ALTA GEOSCIENCES, Inc.
Environmental & Geotechnical Solutions

SITE CHARACTERIZATION REPORT

Hanson Site
Anchorage, Alaska

April 2003

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ALTA GEOSCIENCES, Inc.

Environmental & Geotechnical Solutions

April 29, 2003

Susan Reeves, Esq.
Rubini and Reeves
500 L Street, Suite 300
Anchorage, Alaska 99501

Re: Site Characterization Report
Hanson Site, Anchorage, Alaska

Dear Ms. Reeves:

This Site Characterization Report for the Hanson Site in Anchorage, Alaska has been prepared under the direct supervision of Alex Tula, Project Manager, and Richard Quine, Project Engineer. It has been prepared for the exclusive use of Hanson Associates for application to this specific project and site. This work has been performed in accordance with generally accepted professional practices.

We appreciate the opportunity to assist you on this project. If you have any questions, please feel free to contact us at your earliest convenience.

Sincerely,
***ALTA* Geosciences, Inc.**

Alex Tula, R.G.
Principal Consultant

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1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

This report has been produced by ALTA Geosciences of Bothell, Washington for Hanson Associates, Inc., owner of the Hanson property. The report is necessary to fulfill requirements of the Alaska Department of Environmental Conservation (ADEC) under Title 18 AAC 75.335.

The scope of work for this Site Characterization has included the following:

- Site Survey, to accurately define Site boundaries and sampling grid system
- Groundwater sampling in existing monitoring wells with analysis for Lead and PCBs
- Layout of a comprehensive sampling grid system
- Soil sampling, with selected samples analyzed for Lead, PCBs, Total Organic Carbon, and Diesel Range Organics
- Laboratory data analysis and summary presentation
- Evaluation of potential contaminant migration and clean up levels
- Evaluation of available disposal options and relative costs
- Evaluation remedial alternatives
- Production of a Site Characterization Report, summarizing the above work

1.2 SITE AREAS

The project is collectively known as the "Hanson Site", hereafter referred to as "Site" in this *Site Characterization Report*. The project is located in the 600 block on East International Airport Way, in Anchorage, AK (see Figure 1-1). Within the Site there are five subareas. The general arrangement of these Site "Areas" is presented in Figure 1-2. The Site is bounded on three sides by commercial properties, and a major road on the fourth side.

The largest subarea is the central portion known as the M&M Area, located at 620 East International Airport Road in Anchorage, Alaska. The M&M Area consists of two interconnected single-story wood frame buildings used for commercial space, a large yard behind the buildings and an unpaved parking area in front. Most of the prior remediation and investigation efforts have focused on the fenced yard area behind the buildings (see Figure 1-2). This area was used historically by a company known as "M&M Enterprises" (unrelated to the present owners or operators) for scrap recycling. The M&M Area is currently owned by Hanson Associates, Inc..

The second subarea is an alleyway on the east side of the M&M Area, approximately 35 to 50 feet wide by 180 feet long (the "Alleyway" Area). The alleyway is currently owned by Hanson Associates, Inc.. Portions of this alleyway may have been impacted by past M&M Enterprises operations.

The third subarea is a portion of the property located immediately south of the M&M site at 5333 Fairbanks Avenue. This is referred to as the "Debenham" Area. The Debenham Area was formerly owned by Hanson and the northern portion of it, adjacent to the M&M Area, may have been impacted by former activities from the M&M Area. This property is currently owned jointly by the Ray Gene Debenham Revocable Trust and the Rita Josie Debenham Revocable Trust.

The fourth subarea is the edge of a property located West of the M&M Area, and has been designated the "West" Area in this report. The area was included to evaluate whether the M&M Enterprises operations may have impacted the land located to the west, regardless of the fenceline which has existed along that boundary.

The fifth subarea is designated the Southeast Area, and is located southeast of the M&M Area and east of the Debenham Area. This area contains the pathway for surface water runoff from the M&M Area and was included to evaluate the possibility that surface runoff from former Site operations may have migrated through that pathway.

1.3 PROJECT RESPONSIBILITY

All sampling, laboratory coordination, and production of this Site Characterization Report, was under the direct supervision of an ALTA Geosciences environmental engineering geologist, who is also a registered Alaska Civil Engineer.

1.4 BACKGROUND

Hanson Associates leased the property to a series of operators, one or more of whom may have stored and/or recycled discarded materials, including batteries, on the property. The Site has been leased by Hanson to several different operations since 1964. Site uses have included used appliance recycling (approximate dates 1974 – 1981), and metal and battery recycling (approximate dates 1981 – 1987).

Prior exploration or remediation activities at the Site have included the following:

- *CERCLA Site Inspection Report.* Tryck, Nyman & Hayes (TNH), September 1987 (the "TNH Report"). In July 1986 TNH completed a Phase I Environmental Assessment of the site. In November 1986 TNH installed groundwater monitoring wells and sampled for Lead (Pb) in soils.

They identified several data gaps, and raised questions regarding potentially hazardous wastes at the site, including sulfuric acid, PCBs, and Lead in soils and possibly groundwater.

- *Pollution Assessment Report Phase 1 (Revised)*. America North, Incorporated, October 1989 (the "Phase 1 Report"). ANI sampled and analyzed soil from 21 surface and 10 subsurface locations to evaluate Lead and PCB impacts to the M&M site. Eleven of nineteen surface soil samples contained PCBs above 10 mg/kg, with the highest result being 93.4 mg/kg. Nineteen of 22 surface Lead samples exceeded 1000 mg/kg. Nine subsurface Lead samples from 2.5 feet did not exceed 140 mg/kg. A well point was installed and sampled, with Pb results that slightly exceeded drinking water standards.

- *Pollution Assessment Report Phase 2.* America North, December 1989 (the "Phase 2 Report"). Five borings were drilled and sampled with depths ranging from 16 to 21 feet. These were converted to monitoring wells. Three of 29 Pb samples and six of 29 PCB samples from the top foot exceeded 1000 and 10 mg/kg respectively. Seven of nine PCB testing results from 2.2 to 3.0 feet did not exceed 1 mg/kg. Groundwater testing did not detect Lead in five samples.

- In May 1991, ANI collected six subsurface Pb samples and 10 subsurface PCB samples for analysis. Three PCB results exceeded 10 mg/kg and one Pb result exceeded 1000 mg/kg. A number of the PCB results exceeded 50 mg/kg.

- In July 1992 ANI made 15 borings to depths of 26 inches and sampled for PCBs. Only 5 of 36 samples had PCBs below 10/mg/kg, and results ranged up to a high of 7,600 mg/kg.

- *Self Implementing Cleanup Plan.* EMCON, June 1999 (the "Cleanup Plan"). This report summarized prior investigations

- *Preliminary Contamination Assessment* at 5333 Fairbanks Street, Anchorage, Alaska. Shannon & Wilson, August 5, 1998 (the "Debenham Report").

- Progress Reports. America North/EMCON, various dates.

1.4.1 Zoning

Based on the Municipality of Anchorage Planning Department Zoning Summary and their on-line GIS zoning map, the Site is classified **Light Industrial (I1)**. It is surrounded on three sides by commercial or industrial properties and by a major roadway on the forth side. Across the roadway there are more commercial

properties. Therefore, in the foreseeable future, it is likely this property will continue to have Light Industrial zoning.

1.4.2 Annual Rainfall

Based on Weather Service records, the annual precipitation in Anchorage is approximately 16 inches. We reviewed records from the National Weather Service, Alaska Regional Office. For the 46 years of records available electronically, the mean-plus-one-standard-deviation for total precipitation (including snowfall) is given as 19.02 inches. However, this includes all precipitation (including snowfall). To adjust to yearly rainfall, we omitted the precipitation data from November through February, since this precipitation is almost inevitably snowfall. This yielded a mean-plus-one-standard-deviation of 15.01 in/yr.

1.5 SUMMARY OF PRIOR SITE INVESTIGATION AND REMOVAL ACTIVITIES

1.5.1 M&M Area

Site investigations in 1986 by TNH produced little evidence of impacts severe enough to warrant remediation. In 1989, ANI sampled ten subsurface locations and 21 surface locations. Eleven of nineteen surface soil samples and one subsurface sample showed PCBs greater than 10 mg/kg. Nineteen surface soil samples produced Total Lead values above 1000 mg/kg, many substantially above, with the highest at 154,000 mg/kg. Samples collected from 2.5 feet showed one PCB sample above 10 mg/kg and no Lead samples above 140 mg/kg.

Later in 1989, TNH drilled and sampled 7 borings ranging from 16 to 21.5 feet deep. Surface or near-surface samples showed seven of 24 results for PCBs exceeded 10 mg/kg and three Lead values exceeding 1000 mg/kg.

Site remediation included work in 1990 to remove soils with the highest tested Lead and PCB values. From the west portion of the M&M Area, approximately 30 tons of PCB/Lead waste was removed. From the east portion of the M&M Area approximately 0.8 tons of batteries, 186 tons of soil, and 0.8 tons of drummed waste was removed. In 1995, an additional 44 tons of stockpiled waste was removed.

These remediation activities should be viewed as "Hot Spot" removal of the most highly impacted near-surface soils and waste materials. As such, these efforts reduce the potential for offsite migration of contaminants and mitigate potential adverse impacts to human health and the environment.

In May 1991, ANI collected six PCB and ten Lead samples from 4-8 inches deep. Three PCB samples ranged from 100 to 297 mg/kg and one Lead sample had a value of 1550 mg/kg. In July 1992, soil samples were collected from 15 borings (max. depth 26 inches). All but two results exceeded 10 mg/kg.

Although considerable surface sample data has been collected, at least some of this data represents soils now removed. There is little information concerning subsurface extent of contamination, and the data is somewhat inconsistent with respect to vertical and horizontal definition.

There is essentially no data east of the eastern fence line, although some samples just inside the fence indicated quite high concentrations of Lead (i.e., Phase 1 sample 5A, 153,000 mg/kg) and PCBs (1992 sample P1, 331 mg/kg).

1.5.2 Alleyway Area

This area is an alley about 35 feet wide at its north end at International Airport Road and 180 feet long. The alley widens toward the east behind the buildings fronting the road. The TNH report documents one surface soil sampling location immediately east of the site (Sample FG). TNH samples were analyzed only for Lead. The FG sample location was a soil boring, and aside from the surface sample the only samples analyzed were from 10 and 15 feet below ground surface (bgs). The two subsurface samples contained less than 8 mg/kg Lead and as these are far below applicable cleanup criteria, no further discussion is warranted.

Phase 1 and Phase 2 reports documents 3 surface sample locations on the east side of the site (1G, ANIB3, and 3G). ANIB3 was a soil boring and in addition to the surface sample, 5 soil samples were collected and analyzed from depths ranging from 6 to 14 feet. The maximum concentration of Lead and PCBs from the soil boring subsurface samples was 6.6 mg/kg Lead and 0.012 mg/kg PCBs. As these are far below applicable cleanup criteria, no further discussion is warranted. The results of the east side soil analyses are shown below:

Alleyway Surface Soil Analyses (mg/kg)

Sample	PCBs	Lead
FG	na	5000
1G	0.58	3970
ANIB3	na	331
3G	0.22	6510

Note that while the data for samples 1G and 3G is shown on figures in the Phase 2 report and the laboratory certificates are found in the appendix, the results are not shown on the data tables in the report.

A manhole is located in the alley on the east side of the site, near the southeast corner of the M&M Area (Figure 1-2). The manhole accesses the sanitary sewer. The manhole and attached sewer line was inspected by AWWU staff (Phase 2 report) and found to be in good condition with no evidence of deterioration. This inspection coupled with the subsurface soil sample results from ANIB3 and ANIB5 (near the sewer line alignment) suggests that leakage of Lead from the sewer line is not a significant issue requiring remediation and the sewer line does not require replacement. Any Lead released to the sewer should by now have been flushed to and treated in the AWWU wastewater treatment plant.

Based on the above, there appears to have been sufficient Lead contamination in surface soils of the Alleyway to merit investigation for the present report.

1.5.3 Debenham Area

TNH collected no samples south of the south fence of the M&M site. The Phase 1 and Phase 2 reports document 2 sample locations (5E and ANIB5). Sample 5E was a surface soil sample. ANIB5 was a soil boring and included a surface sample and 4 subsurface samples from 4 to 12 feet bgs. The sample from ANIB5 at the 4 foot depth contained 41.6 mg/kg Lead. All deeper samples contained less than 5 mg/kg Lead. All PCB results from subsurface samples at ANIB5 were less than 0.1 mg/kg.

The Debenham report (S&W 1998) documents discovery of buried battery debris in an area extending from the south fence line of the M&M Area to about 60 feet south of this fence line. The report infers a width of this area of as much as 100 feet, extending westward from the southeast corner of the M&M Area. According to Shannon & Wilson, the battery disposal area was covered with approximately two feet of apparently unimpacted fill, and extended from 1 to 2 feet below ground surface (bgs) to approximately 5 feet bgs. A soil sample was collected from each of 5 test pits excavated in this area. Test pits were excavated to a depth of about 5 feet. The five soil samples (designated S1 through S5) were collected from the excavation sidewalls at depths ranging from 3 to 5 feet bgs. Two of the samples were analyzed for petroleum hydrocarbons, Lead (total and TCLP), TCLP barium, TCLP arsenic, volatile organic aromatic compounds (benzene, toluene, ethylbenzene, and xylenes (BTEX), polynuclear aromatic hydrocarbons (PAHs), and PCBs. The remaining three samples were analyzed for Lead (total and TCLP), TCLP barium and TCLP arsenic only. Analytical results for PAHs, BTEX, barium, and arsenic were all well below cleanup criteria and will not therefore be discussed further. The petroleum hydrocarbons analyses indicated only diesel range organics (DRO) exceeded ADEC Method 2 cleanup criteria (250 mg/kg) and only in one sample (S2, 557 mg/kg). Therefore, petroleum hydrocarbons are considered herein as incidental to the other, more significant, contamination from PCBs and Lead and are also not discussed further.

Sample results from these locations are summarized below:

Debenham Area Soil Analyses (mg/kg)

Sample	Depth (ft)	PCBs	Lead	TCLP Lead
5E	Surf	nd	6	na
ANIB5	0.2.-1	0.4	30	na
ANIB5	4	na	41.6	0.076
S1	4.8	11.4	846	17.1
S2	4.3	5.05	278	3.44
S3	3.6	0.388	2670	42.6
S4	3.0	6.0	2620	51.0
S5	3.0	28.8	54,500	248

The Phase 2 boring ANIB5 is actually located within the area identified as "probable battery disposal area" on Figure 1 (not included herein) of the Debenham report. However, it was located towards the western side of that area about 30 feet west of the westernmost sampling location in the Debenham report (S5). This may indicate that the affected area is somewhat smaller than suggested by the Debenham report.

The data from the Debenham report shows there is a significant amount of soil impacted by Lead in at least one portion of this property. The majority of the soil impacted will also exceed the TCLP criteria, resulting in the soil being classified a D001 characteristic hazardous waste for disposal purposes. Such soils require special treatment prior to disposal.

1.5.4 Hanson Site Groundwater Investigations

Looking at the Site as a whole, prior groundwater investigations have not generally detected compounds of concern above regulatory levels. The available data regarding groundwater quality is summarized below.

TNH installed one onsite and two offsite wells, and one upgradient background well (not discussed further). Well IW1 (onsite) was located in the northwest quadrant of the site. Well FG1 was located on the east side of the site, and well SW1 was located about 300 feet southeast of the site. Locations FG1 and SW1 coincide with the soil sampling locations cited above. Based on the Phase 2 report, groundwater flow is to the east-southeast. TNH analyzed groundwater samples from the wells for Lead and sulfate. Results of these analyses are shown below:

TNH Groundwater Results

Well	Lead (ug/L)
IW1	3
FG1	47
SW1	15

Although the Lead results from FG1 are of concern, it was noted that the well was backfilled with soil cuttings, a practice no longer allowed and which often resulted in anomalous sampling results.

As a part of the Phase 2 work, 5 new monitoring wells were installed at the site using only clean material and proper well construction techniques. It is not known if the TNH wells have been properly abandoned. The five wells have been sampled and analyzed for Lead 5 times, in November 1989, as a part of the Phase 2 work, and as reported in the four semiannual groundwater monitoring reports. All results were 'non-detect" for Lead. In each case, the samples were field filtered.

Groundwater samples from the 5 newly installed wells were analyzed for PCBs once, as a part of the September, 1990, monitoring event. No PCBs were detected. The samples were not filtered. This appears to provide evidence that PCBs are not migrating offsite with the groundwater.

The Debenham report indicates one water sample was collected from water accumulated in a test pit. The sample was analyzed for petroleum hydrocarbons, BTEX, RCRA metals (field filtered), halogenated volatile organic compounds (HVOCs), PAHs and PCBs. Reported concentrations of HVOCs, PAHs and BTEX were either non-detect or far below levels of regulatory significance. Only the metal barium was detected in the field-filtered sample (119 ug/L, cleanup level = 2000 ug/L). Diesel range organics were reported to be at a concentration of 1.17 mg/L, below the cleanup level of 1.5 mg/L considering the disturbance associated with samples from test pit excavations, which often exaggerates the actual groundwater impacts, this result is probably biased high. Based on the above data there is no evidence of significant groundwater contamination on the Debenham Area (Note: See Chapter 3 discussion of 11/3/02 groundwater monitoring event).

