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A Report Prepared for
U.S. Army Corps of Engineers, Alaska District
Project Support Section
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**SITE ASSESSMENT/
RELEASE INVESTIGATION AND
CORRECTIVE ACTION PLAN
SITE 4, BUILDING 35752
HIGH-FREQUENCY TRANSMITTER SITE
FORT RICHARDSON, ALASKA**

HLA Project No. 24212

by



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EXECUTIVE SUMMARY

This report presents the results of an underground storage tank (UST) release investigation conducted by Harding Lawson Associates (HLA) for the U.S. Army Corps of Engineers (USACE), Alaska District. This project was assigned to HLA as Delivery Order No. 0012 under Indefinite Architect-Engineer Services Contract No. DACA85-91-D-0008.

The release investigation was conducted at Site 4, Building 35752 to 1) assess the presence and concentrations of petroleum hydrocarbons and related chemicals in the soil and groundwater, 2) evaluate the need for remediation, and 3) provide site-specific data for development of a corrective action plan for contaminated soil and groundwater, as appropriate.

Fieldwork was conducted at the site from August 22 through September 2, 1993, and consisted of drilling and sampling six soil borings, installing two new monitoring wells, and sampling surface-water and sediment from two water ponds west of the site. The sample results are compared to maximum contaminant levels (MCLs) in groundwater and Alaska Department of Environmental Conservation (ADEC) cleanup levels specified in Title 18, Alaska Administrative Code, Chapter 78.315 (18 AAC 78.315) for soil, and are included in section 5. Potential remedial alternatives are identified in the Corrective Action Plan (section 6).

Results and conclusions from the investigation are summarized as follows:

- Petroleum hydrocarbon concentrations detected in borings were above ADEC cleanup levels estimated for the site.
- Polychlorinated biphenyl (PCB) concentrations were detected in soil borings. If results of quantitative risk assessment confirm that PCB concentrations pose unacceptable risk to human health, solvent extraction or excavation and offsite landfilling is recommended.

If results of the proposed quantitative risk assessment confirm that concentrations pose some risk to human health, possibly limited action (site capping), bioremediation, or a combination of the two alternatives is recommended.

If results of the proposed quantitative risk assessment confirm that concentrations do not pose unacceptable risk to human health, a no-action alternative is recommended.

- Benzene was detected above the MCL in groundwater at Monitoring Well AP-2982. No remedial measures are recommended at this time, except to continue monitoring groundwater for continuing decreases in contaminant concentrations.
- Petroleum hydrocarbon, PCB, and lead concentrations were detected in sediment from the ponds in the vicinity of Building 35752. Cleanup levels for sediment have not been estimated for this site. A risk assessment is recommended to evaluate the significance of detected concentrations.

1.0 INTRODUCTION

The U.S. Army Corps of Engineers (USACE), Alaska District, retained Harding Lawson Associates (HLA) to perform an underground storage tank (UST) release investigation at Site 4, Building 35752, High-Frequency Transmitter site (Site 4), Fort Richardson, Alaska (Plate 1). The USACE assigned this project to HLA as Delivery Order No. 0012 under the terms of Indefinite Architect-Engineer Services Contract No. DACA85-91-D-0008. The Scope of Work (SOW) was authorized by Mr. James Rich, the USACE's Contracting/Ordering Officer, on April 14, 1993.

1.1 OBJECTIVES

The Fort Richardson UST release investigation was conducted to 1) assess the presence and concentrations of petroleum hydrocarbons and related chemicals in the soil and groundwater at the former UST locations, 2) evaluate the need for remediation, and 3) provide site-specific data for development of a Corrective Action Plan (CAP) for contaminated soil and groundwater, as appropriate.

This UST release investigation was conducted in accordance with Title 18, Alaska Administrative Code, Chapter 78 (18 AAC 78).

1.2 SUMMARY

This report documents the results of the Site 4 UST release investigation and presents HLA's recommendations for corrective actions. Section 2 provides background information on Site 4. HLA's field sampling program and results are summarized in sections 3 and 4, respectively. Section 5 presents the significance of findings.

Following review of the draft site assessment/release investigation (SA/RI) and CAP, this final SA/RI CAP was prepared by HLA incorporating appropriate USACE, Fort Richardson Directorate of Public Works (DPW), and Alaska Department of Environmental Conservation (ADEC) comments. Appendix A contains these comments.

2.0 BACKGROUND

2.1 PROJECT LOCATION

Fort Richardson is bounded by the City of Anchorage to the south and west, by Elmendorf Air Force Base to the west, by Knik Arm to the north and west, and by the Chugach Mountains to the south and east (Plate 1). The main cantonment area, which includes an airfield and numerous roads and structures, is located within Townships 13 and 14 North, Ranges 2 and 3 West, of the Seward Meridian. The Glenn Highway bisects Fort Richardson south of the main cantonment area.

Site 4 is located in the southwest area of Fort Richardson at Building 35752, near Ship Creek and the intersection of the Glenn Highway and Muldoon Road.

2.2 HISTORY OF FORT RICHARDSON

Fort Richardson was established northeast of Anchorage, Alaska, in 1940, under the command of the Alaskan Defense Force, which was redesignated the Alaskan Defense Command in 1941. Approximately 7,800 U.S. Army personnel were stationed on post. Fort Richardson was utilized as a staging area and supply point during World War II, when troop strengths increased to over 15,500. In 1947, the Alaskan Defense Command was reorganized as the U.S. Army, Alaska (ESE, 1983).

In 1950, use of the Fort Richardson property was divided between the Army and the U.S. Air Force. The Army established a new cantonment area on the northern portion of the property, while the Air Force established Elmendorf Air Force Base on the southern portion of the property. In 1963, the U.S. Army, Alaska, was reorganized into the 172nd Infantry Brigade. Since 1986, Fort Richardson has been under the command of the 6th Infantry Division (Light) (6th ID) (DOEH, 1990).

2.3 POPULATION

Fort Richardson lies within the boundaries of the Municipality of Anchorage. The post is currently staffed by about 1,200 civilians and 4,200 military personnel (U.S. Army, 1993). Estimates indicate that roughly one-third of the assigned military personnel live off post.

2.4 CLIMATE

Fort Richardson is located in a climatic transition zone between the maritime climate of the coast and the continental climate of interior Alaska. The mean annual temperature is 38.2 degrees Fahrenheit (°F). Mean monthly temperatures range from 13.8°F in January to 50.0°F in July (NOAA, 1987).

The mean annual total precipitation for Fort Richardson is approximately 15.7 inches (Patric, et. al., 1992) with almost half of the

precipitation occurring in July, August, and September. The total precipitation includes a mean annual snowfall of about 65 inches. The driest period occurs from January through May (GACC, et. al., 1975).

The area is moderately to very cloudy throughout the year, with approximately 234 cloudy days and 65 partly cloudy days. Heavy fog occurs approximately 22 days each year (E&E, 1991).

2.5 REGIONAL GEOLOGY

Fort Richardson is situated between the Chugach Mountains to the south and east, and Knik Arm of Cook Inlet to the north and west (Plate 1). Deposits in this area consist of a thick Quaternary unit overlying Tertiary bedrock. The Quaternary unit consists of deposits from five major glaciations (Karlstrom, et al., 1964), interfingering with deposits of marine and fluvial origin. The bulk of deposition occurred during the last two glacial events (75,000 to 10,000 years before present), and most of the surficial deposits in the Fort Richardson area are part of a large glacio-alluvial outwash plain which is several miles wide. These deposits accumulated to a large degree about 25,000 to 10,000 years ago (Zenone, et al., 1974).

Stratigraphic units in the Anchorage area are commonly interfingering as a result of the interplay of several geologic processes, including glacio-fluvial, marine, and glacio-deltaic sedimentation. These processes created a complex stratigraphic record that consists of four generalized units (U.S. Army, undated). The surface unit consists of a thin mantle of fine-grained soil, generally 2 to 5 feet deep, which blankets the area around Ship

Creek. Underlying the surface fines are relatively clean coarse-grained soils derived from outwash and glacial debris. These deposits are approximately 10 to 50 feet thick. The outwash material grades east into cobble- and boulder-sized particles near the base of the Chugach Mountains. The coarse-grained outwash unit is underlain by a unit characterized by marine clay interbedded with silt and fine clay. This unit is commonly referred to as the Bootlegger Cove Formation (Urdike and Carpenter, 1986) and extends to depths of 200 to 250 feet near the mouth of Ship Creek. The Bootlegger Cove Formation thins toward the east and north and is not present along the Chugach Mountain front (Freethey, 1976). Glacial till underlies the Bootlegger Cove Formation and consists of boulders, cobbles, gravel, sands, and fine-grained soils. This unit extends to bedrock.

Bedrock is not exposed in the lowlands of Anchorage and has been penetrated in only a few instances. Bedrock is exposed in the Chugach Mountains to the east and consists of undifferentiated Mesozoic rocks. Tertiary deposits of the Kenai Group unconformably overlie the Mesozoic rocks and form a westward thickening wedge which pinches out near the base of the Chugach Mountains. Near the mouth of Ship Creek, bedrock occurs approximately 300 to 400 feet below ground (HLA, 1988).

2.6 WATER RESOURCES

Water resources in the Fort Richardson area include both surface-water features and groundwater. As discussed in section 2.4, regional

precipitation, including rainfall and snowmelt, provides approximately 16 inches of water per year, and the Chugach Mountains to the east provide a large recharge source to the area.

2.6.1 Surface Water

The two main surface drainages at the Fort Richardson post are Eagle River and Ship Creek. These drainages traverse the installation from east to west and drain into Knik Arm. Eagle River traverses the northern part of Fort Richardson and forms Eagle River Flats and Eagle Bay at the mouth of the river. Ship Creek traverses the southern part of Fort Richardson, through the City of Anchorage, and drains near the mouth of Knik Arm (see Plate 1).

Seepage investigations were performed along Ship Creek by the U.S. Geological Survey (USGS) to assess channel gains or losses from unconfined groundwater. The investigations showed that Ship Creek is losing water in areas upstream of the Davis Highway (Plate 2) and regaining water from the Davis Highway area to the stream mouth (Freethy, 1976).

2.6.2 Groundwater

Water-bearing strata (aquifers) in the Anchorage lowlands consist of a shallow unconfined aquifer, perched aquifers, and a deeper confined aquifer. The Bootlegger Cove Formation is the main confining unit to the deeper confined aquifer. However, the Bootlegger Cove Formation pinches out to the north, and the aquifer is less clearly defined. In this area, the discontinuous units of impermeable glacial deposits result in the formation of

several perched aquifers. Wells within Fort Richardson indicate that the depth to groundwater varies from near the surface in the immediate vicinity of Ship Creek to more than 200 feet at other areas on the post. The range is attributed mainly to the variable nature of these glacial deposits. Groundwater typically flows in a westerly direction toward Knik Arm (U.S. Army, undated).

2.6.3 Drinking Water Supply

Drinking water at Fort Richardson is provided mainly by surface water from Ship Creek obtained at the Fort Richardson Military Dam located near the Chugach Mountain Front. Several deep wells (more than 300 feet deep) located near the hospital at Elmendorf Air Force Base provide a backup water supply if needed. A water treatment plant located near the dam provides treatment for drinking water used at Fort Richardson and Elmendorf Air Force Base (E&E, 1991). The Municipality of Anchorage's main drinking water supply sources are Ship Creek and Eklutna Lake.

2.7 SITE DESCRIPTIONS/INVESTIGATIVE HISTORY

Site 4 (Plate 2) was identified for investigation under Delivery Order No. 0012. Site 4 consists of Building 35750, which houses equipment and controls for operation of nearby high-frequency radio transmitters, and Building 35752, a former generator building. Building 35752 is abandoned and is reportedly scheduled for demolition.

Seven 5,000-gallon waste oil USTs were formerly located on the south side of Building 35752 (Plate 2). The USTs were identified as Tanks 51, 52, 53, 54, 86, 87, and 88 (USACE, 1990a). Concern over potential releases prompted the removal of the tanks in 1990.

2.7.1 UST Decommissioning

During May of 1990, seven 5,000-gallon waste oil USTs were removed by the 6th ID/DPW. The excavation was reportedly approximately 19 feet deep and measured 98 feet by 43 feet at the surface (USACE, 1991). Based on these measurements, more than 2,000 cubic yards of soil was excavated. Groundwater was encountered in the excavation at approximately 16 feet. Excluding tank volumes, the excavation yielded an estimated 840 cubic yards of soil potentially contaminated with hydrocarbons. The potentially contaminated soil was taken to the Fort Richardson Landfill for temporary storage, and the excavation was backfilled with soil (USACE, 1990). Based on the apparent discrepancy between the excavated volume and the volume of potentially contaminated soil removed, some of the excavated soil may have been used as backfill.

The stockpiled soil was sampled and characterized a year later by Ecology and Environment, Inc., (E&E) in August 1991 (E&E, 1992). The volume of stockpile material was not verified prior to sampling. Results of the analyses indicated that polychlorinated biphenyls (PCBs) concentrations ranging from 5,500 to 322,000 micrograms per kilogram ($\mu\text{g}/\text{kg}$) were present.

The stockpiled soil was containerized, manifested, and shipped to Envirosafe Services of Idaho, Inc.'s, treatment, storage, and disposal (TSD) facility in Grandview, Idaho.

Residual liquid/sludge from within four of the seven tanks was sampled and analyzed by Northern Testing Laboratories, Inc., (NTL) in Anchorage for halogens, metals, and PCBs. The other three tanks did not have enough sludge to draw a sample (U.S. Army, 1990). PCBs were not detected in the sludge samples.

Following UST removal, 21 soil samples and 2 groundwater samples were collected from the limits of the excavations by DPW personnel and were analyzed by NTL. Sampled soil revealed total petroleum hydrocarbons (TPH) at levels of up to 14,000 milligrams per kilogram (mg/kg), and benzene, toluene, ethylbenzene, and xylenes (total BTEX) of up to 100 mg/kg. PCBs were not detected above the detection limit of 0.1 mg/kg in the four soil samples that were analyzed for PCBs.

2.7.2 USACE Site Release Investigation

Subsequent to the UST decommissionings, the USACE performed a release investigation at the site. The USACE drilled six soil borings around the perimeter of the excavation in August 1990 (Plate 3). Each of the borings were completed as monitoring wells (AP-2982, AP-2983, AP-2984, AP-2985, AP-2986, AP-2987).

Nineteen soil samples from six borings were collected and analyzed for volatile organic compounds (VOCs) and petroleum hydrocarbons. Samples were not analyzed for PCBs. Analytical data for soil are presented in Appendix B. Soil samples from AP-2986 contained 730 mg/kg of diesel fuel at 10 feet below ground surface. AP-2986 is located on the south side of the excavation. No other soil borings had contaminant concentrations above the ADEC matrix cleanup levels for this site.

Six groundwater samples were collected and analyzed for VOCs and petroleum hydrocarbons from six monitoring wells in 1990. Analytical data for water is presented in Appendix B. A groundwater sample from Monitoring Well AP-2982 located outside excavation boundaries on the northwest corner of the excavation contained 620 $\mu\text{g}/\text{kg}$ of benzene and 1,300 $\mu\text{g}/\text{kg}$ of toluene. Groundwater samples collected and analyzed from AP-2987 contained 420 micrograms per liter ($\mu\text{g}/\text{L}$) of benzene and 1,300 $\mu\text{g}/\text{L}$ toluene. AP-2987 is located outside the southwest corner of the excavation. No other groundwater samples contained analyte concentrations above MCLs.

3.0 FIELD INVESTIGATION SUMMARY

3.1 OBJECTIVE AND FIELD PROGRAM IMPLEMENTATION

The objective of the field program was to evaluate the presence and concentrations of petroleum compounds and related hazardous substances in soil and groundwater at Site 4. To accomplish this goal, HLA performed the following tasks:

- Soil samples were collected from six soil borings drilled on site.
- Two new monitoring wells were installed.
- Groundwater samples were collected from the two new and six existing monitoring wells.
- Surface-water and sediment samples were collected from two water ponds directly west of Building 35752.

HLA conducted a geophysical survey at the site on August 22, 1993, to clear soil boring locations for drilling. HLA's field investigation team mobilized to Fort Richardson on August 23, 1993. Soil borings were drilled and monitoring wells were constructed from August 23 through 26, 1993. HLA developed and sampled the two newly completed monitoring wells and sampled six existing monitoring wells from August 31 through September 2, 1993.

3.1.1 Deviations from the Release Investigation Plan

The field program was executed, with some exceptions, following the procedures set forth in HLA's "Sampling and Analysis Plan, Site 4,

Building 35752 High-Frequency Transmitter Site, Fort Richardson, Alaska" (1993a), and HLA's "Quality Assurance Program Plan for Underground Storage Tank Site Assessments Within Alaska" (1991).

At the request of the USACE, Site 1, Building 36012 was deleted from the scope of this project and one additional soil boring was added to the Site 4 investigation. This change was documented in the USACE's revised SOW dated August 19, 1993. The additional soil boring at Site 4 brought the total number of soil borings installed to six, instead of the five originally presented in the Sampling and Analysis Plan (SAP). The six soil borings installed at the site increased the number of soil samples collected at the site during the field investigation. Fifteen project and 4 quality assurance/quality control (QA/QC) samples originally presented in the sample plan increased to 18 project and 6 QA/QC samples during the actual investigation. The number of geotechnical samples collected also increased from five to six (one from each boring).

The SAP originally proposed collecting eight project and four QA/QC groundwater samples. HLA collected eight project and two of the four QA/QC groundwater samples from the eight monitoring wells on site.

A 2-inch standpipe near Monitoring Well AP-3232 noted in the SAP was investigated to evaluate whether it was associated with an unknown UST. Based on a geophysical study performed at the site by HLA on August 22, 1993, HLA concluded that a UST was not associated with the standpipe. The standpipe was not considered further in the field investigation.

3.2 SAMPLING PROGRAM

3.2.1 Borings

HLA drilled six borings at Site 4, as shown on Plate 3. Borings were drilled using a truck-mounted, B-61 Mobile Drill equipped with a 10-inch outside diameter (O.D.) hollow-stem auger. Boring depths typically ranged from 16 to 22 feet. Boring logs and geotechnical data are presented in Appendix C.

Surface geophysical methods were employed to locate utilities and other obstructions to drilling without disturbing the ground surface. Geophysical equipment used at Site 4 included ground-penetrating radar (GPR), an electromagnetic (EM) induction instrument, and a buried pipe and cable locator (RD-400).

Soil samples from each boring were collected for both chemical and geotechnical analyses by driving a split-barrel sampler with a 300-pound hammer falling 30 inches. Boring numbers, sample numbers, depths, and chemical analyses requested by the USACE are summarized in Appendix D. One soil sample was collected from each boring for geotechnical analyses of grain-size distribution, plasticity, and soil moisture. The geotechnical samples were collected from various depths at the sites to verify visual soil classifications made in the field during drilling and to evaluate soil conditions for remedial design.

Four borings not completed as monitoring wells were backfilled with bentonite following the procedures outlined in the SAP (HLA, 1993a).

The location and elevation of each soil boring was surveyed by the USACE. Survey coordinates and the ground-surface elevation for each boring location are included on the boring logs and on a summary sheet in Appendix C.

The following procedures were used to collect soil samples:

- Subsurface-soil samples from borings were collected with a 4-inch-diameter, 18-inch-long, split-barrel drive sampler. The sampler was driven at least 18 inches (or farther if necessary) to obtain sufficient sample volume to fill the sample containers. Sampling intervals were at 5, 10, and 15 feet.
- Samples to be analyzed for VOCs or gasoline-range organics (GRO) were retrieved from the sampler first to minimize aeration. Soil for the other required analyses was composited in a stainless steel bowl before being placed in the sample containers.
- All analytical sample containers were labeled at the time of collection with boring number, depth, time, date, and sampler's initials, and then logged onto the chain-of-custody form before the sampler left the location. Geotechnical sample containers were also labeled with this information.
- Analytical sample containers were stored and shipped in coolers with Blue Ice.

