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Defence Construction Canada

The Collection of Landfill Monitoring Data at the CAM-4 Kugaaruk Site – 2008 FINAL Report

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Prepared by:

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In association with:

Kitnuna Projects Inc.

Date:

November, 2008

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November 25, 2008 Project Number: 80-297-4

Ms. Janis Hamacher
Contract Coordinator
Defence Construction Canada
Constitution Square, Suite 1720
350 Albert Street
Ottawa, ON K1A 0K3

privileged and confidential

Dear Ms. Hamacher:

Re: FINAL Report for the 2008 Collection of Landfill Monitoring Data at the CAM-4 Dew Line Site, Kugaaruk, Nunavut

AECOM is pleased to submit eight hard copies of the 2008 Report on Collection of Landfill Monitoring Data at the CAM-4 DEW Line Site at Kugaaruk (formerly Pelly Bay), Nunavut. This report documents the data collected from the site visit to the CAM-4 Site between August 14 and 17, 2008. In addition to the hard copy reports, also attached are three digital data discs to the report which contains:

a) all numeric data files including analytical results, thermistor data and associated graphs, submitted in MS Excel 2003;
b) all text files submitted in MS Word 2003;
c) all Drawings submitted in AutoCAD Version 2008;
d) all photographic records of the soil samples collected at each landfill. These have been provided as an attachment to the main report and include and index of the photo numbers and the locations;
e) all photographic records of the condition of the thermistor casings and dataloggers, along with maintenance report forms;
f) all photographic records of the condition of the monitoring wells. These have been provided as attachments to the main report and include and index of the photo numbers and the locations; and,
g) all field notes have been attaché to each specific landfill investigation report.

The digital information contained on the CD/DVD disc has also been uploaded to the DCC FTP server.

Visual inspections were completed at the following landfills: Station Area Non-hazardous Waste Landfill, DCC Tier II Soil Disposal Facility, Upper Site Landfill, Lower Site Non-hazardous Waste Landfill, and the Lower Site Landfill. The CAM-4 landfills all appear to be in stable physical condition and overall landfill performance is rated as “acceptable”. No erosion or issues of concern requiring immediate attention were identified. The observed conditions are documented in the attached appendices and photographs.

Soil samples were collected at two depths from test pits at the following landfills: DCC Tier II Soil Disposal Facility, Upper Site Landfill, and the Lower Site Landfill. Sample results are located within each specific landfill report. DCC should compare the laboratory results to their internal DEW Line Site Guidelines to confirm whether the analytical results are in compliance.

Fourteen of the fifteen monitoring wells monitored in 2008 contained sufficient water to collect a sample for analysis. Monitor MW-10 (Upper Site Landfill) was dry, thus no sample was collected at that location. Sample results are located within each specific landfill report. DCC should compare the laboratory results to their internal DEW Line Site Guidelines to confirm whether the analytical results are in compliance.

All thermistors were downloaded successfully. Data loggers were reset in accordance with the instructions provided by other consultants representing DCC.

If you have any questions or comments concerning this report, please do not hesitate to call me.

Sincerely,
Gartner Lee Limited doing business as AECOM

Darrin C. Johnson, M.Sc., P.Eng.
Geotechnical Engineer

DCJ:pc
Encl.

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Signature Page

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Report Prepared By:	Report Reviewed By:
	
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1. Introduction

The Department of National Defence (DND) in co-operation with Nunavut Tunngavik Incorporated (NTI) has developed a Landfill Monitoring Plan to address post closure monitoring requirements for the landfills at the DEW Line sites. Defence Construction Canada (DCC) is managing the clean-up monitoring programs on behalf of DND. Kitnuna Projects Inc. (Kitnuna) and AECOM, in a joint venture, were awarded the contract for the purposes of providing services for the collection of landfill monitoring data at the CAM-4 Kugaaruk (formerly Pelly Bay) Site in the Nunavut Settlement Area for 2008. This report will provide the procedures and the results for interpretation on the monitoring completed in 2008.

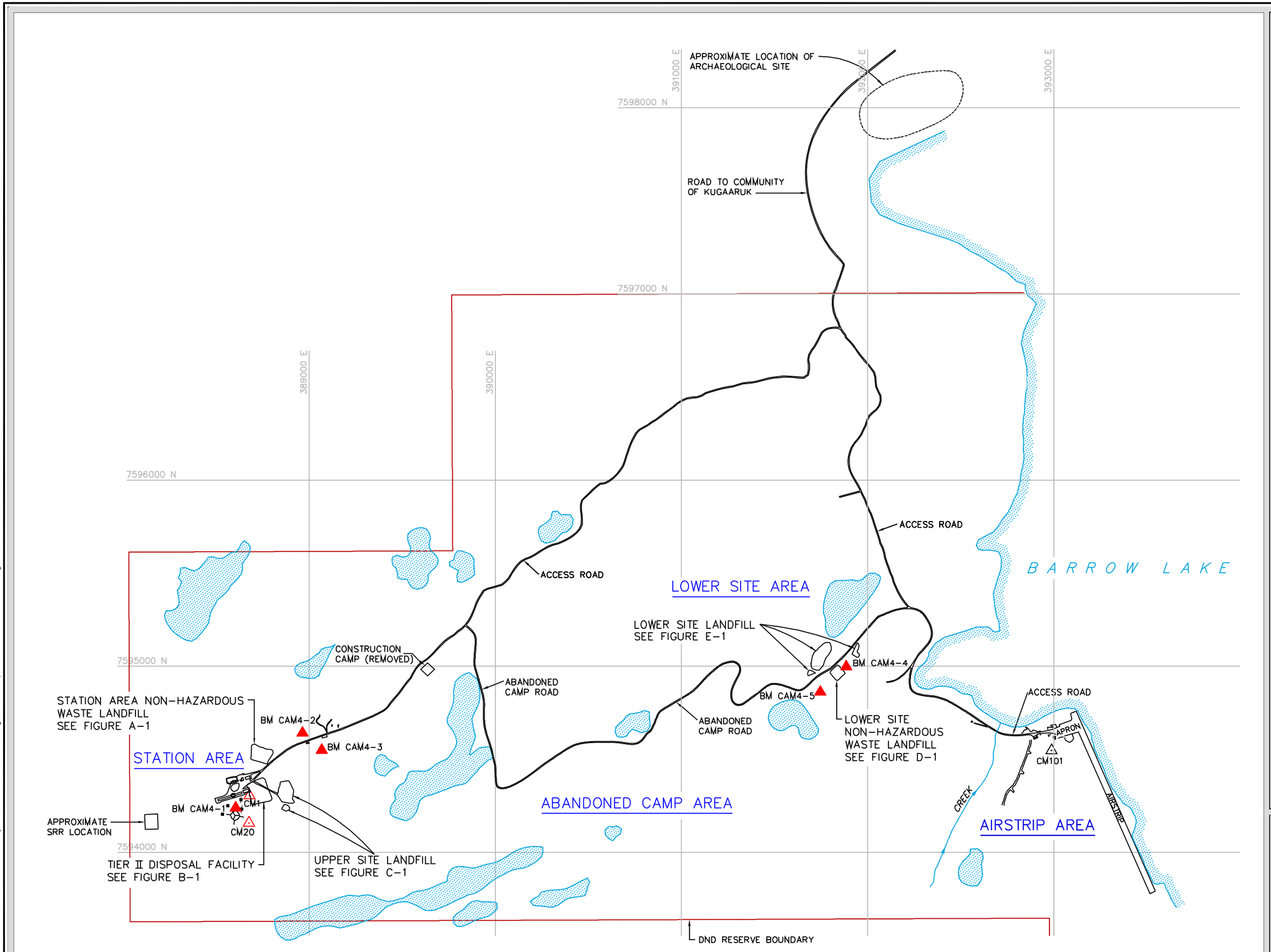
2. Background

The CAM-4 Kugaaruk DEW Line site is located on the Simpson Peninsula at 68° 27' north latitude and 89° 45' west longitude, and is approximately 340 kilometres southwest of the community of Hall Beach, and 640 kilometres east of Cambridge Bay. The station is located inland about 14 kilometres southeast of the community of Kugaaruk (formerly Pelly Bay).

CAM-4 was converted to a Short Range Radar (SRR) site in the early 1990s. The environmental cleanup and demolition of facilities not required for the operation of the SRR site commenced in 2001 and was completed in 2006. The cleanup 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, at the upper and lower sites. Additionally, a DCC Tier II soil disposal facility was constructed at this site. A total of 5 landfills exist at the CAM-4 site today:

- Upper Site Landfill
- Lower Site Landfill
- Lower Site Non-Hazardous Waste Landfill
- Station Area Non-Hazardous Waste Landfill
- DCC Tier II Soil Disposal Facility

The locations of the various landfills are shown on Figure 2-1. Access to the landfills was gained through on-site roads. The baseline monitoring of the landfills commenced in 2007. 2008 was the first year of monitoring by external consultant.



Legend

CM1	SURVEY CONTROL MONUMENT
BM-2	PERMANENT BENCHMARK LOCATION

Map Sources / Notes:
Source drawing from UMA: C4-RD01.dwg

0 100 200 400 600 800 m

1 : 20,000

UTM Zone 16W, NAD83

File Name:	C4-RD01.dwg		
Reviewed by:	DCJ	Prepared by:	KAB
Date Issued:	October, 2008	Project Number:	80-297

Defence Construction Canada

2008 CAM-4 DEW Line Monitoring Program
CAM-4 Kugaaruk
Nunavut Territory

Dew Line Clean Up Monitoring Plan

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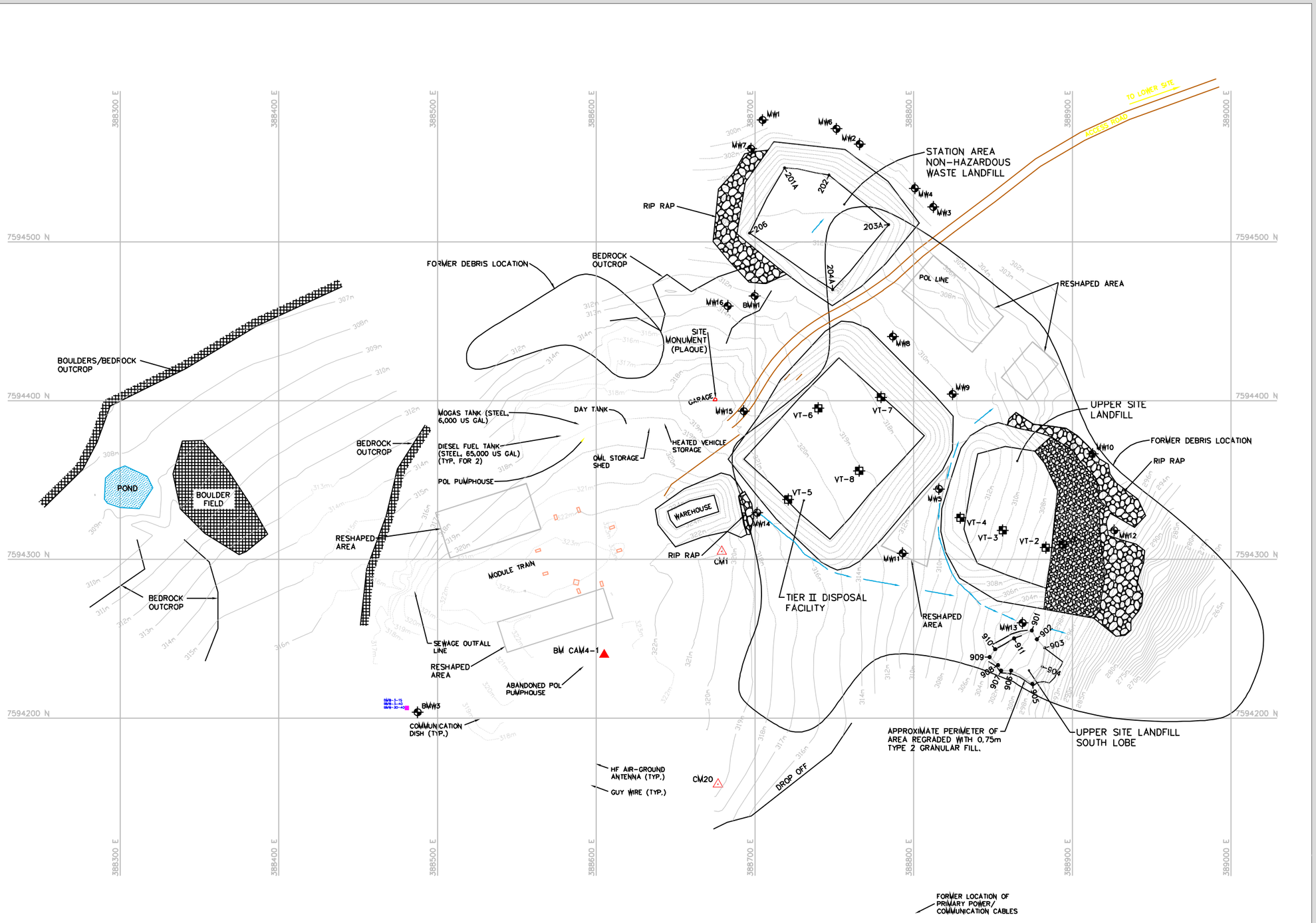
Figure 2-1
Version 1

Date Plotted: October 16, 2006 Path: N:\Projects\2008\80297\2008\Work In Progress\DataInterpretation\CAD\CAM-4\C4-RD01.dwg



Legend

- CM20 — TEMPORARY BENCHMARK
- BM-1 — PERMANENT BENCHMARK
- THERMISTOR LOCATION
- C4-MW-1A / C4-MW-1B — MONITORING SOIL SAMPLE LOCATION
- MONITORING WELL LOCATION

RECORD DRAWING
NOT FOR CONSTRUCTION

Map Sources / Notes:
Source drawing from UMA: C4-RD01A.dwg

0 10 20 40 60 80 100 m
1 : 2500
UTM Zone 16W, NAD83

File Name:	C4-RD01A.dwg		
Reviewed by:	DCJ	Prepared by:	KAB
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Defence Construction Canada

2008 CAM-4 DEW Line Monitoring Program
CAM-4 Kugaaruk
Nunavut Territory

Upper Site Layout

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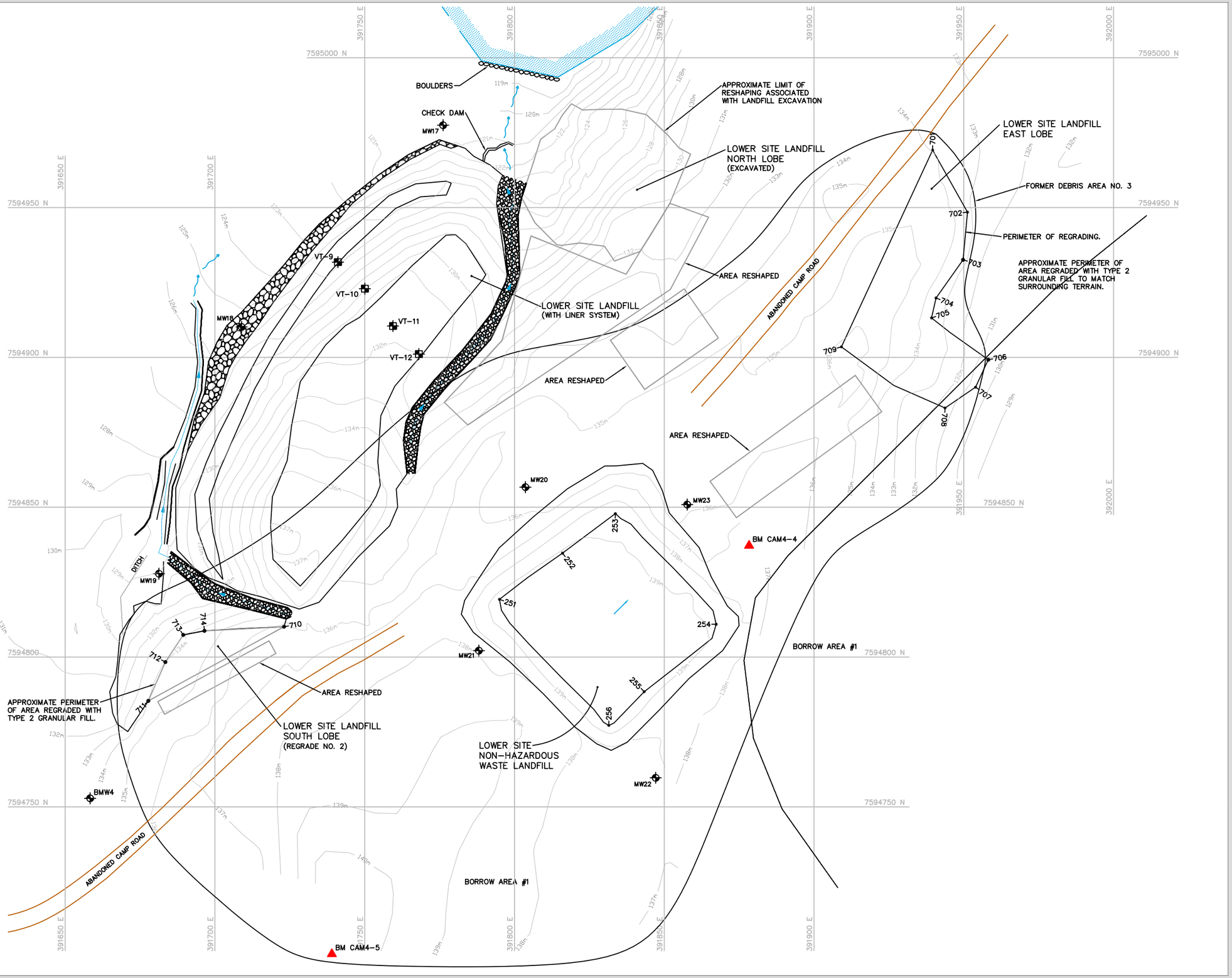
Figure 2-2
Version 1

Date Plotted: October 16, 2006 Path: N:\Projects\20080\80297\2008\WorkInProgress\DataInterpretation\CAD\CAM-4\C4-RD01A.dwg



Legend

- CM20 — TEMPORARY BENCHMARK
- BM-1 — PERMANENT BENCHMARK
- THERMISTOR LOCATION
- MONITORING WELL LOCATION

RECORD DRAWING
NOT FOR CONSTRUCTION

Map Sources / Notes:
Source drawing from UMA: C4-RD01B.dwg

0 5 10 20 30 40 50 m

1 : 1250
UTM Zone 16W, NAD83

File Name:	C4-RD01B.dwg		
Reviewed by:	DCJ	Prepared by:	KAB
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2008 CAM-4 DEW Line Monitoring Program
CAM-4 Kugaaruk
Nunavut Territory

Lower Site Layout

AECOM

Figure 2-3
Version 1

Date Plotted: October 16, 2006 Path: N:\Projects\20081802971\2008\WorkInProgress\Documents\80297-4_CAM-4-FINAL-Report\ACAD_Files\C4-RD01B.dwg

2.1 Project Objectives

The objective of the landfill monitoring program is to collect sufficient information to assess the performance of the landfill from a geotechnical and environmental perspective. The Landfill Monitoring Plan specified the requirements for the visual inspection as well as the chemical and thermal monitoring of the landfills. The long term monitoring plan consists of visual monitoring for signs of settlement, erosion and/or slope instability, collection of soil and groundwater samples to evaluate the effectiveness of the leachate containment systems, and monitoring of the sub-surface ground temperatures along the toe of and within the main body of specific landfills.

2.2 2008 Monitoring Event

Between August 14 and 17, 2008 field data collection was conducted at the CAM-4 DEW Line site. The monitoring event consisted of visual inspections of all landfill locations, as well as soil and groundwater sampling, and thermal monitoring. The landfill monitoring requirements as outlined in the Terms of Reference (TOR) are displayed in Table 1 below.

Table 1. Summary of Landfill Monitoring Requirements for 2008

Landfill Designation	Visual Inspection	Soil Sampling	Groundwater Sampling	Thermal Monitoring
YEAR 2008				
CAM-4 Kugaaruk (Pelly Bay)				
Station Area Non-Hazardous Waste Landfill	✓			
DCC Tier II Disposal Facility	✓	✓	✓	✓
Upper Site Landfill	✓	✓	✓	✓
Lower Site Non-Hazardous Waste Landfill	✓			
Lower Site Landfill	✓	✓	✓	✓

On August 14, 2008 the weather was sunny, clear sky, strong wind and about 5 degrees Celsius. On August 15, 2008 the weather in the morning was sunny, clear sky and about 10 degrees Celsius becoming overcast, raining, cold wind, and about 2 degrees Celsius in the afternoon. On August 16, 2008 the weather was overcast, raining and about 5 degrees Celsius.

At each of the landfill locations, a field inspection was conducted to observe whether there were any visual signs of impact (such as seepage or stressed vegetation caused by the landfill) and for physical stability. Photographic records were taken to show the condition of the landfill and any area of concern that was observed. The observations and the photographic record for each of the landfills are discussed individually in the landfill reports presented in Appendices A through E.

Soil sampling was conducted at the Upper Site Landfill, the DCC Tier II Soil Disposal Facility, and the Lower Site Landfill for 2008. Generally, soil samples were collected at depths of approximately 0.10 m to 0.15 m and approximately 0.25 m to 0.50 m although there were some variations in sample depths dependent on

the ground conditions. The soil samples were analyzed for Polychlorinated Biphenyls (PCB) analyzed for Total Aroclors, Total Petroleum Hydrocarbons (TPH) as defined by the Canadian Council of Ministers of the Environment (CCME) Canada Wide Standards (CWS) Fraction 1 to Fraction 3 and inorganic elements analyzed for total metals using low level detection limits. The analytical results for each sampled landfill are discussed individually in the landfill reports presented in Appendices B, C and E.

Where possible, groundwater elevations were measured using an interface meter at each observation well at the Upper Site Landfill, the DCC Tier II Soil Disposal Facility, and the Lower Site Landfill. The monitoring conditions and field measurements were documented and collected at each monitoring well. The field measurements included the following: presence and thickness of free product (if present), depth to bottom of well, stick up height and visual condition of the observation well. Prior to sampling, wells were purged to remove at least one well volume of water, and field chemistry was monitored using a flow-through cell and a digital probe for stability of the following parameters: Temperature, pH, conductivity, and turbidity. Following purging, groundwater samples were collected from observation wells that had sufficient water volumes to obtain samples. The groundwater samples were analyzed for PCB, TPH, and inorganic elements. Both purging and collection of water samples were conducted using a peristaltic pump for low flow extraction with disposable tubing used for each well. Further discussion regarding the field measurements, the field chemistry and the analytical results are discussed in the landfill reports presented in Appendices B, C, and E. The well sampling records are appended to the relevant sections in Appendices B, C, and E.

Thermal Monitoring was conducted at the Upper Site Landfill, the DCC Tier II Soil Disposal Facility, and the Lower Site Landfill in 2008. The data was downloaded from the system using the Lakewood Systems Ltd. Software *Prolog*. The information downloaded is further discussed in the individual landfill reports presented in Appendices B, C, and E.

3. Landfill Monitoring

As requested by DCC, AECOM has presented the landfill monitoring reports as individual reports under the cover of this main report. The Landfill Monitoring Reports for each locality are presented in the appendices of this main report as follows:

Appendix A	Station Area Non-hazardous Waste Landfill;
Appendix B	DCC Tier II Soil Disposal Facility;
Appendix C	Upper Site Landfill;
Appendix D	Lower Site Non-hazardous Waste Landfill; and,
Appendix E	Lower Site Landfill.

All information collected that is relevant to these individual areas is presented in these sections or as attachments at the end of the respective appendices.

4. Quality Assurance/Quality Control

For the soil and groundwater samples collected, a blind duplicate was collected with a frequency of approximately one in ten samples collected. Tables used for the calculation of RSD values are located in Appendix G.

A total of three blind duplicate soil samples and two blind duplicate groundwater samples were collected for submission. All duplicate samples were submitted to both ALS Environmental and Cantest Ltd. for analysis. As well, duplicate soil samples were sent to the Environmental Services Group for archival purposes. The soil and water samples submitted and the corresponding sample locations are documented in Table 2.

Table 2. Blind Duplicates

Sample Identification	Duplicate of Sample	Sample Location	Depth (m)	Matrix (soil/water)	Landfill
BMW-30-40	BMW-3-40	BMW-3	0.40	Soil	Tier II
MW-140-A-30	MW-14-A-30	MW-14-A	0.30	Soil	Tier II
MW-200-35	MW-20-35	MW-20	0.35	Soil	Lower
MW-150	MW-15	MW-15	-	Water	Tier II
MW-200	MW-20	MW-20	-	Water	Lower

Each soil sample was analyzed for fourteen (14) parameters yielding a total of forty two (42) sets of numbers to be calculated for relative standard deviation (RSD). Of the 42 RSD values calculated, twenty four (24) returned a value of “n/a” due to one or more concentrations being below the detection limit. Seventeen (17) sets returned an acceptable RSD of below 20% for inorganics. It should be noted that one (1) set returned an RSD of 20% for copper. The duplicate soil sample collected at monitoring location BMW-3 at a depth of 0.40 meters returned an RSD value of 20% for copper although this does not exceed the acceptable RSD value of 20%.

Each groundwater sample was analyzed for 12 parameters yielding a total of twenty four (24) sets of numbers to be calculated for RSD. Of the 24 RSD values calculated, seventeen (17) returned a value of “n/a” due to one or more concentrations being below the detection limit. Four (4) sets returned acceptable RSD values of below 20% for inorganics and two (2) sets returned acceptable RSD values of below 30% for inorganics. One set returned an unacceptable RSD value of 31.5% for F2 (C10-C16).

The duplicate groundwater sample collected at MW-20 returned an RSD value of 31.5% for F2 (C10-C16). This exceedance can be attributed to non-laminar flow being discharged from the peristaltic pump into one or more sample containers, and/or portions of the composite sample not distributed equally into each sample container.

5. Conclusions

Based on the visual geotechnical inspection, there does not appear to be any indications of imminent cover instability or significant erosion at the landfills. All landfills at CAM-4 have been assigned an overall landfill performance rating of "acceptable". Minor erosion rills on some landfill slopes at the Station Area Non-Hazardous Waste Landfill and Lower Site Landfill appear to be self-armouring. Minor seepage was observed from the lower half of some landfill slopes at the Station Area Non-Hazardous Waste Landfill, Lower Site Landfill, and Tier II Soil Disposal Facility. Minor orange staining was observed on the Station Area Non-Hazardous Waste Landfill northeast slope and at the northeast toe of the Tier II Soil Disposal Facility. No issues of concern requiring immediate attention were identified.

Soil samples were collected at all designated monitoring locations for the 2008 monitoring year. Two samples were collected, (one shallow and one deeper) at each monitoring location. Total Petroleum Hydrocarbon (TPH) concentrations were detected at four monitoring locations at the Tier II Disposal Facility (MW-8, MW-9, MW15 and MW-16) and at two locations at the Upper Site Landfill (MW-11 and MW-13). These concentrations should be compared to the internal DCC Dew Line Cleanup standards as well as in the context of this monitoring program.

Groundwater samples were collected at all designated monitoring wells for the 2008 monitoring year, with the exception of MW-10, which was dry. The mid-August timing of the sampling event appears to have occurred during maximum thaw. TPH concentrations were detected at six monitoring wells at the Tier II Disposal Facility (MW-5, MW-8, MW-9, MW-14-A, MW-15 and MW-16) and at three monitoring wells at the Upper Site Landfill (MW-11, MW-12 and MW-13). Additionally, elevated chromium and lead concentrations were detected at MW-12. TPH concentrations were also detected at three monitoring wells at the Lower Site Landfill (MW-17, MW-19 and MW-20). These concentrations should be compared to the internal DCC Dew Line Cleanup standards as well as in the context of this monitoring program.

6. Limitations

This report has been prepared as an assessment of the environmental condition of the subject site located at near Kugaaruk (Pelly Bay), Nunavut. The monitoring and investigation programs as described in this report, were conducted in a manner consistent with that level of care and skill normally exercised by other members of the engineering and science professions currently practising under similar conditions, subject to the time limits and financial and physical constraints applicable to the services and in agreement with the Terms of Reference prepared by Defence Construction Canada.

Any use which a third party makes of this report, or any reliance on, or decisions to be made based on it, are the responsibility of such third parties. AECOM accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on the information contained in this report.

The content of this report is based on information collected during our investigation, our present understanding of the site conditions, and our professional judgement in light of such information at the time of this report. This report provides a professional opinion and therefore no warranty is expressed, implied, or made as to the conclusions, advice and recommendations offered in this report. This report does not provide a legal opinion regarding compliance with applicable laws. With respect to regulatory compliance issues, it should be noted that regulatory statutes and the interpretation of regulatory statutes are subject to change.

The findings and conclusions of this report are valid only as of the date of this report. If new information is discovered in future work, including excavations, borings, or other studies, AECOM should be requested to re-evaluate the conclusions of this report, and to provide amendments as required.

Appendix A

Station Area Non-hazardous Waste Landfill

- A1 – Site Condition/Visual Inspection Records
- A2 – Geotechnical Inspection Photographic Records
- A3 – Field Notes

A1. Station Area Non-hazardous Landfill

A1.1 Landfill Summary

The Station Area Non-Hazardous Waste Landfill is located on the Upper Site, approximately 500 m northeast of the main facilities area. The landfill contains non-hazardous wastes and debris generated and collected during clean up of the site. The landfill consists of perimeter berms and a cap of compacted granular fill. The location of the Station Area Non-Hazardous Waste Landfill is presented in Figure A-1.

For 2008, the monitoring requirements for the Station Area Non-Hazardous Waste Landfill included visual inspection only.

A1.2 Visual Monitoring

No significant erosion, settlement or indications of slope instability were observed at the Station Area Non-Hazardous Waste Landfill. Overall landfill performance is assessed as “acceptable”. Appendix A1 presents a summary of the 2008 visual inspection results.

Minor erosion gullies were observed on the east slope that appear to be self-armouring (Photo SNH-8 in Appendix A2). An area of minor seepage and orange staining was observed on the lower half of the northeast slope (Photos SNH-7A and 7B in Appendix A2). Some minor drainage was observed along the road at the south toe (Photo SNH-10 in Appendix A2). No issues of concern that require immediate attention were identified.

A1.3 Soil Sampling

Soil sampling was not scheduled for the 2008 monitoring year.

A1.4 Groundwater Sampling

Groundwater sampling was not scheduled for the 2008 monitoring year.

A1 – Site Condition/Visual Inspection Records

Visual Inspection Checklist
Inspection Report – Page 1 of 2

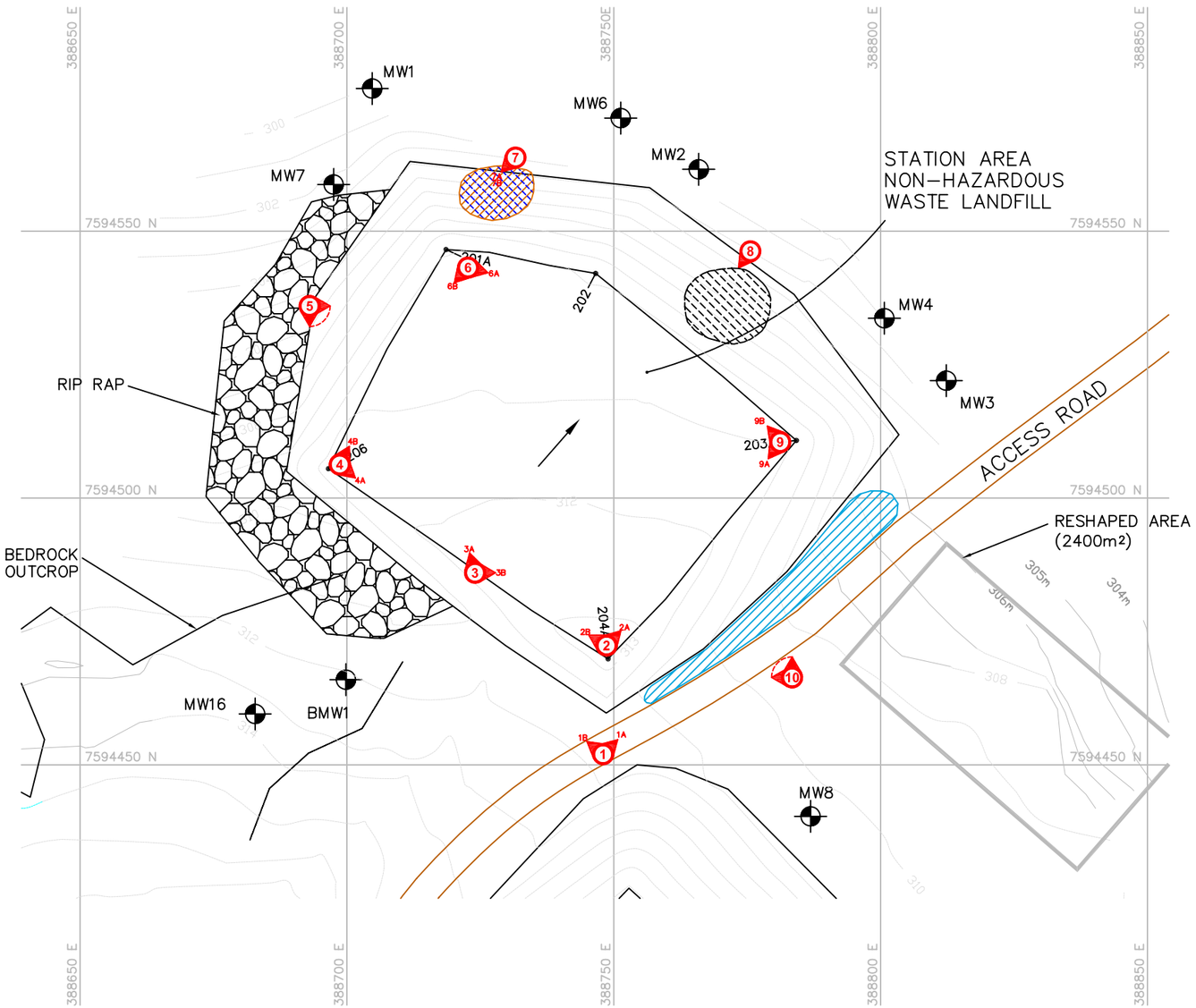
SITE NAME:	CAM-4 - Pelly Bay
LANDFILL/AREA DESIGNATION:	Station Area Non-Hazardous Waste Landfill
DATE OF INSPECTION:	August 14, 2008
DATE OF PREVIOUS INSPECTION:	August 24 - 26, 2007
INSPECTED BY:	Darrin Johnson, P.Eng.
REPORT PREPARED BY:	Darrin Johnson, P.Eng.

The preparer represents to the best of the preparer's knowledge, the following statements and observations are true and correct and to the best of the preparer's actual knowledge, no material facts have been suppressed or misstated.

Preliminary Stability Assessment

Feature	Severity Rating	Extent
Settlement	Not observed	None
Erosion	Acceptable	Isolated
Frost Action	Not observed	None
Animal Burrows	Not observed	None
Vegetation	Not observed	None
Staining	Acceptable	Isolated
Vegetation Stress	Not observed	None
Seepage Points	Acceptable	Isolated
Debris Exposed	Not observed	None
Tension Crack	Not observed	None
Overall Landfill Performance	Acceptable	

Checklist Item	Present Yes/No	Location	Dimensions (L x W) (m)	Depth (m)	Extent (%)	Description	Photographic Records (Photos referenced in photolog and in figures)	Additional Comments/ Preliminary Stability Assessment
Settlement	No							
Erosion	Minor	East slope	10m x 10m	0.1m	1%	Isoloated area of minor erosion that appears to be self-armouring.	SNH-8	Acceptable
Frost Action	No							
Animal Burrows	No							
Vegetation	No							
Staining	Yes	Northeast corner slope	10m x 10m	N/A	1%	Isolated area of minor orange staining.	SNH-7A and SNH-7B	Acceptable
Vegetation Stress	No							
Seepage Points	Yes	Northeast corner slope	10m x 10m	N/A	1%	Isolated area of minor seepage.	SNH-7A and SNH-7B	Acceptable
Debris Exposed	No							
Presence/ Condition of Monitoring Instruments	Good							
Other Features of Note.	Yes	South toe along road	50m x 5m	N/A	3%	Drainage along road at toe. No staining.	SNH-10	Acceptable
Additional Photos						General	SNH-1A, 1B, 2A, 2B, 3A, 3B, 4A, 4B, 5, 6A, 6B, 9A, 9B	



Legend

- TBM4 — TEMPORARY BENCHMARK
- BM-1 — PERMANENT BENCHMARK
- 101 — COORDINATE POINT
- MONITORING WELL LOCATION
- PHOTOGRAPH LOCATION
- AREA OF ORANGE STAINING
- AREA OF MINOR SEEPAGE
- AREA OF MINOR EROSION
- AREA OF WATER DRAINAGE

RECORD DRAWING
NOT FOR CONSTRUCTION

Map Sources / Notes:
-Source drawing from UMA: C4-RD02.dwg
-Photograph numbers refer to those found in Appendix A2 - Visual Inspection Photographs

0 5 10 20 30 40 m

1 : 1000
UTM Zone 16W, NAD83

File Name:	C4-RD02.dwg		
Reviewed by:	DCJ	Prepared by:	KAB
Date Issued:	October, 2008	Project Number:	80-297

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2008 CAM-4 DEW Line Monitoring Program
CAM-4 Kugaaruk
Nunavut Territory

Station Area Non-Hazardous Waste Landfill

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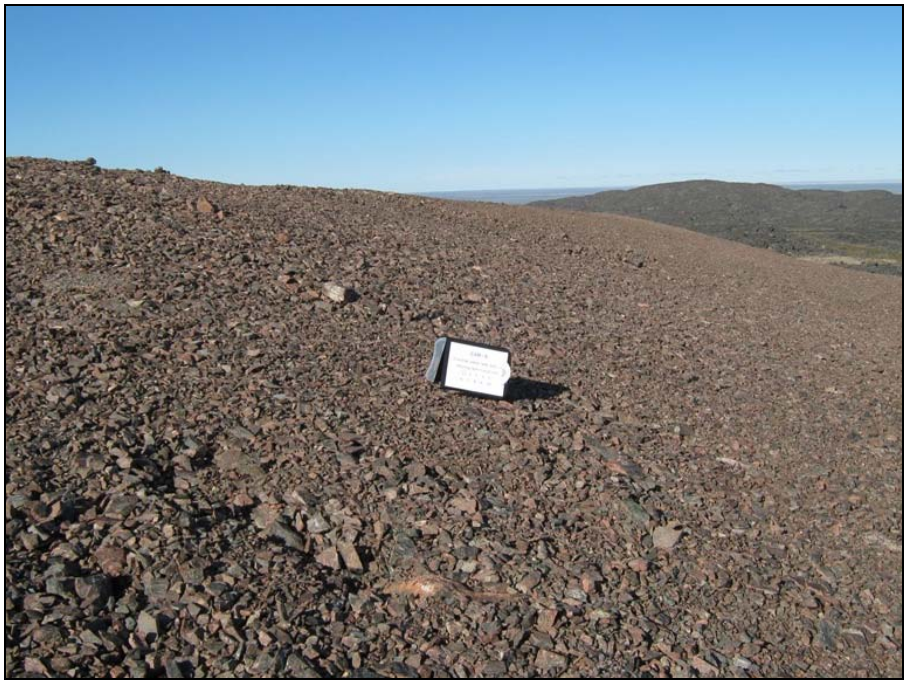
Figure A-1
Version 1

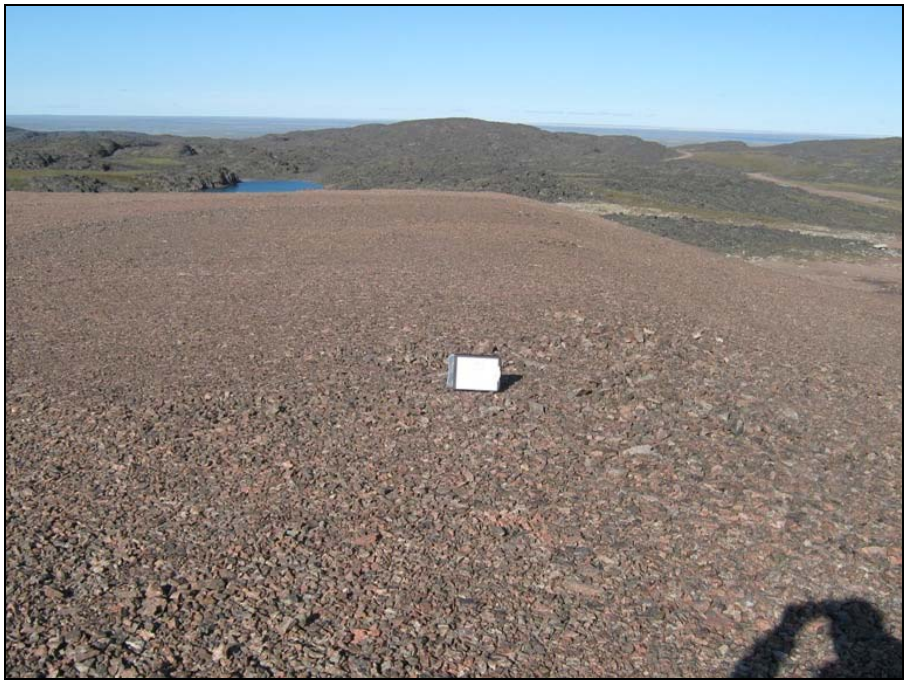
Date Plotted: October 16, 2006 Path: N:\Projects\20088\80297\2008\WorkInProgress\Documents\80297-4_CAM-4-FINAL-Report\ACAD_Files\C4-RD02.dwg

A2 – Geotechnical Inspection Photographic Records



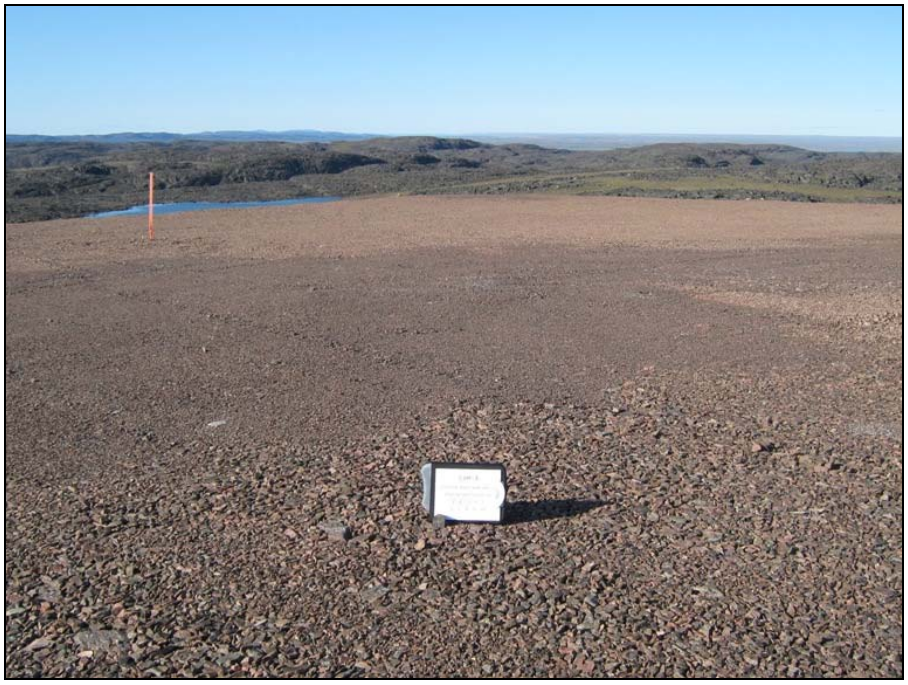
Photograph SNH-1A. Southwest corner at the toe, facing northeast. ↑

Photograph SNH-1B. Southwest corner at the toe, facing north. ↑



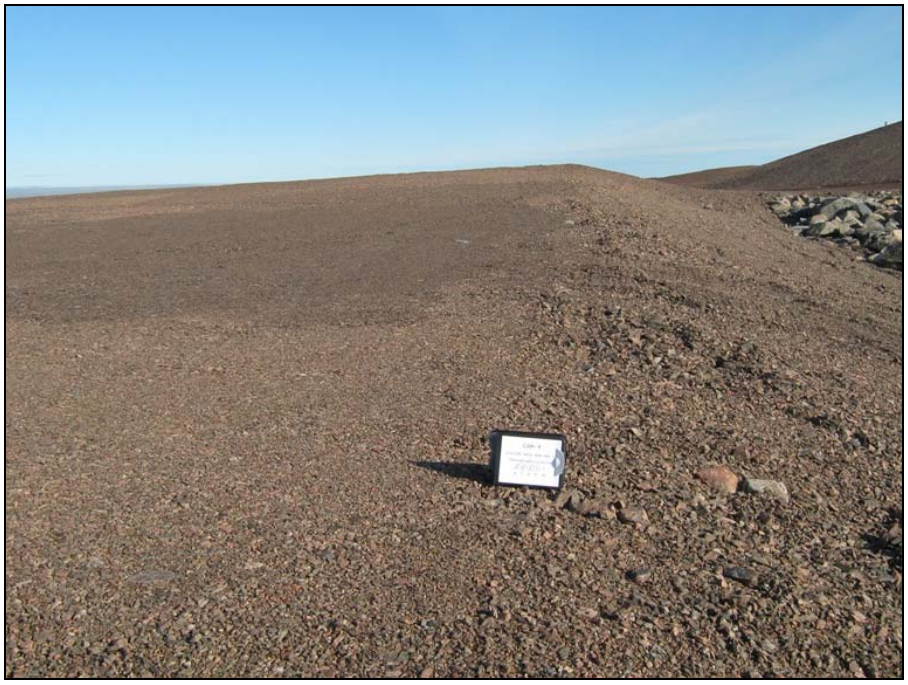
Photograph SNH-2A. Southwest corner at the crest facing northeast. Some tire tracks from a vehicle that tried to drive up onto the landfill near clipboard. ↑

