Michael Nahir

PWGSC

Quality in Environmental Services

DETAILED SITE CHARACTERIZATION AND MONITORING

at the

Abandoned Landfill, Eureka, N.W.T

Prepared for: Brock Goalen
Head, Facilities Engineering
AES, Environment Canada
Winnipeg, MB.

Prepared by: Michael Nahir
Head, Contaminated Sites
Environmental Services, A&ES, (AB/NWT)
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EXECUTIVE SUMMARY

A detailed site characterization and the installation of a monitoring system was conducted at the main abandoned landfill at the Eureka High Arctic Weather Station on September 7 and 8, 1995.

Preliminary site characterization, conducted by Environmental Services staff in 1994, showed hydrocarbon and targeted inorganic compounds had concentrations that exceeded the federal assessment criteria. Based on the preliminary sampling results, the observed exposed drums and the HAZMAT (batteries, containers of hazardous materials, etc.) it was recommended to conduct a detailed site characterization to determine the concentration and extent of the contamination.

The environmental concerns are that: contaminants leaching from the landfill contents may be entering Slidre Fiord and present a Fisheries Act violation; and landfill capping material may not freeze back to form a permafrost layer rendering contents and landfill cover unstable.

In the early summer of 1995, Environment Canada Staff at Eureka in conjunction with National Defence staff initiated a capping operation of the landfill. Large sections of potentially contaminated soils have been scrapped from the landfill drainage area and used as capping material. Work has not been completed and several exposed sections of debris remain visible. The resulting slope of the landfill face exceeds the angle of repose for the local soil conditions and is unstable.

The detailed soil sampling program shows that at present there has not been off-site migration of contaminants.

A temperature sensor monitoring system was installed at a stable location through one (1) metre of capping depth. The system is designed to monitor freezeback in the landfill cap. Monitoring freezeback is essential for confirming landfill environmental and structural stability, as well as to confirm the suitability of the design cap thickness.

It is recommended that completion of the landfill closure be properly engineered to prevent both structural and environmental failure.

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1.0 INTRODUCTION

Eureka, established on April 7, 1947, was the first Joint Arctic Weather Station operated cooperatively by the Canadian and American Governments. In 1972, the American participation ended and was renamed the Eureka High Arctic Weather Station (HAWS).

Eureka is approximately 1100 Km from the true North Pole and is located on Fosheim Peninsula, on the northern shore of Slidre Fiord (Figures 1 and 2). Eureka's coordinates are, 79^{0}59'41" N and 85^{0}48'48" W. The duration of the light season is between April 14 and October 21. Annual precipitation, mostly in the form of snow, is approximately 6.8 cm.

In November, 1994 a preliminary site characterization of the main abandonned landfill was conducted by Environmental Services, PW&GSC staff. Thirteen (13) samples were taken in and around the landfill site and analyzed for hydrocarbon parameters and targeted inorganic and heavy metal compounds. Assessment criteria, which determines the presence of contamination, were exceeded in two (2) samples for hydrocarbons and exceeded in five (5) samples for heavy metals (boron, chromium, cobalt, lead, molybdenum, nickel, and zinc). In addition, large numbers of 45 gallon drums and other hazardous materials (batteries, fuel tanks, containers of glycol, and others) were observed exposed to the environment.

It was recommended from the preliminary site characterization that a detailed characterization be conducted to delineate the concentration and extent of contamination that exists around the landfill. It was also recommended that proper closure of the landfill be carried out including removal of all 45 gallon drums and other point sources of contamination and the placement of properly sloped capping to prevent further leaching of contaminants. Finally, it was suspected that the background sample taken during the preliminary site characterization was from a highly disturbed area, therefore, it was recommended that further background sampes be taken to adequately evaluate the contribution of point source contamination.

In the early summer of 1995, under the direction of the Environment Canada Officer in Charge and with the cooperation of National Defence, capping of the landfill was initiated though not completed.

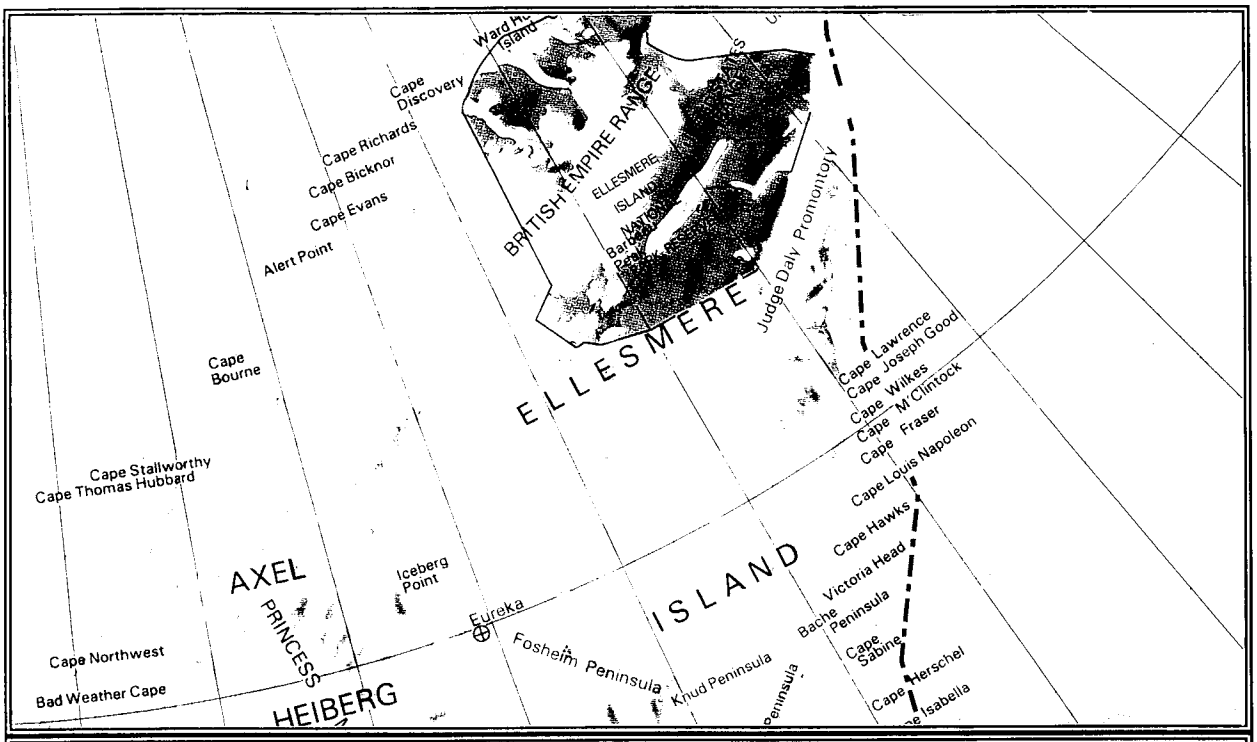

Figure 1. Topographical Map: 1:5,000,000 - NWT, GNWT, 1987

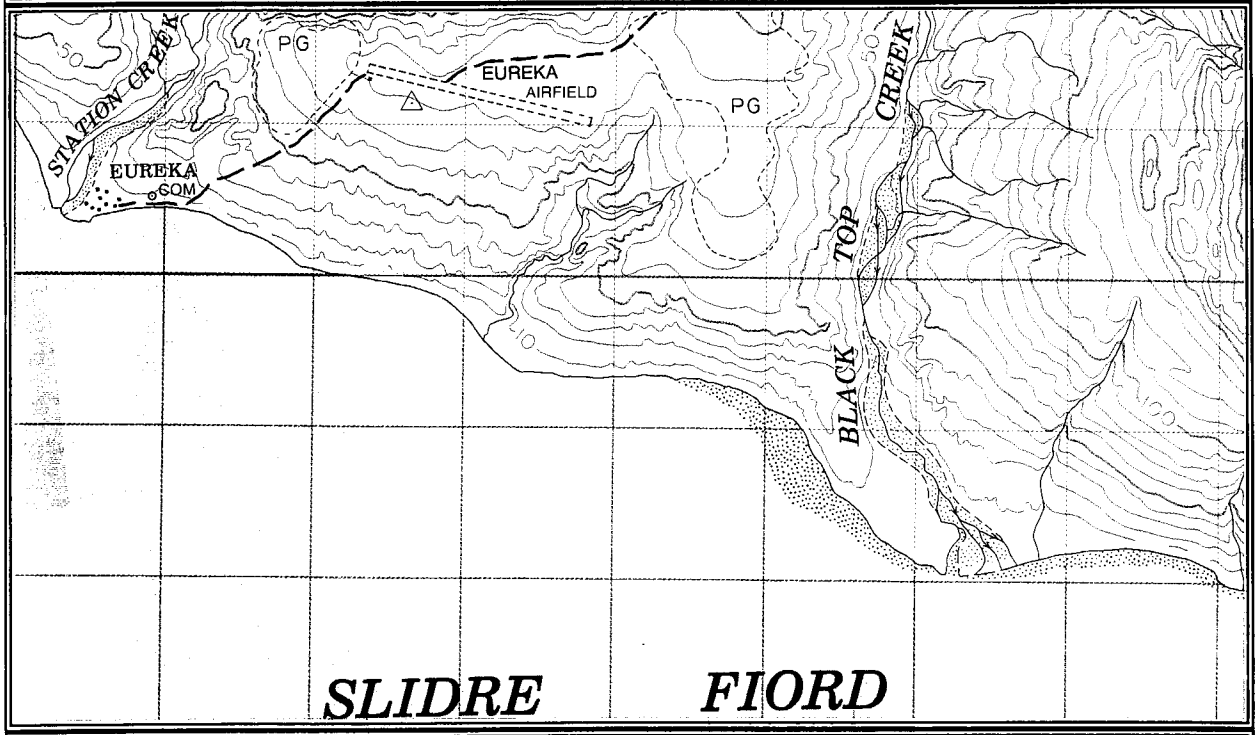

Figure 2. Topographical Map: 1:50,000, Eureka 49G/15, EMR, 1983

2.0 ENVIRONMENTAL SETTING

The annual precipitation in the Eureka area is very low at 6.8 cm. It primarily occurs as snow and can fall any time of the year. The main off-site drainage occurs seasonally in the spring in late May and early June. The landfill site drains by a 1500 m channel and a 60 m relief to Slidre Fiord.

