UMA | AECOM

DEW Line Clean-up Project

CAM-4 Pelly Bay

Baseline Landfill Monitoring

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1.0 CAM-4 Pelly Bay

1.1 Introduction

The CAM-4 Pelly Bay DEW Line site is located on the Simpson Peninsula, Nunavut, at 68^{o} 27' north latitude and 89^{o} 45' west longitude. The site is located approximately 20 km southeast of the community of Kugaaruk (formerly Pelly Bay) and 7 km inland of Pelly Bay. A full range of commercial services is available in Kugaaruk, and there is commercial airline access to the community. A road connecting the DEW Line site and community was built and maintained during site clean-up; however, road maintenance was discontinued following clean-up. An unmaintained airstrip is also present at the lower site area of the DEW Line site.

CAM-4 was decommissioned in 1992 after being an auxiliary DEW Line station. At a distance 200 m west of the original station, a new Short-Range Radar (SRR) North Warning Site (NWS) was constructed in 1990. The environmental clean-up and demolition of facilities not required for the operation of the SRR site commenced in 2001 and was completed during the summer of 2006. The clean-up included the closure and remediation of four existing landfills as well as the construction of two landfills for the disposal of non-hazardous wastes generated from demolition, and collection of site debris, and a Tier II Soil Disposal Facility for disposal of Tier II impacted soils. These landfills, as shown on the overall site plan, Figure CAM-4.1, include:

- Station Non-Hazardous Waste Landfill;
- Tier II Soil Disposal Facility;
- Upper Site Landfill;
- Lower Site Non-Hazardous Waste Landfill; and
- Lower Site Landfill.

The site investigation of CAM-4 was carried out in 1997 and 1999. Additional delineation of hydrocarbon impacts in the vicinity of the Station Non-Hazardous Waste Landfill was completed during the early stages of site clean-up. The engineering component of the assessment was completed by UMA Engineering Ltd. (UMA) and the environmental component by the Environmental Sciences Group (ESG). Input on traditional land use was provided by Nunavut Tunngavik Incorporated (NTI). Design requirements for landfill closure were based up the geophysical and geotechnical investigations performed by UMA and EBA Engineering Consultants Ltd. (EBA), and the environmental data provided by ESG.

In accordance with the NTI-DND Cooperation Agreement, landfill monitoring will be carried out following cleanup of the site. The monitoring schedule for the CAM-4 Pelly Bay site is provided in Table 1.1. Shaded rows indicate the monitoring events conducted internally by the DEW Line Clean-up project team.

This report has been prepared as a summary of the baseline monitoring carried out at CAM-4 Pelly Bay. Soil and groundwater sampling was done by ESG, with analytical work performed by Queen's University and the Royal Military College laboratories in Kingston, Ontario. The final construction inspection of the landfills was carried out by EBA and UMA.

The following sections provide an overview of the site biophysical environment and traditional land use activities, site background conditions, the general monitoring program, and the basis for evaluation of monitoring results.

Table 1.1: Monitoring Schedule - CAM-4 Pelly Bay

No. of Years After Construction	Monitoring Event Number	Year
Prior to and during	Baseline	1999/2000, 2001-2006
1	1	2007
2	2	2008
3	3	2009
4	4	2010
5	5	2011
7	6	2013
10	7	2016
15	8	2021
25	9	2031

1.2 Background

1.2.1 Geology and Background Geochemical Conditions

CAM-4 is dominated by rough terrain. The majority of the site consists of Precambrian gneiss and granite bedrock. The bedrock tends to be frost shattered and has boulders up to 3 m in size. In low lying areas silty sand and gravel, and organic matter fill the space between the boulders. The boulders are found from near surface to several metres below ground in low lying areas.

There were four terrain units identified in the vicinity of the CAM-4 site. Terrain Unit 1 consists of three subunits. The first is mostly boulder covered bedrock with a cover in places of finer textured material. This comprises the terrain down-gradient of the Station Non-Hazardous Waste Landfill, and the terrain surrounding the Upper Site Landfill. The second subunit encompasses the overall, disturbed, station area, including the location of the Tier II Disposal Facility, and the up-gradient area of the Station Non-Hazardous Waste Landfill. It consists of coarse grained sands and gravels with boulders and fractured bedrock throughout. The drainage is radial away from the site, which sits at the highest point. The third subunit is down-gradient of the second subunit and includes an area of sheared bedrock adjacent to a southeast facing slope, down-gradient of the Upper Site Landfill. Drainage from the eastern side of the upper site is directed toward this unit, and accumulates within an elongate gently curved linear water body approximately at the midpoint of the unit.

Terrain Unit 2 consists of cobbles, sand and gravels distributed on a continuous, thin covering within the bedrock uplands. Surfaces are inclined with various slopes. The gravely surface materials are highly pervious and drainage is controlled by slope direction, which varies throughout the landscape. This unit generally surrounds unit 1 to the northeast, north, and west.

Terrain Unit 3 is extensively deformed rock that occurs between the upper and lower site areas. The area is a well developed shear zone and is very rugged. Surface materials consist of rock covered by a discontinuous layer of rubble made up of cobble, sand, and gravel sized material. Drainage is controlled by the structural grain of deformation. The water bodies within the base of the valley are oriented roughly parallel to the strike of the shear planes.

Terrain Unit 4 consists of the marine reworked terrain along the lower site area and the shore of Barrow Lake. An unconsolidated sand, gravel and cobble veneer covers the underlying bedrock and pockets of sand and gravel occur throughout the landscape. There is variable topography ranging from gently rolling or undulating to rolling and rugged. Drainage channels parallel slope directions and typically fashion complex patterns particularly within the high relief terrain.

Soil samples were collected in locations removed from site activities within appropriate terrain units to establish background geochemical conditions in areas investigated at the site. Sample results are presented in Table 1.2. Inorganic element concentrations were low for all samples.

1.2.2 Biophysical Environment

At the upper site, the vegetation is sparse due to large amounts of exposed bedrock and boulders. Mountain avens and sedges characterize the small patches of vegetation that occur. Other incidental plants include Arctic poppy, and saxifrages. There is continuous cover of vegetation in low lying areas, like Barrow Lake, that is typical of low-Arctic tundra. The vegetation is less than 20 cm tall and consists of willow, sedge, mountain avens, saxifrage, Arctic poppy, lousewort, polar grass and cotton grass. Grasses and mosses are commonly associated with moist sites.

Pelly Bay is 323 m above sea level on the Simpson Peninsula and is located in the polar desert. Annual precipitation is in the order of 232 mm, with approximately 106.7 mm as rain and the remainder as snowfall. West and west-southwest winds are common year round and blowing snow occurs 10 to 17% of the time in the winter, but is negligible in the summer. Fog and ice fog are most common in May-June and September-October. Low cloud cover is common year round and causes reduced visibility. Climate normals for the site, from 1961-1990, are provided in Table 1.3.

Muskoxen had not been seen in the Pelly Bay area for 30 years before 1980 and a suitable habitat survey in 1980 reported no muskoxen. Barren-ground caribou are found in the area and residents of Kugaaruk have observed caribou moving south from the Simpson Peninsula in early May. Calving occurs during the first half of June in an area of special significance just north of Wager Bay. There have been no recent sightings of polar bears, but they are known to den along the north coast of the Simpson Peninsula. The lack of polar bear sightings could be due to high elevation and isolation from the coast. Grizzly bears are known to exist in this region and during a site visit, an individual grizzly bear was reported approximately 40 km south of the station. Arctic fox, Arctic hares and Arctic ground squirrels were observed at the site. The Arctic foxes were most likely attracted to the artificial food sources (litter) and were seen feeding on Arctic char remains that had been caught and cleaned by station personnel. The wolf, short-tailed weasel collared lemming and brown lemming were not observed, but probably exist in this area.

After ice breakup in the spring, beluga and narwhal whales migrate westward from Baffin Bay through Lancaster Sound into Parry Channel. Around this time most marine mammals concentrate in the main channel of Lancaster Sound with diminished numbers migrating further west to Barrow Strait and very few still farther west into Viscount Melville Sound. Some whales move south along the east coast of Somerset Island and into the Gulf of Boothia; Brentwood Bay, located in the Gulf of Boothia near Bellot Strait, is one of the preferred summer habitats and areas of major concentrations of beluga and narwhal. The endangered bowhead whale is unlikely to be encountered in the site vicinity, preferring the fjords of northern Baffin Island and Lancaster Sound. Walrus also concentrate in Lancaster Sound and are unlikely to be seen in and around Pelly Bay since only periodic migrations are made south of Somerset Island into the Gulf of Boothia. Seals occur year round in the region. The bearded and ringed seals are the most common seal species around Pelly Bay.

The area is rich in avifauna, with many species known to occur in the region including snowy owl, peregrine falcon, gyrfalcon, and rough-legged hawk, though none were seen. Few waterfowl are common near the station due to the lack of suitable habitat in the area. The Pacific loon, Yellow-billed loon and Red-throated loon are all found in the region, but only the Pacific loon was observed. A nest of Pacific loons with eggs was found on a small lake approximately 2 km from the station. Within 500 m north and south of the station Water Pipit and Horned Lark were found nesting. Common species at the site included Snow Bunting and Semipalmated Plover. The Buntings were extremely abundant and were found nesting beneath the trains. Lapland Longspur were found near Barrow Lake and other water bodies found to the north. Rock Ptarmigan signs were found throughout the sight and on two occasions a male with two females were seen. There was a Thayer's Gull colony consisting of about 200 pairs approximately 4 km north of the station. The gulls were seen flying back and forth towards the dump site during the site visit. Glacous gulls and Northern Ravens were also foraging at the dump site and may have been nesting near the landfill.

Arctic char and lake trout are plentiful in nearby lakes and rivers, while Arctic char is present in Pelly Bay.

1.2.3 Traditional Land Use

There are at least six prehistoric archaeological sites in the site area, but only one is near site operational areas.

As noted above, the community of Kugaaruk is in close proximity to the site. The upper site area is not travelled to frequently by residents, but the lower site area, and Barrow Lake in particular, are commonly visited, particularly with the construction of the road from the hamlet. Barrow Lake is used as a freshwater source. Fishing for Arctic char and trout occurs with nets set at the mouths of larger rivers along Pelly Bay during July through September and through ice at Barrow Lake and on the Kugajuk River during the winter. Fruit-bearing vegetation and vegetation used for medicinal purposes are gathered in the site vicinity. Caribou is hunted in the area.

Table 1.2: CAM-4 Pelly Bay - Summary of Site Background Soil Analytical Data

Sample #	Date	Depth (cm)	Copper [mg/kg]	Nickel [mg/kg]	Cobalt [mg/kg]	Cadmium [mg/kg]	Lead [mg/kg]	Zinc [mg/kg]	Chromium [mg/kg]	Arsenic [mg/kg]	Mercury [mg/kg]	PCBs [mg/kg]	TPH [mg/kg]
Upper Site													
17278	2002	0	8.8	12	6.3	<1.0	<10	29	25	1.1	<0.1	0.0071	<40
17279/80/81	2002	30	18	20	10	<1.0	<10	56	32	2.2	<0.1	<0.003	<40
17296	2002	0	15	17	11	<1.0	<10	53	36	2.1	<0.1	0.041	<40
17298	2002	30	8.9	11	7.3	<1.0	<10	30	25	1.1	<0.1	<0.003	<40
17982	2003	0	25	24	14	<1.0	12	84	45	2.2	<0.1	<0.003	<40
17984	2003	30	15	15	9.0	<1.0	<10	44	35	1.7	<0.1	<0.003	<40
17986	2003	0	19	22	13	<1.0	11	66	43	3.5	<0.1	<0.003	<40
17988	2003	30	15	18	10	<1.0	<10	44	32	2.7	<0.1	<0.003	<40
18030	2003	0	22	25	14	<1.0	13	77	46	2.1	<0.1	0.0034	<40
18032	2003	30	12	14	8.3	<1.0	<10	38	27	1.2	<0.1	<0.003	<40
21222	2005	0	14	16	9.8	<1.0	<10	56	31	3.1	<0.1	0.020	47
21224	2005	30	10	13	8.1	<1.0	<10	35	25	1.4	<0.1	0.065	<10
21266	2005	30	11	18	8.9	<1.0	10	43	26	2	<0.1	0.042	84
21268	2005	0	9.4	12	7.2	<1.0	<10	53	22	1.7	<0.1	0.0046	56
21358	2005	0	8.7	12	7.8	<1.0	<10	48	23	1.3	<0.1	0.0081	77
36000	2005	30	18	22	13	<1.0	10	77	44	3.3	<0.1	0.060	48
11992	2006	0	12	11	8.6	<1.0	<10	44	24	3.2	<0.1	<0.003	38.2
11994	2006	30	16	17	11	<1.0	<10	53	34	2.6	<0.1	<0.003	213
12048	2006	0	16	18	10	<1.0	<10	53	39	4.0	<0.1	<0.003	10
12050	2006	30	11	15	8.8	<1.0	<10	39	30	2.9	<0.1	<0.003	34
12056	2006	0	10	12	6.9	<1.0	<10	34	27	3.2	<0.1	<0.003	10
12058	2006	30	13	14	8.3	<1.0	<10	39	29	3.5	<0.1	<0.003	21.1
N Value			22	22	22	22	22	22	22	22	22	22	22
Average			14.0	16.3	9.6	<1.0	6.4	49.8	31.8	2.4	<0.1	0.0	58.0
Standard Deviation			4.4	4.2	2.3		2.7	15.2	7.6	0.9		0.0	56.8
Minimum			8.7	11.0	6.3		5.0	29.0	22.0	1.1		0.0	10.0
Maximum			25.0	25.0	14.0		13.0	84.0	46.0	4.0		0.1	213.0
95% Confidence Limit			1.9	1.8	0.9		1.1	6.3	3.2	0.4		0.0	23.7

Sample #	Date	Depth (cm)	Copper [mg/kg]	Nickel [mg/kg]	Cobalt [mg/kg]	Cadmium [mg/kg]	Lead [mg/kg]	Zinc [mg/kg]	Chromium [mg/kg]	Arsenic [mg/kg]	Mercury [mg/kg]	PCBs [mg/kg]	TPH [mg/kg]
Lower Site													
C4-041	1984	0		19		<1.0	<10			4.8	<0.05	<0.01	<5
17976	2003	0	9.0	7.6	<5.0	<1.0	<10	24	<20	<1.0	<0.1	<0.003	<40
17978	2003	30	12	9.0	5.3	<1.0	<10	26	<20	<1.0	<0.1	<0.003	<40
21340	2005	0	6.9	7.1	<5.0	<1.0	<10	33	<20	<0.1	<0.1	0.014	102
21342	2005	30	<5.0	6.3	<5.0	<1.0	<10	22	<20	<0.1	<0.1	0.0099	10
11948	2006	0	<5.0	5.9	<5.0	<1.0	<10	22	<20	1.7	<0.1	0.16	363
11950	2006	30	7.9	8	<5.0	<1.0	<10	26	<20	1.7	<0.1	<0.003	10
N Value			6	7	6	7	7	6	6	7	7	7	7
Average			9.0	9.0	3.0	<1.0	<10	25.5	<20	0.8	<0.1	0.1	121.3
Standard Deviation			2.2	4.5	1.1			4.1		0.8		0.1	166.9
Minimum			6.9	5.9	2.5			22.0		0.1		0.0	10.0
Maximum			12.0	19	5.3			33.0		1.7		0.2	363.0
95% Confidence Limit			1.8	3.4	0.9			3.3		0.6		0.1	133.5

Table 1.3: Climate Normals for the CAM-4 Pelly Bay Site

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Precipitation													
Mean Rainfall	0.0	0.0	0.0	0.0	0.8	8.7	34.8	43.5	18.1	0.7	0.0	0.0	106.7
Mean Snowfall	3.4	3.5	5.4	11.9	19.5	9.3	1.7	5.5	19.8	28.3	9.9	6.9	125.1
Precipitation (mm)	3.4	3.5	5.4	11.9	20.3	18.1	36.4	49.0	38.0	29.1	9.9	6.9	232.0
#. days w/ meas. rain	0	0	0	0	*	3	9	11	4	*	0	0	27
#. days w/ meas. snow	2	2	3	4	8	4	1	2	9	11	4	3	53
Temperature													
Mean Daily Max.	-29.8	-30.1	-26.4	-17.2	-7.2	2.7	10.1	7.6	-0.7	-9.6	-19.9	-25.7	-12.2
Mean Daily Min.	-36.2	-36.2	-33.3	-24.3	-13.1	-2.6	3.0	1.5	-4.9	-15.0	-26.0	-32.0	-18.3
Daily Mean	-32.8	-33.0	-29.6	-20.6	-10.1	0.1	6.6	4.6	-2.7	-12.2	-22.9	-28.5	-15.1
Extreme Max.	-3.9	-1.1	-5.7	4.4	6.1	21.1	25.1	23.9	15.7	7.6	-1.1	-2.8	
Extreme Min.	-51.7	-54.0	-47.8	-41.1	-27.8	-15.0	-5.6	-7.0	-18.3	-34.0	-44.4	-46.1	
Degree Days													
Above 18°C	0	0	0	0	0	0	0.1	0.1	0	0	0	0	0
Below 18°C	1585.6	1448.4	1492.9	1160.5	878.6	537.7	355.1	414.8	624.2	941.7	1230.3	1432.3	12102
Above 5°C	0	0	0	0	0	15.3	75.7	45.2	2.7	0	0	0	139
Below 0°C	1027.6	940.3	934.9	620.6	321.1	54.5	1.0	4.7	104.6	383.7	690.3	874.3	5958
Month-end Snow Cover (cm)	40	41	42	42	36	4	0	1	12	30	36	40	

*less than 0.5 greater than 0.01

Information as provided by Environment Canada - Climate Normals 1956-1990 for Pelly Bay, Nunavut.

1.3 Landfill Monitoring Program

The general components of the landfill monitoring program at CAM-4 include:

- Visual inspection;
- Surface and shallow depth soil sampling and analyses;
- Groundwater sampling and analyses; and
- Ground temperature monitoring.

The requirements for landfill monitoring, as laid out in Environmental Provisions of the NTI-DND Agreement, are summarized in Table 1.4. Detailed landfill monitoring requirements are described in the Landfill Monitoring Plan - Part B - Nunavut Settlement Region.

Table 1.4: 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 CAM-4, is provided in Table 1.5. The rationale for the monitoring requirements is provided in the landfill-specific sections.

Table 1.5: CAM-4 Pelly Bay Landfill Monitoring Requirements

Landfill Designation	Visual Inspection	Groundwater Sampling	Soil Sampling	Thermal Monitoring
Station Area Non-Hazardous Waste Landfill	√	√	√	
Tier II Soil Disposal Facility	√	√	√	√
Upper Site Landfill	√	√	√	√
Lower Site Non-Hazardous Waste Landfill	√	√	√	
Lower Site Landfill	√	√	√	√

1.3.1 Visual Inspection

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 Sampling

Background (naturally occurring) conditions refer to native soil geochemistry and represent soil quality from an area not impacted by site activities. Soil sampling to establish general site background conditions was conducted in 2002, 2003, 2005, and 2006. Results are reported in Table 1.2 above.

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 up-gradient and down-gradient of each landfill. Up-gradient samples are targeted to areas near the landfill, but not influenced by migration of contaminants through the landfill. Up-gradient samples are meant to be representative of contaminant input conditions to the landfill and serve as the primary basis upon which to compare the down-gradient contaminant concentrations.

Down-gradient 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, either historically or recent, from the landfill area. Although contaminants are primarily transported in water (surface and groundwater), they have a tendency to absorb to soil particles the water is migrating through. The soil, thus, retains information regarding the historical input of contaminants.

Analytical results of soil samples collected down-gradient of landfills are compared to contaminant concentrations of samples collected up-gradient of landfills. Down-gradient 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 down-gradient samples that are significantly higher than background or up-gradient concentrations, particularly where there have been changes over time; provide evidence of contaminants having migrated to and, 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.

Soil sampling locations are indicated on the site-specific landfill drawings included in the annexes to this report. Samples collected during baseline and subsequent landfill monitoring is 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 (nC_6 to nC_{10}), F2 (nC_{10} to nC_{16}.), and F3 (nC_{16} to nC_{34}.), as defined by the CCME Tier I Method - Rev. 5, Analyses of Total Petroleum Hydrocarbons in soil.

The Method Detection Limit (MDL) for each parameter is specified in Table 1.8.

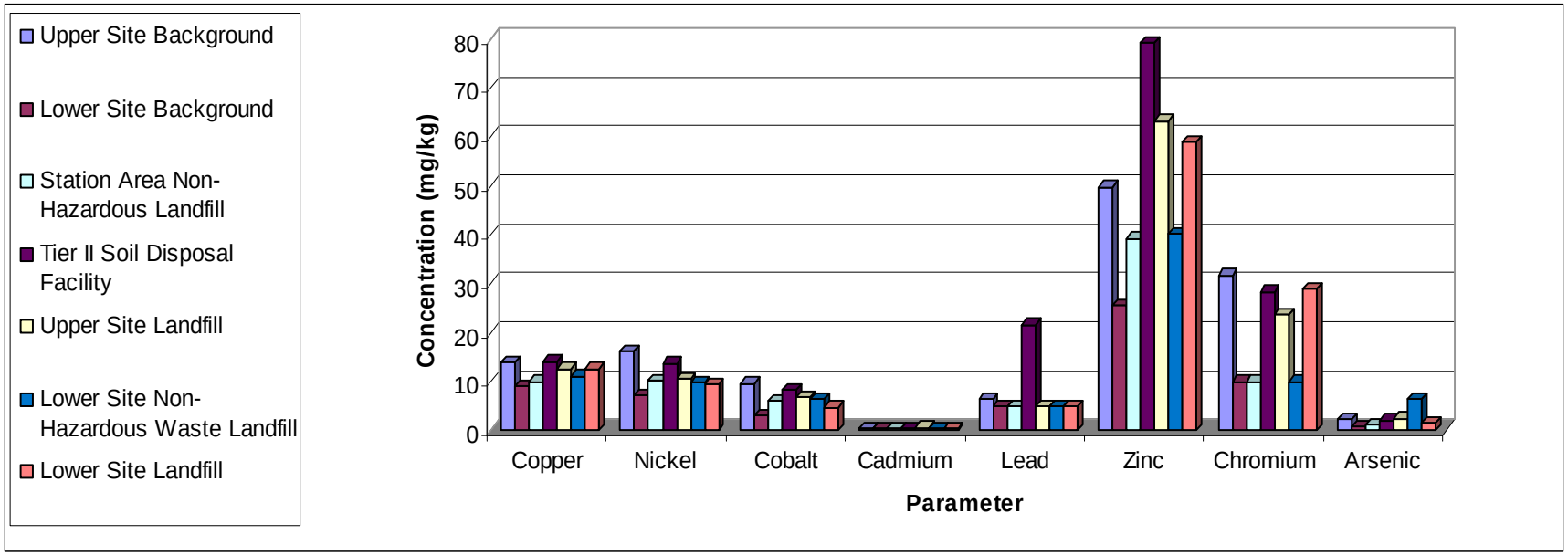
The requirement for the analyses of baseline samples is to provide record information on the environmental status of the landfill should potential problems be identified during the monitoring program. Analytical results are presented under the discussion for each landfill.

To provide a basis for evaluation with subsequent monitoring analytical results, simple statistical analyses were carried out to determine the arithmetic mean, standard deviation, and 95% confidence interval for each inorganic parameter analyzed. In general, for samples in which the concentration was less than the Method Detection Limit (MDL), one-half of the MDL was used in the statistical analyses. However, in cases where the majority of the analytical results fell below the MDL, the arithmetic mean is represented as less than the MDL. It should be noted that MDLs for analyses completed under previous years' landfill assessment programs may not be the same as those specified Table 1.8, particularly for PCBs. In cases where the contaminant was not detected, the chemical baseline is typically represented as a range over the different MDLs. Summaries of the arithmetic mean of the concentration of inorganic elements in soil are presented in Table 1.6. Additional statistical data is presented under the discussion for each landfill.

Table 1.6: CAM-4 Pelly Bay - Summary of Arithmetic Mean - Soil Baseline Data

Area	Arithmetic Mean (in mg/kg)								Range
	Copper	Nickel	Cobalt	Cadmium	Lead	Zinc	Chromium	Arsenic	PCBs
Upper Site Background	14.0	16.3	9.6	<1.0	6.4	49.8	31.8	2.4	0.0
Lower Site Background	9.0	7.3	3.0	<1.0	<10	25.5	<20	0.8	0.1
Station Area Landfill	10.0	10.3	6.1	<1.0	<10	39.2	<20	1.3	<0.003 to 1.0
Tier II Soil Disposal Facility	14.2	13.8	8.4	<1.0	21.7	79.1	28.4	2.1	<0.003 to 2.5
Upper Site Landfill	12.6	10.6	6.8	<1.0	<10	63.2	23.7	2.5	<0.1 to 0.4
Lower Site Non-Hazardous Waste Landfill	11.1	9.9	6.5	<1.0	<10	40.3	<20	6.5	0.002 to 0.160
Lower Site Landfill	12.6	9.4	4.8	<1.0	<10	59.0	29.0	1.6	0.004 to 0.160

Figure 1.1: CAM-4 Pelly Bay - Summary of Arithmetic Mean - Soil Baseline Data



1.3.3 Groundwater Sampling

During the construction phase, groundwater monitoring wells are installed at all existing landfills classified as a high environmental risk (Class A landfills), moderate environmental risk (Class B landfills) and new landfills. At CAM-4, the Lower Site Landfill was classified as Class B. Three new landfills were built during the construction phase; the Station Area Non-Hazardous Waste Landfill and the Lower Site Non-Hazardous Waste Landfill to accommodate non-hazardous demolition waste and site debris, and the Tier II Disposal Facility to accommodate Tier II contaminated soil. Groundwater monitoring wells were installed hydraulically up-gradient and down-gradient of the landfills as indicated in Table 1.5 and Table 1.9. Surface and shallow depth soil samples are also collected adjacent to monitoring well locations. Analytical data from water samples collected from wells up and down-gradient are reviewed in conjunction with soil analytical data to evaluate potential impacts associated with the landfill. Baseline groundwater data exists only from the site investigation as well as the site clean-up period. A summary of mean baseline concentrations of contaminants in groundwater is provided in Table 1.7.

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

- Water elevation.
- Total water of 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 include:

- 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) - C_6 to C_{32}.

Minimum Method Detection Limits are specified in Table 1.8. A summary of the landfill monitoring installations/sampling locations is provided in Table 1.9.

Table 1.7: CAM-4 Pelly Bay - Summary of Arithmetic Mean - Groundwater Baseline Data

Area	Arithmetic Mean (in mg/L)							
	Copper	Nickel	Cobalt	Cadmium	Lead	Zinc	Chromium	Arsenic
Upper Site Background	0.173	0.253	0.136	0.003	0.114	0.747	0.479	0.024
Lower Site Background	0.188	0.150	0.061	0.001	0.079	0.442	0.309	0.027
Station Area Non-Hazardous Waste Landfill	0.196	0.307	0.154	<0.001	0.134	1.045	0.553	0.027
Tier II Soil Disposal Facility	0.043	0.074	0.014	<0.001	<0.010	0.353	0.129	0.005
Upper Site Landfill	0.100	0.122	0.047	<0.001	0.041	0.334	0.191	0.013
Lower Site Non-Hazardous Waste Landfill	0.204	0.157	0.063	<0.001	0.088	1.153	0.334	0.023
Lower Site Landfill	0.303	0.241	0.114	<0.001	0.203	0.969	0.400	0.046

Figure 1.2: CAM-4 Pelly Bay - Summary of Arithmetic Mean - Groundwater Baseline Data

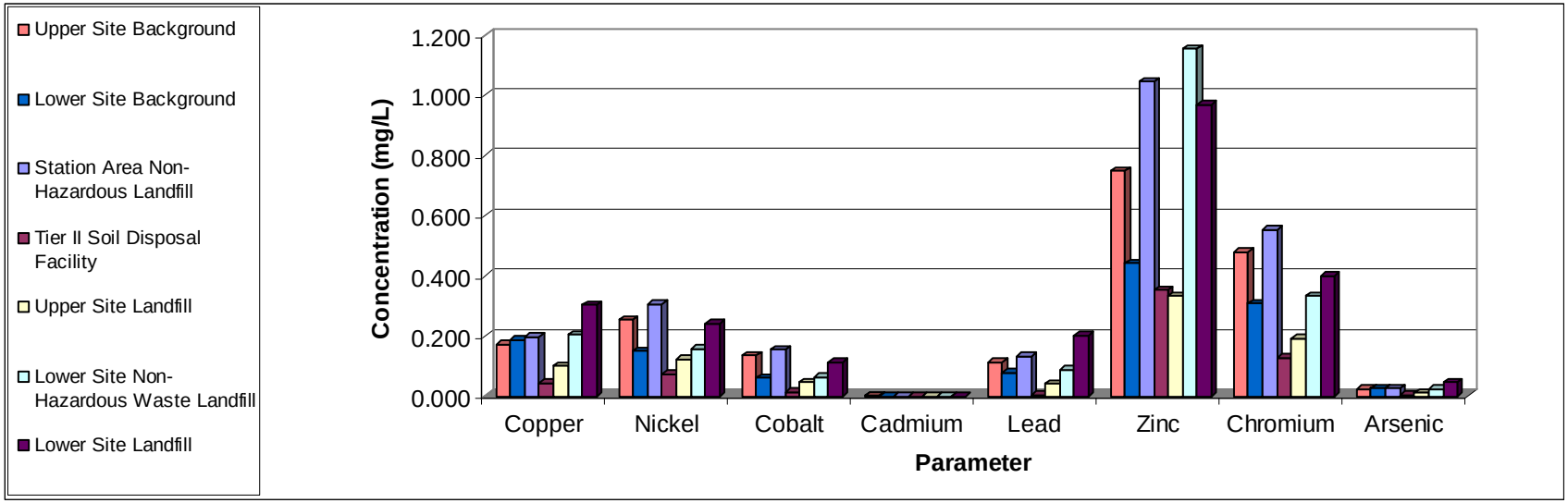


Table 1.8: Detection Limits for Analytical Requirements

Parameter	Soil Samples Minimum Analytical Detection Limit (mg/kg = ppm)	Water Samples Minimum Analytical Detection Limit (mg/L = ppm)
Copper	<3.0	<0.005
Nickel	<5.0	<0.010
Cobalt	<5.0	<0.005
Cadmium	<1.0	<0.001
Lead	<10	<0.01
Zinc	<15	<0.005
Chromium (total)	<20	<0.005
Arsenic	<0.2	<0.05
Mercury	<0.1	<0.001
PCBs	<0.05	<0.003
TPH	<40	<1

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 modelling 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. Modelling also determines the length of time required for the landfill contents to freeze-back following the placement of additional surface fill. Geothermal modelling considers 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 (1956-1990 climate normals data from Environment Canada for Pelly Bay, Nunavut), 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). At CAM-4, a typical active layer depth based on mean climatic data is 1.9 m for the Tier II Soil Disposal Facility. The predicted active layer depth for a 1 in 100 warm year is 2.1 and for ten consecutive 1 in 100 warm years is 2.3 m. The predicted active layer depth for the landfill after 100 years of global warming (using the best estimate approximation method as opposed to more conservative estimate) is 2.1 m. The active layer depth used for the Tier II Soil Disposal Facility design at CAM-4 is the resultant active layer depth from modelling 10 consecutive 1 in 100 warm years - a depth of 2.3 m. It is expected to take one year for the landfill contents to freeze back with this depth of cover fill.

For the existing landfills - the Upper Site and Lower Site Landfills - the active layer depth based on ten years of mean climatic data is 1.9 m. For an estimated 1:100 warm year, the resultant active layer depth was determined to be 2.4 m for the Upper Site and 2.3 m for the Lower Site Landfill. For 10 consecutive 1 in 100 warm years, both landfills had a predicted active layer depth of 2.6 m. The predicted active layer depth for the landfills after 100 years of global warming is 2.5 m. The active layer depth used for the remedial designs at both landfills is the resultant active layer depth from modelling 10 consecutive 1 in 100 warm years - a depth of 2.6 m.

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 Scope of Report

The following sections of the report are organized according to landfill designation. For each landfill included in the monitoring program, the following information is provided:

- A brief description of the landfill.
- Qualitative assessment of the potential environmental risk associated with the specific landfill.
- Summary of the remediation design.
- Baseline conditions (as applicable).

Table 1.9: Summary of Landfill Monitoring Installations/Sampling Locations CAM-4 Pelly Bay

Landfill Designation/Monitoring Locations	Coordinates[1]		Elevation
	North (m)	East (m)	(masl)
Background Monitoring Wells			
BMW-3 (soil and groundwater)	9898.7	9808.4	319.5
BMW-4 (soil and groundwater)	20365.9	18677.3	133.9
Station Area Non-Hazardous Landfill			
BMW-1 (soil and groundwater)	10161.0	10020.8	312.1
MW-1 (soil and groundwater)	10271.7	10025.7	300.1
MW-2 (soil and groundwater)	10256.6	10086.9	-
MW-3 (soil and groundwater)	10217.0	10133.3	-
MW-4A (soil and groundwater)	10229.6	10123	303.9
MW-4B (soil and groundwater)	10228.7	10121.7	303.8
MW-6A (soil and groundwater)	10266.2	10072.3	301.9
MW-6B (soil and groundwater)	10267.5	10073.3	301.7
MW-7A (soil and groundwater)	10253.8	10018.5	302.4
MW-7B (soil and groundwater)	10253.5	10020.3	303.1
Tier II Soil Disposal Facility			
VT-5 (ground temperature)	10032.7	10041.9	320.9
VT-6 (ground temperature)	10090.2	10060.8	319.4
VT-7 (ground temperature)	10097.1	10100.4	317.8
VT-8 (ground temperature)	10050.8	10086.6	319.1
MW-5 (soil and groundwater)	10039.4	10136.9	310.1
MW-8 (soil and groundwater)	10135.2	10107.6	310.2
MW-9 (soil and groundwater)	10099.3	10145.5	310.4
MW-14A (soil and groundwater)	10025.4	10022.3	317.7
MW-14B (soil and groundwater)	10024.5	10022.4	317.8
MW-15 (soil and groundwater)	10088.3	10013.9	317.7
MW-16 (soil and groundwater)	10154.8	10003.7	314.3
Upper Site Landfill			
VT-1 (ground temperature)	10004.3	10214.8	304.4

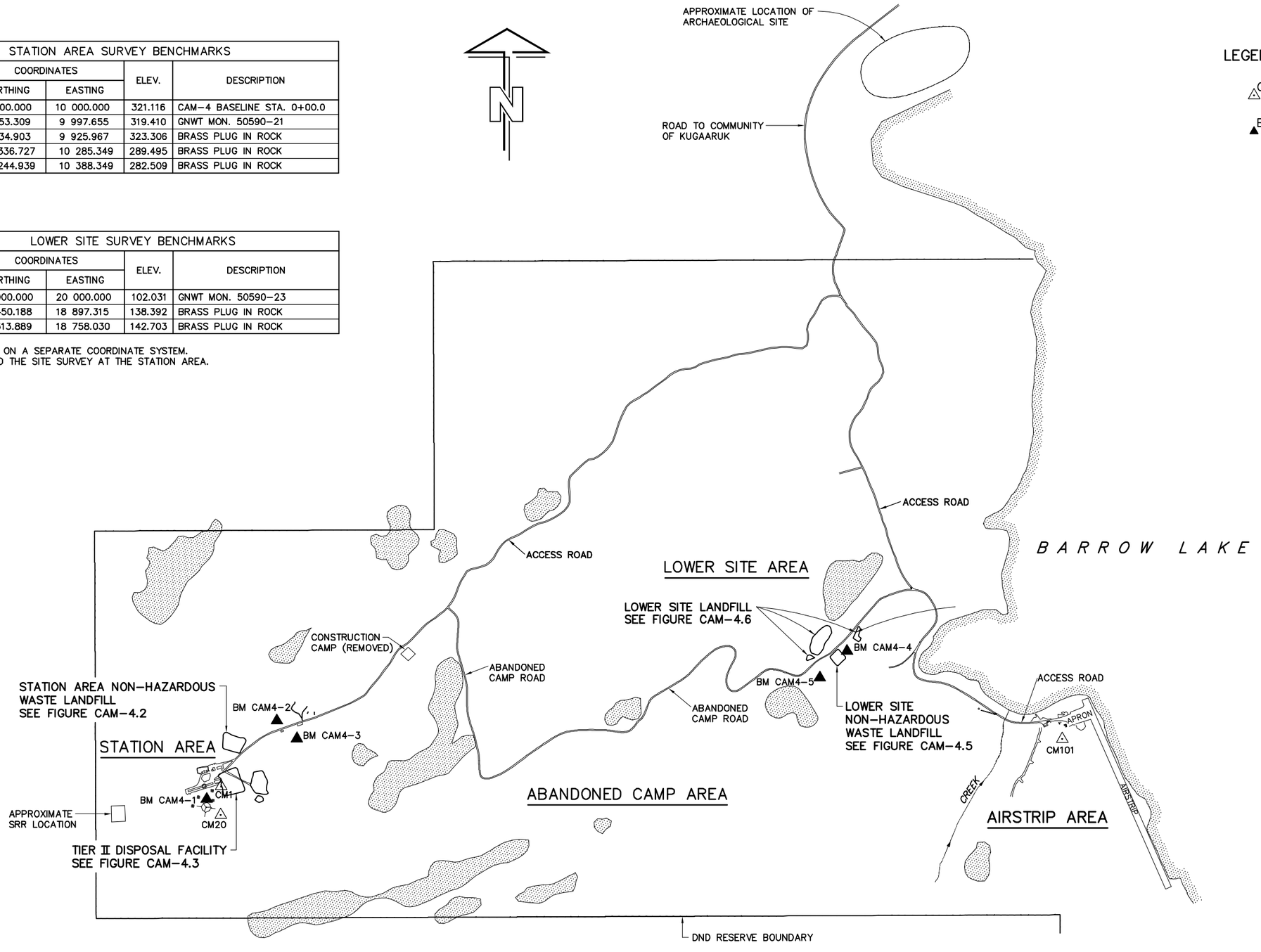
Landfill Designation/Monitoring Locations	Coordinates[1]		Elevation
	North (m)	East (m)	(masl)
VT-2 (ground temperature)	10002.4	10204.2	306.7
VT-3 (ground temperature)	10013.3	10177.1	310.1
VT-4 (ground temperature)	10021.2	10150.4	312.8
MW-10 (soil and groundwater)	10061.4	10233.7	301.5
MW-11 (soil and groundwater)	9998.8	10114.0	312.6
MW-12 (soil and groundwater)	10013.3	10247.3	295.9
MW-13 (soil and groundwater)	9954.9	10189.6	302.4
Lower Site Non-Hazardous Waste Landfill			
MW-21 (soil and groundwater)	20415.1	18807.1	138.0
MW-22 (soil and groundwater)	20372.7	18866.1	137.8
MW-23 (soil and groundwater)	20463.9	18876.7	135.9
Lower Site Landfill			
VT-9 (ground temperature)	20544.8	18760.1	-
VT-10 (ground temperature)	20505.9	18769.1	-
VT-11 (ground temperature)	20523.5	18778.4	-
VT-12 (ground temperature)	20514.1	18787.1	-
MW-17 (soil and groundwater)	20590.5	18795.2	120.4
MW-18 (soil and groundwater)	20523.2	18727.9	125.3
MW-19 (soil and groundwater)	20440.8	18700.3	129.1
MW-20 (soil and groundwater)	20469.7	18822.7	135.4
C4-1 (soil only)	20539.3	18932.5	
C4-2 (soil only)	20546.9	18976.9	
C4-3 (soil only)	20504.5	18982.6	

Note 1: Coordinates referenced to local grid system. Note that the Upper and Lower Site of CAM-4 are on different local grid systems. Monitoring well and thermistor coordinates as provided by the cleanup contractor.

STATION AREA SURVEY BENCHMARKS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
CM1	10 000.000	10 000.000	321.116	CAM–4 BASELINE STA. 0+00.0
CM20	9 853.309	9 997.655	319.410	GNWT MON. 50590–21
BM CAM4–1	9 934.903	9 925.967	323.306	BRASS PLUG IN ROCK
BM CAM4–2	10 336.727	10 285.349	289.495	BRASS PLUG IN ROCK
BM CAM4–3	10 244.939	10 388.349	282.509	BRASS PLUG IN ROCK

LOWER SITE SURVEY BENCHMARKS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
CM101	20 000.000	20 000.000	102.031	GNWT MON. 50590–23
BM CAM4–4	20 450.188	18 897.315	138.392	BRASS PLUG IN ROCK
BM CAM4–5	20 313.889	18 758.030	142.703	BRASS PLUG IN ROCK

THE LOWER CAMP IS ON A SEPARATE COORDINATE SYSTEM.
IT IS NOT TIED–IN TO THE SITE SURVEY AT THE STATION AREA.



LEGEND:

△CM1	SURVEY CONTROL MONUMENT
▲BM–2	PERMANENT BENCHMARK LOCATION

SCALE 1:20000

0 200 400 600 m

UMA | AECOM

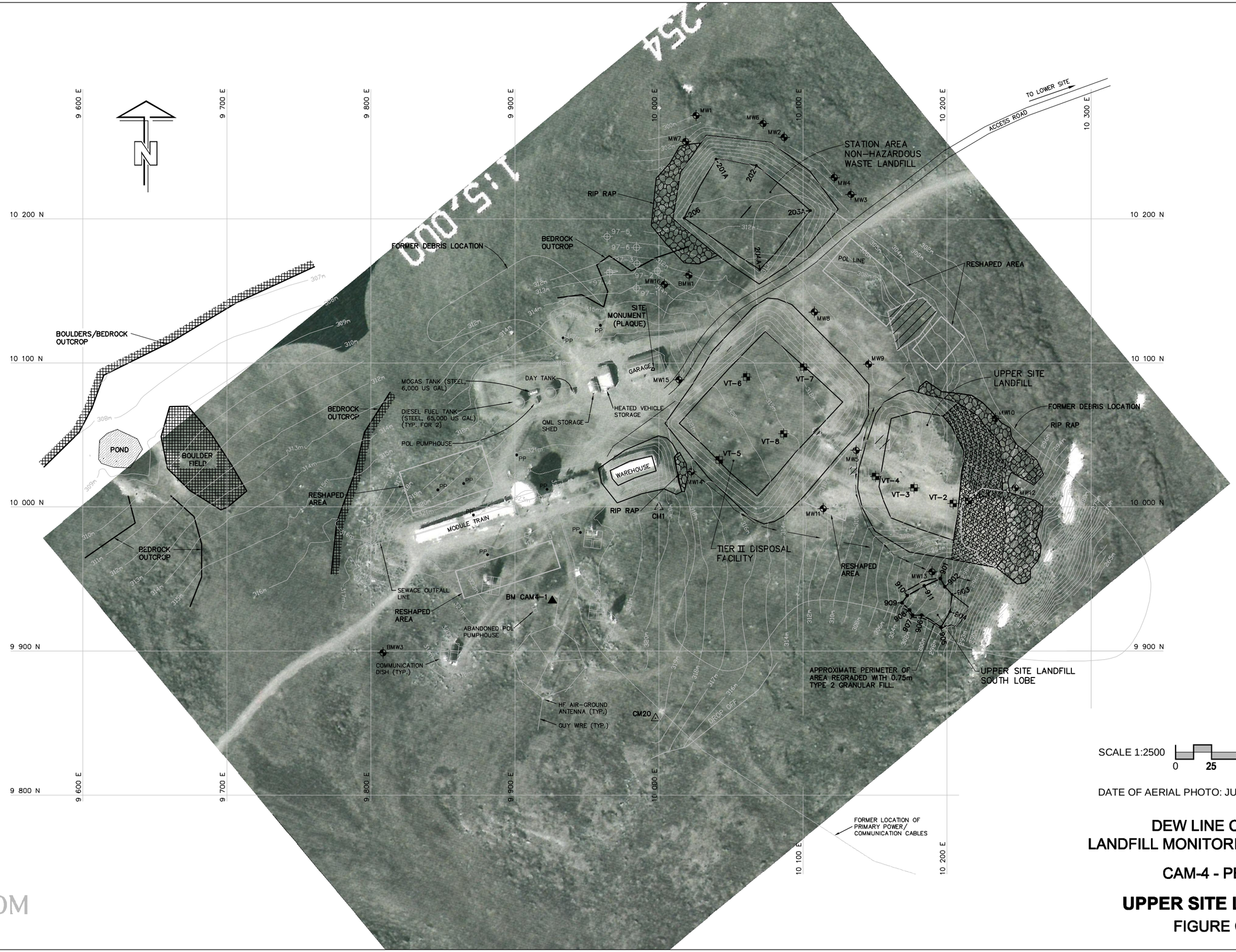
DEW LINE CLEAN UP
LANDFILL MONITORING PLAN

CAM-4 - PELLY BAY

OVERALL SITE PLAN

FIGURE CAM-4.1

DOS NAME: F5–RD02.DWG CLC – 08/01/28



SCALE 1:2500

0 25 50 75 m

DATE OF AERIAL PHOTO: JULY 1993

DEW LINE CLEAN UP
LANDFILL MONITORING PLAN

CAM-4 - PELLY BAY

UPPER SITE LAYOUT

FIGURE CAM-4.1A

UMA | AECOM

DGS NAME: F5-RD01A.DWG CLC – 08/02/08

SCALE 1:1250

0 12.5 25 37.5 m

DATE OF AERIAL PHOTO: JULY 1993

DEW LINE CLEAN UP
LANDFILL MONITORING PLAN

CAM-4 - PELLY BAY

LOWER SITE LAYOUT

FIGURE CAM-4.1B

UMA | AECOM

DOS NAME: F5-RD01B.DWG CLC - 08/02/08

2.0 Station Area Non-Hazardous Waste Landfill

The Station Area Non-Hazardous Waste Landfill is a new landfill constructed for the disposal of non-hazardous wastes and debris generated and collected during the clean-up. The landfill site is located approximately 200 m northeast of the former module train location.

The landfill design includes perimeter berms and placement of a cover of compacted granular fill over the landfilled material. Eight groundwater monitoring wells were installed at the landfill perimeter, three of which are multi-level wells (have two screened intervals).

The long term monitoring plan will consist of visual monitoring and periodic collection of soil and groundwater samples. Approximate locations for the collection of soil and groundwater samples are identified on Figure CAM-4.2.

2.1 Baseline Data

Sample locations for baseline soil samples are shown in Figure CAM-4.2. A summary of the baseline soil analytical data is provided in Table 2.1. Baseline data is comprised of site investigation information collected up-gradient of the landfill in 1997, 1999, 2003, and 2004, and samples collected at permanent monitoring locations up and down-gradient of the landfill from 2002 to 2006.

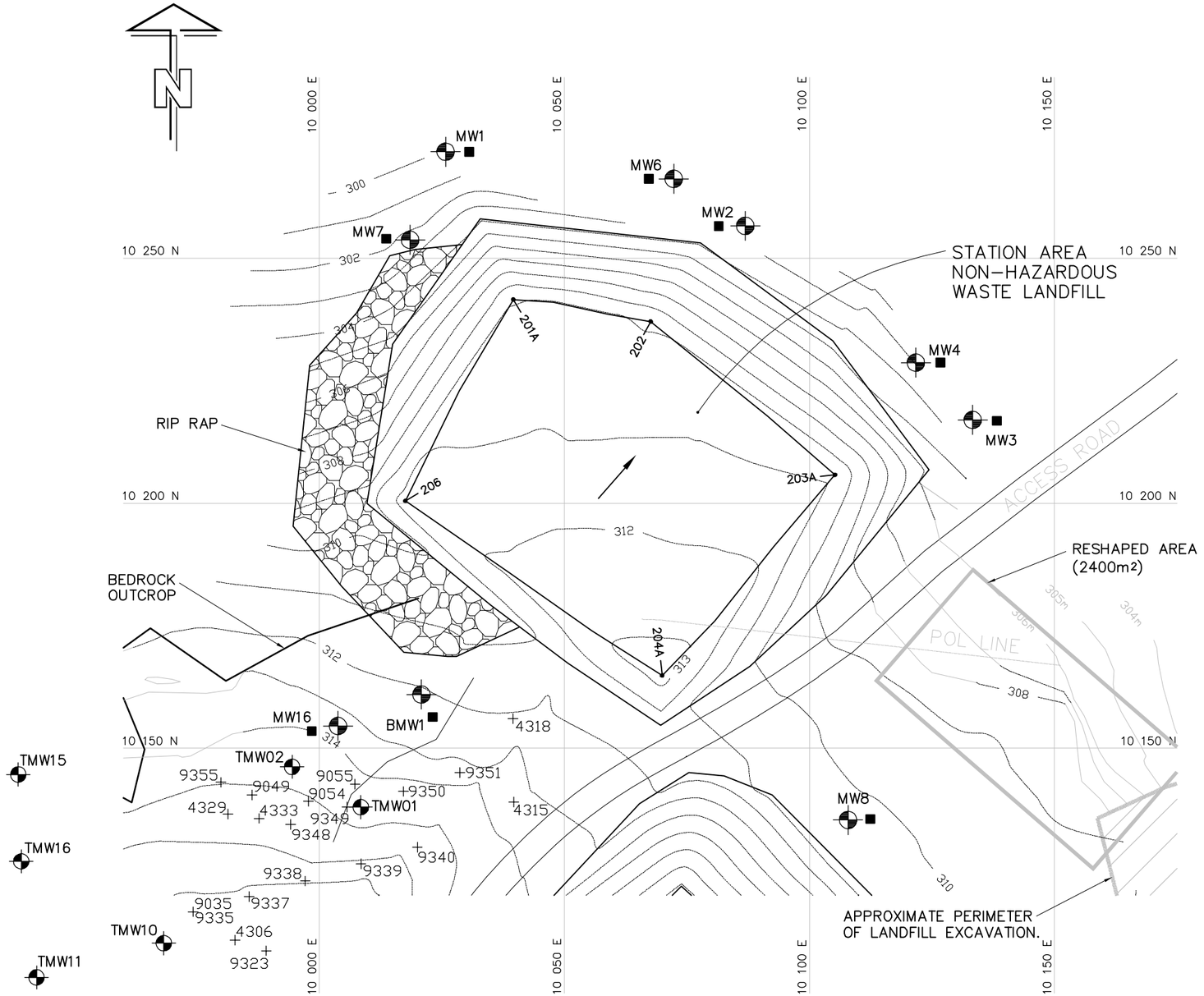
The landfill is located down-gradient of the former garage area, and TPH impacts were identified for remediation during the site investigations. In 2002, free phase hydrocarbon product was identified in BMW-1, a background well for the upper site and an up-gradient well for the Station Area landfill. Additional investigation was completed in the vicinity during 2003 and 2004. The results of those investigations indicated that a release of residual fuel had occurred during the 2002 season, when a POL diesel day tank was removed from the garage pad area. An existing POL line was cut at the time of tank removal, and it appears that residual fuel had been present in the line and was not captured during the demolition activities.