Photograph SNH-2B. Southwest corner at the crest, facing north. ↑

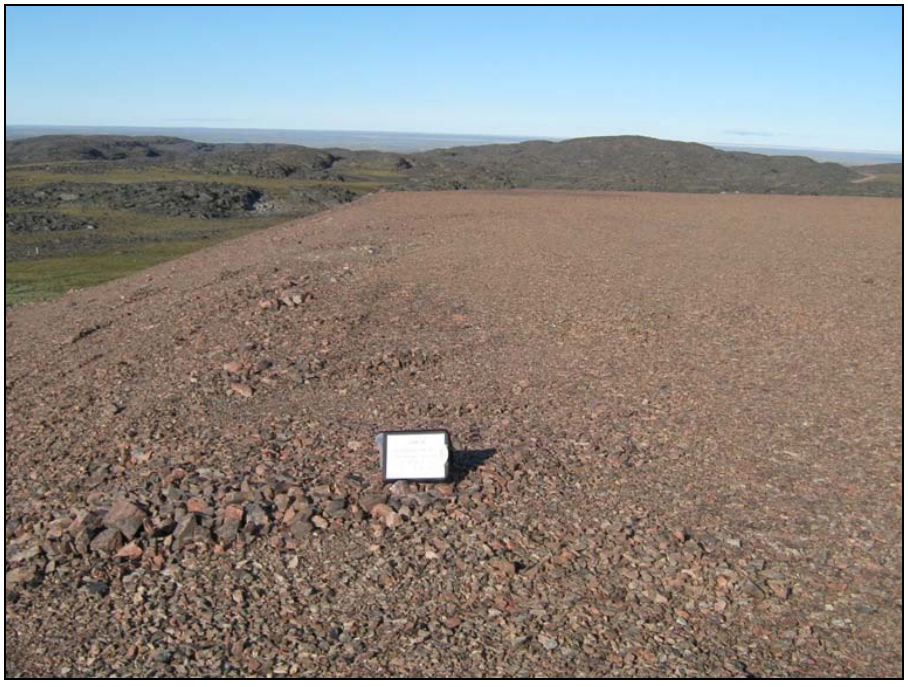


Photograph SNH-3A. Facing northeast over landfill surface. ↑

Photograph SNH-3B. Facing southeast over landfill top. ↑



Photograph SNH-4A. Northwest corner crest, facing south. ↑

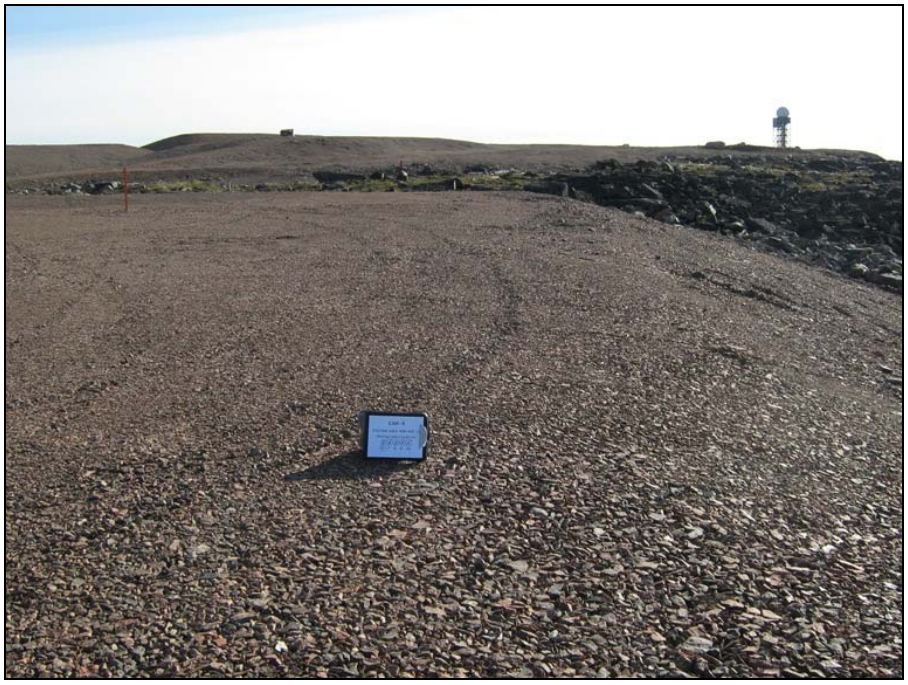


Photograph SNH-4B. Northwest corner crest, facing east. ↑

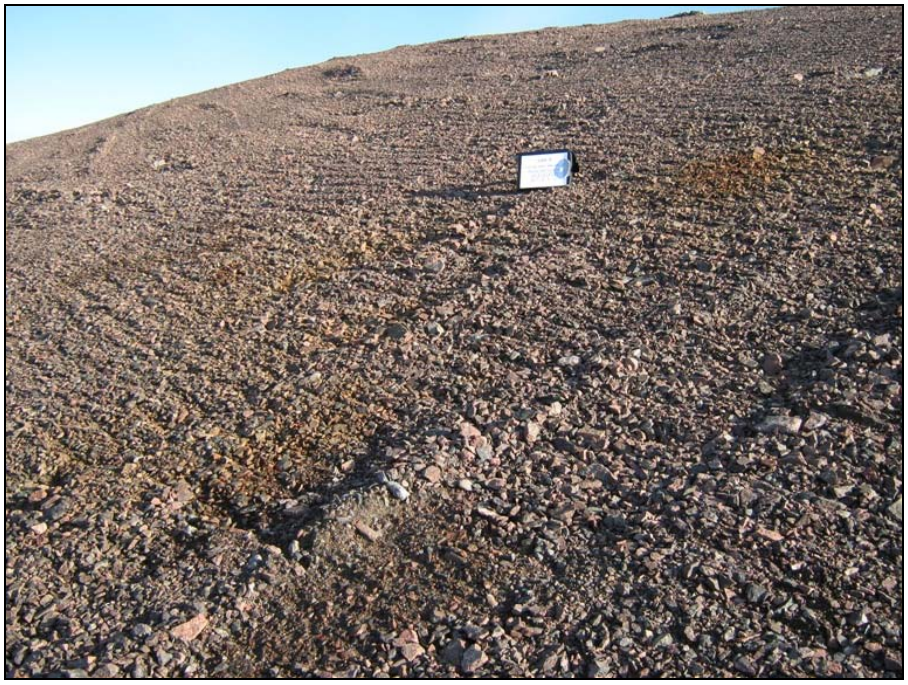
Photograph SNH-5. Panoramic of the north slope. ↑

Photograph SNH-6A. Northeast corner facing south. ↑

privileged and confidential



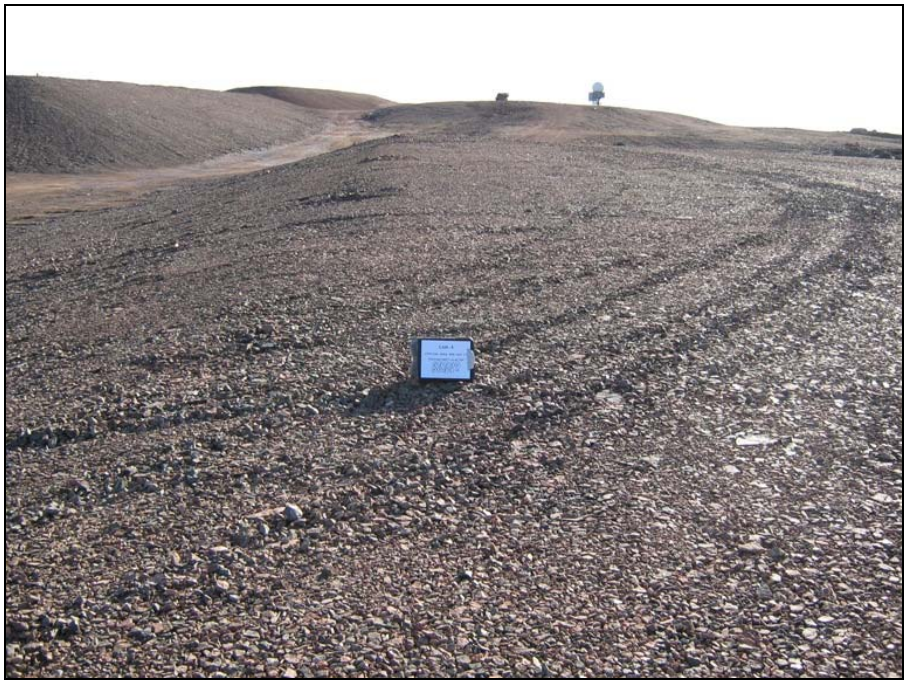
Photograph SNH-6B. Northeast corner facing west. ↑



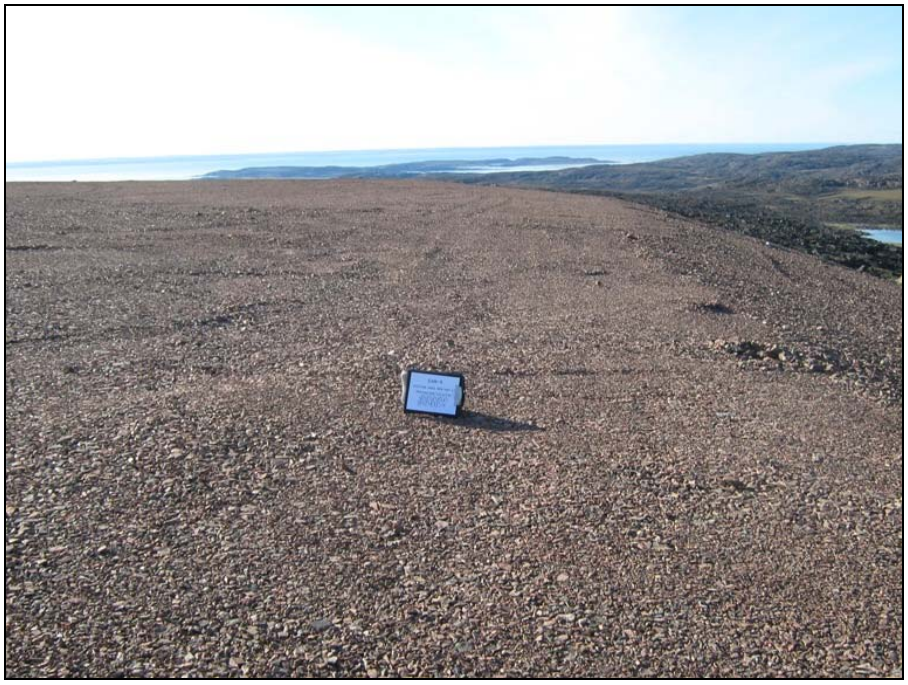
Photograph SNH-7A. Facing slope. Some seepage and orange staining over 10m x 10m area on lower half of east slope, towards the northeast corner toe. ↑

Photograph SNH-7B. Toe of slope near northeast corner. Orange staingin and seepage discharging onto rocks at toe of landfill. Down-slope of photo SNH-12. ↑

Photograph SNH-8. East slope. Area of possible minor erosion with gullies about 0.5m wide and less than 0.1m deep that appear to be self healing with larger rock in cover fill. ↑



Photograph SNH-9A. Facing west along south crest. ↑



Photograph SNH-9B. Facing north along east crest. Some tire tracks but no damage. ↑

privileged and confidential

Photograph SNH-10. Panoramic of the south face. Some seepage and drainage along road at toe. No staining. ↑

A3 – Field Notes

- STATION AREA NON-HAZ LANDFILL (SANH)
- STARTED INSPECTION AT 3:30PM

- SANH PHOTO LOC. 1 (WAYPOINT 25)
  - SOUTHWEST CORNER TOE
  - PHOTO 46 (FACING NE)
  - PHOTO 47 (FACING NORTH)
  - COARSE ROCK ON SLOPES
  - NO EROSION OR TENSION CRACKS OBSERVED

- SANH PHOTO 2 (WAYPOINT 26)
  - SOUTHWEST CORNER CREST
  - PHOTO 48 (FACING NE)
  - PHOTO 49 (FACING NORTH)
  - SOME TIRE TRACKS FROM A VEHICLE THAT TRIED TO DRIVE UP ONTO LANDFILL NEAR PHOTO SIGN FOR PHOTO 48

- SANH PHOTO 3 (WAYPOINT 27)
  - PHOTO 50 (FACING NE OVER LF SURFACE)
  - PHOTO 51 (FACING SE OVER LF TOP)
  - NO SIGNIFICANT SETTLEMENT OR CONCERN

STATION AREA NON-HAZ (PAGE 2)

- PHOTO LOC. 4 (WAYPOINT 28)
  - NORTHWEST CORNER CREST
  - PHOTO 52 (FACING SOUTH)
  - PHOTO 53 (FACING EAST)
  - PHOTO 54 (OCEAN IN DISTANCE)

- PHOTO LOC. 5 (WAYPOINT 29)
  - NORTH SLOPE
  - PHOTOS 55, 56 & 57 (PANORAMIC)
  - NO EROSION OR CRACKS OBSERVED
  - LARGE 1m DIA. ROCKS AT TOE
  - NO SEEPAGE OBSERVED

- PHOTO LOC. 6 (WAYPOINT 30-NE CORNER)
  - PHOTO 58 (FACING SOUTH)
  - PHOTO 59 (FACING WEST)

- PHOTO LOC. 7 (WAYPOINT 31)
  - PHOTO 60 (FACING SLOPE)
  - SOME SEEPAGE AND ORANGE STAINING OVER 10m x 10m AREA ON LOWER HALF OF EAST SLOPE TOWARDS NE CORNER TOE.

STATION AREA NON-HAZ (PAGE 3)

- PHOTO 61 (TOE OF SLOPE NEAR NE CORNER)
  - ORANGE STAINING AND SEEPAGE DISCHARGING ONTO ROCKS AT TOE OF LANDFILL
  - DOWNSLOPE OF PHOTO 60

- PHOTO LOC. 8 (WAYPOINT 32)
  - PHOTO 62 (EAST SLOPE)
  - AREA OF POSSIBLE MINOR EROSION WITH GULLIES ABOUT 0.5m WIDE AND LESS THAN 0.1m DEEP. THAT APPEAR TO BE SELF HEALING WITH LARGER ROCK IN COVER FILL

- PHOTO LOC. 9 (WAYPOINT 33)
  - PHOTO 63 (FACING WEST ALONG SOUTH COAST)
  - PHOTO 64 (FACING NORTH ALONG EAST COAST)
  - SOME TIRE TRACKS - NO DAMAGE

- PHOTO LOC. 10 (WAYPOINT 34 - SOUTH FACE)
  - PHOTOS 65, 66 & 67 (PANORAMIC)
  - SOME SEEPAGE AND DRAINAGE ALONG ROAD AT TOE, NO STAINING

Appendix B

DCC Tier II Soil Disposal Facility

- B1 – Site Condition/Visual Inspection Records
- B2 – Geotechnical Inspection Photographic Records
- B3 – Monitoring Photographic Records
- B4 – Monitoring Well Sampling Records
- B5 – Thermistor Maintenance Records
- B6 – Thermistor Graphs
- B7 – Field Notes

B1. Tier II Soil Disposal Facility

B1.1 Landfill Summary

The Tier II Soil Disposal Facility is located approximately 550 m west of the main facilities area. The landfill was constructed for disposal of Tier II soil excavated during the clean up. The location and plan of the Tier II Disposal Facility is presented in Figure B-1.

The landfill has a double containment system consisting of a geomembrane liner and placement of sufficient surface fill to promote permafrost aggradation through the landfill contents. The liner was placed across the bottom of the landfill, along the berms and over top of the landfilled material.

For 2008, the monitoring requirements for the Tier II Soil Disposal Facility included visual inspection, soil sampling, groundwater sampling and thermal monitoring.

B1.2 Visual Monitoring

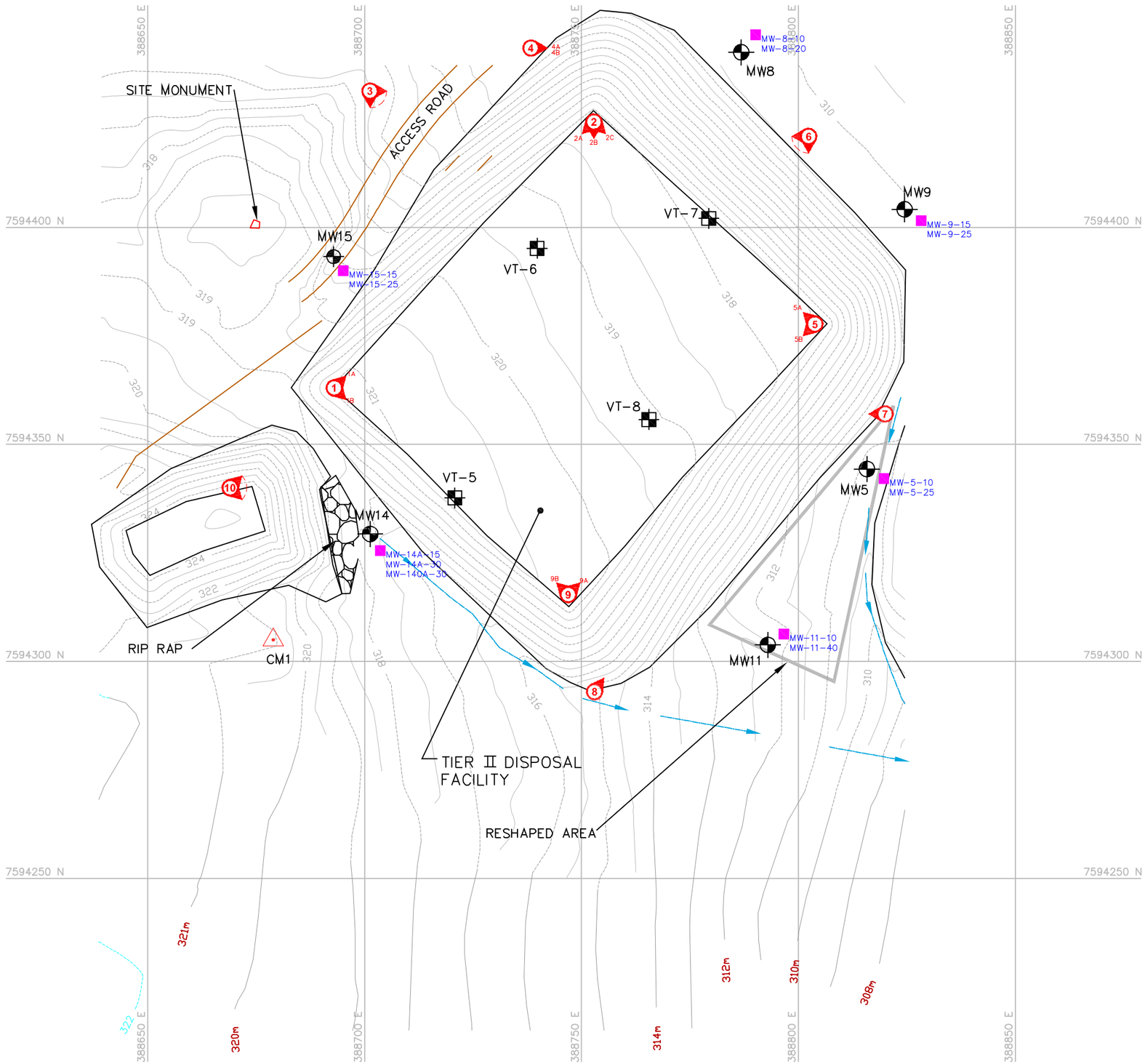
No significant erosion, settlement or indications of slope instability were observed at the Tier II Soil Disposal Facility. Overall landfill performance is assessed as “acceptable”. Appendix B1 presents a summary of the 2008 visual inspection results.

An area of minor orange staining was observed at the toe of the northeast slope (TII-4A in Appendix B2). Seepage was observed from the lower half of the northeast and southeast slopes (TII-6 and 7 in Appendix B2). No staining was observed on the slopes. Minor ponding of water and drainage was observed along the toes of the northwest, southeast and southwest slopes (TII-3, 9A and 10 in Appendix B2). No issues of concern that require immediate attention were identified.

B1.3 Soil Sampling

Soil samples were collected at the designated locations (BMW-3, MW-5, MW-8, MW-9, MW-14-A, MW-15 AND MW-16). Sampling locations are shown on Figure B-1. Two samples were collected at each station at depths of 0.10 – 0.15 m below ground surface and between 0.25 – 0.40 meters below ground surface. The photographs of each monitoring well and test pit location are included in Attachment B3.

No staining or free product was observed during the sampling event at the Tier II Soil Disposal Facility. There were no odours documented during the Tier II Disposal Facility sampling event, with the exception of one monitoring location, MW-16. An ambient hydrocarbon-like odour was detected during soil sampling at the MW-16 monitoring location.



Legend

- TBM4 — TEMPORARY BENCHMARK
- BM-1 — PERMANENT BENCHMARK
- 101 — COORDINATE POINT
- MW-11-10 / MW-11-40 — MONITORING SOIL SAMPLE LOCATION
- MONITORING WELL LOCATION
- VERTICAL THERMISTOR LOCATION
- 1 — PHOTOGRAPH LOCATION

RECORD DRAWING
NOT FOR CONSTRUCTION

Map Sources / Notes:
Source drawing from UMA: C4-RD03.dwg

0 5 10 20 30 40 m
1 : 1000
UTM Zone 16W, NAD83

File Name:	C4-RD03.dwg		
Reviewed by:	DCJ	Prepared by:	KAB
Date Issued:	October, 2008	Project Number:	80-297

Defence Construction Canada

2008 CAM-4 DEW LIne Monitoring Program
CAM-4 Kugaaruk
Nunavut Territory

DCC Tier II
Soil Disposal Facility

AECOM

Figure B-1
Version 1

Date Plotted: October 16, 2006 Path: N:\Projects\2008\80297\2008\WorkInProgress\DataInterpretation\CAD\CAM-4\C4-RD03.dwg

The laboratory analyses detected concentrations of TPH (C6-34) at monitoring locations MW-8, MW-9, MW-15 and MW-16. It is recommended that these results be evaluated in the context of the Landfill Monitoring Plan.

The analytical results and depths of samples are provided in Table B-1. The Laboratory Certificates of Analysis are provided in Appendix F.

B1.4 Groundwater Sampling

Groundwater measurements and monitoring system condition records were documented for observation wells BMW-3, MW-5, MW-8, MW-9, MW-14-A, MW-15 and MW-16. These records are provided in Attachment B4.

All groundwater monitoring wells slated for monitoring in 2008 at the Tier II Soil Disposal Facility contained sufficient volume for sampling. Samples were collected at a flow rate equal to the recharge rate of the monitoring well (and not exceeding 100mL/min). All monitors were sampled using a peristaltic pump and disposable LDPE tubing with the exception of BMW-3 and MW-16. The rechargeable battery provided with the peristaltic pump from the supplier proved to be faulty, thus monitors that were accessible by vehicle were sampled with the peristaltic pump runoff the vehicle battery. Monitors BMW-3 and MW-16 were not accessible by vehicle, therefore were purged and sampled using a disposable bailer.

Groundwater samples were not filtered and not preserved. Samples were analyzed for total concentration of inorganic metals, TPH (C6-C32) and PCB.

TPH (C6-C32) was detected in monitoring wells MW-5, MW-8, MW-9, MW-14-A, MW-15 and MW-16. The results should be evaluated in the context of the Landfill Monitoring Plan as well as compared with DCC internal standards.

The results are presented in Table B-2. The laboratory Certificates of Analysis are provided in Appendix F.

B1.5 Thermal Monitoring

All thermistors at the Tier II Soil Disposal Facility were in good condition. Thermistor data was downloaded on August 15, 2008, programming was checked and the data loggers were reset. The data logger clocks were adjusted to local (Standard Time). Battery charge was checked to ensure sufficient remaining charge and batteries were not changed in 2008.

Thermistor Maintenance Records were completed for all thermistors located at the Lower Landfill and are located in Appendix B5. Selected data has been plotted into graphs for each thermistor which are provided as Graphs B-1 through B-4 located in Appendix B6.

Table B-1. CAM-4 Kugaaruk, Summary of 2008 Soil Analysis - Tier II Soil Disposal Facility

Sample Ident.	Sample Location	Depth	Copper Cu	Nickel Ni	Cobalt Co	Cadmium Cd	Lead Pb	Zinc Zn	Chromium Cr	Arsenic As	Mercury Hg	PCB Total Aroclors	F1 C6-C10	F2 C10-C16	F3 C16-C34	TPH C6-34
		(m)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Upgradient Samples																
BMW-3-15	BMW-3	0.15	13.9	15.7	8.5	<0.50	9.3	44.0	31.8	<5.0	<0.0050	<0.050	<10	<30	<50	0
BMW-3-40	BMW-3	0.40	16.8	17.5	9.0	<0.50	10.9	53.7	35.0	<5.0	0.0086	<0.050	<10	<31	<51	0
BMW-30-40*	BMW-3	0.40	12.0	13.9	7.1	<0.50	8.0	38.3	28.4	<5.0	<0.0050	<0.050	<10	<30	<50	0
MW-14-A-15	MW-14-A	0.15	11.0	13.3	6.2	<0.50	8.0	33.2	28.0	<5.0	<0.0050	<0.050	<10	<30	<50	0
MW-14-A-30	MW-14-A	0.30	12.1	14.2	6.7	<0.50	8.3	35.8	28.1	<5.0	<0.0050	<0.050	<10	<30	<50	0
MW-140-A-30*	MW-14-A	0.30	11.8	13.9	6.1	<0.50	8.0	33.8	27.4	<5.0	<0.0050	<0.050	<10	<30	<50	0
MW-15-15	MW-15	0.15	9.8	9.4	6.5	<0.50	8.0	41.3	17.1	<5.0	<0.0050	<0.050	<10	118	235	353
MW-15-25	MW-15	0.25	11.2	9.3	7.0	<0.50	7.4	43.9	17.9	<5.0	<0.0050	<0.050	<10	119	302	421
MW-16-15	MW-16	0.15	14.2	16.0	7.8	<0.50	8.4	43.1	31.9	<5.0	<0.0050	<0.050	<10	286	133	419
MW-16-40	MW-16	0.40	12.3	15.2	7.8	<0.50	8.0	39.3	29.5	<5.0	<0.0050	<0.050	<10	49	<50	49
Downgradient Samples																
MW-5-10	MW-5	0.10	11.5	9.4	6.6	<0.50	6.6	33.0	18.3	<5.0	<0.0050	<0.050	<10	<30	<50	0
MW-5-25	MW-5	0.25	11.6	9.0	6.3	<0.50	6.8	33.5	19.0	<5.0	0.0051	<0.050	<10	<30	<50	0
MW-8-10	MW-8	0.10	11.9	10.6	6.8	<0.50	7.9	40.5	19.8	<5.0	<0.0050	<0.050	<10	<30	<50	0
MW-8-20	MW-8	0.20	11.9	10.6	6.4	<0.50	13.5	38.6	22.5	<5.0	0.0066	<0.050	<10	296	121	417
MW-9-15	MW-9	0.15	10.3	8.9	6.4	<0.50	11.6	35.6	18.1	<5.0	0.0070	<0.050	<10	<30	69	69
MW-9-25	MW-9	0.25	10.4	7.9	6.2	<0.50	9.7	35.6	16.6	<5.0	0.0056	<0.050	<10	<30	<50	0

***** *Denotes duplicate sample. (Further information located in Table 2 of main report)*

Note: mg/kg = ug/g

TPH is represented as the total of F1, F2 and F3 as defined by CCME Tier I Method - Rev. 5 Analysis of Petroleum Hydrocarbons in Soil

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Table B-2. CAM-4 Kugaaruk, Summary of 2008 Groundwater Analysis - Tier II Soil Disposal Facility

Sample Identification	Location	Groundwater Elevation (masl)	Copper Cu (mg/L)	Nickel Ni (mg/L)	Cobalt Co (mg/L)	Cadmium Cd (mg/L)	Lead Pb (mg/L)	Zinc Zn (mg/L)	Chromium Cr (mg/L)	Arsenic As (mg/L)	Mercury Hg (mg/L)	PCB Total Aroclors (mg/L)	F1 C6-C10 (mg/L)	F2 C10-C16 (mg/L)	F3 C16-C34 (mg/L)	TPH C6-34 (mg/L)
Upgradient Samples																
BMW-3	BMW-3	316.84	0.0155	0.0180	0.00817	0.000061	0.0091	0.0513	0.0437	0.00230	<0.000020	<0.0010	<0.10	<0.30	<0.30	0
MW-14A	MW-14A	317.24	0.0146	0.0091	0.00135	0.000067	0.00112	2.41	0.0100	0.00067	<0.000020	<0.0010	<0.10	<0.30	0.33	0.33
MW-15	MW-15	317.76	<0.0020	0.0065	0.00216	<0.000034	<0.0010	0.250	0.0024	0.0020	<0.000020	<0.0010	0.35	5.98	1.65	7.98
MW-150*	MW-15	317.76	<0.0020	0.0063	0.00208	<0.000034	<0.0010	0.239	<0.0030	0.0020	<0.000020	<0.0010	0.33	5.15	1.40	6.88
MW-16	MW-16	312.96	0.0040	0.0120	0.00210	0.000082	0.00056	0.0149	0.0025	0.00076	<0.000020	<0.0010	2.23	76.7	8.01	86.94
Downgradient Samples																
MW-5	MW-5	310.34	0.0043	0.0086	0.00030	0.000039	0.00142	0.0366	0.0051	<0.00050	<0.000020	<0.0010	<0.10	<0.30	0.33	0.33
MW-8	MW-8	310.20	0.0228	0.0268	0.0031	0.000170	<0.0025	0.0391	<0.0050	<0.0025	<0.000020	<0.0010	2.89	8.17	1.84	12.9
MW-9	MW-9	310.14	0.0071	0.0079	<0.0015	<0.000085	<0.0025	0.0382	0.0183	<0.0025	<0.000020	<0.0010	<0.10	0.44	0.63	1.07

***** *Denotes duplicate sample. (Further information located in Table 2 of main report)*

Note: mg/L = 1000 ug/L

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B1 – Site Condition/Visual Inspection Records

Visual Inspection Checklist
Inspection Report – Page 1 of 2

SITE NAME:	CAM-4 - Pelly Bay
LANDFILL/AREA DESIGNATION:	DCC Tier II Soil Disposal Facility
DATE OF INSPECTION:	August 14, 2008
DATE OF PREVIOUS INSPECTION:	August 24 - 26, 2007
INSPECTED BY:	Darrin Johnson, P.Eng.
REPORT PREPARED BY:	Darrin Johnson, P.Eng.

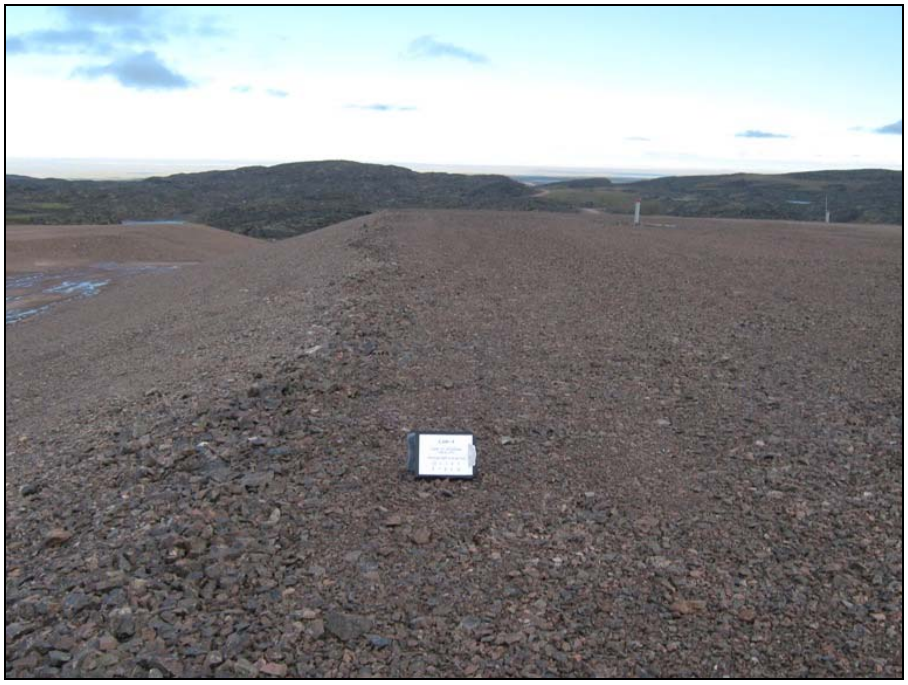
The preparer represents to the best of the preparer's knowledge, the following statements and observations are true and correct and to the best of the preparer's actual knowledge, no material facts have been suppressed or misstated.

Preliminary Stability Assessment

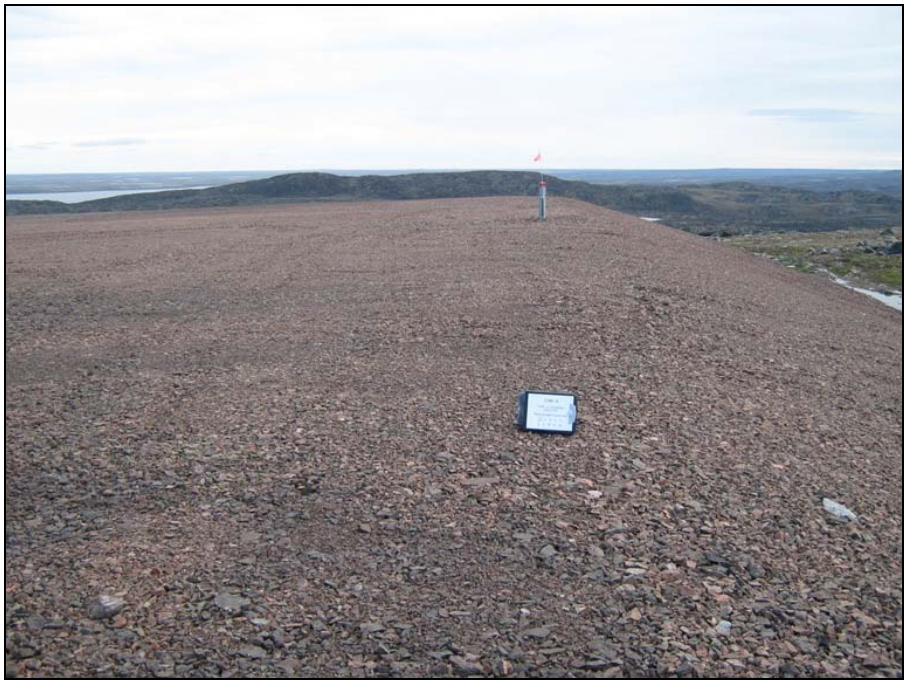
Feature	Severity Rating	Extent
Settlement	Not observed	None
Erosion	Not observed	None
Frost Action	Not observed	None
Animal Burrows	Not observed	None
Vegetation	Not observed	None
Staining	Acceptable	Isolated
Vegetation Stress	Not observed	None
Seepage Points	Acceptable	Occasional
Debris Exposed	Not observed	None
Tension Crack	Not observed	None
Overall Landfill Performance	Acceptable	

Checklist Item	Present Yes/No	Location	Dimensions (L x W) (m)	Depth (m)	Extent (%)	Description	Photographic Records (Photos referenced in photolog and in figures)	Additional Comments/ Preliminary Stability Assessment
Settlement	No							
Erosion	No							
Frost Action	No							
Animal Burrows	No							
Vegetation	No							
Staining	Yes	Northeast toe	10 m x 10 m	N/A	1%	Orange staining at toe of slope.	TII-4A	Acceptable
Vegetation Stress	No							
Seepage Points	Yes	Lower half of northeast and southeast slopes.	60 m x 10 m	N/A	6%	Some seepage from lower half of slope. No staining on slopes observed.	TII-6 and TII-7	Acceptable
Debris Exposed	No							
Presence/ Condition of Monitoring Instruments	Good							
Other Features of Note.	Yes	Ponded water along toes of northwest, southeast and southwest slopes.	50m x 5m x3	N/A	8%	Minor ponding of water and drainage along toe.	TII-3, 9A, 10	Acceptable
Additional Photos							TII-1A, 1B, 2A, 2B, 2C, 4B, 5A, 5B, 8, 9B	

B2 – Geotechnical Inspection Photographic Records



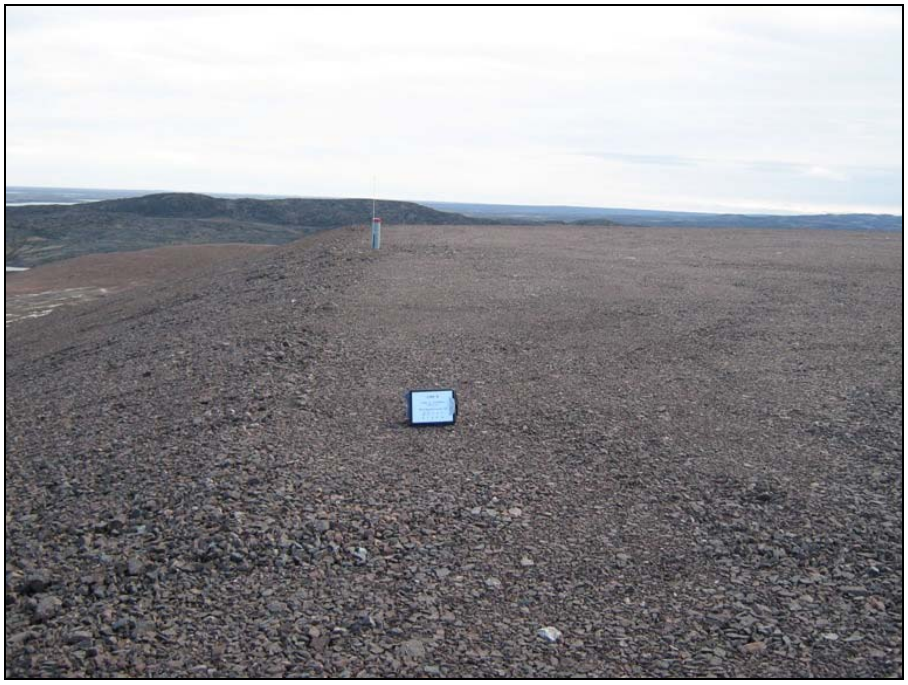
Photograph TII-1A. Northwest corner of landfill facing east along crest. ↑



Photograph TII-1B. Northwest corner of landfill facing south along crest. ↑

Photograph TII-2A. Northeast corner of landfill facing west. ↑

Photograph TII-2B. Northeast corner of landfill facing southwest. ↑

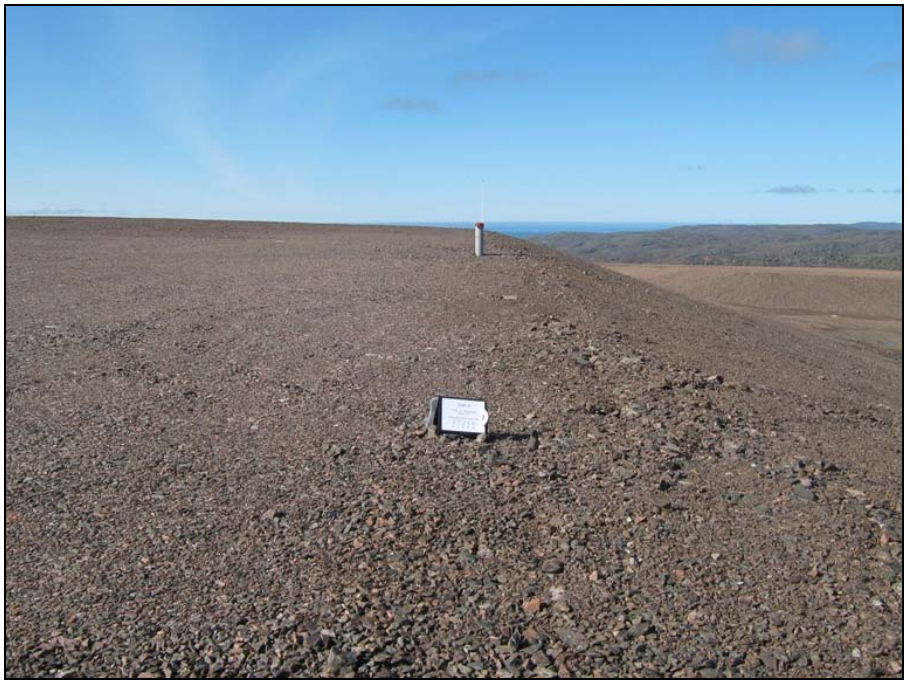


Photograph TII-2C. Northeast corner of landfill facing south. ↑

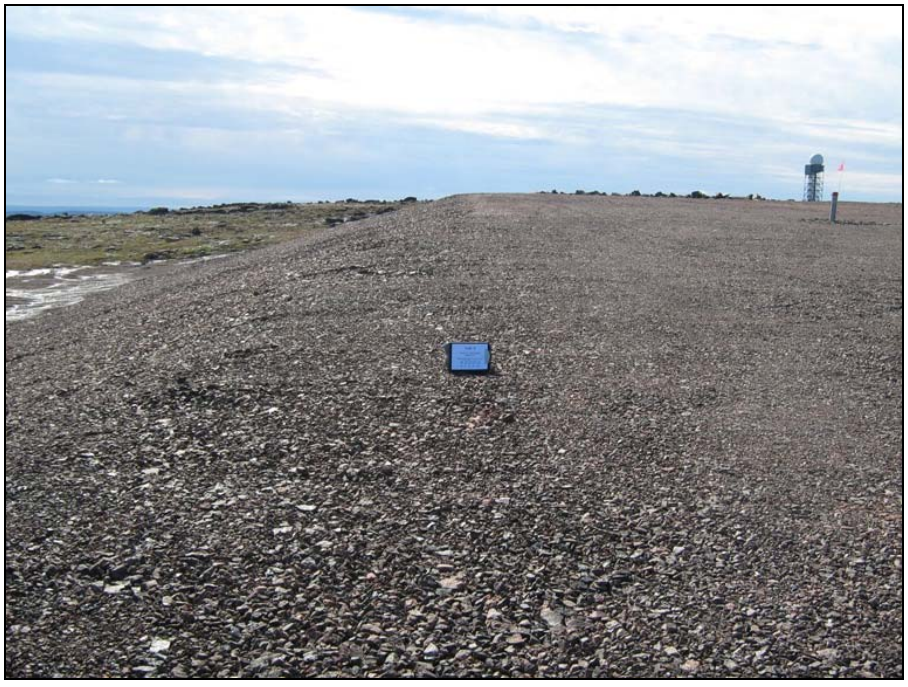
Photograph TII-3. Panoramic photo of the north slope. ↑

Photograph TII-4A. At the northeast toe. Some seepage with orange staining. Some water drainage along the road at the toe. ↑

Photograph TII-4B. Northeast corner and toe. ↑



Photograph TII-5A. Southeast crest facing north. ↑

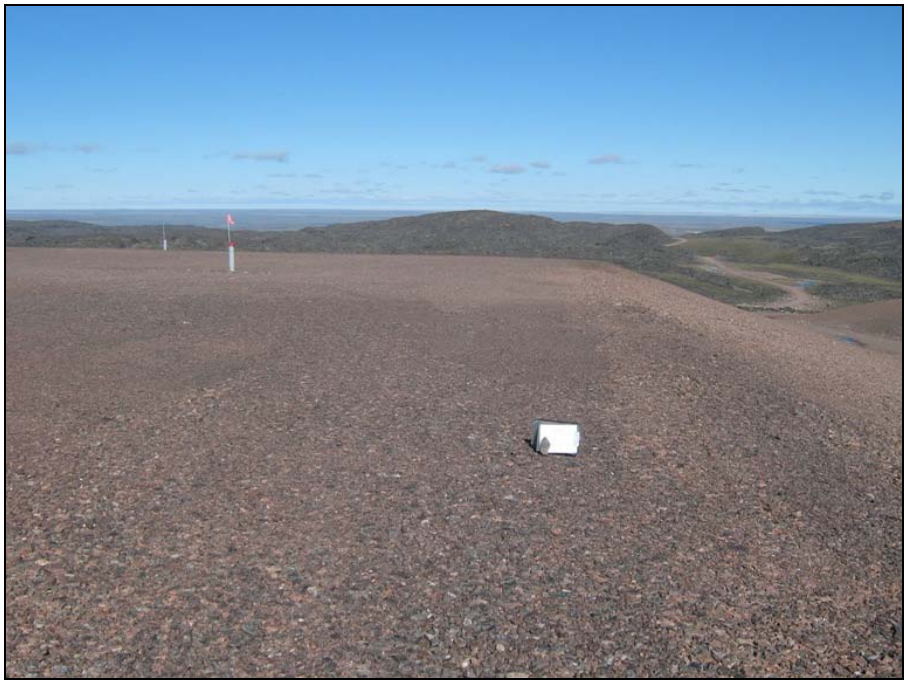


Photograph TII-5B. Southeast crest facing west. Some coarse rockfill along crest edge but there does not appear to be tension cracks. ↑

Photograph TII-6. Panoramic photo of the southeast slope. Some water seeping out of slope face. No staining. ↑

Photograph TII-7. South slope from southeast toe facing west. Some seepage from south slope and minor ponding at toe. No staining. ↑

Photograph TII-8. South slope from southwest toe facing east. ↑



Photograph TII-9A. Facing east along crest from the southwest corner of the landfill. ↑

Photograph TII-9B. Facing north along crest from the southwest corner of the landfill. Some ponded water along toe. No staining. ↑

Photograph TII-10. Panoramic photo of Tier II landfill facing east from raised gravel pad. ↑

B3 – Monitoring Photographic Records

Photograph 1. Monitoring Location BMW-3 (Upgradient) Facing South. ↑

Photograph 2. Monitoring Location MW-14-A (Upgradient). Facing North. ↑

Photograph 3. Monitoring Location MW-15 (Upgradient). Facing East. ↑

Photograph 4. Monitoring Location MW-16 (Upgradient). Facing South. ↑

Photograph 5. Monitoring Location MW-5 (Downgradient). Facing Northwest. ↑

Photograph 6. Monitoring Location MW-8 (Downgradient). Facing Northwest. ↑

Photograph 7. Monitoring Location MW-9 (Downgradient). Facing North. ↑

B4 – Monitoring Well Sampling Records

2008 Monitoring Well Sampling Log (BMW-3)

Site name:	CAM-4
Date of sampling event:	14-17 Aug 2008
Names of samplers:	TFB
Monitoring well ID:	BMW-3
Facility:	Tier II Soil Disposal Facility

Known Data

Depth of installation* (m):	3.45
Length of screened section (m):	2.03
Depth to top of screen* (m):	0.46

Measured Data

Condition of well:	Good	Procedure/Equipment:	Interface Meter
Procedure/Equipment:	Interface Meter	Depth to water surface (m):	0.92
Well height above ground (m):	0.76	Depth to bottom (m):	2.25
Diameter of well (m):	0.05	Free product thickness (mm):	-

