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U.S. Army
Corps of Engineers
Alaska District

PRELIMINARY SOURCE EVALUATION 2 OPERABLE UNIT D

Fort Richardson, Alaska

FINAL
October 1996

ENSR

CONTENTS

CONTENTS
(Cont'd)

CONTENTS
(Cont'd)

CONTENTS
(Cont'd)

CONTENTS
(Cont'd)

APPENDICES

LIST OF TABLES

LIST OF TABLES
(Cont'd)

LIST OF TABLES
(Cont'd)

LIST OF FIGURES

LIST OF FIGURES
(Cont'd)

1.0 INTRODUCTION

This document presents the field investigation results for the Preliminary Source Evaluation 2 (PSE2) conducted at nine Operable Unit D (OUD) sites at Fort Richardson, Alaska (Figure 1-1). OUD is being investigated for potential hazardous waste contamination under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Superfund Amendments and Reauthorization Act (SARA), commonly referred to as Superfund. (This document will henceforth refer to CERCLA/SARA simply as CERCLA.)

A Federal Facility Agreement (FFA) between the Army, U.S. Environmental Protection Agency (EPA) Region 10, and Alaska Department of Environmental Conservation (ADEC) was implemented in 1994 to ensure that the Fort Richardson facility and other areas potentially contaminated from sources at Fort Richardson are thoroughly investigated and remediated as necessary to protect the public health, welfare, and the environment. The FFA facilitates cooperation, information exchange, and participation among the parties by specifying the roles of the agencies in the investigation and cleanup process and by specifying that all work will be performed in accordance with CERCLA and applicable state laws.

The nine sites being investigated at OUD are listed below and identified in Figure 1-2:

- Building 35-752
- Stormwater Outfall to Ship Creek
- Building 700/718
- Building 704
- Building 796
- Building 955
- Dust Palliative
- Fire Training Area
- Grease Pits

1.1 Preliminary Source Evaluation Objectives

A PSE is a process used to describe an individual site, its current and past uses, and potential contamination sources. Information for the PSE is gathered from several sources, including site inspections, existing reports, review of facility plans, and employee interviews.

A site and document review process was used to identify potential contaminants for each site and to develop a conceptual site model (CSM) indicating where contamination was likely to be present. A limited sampling program was designed to sample potentially contaminated areas at each site.

At the conclusion of this PSE2 process, each of the nine sites will be designated for one of four possible outcomes:

- No further action (NFA). This action may be selected when investigation results indicate that a particular site presents no apparent risk to human health or the environment and displays no environmental contamination requiring cleanup.
- Interim remedial measure (IRM). This action may be selected when there is an identifiable and ongoing threat to public health, welfare, or the environment from identifiable sources. Generally the pollutant threat must be acute and continuing, and must be able to be mitigated by direct physical or mechanical means. The threat must be sufficient that the time frame to perform a characterization (a full remedial investigation/feasibility study) prior to implementing a remedial action is unacceptable in its protection of human health or the environment.
- Remedial investigation/feasibility study (RI/FS). This action will be selected if results of the PSE2 confirm that a chemical release has occurred and if environmental contamination exceeds threshold concentrations, presents a risk to human health or the environment, and is not solely petroleum, oil, and lubricant (POL) contamination, which may fall into another regulatory program as described below. The purpose of an RI/FS is to collect information necessary to assess the risks to human health and environment presented from contamination at a site, and to develop and analyze remedial action alternatives. At the conclusion of the RI/FS process, either a specific remedial action or no further action will be recommended.
- Other program. This action will be selected if the source area is from an underground storage tank (UST), an aboveground storage tank (AST), or if only POL contamination is present above threshold concentrations. Investigation and remediation activities may be referred to another program such as the State-Fort Richardson Environmental Restoration Agreement.

1.2 Project Scope

The specific objectives of this PSE2 include the following:

- Identify the presence or absence of contaminated media (i.e., soil, sediment, and/or groundwater).
- Determine and document no further action decisions where supported by analytical data.
- Evaluate whether contaminant concentrations are sufficient to require further action, and if so, what type of action would be appropriate.

The PSE2 report summarizes and interprets the data collected from the field activities as well as previous investigations to provide an evaluation of the observed and potential extent of environmental contamination at the nine sites in Operable Unit D.

The statement of work (SOW) for the PSE2 investigation included the following activities, presented by site.

<u>Building 35-752</u>

- Drum Accumulation Area. Collect soil samples from 6 inches and 2 feet below ground surface (bgs) from eight hand-auger borings. Upon receipt of sample results, advance and sample two borings to 20 feet bgs or until groundwater is encountered.
- Cooling Ponds. Collect eight sediment samples, four from the bottom of each pond. At the east side of the pond, complete one boring angled west under the pond and sample at depth of approximately 5 to 10 feet below the bottom of the pond. Advance three borings, west, north, and northeast of the pond, and complete as monitoring wells. Collect groundwater samples from the three new monitoring wells and two existing monitoring wells.
- Concrete Floor. Collect polychlorinated biphenyl (PCB) wipe samples from 28 locations inside Building 35-752.
- Former UST Location. Advance and sample four borings to 20 feet bgs or to groundwater within the footprint of the former UST excavation. Collect groundwater samples from two existing wells.

Stormwater Outfall to Ship Creek

- Ship Creek. Collect one sidewall and one sediment sample from a location upstream and a location downstream of the stormwater outfall.

- Stormwater Drainage System. Collect one sidewall and one sediment sample from the drainage ditch within 25 feet of the confluence with Ship Creek.

Building 700/718

- Drum Accumulation Area. Collect soil samples from 6 inches and 2 feet bgs from eight hand-auger borings. Upon receipt of sample results, advance and sample two borings to 20 feet bgs or until groundwater is encountered.

Building 704

- Drum Storage Area. Collect soil samples from 6 inches and 2 feet bgs from eight hand-auger borings. Upon receipt of sample results, advance and sample two borings to 20 feet bgs or until groundwater is encountered.

Building 796

- Battery Acid Shop. Advance and sample four borings to 20 feet bgs, two inside and two outside the Battery Acid Shop. Upon receipt of soil sampling results, locate and sample a monitoring well.

Building 955

- Former Sludge Bin Area. Advance and sample four borings to a depth of 20 feet bgs.

Dust Palliative

- Collect three composite samples from each of the following locations (each composite sample will consist of four grab samples from a depth of 18 inches bgs):

    1. UC 5497 (Loop Road) between Roosevelt Road to the north and the turnoff to the water reservoir to the south. (This section is also referred to as the road to Otter Lake.)
    2. Roosevelt Road east of the Alaska Railroad right-of-way.

3. UC 5997 (Davis Highway) between Sixth Street and Roosevelt Road.
4. Building 796 east side parking lot.

Fire Training Area

- Collect 10 samples from a depth of 6 inches to 1 foot below the Fire Training Area. Upon receipt of the sample results, advance and sample three 20-foot borings, two inside and one outside the Fire Training Area.

Grease Pits

- Collect samples from three soil borings advanced to groundwater. Convert to monitoring wells and sample.

Background

- At each of four selected background locations, collect soil samples from 6 inches and 2 feet bgs from one hand auger boring. Advance and sample one boring to 20 feet bgs or until groundwater is encountered.

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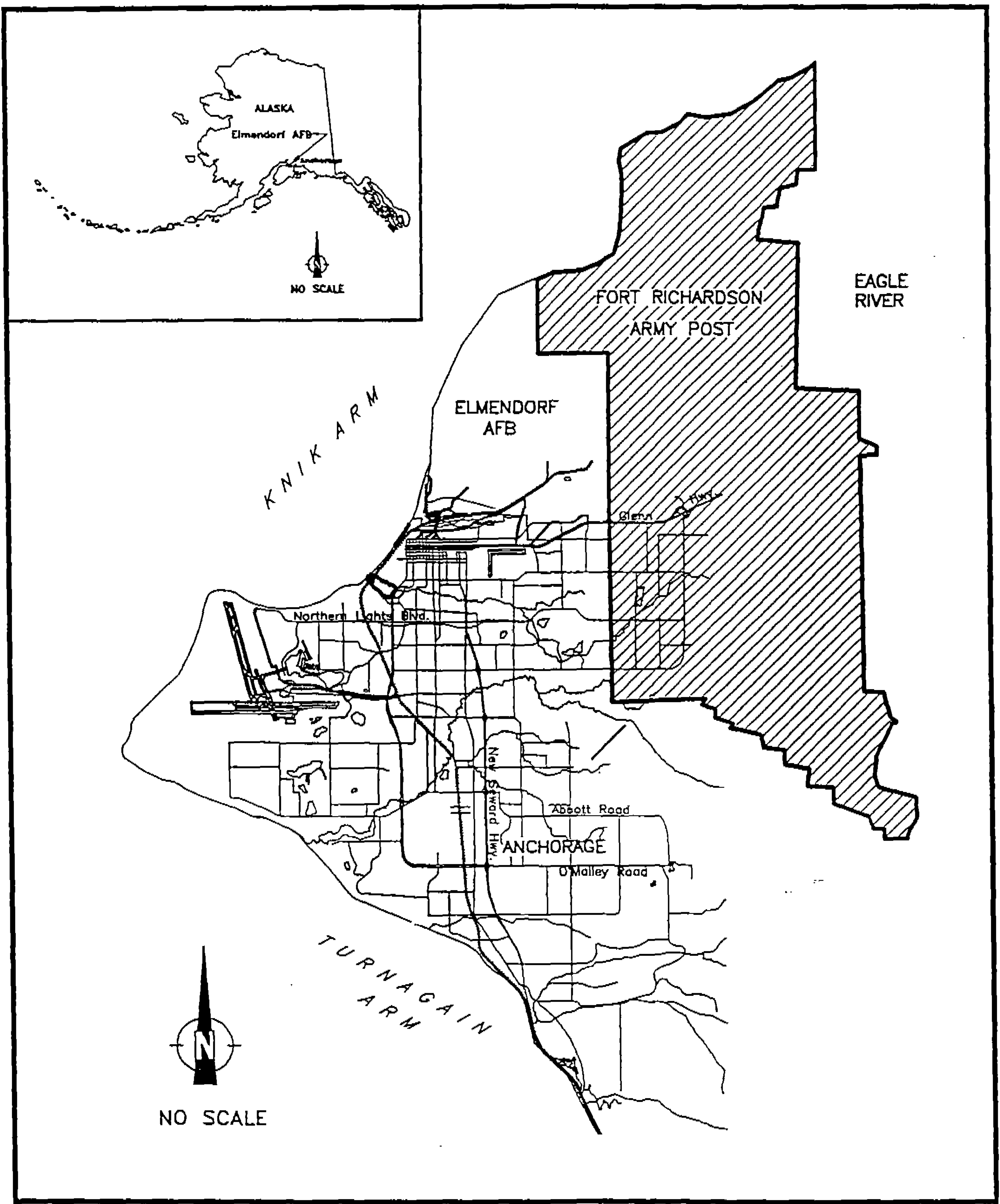

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DRAWING: SITELOCA DRAWN: SR
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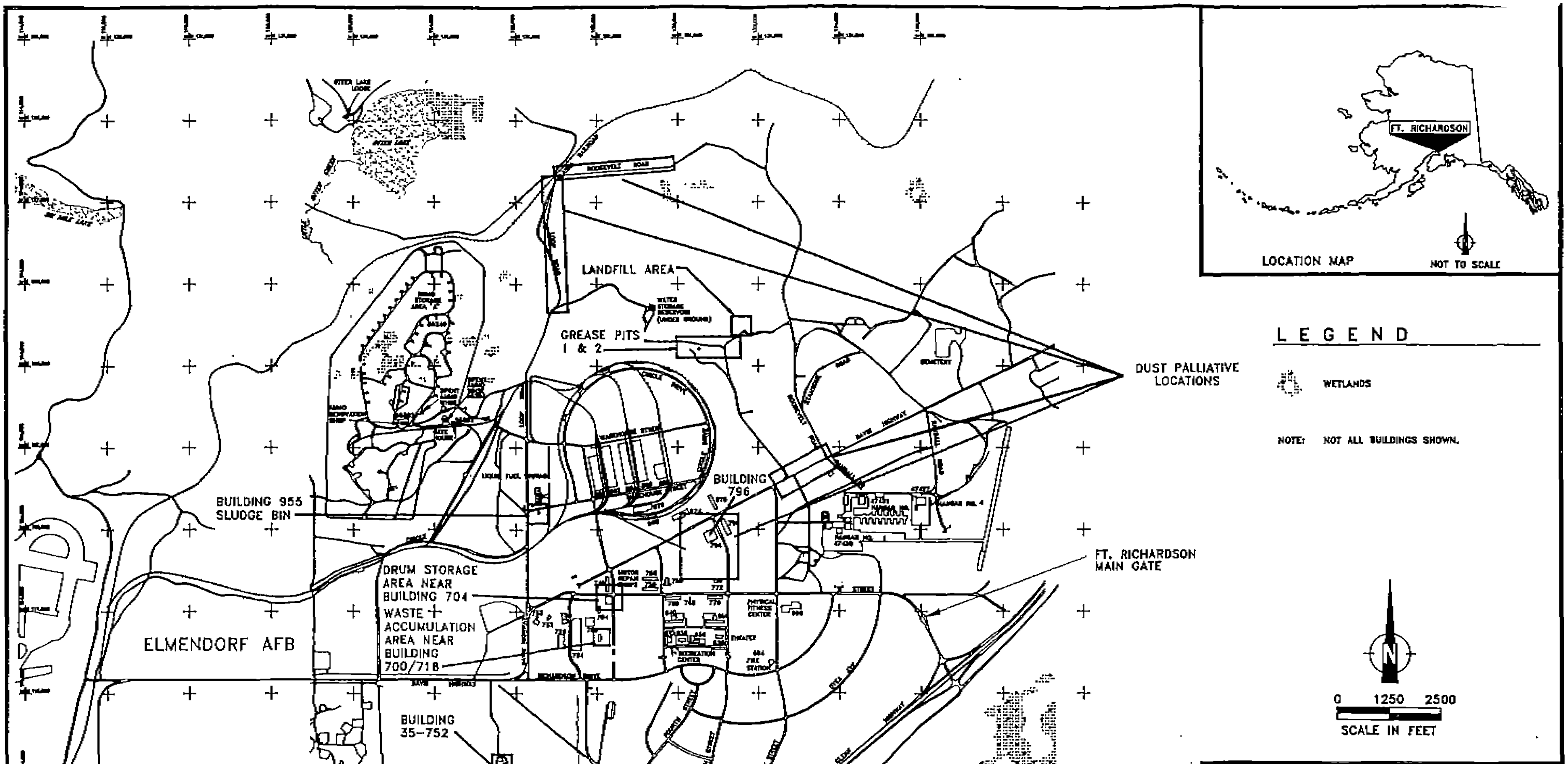
DATE: 10/8/96 CHECK: S.W.

FIGURE 1-1
FORT RICHARDSON
SITE LOCATION MAP

FORT RICHARDSON
ANCHORAGE, ALASKA
PROJECT 9000-066



SOURCE: CORP OF ENGINEERS/FTR-MST/INV. NO. DACA85-00-8

OPERABLE UNIT D
FORT RICHARDSON, ALASKA

FIGURE 1-2
SITE LOCATION
MAP FOR OPERABLE UNIT "D"

DATE: 7/6/95	DRAWN BY: SSR	SCALE: AS SHOWN	DRAWING: BSUNO
C/SC: 1:2500 DISK: 131/94	ENGINEER: S. WING	CHECKED: S. WING	PROJECT: 9000-036

2

2.0 FORT RICHARDSON BACKGROUND

2.1 Post Description

Fort Richardson was established in 1940 under the command of the Alaskan Defense Force (ADF) to protect Alaska against foreign attack. The base included an airfield, which was called Elmendorf Field. In 1941, the ADF was renamed the Alaskan Defense Command (ADC). At that time, Fort Richardson had approximately 7,800 personnel. During World War II, Fort Richardson was used as a staging and supply area for operations occurring on the Aleutian Islands. The troop complement varied in size from 7,800 to over 15,000. In 1943, the ADC was renamed the Alaskan Department and in 1947, it was again reorganized as the U.S. Army Alaska (USARAK).

In 1950, Fort Richardson was divided between the Army and Air Force. On the northern part of the installation, the Army established a new cantonment area. The original base was released to the Air Force and renamed Elmendorf Air Force Base (AFB). Fort Richardson has undergone a number of reorganizations, and command and control changes since that time, including expansion of the cantonment area. Fort Richardson is currently the home of USARAK and has approximately 2,175 military and 3,820 dependent personnel stationed at the base. In addition, approximately 1,500 civilian employees work on the base. The overall mission of Fort Richardson has not changed over time; it is still tasked with protecting Alaska from foreign invasion.

2.2 Environmental Setting

2.2.1 Geographic Setting and Topography

Fort Richardson is located on 62,000 acres of land northeast of the Municipality of Anchorage and Elmendorf AFB. Geographically, the base is bordered by Eagle Bay and the Knik Arm of Cook Inlet to the north, and the Chugach Mountain Range and State Park to the south and east. The elevation of most of Fort Richardson lies between 45 and 225 feet above mean sea level (MSL).

2.2.2 Regional Geology

The following descriptions of regional geology are extracted from Schmoll and Dobrovolny (1972), Kirschner and Lyon (1973), and Freethey (1976).

The vicinity in which Fort Richardson is located has three general geologic terrains: glacial deposits, alluvial deposits, and metamorphic rock. Glacial sediments deposited in the Cook Inlet basin during a series of five glacial periods in recent geologic history constitute the north and central portions of Fort Richardson. In particular, terminal moraine deposits (the Elmendorf moraine) are present directly northwest of the main cantonment area. The soils of the Elmendorf moraine are composed of fine-grained, poorly sorted glacial materials (clays, silts, very fine sands), with interbedded heterogeneous layers of boulders, cobbles, gravel, sand, silt, and clays.

In this region, the marine Bootlegger Cove Formation was deposited concurrently with glacial outwash deposits. The Bootlegger Cove Formation consists primarily of thinly bedded gray to light gray silt clay to clayey silt. Where it occurs, the Bootlegger Cove Formation acts as an aquitard to groundwater movement.

Alluvial sediments of the Anchorage Plain extend from northeast of the Fort Richardson main cantonment area, southwest to the city of Anchorage. Metamorphic bedrock outcrops and mountains predominate in the south-central and southern portions of Fort Richardson. In the cantonment area, the alluvial deposits are bounded to the northwest by the Elmendorf Moraine and to the southeast by the metamorphic terrain, as described above. The alluvial sediments comprise both glacial outwash, alluvial fan, and fluvial deposits, grading from gravel in the eastern portion of the plain to sand in the southwestern portion. In the cantonment area, deposits are composed chiefly of well-bedded and well-sorted gravel (Schmoll and Dobrovolny 1972).

The OUD sites are on a sequence of alluvium and buried till to depths on the order of 200 feet. This sequence of alluvium and till probably overlies the Bootlegger Cove Formation, a dense marine clay that acts as a local aquitard.

2.2.3 Hydrogeology

The primary surface drainage features in the area are Eagle River, to the north of the main cantonment, and Ship Creek, located south of the main cantonment. Both originate in the Chugach Mountains and flow westerly across the installation into Knik Arm. Eagle River is fed by turbid glacial meltwaters, and Ship Creek is sustained by snowmelt and rainwater runoff. Surface drainage across the main cantonment is southerly, towards Ship Creek.

Surface water from Ship Creek is the main source of drinking water for Fort Richardson. A diversion dam, where water is taken from the creek, is located approximately 10.5 miles upstream from the mouth. The Municipality of Anchorage, Elmendorf AFB, and Fort Richardson pump water from a deep aquifer for drinking water when there is low stream flow (Freethey 1976).

Two major groundwater systems have been identified in the area of Fort Richardson: a shallow system and deep system (Freethey 1976). The groundwater of the shallow system occurs under unconfined conditions in the Anchorage Plain deposits and in unconfined to semi-confined conditions in the till of the Elmendorf Moraine. Shallow perched groundwater of limited volume and extent exists in localized areas within the Elmendorf Moraine till deposits. The deep system occurs under artesian (confined) conditions beneath areas where the Bootlegger Cove Formation is present.

Groundwater in the Anchorage Plain deposits occurs between 10 and 20 feet bgs. Flow in this system is generally southerly towards Ship Creek, with a gradient between 0.05 and 0.01 ft/ft (USACE 1991). Groundwater in the deep system has been encountered at a minimum depth of 130 feet bgs in the northern area of Fort Richardson. The flow in the deep system is generally westerly to northwesterly towards Knik Arm, with a gradient between 0.02 and 0.0025 ft/ft (USACE 1991).

2.2.4 Climatology

Fort Richardson lies in a climatic transition zone between the maritime climate of the coast and continental climate of interior Alaska. Meteorological data from Anchorage from 1952 to 1987 indicate a yearly average temperature of 35.7°F, with summer temperatures ranging over 70°F and winter temperatures to -30°F. The yearly average precipitation is approximately 15 inches (UAA 1989).

Infiltration and runoff from precipitation are both predominant during breakup when the winter snowpack melts.

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3.0 FIELD OPERATIONS

This section is a summary of field operations conducted at each site. Results and findings for each site are presented in Section 5.0. The field investigation at Fort Richardson OUD was conducted from September 1994 to April 1995. The field activities included advancing and sampling soil borings, collecting surface samples, pond/stream sediment samples, PCB wipe samples, and installing and sampling monitoring wells as previously mentioned in Section 1.2. Six suction lysimeters were installed at the Grease Pits.

3.1 Field Activities

3.1.1 Surface Soil Samples

Surface soil samples were collected from seven of the nine OUD sites–Building 35-752, Building 700/718, Building 704, Building 796, Building 955, Dust Palliative, and Fire Training Area–and the Background site. Surface samples were not collected from the Stormwater Outfall to Ship Creek and the Grease Pits.

At the Fire Training Area, approximately 3 to 6 feet of fill was deposited on the pit. Surface samples were collected by drilling through the fill to the former surface of the Fire Training Area (see Section 3.1.4).

Sampling Technique

Surface samples at Building 35-752 were collected using a 2-person power auger. Large cobbles encountered at Building 35-752 resulted in frequent refusal and difficult drilling conditions. For the remaining sites, an auger extension attached to a bobcat was used to collect surface samples. Samples were collected at depths varying from 6 inches bgs to 2.5 feet bgs using a decontaminated trowel, shovel, or with a latex- or nitrile-gloved hand. New, clean gloves were worn at each sampling location.

For each sampling location, samples were not composited and containers were filled for gasoline range organic (GRO), volatile organic compound (VOC), and ethylene glycol samples first to minimize aeration. Remaining, less volatile samples were subsequently collected.

In addition, samples were collected from each sampling interval and placed in resealable plastic bags to measure ambient temperature headspace (ATH) using an organic vapor meter (OVM).

Composite Surface Soil Samples

Composite samples were collected from the Dust Palliative site. Each composite sample consisted of four grab samples. Equal volumes of soil from each of the four grab samples were mixed in a stainless steel bowl to make one composite sample prior to packing the soil into individual sample containers. Grab samples were collected at 18 inches bgs.

Additional samples were also collected for OVM ATH readings.

3.1.2 Sediment Samples

Sediment samples were collected from the Cooling Ponds at Building 35-752 and the Storm Water Outfall at Ship Creek.

Cooling Ponds at Building 35-752

Sediment samples from the cooling ponds at Building 35-752 were collected from approximately 6 inches below the pond bottom using a backhoe. The backhoe bucket was used to scrape the top layer of sediment from sample areas before collecting the sediment sample from approximately 6 inches to 1 foot below the pond bottom surface. Pond water was decanted from the backhoe bucket, and a decontaminated trowel was used to remove the top 6 inches of sediment from the bucket before collecting the samples. Volatile samples were immediately placed into containers, followed by the remaining parameters.

Stormwater Outfall at Ship Creek

Sediment samples from the Stormwater Outfall to Ship Creek were collected upstream and downstream of the outfall in Ship Creek and from sediment in the outfall itself. Two samples were collected from each of the three locations; one from sidewall sediments to assess potential contaminants from surface waters and one from the creek bottom to assess contaminants that may have been deposited by the transport waters.

As a result of extreme weather conditions (deep snow and temperatures ranging from 0 to 5°F) samples were collected by scraping sediment (the fine soil fraction along the sidewall or bottom) into a new, clean 2-liter plastic jar using a gloved hand. No head space was left in the plastic jar. Sediments were then transferred to appropriate sampling containers. GRO and VOC sample containers were filled first from the plastic jar, followed by the remaining parameters.

3.1.3 PCB Wipe Sampling

Polychlorinated biphenyl (PCB) wipe samples were collected from the concrete floor at Building 35-752.

Concrete Floor at Building 35-752

A standard PCB wipe test was conducted using a 10-by-10-cm cardboard template placed on the concrete floor as a guide for the area to be wiped. A gauze pad constructed of 100 percent cotton was saturated with hexane and wiped 10 times in a forward and backward motion within the template area. The pad was then turned over and wiped side to side 10 times within the template area, folded, and placed into a sample jar.

At the time of sampling, equipment was stored inside the building and areas of the floor were covered in ice. Samples were collected in a modified grid pattern based on available floor space.

3.1.4 Subsurface Soil Samples

Subsurface soil samples were collected from eight of the nine OUD sites (Building 35-752, Building 700/718, Building 704, Building 796, Building 955, Dust Palliative, Fire Training Area, and Grease Pits) and the Background site. Subsurface samples were not collected from the Stormwater Outfall at Ship Creek.

Shallow Borings (0 to 20+ feet)

Hollow-stem auger methods were used to complete shallow soil borings and install shallow groundwater monitoring wells. The hollow-stem auger drilling was conducted using a CME-75 drilling rig. For subsurface soil sampling and monitoring well installation, 4.25-inch inside-diameter and 8-inch outside-diameter auger flights were used. Drill cuttings were placed into 55-gallon drums for handling and disposal as investigation-derived waste (IDW).

Upon completion, the soil borings were backfilled with bentonite grout in accordance with ADEC and the U.S. Army Corps of Engineers (USACE) regulations per the OUD PSE2 work plan.

Subsurface Sample Collection

Subsurface samples were collected from soil borings using a clean 2.5-inch inner-diameter, 24-inch long, split-spoon sampler. The sampler was driven approximately 26 inches to obtain sufficient soil volume to fill sample containers. Generally, borings were sampled at 5-foot intervals:

- 0 to 2 feet,
- 4 to 6 feet,
- 9 to 11 feet,
- 14 to 16 feet, and
- 19 to 21 feet below grade.

In some instances, there was insufficient recovery of soil from the split-spoon sampler to collect a full suite of samples for analyses due to large grain sizes and soil conditions. In these cases, additional split spoons were collected, the sampling interval increased, and a full suite of analyses was collected.

Samples to be analyzed for VOC, GRO, and ethylene glycol were collected from the split barrel sampler first to minimize aeration. The remaining soil was then geologically logged and classified using the Unified Soil Classification System. Soil samples were then placed in resealable plastic bags for an OVM reading. Remaining soil was homogenized in a clean, stainless steel bowl, and all other sample parameters were collected from the homogenized soils.

Deep Borings (>30 feet)

Air rotary drilling methods were used to advance one soil boring at Building 796 and four soil borings at the Grease Pits site. The soil boring at Building 796 was completed as a monitoring well, and two of the four soil borings at the Grease Pit site were completed with a grouping of three tensiometers. The two other soil borings at the Grease Pits were backfilled with bentonite grout in accordance with ADEC and USACE regulations per the OUD PSE2 work plan.

Due to subsurface conditions exceeding the safe usage of a hollow-stem auger drilling rig (a significant amount of cobbles and small boulders are present under the main cantonment area of Fort Richardson), a Driltek DJ-25, direct circulation, air-rotary drilling rig with a Torr Tierra casing hammer was used (operated by Alpine Drilling). A 6-inch outer-diameter tricone bit was used to cut a hole while a 7-inch outer diameter steel casing was simultaneously pounded. Boreholes were advanced in 10-foot intervals. Casing refusal frequently occurred and obstructions (cobbles and boulders) were crushed with the bit in order to continue casing penetration. Cuttings were ejected from the casing annulus using compressed air, discharged to an area lined with plastic tarps, and transferred to 55-gallon drums for handling and disposal as IDW.

Surface samples at the Grease Pit site were collected at approximately 10 feet bgs from trenches. The trenches were excavated prior to drilling because of reported drums and the unknown contents of the landfill.

Subsurface Sample Collection

Subsurface samples were collected from soil borings using a clean 2.5-inch inner-diameter, 24-inch-long, split-spoon sampler. Sampler refusal generally resulted in soil samples less than 2 feet in length being retrieved. Soil samples were collected at the end of each 10-foot penetration using a hammer driven, 2.5-inch inner-diameter, 2-foot split-spoon sampler, with typical 3000 foot-pound blows. Between 50 and 200 blows were required for each 0.5 feet of cut core.

In the instances where there was insufficient recovery to run a complete set of analyses, soil was collected for as many of the analyses as volume permitted before advancing the soil boring to the next sampling interval.

Samples to be analyzed for VOC, GRO, and ethylene glycol were collected from the split-spoon sampler first to minimize aeration. Remaining soil was homogenized in a clean stainless steel bowl, and all other sample parameters were collected from the homogenized soils. Samples were screened using an OVM.

Soil samples were geologically logged in terms of texture, composition, and sedimentary structures when observed. Samples were also logged for moisture and classified using the Unified Soil Classification System.

3.1.5 Ambient Temperature Headspace

Representative soil samples were collected in resealable plastic bags leaving approximately 2 inches of headspace. Bags were placed in a heated vehicle for a minimum of 2 hours, allowing the soil to reach an ambient temperature of 50° to 70°F. After reaching ambient temperature, an OVM probe was inserted into the headspace of the bag to detect the presence of photoionizable VOCs. The OVM was calibrated to 100 parts per million (ppm) isobutylene standard utilized for analysis.

3.1.6 Groundwater Samples

Groundwater samples were collected from two sites: from ENSR-installed and previously existing shallow monitoring wells at Building 35-752, and from an ENSR-installed deep monitoring well at Building 796.

Well Installation and Development

Monitoring wells were designed with expected aquifer materials of 1 to 2 mm of mean grain size and a seasonal water table fluctuation of less than 2 feet. Shallow monitoring wells were constructed of 2-inch inner-diameter Schedule 40 polyvinyl chloride (PVC) riser pipe with a 10-foot prepacked 8-slotted screen filled with 40-60 sand. Deep monitoring wells used a 20-foot prepacked screen. After the prepacked screen was attached to the riser pipe, the screen was lowered to allow approximately 7 feet of screen below the water table and 3 feet above the water table. The deep well was placed with approximately 14 feet of screen below the water table and 6 feet above the water table.

The annulus was packed with sand, and a minimum 2-foot-thick bentonite pellet seal was placed on top of the sand pack. The bentonite was poured into the annual space. After the bentonite was in place, water was poured into the annulus on top of the bentonite. The bentonite was allowed to hydrate for at least 5 minutes to create an adequate seal. The annulus above the bentonite seal was filled with Volclay grout.

Wells were completed with either a flush-mounted, watertight cover, or an above-grade stickup with a locking, protective casing.

Each monitoring well was developed by surging and bailing at least 24 hours after the final completion of the well to allow the grout to set. The purpose of well development was to remove any fine sand or silt particles that may have settled around the well screen during installation and to enhance the hydrologic connection between the well and the aquifer. During development, the purged water was measured for pH, specific conductivity, and temperature. Measurements were taken after each well volume was removed. These measurements, as well as water clarity, were recorded on the well development record in the field logbooks. The well was considered developed when:

- the pH, specific conductivity, and temperature readings for three consecutive well volumes were within 10 percent and the discharge was reasonably clean of free silt.
- The well was bailed dry three times in succession.

Well development records are in the appendix designated for each site.

Groundwater Samples

The wells were sampled at least 24 hours after well development to allow for aquifer stabilization. Groundwater sampling procedures are discussed below:

- The static water level of the well and the total depth of the well were measured.
- At least three well volumes were purged from the well. If the well was bailed dry before three well volumes had been removed, samples were collected when sufficient water reentered the well.
- The pH, specific conductivity, and temperature measurements were taken after each well volume was removed. When three consecutive pH, specific conductivity, and temperature measurements were within 10 percent, the well was considered adequately purged and it was assumed that representative groundwater was being collected.
- Samples were collected from each well using a dedicated, disposable bailer constructed of high density polyethylene (HDPE).

Samples to be analyzed for VOC or GRO were taken from the bailer first to minimize aeration. The 40-ml vials were checked for air bubbles at the time of sample collection. All sample containers were labeled at the time of collection with the date, time collected, sample identification number, analysis required, type of preservation, and sampler's initials.

Groundwater sample collection records are in the appendix designated for each site.

3.1.7 Tensiometer Installation

At the Grease Pits Site, nested sets of soil tensiometers were installed in two locations at nominal depths of 65 feet, 45 feet, and 25 feet. In order to qualitatively evaluate capillary pressures at the levels of the soil tensiometers, gypsum blocks were installed within 2 inches above the soil tensiometers. Silica flour was used to suspend the soil tensiometers and gypsum blocks.

A Driltek DJ-25, direct circulation, air-rotary drilling rig was used to reenter the pilot borings, which had previously been stabilized with 4-inch outer-diameter schedule 40 PVC casing. The casing was pulled out, and the boreholes were reamed with a 5-inch tricone bit and simultaneously installed with 6-inch inner-diameter, 7-inch outer-diameter steel casing. Boreholes were redrilled to their original terminal depths (approximately 58 feet bgs).

Soil tensiometers and gypsum blocks were obtained from SoilMoisture Corporation, Santa Barbara, California. The tubing, valving, and an ohm-meter to read the moisture content in the gypsum blocks were also purchased from SoilMoisture Corp. Each setup was calibrated and tested prior to installation.

At each interval, the installation was completed as follows:

1. Preassemble soil tensiometer assembly, attaching premeasured lengths of green sample tubing and black pressure/vacuum tubing to the soil tensiometers, and flexible rubber tubing (pinch valves) at the uphole ends of the tubing. Install gypsum blocks above ceramic cups of soil tensiometers with nylon fasteners. Pressure test each soil tensiometer assembly, at approximately 150 psi, while immersed in distilled water.

2. Presoak soil tensiometers and gypsum blocks a minimum of 6 hours in distilled water.

3. Ream borehole to nominal 60-foot depth.

4. Lift steel casing progressively, leaving a minimum of 2 feet of open hole above intended backfill below the casing shoe.

5. Dry tremie approximately 1 foot of granulated bentonite. Wet tremie approximately 0.5 feet of silica flour slurry, at 2 parts flour to 1 part distilled water.

6. Apply a 70-centibar vacuum to the soil tensiometer with a hand pump, and gently lower the assembly downhole via a 1.9-inch outer-diameter PVC riser. Thread pressure/vacuum and sampling tubing inside of the riser, along with the lead extension from the gypsum block. (The lead to the gypsum block is threaded into a drilled hole at the downhole end of the riser, and the drilled hole is plugged with 100 percent silica glue).

7. Wet tremie approximately 1 foot of silica flour, burying the ceramic cup of the soil tensiometer and gypsum block. Dry tremie approximately 1 foot of granulated bentonite. Dry tremie approximately 1 foot of pelletized bentonite and hydrate with municipal water. Wet tremie bentonite-based grout to next higher interval.

8. Install locking wellhead, with 3-foot stick-up above grade, with appropriate depth-labelling on ends of risers.

3.1.8 Sample Handling and Shipping

Sample handling activities followed applicable requirements in the USACE *Chemical Data Quality Management for Hazardous Waste Remedial Activities* document ER 1110-1-263 (USACE 1990) per the OUD PSE2 work plan.

Samples collected during the field investigation were assigned a unique field-sample tracking number in accordance with USACE procedures.

All sample containers were labeled at the time of collection with the date, time collected, sample identification number, depth, analysis required, and sampler's initials.

Packaging and shipping requirements were carried out in accordance with the United States Department of Transportation (USDOT) regulations as promulgated in Title 49 of the Code of Federal Regulations (CFR), parts 171 through 177.

After collection, sample containers were securely closed, labeled, and placed in separate resealable plastic bags. The samples were placed in a cooler with bubble wrap around each container. Sufficient ice was placed in the cooler to maintain a temperature of 4°C plus or minus 2°C. The chain-of-custody form was placed in a resealable plastic bag and taped to the inside of the cooler lid.

All samples were shipped via overnight delivery to the designated laboratories.

3.1.9 Decontamination

A decontamination pad was set up in an area designated by the Fort Richardson Department of Public Works (DPW) (near Building 955) and relocated as necessary to facilitate ongoing operations. The decontamination pad consisted of one heavy-duty layer of HDPE liner contained on all sides by 4-by-4 timbers. The entire decontamination area was set up over a second layer of HDPE. The decontamination pad was inclined to one corner from which accumulated water was transferred to 55-gallon drums.

Equipment used during the field program was decontaminated prior to and after each use as follows:

- Drill augers and drill rods were steam cleaned prior to use and between borings, except when a boring was relocated or redrilled a short distance from the original location because of auger refusal.

- Sampling equipment, which includes but is not limited to split-spoon samplers, trowels, hand augers, bowls, and shovels, were decontaminated prior to each boring. Prior to individual sample collection, equipment was decontaminated using EPA-accepted protocol; washed in a warm, nonphosphate detergent solution; rinsed in municipal water; sprayed with hexane; and then rinsed with distilled water. All downhole equipment was steam cleaned between holes.

3.1.10 Surveying

Sampling locations and newly installed monitoring wells were surveyed by the USACE. Surveys were conducted for both horizontal and vertical data, and referenced to existing control benchmarks.

3.1.11 Waste Management

Soil cuttings generated during the course of the investigation were containerized in 55-gallon open-top drums at the time of drilling. The decontamination waste water and well development purge water were handled in the same manner but containerized in 55-gallon bung-top drums.

All drums were labeled "non-hazardous waste pending laboratory analysis" with the date, site, borehole or monitoring well number, and point of contact phone number. Filled drums were removed from the individual sites by the Fort Richardson Hazardous Waste Facility staff and stored at Building 45-125.

Drums were characterized from the samples represented in each of the soil drums and the well development purge water drums. Drums containing decontamination water were individually sampled and characterized. A full set of analytical data and recommended disposal characterization for each drum of waste generated was provided to the Fort Richardson Hazardous Waste Facility staff.

Disposable bailers, protective clothing, and other similar supplies were presumed to be nonhazardous and were bagged for disposal at the Municipality of Anchorage regional landfill.

3.2 Field Quality Assurance/Quality Control

Quality Assurance/Quality Control (QA/QC) samples were collected to evaluate matrix handling, transportation, and analytical procedures. QA/QC samples consisted of split samples, also referred to as QA samples, and replicate samples, which were collected at a frequency of 1 every 10 samples. The primary sample and QA sample were given the same identification number. The primary sample was sent to Columbia Analytical Services (CAS), and the QA sample was sent to the USACE North Pacific Division (NPD) Laboratory. The replicate sample was given a sequential number and was submitted to CAS as a blind duplicate.

As part of the groundwater sampling program, additional volumes of water were collected at a frequency of 1 every 20 samples for the matrix spike/matrix spike duplicate (MS/MSD) and were submitted to each laboratory. Trip blanks were transported to the water sampling sites and submitted to the laboratories to verify that water samples were not contaminated in transit. One set of trip blanks, consisting of three volatile organic analysis (VOA) vials for GRO and three for VOCs, were submitted per shipped cooler of water samples for analysis. Each cooler represents one shipment.

Individual field logbooks were developed for each of the nine sites being investigated, as well as the Background site. Each field logbook contained the following:

- Labeling, packaging, and shipping protocol checklist;
- Site map;
- Field investigation summary;
- Sampling summary showing the analysis and number of samples;
- Sampling summary showing sample containers, preservation, holding times, and QA/QC requirements;
- Photograph log sheets;
- Boring logs;
- Daily chronology sheets; and
- Field safety meeting documentation sheets.

Monitoring well development records were added to the field logbooks for Buildings 35-752 and Building 796.

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4

4.0 DATA EVALUATION

This section presents a summary of data quality evaluations, a description of the semi-quantitative risk assessment process, and an evaluation of background concentrations.

4.1 Data Quality Evaluation

According to *Risk Assessment Guidance for Superfund* (EPA 1989), analytical laboratory data should be evaluated prior to comparison with risk-based concentrations (RBCs). The USACE's Chemical Quality Assurance Report (CQAR) evaluates and qualifies laboratory data based on results from the field and laboratory QA/QC process. In addition to the data evaluation performed by USACE, an evaluation of laboratory contamination is presented below. The CQARs indicated the laboratory data from the PSE2 investigation to be useable and valid, except as qualified in the data tables in Section 5.0. (Details of the data evaluation are presented in the site-specific CQAR in the Analytical Data for Preliminary Source Evaluation 2, Operable Unit D, Volumes I, II, and III [ENSR 1995]. These documents were submitted separate to this report.)

4.1.1 Laboratory Contamination

The EPA considers acetone, 2-butanone, methylene chloride, toluene, and the phthalate esters as common laboratory contaminants. If an associated laboratory blank contains detectable levels of a common laboratory contaminant, the sample results should be considered positive only if sample concentrations exceed 10 times the maximum amount detected in the blank. If an associated laboratory blank contains detectable levels of one or more chemicals not considered by the EPA to be common laboratory contaminants, then the sample results should be considered positive only if the sample concentration exceeds 5 times the maximum amount detected in the blank (EPA 1989).

The only reported case of method blank contamination occurred with samples from the Background site. Up to 1.6 parts per billion (ppb) of methylene chloride was detected in the VOC method blanks of CAS reports K946430A and K946594A. The methylene chloride data of the associated samples 94BKGD01SL through -10SL should be considered laboratory contaminants.

4.2 Semi-Quantitative Risk Assessment Process

With the exception of the Ship Creek Outfall, semi-quantitative risk assessments were performed for each of the nine sites in OUD. The risk assessments are considered semi-quantitative because: 1) potential risks to ecological receptors were not evaluated quantitatively, 2) the exposures evaluated reflect the available analytical data and do not necessarily represent the maximum extent of contamination or future changes in contaminant concentrations, and 3) only two exposure pathways were considered (soil ingestion and tapwater ingestion); although these pathways yield the most conservative results, other pathways may also be important.

Human health risk calculations are presented in Appendix A. The parameters and equations used are identical to those employed by EPA Region 3 for development of the *Risk Based Concentration Tables* (EPA 1995a), with two modifications:

- Frozen Ground: Exposure frequencies for surface and subsurface soil were reduced to 7/12 of the default exposure frequency (350 days/year for residential; 250 days per year for commercial/industrial), since the ground is frozen for approximately 5 months of the year.
- Subsurface Soil For subsurface soil, the product of exposure frequency and duration was assumed to be one-fifth of that for surface soil, reflecting the decreased likelihood of exposure for subsurface soil.

Carcinogenic risks and noncarcinogenic hazard indices were evaluated for two exposure pathways: soil ingestion and tapwater ingestion. The tapwater ingestion pathway was evaluated only where groundwater analytical data were obtained. The inhalation and dermal contact pathways were not evaluated; however, a comparison of risks from soil ingestion versus inhalation is presented in Appendix A (Section A.5).

Two exposure scenarios were considered: residential and commercial/industrial. The receptors evaluated under these scenarios are identical to those used to develop the EPA Region 3 RBCs (e.g., combined childhood and adult exposures for soil, adult exposures for tap water, etc.). In this manner, results are presented simply as "residential" or "commercial/industrial", without regard to the individual receptors.

Risk calculations were performed for compounds whose maximum concentrations were:

- greater than the risk-based concentration (RBC) for tap water; or

- greater than 1/10 of the RBC for soil.

RBCs from EPA Region 3 (EPA 1995a) were used to select compounds for inclusion in the semi-quantitative risk assessment. This list reflects more current toxicity information than Region 10 RBCs (EPA 1992) and contains a larger list of compounds. In addition, the Region 3 RBCs are based on age-adjusted exposure factors, which more accurately represent one's cumulative exposure to carcinogens.

Background measurements were performed for all of the target analytes (Section 4.2). Although various organic compounds were detected at levels exceeding RBCs, comparison with naturally occurring levels is generally applicable only for inorganic chemicals (EPA 1989). As a result, a statistical comparison between background and site-related sample populations was performed for metal analytes (Appendix A). Sample populations that could not be distinguished from the background population were eliminated from the risk calculations. However, no organic chemicals were eliminated based on background concentrations.

Although EPA has classified lead as a Class B carcinogen, with an interim soil cleanup level of 400 mg/Kg (EPA 1994), an approved dose-response factor is not available. As a result, lead has been removed from RBC tables published by EPA Region III (EPA 1995a), and quantitative evaluation of human health risks is not possible. Accordingly, lead was eliminated from the semi-quantitative risk assessment. Although the maximum lead concentration in soil is below the interim soil cleanup level at each site, groundwater concentrations at Building 35-752 exceeded the drinking water action level of 0.015 mg/L included in EPA's *Drinking Water Regulations and Health Advisories* (EPA 1995b). These results should be considered for any risk management decisions involving Building 35-752.

As shown on Table 4-1, current RBCs are not available for some target analytes. These analytes were included in the semi-quantitative risk assessment *only* when they were detected in a site-related sample. For other compounds, either method reporting limits or elevated reporting limits (resulting from analytical interference) are above RBCs. A list of compounds not detected at reporting limits exceeding RBCs is provided for each site in Chapter 5. Most of these compounds were identified in the Work Plan (ENSR 1994), but require special analytical services to achieve reporting limits below RBCs. For this situation, the *Risk Assessment Guidance for Superfund* provides the following guidance (EPA 1989, p. 5-9):

Table 4-1. Analytes Lacking Current Risk-Based Concentrations from EPA Region III (1995).

Method	Analyte
Petroleum Hydrocarbons	Gasoline Range Organics (GRO) Diesel Range Organics (DRO) Total Petroleum Hydrocarbons (TPH)
Volatile Organic Compounds (VOCs)	1,1-Dichloropropene 1,2,3-Trichlorobenzene 1,3-Dichloropropane 2,2-Dichloropropane 2-Hexanone 4-Isopropyltoluene Bromobenzene Bromochloromethane Dibromomethane n-Butylbenzene n-Propylbenzene
Semivolatile Organic Compounds (SVOCs)	2-Methyl-4,6-dinitrophenol 2-Methylnaphthalene 2-Nitrophenol 4-Chloro-3-methylphenol 4-Chlorophenyl Phenyl Ether Acenaphthylene Benzo(g,h,i)perylene Bis(2-chloroethoxy)methane Phenanthrene
Pesticides	Delta-BHC Endosulfan II Endosulfan Sulfate Endrin Aldehyde
Metals	Calcium Lead Magnesium Potassium Sodium
Herbicides	Dichloroprop
Polychlorinated Biphenyls (PCBs)	Aroclor 1221 Aroclor 1232 Aroclor 1242 Aroclor 1248 Aroclor 1260

> . . . available modeling data, as well as professional judgement, should be used to evaluate whether the chemical may be present above reference concentrations [RBC]. If the available information indicates the chemical is not present, [continue using only positively detected chemicals]. If there is some indication that the chemical is present, then either re-analyze selected samples using SAS [special analytical services], if time allows, or address the chemical qualitatively.

Except for samples from the Ship Creek Outfall, compounds not detected at reporting limits exceeding RBCs include several chlorinated volatile organics, semivolatile organics (including polycyclic aromatic hydrocarbons [PAH]), and insecticides. Previous detection limits that exceed RBCs may be reached with better sample preparation, better control of extraction dilutions, or through the use of alternate established methods. These items will be examined during the RI/FS.

Calculated risks via soil ingestion and tapwater ingestion are summarized for each site in Chapter 5. These data can be used to evaluate the need for additional action, and to focus subsequent efforts on the most significant human exposures. These data do not, however, constitute a baseline risk assessment, nor do they adequately address potential ecological risks. At sites determined to require further action, these issues should be evaluated further during the RI/FS.

4.3 Background Evaluation

There are two types of background chemicals: 1) naturally occurring chemicals that have not been influenced by humans, and 2) chemicals that are present due to anthropogenic sources. Soils in the alluvial outwash plain on which the main cantonment are of Fort Richardson resides frequently contain coal. Background chemicals are usually eliminated from the RI/FS process, since risks associated with background chemicals are often small when compared to site-related compounds. However, if background risk is significant, this information may be important for risk-management decisions. As a result, where background chemicals are significant, background risks should be calculated separately from site-related risks (EPA 1989a).

In human health risk assessment, inorganic chemicals that are present at naturally occurring levels may be eliminated from further consideration. Comparison with naturally occurring levels is generally applicable only for inorganic chemicals, because most organic chemicals found at contaminated sites are not naturally occurring (EPA 1989a). With the exception of metals, all other analytes are organic chemicals. As a result, background statistical comparisons were performed only for metal analytes. All other analytes were included in the semi-quantitative risk assessment process.

The results of the background metals evaluation are presented in Appendix A and include statistical comparisons based on background sampling performed by ENSR specific for this project using data in *Background Data Analysis Report, Fort Richardson, Alaska* (E&E 1996) for the entire base.

The following sections present a summary of background sampling locations, followed by an analysis of background risks.

4.3.1 Background Sampling

As part of the OUD investigation, Background samples were collected from four areas at Fort Richardson. Four background locations were considered sufficient for the purpose of this investigation, as indicated by ENSR's scope-of-work. The locations were identified as D Street, North, Loop Road, and Ship Creek (Figure 4-1). The objectives of the Background field sampling program were to assess the concentrations of targeted compounds at the nine OUD sites in undisturbed and non-contaminated soils, and to establish the naturally occurring concentrations of target compounds for comparative purposes.

Approximately two surface soil samples and five subsurface soil samples were collected at each background location. The surface samples were collected at 6 inches and 2 feet bgs, and the subsurface samples were collected from one soil boring advanced to a nominal depth of 20 feet bgs. Boring logs are presented in Appendix K.

The soils encountered at the four sites were generally described as sandy gravel and silty sand with some gravel. OVM readings at the Background sites did not exceed 9 ppm. Soil samples were submitted for laboratory analysis of petroleum hydrocarbons, volatile organic compounds, semivolatile organic compounds, pesticides, herbicides, polychlorinated biphenyls, metals, dioxins and furans, ethylene glycol, and inorganics (ammonia nitrogen, nitrate + nitrite, and sulfate). A complete listing of analytical results for samples collected from the background sites is presented in Appendix K.

4.3.2 Background Risk Evaluation

A semi-quantitative risk assessment was performed for background chemicals using the methods described in Section 4.2. The risk assessment is considered semi-quantitative because: 1) potential risks to ecological receptors were not evaluated, 2) the exposures evaluated reflect the available analytical data and do not necessarily represent the maximum extent of contamination or future changes in contaminant concentrations, and 3) only one exposure pathway was considered (soil ingestion); although this pathway usually yields the most conservative results, other pathways may also be important.

4.3.2.1 Compounds of Potential Concern

A summary of the compounds of potential concern is presented in Table 4-2. These compounds include monoaromatics (4-isopropyltoluene), polychlorinated diphenyl alkanes (4,4'-DDT), metals (As, Cr, Ni), and dioxins and furans (several). As shown on Table 4.2, some of these compounds are carcinogens.

All of the other target analytes were either 1) not detected or 2) below 1/10th of the RBC for residential soil EPA Region 10 (1992) suggests 1/10th of the soil RBC as a criterion for compounds to be included in a baseline risk assessment. As shown by Table 4-1, however, RBCs are not available for some compounds. These compounds were included in the semi-quantitative risk assessment *only* when they were detected in a site-related sample.

As described below (Section 4.3.2.4), the toxicity of petroleum hydrocarbons cannot be evaluated using bulk hydrocarbon measurements (GRO, diesel range organics [DRO], and total petroleum hydrocarbons [TPH]). As a result, these data were not included in the semi-quantitative risk assessment.

4.3.2.2 Sources, Transport Mechanisms, Exposure Pathways, and Receptors

Sources, transport mechanisms, exposure pathways, and receptors, elements of the Conceptual Site Model, are shown on Figure 4-2. The source of background contaminants is not known, but is presumably related to previous military activities at Fort Richardson. Potential transport mechanisms include surface water transport, leaching and groundwater transport, and volatilization. Within the air phase, volatile compounds of potential concern (COPC) may disperse in the atmosphere or accumulate in enclosed spaces. However, only one volatile COPC was detected at levels exceeding 1/10th of the RBC for residential soil (4-isopropyltoluene). Concentrations of 4-isopropyltoluene, as well as concentrations of nonvolatile COPCs in airborne dust, are not expected to be of concern in the atmosphere (see Appendix A, Section A.5 for a comparison of exposures via inhalation versus soil ingestion).

Surface water transport may be significant for contaminants present in surface soil. With the exception of 4-isopropyltoluene, leaching is not expected to be significant because most of the COPCs are relatively insoluble in water.

Depending on future land use, potential receptors may include residents, occupational workers, and construction workers. Ecological receptors include terrestrial and aquatic plants, mammals, invertebrates, and avian species.

Table 4-2. Compounds of Potential Concern
Background Samples

Type	Source	Carcinogens	Noncarcinogens
Monoaromatics	Fuels	None	4-Isopropyltoluene
Polychlorinated diphenyl alkanes	Insecticides	4,4'-DDT	
Dioxins and Furans	Herbicides	Dibenzo-p-dioxins and dibenzofurans with chlorine substituted in the 2,3,7,8 positions (several)	None
Metals	Background soil; fuels and oils	Arsenic	Chromium Nickel

4.3.2.3 Exposure Assessment

A preliminary exposure assessment was performed for the soil ingestion pathway. Soil exposures via ingestion generally result in greater chemical uptake than dermal contact, inhalation, or recreation use. Accordingly, this pathway was selected to determine if soil exposures represent a significant human health risk. If human health risks via soil ingestion are significantly below the acceptable risk threshold, then combined health risks from other exposure pathways are probably within acceptable limits. However, if human health risks via soil ingestion are close to the acceptable risk threshold, then other exposure pathways should be evaluated as part of a baseline risk assessment.

Soil exposures were calculated using default exposure factors for residential and commercial/industrial receptors (EPA 1995a). These exposure factors reflect individuals with the highest chronic exposure for noncarcinogens and the highest cumulative exposure for carcinogens. For example, exposures to noncarcinogens are calculated assuming childhood exposure only, whereas exposures to carcinogens are calculated assuming combined childhood and adult exposure. A list of the exposure factors and equations is provided in Appendix A.

Exposure concentrations in soil were calculated as the 95 percent upper confidence limit (UCL) of the average concentration of all samples analyzed from a particular medium (surface or subsurface soil). If the compound was not detected, one-half of the reporting limit was used to calculate the 95 percent UCL. This approach is consistent with EPA guidance (EPA 1991, 1992).

4.3.2.4 Toxicity Assessment

Dose-response factors were obtained from EPA (1995a). These factors were obtained from:

1) EPA's Integrated Risk Information System (current as of January 1, 1995),
2) EPA's Health Effects Assessment Summary Tables (current through March 1994),
3) The Superfund Health Risk Technical Support Center, and
4) Other EPA sources.

Compounds not included in EPA (1995a) were assigned proxy dose-response factors based on those for related compounds. These compounds are listed in Table 4-3, along with related compounds and toxic equivalency factors (TEFs; where available). A provisional reference dose for 1,3,5-trimethylbenzene (EPA 1995a) was used as a proxy reference dose 4-isopropyltoluene. This value was selected because it is the lowest reference dose of all nonhalogenated alkylbenzenes provided in EPA (1995a), thereby providing a conservative estimate of the noncarcinogenic effects of volatile fuel hydrocarbons.

Table 4-3. Proxy Dose-Response Factors for Compounds Lacking Toxicity Data Background Samples

Surrogate Compounds			Target Compound			
Name	Approved RfDo[1]	Approved CSFo[1]	Name	TEF[2]	Proxy RfDo	Proxy CSFo
1,3,5-Trimethylbenzene	0.0004		4-Isopropyltoluene	None[3]	0.0004	
2,3,7,8-TCDD (dioxin)		1.56E+5	2,3,7,8-PeCDDs (dioxins)	0.5		7.80E+4
2,3,7,8-TCDD		1.56E+5	2,3,7,8-HxCDDs	0.1		1.56E+4
2,3,7,8-TCDD		1.56E+5	2,3,7,8-HpCDDs	0.01		1.56E+3
2,3,7,8-TCDD		1.56E+5	OCDD	0.001		1.56E+2
2,3,7,8-TCDD		1.56E+5	2,3,7,8-TCDFs (furans)	0.1		1.56E+4
2,3,7,8-TCDD		1.56E+5	1,2,3,7,8-PeCDFs	0.05		7.80E+3
2,3,7,8-TCDD		1.56E+5	2,3,4,7,8-PeCDFs	0.5		7.80E+4
2,3,7,8-TCDD		1.56E+5	2,3,7,8-HxCDFs	0.1		1.56E+4
2,3,7,8-TCDD		1.56E+5	2,3,7,8-HpCDFs	0.01		1.56E+3
2,3,7,8-TCDD		1.56E+5	OCDF	0.001		1.56E+2

Notes:

[1] "Approved" oral reference doses (RfDs) from EPA (1995a).

[2] Toxicity Equivalency Factors (TEF) for PAH from Magee et al. (1993); dioxins and furans from EPA (1989).

[3] No TEFs have been developed for these compounds. RfDs for surrogate compounds were substituted as those for the target compounds.

Although provisional dose response factors have been developed for JP-4, JP-5, gasoline, and diesel fuel (EPA 1992), these values are not appropriate for this evaluation. These values are based on fresh petroleum products and do not accurately represent the composition, and therefore the toxicity, of weathered petroleum products. They have not been subjected to rigorous peer review and are not routinely used, even by EPA, in risk assessment. As a result, bulk hydrocarbon measurements (GRO, DRO, and TPH) were not included in the semi-quantitative risk assessment.

4.3.2.5 Human Health Risk Characterization

The following sections summarize potential human health risks via soil ingestion. As described above, soil exposures via ingestion generally result in greater chemical uptake than dermal contact, inhalation, or recreation use. Accordingly, if human health risks via soil ingestion are significantly below the acceptable risk threshold, then combined health risks from other exposure pathways are probably within acceptable limits. However, if human health risks via soil ingestion are close to the acceptable risk threshold, then other exposure pathways should be evaluated as part of a baseline risk assessment.

Human Health Risks - Carcinogenic

Carcinogenic risks for the soil ingestion pathway are summarized on Table 4-4. A breakdown of risk calculations for each pathway and receptor are presented in Appendix A.

Table 4-4. Carcinogenic Risks for Soil Ingestion
Background Samples

Pathway	Carcinogenic Risk	
	Residential	Occupational
Surface Soil	1.0×10^{-5}	1.2×10^{-6}
Subsurface Soil	4.0×10^{-5}	4.7×10^{-6}
Total Risk	5.0×10^{-5}	5.9×10^{-6}

Using both residential and occupational exposure factors, the excess lifetime carcinogenic risk for soil ingestion exceeds the lower benchmark of 1 x 10^{-6} listed in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). As a result, exposures via inhalation and dermal contact should also be evaluated. About 92 percent of the carcinogenic risk is associated with arsenic.

Human Health Risks - Noncarcinogenic

Noncarcinogenic hazard indices for the soil ingestion pathway are summarized on Table 4-5. A breakdown of risk calculations for each pathway and receptor are presented in Appendix A.

Table 4-5. Hazard Indices for Soil Ingestion Background Samples

Pathway	Hazard Index	
	Residential	Occupational
Surface Soil	0.20	0.0081
Subsurface Soil	0.19	0.0075
Total Hazard Index	0.39	0.0156

Using residential exposure factors, the total hazard index for soil ingestion is 0.39. This level is close to the estimated threshold for adverse effects (1.0). As a result, additional exposures via dermal contact and inhalation should also be considered. About 94 percent of the noncarcinogenic hazard is associated with 4-isopropyltoluene, and the remainder is associated with chromium and nickel.

Using occupational exposure factors, the total hazard index for soil ingestion and drinking water ingestion is approximately 0.016. This level is well below the estimated threshold for adverse effects (1.0). Additional exposures due to inhalation and dermal contact are not likely to exceed the adverse effects threshold.

4.3.2.6 Summary

The foregoing analysis shows that ingestion of background soil exceeds the NCP's lower carcinogenic risk threshold for both residential and occupational scenarios. In addition, noncarcinogenic risks for residential soil ingestion are sufficiently close to the adverse effects threshold that other exposure pathways should also be evaluated. Carcinogenic risks are associated with both naturally occurring (arsenic) and anthropogenic chemicals (dioxins). Noncarcinogenic risks are primarily the result of anthropogenic chemicals (4-isopropyltoluene).

Although risks due to both naturally occurring and anthropogenic background chemicals can be eliminated during risk assessment, these results should be considered if the risk to individual receptors is important for risk-management decisions (EPA 1989).

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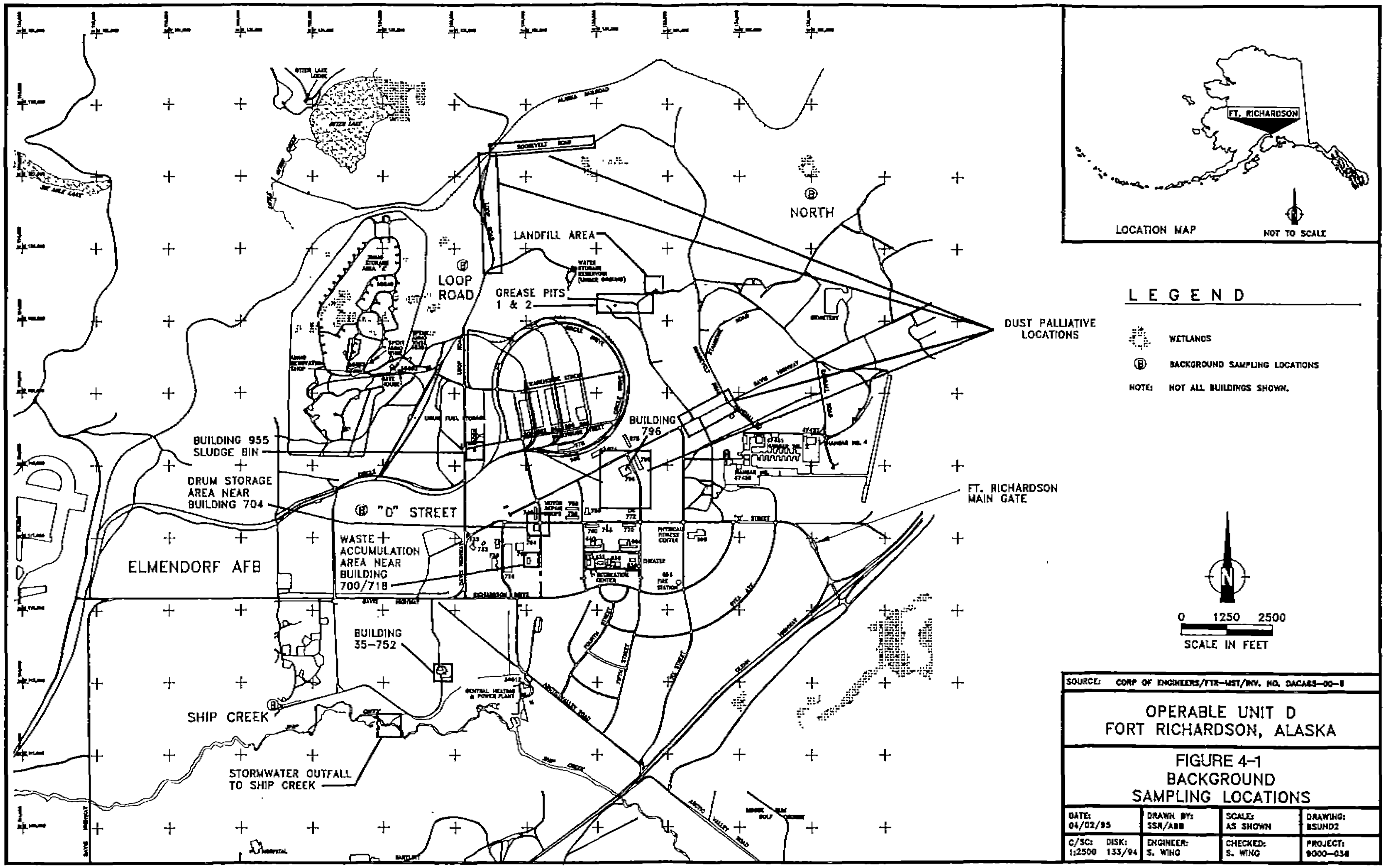


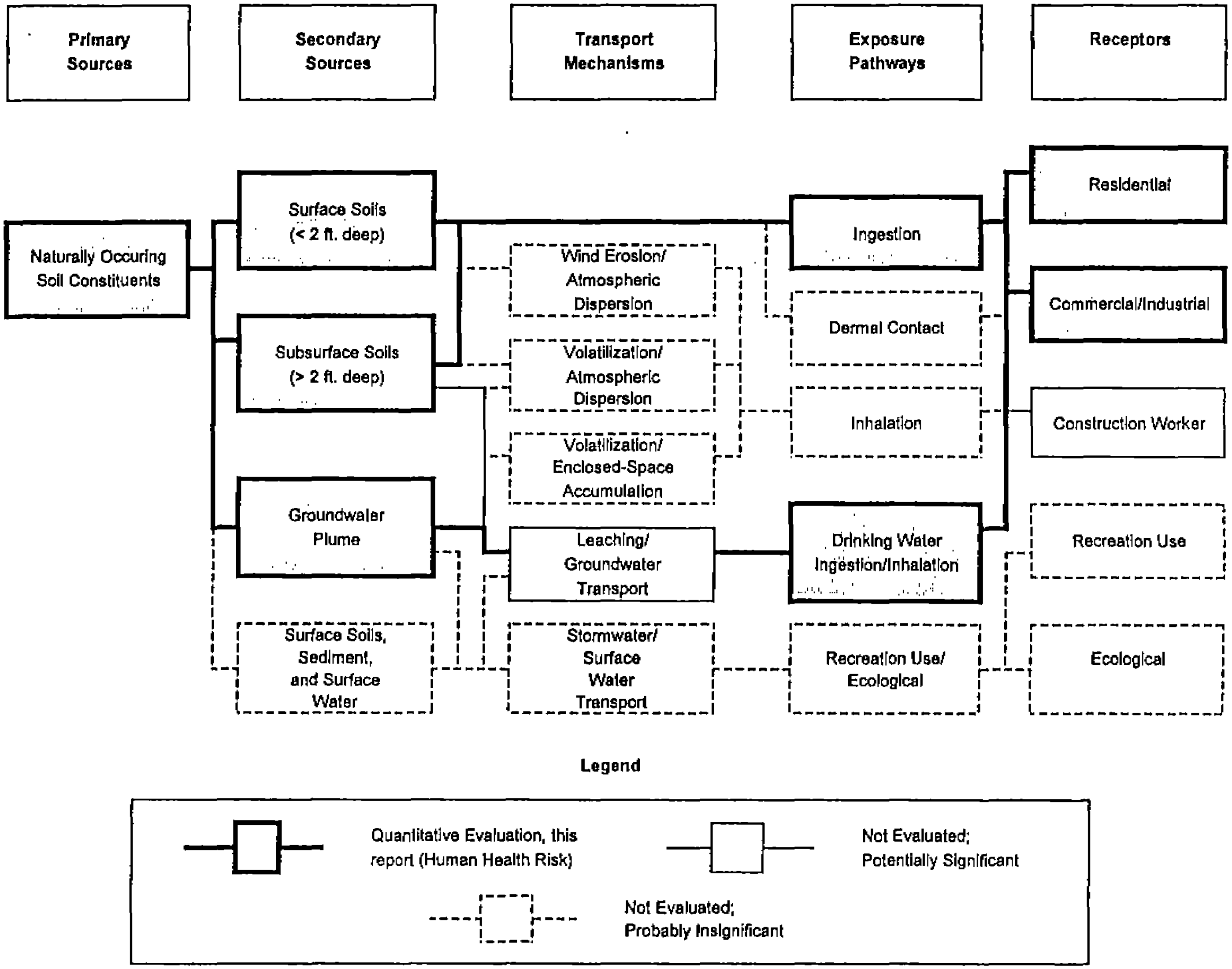
SOURCE: CORP OF ENGINEERS/FTR–MST/INV. NO. DACA85–00–8

OPERABLE UNIT D
FORT RICHARDSON, ALASKA

FIGURE 4–1
BACKGROUND
SAMPLING LOCATIONS

DATE: 04/02/95	DRAWN BY: SSR/ABB	SCALE: AS SHOWN	DRAWING: BSUND2
C/SC: 1:2500 DISK: 133/94	ENGINEER: S. WING	CHECKED: S. WING	PROJECT: 9000–034

Figure 4-2: Sources, Transport Mechanisms, Exposure Pathways, and Receptors
Background



After ASTM (1994)
F:\COMMON\PSE2DATA\SCR-RCPT.XLS

5

5.0 PRESENTATION OF INVESTIGATION RESULTS

This section summarizes the field investigation and presents the findings at each site. Each site is discussed in its entirety before progressing to the next site. Topics discussed for each site include:

- Site History
- Field Investigation
- Analytical Results
- Semi-Quantitative Risk Assessment
- Findings and Conclusions

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Building
35-752

5.1 Building 35-752

5.1.1 Site History

Building 35-752 is the former generator building for the adjacent antenna field transmitter building. The building once housed four generators situated in a 4-inch-deep concrete pit located in the middle of the floor. When the generators were removed in 1987, the pit was filled with concrete to bring this area to grade. In 1989, the building was used as a temporary storage location for 125 bags of polychlorinated biphenyl (PCB)-contaminated soil. Each bag reportedly weighed approximately 2,000 pounds. The bags of soil have since been removed, but dust from the bags may remain on the floor. In 1991, samples of the dust and dirt remaining on the floor were collected and composited. Aroclor 1254, a PCB, was the only compound detected above method reporting limits (MRLs). The Aroclor 1254 concentration in the composited sample was 411 parts per million (ppm).

Seven underground storage tanks (USTs) were excavated from the south side of Building 35-752 in 1990. The tanks were operational from 1953 to 1987 and presumably contained diesel fuel for the generators. During closure activities, petroleum hydrocarbon contamination was found in the excavation. The excavated soil was stockpiled off site; during routine characterization analyses of the piles, Aroclor 1260 was detected at concentrations ranging from 5,500 to 322,000 micrograms per kilogram (μg/Kg). The excavation was filled with clean soil from another location on base.

The south end of the east side of the building was the site of a drum storage area in the 1960s and 1970s. The drums reportedly came from vehicle maintenance shops. The unlined area was approximately 20 feet by 30 feet. In addition, herbicides and pesticides may have been applied to the area.

Insulating oils associated with the generators housed inside Building 35-752 likely contained PCBs. Cooling water from the generators was discharged into cooling ponds located southwest of the building via a culvert pipe extending from the building. There is a remote possibility that discharged water may have carried insulating oils into the ponds. The cooling ponds currently receive discharge water from Building 35-750. A well adjacent to Building 35-750 pumps water to the building cooling system, used to maintain cool temperatures for the electronic gear inside. Water is discharged from the cooling system to the cooling ponds.

The cooling ponds appear to be man-made. The Groundwater Gradient Map shown in Figure 5.1-4 supports this.

5.1.2 Field Investigation

Sampling at Building 35-752 consisted of collecting soil, pond sediment, groundwater, and PCB wipe samples at four potential source locations to assess the presence of contamination, possible downward migration of contaminants, and to evaluate potential source areas for groundwater contamination.

The four areas investigated at Building 35-752 were:

- Concrete floor,
- Former USTs,
- Drum accumulation area, and
- Cooling ponds.

5.1.2.1 Concrete Floor

Building 35-752 is currently used for the storage of fire extinguishers. Entry is restricted; however, fire department personnel regularly enter the building. Access to Building 35-752 was obtained from the Fort Richardson Fire Department in order to assess the presence of PCBs in residual dust and oil on the concrete floor. Level C respiratory protection equipped with high efficiency particulate air (HEPA) filters were put on before entering the building, and the door to the building was left open during sampling. The breaker box was located in the building per the Fire Department's instructions, and power was turned on for sampling purposes. The building was not heated.

Sampling locations were selected to obtain representative coverage of the entire floor area and included areas obviously impacted by dust and oil (Figure 5.1-1). Samples were collected from 28 different locations. A 10-by-10-cm cardboard template was placed on the concrete floor. Gauze pads saturated with hexane were wiped 10 times in a forward and backward motion within the template area, and then turned over and wiped 10 times side to side within the template. The pads were folded and placed in a labeled sample jar. A total of 32 samples were collected and analyzed for PCBs. Each sampling location was measured from the template's southwest corner to the southwest corner of the building and marked with a paint pen for ease of relocation. Samples could not be obtained from the northwest corner of the building due to ice on the floor.

5.1.2.2 Former UST Locations

Four borings were advanced and sampled within the footprint of the former UST excavation to assess the possible downward migration of contaminants from below the backfilled soils (Figure 5.1-2). Soil borings AP-3497 and AP-3499 (Appendix B) were advanced to assess contaminant concentrations at depth. The borings were located adjacent to existing monitoring wells AP-2982 and AP-2987, where hydrocarbon contamination has been detected. Soil borings AP-3498 and AP-3500 were located to evaluate the extent of contamination in the area of the backfilled soils.

Soil boring AP-3497 was advanced and sampled to a depth of 20 feet bgs. Subsurface materials included sandy gravel and sand. A strong hydrocarbon odor was detected from 14 to 18 feet bgs, and a slight hydrocarbon odor was detected from 18 to 20 feet bgs. OVM readings were at 166.6 ppm at 2 feet bgs, 233.3 ppm at 4 feet bgs, 233.4 ppm at 14 to 16 feet bgs, and 2.7 ppm at 18 feet bgs.

Soil boring AP-3498 was advanced and sampled to 16 feet bgs, where groundwater was encountered. Subsurface materials generally consisted of sandy gravel and sand. Strong hydrocarbon odors were detected at 10 to 16 feet bgs. At 14 to 16 feet bgs, a hydrocarbon sheen was observed on the sampler. OVM readings ranged from 1.8 ppm to 1,242 ppm. The highest readings were recorded at 10 to 12 feet bgs.

Soil boring AP-3499 was advanced and sampled to 16 feet bgs. Subsurface materials generally consisted of sandy gravel and sandy silt with pockets of light gray clay and some wood pieces. Strong hydrocarbon odors were noted at 14 to 16 feet bgs. OVM readings ranged from 5.5 ppm to 22.5 ppm.