3.2.2 Monitoring Wells

HLA installed monitoring wells in two borings at the locations shown on Plate 3. Monitoring wells were constructed of 2-inch-diameter, Schedule 40, flush-joint threaded polyvinyl chloride (PVC) piping. The screen consisted of a 2-inch inside diameter (I.D.) by 3.63-inch O.D., 0.008-inch slot PVC Vee-Pack well screen containing prepacked 40/60 silica sand. The 10-foot screened interval was installed so that at least 5 feet of screen extended above the water table. A secondary pack of clean 40/60 mesh silica sand was placed adjacent to the entire screened interval and extended at least

2 feet above the top of the screen. The remaining annulus was backfilled to the surface with hydrated, rough-cut bentonite. Each well was completed at the surface with a locking, steel security casing which was placed over the well pipe and embedded into the bentonite seal. Each security casing was locked with a Master Lock padlock keyed identically, in accordance with Fort Richardson DPW instructions. The well number was marked on the interior and exterior of the security casing. Plate 4 presents monitoring well completion details.

HLA Wells AP-3231 and AP-3232 were developed, purged, and sampled. The six existing wells (AP-2982 through AP-2987) were also purged and sampled. Monitoring well development, purging, and sampling were performed according to the procedures outlined in the SAP (HLA, 1993a). Well development and sampling field data are presented in Appendix E.

The location, ground-surface elevation, and top of casing elevation of each monitoring well were surveyed by the USACE. Survey data and monitoring well completion details are presented on Plate 4.

The following procedures were used to collect groundwater samples:

- Approximately 3 well volumes were pumped from each well immediately after completion of well development, before samples were collected.
- The static water level below the top of the PVC casing was measured and recorded before the monitoring wells were purged.
- After well purging, approximately 1 liter of water was collected in a glass bottle and photographed.
- Wells were sampled using the submersible 2-inch Grundfos pump at a low flow rate (approximately 100 milliliters per minute).

- The appropriate sample containers were filled carefully to minimize aeration and prevent oxidation of reduced compounds.
- Sample containers were stored and shipped in coolers with Blue Ice.

3.2.3 Sediment and Surface Water

Three sediment and three surface-water samples were collected from Sampling Locations SD-1, SD-2, SD-3, SW-1, SW-2, and SW-3, as shown on Plate 3. Sediment samples were collected using a stainless-steel trowel, and surface-water samples were collected by direct submersion of the sample container in the pond.

3.2.4 Quality Assurance and Quality Control Samples

QA/QC samples were collected to assess the precision, accuracy, and representativeness of sampling activities. The following QA/QC sample types were collected during the field program:

- Duplicates
- Rinsate blanks
- Trip blanks

The QA and QC samples were shipped to separate analytical laboratories as identified in section 3.3. QA/QC samples were collected according to the procedures outlined in the SAP (HLA, 1993a). A summary of QA/QC samples collected during this project is presented in Table 3-1. The QA/QC sample collection frequency during the field program is presented in Table 3-2.

Table 3-1. Quality Assurance/Quality Control Sampling Summary

	Subsurface- Soil Samples ^a	Groundwater Samples ^a	Surface Samples ^a	Sediment Samples ^a
QA Duplicates	006SL 011SL 022SL	012WA	004WA	004SD
QC Duplicates	007SL 012SL 023SL	013WA	005WA	005SD
QA Rinsate Blanks	001RB	005RB	003RB	
QC Rinsate Blanks	002RB 007RB	006RB 008RB	004RB	
QA Trip Blanks		002TB		
QC Trip Blanks	005TB 006TB	001TB 003TB 004TB		

^a The sample number prefix 93RTS has been omitted for brevity.

QA = Quality assurance samples were shipped by HLA to the U.S. Army Corps of Engineers' North Pacific Division laboratory.

QC = Quality control samples were shipped by HLA to National Environmental Testing Inc., laboratory.

Table 3-2. Quality Assurance/Quality Control Duplicate Sample Collection Frequency

Analysis	Number of Project Samples	Quality Assurance Duplicates		Quality Control Duplicates	
		Number Collected	Collection ^a Frequency (percent)	Number Collected	Collection ^a Frequency (percent)
<u>Soil</u>					
Volatile Organic Compounds	18	3	16	3	16
Benzene, Toluene, Ethylbenzene, and Xylenes	18	3	16	3	16
Metals	18	3	16	3	16
Total Petroleum Hydrocarbons	18	3	16	3	16
Diesel-Range Petroleum Hydrocarbons	18	3	16	3	16
Gasoline-Range Petroleum Hydrocarbons	18	3	16	3	16
Polychlorinated Biphenyls	18	3	16	3	16
Total Organic Carbon	1	0	0	0	0
Biofeasibility Analyses ^b	2	1	50	1	50
<u>Groundwater</u>					
Volatile Organic Compounds	8	1	12	1	12
Benzene, Toluene, Ethylbenzene, and Xylenes	8	1	12	1	12
Metals	8	1	12	1	12
Total Petroleum Hydrocarbons	8	1	12	1	12
Diesel-Range Petroleum Hydrocarbons	8	1	12	1	12
Gasoline-Range Petroleum Hydrocarbons	8	1	12	1	12
Polychlorinated Biphenyls	8	1	12	1	12
Total Organic Carbon	2	0	0	0	0
Biofeasibility Analyses ^b	2	0	0	1	50
<u>Surface Water</u>					
Volatile Organic Compounds	3	1	33	1	33
Benzene, Toluene, Ethylbenzene, and Xylenes	3	1	33	1	33
Metals					
Total Petroleum Hydrocarbons	3	1	33	1	33
Polychlorinated Biphenyls	3	1	33	1	33

Table 3-2. Quality Assurance/Quality Control Duplicate Sample Collection Frequency
(continued)

Analysis	Number of Project Samples	Quality Assurance Duplicates Collection ^a		Quality Control Duplicates Collection ^a	
		Number Collected	Frequency (percent)	Number Collected	Frequency (percent)
<u>Sediment</u>					
Volatile Organic Compounds	3	1	33	1	33
Benzene, Toluene, Ethylbenzene, and Xylenes	3	1	33	1	33
Metals	3	1	33	1	33
Total Petroleum Hydrocarbons	3	1	33	1	33
Diesel-Range Petroleum Hydrocarbons	3	1	33	1	33
Gasoline-Range Petroleum Hydrocarbons	3	1	33	1	33
Polychlorinated Biphenyls	3	1	33	1	33

^a Collection frequency is expressed as the percent of the number of project samples collected. The quality assurance/quality control goal for this project is at least 10 percent.

^b Biofeasibility analyses consist of sheen screen; heterotrophic bacteria; alkalinity; iron; and nitrate, ammonia, and phosphate.

3.2.5 Equipment Decontamination

Decontamination consisted of steam cleaning and/or Alconox washing followed by potable water and deionized water rinses. All sampling equipment contacting media (soil or water) to be sampled was decontaminated using the procedures specified in the SAP (HLA, 1993a).

3.2.6 Waste Handling

Investigation-derived wastes (IDW) consisted of drill cuttings, well development and purge water, and equipment decontamination water. HLA screened drill cuttings from each boring for organic vapors with a flame ionization detector (FID). Drill cuttings having FID readings of less than 15 parts per million (ppm) were stockpiled on a double layer of 6-mil plastic at the excavation area. The stockpile was covered by a double layer of 6-mil plastic and left on site. Drill cuttings having FID readings of greater than 15 ppm were drummed in new, 55-gallon, open-top drums. All well development, purge, and equipment decontamination water was placed in new, 55-gallon drums with bung-type openings. A label was placed on each drum specifying the source, date filled, drum number, and drum contents.

All drums of IDW were transported to Building 45125 at Fort Richardson. An inventory of containerized soil cuttings, well development and purge water, and equipment decontamination water was performed. The drum inventory log, identifying the drum number, boring or monitoring well number, drum contents, and corresponding sample numbers, is presented in Table 3-3.

Table 3-3. Soil Cuttings, Purge and Development Water, and Equipment Decontamination Water Drum Inventory for Site 4, Building 35752

Boring/Well Number	Drum Number	Date Filled	Contents	Sample Numbers
AP-3227	01S-1a	8/23/93	Soil cuttings	93RTS0015L 93RTS0025L 93RTS0035L
AP-3228	02S-1a	8/24/93	Soil cuttings	93RTS0045L 93RTS0055L 93RTS0085L
AP-3231	MW1W1a	9/2/93	Purge and development water	93RTS014WA
AP-3231	MW1W2b	9/2/93	Purge and development water	93RTS014WA
AP-3232	MW2W1b	9/1/93	Purge and development water	93RTS010WA
AP-3232	MW2W2b	9/1/93	Purge and development water	93RTS010WA
AP-3232	MW2W3b	9/1/93	Purge and development water	93RTS010WA
AP-3232	MW2W4b	9/1/93	Purge and development water	93RTS010WA
AP-2982	AP-2982W1b	9/2/93	Purge and development water	93RTS015WA
AP-2983	AP-2983W1b	8/31/93	Purge and development water	93RTS008WA
AP-2983	AP-2983W2b	8/31/93	Purge and development water	93RTS008WA
AP-2984	AP-2984W1b	8/31/93	Purge and development water	93RTS007WA
AP-2984	AP-2984W1b	8/31/93	Purge and development water	93RTS007WA
AP-2985	AP-2985W1b	8/31/93	Purge and development water	93RTS006WA
AP-2986	AP-2986W1b	8/31/93	Purge and development water	93RTS009WA
AP-2986	AP-2986W2b	8/31/93	Purge and development water	93RTS009WA
AP-2987	AP-2987W1b	9/1/93	Purge and development water	93RTS011WA
Decontamination Water	Decon-1c	8/23/93 through 9/2/93	Decontamination water	No sample

Table 3-3. Soil Cutting, Purge and Development Water, and Equipment Decontamination Water Drum Inventory for Site 4, Building 35752 (continued)

Boring Number	Drum Number	Date Filled	Contents	Sample Numbers
Decontamination Water	Decon-2c	8/23/93 through 9/2/93	Decontamination water	No sample
Decontamination Water	Decon-3c	8/23/93 through 9/2/93	Decontamination water	No sample
Decontamination Water	Decon-4c	8/23/93 through 9/2/93	Decontamination water	No sample
Decontamination Water	Decon-5c	8/23/93 through 9/2/93	Decontamination water	No sample

- a Drums awaiting transfer to the Defense Reutilization Marketing Office (DRMO) for disposal.
- b Uncontaminated water will be disposed of by the Directorate of Public Works (DPW).
- c Awaiting disposal through the DRMO.

3.3 ANALYTICAL PROGRAM

The following laboratories were used during this project:

- National Environmental Testing, Inc., (NET) of Santa Rosa, California;
- Applied Research and Development Laboratory, (ARDL) of Mt. Vernon, Illinois;
- USACE North Pacific Division (NPD) laboratory of Troutdale, Oregon.
- Commercial Testing & Engineering Co. (CT&E), Environmental Laboratory Services of Anchorage, Alaska.

Project and QC samples were analyzed by NET. QA samples were shipped by HLA to the NPD laboratory, which forwarded them to ARDL for analyses. Geotechnical samples were analyzed by the NPD laboratory.

3.3.1 Data Quality Objectives

The data quality objectives (DQOs) for this project were to implement procedures for obtaining and evaluating data in an accurate, precise, and complete manner. The DQOs are necessary so that measurement data, sampling procedures, and field measurements provide information that is comparable to and representative of actual field conditions. The sampling program was designed to produce data of sufficient quality for use in making decisions about additional actions at Site 4. The sample collection, sample handling, and analytical procedures specified in the SAP (HLA, 1993a) were developed to fulfill these DQOs and were strictly adhered to during the field program.

3.3.2 Analytical Methods

Sample preparation and chemical analyses were performed using methods described in "Test Methods for Evaluation of Solid Waste" (EPA [Environmental Protection Agency], 1988), and "Methods for the Determination of Organic Compounds in Drinking Water" (EPA, 1988). GRO was analyzed in accordance with the ADEC's modification of EPA Method SW-8015. DRO was analyzed in accordance with the ADEC's modification of EPA Method SW-8100.

3.3.3 Chain-of-Custody Procedures

The sample handling and chain-of-custody procedures set forth in the SAP (HLA, 1993a) were strictly adhered to. Samples were packaged in coolers with an ice substitute and the chain-of-custody forms. Immediately

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prior to shipment, coolers were sealed with custody tape. The coolers were transported by overnight courier service, which delivered them to NET or the NPD laboratory via overnight express service.

4.0 LABORATORY RESULTS

4.1 CHEMICAL QUALITY ASSURANCE REPORT

A data quality assessment of the project analytical program was performed by the USACE NPD laboratory. Results of the data quality assessment for groundwater and soil samples were delivered to HLA in an October 18, 1993, report titled "Chemical Quality Assurance Report, UST (PCB) - Building 35-752 - Fort Richardson" (CQAR). Based on the NPD's review of the project laboratory's QA/QC program and a comparison of the project analytical data, the CQAR presents data validity and acceptability. A copy of the CQAR is presented in Appendix F.

The CQAR indicates generally which data have met QA/QC standards and identifies specific data which are questionable and should be considered with caution. The CQAR qualifies the analytical results that are accompanied by low surrogate recoveries, inadequate matrix spike/matrix spike duplicates (MS/MSD) recoveries, or relative percent difference (RPD) failures. The NPD recommends that these results be considered estimates, but does not disqualify the results from consideration. HLA has noted these data in the laboratory results tables in section 4.2, and has addressed the noted discrepancies in section 4.2.1.

4.2 SOIL AND GROUNDWATER ANALYTICAL RESULTS

Results for analytes detected in soil boring and sediment samples are presented in Tables 4-1 and 4-2. Results for analytes detected in groundwater and surface-water samples are presented in Tables 4-3 and 4-4. Tabulation of complete laboratory analyses are presented in Appendix D.

4.2.1 Sampling and Analytical Problems

The laboratory QC checks indicate that the analytical data are within acceptable criteria ranges, with exceptions noted in the USACE NPD laboratory's CQAR (Appendix F). Data are considered acceptable and usable, with qualifications noted below.

- The aqueous data for methylene chloride are not considered valid due to its presence in project and QA trip blanks, probably resulting from laboratory contamination. The absence of other targeted analytes in the trip blanks indicates that cross-contamination had not occurred in water samples. Methylene chloride values have, therefore, not been included in Tables 4-3 and 4-4.
- Data for VOCs by EPA Method 524.2 (Samples 93RTS010WA, 93RTS011WA, 93RTS012WA, and 93RTS013WA) should be viewed with caution due to the high detection limits used.
- Laboratory duplicates, matrix spike recoveries, and matrix spike duplicates for VOCs by EPA Method 524.2 were not analyzed by the laboratory for several of the aqueous samples (93RTS010WA, 93RTS011WA, 93RTS012WA, and 93RTS013WA) in Tables 4-3 and 4-4. Data precision and accuracy could not be assessed; therefore, this data should be viewed with caution.
- The VOC results from QA Sample 93RTS004WA should be substituted in Table 4-4 for the original project laboratory surface-water sample (93RTS003WA) as recommended in the CQAR. The project laboratory used higher detection limits than the QA laboratory; therefore, the project laboratory did not detect all the analytes that the QA laboratory did.

Table 4-1. Analytes Detected in Soil Boring Samples at Site 4

Boring Sample Number Laboratory Sample Number Depth (feet) Date Sampled Sample Type Associated Duplicate Project Sample	AP-3227	AP-3227	AP-3227	AP-3228	AP-3228	AP-3228	AP-3228	AP-3228	AP-3228	
	93RTS001SL 171665/171668 5 8/23/93 PR	93RTS002SL 171666/171669 10 8/23/93 PR	93RTS003SL 171667/171670/171778 15 8/23/93 PR	93RTS004SL 171769/171773 5 8/24/93 PR	93RTS005SL 171770/171776 11.5 8/24/93 PR	93RTS006SL 9427-1 11.5 8/24/93 QA 93RTS005SL	93RTS007SL 171777 11.5 8/24/93 QC 93RTS005SL	93RTS008SL 171771/171774 18.5 8/24/93 PR	93RTS008SL 171771/171774 18.5 8/24/93 PR	
<u>Aromatic Volatile Organics</u>										
1,2-Dichlorobenzene	8020	ug/kg	ND(2.3)	ND(2.2)	ND(2.2)	ND(2.2)a	240a	NR	NR	ND(2.5)a
1,3-Dichlorobenzene	8020	ug/kg	ND(2.3)	ND(2.2)	ND(2.2)	ND(2.2)a	98a	NR	NR	ND(2.5)a
1,4-Dichlorobenzene	8020	ug/kg	ND(2.3)	ND(2.2)	ND(2.2)	ND(2.2)a	58a	NR	NR	ND(2.5)a
Ethylbenzene	8020	ug/kg	ND(3.4)	ND(3.3)	ND(3.3)	ND(3.4)	88	NR	NR	ND(3.7)
Toluene	8020	ug/kg	ND(2.8)	ND(2.8)	ND(2.8)	ND(2.8)	200	NR	NR	ND(3.1)
Total Xylenes	8020	ug/kg	ND(3.4)	ND(3.3)	83	ND(3.4)	20,000	NR	NR	ND(3.7)
<u>PCBs</u>										
Aroclor-1260	8080	ug/kg	3,800	270	ND(53)	3,400	84,000	NR	NR	54b
<u>Metals</u>										
Cadmium	6010	mg/kg	4.6	5	5.8	5	4.1	NR	NR	5
Chromium	6010	mg/kg	27	27	30	31	40	NR	NR	31
Arsenic	7060	mg/kg	3.6	0.8	4.7	4.4	3.9	NR	NR	3.8
Lead	7421	mg/kg	25	1.3	5	85	34	NR	NR	4
Gasoline-Range Organics	8015Mc	mg/kg	ND(1.1)	ND(1.1)	390	ND(1.1)	330	NR	NR	5.3
Diesel-Range Organics	8100Mc	mg/kg	150d	140d	80d	470	2,800	NR	NR	17
TRPH	418.1	mg/kg	410	400	170	1,500	4,400	NR	NR	23
Total Organic Carbon	415.1	mg/kg	NR	NR	400d	NR	8,000d	8,350	1,200	NR

Table 4-1. Analytes Detected in Soil Boring Samples at Site 4
(continued)

Boring Sample Number	AP-3229 93RTS009SL	AP-3229 93RTS010SL	AP-3229 93RTS011SL	AP-3229 93RTS012SL	AP-3229 93RTS013SL	AP-3230 93RTS020SL	AP-3230 93RTS021SL	AP-3230 93RTS022SL
Laboratory Sample Number	171772/171775	171779/171785	9428-1	171780/171786	171781/171787	172070/172074	172071/172075	9432-2
Depth (feet)	10	11.5	11.5	11.5	18.5	5	10	10
Date Sampled	8/25/93	8/25/93	8/25/93	8/25/93	8/25/93	8/26/93	8/26/93	8/27/93
Sample Type	PR	PR	QA	QC	PR	PR	PR	QA
Associated Duplicate Project Sample			93RTS010SL	93RTS010SL				93RTS021SL

