradient of landfills. Downgradient samples are also compared to overall site background contaminant levels because they help in establishing a more broad level of

contaminant concentrations that can be found at the site, particularly where different soil or rock types are present. Contaminant concentrations in downgradient samples that are significantly higher than background or upgradient concentrations, particularly where there have been changes over time; provide evidence of contaminants having migrated to, possibly beyond the soil sampling location. These data, in conjunction with other site-specific information, were used in the assessment of the environmental status of the landfill and the determination of an appropriate remediation solution.

Samples collected during baseline and subsequent landfill monitoring are analyzed for the following parameters:

- Inorganic elements: arsenic, cadmium, chromium, cobalt, copper, lead, nickel, and zinc.
- Mercury.
- PCBs (polychlorinated biphenyls – total Aroclor).
- TPH (Total Petroleum Hydrocarbons) – as represented by the sum of F1 (nC₆ to nC₁₀), F2 (nC₁₀ to nC₁₆), and F3 (nC₁₆ to nC₃₄), as defined by the CCME Tier I Method – Rev. 5, Analyses of Total Petroleum Hydrocarbons in soil.

The requirement for the analyses of baseline samples is to provide record information on the environmental status of the landfill should potential problems be identified during the monitoring program.

1.3.3 Groundwater Monitoring

During the construction phase, permanent groundwater monitoring wells are installed at all existing landfills classified as a moderate environmental risk (Class B landfills) and at new landfills built to support site remediation. At FOX-2, this includes the Non-Hazardous Waste Landfill (new), the Tier II Disposal Facility (new) and the Upper Site Landfill (existing). Groundwater monitoring wells were installed hydraulically upgradient and downgradient of the landfills. Surface and shallow depth soil samples are also collected adjacent to monitoring well locations. Analytical data from water samples collected from wells up and downgradient are reviewed in conjunction with soil analytical data to evaluate potential impacts associated with the landfill.

For baseline and for future monitoring events, the following physical measurements are recorded prior to the collections of groundwater samples from a monitoring well:

- Water elevation.
- Total water depth.
- Height of well stick-up.
- Depth to bottom of well.
- Presence of hydrocarbons.
- Hydrocarbon thickness (if appropriate).

Prior to sampling, monitoring wells are purged until groundwater parameters such as pH, temperature and conductivity stabilize. In the event of low recharge volumes, standing water may be sampled and specifically documented. Water samples are not filtered.

Following withdrawal of a water sample, other physical measurements recorded inside:

- Colour, odour.

- pH, conductivity and temperature.

Groundwater samples are analyzed for the following parameters:

- Inorganic elements (total concentrations): arsenic, cadmium, chromium, cobalt, copper, lead, nickel and zinc.
- Mercury.
- PCBs (polychlorinated biphenyls – total Aroclor).
- TPH (Total Petroleum Hydrocarbons) – C₆ to C₃₂.

1.3.4 Thermal Monitoring

For Class B landfills and Tier II Soil Disposal Facilities where a component of the design includes the placement of sufficient fill to promote aggradation of permafrost through the landfill contents, geothermal modeling is conducted to determine the maximum depth of active layer at the landfill, and the amount of fill required on the landfill surface to ensure that the active layer does not penetrate into the landfill contents following freeze-back. Modeling also determines the length of time required for the landfill contents to freeze-back following the placement of additional surface fill. Geothermal modeling considers the following:

- soil type
- soil thermal properties
- presence or absence of insulating cover (vegetation or snow drift)
- measured ground temperatures at the site or at nearby sites
- measured air temperature and climatic data
- an estimated 1 in 100 warm year air temperature
- an estimated ten consecutive years of 1 in 100 warm years, and
- an estimate of the effect of global warming (based on estimates of temperature change reported by the Panel on Energy Research and Development for Environment Canada – PERD – in 1998).

During landfill construction, vertical thermistors were installed within the landfill to record ground temperatures. Measured ground temperatures will be compared to the active layer depth and freeze back time modelled during design. It is anticipated that all landfills where freeze back is an integral part of the design will reach thermal equilibrium within approximately five years following closure. If thermal equilibrium is not achieved within five years, it may be necessary to increase the term of the thermal monitoring.

1.4 Frequency

The landfill monitoring program consists of three phases, as described in detail below.

1.4.1 Phase I

Phase I involves monitoring of conditions to confirm that equilibrium is achieved. The frequency of monitoring events during Phase I is dependent on the closure or remediation design at specific landfills. The five-year term was selected on the basis that ground-temperature thermal regimes will require three to five years to reach equilibrium.

An evaluation of all Phase I data is carried out at the end of five years to confirm that thermal and chemical equilibrium is achieved, and that no stability issues are identified. The Phase I monitoring program may be extended, if required, to provide sufficient data to establish equilibrium conditions.

The first year of the Phase I post-construction monitoring is completed by the Environmental Sciences Group (ESG) of the Royal Military College of Canada, who are part of the DEW Line Clean Up Project Team. Subsequent landfill monitoring events are carried out by independent contractors, who successfully win the competitive tender.

1.4.2 Phase II

Phase II monitoring is the verification of equilibrium conditions established in Phase I. The monitoring frequency in Phase II is downgraded from Phase I and will be carried out according to the following schedule: year 7, 10, 15 and 25. Year 25 marks the end of Phase II monitoring.

1.4.3 Phase III

Phase III involves the monitoring for long-term issues such as liner integrity, permafrost stability and significant storm events. At the end of the Phase II program, 25 years after construction, a re-evaluation of the landfill monitoring program will be carried out prior to initiating any Phase III program. The scope of the Phase III monitoring program is not included here, but is anticipated to be based on a 10 year monitoring interval.

1.5 Review and Evaluation Process

An Environmental Working Group (EWG) was established to provide a technical report and to support the DLCU Steering Committee. This working group is comprised of qualified engineering and environmental scientists with expertise in environmental remediation and clean up in northern climates. The EWG has four designated representatives, two from each of the Owner (DND) and the Inuit (through the NTI), respectively.

During the monitoring program, the EWG reviews the results of the monitoring program in accordance with the methodology as described previously. The results of the review and any recommendations regarding changes to the monitoring plan and/or remediation requirements are reported to the DND/NTI Steering Committee.

The requirement for further monitoring after 25 years is evaluated. Monitoring may be terminated if the performance of the landfill was satisfactory over the period of monitoring from an environmental, geotechnical and thermal perspective, as appropriate. The assessment of satisfactory performance is carried out jointly by the NTI and DND.

2. Detailed Landfill Monitoring Requirements

Site figures documenting the monitoring locations at each landfill are provided in Appendix A. Table 2 provides a summary of the general landfill monitoring requirements at the DND DEW Line sites following construction.

Table 2 - General Landfill Monitoring Requirements

Landfill Classification	Visual Inspection	Groundwater Sampling	Soil Sampling	Thermal Monitoring
Existing Landfills, High Potential Environmental Risk (Class A)	Not required, as landfill to be excavated			
Existing Landfills, Moderate Potential Environmental Risk (Class B)	√	√	√	√
Existing Landfill, Low Potential Environmental Risk (Class C)	√		√	
New Landfill, Non-Hazardous Waste Landfill	√	√	√	
New Landfill, DCC Tier II Disposal Facility	√	√	√	√

A summary of these requirements, as related to the specific landfills at FOX-2, is provided in Table 3. The rationale for the monitoring requirements is provided in the landfill-specific sections.

Table 3 – FOX-2 Landfill Monitoring Requirements

Landfill Designation	Visual Inspection	Groundwater Sampling	Soil Sampling	Thermal Monitoring
Tier II Disposal Facility	√	√	√	√
Non-Hazardous Waste Landfill	√		√	
Upper Site Landfill	√	√	√	√
Airstrip Camp Landfill Lobe A	√		√	
West Landfill Lobe E	√		√	

2.1 Non-Hazardous Waste Landfill

The Non-hazardous Waste Landfill is located in the airstrip area west of Borrow Area #4 and was constructed for the disposal of non-hazardous wastes and debris generated and collected during site clean-up.

The design of this landfill includes perimeter berms, and the placement of a cover of compacted granular fill over the landfilled material. Four groundwater monitoring wells were installed at the landfill perimeter.

The long term monitoring plan consists of visual inspection, and the periodic collection of soil and groundwater samples. Approximate locations for the collection of soil and groundwater samples are identified in Figure FOX-2.3.

2.2 Upper Site Landfill Lobe A

The Upper Site Landfill is 200 m east of the warehouse. It was the main disposal area for station operations, beginning in the 1950s. The size and approximate depth of the lobe is 4040 m² and up to 2.0 m deep. There were several areas of Tier I and Tier II contamination on the landfill surface, as well as downgradient noted during the site investigation. Localized TPH impacts were also present. Surface contamination was generally associated with

debris, but some of the contamination along the toe may be due to landfill leachate. Four groundwater monitoring wells were installed at the landfill perimeter, and four thermistors were installed within the landfill.

Based on the evaluation of the landfill as a potential source of contamination, this landfill was classified as a moderate potential environmental risk. Remediation included excavation of surface hazardous soils and leachate containment.

The long term monitoring plan consists of visual monitoring, the collection of soil and groundwater samples, and monitoring of subsurface ground temperatures of the landfill. Approximate locations for the collection of soil and groundwater samples, and thermistor installation locations are identified on Figure FOX-2.5.

2.3 Tier II Soil Disposal Facility

The Tier II Disposal Facility was constructed approximately 100 m east of the main station area. The landfill cell was constructed with the placement of low-permeability, saturated, compacted berms, the installation of a liner system over the berms and along the landfill base, and the placement of a surface liner system over the landfill contents with the placement of overlying sufficient granular fill to promote freezeback of landfill contents. Four groundwater monitoring wells were installed at the landfill perimeter, and four thermistors were installed within the landfill.

The long term monitoring plan consists of visual monitoring, the collection of soil and groundwater samples, and monitoring of subsurface ground temperatures of the landfill. Approximate locations for the collection of soil and groundwater samples, and thermistor installation locations are identified on Figure FOX-2.4.

2.4 West Landfill Lobe E

The West Landfill is located 0.9 km south of the beach POL area and 1.4 km west of the station area within an old borrow area. A road extends from the main station access road into the landfill/borrow area. Lobe E has an area of 1,780 m², with an estimated depth of 1.5 m. Very little surface debris was noted at the landfill; a crushed barrel was present and there was one area (approximately 2 x 3 m) near the south end that had scattered wood fragments, Plexiglas pieces and miscellaneous small metal debris.

The West Landfill is located in one of the primary geochemical “hot spots” on the site. The subsurface water migration through the shear zone, with subsequent surface discharge, results in precipitation of oxides with co-precipitation of other metals because of a rapid change in redox conditions. The strong iron oxide precipitates, with associated higher levels of other metals, gives the appearance that the landfill is leaching. Applying the site-specific criteria, lobe E was found to have one area downgradient where zinc and nickel values were at or slightly above the criteria. However, the levels were marginally higher than surrounding sample concentrations, and concentrations of other metals were also relatively consistent, providing strong evidence that the observed concentrations were natural. This area has there not been considered as contaminated.

This landfill was evaluated as a low potential environmental risk. Remediation included removal of surface debris and regrading.

The long term monitoring plan consists of visual inspection, and the periodic collection of soil samples. Approximate locations for the collection of soil samples are identified in Figure FOX-2.3.

2.5 Airstrip Camp Landfill Lobe A

The Airstrip Camp Landfill is located 380 m northeast of the hangar, and is accessed via the same trail leading to the Airstrip Landfill. The landfill was not identified during previous investigations but the area was identified for geophysical survey in a review of historical air photos. The landfill sits within the footprint of the former construction

camp and at various times during camp takedown, earthmoving, material storage, and trenching activities were all observed here.

The long term monitoring plan consists of visual monitoring, and the periodic collection of soil samples. Approximate locations for the collection of soil and groundwater samples are identified on Figure FOX-2.2.

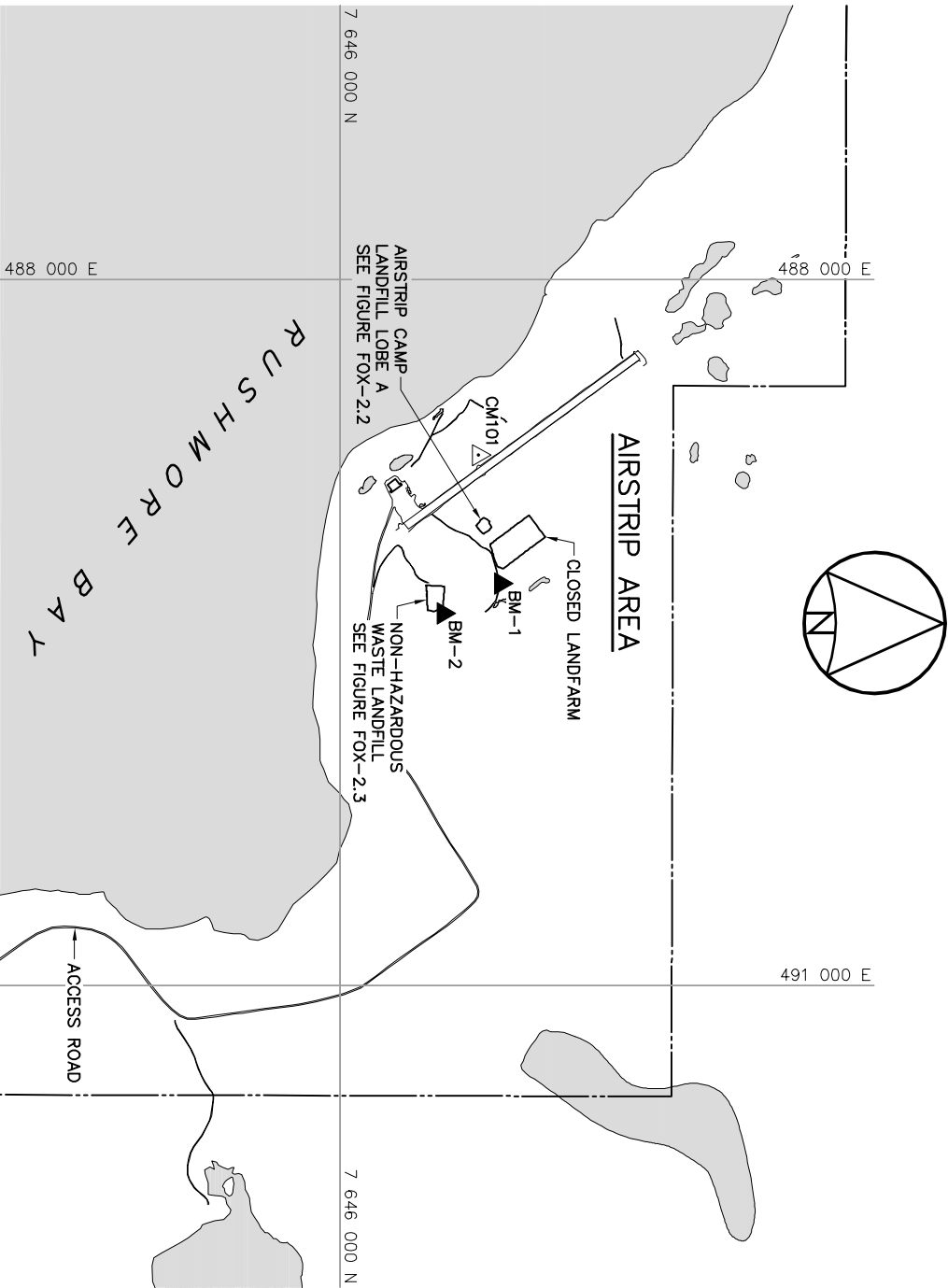
**Table 4: Summary Of Landfill Monitoring Installations/ Sampling Locations
FOX-2 Longstaff Bluff**

Landfill Designation/Monitoring Locations	Coordinates		Elevation
	North (m)	East (m)	(masl)
Airstrip Camp Landfill Lobe A			
Soil Sample 1	TBD	TBD	-
Soil Sample 2	TBD	TBD	-
Soil Sample 3	TBD	TBD	-
Soil Sample 4	TBD	TBD	-
Non-Hazardous Waste Landfill			
MW-05 (soil and groundwater)	7646429.4	489418.7	30.2
MW-06 (soil and groundwater)	7646358.3	489299.2	22.5
MW-07 (soil and groundwater)	7646398.3	489288.6	23.4
MW-08 (soil and groundwater)	7646440.0	489295.8	24.4
West Landfill			
Soil Sample 5	TBD	TBD	-
Soil Sample 6	TBD	TBD	-
Soil Sample 7	TBD	TBD	-
Soil Sample 8	TBD	TBD	-
Soil Sample 9	TBD	TBD	-
Tier II Disposal Facility			
MW-09 (soil and groundwater)	7643176.6	494276.9	156.9
MW-10 (soil and groundwater)	7643288.8	494341.7	149.7
MW-11 (soil and groundwater)	7643300.1	494284.2	148.9
MW-12 (soil and groundwater)	7643300.9	494232.0	149.2
VT-1 (temperature)	TBD	TBD	-
VT-2 (temperature)	TBD	TBD	-
VT-3 (temperature)	TBD	TBD	-
VT-4 (temperature)	TBD	TBD	-

**Table 4: Summary Of Landfill Monitoring Installations/ Sampling Locations
FOX-2 Longstaff Bluff**

Landfill Designation/Monitoring Locations	Coordinates		Elevation
	North (m)	East (m)	(masl)
Upper Site Landfill			
VT-5 (temperature)	TBD	TBD	-
VT-6 (temperature)	TBD	TBD	-
VT-7 (temperature)	TBD	TBD	-
VT-8 (temperature)	TBD	TBD	-
MW-13 (soil and groundwater)	7643177.6	494363.1	156.4
MW-14 (soil and groundwater)	7643301.7	494476.8	148.8
MW-15 (soil and groundwater)	7643264.2	494530.5	148.5
MW-16 (soil and groundwater)	7643213.3	494543.5	147.8

Note 1. Monitoring well coordinates as provided by the cleanup contractor (survey). Coordinates referenced to UTM Zone 14N, NAD83.

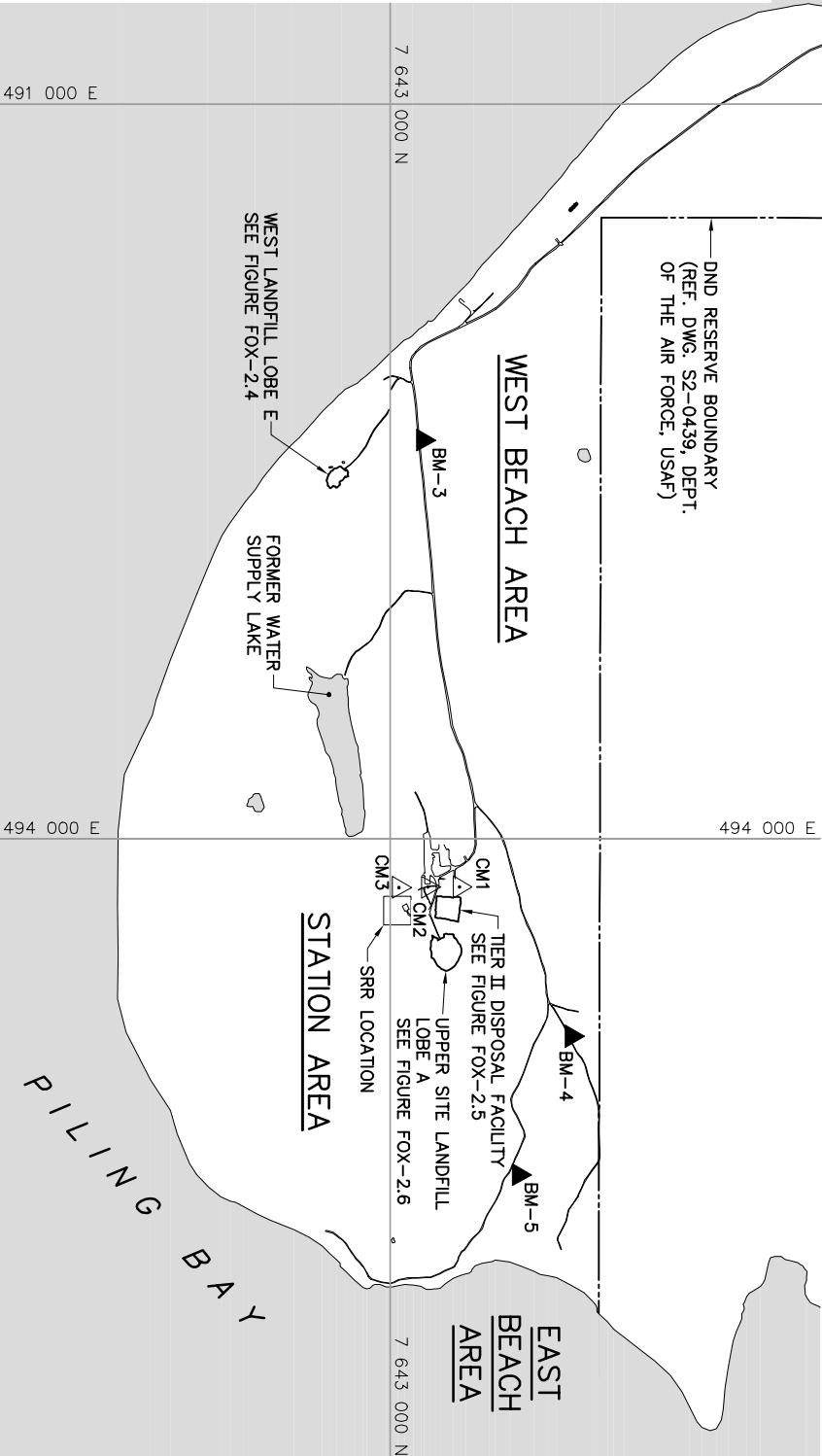
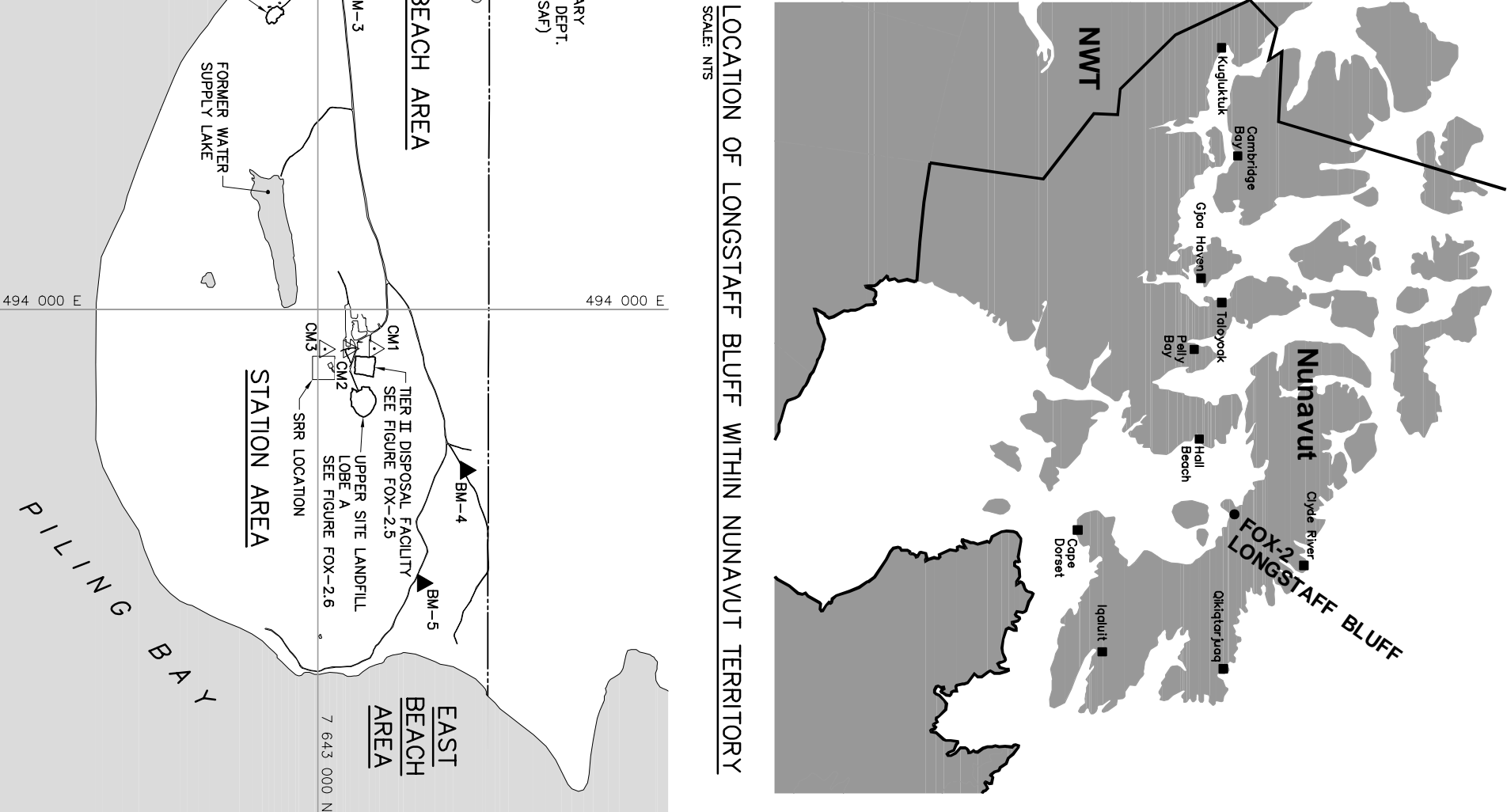


SURVEY CONTROL MONUMENTS			
NO.	UTM COORDINATES		DESCRIPTION
	NORTHING	EASTING	
CM1	7 643 282.694	494 194.669	FOX-2 BASELINE STA. 0+00
CM2	7 643 154.373	494 195.664	FOX-2 BASELINE STA. N/A
CM3	7 643 035.836	494 196.504	FOX-2 BASELINE STA. N/A
CM101	7 646 589.787	488 746.333	FOX-2 BASELINE STA. 12+00

NOTE: BASELINE STATIONS SHOWN ARE IN IMPERIAL UNITS.

PERMANENT BENCHMARK (AS-BUILT)			
NO.	UTM COORDINATES		DESCRIPTION
	NORTHING	EASTING	
BM-1	7 646 684.430	489 291.060	25mm DIA. STEEL PIPE
BM-2	7 646 440.000	489 417.870	25mm DIA. STEEL PIPE
BM-3	7 643 133.590	492 370.950	25mm DIA. STEEL PIPE
BM-4	7 643 740.820	494 804.820	25mm DIA. STEEL PIPE
BM-5	7 643 525.070	493 369.930	25mm DIA. STEEL PIPE

NOTE: COORDINATES AND ELEVATIONS INDICATED ARE TOP OF BENCHMARK PIPE.



- GENERAL NOTES:
- ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 18N. ALL ELEVATIONS REFER TO GEODETIC DATUM.
 - ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.