The finding of free product at the upgradient well for the landfill prompted the installation of an additional up-gradient well, as well as the installation of three more down-gradient wells. In order to determine whether potential hydrocarbon impacts were migrating through the new landfill, or below it, multi-level wells were installed; the upper level was installed in shallow overburden, while the lower level was installed deeper, in fractured bedrock.

Soil baseline concentrations of inorganic elements at the Station Area Non-Hazardous Waste Landfill are consistent with or lower than upper site background levels. Low levels of PCBs were detected at the landfill during site investigation or site clean-up sampling events. Two slightly higher levels of PCBs were found down-gradient of the landfill with concentrations of 0.98 mg/kg at MW-1 in 2005 and 0.1 mg/kg at MW-3 in 2002. There were various detections of low level concentration of hydrocarbons both up and down-gradient of the landfill. In 2006, F2 and F3 fraction hydrocarbons with elevated concentrations were detected at one location up-gradient of the landfill (MW-16). At the surface the F2 fraction concentration was 8,600 mg/kg, with a total (F1, F2, and F3) hydrocarbon concentration of 9,160 mg/kg. At depth (30 cm) the F3 fraction concentration was 270 mg/kg, while the total hydrocarbon concentration was 296 mg/kg. In addition, there were a couple down-gradient detections of F3 hydrocarbons that had similar concentrations to the MW-16 sample taken from depth.

A summary of baseline groundwater data is provided in Table 3.2. Baseline data was collected from permanent monitoring locations in 2002 to 2006. In addition, baseline data was collected from temporary monitoring wells installed in 2003 and 2004. The Station Area Non-Hazardous Waste Landfill had the highest concentrations of copper, nickel, cobalt, lead, zinc, and chromium of the Upper Site Landfills. No PCBs were detected. Results were generally consistent with historical background monitoring well results.

Free product was identified at BMW-1 in 2002, 2003, 2004, and 2006 and in MW-16 in 2005 and 2006. Levels were noted to be declining with time. In 2006, a water sample from MW-16 had a TPH concentration of 1,200 mg/L with high levels of F1.



LEGEND:

- TBM4 ⊡ TEMPORARY BENCHMARK
- BM–1 ▲ PERMANENT BENCHMARK
- 101–• COORDINATE POINT
- ■ MONITORING SOIL SAMPLE LOCATION
- ⊕ MONITORING WELL LOCATION
- +9351 BASELINE SOIL SAMPLE LOCATION

COORDINATE POINTS (AS–BUILT) NON–HAZARDOUS WASTE LANDFILL			
NO.	NORTHING	EASTING	ELEV.
201A	10 241.6	10 039.6	310.0
202	10 237.1	10 067.6	309.9
203A	10 205.8	10 105.2	310.9
204A	10 164.9	10 069.9	313.4
206	10 200.5	10 017.5	311.5

COORDINATE POINTS (AS BUILT) MONITORING WELLS			
NO.	NORTHING	EASTING	ELEV.
MW1	10 271.73	10 025.73	300.05
MW2	10 256.60	10 086.90	–
MW3	10 217.0	10 133.3	–
MW4	10 228.70	10 121.70	303.80
MW6	10 266.20	10 072.30	301.90
MW7	10 253.75	10 018.51	302.29
MW8	10 135.37	10 107.87	310.20
MW16	10 154.55	10 003.80	313.70
BMW1	10 160.97	10 020.81	312.13

SURVEY CONTROL MONUMENTS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
CM1	10 000.000	10 000.000	321.116	CAM–4 BASELINE STA. 0+00.0
CM20	9 853.309	9 997.655	319.410	GNWT MON. 50590–21
BM CAM4–1	10 102.015	9 926.103	319.138	CAM–4 BASELINE STA. 4+13.4

SCALE 1:1000 0 10 20 30 m

RECORD DRAWING
NOT FOR CONSTRUCTION

DEW LINE CLEAN UP
LANDFILL MONITORING PLAN

CAM-4 - PELLY BAY

STATION AREA NON-HAZARDOUS WASTE LANDFILL

FIGURE CAM-4.2

UMA | AECOM

DGN NAME: C4-RD02.DWG CLC – 08/02/04

Table 2.1: Station Area Non-Hazardous Waste Landfill - Baseline Soil Data

Sample #	Location	Date	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co [mg/kg]	Cd [mg/kg]	Pb [mg/kg]	Zn [mg/kg]	Cr [mg/kg]	As [mg/kg]	Hg [mg/kg]	PCBs [mg/kg]	TPH [mg/kg]	TPH Identity		
															F1	F2	F3
Up-gradient Soil Samples																	
9036		1997		6	<5.0	8.6	<1.0	32	95	24	1.3			***11000***	Lube oil & grease		
9049		1997		18			<1.0	120	75				< 0.5	1800	Fuel & Lube oil		
9054		1997												82			
9055		1997												70			
9323		1997		13			<1.0	60	78				<0.5	87	Fuel oil		
9335/36		1997		35			<1.0	140	120		1.8			670	Fuel oil		
9337		1997		17			<1.0	70	84				0.7				
9338		1997						99					< 0.5	280	Fuel oil		
9339		1997		10			<1.0	160	58				< 0.5	77			
9340		1997											< 0.5				
9348		1997		11			<1.0	24	79				<0.5	460	Fuel oil		
9349		1997						<10					< 0.5	290	Fuel oil		
9350		1997															
9351		1997						35					< 0.5	<40			
4306		1999	0											<40			
4307	4306	1999	40	12			<1.0	<10	43				<0.5	45	100% Fuel oil		
4308	4306	1999	95	8.8			<1.0	<10	54				<0.5	290	100% Fuel oil		
4315		1999	0										0.6	53	100% Fuel oil		
4316	4315	1999	45										*1*	***3000***	100% Fuel oil		
4317	4315	1999	105										<0.5	<40			
4318		1999	0											<40			
4319	4318	1999	35											<40			
4320/21	4318	1999	80											1500	100% Fuel oil		
4329		1999	0										< 0.5	180	100% Fuel oil		
4330	4329	1999	40										<0.5	***2200***	81% Fuel oil		
4331/32	4329	1999	90										<0.5	1600	100% Fuel oil		
4333		1999	0										< 0.5	390	100% Fuel oil		
4334	4333	1999	45										<0.5	67	100% Fuel oil		
4335	4333	1999	85										<0.5	1300	100% Fuel oil		

Sample #	Location	Date	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co [mg/kg]	Cd [mg/kg]	Pb [mg/kg]	Zn [mg/kg]	Cr [mg/kg]	As [mg/kg]	Hg [mg/kg]	PCBs [mg/kg]	TPH [mg/kg]	TPH Identity		
															F1	F2	F3
17296	BMW1	2002	0	15	17	11	<1.0	<10	53	36	2.1	<0.10	0.041	<40			
17298	BMW1	2002	30	8.9	11	7.3	<1.0	<10	30	25	1.1	<0.10	<0.0030	<40			
17982	BMW3	2003	0	25	24	14	<1.0	12	84	45	2.2	<0.1	<0.003	<40			
17984	BMW3	2003	30	15	15	9	<1.0	<10	44	35	1.7	<0.1	<0.003	<40			
18030	BMW1	2003	0	22	25	14	<1.0	13	77	46	2.1	<0.1	0.0034	<40			
18032	BMW1	2003	30	12	14	8.3	<1.0	<10	38	27	1.2	<0.1	<0.003	<40			
21266	BMW1	2005	30	11	18	8.9	<1.0	10	43	26	2.0	<0.10	0.042	84	<10	<4.0	84
21268	BMW1	2005	0	9.4	12	7.2	<1.0	<10	53	22	1.7	<0.10	0.0046	56	<10	12	44
21270/	MW16	2005	0	13	15	8.9	<1.0	<10	43	30	2.4	<0.1	0.0039	22	<10	5	17
21272	MW16	2005	30	12	15	8.6	<1.0	<10	41	31	2.4	<0.1	0.021	88	<10	60	28
11992/	BMW1	2006	0	12	11	8.6	<1.0	<10	44	24	3.2	<0.10	<0.0030	<10	4.2	34	24
11994	BMW1	2006	30	16	17	11	<1.0	<10	53	34	2.6	<0.10	<0.0030	<10	83	130	23
11988	MW16	2006	0	14.0	16	9.1	<1.0	<10	46	33	2.1	<0.1	<0.050	9160	<10	8600	560
11990	MW16	2006	30	9	10	6.9	<1.0	<10	29	24	2.2	<0.1	<0.050	296	<10	26	270
Down-gradient Soil Samples																	
17282	MW3	2002	0	9.9	10	6	<1.0	<10	35	42	<1.0	<0.1	0.1	<40			
17284	MW3	2002	30	9.2	9.9	6	<1.0	<10	25	23	<1.0	<0.1	<0.003	<40			
17286	MW2	2002	0	9.7	11	7.1	<1.0	<10	39	22	<1.0	<0.1	<0.003	<40			
17288	MW2	2002	30	6.3	6.3	<5.0	<1.0	<10	<15	<20	1	<0.1	<0.003	<40			
17290/91	MW1	2002	0	7.6	9.6	6.7	<1.0	<10	26	21	<1.0	<0.1	<0.003	<40			
17294	MW1	2002	30	6.3	8	5.9	<1.0	<10	22	<20	<1.0	<0.1	<0.003	<40			
18034	MW1	2003	0	7.1	6.5	<5.0	<1.0	<10	21	<20	<1.0	<0.1	<0.003	<40			
18036	MW1	2003	30	6.2	6.5	<5.0	<1.0	<10	18	<20	<1.0	<0.1	<0.003	<40			
18038	MW2	2003	0	10	9.5	6.4	<1.0	<10	31	<20	1.1	<0.1	<0.003	<40			
18040	MW2	2003	30	6.9	6.7	<5.0	<1.0	<10	20	<20	<1.0	<0.1	<0.003	<40			
18042	MW3	2003	0	9.1	9.5	5.9	<1.0	<10	27	<20	<1.0	<0.1	0.0048	<40			
18044	MW3	2003	30	7.3	14	7	<1.0	<10	25	24	<1.0	<0.1	<0.003	<40			
21242	MW3	2005	0	7.0	8.1	6.4	<1.0	<10	37	<20	<1.0	<0.1	0.0032	17	<10	<4	17
21244	MW3	2005	30	12	13	8.1	<1.0	15	46	27	<1.0	<0.1	0.011	65	<10	7	58
21246	MW4	2005	0	<5.0	5.2	<5.0	<1.0	<10	25	<20	<1.0	<0.1	0.003	60	<10	<4	60
21248	MW4	2005	30	5.3	6.4	<5.0	<1.0	<10	22	<20	<1.0	<0.1	<0.003	26	<10	8	18
21250	MW2	2005	30	5.2	6.2	<5.0	<1.0	<10	21	<20	<1.0	<0.1	0.013	13	<10	<4	13

Sample #	Location	Date	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co [mg/kg]	Cd [mg/kg]	Pb [mg/kg]	Zn [mg/kg]	Cr [mg/kg]	As [mg/kg]	Hg [mg/kg]	PCBs [mg/kg]	TPH [mg/kg]	TPH Identity		
															F1	F2	F3
21252	MW2	2005	0	9.1	6.7	<5.0	<1.0	<10	22	<20	<1.0	<0.1	0.031	62	<10	5	57
21254	MW6	2005	0	6.8	12	6.1	<1.0	<10	37	<20	1.2	<0.1	0.0046	300	<10	60	240
21256	MW6	2005	30	5.4	8.3	<5.0	<1.0	19	17	<20	1.8	<0.1	0.071	<10	<10	<4	<9
21258	MW1	2005	0	5.3	6.4	<5.0	<1.0	<10	22	<20	1.5	<0.1	0.98	24	<10	<4	24
21260	MW1	2005	30	5.4	7.3	5.3	<1.0	<10	21	<20	1.2	<0.1	0.025	10	<10	<4	10
21262	MW7	2005	0	7.7	11	7.4	<1.0	<10	52	<20	1.1	<0.1	<0.003	230	<10	<4	230
21264	MW7	2005	30	<5.0	7.7	5.8	<1.0	<10	24	<20	1.2	<0.1	0.017	<10	<10	<4	<9
11964	MW3	2006	0	6.8	7.3	<5.0	<1.0	<10	21	<20	<1.0	<0.1	0.0049	37	<10	< 4.0	37
11966	MW3	2006	30	6.6	6.8	<5.0	<1.0	<10	20	<20	<1.0	<0.1	<0.003	<10	<10	< 4.0	< 9.0
11968	MW4	2006	0	5.6	5.4	<5.0	<1.0	<10	19	<20	<1.0	<0.1	<0.003	130	<10	< 4.0	130
11970	MW4	2006	30	6.6	5.7	<5.0	<1.0	<10	19	<20	1.9	<0.1	<0.003	26	<10	< 4.0	26
11972	MW2	2006	0	11	8.9	7	<1.0	<10	34	<20	2.1	<0.1	<0.003	5.7	<10	5.7	< 9.0
11974	MW2	2006	30	7.6	7.1	<5.0	<1.0	<10	23	<20	1.6	<0.1	<0.003	18.2	<10	7.2	11
11976	MW6	2006	0	8.3	8.5	5.7	<1.0	<10	25	<20	1.6	<0.1	0.003	12	<10	< 4.0	12
11978	MW6	2006	30	6.9	7.5	5.1	<1.0	<10	21	<20	2.1	<0.1	<0.003	19	<10	< 4.0	19
11980	MW1	2006	0	6.7	6.3	<5.0	<1.0	<10	22	<20	1.9	<0.1	<0.003	24	<10	< 4.0	24
11982	MW1	2006	30	11	11	7.9	<1.0	<10	34	24	2.3	<0.1	<0.003	19.6	<10	5.6	14
11984	MW7	2006	0	9.7	11	6.7	<1.0	<10	37	21	2.3	<0.1	<0.003	23	<10	< 4.0	23
11986	MW7	2006	30	8.4	9.6	6.6	<1.0	<10	29	21	2.0	<0.1	<0.003	20.5	<10	4.5	16
	N Value			59	51	52	59	62	59	53	54	50	70	76			
	Average			10.0	10.3	6.1	<1.0	<10	39.2	<20	1.3	<0.1	<0.003	484			
	Standard Deviation			5.4	4.6	3.0			22.6		0.8			1682			
	Minimum			<5.0	<5.0	<5.0		<10	<15	<20	<1.0		<0.003	<10			
	Maximum			35.0	25.0	14.0		160	120.0	46.0	3.2		1.0	11000			
	95% Confidence Limit			1.4	1.3	0.8			5.8		0.2			378			

Table 2.2: Station Area Non-Hazardous Waste Landfill - Baseline Groundwater Data

Sample #	Location	Date	Cu [mg/L]	Ni [mg/L]	Co [mg/L]	Cd [mg/L]	Pb [mg/L]	Zn [mg/L]	Cr [mg/L]	As [mg/L]	Hg [mg/L]	PCBs [mg/L]	TPH [mg/L]	TPH Identity		
														F1	F2	F3
Up-gradient Groundwater Samples																
17985	BMW 3	2003	1.09	1.57	0.946	<0.04	0.806	5.17	2.98	0.119	<0.0004	<0.00002	<1.0			
18018	TMW4	2003											<1.0			
18019	TMW1	2003											<1.0			
18020	TMW1	2003											<1.0			
18021	TMW2	2003											1.6			
19213	TMW10	2004											8.5			
19214	TMW11	2004											<1.0			
19215	TMW12	2004											5.4			
19216	TMW13	2004											3.9			
19217	TMW15	2004											5.1			
19217	TMW16	2004											350			
21186	BMW3	2005	0.018	0.028	0.0060	<0.0010	<0.010	0.053	0.059	0.0080	<0.0040	<0.000020	<1.0	<0.050	<0.50	<1.0
12026	BMW1	2006											317	290	25	2.0
12023	BMW3	2006	0.10	0.17	0.068	<0.0010	0.047	0.36	0.34	0.014	<0.00040	<0.000020	<1.0	8.2	<0.50	<1.0
12025	MW16	2006											1200	920	100	180
Down-gradient Groundwater Samples																
21195	MW7B	2005	0.041	0.059	0.012	<0.001	0.015	0.69	0.029	0.003	<0.004	<0.00002	<1	<0.05	<0.5	<1
12012	MW6B	2006	0.038	0.078	0.009	<0.001	0.022	0.29	0.082	0.0062	<0.0004	<0.00002	<1.6	<1.6	<0.5	<1
12013	MW1	2006	0.018	0.105	0.0066	<0.001	<0.010	0.10	0.21	<0.003	<0.0004	<0.00002	1.6	1.6	<0.5	<1
12014	MW7B	2006	0.069	0.138	0.031	<0.001	0.035	0.65	0.18	0.0093	<0.0004	<0.00002	<1.6	<1.6	<0.5	<1
N Value			7	7	7	7	7	7	7	7	7	7	19			
Average			0.196	0.307	0.154	<0.0010	0.134	1.045	0.553	0.027	<0.0004	<0.00002	<1.0			
Standard Deviation			0.395	0.559	0.350		0.297	1.835	1.075	0.045						
Minimum			0.018	0.028	0.006	<0.0010	<0.010	0.053	0.029	0.003			<1.0			
Maximum			1.090	1.570	0.946	<0.04	0.806	5.170	2.980	0.119			1200			
95% Confidence Limit			0.293	0.414	0.259		0.220	1.360	0.797	0.034						

3.0 Tier II Disposal Facility

A DCC Tier II Disposal Facility has been constructed at the CAM-4 site for the disposal of Tier II soil excavated during the clean-up. The facility is located west of the former warehouse, and up-gradient of the Upper Site Landfill.

The Tier II Disposal Facility design is a double containment system. The landfill was constructed with the placement of low-permeability, saturated, compacted berms keyed into frozen/saturated ground below existing ground, 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 freeze back of landfill contents. Five groundwater monitoring wells were installed at the landfill perimeter, and four thermistors were installed within the landfill to monitor ground temperatures.

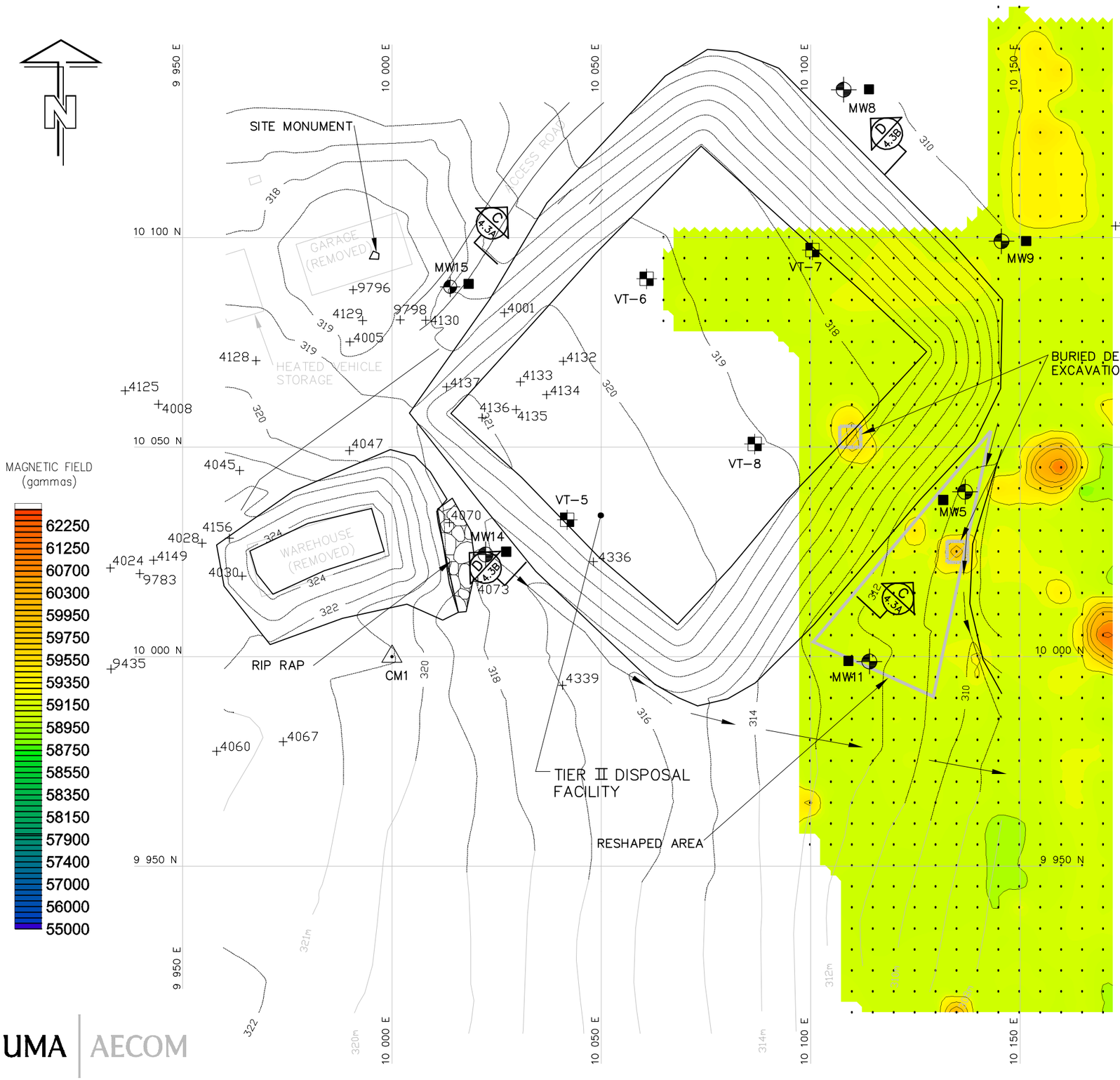
The long term monitoring plan consists of visual monitoring, periodic collection of soil and groundwater samples, and monitoring of subsurface ground temperatures in the berms and in the main body of the disposal facility. Locations for the collection of soil and groundwater samples and thermistor installations are identified on Figure CAM-4.3.

3.1 Baseline Data

Because of its location immediately down-gradient of the station infrastructure pad, residual contaminant levels are expected along the up-gradient edge. Furthermore, the down-gradient area of the landfill (to the west-northwest) is a former pallet line storage area for the site operations, and an equipment laydown area heavily used by the contractor over the course of site clean-up. Accordingly, residual, low level, contaminant concentrations may be detected here during monitoring as well. However, contaminant levels from residual impacts should decline over time.

Sample locations for baseline soil samples are shown in Figure CAM-4.3. A summary of the baseline soil analytical data is provided in Table 3.1. Baseline data is comprised of site investigation information collected up-gradient of the landfill in 1997 and 1999, and samples collected at permanent monitoring locations up and down-gradient of the landfill from 2002 to 2006. Soil baseline concentrations of inorganic elements at the Tier II Soil Disposal Facility are consistent with or lower than upper site background levels except for nickel, lead and zinc which all have significantly higher concentrations than the background levels (see Table 3.1). Low-level PCBs (up to 0.65 mg/kg) were detected at both surface and depth at various monitoring locations both up and down-gradient of the facility. Elevated PCB and metal levels are likely due to residual impacts from the station area. In 2005 and 2006 most samples taken from both up and down-gradient locations had detections of TPH that ranged from 10 to 596 mg/kg, while samples taken in 2003 did not have any TPH detected. It has been noted commonly that hydrocarbon impacts have been newly identified when the analytical method changes from TPH analysis to the CCME CWS methodology, which is consistent with the timing of impacts noted above. Some of the impacts may also be attributed to the hydrocarbon impacts identified at the Station Area Non-Hazardous Waste Landfill (in the case of upgradient locations) and to contractor operations (in the case of downgradient samples).

A summary of baseline groundwater data is provided in Table 3.2. Baseline data was collected from permanent monitoring locations in 2003 to 2006. One elevated zinc sample was collected in 2005 (2.32 mg/L) all other inorganic element data was below the Upper Site background mean. No PCBs were detected and all but four samples had no detection of TPH. In 2005 and 2006, there were four TPH detections with concentrations up to 12.2 mg/L (primarily F1). The increase is likely caused by the same factors noted in the preceding paragraph.



LEGEND:

- TBM4 — TEMPORARY BENCHMARK
- BM–1 — PERMANENT BENCHMARK
- 101 — COORDINATE POINT
- ■ — MONITORING SOIL SAMPLE LOCATION
- ⊕ — MONITORING WELL LOCATION
- ▣ — VERTICAL THERMISTOR LOCATION
- +4070 — BASELINE SOIL SAMPLE LOCATION

COORDINATE POINTS (AS–BUILT) VERTICAL THERMISTORS		
NO.	NORTHING	EASTING
VT–5	10 032.67	10 041.85
VT–6	10 090.20	10 060.83
VT–7	10 097.07	10 100.40
VT–8	10 050.75	10 086.59

COORDINATE POINTS (AS BUILT) MONITORING WELLS			
NO.	NORTHING	EASTING	ELEV.
MW5	10 039.35	10 136.86	310.91
MW8	10 135.37	10 107.87	310.20
MW9	10 099.17	10 145.56	310.10
MW11	9 998.83	10 114.01	312.57
MW14	10 024.37	10 022.34	317.80
MW15	10 088.30	10 013.90	317.70

SURVEY CONTROL MONUMENTS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
CM1	10 000.000	10 000.000	321.116	CAM–4 BASELINE STA. 0+00.0

SCALE 1:1000 — 0 10 20 30 m

RECORD DRAWING
NOT FOR CONSTRUCTION

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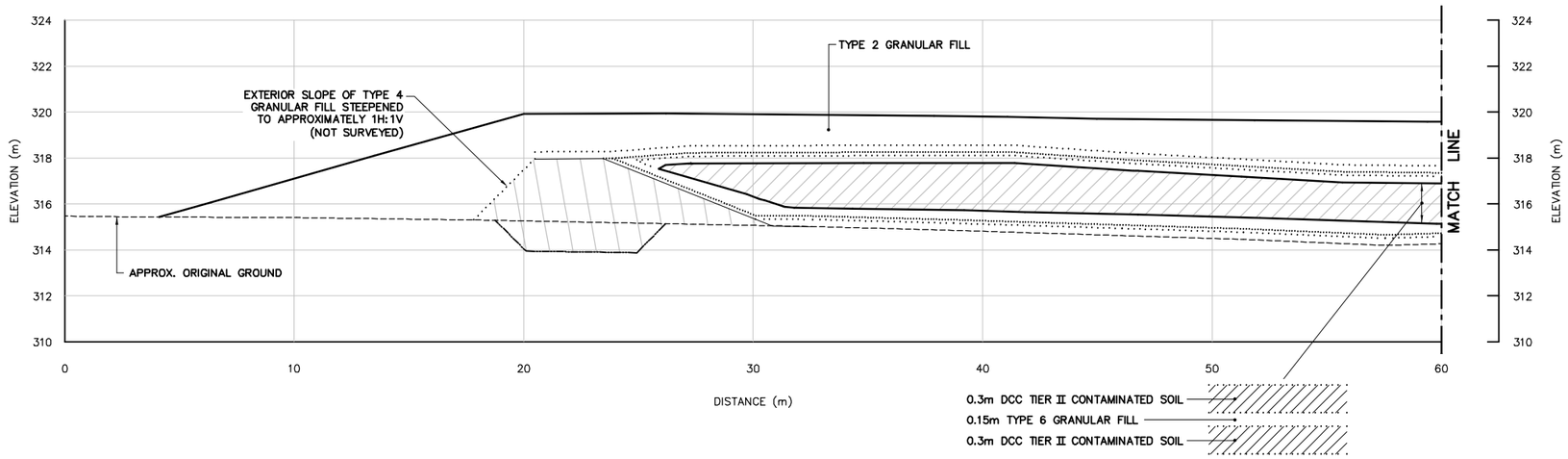
DGN NAME: C4–R003.DWG CLC – 08/02/04

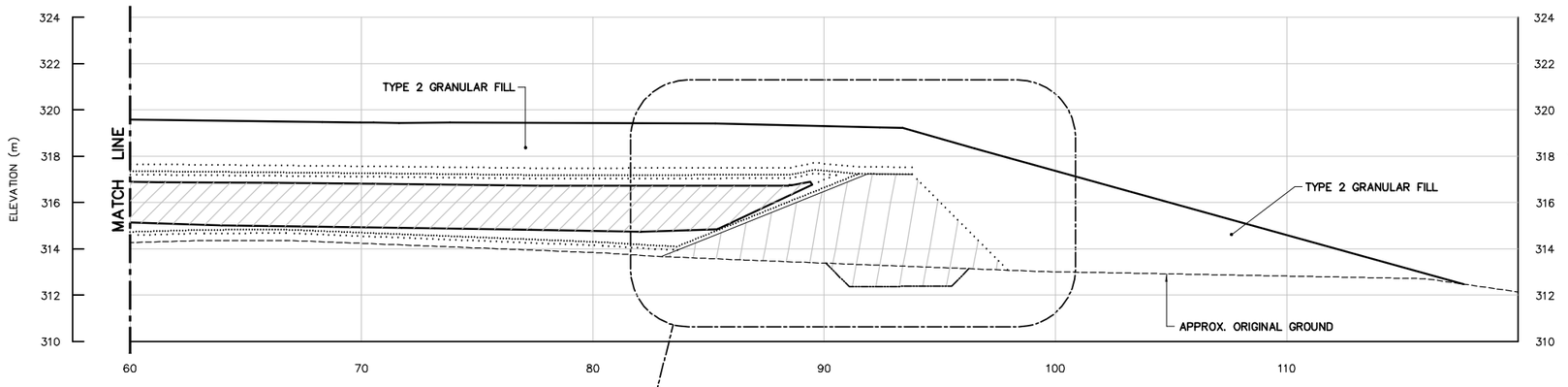
DEW LINE CLEAN UP
LANDFILL MONITORING PLAN

CAM-4 - PELLY BAY

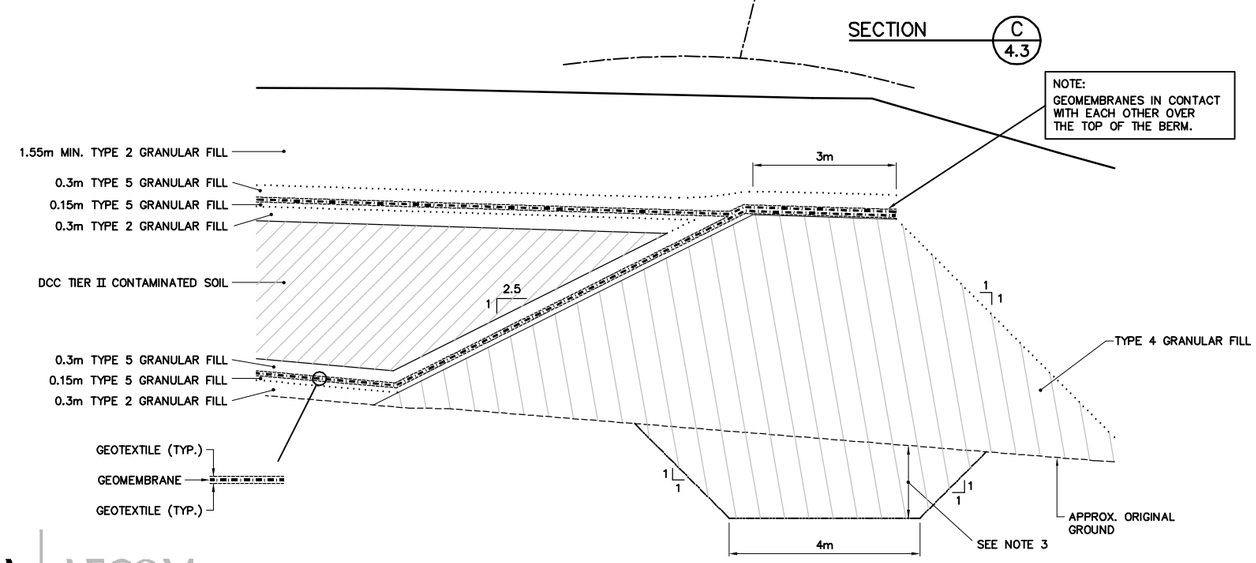
TIER II DISPOSAL FACILITY

FIGURE CAM-4.3





SECTION C 4.3



KEY TRENCH AND LINER DETAIL
N.T.S.

General Notes:

1. ALL ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. KEY TRENCH EXTENDS BELOW ORIGINAL GROUND TO SATURATED GROUND (DEPTH VARIES).

Legend:

- GENERATED BASED ON PROVIDED SURVEY INFORMATION
- BASED ON DESIGN, NOT SURVEYED

SCALE 1:250 (0, 2.5, 5 m)

NOTE:
THIS DRAWING HAS BEEN REPLOTTED FOR RECORD DRAWING PURPOSES FROM INFORMATION SUPPLIED BY DEFENCE CONSTRUCTION CANADA IN SEPTEMBER, 2006.
CONTRACT DRAWINGS INCLUDE THE ENGINEER'S STAMP.

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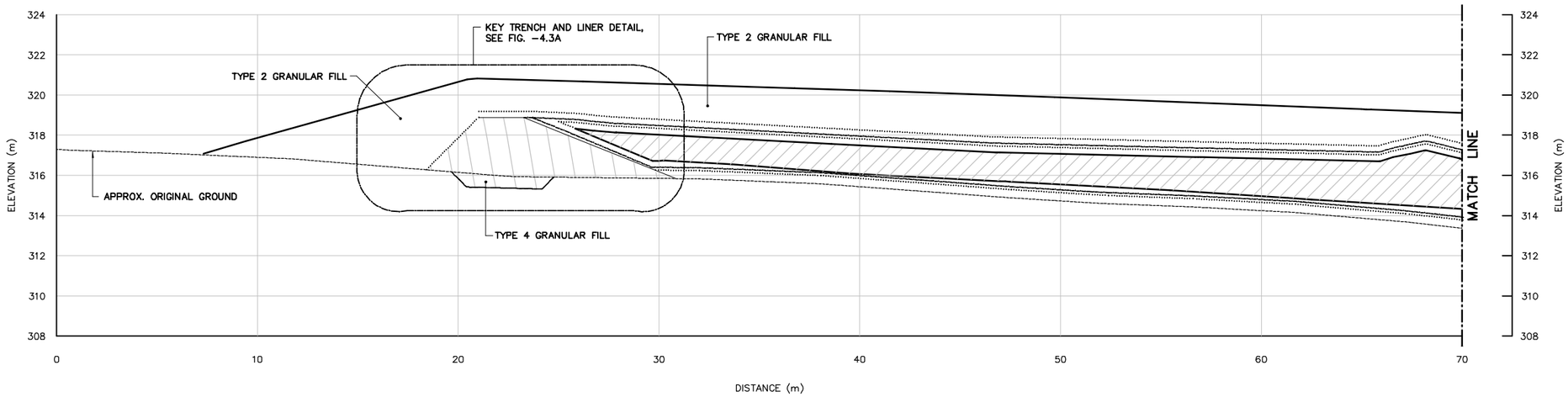
DEW LINE CLEAN UP
LANDFILL MONITORING PLAN

CAM-4 - PELLY BAY
TIER II DISPOSAL FACILITY CROSS-SECTION
FIGURE CAM-4.3A

DOS NAME: C4-RD03A.DWG CLC - 08/02/07

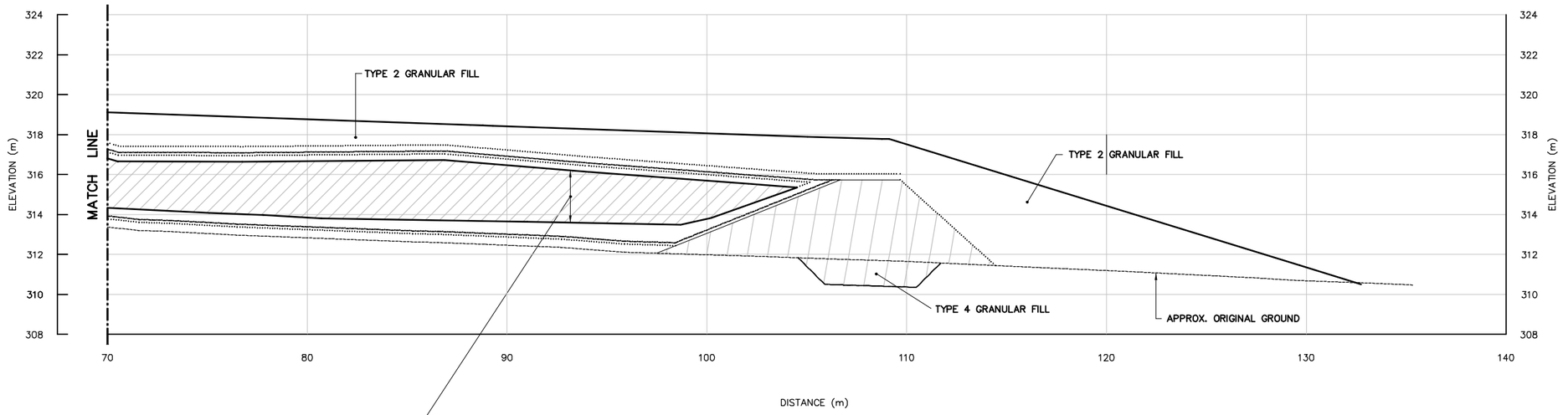


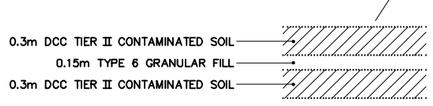
General Notes:

1. ALL ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. KEY TRENCH EXTENDS BELOW ORIGINAL GROUND TO SATURATED GROUND (DEPTH VARIES).

Legend:

- GENERATED BASED ON PROVIDED SURVEY INFORMATION
- BASED ON DESIGN, NOT SURVEYED





SECTION D 4.3

SCALE 1:250 0 2.5 5 m

NOTE:

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CONTRACT DRAWINGS INCLUDE THE ENGINEER'S STAMP.

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DGN NAME: C4-RD03B.DWG CLC – 08/02/07

DEW LINE CLEAN UP
LANDFILL MONITORING PLAN

CAM-4 - PELLY BAY
TIER II DISPOSAL FACILITY CROSS-SECTION
FIGURE CAM-4.3B

Table 3.1: Tier II Disposal Facility - Baseline Soil Data

Sample #	Location	Date	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co [mg/kg]	Cd [mg/kg]	Pb [mg/kg]	Zn [mg/kg]	Cr [mg/kg]	As [mg/kg]	Hg [mg/kg]	PCBs [mg/kg]	TPH [mg/kg]	TPH Identity		
															F1	F2	F3
Up-gradient Soil Samples																	
9435		1997						22	90								
9436	97-9435	1997	15	15				<10	77				<0.5				
9783		1997		11			<1.0	17	200				<0.5				
9796		1997		21				92	140			0.5					
9798		1997		22			1.4	93	190			< 0.5					
4005	4004	1999	70										<0.5	***11000***	100% fuel oil		
4006	4004	1999	110										<0.5	***9500***	100% fuel oil		
4008	4007	1999	50	9.4			<1.0	<10	50				<0.5	***12000***	100% fuel oil		
4009	4007	1999	95	10			<1.0	<10	37				<0.5	***17000***	100% fuel oil		
4024		1999	0						92				< 0.5				
4025	4024	1999	45										<0.5	<40			
4026	4024	1999	95										<0.5	180	100% fuel oil		
4028	4027	1999	50										<0.5	<40			
4029	4027	1999	95										<0.5	1900	100% fuel oil		
4030		1999	0	16				19	140				0.8				
4031/32	4030	1999	60											90	100% lube oil		
4033	4030	1999	120											1100	100% fuel oil		
4045	4044	1999	60										<0.5	***7900***	100% fuel oil		
4046	4044	1999	100										<0.5	86	100% fuel oil		
4047		1999	0										*2.5*	<40			
4048	4047	1999	45										<0.5	500	100% fuel oil		
4049	4047	1999	90										<0.5	310	100% fuel oil		
4061/62	4060	1999	30											1200	100% fuel oil		
4063	4060	1999	70											740	100% fuel oil		
4067		1999	0											<40			
4068	4067	1999	40											<40			
4069	4067	1999	90											<40			
4070		1999	0	8.2	15	5.9	<1.0	<10	29	35	1.4		<0.1				
4071/72	4070	1999	60	20	27	11	<1.0	<10	59	53	2.8		<0.1	<40			

Sample #	Location	Date	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co [mg/kg]	Cd [mg/kg]	Pb [mg/kg]	Zn [mg/kg]	Cr [mg/kg]	As [mg/kg]	Hg [mg/kg]	PCBs [mg/kg]	TPH [mg/kg]	TPH Identity		
															F1	F2	F3
4073		1999	0	19	20	9.3	<0.1	10	85	53	3.1		<0.1	<40			
4074	4073	1999	90	11	17	7.7	<0.1	<10	64	42	2.2		<0.1	<40			
4125		1999		18				130	180								
4128		1999		9.8			<1.0	14	64				<0.5	<40			
4129		1999		14			<1.0	45	73				<0.5				
4130/31		1999		16			<1.0	74	47				<0.5				
4149		1999												<40			
4156		1999		10				22	100				<0.5				
4339		1999	0	7.8	10	5.8	<1.0	<10	42	32	1.4		<0.1	<40			
4340	4339	1999	40	12	16	8.4	<1.0	<10	52	40	2.2		<0.1	<40			
4341/42	4339	1999	80	15	19	10	<1.0	<10	170	51	1.9		<0.1	<40			
17986	BMW2	2003	0	19	22	13	<1.0	11	66	43	3.5	<0.1	<0.003	<40			
17988	BMW2	2003	30	15	18	10	<1.0	<10	44	32	2.7	<0.1	<0.003	<40			
17992	MW14B	2003	0	26	25	13	<1.0	15	74	48	2.9	<0.1	<0.003	<40			
17994	MW14B	2003	30	17	18	11	<1.0	<10	52	35	2.7	<0.1	<0.003	<40			
21226	MW14	2005	0	10	15	10	<1.0	<10	44	32	1.6	<0.1	0.65	<10	<10	<4	<9
21228	MW14	2005	30	19	21	12	<1.0	28	64	40	2.5	<0.1	0.25	<10	<10	<4	<9
21230	MW15	2005	0	8.2	7.7	6.7	<1.0	<10	44	<20	<1.0	<0.1	0.018	396	40	270	86
21232	MW15	2005	30	9.3	9.8	8.1	<1.0	<10	47	26	<1.0	<0.1	0.013	596	25	480	91
12052	MW14	2006	0	13	12	7.3	<1.0	13	53	24	2.5	<0.1	0.043	69	<10	37	32
12054	MW14	2006	30	13	15	7.9	<1.0	<10	41	30	2.3	<0.1	<0.003	<10	<10	4.5	<9.0
12060	MW15	2006	0	11	8.2	6.8	<1.0	<10	45	<20	2.5	<0.1	0.0089	41	<10	15	26
12062	MW15	2006	30	11	9.9	7.8	<1.0	<10	44	<20	2.3	<0.1	0.034	270	<10	140	130
Down-gradient Soil Samples																	
4001	4003	1999	95	12			<1.0	<10	54				<0.5	<40			
4002	4003	1999	40	6.4			<1.0	<10	32				0.7	<40			
4003		1999	0	15			<1.0	37	75				<0.5	<40			
4132		1999		14	11	7.4	<1.0	64	180	34	1.6		0.3				
4133		1999		13	8.9	9.5	<1.0	27	70	21	1.2		<0.5	<40			
4134		1999		13	9.9	11	<1.0	48	170	31	1.5		0.1	<40			
4135		1999		15	10	7.1	<1.0	64	170	30	1.4		0.2	<40			
4136		1999		18	11	7.1	<1.0	68	200	23	1.2		0.5				

Sample #	Location	Date	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co [mg/kg]	Cd [mg/kg]	Pb [mg/kg]	Zn [mg/kg]	Cr [mg/kg]	As [mg/kg]	Hg [mg/kg]	PCBs [mg/kg]	TPH [mg/kg]	TPH Identity		
															F1	F2	F3
4137		1999		18	9.5	7.5	<1.0	53	180	24	1.1		0.2				
4235		1999		7.6	11	6.6	<1.0	<10	41	25	0.95		<0.1	<40			
4236		1999		15	10	6	<1.0	22	73	30	1.2		0.2	<40			
4237		1999												<40			
4238		1999		5.8	6.9	5	<1.0	<10	32	23	0.59		<0.1	<40			
4240/41		1999		35	14	9.2	0.8	51	150	36	1.8		0.2				
4242		1999		14	11	6.6	1.3	19	63	36	0.89		0.1				
4336		1999	0	7.2	20	5	<1.0	<10	49	33	1.4		<0.1	<40			
4337	4336	1999	35	13	19	7.4	<1.0	<10	60	36	3.6		<0.1	<40			
4338	4336	1999	65	11	21	10	<1.0	<10	48	33	2.5		<0.1				
18002	MW5	2003	0	16	13	9.1	<1.0	14	110	24	1.5	<0.1	0.088	<40			
18004	MW5	2003	30	37	20	12	<1.0	16	90	36	1.6	<0.1	0.071	<40			
21214	MW5	2005	0	11	11	7.7	<1.0	26	81	21	1.6	<0.1	0.013	11	<10	<4	11
21216	MW5	2005	30	17	14	8.5	<1.0	19	93	28	1.5	<0.1	0.014	<10	<10	<4	<9
21234	MW9	2005	0	14	13	9.3	<1.0	15	52	28	1.0	<0.1	0.035	331	39	220	72
21236	MW9	2005	30	8.9	8.9	7.3	<1.0	50	45	<20	<1.0	<0.1	0.015	427	<10	7	420
21238	MW8	2005	0	9.9	9.7	8.0	<1.0	<10	39	<20	4.7	<0.1	0.068	240	<10	<4	240
21240/41	MW8	2005	30	9.1	8.6	6.6	<1.0	<10	38	<20	<1.0	<0.1	0.0074	169	<10	19	150
11996	MW8	2006	0	11	9.4	6.2	<1.0	<10	36	<20	3.3	<0.1	0.011	92	<10	< 4.0	92
11998	MW8	2006	30	23	22	13	<1.0	11	76	46	3.7	<0.1	<0.003	266.3	250	5.3	11
12000/01	MW9	2006	0	15	11	8.9	<1.0	<10	45	<20	3.4	<0.1	<0.003	10	<10	< 4.0	10
12002	MW9	2006	30	13	8.7	7.2	<1.0	<10	35	<20	2.5	<0.1	<0.003	21.2	<10	8.2	13
12004	MW5	2006	0	11	8.6	7.3	<1.0	<10	35	<20	2.1	<0.1	<0.003	<10	<10	< 4.0	< 9.0
12006	MW5	2006	30	14	11	8.7	<1.0	<10	42	22	3.9	<0.1	<0.050	<10	<10	< 4.0	< 9.0
	N Value			62	47	47	57	63	64	49	49	28	77	71			
	Average			14.2	13.8	8.4	<1.0	21.7	79.1	28.4	2.1	<0.1	<0.003	<40			
	Standard Deviation			5.8	5.1	2.1		26.6	49.4	12.5	0.9						
	Minimum			5.8	6.9	5.0	<1.0	<10	29.0	<20	0.6	<0.1	<0.003	<10			
	Maximum			37.0	27.0	13.0	1.4	130.0	200.0	53.0	4.7	0.5	2.5	17000			
	95% Confidence Limit			1.5	1.5	0.6		6.6	12.1	3.5	0.3						

Table 3.2: Tier II Disposal Facility - Baseline Groundwater Data

Sample #	Location	Date	Cu [mg/L]	Ni [mg/L]	Co [mg/L]	Cd [mg/L]	Pb [mg/L]	Zn [mg/L]	Cr [mg/L]	As [mg/L]	Hg [mg/L]	PCBs [mg/L]	TPH [mg/L]	TPH Identity		
														F1	F2	F3
Up-gradient Groundwater Samples																
17990	BMW2	2003	0.088	0.08	0.039	<0.001	0.031	0.233	0.143	0.011	<0.0004	<0.00002	<1.0			
17991	BMW2	2003	0.097	0.084	0.043	<0.001	0.033	0.241	0.148	0.013	<0.0004	<0.00002	<1.0			
17996	MW14	2003	0.016	0.013	0.005	<0.001	<0.010	0.039	0.018	<0.003	<0.0004	<0.00002	<1.0			
19197	MW14	2004	0.031	0.024	<0.003	<0.001	<0.010	0.053	0.043	<0.003	<0.0004	<0.00002	<1.0			
21183	MW14A	2005	0.025	0.0070	<0.003	<0.001	<0.010	0.056	0.011	0.0070	<0.004	<0.00002	<1	<0.05	<0.5	<1
21184	MW15	2005	0.035	0.091	0.040	<0.001	0.015	2.32	0.043	0.010	<0.004	<0.00002	2.32	0.52	1.8	<1
12015	MW15	2006	0.014	0.078	0.0089	<0.001	<0.010	0.88	0.12	<0.003	<0.0004	<0.00002	12.2	7.9	4.3	<1
12022	MW14A	2006	0.045	0.13	0.014	<0.001	<0.010	0.11	0.24	0.004	<0.0004	<0.00002	8.1	8.1	<0.5	<1
Down-gradient Groundwater Samples																
18006	MW5	2003	0.078	0.016	<0.003	<0.001	0.013	0.033	0.025	<0.003	<0.0004	<0.00002	<1.0			
19194	MW5	2004	0.037	0.018	<0.003	<0.001	<0.010	0.14	0.021	<0.003	<0.0004	<0.00002	<1.0			
21179	MW 5	2005	0.019	0.008	<0.003	<0.001	<0.010	0.082	0.01	<0.003	<0.004	<0.00002	<1	<0.05	<0.5	<1
21193	MW 9	2005	0.025	0.030	0.0050	<0.001	<0.010	0.086	0.056	0.0050	<0.004		<1	<0.05	<0.5	<1
12016	MW9	2006	0.038	0.37	0.010	<0.001	<0.010	0.072	0.73	0.0063	<0.0004	<0.00002	9.5	9.5	<0.5	<1
12017	MW5	2006	0.053	0.091	0.017	<0.001	0.019	0.60	0.20	0.0038	<0.0004	<0.00002	<1.6	<1.6	<0.5	<1
N Value			14	14	14	14	14	14	14	14	14	13	14			
Average			0.043	0.074	0.014	<0.001	<0.010	0.353	0.129	0.005	<0.0004	<0.00002	<1.0			
Standard Deviation			0.027	0.094	0.016			0.616	0.188	0.004						
Minimum			0.014	0.007	<0.003		<0.010	0.033	0.010	<0.003			<1.0			
Maximum			0.097	0.371	0.043		0.033	2.320	0.727	0.013			12.2			
95% Confidence Limit			0.014	0.049	0.008			0.323	0.098	0.002						

4.0 Upper Site Landfill

The Upper Site Landfill is located approximately 200 m east of the module train. The landfill consists of three lobes: the south, central and north lobes. Based on geophysical survey of the landfill area, the debris is continuous between the north and central lobes, but the south lobe is more isolated. The area encompassed by all three lobes is approximately 12,000 m^2. At the time of investigation, large, extensive amounts of debris were exposed along the steep toe of the central lobe, with the toe of the lobe varying from 4 to 8 m high. The landfill surface slopes moderately at a gradient ranging from 10 to 25% until dropping off at the toe.