Analyte	Method	Units								
<u>Aromatic Volatile Organics</u>										
1,2-Dichlorobenzene	8020	ug/kg	ND(2.1)a	ND(2.1)a	ND(4.0)	ND(2.1)	ND(2.2)	ND(2.1)	ND(2.1)	ND(3.5)
1,3-Dichlorobenzene	8020	ug/kg	ND(2.1)a	ND(2.1)a	ND(4.0)	ND(2.1)	ND(2.2)	ND(2.1)	ND(2.1)	ND(1.6)
1,4-Dichlorobenzene	8020	ug/kg	ND(2.1)a	ND(2.1)a	ND(4.0)	ND(2.1)	ND(2.2)	ND(2.1)	ND(2.1)	ND(2.6)
Ethylbenzene	8020	ug/kg	ND(3.2)	ND(3.2)	ND(2.0)	ND(3.2)	ND(3.3)	ND(3.1)	ND(3.2)	ND(220)
Toluene	8020	ug/kg	ND(2.6)	ND(2.7)	ND(2.0)	ND(2.7)	ND(2.8)	ND(2.6)	ND(2.7)	ND(220)
Total Xylenes	8020	ug/kg	ND(3.2)	ND(3.2)	ND(2.0)	ND(3.2)	ND(3.3)	ND(3.1)	190	ND(220)
<u>PCBs</u>										
Aroclor-1260	8080	ug/kg	ND(52)	ND(54)	ND(170)	ND(53)	ND(56)	ND(53)	ND(54)	ND(180)
<u>Metals</u>										
Cadmium	6010	mg/kg	4.7	4.5	ND(0.43)	6.2	4	ND(2.1)	ND(2.2)	ND(0.44)
Chromium	6010	mg/kg	38	37	25.6	31	29	31	33	33.4
Arsenic	7060	mg/kg	4.0	4.0	4.9	3.9	3.8	5.2f	4.1f	4
Lead	7421	mg/kg	5.3	5.3	3.6	5.3	4.5	10c,f	4.7f	4.9
Gasoline-Range Organics	8015Mc	mg/kg	ND(1.0)	ND(1.1)a	ND(5.0)	ND(1.1)	ND(1.1)a	ND(1.1)	36	75
Diesel-Range Organics	8100Mc	mg/kg	8.6	ND(4.3)	ND(2.7)	ND(4.2)	ND(4.5)	ND(4.2)	150	110
1RP11	418.1	mg/kg	ND(10)	37*	ND(5.3)	ND(11)	ND(11)e	ND(11)	200	ND(5.5)
Total Organic Carbon	415.1	mg/kg	NR	NR	NR	NR	NR	NR	NR	NR

Table 4-1. Analytes Detected in Soil Boring Samples at Site 4
(continued)

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Boring Sample Number	AP-3230	AP-3230	AP-3231	AP-3231	AP-3231	AP-3232	AP-3232	AP-3232
Laboratory Sample Number	93RTS023SL	93RTS024SL	93RTS017SL	93RTS018SL	93RTS019SL	93RTS014SL	93RTS015SL	93RTS018SL
Depth (feet)	172072/172076	172073/172077	172104/172107	172105/172108	172106/172109	171782/171788	171783/171789	171784/171790
Date Sampled	10	15	10	15	20	5	10	15
Sample Type	8/28/93	8/26/93	8/26/93	8/26/93	8/26/93	8/25/93	8/25/93	8/25/93
Associated Duplicate Project Sample	QC	PR	PR	PR	PR	PR	PR	PR
	93RTS021SL							

Analyte	Method	Units	AP-3230	AP-3230	AP-3231	AP-3231	AP-3231	AP-3232	AP-3232	AP-3232
<u>Aromatic Volatile Organics</u>										
1,2-Dichlorobenzene	8020	ug/kg	ND(2.1)	ND(2.2)	ND(2.1)	ND(2.2)	ND(2.2)	ND(2.1)	ND(2.1)	ND(2.3)
1,3-Dichlorobenzene	8020	ug/kg	ND(2.1)	ND(2.2)	ND(2.1)	ND(2.2)	ND(2.2)	ND(2.1)	ND(2.1)	ND(2.3)
1,4-Dichlorobenzene	8020	ug/kg	ND(2.1)	ND(2.2)	ND(2.1)	ND(2.2)	ND(2.2)	ND(2.1)	ND(2.1)	ND(2.3)
Ethylbenzene	8020	ug/kg	ND(3.2)	ND(3.4)	ND(3.1)	ND(3.3)	ND(3.3)	ND(3.1)	ND(3.2)	ND(3.4)
Toluene	8020	ug/kg	ND(2.6)	ND(2.8)	ND(2.6)	ND(2.7)	ND(2.7)	ND(2.6)	ND(2.7)	ND(2.9)
Total Xylenes	8020	ug/kg	82	ND(3.4)	ND(3.1)	ND(3.3)	ND(3.3)	ND(3.1)	ND(3.2)	ND(3.4)
<u>PCBs</u>										
Aroclor-1260	8080	ug/kg	ND(54)	ND(56)	ND(52)	ND(54)	ND(56)	ND(52)	ND(54)	ND(57)
<u>Metals</u>										
Cadmium	6010	mg/kg	ND(2.1)	ND(2.2)	ND(2.1)	ND(2.2)	ND(2.2)	5.6	4.7	5.7
Chromium	6010	mg/kg	30	26	34	36	29	33	26	28
Arsenic	7060	mg/kg	3	3.8	4.0f	4.8f	11	3.5	4.1	4.6
Lead	7421	mg/kg	4.1	4.2	5.1f	5.5f	5.2	4.8	4.9	5
Gasoline-Range Organics	8015Mc	mg/kg	6.8	ND(1.1)	ND(1.0)g	ND(1.1)g	ND(1.1)	ND(1.0)a	ND(1.1)a	ND(1.1)a
Diesel-Range Organics	8100Mc	mg/kg	190	ND(4.4)	ND(4.2)	ND(4.3)	ND(4.5)	ND(4.1)	5.4	ND(4.6)
TRPH	418.1	mg/kg	140	14	ND(10)	12	12	12e	12e	22
Total Organic Carbon	415.1	mg/kg	NR	NR	NR	NR	NR	NR	NR	NR

- * The quality assurance sample result should be used instead of the project result per the U.S. Army Corps of Engineers' Chemical Quality Assurance Report.
- a Daily calibration percent recovery exceeded acceptance limits.
- b Value is an estimate. Analyte concentration is greater than the instrument detection limit, but less than the contract-required method reporting limit.
- c Alaska Department of Environmental Conservation modification.
- d Discussed in laboratory results section.
- e The relative percent difference for the matrix spike/matrix spike duplicate (MS/MSD) exceeds acceptance criteria as a result of the heterogeneous sample.
- f Results should be considered low estimates due to low MS/MSD recoveries.
- g MS/MSD recoveries were not calculated because they were over the calibration range.

mg/kg = Milligrams per kilogram.
 ND = Not detected. The analyte concentration is less than the method reporting limit shown in parentheses.
 NR = Not requested.
 PCBs = Polychlorinated biphenyls.
 PR = Project sample.
 QA = Quality assurance sample.
 QC = Quality control sample.
 TRPH = Total recoverable petroleum hydrocarbons.
 ug/kg = Micrograms per kilogram.

Table 4-2. Analytes Detected in Sediment Samples at Site 4

Boring	SD-1	SD-2	SD-3	SD-4	SD-5
Sample Number	93RTS001SD	93RTS002SD	93RTS003SD	93RTS004SD	93RTS005SD
Laboratory Sample Number	172838	172839	172840	9438-2	172841
Date Sampled	9/2/93	9/2/93	9/2/93	9/2/93	9/2/93
Sample Type	PR	PR	PR	QA	QC
Associated Duplicate Project Sample				93RTS003SD	93RTS003SD

Analyte	Method	Units	SD-1	SD-2	SD-3	SD-4	SD-5
<u>Aromatic Volatile Organics</u>							
1,2-Dichlorobenzene	8020	µg/kg	ND(2.5)	ND(2.2)	ND(2.2)	ND(4.4)	ND(2.2)
1,3-Dichlorobenzene	8020	µg/kg	ND(2.5)	ND(2.2)	ND(2.2)	ND(4.4)	ND(2.2)
1,4-Dichlorobenzene	8020	µg/kg	ND(2.5)	ND(2.2)	ND(2.2)	ND(4.4)	ND(2.2)
Ethylbenzene	8020	µg/kg	ND(3.7)	ND(3.3)	ND(3.3)	ND(2.2)	ND(2.2)
Toluene	8020	µg/kg	ND(3.1)	ND(2.7)	ND(2.8)	ND(2.2)	ND(2.2)
Total Xylenes	8020	µg/kg	ND(3.7)	ND(3.3)	ND(3.3)	ND(2.2)	ND(2.2)
<u>PCBs</u>							
Aroclor-1260	8080	µg/kg	1.150	ND(58)	55a	ND(1.8)	ND(55)
<u>Metals</u>							
Cadmium	6010	mg/kg	ND(2.3)	ND(2.3)	ND(2.2)	ND(0.44)	ND(2.2)
Chromium	6010	mg/kg	21	28	32	19.1	25
Arsenic	7060	mg/kg	2.8	4.5	3	2.8	3
Lead	7421	mg/kg	21	5.5	8.9	8.5	11
Gasoline-Range Organics	8015Mb	mg/kg	ND(1.2)	ND(1.1)	ND(1.1)	ND(5.0)	ND(1.1)
Diesel-Range Organics	8100Mb	mg/kg	120	5.8	37	12	35
TRPH	418.1	mg/kg	175	22	100	92.5	75

a Value is between the Instrument Detection Limit and the Contract-Required Detection Limit.
 b Alaska Department of Environmental Conservation modification.

mg/kg = Milligrams per kilogram.

ND = Not detected. The analyte concentration is less than the method reporting limit shown in parentheses.

PCBs = Polychlorinated biphenyls.

PR = Project sample.

QA = Quality assurance sample.

QC = Quality control sample.

TRPH = Total recoverable petroleum hydrocarbons.

µg/kg = Micrograms per kilogram.

Table 4-3. Analytes Detected in Groundwater Samples at Site 4

Monitoring Well Sample Number Laboratory Sample Number Date Sampled Sample Type Associated Duplicate Project Sample	AP-2982 93RTS015WA 172835 9/2/93 PR	AP-2983 93RTS008WA 172591 8/31/93 PR	AP-2984 93RTS007WA 172590 8/31/93 PR	AP-2985 93RTS006WA 172589 8/31/93 PR	AP-2986 93RTS009WA 172592 8/31/93 PR	AP-2987 93RTS011WA 172700 9/1/93 PR	AP-2987 93RTS012WA 9437-2 9/1/93 QA 93RTS011WA	AP-2987 93RTS013WA 172701 9/1/93 QC 93RTS011WA	AP-3231 93RTS014WA 172834 9/2/93 PR	AP-3232 93RTS010WA 172698 9/1/93 PR		
Analyte												
Method												
Units												
Lead	7421	mg/L	ND(0.002)	0.002	ND(0.002)	0.007	ND(0.002)	ND(0.002)	0.028	ND(0.002)	ND(0.002)	ND(0.002)
Total Organic Carbon	415.1	mg/L	1.4	NR	NR	NR	NR	14	14.4	2.1	NR	NR
Volatile Organic Compounds (VOCs)a												
Benzene	8260/524.2	ug/L	25	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)a,b	ND(0.4)a	ND(1.0)a	ND(1.0)	ND(1.0)a,b
Ethylbenzene	8260/524.2	ug/L	19	ND(1.0)	ND(1.0)	ND(1.0)	2.2	ND(1.0)a	ND(0.4)a	ND(1.0)a	ND(1.0)	ND(1.0)a
Naphthalene	8260/524.2	ug/L	4	ND(1.0)	ND(1.0)	ND(1.0)	1.4	ND(1.0)a	ND(0.7)a	ND(1.0)a	ND(1.0)	ND(1.0)a
n-Propylbenzene	8260/524.2	ug/L	1.4	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)a	ND(0.4)a	ND(1.0)a	ND(1.0)	ND(1.0)a
1,1,1-Trichloroethane	8260/524.2	ug/L	5.3	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)a	ND(0.4)a	ND(1.0)a	ND(1.0)	ND(1.0)a
1,2,4-Trimethylbenzene	8260/524.2	ug/L	11	ND(1.0)	ND(1.0)	ND(1.0)	2.7	ND(1.0)a	ND(0.4)a	ND(1.0)a	ND(1.0)	ND(1.0)a
1,3,5-Trimethylbenzene	8260/524.2	ug/L	3	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)a	ND(0.4)a	ND(1.0)a	ND(1.0)	ND(1.0)a
Toluene	8260/524.2	ug/L	89	ND(1.0)	ND(1.0)	ND(1.0)	2.4	ND(1.0)a,b	ND(0.4)a	ND(1.0)a	ND(1.0)	ND(1.0)a,b
o-Xylene	8260/524.2	ug/L	36	ND(1.0)	ND(1.0)	ND(1.0)	4.9	ND(1.0)a	ND(0.4)a	ND(1.0)a	ND(1.0)	ND(1.0)a
m- & p-Xylene	8260/524.2	ug/L	55	ND(1.0)	ND(1.0)	ND(1.0)	7.6	ND(1.0)a	ND(0.8)a	ND(1.0)a	ND(1.0)	ND(1.0)a
Polychlorinated Biphenyls (PCBs)												
Aroclor-1016	8080	ug/L	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(1.0)	ND(0.5)	ND(0.5)	ND(0.5)
Aroclor-1221	8080	ug/L	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(2.0)	ND(0.5)	ND(0.5)	ND(0.5)
Aroclor-1232	8080	ug/L	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(1.0)	ND(0.5)	ND(0.5)	ND(0.5)
Aroclor-1242	8080	ug/L	ND(6.0)	ND(0.6)	ND(0.6)	ND(0.6)	ND(0.6)	ND(0.6)	ND(1.0)	ND(0.6)	ND(0.6)	ND(0.6)
Aroclor-1248	8080	ug/L	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(1.0)	ND(0.5)	ND(0.5)	ND(0.5)
Aroclor-1254	8080	ug/L	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(1.0)	ND(0.5)	ND(0.5)	ND(0.5)
Aroclor-1260	8080	ug/L	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(1.0)	ND(0.5)	ND(0.5)	ND(0.5)

- a No duplicates or matrix spike recoveries were submitted for VOCs by Environmental Protection Agency (EPA) Method 524.2. All samples were analyzed by EPA Method 8260, except Samples from AP-2987 and AP-3232, which were analyzed by EPA Method 524.2. Data from EPA Method 524.2 should be considered an estimate.
- b Relative percent differences exceed acceptance limits.

mg/L = Milligrams per liter.
 ND = Not detected. The analyte concentration is less than the method reporting limit shown in parentheses.
 NR = Not requested.
 PR = Project sample.
 QA = Quality assurance sample.
 QC = Quality control sample.
 ug/L = Micrograms per liter.

Table 4-4. Analytes Detected in Surface-Water Samples at Site 4

Sample Location	SW-1	SW-2	SW-3	SW-4	SW-5
Sample Number	93RTS001WA	93RTS002WA	93RTS003WA	93RTS004WA	93RTS005WA
Laboratory Sample Number	172481	172482	172483	9433-1	172484
Date Sampled	8/30/93	8/30/93	8/30/93	8/30/93	8/30/93
Sample Type	PR	PR	PR	QA	QC
Associated Duplicate Project Sample				93RTS003WA	93RTS003WA

Analyte	Method	Units	SW-1	SW-2	SW-3	SW-4	SW-5
Lead							
Total Organic Carbon	7421	mg/L	ND(0.002)	0.003	ND(0.002)	ND(0.001)	ND(0.002)
	415.1	mg/L	NR	NR	NR	NR	NR
Volatile Organic Compounds (VOCs)							
Benzene	524.2	µg/L	ND(1.0)	ND(1.0)	1.6*	ND(0.4)	ND(1.0)
Ethylbenzene	524.2	µg/L	ND(1.0)	ND(1.0)	ND(1.0)*	ND(0.4)	ND(1.0)
Naphthalene	524.2	µg/L	ND(1.0)	ND(1.0)	ND(1.0)*	ND(0.7)	ND(1.0)
n-Propylbenzene	524.2	µg/L	ND(1.0)	ND(1.0)	ND(1.0)*	ND(0.4)	ND(1.0)
1,1,1-Trichloroethane	524.2	µg/L	ND(1.0)	ND(1.0)	ND(1.0)*	ND(0.4)	ND(1.0)
1,2,4-Trimethylbenzene	524.2	µg/L	ND(1.0)	ND(1.0)	ND(1.0)*	ND(0.4)	ND(1.0)
1,3,5-Trimethylbenzene	524.2	µg/L	ND(1.0)	ND(1.0)	ND(1.0)*	ND(0.4)	ND(1.0)
Toluene	524.2	µg/L	ND(1.0)	ND(1.0)	ND(1.0)*	ND(0.1) ^a	ND(1.0)
o-Xylene	524.2	µg/L	ND(1.0)	ND(1.0)	ND(1.0)*	ND(0.4)	ND(1.0)
m- & p-Xylene	524.2	µg/L	ND(1.0)	ND(1.0)	ND(1.0)*	ND(0.8)	ND(1.0)
Polychlorinated Biphenyls (PCBs)							
Aroclor 1016	80E0	µg/L	ND(0.5)	ND(0.5)	ND(0.5)	ND(1.0)	ND(0.5)
Aroclor 1221	80E0	µg/L	ND(0.5)	ND(0.5)	ND(0.5)	ND(2.0)	ND(0.5)
Aroclor 1232	80E0	µg/L	ND(0.5)	ND(0.5)	ND(0.5)	ND(1.0)	ND(0.5)
Aroclor 1242	80E0	µg/L	ND(0.6)	ND(0.6)	ND(0.6)	ND(1.0)	ND(0.6)
Aroclor 1248	80E0	µg/L	ND(0.5)	ND(0.5)	ND(0.5)	ND(1.0)	ND(0.5)
Aroclor 1254	80E0	µg/L	ND(0.5)	ND(0.5)	ND(0.5)	ND(1.0)	ND(0.5)
Aroclor 1260	80E0	µg/L	ND(0.5)	ND(0.5)	ND(0.5)	ND(1.0)	ND(0.5)

* Quality assurance sample result should be used instead of the project result per the Chemical Quality Assurance Report.

^a Estimated value.

mg/L = Milligrams per liter.

ND = Not detected. The analyte concentration is less than the method reporting limit shown in parentheses.

NR = Not requested.

PR = Project sample.

QA = Quality assurance sample.

QC = Quality control sample.

µg/L = Micrograms per liter.

- The total recoverable petroleum hydrocarbon (TRPH) result from Sample 93RTS010SL in Table 4-1 should be viewed with caution because of suspected project laboratory contamination, as recommended in the CQAR.
- Arsenic and lead data for Soil Samples 93RTS017, 018, 020, and 021 should be considered low estimates due to low MS/MSD recoveries. Footnotes to this effect have been included with these data in Table 4-1.
- Diesel-range organics (DRO) results for three soil samples should be considered estimates due to RPDs above method QC limits. DRO results for Soil Samples 93RTS001, 002, and 003 in Table 4-1 have been footnoted accordingly.
- Total organic carbon (TOC) concentrations as measured by 415.1 could be increased by TRPH in the soil that would not volatilize at room temperature during purging of CO₂ gas in the sample preparation process.

4.3 BIOFEASIBILITY ANALYSES

Biofeasibility analyses were performed by CT&E in Anchorage. The analyses were to evaluate whether microbial populations in the soil and water have the enzymatic capacity to degrade petroleum hydrocarbons and whether environmental conditions are conducive to such activity.

Two soil and two water samples were analyzed for inorganic nutrients and microbial populations. Samples were analyzed to estimate the total heterotrophic microbial population and the microbial population capable of utilizing petroleum hydrocarbons as a source of carbon and energy. Soil and water sample analyses also included chemistry profiles for inorganic nutrients. The results of the microbial evaluation and chemistry profile for soil and water are presented in Tables 4-5 and 4-6.