The depth of the permafrost layer of the Eureka area is between 0.15 to 0.5 m. Soils in the active layer are composed of mainly sands (18%), silts (47%),and clays (35%) and is representative of soils commonly found in the high Arctic tundra.

Wildlife observed in the Ellesmere Island area include, Arctic wolf, Arctic fox, caribou, muskox, Arctic hare, polar bear, ermine, beluga, narwhal, walrus, ringed seal, waterfowl, seabirds, and raptors. The landfill site in particular was observed to attract scavenging Arctic wolves and occasionally muskox.

The major plant varieties include lichens, cotton grass, sedges, and grasses and represent the major food source for the herbivores.

3.0 OBJECTIVES

The following are the three objectives of the investigation:

3.1 To conduct a detailed site characterization to delineate the nature and extent of the contamination plume identified in the preliminary site characterization;

3.2 To determine a baseline contamination concentrations in the landfill drainage area;

3.3 To provide a program for monitoring the performance of the landfill capping and containment structure.

4.0 SCOPE OF WORK

4.1 Background:

4.1.1 Review of background documentation including the *Preliminary Site Characterization of an Abandonned Landfill, Eureka, N.W.T.*, as well as, files, drawings, aerial survey maps.

4.1.2 Discussion with key personnel familiar with the site.

4.2 Field Program:

4.2.1 Conduct a detailed sampling of soils and sediments to delineate the nature and extent of contamination previously identified to determine whether concentrations are exceeding criteria.

4.2.2 Install a capping freeze-back monitoring system for the long-range assessment of the landfill capping and containment performance.

4.3 Analysis of Soil and Sediment Samples:

4.3.1 Samples are to be performed by a member of the Canadian Association for Environmental Analytical Laboratories (CAEAL): *Norwest Labs 9936-67 Avenue, Edmonton, Alberta, T6E 0P5, (403) 438-5522.*

4.3.2 Delineation and remediation criteria is the DEW Line Cleanup Criteria (DCC). Remediation is to be applied to soils and sediments where inorganic elements and/or PCBs have been found to be present at concentrations in excess of the DCC.

4.4 Documentation:

4.4.1 Preparation of the draft document detailing sampling results, conclusions, and recommendations.

4.4.2 Document review by Environment Canada (AES) staff.

4.4.3 Preparation and delivery of final documentation (3 copies).

5.0 CRITERIA

The DEW Line Clean Up Protocol (DCLU), of which the DCC is a component of, provides a strategy for dealing with chemical contamination and physical debris at DEW Line sites. The DCLU was originally endorsed by various government agencies including Environment Canada, Indian and Northern Affairs Canada, Government of the Northwest Territories and the Department of Fisheries and Oceans in 1991 and revised in 1994. The DCC are a combination of the CCME R/P[1] and the Quebec B[2] criteria and were determined, on the basis of site specific risk assessments, to be protctive of the Arctic ecosystem.

As a result of similar operations and environmental settings, the DEW Line Cleanup Criteria is considered an appropriate standard for remediation of soils and sediments.

Although not necessarily limited to, standards which may be employed include the following:

- Interim Canadian Environmental Quality Criteria for Contaminated Sites, CCME, 1991.
- Environmental Guidelines for Site Remediation, Northwest Territories Renewable Resources, 1994.
- Guidelines for the Planning, Design, Operation and Maintenance of Solid Waste Modified Landfill Sites in the Northwest Territories, GNWT, 1990.
- DEW Line Cleanup Criteria, ESG, 1994.
- Guidelines for Contaminated Site Remediation, G.N.W.T., 1993.
- Guidance Manual on Sampling, Analysis, and Data Management for Contaminated Sites, CCME, 1993.

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[1] Interim Canadian Environmental Quality Criteria for Contaminated Sites for the Canadian Council for the Ministers of the Environment (CCME:1991).

[2] Quebec Soil Contamination Guidelines (GoQ:1991).

- Technical Assistance Bulletin on Contaminated Sites #4 - Sampling and Analysis of Hydrocarbon Contaminated soil, Environment Canada, 1992.
- Subsurface Assessment Handbook for Contaminated Sites, CCME, 1994.
- Canadian Environmental Protection Act.
- Fisheries Act.
- Canadian Environmental Assessment Act, 1992.

6.0 SAMPLING METHODOLOGY & SOILS INVESTIGATION

Targeted compounds follow closely the analytical parameters specified in the DEW Line Cleanup Criteria. These include Arsenic, Cadmium, Chromium, Cobalt, Copper, Lead, Mercury, Nickel, Zinc, and PCBs.

In keeping with the risk assessments conducted for the DEW Line sites, gross hydrocarbon parameters were not targeted.

The detailed sampling was conducted by Michael Nahir of Environmental Services, PW&GSC. Two (2) background soil samples were taken on May 26, 1995. Twenty five (25) soil and sediment samples were taken on September 8, 1995.

The two background samples were taken approximately 1 km east of the runways east end well away from the landfill. The location was chosen from aerial photos prior to the field visit and selected based on visible non-impacted areas. Background samples were taken close to vegetation in nonimpacted areas.

Twenty (20) samples were taken in the immediate area of the landfill along the perimeter and somewhat further downgradient at regular intervals covering the complete drainage zone. Five (5) soil/sediment samples were taken along the drainage channel leading southwest of the landfill and into Slidre Fiord.

Sampling locations were chosen in small drainage channels, in low spots, at channel bends, and in other locations likely to contain migrating contaminants.

Sampling involved using an Arctic sampling tool composed of a bevelled edge cylinder and a piston/plunger assembly for sample extraction. Column core samples were taken to just above the permafrost layer so as to capture the "floating" contaminant. The samplers were washed with water and paper towel, rinsed with acetone, and again rinsed with water and dried.

Samples were placed in 100 ml wide mouthed precleaned jars, filled to the top (to reduce headspace), and capped with Teflon lined lids. Each sample was labelled and placed in an ice packed coolers. All sample jars were supplied by Norwest Labs in Edmonton and arrived in sealed cartons. All samples were delivered by Michael Nahir to Norwest Labs, 9938-67 Avenue, Edmonton, Alberta on September 11, 1995. Norwest Labs is a member of Canadian Association for Environmental Analytical Laboratories.

The sampling strategy involved taking (twenty) 20 grid samples along the bottom of the landfill and extended outwards in the main drainage area down gradient of the working face (see Figure 3). Five (5) sediment/soil samples were taken along the drainage channel upslope of Slidre Fiord. The samples were located to define the extents and variations in the concentrations of the targeted contaminants. Remedial actions are based on the results of these findings.

No water samples were taken as there was no run-off on site at the time of sampling.

7.0 RESULTS

Analytical results for twenty five (25) soil and sediment samples are shown in Table 1. Sampling locations are shown in Drawing 1. Results are compared to the DEW Line Cleanup Criteria and the average value of the background samples. Since PCBs are not a naturally occurring compound in the environment, background samples were not analyzed for PCBs.

It was observed that there were several sections of the landfill exposed and left uncapped. Small quantities of waste debris remain outside the immediate landfill area.

The landfill slope with the present capping system significantly exceeds the location's natural angle of repose and is therefore unstable.