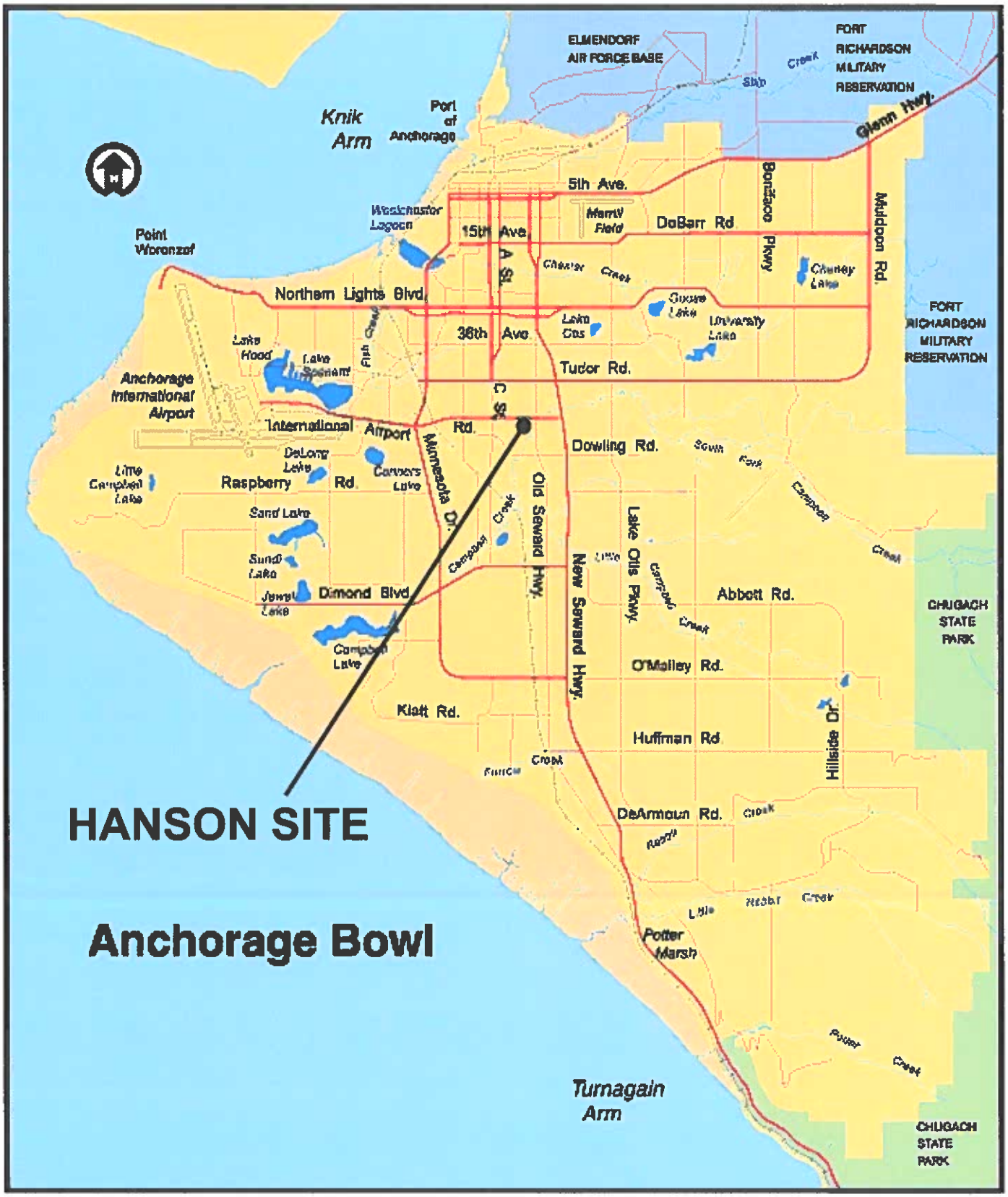
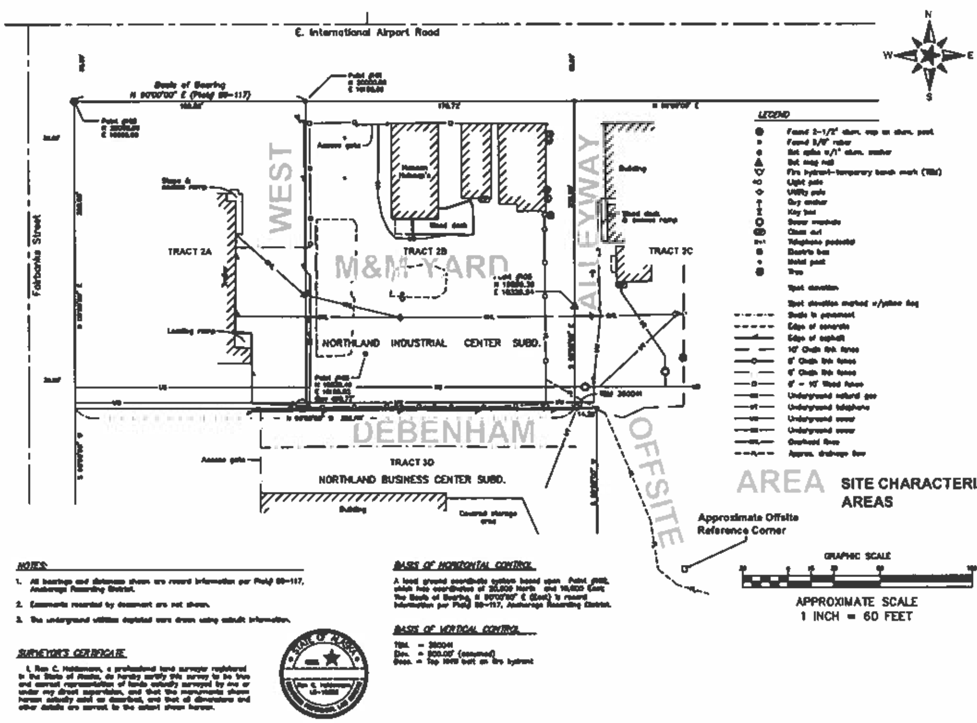


Figure 1-1
PROJECT LOCATION MAP
Hanson Site Anchorage, Alaska

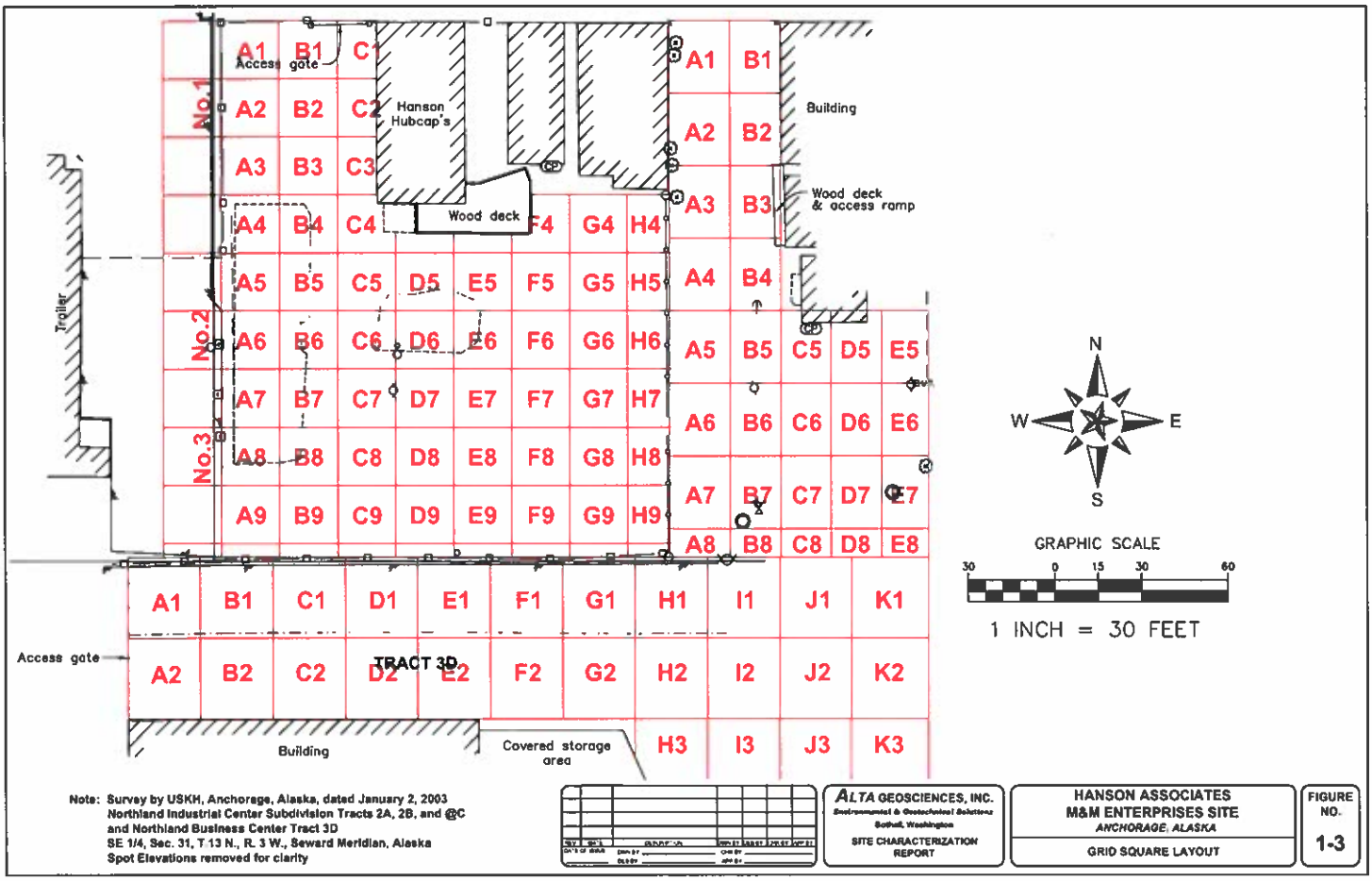


Note: Survey by USKH, Anchorage, Alaska, dated January 2, 2003
Northland Industrial Center Subdivision Tracts 2A, 2B, and @C
and Northland Business Center Tract 3D
SE 1/4, Sec. 31, T.13 N., R. 3 W., Seward Meridian, Alaska
Spot Elevations removed for clarity

ALTA GEOSCIENCES, INC.
Environmental & Geotechnical Solutions
Bothell, Washington
SITE CHARACTERIZATION REPORT

HANSON ASSOCIATES
M&M ENTERPRISES SITE
ANCHORAGE, ALASKA
SITE SURVEY AND SAMPLING AREAS

FIGURE NO.
1-2



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Bothell, Washington
SITE CHARACTERIZATION REPORT

HANSON ASSOCIATES
M&M ENTERPRISES SITE
ANCHORAGE, ALASKA
GRID SQUARE LAYOUT

FIGURE NO. 1-3

2.0 FIELD INVESTIGATION SUMMARY

The field investigation for the Hanson Site was undertaken November 2nd through November 10, 2002, under the direct oversight of an ALTA Geosciences environmental specialist. The work was performed in accordance with the *Site Characterization Work Plan* (ALTA, 2002) submitted to ADEC and dated October 28, 2002.

2.1 GRID SYSTEM DEFINED

A grid system is used to aid in site characterization as well as definition of potential future soils remediation zones. Each of the three main Site subareas, M&M Area, Alleyway Area, and Debenham Area received a grid overlay. The West and Offsite subareas could not effectively be gridded.

In any investigation it is desirable to reduce the number of investigation points, and hence the cost, however, this has to be weighed against the need for sufficient data to characterize the Site. In this case, we also attempted to collect sufficient data to begin work on a remedial design. The size of the grid squares was carefully chosen, because of the potentially high unit remediation costs. Too little investigation data can lead to unnecessary soils remediation and cost, if large zones of soil are remediated based on widely scattered samples.

Based on preliminary estimates of unit remediation costs and fitting the grid to the physical dimension of the Site subareas, the grids were established in preliminary maps and by measuring and staking grid line intersections in the field. This was done for the M&M Area, northern portion of the Debenham Property, and the Alleyway. The grid layout is shown on Figure 1-3 based on the formal site survey as a basemap (survey completed after the soils investigation). The layout shown on this figure represents approximately the physical layout established in the field prior to starting soil sampling, with an estimated margin of error of a few tenths of a foot plus or minus. The M&M Area grids were 20' x 20', the Debenham grids were 25' x 25', and the Alleyway grids were approximately 17.5' x 25'.

In terms of a potential future soils remediation, control of removal depths is also critical to cost-effective construction. For this project, remediation zones will be defined by grid square layers, keyed to analytical data from the same depth range in any given grid square. Samples have been collected which represent 6-inch or 12-inch layers within a grid square. When analytical data indicate exceedence of cleanup levels, a grid square layer is designated for remediation.

2.2 SAMPLING AND ANALYSIS

The primary sampling method used was driven California-Type samplers, using a hollow stem auger drill rig. In areas inaccessible to the drill rig, hand excavations with a shovel were made and samples were collected with stainless steel spoons from the side of the excavation throughout the specified interval of sampling. Extensive experience with using these sampling approaches for PCBs and Lead has produced good results in the past. Neither Lead, PCBs, nor residual hydrocarbon compounds are considered to have sufficient volatility to require other approaches, such as the use of sampler liners.

In sampling using the hollow stem auger drill rig, a 24-inch long, 2-inch I.D. split spoon sampler was driven approximately 24-inches with a 240-pound hammer on a cathead and rope. Initial sampling tried to use catchers in the sampler. However, because of catcher stiffness and soft soil, soil entry to the sampler was blocked, resulting in zero recovery. Therefore, catchers could not be used. Some samples were lost by the sample falling out on extraction, however, the large majority of samples were retrieved with acceptable recovery.

The sampler was completely disassembled for decontamination between each drive. Samples were immediately logged, divided by depth interval, and placed in jars. If samples had to be split in volume, they were placed in a clean stainless steel bowl, mixed with a stainless steel spoon, and split by quartering, before being placed in cleaned 8-oz laboratory jar with Teflon lid insert. All soil duplicates were handled in this manner. Bowls and spoons were decontaminated between each use. Sample bottles were stored in an iced chest at approximately 4 ^{o}C until delivered to the local testing laboratory, usually on the morning of the following day. A chain of custody form followed the samples until delivery to the laboratory.

Each drive sample was recorded on a log form, including date, time, depth, and location collected, lab test type (e.g., PCB, Lead, etc.), and soil type. Identifiable debris, such as battery parts, was noted, as was oil, discolorations, or odors.

Samples were taken of the concrete slabs using a rotary hammer drill equipped with a ½-inch drill bit. The area to be sampled was first cleaned of loose dirt, then the drill was advanced the full depth of the slab. The drill chips were then collected and placed in the sample jar. Four to six drill holes were needed to obtain sufficient sample volume.

2.3 GROUNDWATER MONITORING

Monitoring wells were sampled on 11/03/02 and 11/04/02. Prior to sampling, water levels were measured with an electronic well sounder. Table 2-1 summarizes the depth to groundwater from these readings. Top of casing elevations were taken from the original ANI well logs. Figure 2-1 shows the well

locations and interpreted groundwater flow direction, based on a three-point problem solution using onsite wells (excluding ANI-B-1).

2.3.1 Well Conditions

The condition of monitoring wells and problems associated with sampling the wells are discussed below.

- Well ANI-B1 is upgradient, across East International Airport Way from the Site. It was found to be in good condition.

- Well ANI-B2 is located in the NW corner of the M&M Area, in an area with moderate to severe Lead and PCB impacts. It was slightly damaged, and, while the pvc pipe was serviceable, the steel wellhead was disconnected from the ground (possibly due to prior soils removal).

- Well ANI-B-3 is located in the rear of the Alleyway and had been run over. The pvc casing was kinked about 2 feet below the ground and the wellhead casing was hanging loose. The well was dug out, the top 4 feet of pipe was replaced and the wellhead casing was restored. The top of casing elevation was reduced by 0.6 feet from the original elevation. After repairs, the well was serviceable.

- Well ANI-B-4 is located in the east portion of the Debenham property (near grid square J3), south of an area with a suspected battery casing dump. The well was serviceable, but suffers from severe drawdown and turbidity problems.

- Well ANI-B-5 appears to have been destroyed by earlier remediation performed on the Debenham property by the present owner (not by Hanson). Based on measurements in the original well log, the place where the well was located is in grid square D1, 22 feet south of the fence. Soil sampling in this grid square indicates 18 inches of imported fill has been placed in this area. It is unknown if the well was properly abandoned.

Table 2-1
GROUNDWATER AND WELL DATA

Well No.	Top Of Casing Elevation	11/3/03 Groundwater Depth (Feet)	11/3/03 Groundwater Elevation
ANI-B-1	119.38	8.49	110.89
ANI-B-2	114.92	5.68	109.24
ANI-B-3	112.18	4.64	107.54
ANI-B-4	110.93	3.51	107.42
ANI-B-5	Abandoned		

2.3.2 Sampling Method

Sampling was completed using a low-stress/low-flow method to produce a sample representative of actual aquifer conditions and to minimize sample turbidity. An EnviroTech ES-40 sampling pump was used for both purging and sampling. The pump was operated at less than 1 Liter per minute to minimize stress on the aquifer materials in the vicinity of the well. Groundwater from the sampling pump was monitored for groundwater parameters, including pH, temperature, electrical conductivity, and turbidity. Purging was continued until groundwater parameters (with particular emphasis on turbidity) stabilized within 10 percent.

Field parameters were measured on water samples taken directly from the discharge line using digital field instruments. Parameters monitored included temperature, pH, and conductivity. Turbidity (as NTUs) was measured from a separate water aliquot collected manually from the discharge tubing. NTUs were measured using an Orbeco-Hellige Model 966 Turbidity Meter. Table 2-2 presents a summary of the above parameters at the conclusion of purging. Normally for sampling of this type we try to try to slowly purge until the sample is clear, with turbidity less than 5 NTU. This reduces suspended PCBs or Lead attached to soil particles and helps to measure only dissolved constituents. Because of well conditions, this was not possible for onsite wells.

