7.4.2 Lake Road

Repairs to the Lake Road include repair of 240 m of road where minor washouts have occurred, and general grading along the remainder of the road. No import of fill from any of the prospective borrow sites is required for road repairs.

The equipment time and costs are listed in Table 6.

TABLE 6
COST ESTIMATE FOR THE LAKE ROAD

Description	Hours	Quantity	Unit Price	Cost
Dozer	8		$145	$1,160
Grader	8		$130	$1,040
			Subtotal	$2,200

7.4.3 Station Road

Most of the hauling of debris and landfill borrow on Station Road will be from Kilometre 3.0 onward. This will likely result in high two-way traffic between Kilometre 3.0 and the end of Station Road (Kilometre 5.9) whereas the use of first 3.0 kilometres of Station Road from the Junction to Kilometre 3.0 might be limited. Therefore, it may be feasible to upgrade the road in the first 3.0 kilometres so that it is suitable for seasonal temporary access sufficient to mobilize equipment to Kilometre 3.0 and provide a safe passage out in the event of an emergency.

Equipment hours and material quantities for Station Road repairs are based on the following assumptions and tasks:

General Repairs From Junction to Kilometre 3.0

There are several segments that will require regrading in this section of roadway between River Crossing 1 and River Crossing 2 in addition to sections of road between impasses which are discussed below. The existing roadway surface will be regraded using fill material from upslope of the road.

River Crossing 2

For estimating purposes EBA has assumed:

- For estimating purposes the installation two culverts on a boulder subbase has been assumed.
- The boulders to be used for the subbase along with the surface course can be sourced from the area or Borrow Area 1.
- The fill material will be sourced from Borrow Area 1.
- Development of Borrow Area 1 will require approximately three days of dozer time to gain access and stockpile material for the hauling.
- It has been assumed that three articulated haul trucks and a loader will be utilized for the hauling operation and an excavator will be used to place the material.
- Approximately 420 m^3 of fill material will be required.

Washout 1

- There is approximately 80 m of affected roadway.
- The culverts will need to be replaced.
- It is assumed that the existing roadway surface will be regraded using fill material from upslope of the road
- Approximately 100 m^3 of fill material will be required.

Washout 2

- There is approximately 60 m of affected roadway.
- A culvert will be installed at this location.
- It is assumed that the existing roadway surface will be regraded using fill material cut from upslope of the road
- Approximately 80 m^3 of fill material will be required.

Washout 3

- There is approximately 100 m of affected roadway.
- The installation of a culvert is recommended at this location.

- It is assumed that the existing roadway surface will be regraded using fill material cut from upslope of the road
- Approximately 100 m^3 of fill material will be required.

Washout 4

- A watercourse crosses the roadway at this location.
- There is approximately 95 m of affected roadway.
- The installation of a culvert is recommended at this location.
- It is assumed that the existing roadway surface will be regraded using fill material cut from upslope of the road
- Approximately 400 m^3 of fill material will be required.

Washout 5

- There is approximately 120 m of affected roadway.
- A culvert should be installed at this location.
- It is assumed that the existing roadway surface will be regraded using fill material cut from upslope of the road
- Approximately 145 m3 of fill material will be required.

An estimate of equipment time and costs for upgrading Station Road is presented in Table 7.

TABLE 7
COST ESTIMATE FOR THE STATION ROAD

Description	Hours	Quantity	Unit Price	Cost
Excavator	150		$ 155	$ 23,250
Articulated Haul Trucks[1]	200		$ 135	$ 27,000
Dozer	250		$ 145	$ 36,250
Loader	70		$ 130	$ 9,100
Grader	40		$ 130	$ 5,200
Culverts		12	$ 1,000	$ 12,000
			Subtotal	$112,800
		Assume additional 20% for equipment downtime etc.		$135,360

Note: [1] 3 Articulated Haul Trucks assumed

It is estimated that the road repairs can be completed in approximately 25 working days. Camp, supervisory costs and project management costs should be added to the construction costs.