Calculations

Depth of water (m):	1.33
Well volume of water (L):	2.61
Static water level* (m):	0.16
Length of screen collecting water (m):	1.03

Notes

Evidence of sludge:	-
Evidence of freezing/siltation:	-

Development/Purging Information

Equipment:	Disposable Bailer, Horiba U-22

Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (µS/cm)	Turbidity (NTU)	Description of Water
16-Aug-08	3	2.81	8.73	0.504	-	Silty, greyish brown, N/O

Water Sampling

Date & Time Collected:	16-Aug-08
Sample Number - Water:	BMW-3
Sample Containers:	3 x 0.5L Amber Glass 2 x VOC vials
Procedure/Equipment:	Disposable Bailer
Water Description:	Silty, greyish brown, N/O
Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	1
Number Rinses:	2

Soil Sampling

Date and Time Collected:	14-Aug-08
Sample Number - Soil:	BMW-3-15 BMW-3-40 Dup BMW-30-40
Sample Containers:	8 x 250mL Glass
Procedure/Equipment:	SS Trowel
Soil Description:	Greyish brown silt till, some gravel.
Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	2
Number Rinses:	2

*From ground surface. Unless this is stated, all measurments are assumed to be from the top of the casing.
n/a=not applicable
LDPE=Low Density Polyethylene
SS=Stainless Steel

AECOM

2008 Monitoring Well Sampling Log (MW-5)

Site name:	CAM-4
Date of sampling event:	14-17 Aug 2008
Names of samplers:	TFB
Monitoring well ID:	MW-5
Facility:	Tier II Soil Disposal Facility

Known Data

Depth of installation* (m):	3.60
Length of screened section (m):	2.03
Depth to top of screen* (m):	0.60

Measured Data

Condition of well:	Good	Procedure/Equipment:	Interface Meter
Procedure/Equipment:	Interface Meter	Depth to water surface (m):	1.17
Well height above ground (m):	0.60	Depth to bottom (m):	3.25
Diameter of well (m):	0.05	Free product thickness (mm):	-

Calculations

Depth of water (m):	2.08
Well volume of water (L):	4.08
Static water level* (m):	0.57
Length of screen collecting water (m):	2.05

Notes

Evidence of sludge:	-
Evidence of freezing/siltation:	-

Development/Purging Information

Equipment: Peristaltic Pump, Horiba U-22 with flow through cell, LDPE

Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (µS/cm)	Turbidity (NTU)	Description of Water
16-Aug-08	4.8	2.05	7.32	0.887	6.1	C&C, Slight chemical odour

Water Sampling

Date & Time Collected:	15-Aug-08
Sample Number - Water:	MW-5
Sample Containers:	3 x 0.5L Amber Glass
	2 x VOC vials
Procedure/Equipment:	Peristaltic Pump, Horiba U-22
Water Description:	C&C, Slight chemical odour
Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	1
Number Rinses:	2

Soil Sampling

Date and Time Collected:	14-Aug-08
Sample Number - Soil:	MW-5-10
Refusal @ 0.25 m	MW-5-25
Sample Containers:	4 x 250mL Glass
Procedure/Equipment:	SS Trowel
Soil Description:	Greyish brown silt till, some gravel.
Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	2
Number Rinses:	2

*From ground surface. Unless this is stated, all measurments are assumed to be from the top of the casing.
n/a=not applicable
LDPE=Low Density Polyethylene
SS=Stainless Steel

AECOM

2008 Monitoring Well Sampling Log (MW-8)

Site name:	CAM-4
Date of sampling event:	14-17 Aug 2008
Names of samplers:	TFB
Monitoring well ID:	MW-8
Facility:	Tier II Soil Disposal Facility

Known Data

Depth of installation* (m):	4.08
Length of screened section (m):	2.01
Depth to top of screen* (m):	0.97

Measured Data

Condition of well:	Good	Procedure/Equipment:	Interface Meter
Procedure/Equipment:	Interface Meter	Depth to water surface (m):	0.97
Well height above ground (m):	0.97	Depth to bottom (m):	2.45
Diameter of well (m):	0.05	Free product thickness (mm):	-

Calculations

Depth of water (m):	1.48
Well volume of water (L):	2.91
Static water level* (m):	0.00
Length of screen collecting water (m):	0.51

Notes

Evidence of sludge:	-
Evidence of freezing/siltation:	-

Development/Purging Information

Equipment: Peristaltic Pump, Horiba U-22 with flow through cell, LDPE

Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (µS/cm)	Turbidity (NTU)	Description of Water
16-Aug-08	3	3.7	7.01	1150	10.7	C&C Chemical odour

Water Sampling

Date & Time Collected:	16-Aug-08
Sample Number - Water:	MW-8
Sample Containers:	3 x 0.5L Amber Glass 2 x VOC vials
Procedure/Equipment:	Peristaltic Pump, Horiba U-22
Water Description:	C&C, Chemical Odour
Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	1
Number Rinses:	2

Soil Sampling

Date and Time Collected:	14-Aug-08
Sample Number - Soil:	MW-8-10 MW-8-20
Sample Containers:	4 x 250mL Glass
Procedure/Equipment:	SS Trowel
Soil Description:	Brown sandy silt till, some gravel.
Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	2
Number Rinses:	3

*From ground surface. Unless this is stated, all measurments are assumed to be from the top of the casing.
n/a=not applicable
LDPE=Low Density Polyethylene
SS=Stainless Steel

AECOM

2008 Monitoring Well Sampling Log (MW-9)

Site name:	CAM-4
Date of sampling event:	14-17 Aug 2008
Names of samplers:	TFB
Monitoring well ID:	MW-9
Facility:	Tier II Soil Disposal Facility

Known Data

Depth of installation* (m):	3.32
Length of screened section (m):	2.01
Depth to top of screen* (m):	0.40

Measured Data

Condition of well:	Good	Procedure/Equipment:	Interface Meter
Procedure/Equipment:	Interface Meter	Depth to water surface (m):	0.29
Well height above ground (m):	0.33	Depth to bottom (m):	1.98
Diameter of well (m):	0.05	Free product thickness (mm):	-

Calculations

Depth of water (m):	1.69
Well volume of water (L):	3.32
Static water level* (m):	-0.04
Length of screen collecting water (m):	1.25

Notes

Evidence of sludge:	-
Evidence of freezing/siltation:	-

Development/Purging Information

Equipment: Peristaltic Pump, Horiba U-22 with flow through cell, LDPE

Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (µS/cm)	Turbidity (NTU)	Description of Water
15-Aug-08	4	2.62	11.34	1060	41.3	C&C Chemical odour

Water Sampling

Date & Time Collected:	16-Aug-08
Sample Number - Water:	MW-9
Sample Containers:	3 x 0.5L Amber Glass
	2 x VOC vials
Procedure/Equipment:	Peristaltic Pump, Horiba U-22
Water Description:	C&C Chemical odour
Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	1
Number Rinses:	2

Soil Sampling

Date and Time Collected:	14-Aug-08
Sample Number - Soil:	MW-9-15
Refusal @ 0.25 m	MW-9-25
Sample Containers:	4 x 250mL Glass
Procedure/Equipment:	SS Trowel
Soil Description:	Brown sandy silt till, some gravel.
Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	2
Number Rinses:	3

*From ground surface. Unless this is stated, all measurments are assumed to be from the top of the casing.
n/a=not applicable
LDPE=Low Density Polyethylene
SS=Stainless Steel

AECOM

2008 Monitoring Well Sampling Log (MW-14-A)

Site name:	CAM-4
Date of sampling event:	14-17 Aug 2008
Names of samplers:	TFB
Monitoring well ID:	MW-14-A
Facility:	Tier II Soil Disposal Facility

Known Data

Depth of installation* (m):	4.66
Length of screened section (m):	2.03
Depth to top of screen* (m):	1.67

Measured Data

Condition of well:	Good	Procedure/Equipment:	Interface Meter
Procedure/Equipment:	Interface Meter	Depth to water surface (m):	1.07
Well height above ground (m):	0.51	Depth to bottom (m):	2.47
Diameter of well (m):	0.05	Free product thickness (mm):	-

Calculations

Depth of water (m):	1.40
Well volume of water (L):	2.75
Static water level* (m):	0.56
Length of screen collecting water (m):	0.29

Notes

Evidence of sludge:	-
Evidence of freezing/siltation:	-

Development/Purging Information

Equipment: Peristaltic Pump, Horiba U-22 with flow through cell, LDPE

Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (µS/cm)	Turbidity (NTU)	Description of Water
16-Aug-08	3	1.01	6.73	0.95	-	Grey, slightly cloudy N/O

Water Sampling

Date & Time Collected:	16-Aug-08
Sample Number - Water:	MW-14-A
Sample Containers:	3 x 0.5L Amber Glass
	2 x VOC vials
Procedure/Equipment:	Peristaltic Pump, Horiba U-22
Water Description:	Grey, slightly cloudy, N/O
Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	2
Number Rinses:	2

Soil Sampling

Date and Time Collected:	14-Aug-08
Sample Number - Soil:	MW-14-A-15
Refusal @ 0.30 m	MW-14-A-30
Dup	MW-140-A-30
Sample Containers:	8 x 250mL Glass
Procedure/Equipment:	SS Trowel
Soil Description:	Brown sandy silt till.
Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	2
Number Rinses:	2

*From ground surface. Unless this is stated, all measurments are assumed to be from the top of the casing.
n/a=not applicable
LDPE=Low Density Polyethylene
SS=Stainless Steel

AECOM

2008 Monitoring Well Sampling Log (MW-15)

Site name:	CAM-4
Date of sampling event:	14-17 Aug 2008
Names of samplers:	TFB
Monitoring well ID:	MW-15
Facility:	Tier II Soil Disposal Facility

Known Data

Depth of installation* (m):	3.25
Length of screened section (m):	1.97
Depth to top of screen* (m):	0.33

Measured Data

Condition of well:	Good	Procedure/Equipment:	Interface Meter
Procedure/Equipment:	Interface Meter	Depth to water surface (m):	0.45
Well height above ground (m):	0.51	Depth to bottom (m):	2.45
Diameter of well (m):	0.05	Free product thickness (mm):	-

Calculations

Depth of water (m):	2.00
Well volume of water (L):	3.93
Static water level* (m):	-0.06
Length of screen collecting water (m):	1.61

Notes

Evidence of sludge:	-
Evidence of freezing/siltation:	-

Development/Purging Information

Equipment: Peristaltic Pump, Horiba U-22 with flow through cell, LDPE

Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (µS/cm)	Turbidity (NTU)	Description of Water
16-Aug-08	4.5	2.08	6.31	0.846	13.5	Clear, slightly yellow Chemical odour

Water Sampling

Date & Time Collected:	16-Aug-08
Sample Number - Water:	MW-15
Dup	MW-150
Sample Containers:	6 x 0.5L Amber glass
	4 x VOC vials
2 x 1L Amber glass	1 x 0.25L Plastic
Procedure/Equipment:	Peristaltic Pump, Horiba U-22
Water Description:	Clear, slightly yellow, chemical odour
Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	2
Number Rinses:	2

Soil Sampling

Date and Time Collected:	14-Aug-08
Sample Number - Soil:	MW-15-15
Refusal @ 0.25 m	MW-15-25
Sample Containers:	4 x 250mL Glass
Procedure/Equipment:	SS Trowel
Soil Description:	Brown sandy silt till, some gravel.
Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	2
Number Rinses:	2

*From ground surface. Unless this is stated, all measurments are assumed to be from the top of the casing.
n/a=not applicable
LDPE=Low Density Polyethylene
SS=Stainless Steel

AECOM

2008 Monitoring Well Sampling Log (MW-16)

Site name:	CAM-4
Date of sampling event:	14-17 Aug 2008
Names of samplers:	TFB
Monitoring well ID:	MW-16
Facility:	Tier II Soil Disposal Facility

Known Data

Depth of installation* (m):	Data not available
Length of screened section (m):	
Depth to top of screen* (m):	

Measured Data

Condition of well:	Good	Procedure/Equipment:	Interface Meter
Procedure/Equipment:	Interface Meter	Depth to water surface (m):	1.34
Well height above ground (m):	0.60	Depth to bottom (m):	3.00
Diameter of well (m):	0.05	Free product thickness (mm):	-

Calculations

Depth of water (m):	1.66
Well volume of water (L):	3.30
Static water level* (m):	0.74
Length of screen collecting water (m):	

Notes

Evidence of sludge:	-
Evidence of freezing/siltation:	-

Development/Purging Information

Equipment:	Disposable Bailer, Horiba U-22

Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (µS/cm)	Turbidity (NTU)	Description of Water
16-Aug-08	4	1.7	6.9	0.544	54	C&C, sheen on surface Hydrocarbon odour

Water Sampling

Date & Time Collected:	16-Aug-08
Sample Number - Water:	MW-16
Sample Containers:	3 x 0.5L Amber Glass
	2 x VOC vials
Procedure/Equipment:	Disposable Bailer
Water Description:	C&C, sheen on surface, Hydrocarbon odour
Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	2
Number Rinses:	3

Soil Sampling

Date and Time Collected:	14-Aug-08
Sample Number - Soil:	MW-16-15
Refusal @ 0.40 m	MW-16-40
Sample Containers:	4 x 250mL Glass
Procedure/Equipment:	SS Trowel
Soil Description:	Brown, sandy silt till
Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	3
Number Rinses:	3

*From ground surface. Unless this is stated, all measurments are assumed to be from the top of the casing.
n/a=not applicable
LDPE=Low Density Polyethylene
SS=Stainless Steel

AECOM

B5 – Thermistor Maintenance Records

Thermal Monitoring
Ground Temperature Annual Maintenance Report

Contarctor Name:	**AECOM**	Inspection Date:	**15-Aug-08**
Prepared By:	**Darrin Johnson**		

Thermistor Information

Site Name:	**CAM-4**		Thermistor Location	**Tier II Disposal Facility**			
Thermistor Number:	**VT05**		Inclination	**Vertical**			
Install Date:	**13-Aug-06**		First Date Event	**27-Aug-07**	Last Date Event	**15-Aug-08**	
Coordinates and Elevation	N		E		Elev	**320.975**	
Length of Cable (m)	**7.7**	Cable Lead Above Ground (m)	**1.2**	Nodal Points	**13**		
Datalogger Serial #	**111092**			Cable Serial Number		**1616**	

Code CAM-4VT05

Thermistor Inspection

	Good	Needs Maintenance
Casing	☑	☐
Cover	☑	☐
Data Logger	☑	☐
Cable	☑	☐
Beads	☑	☐

Battery Installation Date: **Batteries not replaced in 2008.**

Battery Levels: Main **11.34 V** Aux **13.14 V**

Manual Ground Temperature Readings

Bead	ohms	Temp. (ºC)
1		**8.4**
2		**10.9**
3		**3.4**
4		**1.4**
5		**-0.5**
6		**-2.3**
7		**-3.4**
8		**-4.4**

Bead	ohms	Temp. (ºC)
9		**-5.5**
10		**-6.4**
11		**-7.1**
12		**-7.9**
13		**-8.0**

Observations and Proposed Maintenance

Lock lubricated.

Thermal Monitoring
Ground Temperature Annual Maintenance Report

Contarctor Name:	**AECOM**	Inspection Date:	**15-Aug-08**
Prepared By:	**Darrin Johnson**		

Thermistor Information

Site Name:	**CAM-4**	Thermistor Location	**Tier II Disposal Facility**		
Thermistor Number:	**VT06**	Inclination	**Vertical**		
Install Date:	**13-Aug-06**	First Date Event	**27-Aug-07**	Last Date Event	**15-Aug-08**
Coordinates and Elevation	N		E	Elev	**319.3**
Length of Cable (m)	**6.2**	Cable Lead Above Ground (m)	**1.2**	Nodal Points	**10**
Datalogger Serial #	**111102**			Cable Serial Number	**1620**

Code CAM-4VT06

Thermistor Inspection

	Good	Needs Maintenance
Casing	☑	☐
Cover	☑	☐
Data Logger	☑	☐
Cable	☑	☐
Beads	☑	☐

Battery Installation Date: **Batteries not replaced in 2008.**

Battery Levels: Main **11.43 V** Aux **13.02 V**

Manual Ground Temperature Readings

Bead	ohms	Temp. (ºC)
1		**9.9**
2		**9.4**
3		**4.9**
4		**3.1**
5		**0.2**
6		**-1.5**
7		**-3.0**
8		**-4.3**

Bead	ohms	Temp. (ºC)
9		**-5.4**
10		**-5.6**

Observations and Proposed Maintenance

Lock lubricated.

Thermal Monitoring
Ground Temperature Annual Maintenance Report

Contarctor Name:	**AECOM**	Inspection Date:	**15-Aug-08**
Prepared By:	**Darrin Johnson**		

Thermistor Information

Site Name:	**CAM-4**		Thermistor Location	**Tier II Disposal Facility**			
Thermistor Number:	**VT07**		Inclination	**Vertical**			
Install Date:	**13-Aug-06**		First Date Event	**27-Aug-07**	Last Date Event		**15-Aug-08**
Coordinates and Elevation	N		E		Elev		**317.825**
Length of Cable (m)	**9.45**	Cable Lead Above Ground (m)	**1.5**	Nodal Points	**16**		
Datalogger Serial #	**209067**			Cable Serial Number			**1624**

Code CAM-4VT07

Thermistor Inspection

	Good	Needs Maintenance
Casing	☑	☐
Cover	☑	☐
Data Logger	☑	☐
Cable	☑	☐
Beads	☑	☐

Battery Installation Date: **Batteries not replaced in 2008.**

Battery Levels: Main **11.34 V** Aux **13.14 V**

Manual Ground Temperature Readings

Bead	ohms	Temp. (ºC)
1		**4.6**
2		**2.4**
3		**-0.4**
4		**-2.0**
5		**-3.3**
6		**-4.5**
7		**-5.5**
8		**-6.5**

Bead	ohms	Temp. (ºC)
9		**-7.4**
10		**-8.1**
11		**-8.7**
12		**-9.3**
13		**-9.7**
14		**-10.0**
15		**-9.8**
16		**-9.4**

Observations and Proposed Maintenance

Lock lubricated.

Thermal Monitoring
Ground Temperature Annual Maintenance Report

Contarctor Name:	**AECOM**	Inspection Date:	**15-Aug-08**
Prepared By:	**Darrin Johnson**		

Thermistor Information

Site Name:	**CAM-4**	Thermistor Location	**Tier II Disposal Facility**		
Thermistor Number:	**VT08**	Inclination	**Vertical**		
Install Date:	**13-Aug-06**	First Date Event	**27-Aug-07**	Last Date Event	**15-Aug-08**
Coordinates and Elevation	N		E	Elev	**319.18**
Length of Cable (m)	**6.2**	Cable Lead Above Ground (m)	**1.2**	Nodal Points	**10**
Datalogger Serial #	**108038**			Cable Serial Number	**1622**

Code CAM-4VT08

Thermistor Inspection

	Good	Needs Maintenance
Casing	☑	☐
Cover	☑	☐
Data Logger	☑	☐
Cable	☑	☐
Beads	☑	☐

Battery Installation Date: **Batteries not replaced in 2008.**

Battery Levels: Main **11.34 V** Aux **13.02 V**

Manual Ground Temperature Readings

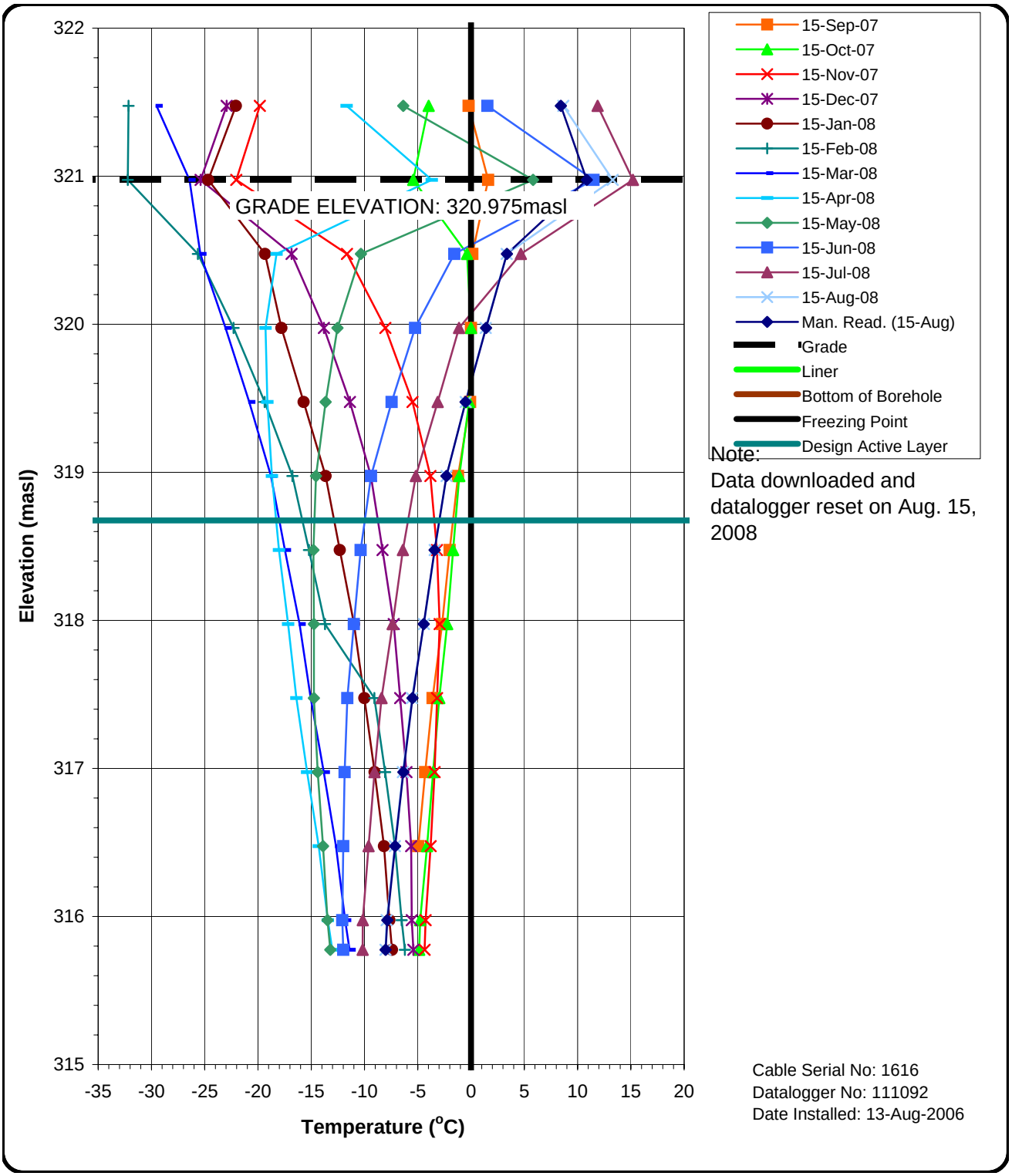
Bead	ohms	Temp. (ºC)
1		**11.3**
2		**9.4**
3		**4.9**
4		**3.2**
5		**0.2**
6		**-1.8**
7		**-3.6**
8		**-4.8**

Bead	ohms	Temp. (ºC)
9		**-5.7**
10		**-6.6**

Observations and Proposed Maintenance

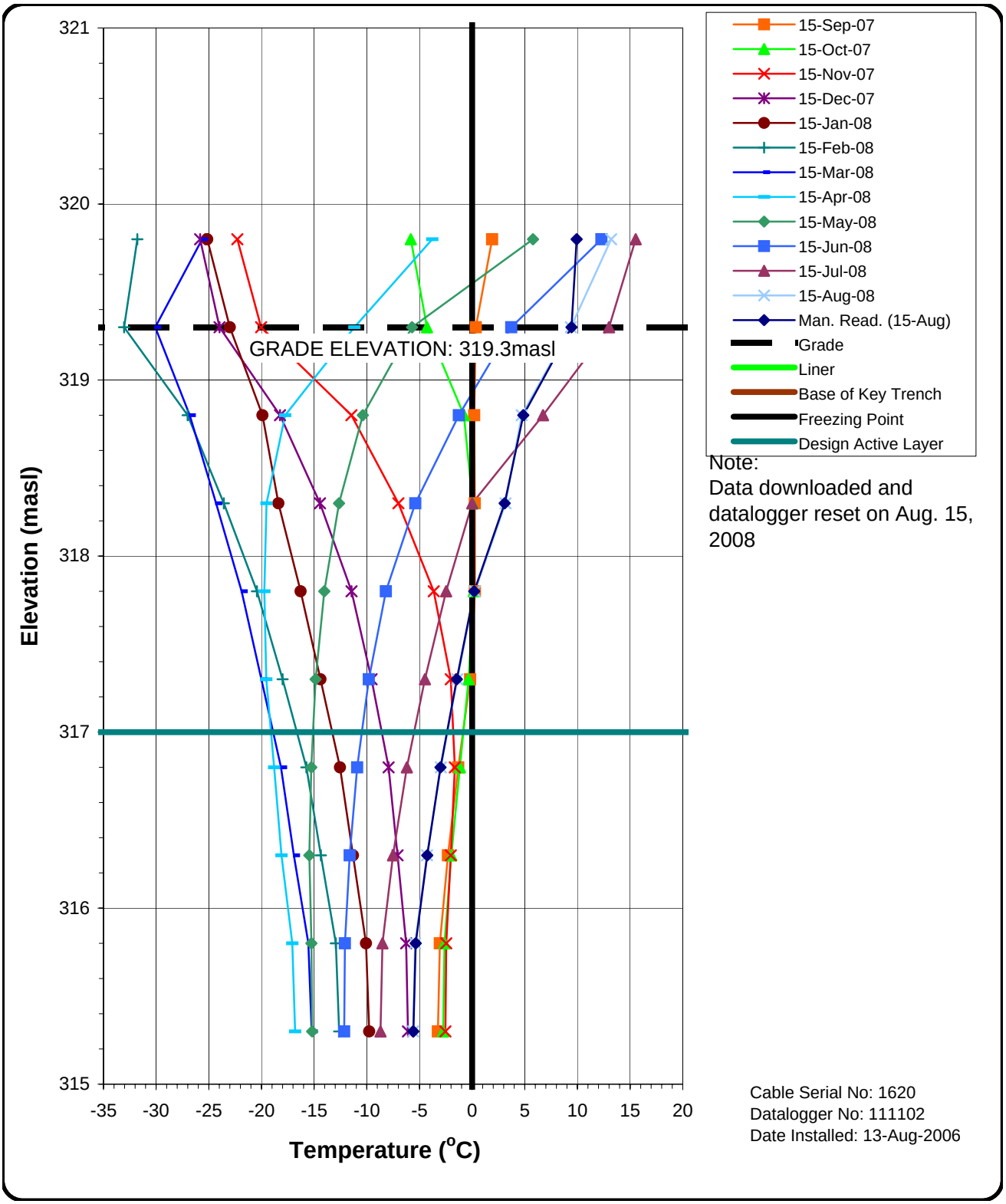
Lock lubricated.

B6 – Thermistor Graphs



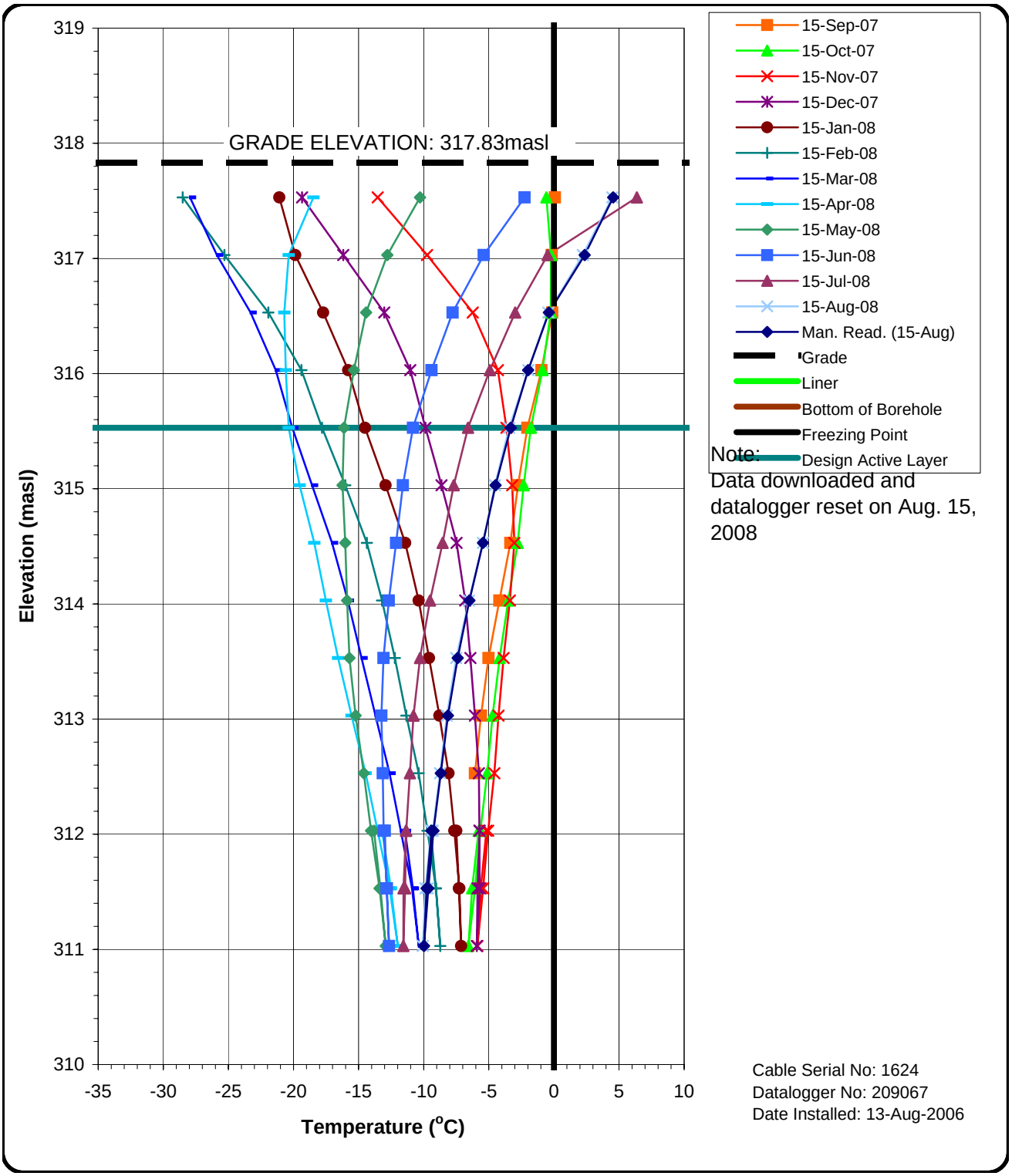
AECOM

Graph B-1
Ground Temperature Profile
Tier II Soil Disposal Facility
Vertical GTC VT-5



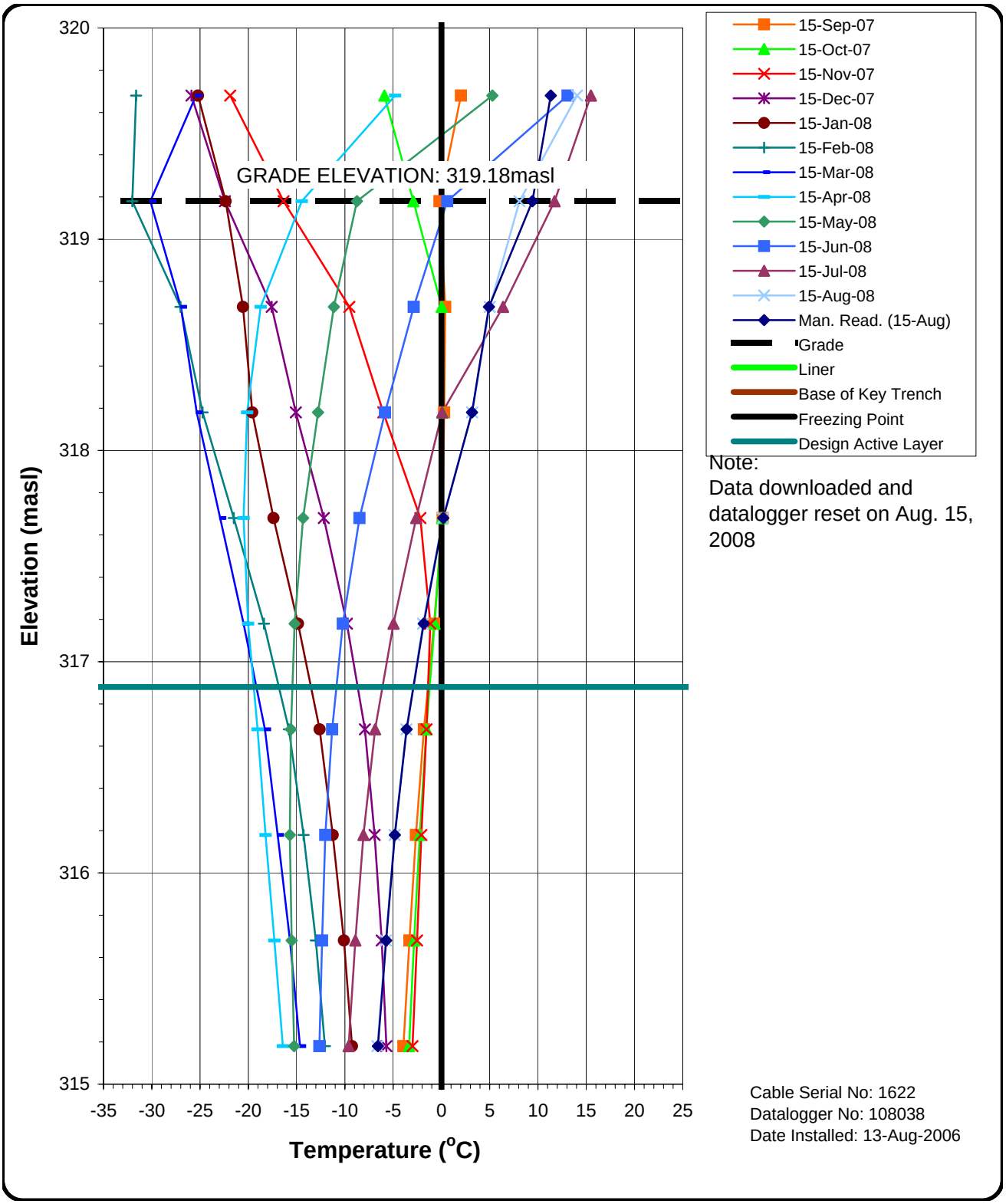
AECOM

Graph B-2
Ground Temperature Profile
Tier II Soil Disposal Facility
Vertical GTC VT-6



AECOM

Graph B-3
Ground Temperature Profile
Tier II Soil Disposal Facility
Vertical GTC VT-7



AECOM

Graph B-4
Ground Temperature Profile
Tier II Soil Disposal Facility
Vertical GTC VT-8

B7 – Field Notes

Aug. 14/08

- TEIR II LANDFILL (TII)
- STARTED INSPECTION @ 12:30PM

- PANORAMIC PHOTO OF TEIR II LF FACING EAST FROM RAISED GRAVEL PAD (WP 3)
  - ↳ PHOTOS 4, 5 & 6 (PANORAMIC) (TEIR II PHOTO LOC. 10)
- WAYPOINT 4 (NW CORNER OF LF)
  - PHOTO 7 (FACING EAST ALONG CREST)
  - PHOTO 7 (FACING SOUTH ALONG CREST) (TEIR II PHOTO LOC 1)
- WAYPOINT 5 (NE CORNER OF LF)
  - PHOTO 8 (FACING WEST)
  - PHOTO 9 (FACING SW)
  - PHOTO 10 (FACING SOUTH) (TEIR II PHOTO LOC. 2)
- WAYPOINT 6 (NORTH SLOPE)
  - PHOTO 11 & 12 (PANORAMIC) (TIER II PHOTO LOC. 3)

- TIER II (PAGE 2)

- WAYPOINT 7 (NE TOE)
  - SOME SEEPAGE AT TOE WITH SOME ORANGE STAINING
  - SOME WATER DRAINAGE ALONG ROAD AT TOE
  - PHOTO 13 (SEEPAGE FROM TOE)
  - PHOTO 14 (NE SLOPE/CORNER) (TIER II PHOTO LOC. 4)

- WAYPOINT 10 (SE CREST CORNER)
  - PHOTO 15 (FACING NORTH)
  - PHOTO 16 (FACING WEST)
  - SOME COARSE ROCKFILL ALONG CREST EDGE BUT DO NOT APPEAR TO BE TENSION CRACKS (TIER II PHOTO LOC. 5)

- WAYPOINT 9 (SE TOE)
  - PHOTOS 17 & 18 (PANORAMIC)
  - SOME WATER SEEPING OUT OF SLOPE FACE, NO STAINING (TIER II PHOTO LOC. 6)

- TIER II (PAGE 3)

- WAYPOINT 8 (SOUTH FACE FROM SE TOE)
  - PHOTO 19 (FACING WEST)
  - SOME SEEPAGE FROM SOUTH SLOPE AND MINOR PONDING AT TOE, NO STAINING (TIER II PHOTO LOC. 7)

- WAYPOINT 11 (SOUTH FACE FROM SW TOE)
  - PHOTO 20 (FACING EAST) (TIER II PHOTO LOC. 8)

- WAYPOINT 12 (SW CORNER CREST)
  - PHOTO 21 (FACING EAST)
  - PHOTO 22 (FACING NORTH) (TIER II PHOTO LOC. 9)
  - SOME PONDED WATER ALONG TOE
  - NO STAINING OBSERVED

OVERALL LANDFILL PERFORMANCE
- ACCEPTABLE, NO SETTLEMENT, EROSION, TENSION CRACKS OBSERVED
- SOME SEEPAGE WITH STAINING AT NORTHEAST TOE

BMW - 3

2008 Monitoring Well Sampling Log (~~MW #~~)

Site name:	CAM - 4
Date of sampling event:	AUG - 14 - 16 / 2008
Names of samplers:	TFB
Monitoring well ID:	BMW - 3
Facility:	UPPER SITE

Known Data

Depth of installation* (m):	3.45
Length of screened section (m):	2.03
Depth to top of screen* (m):	0.46

Measured Data

Condition of well:	GOOD	Procedure/Equipment:	INTERFACE METER
Procedure/Equipment:	INTERFACE METER	Depth to water surface (m):	0.92
Well height above ground (m):	0.76	Depth to bottom (m):	2.25
Diameter of well (m):	2"	Free product thickness (mm):	—

Calculations		Notes	
Depth of water (m):	0.92 ~~1.62~~	Evidence of sludge:	—
Well volume of water (L):	2.60	Evidence of freezing/siltation:	—
Static water level* (m):	0.16		
Length of screen collecting water (m):	~~[illegible]~~ ~~[illegible]~~ ~~[illegible]~~ 1.03		

Development/Purging Information

Equipment:	BAILER

Date & Time	Volume Removed (L)	Temperature (°C)	pH	Conductivity (µS/cm)	Turbidity (NTU)	Description of Water
16-AUG-08	3.0L	2.81	8.73	0.404	—	Silty, Greyish brown, N/O

Water Sampling		Soil Sampling	
Date & Time Collected:	16-AUG-08	Date and Time Collected:	14-AUG-08
Sample Number - Water:	BMW-3	Sample Number - Soil:	BMW-3-15
		DUP = BMW-30-40	~~[illegible]~~
			BMW-3-40
Sample Containers:	3 [illegible]	Sample Containers:	2/250mL
	2 VOCs		Clear
			PER SAMPLE
Procedure/Equipment:	BAILER	Procedure/Equipment:	TROWEL
Water Description:	Silty, Grey with Brown, N/O	Soil Description:	~~[illegible]~~ Gravelly silt fill Greyish Brown
Sampling Equipment Decontamination (Y/N):	Y	Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	1	Number Washes:	2
Number Rinses:	2	Number Rinses:	2

n/a=not applicable

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

Gartner Lee

2008 Monitoring Well Sampling Log (MW # 15)

Site name:	CAM-4
Date of sampling event:	AUG-14-16/2008
Names of samplers:	TFB
Monitoring well ID:	MW-15
Facility:	UPPER SITE

Known Data

Depth of installation* (m):	3.25
Length of screened section (m):	1.97
Depth to top of screen* (m):	0.33

Measured Data

Condition of well:	GOOD	Procedure/Equipment:	INTERFACE METER
Procedure/Equipment:	INTERFACE METER	Depth to water surface (m):	0.45
Well height above ground (m):	0.51	Depth to bottom (m):	2.44
Diameter of well (m):	2"	Free product thickness (mm):	—

Calculations		**Notes**	
Depth of water (m):	0.45	Evidence of sludge:	—
Well volume of water (L):	4.00	Evidence of freezing/siltation:	—
Static water level* (m):	-0.06		
Length of screen collecting water (m):	1.61		

Development/Purging Information

Equipment: PERISTALTIC PUMP

Date & Time	Volume Removed (L)	Temperature (°C)	pH	Conductivity (µS/cm)	Turbidity (NTU)	Description of Water
16-AUG-08	4.5 L	2.08	6.31	0.346	13.5	Clear, Slightly Yellow, Chemical odour

Water Sampling		**Soil Sampling**	
Date & Time Collected:	16 AUG-08	Date and Time Collected:	14 AUG 08
Sample Number - Water:	MW-15	Sample Number - Soil:	MW 15-15
DUP →	MW-150		MW 15-25
		Refusal @ 25cm	
Sample Containers:	6 40mL Ambers	Sample Containers:	2/250mL Clear PER SAMPLE
2/1L Ambers	4 vials		
	1 METALS (60mL)		
Procedure/Equipment:	PERISTALTIC PUMP	Procedure/Equipment:	TROWEL
Water Description:	Clear, Slightly Yellow Chemical odour	Soil Description:	Silty Gravel Till
Sampling Equipment Decontamination (Y/N):	Y	Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	2	Number Washes:	2
Number Rinses:	2	Number Rinses:	2

n/a=not applicable

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

Gartner Lee

2008 Monitoring Well Sampling Log (MW #17-A)

Site name:	CAM- 4
Date of sampling event:	AUG- 14-16/2008
Names of samplers:	TPB
Monitoring well ID:	MW-14-A
Facility:	UPPER SITE

Known Data

Depth of installation* (m):	4.66
Length of screened section (m):	2.03
Depth to top of screen* (m):	1.67

Measured Data

Condition of well:	GOOD	Procedure/Equipment:	INTERFACE METER
Procedure/Equipment:	INTERFACE METER	Depth to water surface (m):	1.07
Well height above ground (m):	0.51	Depth to bottom (m):	2.47
Diameter of well (m):	2"	Free product thickness (mm):	———

Calculations		Notes	
Depth of water (m):	1.07	Evidence of sludge:	———
Well volume of water (L):	2.80	Evidence of freezing/siltation:	———
Static water level* (m):	0.56		
Length of screen collecting water (m):	0.79		

Development/Purging Information

Equipment: PERISTALTIC PUMP

Date & Time	Volume Removed (L)	Temperature (°C)	pH	Conductivity (µS/cm)	Turbidity (NTU)	Description of Water
16-AUG-08	3.0L	1.01	6.73	0.45	WELL BEGAN TO GO DRY → BUBBLES IN FLOW THROUGH CELL	

Water Sampling		Soil Sampling	
Date & Time Collected:	16-AUG-08	Date and Time Collected:	14AUG08
Sample Number - Water:	MW-17-A	Sample Number - Soil:	MW 14-A-15 MW 17-A-30 [redacted] MW 14-A-30
		Refusal @ 30 cm	
Sample Containers:	3 TOTAL AMBER 2 VOA's	+ 2/250mL clear-CANTEST 2/250mL clear-ESG.	Sample Containers: 2/250mL clear PER SAMPLE
Procedure/Equipment:	PERISTALTIC PUMP	Procedure/Equipment:	
Water Description:	Slightly cloudy clear, no/o	Soil Description:	SANDY SILT Till, Brown, Dry
Sampling Equipment Decontamination (Y/N):	Y	Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	2	Number Washes:	2
Number Rinses:	2	Number Rinses:	2

LDP

n/a=not applicable

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

2008 Monitoring Well Sampling Log (MW #16)

Site name:	CAM- 4
Date of sampling event:	AUG- 14-16 / 2008
Names of samplers:	TFB
Monitoring well ID:	MW-16
Facility:	UPPER SITE

Known Data - DATA NOT AVAILABLE

Depth of installation* (m):	
Length of screened section (m):	
Depth to top of screen* (m):	

Measured Data

Condition of well:	GOOD	Procedure/Equipment:	INTERFACE METER
Procedure/Equipment:	INTERFACE METER	Depth to water surface (m):	1.53
Well height above ground (m):	0.60	Depth to bottom (m):	3.00
Diameter of well (m):	2"	Free product thickness (mm):	———

Calculations		**Notes**	
Depth of water (m):	1.34	Evidence of sludge:	———
Well volume of water (L):	3.30	Evidence of freezing/siltation:	———
Static water level* (m):	0.74		
Length of screen collecting water (m):			

Development/Purging Information

Equipment: BAILER

Date & Time	Volume Removed (L)	Temperature (°C)	pH	Conductivity (µS/cm)	Turbidity (NTU)	Description of Water
16-AUG-08	4.0 L	1.70	6.90	0.544	54.0	GC, Sheen on water Hydrocarbon odour

Water Sampling		**Soil Sampling**	
Date & Time Collected:	16-AUG-08	Date and Time Collected:	14-AUG-08
Sample Number - Water:	MW-16	Sample Number - Soil:	MW 16-15
			MW 16-40
		Refusal @ 9cm	
Sample Containers:	3 from AMBER 2 VOA's	Sample Containers:	2/250mL Clear PER SAMPLE
Procedure/Equipment:	BAILER	Procedure/Equipment:	TROWEL
Water Description:	GC, Sheen on TOP OF WATER Hydrocarbon odour	Soil Description:	Sandy silt Till Brown
Sampling Equipment Decontamination (Y/N):	Y	Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	2	Number Washes:	3
Number Rinses:	3	Number Rinses:	3

n/a=not applicable

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

Gartner Lee

2008 Monitoring Well Sampling Log (MW # 8)

Site name:	CAM - 4
Date of sampling event:	AUG - 14-16 / 2008
Names of samplers:	TFB
Monitoring well ID:	MW - 8
Facility:	UPPER SITE

Known Data

Depth of installation* (m):	4.08
Length of screened section (m):	2.01
Depth to top of screen* (m):	0.97