Table 4-5. Biofeasibility Analyses Results for Soil

Boring Sample Number Sample Depth (feet) Date Sampled	AP-3227 93RTS003SL 15 08/23/93	AP-3228 93RTS0055L 15 08/24/93
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Analyte	Method	Units		
<u>Inorganic Nutrients</u>				
Nitrate as Nitrogen	EPA 300.0	mg/kg	ND(1.0)	ND(1.0)
Ammonia as Nitrogen	EPA 350.2	mg/kg	7.35	8.49
Phosphorous Soluble Acid	ASA 1982:24-5	mg/kg	56.9	104
pH	EPA 9045		7.7	6.7
Alkalinity	10-3.2	mg/kg	44	143
Iron	EPA 6010	mg/kg	34,000	38,000
<u>Microbial Population</u>				
Oil-Degrading Bacteria	Screen Sheen MPN	cfu/g	800	700
Heterotrophic Plate Count	SM17 9215D	cfu/g	1,900	11,000

- ASA = American Society of Agronomy.
 cfu/g = Colony forming units per gram.
 EPA = Environmental Protection Agency.
 mg/kg = Milligrams per kilogram.
 MPN = Most probable number.
 ND = Not detected. The analyte concentration is less than the method reporting limit shown in parentheses.

Table 4-6. Biofeasibility Analyses Results for Water

Monitoring Well Sample Number Date Sampled	AP-3227 93RTS011WA 09/03 93	AP-3228 93RTS015WA 09/02/93
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Analyte	Method	Units		
<u>Inorganic Nutrients</u>				
Nitrate as Nitrogen	EPA 353.2/300.0	mg/L	1.61	0.86
Ammonia as Nitrogen	EPA 350.2	mg/L	0.28	0.22
Total Phosphorous	EPA 365.2	mg/L	0.027	0.029
pH	EPA 150.1	mg/L	5.45	6.08
Alkalinity	EPA 310.1	mg/L	40	60
Iron	EPA 200.7	mg/L	0.1	1.6
<u>Microbial Population</u>				
Oil-Degrading Bacteria	Screen Sheen MPN	cfu/ml	ND(2)	40
Heterotrophic Plate Count	SM17 9215D	cfu/ml	23	26

- ASA = American Society of Agronomy.
- cfu/ml = Colony forming units per milliliter.
- EPA = Environmental Protection Agency.
- LT = Less than.
- mg/L = Milligrams per liter.
- MPN = Most probable number.
- ND = Not detected. The analyte concentration is less than the method reporting limit shown in parentheses.

The results of the biofeasibility analyses indicate that soil samples contained existing microbial populations capable of degrading petroleum hydrocarbons. However, the magnitude of the population (700 to 800 colony forming units per gram [cfu/g] of oil-degrading bacteria was at the low end of the range (100 to 10,000 cfu/g) typically found in soil. One water sample contained petroleum hydrocarbon-utilizing organisms at low concentrations, and one water sample showed no concentrations of these organisms.

Enhanced biodegradation of petroleum hydrocarbons may be achieved by adding oxygen and indigenous hydrocarbon-utilizing microorganisms admixed with nutrient formulation to the soil and/or water at the site.

The addition of solutions containing inorganic nutrients, such as soluble nitrogen and phosphorus, often enhances the ability of microorganisms to degrade organic compounds into carbon dioxide and water. These nutrients may be present in contaminated soil, but may not be readily available or may not supply all that is required (Sims and Bass, 1984).

Generally, the acceptable concentrations of key inorganic nutrients necessary to sustain microbial metabolism are as follows:

- Nitrogen as nitrate or ammonia - 20 milligrams (mg) per 100 mg hydrocarbon
- Phosphorus as orthophosphate - 5 mg per 100 mg hydrocarbon

Water soluble forms of nitrogen (i.e. nitrogen as ammonia and nitrate) are low when compared to the requirements outlined above, and may be limiting the potential for microbial degradation of hydrocarbons. Phosphorus

concentrations were 56.9 to 104 mg/kg. Analyses of phosphorus as orthophosphate were not performed, so a comparison with the above requirements cannot be made. The biodegradation rate may be enhanced by supplying oxygen to the subsurface, typically through the use of blowers. Additionally, soil moisture should be maintained in a range conducive to microbial growth and soil workability, typically 30 to 70 percent of saturation.

5.0 SIGNIFICANCE OF FINDINGS

The purpose of the field investigation was to identify the nature and extent of contamination associated with USTs at Site 4 in accordance with 18 AAC 78. Information on the investigation results is presented in this section as a basis for organizing and understanding available data. Historical information and the current field investigation information are considered together to present a complete picture of conditions at Site 4.

5.1 REGULATORY GUIDELINES

The ADEC's soil cleanup guidelines for petroleum hydrocarbons generally applicable to this site are presented in Table D of 18 AAC 78.315 soil cleanup level estimate. Based on site-specific data, the matrix estimates for ADEC-recommended soil cleanup guidelines at Site 4 are

- DRO: 100 mg/kg
- GRO: 50 mg/kg
- Benzene: 0.1 mg/kg
- Total BTEX: 10 mg/kg

In addition, 18 AAC 78.315(f) recommends a soil cleanup level of 2,000 mg/kg for residual-range petroleum hydrocarbons.

The soil cleanup level estimate scores the following factors in estimating a cleanup level:

- Depth to subsurface water
- Mean annual precipitation

- Soil type
- Potential receptors
- Volume of contaminated soil

The soil cleanup level estimates and a Preliminary Risk Evaluation form are presented in Appendix G. The Preliminary Risk Evaluation form is used by the ADEC to collect information on the relative risk a contaminated site may pose to human health and the environment. The ADEC uses the information to prioritize its investigation and cleanup efforts.

The presence of PCBs at the site may be regulated by the Toxic Substances Control Act (TSCA). According to Title 40, Code of Federal Regulations, Part 761.120 (40 CFR 761.120), the TSCA applies to spills that occur after May 4, 1987. The date of the PCB contamination at Site 4 is not known. Cleanup levels for PCBs under the TSCA vary according to type of facility and land use. Cleanup in a restricted access area requires a soil cleanup level of 25 ppm PCBs by weight. Cleanup in a nonrestricted access area requires a soil cleanup level of 10 ppm PCBs by weight, and that the top 10 inches of soil be excavated and replaced with soil containing PCBs at less than 1 ppm.

Subpart G, Sections 761.120 (b) and (c) of the TSCA provides for exceptions to the general PCB cleanup levels to allow for more stringent or less stringent cleanup levels depending on site-specific situations and risk factors. Section 761.120 (e) of the TSCA also allows for the application of other Federal statutes such as the Resource Conservation and Recovery Act (RCRA) and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). If remediation is to proceed under either RCRA or CERCLA, cleanup levels are established through a risk assessment process.

Corrective action levels proposed under Section 264.521(a) of RCRA, and the EPA Region 10 Supplemental Risk Assessment Guidance for Superfund, risk-based concentrations (RBCs) are used for preliminary screening of detected contaminant concentrations to evaluate whether a more detailed site investigation and risk assessment are warranted. The RCRA corrective action level for PCBs in soil is 0.09 mg/kg, and the EPA Region 10 RBCs vary from 0.08 mg/kg for the 10^{-6} carcinogenic risk to 8 mg/kg for the 10^{-4} carcinogenic risk. Both the RCRA corrective action levels and the EPA Region 10 RBCs are based on a residential scenario with exposure through soil ingestion. A site-specific risk assessment taking into consideration the nonresidential nature of the site and the limited opportunity for exposure to PCBs in soil (due to snow cover for 6 months of the year) will likely arrive at a significantly different cleanup level.

National and state primary MCLs (EPA, 1992b; ADEC, 1993b) are generally applicable to contaminants detected in groundwater. Table 5-1 summarizes the MCLs for contaminants in groundwater at Site 4.

5.2 SITE 4 FIELD RESULTS

5.2.1 Historical Summary

As discussed in section 2.7.1, historical results from the USACE's 1990 release investigation suggest that contamination was located at the south

and west sides of the excavation. Contaminant concentrations above matrix cleanup levels occurred near the south margin of the excavation. Groundwater samples were above drinking water MCLs for benzene and toluene from wells

Table 5-1. Drinking Water Maximum Contaminant Levels

Analyte	Units	MCL ^a
1,1,1-Trichloroethane	mg/L	0.2
Benzene	mg/L	0.005
Ethylbenzene	mg/L	0.7
Toluene	mg/L	1
Xylenes (total)	mg/L	10

^a National Primary Drinking Water Regulations (Title 40, Code of Federal Regulations, Part 141), 1992; and State of Alaska Drinking Water Regulations (Title 18, Alaska Administrative Code, Chapter 80), 1993.

MCL = Maximum contaminant level.
 mg/L = Milligrams per liter.

located along the west side of the excavation (AP-2982 and AP-2987). The remaining historical soil and groundwater samples collected at this site were below ADEC's matrix cleanup levels for soil and MCLs for drinking water.

5.2.2 Soil Boring Sampling Results

HLA's field investigation team noted a soil horizon change between 13 and 15 feet below ground surface in Borings AP-3227 and AP-3228 that may indicate the excavation was not as deep as originally estimated.

Several soil samples showed contaminant concentrations above the ADEC's matrix cleanup levels (see Table 4-1), generally from Borings AP-3227 and AP-3228 located inside the excavation boundaries. DRO concentrations in excess of the ADEC cleanup level of 100 mg/kg were detected in soil samples from depths of 5 feet (150 mg/kg) and 10 feet (140 mg/kg) in Boring AP-3227; and in soil samples from depths of 5 feet (470 mg/kg) and 15 feet (2,800 mg/kg) in Boring AP-3228. GRO concentrations in excess of the ADEC cleanup level of 50 mg/kg were detected in soil samples from depths of 15 feet in Boring AP-3227 (390 mg/kg) and 15 feet in Boring AP-3228 (330 mg/kg).

Soil samples from two borings outside the limits of the excavation showed concentrations of contaminants above the estimated ADEC's matrix cleanup levels. The soil sample from a depth of 13 feet in Boring AP-3230 contained DRO at 150 mg/kg. This boring is located approximately 10 feet south of the excavation limits. The soil sample from a depth of 10 feet in Boring AP-2986 contained diesel fuel no. 2 at 730 mg/kg. Boring AP-2986 is located less than 5 feet south of the excavation limits.

Other contaminants of concern detected in samples from within the excavation boundaries include Aroclor 1260 (a PCB) and lead. Aroclor 1260 was detected in samples from Boring AP-3227 and AP-3228 at concentrations ranging from below the detection limit of 53 $\mu\text{g}/\text{kg}$ to 84,000 $\mu\text{g}/\text{kg}$ (from Boring AP-3228 at 15 feet). PCBs were not detected in any soil samples collected from outside the excavation boundaries. Lead concentrations detected in soil samples from within the excavation limits ranged from 1.3 to 85 mg/kg, while

lead concentrations in soil samples from outside the excavation limits ranged from 4 to 10 mg/kg. Cleanup levels for PCBs and lead in soil have not been established for this site.

With the exception of AP-3228 and AP-2986, the soil contamination detected above cleanup action levels appears to be in the excavation fill material, as shown in the cross-sections on Plates 5 and 6. The soil investigation results suggest that the source of contamination at this site is contaminated fill material within the excavation with the exception of the petroleum hydrocarbons remaining from 10 to 13 feet below ground surface south of the excavation limits in the vicinity of AP-2986 and AP-3228. Although no surface soil samples were collected because the backfill material appears to be the source of contamination, contamination is assumed to be present in the surface soil of the backfill material. HLA estimates approximately 2,350 cubic yards of backfill soil contain petroleum hydrocarbons above cleanup action levels. Assuming the initial primary sources of contaminants (the USTs) have been removed, the contaminants present in the soil will infiltrate downward to the water table and then migrate in the direction of groundwater flow.

5.2.3 Groundwater Flow

Regional groundwater flow conditions, survey data obtained from the USACE, and water-level measurements collected by HLA were used to estimate groundwater elevations at Site 4. Regional groundwater flow in this area is generally southwest toward Ship Creek, which is located approximately 0.1 mile

south of the site. The gradient in the area is reported to vary from 0.01 to 0.05 foot per foot. Several water supply wells are located about 1/2 mile southwest of the site on the opposite side of Ship Creek from the transmitter site. No other drinking water wells appear to be located near Site 4 (Fort Richardson UST Remediation Environmental Location and Vicinity Map). The depth to groundwater, as measured in Site 4 monitoring wells in September 1993, is approximately 15 feet below ground surface.

Localized groundwater flow at Site 4 appears to be influenced by the two surface-water ponds west of the excavation and a drainage ditch south of the ponds. A localized groundwater mounding effect is interpreted to be present beneath these surface-water features, causing the local groundwater to flow to the south. Plate 7 illustrates HLA's interpretation of the local groundwater elevations.

5.2.4 Groundwater Sample Results

Groundwater sampling results presented in Table 4-3 show the benzene concentration in Well AP-2982 (25 µg/L) exceeds the drinking water MCL of 5 µg/L. The results from the other wells were below MCLs or at nondetectable levels.

Well AP-2982 is located outside the northwest corner of the excavation boundary. Previous groundwater sampling results from this well (USACE, 1990) were 620 µg/L benzene, and 1,300 µg/L toluene (which exceeds the MCL of 1,000 µg/L). During the 1990 USACE investigation, benzene (420 µg/L) and toluene (1,300 µg/L) were also detected in Well AP-2987. AP-2987 is located

approximately 35 feet south of AP-2982, outside the southwest corner of the excavation limits. The significant decrease of contaminant concentrations in Wells AP-2982 and AP-2987, and the lack of detected contaminants in other nearby downgradient wells (AP-2985, AP-2986, and AP-3232) suggests that groundwater contamination at this site is dissipating.

5.2.5 Surface-Water and Sediment Sampling Results

The most notable analytes detected in sediment samples are DRO, Aroclor 1260 (a PCB), and lead. Although cleanup levels are not established for sediment, these analytes were detected in Sample SD-1 (the sample from the northernmost pond) at higher concentrations than in Samples SD-2 and SD-3 (Table 4-2). DRO was detected at 120 mg/kg in Sample SD-1, 5.8 mg/kg in Sample SD-2, and 37 mg/kg in Sample SD-3; Aroclor 1260 was detected at 1.15 mg/kg in Sample SD-1, not detected (0.058 mg/kg) in Sample SD-2, and detected at 0.055 mg/kg in Sample SD-3; and lead was detected at 21 mg/kg in Sample SD-1, 5.5 mg/kg in Sample SD-2, and 8.9 mg/kg in sample SD-3. The source of contaminated sediments is not clear. During decommissioning activities, contaminated soil may have been carried by the wind or surface water runoff and deposited in the ponds. A risk assessment may be required to evaluate the significance of the detected concentrations in the absence of established cleanup levels for sediments.

5.3 RECOMMENDATIONS

ADEC cleanup criteria for petroleum hydrocarbons have been estimated for the site. Regulatory limits for PCBs directly applicable to this site have not been established. If Site 4 becomes part of a CERCLA Operable Unit (OU), a quantitative risk assessment is needed to evaluate the significance of the detected concentrations, and to identify a site-specific cleanup goal for PCBs, if necessary. Alternative cleanup levels (ACLs) for petroleum hydrocarbons may also be established based on the results of the risk assessment.

Regulatory cleanup levels have not been established for sediment, and corresponding contamination was not detected in surface-water samples. A risk assessment will evaluate site criteria to evaluate the need for remedial measures. If the detected concentrations of DRO and PCBs in sediment are found to pose a significant risk to human health or the environment, additional investigation of the extent of contamination in the sediment may be needed.

Factors that could affect risk-evaluation criteria for surface and/or subsurface contamination at this site include the following:

- Restricted access on a military base
- Transient population versus residential population
- Subsurface location of PCB concentration
- Snow cover 6 months of the year

Groundwater containing benzene in excess of the 5 $\mu\text{g/L}$ MCL was detected in Monitoring Well AP-2982 at 25 $\mu\text{g/L}$. Groundwater remedial measures are not recommended at this time, except to continue monitoring groundwater to evaluate whether contaminant concentrations continue to decrease due to the following site conditions:

- The initial source of the contamination (the waste oil USTs) has been removed.
- Contaminant concentration in Well AP-2982 has decreased significantly since 1990 (from 620 $\mu\text{g/L}$).
- Contaminants were not detected in the other monitoring wells.

6.0 CORRECTIVE ACTION PLAN

This CAP has been prepared to identify and evaluate alternative remedial measures to address contamination associated with the waste oil USTs formerly buried at Building 35752, a High-Frequency Transmitter Site. The evaluation of alternatives presented here is a preliminary screening for evaluating the options. Contaminated media included in this CAP are soil containing petroleum hydrocarbons and PCBs, and groundwater containing benzene. Approximately 2,350 cubic yards of soil contaminated with petroleum hydrocarbons and PCBs is limited to the area of a previous excavation as shown on Plate 2. Soil contaminated with petroleum hydrocarbons and PCBs has been placed in the excavation in a random fashion, and contaminant concentrations cannot be delineated within the excavation boundary (see section 5.2.2).

Groundwater from the site contained one benzene result in excess of MCLs. However, groundwater remedial measures are not recommended at this time due to the following conditions:

- The initial source of the contamination (the waste oil USTs) has been removed.
- Benzene concentrations for Monitoring Well AP-2982 have decreased significantly since 1990.
- Contamination was not detected in the other seven monitoring wells at the site.

Each of the remedial alternatives were evaluated with groundwater monitoring included.

Site cleanup levels have been developed for petroleum hydrocarbons in soil based on the ADEC soil cleanup matrix. However, alternative cleanup levels may be applicable based on the results of the proposed risk assessment. Federal drinking water MCLs may apply to benzene in groundwater (see section 5.1), but an action level for PCBs in soil has not been developed. A risk assessment has been proposed to evaluate whether the maximum concentration of PCBs and petroleum hydrocarbons detected in site soil presents a human health risk great enough to warrant remediation. If Site 4 becomes part of a CERCLA OU the risk assessment will follow CERCLA protocols.

Based on the results of the risk assessment and the ACL evaluation, the following four remedial scenarios may apply to the site:

1. Both petroleum hydrocarbons and PCBs will require remediation;
2. Only petroleum hydrocarbons will require remediation; PCBs will not;
3. Only PCBs will require remediation; petroleum hydrocarbons will not;
4. Neither petroleum hydrocarbons or PCBs will require remediation.

The following alternatives were identified to address the full range of remedial scenarios.

- No action
- Limited action (i.e., institutional control)
- In Situ bioremediation
- Excavation and solvent extraction treatment
- Excavation and off-site landfilling

HLA evaluated the remedial alternatives according to remedial effectiveness, implementability, and cost. The remedial effectiveness criteria encompass the following items: applicable and/or relevant and appropriate requirements (ARARs); toxicity, mobility, and volume (TMV) reduction; and associated short-term and long-term human health risks. The implementability criteria include an evaluation of technological and regulatory implementability. The cost-effectiveness criteria include a cost estimate for implementing the remedial alternative.

Remedial alternatives identified for evaluation are summarized in the following sections. For comparison purposes, HLA has assumed that all petroleum hydrocarbon- and PCB-contaminated soil will require remediation. The proposed health-based risk assessment may ascertain that maximum concentrations of PCBs and/or petroleum hydrocarbons in the site soil do not present unacceptable risk to human health. In this case, site cleanup levels will be established, and remedial alternatives not considered suitable under this evaluation may become the preferred and recommended alternatives.

6.1 NO ACTION

Under the no action alternative, the site would remain in its present condition without remediation of petroleum hydrocarbon and PCB-contaminated soil. The alternative would involve implementing a groundwater monitoring program to evaluate the continued decrease in benzene concentrations in groundwater at the site, or the unexpected migration of additional contaminants (VOCs and PCBs).