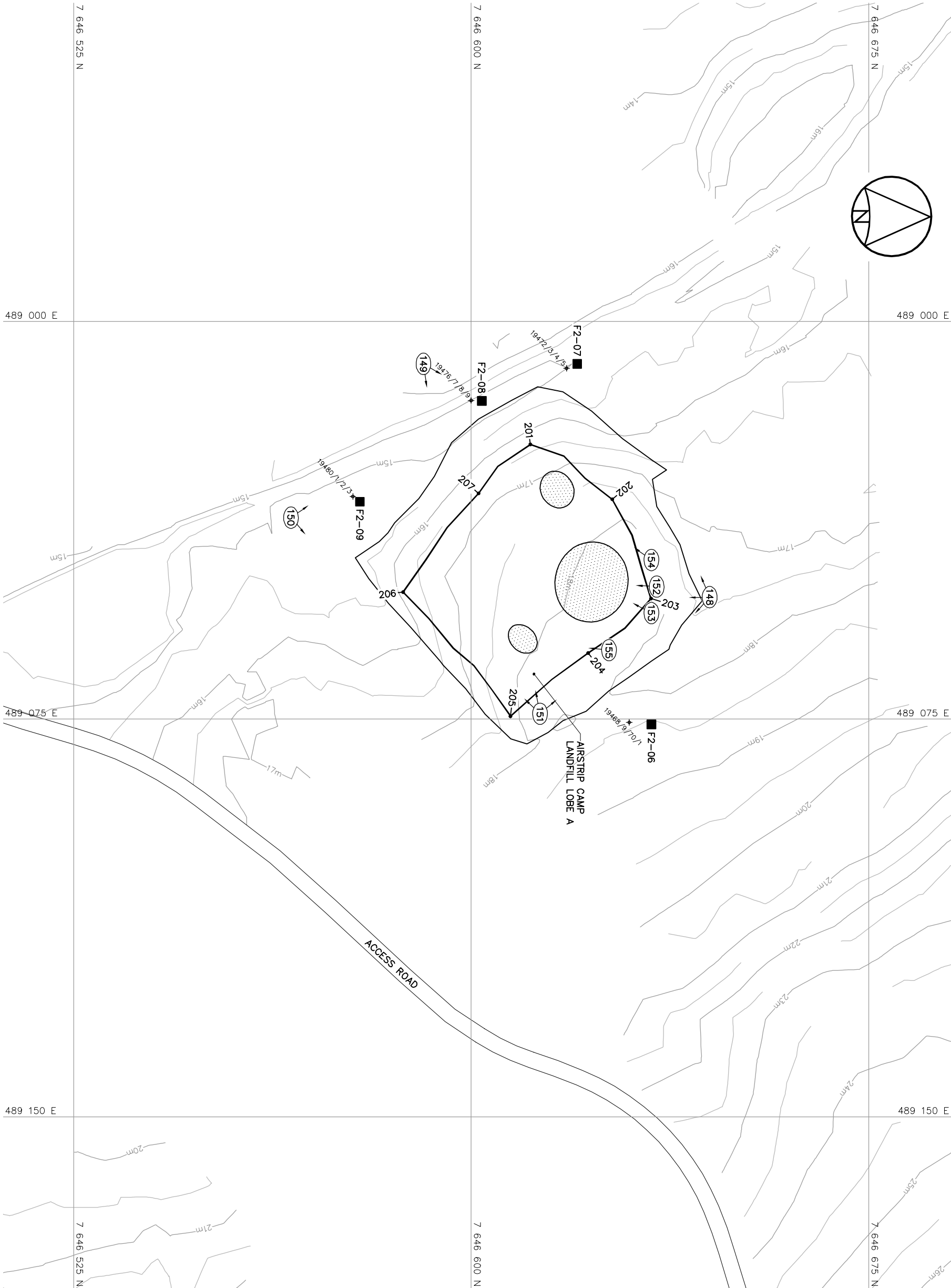
LEGEND:

- CM1 SURVEY CONTROL MONUMENT (4)
- BM-1 PERMANENT BENCHMARK LOCATION (5)
- APPROXIMATE LOCATION OF PROPERTY BOUNDARY
- BODY OF WATER

RECORD DRAWING
NOT FOR CONSTRUCTION



DEW LINE CLEAN UP
LANDFILL MONITORING PLAN
FOX-2 LONGSTAFF BLUFF
LOCATION PLAN
FIGURE FOX-2.1



- GENERAL NOTES:
1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 18N. ALL ELEVATIONS REFER TO GEODETIC DATUM.
 2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.

LEGEND:

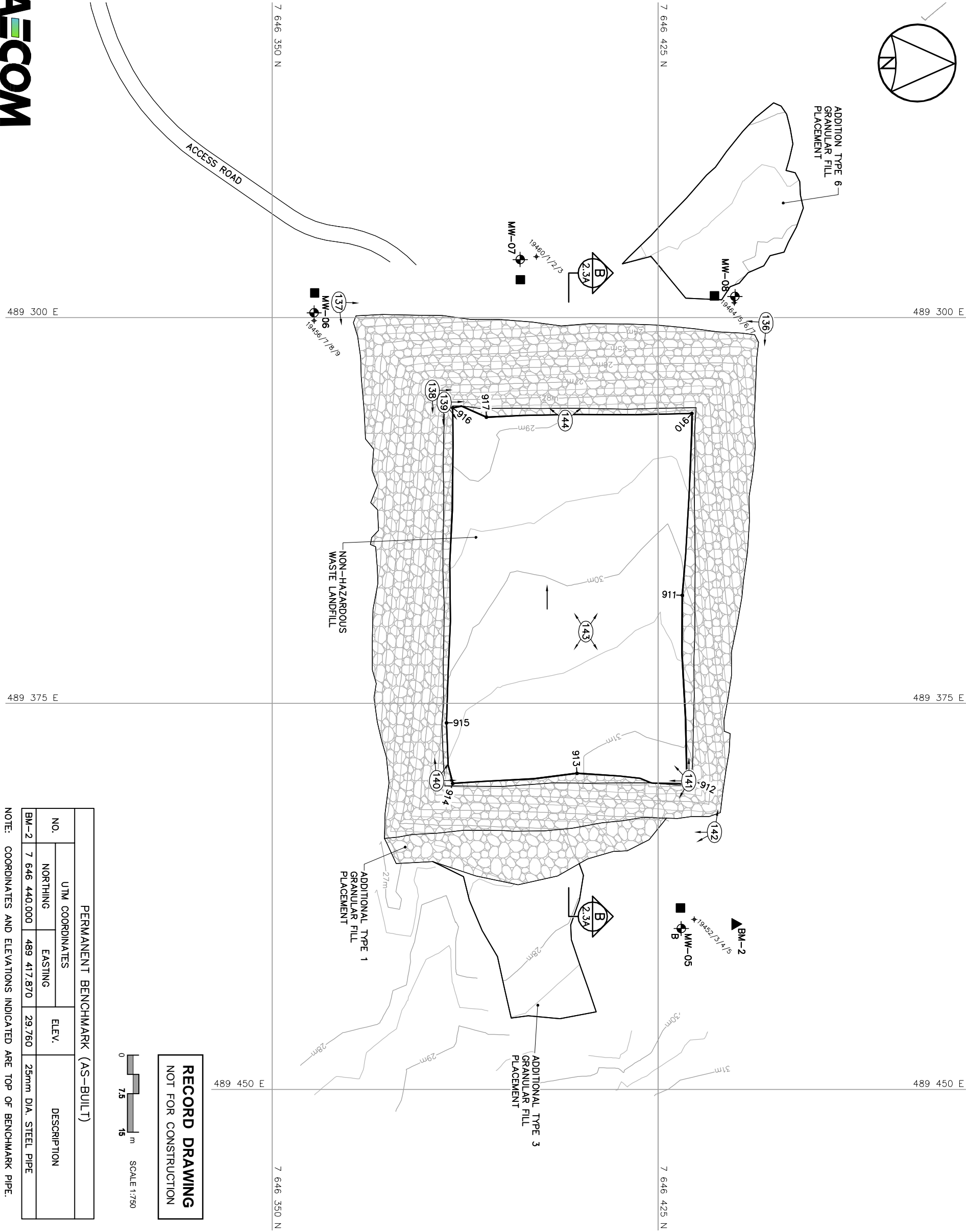
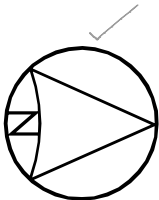
- 201 COORDINATE POINT
- MONITORING SOIL SAMPLE LOCATION (4)
- MONITORING SITE FEATURE
- 148 APPROX. PHOTOGRAPHIC VIEWPOINT
- 19468 2012 SOIL SAMPLE TAG LOCATION

AIRSTRIP CAMP LANDFILL (LOBE A) REGRADED (AS-BUILT)			
NO.	UTM COORDINATES		ELEV.
	NORTHING	EASTING	
201	7 646 611.2	489 023.2	16.4
202	7 646 626.6	489 033.5	17.8
203	7 646 633.9	489 052.3	18.2
204	7 646 622.1	489 062.5	18.3
205	7 646 607.4	489 074.5	17.9
206	7 646 587.2	489 051.1	16.1
207	7 646 601.4	489 032.4	16.7

RECORD DRAWING
NOT FOR CONSTRUCTION



DEW LINE CLEAN UP
LANDFILL MONITORING PLAN
FOX-2 LONGSTAFF BLUFF
AIRSTRIP CAMP
LANDFILL LOBE A
FIGURE FOX-2.2



RECORD DRAWING
NOT FOR CONSTRUCTION



PERMANENT BENCHMARK (AS-BUILT)			
NO.	UTM COORDINATES		DESCRIPTION
	NORTHING	EASTING	
BM-2	7 646 440.000	489 417.870	25mm DIA. STEEL PIPE

NOTE: COORDINATES AND ELEVATIONS INDICATED ARE TOP OF BENCHMARK PIPE.

- GENERAL NOTES:
- ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 18N. ALL ELEVATIONS REFER TO GEODETIC DATUM.
 - ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.

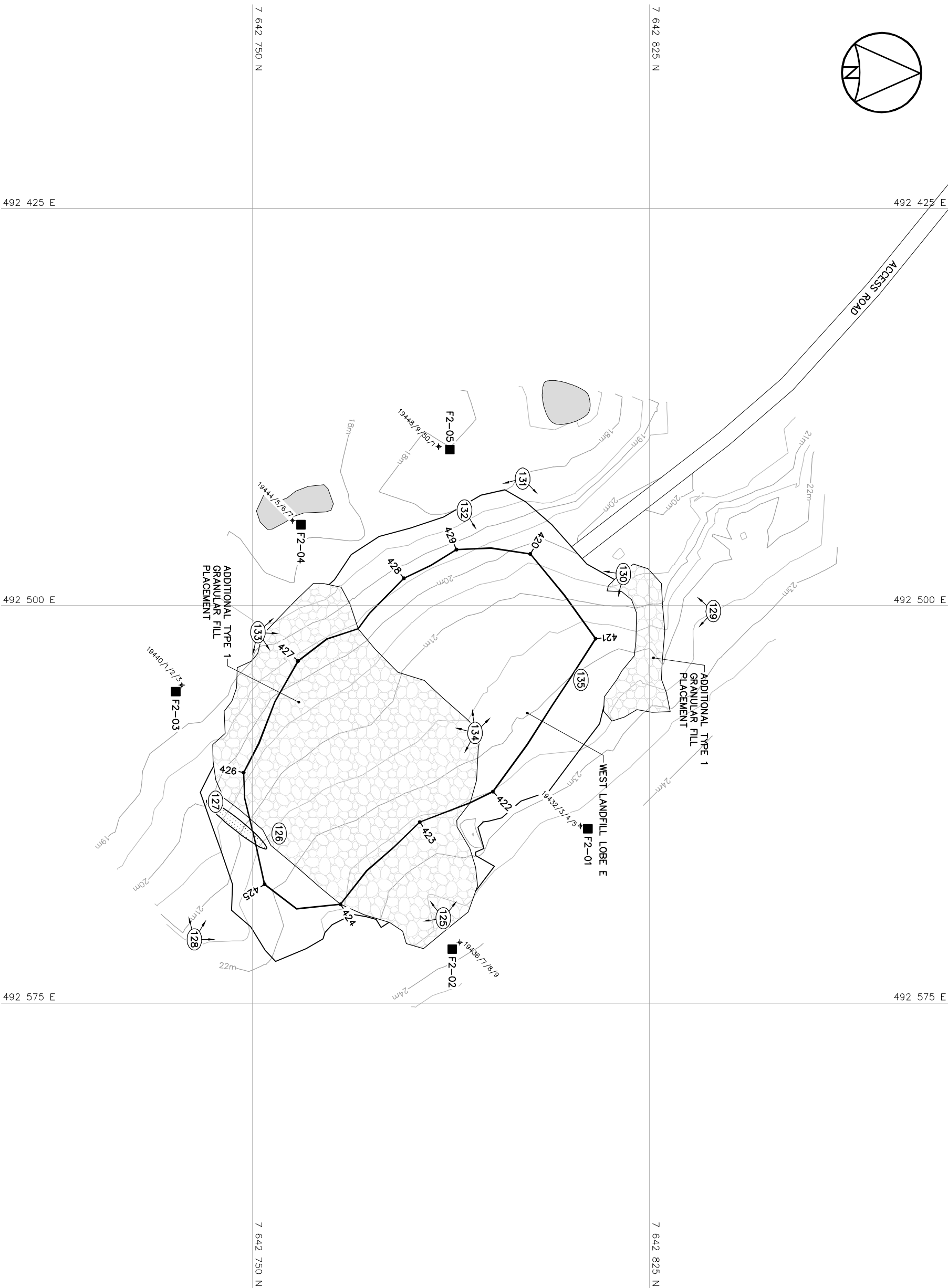
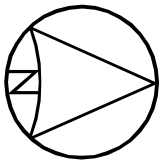
- LEGEND:
- ▲ BM-2 APPROXIMATE PERMANENT BENCHMARK LOCATION (1)
 - 910 COORDINATE POINT
 - ⊕ MONITORING WELL LOCATION (3)
 - ⊕ BACKGROUND MONITORING WELL LOCATION (1)
 - MONITORING SOIL SAMPLE LOCATION (4)
 - ⦿ APPROX. PHOTOGRAPHIC VIEWPOINT
 - ★ 19452 2012 SOIL SAMPLE TAG LOCATION

NON-HAZARDOUS WASTE LANDFILL FINAL GRADING (AS-BUILT)			
NO.	UTM COORDINATES		ELEV.
	NORTHING	EASTING	
910	7 646 431.6	489 318.6	29.2
911	7 646 429.7	489 354.0	30.1
912	7 646 430.6	489 389.4	31.3
913	7 646 409.3	489 388.6	31.0
914	7 646 385.1	489 390.5	30.6
915	7 646 383.9	489 378.8	30.3
916	7 646 385.1	489 317.5	28.6
917	7 646 391.7	489 319.3	28.9

NOTE: COORDINATE POINTS AND ELEVATIONS PROVIDED ARE TO THE FINAL GRADE OF ORGANIC MATERIAL ON THE PLATEAU AND PRIOR TO THE PLACEMENT OF TYPE 1 GRANULAR FILL ON SIDE SLOPES.

NON-HAZARDOUS WASTE LANDFILL MONITORING WELLS (AS-BUILT)			
NO.	UTM COORDINATES		ELEV.
	NORTHING	EASTING	
MW-05	7 646 429.6	489 418.7	29.6
MW-06	7 646 358.2	489 299.1	21.9
MW-07	7 646 398.2	489 288.7	22.9
MW-08	7 646 440.0	489 295.9	23.9

DEW LINE CLEAN UP
LANDFILL MONITORING PLAN
FOX-2 LONGSTAFF BLUFF
**NON-HAZARDOUS
WASTE LANDFILL**
FIGURE FOX-2.3



- GENERAL NOTES:
1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 18N. ALL ELEVATIONS REFER TO GEODETIC DATUM.
 2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.

LEGEND:

- 420 COORDINATE POINT
- MONITORING SOIL SAMPLE LOCATION (5)
- MONITORING SITE FEATURE
- 125 APPROX. PHOTOGRAPHIC VIEWPOINT
- 2012 SOIL SAMPLE TAG LOCATION
- 19432 BODY OF WATER

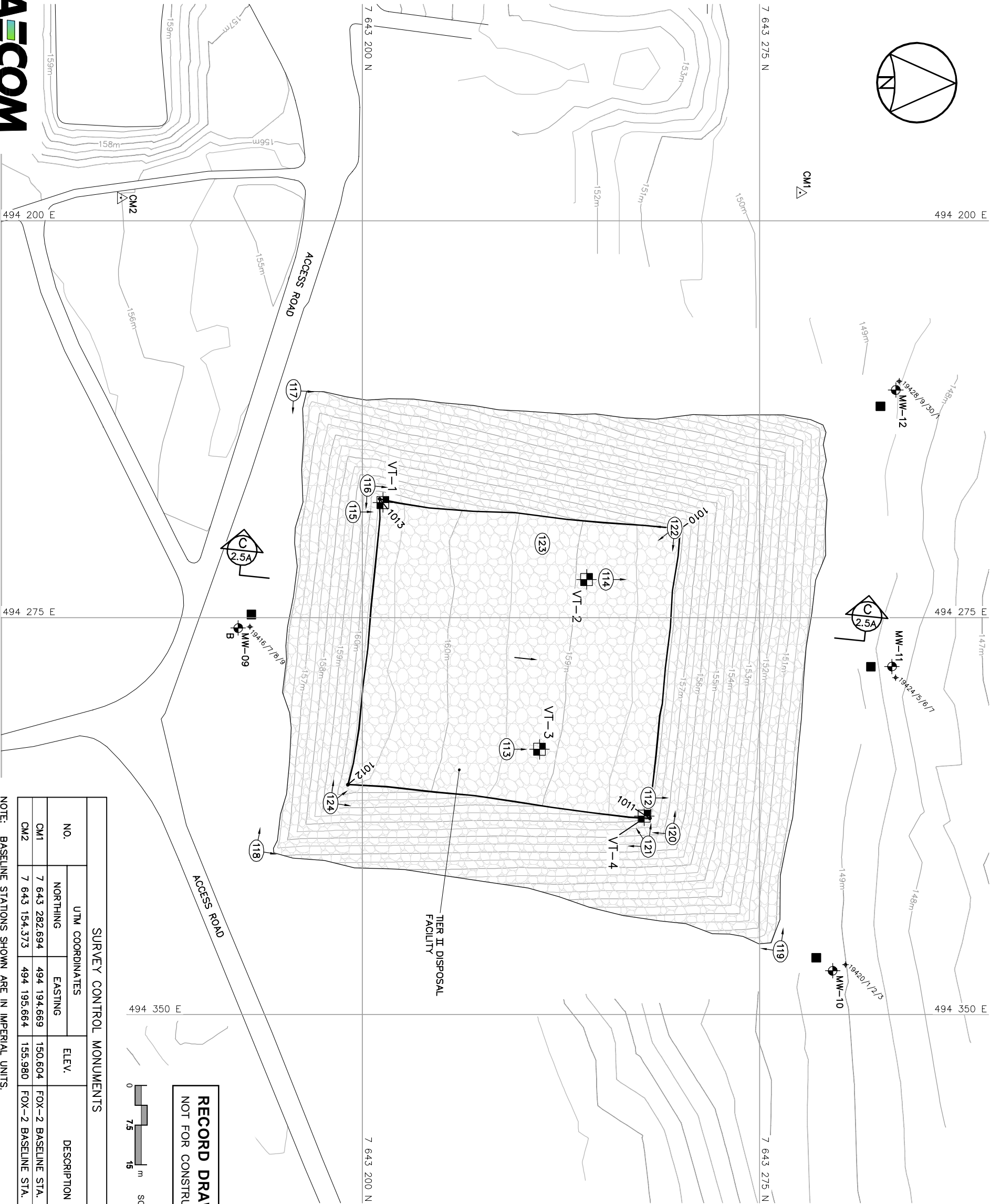
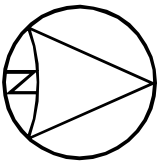
WEST LANDFILL (LOBE E) REGRADED (AS-BUILT)			
NO.	UTM COORDINATES		ELEV.
	NORTHING	EASTING	
420	7 642 802.4	492 490.2	20.4
421	7 642 814.8	492 506.2	21.9
422	7 642 795.4	492 535.1	22.5
423	7 642 781.5	492 540.8	22.6
424	7 642 766.6	492 556.3	22.5
425	7 642 752.3	492 552.6	21.9
426	7 642 748.3	492 531.5	20.4
427	7 642 758.6	492 510.4	19.7
428	7 642 778.6	492 494.8	19.4
429	7 642 788.5	492 489.4	19.3

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DEW LINE CLEAN UP
LANDFILL MONITORING PLAN
FOX-2 LONGSTAFF BLUFF
WEST LANDFILL LOBE E
FIGURE FOX-2.4





RECORD DRAWING
NOT FOR CONSTRUCTION



SURVEY CONTROL MONUMENTS

NO.	UTM COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
CM1	7 643 282.694	494 194.669	150.604	FOX-2 BASELINE STA. 0+00
CM2	7 643 154.373	494 195.664	155.980	FOX-2 BASELINE STA. N/A

NOTE: BASELINE STATIONS SHOWN ARE IN IMPERIAL UNITS.

GENERAL NOTES:

- ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 18N. ALL ELEVATIONS REFER TO GEODETIC DATUM.
- ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.

LEGEND:

- SURVEY CONTROL MONUMENT (2)
- COORDINATE POINT
- MONITORING WELL LOCATION (3)
- BACKGROUND MONITORING WELL LOCATION (1)
- GROUND TEMPERATURE CABLE LOCATION (4)
- MONITORING SOIL SAMPLE LOCATION (4)
- APPROX. PHOTOGRAPHIC VIEWPOINT
- 2012 SOIL SAMPLE TAG LOCATION

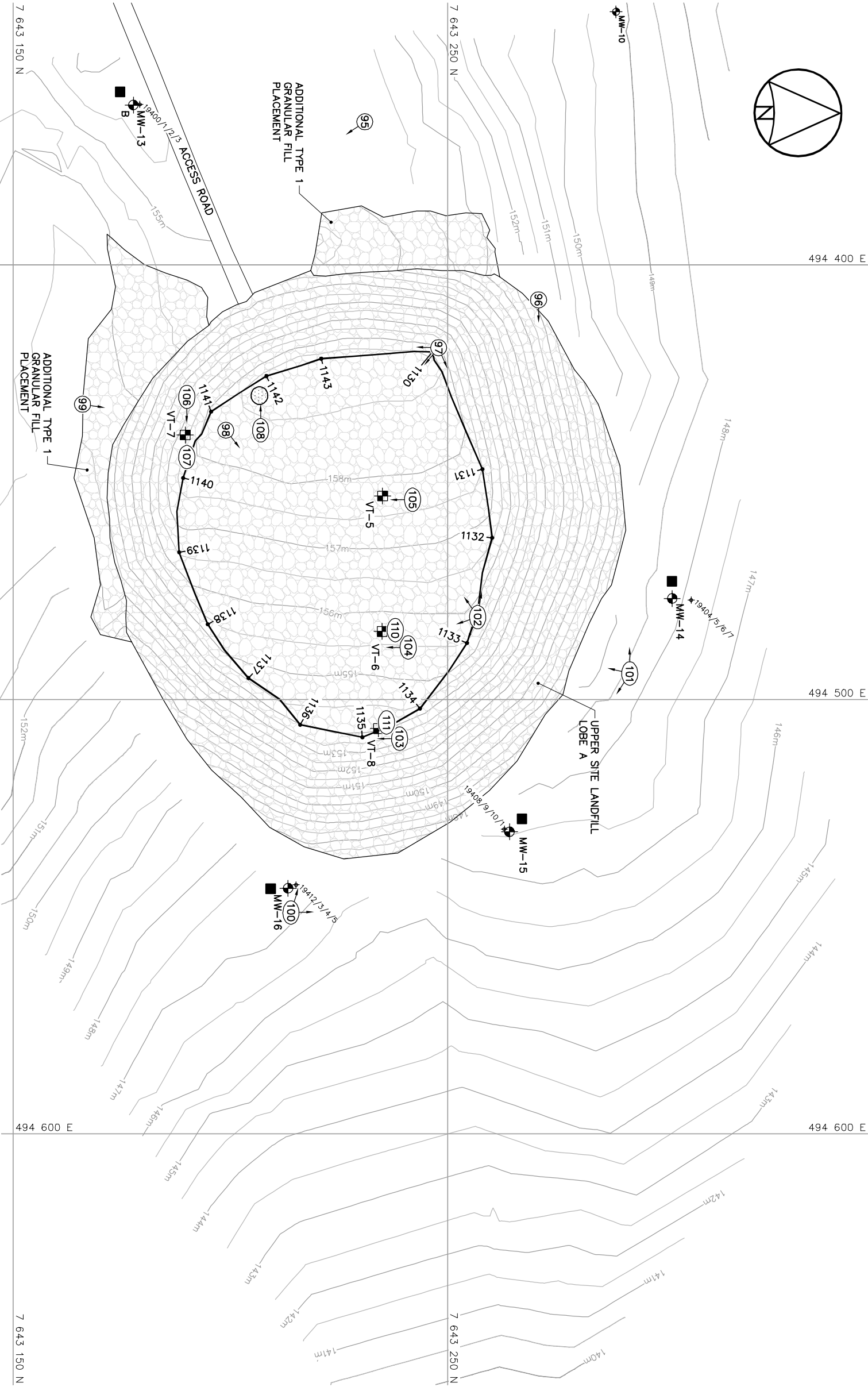
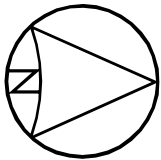
TIER II DISPOSAL FACILITY FINAL GRADING (AS-BUILT)			
NO.	UTM COORDINATES		ELEV.
	NORTHING	EASTING	
1010	7 643 260.1	494 258.2	158.1
1011	7 643 254.3	494 312.9	158.0
1012	7 643 197.3	494 306.5	160.5
1013	7 643 203.3	494 252.5	160.5

TIER II DISPOSAL FACILITY MONITORING WELLS (AS-BUILT)			
NO.	UTM COORDINATES		ELEV.
	NORTHING	EASTING	
MW-09	7 643 176.6	494 276.9	156.4
MW-10	7 643 288.9	494 341.7	149.1
MW-11	7 643 300.1	494 284.2	148.1
MW-12	7 643 300.8	494 232.0	148.6

TIER II DISPOSAL FACILITY GROUND TEMPERATURE CABLES (AS-BUILT)			
NO.	UTM COORDINATES		ELEV.
	NORTHING	EASTING	
VT-1	7 643 203.9	494 253.2	160.7
VT-2	7 643 242.4	494 267.8	158.8
VT-3	7 643 233.5	494 299.8	159.1
VT-4	7 643 253.3	494 312.5	158.2

DEW LINE CLEAN UP
LANDFILL MONITORING PLAN
FOX-2 LONGSTAFF BLUFF
TIER II DISPOSAL FACILITY
FIGURE FOX-2.5





UPPER SITE LANDFILL LOBE A FINAL GRADING (AS-BUILT)						
NO.	UTM COORDINATES			NO.	UTM COORDINATES	
	NORTHING	EASTING	ELEV.		NORTHING	EASTING
1130	7 643 246.6	494 419.9	158.4	1137	7 643 204.2	494 495.0
1131	7 643 258.1	494 447.0	157.5	1138	7 643 194.8	494 482.7
1132	7 643 260.3	494 462.7	156.6	1139	7 643 188.3	494 466.1
1133	7 643 264.5	494 487.0	155.5	1140	7 643 189.2	494 449.0
1134	7 643 243.7	494 502.1	154.4	1141	7 643 195.6	494 433.7
1135	7 643 230.4	494 508.7	153.9	1142	7 643 208.3	494 425.5
1136	7 643 216.1	494 505.8	154.0	1143	7 643 221.0	494 421.5

- GENERAL NOTES:
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 - ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.