Measured Data

Condition of well:	GOOD	Procedure/Equipment:	INTERFACE METER
Procedure/Equipment:	INTERFACE METER	Depth to water surface (m):	0.97
Well height above ground (m):	0.97	Depth to bottom (m):	2.45
Diameter of well (m):	2"	Free product thickness (mm):	—

Calculations		**Notes**	
Depth of water (m):	0.97	Evidence of sludge:	—
Well volume of water (L):	3.0 L	Evidence of freezing/siltation:	—
Static water level* (m):	0.00		
Length of screen collecting water (m):	0.51		

Development/Purging Information

Equipment: PERISTALTIC PUMP

Date & Time	Volume Removed (L)	Temperature (°C)	pH	Conductivity (µS/cm)	Turbidity (NTU)	Description of Water
16-AUG-08	3.0 L	3.70	7.01	1.15 mS/cm	10.7	GC Strong chemical / odour

Water Sampling		**Soil Sampling**	
Date & Time Collected:	16-AUG-08	Date and Time Collected:	14-AUG-08
Sample Number - Water:	MW-8	Sample Number - Soil:	MW8-10 MW8-20 VERY Rocky 1st Sample @ 10cm Refusal @ 20cm
Sample Containers:	3 500mL AMBERS 2 VOA	Sample Containers:	2 / 250mL Clear PER SAMPLE
Procedure/Equipment:	PERISTALTIC PUMP	Procedure/Equipment:	TROWEL
Water Description:	GC Strong chemical odour	Soil Description:	Sandy silt Fill prom OTPL. GRAVEL
Sampling Equipment Decontamination (Y/N):	Y	Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	1	Number Washes:	2
Number Rinses:	2	Number Rinses:	3

n/a=not applicable

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

Gartner Lee

2008 Monitoring Well Sampling Log (MW # 9)

Site name:	CAM- 4
Date of sampling event:	AUG- 14-16/2008
Names of samplers:	TFB
Monitoring well ID:	MW - 9
Facility:	UPPER SITE

Known Data

Depth of installation* (m):	3,32
Length of screened section (m):	2.01
Depth to top of screen* (m):	0,40

Measured Data

Condition of well:	GOOD	Procedure/Equipment:	INTERFACE METER
Procedure/Equipment:	INTERFACE METER	Depth to water surface (m):	0,24
Well height above ground (m):	0,33	Depth to bottom (m):	1,39
Diameter of well (m):	2"	Free product thickness (mm):	—

Calculations		Notes	
Depth of water (m):	0.24 m BTOP	Evidence of sludge:	—
Well volume of water (L):	3,20	Evidence of freezing/siltation:	—
Static water level* (m):	-0.04		
Length of screen collecting water (m):	1,16		

Development/Purging Information

Equipment: PERISTALTIC PUMP

PURGED DRY

Date & Time	Volume Removed (L)	Temperature (°C)	pH	Conductivity (µS/cm)	Turbidity (NTU)	Description of Water
15-AUG-08	4L	2.62	11,34	1.06 mS/cm	41.3	C+C Chemical odour

Water Sampling		Soil Sampling	
Date & Time Collected:	16-AUG-08	Date and Time Collected:	14-AUG-08
Sample Number - Water:	MW 9	Sample Number - Soil:	MW9-15
WL 16-AUG-08 1.01 m BTOP			MW9-25
		Refusal @ 25cm	
Sample Containers:	3 500mL AMBERS	Sample Containers:	2/250mL clear PEK SAMPLE
	2 VOC VIALS		
Procedure/Equipment: PERISTALTIC PUMP	PERISTALTIC PUMP	Procedure/Equipment:	TROWEL
Water Description:	C+C Chemical odour	Soil Description:	SANDY SILT TILL (GRAVELLY from DTPL
Sampling Equipment Decontamination (Y/N):	Y	Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	1	Number Washes:	3
Number Rinses:	1	Number Rinses:	3

n/a=not applicable

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

Gartner Lee

2008 Monitoring Well Sampling Log (MW # 5)

Site name:	CAM - 4
Date of sampling event:	AUG- 14-16 / 2008
Names of samplers:	TFB
Monitoring well ID:	MW - 5
Facility:	UPPER SITE

Known Data

Depth of installation* (m):	3.60
Length of screened section (m):	2.03
Depth to top of screen* (m):	0.60

Measured Data

Condition of well:	GOOD	Procedure/Equipment:	INTERFACE METER
Procedure/Equipment:	INTERFACE METER	Depth to water surface (m):	1.17 m BTOP
Well height above ground (m):	0.60	Depth to bottom (m):	3.25 m BTOP
Diameter of well (m):	2"	Free product thickness (mm):	—

Calculations		Notes	
Depth of water (m):	1.17 m BTOP	Evidence of sludge:	—
Well volume of water (L):	4.20	Evidence of freezing/siltation:	—
Static water level* (m):	0.57		
Length of screen collecting water (m):	2.05		

Development/Purging Information

Equipment: PERISTALTIC PUMP

Date & Time	Volume Removed (L)	Temperature (°C)	pH	Conductivity (µS/cm)	Turbidity (NTU)	Description of Water
15-AUG-08	4.80	2.09	7.32	0.887	6.1	C+C SLIGHT Chemical odour

Water Sampling		Soil Sampling	
Date & Time Collected:	15-AUG-08	Date and Time Collected:	14-AUG-08
Sample Number - Water:	MW-5	Sample Number - Soil:	MW 5-10 MW 5-25 Refusal @ 25cm
Sample Containers:	3 500mL Ambers 2 40 VIALS	Sample Containers:	2 / 250mL Clear PER SAMPLE 3 m F. Com well
Procedure/Equipment:	PERISTALTIC PUMP	Procedure/Equipment:	TROWEL
Water Description:	C+C Slight chemical odour	Soil Description:	SANDY SILT TILL, GRAVELY BROWN DTRL
Sampling Equipment Decontamination (Y/N):	Y	Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	1	Number Washes:	4
Number Rinses:	2	Number Rinses:	4

n/a=not applicable

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

Gartner

VT-6 DOWNLOADED AT 4:55pm
BAT- MAIN 11.34V
AUX 13.02V

CHANNEL	TEMP (°C)
1	11.33
2	9.42
3	4.93
4	3.17
5	0.201
6	-1.84
7	-3.60
8	-4.82
9	-5.73
10	-6.57

- CHECKED PROGRAMMING
- UPDATED CLOCK AND "STOP WHEN FULL"
- RESTARTED DATA LOGGER

WEATHER/TEMP. ⇒ VERY WINDY, ~ 0°C, COLD

VT-5 DOWNLOADED AT 5:10pm
BATT. MAIN, 11.34V
AUX. 13.14V

CHANNEL	TEMP (°C)
1	8.43
2	10.86
3	3.37
4	1.41
5	-0.51
6	-2.31
7	-3.42
8	-4.44
9	-5.50
10	-6.35
11	-7.13
12	-7.86
13	-8.02

- CHECKED PROGRAMMING
- UPDATED CLOCK & "STOP WHEN FULL"
- RESTARTED DATA LOGGER

VT-6 DOWNLOADED AT 5:25PM

BATTERY MAIN 11.34V

AUX 13.02V

CHANNEL	TEMP (°C)
1	9.92
2	9.44
3	4.86
4	3.09
5	0.201
6	-1.45
7	-3.00
8	-4.26
9	-5.36
10	-5.58

- CHECKED PROGRAMMING
- CHANGED CLOCK & "STOP WHEN FULL"
- RESTARTED DATA LOGGER

VT-7 DOWNLOADED AT 5:40PM

BATTERY MAIN 11.34V

AUX 13.14V

CHANNEL	TEMP (°C)
1	4.55
2	2.36
3	-0.39
4	-1.98
5	-3.32
6	-4.48
7	-5.45
8	-6.49
9	-7.39
10	-8.14
11	-8.69
12	-9.25
13	-9.65
14	-9.98
15	-9.78
16	-9.40

- CHECKED PROGRAMMING
- CHANGED/UPDATED CLOCK AND CHECKED "STOP WHEN FULL"
- RESTARTED DATALOGGER

Appendix C

Upper Site Landfill

- C1 – Site Condition/Visual Inspection Records
- C2 – Geotechnical Inspection Photographic Records
- C3 – Monitoring Photographic Records
- C4 – Monitoring Well Sampling Records
- C5 – Thermistor Maintenance Records
- C6 – Thermistor Graphs
- C7 – Field Notes

C1. Upper Site Landfill

C1.1 Landfill Summary

The Upper Site Landfill is located approximately 625 m east of the main facilities area. The original landfill consisted of three lobes (South, Central and North) that encompass an area of approximately 4,500 m^2. The location of the landfill is presented in Figure C-1.

A previous evaluation and geophysical survey determined landfilled material is continuous throughout the north and central lobes and more isolated in the south lobe. Tier I and Tier II contaminated soil was found downgradient of the central lobe, indicating contaminant migration from the landfill, thus, The Upper Site Landfill was classified as high potential environmental risk.

Remediation of the Upper Site Landfill involved complete excavation of the north lobe, partial excavation of the central lobe and installation of a leachate containment system in the central lobe and regrading of the south lobe.

Monitoring requirements for the 2008 monitoring year include visual inspection, soil sampling, groundwater sampling and thermal monitoring.

C1.2 Visual Monitoring

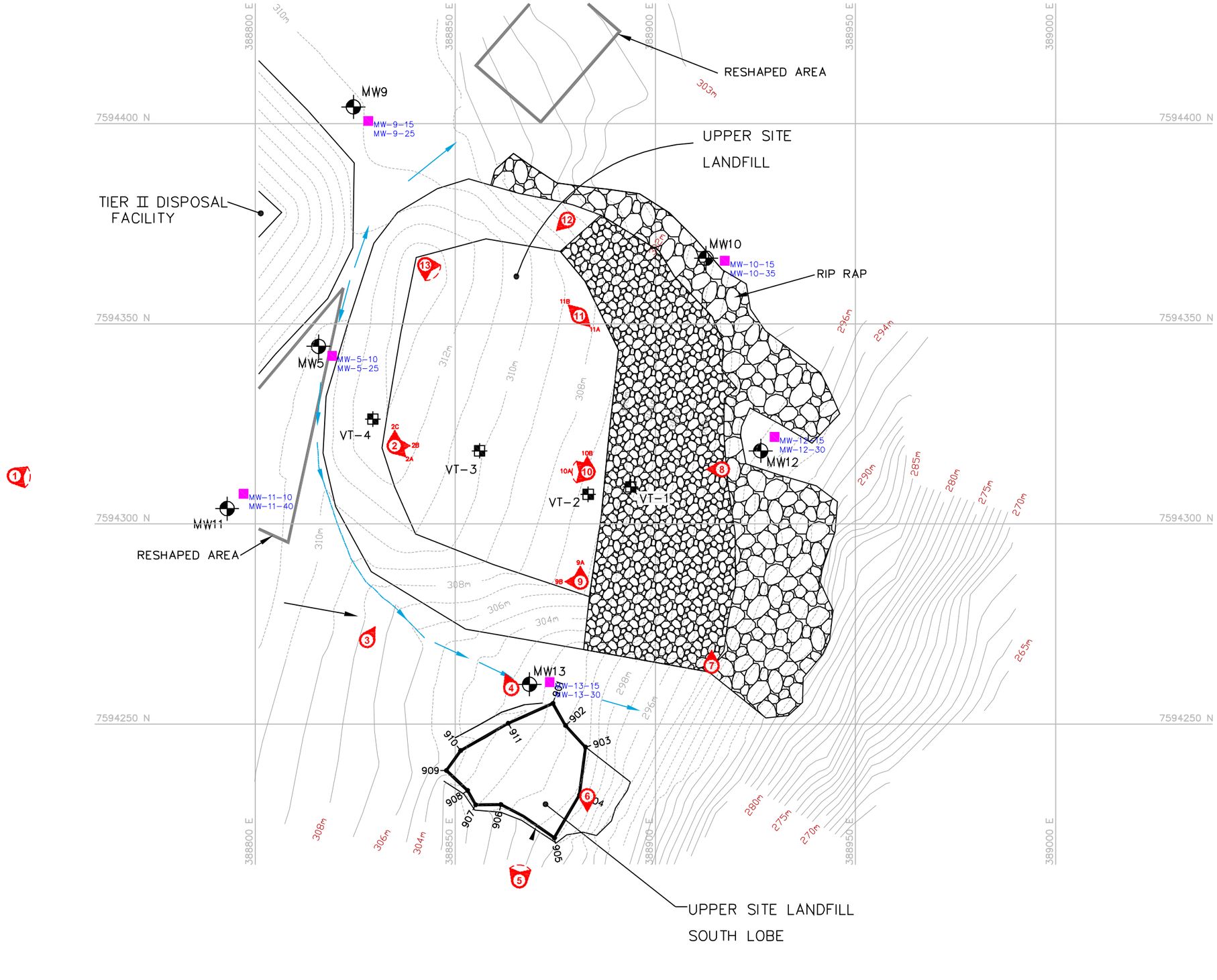
No significant erosion, settlement or indications of slope instability were observed at the Upper Site Landfill. Overall landfill performance is assessed as “acceptable”. Appendix C1 presents a summary of the 2008 visual inspection results.

No issues of concern that require immediate attention were identified.

C1.3 Soil Sampling

Soil samples were collected at monitoring locations MW-10, MW-11, MW-12 and MW-13. The sampling locations are presented in Figure C-1. Two samples were collected at each monitoring location at depths of approximately 0.10 to 0.15 m and 0.30 to 0.40 m below ground surface. The photographs of each monitoring well and test pit location are included in Attachment C3.

No staining or free product was observed during the sampling event at the Upper Site Landfill. No odours were detected during the sampling event at the Upper Site Landfill.



Legend

- TBM4 — TEMPORARY BENCHMARK
- BM-1 — PERMANENT BENCHMARK
- 101 — COORDINATE POINT
- C4-MW-1A / C4-MW-1B — MONITORING SOIL SAMPLE LOCATION
- MONITORING WELL LOCATION
- VERTICAL THERMISTOR LOCATION
- 1 — PHOTOGRAPH LOCATION

RECORD DRAWING
NOT FOR CONSTRUCTION

Map Sources / Notes:
Source drawing from UMA: C4-RD04.dwg

0 5 10 20 30 40 m
1 : 1000
UTM Zone 16W, NAD83

File Name:	C4-RD04.dwg		
Reviewed by:	DCJ	Prepared by:	KAB
Date Issued:	October, 2008	Project Number:	80-297

Defence Construction Canada

2008 CAM-4 DEW LIne Monitoring Program
CAM-4 Kugaaruk
Nunavut Territory

Upper Site Landfill

AECOM

Figure C-1
Version 1

Date Plotted: October 16, 2006 Path: N:\Projects\2008\80297\20081\WorkInProgress\DataInterpretation\CAD\CAM-4\C4-RD04.dwg

Laboratory analysis detected concentrations of TPH (C6-34) at monitoring locations MW-11 and MW-13. It is recommended that these results be evaluated in the context of the Landfill Monitoring Plan. The soil sample at MW-10-35 (0.35 m depth) returned an arsenic concentration of 93.6 mg/kg. This value is presumed to be anomalously high, given the non-detection at the 0.15 m soil sample. At the time of issuing this draft report the results of the confirmatory analysis are awaited from ALS Laboratory Group.

The analytical results and depths of samples are provided in Table C-1. The Laboratory Certificates of Analysis are provided in Appendix F.

C1.4 Groundwater Sampling

Groundwater measurements and monitoring system condition records were documented for monitoring wells MW-10, MW-11, MW-12 and MW-13. These records are provided in attachment C4.

All groundwater monitoring wells slated for monitoring in 2008 at the Upper Site Landfill contained sufficient volume for sampling, with the exception of MW-10, which was completely dry. Samples were collected at a flow rate equal to the recharge rate of the monitoring well (and not exceeding 100mL/min). Monitor MW-11 was sampled using a peristaltic pump and disposable LDPE tubing. The rechargeable battery provided with the peristaltic pump from the supplier proved to be faulty, thus monitors that were accessible by vehicle were sampled with the peristaltic pump run off the vehicle battery. Monitors MW-12 and MW-13 were not accessible by vehicle, therefore were purged and sampled using a disposable bailer. It should be noted that monitoring well MW-12 was found to have a blockage in the well pipe at approximately 0.64 m below ground surface. Sand was discovered on the interface meter as well as the disposable bailer. The blockage in the well pipe may be attributed to a broken coupling, presumably allowing sand pack from the borehole annulus to enter the well.

Groundwater samples were not filtered and not preserved. Samples were analyzed for total concentration of inorganics, TPH (C6-C32) and PCB.

TPH (C6-C32) was detected in monitoring wells MW-11, MW-12 and MW-13. Elevated concentrations of Chromium and Lead were also reported for monitor MW-12. The results should be evaluated in the context of the Landfill Monitoring Plan as well as compared with DCC internal standards.

The results are presented in Table C-2. The laboratory Certificates of Analysis are provided in Appendix F.

C1.5 Thermal Monitoring

All thermistors at the Upper Site Landfill were in good condition. Thermistor data was downloaded on August 15, 2008, programming was checked and the data loggers were reset. The data logger clocks were adjusted to local (Standard Time). Battery charge was checked to ensure sufficient remaining charge and batteries were not changed in 2008.

Tabulated ground temperature data since the last download in August 2007 are included in Appendix C5. Graphs of ground temperature versus depth are presented in Appendix C6.

Table C-1. CAM-4 Kugaaruk, Summary of 2008 Soil Analysis - Upper Site Landfil

Sample Ident.	Sample Location	Depth	Copper Cu	Nickel Ni	Cobalt Co	Cadmium Cd	Lead Pb	Zinc Zn	Chromium Cr	Arsenic As	Mercury Hg	PCB Total Aroclors	F1 C6-C10	F2 C10-C16	F3 C16-C34	TPH C6-34
		(m)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Upgradient Samples																
MW-11-10	MW-11	0.10	11.2	11.9	7.0	<0.50	19.1	43.9	27.7	<5.0	<0.0050	<0.050	<10	<30	1230	1230
MW-11-40	MW-11	0.40	10.0	11.6	6.5	<0.50	8.1	33.3	22.6	<5.0	<0.0050	<0.050	<10	<30	1150	1150
Downgradient Samples																
MW-10-15	MW-10	0.15	6.5	10.5	5.0	<0.50	5.6	22.9	22.3	<5.0	<0.0050	<0.050	<10	<30	<50	0
MW-10-35	MW-10	0.35	8.4	20.0	9.0	<0.50	6.2	27.0	24.8	93.6	<0.0050	<0.050	<10	<30	<50	0
MW-12-15	MW-12	0.15	6.0	6.8	3.6	<0.50	4.9	23.3	17.0	<5.0	<0.0050	<0.050	<10	<30	<50	0
MW-12-30	MW-12	0.30	5.4	6.9	3.8	<0.50	4.9	21.0	15.4	<5.0	<0.0050	<0.050	<10	<30	<50	0
MW-13-15	MW-13	0.15	7.1	8.6	5.1	<0.50	5.7	31.4	17.5	<5.0	0.0117	<0.050	<10	<30	76	76
MW-13-30	MW-13	0.30	3.5	6.6	3.6	<0.50	3.7	17.2	14.9	<5.0	<0.0050	<0.050	<10	<30	<50	0

Note: mg/kg = ug/g

TPH is represented as the total of F1, F2 and F3 as defined by CCME Tier I Method - Rev. 5 Analysis of Petroleum Hydrocarbons in Soil

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Table C-2. CAM-4 Kugaaruk, Summary of 2008 Groundwater Analysis - Upper Site Landfil

Sample Identification	Location	Groundwater Elevation (masl)	Copper Cu (mg/L)	Nickel Ni (mg/L)	Cobalt Co (mg/L)	Cadmium Cd (mg/L)	Lead Pb (mg/L)	Zinc Zn (mg/L)	Chromium Cr (mg/L)	Arsenic As (mg/L)	Mercury Hg (mg/L)	PCB Total Aroclors (mg/L)	F1 C6-C10 (mg/L)	F2 C10-C16 (mg/L)	F3 C16-C34 (mg/L)	TPH C6-34 (mg/L)
Upgradient Samples																
MW-11	MW-11	311.16	<0.0020	0.0026	0.00146	<0.000034	<0.0010	<0.0050	<0.0020	0.0011	<0.000020	<0.0010	<0.10	<0.30	0.47	0.47
Downgradient Samples																
MW-10	MW-10	<299.13	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW-12	MW-12	294.18	0.0433	0.0418	0.0156	0.000135	0.0158	0.208	0.0540	0.0051	<0.000020	<0.0012	<0.10	1.26	2.02	3.28
MW-13	MW-13	301.12	0.0288	0.0257	0.00978	0.000176	0.00725	0.0809	0.0205	0.00216	<0.000020	<0.0011	<0.10	<0.30	1.11	1.11

- Denotes dry well; no sample obtained
Note: mg/L = 1000 ug/L

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C1 – Site Condition/Visual Inspection Records

Visual Inspection Checklist
Inspection Report – Page 1 of 2

SITE NAME:	CAM-4 - Pelly Bay
LANDFILL/AREA DESIGNATION:	Upper Site Landfill
DATE OF INSPECTION:	August 14, 2008
DATE OF PREVIOUS INSPECTION:	August 24 - 26, 2007
INSPECTED BY:	Darrin Johnson, P.Eng.
REPORT PREPARED BY:	Darrin Johnson, P.Eng.

The preparer represents to the best of the preparer's knowledge, the following statements and observations are true and correct and to the best of the preparer's actual knowledge, no material facts have been suppressed or misstated.

Preliminary Stability Assessment

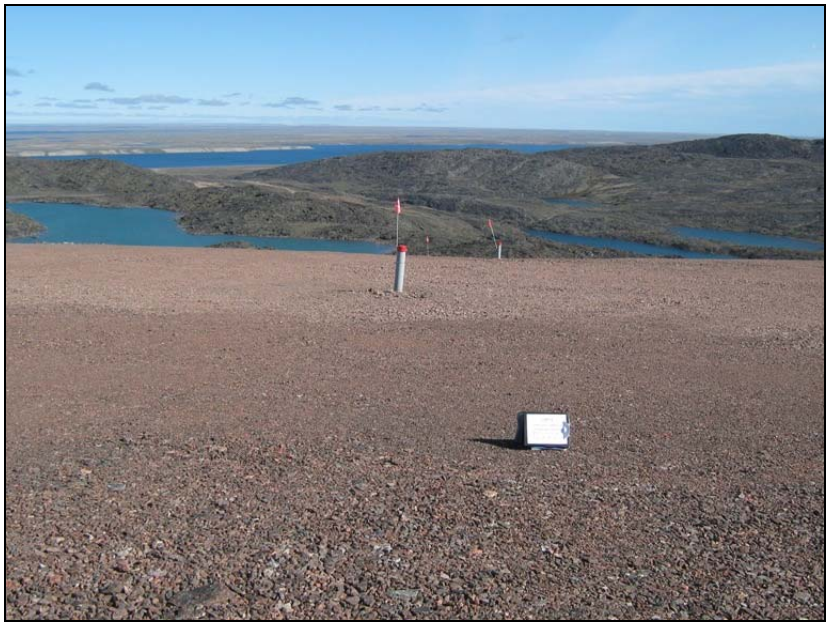
Feature	Severity Rating	Extent
Settlement	Not observed	None
Erosion	Not observed	None
Frost Action	Not observed	None
Animal Burrows	Not observed	None
Vegetation	Not observed	None
Staining	Not observed	None
Vegetation Stress	Not observed	None
Seepage Points	Not observed	None
Debris Exposed	Not observed	None
Tension Crack	Not observed	None
Overall Landfill Performance	Acceptable	

Checklist Item	Present Yes/No	Location	Dimensions (L x W) (m)	Depth (m)	Extent (%)	Description	Photographic Records (Photos referenced in photolog and in figures)	Additional Comments/ Preliminary Stability Assessment
Settlement	No							
Erosion	No							
Frost Action	No							
Animal Burrows	No							
Vegetation	No							
Staining	No							
Vegetation Stress	No							
Seepage Points	No							
Debris Exposed	No							
Presence/ Condition of Monitoring Instruments	Good							
Other Features of Note.	No							
Additional Photos						General	USL-1, 2A, 2B, 2C, 3, 4, 5, 6, 7, 8, 9A, 9B, 10A, 10B, 11A, 11B, 12, 13	

C2 – Geotechnical Inspection Photographic Records

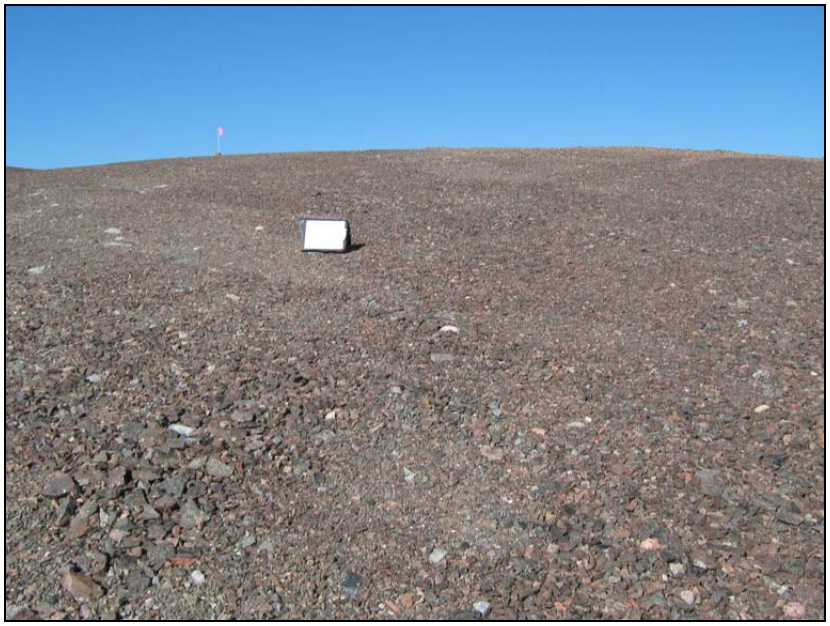
Photograph USL-1. Panoramic photo facing southeast towards west slope of Upper Site Landfill. ↑

Photograph USL-2A. Facing southeast along crest. ↑



Photograph USL-2B. Facing east along line of thermistors. ↑

Photograph USL-2C. Facing north along west crest. ↑



Photograph USL-3. Facing south slope. ↑

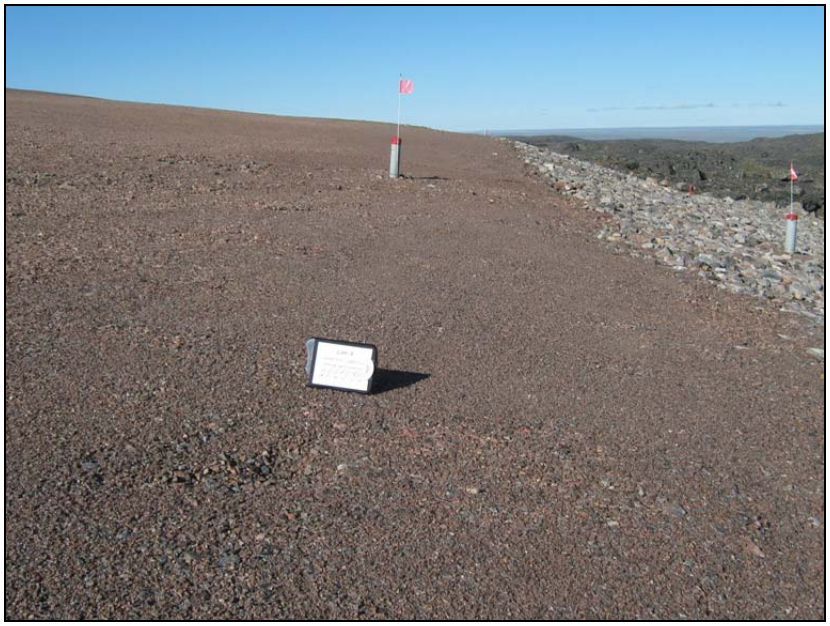
Photograph USL-4. Facing west along south slope. ↑

Photograph USL-5. Panoramic photo from the southwest corner of south lobe. ↑

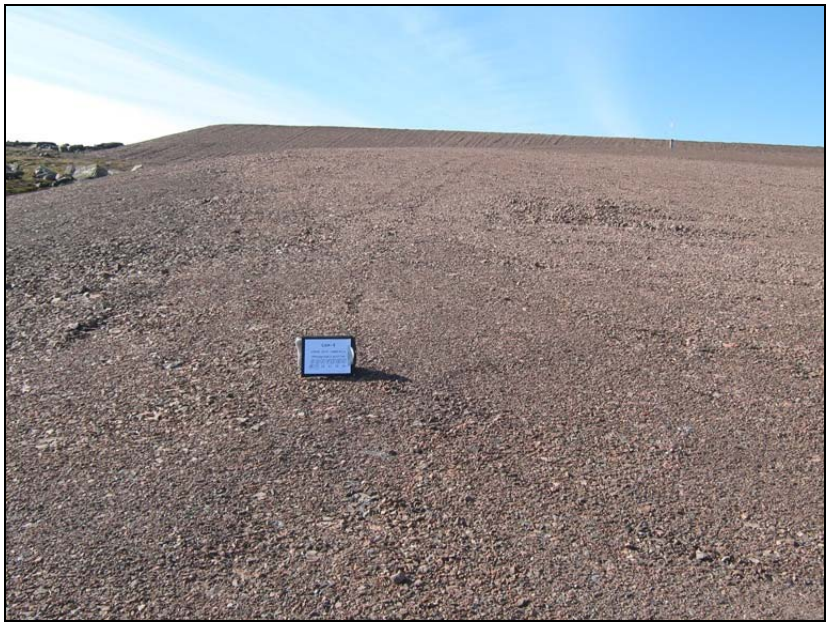
Photograph USL-6. Facing south along the south slope of the south lobe from the southeast corner. ↑

Photograph USL-7. Facing north from the southeast corner of the rip-rap. ↑

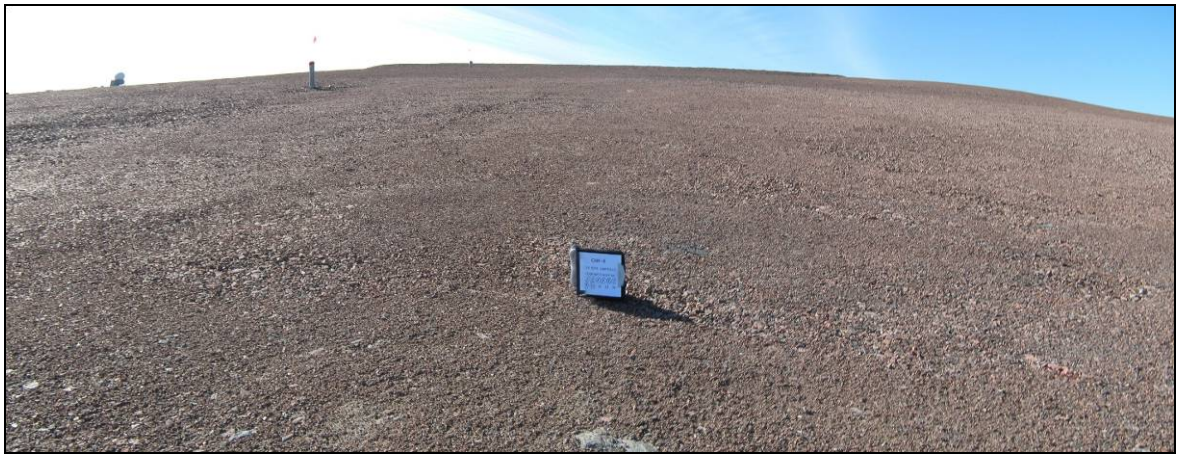
Photograph USL-8. Toe of rip-rap below thiermistors. ↑



Photograph USL-9A. Facing north along crest from southeast corner. ↑



Photograph USL-9B. Facing west along south crest from the southeast corner. ↑



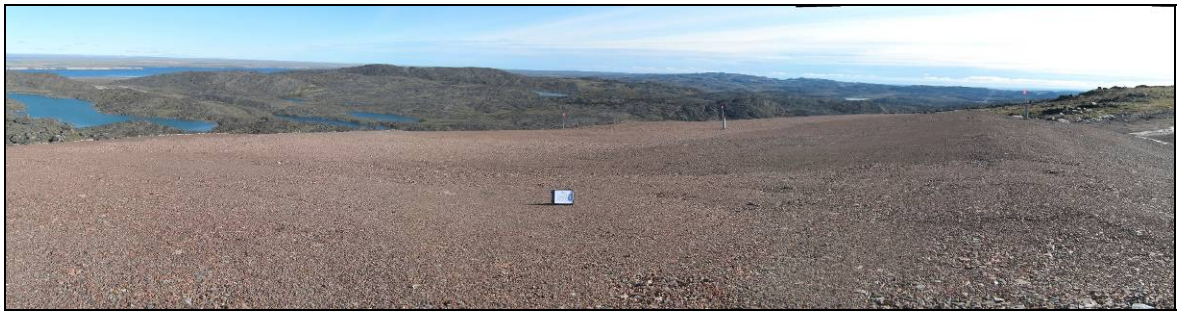
Photograph USL-10A. Panoramic photo of the top of the landfill facing west. ↑

Photograph USL-10B. Facing north along crest. ↑

Photograph USL-11A. Facing southeast. ↑

Photograph USL-11B. Facing northwest. ↑

Photograph USL-12. North gravel slope. ↑



Photograph USL-13. Panoramic photo of the landfill top from the northwest corner. ↑

C3 – Monitoring Photographic Records

Photograph 1. Monitoring Location MW-11 (Upgradient) Facing Southeast. ↑

Photograph 2. Monitoring Location MW-10 (Downgradient). Facing North. ↑

Photograph 3. Monitoring Location MW-12 (Downgradient). Facing North. ↑

Photograph 4. Monitoring Location MW-13 (Downgradient). Facing Northeast. ↑

C4 – Monitoring Well Sampling Records

2008 Monitoring Well Sampling Log (MW-10)

Site name:	CAM-4
Date of sampling event:	14-17 Aug 2008
Names of samplers:	TFB
Monitoring well ID:	MW-10
Facility:	Upper Site Landfill

Known Data	
Depth of installation* (m):	3.37
Length of screened section (m):	2.03
Depth to top of screen* (m):	0.38

Measured Data			
Condition of well:	Good	Procedure/Equipment:	Interface Meter
Procedure/Equipment:	Interface Meter	Depth to water surface (m):	
Well height above ground (m):	0.68	Depth to bottom (m):	2.38
Diameter of well (m):	0.05	Free product thickness (mm):	-

Calculations		Notes	
Depth of water (m):	Dry @ 2.38	Evidence of sludge:	-
Well volume of water (L):	0.00	Evidence of freezing/siltation:	-
Static water level* (m):			
Length of screen collecting water (m):			

Development/Purging Information

Equipment:

Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (µS/cm)	Turbidity (NTU)	Description of Water
16-Aug-08						

Water Sampling		Soil Sampling	
Date & Time Collected:		Date and Time Collected:	14-Aug-08
Sample Number - Water:		Sample Number - Soil:	MW-10-15
			MW-10-35
Sample Containers:		Sample Containers:	4 x 250mL Glass
Procedure/Equipment:		Procedure/Equipment:	SS Trowel
Water Description:		Soil Description:	Brown sandy silt till, some gravel.
Sampling Equipment Decontamination (Y/N):		Sampling Equipment Decontamination (Y/N):	Y
Number Washes:		Number Washes:	2
Number Rinses:		Number Rinses:	2

*From ground surface. Unless this is stated, all measurments are assumed to be from the top of the casing.
n/a=not applicable
LDPE=Low Density Polyethylene
SS=Stainless Steel

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2008 Monitoring Well Sampling Log (MW-11)

Site name:	CAM-4
Date of sampling event:	14-17 Aug 2008
Names of samplers:	TFB
Monitoring well ID:	MW-11
Facility:	Upper Site Landfill

Known Data

Depth of installation* (m):	3.85
Length of screened section (m):	2.03
Depth to top of screen* (m):	0.86

Measured Data

Condition of well:	Good	Procedure/Equipment:	Interface Meter
Procedure/Equipment:	Interface Meter	Depth to water surface (m):	1.97
Well height above ground (m):	0.56	Depth to bottom (m):	2.82
Diameter of well (m):	0.05	Free product thickness (mm):	-

Calculations

Depth of water (m):	0.85
Well volume of water (L):	1.67
Static water level* (m):	1.41
Length of screen collecting water (m):	0.85

Notes

Evidence of sludge:	-
Evidence of freezing/siltation:	-

Development/Purging Information

Equipment: Peristaltic Pump, Horiba U-22 with flow through cell, LDPE

Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (µS/cm)	Turbidity (NTU)	Description of Water
15-Aug-08	2.5	2.71	6.62	0.97	2.3	C&C Chemical odour

Water Sampling

Date & Time Collected:	15-Aug-08
Sample Number - Water:	MW-11
Sample Containers:	3 x 0.5L Amber Glass
	2 x VOC vials
Procedure/Equipment:	Peristaltic Pump, Horiba U-22
Water Description:	C&C, Chemical odour
Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	1
Number Rinses:	2

Soil Sampling

Date and Time Collected:	14-Aug-08
Sample Number - Soil:	MW-11-10
Refusal @ 0.40 m	MW-11-40
Sample Containers:	4 x 250mL Glass
Procedure/Equipment:	SS Trowel
Soil Description:	Brown sandy silt till, some gravel.
Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	3
Number Rinses:	3

*From ground surface. Unless this is stated, all measurments are assumed to be from the top of the casing.
n/a=not applicable
LDPE=Low Density Polyethylene
SS=Stainless Steel

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2008 Monitoring Well Sampling Log (MW-12)

Site name:	CAM-4
Date of sampling event:	14-17 Aug 2008
Names of samplers:	TFB
Monitoring well ID:	MW-12
Facility:	Upper Site Landfill

Known Data

Depth of installation* (m):	3.67
Length of screened section (m):	2.03
Depth to top of screen* (m):	0.68

Measured Data

Condition of well:	See note below	Procedure/Equipment:	Interface Meter
Procedure/Equipment:	Interface Meter	Depth to water surface (m):	1.53
Well height above ground (m):	0.66	Depth to bottom (m):	2.20
Diameter of well (m):	0.05	Free product thickness (mm):	-

Note - Blockage in well approx. 1.30 mBTOP. Possible damaged coupling. Sand pack allowed to enter well at damaged area.

Calculations		Notes	
Depth of water (m):	0.67	Evidence of sludge:	-
Well volume of water (L):	1.32	Evidence of freezing/siltation:	-
Static water level* (m):	0.87		
Length of screen collecting water (m):	0.67		

Development/Purging Information

Equipment:	Disposable Bailer, Horiba U-22

Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (µS/cm)	Turbidity (NTU)	Description of Water
16-Aug-08	1.4	Insufficient volume for field parameters				Grey, cloudy, silty Chemical odour

Water Sampling		Soil Sampling	
Date & Time Collected:	16-Aug-08	Date and Time Collected:	14-Aug-08
Sample Number - Water:	MW-12	Sample Number - Soil:	MW-12-15
		Refusal @ 0.32 m	MW-12-30
Sample Containers:	3 x 0.5L Amber Glass	Sample Containers:	4 x 250mL Glass
	2 x VOC vials		
Procedure/Equipment:	Disposable Bailer	Procedure/Equipment:	SS Trowel
Water Description:	Grey, cloudy, silty, chemical odour	Soil Description:	Brown sandy silt, some gravel.
Sampling Equipment Decontamination (Y/N):	Y	Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	3	Number Washes:	2
Number Rinses:	5	Number Rinses:	2

*From ground surface. Unless this is stated, all measurments are assumed to be from the top of the casing.
n/a=not applicable
LDPE=Low Density Polyethylene
SS=Stainless Steel

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2008 Monitoring Well Sampling Log (MW-13)

Site name:	CAM-4
Date of sampling event:	14-17 Aug 2008
Names of samplers:	TFB/DAJ
Monitoring well ID:	MW-13
Facility:	Upper Site Landfill

Known Data

Depth of installation* (m):	3.18
Length of screened section (m):	1.90
Depth to top of screen* (m):	0.20

Measured Data

Condition of well:	Good	Procedure/Equipment:	Interface Meter
Procedure/Equipment:	Interface Meter	Depth to water surface (m):	1.88
Well height above ground (m):	0.64	Depth to bottom (m):	2.18
Diameter of well (m):	0.05	Free product thickness (mm):	-

Calculations

Depth of water (m):	0.30
Well volume of water (L):	0.59
Static water level* (m):	1.24
Length of screen collecting water (m):	0.30

Notes

Evidence of sludge:	-
Evidence of freezing/siltation:	-

Development/Purging Information

Equipment:	Disposable Bailer, Horiba U-22

Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (µS/cm)	Turbidity (NTU)	Description of Water
16-Aug-08	0.8	2.91	5.98	0.392	903	Grey, cloudy Chemical odour

Water Sampling

Date & Time Collected:	16-Aug-08
Sample Number - Water:	MW-13
Sample Containers:	2 x 0.5L Amber Glass
	2 x VOC vials
Procedure/Equipment:	Disposable Bailer
Water Description:	Cloudy, grey, chemical odour
Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	2
Number Rinses:	3

Soil Sampling

Date and Time Collected:	14-Aug-08
Sample Number - Soil:	MW-13-15
Refusal @ 0.30 m	MW-13-30
Sample Containers:	4 x 250mL Glass
Procedure/Equipment:	SS Trowel
Soil Description:	Brown sandy silt till, some gravel.
Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	2
Number Rinses:	3

*From ground surface. Unless this is stated, all measurments are assumed to be from the top of the casing.
n/a=not applicable
LDPE=Low Density Polyethylene
SS=Stainless Steel

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C5 – Thermistor Maintenance Records

Thermal Monitoring
Ground Temperature Annual Maintenance Report

Contarctor Name:	**AECOM**	Inspection Date:	**15-Aug-08**
Prepared By:	**Darrin Johnson**		

Thermistor Information

Site Name:	**CAM-4**		Thermistor Location	**Upper Site Landfill**			
Thermistor Number:	**VT01**		Inclination	**Vertical**			
Install Date:	**28-Sep-06**		First Date Event	**27-Aug-07**	Last Date Event		**15-Aug-08**
Coordinates and Elevation		N		E		Elev	**304.43**
Length of Cable (m)	**7.7**	Cable Lead Above Ground (m)	**1.2**	Nodal Points	**13**		
Datalogger Serial #	**111071**			Cable Serial Number			**1615**

Code CAM-4VT01

Thermistor Inspection

	Good	Needs Maintenance
Casing	☑	☐
Cover	☑	☐
Data Logger	☑	☐
Cable	☑	☐
Beads	☑	☐

Battery Installation Date: **Batteries not replaced in 2008.**

Battery Levels: Main **11.34 V** Aux **12.29 V**

Manual Ground Temperature Readings

Bead	ohms	Temp. (ºC)
1		**10.1**
2		**12.5**
3		**5.6**
4		**4.8**
5		**4.5**
6		**3.3**
7		**-0.2**
8		**-2.4**

Bead	ohms	Temp. (ºC)
9		**-3.9**
10		**-5.2**
11		**-6.4**
12		**-5.9**
13		**-4.9**

Observations and Proposed Maintenance

Lock lubricated.

Thermal Monitoring
Ground Temperature Annual Maintenance Report

Contarctor Name:	**AECOM**	Inspection Date:	**15-Aug-08**
Prepared By:	**Darrin Johnson**		

Thermistor Information

Site Name:	**CAM-4**		Thermistor Location	**Upper Site Landfill**			
Thermistor Number:	**VT02**		Inclination	**Vertical**			
Install Date:	**28-Sep-06**		First Date Event	**27-Aug-07**	Last Date Event		**15-Aug-08**
Coordinates and Elevation		N		E		Elev	**306.71**
Length of Cable (m)	**6.7**		Cable Lead Above Ground (m)	**1.2**	Nodal Points	**11**	
Datalogger Serial #	**2020175**				Cable Serial Number		**1617**

Code CAM-4VT02

Thermistor Inspection

	Good	Needs Maintenance
Casing	☑	☐
Cover	☑	☐
Data Logger	☑	☐
Cable	☑	☐
Beads	☑	☐

Battery Installation Date: **Batteries not replaced in 2008.**

Battery Levels: Main **11.34 V** Aux **12.77 V**

Manual Ground Temperature Readings

Bead	ohms	Temp. (ºC)
1		**11.2**
2		**8.9**
3		**5.3**
4		**4.0**
5		**1.4**
6		**-0.9**
7		**-2.6**
8		**-3.7**

Bead	ohms	Temp. (ºC)
9		**-4.8**
10		**-6.2**
11		**-7.6**

Observations and Proposed Maintenance

Lock lubricated.

Thermal Monitoring
Ground Temperature Annual Maintenance Report

Contarctor Name:	**AECOM**	Inspection Date:	**15-Aug-08**
Prepared By:	**Darrin Johnson**		

Thermistor Information

Site Name:	**CAM-4**	Thermistor Location	**Upper Site Landfill**		
Thermistor Number:	**VT03**	Inclination	**Vertical**		
Install Date:	**28-Sep-06**	First Date Event	**27-Aug-06**	Last Date Event	**15-Aug-08**
Coordinates and Elevation	N		E	Elev	**310.09**
Length of Cable (m)	**7.2**	Cable Lead Above Ground (m)	**1.2**	Nodal Points	**12**
Datalogger Serial #	**111126**			Cable Serial Number	**1618**

Code CAM-4VT03

Thermistor Inspection

	Good	Needs Maintenance
Casing	☑	☐
Cover	☑	☐
Data Logger	☑	☐
Cable	☑	☐
Beads	☑	☐

Battery Installation Date: **Batteries not replaced in 2008.**

Battery Levels: Main **11.34 V** Aux **13.5 V**

Manual Ground Temperature Readings

Bead	ohms	Temp. (ºC)
1		**14.2**
2		**9.2**
3		**4.1**
4		**2.3**
5		**0.0**
6		**-1.5**
7		**-2.8**
8		**-4.2**

Bead	ohms	Temp. (ºC)
9		**-5.3**
10		**-6.7**
11		**-7.6**
12		**-8.2**

Observations and Proposed Maintenance

Lock lubricated.