Soil boring AP-3500 was advanced and sampled to 18 feet bgs. Subsurface materials consisted of sandy gravel and sandy silt/silty sand. Soils were generally very moist. A moderate hydrocarbon odor was detected at 4 to 6 feet bgs, and a very strong hydrocarbon odor was detected at 15 to 18 feet bgs. Groundwater was encountered at 17.5 feet bgs. The highest recorded OVM reading was >2,000 ppm at 14 to 18 feet bgs.

Groundwater samples were collected from existing wells AP-2983 and AP-2986 to evaluate the former tank area as a potential source of groundwater contamination.

Based on the soil boring logs from Building 35-752, a cross section of the investigation area is presented in Figure 5.1-3.

5.1.2.3 Drum Accumulation Area

The former drum accumulation area was sampled in eight locations within the 20-by-30-foot area (Figure 5.1-2). Samples were collected at 6 inches and 2 feet bgs at each location. The sample locations were based on a grid pattern to assess if a release has occurred and to assess potentially impacted soils. Eighteen samples were submitted for analysis. OVM readings from samples collected at 6 inches bgs ranged from 1.9 to 3.5 ppm. OVM readings from samples collected at 2 feet bgs were recorded as 0 ppm. (Background OVM readings ranged from 10 to 14 ppm.)

Two soil borings were located based on the preliminary analytical results from the surface samples. The borings were advanced in two of the more contaminated areas to evaluate the migration of the contamination through the vadose zone.

Soil borings AP-3505 and AP-3506 were drilled and sampled to 16 feet bgs, where groundwater was encountered. Subsurface materials included sandy silt to silty sand and sandy gravel. No odors were detected. OVM readings of soil samples from the two borings ranged from 2.0 ppm to 6.9 ppm. A cross section of the investigation area is presented in Figure 5.1-3.

5.1.2.4 Cooling Ponds

Eight sediment samples were collected from the Cooling Ponds (Figure 5.1-2). Four representative locations from each pond were chosen for sampling. A backhoe was used to collect the samples from the bottom of the cooling ponds.

Four borings were advanced and sampled as part of the investigation. Borehole AP-3501, a slant boring, was located on the east side of the pond and drilled at a 45-degree angle underneath the pond. The boring was sampled at a depth of approximately 7.5 feet below the bottom of the pond to assess the potential migration of contaminants from the pond sediment. The boring was angled to prevent the transport of pond sediment contaminants during drilling.

Monitoring well AP-3502, to the northeast of the pond, was located to assess local groundwater elevations and to determine whether contaminants from either the pond or monitoring well AP-2982 were present in groundwater at this location. A groundwater gradient map is presented in Figure 5.1-4. The soil boring was advanced to 22.5 feet bgs and completed as monitoring well AP-3502. Soil samples were collected to 13 feet bgs. Subsurface materials consisted of silty sand and sand. Saturated soil was encountered at 15 feet bgs. The well was screened from 12 to 22 feet, packed with sand to 10 feet, and capped with a 2-foot bentonite seal. The annulus was then grouted to the surface. Monitoring well AP-3502 was completed as a flush-mount well. OVM readings from field soil samples ranged from 0.4 ppm to 9.8 ppm.

Monitoring well AP-3503, west of the cooling ponds, was located to determine if contaminants from the pond sludges have impacted adjacent soils or groundwater. The boring was advanced to 19 feet bgs and completed as monitoring well AP-3503. Soil samples were collected to 12 feet bgs where saturated soil was encountered. Subsurface materials ranged from sandy silt to silty sand. The monitoring well was screened from 8.5 feet to 18.5 feet. The annular space was packed with sand to 6 feet bgs with a 2-foot-thick bentonite seal on top of the sand pack. The annulus above the bentonite seal was grouted to the surface. Monitoring well AP-3503 was completed as a stick-up well. OVM readings from field soil samples ranged from 1.1 to 2.4 ppm.

Monitoring well AP-3504 to the north of the ponds was placed to aid in the delineation of the local groundwater flow direction. The soil boring was advanced to 24 feet bgs and completed as monitoring well AP-3504. Soil samples were collected to 16 feet bgs, where saturated soil was encountered. Subsurface materials consisted of silty sand and sandy gravel. A cross section of the investigation area is presented in Figure 5.1-3. The well was screened from 13.5 feet to 23.5 feet bgs, packed with sand to 11 feet, and capped with a 2-foot-thick bentonite seal. The annulus was grouted to the surface. Monitoring well AP-3504 was completed as a flush-mount well. OVM readings from field soil samples ranged from 0.2 to 2.4 ppm.

The three new monitoring wells and existing wells AP-2982 and AP-2987 were sampled in late December 1994 to evaluate the Cooling Ponds as a potential source of groundwater contamination. Monitoring well AP-3502 had slow recovery, and was purged and sampled over a 3-day span.

5.1.3 Analytical Results

The total number of samples collected at Building 35-752 include:

- 63 soil samples, including 8 blind duplicates and 8 QA samples;
- 10 sediment samples, including 1 blind duplicate and 1 QA sample;
- 9 water samples, including 1 blind duplicate and 1 QA sample; and
- 32 PCB wipe samples, including 4 blind duplicates and 4 QA samples.

Soil, sediment, and water samples were analyzed for total recoverable petroleum hydrocarbons (TRPH), GRO, DRO, VOCs, PCBs/organochlorine pesticides, chlorinated herbicides, semivolatile organic compounds (SVOCs), and metals. Analytes above the MRL are shown in Tables 5.1-1 through 5.1-6. A complete summary of all analytical data from Building 35-752 is shown in Appendix B.

In addition, 17 samples, generally two from each borehole, were sent to USACE North Pacific Division (NPD) Laboratory for geotechnical testing, including Atterburg limits, grain size distribution, and percent moisture content. Results from the soil geotechnical analyses are recorded in Appendix B.

All data are accepted with the following general qualifications:

- Low levels of organochlorine pesticides and PCBs may not have been detected in sample 9457524AGW based on low surrogate recoveries.

- DRO data in samples 9457525AGW and -27AGW are considered low estimates based on low surrogate recoveries.

- The selenium data in reports K947974A, K946882A, K946243A, and K946921A (samples 94575273SL through -76SL, -78SL through -84SL, -06SL through -10SL, -19SL through -26SL, -86SL through -90SL, and -4AGW through -7AGW) and the arsenic data in K947974A (samples -4AGW through -7AGW) are considered low estimates based on low matrix spike recovery.

- The lead data in report K947108A (sample 94575240SL), the barium data in report K946243A (samples -06SL through -10SL), and the arsenic data in reports K946240A and K947072A (samples -01SL through -05SL and -35SL through -39SL) are accepted as estimates based on high relative percent differences (RPDs).

More detailed qualifications and exceptions are noted in the USACE NPD Laboratory's CQAR and ENSR Quality Assurance Summary Report (QASR) located in Volumes I through III of Analytical Data for PSE2 OUD (ENSR 1995).

TABLE 5.1-1 Summary of Analytes Detected
Building 35-752 Concrete Floor Wipe Sample Analytical Results

Sample Location No.	Sample ID:	Lab Code:	Date Collected:	Polychlorinated Biphenyls (PCBs)	
				Aroclor 1254 (µg/wipe)	Aroclor 1260 (µg/wipe)
1	94575249MI	K947753-001	12/9/94	750	ND
2	94575250MI	K947753-002	12/9/94	18	ND
3	94575251MI *	K947753-003	12/9/94	37	ND
4	94575252MI	K947753-004	12/9/94	41	6
5	94575253MI	K947753-005	12/9/94	41	24
6	94575254MI	K947753-006	12/9/94	82	14
7	94575255MI	K947753-007	12/9/94	76	ND
8	94575256MI	K947753-008	12/9/94	6	ND
9	94575257MI	K947753-009	12/9/94	88	ND
10	94575258MI	K947753-010	12/9/94	64	ND
11	94575259MI	K947753-011	12/9/94	130	ND
12	94575260MI	K947753-012	12/9/94	40	ND
13	94575261MI *	K947753-013	12/9/94	19	ND
14	94575262MI	K947753-014	12/9/94	38	3
15	94575263MI	K947753-015	12/9/94	33	ND
16	94575264MI	K947753-016	12/9/94	34	4
17	94575265MI *	K947753-017	12/9/94	19	2
18	94575266MI	K947753-018	12/9/94	71	12
19	94575267MI	K947753-019	12/9/94	140	13
20	94575268MI	K947753-020	12/9/94	71	17
21	94575269MI	K947753-021	12/9/94	580	29
22	94575270MI	K947753-022	12/9/94	120	24
23	94575271MI	K947753-023	12/9/94	63	35
24	94575291MI	K947753-024	12/9/94	22	32
25	94575292MI	K947753-025	12/9/94	140	27
26	94575293MI	K947753-026	12/9/94	610	39
27	94575294MI *	K947753-027	12/9/94	160	ND
28	94575295MI	K947753-028	12/9/94	62	8
29	94575296MI	K947753-029	12/9/94	9	ND
30	94575297MI	K947753-030	12/9/94	27	10
31	94575298MI	K947753-031	12/9/94	58	31
32	94575299MI	K947753-032	12/9/94	73	24

FOOTNOTES: *: Duplicate of preceding sample.
ND = Non-detected at the method reporting limit (MRL). (See the Building 35-752 Appendix for MRL values.)

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TABLE 5.1-2 Summary of Analytes Detected
Building 35-752 Soil Sample Analytical Results
Former UST Location

Part 1 of 2

	Location:	SB AP 3497					SB AP 3498		
	Sample Depth:	0-4'	4'-10'	4'-10'	14'-16'	18'-20'	0-4'	4'-8'	10'-12'
	Sample ID:	94575273SL	94575274SL	94575275SL	94575276SL	94575278SL	94575279SL	94575280SL	94575281SL
	Lab Code:	K946882-006	K946882-007	K946882-008	K946882-009	K946882-010	K946882-011	K946882-001	K946882-002
	Date Collected:	11/2/94	11/2/94	11/2/94	11/2/94	11/2/94	11/2/94	11/2/94	11/2/94
Compound	**Residential RBC**								
Petroleum Hydrocarbons (mg/Kg)									
GRO	none	ND	ND	ND	ND	ND	ND	ND	920
DRO	none	487	ND	ND	ND	ND	15	ND	6,150
TPH	none	610	ND	ND	ND	ND	ND	ND	6,900
Organochlorine Pesticides (mg/Kg)									
4,4'-DDT	1.9	<0.07	ND	ND	ND	ND	<0.02	ND	ND
Polychlorinated Biphenyls (mg/Kg)									
Aroclor 1260	none	4.1	ND	ND	ND	ND	0.7	ND	ND
Volatile Organic Compounds (µg/Kg)									
Acetone	7,800,000	ND	ND	ND	ND	ND	ND	78	<12,000
Trichloroethene (TCE)	58,000	34	23	22	ND	ND	ND	ND	<1,200
Ethylbenzene	7,800,000	ND	ND	ND	ND	ND	ND	ND	2,300
Total Xylenes	160,000,000	6	6	ND	ND	ND	ND	ND	14,000
1,3,5-Trimethylbenzene	31,000	ND	ND	ND	ND	ND	ND	ND	7,800
1,2,4-Trimethylbenzene	39,000	ND	ND	ND	ND	ND	ND	ND	18,000
Naphthalene	3,100,000	ND	ND	ND	ND	ND	ND	ND	<5,000
Semivolatile Organic Compounds (mg/Kg)									
Naphthalene	3,100	ND	ND	ND	ND	ND	ND	ND	<6
2-Methylnaphthalene	none	ND	ND	ND	ND	ND	ND	ND	10
Di-n-octyl Phthalate	1,600	0.7	ND	ND	ND	ND	0.36	ND	<6
Total Metals (mg/Kg)									
Arsenic	0.37	6	4	4	5	5	4	5	5
Barium	5,500	66	50	46	42	37	59	72	44
Chromium	390	27	36	35	30	31	28	42	28
Lead	none	20	6	7	7	5	5	8	6
Nickel	1,600	31	32	37	34	35	29	37	30
Selenium	390	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ

FOOTNOTES:
ND = Non-detected at the method reporting limit (MRL). (See the Building 35-752 Appendix for MRL values.)
UJ = The analyte was not detected at the MRL, however, the MRL is considered an estimate.
< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.
A shaded value indicates result exceeds the residential risk based concentration (RBC).

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TABLE 5.1-2 Summary of Analytes Detected (cont.)
Building 35-752 Soil Sample Analytical Results
Former UST Location

Part 2 of 2

Location:		SB AP 3499			SB AP 3500				
Sample Depth:		0-2'	4'-8'	8'-12'	0-4'	0-4'	4'-8'	8'-12'	14'-16'
Sample ID:		94575282SL	94575283SL	94575284SL	94575286SL	94575287SL	94575288SL	94575289SL	94575290SL
Lab Code:		K946882-003	K946882-004	K946882-005	K946921-005	K946921-006	K946921-007	K946921-008	K946921-009
Date Collected:		11/2/94	11/2/94	11/2/94	11/3/94	11/3/94	11/3/94	11/3/94	11/3/94
Compound	**Residential RBC**								
Petroleum Hydrocarbons (mg/Kg)									
GRO	none	ND	ND	ND	ND	ND	ND	ND	910
DRO	none	352	74	50	10	15	40	ND	1,310
TPH	none	430	91	27	35	24	40	ND	1,800
Organochlorine Pesticides (mg/Kg)									
4,4'-DDT	1.9	<0.04	0.01	ND	ND	ND	ND	ND	ND
Polychlorinated Biphenyls (mg/Kg)									
Aroclor 1260	none	0.9	ND	ND	ND	ND	ND	ND	ND
Volatile Organic Compounds (µg/Kg)									
Acetone	7,800,000	ND	ND	ND	ND	ND	ND	ND	<13,000
Trichloroethene (TCE)	58,000	ND	ND	ND	ND	ND	ND	ND	<1,300
Ethylbenzene	7,800,000	ND	ND	ND	ND	ND	ND	ND	2,700
Total Xylenes	160,000,000	ND	ND	ND	ND	5	ND	ND	15,000
1,3,5-Trimethylbenzene	31,000	ND	ND	ND	ND	ND	ND	ND	5,600
1,2,4-Trimethylbenzene	39,000	ND	ND	ND	ND	ND	ND	ND	14,000
Naphthalene	3,100,000	ND	ND	ND	ND	ND	ND	ND	5,300
Semivolatile Organic Compounds (mg/Kg)									
Naphthalene	3,100	ND	ND	ND	ND	ND	ND	ND	1.66
2-Methylnaphthalene	none	ND	ND	ND	ND	ND	ND	ND	4.48
Di-n-octyl Phthalate	1,600	ND	ND	ND	ND	ND	ND	ND	<1.5
Total Metals (mg/Kg)									
Arsenic	0.37	6	5	5	6	5	6	5	5
Barium	5,500	58	94	50	75	61	90	56	57
Chromium	390	20	31	30	28	32	32	28	31
Lead	none	94	8	6	6	5	5	5	5
Nickel	1,600	24	30	30	35	33	38	29	35
Selenium	390	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ

FOOTNOTES:
ND = Non-detected at the method reporting limit (MRL). (See the Building 35-752 Appendix for MRL values.)
UJ = The analyte was not detected at the MRL, however, the MRL is considered an estimate.
< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.
A shaded value indicates result exceeds the residential risk based concentration (RBC).

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TABLE 5.1-3 Summary of Analytes Detected
Building 35-752 Soil Sample Analytical Results
Drum Accumulation Area

Part 1 of 4

Location:		SB AP 3505				SB AP 3506			
Sample Depth:		0-4'	4'-6'	9'-11'	12'-16'	0-2'	4'-8'	8'-12'	14'-16'
Sample ID:		94575219SL	94575220SL	94575221SL	94575222SL	94575223SL	94575224SL	94575225SL	94575226SL
Lab Code:		K946921-001	K946921-002	K946921-003	K946921-004	K946921-010	K946921-011	K946921-012	K946921-013
Data Collected:		11/3/94	11/3/94	11/3/94	11/3/94	11/3/94	11/3/94	11/3/94	11/3/94
Compound	**Residential RBC**								
Petroleum Hydrocarbons (mg/Kg)									
DRO	none	81	61	ND	ND	83	ND	ND	ND
TPH	none	146	56	ND	ND	350	ND	ND	ND
Organochlorine Pesticides (mg/Kg)									
4,4'-DDD	2.7	<0.1	<0.06	ND	ND	ND	ND	ND	ND
4,4'-DDT	1.9	<0.1	<0.1	ND	ND	<0.02	ND	ND	ND
Polychlorinated Biphenyls (mg/Kg)									
Aroclor 1260	none	3.4	1.1	ND	ND	0.3	ND	ND	ND
Volatile Organic Compounds (µg/Kg)									
Trichloroethene (TCE)	58,000	10	6	ND	ND	ND	ND	ND	ND
Toluene	16,000,000	5	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	7,800,000	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	160,000,000	9	6	7	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	39,000	ND	ND	ND	ND	ND	ND	ND	ND
Semivolatile Organic Compounds (mg/Kg)									
Fluoranthene	3,100	<0.6	0.73	ND	ND	<0.6	ND	ND	ND
Pyrene	2,300	<0.6	0.69	ND	ND	<0.6	ND	ND	ND
Bis(2-ethylhexyl) Phthalate	46	<0.6	ND	ND	ND	0.80	ND	ND	ND
Chrysene	88	<0.6	0.85	ND	ND	<0.6	ND	ND	ND
Di-n-octyl Phthalate	1,600	<0.6	0.97	ND	ND	1.32	0.36	0.41	0.3
Benzo(b)fluoranthene	0.88	0.7	0.93	ND	ND	<0.6	ND	ND	ND
Benzo(k)fluoranthene	8.8	0.7	0.65	ND	ND	<0.6	ND	ND	ND
Benzo(a)pyrene	0.088	<0.6	0.31	ND	ND	<0.6	ND	ND	ND
Indeno(1,2,3-cd)pyrene	0.88	<0.6	ND	ND	ND	<0.6	ND	ND	ND
Total Metals (mg/Kg)									
Arsenic	0.37	6	7	4	6	5	4	6	6
Barium	5,500	69	76	44	37	70	63	44	44
Chromium	390	26	28	30	27	30	40	31	32
Lead	none	18	8	4	5	24	6	5	6
Nickel	1,600	31	30	25	32	33	33	30	39
Selenium	390	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ
Aluminum	78,000	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	none	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	4,700	NA	NA	NA	NA	NA	NA	NA	NA
Copper	2,900	NA	NA	NA	NA	NA	NA	NA	NA
Iron	none	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	none	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	390	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	none	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	none	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	550	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	23,000	NA	NA	NA	NA	NA	NA	NA	NA

FOOTNOTES:

ND = Non-detected at the method reporting limit (MRL). (See the Building 35-752 Appendix for MRL values.)

NA = Sample not analyzed for this compound.

UJ = The analyte was not detected at the MRL, however, the MRL is considered an estimate.

< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.

A shaded value indicates result exceeds the residential risk based concentration (RBC).

\OAQC\COMMON\RICH\FINALS\REPTABLES\B35752-F.XLS\B35-752 Drum 10/15/96

TABLE 5.1-3 Summary of Analytes Detected (cont.)
Building 35-752 Soil Sample Analytical Results
Drum Accumulation Area

Part 2 of 4

	Location:	SS 1			SS 2		SS 3	
	Sample Depth:	6"	6"	2'	6"	2'	6"	2'
	Sample ID:	94575201SL	94575202SL	94575218SL	94575203SL	94575217SL	94575204SL	94575216SL
	Lab Code:	K945240-001	K945240-002	K946306-008	K945240-003	K946306-007	K945240-004	K946306-006
	Date Collected:	10/6/94	10/6/94	10/10/94	10/6/94	10/10/94	10/6/94	10/10/94
Compound	Residential RBC							
Petroleum Hydrocarbons (mg/Kg)								
DRO	none	55	50	ND	18	15	70	ND
TPH	none	182	27	13 J	28	27 J	43	16 J
Organochlorine Pesticides (mg/Kg)								
4,4'-DDD	2.7	ND	ND	ND	ND	ND	ND	ND
4,4'-DDT	1.9	ND	0.04	ND	ND	ND	0.02	ND
Polychlorinated Biphenyls (mg/Kg)								
Aroclor 1260	none	ND	ND	ND	ND	ND	ND	ND
Volatile Organic Compounds (µg/Kg)								
Trichloroethene (TCE)	58,000	ND	ND	ND	ND	ND	ND	ND
Toluene	16,000,000	ND	ND	ND	ND	8	6	ND
Ethylbenzene	7,800,000	ND	ND	ND	ND	6	ND	ND
Total Xylenes	160,000,000	ND	ND	ND	ND	38	6	ND
1,2,4-Trimethylbenzene	39,000	ND	ND	ND	ND	23	ND	ND
Semivolatile Organic Compounds (mg/Kg)								
Fluoranthene	3,100	ND	ND	ND	ND	ND	ND	ND
Pyrene	2,300	ND	ND	ND	ND	ND	ND	ND
Bis(2-ethylhexyl) Phthalate	46	ND	ND	ND	ND	ND	ND	ND
Chrysene	88	ND	ND	ND	ND	ND	ND	ND
Di-n-octyl Phthalate	1,600	ND	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	0.88	ND	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	8.8	ND	ND	ND	ND	ND	ND	ND
Benzo(a)pyrene	0.088	ND	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	0.88	ND	ND	ND	ND	ND	ND	ND
Total Metals (mg/Kg)								
Arsenic	0.37	6 J	10 J	5	7 J	7	8 J	5
Barium	5,500	77	97	58	64	57	99	49
Chromium	390	29	35	30	29	38	36	24
Lead	none	5	8	6	8	8	12	5
Nickel	1,600	33	42	37	33	44	49	27
Selenium	390	1 UJ	1 UJ	ND	1 UJ	ND	1 UJ	ND
Aluminum	78,000	15,100	19,200	NA	13,300	NA	18,700	NA
Calcium	none	4,360	5,230	NA	3,940	NA	5,670	NA
Cobalt	4,700	11	13	NA	10	NA	13	NA
Copper	2,900	28	39	NA	28	NA	31	NA
Iron	none	25,100	30,800	NA	22,000	NA	30,900	NA
Magnesium	none	7,420	9,240	NA	7,300	NA	10,300	NA
Manganese	390	564	720	NA	477	NA	669	NA
Potassium	none	440	590	NA	440	NA	590	NA
Sodium	none	122	158	NA	108	NA	171	NA
Vanadium	550	45	57	NA	41	NA	60	NA
Zinc	23,000	57	72	NA	52	NA	72	NA

FOOTNOTES:

ND = Non-detected at the method reporting limit (MRL). (See the Building 35-752 Appendix for MRL values.)

NA = Sample not analyzed for this compound.

UJ = The analyte was not detected at the MRL, however, the MRL is considered an estimate.

J = Value is considered an estimate.

A shaded value indicates result exceeds the residential risk based concentration (RBC).

\QAQC\COMMON\RICH\FINALS\REPTABLES\B35752-F.XLS\B35-752 Drum 10/15/96

TABLE 5.1-3 Summary of Analytes Detected (cont.)
Building 35-752 Soil Sample Analytical Results
Drum Accumulation Area

Part 3 of 4

Location:		SS 4		SS 5			SS 6	
Sample Depth:		6"	2'	6"	2'	2'	6"	2'
Sample ID:		94575205SL	94575215SL	94575206SL	94575213SL	94575214SL	94575207SL	94575212SL
Lab Code:		K945240-005	K946306-005	K946242-001	K946306-003	K946306-004	K946242-002	K946306-002
Date Collected:		10/6/94	10/10/94	10/6/94	10/10/94	10/10/94	10/6/94	10/10/94
Compound	**Residential RBC**							
Petroleum Hydrocarbons (mg/Kg)								
DRO	none	92	61	192	778	669	97	52
TPH	none	270	35 J	740	1,300 J	1,700 J	41	87 J
Organochlorine Pesticides (mg/Kg)								
4,4'-DDD	2.7	ND	ND	ND	ND	ND	ND	ND
4,4'-DDT	1.9	0.12	ND	ND	ND	ND	ND	<0.04
Polychlorinated Biphenyls (mg/Kg)								
Aroclor 1260	none	0.5	ND	1.1	ND	ND	1.1	0.6
Volatile Organic Compounds (µg/Kg)								
Trichloroethene (TCE)	58,000	ND	ND	ND	ND	ND	ND	ND
Toluene	16,000,000	6	ND	ND	ND	ND	ND	ND
Ethylbenzene	7,800,000	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	160,000,000	6	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	39,000	ND	ND	ND	ND	ND	ND	ND
Semivolatile Organic Compounds (mg/Kg)								
Fluoranthene	3,100	ND	ND	ND	ND	<0.7	ND	ND
Pyrene	2,300	ND	ND	ND	ND	<0.7	ND	ND
Bis(2-ethylhexyl) Phthalate	46	ND	ND	ND	ND	<0.7	ND	ND
Chrysene	88	0.3	ND	ND	ND	<0.7	ND	ND
Di-n-octyl Phthalate	1,600	ND	ND	ND	ND	<0.7	ND	ND
Benzo(b)fluoranthene	0.88	ND	ND	ND	ND	<0.7	ND	ND
Benzo(k)fluoranthene	8.8	ND	ND	ND	ND	<0.7	ND	ND
Benzo(a)pyrene	0.088	ND	ND	ND	ND	<0.7	ND	ND
Indeno(1,2,3-cd)pyrene	0.88	ND	ND	ND	ND	<0.7	ND	ND
Total Metals (mg/Kg)								
Arsenic	0.37	7 J	5	5	6	8	7	6
Barium	5,500	110	81	220 J	81	93	73 J	93
Chromium	390	30	36	23	31	38	25	34
Lead	none	10	10	36	11	18	8	10
Nickel	1,600	30	36	23	32	38	27	34
Selenium	390	1 UJ	ND	1 UJ	ND	ND	1 UJ	ND
Aluminum	78,000	17,300	NA	8,620	NA	NA	13,300	NA
Calcium	none	3,150	NA	7,220	NA	NA	3,310	NA
Cobalt	4,700	11	NA	7	NA	NA	10	NA
Copper	2,900	20	NA	22	NA	NA	24	NA
Iron	none	22,700	NA	18,500	NA	NA	22,400	NA
Magnesium	none	5,930	NA	6,820	NA	NA	6,250	NA
Manganese	390	472	NA	383	NA	NA	455	NA
Potassium	none	ND	NA	ND	NA	NA	450	NA
Sodium	none	116	NA	65	NA	NA	111	NA
Vanadium	550	46	NA	28	NA	NA	41	NA
Zinc	23,000	47	NA	86	NA	NA	53	NA

FOOTNOTES:
ND = Non-detected at the method reporting limit (MRL). (See the Building 35-752 Appendix for MRL values.)
NA = Sample not analyzed for this compound.
UJ = The analyte was not detected at the MRL, however, the MRL is considered an estimate.
< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.
J = Value is considered an estimate.
A shaded value indicates result exceeds the residential risk based concentration (RBC).

\QAQC\COMMON\RICH\FINALS\REPTABLES\B35752-F.XLS]B35-752 Drum 10/15/96

TABLE 5.1-3 Summary of Analytes Detected (cont.)
Building 35-752 Soil Sample Analytical Results
Drum Accumulation Area

Part 4 of 4

	Location:	SS 7		SS 8			
	Sample Depth:	6"	2'	6"	2'		
	Sample ID:	94575208SL	94575211SL	94575209SL	94575210SL		
	Lab Code:	K946242-003	K946306-001	K946242-004	K946242-005		
	Date Collected:	10/6/94	10/10/94	10/6/94	10/6/94		
Compound	**Residential RBC**						
Petroleum Hydrocarbons (mg/Kg)							
DRO	none	ND	17	100	ND		
TPH	none	ND	14 J	48	13		
Organochlorine Pesticides (mg/Kg)							
4,4'-DDD	2.7	ND	ND	<0.06	0.01		
4,4'-DDT	1.9	<0.04	<0.02	<0.50	<0.04		
Polychlorinated Biphenyls (mg/Kg)							
Aroclor 1260	none	1.9	0.5	15.6	1.9		
Volatile Organic Compounds (µg/Kg)							
Trichloroethene (TCE)	58,000	ND	ND	ND	ND		
Toluene	16,000,000	ND	ND	ND	5		
Ethylbenzene	7,800,000	ND	ND	ND	ND		
Total Xylenes	160,000,000	ND	ND	ND	ND		
1,2,4-Trimethylbenzene	39,000	ND	ND	ND	ND		
Semivolatile Organic Compounds (mg/Kg)							
Fluoranthene	3,100	ND	ND	0.8	ND		
Pyrene	2,300	ND	ND	0.7	ND		
Bis(2-ethylhexyl) Phthalate	46	ND	ND	ND	ND		
Chrysene	88	ND	ND	0.8	ND		
Di-n-octyl Phthalate	1,600	ND	ND	ND	ND		
Benzo(b)fluoranthene	0.88	ND	ND	0.8	ND		
Benzo(k)fluoranthene	8.8	ND	ND	0.7	ND		
Benzo(a)pyrene	0.088	ND	ND	0.3	ND		
Indeno(1,2,3-cd)pyrene	0.88	ND	ND	0.3	ND		
Total Metals (mg/Kg)							
Arsenic	0.37	7	6	7	7		
Barium	5,500	67 J	90	83 J	92 J		
Chromium	390	30	34	33	32		
Lead	none	6	16	13	7		
Nickel	1,600	30	40	34	29		
Selenium	390	1 UJ	ND	1 UJ	1 UJ		
Aluminum	78,000	14,800	NA	16,200	17,000		
Calcium	none	4,110	NA	4,240	5,620		
Cobalt	4,700	10	NA	12	12		
Copper	2,900	28	NA	34	29		
Iron	none	26,600	NA	28,800	28,800		
Magnesium	none	7,430	NA	8,170	7,840		
Manganese	390	502	NA	544	628		
Potassium	none	610	NA	530	570		
Sodium	none	116	NA	112	134		
Vanadium	550	47	NA	50	50		
Zinc	23,000	61	NA	68	63		

FOOTNOTES:

ND = Non-detected at the method reporting limit (MRL). (See the Building 35-752 Appendix for MRL values.)
J = Value is considered an estimate.
NA = Sample not analyzed for this compound.
UJ = The analyte was not detected at the MRL, however, the MRL is considered an estimate.
< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.
A shaded value indicates result exceeds the residential risk based concentration (RBC).

\QAQC\COMMON\RICH\FINALS\REPTABLES\B35752-F.XLS]B35-752 Drum 10/15/96

TABLE 5.1-4 Summary of Analytes Detected
Building 35-752 Soil Sample Analytical Results
Cooling Ponds

Part 1 of 2

	Location:	MW AP 3502				MW AP 3503			
	Sample Depth:	0-4'	0-4'	4'-6'	9'-13'	0-6'	6'-8'	8'-12'	8'-12'
	Sample ID:	94575227SL	94575228SL	94575229SL	94575230SL	94575231SL	94575232SL	94575233SL	94575234SL
	Lab Code:	K946995-001	K946995-002	K946995-003	K946995-004	K947040-001	K947040-002	K947040-003	K947040-004
	Date Collected:	11/7/94	11/7/94	11/7/94	11/7/94	11/8/94	11/8/94	11/8/94	11/8/94
Compound	**Residential RBC**								
Petroleum Hydrocarbons (mg/Kg)									
GRO	none	6	ND	ND	ND	ND	ND	ND	ND
DRO	none	107 J	151 J	24 J	ND	55	34	ND	ND
TPH	none	71	183	26	ND	64	18	ND	ND
Organochlorine Pesticides (mg/Kg)									
4,4'-DDD	2.7	< 0.1	< 0.1	ND	ND	ND	ND	ND	ND
4,4'-DDT	1.9	< 0.1	< 0.2	< 0.02	ND	0.12	<0.04	ND	ND
Polychlorinated Biphenyls (mg/Kg)									
Aroclor 1260	none	2.3	8.7	0.7	ND	0.5	0.2	ND	ND
Volatile Organic Compounds (µg/Kg)									
Acetone	7,800,000	420	710	ND	ND	ND	ND	ND	ND
Methylene Chloride	85,000	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	47,000,000	90	120	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	780,000	6	ND	ND	ND	ND	ND	ND	ND
Trichloroethene (TCE)	58,000	ND	ND	6	ND	ND	ND	ND	ND
Total Xylenes	160,000,000	16	11	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	39,000	21	46	ND	ND	ND	ND	ND	ND
4-Isopropyltoluene	none	ND	21	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	27,000	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	3,100,000	ND	36	ND	ND	ND	ND	ND	ND
Total Metals (mg/Kg)									
Arsenic	0.37	5	5	5	5	5	4	4	4
Barium	5,500	99	91	89	46	47	54	69	56
Chromium	390	33	34	37	25	27	21	30	29
Lead	none	9	11	7	6	9	5	7	6
Nickel	1,600	30	34	37	30	36	44	36	31

FOOTNOTES:
ND = Non-detected at the method reporting limit (MRL). (See the Building 35-752 Appendix for MRL values.)
J = Value is considered an estimate.
< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.
A shaded value indicates result exceeds the residential risk based concentration (RBC).

\QAQC\COMMON\RICH\FINALS\REPTABLES\B35752-F.XLS]B35-752 Ponds 10/15/96

TABLE 5.1-4 Summary of Analytes Detected (cont.)
Building 35-752 Soil Sample Analytical Results
Cooling Ponds

Part 2 of 2

	Location:	MW AP 3504					SB AP 3501
	Sample Depth:	0-2'	4'-10'	4'-10'	10'-14'	14'-16'	5'-7'
	Sample ID:	94575235SL	94575236SL	94575237SL	94575238SL	94575239SL	94575240SL
	Lab Code:	K947072-001	K947072-002	K947072-003	K947072-004	K947072-005	K7108-001
	Date Collected:	11/9/94	11/9/94	11/9/94	11/9/94	11/9/94	11/11/94
Compound	**Residential RBC**						
Petroleum Hydrocarbons (mg/Kg)							
GRO	none	ND	ND	ND	ND	ND	ND
DRO	none	51	ND	ND	ND	29	100
TPH	none	89	12	20	13	13	137
Organochlorine Pesticides (mg/Kg)							
4,4'-DDD	2.7	<0.08	ND	0.03	ND	ND	<0.15
4,4'-DDT	1.9	0.1	ND	0.03	ND	ND	<0.30
Polychlorinated Biphenyls (mg/Kg)							
Aroclor 1260	none	0.6	ND	ND	ND	ND	18.6
Volatile Organic Compounds (µg/Kg)							
Acetone	7,800,000	ND	ND	ND	ND	ND	59
Methylene Chloride	85,000	20	ND	ND	ND	ND	ND
2-Butanone (MEK)	47,000,000	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	780,000	ND	ND	ND	ND	ND	ND
Trichloroethene (TCE)	58,000	ND	12	19	ND	ND	ND
Total Xylenes	160,000,000	8	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	39,000	ND	ND	ND	ND	ND	ND
4-Isopropyltoluene	none	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	27,000	ND	ND	ND	ND	ND	7
Naphthalene	3,100,000	ND	ND	ND	ND	ND	ND
Total Metals (mg/Kg)							
Arsenic	0.37	5 J	4 J	5 J	4 J	6 J	5
Barium	5,500	79	60	44	64	63	57
Chromium	390	32	38	31	36	38	38
Lead	none	12	5	6	5	8	13 J
Nickel	1,600	29	36	30	45	38	33

FOOTNOTES:
ND = Non-detected at the method reporting limit (MRL). (See the Building 35-752 Appendix for MRL values.)
J = Value is considered an estimate.
< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.
A shaded value indicates result exceeds the residential risk based concentration (RBC).

\QAQC\COMMON\RICH\FINALS\REPTABLES\B35752-F.XLS[B35-752 Ponds 10/18/96

TABLE 5.1-5 Summary of Analytes Detected
Building 35-752 Sediment Sample Analytical Results
Cooling Ponds

	Location:	A		B	C	D	E	F	G	H
	Sample Depth:	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"
	Sample ID:	94575240SD	94575241SD	94575242SD	94575243SD	94575244SD	94575245SD	94575246SD	94575247SD	94575248SD
	Lab Code:	K947714-001	K947714-002	K947714-003	K947714-004	K947714-005	K947714-006	K947714-007	K947714-008	K947714-009
	Date Collected:	12/8/94	12/8/94	12/8/94	12/8/94	12/8/94	12/8/94	12/8/94	12/8/94	12/8/94
Compound	Residential RBC									
Total Petroleum Hydrocarbons (mg/Kg)										
TPH	none	230	240	240	420	280	83	186	440	260
Organochlorine Pesticides (mg/kg)										
4,4'-DDD	2.7	0.03	0.1	0.03	0.02	0.07	<0.04	<0.1	<0.08	<0.05
4,4'-DDT	1.9	<0.2	<0.3	<0.02	<0.04	0.04	<0.04	<0.1	<0.08	<0.07
Polychlorinated Biphenyls (mg/Kg)										
Arodor 1260	none	0.3	0.5	0.4	0.8	0.1	0.5	2.2	4.5	3.4
Volatile Organic Compounds (µg/Kg)										
Acetone	7,800,000	160	170	190	420	210	240	110	180	230
2-Butanone (MEK)	47,000,000	47	43	ND	58	33	20	ND	40	ND
1,1,1-Trichloroethane (TCA)	7,000,000	18	ND	ND	<10	ND	14	10	<10	ND
1,4-Dichlorobenzene	27,000	ND	ND	ND	<10	ND	ND	ND	15	6
Semivolatile Organic Compounds (mg/Kg)										
Phenanthrene	none	ND	ND	ND	<4	0.4	2.2	1.5	1.5	0.7
Fluoranthene	3,100	ND	0.3	ND	<4	0.5	3.9	2.1	2.3	4.4
Pyrene	2,300	ND	ND	ND	<4	0.4	0.7	1.9	<0.8	5.4
Benz(a)anthracene	0.88	ND	ND	ND	<4	ND	0.6	ND	<0.8	1.5
Bis(2-ethylhexyl) Phthalate	46	ND	ND	ND	<4	ND	ND	ND	<0.8	0.4
Chrysene	88	ND	ND	ND	<4	ND	1.1	0.8	<0.8	1.6
Benzo(b)fluoranthene	0.88	ND	ND	ND	<4	ND	0.7	0.4	<0.8	2
Benzo(k)fluoranthene	8.8	ND	ND	ND	<4	ND	0.4	0.5	<0.8	1.3
Benzo(a)pyrene	0.088	ND	ND	ND	<4	ND	ND	ND	<0.8	1.2
Indeno(1,2,3-cd)pyrene	0.88	ND	ND	ND	<4	ND	ND	ND	<0.8	0.5
Benzo(g,h,i)perylene	none	ND	ND	ND	<4	ND	ND	ND	<0.8	0.5
Total Metals (mg/Kg)										
Arsenic	0.37	4	4	4	3	5	3	3	5	5
Barium	5,500	103	114	113	65	98	44	49	83	61
Chromium	390	34	35	43	33	46	33	26	45	43
Lead	none	22	26	48	23	21	14	31	61	36
Nickel	1,600	29	30	37	31	42	35	40	44	40

FOOTNOTES:

ND = Non-detected at the method reporting limit (MRL). (See the Building 35-752 Appendix for MRL values.)

< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.

A shaded value indicates result exceeds the residential risk based concentration (RBC).

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TABLE 5.1-6 Summary of Analytes Detected
Building 35-752 Groundwater Sample Analytical Results
Cooling Ponds

Location:		MW AP 3502	MW AP 3503	MW AP 3504		MW AP 2982	MW AP 2983	MW AP 2986	MW AP 2987
Sample ID:		9457528AGW	9457525AGW	9457521AGW	9457522AGW	9457523AGW	9457526AGW	9457527AGW	9457524AGW
Lab Code:		K948015-003	K947974-005	K947938-001	K947938-002	K948015-001	K947974-001	K947974-007	K947974-003
Date Collected:		12/21/94	12/20/94	12/19/94	12/19/94	12/20/94	12/20/94	12/20/94	12/20/94
Compound	**Residential RBC**								
Petroleum Hydrocarbons (µg/L)									
GRO	none	ND	ND	ND	NA	292	ND	ND	ND
DRO	none	105	89 J	ND	ND	226	ND	566 J	1310
TPH	none	ND	ND	ND	ND	ND	ND	500	ND
Polychlorinated Biphenyls (PCBs) (µg/L)									
Aroclor 1260	none	ND	ND	ND	ND	ND	ND	0.7	0.2 UJ
Volatile Organic Compounds (µg/L)									
1,1-Dichloroethane	810	ND	ND	ND	NA	0.6	ND	ND	ND
1,1,1-Trichloroethane (TCA)	1,300	ND	ND	3.4	NA	9.7	ND	ND	ND
Benzene	0.36	ND	ND	ND	NA	46	ND	ND	1.6
Trichloroethene (TCE)	1.6	ND	ND	0.6	NA	0.6	0.5	ND	0.6
Toluene	750	ND	ND	ND	NA	2.8	ND	ND	ND
Ethylbenzene	1,300	ND	ND	ND	NA	22	ND	ND	ND
Total Xylenes	12,000	ND	ND	ND	NA	56	ND	ND	ND
1,3,5-Trimethylbenzene	2.4	ND	ND	ND	NA	2	ND	ND	ND
1,2,4-Trimethylbenzene	3	ND	ND	ND	NA	11	ND	ND	ND
Naphthalene	1,500	ND	ND	ND	NA	9	ND	ND	ND
Semivolatile Organic Compounds (µg/L)									
Bis(2-ethylhexyl) Phthalate	48	ND	ND	ND	ND	ND	ND	11	ND
Total Metals (µg/L)									
Arsenic	0.038	5	52 J	29	34	27	28 J	48 J	27 J
Barium	2,600	129	1,480	683	722	424	761	245	604
Cadmium	18	ND	6	ND	ND	ND	ND	ND	ND
Chromium	180	17	402	206	229	97	182	72	154
Lead	none	5	112	48	53	26	64	44	52
Mercury	11	ND	1.8	1.2	1.2	0.7	1.5	0.7	1.1
Nickel	730	25	548	318	345	153	290	102	229

FOOTNOTES:
ND = Non-detected at the method reporting limit (MRL). (See the Building 35-752 Appendix for MRL values.)
J = Value is considered an estimate.
UJ = The analyte was not detected at the MRL, however, the MRL is considered an estimate.
NA = not analyzed.
A shaded value indicates result exceeds the residential risk based concentration (RBC)

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10/15/96

5.1.4 Semi-Quantitative Risk Assessment

As described in Section 4.2, a semi-quantitative risk assessment was conducted encompassing the four areas investigated at Building 35-752. The risk assessment is considered semi-quantitative because: 1) potential risks to ecological receptors were not evaluated quantitatively, 2) the exposures evaluated reflect the available analytical data and do not necessarily represent the maximum extent of contamination or future changes in contaminant concentrations, and 3) only two exposure pathways were considered (soil ingestion and tapwater ingestion); although these pathways yield the most conservative results, other pathways may also be important.

Building 35-752 is located approximately 1,250 feet north of Ship Creek. The site is surrounded by mixed spruce and birch forest, with grassy clearings. Surface soils are exposed in the gravel parking area around the building. The interior of Building 35-752 is used as storage space for fire extinguishers; access is restricted.

The cooling ponds discharge to an unlined ditch that transports moving water for several hundred feet to the south. The flow rate was estimated at 5 to 10 gallons per minute (gpm) during the site visit but probably increases during rainfall or snowmelt events.

5.1.4.1 Compounds of Potential Concern

A summary of the compounds of potential concern (COPC) is presented in Table 5.1-7. These compounds include monoaromatics (benzene, toluene, ethylbenzene, xylenes, 1,3,5-trimethylbenzene, 1,2,4-trimethylbenzene, and 4-isopropyltoluene), polycyclic aromatic hydrocarbons (PAHs) [naphthalene, 2-methylnaphpthalene, phenanthrene, benz(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, and benzo(g,h,i)perylene], chlorinated aliphatics (trichlorethene, 1,1,1-trichloroethane, and 1,1-dichloroethane), PCBs, polychlorinated diphenyl alkanes (4,4'-DDT), phthalates (bis[2-ethylhexyl]phthalate), and metals (arsenic, barium, cadmium, chromium, mercury, nickel, and vanadium). As shown on Table 5.1-7, some of these compounds are carcinogens.

All of the other target analytes were either 1) not detected, 2) below 1/10th of the RBC for residential soil, 3) below the RBC for residential tap water, or 4) not statistically different from the background sample population (metals only). As shown by Table 4-1, however, RBCs are not available for some compounds. These compounds were included in the semi-quantitative risk assessment *only* when they were detected in a site-related sample. In addition, a list of

Table 5.1-7. Compounds of Potential Concern
Building 35-752

Type	Source	Carcinogens	Noncarcinogens
Monoaromatics	Fuels	Benzene	Toluene Ethylbenzene Xylenes 1,3,5-Trimethylbenzene 1,2,4-Trimethylbenzene 4-Isopropyltoluene
Polyaromatics (PAH)	Fuels, oils	Benz(a)anthracene Benzo(b)fluoranthene Benzo(k)fluoranthene Benzo(a)pyrene Indeno(1,2,3-cd)pyrene	Naphthalene 2-Methylnaphthalene Phenanthrene Benzo(g,h,i)perylene
Chlorinated aliphatics	Solvents	Trichloroethene (TCE)	1,1,1-Trichloroethane (TCA) 1,1-Dichloroethane
Polychlorinated biphenyls (PCB)	Transformer oil	Total PCBs	(Aroclor 1016 or 1254 only)
Polychlorinated diphenyl alkanes	Insecticides	4,4'-DDT	None
Phthalates	Plastics	Bis(2-ethylhexyl) phthalate	None
Metals[1]	Background soil; fuels & oils	Arsenic	Barium Cadmium[2] Chromium Mercury Nickel Vanadium

[1] Based on the background metals statistics evaluation in Appendix A, some metals were not included in the semi-quantative risk assessment because they were not statistically significant from background concentrations.

[2] Cadmium is considered a carcinogen via the inhalation pathway; however, inhalation of nonvolatile compounds is considered insignificant relative to oral ingestion (see Appendix A, Section A.5).

compounds that were not detected at detection limits exceeding current risk-based concentrations is provided in Table 5.1-8. Most of these compounds were identified in the Work Plan (ENSR 1994) but require special analytical services to achieve reporting limits below RBCs. During the RI/FS, Table 5.1-8 should be reviewed to determine if the likelihood that the compound is present warrants the use of special analytical services.

As described in Section 5.1.4.4, the toxicity of petroleum hydrocarbons cannot be evaluated using bulk hydrocarbon measurements (GRO, DRO, and TPH). As a result, these data were not included in the semi-quantitative risk assessment.

5.1.4.2 Sources, Transport Mechanisms, Exposure Pathways, and Receptors

Sources, transport mechanisms, exposure pathways, and receptors (elements of the Conceptual Site Model) are shown on Figure 5.1-5. As discussed previously, four primary sources are present at the site: surface dust on oiled concrete inside Building 35-752; the former drum accumulation area; seven former USTs; and the Cooling Ponds. With the exception of the concrete floor, all of these sources appear to have impacted surface soils, subsurface soils, and groundwater. The Cooling Ponds also appear to have impacted pond sediments and possibly surface water.

Potential transport mechanisms include surface water transport, leaching and groundwater transport, and volatilization. Within the air phase, volatile COPCs may disperse in the atmosphere or accumulate in enclosed spaces. In accordance with EPA (1995a), several COPCs are considered "volatile" (benzene, toluene, ethylbenzene, xylenes, 1,3,5-trimethylbenzene, 1,2,4-trimethylbenzene, trichloroethene, 1,1,1-trichloroethane, and 1,1-dichloroethane), having Henry's Law constants greater than 10^{-5}. Concentrations of these compounds are not expected to be significant in atmospheric air, but may be of concern within Building 35-752. Similarly, concentrations of nonvolatile COPCs in airborne dust are not expected to be of concern in the atmosphere, but may be significant within Building 35-752 (particularly PCBs).

Surface water transport may be significant for contaminated sediments present in the Cooling Ponds, particularly during rainfall or snowmelt events. Leaching and groundwater transport has resulted in migration of monoaromatics, PAH, chlorinated aliphatics, PCBs, phthalates, and metals. The dynamic state of the dissolved plume (expanding, degrading, or steady state) is not known, but is expected to be degrading. Long-term monitoring, or leaching and dissolved phase transport modeling, is required to verify this conclusion.

Table 5.1-8 Compounds Not Detected at Reporting Limits Exceeding Current Risk-Based Concentrations, Building 35-752

Compound	Matrix	Maximum Detection Limit	Risk-Based Concentration
Vinyl Chloride	Soil	1300 µg/Kg	340 µg/Kg
1,1-Dichloroethene	Soil	1300 µg/Kg	1,100 µg/Kg
1,2-Dibromoethane (EDB)	Soil	5300 µg/Kg	8 µg/Kg
1,2,3-Trichloropropane	Soil	1300 µg/Kg	91 µg/Kg
1,2-Dibromo-3-chloropropane (DBCP)	Soil	5300 µg/Kg	460 µg/Kg
N-Nitrosodimethylamine	Soil	40 mg/Kg	0.013 mg/Kg
Bis(2-chloroethyl) Ether	Soil	6 mg/Kg	0.58 mg/Kg
N-Nitrosodi-n-propylamine	Soil	6 mg/Kg	0.091 mg/Kg
2-Nitroaniline	Soil	40 mg/Kg	4.7 mg/Kg
Hexachlorobenzene	Soil	6 mg/Kg	0.4 mg/Kg
3,3'-Dichlorobenzidine	Soil	40 mg/Kg	1.4 mg/Kg
Benz(a)anthracene	Soil	6 mg/Kg	0.88 mg/Kg
Benzo(b)fluoranthene	Soil	6 mg/Kg	0.88 mg/Kg
Benzo(a)pyrene	Soil	6 mg/Kg	0.088 mg/Kg
Indeno(1,2,3-cd)pyrene	Soil	6 mg/Kg	0.88 mg/Kg
Dibenz(a,h)anthracene	Soil	6 mg/Kg	0.088 mg/Kg
Pentachlorophenol	Soil	40 mg/Kg	5.3 mg/Kg
Beryllium	Soil	1 mg/Kg	0.15 mg/Kg
Heptachlor Epoxide	Soil	0.1 mg/Kg	0.07 mg/Kg
Dieldrin	Soil	0.1 mg/Kg	0.04 mg/Kg
Toxaphene	Soil	6 mg/Kg	0.58 mg/Kg
Aroclor 1254	Soil	6 mg/Kg	1.6 mg/Kg
1,2-Dibromoethane (EDB)	Sediment	40 µg/Kg	8 µg/Kg
N-Nitrosodimethylamine	Sediment	24 mg/Kg	0.013 mg/Kg
Bis(2-chloroethyl) Ether	Sediment	4 mg/Kg	0.58 mg/Kg
N-Nitrosodi-n-propylamine	Sediment	4 mg/Kg	0.091 mg/Kg
2-Nitroaniline	Sediment	24 mg/Kg	4.7 mg/Kg
Hexachlorobenzene	Sediment	4 mg/Kg	0.4 mg/Kg
3,3'-Dichlorobenzidine	Sediment	24 mg/Kg	1.4 mg/Kg
Dibenz(a,h)anthracene	Sediment	4 mg/Kg	0.088 mg/Kg
Pentachlorophenol	Sediment	24 mg/Kg	5.3 mg/Kg
Dieldrin	Sediment	0.1 mg/Kg	0.04 mg/Kg
Toxaphene	Sediment	5 mg/Kg	0.58 mg/Kg
Chlordane	Sediment	0.8 mg/Kg	0.49 mg/Kg
1,1-Dichloroethene	Water	0.5 µg/L	0.044 µg/L
Chloroform	Water	0.5 µg/L	0.15 µg/L
Bromodichloromethane	Water	0.5 µg/L	0.17 µg/L
Carbon Tetrachloride	Water	0.5 µg/L	0.16 µg/L

Note: Some detection limits are elevated due to analytical interference. See the Building 35-752 Appendix for a complete list of detection limits

Table 5.1-8, cont'd. Compounds Not Detected at Reporting Limits Exceeding Current Risk-Based Concentrations, Building 35-752

Compound	Matrix	Maximum Detection Limit	Risk-Based Concentration
1,2-Dichloroethane	Water	0.5 µg/L	0.12 µg/L
1,2-Dichloropropane	Water	0.5 µg/L	0.16 µg/L
cis-1,3-Dichloropropene	Water	0.5 µg/L	0.077 µg/L
1,1,2-Trichloroethane	Water	0.5 µg/L	0.19 µg/L
1,2-Dibromoethane (EDB)	Water	2 µg/L	0.00075 µg/L
1,1,1,2-Tetrachloroethane	Water	0.5 µg/L	0.41 µg/L
1,1,2,2-Tetrachloroethane	Water	0.5 µg/L	0.052 µg/L
Vinyl Chloride	Water	0.5 µg/L	0.019 µg/L
1,4-Dichlorobenzene	Water	0.5 µg/L	0.44 µg/L
1,2-Dibromo-3-chloropropane (DBCP)	Water	2 µg/L	0.048 µg/L
Hexachlorobutadiene	Water	2 µg/L	0.14 µg/L
trans-1,3-Dichloropropene	Water	0.5 µg/L	0.077 µg/L
N-Nitrosodimethylamine	Water	25 µg/L	0.0013 µg/L
Aniline	Water	25 µg/L	10 µg/L
Bis(2-chloroethyl) Ether	Water	10 µg/L	0.0092 µg/L
1,4-Dichlorobenzene	Water	10 µg/L	0.44 µg/L
Bis(2-chloroisopropyl) Ether	Water	10 µg/L	0.26 µg/L
N-Nitrosodi-n-propylamine	Water	10 µg/L	0.0096 µg/L
Hexachloroethane	Water	10 µg/L	0.75 µg/L
Nitrobenzene	Water	10 µg/L	3.4 µg/L
Hexachlorobutadiene	Water	10 µg/L	0.14 µg/L
Hexachlorocyclopentadiene	Water	10 µg/L	0.15 µg/L
2-Nitroaniline	Water	25 µg/L	2.2 µg/L
Hexachlorobenzene	Water	10 µg/L	0.0066 µg/L
3,3'-Dichlorobenzidine	Water	25 µg/L	0.15 µg/L
Benz(a)anthracene	Water	10 µg/L	0.092 µg/L
Bis(2-ethylhexyl) Phthalate	Water	10 µg/L	4.8 µg/L
Chrysene	Water	10 µg/L	9.2 µg/L
Benzo(b)fluoranthene	Water	10 µg/L	0.092 µg/L
Benzo(k)fluoranthene	Water	10 µg/L	0.92 µg/L
Benzo(a)pyrene	Water	10 µg/L	0.0092 µg/L
Indeno(1,2,3-cd)pyrene	Water	10 µg/L	0.092 µg/L
Dibenz(a,h)anthracene	Water	10 µg/L	0.0092 µg/L
2,4,6-Trichlorophenol	Water	10 µg/L	6.1 µg/L
Pentachlorophenol	Water	25 µg/L	0.56 µg/L
Arsenic	Water	5 µg/L	0.038 µg/L
Heptachlor	Water	0.04 µg/L	0.0023 µg/L
Aldrin	Water	0.04 µg/L	0.004 µg/L

Note: Some detection limits are elevated due to analytical interference. See the Building 35-752 Appendix for a complete list of detection limits

Table 5.1-8, cont'd. Compounds Not Detected at Reporting Limits Exceeding Current Risk-Based Concentrations, Building 35-752

Compound	Matrix	Maximum Detection Limit	Risk-Based Concentration
Heptachlor Epoxide	Water	0.04 µg/L	0.0012 µg/L
4,4'-DDT	Water	0.5 µg/L	0.2 µg/L
Dieldrin	Water	0.04 µg/L	0.0042 µg/L
Toxaphene	Water	1 µg/L	0.061 µg/L
Chlordane	Water	0.5 µg/L	0.052 µg/L
Note: Some detection limits are elevated due to analytical interference. See the Building 35-752 Appendix for a complete list of detection limits			

Depending on the future land use, potential receptors may include residents, occupational workers, and construction workers. Although it is unlikely that contaminants would reach Ship Creek, additional receptors could include recreational users. Ecological receptors include terrestrial plants, mammals, waterfowl, and aquatic species.

5.1.4.3 Exposure Assessment

A preliminary exposure assessment was performed for the soil ingestion and drinking water ingestion pathways. Exposures via these pathways generally result in greater chemical uptake than dermal contact, inhalation, or recreation use. Accordingly, these pathways were selected to determine if soil exposures represent a significant human health risk. If human health risks via soil ingestion and drinking water ingestion are significantly below the acceptable risk threshold, then combined health risks from other exposure pathways are probably within acceptable limits. However, if human health risks via soil ingestion and drinking water ingestion are close to the acceptable risk threshold, then other exposure pathways should be evaluated as part of a baseline risk assessment.

Exposures were calculated using default exposure factors for residential and commercial/industrial receptors (EPA 1995a). These exposure factors reflect individuals with the highest chronic exposure for noncarcinogens and the highest cumulative exposure for carcinogens. For example, soil exposures for noncarcinogens are calculated assuming childhood exposure only, whereas soil exposures for carcinogens are calculated assuming combined childhood and adult exposure. A list of the exposure factors and equations is provided in Appendix A.

Exposure concentrations were calculated as the 95 percent upper confidence limit (UCL) of the average concentration of all samples analyzed from a particular medium (surface soil, subsurface soil, or groundwater). If the compound was not detected, one-half of the reporting limit was used to calculate the 95 percent UCL. This approach is consistent with EPA guidance (EPA 1991, 1992).

5.1.4.4 Toxicity Assessment

Dose-response factors for most compounds were obtained from EPA (1995a). These factors were obtained from:

1) EPA's Integrated Risk Information System (current as of January 1, 1995),
2) EPA's Health Effects Assessment Summary Tables (current through March 1994),

3) The Superfund Health Risk Technical Support Center, and
4) Other EPA sources.

Compounds not included in EPA (1995a) were assigned proxy dose-response factors based on those for related compounds. These compounds are listed in Table 5.1-9. A provisional reference dose for 1,3,5-trimethylbenzene (EPA 1995a) was used as a proxy reference dose for other alkylbenzenes lacking approved dose-response factors. This value was selected because it is the lowest reference dose of all nonhalogenated alkylbenzenes provided by EPA (1995a), thereby providing a conservative estimate of the noncarcinogenic effects of volatile fuel hydrocarbons. Similarly, toxic equivalence factors developed by Magee et al. (1993) were used to estimate proxy reference doses for noncarcinogenic PAH lacking approved dose-response factors. These factors were used to evaluate potential noncarcinogenic effects associated with semivolatile fuel hydrocarbons (i.e., PAH).

Although provisional dose response factors have been developed for JP-4, JP-5, gasoline, and diesel fuel (EPA 1992b), these values are not appropriate for this evaluation. These values are based on fresh petroleum products and do not accurately represent the composition, and therefore the toxicity, of weathered petroleum products. They have not been subjected to rigorous peer review and are not routinely used, even by EPA, in risk assessment. As a result, bulk hydrocarbon measurements (GRO, DRO, and TPH) were not included in the semi-quantitative risk assessment.

5.1.4.5 Human Health Risk Characterization

The following sections summarize potential human health risks via soil ingestion and tapwater ingestion. As previously described, exposures via these pathways generally result in greater chemical uptake than dermal contact, inhalation, or recreation use. Accordingly, if human health risks via soil ingestion and drinking water ingestion are significantly below the acceptable risk threshold, then combined health risks from other exposure pathways are probably within acceptable limits. However, if human health risks via soil ingestion and drinking water ingestion are close to the acceptable risk threshold, then other exposure pathways should be evaluated as part of the baseline risk assessment.

Human Health Risks - Carcinogenic

Carcinogenic risks for the soil ingestion and drinking water ingestion pathways are summarized on Table 5.1-10. Detailed risk calculations for each pathway and receptor are presented in Appendix A.

Table 5.1-9. Proxy Dose-Response Factors for Compounds Lacking Toxicity Data Building 35-752

Surrogate Compounds		Target Compound			
Name	Approved RfDo[1]	Name	TEF[2]	Proxy RfDo	Proxy CSFo
1,3,5-Trimethylbenzene	0.0004	4-Isopropyltoluene	None[3]	0.0004	
Naphthalene	0.04	2-Methylnaphthalene	1	0.04	
Naphthalene	0.04	Phenanthrene	0.13	0.308	
Naphthalene	0.04	Benzo(g,h,i)perylene	1.3	0.0308	

Notes:

[1] "Approved" oral reference doses (RfDs) from EPA (1995).

[2] Toxicity Equivalency Factors (TEF) for PAH from Magee et al. (1993).

[3] No TEFs have been developed for these compounds. RfDs for surrogate compounds were substituted as those for the target compounds.

Table 5.1-10. Carcinogenic Risks for Soil Ingestion and Drinking Water Ingestion Building 35-752

Pathway	Carcinogenic Risk	
	Residential	Occupational
Surface Soil	2.2×10^{-5}	2.6×10^{-6}
Subsurface Soil	7.1×10^{-7}	8.4×10^{-8}
Groundwater (as tap water)	1.2×10^{-3}	5.7×10^{-4}
Total Risk	1.2×10^{-3}	5.7×10^{-4}

Using both residential and occupational exposure factors, the excess lifetime carcinogenic risk for soil ingestion and drinking water ingestion exceeds the lower benchmark of 1×10^{-6} listed in the NCP. As a result, exposures via inhalation and dermal contact may also be evaluated. The majority of the carcinogenic risk is associated with arsenic in groundwater. The remainder of the carcinogenic risk is associated with PCBs, benzene, trichloroethene, and bis(2-ethylhexyl)phthalate.

Human Health Risks - Noncarcinogenic

Noncarcinogenic hazard indices for the soil ingestion and drinking water ingestion pathways are summarized on Table 5.1-11. A breakdown of risk calculations for each pathway and receptor are presented in Appendix A.

Table 5.1-11. Hazard Indices for Soil Ingestion and Drinking Water Ingestion Building 35-752

Pathway	Hazard Index	
	Residential	Occupational
Surface Soil	0.055	0.0022
Subsurface Soil	0.010	0.00040
Groundwater (as tap water)	3.5	2.1
Total Hazard Index	3.5	2.1

Using both residential and occupational exposure factors, the total hazard index for soil/drinking water ingestion is above the estimated threshold for adverse effects.

5.1.4.6 Ecological Risk Characterization

Quantitative assessment of ecological risks can be performed at the organism, population, or ecosystem level. Although ecosystem-level effects may be the most important, effects testing and modeling are rarely performed due to a number of practical considerations (Suter 1993). Quantification of population-level effects, such as reproductive potential, is important to maintain species populations, whereas assessment of organism-level effects evaluates the risk to individual organisms.

Chemicals can be evaluated as single compounds or as mixtures. Methods for evaluating the toxicity of mixtures requires knowledge regarding the sites and modes of action of individual compounds. Unlike for human health risk assessment, these methods have not been standardized, and there is some debate regarding the most appropriate approach.

If potential exposure pathways and receptors are present, ecological assessment begins with identification of the compounds of potential concern. This can be done in a similar fashion as for human health risk assessment, using ecological RBCs. Ecological RBCs may include toxicity benchmarks, sediment quality criteria, or other regulatory criteria. One set of criteria in common use provides benchmark concentrations for eight representative mammalian species and nine avian species (Opresko et al. 1994). Although benchmark concentrations are provided for 76 chemicals, toxicity benchmarks are not available for many target analytes. Also, the benchmarks are provided as concentrations in food, requiring evaluation of plant uptake and other routes of dietary exposure.

Likewise, standardized criteria for aquatic species reflect various exposure routes and test methods, and are not available for all target compounds. As a result, compilation of ecological RBCs can involve significant effort. Due to the large number of analytes measured at Building 35-752, ecological RBCs were not compiled as part of this project.

Potential receptors at Building 35-752 include terrestrial, avian, and aquatic species at a variety of trophic levels. The most highly exposed species include those with a small home range and small body weight to food consumption ratio (e.g., mice, benthic invertebrates, resident songbirds). However, other less exposed species may warrant evaluation based on their susceptibility to particular chemicals (e.g., reproductive effects of 4,4'-DDT in raptors).

A comparison of cooling pond sediment concentrations with available sediment quality criteria is shown on Table 5.1-12. The compounds shown, however, were selected using human health RBCs as described in Section 5.1.4.1. These criteria may not be appropriate for selection of ecological compounds of potential concern.

The results shown on Table 5.1-12 indicate that concentrations of several chemicals exceeded the lowest sediment benchmark value. As a result, more detailed quantitative analyses may be warranted. First, ecological RBCs may be identified for representative terrestrial, avian, and aquatic species. Compounds of potential concern may then be selected based on a comparison of ecological RBCs with measured concentrations. At this point, the appropriate risk quantitation methods and measurement endpoints may be selected.

5.1.5 Findings and Conclusions

Risks to human health associated with noncarcinogenic compounds are above the estimated threshold for adverse effects. The excess lifetime carcinogenic risk for soil ingestion and drinking water ingestion exceeds the lower benchmark of 1 x 10^{-6} listed in the NCP. The greatest carcinogenic risk is associated with arsenic. The remainder of the carcinogenic risk is associated with PCBs, benzene, trichloroethene, and bis(2-ethylhexyl)phthalate.