Table 1 Soil and Sediment Sampling Analysis of Landfill Drainage Area

	DEW Line Cleanup Criteria (ppm)		Back-ground (ppm)	Soil Sample (ppm)				
Parameter	Tier 1	Tier 2	AVG.	1	2	3	4	5
PCBs	1.0	200		<0.1	<0.1	<0.1	<0.1	<0.1
As		30	8.30	6.68	6.80	6.95	6.69	6.35
Ba			44.8	104	93.7	94.1	99.6	77.2
Be			0.3	1.17	1.02	1.08	1.15	0.792
Cd		5.0	<0.3	0.142	0.119	0.179	0.121	0.161
Cr		250	15.5	33.7	24.8	42.1	33.2	24.4
Co		50	5.5	12.6	12.6	12.6	13.1	9.98
Cu		100	9.5	26.8	26.2	24.8	28.0	19.7
Hg		2.0	0.03	0.06	0.06	0.06	0.06	0.06
Pb	200	500	3	11.2	11.6	11.6	10.9	11.0
Mo			<2	0.20	0.30	0.65	0.22	0.26
Ni		100	14	29.1	28.4	36.0	30.6	24.9
Se			0.07	2.61	2.70	2.41	2.71	1.92
Ti			<5	1.11	0.98	1.04	1.01	0.81
V			26.7	40.6	38.0	38.6	39.4	28.5
Zn		500	35.6	71.0	73.3	69.2	69.8	96.5

Table 1 Soil and Sediment Sampling Analysis of Landfill Drainage Area (Cont'd)

	DEW Line Cleanup Criteria (ppm)		Back-ground (ppm)	Soil Sample (ppm)				
Parameter	Tier 1	Tier 2	AVG.	6	7	8	9	10
PCBs	1.0	200		<0.1	<0.1	<0.1	<0.1	<0.1
As		30	8.30	6.89	0.74	7.08	6.27	6.30
Ba			44.8	104	93.7	94.1	99.6	77.2
Be			0.3	1.17	1.02	1.08	1.15	0.792
Cd		5.0	<0.3	0.142	0.119	0.179	0.121	0.161
Cr		250	15.5	33.7	24.8	42.1	33.2	24.4
Co		50	5.5	12.6	12.6	12.6	13.1	9.98
Cu		100	9.5	26.8	26.2	24.8	28.0	19.7
Hg		2.0	0.03	0.06	0.06	0.06	0.05	0.05
Pb	200	500	3	10.2	1.8	11.0	9.7	9.6
Mo			<2	0.30	<0.05	0.22	0.24	0.022
Ni		100	14	27.6	3.42	28.9	24.8	26.3
Se			0.07	2.15	<0.15	2.54	2.10	2.25
Ti			<5	0.67	0.41	1.06	0.74	0.73
V			26.7	33.1	4.45	41.0	37.7	36.2
Zn		500	35.6	67.9	10.2	73.6	65.6	63.2

Table 1 Soil and Sediment Sampling Analysis of Landfill Drainage Area (Cont'd)

	DEW Line Cleanup Criteria (ppm)		Back-ground (ppm)	Soil Sample (ppm)				
Parameter	Tier 1	Tier 2	AVG.	11	12	13	14	15
PCBs	1.0	200		<0.1	<0.1	<0.1	<0.1	<0.1
As		30	8.30	0.62	6.46	6.48	0.69	0.62
Ba			44.8	10.0	79.8	108	9.33	9.59
Be			0.3	0.132	0.913	0.925	0.116	0.119
Cd		5.0	<0.3	<0.025	0.172	0.228	<0.025	0.036
Cr		250	15.5	3.83	29.7	24.9	3.01	2.95
Co		50	5.5	1.50	11.4	11.5	1.40	1.52
Cu		100	9.5	2.73	21.8	22.6	2.54	2.65
Hg		2.0	0.03	0.06	0.06	0.05	0.05	0.06
Pb	200	500	3	1.5	11.6	25.4	1.4	1.3
Mo			<2	<0.05	0.28	0.22	<0.05	<0.05
Ni		100	14	3.39	28.5	25.6	3.01	3.33
Se			0.07	0.27	1.96	2.18	0.21	0.22
Ti			<5	<0.20	0.68	0.79	<0.20	0.31
V			26.7	4.27	32.7	34.0	4.19	4.16
Zn		500	35.6	9.03	70.0	65.5	8.17	8.25

Table 1 Soil and Sediment Sampling Analysis of Landfill Drainage Area (Cont'd)

	DEW Line Cleanup Criteria (ppm)		Back-ground (ppm)	Soil Sample (ppm)				
Parameter	Tier 1	Tier 2	AVG.	16	17	18	19	20
PCBs	1	200		<0.1	<0.1	<0.1	<0.1	<0.1
As		30	8.30	7.07	6.55	7.27	6.27	6.85
Ba			44.8	63.2	90.0	82.4	95.6	92.7
Be			0.3	0.718	1.02	0.974	0.98	1.12
Cd		5	<0.3	<0.025	0.172	0.228	<0.025	0.036
Cr		250	15.5	3.83	29.7	24.9	3.01	2.95
Co		50	5.5	1.50	11.4	11.5	1.40	1.52
Cu		100	9.5	2.73	21.8	22.6	2.54	2.65
Hg		2	0.03	0.06	0.06	0.06	0.05	0.06
Pb	200	500	3	10.2	9.8	10.7	14.4	10.7
Mo			<2	0.24	0.25	0.23	0.18	0.17
Ni		100	14	20.1	27.2	26.3	25.9	30.5
Se			0.07	1.69	2.27	2.47	2.22	2.33
Ti			<5	0.40	0.79	0.75	0.80	0.90
V			26.7	25.3	35.9	36.2	37.3	38.4
Zn		500	35.6	50.9	63.9	68.6	69.8	70.7

Table 1 Soil and Sediment Sampling Analysis of Landfill Drainage Area (Cont'd)

	DEW Line Cleanup Criteria (ppm)		Back-ground (ppm)	Soil Sample (ppm)				
Parameter	Tier 1	Tier 2	AVG.	21	22	23	24	25
PCBs	1.0	200		<0.1	<0.1	<0.1	<0.1	<0.1
As		30	8.30	6.49	6.63	9.54	4.25	5.77
Ba			44.8	85.7	83.9	95.9	35.3	46.0
Be			0.3	0.907	0.924	0.488	0.397	0.591
Cd		5.0	<0.3	0.302	0.133	0.089	0.070	0.088
Cr		250	15.5	25.7	28.1	13.7	12.4	17.4
Co		50	5.5	11.4	10.8	6.46	5.77	7.34
Cu		100	9.5	22.4	20.8	10.9	8.85	13.4
Hg		2.0	0.03	0.05	0.05	0.04	0.02	0.04
Pb	200	500	3	20.0	10.5	6.4	5.0	6.4
Mo			<2	0.29	0.20	0.39	0.26	0.23
Ni		100	14	24.7	25.1	16.5	12.3	17.0
Se			0.07	2.27	2.17	2.00	1.05	1.34
Ti			<5	0.65	0.63	0.83	0.27	0.30
V			26.7	33.1	33.8	20.6	17.7	22.4
Zn		500	35.6	77.9	64.3	36.1	30.0	37.5

8.0 MONITORING

In the program for decommissioning of the first DEW Line site, determination of landfill capping freeze-back was identified as an effective monitoring objective. Detection of freeze-back provides an indication of landfill stability and suitability of the capping thickness. By measuring temperature in the active zone you can determine the dynamic freeze-thaw cycle. Often, sources of contamination produce significant amounts of heat as a result of biological decay of waste. This heat can modify the freeze-thaw cycle in the active zone.

The temperature sensor system is composed of three (3) *Stowaway* dataloggers by *Onset Computer Corporation* placed at 0.5 m depth intervals in a 1.5 m long and 3 inch diameter vertically placed and backfilled PVC standpipe. Readings should be taken twice a year to prevent loss of temperature information. Data is to be downloaded onto PC system (laptop) from each of three sensors placed at the three depths. *Windows* compatible datalogger software and instruction is attached as an Annex.

The sensor system was placed in a relatively stable location of the landfill. The location had a 1m capping thickness and was only moderately sloped. The datalogger depths were chosen to reflect a complete temperature profile across the capping thickness. The sensor location and detail is shown in Drawing 1. Monitoring temperature sensor details are listed in Table 2.

Table 2 Temperature Monitoring Sensors

Stowaway Unit S/N	Label No.	Depth Below Grade (m)	Monitoring Duration (days)	Measurement Frequency (hr-min)	Start of Charging (Date,Time)
5038	EU-A,0	0	360	4-48	9.8.95-09:00
5037	EU-A,0.5	0.5	360	4-48	9.8.95-09:00
5040	EU-A,1.0	1	360	4-48	9.8.95-09:00

9.0 CONCLUSIONS AND RECOMMENDATIONS

Landfill coverage has been partially completed with some sections exposed. Much of the drainage soils have been disturbed and used as capping material. Landfill slope is greater than angle of repose and is therefore unstable. Landfill drainage is by channel/stream into Slidre Fiord.

Soil sampling in landfill drainage area showed no off-site migration of contamination. A further five downstream sediment/soil samples did not show off-site contamination. This is expected as a result of the soils removed from the drainage area during this summers initial capping operation. This likely includes the soils which showed high contaminant levels as indicated in the *Preliminary Site Characterization* conducted by Environmental Services on June 2, 1994. Since the analytical results indicate that no contamination has been transported through the active layer (above permafrost), any existing contaminanted soils are presently within the capping system. In order to prevent possible migration of these contaminants, it is recommended that the landfill be properly capped and sloped.

Detection and analysis criteria used at the Eureka Landfill is consistent with the clean-up of northern DEW Line sites.

It is recommended that completion of landfill closure be properly engineered to prevent both structural and environmental failure of existing partially capped system. The previous work in the partial decommissioning of the landfill was not supervised by trained staff and, as a result, possesses potential liabilities.