- LEGEND:
- COORDINATE POINT
 - MONITORING WELL LOCATION (3)
 - BACKGROUND MONITORING WELL LOCATION (1)
 - GROUND TEMPERATURE CABLE LOCATION (4)
 - MONITORING SOIL SAMPLE LOCATION (4)
 - MONITORING SITE FEATURE
 - APPROX. PHOTOGRAPHIC VIEWPOINT
 - 2012 SOIL SAMPLE TAG LOCATION

UPPER SITE LANDFILL LOBE A MONITORING WELLS (AS-BUILT)		
NO.	UTM COORDINATES	
	NORTHING	EASTING
MW-13	7 643 177.7	494 363.1
MW-14	7 643 301.8	494 476.7
MW-15	7 643 264.3	494 530.4
MW-16	7 643 213.3	494 543.4

UPPER SITE LANDFILL LOBE A GROUND TEMPERATURE CABLES (AS-BUILT)		
NO.	UTM COORDINATES	
	NORTHING	EASTING
VT-5	7 643 235.1	494 453.1
VT-6	7 643 235.0	494 484.3
VT-7	7 643 189.6	494 439.1
VT-8	7 643 234.1	494 506.7

RECORD DRAWING
NOT FOR CONSTRUCTION




DEW LINE CLEAN UP
LANDFILL MONITORING PLAN
FOX-2 LONGSTAFF BLUFF
UPPER SITE LANDFILL LOBE A
FIGURE FOX-2.6



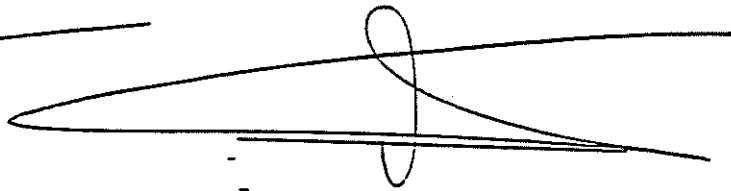
*Copy of original
26 Nov 98*

AGREEMENT
BETWEEN
NUNAVUT TUNNGAVIK INCORPORATED
AND
HER MAJESTY IN THE RIGHT OF CANADA
AS REPRESENTED BY
THE MINISTER OF NATIONAL DEFENCE
FOR THE CLEAN-UP AND RESTORATION OF
DISTANT EARLY WARNING SITES
WITHIN THE NUNAVUT SETTLEMENT AREA

(Environmental Provisions)



Arthur C. Eggleton
Minister of National Defence



James Eetoolok
1st Vice President
Nunavut Tunngavik Incorporated

Dated

1 Sep 98

Dated

1 Sep 98

AGIKATIGEGUTAORYOK

UGUNAGA

NUNAVUT TUNNGAVITKUN TIMIKUTIGIYANIN

UVALO

KOENMIN IHUMAKHUTIVLOGIN KANATAMI

GIVGAKTOKTIGIVLOGO UNA

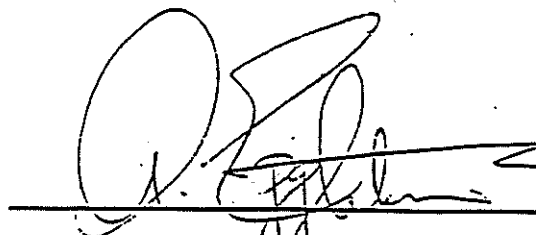
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HALUMAKHIVALEATILOGIN IHOAKHAKHUGILO

TULAEGUYUN IGLUKAKVEN

UGUNANI NUNAVUTMI NUNATAKNIKMI NUNAOYUN

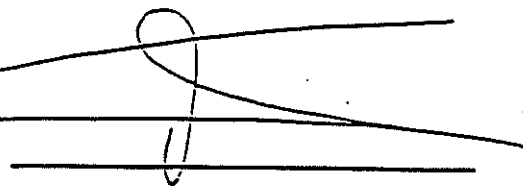
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ARTHUR C. EGGLETON
MINISTAORYOK AGUYAKTILIKIYINI

KANATAOM GAVAMAENI

UVLOANI _____



JAMES EETOOLOOK
HIVULIK TUKLEATA
IKHIVAOTALEOM
NUNAVUT TUNNGAVITKUN
TIMIKUTIGIYANI
UVLOANI _____

AGIKATIGEGUTAOK

UGUNAGA

NUNAVUT TUNNGAVITKUN TIMIKUTIGIYANIN

UVALO

KOENMIN IHUMAKHUTIVLOGIN KANATAMI

GIVGAKTOKTIGIVLOGO UNA

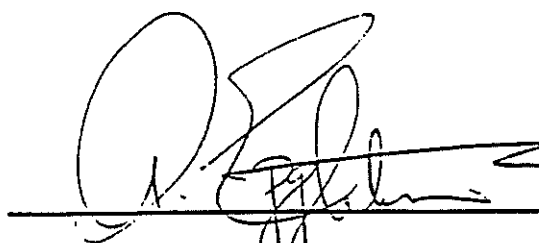
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TULAEUYUN IGLUKAKVEN

UGUNANI NUNAVUTMI NUNATAKNIKMI NUNAOYUN

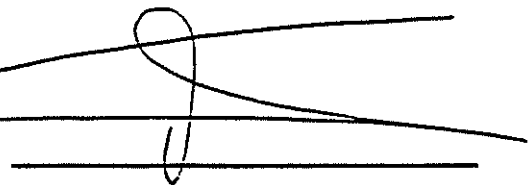
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UVLOANI _____



JAMES EETOOLOOK
HIVULIK TUKLEATA
IKHIVAOALEOM
NUNAVUT TUNNGAVITKUN
TIMIKUTIGIYANI
UVLOANI _____

၁။ မြန်မာနိုင်ငံတော်အတွင်း နယ်လွှတ်ချက်များ ပြုပြင်ဆင်ခြင်မှုများ
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٥٢٣

PREAMBLE

WHEREAS the Government of Canada (Canada) has modernized the air defences of Canada through a joint USA/Canada project referred to as the North American Air Defence Modernization Project (NAADM);

AND WHEREAS NAADM includes the decommissioning of some of the Distant Early Warning (DEW Line) radar sites and the conversion of others to North Warning System (NWS) radar sites;

AND WHEREAS fifteen DEW Line sites are located on Department of National Defence (DND) reserves within the Nunavut Settlement Area (NSA);

AND WHEREAS DND wishes to undertake an environmental clean-up of the DEW Line sites, facilities and associated areas;

AND WHEREAS the Inuit and the Federal Government have an interest in all activities that occur within the NSA, including, but not limited to, protecting the ecosystem integrity and the existing and future well-being of the residents and communities of the NSA and increasing the participation of Inuit and Inuit Firms in business and employment opportunities in the NSA;

AND WHEREAS DND and NTI are voluntarily entering into this Agreement to establish a framework for the decommissioning, remediation and restoration of the DEW Line sites in the NSA;

NOW THEREFORE, in consideration of the premises and mutual covenants contained herein, the Parties agree as follows:

1.0 DEFINITIONS

Debris means hazardous and non-hazardous materials of non-natural origin existing on the surface, or visible and partially embedded within one metre of the surface or within two metres of the surface of any water body at low tide and any structures scheduled for demolition

DEW Line sites means the Distant Early Warning Sites listed in paragraph 3.1 below;

DEW Line Clean-up
Environmental Provisions

DCL means Defence Construction (1951) Limited the designated contracting agent for contracting for the Department of National Defence for the Dew Line Clean-up;

DND means the Crown in the right of Canada represented by the Minister of National Defence or his delegate

Engineered Landfill means a landfill professionally designed to permanently isolate the contents of the landfill from contact with the environment.

Hazardous materials or substances means all materials or substances designated as hazardous under territorial or federal legislation at the time of the clean-up of a particular landfill.

Inuit has the same meaning as in the NLCA;

Inuit Owned Lands has the same meaning as in the NLCA;

Landfill means any area where a concentration of non-hazardous and/or hazardous substances or materials or Debris have been buried;

Minister of National Defence means the Minister of National Defence or his designate

Nunavut Settlement Area has the same meaning as in the NLCA;

Rules means the *Rules and Procedures for the Management of Inuit Owned Lands* adopted by NTI, as amended from time to time,;

Parties means NTI and DND;

Regional Inuit Associations (RIA) means the Qikiqtani Inuit Association, the Kivalliq Inuit Association and the Kitikmeot Inuit Association;

Relevant RIA means the RIA in the region in which a DEW Line site is located;

Work means all the materials, equipment, goods, services, labour, matters and things done or furnished or required to be done or furnished to perform any DEW Line site decommissioning, remediation or restoration activity.

2.0 OBJECTIVES

- 2.1 The objectives of this Agreement are to establish a broad environmental framework for participation of the Inuit in the clean-up of the DEW Line Sites in the NSA and to achieve cost effective and an environmentally sound DEW Line clean-up as described herein.
- 2.2 DND and NTI will enter into a corollary agreement with respect to economic benefits for the Inuit and Inuit firms including provisions for training (this agreement may or may not involve regional negotiations).

3.0 GENERAL

- 3.1 Scope. This Agreement relates to the decommissioning, remediation, restoration and related activities of the following DEW Line sites:

PIN 2 - Cape Young
PIN 3 - Lady Franklin Point
PIN 4 - Byron Bay
CAM M - Cambridge Bay
CAM 1 - Jenny Lind Island
CAM 2 - Gladman Point
CAM 3 - Shepherd Bay
CAM 4 - Pelly Bay
CAM 5 - Mackar Inlet
FOX M - Hall Beach
FOX 2 - Longstaff Bluff
FOX 3 - Dewar Lakes
FOX 4 - Cape Hooper*
FOX 5 - Broughton Island
DYE M - Cape Dyer

* Prior to the signing of this Agreement the clean-up of Cape Hooper (FOX 4) had already begun under a separate set of understandings. Therefore only the post clean-up provisions of this Agreement will apply to this site

- 3.2 **Precedent.** This Agreement is not to be construed as a precedent for any other activities of DND, Canada or any third party. Nothing in this Agreement shall be interpreted or used to define the rights of the Parties, Canada or any third party in relation to any matter under the NLCA or to interpret any Article of the NLCA except for the purpose of this Agreement.;
- 3.3 **Urgency.** The Parties mutually agree to recognize the urgency of the matters dealt with in this Agreement and to perform all required actions as expeditiously as possible.
- 3.4 **Nunavut Land Claims Agreement.** The Parties recognize and acknowledge their respective obligations to comply with the NLCA in connection with all Work.
- 3.5 **Inuit Owned Lands.** All use of and access to Inuit Owned lands by DND, Contractors and subcontractors for the purposes of the Work is subject to the NLCA and the Rules, to the extent that the Rules are not inconsistent with the NCLA.
- 3.6 **Clean-up Schedule.** The commencement and completion of the Work will take place in accordance with the attached Appendix A. The Parties will use their best efforts to adhere to Appendix A.
- 4.0 **Steering Committee**
- 4.1 There shall, during the duration of this Agreement, be a Steering Committee to monitor progress, develop recommendations and suggest alternative solutions for achieving the commitments set forth in this Agreement by:
- (a) reviewing progress in achieving the commitments set out in this Agreement;
 - (b) ensuring that any perceived deficiencies with respect to the Work or to commitments under this Agreement discussed and, where agreed, are expeditiously acted upon;
 - (c) considering other items of mutual concern, as appropriate;

- (d) requesting the Environmental Working Group (EWG), established in accordance with section 7 of this Agreement, to undertake additional study and formulate recommendations to the Steering Committee.

4.2 The Steering Committee shall consist of four members, two to be named by DND and two to be named by NTI. It shall meet at least twice a year and at the request of any Party at mutually agreed upon times and locations. In order to place an item in the agenda, a Party shall provide that item to the other Party not less than ten working days before each scheduled meeting. The Steering Committee shall operate on the basis of unanimous agreement.

4.3 Recommendations agreed to by a majority of the members of the EWG will be incorporated into the site specific plan referred to in section 23 of this Agreement or into the post-clean-up methodology as the case may be. Where either DND or NTI disagree with the EWG recommendations, it will raise the issue at the Steering Committee for discussion in accordance with clause 4.4. If the Environmental Working Group is deadlocked (ie 2-2) on any issue, including scoring of the risk assessment matrix and landfill remediation, the Steering Committee will discuss the situation and attempt, in good faith, to arrive at a consensus. The Parties pursuant to clause 4.5 may, where appropriate, seek independent advice.

4.4 Should unanimous agreement not be reached at the Steering Committee the following approach will be used:

- (a) Prior to Clean-up Commencing - the clean-up will not commence until the issue is resolved to the satisfaction of both Parties.
- (b) Clean-up has commenced - the clean-up will continue in accordance with the site specific clean-up plan. If the issue is not included in the site specific plan then DND will proceed based on the advice provided by its consultants. DND and NTI will continue to attempt to arrive at a consensus.

In either event, both Parties continue to have the option of involving the provisions of section 5 of this Agreement if unanimous agreement cannot be reached. If unanimous agreement is reached at a later date or there is an arbitration decision which differs from the actions taken by DND, the new decision will be implemented.

4.5 The Steering Committee shall, with the agreement of the members, acting reasonably, invite representatives of Government departments, Inuit organizations, non-governmental organizations, Contractors, Subcontractors and others to provide advice or information as required. If requested by the other Party, DND and NTI agree to provide each other with all relevant scientific and technical information, with the exception of:

- advice to Ministers or Inuit Boards of Directors
- negotiating strategies
- commercially confidential third Party information
- personal information

4.6 The Parties each shall be responsible for their respective costs associated with participating in Steering Committee meetings.

5.0 ARBITRATION

5.1 If DND and NTI disagree on any question of fact or mixed question of law and fact related to the interpretation, implementation or operation of this Agreement, with the exception of any matter within the jurisdiction of the Arbitration Board under the NLCA, either party may by written demand refer the dispute to arbitration in accordance with the following provisions.

5.2 An arbitration Panel consisting of a single arbitrator who both Parties agree is qualified to arbitrate the question in dispute will render a decision on the dispute. If DND and NTI cannot agree on a single arbitrator then a decision will be rendered by an Arbitration Panel consisting of three similarly qualified arbitrators, one of whom shall be chosen by NTI, one by DND and the third by the two so chosen, which third arbitrator shall be the chairperson. If within fifteen days of having received a written demand, or such extended time as the parties agree, a party fails to either agree to a single arbitrator or to appoint an arbitrator, or if the two arbitrators appointed by the parties do not agree upon the third arbitrator, then upon written application by either party such third arbitrator shall be appointed by the superior court having jurisdiction in the NSA.

- 5.3 The arbitration proceedings shall be held within thirty days following the appointment of the Arbitration Panel in a location agreed upon by the Parties or, if the Parties are unable to agree, as determined by the arbitration panel. The timing for the panel hearing may be extended by mutual consent of the Parties, not unreasonably being withheld.
- 5.4 The arbitration panel shall have jurisdiction to determine all questions of fact, questions of mixed law and fact and to make an award, including interim relief, payment of interest, and costs. If an arbitration panel makes no decision as to costs, each party shall bear its own costs and an equal share of the other costs of the arbitration, including the remuneration and expenses of the arbitration panel.
- 5.5 The Arbitration Panel shall render a decision, in writing, within thirty days of the completion of the arbitration hearing and state the reasons on which it is based. The decision is final and binding and is not subject to appeal. Pursuant to section 17(3)(b) of the *Federal Court Act*, the Parties agree that the Federal Court Trial Division shall have jurisdiction to review the decision of an arbitration panel on any grounds set out in section 18.1(4) of the *Federal Court Act*.
- 5.6 Where a party to an arbitration fails to comply with any of the terms of the decision of the arbitration panel, any party to the arbitration may file in the office of the Registrar of the superior court having jurisdiction in the NSA, a copy of the decision in the prescribed form, whereupon the decision shall be entered in the same way as a judgement or order of that court, and is enforceable as such.
- 5.7 The territorial *Arbitration Act* shall apply in any arbitration under this Agreement to the extent that it is not inconsistent with this Agreement, unless otherwise agreed by the parties.
- 5.8 The arbitration panel may, on application, allow any to participate in an arbitration as an intervenor, if in the arbitration panel's opinion the interest of that person may be directly affected by the arbitration, and on such terms as the arbitration panel in its discretion may order.
- 5.9 Unless the parties otherwise agree, the proceedings and Board's decision shall be made public.

6.0 Environmental Risk Assessment Matrix

- 6.1 All landfills will be scored by the EWG in accordance with the Environmental Risk Assessment Matrix as set out in Appendix B of this Agreement. The construction of this matrix takes into account two conservative assumptions:
- The contents of the landfills are unknown and all potential contaminants (ie substances typically used at DEW Line sites) may be present in the landfill
 - If a contaminant comes into contact with receptors, it could have an adverse impact on those receptors regardless of the exposure duration or concentration
- 6.2 Landfills scoring 105 points or more are classified as potentially high environmental risk (Class A) and will be excavated. Landfills with a score of 100-104 points will be considered on a case by case basis to determine whether they should be excavated or considered as Class B landfills.
- 6.3 Landfills with a score in the range 75 to 99 points are classified as moderate environmental risk (Class B). An engineered leachate containment system will be provided for these landfills to mitigate against potential environmental risks. The landfill engineers under contract to DCL will take into consideration any suggestion of the EWG regarding the design of the leachate containment facility. In specific cases where an engineered leachate containment system cannot be constructed, the EWG will recommend whether complete excavation or partial excavation with a leachate containment system is required.
- 6.4 Landfills with scores of 75 or less are classified as low environmental risk (Class C). The remediation approach for these landfills will be the placement of an engineered cover following collecting, sorting, and appropriate disposal of debris where it may impact on the integrity of the landfill. Hazardous debris will be removed and disposed of in accordance with federal regulations. Generally, the final thickness of cover material will be approximately 0.75 metres, but may vary depending on site specific conditions.
- 6.5 Scores that fall within plus or minus five points of 75 points will be considered on a case by case basis.

- 6.6 The scoring of Category C: Receptors of the matrix will take into account local/traditional knowledge in accordance with the procedures set out in Section 8 of this Agreement. The primary focus for the collection of local/traditional knowledge will be on the local community and an Inuit representative who is familiar with the DEW site under assessment.
- 6.7 The scoring of the landfills will take place before the clean-up at that DEW site commences and the site specific clean-up plan is finalized.
- 7.0 **Environmental Working Group**
- 7.1 An Environmental Working Group (EWG) will be established. The EWG will consist of four members, two chosen by each of the Parties. The members will be qualified engineers and/or scientists with expertise in environmental remediation and clean-up in northern climates.
- 7.2 The EWG will, for each of the landfills prior to the clean-up of that site, be responsible for the scoring of the risk assessment matrix, interpreting the results and recommending a remediation solution in accordance with this Agreement. If a majority of the members of the EWG are in agreement with the EWG recommendations then DND will include these recommendations in its site specific plans which are referred to in section 23 of this Agreement. If the EWG is deadlocked then the issue will be referred to the Steering Committee as per section 4.3 of this Agreement.
- 7.3 During the monitoring period, the EWG will also examine the results of the monitoring program in accordance with the methodology set out in section 20 of this Agreement and report to the Steering Committee on the results of their investigation. Should changes to the monitoring plan and/or additional remediation be required, the EWG will make recommendations to the Steering Committee on what action should be taken as per section 4.3 of this Agreement.
- 7.4 The EWG will go on-site during the pre-cleanup delineation phase of the project to assemble information required, including local/traditional knowledge as per section 8 of this Agreement, to score the risk assessment matrix. DND will contribute \$10,000 per site to NTI to defray the cost incurred by its EWG members and a community representative selected by the relevant RIA (NTI Representative). DND will also provide the NTI representative transportation

costs whenever the NTI representatives are travelling to a site or to a community with the DND representatives on a DND charter. DND will also provide meals and accommodation for the NTI representative while at the site.

- 7.5 The EWG will also act as a resource to the Steering Committee and will upon request from the Steering Committee investigate certain matters and produce reports or studies for consideration by the Steering Committee. Both Parties agree to cover the costs of their members of the EWG to undertake such work.
- 8.0 **Local/Traditional Knowledge**
- 8.1 Traditional and local knowledge for use in the scoring of the risk assessment matrix will be collected during the Pre-Cleanup Delineation phase of the DEW Line clean-up project.
- 8.2 An Inuit representative familiar with the DEW site and traditional use of the area around the site will be chosen by the relevant Regional Inuit Association to be on site during the pre-construction delineation phase of a site clean-up. The Inuit representative will work closely with the EWG to identify Inuit use of the area, wildlife patterns, and past events and occurrences that may have impacted on landfills (i.e. dumping, hazardous waste storage, natural occurrences) in order to assist in the scoring of the matrix.
- 8.3 DND and NTI will attempt to establish a community DEW Line Clean-up Committee which would facilitate the flow of local knowledge to the EWG prior to, and during, the site visit.
- 8.4 The EWG will visit the local community (ies) most affected by the DEW site. The EWG will conduct one-on-one interviews with a number of residents and will also meet with the Hamlet Administration Officer and/or the Hamlet Mayor, the local Hunters and Trappers Association, and relevant community organizations to obtain information concerning the traditional use of the area by the community. The Community Land and Resource Committee (CLARC) will be consulted if Inuit Owned Land is affected in any way.
- 8.5 In anticipation of these community consultations, DND, in consultation with NTI will prepare an information package in English and the relevant Inuit language for

use in the community consultations. The package will include maps of the site and the surrounding area along with sample questions (see Appendix D) that would facilitate discussion.

- 8.6 DND will provide NTI with at least six months notice regarding the site visit in a given season. Six weeks notice will be provided regarding the dates for the community visit. DND will attempt to arrange the timing for the community consultation to avoid harvest time when members of the community might be on the land. NTI in conjunction with the EWG will arrange the interviews with the various community associations and individuals.
- 8.7 The EWG will document all information collected during the community consultations. This information will be provided to DND, NTI, the relevant RIA and the host community.
- 8.8 All information collected from the interviews will be considered during the matrix scoring and will be given equal consideration with conventional scientific knowledge collected during the site visits.
- 8.9 Prior to the actual clean-up, DND will conduct a community information session to inform the residents of the scope of the Work and other relevant facts. In the case of CAM 4, there will be a community information session during the summer of 1998 at the option of the RIA. For Fox 5, in addition to this community information session, the EWG will be consulting the community of Broughton Island on FOX-5 as part of its work on scoring landfill evaluation matrices, during the summer of 1998 and DND will provide a limited public information session at that time.
- 9.0 **CEPA Soils**
- 9.1 Soils at concentrations exceeding federal regulations (referred to herein as "CEPA" soils) will be removed from the site and disposed of in a licenced facility in accordance with those federal regulations.
- 10.0 **Tier II Soils**
- 10.1 Tier II soils are defined in Appendix E of this Agreement.

10.2 Tier II soils will be excavated and placed in an engineered, lined, containment facility (Tier II Disposal Facility). After excavation, the area will be backfilled with sufficient clean fill to provide an effective layer over any remaining Tier I soils and to meet the requirement of clause 22 of this Agreement. A schematic of a Tier II Disposal facility is presented in Appendix K. Tier II soils may also be placed in a similarly engineered cell of a larger landfill. The location of the Tier II Disposal Facility will be selected in order to minimize potential environmental impact in a cost-effective manner. In some cases Tier II soils may be transported from one DEW site to another depending on soil volumes and project economics.

10.3 Confirmatory testing will be conducted in accordance with the methodology outlined in section 13 of this Agreement.

11.0 Tier I Soils

11.1 Tier I Soils are defined in Appendix E of this Agreement.

11.2 Tier I soils will be excavated to a depth of to 30 cm if the soil is located on a flat or gently sloping area such as a gravel pad unless delineation testing indicates a lessor depth of contamination. In such a case, a suitable safety margin will be excavated. Where Tier I soils are located on slopes greater than 3:1 (horizontal:vertical), the contaminated soils will be excavated to a depth of up to 60 cm. After excavation, the area will be backfilled with sufficient clean fill to provide an effective layer over any remaining Tier I soils and to meet the requirement of clause 22 of this Agreement.

11.3 Tier I soils will be placed in a professionally engineered landfill where they may be used as intermediate fill.

11.4 During the pre clean-up delineation phase prior to going to tender for the clean-up, testing to determine the presence or absence of Tier II contaminated soil below the Tier I soils will be conducted.

12.0 Hydrocarbon Soils

12.1 Hydrocarbon contamination will be based initially on the measurement of Total

will investigate areas of concern identified by NTI and/or its representatives who will be on-site during the delineation work. Risk assessment consideration will be given to soils that act as sources of contaminants to nearby aquatic environments even if the contaminants are below the relevant DCC criteria. The method of delineation will follow the grid as set out in Appendix F of this Agreement.

- 13.2 Confirmatory testing of contaminated areas, other than Tier I soils, will be conducted after contaminated soils have been excavated. Confirmatory testing will be conducted in accordance with the protocol outlined in Appendix F of this Agreement.
- 13.3 Should there be evidence to suggest that some contaminated areas were missed during the pre clean-up delineation work, these areas will be investigated in accordance with the pre clean-up delineation methodology.
- 13.4 During the confirmatory testing phase, NTI may assign a qualified observer to the site.
- 13.5 Appropriate quality assurance measures acceptable to the EWG will be taken to ensure the accuracy of all analytical work in the field or in laboratories.

14.0 Debris

- 14.1 Debris will be collected and sorted into hazardous and non-hazardous components. Hazardous debris will be disposed of in accordance with Federal regulations. Non-hazardous debris will be buried in a professionally engineered landfill, provided there is a suitable location and sufficient gravel is available. Appendix C contains additional details concerning the destination of collected debris.
- 14.2 All debris which is attributable to the operation of any DEW site and is within two metres of the surface at low tide or within two metres of the surface of an inland water body will be removed by DND.

15.0 Off Site Contamination and Debris

- 15.1 Where there is reasonable evidence of additional off site contamination or debris

Petroleum Hydrocarbons (TPH) where the TPH value is greater than or equal to 2500 ppm. Should the soils contain Tier I or Tier II contamination, they will be treated in accordance with the relevant sections of this Agreement. These hydrocarbon areas will be identified on site as part of the pre-construction delineation testing.

12.2 Each contaminated area will be evaluated qualitatively by the EWG using the checklist outlined in Appendix J of this Agreement.

12.3 Where remediation is required, one of the following options will be used:

- aerating the hydrocarbon contaminated soil in place to reduce hydrocarbon contaminant concentrations
- use of hydrocarbon contaminated soil as intermediate fill within an engineered landfill
- landfilling in a Tier II Disposal facility
- bioremediation using a landfarming or bio-pile processes
- soil washing
- other equivalent technologies recommended by the EWG

12.4 Based on site specific conditions, the EWG will recommend the most appropriate of the remediation options outlined in clause 12.3 in accordance with section 4.3 of this Agreement. The appropriateness of the options will take into consideration the environmental sensitivity of the area. Factors which will be considered in the selection of the method are:

- type of contaminant (ie fuel or lubricating oil)
- total volume of hydrocarbon contaminated soils on site (mobilization costs, ability to treat the soil)
- concentration of hydrocarbons within the soil (effectiveness of treatment process)
- type of soil

13.0 **Pre Clean-up Delineation and Confirmatory Soil Testing**

13.1 A comprehensive pre clean-up delineation program will be designed to ensure that all contaminated soil and contaminated building material will be identified . DND

which, subject to clause 15.2, is attributable to the operation of a nearby DEW site, DND will undertake testing to determine the extent of the contamination in consultation with NTI and remediate the site in accordance with the relevant sections of this Agreement.

15.2 Should the evidence clearly demonstrate that other individuals or organizations have contributed significantly to the contamination or debris, then NTI and DND will endeavour to obtain the third Party (ies) agreement to contribute its pro-rated share of the investigation and clean-up costs before the investigation and clean-up commences. If the third party does not agree to pay their share of the costs, DND has the option, where practical, to clean up its share of the contamination, or in the alternative, waiting until there is third party agreement regarding payment of the investigation and clean-up costs. The investigation and clean-up will be in accordance with the clean-up protocol outlined in this Agreement.

15.3 NTI will endeavour to identify areas of concern prior to the delineation phase of the clean-up.

16.0 PCBs in Paint

16.1 PCBs in paint will be treated in accordance with applicable federal regulations. Changes to these regulations will be dealt with in accordance with section 25.1 of this Agreement.

17.0 Materials Containing Lead-based Paints

17.1 Materials containing lead-based paints will be placed in a professionally engineered landfill. Should regulations or guidelines be issued which direct otherwise, the implementation of this change will be dealt with in accordance section 25.1 of this Agreement.

18.0 Barrels

18.1 The testing and disposal of POL tank sludge, waste oil, petroleum products, antifreezing agents, solvents and barrels will be handled in accordance with the criteria as set out in Appendix G.

19.0 Borrow Material

- 19.1 DND will attempt to minimize new excavation of borrow materials required for the clean-up activities. Where possible, existing sources of borrow material will be used. All borrow areas will be regraded to match the surrounding topography.

20.0 Monitoring Program

- 20.1 The monitoring program will identify an actual or potential landfill failure. Remedial action will be undertaken if leachate is present at levels greater than the site specific baseline concentrations at the time of the landfill completion. Action taken as result of the monitoring program will ensure the integrity of the landfills and thereby the health of the Inuit is protected on a continuing basis.
- 20.2 Following the completion of the clean-up for a site, DND will commence a monitoring program in accordance with Appendix H of this Agreement.
- 20.3 The monitoring program will have three phases. The objective of each phase are identified in Appendix H.
- 20.4 Monitoring results will be communicated to both Parties in the form of a comprehensive report.