Table 5.1-12. Cooling Pond Sediment Concentrations and Ecological Sediment Quality Benchmarks
Building 35-752

Compound	MRL, mg/Kg	Samples/ Detects	Concentration, mg/Kg			Sediment Quality Benchmarks				
			Min.	Max.	Mean	Ont. MOE	ORNL-SQB	WDNR-SQC	EPA-SQC	NOAA ER-L
Acetone	0.05	9/9	0.11	0.42	0.21		0.064			
2-Butanone (MEK)	0.02	9/6	0.01	0.058	0.030					
1,1,1-Trichloroethane (TCA)	0.005	9/3	0.003	0.018	0.007		0.179			
1,4-Dichlorobenzene	0.005	9/2	0.003	0.015	0.005					
Phenanthrene	0.3	9/5	0.15	2.2	0.97				1.8 (b)	0.225
Fluoranthene	0.3	9/6	0.15	4.4	1.8			12.2 (b)	6.2 (b)	0.6
Pyrene	0.3	9/4	0.15	5.4	1.3					0.35
Benz(a)anthracene	0.3	9/2	0.15	2	0.58		0.108			0.23
Chrysene	0.3	9/3	0.15	2	0.74					0.4
Benzo(b)fluoranthene	0.3	9/3	0.15	2	0.68					
Benzo(k)fluoranthene	0.3	9/3	0.15	2	0.58					
Benzo(a)pyrene	0.3	9/1	0.15	2	0.50		0.14	0.89 (b)		0.4
Indeno(1,2,3-cd)pyrene	0.3	9/1	0.15	2	0.42					
Benzo(g,h,i)perylene	0.3	9/1	0.15	2	0.42					
Bis(2-ethylhexyl) Phthalate	0.3	9/1	0.15	2	0.41		8.9E+5			
Aroclor 1260	0.1	9/9	0.1	4.5	1.4	0.005	1099			
Total PCBs	0.7	9/9	0.4	4.8	1.7		20.52			0.05
4,4'-DDD	0.01	9/5	0.02	0.1	0.043	0.008				0.002
4,4'-DDT	0.01	9/1	0.01	0.15	0.052	0.007				0.001
Arsenic	1	9/9	3	5	4.0	6		10		8.2
Barium	1	9/9	44	114	81			500		
Chromium	2	9/9	26	46	38	26		100		81
Lead	1	9/9	14	61	31	31		50		46.7
Nickel	10	9/9	29	44	36	16		100		21
Total Petroleum Hydrocarbons (TPH)	10	9/9	83	440	265					

(b) = assumed 1% organic carbon content

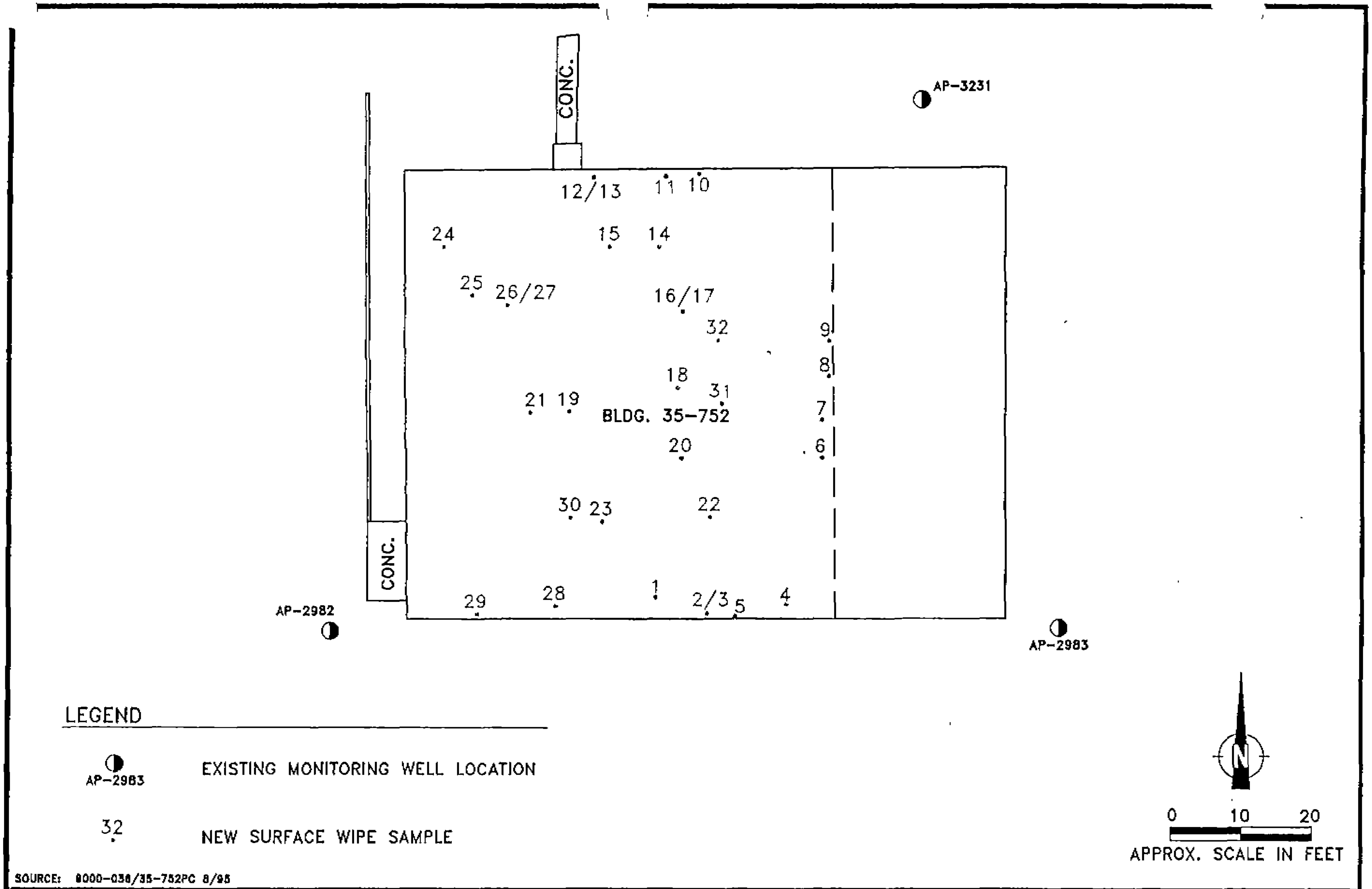
Ont-MOE = Ontario Ministry of the Environment, Lowest Effect Level (Persaud 1990)

ORNL-SQB = Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Sediment-Associated Biota (Hull & Suter 1994)

WDNR-SQB = Wisconsin Department of Natural Resources Sediment Quality Criteria

EPA SQC = EPA Sediment Quality Criteria derived for five contaminants (1993)

NOAA ER-L = National Oceanic and Atmospheric Administration Effects Range - Low, values for screening contaminants in sediment (Long & Morgan, revised 1993)



SOURCE: 9000-036/35-752PC 8/95

F5.1-A

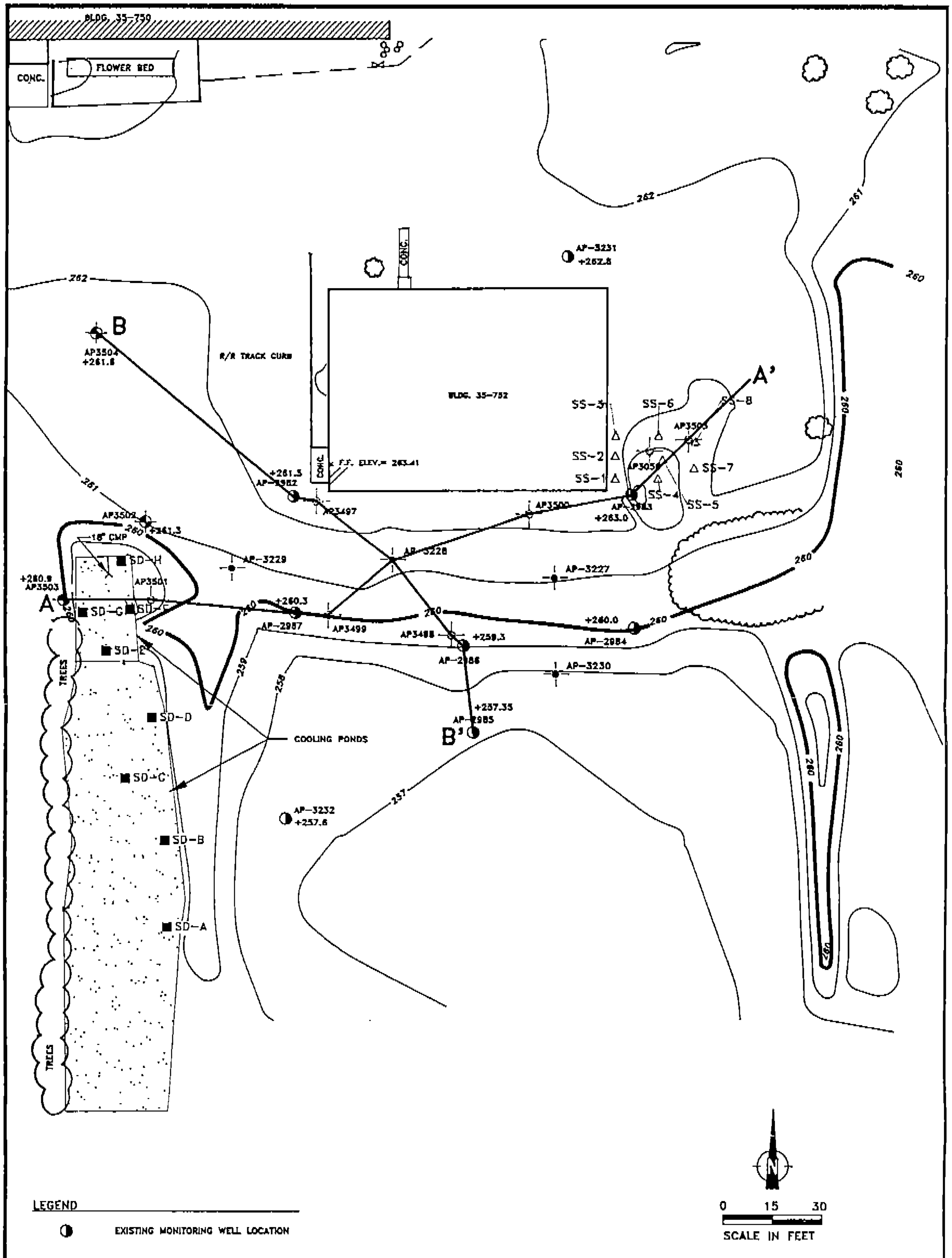
DRAWING: 35752PCB	DRAWN: SSR
C/SC: 1:20	DISK: 371/95
DATE: 10/16/96	CHECK: S. WRENN

FIGURE 5.1-1

PCB WIPE LOCATION MAP
FOR BUILDING 35-752

OPERABLE UNIT D
FORT RICHARDSON, ALASKA

PROJECT 9000-036



LEGEND

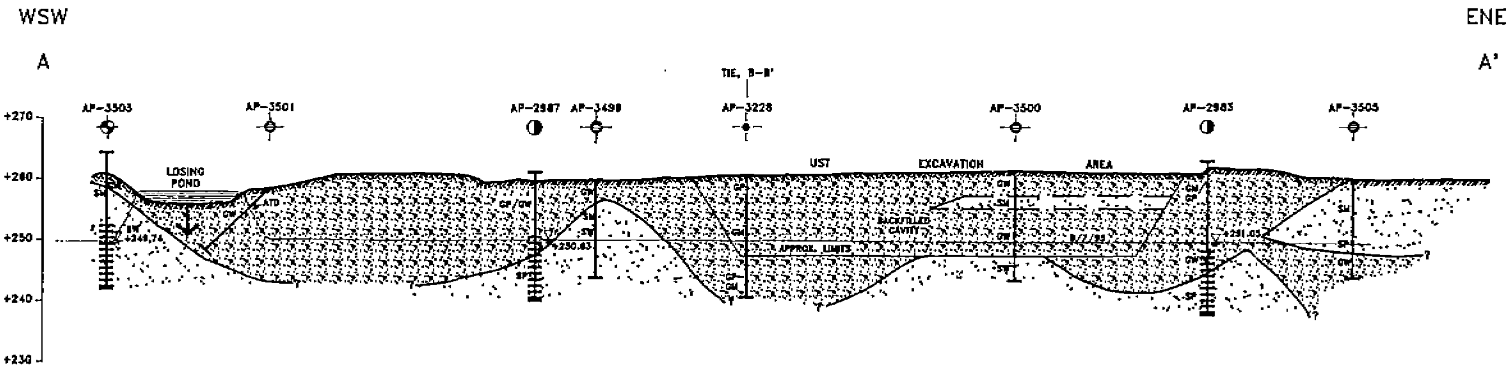
◑	EXISTING MONITORING WELL LOCATION
+261.60	GROUND ELEVATION AT MONITORING WELL
-●-	PREVIOUS SOIL BORING
-◑-	NEW MONITORING WELL LOCATION
-○-	NEW SOIL BORING LOCATION
△	NEW SURFACE SAMPLE LOCATION
■	NEW SEDIMENT SAMPLE LOCATION
⌒⌒⌒	TREELINE

SOURCE: ENSR/9000-036/35-752SL

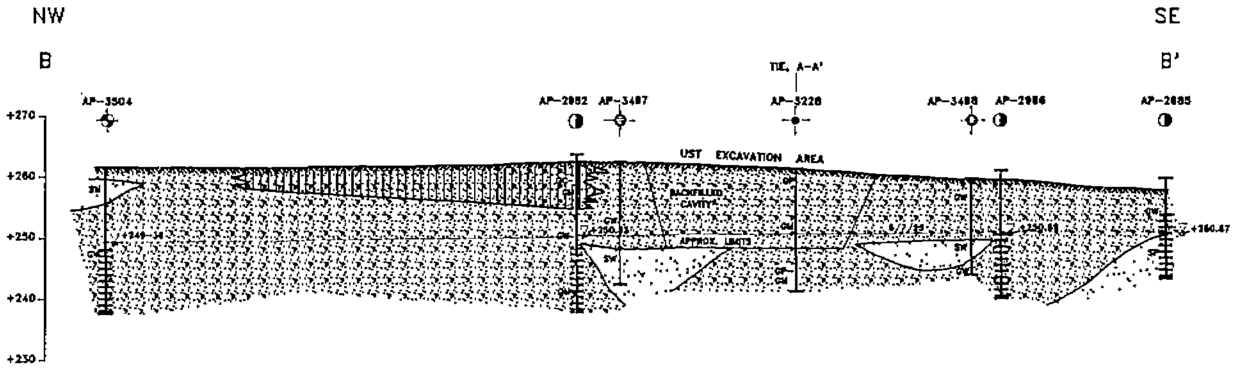
OPERABLE UNIT D
FT. RICHARDSON, ALASKA

FIGURE 5.1-2
SOIL BORING, SEDIMENT AND MONITORING WELL LOCATION MAP FOR BUILDING 35-752

DATE: 8/14/95		DRAWN BY: SRR/ABB	SCALE: AS SHOWN	DRAWING: 35-752MW
C/SC: 1:30	DISK: 305/95	ENGINEER: W. WILBER	CHECKED: W. WILBER	PROJECT: 9000-036



CROSS SECTION A–A'



CROSS SECTION B–B'

SCALE: 1" = 20'
NO VERTICAL EXAGGERATION

LEGEND

- ◑ EXISTING MONITORING WELL LOCATION
- -•- PREVIOUS SOIL BORING
- ⊕ NEW MONITORING WELL LOCATION
- -⊖- NEW SOIL BORING LOCATION
- ▨ SW, SM, SP, WELL TO POORLY GRADED, GRAVELLY SANDS
- ▨ GW, GM, GP WELL TO POORLY GRADED GRAVELS
- ▥ GC–GM, GRAVELLY CLAYS TO MEDIUM GRADED GRAVELS

NOTES:

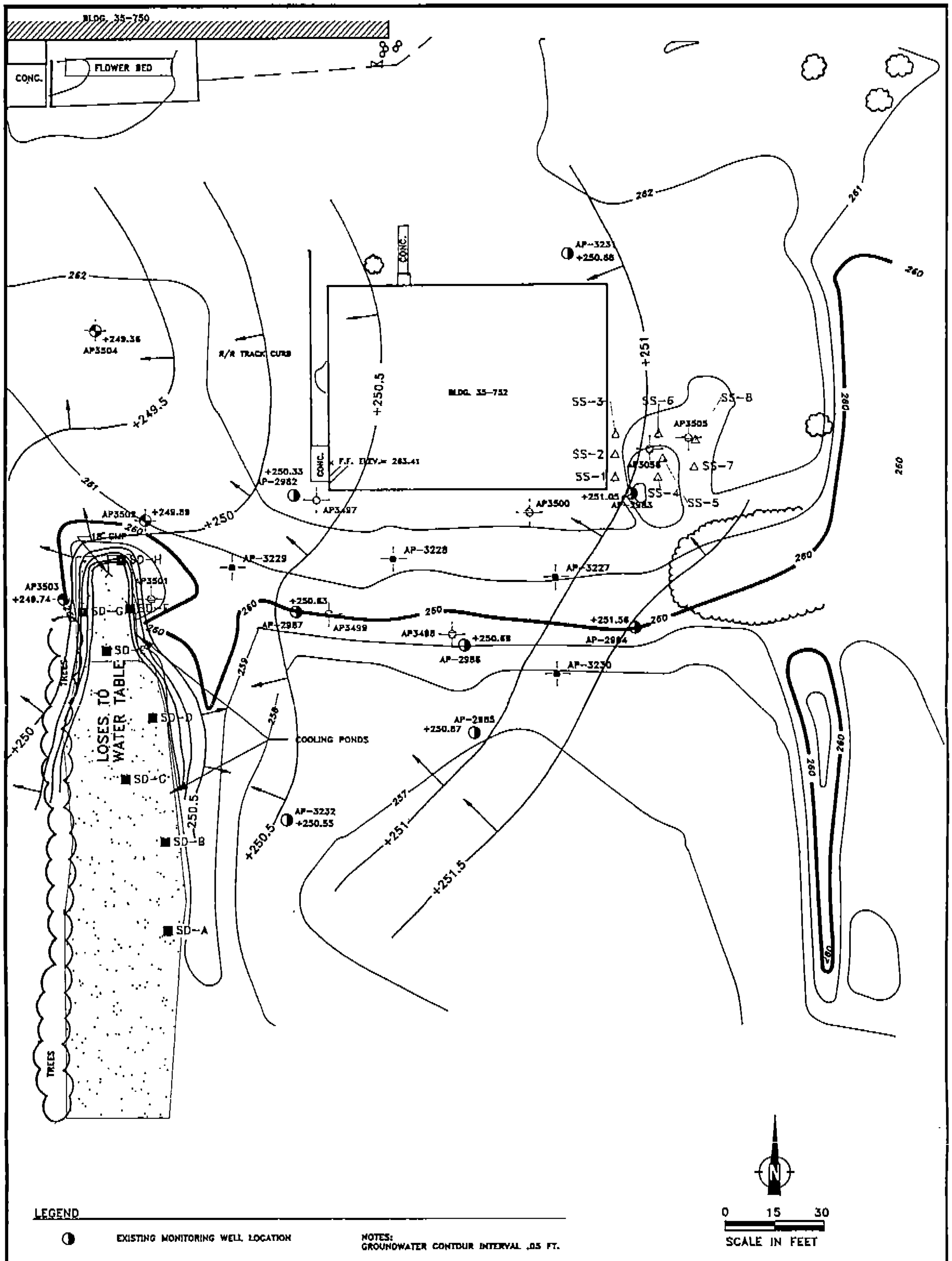
1. ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL (MSL)
2. GRADE LEVEL PROFILE BASED ON SURVEY DATA PROVIDED BY JERRY ZUSPAN(COE), 8/4/95 TOPOGRAPHY WAS VISUALLY CHECKED AND FOUND TO BE IN AGREEMENT WITH THE 8/4/95 DATA. PREVIOUS SURVEYED ELEVATIONS OF BORINGS WERE DISREGARDED.

SOURCE:

OPERABLE UNIT D
FORT RICHARDSON, ALASKA

FIGURE 5.1–3
CROSS SECTION A–A' AND B–B'
FOR BUILDING 35–752

DATE: 8/14/95	DRAWN BY: SR	SCALE: AS SHOWN	DRAWING: 35–752CS
C/SC: 1:2 DISK: 221/94	GEOLOGIST: E. RAPPORT	CHECKED: E. RAPPORT	PROJECT: 8000–036



LEGEND

◐	EXISTING MONITORING WELL LOCATION
251.50	GROUNDWATER TABLE ELEVATION
-●-	PREVIOUS SOIL BORING
-◕-	NEW MONITORING WELL LOCATION
-○-	NEW SOIL BORING LOCATION
△	NEW SURFACE SAMPLE LOCATION
■	NEW SEDIMENT SAMPLE LOCATION
⌒⌒⌒	TREELINE

NOTES:
GROUNDWATER CONTOUR INTERVAL .05 FT.

GROUNDWATER ELEVATIONS BASED ON AUGUST 7, 1995 MEASUREMENTS

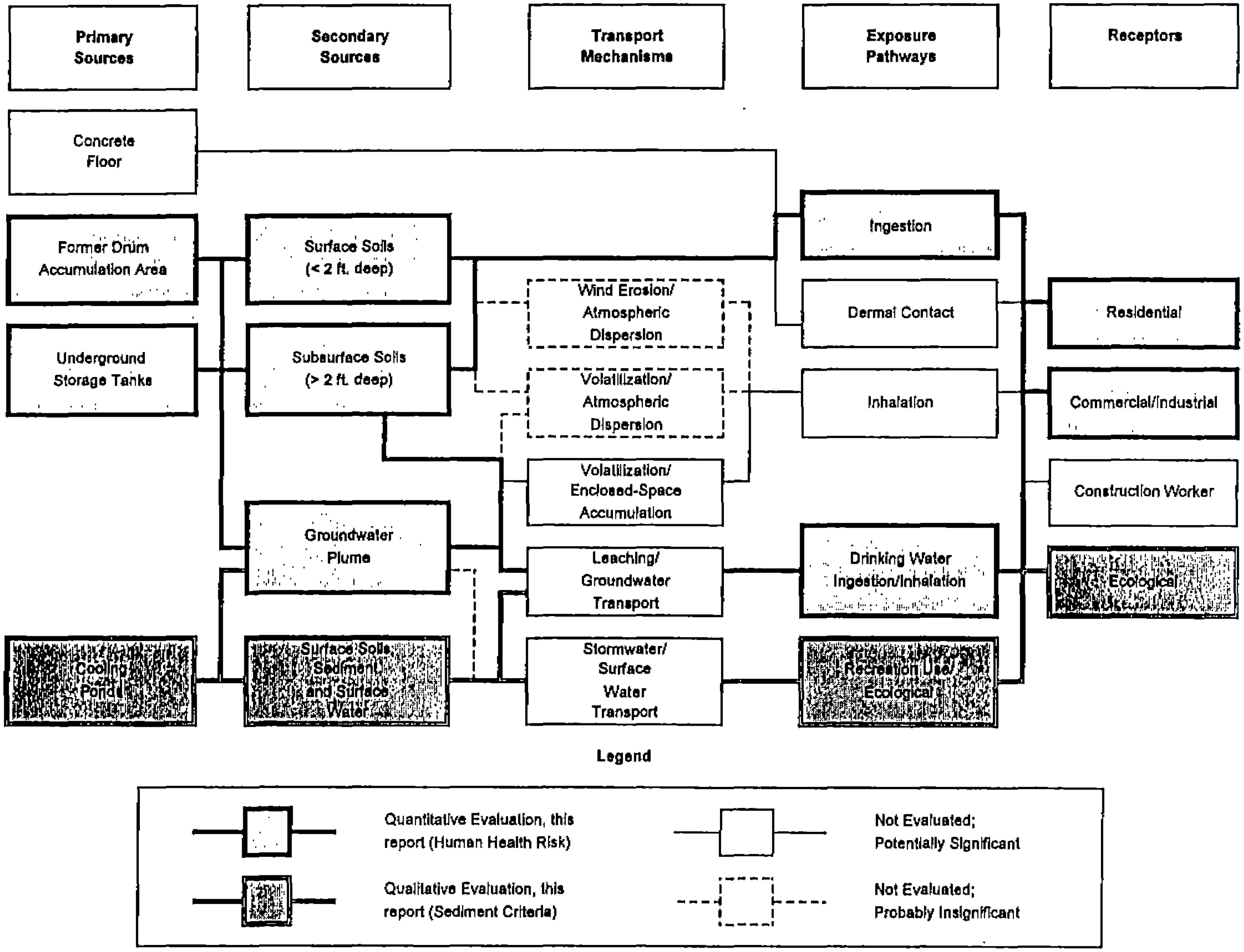
SOURCE: ENSR/9000-036/35-752BS

OPERABLE UNIT D
FT. RICHARDSON, ALASKA

FIGURE 5.1-4
GROUNDWATER GRADIENT MAP
FOR BUILDING 35-752

DATE: 8/14/95	DRAWN BY: SRR/ABB	SCALE: AS SHOWN	DRAWING: 35-752GM
C/SC: 1:30 DISK: 350/95	ENGINEER: S. WING	CHECKED: S. WING	PROJECT: 9000-036

Figure 5.1-5: Sources, Transport Mechanisms, Exposure Pathways, and Receptors
Building 35-752



After ASTM (1994)
P:\COMMON\PSE2DATA\BCR-RCPT.XLS

Stormwater
Outfall
to Ship Creek

5.2 Stormwater Outfall to Ship Creek

5.2.1 Site History

The Stormwater Outfall to Ship Creek serves as the discharge point for the stormwater drainage system of Fort Richardson's main cantonment (Figure 5.2-1). The stormwater drainage system consists of a network of aluminum, corrugated metal, and asbestos cement pipes that discharge to unlined culverts directed south towards Ship Creek. The operational dates of the stormwater drainage system are uncertain; however, it is likely the stormwater system has drained through the stormwater outfall to Ship Creek since the construction of the main cantonment in 1955. Fort Richardson does not currently have a National Pollutant Discharge Elimination System (NPDES) permit for stormwater discharge. Oils, fuels, and solvents--and to a lesser degree herbicides and pesticides, metals, and PCBs--may have been carried from the main cantonment area by surface runoff and deposited in soil and bottom sediments in the stormwater outfall ditch.

Approximately 420 yards upstream from the outfall are the Cooling Ponds at Building 35-752. Sediments in the Cooling Ponds are known to have elevated levels of PCBs and DRO. The Cooling Ponds are drained by an unlined culvert that feeds into the stormwater outfall system.

5.2.2 Field Investigation

The objective of the investigation at the stormwater outfall was to evaluate the drainage system as a source of contaminants to Ship Creek (Figure 5.2-2).

Surface sediment samples were collected from the stormwater outfall drainage ditch and Ship Creek in late November. A sample from each location was collected by scraping sediment (the fine depositional soil fraction along the sidewall or bottom) into a clean 2-liter plastic jar and then transferred to the appropriate glass sampling container. The plastic jars were used as an intermediate measure to minimize the length of time spent in the water at sub-zero temperatures and because of the dangerous conditions associated with sampling in Ship Creek.

One sidewall sample and one sediment sample were collected upstream of the stormwater outfall to assess background constituents and the potential for upstream contaminant sources. The sidewall sample was collected from the south bank of Ship Creek, 20 feet upstream from the stormwater outfall. The sediment sample was collected from the creek bottom, 15 feet from the south bank and 12 feet from the north bank.

One sidewall sample and one sediment sample were also collected downstream of the stormwater outfall to assess the potential discharge of the contaminants from the stormwater drainage system. The sidewall sample was collected from the south bank 15 feet downstream from the outfall. The sediment sample was collected downstream of the outfall in the middle of the creek, 6 feet from the south bank and 15 feet from the north bank.

Two samples were collected from the stormwater drainage ditch to assess the potential presence of residual hydrocarbons and other contaminants that may have absorbed into soils from the surface water. The first soil sample was collected from the sidewall of the drainage ditch, 6 feet from the outlet to Ship Creek. A sediment sample was also collected from the bottom of the stormwater outfall ditch, 15 feet from the outlet to Ship Creek.

5.2.3 Analytical Results

A total of 10 samples were collected, including two blind duplicates and two QA samples. All samples were analyzed for TRPH, GRO, DRO, VOCs, PCBs/organochlorine pesticides, and metals. Analytes detected above the MRL are shown in Table 5.2-1. A complete summary of the analytical data is presented in Appendix C.

The laboratory quality control checks indicate that the analytical data are within acceptable criteria ranges, with the exceptions noted in the USACE NPD laboratory's CQAR (ENSR 1995).

- Up to 1.6 ppb of methylene chloride was detected in the VOC method blanks of CAS reports K946430A and K946594A. The methylene chloride data of the associated samples 94BKGD01SL through -10SL should be considered a result of laboratory contamination.

- The VOC data of samples 94BKGD03SL, -05SL, and -22SL should be considered low estimates, if detected, based on low recovery of one out of three surrogates.

- Low levels of selenium may not have been detected in the samples of CAS reports K946430A, K94659A, and K946865A (samples 94BKGD01SL through -10SL and 94BKGD20SL through -26SL) due to low matrix spike recoveries. The lead data in CAS report K946850A (samples 94BKGD11SL through -19SL) should be considered estimates due to high laboratory duplicate RPD results.

A complete discussion of the QA checks can be found in the USACE NPD Laboratory CQAR and ENSR QASR located in Volumes I through III of Analytical Data for PSE2 OUD (ENSR 1995).

TABLE 5.2-1 Summary of Detected Analytes

Ship Creek Stormwater Outfall Soil Sample Analytical Results

		SS1	SS2	SS3	SS3D	SS4	SS5	SS5D	SS6
	Sample Depth:	Suface	Suface	Suface	Suface	Suface	Suface	Suface	Suface
	Sample ID:	94SWOF01SD	94SWOF02SD	94SWOF03SD	94SWOF04SD	94SWOF05SD	94SWOF06SL	94SWOF07SL	94SWOF08SL
	Lab Code:	K947379-001	K947379-002	K947379-003	K947379-004	K947370-005	K947370-006	K947370-007	K947370-008
	Date Collected:	11/22/94	11/22/94	11/22/94	11/22/94	11/22/94	11/22/94	11/22/94	11/22/94
Compound	**Residential RBC**								
Petroleum Hydrocarbons (mg/Kg)									
DRO	none	16 J	ND	ND	ND	ND	ND	ND	ND
TPH	none	29	13	ND	ND	ND	ND	ND	ND
Total Metals (mg/Kg)									
Arsenic	0.37	5	4	4	3	3	4	4	5
Barium	5,500	52	32	42	34	31	41	43	39
Chromium	390	35	31	33	28	29	29	31	37
Lead	none	7	5	5	4	4	5	4	5
Nickel	1,600	29	24	25	21	23	24	28	30

FOOTNOTES:
ND = Non-detected at the method reporting limit (MRL). (See Stormwater Outfall Appendix for MRL values.)
J = Value is considered an estimate.
A shaded value indicates result exceeds the residential risk based concentration (RBC)

\QAQC\COMMON\RICH\FINALS\REPTABLES\SHIP-F.XLS|Ship 10/16/96

5.2.4 Semi-Quantitative Risk Assessment

Semi-quantitative risk assessment was not performed for the Stormwater Outfall site because the concentrations of all organic compounds (with the exception of DRO and TPH) were below the MRLs. A comparison of MRLs versus human health RBCs indicates that the MRL for only one organic compound (1,2-dibromoethane) exceeded the residential RBC for soil. However, comparison with human health RBCs is inappropriate for this site, because ecological effects are probably more significant. As described in Section 5.1.4.6, a compilation of ecological RBCs is beyond the scope of this effort; however, a comparison between detected concentrations and ecological benchmark values is presented in Table 5.2-2.

Results shown on Table 5.2-2 indicate that the concentrations of some chemicals exceeded the lowest sediment benchmark value. As a result, more detailed quantitative analyses may be warranted. As part of this effort, background concentrations should be measured for stream sediment, which may be different than for soil.

5.2.5 Findings and Conclusions

Metals data may not be compared to background data collected as part of this PSE2. The background samples collected were for soil, not for stream or outfall sediment. Additional background sampling of outfall and stream sediments may indicate that arsenic concentrations are representative of background conditions.

A semi-quantitative risk assessment was not performed for this site. Exposure assumptions, detected compounds, future land use, and contaminant fate and transport may be evaluated for inclusion in a baseline risk assessment. In addition, ecological receptors, RBCs, risk quantitation methods, and measurement endpoints may be identified for inclusion in a baseline ecological risk assessment. Results of the baseline risk assessment may be used to evaluate the need for continued monitoring or corrective action. The extent of contamination and the dynamic state of sediment, and soil (expanding, degrading, or steady-state) have not been evaluated.

Table 5.2-2. Soil/Sediment Concentrations and Ecological Sediment Quality Benchmarks
Ship Creek Outfall

Compound	MRL, mg/Kg	Samples/ Detects	Concentration, mg/Kg			Sediment Quality Benchmarks		
			Min.	Max.	Mean	Ont. MOE	WDNR-SQC	NOAA ER-L
Arsenic	1	8/8	3	5	4.0	6	10	8.2
Barium	1	8/8	31	52	39		500	
Chromium	2	8/8	28	37	32	26	100	81
Lead	1	8/8	4	7	5	31	50	46.7
Nickel	10	8/8	21	30	25	16	100	21
Diesel Range Organics (DRO)	10	8/1	5	16	6			
Total Petroleum Hydrocarbons (TPH)	10	8/2	5	29	9			

Ont-MOE = Ontario Ministry of the Environment, Lowest Effect Level (Persaud 1990)

ORNL-SQB = Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Sediment-Associated Biota (Hull & Suter 1994)

WDNR-SQB = Wisconsin Department of Natural Resources Sediment Quality Criteria

EPA SQC = EPA Sediment Quality Criteria derived for five contaminants (1993)

NOAA ER-L = National Oceanic and Atmospheric Adminstration Effects Range - Low, values for screening contaminants in sediment (Long & Morgan, revised 1993)

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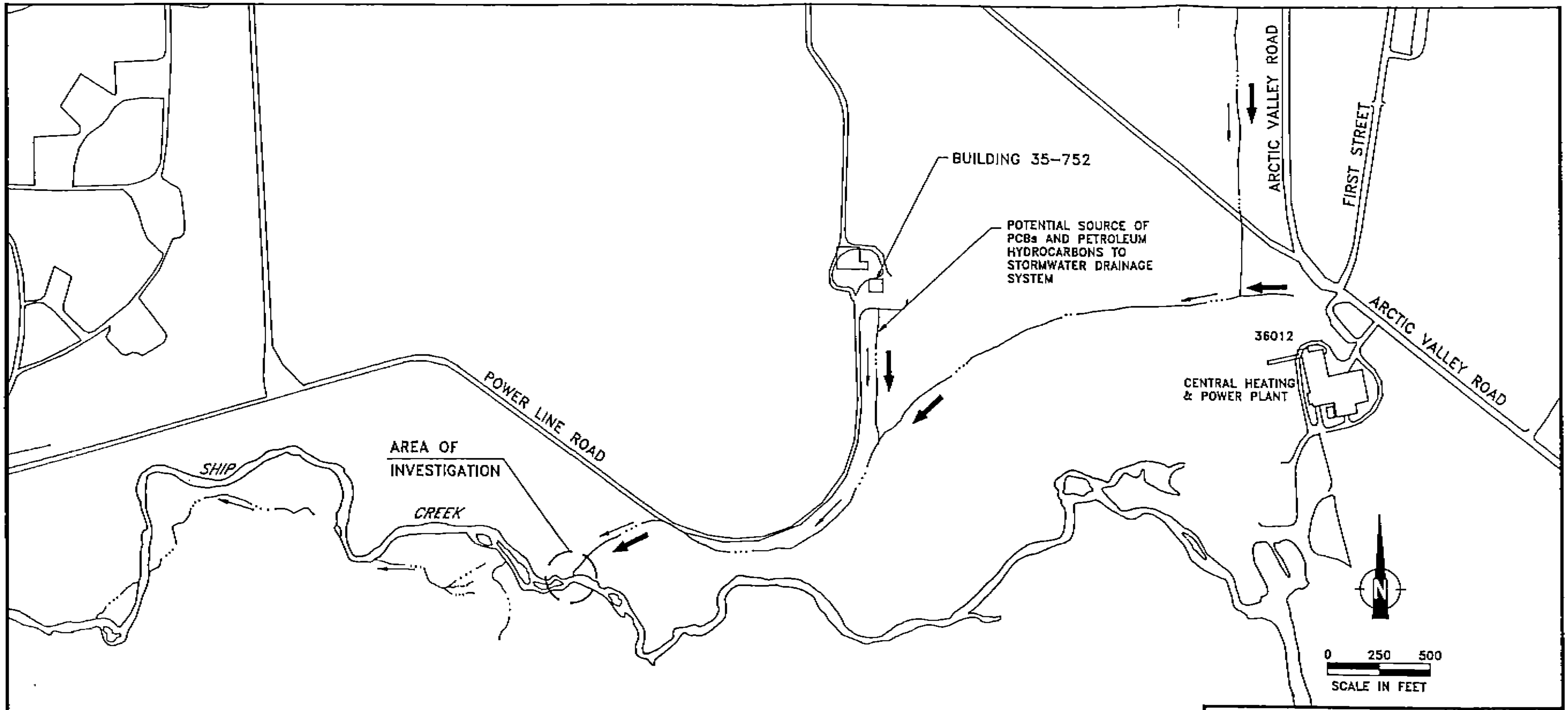


LEGEND

- ⟵ POTENTIAL MIGRATION OF CONTAMINANTS THROUGH STORMWATER DRAINAGE SYSTEM.
- ← STORMWATER DRAINAGE SYSTEM FLOW DIRECTION

SOURCE: FT. RICHARDSON/FTR-MST

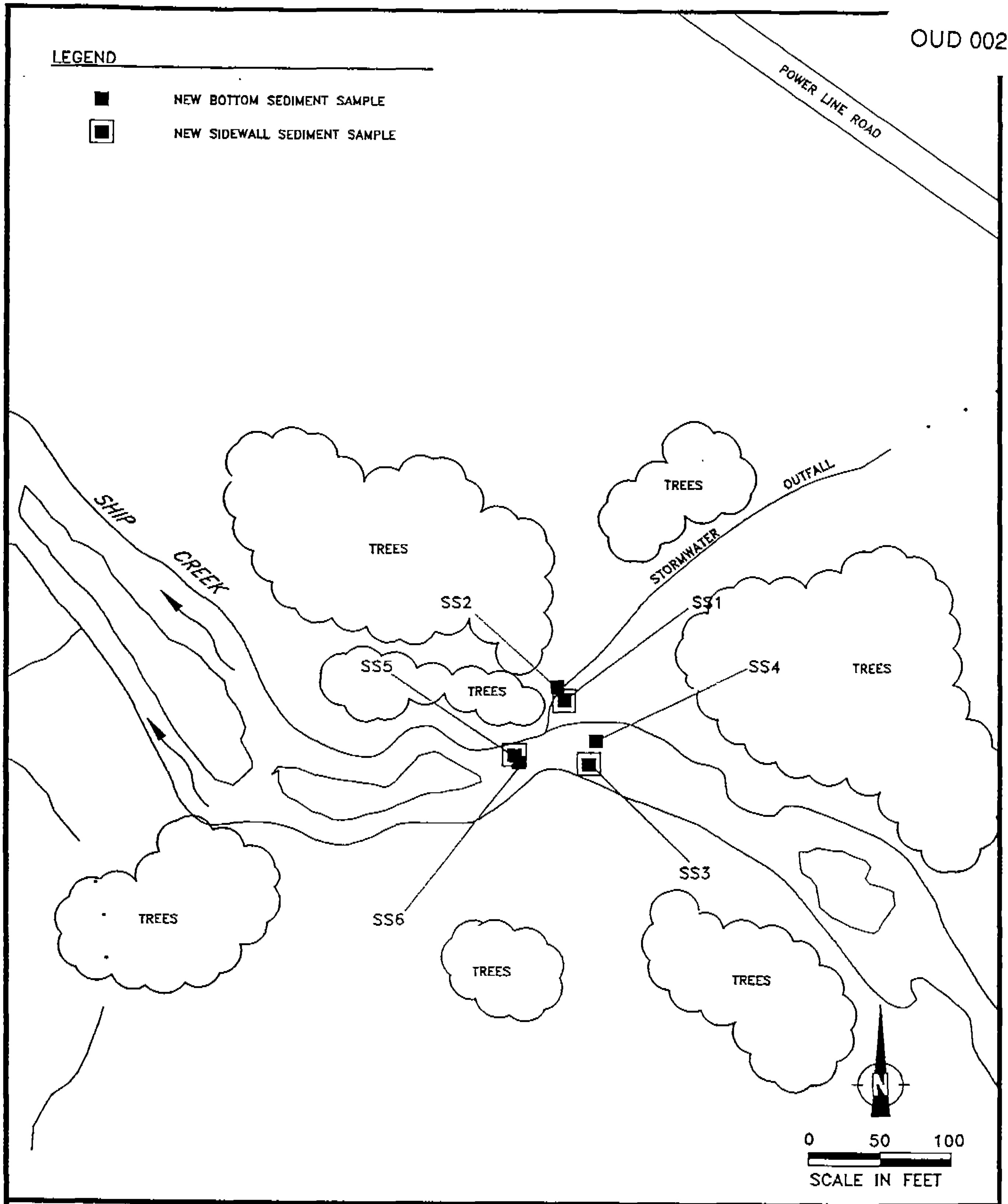
ENSR

ENSR CONSULTING & ENGINEERING

OPERABLE UNIT D
FORT RICHARDSON
ALASKA

FIGURE 5.2-1
STORMWATER OUTFALLTO SHIP CREEK
LOCATION MAP

DATE: 8/14/95	DRAWN BY: SSR/ABB	SCALE: 100	DRAWING: SWOLOCA
C/SC: 1:500 DISK: 307/95	ENGINEER: S. WING	CHECKED: W. WILBUR	PROJECT: 9000-036



DRAWING: SWOSB
DRAWN: ABB
C/SC: 1:100
DISK: 307/95
DATE: 10/10/96
CHECK: WW

FIGURE 5.2-2
SEDIMENT SAMPLE LOCATIONS
STORMWATER OUTFALL

OPERABLE UNIT D
FORT RICHARDSON
PROJECT 9000-036

Building
718

5.3 Building 700/718

5.3.1 Site History

Wastes generated from Building 700, the Recurring Maintenance Building and Paint Shop, are temporarily stored in an unpaved 30-by-30-foot drum accumulation area on the east side of Building 718 (Figure 5.3-1). Building 718 is a general storage shed within a secured, fenced area associated with Building 700. Based on site history, drums may have contained acids, denatured alcohol, mineral spirits, methyl ethyl ketone, waste oil, grease, solvents, enamel paints, and PCBs. The site is currently active and has been in operation at least 10 years.

In 1990, the U.S. Army Environmental Hygiene Agency (AEHA) performed a characterization of the wastes stored in twenty-seven 55-gallon drums. The drums had been transported to this location from a warehouse facility in Haines, Alaska, in the late 1980s. Results from the waste characterizations indicated drums contained mineral spirits, Stoddard solvent, gasoline, JP-4, kerosene, fuel oil, lubrication oil, ethylene glycol, and PCBs.

No previous investigations of soils or groundwater have been conducted at this site.

5.3.2 Field Investigation

The objectives of the PSE2 investigation at Building 700/718 were to assess the potential release of contaminants from the drum accumulation area, to evaluate the locations of potentially contaminated soils, and to evaluate possible downward migration of contamination from surface spills. Groundwater was not investigated because the purpose of this investigation was to identify specific contaminants present in the soil. A groundwater investigation, if necessary, could be included as part of an RI.

Surface samples were collected at eight locations within the 30-by-30-foot investigation area (Figure 5.3-2). Samples were collected at 6 inches and 2 feet bgs to determine if a release has occurred at the site. At surface sample 1, soils were stained down to 2 feet bgs. A strong hydrocarbon odor was detected at 2 feet bgs, and the OVM reading was 229 ppm. At surface sample 2, 6 inches bgs, the OVM reading was 79 ppm. Samples were submitted for laboratory analysis, and preliminary analytical results were obtained within 2 weeks. Upon receipt of the preliminary analytical data, the results were evaluated to position two 20-foot soil borings.

The two 20-foot borings were located adjacent to surface samples 1 and 3 based on preliminary analytical results (Figure 5.3-2). Subsurface material at AP-3507 (Appendix D) consisted of sandy gravel. A moderate solvent odor was detected at 2 to 4 feet bgs. OVM readings ranged from 1.8 ppm to 141.1 ppm. The highest reading was at 2 feet bgs.

Subsurface material at AP-3508 consisted of sandy gravel. No odors were noted and OVM readings ranged from 0.2 to 2.0 ppm.

Based on the soil boring logs from Building 700/718, a cross section of the investigation area is presented in Figure 5.3-3.

5.3.3 Analytical Results

A total of 31 samples, including three blind duplicates and two QA samples, were submitted for laboratory analysis. All samples at Building 700/718 were analyzed for TRPH, GRO, DRO, VOCs, PCBs/organochlorine pesticides, ethylene glycol, and metals. Analytes detected above the MRL are shown in Table 5.3-1. A complete summary of all analytical data from Building 700/718 is provided in Appendix D.

In addition, four samples, two from each 20-foot boring, were sent to the USACE NPD laboratory for geotechnical testing, including Atterburg limits, grain size distribution, and percent moisture content. Results from the soil geotechnical analyses are presented in Appendix D.

The laboratory quality control checks indicate that the analytical data are within acceptable criteria ranges, with the following exceptions noted in the USACE NPD laboratory's CQAR (ENSR 1995).

- The project laboratory's ethylene glycol data and selenium data were considered low estimates due to out-of-control QC data.

More detailed qualifications and exceptions are noted in the USACE NPD Laboratory's CQAR and ENSR QASR located in Volumes I through III of Analytical Data for PSE2 OUD (ENSR 1995).

5.3.4 Semi-Quantitative Risk Assessment

As described in Section 4.2, a semi-quantitative risk assessment was conducted for this site. The risk assessment is considered semi-quantitative because: 1) potential risks to ecological receptors were not evaluated, 2) the exposures evaluated reflect the available analytical data

TABLE 5.3-1 Summary of Analytes Detected
Building 700/718 Soil Sample Analytical Results

Part 1 of 3

Location:		SB AP 3507						SB AP 3508				
Depth (feet):		0-4	0-4	4-6	6-12	14-16	16-20	0-4	4-6	9-11	12-16	16-20
Sample ID:		94B71819SL	94B71820SL	94B71821SL	94B71822SL	94B71823SL	94B71824SL	94B71825SL	94B71826SL	94B71827SL	94B71828SL	94B71829SL
Lab Code:		K946935-001	K946935-002	K946935-003	K946935-004	K946935-005	K946937-001	K946937-002	K946937-003	K946937-004	K946937-005	K946937-006
Date Collected:		11/4/94	11/4/94	11/4/94	11/4/94	11/4/94	11/4/94	11/4/94	11/4/94	11/4/94	11/4/94	11/4/94
Compound	Residential RBC											
Petroleum Hydrocarbons (mg/Kg)												
GRO	none	120	63	ND	ND	ND	ND	ND	ND	ND	ND	ND
DRO	none	4,840	4,430	73	ND	ND	ND	16	ND	ND	ND	ND
TPH	none	6,800	10,000	200	ND	ND	ND	31	ND	ND	ND	ND
Organochlorine Pesticides (mg/Kg)												
4,4'-DDD	2.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDT	1.9	ND	ND	ND	ND	ND	ND	0.03	ND	ND	ND	ND
4,4'-DDE	1.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Polychlorinated Biphenyls (PCBs) (mg/Kg)												
Aroclor 1260	none	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Volatile Organic Compounds (µg/Kg)												
Acetone	7,800,000	ND	ND	ND	64	66	ND	ND	ND	ND	ND	52
Toluene	16,000,000	ND	6	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene (PCE)	12,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	160,000,000	ND	ND	ND	ND	ND	ND	5	ND	ND	ND	ND
Total Metals (mg/Kg)												
Arsenic	0.37	9	7	5	7	6	9	6	6	7	8	5
Barium	5,500	52	32	33	30	44	52	62	35	41	59	51
Chromium	390	42	24	30	28	29	50	30	29	31	30	38
Lead	none	10	5	5	5	5	6	8	5	6	6	5
Nickel	1,600	63	35	40	32	39	63	32	37	30	28	38

FOOTNOTES:
ND = Non-detected at the method reporting limit (MRL). (See the Building 700/718 Appendix for MRL values.)
< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.
UJ = The analyte was not detected at the MRL, however, the MRL is considered an estimate.
A shaded value indicates result exceeds the residential risk based concentration (RBC).

\QAQC\COMMON\RICH\FINALS\REPTABLES\BLD718-F.XLS|700-718

10/15/96

TABLE 5.3-1 Summary of Analytes Detected (cont.)
Building 700/718 Soil Sample Analytical Results

Part 2 of 3

	Location:	Surface 1		Surface 2		Surface 3		Surface 4		Surface 5		
	Depth (feet):	0.5	2	0.5	2	0.5	2	0.5	2	0.5	2	2
	Sample ID:	94B71818SL	94B71817SL	94B71816SL	94B71815SL	94B71814SL	94B71813SL	94B71804SL	94B71805SL	94B71801SL	94B71802SL	94B71803SL
	Lab Code:	K946431-009	K946431-008	K946431-007	K946431-006	K946431-005	K946431-004	K946386-004	K946386-005	K946386-001	K946386-002	K946386-003
	Date Collected:	10/13/94	10/13/94	10/13/94	10/13/94	10/13/94	10/13/94	10/12/94	10/12/94	10/12/94	10/12/94	10/12/94
Compound	Residential RBC											
Petroleum Hydrocarbons (mg/Kg)												
GRO	none	151	177	ND	ND	ND	ND	ND	ND	ND	ND	ND
ORO	none	24,000	10,300	559	167	56	569	12	13	104	28	20
TPH	none	34,000	31,000	360	330	78	1500	30	34	45	33	36
Organochlorine Pesticides (mg/Kg)												
4,4'-DDD	2.7	<0.02	<0.02	ND	ND	ND	ND	ND	ND	0.01	ND	ND
4,4'-DDT	1.9	<0.02	<0.02	0.12	0.1	0.03	0.01	0.01	ND	0.05	0.02	0.01
4,4'-DDE	1.9	<0.02	<0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND
Polychlorinated Biphenyls (PCBs) (mg/Kg)												
Aroclor 1260	none	ND	ND	ND	0.2	ND	ND	ND	ND	ND	ND	ND
Volatile Organic Compounds (µg/Kg)												
Acetone	7,800,000	<5,000	<5,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	16,000,000	<500	<500	ND	ND	7	ND	ND	ND	ND	ND	ND
Tetrachloroethene (PCE)	12,000	<500	<500	100	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	160,000,000	<500	<500	ND	ND	10	ND	ND	7	ND	ND	ND
Total Metals (mg/Kg)												
Arsenic	0.37	7	6	6	6	7	8	6	8	7	8	6
Barium	5,500	56	39	44	54	61	69	45	52	51	50	41
Chromium	390	33	30	26	32	34	27	30	29	31	29	27
Lead	none	267	67	12	10	9	9	8	8	12	10	9
Nickel	1,600	49	38	29	37	44	34	42	39	47	47	38

FOOTNOTES:
ND = Non-detected at the method reporting limit (MRL). (See the Building 700/718 Appendix for MRL values.)
< = Less than. Analytical reporting limit has been elevated due to matrix interference
UJ = The analyte was not detected at the MRL, however, the MRL is considered an estimate.
A shaded value indicates result exceeds the residential risk based concentration (RBC).

\QAQC\COMMON\RICH\FINALS\REPTABLES\BLD718-F.XLS|700-718

10/15/96

TABLE 5.3-1 Summary of Analytes Detected (cont.)
Building 700/718 Soil Sample Analytical Results

Part 3 of 3

	Location:	Surface 6		Surface 7			Surface 8	
	Depth (feet):	0.5	2	0.5	2	2	0.5	2
	Sample ID:	94B71806SL	94B71807SL	94B71812SL	94B71810SL	94B71811SL	94B71808SL	94B71809SL
	Lab Code:	K946386-006	K946386-007	K946431-003	K946431-001	K946431-002	K946386-008	K946386-009
	Date Collected:	10/12/94	10/12/94	10/13/94	10/13/94	10/13/94	10/12/94	10/12/94
Compound	**Residential RBC**							
Petroleum Hydrocarbons (mg/Kg)								
GRO	none	ND	ND	ND	ND	ND	ND	ND
DRO	none	108	24	92	198	345	37	32
TPH	none	70	45	750	500	1,400	98	62
Organochlorine Pesticides (mg/Kg)								
4,4'-DDD	2.7	ND	ND	ND	ND	ND	ND	ND
4,4'-DDT	1.9	0.25	ND	0.03	0.01	0.02	ND	ND
4,4'-DDE	1.9	0.01	ND	ND	ND	ND	ND	ND
Polychlorinated Biphenyls (PCBs) (mg/Kg)								
Aroclor 1260	none	ND	ND	0.2	ND	ND	ND	ND
Volatile Organic Compounds (µg/Kg)								
Acetone	7,800,000	ND	ND	ND	ND	ND	ND	ND
Toluene	16,000,000	ND	6	5	ND	ND	ND	7
Tetrachloroethene (PCE)	12,000	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	160,000,000	8	6	ND	ND	ND	ND	7
Total Metals (mg/Kg)								
Arsenic	0.37	7	6	7	7	7	5	6
Barium	5,500	53	61	53	52	53	50	61
Chromium	390	26	22	35	27	27	30	23
Lead	none	15	9	8	7	7	8	8
Nickel	1,600	33	29	35	33	37	41	27

FOOTNOTES:
ND = Non-detected at the method reporting limit (MRL). (See the Building 700/718 Appendix for MRL values.)
< = Less than. Analytical reporting li
UJ = The analyte was not detected at the MRL, however, the MRL is considered an estimate.
A shaded value indicates result exceeds the residential risk based concentration (RBC).

\OAQC\COMMON\RICH\FINALS\REPTABLES\BLD718-F.XLS]700-718 10/15/96 and do not necessarily represent the maximum extent of contamination or future changes in contaminant concentrations, and 3) only one exposure pathway was considered (soil ingestion); although this pathway usually yields the most conservative results, other pathways may also be important.

The drum storage area at Building 700/718 is in a developed area consisting of a metal storage building on a gravel pad. Access is restricted to the area by a fence and locked gate. Surrounding land uses are generally industrial in nature, with railroad tracks west of the site. There is a second-growth forest approximately 500 feet south of the building. There are no surface water bodies within 0.5 mile.

5.3.4.1 Compounds of Potential Concern

A summary of the COPCs is presented in Table 5.3-2. These compounds include PCBs, insecticides (4,4'-DDT), and arsenic. All of these compounds are carcinogens.

Table 5.3-2. Compounds of Potential Concern
Building 700/718

Type	Source	Carcinogens
Polychlorinated biphenyls (PCB)	Transformer oil	Total PCBs
Polychlorinated diphenyl alkanes	Insecticides	4-4'-DDT
Metals[1]	Background soil	Arsenic

[1] Based on the background metals statistics evaluation in Appendix A, some metals were not included in the semi-quantitative risk assessment because they were not statistically significant from background concentrations.

All other target analytes were either 1) not detected, 2) below 1/10th of the RBC for residential soil, or 3) not statistically different from the background sample population (metals only). As shown by Table 4-1, however, RBCs are not available for some compounds. These compounds were included in the semi-quantitative risk assessment *only* when they were detected in a site-related sample. In addition, a list of compounds that were not detected at detection limits exceeding current risk-based concentrations is provided in Table 5.3-3. Most of these compounds were identified in the Work Plan (ENSR 1994) but require special analytical services to achieve reporting limits below RBCs. During the RI/FS, Table 5.3-3 should be reviewed to determine if the likelihood that the compound is present warrants the use of special analytical services.

Table 5.3-3 Compounds Not Detected at Reporting Limits Exceeding Current Risk-Based Concentrations, Building 718

Compound	Matrix	Maximum Detection Limit	Risk-Based Concentration
Aldrin	Soil	0.04 mg/Kg	0.038 mg/Kg
Toxaphene	Soil	0.7 mg/Kg	0.58 mg/Kg
Vinyl Chloride	Soil	500 µg/Kg	340 µg/Kg
1,2-Dibromoethane (EDB)	Soil	2000 µg/Kg	7.5 µg/Kg
1,2,3-Trichloropropane	Soil	500 µg/Kg	91 µg/Kg
1,2-Dibromo-3-chloropropane (DBCP)	Soil	2000 µg/Kg	460 µg/Kg

Note: Some detection limits are elevated due to analytical interference. See the Building 718 Appendix for a complete list of detection limits

As described in Section 5.3.4.4, the toxicity of petroleum hydrocarbons cannot be evaluated using bulk hydrocarbon measurements (GRO, DRO, and TPH). As a result, these data were not included in the semi-quantitative risk assessment.

5.3.4.2 Sources, Transport Mechanisms, Exposure Pathways, and Receptors

Sources, transport mechanisms, exposure pathways, and receptors (elements of a Conceptual Site Model) are shown on Figure 5.3-4. As discussed previously, the primary source is the drum accumulation area. Secondary sources include contaminated surface and subsurface soil. It is not known whether groundwater or surface waters have been impacted.

Potential transport mechanisms include surface water transport, leaching and groundwater transport, and volatilization. Within the air phase, volatile COPCs may disperse in the atmosphere or accumulate in enclosed spaces. However, no volatile COPCs were detected at concentrations exceeding 1/10th of the RBC for residential soil. Concentrations of nonvolatile COPCs in airborne dust are not expected to be of concern in the atmosphere (see Appendix A, Section A.5).

Surface water transport is not expected to be significant, since the surrounding topography is relatively flat and no surface water bodies are present within 0.5 mile of the site. Leaching is not expected to be significant since all of the COPCs are relatively insoluble in water.

Depending on the future land use, potential receptors may include residents, occupational workers, and construction workers. Ecological receptors include terrestrial plants, mammals, and avian species.

5.3.4.3 Exposure Assessment

A preliminary exposure assessment was performed for the soil ingestion pathway. Soil exposures via ingestion generally result in greater chemical uptake than dermal contact, inhalation, or recreation use. Accordingly, this pathway was selected to determine if soil exposures represent a significant human health risk. If human health risks via soil ingestion are significantly below the acceptable risk threshold, then combined health risks from other exposure pathways are probably within acceptable limits. However, if human health risks via soil ingestion are close to the acceptable risk threshold, then other exposure pathways should be evaluated as part of a baseline risk assessment.

Soil exposures were calculated using default exposure factors for residential and commercial/industrial receptors (EPA 1995a). These exposure factors reflect individuals with the highest chronic exposure for noncarcinogens and the highest cumulative exposure for carcinogens. For example, exposures to noncarcinogens are calculated assuming childhood exposure only, whereas exposures to carcinogens are calculated assuming combined childhood and adult exposure. A list of the exposure factors and equations is provided in Appendix A.

Exposure concentrations in soil were calculated as the 95 percent UCL of the average concentration of all samples analyzed from a particular medium (surface or subsurface soil). If the compound was not detected, one-half of the reporting limit was used to calculate the 95 percent UCL. This approach is consistent with EPA guidance (EPA 1991, 1992).

5.3.4.4 Toxicity Assessment

Dose-response factors were obtained from EPA (1995a). These factors were obtained from:

1) EPA's Integrated Risk Information System (current as of January 1, 1995),
2) EPA's Health Effects Assessment Summary Tables (current through March 1994),
3) The Superfund Health Risk Technical Support Center, and
4) Other EPA sources.

Although provisional dose response factors have been developed for JP-4, JP-5, gasoline, and diesel fuel (EPA 1992b), these values are not appropriate for this evaluation. These values are based on fresh petroleum products and do not accurately represent the composition, and therefore the toxicity, of weathered petroleum products. They have not been subjected to rigorous peer review and are not routinely used, even by EPA, in risk assessment. As a result, bulk hydrocarbon measurements (GRO, DRO, and TPH) were not included in the semi-quantitative risk assessment.

5.3.4.5 Human Health Risk Characterization

The following sections summarize potential human health risks via soil ingestion. As described above, soil exposures via ingestion generally result in greater chemical uptake than dermal contact, inhalation, or recreation use. Accordingly, if human health risks via soil ingestion are significantly below the acceptable risk threshold, then combined health risks from other exposure pathways are probably within acceptable limits. However, if human health risks via soil ingestion are close to the acceptable risk threshold, then other exposure pathways may need to be evaluated as part of a baseline risk assessment.

Human Health Risks

Carcinogenic risks for the soil ingestion pathway are summarized on Table 5.3-4. A breakdown of risk calculations for each pathway and receptor are presented in Appendix A. Noncarcinogenic risks were not evaluated, since all noncarcinogenic compounds were either 1) not detected, 2) below 1/10th of the RBC for residential soil, or 3) not statistically different from the background sample population (metals only).

Table 5.3-4. Carcinogenic Risks for Soil Ingestion
Building 700/718

Pathway	Carcinogenic Risk	
	Residential	Occupational
Surface Soil	2.9×10^{-6}	3.4×10^{-7}
Subsurface Soil	6.1×10^{-6}	7.1×10^{-11}
Total Risk	9.0×10^{-6}	3.4×10^{-7}

Using residential exposure factors, the excess lifetime carcinogenic risk for soil ingestion exceeds the lower benchmark of 1×10^{-6} listed in the NCP. As a result, exposures via inhalation and dermal contact may also be evaluated. Nearly all of the carcinogenic risk is associated with PCBs. A very small fraction of the total risk is associated with 4,4'-DDT.

Using the occupational exposure factors, the excess lifetime carcinogenic risk for soil ingestion does not exceed the lower benchmark of 1×10^{-6} listed in the NCP.

As described in Section 5.3.4.4, risks associated with bulk hydrocarbon measurements (GRO, DRO, and TPH) could not be evaluated. During the RI/FS, an effort may be made to evaluate the transport, fate, and toxicity of petroleum hydrocarbons in surface and subsurface soil.

5.3.4.6 Ecological Risk Characterization

Quantitative assessment of ecological risks can be performed at the organism, population, or ecosystem level. Although ecosystem-level effects may be the most important, effects testing and modeling are rarely performed due to a number of practical considerations (Suter 1993).

Quantification of population-level effects, such as reproductive potential, is important to maintain species populations, whereas assessment of organism-level effects evaluates the risk to individual organisms.

Chemicals can be evaluated as single compounds or as mixtures. Methods for evaluating the toxicity of mixtures requires knowledge regarding the sites and modes of action of individual compounds. Unlike for human health risk assessment, these methods have not been standardized, and there is some debate regarding the most appropriate approach.

If potential exposure pathways and receptors are present, ecological assessment begins with identification of the compounds of potential concern. This can be done in a similar fashion as for human health risk assessment, using ecological RBCs. Ecological RBCs may include toxicity benchmarks, sediment quality criteria, or other regulatory criteria. One set of criteria in common use provides benchmark concentrations for eight representative mammalian species and nine avian species (Opresko et al. 1994). Although benchmark concentrations are provided for 76 chemicals, toxicity benchmarks are not available for many target analytes. Also, the benchmarks are provided as concentrations in food, requiring evaluation of plant uptake and other routes of dietary exposure. Due to the large number of analytes measured at Building 700/718, ecological RBCs were not compiled as part of this project.

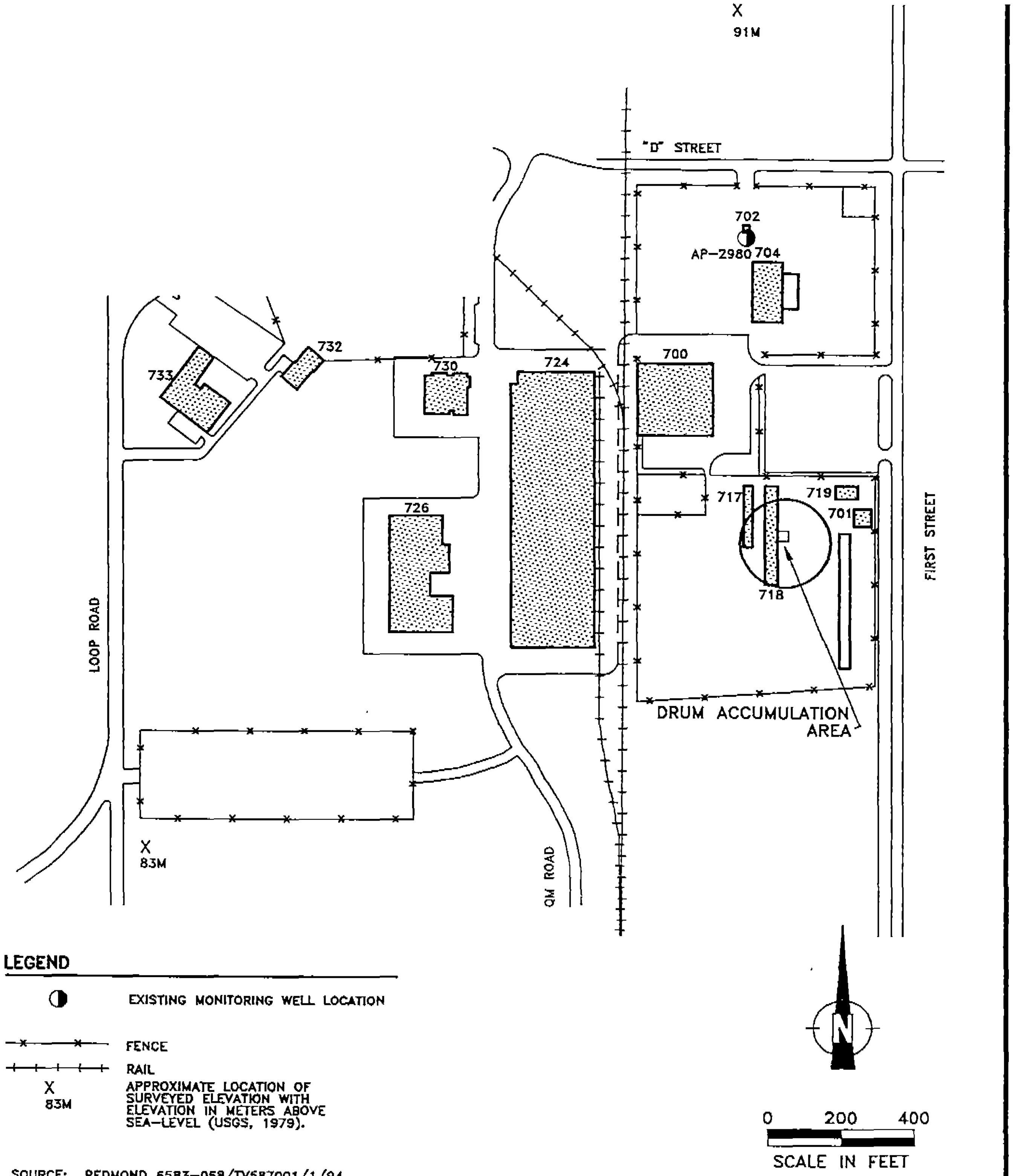
Potential receptors at Building 700/718 include terrestrial and avian species at a variety of trophic levels. The most highly exposed species include those with a small home range and small body weight to food consumption ratio (e.g., mice and resident songbirds). However, other less exposed species may warrant evaluation based on their susceptibility to particular chemicals (e.g., reproductive effects of 4,4'-DDT in raptors).

As part of the RI/FS, ecological RBCs may be identified for representative terrestrial and avian species. Compounds of potential concern may be selected based on a comparison of ecological RBCs with measured concentrations. At this point, the appropriate risk quantitation methods and measurement endpoints may be selected.

5.3.5 Findings and Conclusions

Although risks associated with noncarcinogenic compounds are below the estimated threshold for adverse effects, the excess lifetime carcinogenic risk for soil ingestion using residential exposures exceeds the lower benchmark of 1 x 10^{-6} listed in the NCP. Nearly all of the risk is associated with PCBs. A very small fraction of the total excess lifetime cancer risk is associated with 4,4'-DDT.

The semi-quantitative risk assessment was performed using exposure assumptions that may not be appropriate for the site (e.g., residential use). In addition, the extent of contamination and the dynamic state of soil contamination plumes (expanding, degrading, or steady-state) have not been evaluated. The exposure assumptions, compounds of potential concern, future land use, and contaminant fate and transport may be re-evaluated for inclusion in a baseline risk assessment, if required. In addition, ecological receptors, RBCs, risk quantitation methods, and measurement endpoints may be identified for inclusion in a baseline ecological risk assessment.



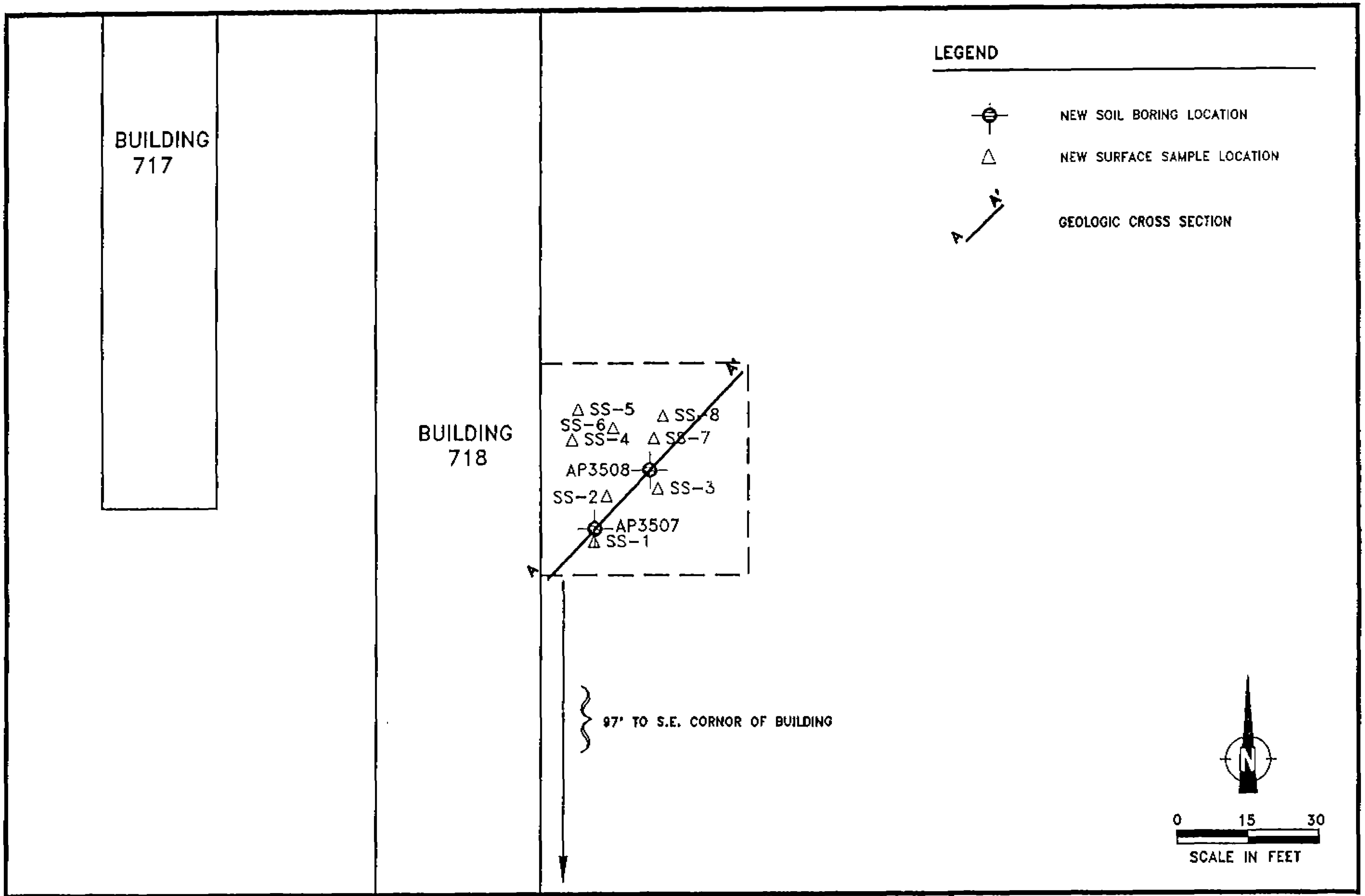
SOURCE: REDMOND 6583-058/TV587001/1/94

DRAWING: 700LOCA DRAWN: ABB
C/SC: 1:400 DISK: 153/96
DATE: 10/8/96 CHECK: WW

FIGURE 5.3-1
LOCATION MAP
BUILDING 700/718

OPERABLE UNIT D
FORT RICHARDSON, ALASKA
PROJECT 9000-066

F5.3-B



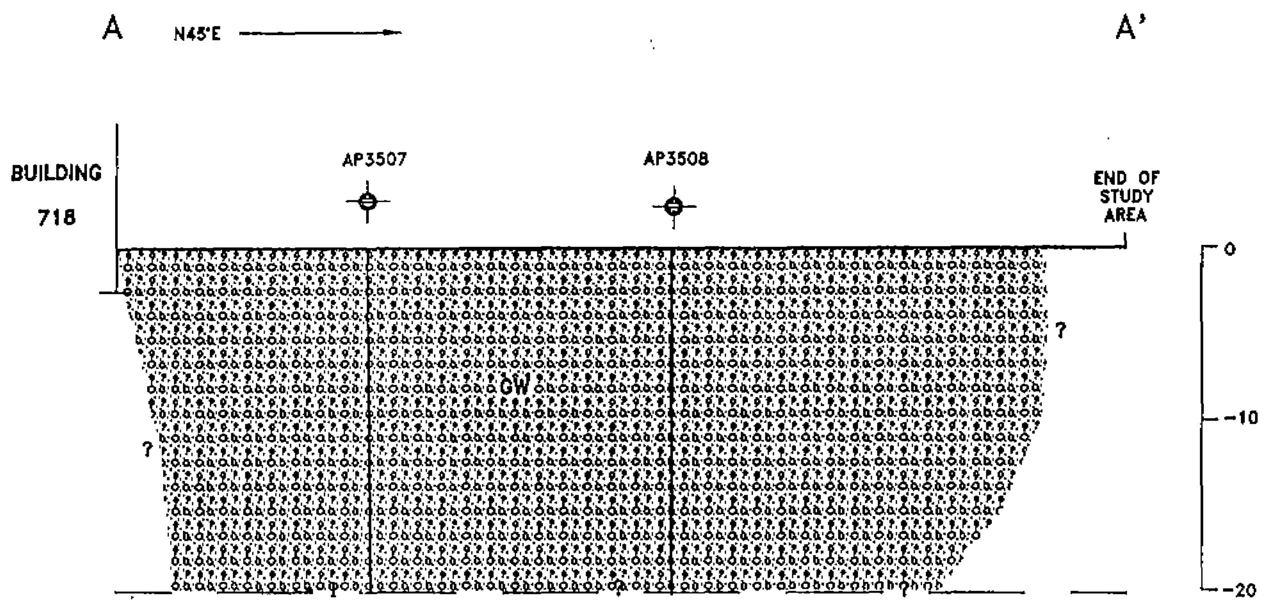
DRAWING: 700SB
C/SC: 1:30
DATE: 8/14/95

DRAWN: ABB
DISK: 304/95
CHECK: WW

FIGURE 5.3-2
SOIL BORING LOCATIONS
FOR BUILDING 700/718

OPERABLE UNIT D
FORT RICHARDSON
PROJECT 9000-036

F5.3-C



L E G E N D

⊕ NEW SOIL BORING LOCATION

▨ WELL GRADED GRAVELS (GW)

SCALE: 1"= 10', NO VERTICAL EXAGGERATION

DRAWING: BLG718CS
C/SC: 1:1
DATE: 3/20/95

DRAWN: ABB
DISK: NET
CHECK: PK

FIGURE 5.3-3
CROSS SECTION
A-A'
FOR BUILDING 718

OPERABLE UNIT D
FORT RICHARDSON, ALASKA
PROJECT 9000-036

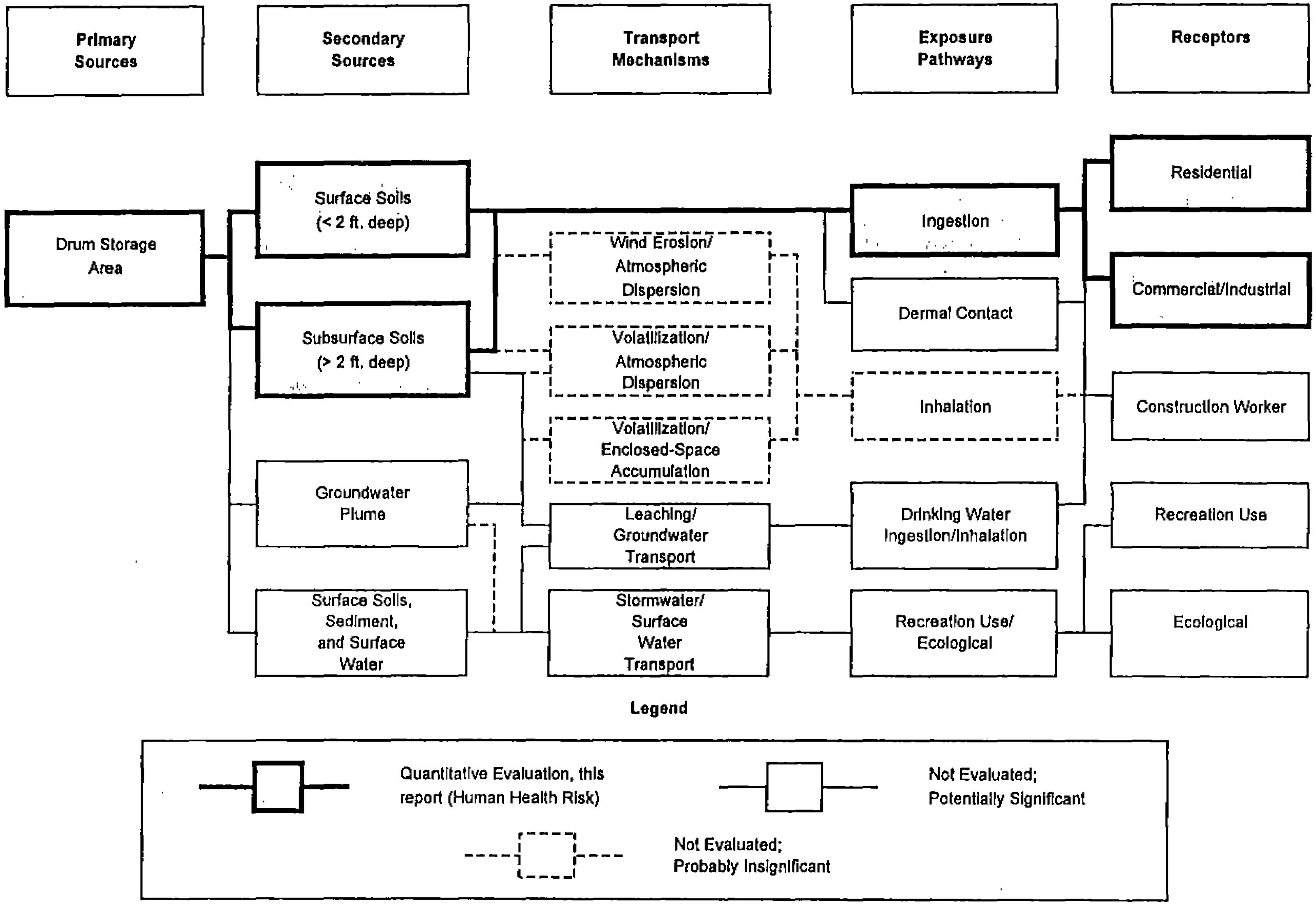


Figure 5.3-4: Sources, Transport Mechanisms, Exposure Pathways, and Receptors
Building 700 / 718

After ASTM (1994)
P:\COMMON\PSE2DATA\SCR-RCPT XLS

Building
704

5.4 Building 704

5.4.1 Site History

Building 704 and the surrounding parking area are used for storage and maintenance of U.S. Army Directorate of Public Works (PW) vehicles and heavy equipment (Figure 5.4-1). At the time of an Army inspection conducted in 1990, containers holding various wastes and unused petroleum products were stored in an approximately 85-by-85-foot area in the northeast corner of the Building 704 parking area. The AEHA performed a characterization of the drum contents, and the results indicated that waste paint, brake fluid, lubricating oil, gasoline, diesel, kerosene, mineral spirits, fuel oil, JP-4, ballast water, alcohols, chlorinated solvents, and other flammable liquids were stored in this location. All containers were removed from the site in 1991.

5.4.2 Field Investigation

The objectives of the PSE2 investigation at Building 704 were to assess the potential release of contaminants from the drum storage area; to evaluate the locations of potentially impacted soils; and to evaluate possible downward migration of contaminants from surface spills.

Surface samples were collected at eight locations within the 85-by-85-foot investigation area (Figure 5.4-2). Samples were collected at 6 inches and 2 feet bgs in areas with visible staining and at 12 inches and 2.5 feet in areas not visibly stained. At surface sample 1, a band of asphalt was observed at 6 inches bgs, and at 2 feet bgs a strong hydrocarbon odor was noted. Samples were shipped to the laboratory for analysis, and analytical results were obtained within 2 weeks. Upon receipt of the preliminary analytical data, the results were evaluated to assess the potentially impacted areas for further investigation.

Two 20-foot borings were located based on preliminary data adjacent to surface samples 1 and 8. Subsurface material at boring AP-3509 (Appendix E) included sandy gravel and gravel. At boring AP-3510, subsurface material consisted of sandy gravel until a clayey silt was encountered at approximately 19 feet bgs.

All OVM readings from field samples were below 6 ppm.

Based on the soil boring logs, a cross section of the investigation area is presented in Figure 5.4-3.

5.4.3 Analytical Results

A total of 34 samples, including four blind duplicate samples and three QA samples, were shipped to the laboratory for analysis. All samples at Building 704 were analyzed for TRPH, GRO, DRO, VOCs, PCBs/organochlorine pesticides, ethylene glycol, and metals. Analytes above the MRLs are shown in Table 5.4-1. A complete summary of analytical data for Building 704 is presented in Appendix E.

In addition, two samples from each 20-foot boring were sent to the USACE NPD laboratory for geotechnical testing, including Atterburg limits, grain size distribution, and percent moisture content. Results from the soil geotechnical analyses are presented in Appendix E.

The laboratory quality control checks indicate that the analytical data are within acceptable criteria ranges, with the exceptions noted in the USACE NPD laboratory's CQAR (ENSR 1995). More detailed qualifications and exceptions are noted in the USACE NPD Laboratory's CQAR and ENSR QASR located in Volumes I through III of Analytical Data for PSE2 OUD (ENSR 1995).

In general the following qualifications apply to the data:

- The pesticide/PCB data for samples 94B70401SL through -18SL should be considered high estimates due to high laboratory control (LC) recoveries.
- Low levels of selenium may not have been detected if present in the associated samples due to a low matrix spike recovery.

5.4.4 Semi-Quantitative Risk Assessment

As described in Section 4.2, a semi-quantitative risk assessment was performed for this site. The risk assessment is considered semi-quantitative because: 1) potential risks to ecological receptors were not evaluated, 2) the exposures evaluated reflect the available analytical data and do not necessarily represent the maximum extent of contamination or future changes in contaminant concentrations, and 3) only one exposure pathway was considered (soil ingestion); although this pathway usually yields the most conservative results, other pathways may also be important.