On-going monitoring of capping freezeback assists in detecting landfill stability as well as verifying capping thickness. Readings should be taken twice a year to prevent loss of temperature information. Monitoring should continue until the stability off the permafrost layer can be ensured within the capping system.

10.0 REFERENCES

Alberta Environmental Protection, Guidelines for Industrial Landfills, Alberta Environment, June 1987.

Canadian Council of Ministers of the Environment, Surface Assessment Handbook for Contaminated Sites, March, 1994.

Canadian Council of Ministers of the Environment, National Guidelines for the Landfilling of Hazardous Wastes, April,1991.

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G.N.W.T., "Guidelines for Contaminated Site Remediation ", 1993.

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Public Works and Government Services Canada: Environmental Services, Preliminary Site Characterization of an Abandonned Landfill, Eureka, N.W.T.

ANNEX A

PHOTOGRAPHS

Photo #1: Landfill Prior to Partial Capping, North, May 1995

Photo #2: Landfill Prior to Partial Capping, South, May 1995

Photo #3: Landfill After Partial Capping, South, September 1995

Photo #4: Landfill After Partial Capping, South, September 1995

Photo #5: Uncapped Debris, Southwest, September 1995

Photo #6: Sampling Program (note Scraped Drainage), North, Sep.1995

Photo #7: Sampling Drainage Channel, North, Sep.1995

Photo #8: Sampling Drainage Channel, North, Sep.1995

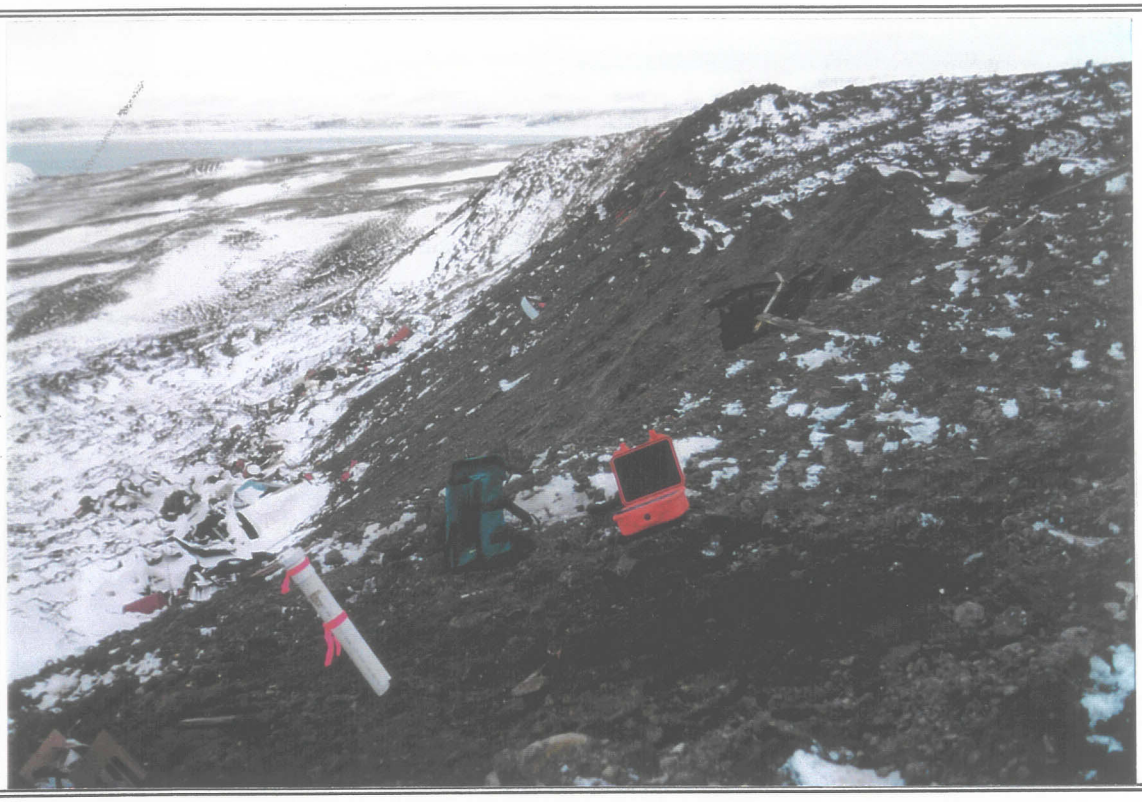

Photo #9: Temperature Monitoring Sensors, South, Sep.1995

Photo #10: Temperature Monitoring Sensors, South, Sep.1995

ANNEX B

LABORATORY ANALYSIS

9938-67 Avenue
Edmonton,AB
T6E 0P5

NORWEST LABS
(403) 438-5522 or 1-800-661-7645
(403) 438-0396 fax

DATE 15 SEP 95 14:39
P.O. NO.
W.O. NO. 4 103006
PAGE 1

PUBLIC WORKS CANADA
1000, 9700 JASPER AVE
EDMONTON, AB
T5J 4E2

MICHAEL NAHIR
EUREKA LANDFILL
09 09 95

SOILS AND SEDIMENTS ANALYSIS REPORT

ICP TRACE, 3050=

SAMPLE DESCRIPTION	EPA3050 As mg/kg	EPA 3050 Ba mg/kg	EPA3050 Be mg/kg	EPA3050 Cd mg/kg	EPA3050 Cr mg/kg	EPA3050 Co mg/kg	EPA3050 Cu mg/kg
1 EU-1	6.68	104	1.17	0.142	33.7	12.6	26.8
2 EU-2	6.80	93.7	1.02	0.119	24.8	12.6	26.2
3 EU-3	6.95	94.1	1.08	0.179	42.1	12.6	24.8
4 EU-4	6.69	99.6	1.15	0.121	33.2	13.1	28.0
5 EU-5	6.35	77.2	0.792	0.161	24.4	9.98	19.7
6 EU-6	6.89	77.1	0.886	0.116	24.3	11.1	21.2
7 EU-7	0.74	10.4	0.140	< 0.025	4.10	1.53	2.89
8 EU-8	7.08	108	1.15	0.236	31.4	12.9	25.8
9 EU-9	6.27	88.4	0.973	0.169	26.1	11.5	22.4
10 EU-10	6.30	87.1	1.00	0.136	28.7	11.9	22.6
11 EU-11	0.62	10.0	0.132	< 0.025	3.83	1.50	2.73
12 EU-12	6.46	79.8	0.913	0.172	29.7	11.4	21.8
13 EU-13	6.48	108	0.925	0.228	24.9	11.5	22.6
14 EU-14	0.69	9.33	0.116	< 0.025	3.01	1.40	2.54
15 EU-15	0.62	9.59	0.119	0.036	2.95	1.52	2.65
16 EU-16	7.07	63.2	0.718	0.091	20.1	8.57	17.6
17 EU-17	6.55	90.0	1.02	0.141	28.7	12.1	23.4
18 EU-18	7.27	82.4	0.974	0.148	22.4	12.0	24.9
19 EU-19	6.27	95.6	0.985	0.195	29.0	11.3	22.7
20 EU-20	6.85	92.7	1.12	0.144	30.9	12.8	25.7
21 EU-21	6.49	85.7	0.907	0.302	25.7	11.4	22.4
22 EU-22	6.63	83.9	0.924	0.133	28.1	10.8	20.8
23 EU-23	9.54	35.9	0.488	0.089	13.7	6.46	10.9
24 EU-24	4.25	35.3	0.397	0.070	12.4	5.77	8.85
25 EU-25	5.77	46.0	0.591	0.088	17.4	7.34	13.4

Lab Manager: _____

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T5J 4E2

MICHAEL NAHIR
EUREKA LANDFILL
09 09 95

SOILS AND SEDIMENTS ANALYSIS REPORT

ICP TRACE, 3050=

SAMPLE DESCRIPTION	EPA3050 Pb mg/kg	EPA3050 Mo mg/kg	EPA3050 Ni mg/kg	EPA3050 Se mg/kg	EPA3050 Tl mg/kg	EPA3050 V mg/kg	EPA3050 Zn mg/kg
1 EU-1	11.2	0.20	29.1	2.61	1.11	40.6	71.0
2 EU-2	11.6	0.30	28.4	2.70	0.98	38.0	73.3
3 EU-3	11.6	0.65	36.0	2.41	1.04	38.6	69.2
4 EU-4	10.9	0.22	30.6	2.71	1.01	39.4	69.8
5 EU-5	11.0	0.26	24.9	1.92	0.81	28.5	96.5
6 EU-6	10.2	0.30	27.6	2.15	0.67	33.1	67.9
7 EU-7	1.8	< 0.05	3.42	< 0.15	0.41	4.45	10.2
8 EU-8	11.0	0.22	28.9	2.54	1.06	41.0	73.6
9 EU-9	9.7	0.24	24.8	2.10	0.74	37.7	65.6
10 EU-10	9.6	0.22	26.3	2.25	0.73	36.2	63.2
11 EU-11	1.5	< 0.05	3.39	0.27	< 0.20	4.27	9.03
12 EU-12	11.6	0.28	28.5	1.96	0.68	32.7	70.0
13 EU-13	25.4	0.22	25.6	2.18	0.79	34.0	65.5
14 EU-14	1.4	< 0.05	3.01	0.21	< 0.20	4.19	8.17
15 EU-15	1.3	< 0.05	3.33	0.22	0.31	4.16	8.25
16 EU-16	10.2	0.24	20.1	1.69	0.40	25.3	50.9
17 EU-17	9.8	0.25	27.2	2.27	0.79	35.9	63.9
18 EU-18	10.7	0.23	26.3	2.47	0.75	36.2	68.6
19 EU-19	14.4	0.18	25.9	2.22	0.80	37.3	69.8
20 EU-20	10.7	0.17	30.5	2.33	0.90	38.4	70.7
21 EU-21	20.0	0.29	24.7	2.27	0.65	33.1	77.9
22 EU-22	10.5	0.20	25.1	2.17	0.63	33.8	64.3
23 EU-23	6.4	0.39	16.5	2.00	0.83	20.6	36.1
24 EU-24	5.0	0.26	12.3	1.05	0.27	17.7	30.0
25 EU-25	6.4	0.23	17.0	1.34	0.30	22.4	37.5

