Photograph 5.6: Liner installation

Covering of the landfill with the final clean soil layers

Three lifts of clean soil of different grades have been spread on the final membrane layer; Type 4, type 2 and then Type 1.

Approximately 2,400 m^3 type 4 (from Radio Hill borrow pit) was placed and compacted over the membrane layer. The type 4 layer placement was initiated on August 16 and completed on August 18. A survey was then done.

An approximative type 2 volume of 5,700 m^3 (from Airstrip borrow pit and Lake #2) was spread in two compacted lifts over the type 4 layer. The type 2 layer placement was initiated on August 18 and completed on August 22. Much attention was put on the compaction of the type 2 layer in order to avoid any deviancies from specifications.

Once the compaction was completed, approximately 3,800 m^3 type 1 (from Radio Hill, Airstrip borrow pit) was placed over the type 2 layer. A survey was done. The on-site representative from EBA/UMA company gave his final approval on August 25: the Tier II Landfill construction complied with the specifications.

On August 29, after the EBA representative and the landfill foreman departure, the EBA company notified the superintendent that, based on the last survey, the Tier II landfill did not meet the specifications. The final elevations on the south-west part of the landfill were apparently too low.

To respond to this issue, QC decided to take the following actions:

- all the heavy equipment were remobilised,
- test pits were done in order to find some more type 1 graded clean soil,

- a new surveyor was contacted as the foreman (also surveyor) had left the site.

To comply with UMA/EBA's demand, an area of 60 m × 15 m was delimited using paint and markers. Approximately 430 m^3 type 1 (from Radio Hill, S1/S4 Valley) was placed. A final survey of the landfill was done on September 5 by a new sub-contractor requested at the last minute. Unfortunately, the survey results are not satisfying due to discrepancies with previous topographic results.

Photograph 5.7: Type 4, type 2 and type 1 layers

The volumes of each type of material used in the construction of the Tier II landfill are presented in Table 5.2. The 2005 As-Built Drawings present the Tier II landfill construction work conducted during this past season.

Table 5.2: Volumes of granular materials used for landfill construction in 2005

Materials	Type 1	Type 2	Type 4	Total
Volumes (m^3)	4,215	7,824	7,694	19,733

5.3- Other Related Activities

Thermistors

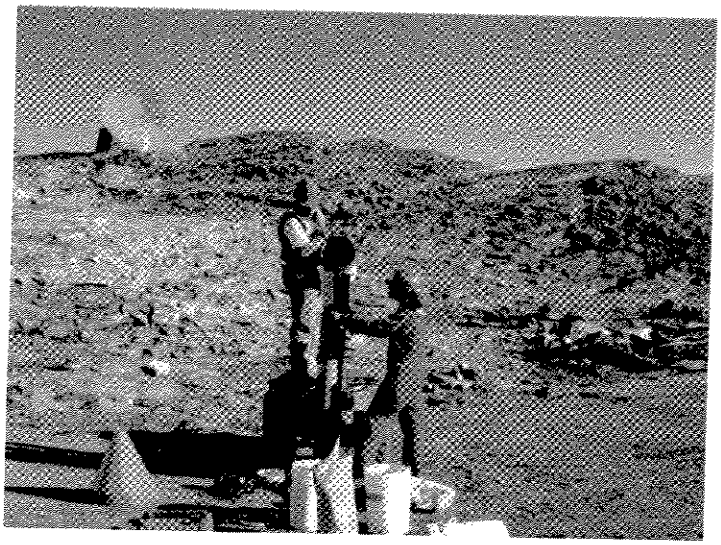
The installation of two (2) thermistors in the landfill south berm core planned for the 2004 season was done during the 2005 season.

The drilling of the two (2) boreholes was done on June 29 using the airtrack. The drilling depth of the south east berm thermistor is 5,75 m and the drilling depth of the south west thermistor is 1,75 m. The PVC pipes were installed and the top of the pipe was covered with a protective cap. The ground temperature cables and the waterproof housing for the dataloggers were installed on August 20. The filling with silica sand and cement grout was completed on August 23. The same day, the dataloggers were set up.