The no action alternative is not an effective remedial alternative for Site 4. Chemical-specific ARARs would not be satisfied under this alternative. While the TMV of petroleum hydrocarbon-contaminated soil and benzene-contaminated groundwater at the site may be reduced over time by natural degradation and attenuation, the TMV of PCB-contaminated soil would not be reduced. Although the no action alternative is technologically feasible and easily implemented by utilizing existing groundwater monitoring wells, regulatory requirements would not be satisfied. Access to contaminated surface soil is unrestricted. A cost estimate for the no action alternative is presented in Table 6-1.

Should the health-based risk assessment find that the maximum concentrations of petroleum hydrocarbons and PCBs do not present unacceptable risk to human health, the no action alternative may be considered an effective, and implementable remedial alternative.

6.2 LIMITED ACTION (SITE CAPPING)

Under the limited action alternative, institutional or engineering controls such as capping and/or restricting site access would be implemented to reduce or eliminate exposure to the contaminants. The concentrations of petroleum hydrocarbons and PCBs in soil would not be reduced. The limited action alternative would include implementing a groundwater monitoring program to evaluate the continued decrease in benzene concentrations in groundwater at the site.

Table 6-1. Cost Estimate for No Action Alternative - Site 4

Description	1993 Rate (\$)	Quantity	Unit	Estimated Cost (thousands)
Perform Risk Assessment	50,000	1	Lump sum	\$ 50.0
Prepare Final Corrective Action Plan	6,000	1	Lump sum	6.0
Monitor Groundwater				
Purge and Sample Monitoring Wells	75.00	80	Man hour	6.0
Provide Equipment	1,000	1	Lump sum	1.0
Perform Laboratory Analysis and Shipping	3,000	1	Lump sum	3.0
Dispose of Purge Water	3	100	Gallon	0.3
Prepare Monitoring Report	4,000	1	Lump sum	<u>4.0</u>
Annual Groundwater Monitoring Subtotal				14.3
Estimated Groundwater Monitoring 5-Year Duration Costs				<u>71.5</u>
TOTAL ESTIMATED COST				<u>\$127.5</u>

Assumptions:

1. Groundwater monitoring program will include annual sampling of eight wells for 5 years.
2. Groundwater samples will be analyzed for volatile organic compounds (VOCs) by Environmental Protection Agency (EPA) Method 8020 and polychlorinated biphenyls (PCEs) by EPA Method 8080.

The limited action alternative would not satisfy chemical-specific ARARs. While the toxicity and volume of petroleum hydrocarbon-contaminated soil and benzene-contaminated groundwater at the site may be reduced over time by natural degradation and attenuation, the toxicity and volume of PCB-contaminated soil would not be reduced. Capping the site would reduce the mobility of both petroleum hydrocarbons and PCBs. Institutional and engineering controls would reduce short-term risk by restricting site access and reducing chemical mobility. Long-term risk would not be reduced. The limited action alternative is technologically feasible and easily implemented, but regulatory requirements would not be satisfied under this alternative. The limited action alternative requires the construction and long-term maintenance of an institutional or engineering control. The cost estimate for the limited action alternative is presented in Table 6-2.

Table 6-2. Cost Estimate for Limited Action Alternative (Site Capping) - Site 4

Description	1993 Rate (\$)	Quantity	Unit	Estimated Cost (thousands)
Perform Risk Assessment	50,000	1	Lump sum	\$50.0
Prepare Final Corrective Action Plan	10,000	1	Lump sum	10.0
Install Concrete Cap	180	95	Cubic yard	17.1
Monitor Groundwater ^a	14,300	5	Year	71.5
TOTAL ESTIMATED COST				<u>\$148.6</u>

^a Groundwater monitoring cost details are presented in Table 6-1.

Assumptions:

1. Does not include cost for pavement maintenance.
2. Area to be capped is approximately 100 by 45 feet; cap thickness is 0.5 feet.

Should the health-based risk assessment find that the maximum concentrations of petroleum hydrocarbons and PCBs do not present unacceptable risk to human health, the limited action alternative may be considered an effective and implementable remedial alternative.

6.3 IN SITU BIOREMEDIATION

In situ bioremediation utilizes microorganisms that break down petroleum hydrocarbons in soil. This process requires an adequate supply of oil-degrading microbes, oxygen, water, and inorganic nutrients. Biofeasibility analyses were performed on samples from the site to provide information on these parameters. The addition of oxygen, inorganic nutrients, and moisture may be necessary to enhance the natural biodegradation of petroleum hydrocarbons in soil.

This alternative would also include implementing a groundwater monitoring program to evaluate the continued decrease in benzene concentrations in groundwater at the site.

ISB is considered an effective remedial alternative for petroleum hydrocarbon-contaminated soil. The site appears to be suited for ISB based on the soil types encountered during the investigation. However, ISB has not yet been shown to be a successful technology for treatment of PCB-contaminated soil. Implementing this alternative would satisfy chemical-specific ARARs for petroleum hydrocarbons, but may not satisfy chemical-specific ARARs for PCBs. While the TMV of petroleum hydrocarbon-contaminated soil will be reduced within an estimated 2-year period, the TMV of PCB-contaminated soil may not be

reduced. Short-term risk from unrestricted site access and potential exposure to contaminated surface soil would not be reduced. Potential long-term risk associated with petroleum hydrocarbon-contamination would be eliminated, but long-term risk associated with PCB-contamination would not be reduced. ISB is technologically feasible and easily implemented, and regulatory requirements would be partially satisfied under this alternative. However, ISB would require construction, and periodic operation and maintenance for an estimated 2-year period. The cost estimate for the ISB alternative is presented in Table 6-3.

If the results of the risk assessment indicate that PCBs present in soil at the site do not pose an unacceptable health risk, ISB will be considered a preferred and cost-effective remedial solution. If concentrations of PCBs that pose unacceptable human health risk are limited to surface soil, ISB may be implemented in combination with an institutional control such as site capping.

Table 6-3. Cost Estimate for In Situ Bioremediation - Site 4

Description	1993 Rate (\$)	Quantity	Units	1993 Cost (thousands)
Perform Risk Assessment	50.000	1	Lump Sum	\$50.0
Prepare Final Corrective Action Plan	10.000	1	Lump Sum	10.0
Prepare Bioventing System Design, Plans and Specifications	8.000	1	Lump Sum	8.0
Prepare Site, Locate Utilities, and Mobilize/Demobilize	3.000	1	Lump Sum	3.0
Install Bioventing Wells	65	160	Foot	10.4
Provide Blowers and Miscellaneous Equipment	15.000	1	Lump Sum	15.0
Provide and Supervise Construction Labor	75	200	Man Hour	15.0
Provide Construction Equipment	1.500	7	Day	10.5
Start Up System	75	40	Man Hour	3.0
Prepare As-Built Drawings and Survey	4.000	1	Lump Sum	4.0
Perform Pre-Closure Invasive Investigation, Manage Project, and Prepare Report	25.000	1	Lump Sum	25.0
Conduct Monthly Inspection and Maintenance	500	23	Site Visit	\$11.5
Perform Air Permeability Tests	2.000	4	Test	8.0
Perform Respiration Tests	8.000	4	Test	32.0
Provide Electricity	0.08	130,000	KW Hour	10.4
Monitor Groundwater ^a	14,300	5	Years	71.5
TOTAL ESTIMATED COST				<u>\$287.3</u>

a Groundwater monitoring cost details are presented in Table 6-1.

Assumptions:

1. Approximately 2,350 cubic yards of soil will be treated in situ.
2. A total of eight bioventing wells (three air extraction and five relief) will be required.
3. The wells will be installed to depths of 20 feet. Each well will be screened above and below the water table.
4. Three 1-horsepower regenerative blowers will be required.
5. Two years will be required to achieve treatment.
6. Monthly inspections and maintenance will be performed.
7. An invasive investigation will be required to document treatment completion.
8. A respiration test will be performed twice each treatment season. A treatment season is 12 months.
9. The final corrective action plan will meet the requirements of Title 18, Alaska Administrative Code, Chapter 78.

6.4 EXCAVATION AND SOLVENT EXTRACTION TREATMENT

This alternative involves treating PCB- and petroleum hydrocarbon-contaminated soil with a solvent extraction treatment process. Solvent extraction uses organic solvents to extract the contaminants from the soil and concentrate them in the solvent. The contaminants are then stripped from the solvent and disposed of or treated as hazardous waste. This alternative requires that all contaminated soil be excavated prior to treatment. This alternative would implement a groundwater monitoring program to evaluate the continued decrease in benzene concentrations in groundwater at the site.

Solvent extraction is considered an effective remedial alternative for PCBs and petroleum hydrocarbon-contaminated soil, and is technologically feasible and moderately easy to implement. To perform solvent extraction, the substantive requirements of 40 CFR 761.60 must be considered. Implementing this alternative would satisfy chemical-specific ARARs for PCBs and petroleum hydrocarbons, and would satisfy regulatory requirements. The volume of contamination would be reduced by concentration and subsequent extraction through the solvent process, but toxicity and mobility of the contaminants would not be reduced. Proper disposal of the solvent extract will reduce the toxicity and mobility of the contaminants onsite. Short-term risk from potential worker exposure during excavation of contaminated soil would be increased, however, potential long-term risk associated with PCBs and petroleum hydrocarbons in the soil would be eliminated. The cost estimate for the excavation and solvent extraction alternative is presented in Table 6-4.

Table 6-4. Cost Estimate for Excavation and Solvent Extraction Treatment - Site 4

Description	1993 Rate (\$)	Quantity	Unit	Estimated Cost (thousands)
Perform Risk Assessment	50,000	1	Lump sum	\$ 50.0
Prepare Final Corrective Action Plan	15,000	1	Lump sum	15.0
Prepare Site, Locate Utilities, Mobilize and Demobilize	3,000	1	Lump sum	3.0
Excavate Soil	7	2,350	Cubic yard	16.5
Provide Temporary Stockpile Liner and Cover for Contaminated Soil	0.35	15,000	Square feet	5.3
Haul, Place, and Compact Imported Clean Soil	6	2,350	Cubic yard	14.1
Conduct Field Supervision	2,000	30	Day	60.0
Prepare Excavation Closure and Sample Analyses	550	15	Sample	8.3
Treat Contaminated Soil	400	2,350	Cubic yard	940.0
Report Closure and Manage Project	10,000	1	Lump sum	10.0
Monitor Groundwater ^a	14,300	5	Year	71.5
TOTAL ESTIMATED COST				<u>\$1,193.7</u>

^a Groundwater monitoring cost details are presented in Table 6-1.

Assumptions:

1. Approximately 2,350 cubic yards of soil will be excavated and will meet landfill disposal criteria. Clean soil will be used to backfill the excavation.
2. Treated soil will be disposed of at the Anchorage Regional Landfill.
3. Excavation closure samples will be analyzed for diesel-range petroleum hydrocarbons (DRPH); gasoline-range petroleum hydrocarbons (GRPH); benzene, toluene, ethylbenzene, and xylenes (BTEX); lead; and polychlorinated biphenyls (PCBs). Alaska Department of Environmental Conservation level III data packages will be required.
4. Excavated and treated soil will be analyzed for DRPH, GRPH, BTEX, lead, and PCBs.
5. Based on vendor-supplied information, approximately 30 days will be required to treat 2,350 yards of soil. Source is the Environmental Protection Agency's (EPA's) "Vendor Information System for Innovative Treatment Technologies" (VISITT Version 2.0) EPA 542-R-93-0001, April 1993.

If the results of the risk assessment indicate that PCBs present in the soil at the site pose an unacceptable health risk, then solvent extraction would be considered a preferred remedial solution.

6.5 EXCAVATION AND OFF-SITE LANDFILLING

This alternative involves excavating PCB- and petroleum hydrocarbon-contaminated soil for shipment to and disposal at a Resource Conservation and Recovery Act (RCRA) hazardous-waste landfill authorized to accept materials containing PCBs. Off-site landfilling is the same disposal option used previously for the excavated soil from waste oil UST removals in 1990. Excavated soil would be packaged in drums, crates, or super sacks, and shipped to the EnvironSafe Services landfill in Grandview, Idaho, for disposal. This alternative would include implementing a groundwater monitoring program to evaluate the continued decrease of benzene concentrations in groundwater at the site.

Excavation and off-site landfilling is considered an effective remedial alternative for PCBs- and petroleum hydrocarbon-contaminated soil. Implementing this alternative would satisfy chemical-specific ARARs for PCBs and petroleum hydrocarbons, and would satisfy regulatory requirements. TMV criteria would not be reduced with this alternative. Short-term risk from potential worker exposure during excavation of contaminated soil would increase, but potential long-term risk associated with PCBs and petroleum hydrocarbons in the soil would be eliminated. Excavation and off-site

landfilling is technologically feasible and moderately easy to implement. The cost estimate for the excavation and off-site landfilling alternative is presented in Table 6-5.

If the results of the risk assessment indicate that PCBs present in soil at the site pose an unacceptable health risk, or both PCBs and petroleum hydrocarbons pose an unacceptable health risk, then excavation and off-site landfilling will be considered a preferred remedial solution.

Table 6-5. Cost Estimate for Excavation and Off-Site Landfilling - Site 4

Description	1993 Rate (\$)	Quantity	Unit	Estimated Cost (thousands)
Perform Risk Assessment	50,000	1	Lump sum	\$ 50.0
Prepare Final Corrective Action Plan	10,000	1	Lump sum	10.0
Prepare Site, Locate Utilities, Mobilize and Demobilize	3,000	1	Lump sum	3.0
Excavate Soil	7	2,350	Cubic yard	14.5
Provide Temporary Stockpile Liner and Cover for Contaminated Soil	0.35	15,000	Square feet	5.3
Haul, Place, and Compact Imported Clean Soil	6	2,350	Cubic yard	14.1
Load and Transport Contaminated Soil to Landfill	350	2,350	Cubic yard	822.5
Conduct Field Supervision and Excavation Screening	2,000	4	Day	8.0
Perform Excavation Closure and Sample Analyses	550	15	Sample	8.3
Treat Contaminated Soil	485	2,350	Cubic yard	1,139.8
Perform Treated Soil Sample Analyses	550	10	Sample	5.5
Report Closure and Manage Project	10,000	1	Lump sum	10.0
Monitor Groundwater ^a	14,300	5	Year	71.5
TOTAL ESTIMATED COST				<u>\$2,164.5</u>

^a Groundwater monitoring cost details are presented in Table 6-1.

Assumptions:

1. Approximately 2,350 cubic yards of soil will be excavated and will meet landfill disposal criteria. Clean soil will be used to backfill the excavation.
2. Excavation closure samples will be analyzed for diesel-range petroleum hydrocarbons; gasoline-range petroleum hydrocarbons; benzene, toluene, ethylbenzene, and xylenes; lead; and polychlorinated biphenyls.

7.0 CONCLUSION AND RECOMMENDATIONS

HLA evaluated each CAP alternative for effectiveness, implementability, and cost. The comparison of remedial alternatives is presented in Table 7-1.

For alternative comparison purposes, HLA has assumed that PCB and petroleum hydrocarbons in soil will require remediation. However, based on the results of the investigative program and the corrective action alternatives evaluation, HLA recommends that a quantitative risk evaluation be performed for the site to establish alternative cleanup levels for PCBs and petroleum hydrocarbons.

An appropriate remedial alternative can be selected for the site based on the results of a risk assessment. If the risk assessment indicates that no risk is present, the no action alternative would be an appropriate choice. If the risk assessment indicates that significant risk from on-site contamination is present, solvent extraction or off-site landfilling would be appropriate alternatives. If the risk assessment finds some risk present from either petroleum hydrocarbons or PCBs, possibly limited action (site capping), bioremediation, or a combination of the two alternatives would be appropriate choices for this site.

For each alternative including no action, HLA recommends that groundwater monitoring be conducted for 5 years to evaluate whether benzene detected in one monitoring well continues to decrease to below MCLs.

Table 7-1. Comparison of Remedial Alternatives to Evaluation Criteria

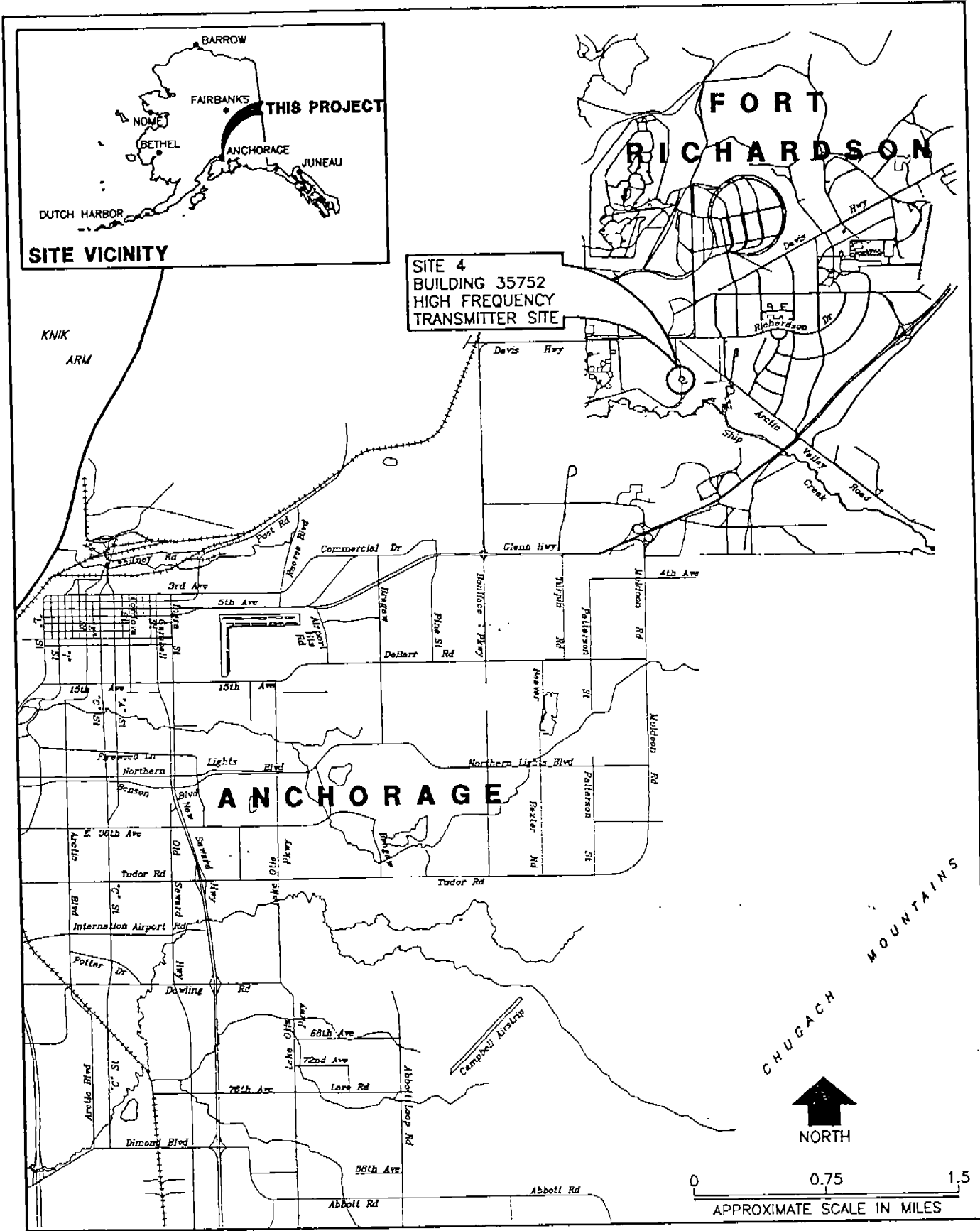
Alternative	Description	Effectiveness	Implementability	Estimated Cost (thousands)
1	No action and GW monitoring	<ul style="list-style-type: none"> Does not comply with ARARs Does not reduce TMV Does not reduce short- and long-term risk. 	<ul style="list-style-type: none"> Is easy to implement. May not be acceptable to the local regulatory and community approval. 	\$127.5
2	Limited action and GW monitoring	<ul style="list-style-type: none"> Does not comply with ARARs Reduces contaminant mobility Does not reduce toxicity and volume Reduces short-term risk, but not long-term risk. 	<ul style="list-style-type: none"> Is easy to implement. May not meet local regulatory and community approval. 	\$148.6
3	In Situ Bioremediation and GW monitoring	<ul style="list-style-type: none"> Complies with ARARs for petroleum hydrocarbons, but not for PCBs Reduces TMV of petroleum hydrocarbons, but not PCBs. Increases short-term risk due to worker exposure Reduces long-term risk associated with petroleum hydrocarbons, but not PCBs. 	<ul style="list-style-type: none"> Is moderately easy to implement. May not meet local regulatory and community approval. 	\$287.3
4	Excavation and solvent extraction treatment, and GW monitoring	<ul style="list-style-type: none"> Complies with ARARs Reduces TMV of contaminants Increases short-term risk due to worker exposure Eliminates long-term risk. 	<ul style="list-style-type: none"> Is moderately easy to implement. Probably meets local regulatory and community approval. 	\$1,193.7
5	Excavation and off-site landfilling, and GW monitoring	<ul style="list-style-type: none"> Complies with ARARs Does not reduce toxicity, mobility, and volume Increases short-term risk due to worker exposure Eliminates long-term risk. 	<ul style="list-style-type: none"> Moderately easy to implement. Probably meets local and regulatory and community approval. 	\$2,164.5

ARARs = Applicable or relevant and appropriate requirements.