21.0 Research Proposals

- 21.1 NTI, on behalf of communities, may raise at the Steering Committee, items, including the need for hydrographic mapping, which could involve the requirement for research and investigation. These proposals will be discussed and evaluated at the Steering Committee. If the Steering Committee decides that the proposals are consistent with the objective of the clean-up which is to protect the environment from contaminants entering the food chain or involve direct DEW site related impacts which could cause significant economic impact, DND will fund the agreed upon research activities.
- 21.2 Where the proposals are broader in nature and not solely restricted to DND DEW

site activities, DND will support NTI in seeking funding under other Government programs and/or initiatives and may contribute funding to the approved proposals.

- 21.3 Involvement of the Inuit in the research activities including training and technology transfer will be dealt with in an agreement dealing with economic provisions.

22.0 Site Restoration

- 22.1 All sites will be regraded to the extent possible to conform to the natural contours. The regrading will pay particular attention to hydrocarbon stained areas and wherever feasible these areas will be regraded so as to improve the aesthetics of the stained area.

23.0 Site Specific Clean-up Plan

- 23.1 DND will provide NTI with a site specific clean-up plan six months in advance of the clean-up of a particular site. NTI will review the plan to satisfy itself that the plan is in accordance with the requirements as set out in this Agreement. Any items of concern to NTI will be referred to the Steering Committee for resolution in accordance with section 4.3 of the Agreement prior to the issuance of any requests for bids by DCL. DCL, as the representative of the project proponent (DND), will be responsible for preparing all necessary submissions to obtain regulatory approval to proceed with the clean-up activity.

24.0 Liability and Indemnification

- 24.1 DND acknowledges and agrees that it has continuing responsibility and liability for the integrity of all landfills remaining on site. DND agrees that should there be evidence of potential or actual failure of a landfill, it will investigate the situation pursuant to the monitoring provisions of this Agreement.
- 24.2 Should there be evidence of contamination at the DEW Line site which exceeds the protocol as set out in this Agreement at the time of the signing of this Agreement and which cannot be attributed to a third Party then DND will undertake the clean-up.

- 24.3 DND agrees that nothing in this Agreement shall relieve the Crown or its agents either at present or in the future from complying with all applicable federal laws of general application. Changes to territorial law will be referred to the EWG which will make recommendations to the Steering Committee concerning the relevance of these changes to the clean-up.
- 24.4 DND agrees that it will be a condition of any sale or transfer of any of the lands comprising the DEW Line sites that the purchaser must assume DND's obligations under this Agreement with respect to the lands sold or transferred. It will also be a further condition of any such sale or transfer that the purchaser or transferee shall provide security for the performance of the assumed obligation and shall provide and maintain a letter of credit, surety bond, or other security in a form and amount mutually agreeable to the Parties.
- 25.0 Amendments
- 25.1 Should existing federal regulations or guidelines be amended, the EWG will examine the implementation of these changes or amendments taking account the special characteristics of the Arctic environment and make appropriate recommendations to the Steering Committee in accordance with section 4.3 of this Agreement.
- 25.2 The Protocol for confirmatory testing may be reviewed and adjusted on a site by site basis provided that a majority of the EWG are in agreement with the changes. Permanent or major changes will require the prior approval of the Steering Committee.
- 25.3 In the event that either Party wishes to amend the schedule as set out in Appendix A, it will provide the other Party with thirty (30) months written notice. If unforeseen event(s) or a decision by a regulatory body occurs which has a material impact on this schedule, the Parties will review these events and attempt to arrive at a mutually acceptable alternative.
- 25.4 Both Parties agree to review changes in technology and research studies which may have a bearing on this Agreement and discuss the need for changes resulting from these developments. The Steering Committee may task the EWG to investigate a particular technology pursuant to clause 4.1 (d) of this Agreement.

Recommendations of the EWG will be implemented in accordance with section 4.3.

25.5 If either Party wishes to make other changes to this Agreement, it will provide, in writing, six months notice of proposed changes. Any agreed upon amendments will be executed and attached as an appendix to this Agreement.

25.6 DND and NTI agree to consider amendments in an expeditious manner, particularly where the proposed amendments directly affects the conduct of a clean-up in progress or one which is scheduled to commence in the near term.

26.0 EWG Reports

26.1 All reports of the EWG will be available to provide additional information and guidance in the implementation of this Agreement. In the event of any conflicts or differences in interpretation of the EWG reports and this Agreement, this Agreement will prevail.

27.0 Notices

27.1 Where any Party is obliged or entitled to give any notice, request, approval, demand, consent, direction or other communication (ie Notice) to the other Party, such party shall first communicate the substance thereof personally or by telephone. However, such Notice shall not be sufficiently given until sent in writing to the addressees at the address below. Any Notice may be personally delivered or sent by registered mail or telefacimile and will be effective upon receipt by the addressee.

27.2 Notices to DND will be sent to:

Director General Environment
National Defence Headquarters
101 Colonel By Drive
Ottawa, Ontario
K1A 0K2

27.3 Notices to NTI will be sent to:

1st Vice President
Nunavut Tunngavik Incorporated
Box 1041
Cambridge Bay
Northwest Territories
X0E 0C0

28.0 Termination of the Agreement

- 28.1 This Agreement will terminate on the later of December 31st, 2008 or when the clean-up work as set out in this Agreement for the sites listed in Appendix A is completed or on such a date agreed to by the Parties in accordance with clause 25.3 of this Agreement.
- 28.2 Notwithstanding clause 28.1 of this Agreement, monitoring and any necessary remediation in accordance with section 20 of this Agreement will continue for twenty five (25) years after the termination of this Agreement.
- 28.3 At the end of twenty five years of monitoring following the termination of this Agreement, DND and NTI will negotiate a new agreement to specify the terms of any further monitoring (if required).

Annexes to the Agreement

DEW Line Clean-up
Environmental Provisions

Appendix A

Clean-up Schedule

Site*		Start Date	Completion Date
CAM M	Cambridge Bay	1998	1999
FOX 5**	Broughton Island	2001	2003
CAM 4**	Pelly Bay	2001	2003
FOX M/CAM 5	Hall Beach/Maclar Inlet	2002	2006
CAM 3	Shepard Bay	2002	2003
DYE M	Cape Dyer	2003	2006
CAM 2	Gladman Point	2003	2004
FOX 2/FOX 3	Longstaff Bluff/Dewar Lakes	2004	2008
CAM 1	Jenny Lind Island	2004	2005
PIN 4	Byron Bay	2005	2006
PIN 3	Lady Franklin Point	2006	2007
PIN 2	Cape Young	2007	2008

* Dates for the Baffin Sites are tentative pending resolution of economic and business issues

** The starting dates for CAM 4 and Fox 5 and the subsequent starting dates could be moved up pending the timing of the PCBs in paint decision by Environment Canada

Appendix B

Environmental Risk Assessment Matrix

Introduction

The matrix has been based on the CCME National Classification System for Contaminated Sites, and adapted to address the particular concerns of the Arctic environment. The matrix is divided into three categories of equal weight: contaminated source, pathways, and receptors. The interaction of these three elements results in environmental risk. Each category is assigned 50 points, which are distributed among several factors. Each of these factors has been made as specific as possible in order to reduce the subjectivity of the matrix to a minimum. In addition, each of the three main categories is assigned a highly subjective "special considerations" factor according to the method described in the CCME Classification System. As it is unlikely that any classification system could address all possible factors, a special considerations factor allows the user to increase or decrease the score "to emphasize important concerns about a site and should be used as an exception rather than as a rule" (CCME 1992, p.6-7).

The purpose of the matrix is to evaluate the environmental risk posed by landfills in their current condition and location. It is not suitable for determining the risk posed by a landfill post-closure, as most of the elements in the matrix would not change by the application of a remedial solution. It should also be recognized that monitoring is an integral part of the closure.

The next sections provide guidance to the EWG on the methodology and items to be considered when scoring the matrix. This section is followed by the actual matrix which is to be used in the scoring.

A. Contaminant Source

Five factors were considered under Contaminant Source to describe specific landfills, as follows:

- A.1 Landfill Extent
- A.2 Estimated Depth of Landfill
- A.3 Presence of Leachate
- A.4 Presence of Surface Contaminated Soil
- A.5 Presence of Surface Debris

A.1 Landfill Extent

Landfill areas will be based on the results of geotechnical/geophysical site surveys and visual observations. Those landfills with an area greater than 10,000 square metres will score 10 and those smaller landfills will be scored in proportion to their size relative to 10,000 square metres.

A.2 Estimated Depth

The estimated depth of a landfill is determined by visual inspection of surrounding topographic features. The average depth of the active layer will be used as a qualifier for the description of landfill depth, as this is generally the maximum depth of investigation. The depth of the active layer may range from one to two meters at these sites, depending on material type; therefore an average depth of 1.5 meters was used in the rating. Landfills with estimated depths of greater than 1.5 meters will score 5 and those with estimated depths of less than 1.5 meters will score less.

A.3 Presence of Leachate

Leachate provides evidence of contamination within landfill. Leachate can be defined as the presence of contaminants in water emanating from the landfill, but concentrations may be so low as to be difficult to detect. The presence of leachate can be better determined by the presence of contaminated soil at the toe of the landfill, indicating

chronic low levels of contaminants leaching from the landfill. All types of contaminants in leachate (PCBs, (Polychlorinated Biphenyls) TPH (Total Petroleum Hydrocarbons) or inorganics) are considered to be of equal concern, as indicators of contamination within the landfill.

In the scoring, leachate is considered to be either present or not; no interpolation of the score is used in this category.

A.4 Surface contaminated soil

Within each landfill, there is potentially a source of contamination. The presence of surface contaminated soil, like the presence of leachate, is an indication that the landfill contains contamination. The volume of contaminated soil is not taken into consideration; this provides a conservative approach in that a small amount of contaminated soil can trigger a high score. The presence of Tier II soils will trigger the highest score (15). Based on the hypothesis that each landfill potentially contains contaminants, 5 points are given to this subsection, even if no surface contaminated soils were identified.

A.5 Presence of surface debris

At some landfills surface debris is very extensive, while at others there is almost no debris. Scoring needs to be quantitative; therefore the percentage of the surface area of the landfill that is covered with debris is used as the basis for scoring. A landfill that has surface debris covering more than 50% of its surface receives a full score.

B. Pathways

The primary transport mechanisms for contaminants from the DEW Line landfills are considered to be:

- aerial transport of fine particles; and
- water transport, both as surface water run-off or subsurface water flow.

B.1 Aerial Transport of Contaminants

All contaminants can be transported as particles; windblown debris is not considered in this category, as debris pickup is inherent in any cleanup. Surface contamination or surface expressions of leachate imply the potential for aerial transport. This factor is given a low weight because the quantity of contaminated soil on the surface of a landfill is generally low relative to the quantity of contaminated soil at the site as a whole. In addition, it is anticipated that relative to the effect of water movement, aerial transport contributes less to the transport of contaminants away from a landfill.

B.2 Water Movement

Water movement includes the movement of surface water and subsurface water within the active layer. "Groundwater" is not addressed as an issue separate from surface water as the movement of water within the active layer is subject to the same driving forces as surface water. The intent of this sub-category is to examine factors that affect migration away from the landfill – slope, runoff, extent and type of cover on the landfill, annual precipitation and distance to surface water. Among these factors, topography, runoff potential and proximity to surface water are given the highest weight.

B.2.1 Topography

The degree of the slope on which the landfill is located is one of the major factors contributing to transport of contaminants; the scoring is carried out on a sliding scale. In cases where there are different slopes across the landfill, a weighted average is used.

B.2.2 Cover Material – Depth

The extent to which potential contaminants are available to transport is also dependent on the depth and type of cover material. The potential for leachate generation and correspondingly, leachate migration, is related to the infiltration of water into the landfill. Cover over the landfill helps mitigate infiltration of water into the landfill contents. As the thickness of the landfill cover increases, the likelihood that potential contaminants will be released from the landfill decreases. If the active layer is contained in the cover material above the debris, then the potential for surface water infiltration into the landfill is small; this circumstance is assigned the lowest score.

B.2.3 Cover Material – Type

The erosion potential of a landfill is partly based on the type of cover material. Erosion can eventually lead to the exposure of the landfill contents. Some cover materials are more susceptible to erosion than others; well graded gravels are the least susceptible, and silty materials are the most susceptible. In cases where there is no cover, this factor is assigned the highest score. Where the cover materials consist of a combination of soil types, the scoring should reflect the more conservative or higher score.

B.2.4 Surface Water/Run-Off Potential

This factor aims to describe the destructive potential of water action on the landfill, which could take the form of waves; streams, rivers or lakes; or seasonal drainage. Where there is significant seasonal drainage, the run-off potential is high. "Significant seasonal drainage" is defined as run-off that has the potential to transport large quantities and concentrations of contaminants to surface water courses over a short period of time (CCME 1992, p.23). Significant seasonal drainage also includes consideration of major snow drifting on a landfill.

B.2.5 Precipitation

The amount of precipitation received, either as rain or snow fall, affects the amount of surface water infiltration or run-off. The majority of the DEW Line sites receive less than 500 mm of precipitation annually, with the exception of Cape Dyer. Typically, the amount of precipitation at any site is relatively low; therefore it is unlikely that any single precipitation event would cause significant runoff. This factor is therefore given a relatively low weight.

B.2.6 Distance to Downgradient Perennial Surface Water/Seasonal Drainage Channel

The distance to surface water will affect the probability of contaminants reaching the watercourse. This factor can include streams, seasonal or perennial, running directly through the landfill, or streams and lakes downgradient from the landfill, but it is intended to exclude small ponds with no outflow. On very steep slopes this distance should consider the horizontal distance to the water body rather than the vertical drop. The impact of drainage with respect to contaminant exposure is not considered in this category (it is considered under Receptors); this factor determines whether there is a drainage pathway from the landfill.

C. Receptors

This section addresses the potential for impact on receptors, specifically, aquatic and terrestrial habitats, as well as human exposure. Impact on humans is the primary consideration; however, it should be recognized that impact on humans is implicit in the scoring of factors addressing ecosystem impact. The scoring within each category is to be based on recorded data, as well as local knowledge of the land use in the area, and therefore requires local input.

C.1 Potential Impact on Receiving Freshwater/Marine Habitat

The water body should be selected based on the potential effects on the receiving habitat. In the selection of the receiving water body to be used in the landfill evaluation matrix, consideration must be given to the regional drainage patterns. For example, where the drainage from a landfill is overland (i.e. there is no direct connection between the landfill and the downgradient water body), water bodies beyond 2 kilometers should not be used in the evaluation. This is based on the premise that natural attenuation of any potential contamination will occur with overland flow. Where a direct connection between a landfill and a downgradient water body exists, via a stream or interconnected ponds, the two-kilometre limit should not be used.

C.1.1 Proximity to Receiving Freshwater/Marine Habitat

“Receiving habitat” is considered to be the most potentially impacted significant body of water near the toe of the landfill. The water body may support freshwater or marine life and/or may be used by avifauna and/or terrestrial mammals as a water source. It is not necessarily the seasonal drainage course or perennial water body closest to the landfill toe: This section’s objective is to select a habitat which support receptors rather than identify the closest body of water. It is assumed that only habitat downgradient from the landfill is to be considered (given that aerial transport of contaminants to habitat upgradient from the landfill will be addressed by the remediation of contaminated soil).

C.1.2 Estimated Habitat Usage – Freshwater/Marine

This section is scored based on the frequency of usage within the selected receiving water body: the level of biodiversity and the occurrence of calving/spawning should be considered in scoring. It is recognized that freshwater and/or marine wildlife is potentially more at risk compared with terrestrial wildlife or avifauna, which should only be exposed through water ingestion. Thus, when terrestrial wildlife or avifauna is the primary receptor, the score for this factor should fall into the moderate or low category based on the potential frequency of usage. Otherwise, when the selected water body sustains freshwater and/or marine wildlife, the level of biodiversity should be used to evaluate the score. It should be noted that the most conservative approach - in the selection of the receiving water body - must be used when scores from section C.1.1 and C.1.2 are combined. Finally, "Biologically sensitive" areas such as bird sanctuaries and/or endangered, threatened or vulnerable populations should be considered as "special considerations".

C.2 Potential Impact on Receiving Terrestrial Habitat

C.2.1 Extent of Vegetation

Typically the area in which to consider vegetation would include an area 300 m downgradient from the toe of the landfill. The area within this distance is expected to be most susceptible to uptake of contaminants if they are leaching from the landfill, but a larger or smaller area could be considered if site specific conditions warrant it.

C.2.2 Estimated Habitat Usage – Terrestrial/Avifauna

The same criteria as for usage of aquatic habitat are to be applied.

C.3 Potential Human Exposure Through Land Use

C.3.1 Presence/Occupation

This factor addresses strictly dermal exposure and inhalation; consumption of food and water from the area is dealt with in subsequent factors. The risk of dermal exposure or inhalation is much lower when soil is frozen; therefore winter occupation of the site is assigned a low risk. "Summer" in this factor is intended to include the spring, summer and fall periods when the ground is not frozen. Within this factor, the scoring takes into account the likelihood and the duration of contact. In such way, proximity to a community is considered (high likelihood of contact), although proximity to a community does not necessarily trigger a high score if visits are infrequent (low duration of contact).

The likelihood of contact considers proximity to community or to a camp, as well as proximity to "travel routes". The duration of contact considers full time residences (i.e. permanent community for high, summer camp for moderate, winter camp or travel routes as low). Scores may be interpolated between the allocated points, according to the table below.

Table 1-1: Scoring Guide for Section C.3.1

	High Likelihood of Contact	Moderate Likelihood of Contact	Low Likelihood of Contact
High Duration of Contact	8	6	4
Moderate Duration of Contact	6	4	2
Low Duration of Contact	4	2	1

For large DEW Line sites, different parts of the site need to be considered individually, as some areas of the site could be quite far (more than a few kilometres) from the landfill under consideration.

C.3.2 Proximity to Drinking Water Source

Regardless of whether the source is seasonal or perennial, an established community or a summer camp water source located downgradient of the landfill is to be considered in this factor.

C.3.3 Food Consumption

Sedentary organisms are more susceptible to local inputs as their exposure is large if they are downgradient from the landfill. These organisms can include bottom-dwellers such as sculpins, mussels, sea urchins etc., as well as terrestrial vegetation, which can be used for medicinal purposes. This kind of contamination "is quite localized when considered on a broad regional scale" (DIAND 1997, pg. 5). Migratory marine animals may have body burdens of contaminants; these are not directly attributable to local contaminant sources, as the vast majority of organochlorines, for instance, arrive in the Arctic via long range transport.

Caribou living in the general area of DEW Line sites do not have elevated levels of contaminants, since they feed over a very wide area. The Canadian Arctic Contaminant Assessment Report (DIAND, 1997) describes these results in more detail.

It is recognized, however, that sources such as DEW Line sites do contribute contaminants to the Arctic ecosystem. For the purpose of scoring the matrix, therefore, a high consumption of animals from the area surrounding the DEW Line sites has the potential to pose a higher risk than a low consumption, **although in general the risk remains low.**

This factor is divided into two sub-sections, and the score is the sum of the score for each of the two sub-sections.

1.3 Special Considerations

As indicated in the introduction to the matrix (section 1.1), each of the three main categories includes a "*special considerations*" factor. The proposed value of the special considerations factor is a maximum of ten percent of the overall score for each category. It is intended that no circumstance will allow a user to assign a special considerations score that will cause the score for that category to exceed the maximum allotted. To avoid undue bias, it is also suggested that the user should complete the entire evaluation form and score a site before addressing special considerations in the total score.

The Environmental Working Group (EWG) based the landfill risk evaluation matrix on the CCME model which defines three categories: contaminant source, pathways and receptors. Within those three categories, the EWG tried to address all of the possible factors contributing to risk. Recognizing that even a thorough matrix could never address all possible risk factors, special considerations were included to address specific risk factors, which are not general to all of the DEW Line sites.

As noted in the CCME document, the special considerations factor is not intended to be applied on a regular basis, as it addresses very site-specific risk factors. In fact, if the special consideration factor was being consistently applied in the scoring of landfills, it would indicate that the matrix itself was incomplete. Special considerations should be site-specific characteristics that can be documented.

Three examples of how special considerations could be applied are provided to clarify the use of such a classification:

Example 1. Wildlife on site

At Byron Bay, the caribou belong to the Peary herd, an endangered species. It may be that "special considerations" points would be assigned to the Receptors category when endangered, threatened and/or vulnerable species (COSEWIC, 1997) are known to visit the DEW Line landfill.

Example 2. Drinking water

The risk associated with landfill impact on a drinking water source is addressed in section C.3.2. In that section, the distance from a landfill to a known drinking water source, permanent or seasonal, is used as an indicator of the risk that the contaminants in the landfill could have an impact on the drinking water source. If a landfill is close to a drinking water source, then section C.3.2 would be assigned the maximum score (8 points). In the case of Pelly Bay, however, where the landfills are far from the drinking water source and therefore receive a relatively low score in section C.3.2, "special considerations" points may be added to address concerns that the landfills are located in the watershed for the community drinking water supply.

Example 3. Proximity to a community

In the landfill risk evaluation matrix, human exposure to a landfill is measured in the following way: people can spend time at the landfill (potential dermal exposure), they can drink water from an area near the landfill (potential ingestion), they could live very close to landfills (potential exposure through aerial transport) or they could eat animals that feed near the landfill (potential ingestion). These three considerations form section C.3 of the risk evaluation matrix. If a landfill is located near a community, there is a greater likelihood that people will spend time at the landfill than there is for landfills far from a community. It is not necessarily the case, however, that landfills near communities receive frequent visits; therefore, instead of creating a special section addressing proximity to a community, the risk of human exposure (section C.3.1) is more accurately evaluated by measuring time spent at a landfill. In these cases, however, "special considerations" points may be added to the Receptors category to address a community's specific concerns.

PROPOSED ENVIRONMENTAL RISK EVALUATION MATRIX FOR LANDFILLS IN THE NUNAVUT REGION			
A.	CONTAMINANT SOURCE		Maximum Score
A.1	LANDFILL EXTENT		10
	>10 000 m ²	10	
	For areas less than 10 000 = Area of Landfill X 10 / 10 000	2-9	
	Minimum Score	1	
A.2	ESTIMATED DEPTH OF LANDFILL		5
	greater than 1.5 m	5	
	less than 1.5 m	2-4	
A.3	PRESENCE OF LEACHATE		10
	Evidence of Leachate	10	
	No Evidence of Leachate	0	
A.4	PRESENCE OF SURFACE CONTAMINATED SOIL		15
	> DCC Tier II Stains	15	
	> DCC Tier I < DCC Tier II Stains	10	
	Contaminated suspected, no surface contamination noted	5	
A.5	PRESENCE OF SURFACE DEBRIS AT LANDFILL		10
	>50% of surface area	10	
	<50% of surface area, pro-rated	1-9	
	No debris observed	0	
	SPECIAL CONSIDERATIONS		
		+/- 5	
	TOTAL SCORE - CONTAMINANT SOURCE		50

PROPOSED ENVIRONMENTAL RISK EVALUATION MATRIX FOR LANDFILLS IN THE NUHAVUT REGION			
B.	PATHWAY/TRANSPORT MECHANISMS		Maximum Score
B.1	AERIAL TRANSPORT OF CONTAMINANTS		2
	All Landfills Scored as 2 if Surface Soil Contamination (A.4) or leachate (A.3) has been identified		
B.2	WATER MOVEMENT		
B.2.1	TOPOGRAPHY		12
	Steeply Slope (>40 % Grade)	12	
	Sloping (10% to 40% Grade)	4-11	
	Subdued to 10% Slope	2-3	
	Flat (< 3%)	1	
B.2.2	COVER MATERIALS -DEPTH		4
	No to little existing cover	4	
	Greater than 50% exposed/surface debris	3	
	Occasional exposed/surface debris	2	
	Existing cover, minimal debris	1	
	Cover thickness > average active layer thickness	0	
B.2.3	COVER MATERIAL - TYPE		5
	No cover	5	
	Silty/Sandy Material	4	
	Sand/Gravel Material	3	
	Gravel Material	1-2	
B.2.4	SURFACE WATER/RUN-OFF POTENTIAL		12
	Very High - evidence of erosion, continuing run-off, or wave action	12	
	High - evidence of erosion, seasonal, widespread, storm waves	10	
	Moderate - % area affected by erosion	3-9	
	Low - no evidence of erosion, slight slopes	1-2	
B.2.5	PRECIPITATION		5
	> 500 mm annual precipitation	5	
	< 500 mm annual precipitation (pro-rated)	1-4	
B.2.6	DISTANCE TO DOWNGRADIENT PERENNIAL SURFACE/L SEASONAL DRAINAGE CHANNEL		10
	0 to 100 m	10	
	100 to 300 m	7-9	
	300 to 1 km	2-6	
	greater than 1 km	1	
	SPECIAL CONSIDERATIONS		
		+/- 5	
	TOTAL SCORE - PATHWAYS		50

PROPOSED ENVIRONMENTAL RISK EVALUATION MATRIX FOR LANDFILLS IN THE NUNAVUT REGION				
C.	RECEPTORS			Maximum Score
C.1	POTENTIAL IMPACT ON RECEIVING FRESHWATER/MARINE HABITAT			
C.1.1	PROXIMITY TO RECEIVING FRESHWATER/MARINE HABITAT			
	0 to 100 m	6		6
	100 to 300 m	4-5		
	300 to 1 km	2-3		
	greater than 1 km	1		
C.1.2	ESTIMATED HABITAT USAGE - FRESHWATER/MARINE			
	High: High Biodiversity/ High Occurrence/Calmng or Spawning Area	5-6		6
	Moderate: Moderate Biodiversity, Migratory	3-4		
	Low: Low biodiversity, rare sightings	1-2		
C.2	POTENTIAL IMPACT ON RECEIVING TERRESTRIAL HABITAT			
C.2.1	Extent of Vegetation			
	Extensive vegetation growth, (80 to 100 % ground cover)	6		6
	Moderate vegetation growth (40 to 60% ground cover)	4-5		
	Low vegetation growth (20 to 40% ground cover)	2-3		
	Sparse vegetation (<20% ground cover)	1		
C.2.2	ESTIMATED HABITAT USAGE - TERRESTRIAL/AVIFAUNA			
	High: High Biodiversity/ High Occurrence/Calmng, Denning or Nesting Area	5-6		6
	Moderate: Moderate Biodiversity, Migratory	3-4		
	Low: Low biodiversity, rare sightings	1-2		
C.3	POTENTIAL HUMAN EXPOSURE THROUGH LAND USE			
C.3.1	Presence/Occupation	likelihood of contact		
	Duration of contact	high	moderate	low
	High - Numerous visits, summer camp	6	6	4
	Moderate - occasional summer camp	6	4	2
	Low - Infrequent visits or winter camp	4	2	1
C.3.2	Proximity to Drinking Water Source			
	0 to 100 m	8		8
	100 to 300 m	5-7		
	300 to 1 km	2-4		
	greater than 1 km	1		
C.3.3	Feed Consumption			
	High quantity of sedentary organisms - manne & plant life	8		8
	Moderate quantity of sedentary organisms - manne & plant life	6		
	Low quantity of sedentary organisms - manne & plant life	4		
	No consumption	0		
	High quantity of migratory organisms	2		2
	Moderate quantity of migratory organisms	1		
	Low quantity of migratory organisms	0.5		
	No consumption	0		
	SPECIAL CONSIDERATIONS			
		+/-5		
	TOTAL SCORE - RECEPTORS			50
	TOTAL SCORE			150

Appendix C
Disposal Requirements For Items
Potentially Found At Dew Line Sites

Hazardous materials (as defined by federal or territorial legislation) will not be landfilled at the DEW sites.

The following table includes items that could be found at DEW sites and provides the treatment of these items as part of the clean-up.