8.0 QUALITY ASSURANCE

Construction monitoring and quality control are essential for satisfactory performance of the concepts presented in this report. Inspection by a geotechnical engineer with arctic experience is recommended during construction so that the required density and moisture conditioning critical to the design are achieved.

Liner installation (if required) should be monitored by qualified construction quality assurance personnel. Supplied materials should be inspected and conform to specifications.

9.0 POST CONSTRUCTION MONITORING

A post-construction monitoring program is recommended for the landfills. New landfills and closure landfills should be monitored visually for any signs of settlement, erosion, and ponded water. It is recommended that they be inspected three years after construction is complete. The monitoring program for the Soil Disposal Facility landfill should be carried out during the period required for the facility to achieve thermal equilibrium. Three to five years duration is suggested initially, with the program suspended or substantially downgraded as acceptable performance is confirmed.

The monitoring program for landfills should consist of: visual monitoring; thermal monitoring; surface water or active layer water monitoring.

Suggested monitoring requirements are described in the following sections.

9.1 Visual Monitoring Program

A visual monitoring program should be carried out on an annual basis, by a Professional Engineer registered in NT who is familiar with the requirements of the landfill remediation design. The inspector should look for any signs of distress, including:

- signs of damage or potential damage from settlement, ponding, thermal instability, frost action, or erosion. The visual observations should be supported by simple elevation surveys and photography; and

- damage to the above-ground portions of groundwater monitoring devices or thermistors.

9.2 Thermal Monitoring

A thermal monitoring system should be implemented if freezeback designs are employed. A thermal/monitoring program would allow verification of predicted ground temperatures within the landfill structures. It is recommended that two ground temperature cables be installed within the central area of the landfill and two ground temperature cables be installed in the containment berms around the landfill. The cables should be installed in drill holes, inside a 25 mm diameter PVC casing, and backfilled with dry sand to eliminate air voids.

9.3 Ground Water or Surface Water Monitoring

Water quality should be monitored within 30 m of the facility. Monitoring should be carried out in existing surface waters or by using monitoring wells installed through the active layer. Samples of water should be obtained from the base of the active layer for testing at the end of the summer season. Baseline water quality data should be determined before any waste is placed in the facility. Representative background conditions should be measured approximately 200 m from the facility.

The results of monitoring during subsequent years should be analyzed and compared to the baseline data and monitoring data from previous years to identify any changes in water quality.

10.0 LIMITATIONS

This report pertains to the specific site and development described in Section 1.0. Isolated information should not be reproduced, transferred, or used outside the context of this report unless clearly referenced to the source. EBA Engineering Consultants Ltd. will not be responsible for unauthorized reuse or interpretation of information presented herein.

This report summarizes the data collected by EBA during the 2004 Geotechnical Investigation. It is recommended that EBA be given the opportunity to review or develop the details of the final design. It is also recommended that geotechnical, materials and environmental engineering field services, such as backfill and drainage measures and testing of soil density and gradation, be performed as construction proceeds to ensure that the design intent is met.

The design concepts presented in this report are based on analyses that demonstrate their feasibility. Certain assumptions pertaining to soil properties, active layer thickness and ground temperatures have been made based on regional knowledge of the terrain and engineering judgement. Engineering inspection during construction must be planned to observe and report site conditions such as active layer depth, soil texture and water content and groundwater conditions encountered during excavation. This data must be reviewed by the geotechnical engineer to confirm that the design intent will be met.

No thermal analysis has been completed to date for the design of a Soil Disposal Facility. Should a facility be required, further analyses are required for final design.

It should be noted that geological conditions are innately variable and are seldom spatially uniform. Stratigraphic information has been based on shallow testpits and surface exposures. In order to develop recommendations from this information, it is necessary to make assumptions concerning the stratigraphy. Adequate monitoring should be provided during construction to check that these assumptions are reasonable. Further conditions are presented in Appendix D, "Geotechnical Report – General Conditions."

11.0 CLOSURE

This report has been prepared in accordance with generally accepted engineering practices and judgement has been used in developing recommendations. No other warrant is made, either expressed or implied.