Thermal Monitoring
Ground Temperature Annual Maintenance Report

Contarctor Name:	**AECOM**	Inspection Date:	**15-Aug-08**
Prepared By:	**Darrin Johnson**		

Thermistor Information

Site Name:	**CAM-4**		Thermistor Location	**Upper Site Landfill**			
Thermistor Number:	**VT04**		Inclination	**Vertical**			
Install Date:	**26-Sep-06**		First Date Event	**27-Aug-07**	Last Date Event		**15-Aug-08**
Coordinates and Elevation		N		E		Elev	**312.8**
Length of Cable (m)	**6.2**		Cable Lead Above Ground (m)	**1.2**	Nodal Points	**10**	
Datalogger Serial #	**207046**				Cable Serial Number		**1619**

Code CAM-4VT04

Thermistor Inspection

	Good	Needs Maintenance
Casing	☑	☐
Cover	☑	☐
Data Logger	☑	☐
Cable	☑	☐
Beads	☑	☐

Battery Installation Date: **Batteries not replaced in 2008.**

Battery Levels: Main **11.34 V** Aux **13.63 V**

Manual Ground Temperature Readings

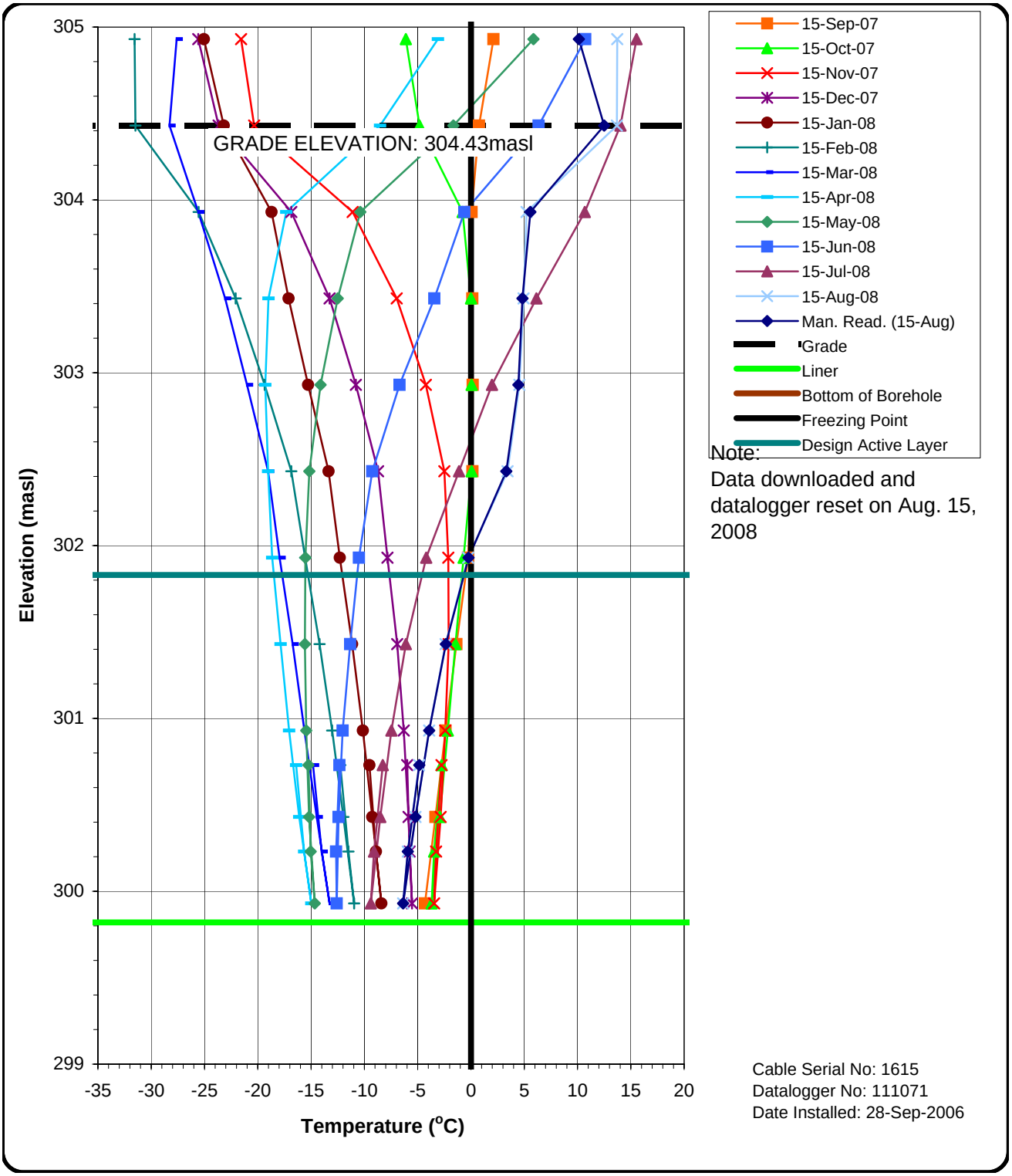
Bead	ohms	Temp. (ºC)
1		**13.7**
2		**9.6**
3		**5.0**
4		**3.4**
5		**1.2**
6		**-1.1**
7		**-2.5**
8		**-4.0**

Bead	ohms	Temp. (ºC)
9		**-5.2**
10		**-5.3**

Observations and Proposed Maintenance

Lock lubricated.

C6 – Thermistor Graphs



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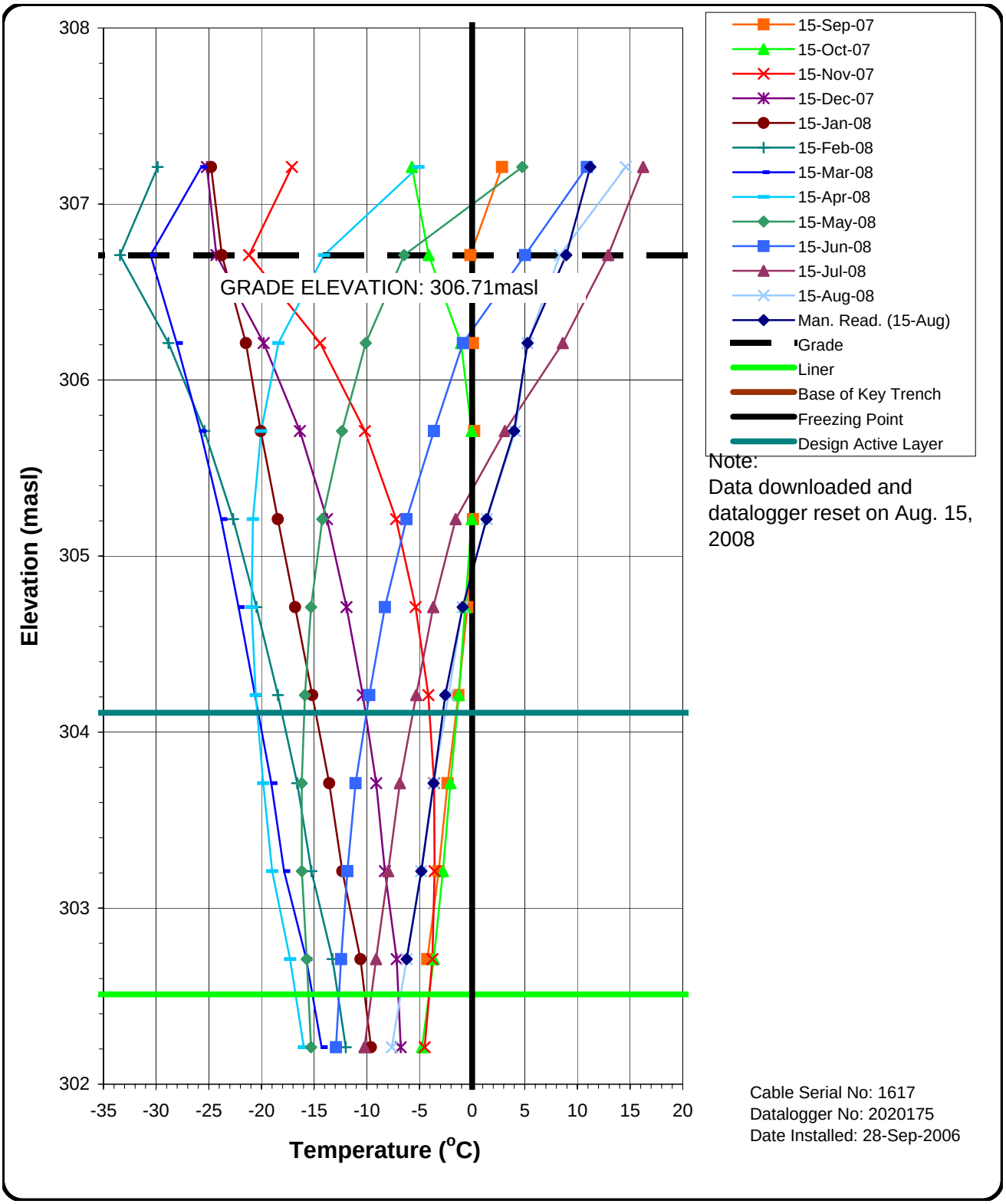
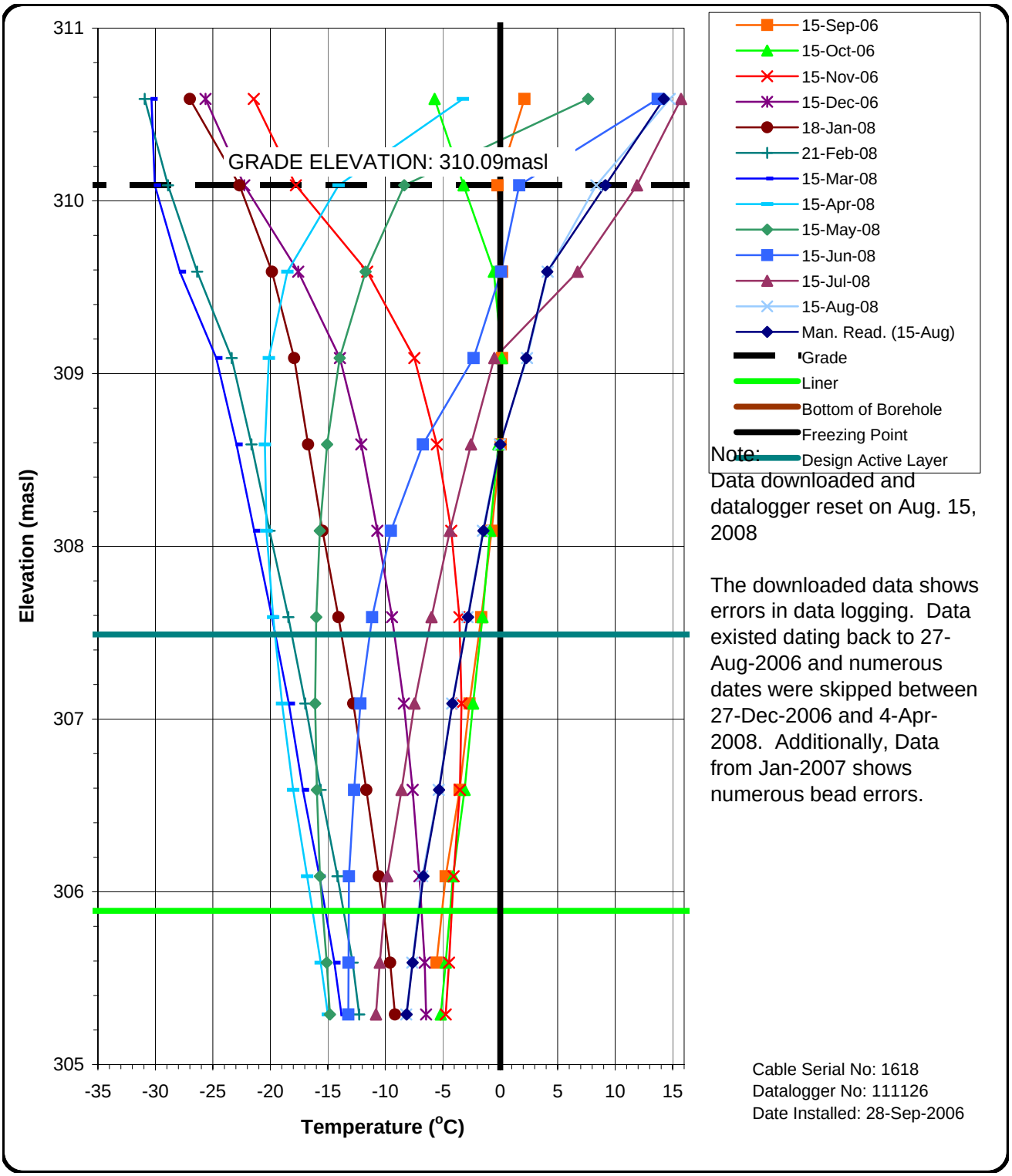
Graph C-1
Ground Temperature Profile
Upper Site Landfill
Vertical GTC VT-1



AECOM

Graph C-2
Ground Temperature Profile
Upper Site Landfill
Vertical GTC VT-2



Note:
Data downloaded and datalogger reset on Aug. 15, 2008

The downloaded data shows errors in data logging. Data existed dating back to 27-Aug-2006 and numerous dates were skipped between 27-Dec-2006 and 4-Apr-2008. Additionally, Data from Jan-2007 shows numerous bead errors.

Cable Serial No: 1618
Datalogger No: 111126
Date Installed: 28-Sep-2006

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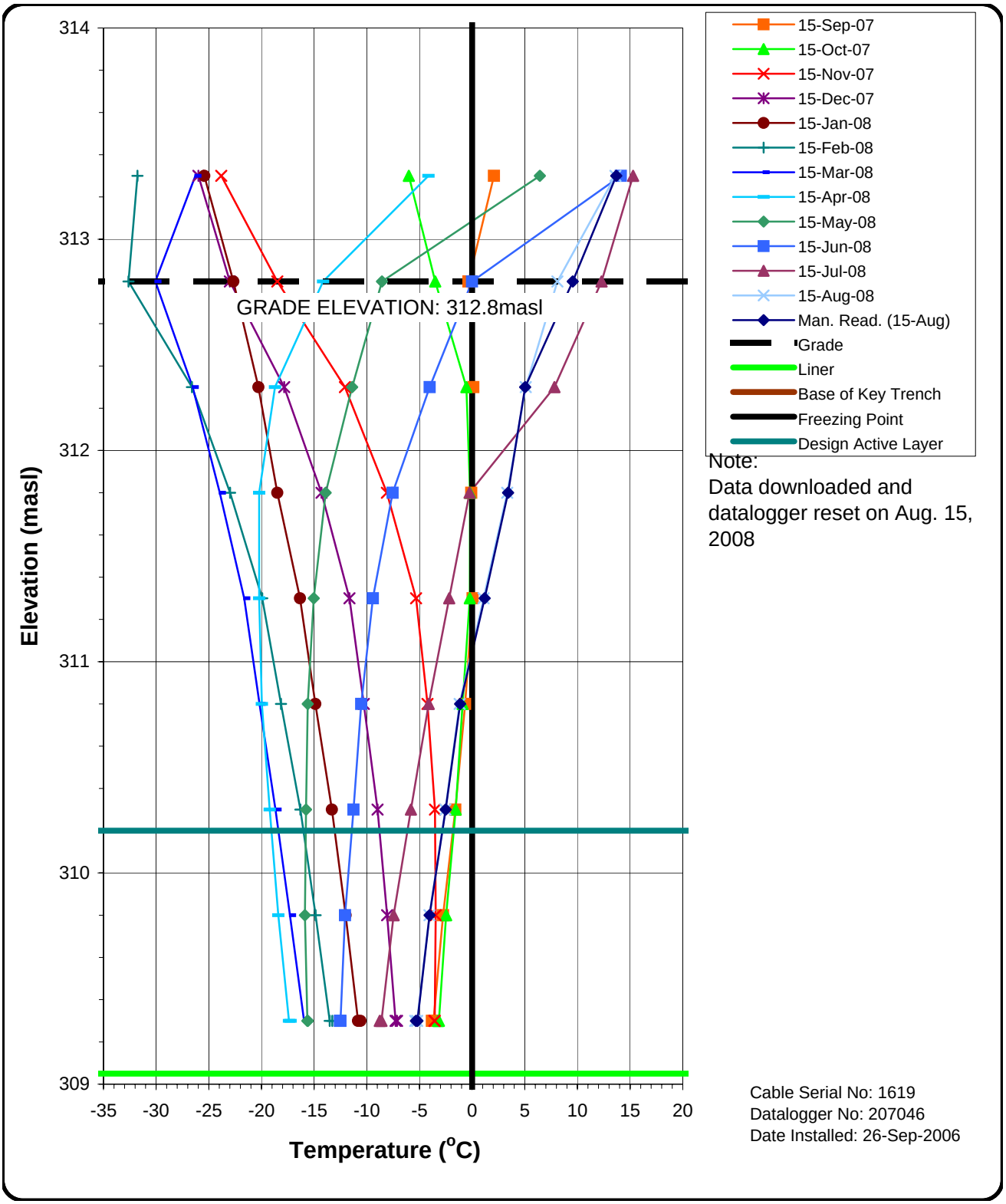
Graph C-3
Ground Temperature Profile
Upper Site Landfill
Vertical GTC VT-3



AECOM

Graph C-4
Ground Temperature Profile
Upper Site Landfill
Vertical GTC VT-4

C7 – Field Notes

Aug. 15/08

- LOWER SITE NON-HAZ LF (LSNH)
- STARTED INSPECTION AT 10AM

- LSNH PHOTO LOC. 1 (WAYPOINT 34)
  - FROM MW-20 (NORTH SLOPE)
  - PHOTOS 68, 69 & 70 (PANORAMIC)
  - COARSE ROCKFILL ON SLOPE WITH NO EROSION OR CRACKS OBSERVED, NO SEEPAGE AT TOE

- LSNH PHOTO LOC. 2 (WP 35)
  - CENTRE OF NORTH CREST ABOVE PHOTO LOC. 1
  - PHOTO 71 (CREST FACING EAST)
  - PHOTO 73 (TOP OF LF FACING SOUTH)
  - PHOTO 72 (CREST FACING WEST)
  - NO CRACKS OBSERVED ALONG CREST
  - NO SIGNIFICANT SETTLEMENT OF EXCAVATION ON TOP OF LF
  - SOME TIRE TRACKS VISIBLE BUT NO DAMAGE OR RUTTING

LSNH LF (PAGE 2)

- LSNH PHOTO LOC. 3 (WP 36)
  - CENTRE OF EAST CREST
  - PHOTO 74 (FACING NORTH)
  - PHOTO 75 (FACING SOUTH)

- LSNH PHOTO LOC. 4 (WP 37)
  - EAST SLOPE FACING NORTHWEST
  - PHOTO 76 (FACING SLOPE)

- LSNH PHOTO LOC. 5 (WP 38)
  - CENTRE OF SOUTH CREST
  - PHOTO 77 (FACING WEST CREST)
  - PHOTO 78 (FACING NORTH)
  - PHOTO 79 (FACING EAST ALONG CREST)
  - NO CRACKING OR SETTLEMENTS OBSERVED

- LSNH PHOTO LOC. 6 (WP 39)
  - CENTRE OF WEST CREST
  - PHOTO 80 (FACING NORTH)
  - PHOTO 81 (FACING SOUTH)

LSNH LF (PAGE 3)

- LSNH PHOTO LOC. 7 (WP 40)
  - WEST SLOPE OF LF
  - PHOTO 82 (FACING NE)
  - PHOTO 83 (FACING SE)

- OVERALL LANDFILL APPEARS TO BE STABLE, WITH NO EROSION OR CRACKING OBSERVED.
- NO SEEPAGE FROM TOES.
- NO VEGETATION.

2008 Monitoring Well Sampling Log (MW # 11)

Site name:	CAM- 4
Date of sampling event:	AUG- 14-16 / 2008
Names of samplers:	TFB
Monitoring well ID:	MW-11
Facility:	UPPER SITE

Known Data

Depth of installation* (m):	3.85
Length of screened section (m):	2.03
Depth to top of screen* (m):	0.86

Measured Data

Condition of well:	GOOD	Procedure/Equipment:	INTERFACE METER
Procedure/Equipment:	INTERFACE METER	Depth to water surface (m):	1.97 mBTOC
Well height above ground (m):	0.56	Depth to bottom (m):	2.82 mBTOC
Diameter of well (m):	2"	Free product thickness (mm):	—

Calculations

Depth of water (m):	1.97 mBTOC
Well volume of water (L):	7 mL
Static water level* (m):	1.41
Length of screen collecting water (m):	1.40

Notes

Evidence of sludge:	—
Evidence of freezing/siltation:	—

Development/Purging Information

Equipment: PERISTALTIC PUMP

Date & Time	Volume Removed (L)	Temperature (°C)	pH	Conductivity (µS/cm)	Turbidity (NTU)	Description of Water
15-AUG-08	2.50	2.71	6.62	0.97	2.3	C+C chemical odor

Water Sampling

Date & Time Collected:	15-AUG-08
Sample Number - Water:	MW-11
Sample Containers:	3 500 mL AMBERS 2 VOC VIALS
Procedure/Equipment:	PERISTALTIC PUMP
Water Description:	C+C chemical odor
Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	1
Number Rinses:	2

Soil Sampling

Date and Time Collected:	14-AUG-08
Sample Number - Soil:	MW 11-10 MW 11-40
	Refusal @ 90 cm
Sample Containers:	2 / 250 mL Clear PER SAMPLE 2M FILTERED
Procedure/Equipment:	TROWEL
Soil Description:	SANDY SILT TILL BROWN GRAVELLY, DRY
Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	3
Number Rinses:	3

n/a=not applicable

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

Gartner Lee

2008 Monitoring Well Sampling Log (MW # 13)

Site name:	CAM - 4
Date of sampling event:	AUG- 14-16/2008
Names of samplers:	TFB / DS (soil)
Monitoring well ID:	MW-13
Facility:	UPPER SITE

Known Data

Depth of installation* (m):	3.18
Length of screened section (m):	1.90
Depth to top of screen* (m):	0.20

Measured Data

Condition of well:	GOOD	Procedure/Equipment:	INTERFACE METER
Procedure/Equipment:	INTERFACE METER	Depth to water surface (m):	1.99
Well height above ground (m):	0.64	Depth to bottom (m):	2.18
Diameter of well (m):	2"	Free product thickness (mm):	—

Calculations		Notes	
Depth of water (m):	1.88	Evidence of sludge:	—
Well volume of water (L):	0.6 L	Evidence of freezing/siltation:	—
Static water level* (m):	1.24		
Length of screen collecting water (m):	1.34		

Development/Purging Information

Equipment: BAILER → SOME STAGNANT (WELL DRY)

Date & Time	Volume Removed (L)	Temperature (°C)	pH	Conductivity (µS/cm)	Turbidity (NTU)	Description of Water
16-AUG-08	0.8L	2.41	5.98	0.342	903.0	Cloudy, GREY chemical odour

Water Sampling		Soil Sampling	
Date & Time Collected:	16-AUG-08	Date and Time Collected:	19-AUG-08
Sample Number - Water:	MW-13,	Sample Number - Soil:	MW13-15 MW13-30
		Reduce 30cm	
Sample Containers:	2 VOC's 2 500mL AMBER	Sample Containers:	4 125mL Clear
Procedure/Equipment:	BAILER	Procedure/Equipment:	TROWEL
Water Description:	Cloudy, GREY Chemical odour.	Soil Description:	SANDY SILT TILL, brown GRAVELLY, moist
Sampling Equipment Decontamination (Y/N):	Y	Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	2	Number Washes:	2
Number Rinses:	3	Number Rinses:	3

n/a=not applicable

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

Gartner Lee

2008 Monitoring Well Sampling Log (MW # 10)

Site name:	CAM- 4
Date of sampling event:	AUG- 14-16 / 2008
Names of samplers:	TFB
Monitoring well ID:	MW - 10
Facility:	UPPER SITE

Known Data

Depth of installation* (m):	3.37
Length of screened section (m):	2.03
Depth to top of screen* (m):	0.38

Measured Data

Condition of well:	GOOD	Procedure/Equipment:	INTERFACE METER
Procedure/Equipment:	INTERFACE METER	Depth to water surface (m):	DRY @ 2.35
Well height above ground (m):	0.68	Depth to bottom (m):	
Diameter of well (m):	2"	Free product thickness (mm):	—

Calculations

Depth of water (m):	DRY @ 1.38
Well volume of water (L):	
Static water level* (m):	
Length of screen collecting water (m):	1.32

Notes

Evidence of sludge:	—
Evidence of freezing/siltation:	—

Development/Purging Information

Equipment: —

Date & Time	Volume Removed (L)	Temperature (°C)	pH	Conductivity (µS/cm)	Turbidity (NTU)	Description of Water
16-AUG-08	DRY					

Water Sampling

Date & Time Collected:	
Sample Number - Water:	DRY
Sample Containers:	
Procedure/Equipment:	
Water Description:	
Sampling Equipment Decontamination (Y/N):	
Number Washes:	
Number Rinses:	

Soil Sampling

Date and Time Collected:	14 AUG 08
Sample Number - Soil:	MW10-15 MW 10-35
Sample Containers:	2/250 mL clear PER SAMPLE
Procedure/Equipment:	TROWEL
Soil Description:	SAND/SILT GRAVEL BROWN/GREY
Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	2
Number Rinses:	2

n/a=not applicable

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

Gartner Lee

2008 Monitoring Well Sampling Log (MW #12)

Site name:	CAM-4
Date of sampling event:	AUG- ~~19~~ 16 / 2008
Names of samplers:	TFB
Monitoring well ID:	MW-12
Facility:	UPPER SITE

Known Data

Depth of installation* (m):	3.67
Length of screened section (m):	2.03
Depth to top of screen* (m):	0.68

Measured Data

Condition of well:	SEE BELOW	Procedure/Equipment:	INTERFACE METER
Procedure/Equipment:	INTERFACE METER	Depth to water surface (m):	1.53
Well height above ground (m):	0.66	Depth to bottom (m):	2.20
Diameter of well (m):	2"	Free product thickness (mm):	

Calculations		Notes	
Depth of water (m):	1.53	Evidence of sludge:	—
Well volume of water (L):	1.40	Evidence of freezing/siltation:	—
Static water level* (m):	0.87		
Length of screen collecting water (m):	0.86		

Development/Purging Information

Equipment:	BAILER

Date & Time	Volume Removed (L)	Temperature (°C)	pH	Conductivity (µS/cm)	Turbidity (NTU)	Description of Water
16-AUG-08	~~[illegible]~~ 1.40L	WELL DRY AFTER SAMPLE COLLECTION NO FIELD PARAMETERS				

Water Sampling		Soil Sampling	
Date & Time Collected:	16-AUG-08	Date and Time Collected:	19-AUG-08
Sample Number - Water: Blockage IN well SAND pack ? @ coupling	MW-12	Sample Number - Soil:	MW12-19
		Refusal @ 32cm.	MW12-20
Sample Containers:	3 500 ml AMBERS	Sample Containers:	2/250ML clear
	2 VOCs		PCR SAMPLE
Procedure/Equipment:	BAILER	Procedure/Equipment:	TROWEL
Water Description:	cloudy GREY SILTY chemical odour	Soil Description:	SANDY SILT SOME GRAVEL DARK BROWN
Sampling Equipment Decontamination (Y/N):	Y	Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	3	Number Washes:	2
Number Rinses:	5	Number Rinses:	2

n/a=not applicable

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

Gartner Lee

VT-4 DOWNLOADING AT 3:50PM

BATTERY MAIN 11.34V
AUX 13.63V

CHANNEL	TEMP (°C)	VOLT
1	13.69	1.35
2	9.55	1.23
3	5.037	1.09
4	3.41	1.04
5	1.19	0.97
6	-1.14	0.91
7	-2.52	0.87
8	-4.04	0.82
9	-5.19	0.79
10	-5.33	0.78

- CHECKED PROGRAMMING
- UPDATED CLOCK & CHECKED "STOP WHEN FULL"
- RESTARTED DATALOGGER

WEATHER: BECOMING OVERCAST COLD WIND, ~~ABOUT~~ 2°C

VT-3 DOWNLOADED AT 4:10PM

BATTERY MAIN 11.34V
AUX 13.5V

CHANNEL	TEMP (°C)	VOLT (V)
1	14.23	
2	9.15	
3	4.09	
4	2.27	
5	0.091	
6	-1.46	
7	-2.80	
8	-4.16	
9	-5.32	
10	-6.69	
11	-7.62	
12	-8.15	

- CHECKED PROGRAMMING
- UPDATED CLOCK & CHECKED "STOP WHEN FULL"
- RESTARTED DATALOGGER

VT-2 DOWNLOADED STARTED AT 4:20
BAT. MAIN 11.34V
AUX 12.77V

CHANNEL	TEMP (°C)	VOLT (V)
1	11.22	
2	8.94	
3	5.27	
4	3.98	
5	1.36	
6	-0.90	
7	-2.55	
8	-3.66	
9	-4.82	
10	-6.22	
11	-7.55	

- CHECKED PROGRAMMING
- UPDATED CLOCK & CHECKED "STOP WHEN FULL"
- RESTARTED DATALOGGER
- CHANGED SITE FROM 1 TO 2

VT-1 DOWNLOADED AT 4:35PM
BATT MAIN 11.34V
AUX. 12.29V

CHANNEL	TEMP (°C)
1	10.12
2	12.50
3	5.57
4	4.83
5	4.45
6	3.31
7	-0.23
8	-2.36
9	-3.92
10	-5.21
11	-6.37
12	-5.93
13	-4.85

- CHECKED PROGRAMMING
- CHANGED ETS-1 TO VT-1
- UPDATED CLOCK & CHECKED "STOP WHEN FULL"
- RESTARTED DATALOGGER

Appendix D

Lower Site Non-hazardous Waste Landfill

- D1 – Site Condition/Visual Inspection Records
- D2 – Geotechnical Inspection Photographic Records
- D3 – Field Notes

D1. Lower Site Non-hazardous Landfill

D1.1 Landfill Summary

The Lower Site Non-Hazardous Waste Landfill is located approximately 1.5 kilometres west of the west end of the airstrip, across the road from the Lower Site Landfill. The landfill contains non-hazardous wastes and debris generated and collected during clean up of the site. The location of the Lower Site Non-Hazardous Waste Landfill is presented in Figure D-1.

The landfill design consists of perimeter berms and a permanent cap of compacted granular fill over the landfilled material.

The monitoring requirements for 2008 include visual inspection only.

D1.2 Visual Monitoring

No significant erosion, settlement or indications of slope instability were observed at the Lower Site Non-Hazardous Waste Landfill. Overall landfill performance is assessed as “acceptable”. Appendix D1 presents a summary of the 2008 visual inspection results.

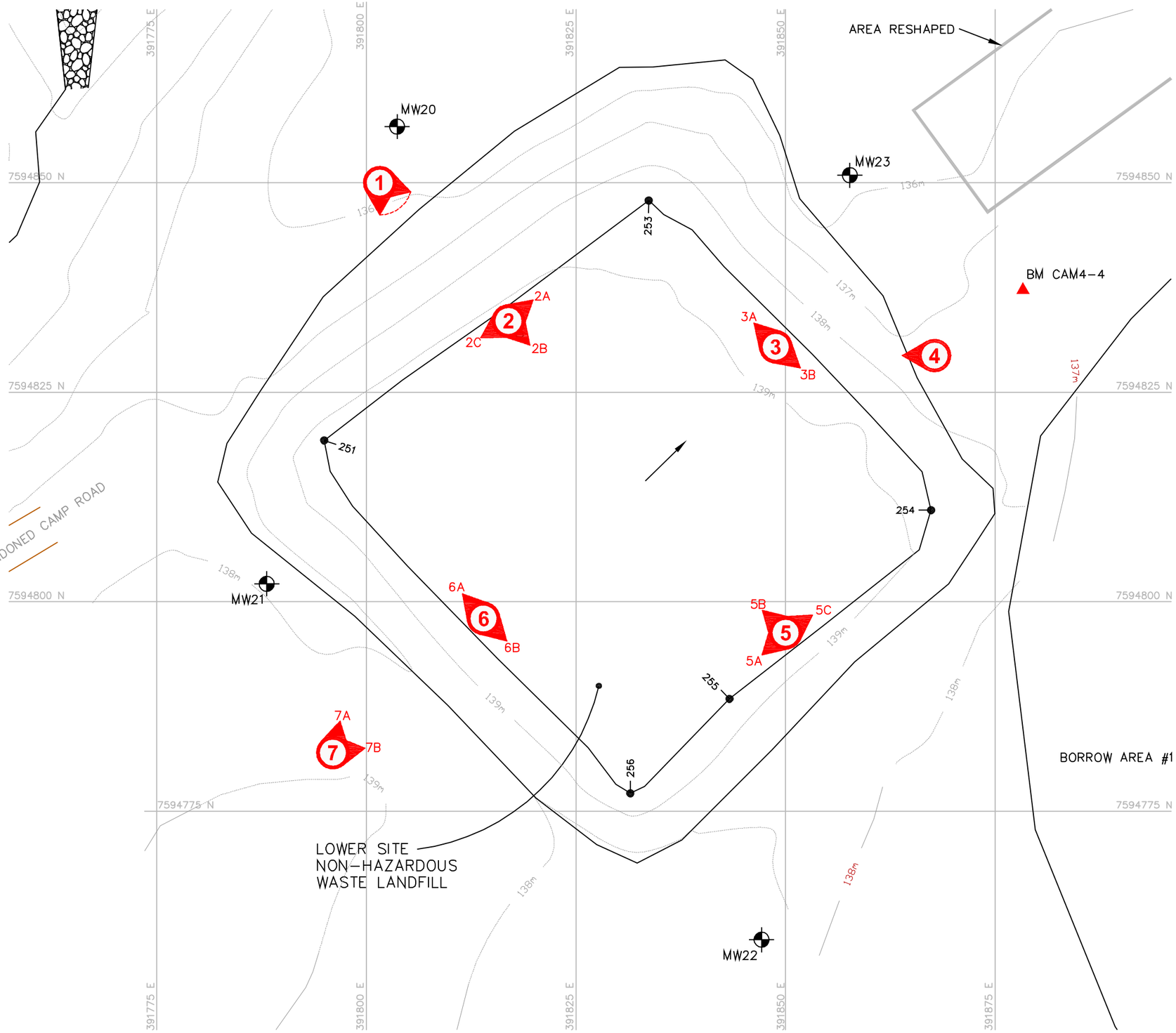
No issues of concern that require immediate attention were identified.

D1.3 Soil Sampling

Soil sampling was not scheduled for the 2008 monitoring year.

D1.4 Groundwater Sampling

Groundwater sampling was not scheduled for the 2008 monitoring year.



Legend

- TBM4 — TEMPORARY BENCHMARK
- BM-1 — PERMANENT BENCHMARK
- 101 — COORDINATE POINT
- MONITORING WELL LOCATION
- PHOTOGRAPH LOCATION

RECORD DRAWING
NOT FOR CONSTRUCTION

Map Sources / Notes:
Source drawing from UMA: C4-RD05.dwg

0 2.5 5 10 15 20 m
1 : 500
UTM Zone 16W, NAD83

File Name:	C4-RD05.dwg		
Reviewed by:	DCJ	Prepared by:	KAB
Date Issued:	October, 2008	Project Number:	80-297

Defence Construction Canada

2008 CAM-4 DEW LIne Monitoring Program
CAM-4 Kugaaruk
Nunavut Territory

Lower Site
Non-hazardous Waste Landfill

AECOM

Figure D-1
Version 1

Date Plotted: October 16, 2006 Path: N:\Projects\20081802971\2008\WorkInProgress\DataInterpretation\CAD\CAM-4\C4-RD05.dwg

D1 – Site Condition/Visual Inspection Records

Visual Inspection Checklist
Inspection Report – Page 1 of 2

SITE NAME:	CAM-4 - Pelly Bay
LANDFILL/AREA DESIGNATION:	Lower Site Non-Hazardous Waste Landfill
DATE OF INSPECTION:	August 15, 2008
DATE OF PREVIOUS INSPECTION:	August 24 - 26, 2007
INSPECTED BY:	Darrin Johnson, P.Eng.
REPORT PREPARED BY:	Darrin Johnson, P.Eng.

The preparer represents to the best of the preparer's knowledge, the following statements and observations are true and correct and to the best of the preparer's actual knowledge, no material facts have been suppressed or misstated.

Preliminary Stability Assessment

Feature	Severity Rating	Extent
Settlement	Not observed	None
Erosion	Not observed	None
Frost Action	Not observed	None
Animal Burrows	Not observed	None
Vegetation	Not observed	None
Staining	Not observed	None
Vegetation Stress	Not observed	None
Seepage Points	Not observed	None
Debris Exposed	Not observed	None
Tension Crack	Not observed	None
Overall Landfill Performance	Acceptable	

Checklist Item	Present Yes/No	Location	Dimensions (L x W) (m)	Depth (m)	Extent (%)	Description	Photographic Records (Photos referenced in photolog and in figures)	Additional Comments/ Preliminary Stability Assessment
Settlement	No							
Erosion	No							
Frost Action	No							
Animal Burrows	No							
Vegetation	No							
Staining	No							
Vegetation Stress	No							
Seepage Points	No							
Debris Exposed	No							
Presence/ Condition of Monitoring Instruments	Good							
Other Features of Note.	No							
Additional Photos						General	LNH-1, 2A, 2B, 2C, 3A, 3B, 4, 5A, 5B, 5C, 6A, 6B, 7A, 7B	

D2 – Geotechnical Inspection Photographic Records

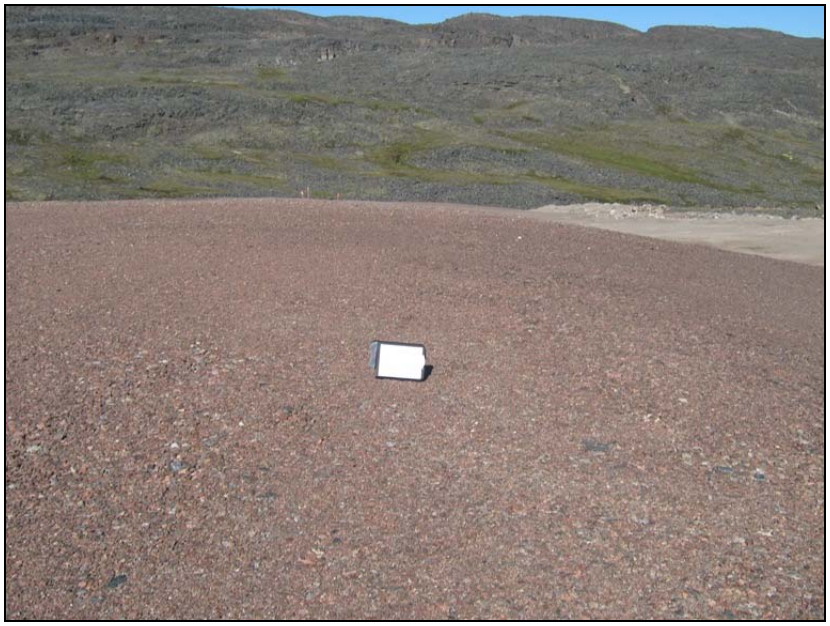
privileged and confidential

Photograph LNH-1. Panoramic photo of the north slope.___ ↑

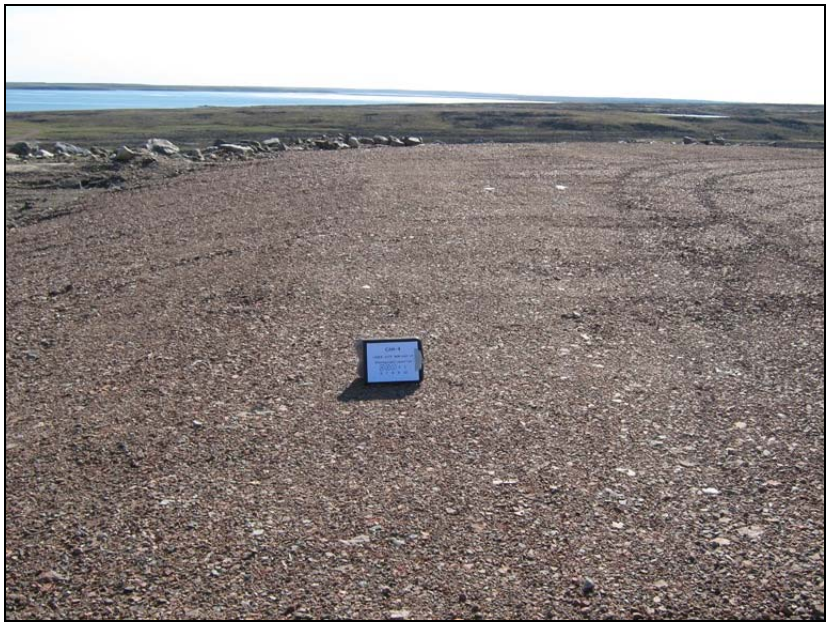
Photograph LNH-2A. Facing east along crest from the centre of the north crest. ↑

Photograph LNH-2B. Facing west along the crest from the centre of the north crest. Some tire tracks visible but no damage or rutting. ↑

Photograph LNH-2C. Top of the landfill facing south from the centre of the north crest. ↑



Photograph LNH-3A. Facing north from the centre of the east crest. ↑



Photograph LNH-3B. Facing south from the centre of the east crest. ↑

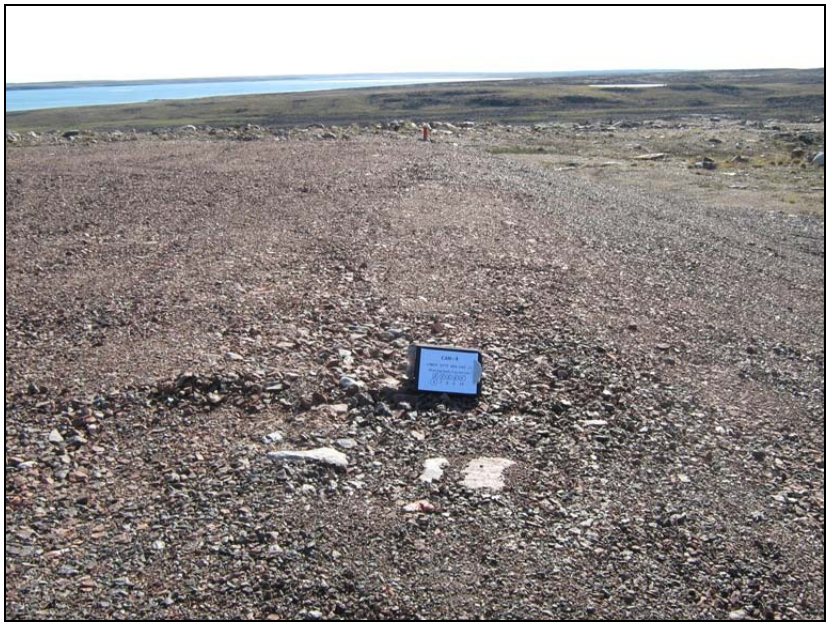
Photograph LNH-4. Facing northwest along the east slope. ↑

Photograph LNH-5A. Facing west along the crest from the centre of the south crest. ↑

Photograph LNH-5B. Facing north along the top of the landfill from the centre of the south crest. ↑

Photograph LNH-5C. Facing east along the crest from the centre of the south crest. ↑

Photograph LNH-6A. Facing north along the crest from the centre of the west crest. ↑



Photograph LNH-6B. Facing south along the crest from the centre of the west crest. ↑

Photograph LNH-7A. Facing northeast towards the west slope. ↑

Photograph LNH-7B. Facing southeast towards the west slope. ↑

D3 – Field Notes

Aug. 15/08

- LOWER SITE NON-HAZ LF (LSNH)
- STARTED INSPECTION AT 10AM

- LSNH PHOTO LOC. 1 (WAYPOINT 34)
  - FROM MW-20 (NORTH SLOPE)
  - PHOTOS 68, 69 & 70 (PANORAMIC)
  - COARSE ROCKFILL ON SLOPE WITH NO EROSION OR CRACKS OBSERVED, NO SEEPAGE AT TOE

- LSNH PHOTO LOC. 2 (WP 35)
  - CENTRE OF NORTH CREST ABOVE PHOTO LOC. 1
  - PHOTO 71 (CREST FACING EAST)
  - PHOTO 73 (TOP OF LF FACING SOUTH)
  - PHOTO 72 (CREST FACING WEST)
  - NO CRACKS OBSERVED ALONG CREST
  - NO SIGNIFICANT SETTLEMENT OF EXCAVATION ON TOP OF LF
  - SOME TIRE TRACKS VISIBLE BUT NO DAMAGE OR RUTTING

LSNH LF (PAGE 2)

- LSNH PHOTO LOC. 3 (WP 36)
  - CENTRE OF EAST CREST
  - PHOTO 74 (FACING NORTH)
  - PHOTO 75 (FACING SOUTH)

- LSNH PHOTO LOC. 4 (WP 37)
  - EAST SLOPE FACING NORTHWEST
  - PHOTO 76 (FACING SLOPE)

- LSNH PHOTO LOC. 5 (WP 38)
  - CENTRE OF SOUTH CREST
  - PHOTO 77 (FACING WEST CREST)
  - PHOTO 78 (FACING NORTH)
  - PHOTO 79 (FACING EAST ALONG CREST)
  - NO CRACKING OR SETTLEMENTS OBSERVED

- LSNH PHOTO LOC. 6 (WP 39)
  - CENTRE OF WEST CREST
  - PHOTO 80 (FACING NORTH)
  - PHOTO 81 (FACING SOUTH)

LSNH LF (PAGE 3)

- LSNH PHOTO LOC. 7 (WP 40)
  - WEST SLOPE OF LF
  - PHOTO 82 (FACING NE)
  - PHOTO 83 (FACING SE)

- OVERALL LANDFILL APPEARS TO BE STABLE, WITH NO EROSION OR CRACKING OBSERVED.
- NO SEEPAGE FROM TOES.
- NO VEGETATION.

Appendix E

Lower Site Landfill

- E1 – Site Condition/Visual Inspection Records
- E2 – Geotechnical Inspection Photographic Records
- E3 – Monitoring Photographic Records
- E4 – Monitoring Well Sampling Records
- E5 – Thermistor Maintenance Records
- E6 – Thermistor Graphs
- E7 – Field Notes

E1. Lower Site Landfill

E1.1 Landfill Summary

The Lower Site Landfill is located approximately 1.5 kilometres west of the west end of the airstrip. The original landfill consisted of four lobes (north, main, south and east), encompassing an area of approximately 10,000m^2. The location of the landfill is presented in Figure E-1.

A previous evaluation determined the north, main and south lobes drained into an intermittent channel along the toe, ultimately draining into a small lake near the north lobe. No contaminated soil was found downgradient of the landfill, however, a localized stain of Tier I concentration was identified south of the landfill perimeter. The Lower Site Landfill was classified as a moderate potential environmental risk.