Vegetation was scarce within the perimeter of the landfill, but varied from moderate to completely covered beyond the toe of the landfill. Contaminant migration from the landfill was indicated by the Tier I and Tier II contaminated soil (lead, zinc, and PCBs) found down-gradient of the central lobe. No contaminated soil or evidence of leachate was detected at the south lobe.

The Upper Site Landfill was classified as high potential environmental risk when evaluated as a source of contamination, potential pathways, and receptors. The driving factors for this classification include the presence of contaminated soil and leachate at the toe of the landfill, the geometry of the landfill (the steepness and height of the landfill toe), and the extent of debris. Receptors noted include a small lake 500 m down-gradient, vegetation (potentially fruit-bearing and/or used for medicinal purposes), and some terrestrial wildlife.

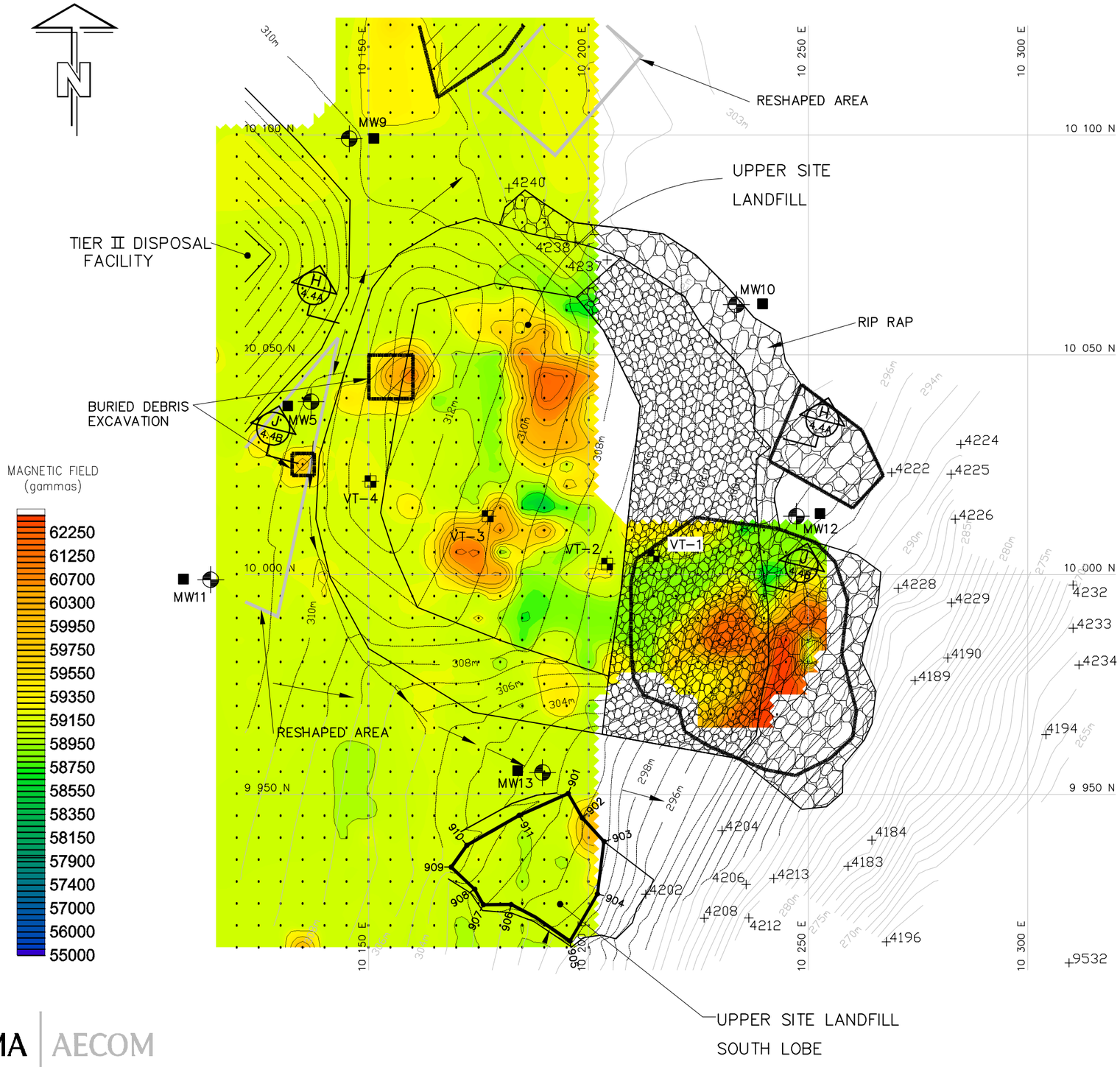
Landfill remediation included complete excavation of the north lobe, partial excavation and installation of a leachate containment system at the central lobe, and regrading of the south lobe. Leachate containment design included the excavation of a trench to saturated and/or frozen ground beyond the landfill perimeter, and the placement of a synthetic liner system anchored into the trench and extended over the full landfill surface. Saturated, compacted, well-graded silty sand and gravel (Type 4 granular) was placed within the trench and over the entire landfill surface overlying the liner system. Finally, a sufficient cover of granular fill was placed over the surface and key trench to promote the aggradation of permafrost into the landfill contents and the overlying Type 4 granular fill sections. For erosion protection from surface drainage, the top cover section along the down-gradient slope was comprised of Type 1 (rip rap) granular. Five groundwater monitoring wells were installed at the landfill perimeter, and four thermistors were installed within the landfill footprint to monitor freeze back conditions.

The long term monitoring plan consists of visual monitoring, collection of soil samples, collection of groundwater samples, and downloading of ground temperature data. Approximate locations for the collection of soil and groundwater samples, and thermistor installation locations are identified on Figure CAM-4.4.

4.1 Baseline Data

Locations for baseline soil samples are shown in Figure CAM-4.2. A summary of baseline soil analytical data is provided in Table 2.1. Baseline data is comprised of landfill assessment data for soil samples collected up and down-gradient of the landfill in 1997, 1999, and baseline monitoring data from 2003, 2005, and 2006. Soil baseline concentrations of inorganic elements at the Upper Site Landfill are consistent with or lower than upper site background levels. One occurrence of Tier II arsenic was identified, at MW-11 in 2003, but concentrations were below criteria in subsequent monitoring events. Low concentrations of PCBs were found at the permanent monitoring locations in 2003 and 2006, while higher concentrations of PCBs were detected in 2005 especially at down-gradient sites. The down-gradient concentrations ranged from 0.025 to 0.2 mg/kg (MW-10 and 12 respectively). F1 and F2 hydrocarbon fractions had low concentrations in both the up-gradient and down-gradient sites, but F3 hydrocarbon fractions had high concentrations in the up-gradient samples taken from MW-11 in 2003, 2005, and 2006. The F3 fraction concentrations at MW-11 ranged from 467 to 5,900 mg/kg. The noted elevated contaminant concentrations in baseline samples are thought to be due to residual impacts from the station area and historical contaminant migration down-gradient. Concentrations are expected to decline over time.

A summary of baseline groundwater data is provided in Table 2.2. Baseline data was collected from permanent monitoring locations in 2003, 2004, 2005, and 2006. Levels of inorganic elements at MW12 were elevated above Upper Site background concentrations in 2003. Results since then have been consistent with background concentrations. No PCBs were detected and most samples had no detection of TPH. Low levels of TPH were detected in three samples, with the highest concentrations being F1 fractions of 8.4 mg/L from MW-12 and MW-11 in 2006.



MAGNETIC FIELD
(gammas)

62250
61250
60700
60300
59950
59750
59550
59350
59150
58950
58750
58550
58350
58150
57900
57400
57000
56000
55000

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DGN NAME: C4-RD04.DWG CLC - 08/02/05

LEGEND:

- TBM4 — TEMPORARY BENCHMARK
- BM-1 — PERMANENT BENCHMARK
- 101 — COORDINATE POINT
- MONITORING SOIL SAMPLE LOCATION
- MONITORING WELL LOCATION
- VERTICAL THERMISTOR LOCATION
- 4222 — BASELINE SOIL SAMPLE LOCATION
- BURIED DEBRIS EXCAVATION

COORDINATE POINTS (AS-BUILT)
VERTICAL THERMISTORS

NO.	NORTHING	EASTING
VT-1	10 004.25	10 214.81
VT-2	10 002.40	10 204.22
VT-3	10 013.27	10 177.09
VT-4	10 021.18	10 150.41

COORDINATE POINTS (AS BUILT)
MONITORING WELLS

NO.	NORTHING	EASTING	ELEV.
MW5	10 039.35	10 136.86	310.91
MW9	10 099.17	10 145.56	310.10
MW10	10 061.40	10 233.67	301.51
MW11	9 998.83	10 114.01	312.57
MW12	10 013.26	10 247.33	295.85
MW13	9 954.94	10 189.55	302.36

COORDINATE POINTS (AS BUILT)
UPPER SITE LANDFILL – SOUTH LOBE

NO.	NORTHING	EASTING	ELEV.
901	9 950.2	10 195.4	301.8
902	9 944.7	10 198.6	301.0
903	9 939.2	10 203.5	300.4
904	9 927.3	10 202.0	299.9
905	9 916.6	10 195.8	299.3
906	9 924.9	10 182.4	301.4
907	9 924.9	10 176.1	302.1
908	9 928.4	10 174.1	302.4
909	9 933.4	10 168.8	304.6
910	9 938.4	10 172.3	304.3
911	9 945.2	10 184.3	302.8

SCALE 1:1000
0 10 20 30 m

RECORD DRAWING
NOT FOR CONSTRUCTION

DEW LINE CLEAN UP
LANDFILL MONITORING PLAN

CAM-4 - PELLY BAY

UPPER SITE LANDFILL

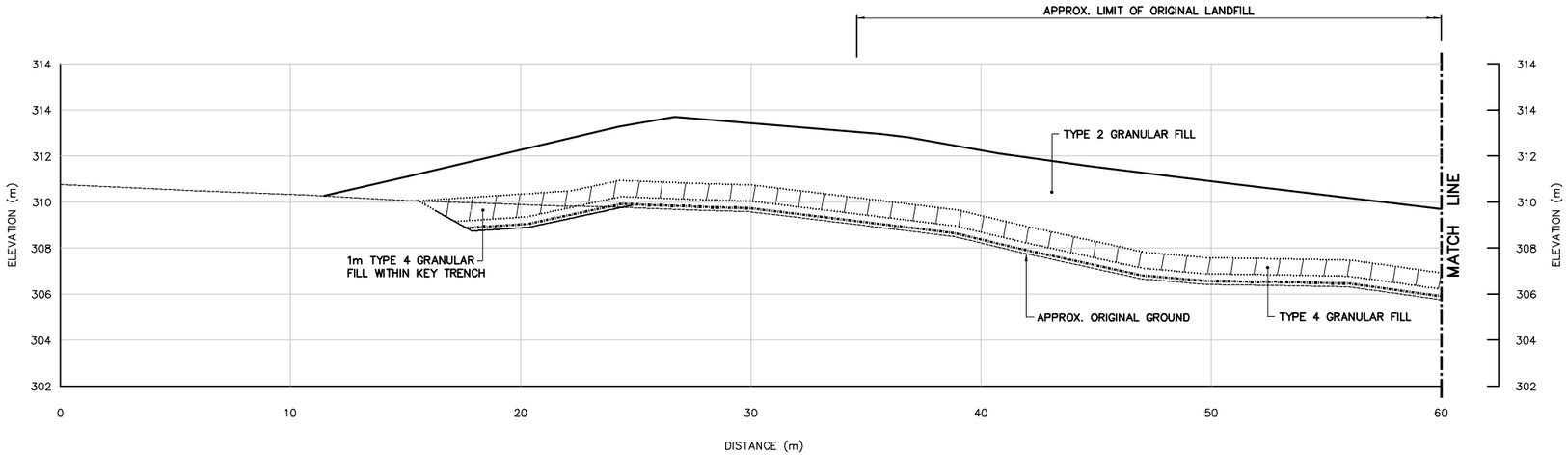
FIGURE CAM 4.4

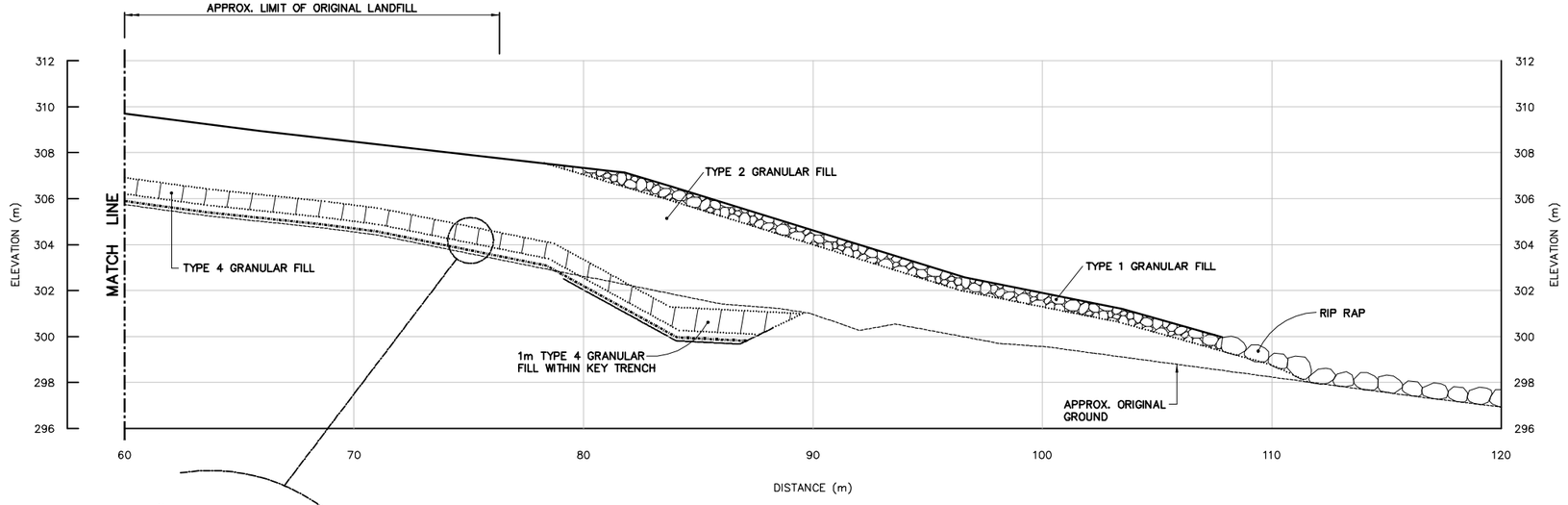
General Notes:

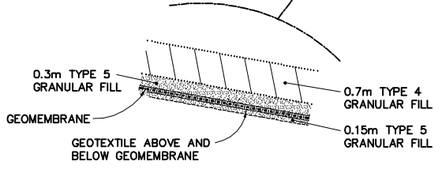
1. ALL ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. KEY TRENCH EXTENDS BELOW ORIGINAL GROUND TO SATURATED GROUND (DEPTH VARIES).

Legend:

- GENERATED BASED ON PROVIDED SURVEY INFORMATION
- BASED ON DESIGN, NOT SURVEYED







SECTION H 4.4

SCALE 1:250 0 2.5 5 m

NOTE:

THIS DRAWING HAS BEEN REPLOTTED FOR RECORD DRAWING PURPOSES FROM INFORMATION SUPPLIED BY DEFENCE CONSTRUCTION CANADA IN SEPTEMBER, 2006.

CONTRACT DRAWINGS INCLUDE THE ENGINEER'S STAMP.

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DEW LINE CLEAN UP
LANDFILL MONITORING PLAN

CAM-4 - PELLY BAY
UPPER SITE LANDFILL CROSS-SECTION
FIGURE CAM 4.4A

DOS NAME: C4-R004A.DWG CLC - 08/02/07

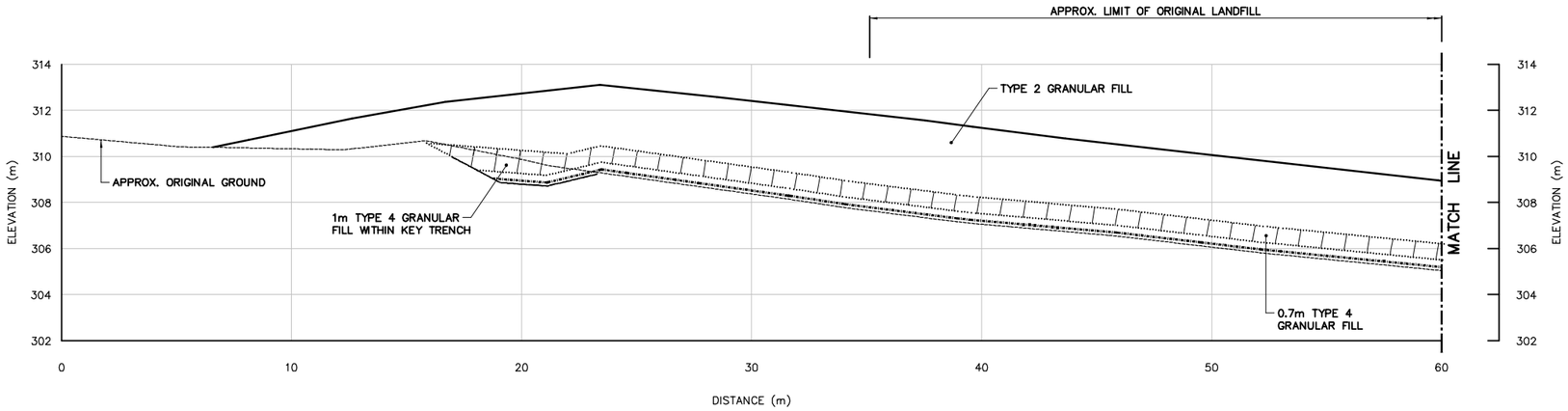
General Notes:

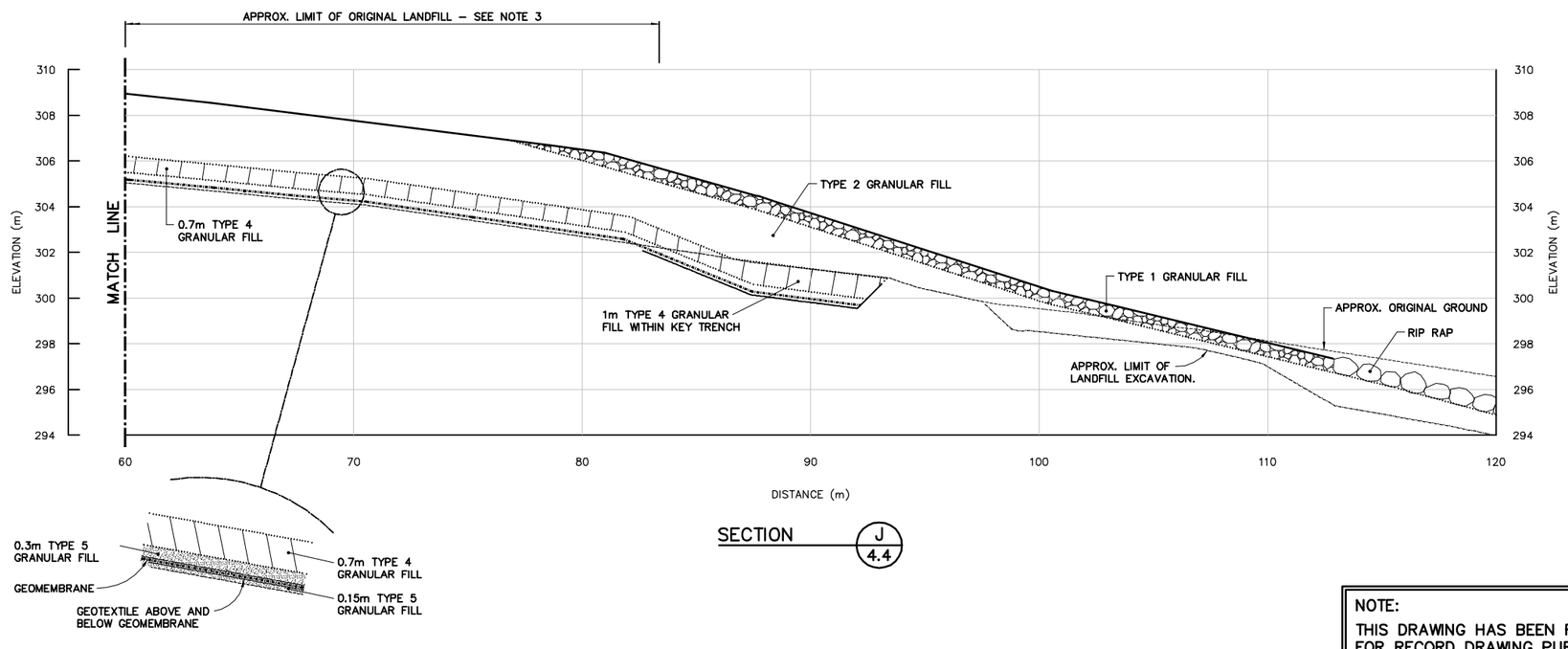
1. ALL ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. KEY TRENCH EXTENDS BELOW ORIGINAL GROUND TO SATURATED GROUND (DEPTH VARIES).

Legend:

GENERATED BASED ON PROVIDED SURVEY INFORMATION

BASED ON DESIGN, NOT SURVEYED





SECTION J 4.4

SCALE 1:250 0 2.5 5 m

NOTE:

THIS DRAWING HAS BEEN REPLOTTED FOR RECORD DRAWING PURPOSES FROM INFORMATION SUPPLIED BY DEFENCE CONSTRUCTION CANADA IN SEPTEMBER, 2006.

CONTRACT DRAWINGS INCLUDE THE ENGINEER'S STAMP.

UMA | AECOM

DGN NAME: C4-RD04B.DWG CLC - 08/02/07

DEW LINE CLEAN UP
LANDFILL MONITORING PLAN

CAM-4 - PELLY BAY
UPPER SITE LANDFILL CROSS-SECTION
FIGURE CAM 4.4B

Table 4.1: Upper Site Landfill - Baseline Soil Data

Sample #	Location	Date	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co [mg/kg]	Cd [mg/kg]	Pb [mg/kg]	Zn [mg/kg]	Cr [mg/kg]	As [mg/kg]	Hg [mg/kg]	PCBs [mg/kg]	TPH [mg/kg]	TPH Identity		
															F1	F2	F3
Up-gradient Soil Samples																	
4240/41		1999		35	14	9.2	0.8	51	150	36	1.8		0.2				
18002	MW5	2003	0	16	13	9.1	<1.0	14	110	24	1.5	<0.1	0.088	<40			
18004	MW5	2003	30	37	20	12	<1.0	16	90	36	1.6	<0.1	0.071	<40			
17998	MW11	2003	0	9.6	14	11	<1.0	26	82	20	***57***	<0.1	0.16	***5900***	100% lube oil		
18000	MW11	2003	30	9	8	9.5	<1.0	10	57	<20	1.2	<0.1	0.028	920	100% lube oil		
21214	MW5	2005	0	11	11	7.7	<1.0	26	81	21	1.6	<0.1	0.013	11	<10	<4	11
21216	MW5	2005	30	17	14	8.5	<1.0	19	93	28	1.5	<0.1	0.014	<10	<10	<4	<9
21218	MW11	2005	0	17	15	11	<1.0	11	71	30	2.2	<0.1	0.0073	3400	<10	<40	3400
21220	MW11	2005	30	11	12	8.0	<1.0	<10	36	26	1.8	<0.1	0.0039	***467***	<10	7	460
12004	MW5	2006	0	11	8.6	7.3	<1.0	<10	35	<20	2.1	<0.1	<0.003	<10	<10	< 4.0	< 9.0
12006	MW5	2006	30	14	11	8.7	<1.0	<10	42	22	3.9	<0.1	<0.050	<10	<10	< 4.0	< 9.0
12008	MW11	2006	0	11	11	10	<1.0	27	93	25	4.0	<0.1	<0.050	***4784***	<10	84	4700
12010	MW11	2006	30	8.6	8.2	8.8	<1.0	13	57	<20	3.0	<0.1	<0.050	***2000***	<10	200	1800
Down-gradient Soil Samples																	
9532		1997											<0.5				
4183		1999		12	9.7	5.8	<1.0	32	71	27	0.66		0.4				
4189		1999		6.8	7.3	<5.0	<1.0	<10	40	23	0.58		<0.1				
4190/91		1999		17	13	7.9	<1.0	54	180	38	0.63		0.2				
4194		1999											<0.1				
4196		1999											<0.1				
4200		1999		81	32	25	1.5	49	210	71	3.3		0.2				
4202		1999		40	11	6.6	<1.0	88	230	25	1		<0.1				
4204		1999		6.6	8.5	5.5	<1.0	<10	32	25	0.87		<0.1				
4206		1999		11	14	7	<1.0	<10	42	32	1.2		<0.1				
4208		1999		6.5	7.9	5.8	<1.0	<10	32	23	0.84		<0.1				
4212		1999		6.8	8.6	5.2	<1.0	<10	30	25	0.72		<0.1				
4213		1999		7.7	10	6	<1.0	<10	34	28	0.76		<0.1				
4214		1999		6.9	9.1	<5.0	<1.0	<10	33	24	0.75		<0.1				
4222		1999		5.6	6.6	5	<1.0	<10	36	21	0.91		<0.1				
4224		1999		5.2	<5.0	<5.0	<1.0	<10	26	<20	0.47		<0.1				

Sample #	Location	Date	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co [mg/kg]	Cd [mg/kg]	Pb [mg/kg]	Zn [mg/kg]	Cr [mg/kg]	As [mg/kg]	Hg [mg/kg]	PCBs [mg/kg]	TPH [mg/kg]	TPH Identity		
															F1	F2	F3
4225		1999		7.7	7.5	5.2	<1.0	<10	48	25	0.82		<0.1				
4226		1999		6.1	7.3	<5.0	<1.0	<10	23	20	0.69		<0.1				
4228		1999		4.8	7	<5.0	<1.0	<10	22	25	0.65		<0.1				
4229		1999		13	16	8.6	<1.0	<10	61	45	1.5		<0.1				
4232		1999		6.7	7.3	5	<1.0	<10	63	30	1.1		<0.1				
4233		1999		3.4	7.7	5.2	<1.0	<10	24	21	0.42		<0.1				
4234		1999		5.3	8.9	5.9	<1.0	<10	39	29	0.55		<0.1				
4237		1999												<40			
4238		1999		5.8	6.9	5	<1.0	<10	32	23	0.59		<0.1	<40			
18008	MW10	2003	0	10	11	7.1	<1.0	<10	37	24	<1.0	<0.1	<0.003	<40			
18010	MW10	2003	30	9.4	10	6.3	<1.0	<10	26	21	<1.0	<0.1	<0.003	<40			
18012	MW12	2003	0	9.8	8.7	5.5	<1.0	<10	28	<20	<1.0	<0.1	<0.003	<40			
18014	MW12	2003	30	7.8	7.8	5	<1.0	<10	23	<20	<1.0	<0.1	<0.003	<40			
21274	MW10	2005	0	8.2	13	6.8	<1.0	<10	42	34	1.4	<0.1	0.0068	<10	<10	<4	<9
21276	MW10	2005	30	7.2	10	6.7	<1.0	<10	28	22	1.4	<0.1	0.025	10	<10	<4	10
21350	MW12	2005	0	39	25	14	2.1	48	350	57	2.6	<0.1	0.20	200	<10	<4	200
21352	MW12	2005	30	8.9	8.9	6.2	<1.0	13	48	<20	1.2	<0.1	0.12	217	<10	7	210
21354	MW13	2005	0	<5.0	6.7	<5.0	<1.0	<10	51	<20	1.1	<0.1	0.071	<10	<10	<4	<9
21356	MW13	2005	30	8.6	12	6.6	<1.0	<10	35	26	1.6	<0.1	0.077	63	<10	8	55
12036	MW13	2006	0	5.9	6.3	<5.0	<1.0	<10	50	<20	1.9	<0.1	<0.003	19.5	<10	7.5	12
12038	MW13	2006	30	9.1	9.5	5.7	<1.0	<10	30	<20	2.2	<0.1	<0.003	20	<10	<4.0	20
12040	MW12	2006	0	7.5	8.2	5.6	<1.0	<10	29	<20	2.0	<0.1	0.006	<10	<10	<4.0	<9.0
12042	MW12	2006	30	7.6	7.9	<5.0	<1.0	<10	25	<20	1.7	<0.1	<0.003	<10	<10	6.4	< 9.0
12044	MW10	2006	0	7.7	8	5.3	<1.0	<10	25	<20	2.5	<0.1	<0.003	17.9	<10	6.9	11
12046	MW10	2006	30	8.4	9.8	5.9	<1.0	<10	27	<20	1.9	<0.1	<0.003	14.2	<10	4.3	9.9
	N Value			50	50	50	50	50	50	50	50	28	53	30			
	Average			12.6	10.6	6.8	<1.0	<10	63.2	23.7	2.5	<0.1	<0.1	629			
	Standard Deviation			13.1	4.8	3.7			62.2	12.2	7.9			1499			
	Minimum			<5.0	<5.0	<5.0	<1.0	<10	22.0	<20	0.4		<0.1	<10			
	Maximum			81.0	32.0	25.0	2.1	88.0	350.0	71.0	57.0		0.4	5900			
	95% Confidence Limit			3.6	1.3	1.0			17.2	3.4	2.2			537			

Table 4.2: Upper Site Landfill - Baseline Groundwater Data

Sample #	Location	Date	Cu [mg/L]	Ni [mg/L]	Co [mg/L]	Cd [mg/L]	Pb [mg/L]	Zn [mg/L]	Cr [mg/L]	As [mg/L]	Hg [mg/L]	PCBs [mg/L]	TPH [mg/L]	TPH Identity		
														F1	F2	F3
Up-gradient Groundwater Samples																
18001	MW 11	2003	0.03	0.039	0.008	<0.001	0.01	0.061	0.053	0.004	<0.0004	<0.00002	<1.0			
18006	MW 5	2003	0.078	0.016	<0.003	<0.001	0.013	0.033	0.025	<0.003	<0.0004	<0.00002	<1.0			
19194	MW5	2004	0.037	0.018	<0.003	<0.001	<0.010	0.14	0.021	<0.003	<0.0004	<0.00002	<1.0			
19195	MW11	2004	0.016	0.017	0.0030	<0.001	<0.010	0.056	0.045	0.0070	<0.0004	<0.00002	1.2	100% fuel oil		
21179	MW 5	2005	0.019	0.008	<0.003	<0.001	<0.010	0.082	0.01	<0.003	<0.004	<0.00002	<1	<0.05	<0.5	<1
21182	MW 11	2005	0.013	0.010	<0.003	<0.001	<0.010	0.020	0.014	<0.003	<0.004	<0.00002	<1	<0.05	<0.5	<1
12017	MW5	2006	0.053	0.091	0.017	<0.001	0.019	0.60	0.20	0.0038	<0.0004	<0.00002	<1.6	<1.6	<0.5	<1
12019	MW11	2006	0.007	0.043	0.0032	<0.001	<0.010	0.04	0.063	0.0035	<0.0004	<0.00002	8.4	8.4	<0.5	<1
Down-gradient Groundwater Samples																
18016	MW 12	2003	0.567	0.711	0.35	<0.001	0.315	1.93	1.14	0.086	<0.0004	<0.00002	<1.0			
19196	MW12	2004	0.086	0.12	0.039	<0.001	0.03	0.35	0.16	0.011	<0.0004	<0.00002	<1.0			
21185	MW 12	2005	0.18	0.20	0.091	<0.001	0.067	0.50	0.31	0.026	<0.004	<0.00002	<1	<0.05	<0.5	<1
12018	MW13	2006	0.050	0.052	0.012	<0.001	<0.010	0.14	0.059	<0.003	<0.0004	<0.00002	8.4	8.4	<0.5	<1
12024	MW12	2006	0.17	0.26	0.080	<0.001	0.053	0.39	0.39	0.020	<0.0004	<0.00002	<1.6	<1.6	<0.5	<1
N Value			13	13	13	13	13	13	13	13	13	13	13			
Average			0.100	0.122	0.047	<0.001	0.041	0.334	0.191	0.013	<0.0004	<0.00002	<1.0			
Standard Deviation			0.151	0.194	0.096		0.085	0.518	0.309	0.023						
Minimum			0.007	0.008	<0.003		<0.010	0.020	0.010	<0.003	<0.0004		<1.0			
Maximum			0.567	0.711	0.350		0.315	1.930	1.140	0.086	<0.004		8.4			
95% Confidence Limit			0.082	0.105	0.052		0.046	0.281	0.168	0.013						

5.0 Lower Site Non-Hazardous Waste Landfill

The Lower Site Non-Hazardous Waste Landfill is a new landfill constructed for the disposal of non-hazardous wastes and debris generated and collected during the clean-up. The landfill site is located approximately 1.5 km west of the west end of the airstrip, across the road from the Lower Site Landfill main lobe, and to the south of the Lower Site Landfill east lobe.

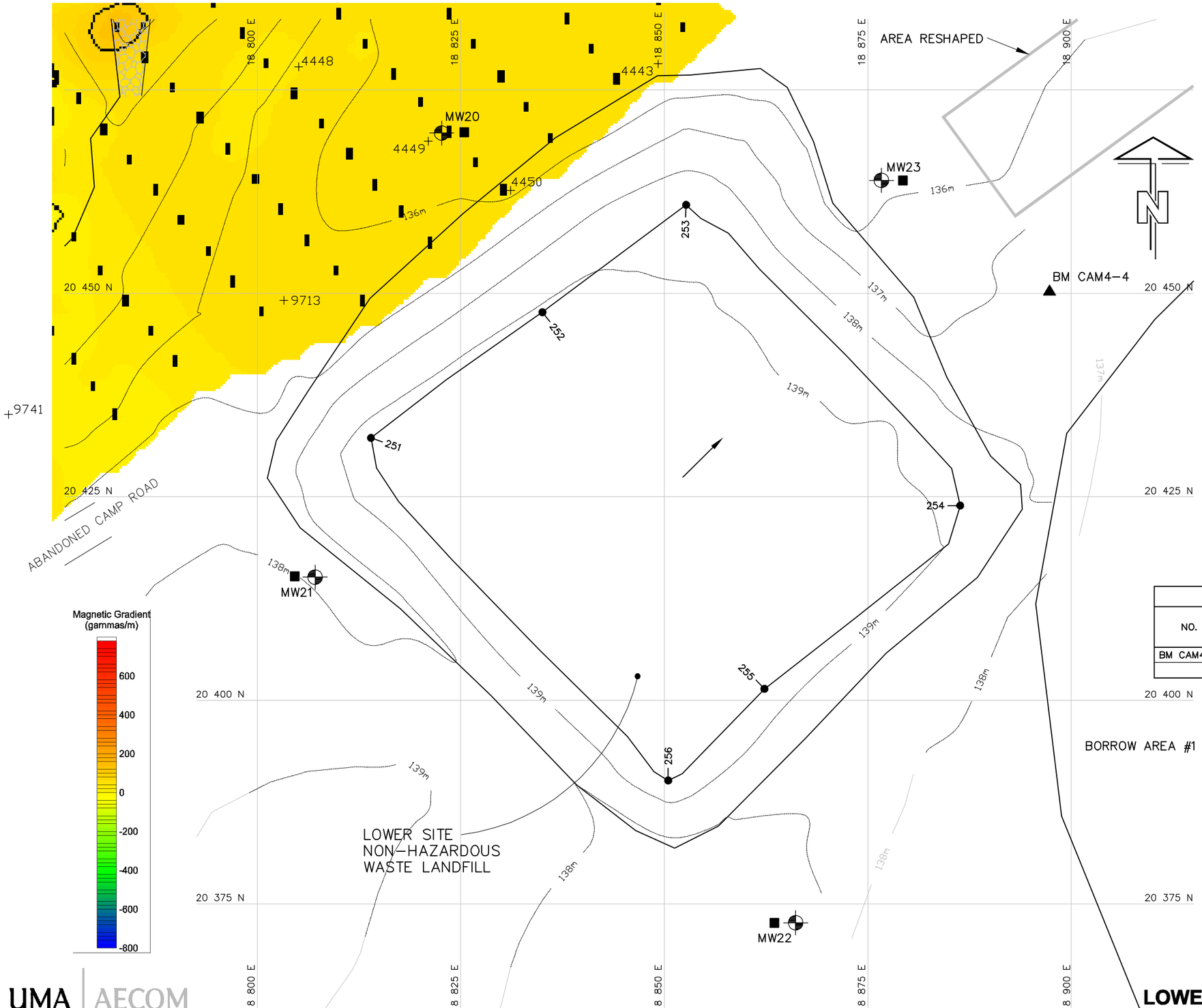
The design of this landfill includes perimeter berms and placement of a cover of compacted granular fill over the landfilled material. Four groundwater monitoring wells were installed at the landfill perimeter.

The long term monitoring plan will consist of visual monitoring and periodic collection of soil and groundwater samples. Approximate locations for the collection of soil and groundwater samples are identified on Figure CAM-4.5.

5.1 Baseline Data

Sample locations for baseline soil samples are shown in Figure CAM-4.5. A summary of the baseline soil analytical data is provided in Table 5.1. Baseline data is comprised of samples collected in the vicinity of the Lower Site Landfill during the site investigations in 1997 and 1999, and samples collected at permanent monitoring locations during 2003, 2005 and 2006. Mean baseline concentrations for copper, nickel, cobalt, lead, and zinc were noted to be higher than background concentrations for the lower site area. Low-level PCBs concentrations were detected at almost all sample locations in 2005 and 2006, including at the background/reference monitoring well, with concentrations up to 0.11 mg/kg. Similarly, low-level TPH concentrations (F2 and F3 fractions) were detected at most monitoring locations, including the background/reference well. The maximum concentration observed was 284.6 mg/kg (almost all F3).

A summary of baseline groundwater data is provided in Table 5.2. Baseline data was collected from permanent monitoring locations in 2003, 2004, 2005, and 2006. Mean baseline concentrations for copper, nickel, cobalt, lead, zinc, and chromium were noted to be higher than reference concentrations for the lower site area. No PCBs were detected and all but one sample had no detection of TPH. In 2006 at monitoring well MW-23 there was a TPH detection of 3.9 mg/L (F1 fraction).



LEGEND:

TBM4 ⊡	TEMPORARY BENCHMARK
BM-1 ▲	PERMANENT BENCHMARK
101-•	COORDINATE POINT
■	MONITORING SOIL SAMPLE LOCATION
⊕	MONITORING WELL LOCATION
+9713	BASELINE SOIL SAMPLE LOCATION

COORDINATE POINTS (AS BUILT)
NON-HAZARDOUS WASTE LANDFILL

NO.	NORTHING	EASTING	ELEV.
251	20 432.2	18 814.0	139.0
252	20 447.7	18 835.0	139.1
253	20 460.9	18 852.7	139.6
254	20 423.9	18 886.4	138.9
255	20 401.4	18 862.3	139.5
256	20 390.2	18 850.5	139.6

COORDINATE POINTS (AS BUILT)
MONITORING WELLS

NO.	NORTHING	EASTING	ELEV.
MW20	20 469.69	18 822.66	135.36
MW21	20 415.14	18 807.11	137.95
MW22	20 372.69	18 866.14	137.78
MW23	20 463.89	18 876.67	135.90

PERMANENT BENCHMARKS

NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
BM CAM4-4	20 450.188	18 897.315	138.392	BRASS PLUG IN ROCK

SCALE 1:500

0 5 10 15 m

RECORD DRAWING
NOT FOR CONSTRUCTION

UMA | AECOM

DOS NAME: C4-RD05.DWG CLC - 08/02/06

DEW LINE CLEAN UP
LANDFILL MONITORING PLAN

CAM-4 - PELLY BAY

LOWER SITE NON-HAZARDOUS WASTE LANDFILL

FIGURE CAM-4.5

Table 5.1: Lower Site Non-Hazardous Waste Landfill - Baseline Soil Data

Sample #	Location	Date	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co [mg/kg]	Cd [mg/kg]	Pb [mg/kg]	Zn [mg/kg]	Cr [mg/kg]	As [mg/kg]	Hg [mg/kg]	PCBs [mg/kg]	TPH [mg/kg]	TPH Identity		
															F1	F2	F3
Reference Soil Samples																	
17976	BMW4	2003	0	9.0	7.6	<5.0	<1.0	<10	24	<20	<1.0	<0.1	<0.003	<40			
17978	BMW4	2003	30	12	9.0	5.3	<1.0	<10	26	<20	<1.0	<0.1	<0.003	<40			
21340	BMW4	2005	0	6.9	7.1	<5.0	<1.0	<10	33	<20	<0.1	<0.1	0.014	102	<10	6.0	96
21342	BMW4	2005	30	<5.0	6.3	<5.0	<1.0	<10	22	<20	<0.1	<0.1	0.0099	10	<10	<4	9.0
11948	BMW4	2006	0	<5.0	5.9	<5.0	<1.0	<10	22	<20	1.7	<0.1	0.16	363	<10	340	23
11950	BMW4	2006	30	7.9	8	<5.0	<1.0	<10	26	<20	1.7	<0.1	<0.003	10	<10	8.2	< 9.0
Down-gradient Soil Samples																	
9713		1997		19	13	8.5	<1.0	<10	54	24	12	<0.1	0.05				
9714	9713	1997	50	13	45	12	<1.0	<10	120	110	0.91	<0.1	0.05				
4443		1999			7.7				34	49							
4448		1999			7.9				<10	34							
4449		1999			17				24	110							
4450		1999			8.1				13	29							
17958	MW21	2003	0	12	11	6.4	<1.0	77	130	30	2	<0.1	<0.003	<40			
17960	MW21	2003	30	13	9.3	5.4	<1.0	20	70	21	1.6	<0.1	<0.003	<40			
17952	MW23	2003	0	15	9.4	5.5	<1.0	65	34	<20	1.7	<0.1	<0.003	<40			
17954	MW23	2003	30	11	10	6	<1.0	10	26	<20	1.1	<0.1	<0.003	<40			
21206	MW20	2005	30	13	9.8	5.9	<1.0	24	47	20	1.5	<0.1	0.022	<10	<10	<4	<9
21208	MW20	2005	0	15	11	6.8	<1.0	13	40	24	11	<0.1	0.0040	<10	<10	<4	<9
21210	MW21	2005	0	13	22	7.3	<1.0	78	130	56	2.5	<0.1	0.019	200	<10	<4	200
21212	MW21	2005	30	7.9	9.7	5.4	<1.0	<10	30	21	1.5	<0.1	0.0068	<10	<10	<4	<9
21316	MW22	2005	0	13	6.9	<5.0	<1.0	<10	27	<20	<0.1	<0.1	0.038	10	<10	<4	10
21318	MW22	2005	30	12	12	<5.0	<1.0	<10	25	<20	<0.1	<0.1	0.027	<10	<10	<4	<9
21280	MW23	2005	0	9.5	8.7	5.8	<1.0	39	34	<20	2.1	<0.1	0.019	<10	<10	<4	<9
21282	MW23	2005	30	10	10	5.9	<1.0	<10	25	20	1.3	<0.1	0.022	<10	<10	<4	<9
11928	MW20	2006	0	9.6	9.2	5.3	<1.0	<10	27	<20	3.6	<0.1	0.11	200	<10	< 4.0	200
11930	MW20	2006	30	11	8.6	5.3	<1.0	<10	23	<20	1.8	<0.1	0.0038	14	<10	< 4.0	14
11932	MW21	2006	0	13	11	6.5	<1.0	54	160	32	2.6	<0.1	0.11	284.6	<10	4.6	280
11934	MW21	2006	30	12	11	6.6	<1.0	32	82	30	2.8	<0.1	0.037	124.7	<10	4.7	120

Sample #	Location	Date	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co [mg/kg]	Cd [mg/kg]	Pb [mg/kg]	Zn [mg/kg]	Cr [mg/kg]	As [mg/kg]	Hg [mg/kg]	PCBs [mg/kg]	TPH [mg/kg]	TPH Identity		
															F1	F2	F3
11920	MW22	2006	0	10	6.9	<5.0	<1.0	<10	23	<20	1.5	<0.1	<0.003	<10	<10	< 4.0	< 9.0
11922	MW22	2006	30	9.5	6.6	<5.0	<1.0	<10	22	<20	1.6	<0.1	<0.003	<10	<10	4.3	< 9.0
11924	MW23	2006	0	11	9.8	6.3	<1.0	<10	30	<20	2.6	<0.1	<0.003	181	<10	81	100
11926	MW23	2006	30	10	8.0	5.2	<1.0	<10	30	<20	1.8	<0.1	0.0043	15	<10	< 4.0	15
	N Value			28	32	28	28	28	32	32	28	28	28	26			
	Average			11.5	10.7	6.5	<1.0	<10	45.6	<20	2.2	<0.1	0.026	<40			
	Standard Deviation			2.6	7.0	7.9			38.1		2.8		0.039				
	Minimum			6.9	5.9	<5.0	<1.0	<10	13.0	<20	0.1	<0.1	0.002	<10			
	Maximum			19.0	45.0	45.0		78.0	160.0	110.0	12.0		0.160	363			
	95% Confidence Limit			1.0	2.4	2.9			13.2		1.0		0.015				

Table 5.2: Lower Site Non-Hazardous Waste Landfill - Baseline Groundwater Data

Sample #	Location	Date	Cu [mg/L]	Ni [mg/L]	Co [mg/L]	Cd [mg/L]	Pb [mg/L]	Zn [mg/L]	Cr [mg/L]	As [mg/L]	Hg [mg/L]	PCBs [mg/L]	TPH [mg/L]	TPH Identity		
														F1	F2	F3
Reference Groundwater Samples																
17980	BMW4	2003	0.425	0.353	0.168	<0.0010	0.21	0.827	0.814	0.076	<0.00040	<0.000020	<1.0			
19193	BMW4	2004	0.067	0.071	0.024	<0.0010	0.037	0.342	0.119	0.011	<0.00040	<0.000020	<1.0			
21189	BMW4	2005	0.20	0.10	0.039	<0.0010	0.054	0.45	0.16	0.016	<0.0040	<0.000020	<1.0	<0.050	<0.50	<1.0
12027	BMW4	2006	0.056	0.071	0.013	<0.0010	0.014	0.15	0.14	0.0052	<0.00040	<0.000020	<1.6	<1.6	<0.50	<1.0
Down-gradient Groundwater Samples																
12030	MW22	2006	0.055	0.049	0.024	<0.001	0.035	0.13	0.077	0.010	<0.0004	<0.00002	<1.6	<1.6	<0.5	<1
17956	MW23	2003	0.652	0.489	0.202	<0.001	0.3	4.69	1.23	0.063	<0.0004	<0.00002	<1.0			
19204	MW23	2004	0.14	0.085	0.038	<0.001	0.049	1.4	0.14	0.008	<0.0004	<0.00002	<1.0			
21198	MW23	2005	0.11	0.061	0.020	<0.001	0.029	1.1	0.093	0.0050	<0.004	<0.00002	<1	<0.05	<0.5	<1
12028	MW23	2006	0.13	0.13	0.035	<0.001	0.068	1.3	0.24	0.010	<0.0004	<0.00002	3.9	3.9	<0.5	<1
N Value			9	9	9	9	9	9	9	9	9	9	9			
Average			0.204	0.157	0.063	<0.001	0.088	1.153	0.334	0.023	<0.0004	<0.00002	<1.0			
Standard Deviation			0.204	0.155	0.070		0.098	1.409	0.406	0.027						
Minimum			0.055	0.049	0.013		0.014	0.130	0.077	0.005			<1.0			
Maximum			0.652	0.489	0.202		0.300	4.690	1.230	0.076			3.9			
95% Confidence Limit			0.133	0.101	0.046		0.064	0.921	0.265	0.018						

6.0 Lower Site Landfill

The Lower Site Landfill is about 1.5 km west of the west end of the airstrip. The landfill is comprised of distinct lobes of buried material as indicated by the geophysical survey and visual observations. The total area, including all lobes, is approximately 5,000 m^2. The slopes along the toe of the landfill range from two to four metres high. There are visible voids within the landfill material and approximately 15% of the area consists of partially exposed debris. The south, main and north landfill lobes drain to an intermittent channel along the toe, which drains into a small lake near the north lobe. This lake eventually drains into Barrow Lake. There was no contaminated soil identified down-gradient or within the landfill, but a localized stain of Tier I concentration was identified south (up-gradient) of the landfill perimeter. Evidence of contaminant migration was identified at the north and main lobes. There is minimal surface vegetation on the landfill (less than 5%), but vegetation increases in areas down-gradient of the landfill to about 25%.