Table 2-2
Groundwater Field Parameters

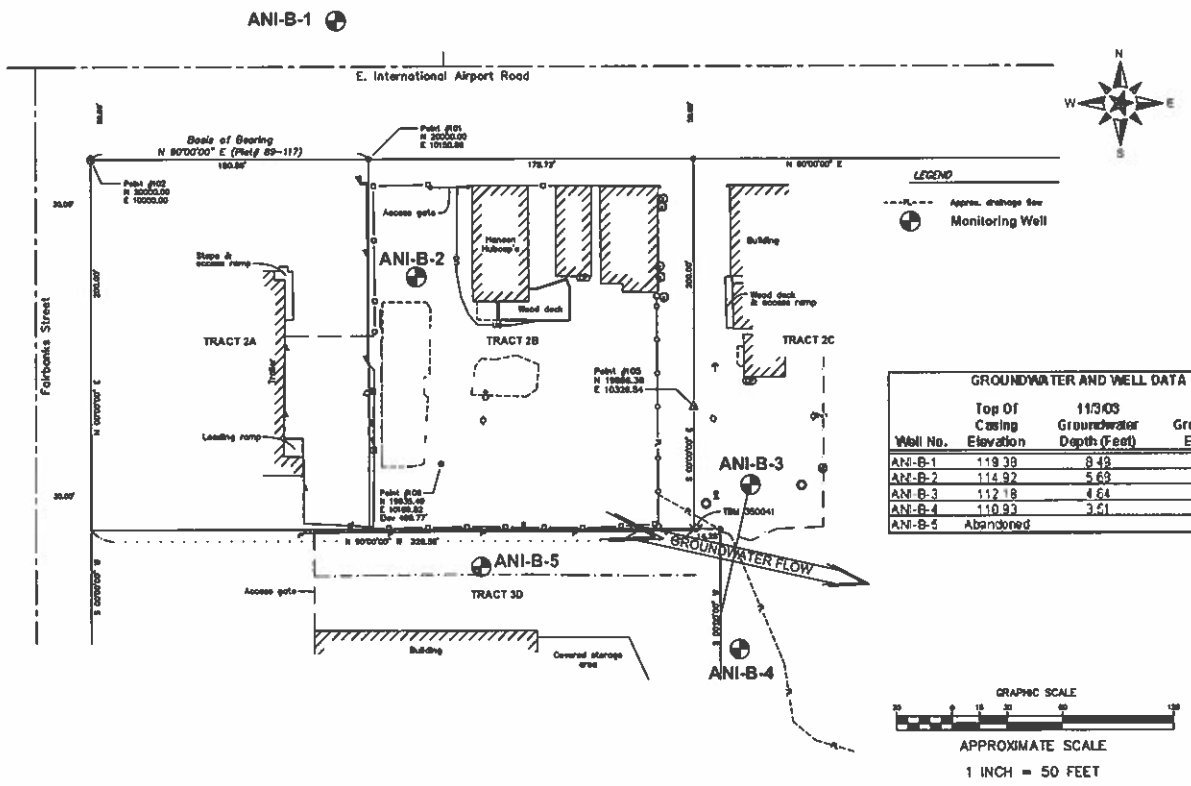
	SAMPLING LOCATIONS			
	ANI-B-1	ANI-B-2	ANI-B-3	ANI-B-4
Field Parameters				
pH	6.33	6.05	6.24	7.11
Temperature (°C)	7.0	9.0	8.7	6.5
Conductivity (uS)	766	596	951	451
Turbidity (NTU)	5.5	54	15	760

The field instruments were calibrated in accordance with the manufacturer's recommendations. The turbidity meter was calibrated in the field using a 40 NTU standard solution. Prior to the sampling and between sampling events, all downhole sampling equipment was decontaminated as follows:

- Place the pump in a container with a laboratory grade phosphate-free detergent and potable water.
- Pump the detergent mixture through the pump and tubing in a recirculating manner for 5 minutes.

- o Empty the pump and tubing of detergent.
- o Place the pump in a container with potable water and pump the water through the pump and tubing in a recirculating manner for 5 minutes.

All purge and decontamination water was placed in 5 gallon pails and returned to the Site for storage, pending evaluation of discharge requirements.



GROUNDWATER AND WELL DATA

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ANI-B-5	Abandoned		

Note: Survey by USKH, Anchorage, Alaska, dated January 2, 2003
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Spot Elevations removed for clarity

ALTA GEOSCIENCES, INC.
Environmental & Geotechnical Solutions
Bothell, Washington

SITE CHARACTERIZATION REPORT

HANSON ASSOCIATES
M&M ENTERPRISES SITE
ANCHORAGE, ALASKA

MONITORING WELL LOCATIONS

FIGURE NO. 2-1

3.0 LABORATORY ANALYSIS RESULTS

3.1 SAMPLE HANDLING

Following collection, samples were labeled, logged on a chain of custody form, and stored in ice chests at approximately 4 °C. Samples were delivered directly (not shipped) to the CT&E Analytical Laboratory, located approximately 1 mile from the Site. Deliveries were generally made each morning for the previous day's samples. Overnight, samples were stored in the cab of a locked field vehicle. CT&E is an Alaska Certified analytical testing laboratory.

3.2 SAMPLE TESTING/SELECTION APPROACH

First round testing selection, ordered at the time of sample submittal to the lab, was based on historical use of Site subareas, findings of prior investigations, and types of potential remediation that was anticipated. For oily or discolored samples, deeper samples were often selected for first round testing. After seeing the first round testing results, the Engineer directed deeper testing in grid squares where initial results were near or exceeded values of 1000 mg/Kg in Lead and 10 mg/Kg in PCBs. This additional testing was for the specific contaminant that had exceeded criteria. This process was repeated iteratively until available samples were exhausted or results did not exceed the above criteria.

3.3 LABORATORY TESTING METHODS

Depending on the sample location and historical data regarding type of contaminants present, samples were tested for PCBs (EPA Method 8082) and/or Lead (EPA Method 7421). Approximately 7 samples with a wide range of total Lead concentrations were analyzed with EPA Method SW1311/6010 TCLP analysis for leachability. These samples were used to evaluate the empirical relationship between total and soluble Lead. Samples that were visibly stained, or had a petroleum odor, were analyzed for Diesel Range Organics (DRO) by Method AK102. Groundwater samples were all analyzed for Lead (EPA Method 7421) and PCBs (EPA Method 8082).

Field duplicate QA/QC samples were collected for soil samples on the basis of approximately one QA/QC sample per 20 environmental samples.

The following sections present a discussion of the analytical findings for each area. Summary data tables for each of the five Site Areas, plus the groundwater monitoring and TCLP Lead testing are located at the end of this chapter. Appendix C (bound separately) presents copies of the laboratory analytical sheets for each Site sub-area plus the groundwater.

Review of the summary data tables will indicate no data is available for some grid squares and for certain depth intervals in other grid squares. This may be the result of zero recovery in a boring or inaccessible areas where no boring could be made. A few days preceding the Site Investigation, heavy rains had flooded portions of the Site, making sampling impractical in depressions. Also, because of utilities and surface obstructions, there were access limitations to some areas. At present, sufficient data exists to characterize the Site for this report. Additional sampling may be undertaken in May or early June 2003 to fill in some of the missing information prior to completion of the remedial design. As the first stage of Site remediation (Summer 2003), other areas will be investigated when obstructions are removed. Ultimately, every grid square will either be investigated and cleared, or remediated and have confirmation sampling results.

3.4 SOIL SAMPLE TESTING DATA SUMMARY

3.4.1 Contaminant Screening Levels

A complete discussion of cleanup levels is presented in Section 4. For the purposes of discussing the distribution of contaminants in the various areas investigated as a part of this Site Characterization, the following soil screening levels are used:

- Lead – 1,000 mg/kg – based on ADEC Method 2 criteria for commercial/industrial land use
- PCBs – 10 mg/kg – based on historically utilized values by ADEC for commercial/industrial land use
- Diesel Range Organics – 250 mg/kg based on ADEC Method 2 criteria for the Migration to Groundwater pathway.

Note that these screening levels are not considered as cleanup levels, but only used for the purpose of describing site contamination in this section.

3.4.1 M&M Area

Both PCBs and total Lead were analyzed for the surface samples in all cases, based on prior uses of this area and prior investigation findings. In numerous grid squares subsequent rounds tested deeper samples, based on exceedance of the criteria for Lead >1000 mg/Kg and PCBs >10 mg/Kg. Analyses for Diesel Range Organics (DRO) were performed on a limited number of samples based on field screening indications (odor, staining, sheen). Table 3-1 presents a summary of the testing results.

There are 55 grid squares in the M&M Area. Eleven of these were not sampled due to obstructions or prior data and are so identified on Table 3-1. A total of 107 samples were analyzed for total lead. Concentrations ranged from 10.4 mg/kg to 83,900 mg/kg. Of these, 66 samples (61 percent) exceeded the

screening criteria. A total of 77 samples were analyzed for PCBs. Concentrations ranged from 0.13mg/kg to 2,070 mg/kg. Of these, 33 (43 percent) exceeded the screening criteria. A total of 10 samples were analyzed for DRO, which ranged from 245 mg/kg to 9,650 mg/kg. Only one sample was below the preliminary screening level for DRO.

Approximately 42 of the 55 grid squares exceed the screening criteria for lead and/or PCBs in one or more samples. Based on location and surrounding impacts, 6 of the unsampled grid squares are considered likely to exceed the screening levels. Only one square was cleared entirely by the available data, with no further sampling required. Most exceedances of screening criteria were at depths of 6" to 12", but a few are up to at least 3 feet deep.

Three samples of the concrete slabs were collected, identified as SLAB A7, SLAB B5, AND SLAB D6 in Table 3-1. These samples were analyzed for Lead and PCBs. None of the samples exceeded screening criteria.

3.4.2 Alleyway Area

In the initial testing round, only samples from 0" to 6" depth were analyzed for Lead, based on prior area usage. Subsequent rounds of testing looked at samples below any first round sample having Lead greater than 600 mg/Kg. This was a slightly more conservative evaluation than using the criteria Lead >1000 mg/Kg, due to the more frequent public access to the Alleyway area. Table 3-2 presents a summary of the testing results.

There are 28 grid squares shown on Figure 3 in the Alleyway Area, of which samples were collected from 15. Review of the data indicates that there is no reason to sample in grid column E (previously unsampled) nor in grid squares D5 and D8. This leaves only Grid squares A6, A7, A8, B6, B8, C5 and C8 which will need confirmation analyses at some point. These squares were obstructed by vehicles or stock at the time of the investigation.

A total of 33 samples were analyzed for lead, with concentrations ranging from 8.87 mg/kg to 4200 mg/kg. Of these, only two exceeded the screening criteria. Two samples from a hand excavation adjacent to the manhole at the back of the alley (B7) were analyzed for PCBs. These samples contained 2.16 and 2.62 mg/kg PCBs, well below the screening criteria.

Out of a total of 28 grid squares in this area, 16 squares were sampled as a part of this site characterization effort. Of those 16 squares, only two exceeded the proposed Lead Cleanup Criteria of 1000 mg/Kg. At least three (A6-A8) of the unsampled squares are adjacent to grid squares in the M&M Area that exceed the screening criteria and may exceed 1000 mg/Kg Pb when tested.

3.4.3 Debenham Area

Except for the eastern end of the investigation area, this area is paved. Beneath the pavement is 18-36 inches of imported fill (road base material). The imported fill is underlain by a geotextile fabric which marks the original ground surface and the imported fill was placed above the fabric. Our sample testing focused on material from below the fabric depth. Three samples were tested from above the fabric, to demonstrate the imported fill did not have Lead or PCB impacts. In most cases the first full sample below the fabric was tested for Lead and PCBs. Table 3-3 presents a summary of the testing results. A column in the table, Geotextile Depth, indicates the depth below the surface at which the fabric was encountered.

There are a total of 26 grid squares in the Debenham area. Because of stored pipe owned by the business at this location, and utility conflicts, some squares in the eastern end of the area were not explored. Specifically these included squares I2&3, J2&3, and K1, 2, &3. Review of the data indicates there is no reason to further explore in columns J or K unless excavation of impacted material leads into these areas.

A total of 51 samples were analyzed for lead, of which only one (3,650 mg/kg) exceeded the screening criteria. Indeed, at least 40 of these samples had concentrations of less than 20 mg/kg Lead which could well be within normal background levels. Forty nine samples were analyzed for PCBs, with a maximum reported concentration of 9.04 mg/kg. Twenty-five of the 49 samples had no detectable PCBs. Nine samples were analyzed for DRO, with the highest reported concentration being 3,290 mg/kg. Only two samples exceeded the screening criteria, and 6 of the samples had no detectable DRO.

In the first 125 feet east of the front access gate (west end of Debenham Area), Lead appears not to be elevated in any squares. Square C2 did show a PCB value of 1.5 mg/Kg at 2-2.5 feet.

In Square F2, we encountered elevated Lead at 5-6 feet deep (300-539 mg/Kg), but still not above screening levels. This square also had a DRO test result of 3290 mg/Kg and a PCB test result of 9.04 mg/Kg.

In square G2 there was an exceedance of the Lead criteria (3650 mg/Kg) and a PCB result of 1.95 mg/Kg in the 2-3 foot depth interval. Fragments of battery casings were observed in this same interval. The next deeper sample from this boring at 3-4 feet was only slightly elevated for Lead (210 mg/Kg). Other Lead and PCB samples down to 6 feet were not elevated.

Other grid square samples tested to date from this end of the Debenham Area were not elevated for either Lead or PCBs. Because of earlier reports of a "battery casing dump" in the east end of the Area, we are cautious that the full

extent of the area of elevated Lead has yet to be determined on this property. It may be that the G2 sample from 2-3 feet encountered the edge of the alleged dumping area. At this time it appears the actual size of the battery debris area is probably smaller than previously suggested (S&W, 1998).

3.4.4 West Area

Three locations were selected adjacent to the fence with the M&M Area based on proximity to areas of previously known contamination. The sampled locations were designated north to south, No. 1, No. 2, and No. 3 (see Figure 1-3). At the first two locations the surface grade has been raised about a foot from that in the adjacent M&M Area. The preliminary concern was that this fill may have been placed after contamination of the adjacent M&M Area. The imported material is somewhat different than the pre-existing soils and can be distinguished in the field by texture, as well as grade (elevation). Although there is no known evidence that the actual operations in the M&M Area extended into the West Area, and even though there may have been a fence in place, contamination may have spread through surface runoff or dumping on the West Area. Samples were tested for both Lead and PCBs. Table 3-4 presents a summary of the testing data.

Sample No. 1 from 12-18 inches deep showed elevated Lead (759 mg/Kg) and PCB (5.3 mg/Kg) values which do not exceed screening criteria. The No.1 sample from 18-24 inches deep was not elevated in Lead and only slightly elevated in PCBs (0.3 mg/Kg). Sample No. 2 from 12-18 inches showed Lead at 1020 mg/Kg and PCBs at 13.4 mg/Kg, both slightly exceeding screening criteria. At a depth of 24-30 inches, both constituents were still elevated, but did not exceed proposed cleanup criteria (191 mg/Kg for Pb, and 7.86 mg/Kg for PCBs). In the Sample No. 3 area, from 0-12 inches, Lead appears not to be elevated, and PCBs were slightly elevated (3.4 -3.8 mg/Kg).

3.4.5 Southeast Area

Five samples were collected along the upper portions of the drainage swale running from the rear of the Alleyway toward the southeast. The reference point for these samples was a fence corner, where the E-W fence at the back of the property located east of the Alleyway intersects a N-S fence in the northeast portion of the Debenham Area. This is shown approximately on the Overview site drawing; Table 3-5 presents a summary of the testing data.

The samples from north of the reference point (N.30'-E15' and N70'-E8') are from a swale in the developed area a few feet west of a building on the SW corner of the property located east of the Debenham Area. Most of the surface vegetation has been removed in this area. The other three samples, from east of the reference point are in a braded drainage in undeveloped woodlands having a

thick mat of coarse vegetation. In both cases, the samples started at the top of the underlying soil, not in the vegetation mat.

Lead test values ranged from 25.7 to 247 mg/Kg. PCB test values ranged form 0.06 to 9.68 mg/Kg, with only one exceeding 1.0 mg/Kg.

3.4.6 Relationship of Leachable (TCLP) Versus Total Lead

The site-specific relationship between total Lead and leachable Lead as defined by the Toxicity Characteristic Leaching Procedure test was investigated by testing seven samples for both parameters. Samples were all from the M&M Area, since this area is considered the primary remediation target. Samples were first tested with EPA Method 7421 for total Lead. A range of total Lead values from 581 mg/kg to 24,000 mg/kg were selected from diverse portions of the M&M Area. Then, material from the original jars was tested using the Toxicity Characteristic Leaching Procedure Test (TCLP) by EPA Method 6010B to determine the leachability of the samples. Table 3-6 presents a summary of the testing data. Examination of the data suggests that soils with total Lead above 1,000 mg/Kg would likely exceed 5 mg/Kg TCLP soluble Lead.

3.4.7 Total Organic Carbon Data

A total of 10 soil samples were analyzed for total organic carbon for use in "fraction organic carbon" analysis as provided for in 18 AAC 75. Samples were selected to be statistically representative of the soil strata at the site. Samples with field screening evidence of hydrocarbon contamination (odor, stains, sheen) were not considered for these analyses. The foc for these samples ranged from 0.0033 to 0.1812, considerably higher than the ADEC default of 0.001. This data is discussed further in Section 4.

3.5 GROUNDWATER TESTING DATA SUMMARY

Groundwater samples were collected from four existing wells. Samples were tested for PCBs by Method 8082 and Lead by Method 7421. Table 3-6 presents a summary of the testing data from the groundwater sampling event.

Testing results were all non-detect for both Lead and PCBs, except for a Lead result of 52.2 ug/L in sample ANI-B-4. This result was approximately 3 times the Groundwater Cleanup Level for Lead (15 ug/L). Water from the well was very turbid and well recovery was slow. The high turbidity of the sample suggests that the reported Lead concentration is likely an artifact of sampling resulting from a poorly installed or developed well. It is possible this well is within or just down gradient from the alleged battery dumping area. We recommend replacement or redevelopment of the well and re-sampling. It is possible, even likely, that well ANI-B-4 will be removed as part of the soils excavation for remediation in this area. In that case, the well would be replaced with a new well down-gradient but outside of the remediation zone.