GW = Groundwater.

TMV = Toxicity, mobility, and volume.

8.0 ILLUSTRATIONS



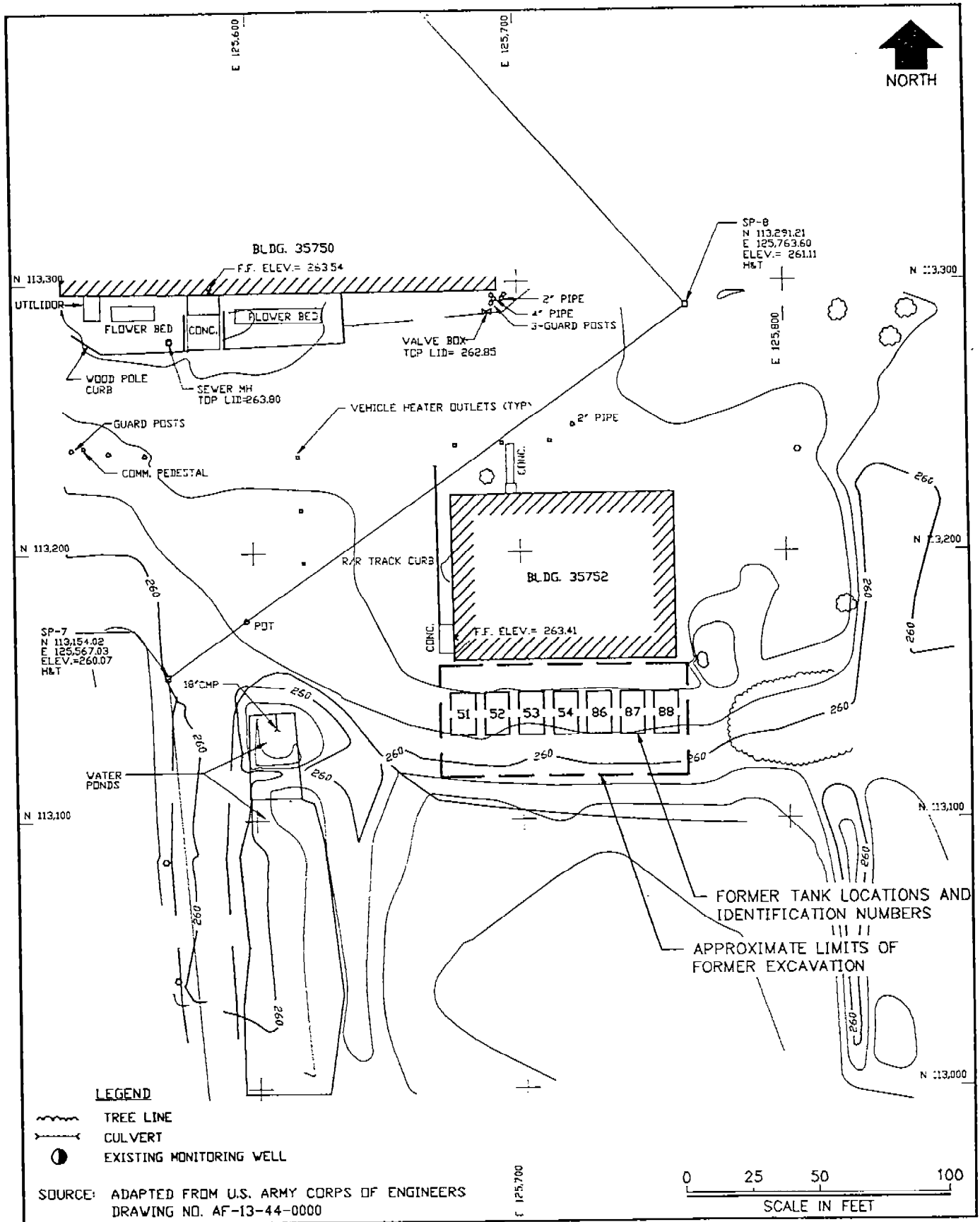
Harding Lawson Associates
Engineering and
Environmental Services

Project Vicinity Map

Site Assessment/Release Investigation and Corrective Action Plan
Fort Richardson, Alaska

PLATE
1

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SOURCE: ADAPTED FROM U.S. ARMY CORPS OF ENGINEERS
DRAWING NO. AF-13-44-0000

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SCALE IN FEET



Harding Lawson Associates
Engineering and
Environmental Services

Site 4 Area Map

Site Assessment/Release Investigation and Corrective Action Plan
Fort Richardson, Alaska

PLATE

2

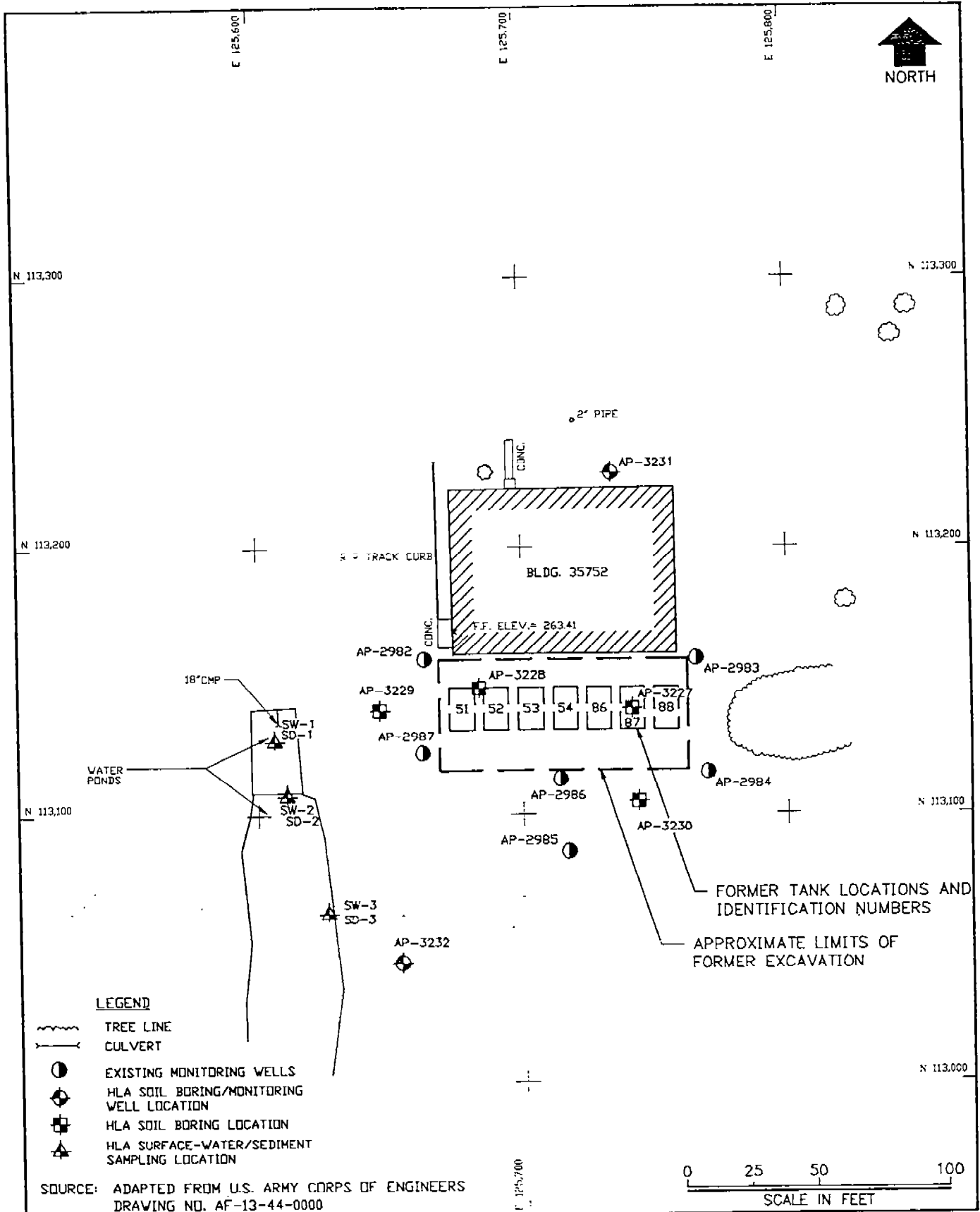
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10/93

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Engineering and
Environmental Services

Boring/Sampling Locations

Site Assessment/Release Investigation and Corrective Action Plan
Fort Richardson, Alaska

PLATE

3

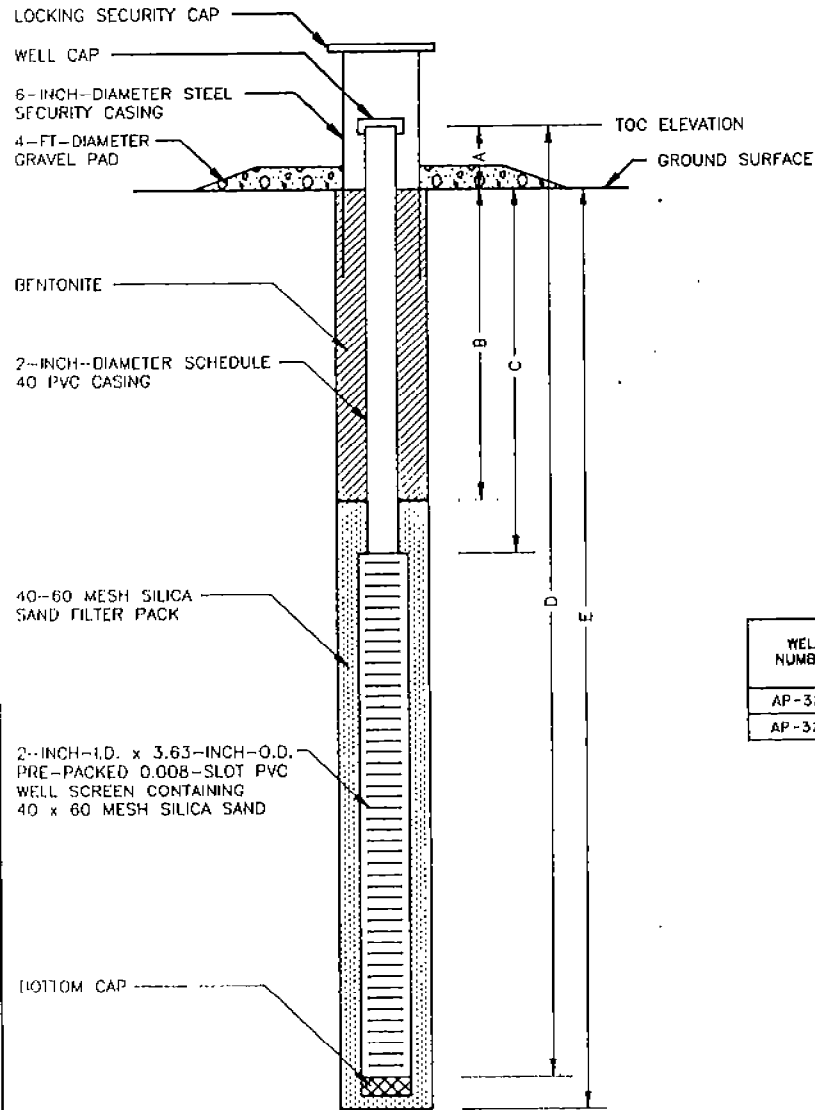
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WELL NUMBER	NORTHING FT	EASTING FT	GROUND ELEVATION FT(MSL)	TOC ELEVATION FT(MSL)	A CASING STICK UP FT(AGS)	B DEPTH TO SANDPACK FT(BGS)	C DEPTH TO SCREEN FT(BGS)	D WELL DEPTH FT(BGS)	E BORING DEPTH FT(BGS)
AP-3231	113231.42	125746.40	265.55	268.35	2.8	8.9	10.7	21.0	21.5
AP-3232	113059.72	125661.57	259.67	261.97	2.3	3.0	5.0	15.3	15.5

AGS - ABOVE GROUND SURFACE FT - FEET
 BGS - BELOW GROUND SURFACE MSL - MEAN SEA LEVEL
 TOC - TOP OF CASING PVC - POLYVINYL CHLORIDE



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 Engineering and
 Environmental Services

Monitoring Well Completion Details

Site Assessment/Release Investigation and Corrective Action Plan
 Fort Richardson, Alaska

PLATE
4

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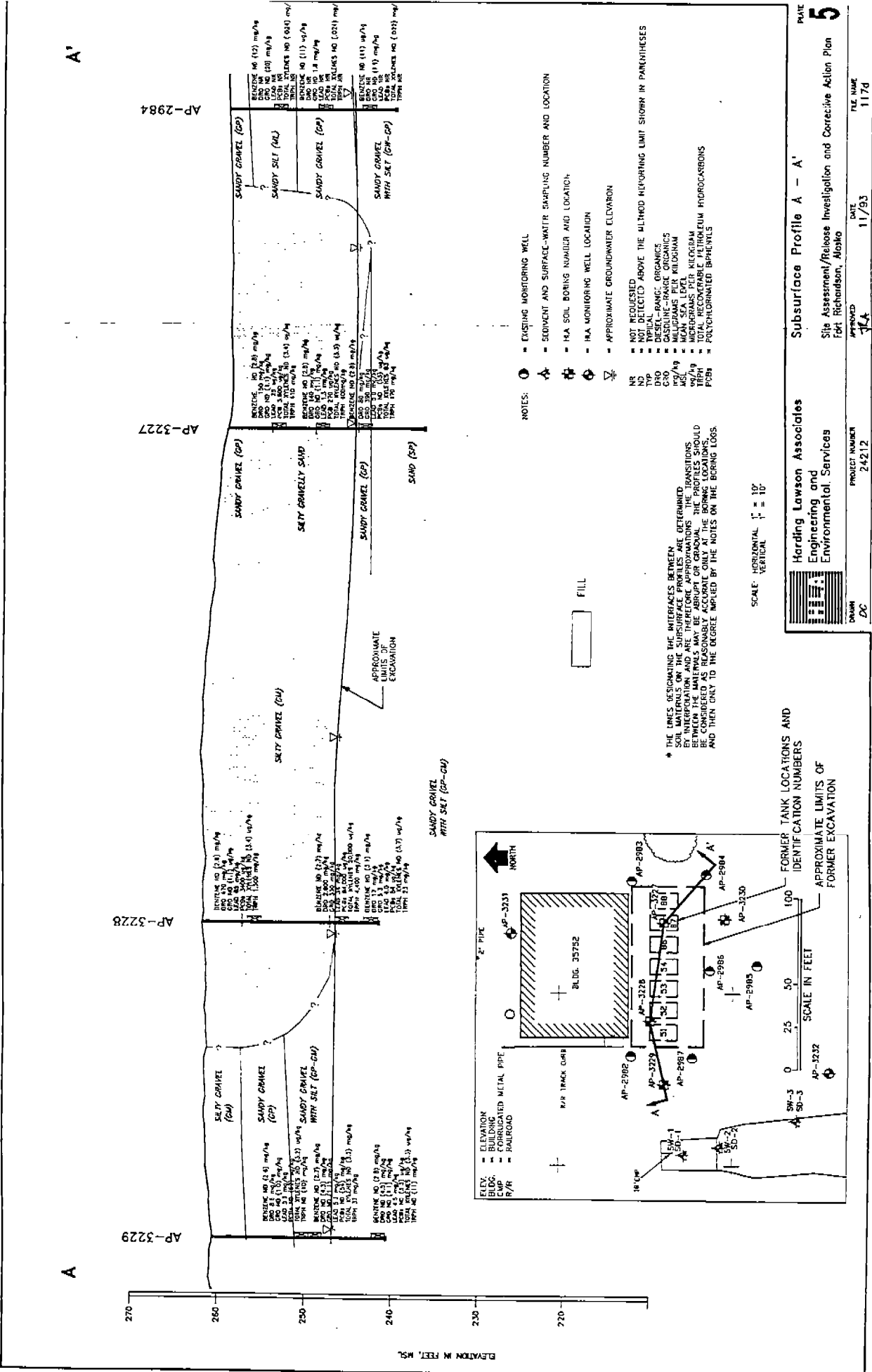
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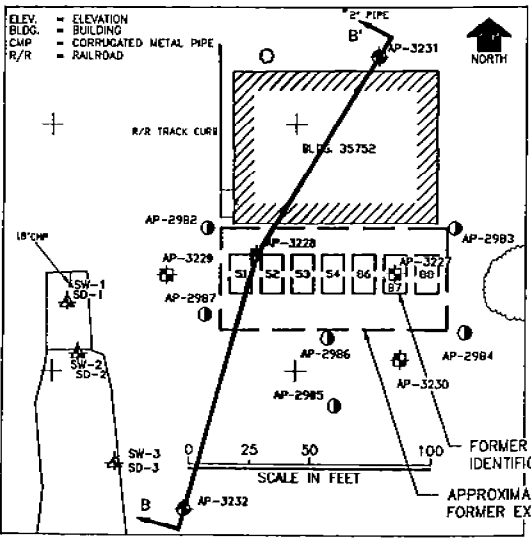
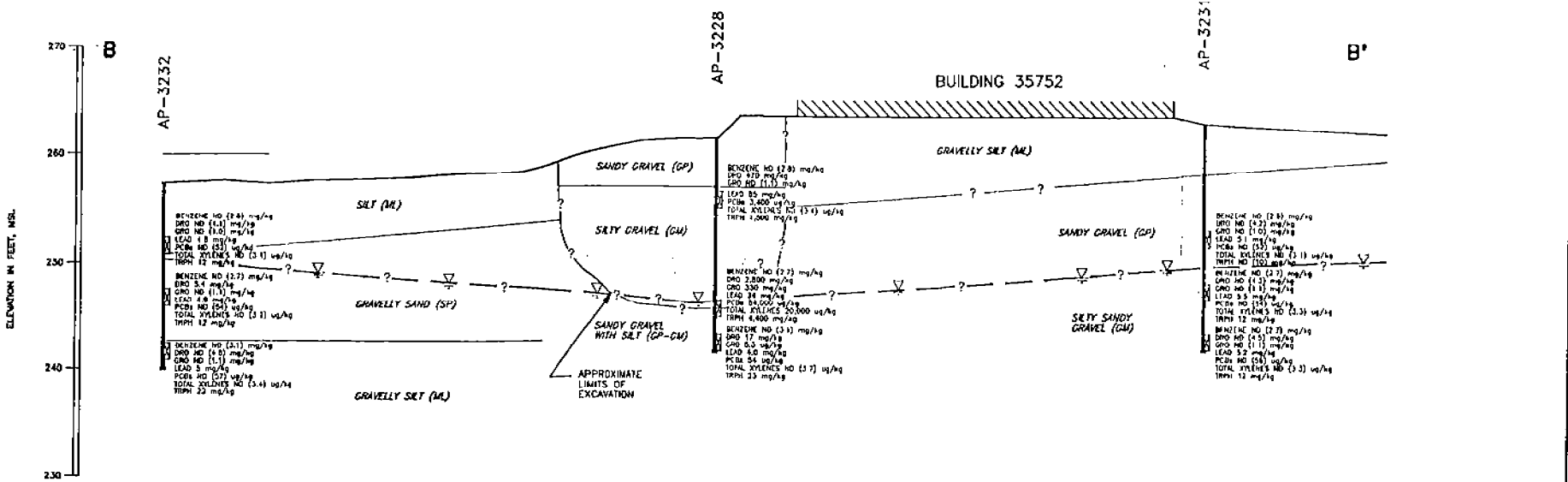
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AP-2984