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SOILS AND SEDIMENTS ANALYSIS REPORT

SOIL COL

SAMPLE DESCRIPTION	Hg mg/kg
1 EU-1	0.06
2 EU-2	0.06
3 EU-3	0.06
4 EU-4	0.06
5 EU-5	0.06
6 EU-6	0.06
7 EU-7	0.06
8 EU-8	0.06
9 EU-9	0.05
10 EU-10	0.05
11 EU-11	0.06
12 EU-12	0.06
13 EU-13	0.05
14 EU-14	0.05
15 EU-15	0.06
16 EU-16	0.06
17 EU-17	0.06
18 EU-18	0.06
19 EU-19	0.05
20 EU-20	0.06
21 EU-21	0.05
22 EU-22	0.05
23 EU-23	0.04
24 EU-24	0.02
25 EU-25	0.04

note MERCURY ANALYSIS PERFORMED ON DRIED AND GROUND SAMPLE.DRYING TEMPERATURE NOT TO EXCEED 60 DEGREES CENTIGRADE AS PER EPA 7471.

ADDITIONAL PKG DSHG,ALL SAMPLES FROM 1 TO 25

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SOILS AND SEDIMENTS ANALYSIS REPORT

The following published METHODS OF ANALYSIS were used:

EPA3050 ARSENIC
EPA 3050 BARIUM
Acid digestion of sediments, soils,and sludges using nitric acid/hydrogen peroxide. Reported on dry weight(mg/kg).
Ref. EPA 3050 (SW-846)
EPA3050 BERYLLIUM
EPA3050 CADMIUM
EPA3050 CHROMIUM
EPA3050 COBALT
EPA3050 COPPER
EPA3050 LEAD
EPA3050 MOLYBDENUM
EPA3050 NICKEL
EPA3050 SELENIUM
A3050 THALLIUM
A3050 VANADIUM
EPA3050 ZINC
EPA 3050 TRACE EPA 3050
Acid digestion of sediments, soils,and sludges using nitric acid/hydrogen peroxide. Reported on dry weight(mg/kg).
Ref. EPA 3050 (SW-846)

Method References:

1. APHA Standard Methods for the Examination of Water and Wastewater, American Public Health Assoc., 17th ed.
2. EPA a. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods SW-846, 3rd ed., US EPA, 1986
b. Methods for Chemical Analysis of Water and Wastewater, US EPA, 1983
3. MSS Manual on Soil Sampling and Methods of Analysis, Cdn. Soc. of Soil Science, J. A. McKeague, 2nd ed.

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Lab Manager: _____

NORWEST LABS

#6, 2712 - 37 Ave N.E.
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Phone: (403) 291-2022
Fax: (403) 291-2021

TO:	Public Works Canada	**DATE SAMPLED:**	
		DATE RECEIVED:	11-Sep-95
ATTN:	Michael Nahir	**DATE REPORTED:**	20-Sep-95
		LAB FILE#:	95-09-1809
		Eureka Landfill	

POLYCHLORINATED BIPHENYLS IN SOIL

EDMONTON WO# 103006	**1**	**2**	**3**	**4**	
LAB #	**R6963**	**R6964**	**R6965**	**R6966**	**Detection**
CLIENT #	**EU-1**	**EU-2**	**EU-3**	**EU-4**	**Limit**
PCB Content	<0.1	<0.1	<0.1	<0.1	1
Aroclor Type	----	----	----	----	
Surrogate Recovery % **Decachlorobiphenyl**	99	94	105	103	

Results expressed in mg/kg dry wt. (ppm)

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Phone: (403) 291-2022
Fax: (403) 291-2021

TO:	Public Works Canada	**DATE SAMPLED:**	
		DATE RECEIVED:	11-Sep-95
ATTN:	Michael Nahir	**DATE REPORTED:**	20-Sep-95
		LAB FILE#:	95-09-1809
		Eureka Landfill	

POLYCHLORINATED BIPHENYLS IN SOIL

EDMONTON WO# 103006	**5**	**6**	**7**	**8**	
LAB #	**R6967**	**R6968**	**R6969**	**R6970**	**Detection**
CLIENT #	**EU-5**	**EU-6**	**EU-7**	**EU-8**	**Limit**
PCB Content	<0.1	<0.1	<0.1	<0.1	1
Aroclor Type	———	———	———	———	
Surrogate Recovery % **Decachlorobiphenyl**	86	99	96	98	

Results expressed in mg/kg dry wt. (ppm)

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Fax: (403) 291-2021

TO:	Public Works Canada	**DATE SAMPLED:**	
		DATE RECEIVED:	11-Sep-95
ATTN:	Michael Nahir	**DATE REPORTED:**	20-Sep-95
		LAB FILE#:	95-09-1809
		Eureka Landfill	

POLYCHLORINATED BIPHENYLS IN SOIL

EDMONTON WO# 103006	**9**	**10**	**11**	**12**	
LAB #	**R6971**	**R6972**	**R6973**	**R6974**	**Detection**
CLIENT #	**EU-9**	**EU-10**	**EU-11**	**EU-12**	**Limit**
PCB Content	<0.1	<0.1	<0.1	<0.1	1
Aroclor Type	———	———	———	———	
Surrogate Recovery % **Decachlorobiphenyl**	103	102	103	105	

Results expressed in mg/kg dry wt. (ppm)

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Phone: (403) 291-2022
Fax: (403) 291-2021

TO:	Public Works Canada	**DATE SAMPLED:**	
		DATE RECEIVED:	11-Sep-95
ATTN:	Michael Nahir	**DATE REPORTED:**	20-Sep-95
		LAB FILE#:	95-09-1809
		Eureka Landfill	

POLYCHLORINATED BIPHENYLS IN SOIL

EDMONTON WO# 103006	**13**	**14**	**15**	**16**	
LAB #	**R6975**	**R6976**	**R6977**	**R6978**	**Detection**
CLIENT #	**EU-13**	**EU-14**	**EU-15**	**EU-16**	**Limit**
PCB Content	<0.1	<0.1	<0.1	<0.1	1
Aroclor Type	———	———	———	———	
Surrogate Recovery % **Decachlorobiphenyl**	103	101	100	106	

Results expressed in mg/kg dry wt. (ppm)

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TO:	Public Works Canada	**DATE SAMPLED:**	
		DATE RECEIVED:	11-Sep-95
ATTN:	Michael Nahir	**DATE REPORTED:**	20-Sep-95
		LAB FILE#:	95-09-1809
		Eureka Landfill	

POLYCHLORINATED BIPHENYLS IN SOIL

EDMONTON WO# 103006	**17**	**18**	**19**	**20**	
LAB #	**R6979**	**R6980**	**R6981**	**R6982**	**Detection**
CLIENT #	**EU-17**	**EU-18**	**EU-19**	**EU-20**	**Limit**
PCB Content	<0.1	<0.1	<0.1	<0.1	1
Aroclor Type	———	———	———	———	
Surrogate Recovery % **Decachlorobiphenyl**	78	83	90	88	

Results expressed in mg/kg dry wt. (ppm)

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Phone: (403) 291-2022
Fax: (403) 291-2021

TO:	Public Works Canada	**DATE SAMPLED:**	
		DATE RECEIVED:	11-Sep-95
ATTN:	Michael Nahir	**DATE REPORTED:**	20-Sep-95
		LAB FILE#:	95-09-1809
		Eureka Landfill	

POLYCHLORINATED BIPHENYLS IN SOIL

EDMONTON WO# 103006	**21**	**22**	**23**	**24**	
LAB #	**R6983**	**R6984**	**R6985**	**R6986**	**Detection**
CLIENT #	**EU-21**	**EU-22**	**EU-23**	**EU-24**	**Limit**
PCB Content	<0.1	<0.1	<0.1	<0.1	1
Aroclor Type	----	----	----	----	
Surrogate Recovery % **Decachlorobiphenyl**	84	86	89	89	

Results expressed in mg/kg dry wt. (ppm)

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Phone: (403) 291-2022
Fax: (403) 291-2021

TO:	Public Works Canada	**DATE SAMPLED:**	
		DATE RECEIVED:	11-Sep-95
ATTN:	Michael Nahir	**DATE REPORTED:**	20-Sep-95
		LAB FILE#:	95-09-1809
		Eureka Landfill	