Remediation of the Lower Site Landfill included installation of a double synthetic liner system anchored into the permafrost at the toe, regrading and placement of additional granular fill, complete excavation of the north lobe and regrading of the south and east lobes.

Monitoring requirements for the 2008 monitoring year include visual inspection, soil sampling, groundwater sampling and thermal monitoring.

E1.2 Visual Monitoring

No significant erosion, settlement or indications of slope instability were observed at the Lower Site Landfill. Overall landfill performance is assessed as “acceptable”. Appendix E1 presents a summary of the 2008 visual inspection results.

Minor erosion of fines was observed at the southwest end of the west slope (LSL-10 in Appendix E2). The erosion of fines appears to be self-armouring and is not a concern. Seepage was observed from the lower half of the north slope near the thermistors (LSL-7 in Appendix E2). No staining was observed on the slope. No issues of concern that require immediate attention were identified.

E1.3 Soil Sampling

Soil samples were collected at monitoring locations MW-17, MW-18, MW-19 and MW-20. The sampling locations are presented in Figure E-1. Two samples were collected at each monitoring location at depths of approximately 0.15 – 0.20 meters and 0.30 – 0.50 meters below ground surface. The photographs of each monitoring well and test pit location are included in Attachment E3.

No staining or free product was observed during the sampling event at the Lower Site Landfill. No odours were detected during the sampling event at the Lower Site Landfill.

LOWER SITE LANDFILL
NORTH LOBE
(EXCAVATED)

APPROXIMATE LIMIT OF
RESHAPING
ASSOCIATED WITH
LANDFILL EXCAVATION

CHECK DAM

MW17
C4-MW-1A
C4-MW-1B

MW18
C4-MW-1A
C4-MW-1B

MW19
C4-MW-1A
C4-MW-1B

MW20
C4-MW-1A
C4-MW-1B

MW21

MW23

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

AREA RESHAPED

LOWER SITE LANDFILL
(WITH LINER
SYSTEM)

AREA
RESHAPED

ABANDONED CAMP ROAD

PERIMETER OF REGRADING.

AREA
RESHAPED

LOWER SITE LANDFILL
EAST LOBE

BORROW AREA #1

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

DITCH

LOWER SITE
NON-HAZARDOUS
WASTE LANDFILL

LOWER SITE LANDFILL
SOUTH LOBE
(REGRADE NO. 2)

AREA RESHAPED

APPROXIMATE
PERIMETER OF AREA
REGRADED WITH TYPE
2 GRANULAR FILL.

391700 E
391750 E
391800 E
391850 E
391900 E
391950 E

7594950 N
7594901 N
7594900 N
7594850 N
7594800 N

Legend

- TBM4 — TEMPORARY BENCHMARK
- BM-1 — PERMANENT BENCHMARK
- 101 — COORDINATE POINT
- C4-MW-1A / C4-MW-1B — MONITORING SOIL SAMPLE LOCATION
- MONITORING WELL LOCATION
- VERTICAL THERMISTOR LOCATION
- 1 — PHOTOGRAPH LOCATION

RECORD DRAWING
NOT FOR CONSTRUCTION

Map Sources / Notes:
Source drawing from UMA: C4-RD06.dwg

0 5 10 20 30 40 m
1 : 1000
UTM Zone 16W, NAD83

File Name:	C4-RD06.dwg		
Reviewed by:	DCJ	Prepared by:	KAB
Date Issued:	October, 2008	Project Number:	80-297

Defence Construction Canada

2008 CAM-4 DEW Line Monitoring Program
CAM-4 Kugaaruk
Nunavut Territory

Lower Site Landfill

AECOM

Figure E-1
Version 1

Date Plotted: October 16, 2006 Path: N:\Projects\20081802971\2008\WorkInProgress\DataInterpretation\CAD\CAM-4\C4-RD06.dwg

No significant concentrations were detected at any of the soil monitoring locations at the Lower Site Landfill.

The analytical results and depths of samples are provided in Table E-1. The Laboratory Certificates of Analysis are provided in Appendix F.

E1.4 Groundwater Sampling

Groundwater measurements and monitoring system condition records were documented for monitoring wells MW-17, MW-18, MW-19 and MW-20. These records are provided in attachment E4.

All groundwater monitoring wells slated for monitoring in 2008 at the Lower Site Landfill contained sufficient volume for sampling. Samples were collected at a flow rate equal to the recharge rate of the monitoring well (and not exceeding 100mL/min). Monitor MW-19 was sampled using a peristaltic pump and disposable LDPE tubing. The rechargeable battery provided with the peristaltic pump from the supplier proved to be faulty following purging and sampling at monitors MW-17 and MW-18. Subsequently, monitors that were accessible by vehicle were sampled with the peristaltic pump running off the vehicle battery. Monitor MW-19 was not accessible by vehicle, therefore were purged and sampled using a disposable bailer.

Groundwater samples were not filtered and not preserved. Samples were analyzed for total concentration of inorganic metals, TPH (C6-C32) and PCB.

TPH (C6-C32) was detected in monitoring wells MW-17, MW-19 and MW-20. The results should be evaluated in the context of the Landfill Monitoring Plan as well as compared with DCC internal standards.

The results are presented in Table E-2. The laboratory Certificates of Analysis are provided in Appendix F.

E1.5 Thermal Monitoring

All thermistors at the Lower Site Landfill were in good condition. Thermistor data was downloaded on August 15, 2008, programming was checked and the data loggers were reset. The data logger clocks were adjusted to local (Standard Time). Battery charge was checked to ensure sufficient remaining charge and batteries were not changed in 2008.

Thermistor Maintenance Records were completed for all thermistors located at the Lower Landfill and are located in Appendix E5. Selected data has been plotted into graphs for each thermistor which are provided as Graphs E-1 through E-4 located in Appendix E6.

Table E-1. CAM-4 Kugaaruk, Summary of 2008 Soil Analysis - Lower Site Landfil

Sample Ident.	Sample Location	Depth (m)	Copper Cu (mg/kg)	Nickel Ni (mg/kg)	Cobalt Co (mg/kg)	Cadmium Cd (mg/kg)	Lead Pb (mg/kg)	Zinc Zn (mg/kg)	Chromium Cr (mg/kg)	Arsenic As (mg/kg)	Mercury Hg (mg/kg)	PCB Total Aroclors (mg/kg)	F1 C6-C10 (mg/kg)	F2 C10-C16 (mg/kg)	F3 C16-C34 (mg/kg)	TPH C6-34 (mg/kg)
Upgradient Samples																
MW-20-15	MW-20	0.15	12.3	9.6	5.9	<0.50	10.6	37.4	18.0	<5.0	<0.0050	<0.050	<10	<30	<50	0
MW-20-35	MW-20	0.35	10.0	8.7	4.7	<0.50	10.8	25.6	16.7	<5.0	<0.0050	<0.050	<10	<30	<50	0
MW-200-35*	MW-20	0.35	10.8	10.3	5.0	<0.50	10.7	26.8	20.8	<5.0	<0.0050	<0.050	<10	<30	<50	0
Downgradient Samples																
MW-17-15	MW-17	0.15	6.6	6.6	3.8	<0.50	5.4	18.2	14.0	<5.0	<0.0050	<0.050	<10	<30	<50	0
MW-17-40	MW-17	0.40	13.9	10.2	5.5	<0.50	8.7	32.0	20.8	<5.0	0.0052	<0.050	<10	<30	<50	0
MW-18-15	MW-18	0.15	9.5	8.0	3.8	<0.50	7.2	31.4	15.8	<5.0	0.0120	<0.050	<10	<30	<50	0
MW-18-30	MW-18	0.30	10.1	8.7	3.8	<0.50	8.9	35.5	17.9	<5.0	0.0085	<0.050	<10	<30	<50	0
MW-19-20	MW-19	0.20	7.4	7.2	3.9	<0.50	6.4	26.5	14.7	<5.0	<0.0050	<0.050	<10	<30	<50	0
MW-19-50	MW-19	0.50	7.1	6.6	3.9	<0.50	7.8	29.0	12.1	<5.0	<0.0050	<0.050	<10	<30	<50	0

***** *Denotes duplicate sample. (Further information located in Table 2 of main report)*

Note: mg/kg = ug/g

TPH is represented as the total of F1, F2 and F3 as defined by CCME Tier I Method - Rev. 5 Analysis of Petroleum Hydrocarbons in Soil

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Table E-2. CAM-4 Kugaaruk, Summary of 2008 Groundwater Analysis - Lower Site Landfill

Sample Identification	Location	Groundwater Elevation (masl)	Copper Cu (mg/L)	Nickel Ni (mg/L)	Cobalt Co (mg/L)	Cadmium Cd (mg/L)	Lead Pb (mg/L)	Zinc Zn (mg/L)	Chromium Cr (mg/L)	Arsenic As (mg/L)	Mercury Hg (mg/L)	PCB Total Aroclors (mg/L)	F1 C6-C10 (mg/L)	F2 C10-C16 (mg/L)	F3 C16-C34 (mg/L)	TPH C6-34 (mg/L)
Upgradient Samples																
MW-20	MW-20	133.69	0.0029	<0.0010	<0.00030	0.000024	<0.00050	<0.0050	<0.0010	<0.00050	<0.000020	<0.0010	0.75	1.99	<0.30	2.74
MW-200*	MW-20	133.69	0.0035	<0.0010	<0.00030	0.000028	<0.00050	<0.0050	<0.0010	<0.00050	<0.000020	<0.0010	0.74	2.33	<0.30	3.07
Downgradient Samples																
MW-17	MW-17	119.66	0.0069	0.0024	0.00285	0.000056	<0.00050	<0.0050	0.0014	0.00062	<0.000020	<0.0010	<0.10	<0.30	0.33	0.33
MW-18	MW-18	125.44	0.0023	0.0014	<0.00030	0.000025	<0.00050	0.0081	<0.0010	<0.00050	<0.000020	<0.0010	<0.10	<0.30	<0.30	0
MW-19	MW-19	128.87	0.0033	0.0041	0.00199	0.000210	<0.00050	0.0856	0.0014	<0.00050	<0.000020	<0.0010	<0.10	<0.30	0.32	0.32

***** *Denotes duplicate sample. (Further information located in Table 2 of main report)*
Note: mg/L = 1000 ug/L

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E1 – Site Condition/Visual Inspection Records

Visual Inspection Checklist
Inspection Report – Page 1 of 2

SITE NAME:	CAM-4 - Pelly Bay
LANDFILL/AREA DESIGNATION:	Lower Site Landfill
DATE OF INSPECTION:	August 15, 2008
DATE OF PREVIOUS INSPECTION:	August 24 - 26, 2007
INSPECTED BY:	Darrin Johnson, P.Eng.
REPORT PREPARED BY:	Darrin Johnson, P.Eng.

The preparer represents to the best of the preparer's knowledge, the following statements and observations are true and correct and to the best of the preparer's actual knowledge, no material facts have been suppressed or misstated.

Preliminary Stability Assessment

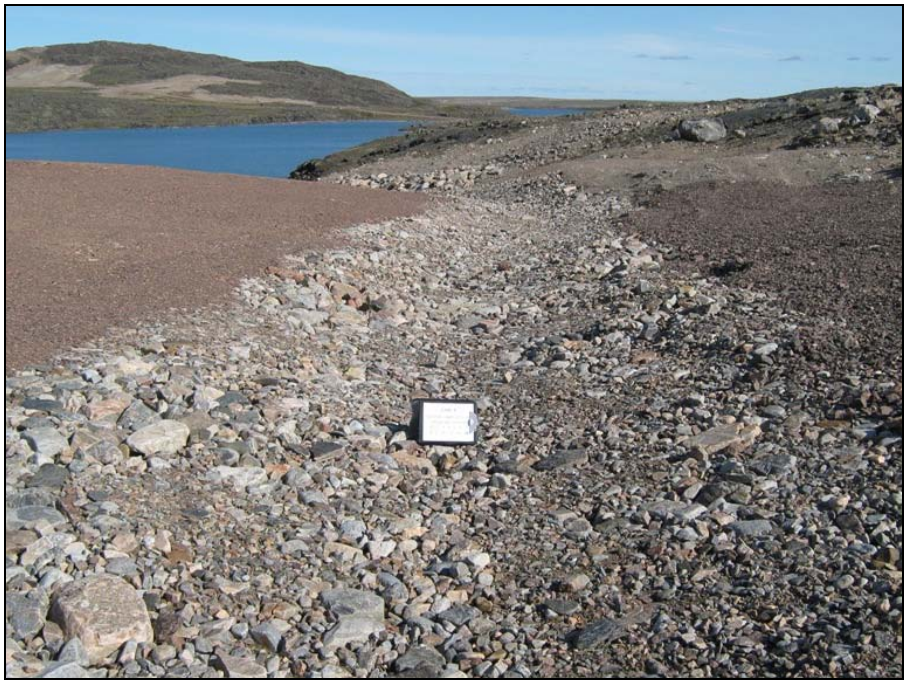
Feature	Severity Rating	Extent
Settlement	Not observed	None
Erosion	Acceptable	Isolated
Frost Action	Not observed	None
Animal Burrows	Not observed	None
Vegetation	Not observed	None
Staining	Not observed	None
Vegetation Stress	Not observed	None
Seepage Points	Acceptable	Isolated
Debris Exposed	Not observed	None
Tension Crack	Not observed	None
Overall Landfill Performance	Acceptable	

Checklist Item	Present Yes/No	Location	Dimensions (L x W) (m)	Depth (m)	Extent (%)	Description	Photographic Records (Photos referenced in photolog and in figures)	Additional Comments/ Preliminary Stability Assessment
Settlement	No							
Erosion	Minor	Southwest end of west slope.	30 m x 20 m	N/A	3%	Minor erosion of fines that appears to be self-armouring.	LSL-10	Acceptable
Frost Action	No							
Animal Burrows	No							
Vegetation	No							
Staining	No							
Vegetation Stress	No							
Seepage Points	Yes	Lower half of north slope near thermistors.	20 m x 10 m	N/A	1%	Minor seepage from lower half of slope. No staining.	LSL-7	Acceptable
Debris Exposed	No							
Presence/ Condition of Monitoring Instruments	Good							
Other Features of Note.	No							
Additional Photos						General	LSL-1, 2A, 2B, 3, 4, 5, 6, 7, 8, 9, 10, 11A, 11B, 11C, 12, 13	

E2 – Geotechnical Inspection Photographic Records

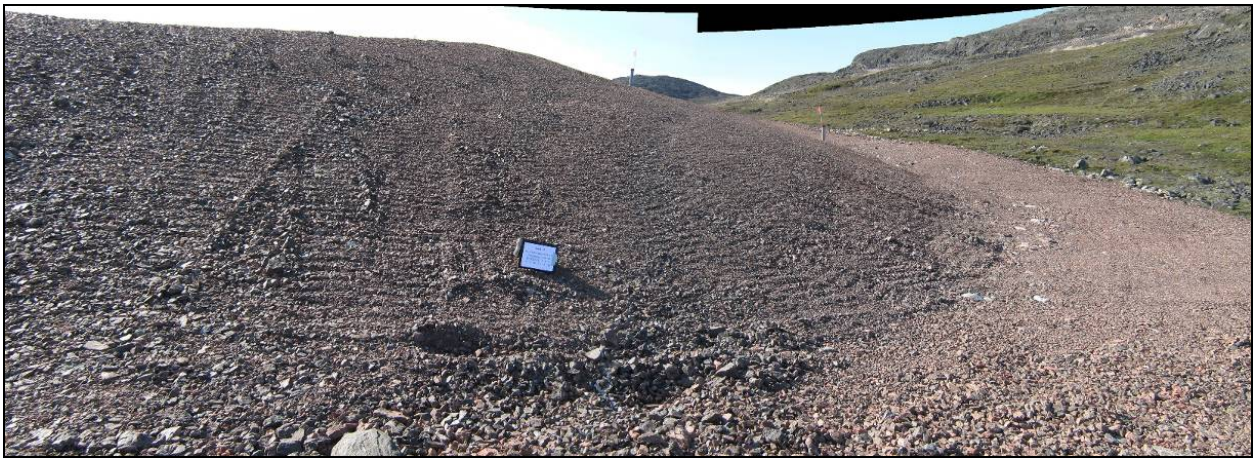
Photograph LSL-1. Panoramic photo of landfill from regraded hill near MW-20 ↑

Photograph LSL-2A. Looking west, upstream, along the rip-rap lined drainage channel. ↑



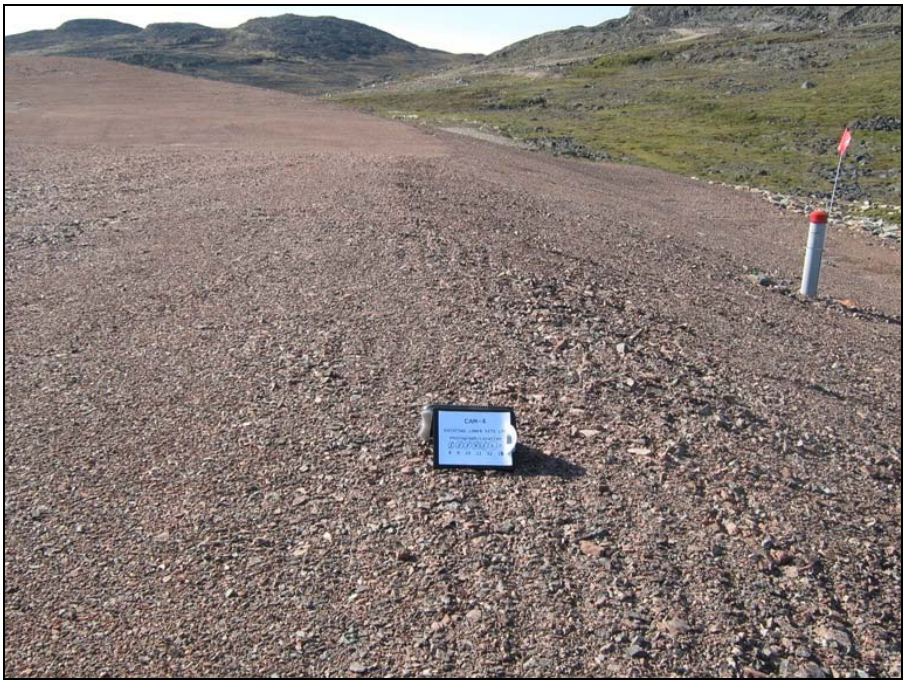
Photograph LSL-2B. Facing east, downstream, along the rip-rap lined drainage channel. ↑

Photograph LSL-3. Panoramic photo of the southeast end of the landfill from the toe of the landfill near the rip-rap drainage channel outlet. ↑



Photograph LSL-4. Panoramic photo facing west to the northeast corner of the landfill. ↑

Photograph LSL-5. View of the northeast corner slope from near MW-17, facing southwest. ↑



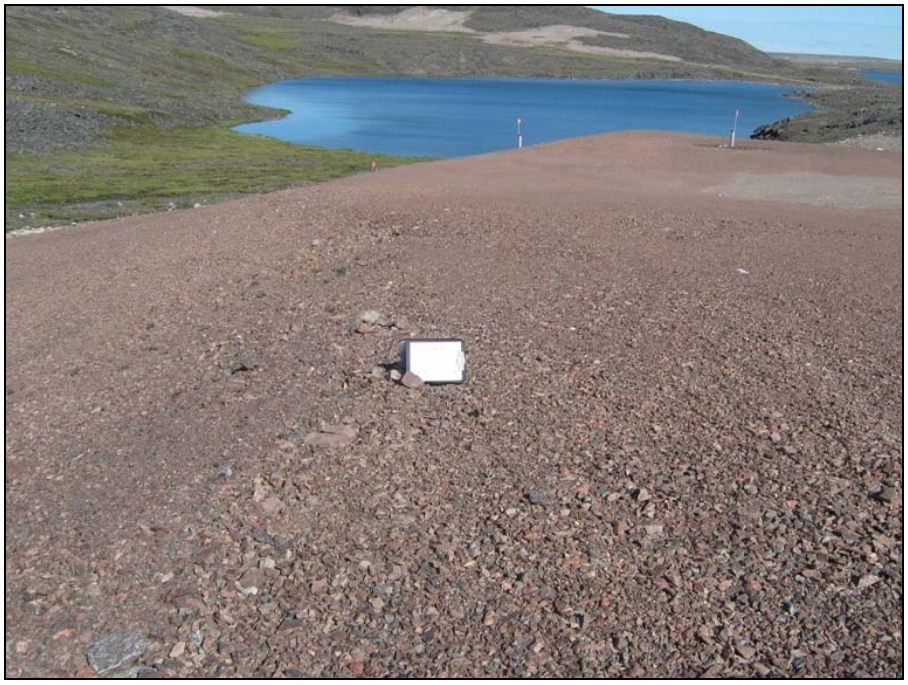
Photograph LSL-6. Facing west long the north crest. Some seepage from lower half of north face. No staining observed. ↑

Photograph LSL-7. Facing southwest to the north slope near thermistors. Seepage from lower half of slope, with no staining observed. Very small tuffs of grass/vegetation observed. ↑

Photograph LSL-8. Facing east along the north crest near thermistors. ↑

Photograph LSL-9. Facing southeast to slope. ↑

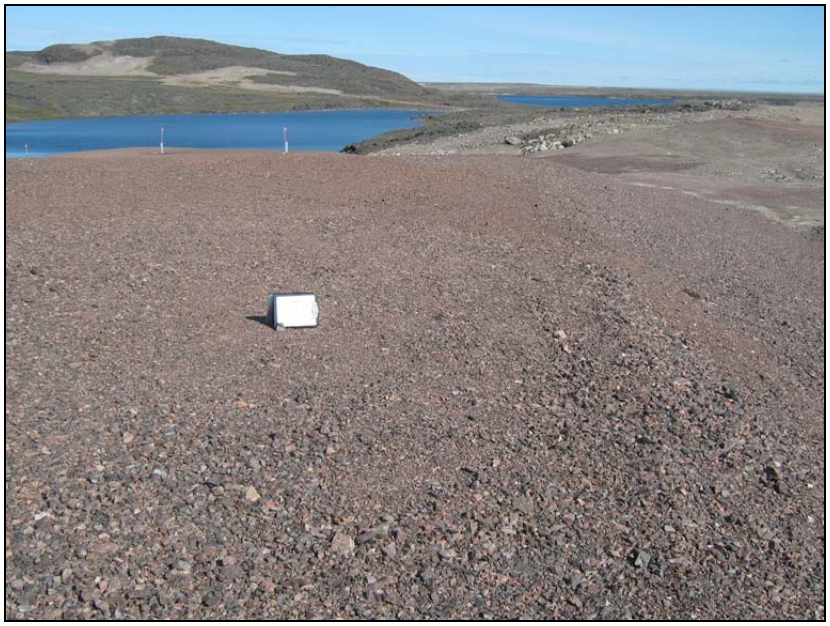
Photograph LSL-10. Panoramic photo facing southeast to the north slope at northwest end. Minor erosion of fines but self armouring. ↑



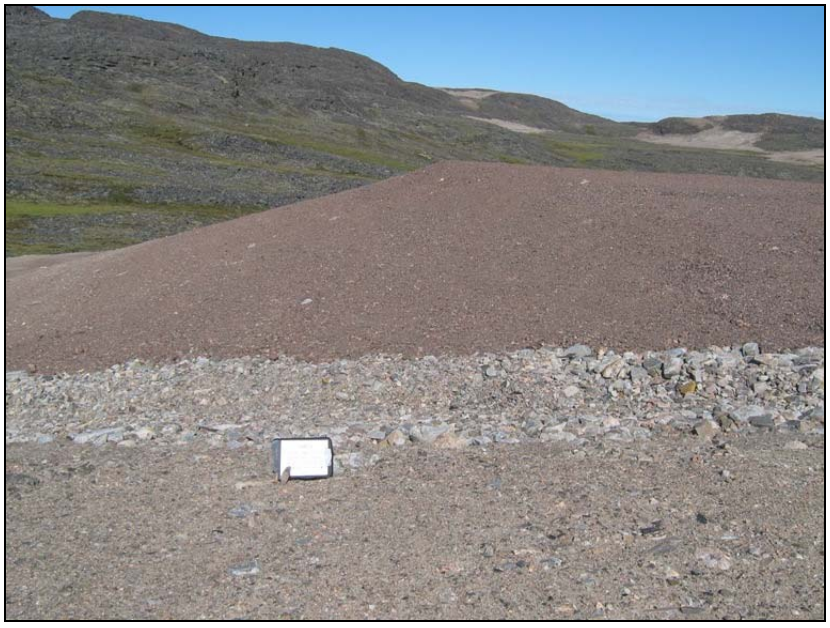
Photograph LSL-11A. Facing east along northwest crest. ↑

Photograph LSL-11B. Facing south over the landfill from the northwest crest. ↑

Photograph LSL-11C. Facing west along the northwest crest. ↑



Photograph LSL-12. Facing east along crest at the southwest corner. ↑



Photograph LSL-13. Facing northeast to the west slope and rip-rap lined drainage ditch at the toe of the landfill. ↑

E3 – Monitoring Photographic Records

Photograph 1. Monitoring Location MW-20 (Upgradient) Facing Northeast. ↑

Photograph 2. Monitoring Location MW-17 (Downgradient). Facing Southeast. ↑

Photograph 3. Monitoring Location MW-18 (Downgradient). Facing Northwest. ↑

Photograph 4. Monitoring Location MW-19 (Downgradient). Facing Southwest. ↑

E4 – Monitoring Well Sampling Records

2008 Monitoring Well Sampling Log (MW-17)

Site name:	CAM-4
Date of sampling event:	14-17 Aug 2008
Names of samplers:	TFB
Monitoring well ID:	MW-17
Facility:	Lower Site Landfill

Known Data

Depth of installation* (m):	3.82
Length of screened section (m):	2.03
Depth to top of screen* (m):	0.83

Measured Data

Condition of well:	Good	Procedure/Equipment:	Interface Meter
Procedure/Equipment:	Interface Meter	Depth to water surface (m):	1.48
Well height above ground (m):	0.74	Depth to bottom (m):	2.20
Diameter of well (m):	0.05	Free product thickness (mm):	-

Calculations

Depth of water (m):	0.72
Well volume of water (L):	1.41
Static water level* (m):	0.74
Length of screen collecting water (m):	0.63

Notes

Evidence of sludge:	-
Evidence of freezing/siltation:	-

Development/Purging Information

Equipment: Peristaltic Pump, Horiba U-22 with flow through cell, LDPE

Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (µS/cm)	Turbidity (NTU)	Description of Water
15-Aug-08	3.5	5.41	6.16	0.54	27.9	C&C, N/O

Water Sampling

Date & Time Collected:	15-Aug-08
Sample Number - Water:	MW-17
Sample Containers:	3 x 0.5L Amber Glass
	2 x VOC vials
Procedure/Equipment:	Peristaltic Pump, Horiba U-22
Water Description:	C&C, N/O
Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	1
Number Rinses:	1

Soil Sampling

Date and Time Collected:	15-Aug-08
Sample Number - Soil:	MW-17-15
	MW-17-40
Sample Containers:	4 x 250mL Glass
Procedure/Equipment:	SS Trowel
Soil Description:	Brown sandy silt
Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	2
Number Rinses:	3

*From ground surface. Unless this is stated, all measurments are assumed to be from the top of the casing.
n/a=not applicable
LDPE=Low Density Polyethylene
SS=Stainless Steel

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2008 Monitoring Well Sampling Log (MW-18)

Site name:	CAM-4
Date of sampling event:	14-17 Aug 2008
Names of samplers:	TFB/DAJ
Monitoring well ID:	MW_18
Facility:	Lower Site Landfill

Known Data

Depth of installation* (m):	3.80
Length of screened section (m):	2.03
Depth to top of screen* (m):	0.81

Measured Data

Condition of well:	Good	Procedure/Equipment:	Interface Meter
Procedure/Equipment:	Interface Meter	Depth to water surface (m):	0.73
Well height above ground (m):	0.57	Depth to bottom (m):	2.30
Diameter of well (m):	0.05	Free product thickness (mm):	-

Calculations

Depth of water (m):	1.57
Well volume of water (L):	3.08
Static water level* (m):	0.16
Length of screen collecting water (m):	0.92

Notes

Evidence of sludge:	-
Evidence of freezing/siltation:	-

Development/Purging Information

Equipment: Peristaltic Pump, Horiba U-22 with flow through cell, LDPE

Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (µS/cm)	Turbidity (NTU)	Description of Water
15-Aug-08	3.5	5.12	5.82	0.223	8.6	C&C Slight chemical odour

Water Sampling

Date & Time Collected:	15-Aug-08
Sample Number - Water:	MW-18
Sample Containers:	3 x 0.5L Amber Glass 2 x VOC vials
Procedure/Equipment:	Peristaltic Pump, Horiba U-22
Water Description:	C&C, Slight chemical odour
Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	2
Number Rinses:	2

Soil Sampling

Date and Time Collected:	15-Aug-08
Sample Number - Soil:	MW-18-15 MW-18-30
Sample Containers:	4 x 250mL Glass
Procedure/Equipment:	SS Trowel
Soil Description:	Brown sandy silt
Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	2
Number Rinses:	2

*From ground surface. Unless this is stated, all measurments are assumed to be from the top of the casing.
n/a=not applicable
LDPE=Low Density Polyethylene
SS=Stainless Steel

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2008 Monitoring Well Sampling Log (MW-19)

Site name:	CAM-4
Date of sampling event:	14-17 Aug 2008
Names of samplers:	TFB
Monitoring well ID:	MW-19
Facility:	Lower Site Landfill

Known Data

Depth of installation* (m):	3.83
Length of screened section (m):	2.03
Depth to top of screen* (m):	0.84

Measured Data

Condition of well:	Good	Procedure/Equipment:	Interface Meter
Procedure/Equipment:	Interface Meter	Depth to water surface (m):	0.78
Well height above ground (m):	0.65	Depth to bottom (m):	2.10
Diameter of well (m):	0.05	Free product thickness (mm):	-

Calculations

Depth of water (m):	1.32
Well volume of water (L):	2.59
Static water level* (m):	0.13
Length of screen collecting water (m):	0.61

Notes

Evidence of sludge:	-
Evidence of freezing/siltation:	-

Development/Purging Information

Equipment:	Disposable bailer, Horiba U-22

Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (µS/cm)	Turbidity (NTU)	Description of Water
15-Aug-08	3.2	7.3	5.55	0.645	260	C&C Slight chemical odour

Water Sampling

Date & Time Collected:	15-Aug-08
Sample Number - Water:	MW-19
Sample Containers:	3 x 0.5L Amber Glass 2 x VOC vials
Procedure/Equipment:	Peristaltic Pump, Horiba U-22
Water Description:	C&C, slight chemical odour
Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	2
Number Rinses:	2

Soil Sampling

Date and Time Collected:	15-Aug-08
Sample Number - Soil:	MW-19-20 MW-19-50
Sample Containers:	4 x 250mL Glass
Procedure/Equipment:	SS Trowel
Soil Description:	Brown sandy silt
Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	2
Number Rinses:	2

*From ground surface. Unless this is stated, all measurments are assumed to be from the top of the casing.
n/a=not applicable
LDPE=Low Density Polyethylene
SS=Stainless Steel

AECOM

2008 Monitoring Well Sampling Log (MW-20)

Site name:	CAM-4
Date of sampling event:	14-17 Aug 2008
Names of samplers:	TFB
Monitoring well ID:	MW-20
Facility:	Lower Site Landfill

Known Data

Depth of installation* (m):	3.43
Length of screened section (m):	2.05
Depth to top of screen* (m):	0.30

Measured Data

Condition of well:	Good	Procedure/Equipment:	Interface Meter
Procedure/Equipment:	Interface Meter	Depth to water surface (m):	2.37
Well height above ground (m):	0.66	Depth to bottom (m):	2.93
Diameter of well (m):	0.05	Free product thickness (mm):	-

Calculations

Depth of water (m):	0.56
Well volume of water (L):	1.10
Static water level* (m):	1.71
Length of screen collecting water (m):	0.56

Notes

Evidence of sludge:	-
Evidence of freezing/siltation:	-

Development/Purging Information

Equipment: Peristaltic Pump, Horiba U-22 with flow through cell, LDPE

Date & Time	Volume Removed (L)	Temperature (^{o}C)	pH	Conductivity (µS/cm)	Turbidity (NTU)	Description of Water
15-Aug-08	1.5	4.76	6.67	0.396	4.4	C&C, N/O

Water Sampling

Date & Time Collected:	15-Aug-08
Sample Number - Water:	MW-20
Sample Containers:	6 x 0.5L Amber Glass
	4 x VOC vials
2 x 1L Amber glass	1 x 0.25L Plastic
Procedure/Equipment:	Peristaltic Pump, Horiba U-22
Water Description:	C&C,N/O
Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	1
Number Rinses:	1

Soil Sampling

Date and Time Collected:	15-Aug-08
Sample Number - Soil:	MW-20-15
	MW-20-35
Dup	MW-200-35
Sample Containers:	8 x 250mL Glass
Procedure/Equipment:	SS Trowel
Soil Description:	Brown sandy silt
Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	2
Number Rinses:	2

*From ground surface. Unless this is stated, all measurments are assumed to be from the top of the casing.
n/a=not applicable
LDPE=Low Density Polyethylene
SS=Stainless Steel

AECOM

E5 – Thermistor Maintenance Records

Thermal Monitoring
Ground Temperature Annual Maintenance Report

Contarctor Name:	**AECOM**	Inspection Date:	**15-Aug-08**
Prepared By:	**Darrin Johnson**		

Thermistor Information

Site Name:	**CAM-4**		Thermistor Location	**Lower Site Landfill**			
Thermistor Number:	**VT09**		Inclination	**Vertical**			
Install Date:	**29-Sep-06**		First Date Event	**27-Aug-07**	Last Date Event		**15-Aug-08**
Coordinates and Elevation		N		E		Elev	**125.769**
Length of Cable (m)	**6.2**		Cable Lead Above Ground (m)	**1.2**	Nodal Points	**10**	
Datalogger Serial #	**2020165**				Cable Serial Number		**1623**

Code CAM-4VT09

Thermistor Inspection

	Good	Needs Maintenance
Casing	☑	☐
Cover	☑	☐
Data Logger	☑	☐
Cable	☑	☐
Beads	☑	☐

Battery Installation Date: **Batteries not replaced in 2008.**

Battery Levels: Main **11.34 V** Aux **13.5 V**

Manual Ground Temperature Readings

Bead	ohms	Temp. (ºC)
1		**16.0**
2		**13.2**
3		**6.1**
4		**4.5**
5		**2.0**
6		**-0.6**
7		**-1.9**
8		**-3.2**

Bead	ohms	Temp. (ºC)
9		**-4.4**
10		**-5.4**

Observations and Proposed Maintenance

Lock lubricated.

Thermal Monitoring
Ground Temperature Annual Maintenance Report

Contarctor Name:	**AECOM**	Inspection Date:	**15-Aug-08**
Prepared By:	**Darrin Johnson**		

Thermistor Information

Site Name:	**CAM-4**		Thermistor Location	**Lower Site Landfill**			
Thermistor Number:	**VT10**		Inclination	**Vertical**			
Install Date:	**29-Sep-06**		First Date Event	**27-Aug-07**	Last Date Event		**15-Aug-08**
Coordinates and Elevation		N		E		Elev	**129.924**
Length of Cable (m)	**6.2**		Cable Lead Above Ground (m)	**1.2**	Nodal Points	**10**	
Datalogger Serial #	**108060**				Cable Serial Number		**1625**

Code CAM-4VT10

Thermistor Inspection

	Good	Needs Maintenance
Casing	☑	☐
Cover	☑	☐
Data Logger	☑	☐
Cable	☑	☐
Beads	☑	☐

Battery Installation Date: **Batteries not replaced in 2008.**

Battery Levels: Main **11.34 V** Aux **12.53 V**

Manual Ground Temperature Readings

Bead	ohms	Temp. (ºC)
1		**14.0**
2		**7.4**
3		**4.2**
4		**2.6**
5		**1.9**
6		**-0.1**
7		**-1.5**
8		**-2.8**

Bead	ohms	Temp. (ºC)
9		**-4.5**
10		**-5.2**

Observations and Proposed Maintenance

Lock lubricated.

Thermal Monitoring
Ground Temperature Annual Maintenance Report

Contarctor Name:	**AECOM**	Inspection Date:	**15-Aug-08**
Prepared By:	**Darrin Johnson**		

Thermistor Information

Site Name:	**CAM-4**		Thermistor Location	**Lower Site Landfill**			
Thermistor Number:	**VT11**		Inclination	**Vertical**			
Install Date:	**29-Sep-06**		First Date Event	**27-Aug-07**	Last Date Event		**15-Aug-08**
Coordinates and Elevation		N		E		Elev	**131.86**
Length of Cable (m)	**6.2**	Cable Lead Above Ground (m)	**1.2**	Nodal Points	**10**		
Datalogger Serial #	**111070**			Cable Serial Number			**1621**

Code CAM-4VT11

Thermistor Inspection

	Good	Needs Maintenance
Casing	☑	☐
Cover	☑	☐
Data Logger	☑	☐
Cable	☑	☐
Beads	☑	☐

Battery Installation Date: **Batteries not replaced in 2008.**

Battery Levels: Main **11.34 V** Aux **13.63 V**

Manual Ground Temperature Readings

Bead	ohms	Temp. (ºC)
1		**14.9**
2		**7.4**
3		**5.8**
4		**4.5**
5		**1.8**
6		**-0.5**
7		**-2.1**
8		**-3.2**

Bead	ohms	Temp. (ºC)
9		**-4.1**
10		**-2.8**

Observations and Proposed Maintenance

Lock lubricated.

Thermal Monitoring
Ground Temperature Annual Maintenance Report

Contarctor Name:	**AECOM**	Inspection Date:	**15-Aug-08**
Prepared By:	**Darrin Johnson**		

Thermistor Information

Site Name:	**CAM-4**		Thermistor Location	**Lower Site Landfill**			
Thermistor Number:	**VT12**		Inclination	**Vertical**			
Install Date:	**29-Sep-06**		First Date Event	**27-Aug-07**	Last Date Event		**15-Aug-08**
Coordinates and Elevation		N		E		Elev	**131.966**
Length of Cable (m)	**6.7**		Cable Lead Above Ground (m)	**1.2**	Nodal Points	**11**	
Datalogger Serial #	**2020150**				Cable Serial Number		**1626**

Code CAM-4VT12

Thermistor Inspection

	Good	Needs Maintenance
Casing	☑	☐
Cover	☑	☐
Data Logger	☑	☐
Cable	☑	☐
Beads	☑	☐

Battery Installation Date: **Batteries not replaced in 2008.**

Battery Levels: Main **11.34 V** Aux **13.38 V**

Manual Ground Temperature Readings

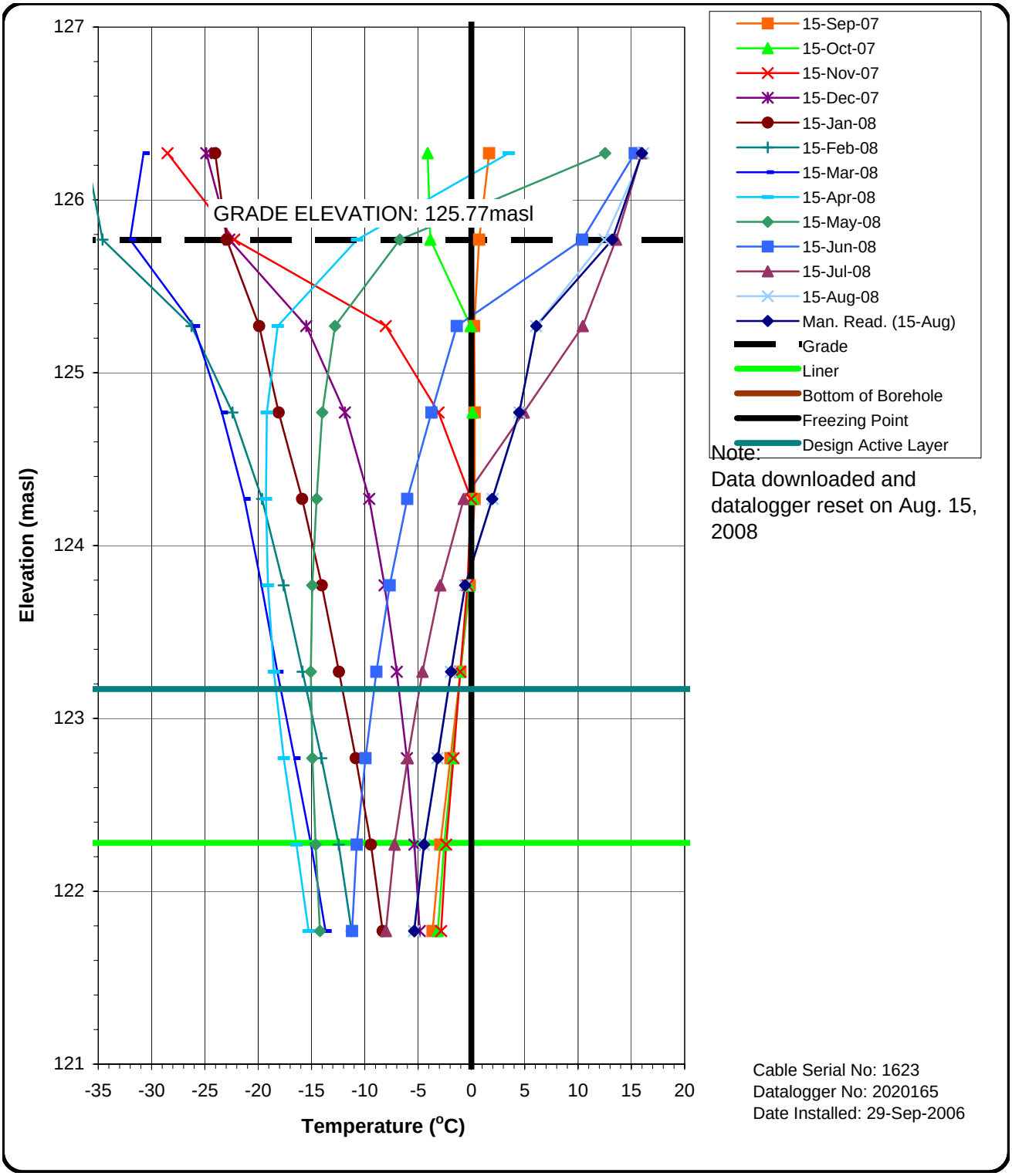
Bead	ohms	Temp. (ºC)
1		**15.8**
2		**10.5**
3		**6.7**
4		**5.3**
5		**3.0**
6		**0.0**
7		**-1.4**
8		**-2.6**

Bead	ohms	Temp. (ºC)
9		**-4.1**
10		**-5.4**
11		**-5.4**

Observations and Proposed Maintenance

Lock lubricated.