Table 3-1

M&M AREA SAMPLE DATA SUMMARY (mg/Kg)

SAMPLE NUMBER	LEAD RESULT (EPA7421)	PCB RESULT (EPA8082)	DIESEL ORGANIC (AK102)	COMMENTS
A1-0-6"	**1410**	2.06		
A1-6-12"	129			
A2-0-6"	**1370**	**12.1**		
A2-6-12"	845	3.11		
A3				NOT SAMPLED
A4				NOT SAMPLED
A5-0-6"	**73400**	**293**	**9650**	
A5-6-12"	**9960**	**197**		
A6				NOT SAMPLED
A7-0-6"	**4580**	**13.2**		
A7-6-12"	144	0.131		
A7-18-24"	34.2			
A8				NOT SAMPLED
A9				NOT SAMPLED
B1-0-6"	**1760**	4.77		Aroclor1016=1.31
B1-6-12"	18.9			
B2-0-6"	**3370**	5.17		
B2-6-12"	44.2			
B2-12-18"	40.1			
B3-0-6"	**4910**	**49.3**		
B3-12-18"	**9870**			
B3-24-30"	**20700**	**489**	**623**	
B3-30-36"	**2740**	**597**		
B4-0-6"	**34700**	**199**		
B4-6-12"	**43800**			
B4-18-24"	18.1	2.49		
B5-0-6"	**26900**	**1900**	**8970**	
B5-18-24"	**4900**	**1500**		
B5-24-30"	**2130**	**2070**		
B6				NOT SAMPLED
B7-6-12"	**14500**	**19.3**		
B8				NOT SAMPLED
B9-0-6"	49.9	0.859		
B9-6-12"	29.1			
B9-12-18"	63.1	7.94		
C1-0-6"	**2460**	7.4		

Table 3-1

M&M AREA SAMPLE DATA SUMMARY (mg/Kg)

SAMPLE NUMBER	LEAD RESULT (EPA7421)	PCB RESULT (EPA8082)	DIESEL ORGANIC (AK102)	COMMENTS
C1-6-12"	28.5			
C2-0-6"	**3140**	9.56		
C2-6-12"	**6370**	3.67		
C2-12-18"	**3550**			
C2-18-30"	552			
C3-0-6"	**24000**	**11.7**		
C3-0-6" DUP	**12500**	9.93		
C3-6-12"		1.05		
C3-12-18"	29.5			
C3-18-30"	106			
C4-0-6"	**5080**	**48.8**		
C4-6-12"	423	8.46		
C5-0-6"	**42100**	**200**	**4710**	
C5-18-24"	**24700**	**78.2**	245	
C5-24-30"	74.1	**72.3**		
C6-0-6"	**20900**	**285**	**6250**	
C6-6-12"	**51300**			
C6-12-18"	87.3	**530**		
C7-6-12"	**20500**	**534**	**5890**	
C7-12-18"	**5050**	**315**		
C7-36"	**2150**		**1220**	
C8-0-6"	**4010**	**221**		
C8-12-18"	55.1			
C8-18-24"	171	4.69		
C9-0-6"		1.49		
C9-0-6"	58.8			
C9-12-18"	**3560**	**272**	**1310**	
C9-12-18" DUP	**2070**	**267**	**1580**	
C9-18-30"	**2530**	**187**		
D5-0-6"	**10400**	**160**		
D5-12-18"	165	1.02		
D6				NOT SAMPLED
D7-0-6"	**83900**	**29.1**		
D7-12-18"	193	**11.3**		
D7-18-30"	43.4			
D8-0-6"	**1760**	**86**		

Table 3-1
M&M AREA SAMPLE DATA SUMMARY (mg/Kg)

SAMPLE NUMBER	LEAD RESULT (EPA7421)	PCB RESULT (EPA8082)	DIESEL ORGANIC (AK102)	COMMENTS
D8-6-12"	**1210**	**70.8**		
D8-12-18"	10.4	3.06		
D9-0-6"	829	**11.5**		
D9-12-18"	**9750**	**716**		
D9-18-30"	**5650**	**359**		
E5-0-6"	**11000**	**32.6**		
E5-6-12"	239	0.69		
E5-6-12" DUP	142	0.497		
E6-0-6"	**1940**	2.62		
E6-6-12"	397	0.332		
E7-0-6"	**2530**	**18.7**		
E7-6-12"	**3170**	**73.6**		
E8-0-6"	**2120**	4.81		
E8-6-12"	**2290**			
E9-0-6"	581	**13**		
E9-6-12"	**1940**	**20.8**		
E9-12-18"	951	**15.5**		
F4				NOT SAMPLED
F5-0-6"	**11100**	6.81		
F6-0-6"	**1700**	1.08		
F6-6-12"	71			
F7-0-6"	**3830**	0.78		
F8-0-6"	**1490**	2.34		
F8-6-12"	620			
F9-0-6"	**2380**	3.01		
F9-6-12"	**1060**			
F9-12-18"	**1060**			
G4				NOT SAMPLED
G5				NOT SAMPLED
G6-0-6"	**2470**	4.89		
G6-6-12"	610			
G7-0-6"	**4690**	1.94		
G8-0-6"	**4680**	4.07		
G8-6-12"	**7290**			
G8-12-18"	**2340**			
G8-18-30"	29.7			

Table 3-1
M&M AREA SAMPLE DATA SUMMARY (mg/Kg)

SAMPLE NUMBER	LEAD RESULT (EPA7421)	PCB RESULT (EPA8082)	DIESEL ORGANIC (AK102)	COMMENTS
G9-0-6"	**1630**	3.9		
H4				NOT SAMPLED
H5				NOT SAMPLED
H6-0-6"		3.46		
H6-0-6"	**7000**			
H6-6-12"	73.8			
H7-0-6"	**10600**	2.79		
H7-6-12"	81.6			
H7-18-30"	57.7			
H8-0-6"	**14200**	4.5		
H8-6-12"	19.4			
H8-18-30"	20			
H9-0-6"	**8750**	0.181		
H9-12-18"	**2810**	**91.9**		
H9-24-36"	949	**38.8**		
SLAB SAMPLES				
SLAB A7	115	0.446		
SLAB B5	24.0	0.339		
SLAB D6	59.3	0.801		

NOTES:
1. All results in mg/kg
2. BLANK=Not analyzed
3. All PCB detections were Aroclor 1260, except B1, 0-6" ; seven Aroclors analyzed
4. Numbers to right of cell designator (e.g., 6-12") indicate sample depth below ground surface

Table 3-2
ALLEYWAY SAMPLE DATA SUMMARY (mg/Kg)

	LEAD RESULT (7421)	PCB RESULT (8082)	COMMENT
A1-0-6"	185		
A2-0-6"	876		
A2-12-18"	8.87		
A3-0-6"	604		
A3-6-12"	**1080**		
A3-12-18"	22.7		
A4-0-6"	864		
A4-6-12"	437		
A5-0-6"	441		
A5-6-12"	639		
A6			NOT SAMPLED
A7			NOT SAMPLED
A8			NOT SAMPLED
B1-0-6"	123		
B2-0-6"	214		
B3-0-6"	281		
B4-0-6"	631		
B4-6-12"	52.1		
B5-0-6"	829		
B5-6-12"	**4200**		
B5-18-30"	23.8		
B6			NOT SAMPLED
B7-MHW-0-6"	575	2.15	
B7-MHW-18-24"	701	2.62	
B7-MHW-24-36"	617		
B8			NOT SAMPLED
C6 0-6"	19.9		
C7-0-6"	44.5		
C8			NOT SAMPLED
D5			NOT SAMPLED
D6-0-6"	9.2		
D7-0-6"	23.2		
D8			NOT SAMPLED

1. All results in mg/kg
2. BLANK=Not analyzed

3. All PCB detections were Aroclor 1260
4. Numbers to right of cell designator (e.g., 6-12") indicate sample depth below ground surface

Table 3-3
DEBENHAM AREA SAMPLE DATA SUMMARY

SAMPLE NUMBER	LEAD RESULT (EPA7421)	PCB RESULT (EPA8082)	DIESEL ORGANIC (AK102)	GEOTEXTILE DEPTH (IN.)	COMMENTS
A1-24-30"	3.64	<0.25		18	
A2-28-30"	3.66	<0.25		28	
B1-24-30"	10.8	<0.22		28	
B2-30-36"	16.4	0.52		30	
C1-0-24"	3.35	<0.22		24	Imported Fill
C1-24-36"	5.25	<0.24			
C1-36-42"	5.53				
C2-24-30"	46.9	1.51		22	
D1-18-24"	29.3	0.92		18	
D2-24-36"	7.16	0.05		24	
E1-24-36"	4.57	<0.26		24	
E1-36-48"	5.78	<0.25			
E2-24-36"	8.39	0.113		24	
E2-36-48"	9.08	0.0945			
F1-0-18"	4.63	<0.22		18 & 22	Imported Fill
F1-18-30"	4.85	<0.23			
F1-30-48"	7.35	0.437			
F2-18-30"	7.68	0.0602		18 & 22	
F2-54-60"	4.78	<0.26	<24.3		
F2-60-66"	539	9.04	**3290**		
F2-66-72"	300	0.866	**798**		
G1-36-48"	37.9	<0.23		34	
G1-48-60"	7.05	<0.23	<21.7		
G2-0-24"	346	0.286		24	Imported Fill
G2-24-36"	**3650**	1.95			
G2-36-48"	210	0.118			
G2-48-60"	16.2	<0.24			
G2-60-66"	6.18	<0.24	<22.5		
G2-66-72"	8.01	<8.77			Matrix Interference
H1-30-36"	6.29	<0.23		27	
H1-36-48"	5.11				
H2-6-18"	16.5	0.26		6	
H2-24-30"	292	0.57			
H2-30-48"	8.17	<0.23			
H3-18-24"	22.1	<0.52		18	

Table 3-3
DEBENHAM AREA SAMPLE DATA SUMMARY

SAMPLE NUMBER	LEAD RESULT (EPA7421)	PCB RESULT (EPA8082)	DIESEL ORGANIC (AK102)	GEOTEXTILE DEPTH (IN.)	COMMENTS
H3-24-30"	60.7	<0.5			
I1-36-48"	10.3	0.285		36	
I1-60-72"	7.17	<0.33	54.2		
I1-72-84"	9.36	<2.38	<81.3		
I1-84-90"	11	<0.31	<35		
I1-90-96"	7.09	<0.54	<31.3		
I2					NOT SAMPLED
I3					NOT SAMPLED
J1-24-48"	7.32	<0.23		None	
J1-54-60"	11.6	<0.48			
J2					NOT SAMPLED
J3					NOT SAMPLED

NOTES:
1. All results in mg/kg
2. BLANK=Not analyzed
3. All PCB detections were Aroclor 1260
4. Geotextile depth is depth from ground surface to geotextile layer marking boundary between imported pavement base rock and original ground
5. Numbers to right of cell designator (e.g., 6-12") indicate sample depth below ground surface

Table 3-4
WEST AREA SAMPLE DATA SUMMARY

SAMPLE NUMBER	LEAD RESULT (EPA7421)	PCB RESULT (EPA8082)	DEPTH TO ORIGINAL GROUND (INCHES)
No.1-12-18"	759	5.3	16
No.1-18-24"	31.3	0.306	
No.2-12-18"	**1020**	**13.4**	14
No.2-24-30"	191	7.86	
No.2-6-12"	48.7	1.8	
No.3-0-6"	65.4	3.4	At Surface
No.3-6-12"	30.6	3.81	

NOTES:
1. All results in mg/kg
2. BLANK=Not analyzed
3. All PCB detections were Aroclor 1260
4. Numbers to right of sample designator (e.g., 6-12") indicate sample depth below ground surface

Table 3-5
SOUTHEAST AREA SAMPLE DATA SUMMARY

SAMPLE NUMBER	LEAD RESULT (EPA7421)	PCB RESULT (EPA8082)	COMMENTS
E.20', S.2', 6"-12"	25.7	0.0617	
E.32', S.9', 6"-18"	50.7	0.43	
E.55', S.15', 3"-15"	179	9.68	
N.30', E.15', 2"-8"	247	0.501	
N.70', E.8', 0"-6"	125	0.2	

NOTES:
1. All results in mg/kg
2. BLANK=Not analyzed
3. All PCB detections were Aroclor 1260
4. Numbers to right of sample designator (e.g., 6-12") indicate sample depth below ground surface

Table 3-6
TLCP LEAD TESTING DATA SUMMARY

SAMPLE NUMBER	LAB ID NUMBER	Lead - Total	Lead - TCLP
E9-0-6"	1027574035	581	1.48
H9-24-36"	1027574066	949	**6.19**
B1-0-6"	1027532006	**1760**	**52.7**
E6-0-6"	1027709006	**1940**	**46.7**
B5-24-30"	1027574014	**2130**	3
C8-0-6"	1027532046	**4010**	**276**
C3-0-6"***	1027532056	**24000**	**246**

Table 3-7
TOTAL ORGANIC CARBON TESTING SUMMARY

PROJECT AREA	SAMPLE_ID	SOIL DESCRIPTION	RESULT (mg/Kg)	Foc
Debenham	B2 30-36	Silty Sand	21060	0.0211
Debenham	E2 48-60	S&G	8103	0.0081
Debenham	G2 66-72	Organic Silt	82300	0.0823
M&M	B1 6-12	S&G	3282	0.0033
M&M	B2 18-30	Peat	181200	0.1812
M&M	B4 18-24	Peat + S&G	62500	0.0625
M&M	C8 0-6	Silty S&G	48510	0.0485
M&M	E6 6-12	S&G	11910	0.0119
M&M	E9 0-6	Silty S&G	46710	0.0467
M&M	F6 12-18	S&G	31540	0.0315

NOTES:
1. TOC analysis by CTE Standard Operating Procedure (internal method)
2. Samples were selected to represent the range of organic content exhibited overall by the soils collected.
3. None of the samples showed any evidence of hydrocarbon contamination (e.g., odor, staining, and sheen).

Table 3-8
GROUNDWATER SAMPLE DATA SUMMARY

SAMPLE NUMBER	LEAD RESULT (EPA7421)	PCB RESULT (EPA8082)	COMMENTS
ANI-B-1	<0.005	<0.099	
ANI-B-2	<0.005	<0.099	
ANI-B-3	<0.005	<0.099	
ANI-B-4	**0.0522**	<0.495	High reporting level caused by matrix interference and high turbidity. See text.

NOTE:
1. All results in mg/L
2. Reporting limit for PCBs is for each Aroclor individually.

4.0 CLEANUP LEVEL ANALYSIS

4.1 INTRODUCTION

Soil cleanup levels are set forth in 18 AAC 75.340. Three methods for determining soil cleanup levels are provided. Method 1 applies only to petroleum hydrocarbons and represents Alaska's first attempt at providing rational cleanup levels. Method 1 will therefore not be discussed further.

Method 2 cleanup levels for soils are presented in Tables B1. These are based on ADEC's approved cleanup level equations using default site parameters. These equations provide a simplified fate-and-transport and risk assessment model. The results of these calculations (using the default parameters) provides the requirements for "unrestricted" (e.g., high occupancy residential) land use for three exposure pathways (ingestion, inhalation, and migration to groundwater) and three climatic zones (arctic zone, under 40 inch annual precipitation zone, and over 40 inch annual precipitation zone). The Hanson site is located in the Under 40 Inch climatic zone, and past, current and projected future land use is commercial/industrial (based on current use and zoning).

Method 3 provides for modification of the Method 2 cleanup levels based on site-specific conditions related to soil, groundwater, rainfall and land use. Application of Method 3 cleanup levels usually requires some form of institutional controls.

Potentially applicable cleanup levels using both methods are presented for each of the three chemicals of concern (Lead, PCBs, and DRO) in the sections below.

4.2 POTENTIAL PCB CLEANUP LEVELS

4.2.1 Alaska State Method 2 Cleanup Levels for PCBs

Prior to January 30, 2003, Method 2 PCB cleanup levels in 18 AAC 75 were specified as follows:

> *For residential land use, the cleanup level for PCBs in surface soil is 1 mg/kg; for commercial or industrial land use, the cleanup level for PCBs in surface soils is 10 mg/kg and for PCBs in subsurface soil is 25 mg/kg.*

Thus, for the Hanson site, the applicable cleanup level would have been 10 mg/kg in surface soils (defined as the upper 2 feet) and 25 mg/kg below. On January 30, 18 AAC 75 was amended and the cleanup levels for PCBs were restructured as discussed below.

Examination of Table B1 in the January 30, 2003 edition of 18 AAC 75 indicates a risk-based cleanup level for PCBs of 1 mg/Kg for both Ingestion and Inhalation exposure pathways. No cleanup level is specified for the migration to groundwater pathway, presumably because of PCBs strong affinity for soils and organic matter and low solubility. Footnote 9 at the end of the table explains and modifies the table as follows:

> *9. For unrestricted land use, PCBs in soil shall be cleaned up to one mg/kg or less, unless the department determines that a different cleanup level is necessary as provided in 18 AAC 75.340(i), as, for example, in a subsistence food gathering area. With the prior approval of the department, PCBs in soil may be cleaned up to*
>
> *(A) between 1 and 10 mg/kg if the responsible person*
>
> *(i) caps each area containing PCBs in soil at levels between 1 and 10 mg/kg; for purposes of this Note 9, "caps" means covering an area of PCB contaminated soil with an appropriate material to prevent exposure of humans and the environment to PCBs; to be approved, a cap must be designed and constructed of a material acceptable to the department and of sufficient strength and durability to withstand the use of the surface that is exposed to the environment; within 72 hours after discovery of a breach to the integrity of a cap, the responsible person or the landowner shall initiate repairs to that breach; and*
>
> *(ii) provides the department within 60 days after completing the cleanup, documentation that the responsible person has recorded a deed notation in the appropriate land records, or on another instrument that is normally examined during a title search, documenting that PCBs remain in the soil, that the contaminated soil has been capped, and that subsequent interest holders may have legal obligations with respect to the cap and the contaminated soil; or*
>
> *(B) an alternative PCB soil cleanup level developed through an approved site-specific risk assessment, conducted according to the Risk Assessment Procedures Manual, adopted by reference at 18 AAC 75.340.*

At the very end of Section 18 AAC 75.341 there is a further note as follows:

> *The applicable EPA rule governing disposal and cleanup of PCB contaminated facilities under 40 C.F.R. Part 761.61 (PCB remediation waste) may apply to PCB cleanup at a contaminated site. The PCB cleanup levels listed in Table B1 are based on cleanup levels referred to in 40 C.F.R. 761.61 <u>for high occupancy areas</u>* (emphasis added) *with no cap.*

The Method 2 cleanup requirements, as presented in Table B1 and its footnotes appear to substantially follow Federal requirements, and as indicated in the above note, the applicable Federal rules may be applied to site cleanup for low occupancy (e.g., industrial/commercial) land uses. As discussed elsewhere in this Site Characterization Report, the site's historic land use is commercial/industrial, the area is zoned for industrial land use, and all adjacent properties are in light industrial/commercial uses. Consequently, as discussed below, the Site has "Low" Occupancy rating (instead of the "High" rating), under the Federal definitions.