Initially, four (4) thermistors had to be installed inside the landfill; according to the EBA on-site engineer, only two (2) in addition to those mentioned above were finally required. The drilling was scheduled once the type 4 layer was completed (underneath the final membrane layer). One (1) technician from the specialized drilling contractor Sonic Soils drilled the boreholes as per Specifications using the grapple and Sonic augers. Due to the concrete-like characteristics of the soil, the drilling (August 6) was unsuccessful despite nine (9) different drilling locations attempts. The day after, with the approval of EBA/UMA, the airtrack was used successfully to drill the two (2) boreholes. The east borehole was 2,5 m depth and the west borehole was 2 m depth from the top of the type 4 layer.

The PVC pipes were installed and the top of the pipe was covered with a cap. The ground temperature cables and the waterproof housing for the dataloggers were installed on August 20; the filling with silica sand and cement grout was completed on August 23. The same day, the dataloggers were set up.

The first data were downloaded on August 31 and sent to UMA/EBA. All the information regarding the thermistors installation are presented in the Appendix 7.



Photograph 5.8: Thermistor installation and filling

6- OTHER ACTIVITIES

Other activities planned and carried out during the 2005 field season included:

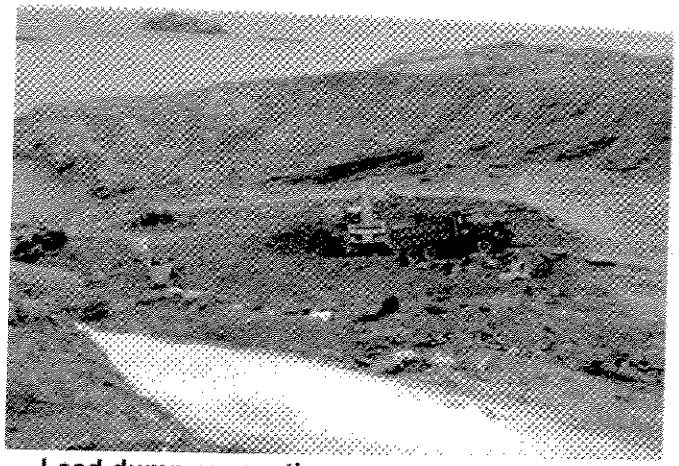
- Excavation and landfilling of metal contaminated soils at the lead dump, cobalt dump and North slope dump,
- Incineration of waste POL products,
- Filtration of the contaminated fuel in the fuel tanks,
- Non-hazardous waste shredding and landfilling,
- Excavation and containerization of heavy hydrocarbon contaminated soils,
- Excavation of light hydrocarbon contaminated soil for landfarming,
- S4 building slab covering,
- Dismantling and landfilling of the three (3) POL tanks,
- Installation of two (2) monitoring wells at the maintenance dump,
- Renovation of the training center,
- Assistance to ASU in constructing barriers and landfarm tilling,
- Road maintenance.

The following sections describe these activities in detail.

6.1- Excavation and landfilling of metal contaminated soils

6.1.1.- Lead dump

After the removal of all remaining debris on the top surface of the dump (mainly drums), ASU conducted soil testing to delineate Tier I and Tier II contaminated soils. The excavation of Tier II and Tier I soils contaminated with heavy metals (lead) was initiated on July 15 and was completed on August 01. Approximately 740 m^3 of Tier II soil and 1,025 m^3 of Tier I soil was removed from the lead dump and hauled to the Tier II Landfill.



Photograph 6.1: Lead dump excavation

6.1.2.- Cobalt dump

The excavation of Tier II soils contaminated with cobalt was initiated and completed on July 24. Approximately 180 m^3 of Tier II soil was removed from the cobalt dump and hauled to the Tier II Landfill.

Photograph 6.2: Cobalt dump excavation

6.1.3.- North slope dump

The excavation of Tier II soils contaminated with heavy metals (copper) was initiated and completed on July 31. Approximately 40 m^3 of Tier II soil was removed from the North slope dump and hauled to the Tier II Landfill.