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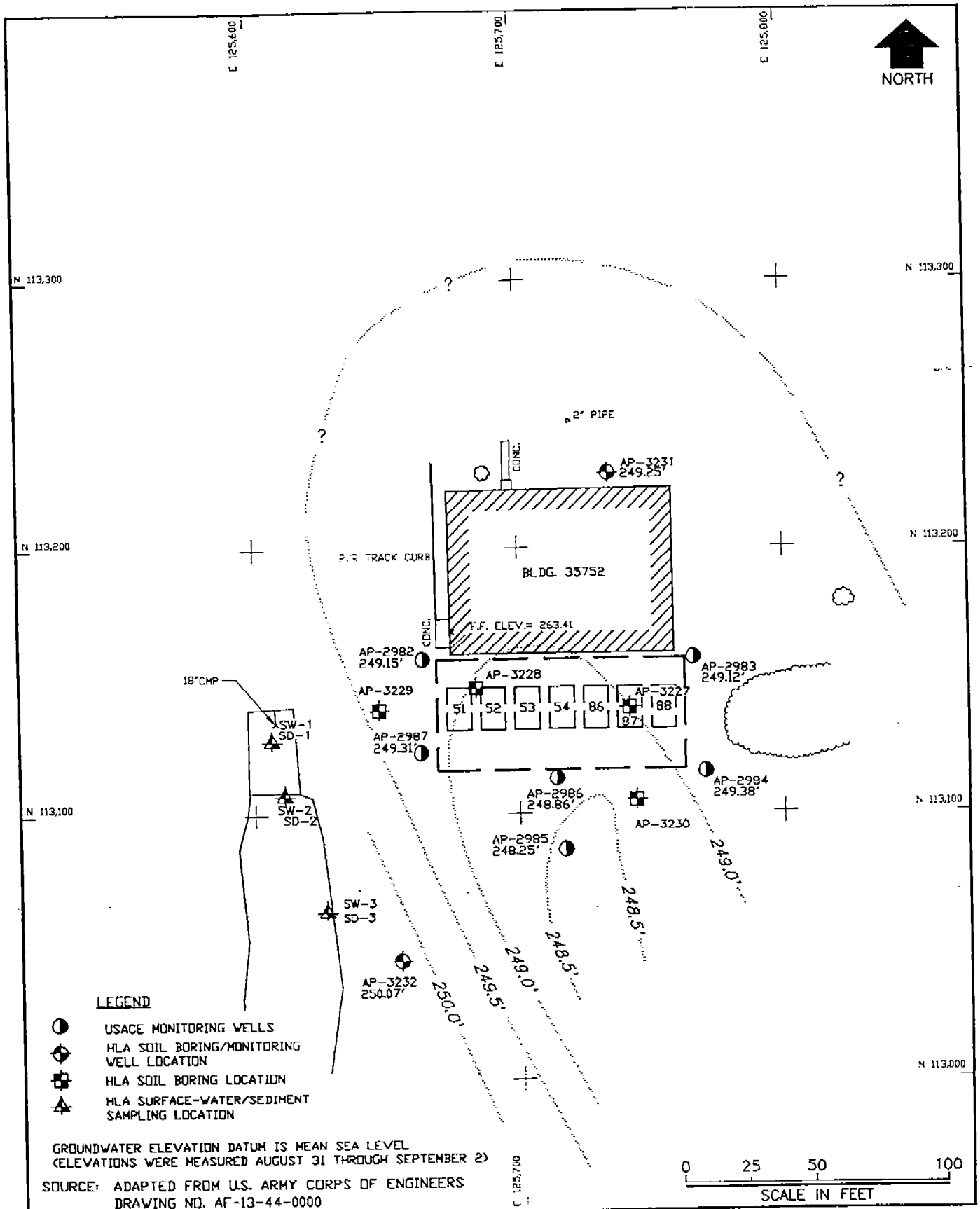


* THE LINES DESIGNATING THE INTERFACES BETWEEN SOIL MATERIALS ON THE SUBSURFACE PROFILES ARE DETERMINED BY INTERPOLATION AND ARE THEREFORE APPROXIMATIONS. THE TRANSITIONS BETWEEN THE MATERIALS MAY BE ABRUPT OR GRADUAL. THE PROFILES SHOULD BE CONSIDERED AS REASONABLY ACCURATE ONLY AT THE BORING LOCATIONS, AND THEN ONLY TO THE DEGREE IMPLIED BY THE NOTES ON THE BORING LOGS.

- NOTES:**
- = EXISTING MONITORING WELL
 - ▲ = SEDIMENT AND SURFACE-WATER SAMPLING NUMBER AND LOCATION
 - ⊕ = HLA SOIL BORING NUMBER AND LOCATION
 - ⊙ = HLA MONITORING WELL LOCATION
 - ▽ = APPROXIMATE GROUNDWATER ELEVATION
- ABBREVIATIONS:**
- NR = NOT REQUESTED
 - ND = NOT DETECTED ABOVE THE METHOD REPORTING LIMIT SHOWN IN PARENTHESES
 - TYP = TYPICAL
 - DRO = DIESEL-RANGE ORGANICS
 - CRD = GASOLINE-RANGE ORGANICS
 - mg/lg = MILLIGRAMS PER KILOGRAM
 - MSL = MEAN SEA LEVEL
 - ug/kg = MICROGRAMS PER KILOGRAM
 - TRPH = TOTAL RECOVERABLE PETROLEUM HYDROCARBONS
 - PCBs = POLYCHLORINATED BIPHENYLS

SCALE: HORIZONTAL 1" = 20'
VERTICAL 1" = 10'

	Harding Lawson Associates	Subsurface Profile B - B'		PLATE
	Engineering and Environmental Services	Site Assessment/Release Investigation and Corrective Action Plan		6
DRAWN DC	PROJECT NUMBER 24212	APPROVED JLA	DATE 11/93	FILE 117d



Harding Lawson Associates
 Engineering and
 Environmental Services

Groundwater Elevations

PLATE

Site Assessment/Release Investigation and Corrective Action Plan
 Fort Richardson, Alaska

7

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24212

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10/93

FILE NAME
0247J

APPENDIX A
REVIEW COMMENTS



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
 REGION 10
 1200 Sixth Avenue
 Seattle, Washington 98101

February 24, 1994

Reply To
 Attn Of: HW-124

Major Kevin Gardner
 Department of Public Works, Environmental Division
 6th Infantry Division (Light) and US Army Garrison .
 ATTN: APVR-DE-PSE
 Fort Richardson, Alaska 99595-5500

Re: Draft Site Analysis/Remedial Investigation, Site 4, Building
 35725, High Frequency Transmitter Site

Dear Maj. Gardner:

Enclosed are the comments by EPA on the Draft Site
 Analysis/Remedial Investigation for Building 35725 (High
 Frequency Transmitter Site) at Fort Richardson.

The main focus of EPA's comments are the lack of
 justification as to why the investigation did not include the
 entire site, e.g. Building 35750, lack of detail and vagueness of
 the document, and some of the cost estimates. The specific
 comments are attached.

Please call me at 206/553-1284 if you have any questions
 regarding these comments.

Sincerely,

R. Matthew Wilkening
 Remedial Project Manager
 Federal Facility Section I

enclosure

cc: Louis Howard, ADEC
 Juanita Gwin, ACOE, Alaska
 Brian Brass, Weston

REVIEW OF DRAFT SITE ASSESSMENT/REMEDIAL INVESTIGATION AND
CORRECTIVE ACTION PLAN, SITE 4, BUILDING 35-752
FORT RICHARDSON, ALASKA

GENERAL COMMENTS

1. The document is vague and lacks detail in several areas such as the corrective action plan, geophysical investigation, soil sampling, and water sampling methods. Although much of this information may be available in the Sampling and Analysis Plan, general techniques should be provided in this document.
2. The document fails to evaluate the entire site. That is, the investigation is focused in the former UST area without providing justification for omitting other areas.
3. The document should provide additional information regarding any seasonal variability in the hydrology. If no information is available or this information is not pertinent it should be stated.
4. The document lacks detail in the Corrective Action Plan. More effort should be made to provide detail on the technology, the exact areas targeted for remediation, and the exact remediation steps. In addition, the costs and the ability to implement the technology should be evaluated on a site specific basis. The addition of detail will provide justification for the costs.
5. There are some general concerns about the methodology of determining costs. For example, it may be desirable to present the alternative costs as a net present worth value instead of simply multiplying the years by the cost. Also, mobilization/demobilization costs should be specific to the type of treatment provided such as the type and quantity of equipment being mobilized.

SPECIFIC COMMENTS

1. Page 12, Section 3.1. The type of geophysical method employed requires clarifying, GPR or E-M, one or both?
2. Page 14, Section 3.2.1. Due to the high concentrations detected in the existing borings, it is recommended that borings be placed to the west of AP-2986 and east of the excavation area, and two more in the excavation area
3. Page 15, Section 3.2.2, Monitoring Wells, Paragraph 2 The type of submersible pump employed to sample the wells should

- be indicated. Appendix E states a submersible was used to sample VOCs, which limits pump type for suitable sampling.
4. Page 35, Section 4.3, Biofeasibility Analysis. EPA disagrees that the magnitude of the microbial populations capable of degrading petroleum hydrocarbons is at the low end of the scale. The low end of the scale is 100 cfu/g. This population represents only 25-40% of this low end, i.e. 27 to 40 cfu/g and this population should not be presented in such an optimistic manner.
 5. Page 40, Section 5.2.3, Groundwater flow, Paragraph 2 No mention was made of local or regional groundwater gradient. This information is required for interpreting groundwater data and for developing a corrective action plan.
 6. Page 47, Section 6.1, No Action Alternative The text states that groundwater monitoring would evaluate unexpected migration of additional contaminants. These contaminants should be listed so the reader may evaluate whether the groundwater monitoring program is capable of detecting the presence of the additional contaminants. The introduction states that only benzene exceeded MCLs. Also see comment below on laboratory analysis and shipping (page 49).
 7. Page 48, Section 6.1, No Action Alternative Capping is considered an engineering control, not an institutional control. An institutional control is a control caused by a change in policy or regulation. Institutional controls include actions such as access restrictions, limitations on recreational use, and issuance of public health advisories. Capping is considered a containment option (a control due to engineering). Given this definition, the institutional controls (site restrictions) will not reduce contaminant mobility and it is erroneous to say that the "limited action alternative requires the construction...of an institutional control."
 8. Page 49, Section 6.1, No Action Alternative It is difficult to tell if \$50,000 for the risk assessment and \$6,000 for the final corrective action plan is reasonable when the scope of work is not provided. Please provide the scope of work with detailed information in the text. The cost for a risk assessment will be determined by factors such as the assumed exposure routes, media, contaminants, and needs for modeling. The introduction (page 46) may be an appropriate place to add this information. The cost for the final corrective action plan is different for the no action alternative than the limited action and disposal alternatives. Was this intentional? If so, state why in the text.

9. Page 49, Section 6.1, No Action Alternative Ten hours per well for sampling and purging monitoring wells seems excessive.
10. Page 49, Section 6.1, No Action Alternative What does laboratory analysis and shipping cover? If there are eight samples, individual analysis costs \$187.50, which is reasonable for a benzene analysis. However the text says monitoring for benzene and other contaminants will occur. Obtaining analysis for other contaminants will be difficult at this cost.
11. Page 49, Section 6.1, No Action Alternative It is assumed there are 100 gallons of purge water. This quantity results in 2.5 gallons per well if there are eight samples. This quantity seems low. Typically three well volumes are used to purge the well.
12. Page 48, Section 6.2, Limited Action Please describe the exact area that will be capped, the square footage, and the thickness of the cap. It is difficult to tell if 95 cubic yards is reasonable.
13. Page 51, Section 6.3, In-Situ Bioremediation Please describe the implementability of this alternative in terms of site specific geology and other physical parameters. For instance, it is desirable to have a highly permeable, homogeneous aquifer when bioventing. Does the site meet these restrictions? Are there silt lenses that may be difficult to remediate and, therefore, require special targeting? Based on site specific geology, what would the expected radius of influence be? Three wells may or may not be reasonable.
14. Page 53, Section 6.3, In-Situ Bioremediation We would suggest including a pilot plant study in the cost estimate and in the discussion. A pilot plant study will give critical information on the feasibility of in-situ bioremediation; as well as information on whether off-gas treatment is required.
15. Page 53, Section 6.3, In-Situ Bioremediation In Assumption 8, define treatment season.
16. Page 53, Section 6.3, In-Situ Bioremediation Bioventing is typically accomplished by pulling a vacuum in the vadose zone. In Section 5.2.3, the depth to groundwater is stated to be 15 feet bgs. If the air extraction wells are screened to depths of 20 feet then water will be drawn, not air. Please note that bioventing is not applicable to the saturated zone.
17. Page 53, Section 6.3, In-Situ Bioremediation The well installation cost of \$65 per foot might be low.

18. Page 53, Section 6.3, In-Situ Bioremediation The costs for blowers and miscellaneous equipment might be low if three 1 HP blowers are used. Please check the costs for piping and valves since they can be significant. Why are three small blowers used instead of one large one?
19. Page 53, Section 6.3, In-Situ Bioremediation It seems that the cost to prepare the final corrective action plan and bioventing system design, plans and specifications might be low. The engineering costs for the bioventing system design, plans, and specifications might take the entire cost shown. Please break the costs for the corrective action plan and bioventing system design, plans, and specification into two line items so that it is easier to evaluate the costs. In addition, providing the scope of work for the final corrective action plan as stated earlier will help.
20. Page 54, Section 6.4, Excavation and Solvent Extraction Treatment. In order to perform solvent extraction, an alternative disposal methods of PCBs, the substantive requirements of 40 CFR Section 761.60 must be met.
21. Page 54, Section 6.4 Excavation and Solvent Extraction Treatment. If the extracted contaminants are disposed of properly then contaminant mobility will be reduced.
22. Page 55, Section 6.4 Excavation and Solvent Extraction Treatment solvent extraction treatment costs seem conservative, but are not unreasonable. Please provide text describing site specific characteristics (such as moisture content, grain size, and tonnage of material) and the associated effect on treatment costs.
23. Page 55, Section 6.4 Excavation and Solvent Extraction Treatment Why is imported clean soil and not treated soil being backfilled? If imported soil is used for backfill what is the disposition of the treated soil?
24. Page 58, Section 6.5 Excavation and Off-Site Landfilling The costs for disposal in an off-site RCRA landfill seem very low. Please double check the costs.
25. Appendix C, Boring Logs and Laboratory Geotechnical Data, All Plates Define the type of instrument employed for the headspace analysis. Are the readings really headspace or simply field screening of split-spoon? The boring log key has no explanation for "SS".
26. Appendix E, Well Development and Water Sampling Field Data, All Plates Need explanation for Purge Volume Calculation. No explanation for code "VCS" under analysis requested.

27. Page E-1, Appendix E, Well Development and Water Sampling Field Data The actual Purge Volume, Purge Intake, and Final and Average GPM data is missing.
28. Plates 5 and 6, Subsurface Profiles A-A' & B-B' Key of symbols (Notes) missing symbol "O".
29. Chemical Quality Assurance Report, Section 6 a., Surrogate Recoveries While PCB surrogate recoveries are advisory only, low recoveries from blank samples are cause for concern since there should be no matrix effects.
30. Chemical Quality Assurance Report, Section 6 c., Laboratory duplicates Relative Percent Differences (RPD) exceeding QC limits for spiked blank samples are a case for concern. There should be no matrix effects in a blank sample and, therefore, exceedances are indicative of poor laboratory precision. All associated Method 524.2 data should be qualified as estimated.

Facsimile Sheet



2:10

U.S. Army Engineer District, Alaska

P.O. Box 898
Anchorage, Alaska 99506-0898

From (Name) JOHN WALLS	Office Symbol CE/PA-EN- EE-AI	Telephone No.: 753-5608	
		Fax No.: 753-5611	
To (Name) MARK BEVANT	Office Symbol HLA	Telephone No.: 563-8102	
		Fax No.: 561-4574	
Refuser's Signature <i>[Signature]</i>	# Pages 4	Precedence	Date 8 MAR 94
Subject FT RICH BUILDING 35752, HIGH FREQUENCY TRANSMITTER SITE - COMMENTS FROM ADEC			

Message

MAR- 8-94 TUE 14:31

STATE OF ALASKA

WALTER J. HICKEL, GOVERNOR

DEPT. OF ENVIRONMENTAL CONSERVATION

SOUTHCENTRAL REGIONAL OFFICE
 CONTAMINATED SITE PROGRAMS
 DEFENSE FACILITIES OVERSIGHT
 3601 C STREET, SUITE 1334
 ANCHORAGE, ALASKA 99503

PHONE: (907) 563-6529
 FAX: (907) 273-4331

CERTIFIED MAIL
 RETURN RECEIPT REQUESTED
 NO. P 521 088 965

February 22, 1994

MAJ Kevin Gardner
 6th Infantry Division (Light)
 and US Army Garrison, Alaska
 Public Works, Attn: APVR-PW-ENV
 600 Richardson Drive, #6500
 Fort Richardson, AK 99505-5500

Re: January 1994 Draft Remedial Investigation/Corrective Action Plan
 HLA Project No. 24212 Building 35752 Fort Richardson, Alaska

Dear Kevin:

The Alaska Department of Environmental Conservation-Defense Facilities Oversight group (ADEC) has received, on January 28, 1994, a copy of the DRAFT Remedial Investigation and Corrective Action Plan (RI/CAP) Site 4, building 35752 High Frequency Transmitter Site, HLA Project No. 24212 dated January 18, 1994. Here are ADEC's comments regarding this document.

3.1.1 Deviations from the Release Investigation Plan page 13

The text states that the two inch standpipe near monitoring well AP-3232 was investigated through geophysics by Harding Lawson Associates. A conclusion was reached that an underground storage tank was not associated with this standpipe. Although the standpipe was not considered for further investigation by HLA, ADEC requests that the Army further investigate and/or remove it. Any further investigation or proposed removal will have to follow CERCLA protocols and requirements since the garrison is proposed to be listed on the National Priorities List and this site is included as a part of Operable Unit (OU) B.