4.2.2 Federal Cleanup Requirements

Regarding cleanup levels for PCB impacted soils, 40 CFR761.61 (4) states the following:

> ***(4) Cleanup levels.*** *For purposes of cleaning, decontaminating, or removing PCB remediation waste under this section, there are four general waste categories: bulk PCB remediation waste, non-porous surfaces, porous surfaces, and liquids. Cleanup levels are based on the kind of material and the potential exposure to PCBs left after cleanup is completed.*
>
> ***(i) Bulk PCB remediation waste.*** *Bulk PCB remediation waste includes, but is not limited to, the following non-liquid PCB remediation waste: soil, sediments, dredged materials, muds, PCB sewage sludge, and industrial sludge.*
>
> ***(A) High occupancy areas.*** *The cleanup level for bulk PCB remediation waste in high occupancy areas is □1 ppm without further conditions. High occupancy areas where bulk PCB remediation waste remains at concentrations >1 ppm and <10 ppm shall be covered with a cap meeting the requirements of paragraphs (a)(7) and (a)(8) of this section.*
>
> ***(B) Low occupancy areas.*** ***(1)*** *The cleanup level for bulk PCB remediation waste in low occupancy areas is □25 ppm unless otherwise specified in this paragraph.*
>
> ***(2)*** *Bulk PCB remediation wastes may remain at a cleanup site at concentrations >25 ppm and <50 ppm if the site is secured by a fence and marked with a sign including the ML mark.*
>
> ***(3)*** *Bulk PCB remediation wastes may remain at a cleanup site at concentrations >25 ppm and □100 ppm if the site is covered with a cap meeting the requirements of paragraphs (a)(7) and (a)(8) of this section.*

Site occupancy categories are defined in 40 CFR761.3 as follows:

> ***Low occupancy*** *area means any area where PCB remediation waste has been disposed of on-site and where occupancy for any individual not wearing dermal and respiratory protection for a calendar year is: less than 840 hours (an average of 16.8 hours per week) for non-porous surfaces and less than 335 hours (an average of 6.7 hours per week) for bulk PCB remediation waste. Examples could include an electrical substation or a location in an industrial facility where a worker spends small amounts of time per week (such as an unoccupied area outside a building, an electrical equipment vault, or in the non-office space in a warehouse where occupancy is transitory).*
>
> ***High occupancy*** *area means any area where PCB remediation waste has been disposed of on-site and where occupancy for any individual not wearing dermal and respiratory protection for a calendar year is: 840 hours or more (an average of 16.8 hours or more per week) for non-porous surfaces and 335 hours or more (an average of 6.7 hours or more per week) for bulk PCB remediation waste. Examples could include a residence, school, day care center, sleeping quarters, a single or multiple occupancy 40 hours per week work station, a school class room, a cafeteria in an industrial facility, a control room, and a work station at an assembly line.*

The present use by workers at the M&M Area is primarily for occasional access to the back doors of businesses, or to stored equipment and vehicles. One of the businesses (Hanson Hubcaps) stores auto parts outside the rear of their building on racks located on an elevated wooden deck, not on the ground. The only reasonably anticipated future use for the M&M Area is storage or parking associated with commercial or industrial buildings in the front portion of the property. Therefore, under present or future usage, this area will fall under the above definition of low occupancy. For this case, the Federal requirements would therefore specify a Site Cleanup level for PCB of □25 ppm, or □100 ppm with a cap and appropriate institutional controls. 40CFR761.61(a)(7) indicates that an acceptable cap would consist of 6 inches of asphalt or concrete.

4.2.3 Alaska State Method 3 Cleanup Levels for PCBs

Cleanup level guidance documents published by ADEC and by EPA were reviewed to determine if risk-based calculation of cleanup levels could be applied to this Site. It was found that some essential parameters for PCBs and Lead needed to calculate their cleanup values were missing in both State and Federal tables. However, ADEC's Method 3 Calculator was used, inputting site specific parameters for fraction organic carbon, Lead (presumed residual level of 1,000 mg/kg) and DRO. The Method 3 Calculator output is presented in Appendix B and indicates the following cleanup levels for PCBs:

Cleanup levels for commercial/industrial land use are 10 mg/kg and 25 mg/kg for surface and subsurface soil, respectively.

4.3 POTENTIAL LEAD CLEANUP LEVELS

Table B1 lists 400 mg/Kg as the Method 2 cleanup level for Lead, based on risk based criteria for both ingestion and inhalation. Note 11 to Table B1 modified the values shown in the table as follows:

Lead cleanup levels must be determined on a site-specific basis, based on land use. For residential land use, the soil cleanup level is 400 mg/kg. For commercial or industrial land use, as applied in 18 AAC 75.340(e)(3), the soil cleanup level is 1,000 mg/kg.

4.4 POTENTIAL DIESEL RANGE ORGANICS (DRO) CLEANUP LEVELS

Table B2 lists 250 mg/Kg as the Method 2 cleanup level for DRO, based on the Migration to Groundwater pathway (the Ingestion and Inhalation cleanup levels are both 12,500 mg/kg). Review of the default parameters for the cleanup level calculations shows that site soils contain a much higher fraction organic carbon (foc) than the default value (0.001). As discussed in Section 3.4.7 and as shown on Table 3-7, foc values for site soils range from 0.0033 to 0.1812, compared to the default value of 0.001. Therefore, we used the Method 3 calculator to calculate a site specific Method 3 cleanup level for DRO, changing only the foc value, but also inputting the presence of lead at 1,000 mg/kg and PCBs. Conforming to ADEC practice, for the 10 foc analyses, we discounted the highest and lowest values and averaged the remaining 8. This yielded an foc of 0.039 which was used in the Method 3 Calculator. The output is attached in Appendix B and indicates a cleanup level for DRO of 9,760 mg/kg.

4.5 PROPOSED CLEANUP LEVELS

All cleanup levels proposed envision continued retention of the land use as industrial/commercial with appropriate institutional controls (e.g., deed notice) to ensure this. Other issues that may need to be addressed as a part of the institutional controls may include notice of the presence of soils onsite that exceed ADEC Method 2 criteria.

4.5.1 PCB Cleanup Level

Two cleanup levels are currently proposed for PCBs:

1. No Cap: □10 mg/Kg total PCBs in the top 2 feet (relative to finished site grade) and □25 mg/Kg total PCBs all areas below 2 feet in depth. Soils

containing >10 mg/kg PCBs but <25 mg/kg PCBs could be consolidated into deeper parts of any onsite excavations to avoid offsite disposal.

2. With Cap: □100 mg/kg PCBs in all areas beneath the cap.

The potential cost effectiveness of using a cap will need to be evaluated further as part of the Cleanup Plan.

4.5.2 Lead Cleanup Level

A Total Lead Cleanup Level of □1,000 mg/Kg is proposed. This is based on the Light Industrial Zoning, commercial nature of the property.

4.5.3 DRO Cleanup Level

A Cleanup Level for DRO of 9,760 mg/kg is proposed based on the Method 3 analysis of the migration to groundwater pathway.

5.0
WASTE DISPOSAL CONSIDERATIONS

Based on the discussion in Chapter 3 regarding TCLP testing on Lead-impacted soils, and assuming the Lead Cleanup Level is 1000 mg/Kg as proposed, all soils removed for Lead will have to be stabilized prior to disposal to remove the lead characteristic. Treatment can be performed onsite, in which case once treated, these soils are no longer considered a RCRA Hazardous Waste, and may be less costly to ship and dispose in a landfill. However, depending on the treatment technology utilized, there may be some increase in weight. Alternatively, soils can be transported and disposed as RCRA hazardous waste with treatment performed at the landfill.

Soils planned for offsite disposal which equal or exceed 50 mg/kg PCBs will constitute a waste regulated under the Toxic Substances Control Act (TSCA) and offsite disposal will need an appropriately permitted landfill.

There are no permitted RCRA hazardous waste or TSCA waste landfills in Alaska. Various landfill alternatives are available in the lower 48.

6.0
SITE REMEDIAL ALTERNATIVE EVALUATION

6.1 INTRODUCTION

This section discusses remediation options that may be considered for the Hanson Site:

1. No action
2. Excavation with offsite disposal of all soils containing >400 mg/Kg Lead and/or >1 mg/kg PCBs.
3. Excavation with offsite disposal of all soils containing >1000 mg/Kg Lead and/or >25 mg/kg PCBs, with consolidation of soils containing 10 to 25 mg/kg PCBs below 2 feet bgs, with institutional controls.
4. Excavation with offsite disposal of all soils containing >1000 mg/Kg Lead and/or >100 mg/kg PCBs, with capping and institutional controls.
5. Onsite stabilization/solidification with capping and institutional controls

Each of these alternatives is briefly discussed below.

6.2 ALTERNATIVE DESCRIPTIONS

1. No Action

This is the least costly alternative. At a minimum, this would require extensive institutional controls and long term monitoring. Because neither Lead nor PCBs degrade appreciably in the environment, monitoring and institutional controls would need to be continued indefinitely. A site specific risk assessment would be needed. The site would not qualify for issuance of a determination of No Further Remedial Action Planned (NFRAP) from ADEC.

2. Excavation With Offsite Disposal Of All Soils Containing >400 Mg/Kg Lead And/Or >1 Mg/Kg PCBs

This would result in a complete cleanup to ADEC Method 2 criteria as presented in Table B1 of 18 AAC 75. No site use restrictions, institutional controls, or monitoring would be required. As there are no permitted disposal facilities for such contaminated soils in Alaska, all excavated soils would need to be transported to the lower 48 for disposal. Soils containing >1,000 mg/kg Lead would require treatment to remove the Lead characteristic prior to disposal. Such soils could be treated onsite and disposed as solid waste at an appropriately permitted industrial waste landfill provided that the PCB concentrations met permit requirements (e.g., <50 mg/kg PCBs).

This would constitute a full site closure from ADEC.

3. **Excavation With Offsite Disposal Of All Soils Containing >1000 Mg/Kg Lead And/Or >25 Mg/Kg PCBs, With Consolidation Of Soils Containing 10 To 25 Mg/Kg PCBs Below 2 Feet Bgs, With Institutional Controls.**

This alternative is similar to number 2 above except with higher cleanup levels reflective of the sites industrial/commercial use and zoning. Excavated soils would need to be transported to a disposal site in the lower 48. Soils containing >1,000 mg/kg Lead would require treatment to remove the Lead characteristic prior to disposal. Such soils could be treated onsite and disposed as solid waste at an appropriately permitted industrial waste landfill provided that the PCB concentrations met permit requirements (e.g., <50 mg/kg PCBs). Institutional controls would consist of a deed notice restricting future site use to industrial/commercial uses and a notification that soils exceeding ADEC Method 2 criteria remain onsite. Following remediation the site would qualify for issuance of an NFRAP from ADEC.

4. **Excavation With Offsite Disposal Of All Soils Containing >1000 Mg/Kg Lead And/Or >100 Mg/Kg PCBs, With Capping And Institutional Controls.**

This is similar to Alternative 3, with a slightly higher cleanup level for PCBs. An additional requirement of 40CFR761 would be the provision of an asphalt cap 6 inches in thickness over the entire area. Institutional controls would consist of a deed notice restricting future site use to industrial/commercial uses and a notification that soils exceeding ADEC Method 2 criteria remain onsite. Following remediation the site would qualify for issuance of an NFRAP from ADEC.

5. **Onsite Stabilization/Solidification With Capping And Institutional Controls**

In this alternative, all contaminated soils remain onsite. Soils containing >1,000 mg/kg Lead would be treated (stabilized) to prevent leaching of lead. Soils containing >50 mg/kg PCBs would be solidified by adding Portland cement to form a concrete-like mass which is resistant to excavation, erosion, and groundwater flow. An engineered geomembrane cap system and 2 feet of cover soil would also be needed.

This alternative has the advantage of avoiding high costs of transportation to the lower 48 and offsite disposal. This approach has been used at similar sites, such as the Standard Steel Superfund Site in Anchorage. Significant institutional controls would be needed to ensure the permanence of the remedy. Significant regulatory issues would need resolution, including EPA approval as this essentially becomes a TSCA landfill. Because of the presence of such elevated contaminant levels, monitoring would need to continue indefinitely. The site

grade would rise several feet due to the added volume of Portland cement and the cap/cover system. A site specific risk assessment would be needed.

Following remediation, the site would qualify for an NFRAP determination from ADEC.

6.3 EVALUATION OF ALTERNATIVES

1. No Action

The presence of significantly elevated concentrations of Lead and PCBs in surface soil could result in unacceptable exposure and the possibility of offsite transport by wind and surface water. For these reasons, this alternative is not further considered.

2. Excavation With Offsite Disposal Of All Soils Containing >400 Mg/Kg Lead And/Or >1 Mg/Kg PCBs

Although this would result in a full site closure with unrestricted site use, the high cost of offsite disposal and the current and reasonable future land uses do not make this alternative cost effective and it is not further considered.

3. Excavation With Offsite Disposal Of All Soils Containing >1000 Mg/Kg Lead And/Or >25 Mg/Kg PCBs, With Consolidation Of Soils Containing 10 To 25 Mg/Kg PCBs Below 2 Feet Bgs, With Institutional Controls.

This alternative is similar to Alternative 2 with higher cleanup levels for Lead and PCBs, which are consistent with current and future land uses and comply with ADEC and EPA regulations for closure.

4. Excavation With Offsite Disposal Of All Soils Containing >1000 Mg/Kg Lead And/Or >100 Mg/Kg PCBs, With Capping And Institutional Controls.

This alternative is similar to Alternative 3, with a slightly higher cleanup level for PCBs and with an added requirement of a 6-inch asphalt cap. Review of site data (Table 3-1) indicates that only a very small percentage of the soils contain PCB concentrations of 25 to 100 mg/kg AND have less than 1,000 mg/kg Lead. Therefore, the high cost of the asphalt cap cannot be justified for the fairly small savings in disposal costs and this alternative is not retained for further consideration.

5. **Onsite Stabilization/Solidification With Capping And Institutional Controls**

Although likely less costly than any of the other alternative except No Action, this alternative presents significant issues of regulatory acceptability, permitting, long term monitoring, and land use restrictions. For these reasons it is not retained for further consideration.

6.4 RECOMMENDED ALTERNATIVE

Based on these analyses, the recommended alternative is Alternative 3: Excavation With Offsite Disposal Of All Soils Containing >1000 Mg/Kg Lead And/Or >25 Mg/Kg PCBs, With Consolidation Of Soils Containing 10 To 25 Mg/Kg PCBs Below 2 Feet Bgs, With Institutional Controls. This presents the best balance of protection of human health and the environment, regulatory acceptability, minimal institutional controls, no significant long term monitoring, and cost.

7.0
CONCLUSIONS & RECOMMENDATIONS

7.1 CONCLUSIONS

The field portion of the site investigation was performed in late October and early November 2002 by ALTA geosciences. Approximately 321 soils samples were collected from five areas on the Site, and selectively analyzed for Lead, PCBs, or DRO, based on prior area usage and sampling data. Relatively minor impacts have been identified in four of the five Site areas (West, Alleyway, Southeast, and Debenham). The M&M Area, was found to be more severely impacted with both Lead and PCB contamination than previously believed. A prior expedited removal action in this area did remove some highly impacted soils, but unfortunately left extensive contamination. Concrete slabs on the M&M Area were found to be minimally contaminated, although the underlying soil is in some cases highly impacted. Therefore, the slabs will need to be removed to gain access to the underlying soils, but the slabs themselves may be left onsite.

Groundwater was found to be impacted by Lead in one well on the Debenham property. However, the poor condition of the well suggests this may be an artifact of excessive particulate matter in the well rather than actual dissolved lead. After soils remediation is completed, a new well should be installed down-gradient from the excavation area, to allow sampling from a better quality well and monitor any remaining groundwater impacts at that time.

The following cleanup levels are proposed:

- PCBs: □10 mg/Kg total PCBs in the top 2 feet (relative to finished site grade) and □25 mg/Kg total PCBs all areas below 2 feet in depth. Based on "Low Occupancy" criteria in current Federal regulations.

- Lead: 1,000 mg/Kg is proposed. This is based on the Light Industrial Zoning, and the commercial nature of the property.

- DRO: 9,760 mg/kg is proposed based on the Method 3 analysis of the migration to groundwater pathway. Based on this cleanup criteria and review of available site data, no further evaluation of DRO contamination is warranted.

These cleanup levels will all require some form of institutional control to maintain the continued commercial/industrial classification of the property and to prevent inappropriate offsite transport and disposal of soils not meeting ADEC Method 2 criteria.

Only very minor and statistically insignificant outliers of contaminants appear to be present in the West Area beneath asphalt pavement. Further investigation or remediation in this is not warranted.

No contamination exceeding the proposed cleanup levels was discovered in the Southeast Area. Further investigation is not warranted.

7.2 RECOMMENDATIONS

The recommended alternative is excavation with offsite disposal of all soils containing >1000 mg/kg lead and/or >25 mg/kg PCBs, with consolidation of soils containing 10 to 25 mg/kg PCBs below 2 feet bgs. This alternative would include institutional controls consisting of a deed notice advising of the presence of soils exceeding ADEC Method 2 criteria and requiring continued land use as industrial/commercial. This presents the best balance of protection of human health and the environment, regulatory acceptability, minimal institutional controls, no significant long term monitoring, and cost.

The following tasks need to be performed:

1. A cleanup plan needs to be developed and submitted to ADEC for approval.
2. Engineering plans and specifications and a bid package need to be developed and provided to potential bidders.
3. A small amount of additional investigation in previously unsampled areas should be performed prior to the start of construction.

8.0 REFERENCES

- CERCLA Site Inspection Report. Tryck, Nyman & Hayes, September 1987 (the "TNH Report".
- Pollution Assessment Report Phase 1 (Revised). America North, October 1989 (the "Phase 1 Report").
- Pollution Assessment Report Phase 2. America North, December 1989 (the "Phase 2 Report").
- Self Implementing Cleanup Plan. EMCON, June 1999 (the "Cleanup Plan").
- Preliminary Contamination Assessment at 5333 Fairbanks Street, Anchorage, Alaska. Shannon & Wilson, August 5, 1998 (the "Debenham Report").
- Progress Reports. America North/EMCON, various dates.
- Complaint, Debenham et al. vs. Hanson et al., Case No. 3AN-00-8542 (the "Complaint").