6.2. Incineration of waste POL products

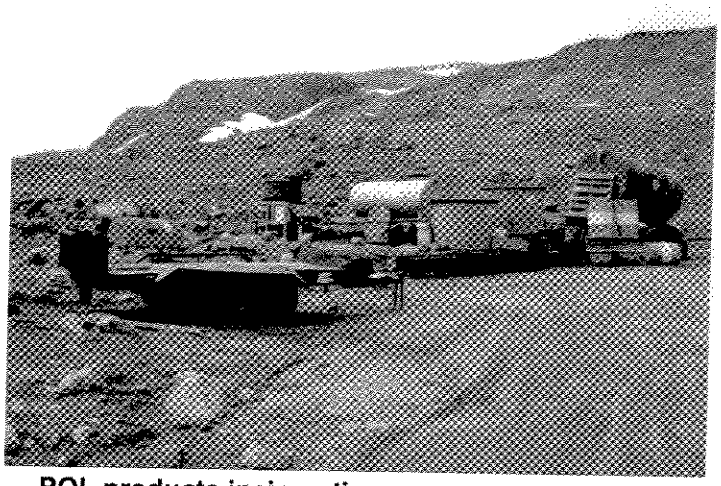
Management of drums and POL (Petroleum, Oil and Lubricants) waste products continued and completed during the 2005 season. First, the incineration platform was remobilized beside the west beach POL tank at the beach on July 10 and demobilized on August 20.

The main activity consisted in the processing and incineration of the remaining drums of waste oil. Another activity consisted in the incineration of the contaminated fuel issued from the successive filtrations operated on the fuel tanks earlier in the season. 6,000 L of fuel contaminated with water was incinerated. Associated operations such as drum pumping and drainage, as well as phase separation and water treatment were also carried out.

During the 2005 field season, the incinerator was operated for a 39-day period. The system ran 11 hours/day with one operator. A total of 170 drums were pumped into the system and about 17,000 liters of waste oil were incinerated. The average burning rate of the incineration system was 130

liters/hr.

The water phase which settled at the bottom of the feeding tank was processed through the oil-water separator. The empty drums were temporarily stockpiled nearby and then hauled to the beach shredder. The shredded drums were dumped into the Beach Non-Hazardous landfill (see section 6.4).

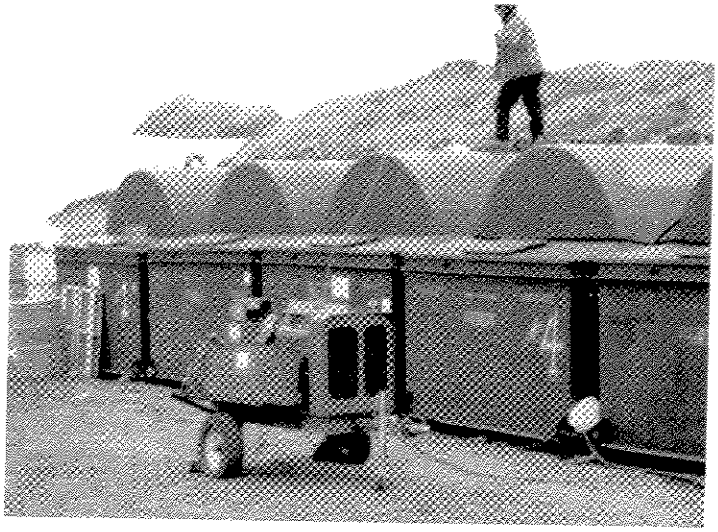


Photograph 6.3: POL products incineration

6.3. Remediation of fuel contaminated with water

Prior of the transfer of 50,000 L of clean fuel from NWS tanks, the project's fuel tanks located at the beach area have been emptied and cleaned. Some water had contaminated the fuel during the winter time and the fuel also needed to be filtered. Two (2) technicians from the company SANEXEN were involved in the decontamination process.

- The tanks 2, 6, 7 and 8 were almost emptied; their content has been transferred in the tank 1 to allow their cleaning.
- The tanks 3, 4 and 5 were contaminated with water; after a first filtration, the fuel was transferred in the tanks 6, 7 and 8. The tanks 3, 4 and 5 were then cleaned. The fuel underwent a second filtration and was transferred to the tanks 3, 4 and 5.
- The fuel contained in the tank 1 (almost 6,000 L) was transferred in a wheel tank to allow its incineration (POL incineration area).



Photograph 6.4: Fuel filtration

6.4. Non-Hazardous Waste Shredding and Landfilling

Various type of waste and debris from various origins were hauled to the beach and camp non-hazardous (NH) landfills for shredding and/or disposal. These waste materials include:

- communication dish debris from the S1/S4 valley area (across the landfill);
- creosote telephone poles and timbers;
- red vaults (emptied from Tier II soil);
- metal pieces from the torn down POL tanks;
- old tanks (S1/S4 valley, beside the landfill);
- old heavy equipment pieces: trucks, snow blower, bulldozer;
- all old pipes: POL and water pipes dismantled from the camp to the beach;
- empty drums gathered from various locations,
- scattered debris (metal, wood...) gathered from various areas (Lead dump, Beach area, Radio Hill, Old antennae, North slope dump, Old fresh water lake...); and,
- empty drums from the incineration platform.