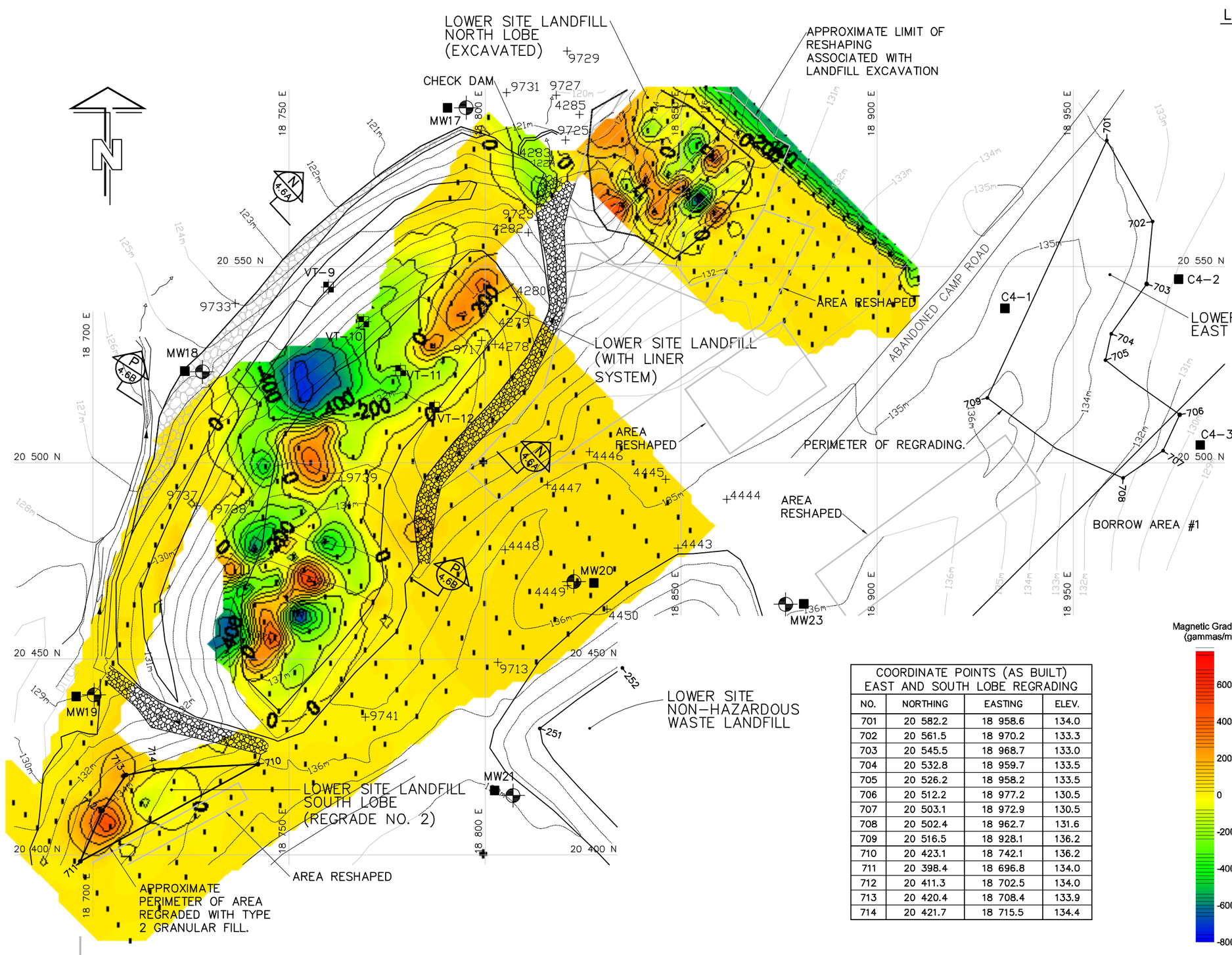
The Lower Site Landfill was classified as moderate to high potential environmental risk based on the evaluation of the landfill as a source of contamination, potential pathways and receptors. Remediation included excavation of the north lobe, leachate containment of the main (central) lobe, and regrading of the south and east lobes. Leachate containment design included the excavation of a trench to saturated and/or frozen ground beyond the landfill perimeter, and the placement of a synthetic liner system anchored into the trench and extended over the full landfill surface. Saturated, compacted, well-graded silty sand and gravel (Type 4 granular) was placed within the trench overlying the liner system. Finally, a sufficient cover of granular fill was placed over the surface and key trench to promote the aggradation of permafrost into the landfill contents. A drainage swale was constructed along the west and north edges of the landfill, with a check dam placed in the northern swale between the landfill and the lake. Type 1 granular (rip rap) was placed along the toe of the landfill to the north-northwest, the southwest, and the northeast to further assist with directing drainage and to provide erosion protection. Four groundwater monitoring wells were installed at the main landfill lobe perimeter, and an additional background well for the overall lower site was installed southwest of the south lobe. Four thermistors were installed within leachate-contained lobe.

The long term monitoring plan consists of visual monitoring, collection of soil and groundwater samples, and thermal monitoring. Approximate locations for the collection of soil and groundwater samples, and thermistor installation locations are identified on Figure CAM-4.6.

6.1 Baseline Data

Sample locations for baseline soil samples are shown in Figure CAM-4.6. A summary of the baseline soil analytical data is provided in Table 6.1. Baseline data is comprised of samples collected during 1997, 1999, 2003, 2005 and 2006. Mean baseline concentrations for copper, nickel, cobalt, lead, and zinc were noted to be higher than background concentrations for the lower site area. There were two separate samples taken in 2005 upgradient of the east landfill lobe which exceeded the Tier II criteria: one with a lead concentration of 1200 ppm and the other with a zinc concentration of 910 ppm. Low-level PCBs (up to 0.11 mg/kg) were noted at numerous up and downgradient sample locations in 2005 and 2006. TPH was detected at several locations both up and down-gradient of the landfill, some with concentrations as high as 1900 mg/kg in 1999 and 1411 mg/kg in 2005. Most TPH detections were low and there were numerous samples with no detection of hydrocarbons at all.

A summary of baseline groundwater data is provided in Table 6.2. Baseline data was collected from permanent monitoring locations in 2003, 2004, 2005, and 2006. Mean baseline concentrations for copper, nickel, cobalt, lead, zinc, chromium and arsenic were noted to be higher than background concentrations for the lower site area. No PCBs were detected and two samples had a detection of TPH. In 2006 at monitoring well MW-18 there was a TPH detection of 4.1 mg/L (F1 fraction) and at MW-20 there was a detection of 9.4 mg/L (F1 fraction).



LEGEND:

- TBM4 — TEMPORARY BENCHMARK
- BM-1 — PERMANENT BENCHMARK
- 101 — COORDINATE POINT
- MONITORING SOIL SAMPLE LOCATION
- MONITORING WELL LOCATION
- VERTICAL THERMISTOR LOCATION
- 4449 — BASELINE SOIL SAMPLE LOCATION

COORDINATE POINTS (AS-BUILT) VERTICAL THERMISTORS		
NO.	NORTHING	EASTING
VT-9	20 544.8	18 760.1
VT-10	20 535.9	18 769.1
VT-11	20 523.5	18 778.4
VT-12	20 514.1	18 787.1

COORDINATE POINTS (AS BUILT) MONITORING WELLS			
NO.	NORTHING	EASTING	ELEV.
MW17	20 590.5	18 795.2	120.4
MW18	20 523.2	18 727.9	125.3
MW19	20 440.8	18 700.3	129.0
MW20	20 469.7	18 822.7	135.4
MW21	20 415.1	18 807.1	137.9
MW23	20 463.9	18 876.7	135.9

COORDINATE POINTS (AS BUILT) EAST AND SOUTH LOBE REGRADING			
NO.	NORTHING	EASTING	ELEV.
701	20 582.2	18 958.6	134.0
702	20 561.5	18 970.2	133.3
703	20 545.5	18 968.7	133.0
704	20 532.8	18 959.7	133.5
705	20 526.2	18 958.2	133.5
706	20 512.2	18 977.2	130.5
707	20 503.1	18 972.9	130.5
708	20 502.4	18 962.7	131.6
709	20 516.5	18 928.1	136.2
710	20 423.1	18 742.1	136.2
711	20 398.4	18 696.8	134.0
712	20 411.3	18 702.5	134.0
713	20 420.4	18 708.4	133.9
714	20 421.7	18 715.5	134.4

Magnetic Gradient (gammas/m)

600 400 200 0 -200 -400 -600 -800

SCALE 1:1000 0 10 20 30 m

RECORD DRAWING
NOT FOR CONSTRUCTION

UMA | AECOM

DEW LINE CLEAN UP
LANDFILL MONITORING PLAN

CAM-4 - PELLY BAY

LOWER SITE LANDFILL

FIGURE CAM-4.6

DOS NAME: C4-R006.DWG CLC - 08/02/06

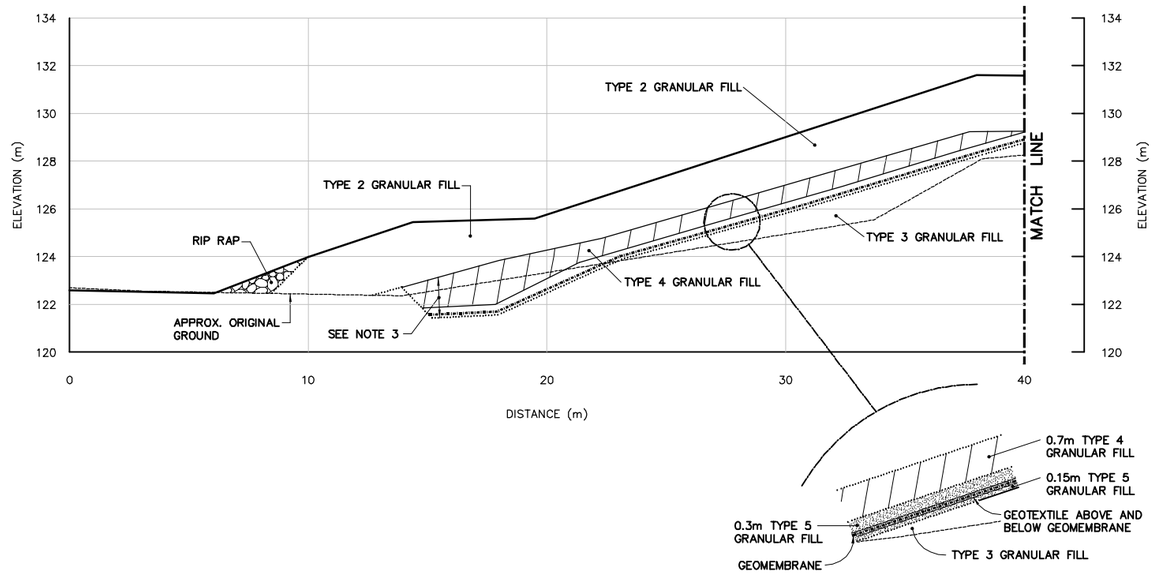
General Notes:

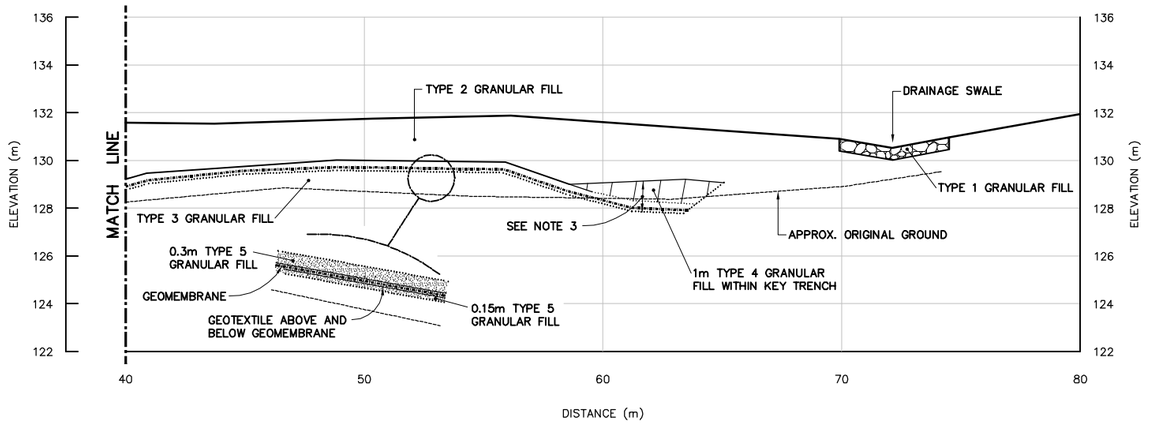
1. ALL ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. KEY TRENCH EXTENDS BELOW ORIGINAL GROUND TO SATURATED GROUND (DEPTH VARIES).

Legend:

GENERATED BASED ON PROVIDED SURVEY INFORMATION

BASED ON DESIGN, NOT SURVEYED





SECTION N 4.6

SCALE 1:250 0 2.5 5 m

NOTE:

THIS DRAWING HAS BEEN REPLOTTED FOR RECORD DRAWING PURPOSES FROM INFORMATION SUPPLIED BY DEFENCE CONSTRUCTION CANADA IN SEPTEMBER, 2006.

CONTRACT DRAWINGS INCLUDE THE ENGINEER'S STAMP.

UMA | AECOM

DWG NAME: C4-R006A.DWG CLC - 08/02/08

DEW LINE CLEAN UP
LANDFILL MONITORING PLAN

CAM-4 - PELLY BAY
LOWER SITE LANDFILL CROSS-SECTION
FIGURE CAM-4.6A

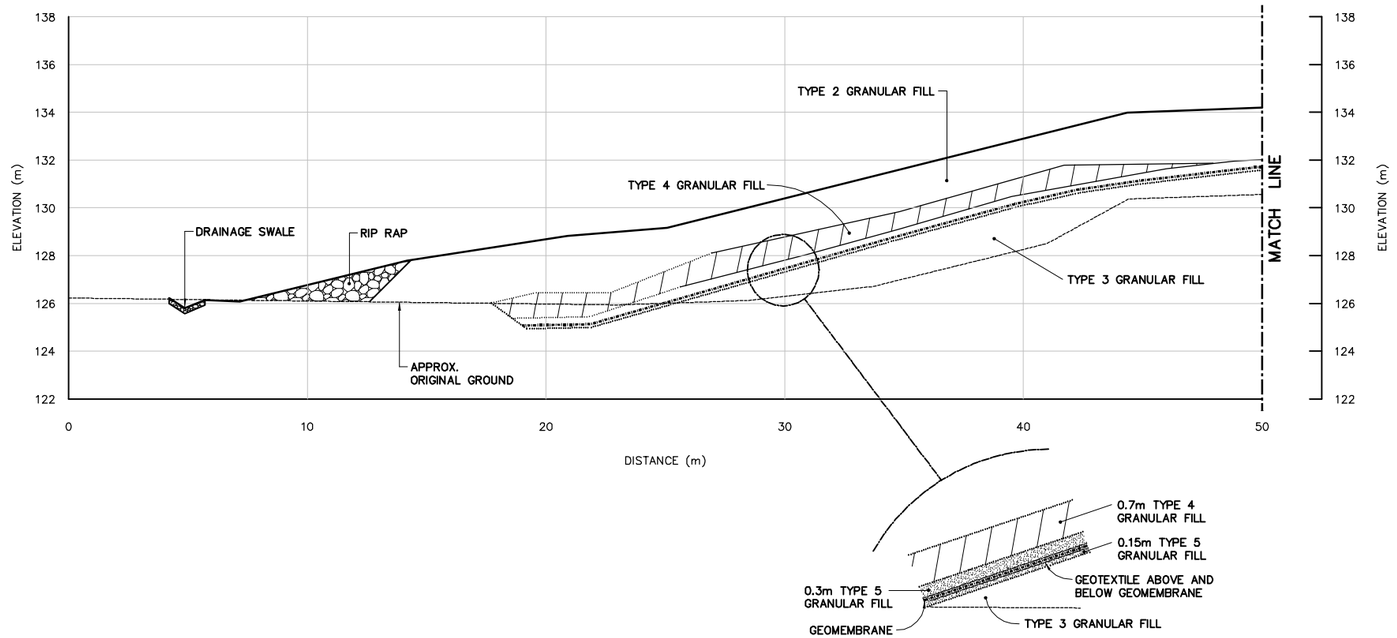
General Notes:

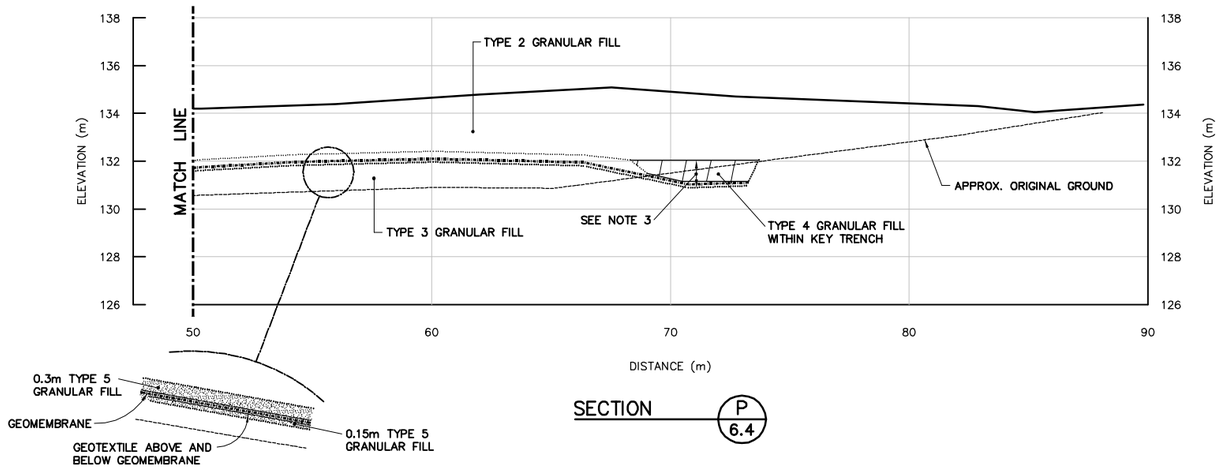
1. ALL ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. KEY TRENCH EXTENDS BELOW ORIGINAL GROUND TO SATURATED GROUND (DEPTH VARIES).

Legend:

GENERATED BASED ON PROVIDED SURVEY INFORMATION

BASED ON DESIGN, NOT SURVEYED





SECTION P 6.4

NOTE:

THIS DRAWING HAS BEEN REPLOTTED FOR RECORD DRAWING PURPOSES FROM INFORMATION SUPPLIED BY DEFENCE CONSTRUCTION CANADA IN SEPTEMBER, 2006.

CONTRACT DRAWINGS INCLUDE THE ENGINEER'S STAMP.

SCALE 1:250

0 2.5 5 m

UMA | AECOM

DEW LINE CLEAN UP
LANDFILL MONITORING PLAN

CAM-4 - PELLY BAY
LOWER SITE LANDFILL CROSS-SECTION
FIGURE CAM-4.6B

DOS NAME: C4-R006B.DWG CLC - 08/02/08

Table 6.1: Lower Site Landfill - Baseline Soil Data

Sample #	Location	Date	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co [mg/kg]	Cd [mg/kg]	Pb [mg/kg]	Zn [mg/kg]	Cr [mg/kg]	As [mg/kg]	Hg [mg/kg]	PCBs [mg/kg]	TPH [mg/kg]	TPH Identity		
															F1	F2	F3
Up-gradient Soil Samples																	
9713		1997		19	13	8.5	<1.0	<10	54	24	12		<0.1				
9714	9713	1997		13	45	12	<1.0	<10	120	110	0.91		<0.1				
9739		1997		9	11	6.1	<1.0	11	42	23	0.83		<0.1				
9740	9739	1997	50	9	6.7	5.3	<1.0	<10	30	<20	1		<0.1				
9741		1997		8	7.4	<5.0	<1.0	<10	33	<20	0.77		<0.1				
9742	9741	1997	50	6.6	7.5	<5.0	<1.0	<10	27	<20	0.51		<0.1				
4278		1999		13	12.0	5.7	<1.0	10	52	29	0.9		<0.1	1200	100% fuel oil		
4279		1999		5.6	5.8	<5.0	<1.0	<10	29	<20	0.6		<0.1	<40			
4280		1999		8.4	7.8	<5.0	<1.0	<10	28	20	0.4		<0.1	1400	100% fuel oil		
4443		1999		7.7				34	49								
4444		1999		9				54	40								
4445		1999		4.2				<10	28								
4446		1999		64				15	170								
4447		1999		8.8				<10	38								
4448		1999		7.9				<10	34								
4449		1999		17				24	110								
4450		1999		8.1				13	29								
17976	BMW4	2003	0	9	7.6	<5.0	<1.0	<10	24	<20	<1.0	<0.1	<0.003	<40			
17978	BMW4	2003	30	12	9	5.3	<1.0	<10	26	<20	<1.0	<0.1	<0.003	<40			
21340	BMW4	2005	0	6.9	7.1	<5.0	<1.0	<10	33	<20	<0.1	<0.10	0.014	<10	<10	6.0	96
21342	BMW4	2005	30	<5.0	6.3	<5.0	<1.0	<10	22	<20	<0.1	<0.10	0.0099	<10	<10	<4.0	9.0
11948	BMW4	2006	0	<5.0	5.9	<5.0	<1.0	<10	22	<20	1.7	<0.10	0.16	<10	<10	340	23
11950	BMW4	2006	30	7.9	8.0	<5.0	<1.0	<10	26	<20	1.7	<0.10	<0.0030	<10	<10	8.2	< 9.0
21206	MW20	2005	30	13	9.8	5.9	<1.0	24	47	20	1.5	<0.1	0.022	<10	<10	<4	<9
21208	MW20	2005	0	15	11	6.8	<1.0	13	40	24	11	<0.1	0.0040	<10	<10	<4	<9
11928	MW20	2006	0	9.6	9.2	5.3	<1.0	<10	27	<20	3.6	<0.1	0.11	200	<10	< 4.0	200
11930	MW20	2006	30	11	8.6	5.3	<1.0	<10	23	<20	1.8	<0.1	0.0038	14	<10	< 4.0	14
21284	C4-1	2005	0	52	17	8.4	<1.0	210	**910**	31	3.1	<0.1	0.0098	1411	<10	11	1400
21286	C4-1	2005	30	44	16	9.2	<1.0	**1200**	490	32	2.7	<0.1	0.0083	157	<10	7	150
11952	C4-1	2006	0	13	11	7.0	<1.0	<10	46	22	1.9	<0.1	<0.003	18	<10	< 4.0	18

Sample #	Location	Date	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co [mg/kg]	Cd [mg/kg]	Pb [mg/kg]	Zn [mg/kg]	Cr [mg/kg]	As [mg/kg]	Hg [mg/kg]	PCBs [mg/kg]	TPH [mg/kg]	TPH Identity		
															F1	F2	F3
11954	C4-1	2006	30	6.2	<5.0	<5.0	<1.0	<10	<15	<20	3.3	<0.1	<0.003	11	<10	< 4.0	11
Down-gradient Soil Samples																	
9717		1997		9.8	7.3	<5.0	<1.0	<10	37	21	<0.2		<0.1	<40			
9718	9717	1997	50	6.3	7.2	<5.0	<1.0	<100	24	<20	0.69		<0.1				
9723		1997		7.6	8.9	6.8	<1.0	<10	39	26	0.9		<0.1	880	100% fuel oil		
9724	9723	1997	50	6.1	7.3	<5.0	<1.0	<10	26	<20	0.5		<0.1				
9725		1997		21	13.0	7.7	<1.0	29	84	36	2.6		<0.1	<40			
9726	9725	1997	50	16	12.0	6.5	<1.0	20	66	34	1.8		<0.1				
9727		1997		12	9.3	<5.0	<1.0	<10	52	27	2.6		<0.1	<40			
9728	9727	1997	50	12	8.8	<5.0	<1.0	14	45	25	1.3		<0.1				
9729		1997		25	11.0	8.8	<1.0	13	64	27	0.9		<0.1	59			
9730	9729	1997	50	8.8	7.9	<5.0	<1.0	<10	41	<20	1.1		<0.1				
9731		1997		5.8	5.7	<5.0	<1.0	<10	28	<20	0.9		<0.1				
9732	9731	1997	50	14	7.0	<5.0	<1.0	11	41	<20	1.6		<0.1				
9733		1997		17	11.0	7.2	<1.0	10	59	21	0.8		<0.1				
9737		1997		6.2	5.7	5	<1.0	<100	24	22	<0.2		<0.1	<40			
9738		1997		5.8	6.4	5.9	<1.0	<10	30	24	0.9		<0.1				
4282		1999		7.3	7.2	<5.0	<1.0	<10	20	<20	0.6		<0.1	770	100% fuel oil		
4283		1999		7.4	7.1	<5.0	<1.0	<10	24	<20	0.5		<0.1	<40			
4284	4283	1999	30	8.9	7.3	<5.0	<1.0	<10	27	<20	0.8		<0.1	<40			
4285		1999		18	13	6.8	<1.0	25	66	41	1.0			<40			
17962	MW17	2003	0	9.9	8.1	<5.0	<1.0	<10	23	<20	<1.0	<0.1	<0.003	<40			
17964	MW17	2003	30	9.9	9	5.6	<1.0	<10	30	<20	<1.0	<0.1	<0.003	<40			
17966	MW18	2003	0	11	9.3	5.6	<1.0	<10	47	<20	2.6	<0.1	<0.003	<40			
17968	MW18	2003	30	11	11	<5.0	<1.0	<10	53	<20	1.4	<0.1	<0.003	<40			
17972	MW19	2003	0	10	8.6	5.3	<1.0	<10	29	<20	1.3	<0.1	<0.003	<40			
17974	MW19	2003	30	8.5	8.7	<5.0	<1.0	<10	25	<20	<1.0	<0.1	<0.003	<40			
21288	C4-2	2005	0	11	9.5	8.3	<1.0	12	43	22	3.8	<0.1	0.035	83	<10	10	73
21290	C4-2	2005	30	32	11	7.7	<1.0	10	51	27	2.6	<0.1	0.030	20	<10	<4	20
21292	C4-3	2005	0	7.4	7.6	<5.0	<1.0	<10	32	23	<1.0	<0.1	0.0039	<40	<10	<40	12
21294	C4-3	2005	30	14	9.0	5.8	<1.0	<10	41	23	1.1	<0.1	0.049	56	<10	<4	56
21320	MW18	2005	0	17	16	10	<1.0	16	90	29	<0.1	<0.1	0.10	36	<10	<4	36

Sample #	Location	Date	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co [mg/kg]	Cd [mg/kg]	Pb [mg/kg]	Zn [mg/kg]	Cr [mg/kg]	As [mg/kg]	Hg [mg/kg]	PCBs [mg/kg]	TPH [mg/kg]	TPH Identity		
															F1	F2	F3
21322	MW18	2005	30	8.4	7.5	<5.0	<1.0	<10	32	<20	<0.1	<0.1	0.045	43	<10	<4	43
21324	MW17	2005	0	6.9	<5.0	<5.0	<1.0	<10	18	<20	<0.1	<0.1	0.11	540	<10	<4	540
21326	MW17	2005	30	10	6.7	<5.0	<1.0	<10	20	<20	<0.1	<0.1	0.054	210	<10	<4	210
21328	MW19	2005	0	18	8.4	5.5	<1.0	<10	34	<20	<0.1	<0.1	0.083	45	<10	5.0	40
21330	MW19	2005	30	16	7.6	<5.0	<1.0	<10	31	<20	<0.1	<0.1	0.092	<10	<10	<4	<9
11936	MW17	2006	0	8.5	7.5	<5.0	<1.0	<10	24	<20	1.7	<0.1	<0.003	18	<10	< 4.0	18
11938	MW17	2006	30	7.8	7.9	<5.0	<1.0	<10	22	<20	1.7	<0.1	<0.003	<5.2	<10	5.2	< 9.0
11940	MW18	2006	0	12	10	6.6	<1.0	<10	53	<20	1.5	<0.1	0.0075	46.4	<10	8.4	38
11942	MW18	2006	30	17	14.0	8.9	<1.0	16	70	28	4.5	<0.1	<0.003	<10	<10	4.4	< 9.0
11944	MW19	2006	0	10	7.8	5.0	<1.0	<10	26	<20	2.5	<0.1	<0.003	<10	<10	5.4	< 9.0
11946	MW19	2006	30	13	8.9	5.2	<1.0	<10	32	<20	2.5	<0.1	0.016	<10	<10	4.5	< 9.0
11956	C4-2	2006	0	12	9.2	6.2	<1.0	10	41	<20	2.0	<0.1	<0.003	163	<10	13.0	150
11958	C4-2	2006	30	4.3	5.8	5.4	<1.0	<10	24	<20	<1.0	<0.1	<0.003	70	<10	< 4.0	70
11960	C4-3	2006	0	7.2	11	7.7	<1.0	<10	46	28	1.7	<0.1	<0.003	46	<10	< 4.0	46
11962	C4-3	2006	30	8.5	8.9	5.8	<1.0	<10	28	22	1.3	<0.1	0.0049	23	<10	< 4.0	23
	N Value			76	68	68	68	76	76	68	68	40	67	53			
	Average			12.6	9.4	4.8	<1.0	<10	59	29	1.6	<0.1	<0.003	<40			
	Standard Deviation			9.8	5.2	2.4			115	16	2.0						
	Minimum			4.2	<5.0	<5.0		<10	18	20	<0.1		0.004	11			
	Maximum			64.0	45.0	12.0		1200	910	110	12.0		0.160	1411			
	95% Confidence Limit			2.2	1.2	0.6			26	4	0.5						

Table 6.2: Lower Site Landfill - Baseline Groundwater Data

Sample #	Location	Date	Cu [mg/L]	Ni [mg/L]	Co [mg/L]	Cd [mg/L]	Pb [mg/L]	Zn [mg/L]	Cr [mg/L]	As [mg/L]	Hg [mg/L]	PCBs [mg/L]	TPH [mg/L]	TPH Identity		
														F1	F2	F3
Upgradient Groundwater Samples																
17980	BMW4	2003	0.425	0.353	0.168	<0.0010	0.21	0.827	0.814	0.076	<0.00040	<0.000020	<1.0			
19193	BMW4	2004	0.067	0.071	0.024	<0.0010	0.037	0.342	0.119	0.011	<0.00040	<0.000020	<1.0			
21189	BMW4	2005	0.20	0.10	0.039	<0.0010	0.054	0.45	0.16	0.016	<0.0040	<0.000020	<1.0	<0.050	<0.50	<1.0
12027	BMW4	2006	0.056	0.071	0.013	<0.0010	0.014	0.15	0.14	0.0052	<0.00040	<0.000020	<1.6	<1.6	<0.50	<1.0
Downgradient Groundwater Samples																
17965	MW17	2003	0.256	0.146	0.073	<0.001	0.097	0.389	0.217	0.034	<0.0004	<0.00002	<1.0			
17970	MW18	2003	2.24	1.78	0.916	<0.04	2	9.15	2.73	0.339	0.0004	<0.00002	<1.0			
17975	MW19	2003	0.3	0.199	0.109	<0.001	0.155	0.668	0.421	0.047	<0.0004	<0.00002	<1.0			
19198	MW17	2004	0.035	0.033	0.01	<0.001	0.016	0.085	0.045	0.005	<0.0004	<.00002	<1.0			
19202	MW18	2004	0.202	0.14	0.065	<0.001	0.116	0.7	0.204	0.033	<0.0004	<.00002	<1.0			
19203	MW19	2004	0.475	0.343	0.194	0.001	0.257	1.25	0.635	0.07	<0.0004	<.00002	<1.0			
21187	MW18	2005	0.035	0.022	0.0080	<0.001	0.017	0.12	0.028	0.010	<0.004	<0.00002	<1	<0.05	<0.5	<1
21188	MW17	2005	0.071	0.051	0.022	<0.001	0.029	0.13	0.080	0.010	<0.004	<0.00002	<1	<0.05	<0.5	<1
21192	MW19	2005	0.27	0.26	0.11	<0.001	0.14	0.74	0.34	0.045	<0.004	<0.00002	<1	<0.05	<0.5	<1
12029	MW20	2006	0.021	0.054	<0.003	<0.001	<0.010	0.046	0.10	<0.003	<0.0004	<0.00002	9.4	9.4	<0.5	<1
12032	MW18	2006	0.071	0.095	0.029	<0.001	0.046	0.23	0.15	0.015	<0.0004	<0.00002	4.1	4.1	<0.5	<1
12033	MW17	2006	0.13	0.13	0.045	<0.001	0.054	0.23	0.21	0.022	<0.0004	<0.00002	<1.6	<1.6	<0.5	<1
N Value			16	16	16	15	16	16	16	16	16	16	14			
Average			0.303	0.241	0.114	<0.001	0.203	0.969	0.400	0.046	<0.0004	<0.00002	<1.0			
Standard Deviation			0.535	0.423	0.221		0.485	2.207	0.658	0.081						
Minimum			0.021	0.022	<0.003		0.005	0.046	0.028	0.002			<1.0			
Maximum			2.240	1.780	0.916		2.000	9.150	2.730	0.339			9.4			
95% Confidence Limit			0.262	0.207	0.109		0.238	1.081	0.322	0.040						

Appendix
CAM-4 Pelly Bay Year 1 Monitoring Data

CAM-4 Pelly Bay - 2007 Landfill Monitoring

In August 2007, a visual inspection of each landfill and downloading of ground temperature data, where required, was carried out by EBA Engineering Consultants Ltd. (EBA). Soil and groundwater samples were collected where applicable by the Environmental Sciences Group (ESG). Samples were analyzed at Queen's University and Royal Military College laboratories, in Kingston, Ontario.

The following table documents the specific monitoring requirements for 2007 (year 1 of monitoring) at each landfill.

Landfill Designation	Visual Inspection	Groundwater Sampling	Soil Sampling	Thermal Monitoring
Station Area Non-Hazardous Waste Landfill	√	√	√	
Tier II Soil Disposal Facility	√	√	√	√
Upper Site Landfills	√	√	√	√
Lower Site Non-Hazardous Waste Landfill	√	√	√	
Lower Site Landfills	√	√	√	√

This appendix serves as a compilation of the EBA geotechnical report (EBA 2008) and the ESG environmental report (ESG 2007) to document the results of landfill monitoring from year 1. The data is organized by landfill in separate annexes. The following information is provided in each annex:

- Visual inspection checklist;
- Visual inspection drawing mark-up;
- A selection of visual inspection photos (all photos will be provided electronically);
- Thermal monitoring summary (where applicable);
- Plots of ground temperatures with depth at each thermistor installation (where applicable);
- Evaluation of 2007 soil analytical data, as compared to baseline conditions;
- Summary of 2007 soil analytical data;
- Summary of 2007 groundwater analytical data; and
- Monitoring well development/sampling reports (where applicable).

Summary of Significant Observations

With the exception of thermal data, no interpretation or recommendations have been provided in this appendix; these shall be provided by the Environmental Working Group - Nunavut Tunngavik Incorporated (EWG-NTI). Meeting minutes from the review shall be appended to this report.

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Annex Station Area Non-Hazardous Waste Landfill- Year 1 Data

Figures:

- CAM-4.2: Site Plan - Station Area Non-Hazardous Waste Landfill

Tables:

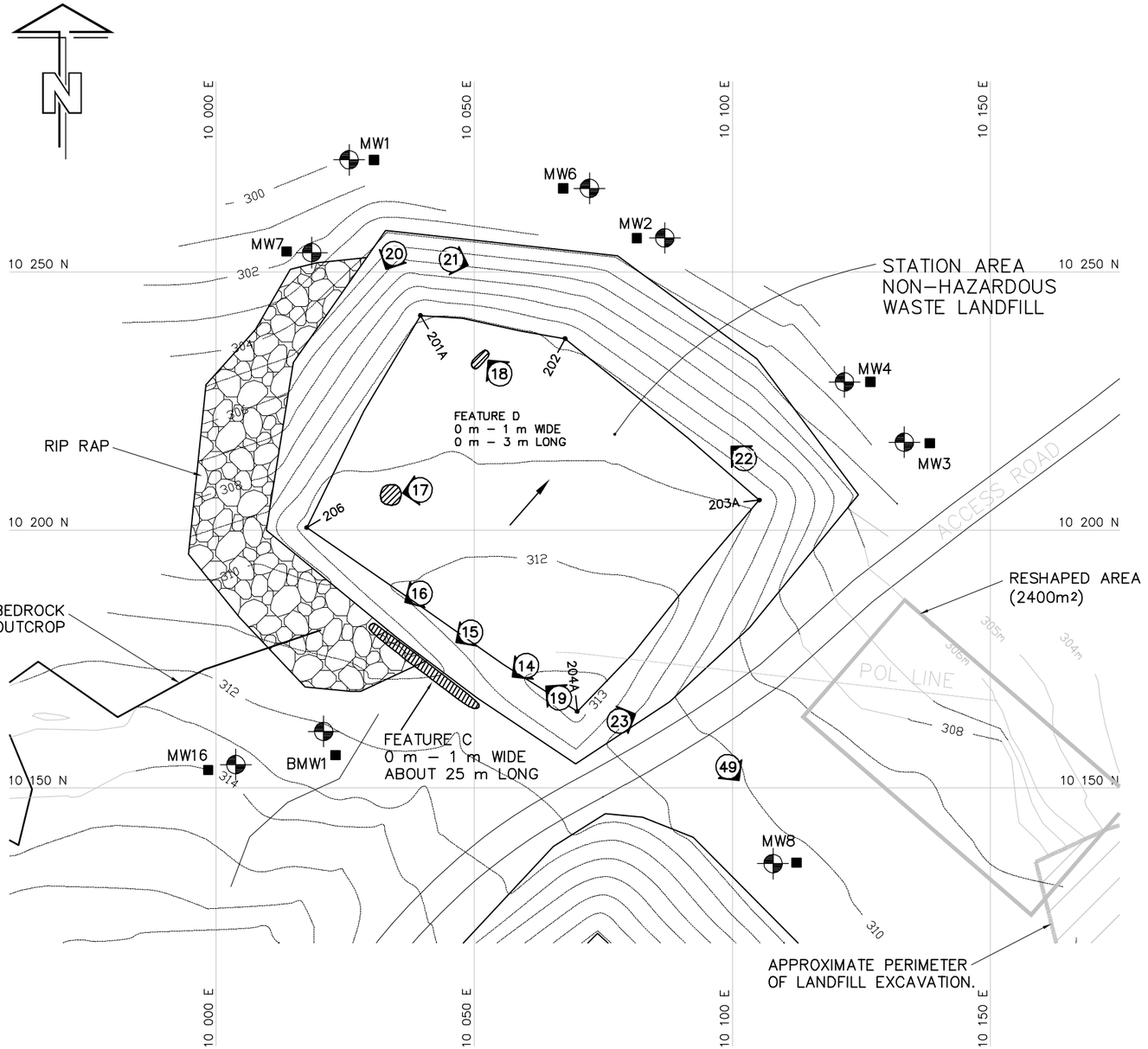
- Landfill Visual Inspection - CAM-4 Pelly Bay Station Area Non-Hazardous Waste Landfill
- Station Area Landfill - Evaluation of Year 1 Soil Analytical Data
- Station Area Landfill - Year 1 (2007) Soil Data
- Station Area Landfill - Year 1 (2007) Groundwater Data

Photographic Records:

- Photos 7 and 8
- Photos 9 and 10

Well Sampling Records:

- Well BMW-1
- Well MW-1
- Well MW-2
- Well MW-3
- Well MW-4A
- Well MW-4B
- Well MW-6A
- Well MW-6B
- Well MW-7A
- Well MW-7B
- Well MW-16



LEGEND:

- TBM4 ⊡ TEMPORARY BENCHMARK
- BM–1 ▲ PERMANENT BENCHMARK
- 101–• COORDINATE POINT
- ■ MONITORING SOIL SAMPLE LOCATION
- ⊕ MONITORING WELL LOCATION
- (22) PHOTOGRAPHIC VIEWPOINT
- ▨ PONDED WATER

COORDINATE POINTS (AS–BUILT) NON–HAZARDOUS WASTE LANDFILL			
NO.	NORTHING	EASTING	ELEV.
201A	10 241.6	10 039.6	310.0
202	10 237.1	10 067.6	309.9
203A	10 205.8	10 105.2	310.9
204A	10 164.9	10 069.9	313.4
206	10 200.5	10 017.5	311.5

COORDINATE POINTS (AS BUILT) MONITORING WELLS			
NO.	NORTHING	EASTING	ELEV.
MW1	10 271.73	10 025.73	300.05
MW2	10 256.60	10 086.90	–
MW3	10 217.0	10 133.3	–
MW4	10 228.70	10 121.70	303.80
MW6	10 266.20	10 072.30	301.90
MW7	10 253.75	10 018.51	302.29
MW8	10 135.37	10 107.87	310.20
MW16	10 154.55	10 003.80	313.70
BMW1	10 160.97	10 020.81	312.13

SURVEY CONTROL MONUMENTS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
CM1	10 000.000	10 000.000	321.116	CAM–4 BASELINE STA. 0+00.0
CM20	9 853.309	9 997.655	319.410	GNWT MON. 50590–21
BM CAM4–1	10 102.015	9 926.103	319.138	CAM–4 BASELINE STA. 4+13.4

SCALE 1:1000 0 10 20 30 m

RECORD DRAWING
NOT FOR CONSTRUCTION

DEW LINE CLEAN UP
LANDFILL MONITORING PLAN

CAM-4 - PELLY BAY

STATION AREA NON-HAZARDOUS WASTE LANDFILL

FIGURE CAM-4.2

UMA | AECOM

DGN NAME: C4-RD02.DWG CLC – 08/02/15

LANDFILL VISUAL INSPECTION

Site Name: CAM-4, Pelly Bay
Landfill: **Station Area Non-Hazardous Waste Landfill**
Designation:
Date Inspected: August 24 to August 26, 2007
Inspected by: Ed Grozic, P.Eng.
EBA Engineering Consultants Ltd.

Signature: 

TABLE B1: STATION AREA NON-HAZARDOUS WASTE LANDFILL

Checklist Item	Present (Yes/No)	Location	Length	Width	Depth	Extent	Description	Photographic Records (Images provided on Data CD)	Severity Rating	Additional Comments
Settlement	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Erosion	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Frost Action	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Animal Burrows	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Vegetation	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Staining	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Vegetation Stress	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Seepage Points	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Debris Exposed	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Presence/Condition of Monitoring Instruments	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Other Features of Note Ponded water from rainfall along southwest toe of landfill	Yes	Feature C See Figure B1	~ 25 m	0 m to 1m	0 m to 0.25 m	Isolated	Isolated patches of ponded water	Photo 7 (Image 14), Photo 8 (Image 15), and Photo 9 (Image 16)	Acceptable	Ponded water in low-lying areas between boulders along southwest facing toe of landfill. Landfill slopes are in good condition, free of erosion and visible deformation.
Other Features of Note Ponded water from rainfall on surface of landfill	Yes	Feature D See Figure B1	0 m to 3 m	0 m to 1m	0 m to 0.02 m	Isolated	Isolated patches of ponded water	Photo 10 (Image 17), and Image 18	Acceptable	Ponded water on surface of landfill. Ponded water is shallow, less than 2 cm deep and the areas are small in size The low lying micro topography on the surface of the landfill temporarily ponds with water during periods of rainfall. Landfill surface is in good condition, free of erosion and visible deformation.
Overall Landfill Performance:	**Acceptable**									

Station Area Non-Hazardous Waste Landfill - EVALUATION OF YEAR 1 SOIL ANALYTICAL DATA

Parameter	N value Baseline	Arithmetic Mean +/- 95% Confidence Limit Baseline	Maximum Baseline (mg/kg)	2007	Comments
Copper	59	10.0+/-1.4	35	Measured concentrations within or less than 95% confidence interval with one exception.	Up-gradient surface sample at MW-16 had a concentration of 20 mg/kg (below baseline max).
Nickel	51	10.3+/-1.3	25	Measured concentrations within or less than 95% confidence interval for 10 of 16 samples.	Samples at MW-16 (both), BMW-1 (surface), MW-3 (both) and MW-7A (surface) were above the 95% confidence interval (concentrations up to 26 mg/kg).
Cobalt	52	6.1+/-0.8	14	Measured concentrations within or less than 95% confidence interval for 10 of 16 samples.	Samples at MW-16 (both), BMW-1 (surface), MW-3 (both) and MW-7A (surface) were above the 95% confidence interval (concentrations up to 15 mg/kg).
Cadmium	59	<1.0		Measured concentrations within 95% confidence interval (non-detect).	
Lead	62	<10	160	Measured concentrations within or less than 95% confidence interval with one exception.	Up-gradient surface sample at MW-16 had a concentration of 11 mg/kg (below baseline max).
Zinc	59	39+/-6	120	Measured concentrations within or less than 95% confidence interval with two exceptions.	Surface samples at both up-gradient wells (MW-16 and BMW-1) had concentrations of 82 & 47 mg/kg, respectively.
Chromium	53	<20	46	Measured concentrations within or less than 95% confidence interval for 8 of 16 samples.	Sample results are below baseline max except for the surface sample at MW-16 (47mg/kg).
Arsenic	54	1.3+/-0.2	3.2	Measured concentrations within or less than 95% confidence interval for 11 of 16 samples.	MW-16 (both), BMW-1 (surface), MW-2 (surface) and MW-3 (depth) had concentrations above the 95% confidence interval, but below baseline max. The surface sample at MW-16 (3.4 mg/kg) was above the baseline max.

Station Area Non-Hazardous Waste Landfill - EVALUATION OF YEAR 1 SOIL ANALYTICAL DATA

Parameter	N value Baseline	Arithmetic Mean +/- 95% Confidence Limit Baseline	Maximum Baseline (mg/kg)	2007	Comments
Mercury	50	<0.1		Measured concentrations within 95% confidence interval (non-detect).	
PCBs	70	<0.0030	1	Measured concentrations within or less than 95% confidence interval with two exceptions.	The depth sample at BMW-1 (0.0053 mg/kg) and depth sample at MW-3 (0.0056 mg/kg) were above the 95% confidence limit but below the baseline max.
TPH	76	484+/-378	1100	Measured concentrations within or less than 95% confidence interval with one exception.	Surface sample at MW-16 had a concentration of 1720 mg/kg (F2 and F3).

Station Area Non-Hazardous Waste Landfill - Year 1 (2007) Soil Data

Sample #	Location	Date	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co [mg/kg]	Cd [mg/kg]	Pb [mg/kg]	Zn [mg/kg]	Cr [mg/kg]	As [mg/kg]	Hg [mg/kg]	PCBs [mg/kg]	TPH [mg/kg]	TPH Identity		
															F1	F2	F3
Station Area Non-Hazardous Waste Landfill - Baseline Concentrations				**10.0+/-1.4**	**10.3+/-1.3**	**6.1+/-0.8**	**<1.0**	**<10**	**39+/-6**	**<20**	**1.3+/-0.2**	**<0.1**	**<0.0030**	**484+/-378**			
Station Area Non-Hazardous Waste Landfill - Maximum Concentrations				**35**	**25**	**14**	**<1.0**	**160**	**120**	**46**	**3.2**	**<0.1**	**1**	**1100**			
Up-gradient Soil Samples																	
24844/45	MW16	2007	0	20	26	15	<1.0	11	82	47	3.4	< 0.10	< 0.0030	1720	<10	1100	620
24846/47	MW16	2007	30	9.7	14	9.0	<1.0	<10	39	29	2.0	< 0.10	< 0.0030	151	<10	79	72
24848/49	BMW1	2007	0	13	17	11	<1.0	<10	47	34	2.9	< 0.10	< 0.0030	11	<10	< 4.0	11
24850/51	BMW1	2007	30	6.3	9.7	6.9	<1.0	<10	29	<20	1.4	< 0.10	0.0053	104	<10	4.3	100
Down-gradient Soil Samples																	
24868/69	MW1	2007	0	5.7	9.2	6.3	<1.0	<10	27	22	<1.0	< 0.10	< 0.0030	30	<10	4.7	25
24870/71	MW1	2007	30	5.9	8.9	6.3	<1.0	<10	28	20	<1.0	< 0.10	< 0.0030	28	<10	< 4.0	28
24860/61	MW2	2007	0	4.2	7.7	<5.0	<1.0	<10	22	<20	1.8	< 0.10	< 0.0030	6.2	<10	6.2	< 9.0
24862/63	MW2	2007	30	3.1	6.2	<5.0	<1.0	<10	16	<20	1.2	< 0.10	< 0.0030	21	<10	6.2	15
24852/53	MW3	2007	0	10	13	8.3	<1.0	<10	40	26	1.5	< 0.10	< 0.0030	103	<10	4.3	99
24854/55	MW3	2007	30	10	14	7.5	<1.0	<10	39	27	1.7	< 0.10	0.0056	41	<10	4.5	36
24856/57	MW4A	2007	0	4.1	6.8	<5.0	<1.0	<10	24	<20	1.4	< 0.10	< 0.0030	4	<10	4.0	< 9.0
24858/59	MW4A	2007	30	3.9	7.6	<5.0	<1.0	<10	20	<20	1.1	< 0.10	< 0.0030	5	<10	4.6	< 9.0
24864/65	MW6A	2007	0	7.1	7.9	5.2	<1.0	<10	21	<20	1.4	< 0.10	< 0.0030	26	<10	4.5	21
24866/67	MW6A	2007	30	3.7	7.5	<5.0	<1.0	<10	20	<20	<1.0	< 0.10	< 0.0030	21	<10	6.4	15
24872/73	MW7A	2007	0	8.9	13	7.9	<1.0	<10	40	25	1.5	< 0.10	< 0.0030	31	<10	5.1	26
24874/75	MW7A	2007	30	4.8	8.9	5.7	<1.0	<10	25	<20	1.3	< 0.10	< 0.0030	5	<10	4.7	< 9.0

Station Area Non-Hazardous Waste Landfill - Year 1 (2007) Groundwater Data

Sample #	Location	Date	Cu [mg/L]	Ni [mg/L]	Co [mg/L]	Cd [mg/L]	Pb [mg/L]	Zn [mg/L]	Cr [mg/L]	As [mg/L]	Hg [mg/L]	PCBs [mg/L]	TPH [mg/L]	TPH Identity		
														F1	F2	F3
Up-gradient Groundwater Samples																
24943	BMW1	2007	0.016	0.029	0.0056	<0.0010	<0.010	0.14	0.017	<0.0030	<0.00040	< 0.000020	392	20	340	32
24942	MW16	2007	0.023	0.047	0.0039	<0.0010	<0.010	0.035	0.043	<0.0030	<0.00040	< 0.000020	63	4.8	53	4.8
Down-gradient Groundwater Samples																
24932	MW6B	2007	0.036	0.026	0.0045	<0.0010	0.021	0.84	0.025	0.0056	<0.00040	< 0.000020	<1.0	< 0.050	< 0.50	< 1.0
24928	MW7B	2007	0.098	0.12	0.040	0.0011	0.071	11	0.16	0.020	<0.00040	< 0.000020	<1.0	< 0.050	< 0.50	< 1.0

Photo 7 (Image 14)
Upper Site Non-Hazardous Waste Landfill
Ponded water along southwest facing toe of landfill.

Photo 8 (Image 15)
Upper Site Non-Hazardous Waste Landfill
Ponded water along southwest facing toe of landfill.

Photo 9 (Image 16)
Upper Site Non-Hazardous Waste Landfill
Ponded water along southwest facing toe of landfill.

Photo 10 (Image 17)
Upper Site Non-Hazardous Waste Landfill
Ponded water on surface at northwest corner of landfill.