E6 – Thermistor Graphs

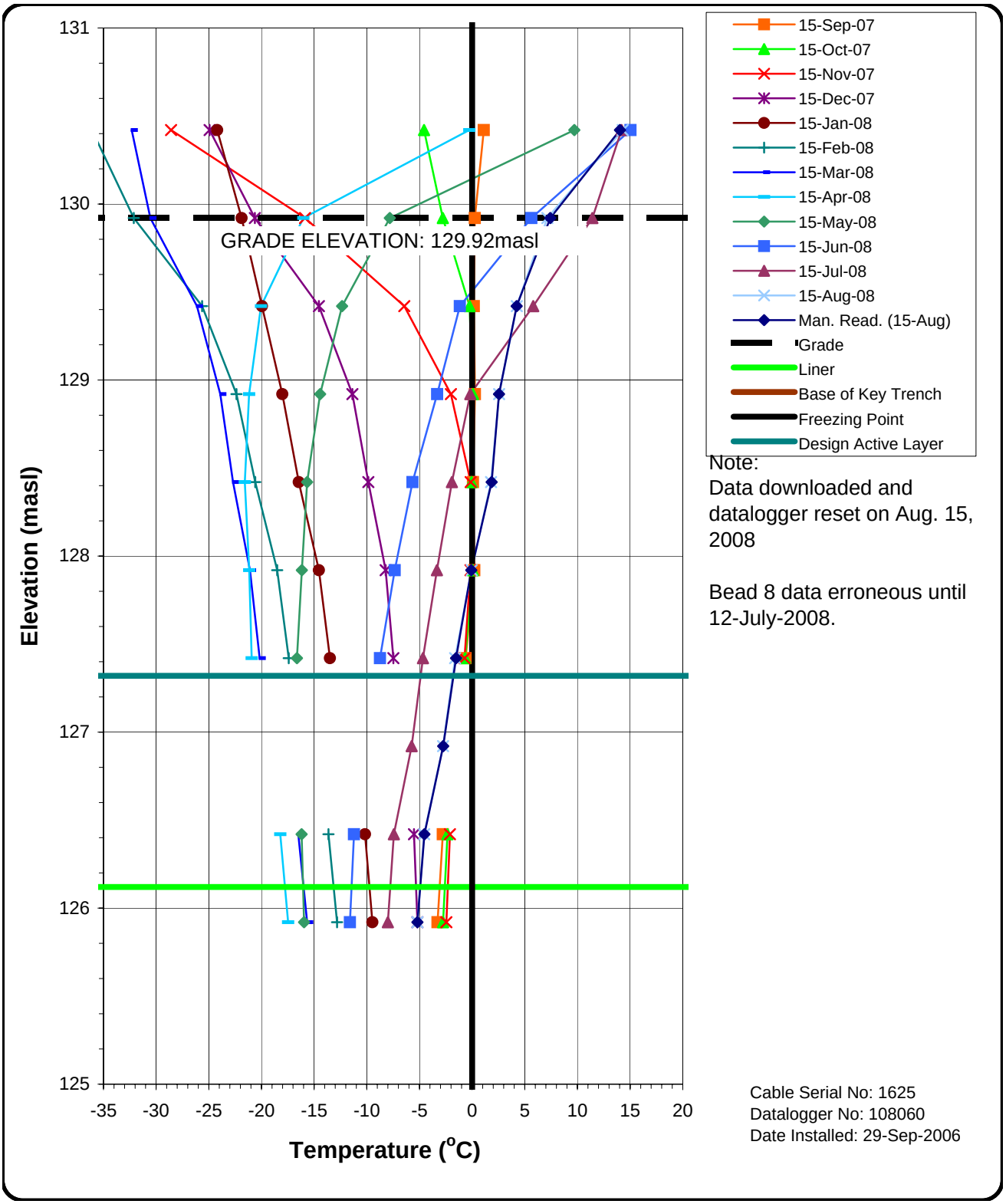


Note:
Data downloaded and datalogger reset on Aug. 15, 2008

Cable Serial No: 1623
Datalogger No: 2020165
Date Installed: 29-Sep-2006

AECOM

Graph E-1
Ground Temperature Profile
Lower Site Landfill
Vertical GTC VT-9



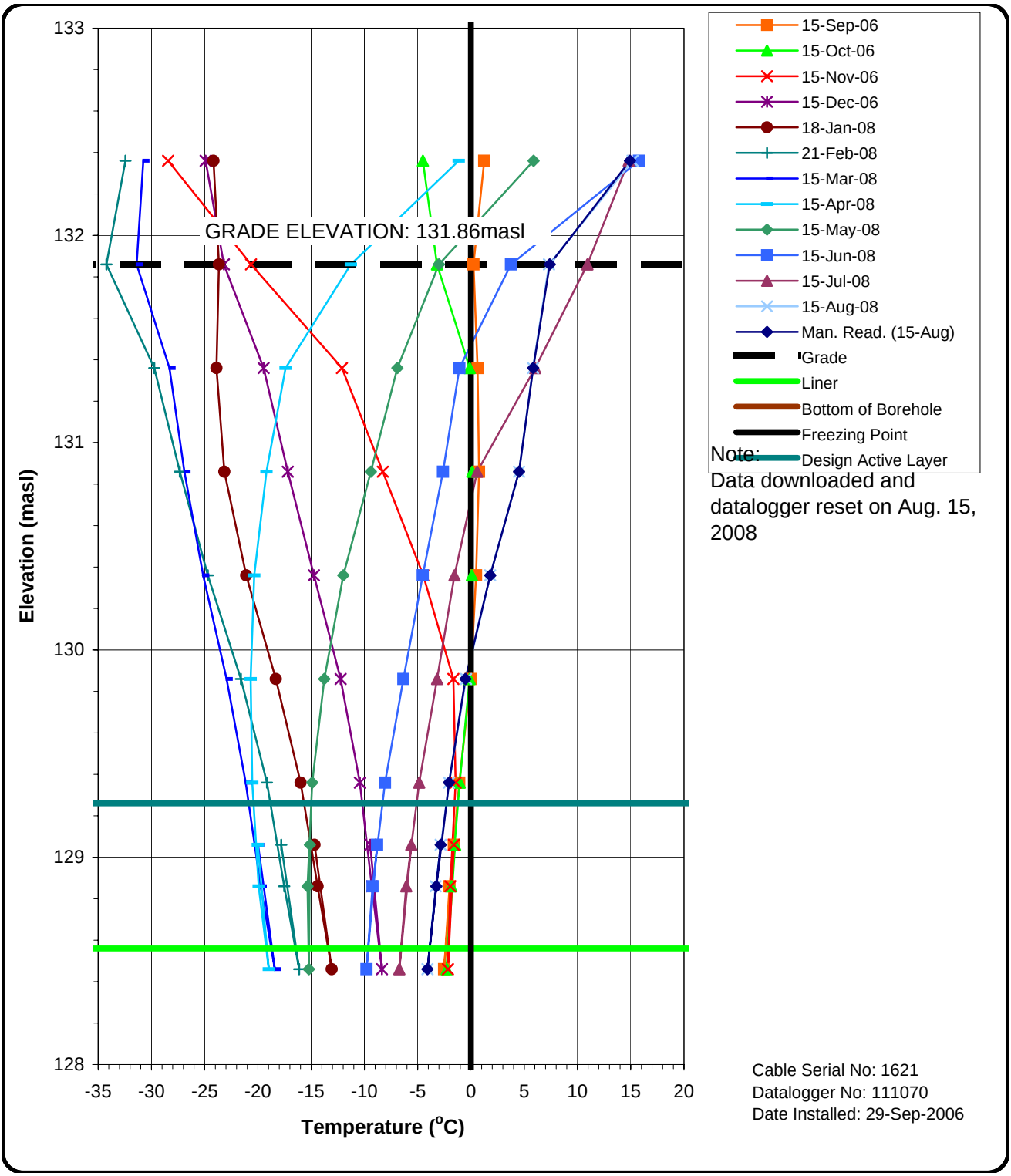
Note:
Data downloaded and datalogger reset on Aug. 15, 2008

Bead 8 data erroneous until 12-July-2008.

Cable Serial No: 1625
Datalogger No: 108060
Date Installed: 29-Sep-2006

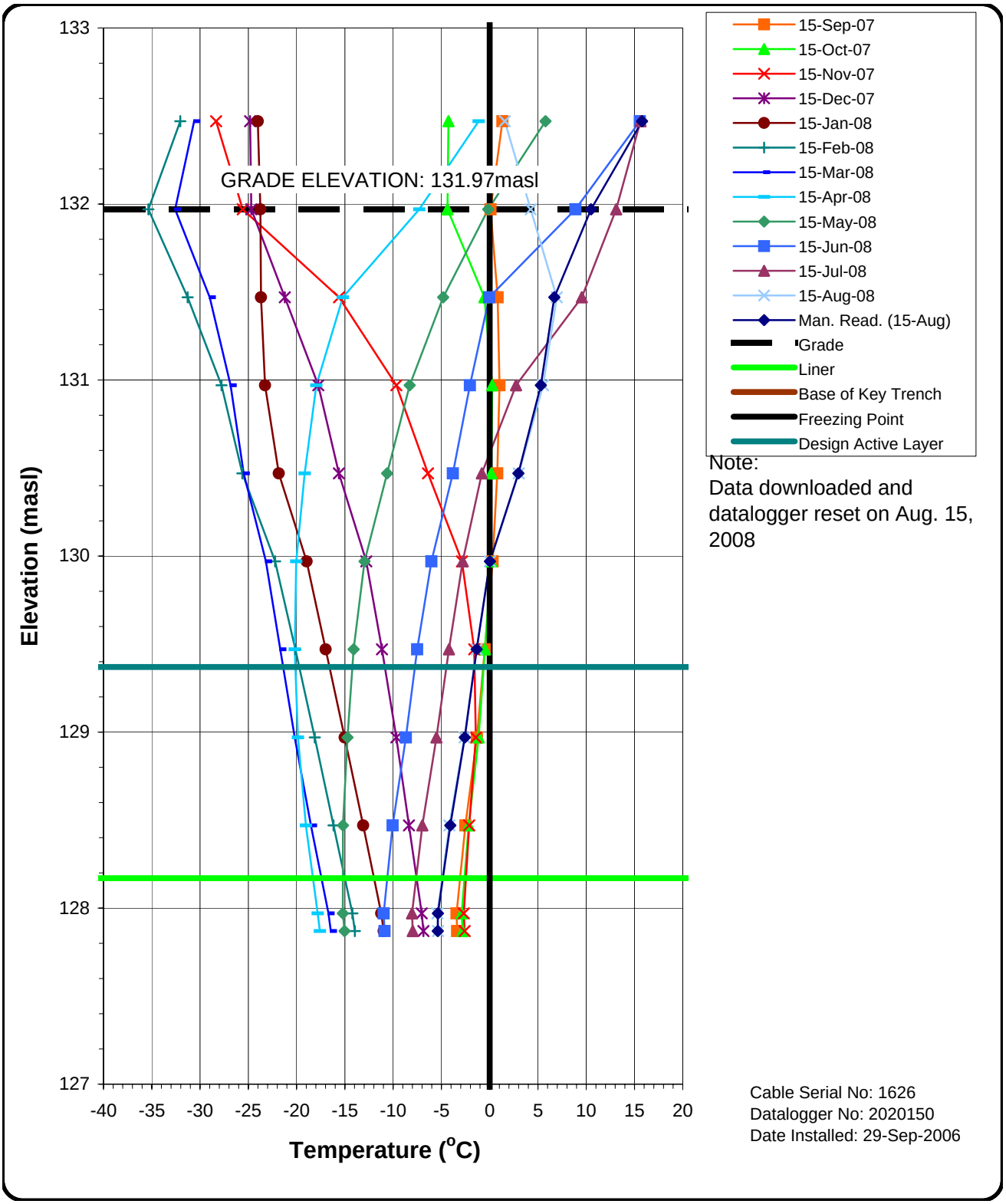
AECOM

Graph E-2
Ground Temperature Profile
Lower Site Landfill
Vertical GTC VT-10



AECOM

Graph E-3
Ground Temperature Profile
Lower Site Landfill
Vertical GTC VT-11



AECOM

Graph E-4
Ground Temperature Profile
Lower Site Landfill
Vertical GTC VT-12

E7 – Field Notes

AUG. 15/02

EXISTING LOWER SITE LANDFILL (ELSL)

ELSL PHOTO LOC. 1 (WP 42)
- VIEW OF LANDFILL FROM REGRADED HILL NEAR MW-20.
- PHOTOS 84, 85, & 86 (PANORAMIC)

ELSL PHOTO LOC. 2 (WP 41)
- RIP-RAP LINED DRAINAGE CHANNEL AT BEND MIDWAY.
- PHOTO 87 (FACING WEST UPSTREAM)
- PHOTO 88 (FACING EAST DOWNSTREAM)
- RIP-RAP WELL COMPACTED AND CONTOURED ⇒ NO EROSION

ELSL PHOTO LOC. 3 (WP 43)
- SOUTHEASTERN END OF LANDFILL SLOPE
- PHOTOS 89 & 90 (PANORAMIC FROM TOE OF LF NEAR RIPRAP DRAINAGE CHANNEL OUTLET.
- NO EROSION OR SEEPAGE OBSERVED

ELSL CONT. (PAGE 2)

ELSL PHOTO LOC. 4 (WP 44)
- NORTHEAST CORNER OF LE
- VIEW FROM BENCH FACING WEST
- PHOTO 91 & 92 (PANORAMIC)

ELSL PHOTO LOC. 5 (WP 45)
- VIEW OF NE CORNER SLOPE FROM NW-17
- PHOTO 95 (FACING SW)
- PHOTOS 93 & 94 (PHOTOS OF PHEASANTS)

ELSL PHOTO LOC. 6 (WP 46)
- PHOTO 96 (FACING WEST ALONG NORTH CREST)
- NO TENSION CRACKS OBSERVED
- SOME SEEPAGE FROM LOWER HALF OF NORTH FACE
- NO STAINING OBSERVED

ELSL CONT. (PAGE 3)

ELSL PHOTO LOC. 7 (WP 48)
- NORTH SLOPE NEAR THERMISTORS
- PHOTO 97 (FACING SOUTHWEST)
- SEEPAGE FROM LOWER HALF OF SLOPE, NO STAINING
- SOME VERY SMALL, OCCASIONAL TUFFS OF GRASS/VEG.

ELSL PHOTO LOC. 8 (WP 47)
- NORTH CREST NEAR THERMISTORS FACING EAST
- PHOTO 98
- NO TENSION CRACKS OBSERVED

ELSL PHOTO LOC. 9 (WP 49)
- PHOTO 99 (FACING SE TO SLOPE)

ELSL PHOTO LOC. 10 (WP 50)
- NORTH SLOPE AT NORTH WEST END
- PHOTOS 100 & 101 (PANORAMIC) (FACING SOUTHEAST)
- MINOR EROSION OF FINES BUT COARSE ROCKFILL IS SELF-ARMOURING
- NO SEEPAGE OR CRACKS OBSERVED

ELSL CONT. (PAGE 4)

ELSL PHOTO LOC. 11 (WP 51)
- NORTHWEST CREST
- PHOTO 102 (FACING EAST ALONG CREST)
- PHOTO 103 (FACING SOUTH)
- PHOTO 104 (FACING WEST ALONG CREST)
- NO TENSION CRACKS OBSERVED

ELSL PHOTO LOC. 12 (WP 52)
- CREST AND TOP AT SOUTHWEST CORNER
- PHOTO 105 (FACING EAST)
- NO CRACKING OR SETTLEMENT OBSERVED

ELSL PHOTO LOC. 12 (WP 53)
- WEST SLOPE AND RIP-RAPPED DRAINAGE DITCH AT TOE
- PHOTO 106 (FACING NE)
- NO EROSION ON SLOPE OR IN DITCH

2008 Monitoring Well Sampling Log (MW #20)

Site name:	CAM-4
Date of sampling event:	AUG 14-16 / 2008
Names of samplers:	TPB
Monitoring well ID:	MW-20
Facility:	LOWER SITE

Known Data

Depth of installation* (m):	3.43
Length of screened section (m):	2.05
Depth to top of screen* (m):	0.30

Measured Data

Condition of well:	GOOD	Procedure/Equipment:	INTERFACE METER
Procedure/Equipment:	INTERFACE METER	Depth to water surface (m):	2.37 m STOP
0.66 m Well height above ground (m):	~~[illegible]~~ 066.	Depth to bottom (m):	2.43 m STOC
Diameter of well (m):	2"	Free product thickness (mm):	Ø

Calculations

Depth of water (m):	2.37
Well volume of water (L):	1.12
Static water level* (m):	1.71
Length of screen collecting water (m):	1.97

Notes

Evidence of sludge:	—
Evidence of freezing/siltation:	—

Development/Purging Information

Equipment: PERISTALTIC PUMP

Date & Time	Volume Removed (L)	Temperature (°C)	pH	Conductivity (µS/cm)	Turbidity (NTU)	Description of Water
15-AUG 08	1.50	4.76	6.67	0.396	4.4	C+C N/O

Water Sampling

Date & Time Collected:	15-AUG-08
Sample Number - Water:	MW-20
DUP →	MW-200
Sample Containers:	4 VOCs
	6 500mL AMBERS
	2 1000mL AMBERS
Procedure/Equipment:	P.P. 1250mL PLASTIC
Water Description:	C+C N/O
Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	1
Number Rinses:	1

Soil Sampling

Date and Time Collected:	15-AUG-08
Sample Number - Soil:	MW 2-15
	MW-20-35
DUP →	MW-200-35
Refusal @ 35cm	
Sample Containers:	4/250mL Clear
3m N of well	PRE SAMPLE = ALS
	2/250mL Clear = ESG
Procedure/Equipment:	2/250mL Clear = Contact
	TROWEL
Soil Description:	SANDY SILT Brown NTPL
Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	2
Number Rinses:	2

n/a=not applicable
*From ground surface. Unless this is stated, all measurments are assumed to be from the top of the casing.

Gartner Lee

2008 Monitoring Well Sampling Log (MW # 17)

Site name:	CAM - 4
Date of sampling event:	AUG 14 - 16 / 2008
Names of samplers:	TPB
Monitoring well ID:	MW 17
Facility:	LOWER

Known Data

Depth of installation* (m):	3.82
Length of screened section (m):	2.03
Depth to top of screen* (m):	0.83

Measured Data

Condition of well:	GOOD	Procedure/Equipment:	INTERFACE METER
Procedure/Equipment:	INTERFACE METER	Depth to water surface (m):	1.48 mBTOP
Well height above ground (m):	0.74	Depth to bottom (m):	2.20 mBTOP
Diameter of well (m):	2"	Free product thickness (mm):	—

Calculations

Depth of water (m):	1.48
Well volume of water (L):	3.00
Static water level* (m):	0.74
Length of screen collecting water (m):	0.63

Notes

Evidence of sludge:	—
Evidence of freezing/siltation:	—

Development/Purging Information

Equipment: PERISTALTIC PUMP

6.16

Date & Time	Volume Removed (L)	Temperature (°C)	pH	Conductivity (µS/cm)	Turbidity (NTU)	Description of Water
15-AUG-08	3.5 L	5.41	[illegible]	0.54	27.9	CLR NIL

Water Sampling

Date & Time Collected:	15-AUG-08
Sample Number - Water:	MW-17
Sample Containers:	3 40mL AMBERS 2 VOC VIALS
Procedure/Equipment:	PERISTALTIC PUMP
Water Description:	CLR NIL
Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	1
Number Rinses:	1

Soil Sampling

Date and Time Collected:	16-AUG-08
Sample Number - Soil:	MW-17-15 MW-17-90
Sample Containers:	2/250mL Clear REG SAMPLE
Procedure/Equipment:	TROWEL
Soil Description:	BROWN SANDY SILT
Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	2
Number Rinses:	3

n/a=not applicable

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

Gartner Lee

2008 Monitoring Well Sampling Log (MW # 18)

Site name:	CAM-4
Date of sampling event:	AUG 14-16/2008
Names of samplers:	TFB
Monitoring well ID:	MW-18
Facility:	LOWER

Known Data	
Depth of installation* (m):	3.80
Length of screened section (m):	2.03
Depth to top of screen* (m):	0.81

Measured Data			
Condition of well:	GOOD	Procedure/Equipment:	INTERFACE METER
Procedure/Equipment:	INTERFACE METER	Depth to water surface (m):	0.73
Well height above ground (m):	0.97	Depth to bottom (m):	2.38
Diameter of well (m):	2"	Free product thickness (mm):	—

Calculations		Notes	
Depth of water (m):	0.73	Evidence of sludge:	—
Well volume of water (L):	3.0L	Evidence of freezing/siltation:	—
Static water level* (m):	0.16		
Length of screen collecting water (m):	0.92		

Development/Purging Information

Equipment: PERISTALTIC PUMP

Date & Time	Volume Removed (L)	Temperature (°C)	pH	Conductivity (µS/cm)	Turbidity (NTU)	Description of Water
15-AUG-08	3.5	5.12	5.82	0.223	8.6	C+C Slight Chemical odour

Water Sampling		Soil Sampling	
Date & Time Collected:	15-AUG-08	Date and Time Collected:	15-AUG-08
Sample Number - Water:	MW-18	Sample Number - Soil:	MW-18-15 MW-18-30
Sample Containers:	3 40mL AMBERS 2 VOCs	Sample Containers:	2/250mL clear PER SAMPLE
Procedure/Equipment:	PERISTALTIC PUMP	Procedure/Equipment:	TROWEL
Water Description:	C+C Slight Chemical odour	Soil Description:	BROWN SANDY SILT
Sampling Equipment Decontamination (Y/N):	Y	Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	2	Number Washes:	2
Number Rinses:	2	Number Rinses:	2

n/a=not applicable

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

2008 Monitoring Well Sampling Log (MW # 19)

Site name:	CAM-4
Date of sampling event:	AUG-19-16-2008
Names of samplers:	TFB
Monitoring well ID:	MW-19
Facility:	LOWER

Known Data

Depth of installation* (m):	3.83
Length of screened section (m):	2.03
Depth to top of screen* (m):	0.84

Measured Data

Condition of well:	GOOD	Procedure/Equipment:	INTERFACE METER
Procedure/Equipment:	INTERFACE METER	Depth to water surface (m):	0.78 mbTOP
Well height above ground (m):	0.65	Depth to bottom (m):	2.10 mbTOP
Diameter of well (m):	2"	Free product thickness (mm):	—

Calculations		Notes	
Depth of water (m):	0.78 mbTOP	Evidence of sludge:	—
Well volume of water (L):	2.70	Evidence of freezing/siltation:	—
Static water level* (m):	~~0.78 mbTOP~~	0.13	
Length of screen collecting water (m):	0.61		

Development/Purging Information

Equipment: Bailer

Date & Time	Volume Removed (L)	Temperature (°C)	pH	Conductivity (µS/cm)	Turbidity (NTU)	Description of Water
15-AUG-08	3.2 L	7.30	5.75	0.645	260	UC SLIGHT Chemical odour

Water Sampling		Soil Sampling	
Date & Time Collected:	15-AUG-08	Date and Time Collected:	15-AUG-08
Sample Number - Water:	MW-19	Sample Number - Soil:	MW-19-20
			MW-19-50
Sample Containers:	3 40ml Amber	Sample Containers:	2/250ml Clear PER SAMPLE
	2 VOCs		
Procedure/Equipment:	BAILER	Procedure/Equipment:	TROWEL
Water Description:	UC slight chemical odour	Soil Description:	BROWN SANDY SILT
Sampling Equipment Decontamination (Y/N):	Y	Sampling Equipment Decontamination (Y/N):	Y
Number Washes:	2	Number Washes:	2
Number Rinses:	2	Number Rinses:	2

n/a=not applicable

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

Gartner Lee

AUG. 15/08

EXISTING LOWER SITE LANDFILL THERMISTORS

VT - 9 (LOWEST/NORTH)
VT - 10
VT - 11
VT - 12 (HIGHEST/SOUTH)

PROGRAMMING CHECK

① CONFIG MODE
↳ SUMMARY TAB
- RECORD VOLTAGE
- SAMPLING RATE ⇒ 12 hrs
- CHECK TIME & DATE

② CORRECT TIME & DATE (IF REQUIRED)
CLOCK TAB
↳ SET DATALOGGER CLOCK

③ CHECK PROGRAMMING
NUMBER - Last 2 digits of datalogger serial number
SAMPLING - 12 hrs
"STOP WITH MEMORY FULL"

- WARM UP TIME = 0.21 sec w/ no delay
- MULTIPLEXER ⇒ ENABLE
- ENABLE CHANNEL 1-16
- STROBE - NOT CHECKED
- START IMMEDIATELY
- CHECK DOUBLE PRECISION
- EXCITATION ⇒ SOURCE MODE
- NO MIN, MAX OR DIGITAL INPUTS

VT-12 ⇒ DOWNLOADED AT 12:15PM

CHANNEL	TEMP (FROM COMPUTER)	VOLTAGE (FROM MULTIMETER)
1	15.78 °C	1.41V
2	10.5 °C	1.26V
3	6.7 °C	1.14V
4	5.3 °C	1.10V
5	2.97 °C	1.03V
6	0.02 °C	0.94V
7	-1.35 °C	0.90V
8	-2.58 °C	0.86V
9	-4.08 °C	0.82V
10	-5.36 °C	0.78V
11	-5.37 °C	0.78V

- VT-12 BATTERY VOLTAGE
  MAIN = 11.34V
  AUX. = 13.38V
- RESET CLOCK TO 12:30PM
- PROGRAMMED DATALOGGER AFTER CHECKING AND CHANGING STOP WHEN MEMORY FULL TO ON.
- RESTARTED DATALOGGER

VT-11 DOWNLOAD AT 12:45PM
BATTERY MAIN 11.34V
AUX. 13.63V
- DOWNLOADED 511 NOTEPAD FILES 25,227 DATA FILES

CHANNEL	TEMP	VOLTAGE
1	14.93°C	1.39V
2	7.40°C	1.17V
3	5.84°C	1.12V
4	4.51°C	1.07V
5	1.81°C	0.99V
6	-0.51°C	0.92V
7	-2.06°C	0.88V
8	-3.25°C	0.85V
9	-4.08°C	0.82V
10	-2.84°C	0.86V

- CHECKED PROGRAMMING AND DATE
- UPDATED CLOCK TO 1:00PM
- CHECKED "STOP WHEN MEMORY FULL"
- RESTARTED DATALOGGER

VT-10 DOWNLOAD AT 1:30PM
- BATTERY MAIN = 11.34V
  AUX = 12.53V
- DOWNLOADED 511 NOTEPAD FILES
  25,229 DATA FILES

CHANNEL	TEMP. (°C)	VOLTAGE
1	14.04	1.37
2	7.42	1.17
3	4.23	1.07
4	2.55	1.02
5	1.85	0.99
6	-0.08	0.94
7	-1.53	0.89
8	-2.75	0.86
9	-4.53	0.809
10	-5.19	0.79

- CHECKED PROGRAMMING & DATE
- UPDATED CLOCK AND CHECKED "STOP WHEN FULL"
- RESTARTED DATALOGGER

VT-9 DOWNLOADED AT 2:00PM/2:30
BATTERY MAIN = 11.34V
AUX = 13,50V
DOWNLOADED 511 NOTEPAD FILES
25,227 DATA FILES

CHANNEL	TEMP (°C)		VOLTAGE (V)
1	16.17	15.99	1.423
2	12.98	13.21	1.34
3	6.05	6.09	1.12
4	4.49	4.49	1.079
5	1.95	1.95	1.002
6	-0.58	-0.58	0.925
7	-1.90	-1.90	0.886
8	-3.16	-3.16	0.849
9	-4.44	-4.44	0.811
10	-5.37	-5.37	0.785

- CHECKED PROGRAMMING & DATE
- UPDATED CLOCK & CHECKED "STOP WHEN FULL"
- RESTARTED DATALOGGER

NOTE: COMPUTER BATTERY DIED DURING 1ST ATTEMPT TO DOWNLOAD VT-9, CHANGED BATTERY.

Appendix F

Laboratory Reports

Analysis Report

REPORT ON: Analysis of Soil, Water Samples

REPORTED TO: Gartner Lee Limited
Suite 300
300 Town Centre Boulevard
Markham, ON
L3R 5Z6

Att'n: Tim Boc

CHAIN OF CUSTODY: 2118991
PROJECT NAME: CAM-4
PROJECT NUMBER: 80-297
P.O. NUMBER: 6076

NUMBER OF SAMPLES: 5

REPORT DATE: August 28, 2008

DATE SUBMITTED: August 19, 2008

GROUP NUMBER: 90819109

SAMPLE TYPE: Soil, Water

NOTE: Results contained in this report refer only to the testing of samples as submitted. Other information is available on request.

TEST METHODS:

CCME Petroleum Hydrocarbons in Soil - analysis was performed using Canadian Council of Ministers of the Environment (CCME) "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil" approved December 2000. The method involves extraction of the different hydrocarbon fractions and analysis by gas chromatography with flame ionization detection (GC/FID).

Canada-Wide Standard for Petroleum Hydrocarbons in Soil (F1 Fraction) - The F1 Fraction (nC6 to nC10) was analyzed based on the CCME Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil-Tier 1 Method (2001). Analysis involves methanol extraction and quantitation using GasChromatography with Flame Ionization Detector (GC-FID). The F1 Fraction is reported with the BTEX compounds (benzene, toluene, ethylbenzene, and ortho, meta and para-xylenes) subtracted (e.g. corrected). These BTEX compounds analyzed by GCMS may be included in this report on request by the customer.

Canada-Wide Standard for Petroleum Hydrocarbons in Soil (F1 Fraction) - The F1 Fraction (nC6 to nC10) analysis was performed based on the CCME Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method (2001). Analysis involves methanol extraction and quantitation using Gas Chromatography with a Flame Ionization Detector (GC-FID). The F1 Fraction is reported with the BTEX compounds (Benzene, Toluene, Ethylbenzene, and Total Xylenes) subtracted (e.g. corrected). These BTEX compounds may be included in this report on request by the customer.

(Continued)

CANTEST LTD.

Anna Becalska, PhD
Trace Metals Coordinator

4606 Canada Way, Burnaby, BC V5G 1K5
Tel: 604 734 7276 Fax: 604 731 2386

Canada-Wide Standard for Petroleum Hydrocarbons in Soil (F2,F3 and F4 Fractions) - The F2 to F4 Fractions (nC10 to nC50) analysis was performed based on the CCME Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method (2001). Analysis involves extraction with50:50 hexane:acetone, silica-gel cleanup and quantitation using Gas Chromatography with a Flame Ionization Detector (GC-FID).

Moisture in Soil - analysis was performed gravimetrically by heating a separate sample portion at 105 C and measuring the weight loss.

pH in Soil or Solid - analysis was performed based on procedures described in the "Manual on Soil Sampling and Methods of Analysis" (1993) published by the Canadian Society of Soil Science. The test was performed using a deionized water leach with measurement by pH meter.

Conventional Parameters - analyses were performed using procedures based on those described in the most current editions of "British Columbia Environmental Laboratory Manual for the Analysis of Water, Wastewater, Sediment and Biological Materials", (2005 edition) Province of British Columbia and "Standard Methods for the Examination of Water and Wastewater" (21st Edition), published by the American Public Health Association.

Mercury in Water - analysis was performed using procedures based on U. S. EPA Method 245.7, oxidative digestion using bromination, and analysis using Cold Vapour Atomic Fluorescence Spectroscopy.

Metals in Water - analysis was performed using Inductively Coupled Plasma Optical Emission Spectroscopy (ICP), Inductively Coupled Plasma-Mass Spectroscopy (ICP/MS).

Polychlorinated Biphenyls - analysis was performed using procedures based upon U.S. EPA Methods 608/8080, involving extraction, clean-up steps, and analysis using GC/ECD. Arochlors 1242, 1248, 1254 and 1260 were included.

Total Extractable Hydrocarbons (TEH) - analysis was performed using procedures based on USEPA Method 8015 and BC MOELP Environmental Laboratory Manual (1994) Method X366, involving dichloromethane extraction and analysis using GC/FID. Components in the C10 to C30 range are included, using an alkane standard for quantitation. The report states if silica gel cleanup was used.

Silver in Soil - analysis was performed using Inductively Coupled Plasma Mass Spectrometry (ICP/MS).

Arsenic in Soil - analysis was performed using Inductively Coupled Plasma Mass Spectrometry (ICP/MS).

Cadmium in Soil - analysis was performed using Inductively Coupled Plasma Mass Spectrometry (ICP/MS).

Mercury in Soil - analysis was performed using Cold Vapour Atomic Fluorescence.

Molybdenum in Soil - analysis was performed using an acid digestion followed by determination using Inductively Coupled Plasma Mass Spectrometry (ICP/MS).

(Continued)

REPORTED TO: Gartner Lee Limited

REPORT DATE: August 28, 2008

GROUP NUMBER: 90819109

Strong Acid Leachable Metals in Soil - analysis was performed using B.C. MOELP Method "Strong Acid Leachable Metals in Soil, Version 1.0". The method involves drying the sample at 60 C, sieving using a 2 mm (10 mesh) sieve and digestion using a mixture of hydrochloric and nitric acids. Analysis was performed using Inductively Coupled Argon Plasma Spectroscopy (ICAP) or by specific techniques as described.

Selenium in Soil - analysis was using Inductively Coupled Plasma Mass Spectrometry (ICP/MS).

Thallium in Soil - analysis was performed using Inductively Coupled Plasma Mass Spectrometry (ICP/MS).

Total Petroleum Hydrocarbons - analysis was performed using procedures based on Alberta Environment Site Investigation requirements, involving summation of the total volatile (purgeable) and semi-volatile (extractable) hydrocarbons.

TEST RESULTS:

(See following pages)

REPORTED TO: Gartner Lee Limited

REPORT DATE: August 28, 2008

GROUP NUMBER: 90819109

CANTEST

Conventional Parameters in Water

CLIENT SAMPLE IDENTIFICATION:	SAMPLE DATE	CANTEST ID	Hardness (Total) CaCO3
MW-20	Aug 15/08	808190321	112
MW-15	Aug 16/08	808190325	342
DETECTION LIMIT			1
UNITS			mg/L

mg/L = milligrams per liter

REPORTED TO: Gartner Lee Limited

REPORT DATE: August 28, 2008

GROUP NUMBER: 90819109

CANTEST

Metals Analysis in Water

CLIENT SAMPLE IDENTIFICATION:		MW-20	MW-15	DETECTION LIMIT	UNITS
SAMPLE PREPARATION:		TOTAL	TOTAL		
DATE SAMPLED:		Aug 15/08	Aug 16/08		
CANTEST ID:		808190321	808190325		
Aluminum	Al	0.2	0.042	0.005	mg/L
Antimony	Sb	0.089	<	0.001	mg/L
Arsenic	As	<	0.001	0.001	mg/L
Barium	Ba	0.003	0.095	0.001	mg/L
Beryllium	Be	<	<	0.001	mg/L
Bismuth	Bi	<	<	0.001	mg/L
Boron	B	0.08	0.19	0.05	mg/L
Cadmium	Cd	<	<	0.0002	mg/L
Calcium	Ca	37	112	0.05	mg/L
Chromium	Cr	<	<	0.001	mg/L
Cobalt	Co	<	0.002	0.001	mg/L
Copper	Cu	0.003	0.001	0.001	mg/L
Iron	Fe	0.18	1.44	0.05	mg/L
Lead	Pb	<	<	0.001	mg/L
Lithium	Li	0.004	0.001	0.001	mg/L
Magnesium	Mg	4.79	15	0.05	mg/L
Manganese	Mn	0.031	2.34	0.001	mg/L
Mercury	Hg	<	<	0.02	µg/L
Molybdenum	Mo	0.0043	0.002	0.0005	mg/L
Nickel	Ni	<	0.007	0.001	mg/L
Phosphorus	P	<	<	0.15	mg/L
Potassium	K	4.5	9.2	0.1	mg/L
Selenium	Se	<	0.002	0.001	mg/L
Silicon	Si	2.2	3.9	0.25	mg/L
Silver	Ag	<	<	0.00025	mg/L
Sodium	Na	20.5	40.2	0.05	mg/L
Strontium	Sr	0.046	0.26	0.001	mg/L
Tellurium	Te	<	<	0.001	mg/L
Thallium	Tl	<	<	0.0001	mg/L
Thorium	Th	<	<	0.0005	mg/L
Tin	Sn	<	<	0.001	mg/L

(Continued on next page)

REPORTED TO: Gartner Lee Limited

REPORT DATE: August 28, 2008

GROUP NUMBER: 90819109

CANTEST

Metals Analysis in Water

CLIENT SAMPLE IDENTIFICATION:		MW-20	MW-15	DETECTION LIMIT	UNITS
SAMPLE PREPARATION:		TOTAL	TOTAL		
DATE SAMPLED:		Aug 15/08	Aug 16/08		
CANTEST ID:		808190321	808190325		
Titanium	Ti	0.009	0.002	0.001	mg/L
Uranium	U	0.061	0.036	0.0005	mg/L
Vanadium	V	<	0.002	0.001	mg/L
Zinc	Zn	0.022	0.32	0.005	mg/L
Zirconium	Zr	<	<	0.01	mg/L

mg/L = milligrams per liter
< = Less than detection limit

µg/L = micrograms per liter

REPORTED TO: Gartner Lee Limited

REPORT DATE: August 28, 2008

GROUP NUMBER: 90819109

CANTEST

Total Extractable Hydrocarbons in Water

CLIENT SAMPLE IDENTIFICATION:	SAMPLE DATE	CANTEST ID	TEH
MW-20	Aug 15/08	808190321	1300
MW-15	Aug 16/08	808190325	5400
DETECTION LIMIT			100
UNITS			µg/L

µg/L = micrograms per liter

REPORTED TO: Gartner Lee Limited

REPORT DATE: August 28, 2008

GROUP NUMBER: 90819109

CANTEST

Polychlorinated Biphenyls in Water

CLIENT SAMPLE IDENTIFICATION:	MW-20	MW-15	
DATE SAMPLED:	Aug 15/08	Aug 16/08	DETECTION LIMIT
CANTEST ID:	808190321	808190325	
Arochlor 1242	<	<	0.1
Arochlor 1248	<	<	0.1
Arochlor 1254	<	<	0.1
Arochlor 1260	<	<	0.1
Total PCB	<	<	0.4
Surrogate Recovery			
2,2',4,4',6,6'-hexabromobiphenyl	85	100	-

Results expressed as micrograms per liter (μg/L)
Surrogate recoveries expressed as percent (%)
< = Less than detection limit

REPORTED TO: Gartner Lee Limited

REPORT DATE: August 28, 2008

GROUP NUMBER: 90819109

Conventional Parameters in Soil

CLIENT SAMPLE IDENTIFICATION:	SAMPLE DATE	CANTEST ID	Moisture	pH
MW-14-A-30	Aug 14/08	808190310	15.1	7.1
BMW-3-40	Aug 14/08	808190315	11.0	6.6
MW-20-35	Aug 15/08	808190318	5.0	7.2
DETECTION LIMIT			0.1	0.1
UNITS			%	pH units

% = percent

REPORTED TO: Gartner Lee Limited

REPORT DATE: August 28, 2008

GROUP NUMBER: 90819109

CANTEST

Polychlorinated Biphenyls in Soil

CLIENT SAMPLE IDENTIFICATION:	MW-14-A-30	BMW-3-40	MW-20-35	
DATE SAMPLED:	Aug 14/08	Aug 14/08	Aug 15/08	DETECTION LIMIT
CANTEST ID:	808190310	808190315	808190318	
Arochlor 1242	<	<	<	0.03
Arochlor 1248	<	<	<	0.03
Arochlor 1254	<	<	<	0.03
Arochlor 1260	<	<	<	0.03
Total PCB	<	<	<	0.03
Surrogate Recovery				
2,2',4,4',6,6'-hexabromobiphenyl	89	63	89	-

Results expressed as micrograms per gram, on a dry weight basis. (μg/g)
Surrogate recoveries expressed as percent (%)
< = Less than detection limit

REPORTED TO: Gartner Lee Limited

REPORT DATE: August 28, 2008

GROUP NUMBER: 90819109

CANTEST

Total Petroleum Hydrocarbons in Soil

CLIENT SAMPLE IDENTIFICATION:	SAMPLE DATE	CANTEST ID	Total Petroleum Hydrocarbons
MW-14-A-30	Aug 14/08	808190310	<
BMW-3-40	Aug 14/08	808190315	<
MW-20-35	Aug 15/08	808190318	<
DETECTION LIMIT			20
UNITS			µg/g

µg/g = micrograms per gram, on a dry weight basis.
< = Less than detection limit

REPORTED TO: Gartner Lee Limited

REPORT DATE: August 28, 2008

GROUP NUMBER: 90819109

CANTEST

CCME Petroleum Hydrocarbons in Soil

CLIENT SAMPLE IDENTIFICATION:	SAMPLE DATE	CANTEST ID	F1 (C6-C10) uncorrected	F1 minus BTEX (C6-C10)
MW-14-A-30	Aug 14/08	808190310	<	<
BMW-3-40	Aug 14/08	808190315	<	<
MW-20-35	Aug 15/08	808190318	<	<
DETECTION LIMIT			5	5
UNITS			µg/g	µg/g

µg/g = micrograms per gram, on a dry weight basis.
< = Less than detection limit

REPORTED TO: Gartner Lee Limited

REPORT DATE: August 28, 2008

GROUP NUMBER: 90819109

CANTEST

CCME Petroleum Hydrocarbons in Soil

CLIENT SAMPLE IDENTIFICATION:	SAMPLE DATE	CANTEST ID	F2 (C10-C16) uncorrected	F3 (C16-C34) uncorrected
MW-14-A-30	Aug 14/08	808190310	<	<
BMW-3-40	Aug 14/08	808190315	<	<
MW-20-35	Aug 15/08	808190318	<	<
DETECTION LIMIT			5	5
UNITS			µg/g	µg/g

µg/g = micrograms per gram, on a dry weight basis.
< = Less than detection limit

REPORTED TO: Gartner Lee Limited

REPORT DATE: August 28, 2008

GROUP NUMBER: 90819109

CANTEST

Strong Acid Soluble Metals in Soil

CLIENT SAMPLE IDENTIFICATION:		MW-14-A-30	BMW-3-40	MW-20-35	
DATE SAMPLED:		Aug 14/08	Aug 14/08	Aug 15/08	DETECTION LIMIT
CANTEST ID:		808190310	808190315	808190318	
Antimony	Sb	<	<	<	0.1
Arsenic	As	2.4	2.3	1.2	0.1
Barium	Ba	68	81	27	1
Beryllium	Be	<	<	<	1
Cadmium	Cd	<	<	<	0.2
Chromium	Cr	28	30	17	2
Cobalt	Co	7	8	4	1
Copper	Cu	11	12	8	1
Lead	Pb	8.4	8.3	10.4	0.2
Mercury	Hg	0.01	0.01	0.01	0.01
Molybdenum	Mo	0.4	0.5	0.4	0.1
Nickel	Ni	14	16	9	2
Selenium	Se	<	0.2	0.2	0.2
Silver	Ag	<	<	<	0.1
Thallium	Tl	0.2	0.3	0.1	0.1
Tin	Sn	<	<	<	5
Vanadium	V	33	36	23	1
Zinc	Zn	38	46	25	1
Aluminum	Al	12200	13400	6460	10
Boron	B	2	2	1	1
Calcium	Ca	2320	2260	1790	1
Iron	Fe	17700	19800	11200	2
Magnesium	Mg	5530	6180	3370	1
Manganese	Mn	190	246	115	1
Phosphorus	P	807	728	623	20
Potassium	K	3520	4000	1500	10
Sodium	Na	116	103	62	5
Strontium	Sr	7	8	4	1
Titanium	Ti	1030	1140	533	1
Zirconium	Zr	4	5	2	1

Results expressed as micrograms per gram, on a dry weight basis. (μg/g)
< = Less than detection limit

REPORTED TO: Gartner Lee Limited

REPORT DATE: August 28, 2008

GROUP NUMBER: 90819109

CANTEST

CCME Petroleum Hydrocarbons in Soil

CLIENT SAMPLE IDENTIFICATION:	MW-14-A-30	BMW-3-40	MW-20-35	
DATE SAMPLED:	Aug 14/08	Aug 14/08	Aug 15/08	DETECTION LIMIT
CANTEST ID:	808190310	808190315	808190318	
Benzene	<	<	<	0.005
Ethylbenzene	<	<	<	0.018
Toluene	<	<	<	0.02
Total Xylenes	<	<	<	0.02

Results expressed as micrograms per gram, on a dry weight basis. (μg/g)
< = Less than detection limit

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Certificate of Analysis

GARTNER LEE LTD.

ATTN: KEN BOLDT

300 TOWN CENTRE BOULVARD
SUITE 300
MARKHAM ON L3R 5Z6

Reported On: 04-SEP-08 04:52 PM

Lab Work Order #: **L671383** **Date Received:** **19-AUG-08**

Project P.O. #: KSL-00627
Job Reference: 80297
Legal Site Desc:
CofC Numbers: C065198

Other Information:

Comments: Please note that Polychlorinated Biphenyl detection limits have been increased for some of the samples due to the analytical interferences encountered during the analysis.

NATASHA MARKOVIC-MIROVIC
Account Manager

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L671383-1	L671383-2	L671383-3	L671383-4	L671383-5
	Description					
	Sampled Date	16-AUG-08	16-AUG-08	16-AUG-08	16-AUG-08	16-AUG-08
	Sampled Time					
	Client ID	BMW-3	MW-15	MW-150	MW-14A	MW-16
Grouping	**Analyte**					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	191	335	338	304	157
Total Metals	Arsenic (As)-Total (mg/L)	0.0023	0.0020	0.0020	0.00067	0.00076
	Cadmium (Cd)-Total (mg/L)	0.000061	<0.000034	<0.000034	0.000067	0.000082
	Chromium (Cr)-Total (mg/L)	0.0437	0.0024	<0.0030	0.0100	0.0025
	Cobalt (Co)-Total (mg/L)	0.00817	0.00216	0.00208	0.00135	0.00210
	Copper (Cu)-Total (mg/L)	0.0155	<0.0020	<0.0020	0.0146	0.0040
	Lead (Pb)-Total (mg/L)	0.0091	<0.0010	<0.0010	0.00112	0.00056
	Mercury (Hg)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Nickel (Ni)-Total (mg/L)	0.0180	0.0065	0.0063	0.0091	0.0120
	Zinc (Zn)-Total (mg/L)	0.0513	0.250	0.239	2.41	0.0149
Hydrocarbons	F1 (C6-C10) (mg/L)	<0.10	0.35	0.33	<0.10	2.23
	F2 (C10-C16) (mg/L)	<0.30	5.98	5.15	<0.30	76.7
	F3 (C16-C34) (mg/L)	<0.30	1.65	1.40	0.33	8.01
Polychlorinated Biphenyls	PCB-1016 (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	PCB-1221 (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	PCB-1232 (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	PCB-1242 (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	PCB-1248 (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	PCB-1254 (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	PCB-1260 (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	PCB-1262 (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	PCB-1268 (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Polychlorinated Biphenyls (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

		Sample ID	L671383-6	L671383-7	L671383-8	L671383-9	
		Description					
		Sampled Date	16-AUG-08	16-AUG-08	16-AUG-08	16-AUG-08	
		Sampled Time					
		Client ID	MW-8	MW-9	MW-13	MW-12	
Grouping	**Analyte**						
WATER							
Physical Tests	Hardness (as CaCO3) (mg/L)		1380	202	140	186	
Total Metals	Arsenic (As)-Total (mg/L)		<0.0025	<0.0025	0.00216	0.0051	
	Cadmium (Cd)-Total (mg/L)		0.000170	<0.000085	0.000176	0.000135	
	Chromium (Cr)-Total (mg/L)		<0.0050	0.0183	0.0205	0.0540	
	Cobalt (Co)-Total (mg/L)		0.0031	<0.0015	0.00978	0.0156	
	Copper (Cu)-Total (mg/L)		0.0228	0.0071	0.0288	0.0433	
	Lead (Pb)-Total (mg/L)		<0.0025	<0.0025	0.00725	0.0158	
	Mercury (Hg)-Total (mg/L)		<0.000020	<0.000020	<0.000020	<0.000020	
	Nickel (Ni)-Total (mg/L)		0.0268	0.0079	0.0257	0.0418	
	Zinc (Zn)-Total (mg/L)		0.0391	0.0382	0.0809	0.208	
Hydrocarbons	F1 (C6-C10) (mg/L)		2.89	<0.10	<0.10	<0.10	
	F2 (C10-C16) (mg/L)		8.17	0.44	<0.30	1.26	
	F3 (C16-C34) (mg/L)		1.84	0.63	1.11	2.02	
Polychlorinated Biphenyls	PCB-1016 (mg/L)		<0.0010	<0.0010	<0.0011	<0.0012	
	PCB-1221 (mg/L)		<0.0010	<0.0010	<0.0011	<0.0012	
	PCB-1232 (mg/L)		<0.0010	<0.0010	<0.0011	<0.0012	
	PCB-1242 (mg/L)		<0.0010	<0.0010	<0.0011	<0.0012	
	PCB-1248 (mg/L)		<0.0010	<0.0010	<0.0011	<0.0012	
	PCB-1254 (mg/L)		<0.0010	<0.0010	<0.0011	<0.0012	
	PCB-1260 (mg/L)		<0.0010	<0.0010	<0.0011	<0.0012	
	PCB-1262 (mg/L)		<0.0010	<0.0010	<0.0011	<0.0012	
	PCB-1268 (mg/L)		<0.0010	<0.0010	<0.0011	<0.0012	
	Total Polychlorinated Biphenyls (mg/L)		<0.0010	<0.0010	<0.0011	<0.0012	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
F1-PT-FID-VA	Water	CCME F1 By P&T with GCFID	EPA SW-846, METHOD 8260

This analysis is based on the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." For F1 (C6-C10), the sample undergoes a purge and trap extraction prior to analysis by GC/FID.

F1 (C6-C10): Sum of all hydrocarbons that elute between nC6 and nC10.