Respectfully submitted,
EBA Engineering Consultants Ltd.

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EBA Engineering Consultants Ltd., 1996. Geotechnical Evaluation and Preliminary Design for the Clean Up of FOX-C DEW Line Site Sarcpa Lake, NWT. Submitted to UMA Engineering Ltd. November 1996.

RRMC 1993. Environmental Study of Eleven DEW Line Sites. Prepared by Royal Roads Military College Environmental Science Group.

Sinanni Inc. and Qikiqtaaluk Corporation, 2001. Engineering Design (95% submission) and Cost Estimates for the Clean up of Ekalugad Fjord (FOX-C): Intermediate Dew Line Site

PHOTOGRAPHS

Photo 1
Main Dump looking west

Photo 2
Main Dump looking east.

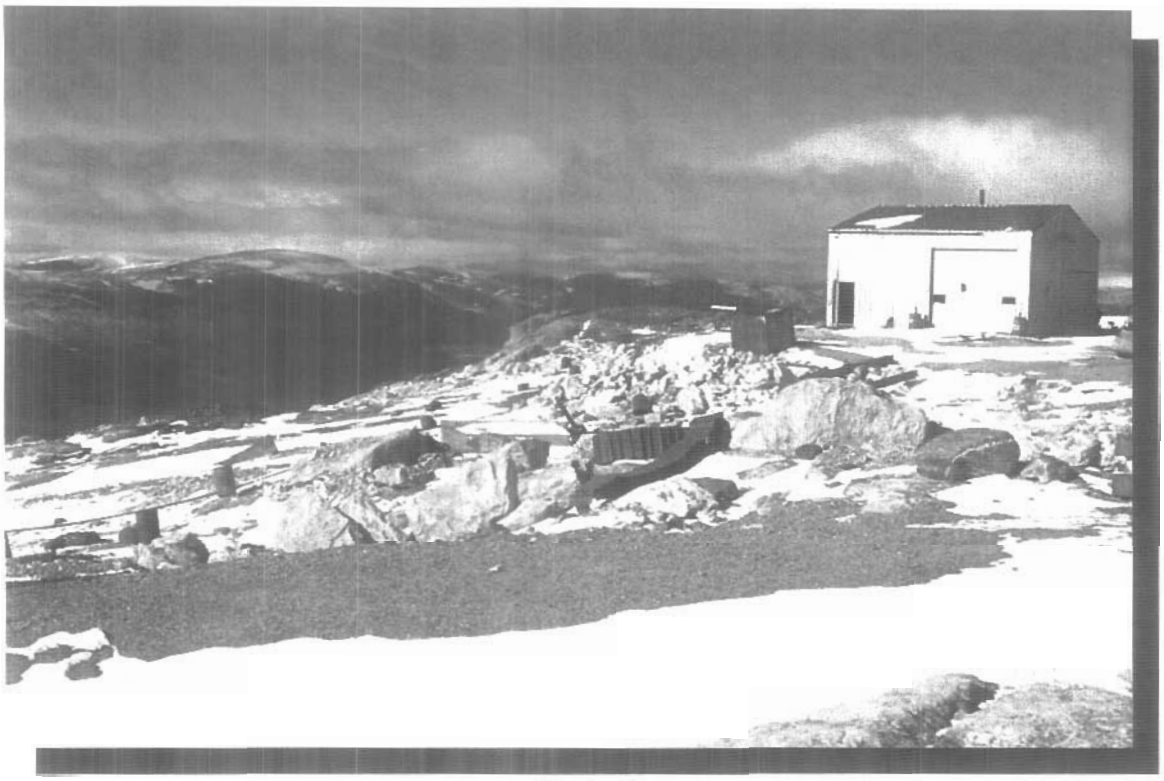

Photo 3
Garage Dump looking southwest, Lobe A in foreground.