Table B-112: Monitoring Well Sampling Log (BMW #1), 2007

Site Name:	CAM-4		
Date of Sampling Event:	Aug. 23 and 25, 2007		
Names of Samplers:	Nick Battye, Line Filion, Kevin Schut		
Monitoring Well ID:	BMW 1		
Facility:	Background		
Water Sample Measured Data			
Condition of Well:	Good		
Procedure/Equipment:	Measuring tape	Procedure/Equipment:	Interface metre
Well height above ground (m)=	0.64	Depth to water surface (m)=	1.95
Diameter of well (m)=	0.05	Static water level* (m)=	1.31
Depth of installation* (m)=	4.46	Depth to bottom (m)=	2.82
Length screened section (m)=	2.03	Free product thickness (mm)=	180.00
Depth to top of screen* (m)=	1.47		
Calculations		**Notes**	
Depth of water (m)=	0.87	Evidence of sludge etc:	N
Well volume of water (L)=	1.71	Evidence of freezing/siltation: (compare to installation record)	Y
Length screen collecting water (m)=	1.35		

Development/Purging Information

Equipment: Disposable bailer.

Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (uS/cm)	Turbidity (NTU)	Description of water
Aug. 25, 2007;	1.5	3	**	130	92.8	trace silt, cloudy,

Water Sampling		**Soil Sampling**	
Date and time collected:	Aug. 25, 2007; 12:34	Date and time collected:	Aug. 23, 2007
Sample Number - Water:	24943	Sample Number - Soil:	24848/49 @ 0-0.1 m
			24850/51 @ 0.3-0.4 m
Sample containers:	1 L HDPE bottle	Sample containers:	Whirlpak
	1 L Teflon bottle		120 mL Amber glass jar
	250 mL Amber glass bottle		
Procedure/Equipment:	Disposable bailer.	Procedure/Equipment:	Disposable sterilized plastic scoop
Water description:	trace silt, cloudy, globules of fuel	Soil description:	Light brown/grey sand, very fine to coarse grained, well graded, with gravel, fine to coarse grained, sub-angular, some fines, moist, no odour
Filtration: (Y/N)	N		
Acidification: (Y/N)	N		
Sampling Equipment Decontamination: (Y/N)	Y	Sampling Equipment Decontamination: (Y/N)	No; disposable scoops were used.
Number washes:	Soapy water (1)	Number washes:	n/a
Number rinses:	Tap water (1) DDW (1)	Number rinses:	n/a

n/a=not applicable

*From ground surface. Unless this is stated, all measurements are assumed to be from the top of the casing.

** pH probe was broken, analysis was performed in the south

Table B-116: Monitoring Well Sampling Log (MW #1), 2007

Site Name:	CAM-4		
Date of Sampling Event:	Aug. 23 and 25, 2007		
Names of Samplers:	Nick Battye, Line Filion, Kevin Schut		
Monitoring Well ID:	MW 1		
Facility:	SA NHWLF		
Water Sample Measured Data			
Condition of Well:	Good		
Procedure/Equipment:	Measuring tape	Procedure/Equipment:	Interface metre
Well height above ground (m)=	0.54	Depth to water surface (m)=	1.98
Diameter of well (m)=	0.05	Static water level* (m)=	1.44
Depth of installation* (m)=	4.50	Depth to bottom (m)=	2.12
Length screened section (m)=	2.03	Free product thickness (mm)=	n/a
Depth to top of screen* (m)=	1.5		
Calculations		**Notes**	
Depth of water (m)=	0.14	Evidence of sludge etc:	N
Well volume of water (L)=	0.27	Evidence of freezing/siltation: (compare to installation record)	Y
Length screen collecting water (m)=	0.62		

Development/Purging Information

Equipment: Teflon tubing with teflon foot valve.

Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (uS/cm)	Turbidity (NTU)	Description of water
No sample collected						

Water Sampling		**Soil Sampling**	
Date and time collected:		Date and time collected:	**Aug. 23, 2007**
Sample Number - Water:	No sample collected	Sample Number - Soil:	24868/69 @ 0-0.1 m
			24870/71 @ 0.3-0.4 m
Sample containers:		Sample containers:	Whirlpak
			120 mL Amber glass jar
Procedure/Equipment:		Procedure/Equipment:	Disposable sterilized plastic scoop
Water description:		Soil description:	Light brown sand, very fine to coarse grained, some gravel, fine to coarse grained, sub-angular, fines and cobbles, damp, no odour.
Filtration: (Y/N)			
Acidification: (Y/N)			
Sampling Equipment Decontamination: (Y/N)		Sampling Equipment Decontamination: (Y/N)	No; disposable scoops were used.
Number washes:		Number washes:	n/a
Number rinses:		Number rinses:	n/a

n/a=not applicable

*From ground surface. Unless this is stated, all measurements are assumed to be from the top of the casing.

Table B-117: Monitoring Well Sampling Log (MW #2), 2007

Site Name:	CAM-4		
Date of Sampling Event:	Aug. 23 and 25, 2007		
Names of Samplers:	Nick Battye, Line Filion, Kevin Schut		
Monitoring Well ID:	MW 2		
Facility:	SA NHWLF		
Water Sample Measured Data			
Condition of Well:	Good		
Procedure/Equipment:	Measuring tape	Procedure/Equipment:	Interface metre
Well height above ground (m)=	0.54	Depth to water surface (m)=	1.98
Diameter of well (m)=	0.05	Static water level* (m)=	1.44
Depth of installation* (m)=	4.50	Depth to bottom (m)=	2.25
Length screened section (m)=	2.0**	Free product thickness (mm)=	80.00
Depth to top of screen* (m)=	1.5		
Calculations		**Notes**	
Depth of water (m)=	0.27	Evidence of sludge etc:	N
Well volume of water (L)=	0.53	Evidence of freezing/siltation: (compare to installation record)	Y
Length screen collecting water (m)=	0.75		

Development/Purging Information

Equipment: Teflon tubing with teflon foot valve.

Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (uS/cm)	Turbidity (NTU)	Description of water
No sample collected						

Water Sampling		**Soil Sampling**	
Date and time collected:		Date and time collected:	Aug. 23, 2007
Sample Number - Water:	No sample collected	Sample Number - Soil:	24860/61 @ 0-0.1 m
			24862/63 @ 0.3-0.4 m
Sample containers:		Sample containers:	Whirlpak
			120 mL Amber glass jar
Procedure/Equipment:		Procedure/Equipment:	Disposable sterilized plastic scoop
Water description:		Soil description:	Light brown sand, very fine to medium grained, well graded, some gravel, fine to coarse grained, sub-angular, fines and cobbles, damp, no odour.
Filtration: (Y/N)			
Acidification: (Y/N)			
Sampling Equipment Decontamination: (Y/N)		Sampling Equipment Decontamination: (Y/N)	No; disposable scoops were used.
Number washes:		Number washes:	n/a
Number rinses:		Number rinses:	n/a

n/a=not applicable

*From ground surface. Unless this is stated, all measurements are assumed to be from the top of the casing.

**Measurement from site specifications; not recorded in MW log.

Table B-118: Monitoring Well Sampling Log (MW 3), 2007

Site Name:	CAM-4		
Date of Sampling Event:	Aug. 23 and 25, 2007		
Names of Samplers:	Nick Battye, Line Filion, Kevin Schut		
Monitoring Well ID:	MW 3		
Facility:	SA NHWLF		
Water Sample Measured Data			
Condition of Well:	Good		
Procedure/Equipment:	Measuring tape	Procedure/Equipment:	Interface metre
Well height above ground (m)=	0.63	Depth to water surface (m)=	n/a
Diameter of well (m)=	0.05	Static water level* (m)=	n/a
Depth of installation* (m)=	4.50	Depth to bottom (m)=	5.10
Length screened section (m)=	2.0**	Free product thickness (mm)=	n/a
Depth to top of screen* (m)=	1.5		
Calculations		**Notes**	
Depth of water (m)=	n/a	Evidence of sludge etc:	N
Well volume of water (L)=	n/a	Evidence of freezing/siltation: (compare to installation record)	N
Length screen collecting water (m)=	n/a		

Development/Purging Information						
Equipment:	Teflon tubing with teflon foot valve.					
Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (uS/cm)	Turbidity (NTU)	Description of water
Well Dry						

Water Sampling		**Soil Sampling**	
Date and time collected:		Date and time collected:	Aug. 23, 2007
Sample Number - Water:	No sample collected	Sample Number - Soil:	24852/53 @ 0-0.1 m
			24854/55 @ 0.3-0.4 m
Sample containers:		Sample containers:	Whirlpak
			120 mL Amber glass jar
Procedure/Equipment:		Procedure/Equipment:	Disposable sterilized plastic scoop
Water description:		Soil description:	Light brown sand, medium to coarse grained, with gravel, fine to coarse grained, sub angular to sub-round, some fines, damp, no odour.
Filtration: (Y/N)			
Acidification: (Y/N)			
Sampling Equipment Decontamination: (Y/N)		Sampling Equipment Decontamination: (Y/N)	No; disposable scoops were used.
Number washes:		Number washes:	n/a
Number rinses:		Number rinses:	n/a

n/a=not applicable

*From ground surface. Unless this is stated, all measurements are assumed to be from the top of the casing.

**Measurement from site specifications; not recorded in MW log.

Table B-119: Monitoring Well Sampling Log (MW 4A), 2007

Site Name:	CAM-4				
Date of Sampling Event:	Aug. 23 and 25, 2007				
Names of Samplers:	Nick Battye, Line Filion, Kevin Schut				
Monitoring Well ID:	MW 4A				
Facility:	SA NHWLF				
Water Sample Measured Data					
Condition of Well:	Good - was unable to remove PVC lid from well.				
Procedure/Equipment:	Measuring tape		Procedure/Equipment:	Interface metre	
Well height above ground (m)=			Depth to water surface (m)=	n/a	
Diameter of well (m)=	0.05		Static water level* (m)=	n/a	
Depth of installation* (m)=	4.00		Depth to bottom (m)=	n/a	
Length screened section (m)=	1.38		Free product thickness (mm)=	n/a	
Depth to top of screen* (m)=	2.58				
Calculations			**Notes**		
Depth of water (m)=	n/a		Evidence of sludge etc:	n/a	
Well volume of water (L)=	n/a		Evidence of freezing/siltation: (compare to installation record)	n/a	
Length screen collecting water (m)=	n/a				

Development/Purging Information						
Equipment:	Teflon tubing with teflon foot valve.					
Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (uS/cm)	Turbidity (NTU)	Description of water
Unable to collect sample						

Water Sampling		**Soil Sampling**	
Date and time collected:		Date and time collected:	Aug. 23, 2007
Sample Number - Water:	No sample collected	Sample Number - Soil:	24856/57 @ 0-0.1 m
			24858/59 @ 0.3-0.4 m
Sample containers:		Sample containers:	Whirlpak
			120 mL Amber glass jar
Procedure/Equipment:		Procedure/Equipment:	Disposable sterilized plastic scoop
Water description:		Soil description:	Light brown sand, very fine to medium grained, well graded, some gravel, fine to coarse grained, sub-angular, trace fines, damp, no odour.
Filtration: (Y/N)			
Acidification: (Y/N)			
Sampling Equipment Decontamination: (Y/N)		Sampling Equipment Decontamination: (Y/N)	No; disposable scoops were used.
Number washes:		Number washes:	n/a
Number rinses:		Number rinses:	n/a

n/a=not applicable

*From ground surface. Unless this is stated, all measurements are assumed to be from the top of the casing.

Table B-120: Monitoring Well Sampling Log (MW #4B), 2007

Site Name:	CAM-4		
Date of Sampling Event:	Aug. 23 and 25, 2007		
Names of Samplers:	Nick Battye, Line Filion, Kevin Schut		
Monitoring Well ID:	MW 4B		
Facility:	SA NHWLF		
Water Sample Measured Data			
Condition of Well:	Good		
Procedure/Equipment:	Measuring tape	Procedure/Equipment:	Interface metre
Well height above ground (m)=	0.56	Depth to water surface (m)=	1.66
Diameter of well (m)=	0.05	Static water level* (m)=	1.10
Depth of installation* (m)=	2.80	Depth to bottom (m)=	2.00
Length screened section (m)=	2.28	Free product thickness (mm)=	n/a
Depth to top of screen* (m)=	0.48		
Calculations		**Notes**	
Depth of water (m)=	0.34	Evidence of sludge etc:	N
Well volume of water (L)=	0.67	Evidence of freezing/siltation: (compare to installation record)	Y
Length screen collecting water (m)=	0.34		

Development/Purging Information

Equipment: Teflon tubing with teflon foot valve.

Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (uS/cm)	Turbidity (NTU)	Description of water
No sample collected						

Water Sampling		**Soil Sampling**	
Date and time collected:		Date and time collected:	Aug. 23, 2007
Sample Number - Water:	No sample collected	Sample Number - Soil:	24856/57 @ 0-0.1 m
			24858/59 @ 0.3-0.4 m
Sample containers:		Sample containers:	Whirlpak
			120 mL Amber glass jar
Procedure/Equipment:		Procedure/Equipment:	Disposable sterilized plastic scoop
Water description:		Soil description:	Light brown sand, very fine to medium grained, well graded, some gravel, fine to coarse grained, sub-angular, trace fines, damp, no odour.
Filtration: (Y/N)			
Acidification: (Y/N)			
Sampling Equipment Decontamination: (Y/N)		Sampling Equipment Decontamination: (Y/N)	No; disposable scoops were used.
Number washes:		Number washes:	n/a
Number rinses:		Number rinses:	n/a

n/a=not applicable

*From ground surface. Unless this is stated, all measurements are assumed to be from the top of the casing.

Table B-122: Monitoring Well Sampling Log (MW #6A), 2007

Site Name:	CAM-4		
Date of Sampling Event:	Aug. 23 and 24, 2007		
Names of Samplers:	Nick Battye, Line Filion, Kevin Schut		
Monitoring Well ID:	MW 6A		
Facility:	SA NHWLF		
Water Sample Measured Data			
Condition of Well:	Good		
Procedure/Equipment:	Measuring tape	Procedure/Equipment:	Interface metre
Well height above ground (m)=	0.49	Depth to water surface (m)=	n/a
Diameter of well (m)=	0.05	Static water level* (m)=	n/a
Depth of installation* (m)=	4.27	Depth to bottom (m)=	1.88
Length screened section (m)=	1	Free product thickness (mm)=	n/a
Depth to top of screen* (m)=	2.89		
Calculations		**Notes**	
Depth of water (m)=	n/a	Evidence of sludge etc:	N
Well volume of water (L)=	n/a	Evidence of freezing/siltation: (compare to installation record)	Y
Length screen collecting water (m)=	n/a		

Development/Purging Information

Equipment: Teflon tubing with teflon foot valve.

Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (uS/cm)	Turbidity (NTU)	Description of water
Well Dry						

Water Sampling		**Soil Sampling**	
Date and time collected:		Date and time collected:	Aug. 23, 2007
Sample Number - Water:	No sample collected	Sample Number - Soil:	24864/65 @ 0-0.1 m
			24866/67 @ 0.3-0.4 m
Sample containers:		Sample containers:	Whirlpak
			120 mL Amber glass jar
Procedure/Equipment:		Procedure/Equipment:	Disposable sterilized plastic scoop
Water description:		Soil description:	Light brown sand, very fine to fine grained, some gravel, fine to coarse grained, sub-angular, fines and cobbles, damp, no odour.
Filtration: (Y/N)			
Acidification: (Y/N)			
Sampling Equipment Decontamination: (Y/N)		Sampling Equipment Decontamination: (Y/N)	No; disposable scoops were used.
Number washes:		Number washes:	n/a
Number rinses:		Number rinses:	n/a

n/a=not applicable

*From ground surface. Unless this is stated, all measurements are assumed to be from the top of the casing.

Table B-123: Monitoring Well Sampling Log (MW #6B), 2007

Site Name:	CAM-4		
Date of Sampling Event:	Aug. 23 and 24, 2007		
Names of Samplers:	Nick Battye, Line Filion, Kevin Schut		
Monitoring Well ID:	MW 6B		
Facility:	SA NHWLF		
Water Sample Measured Data			
Condition of Well:	Good		
Procedure/Equipment:	Measuring tape	Procedure/Equipment:	Interface metre
Well height above ground (m)=	0.6	Depth to water surface (m)=	0.90
Diameter of well (m)=	0.05	Static water level* (m)=	0.30
Depth of installation* (m)=	4.27	Depth to bottom (m)=	2.07
Length screened section (m)=	2.26	Free product thickness (mm)=	n/a
Depth to top of screen* (m)=	0.5		
Calculations		**Notes**	
Depth of water (m)=	1.17	Evidence of sludge etc:	N
Well volume of water (L)=	2.30	Evidence of freezing/siltation: (compare to installation record)	Y
Length screen collecting water (m)=	1.57		

Development/Purging Information

Equipment: Teflon tubing with teflon foot valve.

Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (uS/cm)	Turbidity (NTU)	Description of water
Aug. 24, 2007; 13:06	1	2.4	**	385	908	some silt, cloudy, brown

Water Sampling		**Soil Sampling**	
Date and time collected:	Aug. 24, 2007; 13:09	Date and time collected:	Aug. 23, 2007
Sample Number - Water:	24932	Sample Number - Soil:	24864/65 @ 0-0.1 m
			24866/67 @ 0.3-0.4 m
Sample containers:	1 L HDPE bottle	Sample containers:	Whirlpak
	1 L Teflon bottle		120 mL Amber glass jar
	250 mL Amber glass jar		
Procedure/Equipment:	Teflon tubing with teflon foot valve.	Procedure/Equipment:	Disposable sterilized plastic scoop
Water description:	some silt, cloudy, brown	Soil description:	Light brown sand, very fine to fine grained, some gravel, fine to coarse grained, sub-angular, fines and cobbles, damp, no odour.
Filtration: (Y/N)	N		
Acidification: (Y/N)	N		
Sampling Equipment Decontamination: (Y/N)	Y	Sampling Equipment Decontamination: (Y/N)	No; disposable scoops were used.
Number washes:	Soapy water (1)	Number washes:	n/a
Number rinses:	Tap water (1) DDW (1)	Number rinses:	n/a

n/a=not applicable

*From ground surface. Unless this is stated, all measurements are assumed to be from the top of the casing.

** pH probe was broken, analysis was performed in the south

Table B-124: Monitoring Well Sampling Log (MW #7A), 2007

Site Name:	CAM-4		
Date of Sampling Event:	Aug. 23 and 24, 2007		
Names of Samplers:	Nick Battye, Line Filion, Kevin Schut		
Monitoring Well ID:	MW 7A		
Facility:	SA NHWLF		
Water Sample Measured Data			
Condition of Well:	Good		
Procedure/Equipment:	Measuring tape	Procedure/Equipment:	Interface metre
Well height above ground (m)=	0.57	Depth to water surface (m)=	n/a
Diameter of well (m)=	0.05	Static water level* (m)=	n/a
Depth of installation* (m)=	4.57	Depth to bottom (m)=	1.83
Length screened section (m)=	1	Free product thickness (mm)=	n/a
Depth to top of screen* (m)=	3.45		
Calculations		**Notes**	
Depth of water (m)=	n/a	Evidence of sludge etc:	N
Well volume of water (L)=	n/a	Evidence of freezing/siltation: (compare to installation record)	Y
Length screen collecting water (m)=	n/a		

Development/Purging Information

Equipment: Teflon tubing with teflon foot valve.

Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (uS/cm)	Turbidity (NTU)	Description of water
Well Dry						

Water Sampling		**Soil Sampling**	
Date and time collected:		Date and time collected:	Aug. 23, 2007
Sample Number - Water:	No sample collected	Sample Number - Soil:	24872/73 @ 0-0.1 m
			24874/75 @ 0.3-0.4 m
Sample containers:		Sample containers:	Whirlpak
			120 mL Amber glass jar
Procedure/Equipment:		Procedure/Equipment:	Disposable sterilized plastic scoop
Water description:		Soil description:	Light brown sand, fine to coarse grained, and gravel, fine to coarse grained, sub-angular, some fines and cobbles, damp to wet, seepage at 30, no odour.
Filtration: (Y/N)			
Acidification: (Y/N)			
Sampling Equipment Decontamination: (Y/N)		Sampling Equipment Decontamination: (Y/N)	No; disposable scoops were used.
Number washes:		Number washes:	n/a
Number rinses:		Number rinses:	n/a

n/a=not applicable

*From ground surface. Unless this is stated, all measurements are assumed to be from the top of the casing.

Table B-125: Monitoring Well Sampling Log (MW #7B), 2007

Site Name:	CAM-4		
Date of Sampling Event:	Aug. 23, 24 and 25, 2007		
Names of Samplers:	Nick Battye, Line Filion, Kevin Schut		
Monitoring Well ID:	MW 7B		
Facility:	SA NHWLF		
Water Sample Measured Data			
Condition of Well:	Good		
Procedure/Equipment:	Measuring tape	Procedure/Equipment:	Interface metre
Well height above ground (m)=	0.76	Depth to water surface (m)=	0.84
Diameter of well (m)=	0.05	Static water level* (m)=	0.08
Depth of installation* (m)=	2.74	Depth to bottom (m)=	1.23
Length screened section (m)=	1.95	Free product thickness (mm)=	n/a
Depth to top of screen* (m)=	0.71		
Calculations		**Notes**	
Depth of water (m)=	0.39	Evidence of sludge etc:	N
Well volume of water (L)=	0.77	Evidence of freezing/siltation: (compare to installation record)	Y
Length screen collecting water (m)=	0.52		

Development/Purging Information

Equipment: Teflon tubing with teflon foot valve.

Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (uS/cm)	Turbidity (NTU)	Description of water
Aug. 24, 2007; 13:21	2	2.3	***	827	859	very silty, dark brown

Water Sampling		**Soil Sampling**	
Date and time collected:	Aug. 24, 2007; 13:40**	Date and time collected:	Aug. 23, 2007
Sample Number - Water:	24928	Sample Number - Soil:	24872/73 @ 0-0.1 m
			24874/75 @ 0.3-0.4 m
Sample containers:	1 L HDPE bottle	Sample containers:	Whirlpak
	1 L Teflon bottle		120 mL Amber glass jar
	250 mL Amber glass jar		
Procedure/Equipment:	Teflon tubing with teflon foot valve.	Procedure/Equipment:	Disposable sterilized plastic scoop
Water description:	very silty, dark brown	Soil description:	Light brown sand, fine to coarse grained, and gravel, fine to coarse grained, sub-angular, some fines and cobbles, damp to wet, seepage at 30, no odour.
Filtration: (Y/N)	N		
Acidification: (Y/N)	N		
Sampling Equipment Decontamination: (Y/N)	Y	Sampling Equipment Decontamination: (Y/N)	No; disposable scoops were used.
Number washes:	Soapy water (1)	Number washes:	n/a
Number rinses:	Tap water (1) DDW (1)	Number rinses:	n/a

n/a=not applicable

*From ground surface. Unless this is stated, all measurements are assumed to be from the top of the casing.

**Sample collection was started on indicated date but needed to recharge overnight to obtain the last 1.5 L of sample, which was obtained on Aug. 25, 2007 at 13:29.

*** pH probe was broken, analysis was performed in the south

Table B-135: Monitoring Well Sampling Log (MW #16), 2007

Site Name:	CAM-4					
Date of Sampling Event:	Aug. 23 and 26, 2007					
Names of Samplers:	Nick Battye, Line Filion, Kevin Schut					
Monitoring Well ID:	MW 16					
Facility:	SA NHWLF					
Water Sample Measured Data						
Condition of Well:	Good					
Procedure/Equipment:	Measuring tape			Procedure/Equipment:	Interface metre	
Well height above ground (m)=	0.49			Depth to water surface (m)=	1.23	
Diameter of well (m)=	0.05			Static water level* (m)=	0.74	
Depth of installation* (m)=	3.01			Depth to bottom (m)=	2.94	
Length screened section (m)=	2.01			Free product thickness (mm)=	n/a	
Depth to top of screen* (m)=	0.54					
Calculations				**Notes**		
Depth of water (m)=	1.71			Evidence of sludge etc:	N	
Well volume of water (L)=	3.36			Evidence of freezing/siltation: (compare to installation record)	N	
Length screen collecting water (m)=	1.71					
Development/Purging Information						
Equipment:	Teflon tubing with teflon foot valve.					
Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (uS/cm)	Turbidity (NTU)	Description of water
Aug. 26, 2007; 15:48	4	1.6	**	526	78.8	clear with visible sheen on
Water Sampling				**Soil Sampling**		
Date and time collected:	Aug. 26, 2007; 15:45			Date and time collected:	Aug. 23, 2007	
Sample Number - Water:	24942			Sample Number - Soil:	24844/45 @ 0-0.1 m	
					24846/47 @ 0.3-0.4 m	
Sample containers:	1 L HDPE bottle			Sample containers:	Whirlpak	
	1 L Teflon bottle				120 mL Amber glass jar	
	250 mL Amber glass jar					
Procedure/Equipment:	Teflon tubing with teflon foot valve.			Procedure/Equipment:	Disposable sterilized plastic scoop	
Water description:	clear with visible sheen on surface			Soil description:	Light brown/grey sand, very fine grained, and gravel, fine to coarse grained, sub angular to sub-round, some fines, damp to wet, seepage at 10, no odour.	
Filtration: (Y/N)	N					
Acidification: (Y/N)	N					
Sampling Equipment Decontamination: (Y/N)	Y			Sampling Equipment Decontamination: (Y/N)	No; disposable scoops were used.	
Number washes:	Soapy water (1)			Number washes:	n/a	
Number rinses:	Tap water (1)	DDW (1)		Number rinses:	n/a	

n/a=not applicable

*From ground surface. Unless this is stated, all measurements are assumed to be from the top of the casing.

** pH probe was broken, analysis was performed in the south

Annex Tier II Soil Disposal Facility - Year 1 Data

Figure:

- CAM-4.3: Site Plan - Tier II Disposal Facility
- Ground Temperature Profile Tier II Disposal Facility Vertical VT-5
- Ground Temperature Profile Tier II Disposal Facility Vertical VT-6
- Ground Temperature Profile Tier II Disposal Facility Vertical VT-7
- Ground Temperature Profile Tier II Disposal Facility Vertical VT-8

Tables:

- Landfill Visual Inspection - CAM-4 Pelly Bay Tier II Disposal Facility
- Tier II Disposal Facility - Evaluation of Year 1 Soil Analytical Data
- Tier II Disposal Facility - Year 1 (2007) Soil Data
- Tier II Disposal Facility - Year 1 (2007) Groundwater Data

Photographic Records:

- Photos 11 and 12
- Photos 13 and 14
- Photos 15 and 16

Monitoring Well Records:

- Well MW-5
- Well MW-8
- Well MW-9
- Well MW-14
- Well MW-14B
- Well MW-15

Thermistor Annual Maintenance Records:

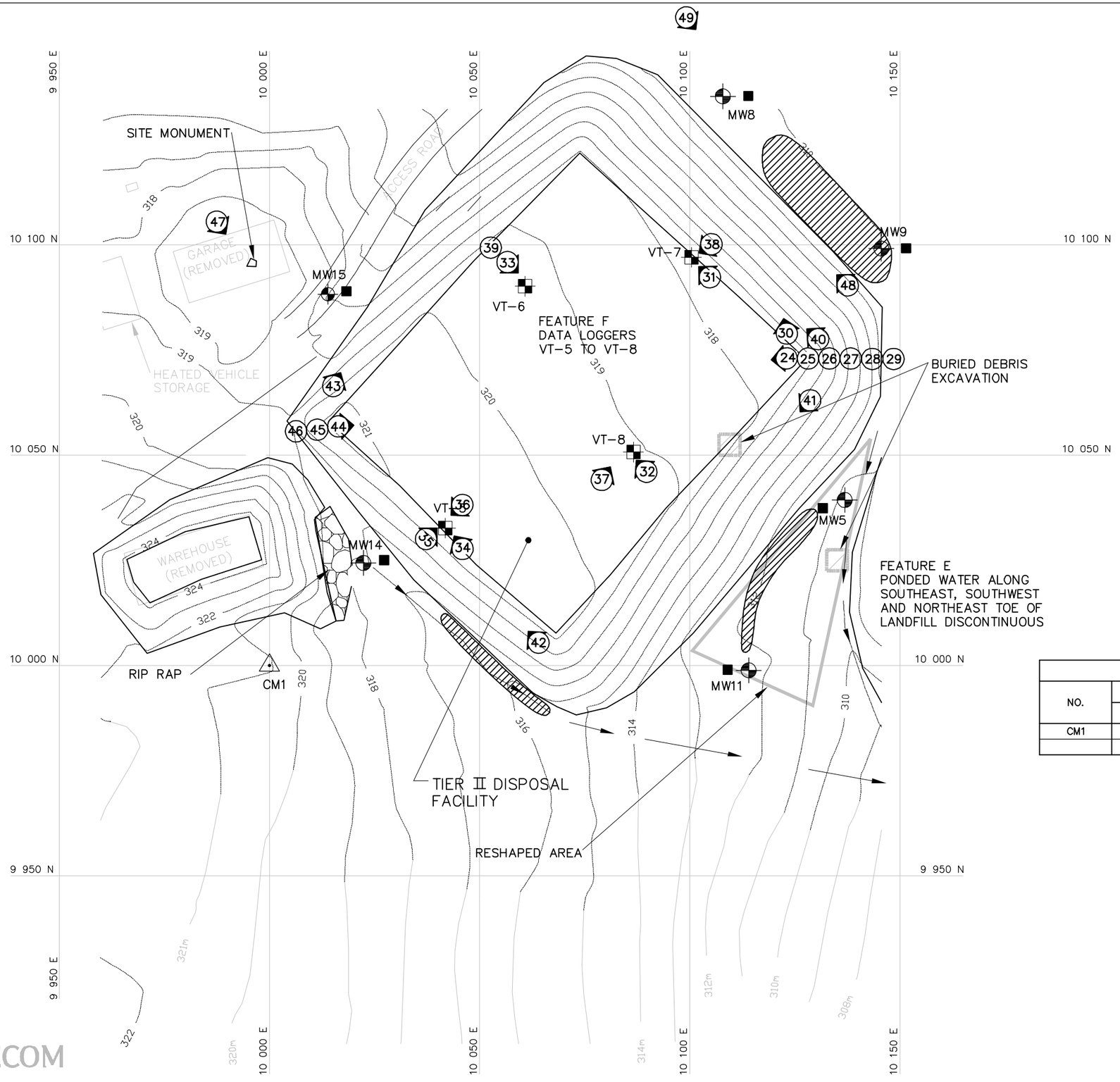
- VT-5
- VT-6
- VT-7
- VT-8

DCC Tier II Disposal Facility - Evaluation of Ground Temperature Data

Ground temperature profiles for vertical thermistors VT-1 to VT-4 are attached, showing ground temperatures curves since August 2007. The table shows the depth of active layer as defined by the 0°C isotherm for August 25, 2007.

Summary of Tier II Disposal Facility Thermal Results				
	VT-5	**VT-6**	**VT-7**	**VT-8**
Depth (m) of 0°C Isotherm (Aug 25/07)	1.5	1.9	1.2	1.7

The inferred active layer depths noted above are less than the thickness of the 2.6 m granular cover over the Tier II soil; the landfill contents are remaining frozen. The measured active layers are within the range of the thermal calculations (EBA 2008).



LEGEND:

- TBM4 — TEMPORARY BENCHMARK
- BM–1 — PERMANENT BENCHMARK
- 101 — COORDINATE POINT
- MONITORING SOIL SAMPLE LOCATION
- MONITORING WELL LOCATION
- VERTICAL THERMISTOR LOCATION
- 32 — PHOTOGRAPHIC VIEWPOINT
- PONDED WATER

COORDINATE POINTS (AS–BUILT) VERTICAL THERMISTORS

NO.	NORTHING	EASTING
VT–5	10 032.67	10 041.85
VT–6	10 090.20	10 060.83
VT–7	10 097.07	10 100.40
VT–8	10 050.75	10 086.59

COORDINATE POINTS (AS BUILT) MONITORING WELLS

NO.	NORTHING	EASTING	ELEV.
MW5	10 039.35	10 136.86	310.91
MW8	10 135.37	10 107.87	310.20
MW9	10 099.17	10 145.56	310.10
MW11	9 998.83	10 114.01	312.57
MW14	10 024.37	10 022.34	317.80
MW15	10 088.30	10 013.90	317.70

SURVEY CONTROL MONUMENTS

NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
CM1	10 000.000	10 000.000	321.116	CAM–4 BASELINE STA. 0+00.0

SCALE 1:1000 — 0 10 20 30 m

RECORD DRAWING
NOT FOR CONSTRUCTION

UMA | AECOM

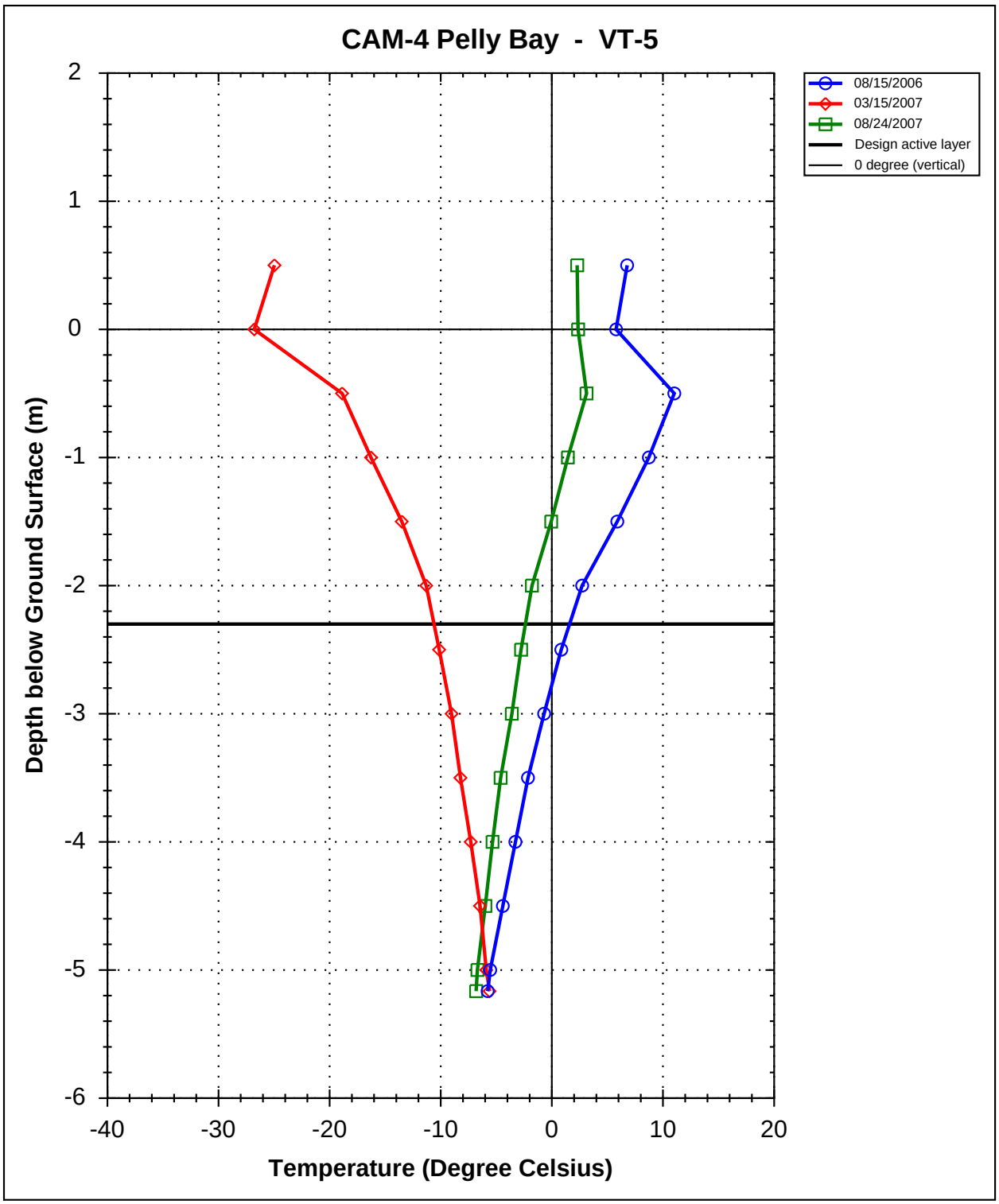
DGN NAME: C4-RD03.DWG CLC - 08/02/04

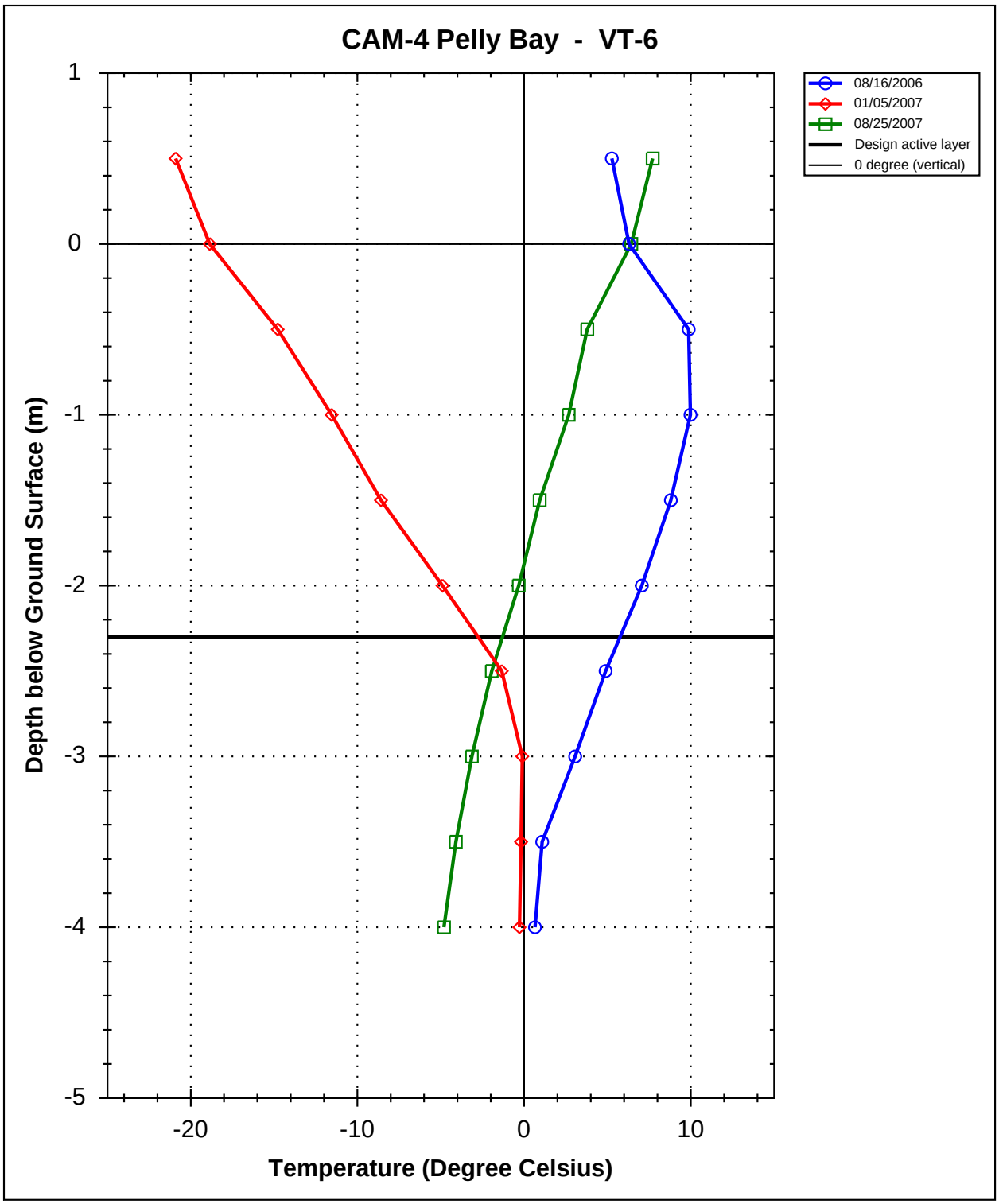
DEW LINE CLEAN UP
LANDFILL MONITORING PLAN

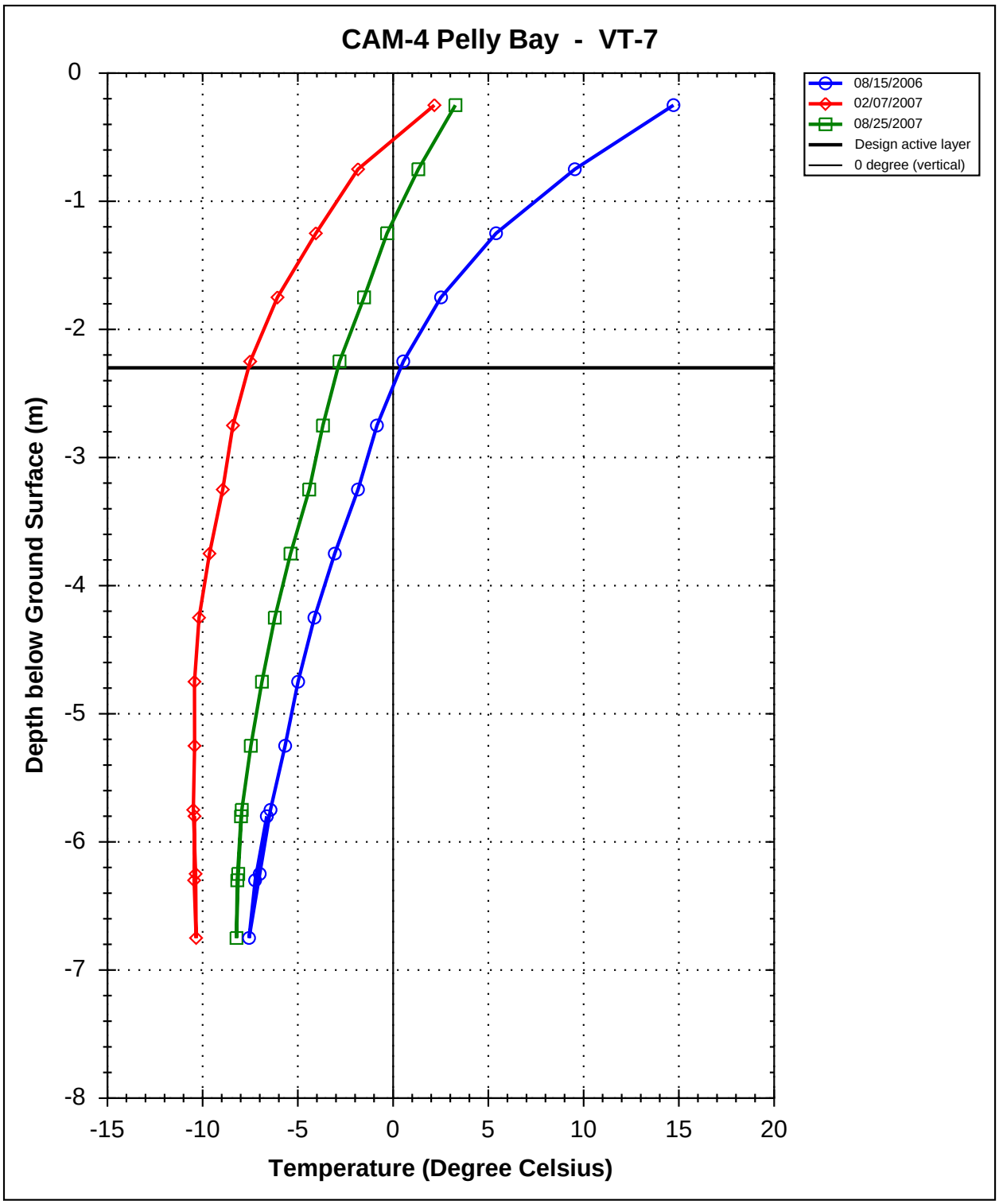
CAM-4 - PELLY BAY

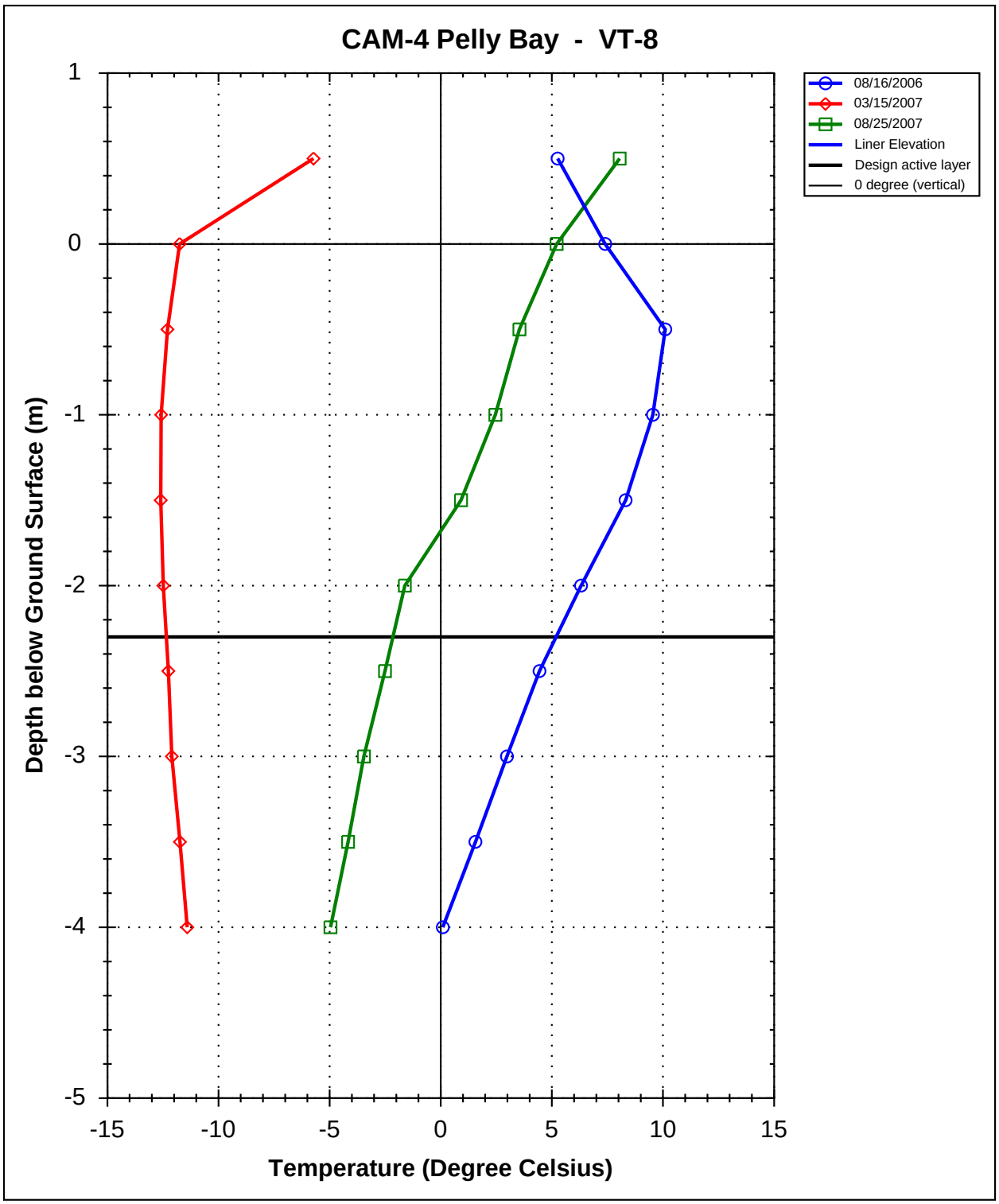
TIER II DISPOSAL FACILITY

FIGURE CAM-4.3


CAM-4 Pelly Bay - VT-5
08/15/2006
03/15/2007
08/24/2007
Design active layer
0 degree (vertical)
Depth below Ground Surface (m)
2
1
0
-1
-2
-3
-4
-5
-6
-40
-30
-20
-10
0
10
20
Temperature (Degree Celsius)


CAM-4 Pelly Bay - VT-6
08/16/2006
01/05/2007
08/25/2007
Design active layer
0 degree (vertical)
Depth below Ground Surface (m)
1
0
-1
-2
-3
-4
-5
-20
-10
0
10
Temperature (Degree Celsius)


CAM-4 Pelly Bay - VT-7
Depth below Ground Surface (m)
Temperature (Degree Celsius)
0
-1
-2
-3
-4
-5
-6
-7
-8
-15
-10
-5
0
5
10
15
20
08/15/2006
02/07/2007
08/25/2007
Design active layer
0 degree (vertical)


CAM-4 Pelly Bay - VT-8
08/16/2006
03/15/2007
08/25/2007
Liner Elevation
Design active layer
0 degree (vertical)
Depth below Ground Surface (m)
1
0
-1
-2
-3
-4
-5
-15
-10
-5
0
5
10
15
Temperature (Degree Celsius)

LANDFILL VISUAL INSPECTION

Site Name: CAM-4, Pelly Bay
Landfill: **Tier II Soil Disposal Facility**
Designation:
Date Inspected: August 24 to August 26, 2007
Inspected by: Ed Grozic, P.Eng.
EBA Engineering Consultants Ltd.