5.2.2 Soil Boring Sampling Results page 39

The text states that Diesel Range Organics (DRO) and Gasoline Range Organics (GRO) concentrations were in excess of ADEC Level "A" cleanup levels mainly in borings AP-3227 and AP-3228. The cleanup levels referenced ADEC's soil matrix scoresheet are to ensure that groundwater does not become impacted due to contaminant migration from the zone of contamination. Since the groundwater at the site is impacted from petroleum contamination above MCLs the use of Level "A" cleanup levels is inappropriate. Alternative cleanup levels will have to be developed through a risk assessment that follows CERCLA protocols.

MAJ Kevin Gardner

-2-

February 22, 1994

ADEC is concerned that the presence of petroleum contaminants and PCBs in the subsurface soils at the fifteen foot depth interval poses a risk to the environment through increased mobilization. ADEC requests that any corrective action plans or interim removal actions for this site incorporate an appropriate method of dealing with PCB contaminated soils (i.e. TSD facility) that will satisfy CERCLA requirements.

The document also states that a qualitative risk assessment for risk based concentrations (RBCs) and potential receptors at the site be conducted to determine actions levels for PCBs. ADEC requests that the risk assessment follow CERCLA protocols and methodology. The methodology in developing a baseline risk assessment is described in the Risk Assessment Guidance For Superfund, Volume I: Human Health Evaluation Manual, Part A, (EPA 1989d) (RAGS HHM and Volume II, Environmental Evaluation Manual (EPA 1989e).

5.2.3 Groundwater Sample Results page 41

The text states that the significant decrease of contaminant concentrations in wells AP-2982 and AP-2987 and lack of detected contaminants in other nearby downgradient wells suggests that the contaminants detected during the 1990 USAACE investigation are dissipating. This assumption cannot be substantiated with the current data set given the qualifications listed in 4.2.1 on page 25. The text states that no duplicates or MS recoveries for Volatile Organic Compounds (VOCs) were submitted for several of the aqueous samples so the data precision and accuracy could not be assessed. Subsequently, the data is suspect and should be viewed with caution. ADEC requests that any additional sampling be conducted with CERCLA protocols in mind since this site is proposed to be included in OU B.

5.2.4 Surface-Water and Sediment Sampling Results Page 42

The text states that cleanup levels are not established for sediment, however there are sediment quality criteria (SQC) available that the U.S. EPA recommends be considered in establishing remediation goals for contaminated sediments. The SQC were designed to be protective of aquatic life and animals that consume aquatic life. The PCB SQC is not a fixed value; rather, it is dependent on the total organic carbon (TOC) concentration in the sediment. In order for the appropriate SQC level to be determined, the TOC will have to be calculated from another round of sediment sampling. ADEC requests that a sampling plan be submitted, using applicable CERCLA protocols, outlining specifically what sediment sampling will be done and exactly how the sample will be collected.

5.3 Recommendations Page 43

ADEC concurs with the assumption that a risk assessment is needed to evaluate the level of PCBs detected (see comments under 5.2.2). However, this risk assessment must follow CERCLA protocols and include: a conceptual site model, preliminary remediation goals, exposure scenarios and pathways. The use of the sediment quality criteria (SQC) is recommended in establishing remedial goals of the contamination present (see comment 5.2.4). Groundwater contaminated with benzene at 25 ug/L is in excess of the 5 ug/L MCL and cannot be overlooked in any comprehensive risk assessment or remedial design being considered (also see comments under 5.2.3). Continued monitoring of the groundwater with no remedial action of the groundwater cannot be justified without first conducting a risk assessment that follows all CERCLA protocols described previously

MAJ Kevin Gardner

-3-

February 22, 1994

6.0 Corrective Action Plan Page 45

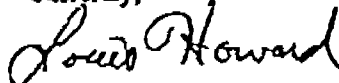
The text states the source of the contamination (the waste oil USTs) has been removed. This is only partially true since there is petroleum contamination (2,800 mg/kg DRO 330 mg/kg GRO) at the fifteen foot interval in the soils. Since the contamination is present at the same depth as the PCB contaminants at soil/groundwater interface there is a high possibility of it posing as a source for groundwater contamination through leaching. Selection of a remedial alternative for the contamination at the site must be justified by a risk assessment using CERCLA protocols.

Appendix F Chemical Quality Assurance Report

Use of the detection limits for PCBs water samples of 0.5 to 1.0 ug/L (ppb) is not low enough to determine if the National Ambient Water Quality Criteria of 0.014 ug/L was exceeded. ADEC requests that additional water sampling of all monitoring wells at the site for PCBs (in addition to the VOCs mentioned in section 5.2.3) be performed using CERCLA protocols and methods that are able to detect this level of concern.

ADEC requests a written response outlining steps that the Army will be taking to resolve the issues discussed above within thirty (30) days of receipt of this letter by the Army. If there are any questions regarding this letter or you wish to schedule a meeting to discuss the issues raised in this letter, please contact me at the Southcentral Regional Office, telephone number: (907) 563-6529.

Sincerely,



Louis Howard
Environmental Specialist

LH:el

cc: Bill Lamoreaux, ADEC/ADO
John Halverson, ADEC/SCRO
Matt Wilkening, EPA Region X Seattle, HW-124

REV ^N COMMENTS

PROJECT: Bldg 35 752

LOCATION: Ft. Rucker

<input type="checkbox"/> NP Date: 3/10/84 <input type="checkbox"/> Air Force Reviewer: T. ... <input type="checkbox"/> Army Phone: x 1115 <input type="checkbox"/>		Design Document <input type="checkbox"/> D. Menu <input type="checkbox"/> Concept <input type="checkbox"/> P & S <input type="checkbox"/> Prelim. <input type="checkbox"/> <input type="checkbox"/> Final		<input type="checkbox"/> Arch./LA <input type="checkbox"/> Civ./San. <input type="checkbox"/> Mech./Elec. <input type="checkbox"/> Struct.		Action taken on comment by:		
				REVIEW CONF A-cmt accepted	C-correction made. List DWG or paragraph number where correction made	Back check by (initial)		
Item No	Drawing Sht. Spec. Para.	COMMENTS			if not, explain	(if not corrected - explain)	(initial)	
1	Tb.3-1	ER 1110-1-263 and the sampling plan require that rinsate blanks and trip blanks be numbered just like other water samples. This requirement was ignored. Please explain why.						
2	p. 20	3.2.6: Include information about disposition of IDW by DPW (where was it ultimately disposed?)						
3	p. 22	3.3: QC samples were not analyzed by NPD. Correct.						
4	gen	Data tables (4-1, etc.) must include the QC and QA duplicate data alongside the project samples that they replicate.						
5	p. 25	4.2.1, bullet items 4 & 5: Do not actually substitute the data. Include the project, QC and QA data, and indicate in footnote that QAR recommends that QA data be used. Explain in text <u>why</u> the project data are unusable.						
6	p. 28	What does note c mean? Please explain.						
7	p. 34	Table 4-6: Correct from "ND (LT 2)" to "ND (2)".						
8	p. 35	Last paragraph, 4.3: Disagree that addition of microorganisms is necessary.						

REV ^V COMMENTS

PROJECT: 35 15 2

LOCATION:

<input type="checkbox"/> NP Date: _____ <input type="checkbox"/> Air Force Reviewer: _____ <input type="checkbox"/> Army Phone: _____ <input type="checkbox"/> _____		Design Document <input type="checkbox"/> D.Memo <input type="checkbox"/> Concept <input type="checkbox"/> P&S <input type="checkbox"/> Prelim. <input type="checkbox"/> _____ <input type="checkbox"/> Final		<input type="checkbox"/> Arch./LA <input type="checkbox"/> Civ./San. <input type="checkbox"/> Mech./Elec. <input type="checkbox"/> Struct.		Action taken on comment by: REVIEW CONF A-cmt accepted			DISCUSSION OFFICE C-correction made. List DWG or paragraph number where correction made		Back Check By (initial)
Item No	Drawing Sht. Spec. Para.	COMMENTS				if not explain	(if not corrected - explain)		(initial)		
9	p. 35	More likely, their growth is oxygen-limited.									
10	p. 36	Last paragraph, 4.3: Conclusion that nutrient levels are too low seems premature. Justify or change wording.									
11	p. 38	5.1: Include a completed matrix score sheet for this site as an appendix.									
12	Pl. 5	Delete this table. These are <u>not</u> contaminants of concern at this site.									
13	Pl. 5	Recommend including hits only, to make data easier to scan.									
14	p. 40	Data do not match tables, e.g., AP-3228, 18.5' bgs, table says 54 ppb, plate says ND with a detection limit of 54 ppb. Check accuracy of all data & correct errors.									
15	p. 42	AP-2986 was contaminated at 10' bgs. AP-3230 was contaminated at 13' bgs. Both are outside the excavation limits, so your statement that contamination is all in fill (last paragraph 5.2.2) is wrong. Re-do this paragraph to reflect this.									
		5.3, first sentence: Final ADEC cleanup									

REV. ^V
COMMENTS

PROJECT:

LOCATION:

<input type="checkbox"/> NP Date: _____ <input checked="" type="checkbox"/> Air Force Reviewer: _____ <input type="checkbox"/> Army Phone: _____ <input type="checkbox"/> _____		Design Document <input type="checkbox"/> D. Memo <input type="checkbox"/> Concept <input type="checkbox"/> P & S <input type="checkbox"/> Prelim. <input type="checkbox"/> _____ <input type="checkbox"/> Final		<input type="checkbox"/> Arch./LA <input type="checkbox"/> Civ./San. <input type="checkbox"/> Mech./Elec. <input type="checkbox"/> Struct.		Action taken on comment by: <input type="checkbox"/> A-cmt accepted <input type="checkbox"/> C-corr. made. List DWG or paragraph number where correction made <input type="checkbox"/> If not corrected - explain			Checked by _____ (initial)	
Item No	Drawing Sht. Spec. Para.	COMMENTS	If not, explain	(if not corrected - explain)	(initial)					
		criteria have <u>not</u> been established. Change wording.								
16	p. 42	5.2.4: SD-1 in Table 4-2 has 1.15 ppm PCBs; text here states 1.3 ppm. Coordinate.								
17	p. 46	6.0, paragraph 4, line 4: Insert "may" between "MCLs" and "apply".								
18	p. 48	6.1: Define TMV.								
19	p. 48	6.1, paragraph 2: <u>What</u> contaminated surface soil?								
20	p. 48	6.2: Why is capping appropriate? Please explain.								

U.S. ARMY CORPS OF ENGINEERS CENPA-EN-EE-TE		DATE: 2/27/94 REVIEWER: Bob Haviland PHONE: 753-5724	ACTION TAKEN ON COMMENT BY: _____		
ITEM NO.	Drawing Sht. Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	DESIGN OFFICE C - correction made (If not, explain)	Back check by:
1	App A	No annotated review comments were received. Comments shall be annotated to document the review conference action and the action of the designer. (comment incorporated and where incorporated). These comments are made after lengthy reviews. It is not only courteous for the designer to annotate for backcheck, but required. Were any of the original comments incorporated? All of them?			
2	GEN	The SOW does not require a quantitative CERCLA risk assessment. However, in order to evaluate alternatives, a conceptual site model and some type of risk evaluation is needed. To simply rely on regulatory values is weak. The reference to the EPA Supplementary Risk Assessment Guidance or simplified risk assumptions would have added considerable weight to the report. It was known that contamination levels over regulatory levels were on site prior to the NTP. The SOW required a risk evaluation. It could be argued that this report complied with the SOW, although weakly. However, a risk evaluation should include all contamination, not only petroleum. The SOW is calling for professional treatment of this project, not a book keeping exercise. Your recommendations could have been written prior to any field work. It was known there was petroleum and PCB contamination on site prior to the NTP.			

00D 0017445

U.S. ARMY CORPS OF ENGINEERS CENPA-EN-EE-TE		DATE: 2/27/94 REVIEWER: Bob Haviland PHONE: 753-5724	ACTION TAKEN ON COMMENT BY: _____		
ITEM NO.	Drawing Sht. Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	DESIGN OFFICE C - correction made (If not, explain)	Back check by:
3	ii	Add the Executive Summary as required by the SOW.			
4	8 (& 9)	Last sentence: The SOW states 1989 for tank removal, your report states 1990. Verify. Which one is incorrect?			
5	9	Last sentence first paragraph states backfill was clean soil. Elsewhere (p. 39) the report states contaminated backfill. Verify and clarify.			
6	10	First paragraph, last sentence: Were PCBs tested for? If so, what were detection limits? How many tests?			
7	12	Your stated objectives differ from the SOW which states in paragraph 5.1: "The AE shall conduct those field investigations necessary to characterize the HF Transmitter Site (Site No. 4), to evaluate the actual or potential risk to human health and the environment posed by the site, and satisfy 18 AAC requirements for site assessments, initial abatement and release investigation, and corrective action investigations."			
8	23	Paragraph 3.3.2: Clarify if API methods or ADEC methods were used. If API, explain why ADEC methods were not used as required by 18 AAC 78.			
9	25	Second bullet: Explain why high detection limits were used.			

00D 0017446

REVIEW
COMME

PROJECT: SITE 4, BLDG. 35752, HF TRANSMITTER SITE
DESIGN DOCUMENT: Draft Site Assessment, and CAP

LOCATION: FT R RDSON

U.S. ARMY CORPS OF ENGINEERS CENPA-EN-EE-TE		DATE: 2/27/94 REVIEWER: Bob Haviland PHONE: 753-5724	ACTION TAKEN ON COMMENT BY: _____		
ITEM NO.	Drawing Sht. Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	DESIGN OFFICE C - correction made (If not, explain)	Back check by:
10	26	Column AP-3228 @ 15': Clarify concentrations. Is it 20.000 or 20,000? Likewise with 84.000 or 84,000.			
11	32	Paragraph 4.3: Good. Now carry this through into the CAP alternatives.			
12	35	First paragraph: Clarify. Are petroleum degraders "typically found in soil?"			
13	35	Second paragraph: Elaborate/clarify. How does adding hydrocarbon-utilizing microorganisms stimulate the indigenous hydrocarbon-utilizing microorganisms? Also, you mention that soil moisture should be maintained in a range conducive to microbial growth and soil workability. Don't keep us in suspense . . . what's the range?			
14	36	First paragraph: Similar comment as No. 7.			
15	36	Regulatory guidelines: What about ADEC waste oil regulations, PCBs, TSCA & RCRA?			
16	37	Paragraph before paragraph 5.2: This is weak. See comment 2.			
17	40	First paragraph: What are your recommendations for lead and PCBs? See comment 2.			
18	40	Second paragraph states the source of contamination is the backfill material. Explain the contaminated sediment in view of this.			

00D 0017447

REVIEW
COMMENT

PROJECT: SITE 4, BLDG. 35752, HF TRANSMITTER SITE
DESIGN DOCUMENT: Draft Site Assessment, and CAP

LOCATION: FT R. RDSON

U.S. ARMY CORPS OF ENGINEERS CENPA-EN-EE-TE		DATE: 2/27/94 REVIEWER: Bob Haviland PHONE: 753-5724	ACTION TAKEN ON COMMENT BY: _____		
ITEM NO.	Drawing Sht. Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	DESIGN OFFICE C - correction made (If not, explain)	Back check by:
19	45, 9	Clarify your soil volumes. There appears to be a contradiction between 840 CYs and 2350 CYs.			
20	46, 47	The report states that HLA evaluated the remedial alternatives according to, among other criteria, associated short-term and long-term health risks. This is untrue and implies HLA did a thorough job.			
21	47	A no action alternative is strictly that. No action, no cost for implementation. Monitoring and performing a risk assessment is not no action. Clarify.			
22	51	Verify that PCBs are not biodegradable. I believe they are but the efficiency is lower. However, a question is, is this remedial method acceptable by law/regulation?			
23	Plate 2	Locate underground utilities in the area. These are potential pathways of contamination and should have been included. SOW paragraph 6.2.1.3.			
24	Plate 3	An 18" CMP is shown. Where does this drain from. A potential source of contamination. It should have been included in your analysis.			
25	App. B	Include dates of this analysis.			

00D 0017448

REVIEW
 COMMENTS PROJECT Draft SI/RI/CAP High Freq. Trans. Site
 LOCATION: Ft. Richardson, AK HLA Project # 24212

U.S. CORPS OF ENGINEERS CBNPA-EN-EE-TE		DATE: February 27, 1994 REVIEWER: FRANK POFF PHONE: X-1708	ACTION TAKEN BY: _____	
		COMMENTS	A - ACCEPTED N - NOT ACCEPTED W - WITHDRAWN	ACTION TAKEN
ITEM NO.	section, pg., para.			
	5.1	SOW directs AE to use 18 AAC 78. 18 AAC 78.315 (g) directs the AE to 18 AAC 75.319 which defines "Hazardous Substances" as part of AS 46.03.828 Definitions, which in-turn directs the AE to 42 USC 9601 (14) which is the Federal CERCLA program. The AE did not follow SOW by not including the requirements of 18 AAC 78 and the other referenced regulations and statutes.		
	5.1	SOW also directs AE to applicable portions of 40 CFR 761 and the SOW. Is this a typical spill under TSCA? Is it an old spill before Feb. 1978? This information is critical background regulatory information and must be in the report.		
	6.0	After PCBs were confirmed at this site, and a review of the regulations revealed that EPA Region 10 would have to determine PCB cleanup levels for this site. Task 5.6 and 7 of SOW could not be sensibly accomplished and ADCOEs should have been advised that work could not progress until PCB levels were determined.		

		COMMENTS	A - ACCEPTED N - NOT ACCEPTED W - WITHDRAWN	ACTION TAKEN
ITEM NO.	section, pg., para.			

	6.0	SOVAT 1013 requires HLA "to evaluate the actual or potential risk to human health and the environment posed by the site(s)." If this task could not be accomplished then ADCOE should have been advised on this fact in the interim draft and no further work accomplished on Task 6.0 and 7.		
	3.2	As part of Task 3 the AE should have performed or suggested field screening to determine the presence of PCBs. These cheap PCBs field screening tests would have aided the AE in determining if more than the minimum number of borings/samples were needed. Field screening test would have aided in the characterization of PCB contaminates sediments also.		
	3.2.1	The highest contamination reported by the Corps sampling was AP-2986, the closest bore hole by HLA was over 50 ft away. There were PCBs sampled outside of the excavation. This site is still uncharacterized with reference to PCBs and the advise ADCOEs on further sampling of the area.		
	---	Section 5.21 of the SOW requires the submission of field notes as part of draft reports. I have not seen any field notes or photographs, as yet.		

		COMMENTS	A - ACCEPTED N - NOT ACCEPTED W - WITHDRAWN	ACTION TAKEN
ITEM NO.	section, pg., para.			

	5.2.2	Section 5.2.3 and 5.2.4 of SOW requires the AE to estimate the horizontal and vertical distribution of contaminants. The AE did not estimate the distribution of PCBs. AE must explain why this was not done or could not be done (perhaps lack of site characterization with reference to PCBs was the reason). ADCOE should have been advised that Task 5.2.3 could not be completed as part of SOW or AE should have conducted field screening for PCBs. Field screening methods are very cheap and would not place an undue burden on the AE if training of personnel was not needed.		
	3.2.6	Was all waste containing PCBs handled and manifested in accordance to applicable regulations? Please explain exactly how the IDW was transported, manifested, and disposed. Since PCBs were not definitely identified when the waste was generated.		
	4.2	Section 6.2.1.3 of SOW was not done for PCBs. Has the possibility of a surface spill been eliminated by the AE's investigation?		
1	Append. G	Question 8: Please document the known wells, sources of information, and surety of the data used somewhere in the report. Question 12, 13, 14: Does the AE have enough information to this decision? Question 16, and 17: I am not convinced that the information available has proven that the tanks were the sole source of PCBs contamination.		