Item	Disposal
Waste oil	Treat as per the DLCU Barrel Protocol/GNWT criteria
PCB-containing equipment (e.g. transformers/capacitors)	Treat as per federal regulations
Asbestos	Bag and bury according to GNWT regulations
Sewage-liquid	Treat as per wastewater discharge criteria
Sewage-solid	Treat as soil
Lead and PCB based paints	Treat as per federal regulations
Radioactive tubes	Not suitable for landfill
Scrap metal	Bury in engineered landfill on site
Radar components	Bury in engineered landfill on site
Fuel barrels	Treat as per the DLCU Barrel Protocol/GNWT criteria
Lime	Not suitable for landfill
Antifreeze	Treat as per the DLCU Barrel Protocol/GNWT criteria
Wood	Bury in engineered landfill on site
AVGAS (aviation fuel)	Treat as per the DLCU Barrel Protocol/GNWT criteria
Sulfamic acid	Not suitable for landfill.
Cathode-ray tubes and screens	Bury in engineered landfill on site
Filtron tubes	Not suitable for landfill
Oscillators	Bury in engineered landfill on site
Meters	Not suitable for landfill if PCB- or mercury-containing
Copper wire	Bury in engineered landfill on site
Transmission fluid	Treat as per the DLCU Barrel Protocol/GNWT criteria
1,1,1-trichloroethane	Not suitable for landfill
PBX telephone equipment	Bury in engineered landfill on site
Mercury vapour rectifier tubes	Not suitable for landfill
Paint thinners	Treat as per the DLCU Barrel Protocol/GNWT criteria
Batteries	Not suitable for landfill
Chlorinated hydrocarbons	Treat as per the DLCU Barrel Protocol/GNWT criteria
Corrosion inhibitors	Not suitable for landfill
Lye	Not suitable for landfill
Corrosives	Not suitable for landfill

Item	Disposal
Plastic	Bury in engineered landfill on site
Solvent	Treat as per DLCU Barrel Protocol/GNWT criteria
Dynamite	Not suitable for landfill
RF Interference filters	Bury in engineered landfill on site
Generators	Clean and bury in engineered landfill on site
Scopes	Bury in engineered landfill on site
Vehicles	Clean and bury in engineered landfill
Rubber fuel bladders	Clean and bury in engineered landfill on site
Creosote-treated poles	Bag and bury in engineered landfill on site
Compressed gas cylinders	Vent, puncture and bury in engineered landfill on site
Refrigeration equipment	Recover freon and bury in engineered landfill on site
Paper	Bury in engineered landfill on site

Appendix D

Sample Questions For Community Consultations

Habitat Considerations

- Are there fish/birds/clams in the pond/lake/bay immediately down hill of the landfill?
- Are there many different types of fish/birds/clams in the pond/lake/bay? What species have you observed in that water body?
- Does spawning or nesting occur in the pond/lake/bay?
- Do the animals in the pond/lake/bay stay all year round or are they migratory?
- Have you observed any land animals such as caribou, fox or bear at the DEW Line site? How many? Was the wildlife feeding/calving/nesting/burrowing on site or near a landfill?

Exposure Considerations

- Does the community fish in the pond/lake/bay down hill of the landfill? Where does the community fish?
- Does the community collect clams/sculpins/urchins from the lake/bay?
- Does the community hunt seal, walrus or whales from the bay?
- Does the community pick berries or use the vegetation down gradient of the landfill?
- Does the community hunt at the DEW Line site? What do they hunt?
- How often do the community residents visit the site? Do you camp there seasonally? Where is the camp located?
- Where is drinking water taken from on-site?

Special Considerations

- Is the community aware of this landfill? Are there any special considerations?

Appendix E.

Tier I and Tier II DEW Line Clean-up Criteria

Substance	Units	DCC Tier I	DCC Tier II*
Arsenic	ppm	-	30
Cadmium	ppm	-	5.0
Chromium	ppm	-	250
Cobalt	ppm	-	50
Copper	ppm	-	100
Lead	ppm	200**	500
Mercury	ppm	-	2.0
Nickel	ppm	-	100
Zinc	ppm	-	500
PCB's	ppm	1.0***	5.0

* concentrations exceeding this limits are classified as Tier II Soils except where the concentrations exceed federal regulations (referred to herein as "CEPA" soils)

** concentrations between 200 and 500 ppm are classified as Tier I Soils

*** concentrations between 1.0 and 5.0 ppm are classified as Tier I Soils

Appendix F

Confirmatory Testing Protocol

Confirmatory Testing Grid Sizes

Size of area	Grid size	# Perimeter samples analyzed	# Interior grid samples analyzed
<100 m ²	3x3 m	all	all
>100 m ² , <2500 m ²	6x6 m	50%	40%
>2500 m ²	12x12 m	50%	40%

Where the excavation has an irregular shape, samples from the perimeter of the excavated area are to be collected following the shape of the excavation, rather than the grid if the grid points do not fall on the edge of the excavation.

Samples at the grid intersections will be point samples (as opposed to composite samples from each cell on the grid), to ensure simplicity of sampling and clarity of the result.

Appendix G

Barrel Contents Criteria and Disposal

Introduction

In order to determine the correct disposal method for barrels and their contents, the contents must first be identified. All barrel contents will be sampled and analyzed. Analytical data obtained for the samples collected from barrels located at the site will be compared to the criteria included in Table 1, below. Barrel contents are identified as organic or aqueous and the concentrations of glycols, alcohols, PCBs, chlorine, cadmium, chromium and lead are determined. Uncontaminated aqueous phases can be disposed of on the land; uncontaminated organic phases can be incinerated; contaminated aqueous material should be scrubbed free of organic material; and contaminated organic material should be disposed of as hazardous material.

Table 1: Barrel Protocol Criteria and Disposal Summary

Phase	% glycols or alcohols	PCB	Cl	Cd	Cr	Pb	Disposal
Organic	-	<2	<1000	<2	<10	<100	Incineration
Organic	-	>2	>1000	>2	>10	>100	Ship south
Aqueous	>2 %	>2	>1000	>2	>10	>100	Ship south
Aqueous	>2 %	<2	<1000	<2	<10	<100	Incineration
Aqueous	<2%						Scrub and discard

A. Inspection

1. All barrels are to be inspected to address the following items which shall be recorded and used as a guide prior to opening barrels.

2. Symbols, words, or other marks on the barrel that identify its contents, and/or that its contents are hazardous: e.g. radioactive, explosive, corrosive, toxic, flammable.
3. Symbols, words, or other marks on the barrel that indicate that it contains discarded laboratory chemicals, reagents, or other potentially dangerous materials in small-volume containers.
4. Signs of deterioration or damage such as corrosion, rust, or leaks at seams, rims, and V grooves.
5. Spillage or discoloration on the top and sides of the barrel.
6. Signs that the barrel is under pressure such as bulging and swelling.

B. Sampling

1. Barrels shall not be transported until it has been determined that they are not under pressure, do not leak, and are sufficiently sound for transport.
2. Barrels to be sampled should be set in an upright position, provided that this does not cause them to leak and that it is physically possible.
3. Barrels should only be opened using heavy equipment, according to accepted procedures and under qualified supervision.
4. Once open, barrels will be sampled by personnel wearing proper personal protective gear. Samples of the contents of all barrels shall be extracted using a drum thief.
5. In instances where there are a large number of barrels with obviously similar contents, these can be grouped together and 30 to 40% of the barrels in the group sampled. Barrels containing less than 50 mm of liquid may be combined with compatible material prior to sampling; samples inferred to contain only water on a visual examination shall be tested prior to this consolidation. Barrel contents, which consist of black oil, shall not be consolidated.
6. All barrels shall be clearly numbered using spray paint or other suitable marker. The number on this label should be the only sample coding provided to the laboratory.
7. The barrel locations and barrel sample descriptions should be recorded.
8. Samples should be kept at ambient temperatures and shipped by guaranteed freight to laboratories where they should be kept cold pending analysis.

C. Testing

1. Liquid samples shall be inspected and classified as either containing water or organic materials. Samples thought to contain water shall be analyzed to confirm that they are indeed water, and contain less than 2% glycols or alcohols.
2. The contents of barrels containing organic materials, including aqueous samples which contain more than 2% glycols or alcohols, shall be tested for PCBs, total

chlorine, cadmium, chromium and lead, in addition to identification of the major components e.g. fuel oil, lubricating oil.

3. Contents of barrels which contain two or more phases shall have all phases analyzed; the organic phases as described above and the aqueous phase to ascertain whether it contains less than 2% organic substances. In addition, the aqueous phase shall be tested for any components found in the organic phases above the criteria described below.

D. Disposal of Barrel Contents

1. Barrels containing only rust and sediment shall be treated as empty barrels.
2. Barrel contents comprising water only (less than 2% glycols or alcohols) shall be transferred to an open vessel such as a utility tub or half-barrel and any organic material removed by agitation with a pillow or segment of oil absorbent material. The water may then be discarded on to the ground that is a minimum of 30 meters distance from natural drainage courses. Used oil absorbent material shall be treated as described in below (D.5.).
3. Barrel contents which are composed of water with glycols and/or alcohols or organic phases, and which contain less than 2 ppm PCBs, 1000 ppm chlorine, 2 ppm cadmium, 10 ppm chromium, and 100 ppm lead, may be disposed of by incineration. Alternatively these contents may be disposed of off-site at a licensed disposal facility. The solid residual material resulting from incineration shall be subjected to a leachate extraction test. Material found to be not leachate toxic shall be disposed of as DCC Tier II contaminated soil. Leachate toxic material shall be treated as hazardous waste and disposed of off-site at a licensed disposal facility.
4. Barrel contents, which contain greater than 2 ppm PCBs, 1000 ppm chlorine, 2 ppm cadmium, 10 ppm chromium or 100 ppm lead shall be disposed of off-site at a licensed disposal facility. Contents may be combined with compatible materials for shipping purposes. Flash points may be required to be determined if they cannot be inferred from the product identification.
5. Used oil absorbent material should be treated as hazardous waste and disposed of off-site at a licensed disposal facility. If it is shown to be uncontaminated with PCBs (< 2 ppm), chlorine (< 1000 ppm), cadmium (< 2 ppm), chromium (< 10 ppm) and lead (< 100 ppm), it may be incinerated on-site.

E. Disposal of Barrels

1. Empty barrels may be crushed or shredded and landfilled on-site as non-hazardous waste after they have been cleaned in an appropriate manner. The barrels shall be

crushed in such a manner so as to reduce their volume by a minimum of 75%.
Shredded barrels may be disposed of off-site as recycled metals.

Appendix H

Post Construction Landfill Monitoring Regime

1.0 Types of Landfills

There are four types of landfills that require monitoring:

- New landfills for non-hazardous materials and Tier I soil;
- Landfills to be closed by the addition of granular fill and regraded;
- Landfills to be closed with leachate containment; and
- Tier II soil disposal facilities.

2.0 Monitoring

New landfills are to be constructed for the disposal of non-hazardous demolition wastes, site debris and Tier I soil. These landfills, constructed according to specifications, are considered to pose low potential environmental risks as the contents and placement of the materials in the landfill are known. The monitoring of these landfills will be limited to a visual inspection program to evaluate the stability of the landfill.

Existing landfills that are to be regraded will be monitored for leachate periodically by the collection of soil and/or water samples from test pits at the toe of the landfill, in addition to visual inspection.

For existing landfills that have been classified as moderate potential environmental risk, and proposed Tier II soil disposal areas, the design in both cases is to incorporate a leachate containment system, consisting of synthetic liners (geocomposite clay liners, and/or geomembrane liners) and promotion of permafrost aggradation through the landfill contents. The monitoring program for these landfills will include thermal monitoring of the ground temperatures in and around the landfill, collection and analysis of soil samples, collection and analysis of water from wells around the landfill, and visual inspection.

3.0 Description of Monitoring Components

3.1 Visual Inspection

The physical integrity of the landfill will be inspected and reported using photographs (from the air as well as ground level) and hand drawn sketches. Documented observations should include:

- Signs of damage from settlement, ponding, frost action, erosion, and lateral movement.
- Sloughing of berms, thermal contraction cracks etc.

3.2 Soil and Water Sampling

Soil and water samples, representing background as well as baseline conditions, will be collected. Results of analyses of samples from landfills will be compared to these baseline and background samples as this is indicative of changing environmental conditions at the site.

In general, one monitoring well will be placed upgradient and three will be placed downgradient. This allows the assessment of hydraulic gradient and evaluation of potential impacts. Soil samples will be collected from the toe of the landfill, and will generally be taken from the same locations as the wells. Soil samples at the toe of the landfill reflect chronic input from water and are a very important indicator of leachate.

Soil and water samples will be tested for:

- PCBs (polychlorinated biphenyls);
- TPH (total petroleum hydrocarbons),; and;
- Inorganic elements: arsenic, cadmium, chromium, cobalt, copper, lead, nickel and zinc.

If the landfill is close to a drinking water source and has the potential to have an impact on it, the water samples will be analyzed for the following parameters in addition to the compounds and elements listed above:

- inorganic elements by ICP scan;

- major ions, hardness, and total dissolved solids,; and;
- pH and conductivity,;

The intent of the additional analyses is to provide added information to evaluate the potential impacts related to the landfill, and not necessarily to provide an assessment of the potability of the water source. In this latter case, the results of the analyses of these drinking water samples will be compared to the most current version of Canadian and/or Territorial standards for drinking water for the parameters analysed, in addition to comparison with background and baseline data.

3.3 Thermal Monitoring

As indicated previously, one component of the leachate containment system incorporates aggradation of the permafrost through the landfill contents such that the active layer does not penetrate the waste materials. Geothermal analyses were carried out to predict the length of time for freezeback of the landfill; long-term and short-term thermal regime in the ground; and the depth of the active layer in the cover material. The analyses have shown that it takes several years for the landfill temperatures to equilibrate and stabilize.

A thermal monitoring system provides measurement of sub-surface ground temperatures, which allows comparison to and verification of the predicted ground temperatures. The thermal monitoring system consists of installation of thermistor strings, with "thermistor beads" at select intervals to provide ground temperature profiles at various locations within the landfill. The thermistor strings are attached to automated data-loggers which allow for remote data collection. In general, a minimum of three thermistors will be placed; the actual number will be evaluated on a landfill-specific basis. Thermistor installation will be in accordance with standard engineering practice.

Checklists for the collection of monitoring data are presented in Appendix I.

4.0 Monitoring Frequency

Generally, the post-construction monitoring program would have three phases, each with a different objective.

4.1 Phase I: Monitoring of conditions to confirm that equilibrium is achieved.

During Phase I, sites where leachate containment and/or Tier II soil facilities have been constructed, monitoring will take place on an annual basis, for an estimated period of five years following construction. The five-year term was selected on the basis that ground-temperature thermal regimes at these specific landfills would require three to five years to reach equilibrium.

At other locations, where existing landfills have been regraded and new landfills have been constructed, Phase I monitoring will be carried out on in the first, third and fifth years following construction.

An evaluation of the Phase I data will be carried out at the end of five years to confirm that thermal and chemical equilibrium had been achieved, and that no stability issues have been identified. The Phase I monitoring program may be extended, if required.

4.2 Phase II: Verification of equilibrium conditions established during Phase I.

The monitoring frequency in Phase II be downgraded from Phase I, and be carried out according to the following schedule: year 7, year 10, year 15 and year 25. Year 25 would mark the end of Phase II monitoring.

4.3 Phase III: Monitoring for long term issues such as liner integrity, permafrost stability, and significant storm events.

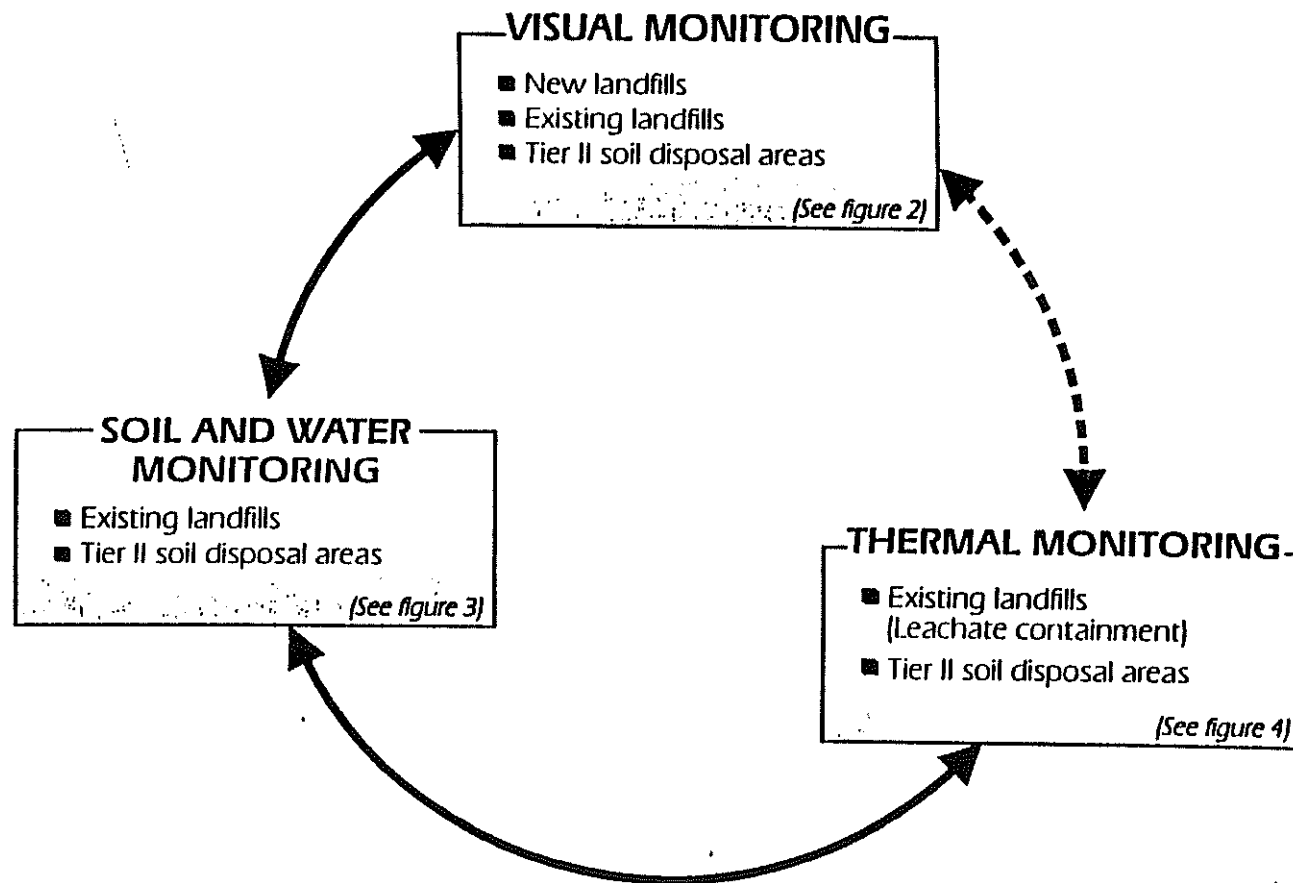
At the end of Phase II, 25 years after implementation of the remedial actions for a given landfill, a major re-evaluation of the monitoring program will be carried out prior to initiating Phase III. It is difficult to predict beyond 25 years how world events and improvements in technology may impact on monitoring requirements. Based on current technology and knowledge, a Phase III program should be implemented at 10 year intervals. The duration of the Phase III program will be estimated at the outset of the program and be subject to re-evaluation as new technologies are developed and new information becomes available.

5.0 Interpreting Monitoring Results

Monitoring results (thermal, chemical and visual) have to be interpreted in concert with one another. An increase in chemical concentrations, for instance, from one year to the next does not necessarily trigger action if there are no other signs of landfill instability. Stability problems would have to be established by a geotechnical engineer with northern experience. Action will be taken based on trends in chemical data rather than isolated results.

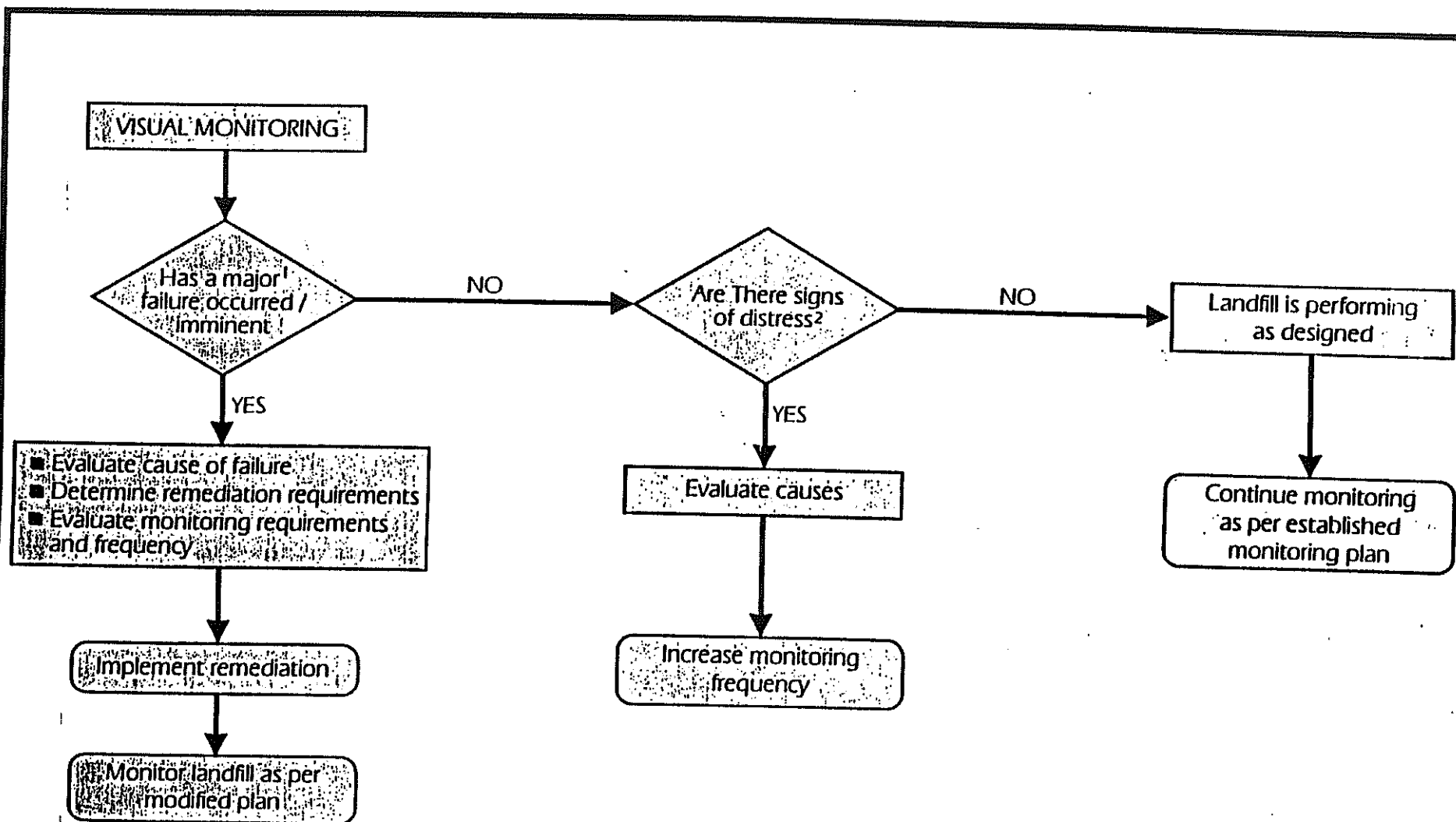
Normally, the first step to be taken when a potential problem is identified is to intensify the monitoring program. If a problem has been confirmed, then remedial action will be undertaken.

The flowcharts in Figures 1 to 4 illustrates the decision-making process to be applied to monitoring data. The following section outlines actions to be taken if the monitoring program indicates a deficiency in a landfill.



DEW Line Clean-Up
Environmental Working Group
LANDFILL MONITORING PROGRAM

SUMMARY FLOW CHART

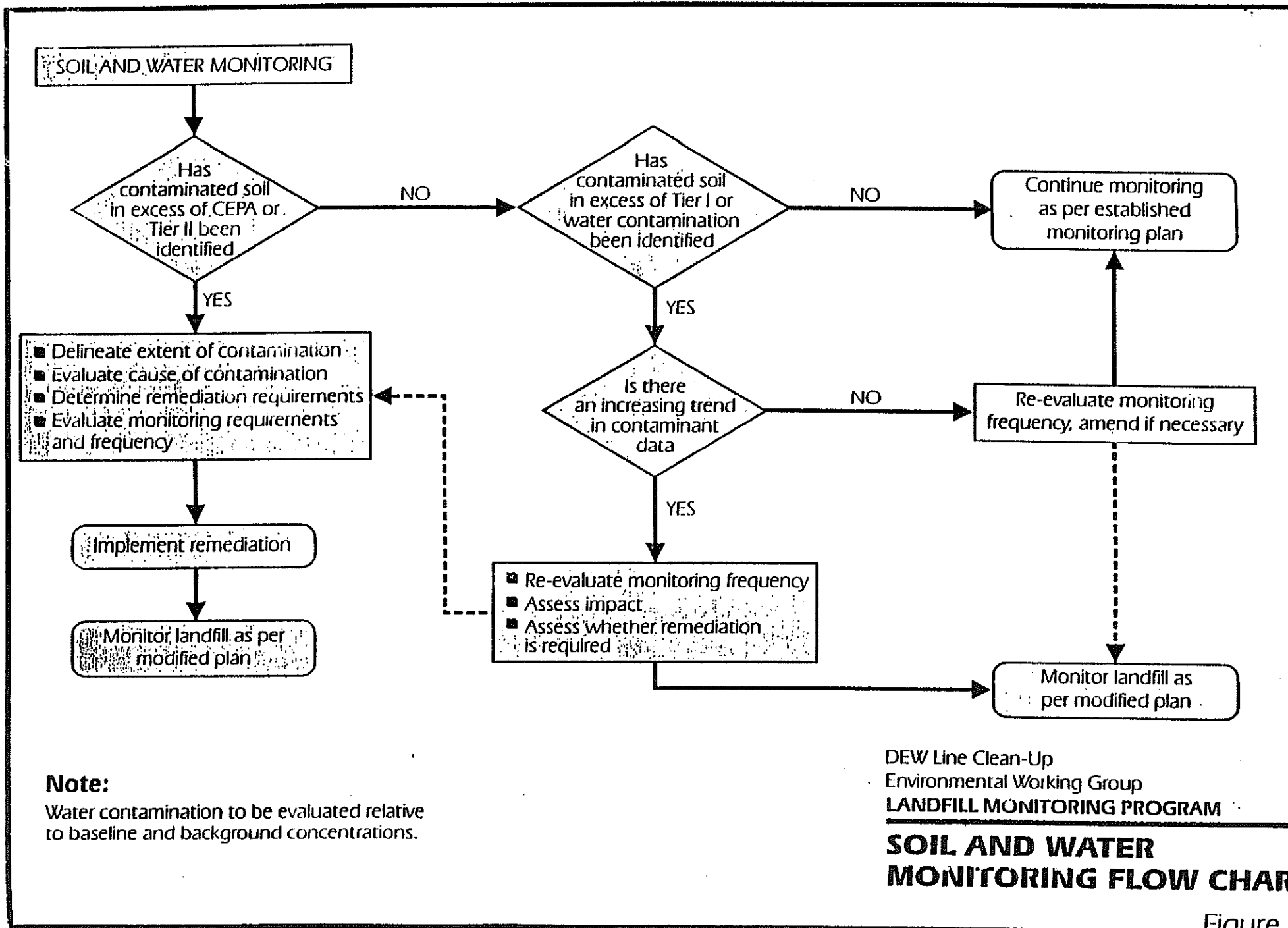


Notes:

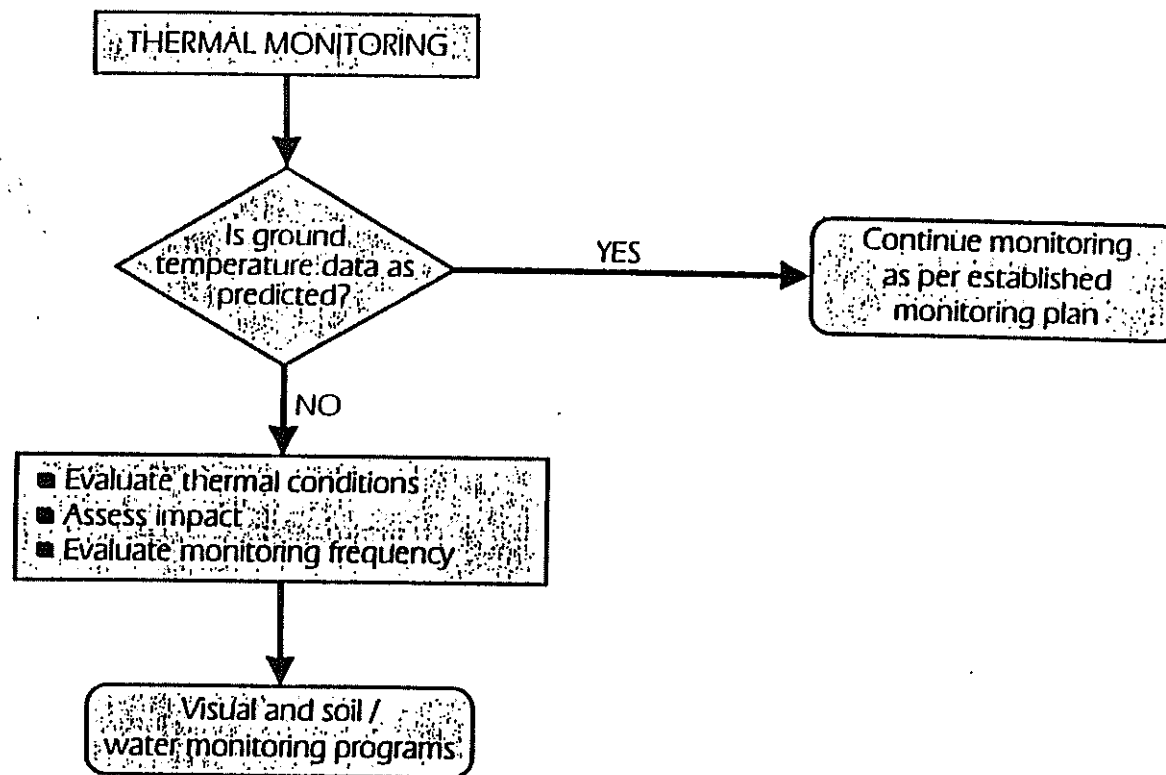
- 1 Major Failure: significant exposed debris (>25% of surface area) due to erosion, settlement, frost action; berm failure (slope stability)
- 2 Signs of Distress: Voids due to settlement, ponding on surface, and/or tension cracks, and/or erosion.