APPENDIX A

EXCERPTS FROM PRIOR REPORTS

1. CERCLA Site Inspection Report. Tryck, Nyman & Hayes, September 1987 (the "TNH Report".

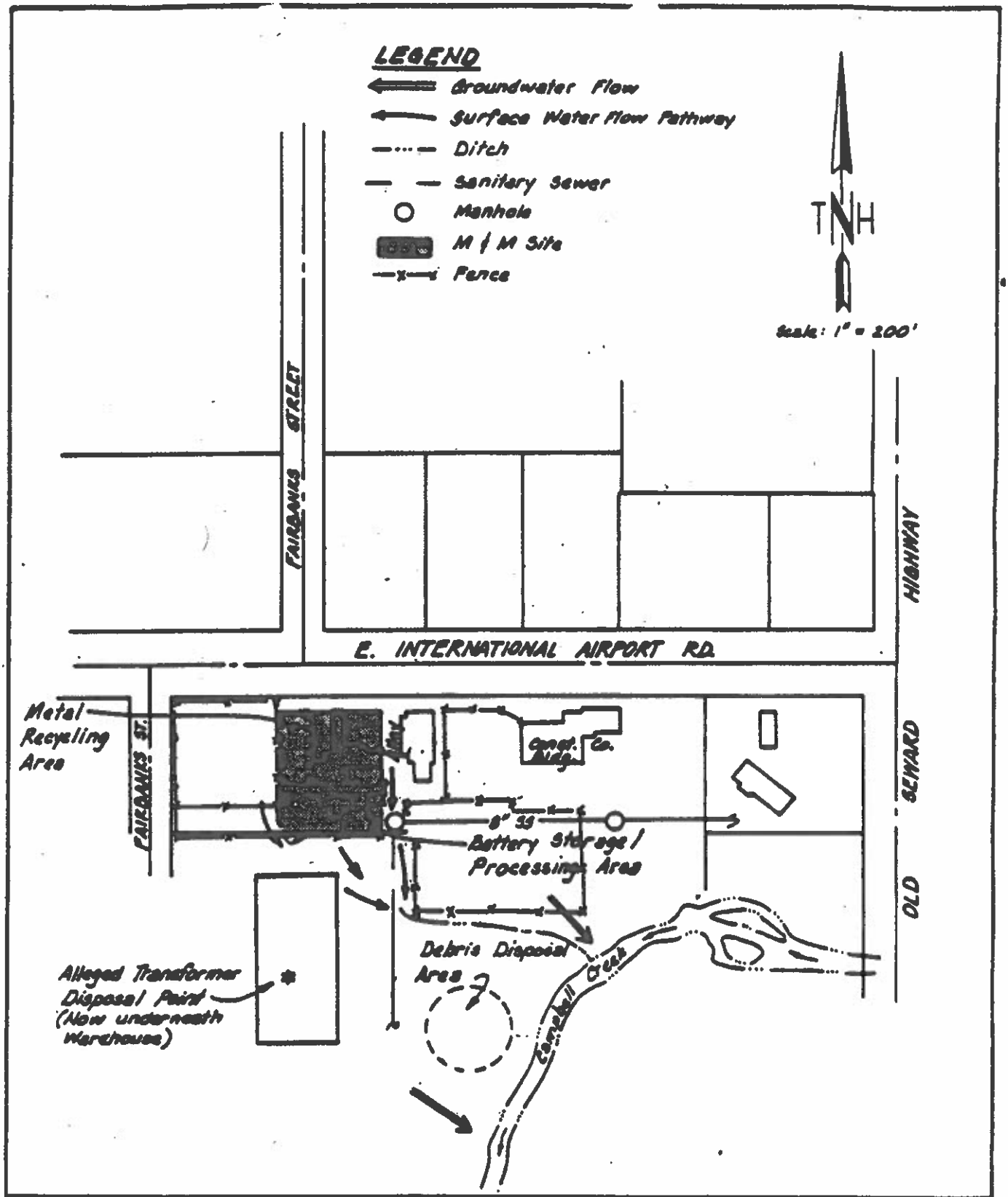
2. Pollution Assessment Report Phase 1 (Revised). America North, October 1989 (the "Phase 1 Report").

   Pollution Assessment Report Phase 2. America North, December 1989 (the "Phase 2 Report").

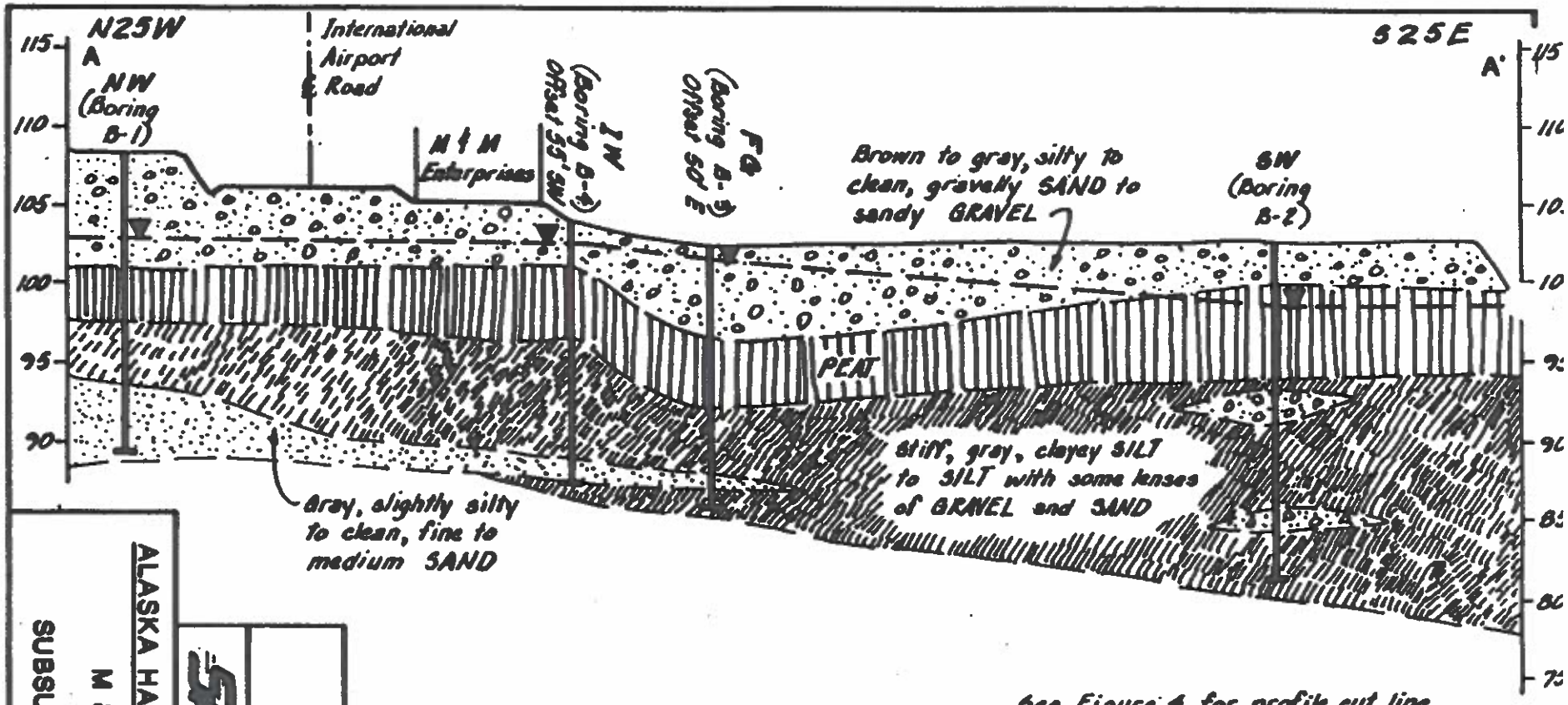
   Self Implementing Cleanup Plan. EMCON, June 1999 (the "Cleanup Plan").

3. Preliminary Contamination Assessment at 5333 Fairbanks Street, Anchorage, Alaska. Shannon & Wilson, August 5, 1998 (the "Debenham Report").

CERCLA Site Inspection Report. Tryck, Nyman & Hayes, September 1987 (the "TNH Report").



TRYCK NYMAN & HAYES	ALASKA HAZARDOUS WASTE PROGRAM M & M ENTERPRISES SITE MAP	FIGURE 2



LEGEND

- Gravel
- Sand
- Silt
- Peat
- Measured Water Table (November, 1986)

See Figure 4 for profile cut line.

Note: 1) The profile is generalized from materials encountered in the borings, and variations between the profile and actual conditions may exist.

2) Dashed lines indicate inferred contacts between different soil units.

100' 0' 100' 200'

GRAPHIC SCALE 1"=100'

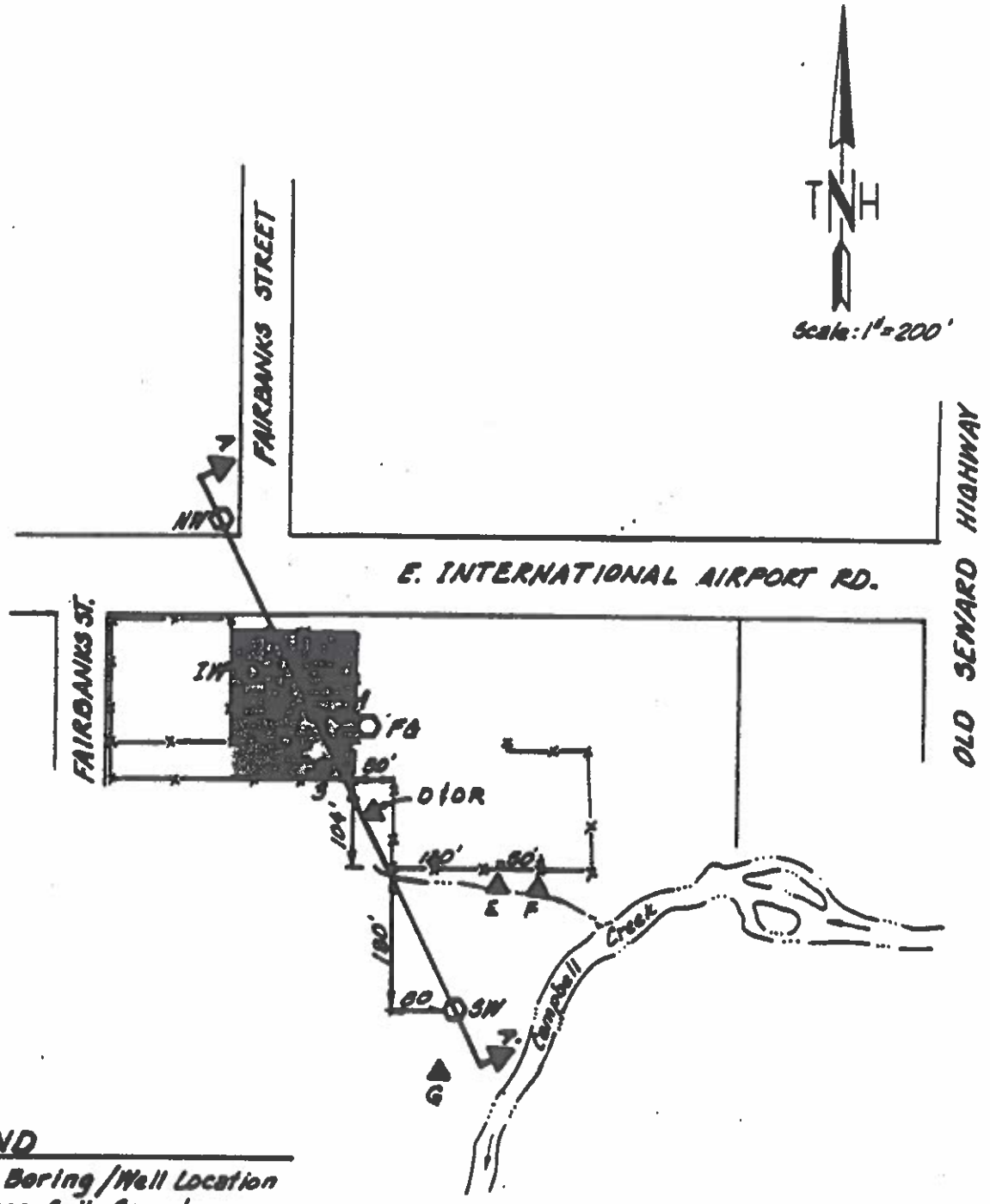
ALASKA HAZARDOUS WASTE PROGRAM

M & M ENTERPRISES

SUBSURFACE PROFILE A-A'

FIGURE 3

TRYCK NYMAN HAYES



TRYCK NYMAN & HAYES

SAIC

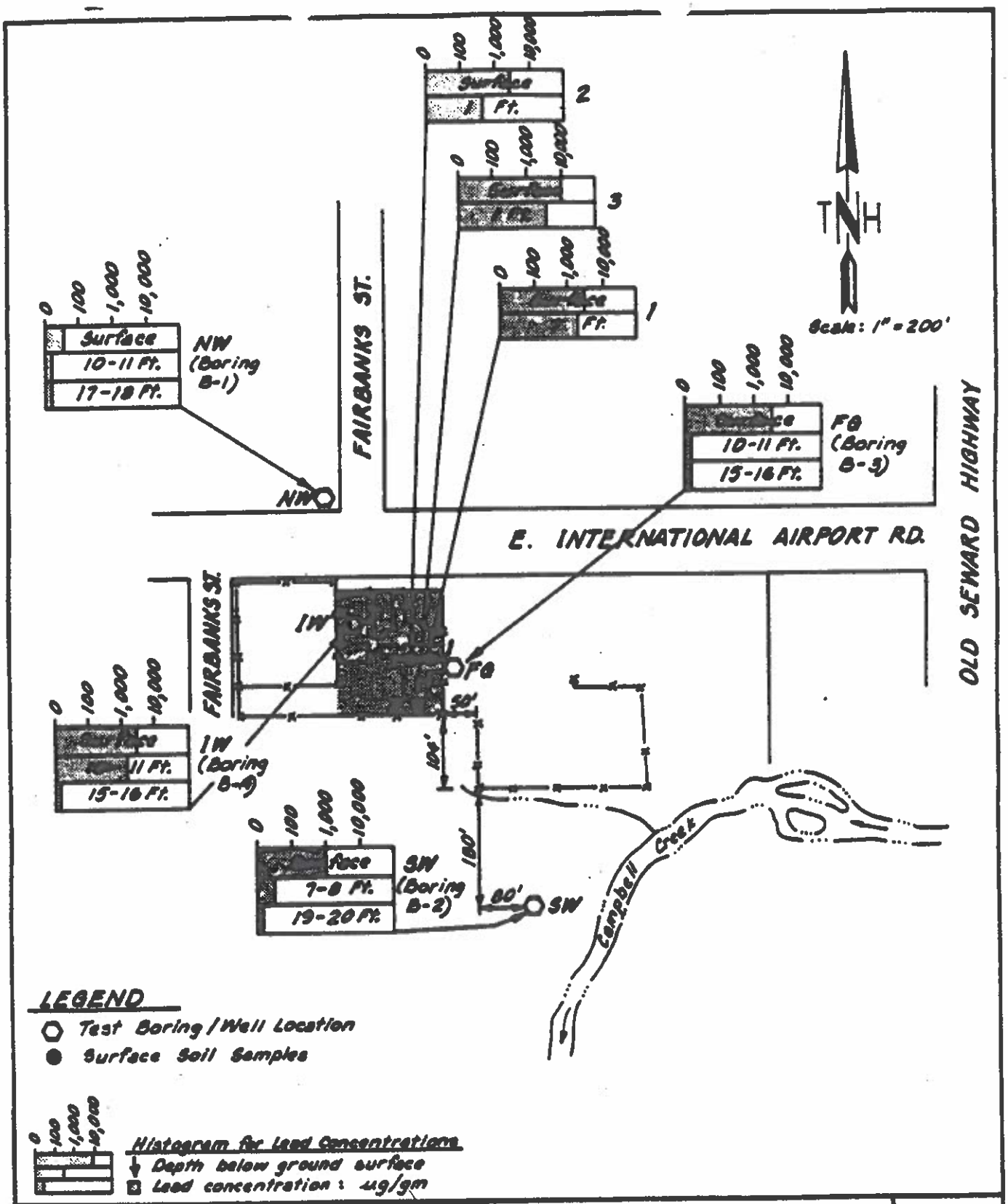
ERM

ALASKA HAZARDOUS WASTE PROGRAM

M & M ENTERPRISES

SAMPLING LOCATION MAP

FIGURE 4



TRYCK NYMAN & HAYES

SAE

ALASKA HAZARDOUS WASTE PROGRAM

M & M ENTERPRISES

LEAD CONCENTRATIONS IN SOIL

FIGURE 5

M & M ENTERPRISES

SOIL ANALYSES

TABLE 1

Location/Sample	Depth (ft.)	Lead (ug/g dry wt.)	pH
NWS1	Surface	43]	7.32
NWS1R	Surface	39]	7.11
NWS2	10-11	4.8	4.0
NWS3	17-18	3.7	6.63
SWS1	Surface	900]	--
SWS1R	Surface	670]	--
SWS2	7.5- 8.5	43	6.38
SWS3	19.5-20.5	4.1	9.62
FGS1	Surface	5000	9.97
FGS2	10-11	2.2	6.33
FGS3	15-16	5.4	7.23
IWS1	Surface	3100	6.51
IWS2	10	1500]] 1600]]	6.47
IWS3	15-16	4.2	6.52
IA	Surface	5400	9.29
IB	1	4900]	4.86
IBR	1	6200]	8.64
2A	Surface	2900	4.89
2B	1	510	6.22
3A	Surface	7200]	2.28
3AR	Surface	12000]] 11000]]	3.05

3B	1	4100	3.04

] indicates duplicate sample
]] indicates replicate analysis of same sample

M & M ENTERPRISES

GROUNDWATER ANALYSES

TABLE 2

GW Well Analyte	Background Well NW1	On-Site Well IW1	Off-Site Well PG1	Downgradient Well SW1	FBO2(a)	Nat'l Drinking Water Standards* Detect. Limits	Fed Prim. STDS (d)	Fed Secon. STDS (e)
pH @ temp. (Degree C)	5.9 @ 12.6	6.3 @ 10.6 6.4 @ 12.2 (b)	5.4 @ 16.1	6.2 @ 12.3	N/A	N/A	N/A	6.5 - 8.5
Conductivity (umhos/cm)	840	1430 1640 (b)	14,800	1030	N/A	N/A	N/A	N/A
Lead (mg/L)	0.003	0.003 0.003 0.005 (c)	0.047	0.015	0.001	0.001	0.05	N/A
Sulfate (mg/L)	15.1	470. 470. 360. (c)	11,000	40.	12.3	1.0	N/A	250.