Signature: 

TABLE C1: TIER II SOIL DISPOSAL FACILITY

Checklist Item	Present (Yes/No)	Location	Length	Width	Depth	Extent	Description	Photographic Records (Images provided on Data CD)	Severity Rating	Additional Comments
Settlement	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Erosion	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Frost Action	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Animal Burrows	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Vegetation	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Staining	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Vegetation Stress	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Seepage Points	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Debris Exposed	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Presence/Condition of Monitoring Instruments	Yes	Feature F See Figure C1	N/A	N/A	N/A	N/A	VT-5, VT-6, VT-7 and VT-8	Photo 13 (Image 36), Photo 14 (Image 39), Photo 15 (Image 38), and Photo 16 (Image 37)	Acceptable	Successfully downloaded ground temperature data from VT-5. Batteries failed in data loggers from VT-6, VT-7 and VT-8. Ground temperature data were retrieved from these loggers while on site; however, the data had to be processed in the office. The data loggers were serviced and redeployed. Available ground temperature data is presented herein.
Other Features of Note Ponded water from rainfall along toe of landfill	Yes	Feature E See Figure C1	~ 50 m	0 m to 1.5 m	0 m to 0.03 m	Isolated	Ponded water along southeast, southwest and northeast toe of landfill	Photo 11 (Image 40), Photo 12 (Image 42), Image 41 and Image 48	Acceptable	Ponded water along toe of landfill. The water temporarily ponds during periods of rainfall and shortly thereafter evaporates or infiltrates.
Overall Landfill Performance:	**Acceptable**									

Tier II Disposal Facility - EVALUATION OF YEAR 1 SOIL ANALYTICAL DATA

Parameter	N value Baseline	Arithmetic Mean +/- 95% Confidence Limit Baseline	Maximum Baseline [mg/kg]	2007	Comments
Copper	62	14.2+/-1.5	37	Measured concentrations within 95% confidence intervals.	
Nickel	47	13.8+/-1.5	27	Measured concentrations within 95% confidence intervals for all samples with one exception.	Surface sample at BMW-2 has a concentration of 17 mg/kg (below baseline max).
Cobalt	47	8.4+/-0.6	13	Measured concentrations within 95% confidence intervals for all samples with one exception.	Surface sample at BMW-2 has a concentration of 9.7 mg/kg (below baseline max).
Cadmium	57	<1.0	1.4	Measured concentrations within 95% confidence intervals.	
Lead	63	22+/-7	130	Measured concentrations within 95% confidence intervals.	
Zinc	64	79+/-12	200	Measured concentrations within 95% confidence intervals.	
Chromium	49	28+/-4	53	Measured concentrations within 95% confidence intervals for all samples with one exception.	Surface sample at BMW-2 has a concentration of 33 mg/kg (below baseline max).
Arsenic	49	2.1+/-0.3	4.7	Measured concentrations within 95% confidence interval for 8 of 12 samples.	Surface samples at BMW-2 and MW-15 and surface and depth samples at MW-14 outside 95% confidence interval but below baseline max (concentrations up to 3.3 mg/kg).
Mercury	28	<0.1	0.5	Measured concentrations within 95% confidence intervals.	
PCBs	77	<0.003	2.5	Measured concentrations within 95% confidence interval for 10 of 12 samples.	BMW-2 surface sample had a concentration of 0.024 mg/kg and depth sample at MW-9 had a concentration of 0.0041 mg/kg (below baseline max).

Tier II Disposal Facility - EVALUATION OF YEAR 1 SOIL ANALYTICAL DATA

Parameter	N value Baseline	Arithmetic Mean +/- 95% Confidence Limit Baseline	Maximum Baseline [mg/kg]	2007	Comments
TPH	71	<40	17000	Measured concentrations within 95% confidence intervals for all samples with three exceptions.	TPH detected in MW-8 downgradient of the landfill at surface and depth (62 & 1549 mg/kg). Upgradient well MW-15 had a concentration of 83 mg/kg at surface. Results below baseline max.

Tier II Disposal Facility - Year 1 (2007) Soil Data

Sample #	Location	Date	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co [mg/kg]	Cd [mg/kg]	Pb [mg/kg]	Zn [mg/kg]	Cr [mg/kg]	As [mg/kg]	Hg [mg/kg]	PCBs [mg/kg]	TPH [mg/kg]	TPH Identity		
															F1	F2	F3
Tier II Disposal Facility - Baseline Concentrations				**14.2+/-1.5**	**13.8+/-1.5**	**8.4+/-0.6**	**<1.0**	**22+/-7**	**79+/-12**	**28+/-4**	**2.1+/-0.3**	**<0.1**	**<0.003**	**<40**			
Tier II Disposal Facility - Maximum Concentrations				**37**	**27**	**13**	**1.4**	**130**	**200**	**53**	**4.7**	**0.5**	**2.5**	**17000**			
Up-gradient Soil Samples																	
24804/05	BMW2	2007	0	12	17	9.7	<1.0	<10	45	33	2.5	< 0.10	0.024	20.7	<10	6.7	14
24806/07	BMW2	2007	30	9.5	14	9.0	<1.0	<10	41	29	2.3	< 0.10	< 0.0030	23.7	<10	7.7	16
24808/09	MW14	2007	0	8.3	13	8.5	<1.0	<10	36	28	2.9	< 0.10	< 0.0030	<10	<10	7.4	< 9.0
24810/11	MW14	2007	30	10	15	11	<1.0	<10	48	30	2.5	< 0.10	< 0.0030	39.3	<10	6.3	33
24840/41	MW15	2007	0	8.7	9.0	7.3	<1.0	12	56	<20	3.3	< 0.10	< 0.0030	83	<10	< 4.0	83
24842/43	MW15	2007	30	7.6	9.7	8.3	<1.0	<10	47	<20	2.0	< 0.10	< 0.0030	32.8	<10	6.8	26
Down-gradient Soil Samples																	
24828/29	MW5	2007	0	9.9	10	8.7	<1.0	<10	40	21	2.2	< 0.10	< 0.0030	26.6	<10	5.6	21
24830/31	MW5	2007	30	7.9	8.1	7.2	<1.0	<10	32	<20	1.7	< 0.10	< 0.0030	24.4	<10	4.4	20
24836/37	MW8	2007	0	9.5	11	9.2	<1.0	<10	46	23	2.2	< 0.10	< 0.0030	62.0	<10	5.0	57
24838/39	MW8	2007	30	7.3	12	8.5	<1.0	<10	35	26	1.6	< 0.10	< 0.0030	1549	89	1300	160
24832/33	MW9	2007	0	9.3	9.6	8.1	<1.0	<10	37	<20	2.4	< 0.10	< 0.0030	22.6	<10	5.6	17
24834/35	MW9	2007	30	10	9.6	8.5	<1.0	<10	40	<20	2.3	< 0.10	0.0041	34.1	<10	5.1	29

Tier II Disposal Facility - Year 1 (2007) Groundwater Data

Sample #	Location	Date	Cu [mg/L]	Ni [mg/L]	Co [mg/L]	Cd [mg/L]	Pb [mg/L]	Zn [mg/L]	Cr [mg/L]	As [mg/L]	Hg [mg/L]	PCBs [mg/L]	TPH [mg/L]	TPH Identity		
														F1	F2	F3
Up-gradient Groundwater Samples																
24920/21	BMW2	2007	0.030	0.035	0.010	<0.0010	<0.010	0.065	0.057	<0.0030	<0.00040	< 0.000020	<1.0	< 0.050	< 0.50	< 1.0
24922	MW14A	2007	0.043	0.66	0.0097	<0.0010	0.024	0.27	1.2	<0.0030	<0.00040	< 0.000020	<1.0	< 0.050	< 0.50	< 1.0
24939	MW15	2007	0.0091	0.028	0.0048	<0.0010	<0.010	1.4	0.017	<0.0030	<0.00040	< 0.000020	<1.0	1.9	5.9	< 1.0
Down-gradient Groundwater Samples																
24923	MW5	2007	0.045	0.12	0.022	<0.0010	0.021	0.32	0.086	0.0051	<0.00040	< 0.000020	<1.0	1.5	1.9	< 1.0
24926	MW8	2007	0.056	0.18	0.021	<0.0010	0.014	0.15	0.33	0.016	<0.00040	< 0.000020	3.6	< 0.050	< 0.50	3.6
24927	MW9	2007	0.056	0.064	0.0083	<0.0010	<0.010	5.2	0.11	<0.0030	<0.00040	< 0.000020	<1.0	< 0.050	< 0.50	< 1.0

Photo 11 (Image 40)
Tier II Soil Disposal Facility
Ponded water along northeast facing slope looking northwest from east corner of landfill.

Photo 12 (Image 42)
Tier II Soil Disposal Facility
Ponded water along southwest facing slope looking northwest from south corner of landfill.

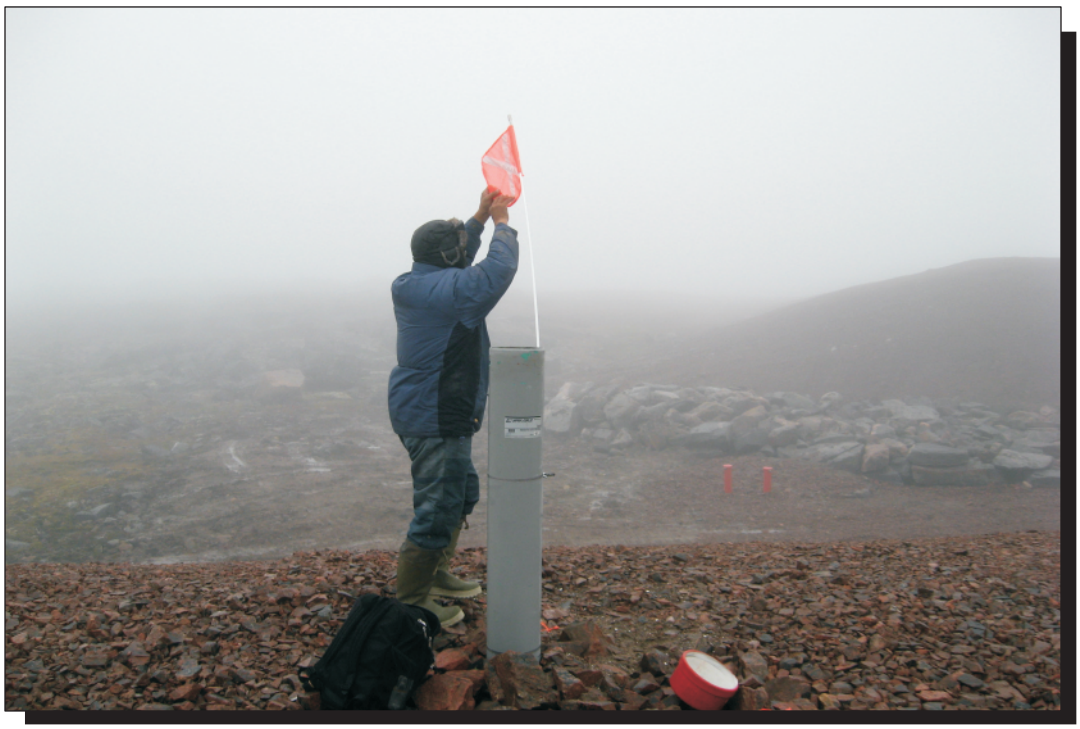


Photo 13 (Image 36)
Tier II Soil Disposal Facility
View of VT-5 looking southwest.

Photo 14 (Image 39)
Tierr II Soil Disposal Facility
View of VT-6 looking towards VT-8 in background.

Photo 15 (Image 38)
Tier II Soil Disposal Facility
View of VT-7 looking towards VT-6.

Photo 16 (Image 37)
Tier II Soil Disposal Facility
View of VT-8 looking northeast.

Table B-121: Monitoring Well Sampling Log (MW #5), 2007

Site Name:	CAM-4		
Date of Sampling Event:	Aug. 22 and 24, 2007		
Names of Samplers:	Nick Battye, Line Filion, Kevin Schut		
Monitoring Well ID:	MW 5		
Facility:	Tier II Disposal Facility		
Water Sample Measured Data			
Condition of Well:	Good		
Procedure/Equipment:	Measuring tape	Procedure/Equipment:	Interface metre
Well height above ground (m)=	0.955	Depth to water surface (m)=	1.10
Diameter of well (m)=	0.05	Static water level* (m)=	0.14
Depth of installation* (m)=	3.60	Depth to bottom (m)=	2.76
Length screened section (m)=	2.03	Free product thickness (mm)=	n/a
Depth to top of screen* (m)=	0.6		
Calculations		**Notes**	
Depth of water (m)=	1.67	Evidence of sludge etc:	N
Well volume of water (L)=	3.27	Evidence of freezing/siltation: (compare to installation record)	Y
Length screen collecting water (m)=	2.16		

Development/Purging Information

Equipment: Teflon tubing with teflon foot valve.

Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (uS/cm)	Turbidity (NTU)	Description of water
Aug. 24, 2007; 10:55	1	2.2	**	702	49.1	some silt, cloudy

Water Sampling		**Soil Sampling**	
Date and time collected:	Aug. 24, 2007; 11:59	Date and time collected:	Aug. 22, 2007
Sample Number - Water:	24923	Sample Number - Soil:	24828/29 @ 0-0.1 m
			24830/31 @ 0.3-0.4 m
Sample containers:	1 L HDPE bottle	Sample containers:	Whirlpak
	1 L Teflon bottle		120 mL Amber glass jar
	250 mL Amber glass jar		
Procedure/Equipment:	Teflon tubing with teflon foot valve.	Procedure/Equipment:	Disposable sterilized plastic scoop
Water description:	some silt, cloudy	Soil description:	Brown sand, very fine to medium grained, and gravel, fine to coarse grained, some cobble, damp to wet, seepage at 30, no odour.
Filtration: (Y/N)	N		
Acidification: (Y/N)	N		
Sampling Equipment Decontamination: (Y/N)	Y	Sampling Equipment Decontamination: (Y/N)	No; disposable scoops were used.
Number washes:	Soapy water (1)	Number washes:	n/a
Number rinses:	Tap water (1) DDW (1)	Number rinses:	n/a

n/a=not applicable

*From ground surface. Unless this is stated, all measurements are assumed to be from the top of the casing.

** pH probe was broken, analysis was performed in the south

Table B-126: Monitoring Well Sampling Log (MW #8), 2007

Site Name:	CAM-4		
Date of Sampling Event:	Aug. 22 and 24, 2007		
Names of Samplers:	Nick Battye, Line Filion, Kevin Schut		
Monitoring Well ID:	MW 8		
Facility:	Tier II Disposal Facility		
Water Sample Measured Data			
Condition of Well:	Good		
Procedure/Equipment:	Measuring tape	Procedure/Equipment:	Interface metre
Well height above ground (m)=	0.95	Depth to water surface (m)=	0.95
Diameter of well (m)=	0.05	Static water level* (m)=	0.00
Depth of installation* (m)=	4.08	Depth to bottom (m)=	2.49
Length screened section (m)=	2.01	Free product thickness (mm)=	n/a
Depth to top of screen* (m)=	0.97		
Calculations		**Notes**	
Depth of water (m)=	1.54	Evidence of sludge etc:	N
Well volume of water (L)=	3.02	Evidence of freezing/siltation: (compare to installation record)	Y
Length screen collecting water (m)=	1.52		

Development/Purging Information

Equipment: Teflon tubing with teflon foot valve.

Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (uS/cm)	Turbidity (NTU)	Description of water
Aug. 24, 2007; 12:26	3.5	1.5	**	1205	906	trace silt, cloudy, light

Water Sampling		**Soil Sampling**	
Date and time collected:	Aug. 24, 2007; 12:36	Date and time collected:	Aug. 22, 2007
Sample Number - Water:	24926	Sample Number - Soil:	24836/37 @ 0-0.1 m
			24838/39 @ 0.3-0.4 m
Sample containers:	1 L HDPE bottle	Sample containers:	Whirlpak
	1 L Teflon bottle		120 mL Amber glass jar
	250 mL Amber glass jar		
Procedure/Equipment:	Teflon tubing with teflon foot valve.	Procedure/Equipment:	Disposable sterilized plastic scoop
Water description:	trace silt, cloudy, light brown	Soil description:	Dark brown sand, fine to coarse grained, well graded, some gravel, fine to coarse grained, and fines, damp to moist, slight to moderate HC odour.
Filtration: (Y/N)	N		
Acidification: (Y/N)	N		
Sampling Equipment Decontamination: (Y/N)	Y	Sampling Equipment Decontamination: (Y/N)	No; disposable scoops were used.
Number washes:	Soapy water (1)	Number washes:	n/a
Number rinses:	Tap water (1) DDW (1)	Number rinses:	n/a

n/a=not applicable

*From ground surface. Unless this is stated, all measurements are assumed to be from the top of the casing.

** pH probe was broken, analysis was performed in the south

Table B-127: Monitoring Well Sampling Log (MW #9), 2007

Site Name:	CAM-4					
Date of Sampling Event:	Aug. 22 and 24, 2007					
Names of Samplers:	Nick Battye, Line Filion, Kevin Schut					
Monitoring Well ID:	MW 9					
Facility:	Tier II Disposal Facility					
Water Sample Measured Data						
Condition of Well:	Good					
Procedure/Equipment:	Measuring tape			Procedure/Equipment:	Interface metre	
Well height above ground (m)=	0.32			Depth to water surface (m)=	0.32	
Diameter of well (m)=	0.05			Static water level* (m)=	0.00	
Depth of installation* (m)=	3.32			Depth to bottom (m)=	1.95	
Length screened section (m)=	2.01			Free product thickness (mm)=	n/a	
Depth to top of screen* (m)=	0.4					
Calculations				**Notes**		
Depth of water (m)=	1.63			Evidence of sludge etc:	N	
Well volume of water (L)=	3.20			Evidence of freezing/siltation: (compare to installation record)	Y	
Length screen collecting water (m)=	1.55					
Development/Purging Information						
Equipment:	Teflon tubing with teflon foot valve.					
Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (uS/cm)	Turbidity (NTU)	Description of water
Aug. 24, 2007; 12:05	2	2.4	**	1314	853	trace silt, cloudy, light
Water Sampling				**Soil Sampling**		
Date and time collected:	Aug. 24, 2007; 12:07			Date and time collected:	Aug. 22, 2007	
Sample Number - Water:	24927			Sample Number - Soil:	24832/33 @ 0-0.1 m	
					24834/35 @ 0.3-0.4 m	
Sample containers:	1 L HDPE bottle			Sample containers:	Whirlpak	
	1 L Teflon bottle				120 mL Amber glass jar	
	250 mL Amber glass jar					
Procedure/Equipment:	Teflon tubing with teflon foot valve.			Procedure/Equipment:	Disposable sterilized plastic scoop	
Water description:	trace silt, cloudy, light brown			Soil description:	Brown sand, very fine grained, some gravel, fine to coarse grained, fines and cobble, moist, seepage at 30, no odour.	
Filtration: (Y/N)	N					
Acidification: (Y/N)	N					
Sampling Equipment Decontamination: (Y/N)	Y			Sampling Equipment Decontamination: (Y/N)	No; disposable scoops were used.	
Number washes:	Soapy water (1)			Number washes:	n/a	
Number rinses:	Tap water (1) DDW (1)			Number rinses:	n/a	

n/a=not applicable

*From ground surface. Unless this is stated, all measurements are assumed to be from the top of the casing.

** pH probe was broken, analysis was performed in the south

Table B-132: Monitoring Well Sampling Log (MW #14), 2007

Site Name:	CAM-4		
Date of Sampling Event:	Aug. 22 and 24, 2007		
Names of Samplers:	Nick Battye, Line Filion, Kevin Schut		
Monitoring Well ID:	MW 14		
Facility:	Tier II Disposal Facility		
Water Sample Measured Data			
Condition of Well:	Good		
Procedure/Equipment:	Measuring tape	Procedure/Equipment:	Interface metre
Well height above ground (m)=	0.52	Depth to water surface (m)=	0.90
Diameter of well (m)=	0.05	Static water level* (m)=	0.38
Depth of installation* (m)=	4.66	Depth to bottom (m)=	2.25
Length screened section (m)=	2.03	Free product thickness (mm)=	n/a
Depth to top of screen* (m)=	1.67		
Calculations		**Notes**	
Depth of water (m)=	1.35	Evidence of sludge etc:	N
Well volume of water (L)=	2.65	Evidence of freezing/siltation: (compare to installation record)	Y
Length screen collecting water (m)=	0.58		

Development/Purging Information

Equipment: Teflon tubing with teflon foot valve.

Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (uS/cm)	Turbidity (NTU)	Description of water
Aug. 24, 2007; 09:35	2.5	2.5	**	848	73.6	cloudy, light brown

Water Sampling		**Soil Sampling**	
Date and time collected:	Aug. 24, 2007; 10:00	Date and time collected:	Aug. 22, 2007
Sample Number - Water:	24922	Sample Number - Soil:	24808/09 @ 0-0.1 m
			24810/11 @ 0.3-0.4 m
Sample containers:	1 L HDPE bottle	Sample containers:	Whirlpak
	1 L Teflon bottle		120 mL Amber glass jar
	250 mL Amber glass jar		
Procedure/Equipment:	Teflon tubing with teflon foot valve.	Procedure/Equipment:	Disposable sterilized plastic scoop
Water description:	cloudy, light brown	Soil description:	Brown/grey sand, very fine grained, with fines, some gravel, fine to coarse, angular to sub-angular, damp, no odour.
Filtration: (Y/N)	N		
Acidification: (Y/N)	N		
Sampling Equipment Decontamination: (Y/N)	Y	Sampling Equipment Decontamination: (Y/N)	No; disposable scoops were used.
Number washes:	Soapy water (1)	Number washes:	n/a
Number rinses:	Tap water (1) DDW (1)	Number rinses:	n/a

n/a=not applicable

*From ground surface. Unless this is stated, all measurements are assumed to be from the top of the casing.

** pH probe was broken, analysis was performed in the south

Table B-133: Monitoring Well Sampling Log (MW #14B), 2007

Site Name:	CAM-4		
Date of Sampling Event:	Aug. 22 and 24, 2007		
Names of Samplers:	Nick Battye, Line Filion, Kevin Schut		
Monitoring Well ID:	MW 14B		
Facility:	Tier II Disposal Facility		
Water Sample Measured Data			
Condition of Well:	Good		
Procedure/Equipment:	Measuring tape	Procedure/Equipment:	Interface metre
Well height above ground (m)=	0.54	Depth to water surface (m)=	n/a
Diameter of well (m)=	0.05	Static water level* (m)=	n/a
Depth of installation* (m)=	3.62	Depth to bottom (m)=	4.23
Length screened section (m)=	2.0**	Free product thickness (mm)=	n/a
Depth to top of screen* (m)=	0.5		
Calculations		**Notes**	
Depth of water (m)=	n/a	Evidence of sludge etc:	N
Well volume of water (L)=	n/a	Evidence of freezing/siltation: (compare to installation record)	Y
Length screen collecting water (m)=	n/a		

Development/Purging Information

Equipment: Teflon tubing with teflon foot valve.

Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (uS/cm)	Turbidity (NTU)	Description of water
Well Dry						

Water Sampling		**Soil Sampling**	
Date and time collected:		Date and time collected:	Aug. 22, 2007
Sample Number - Water:	No sample collected	Sample Number - Soil:	24808/09 @ 0-0.1 m
			24810/11 @ 0.3-0.4 m
Sample containers:		Sample containers:	Whirlpak
			120 mL Amber glass jar
Procedure/Equipment:		Procedure/Equipment:	Disposable sterilized plastic scoop
Water description:		Soil description:	Brown/grey sand, very fine grained, with fines, some gravel, fine to coarse, angular to sub-angular, damp, no odour.
Filtration: (Y/N)			
Acidification: (Y/N)			
Sampling Equipment Decontamination: (Y/N)		Sampling Equipment Decontamination: (Y/N)	No; disposable scoops were used.
Number washes:		Number washes:	n/a
Number rinses:		Number rinses:	n/a

n/a=not applicable

*From ground surface. Unless this is stated, all measurements are assumed to be from the top of the casing.

**Measurement from site specifications; not recorded in MW log.

Table B-134: Monitoring Well Sampling Log (MW #15), 2007

Site Name:	CAM-4					
Date of Sampling Event:	Aug. 22 and 25, 2007					
Names of Samplers:	Nick Battye, Line Filion, Kevin Schut					
Monitoring Well ID:	MW 15					
Facility:	Tier II Disposal Facility					
Water Sample Measured Data						
Condition of Well:	Good					
Procedure/Equipment:	Measuring tape			Procedure/Equipment:	Interface metre	
Well height above ground (m)=	0.5			Depth to water surface (m)=	0.50	
Diameter of well (m)=	0.05			Static water level* (m)=	0.00	
Depth of installation* (m)=	3.25			Depth to bottom (m)=	2.37	
Length screened section (m)=	1.97			Free product thickness (mm)=	n/a	
Depth to top of screen* (m)=	0.33					
Calculations				**Notes**		
Depth of water (m)=	1.87			Evidence of sludge etc:	N	
Well volume of water (L)=	3.67			Evidence of freezing/siltation: (compare to installation record)	Y	
Length screen collecting water (m)=	2.04					
Development/Purging Information						
Equipment:	Teflon tubing with teflon foot valve.					
Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (uS/cm)	Turbidity (NTU)	Description of water
Aug. 25, 2007; 12:05	1.5	2.8	**	418	0.33	clear, orange/yellow
Water Sampling				**Soil Sampling**		
Date and time collected:	Aug. 25, 2007; 12:27			Date and time collected:	Aug. 22, 2007	
Sample Number - Water:	24939			Sample Number - Soil:	24840/41 @ 0-0.1 m	
					24842/43 @ 0.2-0.3 m	
Sample containers:	1 L HDPE bottle			Sample containers:	Whirlpak	
	1 L Teflon bottle				120 mL Amber glass jar	
	250 mL Amber glass jar					
Procedure/Equipment:	Teflon tubing with teflon foot valve.			Procedure/Equipment:	Disposable sterilized plastic scoop	
Water description:	clear, orange/yellow			Soil description:	Light brown/grey sand, very fine grained, with gravel, fine to coarse grained, trace fines, refusal on cobbles, moist to wet, seepage at 30, slight HC odour.	
Filtration: (Y/N)	N					
Acidification: (Y/N)	N					
Sampling Equipment Decontamination: (Y/N)	Y			Sampling Equipment Decontamination: (Y/N)	No; disposable scoops were used.	
Number washes:	Soapy water (1)			Number washes:	n/a	
Number rinses:	Tap water (1)	DDW (1)		Number rinses:	n/a	

n/a=not applicable

*From ground surface. Unless this is stated, all measurements are assumed to be from the top of the casing.

** pH probe was broken, analysis was performed in the south

Thermal Monitoring

Thermistor Annual Maintenance Report

Contractor Name:	**EBA**	Inspection Date:	**8/25/2007**
Prepared By:	**Ed Grozic**		

Thermistor Information

Site Name:	**CAM-4 Pelly Bay**	Thermistor Location:	**Tier II Soil Disposal Facility**
Thermistor Number:	**VT-5**	Inclination:	**Vertical**

Install Date:	**8/13/2006**	First Date Event:	**7/14/2006**	Last Date Event:	**8/26/2007**		
Coordinates and Elevation:	N	**1033.5**	E	**10043.8**	Elev	**321**	
Total Cable Length (m):	**6.2**	Lead Length to 1st Bead (m):	**1.21**	Number of Beads:	**13**		
Datalogger Serial #:	**111092**	Cable Serial #:	**1616**				

Thermistor Inspection

	Good	Need Maintenance	
Casing	**Yes**	**No**	
Cover	**Yes**	**No**	
Data Logger	**No**	**Yes**	**ULB5 & 9V batteries replaced**
Cable	**Yes**	**No**	
Beads	**Yes**	**No**	
Battery Installation Date		**8/26/2007**	
Battery Levels	Main **11.3**	Aux **12.8**	

Manual Ground Temperature Reading

Bead	Ohms	Degree C
1	11860	6.3784
2	11360	7.2585
3	14020	3.0044
4	15330	1.2316
5	16510	-0.2253
6	17910	-1.8093
7	18890	-2.8375
8	19790	-3.7305

Bead	Ohms	Degree C
9	20610	-4.5052
10	21510	-5.3168
11	22250	-5.9561
12	22640	-6.2835
13	22770	-6.3913

Observation and Proposed Maintenance

Data logger batteries critically low. Batteries replaced.

Thermal Monitoring

Thermistor Annual Maintenance Report

Contractor Name:	**EBA**	Inspection Date:	**8/25/2007**
Prepared By:	**Ed Grozic**		

Thermistor Information

Site Name:	**CAM-4 Pelly Bay**	Thermistor Location:	**Tier II Soil Disposal Facility**
Thermistor Number:	**VT-6**	Inclination:	**Vertical**

Install Date:	**8/13/2006**	First Date Event:	**1/1/2000**	Last Date Event:	**8/25/2007**
Coordinates and Elevation:	N **10090**	E **10060.8**	Elev **319**		
Total Cable Length (m):	**4.5**	Lead Length to 1st Bead (m):	**1.26**	Number of Beads:	**10**
Datalogger Serial #:	**111102**	Cable Serial #:	**1620**		

Thermistor Inspection

	Good	Need Maintenance	
Casing	**Yes**	**No**	
Cover	**Yes**	**No**	
Data Logger	**No**	**Yes**	**Replaced ULB5 & 9V batteries**
Cable	**Yes**	**No**	
Beads	**Yes**	**No**	
Battery Installation Date		**8/26/2007**	
Battery Levels	Main **11.3**	Aux **12.8**	

Manual Ground Temperature Reading

Bead	Ohms	Degree C
1	1110	63.1971
2	11830	6.4300
3	13480	3.7901
4	14250	2.6800
5	15560	0.9379
6	16590	-0.3198
7	18030	-1.9385
8	19180	-3.1304

Bead	Ohms	Degree C
9	20170	-4.0939
10	20940	-4.8073

Observation and Proposed Maintenance

Data logger batteries critically low. Replaced ULB5 & 9V batteries. Ground temperature cable only as long as the height of the protective casing - difficult to reconnect data logger to cable.

Thermal Monitoring

Thermistor Annual Maintenance Report

Contractor Name:	**EBA**	Inspection Date:	**8/25/2007**
Prepared By:	**Ed Grozic**		

Thermistor Information

Site Name:	**CAM-4 Pelly Bay**	Thermistor Location:	**Tier II Soil Disposal Facility**
Thermistor Number:	**VT-7**	Inclination:	**Vertical**

Install Date:	**8/13/2006**	First Date Event:	**8/13/2006**	Last Date Event:	**8/25/2007**
Coordinates and Elevation:	N **10097.1**	E **10100.4**	Elev **318**		
Total Cable Length (m):	**8.5**	Lead Length to 1st Bead (m):	**1.45**	Number of Beads:	**16**
Datalogger Serial #:	**108067**	Cable Serial #:	**1624**		

Thermistor Inspection

	Good	Need Maintenance	
Casing	**Yes**	**No**	
Cover	**Yes**	**No**	
Data Logger	**No**	**Yes**	**Replaced ULB5 & 9V batteries**
Cable	**Yes**	**No**	
Beads	**Yes**	**No**	
Battery Installation Date		**8/26/2007**	
Battery Levels	Main **11.3**	Aux **12.8**	

Manual Ground Temperature Reading

Bead	Ohms	Degree C
1	13780	3.3493
2	15090	1.5433
3	16520	-0.2372
4	17630	-1.5039
5	18720	-2.6635
6	19630	-3.5751
7	20490	-4.3940
8	21510	-5.3168

Bead	Ohms	Degree C
9	22400	-6.0828
10	23230	-6.7670
11	24030	-7.4011
12	24620	-7.8538
13	24910	-8.0718
14	24980	-8.1240
15	24910	-8.0718
16	24700	-7.9142

Observation and Proposed Maintenance

Data logger batteries failed. Last reading February 2, 2007. Replaced data logger batteries.

Thermal Monitoring

Thermistor Annual Maintenance Report

Contractor Name:	**EBA**	Inspection Date:	**8/25/2007**
Prepared By:	**Ed Grozic**		

Thermistor Information

Site Name:	**CAM-4 Pelly Bay**	Thermistor Location:	**Tier II Soil Disposal Facility**
Thermistor Number:	**VT-8**	Inclination:	**Vertical**

Install Date:	**8/13/2006**	First Date Event:	**7/14/2006**	Last Date Event:	**8/25/2007**
Coordinates and Elevation:	N **10050.8**	E **10086.6**	Elev **319**		
Total Cable Length (m):	**4.5**	Lead Length to 1st Bead (m):	**1.07**	Number of Beads:	**10**
Datalogger Serial #:	**108038**	Cable Serial #:	**1622**		

Thermistor Inspection

	Good	Need Maintenance	
Casing	**Yes**	**No**	
Cover	**Yes**	**No**	
Data Logger	**No**	**Yes**	**Replaced ULB5 & 9V batteries**
Cable	**Yes**	**No**	
Beads	**Yes**	**No**	
Battery Installation Date		**8/26/2007**	
Battery Levels	Main **11.3**	Aux **12.8**	

Manual Ground Temperature Reading

Bead	Ohms	Degree C
1	10930	8.0511
2	12560	5.2140
3	13650	3.5390
4	14410	2.4578
5	15580	0.9126
6	17730	-1.6136
7	18570	-2.5085
8	19510	-3.4576

Bead	Ohms	Degree C
9	20250	-4.1694
10	21110	-4.9609

Observation and Proposed Maintenance

Data logger batteries failed. Last day of data June 24, 2007. Batteries replaced and data logger redeployed.

Annex Upper Site Landfill - Year 1 Data

Figure:

- CAM-4.4: Site Plan - Upper Site Landfill
- Ground Temperature Profile Upper Site Landfill Vertical VT-1
- Ground Temperature Profile Upper Site Landfill Vertical VT-2
- Ground Temperature Profile Upper Site Landfill Vertical VT-3
- Ground Temperature Profile Upper Site Landfill Vertical VT-4

Tables:

- Landfill Visual Inspection - CAM-4 Pelly Bay Upper Site Landfill
- Upper Site Landfill - Evaluation of Year 1 Soil Analytical Data
- Upper Site Landfill - Year 1 (2007) Soil Data
- Upper Site Landfill - Year 1 (2007) Groundwater Data

Photographic Records:

- Photos 1 and 2
- Photos 3 and 4
- Photos 5 and 6

Well Sampling Records:

- Well MW-10
- Well MW-11
- Well MW-12
- Well MW-13

Thermistor Annual Maintenance Reports:

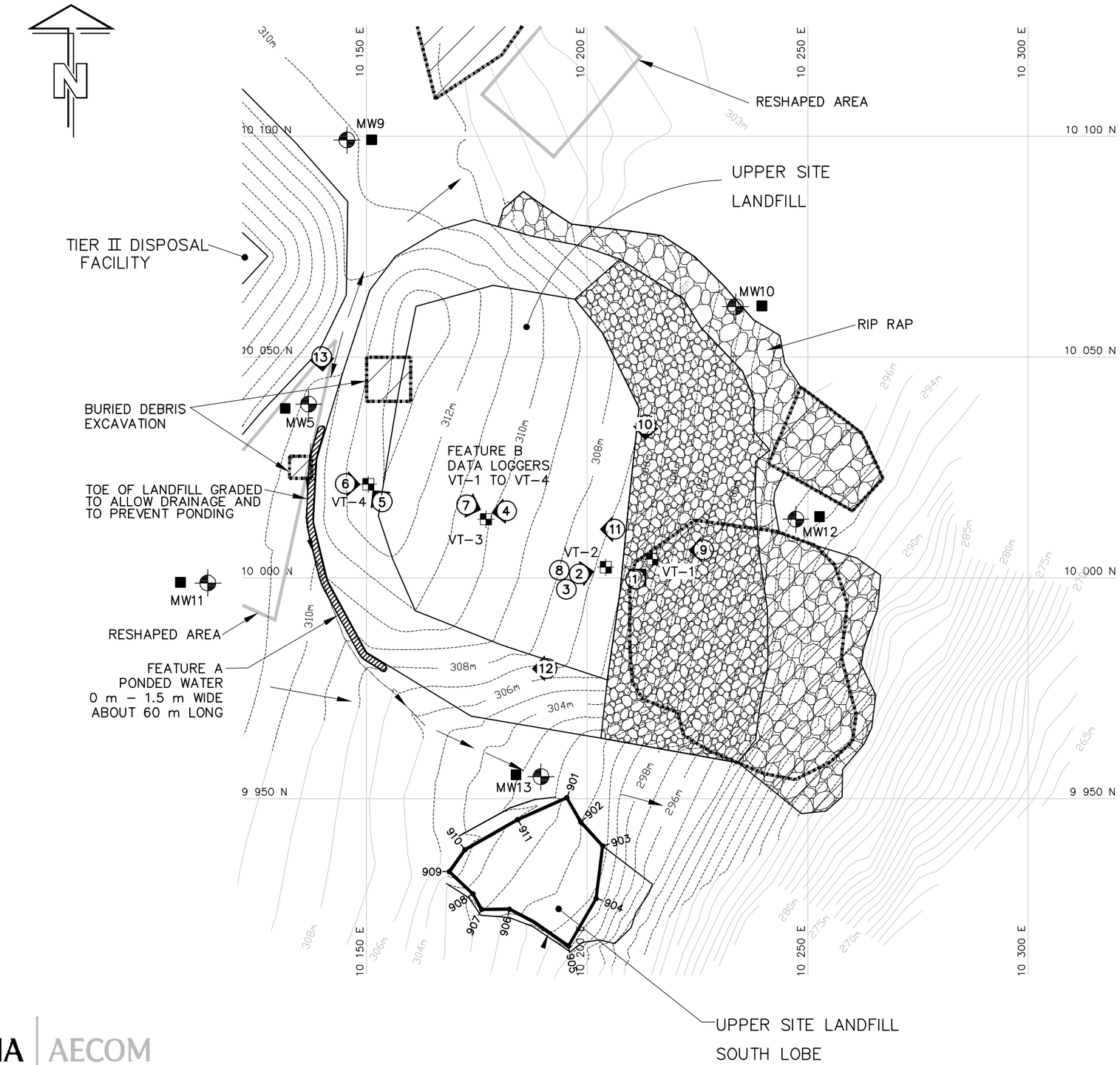
- VT-1
- VT-2
- VT-3
- VT-4

Upper Site Landfill - Evaluation of Ground Temperature Data

Ground temperature profiles for vertical thermistors VT-1 to VT-4 are attached, showing ground temperatures curves since August 2007. The table shows the depth of active layer as defined by the 0°C isotherm for August 25, 2007.

Summary of Tier II Soil Disposal Facility Thermal Results				
	VT-1	**VT-2**	**VT-3**	**VT-4**
Depth (m) of 0°C Isotherm (Aug 25/07)	2.5	1.8	1.6	1.7

The inferred active layer depths noted above are less than the thickness of the 2.6 m granular cover over the debris; the landfill contents are remaining frozen. The measured active layers are within the range of the thermal calculations (EBA 2008).



LEGEND:

- TBM4 ⊡ TEMPORARY BENCHMARK
- BM–1 ▲ PERMANENT BENCHMARK
- 101 • COORDINATE POINT
- ■ MONITORING SOIL SAMPLE LOCATION
- ⊕ MONITORING WELL LOCATION
- ▣ VERTICAL THERMISTOR LOCATION
- (15) PHOTOGRAPHIC VIEWPOINT
- BURIED DEBRIS EXCAVATION
- PONDED WATER

COORDINATE POINTS (AS–BUILT) VERTICAL THERMISTORS		
NO.	NORTHING	EASTING
VT–1	10 004.25	10 214.81
VT–2	10 002.40	10 204.22
VT–3	10 013.27	10 177.09
VT–4	10 021.18	10 150.41

COORDINATE POINTS (AS BUILT) MONITORING WELLS			
NO.	NORTHING	EASTING	ELEV.
MW5	10 039.35	10 136.86	310.91
MW9	10 099.17	10 145.56	310.10
MW10	10 061.40	10 233.67	301.51
MW11	9 998.83	10 114.01	312.57
MW12	10 013.26	10 247.33	295.85
MW13	9 954.94	10 189.55	302.36

COORDINATE POINTS (AS BUILT) UPPER SITE LANDFILL – SOUTH LOBE			
NO.	NORTHING	EASTING	ELEV.
901	9 950.2	10 195.4	301.8
902	9 944.7	10 198.6	301.0
903	9 939.2	10 203.5	300.4
904	9 927.3	10 202.0	299.9
905	9 916.6	10 195.8	299.3
906	9 924.9	10 182.4	301.4
907	9 924.9	10 176.1	302.1
908	9 928.4	10 174.1	302.4
909	9 933.4	10 168.8	304.6
910	9 938.4	10 172.3	304.3
911	9 945.2	10 184.3	302.8

SCALE 1:1000 0 10 20 30 m

RECORD DRAWING
NOT FOR CONSTRUCTION

UMA | AECOM

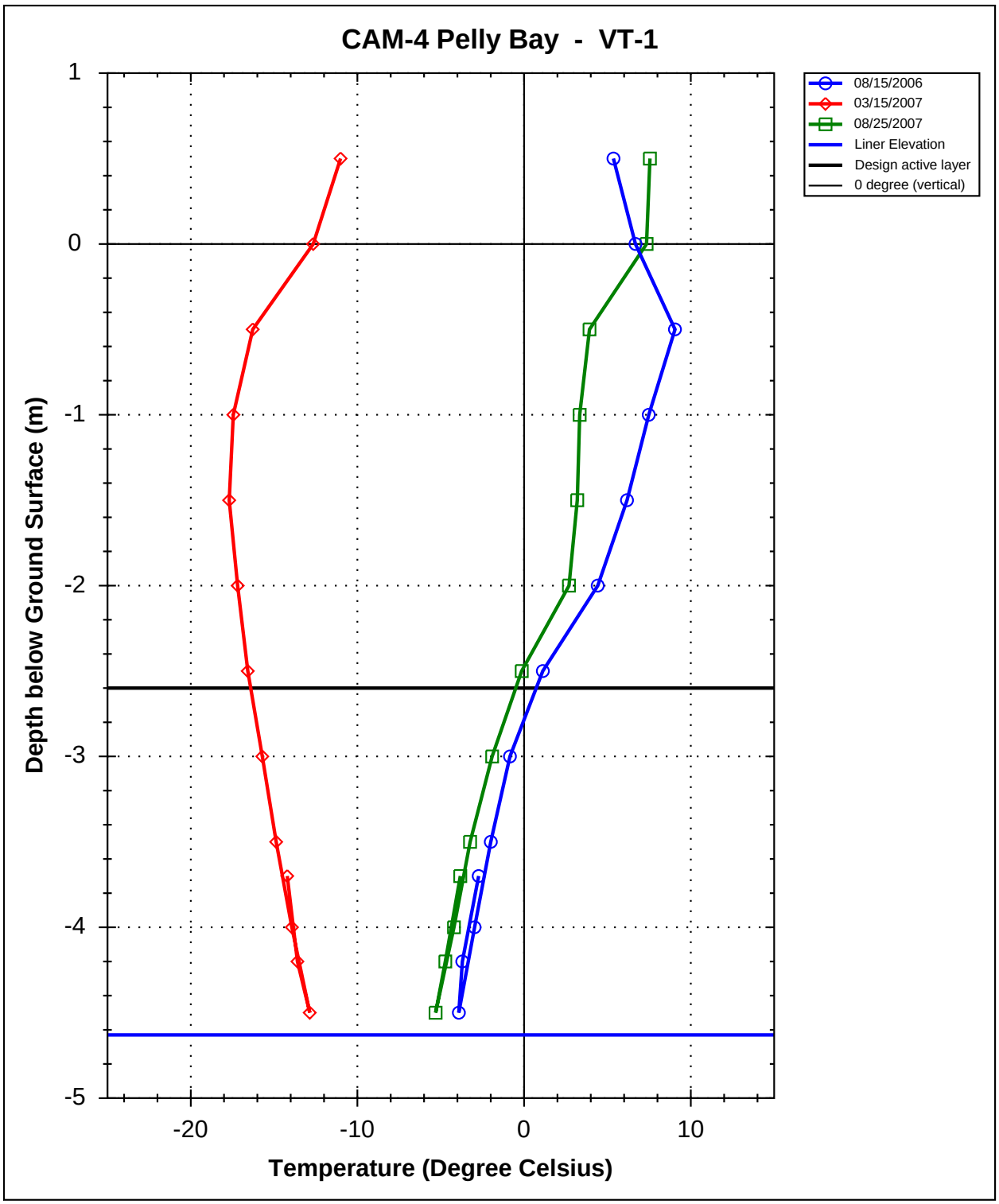
DEW LINE CLEAN UP
LANDFILL MONITORING PLAN

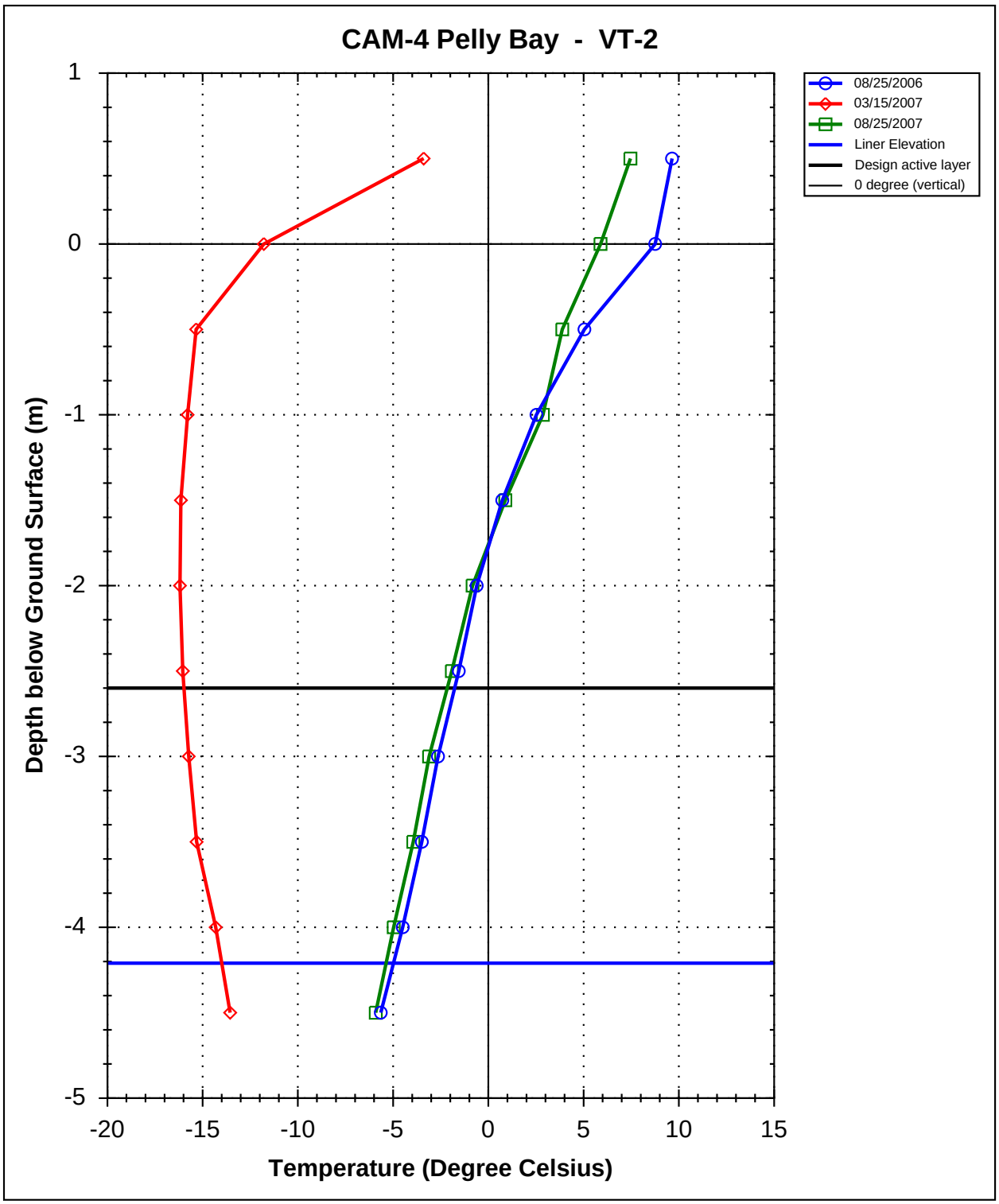
CAM-4 - PELLY BAY

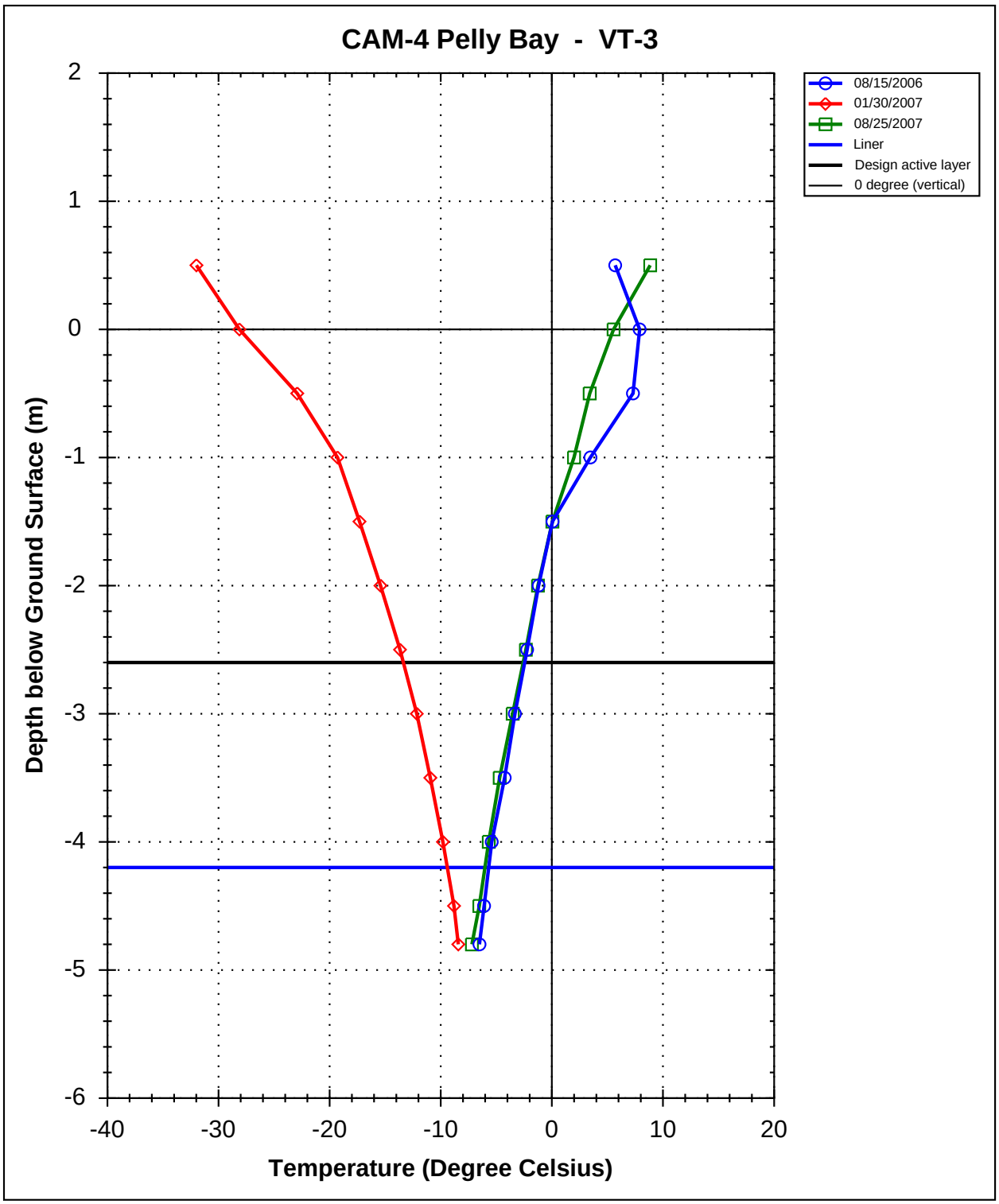
UPPER SITE LANDFILL

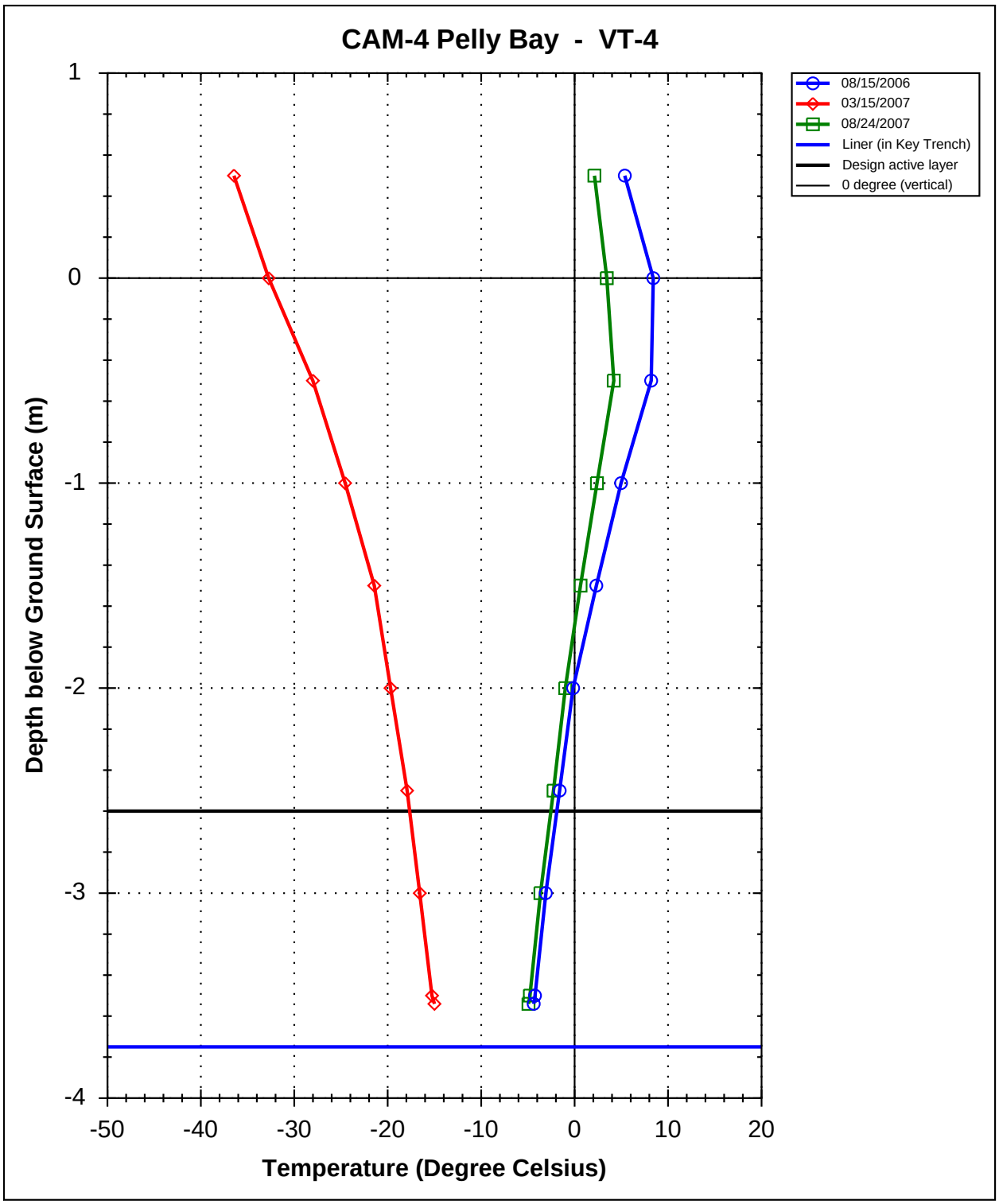
FIGURE CAM 4.4

DOS NAME: C4-RD04.DWG CLC – 08/02/05


CAM-4 Pelly Bay - VT-1
08/15/2006
03/15/2007
08/25/2007
Liner Elevation
Design active layer
0 degree (vertical)
Depth below Ground Surface (m)
1
0
-1
-2
-3
-4
-5
-20
-10
0
10
Temperature (Degree Celsius)


CAM-4 Pelly Bay - VT-2
Depth below Ground Surface (m)
Temperature (Degree Celsius)
1
0
-1
-2
-3
-4
-5
-20
-15
-10
-5
0
5
10
15
08/25/2006
03/15/2007
08/25/2007
Liner Elevation
Design active layer
0 degree (vertical)


CAM-4 Pelly Bay - VT-3
08/15/2006
01/30/2007
08/25/2007
Liner
Design active layer
0 degree (vertical)
Depth below Ground Surface (m)
2
1
0
-1
-2
-3
-4
-5
-6
-40
-30
-20
-10
0
10
20
Temperature (Degree Celsius)


CAM-4 Pelly Bay - VT-4
Depth below Ground Surface (m)
Temperature (Degree Celsius)
1
0
-1
-2
-3
-4
-50
-40
-30
-20
-10
0
10
20
08/15/2006
03/15/2007
08/24/2007
Liner (in Key Trench)
Design active layer
0 degree (vertical)

LANDFILL VISUAL INSPECTION

Site Name: CAM-4, Pelly Bay
Landfill: **Upper Site Landfill**
Designation:
Date Inspected: August 24 to August 26, 2007
Inspected by: Ed Grozic, P.Eng.
EBA Engineering Consultants Ltd.