DEW Line Clean-Up
Environmental Working Group
LANDFILL MONITORING PROGRAM

VISUAL MONITORING FLOW CHART



Figure



DEW Line Clean-Up
Environmental Working Group
LANDFILL MONITORING PROGRAM

THERMAL MONITORING FLOW CHART

6.0 Impact of Monitoring Results

The possible results and the associated potential mitigation requirements for the landfill monitoring components are described in the following subsections. For all instances, the mitigation requirements are dependent on the severity of the deficiency, and will be assessed by a professional geotechnical engineer with northern engineering design and construction experience. In addition, the assessment and implementation of resulting remediation requirements will be carried out in a staged approach to ensure that the proposed solutions address the specific requirements in a logical and cost effective manner.

6.1 Visual Inspection

If the results of the visual inspection program indicate evidence of significant settlement, ponding, or frost jacking, it may be necessary to implement one or more of the following mitigative measures:

- increase the frequency of the visual monitoring program
- place erosion protection material such as riprap, vegetation mats, etc.
- recompact existing debris material and existing granular material
- place additional granular fill
- regrade, as required, to promote positive drainage away from the deficient landfill area.

It should be noted that settlement of the landfill surface may not necessarily result in failure of the landfill. Settlement (typically differential settlement) that results in ponding and infiltration of surface water could lead to erosion and frost jacking problems.

If the visual monitoring program results indicate evidence of sloughing of landfill perimeter berms and thermal contraction cracks, it may be necessary to implement one or more of the following mitigative measures:

- flatten granular berm slopes
- compact existing granular slopes
- place and compact additional granular fill material

6.2 Soil and Groundwater Monitoring

The results of the soil and groundwater monitoring program will be compared against baseline data established prior to the initial landfill development or remediation program. Results of the analysis of soil and groundwater samples that show decreasing trends of contamination at the perimeter of landfills typically indicate that the implemented landfill remediation has been effective. Conversely, if the results indicate increasing levels of contamination, then it may be necessary to implement one or all of the following:

- Increase the frequency of the monitoring program.
- Carry out a review and evaluation of the nature and extent of the contamination, including the incorporation of the results of the visual monitoring program. The major objective of this evaluation will be to determine the cause of the contaminant migration problem, and in particular to determine if it is the result of ineffective design, material (e.g. liner) failure, improper compaction, selection and use of inadequate granular material, poor grading, etc. This evaluation may require intrusive investigation into and around the landfill.
- Depending on the results of the above, it may be necessary to remove and replace liner material, reconstruct containment berms, etc.
- Assess the requirement to excavate and dispose of the contaminated soil; this would include the delineation of the vertical and areal extent of the contamination.
- Excavate and dispose of contaminated soil and/or excavate all or part(s) of the landfill, as required.

The requirement for the specific scope and extent of remediation, as outlined above, will also incorporate an risk evaluation of the potential impacts of the contamination based on the principles defined in the Landfill Risk Evaluation Matrix. The need for the risk evaluation is predicated on the understanding that not all affected sites pose the same risk to the environment, and consequently remediation requirements will vary.

6.3 Thermal Monitoring

The results of the thermal monitoring program will be compared against the parameters for freezeback that were incorporated into the geothermal design of the landfills. It is important that the overall assessment of these results consider the results of both the visual and soil/groundwater monitoring programs. If the thermal monitoring results indicate ground temperatures that are significantly higher (greater than 2° C) than

predicted during the geothermal analyses carried out as part of the design, then it may be necessary to implement one or more of the following:

- Increase the frequency of the recording and assessment of results from the thermal monitors.
- Establish, based on the results of the soil and groundwater monitoring programs, if groundwater and/or soil contaminant levels beyond the perimeter of the landfill have increased. Incorporate the results of a risk assessment. Assess the impacts, as outlined above, to determine the appropriate remediation requirements.
- If it established that a slower than expected freezeback period has resulted in the migration of contamination beyond the landfill and depending on the results of the above risk assessment, then it may be necessary to implement one or more of the following:
 - determine if the rate of the freezeback progress is continuing, or if freezeback within the landfill has terminated; is at steady-state;
 - excavate and dispose of contaminated soil and/or excavate all or part of the landfill, as required;
 - place additional granular cover material or other insulating material (styrofoam insulation, vegetation) over the landfill to provide an increased insulation barrier over the landfill;
 - reconstruct and/or re-saturate the perimeter berms of the landfill.

Appendix I

Landfill Monitoring Checklist

DEW Line Clean-up
Environmental Provisions

**DEW LINE CLEANUP
LANDFILL MONITORING CHECKLIST**

MONITORING PROGRAM

LANDFILL TYPE	Visual	Soil and Water	Thermal
New Landfill (Non-Hazardous Wastes)	X		
Landfill requiring Regrading	X	X	
Landfill requiring Leachate Containment	X	X	X
Tier II Soil Disposal Facilities	X	X	X

SITE: _____

LANDFILL DESIGNATION: _____

LANDFILL TYPE: _____

DATE: _____

MONITORING EVENT NO.: _____

NAME: _____

WEATHER CONDITIONS: _____

VISUAL INSPECTION CHECKLIST

Carry out a visual inspection of the landfill surface, berms, toe of berms and identify potential areas of distress as follows:

1. Settlement:

- a) Is there differential settlement occurring on the surface?
 - i) low areas or depressions;
 - ii) voids forming
- b) What is the extent of settlement?
 - i) percent of surface area affected;
 - ii) localized areas or continuous;
 - iii) how deep;
- c) Where is the settlement occurring?
 - i) near berms, center of facility, etc.
- d) Explain?
 - i) evidence of significant surface infiltration,
 - ii) water ponding on surface
 - iii) snow drifting

32. Erosion

- a) Is there erosion occurring on the surface or berms of the landfill?
 - i) preferred drainage channels;
 - ii) sloughing of material;
- b) What is the extent of erosion?
 - i) percent of surface area affected;
 - ii) localized areas or continuous;
- c) Where is the erosion occurring?
 - i) along the toe, on the surface, through the berms;
- d) Explain?
 - i) evidence of significant surface water run-off;
 - ii) poor material type;

34. Frost Action

- a) Is there frost action/damage to the landfill?
 - i) exposure of debris due to uplift;
 - ii) tension cracking along berms;
 - iii) sorting of granular fill;
- b) What is the extent of frost action?
 - i) percent of surface area affected;
 - ii) localized areas or continuous;
- c) Where is the cracking, frost heaving occurring?
 - i) along the toe, on the surface, through the berms;
- d) Explain?
 - i) poor material gradation;
 - ii) poor compaction;
 - iii) high water content, silt content in cover material;

45. Condition of Other Monitoring Instruments:

56. Provide detailed sketch and photographic record of landfill.

PRELIMINARY STABILITY ASSESSMENT

SOIL AND GROUNDWATER MONITORING FIELD CHECKLIST

1. Soil Samples:

Sample No:	
Field Measurements: VOC	
Soil Description:	
Analyses Requested	

SOIL AND GROUNDWATER MONITORING FIELD CHECKLIST cont'd

2. Water Samples

Sample No: Well No.:	
Field Measurements :	pH Conductivity Temperature
Well Processing	Water level <hr/> Purged well or standing water sampled <hr/> Recovery Rates <hr/>
Analyses Requested	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>

Comments:

Additional surface water samples: where, why, describe areas of stressed vegetation

THERMAL MONITORING CHECKLIST

Thermistor Number:

Location:

1. Download data
2. Replace battery pack
3. Check condition of connections and instrumentation
4. Save data to hard-drive and disk.
5. Relock cap

DEW Line Clean-up
Environmental Provisions

Appendix J

Hydrocarbon Contamination Checklist

General

Date:

Name of Assessor:

Site Name:

Hydrocarbon Spill/Stain Location:

Hydrocarbon Source

What type of hydrocarbon is present in this stain? Consider the following:

Toxicity (Lubrication Oil, Diesel, Gasoline/Avgas)

Fluidity

Solubility

Volatility

What is the concentration of total petroleum hydrocarbons in parts per million (ppm)? Is it above 2500 ppm?

What is the approximate volume of contaminated soil in cubic metres?

Pathways

1. Is the contaminated soil in a stable location or on a slope?
2. What is the estimated organic matter in the contaminated soil? (ie. <0.1%, <5%, >5%)

DEW Line Clean-up
Environmental Provisions

3. What is the estimated grain size of the contaminated soil? Consider the following:

Coarse ($D_{50} > 75$ micron)

Fine ($D_{50} < 75$ micron)

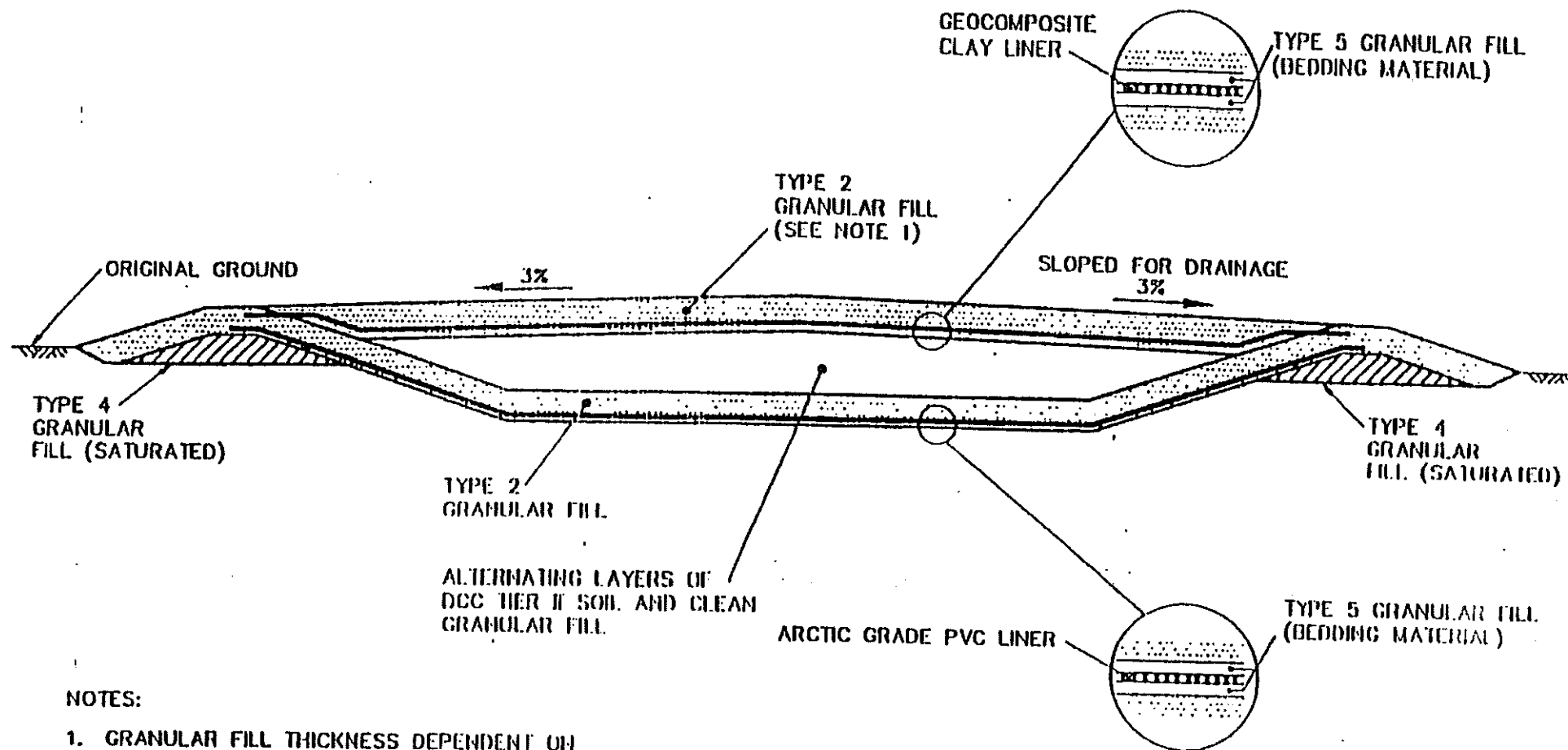
4. What is the distance from the contaminated soil to a marine or freshwater environment?
5. What is the annual precipitation of the site?
6. What is the mean summer temperature?

Potential Impacts on Receptors

1. What is the distance to the nearest down gradient marine or freshwater habitat?
2. Is this a potential or known drinking water source for terrestrial animals or humans?
3. What is the down gradient habitat usage? Consider the following:
- Grazing, nesting, denning, spawning, calving
High, medium, or low number of sitings.
High, medium or low biodiversity.
4. Is this area visited frequently by humans for hunting, fishing, gathering or camping purposes? What is consumed and from where is it obtained?

Appendix K
Tier II Disposal Facility

DEW Line Clean-up
Environmental Provisions



NOTES:

1. GRANULAR FILL THICKNESS DEPENDENT ON SITE SPECIFIC CONDITIONS.
2. GRANULAR FILL GRADATIONS ARE SITE SPECIFIC.

TIER II DISPOSAL FACILITY

TYPICAL CROSS SECTION

AGREEMENT BETWEEN

Nunavut Tunngavik Incorporated

And

Her Majesty In The Right Of Canada,

Represented By

The Minister Of National Defence

With Respect To Economic Benefits For Inuit

In The Clean-Up And Restoration Of

Distant Early Warning Sites

Within The Nunavut Settlement Area

(NTI-DND Economic Agreement)

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PREAMBLE

WHEREAS fifteen Distant Early Warning (DEW) Line Sites are located on Department of National Defence (DND) reserves within the Nunavut Settlement Area (NSA);

AND WHEREAS DND is undertaking an environmental clean-up of the DEW Line sites, facilities and associated areas;

AND WHEREAS the Inuit and the Federal Government have an interest in protecting the ecosystem integrity and the existing and future well-being of the residents and communities of the NSA and increasing the participation of Inuit and Inuit firms in business and employment opportunities in the NSA;

AND WHEREAS on September 1, 1998 DND and NTI have entered into an agreement to establish a framework for the remediation and restoration of the DEW Line Sites in the NSA;

AND WHEREAS the Parties wish to enter into an agreement addressing the participation of Inuit in the clean-up of DEW Line sites in the Nunavut Settlement Area, in order to achieve a cost-effective and environmentally sound clean up and restoration of DEW Line Sites, which optimises economic benefits and opportunities for Inuit in employment, the provision of goods and services, training and the transfer of technology, in accordance with the *Nunavut Land Claims Agreement* (NLCA), and specifically Article 24 of the NLCA;

NOW THEREFORE, in consideration of the premises and mutual covenants contained herein, the Parties agree as follows:

1.0 DEFINITIONS

Clean-up Contract means a contract entered into by DND's contracting agent and a Contractor for a Site clean-up;

Contractor means the party who has contracted with DND's contracting agent to carry out a Site clean-up;

Contracting Working Group means the working group established under Section 4.2 of the Agreement;

DEW Line Site means one of the Distant Early Warning Sites listed in Section 3.1 below;

DIAND DEW Line Sites means the Distant Early Warning Sites in Nunavut not listed in Sections 3.1 and 3.2;

DND means the Crown in right of Canada represented by the Minister of National Defence or his delegate;

Inuit firm has the same meaning as in the *Nunavut Land Claims Agreement*;

Inuit Firm Registry is the comprehensive list of Inuit firms maintained in accordance with Paragraph 24.7.1 of the *Nunavut Land Claims Agreement*;

MIEC means the Minimum Inuit Employment Content set in accordance with Section 5.0 of this Agreement;

MICC means the Minimum Inuit Content for Contracting set in accordance with Section 6.0 of this Agreement;

NLCA means *Nunavut Land Claims Agreement*;

NTI has the same meaning as "Tungavik" under Section 1.1.1 of the NLCA;

NTI-DND Environmental Agreement means "The Agreement Between Nunavut Tunngavik Incorporated and the Department of National Defence for the Clean-up and Restoration of DEW Sites Within the Nunavut Settlement Area" dated September 1, 1998;

Nunavut Settlement Area has the same meaning as in the NLCA;

Parties means Nunavut Tunngavik Incorporated and the Department of National Defence;

Regional Inuit Association means the Kivalliq Inuit Association, the Qikiqtani Inuit Association or the Kitikmeot Inuit Association or their successors;

Representative Occupational Grouping means a category of personnel required for a Site clean-up classified by occupation or type of work to be performed;

Registry has the same meaning as "Inuit Firm Registry";

RIA means "Regional Inuit Association";

Site means a "DEW Line Site" that is, or is projected to be, remediated and restored, as provided for in the NTI-DND Environmental Agreement;

Steering Committee means the Committee established under Section 4.1 of the Agreement;

Subcontractor means a party who contracts with a Contractor or Subcontractor to perform any part of the Contractor's obligations on a Site;

Work means materials and services furnished or provided to perform a clean-up or restoration of a Site.

2.0 OBJECTIVES

2.1 The objectives of this Agreement are as follows:

- a) to complement the NTI/DND environmental provisions as set out in the NTI-DND Agreement for the Clean-up and Restoration of DEW Sites Within the Nunavut Settlement Area, 1 Sept. 1998;
- b) to further the objectives of Article 24 of the NLCA in relation to the DEW Line Clean-up in the NSA;
- c) to achieve an efficient and cost-effective clean-up and restoration of the DEW Line Sites in the NSA;
- d) to achieve:
 - i) increased participation by Inuit firms in business opportunities generated by the clean-up;
 - ii) improved capacity of Inuit firms to compete for government contracts;
 - iii) increased employment of Inuit up to a representative level;
 - iv) increased access by Inuit to career training, on-the-job training, apprenticeship, and other job-related programs, in order to develop a skilled and professional pool of labour available for work on the DEW Line Clean Up in the NSA; and
 - v) increased opportunities for Inuit to receive training and experience to successfully create, operate and manage businesses in Nunavut;
- e) to establish a mechanism whereby successful Contractors fulfill agreed-upon commitments to levels of Inuit participation.

3.0 GENERAL

- 3.1 **Scope.** This Agreement applies to the Site clean-up at the following DEW Line Sites:

PIN 2 - Cape Young
PIN 3 - Lady Franklin Point
PIN 4 - Byron Bay
CAM 1 - Jenny Lind Island
CAM 2 - Gladman Point
CAM 3 - Shepherd Bay
CAM 4 - Pelly Bay (near Kugaaruk)
CAM 5 - Mackar Inlet
FOX M - Hall Beach
FOX 2 - Longstaff Bluff
FOX 3 - Dewar Lakes
FOX 5 - Broughton Island (near Qikiqtarjuaq)
DYE M - Cape Dyer

- 3.2 The Parties acknowledge that prior to the signing of this Agreement, the clean-up of Cape Hooper (FOX 4) and Cambridge Bay (CAM M) had been completed. Note that the process for awarding the contracts for the clean-up of Pelly Bay (CAM 4) and Broughton Island (FOX 5) will have started prior to the timelines contemplated in this Agreement.
- 3.3 **No Precedent.** This Agreement is not to be construed as a precedent for any other activities of DND, Canada or any third party. Nothing in this Agreement shall be interpreted or used to define the rights of the Parties, Canada or any third party in relation to any matter under the NLCA or to interpret any Article of the NLCA except for the purpose of this Agreement.
- 3.4 **Urgency.** The Parties recognize the urgency of the matters dealt with in this Agreement and agree to perform all required actions as expeditiously as possible.
- 3.5 **Nunavut Land Claims Agreement.** The Parties recognize and acknowledge their respective obligations to comply with the NLCA in connection with all Work.
- 3.6 **No Retrospectivity.** This Agreement binds the Parties only with respect to Site clean-ups, including selection of Contractors for Site clean-ups, that have not commenced as of the date of the signing of this Agreement, unless the Parties agree otherwise.

4.0 STEERING COMMITTEE AND CONTRACTING WORKING GROUP

4.1 Steering Committee

4.1.1 The Steering Committee established under Article 4.0 of the NTI-DND Environmental Agreement shall perform the following functions in connection with this Agreement:

- a) establish Minimum Inuit Employment Content, under Section 5.10;
- b) establish Minimum Inuit Content for Contracting, under Section 6.10;
- c) review contract award issues, under Sections 8.3.1, 8.3.3, and 8.3.5 through 8.3.11; and
- d) review Contractor's deviation from MIEC and MICC pursuant to Section 12.2;
- e) consider other items of mutual concern related to the implementation of this Agreement, raised by either Party.

4.1.2 The Steering Committee may meet either in person or by teleconference.

4.1.3 The Steering Committee shall operate on the basis of consensus.

4.1.4 The Parties each shall be responsible for their respective costs associated with participating in Steering Committee meetings.

4.1.5 The Steering Committee shall establish and make publicly available procedures governing its operations and those of the Contracting Working Group, including, without limitation, conflict of interest, release of information provided to either Party, and procedures for decision-making that ensure fairness and due process to Contractors.

4.2 Contracting Working Group

4.2.1 A Contracting Working Group shall be established, composed of two members appointed by NTI and two members appointed by DND. The working group shall perform the following functions in connection this Agreement:

- a) make a recommendation to the Steering Committee on the Minimum Inuit Employment Content (MIEC), under Section 5.8; and

- b) make a recommendation to the Steering Committee on the Minimum Inuit Content for Contracting (MICC), under Section 6.8.

4.2.2 The Contracting Working Group shall operate on the basis of consensus.

4.2.3 The Parties each shall be responsible for their respective costs associated with participating in Contracting Working Group meetings.

5.0 MINIMUM INUIT EMPLOYMENT CONTENT

5.1 A Minimum Inuit Employment Content (MIEC) shall be set for each Site.

5.2 The MIEC for a Site is the minimum level of Inuit employment that DND shall require the Contractor to achieve for the clean-up of that Site.

5.3 The MIEC shall be expressed as a percentage, and shall be calculated by dividing the total number of Inuit employed, in person-days, by the total number of persons employed, in person days, for the term of the contract of a Site clean-up. The calculation shall include all on-site and off-site personnel employed by Contractors and Subcontractors. Off-site personnel shall include without limitation:

- a) management and support personnel dedicated to the Site clean-up;
- b) project management personnel employed by the Contractor;
- c) technical or drafting personnel; and
- d) expediting, shipping, payroll or accounting personnel.

5.4 The calculation of the MIEC shall not include:

- a) project management staff at DND's contracting agent;
- b) DND employees; and
- c) any consultants contracted by DND or DND's contracting agent for the provision of advice concerning the specifications of the clean-up, contract management or other advice.

5.5 The MIEC shall be within a range of 65-85%.

5.6 Eight months prior to the scheduled commencement of a Site clean-up, DND shall provide NTI with DND's estimates of the types and level of positions that will be required for the conduct of the Site clean-up, in person-days, and broken out by Representative Occupational Grouping. The estimate shall be

provided in the form attached as Annex A.1. Education and skills profiles for Representative Occupational Groupings are listed in Annex B.

- 5.7 Within two months of the receipt of the information described in Section 5.6, NTI, in consultation with the RIAs, shall provide DND with a projection of the level of Inuit employment for the Site clean-up. The projection will be provided in the form attached as Annex A.2 to this Agreement. NTI's projection will be based on an analysis, for each Representative Occupational Grouping, of the number of Inuit qualified for work on the Site clean-up in relation to the employment opportunities using, to the extent possible, relevant available information on Inuit qualifications and employment.
- 5.8 Within one month of receipt by DND of the projection under Section 5.7, the Contracting Working Group shall recommend a MIEC for the Site clean-up. In making the recommendation to the Steering Committee for the MIEC, the Contracting Working Group shall take into account, for each Representative Occupational Grouping, the following factors:
- a) NTI's projection of Inuit employment;
 - b) Inuit employment achieved on other DND DEW Line Site clean-ups to date, compared to the MIEC established for the Sites, and on DIAND DEW Line Sites;
 - c) the results achieved by training and apprenticeship programs for Inuit labour, to date; and
 - d) the projected impact on the availability of Inuit labour of other projects being undertaken in Nunavut.
- 5.9 Where the Contracting Working Group, after a reasonable effort, is unable to reach agreement on the MIEC for a Site clean-up, either Party may refer the MIEC to the Steering Committee for resolution.
- 5.10 The Steering Committee shall meet as soon as practicable following a recommendation under Section 5.8 or a referral under Section 5.9 to decide on a MIEC. In the event that the Steering Committee does not reach agreement on a MIEC within two weeks, either Party may refer the matter to Expedited Arbitration, as provided under Section 14.0.
- 5.11 The MIEC resulting from a decision of the Steering Committee or arbitrator shall be the MIEC required under Section 5.1.
- 5.12 The forms used to provide the information required under Section 5.6 and 5.7 may be modified for a Site clean-up upon the agreement of all members of the Contracting Working Group.

6.0 MINIMUM INUIT CONTENT FOR CONTRACTING (MICC)

- 6.1 A Minimum Inuit Content for Contracting (MICC) shall be set for each Site.
- 6.2 The MICC for a Site is the minimum level of Inuit business participation that DND shall require the Contractor to achieve for the clean-up of that Site.
- 6.3 The Minimum Inuit Content for Contracting (MICC) for a Site clean-up shall be expressed as a percentage, and shall be calculated by dividing the total dollar value of Inuit contracting content by the total dollar value of the Clean-up Contract. The total dollar value of Inuit contracting content shall be calculated by adding the dollar value of all subcontracts for goods or services to be obtained through, or awarded to Inuit firms, including all labour costs. Where the Contractor is an Inuit firm, the total dollar value of Inuit contracting shall also include the Contractor's share of the Clean-up Contract, which is the total dollar value of the contract minus the dollar value of all subcontracts.
- 6.4 The MICC shall be within a range of 60-75%.
- 6.5 Eight months prior to the start of a Site clean-up, DND shall provide NTI with an analysis of categories of contracting opportunities and an estimate of each category's percentage of total value of the Clean-up Contract for the Site clean-up. The analysis shall be in the form provided in Annex A.3.
- 6.6 Within two months of the receipt of the analysis required under Section 6.5, NTI, in consultation with the RIAs, shall provide to DND a list of Inuit firms that have declared themselves able to perform work on a Site clean-up, listed according to the categories of contracting opportunities identified under Section 6.5.
- 6.7 NTI shall request Inuit firms to provide corporate resumes to their RIAs that shall include information on relevant capacity and work experience. NTI shall deal with all information provided to it under this section as strictly confidential. DND shall treat all information provided to it by NTI under this section as commercial confidential information. DND shall not release such information unless prior approval is received from the Inuit firm, or DND is required to release such information under the provisions of the *Access to Information Act* and/or the *Privacy Act*.
- 6.8 The Contracting Working Group shall recommend the MICC for a Site to the Steering Committee within one month of receipt of the list of Inuit firms required under Section 6.6. This recommendation shall take into account the following factors:

- a) Inuit firms' capacities;
 - b) historical data from prior Site clean-ups in Nunavut and the Western Arctic;
 - c) Site-specific characteristics; and
 - d) impact of other projects on the availability of Inuit firms.
- 6.9 In the event that the Contracting Working Group is unable to reach agreement on the MICC, as provided in Section 6.8, either Party may refer the matter to the Steering Committee.
- 6.10 The Steering Committee shall meet as soon as practicable following a recommendation under Section 6.8 or a referral under Section 6.9 to decide the MICC. In the event that the Steering Committee does not reach agreement on the matter within two weeks of a referral, either Party may refer the matter to Expedited Arbitration, as provided under Section 14.0.
- 6.11 The MICC resulting from a decision of the Steering Committee or arbitrator shall be the MICC required under Section 6.1 for a Site.
- 6.12 The form used to provide the information required under Section 6.5 may be modified for a Site clean-up upon the agreement of all members of the Contracting Working Group.