(a) Field Blank Bailer Wash
(b) Field Replicate Sample Results
(c) Laboratory Replicate Sample Results
(d) Source: U.S.EPA, Sept.1976; (48 FR8413), Feb. 1983; 40 CFR141, (50 FR46902), Nov. 1985 (51 FR34836), Sept. 198
(e) Source: U.S.EPA, 40 CFR143 (44 FR2198), July 19, 1979

* The State of Alaska has adopted existing levels of the National Drinking Water Standards (Alaska Department of Enviromental Conservation, Drinking Water Regulations, 18 ACC 80.050, 1982).

NOTE: The groundwater test results reported here may be questioned due to improper well construction procedures.

Pollution Assessment Report Phase 1 (Revised). America North, October 1989 (the "Phase 1 Report").

Pollution Assessment Report Phase 2. America North, December 1989 (the "Phase 2 Report").

Self Implementing Cleanup Plan. EMCON, June 1999 (the "Cleanup Plan").

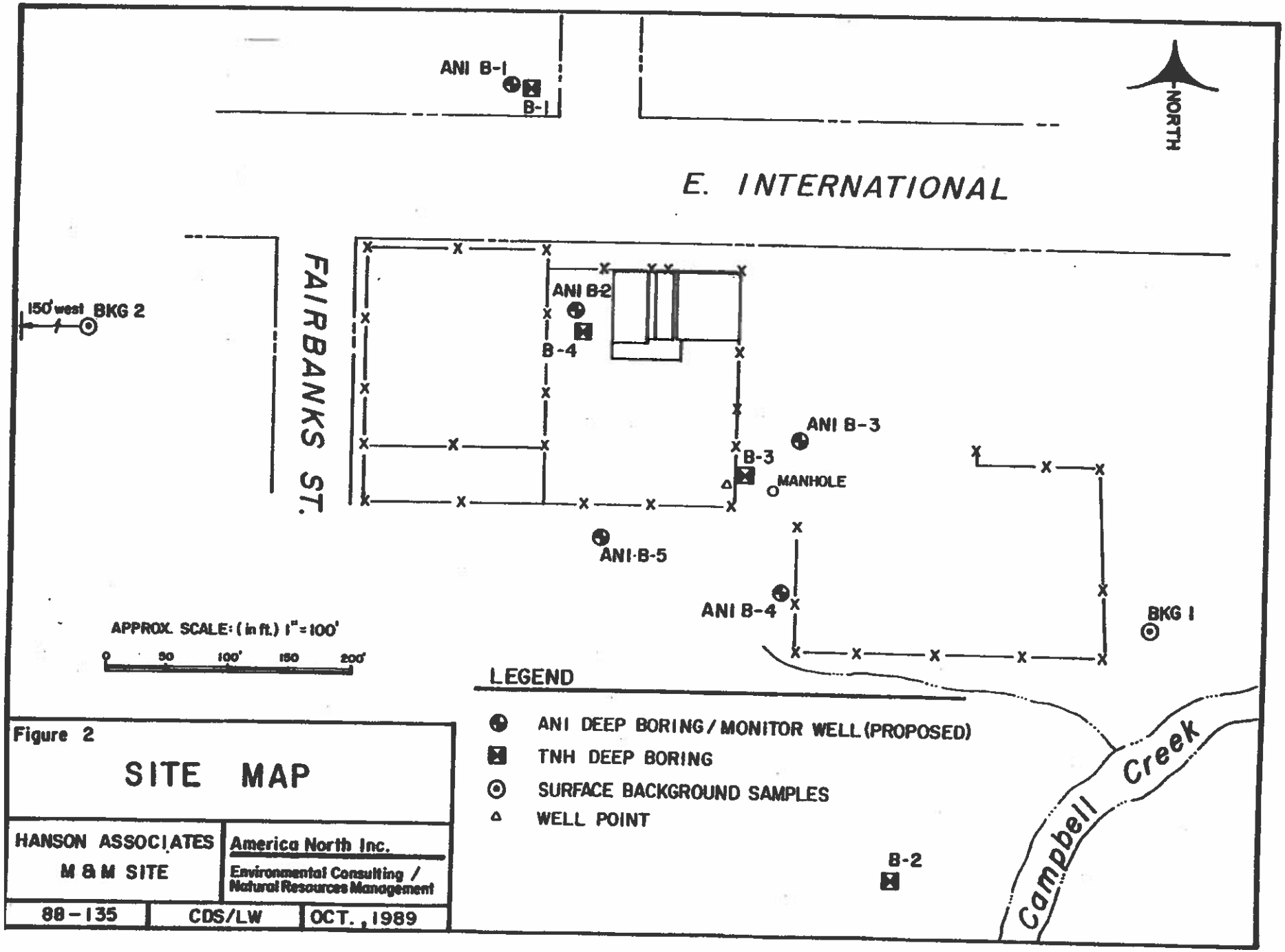
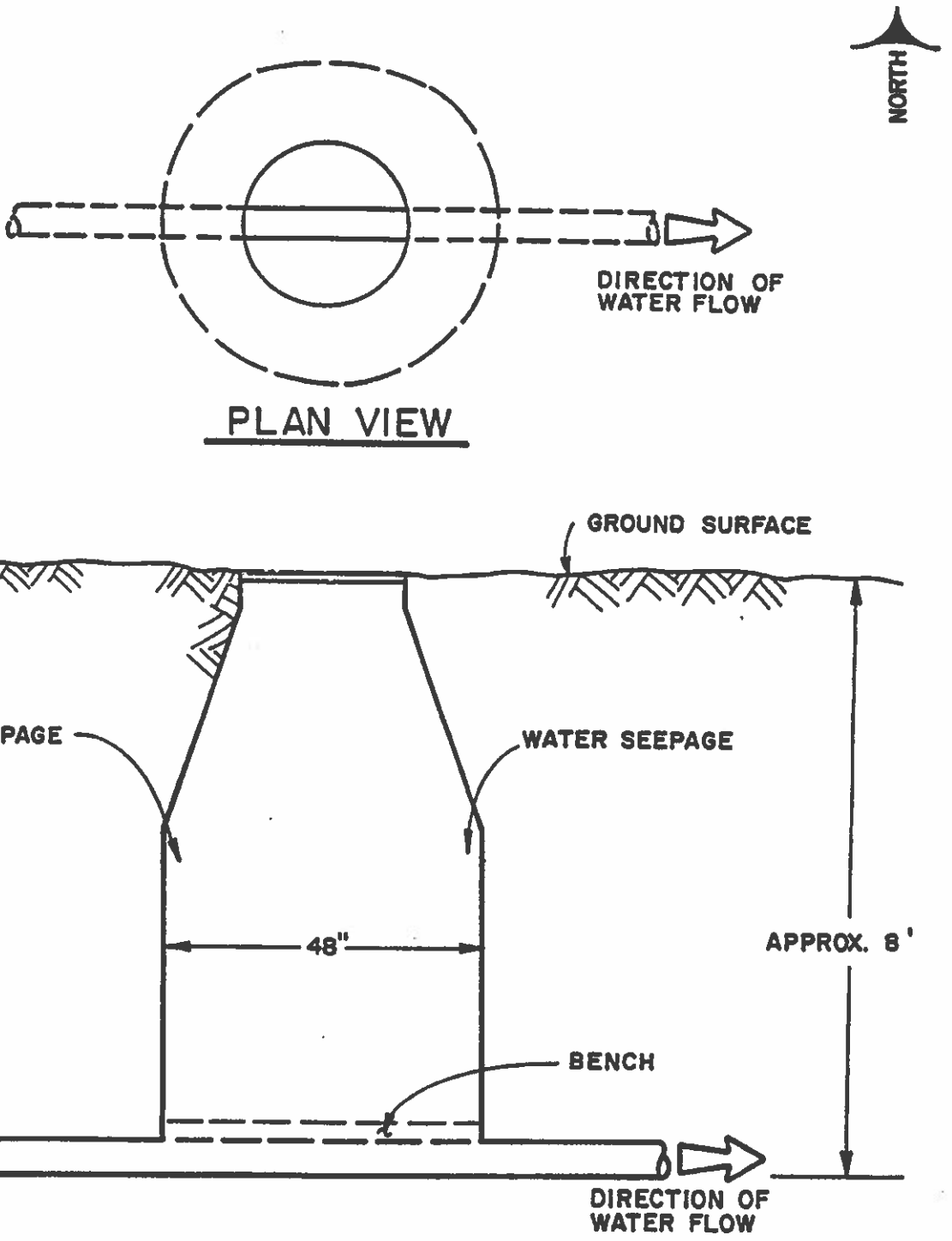


Figure 2

SITE MAP

HANSON ASSOCIATES M & M SITE	America North Inc. Environmental Consulting / Natural Resources Management	
88-135	CDS/LW	OCT., 1989

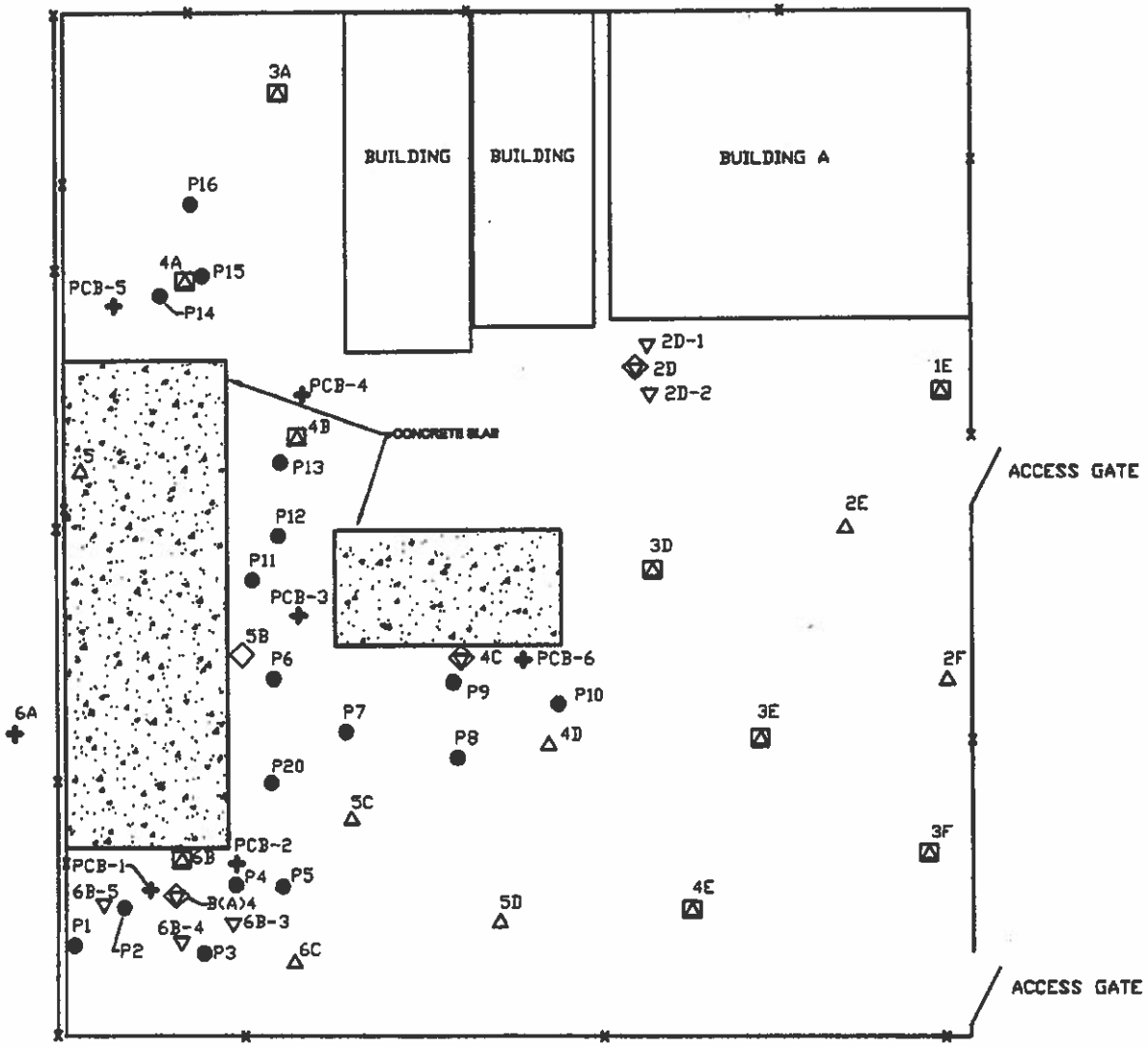


NOTE :
DIMENSIONS ARE APPROXIMATE.

0 1 2
SCALE IN FEET

Figure 6
MANHOLE SCHEMATIC

HANSON ASSOCIATES M & M SITE	America North Inc. Environmental Consulting / Natural Resources Management
Project # 135	Ckd. B.A. Drwn. CDS DEC., 1989



EMCON Alaska, Inc.
4701 Business Park Blvd Suite 36
Anchorage, Alaska 99503-7166
(907) 562-3452 Fax (907) 563-2814

DATE APRIL, 1999
DWN. M. RIESER
CKD. JON MCVAY
REV. 0
PROJECT No.
55112-002.000

HANSON ASSOCIATES
M&M SITE

HISTORICAL SOIL SAMPLING POINTS

FIGURE
3

Summary of Phase I, Soil Sample Analytical Results

Location	Date	Depth Interval (feet)	Total PCB[1] mg/kg	Total Lead[2] mg/kg
BKG1	8/89	0	0.163	195
BKG2	8/89	0	ND	8.67
1E	8/89	0	2.96	1,880
2D	8/89	0	40.9	6,180
2E	8/89	0	13.5	39,600
2F	8/89	0	0.446	87,200
3A	8/89	0	12.4	19,400
3D	8/89	0	12.0	45,500
3E	8/89	0	8.49	108,000
3F	8/89	0	2.47	22,500
4A	8/89	0	23.3	33,300
4B	8/89	0	25.3	24,400
4C	8/89	0	30.2	59,100
4D	8/89	0	1.82	83,400
4E	8/89	0	0.49	38,500
5A	8/89	0	28.5	153,000
5B	8/89	0	20.6	17,000
5C	8/89	0	11.4	5,470
5D	8/89	0	6.02	94,900
5D	8/89	0	4.18	8,680
6B	8/89	0	93.4	8,370
6C	8/89	0	9.15	840
1E	8/89	2.5	ND	4.3
3D	8/89	2.5	ND	36.4
3A	8/89	2.5	0.015	18.2
4A	8/89	2.5	0.052	7.88
4B	8/89	2.5	0.322	18.9
6B	8/89	2.5	15.3	16.0
4E	8/89	2.5	2.48	140
3F	8/89	2.5	ND	5.45
3E	8/89	2.5	ND	28.1

NOTE: ND = Analyte not detected (0.010 mg/kg, except for 3KG2, 0.040 mg/kg))
1 = USEPA Method 8080
2 = Total lead by inductively coupled plasma

Table 2
Summary of Phase II, Soil Sample Analytical Results

Location	Date	Depth Interval (feet)	Total PCB[1] mg/kg	Total Lead[2] mg/kg
1G	1989	0	0.6	3,970
2D-1	1989	0	5.1	NA
2D-2	1989	0	16.6	NA
3G	1989	0	0.2	6,510
6A	1989	0.1 - 0.3	0.6	23.6
6B-1	1989	0	53.2	NA
6B-2	1989	0	14.1 (12)	NA
6B-3	1989	0	35.3	NA
6B-4	1989	0	61.6	NA
6B-5	1989	0	38.3 (13)	NA
2D	1989	0.5	0.2	NA
2E	1989	0.5	NA	752
2F	1989	0.5	NA	283 (329)
3A	1989	0.5	NA	91
3D	1989	0.5	NA	14
3E	1989	0.5	NA	96
3F	1989	0.7	NA	9 (<20)
4A	1989	0.9	87.1	365
4B	1989	0.4	63.5	NA
4C	1989	0.4	15.7	745
4D	1989	0.8	NA	3,300
4E	1989	0.4	NA	4
5B	1989	0.5	6.4	299
5D	1989	0.6	NA	92
5E	1989	0.1 - 0.3	<0.02	6
6B-A	1989	0.3	10.6	211
ANIB3	1989	0	0.2	NA
ANIB3	1989	0 - 0.5	NA	331
ANIB5	1989	0.2 - 1.0	0.4	30

NOTE: ND = Analyte not detected
NA = Not analyzed
( ) = Duplicate sample result

1 = USEPA Method 8080
2 = Lead by inductively coupled plasma

Table 3
Summary of 1991 Soil Sample Analytical Results

Location	Date	Depth Interval (feet)	Total PCB[1] mg/kg	Total Lead[2] mg/kg
Pb1-053191-S	5/31/91	0.3 - 0.6	NA	47
Pb2-053191-S	5/31/91	0.3 - 0.6	NA	423
Pb3-053191-S	5/31/91	0.3 - 0.6	NA	498
Pb4-053191-S	5/31/91	0.3 - 0.6	NA	266
Pb5-053191-S	5/31/91	0.3 - 0.6	NA	517
Pb6-053191-S	5/31/91	0.3 - 0.6	NA	201
Pb7-053191-S	5/31/91	0.3 - 0.6	NA	26
Pb8-053191-S	5/31/91	0.3 - 0.6	NA	ND
Pb9-053191-S	5/31/91	0.3 - 0.6	NA	1550
Pb10-053191-S	5/31/91	0.3 - 0.6	NA	173
PCB1-053191-S	5/31/91	0.3 - 0.6	100	NA
PCB2-053191-S	5/31/91	0.3 - 0.6	297	NA
PCB3-053191-S	5/31/91	0.3 - 0.6	108	NA
PCB4-053191-S	5/31/91	0.3 - 0.6	ND	NA
PCB5-053191-S	5/31/91	0.3 - 0.6	ND	NA
PCB6-053191-S	5/31/91	0.3 - 0.6	7	NA

NOTE: ND = Analyte not detected
NA = Not analyzed
1 = USEPA Method 3540/8080
2 = USEPA Method 6010