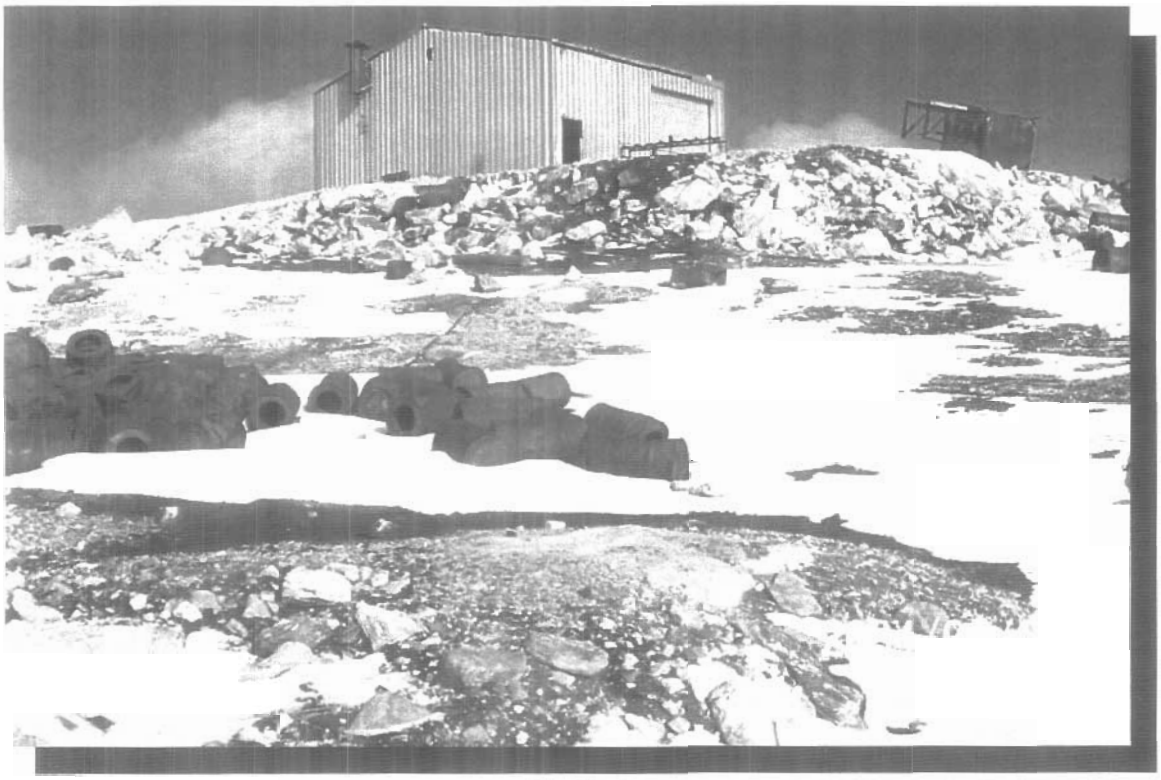

Photo 4
Garage Dump looking north, Lobe B in foreground.