7.0 CONTRACTOR'S INUIT PARTICIPATION PLAN

- 7.1 DND shall require all companies that either submit a bid on a Clean-up Contract or enter into negotiations for a Clean-up Contract to provide a preliminary Contractor's Inuit Participation Plan (CIPP) that shall include:
- a) a description of how the company intends to achieve the MIEC, including, where possible and without limitation:
 - i) the number, percentage and types of positions, including training positions, that the company proposes to fill with Inuit, in relation to the total number of positions, and the number and percentage of person-days proposed for these positions in relation to total person-days;
 - ii) the steps the company will take to recruit potential Inuit employees; and
 - iii) any measures the company has taken or proposes to take to increase Inuit employment, including such things as the details of any Inuit recruitment programs, training or apprenticeship programs, and equivalencies for formal qualifications;

- b) where the MIEC is lower than the NTI projection provided to DND under Section 5.7, a description of how the Contractor could achieve the NTI projection for Inuit employment;
 - c) any other measures for optimizing Inuit employment and training; and
 - d) a description of how the company intends to achieve the MICC, including, where possible and without limitation the names, address and particulars of any actual or proposed Subcontractors; and the specifics of any actual or proposed contracting arrangements.
- 7.2 DND shall require all companies that submit a bid on a Clean-up Contract to submit their preliminary Contractor's Inuit Participation Plans in a separate envelope from their tender bid, to DND's contracting agent prior to the closing of bids.
- 7.3 For all bids for contracts for a Site clean-up, DND or its contracting agent shall:
 - a) advise bidders that the envelope containing the CIPP shall be opened first; and
 - b) advise bidders that bids shall be opened only if the CIPP complies fully with the requirements contained in Section 7.1.
- 7.4 Within three (3) months of DND having provided NTI with the estimates required under Section 5.6 above, NTI, through the Regional Inuit Associations, shall ensure that information regarding Inuit who have indicated their interest in employment in Site clean-ups, including information regarding their work experience and qualifications, is provided to DND's contracting agent.
- 7.5 DND's contracting agent shall make the information provided to it under Section 7.4 available to bidders for use by them in the preparation of bids and in finding suitable Inuit labour.
- 7.6 Upon the written request of the Contractor, DND's contracting agent may approve revisions to the CIPP during the course of a Site clean-up, provided that the Contractor demonstrates to DND's contracting agent that the MIEC and MICC for the Site clean-up will still be achieved.
- 7.7 In the event that DND's contracting agent approves a revised CIPP under Section 7.6, it shall provide the Steering Committee with the revised CIPP within five (5) working days of its approval. DND's contracting agent shall not release commercial confidential information to the Steering Committee without written permission from the Contractor.

8.0 SELECTION PROCESS FOR CONTRACTOR

8.1 Tender and Contract Documents

- 8.1.1 In all tender documents issued to companies that submit a bid on a Clean-up Contract or enter into negotiations for a Clean-up Contract, DND's contracting agent shall identify the following as criteria that a Contractor must comply with in a bid:
- a) Minimum Inuit Employment Content (MIEC) established in accordance with Section 5.11;
 - b) Minimum Inuit Content for Contracting (MICC) established in accordance with Section 6.11; and
 - c) Submission of a Contractor's Inuit Participation Plan (CIPP) that fully complies with Section 7.1.
- 8.1.2 DND's contracting agent shall provide a copy of this Agreement in all tender documents issued to companies that submit a bid on a Clean-up Contract or enter into negotiations for a Clean-up Contract, and shall advise such companies in the tender documents that compliance with the provisions of the Agreement by the Contractor and its Subcontractors is mandatory.
- 8.1.3 DND's contracting agent shall include as a term in all Clean-up Contracts that the Contractor will comply with this Agreement and a term that the Contractor will ensure that any Subcontractors will be bound by and comply with the Agreement, where applicable.

8.2 Solicitation of Interest

- 8.2.1 DND's contracting agent shall prepare a Solicitation of Interest (SOI) for a Site clean-up. The SOI shall be in English and Inuktitut and shall request Letters of Interest (LOI) to identify firms that are both interested in and capable of performing as the prime Contractor for clean-up of the Site. The SOI shall be distributed Canada-wide through MERX and by mail or by fax to firms on the Registry.
- 8.2.2 The Solicitation of Interest under subsection 8.2.1 shall have the following characteristics:
- a) The type of opportunity will be a *Letter of Interest (LOI)*;
 - b) The region of delivery will be *Nunavut*;
 - c) The region of opportunity will be *Canada Wide*;

- d) The agreement type is *Comprehensive Land Claim Agreement (CLCA)*.

8.2.3 DND's contracting agent shall include the following in the SOI: .

- a) A description of the background, objectives and nature of the clean-up of DND DEW Line Sites;
- b) A description of the services to be provided by a Contractor for clean-up of the Site and of the specific capabilities required for a Contractor;
- c) A statement that the Site is located in a region where a Comprehensive Land Claim Agreement has been signed;
- d) Instructions for the preparation of a response to the Solicitation of Interest;
- e) A description of the employment and contracting environment in Nunavut, within the context of the NCLA and the requirements of the NTI-DND Economic Agreement (as per Annex D of this Agreement);
- f) A definition of Minimum Inuit Employment Content (MIEC) and the Minimum Inuit Content for Contracting (MICC) and identification of the range for the MIEC and MICC that must be achieved by the Contractor in the Site clean-up;
- g) All available values for the MICC and MIEC for previous Clean-up Contracts in Nunavut.

8.2.4 DND's contracting agent shall require that firms responding to the Solicitation of Interest adhere to the following process:

- a) Firms shall provide a complete and fully documented LOI in the format prescribed in the SOI.
- b) Firms shall provide in a LOI any information or documentation necessary to demonstrate capability to:
 - i) Provide the services of a Contractor for clean-up of the Site;
 - ii) Manage and finance a contract as Contractor for clean-up of the Site;
 - iii) Obtain liability insurance;
- c) Each firm's LOI shall contain a statement that the firm understands the requirements to meet the levels for MIEC and MICC for the clean-up of the Site provided for under Sections 5.5 and 6.4 of the Agreement, and is capable of meeting those requirements

8.2.5 DND's contracting agent shall assess the Letters of Interest to determine those firms that have demonstrated their capability to be a Contractor for clean-up of a given Site and based on that assessment shall establish a list of qualified Contractors for that Site.

8.3 Selection Process for a Site Clean-up

8.3.1 Where DND's contracting agent determines under Section 8.2.5 that only one firm is capable of performing the contract for the Site clean-up, the following procedure shall be followed:

- (a) DND's contracting agent shall issue an Advance Contract Award Notice (ACAN) indicating its intent to negotiate the contract with the firm;
- b) if no valid challenge to the ACAN is received within the time frame provided for in the Treasury Board of Canada Contracting Policy, DND's contracting agent shall negotiate with the firm for the purpose of arriving at a price for the Site clean-up and shall require the firm to submit a CIPP in accordance with the requirements of Section 7.1 above;
- c) if negotiations have been successfully completed under Subsection b), above, DND shall make a determination as to whether the price is acceptable, and whether the criteria set forth in Subsections 8.1.1 (a) to (c) have been met;
- d) in the event that DND determines under Subsection c) above that the price is acceptable and that the criteria set forth in Subsections 8.1.1 (a) to (c) have been met, DND's contracting agent shall issue a letter of intent to award the contract to the firm;
- e) in the event that DND determines under Subsection c) above that the firm has not fully met the criteria set forth in Subsections 8.1.1 (a) to (c), DND shall refer the matter to the Steering Committee and Sections 8.3.7 through 8.3.10 shall apply; and
- f) in the event that negotiations under Subsection b) above are not successfully completed, or the price is not acceptable to DND, DND's contracting agent may decline to award the contract to the firm.

8.3.2 Where DND's contracting agent determines under Section 8.2.5 that more than one firm is capable of performing the Clean-up Contract, it may invite bids from the list of firms determined in 8.2.5 in accordance with Section 8.3.3. Where there is a valid challenge to the Advance Contract Award Notice issued in accordance with Section 8.3.1, DND's contracting agent may

invite bids from the sole firm considered capable in Section 8.2.5 plus the firms which have put forward a valid challenge to the ACAN, in accordance with Section 8.3.3.

8.3.3 The process for the tender shall follow the Treasury Board of Canada Contracting Policy, along with the following specific procedures, whereby DND's contracting agent shall:

- a) open the envelopes containing the Bidder's CIPP before opening any other part of any bid;
- b) with respect to each bidder's CIPP, make a determination as to whether the CIPP meets the criteria set forth in Subsections 8.1.1 (a) to (c) , and open only those bids that in DND's contracting agent's determination meet those criteria;
- c) if DND's contracting agent determines that none of the bids meets the criteria set forth in Subsections 8.1.1 (a) to (c), refer the matter to the Steering Committee, which shall determine if the work should be retendered with a revised MIEC and/or MICC;
- d) identify the lowest priced of the bids opened under Subsection b) and determine whether the price is acceptable to DND; and
- e) if the bid meets the criteria set forth in Subsections 8.1.1 (a) to (c) and the price is acceptable, issue a letter of intent to award the contract, otherwise the contract shall not be awarded.

8.3.4 DND's contracting agent shall require that, within twenty-eight (28) calendar days of a company receiving a letter of intent pursuant to Sections 8.3.1 or 8.3.3, the company shall provide to DND's contracting agent a final CIPP confirming that it is capable of achieving the MICC and MIEC for the Site, and that this final CIPP shall meet the criteria set forth in Subsections 8.1.1 (a) to (c), and shall include, without limitation:

- a) documentation evidencing the signing of agreements with Inuit Subcontractors, or the intention to enter into subcontracts with Inuit Subcontractors, if applicable; and
- b) a schedule showing a monthly projection of Inuit labour and Subcontractors to be utilized throughout the life of the contract.

8.3.5 DND's contracting agent shall review the final CIPP, including the documentation and schedule provided by the company under Section 8.3.4. In the event that DND's contracting agent determines that the documentation and schedule is adequate to confirm that the bidder can meet the criteria set forth in Subsections 8.1.1 (a) to (c), the contracting agent, acting in good

faith, shall approve the CIPP and may award the Contract to the company. In all other events DND's contracting agent shall either:

- a) withdraw the letter of intent; or
- b) request a review by the Steering Committee.

8.3.6 DND's contracting agent shall provide the Steering Committee with a copy of the approved CIPP within fifteen (15) days of contract award. DND's contracting agent shall not release commercial confidential information to the Steering Committee without written permission from the Contractor.

8.3.7 In the event that DND's contracting agent requests a review of a contract award under Section 8.3.1, 8.3.3 or 8.3.5, the Steering Committee shall meet to determine whether the company has made best efforts to meet the criteria set forth in Subsections 8.1.1 (a) to (c), and, whether fault for any failure to do so cannot reasonably be placed on that company. The determination of best efforts shall take into account, without limitation:

- a) the specific activities of the firm to achieve the elements contained in its preliminary CIPP; and
- b) adherence by the firm with the requirements of Section 9.0.

8.3.8 In the event that the Steering Committee fails, within 3 weeks of a matter being referred to it under Section 8.3.1, 8.3.3 or 8.3.5, to agree on whether the company has made best efforts to meet the criteria set forth in Subsections 8.1.1 (a) to (c), the Steering Committee shall refer the matter for decision under the Expedited Arbitration provisions in Section 14.0.

8.3.9 In the event that the Steering Committee, or arbitrator appointed under Section 14.0, determines that the company failed to make best efforts to meet the criteria set forth in Subsections 8.1.1 (a) to (c) and that fault for the failure can reasonably be placed on the company, DND's contracting agent shall withdraw the letter of intent to award the contract.

8.3.10 In the event that the Steering Committee, or arbitrator appointed under Section 14.0, determines that the company has made best efforts to meet the criteria set forth in Subsections 8.1.1 (a) to (c) and that fault cannot reasonably be placed on the company for its failure, the MICC shall be adjusted at the discretion of the Steering Committee or arbitrator in order to allow for the awarding of the contract.

8.3.11 The specific contracting process to be utilized in issuing contracts for monitoring of Sites will be determined by the Steering Committee prior to the preparation of any future contract documents for monitoring of Sites.

9.0 SELECTION PROCESS FOR INUIT SUBCONTRACTORS

9.1 Inuit Firm Registry

- 9.1.1 NTI shall provide to DND the most current Inuit Firm Registry ("the Registry"). The Registry shall contain a brief description of the equipment, goods or services provided by each Inuit firm, the firm's experience, address and contact name.
- 9.1.2 The Registry shall be included in all contract solicitation documents.

9.2 Bid Invitations for Subcontracts

- 9.2.1 DND's contracting agent shall require Contractors who have a letter of intent or who have been awarded the contract, or any Subcontractors, in subcontracting work on a Site clean-up, to invite Inuit firms listed in the Registry that may be capable of performing the proposed subcontracting work, to bid on the proposed subcontracting work.
- 9.2.2 DND and its contracting agent and Contractors shall be held blameless if Inuit firms that do not appear in the Registry are not solicited under Section 9.2.1.
- 9.2.3 Nothing in Section 9.2.1 shall prevent a Contractor or Subcontractor from seeking bids from firms not listed in the Registry.
- 9.2.4 All contract documents issued by DND's contracting agent shall require Contractors and Subcontractors, in subcontracting work on a Site clean-up, to:
- a) include in bid invitations only employment and skills requirements that are essential to the Site clean-up;
 - b) provide Inuit firms with a minimum of 15 days to respond to a bid invitation, but that in no event shall an Inuit firm have less time to respond than firms not listed in the Registry; and
 - c) enter into a contract with an Inuit firm if that Inuit firm's bid meets the Contractor's or Subcontractor's requirements, including such criteria as technical compliance and price, if the Contractor or Subcontractor enters into a subcontract for the Work.
- 9.2.5 All contract documents issued by DND's contracting agent shall require Contractors and Subcontractors, in subcontracting Work on a Site clean-up, to take the following steps in the event that they reject a bid from an Inuit firm

on grounds that it contains minor variances which cause it to be considered not technically compliant or not competitive:

- a) provide the Inuit firm that submitted the bid with a written statement of the variances and the grounds for rejection;
- b) provide the Inuit firm that submitted the bid the opportunity to revise its bid to address the stated variances and submit another bid within 7 calendar days of the date on which it was notified that the bid was rejected; and
- c) enter into a subcontract with the Inuit firm if the new bid meets the Contractor's or Subcontractor's requirements and is less than or equal to the lowest priced bid from non Inuit firms which meet the Contractor's or Subcontractor's requirements; otherwise the contract may be awarded to a firm not listed in the Registry.

9.2.6 DND's contracting agent shall, where a bid has been rejected under Section 9.2.5, require the Contractor or Subcontractor, upon receiving a request in writing, to provide the Inuit firm within thirty (30) calendar days with written reasons why the bid was rejected. Subject to the approval of the Inuit firm, a copy of the reasons shall also be provided to NTI.

10.0 TRAINING

- 10.1 DND shall provide NTI with \$50,000 per Site to assist in meeting the overall objective of achieving a representative level of Inuit employment on DEW Line Site clean-ups through the training of Inuit for clean-up related jobs, for a total of \$750,000 for all Sites in Nunavut.
- 10.2 DND and NTI agree to work jointly to identify additional funding sources for training activities envisioned in Section 10.1.
- 10.3 Of the \$750,000 DND has agreed to provide under Section 10.1, NTI acknowledges that DND has already provided \$100,000 in connection with the clean-up of the FOX 4 and CAM M Sites. Of the \$650,000 remaining, DND shall make an initial payment of \$75,000 to NTI as soon as practical after the signing of this Agreement to fund the development of a comprehensive training plan, schedule and budget.
- 10.4 The cost of any training positions identified in the plan developed by NTI for on-the-job training at a Site shall be funded from sources other than DND's budget for the Site Clean-up Contract. Cost for such training shall also include administrative costs that may be borne as result of the presence of trainees.

- 10.5 The training plan, which shall be completed within one year after receipt of funding for the plan, shall set out a schedule for further payments to NTI from DND up to the full amount of \$650,000.
- 10.6 Subject to DND's agreement to the schedule which may be based on reasonable budget considerations, DND shall make payments to NTI in accordance with the schedule completed under Section 10.5. NTI shall provide DND with an updated training plan and budget, outlining the proposed use of funds, prior to each payment.
- 10.7 The training plan referred to in Section 10.3 shall incorporate both common and site specific elements. The training plan shall include, without limitation, the following elements:
- a) an analysis of skills and knowledge requirements for all positions;
 - b) learning objectives derived from the skills analysis identified in Subsection (a);
 - c) identification of training resources, including existing and required training programs;
 - d) development of a detailed plan and schedule for design, delivery and evaluation of orientation and training courses necessary to achieve representative levels of Inuit employment; and
 - e) development of milestones and performance indicators that will be considered in setting MIEC and MICC under Sections 5.8 and 6.8.

11.0 REPORTING

- 11.1 DND shall provide to NTI, by December 1 of each year that this Agreement is in effect, a report covering annual and cumulative results by type and level of employment, for each Site clean-up, including:
- a) the total number of person days worked by all employees by Representative Occupational Grouping;
 - b) the total number of person days worked by Inuit, by Representative Occupational Grouping;
 - c) the percentage of total person days worked by Inuit, by Representative Occupational Grouping; and
 - d) a list of all contracts for goods, services and labour awarded to Inuit firms and to non-Inuit firms during the year and the dollar value of each of those contracts.

- 11.2 NTI shall provide DND with a report, by December 1 of each year that this Agreement is in effect, outlining the progress of the training program, the number of Inuit trained as well as the success rate of the program, including:
- a) a list of training programs provided under the NTI training plan;
 - b) the number of hours of training received by Inuit in these programs;
 - b) the percentage of Inuit who successfully completed the training; and
 - c) the number of graduates who were subsequently hired by Contractors and Subcontractors.
- 11.3 DND shall include as a term in all Clean-up Contracts between DND and the Contractor a requirement for the Contractor to submit monthly reports on the Contractor's compliance with the final CIPP or the revised CIPP. DND shall advise NTI within five (5) business days of any deviations below the currently approved CIPP. Either Party may request a meeting of the Steering Committee following such a report. Where DND advises NTI of such a deviation below the CIPP in any two consecutive months, a meeting of the Steering Committee is required to be held pursuant to Section 12.2.

12.0 ENFORCEMENT

- 12.1 Where, during a Site clean-up, deviation from the approved CIPP or from the CIPP as amended pursuant to Section 7.6 indicate that the MIEC or MICC may not be achieved by the Contractor over the remainder of the Site clean-up, DND or its contracting agent shall advise the Steering Committee within ten (10) working days.
- 12.2 The Steering Committee, within one week of receiving notice under Section 12.1, shall convene to make a determination as to whether the Contractor is using its best efforts to comply with the MIEC or MICC. The Contractor shall then be required to demonstrate to the satisfaction of the Steering Committee that it has made best efforts to comply with the MIEC or MICC, and that fault for the failure to comply with the MIEC or MICC cannot reasonably be placed on the Contractor.
- 12.3 Where the Steering Committee does not make the determination required under Section 12.2 within 3 weeks, either Party may refer the matter to arbitration under the Expedited Arbitration provisions in Section 14.0.
- 12.4 Where the Steering Committee in a determination made under Section 12.2, or arbitrator to which a matter is referred under Section 12.3, determines that the Contractor failed to make best efforts to comply with the MIEC or MICC, and that fault can reasonably be placed on the Contractor for this failure, the

Steering Committee shall so advise DND's contracting agent of their determination or of that of the arbitrator. The Steering Committee or arbitrator may make recommendations on remedial measures to be applied, and DND's contracting agent may, after considering any recommendations by the Steering Committee or arbitrator, apply remedial measures at its sole discretion. DND's contracting agent shall report to the Steering Committee as soon as practicable on the results of the remedial measures applied. Remedial measures shall, to the extent possible, be designed to correct the Contractor's failure to achieve the MIEC and/or MIEC, and to provide a disincentive for future failures. DND's contracting agent shall consider the following measures and inform NTI of the actions taken. Measures may include:

- a) requiring the Contractor to undertake additional measures to achieve the MIEC or MIEC;
 - b) providing the Contractor with information about specific Inuit or Inuit firms who are known to be available and qualified for employment by the Contractor, and advising the Contractor that further enforcement steps may be taken if the MIEC or MIEC are not met;
 - c) withholding progress payments;
 - d) issuing a stop work order;
 - e) charging the Contractor for damages related to a stop work order; or
 - f) terminating the contract.
- 12.5 Where the Steering Committee, or arbitrator appointed under Section 14.0 determines that the Contractor made best efforts to achieve the MIEC and MIEC through its currently approved CIPP, and that fault cannot reasonably be placed on the Contractor for failing to meet the MIEC or MIEC, the Steering Committee, or arbitrator, shall adjust the MIEC or MIEC.
- 12.6 Following an adjustment to the MIEC or MIEC under Section 12.5, DND's contracting agent shall thereafter continue to monitor and report on the Contractor's performance as provided for in Section 11.3.

13.0 ARBITRATION

- 13.1 If DND and NTI disagree on any question of fact or mixed question of law and fact related to the interpretation, implementation or operation of this Agreement, with the exception of any matter within the jurisdiction of the Arbitration Board under the NLCA and of any matter related to provisions of this Agreement mentioned in Section 14.1, either Party may by written demand refer the dispute to arbitration in accordance with the following

- 14.6 The arbitration proceedings shall be held within two weeks of the appointment of an arbitrator. The arbitration proceedings shall be in a location agreed upon by the Parties, or if the Parties are unable to agree, as determined by the arbitrator. The timing for the hearing may be extended only by the mutual consent of the Parties, acting reasonably.
- 14.7 The arbitrator shall have all of the powers granted under the Commercial Arbitration Act (Canada) to conduct the arbitration, may compel the attendance of the Parties and any required witnesses and the tendering of any documents or things and dispose of any further matters that arise out of the arbitration decision (if raised by the Parties within five (5) days of the completion of the arbitrator's written decision).
- 14.8 With respect to any such arbitration:
- a) each Party shall bear its own costs and an equal share of the other costs of the arbitration, including remuneration and expenses of the arbitrator;
 - b) the arbitrator shall have jurisdiction to determine all questions of fact, law, and questions of mixed fact and law and make a determination;
 - c) all witnesses called to give evidence at the hearing shall be sworn under oath and shall be subject to such examination as the arbitrator determines to be appropriate, and there shall be a court reporter and a formal record of the hearing.
- 14.9 The arbitrator shall, on application, allow a Contractor or a Subcontractor directly affected by a decision requested of the arbitrator to participate in the expedited arbitration as an intervenor, on such terms as the arbitrator in his or her discretion may order.
- 14.10 The arbitrator shall render a decision in writing and provide such decision to the Steering Committee within one week of the conclusion of the hearing. The decision shall state the reasons on which it is based. The decision is final and binding, and is not subject to appeal.
- 14.11 Where a Party to the arbitration fails to comply with any of the terms of the decision of the arbitrator, any Party to the arbitration may file in the office of the Registrar of the Nunavut Court of Justice, a copy of the decision in the prescribed form, whereupon the decision shall be entered in the same way as a judgment or order of the court, and is enforceable as such.
- 14.12 Unless the Parties otherwise agree, the proceedings and arbitrator's decision shall be made public.

15.0 ENTIRE AGREEMENT

This Agreement and the Annexes hereto shall constitute the entire and sole agreement between the Parties and shall supersede all other communications, negotiations, arrangements and agreements of any nature among them in relation to this Agreement prior to the date of the Agreement.

16.0 SEVERABILITY

If any provision of this Agreement or its application to any person or circumstance shall, to any extent, be invalid and unenforceable, the remainder of this Agreement, or the application of such provisions to persons or circumstances other than those as to which it is held invalid or unenforceable, shall be valid and enforced to the fullest extent permitted by law and be independent of every other provision of this Agreement.

17.0 ENUREMENT

This Agreement shall enure to the benefit of and be binding upon each of the Parties hereto, their respective heirs, legal representatives, successors and permitted assigns.

18.0 APPLICABLE LAW

This Agreement shall be governed by and construed in accordance with the applicable laws of Canada and Nunavut.

19.0 TIME IS OF THE ESSENCE

The Parties acknowledge that time is of the essence of this Agreement.

20.0 PARLIAMENTARY APPROPRIATION

The implementation of the Agreement is subject to there being an appropriation for the contracts for the fiscal year in which any commitment would come in course of payment.

21.0 HOUSE OF COMMONS

No member of the House of Commons shall be admitted to any share or part of this Agreement, or to any benefit arising thereof.

22.0 AMENDMENTS

- 22.1 If either Party wishes to make changes to this Agreement, it shall provide notice of proposed changes in writing to the other Party. Amendments must be agreed upon by both Parties. Any agreed-upon amendments will be executed and attached as an appendix to this Agreement.
- 22.2 DND and NTI agree to consider amendments in an expeditious manner, particularly where the proposed amendments directly affect the conduct of a Site clean-up that is in progress or one which is scheduled to commence in the near term.

23.0 NOTICES

- 23.1 Where any Party is obliged or entitled to give any notice, request, approval, demand, consent, direction or other communication (i.e. Notice) to the other Party, such Party shall first communicate the substance thereof personally or by telephone. However, such Notice shall not be sufficiently given until sent in writing to the addressees at the address below. Any Notice may be personally delivered or sent by registered mail or telefacsimile and will be effective upon receipt by the addressee.

- 23.2 Notices to DND will be sent to:

Director General Environment
National Defence Headquarters
101 Colonel By Drive
Ottawa, Ontario
K1A 0K2

- 23.3 Notices to NTI will be sent to:

1st Vice President
Nunavut Tunngavik Incorporated
Box 1041
Cambridge Bay
Nunavut
X0E 0C0

24.0 OFFICIAL LANGUAGES

- 24.1 The official languages of this Agreement shall be English and Inuktitut. In the case of incompatibility between the two texts, the text of the English version shall prevail.

25.0 TERMINATION OF THE AGREEMENT

- 25.1 This Agreement will terminate on the later of December 31st, 2008 or when the Clean-Up Work as set out in this Agreement for the Sites listed in Section 3.1 is completed or on such a date agreed to by the Parties in accordance with Section 22.3 of this Agreement.

IN WITNESS HEREOF, the Parties have executed this Agreement.