TABLE 5.4-1 Summary of Analytes Detected
Building 704 Soil Sample Analytical Results

Part 1 of 5

Location:		SB AP 3509					
Depth (feet):		0-4	0-4	4-6	9-11	12-16	18-20
Sample ID:		94B70419SL	94B70420SL	94B70421SL	94B70422SL	94B70423SL	94B70424SL
Lab Code:		K946936-001	K946936-002	K946936-003	K946936-004	K946936-005	K946936-006
Date Collected:		11/4/94	11/4/94	11/4/94	11/4/94	11/4/94	11/4/94
Compound	**Residential RBC**						
Petroleum Hydrocarbons (mg/Kg)							
GRO	none	ND	ND	ND	ND	ND	ND
DRO	none	ND	ND	ND	ND	ND	ND
TPH	none	ND	16	ND	ND	ND	ND
Organochlorine Pesticides (mg/Kg)							
4,4'-DDD	2.7	ND	ND	ND	ND	ND	ND
4,4'-DDT	1.9	0.04	0.02	0.05	ND	ND	ND
4,4'-DDE	1.9	ND	ND	ND	ND	ND	ND
Chlordane	0.49	ND	ND	<0.3	ND	ND	ND
Volatile Organic Compounds (µg/Kg)							
Acetone	7,800,000	ND	ND	69	60	61	ND
Toluene	16,000,000	ND	ND	ND	ND	ND	8
Tetrachloroethene (PCE)	12,000	ND	ND	ND	ND	ND	ND
Total Xylenes	160,000,000	ND	ND	ND	ND	ND	9
Total Metals (mg/Kg)							
Arsenic	0.37	10	5	4	18	8	6
Barium	5,500	38	28	30	28	33	40
Chromium	390	28	30	23	17	19	19
Lead	none	10	6	5	6	4	6
Nickel	1,600	48	47	50	25	28	28

FOOTNOTES:
ND = Non-detected at the method reporting limit (MRL). (See the Building 704 Appendix for MRL values.)
< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.
A shaded value indicates result exceeds the residential risk based concentration (RBC).

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TABLE 5.4-1 Summary of Analytes Detected (cont.)
Building 704 Soil Sample Analytical Results

Part 2 of 5

	Location:	SB AP 3510					
	Depth (feet):	0-4	4-8	4-8	9-11	14-16	18-20
	Sample ID:	94B70425SL	94B70426SL	94B70427SL	94B70428SL	94B70429SL	94B70430SL
	Lab Code:	K947000-001	K947000-002	K947000-003	K947000-004	K947000-005	K947000-006
	Date Collected:	11/7/94	11/7/94	11/7/94	11/7/94	11/7/94	11/7/94
Compound	**Residential RBC**						
Petroleum Hydrocarbons (mg/Kg)							
GRO	none	5	ND	ND	ND	ND	ND
DRO	none	270	33	27	14	ND	ND
TPH	none	190	16	20	ND	ND	ND
Organochlorine Pesticides (mg/Kg)							
4,4'-DDD	2.7	0.01	ND	ND	ND	ND	ND
4,4'-DDT	1.9	0.02	ND	ND	ND	ND	ND
4,4'-DDE	1.9	ND	ND	ND	ND	ND	ND
Chlordane	0.49	ND	ND	ND	ND	ND	ND
Volatile Organic Compounds (µg/Kg)							
Acetone	7,800,000	88	ND	ND	ND	ND	ND
Toluene	16,000,000	ND	ND	ND	ND	ND	ND
Tetrachloroethene (PCE)	12,000	ND	ND	ND	ND	ND	ND
Total Xylenes	160,000,000	ND	ND	6	ND	ND	6
Total Metals (mg/Kg)							
Arsenic	0.37	5	5	8	5	6	7
Barium	5,500	77	47	53	55	54	96
Chromium	390	37	28	31	36	38	44
Lead	none	13	7	7	7	7	7
Nickel	1,600	48	35	38	35	38	48

FOOTNOTES:
ND = Non-detected at the method reporting limit (MRL). (See the Building 704 Appendix for MRL values.)
< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.
A shaded value indicates result exceeds the residential risk based concentration (RBC).

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TABLE 5.4-1 Summary of Analytes Detected (cont.)
Building 704 Soil Sample Analytical Results

Part 3 of 5

	Location:	Surface 1		Surface 2		Surface 3	
	Depth (feet):	0.5	2	1	2.5	0.5	2
	Sample ID:	94B70404SL	94B70405SL	94B70408SL	94B70409SL	94B70413SL	94B70414SL
	Lab Code:	K946366-004	K946366-005	K946366-008	K946366-009	K946366-013	K946366-014
	Date Collected:	10/11/94	10/11/94	10/11/94	10/11/94	10/11/94	10/11/94
Compound	**Residential RBC**						
Petroleum Hydrocarbons (mg/Kg)							
GRO	none	11	ND	ND	ND	ND	ND
DRO	none	1,454	293	ND	133	372	291
TPH	none	1,600	650	500	400	680	360
Organochlorine Pesticides (mg/Kg)							
4,4'-DDD	2.7	0.08 J	0.02 J	ND	0.03 J	0.05 J	0.02 J
4,4'-DDT	1.9	0.19 J	0.03 J	ND	0.58 J	0.67 J	0.28 J
4,4'-DDE	1.9	<0.05	ND	ND	0.05 J	0.01 J	ND
Chlordane	0.49	<0.5	ND	ND	ND	ND	ND
Volatile Organic Compounds (µg/Kg)							
Acetone	7,800,000	ND	ND	ND	ND	ND	ND
Toluene	16,000,000	12	ND	ND	ND	ND	ND
Tetrachloroethene (PCE)	12,000	ND	ND	ND	ND	ND	ND
Total Xylenes	160,000,000	12	ND	ND	ND	ND	ND
Total Metals (mg/Kg)							
Arsenic	0.37	6	6	8	9	7	6
Barium	5,500	109	55	80	60	47	44
Chromium	390	24	40	28	41	31	30
Lead	none	85	17	23	18	18	13
Nickel	1,600	28	42	36	46	40	38

FOOTNOTES:

ND = Non-detected at the method reporting limit (MRL). (See the Building 704 Appendix for MRL values.)

J = Value is considered an estimate.

< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.

A shaded value indicates result exceeds the residential risk based concentration (RBC).

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TABLE 5.4-1 Summary of Analytes Detected (cont.)
Building 704 Soil Sample Analytical Results

Part 4 of 5

	Location:	Surface 4			Surface 5	
	Depth (feet):	0.5	2	2	0.5	2
	Sample ID:	94B70410SL	94B70411SL	94B70412SL	94B70406SL	94B70407SL
	Lab Code:	K946366-010	K946366-011	K946366-012	K946366-006	K946366-007
	Date Collected:	10/11/94	10/11/94	10/11/94	10/11/94	10/11/94
Compound	**Residential RBC**					
Petroleum Hydrocarbons (mg/Kg)						
GRO	none	ND	ND	ND	ND	ND
DRO	none	50	22	41	63	63
TPH	none	430	160	132	310	290
Organochlorine Pesticides (mg/Kg)						
4,4'-DDD	2.7	0.04 J	0.01 J	0.01 J	0.08 J	0.04 J
4,4'-DDT	1.9	0.52 J	0.17 J	0.16 J	1.54 J	0.61 J
4,4'-DDE	1.9	ND	ND	ND	0.09 J	0.03 J
Chlordane	0.49	ND	ND	ND	ND	ND
Volatile Organic Compounds (µg/Kg)						
Acetone	7,800,000	ND	ND	ND	ND	ND
Toluene	16,000,000	5	ND	ND	8	ND
Tetrachloroethene (PCE)	12,000	ND	ND	ND	ND	ND
Total Xylenes	160,000,000	ND	6	ND	9	ND
Total Metals (mg/Kg)						
Arsenic	0.37	6	12	12	7	8
Barium	5,500	92	45	42	72	47
Chromium	390	38	34	28	36	28
Lead	none	28	12	8	29	16
Nickel	1,600	40	48	44	44	31

FOOTNOTES:
ND = Non-detected at the method reporting limit (MRL). (See the Building 704 Appendix for MRL values.)
J = Value is considered an estimate.
< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.
A shaded value indicates result exceeds the residential risk based concentration (RBC).

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TABLE 5.4-1 Summary of Analytes Detected (cont.)
Building 704 Soil Sample Analytical Results

Part 5 of 5

	Location:	Surface 6			Surface 7		Surface 8	
	Depth (feet):	1	1	2.5	1	2.5	0.5	2
	Sample ID:	94B70401SL	94B70402SL	94B70403SL	94B70415SL	94B70416SL	94B70417SL	94B70418SL
	Lab Code:	K946366-001	K946366-002	K946366-003	K946366-015	K946366-016	K946366-017	K946366-018
	Date Collected:	10/11/94	10/11/94	10/11/94	10/11/94	10/11/94	10/11/94	10/11/94
Compound	**Residential RBC**							
Petroleum Hydrocarbons (mg/Kg)								
GRO	none	ND	ND	ND	ND	ND	ND	ND
DRO	none	442	473	20	501	103	89	28
TPH	none	850	730	22	370	310	200	71
Organochlorine Pesticides (mg/Kg)								
4,4'-DDD	2.7	0.04 J	0.02 J	ND	0.05 J	0.02 J	0.05 J	<0.05
4,4'-DDT	1.9	0.46 J	0.27 J	0.02 J	0.44 J	0.31 J	1.12 J	0.67 J
4,4'-DDE	1.9	ND	ND	ND	0.02 J	ND	0.07 J	<0.05
Chlordane	0.49	ND	ND	ND	0.2 J	0.4 J	2.3 J	2.5 J
Volatile Organic Compounds (µg/Kg)								
Acetone	7,800,000	ND	ND	ND	ND	ND	ND	ND
Toluene	16,000,000	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene (PCE)	12,000	ND	ND	ND	ND	6	ND	ND
Total Xylenes	160,000,000	ND	ND	ND	ND	ND	ND	ND
Total Metals (mg/Kg)								
Arsenic	0.37	6	6	6	7	8	8	6
Barium	5,500	79	76	39	80	68	89	53
Chromium	390	33	32	28	31	29	36	32
Lead	none	48	60	9	26	28	36	15
Nickel	1,600	38	34	33	34	36	26	36

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL). (See the Building 704 Appendix for MRL values.)

J = Value is considered an estimate.

< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.

A shaded value indicates result exceeds the residential risk based concentration (RBC).

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Building 704 is located in a developed area, consisting of a maintenance building on a cleared gravel staging area. Surrounding land uses are generally industrial in nature, with railroad tracks on the west side of the site. A second-growth forest is located approximately 1,000 feet south of the site. There are no surface water bodies within 0.5 mile.

5.4.4.1 Compounds of Potential Concern

A summary of the COPCs is presented in Table 5.4-2. These compounds include insecticides (4,4'-DDT and chlordane) and metals (arsenic). All of these compounds are carcinogens.

**Table 5.4-2. Compounds of Potential Concern
Building 704**

Type	Source	Carcinogens
Polychlorinated diphenyl alkanes	Insecticides	4-4'-DDT
Chlorinated cyclodienes	Insecticides	Chlordane
Metals[1]	Background soil	Arsenic

[1] Based on the background metals statistics evaluation in Appendix A, some metals were not included in the semi-quantitative risk assessment because they were not statistically significant from background concentrations.

All other target analytes were either 1) not detected, 2) below 1/10th of the RBC for residential soil, or 3) not statistically different from the background sample population (metals only). As shown by Table 4-1, however, RBCs are not available for some compounds. These compounds were included in the semi-quantitative risk assessment *only* when they were detected in a site-related sample. In addition, a list of compounds that were not detected at detection limits exceeding current risk-based concentrations is provided in Table 5.4-3. Most of these compounds were identified in the Work Plan (ENSR 1994) but require special analytical services to achieve reporting limits below RBCs. During the RI/FS, Table 5.4-3 should be reviewed to determine if the likelihood that the compound is present warrants the use of special analytical services.

As described in Section 5.4.4.4, the toxicity of petroleum hydrocarbons cannot be evaluated using bulk hydrocarbon measurements (GRO, DRO, and TPH). As a result, these data were not included in the semi-quantitative risk assessment.

Table 5.4-3 Compounds Not Detected at Detection Limits Exceeding Current Risk-Based Concentrations, Building 704

Compound	Matrix	Maximum Detection Limit	Risk-Based Concentration
Aldrin	Soil	0.05 mg/Kg	0.038 mg/Kg
Dieldrin	Soil	0.05 mg/Kg	0.04 mg/Kg
Toxaphene	Soil	2 mg/Kg	0.58 mg/Kg
Chlordane	Soil	0.5 mg/Kg	0.49 mg/Kg
1,2-Dibromoethane (EDB)	Soil	20 µg/Kg	7.5 µg/Kg

Note: Some detection limits are elevated due to analytical interference. See the Building 704 Appendix for a complete list of detection limits

5.4.4.2 Sources, Transport Mechanisms, Exposure Pathways, and Receptors

Sources, transport mechanisms, exposure pathways, and receptors (elements of a Conceptual Site Model) are shown on Figure 5.4-4. As discussed previously, the primary source is the drum storage area. Secondary sources include contaminated surface and subsurface soil. It is not known whether groundwater or surface waters have been impacted.

Potential transport mechanisms include surface water transport, leaching and groundwater transport, and volatilization. Within the air phase, volatile COPCs may disperse in the atmosphere or accumulate in enclosed spaces. However, no volatile COPCs were detected at concentrations exceeding 1/10th of the RBC for residential soil. Concentrations of nonvolatile COPCs in airborne dust are not expected to be of concern in the atmosphere (see Appendix A, Section A.5).

Surface water transport is not expected to be significant since the surrounding topography is relatively flat and no surface water bodies are present within 0.5 mile of the site. Leaching is not expected to be significant since all of the COPCs are relatively insoluble in water.

Depending on the future land use, potential receptors may include residents, occupational workers, and construction workers. Ecological receptors include terrestrial plants, mammals, and avian species.

5.4.4.3 Exposure Assessment

A preliminary exposure assessment was performed for the soil ingestion pathway. Soil exposures via ingestion generally result in greater chemical uptake than dermal contact, inhalation, or recreation use. Accordingly, this pathway was selected to determine if soil exposures represent a significant human health risk. If human health risks via soil ingestion are significantly below the acceptable risk threshold, then combined health risks from other exposure pathways are probably within acceptable limits. However, if human health risks via soil ingestion are close to the acceptable risk threshold, then other exposure pathways should be evaluated as part of the baseline risk assessment.

Soil exposures were calculated using default exposure factors for residential and commercial/industrial receptors (EPA 1995a). These exposure factors reflect individuals with the highest chronic exposure for noncarcinogens and the highest cumulative exposure for carcinogens. For example, exposures to noncarcinogens are calculated assuming childhood exposure only, whereas exposures to carcinogens are calculated assuming combined childhood and adult exposure. A list of the exposure factors and equations is provided in Appendix A.

Exposure concentrations in soil were calculated as the 95 percent UCL of the average concentration of all samples analyzed from a particular medium (surface or subsurface soil). If the compound was not detected, one-half of the reporting limit was used to calculate the 95 percent UCL. This approach is consistent with EPA guidance (EPA 1991, 1992).

5.4.4.4 Toxicity Assessment

Dose-response factors were obtained from EPA (1995a). These factors were obtained from:

1) EPA's Integrated Risk Information System (current as of January 1, 1995),
2) EPA's Health Effects Assessment Summary Tables (current through March 1994),
3) The Superfund Health Risk Technical Support Center, and
4) Other EPA sources.

Although provisional dose response factors have been developed for JP-4, JP-5, gasoline, and diesel fuel (EPA 1992b), these values are not appropriate for this evaluation. These values are based on fresh petroleum products and do not accurately represent the composition, and therefore the toxicity, of weathered petroleum products. They have not been subjected to rigorous peer review and are not routinely used, even by EPA, in risk assessment. As a result, bulk hydrocarbon measurements (GRO, DRO, and TPH) were not included in the semi-quantitative risk assessment.

5.4.4.5 Human Health Risk Characterization

The following sections summarize potential human health risks via soil ingestion. As described above, soil exposures via ingestion generally result in greater chemical uptake than dermal contact, inhalation, or recreation use. Accordingly, if human health risks via soil ingestion are significantly below the acceptable risk threshold, then combined health risks from other exposure pathways are probably within acceptable limits. However, if human health risks via soil ingestion are close to the acceptable risk threshold, then other exposure pathways may need to be evaluated as part of the baseline risk assessment.

Human Health Risks

Carcinogenic risks for the soil ingestion pathway are summarized on Table 5.4-4. A breakdown of risk calculations for each pathway and receptor are presented in Appendix A. Noncarcinogenic risks were not evaluated, since all noncarcinogenic compounds were either 1) not detected, 2) below 1/10th of the RBC for residential soil, or 3) not statistically different from the background sample population (metals only).

Table 5.4-4. Carcinogenic Risks for Soil Ingestion
Building 704

Pathway	Carcinogenic Risk	
	Residential	**Occupational**
Surface Soil	9.2×10^{-7}	1.0×10^{-7}
Subsurface Soil	4.3×10^{-8}	5.1×10^{-9}
Total Risk	9.6×10^{-7}	1.1×10^{-7}

Using both residential and occupational exposure factors, the excess lifetime carcinogenic risk for soil ingestion does not exceed the lower benchmark of 1×10^{-6} listed in the NCP. As described in Section 5.4.4.4, risks associated with bulk hydrocarbon measurements (GRO, DRO, and TPH) could not be evaluated. During the RI/FS, an effort may be made to evaluate the transport, fate, and toxicity of petroleum hydrocarbons in surface and subsurface soil.

5.4.4.6 Ecological Risk Characterization

Quantitative assessment of ecological risks can be performed at the organism, population, or ecosystem level. Although ecosystem-level effects may be the most important, effects testing and modeling are rarely performed due to a number of practical considerations (Suter 1993). Quantification of population-level effects, such as reproductive potential, is important to maintain species populations, whereas assessment of organism-level effects evaluates the risk to individual organisms.

Chemicals can be evaluated as single compounds or as mixtures. Methods for evaluating the toxicity of mixtures requires knowledge regarding the sites and modes of action of individual compounds. Unlike for human health risk assessment, these methods have not been standardized, and there is some debate regarding the most appropriate approach.

If potential exposure pathways and receptors are present, ecological assessment begins with identification of the compounds of potential concern. This can be done in a similar fashion as for human health risk assessment, using ecological RBCs. Ecological RBCs may include toxicity benchmarks, sediment quality criteria, or other regulatory criteria. One set of criteria in common use provides benchmark concentrations for eight representative mammalian species and nine avian species (Opresko et al. 1994). Although benchmark concentrations are provided for 76 chemicals, toxicity benchmarks are not available for many target analytes. Also, the benchmarks are provided as concentrations in food, requiring evaluation of plant uptake and other routes of dietary exposure. Due to the large number of analytes measured at Building 704, ecological RBCs were not compiled as part of this project.

Potential receptors at Building 704 include terrestrial and avian species at a variety of trophic levels. The most highly exposed species include those with a small home range and small body weight to food consumption ratio (e.g., mice and resident songbirds). However, other less exposed species may warrant evaluation based on their susceptibility to particular chemicals (e.g., reproductive effects of 4,4'-DDT in raptors).

As part of the RI/FS, ecological RBCs may be identified for representative terrestrial and avian species. Compounds of potential concern may be selected based on a comparison of ecological RBCs with measured concentrations. At this point, the appropriate risk quantitation methods and measurement endpoints may be selected.

5.4.5 Findings and Conclusions

The risks associated with and noncarcinogenic compounds are below the estimated threshold for adverse effects, and the excess lifetime carcinogenic risk for soil ingestion does not exceed the lower benchmark of 1 x 10^{-6} listed in the NCP.

The semi-quantitative risk assessment was performed using exposure assumptions that may not be appropriate for the site (e.g., residential use). In addition, the extent of contamination and the dynamic state of soil contamination (expanding, degrading, or steady-state) have not been evaluated. The exposure assumptions, compounds of potential concern, future land use, and contaminant fate and transport may be re-evaluated for inclusion in a baseline risk assessment, if required. In addition, ecological receptors, RBCs, risk quantitation methods, and measurement endpoints may be identified for inclusion in a baseline ecological risk assessment.

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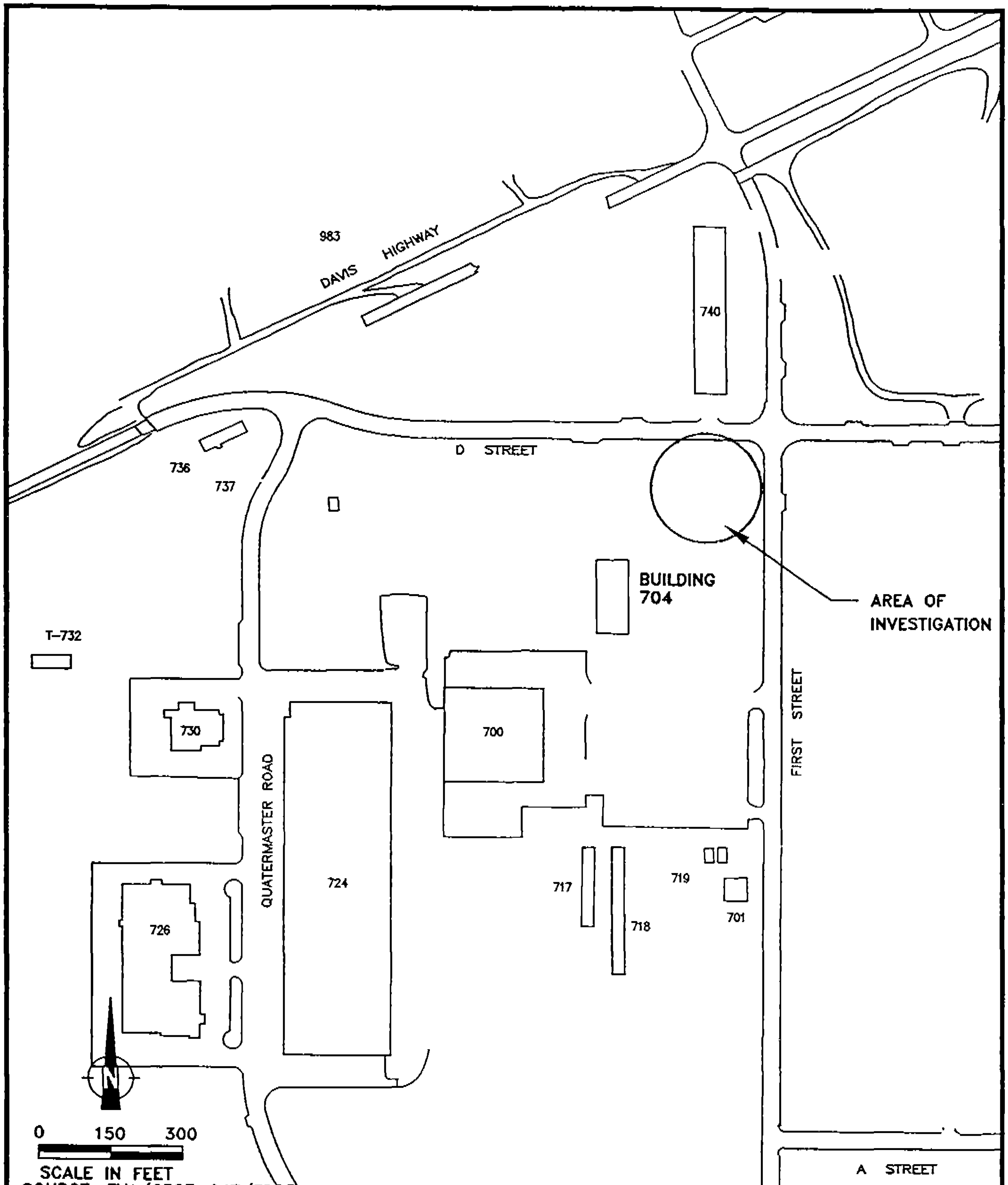
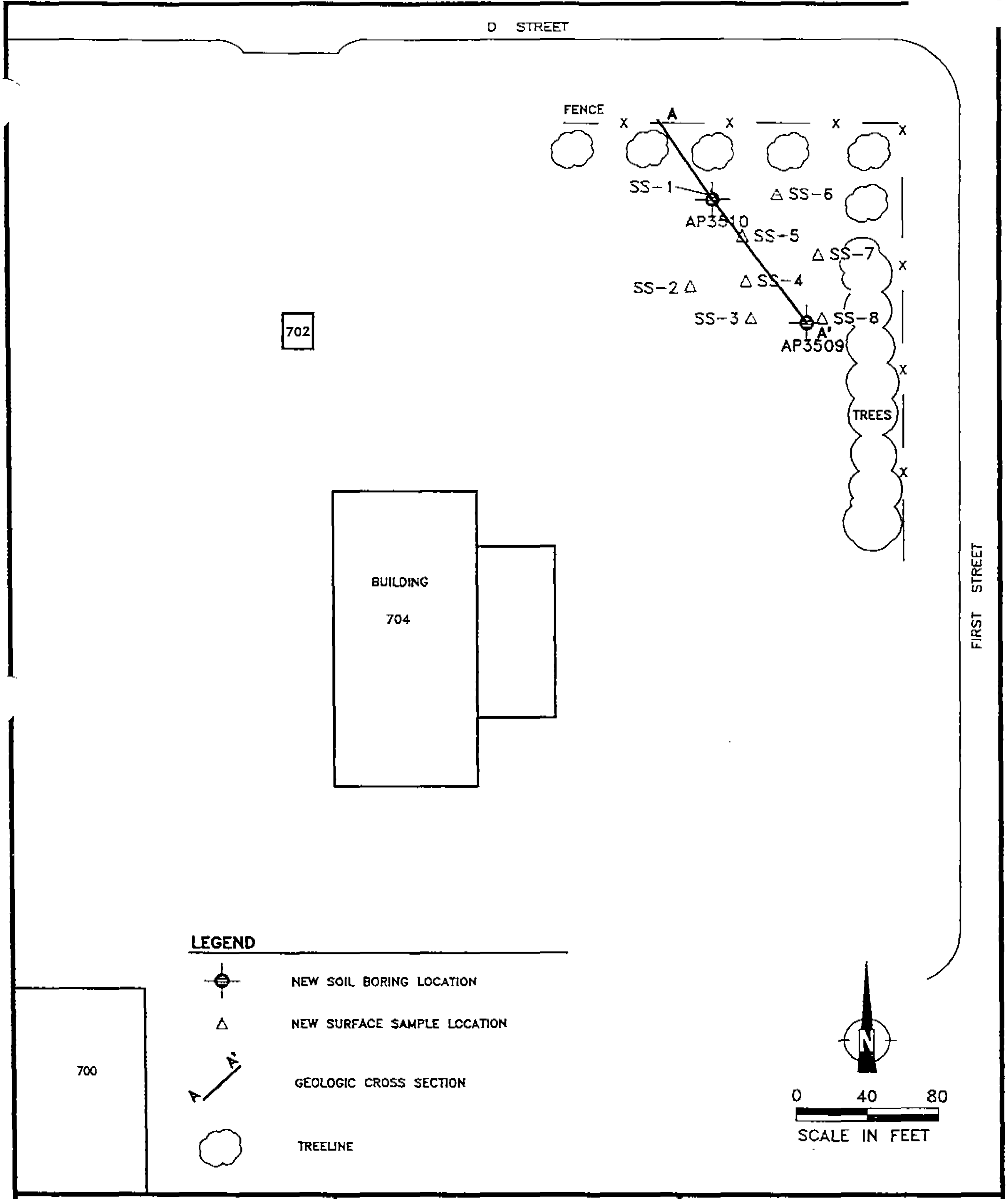


SOURCE: TVA/6583-047/FRG3

DRAWING: 704LOCA DRAWN: ABB
C/SC: 1:300 DISK: 304/95
DATE: 03/29/95 CHECK: WW

FIGURE 5.4-1
LOCATION MAP
BUILDING 704

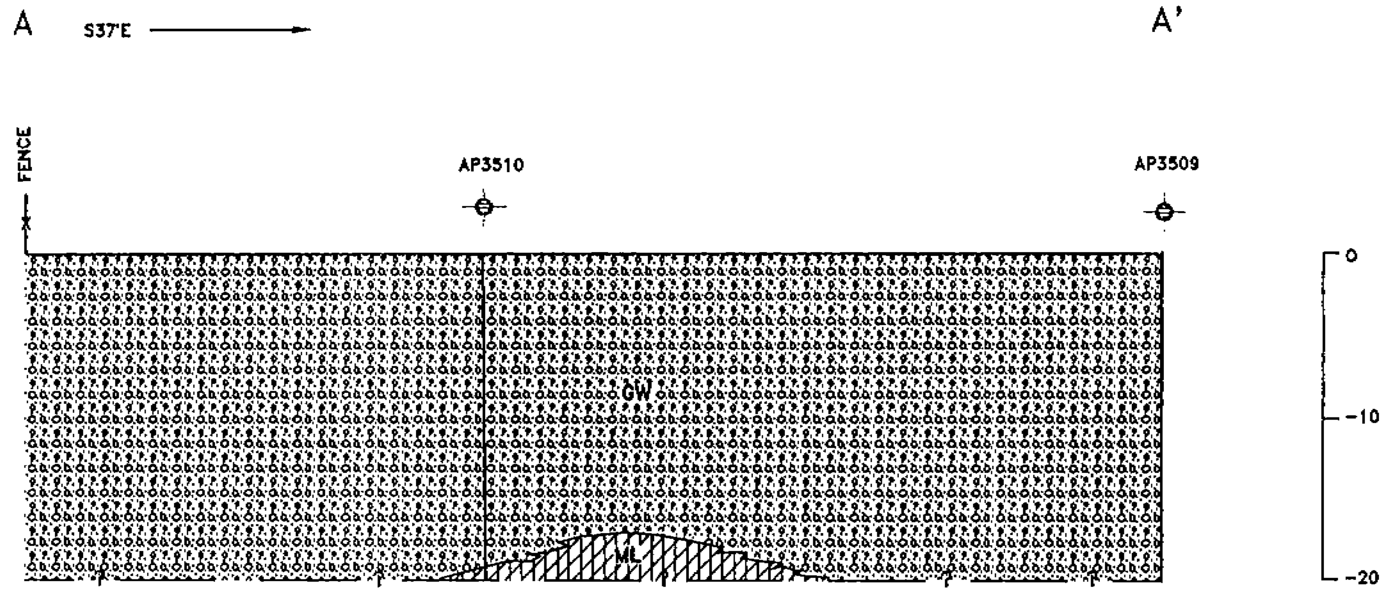
OPERABLE UNIT D
FORT RICHARDSON
PROJECT 9000-036



DRAWING: 704SB DRAWN: ABB
C/SC: 1:80 DISK: 153/96
DATE: 10/8/96 CHECK: WW

FIGURE 5.4-2
SOIL BORING LOCATIONS
BUILDING 704

OPERABLE UNIT D
FORT RICHARDSON
PROJECT 9000-066



L E G E N D

⊕ NEW SOIL BORING LOCATION

▨ WELL GRADED GRAVELS (GW)

▧ SILT – CLAYEY (ML)

SCALE: 1"= 20', VERTICAL EXAGGERATION X 2

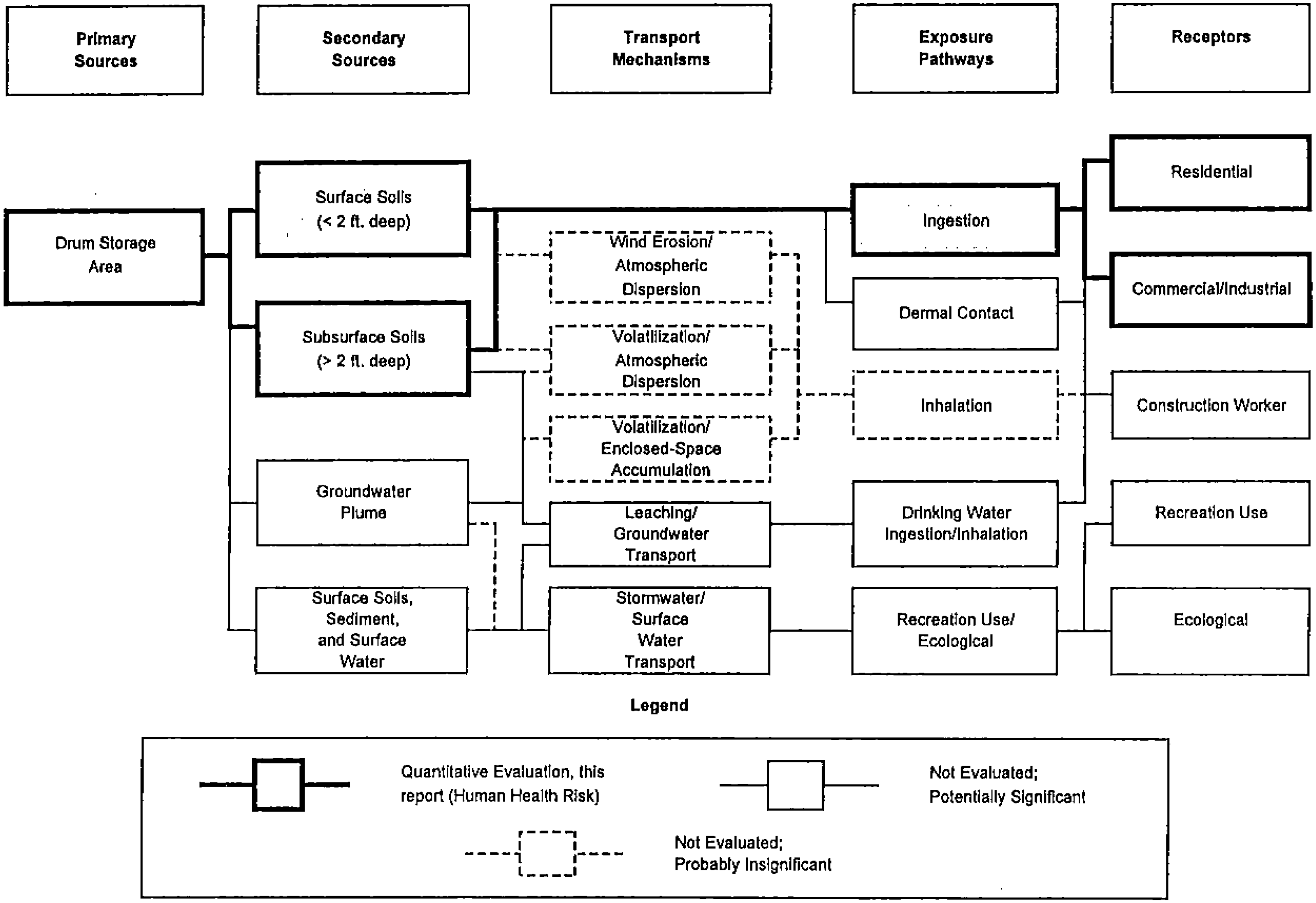
DRAWING: BLG704CS
C/SC: 1:1
DATE: 3/20/95

DRAWN: ABB
DISK: NET
CHECK: PK

FIGURE 5.4-3
CROSS SECTION
A-A'
FOR BUILDING 704

OPERABLE UNIT D
FORT RICHARDSON, ALASKA
PROJECT 9000-036

Figure 5.4-4: Sources, Transport Mechanisms, Exposure Pathways, and Receptors
Building 704



After ASTM (1994)
P:\COMMON\PSE2DATA\SCR-RCPT.XLS

F5.4-D

Building
796

5.5 Building 796

5.5.1 Site History

Building 796, the DOL Maintenance/Vehicle and Weapons Repair Section, is used for vehicle and equipment maintenance (Figure 5.5-1). A Battery Shop is located within the building. At the Battery Shop, batteries were reportedly drained onto a stainless steel table and into a small aboveground tank. The acids were neutralized with sodium bicarbonate, and resulting fluids were tested for pH with litmus paper. When the fluids were adequately neutralized, they were discharged via a floor drain to a UST (SAIC 1990). The UST location has not yet been defined but is reportedly located approximately 100 feet from the Battery Shop. Site drawings show a floor drain connected to the sanitary sewer. If there was a UST connected to the acid neutralization system, it would probably have been located along the former storm sewer line. The UST system was in operation until 1980 when the acids were reportedly discharged to a log crib located outside the shop. The crib was removed in approximately 1985, and the floor drain was reconnected to the storm drain. In 1993, the floor drain was connected to an oil/water separator.

The old acid disposal lines and surrounding soils were reportedly removed after 1981 (they were likely removed in 1985 after the system was shut down). When removed, the pipe was reportedly no longer structurally sound. The depth of the excavation immediately adjacent to the building was 8 feet.

An oil/water separator is located on the east side of the facility, approximately 20 feet from the Battery Shop. The oil/water separator visually appears to be in good condition and has apparently been added to the facility within the last several years. The oil/water separator reportedly backs up on occasion, overflowing various parts of the system. Past leaks could possibly have impacted the area investigated.

No previous investigations have been conducted at the Battery Shop site. Potential contaminants of concern include metals, VOCs, GRO, DRO, SVOCs, ethylene glycol, and PCBs.

5.5.2 Field Investigation

The objectives of the PSE2 investigation at Building 796 are to evaluate the potential presence of contaminants in subsurface soils near the former storm sewer line, to evaluate the potential presence of contaminants below the former floor drain and sewer line in the Battery Shop, and to assess the potential release of contaminants to groundwater.

The investigation was to include four soil borings and one monitoring well. The soil boring sites were selected based on the previously reported locations for the storm sewer line and the former log crib. The first two borings were to have been located inside the Battery Shop. The next two borings were located immediately outside the Battery Shop; one in the location of the former log crib, and the other over the former storm sewer line.

The two borings inside the shop were finished as shallow subsurface samples because the interior dimensions of the Battery Shop precluded the use of the drilling rig. These former borings were advanced via a bobcat-mounted auger and hand excavation to a maximum practical depth of 48 inches bgs. An electric jackhammer was used to break through the 12-inch deep concrete floor. The remaining depth was achieved by a combination of hand-held shovels and an auger attachment on a bobcat. Large cobbles, rebar, and cast iron piping were encountered during the sampling of these two borings.

Sample location 1, inside the Battery Shop, was 15 feet from the center of the bay door. One sample was collected from a depth of 32 to 40 inches bgs. The field team encountered a large boulder at 12 to 34 inches bgs and a 4-inch diameter cast iron pipe at 34 inches bgs, which precluded the advancement of this boring beyond 40 inches bgs. The sample collected had an observed OVM reading of 0.0 ppm.

Sample location 2, inside the Battery Shop, was 30 feet from the center of the bay door. Two samples were collected at depths of 32 to 36 inches bgs and 48 inches bgs. Rebar was encountered, which precluded the advancement of this boring beyond 48 inches bgs. The OVM readings for these two samples were 1.7 ppm and 0.0 ppm, respectively. Boreholes 1 and 2 were backfilled to grade with excavated materials, and concrete patches were placed over the disturbed floor areas. The concrete patches were merged with surrounding concrete by extending rebar from the existing concrete into the area to be patched.

The soils encountered at the borings inside the building were generally described as sandy gravel including large cobbles.

All samples from the first two borings were analyzed for the entire list of parameters selected for this site: TRPH, GRO, DRO, VOCs, SVOCs, PCBs/organochlorine pesticides, ethylene glycol, sulfate, metals, oxygen reduction potential (Redox), and soil pH.

Boring AP-3511 (Appendix F) was advanced to 18 feet bgs outside the Battery Shop, over the former log crib site, and 15 feet northeast of the center of the bay door. Recovery of soil in the split-spoon sampler was consistently low; therefore, a field decision was made to prioritize the parameters to be analyzed. Continuous sampling was conducted from 0 to 9 feet bgs to collect the first sample for GRO, VOC, and ethylene glycol analyses. The next sample was collected at 10 to 12 feet bgs for GRO, VOCs, ethylene glycol, metals, and sulfate analyses. The third sample was collected at 12 to 14 feet bgs for TRPH, DRO, SVOCs, PCBs/organochlorine pesticides, sulfate, metals, and Redox analyses. The next two samples for this boring were collected at 14 to 16 feet bgs and 16 to 18 feet bgs for analyses of the entire list of parameters. The last sample was also tested for Atterburg limits, percent moisture content, and grain size distribution.

Soils were generally described as silty sand to 14 feet bgs and sandy gravel to 17 feet bgs. Throughout this boring, there were no odors detected. The samples collected at 12 to 14 feet bgs, 14 to 16 feet bgs, and 16 to 18 feet bgs contained light-yellow colored silt mixed throughout the core. The last sample collected also contained a light-gray silt mixed throughout the core.

Boring AP-3512 was advanced to 19 feet bgs outside the building and 150 feet east from the center of the bay door. The boring was located over the former storm sewer line. A steam line was encountered at 6 feet bgs, and the location was moved west 5 feet and redrilled. The samples from this boring were analyzed for the entire list of parameters. Geotechnical testing for Atterburg limits, percent moisture content, and grain size distribution was performed on the samples collected at 5 to 7 bgs and 15 to 17 feet bgs.

Soils were described as silty sand to 9 feet bgs and sandy gravel to 16.5 feet bgs. There were no odors observed throughout the boring, and only slight orange staining was encountered at 17 feet, which was attributed to iron oxide.

Monitoring well AP-3513 was located adjacent to Boring AP-3511 (Figure 5.5-2). The borehole was advanced to 18 feet bgs before the first sample was collected. Bentonite slurry from the completion of boring AP-3511 was observed on the outside of the split-spoon sampler at 19.4 feet bgs. The first sample was analyzed for the entire list of parameters. The second sampling location, at a depth of 28 to 29.8 feet bgs, yielded low recovery of soil in the first sampler, therefore a second sampler was advanced. The samples collected at 28 to 29.8 feet bgs and 38 to 39.8 feet bgs were analyzed for all parameters. The subsequent sample yielded extremely low recovery of soils; therefore soils were analyzed for fewer parameters (GRO, VOCs, and ethylene glycol). Sufficient recovery of soil was obtained in the sampler at 58 to 59.9 feet bgs to analyze for the full list of parameters. The following sample, at a depth of 68 to 68.7 feet bgs, again provided low recovery; soils for this sample were analyzed for GRO and ethylene glycol only. The last sample obtained, 80 to 81.1 feet bgs, was analyzed for GRO, DRO, VOCs, SVOCs, PCBs/organochlorine pesticides, ethylene glycol, sulfate, metals, Redox, and soil pH. Groundwater was encountered at a depth of 87.9 feet bgs, and the well was advanced to a total depth of 91.5 feet bgs. The borehole was completed as a monitoring well in accordance with the work plan. The well was screened at an interval of 3.6 feet below water level and 6.4 feet above water level. Sand was added to a depth of 78.4 feet bgs and capped with an 8.4-foot-thick bentonite seal. The well was then grouted to the surface.

The soils encountered at the borings outside the building were generally described as silty, sandy gravel to a depth of 89 feet bgs where saturated silty mud was encountered.

Monitoring well AP-3513 was developed according to the work plan. The well was sampled and the water was analyzed for the entire list of parameters. There were no unusual odors or coloration noticed while sampling.

Based on the soil boring logs from Building 796, a cross section of the investigation area is shown in Figure 5.5-3.

5.5.3 Analytical Results

A total of 33 soil samples, including six blind duplicates and five QA samples, were collected. One groundwater sample, including a blind duplicate and QA sample, was also collected. Trip blanks were shipped with the water samples. Analytes above the MRLs are shown in Tables 5.5-1 and 5.5-2. A complete summary of all analytical data from Building 796 is shown in Appendix F.

In addition, samples from the soil borings were sent to USACE NPD Laboratory for geotechnical testing, including Atterburg limits, grain size distribution, and percent moisture content. Results from the soil geotechnical analysis are presented in Appendix F.

The laboratory quality control checks indicate that the analytical data are within acceptable criteria ranges, with the exceptions noted in the USACE NPD laboratory's CQAR and ENSR QASR located in Volumes I through III of Analytical Data for PSE2 OUD (ENSR 1995).

The following deficiencies were noted in the data:

- Based on a low out-of-control VOC surrogate recovery, the soil VOC data of sample 94B79627SL should be considered low estimates.

TABLE 5.5-1 Summary of Analytes Detected
Building 796 Soil Sample Analytical Results

Part 1 of 3

	Location:	SB AP 3511							
	Sample Depth:	0-9'		10'-12'	12'-14'		14'-16'		16'-18'
	Sample ID:	94B79606SL	94B79607SL	94B79608SL	94B79609SL	94B79610SL	94B79611SL	94B79612SL	94B79613SL
	Lab Code:	K946693-008	K946693-009	K946693-010	K946693-011	K946693-012	K946693-013	K946693-014	K946693-001
	Date Collected:	10/25/94	10/25/94	10/25/94	10/25/94	10/25/94	10/25/94	10/25/94	10/25/94
Compound	Residendial RBC								
Petroleum Hydrocarbons (mg/Kg)									
DRO	none	NA	NA	NA	ND	12	ND	NA	ND
TPH	none	NA	NA	NA	14	21	16	NA	11
Organochlorine Pesticides (mg/Kg)									
4,4'-DDT	1.9	NA	NA	NA	ND	ND	ND	NA	ND
Volatile Organic Compounds (µg/Kg)									
Acetone	7,800,000	ND	ND	ND	NA	NA	ND	NA	ND
Chloroform	100,000	ND	ND	ND	NA	NA	ND	NA	ND
Carbon Tetrachloride	4,900	ND	ND	ND	NA	NA	ND	NA	ND
Trichloroethene (TCE)	58,000	ND	ND	ND	NA	NA	8	NA	ND
Toluene	16,000,000	ND	ND	ND	NA	NA	ND	NA	ND
Total Xylenes	160,000,000	ND	ND	ND	NA	NA	ND	NA	ND
1,2,4-Trichlorobenzene	780,000	ND	ND	ND	NA	NA	ND	NA	ND
Total Metals (mg/Kg)									
Arsenic	0.37	NA	NA	7	7	8	6	NA	5
Barium	5,500	NA	NA	59	64	54	43	NA	47
Chromium	390	NA	NA	129	48	48	35	NA	34
Lead	none	NA	NA	357	37	44	35	NA	16
Nickel	1,600	NA	NA	13	25	23	20	NA	22
Other Analyses									
pH (units)	none	NA	NA	NA	6.80	6.91	7.37	7.30	6.81
Redox Potential (mV)	none	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate (mg/Kg)	none	NA	NA	200	580	540	1800	NA	930

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL). (See the Building 796 Appendix for MRL values.)
NA = not analyzed.
A shaded value indicates result exceeds the residential risk based concentration (RBC).

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10/15/96

TABLE 5.5-1 Summary of Analytes Detected (cont.)
Building 796 Soil Sample Analytical Results

Part 2 of 3

	Location:	SB AP 3512					SS 1		SS 2		
	Sample Depth:	0-2'	7'-9'	9'-11'	15'-17'	17'-19'	32"-40"		32"-36"	48"	
	Sample ID:	94B79614SL	94B79616SL	94B79617SL	94B79618SL	94B79619SL	94B79601SL	94B79602SL	94B79603SL	94B79604SL	94B79605SL
	Lab Code:	K946693-002	K946693-004	K946693-005	K946693-006	K946693-007	K946524-001	K946524-002	K946524-003	K946565-001	K946565-002
	Date Collected:	10/25/94	10/25/94	10/25/94	10/25/94	10/25/94	10/18/94	10/18/94	10/18/94	10/19/94	10/19/94
Compound	**Residendial RBC**										
Petroleum Hydrocarbons (mg/Kg)											
DRO	none	ND	NA	ND	ND	ND	364	302	ND	ND	ND
TPH	none	650	ND	ND	ND	ND	240	730	14	ND	ND
Organochlorine Pesticides (mg/Kg)											
4,4'-DDT	1.9	0.01	NA	ND	ND	ND	NA	NA	NA	ND	ND
Volatile Organic Compounds (µg/Kg)											
Acetone	7,800,000	ND	ND	ND	65	83	ND	55	ND	ND	ND
Chloroform	100,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	4,900	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene (TCE)	58,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	16,000,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	160,000,000	ND	ND	ND	ND	ND	5	ND	ND	ND	ND
1,2,4-Trichlorobenzene	780,000	ND	ND	ND	ND	ND	20	25	ND	ND	ND
Total Metals (mg/Kg)											
Arsenic	0.37	10	8	6	6	12	8	7	7	6	6
Barium	5,500	55	33	40	40	44	52	56	32	27	26
Chromium	390	37	25	30	28	29	37	37	31	28	20
Lead	none	10	5	5	6	5	45	164	8	7	6
Nickel	1,600	51	32	48	28	42	52	56	56	51	36
Other Analyses											
pH (units)	none	7.47	7.11	7.40	7.05	7.19	4.73	5.2	6.1	6.09	6.29
Redox Potential (mV)	none	NA	NA	NA	NA	NA	290	270	240	310	270
Sulfate (mg/Kg)	none	5.2	37	10	9.9	6.3	2100	3500	55	48	18

FOOTNOTES:
ND = Non-detected at the method reporting limit (MRL). (See the Building 796 Appendix for MRL values.)
NA = not analyzed.
J = Value is considered an estimate.
UJ = The analyte was not detected at the MRL, however, the MRL is considered an estimate.
A shaded value indicates result exceeds the residential risk based concentration (RBC).

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TABLE 5.5-1 Summary of Analytes Detected (cont.)
Building 796 Soil Sample Analytical Results

Part 3 of 3

Location:		MW AP 3513							
Sample Depth:		18'-19'	28'-29.8'		38'-39.8'	48'-49.5'	58'-59.9'	68'-68.8'	80'-81.7'
Sample ID:		94B79620SL	94B79621SL	94B79622SL	94B79623SL	94B79624SL	94B79625SL	94B79626SL	94B79627SL
Lab Code:		K947757-002	K947757-001	K947757-003	K947757-004	K947797-001	K947797-002	K947797-003	K947797-004
Date Collected:		12/12/94	12/12/94	12/12/94	12/12/94	12/13/94	12/13/94	12/13/94	12/13/94
Compound	Residendial RBC								
Petroleum Hydrocarbons (mg/Kg)									
DRO	none	ND	16	18	ND	NA	33	NA	19
TPH	none	28	48	52	11	NA	63	NA	NA
Organochlorine Pesticides (mg/Kg)									
4,4'-DDT	1.9	ND	ND	ND	ND	NA	ND	NA	ND
Volatile Organic Compounds (µg/Kg)									
Acetone	7,800,000	ND	ND	ND	ND	ND	ND	NA	71 J
Chloroform	100,000	ND	ND	ND	ND	ND	ND	NA	5 J
Carbon Tetrachloride	4,900	ND	ND	ND	ND	ND	ND	NA	30 J
Trichloroethene (TCE)	58,000	ND	ND	ND	ND	ND	ND	NA	5 UJ
Toluene	16,000,000	ND	ND	ND	ND	ND	6	NA	10 J
Total Xylenes	160,000,000	ND	ND	ND	ND	ND	14	NA	11 J
1,2,4-Trichlorobenzene	780,000	ND	ND	ND	ND	ND	ND	NA	20 UJ
Total Metals (mg/Kg)									
Arsenic	0.37	6	4	4	4	NA	6	NA	4
Barium	5,500	56	64	72	51	NA	50	NA	44
Chromium	390	34	34	38	22	NA	36	NA	24
Lead	none	5	6	6	5	NA	5	NA	5
Nickel	1,600	33	85	94	33	NA	46	NA	23
Other Analyses									
pH (units)	none	7.16	7.31	7.23	7.16	NA	7.77	NA	7.73
Redox Potential (mV)	none	220	230	200	220	NA	210	NA	200
Sulfate (mg/Kg)	none	210	150	170	110	NA	53	NA	60

FOOTNOTES:
ND = Non-detected at the method reporting limit (MRL). (See the Building 796 Appendix for MRL values.)
NA = not analyzed.
J = Value is considered an estimate.
UJ = The analyte was not detected at the MRL, however, the MRL is considered an estimate.
A shaded value indicates result exceeds the residential risk based concentration (RBC).

QAQC\COMMON\RICH\FINALS\REPTABLE\TABLES.XLS]796 soil

10/15/96

TABLE 5.5-2 Summary of Analytes Detected
Building 796 Groundwater Sample Analytical Results

	Location:	MW AP 3513		
	Sample ID:	94B79628GW	94B79628GW	94B79629GW
	Lab Code:	K948014-001	K948049-001	K948049-003
	Date Collected:	12/21/94	12/21/94	12/21/94
Compound	**Residential RBC**			
Petroleum Hydrocarbons (µg/L)				
DRO	none	199	132	238
TPH	none	ND	0.5	0.8
Volatile Organic Compounds (µg/L)				
Chloroform	0.15	4	3.4	3.6
Carbon Tetrachloride	0.16	0.7	0.6	0.7
Toluene	750	1	0.6	0.8
Semivolatile Organic Compounds (µg/L)				
Bis(2-ethylhexyl) Phthalate	4.8	ND	15	ND
Total Metals (µg/L)				
Arsenic	0.038	13	14	17
Barium	2,600	323	342	426
Chromium	180	81	99	129
Lead	none	14	21	26
Nickel	730	100	114	151
Other Analyses				
Sulfate (mg/L)	none	32	NA	33

FOOTNOTES:
ND = Non-detected at the method reporting limit (MRL). (See the Building 796 Appendix for MRL values.)
NA = Analysis not performed on that sample.
A shaded value indicates result exceeds the residential risk based concentration (RBC).

\\QAOC\COMMON\RICH\FINALS\REPTABLES\TABLES.XLS]796 water 10/15/96

- The precision of the bis (2-ethylhexyl) phthalate data for water sample 94B79628GW should be considered as an estimate due to the lack of submitted precision data.

- As a result of elevated detection limits, low levels of organochlorine pesticides and PCBs may not have been detected in soil samples 94B79601SL and -02SL.

5.5.4 Semi-Quantitative Risk Assessment

As described in Section 4.2, a semi-quantitative risk assessment was conducted for this site. The risk assessment is considered semi-quantitative because: 1) potential risks to ecological receptors were not evaluated, 2) the exposures evaluated reflect the available analytical data and do not necessarily represent the maximum extent of contamination or future changes in contaminant concentrations, and 3) only one exposure pathway was considered (soil ingestion); although this pathway usually yields the most conservative results, other pathways may also be important.

Building 796 is located in a developed area, consisting of a building and a paved parking lot. The building is adjacent to a road, with surface runoff into a ditch graded toward the south. There are no surface water bodies within 0.5 mile.

5.5.4.1 Compounds of Potential Concern

A summary of COPCs is presented in Table 5.5-3. These compounds include monoaromatics (toluene), chlorinated alkanes (carbon tetrachloride, chloroform), and metals (arsenic, chromium, and nickel). As shown in Table 5.5-3, some of these compounds are carcinogens.

Table 5.5-3. Compounds of Potential Concern
Building 796

Type	Source	Carcinogens	Noncarcinogens
Monoaromatics	Fuels	None	Toluene
Chlorinated alkanes	Solvents	Carbon tetrachloride Chloroform	None
Metals[1]	Background soil; fuels and oils; batteries	Arsenic	Nickel Chromium

[1] Based on the background metals statistics evaluation in Appendix A, some metals were not included in the semi-quantitative risk assessment because they were not statistically significant from background concentrations.

All other target analytes were either 1) not detected, 2) below the RBC for tap water, 3) below 1/10th of the RBC for residential soil, or 4) not statistically different from the background sample population (metals only). As shown by Table 4-1, however, RBCs are not available for some compounds. These compounds were included in the semi-quantitative risk assessment *only* when they were detected in a site-related sample. In addition, a list of compounds that were not detected at detection limits exceeding current risk-based concentrations is provided in Table 5.5-4 . Most of these compounds were identified in the Work Plan (ENSR 1994) but require special analytical services to achieve reporting limits below RBCs. During the RI/FS, Table 5.5-4 should be reviewed to determine if the likelihood that the compound is present warrants the use of special analytical services.

As described in Section 5.5.4.4, the toxicity of petroleum hydrocarbons cannot be evaluated using bulk hydrocarbon measurements (GRO, DRO, and TPH). As a result, these data were not included in the semi-quantitative risk assessment.

5.5.4.2 Sources, Transport Mechanisms, Exposure Pathways, and Receptors

Sources, transport mechanisms, exposure pathways, and receptors (elements of a Conceptual Site Model) are shown on Figure 5.5-4. As discussed previously, primary sources include an oil/water separator and a former acid discharge line. Secondary sources include contaminated surface soil, subsurface soil, and groundwater. It is not known whether surface waters have been impacted.

Potential transport mechanisms include surface water transport, leaching and groundwater transport, and volatilization. Within the air phase, volatile COPCs may disperse in the atmosphere or accumulate in enclosed spaces. Three volatile compounds were detected (toluene, carbon tetrachloride, and chloroform). Concentrations of these compounds are not expected to be significant in atmospheric air, but may be of concern within Building 796. Similarly, concentrations of nonvolatile COPCs in airborne dust are not expected to be of concern in the atmosphere (see Appendix A, Section A.5).

Surface water transport is not expected to be significant, since the surrounding topography is relatively flat, and no surface water bodies are present within 0.5 mile of the site. Leaching and groundwater transport has resulted in migration of toluene, chloroform, and carbon tetrachloride. The dynamic state of the dissolved plume (expanding, degrading, or steady state) is not known, but is expected to be degrading. Long-term monitoring, or leaching and dissolved phase transport modeling, is required to verify this conclusion.

Table 5.5-4 Compounds Not Detected at Detection Limits Exceeding Current Risk-Based Concentrations, Building 796

Compound	Matrix	Maximum Detection Limit	Risk-Based Concentration
Heptachlor	Water	0.04 μg/L	0.0023 μg/L
Aldrin	Water	0.04 μg/L	0.004 μg/L
Heptachlor Epoxide	Water	0.04 μg/L	0.0012 μg/L
Dieldrin	Water	0.04 μg/L	0.0042 μg/L
Toxaphene	Water	1 μg/L	0.061 μg/L
Chlordane	Water	0.5 μg/L	0.052 μg/L
Vinyl Chloride	Water	0.5 μg/L	0.019 μg/L
1,1-Dichloroethene	Water	0.5 μg/L	0.044 μg/L
Chloroform	Water	0.5 μg/L	0.15 μg/L
Carbon Tetrachloride	Water	0.5 μg/L	0.16 μg/L
1,2-Dichloroethane	Water	0.5 μg/L	0.12 μg/L
Benzene	Water	0.5 μg/L	0.36 μg/L
1,2-Dichloropropane	Water	0.5 μg/L	0.16 μg/L
Bromodichloromethane	Water	0.5 μg/L	0.17 μg/L
cis-1,3-Dichloropropene	Water	0.5 μg/L	0.077 μg/L
trans-1,3-Dichloropropene	Water	0.5 μg/L	0.077 μg/L
1,1,2-Trichloroethane	Water	0.5 μg/L	0.19 μg/L
1,2-Dibromoethane (EDB)	Water	2 μg/L	0.00075 μg/L
1,1,1,2-Tetrachloroethane	Water	0.5 μg/L	0.41 μg/L
1,1,2,2-Tetrachloroethane	Water	0.5 μg/L	0.052 μg/L
1,4-Dichlorobenzene	Water	0.5 μg/L	0.44 μg/L
1,2-Dibromo-3-chloropropane (DBCP)	Water	2 μg/L	0.048 μg/L
Hexachlorobutadiene	Water	2 μg/L	0.14 μg/L
N-Nitrosodimethylamine	Water	25 μg/L	0.0013 μg/L
Aniline	Water	25 μg/L	10 μg/L
Bis(2-chloroethyl) Ether	Water	10 μg/L	0.0092 μg/L
1,4-Dichlorobenzene	Water	10 μg/L	0.44 μg/L
Bis(2-chloroisopropyl) Ether	Water	10 μg/L	0.26 μg/L
N-Nitrosodi-n-propylamine	Water	10 μg/L	0.0096 μg/L
Hexachloroethane	Water	10 μg/L	0.75 μg/L
Nitrobenzene	Water	10 μg/L	3.4 μg/L
Hexachlorobutadiene	Water	10 μg/L	0.14 μg/L
Hexachlorocyclopentadiene	Water	10 μg/L	0.15 μg/L
2-Nitroaniline	Water	25 μg/L	2.2 μg/L
Hexachlorobenzene	Water	10 μg/L	0.0066 μg/L
3,3'-Dichlorobenzidine	Water	25 μg/L	0.15 μg/L
Benz(a)anthracene	Water	10 μg/L	0.092 μg/L
Bis(2-ethylhexyl) Phthalate	Water	10 μg/L	4.8 μg/L
Chrysene	Water	10 μg/L	9.2 μg/L

Note: Some detection limits are elevated due to analytical interference. See the Building 796 Appendix for a complete list of detection limits

Table 5.5-4, cont'd. Compounds Not Detected at Detection Limits Exceeding Current Risk-Based Concentrations, Building 796

Compound	Matrix	Maximum Detection Limit	Risk-Based Concentration
Benzo(b)fluoranthene	Water	10 µg/L	0.092 µg/L
Benzo(k)fluoranthene	Water	10 µg/L	0.92 µg/L
Benzo(a)pyrene	Water	10 µg/L	0.0092 µg/L
Indeno(1,2,3-cd)pyrene	Water	10 µg/L	0.092 µg/L
Dibenz(a,h)anthracene	Water	10 µg/L	0.0092 µg/L
2,4,6-Trichlorophenol	Water	10 µg/L	6.1 µg/L
Pentachlorophenol	Water	25 µg/L	0.56 µg/L
Arsenic	Water	5 µg/L	0.038 µg/L
1,2-Dibromoethane (EDB)	Soil	20 µg/Kg	7.5 µg/Kg
N-Nitrosodimethylamine	Soil	2 mg/Kg	0.013 mg/Kg
N-Nitrosodi-n-propylamine	Soil	0.3 mg/Kg	0.091 mg/Kg
3,3'-Dichlorobenzidine	Soil	2 mg/Kg	1.4 mg/Kg
Benzo(a)pyrene	Soil	0.3 mg/Kg	0.088 mg/Kg
Dibenz(a,h)anthracene	Soil	0.3 mg/Kg	0.088 mg/Kg

Note: Some detection limits are elevated due to analytical interference. See the Building 796 Appendix for a complete list of detection limits

Depending on the future land use, potential receptors may include residents, occupational workers, and construction workers. Ecological receptors include terrestrial plants, mammals, and avian species.

5.5.4.3 Exposure Assessment

A preliminary exposure assessment was performed for the soil ingestion and drinking water ingestion pathways. Exposures via these pathways generally result in greater chemical uptake than dermal contact, inhalation, or recreation use. Accordingly, these pathways were selected to determine if chemical exposures represent a significant human health risk. If human health risks via soil ingestion and drinking water ingestion are significantly below the acceptable risk threshold, then combined health risks from other exposure pathways are probably within acceptable limits. However, if human health risks via soil ingestion and drinking water ingestion are close to the acceptable risk threshold, then other exposure pathways should be evaluated as part of the baseline risk assessment.

Exposures were calculated using default exposure factors for residential and commercial/industrial receptors (EPA 1995a). These exposure factors reflect individuals with the highest chronic exposure for noncarcinogens and the highest cumulative exposure for carcinogens. For example, exposures to noncarcinogens are calculated assuming childhood exposure only, whereas exposures to carcinogens are calculated assuming combined childhood and adult exposure. A list of the exposure factors and equations is provided in Appendix A.

Exposure concentrations in soil were calculated as the 95 percent UCL of the average concentration of all samples analyzed from a particular medium (surface soil, subsurface soil, or groundwater). If the compound was not detected, one-half of the reporting limit was used to calculate the 95 percent UCL. This approach is consistent with EPA guidance (EPA 1991, 1992).

5.5.4.4 Toxicity Assessment

Dose-response factors were obtained from EPA (1995a). These factors were obtained from:

1) EPA's Integrated Risk Information System (current as of January 1, 1995),
2) EPA's Health Effects Assessment Summary Tables (current through March 1994),
3) The Superfund Health Risk Technical Support Center, and
4) Other EPA sources.

Although provisional dose response factors have been developed for JP-4, JP-5, gasoline, and diesel fuel (EPA 1992b), these values are not appropriate for this evaluation. These values are based on fresh petroleum products and do not accurately represent the composition, and therefore the toxicity, of weathered petroleum products. They have not been subjected to rigorous peer review and are not routinely used, even by EPA, in risk assessment. As a result, bulk hydrocarbon measurements (GRO, DRO, and TPH) were not included in the semi-quantitative risk assessment.

5.5.4.5 Human Health Risk Characterization

The following sections summarize potential human health risks via soil ingestion and drinking water ingestion. As described previously, exposures via these pathways generally result in greater chemical uptake than dermal contact, inhalation, or recreation use. Accordingly, if human health risks via soil ingestion and drinking water ingestion are significantly below the acceptable risk threshold, then combined health risks from other exposure pathways are probably within acceptable limits. However, if human health risks via soil ingestion and drinking water ingestion are close to the acceptable risk threshold, then other exposure pathways may be evaluated as part of the baseline risk assessment.

Human Health Risks - Carcinogenic

Carcinogenic risks for the soil ingestion and drinking water ingestion pathways are summarized on Table 5.5-5. Detailed risk calculations for each pathway and receptor are presented in Appendix A.

Table 5.5-5. Carcinogenic Risks for Soil Ingestion and Drinking Water Ingestion Building 796

Pathway	Carcinogenic Risk	
	Residential	Occupational
Surface Soil	2.9×10^{-10}	3.4×10^{-11}
Subsurface Soil	1.5×10^{-10}	1.8×10^{-11}
Groundwater (as tap water)	4.7×10^{-4}	2.2×10^{-4}
Total Risk	4.7×10^{-4}	2.2×10^{-4}

Using residential and occupational exposure factors, the excess lifetime carcinogenic risk for soil/drinking water ingestion exceeds the lower benchmark of 1 x 10^{-6} listed in the NCP. As a result, exposures via inhalation and dermal contact may also be evaluated. The majority of the carcinogenic risk is associated with ingestion of arsenic in groundwater. It is important to note that it was not possible to determine whether the arsenic levels in groundwater are within normal background ranges. If groundwater arsenic concentrations are within normal background ranges, total carcinogenic risks would fall below the 1 x 10^{-6} benchmark for both residential and occupational exposure. The soil exposures do not exceed the lower benchmark of 1 x 10^{-6} listed in the NCP.

Human Health Risks - Noncarcinogenic

Noncarcinogenic hazard indices for the soil ingestion and drinking water ingestion pathways are summarized on Table 5.5-6. Detailed risk calculations for each pathway and receptor are presented in Appendix A.

Table 5.5-6. Hazard Indices for Soil Ingestion and Drinking Water Ingestion Building 796

Pathway	Hazard Index	
	Residential	Occupational
Surface Soil	Not calculated; concentrations below relevant thresholds	
Subsurface Soil	Not calculated; concentrations below relevant thresholds	
Groundwater (as tap water)	0.0013	0.00096
Total Hazard Index	0.0013	0.00096

Using both residential and occupational exposure factors, the total hazard index for soil/drinking water ingestion is well below the estimated threshold for adverse effects (1.0).

5.5.4.6 Ecological Risk Characterization

Quantitative assessment of ecological risks can be performed at the organism, population, or ecosystem level. Although ecosystem-level effects may be the most important, effects testing and modeling are rarely performed due to a number of practical considerations (Suter 1993).

Quantification of population-level effects, such as reproductive potential, is important to maintain species populations; whereas assessment of organism-level effects evaluates the risk to individual organisms.

Chemicals can be evaluated as single compounds or as mixtures. Methods for evaluating the toxicity of mixtures requires knowledge regarding the sites and modes of action of individual compounds. Unlike for human health risk assessment, these methods have not been standardized, and there is some debate regarding the most appropriate approach.

If potential exposure pathways and receptors are present, ecological assessment begins with identification of the compounds of potential concern. This can be done in a similar fashion as for human health risk assessment, using ecological RBCs. Ecological RBCs may include toxicity benchmarks, sediment quality criteria, or other regulatory criteria. One set of criteria in common use provides benchmark concentrations for eight representative mammalian species and nine avian species (Opresko et al. 1994). Although benchmark concentrations are provided for 76 chemicals, toxicity benchmarks are not available for many target analytes. Also, the benchmarks are provided as concentrations in food, requiring evaluation of plant uptake and other routes of dietary exposure. Due to the large number of analytes measured at Building 796, ecological RBCs were not compiled as part of this project.

Potential receptors at Building 796 include terrestrial and avian species at a variety of trophic levels. The most highly exposed species include those with a small home range and small body weight to food consumption ratio (e.g., mice and resident songbirds). However, other less exposed species may warrant evaluation based on their susceptibility to particular chemicals (e.g., reproductive effects of 4,4'-DDT in raptors).

As part of the RI/FS, ecological RBCs may be identified for representative terrestrial and avian species. Compounds of potential concern may be selected based on a comparison of ecological RBCs with measured concentrations. At this point, the appropriate risk quantitation methods and measurement endpoints may be selected.

5.5.5 Findings and Conclusions

The risks associated with noncarcinogenic compounds are below the estimated threshold for adverse effects, the excess lifetime carcinogenic risk for drinking water ingestion exceeds the lower benchmark of 1×10^{-6} listed in the NCP. The majority of the excess lifetime cancer risk is associated with arsenic in groundwater. Arsenic is assumed to be completely in its carcinogenic form and above natural background levels. The remainder of the risk is associated with carbon tetrachloride and chloroform. However, if arsenic were eliminated as a compound of potential concern by comparison with background levels in groundwater, carcinogenic risks would also fall below the threshold for adverse effects.

The semi-quantitative risk assessment was performed using exposure assumptions that may not be appropriate for the site (e.g., residential use). In addition, the extent of contamination and the dynamic state of soil and groundwater contamination plumes (expanding, degrading, or steady-state) have not been evaluated. The exposure assumptions, compounds of concern, future land use, and contaminant fate and transport may be re-evaluated for inclusion in a baseline risk assessment, if required. In addition, ecological receptors, RBCs, risk quantitation methods, and measurement endpoints may be identified for inclusion in a baseline ecological risk assessment.