Signature: 

TABLE A1: UPPER SITE LANDFILL

Checklist Item	Present Yes/No	Location	Length	Width	Depth	Extent	Description	Photographic Records (Images provided on Data CD)	Severity Rating	Additional Comments
Settlement	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Erosion	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Frost Action	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Animal Burrows	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Vegetation	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Staining	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Vegetation Stress	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Seepage Points	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Debris Exposed	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Presence/Condition of Monitoring Instruments	Yes	Feature B See Figure A1	N/A	N/A	N/A	N/A	VT-1, VT-2, VT-3 and VT-4	Photo 1 (Image 11), Photo 3 (Image 9), Photo 4 (Image 8), Photo 5 (Image 7), and Photo 6 (Image 6)	Acceptable	Successfully downloaded ground temperature data from VT-4. Batteries failed on data loggers from VT-1, VT-2 and VT-3. Ground temperature data were retrieved from these loggers while on site; however, the data had to be processed in the office. The data loggers were serviced and redeployed. Available ground temperature data is presented herein.
Other Features of Note Ponded water from rainfall along west and south toe of landfill	Yes	Feature A See Figure A1	~ 60 m (intermittent)	0 m to 1.5 m	0 m to 0.03 m	Isolated	Ponded water along west and south toe of landfill	Photo 2 (Image 13) and Image 12	Acceptable	Ponded water along west and south facing toe of landfill. The water temporarily ponds during periods of rainfall and shortly thereafter evaporates or infiltrates.
Overall Landfill Performance:	**Acceptable**									

Upper Site Landfill - EVALUATION OF YEAR 1 SOIL ANALYTICAL DATA

Parameter	N value Baseline	Arithmetic Mean +/- 95% Confidence Limit Baseline	Maximum Baseline [mg/kg]	2007	Comments
Copper	50	**12.6+/- 3.6**	**81**	Measured concentrations within or less than 95% confidence interval.	
Nickel	50	**10.6+/-1.3**	**32**	Measured concentrations within or less than 95% confidence interval, with one exception.	Upgradient well MW11 had a concentration of 18 mg/kg at surface (below baseline max).
Cobalt	50	**6.8+/-1.0**	**25**	Measured concentrations within or less than 95% confidence interval, with one exception.	Upgradient well MW11 had a concentration of 10 mg/kg at surface (below baseline max).
Cadmium	50	**<1.0**	**2.1**	Measured concentrations within or less than 95% confidence interval (non-detect).	
Lead	50	**<10**	**88**	Measured concentrations within or less than 95% confidence interval (non-detect).	
Zinc	50	**63+/-17**	**350**	Measured concentrations within or less than 95% confidence interval.	
Chromium	50	**22+/-3**	**71**	Measured concentrations within or less than 95% confidence interval, with one exception.	Upgradient well MW11 had a concentration of 36 mg/kg at surface (below baseline max).
Arsenic	50	**2.5+/-2.2**	**57**	Measured concentrations within or less than 95% confidence interval.	
Mercury	28	**<0.1**	**<0.1**	Measured concentrations within or less than 95% confidence interval (non-detect).	
PCBs	53	**<0.1**	**0.4**	Measured concentrations within or less than 95% confidence interval (non-detect).	
TPH	30	**629+/-537**	**5900**	Measured concentrations within or less than 95% confidence interval, with one exception.	Upgradient well MW11 had a concentration of 48,580 mg/kg at surface.

Upper Site Landfill - Year 1 (2007) Soil Data

Sample #	Location	Date	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co [mg/kg]	Cd [mg/kg]	Pb [mg/kg]	Zn [mg/kg]	Cr [mg/kg]	As [mg/kg]	Hg [mg/kg]	PCBs [mg/kg]	TPH [mg/kg]	TPH Identity F1	TPH Identity F2	TPH Identity F3
Upper Site Landfill - Baseline Concentrations				**12.6+/-3.6**	**10.6+/-1.3**	**6.8+/-1.0**	**<1.0**	**<10**	**63+/-17**	**22+/-3**	**2.5+/-2.2**	**<0.1**	**<0.1**	**629+/-537**			
Upper Site Landfill - Maximum Concentrations				**81**	**32**	**25**	**2.1**	**88**	**350**	**71**	**57**	**<0.1**	**0.4**	**5900**			
Up-gradient Soil Samples																	
24828/29	MW5	2007	0	9.9	10	8.7	<1.0	<10	40	21	2.2	< 0.10	< 0.0030	26.6	<10	5.6	21
24830/31	MW5	2007	30	7.9	8.1	7.2	<1.0	<10	32	<20	1.7	< 0.10	< 0.0030	24.4	<10	4.4	20
24812/13	MW11	2007	0	14	18	10	<1.0	<10	66	36	2.6	< 0.10	< 0.0030	48580	<10	580	48000
24814/15	MW11	2007	30	9.2	12	7.3	<1.0	<10	39	25	1.2	< 0.10	< 0.0030	4147	<10	47	4100
Down-gradient Soil Samples																	
24824/25	MW10	2007	0	3.2	6.6	<5.0	<1.0	<10	<15	<20	1.1	< 0.10	< 0.0030	24	<10	4.2	20
24826/27	MW10	2007	30	4.0	7.7	5.2	<1.0	<10	21	<20	1.2	< 0.10	< 0.0030	37	<10	5.3	32
24820/21	MW12	2007	0	4.1	7.2	5.8	<1.0	<10	22	<20	1.6	< 0.10	< 0.0030	43	<10	6.7	36
24822/23	MW12	2007	30	4.0	7.6	5.9	<1.0	<10	21	<20	1.6	< 0.10	< 0.0030	28	<10	< 4.0	28
24816/17	MW13	2007	0	4.2	8.8	5.7	<1.0	<10	24	<20	1.6	< 0.10	< 0.0030	14	<10	4.7	9.7
24818/19	MW13	2007	30	3.2	6.3	<5.0	<1.0	<10	19	<20	1.9	< 0.10	< 0.0030	23	<10	4.8	18

Upper Site Landfill - Year 1 (2007) Groundwater Data

Sample #	Location	Date	Cu [mg/L]	Ni [mg/L]	Co [mg/L]	Cd [mg/L]	Pb [mg/L]	Zn [mg/L]	Cr [mg/L]	As [mg/L]	Hg [mg/L]	PCBs [mg/L]	TPH [mg/L]	TPH Identity		
														F1	F2	F3
Up-gradient Groundwater Samples																
24923	MW5	2007	0.045	0.12	0.022	<0.0010	0.021	0.32	0.086	0.0051	<0.00040	< 0.000020	<1.0	1.5	1.9	< 1.0
24924	MW11	2007	0.0057	0.015	<0.0030	<0.0010	<0.010	0.024	0.024	<0.0030	<0.00040	< 0.000020	<1.0	< 0.050	< 0.50	< 1.0
Down-gradient Groundwater Samples																
24925	MW13	2007	0.075	0.11	0.012	<0.0010	0.019	0.39	0.21	<0.0030	<0.00040	< 0.000020	<1.0	< 0.050	< 0.50	< 1.0

Photo 1 (Image 11)
Upper Site Landfill
Surface of landfill looking northeast from VT-2 towards VT-3.

Photo 2 (Image 13)
Upper Site Landfill
Ponded water along toe of west facing slope looking south towards VT-4.

Photo 3 (Image 9)
Upper Site Landfill
View from VT-1 looking towards VT-2.

Photo 4 (Image 8)
Upper Site Landfill
View from VT-2 looking towards VT-1.

Photo 5 (Image 7)
Upper Site Landfill
View from VT-3 looking towards VT-2.

Photo 6 (Image 6)
Upper Site Landfill
View from VT-4 looking towards VT-3.

Table B-128: Monitoring Well Sampling Log (MW #10), 2007

Site Name:	CAM-4		
Date of Sampling Event:	Aug. 22 and 24, 2007		
Names of Samplers:	Nick Battye, Line Filion, Kevin Schut		
Monitoring Well ID:	MW 10		
Facility:	Upper Site Landfill		
Water Sample Measured Data			
Condition of Well:	Good - MW was found unlocked in 2007, presumably since last year (2006).		
Procedure/Equipment:	Measuring tape	Procedure/Equipment:	Interface metre
Well height above ground (m)=	0.67	Depth to water surface (m)=	n/a
Diameter of well (m)=	0.05	Static water level* (m)=	n/a
Depth of installation* (m)=	3.37	Depth to bottom (m)=	2.27
Length screened section (m)=	2.03	Free product thickness (mm)=	n/a
Depth to top of screen* (m)=	0.38		
Calculations		**Notes**	
Depth of water (m)=	n/a	Evidence of sludge etc:	N
Well volume of water (L)=	n/a	Evidence of freezing/siltation: (compare to installation record)	Y
Length screen collecting water (m)=	n/a		

Development/Purging Information

Equipment: Teflon tubing with teflon foot valve.

Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (uS/cm)	Turbidity (NTU)	Description of water
Well Dry						

Water Sampling		**Soil Sampling**	
Date and time collected:		Date and time collected:	Aug. 22, 2007
Sample Number - Water:	No sample collected	Sample Number - Soil:	24824/25 @ 0-0.1 m
			24826/27 @ 0.3-0.4 m
Sample containers:		Sample containers:	Whirlpak
			120 mL Amber glass jar
Procedure/Equipment:		Procedure/Equipment:	Disposable sterilized plastic scoop
Water description:		Soil description:	Light brown sand, fine to coarse grained, well graded, trace fines, gravel, and cobble, angular to sub-angular, damp, no odour.
Filtration: (Y/N)			
Acidification: (Y/N)			
Sampling Equipment Decontamination: (Y/N)		Sampling Equipment Decontamination: (Y/N)	No; disposable scoops were used.
Number washes:		Number washes:	n/a
Number rinses:		Number rinses:	n/a

n/a=not applicable

*From ground surface. Unless this is stated, all measurements are assumed to be from the top of the casing.

Table B-129: Monitoring Well Sampling Log (MW #11), 2007

Site Name:	CAM-4					
Date of Sampling Event:	Aug. 22 and 24, 2007					
Names of Samplers:	Nick Battye, Line Filion, Kevin Schut					
Monitoring Well ID:	MW 11					
Facility:	Upper Site Landfill					
Water Sample Measured Data						
Condition of Well:	Good					
Procedure/Equipment:	Measuring tape			Procedure/Equipment:	Interface metre	
Well height above ground (m)=	0.56			Depth to water surface (m)=	1.65	
Diameter of well (m)=	0.05			Static water level* (m)=	1.09	
Depth of installation* (m)=	3.85			Depth to bottom (m)=	2.79	
Length screened section (m)=	2.03			Free product thickness (mm)=	n/a	
Depth to top of screen* (m)=	0.86					
Calculations				**Notes**		
Depth of water (m)=	1.14			Evidence of sludge etc:	N	
Well volume of water (L)=	2.24			Evidence of freezing/siltation: (compare to installation record)	Y	
Length screen collecting water (m)=	1.14					
Development/Purging Information						
Equipment:	Teflon tubing with teflon foot valve.					
Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (uS/cm)	Turbidity (NTU)	Description of water
Aug. 24, 2007; 10:45	3	1.2	**	894	15.7	cloudy, orange
Water Sampling				**Soil Sampling**		
Date and time collected:	Aug. 24, 2007; 10:46			Date and time collected:	Aug. 22, 2007	
Sample Number - Water:	24924			Sample Number - Soil:	24812/13 @ 0-0.1 m	
					24814/15 @ 0.3-0.4 m	
Sample containers:	1 L HDPE bottle			Sample containers:	Whirlpak	
	1 L Teflon bottle				120 mL Amber glass jar	
	250 mL Amber glass jar					
Procedure/Equipment:	Teflon tubing with teflon foot valve.			Procedure/Equipment:	Disposable sterilized plastic scoop	
Water description:	cloudy, orange			Soil description:	Brown and light brown sand, very fine grained, with fines, some gravel, fine to coarse, angular to sub-angular, trace cobble, damp, no odour.	
Filtration: (Y/N)	N					
Acidification: (Y/N)	N					
Sampling Equipment Decontamination: (Y/N)	Y			Sampling Equipment Decontamination: (Y/N)	No; disposable scoops were used.	
Number washes:	Soapy water (1)			Number washes:	n/a	
Number rinses:	Tap water (1) DDW (1)			Number rinses:	n/a	

n/a=not applicable

*From ground surface. Unless this is stated, all measurements are assumed to be from the top of the casing.

** pH probe was broken, analysis was performed in the south

Table B-130: Monitoring Well Sampling Log (MW #12), 2007

Site Name:	CAM-4		
Date of Sampling Event:	Aug. 22 and 24, 2007		
Names of Samplers:	Nick Battye, Line Filion, Kevin Schut		
Monitoring Well ID:	MW 12		
Facility:	Upper Site Landfill		
Water Sample Measured Data			
Condition of Well:	Good		
Procedure/Equipment:	Measuring tape	Procedure/Equipment:	Interface metre
Well height above ground (m)=	0.65	Depth to water surface (m)=	2.10
Diameter of well (m)=	0.05	Static water level* (m)=	1.45
Depth of installation* (m)=	3.67	Depth to bottom (m)=	2.16
Length screened section (m)=	2.03	Free product thickness (mm)=	n/a
Depth to top of screen* (m)=	0.68		
Calculations		**Notes**	
Depth of water (m)=	0.06	Evidence of sludge etc:	N
Well volume of water (L)=	0.12	Evidence of freezing/siltation: (compare to installation record)	Y
Length screen collecting water (m)=	0.06		

Development/Purging Information

Equipment: Teflon tubing with teflon foot valve.

Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (uS/cm)	Turbidity (NTU)	Description of water
Well Dry						

Water Sampling		**Soil Sampling**	
Date and time collected:		Date and time collected:	Aug. 22, 2007
Sample Number - Water:	No sample collected	Sample Number - Soil:	24820/21 @ 0-0.1 m
			24822/23 @ 0.3-0.4 m
Sample containers:		Sample containers:	Whirlpak
			120 mL Amber glass jar
Procedure/Equipment:		Procedure/Equipment:	Disposable sterilized plastic scoop
Water description:		Soil description:	Brown sand, fine to medium grained, some fines, some gravel, fine to coarse, angular to sub-angular, damp, no odour.
Filtration: (Y/N)			
Acidification: (Y/N)			
Sampling Equipment Decontamination: (Y/N)		Sampling Equipment Decontamination: (Y/N)	No; disposable scoops were used.
Number washes:		Number washes:	n/a
Number rinses:		Number rinses:	n/a

n/a=not applicable

*From ground surface. Unless this is stated, all measurements are assumed to be from the top of the casing.

Table B-131: Monitoring Well Sampling Log (MW #13), 2007

Site Name:	CAM-4					
Date of Sampling Event:	Aug. 22 and 24, 2007					
Names of Samplers:	Nick Battye, Line Filion, Kevin Schut					
Monitoring Well ID:	MW 13					
Facility:	Upper Site Landfill					
Water Sample Measured Data						
Condition of Well:	Good					
Procedure/Equipment:	Measuring tape			Procedure/Equipment:	Interface metre	
Well height above ground (m)=	0.62			Depth to water surface (m)=	1.26	
Diameter of well (m)=	0.05			Static water level* (m)=	0.64	
Depth of installation* (m)=	3.18			Depth to bottom (m)=	2.07	
Length screened section (m)=	1.9			Free product thickness (mm)=	n/a	
Depth to top of screen* (m)=	0.2					
Calculations				**Notes**		
Depth of water (m)=	0.81			Evidence of sludge etc:	N	
Well volume of water (L)=	1.59			Evidence of freezing/siltation: (compare to installation record)	Y	
Length screen collecting water (m)=	0.81					
Development/Purging Information						
Equipment:	Teflon tubing with teflon foot valve.					
Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (uS/cm)	Turbidity (NTU)	Description of water
Aug. 24, 2007; 11:30	1.5	1.8	**	80.5	866	cloudy, light brown
Water Sampling				**Soil Sampling**		
Date and time collected:	Aug. 24, 2007; 11:33			Date and time collected:	Aug. 22, 2007	
Sample Number - Water:	24925			Sample Number - Soil:	24816/17 @ 0-0.1 m	
					24818/19 @ 0.3-0.4 m	
Sample containers:	1 L HDPE bottle			Sample containers:	Whirlpak	
	1 L Teflon bottle				120 mL Amber glass jar	
	250 mL Amber glass jar					
Procedure/Equipment:	Teflon tubing with teflon foot valve.			Procedure/Equipment:	Disposable sterilized plastic scoop	
Water description:	cloudy, light brown			Soil description:	0-20: brown/grey sand, very fine grained, some fines, some gravel, fine to coarse, damp, no odour; 20-25: black organic mat (original ground); 25-40: brown sand, fine to coarse grained, some fines, trace gravel, fine to coarse, damp, no odour.	
Filtration: (Y/N)	N					
Acidification: (Y/N)	N					
Sampling Equipment Decontamination: (Y/N)	Y			Sampling Equipment Decontamination: (Y/N)	No; disposable scoops were used.	
Number washes:	Soapy water (1)			Number washes:	n/a	
Number rinses:	Tap water (1)	DDW (1)		Number rinses:	n/a	

n/a=not applicable

*From ground surface. Unless this is stated, all measurements are assumed to be from the top of the casing.

** pH probe was broken, analysis was performed in the south

Thermal Monitoring

Thermistor Annual Maintenance Report

Contractor Name:	**EBA**	Inspection Date:	**8/15/2007**
Prepared By:	**Ed Grozic**		

Thermistor Information

Site Name:	**CAM-4 Pelly Bay**	Thermistor Location:	**Upper Site Landfill**
Thermistor Number:	**VT-1**	Inclination:	**Vertical**

Install Date:	**7/28/2006**	First Date Event:	**8/2/2006**	Last Date Event:	**8/25/2007**		
Coordinates and Elevation:	N	**10004.25**	E	**10214.81**	Elev	**304**	
Total Cable Length (m):	**6.7**	Lead Length to 1st Bead (m):	**1.32**	Number of Beads:	**13**		
Datalogger Serial #:	**111071**	Cable Serial #:	**1615**				

Thermistor Inspection

	Good	Need Maintenance	
Casing	**Yes**	**No**	
Cover	**Yes**	**No**	
Data Logger	**No**	**Yes**	**Replaced ULB5 & 9V batteries**
Cable	**Yes**	**No**	
Beads	**Yes**	**No**	
Battery Installation Date	**8/26/2007**		
Battery Levels	Main **11.34**	Aux **12.77**	

Manual Ground Temperature Reading

Bead	Ohms	Degree C
1	11200	7.5494
2	11310	7.3489
3	13390	3.9245
4	13790	3.3348
5	13890	3.1904
6	14240	2.6940
7	16440	-0.1422
8	18010	-1.9171

Bead	Ohms	Degree C
9	19290	-3.2401
10	20290	-4.2071
11	21500	-5.3080
12	20850	-4.7255
13	19890	-3.8268

Observation and Proposed Maintenance

Data logger batteries failed. Last day of readings July 28, 2007. Batteries replaced and data logger redeployed.

Thermal Monitoring

Thermistor Annual Maintenance Report

Contractor Name:	**EBA Engineering**	Inspection Date:	**8/25/2007**
Prepared By:	**Ed Grozic**		

Thermistor Information

Site Name:	**CAM-4 Pelly Bay**	Thermistor Location:	**Upper Site Landfill**
Thermistor Number:	**VT-2**	Inclination:	**Vertical**

Install Date:	**7/28/2006**	First Date Event:	**7/14/2006**	Last Date Event:	**7/12/2007**		
Coordinates and Elevation:	N	**10002.4**	E	**10204.22**	Elev	**307**	
Total Cable Length (m):	**5.2**	Lead Length to 1st Bead (m):	**1.15**	Number of Beads:	**11**		
Datalogger Serial #:	**02020175**	Cable Serial #:	**1617**				

Thermistor Inspection

	Good	Need Maintenance	
Casing	**Yes**	**No**	
Cover	**Yes**	**No**	
Data Logger	**No**	**Yes**	**Replaced ULB5 & 9V batteries**
Cable	**Yes**	**No**	
Beads	**Yes**	**No**	
Battery Installation Date		**8/26/2007**	
Battery Levels	Main **11.34**	Aux **12.9**	

Manual Ground Temperature Reading

Bead	Ohms	Degree C
1	11250	7.4580
2	12150	5.8869
3	13420	3.8796
4	14120	2.8626
5	15600	0.8874
6	17030	-0.8307
7	18010	-1.9171
8	19160	-3.1103

Bead	Ohms	Degree C
9	20010	-3.9418
10	21120	-4.9699
11	22200	-5.9137

Observation and Proposed Maintenance

Replaced data logger batteries.

Thermal Monitoring

Thermistor Annual Maintenance Report

Contractor Name:	**EBA Engineering**	Inspection Date:	**8/25/2007**
Ppared By:	**Ed Grozic**		

Thermistor Information

Site Name:	**CAM-4 Pelly Bay**	Thermistor Location:	**Upper Site Landfill**
Thermistor Number:	**VT-3**	Inclination:	**Vertical**

Install Date:	**7/28/2006**	First Date Event:	**7/25/2006**	Last Date Event:	**1/31/2007**		
Coordinates and Elevation:	N	**10013.27**	E	**10177.09**	Elev	**310**	
Total Cable Length (m):	**5.5**	Lead Length to 1st Bead (m):	**1.15**	Number of Beads:	**12**		
Datalogger Serial #:	**111126**	Cable Serial #:	**1618**				

Thermistor Inspection

	Good	Need Maintenance	
Casing	**Yes**	**No**	
Cover	**Yes**	**No**	
Data Logger	**No**	**Yes**	**Replaced ULB5 & 9V batteries**
Cable	**Yes**	**No**	
Beads	**Yes**	**No**	
Battery Installation Date		**8/26/2007**	
Battery Levels	Main **11.34**		Aux **12.8**

Manual Ground Temperature Reading

Bead	Ohms	Degree C
1	10530	8.8205
2	12310	5.6213
3	13720	3.4366
4	14730	2.0215
5	16220	0.1216
6	17340	-1.1818
7	18360	-2.2891
8	19520	-3.4674

Bead	Ohms	Degree C
9	20760	-4.6432
10	21810	-5.5789
11	22880	-6.4819
12	23690	-7.1345

Observation and Proposed Maintenance

Data logger batteries failed. Last day of readings January 31, 2007. Logger batteries replaced.

Thermal Monitoring

Thermistor Annual Maintenance Report

Contractor Name:	**EBA**	Inspection Date:	**8/25/2007**
Prepared By:	**Ed Grozic**		

Thermistor Information

Site Name:	**CAM-4 Pelly Bay**	Thermistor Location:	**Upper Site Landfill**
Thermistor Number:	**VT-4**	Inclination:	**Vertical**

Install Date:	**7/26/2006**	First Date Event:	**7/14/2006**	Last Date Event:	**8/26/2007**		
Coordinates and Elevation:	N	**10021.18**	E	**10150.41**	Elev	**313**	
Total Cable Length (m):	**4.7**	Lead Length to 1st Bead (m):	**1.13**	Number of Beads:	**10**		
Datalogger Serial #:	**207046**	Cable Serial #:	**1619**				

Thermistor Inspection

	Good	Need Maintenance	
Casing	**Yes**	**No**	
Cover	**Yes**	**No**	
Data Logger	**No**	**Yes**	**Replaced ULB5 & 9V batteries**
Cable			
Beads			
Battery Installation Date		**8/26/2007**	
Battery Levels	Main **11.3**	Aux **12.8**	

Manual Ground Temperature Reading

Bead	Ohms	Degree C
1	10740	8.4125
2	12500	5.3109
3	13520	3.7307
4	14470	2.3751
5	15700	0.7616
6	17100	-0.9106
7	18270	-2.1942
8	19640	-3.5848

Bead	Ohms	Degree C
9	20690	-4.5790
10	20710	-4.5974

Observation and Proposed Maintenance

Replaced data logger batteries.

Annex Lower Site Non-Hazardous Waste Landfill - Year 1 Data

Figure:

- CAM-4.5: Site Plan - Lower Site Non-Hazardous Waste Landfill

Tables:

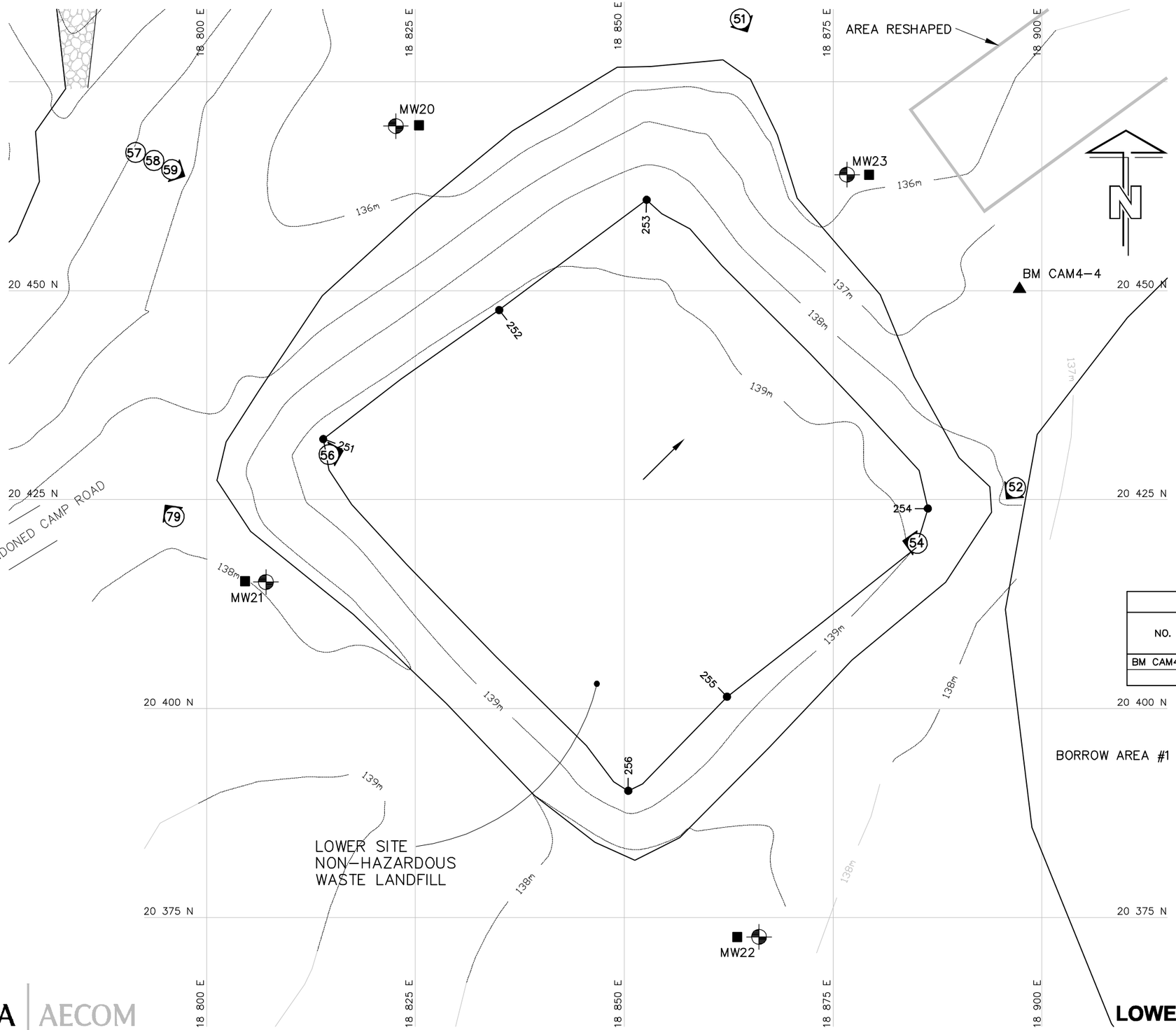
- Landfill Visual Inspection - CAM-4 Pelly Bay Lower Site Non-Hazardous Waste Landfill
- Lower Site Non-Hazardous Waste Landfill - Evaluation of Year 1 Soil Analytical Data
- Lower Site Non-Hazardous Waste Landfill - Year 1 (2007) Soil Data
- Lower Site Non-Hazardous Waste Landfill - Year 1 (2007) Groundwater Data

Photographic Records:

- Photos 17 and 18

Monitoring Well Sampling Records:

- Well MW-20
- Well MW-21
- Well MW-22
- Well MW-23



LEGEND:

- TBM4 ⊡ — TEMPORARY BENCHMARK
- BM–1 ▲ — PERMANENT BENCHMARK
- 101–• — COORDINATE POINT
- ■ — MONITORING SOIL SAMPLE LOCATION
- ⊕ — MONITORING WELL LOCATION
- (58) — PHOTOGRAPHIC VIEWPOINT

COORDINATE POINTS (AS BUILT) NON–HAZARDOUS WASTE LANDFILL			
NO.	NORTHING	EASTING	ELEV.
251	20 432.2	18 814.0	139.0
252	20 447.7	18 835.0	139.1
253	20 460.9	18 852.7	139.6
254	20 423.9	18 886.4	138.9
255	20 401.4	18 862.3	139.5
256	20 390.2	18 850.5	139.6

COORDINATE POINTS (AS BUILT) MONITORING WELLS			
NO.	NORTHING	EASTING	ELEV.
MW20	20 469.69	18 822.66	135.36
MW21	20 415.14	18 807.11	137.95
MW22	20 372.69	18 866.14	137.78
MW23	20 463.89	18 876.67	135.90

PERMANENT BENCHMARKS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
BM CAM4–4	20 450.188	18 897.315	138.392	BRASS PLUG IN ROCK

SCALE 1:500 — 0 5 10 15 m

RECORD DRAWING
NOT FOR CONSTRUCTION

UMA | AECOM

DGN NAME: C4-R005.DWG CLC – 08/02/06

DEW LINE CLEAN UP
LANDFILL MONITORING PLAN
CAM-4 - PELLY BAY
LOWER SITE NON-HAZARDOUS WASTE LANDFILL
FIGURE CAM-4.5

LANDFILL VISUAL INSPECTION

Site Name: CAM-4, Pelly Bay
Landfill: **Lower Site Non-Hazardous Waste Landfill**
Designation:
Date Inspected: August 24 to August 26, 2007
Inspected by: Ed Grozic, P.Eng.
EBA Engineering Consultants Ltd.

Signature: 

TABLE D1: LOWER SITE NON-HAZARDOUS WASTE LANDFILL

Checklist Item	Present Yes/No	Location	Length	Width	Depth	Extent	Description	Photographic Records	Severity Rating	Additional Comments
Settlement	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Erosion	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Frost Action	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Animal Burrows	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Vegetation	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Staining	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Vegetation Stress	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Seepage Points	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Debris Exposed	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Presence/Condition of Monitoring Instruments	No	N/A	N/A	N/A	N/A	None	N/A	N/A	Not observed	N/A
Other features of Note										
Overall Landfill Performance	**Acceptable**									

Tier II Disposal Facility - EVALUATION OF YEAR 1 SOIL ANALYTICAL DATA

Parameter	N value Baseline	Arithmetic Mean +/- 95% Confidence Limit Baseline	Maximum Baseline [mg/kg]	2006	Comments
Copper	28	11.5+/-1.0	19	Measured concentrations within 95% confidence intervals.	
Nickel	32	10.7+/-2.4	45	Measured concentrations within 95% confidence intervals.	
Cobalt	28	6.5+/-2.9	45	Measured concentrations within 95% confidence intervals.	
Cadmium	28	<1.0		Measured concentrations within 95% confidence intervals.	
Lead	28	<10	78	Measured concentrations within 95% confidence intervals.	
Zinc	32	46+/-13	160	Measured concentrations within 95% confidence intervals for all samples with one exception.	Surface sample at MW-21 had a concentration of 100 mg/kg (below baseline max).
Chromium	32	<20	110	Measured concentrations within 95% confidence intervals.	
Arsenic	28	2.2+/-1.0	12	Measured concentrations within 95% confidence intervals.	
Mercury	28	<0.1		Measured concentrations within 95% confidence intervals.	
PCBs	28	0.026+/-0.015	0.0146	Measured concentrations within 95% confidence intervals.	
TPH	26	<40	363	Measured concentrations within 95% confidence intervals for all samples with one exception.	Surface sample at MW-21 had a concentration of 295 mg/kg (below baseline max).

Lower Site Non-Hazardous Waste Landfill - Year 1 (2007) Soil Data

Sample #	Location	Date	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co [mg/kg]	Cd [mg/kg]	Pb [mg/kg]	Zn [mg/kg]	Cr [mg/kg]	As [mg/kg]	Hg [mg/kg]	PCBs [mg/kg]	TPH [mg/kg]	TPH Identity		
															F1	F2	F3
Lower Site Non-Hazardous Waste Landfill - Baseline Concentrations				**11.5+/-1.0**	**10.7+/-2.4**	**6.5+/-2.9**	**<1.0**	**<10**	**46+/-13**	**<20**	**2.2+/-1.0**	**<0.1**	**0.026+/-0.015**	**<40**			
Lower Site Non-Hazardous Waste Landfill - Maximum Concentrations				**19**	**45**	**45**		**78**	**160**	**110**	**12**		**0.0146**	**363**			
Up-gradient Soil Samples																	
24888/89	BMW4	2007	0	5.2	7.3	5.0	<1.0	<10	20	<20	1.9	< 0.10	< 0.0030	<10	<10	7.4	< 9.0
24890/91	BMW4	2007	30	5.7	7.6	<5.0	<1.0	<10	21	<20	1.4	< 0.10	< 0.0030	67	<10	4.8	62
Down-gradient Soil Samples																	
24904/05	MW20	2007	0	9.9	9.7	6.5	<1.0	17	30	21	2.4	< 0.10	< 0.0030	15	<10	4.1	11
24906/07	MW20	2007	30	6.7	6.9	<5.0	<1.0	<10	19	<20	1.2	< 0.10	< 0.0030	14	<10	< 4.0	14
24892/93	MW21	2007	0	7.8	9.3	5.8	<1.0	43	100	24	2.1	< 0.10	0.0038	295	<10	5.3	290
24894/95	MW21	2007	30	10	11	6.6	<1.0	28	80	27	2.2	< 0.10	< 0.0030	115	<10	4.5	110
24896/97	MW22	2007	0	6.1	7.1	<5.0	<1.0	<10	24	<20	1.9	< 0.10	< 0.0030	<10	<10	4.8	< 9.0
24898/99	MW22	2007	30	6.9	7.6	<5.0	<1.0	<10	25	<20	1.5	< 0.10	< 0.0030	<10	<10	< 4.0	< 9.0
24900/01	MW23	2007	0	7.9	8.6	6.4	<1.0	<10	31	<20	1.4	< 0.10	< 0.0030	14	<10	4.2	10
24902/03	MW23	2007	30	8.5	8.9	6.0	<1.0	<10	30	<20	1.2	< 0.10	< 0.0030	<10	<10	< 4.0	9.6

Tier II Disposal Facility - Year 1 (2007) Groundwater Data

Sample #	Location	Date	Cu [mg/L]	Ni [mg/L]	Co [mg/L]	Cd [mg/L]	Pb [mg/L]	Zn [mg/L]	Cr [mg/L]	As [mg/L]	Hg [mg/L]	PCBs [mg/L]	TPH [mg/L]	TPH Identity		
														F1	F2	F3
Upgradient Groundwater Samples																
24935	BMW4	2007	0.030	0.020	<0.0030	<0.0010	<0.010	0.098	0.029	0.0032	<0.00040	< 0.000020	<1.0	< 0.050	< 0.50	< 1.0
Downgradient Groundwater Samples																
24933	MW20	2007	0.029	0.043	<0.0030	<0.0010	<0.010	0.034	0.079	<0.0030	<0.00040	< 0.000020	<1.0	< 0.050	< 0.50	< 1.0
24929	MW22	2007	0.041	0.039	0.020	<0.0010	0.028	0.12	0.065	0.0063	<0.00040	< 0.000020	<1.0	< 0.050	< 0.50	< 1.0
24930/31	MW23	2007	0.033	0.070	0.0097	<0.0010	0.013	0.34	0.12	<0.0030	<0.00040	< 0.000020	<1.0	< 0.050	< 0.50	< 1.0

Photo 17 (Image 55)
Lower Site Non-Hazardous Waste Landfill
Panoramic view of landfill looking southeast.

Photo 18 (Image 54)
Lower Site Non-Hazardous Waste Landfill
Panoramic view of surface of landfill from east corner of landfill.

Table B-139: Monitoring Well Sampling Log (MW #20), 2007

Site Name:	CAM-4					
Date of Sampling Event:	Aug. 23 and 24, 2007					
Names of Samplers:	Nick Battye, Line Filion, Kevin Schut					
Monitoring Well ID:	MW 20					
Facility:	LS NHWLF					
Water Sample Measured Data						
Condition of Well:	Good					
Procedure/Equipment:	Measuring tape			Procedure/Equipment:	Interface metre	
Well height above ground (m)=	0.66			Depth to water surface (m)=	2.39	
Diameter of well (m)=	0.05			Static water level* (m)=	1.73	
Depth of installation* (m)=	3.43			Depth to bottom (m)=	2.90	
Length screened section (m)=	2.05			Free product thickness (mm)=	n/a	
Depth to top of screen* (m)=	0.3					
Calculations				**Notes**		
Depth of water (m)=	0.51			Evidence of sludge etc:	N	
Well volume of water (L)=	1.00			Evidence of freezing/siltation: (compare to installation record)	N	
Length screen collecting water (m)=	0.51					
Development/Purging Information						
Equipment:	Teflon tubing with teflon foot valve.					
Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (uS/cm)	Turbidity (NTU)	Description of water
Aug. 24, 2007; 14:49	1	1.6	**	455	232	trace particles, clear
Water Sampling				**Soil Sampling**		
Date and time collected:	Aug. 24, 2007; 14:56			Date and time collected:	Aug. 23, 2007	
Sample Number - Water:	24933			Sample Number - Soil:	24904/05 @ 0-0.1 m	
					24906/07 @ 0.2-0.3 m	
Sample containers:	1 L HDPE bottle			Sample containers:	Whirlpak	
	1 L Teflon bottle				120 mL Amber glass jar	
	250 mL Amber glass jar					
Procedure/Equipment:	Teflon tubing with teflon foot valve.			Procedure/Equipment:	Disposable sterilized plastic scoop	
Water description:	trace particles, clear			Soil description:	Light brown sand, fine to coarse grained, some gravel, fine to coarse grained, sub-angular, trace fines, some cobble causing refusal, damp, no odour.	
Filtration: (Y/N)	N					
Acidification: (Y/N)	N					
Sampling Equipment Decontamination: (Y/N)	Y			Sampling Equipment Decontamination: (Y/N)	No; disposable scoops were used.	
Number washes:	Soapy water (1)			Number washes:	n/a	
Number rinses:	Tap water (1) DDW (1)			Number rinses:	n/a	

n/a=not applicable

*From ground surface. Unless this is stated, all measurements are assumed to be from the top of the casing.

** pH probe was broken, analysis was performed in the south

Table B-140: Monitoring Well Sampling Log (MW #21), 2007

Site Name:	CAM-4		
Date of Sampling Event:	Aug. 23 and 24, 2007		
Names of Samplers:	Nick Battye, Line Filion, Kevin Schut		
Monitoring Well ID:	MW 21		
Facility:	LS NHWLF		
Water Sample Measured Data			
Condition of Well:	Good		
Procedure/Equipment:	Measuring tape	Procedure/Equipment:	Interface metre
Well height above ground (m)=	0.55	Depth to water surface (m)=	2.34
Diameter of well (m)=	0.05	Static water level* (m)=	1.79
Depth of installation* (m)=	3.57	Depth to bottom (m)=	2.43
Length screened section (m)=	2.03	Free product thickness (mm)=	n/a
Depth to top of screen* (m)=	0.58		
Calculations		**Notes**	
Depth of water (m)=	0.09	Evidence of sludge etc:	N
Well volume of water (L)=	0.18	Evidence of freezing/siltation: (compare to installation record)	Y
Length screen collecting water (m)=	0.09		

Development/Purging Information

Equipment: Teflon tubing with teflon foot valve.

Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (uS/cm)	Turbidity (NTU)	Description of water
Well Dry						

Water Sampling		**Soil Sampling**	
Date and time collected:		Date and time collected:	Aug. 23, 2007
Sample Number - Water:	No sample collected	Sample Number - Soil:	24892/93 @ 0-0.1 m
			24894/95 @ 0.3-0.4 m
Sample containers:		Sample containers:	Whirlpak
			120 mL Amber glass jar
Procedure/Equipment:		Procedure/Equipment:	Disposable sterilized plastic scoop
Water description:		Soil description:	Medium brown sand, fine to coarse grained, some gravel, fine to coarse grained, sub-angular, trace fines and cobble, damp, no odour. Colour change to light brown at 40.
Filtration: (Y/N)			
Acidification: (Y/N)			
Sampling Equipment Decontamination: (Y/N)		Sampling Equipment Decontamination: (Y/N)	No; disposable scoops were used.
Number washes:		Number washes:	n/a
Number rinses:		Number rinses:	n/a

n/a=not applicable

*From ground surface. Unless this is stated, all measurements are assumed to be from the top of the casing.

Table B-141: Monitoring Well Sampling Log (MW #22), 2007

Site Name:	CAM-4					
Date of Sampling Event:	Aug. 23 and 24, 2007					
Names of Samplers:	Nick Battye, Line Filion, Kevin Schut					
Monitoring Well ID:	MW 22					
Facility:	LS NHWLF					
Water Sample Measured Data						
Condition of Well:	Good					
Procedure/Equipment:	Measuring tape			Procedure/Equipment:	Interface metre	
Well height above ground (m)=	0.46			Depth to water surface (m)=	1.89	
Diameter of well (m)=	0.05			Static water level* (m)=	1.43	
Depth of installation* (m)=	3.62			Depth to bottom (m)=	2.60	
Length screened section (m)=	2.05			Free product thickness (mm)=	n/a	
Depth to top of screen* (m)=	0.5					
Calculations				**Notes**		
Depth of water (m)=	0.71			Evidence of sludge etc:	N	
Well volume of water (L)=	1.38			Evidence of freezing/siltation: (compare to installation record)	Y	
Length screen collecting water (m)=	0.71					
Development/Purging Information						
Equipment:	Teflon tubing with teflon foot valve.					
Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (uS/cm)	Turbidity (NTU)	Description of water
Aug. 24, 2007; 14:17	5	1.3	**	70.8	797	clear
Water Sampling				**Soil Sampling**		
Date and time collected:	Aug. 24, 2007; 14:21			Date and time collected:	Aug. 23, 2007	
Sample Number - Water:	24929			Sample Number - Soil:	24896/97 @ 0-0.1 m	
					24898/99 @ 0.3-0.4 m	
Sample containers:	1 L HDPE bottle			Sample containers:	Whirlpak	
	1 L Teflon bottle				120 mL Amber glass jar	
	250 mL Amber glass jar					
Procedure/Equipment:	Teflon tubing with teflon foot valve.			Procedure/Equipment:	Disposable sterilized plastic scoop	
Water description:	clear			Soil description:	Light brown sand, fine to coarse grained, well graded, some gravel, fine to coarse grained, sub-angular, trace fines and cobble, damp, no odour.	
Filtration: (Y/N)	N					
Acidification: (Y/N)	N					
Sampling Equipment Decontamination: (Y/N)	Y			Sampling Equipment Decontamination: (Y/N)	No; disposable scoops were used.	
Number washes:	Soapy water (1)			Number washes:	n/a	
Number rinses:	Tap water (1)	DDW (1)		Number rinses:	n/a	

n/a=not applicable

*From ground surface. Unless this is stated, all measurements are assumed to be from the top of the casing.