**Nunavut Tunngavik
Incorporated**

Department of National Defence

Acting President

Minister of National Defence

this _____ day of _____ 2001

ANNEXES TO THE AGREEMENT

ANNEX A: REPORTS

A.1 Format for DND Work Force Estimate (Section 5.6)

Site:
Region:

Occupational Group	Projected Manpower Requirements							
	Year 1		Year 2		Year 3		Overall	
	Positions	Persondays	Positions	Persondays	Positions	Persondays	Positions	Persondays
Project Manager/General								
Superintendent (Off-site)								
Site Superintendent								
Site Clerk								
Expediter (Off-Site)								
Surveyor								
Surveyor's Assistant								
Service Truck Driver								
Camp Setup Carpenter/								
Electrician/Plumber								
Foreman								
Heavy Equipment Operator								
Heavy Equipment Mechanic								
Truck Driver								
Labourer/Scaleperson/Cutter								
Asbestos Labourer								
Hazardous Material Handler								
Cook/Cook's Helper								
Bear Monitor								
Nurse/First Aid								
Other								
Other								
Total:								

Note: The specific Representative Occupational Groupings included in this form may be changed, under Section 5.12, by mutual consent of the Contracting Working Group to reflect variations among Sites. DND's work force estimate may include additional categories of work not listed, as required.

A.2 Format for NTI Inuit Labour Projection (Section 5.7)

Site:															
Region:															
Positions Identified	Projected Manpower Requirements (person days)							Projected Inuit Employment (person days)							
	Year 1		Year 2		Year 3		Overall	Year 1		Year 2		Year 3		Overall	
	Pos.	Person Days	Pos.	Person Days	Pos.	Person Days	Person Days	Pos.	Person Days	Pos.	Person Days	Pos.	Person Days	Person Days	
Project Management															
Site Superintendent															
Site Clerk															
Expediter															
Surveyor															
Surveyor's Assistant															
Service Truck Driver															
Camp Setup															
Carpenter/Electrician/Plumber															
Foreman															
Heavy Equipment Operator															
Heavy Equipment Mechanic															
Truck Driver															
Labourer/Scaleperson/Cutter															
Asbestos Labourer															
Hazardous Material Handler															
Cook/Cook's Helper															
Bear Monitor															
Nurse/First Aid															
Other															
Other															
Total Positions															
Projected Inuit Employment									%		%		%	%	

Note: The specific Representative Occupational Groupings included in this form may be changed, under Section 5.12, by mutual consent of the Contracting Working Group to reflect variations among Sites.

A.3 DND: Analysis of Contracting Opportunities (Section 6.5)

Site: Region:	
Description	% of Total Contract Value
1 Marine Transportation 2 Commercial Airlines 3 Local Aircraft Charter 4 Catering 5 Small Tools 6 Camp Supply 7 Bonds & Insurance 8 Office Supplies 9 Communications Equipment 10 Bear Monitor 11 Geotextile - Supply & Install 12 Geomembrane - Supply & Install 13 Drilling for Instrumentation 14 Instrumentation 15 Public Consultation/Translation 16 Excavate Hazardous/Contaminated Soil 17 Landfarming 18 Gravel - Excavate & Place 19 Excavation 20 Demolition & Debris 21 Landfill Excavation 22 Asbestos Abatement 23 Project Management and Overhead 24 Other	
Total	100%

Note: The specific Contracting Opportunities included in this form may be changed, under Section 6.12, by mutual consent of the Contracting Working Group to reflect variations among Sites. DND's analysis of contracting opportunities may include other contracting opportunities not listed, as required.

ANNEX B: EDUCATION AND SKILLS PROFILES

Position	Essential Qualifications
Superintendent/Construction Manager	3-5 years directly related project management experience, and substantial (minimum 10 years) construction supervision experience, normally combined with trade certification in one or more relevant trades and/or relevant post-secondary education
Clerk	Previous clerical experience
Expediter	2-3 years experience as expeditor for a northern construction company, ideally combined with 2-3 years trade experience in an applicable construction trade
Surveyor Technologists	2-3 year college program and trade certification
Surveying Assistants	Some related training and/or experience
Service Truck Driver	On-the-job training Driver's license appropriate to class of vehicle
Foreman	3 years supervising similar construction activities
Electrician	Trade certification
Carpenter	Trade certification or 3-5 years on the job experience
Welder	Trade certification
Plumber	Trade certification
Heavy Equipment Operator	5 week certification program Valid driver's license
Heavy Equipment Mechanic	Trade certification or 5 years experience
Small Equipment Mechanic	Trade certification or 3-5 years experience
Truck Driver	Valid driver's license Approved medical certificate 3-4 weeks training
Labourer	On-the-job training; physically fit for the proposed work
Asbestos Labourer	12 hours classroom instruction 12 hours practical instruction
Asbestos Foreman	18 hour training course (following minimum of 2 years of experience as asbestos labourer)

Position	Essential Qualifications
	Certificate from Occupational Health and Safety
Hazardous Materials Handler	5 years + TDG certification through employer
Cooks	Trade certification or 2 years experience
Cooks Helper	Some related experience
First Aid	Training in appropriate first aid courses
Bear Monitor	Experienced polar bear hunter

Note: This list of qualifications is for the use of the Contracting Working Group in establishing the MIEC. This list is not intended for any other use by any third party for any purpose, and DND and NTI are not liable for any use of this list by any third party. Bidders or Contractors are required to establish their own criteria for hiring project staff.

ANNEX C: LIST OF ARBITRATORS

Honourable Roger P. Kerans

Roger F. X. Marentette

Daniel Ish Q.C.

Harvey J. Kirsh

Honourable Lorne O. Clarke

Paul-Emile Chiasson

ANNEX D BUSINESS ENVIRONMENT STATEMENT

The following language shall be included in all Solicitations of Interest prepared and distributed by DND's contracting agent, as described in Section 8.2 of this Agreement:

One of the principal objectives of The Nunavut Land Claims Agreement is to provide Inuit with means of participating in economic opportunities through government contracting. Article 24 of the NLCA ("Government Contracting") provides full details of the Government of Canada's obligations to fulfill this objective. In the case of DEW Line Clean Up for which the Department of National Defence (DND) has responsibility, NTI and the Government of Canada, as represented by DND, have entered into an Agreement (see Annex XX of the SOI).

The principal mechanism to which NTI and DND have agreed for provision of economic benefit for Inuit is the use of a Minimum Inuit Employment Content (MIEC) and a Minimum Inuit Content for Contracting (MICC). Companies that are invited to submit tenders for the work following this SOI will be informed of the site specific MIEC and MICC. These levels will be set within the following ranges – MIEC (65-85%); MICC (60-75%). Contractors will be required to achieve the MIEC and MICC in the contract, and DND's contracting agent will monitor levels of MIEC and MICC based on a monthly plan submitted by the Contractor.

In the case of the MIEC the Inuit workforce must be made up of Inuit enrolled under the NLCA. Contractors must understand that they may need to recruit a workforce from a number of communities in Nunavut, and that a significant number of the workers have Inuktitut as their first language. DND's contracting agent will provide bidders with a list of Inuit who have indicated their interest in employment in Site clean-ups, including information regarding their work experience and qualifications. This list will be prepared by NTI approximately six months prior to the commencement of the clean-up of a given Site.

In the case of the MICC, Inuit firms used as Subcontractors must be drawn from the Inuit Firm Registry maintained by NTI.

Spill Contingency Plan

1. Contact Information

The Spill Contingency Plan (SCP) was prepared for the FOX-2, Longstaff Bluff landfill monitoring team. The SCP is effective as of June 1, 2013 and will be available as a stand-alone document to all team members and will also be posted on-site in the camp.

The landfill monitoring is being conducted as a follow up to the DEW Line Clean Up Project, as represented by the Department of National Defence and Defence Construction Canada. To request additional information, or additional copies of the SCP, please contact:

Tamara Van Dyck (DCC)

Director General Military Engineering | Directeur général - Génie militaire

National Defence Headquarters | Quartier général de la défense nationale

101 Colonel By Drive, Ottawa, ON K1A 0K2 | 101, promenade Colonel By, Ottawa ON K1A 0K2

2. Introduction

The following contingency plan presents the prescribed course of action to be taken in the case of an unanticipated spill event occurring during the landfill monitoring program at the FOX-2 site. The plan will enable the site team to maximize the effectiveness of the environmental protection response and meet all regulatory requirements for reporting to the appropriate authorities.

2.1 Scope and Purpose

The purpose of the plan is to:

- Provide a clear statement of the procedures to be followed in response to a spill;
- Minimize the potential environmental impact of a spill by establishing a pre-determined action plan;
- Protect the health and ensure the safety of the personnel involved in the Spill Response activities;
- Provide a reporting network for spills;
- Ensure site restoration;
- Identify the roles and responsibilities involved in the spill response activities; and
- Identify sufficient personnel, materials and equipment needed to make an adequate response to a spill.

2.2 Site Information

It is estimated that the camp operation will require minimal amounts of gasoline for the all-terrain vehicles, which will be purchased from the community and will not be stored. Each ATV will be equipped with a spill kit, in the event of an equipment leak.

2.3 Potential Safety Hazards

The most significant potential safety hazard related to a fuel spill at the FOX-2 site is the possible soil and water contamination from the spill. The ATV's will not be stopped in areas of ponded water or near streams to avoid this hazard. Although soil contamination is a real potential hazard, the likelihood is small, and potential spill volumes are small.

2.4 Environmental Mapping

The attached drawing shows the site plan.

2.5 Resource Inventory

The following equipment is typically on-site during a landfill monitoring program event: ATV, small spill kits, and shovels.

2.6 Training and Exercises

As the potential spill volume is small (20 L or less), no formal spill response training is typically provided. However, general spill response awareness and use of the spill clean-up materials is provided as part of the Health and Safety training for the site.

3. Response Organization

3.1 Roles and Responsibilities

The contractor will be responsible for spill response clean up in the event of a spill during the landfill monitoring activities at FOX-2. The responsibilities are described below.

- Ensure the team is aware of the spill kit locations and their use.
- Ensure sufficient materials and equipment are available for adequate response to fuel and hazardous material spills.
- Verbally report all spills to the DCC Project Manager as soon as practical.
- Stop or reduce discharge, if it is safe to do so.
- Make every effort to contain the spill.
- Deploy hand tools and absorbents to the spill site.
- Follow all guidelines and regulations for disposal of spilled materials and contaminated soil as established by appropriate government agencies.
- Document all events/actions.
- Report the spill to the Spill Report Line and follow up with a written spill report. This report shall summarize the initial report information; confirmation of spill volume; actions taken; future remediation/monitoring requirements; and a sketch map and/or photographs of the spill area.

3.2 Communications and Contacts

Intra-site communication is via two-way radios, and a satellite phone will be used for all other communications. The following table provides relevant contact numbers.

Resource	Location	Phone No.
24 Hour Spill Line	NWT/Nunavut	867-920-8130
Environment Canada	Environmental 24 hour Emergency	867-920-5131
Environment Canada	Enforcement Officer	867-975-4644
Government of Nunavut – Environmental Protection	Iqaluit	867-975-5907
Indian and Northern Affairs Canada – Water Resources Inspector	Nunavut Regional Office	867-975-4550
Indian and Northern Affairs Canada – Land Administration Minister	Nunavut Regional Office	867-975-4280
Department of Fisheries and Oceans	Nunavut Regional Office	867-975-8000
Defence Construction Canada (representatives for the Department of National Defence)	Environmental Officer – Tamara Van Dyck	613-995-9741
	Project Manager – LCol. David Eagles	613-943-7950

4. Action Plan

Gasoline could potentially be spilled at the FOX-2 site. The fuel will be stored in the original barrel in the upright position, so the potential spill volumes are relatively small and would only affect the immediate area around the camp, where the fuel will be stored.

4.1 Initial Action

In the event of a spill, protection of human health and safety is paramount. Contamination of personnel involved in a clean-up is a real possibility, as is contamination of the surrounding workplace and environment. The individual discovering a spill shall:

- Warn the people in the immediate vicinity and evacuate if necessary.
- Isolate or remove any ignition sources and take all safety precautions before approaching.
- Attempt to stop the leakage and contain the spill, if safe to do so.
- Deploy equipment and personnel to initiate containment and clean up, report to the DCC Project Manager.
- Prepare the Government of the Northwest Territories Spill Report Form.
- Notify all other pertinent parties, including the DND and other government agencies.

4.2 ATV Parking Area

In order to prevent spill or accidents at ATV parking area, the following procedures apply:

- Conduct ATV fuelling in a manner that avoids spillage. Operators are to be in attendance for the duration of the refuelling operation and are to ensure that all storage container outlets are properly sealed after use.
- Smoking is prohibited within 7.5 metres of the fuel storage facility.

5. Reporting Procedures

When reporting a spill to the 24 Hour Spill Report Line and completing the Nunavut Spill Report Form, the following information shall be included:

- Date and time of the spill;
- Location of the spill and direction the spill may be moving;
- Name and phone number of a contact person close to the location of the spill;
- Type of contaminant spilled and quantity spilled;
- Cause of the spill;
- Whether the spill is continuing or has stopped;
- Description of the existing containment;
- Action taken to contain, recover, clean up and dispose of spilled material;
- Name, address and phone number of the person reporting the spill; and
- Name of owner or person in charge, management or control of the contaminants at the time of the spill.

The spill report is to be submitted to the INAC Water Resources Officer no later than 30 days after initially reporting the spill to the spill report line. The contact list is provided in Section 2.2.



MATERIAL SAFETY DATA SHEET

Gasoline, All Grades

MSDS No. 9950

EMERGENCY OVERVIEW

DANGER!

**EXTREMELY FLAMMABLE - EYE AND MUCOUS MEMBRANE IRRITANT
- EFFECTS CENTRAL NERVOUS SYSTEM - HARMFUL OR FATAL IF
SWALLOWED - ASPIRATION HAZARD**



NFPA 704 (Section 16)

High fire hazard. Keep away from heat, spark, open flame, and other ignition sources.

If ingested, do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs). Contact may cause eye, skin and mucous membrane irritation. Harmful if absorbed through the skin. Avoid prolonged breathing of vapors or mists. Inhalation may cause irritation, anesthetic effects (dizziness, nausea, headache, intoxication), and respiratory system effects.

Long-term exposure may cause effects to specific organs, such as to the liver, kidneys, blood, nervous system, and skin. Contains benzene, which can cause blood disease, including anemia and leukemia.

1. CHEMICAL PRODUCT and COMPANY INFORMATION

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

EMERGENCY TELEPHONE NUMBER (24 hrs):
COMPANY CONTACT (business hours):
MSDS (Environment, Health, Safety) Internet Website

CHEMTREC (800)424-9300
Corporate Safety (732)750-6000
www.hess.com

SYNONYMS: Hess Conventional (Oxygenated and Non-oxygenated) Gasoline; Reformulated Gasoline (RFG); Reformulated Gasoline Blendstock for Oxygenate Blending (RBOB); Unleaded Motor or Automotive Gasoline

See Section 16 for abbreviations and acronyms.

2. COMPOSITION and INFORMATION ON INGREDIENTS *

INGREDIENT NAME (CAS No.)	CONCENTRATION PERCENT BY WEIGHT
Gasoline (86290-81-5)	100
Benzene (71-43-2)	0.1 - 4.9 (0.1 - 1.3 reformulated gasoline)
n-Butane (106-97-8)	< 10
Ethyl Alcohol (Ethanol) (64-17-5)	0 - 10
Ethyl benzene (100-41-4)	< 3
n-Hexane (110-54-3)	0.5 to 4
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0
Tertiary-amyl methyl ether (TAME) (994-05-8)	0 to 17.2
Toluene (108-88-3)	1 - 25
1,2,4- Trimethylbenzene (95-63-6)	< 6
Xylene, mixed isomers (1330-20-7)	1 - 15

A complex blend of petroleum-derived normal and branched-chain alkane, cycloalkane, alkene, and aromatic hydrocarbons. May contain antioxidant and multifunctional additives. Non-oxygenated Conventional Gasoline and RBOB do not have oxygenates (Ethanol or MTBE and/or TAME).



MATERIAL SAFETY DATA SHEET

Gasoline, All Grades

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Oxygenated Conventional and Reformulated Gasoline will have oxygenates for octane enhancement or as legally required.

3. HAZARDS IDENTIFICATION

EYES

Moderate irritant. Contact with liquid or vapor may cause irritation.

SKIN

Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are exposed repeatedly.

INGESTION

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

INHALATION

Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

CHRONIC EFFECTS and CARCINOGENICITY

Contains benzene, a regulated human carcinogen. Benzene has the potential to cause anemia and other blood diseases, including leukemia, after repeated and prolonged exposure. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with systemic toxicity. See also Section 11 - Toxicological Information.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE

Irritation from skin exposure may aggravate existing open wounds, skin disorders, and dermatitis (rash). Chronic respiratory disease, liver or kidney dysfunction, or pre-existing central nervous system disorders may be aggravated by exposure.

4. FIRST AID MEASURES

EYES

In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

SKIN

Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops.

INGESTION



MATERIAL SAFETY DATA SHEET

Gasoline, All Grades

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DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

INHALATION

Remove person to fresh air. If person is not breathing, ensure an open airway and provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES:

FLASH POINT:	-45 °F (-43°C)
AUTOIGNITION TEMPERATURE:	highly variable; > 530 °F (>280 °C)
OSHA/NFPA FLAMMABILITY CLASS:	1A (flammable liquid)
LOWER EXPLOSIVE LIMIT (%):	1.4%
UPPER EXPLOSIVE LIMIT (%):	7.6%

FIRE AND EXPLOSION HAZARDS

Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. Flowing product may be ignited by self-generated static electricity. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

EXTINGUISHING MEDIA

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO₂, water spray, fire fighting foam, or Halon.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

During certain times of the year and/or in certain geographical locations, gasoline may contain MTBE and/or TAME. Firefighting foam suitable for polar solvents is recommended for fuel with greater than 10% oxygenate concentration - refer to NFPA 11 "Low Expansion Foam - 1994 Edition."

FIRE FIGHTING INSTRUCTIONS

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

See Section 16 for the NFPA 704 Hazard Rating.



MATERIAL SAFETY DATA SHEET

Gasoline, All Grades

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6. ACCIDENTAL RELEASE MEASURES

ACTIVATE FACILITY SPILL CONTINGENCY or EMERGENCY PLAN.

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

7. HANDLING and STORAGE

HANDLING PRECAUTIONS

*****USE ONLY AS A MOTOR FUEL*****

*****DO NOT SIPHON BY MOUTH*****

Handle as a flammable liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents.

STORAGE PRECAUTIONS

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

WORK/HYGIENIC PRACTICES

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.



MATERIAL SAFETY DATA SHEET

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8. EXPOSURE CONTROLS and PERSONAL PROTECTION

EXPOSURE LIMITS

Component (CAS No.)	Source	TWA (ppm)	STEL (ppm)	Exposure Limits	Note
Gasoline (86290-81-5)	ACGIH	300	500	A3	
Benzene (71-43-2)	OSHA	1	5	Carcinogen	
	ACGIH	0.5	2.5	A1, skin	
	USCG	1	5		
n-Butane (106-97-8)	ACGIH	1000	--	Aliphatic Hydrocarbon Gases Alkane (C1-C4)	
Ethyl Alcohol (ethanol) (64-17-5)	OSHA	1000	--		
	ACGIH	1000	--	A4	
Ethyl benzene (100-41-4)	OSHA	100	--		
	ACGIH	100	125	A3	
n-Hexane (110-54-3)	OSHA	500	--		
	ACGIH	50	--	Skin	
Methyl-tertiary butyl ether [MTBE] (1634-04-4)	ACGIH	50		A3	
Tertiary-amyl methyl ether [TAME] (994-05-8)				None established	
Toluene (108-88-3)	OSHA	200		Ceiling: 300 ppm; Peak: 500 ppm (10 min.)	
	ACGIH	20	--	A4	
1,2,4-Trimethylbenzene (95-63-6)	ACGIH	25	--		
Xylene, mixed isomers (1330-20-7)	OSHA	100	--		
	ACGIH	100	150	A4	

ENGINEERING CONTROLS

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

EYE/FACE PROTECTION

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

SKIN PROTECTION

Gloves constructed of nitrile or neoprene are recommended. Chemical protective clothing such as that made of of E.I. DuPont Tychem®, products or equivalent is recommended based on degree of exposure.

Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

RESPIRATORY PROTECTION

A NIOSH-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection and limitations.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

9. PHYSICAL and CHEMICAL PROPERTIES

APPEARANCE

A translucent, straw-colored or light yellow liquid



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ODOR

A strong, characteristic aromatic hydrocarbon odor. Oxygenated gasoline with MTBE and/or TAME may have a sweet, ether-like odor and is detectable at a lower concentration than non-oxygenated gasoline.

ODOR THRESHOLD

	<u>Odor Detection</u>	<u>Odor Recognition</u>
Non-oxygenated gasoline:	0.5 - 0.6 ppm	0.8 - 1.1 ppm
Gasoline with 15% MTBE:	0.2 - 0.3 ppm	0.4 - 0.7 ppm
Gasoline with 15% TAME:	0.1 ppm	0.2 ppm

BASIC PHYSICAL PROPERTIES

BOILING RANGE:	85 to 437 °F (39 to 200 °C)
VAPOR PRESSURE:	6.4 - 15 RVP @ 100 °F (38 °C) (275-475 mm Hg @ 68 °F (20 °C)
VAPOR DENSITY (air = 1):	AP 3 to 4
SPECIFIC GRAVITY (H ₂ O = 1):	0.70 - 0.78
EVAPORATION RATE:	10-11 (n-butyl acetate = 1)
PERCENT VOLATILES:	100 %
SOLUBILITY (H ₂ O):	Non-oxygenated gasoline - negligible (< 0.1% @ 77 °F). Gasoline with 15% MTBE - slight (0.1 - 3% @ 77 °F); ethanol is readily soluble in water

10. STABILITY and REACTIVITY)

STABILITY: Stable. Hazardous polymerization will not occur.

CONDITIONS TO AVOID

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources

INCOMPATIBLE MATERIALS

Keep away from strong oxidizers.

HAZARDOUS DECOMPOSITION PRODUCTS

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke). Contact with nitric and sulfuric acids will form nitroresols that can decompose violently.

11. TOXICOLOGICAL PROPERTIES

ACUTE TOXICITY

Acute Dermal LD50 (rabbits): > 5 ml/kg	Acute Oral LD50 (rat): 18.75 ml/kg
Primary dermal irritation (rabbits): slightly irritating	Draize eye irritation (rabbits): non-irritating
Guinea pig sensitization: negative	

CHRONIC EFFECTS AND CARCINOGENICITY

Carcinogenicity: OSHA: NO IARC: YES - 2B NTP: NO ACGIH: YES (A3)

IARC has determined that gasoline and gasoline exhaust are possibly carcinogenic in humans. Inhalation exposure to completely vaporized unleaded gasoline caused kidney cancers in male rats and liver tumors in female mice. The U.S. EPA has determined that the male kidney tumors are species-specific and are irrelevant for human health risk assessment. The significance of the tumors seen in female mice is not known. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with effects to the central and peripheral nervous systems, liver, and kidneys. The significance of these animal models to predict similar human response to gasoline is uncertain.

This product contains benzene. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.



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Gasoline, All Grades

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This product may contain methyl tertiary butyl ether (MTBE): animal and human health effects studies indicate that MTBE may cause eye, skin, and respiratory tract irritation, central nervous system depression and neurotoxicity. MTBE is classified as an animal carcinogen (A3) by the ACGIH.

12. ECOLOGICAL INFORMATION

Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations. If released, oxygenates such as ethers and alcohols will be expected to exhibit fairly high mobility in soil, and therefore may leach into groundwater. The API (www.api.org) provides a number of useful references addressing petroleum and oxygenate contamination of groundwater.

13. DISPOSAL CONSIDERATIONS

Consult federal, state and local waste regulations to determine appropriate disposal options.

14. TRANSPORTATION INFORMATION

DOT PROPER SHIPPING NAME: Gasoline
DOT HAZARD CLASS and PACKING GROUP: 3, PG II
DOT IDENTIFICATION NUMBER: UN 1203
DOT SHIPPING LABEL: FLAMMABLE LIQUID

PLACARD:



15. REGULATORY INFORMATION

U.S. FEDERAL, STATE, and LOCAL REGULATORY INFORMATION

This product and its constituents listed herein are on the EPA TSCA Inventory. Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other federal, state, or local regulations; consult those regulations applicable to your facility/operation.

CLEAN WATER ACT (OIL SPILLS)

Any spill or release of this product to "navigable waters" (essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)

The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil, refined, and unrefined petroleum products and any indigenous components of such. However, other federal reporting requirements (e.g., SARA Section 304 as well as the Clean Water Act if the spill occurs on navigable waters) may still apply.

SARA SECTION 311/312 - HAZARD CLASSES

<u>ACUTE HEALTH</u>	<u>CHRONIC HEALTH</u>	<u>FIRE</u>	<u>SUDDEN RELEASE OF PRESSURE</u>	<u>REACTIVE</u>
X	X	X	--	--

SARA SECTION 313 - SUPPLIER NOTIFICATION

This product contains the following toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372:

<u>INGREDIENT NAME (CAS NUMBER)</u>	<u>CONCENTRATION WT. PERCENT</u>
Benzene (71-43-2)	0.1 to 4.9 (0.1 to 1.3 for reformulated gasoline)
Ethyl benzene (100-41-4)	< 3



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n-Hexane (110-54-3)	0.5 to 4
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0
Toluene (108-88-3)	1 to 15
1,2,4- Trimethylbenzene (95-63-6)	< 6
Xylene, mixed isomers (1330-20-7)	1 to 15

US EPA guidance documents (www.epa.gov/tri) for reporting Persistent Bioaccumulating Toxics (PBTs) indicate this product may contain the following de minimis levels of toxic chemicals subject to Section 313 reporting:

<u>INGREDIENT NAME (CAS NUMBER)</u>	<u>CONCENTRATION - Parts per million (ppm) by weight</u>
Polycyclic aromatic compounds (PACs)	17
Benzo (g,h,i) perylene (191-24-2)	2.55
Lead (7439-92-1)	0.079

CALIFORNIA PROPOSITION 65 LIST OF CHEMICALS

This product contains the following chemicals that are included on the Proposition 65 "List of Chemicals" required by the California Safe Drinking Water and Toxic Enforcement Act of 1986:

<u>INGREDIENT NAME (CAS NUMBER)</u>	<u>Date Listed</u>
Benzene	2/27/1987
Ethyl benzene	6/11/2004
Toluene	1/1/1991

CANADIAN REGULATORY INFORMATION (WHMIS)

Class B, Division 2 (Flammable Liquid)

Class D, Division 2A (Very toxic by other means) and Class D, Division 2B (Toxic by other means)

16. OTHER INFORMATION

<u>NFPA® HAZARD RATING</u>	HEALTH:	1	Slight
	FIRE:	3	Serious
	REACTIVITY:	0	Minimal
<u>HMIS® HAZARD RATING</u>	HEALTH:	1 *	Slight
	FIRE:	3	Serious
	PHYSICAL:	0	Minimal
			* CHRONIC

SUPERSEDES MSDS DATED: 07/01/06

ABBREVIATIONS:

AP = Approximately < = Less than > = Greater than
N/A = Not Applicable N/D = Not Determined ppm = parts per million

ACRONYMS:

ACGIH	American Conference of Governmental Industrial Hygienists	CERCLA	Comprehensive Emergency Response, Compensation, and Liability Act
AIHA	American Industrial Hygiene Association	DOT	U.S. Department of Transportation
ANSI	American National Standards Institute (212)642-4900		[General Info: (800)467-4922]
API	American Petroleum Institute (202)682-8000	EPA	U.S. Environmental Protection Agency
		HMIS	Hazardous Materials Information System



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IARC	International Agency For Research On Cancer	REL	Recommended Exposure Limit (NIOSH)
MSHA	Mine Safety and Health Administration	SARA	Superfund Amendments and Reauthorization Act of 1986 Title III
NFPA	National Fire Protection Association (617)770-3000	SCBA	Self-Contained Breathing Apparatus
NIOSH	National Institute of Occupational Safety and Health	SPCC	Spill Prevention, Control, and Countermeasures
NOIC	Notice of Intended Change (proposed change to ACGIH TLV)	STEL	Short-Term Exposure Limit (generally 15 minutes)
NTP	National Toxicology Program	TLV	Threshold Limit Value (ACGIH)
OPA	Oil Pollution Act of 1990	TSCA	Toxic Substances Control Act
OSHA	U.S. Occupational Safety & Health Administration	TWA	Time Weighted Average (8 hr.)
PEL	Permissible Exposure Limit (OSHA)	WEEL	Workplace Environmental Exposure Level (AIHA)
RCRA	Resource Conservation and Recovery Act	WHMIS	Workplace Hazardous Materials Information System (Canada)

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