POLYCHLORINATED BIPHENYLS IN SOIL

EDMONTON WO# 103006	**25**	
LAB #	**R6987**	**Detection**
CLIENT #	**EU-25**	**Limit**
PCB Content	<0.1	1
Aroclor Type	----	
Surrogate Recovery %	89	
Decachlorobiphenyl		

R. Corbet, M.Sc., P.Ag.
Manager - Organics

Results expressed in mg/kg dry wt. (ppm)

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Phone: (403) 291-2022
Fax: (403) 291-2021

TO:	Public Works Canada	**DATE SAMPLED:**	
		DATE RECEIVED:	11-Sep-95
ATTN:	Michael Nahir	**DATE REPORTED:**	20-Sep-95
		LAB FILE#:	95-09-1809
		Eureka Landfill	

POLYCHLORINATED BIPHENYLS
QA/QC Data Sheet
Calibration Check (CC)

	Actual Amt. (ng)	Detected Amt. (ng)	% Rec.
Aroclor 1254	1.00	1.037	103.7

$$\text{Accuracy} = \frac{\text{Ave \% Rec. MS + Ave \% Rec. MSD}}{2} = 101.7 \text{ \% Accuracy}$$

$$\text{\% RSD} = \frac{\text{Ave \% Rec. MS - Ave \% Rec. MSD}}{\text{\% Accuracy}} = 2.0 \text{ \% RSD}$$

The calculated values are based on matrix spike and duplicate recovery data performed on your samples at the time of analysis.

Date Acquired: September 18, 1995 Analyst: Trevor Ahlstrom

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MICHAEL NAHIR
EUREKA

SAMPLE		1 #1 EUREKA LANDFILL BACKGROUND	2 #2 EUREKA LANDFILL BACKGROUND	3 #3 EUREKA BATTERY SITE BATTERY STORAGE AREA
SOIL HYDRIDE				
ANTIMONY	ug/gm	0.10	0.08	0.06
ARSENIC	ug/gm	7.34	9.26	8.77
SELENIUM	ug/gm	0.05	0.09	0.33
SOIL COLD VAPOR				
MERCURY	ug/gm	0.02	0.03	0.04
ICP METALS,3050				
BARIUM	ug/gm	43.7	45.8	68.8
BERYLLIUM	ug/gm	0.3	0.3	0.6
CADMIUM	ug/gm	<0.3	<0.3	<0.3
CHROMIUM	ug/gm	15.5	15.4	24.1
COBALT	ug/gm	5	6	9
COPPER	ug/gm	8.8	10.2	18.4
LEAD	ug/gm	3	3	6
MOLYBDENUM	ug/gm	<2	<2	<2
NICKEL	ug/gm	13	14	21
SILVER	ug/gm	<5	<5	<5
THALLIUM	ug/gm	<3	<3	<3
TIN	ug/gm	<5	<5	<5
VANADIUM	ug/gm	26.9	26.4	37.0
ZINC	ug/gm	35.7	35.4	56.8
GFAA METALS 3050				
THALLIUM	ug/gm	<0.30	<0.30	<0.30
HOT WATER BORON				
BORON	ug/gm	1.8	3.4	
PHYSICAL				
MOIST.WET WT.	%	15.5	14.4	10.3

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MICHAEL NAHIR
EUREKA

The following published METHODS OF ANALYSIS were used:

NWL 6836 ARSENIC
Nitric/perchloric acid digest. Analysis by continuous hydride atomic absoption. Ref. APHA 3114 C

NWL6835 MERCURY
Digestion in a hotblock with sulphuric/ nitric acid & vanadium pentoxide. Analysis by continuous flow cold vapor atomic absorption spectrometry. Ref.Knechtel & Conn, WWTC, Env.Can.

EPA6010 BARIUM
ICP Spectroscopy. Ref. EPA 6010 (SW-846)

EPA6010 BERYLLIUM
ICP Spectroscopy. Ref. EPA 6010 (SW-846)

EPA6010 CADMIUM
ICP Spectroscopy. Ref. EPA 6010 (SW-846)

EPA6010 CHROMIUM
ICP Spectroscopy. Ref. EPA 6010 (SW-846)

EPA6010 COBALT
ICP Spectroscopy. Ref. EPA 6010 (SW-846)

EPA6010 COPPER
ICP Spectroscopy. Ref. EPA 6010 (SW-846)

EPA6010 LEAD
ICP Spectroscopy. Ref. EPA 6010 (SW-846)

EPA6010 MOLYBDENUM
ICP Spectroscopy. Ref. EPA 6010 (SW-846)

EPA6010 NICKEL
ICP Spectroscopy. Ref. EPA 6010 (SW-846)

EPA6010 SILVER
ICP Spectroscopy. Ref. EPA 6010 (SW-846)

EPA6010 THALLIUM
ICP Spectroscopy. Ref. EPA 6010 (SW-846)

EPA6010 VANADIUM
ICP Spectroscopy. Ref. EPA 6010 (SW-846)

EPA6010 ZINC
ICP Spectroscopy. Ref. EPA 6010 (SW-846)

MSS 4.6 BORON

Method References:

1. APHA Standard Methods for the Examination of Water and Wastewater, American Public Health Assoc., 17th ed.

2. EPA a. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods SW-846, 3rd ed., US EPA, 1986
b. Methods for Chemical Analysis of Water and Wastewater, US EPA, 1983

3. MSS Manual on Soil Sampling and Methods of Analysis, Cdn. Soc. of Soil Science, J. A. McKeague, 2nd ed.

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MICHAEL NAHIR
EUREKA LANDFILL
09 09 95

SOILS AND SEDIMENTS ANALYSIS REPORT

SAMPLE DESCRIPTION	PARTICLE SIZE HYDROMETER SAND %	SILT %	CLAY %	TEXTURAL CLASS	SOIL COL Hg mg/kg	SOIL COL Hg mg/kg
1 EU-1						0.06
2 EU-2						0.06
3 EU-3						0.06
4 EU-4						0.06
5 EU-5						0.06
6 EU-6						0.06
7 EU-7						0.06
8 EU-8						0.05
9 EU-9						0.05
10 EU-10						0.06
11 EU-11	18.0	47.0	35.0	Si.C.LOM		0.06
12 EU-12						0.05
13 EU-13						0.05
14 EU-14						0.06
15 EU-15						0.06
16 EU-16						0.06
17 EU-17						0.06
18 EU-18						0.05
19 EU-19						0.06
20 EU-20						0.05
21 EU-21						0.05
22 EU-22						0.04
23 EU-23						0.02
24 EU-24						0.04
25 EU-25						

note MERCURY ANALYSIS PERFORMED ON DRIED AND GROUND SAMPLE.DRYING TEMPERATURE NOT TO EXCEED 60 DEGREES CENTIGRADE AS PER EPA 7471.

ADDITIONAL

Lab Manager: JA

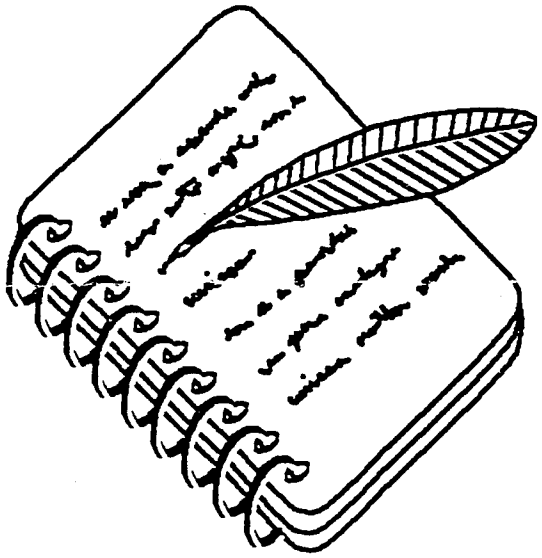
ANNEX C

DATALOGGER PC INFORMATION

LogBook®

for Windows
User's Guide

Vers. 2.0

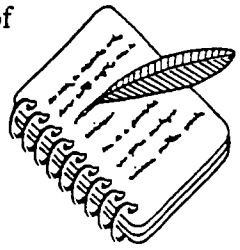


onset

Computer Corporation

LogBook Quick Start

Follow this procedure to quickly get your Hobo or StowAway connected and displaying data. Detailed installation instructions and descriptions of all the menu options follow on later pages.



1. Install the LogBook software.
2. Connect the interface cable to Com Port 1 on the back of the computer.
3. Connect the other end of the interface cable to the logger.
4. Verify and set your computer clock to the correct time and date.
5. Double click on the LogBook icon to start the software.
6. Pull down the **Logger** menu and select **Launch**.
7. Press the Start button. The logger will be launched with default settings and start recording data.
8. Wait a few seconds and pull down the **Logger** menu and select **Readout**. The data recorded by the logger will be downloaded and displayed on the screen as a plot; you will be prompted to save the file.

Congratulations - you have completed the installation and verified the operation of your new logger!

Getting ready

Installing LogBook for Windows on a Hard Drive

To install LogBook software onto your hard drive, insert the LogBook diskette into the floppy drive of your computer. In the **Program Manager**, choose **Run** from the **File** menu, type **a:\install** (or b:\install). It will ask you for the directory (LOGBOOK2 is the default) and install the program and the help file.