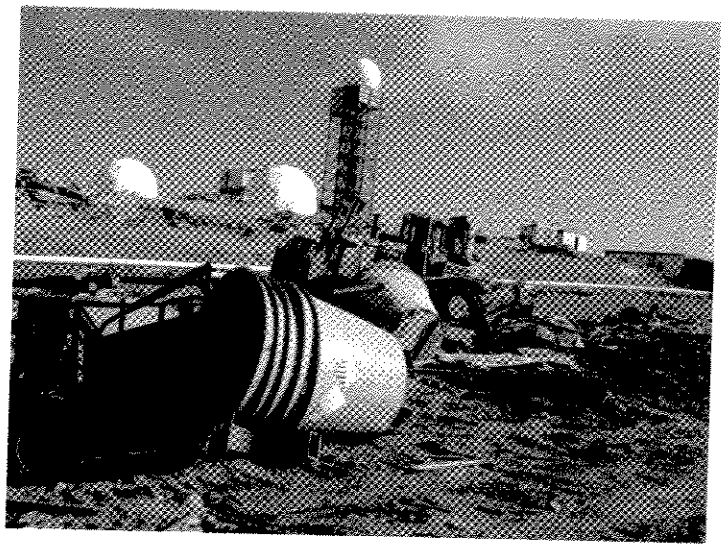
Lighter metal debris such as empty drums were shredded, and disposed of in the non-hazardous waste landfill, while bulkier metal debris were dumped directly into the landfill. Regularly, the landfill debris were compacted by driving the D7 bulldozer on top of the debris pile.

Most creosote telephone poles on site were cut down in 2003 and during the 2004 season, all remaining poles were cut. However during the 2005 season, a few remaining creosote telephone poles and timbers were collected and stockpiled along the road in various areas. These poles, along with creosote timbers used for various purposes on site, were collected and hauled down to the beach NH waste landfill. A polyethylene lined cell was setup in the landfill. The stockpiled poles and timbers were placed in the cell. The cell was covered with a polyethylene liner and with gravel

fill.

One of the pipe connecting the POL tanks at the beach area was found to contain diesel. Diesel was recovered in a plastic container and then transferred to salvage drums About 1500 liters of diesel was recovered. Small quantities of diesel spilled on the ground. Some potentially diesel contaminated soil (about 0.1 m^3) was excavated and placed in small buckets prior to appropriate disposal. Sorbent material was rapidly placed down-gradient from where fuel was spilled to avoid further contamination.

At the beginning of the season, estimates of the total non-hazardous waste volume remaining on site, as well as the available capacity remaining in the Beach and Camp non-hazardous waste landfill were made. The calculations were made to verify if an additional non-hazardous waste landfill location was required. The results showed that the remaining capacity of existing sites was sufficient to receive all remaining non-hazardous waste at Resolution Island. The details of the above mentioned estimates are provided in the Appendix 7.



Photograph 6.5: Debris landfilling

6.5. Excavation and containerization of heavy hydrocarbon contaminated soils

Heavy hydrocarbon contaminated soils (otherwise refers to oily soils) from the Barrel Cache were excavated and containerized in 26 small steel containers. In addition, four (4) similar containers were filled with heavy hydrocarbon contaminated soils previously containerized in wooden boxes and, one (1) was filled with contaminated soils from the POL tank area across the Tier II landfill.

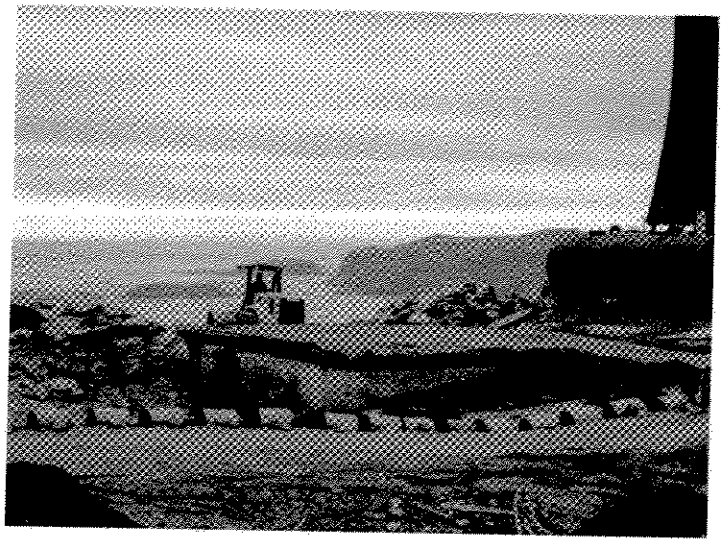
A total of 31 small containers were used to containerize heavy hydrocarbon contaminated soils. All of them were properly labelled and shipped South to the company Horizon Environnement for disposal.