Summary of 1992 Soil Sample Analytical Results

Location	Date	Depth Interval (feet)	Total PCB	Total Lead
P1-4	7/2/92	0.3	331	NA
P1-20	7/2/92	1.3 - 1.7	4	NA
P2-20	7/2/92	1.3 - 1.7	65	NA
P3-14	7/2/92	0.7 - 1.3	4	NA
P4-20	7/2/92	1.3 - 1.7	250	NA
P4-26	7/2/92	1.7 - 2.2	17	NA
P5-4	7/2/92	0.3	24	NA
P5-14	7/2/92	0.7 - 1.3	1400	NA
P5-20	7/2/92	1.3 - 1.7	46	NA
P6-4	7/2/92	0.3	39	NA
P6-14	7/2/92	0.7 - 1.3	300	NA
P6-20	7/2/92	1.3 - 1.7	7600	NA
P7-4	7/2/92	0.3	15	NA
P7-14	7/2/92	0.7 - 1.3	2500	NA
P7-20	7/2/92	1.3 - 1.7	810	NA
P8-4	7/2/92	0.3	100	NA
P8-20	7/2/92	1.3 - 1.7	18	NA
P9-4	7/2/92	0.3	27	NA
P9-14	7/2/92	0.7 - 1.3	22	NA
P9-20	7/2/92	1.3 - 1.7	13	NA
P10-4	7/2/92	0.3	110	NA
P10-14	7/2/92	0.7 - 1.3	12	NA
P10-20	7/2/92	1.3 - 1.7	ND	NA
P11-20	7/2/92	1.3 - 1.7	90	NA
P11-26	7/2/92	1.7 - 2.2	190	NA
P12-4	7/2/92	0.3	140	NA
P12-20	7/2/92	1.3 - 1.7	ND	NA
P13-4	7/2/92	0.3	180	NA
P14-4	7/2/92	0.3	830	NA
P15-4	7/2/92	0.3	81	NA
P15-14	7/2/92	0.7 - 1.3	28	NA
P15-20	7/2/92	1.3 - 1.7	ND	NA
P16-4	7/2/92	0.3	110	NA
P16-20	7/2/92	1.3 - 1.7	10	NA
P20-4	7/2/92	0.3	24	NA
P20-14	7/2/92	0.7 - 1.3	79	NA
P20-20	7/2/92	1.3 - 1.7	290	NA
P17-4 (Duplicate Sample of P15-4)	7/2/92	0.3	90	NA
P18-4 (Duplicate Sample of P10-4)	7/2/92	0.3	18	
P19-4 (Duplicate Sample of P12-4)	7/2/92	0.3	250	
Maximum Contaminant Level			10	

Table 5
Summary of Groundwater Analytical Results

Well ID	Date	Casing Elevation (ft MSL)	Water Depth (ft BTOC)	GW Elevation	pH	Sulfate[3] mg/L	Lead[2] mg/L	PCB[3] mg/L
B-1	10/26/89	119.38	8.31	111.07	6.54	6.5	NAP	NA
	11/17/89		9.16	110.22	NA	NA	ND	NA
	3/30/90		7.17	112.21	NA	NA	NA	NA
	4/27/90		7.93	111.45	6.42	ND	0.0095	NA
	9/25/90		8.34	111.04	6.23	ND	ND	ND
	6/4/91		9.25	110.13	6.15	ND	ND	NA
	11/6/91		8.36	111.02	6.34	0.6	ND	NA
	5/29/92		8.28	111.10	6.21	68	ND	NA
B2	10/26/89	114.92	4.75	110.17	6.38 (6.43)	395 (350)	NAP	NA
	11/17/89		5.38	109.54	NA	613	ND	NA
	3/30/90		6.42	108.50	NA	NA	NA	NA
	4/27/90		3.82	111.10	6.04 (6.09)	674 (705)	ND (ND)	NA
	9/25/90		3.92	111.00	5.93	627	0.006	ND
	6/4/91		5.22	109.70	5.84	440	ND	NA
	11/7/91		4.83	110.09	5.91 (5.89)	350 (330)	ND (ND)	NA
	5/29/92		5.00	109.92	5.85 (5.89)	505 (432)	ND (ND)	NA
B3	10/26/89	112.78	6.44	106.34	6.79	45	NAP	NA
	11/17/89		5.71	107.07	NA	NA	ND (ND)	NA
	3/30/90		3.62	109.16	NA	NA	NA	NA
	4/27/90		4.47	108.31	6.68	256	ND	NA
	9/25/90		4.76	108.02	6.6	178	ND	ND
	6/4/91		6.89	105.89	6.43 (6.45)	212 (210)	ND	NA
	11/7/91		5.90	106.88	6.48	210	ND	NA
	5/29/92		5.67	107.11	6.49	161	ND	NA
B4	10/26/89	110.93	3.61	107.32	7.2	15	NAP	NA
	11/17/89		4.45	106.48	NA	NA	ND	NA
	9/25/90		3.20	107.73	6.91	ND	ND	ND
	11/7/91		3.73	107.20	6.94	4	ND	NA
	5/29/92		3.37	107.56	6.85	75	ND	NA
B5	10/26/89	110.87	1.38	109.49	6.53	17	NAP	NA
	11/17/89		2.00	108.87	NA	NA	ND	NA
	9/25/90		0.99	109.88	6.99	7.9	0.012	ND
	6/4/91		2.44	108.43	6.51	7	ND	NA
	11/6/91		1.18	109.69	6.97	19	ND	NA
	5/29/92		0.99	109.88	6.63	82	ND	NA

NOTE: ND = None Detected
NA = Not Analyzed
NAP = Analyses not applicable, sample not filtered
( ) = Duplicate results
MSL = Mean Sea Level
BTOC = Below the outside casing
1 = USEPA Method 357.4
2 = USEPA Method 239.2
3 = USEPA Method 8080

Preliminary Contamination Assessment at 5333 Fairbanks Street, Anchorage, Alaska. Shannon & Wilson, August 5, 1998 (the "Debenham Report").

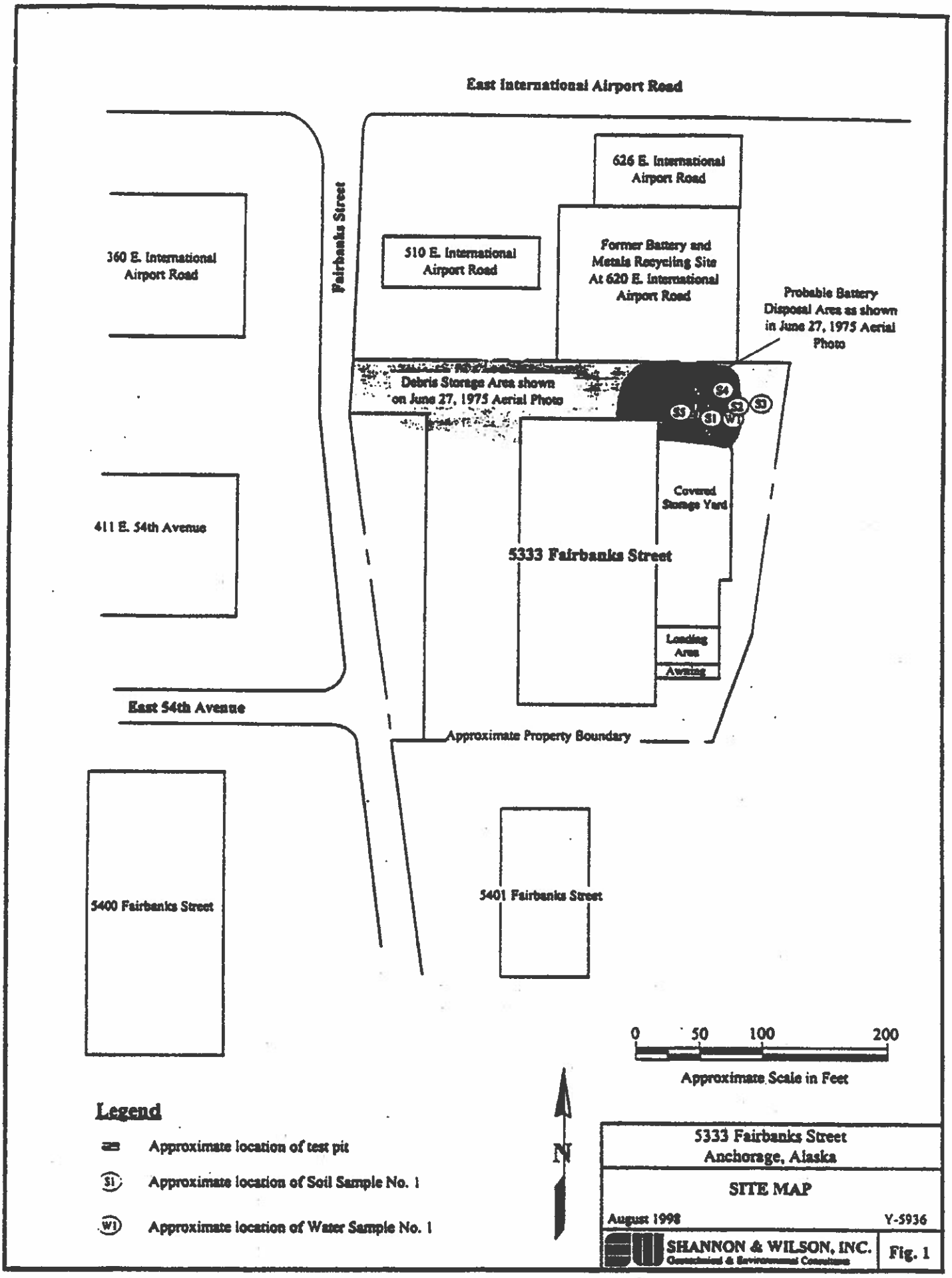

East International Airport Road
626 E. International Airport Road
360 E. International Airport Road
Fairbanks Street
510 E. International Airport Road
Former Battery and Metals Recycling Site At 620 E. International Airport Road
Probable Battery Disposal Area as shown in June 27, 1975 Aerial Photo
Debris Storage Area shown on June 27, 1975 Aerial Photo
S4
S2
S3
S5
S1
W1
411 E. 54th Avenue
Covered Storage Yard
5333 Fairbanks Street
Loading Area
Awning
East 54th Avenue
Approximate Property Boundary
5400 Fairbanks Street
5401 Fairbanks Street
0
50
100
200
Approximate Scale in Feet
N
Legend
Approximate location of test pit
S1 Approximate location of Soil Sample No. 1
W1 Approximate location of Water Sample No. 1
5333 Fairbanks Street
Anchorage, Alaska
SITE MAP
August 1998
Y-5936
SHANNON & WILSON, INC.
Geotechnical & Environmental Consultants
Fig. 1

TABLE 2 - SUMMARY OF ANALYTICAL RESULTS

		Source of Sample, Sample Number and Depth in Inches (See Table 1, Figure 1, and Appendix A)							
		Soil					Water	Quality Control	
		S1	S2	S3	S4	S5	W1	TB1	TB2
Parameter Tested	Method*	56-58	52.0	43	36	36		soil	water
Gasoline Range Organics (GRO) - ppm	AK 101	<0.540	3.3	-	-	-	<0.0400	<2.00	<0.0400
Diesel Range Organics (DRO) - ppm	AK 102	210	557	-	-	-	1.17	-	-
Residual Range Organics (RRO) - ppm	AK 103	129	334	-	-	-	0.744	-	-
Aromatic Volatile Organics (BTEX)									
Benzene - ppm	EPA 8021B/AK 101/EPA 602	<0.0135	<0.0383	-	-	-	<0.0010	<0.0500	<0.0010
Toluene - ppm	EPA 8021B/AK 101/EPA 602	<0.0135	0.0383	-	-	-	0.0024	<0.0500	<0.0010
Ethylbenzene - ppm	EPA 8021B/AK 101/EPA 602	<0.0135	0.131	-	-	-	<0.001	<0.0500	<0.0010
Xylenes - ppm	EPA 8021B/AK 101/EPA 602	0.0308	0.211	-	-	-	0.00162	<0.0500	<0.0010
Total BTEX - ppm	EPA 8021B/AK 101/EPA 602	0.0308	0.3803				0.00402		
Metals									
TCLP Arsenic - ppm	EPA/1311/7060	0.0265	<0.00500	<0.00500	<0.00500	0.786	-	-	-
TCLP Barium - ppm	EPA/1311/6010	0.573	0.859	0.593	0.446	0.532	-	-	-
TCLP Lead - ppm	EPA/1311/6010	17.1	3.44	42.6	51.0	248	-	-	-
Total Lead	EPA 7421	846	278	2670	2620	54500	-	-	-
Dissolved (Field Filtered) Barium	EPA 6010	-	-	-	-	-	0.119	-	-
Dissolved (Field Filtered) Lead	EPA 7421	-	-	-	-	-	<0.00568	-	-
Polynuclear Aromatic Hydrocarbons (PAH)	EPA 8310								
Acenaphthene - ppm	EPA 8310	0.60	<0.33	-	-	-	<0.33	-	-
Fluorene - ppm	EPA 8310	0.042	0.11	-	-	-	<0.033	-	-
Phenanthrene - ppm	EPA 8310	0.074	0.20	-	-	-	<0.017	-	-
Anthracene - ppm	EPA 8310	<0.017	0.068	-	-	-	<0.017	-	-
Fluoranthene - ppm	EPA 8310	0.020	0.032	-	-	-	0.0278	-	-
Pyrene - ppm	EPA 8310	<0.017	0.052	-	-	-	<0.017	-	-
Benzo(a)Anthracene - ppm	EPA 8310	0.011	0.0025	-	-	-	<0.0033	-	-
Benzo(b)Fluoranthene - ppm	EPA 8310	0.020	0.0070	-	-	-	<0.0033	-	-
Benzo(k)Fluoranthene - ppm	EPA 8310	0.013	0.011	-	-	-	<0.0033	-	-
Benzo(a)Pyrene - ppm	EPA 8310	0.037	0.0095	-	-	-	<0.017	-	-
Dibenzo(a,h)Anthracene - ppm	EPA 8310	<0.0033	0.0057	-	-	-	<0.0033	-	-
Benzo(g,h,i)Perylene - ppm	EPA 8310	0.027	0.028	-	-	-	<0.017	-	-
Polychlorinated Biphenyls (PCBs) - total	SW846/8082	11.4	5.05	0.388	6.00	28.8	<0.00104	-	-

KEY	DESCRIPTION
-	Sample not analyzed for this parameter
*	See Attachment A for compounds tested and limits of detection
<1.25	Analyte below the method detection limit of 1.25 ppm
ppm	Parts per million

APPENDIX B

METHOD 3 CALCULATOR OUTPUT

Alaska Department of Environmental Conservation • Spill Prevention and Response

Contaminated Sites Remediation Program

STEP 4:

The following are the calculated cleanup levels for each chemical and pathway. Where values are provided for more than one pathway, the lowest of the values should be used as the soil cleanup level. All cleanup levels are in units of mg/kg. Any other chemical-specific requirements that must be considered follow the table of cleanup levels.

Chemical Name	Chemical Type	Ingestion	Inhalation	Migration to GW
DRO (Total)	Petroleum	12500	12500	9760
Lead	Inorganic			
PCBs	Organic			

Chemical	Notes
DRO (Total)	The Maximum Allowable DRO concentration is 12500 mg/kg.
Lead	Lead cleanup levels are 400 mg/kg for residential sites and 1000 mg/kg for commercial sites.
PCBs	Cleanup levels for PCBs are 1 mg/kg and 10 mg/kg for residential land use in surface and subsurface soil, respectively. Cleanup levels for commercial/industrial land use are 10 mg/kg and 25 mg/kg for surface and subsurface soil, respectively.

These cleanup levels should be printed. To print, please select the print function on your web browser. This page may also be saved and emailed for documentation of the calculated cleanup levels. For best results, save the page as a "Web Archive for email" file (.mht) if your browser supports this; in Internet Explorer 5 choose "Save as..." from the file menu and change the "Save as type" to

"Web Archive for email". Other browsers should have a similar choice.

For reference, the parameters used to calculate these levels are as follows (with defaults that have been changed listed in parentheses):

Volatilization Pathway:

ρ_b: Dry soil bulk density (g/cm^3):	1.5	(Default: 1.5)
n: Total soil porosity (L_{pore}/L_{soil}):	0.434	(Default:
Θ_w: Water-filled soil porosity (L_{water}/L_{soil}):	0.15	(Default: 0.15)
Θ_a: Air-filled soil porosity (L_{air}/L_{soil}):	0.284	(Default:
w: average soil moisture content (g_{water}/g_{soil}):	0.1	(Default: 0.1)
f_{oc}: organic carbon content of soil (g/g):	0.039	(Default:

Groundwater Pathway:

Θ_w: Water-filled soil porosity (L_{water}/L_{soil}):	0.3	(Default: 0.3)
Θ_a: Air-filled soil porosity (L_{air}/L_{soil}):	0.13	(Default: 0.13)
w: average soil moisture content (g_{water}/g_{soil}):	0.2	(Default: 0.2)
K: aquifer hydraulic conductivity (m/yr):	876	(Default: 876)
i: hydraulic gradient (m/m):	0.002	(Default:
L: source length parallel to groundwater flow	32	(Default: 32)
I: infiltration rate (m/yr):	0.13	(Default: 0.13)
d_a: aquifer thickness (m):	10	(Default: 10)

The exposure scenario and zone for this project: Under 40-inch Zone - Commercial/Industrial Exposures
Today's date: 3/27/03
Enter site name to view on printout: HANSON M&M ANCORAGE

If you wish to calculate cumulative risks based on concentrations that have been entered for the site, select the "continue" button

below. If you do not wish to complete this step, please note that you must demonstrate that the calculated cleanup levels will not produce unacceptable cumulative risks before they will be accepted. If cumulative risks are above the benchmarks, the cleanup levels should be modified downwards. See the Guidance on Cleanup Standards Equations and Input Parameters for details.

Continue

Alternatively, to return to the first step to rerun the calculator or change parameters, click here.

STEP 5:

The following are cumulative cancer risks and hazard quotients by chemical. Note that petroleum ranges (GRO, DRO, and RRO) are not included in cumulative risks. Also, if PCBs or dioxins are present at the site, the cumulative risks associated with these chemicals may also need to be considered; please contact the ADEC project manager for your site for information on how to address these chemicals.

Chemical Name	Concentration (mg/kg)	Cancer Risk	Hazard Quotient
Lead	1000	0	0
PCBs	0	0	0

Overall totals are as follows:

Hazard Index: 0
Cancer Risk: 0

These cumulative risk levels should be printed. To print, please select the print function on your web browser. This page may also be saved and emailed for documentation of the calculated cumulative risks. For best results, save the page as a "Web Archive for email" file (.mht) if your browser supports this; in Internet Explorer 5 choose "Save as..." from the file menu and change the "Save as type" to "Web Archive for email". Other browsers should a similar choice.

To revise concentrations and recalculate cumulative risks, click here. Alternatively, to return to the first step to rerun the calculator or change parameters, click here.