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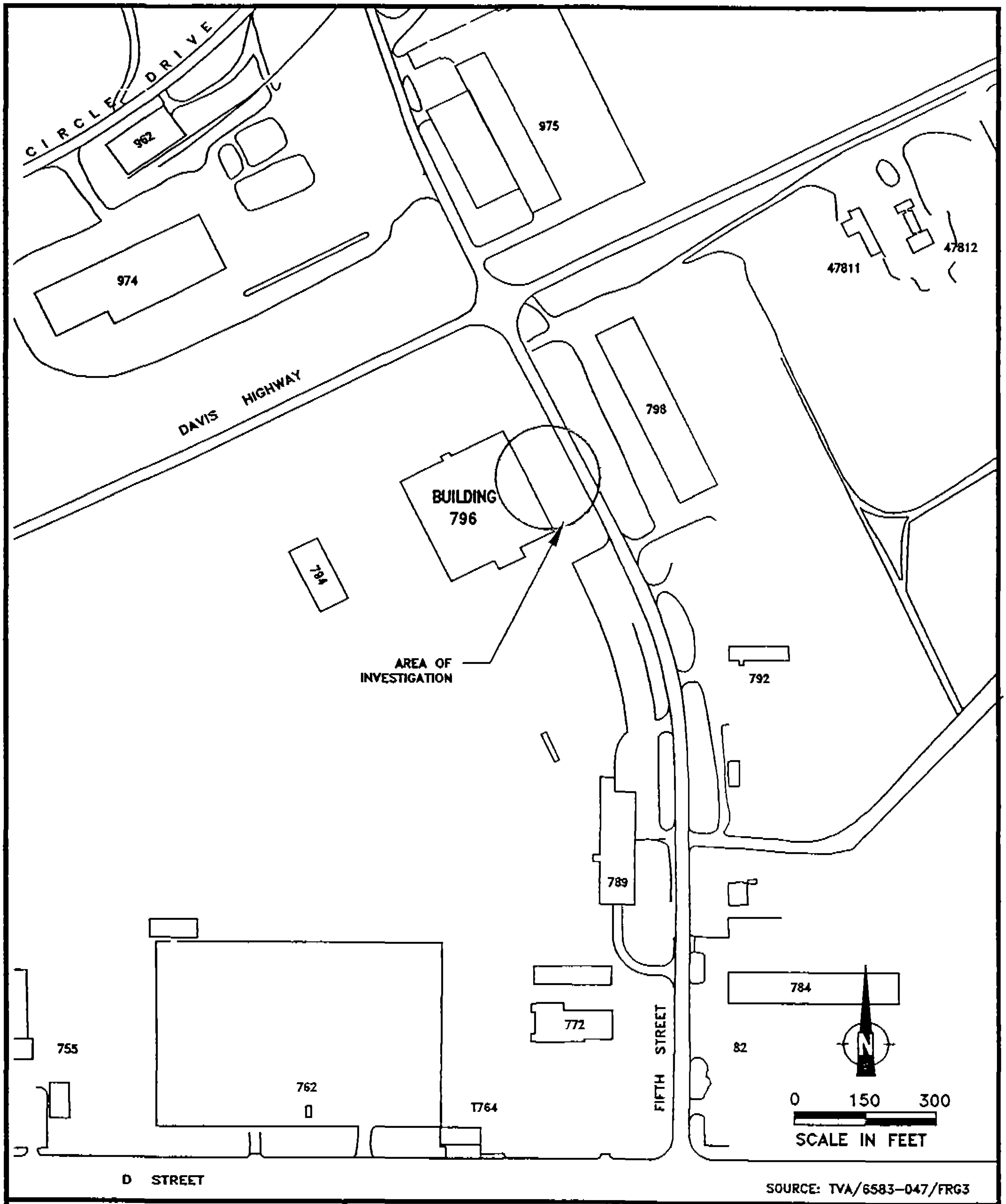


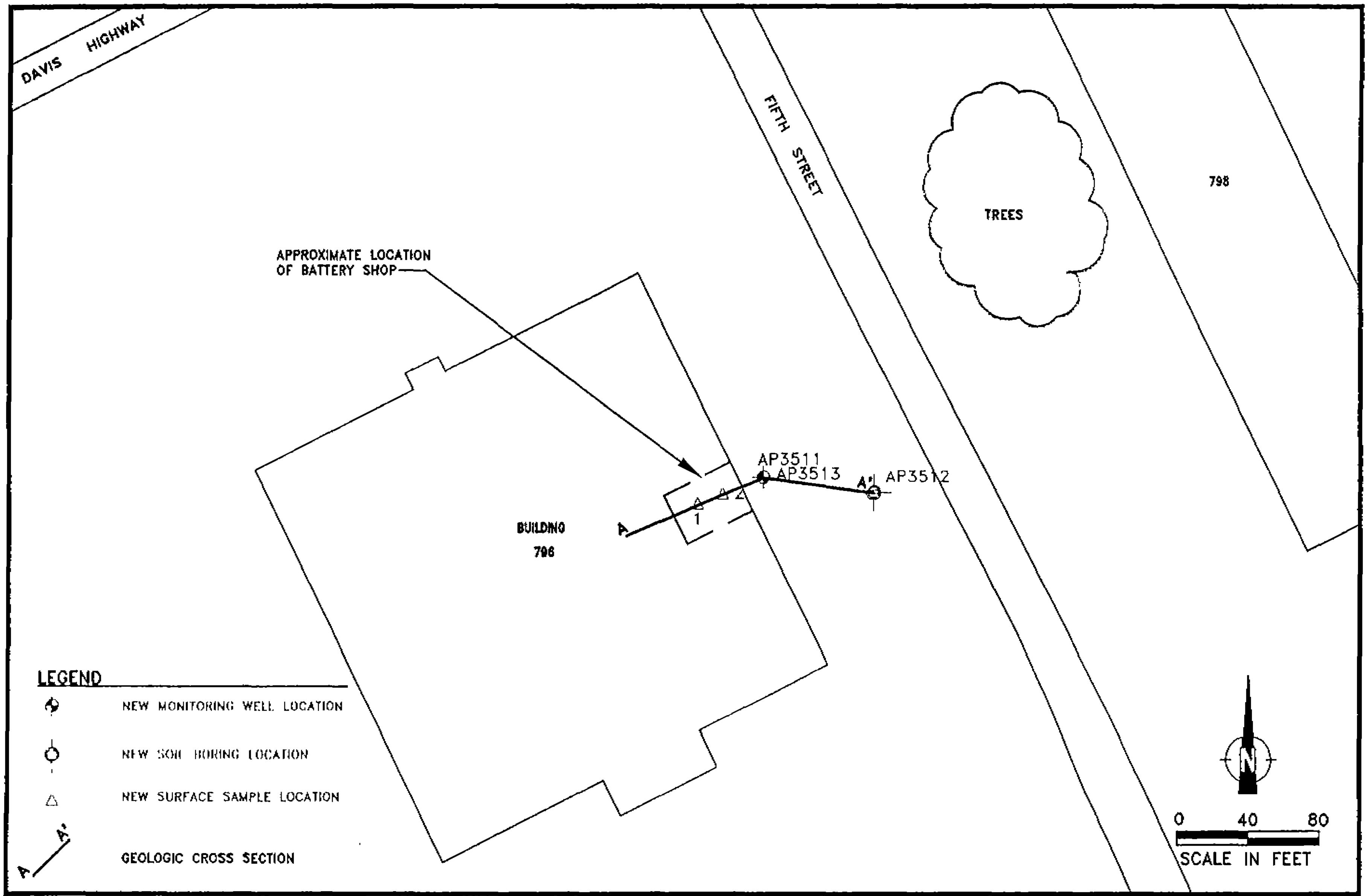
SOURCE: TVA/6583-047/FRG3

DRAWING: 796LOCA DRAWN: ABB
C/SC: 1:300 DISK: 304/95
DATE: 03/30/95 CHECK: WW

FIGURE 5.5-1
LOCATION MAP
BUILDING 796

OPERABLE UNIT D
FORT RICHARDSON
PROJECT 9000-036

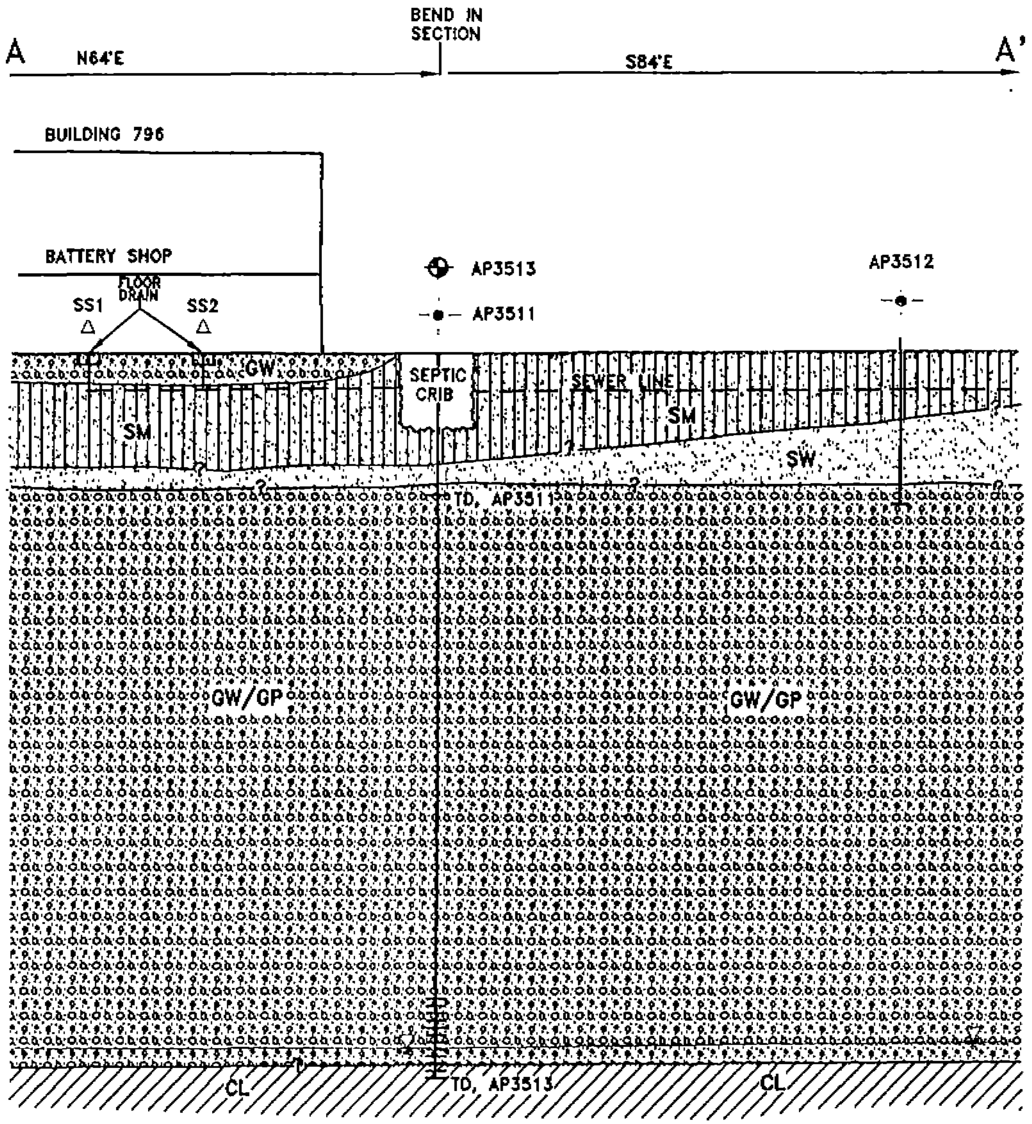
F5.5-B



DRAWING: 796SB	DRAWN: ABB
C/SC: 1:80	DISK: 304/95
DATE: 8/14/95	CHECK: WW

FIGURE 5.5-2
SOIL BORING & MONITORING WELL LOCATIONS–ANALYTICAL SOIL & GROUNDWATER RESULTS
BUILDING 796

OPERABLE UNIT D
FORT RICHARDSON, ALASKA
PROJECT 9000-036



LEGEND

◑	EXISTING MONITORING WELL LOCATION
-●-	PREVIOUS SOIL BORING
⊕	NEW MONITORING WELL LOCATION
-○-	NEW SOIL BORING LOCATION
△	NEW SURFACE SAMPLE LOCATION
▩	WELL & POORLY GRADED GRAVEL (GW/GP)
▨	CLAY (CL)
░	WELL GRADED SANDS (SW)
▩	WELL GRADED GRAVELS (GW)
▥	SILTY SANDS (SM)

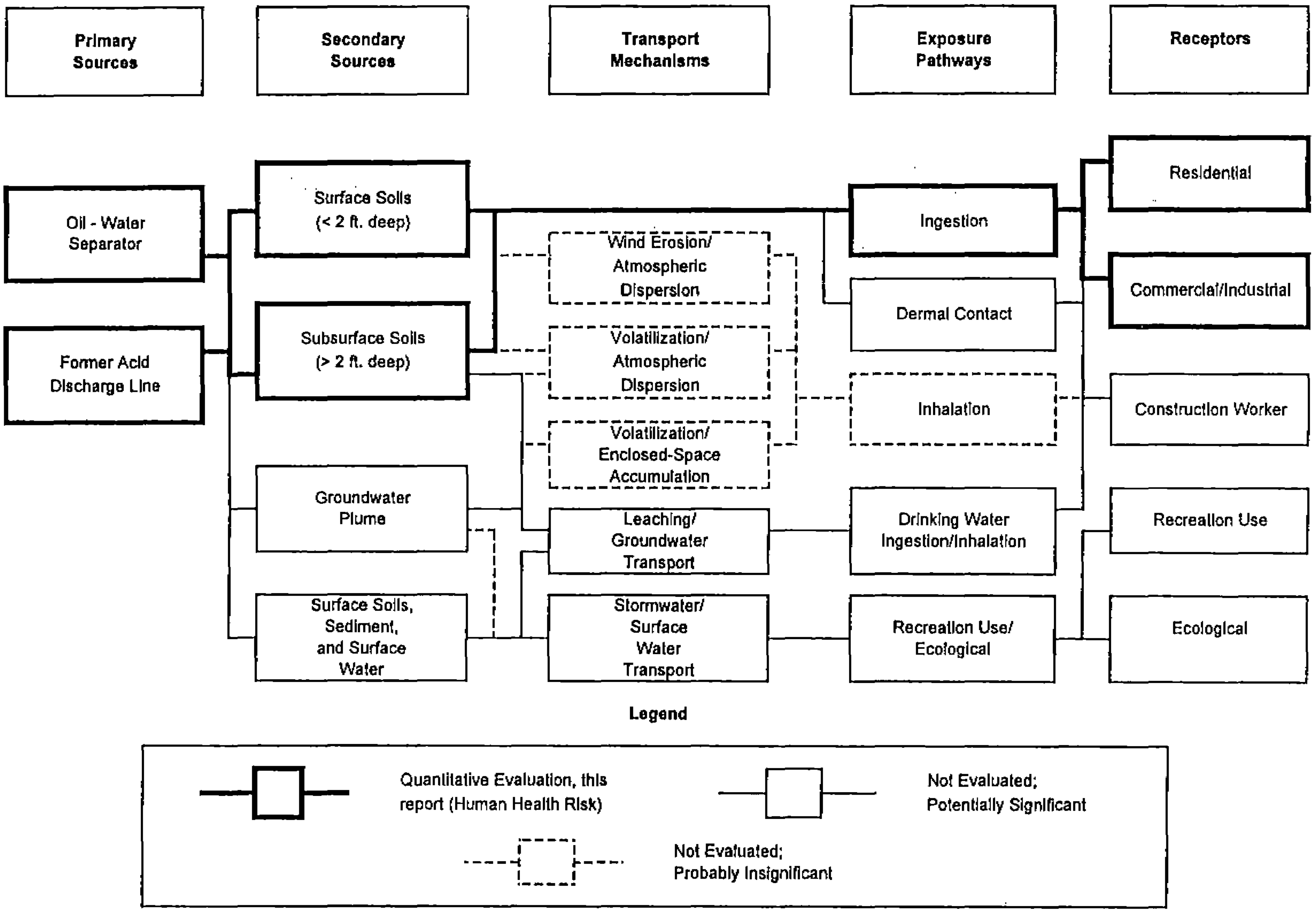
SCALE: 1"= 30', NO VERTICAL EXAGGERATION

DRAWING: BLG796CS
C/SC: 1:1
DATE: 3/20/95
DRAWN: ABB
DISK: NET
CHECK: PK

FIGURE 5.5-3
CROSS SECTION
A-A'
FOR BUILDING 796

OPERABLE UNIT D
FORT RICHARDSON, ALASKA
PROJECT 9000-036

Figure 5.5-4: Sources, Transport Mechanisms, Exposure Pathways, and Receptors
Building 796



After ASTM (1994)
P:\COMMON\PSE2DATA\SCR-RCPT.XLS

Building
955

5.6 Building 955

5.6.1 Site History

This site was the location of a former sludge bin that was used as a transfer area for petroleum wastes (Figure 5.6-1). The bin reportedly consisted of a storage tank that had been split lengthwise. Waste liquids containing water and some solids were transported to this area from various base sources and allowed to separate by gravity. When wastes settled, they were segregated into water, liquid petroleum compounds, and sludge. Water was pumped from the bin and disposed. Liquid petroleum was pumped to railroad tanker cars and transported to Fort Wainwright for energy recovery. Sludges were shoveled into drums and disposed off site.

Potential COPCs associated with the sludge bin include petroleum hydrocarbons, fuels, kerosene, VOCs, SVOCs, PCBs, ethylene glycol, metals, herbicides, and pesticides.

In March 1993, the USACE conducted a geotechnical investigation of soils near the former sludge bin. Subsurface soil samples indicated the presence of petroleum hydrocarbons, VOCs, herbicides, and pesticides.

The focus of this investigation is the original sludge bin described above; however, at least two other sludge bins and possibly three have been in use or are scheduled to be used at the site. Building 955 was reportedly built over one of the additional sludge bins. It has been described as a storage tank split lengthwise. In addition, a new sludge bin and building were constructed in 1990 and became operational in 1994.

5.6.2 Field Investigation

The objective of the PSE2 investigation at Building 955 was to evaluate the potential presence of contaminants in subsurface soils at the suspected location of the former sludge bin. Groundwater was not investigated at this site because the location of the former grease pit was poorly documented and the intent of the PSE2 was to identify specific contaminants in the soil. A groundwater investigation, if necessary, could be included as part of an RI.

The investigation involved collecting subsurface soil samples from four 20-foot soil borings (Figure 5.6-2). The locations for the borings were selected based on review of aerial photographs (dated May 1974). The first boring was centered in a dark stained area identified on the photographs, and subsequent boring locations were based on the expected spread of potential contamination within an area of approximately 20 square feet. Aerial photography was used because the entire site had been regraded and a fresh layer of gravel had been applied.

Boring AP-3514 (Appendix G) was advanced to 20 feet bgs. The soils encountered in the first 6 inches bgs were consistent with gravelly fill. A black staining was observed in the first sample taken at 0 to 2 feet bgs. Soil encountered to a depth of 10 feet bgs was described as sandy gravel with a slight amount of silt. Gravel with some sand was observed at 10 to 12 feet bgs. Silty sand with some gravel was observed at 12 to 18 feet bgs. The last sample was taken at 18 to 20 feet bgs, and the soils were described as gravel with some sand. A slight hydrocarbon odor was observed near the top of boring. The odor became stronger as the depth increased. OVM readings ranged from 32.5 ppm near the surface to 260 ppm at 14 feet bgs.

Boring AP-3515 was advanced to 20 feet bgs. Sand with some gravel was observed to 20 feet bgs. A slight orange staining was observed in the sample taken at 6 to 8 feet bgs and determined to be iron oxidation. No odors were observed in this boring.

Boring AP-3516 was advanced to 20 feet bgs. Sand with some gravel was observed to a depth of 12 feet bgs. Sandy gravel was observed at 12 to 16 feet bgs. A 12-inch layer of black peat was observed at 16 feet bgs. The soils were described as sand with some gravel from 16.5 to 20 feet bgs. A slight orange staining was again observed at a depth of 13 feet bgs and attributed to iron oxidation. There were no odors observed throughout this boring. OVM readings ranged from 0.2 ppm to 2.3 ppm.

Boring AP-3517 was advanced to 20 feet bgs. Sandy gravel fill was described from the samples at 0 to 2, 2 to 4, and 8 to 10 feet bgs. The soil from 10 to 20 feet bgs was described as sand with some gravel. A slight orange staining was observed at a depth of 14 feet bgs. There were no odors observed at this boring. OVM readings ranged from 0.2 ppm to 2.3 ppm.

Based on soil boring logs, a cross section of the investigation area is presented in Figure 5.6-3.

5.6.3 Analytical Results

A total of 20 samples, including two blind duplicates and two QA samples, were collected. Samples were analyzed for TRPH, GRO, DRO, VOCs, PCBs/organochlorine pesticides, chlorinated herbicides, SVOCs, ethylene glycol, and metals. Analytes above the MRLs are shown in Table 5.6-1. A complete summary of analytical data for Building 955 is presented in Appendix G.

In addition, eight samples, generally two from each boring, were sent to the USACE NPD laboratory for geotechnical testing, including Atterburg limits, grain size distribution, and percent moisture content. Results from the soil geotechnical analyses are provided in Appendix G.

TABLE 5.6-1 Summary of Analytes Detected
Building 955 Soil Sample Analytical Results

Part 1 of 2

	Location:	SB AP 3514				SB AP 3515				
	Sample Depth:	0-4'	8'-12'	12'-16'	16'-20'	0-6'	0-6'	8'-12'	12'-16'	16'-20'
	Sample ID:	94B95501SL	94B95502SL	94B95503SL	94B95504SL	94B95505SL	94B95506SL	94B95507SL	94B95508SL	94B95509SL
	Lab Code:	K946767-001	K946767-002	K946767-003	K946767-004	K946767-005	K946767-006	K946767-007	K946767-008	K946767-009
	Date Collected:	10/28/94	10/28/94	10/28/94	10/28/94	10/28/94	10/28/94	10/28/94	10/28/94	10/28/94
Compound	Residential RBC									
Petroleum Hydrocarbons (mg/Kg)										
GRO	none	ND	ND	60	20	ND	ND	ND	ND	ND
DRO	none	353	648	1,720	486	ND	ND	ND	ND	18
TPH	none	260	300	740	190	ND	ND	ND	ND	ND
Organochlorine Pesticides (mg/Kg)										
4,4'-DDT	1.9	0.06	0.04	ND	ND	0.25	0.33	ND	ND	ND
4,4'-DDE	1.9	ND	ND	ND	ND	0.02	0.02	ND	ND	ND
Volatile Organic Compounds (µg/Kg)										
Acetone	7,800,000	ND	ND	<14,000	<7,000	67	78	ND	59	ND
Toluene	16,000,000	ND	ND	<1,400	<700	ND	8	ND	ND	13
Total Xylenes	160,000,000	6	6	<1,400	<700	ND	5	ND	ND	13
Semivolatile Organic Compounds (mg/Kg)										
Bis(2-ethylhexyl) Phthal	46	ND	ND	<1.5	ND	ND	ND	ND	ND	ND
Total Metals (mg/Kg)										
Arsenic	0.37	6	7	7	6	7	8	5	7	7
Barium	5,500	52	50	70	51	59	58	52	61	60
Chromium	390	34	31	38	31	41	34	33	37	36
Lead	none	6	6	8	5	7	8	6	6	7
Nickel	1,600	43	39	34	59	49	46	40	39	41

FOOTNOTES:
ND = Non-detected at the method reporting limit (MRL). (See the Building 955 Appendix for MRL values.)
< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.
A shaded value indicates result exceeds the residential risk based concentration (RBC).

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TABLE 5.6-1 Summary of Analytes Detected (cont.)
Building 955 Soil Sample Analytical Results

Part 2 of 2

	Location:	SB AP 3516					SB AP 3517			
	Sample Depth:	0-8'	0-8'	8'-12'	12'-16'	16'-18'	0-6'	8'-12'	12'-16'	16'-20'
	Sample ID:	94B95510SL	94B95511SL	94B95512SL	94B95513SL	94B95514SL	94B95515SL	94B95516SL	94B95517SL	94B95518SL
	Lab Code:	K946799-005	K946799-006	K946799-007	K946799-008	K946799-009	K946799-001	K946799-002	K946799-003	K946799-004
	Date Collected:	10/29/94	10/29/94	10/29/94	10/29/94	10/29/94	10/29/94	10/29/94	10/29/94	10/29/94
Compound	**Residential RBC**									
Petroleum Hydrocarbons (mg/Kg)										
GRO	none	ND	ND	ND	ND	ND	ND	ND	ND	ND
DRO	none	18	22	ND	ND	27	62	ND	ND	ND
TPH	none	31	37	ND	ND	10	31	ND	ND	ND
Organochlorine Pesticides (mg/Kg)										
4,4'-DDT	1.9	0.01	0.01	ND	ND	ND	95	0.4	0.11	ND
4,4'-DDE	1.9	ND	ND	ND	ND	ND	1.27	ND	ND	ND
Volatile Organic Compounds (µg/Kg)										
Acetone	7,800,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	16,000,000	ND	ND	ND	7	6	9	ND	ND	5
Total Xylene	160,000,000	ND	ND	6	6	ND	7	5	ND	8
Semivolatile Organic Compounds (mg/Kg)										
Bis(2-ethylhe	46	ND	2	ND	ND	ND	ND	ND	ND	ND
Total Metals (mg/Kg)										
Arsenic	0.37	5	8	5	4	4	5	5	6	5
Barium	5,500	157 J	146 J	46 J	54 J	64 J	141 J	51 J	59 J	58 J
Chromium	390	31	37	38	33	47	34	24	21	33
Lead	none	5 J	6 J	4 J	4 J	4 J	9 J	5 J	8 J	5 J
Nickel	1,600	38	39	38	41	50	45	58	31	37

FOOTNOTES ND = Non-detected at the method reporting limit (MRL). (See the Building 955 Appendix for MRL values.)
J = Value is considered an estimate.
A shaded value indicates result exceeds the residential risk based concentration (RBC).

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The laboratory quality control checks indicate that the analytical data are within acceptable criteria ranges, with the exceptions noted in the USACE NPD laboratory's CQAR and ENSR QASR located in Volumes I through III of Analytical Data for PSE2 OUD (ENSR 1995).

- The data results for barium and lead for samples 94B95510SL to -18SL should be considered estimates due to out-of-control sample duplicate RPD results.

5.6.4 Semi-Quantitative Risk Assessment

As described in Section 4.2, a semi-quantitative risk assessment was performed for this site. The risk assessment is considered semi-quantitative because: 1) potential risks to ecological receptors were not evaluated, 2) the exposures evaluated reflect the available analytical data and do not necessarily represent the maximum extent of contamination or future changes in contaminant concentrations, and 3) only one exposure pathway was considered (soil ingestion); although this pathway usually yields the most conservative results, other pathways may also be important.

Building 955 is located in a developed area of the main cantonment. The area of investigation is in a gravel pad staging area. Surrounding land uses are industrial in nature with railroad tracks on the east side of the site. A second-growth forest lies approximately 100 feet south of the site. There is no surface water bodies within 0.5 mile.

5.6.4.1 Compounds of Potential Concern

A summary of the COPCs is presented in Table 5.6-2. These compounds include insecticides (4,4'-DDT, 4,4'-DDE) and arsenic. All of these compounds are carcinogens.

Table 5.6-2. Compounds of Potential Concern
Building 955

Type	Source	Carcinogens
Polychlorinated diphenyl alkanes	Insecticides	4-4'-DDT 4,4'-DDE
Metals[1]	Background soil	Arsenic

[1] Based on the background metals statistics evaluation in Appendix A, some metals were not included in the semi-quantitative risk assessment because they were not statistically significant from background concentrations.

All other target analytes were either 1) not detected, 2) below 1/10th of the RBC for residential soil, or 3) not statistically different from the background sample population (metals only). As shown by Table 4-1, however, RBCs are not available for some compounds. These compounds were included in the semi-quantitative risk assessment *only* when they were detected in a site-related sample. In addition, a list of compounds that were not detected at detection limits exceeding current risk-based concentrations is provided in Table 5.6-3. Most of these compounds were identified in the Work Plan (ENSR 1994) but require special analytical services to achieve reporting limits below RBCs. During the RI/FS, Table 5.6-3 should be reviewed to determine if the likelihood that the compound is present warrants the use of special analytical services.

As described in Section 5.6.4.4, the toxicity of petroleum hydrocarbons cannot be evaluated using bulk hydrocarbon measurements (GRO, DRO, and TPH). As a result, these data were not included in the semi-quantitative risk assessment.

5.6.4.2 Sources, Transport Mechanisms, Exposure Pathways, and Receptors

Sources, transport mechanisms, exposure pathways, and receptors (elements of a Conceptual Site Model) are shown on Figure 5.6-4. As discussed previously, the primary source is the sludge bin/UST area. Secondary sources include contaminated surface and subsurface soil. It is not known whether groundwater or surface waters have been impacted.

Potential transport mechanisms include surface water transport, leaching and groundwater transport, and volatilization. Within the air phase, volatile COPCs may disperse in the atmosphere or accumulate in enclosed spaces. However, no volatile COPCs were detected at concentrations exceeding 1/10th of the RBC for residential soil. Concentrations of nonvolatile COPCs in airborne dust are not expected to be of concern in the atmosphere (see Appendix A, Section A.5).

Surface water transport is not expected to be significant, since the surrounding topography is relatively flat, and no surface water bodies are present within 0.5 mile of the site. Leaching is not expected to be significant, since all of the COPCs are relatively insoluble in water.

Depending on the future land use, potential receptors may include residents, occupational workers, and construction workers. Ecological receptors include terrestrial plants, mammals, and avian species.

Table 5.6-3 Compounds Not Detected at Detection Limits Exceeding Current Risk-Based Concentrations, Building 955

Compound	Matrix	Maximum Detection Limit	Risk-Based Concentration
Toxaphene	Soil	14 mg/Kg	0.58 mg/Kg
Chlordane	Soil	5 mg/Kg	0.49 mg/Kg
Aroclor 1254	Soil	3 mg/Kg	1.6 mg/Kg
Vinyl Chloride	Soil	1400 µg/Kg	340 µg/Kg
1,1-Dichloroethene	Soil	1400 µg/Kg	1100 µg/Kg
1,2-Dibromoethane (EDB)	Soil	5400 µg/Kg	7.5 µg/Kg
1,2,3-Trichloropropane	Soil	1400 µg/Kg	91 µg/Kg
1,2-Dibromo-3-chloropropane (DBCP)	Soil	5400 µg/Kg	460 µg/Kg
N-Nitrosodimethylamine	Soil	10 mg/Kg	0.013 mg/Kg
Bis(2-chloroethyl) Ether	Soil	1.5 mg/Kg	0.58 mg/Kg
N-Nitrosodi-n-propylamine	Soil	1.5 mg/Kg	0.091 mg/Kg
2-Nitroaniline	Soil	10 mg/Kg	4.7 mg/Kg
Hexachlorobenzene	Soil	1.5 mg/Kg	0.4 mg/Kg
3,3'-Dichlorobenzidine	Soil	10 mg/Kg	1.4 mg/Kg
Benz(a)anthracene	Soil	1.5 mg/Kg	0.88 mg/Kg
Benzo(b)fluoranthene	Soil	1.5 mg/Kg	0.88 mg/Kg
Benzo(a)pyrene	Soil	1.5 mg/Kg	0.088 mg/Kg
Indeno(1,2,3-cd)pyrene	Soil	1.5 mg/Kg	0.88 mg/Kg
Dibenz(a,h)anthracene	Soil	1.5 mg/Kg	0.088 mg/Kg
Pentachlorophenol	Soil	10 mg/Kg	5.3 mg/Kg

Note: Some detection limits are elevated due to analytical interference. See the Building 955 Appendix for a complete list of detection limits

5.6.4.3 Exposure Assessment

A preliminary exposure assessment was performed for the soil ingestion pathway. Soil exposures via ingestion generally result in greater chemical uptake than dermal contact, inhalation, or recreation use. Accordingly, this pathway was selected to determine if soil exposures represent a significant human health risk. If human health risks via soil ingestion are significantly below the acceptable risk threshold, then combined health risks from other exposure pathways are probably within acceptable limits. However, if human health risks via soil ingestion are close to the acceptable risk threshold, then other exposure pathways should be evaluated as part of the baseline risk assessment.

Soil exposures were calculated using default exposure factors for residential and commercial/industrial receptors (EPA 1995a). These exposure factors reflect individuals with the highest chronic exposure for noncarcinogens and the highest cumulative exposure for carcinogens. For example, exposures to noncarcinogens are calculated assuming childhood exposure only, whereas exposures to carcinogens are calculated assuming combined childhood and adult exposure. A list of the exposure factors and equations is provided in Appendix A.

Exposure concentrations in soil were calculated as the 95 percent UCL of the average concentration of all samples analyzed from a particular medium (surface or subsurface soil). If the compound was not detected, one-half of the reporting limit was used to calculate the 95 percent UCL. This approach is consistent with EPA guidance (EPA 1991, 1992).

5.6.4.4 Toxicity Assessment

Dose-response factors were obtained from EPA (1995a). These factors were obtained from:

1) EPA's Integrated Risk Information System (current as of January 1, 1995),
2) EPA's Health Effects Assessment Summary Tables (current through March 1994),
3) The Superfund Health Risk Technical Support Center, and
4) Other EPA sources.

Although provisional dose response factors have been developed for JP-4, JP-5, gasoline, and diesel fuel (EPA 1992b), these values are not appropriate for this evaluation. These values are based on fresh petroleum products and do not accurately represent the composition, and therefore the toxicity, of weathered petroleum products. They have not been subjected to rigorous peer review and are not routinely used, even by EPA, in risk assessment. As a result, bulk hydrocarbon measurements (GRO, DRO, and TPH) were not included in the semi-quantitative risk assessment.

5.6.4.5 Human Health Risk Characterization

The following sections summarize potential human health risks via soil ingestion. As described above, soil exposures via ingestion generally result in greater chemical uptake than dermal contact, inhalation, or recreation use. Accordingly, if human health risks via soil ingestion are significantly below the acceptable risk threshold, then combined health risks from other exposure pathways are probably within acceptable limits. However, if human health risks via soil ingestion are close to the acceptable risk threshold, then other exposure pathways may need to be evaluated as part of the baseline risk assessment.

Human Health Risks

Carcinogenic risks for the soil ingestion pathway are summarized on Table 5.6-4. A breakdown of risk calculations for each pathway and receptor are presented in Appendix A. Noncarcinogenic risks were not evaluated, since all noncarcinogenic compounds were either 1) not detected, 2) below 1/10th of the RBC for residential soil, or 3) not statistically different from the background sample population (metals only).

Table 5.6-4. Carcinogenic Risks for Soil Ingestion
Building 955

Pathway	Carcinogenic Risk	
	Residential	Occupational
Surface Soil	1.5×10^{-5}	1.7×10^{-6}
Subsurface Soil	7.0×10^{-9}	8.1×10^{-10}
Total Risk	1.5×10^{-5}	1.7×10^{-6}

Using both residential and occupational exposure factors, the excess lifetime cancer risk for soil ingestion exceeds the lower benchmark of 1×10^{-6} listed in the NCP. As a result, exposures via inhalation and dermal contact may also be evaluated. The risk is associated with 4,4'-DDT and 4,4'-DDE.

5.6.4.6 Ecological Risk Characterization

Quantitative assessment of ecological risks can be performed at the organism, population, or ecosystem level. Although ecosystem-level effects may be the most important, effects testing and modeling are rarely performed due to a number of practical considerations (Suter 1993). Quantification of population-level effects, such as reproductive potential, is important to maintain species populations, whereas assessment of organism-level effects evaluates the risk to individual organisms.

Chemicals can be evaluated as single compounds or as mixtures. Methods for evaluating the toxicity of mixtures requires knowledge regarding the sites and modes of action of individual compounds. Unlike for human health risk assessment, these methods have not been standardized, and there is some debate regarding the most appropriate approach.

If potential exposure pathways and receptors are present, ecological assessment begins with identification of the compounds of potential concern. This can be done in a similar fashion as for human health risk assessment, using ecological RBCs. Ecological RBCs may include toxicity benchmarks, sediment quality criteria, or other regulatory criteria. One set of criteria in common use provides benchmark concentrations for eight representative mammalian species and nine avian species (Opresko et al. 1994). Although benchmark concentrations are provided for 76 chemicals, toxicity benchmarks are not available for many target analytes. Also, the benchmarks are provided as concentrations in food, requiring evaluation of plant uptake and other routes of dietary exposure. Due to the large number of analytes measured at Building 955, ecological RBCs were not compiled as part of this project.

Potential receptors at Building 955 include terrestrial and avian species at a variety of trophic levels. The most highly exposed species include those with a small home range and small body weight to food consumption ratio (e.g., mice and resident songbirds). However, other less exposed species may warrant evaluation based on their susceptibility to particular chemicals (e.g., reproductive effects of 4,4'-DDT in raptors).

As part of the RI/FS, ecological RBCs may be identified for representative terrestrial and avian species. Compounds of potential concern may be selected based on a comparison of ecological RBCs with measured concentrations. At this point, the appropriate risk quantitation methods and measurement endpoints may be selected.

5.6.5 Findings and Conclusions

Although risks associated with noncarcinogenic compounds are below the estimated threshold for adverse effects, the excess lifetime carcinogenic risk for soil ingestion exceeds the lower benchmark of 1 x 10^{-6} listed in the NCP. The carcinogenic risk is associated with 4,4'-DDT and 4,4'-DDE.

The semi-quantitative risk assessment was performed using exposure assumptions that may not be appropriate for the site (e.g., residential use). In addition, the extent of contamination and the dynamic state of soil contamination plumes (expanding, degrading, or steady-state) have not been evaluated. The exposure assumptions, compounds of potential concern, future land use, and contaminant fate and transport may be re-evaluated for inclusion in a baseline risk assessment, if required. In addition, ecological receptors, RBCs, risk quantitation methods, and measurement endpoints may be identified for inclusion in a baseline ecological risk assessment.

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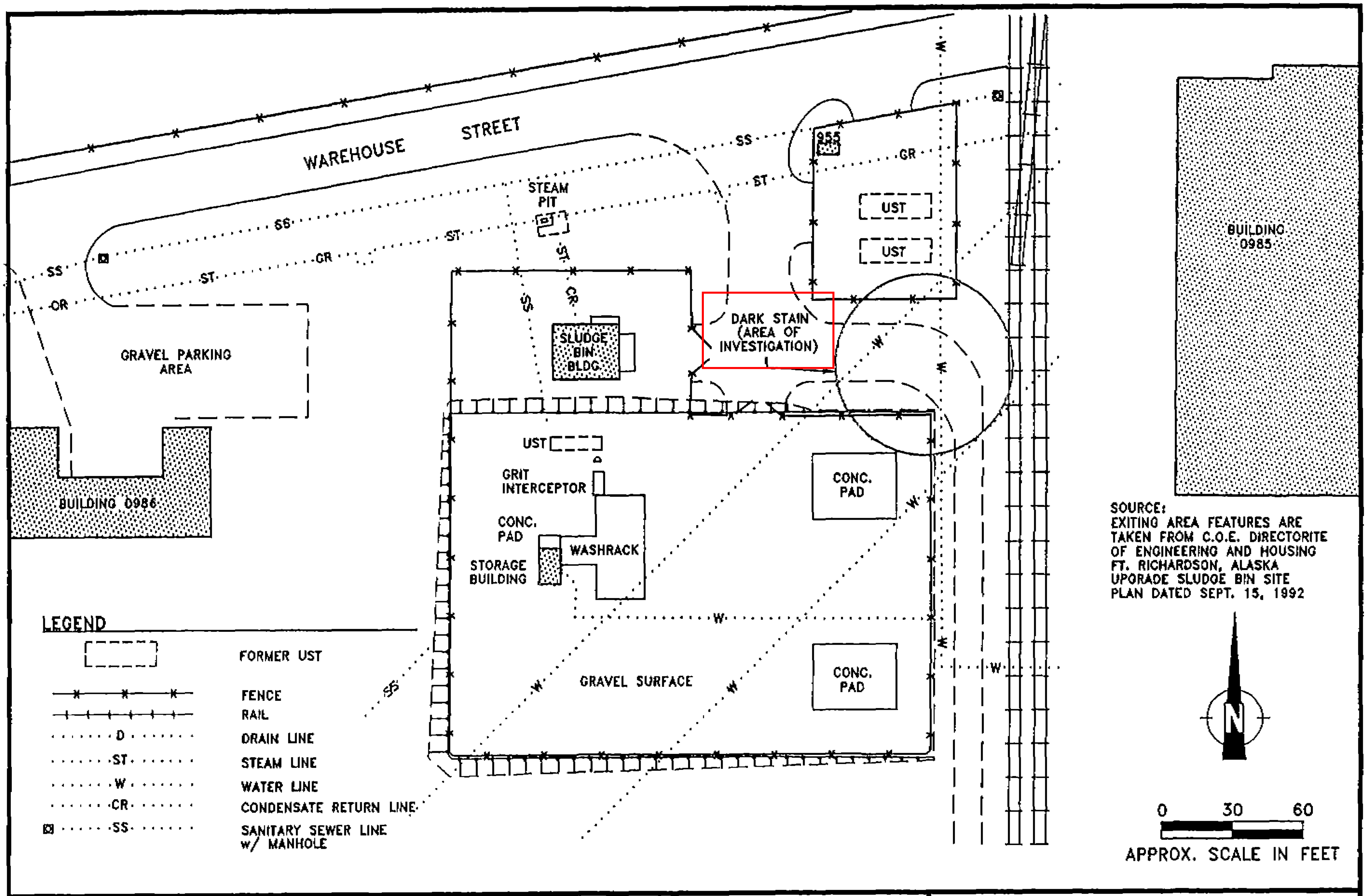
F5.6-A



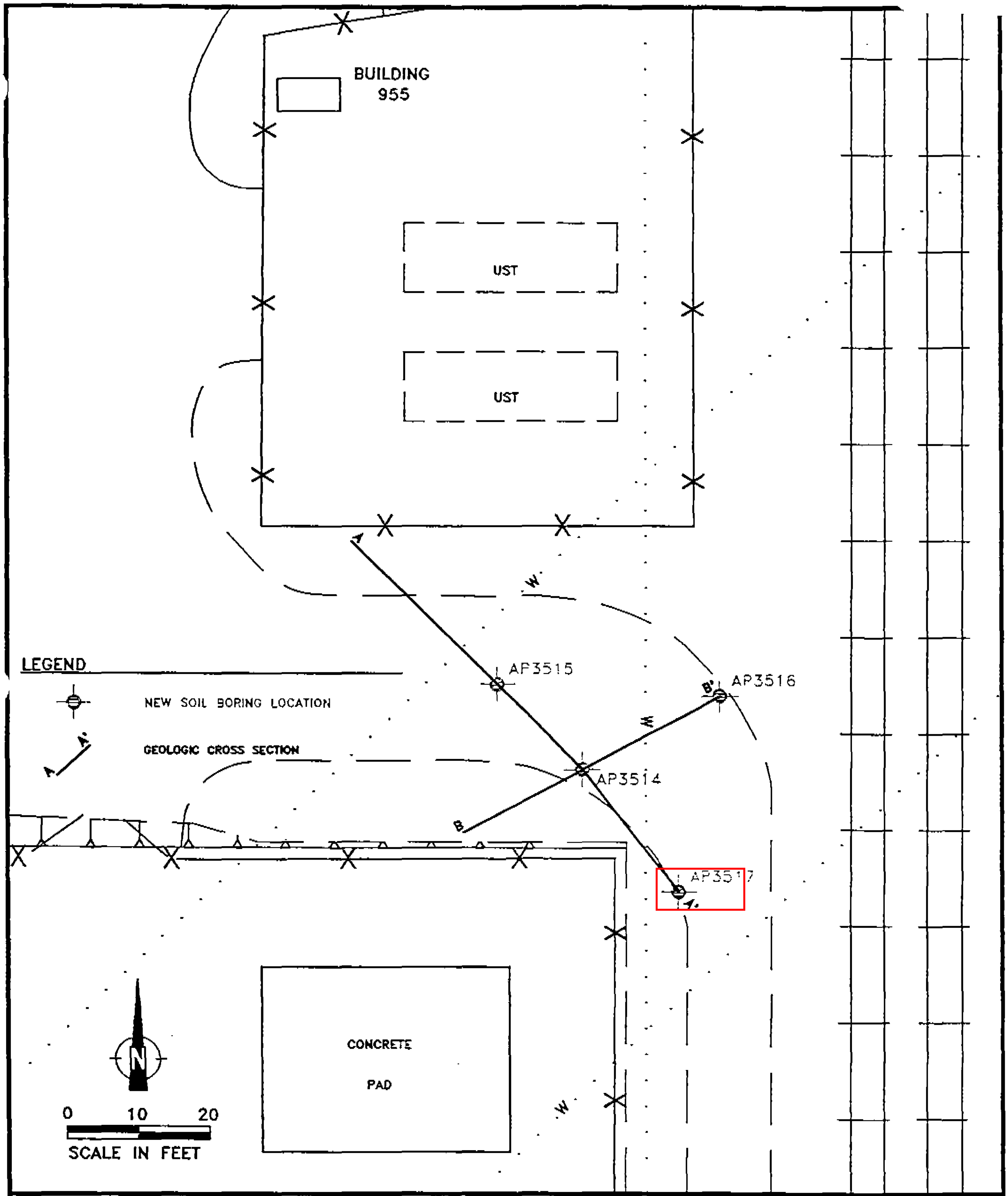
SOURCE:
EXITING AREA FEATURES ARE TAKEN FROM C.O.E. DIRECTORITE OF ENGINEERING AND HOUSING FT. RICHARDSON, ALASKA UPORADE SLUDGE BIN SITE PLAN DATED SEPT. 15, 1992

DRAWING: SBIN
C/SC: 1:60
DATE: 04/18/95

DRAWN: ABB
DISK: 122/94
CHECK: WW

FIGURE 5.6-1
LOCATION MAP
BUILDING 955

OPERABLE UNIT D
FORT RICHARDSON, ALASKA
PROJECT 9000-036

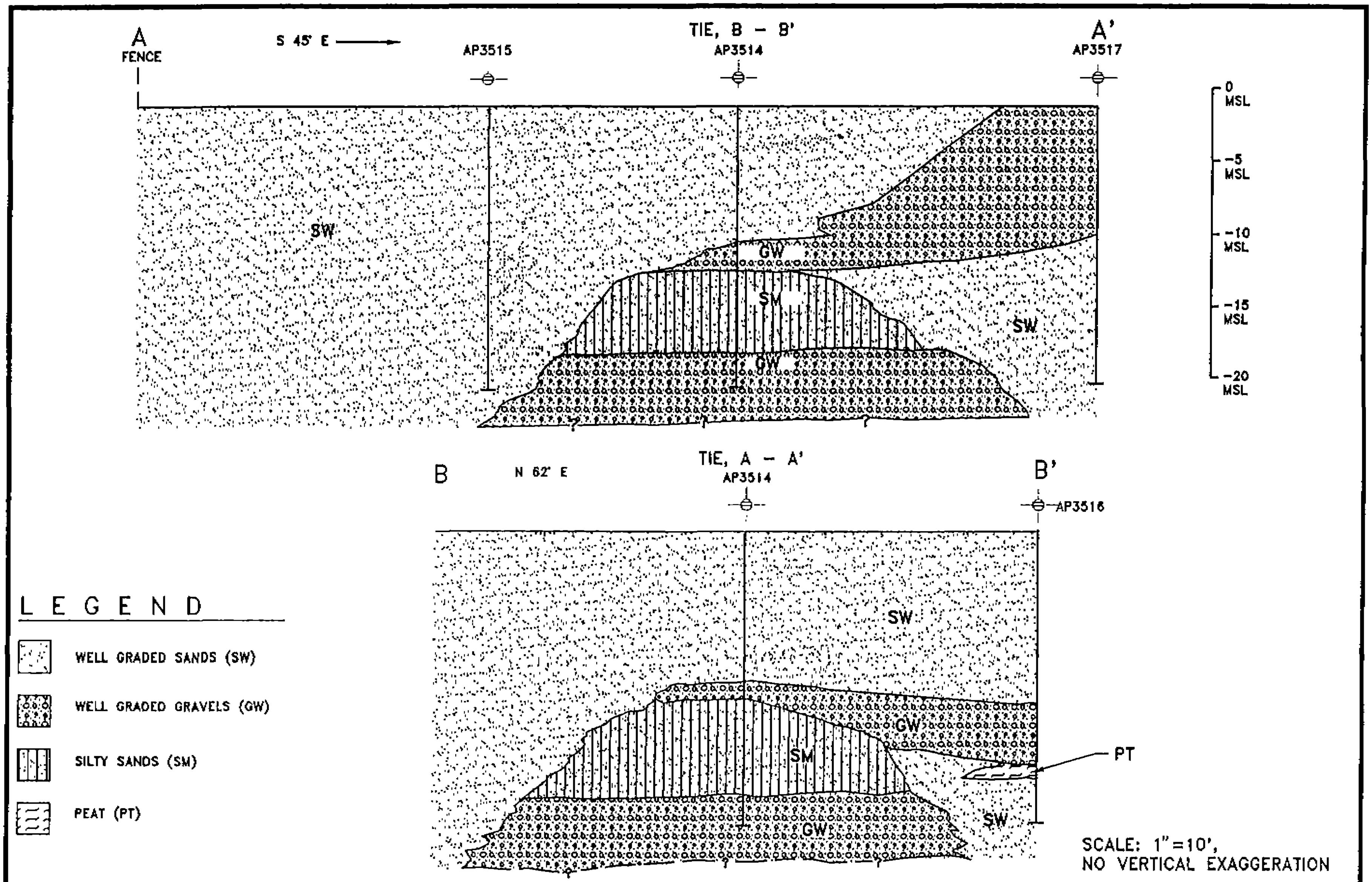


DRAWING: SBINSB
C/SC: 1:20
DATE: 8/14/95

DRAWN: ABB
DISK: 318/95
CHECK: WW

FIGURE 5.6-2
SOIL BORING LOCATIONS
BUILDING 955

OPERABLE UNIT D
FORT RICHARDSON
PROJECT 9000-036

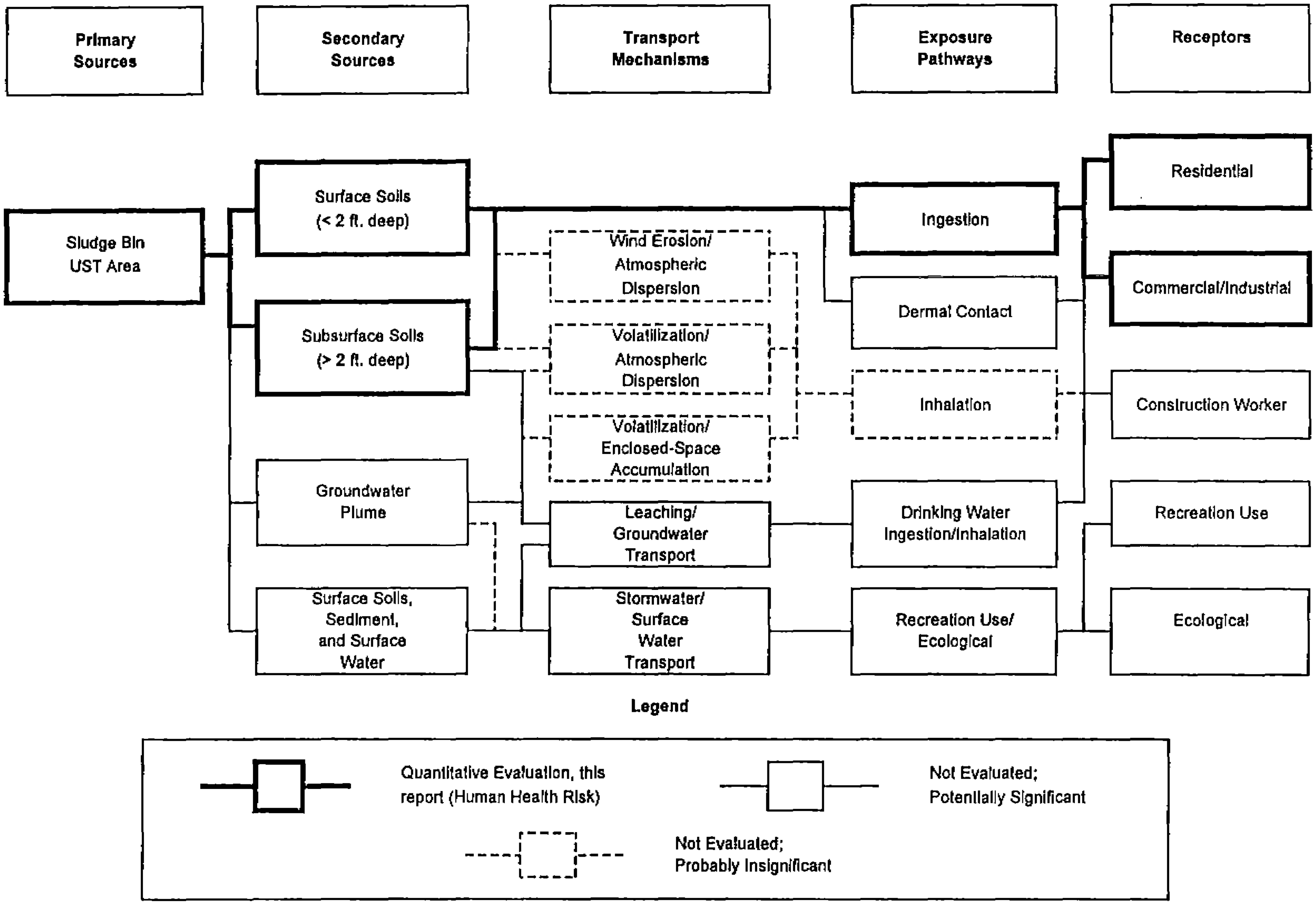


DRAWING: BLDG955CS	DRAWN: AFF,ABB
C/SC: 1:10	DISK: NET
DATE: 4/20/95	CHECK: PK

FIGURE 5.6-3
CROSS SECTION
A–A' & B–B'
FOR BUILDING 955

OPERABLE UNIT D
FORT RICHARDSON, ALASKA
PROJECT 9000-036

Figure 5.6-4: Sources, Transport Mechanisms, Exposure Pathways, and Receptors
Building 955



After ASTM (1994)
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Dust
Palliative

5.7 Dust Palliative

5.7.1 Site History

Road oiling using waste oils has historically been conducted to maintain gravel roads and parking areas at Fort Richardson. No previous investigations of gravel roads or parking lots have been conducted at the base.

Petroleum hydrocarbons, PCBs, and metals are potential contaminants of concern. In addition, herbicides and pesticides were routinely used in the past for vegetation and insect control along roadways.

The study area consists of three roadways and one gravel parking lot (Figure 5.7-1):

- A 1-mile unpaved section of UC 5497 between Roosevelt Road to the north and the turn off to the water reservoir to the south. This section is also known as the road to Otter Lake.
- Roosevelt Road east of the Alaska Railroad right of way.
- UC 5997 (Davis Highway) between Sixth Street and Roosevelt Road.
- The east side parking lot at Building 796.

5.7.2 Field Investigation

The objectives of the investigation at the Dust Palliative sites were to qualitatively evaluate the impact of road oiling over a large area. Groundwater was not investigated because the intent of the PSE2 was to identify specific contaminants impacting soils in the Dust Palliative site. A groundwater investigation, if necessary, could be included as part of an RI.

Three composite samples were collected from each of the four locations (Figures 5.7.2a and 5.7-2b). Each composite sample consisted of four grab samples. Grab samples were collected from a depth of 18 inches bgs. Equal volumes of each set of four grab samples were mixed in a stainless steel bowl to make one composite sample. The samples were then placed in appropriate sample containers.

The samples from Roosevelt Road east of the Alaska Railroad right of way and the 1 mile unpaved section of Roosevelt Road to Otter Lake were collected using a power auger to drill 18 inches bgs. Along the roadways, samples were collected from the shoulders and drainage ditches to minimize conflicts with traffic. In the parking lot at Building 796, sample locations were selected to obtain a representative sample of the area. At UC 5997 and the parking lot of Building 796, the power auger was unable to penetrate the frozen ground, and a drill rig was necessary to advance the shallow borings (samples were collected in late October).

OVM readings from field composite samples from Roosevelt Road east of the Alaska Railroad right of way ranged from 7.0 ppm to 18.0 ppm. At UC 5497, OVM readings were 44 ppm and 55 ppm. At Building 796 and UC 5997, OVM readings ranged from 0.8 ppm to 2.5 ppm.

5.7.3 Analytical Results

A total of 16 composite samples, including two blind duplicates and two QA samples, were collected and analyzed from the Dust Palliative areas. Each sample was tested for TRPH, PCBs/organochlorine pesticides, chlorinated herbicides, SVOCs, and metals. Analytes detected above the MRLs are shown in Table 5.7-1. A complete summary of analytical data is presented in Appendix H.

The laboratory quality control checks indicate that the analytical data are within acceptable criteria ranges, with the exceptions noted in the USACE NPD laboratory's CQAR and ENSR QASR located in Volumes I through III of Analytical Data for PSE2 OUD (ENSR 1995).

- Low levels of SVOC analytes may not have been detected if present in sample 94DUST13SL.

- The data of lead and chromium in samples 94DUST09SL through -15SL should be considered low estimates.

5.7.4 Semi-Quantitative Risk Assessment

As described in Section 4.2, a semi-quantitative risk assessment was performed for this site. The risk assessment is considered semi-quantitative because: 1) potential risks to ecological receptors were not evaluated, 2) the exposures evaluated reflect the available analytical data and do not necessarily represent the maximum extent of contamination or future changes in contaminant concentrations, and 3) only one exposure pathway was considered (soil ingestion); although this pathway usually yields the most conservative results, other pathways may also be important.

TABLE 5.7-1 Summary of Analytes Detected
Dust Palliative Roadway Soil Sample Analytical Results

Part 1 of 2

Location:		Building 796				Roosevelt Road			
Sample:		Surface 1		Surface 2	Surface 3	Surface 1		Surface 2	Surface 3
Sample ID:		94DUST09SL	94DUST10SL	94DUST11SL	94DUST12SL	94DUST01SL	94DUST02SL	94DUST04SL	94DUST05SL
Lab Code:		K946743-001	K946743-002	K946743-003	K946743-004	K946450-001	K946450-002	K946450-003	K946450-004
Date Collected:		10/26/94	10/26/94	10/26/94	10/26/94	10/15/94	10/15/94	10/15/94	10/15/94
Compound	**Residential RBC**								
Petroleum Hydrocarbons (mg/Kg)									
TPH	none	52	66	130	71	76	94	140	87
Organochlorine Pesticides (mg/Kg)									
4,4'-DDT	1.9	ND	ND	0.01	0.02	0.07	0.13	0.16	0.1
Semivolatile Organic Compounds (mg/Kg)									
Bis(2-ethylhexyl) Phthalate	46	ND	ND	ND	ND	ND	0.6	0.9	ND
Total Metals (mg/Kg)									
Arsenic	0.37	7	7	5	6	6	7	6	6
Barium	5,500	51	41	41	64	61	81	46	50
Chromium	390	23 J	23 J	23 J	18 J	34	42	43	31
Lead	none	20 J	17 J	25 J	14 J	9	11	13	10
Nickel	1,600	40	32	30	23	35	34	42	40

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL). (See the Dust Palliative Roadway Appendix for MRL values.)
J = Value is considered an estimate.
A shaded value indicates result exceeds the residential risk based concentration (RBC).

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TABLE 5.7-1 Summary of Analytes Detected (cont.)
Dust Palliative Roadway Soil Sample Analytical Results

Part 2 of 2

Location:		UC 5497			UC 5997		
Sample:		Surface 1	Surface 2	Surface 3	Surface 1	Surface 2	Surface 3
Sample ID:		94DUST06SL	94DUST07SL	94DUST08SL	94DUST13SL	94DUST14SL	94DUST15SL
Lab Code:		K946450-005	K946450-006	K946450-007	K946743-005	K946743-006	K946743-007
Date Collected:		10/15/94	10/15/94	10/15/94	10/26/94	10/26/94	10/26/94
Compound	**Residential RBC**						
Petroleum Hydrocarbons (mg/Kg)							
TPH	none	59	136	39	98	114	260
Organochlorine Pesticides (mg/Kg)							
4,4'-DDT	1.9	ND	ND	ND	0.09	0.04	0.05
Semivolatile Organic Compounds (mg/Kg)							
Bis(2-ethylhexyl) Phthalate	46	ND	ND	ND	<0.6	ND	ND
Total Metals (mg/Kg)							
Arsenic	0 37	6	6	6	8	7	5
Barium	5,500	60	65	70	43	58	46
Chromium	390	31	36	30	20 J	17 J	16 J
Lead	none	7	7	7	13 J	16 J	27 J
Nickel	1,600	38	40	33	42	28	22

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL). (See the Dust Palliative Roadway Appendix for MRL values.)
J = Value is considered an estimate.
A shaded value indicates result exceeds the residential risk based concentration (RBC).

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The Dust Palliative sites are adjacent to residential properties, commercial/industrial properties, and undeveloped areas (including forests, wetlands, etc.). The roadways are travelled by workers, residents, and visitors. Ditches along the roadways transport runoff and snowmelt to nearby surface water bodies.

5.7.4.1 Compounds of Potential Concern

A summary of the COPCs is presented in Table 5.7-2, consisting of arsenic, a carcinogen.

Table 5.7-2. Compounds of Potential Concern
Dust Palliative

Type	Source	Carcinogens
Metals[1]	Background soil	Arsenic

[1] Based on the background metals statistics evaluation in Appendix A, some metals were not included in the semi-quantitative risk assessment because they were not statistically significant from background concentrations.

All other target analytes were either 1) not detected, 2) below 1/10th of the RBC for residential soil, or 3) not statistically different from the background sample population (metals only). As shown by Table 4-1, however, RBCs are not available for some compounds. These compounds were included in the semi-quantitative risk assessment *only* when they were detected in a site-related sample. In addition, a list of compounds that were not detected at detection limits exceeding current risk-based concentrations is provided in Table 5.7-3. Most of these compounds were identified in the Work Plan (ENSR 1994) but require special analytical services to achieve reporting limits below RBCs. During the RI/FS, Table 5.7-3 should be reviewed to determine if the likelihood that the compound is present warrants the use of special analytical services.

As described in Section 5.7.4.4, the toxicity of petroleum hydrocarbons cannot be evaluated using bulk hydrocarbon measurements (GRO, DRO, and TPH). As a result, these data were not included in the semi-quantitative risk assessment.

Table 5.7-3 Compounds Not Detected at Detection Limits Exceeding Current Risk-Based Concentrations, Dust Pallative

Compound	Matrix	Maximum Detection Limit	Risk-Based Concentration
N-Nitrosodimethylamine	Soil	4 mg/Kg	0.013 mg/Kg
Bis(2-chloroethyl) Ether	Soil	0.6 mg/Kg	0.58 mg/Kg
N-Nitrosodi-n-propylamine	Soil	0.6 mg/Kg	0.091 mg/Kg
Hexachlorobenzene	Soil	0.6 mg/Kg	0.4 mg/Kg
3,3'-Dichlorobenzidine	Soil	4 mg/Kg	1.4 mg/Kg
Benzo(a)pyrene	Soil	0.6 mg/Kg	0.088 mg/Kg
Dibenz(a,h)anthracene	Soil	0.6 mg/Kg	0.088 mg/Kg

Note: Some detection limits are elevated due to analytical interference. See the Dust Pallative Appendix for a complete list of detection limits

5.7.4.2 Sources, Transport Mechanisms, Exposure Pathways, and Receptors

Sources, transport mechanisms, exposure pathways, and receptors (elements of a Conceptual Site Model) are shown on Figure 5.7-3. As discussed previously, the primary sources are road oiling and vehicle exhaust. Secondary sources include contaminated surface soil. It is not known whether subsurface soil, groundwater, or surface waters have been impacted.

Potential transport mechanisms include surface water transport, leaching and groundwater transport, and volatilization. Within the air phase, volatile COPCs may disperse in the atmosphere or accumulate in enclosed spaces. However, no volatile COPCs were detected at concentrations exceeding 1/10th of the RBC for residential soil. Concentrations of nonvolatile COPCs in airborne dust are not expected to be of concern in the atmosphere (see Appendix A, Section A.5).

Surface water transport may be significant, particularly during rainfall or snowmelt events. Contaminants would most likely be transported as entrained sediments, since the COPCs are relatively insoluble in water. Similarly, leaching is not expected to be significant, since the COPCs are relatively insoluble.

Depending on the future land use, potential receptors may include residents, occupational workers, and construction workers. Ecological receptors include terrestrial plants, mammals, avian species, and aquatic species.

5.7.4.3 Exposure Assessment

A preliminary exposure assessment was performed for the soil ingestion pathway. Soil exposures via ingestion generally result in greater chemical uptake than dermal contact, inhalation, or recreation use. Accordingly, this pathway was selected to determine if soil exposures represent a significant human health risk. If human health risks via soil ingestion are significantly below the acceptable risk threshold, then combined health risks from other exposure pathways are probably within acceptable limits. However, if human health risks via soil ingestion are close to the acceptable risk threshold, then other exposure pathways should be evaluated as part of the baseline risk assessment.

Soil exposures were calculated using default exposure factors for residential and commercial/industrial receptors (EPA 1995a). These exposure factors reflect individuals with the highest chronic exposure for noncarcinogens and the highest cumulative exposure for carcinogens. For example, exposures to noncarcinogens are calculated assuming childhood exposure only, whereas exposures to carcinogens are calculated assuming combined childhood and adult exposure. A list of the exposure factors and equations is provided in Appendix A.

Exposure concentrations in soil were calculated as the 95 percent UCL of the average concentration of all samples analyzed from a particular medium (surface or subsurface soil). If the compound was not detected, one-half of the reporting limit was used to calculate the 95 percent UCL. This approach is consistent with EPA guidance (EPA 1991, 1992).

5.7.4.4 Toxicity Assessment

Dose-response factors were obtained from EPA (1995a). These factors were obtained from:

1) EPA's Integrated Risk Information System (current as of January 1, 1995),
2) EPA's Health Effects Assessment Summary Tables (current through March 1994),
3) The Superfund Health Risk Technical Support Center, and
4) Other EPA sources.

Although provisional dose response factors have been developed for JP-4, JP-5, gasoline, and diesel fuel (EPA 1992b), these values are not appropriate for this evaluation. These values are based on fresh petroleum products and do not accurately represent the composition, and therefore the toxicity, of weathered petroleum products. They have not been subjected to rigorous peer review and are not routinely used, even by EPA, in risk assessment. As a result, bulk hydrocarbon measurements (GRO, DRO, and TPH) were not included in the semi-quantitative risk assessment.

5.7.4.5 Human Health Risk Characterization

Human Health Risks

Carcinogenic and noncarcinogenic risks were not evaluated, since all carcinogenic and noncarcinogenic compounds were either 1) not detected, 2) below 1/10th of the RBC for residential soil, or 3) not statistically different from the background sample population (metals only).

5.7.4.6 Ecological Risk Characterization

Quantitative assessment of ecological risks can be performed at the organism, population, or ecosystem level. Although ecosystem-level effects may be the most important, effects testing and modeling are rarely performed due to a number of practical considerations (Suter 1993). Quantification of population-level effects, such as reproductive potential, is important to maintain species populations, whereas assessment of organism-level effects evaluates the risk to individual organisms.

Chemicals can be evaluated as single compounds or as mixtures. Methods for evaluating the toxicity of mixtures requires knowledge regarding the sites and modes of action of individual compounds. Unlike for human health risk assessment, these methods have not been standardized, and there is some debate regarding the most appropriate approach.

If potential exposure pathways and receptors are present, ecological assessment begins with identification of the compounds of potential concern. This can be done in a similar fashion as for human health risk assessment, using ecological RBCs. Ecological RBCs may include toxicity benchmarks, sediment quality criteria, or other regulatory criteria. One set of criteria in common use provides benchmark concentrations for eight representative mammalian species and nine avian species (Opresko et al. 1994). Although benchmark concentrations are provided for 76 chemicals, toxicity benchmarks are not available for many target analytes. Also, the benchmarks are provided as concentrations in food, requiring evaluation of plant uptake and other routes of dietary exposure.

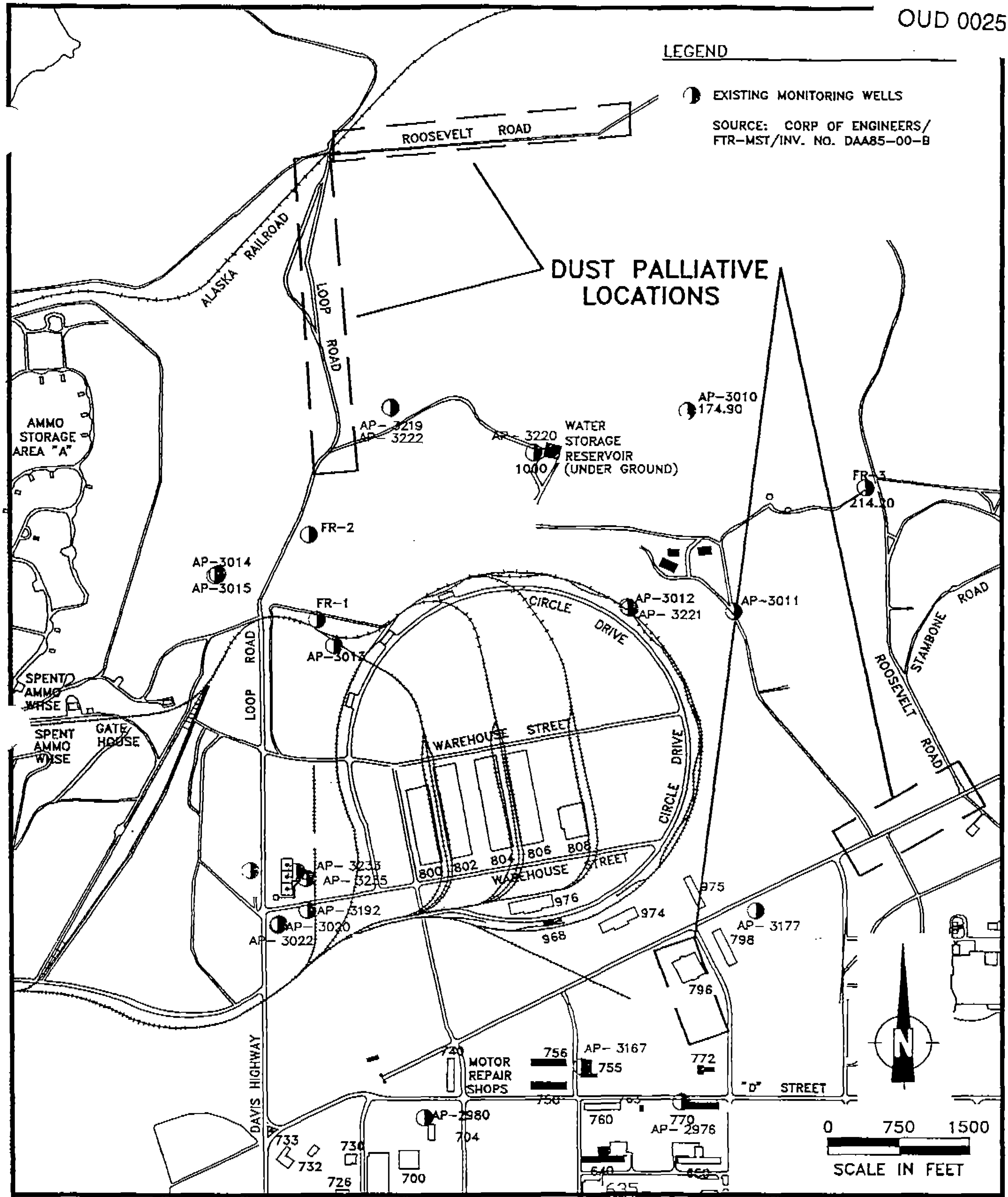
Likewise, standardized criteria for aquatic species reflect various exposure routes and test methods, and are not available for all target compounds. As a result, compilation of ecological RBCs can involve significant effort. Due to the large number of analytes measured at the Dust Palliative sites, ecological RBCs were not compiled as part of this project.

Potential receptors at Dust Palliative sites include terrestrial, avian, and aquatic species at a variety of trophic levels. The most highly exposed species include those with a small home range and small body weight to food consumption ratio (e.g., mice, benthic invertebrates, resident songbirds). However, other less exposed species may warrant evaluation based on their susceptibility to particular chemicals (e.g., reproductive effects of 4,4'-DDT in raptors).

As part of the RI/FS, ecological RBCs may be identified for representative terrestrial, avian, and aquatic species. Compounds of potential concern may be selected based on a comparison of ecological RBCs with measured concentrations. At this point, the appropriate risk quantitation methods and measurement endpoints may be selected.

5.7.5 Findings and Conclusions

Due to the absence of compounds of potential concern, a semi-quantitative evaluation of carcinogenic and noncarcinogenic risks was not performed.