Connecting to Your IBM Compatible

The logger is connected to your computer with an interface cable. The PC-3.5 cable is designed to connect directly between the IBM Compatible's DB-9 serial port and the data logger. A DB-25 to DB-9 adapter may be needed if your computer does not have an available DB-9 port.

Before Starting LogBook

Before starting LogBook make sure your computer's clock is set to the right time because the HOBO or StowAway will use your computer's clock setting to initiate its own internal clock setting. If you are using a HOBO-TEMP or StowAway TEMP with an external thermistor probe, this would be a good time to plug that probe in.

Starting LogBook

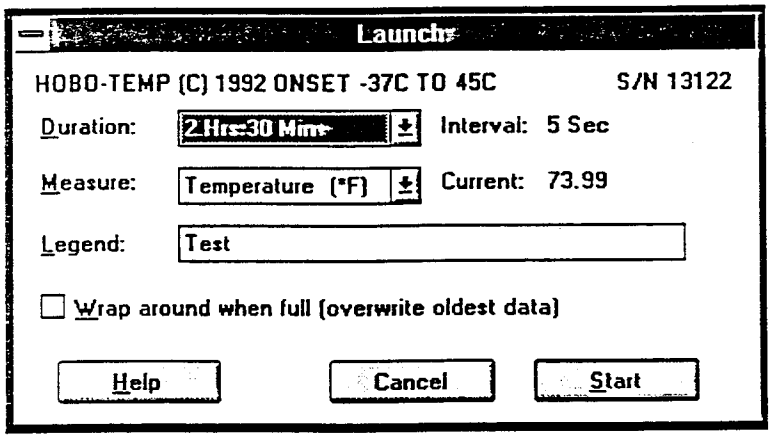
To start LogBook for Windows, double click on the LogBook icon.

Current

LogBook causes the logger to make a measurement every second while the Launch Dialog box is open. Current shows the most recent reading from the logger displayed using the unit specified by 'Measure'.

Legend

The text in the Legend box is displayed below the time axis at read out. Up to 40 characters can be written in this area.



Launch Dialog Box for Hobo Loggers

Wrap around

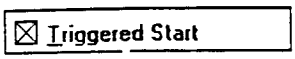
When "Wrap around when full" is checked, the logger will not stop when it is filled, but instead will overwrite the oldest data with new measurements. If you launch with a 30 day duration, but do not recover the logger until much later, the data will reflect the last 30 days. When "Wrap around when full" is not checked, the logger will turn itself off when it is full, and await recovery and read out.

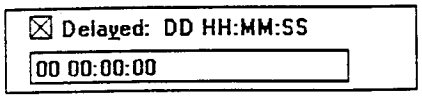
Start

Click the **Start** button when you are satisfied with the current settings. LogBook will load this information in the logger and start it. Do not unplug the logger from the interface cable until Logbook has indicated that the launch has been completed. You can confirm that the logger has been launched by looking at the logger's status LED which will continue to blink at least once every two seconds after it has been launched.

Cancel

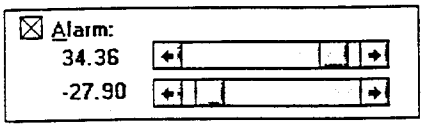
Press the **Cancel** button if you decide not to launch the logger. The old settings and the data in the logger will be preserved.





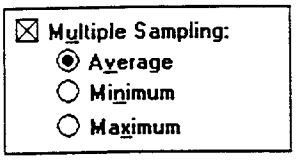
Delay after Triggered Start

Selecting both Triggered Start and Delayed causes the StowAway to delay this amount of time after the trigger has been activated; before it starts logging. Enter this delay in the format DD HH:MM:SS.



Alarm

Alarm, when selected, allows you to see if the StowAway has recorded a reading outside of a selectable range. The alarm reads in the units shown in the Measure box. To set the Alarm, select the alarm box and move the tabs to the desired values. The various StowAway loggers have different ways of representing alarm conditions, read the individual loggers manual for details.



Multiple Sampling

When Multiple Sampling is not selected, the logger measures and stores a single measurement during each measurement interval. Multiple Sampling causes the logger to make multiple measurements during an interval and store the minimum, maximum, or average of the readings, as selected by this box. In multiple sampling mode the logger takes about 100 measurements evenly spaced in each interval unless the interval is less than a minute. For shorter intervals the logger will measure once every half second during the interval.

Multiple sampling increases the average current drain of the logger. To minimize current drain this feature should not be used unless needed.

Zooming in on any Plot Section

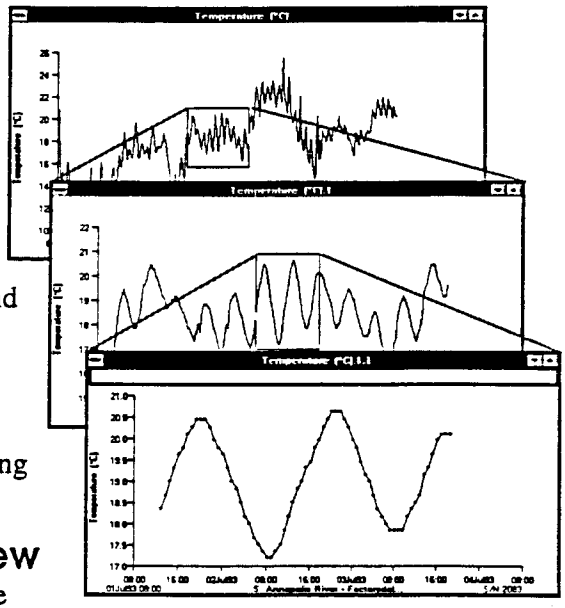
You can zoom in on any section of the plot by using the Selection tool to draw a box around the section of interest. To Zoom, either click inside the box and select **Zoom Selection** on the **View** menu or press F7. If you are using the Zoom tool (magnifying glass cursor), you can use the left mouse button to zoom in on a selection without clicking inside the box first, and the right mouse button can then be used to zoom back out.

Zooming Out

You can zoom out to the previous plot by choosing **Zoom Out** on the **View** menu or by pressing F8.

Returning to the Original Plot View

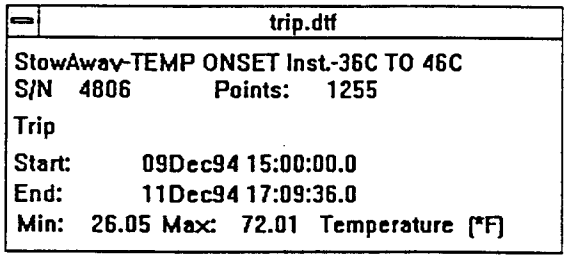
To return to the original plot of your data, choose **Original Plot** from the **View** menu or by pressing F9.



Zooming in on a Plot

File Information

The **File Information** selection from the **View** menu opens a box that describes the currently displayed file. The description is for the entire file and does not change with a zoom.



File Information Dialog Box

Printing your Graph

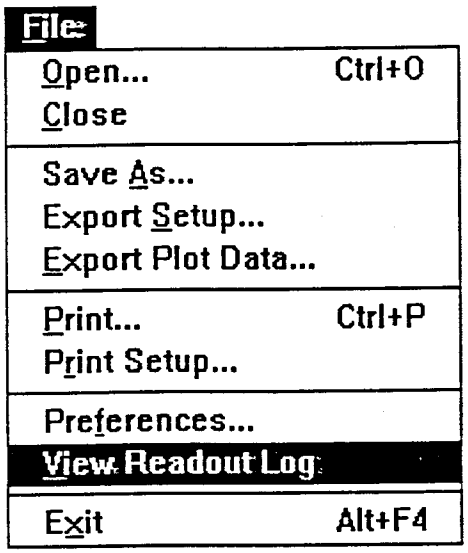
To Print the plot of your data, select **Print...** under the **File** menu. Plots can be resized on the screen but this will not affect the printed size. Plots will be scaled to nearly fit a full page, either in landscape or portrait mode. Plot scaling is not available.

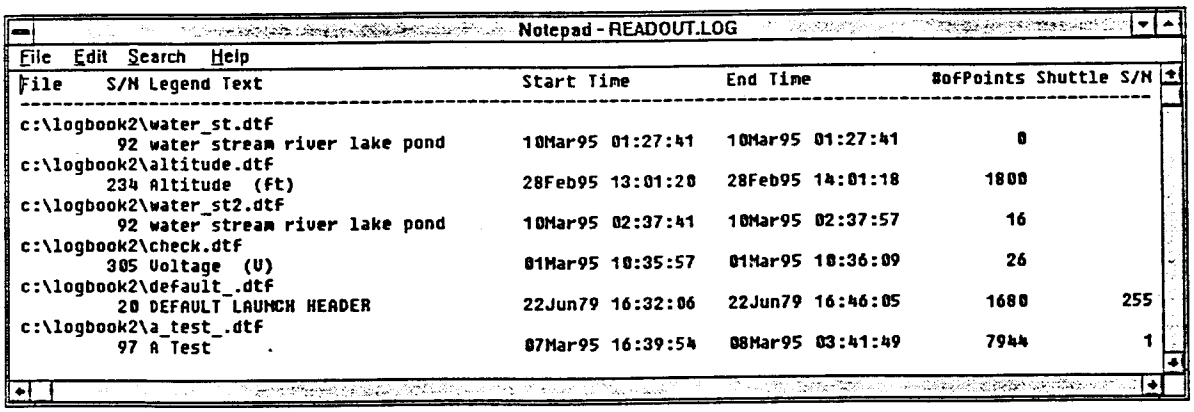
Print Setup

Selecting **Print Setup** from the **File** menu displays the Print Setup dialog box. From here you can choose the page orientation: Portrait or Landscape. Additional options may be available depending on the attached printer.