Table B-142: Monitoring Well Sampling Log (MW #23), 2007

Site Name:	CAM-4					
Date of Sampling Event:	Aug. 23 and 24, 2007					
Names of Samplers:	Nick Battye, Line Filion, Kevin Schut					
Monitoring Well ID:	MW 23					
Facility:	LS NHWLF					
Water Sample Measured Data						
Condition of Well:	Good					
Procedure/Equipment:	Measuring tape			Procedure/Equipment:	Interface metre	
Well height above ground (m)=	0.16			Depth to water surface (m)=	1.29	
Diameter of well (m)=	0.05			Static water level* (m)=	1.13	
Depth of installation* (m)=	3.34			Depth to bottom (m)=	1.80	
Length screened section (m)=	2.03			Free product thickness (mm)=	n/a	
Depth to top of screen* (m)=	0.78					
Calculations				**Notes**		
Depth of water (m)=	0.51			Evidence of sludge etc:	N	
Well volume of water (L)=	1.00			Evidence of freezing/siltation: (compare to installation record)	Y	
Length screen collecting water (m)=	0.51					
Development/Purging Information						
Equipment:	Teflon tubing with teflon foot valve.					
Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (uS/cm)	Turbidity (NTU)	Description of water
Aug. 24, 2007; 14:33	1	2.2	**	814	455	trace silt, clear
Water Sampling				**Soil Sampling**		
Date and time collected:	Aug. 24, 2007; 14:40			Date and time collected:	Aug. 23, 2007	
Sample Number - Water:	24930/31			Sample Number - Soil:	24900/01 @ 0-0.1 m	
					24902/03 @ 0.3-0.4 m	
Sample containers:	1 L HDPE bottle			Sample containers:	Whirlpak	
	1 L Teflon bottle				120 mL Amber glass jar	
	250 mL Amber glass jar					
Procedure/Equipment:	Teflon tubing with teflon foot valve.			Procedure/Equipment:	Disposable sterilized plastic scoop	
Water description:	trace silt, clear			Soil description:	0-20: Olive grey sand, very fine to fine grained, some gravel, fine to coarse grained, sub-angular, damp, no odour; 20-40: colour change to reddish-brown, damp, no odour.	
Filtration: (Y/N)	N					
Acidification: (Y/N)	N					
Sampling Equipment Decontamination: (Y/N)	Y			Sampling Equipment Decontamination: (Y/N)	No; disposable scoops were used.	
Number washes:	Soapy water (1)			Number washes:	n/a	
Number rinses:	Tap water (1) DDW (1)			Number rinses:	n/a	

n/a=not applicable

*From ground surface. Unless this is stated, all measurements are assumed to be from the top of the casing.

** pH probe was broken, analysis was performed in the south

Annex Lower Site Landfill- Year 1 Data

Figures:

- CAM-4.6: Site Plan - Lower Site Landfill
- Ground Temperature Profile Lower Site Landfill Vertical VT-9
- Ground Temperature Profile Lower Site Landfill Vertical VT-10
- Ground Temperature Profile Lower Site Landfill Vertical VT-11
- Ground Temperature Profile Lower Site Landfill Vertical VT-12

Tables:

- Landfill Visual Inspection - CAM-4 Pelly Bay Lower Site Landfill
- Lower Site Landfill - Evaluation of Year 1 Soil Analytical Data
- Lower Site Landfill - Year 1 (2007) Soil Data
- Lower Site Landfill - Year 1 (2007) Groundwater Data

Photographic Records:

- Photos 19 through 21
- Photos 22 and 23
- Photos 24 and 25
- Photos 26 and 27
- Photos 28 and 29
- Photos 30 and 31

Monitoring Well Sampling Records:

- Well MW 17
- Well MW 18
- Well MW 19

Thermistor Annual Maintenance Reports:

- VT-9
- VT-10
- VT-11
- VT-12

Lower Site Landfill - Evaluation of Ground Temperature Data

Ground temperature profiles for vertical thermistors VT-9 to VT-12 are attached, showing ground temperatures curves since August 2007. The table shows the depth of active layer as defined by the 0°C isotherm for August 25, 2007.

Summary of Tier II Soil Disposal Facility Thermal Results				
	VT-9	**VT-10**	**VT-11**	**VT-12**
Depth (m) of 0°C Isotherm (Aug 25/07)	1.9	2.2	1.9	2.2

The inferred active layer depths noted above are less than the thickness of the 2.6 m granular cover over the debris; the landfill contents are remaining frozen. The measured active layers are within the range of the thermal calculations (EBA 2008).

LOWER SITE LANDFILL
NORTH LOBE
(EXCAVATED)

APPROXIMATE LIMIT OF
RESHAPING
ASSOCIATED WITH
LANDFILL EXCAVATION

CHECK DAM

MW17

FEATURE G
DATA LOGGERS VT-9
TO VT-12

VT-9

VT-10

VT-11

VT-12

MW18

FEATURE I
PONDED WATER ON
SURFACE OF LANDFILL
0 m TO 1 m WIDE
0 m TO 3 m LONG

LOWER SITE LANDFILL
(WITH LINER
SYSTEM)

AREA RESHAPED

AREA
RESHAPED

PERIMETER OF REGRADING.

ABANDONED CAMP ROAD

C4-1

C4-2

C4-3

LOWER SITE LANDFILL
EAST LOBE

BORROW AREA #1

AREA
RESHAPED

MW20

MW23

FEATURE H
0 m TO 0.8 m WIDE
ABOUT 30 m LONG

DITCH

MW19

LOWER SITE LANDFILL
SOUTH LOBE
(REGRADE NO. 2)

MW21

LOWER SITE
NON-HAZARDOUS
WASTE LANDFILL

AREA RESHAPED

APPROXIMATE
PERIMETER OF AREA
REGRADED WITH TYPE
2 GRANULAR FILL.

18 700 E
18 750 E
18 800 E
18 850 E
18 900 E
18 950 E
20 550 N
20 500 N
20 450 N
20 400 N

LEGEND:

- TBM4 — TEMPORARY BENCHMARK
- BM-1 — PERMANENT BENCHMARK
- 101 — COORDINATE POINT
- MONITORING SOIL SAMPLE LOCATION
- MONITORING WELL LOCATION
- VERTICAL THERMISTOR LOCATION
- 66 — PHOTOGRAPHIC VIEWPOINT
- PONDED WATER

COORDINATE POINTS (AS-BUILT)
VERTICAL THERMISTORS

NO.	NORTHING	EASTING
VT-9	20 544.8	18 760.1
VT-10	20 535.9	18 769.1
VT-11	20 523.5	18 778.4
VT-12	20 514.1	18 787.1

COORDINATE POINTS (AS BUILT)
MONITORING WELLS

NO.	NORTHING	EASTING	ELEV.
MW17	20 590.5	18 795.2	120.4
MW18	20 523.2	18 727.9	125.3
MW19	20 440.8	18 700.3	129.0
MW20	20 469.7	18 822.7	135.4
MW21	20 415.1	18 807.1	137.9
MW23	20 463.9	18 876.7	135.9

COORDINATE POINTS (AS BUILT)
EAST AND SOUTH LOBE REGRADING

NO.	NORTHING	EASTING	ELEV.
701	20 582.2	18 958.6	134.0
702	20 561.5	18 970.2	133.3
703	20 545.5	18 968.7	133.0
704	20 532.8	18 959.7	133.5
705	20 526.2	18 958.2	133.5
706	20 512.2	18 977.2	130.5
707	20 503.1	18 972.9	130.5
708	20 502.4	18 962.7	131.6
709	20 516.5	18 928.1	136.2
710	20 423.1	18 742.1	136.2
711	20 398.4	18 696.8	134.0
712	20 411.3	18 702.5	134.0
713	20 420.4	18 708.4	133.9
714	20 421.7	18 715.5	134.4

SCALE 1:1000
0 10 20 30 m

RECORD DRAWING
NOT FOR CONSTRUCTION

UMA | AECOM

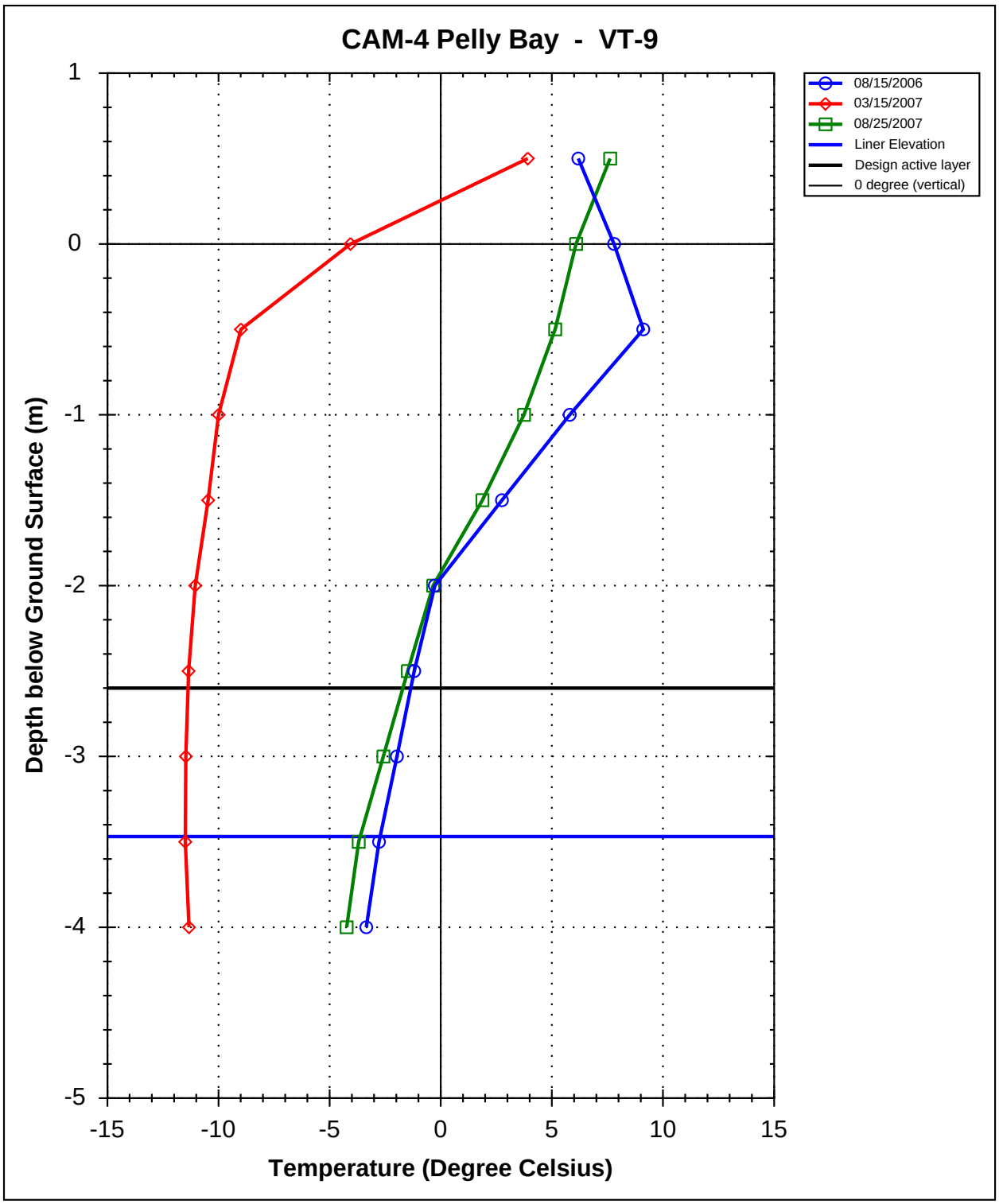
DWG NAME: C4-RD06.DWG CLC - 08/02/06

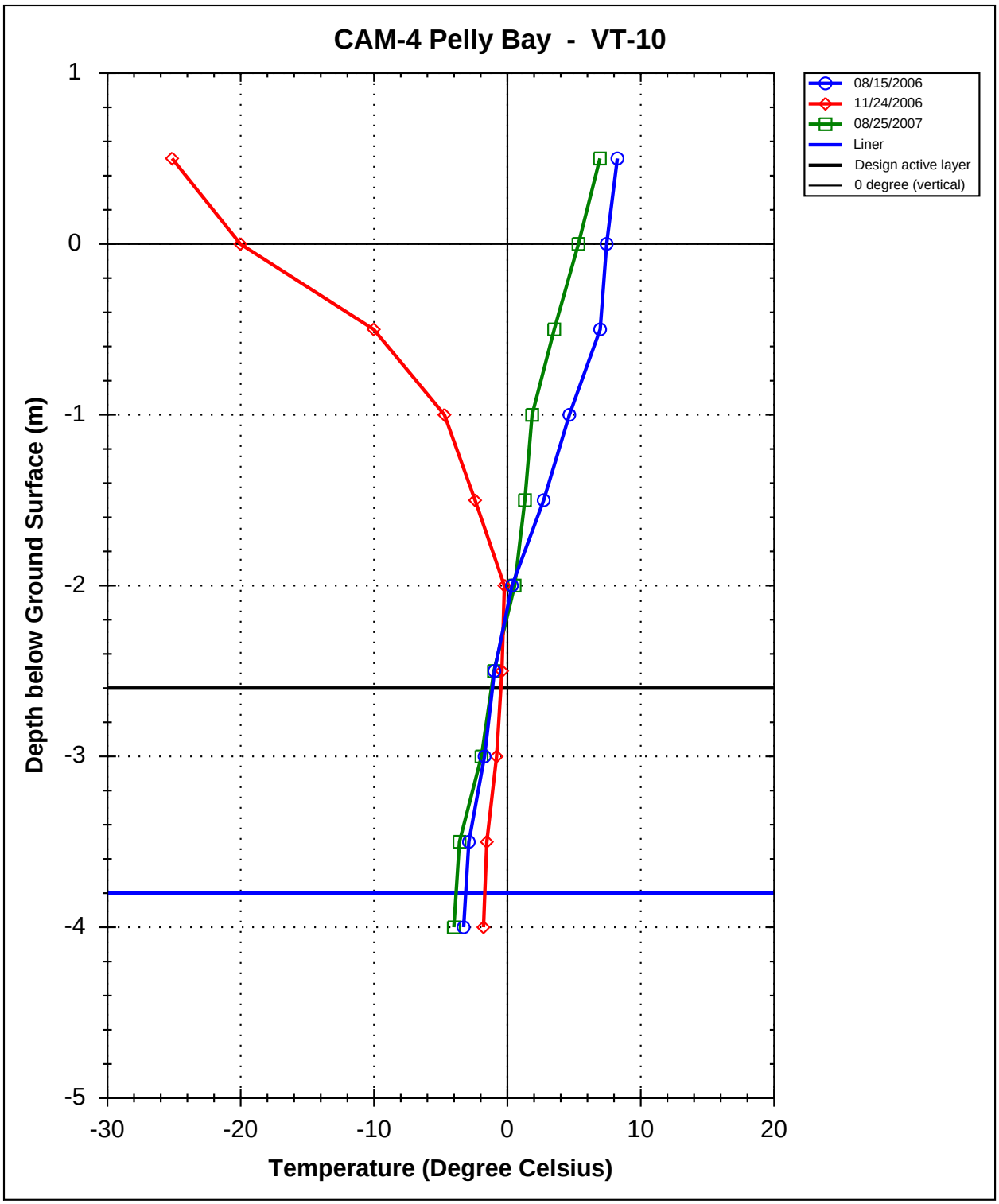
DEW LINE CLEAN UP
LANDFILL MONITORING PLAN

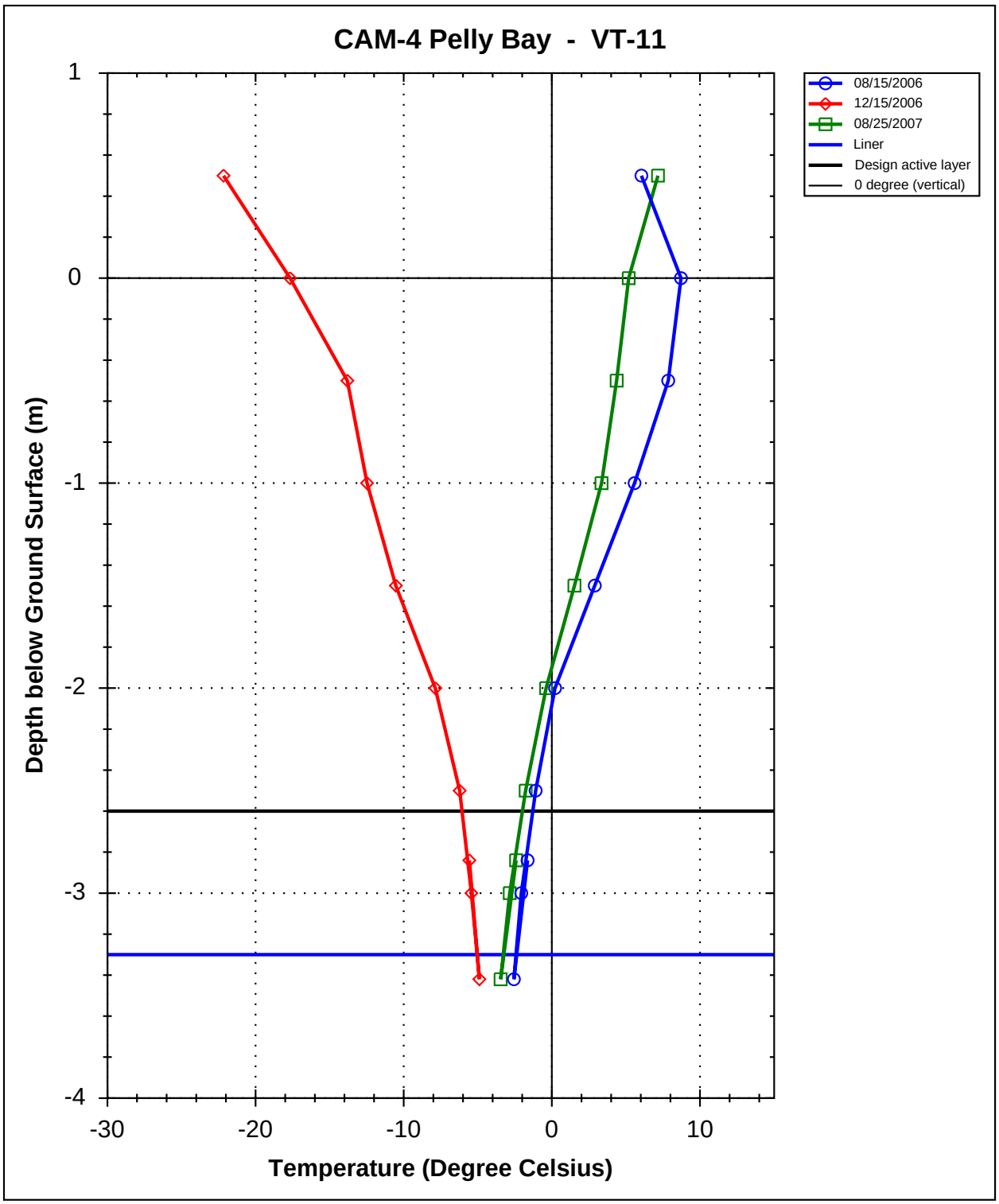
CAM-4 - PELLY BAY

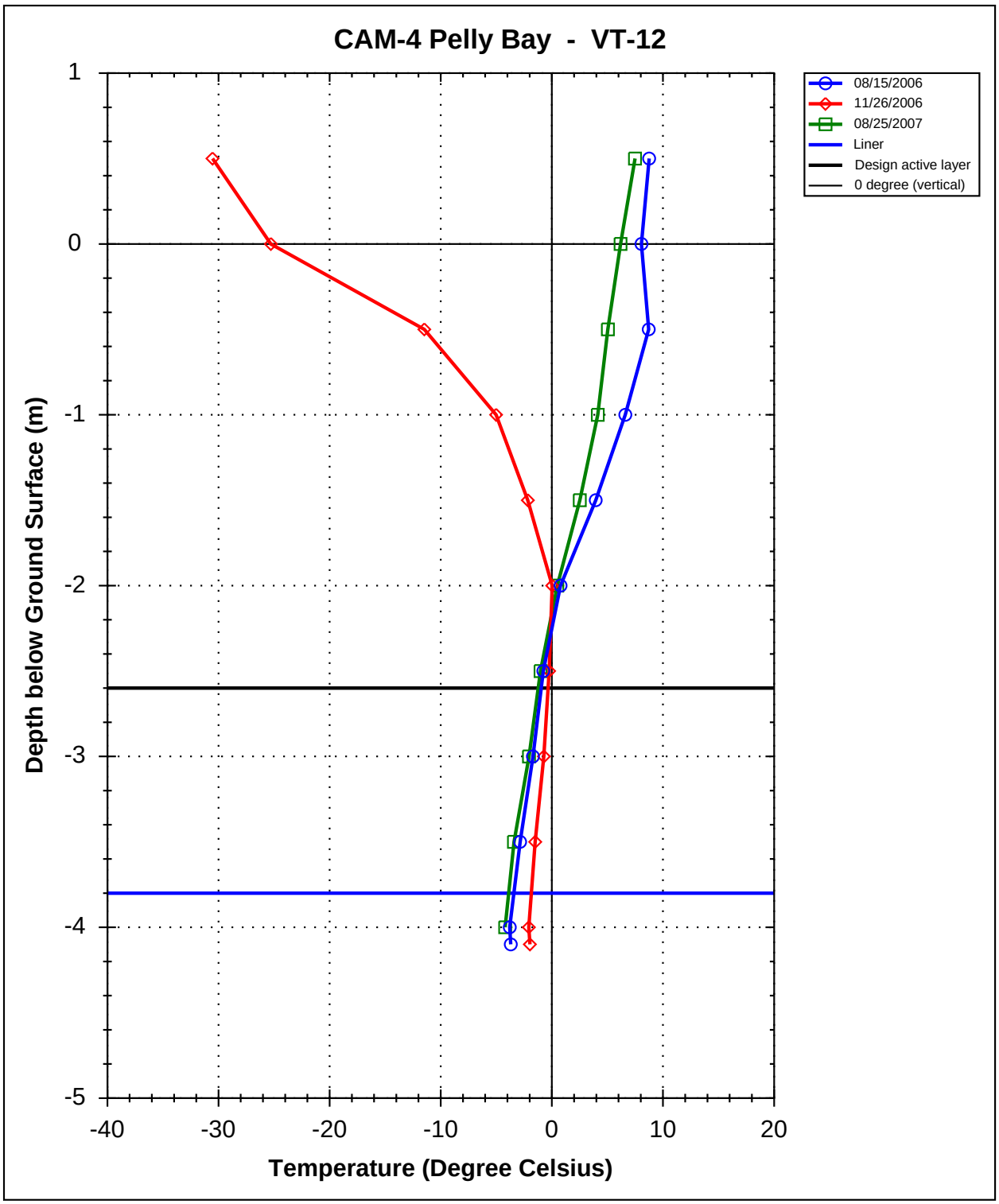
LOWER SITE LANDFILL

FIGURE CAM-4.6


CAM-4 Pelly Bay - VT-9
Depth below Ground Surface (m)
Temperature (Degree Celsius)
1
0
-1
-2
-3
-4
-5
-15
-10
-5
0
5
10
15
08/15/2006
03/15/2007
08/25/2007
Liner Elevation
Design active layer
0 degree (vertical)


CAM-4 Pelly Bay - VT-10
Depth below Ground Surface (m)
Temperature (Degree Celsius)
1
0
-1
-2
-3
-4
-5
-30
-20
-10
0
10
20
08/15/2006
11/24/2006
08/25/2007
Liner
Design active layer
0 degree (vertical)


CAM-4 Pelly Bay - VT-11
Depth below Ground Surface (m)
Temperature (Degree Celsius)
1
0
-1
-2
-3
-4
-30
-20
-10
0
10
08/15/2006
12/15/2006
08/25/2007
Liner
Design active layer
0 degree (vertical)


CAM-4 Pelly Bay - VT-12
Depth below Ground Surface (m)
Temperature (Degree Celsius)
1
0
-1
-2
-3
-4
-5
-40
-30
-20
-10
0
10
20
08/15/2006
11/26/2006
08/25/2007
Liner
Design active layer
0 degree (vertical)

LANDFILL VISUAL INSPECTION

Site Name: CAM-4, Pelly Bay
Landfill: **Lower Site Landfill**
Designation:
Date Inspected: August 24 to August 26, 2007
Inspected by: Ed Grozic, P.Eng.
EBA Engineering Consultants Ltd.

Signature: 

TABLE E1: LOWER SITE LANDFILL

Checklist Item	Present Yes/No	Location	Length	Width	Depth	Extent	Description	Photographic Records (Images provided on Data CD)	Severity Rating	Additional Comments
Settlement	No	N/A	N/A	N/A	N/A	None	N/A	N/A	N/A	N/A
Erosion	No	N/A	N/A	N/A	N/A	None	N/A	N/A	N/A	N/A
Frost Action	No	N/A	N/A	N/A	N/A	None	N/A	N/A	N/A	N/A
Animal Burrows	No	N/A	N/A	N/A	N/A	None	N/A	N/A	N/A	N/A
Vegetation	No	N/A	N/A	N/A	N/A	None	N/A	N/A	N/A	N/A
Staining	No	N/A	N/A	N/A	N/A	None	N/A	N/A	N/A	N/A
Vegetation Stress	No	N/A	N/A	N/A	N/A	None	N/A	N/A	N/A	N/A
Seepage Points	No	N/A	N/A	N/A	N/A	None	N/A	N/A	N/A	N/A
Debris Exposed	No	N/A	N/A	N/A	N/A	None	N/A	N/A	N/A	N/A
Presence/Condition of Monitoring Instruments	Yes	Feature G See Figure E1	N/A	N/A	N/A	N/A	VT-9, VT-10, VT-11 and VT-12	Photo 22 (Image 76), Photo 27 (Image 67), Photo 28 (Image 66), Photo 29 (Image 64), and Photo 30 (Image 63)	Acceptable	Batteries failed in data loggers from VT-9, VT-10, VT-11 and VT-12. Ground temperature data were retrieved from the loggers while on site; however, the data had to be processed in the office. The data loggers were serviced and redeployed. Available ground temperature data is presented herein.
Other Features of Note Ponded water from rainfall along southeast toe of landfill	Yes	Feature H See Figure E1	~ 30 m	0 m to 0.8 m	0 m to 0.03 m	Isolated	Isolated patches of ponded water	Photo 23 (Image 78) and Photo 24 (Image 8)	Acceptable	Ponded water along south-southeast facing toe of landfill. Landfill slopes are in good condition, free of erosion and deformation.
Other Features of Note Ponded water from rainfall on surface of landfill	Yes	Feature I See Figure E1	0 m to 3 m	0 m to 1m	0 m to 0.02 m	Isolated	Isolated patches of ponded water	Photo 31 (Image 83)	Acceptable	Ponded water on surface of landfill. Ponded water is shallow, less than 2 cm deep and the areas are small in size The low lying micro topography on the surface of the landfill temporarily ponds with water during periods of rainfall. Landfill surface is in good condition, free of erosion and visible deformation.
Overall Landfill Performance	**Acceptable**									

Lower Site Landfill - EVALUATION OF YEAR 1 SOIL ANALYTICAL DATA

Parameter	N value Baseline	Arithmetic Mean +/- 95% Confidence Limit Baseline	Maximum Baseline [mg/kg]	2006	Comments
Copper	76	12.6+/-2.2	64	Measured concentrations within 95% confidence intervals.	
Nickel	68	9.4+/-1.2	45	Measured concentrations within 95% confidence intervals.	
Cobalt	68	4.8+/-0.6	12	Measured concentrations within 95% confidence intervals for 8 of 14 samples.	Upgradient surface samples at C4-1, MW-18, surface sample at C4-3 and surface and depth samples at C4-2 were above 95% confidence interval but below baseline max (concentrations up to 12 mg/kg).
Cadmium	68	<1.0		Measured concentrations within 95% confidence intervals.	
Lead	76	<10	1200	Measured concentrations within 95% confidence intervals for all samples with two exceptions.	Surface and depth sample at MW-18 had concentrations of 10 & 18 mg/kg respectively (below baseline max).
Zinc	76	59+/-26	910	Measured concentrations within 95% confidence intervals.	
Chromium	68	29+/-4	110	Measured concentrations within 95% confidence intervals for all samples with one exception.	Depth sample at C4-2 had a concentration of 45 mg/kg (below baseline max).
Arsenic	68	1.6+/-0.5	12	Measured concentrations within 95% confidence intervals for 11 of 14 samples.	Surface samples at MW-18 and 19 and depth sample at MW-18 had concentrations of 2.7, 8.0 & 3.9 mg/kg respectively (below baseline max).
Mercury	40	<0.1		Measured concentrations within 95% confidence intervals.	

Lower Site Landfill - EVALUATION OF YEAR 1 SOIL ANALYTICAL DATA

Parameter	N value Baseline	Arithmetic Mean +/- 95% Confidence Limit Baseline	Maximum Baseline [mg/kg]	2006	Comments
PCBs	67	<0.003	0.16	Measured concentrations within 95% confidence intervals.	
TPH	53	<40	1411	Measured concentrations within 95% confidence intervals for 10 of 14 samples.	Surface samples at BMW-4, MW-19 and C4-2 and depth sample at C4-2 were outside confidence interval limits (up to concentration 218 mg/kg) but below baseline max.

Lower Site Landfill - Year 1 (2007) Soil Data

Sample #	Location	Date	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co [mg/kg]	Cd [mg/kg]	Pb [mg/kg]	Zn [mg/kg]	Cr [mg/kg]	As [mg/kg]	Hg [mg/kg]	PCBs [mg/kg]	TPH [mg/kg]	TPH Identity		
															F1	F2	F3
Lower Site Landfill - Baseline Concentrations				**12.6+/-2.2**	**9.4+/-1.2**	**4.8+/-0.6**	**<1.0**	**<10**	**59+/-26**	**29+/-4**	**1.6+/-0.5**	**<0.1**	**<0.003**	**<40**			
Lower Site Landfill - Maximum Concentrations				**64**	**45**	**12**		**1200**	***910***	**110**	**12**		**0.16**	**1411**			
Up-gradient Soil Samples																	
24888/89	BMW4	2007	0	5.2	7.3	5.0	<1.0	<10	20	<20	1.9	< 0.10	< 0.0030	<10	<10	7.4	< 9.0
24890/91	BMW4	2007	30	5.7	7.6	<5.0	<1.0	<10	21	<20	1.4	< 0.10	< 0.0030	67	<10	4.8	62
24916/17	C4-1	2007	0	10	8.6	5.7	<1.0	<10	35	<20	1.2	< 0.10	< 0.0030	<10	<10	< 4.0	< 9.0
24918/19	C4-1	2007	30	8.1	8.2	5.4	<1.0	<10	28	<20	1.7	< 0.10	< 0.0030	<10	<10	4.2	< 9.0
Down-gradient Soil Samples																	
24876/77	MW17	2007	0	5.5	7.4	<5.0	<1.0	<10	21	<20	1.5	< 0.10	< 0.0030	23	<10	4.4	19
24878/79	MW17	2007	30	6.5	8.7	5.5	<1.0	<10	23	<20	1.7	< 0.10	< 0.0030	<10	<10	< 4.0	< 9.0
24880/81	MW18	2007	0	7.3	8.0	<5.0	<1.0	10	54	<20	2.7	< 0.10	< 0.0030	43	<10	< 4.0	43
24882/83	MW18	2007	30	13	12	12	<1.0	18	69	24	3.9	< 0.10	< 0.0030	39	<10	4.4	35
24884/85	MW19	2007	0	6.3	7.9	<5.0	<1.0	<10	25	<20	1.4	< 0.10	< 0.0030	218	<10	28	190
24886/87	MW19	2007	30	6.2	9.1	<5.0	<1.0	<10	24	<20	8.0	< 0.10	< 0.0030	21	<10	4.3	17
24908/09	C4-2	2007	0	5.8	11	9.5	<1.0	<10	48	27	1.2	< 0.10	< 0.0030	166	<10	6.3	160
24910/11	C4-2	2007	30	8.4	18	13	<1.0	<10	50	45	1.8	< 0.10	< 0.0030	51	<10	11	40
24912/13	C4-3	2007	0	13	11	7.6	<1.0	<10	43	23	2.0	< 0.10	< 0.0030	26	<10	4.6	21
24914/15	C4-3	2007	30	7.2	7.0	<5.0	<1.0	<10	21	<20	1.3	< 0.10	< 0.0030	<10	<10	4.1	< 9.0

Lower Site Landfill - Year 1 (2007) Groundwater Data

Sample #	Location	Date	Cu [mg/L]	Ni [mg/L]	Co [mg/L]	Cd [mg/L]	Pb [mg/L]	Zn [mg/L]	Cr [mg/L]	As [mg/L]	Hg [mg/L]	PCBs [mg/L]	TPH [mg/L]	TPH Identity		
														F1	F2	F3
Up-gradient Groundwater Samples																
24935	BMW4	2007	0.030	0.020	<0.0030	<0.0010	<0.010	0.098	0.029	0.0032	<0.00040	< 0.000020	<1.0	< 0.050	< 0.50	< 1.0
Down-gradient Groundwater Samples																
07-24936	MW17	2007	0.011	0.019	0.0037	<0.0010	<0.010	0.021	0.041	<0.0030	<0.00040	< 0.000020	<1.0	< 0.050	< 0.50	< 1.0
07-24940/41	MW18	2007	0.022	0.022	0.007	<0.0010	0.011	0.075	0.035	0.0038	<0.00040	< 0.000020	<1.0	< 0.050	< 0.50	< 1.0
07-24934	MW19	2007	0.045	0.044	0.020	<0.0010	0.027	0.15	0.063	0.0089	<0.00040	< 0.000020	<1.0	< 0.050	< 0.50	< 1.0

Photo 19 (Image 68)
Lower Site Landfill
Panoramic view of landfill looking southeast.

Photo 20 (Image 60)
Lower Site Landfill
South Lobe looking southeast.

Photo 21 (Image 72)
Lower Site Landfill
North Lobe looking southeast.

Photo 22 (Image 76)
Lower Site Landfill
Panoramic view of surface of landfill looking northeast.

Photo 23 (Image 78)
Lower Site Landfill
Ponding along southeast side of landfill looking towards VT-11 and VT-12.

Photo 24 (Image 80)
Lower Site Landfill
Ponded water along southeast side of landfill looking northeast.

Photo 25 (Image 75)
Lower Site Landfill
Surface of landfill looking southwest towards VT-10 to VT-12.

Photo 26 (Image 74)
Lower Site Landfill
Landfill slope looking southwest towards VT-9 and VT-10.

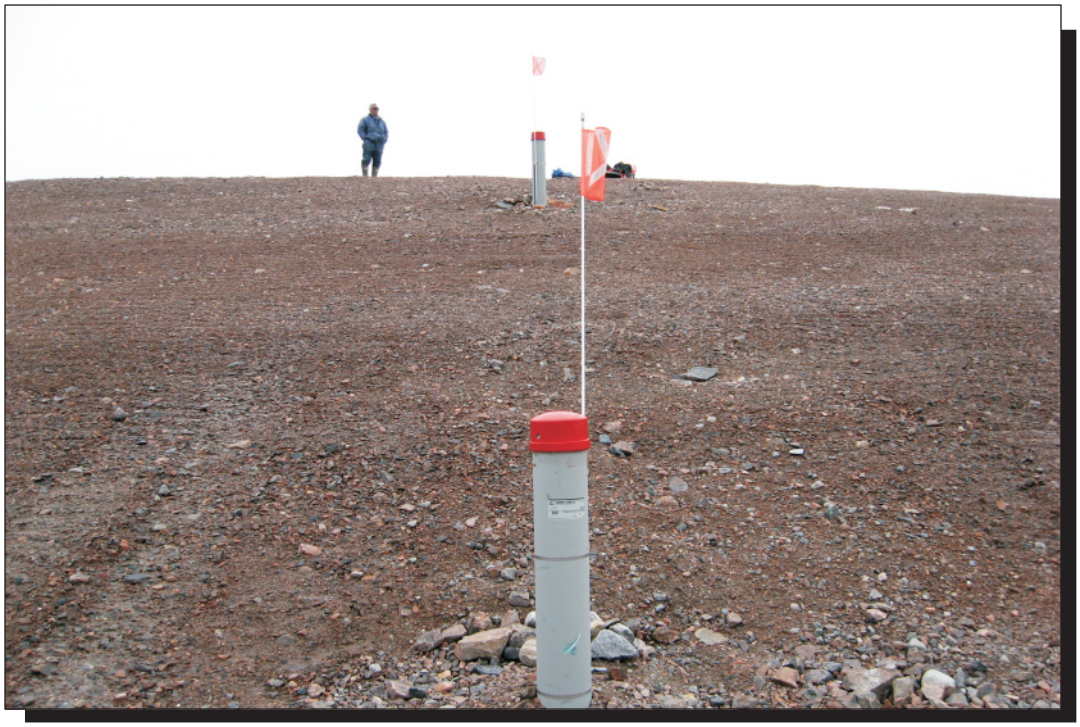


Photo 27 (Image 67)
Lower Site Landfill
View of VT-9 looking towards VT-10.

Photo 28 (Image 66)
Lower Site Landfill
View of VT-10 looking towards VT-9.

Photo 29 (Image 64)
Lower Site Landfill
View of VT-11 looking northwest.

Photo 30 (Image 63)
Lower Site Landfill
View of VT-12 looking northwest towards VT-11.

Photo 31 (Image 83)
Lower Site Landfill
Temporarily ponded water on surface of landfill.

Table B-136: Monitoring Well Sampling Log (MW #17), 2007

Site Name:	CAM-4		
Date of Sampling Event:	Aug. 23 and 25, 2007		
Names of Samplers:	Nick Battye, Line Filion, Kevin Schut		
Monitoring Well ID:	MW 17		
Facility:	Lower Site Landfill		
Water Sample Measured Data			
Condition of Well:	Good		
Procedure/Equipment:	Measuring tape	Procedure/Equipment:	Interface metre
Well height above ground (m)=	0.62	Depth to water surface (m)=	1.35
Diameter of well (m)=	0.05	Static water level* (m)=	0.73
Depth of installation* (m)=	3.82	Depth to bottom (m)=	2.16
Length screened section (m)=	2.03	Free product thickness (mm)=	n/a
Depth to top of screen* (m)=	0.83		
Calculations		**Notes**	
Depth of water (m)=	0.81	Evidence of sludge etc:	N
Well volume of water (L)=	1.59	Evidence of freezing/siltation: (compare to installation record)	Y
Length screen collecting water (m)=	1.33		

Development/Purging Information

Equipment: Teflon tubing with teflon foot valve.

Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (uS/cm)	Turbidity (NTU)	Description of water
Aug. 25, 2007; 10:00	0.5	2.9	**	870	571	clear

Water Sampling		**Soil Sampling**	
Date and time collected:	Aug. 25, 2007; 10:04	Date and time collected:	Aug. 23, 2007
Sample Number - Water:	24936	Sample Number - Soil:	24876/77 @ 0-0.1 m
			24878/79 @ 0.3-0.4 m
Sample containers:	1 L HDPE bottle	Sample containers:	Whirlpak
	1 L Teflon bottle		120 mL Amber glass jar
	250 mL Amber glass jar		
Procedure/Equipment:	Teflon tubing with teflon foot valve.	Procedure/Equipment:	Disposable sterilized plastic scoop
Water description:	clear	Soil description:	Light brown sand, very fine to medium grained, some gravel, fine to coarse grained, sub-angular, trace fines, damp, no odour.
Filtration: (Y/N)	N		
Acidification: (Y/N)	N		
Sampling Equipment Decontamination: (Y/N)	Y	Sampling Equipment Decontamination: (Y/N)	No; disposable scoops were used.
Number washes:	Soapy water (1)	Number washes:	n/a
Number rinses:	Tap water (1) DDW (1)	Number rinses:	n/a

n/a=not applicable

*From ground surface. Unless this is stated, all measurements are assumed to be from the top of the casing.

** pH probe was broken, analysis was performed in the south

Table B-137: Monitoring Well Sampling Log (MW #18), 2007

Site Name:	CAM-4		
Date of Sampling Event:	Aug. 23 and 25, 2007		
Names of Samplers:	Nick Battye, Line Filion, Kevin Schut		
Monitoring Well ID:	MW 18		
Facility:	Lower Site Landfill		
Water Sample Measured Data			
Condition of Well:	Good		
Procedure/Equipment:	Measuring tape	Procedure/Equipment:	Interface metre
Well height above ground (m)=	0.56	Depth to water surface (m)=	0.75
Diameter of well (m)=	0.05	Static water level* (m)=	0.19
Depth of installation* (m)=	3.80	Depth to bottom (m)=	2.22
Length screened section (m)=	2.03	Free product thickness (mm)=	n/a
Depth to top of screen* (m)=	0.81		
Calculations		**Notes**	
Depth of water (m)=	1.47	Evidence of sludge etc:	N
Well volume of water (L)=	2.89	Evidence of freezing/siltation: (compare to installation record)	Y
Length screen collecting water (m)=	1.41		

Development/Purging Information

Equipment: Teflon tubing with teflon foot valve.

Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (uS/cm)	Turbidity (NTU)	Description of water
Aug. 25, 2007; 09:47	2	1.8	**	138.3	851	trace silt, clear

Water Sampling		**Soil Sampling**	
Date and time collected:	Aug. 25, 2007; 09:51	Date and time collected:	Aug. 23, 2007
Sample Number - Water:	24940/41	Sample Number - Soil:	24880/81 @ 0-0.1 m
			24882/83 @ 0.3-0.4 m
Sample containers:	1 L HDPE bottle	Sample containers:	Whirlpak
	1 L Teflon bottle		120 mL Amber glass jar
	250 mL Amber glass jar		
Procedure/Equipment:	Teflon tubing with teflon foot valve.	Procedure/Equipment:	Disposable sterilized plastic scoop
Water description:	trace silt, clear	Soil description:	Dark, light brown and rusty red mottled patches of sand, very fine to medium grained, and gravel, coarse grained, sub-angular, cobbles and boulders causing refusal, damp to wet, seepage at 30, swamp odour.
Filtration: (Y/N)	N		
Acidification: (Y/N)	N		
Sampling Equipment Decontamination: (Y/N)	Y	Sampling Equipment Decontamination: (Y/N)	No; disposable scoops were used.
Number washes:	Soapy water (1)	Number washes:	n/a
Number rinses:	Tap water (1) DDW (1)	Number rinses:	n/a

n/a=not applicable

*From ground surface. Unless this is stated, all measurements are assumed to be from the top of the casing.

** pH probe was broken, analysis was performed in the south

Table B-138: Monitoring Well Sampling Log (MW #19), 2007

Site Name:	CAM-4					
Date of Sampling Event:	Aug. 23 and 25, 2007					
Names of Samplers:	Nick Battye, Line Filion, Kevin Schut					
Monitoring Well ID:	MW 19					
Facility:	Lower Site Landfill					
Water Sample Measured Data						
Condition of Well:	Good					
Procedure/Equipment:	Measuring tape			Procedure/Equipment:	Interface metre	
Well height above ground (m)=	0.64			Depth to water surface (m)=	0.75	
Diameter of well (m)=	0.05			Static water level* (m)=	0.11	
Depth of installation* (m)=	3.83			Depth to bottom (m)=	2.01	
Length screened section (m)=	2.03			Free product thickness (mm)=	n/a	
Depth to top of screen* (m)=	0.84					
Calculations				**Notes**		
Depth of water (m)=	1.26			Evidence of sludge etc:	N	
Well volume of water (L)=	2.47			Evidence of freezing/siltation: (compare to installation record)	Y	
Length screen collecting water (m)=	1.17					
Development/Purging Information						
Equipment:	Teflon tubing with teflon foot valve.					
Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (uS/cm)	Turbidity (NTU)	Description of water
Aug. 25, 2007; 09:31	3	2.4	**	494	373	clear
Water Sampling				**Soil Sampling**		
Date and time collected:	Aug. 25, 2007; 09:35			Date and time collected:	Aug. 23, 2007	
Sample Number - Water:	24934			Sample Number - Soil:	24884/85 @ 0-0.1 m	
					24886/87 @ 0.3-0.4 m	
Sample containers:	1 L HDPE bottle			Sample containers:	Whirlpak	
	1 L Teflon bottle				120 mL Amber glass jar	
	250 mL Amber glass jar					
Procedure/Equipment:	Teflon tubing with teflon foot valve.			Procedure/Equipment:	Disposable sterilized plastic scoop	
Water description:	clear			Soil description:	Medium brown sand, fine to coarse grained, and gravel, fine to coarse grained, sub-angular, some fines and cobble, wet, seepage entering from surfaceand throughout, no odour.	
Filtration: (Y/N)	N					
Acidification: (Y/N)	N					
Sampling Equipment Decontamination: (Y/N)	Y			Sampling Equipment Decontamination: (Y/N)	No; disposable scoops were used.	
Number washes:	Soapy water (1)			Number washes:	n/a	
Number rinses:	Tap water (1) DDW (1)			Number rinses:	n/a	

n/a=not applicable

*From ground surface. Unless this is stated, all measurements are assumed to be from the top of the casing.

** pH probe was broken, analysis was performed in the south

Thermal Monitoring

Thermistor Annual Maintenance Report

Contractor Name:	**EBA Engineering**	Inspection Date:	**8/25/2007**
Prepared By:	**Ed Grozic**		

Thermistor Information

Site Name:	**CAM-4 Pelly Bay**	Thermistor Location:	**Lower Site Landfill**
Thermistor Number:	**VT-9**	Inclination:	**Vertical**

Install Date:	**7/29/2006**	First Date Event:	**7/14/2006**	Last Date Event:	**6/6/2007**		
Coordinates and Elevation:	N	**20544.8**	E	**18760.1**	Elev	**126**	
Total Cable Length (m):	**4.5**	Lead Length to 1st Bead (m):	**1.32**	Number of Beads:	**10**		
Datalogger Serial #:	**02020165**	Cable Serial #:	**1623**				

Thermistor Inspection

	Good	Need Maintenance	
Casing	**Yes**	**No**	
Cover	**Yes**	**No**	
Data Logger	**No**	**Yes**	**Data Logger batteries replaced**
Cable	**Yes**	**No**	
Beads	**Yes**	**No**	
Battery Installation Date		**8/26/2007**	
Battery Levels	Main **11.3**	Aux **12.9**	

Manual Ground Temperature Reading

Bead	Ohms	Degree C
1	11160	7.6229
2	12030	6.0887
3	12600	5.1497
4	13510	3.7456
5	14840	1.8740
6	16610	-0.3434
7	17610	-1.4818
8	18640	-2.5810

Bead	Ohms	Degree C
9	19750	-3.6917
10	20320	-4.2352

Observation and Proposed Maintenance

Data logger batteries had failed. Last day of data June 6, 2007. ULB5 & 9V batteries replaced and logger redeployed.

Thermal Monitoring

Thermistor Annual Maintenance Report

Contractor Name:	**EBA Engineering**	Inspection Date:	**8/25/2007**
Prepared By:	**Ed Grozic**		

Thermistor Information

Site Name:	**CAM-4 Pelly Bay**	Thermistor Location:	**Lower Site Landfill**
Thermistor Number:	**VT-10**	Inclination:	**Vertical**

Install Date:	**7/29/2006**	First Date Event:	**8/9/2006**	Last Date Event:	**11/24/2006**		
Coordinates and Elevation:	N	**20535.9**	E	**18769.1**	Elev	**130**	
Total Cable Length (m):	**4.3**	Lead Length to 1st Bead (m):	**1.16**	Number of Beads:	**10**		
Datalogger Serial #:	**108060**	Cable Serial #:	**1625**				

Thermistor Inspection

	Good	Need Maintenance	
Casing	**Yes**	**No**	
Cover	**Yes**	**No**	
Data Logger	**No**	**Yes**	**batteries replaced**
Cable	**Yes**	**No**	
Beads	**Yes**	**No**	
Battery Installation Date		**8/26/2007**	
Battery Levels	Main **11.34**		Aux **12.9**

Manual Ground Temperature Reading

Bead	Ohms	Degree C
1	11460	7.0791
2	12460	5.3758
3	13610	3.5978
4	14810	1.9141
5	15170	1.4388
6	15860	0.5622
7	17090	-0.8992
8	17979	-1.8837

Bead	Ohms	Degree C
9	19590	-3.5360
10	20030	-3.9609

Observation and Proposed Maintenance

Data logger batteries failed. Last day of data November 24, 2006. Data logger ULB5 and 9V batteries replaced.

Thermal Monitoring

Thermistor Annual Maintenance Report

Contractor Name:	**EBA Engineering**	Inspection Date:	**8/25/2007**
Prepared By:	**Ed Grozic**		

Thermistor Information

Site Name:	**CAM-4 Pelly Bay**	Thermistor Location:	**Lower Site Landfill**
Thermistor Number:	**VT-11**	Inclination:	**Vertical**

Install Date:	**7/29/2006**	First Date Event:	**8/9/2006**	Last Date Event:	**12/20/2006**
Coordinates and Elevation:	N **20523.5**	E **18778.4**	Elev **132**		
Total Cable Length (m):	**4.5**	Lead Length to 1st Bead (m):	**1.11**	Number of Beads:	**10**
Datalogger Serial #:	**111070**	Cable Serial #:	**1621**		

Thermistor Inspection

	Good	Need Maintenance	
Casing	**Yes**	**No**	
Cover	**Yes**	**No**	
Data Logger	**No**	**Yes**	**Data Logger batteries replaced**
Cable	**Yes**	**No**	
Beads	**Yes**	**No**	
Battery Installation Date		**8/26/2007**	
Battery Levels	Main **11.34**	Aux **13.5**	

Manual Ground Temperature Reading

Bead	Ohms	Degree C
1	11370	7.2405
2	12540	5.2463
3	13050	4.4416
4	13730	3.4220
5	15060	1.5827
6	16640	-0.3787
7	17810	-1.7008
8	18780	-2.7251

Bead	Ohms	Degree C
9	19470	-3.4183
10	18440	-2.3730

Observation and Proposed Maintenance

Data logger batteries failed. Last day of data December 20, 2006. ULB5 and 9V batteries replaced.

Thermal Monitoring

Thermistor Annual Maintenance Report

Contractor Name:	**EBA Engineering**	Inspection Date:	**8/25/2007**
Prepared By:	**Ed Grozic**		

Thermistor Information

Site Name:	**CAM-4 Pelly Bay**	Thermistor Location:	**Lower Site Landfill**
Thermistor Number:	**VT-12**	Inclination:	**Vertical**

Install Date:	**7/29/2006**	First Date Event:	**8/8/2006**	Last Date Event:	**11/26/2006**
Coordinates and Elevation:	N **20514.1**	E **18787.1**	Elev **132**		
Total Cable Length (m):	**4.9**	Lead Length to 1st Bead (m):	**1.21**	Number of Beads:	**11**
Datalogger Serial #:	**02020150**	Cable Serial #:	**1626**		

Thermistor Inspection

	Good	Need Maintenance	
Casing	**Yes**	**No**	
Cover	**Yes**	**No**	
Data Logger	**No**	**Yes**	**Data Logger batteries replaced**
Cable	**Yes**	**No**	
Beads	**Yes**	**No**	
Battery Installation Date		**8/26/2007**	
Battery Levels	Main **11.34**	Aux **11.38**	

Manual Ground Temperature Reading

Bead	Ohms	Degree C
1	11230	7.4945
2	11940	6.2415
3	12650	5.0696
4	13280	4.0902
5	14370	2.5131
6	15930	0.4756
7	17170	-0.9901
8	18120	-2.0349

Bead	Ohms	Degree C
9	19370	-3.3195
10	20220	-4.1411
11		

Observation and Proposed Maintenance

Data logger batteries failed. Last day of data November 26, 2006. ULB5 and 9V batteries replaced. Logger redeployed.