F2-F3-SF-FID-VA	Water	Extractable Hydrocanbons in water GCFID	CWS (CCME)

Petroleum Hydrocarbons (F2-F3) in Water

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, published by the United States Environmental Protection Agency (EPA) and the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." The procedure involves a liquid-liquid extraction of the entire water sample using dichloromethane prior to capillary column gas chromatography with flame ionization detection (GC/FID).

A silica gel cleanup procedure is applied before GC analysis, which is intended to selectively remove most naturally occurring organics.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness is calculated from Calcium and Magnesium concentrations, and is expressed as calcium carbonate equivalents.

HG-TOT-CCME-CVAFS-VA	Water	Total Mercury in Water by CVAFS (CCME)	EPA 245.7

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

MET-TOT-CCME-ICP-VA	Water	Total Metals in Water by ICPOES (CCME)	EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-TOT-CCME-MS-VA	Water	Total Metals in Water by ICPMS (CCME)	EPA SW-846 3005A/6020A

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).

PCB-SF-ECD-VA	Water	PCB by Extraction with GCECD	EPA 3510/8082 Liq-Liq GCECD

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Methods 3510, 3620, 3660, 3665 & 8082, published by the United States Environmental Protection Agency (EPA). The procedure involves a liquid-liquid extraction of the entire water sample using dichloromethane. The extract is then solvent exchanged to hexane followed by one or more of the following clean-up procedures (if required): florisil clean-up, sulphur clean-up and/or sulphuric acid clean-up. The final extract is analysed by capillary column gas chromatography with electron capture detection (GC/ECD).

** Laboratory Methods employed follow in-house procedures, which are generally based on nationally or internationally accepted methodologies.
The last two letters of the above ALS Test Code column indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location	Laboratory Definition Code	Laboratory Location
VA	ALS LABORATORY GROUP - VANCOUVER, BC, CANADA		

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)

GLOSSARY OF REPORT TERMS
Surr - A surrogate is an organic compound that is similar to the target analyte(s) in chemical composition and behavior but not normally detected in enviromental samples. Prior to sample processing, samples are fortified with one or more surrogate compounds.
The reported surrogate recovery value provides a measure of method efficiency.
mg/kg (units) - unit of concentration based on mass, parts per million
mg/L (units) - unit of concentration based on volume, parts per million
N/A - Result not available. Refer to qualifier code and definition for explanation

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Although test results are generated under strict QA/QC protocols, any unsigned test reports, faxes, or emails are considered preliminary.

ALS Laboratory Group has an extensive QA/QC program where all analytical data reported is analyzed using approved referenced procedures followed by checks and reviews by senior managers and quality assurance personnel. However, since the results are obtained from chemical measurements and thus cannot be guaranteed, ALS Laboratory Group assumes no liability for the use or interpretation of the results.

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

CHAIN OF CUSTODY / ANALYTICAL REQUEST FORM

CANADA TOLL FREE 1-800-668-9878

www.alsenviro.com

COC # C065198

Page 1 of 1

REPORT TO:	REPORT FORMAT / DISTRIBUTION	SERVICE REQUESTED
COMPANY: GARTNER LEE LTD.	STANDARD ✓ OTHER ___	REGULAR SERVICE (DEFAULT) ✓
CONTACT: KEN BOLDT	PDF ✓ EXCEL ✓ CUSTOM ___ FAX ___	RUSH SERVICE (2-3 DAYS)
ADDRESS: 300 TOWN CENTRE BLVD.	EMAIL 1: kboldt@GARTNERLEE.com	PRIORITY SERVICE (1 DAY or ASAP)
SUITE 300, MARKHAM ON.	EMAIL 2: TBOC@GARTNERLEE.com	EMERGENCY SERVICE (<1 DAY / WEEKEND) - CONTACT ALS
PHONE: 905-477-8600 FAX:		
INVOICE TO: SAME AS REPORT ? YES / (NO)	INDICATE BOTTLES: FILTERED / PRESERVED (F/P) → → →	ANALYSIS REQUEST
COMPANY: KITNUNA PROJECTS INC.	CLIENT / PROJECT INFORMATION:	
CONTACT: PETER ARMSTRONG	JOB #: 80297	
ADDRESS: CAMBRIDGE BAY, NU.	PO /AFE:	
	Legal Site Description:	
PHONE: 867-983-7808 FAX:	QUOTE #: C/O KITNUNA PROJECTS INC.	
Lab Work Order # (lab use only): L671383	SAMPLER (Initials): TB.	

Sample #	SAMPLE IDENTIFICATION (This description will appear on the report)	DATE	TIME	SAMPLE TYPE	METALS + Hg	TPH F1 - F3	PCBs	HAZARDOUS ?	HIGHLY CONTAMINATED ?	NUMBER OF CONTAINERS
	BMW-3	16-AUG-08		GW	X	X	X			5
	MW-15				X	X	X			5
	MW-150				X	X	X			5
	MW-14-A				X	X	X			4
	MW-16				X	X	X			5
	MW-8				X	X	X			5
	MW-9				X	X	X			5
	MW-13				X	X	X			4
	MW-12				X	X	X			5
	PLEASE DECANT GROUNDWATER SAMPLES									

GUIDELINES / REGULATIONS	SPECIAL INSTRUCTIONS / HAZARDOUS DETAILS
CCME	CCME DETECTION LIMITS (2 coolers SHIPPED) METALS = TOTAL METALS

Failure to complete all portions of this form may delay analysis. Please fill in this form *LEGIBLY*.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the reverse page of the white report copy.

RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:	SAMPLE CONDITION (lab use only)
	17/AUG/08/1000			TEMPERATURE: 13/12°C — SAMPLES RECEIVED IN GOOD CONDITION ? YES / NO (If no provide details)
RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:	
			Aug. 19 11am	

REFER TO BACK PAGE FOR REGIONAL LOCATIONS AND SAMPLING INFORMATION

WHITE - REPORT COPY, PINK - FILE COPY, YELLOW - CLIENT COPY

GEN F14.00

Certificate of Analysis

GARTNER LEE LTD.

ATTN: KEN BOLDT

300 TOWN CENTRE BOULVARD
SUITE 300
MARKHAM ON L3R 5Z6

Reported On: 01-OCT-08 11:49 AM
Revision: 7

Lab Work Order #: **L671792** **Date Received:** **19-AUG-08**

Project P.O. #: KSL-00627
Job Reference: GU80-297
Legal Site Desc:
CofC Numbers: C065196, C065204, C065206, C065207

Other Information:

Comments: Please note that Revision 7 replaces and supersedes all previous revisions. The Hydrocarbons F2 (C10-16) and F3 (C16-C32) results have been changed for the sample identified as BMW-3-40.

The detection limits for some metals analysis have been increased due to high levels of metals in the samples or interferences encountered during analysis.

Natasha Markovic-M.

NATASHA MARKOVIC-MIROVIC
Account Manager

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L671792-1	L671792-2	L671792-3	L671792-4	L671792-5
	Description					
	Sampled Date	14-AUG-08	14-AUG-08	14-AUG-08	14-AUG-08	14-AUG-08
	Sampled Time					
	Client ID	BMW-3-15	MW-5-10	MW-5-25	MW-8-10	MW-8-20
Grouping	**Analyte**					
SOIL						
Physical Tests	% Moisture (%)	20.3	11.0	12.1	8.40	7.89
	pH (pH)	5.96	6.99	6.93	6.93	7.01
Metals	Arsenic (As) (mg/kg)	<5.0	<5.0	<5.0	<5.0	<5.0
	Cadmium (Cd) (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Chromium (Cr) (mg/kg)	31.8	18.3	19.0	19.8	22.5
	Cobalt (Co) (mg/kg)	8.5	6.6	6.3	6.8	6.4
	Copper (Cu) (mg/kg)	13.9	11.5	11.6	11.9	11.9
	Lead (Pb) (mg/kg)	9.3	6.6	6.8	7.9	13.5
	Mercury (Hg) (mg/kg)	<0.0050	<0.0050	0.0051	<0.0050	0.0066
	Nickel (Ni) (mg/kg)	15.7	9.4	9.0	10.6	10.6
	Zinc (Zn) (mg/kg)	44.0	33.0	33.5	40.5	38.6
Hydrocarbons	F2 (C10-C16) (mg/kg)	<30	<30	<30	<30	296
	F3 (C16-C34) (mg/kg)	<50	<50	<50	<50	121
	F1 (C6-C10) (mg/kg)	<10	<10	<10	<10	<10
Polychlorinated Biphenyls	PCB-1016 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1221 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1232 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1242 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1248 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1254 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1260 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1262 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1268 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Total Polychlorinated Biphenyls (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050

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	Sample ID	L671792-6	L671792-7	L671792-8	L671792-9	L671792-10
	Description					
	Sampled Date	14-AUG-08	14-AUG-08	14-AUG-08	14-AUG-08	14-AUG-08
	Sampled Time					
	Client ID	BMW-3-40	BMW-30-40	MW-9-15	MW-9-25	MW-10-15
Grouping	**Analyte**					
SOIL						
Physical Tests	% Moisture (%)	18.3	21.7	8.83	9.95	8.09
	pH (pH)	6.45	6.60	7.29	7.27	6.57
Metals	Arsenic (As) (mg/kg)	<5.0	<5.0	<5.0	<5.0	<5.0
	Cadmium (Cd) (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Chromium (Cr) (mg/kg)	35.0	28.4	18.1	16.6	22.3
	Cobalt (Co) (mg/kg)	9.0	7.1	6.4	6.2	5.0
	Copper (Cu) (mg/kg)	16.8	12.0	10.3	10.4	6.5
	Lead (Pb) (mg/kg)	10.9	8.0	11.6	9.7	5.6
	Mercury (Hg) (mg/kg)	0.0086	<0.0050	0.0070	0.0056	<0.0050
	Nickel (Ni) (mg/kg)	17.5	13.9	8.9	7.9	10.5
	Zinc (Zn) (mg/kg)	53.7	38.3	35.6	35.6	22.9
Hydrocarbons	F2 (C10-C16) (mg/kg)	<30	<30	<30	<30	<30
	F3 (C16-C34) (mg/kg)	<50	<50	69	<50	<50
	F1 (C6-C10) (mg/kg)	<10	<10	<10	<10	<10
Polychlorinated Biphenyls	PCB-1016 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1221 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1232 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1242 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1248 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1254 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1260 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1262 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1268 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Total Polychlorinated Biphenyls (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050

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	Sample ID	L671792-11	L671792-12	L671792-13	L671792-14	L671792-15
	Description					
	Sampled Date	14-AUG-08	14-AUG-08	14-AUG-08	14-AUG-08	14-AUG-08
	Sampled Time					
	Client ID	MW-10-35	MW-11-10	MW-11-40	MW-12-15	MW-12-30
Grouping	**Analyte**					
SOIL						
Physical Tests	% Moisture (%)	12.2	8.75	8.65	9.59	10.8
	pH (pH)	6.48	6.68	6.75	6.82	6.92
Metals	Arsenic (As) (mg/kg)	93.6	<5.0	<5.0	<5.0	<5.0
	Cadmium (Cd) (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Chromium (Cr) (mg/kg)	24.8	27.7	22.6	17.0	15.4
	Cobalt (Co) (mg/kg)	9.0	7.0	6.5	3.6	3.8
	Copper (Cu) (mg/kg)	8.4	11.2	10.0	6.0	5.4
	Lead (Pb) (mg/kg)	6.2	19.1	8.1	4.9	4.9
	Mercury (Hg) (mg/kg)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Nickel (Ni) (mg/kg)	20.0	11.9	11.6	6.8	6.9
	Zinc (Zn) (mg/kg)	27.0	43.9	33.3	23.3	21.0
Hydrocarbons	F2 (C10-C16) (mg/kg)	<30	<30	<30	<30	<30
	F3 (C16-C34) (mg/kg)	<50	1230	1150	<50	<50
	F1 (C6-C10) (mg/kg)	<10	<10	<10	<10	<10
Polychlorinated Biphenyls	PCB-1016 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1221 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1232 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1242 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1248 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1254 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1260 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1262 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1268 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Total Polychlorinated Biphenyls (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050

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	Sample ID	L671792-16	L671792-17	L671792-18	L671792-19	L671792-20
	Description					
	Sampled Date	14-AUG-08	14-AUG-08	14-AUG-08	14-AUG-08	14-AUG-08
	Sampled Time					
	Client ID	MW-13-15	MW-13-30	MW-14-A-15	MW-14-A-30	MW-140-A-30
Grouping	**Analyte**					
SOIL						
Physical Tests	% Moisture (%)	12.5	8.23	11.6	16.6	16.5
	pH (pH)	5.72	6.34	6.60	6.68	6.74
Metals	Arsenic (As) (mg/kg)	<5.0	<5.0	<5.0	<5.0	<5.0
	Cadmium (Cd) (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Chromium (Cr) (mg/kg)	17.5	14.9	28.0	28.1	27.4
	Cobalt (Co) (mg/kg)	5.1	3.6	6.2	6.7	6.1
	Copper (Cu) (mg/kg)	7.1	3.5	11.0	12.1	11.8
	Lead (Pb) (mg/kg)	5.7	3.7	8.0	8.3	8.0
	Mercury (Hg) (mg/kg)	0.0117	<0.0050	<0.0050	<0.0050	<0.0050
	Nickel (Ni) (mg/kg)	8.6	6.6	13.3	14.2	13.9
	Zinc (Zn) (mg/kg)	31.4	17.2	33.2	35.8	33.8
Hydrocarbons	F2 (C10-C16) (mg/kg)	<30	<30	<30	<30	<30
	F3 (C16-C34) (mg/kg)	76	<50	<50	<50	<50
	F1 (C6-C10) (mg/kg)	<10	<10	<10	<10	<10
Polychlorinated Biphenyls	PCB-1016 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1221 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1232 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1242 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1248 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1254 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1260 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1262 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1268 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Total Polychlorinated Biphenyls (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050

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	Sample ID	L671792-21	L671792-22	L671792-23	L671792-24	L671792-25
	Description					
	Sampled Date	14-AUG-08	14-AUG-08	14-AUG-08	14-AUG-08	15-AUG-08
	Sampled Time					
	Client ID	MW-16-15	MW-16-40	MW-15-15	MW-15-25	MW-18-15
Grouping	**Analyte**					
SOIL						
Physical Tests	% Moisture (%)	11.3	18.5	20.7	17.1	21.2
	pH (pH)	6.58	6.60	7.47	7.79	6.78
Metals	Arsenic (As) (mg/kg)	<5.0	<5.0	<5.0	<5.0	<5.0
	Cadmium (Cd) (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Chromium (Cr) (mg/kg)	31.9	29.5	17.1	17.9	15.8
	Cobalt (Co) (mg/kg)	7.8	7.8	6.5	7.0	3.8
	Copper (Cu) (mg/kg)	14.2	12.3	9.8	11.2	9.5
	Lead (Pb) (mg/kg)	8.4	8.0	8.0	7.4	7.2
	Mercury (Hg) (mg/kg)	<0.0050	<0.0050	<0.0050	<0.0050	0.0120
	Nickel (Ni) (mg/kg)	16.0	15.2	9.4	9.3	8.0
	Zinc (Zn) (mg/kg)	43.1	39.3	41.3	43.9	31.4
Hydrocarbons	F2 (C10-C16) (mg/kg)	286	49	118	119	<30
	F3 (C16-C34) (mg/kg)	133	<50	235	302	<50
	F1 (C6-C10) (mg/kg)	<10	<10	<10	<10	<10
Polychlorinated Biphenyls	PCB-1016 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1221 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1232 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1242 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1248 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1254 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1260 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1262 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1268 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Total Polychlorinated Biphenyls (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050

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	Sample ID	L671792-26	L671792-27	L671792-28	L671792-29	L671792-30
	Description					
	Sampled Date	15-AUG-08	15-AUG-08	15-AUG-08	15-AUG-08	15-AUG-08
	Sampled Time					
	Client ID	MW-18-30	MW-17-15	MW-17-40	MW-20-35	MW-20-15
Grouping	**Analyte**					
SOIL						
Physical Tests	% Moisture (%)	18.4	9.49	10.5	5.00	5.90
	pH (pH)	6.30	6.31	6.50	7.00	7.49
Metals	Arsenic (As) (mg/kg)	<5.0	<5.0	<5.0	<5.0	<5.0
	Cadmium (Cd) (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Chromium (Cr) (mg/kg)	17.9	14.0	20.8	16.7	18.0
	Cobalt (Co) (mg/kg)	3.8	3.8	5.5	4.7	5.9
	Copper (Cu) (mg/kg)	10.1	6.6	13.9	10.0	12.3
	Lead (Pb) (mg/kg)	8.9	5.4	8.7	10.8	10.6
	Mercury (Hg) (mg/kg)	0.0085	<0.0050	0.0052	<0.0050	<0.0050
	Nickel (Ni) (mg/kg)	8.7	6.6	10.2	8.7	9.6
	Zinc (Zn) (mg/kg)	35.5	18.2	32.0	25.6	37.4
Hydrocarbons	F2 (C10-C16) (mg/kg)	<30	<30	<30	<30	<30
	F3 (C16-C34) (mg/kg)	<50	<50	<50	<50	<50
	F1 (C6-C10) (mg/kg)	<10	<10	<10	<10	<10
Polychlorinated Biphenyls	PCB-1016 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1221 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1232 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1242 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1248 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1254 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1260 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1262 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	PCB-1268 (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Total Polychlorinated Biphenyls (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050

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	Sample ID	L671792-31	L671792-32	L671792-33		
	Description					
	Sampled Date	15-AUG-08	15-AUG-08	15-AUG-08		
	Sampled Time					
	Client ID	MW-200-35	MW-19-20	MW-19-50		
Grouping	**Analyte**					
SOIL						
Physical Tests	% Moisture (%)	5.29	10.3	10.4		
	pH (pH)	7.52	6.30	6.29		
Metals	Arsenic (As) (mg/kg)	<5.0	<5.0	<5.0		
	Cadmium (Cd) (mg/kg)	<0.50	<0.50	<0.50		
	Chromium (Cr) (mg/kg)	20.8	14.7	12.1		
	Cobalt (Co) (mg/kg)	5.0	3.9	3.9		
	Copper (Cu) (mg/kg)	10.8	7.4	7.1		
	Lead (Pb) (mg/kg)	10.7	6.4	7.8		
	Mercury (Hg) (mg/kg)	<0.0050	<0.0050	<0.0050		
	Nickel (Ni) (mg/kg)	10.3	7.2	6.6		
	Zinc (Zn) (mg/kg)	26.8	26.5	29.0		
Hydrocarbons	F2 (C10-C16) (mg/kg)	<30	<30	<30		
	F3 (C16-C34) (mg/kg)	<50	<50	<50		
	F1 (C6-C10) (mg/kg)	<10	<10	<10		
Polychlorinated Biphenyls	PCB-1016 (mg/kg)	<0.050	<0.050	<0.050		
	PCB-1221 (mg/kg)	<0.050	<0.050	<0.050		
	PCB-1232 (mg/kg)	<0.050	<0.050	<0.050		
	PCB-1242 (mg/kg)	<0.050	<0.050	<0.050		
	PCB-1248 (mg/kg)	<0.050	<0.050	<0.050		
	PCB-1254 (mg/kg)	<0.050	<0.050	<0.050		
	PCB-1260 (mg/kg)	<0.050	<0.050	<0.050		
	PCB-1262 (mg/kg)	<0.050	<0.050	<0.050		
	PCB-1268 (mg/kg)	<0.050	<0.050	<0.050		
	Total Polychlorinated Biphenyls (mg/kg)	<0.050	<0.050	<0.050		

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	Sample ID	L671792-34	L671792-35	L671792-36	L671792-37	L671792-38
	Description					
	Sampled Date	15-AUG-08	15-AUG-08	15-AUG-08	15-AUG-08	15-AUG-08
	Sampled Time					
	Client ID	MW-5	MW-11	MW-200	MW-19	MW-17
Grouping	**Analyte**					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	418	458	109	150	128
Total Metals	Arsenic (As)-Total (mg/L)	<0.00050	0.0011	<0.00050	<0.00050	0.00062
	Cadmium (Cd)-Total (mg/L)	0.000039	<0.000034	0.000028	0.000210	0.000056
	Chromium (Cr)-Total (mg/L)	0.0051	<0.0020	<0.0010	0.0014	0.0014
	Cobalt (Co)-Total (mg/L)	0.00030	0.00146	<0.00030	0.00199	0.00285
	Copper (Cu)-Total (mg/L)	0.0043	<0.0020	0.0035	0.0033	0.0069
	Lead (Pb)-Total (mg/L)	0.00142	<0.0010	<0.00050	<0.00050	<0.00050
	Mercury (Hg)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Nickel (Ni)-Total (mg/L)	0.0086	0.0026	<0.0010	0.0041	0.0024
	Zinc (Zn)-Total (mg/L)	0.0366	<0.0050	<0.0050	0.0856	<0.0050
Hydrocarbons	F2 (C10-C16) (mg/L)	<0.30	<0.30	2.33	<0.30	<0.30
	F3 (C16-C34) (mg/L)	0.33	0.47	<0.30	0.32	0.33
	F1 (C6-C10) (mg/L)	<0.10	<0.10	0.74	<0.10	<0.10
Polychlorinated Biphenyls	PCB-1016 (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	PCB-1221 (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	PCB-1232 (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	PCB-1242 (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	PCB-1248 (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	PCB-1254 (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	PCB-1260 (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	PCB-1262 (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	PCB-1268 (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Polychlorinated Biphenyls (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

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	Sample ID	L671792-39	L671792-40			
	Description					
	Sampled Date	15-AUG-08	15-AUG-08			
	Sampled Time					
	Client ID	MW-18	MW-20			
Grouping	**Analyte**					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	51.8	113			
Total Metals	Arsenic (As)-Total (mg/L)	<0.00050	<0.00050			
	Cadmium (Cd)-Total (mg/L)	0.000025	0.000024			
	Chromium (Cr)-Total (mg/L)	<0.0010	<0.0010			
	Cobalt (Co)-Total (mg/L)	<0.00030	<0.00030			
	Copper (Cu)-Total (mg/L)	0.0023	0.0029			
	Lead (Pb)-Total (mg/L)	<0.00050	<0.00050			
	Mercury (Hg)-Total (mg/L)	<0.000020	<0.000020			
	Nickel (Ni)-Total (mg/L)	0.0014	<0.0010			
	Zinc (Zn)-Total (mg/L)	0.0081	<0.0050			
Hydrocarbons	F2 (C10-C16) (mg/L)	<0.30	1.99			
	F3 (C16-C34) (mg/L)	<0.30	<0.30			
	F1 (C6-C10) (mg/L)	<0.10	0.75			
Polychlorinated Biphenyls	PCB-1016 (mg/L)	<0.0010	<0.0010			
	PCB-1221 (mg/L)	<0.0010	<0.0010			
	PCB-1232 (mg/L)	<0.0010	<0.0010			
	PCB-1242 (mg/L)	<0.0010	<0.0010			
	PCB-1248 (mg/L)	<0.0010	<0.0010			
	PCB-1254 (mg/L)	<0.0010	<0.0010			
	PCB-1260 (mg/L)	<0.0010	<0.0010			
	PCB-1262 (mg/L)	<0.0010	<0.0010			
	PCB-1268 (mg/L)	<0.0010	<0.0010			
	Total Polychlorinated Biphenyls (mg/L)	<0.0010	<0.0010			

Reference Information

Additional Comments for Sample Listed:

Samplenum	Matrix	Report Remarks	Sample Comments

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
F1-MET-PT-FID-VA	Soil	CCME by Purge and Trap with GCMS	EPA 8260B & 524.2

This analysis is carried out in accordance with the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." For F1 (C6-C10), a subsample of the sediment/soil is extracted with methanol and analysed by purge & trap GC/FID.

Notes:
1. F1 (C6-C10): Sum of all hydrocarbons that elute between nC6 and nC10.
2. Reported results are expressed as milligrams per dry kilogram.
3. This method is validated for use.
4. Data from analysis of quality control samples is available upon request.

F1-PT-FID-VA Water CCME F1 By P&T with GCFID EPA SW-846, METHOD 8260

This analysis is based on the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." For F1 (C6-C10), the sample undergoes a purge and trap extraction prior to analysis by GC/FID.

F1 (C6-C10): Sum of all hydrocarbons that elute between nC6 and nC10.

F2-F3-SF-FID-VA Water Extractable Hydrocanbons in water GCFID CWS (CCME)

Petroleum Hydrocarbons (F2-F3) in Water

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, published by the United States Environmental Protection Agency (EPA) and the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." The procedure involves a liquid-liquid extraction of the entire water sample using dichloromethane prior to capillary column gas chromatography with flame ionization detection (GC/FID).

A silica gel cleanup procedure is applied before GC analysis, which is intended to selectively remove most naturally occurring organics.

F2F3-TUMB-H/A-FID-VA Soil Petroleum Hydrocarbon by Tumbler GCFID CCME

This analysis is carried out in accordance with the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." For C10 to C34 hydrocarbons (F2 & F3) a subsample of the sediment/soil is extracted with 1:1 hexane:acetone using a rotary extractor. The extract undergoes a silica-gel clean-up to remove polar compounds and is analyzed by on-column GC/FID.

Notes:
1. F2 (C10-C16): Sum of all hydrocarbons that elute between nC10 and nC16.
2. F3 (C16-C34): Sum of all hydrocarbons that elute between nC16 and nC34.
3. This method is validated for use.
4. Data from analysis of quality control samples is available upon request.
5. Reported results are expressed as milligrams per dry kilogram.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness is calculated from Calcium and Magnesium concentrations, and is expressed as calcium carbonate equivalents.

HG-CCME-CVAFS-VA Soil CVAFS Hg in Soil (CCME) CCME

This analysis is carried out using procedures from CSR Analytical Method 8 "Strong Acid Leachable Metals (SALM) in Soil", BC Ministry of Environment, Lands and Parks, 26 June 2001, and procedures adapted from "Test Methods for Evaluating Solid Waste", SW-846 Method 3050B United States Environmental Protection Agency (EPA). The sample is manually homogenized, dried at 60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve, and a representative subsample of the dry material is weighed. The sample is then digested at 90 degrees Celsius for 2 hours by block digester using a 1:1 ratio of concentrated nitric and hydrochloric acids. Instrumental analysis is by atomic fluorescence spectrophotometry (EPA Method 7000 series).

Method Limitation: This method is not a total digestion technique. It is a very strong acid digestion that is intended to dissolve those metals that may be environmentally available. By design, elements bound in silicate structures are not normally dissolved by this procedure as they are not usually mobile in the environment.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
HG-TOT-CCME-CVAFS-VA	Water	Total Mercury in Water by CVAFS (CCME)	EPA 245.7

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

MET-CSR-FULL-ICP-VA	Soil	Metals in Soil by ICPOES (CSR SALM)	BCMELP CSR SALM METHOD 8

This analysis is carried out using procedures from CSR Analytical Method 8 "Strong Acid Leachable Metals (SALM) in Soil", BC Ministry of Environment, Lands and Parks, 26 June 2001, and procedures adapted from "Test Methods for Evaluating Solid Waste", SW-846 Method 3050B United States Environmental Protection Agency (EPA). The sample is manually homogenized, dried at 60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve, and a representative subsample of the dry material is weighed. The sample is then digested at 90 degrees Celsius for 2 hours by block digester using a 1:1 ratio of concentrated nitric and hydrochloric acids. Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

Method Limitation: This method is not a total digestion technique. It is a very strong acid digestion that is intended to dissolve those metals that may be environmentally available. By design, elements bound in silicate structures are not normally dissolved by this procedure as they are not usually mobile in the environment.

MET-CSR-MS-VA	Soil	Metals in Soil by ICPMS (CSR SALM)	BCMELP CSR SALM Method 8

This analysis is carried out using procedures from CSR Analytical Method 8 "Strong Acid Leachable Metals (SALM) in Soil", BC Ministry of Environment, Lands and Parks, 26 June 2001, and procedures adapted from "Test Methods for Evaluating Solid Waste", SW-846 Method 3050B United States Environmental Protection Agency (EPA). The sample is manually homogenized, dried at 60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve, and a representative subsample of the dry material is weighed. The sample is then digested at 90 degrees Celsius for 2 hours by either hotplate or block digester using a 1:1 ratio of concentrated nitric and hydrochloric acids. Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).

Method Limitation: This method is not a total digestion technique. It is a very strong acid digestion that is intended to dissolve those metals that may be environmentally available. By design, elements bound in silicate structures are not normally dissolved by this procedure as they are not usually mobile in the environment.

MET-TOT-CCME-ICP-VA	Water	Total Metals in Water by ICPOES (CCME)	EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-TOT-CCME-MS-VA	Water	Total Metals in Water by ICPMS (CCME)	EPA SW-846 3005A/6020A

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).

MOISTURE-VA	Soil	Moisture content	ASTM METHOD D2794-00

This analysis is carried out gravimetrically by drying the sample at 105 C for a minimum of six hours.

MOISTURE-VA	Soil		ASTM METHOD D2794-00

This analysis is carried out gravimetrically by drying the sample at 105 C for a minimum of six hours.

PCB-SE-ECD-VA	Soil	PCB by Extraction with GCECD	EPA 3630/8082 GCECD

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Methods 3500, 3620, 3630, 3660, 3665 & 8082, published by the United States Environmental Protection Agency (EPA). The procedure involves a solid-liquid extraction of a subsample of the sediment/soil using a mixture of hexane and acetone. Water is added to the extract and the resulting hexane extract undergoes one or more of the following clean-up procedures (if required): florisil clean-up, silica gel clean-up, sulphur clean-up and/or sulphuric acid clean-up. The final extract is analysed by capillary column gas chromatography with electron capture detection (GC/ECD).

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
PCB-SF-ECD-VA	Water	PCB by Extraction with GCECD	EPA 3510/8082 Liq-Liq GCECD

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Methods 3510, 3620, 3660, 3665 & 8082, published by the United States Environmental Protection Agency (EPA). The procedure involves a liquid-liquid extraction of the entire water sample using dichloromethane. The extract is then solvent exchanged to hexane followed by one or more of the following clean-up procedures (if required): florisil clean-up, sulphur clean-up and/or sulphuric acid clean-up. The final extract is analysed by capillary column gas chromatography with electron capture detection (GC/ECD).

PH-1:2-VA	Soil	CSR pH by 1:2 Water Leach	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL

This analysis is carried out in accordance with procedures described in the pH, Electrometric in Soil and Sediment method - Section B Physical/Inorganic and Misc. Constituents, BC Environmental Laboratory Manual 2007. The procedure involves mixing the dried (at <60°C) and sieved (10 mesh /2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water. The pH of the solution is then measured using a standard pH probe.

TL-CSR-MS-VA	Soil	ICPMS Tl in Soil by CSR SALM	BCMELP CSR SALM Method 8

This analysis is carried out using procedures from CSR Analytical Method 8 "Strong Acid Leachable Metals (SALM) in Soil", BC Ministry of Environment, Lands and Parks, 26 June 2001, and procedures adapted from "Test Methods for Evaluating Solid Waste", SW-846 Method 3050B United States Environmental Protection Agency (EPA). The sample is manually homogenized, dried at 60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve, and a representative subsample of the dry material is weighed. The sample is then digested at 90 degrees Celsius for 2 hours by either hotplate or block digester using a 1:1 ratio of concentrated nitric and hydrochloric acids. Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).

Method Limitation: This method is not a total digestion technique. It is a very strong acid digestion that is intended to dissolve those metals that may be environmentally available. By design, elements bound in silicate structures are not normally dissolved by this procedure as they are not usually mobile in the environment.

** Laboratory Methods employed follow in-house procedures, which are generally based on nationally or internationally accepted methodologies.
The last two letters of the above ALS Test Code column indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location	Laboratory Definition Code	Laboratory Location
VA	ALS LABORATORY GROUP - VANCOUVER, BC, CANADA		

GLOSSARY OF REPORT TERMS
Surr - A surrogate is an organic compound that is similar to the target analyte(s) in chemical composition and behavior but not normally detected in enviromental samples. Prior to sample processing, samples are fortified with one or more surrogate compounds.
The reported surrogate recovery value provides a measure of method efficiency.
mg/kg (units) - unit of concentration based on mass, parts per million
mg/L (units) - unit of concentration based on volume, parts per million
N/A - Result not available. Refer to qualifier code and definition for explanation

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Although test results are generated under strict QA/QC protocols, any unsigned test reports, faxes, or emails are considered preliminary.

ALS Laboratory Group has an extensive QA/QC program where all analytical data reported is analyzed using approved referenced procedures followed by checks and reviews by senior managers and quality assurance personnel. However, since the results are obtained from chemical measurements and thus cannot be guaranteed, ALS Laboratory Group assumes no liability for the use or interpretation of the results.

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ADDRESS: 300 TOWN CENTRE, SUITE 300	EMAIL 1: kboldt@gartnerlee.com	PRIORITY SERVICE (1 DAY or ASAP)
	EMAIL 2: tboe@gartnerlee.com	EMERGENCY SERVICE (<1 DAY / WEEKEND) - CONTACT ALS
PHONE: 905 477 8400 FAX:		

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CONTACT: PETER ARMSTRONG	JOB #: GL80-297
ADDRESS: CAMBRIDGE BAY, NU	PO / AFE:
	Legal Site Description:
PHONE: 867-983-3500 FAX:	QUOTE #: c/o KITNUNA PROJECTS INC.
Lab Work Order # (lab use only): L671792	SAMPLER (Initials): TB

ANALYSIS REQUEST

Sample #	SAMPLE IDENTIFICATION (This description will appear on the report)	DATE	TIME	SAMPLE TYPE	METALS + HG	TPH F1-F3	PCBs										HAZARDOUS ?	HIGHLY CONTAMINATED ?	NUMBER OF CONTAINERS
	BMW-3-15	AUG. 14/08		SOIL	✓	✓	✓												2
	MW-5-10	↓		↓	✓	✓	✓												2
	MW-5-25				✓	✓	✓												2
	MW-8-10				✓	✓	✓												2
	MW-8-20				✓	✓	✓												2
	BMW-3-40				✓	✓	✓												2
	BMW-30-40				✓	✓	✓												2
	MW-9-15				✓	✓	✓												2
	MW-9-25				✓	✓	✓												2
	MW-10-15	↓		↓	✓	✓	✓												2

GUIDELINES / REGULATIONS	SPECIAL INSTRUCTIONS / HAZARDOUS DETAILS
CCME	CCME DETECTION LIMITS (3 COOLERS SHIPPED)

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DARRIN JOHNSON	AUG. 16/08			TEMPERATURE	SAMPLES RECEIVED IN GOOD CONDITION ? (YES) NO (If no provide details)
RELINQUISHED BY:	DATE & TIME:	RECEIVED BY: GWW	DATE & TIME: Aug. 19 11am	12/7/6°C (waters / soils)	

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ADDRESS:	EMAIL 1: kboldt@gartnerlee.com	PRIORITY SERVICE (1 DAY or ASAP)
	EMAIL 2: tbac@gartnerlee.com	EMERGENCY SERVICE (<1 DAY / WEEKEND) - CONTACT ALS
PHONE: 905 477 8400 FAX:		ANALYSIS REQUEST
INVOICE TO: SAME AS REPORT ? YES / (NO)	INDICATE BOTTLES: FILTERED / PRESERVED (F/P) → → →	
COMPANY: KITIKMEOT PROJECTS INC.	CLIENT / PROJECT INFORMATION:	
CONTACT: PETER ARMSTRONG	JOB #: GL 90-297	
ADDRESS:	PO /AFE:	
	Legal Site Description:	
PHONE: 867-983-3508 FAX:	QUOTE #: c/o KITIKMEOT PROJECTS INC.	
Lab Work Order # (lab use only)	SAMPLER (Initials): TB	

Sample #	SAMPLE IDENTIFICATION (This description will appear on the report)	DATE	TIME	SAMPLE TYPE	METALS & MERCURY	TPH F1-F3	PCB'S	HAZARDOUS ?	HIGHLY CONTAMINATED ?	NUMBER OF CONTAINERS
	MW-10-35	AUG. 14/08		SOIL	✓	✓	✓			2
	MW-11-10				✓	✓	✓			2
	MW-11-40				✓	✓	✓			2
	MW-12-15				✓	✓	✓			2
	MW-12-30				✓	✓	✓			2
	MW-13-15				✓	✓	✓			2
	MW-13-30				✓	✓	✓			2
	MW-14-A-15				✓	✓	✓			2
	MW-14-A-30				✓	✓	✓			2
	MW-140-A-30				✓	✓	✓			2

GUIDELINES / REGULATIONS	SPECIAL INSTRUCTIONS / HAZARDOUS DETAILS
CCME	PART OF 3 COOLER SHIPMENT

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DARRIN JOHNSON	AUG. 16/08		
RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:
		Cam	Aug. 19

SAMPLE CONDITION (lab use only)

TEMPERATURE	SAMPLES RECEIVED IN GOOD CONDITION ? YES / NO (If no provide details)
12/7/6 °C	

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	EMAIL 2: tboe@gartnerlee.com	EMERGENCY SERVICE (<1 DAY / WEEKEND) - CONTACT ALS
PHONE: 905 477 8400 FAX:		ANALYSIS REQUEST
INVOICE TO: SAME AS REPORT ? YES / NO	INDICATE BOTTLES: FILTERED / PRESERVED (F/P) → → →	
COMPANY: KITIMAT PROJECTS INC.	CLIENT / PROJECT INFORMATION:	
CONTACT: PETER ARMSTRONG	JOB #: GW 80-297	
ADDRESS:	PO /AFE:	
	Legal Site Description:	
PHONE: 867 983-7508 FAX:	QUOTE #: C/O KITIMAT PROJECTS INC.	
Lab Work Order # (lab use only)	SAMPLER (Initials): TB	

Sample #	SAMPLE IDENTIFICATION (This description will appear on the report)	DATE	TIME	SAMPLE TYPE	METALS & MERCURY	TPH F1 - F3	PCB's	HAZARDOUS ?	HIGHLY CONTAMINATED ?	NUMBER OF CONTAINERS
	MW-16-15	AUG. 14/08		SOIL	✓	✓	✓			2
	MW-16-40	↓		↓	✓	✓	✓			2
	MW-15-15				✓	✓	✓			2
	MW-15-25				✓	✓	✓			2
	MW-18-15	AUG. 15/08			✓	✓	✓			2
	MW-18-30	↓			✓	✓	✓			2
	MW-17-15				✓	✓	✓			2
	MW-17-40				✓	✓	✓			2
	MW-20-35				✓	✓	✓			2
	MW-20-15	↓		↓	✓	✓	✓			2

GUIDELINES / REGULATIONS	SPECIAL INSTRUCTIONS / HAZARDOUS DETAILS
CCME	PART OF 3 COOLER SHIPMENT

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RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:	SAMPLE CONDITION (lab use only)
DARRIN JOHNSON	AUG. 16/08			TEMPERATURE: 12/7/6°C — SAMPLES RECEIVED IN GOOD CONDITION ? YES / NO (If no provide details)
RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:	
		Gunn	Aug. 19 11am	

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ADDRESS:	EMAIL 1: kbolot@gartnerlee.com	PRIORITY SERVICE (1 DAY or ASAP)
	EMAIL 2: tboc@gartnerlee.com	EMERGENCY SERVICE (<1 DAY / WEEKEND) - CONTACT ALS
PHONE: 905 477 8400 FAX:		ANALYSIS REQUEST
INVOICE TO: SAME AS REPORT ? YES / NO	INDICATE BOTTLES: FILTERED / PRESERVED (F/P) → → →	
COMPANY: KIENUNA PROJECTS INC.	CLIENT / PROJECT INFORMATION:	
CONTACT: PETER ARMSTRONG	JOB #: BL BD-297	
ADDRESS:	PO /AFE:	
	Legal Site Description:	
PHONE: 867 983-7508 FAX:	QUOTE #: c/o KIENUNA PROJECTS INC.	
Lab Work Order # (lab use only)	SAMPLER (Initials): TB	

Sample #	SAMPLE IDENTIFICATION (This description will appear on the report)	DATE	TIME	SAMPLE TYPE	METALS + MERCURY	TPH F1 - F3	PCB's	HAZARDOUS ?	HIGHLY CONTAMINATED ?	NUMBER OF CONTAINERS
	MW-200-35	AUG. 15/08		SOIL	✓	✓	✓			2
	MW-19-20			SOIL	✓	✓	✓			2
	MW-19-50			SOIL	✓	✓	✓			2
	MW-5			WATER	✓	✓	✓			5
	MW-11				✓	✓	✓			5
	MW-200				✓	✓	✓			5
	MW-19				✓	✓	✓			5
	MW-17				✓	✓	✓			5
	MW-18				✓	✓	✓			5
	MW-20				✓	✓	✓			5

GUIDELINES / REGULATIONS	SPECIAL INSTRUCTIONS / HAZARDOUS DETAILS
CCME	PART OF 3 COOLER SHIPMENT

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DARRIN JOHNSON	AUG. 16/08		
RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:
		Gunn	Aug. 19 11am

SAMPLE CONDITION (lab use only)

TEMPERATURE	SAMPLES RECEIVED IN GOOD CONDITION ? YES / NO (If no provide details)
12/7/6°C	YES

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Appendix G

Quality Assurance/Quality Control

- Table G1 – Soil Sampling QA/QC Results
- Table G2 – Water Sampling QA/QC Results

Table G-1. CAM-4 Kugaaruk, Soil Analysis - QA/QC

	Sample Ident.	Sample Location	Depth (m)	Laboratory	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)	Petroleum Hydrocarbons				PCB Total Aroclors (mg/kg)
														TPH C6-C34 (mg/kg)	C6-C10 (mg/kg)	C10-C16 (mg/kg)	C16-C34 (mg/kg)	
	BMW-3-40	BMW-3	0.40	ALS	16.8	17.5	9.0	<0.50	10.9	53.7	35.0	<5.0	0.0086	0	<10	<30	<50	<0.050
	BMW-30-40*	BMW-3	0.40	ALS	12.0	13.9	7.1	<0.50	8.0	38.3	28.4	<5.0	<0.0050	0	<10	<30	<50	<0.050
	BMW-3-40*	BMW-3	0.40	Cantest	12.0	16.0	8.0	<0.2	8.3	46.0	30.0	2.3	0.01	0	<5	<5	<5	<0.030
Average					13.60	15.80	8.03	-	9.07	46.00	31.13	-	-	-	-	-	-	-
RSD					20%	11%	12%	-	18%	17%	11%	-	-	-	-	-	-	-
	MW-14-A-30	MW-14-A	0.30	ALS	12.1	14.2	6.7	<0.50	8.3	35.8	28.1	<5.0	<0.0050	0	<10	<30	<50	<0.050
	MW-140-A-30*	MW-14-A	0.30	ALS	11.8	13.9	6.1	<0.50	8.0	33.8	27.4	<5.0	<0.0050	0	<10	<30	<50	<0.050
	MW-14-A-30*	MW-14-A	0.30	Cantest	11.0	14.0	7.0	<0.2	8.4	38.0	28.0	2.4	0.01	0	<5	<5	<5	<0.030
Average					11.63	14.03	6.60	-	8.23	35.87	27.83	-	-	-	-	-	-	-
RSD					5%	1%	7%	-	3%	6%	1%	-	-	-	-	-	-	-
	MW-20-35	MW-20	0.35	ALS	10.0	8.7	4.7	<0.50	10.8	25.6	16.7	<5.0	<0.0050	0	<10	<30	<50	<0.050
	MW-200-35*	MW-20	0.35	ALS	10.8	10.3	5.0	<0.50	10.7	26.8	20.8	<5.0	<0.0050	0	<10	<30	<50	<0.050
	MW-20-35*	MW-20	0.35	Cantest	8.0	9.0	4.0	<0.2	10.4	25.0	17.0	1.2	0.01	0	<5	<5	<5	<0.030
Average					9.60	9.33	4.57	-	10.63	25.80	18.17	-	-	-	-	-	-	-
RSD					15%	9%	11%	-	2%	4%	13%	-	-	-	-	-	-	-

Notes: *Relative Standard Deviation (RSDs) calculated by dividing the standard deviation of the comparitive set by the average.*

** Denotes duplicate sample*

xx% *Exceeds QA/QC goal of 20% for inorganics or 30% for organics.*

AECOM

Table G-2. CAM-4 Kugaaruk, 2008 Groundwater Analysis - QA/QC

	Sample Ident.	Sample Location	Laboratory	Copper (mg/L)	Nickel (mg/L)	Cobalt (mg/L)	Cadmium (mg/L)	Lead (mg/L)	Zinc (mg/L)	Chromium (mg/L)	Arsenic (mg/L)	Mercury (mg/L)	Petroleum Hydrocarbons				PCB Total Aroclors (mg/L)
													TPH C6-C34 (mg/L)	C6-C10 (mg/L)	C10-C16 (mg/L)	C16-C34 (mg/L)	
	MW-15	MW-15	ALS	<0.0020	0.0065	0.00216	<0.00003	<0.0010	0.250	0.0024	0.002	<0.00002	7.98	0.35	5.98	1.65	<0.0010
	MW-150*	MW-15	ALS	<0.0020	0.0063	0.00208	<0.00003	<0.0010	0.239	<0.0030	0.002	<0.00002	6.88	0.33	5.15	1.4	<0.0010
	MW-15*	MW-15	Cantest	0.001	0.007	0.002	<0.0002	<0.001	0.32	<0.001	<0.001	<0.02			3.8	1.6	<0.0004
Average				-	0.007	0.002	-	-	0.270	-	-	-	-	-	4.97667	1.55	-
RPD				-	5.5%	3.8%	-	-	16.3%	-	-	-	-	-	22.1%	8.5%	-
	MW-20	MW-20	ALS	0.0029	<0.0010	<0.00030	0.000024	<0.00050	<0.0050	<0.0010	<0.00050	<0.00002	2.74	0.75	1.99	<0.30	<0.0010
	MW-200*	MW-20	ALS	0.0035	<0.0010	<0.00030	0.000028	<0.00050	<0.0050	<0.0010	<0.00050	<0.00002	3.07	0.74	2.33	<0.30	<0.0010
	MW-20*	MW-20	Cantest	0.003	<0.001	<0.001	<0.0002	<0.001	0.022	<0.001	<0.001	<0.02			1.2	<0.25	<0.0004
Average				0.003	-	-	-	-	-	-	-	-	-	-	1.840	-	-
RPD				10.3%	-	-	-	-	-	-	-	-	-	-	31.5%	-	-

Notes: *Relative Standard Deviation (RSDs) calculated by dividing the standard deviation of the comparitive set by the average.*

** Denotes duplicate sample*

xx% *Exceeds QA/QC goal of 20% for inorganics or 30% for organics.*

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