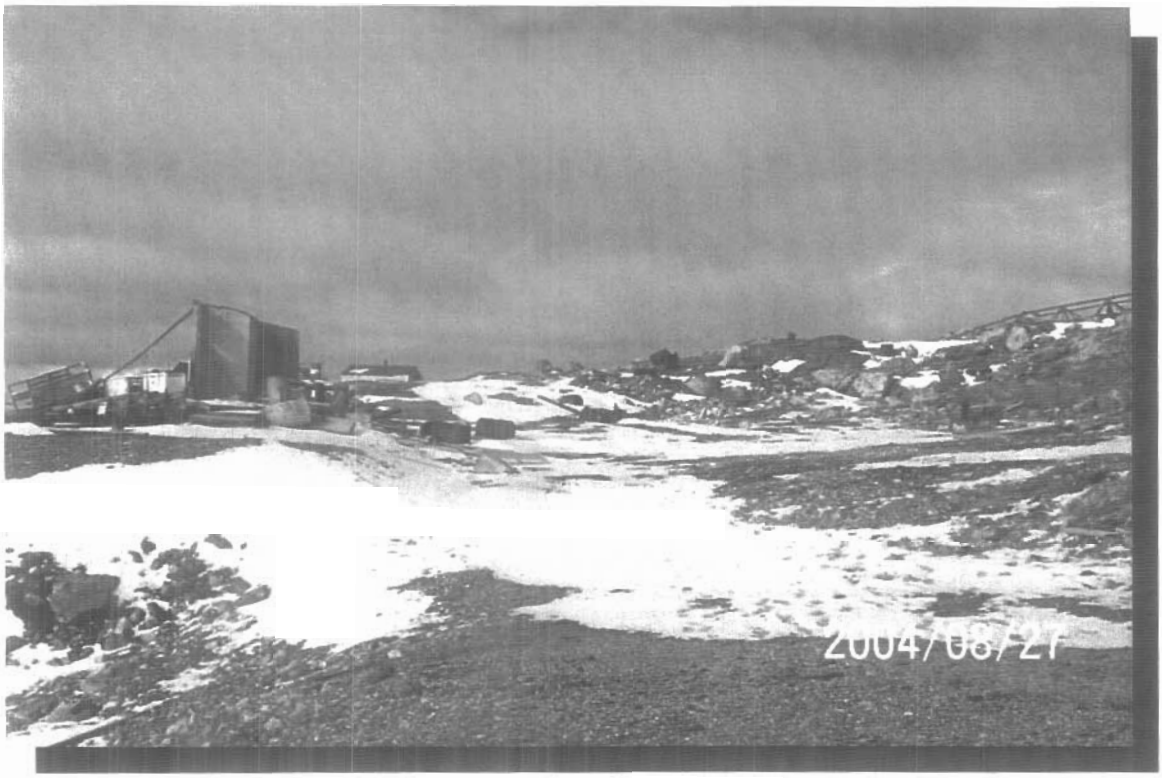

Photo 5
House Dump looking west, remnants of Inuit house on left, House Dump on right.

Photo 6
House Dump looking north.

Photo 7
Original Dump looking southwest, west side of Station Road.