View Readout Log

LogBook will create an entry in the Readout Log for each saved file with the information: *file name, serial number, header information, start and end date/time, and number of points*. You can use **View Readout Log** under the **File** menu to view the text file using NotePad. It can also be viewed using any other text editor.






```
File    S/N Legend Text                          Start Time          End Time            #ofPoints Shuttle S/N
-------------------------------------------------------------------------------------------------------------
c:\logbook2\water_st.dtf
        92 water stream river lake pond          10Mar95 01:27:41    10Mar95 01:27:41          0
c:\logbook2\altitude.dtf
        234 Altitude  (ft)                       28Feb95 13:01:20    28Feb95 14:01:18       1800
c:\logbook2\water_st2.dtf
        92 water stream river lake pond          10Mar95 02:37:41    10Mar95 02:37:57         16
c:\logbook2\check.dtf
        305 Voltage  (V)                         01Mar95 10:35:57    01Mar95 10:36:09         26
c:\logbook2\default_.dtf
        20 DEFAULT LAUNCH HEADER                 22Jun79 16:32:06    22Jun79 16:46:05       1680      255
c:\logbook2\a_test_.dtf
        97 A Test                                07Mar95 16:39:54    08Mar95 03:41:49       7944        1
```

Readout Log Window

Export Current Display Units Only

Export normally provides separate columns for each unit available for displaying the data. With this box checked, only one data column is created, containing the units used in the plot currently selected.

Exporting the Data

To export a file with LogBook, first open an existing file or read out a new file. Next, choose **Export Plot Data** from the **File** menu. LogBook will then ask you to Save the file with the extension .TXT. The data will then be exported in the format last specified by the Export Setup dialog.

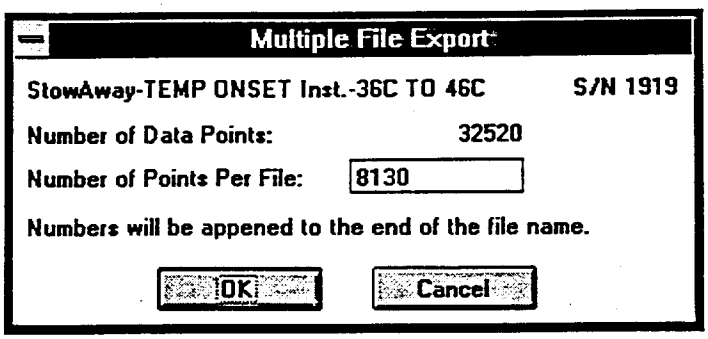
NOTE: Exported files cannot be read back into LogBook.

Working with an Exported File

To work with an exported file, start the intended program, e.g., Lotus 1-2-3, Excel, or Quattro Pro, and then import or open the file that was saved with the .TXT extension. If you are having problems finding the file which was saved, please refer to the User's Guide which came with your computer. This will allow you to work with your data inside the spreadsheet.

Multiple File Export

Some spreadsheets are not able to import files with more than 16,000 points. So, when you try to export a file that contains 16,000 points or more, LogBook will ask you if you wish to separate the data into more than one file. If you choose yes, a dialog will appear telling you the number of points in the file and will ask you to specify the number of points per file. Once you choose the number of points, it will prompt you to select a file name. All the files will be saved with this name with a number appended to the end.



Multiple File Export Dialog

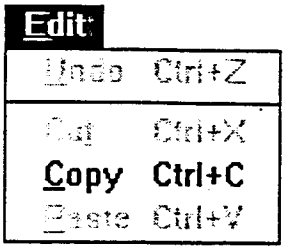
The Tool Bar

The buttons on the **Tool Bar** allow quick access to some of the functions. The **Message Bar** at the bottom of the window describes these when the pointer is placed on them.

Tool Bar Button Descriptions (from left to right)

Open: Allows you to plot previously off-loaded LogBook compatible files.
Save As: Saves the currently displayed file using a selectable name.
Print: Allows you to print the currently selected plot.
Copy: Copies the plot as a bitmap to the Clipboard.
Launch: Displays the launch dialog box.
Readout: Reads the data from the logger.
Shuttle Readout: Off-load data files from the Optic Shuttle
Connect Points: Draws a line between each point on the plot.
Mark Points: Displays a small circle around each data point.
File Information: Displays additional information about the current plot.
Selection Tool: This is the default general purpose selection cursor.
Zoom Tool : Allows you to select an area of a plot and magnify it.
Help: Brings you to the contents of the help file.

Copying Pictures



To copy your graph as a bitmap to the Clipboard, select **Copy** from the **Edit Menu** or use the button on the toolbar. To copy just a section of you graph, use the Selection tool to select the area of interest and then select **Copy**.

NOTE: The Undo, Cut and Paste functions are not currently available.

Commonly Asked Questions

Q. *When selecting Launch or Readout, the software gives the message "Can't connect to data logger." What's wrong?*

A. This is probably a serial port problem:

1. Make sure that the interface cable is pressed all the way into the jack on the Logger.

2. Make sure that the interface cable is connected to a working serial port. If the serial port was recently used for a network or a mouse, the port may still be configured as such. When removing a mouse, reboot your system.

Q. *Can a Logger that has been launched with one version of LogBook be read out by LogBook 2.0?*

A. Yes!!

Q. *When I use the Excel or Lotus time format to export the data, there are large decimal numbers in the first column, for example: 34436.4687037. What are these numbers?*

A. Spreadsheet programs use numbers called 'serial numbers' to represent dates and times. These need to be reformatted into a readable form. The part to the left of the decimal point is the number of days from some date in the past, often January 1, 1900, and the fractional part represents the fraction of a day thereafter. In order to format this column please see the section on Export Setup.

Q. *My spreadsheet program allows either MM-DD-YY or HH:MM:SS for the possible time and date formats. What can I do to get both date and time?*

A. Use the insert command in your spreadsheet program to insert a new column in the spreadsheet. Copy the column containing the time serial numbers to the column you have inserted. Use the formatting commands on your spreadsheet to format one as date: MM-DD-YY, and one as time: HH:MM:SS.

Keyboard Shortcut Table

Action	Keys to Press
Open	Ctrl+O
Print	Ctrl+P
Exit	Alt+F4
Copy	Ctrl+C
Launch	Ctrl+L
Readout	Ctrl+R
Connect Points	F4
Mark Points	F6
Zoom Selection	F7
Zoom Out	F8
Original Plot View	F9
Help	F1

The Onset 'SUBCASE' products were originally designed by Ikelite and are now produced for Onset on a special order basis. They provide generally reliable water tight solutions at a low cost for most applications. However, because each use of a case requires making a new seal, Onset can not guarantee that yours will not leak. In fact, they are not tested before resale. After more than a year of customer experience, we have found field failures to be rare and in nearly all cases, failure could have been avoided. Please read these notes on the use and care of the following products;

SUBCASE-WH	general purpose white submersible case
SUBCASE-CLR	general purpose clear submersible case
SUBCASE-A	white submersible case with thermistor potted to inside surface

Onset specifies the cases for use in dry air where the temperature remains between -50°C and +120°C or in humid air or fresh or salt water where the temperature remains between -50°C and +60°C. They should not be placed more than 400 feet below the water's surface. Steam baths or autoclaves will cause the case to become brittle and crack.

Onset does not recommend the cases for any other environment. They are made from polycarbonate and can be adversely affected by certain combinations of chemical exposure, heat and pressure. Use only O-rings and lubricants provided by Onset. Failures from exposure to various chemicals range from immediate crumbling to gradual crazing. Use only mild soap solutions to clean the cases. The following chemical classes are known to adversely effect polycarbonate; amines, aromatic hydrocarbons, halogenated hydrocarbons, esters, ketones and high concentrations of acid, alcohols, or alkalis. While petroleum and silicone greases and oils are safe, common additives to them are not.

Before using your submersible case, inspect the area where the o-ring will be placed. Make sure the surface is clean and there are no cracks. The surface will not be perfectly smooth, that is normal.

When placing your Hobo or Stowaway in the case, note that the fit is very snug. Do not force the logger all the way to the bottom or it will be difficult to remove later. Place a desiccant pack in the case with your Hobo or Stowaway. Warm air holds more moisture than cool air. If your case gets colder, water may condense out of the enclosed air and can cause corrosion of your data logger or possibly stop it from running. Color coded desiccant packs can be purchased from Onset. When they are dry and able to absorb moisture they will be blue. As they become saturated, they turn pink. If the desiccant is white or clear, it is not color coded.