6.6. Excavation of light hydrocarbon contaminated soil

Light hydrocarbon soil was excavated at the beach area (between POL tanks) and placed in two (2) large steel containers (3.1 m^3). Based on ASU's available results, no additional light hydrocarbon contaminated soil was remaining on site and therefore nothing was hauled to the landfarm. Towards the end of the season, the two steel containers were shipped to McGill University as part of a research project[2].

6.7. S4 slab building covering

Once all Tier I and Tier II PCB contaminated soil were excavated in the close vicinity, the slab of the S4 building, demolished during the 2004 season, was covered with approximately 280 m^3 of clean soil (pit run) excavated from the Airstrip borrow pit.



Photograph 6.6: S4 building slab covering

6.8. POL tanks dismantling

The imploded POL tank across the Tier II landfill was torn down at the beginning of the season using a Caterpillar 322BL Excavator equipped with a sharp tooth ripper. After complete dismantling, some hydrocarbon contamination was suspected. ASU's analysis revealed the presence of heavy hydrocarbon contaminated soils. These soils were excavated and containerized in one small container (see section 6.5).

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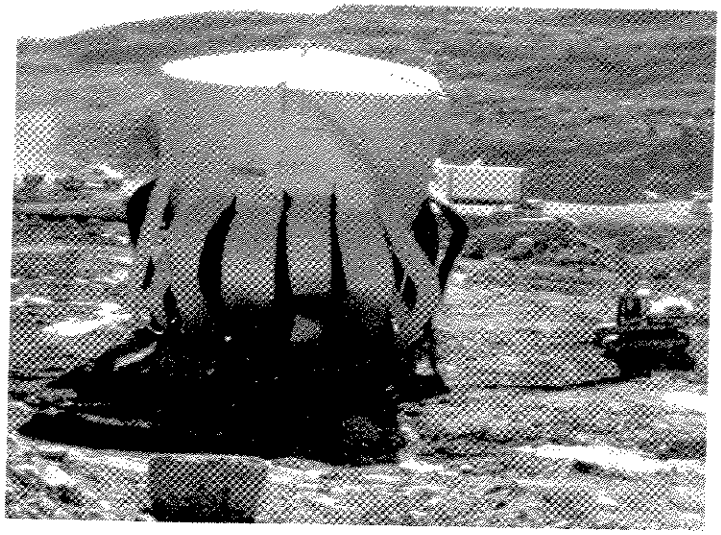
[2] The marine shipment and road transportation of these 2 containers (plus 2 containers of clean soil) were paid directly by Qikiqtaaluk Environmental Inc, as part of their funding commitment to the research project: Ghoshal, S. And L. Whyte, "Bioremediation of Petroleum Hydrocarbon Contaminated Soil in Arctic and Sub-Arctic Conditions", McGill University, 2005.

The two (2) POL tanks located at the beach area were demolished on August 20 and 21 using the ripper. All metal pieces were cut and hauled to the beach non-hazardous landfill. ASU was requested to do analysis (refer to ASU report for results).



Photograph 6.7: POL tanks dismantling

6.9- Monitoring wells at the cobalt dump

In 2005, two monitoring wells were installed at the cobalt dump downstream the Tier II contaminated area. The boreholes were dug on June 30 using the airtrack and installation was done as per specifications. However, one of the hole (located the closest from the contaminated area) was rapidly filled with muddy water (due to the high groundwater table). Therefore, the installation could not be completed with sand and bentonite and the steel piping ended up being stuck in the ground. Despite a few attempts, it was impossible to remove either the mud or the pipe. As a result, another borehole was drilled just beside at the end of the season and the installation was completed as per specifications.

The two (2) wells were labeled as followed:

- MW9 for the monitoring well located 10 m from the contaminated area,
- MW10 for the one located 20 m from the polluted area.