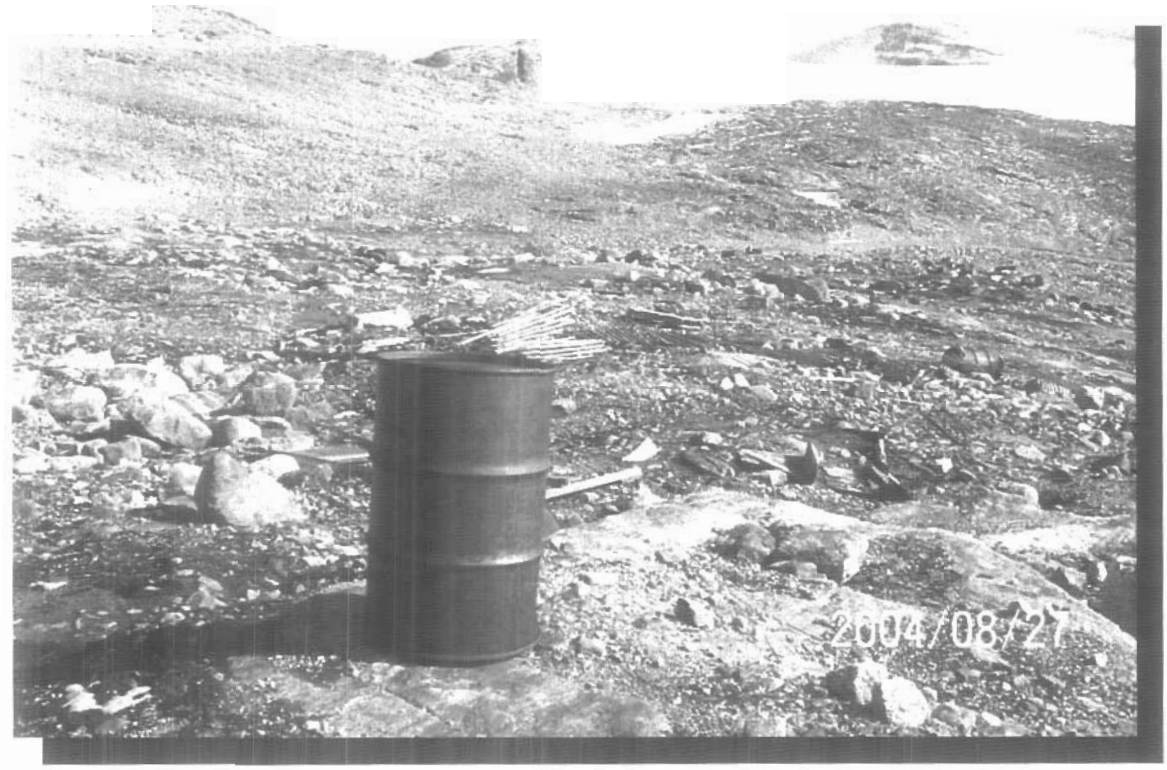

Photo 8
Original Dump looking southwest, east side of Station Road.

Photo 9
Midstation Dump Lobe A looking northwest, pad area.

Photo 10
Midstation Dump looking north, Lobe B.

Photo 11
Midstation Dump looking north, Lobe B in foreground.

Photo 12
Midstation Dump looking east, toe of Lobe B.

Photo 13
West Laydown Debris Area looking east, Lobe A in foreground, Lobe B in background.

Photo 14
East Laydown Debris Area looking west, Lobe B in foreground.

Photo 15
Beach POL Debris Area looking northeast, Lobe A in background.

Photo 16
Potential Debris Landfill Location 2 looking northwest, barrel cache in background.