ENSR

ENSR CONSULTING & ENGINEERING

DRAWING: DPLOCA	DRAWN: ABB
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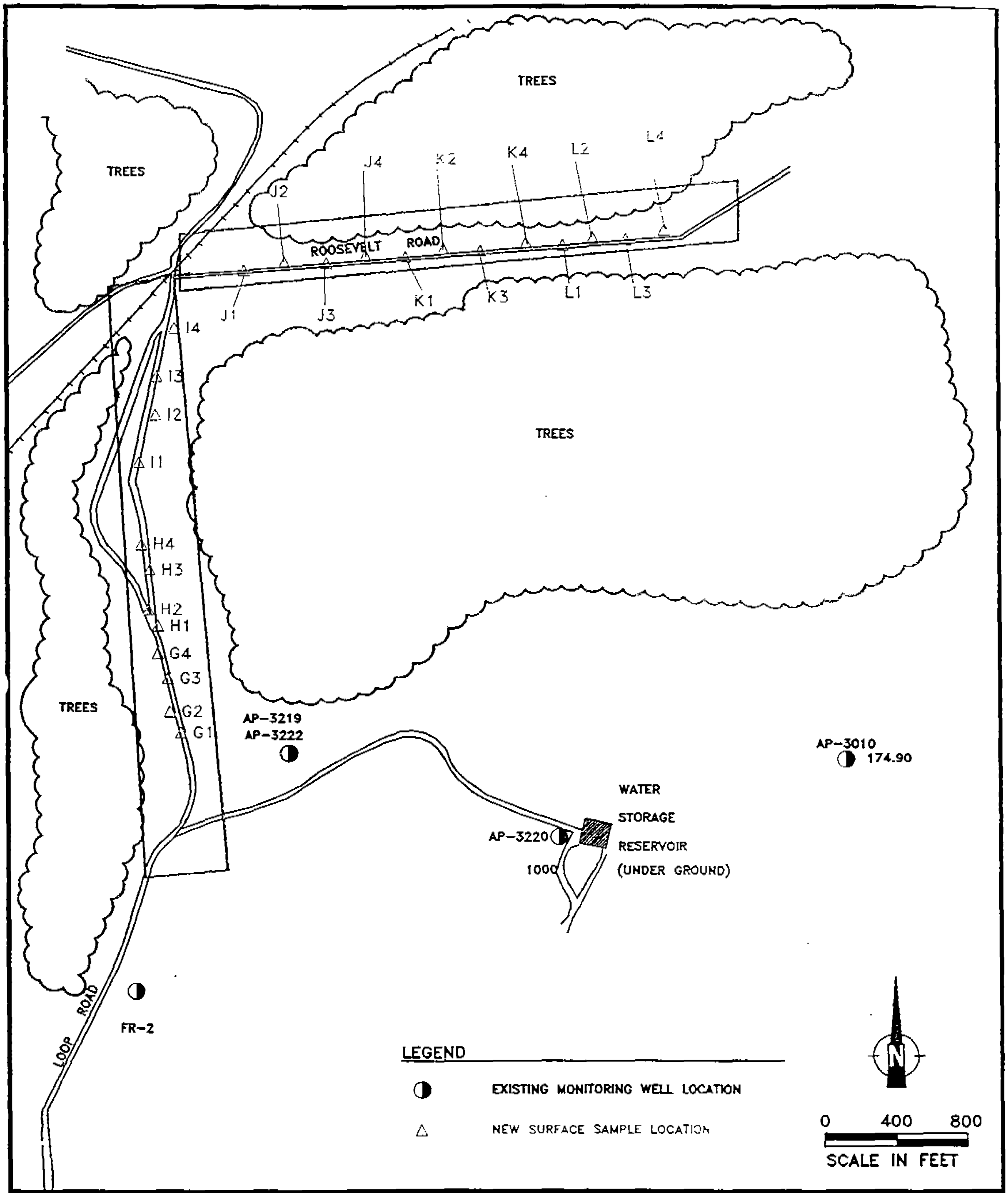
DATE: 10/8/96	CHECK: WW

FIGURE 5.7-1
LOCATION MAP
DUST PALLIATIVE

FORT RICHARDSON
ANCHORAGE, ALASKA
PROJECT 9000-066



DRAWING: 5497SB
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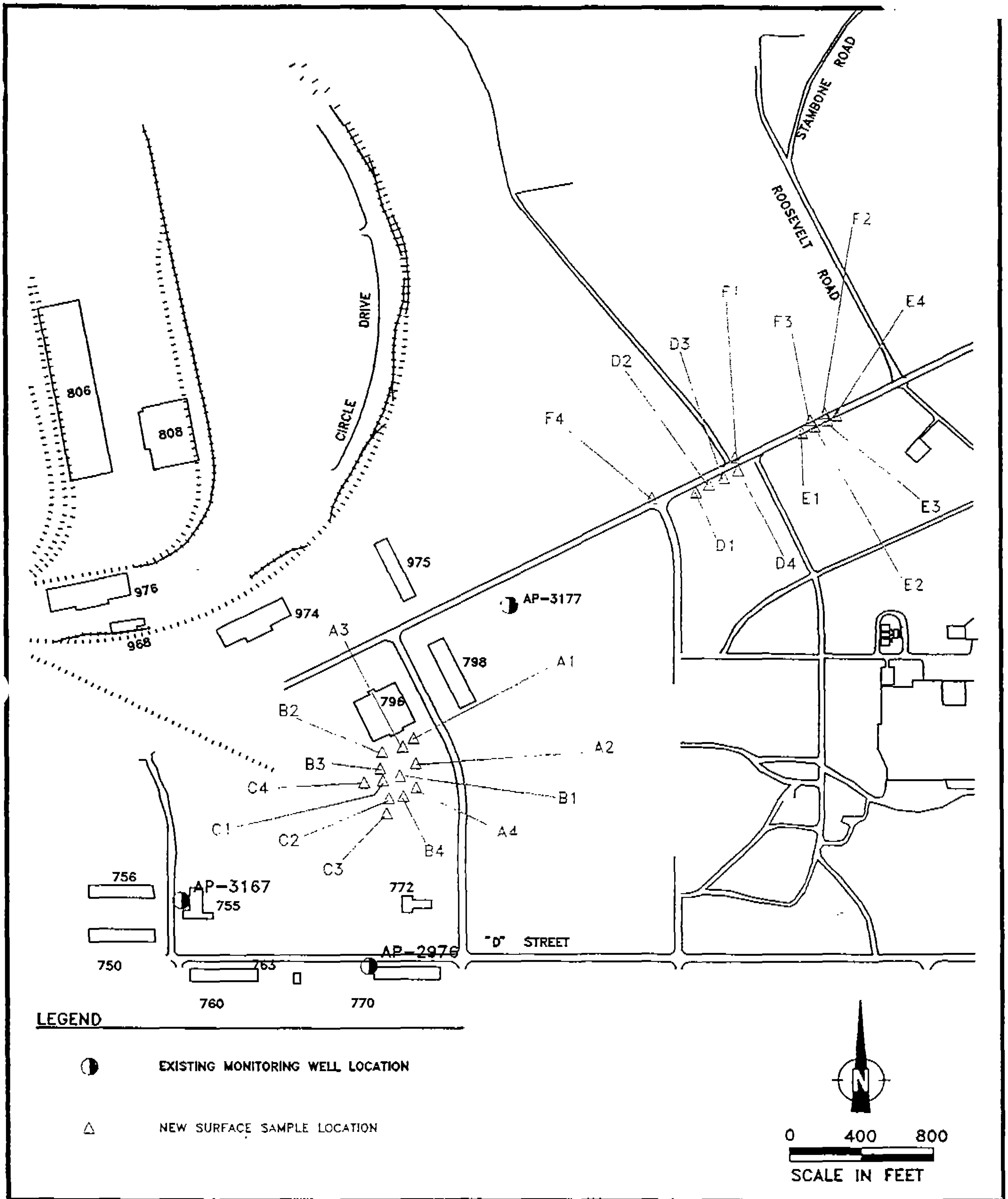
C/SC: 1:800
DISK: 304/95
DATE: 8/14/95
CHECK: WW

FIGURE 5.7-2a
SOIL BORING LOCATIONS
UC 5497 & ROOSEVELT ROAD

OPERABLE UNIT D
FORT RICHARDSON
PROJECT 9000-036

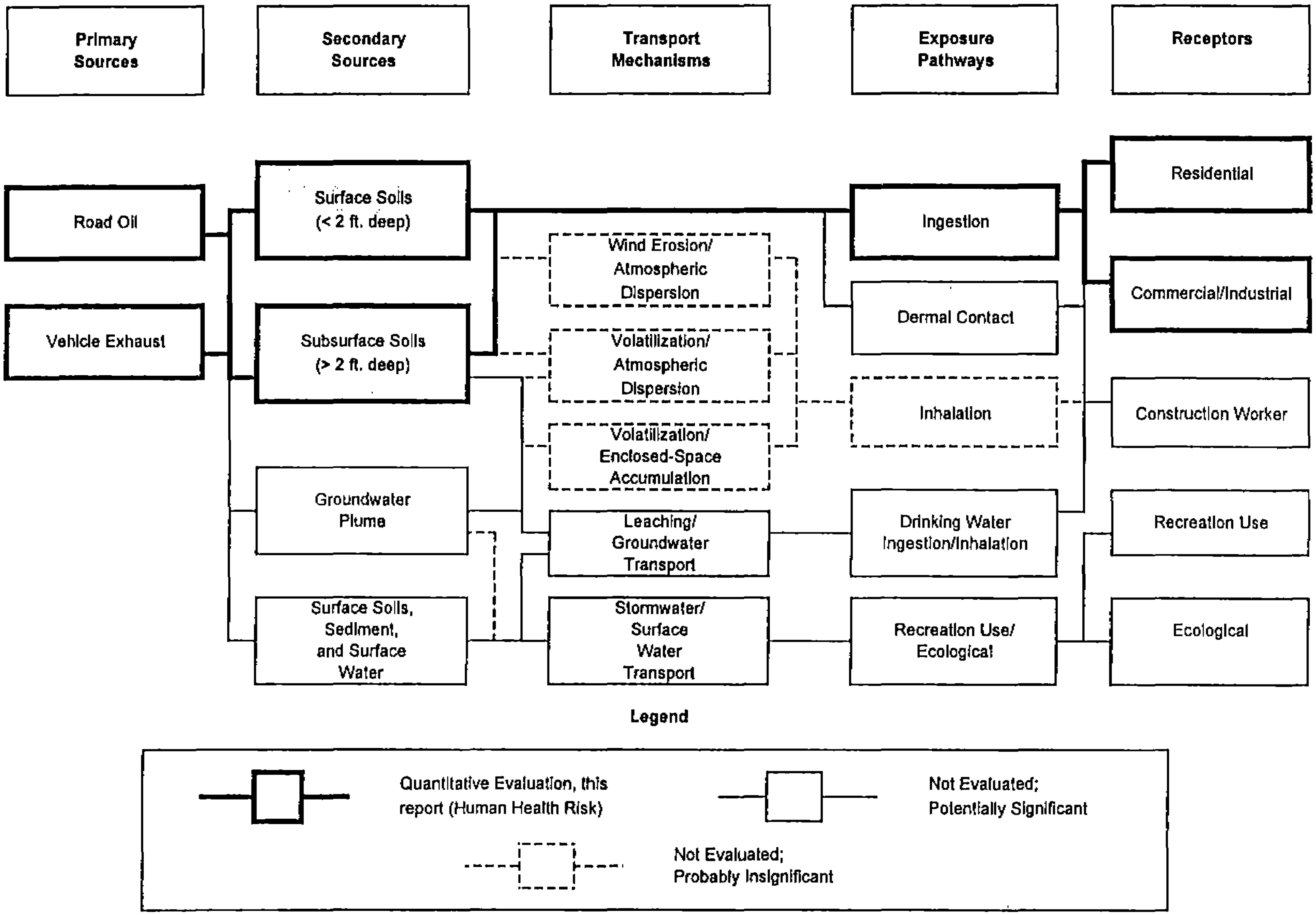


DRAWING: 5997SB
DRAWN: ABB
C/SC: 1:800
DISK: 318/95
DATE: 8/14/95
CHECK: WW

FIGURE 5.7-2b
SOIL BORING LOCATIONS
& ANALYTICAL SOIL RESULTS
UC 5997 & BUILDING 796

OPERABLE UNIT D
FORT RICHARDSON
PROJECT 9000-036

Figure 5.7-3: Sources, Transport Mechanisms, Exposure Pathways, and Receptors
Dust Palliative Roadway



After ASTM (1994)
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Fire Training Area

5.8 Fire Training Area

5.8.1 Site History

The former Fire Training Area is located between Loop Road and Roosevelt Road, and north of Circle Drive (Figure 5.8-1). The fire training pit, situated over a former landfill, was approximately 50 feet in diameter, surrounded by a 1-foot berm. The site was used for fire training between 1985 and 1988. Liquid petroleum hydrocarbons, including diesel, JP-4, waste oil, transmission fluid, brake fluid, hydraulic fluid, fuels mixed with solvents, and soils contaminated with petroleum products, were poured into the unlined pit and ignited. Fluids were stored at the site until they were burned. An estimated 1,500 to 2,300 gallons of waste were burned per year at each fire training pit (E&E 1991; WCC 1987). Subsequent to 1988, the fire training pit has been covered with an estimated 3 to 6 feet of stockpiled POL-contaminated soil originating from other sites.

Previous investigations at the fire training area have focused on fuel identification, metals, VOCs, SVOCs, herbicides, and pesticides. In 1986, the AEHA reported unlabelled drums at the site. Analyses of soils in and near the fire training pit detected toluene and ethylbenzene to 6 feet bgs. Landfill debris was encountered at 6 to 8 feet bgs.

In 1989, a soil gas survey probed the area to a depth of 12.5 feet (WCC 1990). High concentrations of benzene (830 parts per million by volume [ppmv]), toluene (910 ppmv), and xylenes (480 ppmv) were detected. At 12.5 feet bgs, the sample probe was in the landfill itself, and results may not be indicative of the fire training pit.

Another shallow soil gas survey detected maximum concentrations of 11,900 ppm of benzene, toluene, and xylenes (E&E 1991).

5.8.2 Field Investigation

The location of the fire training pit was determined by the USACE survey crew based on an aerial photograph. Ten surface sampling locations were evenly spaced within a 35-foot radius from the center point of the fire training pit (Figure 5.8-2).

Based on soils encountered at the first sampling location, the fill depth was estimated to be 2 feet and not the previously estimated 3 to 6 feet.

A CME-75 drill rig was used to obtain shallow subsurface samples varying in depth from 2 to 9.5 feet bgs. The drill rig was used to bore through the observed fill depth of 2 feet before each sample was collected. The depth of the samples varied according to the amount of soil recovered in the split-spoon sampler. The sample depth was increased if initial recovery was insufficient to fill all sample jars.

The field team was able to verify the approximate location of the pit by the observation of strong solvent and fuel odors in 7 of the 10 samples collected and a dark staining due to burned soils observed in 4 of the 10 samples collected. Two of the samples contained scraps of a cotton material similar to absorbent pads. Samples were submitted for laboratory analysis, and preliminary results were received with 2 weeks.

The results of the preliminary laboratory data were reviewed to select the most impacted locations as sites for three of the four 20-foot soil borings (Figure 5.8-2). Groundwater was not investigated because the intent of the PSE2 was to identify specific contaminants impacting soils in the Fire Training area. A groundwater investigation, if necessary, could be included as part of an RI.

Soil boring AP-3518 (Appendix I) was located outside the Fire Training Area, 85 feet from the center point. The boring was advanced to a depth of 22 feet bgs. Soils encountered were described as sandy gravel to 14 feet bgs, silty sand to 20 feet bgs, and gravel to 22 feet bgs. The presence of a very strong fuel/solvent odor was first observed at 6 feet bgs and continued throughout the boring. Wood and paper scraps were encountered at a depth of 8 feet bgs, and an oily substance was observed at 12 feet bgs.

Soil boring AP-3519 was advanced to 22 feet bgs adjacent to surface sampling location 7. Strong hydrocarbon and solvent odors were encountered at a depth of 4 feet bgs and continued throughout the boring. Paper debris was observed at a depth of 6 feet. The amount and variety of debris encountered increased from 6 to 16 feet bgs. This debris was consistent with general landfill materials and ceased at the 18 foot bgs depth. Gravelly sand fill was encountered to 16 feet bgs with some gravel to 22 feet bgs.

Soil boring AP-3520 was advanced to 23 feet bgs between surface sampling locations 9 and 10. Strong hydrocarbon odors were observed starting at 2 feet bgs and continuing to 23 feet bgs. Debris was not encountered at this boring location.

Soil boring AP-3521 was advanced to 24 feet bgs adjacent to surface sampling location 5. Burnt soil materials and a very strong hydrocarbon odor were observed at a depth of 4 feet bgs. The same odor decreased at the 6-foot-bgs depth and continued to 12 feet bgs. Wood pieces and a strong hydrocarbon odor were observed at a depth of 14 feet bgs with the odor continuing to 18 feet bgs. A slight hydrocarbon odor was observed at a depth of 20 feet bgs to 24 feet bgs.

Based on the soil boring logs, a cross section of the investigation area is presented in Figure 5.8-3.

5.8.3 Analytical Results

A total of 30 samples, including three blind duplicate samples and three QA samples, were collected and sent to the laboratory for analysis. All samples were analyzed for TRPH, GRO, DRO, VOCs, PCBs, SVOCs, ethylene glycol, metals, and dioxins/furans. Analytes above the MRL are shown in Table 5.8-1. A complete summary of the analytical data for the Fire Training Area is show in Appendix I.

Geotechnical testing, including Atterburg limits, grain size distribution, and percent moisture content, was performed on 15 samples. The results from this testing are presented in Appendix I.

The project data are accepted with the following exception noted in the USACE NPD laboratory's CQAR and ENSR QASR located in Volumes I through III of Analytical Data for PSE2 OUD (ENSR 1995).

- Project data of total recoverable petroleum hydrocarbons in CAS reports K946749A, K947227A, and K947276A (sample numbers 94FTP101SL through -27SL) were considered estimates due to high RPD.

5.8.4 Semi-Quantitative Risk Assessment

As described in Section 4.2, a semi-quantitative risk assessment was performed for this site. The risk assessment is considered semi-quantitative because: 1) potential risks to ecological receptors were not evaluated, 2) the exposures evaluated reflect the available analytical data and do not necessarily represent the maximum extent of contamination or future changes in contaminant concentrations, and 3) only one exposure pathway was considered (soil ingestion); although this pathway usually yields the most conservative results, other pathways may also be important.

TABLE 5.8-1 Summary of Analytes Detected
Fire Training Area Soil Sample Analytical Results

Part 1 of 9

	Location:	SB AP 3518				SB AP 3519				
	Sample Depth:	2'-6'	6'-10'	10'-18'	18'-22'	2'-8'		8'-14'	14'-18'	20'-22'
	Sample ID:	94FTP112SL	94FTP113SL	94FTP114SL	94FTP115SL	94FTP116SL	94FTP117SL	94FTP118SL	94FTP119SL	94FTP120SL
	Lab Code:	K7227-001	K7227-002	K7227-003	K7227-004	K7227-005	K7276-009	K7276-010	K7276-011	7276-012
	Date Collected:	11/15/94	11/15/94	11/15/94	11/15/94	11/15/94	11/15,16/94	11/15,16/94	11/15,16/94	11/15,16/94
Compound	Residential RBC									
Petroleum Hydrocarbons (mg/Kg)										
GRO	none	ND	ND	81	ND	1,800	1,900	1,200	ND	ND
DRO	none	461	1,630	1,250	315	1,120	1,180	380	ND	ND
TPH	none	490 J	2,900 J	17,000 J	2,700 J	2,100 J	1,700 J	470 J	10 J	10 UJ
Organochlorine Pesticides (mg/Kg)										
4,4'-DDD	2.7	ND	0.04	<0.03	<0.02	ND	ND	<0.02	ND	ND
4,4'-DDE	1.9	ND	<0.03	<0.02	<0.02	ND	ND	0.07	ND	ND
Polychlorinated Biphenyls (PCBs) (mg/Kg)										
Aroclor 1232	none	ND	<3.5	<0.7	<1.2	ND	ND	3.8	ND	ND
Aroclor 1248	none	ND	<1.5	0.2	<0.8	ND	ND	<0.3	ND	ND
Aroclor 1254	1.6	ND	<0.7	<0.7	<0.8	ND	ND	0.4	ND	ND
Aroclor 1260	none	ND	<0.7	0.5	<0.3	ND	ND	ND	ND	ND
Volatile Organic Compounds (µg/Kg)										
Acetone	7,800,000	ND	110	<13,000	81	240	<6,500	200	97	6,800
Methylene Chloride	85,000	ND	ND	<2,600	ND	ND	<1,300	ND	ND	ND
2-Butanone (MEK)	47,000,000	ND	ND	<5,200	ND	75	<2,600	57	73	3200
Benzene	22,000	ND	ND	<1,300	ND	9	<650	ND	ND	ND
2-Hexanone	none	ND	ND	<5,200	ND	ND	<2,600	ND	ND	ND
Toluene	16,000,000	8	11	<1,300	ND	310	1,500	50	17	12
4-Methyl-2-pentanone (MIBK)	none	ND	ND	<5,200	ND	ND	<2,600	72	ND	ND
Ethylbenzene	7,800,000	ND	ND	1,700	ND	120	840	45	5	ND
Total Xylenes	160,000,000	7	ND	10,000	17	810	6,400	340	35	11
Isopropylbenzene	3,100,000	ND	ND	<5,200	ND	48	<2,600	ND	ND	ND
n-Propylbenzene	none	ND	ND	<5,200	ND	150	<2,600	84	ND	ND
1,3,5-Trimethylbenzene	31,000	ND	ND	6,500	ND	270	<2,600	150	ND	ND
1,2,4-Trimethylbenzene	39,000	ND	ND	18,000	ND	810	6,700	400	41	ND
sec-Butylbenzene	780,000	ND	ND	<5,200	ND	68	<2,600	ND	ND	ND
4-Isopropyltoluene	none	ND	ND	5,600	ND	55	<2,600	60	ND	ND
1,4-Dichlorobenzene	27,000	ND	ND	2,900	73	ND	<650	ND	ND	ND
Naphthalene	3,100,000	ND	ND	<5,200	37	730	3,100	ND	ND	ND

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL). (See the Fire Training Area Appendix for MRL values.)
< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.
J = Value is considered an estimate.
UJ = The analyte was not detected at the MRL, however, the MRL is considered an estimate.

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TABLE 5.8-1 Summary of Analytes Detected (cont.)
Fire Training Area Soil Sample Analytical Results

Part 2 of 9

	Location:	SB AP 3520				SB AP 3521			Surface 1	Surface 2
	Sample Depth:	2'-10'	13'-17'	17'-23'		2'-6'	12'-16'	16'-20'	2.5'-4.5'	2'-6'
	Sample ID:	94FTP121SL	94FTP122SL	94FTP123SL	94FTP124SL	94FTP125SL	94FTP126SL	94FTP127SL	94FTP101SL	94FTP102SL
	Lab Code:	K7276-005	K7276-006	K7276-007	K7276-008	K7278-001	K7276-002	K7276-003	K946749-007	K946749-008
	Date Collected:	11/15,16/94	11/15,16/94	11/15,16/94	11/15,16/94	11/15,16/94	11/15,16/94	11/15,16/94	10/27/94	10/27/94
Compound	Residential RBC									
Petroleum Hydrocarbons (mg/Kg)										
GRO	none	920	ND	ND	ND	634	ND	ND	1,800	9
DRO	none	985	ND	ND	ND	764	206	24	3,810	64
TPH	none	1,300 J	16 J	10 UJ	16 J	1,100	430	35	5,800	69
Organochlorine Pesticides (mg/Kg)										
4,4'-DDD	2.7	ND	ND	ND	ND	ND	ND	0.01	ND	ND
4,4'-DDE	1.9	ND	ND	ND	ND	ND	ND	ND	ND	ND
Polychlorinated Biphenyls (PCBs) (mg/Kg)										
Aroclor 1232	none	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	none	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	1.6	ND	ND	ND		ND	ND	ND	ND	ND
Aroclor 1260	none	ND	ND	ND	ND	ND	ND	ND	ND	ND
Volatile Organic Compounds (ug/Kg)										
Acetone	7,800,000	<6,500	120	330	310	<13,000	52	460	<13,000	ND
Methylene Chloride	85,000	<1,300	ND	ND	ND	<2,600	19	ND	<2,600	31
2-Butanone (MEK)	47,000,000	<2,600	210	330	1700	<5,200	ND	300	<5,200	ND
Benzene	22,000	<650	ND	ND	ND	<1,300	ND	ND	<1,300	ND
2-Hexanone	none	<2,600	ND	ND	ND	<5,200	ND	84	<5,200	ND
Toluene	16,000,000	2,900	8	10	25	<1,300	6	13	1,900	7
4-Methyl-2-pentanone (MIBK)	none	<2,600	ND	25	30	<5,200	ND	ND	<5,200	ND
Ethylbenzene	7,800,000	1,600	ND	ND	6	2,100	ND	9	<1,300	ND
Total Xylenes	160,000,000	13,000	10	7	41	10,000	13	71	68,000	16
Isopropylbenzene	3,100,000	<2,600	ND	ND	ND	<5,200	ND	ND	<5,200	ND
n-Propylbenzene	none	<2,600	ND	ND	ND	<5,200	ND	ND	<5,200	ND
1,3,5-Trimethylbenzene	31,000	<2,600	ND	ND	ND	24,000	ND	ND	30,000	ND
1,2,4-Trimethylbenzene	39,000	5,400	ND	ND	ND	47,000	ND	40	39,000	ND
sec-Butylbenzene	780,000	<2,600	ND	ND	ND	<5,200	ND	ND	<5,200	ND
4-Isopropyltoluene	none	<2,600	ND	ND	ND	<5,200	ND	39	<5,200	ND
1,4-Dichlorobenzene	27,000	<650	ND	ND	ND	<1,300	ND	ND	<1,300	ND
Naphthalene	3,100,000	3,100	ND	ND	ND	15,000	ND	ND	<5,200	ND

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL). (See the Fire Training Area Appendix for MRL values.)
< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.
J = Value is considered an estimate.
UJ = The analyte was not detected at the MRL, however, the MRL is considered an estimate.
A shaded value indicates result exceeds the residential risk based concentration (RBC).

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TABLE 5.8-1 Summary of Analytes Detected (cont.)
Fire Training Area Soil Sample Analytical Results

Part 3 of 9

Location:		Surface 3	Surface 4		Surface 5	Surface 6	Surface 7	Surface 8	Surface 9	Surface 10
Sample Depth:		2'-6'	3.5'9.5'	3.5'9.5'	2'-6'	4'-6'	2'-6'	2.5'-6.5'	0-2'	0-4'
Sample ID:		94FTP103SL	94FTP104SL	94FTP105SL	94FTP106SL	94FTP107SL	94FTP108SL	94FTP109SL	94FTP110SL	94FTP111SL
Lab Code:		K946749-009	K946749-010	K946749-011	K946749-001	K946749-002	K946749-003	K946749-004	K946749-005	K946749-006
Date Collected:		10/27/94	10/27/94	10/27/94	10/27/94	10/27/94	10/27/94	10/27/94	10/27/94	10/27/94
Compound	Residential RBC									
Petroleum Hydrocarbons (mg/Kg)										
GRO	none	ND	28	9	2,000	453	12,000	522	4,200	4,200
DRO	none	247	47	49	472	755	2,250	2,650	5,370	3,670
TPH	none	430	77	93	1,100	1,500	3,700	3,900	8,100	6,100
Organochlorine Pesticides (mg/Kg)										
4,4'-DDD	2.7	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDE	1.9	ND	ND	ND	ND	ND	ND	ND	ND	ND
Polychlorinated Biphenyls (PCBs) (mg/Kg)										
Aroclor 1232	none	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	none	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	1.6	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1260	none	ND	ND	ND	ND	ND	ND	ND	ND	ND
Volatile Organic Compounds (µg/Kg)										
Acetone	7,800,000	ND	360	98	<6,500	<14,000	<14,000	<7,000	<14,000	<6,500
Methylene Chloride	85,000	39	31	ND	<1,300	<2,700	<2,700	<1,400	<2,700	<1,300
2-Butanone (MEK)	47,000,000	ND	56	ND	<2,600	<5,400	<5,400	<2,800	<5,400	<2,600
Benzene	22,000	ND	7	ND	<650	<1,400	3,600	1,000	<1,400	5,200
2-Hexanone	none	ND	ND	ND	<2,600	<5,400	<5,400	<2,800	<5,400	41,000
Toluene	16,000,000	12	9	5	<650	<1,400	160,000	650	25,000	240,000
4-Methyl-2-pentanone (MIBK)	none	ND	ND	ND	<2,600	<5,400	<5,400	<2,800	<5,400	<2,600
Ethylbenzene	7,800,000	ND	77	38	3,900	<1,400	39,000	7,500	2,600	16,000
Total Xylenes	160,000,000	7	240	65	17,000	9,000	360,000	43,000	200,000	160,000
Isopropylbenzene	3,100,000	ND	43	ND	3,500	<5,400	9,200	<2,800	<5,400	4,800
n-Propylbenzene	none	ND	43	ND	7,100	<5,400	17,000	6,700	<5,400	7,300
1,3,5-Trimethylbenzene	31,000	ND	190	59	23,000	25,000	22,000	15,000	36,000	15,000
1,2,4-Trimethylbenzene	39,000	ND	290	34	74,000	32,000	57,000	26,000	93,000	46,000
sec-Butylbenzene	780,000	ND	ND	ND	4,600	<5,400	5,600	<2,800	<5,400	3,400
4-Isopropyltoluene	none	ND	ND	ND	4,400	<5,400	<5,400	<2,800	<5,400	3,000
1,4-Dichlorobenzene	27,000	ND	ND	ND	<650	<1,400	<1,400	<700	<1,400	<650
Naphthalene	3,100,000	ND	ND	ND	28,000	8,000	24,000	12,000	31,000	12,000

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL). (See the Fire Training Area Appendix for MRL values.)
< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.
A shaded value indicates result exceeds the residential risk based concentration (RBC).

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TABLE 5.8-1 Summary of Analytes Detected (cont.)
Fire Training Area Soil Sample Analytical Results

Part 4 of 9

	Location:	SB AP 3518				SB AP 3519				
	Sample Depth:	2'-6'	6'-10'	10'-16'	16'-22'	2'-8'		8'-14'	14'-18'	20'-22'
	Sample ID:	94FTP112SL	94FTP113SL	94FTP114SL	94FTP115SL	94FTP116SL	94FTP117SL	94FTP118SL	94FTP119SL	94FTP120SL
	Lab Code:	K7227-001	K7227-002	K7227-003	K7227-004	K7227-005	K7276-009	K7276-010	K7276-011	7276-012
	Date Collected:	11/15/94	11/15/94	11/15/94	11/15/94	11/15/94	11/15,16/94	11/15,16/94	11/15,16/94	11/15,16/94
Compound	**Residential RBC**									
Semivolatile Organic Compounds (mg/Kg)										
Naphthalene	3,100	ND	2.2	<1.5	0.4	5	8	0.7	ND	ND
2-Methylnaphthalene	none	ND	<1.5	<1.5	ND	8	10	1	ND	ND
Diethyl Phthalate	63,000	ND	<1.5	<1.5	0.3	<3	<3	ND	ND	ND
Di-n-butyl Phthalate	none	ND	<1.5	<1.5	0.4	<3	<3	ND	ND	ND
Butylbenzyl Phthalate	16,000	ND	<1.5	4.9	0.5	<3	<3	ND	ND	ND
Bis(2-ethylhexyl) Phthalate	46	ND	<1.5	1.7	0.7	<3	<3	ND	ND	ND
3- and 4-Methylphenol	390	ND	<1.5	2.7	0.7	<3	<3	ND	ND	ND
Total Metals (mg/Kg)										
Arsenic	0.37	5	6	6	5	4	7	10	7	8
Barium	5,500	65	76	76	51	46	50	49	58	41
Cadmium	39	ND	4	ND	ND	ND	ND	ND	ND	ND
Chromium	390	35	34	41	41	30	46	30	24	22
Lead	none	15	111	87	18	10	15	8	7	6
Mercury	23	ND	0.3	0.3	ND	ND	ND	ND	ND	ND
Nickel	1,600	37	37	37	34	37	46	33	30	26
Silver	390	ND	2	ND	ND	ND	ND	ND	ND	ND

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL). (See the Fire Training Area Appendix for MRL values.)
< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.
A shaded value indicates result exceeds the residential risk based concentration (RBC).

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TABLE 5.8-1 Summary of Analytes Detected (cont.)
Fire Training Area Soil Sample Analytical Results

Part 5 of 9

	Location:	SB AP 3520				SB AP 3521			Surface 1	Surface 2
	Sample Depth:	2'-10'	13'-17'	17'-23'		2'-6'	12'-16'	16'-20'	2.5'-4.5'	2'-6'
	Sample ID:	94FTP121SL	94FTP122SL	94FTP123SL	94FTP124SL	94FTP125SL	94FTP126SL	94FTP127SL	94FTP101SL	94FTP102SL
	Lab Code:	K7276-005	K7276-006	K7276-007	K7276-008	K7276-001	K7276-002	K7276-003	K946749-007	K946749-008
	Date Collected:	11/15,16/94	11/15,16/94	11/15,16/94	11/15,16/94	11/15,16/94	11/15,16/94	11/15,16/94	10/27/94	10/27/94
Compound	Residential RBC									
Semivolatile Organic Compounds (mg/Kg)										
Naphthalene	3,100	3	ND	ND	ND	<3	ND	ND	9	ND
2-Methylnaphthalene	none	5	ND	ND	ND	5	ND	ND	8	ND
Diethyl Phthalate	63,000	<3	ND	ND	ND	<3	ND	ND	<2	ND
Di-n-butyl Phthalate	none	<3	ND	ND	ND	<3	ND	ND	<2	ND
Butylbenzyl Phthalate	16,000	<3	ND	ND	ND	<3	ND	ND	<2	ND
Bis(2-ethylhexyl) Phthalate	46	<3	ND	ND	ND	<3	ND	ND	<2	ND
3- and 4-Methylphenol	390	<3	ND	ND	ND	<3	ND	ND	<2	ND
Total Metals (mg/Kg)										
Arsenic	0.37	9	7	8	7	7	6	6	6	7
Barium	5,500	47	39	62	73	64	38	44	60	64
Cadmium	39	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chromium	390	33	28	41	30	41	32	31	35	31
Lead	none	9	7	9	6	9	7	8	15	10
Mercury	23	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	1,600	40	35	44	34	78	40	46	47	39
Silver	390	ND	ND	ND	ND	ND	ND	ND	ND	ND

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL). (See the Fire Training Area Appendix for MRL values.)
< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.
A shaded value indicates result exceeds the residential risk based concentration (RBC).

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10/15/96

TABLE 5.8-1 Summary of Analytes Detected (cont.)
Fire Training Area Soil Sample Analytical Results

Part 6 of 9

	Location:	Surface 3	Surface 4		Surface 5	Surface 6	Surface 7	Surface 8	Surface 9	Surface 10
	Sample Depth:	2'-6'	3.5'9.5'	3.5'9.5'	2'-6'	4'-6'	2'-6'	2.5'-6.5'	0-2'	0-4'
	Sample ID:	94FTP103SL	94FTP104SL	94FTP105SL	94FTP106SL	94FTP107SL	94FTP108SL	94FTP109SL	94FTP110SL	94FTP111SL
	Lab Code:	K946749-009	K946749-010	K946749-011	K946749-001	K946749-002	K946749-003	K946749-004	K946749-005	K946749-006
	Date Collected:	10/27/94	10/27/94	10/27/94	10/27/94	10/27/94	10/27/94	10/27/94	10/27/94	10/27/94
Compound	**Residential RBC**									
Semivolatile Organic Compounds (mg/Kg)										
Naphthalene	3,100	ND	ND	ND	0.9	0.31	9	4	17	12
2-Methylnaphthalene	none	ND	ND	ND	2.0	0.91	9	4	13	11
Diethyl Phthalate	63,000	ND	ND	ND	ND	ND	<2	<2	<2	<2
Di-n-butyl Phthalate	none	ND	ND	ND	ND	ND	<2	<2	<2	<2
Butylbenzyl Phthalate	16,000	ND	ND	ND	ND	ND	<2	<2	<2	<2
Bis(2-ethylhexyl) Phthalate	46	ND	ND	ND	ND	ND	<2	<2	<2	<2
3- and 4-Methylphenol	390	ND	ND	ND	ND	ND	<2	<2	<2	<2
Total Metals (mg/Kg)										
Arsenic	0.37	7	7	7	6	7	6	8	6	9
Barium	5,500	86	100	86	89	90	64	78	72	68
Cadmium	39	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chromium	390	46	42	34	38	39	43	40	34	39
Lead	none	12	8	6	11	8	11	15	17	29
Mercury	23	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	1,600	43	49	41	37	47	46	56	37	48
Silver	390	ND	ND	ND	ND	ND	ND	ND	ND	ND

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL). (See the Fire Training Area Appendix for MRL values.)
< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.
A shaded value indicates result exceeds the residential risk based concentration (RBC).

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TABLE 5.8-1 Summary of Analytes Detected (cont.)
Fire Training Area Soil Sample Analytical Results

Part 7 of 9

	Location:	SB AP 3518				SB AP 3519				
	Sample Depth:	2'-6'	6'-10'	10'-18'	18'-22'	2'-8'		8'-14'	14'-18'	20'-22'
	Sample ID:	94FTP112SL	94FTP113SL	94FTP114SL	94FTP115SL	94FTP116SL	94FTP117SL	94FTP118SL	94FTP119SL	94FTP120SL
	Lab Code:	K7227-001	K7227-002	K7227-003	K7227-004	K7227-005	K7276-009	K7276-010	K7276-011	7276-012
	Date Collected:	11/15/94	11/15/94	· 11/15/94	11/15/94	11/15/94	11/15,16/94	11/15,16/94	11/15,16/94	11/15,16/94
Compound	Residential RBC									
Dioxins & Furans (pg/g)										
2,3,7,8-TCDD	4,000	ND	1.6	ND	ND	ND	ND	ND	ND	ND
Total TCDD	none	ND	21	ND	ND	ND	ND	ND	ND	ND
1,2,3,7,8-PeCDD	none	ND	5.5	ND	ND	ND	ND	ND	ND	ND
Total PeCDD	none	ND	42	ND	ND	ND	ND	ND	ND	ND
1,2,3,4,7,8-HxCDD	none	ND	7.4	ND	ND	ND	ND	ND	ND	ND
1,2,3,6,7,8-HxCDD	none	ND	100	20	2.7	ND	ND	ND	ND	ND
1,2,3,7,8,9-HxCDD	none	ND	25	5.6	ND	ND	ND	ND	ND	ND
Total HxCDD	none	ND	480	99	13	ND	ND	1.4	ND	ND
1,2,3,4,6,7,8-HpCDD	none	5.1	1,200	340	70	4.3	4	7.2	ND	ND
Total HpCDD	none	6.8	2,000	580	150	7.9	7.5	12	ND	ND
OCDD	none	35	10,000	3,200	1,300	32	40	84	1	0.99
2,3,7,8-TCDF	none	ND	4.4	ND	ND	ND	ND	ND	ND	ND
Total TCDF	none	1.9	61	ND	ND	ND	ND	ND	ND	ND
1,2,3,7,8-PeCDF	none	ND	2.5	ND	ND	ND	ND	ND	ND	ND
2,3,4,7,8-PeCDF	none	ND	4.3	ND	ND	ND	ND	ND	ND	ND
Total PeCDF	none	3.8	61	6.4	ND	0.7	ND	ND	ND	ND
1,2,3,4,7,8-HxCDF	none	ND	10	4.8	ND	ND	ND	ND	ND	ND
1,2,3,6,7,8-HxCDF	none	ND	14	ND	ND	ND	ND	ND	ND	ND
2,3,4,6,7,8-HxCDF	none	ND	11	3.4	ND	ND	ND	ND	ND	ND
1,2,3,7,8,9-HxCDF	none	ND	2.2	ND	ND	ND	ND	ND	ND	ND
Total HxCDF	none	2.1	680	150	11	ND	ND	1.5	ND	ND
1,2,3,4,6,7,8-HpCDF	none	2.1	560	110	14	1.4	1.1	1.2	ND	ND
1,2,3,4,7,8,9-HpCDF	none	ND	17	6.1	ND	ND	ND	ND	ND	ND
Total HpCDF	none	5	2,200	450	85	2.2	3.6	3.7	ND	ND
OCDF	none	5	2,200	530	62	ND	2.8	2.3	ND	ND

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL). (See the Fire Training Area Appendix for MRL values.)

TCDD = Tetrachlorodibenzo-p-dioxin
PeCDD = Pentachlorodibenzo-p-dioxin
HxCDD = Hexachlorodibenzo-p-dioxin
HpCDD = Heptachlorodibenzo-p-dioxin
TCDF = Tetrachlorodibenzofuran
PeCDF = 1,2,3,7,8-Pentachlorodibenzofuran
HxCDF = Hexachlorodibenzofuran
HpCDF = Heptachlorodibenzofuran

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10/15/96

TABLE 5.8-1 Summary of Analytes Detected (cont.)
Fire Training Area Soil Sample Analytical Results

Part 8 of 9

	Location:	SB AP 3520				SB AP 3521			Surface 1	Surface 2
	Sample Depth:	2'-10'	13'-17'	17'-23'		2'-6'	12'-16'	16'-20'	2.5'-4.5'	2'-6'
	Sample ID:	94FTP121SL	94FTP122SL	94FTP123SL	94FTP124SL	94FTP125SL	94FTP126SL	94FTP127SL	94FTP101SL	94FTP102SL
	Lab Code:	K7276-005	K7276-006	K7276-007	K7276-008	K7276-001	K7276-002	K7276-003	K946749-007	K946749-008
	Date Collected:	11/15,16/94	11/15,16/94	11/15,16/94	11/15,16/94	11/15,16/94	11/15,16/94	11/15,16/94	10/27/94	10/27/94
Compound	Residential RBC									
Dioxins & Furans (pg/g)										
2,3,7,8-TCDD	4,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total TCDD	none	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,7,8-PeCDD	none	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total PeCDD	none	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,4,7,8-HxCDD	none	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,6,7,8-HxCDD	none	ND	ND	ND	ND	ND	1.5	ND	ND	ND
1,2,3,7,8,9-HxCDD	none	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total HxCDD	none	ND	ND	ND	ND	ND	5.7	ND	ND	ND
1,2,3,4,6,7,8-HpCDD	none	3.3	ND	ND	ND	3.6	36	4.5	2.2	3.8
Total HpCDD	none	6.3	ND	ND	ND	6.6	69	7.9	3.9	6.8
OCDD	none	24	1.3	1.2	1.1	26	490	38	17	29
2,3,7,8-TCDF	none	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total TCDF	none	ND	ND	ND	ND	1.6	ND	ND	ND	0.57
1,2,3,7,8-PeCDF	none	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3,4,7,8-PeCDF	none	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total PeCDF	none	ND	ND	ND	ND	1.6	ND	ND	0.34	2.5
1,2,3,4,7,8-HxCDF	none	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,6,7,8-HxCDF	none	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3,4,6,7,8-HxCDF	none	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,7,8,9-HxCDF	none	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total HxCDF	none	ND	ND	ND	ND	1.9	5.9	ND	0.95	2.3
1,2,3,4,6,7,8-HpCDF	none	ND	ND	ND	ND	1.4	4.9	ND	0.76	1.3
1,2,3,4,7,8,9-HpCDF	none	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total HpCDF	none	1.5	ND	ND	ND	3.6	22	ND	2.1	3.8
OCDF	none	3.2	ND	ND	ND	3.4	15	2.9	2	3.7

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL). (See the Fire Training Area Appendix for MRL values.)

TCDD = Tetrachlorodibenzo-p-dioxin
PeCDD = Pentachlorodibenzo-p-dioxin
HxCDD = Hexachlorodibenzo-p-dioxin
HpCDD = Heptachlorodibenzo-p-dioxin

TCDF = Tetrachlorodibenzofuran
PeCDF = 1,2,3,7,8-Pentachlorodibenzofuran
HxCDF = Hexachlorodibenzofuran
HpCDF = Heptachlorodibenzofuran

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10/15/96

TABLE 5.8-1 Summary of Analytes Detected (cont.)
Fire Training Area Soil Sample Analytical Results

Part 9 of 9

	Location:	Surface 3	Surface 4		Surface 5	Surface 6	Surface 7	Surface 8	Surface 9	Surface 10
	Sample Depth:	2'-6'	3.5'9.5'	3.5'9.5'	2'-6'	4'-6'	2'-6'	2.5'-6.5'	0-2'	0-4'
	Sample ID:	94FTP103SL	94FTP104SL	94FTP105SL	94FTP106SL	94FTP107SL	94FTP108SL	94FTP109SL	94FTP110SL	94FTP111SL
	Lab Code:	K946749-009	K946749-010	K946749-011	K946749-001	K946749-002	K946749-003	K946749-004	K946749-005	K946749-006
	Date Collected:	10/27/94	10/27/94	10/27/94	10/27/94	10/27/94	10/27/94	10/27/94	10/27/94	10/27/94
Compound	**Residential RBC**									
Dioxins & Furans (pg/g)										
2,3,7,8-TCDD	4,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total TCDD	none	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,7,8-PeCDD	none	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total PeCDD	none	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,4,7,8-HxCDD	none	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,6,7,8-HxCDD	none	ND	ND	ND	ND	ND	0.54	0.88	ND	ND
1,2,3,7,8,9-HxCDD	none	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total HxCDD	none	ND	ND	ND	1.1	ND	2.3	3.1	ND	2.2
1,2,3,4,6,7,8-HpCDD	none	5.2	2.9	3.7	4.4	2.5	11	14	5.3	8.8
Total HpCDD	none	13	5.8	7.8	11	4.3	21	25	12	18
OCDD	none	41	21	29	36	19	110	100	48	80
2,3,7,8-TCDF	none	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total TCDF	none	2.7	ND	ND	1.2	ND	ND	5.8	ND	ND
1,2,3,7,8-PeCDF	none	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3,4,7,8-PeCDF	none	0.43	ND	ND	0.34	ND	ND	0.58	ND	ND
Total PeCDF	none	5.7	0.94	2.2	4.4	0.54	1.3	10	0.73	0.84
1,2,3,4,7,8-HxCDF	none	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,6,7,8-HxCDF	none	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3,4,6,7,8-HxCDF	none	0.55	0.37	0.41	0.48	0.4	ND	0.64	ND	ND
1,2,3,7,8,9-HxCDF	none	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total HxCDF	none	3.6	1.2	2.1	2	1.2	1.6	7.5	1.2	2
1,2,3,4,6,7,8-HpCDF	none	1.8	0.8	1.2	1.4	0.86	2.4	4.7	1.3	1.9
1,2,3,4,7,8,9-HpCDF	none	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total HpCDF	none	4.7	2.4	3.6	3.9	2.8	8	15	3.8	6.7
OCDF	none	4.1	2	3.2	3.2	2.2	5.2	13	2.8	5

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL). (See the Fire Training Area Appendix for MRL values.)

TCDD = Tetrachlorodibenzo-p-dioxin	TCDF = Tetrachlorodibenzofuran
PeCDD = Pentachlorodibenzo-p-dioxin	PeCDF = 1,2,3,7,8-Pentachlorodibenzofuran
HxCDD = Hexachlorodibenzo-p-dioxin	HxCDF = Hexachlorodibenzofuran
HpCDD = Heptachlorodibenzo-p-dioxin	HpCDF = Heptachlorodibenzofuran

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10/15/96

The Fire Training Area is located within a fenced and locked area north of the main cantonment. Mixed brush and grassland, and spruce and birch forests surround the area. Immediately south of the landfill access road to the Fire Training Area is an active borrow pit. Prevailing drainage runs through the Fire Training Area to the borrow pit. There are no surface water bodies within 0.5 mile.

5.8.4.1 Compounds of Potential Concern

A summary of the COPCs is presented in Table 5.8-2. These compounds include monoaromatics (benzene, 1,3,5-trimethylbenzene, 1,2,4-trimethylbenzene, 4-isopropyltoluene, isopropylbenzene, n-propylbenzene, and 4-isopropyltoluene), PAH (2-methylnaphpthalene), chlorinated monoaromatics (1,4-dichlorobenzene), ketones (2-hexanone and 4-methyl-2-pentanone), PCBs, dioxins and furans (several), phthalates (di-n-butyl phthalate), and metals (arsenic and cadmium). As shown on Table 5.8-2, compounds are identified as carcinogens and noncarcinogens.

Table 5.8-2. Compounds of Potential Concern
Fire Training Area

Type	Source	Carcinogens	Noncarcinogens
Monoaromatics	Fuels	Benzene	1,3,5-Trimethylbenzene 1,2,4-Trimethylbenzene Isopropylbenzene n-Propylbenzene 4-Isopropyltoluene
Polyaromatics (PAH)	Fuels, oils	None	2-Methylnaphthalene
Chlorinated monoaromatics	Solvents	1,4-Dichlorobenzene	None
Ketones	Solvents	None	2-Hexanone 4-Methyl-2-pentanone
Polychlorinated biphenyls (PCB)	Transformer oil	Total PCBs	(Aroclor 1016 or 1254 only)
Dioxins and furans	Herbicides, Burning Chlorinated Organics	Dibenzo-p-dioxins and dibenzofurans with chlorine substituted in the 2,3,7,8 positions (several)	None
Phthalates	Plastics	None	Di-n-butyl Phthalate
Metals[1]	Background soil; fuels and oils	Arsenic	Cadmium

[1] Based on the background metals statistics evaluation in Appendix A, some metals were not included in the semi-quantitative risk assessment because they were not statistically significant from background concentrations.

All other target analytes were either 1) not detected, 2) below 1/10th of the RBC for residential soil, or 3) not statistically different from the background sample population (metals only). As shown by Table 4-1, however, RBCs are not available for some compounds. These compounds were included in the semi-quantitative risk assessment *only* when they were detected in a site-related sample. In addition, a list of compounds that were not detected at detection limits exceeding current risk-based concentrations is provided in Table 5.8-3. Most of these compounds were identified in the Work Plan (ENSR 1994) but require special analytical services to achieve reporting limits below RBCs. During the RI/FS, Table 5.8-3 should be reviewed to determine if the likelihood that the compound is present warrants the use of special analytical services.

As described in Section 5.8.4.4, the toxicity of petroleum hydrocarbons cannot be evaluated using bulk hydrocarbon measurements (GRO, DRO, and TPH). As a result, these data were not included in the semi-quantitative risk assessment.

5.8.4.2 Sources, Transport Mechanisms, Exposure Pathways, and Receptors

Sources, transport mechanisms, exposure pathways, and receptors (elements of a Conceptual Site Model) are shown on Figure 5.8-4. As discussed previously, primary sources include the former fire training pit, a former landfill, contaminated soil stockpiles, and drums containing flammable liquids. Secondary sources include contaminated surface and subsurface soil. It is not known whether groundwater or surface waters have been impacted.

Potential transport mechanisms include surface water transport, leaching and groundwater transport, and volatilization. Within the air phase, volatile COPCs may disperse in the atmosphere or accumulate in enclosed spaces. However, no enclosed spaces are present in the vicinity of the Fire Training Area. In accordance with EPA (1995a), only four COPCs are considered "volatile" (benzene, 1,4-dichlorobenzene, 1,3,5-trimethylbenzene and 1,2,4-trimethylbenzene), having Henry's Law constants greater than 10^{-5}. Concentrations of these compounds are not expected to be significant in atmospheric air. Similarly, concentrations of nonvolatile COPCs in airborne dust are not expected to be of concern in the atmosphere (see Appendix A, Section A.5).

Surface water transport is not expected to be significant, since the surrounding topography is relatively flat, and no surface water bodies are present within 0.5 mile of the site. Leaching may be significant for the more soluble compounds, including monoaromatics, ketones, and chlorinated monoaromatics. However, the depth to groundwater (approximately 180 feet) may be sufficient for natural attenuation of these compounds concurrent with downward migration.

Table 5.8-3 Compounds Not Detected at Detection Limits Exceeding Current Risk-Based Concentrations, Fire Training Pits

Compound	Matrix	Maximum Detection Limit	Risk-Based Concentration
Toxaphene	Soil	0.7 mg/Kg	0.58 mg/Kg
1,2-Dibromoethane (EDB)	Soil	5400 µg/Kg	7.5 µg/Kg
1,2,3-Trichloropropane	Soil	1400 µg/Kg	91 µg/Kg
1,2-Dibromo-3-chloropropane (DBCP)	Soil	5400 µg/Kg	460 µg/Kg
N-Nitrosodimethylamine	Soil	20 mg/Kg	0.013 mg/Kg
Bis(2-chloroethyl) Ether	Soil	3 mg/Kg	0.58 mg/Kg
N-Nitrosodi-n-propylamine	Soil	3 mg/Kg	0.091 mg/Kg
2-Nitroaniline	Soil	20 mg/Kg	4.7 mg/Kg
Hexachlorobenzene	Soil	3 mg/Kg	0.4 mg/Kg
3,3'-Dichlorobenzidine	Soil	20 mg/Kg	1.4 mg/Kg
Benz(a)anthracene	Soil	3 mg/Kg	0.88 mg/Kg
Benzo(b)fluoranthene	Soil	3 mg/Kg	0.88 mg/Kg
Benzo(a)pyrene	Soil	3 mg/Kg	0.088 mg/Kg
Indeno(1,2,3-cd)pyrene	Soil	3 mg/Kg	0.88 mg/Kg
Dibenz(a,h)anthracene	Soil	3 mg/Kg	0.088 mg/Kg
Pentachlorophenol	Soil	20 mg/Kg	5.3 mg/Kg

Note: Some detection limits are elevated due to analytical interference. See the Fire Training Pits Appendix for a complete list of detection limits

Depending on the future land use, potential receptors may include residents, occupational workers, and construction workers. Ecological receptors include terrestrial plants, mammals, and avian species.

5.8.4.3 Exposure Assessment

A preliminary exposure assessment was performed for the soil ingestion pathway. Soil exposures via ingestion generally result in greater chemical uptake than dermal contact, inhalation, or recreation use. Accordingly, this pathway was selected to determine if soil exposures represent a significant human health risk. If human health risks via soil ingestion are significantly below the acceptable risk threshold, then combined health risks from other exposure pathways are probably within acceptable limits. However, if human health risks via soil ingestion are close to the acceptable risk threshold, then other exposure pathways should be evaluated as part of a baseline risk assessment.

Soil exposures were calculated using default exposure factors for residential and commercial/industrial receptors (EPA 1995a). These exposure factors reflect individuals with the highest chronic exposure for noncarcinogens and the highest cumulative exposure for carcinogens. For example, exposures to noncarcinogens are calculated assuming childhood exposure only, whereas exposures to carcinogens are calculated assuming combined childhood and adult exposure. A list of the exposure factors and equations is provided in Appendix A.

Exposure concentrations in soil were calculated as the 95 percent UCL of the average concentration of all samples analyzed from a particular medium (surface or subsurface soil). If the compound was not detected, one-half of the reporting limit was used to calculate the 95 percent UCL. This approach is consistent with EPA guidance (EPA 1991b, 1992).

5.8.4.4 Toxicity Assessment

Dose-response factors for most compounds were obtained from EPA (1995a). These factors were obtained from:

1) EPA's Integrated Risk Information System (current as of January 1, 1995),
2) EPA's Health Effects Assessment Summary Tables (current through March 1994),
3) The Superfund Health Risk Technical Support Center, and
4) Other EPA sources.

Compounds not included in EPA (1995a) were assigned proxy dose-response factors based on those for related compounds. These compounds are listed in Table 5.8-4, along with related compounds and toxicity equivalency factors (where available). A provisional reference dose for 1,3,5-trimethylbenzene (EPA 1995a) was used as a proxy reference dose for other alkylbenzenes lacking approved dose-response factors. This value was selected because it is the lowest reference dose of all nonhalogenated alkylbenzenes provided in EPA (1995a), thereby providing a conservative estimate of the noncarcinogenic effects of volatile fuel hydrocarbons. Similarly, toxic equivalence factors developed by Magee et al. (1993) were used to estimate proxy reference doses for noncarcinogenic PAH lacking approved dose-response factors. These factors were used to evaluate potential noncarcinogenic effects associated with semivolatile fuel hydrocarbons (i.e., PAH).

Although provisional dose response factors have been developed for JP-4, JP-5, gasoline, and diesel fuel (EPA 1992b), these values are not appropriate for this evaluation. These values are based on fresh petroleum products and do not accurately represent the composition, and therefore the toxicity, of weathered petroleum products. They have not been subjected to rigorous peer review and are not routinely used, even by EPA, in risk assessment. As a result, bulk hydrocarbon measurements (GRO, DRO, and TPH) were not included in the semi-quantitative risk assessment.

5.8.4.5 Human Health Risk Characterization

The following sections summarize potential human health risks via soil ingestion. As described previously, soil exposures via ingestion generally result in greater chemical uptake than dermal contact, inhalation, or recreation use. Accordingly, if human health risks via soil ingestion are significantly below the acceptable risk threshold, then combined health risks from other exposure pathways are probably within acceptable limits. However, if human health risks via soil ingestion are close to the acceptable risk threshold, then other exposure pathways may be evaluated as part of a baseline risk assessment.

Human Health Risks - Carcinogenic

Carcinogenic risks for the soil ingestion pathway are summarized on Table 5.8-5. Detailed risk calculations for each pathway and receptor are presented in Appendix A.

Table 5.8-4. Proxy Dose-Response Factors for Compounds Lacking Toxicity Data Fire Training Area

Surrogate Compounds			Target Compound			
Name	Approved RfDo[1]	Approved CSFo[1]	Name	TEF[2]	Proxy RfDo	Proxy CSFo
1,3,5-Trimethylbenzene	0.0004		4-Isopropyltoluene	None[3]	0.0004	
Isopropylbenzene	0.04		n-Propylbenzene	None[3]	0.04	
Methyl ethyl ketone	0.6		4-Methyl-2-pentanone	None[3]	0.6	
Methyl ethyl ketone	0.6		2-Hexanone	None[3]	0.6	
Dibutyl phthalate	0.1		Di-n-butyl phthalate	None[3]	0.1	
Naphthalene	0.04		2-Methylnaphthalene	1	0.04	
2,3,7,8-TCDD (dioxin)		1.56E+5	2,3,7,8-PeCDDs (dioxins)	0.5		7.80E+4
2,3,7,8-TCDD		1.56E+5	2,3,7,8-HxCDDs	0.1		1.56E+4
2,3,7,8-TCDD		1.56E+5	2,3,7,8-HpCDDs	0.01		1.56E+3
2,3,7,8-TCDD		1.56E+5	OCDD	0.001		1.56E+2
2,3,7,8-TCDD		1.56E+5	2,3,7,8-TCDFs (furans)	0.1		1.56E+4
2,3,7,8-TCDD		1.56E+5	1,2,3,7,8-PeCDFs	0.05		7.80E+3
2,3,7,8-TCDD		1.56E+5	2,3,4,7,8-PeCDFs	0.5		7.80E+4
2,3,7,8-TCDD		1.56E+5	2,3,7,8-HxCDFs	0.1		1.56E+4
2,3,7,8-TCDD		1.56E+5	2,3,7,8-HpCDFs	0.01		1.56E+3
2,3,7,8-TCDD		1.56E+5	OCDF	0.001		1.56E+2

Notes:

[1] "Approved" oral reference doses (RfDs) from EPA (1995a).

[2] Toxicity Equivalency Factors (TEF) for PAH from Magee et al. (1993); dioxins and furans from EPA (1989).

[3] No TEFs have been developed for these compounds. RfDs for surrogate compounds were substituted as those for the target compounds.

Table 5.8-5. Carcinogenic Risks for Soil Ingestion Fire Training Area

Pathway	Carcinogenic Risk	
	Residential	Occupational
Surface Soil	3.0×10^{-6}	3.5×10^{-7}
Subsurface Soil	3.1×10^{-6}	3.7×10^{-7}
Total Risk	6.1×10^{-6}	7.2×10^{-7}

Using both residential and occupational exposure factors, the excess lifetime carcinogenic risk for soil ingestion exceeds the lower benchmark of 1×10^{-6} listed in the NCP. As a result, exposures via inhalation and dermal contact may need to be evaluated. The carcinogenic risk is associated with PCBs, benzene, 1,4-dichlorobenzene, dioxins, and furans.

Human Health Risks - Noncarcinogenic

Noncarcinogenic hazard indices for the soil ingestion pathway are summarized on Table 5.8-6. Detailed risk calculations for each pathway and receptor are presented in Appendix A.

Table 5.8-6. Noncarcinogenic Hazard Indices for Soil Ingestion Fire Training Area

Pathway	Noncarcinogenic Hazard Index	
	Residential	Occupational
Surface Soil	1.1	0.043
Subsurface Soil	0.081	0.0033
Total Hazard Index	1.2	0.046

Using residential exposure factors, the total hazard index for soil ingestion is above the estimated threshold for adverse effects (1.0). As a result, exposures via inhalation and dermal contact may need to be evaluated. The majority of noncarcinogenic hazard is associated with trimethylbenzenes. The remainder of the noncarcinogenic hazard is associated with other monoaromatics (isopropylbenzene, n-propylbenzene, and 4-isopropyltoluene), ketones (2-hexanone and 4-methyl-2-pentanone), 2-methylnaphthalene, di-n-butyl phthalate, and cadmium.

Using occupational exposure factors, the total hazard index for soil ingestion is well below the estimated threshold for adverse effects (1.0). However, if groundwater impacts are present, the additional noncarcinogenic hazard associated with potential groundwater use may need to be evaluated.

5.8.4.6 Ecological Risk Characterization

Quantitative assessment of ecological risks can be performed at the organism, population, or ecosystem level. Although ecosystem-level effects may be the most important, effects testing and modeling are rarely performed due to a number of practical considerations (Suter 1993). Quantification of population-level effects, such as reproductive potential, is important to maintain species populations, whereas assessment of organism-level effects evaluates the risk to individual organisms.

Chemicals can be evaluated as single compounds or as mixtures. Methods for evaluating the toxicity of mixtures requires knowledge regarding the sites and modes of action of individual compounds. Unlike for human health risk assessment, these methods have not been standardized, and there is some debate regarding the most appropriate approach.

If potential exposure pathways and receptors are present, ecological assessment begins with identification of the compounds of potential concern. This can be done in a similar fashion as for human health risk assessment, using ecological RBCs. Ecological RBCs may include toxicity benchmarks, sediment quality criteria, or other regulatory criteria. One set of criteria in common use provides benchmark concentrations for eight representative mammalian species and nine avian species (Opresko et al. 1994). Although benchmark concentrations are provided for 76 chemicals, toxicity benchmarks are not available for many target analytes. Also, the benchmarks are provided as concentrations in food, requiring evaluation of plant uptake and other routes of dietary exposure. Due to the large number of analytes measured at the Fire Training Pits, ecological RBCs were not compiled as part of this project.

Potential receptors at the Fire Training Pits include terrestrial and avian species at a variety of trophic levels. The most highly exposed species include those with a small home range and small body weight to food consumption ratio (e.g., mice and resident songbirds). However, other less exposed species may warrant evaluation based on their susceptibility to particular chemicals (e.g., reproductive effects of 4,4'-DDT in raptors).

As part of the RI/FS, ecological RBCs may need to be identified for representative terrestrial and avian species. Compounds of potential concern may be selected based on a comparison of ecological RBCs with measured concentrations. At this point, the appropriate risk quantitation methods and measurement endpoints may be selected.

5.8.5 Findings and Conclusions

The concentrations of carcinogenic and noncarcinogenic compounds are above the estimated threshold levels for adverse effects, the excess lifetime carcinogenic risk for soil ingestion exceeds the lower benchmark of 1×10^{-6} listed in the NCP. The carcinogenic risk is associated with benzene, 1,4-dichlorobenzene, PCBs, and various dioxin and furan congeners.

The semi-quantitative risk assessment was performed using exposure assumptions that may not be appropriate for the site (e.g., residential use). In addition, the extent of contamination and the dynamic state of soil contamination plumes (expanding, degrading, or steady-state) have not been evaluated. The exposure assumptions, compounds of potential concern, future land use, and contaminant fate and transport may be re-evaluated for inclusion in a baseline risk assessment, if required. In addition, ecological receptors, RBCs, risk quantitation methods, and measurement endpoints may need to be identified for inclusion in a baseline ecological risk assessment.

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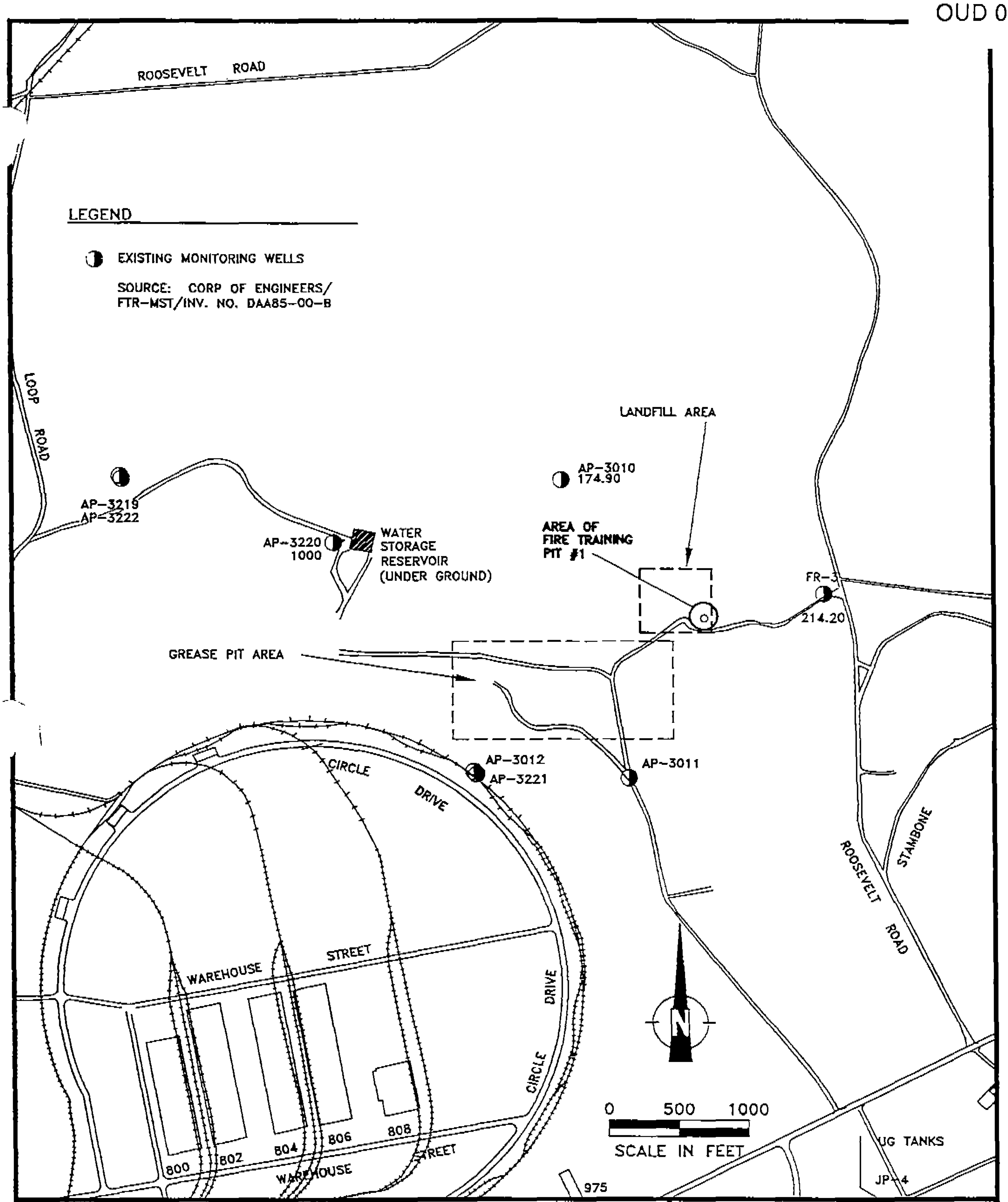


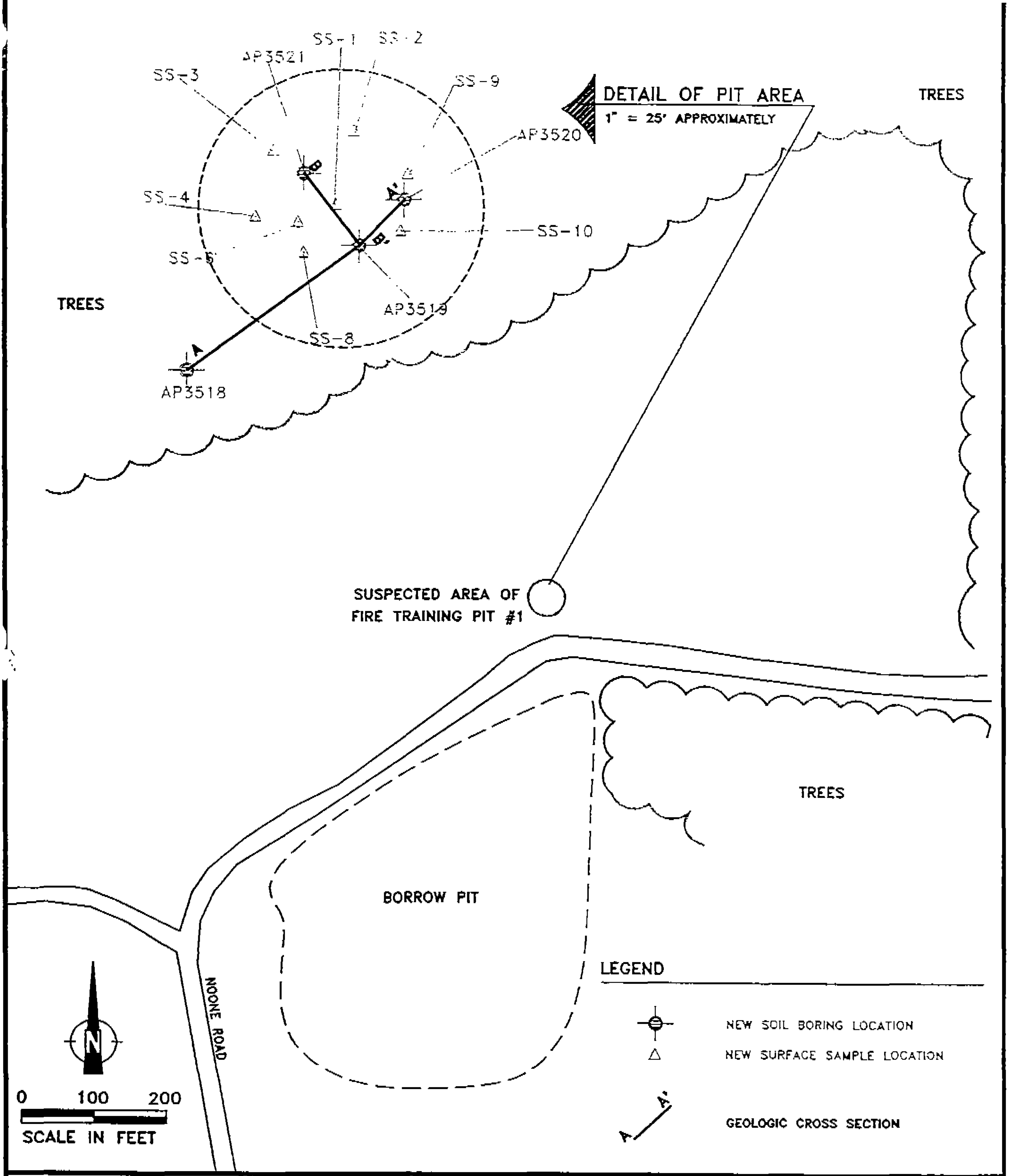
ENSR

ENSR CONSULTING & ENGINEERING

DRAWING: GPSP DRAWN: SR/ABB
C/SC: 1:1000 DISK: 153/96
ATE: 10/8/96 CHECK: T.B.

FIGURE 5.8-1
FIRE TRAINING PIT
SITE PLAN

OPERABLE UNIT D
FORT RICHARDSON
PROJECT 9000-066



DRAWING: FTPSB
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DISK: 307/95
DATE: 8/14/95
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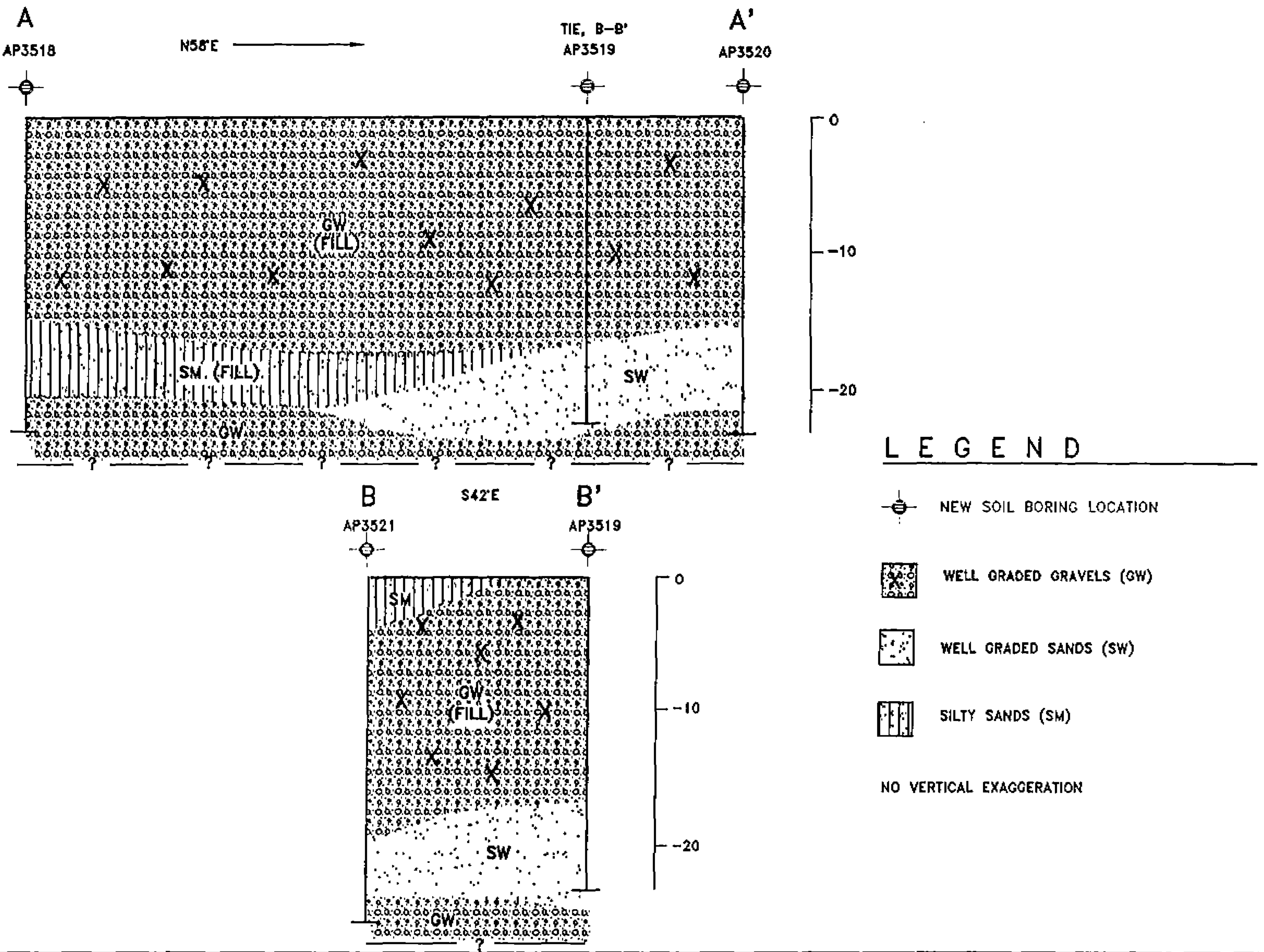
FIGURE 5.8-2
SOIL BORING LOCATIONS
FIRE TRAINING PIT

OPERABLE UNIT D
FORT RICHARDSON
PROJECT 9000-036



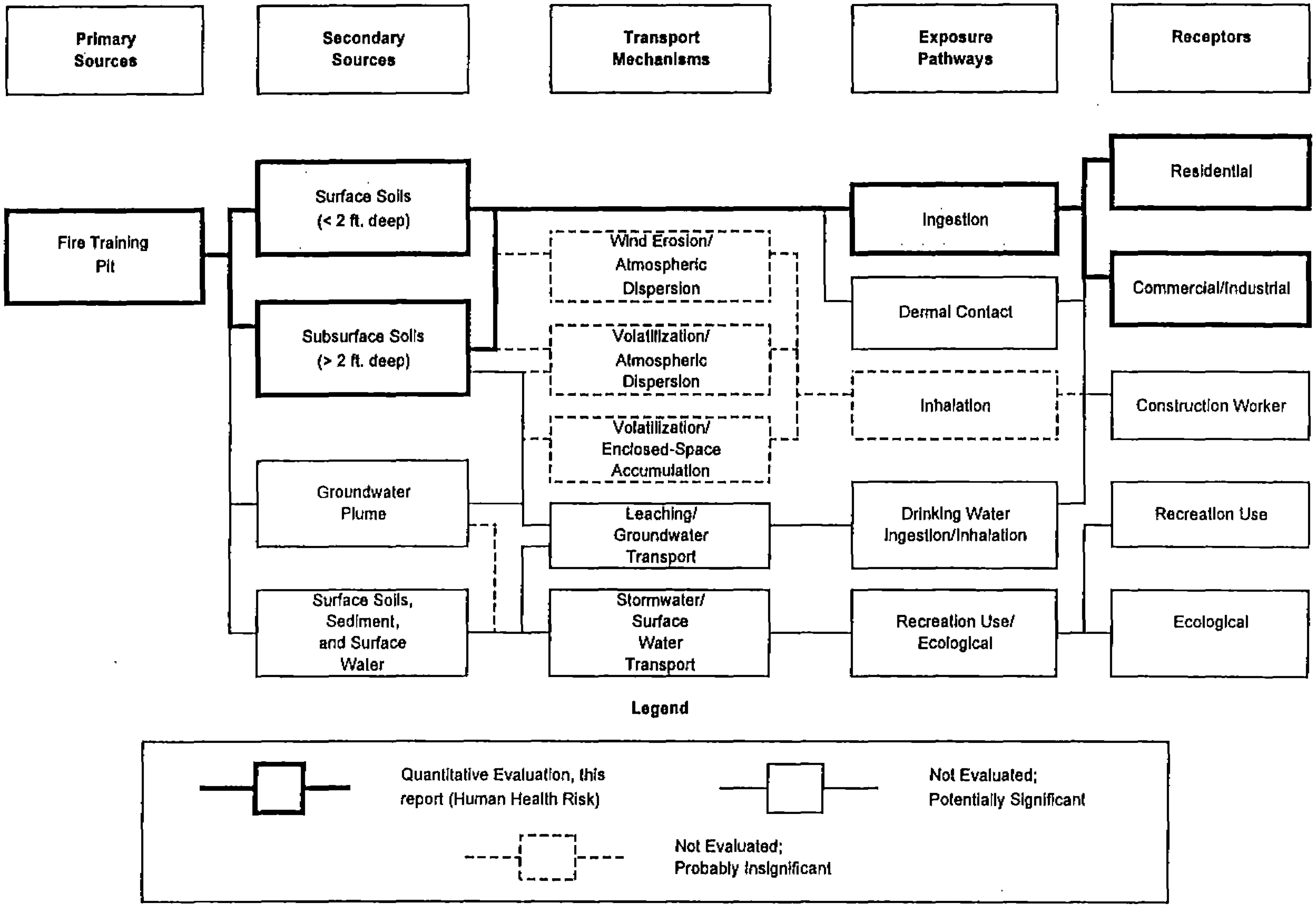
DRAWING: FTPCS
C/SC: 1:1
DATE: 8/14/95

DRAWN: ABB/SR
DISK: NET
CHECK: TB

FIGURE 5.8-3
CROSS SECTION
A-A' AND B-B'
FOR FIRE TRAINING PITS

OPERABLE UNIT D
FORT RICHARDSON, ALASKA
PROJECT 9000-036

Figure 5.8-4: Sources, Transport Mechanisms, Exposure Pathways, and Receptors
Fire Training Pit



After ASTM (1994)
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Grease Pits

5.9 Grease Pits

5.9.1 Site History

The Grease Pits Site is located north of the main cantonment and southwest of the previously discussed Fire Training Pit in the area of Fort Richardson's former landfill (Figure 5.9-1). The original Work Plan was prepared to investigate two grease pits and one human waste pit at the site. During the course of the investigation, it was determined that at least 10 pits and possibly more have been excavated, used, and backfilled at the site. The ultimate scope of work performed and described herein was correspondingly modified after discussions between ENSR, the USACE, EPA, and ADEC.

Historical information on the Grease Pits Site is not well documented; however, some information relevant to this study is indicated as follows:

- According to Travis Barber, USACE (pers. comm.), many pits have existed on site (exact locations are unknown), and at least two pits existed east of the main pit area. Five pit locations were tentatively identified in the main pit area (see Figure 5.9-2).
- The pits may have been used to dump cooking greases and other oils from field training exercises, miscellaneous trash and debris, and human waste.
- Although the grease pits were not intended for general landfill use, the grease pit site is included as a portion of "old landfill" disposal areas that were in operation as recently as 1977 (E&E 1993a).
- During a May 1988, AEHA inspection, two trenches were open, with 55-gallon drums and liquid waste floating on the surface of the water in the base of the trench; the exact location of these trenches has not been determined.
- At the time of a later visual site inspection (SAIC 1990), one grease pit (location unknown) contained four drums labelled ethylene glycol; these drums had spilled and their contents were pooling in a brown puddle on the trench bottom. Another grease pit contained eight unidentified drums at the time of the 1990 site inspection.
- One identified human waste pit is approximately 50 feet east of the pit with the ethylene glycol.

- It is also possible that some individual pits have been used for disposal of petroleum-type grease and oil, oil/water/sediment separator bottoms, fuel tank water, and other chemicals.

- It has been reported that active uses of the trenches at the Grease Pits Site stopped sometime after 1988. All open trenches have been backfilled, regraded, and the surface has been hydroseeded.

As the number, location, and exact use of each pit is uncertain, the environmental investigation of this site focuses on the identification of contaminants in representative pits rather than attempting to locate each individual grease pit. Contaminants of concern that were examined at the Grease Pits Site include petroleum hydrocarbons, VOCs, SVOCs, halogenated compounds, solvents, metals, ethylene glycol, and fecal coliform.

5.9.2 Field Investigation

Field investigation, as modified, included:

- Excavating seven trenches ranging in depth from 5 to 10 feet bgs and 12 to 50 feet in length, to locate some representative pits, prior to drilling soil borings; screening headspace vapors with an OVM.

- Four soil borings (Appendix J) to depths of 30 to 60 feet bgs.

The location of the trenches, soil borings, and samples locations are shown in Figure 5.9-2. A cross section of this area is provided in Figure 5.9-3.

Trenches were excavated with a backhoe as described below. Trench depths are provided in Appendix J.

Trench	Depth	Length	Comments
1	10	40	Oil automotive debris and headspace vapors up to 200 ppm.
2	10	15	Weathered trash from 0.5 to 2 feet. 0 ppm headspace vapors.
3	10	35	Native soil.

Trench	Depth	Length	Comments
4	10	20	Mess hall waste from 3 to 5 feet. Metallic debris (e.g., bulldozer parts, wire rope, spent artillery casing) from 5 to 8 feet. Probable date of burial early 1970s based on some items found. No fuel solvent odors or headspace vapors above background.
5	5	12	Native soil.
6	7	50	Southern ⅓ of trench - mess hall waste and spent artillery casing container. Fuel/solvent odor.
7	7	35	Native soil.

Borings were drilled using an air-rotary drilling rig described in Section 3.1.4.

The Grease Pit Area investigation was modified to investigate the area the pits are located in by collecting samples at 10-foot intervals from three soil borings and completing the soil borings as monitoring wells.

While advancing the soil borings, high fluid saturations were encountered in the vadose interval at a variety of depths ranging from 30 to 50 feet below grade level. Relatively highest water saturations (specific retentions) are generally associated with finer-grained materials (recovered gravelly muds). A fourth soil boring was advanced to bracket the area where the grease pits are known to be located.

In order to assess the groundwater quality in the vadose zone and to assess the degree of capillary rise, two nested sets of suction lysimeters with gypsum blocks were installed in the borings; AP-3522 and AP-3525. Details regarding the installation and data collection from the suction lysimeters is presented in Section 5.9.4. The other two borings were backfilled with bentonite-based grout. Comments regarding installation of the borings are described below:

Boring	Depth	Comments
AP-3522 (site of Trench 1)	58.8	In location of obvious backfilled pit. High headspace screening (up to 200 ppm) to 25 feet. Muddy gravels. Background levels in headspace deeper than 25 feet bgs. Very moist soils at 48 feet bgs; no free water.
AP-3523 (site of Trench 2)	28.3	Very moist soils at 28.1 feet. Muddy gravels. Background levels in headspace vapors.
AP-3524 (site of Trench 3)	48.5	Moist to wet soils from 27 to 45 feet. Muddy gravel. Background levels in headspace vapors.
AP-3525 (site of Trench 4)	57.9	In location of obvious backfilled pit. Moist to wet from 27 to 28 feet. Muddy gravel.

Based on these field investigations, the following observations and conclusions were made:

- The metallic debris uncovered in trench 4 does not appear to include spent petroleum hydrocarbon.
- The debris found in trenches 1 and 6 are likely to include petroleum wastes.
- Based on readings of headspace vapors, vertical migration of contaminants through subsurface soil is likely to be limited to 25 feet bgs or less.

There is still a concern that the location of other backfilled trenches/pits have not been identified.

5.9.3 Analytical Results

A total of 29 soil samples, including three blind duplicate samples and three QA samples, were collected and sent to the laboratory for analysis. Analytes detected above the MRLs are shown in Table 5.9-1. A complete summary of analytical data is presented in Appendix J.

Four samples were submitted to the USACE NPD Laboratory for geotechnical analysis, which included Atterburg limits, percent moisture content, and grain size testing.

The project data was determined to be acceptable with the following qualification:

- Precision and accuracy of soil SVOC data could not be completely assessed due to matrix interference in matrix spike/matrix spike duplicate recoveries.

TABLE 5.9-1 Summary of Analytes Detected
Grease Pits Soil Sample Analytical Results

Part 1 of 3

	Location:	SB AP 3522						
	Sample Depth:	10'		17.8'-18.6'	27.3'-29.2'	37.8'-38.9'	48.6'-49.6'	57.8'-58.8'
	Sample ID:	95GP1201SL	95GP1202SL	95GP1203SL	95GP1204SL	95GP1205SL	95GP1206SL	95GP1207SL
	Lab Code:	K950397-001	K950397-002	K950447-001	K950447-002	K950447-003	K950476-002	K950476-001
	Date Collected:	1/20/95	1/20/95	1/23/95	1/23/95	1/23/95	1/24/95	1/24/95
Compound	**Residential RBC**							
Petroleum Hydrocarbons (mg/Kg)								
GRO	none	NA	NA	NA	NA	NA	NA	NA
DRO	none	NA	NA	NA	NA	NA	NA	NA
TPH	none	NA	NA	NA	NA	NA	NA	NA
Volatile Organic Compounds (µg/Kg)								
Acetone	7,800,000	<12,000	<8,000	<12,000	110	57	ND	ND
2-Butanone (MEK)	47,000,000	<5,000	<2,400	<5,000	25	ND	ND	ND
Benzene	22,000	<1,200	<600	<1,200	16	ND	ND	ND
Toluene	16,000,000	<1,200	<600	39,000	9	ND	ND	ND
Tetrachloroethene (PCE)	12,000	<1,200	<600	2,200	ND	ND	ND	ND
Ethylbenzene	7,800,000	<1,200	<600	25,000	6	ND	ND	ND
Total Xylenes	160,000,000	<1,200	<600	94,000	23	ND	ND	ND
Isopropylbenzene	3,100,000	<5,000	<2,400	5,500	ND	ND	ND	ND
n-Propylbenzene	none	<5,000	<2,400	11,000	ND	ND	ND	ND
1,3,5-Trimethylbenzene	31,000	<5,000	<2,400	14,000	ND	ND	ND	ND
1,2,4-Trimethylbenzene	39,000	<5,000	<2,400	39,000	ND	ND	ND	ND
Naphthalene	3,100,000	<5,000	<2,400	8,500	ND	ND	ND	ND
Semivolatile Organic Compounds (mg/Kg)								
Naphthalene	3,100	<3	<3	0.6	ND	ND	ND	ND
2-Methylnaphthalene	none	<3	<3	1.4	ND	ND	ND	ND
Bis(2-ethylhexyl) Phthalate	46	<3	<3	ND	ND	ND	ND	ND
Di-n-octyl Phthalate	1,600	<3	<3	ND	ND	ND	ND	ND
Total Metals (mg/Kg)								
Arsenic	0.37	4	4	NA	6 J	7 J	NA	NA
Barium	5,500	28	31	NA	79	68	NA	NA
Chromium	390	24	25	NA	ND	ND	NA	NA
Lead	none	13	15	NA	42	34	NA	NA
Mercury	23	ND	ND	NA	6	6	NA	NA
Nickel	1,600	27	26	NA	ND	ND	NA	NA
Selenium	390	ND	ND	NA	31	55	NA	NA
Other Analyses (mg/Kg)								
Ammonia as Nitrogen	none	0.4	0.5	NA	0.4	0.4	0.7	0.3
Nitrate + Nitrite as Nitrogen	none	ND	ND	NA	ND	ND	ND	ND

FOOTNOTES:
ND = Non-detected at the method reporting limit (MRL). (See the Grease Pits Appendix for MRL values.)
NA = Analysis not performed on this sample.
J = Value is considered an estimate.
< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.
A shaded value indicates result exceeds the residential risk based concentration (RBC).

\QAQC\COMMON\RICH\FINALS\REPTABLES\TABLES.XLS|GP soil 10/7/96

TABLE 5.9-1 Summary of Analytes Detected (cont.)
Grease Pits Soil Sample Analytical Results

Part 2 of 3

	Location:	SB AP 3523				SB AP 3524				
	Sample Depth:	10'		17.3'-18.3'	27.3'-28.3'	10'	17.3'-18.2'	27.3'	37.3'-38.2'	47.3'-48.1'
	Sample ID:	95GP1208SL	95GP1209SL	95GP1210SL	95GP1211SL	95GP1212SL	95GP1215SL	95GP1216SL	95GP1217SL	95GP1218SL
	Lab Code:	K950502-001	K950502-002	K950601-001	K950601-002	K950638-001	K950667-004	K950667-003	K950667-002	K950667-001
	Date Collected:	1/25/95	1/25/95	1/30/95	1/30/95	1/31/95	2/1/95	2/1/95	2/1/95	2/1/95
Compound	Residential RBC									
Petroleum Hydrocarbons (mg/Kg)										
GRO	none	NA	NA	NA	NA	NA	NA	NA	NA	NA
DRO	none	NA	NA	NA	NA	NA	NA	NA	NA	NA
TPH	none	NA	NA	NA	NA	NA	NA	NA	NA	NA
Volatile Organic Compounds (µg/Kg)										
Acetone	7,800,000	ND	ND	ND	ND	83	ND	ND	78	ND
2-Butanone (MEK)	47,000,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	22,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	16,000,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene (PCE)	12,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	7,800,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	160,000,000	ND	ND	ND	ND	6	ND	ND	ND	ND
Isopropylbenzene	3,100,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Propylbenzene	none	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	31,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	39,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	3,100,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Semivolatile Organic Compounds (mg/Kg)										
Naphthalene	3,100	ND	ND	ND	ND	ND	ND	NA	ND	ND
2-Methylnaphthalene	none	ND	ND	ND	ND	ND	ND	NA	ND	ND
Bis(2-ethylhexyl) Phthalate	46	ND	ND	ND	0.4	ND	ND	NA	ND	0.3
Di-n-octyl Phthalate	1,600	ND	ND	ND	ND	ND	0.3	NA	ND	0.4
Total Metals (mg/Kg)										
Arsenic	0.37	6	5	5	4	8	NA	NA	6	NA
Barium	5,500	28	29	51	62	39	NA	NA	82	NA
Chromium	390	21	25	30	35	25	NA	NA	35	NA
Lead	none	5	7	5	6	4	NA	NA	5	NA
Mercury	23	ND	ND	ND	ND	ND	NA	NA	ND	NA
Nickel	1,600	29	32	43	44	34	NA	NA	46	NA
Selenium	390	ND	ND	ND	ND	ND	NA	NA	1 UJ	NA
Other Analyses (mg/Kg)										
Ammonia as Nitrogen	none	0.5	0.3	0.2	0.5	0.2	NA	NA	ND	NA
Nitrate + Nitrite as Nitrogen	none	ND	ND	ND	ND	ND	ND	NA	ND	NA

FOOTNOTES:
ND = Non-detected at the method reporting limit (MRL) (See the Grease Pits Appendix for MRL values.)
NA = Analysis not performed on this sample.
J = Value is considered an estimate.
< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.
A shaded value indicates result exceeds the residential risk based concentration (RBC).

TABLE 5.9-1 Summary of Analytes Detected (cont.)
Grease Pits Soil Sample Analytical Results

Part 3 of 3

Location:		SB AP 3525							Trench 5	Trench 6	Trench 7
Sample Depth:		10'		17.3'-18.3'	27.3'-27.9'	37.3'	47.3'-47.8'	57.3'-57.7'	4'	4'	6'
Sample ID:		95GP1213SL	95GP1214SL	95GP1219SL	95GP1220SL	95GP1221SL	95GP1222SL	95GP1223SLa	95GP1223SLb	95GP1224SL	95GP1225SL
Lab Code:		K950636-003	K950638-002	K950694-003	K950694-002	K950694-001	K950717-002	K950717-001	K950778-001	K950778-002	K950778-003
Date Collected:		1/31/95	1/31/95	2/2/95	2/2/95	2/2/95	2/9/95	2/3/95	2/7/95	2/7/95	2/7/95
Compound	**Residential RBC**										
Petroleum Hydrocarbons (mg/Kg)											
GRO	none	NA	NA	NA	NA	NA	NA	NA	ND	NA	800
DRO	none	NA	NA	NA	NA	NA	NA	NA	ND	NA	3,600
TPH	none	NA	NA	NA	NA	NA	NA	NA	ND	ND	5,600
Volatile Organic Compounds (µg/Kg)											
Acetone	7,800,000	50	ND	68	73	65 J	ND	51	ND	ND	<12,000
2-Butanone (MEK)	47,000,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	<5,000
Benzene	22,000	ND	ND	ND	6	110 J	ND	ND	ND	ND	<1,200
Toluene	16,000,000	ND	ND	ND	ND	11 J	ND	ND	ND	ND	<1,200
Tetrachloroethene (PCE)	12,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	<1,200
Ethylbenzene	7,800,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	<1,200
Total Xylenes	160,000,000	ND	ND	6	ND	14 J	ND	ND	ND	ND	19,000
Isopropylbenzene	3,100,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	<5,000
n-Propylbenzene	none	ND	ND	ND	ND	ND	ND	ND	ND	ND	<5,000
1,3,5-Trimethylbenzene	31,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	5,900
1,2,4-Trimethylbenzene	39,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	17,000
Naphthalene	3,100,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	<5,000
Semivolatile Organic Compounds (mg/Kg)											
Naphthalene	3,100	ND	ND	ND	ND	ND	NA	NA	ND	ND	4
2-Methylnaphthalene	none	ND	ND	ND	ND	ND	NA	NA	ND	ND	7
Bis(2-ethylhexyl) Phthalate	46	ND	ND	0.3	ND	ND	NA	NA	ND	ND	<3
Di-n-octyl Phthalate	1,600	ND	ND	0.3	0.6	0.7	NA	NA	ND	ND	<3
Total Metals (mg/Kg)											
Arsenic	0.37	3	4	7	NA	NA	NA	NA	4	NA	7
Barium	5,500	32	29	69	NA	NA	NA	NA	32	NA	38
Chromium	390	23	20	53	NA	NA	NA	NA	37 J	NA	28 J
Lead	none	4	6	7	NA	NA	NA	NA	9	NA	22
Mercury	23	ND	ND	ND	NA	NA	NA	NA	ND	NA	ND
Nickel	1,600	60	37	48	NA	NA	NA	NA	41	NA	43
Selenium	390	ND	ND	ND	NA	NA	NA	NA	ND	NA	ND
Other Analyses (mg/Kg)											
Ammonia as Nitrogen	none	ND	ND	NA	NA	NA	NA	NA	ND	ND	<0.8
Nitrate + Nitrite as Nitrogen	none	ND	ND	ND	NA	12	NA	NA	ND	2.2	ND

FOOTNOTES:
ND = Non-detected at the method reporting limit (MRL). (See the Grease Pits Appendix for MRL values.)
NA = Analysis not performed on this sample.
J = Value is considered an estimate.
< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.
UJ = Analyte was not detected at the MRL, however, the MRL is considered an estimate.
A shaded value indicates result exceeds the residential risk based concentration (RBC).

\OAQC\COMMON\RICH\FINALS\REPTABLES\TABLE5.XLS|GP soil

10/15/96

TABLE 5.9-1 Summary of Analytes Detected
Grease Pits Water Sample Analytical Results

Page 1

µg/L Location:	AP 3522			AP 3522			AP 3522			AP 3525			AP 3525								
Sample ID:	95GP1290GW			95GP1291GW			95GP129GW DUP			95GP1293GW			95GP1294GW			Method Blank			Method Blank		
Depth:	27 ft. BGS			43 ft. BGS			43 ft. BGS			22 ft. BGS			32 ft. BGS			K951101-MB1			K951102-MB2		
Lab Code:	K9506659-001			K9506659-002			K9506659-003			K9506659-004			K9506659-005			K951101-MB1			K951102-MB2		
Date Collected:	10/18/95			10/18/95			10/18/95			10/18/95			10/18/95								
Volatile Organic Compounds (EPA Method 8260)			MRL			MRL			MRL			MRL			MRL			MRL			MRL
1,1,1,2-Tetrachloroethane	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5
1,1,1-Trichloroethane	0.3	J	0.5	2.2		0.5	1.8		0.5	0.1	J	0.5	ND		0.5	ND		0.5	ND		0.5
1,1,2,2-Tetrachloroethane	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5
1,1,2-Trichloroethane	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5
1,1-Dichloroethane	6.3		0.5	12		0.5	9.9		0.5	1.0		0.5	ND		0.5	ND		0.5	ND		0.5
1,1-Dichloroethene	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5
1,1-Dichloropropene	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5
1,2,3-Trichlorobenzene	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0
1,2,3-Trichloropropane	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5
1,2,4-Trichlorobenzene	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0
1,2,4-Trimethylbenzene	3.0		2.0	0.3	J	2.0	0.2	J	2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0
1,2-Dibromo-3-chloropropane	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0
1,2-Dibromoethane	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0
1,2-Dichlorobenzene	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5
1,2-Dichloroethane	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5
1,2-Dichloropropane	0.2	J	0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5
1,3,5-Trimethylbenzene	1.0		2.0	0.3	J	2.0	0.3	J	2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0
1,3-Dichlorobenzene	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5
1,3-Dichloropropane	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5
1,4-Dichlorobenzene	ND		0.5	0.3	J	0.5	0.3	J	0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5
2,2-Dichloropropane	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5
2-Butanone	ND		20	ND		20	5	J	20	2	J	20	10	J	20	ND		20	ND		20
2-Chlorotoluene	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0
2-Hexanone	ND		20	ND		20	ND		20	ND		20	1	J	20	ND		20	ND		20
4-Chlorotoluene	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0
4-Methyl-2-pentanone	0.4	J	20	ND		20	ND		20	ND		20	1.0	J	20	ND		20	ND		20
Acetone	6.0	J,B	20	6.0	J,B	20	6.0	J,B	20	10	J,B	20	20	B	20	2.0	J	20	2.0	J	20
Benzene	760	D	10	18		0.5	15		0.5	4.4		0.5	0.2	J	0.5	ND		0.5	ND		0.5
Bromobenzene	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5
Bromochloromethane	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5
Bromodichloromethane	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5
Bromoform	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5
Bromomethane	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5
Carbon disulfide	2.2		0.5	0.8		0.5	0.6		0.5	6.1		0.5	3.8		0.5	ND		0.5	ND		0.5
Carbon tetrachloride	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5
Chlorobenzene	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5
Chloroethane	0.4	J	0.5	0.2	J	0.5	ND		0.5	0.2	J	0.5	ND		0.5	ND		0.5	ND		0.5
Chloroform	ND		0.5	ND		0.5	ND		0.5	0.1	J	0.5	ND		0.5	ND		0.5	ND		0.5
Chloromethane	0.2	J	0.5	ND		0.5	0.1	J	0.5	0.2	J	0.5	0.4	J	0.5	ND		0.5	ND		0.5
cis-1,2-Dichloroethene	190	D	10	13		0.5	11		0.5	1.0		0.5	ND		0.5	ND		0.5	ND		0.5
cis-1,3-Dichloropropene	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5
Dibromochloromethane	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5
Dibromomethane	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5
Dichlorodifluoromethane	ND		0.5	1.9		0.5	1.7		0.5	0.9		0.5	0.1	J	0.5	ND		0.5	ND		0.5
Ethylbenzene	16		0.5	0.2	J	0.5	0.2	J	0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5
Hexachlorobutadiene	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0
Isopropylbenzene	0.4	J	2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0
Methylene chloride	1.7	B	1.0	0.8	J,B	1.0	0.7	J,B	1.0	0.9	J,B	1.0	0.8	J,B	1.0	0.6	J	1.0	0.5	J	1.0
n-Butylbenzene	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0
n-Propylbenzene	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0
Naphthalene	4.0		2.0	4.0		2.0	4.0		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0
p-Isopropyltoluene	0.4	J	2.0	0.5	J	2.0	0.6	J	2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0
sec-Butylbenzene	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0
Styrene	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5
tert-Butylbenzene	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0	ND		2.0
Tetrachloroethene	0.5		0.5	3.0		0.5	2.7		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5
Toluene	ND		0.5	2.2		0.5	2.0		0.5	1.0		0.5	1.6		0.5	ND		0.5	ND		0.5
trans-1,2-Dichloroethene	1.0		0.5	0.4	J	0.5	0.3	J	0.5	0.1	J	0.5	ND		0.5	ND		0.5	ND		0.5
trans-1,3-Dichloropropene	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5
Trichloroethene	0.5		0.5	0.5	J	0.5	0.4	J	0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5
Trichlorofluoromethane	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5
Vinyl chloride	92	D	10	3.2		0.5	2.7		0.5	9.2		0.5	ND		0.5	ND		0.5	ND		0.5
Xylenes	62		0.5	1.8		0.5	1.5		0.5	ND		0.5	ND		0.5	ND		0.5	ND		0.5

FOOTNOTE ND = Non-detected at the method reporting limit (MRL).
J = Value is considered estimated, B = Compound was also found present in the associated method blank, D = analysis performed at a dilution.
ft. BGS = Feet below ground surface.

More detailed qualifications and exceptions are noted in the USACE NPD Laboratory's CQAR and ENSR QASR located in Volumes I through III of Analytical Data for PSE2 OUD (ENSR 1995).

Subsequent to the original PSE2 data collection activities, water samples were collected from the suction lysimeters at AP-3522 and AP-3525 in October 1995. Results are presented in Section 5.9.4.

5.9.4 Suction Lysimeter Results

Suction lysimeter arrays were installed in borings AP-3522 and AP-3525 at approximately 25, 45, and 60 feet bgs. A suction lysimeter and gypsum block were installed at each depth (See Figure 5.9-3 and as-built drawings in Appendix J).

Based on available drilling data, the vadose zone in the site area is composed of stratified, cobbly gravels with silt and clay occurring as a pore filling. Suction lysimeters collect water from surrounding soil pore spaces. Water table elevations appear to be deeper than 150 feet bgs based on data from the monitoring wells in the vicinity of the site.

Suction lysimeters AP-3522 and AP-3525 were installed using an air rotary drilling rig in April 1995. The lysimeters were installed with porous ceramic cup assemblies at depths of 25 ft, 45 ft, and 60 ft bgs. Gypsum blocks were set immediately above the levels of the ceramic cups to assess moisture content. The gypsum blocks have wire leads that measure the resistance across the gypsum block in ohms. The resistance changes with the moisture content present. The moisture content is then approximated from moisture content curves available for some typical farm soils. Moisture content readings from AP-3522 ranged from 6 to 8 percent. Moisture content readings from AP-3525 ranged from 3.1 to 7.25 percent.

Distilled water was used with silica flour to make a slurry, and for hydration of bentonite chips. The lysimeters were purged 3 times in April, 4 times in September, and 3 times in October 1995 to equilibrate pore water with surrounding soils, and to assess recovery rates. The ceramic cups were held at 70 centibar vacuums for approximately one week for each event, and the resultant pore water was subsequently extracted using a hand pump. Volumes recovered from the cups fluctuated widely between 0 and 500 mL. The fluctuation in recovered pore water volumes may be attributed to variances in infiltration rates, but is more likely a factor of recovery rates; and field capacity (specific retention).

During October 1995 the cups underwent final purging, and sampling. The cups were purged 3 times during which pH, conductivity, and temperature were measured. The pH readings ranged between 6.7 and 7.99. Conductivity readings ranged from 550 to 3,480 µmhos/cm. Temperature readings ranged between 4.5 and 9 degrees centigrade.

Water samples were collected from the lysimeters on October 18, 1995 and analyzed for EPA Test Method 8260. Pore water was sampled from suction lysimeters AP-3522 and AP-3525 at approximately 25 and 45 ft bgs. Insufficient water was obtained from the 60-foot cups for analysis of samples. A duplicate sample was collected from the 45-foot cup in lysimeter AP-3522.

Following sampling, the lysimeters were flushed with pressurized air, and the cups were then left at ambient pressure to mitigate the potential for ice damage over the winter.

Analytical Results

A total of five water samples, including one duplicate sample, was collected from the lysimeters and sent to the laboratory for analysis. Analytes detected above the MRLs are shown in Table 5.9-1. A complete summary of analytical data is presented in Appendix J.

Benzene was the key constituent of concern; detected in water from lysimeter AP-3522 at 760 µg/L at 27 ft bgs, and 18 µg/L at 43 ft bgs. Varying concentrations of other VOCS were detected up to 190 µg/L in samples from AP-3522. The analytical results for these samples indicated that VOCS generally attenuate at least 1 order of magnitude between 27 and 43 ft bgs. The majority of VOCS were reported below the method reporting limits for samples from AP-3525.

In general, the potentially most mobile VOCs appear to attenuate at the sites of AP-3522 and AP-3525 with increased depth to 45 ft bgs. VOCS in vadose pore fluid attenuate 100 feet above the water table.

5.9.5 Semi-Quantitative Risk Assessment

As described in Section 4.2, a semi-quantitative risk assessment was conducted on this site. The risk assessment is considered semi-quantitative because: 1) potential risks to ecological receptors were not evaluated, 2) the exposures evaluated reflect the available analytical data and do not necessarily represent the maximum extent of contamination or future changes in contaminant concentrations, and 3) only one exposure pathway was considered (soil ingestion); although this pathway usually yields the most conservative results, other pathways may also be important.

The Grease Pit Site is located north of the main cantonment in a fenced and locked area. Surrounding land uses include former landfill areas. The area of investigation is surrounded by mixed spruce and birch forest, with interspersed grasslands. There are no surface water bodies within 0.5 mile.

5.9.5.1 Compounds of Potential Concern

The COPCs are summarized in Table 5.9-2. These compounds include monoaromatics (benzene, toluene, ethylbenzene, xylenes, 1,3,5-trimethylbenzene, 1,2,4-trimethylbenzene, isopropylbenzene, n-propylbenzene, and 4-isopropyltoluene), PAH (naphthalene and 2-methylnaphthalene), chlorinated alkenes (tetrachloroethene), ketones (methyl ethyl ketone), phthalates (bis[2-ethylhexyl]phthalate and di-n-butyl phthalate), and metals (arsenic and cadmium). As shown on Table 5.9-2, some of these compounds are carcinogens.

All other target analytes were either 1) not detected, 2) below 1/10th of the RBC for residential soil, or 3) not statistically different from the background sample population (metals only). As shown by Table 4-1, however, RBCs are not available for some compounds. These compounds were included in the semi-quantitative risk assessment *only* when they were detected in a site-related sample. In addition, a list of compounds that were not detected at detection limits exceeding current risk-based concentrations is provided in Table 5.9-3. Most of these compounds were identified in the Work Plan (ENSR 1994) but require special analytical services to achieve reporting limits below RBCs. During the RI/FS, Table 5.9-3 should be reviewed to determine if the likelihood that the compound is present warrants the use of special analytical services.

As described in Section 5.9.4.4, the toxicity of petroleum hydrocarbons cannot be evaluated using bulk hydrocarbon measurements (GRO, DRO, and TPH). As a result, these data were not included in the semi-quantitative risk assessment.

Table 5.9-2. Compounds of Potential Concern
Grease Pits

Type	Source	Carcinogens	Noncarcinogens
Monoaromatics	Fuels	Benzene	Toluene Ethylbenzene Xylenes 1,3,5-trimethylbenzene 1,2,4-trimethylbenzene Isopropylbenzene n-Propylbenzene 4-Isopropyltoluene
Polyaromatics (PAH)	Fuels, oils	None	Naphthalene 2-Methylnaphthalene
Chlorinated alkenes	Solvents	Tetrachloroethene	None
Ketones	Solvents	Methyl ethyl ketone	Acetone
Phthalates	Plastics	None	Bis(2-ethylhexyl)phthalate Di-n-butyl phthalate
Metals[1]	Background soil; fuels and oils	Arsenic	Barium Chromium Mercury Selenium

[1] Based on the background metals statistics evaluation in Appendix A, some metals were not included in the semi-quantitative risk assessment because they were not statistically significant from background concentrations.

Table 5.9-3 Compounds Not Detected at Detection Limits Exceeding Current Risk-Based Concentrations, Grease Pit

Compound	Matrix	Maximum Detection Limit		Risk-Based Concentration
Benzene	Water	2.5	µg/L	0.36 µg/L
Chloromethane	Water	2.5	µg/L	1.4 µg/L
Vinyl Chloride	Water	2.5	µg/L	0.019 µg/L
1,1-Dichloroethene	Water	2.5	µg/L	0.044 µg/L
Methylene Chloride	Water	5	µg/L	4.1 µg/L
Chloroform	Water	2.5	µg/L	0.15 µg/L
Carbon Tetrachloride	Water	2.5	µg/L	0.16 µg/L
1,2-Dichloroethane	Water	2.5	µg/L	0.12 µg/L
Benzene	Water	2.5	µg/L	0.36 µg/L
Trichloroethene (TCE)	Water	2.5	µg/L	1.6 µg/L
1,2-Dichloropropane	Water	2.5	µg/L	0.16 µg/L
Bromodichloromethane	Water	2.5	µg/L	0.17 µg/L
cis-1,3-Dichloropropene	Water	2.5	µg/L	0.077 µg/L
trans-1,3-Dichloropropene	Water	2.5	µg/L	0.077 µg/L
1,1,2-Trichloroethane	Water	2.5	µg/L	0.19 µg/L
Tetrachloroethene (PCE)	Water	2.5	µg/L	1.1 µg/L
1,2-Dibromoethane (EDB)	Water	10	µg/L	0.00075 µg/L
1,1,1,2-Tetrachloroethane	Water	2.5	µg/L	0.41 µg/L
Bromoform	Water	2.5	µg/L	2.4 µg/L
1,1,2,2-Tetrachloroethane	Water	2.5	µg/L	0.052 µg/L
1,3,5-Trimethylbenzene	Water	10	µg/L	2.4 µg/L
1,2,4-Trimethylbenzene	Water	10	µg/L	3 µg/L
1,4-Dichlorobenzene	Water	2.5	µg/L	0.44 µg/L
1,2-Dibromo-3-chloropropane (DBCP)	Water	10	µg/L	0.048 µg/L
Hexachlorobutadiene	Water	10	µg/L	0.14 µg/L
N-Nitrosodimethylamine	Water	250	µg/L	0.0013 µg/L
Aniline	Water	250	µg/L	10 µg/L
Bis(2-chloroethyl) Ether	Water	100	µg/L	0.0092 µg/L
1,4-Dichlorobenzene	Water	100	µg/L	0.44 µg/L
Bis(2-chloroisopropyl) Ether	Water	100	µg/L	0.26 µg/L
N-Nitrosodi-n-propylamine	Water	100	µg/L	0.0096 µg/L
Hexachloroethane	Water	100	µg/L	0.75 µg/L
Nitrobenzene	Water	100	µg/L	3.4 µg/L
Isophorone	Water	100	µg/L	71 µg/L
Hexachlorobutadiene	Water	100	µg/L	0.14 µg/L
Hexachlorocyclopentadiene	Water	100	µg/L	0.15 µg/L
2-Nitroaniline	Water	250	µg/L	2.2 µg/L
3-Nitroaniline	Water	250	µg/L	110 µg/L
2,4-Dinitrotoluene	Water	100	µg/L	73 µg/L

Note: Some detection limits are elevated due to analytical interference. See the Grease Pit Appendix for a complete list of detection limits

Table 5.9-3, cont'd. Compounds Not Detected at Detection Limits Exceeding Current Risk-Based Concentrations, Grease Pit

Compound	Matrix	Maximum Detection Limit	Risk-Based Concentration
2,6-Dinitrotoluene	Water	100 µg/L	37 µg/L
4-Nitroaniline	Water	250 µg/L	110 µg/L
N-Nitrosodiphenylamine	Water	100 µg/L	14 µg/L
Hexachlorobenzene	Water	100 µg/L	0.0066 µg/L
3,3'-Dichlorobenzidine	Water	250 µg/L	0.15 µg/L
Benz(a)anthracene	Water	100 µg/L	0.092 µg/L
Bis(2-ethylhexyl) Phthalate	Water	100 µg/L	4.8 µg/L
Chrysene	Water	100 µg/L	9.2 µg/L
Benzo(b)fluoranthene	Water	100 µg/L	0.092 µg/L
Benzo(k)fluoranthene	Water	100 µg/L	0.92 µg/L
Benzo(a)pyrene	Water	100 µg/L	0.0092 µg/L
Indeno(1,2,3-cd)pyrene	Water	100 µg/L	0.092 µg/L
Dibenz(a,h)anthracene	Water	100 µg/L	0.0092 µg/L
2,4,6-Trichlorophenol	Water	100 µg/L	6.1 µg/L
2,4-Dinitrophenol	Water	250 µg/L	73 µg/L
Pentachlorophenol	Water	250 µg/L	0.56 µg/L
Arsenic	Water	5 µg/L	0.038 µg/L
Vinyl Chloride	Soil	1200 µg/Kg	340 µg/Kg
1,1-Dichloroethene	Soil	1200 µg/Kg	1100 µg/Kg
1,2-Dibromoethane (EDB)	Soil	5000 µg/Kg	7.5 µg/Kg
1,2,3-Trichloropropane	Soil	1200 µg/Kg	91 µg/Kg
1,2-Dibromo-3-chloropropane (DBCP)	Soil	5000 µg/Kg	460 µg/Kg
N-Nitrosodimethylamine	Soil	20 mg/Kg	0.013 mg/Kg
Bis(2-chloroethyl) Ether	Soil	3 mg/Kg	0.58 mg/Kg
N-Nitrosodi-n-propylamine	Soil	3 mg/Kg	0.091 mg/Kg
2-Nitroaniline	Soil	20 mg/Kg	4.7 mg/Kg
Hexachlorobenzene	Soil	3 mg/Kg	0.4 mg/Kg
3,3'-Dichlorobenzidine	Soil	20 mg/Kg	1.4 mg/Kg
Benz(a)anthracene	Soil	3 mg/Kg	0.88 mg/Kg
Benzo(b)fluoranthene	Soil	3 mg/Kg	0.88 mg/Kg
Benzo(a)pyrene	Soil	3 mg/Kg	0.088 mg/Kg
Indeno(1,2,3-cd)pyrene	Soil	3 mg/Kg	0.88 mg/Kg
Dibenz(a,h)anthracene	Soil	3 mg/Kg	0.088 mg/Kg
Pentachlorophenol	Soil	20 mg/Kg	5.3 mg/Kg

Note: Some detection limits are elevated due to analytical interference. See the Grease Pit Appendix for a complete list of detection limits

5.9.5.2 Sources, Transport Mechanisms, Exposure Pathways, and Receptors

Known primary sources, transport mechanisms, exposure pathways, and receptors, elements of a Conceptual Site Model, are shown on Figure 5.9-4. As discussed previously, primary sources include grease pits and the human waste disposal pit. Secondary sources include contaminated surface and subsurface soil.

Potential transport mechanisms include surface water transport, leaching and groundwater transport, and volatilization. Within the air phase, volatile COPCs may disperse in the atmosphere or accumulate in enclosed spaces; however, no enclosed spaces are present in the vicinity of the fire training area. In accordance with EPA (1995a), several COPCs are considered "volatile" (benzene, toluene, ethylbenzene, xylenes, 1,3,5-trimethylbenzene, 1,2,4-trimethylbenzene, isopropylbenzene, n-propylbenzene, 4-isopropyltoluene, tetrachloroethylene, methyl ethyl ketone, and acetone), having Henry's Law constants greater than 10^{-5}. Concentrations of these compounds are not expected to be significant in atmospheric air. Similarly, concentrations of nonvolatile COPCs in airborne dust are not expected to be of concern in the atmosphere (see Appendix A, Section A.5).

Surface water transport is not expected to be significant, since the surrounding topography is relatively flat, and no surface water bodies are present within 0.5 mile of the site. Leaching may be significant for the more soluble compounds, including monoaromatics, chlorinated alkenes, and ketones. However, the depth to groundwater (estimated at 150 feet bgs) may be sufficient for natural attenuation of these compounds concurrent with downward migration.

Depending on the future land use, potential receptors may include residents, occupational workers, and construction workers. Ecological receptors include terrestrial plants, mammals, and avian species.

5.9.5.3 Exposure Assessment

A preliminary exposure assessment was performed for the soil ingestion pathway. Soil exposures via ingestion generally result in greater chemical uptake than dermal contact, inhalation, or recreation use. Accordingly, this pathway was selected to determine if soil exposures represent a significant human health risk. If human health risks via soil ingestion are significantly below the acceptable risk threshold, then combined health risks from other exposure pathways are probably within acceptable limits. However, if human health risks via soil ingestion are close to the acceptable risk threshold, then other exposure pathways should be evaluated as part of the baseline risk assessment.

Soil exposures were calculated using default exposure factors for residential and commercial/industrial receptors (EPA 1995a). These exposure factors reflect individuals with the highest chronic exposure for noncarcinogens and the highest cumulative exposure for carcinogens. For example, exposures to noncarcinogens are calculated assuming childhood exposure only, whereas exposures to carcinogens are calculated assuming combined childhood and adult exposure. A list of the exposure factors and equations is provided in Appendix A.

Exposure concentrations in soil were calculated as the 95 percent UCL of the average concentration of all samples analyzed from a particular medium (surface or subsurface soil). If the compound was not detected, one-half of the reporting limit was used to calculate the 95 percent UCL. This approach is consistent with EPA guidance (EPA 1991b, 1992).

5.9.5.4 Toxicity Assessment

Dose-response factors for most compounds were obtained from EPA (1995a). These factors were obtained from:

1) EPA's Integrated Risk Information System (current as of January 1, 1995),
2) EPA's Health Effects Assessment Summary Tables (current through March 1994),
3) The Superfund Health Risk Technical Support Center, and
4) Other EPA sources.

Compounds not included in EPA (1995a) were assigned proxy dose-response factors based on those for related compounds. These compounds are listed in Table 5.9-4, along with related compounds and toxicity equivalency factors (where available). A provisional reference dose for 1,3,5-trimethylbenzene (EPA 1995a) was used as a proxy reference dose for n-propylbenzene. This value was selected because it is the lowest reference dose of all nonhalogenated alkylbenzenes provided in EPA (1995a), thereby providing a conservative estimate of the noncarcinogenic effects of volatile fuel hydrocarbons. Similarly, toxic equivalence factors developed by Magee et al. (1993) were used to estimate a proxy reference dose for 2-methylnaphthalene. This factor was used to evaluate potential noncarcinogenic effects associated with semivolatile fuel hydrocarbons (i.e., PAH).

Although provisional dose response factors have been developed for JP-4, JP-5, gasoline, and diesel fuel (EPA 1992b), these values are not appropriate for this evaluation. These values are based on fresh petroleum products and do not accurately represent the composition, and therefore the toxicity, of weathered petroleum products. They have not been subjected to rigorous peer review and are not routinely used, even by EPA, in risk assessment. As a result, bulk hydrocarbon measurements (GRO, DRO, and TPH) were not included in the semi-quantitative risk assessment.

Table 5.9-4. Proxy Dose-Response Factors for Compounds Lacking Toxicity Data Grease Pits

Surrogate Compounds		Target Compound			
Name	Approved RfD_o[1]	Name	TEF[2]	Proxy RfD_o	Proxy CSF_o
Isopropylbenzene	0.04	n-Propylbenzene	None[3]	0.04	
Naphthalene	0.04	2-Methylnaphthalene	1	0.04	

Notes:

[1] "Approved" RfDs from EPA (1995a)

[2] Toxicity Equivalency Factors (TEFs) from Magee et al. (1993)

[3] No TEFs have been developed for these compounds. RfDs for surrogate compounds were substituted as those for the target compounds.

5.9.5.5 Human Health Risk Characterization

The following sections summarize potential human health risks via soil ingestion. As described above, soil exposures via ingestion generally result in greater chemical uptake than dermal contact, inhalation, or recreation use. Accordingly, if human health risks via soil ingestion are significantly below the acceptable risk threshold, then combined health risks from other exposure pathways are probably within acceptable limits. However, if human health risks via soil ingestion are close to the acceptable risk threshold, then other exposure pathways should be evaluated as part of the baseline risk assessment.

Human Health Risks - Carcinogenic

Carcinogenic risks for the soil ingestion pathway are summarized on Table 5.9-5. Detailed risk calculations for each pathway and receptor are presented in Appendix A.

Table 5.9-5. Carcinogenic Risks for Soil Ingestion Grease Pits

Pathway	Carcinogenic Risk	
	Residential	Occupational
Surface Soil	Not evaluated; concentrations below threshold levels	
Subsurface Soil	5.1 x 10^{-8}	5.9 x 10^{-9}
Total Risk	5.1 x 10^{-8}	5.9 x 10^{-9}

Using residential and occupational exposure factors, the excess lifetime carcinogenic risk for soil ingestion does not exceed the lower benchmark of 1 x 10^{-6} listed in the NCP. If groundwater impacts are present, exposures via tapwater ingestion may also be considered.

Human Health Risks - Noncarcinogenic

Noncarcinogenic hazard indices for the soil ingestion pathway are summarized on Table 5.9-6. Detailed risk calculations for each pathway and receptor are presented in Appendix A.

Table 5.9-6. Noncarcinogenic Hazard Indices for Soil Ingestion Grease Pits

Pathway	Noncarcinogenic Hazard Index	
	Residential	Occupational
Surface Soil	Not evaluated; concentrations below threshold levels	
Subsurface Soil	0.11	0.0045
Total Hazard Index	0.11	0.0045

Using residential exposure factors, the total hazard index for soil ingestion is below the estimated threshold for adverse effects (1.0). However, if groundwater impacts are present, exposures via tapwater ingestion may also need to be considered.

Using occupational exposure factors, the total hazard index for soil ingestion is well below the estimated threshold for adverse effects (1.0). Additional noncarcinogenic hazards due to dermal contact and inhalation are not likely to exceed the acceptable limit. However, if groundwater impacts are present, the additional noncarcinogenic hazard associated with potential groundwater use may also need to be evaluated.

5.9.5.6 Ecological Risk Characterization

Quantitative assessment of ecological risks can be performed at the organism, population, or ecosystem level. Although ecosystem-level effects may be the most important, effects testing and modeling are rarely performed due to a number of practical considerations (Suter 1993). Quantification of population-level effects, such as reproductive potential, is important to maintain species populations, whereas assessment of organism-level effects evaluates the risk to individual organisms.

Chemicals can be evaluated as single compounds or as mixtures. Methods for evaluating the toxicity of mixtures requires knowledge regarding the sites and modes of action of individual compounds. Unlike for human health risk assessment, these methods have not been standardized, and there is some debate regarding the most appropriate approach.

If potential exposure pathways and receptors are present, ecological assessment begins with identification of the compounds of potential concern. This can be done in a similar fashion as for human health risk assessment, using ecological RBCs. Ecological RBCs may include toxicity benchmarks, sediment quality criteria, or other regulatory criteria. One set of criteria in common use provides benchmark concentrations for eight representative mammalian species and nine avian species (Opresko et al. 1994). Although benchmark concentrations are provided for 76 chemicals, toxicity benchmarks are not available for many target analytes. Also, the benchmarks are provided as concentrations in food, requiring evaluation of plant uptake and other routes of dietary exposure. Due to the large number of analytes measured at the Grease Pits, ecological RBCs were not compiled as part of this project.

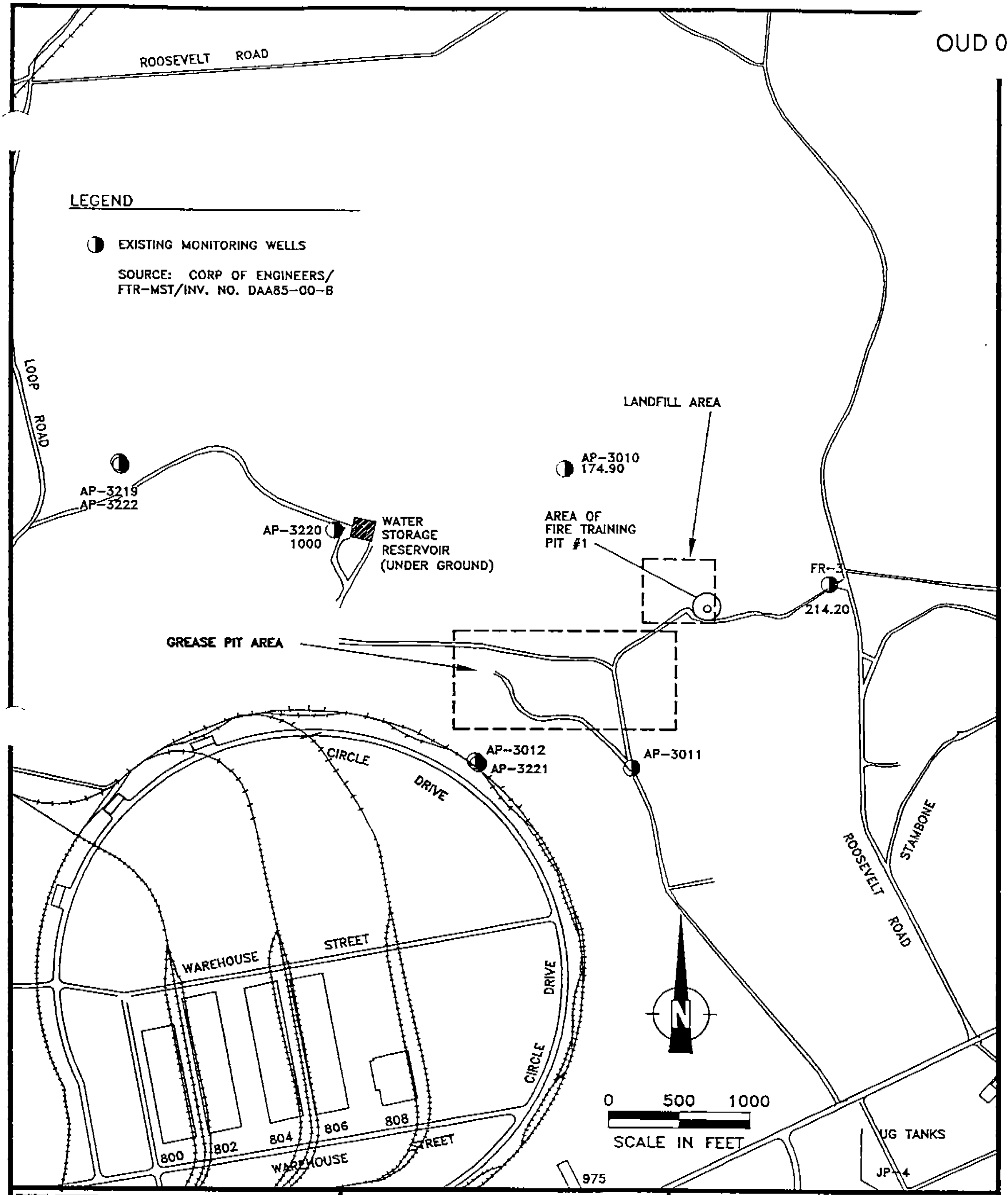
Potential receptors at the Grease Pits include terrestrial and avian species at a variety of trophic levels. The most highly exposed species include those with a small home range and small body weight to food consumption ratio (e.g., mice and resident songbirds). However, other less exposed species may warrant evaluation based on their susceptibility to particular chemicals (e.g., reproductive effects of 4,4'-DDT in raptors).

As part of the RI/FS, ecological RBCs may need to be identified for representative terrestrial and avian species. Compounds of potential concern may be selected based on a comparison of ecological RBCs with measured concentrations. At this point, the appropriate risk quantitation methods and measurement endpoints may be selected.

5.9.6 Findings and Conclusions

The human health risks, using residential exposure parameters for soil ingestion, do not exceed the target noncarcinogenic hazard index of 1.0 or the excess lifetime cancer risk of 1 x 10^{-6} as listed in the NCP.

The semi-quantitative risk assessment was performed using exposure assumptions that may not be appropriate for the site (e.g., residential use). In addition, the extent of contamination and the dynamic state of soil and groundwater contamination plumes (expanding, degrading, or steady-state) have not been evaluated. The exposure assumptions, compounds of potential concern, future land use, and contaminant fate and transport may need to be re-evaluated for inclusion in a baseline risk assessment, if required. In addition, ecological receptors, RBCs, risk quantitation methods, and measurement endpoints may be identified for inclusion in a baseline ecological risk assessment.



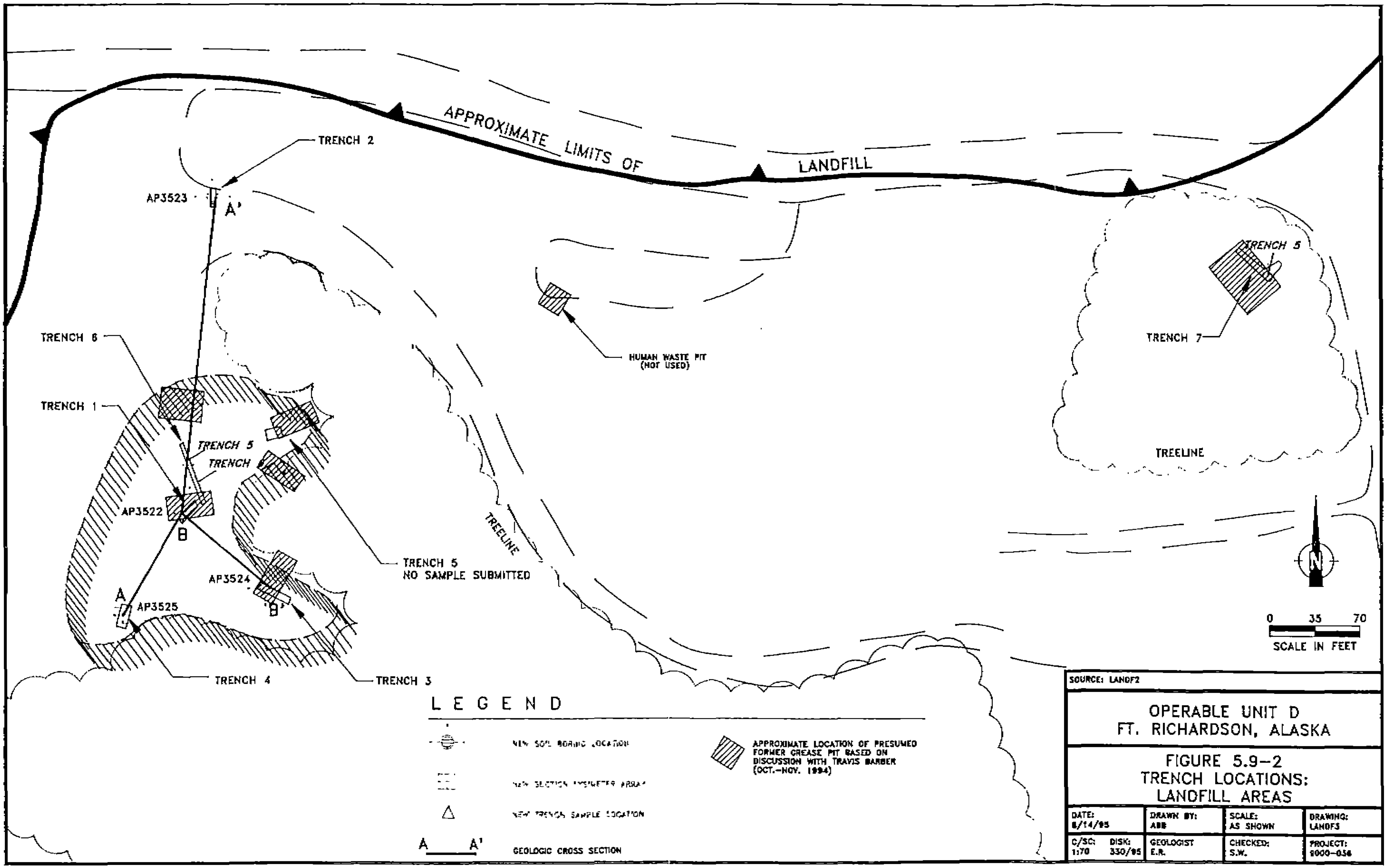
ENSR

ENSR CONSULTING & ENGINEERING

DRAWING: GPSP2
DRAWN: SR/ABB
C/SC: 1:1000
DISK: 152/96
ATE: 10/8/96
CHECK: T.B.

FIGURE 5.9-1
GREASE PIT
SITE PLAN

OPERABLE UNIT D
FORT RICHARDSON
PROJECT 9000-066



LEGEND

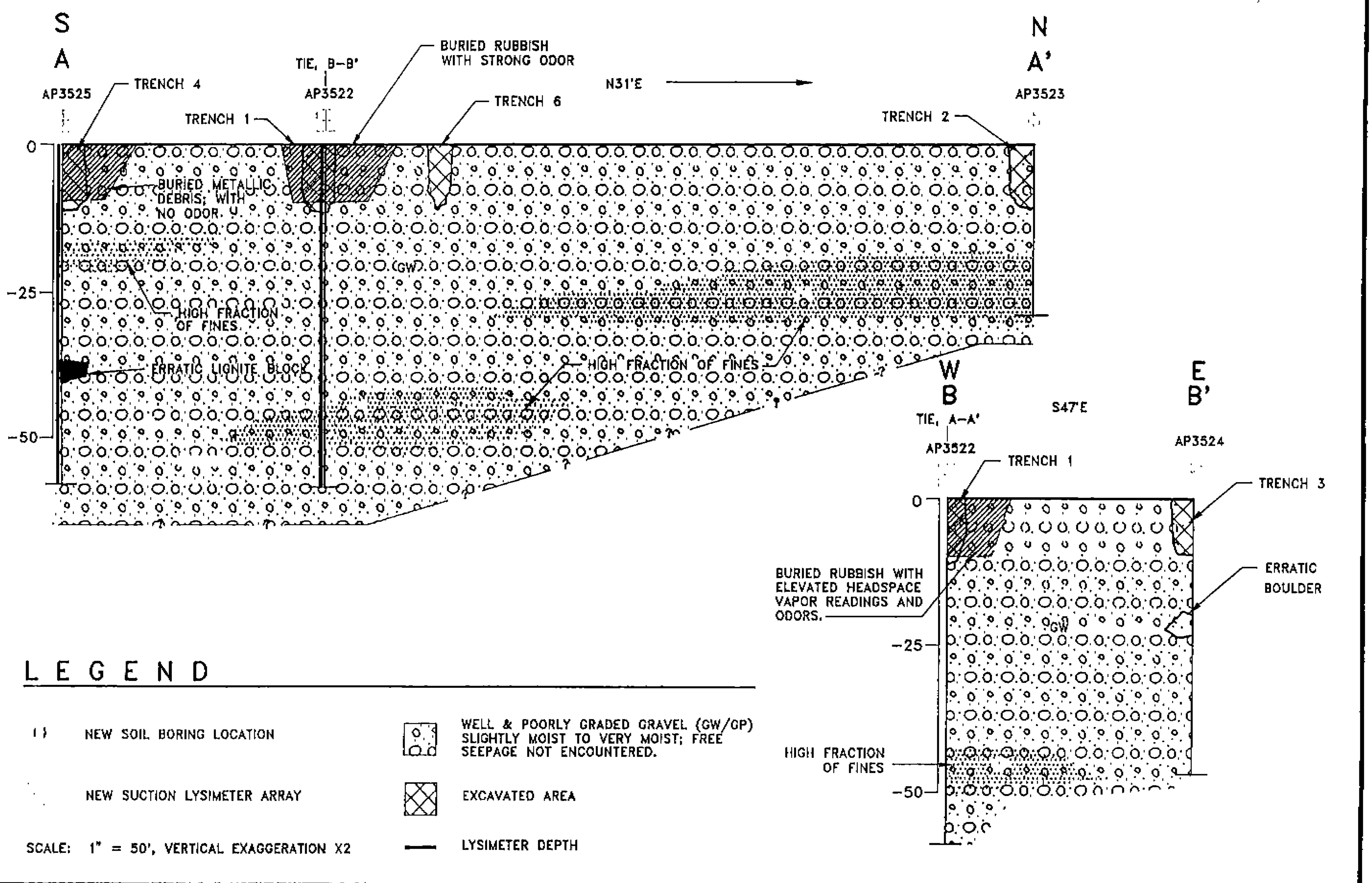
- NEW SOIL BORING LOCATION
- NEW SUCTION LYSIMETER ARRAY
- △ NEW TRENCH SAMPLE LOCATION
- A____A' GEOLOGIC CROSS SECTION
- ▨ APPROXIMATE LOCATION OF PRESUMED FORMER GREASE PIT BASED ON DISCUSSION WITH TRAVIS BARBER (OCT.–NOV. 1994)

SOURCE: LANDF2

OPERABLE UNIT D
FT. RICHARDSON, ALASKA

FIGURE 5.9–2
TRENCH LOCATIONS:
LANDFILL AREAS

DATE: 6/14/95	DRAWN BY: ABB	SCALE: AS SHOWN	DRAWING: LANDF3
C/SC: 1:70 DISK: 330/95	GEOLOGIST E.R.	CHECKED: S.W.	PROJECT: 9000-056



DRAWING: GPCS
C/SC: 1:50
DATE: 10/8/96

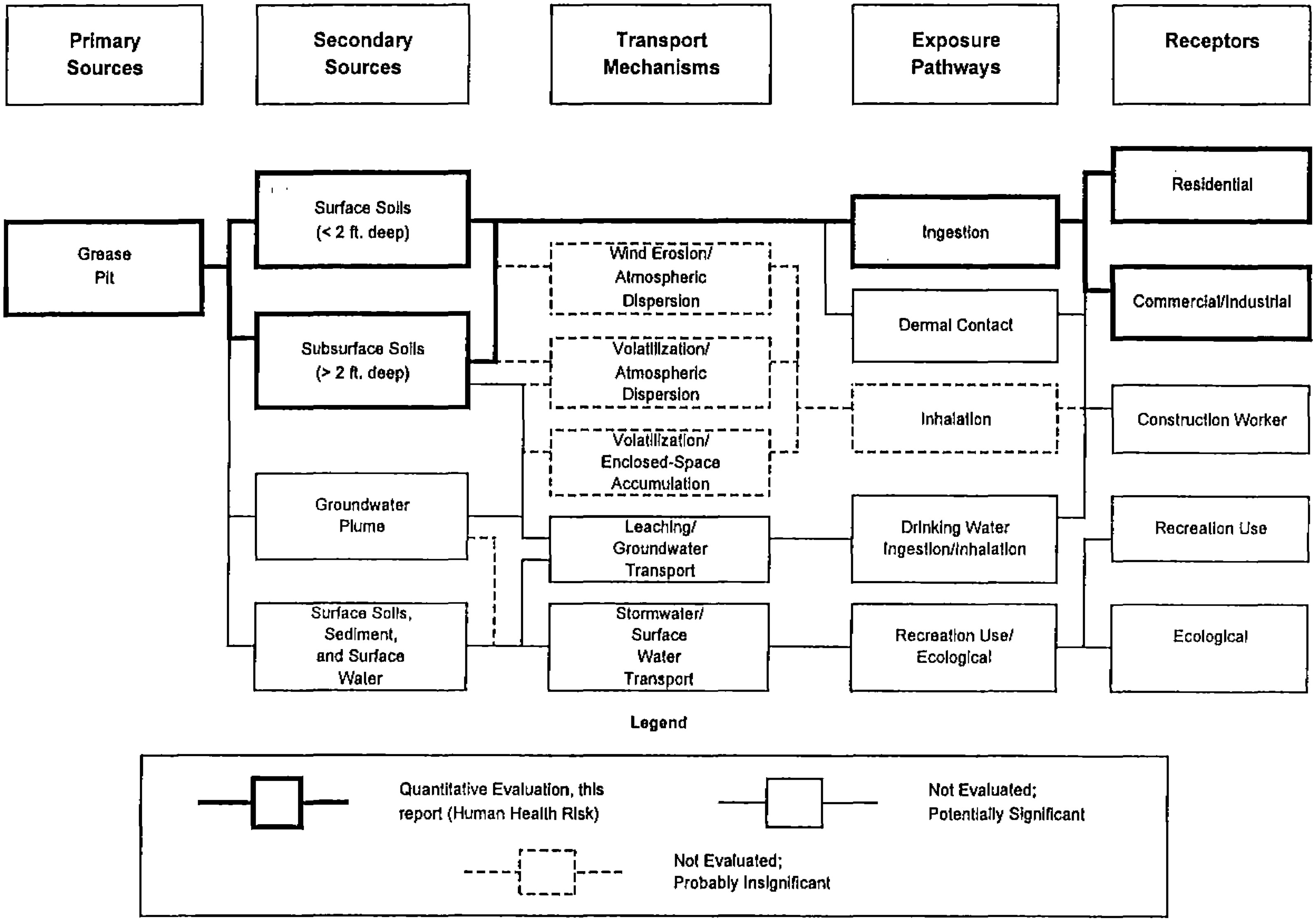
DRAWN: ABB/SSR
DISK: 107/96
CHECK: DG

FIGURE 5.9-3
CROSS SECTION
A-A' AND B-B'
FOR GREASE PITS

OPERABLE UNIT D
FORT RICHARDSON, ALASKA
PROJECT 9000-066

F5.9-C

Figure 5.9-4 Sources, Transport Mechanisms, Exposure Pathways, and Receptors
Grease Pit Area



After ASTM (1994)

F5.9-D

6

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A

APPENDIX A

RISK CALCULATIONS

- Risk Calculations
- Background Metals Statistics
- Summary Risk Tables for Each Site
- Summary Statistics for Each Site

RISK CALCULATIONS

In accordance with EPA Region X guidance (EPA 1992) risk calculations were performed for compounds whose *maximum* concentrations were:

- greater than the risk-based concentration (RBC) for tap water, or
- greater than 1/10 of the RBC for soil.

For metals data, a significance test was performed to determine whether metals data for each site can be distinguished from the background sample population. Metals data which could *not* be distinguished from background were not included in the risk calculations. Details of the statistical analysis are provided in a subsequent section of this Appendix.

RBCs from EPA Region III (EPA 1995) were used for screening criteria. This list reflects more current toxicity information than the Region X RBCs (EPA 1992), and contains a larger list of compounds (nearly 600 compounds for the Region III RBCs, vs. about 140 compounds for the Region X RBCs). In addition, the Region III RBCs are based on age-adjusted exposure factors, which more accurately represent one's cumulative exposure to carcinogens.

The following sections present the equations used to calculate carcinogenic risk and the noncarcinogenic hazard index. The assumptions are identical to those used to develop the EPA Region III RBCs, with two modifications:

- Frozen Ground: Exposure frequencies for surface and subsurface soil were reduced to 7/12 of the default exposure frequency (350 days/year for residential; 250 days per year for commercial/industrial), since the ground is frozen for approximately 5 months of the year.

- Subsurface Soil: For subsurface soil, the product of exposure frequency and duration was assumed to be one-fifth of that for surface soil, reflecting the decreased likelihood of exposure for subsurface soil.

Carcinogenic risks and noncarcinogenic hazard indices were evaluated for two exposure pathways: soil ingestion and tapwater ingestion/inhalation. A justification for eliminating soil exposures via the inhalation pathway is provided in Section A.5 of this Appendix.

Two exposure scenarios were considered: residential and commercial/industrial. The receptors evaluated under these scenarios are identical to those used to develop the EPA Region III RBCs (e.g., combined childhood and adult exposures for soil, adult exposures for tap water, etc.). In this manner, results are presented simply as "residential" or "commercial/industrial", without regard to the individual receptors.

Dose-response factors for most compounds were obtained from EPA (1995). These factors were obtained from:

1) EPA's Integrated Risk Information System (current as of January 1, 1995)
2) EPA's Health Effects Assessment Summary Tables (current through March 1994)
3) The Superfund Health Risk Technical Support Center, and
4) Other EPA sources

In accordance with EPA (1995) oral dose-response factors were substituted for unavailable inhaled dose-response factors. Compounds not included in EPA (1995) were assigned proxy dose-response factors based on those for related compounds. Target compounds, surrogates, and proxy dose response factors are listed for each site in the main body of this report.

A.1 Residential Soil Ingestion

Carcinogenic risks were calculated based on combined childhood and adult exposure (EPA 1995), using a reduced exposure frequency for seasonally frozen soil:

$$ELCR = \frac{EFr_s \cdot IFSadj}{ATc \cdot 10^6 \frac{mg}{kg}} \sum_{i=1}^{n} EC_i \cdot CSFo_i \quad (1)$$

where $ELCR$ = excess lifetime carcinogenic risk
EFr_s = residential exposure frequency, soil (200 d/y)
$IFSadj$ = age-adjusted soil ingestion factor (114.29 mg-y/kg-d)
ATc = averaging time for carcinogens (25550 d)
EC_i = exposure concentration for the i^{th} compound (mg/kg)
$CSFo_i$ = oral cancer slope factor for the i^{th} compound (risk per mg/kg/d)

Using the parameters identified above, equation **(1)** can be simplified as:

$$ELCR = 8.95\ x\ 10^{-7} \cdot \sum_{i=1}^{n} EC_i \cdot CSFo_i \qquad \textbf{(2)}$$

Equation **(2)** was used to calculate carcinogenic risks associated with ingestion of surface soil. For subsurface soil, the combined exposure frequency and duration was assumed to be one-fifth of that for surface soil, resulting in the following equation for carcinogenic risk:

$$ELCR = 1.79\ x\ 10^{-7} \cdot \sum_{i=1}^{n} EC_i \cdot CSFo_i \qquad \textbf{(3)}$$

Noncarcinogenic hazard indices were calculated based on childhood exposure only (EPA 1995):

$$HI = \frac{EFr_s \cdot EDc \cdot IRSc}{BWc \cdot ATn_c \cdot 10^6 \frac{mg}{kg}} \sum_{i=1}^{n} \frac{EC_i}{RfDo_i} \qquad \textbf{(4)}$$

where **HI** = cumulative hazard index
EDc = exposure duration, age 1-6 (6 y)
$IRSc$ = soil ingestion rate, age 1-6 (200 mg/d)
BWc = body weight, age 1-6 (15 kg)
ATn_c = averaging time for noncarcinogens, child (2190 d)
EC_i = exposure concentration for the i^{th} compound (mg/kg)
$RfDo_i$ = oral reference dose for the i^{th} compound (mg/kg/d)

Using the parameters identified above, equation **(4)** reduces to:

$$HI = 7.31\ x\ 10^{-6} \cdot \sum_{i=1}^{n} \frac{EC_i}{RfDo_i} \qquad \text{(5)}$$

Equation **(5)** was used to calculate the hazard index resulting from ingestion of surface soil. For subsurface soil, the product of exposure frequency and duration was assumed to be one-fifth of that for surface soil, resulting in the following equation for the hazard index:

$$HI = 1.46\ x\ 10^{-6} \cdot \sum_{i=1}^{n} \frac{EC_i}{RfDo_i} \qquad \text{(6)}$$

A.2 Commercial/Industrial Soil Ingestion

Carcinogenic risks were calculated based on adult occupational exposure, assuming that only 50 percent of total soil ingestion is work-related (EPA 1995):

$$ELCR = \frac{EFo_s \cdot EDo \cdot IRSa \cdot FC}{BWa \cdot ATc \cdot 10^6 \frac{mg}{kg}} \sum_{i=1}^{n} EC_i \cdot CSFo_i \quad (7)$$

where EFo_s = occupational exposure frequency, soil (150 d/y)
EDo = occupational exposure duration (25 y)
$IRSa$ = soil ingestion rate, adult (100 mg/d)
FC = fraction of contaminated soil ingested (0.5)
BWa = body weight, adult (70 kg)

Using the parameters identified above, equation **(7)** reduces to:

$$ELCR = 1.05 \; x \; 10^{-7} \cdot \sum_{i=1}^{n} EC_i \cdot CSFo_i \quad (8)$$

Equation **(8)** was used to calculate carcinogenic risks associated with ingestion of surface soil. For subsurface soil, the product of exposure frequency and duration was assumed to be one-fifth of that for surface soil, resulting in the following equation for carcinogenic risk:

$$ELCR = 2.10 \; x \; 10^{-8} \cdot \sum_{i=1}^{n} EC_i \cdot CSFo_i \quad (9)$$

Noncarcinogenic hazard indices were also calculated assuming that 50 percent of total soil ingestion is work-related:

$$HI = \frac{EFo_s \cdot EDo \cdot IRSa \cdot FC}{BWa \cdot ATn_o \cdot 10^6 \frac{mg}{kg}} \sum_{i=1}^{n} \frac{EC_i}{RfDo_i} \quad (10)$$

where ATn_o = averaging time for noncarcinogens, occupational (9125 d)

Using the parameters identified above, equation **(10)** reduces to:

$$HI = 2.94 \; x \; 10^{-7} \cdot \sum_{i=1}^{n} \frac{EC_i}{RfDo_i} \quad (11)$$

Equation **(11)** was used to calculate the hazard index resulting from ingestion of surface soil. For subsurface soil, the combined exposure frequency and duration was assumed to be one-fifth of that for surface soil, resulting in the following equation for the hazard index:

$$HI = 5.87\ x\ 10^{-8} \cdot \sum_{i=1}^{n} \frac{EC_i}{RfDo_i} \quad \textbf{(12)}$$

A.3 Residential Drinking Water Ingestion/Inhalation

Volatilization terms were calculated for compounds identified by EPA (1995) as having a Henry's Law constant greater than 10^{-5}. A volatilization factor of 0.5 was used, obtained from RAGS Information Branch (EPA 1991c). Carcinogenic risks were calculated based on combined childhood and adult exposure:

$$ELCR = \frac{EFr_w}{ATc \cdot 1000\frac{\mu g}{mg}} \{K \cdot IFAadj \cdot \sum_{i=1}^{n} EC_i \cdot CSFi_i + IFWadj \cdot \sum_{i=1}^{n} EC_i \cdot CSFo_i\} \quad \textbf{(13)}$$

where **EFr_w** = residential exposure frequency, tap water (350 d/y)
$IFAadj$ = age-adjusted inhalation factor (11.66 m^3-y/kg-d)
K = volatilization factor (0.5 L/m^3)
$IFWadj$ = age-adjusted tap water ingestion factor (1.09 L-y/kg-d)
$CSFi_i$ = inhalation cancer slope factor for the i^{th} compound (risk per mg/kg/d)

Using the parameters identified above, equation **(13)** reduces to:

$$ELCR = 7.98\ x\ 10^{-5} \cdot \{\sum_{i=1}^{n} EC_i \cdot CSFi_i + 0.187 \cdot \sum_{i=1}^{n} EC_i \cdot CSFo_i\} \quad \textbf{(14)}$$

Noncarcinogenic hazard indices were calculated based on combined childhood and adult exposure:

$$HI = \frac{EFr_w \cdot EDtot}{BWa \cdot ATn_r \cdot 1000\frac{\mu g}{mg}} \{K \cdot IRAa \cdot \sum_{i=1}^{n} \frac{EC_i}{RfDi_i} + IRWa \cdot \sum_{i=1}^{n} \frac{EC_i}{RfDo_i}\} \quad \textbf{(15)}$$

where $EDtot$ = exposure duration, total (30 y)
ATn_r = averaging time for noncarcinogens, residential (10950 d)
$IRAa$ = inhalation rate, adult (20 m^3/d)
$IRWa$ = tap water ingestion rate, adult (2 L/d)
$RfDi_i$ = inhalation reference dose for the i^{th} compound (mg/kg/d)

Using the parameters identified above, equation **(15)** reduces to:

$$HI = 1.37 \ x \ 10^{-4} \cdot \{ \sum_{i=1}^{n} \frac{EC_i}{RfDi_i} + 0.20 \cdot \sum_{i=1}^{n} \frac{EC_i}{RfDo_i} \} \qquad \textbf{(16)}$$

A.4 Commercial/Industrial Drinking Water Ingestion/Inhalation

Carcinogenic risks were calculated for an adult, using the default occupational exposure frequency and duration:

$$ELCR = \frac{EFo_w \cdot EDo}{BWa \cdot ATc \cdot 1000 \frac{\mu g}{mg}} \{ K \cdot IRAa \cdot \sum_{i=1}^{n} EC_i \cdot CSFi_i + IRWa \cdot \sum_{i=1}^{n} EC_i \cdot CSFo_i \} \textbf{(17)}$$

where EFo_w = occupational exposure frequency, tap water (250 d/y)

Using the parameters identified above, equation **(17)** reduces to:

$$ELCR = 3.49 \ x \ 10^{-5} \cdot \{ \sum_{i=1}^{n} EC_i \cdot CSFi_i + 0.20 \cdot \sum_{i=1}^{n} EC_i \cdot CSFo_i \} \ \textbf{(18)}$$

Similarly, noncarcinogenic hazard indices were calculated for an adult:

$$HI = \frac{EFo_w \cdot EDo}{BWa \cdot ATn_o \cdot 1000 \frac{\mu g}{mg}} \{ K \cdot IRAa \cdot \sum_{i=1}^{n} \frac{EC_i}{RfDi_i} + IRWa \cdot \sum_{i=1}^{n} \frac{EC_i}{RfDo_i} \} \textbf{(19)}$$

Using the parameters identified above, equation **(19)** reduces to:

$$HI = 9.78 \ x \ 10^{-5} \cdot \{ \sum_{i=1}^{n} \frac{EC_i}{RfDi_i} + 0.20 \cdot \sum_{i=1}^{n} \frac{EC_i}{RfDo_i} \} \qquad \textbf{(20)}$$

A.5 Soil Exposures via the Inhalation Route

The following paragraphs present a comparison of exposures via the inhalation versus ingestion pathways for soil. This analysis is provided as a justification for eliminating the inhalation pathway from semi-quantitative risk calculations.