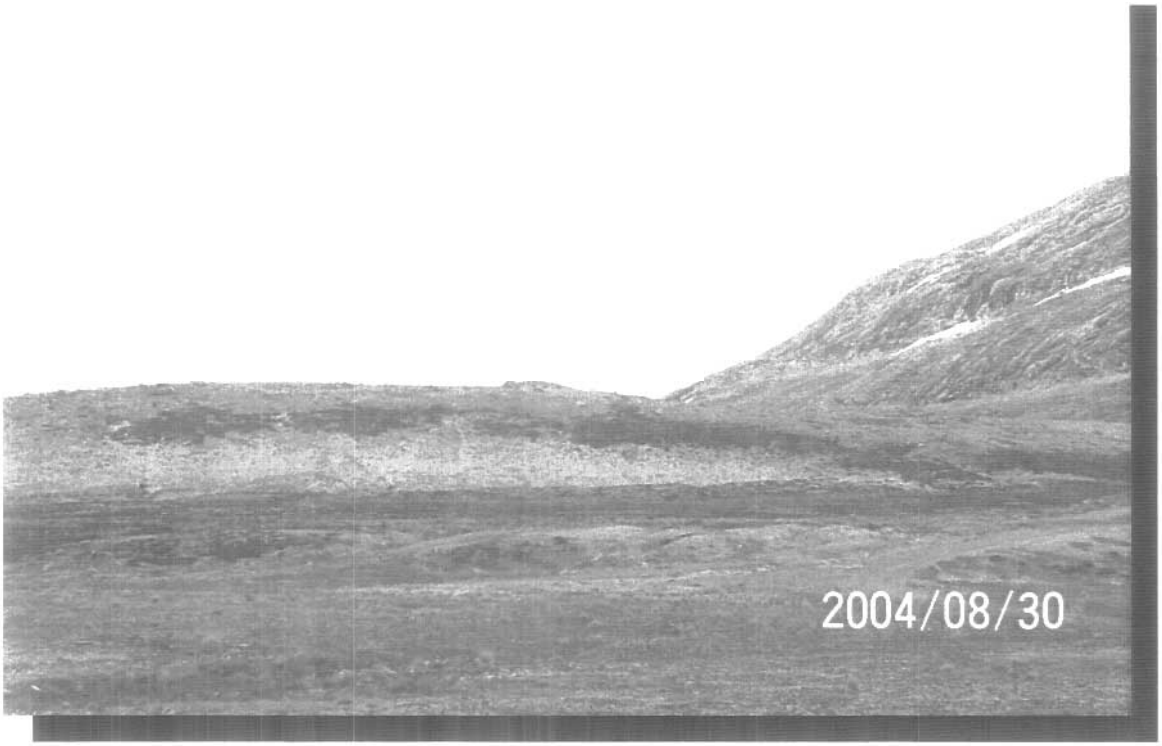

Photo 17
Potential Debris Landfill Location 3 looking west.

Photo 18
Potential Debris Landfill Location 4 looking west.

Photo 19
Potential Debris Landfill Location 4 looking southwest.

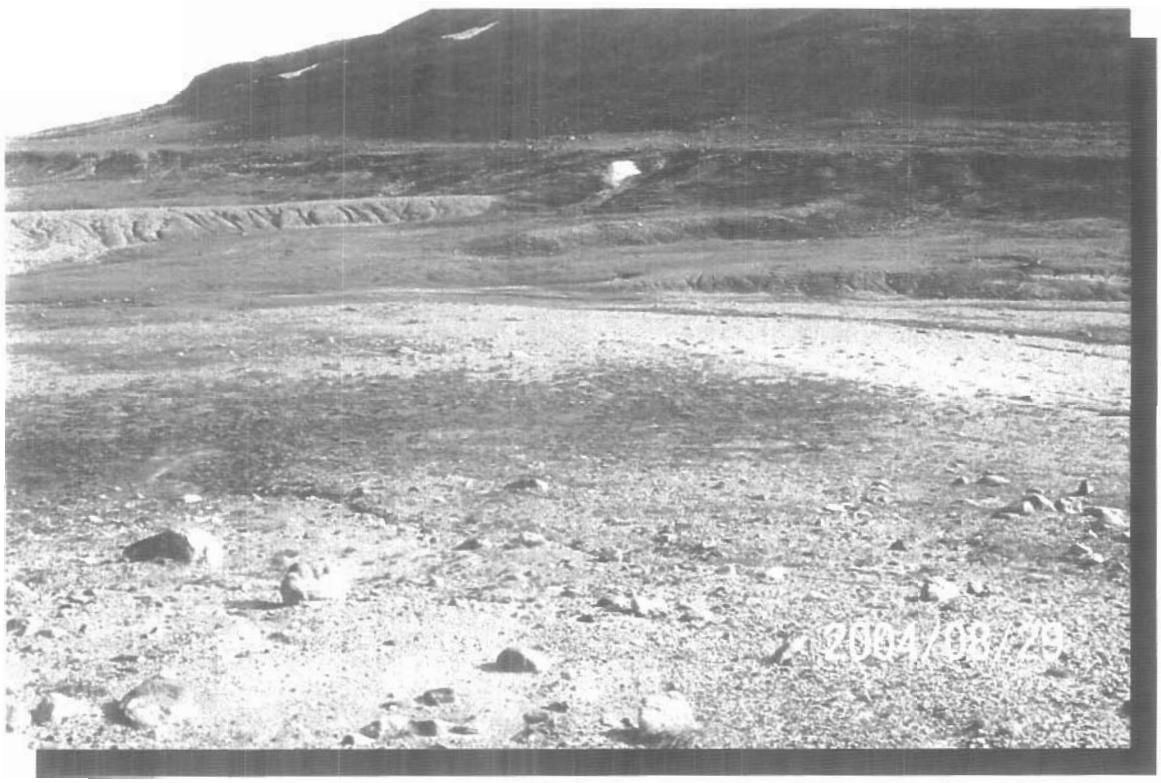

Photo 20
Potential Soil Disposal Facility Location 1 looking northeast.

Photo 21
Proposed Borrow Area 1 looking west.

Photo 22
Proposed Borrow Area 1 looking north.