Carcinogenic risks for residential soil ingestion are provided by equation (1):

$$ELCR = \frac{EFr_s \cdot IFSadj}{ATc \cdot 10^6 \frac{mg}{kg}} \sum_{i=1}^{n} EC_i \cdot CSFo_i \quad (21)$$

Which can be simplified as shown by equation (2):

$$ELCR = 8.95 \, x \, 10^{-7} \cdot \sum_{i=1}^{n} EC_i \cdot CSFo_i \quad (22)$$

Evaluation of exposures via the inhalation pathway requires consideration of both volatilization and particulate emissions. Neglecting the effects of soil adsorption, reductions in molecular mixing, and diffusion through tortuous pore channels, a soil volatilization factor can be obtained by multiplying the tapwater volatilization factor *K* by a representative soil unit weight (say, 125 lbs/ft^3):

$$V = 0.5 \frac{L}{m^3} \cdot \frac{ft^3}{28.32 \, L} \cdot \frac{125 \, lbs}{ft^3} \cdot \frac{kg}{2.203 \, lbs} = 1.002 \frac{kg}{m^3} \quad (23)$$

where: *V* = soil volatilization factor

Employing the particulate emission factor provided in EPA's proposed *Soil Screening Guidance* (EPA 1994), the resulting expression for carcinogenic risk is:

$$ELCR = \frac{EFr_s \cdot IFAadj}{ATc \cdot 10^6 \frac{mg}{kg}} \{ V \cdot \sum_{i=1}^{n} EC_i \cdot CSFi_i + \frac{1}{PEF} \cdot \sum_{i=1}^{n} EC_i \cdot CSFi_i \} \quad (24)$$

where: *PEF* = particulate emission factor (6.79 x 10^8 m^3/kg)

Due to the large size of EPA's particulate emission factor ***PEF***, the second summation in **(24)** can be neglected, yielding:

$$ELCR = \frac{EFr_s \cdot IFAadj \cdot V}{ATc \cdot 10^6 \frac{mg}{kg}} \sum_{i=1}^{n} EC_i \cdot CSFi_i \quad \textbf{(25)}$$

This implies that risks associated with inhalation of soil particulates is probably insignificant relative to risks via soil ingestion. Using the parameters identified previously, equation **(25)** reduces to:

$$ELCR = 9.13 \times 10^{-8} \cdot \sum_{i=1}^{n} EC_i \cdot CSFi_i \quad \textbf{(26)}$$

Noting that oral cancer slope factors are commonly substituted for unavailable inhaled cancer slope factors (EPA 1995), comparison of equations **(22)** and **(26)** indicates that risks via the inhalation pathway *for volatile compounds* are approximately 1/10 of the risks via the ingestion pathway. In reality, however, risks via the inhalation pathway are probably much lower, since volatile compounds are often strongly adsorbed to soil organic matter. In addition, the enthalpy of liquid solutions is greater than solid matrices, resulting in increased molecular mixing and volatilization. Not only is there less molecular mixing in solid matrices (resulting in reduced migration of contaminants to the air-solid interface), diffusion of gaseous contaminants is inhibited by the tortuosity of soil pores. As a result, the soil volatilization factor ***V*** probably grossly overestimates volatilization from contaminated soil.

The foregoing analysis indicates that 1) inhalation exposures for particulate emissions are insignificant relative to exposures via soil ingestion, 2) as a result, inhalation exposures for nonvolatile compounds can probably be neglected, and 3) the incremental carcinogenic risks and noncarcinogenic hazard indices for inhalation of volatile compounds probably range from 1/10 to 1/100 of the carcinogenic risks and noncarcinogenic hazard indices for most compounds.

BACKGROUND METALS STATISTICS

The following paragraphs describe the methods and results of a statistical comparison among site and background soil metal concentrations. The objective was to determine whether soil metal concentrations at the sites were significantly greater than background concentrations and ultimately to determine which metals to include in the risk calculations for exposure to surface and subsurface soil.

Five metals (arsenic, barium, chromium, lead, and nickel) were included in the comparisons. Site soil concentrations for these five metals were compared to the following background soil populations:

- OUD (site-specific) background surface and subsurface soil populations.
- Basewide soil background populations.

The site-specific background soil data were collected in this study and included the background data discussed in Section 4.3. The basewide background data were compiled and summarized in *Background Data Analysis Report, Fort Richardson, Alaska* ("background report"; E&E 1996) and included all background soil metal concentration data collected to date at Fort Richardson.

Background soil metal concentrations were compared to each OUD site sample population using Cochran's approximation to the Behren's Fisher t-test as described in 40 CFR 264, Appendix IV. This test method compares estimated mean metal concentrations determined from site and background sample data and is recommended by EPA due to the test's robustness and power for testing with small sample populations.

Test results are provided in Table 1, which summarizes each comparison among the site and background sample populations. In Table 1, the result of each comparison is tabulated as a yes or no response to the following question:

> "Is the mean metal concentration in the site soil population significantly (at the 95 percent confidence level) greater than in the background soil population?"

Results of the comparisons among the sites and basewide background populations were difficult to interpret due to the fact that the site samples were grouped into one of two categories (surface soil and subsurface soil), whereas the basewide background populations were divided into several other categories, including the root zone, and geologic units (Qay2 and Qey), which were not defined for each site in this study. Due to the differences in how each soil metal concentration population was defined in this study and in the background report, the null hypothesis for the statistical tests is that the site soil population for a given metal is equivalent to at least one of the background soil populations. In other words, to reject the null hypothesis, all the statistical comparisons for a given site and metal must show significant differences between the site and background populations.

Given the null hypothesis, only lead in surface soil at the Fire Training Pit site, the Building 704 site, and in subsurface soil at the Building 796 site was definitely (i.e., in comparison to all background populations) greater than in background soil populations. Consequently, arsenic, barium, chromium, and nickel were not included in the screening for compounds of potential concern in soil. Similarly, lead in soil at the remaining sites and soil depth categories were not included in the screening for compounds of potential concern. The following paragraphs describe the statistical comparison methods in more detail.

OUD Background Metal Concentrations (Site-Specific Background)

The first step in the evaluation consisted of calculating the statistical parameters required in the t-test for the OUD background sample population. For each metal and soil depth range within the OUD background population, the following parameters were obtained:

N_{bs} = The number of background samples obtained from surface soil.

X_{bs} = The estimated mean metal concentration for background surface soil or $\Sigma X_i/N_{bs}$ where X_i is i^{th} metal concentration.

S_{bs}^2 = The estimated variance of the metal concentration in the background surface soil or $\Sigma(X_i - X_{bs})^2/(N_{bs} - 1)$.

W_{bs} = The special weighting as defined in Cochran's approximation to the Behren's-Fisher t-test or S_{bs}^2/N_{bs}.

t_{bs} = The t-statistic for the background surface soil estimated mean metal concentration with (N_{bs} - 1) degrees of freedom and at the 95% level of significance. This level of significance is equivalent to the 90% level of significance for a two-tailed t-test.

The same parameters were calculated for subsurface soil using the subscript (bd). Results of these calculations for each metal and soil depth range are summarized in Table 1.

Based on the OUD background soil metal concentration results, it appeared that surface soil (bs) and subsurface (bd) concentrations were very similar and from the same population. To test this hypothesis, the surface soil and subsurface soil metal concentrations were compared using Cochran's approximation to the Behren's-Fisher t-test.

To compare the OUD background surface and subsurface soil metal concentrations, the following t-statistics were calculated for each metal as described in 40 CFR 264, Appendix IV:

The t-test statistic:

$$T* = (X_{bd} - X_{bs})/(W_{bd} + W_{bs})^{1/2}$$

The critical t-statistic at the 90% significance level for a two-tailed test:

$$T^c = \frac{W_{bd}\, t_{bd} + W_{bs}\, t_{bs}}{W_{bd} + W_{bs}}$$

These test statistics were used to determine whether there were significant (at the 90% confidence level) differences among metal concentrations between OUD background surface and subsurface soil. For each metal, if the absolute value of T^* is less than T^c, then it is unlikely that surface and subsurface soil metal concentrations are different. Conversely, if the absolute value of T^* is more than or equal to T^c, then it is likely that surface and subsurface soil metal concentrations are different. Table 2 summarizes the results of these tests. For each metal, the absolute value of T^* was less than T^c, indicating that surface and subsurface soil contain similar metal concentrations in the OUD background sample population.

Based on the results, the OUD background surface and subsurface metal concentration data were "pooled" into a single OUD background metal soil sample population. The pooled OUD background statistics are summarized in Table 4.

Similarly, test statistics were calculated for each of the basewide soil background metal populations defined by the background report. The pooled OUD background soil populations and the basewide background soil populations were then compared to each site soil population. The following paragraphs describe the methods for these comparisons.

Site Versus Background Metal Concentrations

For each site and soil depth range, metal concentrations in the site sample population were tested against the OUD and basewide background sample population using Cochran's approximation to the Behren's-Fisher t-test. To conduct the tests, the following parameters were obtained for each metal, site, and soil depth range:

N_m = The number of samples obtained from the site for a given metal analyses.

X_m = The estimated mean metal concentration from the site sample population or $\Sigma X_i/N_m$ where X_i is the i^{th} metal concentration.

S_m^2 = The estimated variance of the metal concentration sample population or $\Sigma(X_i - X_m)^2/(N_m - 1)$.

W_m = The special weighting as defined in Cochran's approximation to the Behren's-Fisher t-test or S_m^2/N_m.

t_m = The t-statistic for the site estimated mean metal concentration with $(N_m - 1)$ degrees of freedom and at the 95% level of significance for a one-tailed t-test.

Tables 5 through 9 summarize the results of these calculations for each site, metal, and soil depth range. To test whether site soil estimated mean metal concentrations were significantly (95%) greater than background sample population concentrations, the following test statistics were calculated for each site, metal, and soil depth range:

$$T* = \frac{(X_m - X_b)}{(W_m + W_b)^{1/2}}$$

= The t-test statistic where X_b and W_b are the estimated mean metal concentration and special weighting for the pooled background sample population, respectively.

$$T^c = \frac{W_m t_m + W_b t_b}{W_m + W_b}$$

= The critical t-statistic at the 95% level of significance for a one-tailed test where t_b is the t-statistic for the pooled background sample population.

For each metal and soil depth range, if $T^* < T^c$, then it is unlikely that the site metal concentrations are higher than in background soil. Conversely, if $T^* \geq T^c$, it is likely that site metal concentrations are greater than in background soil.

Tables 5 through 9 summarize the results of these tests for each site and soil depth range. If T^* was greater than or equal to T^c, then a result of "yes", indicating that site soil contained greater metal concentrations as compared to background, was noted in the far right column. If T^* was less than T^c, then a result of "no", indicating that the site soil did not contain significantly higher metal concentrations than in background soil, was noted in the far right column.

The overall results of the comparisons are summarized in Table 1.

Table 1. Summary of Statistical Comparisons Among Site and Background Soil Concentrations.

Site Populations	Background Populations																									
	Arsenic							Barium					Chromium				Lead					Nickel				
	OUD Site Specific	Base Wide Background						OUD Site Specific	Base Wide Background				OUD Site Specific	Base Wide Background			OUD Site Specific	Base Wide Background				OUD Site Specific	Base Wide Background			
Medium/ Site		All	Surface	Root Zone	Sub-surface	Qay2	Qey		All	Surface	Root Zone	Sub-surface		All	Qay2	Qey		All	Surface	Root Zone	Sub-surface		All	Surface	Root Zone	Sub-surface
Surface Soil																										
Fire Training Pit	Yes	No	No	No	Yes	No	Yes	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No
Grease Pits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dust Pallative Rdwy	Yes	Yes	No	No	Yes	No	Yes	No	No	No	No	No	No	No	No	No	Yes	Yes	No	Yes	Yes	No	No	No	No	No
Building 35-752	Yes	No	No	No	No	No	Yes	Yes	Yes	No	No	Yes	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No
Ship Cr SW Outfall	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No
Building 955	Yes	No	No	No	No	No	Yes	Yes	Yes	No	No	Yes	No	Yes	Yes	Yes	No	No	No	No	No	No	Yes	Yes	Yes	Yes
Building 718	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No
Building 704	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No	No	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes
Building 796	N/A	No	No	No	No	No	No	N/A	No	No	No	No	N/A	No	No	No	N/A	No	No	No	No	N/A	No	No	No	No
Subsurface Soil																										
Fire Training Pit	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	Yes	Yes	Yes	Yes
Grease Pits	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Dust Pallative Rdwy	N/A	No	No	No	No	No	No	N/A	No	No	No	No	N/A	No	No	No	N/A	No	No	No	No	N/A	No	No	No	No
Building 35-752	No	No	No	No	No	No	No	Yes	Yes	No	No	Yes	No	No	No	Yes	Yes	Yes	No	No	Yes	No	No	No	No	No
Ship Cr SW Outfall	N/A	No	No	No	No	No	No	N/A	No	No	No	No	N/A	No	No	No	N/A	No	No	No	No	N/A	No	No	No	No
Building 955	No	No	No	No	No	No	Yes	No	No	No	No	No	No	Yes	No	Yes	No	No	No	No	No	No	Yes	Yes	No	Yes
Building 718	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No
Building 704	No	No	No	No	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Building 796	Yes	No	No	No	Yes	No	Yes	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Site Specific Bkgrnd	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes

N/A = not applicable.

Table 2. OUD Background Metal Concentrations in Soil: Summary Statistics.

Metal	N_{bs}	X_{bs}	S_{bs}^2	W_{bs}	t_{bs}	N_{bd}	X_{bd}	S_{bd}^2	W_{bd}	t_{bd}
As	29	5.2000	1.9560	0.1956	1.8331	19	5.0526	1.1640	0.0613	1.7341
Ba	10	55.0000	151.6000	15.1600	1.8331	19	60.4211	840.3000	44.2200	1.7341
Cr	10	32.6000	40.2700	4.0270	1.8331	19	28.7895	60.9500	3.2080	1.7341
Pb	10	6.1000	1.6560	0.1656	1.8331	19	6.3684	7.8010	0.4106	1.7341
Ni	10	44.6000	208.5000	20.8500	1.8331	19	41.7368	2297.0000	120.9000	1.7341

Where: N_{bs} = number of background surface soil samples and N_{bd} = number of background deep soil samples.
X_{bs} = average background surface soil samples and X_{bd} = average background deep soil samples.
S_{bs}^2 = estimated background surface soil sample variance and S_{bd}^2 = estimated background deep soil sample variance.
W_{bs} = special weighting ($=S_{bs}^2/N_{bs}$), surface soil samples and W_{bd} = special weighting ($=S_{bd}^2/N_{bd}$) deep soil samples.
t_{bs} = t-statistic at 95% significance level with (N_{bs} - 1) degrees of freedom.
t_{bd} = t-statistic at 95% significance level with (N_{bd} - 1) degrees of freedom.

Table 3. Calculated T-Values (at 90% confidence level, two-tailed) for OUD Background Surface and Subsurface Soil.

	Metal				
	As	Ba	Cr	Pb	Ni
$\lvert T^* \rvert$	0.2908	-0.7035	1.4167	-0.3536	0.2405
T^c	1.8095	1.7594	1.7892	1.7626	1.7487

Table 4. Pooled Background Metal Concentrations in Soil: Summary Statistics.

Analyte	N_{bp}	X_{bp}	S_{bp}^2	W_{bp}	t_{bp}
Arsenic	29	5.10	1.45	0.05	1.701
Barium	29	58.60	595.37	20.53	1.701
Chromium	29	30.11	548.94	18.93	1.701
Lead	29	40.71	4.56	0.16	1.701
Nickel	29	42.73	1546.30	53.32	1.701

Footnotes:

N_{bp} = number of pooled background soil samples.

X_{bp} = average of pooled background soil samples.

S_{bp}^2 = estimated pooled background soil sample variance.

W_{bp} = special weighting (S_{bp}^2/N_{bp}), soil samples.

t_{bp} = t-statistic at 95% significance level with (N_{bp} - 1) degrees of freedom.

Table 5. Arsenic
Statistical Background Evaluation

Medium/						Site Specific			All			Surface			Root Zone			Subsurface			Qay2			Qey		
Site	N_m	X_m	S_m^2	W_m	t_m	T^*	T^c	Yes/No	T^*	T^c	Yes/No	T^*	T^c	Yes/No	T^*	T^c	Yes/No	T^*	T^c	Yes/No	T^*	T^c	Yes/No	T^*	T^c	Yes/No
Surface Soil																										
Fire Training Pit	11	6.73	3.22	0.29	1.81	2.78	1.80	Yes	1.80	1.81	No	0.12	1.79	No	0.30	1.79	No	2.36	1.81	Yes	1.32	1.81	No	3.23	1.79	Yes
Grease Pits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dust Paliative Rdwy	14	6.29	0.68	0.05	1.77	3.81	1.74	Yes	2.30	1.75	Yes	-1.17	1.72	No	-0.83	1.71	No	3.54	1.75	Yes	1.17	1.75	No	4.79	1.72	Yes
Building 35-752	36	5.72	2.38	0.07	1.69	1.83	1.69	Yes	-0.07	1.69	No	-2.72	1.68	No	-2.41	1.67	No	1.06	1.69	No	-1.03	1.68	No	2.63	1.68	Yes
Ship Cr SW Outfall	8	4.00	0.57	0.07	1.89	-3.20	1.82	No	-6.17	1.87	No	-7.54	1.80	No	-7.24	1.79	No	-5.01	1.87	No	-7.05	1.87	No	-2.62	1.81	No
Building 955	6	6.17	1.37	0.23	2.02	2.03	1.96	Yes	0.88	2.00	No	-0.93	1.95	No	-0.72	1.95	No	1.51	2.00	No	0.33	2.00	No	2.51	1.96	Yes
Building 718	21	6.67	0.83	0.04	1.72	5.29	1.71	Yes	4.25	1.71	Yes	0.03	1.69	No	0.39	1.68	No	5.55	1.71	Yes	2.99	1.71	Yes	6.42	1.69	Yes
Building 704	18	7.06	4.53	0.25	1.74	3.57	1.73	Yes	2.59	1.74	Yes	0.72	1.73	No	0.92	1.72	No	3.18	1.74	Yes	2.06	1.74	Yes	4.06	1.73	Yes
Building 798	1	10.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A	N/A	No	N/A	N/A	No	N/A	N/A	No	N/A	N/A	No	N/A	N/A	No
Subsurface Soil																										
Fire Training Pit	18	6.75	0.73	0.05	1.75	5.39	1.73	Yes	4.37	1.74	Yes	0.29	1.71	No	0.64	1.70	No	5.59	1.74	Yes	3.17	1.74	Yes	6.47	1.71	Yes
Grease Pits	15	5.14	2.21	0.15	1.76	0.08	15.81	No	-1.52	1.76	No	-3.40	1.74	No	-3.15	1.73	No	-0.73	1.76	No	-2.18	1.75	No	0.63	1.74	No
Dust Paliative Rdwy	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A	N/A	No	N/A	N/A	No	N/A	N/A	No	N/A	N/A	No	N/A	N/A	No
Building 35-752	29	5.08	1.10	0.04	1.70	-0.10	1.70	No	-3.10	1.69	No	-5.26	1.68	No	-4.90	1.67	No	-1.62	1.69	No	-4.27	1.69	No	0.74	1.68	No
Ship Cr SW Outfall	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A	N/A	No	N/A	N/A	No	N/A	N/A	No	N/A	N/A	No	N/A	N/A	No
Building 955	12	5.67	1.33	0.11	1.80	1.41	1.77	No	-0.21	1.79	No	-2.45	1.76	No	-2.18	1.75	No	0.68	1.79	No	-0.97	1.78	No	2.06	1.76	Yes
Building 718	8	6.25	1.98	0.25	1.89	2.11	1.86	No	1.01	1.89	No	-0.75	1.86	No	-0.55	1.85	No	1.62	1.89	No	0.49	1.89	No	2.58	1.86	Yes
Building 704	12	7.33	13.33	1.11	1.80	2.07	1.79	No	1.51	1.79	No	0.62	1.79	No	0.73	1.79	No	1.80	1.79	Yes	1.28	1.79	No	2.30	1.79	Yes
Building 796	20	6.35	3.50	0.18	1.73	2.64	1.72	Yes	1.43	1.73	No	-0.65	1.72	No	-0.42	1.71	No	2.14	1.73	Yes	0.81	1.73	No	3.20	1.72	Yes

Footnotes:

N/A = not applicable.

N_m = number of samples.

X_m = average or mean of sample population.

S_m^2 = variance.

W_m = special weighting (S_m^2/N_m).

t_m = t-statistic at the 95% confidence level with N_m-1 degrees of freedom.

t^* = t-test statistic.

t^c = critical t-test statistic.

Yes/No = If the absolute value of T^* is less than T^c, then it is unlikely that the concentrations are different (ie, result is 'No').

Table 6. Barium
Statistical Background Evaluation

Medium/						Site Specific			All			Surface			Root Zone			Subsurface		
Area	N_m	X_m	S_m^2	W_m	t_m	T*	T^c	Yes/No	T*	T^c	Yes/No	T*	T^c	Yes/No	T*	T^c	Yes/No	T*	T^c	Yes/No
Surface Soil																				
Fire Training Pit	11	54.4	166	15.1	1.81	-0.70	1.75	No	-0.87	1.80	No	-2.77	1.76	No	-1.97	1.76	No	0.10	1.79	No
Grease Pits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dust Pallative Roadway	14	56.4	184	13.1	1.77	-0.38	1.73	No	-0.41	1.76	No	-2.48	1.73	No	-1.64	1.73	No	0.62	1.75	No
Building 35-752	36	72.0	1311	36.4	1.69	1.78	1.69	Yes	2.28	1.69	Yes	0.51	1.69	No	1.11	1.69	No	2.91	1.69	Yes
Ship Creek SW Outfall	8	39.3	48	6.0	1.89	-3.75	1.74	No	-6.75	1.84	No	-7.13	1.76	No	-6.11	1.76	No	-5.15	1.83	No
Building 955	6	102.2	2553	425.6	2.02	2.07	2.00	Yes	2.14	2.01	Yes	1.61	2.01	No	1.81	2.01	No	2.33	2.01	Yes
Building 718	21	52.0	73	3.5	1.72	-1.35	1.70	No	-2.63	1.70	No	-4.37	1.69	No	-3.28	1.69	No	-0.84	1.70	No
Buidling 704	18	64.0	503	27.9	1.74	0.78	1.72	No	1.12	1.73	No	-0.72	1.72	No	-0.06	1.72	No	1.83	1.73	Yes
Building 796	1	55.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A	N/A	No	N/A	N/A	No	N/A	N/A	No
Subsurface Soil																				
Fire Training Pit	16	72.4	258	16.1	1.75	2.28	1.72	Yes	3.43	1.74	Yes	0.75	1.72	No	1.54	1.72	No	4.31	1.74	Yes
Grease Pits	15	47.1	402	26.8	1.76	-1.67	0.80	No	-2.03	1.75	No	-3.49	1.74	No	-2.82	1.74	No	-1.28	1.75	No
Dust Pallative Roadway	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A	N/A	No	N/A	N/A	No	N/A	N/A	No
Building 35-752	29	70.9	446	15.4	1.70	2.05	1.70	Yes	3.13	1.70	Yes	0.46	1.69	No	1.26	1.69	No	4.04	1.69	Yes
Ship Creek SW Outfall	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A	N/A	No	N/A	N/A	No	N/A	N/A	No
Building 955	12	56.2	47	3.9	1.80	-0.48	1.72	No	-0.74	1.75	No	-3.21	1.71	No	-2.14	1.71	No	0.90	1.74	No
Building 718	8	43.1	106	13.2	1.89	-2.66	1.78	No	-3.84	1.87	No	-5.17	1.80	No	-4.33	1.80	No	-2.76	1.86	No
Building 704	12	50.3	363	30.2	1.80	-1.16	1.76	No	-1.36	1.79	No	-2.85	1.77	No	-2.20	1.77	No	-0.65	1.79	No
Building 796	20	47.8	159	8.0	1.73	-2.01	1.71	No	-3.26	1.72	No	-4.77	1.70	No	-3.82	1.70	No	-1.93	1.71	No

Footnotes:

N/A = not applicable.

N_m = number of samples.

X_m = average or mean of sample population.

S_m^2 = variance.

W_m = special weighting (S_m^2/N_m).

t_m = t-statistic at the 95% confidence level with N_m-1 degrees of freedom.

t* = t-test statistic.

t^c = critical t-test statistic.

Yes/No = if the absolute value of T* is less than T^c, then it is unlikely that the concentrations are different (ie, result is 'No').

Table 7. Chromium
Statistical Background Evaluation

Medium/						Site Specific			All			Qay2			Qey		
Site	N_m	X_m	S_m^2	W_m	t_m	T^*	T^c	Yes/No	T^*	T^c	Yes/No	T^*	T^c	Yes/No	T^*	T^c	Yes/No
Surface Soil																	
Fire Training Pit	11	33.1	54.7	1.65	1.81	0.66	1.71	No	1.44	1.80	No	0.84	1.80	No	2.86	1.75	Yes
Grease Pits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dust Pallative Roadway	14	27.6	80.4	2.91	1.77	-0.52	1.71	No	-2.03	1.77	No	-2.48	1.77	No	-0.28	1.74	No
Building 35-752	36	31.2	24.5	0.79	1.69	0.24	1.70	No	-0.02	1.68	No	-0.84	1.68	No	2.06	1.67	Yes
Ship Creek SW Outfall	8	31.6	10.0	0.32	1.89	0.35	1.70	No	0.68	1.82	No	-0.51	1.82	No	2.72	1.71	Yes
Building 955	6	35.2	11.8	0.33	2.02	1.15	1.71	No	5.88	1.91	Yes	4.65	1.91	Yes	5.52	1.73	Yes
Building 718	21	29.2	20.3	0.69	1.72	-0.19	1.70	No	-2.14	1.71	No	-3.00	1.71	No	0.73	1.68	No
Buldling 704	18	32.0	17.6	0.55	1.74	0.43	1.70	No	1.00	1.72	No	0.03	1.72	No	2.82	1.68	Yes
Building 796	1	37.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A	N/A	No	N/A	N/A	No
Subsurface Soil																	
Fire Training Pit	16	37.3	23.9	0.64	1.75	1.61	1.70	No	6.93	1.74	Yes	5.97	1.73	Yes	6.56	1.69	Yes
Grease Pits	15	28.3	136.6	9.11	1.76	-0.34	1.26	No	-0.95	1.76	No	-1.21	1.76	No	0.02	1.75	No
Dust Pallative Roadway	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A	N/A	No	N/A	N/A	No
Building 35-752	29	32.6	32.5	1.00	1.70	0.56	1.70	No	1.34	1.70	No	0.59	1.69	No	2.92	1.68	Yes
Ship Creek SW Outfall	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A	N/A	No	N/A	N/A	No
Building 955	12	33.3	44.2	1.33	1.80	0.71	1.71	No	1.79	1.78	Yes	1.13	1.78	No	3.19	1.73	Yes
Building 718	8	32.9	59.6	1.81	1.89	0.61	1.72	No	1.22	1.88	No	0.65	1.88	No	2.66	1.80	Yes
Building 704	12	29.4	80.3	2.73	1.80	-0.15	1.71	No	-1.04	1.79	No	-1.51	1.79	No	0.60	1.75	No
Building 796	20	37.3	521.9	14.01	1.73	1.24	1.71	No	1.62	1.73	No	1.40	1.73	No	2.31	1.72	Yes

Footnotes:

N/A = not applicable.

N_m = number of samples.

X_m = average or mean of sample population.

S_m^2 = variance.

W_m = special weighting (S_m^2/N_m).

t_m = t-statistic at the 95% confidence level with N_m-1 degrees of freedom.

t^* = t-test statistic.

t^c = critical t-test statistic.

Yes/No = if the absolute value of T^* is less than T^c, then it is unlikely that the concentrations are different (ie, result is 'No').

Table 8. Lead
Statistical Background Evaluation

Medium/ Site						Site Specific			All			Surface			Root Zone			Subsurface		
	N_m	X_m	S_m^2	W_m	t_m	T^*	T^c	Yes/No	T^*	T^c	Yes/No	T^*	T^c	Yes/No	T^*	T^c	Yes/No	T^*	T^c	Yes/No
Surface Soil																				
Fire Training Pit	11	267.6	1324	49.70	1.81	2.88	1.81	Yes	36.88	1.81	Yes	36.10	1.81	Yes	36.40	1.81	Yes	37.01	1.81	Yes
Grease Pits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dust Pallative Roadway	14	14.00	41.4	2.96	1.77	4.35	1.77	Yes	3.73	1.77	Yes	1.16	1.76	No	2.20	1.76	Yes	4.23	1.77	Yes
Building 35-752	36	8.24	39.7	4.82	1.69	0.88	1.69	No	0.31	1.69	No	-1.56	1.69	No	-0.76	1.69	No	0.70	1.69	No
Ship Creek SW Outfall	8	4.88	1.0	0.20	1.89	-2.23	1.80	No	-5.63	1.87	No	-8.29	1.73	No	-6.51	1.74	No	-3.91	1.88	No
Building 955	6	6.83	2.2	0.32	2.02	0.78	1.90	No	-1.24	1.99	No	-5.52	1.80	No	-3.68	1.82	No	0.23	2.00	No
Building 718	21	24.10	3261	135.4	1.72	1.53	1.72	No	1.42	1.72	No	1.05	1.72	No	1.21	1.72	No	1.49	1.72	No
Buidling 704	18	25.72	418.9	16.29	1.74	4.79	1.74	Yes	4.50	1.74	Yes	3.39	1.74	Yes	3.85	1.74	Yes	4.71	1.74	Yes
Building 796	1	10.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Subsurface Soil																				
Fire Training Pit	16	11.44	31.7	2.77	1.75	3.00	1.75	Yes	2.32	1.75	Yes	-0.22	1.74	No	0.82	1.74	No	2.83	1.75	Yes
Grease Pits	15	9.00	69.1	4.61	1.76	-14.53	0.68	No	0.67	1.76	No	-1.25	1.75	No	-0.43	1.75	No	1.07	1.76	No
Dust Pallative Roadway	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A	N/A	No	N/A	N/A	No	N/A	N/A	No
Building 35-752	29	16.30	310.5	19.05	1.70	2.29	1.70	Yes	2.00	1.70	Yes	1.01	1.70	No	1.43	1.70	No	2.20	1.70	Yes
Ship Creek SW Outfall	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A	N/A	No	N/A	N/A	No	N/A	N/A	No
Building 955	12	5.50	1.5	0.28	1.80	-1.13	1.76	No	-3.72	1.78	No	-7.15	1.72	No	-5.37	1.72	No	-2.20	1.79	No
Building 718	8	5.38	0.3	0.05	1.89	-1.83	1.74	No	-7.97	1.81	No	-8.68	1.69	No	-6.77	1.69	No	-5.12	1.83	No
Building 704	12	9.25	47.3	5.11	1.80	1.29	1.79	No	0.75	1.80	No	-1.09	1.78	No	-0.31	1.79	No	1.12	1.80	No
Building 796	20	38.60	6938	179.8	1.73	2.41	1.73	Yes	2.32	1.73	Yes	1.99	1.73	Yes	2.13	1.73	Yes	2.38	1.73	Yes

Footnotes:

N/A = not applicable.
N_m = number of samples.
X_m = average or mean of sample population.
S_m^2 = variance.
W_m = special weighting (S_m^2/N_m).
t_m = t-statistic at the 95% confidence level with N_m-1 degrees of freedom.
t^* = t-test statistic.
t^c = critical t-test statistic.
Yes/No = If the absolute value of T^* is less than T^c, then it is unlikely that the concentrations are different (ie, result is 'No').

Table 9. Nickel
Statistical Background Evaluation

Medium/						Site Specific			All			Surface			Root Zone			Subsurface		
Site	N_m	X_m	S_m^2	W_m	t_m	T^*	T^c	Yes/No	T^*	T^c	Yes/No	T^*	T^c	Yes/No	T^*	T^c	Yes/No	T^*	T^c	Yes/No
Surface Soil																				
Fire Training Pit	11	35.64	26.86	2.44	1.81	-0.95	1.71	No	0.12	1.79	No	1.19	1.76	No	-1.32	1.77	No	0.08	1.77	No
Grease Pits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dust Pallative Roadway	14	34.07	43.30	3.09	1.77	-1.15	1.70	No	-0.72	1.76	No	0.39	1.74	No	-1.96	1.74	No	-0.70	1.74	No
Building 35-752	36	34.00	38.83	1.08	1.69	-1.18	1.70	No	-1.16	1.68	No	0.47	1.68	No	-2.66	1.69	No	-1.05	1.68	No
Ship Creek SW Outfall	8	25.25	9.07	1.13	1.89	-2.37	1.71	No	-8.07	1.82	No	-4.72	1.77	No	-8.07	1.78	No	-7.10	1.79	No
Building 955	6	43.33	17.87	2.98	2.02	0.08	1.72	No	4.26	1.97	Yes	4.67	1.89	Yes	2.42	1.91	Yes	3.96	1.93	Yes
Building 718	21	38.43	68.76	3.27	1.72	-0.57	1.70	No	1.55	1.72	No	2.33	1.71	Yes	0.09	1.71	No	1.43	1.71	No
Building 704	18	39.00	46.59	2.59	1.74	-0.50	1.70	No	2.04	1.73	Yes	2.79	1.72	Yes	0.38	1.72	No	1.87	1.72	Yes
Building 796	1	51.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A	N/A	No	N/A	N/A	No	N/A	N/A	No
Subsurface Soil																				
Fire Training Pit	16	45.75	104.5	6.53	1.75	0.39	1.71	No	3.90	1.75	Yes	4.37	1.74	Yes	2.66	1.74	Yes	3.75	1.74	Yes
Grease Pits	15	36.07	157.4	10.49	1.76	-0.83	1.47	No	0.19	1.76	No	0.82	1.75	No	-0.63	1.75	No	0.17	1.75	No
Dust Pallative Roadway	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A	N/A	No	N/A	N/A	No	N/A	N/A	No
Building 35-752	29	33.93	21.61	0.75	1.70	-1.20	1.70	No	-1.38	1.68	No	0.45	1.69	No	-2.91	1.69	No	-1.20	1.68	No
Ship Creek SW Outfall	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A	N/A	No	N/A	N/A	No	N/A	N/A	No
Building 955	12	42.25	78.02	6.50	1.80	-0.06	1.71	No	2.58	1.79	Yes	3.15	1.77	Yes	1.42	1.78	No	2.48	1.78	Yes
Building 718	8	38.38	118.6	14.82	1.89	-0.53	1.74	No	0.75	1.89	No	1.27	1.87	No	0.03	1.88	No	0.73	1.88	No
Building 704	12	36.67	63.88	5.32	1.80	-0.79	1.71	No	0.51	1.78	No	1.30	1.77	No	-0.61	1.77	No	0.47	1.78	No
Building 796	20	40.80	444.2	22.21	1.73	-0.22	1.24	No	1.13	1.73	No	1.55	1.73	No	0.53	1.73	No	1.10	1.73	No

Footnotes:

N/A = not applicable.

N_m = number of samples.

X_m = average or mean of sample population.

S_m^2 = variance.

W_m = special weighting (S_m^2/N_m).

t_m = t-statistic at the 95% confidence level with N_m-1 degrees of freedom.

t^* = t-test statistic.

t^c = critical t-test statistic.

Yes/No = if the absolute value of T^* is less than T^c, then it is unlikely that the concentrations are different (ie, result is 'No').

BUILDING 35-752

SURFACE SOIL (< 2 ft deep); RESIDENTIAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, Kg-d/mg	Exposure Concentration, mg/Kg	Incremental Carcinogenic Risk
4,4'-DDT	N	3.40E-01	4.30E-02	1.31E-08
Benz(a)anthracene	N	7.30E-01	1.50E-01	9.80E-08
Benzo(b)fluoranthene	N	7.30E-01	2.50E-01	1.63E-07
Benzo(k)fluoranthene	N	7.30E-02	2.50E-01	1.63E-08
Benzo(a)pyrene	N	7.30E+00	2.00E-01	1.31E-06
Indeno(1,2,3-cd)pyrene	N	7.30E-01	2.00E-01	1.31E-07
Total PCB	N	7.70E+00	3.00E+00	2.07E-05

Total Carcinogenic Risk **2.24E-05**

Noncarcinogenic Compounds

Compound	VOC ?	RfDo, mg/Kg/d	Exposure Concentration, mg/Kg	Incremental Hazard Index
1,3,5-Trimethylbenzene	Y	4.00E-04	1.00E-02	1.83E-04
1,2,4-Trimethylbenzene	Y	5.00E-04	1.60E-02	2.34E-04
Vanadium	N	7.00E-03	5.19E+01	5.42E-02
4-Isopropyltoluene	N	*4.00E-04*	1.20E-02	2.19E-04
2-Methylnaphthalene	N	*4.00E-02*	2.00E-04	3.66E-08
Phenanthrene	N	*3.08E-01*	1.50E-01	3.56E-06
Benzo(g,h,i)perylene	N	*3.08E-02*	2.00E-01	4.75E-05

Note: major metal cations (Al, Ca, Fe, Mg, Mn, K, Na) eliminated from risk calculations.

Total Hazard Index **5.49E-02**

SUBSURFACE SOIL (> 2 ft deep); RESIDENTIAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, Kg-d/mg	Exposure Concentration, mg/Kg	Incremental Carcinogenic Risk
4,4'-DDT	N	3.40E-01	3.70E-01	2.25E-08
Benz(a)anthracene	N	7.30E-01	5.25E-01	6.86E-08
Benzo(b)fluoranthene	N	7.30E-01	4.30E-01	5.62E-08
Benzo(k)fluoranthene	N	7.30E-02	4.10E-01	5.36E-09
Benzo(a)pyrene	N	7.30E+00	3.90E-01	5.10E-07
Indeno(1,2,3-cd)pyrene	N	7.30E-01	3.90E-01	5.10E-08

Total Carcinogenic Risk **7.13E-07**

Noncarcinogenic Compounds

Compound	VOC ?	RfDo, mg/Kg/d	Exposure Concentration, mg/Kg	Incremental Hazard Index
1,3,5-Trimethylbenzene	Y	4.00E-04	8.26E-01	3.01E-03
1,2,4-Trimethylbenzene	Y	5.00E-04	1.95E+00	5.70E-03
4-Isopropyltoluene	N	*4.00E-04*	3.20E-01	1.17E-03
2-Methylnaphthalene	N	*4.00E-02*	1.04E+00	3.80E-05
Phenanthrene	N	*3.08E-01*	6.42E-01	3.04E-06
Benzo(g,h,i)perylene	N	*3.08E-02*	3.90E-01	1.85E-05

Note: major metal cations (Al, Ca, Fe, Mg, Mn, K, Na) eliminated from risk calculations

Total Hazard Index **9.95E-03**

Italicized dose-response factors are proxies

BUILDING 35-752

SURFACE SOIL (< 2 ft deep); OCCUPATIONAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, Kg-d/mg	Exposure Concentration, mg/Kg	Incremental Carcinogenic Risk
4,4'-DDT	N	3.40E-01	4.30E-02	1.54E-09
Benz(a)anthracene	N	7.30E-01	1.50E-01	1.15E-08
Benzo(b)fluoranthene	N	7.30E-01	2.50E-01	1.92E-08
Benzo(k)fluoranthene	N	7.30E-02	2.50E-01	1.92E-09
Benzo(a)pyrene	N	7.30E+00	2.00E-01	1.53E-07
Indeno(1,2,3-cd)pyrene	N	7.30E-01	2.00E-01	1.53E-08
Total PCB	N	7.70E+00	3.00E+00	2.43E-06
		Total Carcinogenic Risk		**2.63E-06**

Noncarcinogenic Compounds

Compound	VOC ?	RfDo, mg/Kg/d	Exposure Concentration, mg/Kg	Incremental Hazard Index
1,3,5-Trimethylbenzene	Y	4.00E-04	1.00E-02	7.35E-06
1,2,4-Trimethylbenzene	Y	5.00E-04	1.60E-02	9.41E-06
Vanadium	N	7.00E-03	5.19E+01	2.18E-03
4-Isopropyltoluene	N	*4.00E-04*	1.20E-02	8.82E-06
2-Methylnaphthalene	N	*4.00E-02*	2.00E-04	1.47E-09
Phenanthrene	N	*3.08E-01*	1.50E-01	1.43E-07
Benzo(g,h,i)perylene	N	*3.08E-02*	2.00E-01	1.91E-06

Note: major metal cations (Al, Ca, Fe, Mg, Mn, K, Na) eliminated from risk calculations.

	Total Hazard Index		**2.21E-03**

SUBSURFACE SOIL (> 2 ft deep); OCCUPATIONAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, Kg-d/mg	Exposure Concentration, mg/Kg	Incremental Carcinogenic Risk
4,4'-DDT	N	3.40E-01	3.70E-01	2.64E-09
Benz(a)anthracene	N	7.30E-01	5.25E-01	8.05E-09
Benzo(b)fluoranthene	N	7.30E-01	4.30E-01	6.59E-09
Benzo(k)fluoranthene	N	7.30E-02	4.10E-01	6.29E-10
Benzo(a)pyrene	N	7.30E+00	3.90E-01	5.98E-08
Indeno(1,2,3-cd)pyrene	N	7.30E-01	3.90E-01	5.98E-09
		Total Carcinogenic Risk		**8.37E-08**

Noncarcinogenic Compounds

Compound	VOC ?	RfDo, mg/Kg/d	Exposure Concentration, mg/Kg	Incremental Hazard Index
1,3,5-Trimethylbenzene	Y	4.00E-04	8.26E-01	1.21E-04
1,2,4-Trimethylbenzene	Y	5.00E-04	1.95E+00	2.29E-04
4-Isopropyltoluene	N	*4.00E-04*	3.20E-01	4.70E-05
2-Methylnaphthalene	N	*4.00E-02*	1.04E+00	1.53E-06
Phenanthrene	N	*3.08E-01*	6.42E-01	1.22E-07
Benzo(g,h,i)perylene	N	*3.08E-02*	3.90E-01	7.43E-07

Note: major metal cations (Al, Ca, Fe, Mg, Mn, K, Na) eliminated from risk calculations.

	Total Hazard Index		**4.00E-04**

Italicized dose-response factors are proxies

BUILDING 35-752
GROUNDWATER

GROUNDWATER; RESIDENTIAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, Kg-d/mg	CSFi, Kg-d/mg	Exposure Concentration, ug/L	Exposure Concentration, mg/L	Incremental Carcinogenic Risk
Benzene	Y	2.90E-02	2.90E-02	1.96E+01	1.96E-02	5.39E-05
Trichloroethene (TCE)	Y	1.10E-02	6.00E-03	5.70E-01	5.70E-04	3.66E-07
Arsenic	N	1.75E+00	1.51E+00	4.09E+01	4.09E-02	1.07E-03
Bis(2-ethylhexyl) Phthalate	N	1.40E-02	*1.40E-02*	7.17E+00	7.17E-03	1.50E-06
Total PCB	N	7.70E+00	*7.70E+00*	9.00E-01	9.00E-04	1.03E-04
		Total Carcinogenic Risk				**1.23E-03**

Non-Carcinogenic Compounds

Compound	VOC ?	RfDo, mg/Kg-d	RfDi, mg/Kg-d	Exposure Concentration, ug/l	Exposure Concentration, mg/L	Incremental Hazard Index
1,1,1-Trichloroethane (TCA)	Y	9.00E-02	2.86E-01	4.67E+00	4.67E-03	3.66E-03
1,1-Dichloroethane	Y	1.00E-01	1.43E-01	4.00E-01	4.00E-04	4.93E-04
1,2,4-Trimethylbenzene	Y	5.00E-04	*5.00E-04*	5.20E+00	5.20E-03	1.71E+00
1,3,5-Trimethylbenzene	Y	4.00E-04	*4.00E-04*	1.42E+00	1.42E-03	5.84E-01
Ethylbenzene	Y	1.00E-01	2.86E-01	9.39E+00	9.39E-03	7.07E-03
Toluene	Y	2.00E-01	1.14E-01	1.32E+00	1.32E-03	1.77E-03
Total Xylenes	Y	2.00E+00	*2.00E+00*	2.40E+01	2.40E-02	1.97E-03
Barium	N	7.00E-02	1.43E-04	9.08E+02	9.08E-01	3.55E-01
Cadmium	N	5.00E-04	*5.00E-04*	3.13E+00	3.13E-03	1.72E-01
Chromium	N	1.00E+00	5.71E-07	2.49E+02	2.49E-01	6.82E-03
Mercury	N	3.00E-04	8.57E-05	1.39E+00	1.39E-03	1.27E-01
Napthalene	N	*4.00E-02*	*4.00E-02*	4.36E+00	4.36E-03	2.99E-03
Nickel	N	2.00E-02	*2.00E-02*	3.60E+02	3.60E-01	4.93E-01
		Total Hazard Index				**3.46E+00**

GROUNDWATER; OCCUPATIONAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, Kg-d/mg	CSFi, Kg-d/mg	Exposure Concentration, ug/l	Exposure Concentration, mg/L	Incremental Carcinogenic Risk
Benzene	Y	2.90E-02	2.90E-02	1.96E+01	1.96E-02	2.38E-05
Trichloroethene (TCE)	Y	1.10E-02	6.00E-03	5.70E-01	5.70E-04	1.63E-07
Arsenic	N	1.75E+00	1.51E+00	4.09E+01	4.09E-02	5.00E-04
Bis(2-ethylhexyl) Phthalate	N	1.40E-02	*1.40E-02*	7.17E+00	7.17E-03	7.01E-07
Total PCB	N	7.70E+00	*7.70E+00*	9.00E-01	9.00E-04	4.84E-05
		Total Carcinogenic Risk				**5.73E-04**

Non-Carcinogenic Compounds

Compound	VOC ?	RfDo, mg/Kg-d	RfDi, mg/Kg-d	Exposure Concentration, ug/l	Exposure Concentration, mg/L	Incremental Hazard Index
1,1,1-Trichloroethane (TCA)	Y	9.00E-02	2.86E-01	4.67E+00	4.67E-03	2.61E-03
1,1-Dichloroethane	Y	1.00E-01	1.43E-01	4.00E-01	4.00E-04	3.52E-04
1,2,4-Trimethylbenzene	Y	5.00E-04	*5.00E-04*	5.20E+00	5.20E-03	1.22E+00
1,3,5-Trimethylbenzene	Y	4.00E-04	*4.00E-04*	1.42E+00	1.42E-03	4.17E-01
Ethylbenzene	Y	1.00E-01	2.86E-01	9.39E+00	9.39E-03	5.05E-03
Toluene	Y	2.00E-01	1.14E-01	1.32E+00	1.32E-03	1.26E-03
Total Xylenes	Y	2.00E+00	*2.00E+00*	2.40E+01	2.40E-02	1.41E-03
Barium	N	7.00E-02	1.43E-04	9.08E+02	9.08E-01	2.54E-01
Cadmium	N	5.00E-04	*5.00E-04*	3.13E+00	3.13E-03	1.22E-01
Chromium	N	1.00E+00	5.71E-07	2.49E+02	2.49E-01	4.87E-03
Mercury	N	3.00E-04	8.57E-05	1.39E+00	1.39E-03	9.06E-02
Napthalene	N	*4.00E-02*	*4.00E-02*	4.36E+00	4.36E-03	2.13E-03
Nickel	N	2.00E-02	*2.00E-02*	3.60E+02	3.60E-01	3.52E-01
		Total Hazard Index				**2.12E+00**

Italicized dose-response factors are proxies

BUILDING 718

SURFACE SOIL (< 2 ft deep); RESIDENTIAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, Kg-d/mg	Exposure Concentration, mg/Kg	Incremental Carcinogenic Risk
4,4'-DDT	N	3.40E-01	6.00E-02	1.83E-08
Total PCB	N	7.70E+00	4.13E-01	2.85E-06
		Total Carcinogenic Risk		**2.86E-06**

SUBSURFACE SOIL (>2 ft deep); RESIDENTIAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, mg/Kg/d	Exposure Concentration, mg/Kg	Incremental Carcinogenic Risk
4,4'-DDT	N	3.40E-01	1.00E-02	6.09E-10
Total PCB	N	7.70E+00	0.00E+00	0.00E+00
		Total Carcinogenic Risk		**6.09E-10**

SURFACE SOIL (< 2 ft deep); OCCUPATIONAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, Kg-d/mg	Exposure Concentration, mg/Kg	Incremental Carcinogenic Risk
4,4'-DDT	N	3.40E-01	6.00E-02	2.14E-09
Total PCB	N	7.70E+00	4.13E-01	3.34E-07
		Total Carcinogenic Risk		**3.36E-07**

SUBSURFACE SOIL (>2 ft deep); OCCUPATIONAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, mg/Kg/d	Exposure Concentration, mg/Kg	Incremental Carcinogenic Risk
4,4'-DDT	N	3.40E-01	1.00E-02	7.14E-11
Total PCB	N	7.70E+00	0.00E+00	0.00E+00
		Total Carcinogenic Risk		**7.14E-11**

Italicized dose-response factors are proxies

BUILDING 704

SURFACE SOIL (< 2 ft deep); RESIDENTIAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, Kg-d/mg	Exposure Concentration, mg/Kg	Incremental Carcinogenic Risk
4,4'-DDT	N	3.40E-01	5.71E-01	1.74E-07
Chlordane	N	1.30E+00	6.40E-01	7.45E-07
		Total Carcinogenic Risk		**9.19E-07**

SUBSURFACE SOIL (> 2 ft deep); RESIDENTIAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, Kg-d/mg	Exposure Concentration, mg/Kg	Incremental Carcinogenic Risk
4,4'-DDT	N	3.40E-01	1.76E-01	1.07E-08
Chlordane	N	1.30E+00	1.41E-01	3.27E-08
		Total Carcinogenic Risk		**4.34E-08**

SURFACE SOIL (< 2 ft deep); OCCUPATIONAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, Kg-d/mg	Exposure Concentration, mg/Kg	Incremental Carcinogenic Risk
4,4'-DDT	N	3.40E-01	5.71E-01	2.04E-08
Chlordane	N	1.30E+00	6.40E-01	8.74E-08
		Total Carcinogenic Risk		**1.08E-07**

SUBSURFACE SOIL (> 2 ft deep); OCCUPATIONAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, Kg-d/mg	Exposure Concentration, mg/Kg	Incremental Carcinogenic Risk
4,4'-DDT	N	3.40E-01	1.76E-01	1.26E-09
Chlordane	N	1.30E+00	1.41E-01	3.84E-09
		Total Carcinogenic Risk		**5.10E-09**

Italicized dose-response factors are proxies

BUILDING 796

SURFACE SOIL (< 2 ft deep); RESIDENTIAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, Kg-d/mg	Exposure Concentration, mg/Kg	Incremental Carcinogenic Risk
Carbon Tetrachloride	N	1.30E-01	2.50E-03	2.91E-10
		Total Carcinogenic Risk		**2.91E-10**

Noncarcinogenic Compounds

No Compounds of Concern	VOC ?	RfDo, mg/Kg/d	Exposure Concentration, mg/Kg	Incremental Hazard Index
		Total Hazard Index		**0.00E+00**

SUBSURFACE SOIL (> 2 ft deep); RESIDENTIAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, Kg-d/mg	Exposure Concentration, mg/Kg	Incremental Carcinogenic Risk
Carbon Tetrachloride	N	1.30E-01	6.50E-03	1.51E-10
	Total Carcinogenic Risk			**1.51E-10**

Noncarcinogenic Compounds

No Compounds of Concern	VOC ?	RfDo, mg/Kg/d	Exposure Concentration, mg/Kg	Incremental Hazard Index
		Total Hazard Index		**0.00E+00**

Italicized dose-response factors are proxies

BUILDING 796

SURFACE SOIL (< 2 ft deep); OCCUPATIONAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, Kg-d/mg	Exposure Concentration, mg/Kg	Incremental Carcinogenic Risk
Carbon Tetrachloride	N	1.30E-01	2.50E-03	3 41E-11
		Total Carcinogenic Risk		3.41E-11

Noncarcinogenic Compounds

Compound	VOC ?	RfDo, mg/Kg/d	Exposure Concentration, mg/Kg	Incremental Hazard Index
		Total Hazard Index		0.00E+00

SUBSURFACE SOIL (> 2 ft deep); OCCUPATIONAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, Kg-d/mg	Exposure Concentration, mg/Kg	Incremental Carcinogenic Risk
Carbon Tetrachloride	N	1.30E-01	6.50E-03	1.77E-11
		Total Carcinogenic Risk		1.77E-11

Noncarcinogenic Compounds

Compound	VOC ?	RfDo, mg/Kg/d	Exposure Concentration, mg/Kg	Incremental Hazard Index
		Total Hazard Index		0.00E+00

Italicized dose-response factors are proxies

BUILING 796
WATER

GROUNDWATER; RESIDENTIAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, Kg-d/mg	CSFi, Kg-d/mg	Exposure Concentration, ug/l	Exposure Concentration, mg/L	Incremental Carcinogenic Risk
Chloroform	Y	6.10E-03	8.05E-02	4.00E+00	4.00E-03	2.61E-05
Carbon Tetrachloride	Y	1.30E-01	5.25E-02	7.00E-01	7.00E-04	4.29E-06
Arsenic	N	1.75E+00	1.51E+01	1.70E+01	1.70E-02	4.44E-04
			Total Carcinogenic Risk			**4.74E-04**

Non-Carcinogenic Compounds

Compound	VOC ?	RFDo mg/Kg-d	RFDi mg/Kg-d	Exposure Concentration, ug/l	Exposure Concentration, mg/L	Incremental Hazard Index
Toluene	Y	2.00E-01	1.14E-01	1.00E+00	1.00E-03	1.34E-03
			Total Hazard Index			**1.34E-03**

GROUNDWATER; OCCUPATIONAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, Kg-d/mg	CSFi, Kg-d/mg	Exposure Concentration, ug/l	Exposure Concentration, mg/L	Incremental Carcinogenic Risk
Chloroform	Y	6.10E-03	8.05E-02	4.00E+00	4.00E-03	1.14E-05
Carbon Tetrachloride	Y	1.30E-01	5.25E-02	7.00E-01	7.00E-04	1.92E-06
Arsenic	N	1.75E+00	1.51E+01	1.70E+01	1.70E-02	2.08E-04
			Total Carcinogenic Risk			**2.21E-04**

Non-Carcinogenic Compounds

Compound	VOC ?	RFDo mg/Kg-d	RFDI mg/Kg-d	Exposure Concentration, ug/l	Exposure Concentration, mg/L	Incremental Hazard Risk
Toluene	Y	2.00E-01	1.14E-01	1.00E+00	1.00E-03	9.56E-04
			Total Hazard Index			**9.56E-04**

BUILDING 955

SURFACE SOIL (< 2 ft deep); RESIDENTIAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, Kg-d/mg	Exposure Concentration, mg/Kg	Incremental Carcinogenic Risk
4,4'-DDT	N	3.40E-01	4.78E+01	1.45E-05
4,4'-DDE	N	3.40E-01	6.44E-01	1.96E-07
		Total Carcinogenic Risk		1.47E-05

SUBSURFACE SOIL (> 2 ft deep); RESIDENTIAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, Kg-d/mg	Exposure Concentration, mg/Kg	Incremental Carcinogenic Risk
4,4'-DDT	N	3.40E-01	1.09E-01	6.63E-09
4,4'-DDE	N	3.40E-01	5.00E-03	3.04E-10
		Total Carcinogenic Risk		6.94E-09

SURFACE SOIL (< 2 ft deep); OCCUPATIONAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, Kg-d/mg	Exposure Concentration, mg/Kg	Incremental Carcinogenic Risk
4,4'-DDT	N	3.40E-01	4.78E+01	1.71E-06
4,4'-DDE	N	3.40E-01	6.44E-01	2.30E-08
		Total Carcinogenic Risk		1.73E-06

SUBSURFACE SOIL (> 2 ft deep); OCCUPATIONAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, Kg-d/mg	Exposure Concentration, mg/Kg	Incremental Carcinogenic Risk
4,4'-DDT	N	3.40E-01	1.09E-01	7.78E-10
4,4'-DDE	N	3.40E-01	5.00E-03	3.57E-11
		Total Carcinogenic Risk		8.14E-10

Italicized dose-response factors are proxies

DUST PALLATIVE ROADWAY

SURFACE SOIL (< 2 ft deep); RESIDENTIAL

Carcinogenic Compounds

No Compounds of Concern	VOC ?	CSFo, Kg-d/mg	Exposure Concentration, mg/Kg	Incremental Carcinogenic Risk
		Total Carcinogenic Risk		0.00E+00

SURFACE SOIL (< 2 ft deep); OCCUPATIONAL

Carcinogenic Compounds

No Compounds of Concern	VOC ?	CSFo, Kg-d/mg	Exposure Concentration, mg/Kg	Incremental Carcinogenic Risk
		Total Carcinogenic Risk		0.00E+00

Italicized dose-response factors are proxies

FIRE TRAINING PITS

SURFACE SOIL (< 2 ft deep); RESIDENTIAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, Kg-d/mg	Exposure Concentration, mg/Kg	Incremental Carcinogenic Risk
Benzene	Y	2.90E-02	1.93E+00	5.02E-08
1,4-Dichlorobenzene	Y	2.40E-02	4.60E-01	9.88E-09
Total PCB	N	7.70E+00	4.00E-01	2.76E-06
2,3,7,8-Tetrachlorodibenzo-p-dioxin	N	1.56E+05	3.90E-07	5.45E-08
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	N	*7.80E+04*	2.70E-07	1.88E-08
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	N	*1.56E+04*	3.20E-07	4.47E-09
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	N	*1.56E+04*	3.80E-07	5.31E-09
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	N	*1.56E+04*	3.10E-07	4.33E-09
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	N	*1.56E+03*	6.70E-06	9.35E-09
OCDD	N	*1.56E+02*	6.00E-05	8.38E-09
2,3,7,8-Tetrachlorodibenzofuran	N	*1.56E+04*	1.10E-07	1.54E-09
1,2,3,7,8-Pentachlorodibenzofuran	N	*7.80E+03*	1.90E-07	1.33E-09
2,3,4,7,8-Pentachlorodibenzofuran	N	*7.80E+04*	3.00E-07	2.09E-08
1,2,3,4,7,8-Hexachlorodibenzofuran	N	*1.56E+04*	1.30E-07	1.82E-09
1,2,3,6,7,8-Hexachlorodibenzofuran	N	*1.56E+04*	1.30E-07	1.82E-09
2,3,4,6,7,8-Hexachlorodibenzofuran	N	*1.56E+04*	3.14E-07	4.38E-09
1,2,3,7,8,9-Hexachlorodibenzofuran	N	*1.56E+04*	1.35E-07	1.88E-09
1,2,3,4,6,7,8-Heptachlorodibenzofuran	N	*1.56E+03*	1.79E-06	2.50E-09
1,2,3,4,7,8,9-Heptachlorodibenzofuran	N	*1.56E+03*	1.88E-07	2.62E-10
OCDF	N	*1.56E+02*	4.25E-06	5.93E-10

Total Carcinogenic Risk **2.96E-06**

Noncarcinogenic Compounds

Compound	VOC ?	RfDo, mg/Kg/d	Exposure Concentration, mg/Kg	Incremental Hazard Index
1,3,5-Trimethylbenzene	Y	4.00E-04	1.84E+01	3.36E-01
1,2,4-Trimethylbenzene	Y	5.00E-04	4.88E+01	7.14E-01
Cadmium	N	5.00E-04	5.00E-01	7.31E-03
Isopropylbenzene	N	4.00E-02	3.85E+00	7.03E-04
2-Hexanone	N	*6.00E-01*	1.14E+01	1.39E-04
4-Methyl-2-pentanone (MIBK)	N	*6.00E-01*	1.81E+00	2.20E-05
n-Propylbenzene	N	*4.00E-02*	6.42E+00	1.17E-03
4-Isopropyltoluene	N	*4.00E-04*	2.48E+00	4.53E-02
2-Methylnaphthalene	N	*4 00E-02*	8.35E+00	1.53E-03
Di-n-butyl Phthalate	N	*1.00E-01*	1.21E+00	8.85E-05

Note: major metal cations (Al, Ca, Fe, Mg, Mn, K, Na) eliminated from risk calculations.

Total Hazard Index **1.11E+00**

Italicized dose-response factors are proxies

FIRE TRAINING PITS

SURFACE SOIL (< 2 ft deep) OCCUPATIONAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, Kg-d/mg	Exposure Concentration, mg/Kg	Incremental Carcinogenic Risk
Benzene	Y	2.90E-02	1.93E+00	5.89E-09
1,4-Dichlorobenzene	Y	2.40E-02	4.60E-01	1.16E-09
Total PCB	N	7.70E+00	4.00E-01	3.23E-07
2,3,7,8-Tetrachlorodibenzo-p-dioxin	N	1.56E+05	3.90E-07	6.39E-09
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	N	*7.80E+04*	2.70E-07	2.21E-09
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	N	*1.56E+04*	3.20E-07	5.24E-10
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	N	*1.56E+04*	3.80E-07	6.22E-10
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	N	*1.56E+04*	3.10E-07	5.08E-10
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	N	*1.56E+03*	6.70E-06	1.10E-09
OCDD	N	*1.56E+02*	6.00E-05	9.83E-10
2,3,7,8-Tetrachlorodibenzofuran	N	*1.56E+04*	1.10E-07	1.80E-10
1,2,3,7,8-Pentachlorodibenzofuran	N	*7.80E+03*	1.90E-07	1.56E-10
2,3,4,7,8-Pentachlorodibenzofuran	N	*7.80E+04*	3.00E-07	2.46E-09
1,2,3,4,7,8-Hexachlorodibenzofuran	N	*1.56E+04*	1.30E-07	2.13E-10
1,2,3,6,7,8-Hexachlorodibenzofuran	N	*1.56E+04*	1.30E-07	2.13E-10
2,3,4,6,7,8-Hexachlorodibenzofuran	N	*1.56E+04*	3.14E-07	5.14E-10
1,2,3,7,8,9-Hexachlorodibenzofuran	N	*1.56E+04*	1.35E-07	2.21E-10
1,2,3,4,6,7,8-Heptachlorodibenzofuran	N	*1.56E+03*	1.79E-06	2.93E-10
1,2,3,4,7,8,9-Heptachlorodibenzofuran	N	*1.56E+03*	1.88E-07	3.08E-11
OCDF	N	*1.56E+02*	4.25E-06	6.96E-11
		Total Carcinogenic Risk		**3.47E-07**

Noncarcinogenic Compounds

Compound	VOC ?	RfDo, mg/Kg/d	Exposure Concentration, mg/Kg	Incremental Hazard Index
1,3,5-Trimethylbenzene	Y	4.00E-04	1.84E+01	1.35E-02
1,2,4-Trimethylbenzene	Y	5.00E-04	4.88E+01	2.87E-02
Cadmium	N	5.00E-04	5.00E-01	2.94E-04
Isopropylbenzene	N	4.00E-02	3.85E+00	2.83E-05
2-Hexanone	N	*6.00E-01*	1.14E+01	5.59E-06
4-Methyl-2-pentanone (MIBK)	N	*6.00E-01*	1.81E+00	8.85E-07
n-Propylbenzene	N	*4.00E-02*	6.42E+00	4.72E-05
4-Isopropyltoluene	N	*4.00E-04*	2.48E+00	1.82E-03
2-Methylnaphthalene	N	*4.00E-02*	8.35E+00	6.14E-05
Di-n-butyl Phthalate	N	*1.00E-01*	1.21E+00	3.56E-06

Note: major metal cations (Al, Ca, Fe, Mg, Mn, K, Na) eliminated from risk calculations.

Total Hazard Index	**4.25E-02**

Italicized dose-response factors are proxies

FIRE TRAINING PITS

SUBSURFACE SOIL (> 2 ft deep); RESIDENTIAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, Kg-d/mg	Exposure Concentration, mg/Kg	Incremental Carcinogenic Risk
Benzene	Y	2.90E-02	3.39E-01	1.76E-09
1,4-Dichlorobenzene	Y	2.40E-02	6.15E-01	2.64E-09
Total PCB	N	7.70E+00	2.04E+00	2.81E-06
2,3,7,8-Tetrachlorodibenzo-p-dioxin	N	1.56E+05	3.90E-07	1.09E-08
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	N	*7.80E+04*	1.15E-06	1.61E-08
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	N	*1.56E+04*	1.52E-06	4.25E-09
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	N	*1.56E+04*	1.89E-05	5.29E-08
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	N	*1.56E+04*	4.48E-06	1.25E-08
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	N	*1.56E+03*	2.38E-04	6.66E-08
OCDD	N	*1.56E+02*	2.07E-03	5.79E-08
2,3,7,8-Tetrachlorodibenzofuran	N	*1.56E+04*	8.93E-07	2.49E-09
1,2,3,7,8-Pentachlorodibenzofuran	N	*7.80E+03*	6.24E-07	8.71E-10
2,3,4,7,8-Pentachlorodibenzofuran	N	*7.80E+04*	9.60E-07	1.34E-08
1,2,3,4,7,8-Hexachlorodibenzofuran	N	*1.56E+04*	2.18E-06	6.08E-09
1,2,3,6,7,8-Hexachlorodibenzofuran	N	*1.56E+04*	2.56E-06	7.14E-09
2,3,4,6,7,8-Hexachlorodibenzofuran	N	*1.56E+04*	3.14E-07	8.77E-10
1,2,3,7,8,9-Hexachlorodibenzofuran	N	*1.56E+04*	5.14E-07	1.44E-09
1,2,3,4,6,7,8-Heptachlorodibenzofuran	N	*1.56E+03*	1.05E-04	2.94E-08
1,2,3,4,7,8,9-Heptachlorodibenzofuran	N	*1.56E+03*	3.47E-06	9.69E-10
OCDF	N	*1.56E+02*	4.21E-04	1.17E-08
		Total Carcinogenic Risk		**3.11E-06**

Noncarcinogenic Compounds

Compound	VOC ?	RfDo, mg/Kg/d	Exposure Concentration, mg/Kg	Incremental Hazard Index
1,3,5-Trimethylbenzene	Y	4.00E-04	9.08E+00	3.31E-02
1,2,4-Trimethylbenzene	Y	5.00E-04	1.33E+01	3.89E-02
Cadmium	N	5.00E-04	1.10E+00	3.21E-03
Isopropylbenzene	N	4.00E-02	1.06E+00	3.87E-05
2-Hexanone	N	*6.00E-01*	1.06E+00	2.58E-06
4-Methyl-2-pentanone (MIBK)	N	*6.00E-01*	1.06E+00	2.59E-06
n-Propylbenzene	N	*4.00E-02*	1.59E+00	5.81E-05
4-Isopropyltoluene	N	*4.00E-04*	1.48E+00	5.38E-03
2-Methylnaphthalene	N	*4.00E-02*	1.92E+00	7.01E-05
Di-n-butyl Phthalate	N	*1.00E-01*	4.90E-01	7.15E-06

Note: major metal cations (Al, Ca, Fe, Mg, Mn, K, Na) eliminated from risk calculations.

Total Hazard Index **8.09E-02**

Italicized dose-response factors are proxies

FIRE TRAINING PITS

SUBSURFACE SOIL (> 2 ft deep); OCCUPATIONAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, Kg-d/mg	Exposure Concentration, mg/Kg	Incremental Carcinogenic Risk
Benzene	Y	2.90E-02	3.39E-01	2.06E-10
1,4-Dichlorobenzene	Y	2.40E-02	6.15E-01	3.10E-10
Total PCB	N	7.70E+00	2.04E+00	3.30E-07
2,3,7,8-Tetrachlorodibenzo-p-dioxin	N	1.56E+05	3.90E-07	1.28E-09
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	N	*7.80E+04*	1.15E-06	1.88E-09
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	N	*1.56E+04*	1.52E-06	4.99E-10
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	N	*1.56E+04*	1.89E-05	6.20E-09
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	N	*1.56E+04*	4.48E-06	1.47E-09
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	N	*1.56E+03*	2.38E-04	7.81E-09
OCDD	N	*1.56E+02*	2.07E-03	6.79E-09
2,3,7,8-Tetrachlorodibenzofuran	N	*1.56E+04*	8.93E-07	2.93E-10
1,2,3,7,8-Pentachlorodibenzofuran	N	*7.80E+03*	6.24E-07	1.02E-10
2,3,4,7,8-Pentachlorodibenzofuran	N	*7.80E+04*	9.60E-07	1.57E-09
1,2,3,4,7,8-Hexachlorodibenzofuran	N	*1.56E+04*	2.18E-06	7.13E-10
1,2,3,6,7,8-Hexachlorodibenzofuran	N	*1.56E+04*	2.56E-06	8.37E-10
2,3,4,6,7,8-Hexachlorodibenzofuran	N	*1.56E+04*	3.14E-07	1.03E-10
1,2,3,7,8,9-Hexachlorodibenzofuran	N	*1.56E+04*	5.14E-07	1.68E-10
1,2,3,4,6,7,8-Heptachlorodibenzofuran	N	*1.56E+03*	1.05E-04	3.45E-09
1,2,3,4,7,8,9-Heptachlorodibenzofuran	N	*1.56E+03*	3.47E-06	1.14E-10
OCDF	N	*1.56E+02*	4.21E-04	1.38E-09
		Total Carcinogenic Risk		**3.65E-07**

Noncarcinogenic Compounds

Compound	VOC ?	RfDo, mg/Kg/d	Exposure Concentration, mg/Kg	Incremental Hazard Index
1,3,5-Trimethylbenzene	Y	4.00E-04	9.08E+00	1.33E-03
1,2,4-Trimethylbenzene	Y	5.00E-04	1.33E+01	1.57E-03
Cadmium	N	5.00E-04	1.10E+00	1.29E-04
Isopropylbenzene	N	4.00E-02	1.06E+00	1.56E-06
2-Hexanone	N	*6.00E-01*	1.06E+00	1.04E-07
4-Methyl-2-pentanone (MIBK)	N	*6.00E-01*	1.06E+00	1.04E-07
n-Propylbenzene	N	*4.00E-02*	1.59E+00	2.34E-06
4-Isopropyltoluene	N	*4.00E-04*	1.48E+00	2.16E-04
2-Methylnaphthalene	N	*4.00E-02*	1.92E+00	2.82E-06
Di-n-butyl Phthalate	N	*1.00E-01*	4.90E-01	2.88E-07

Note: major metal cations (Al, Ca, Fe, Mg, Mn, K, Na) eliminated from risk calculations.

	Total Hazard Index	**3.25E-03**

Italicized dose-response factors are proxies

GREASE PITS

SUBSURFACE SOIL (> 2 ft deep); RESIDENTIAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, Kg-d/mg	Exposure Concentration, mg/Kg	Incremental Carcinogenic Risk
Benzene	Y	2.90E-02	1.19E-01	6.16E-10
Tetrachloroethene (PCE)	Y	5.20E-02	1.09E-01	1.02E-09

Total Carcinogenic Risk **1.63E-09**

Noncarcinogenic Compounds

Compound	VOC ?	RfDo, mg/Kg/d	Exposure Concentration, mg/Kg	Incremental Hazard Index
Total Xylenes	Y	2.00E+00	1.48E+01	1.08E-05
Acetone	Y	1.00E-01	1.16E+00	1.70E-05
2-Butanone (MEK)	Y	6.00E-01	4.55E-01	4.45E-08
Toluene	Y	2.00E-01	1.10E-01	8.03E-07
Ethylbenzene	Y	1.00E-01	1.17E-01	1.71E-06
Isopropylbenzene	Y	4.00E-02	4.56E-01	1.67E-05
1,3,5-Trimethylbenzene	Y	4.00E-04	1.07E+00	3.90E-03
1,2,4-Trimethylbenzene	Y	5.00E-05	3.09E+00	9.01E-02
Naphthalene	Y	4.00E-02	1.01E+01	3.68E-04
Mercury	N	3.00E-04	1.00E-01	4.87E-04
Selenium	N	5.00E-03	5.00E-01	1.46E-04
n-Propylbenzene	Y	*4.00E-02*	4.56E+02	1.67E-02
2-Methylnaphthalene	Y	*4.00E-02*	2.46E+01	8.97E-04
Bis(2-ethylhexyl) Phthalate	N	2.00E-02	5.94E-01	4.34E-05
Di-n-octyl Phthalate	N	2.00E-02	7.50E-01	5.47E-05

Note: major metal cations (Al, Ca, Fe, Mg, Mn, K, Na) eliminated from risk calculations.

Total Hazard Index **1.13E-01**

Italicized dose-response factors are proxies

GREASE PITS

SUBSURFACE SOIL (> 2 ft deep); OCCUPATIONAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, Kg-d/mg	Exposure Concentration, mg/Kg	Incremental Carcinogenic Risk
Benzene	Y	2.90E-02	1.19E-01	7.22E-11
Tetrachloroethene (PCE)	Y	5.20E-02	1.09E-01	1.19E-10
		Total Carcinogenic Risk		**1.92E-10**

Noncarcinogenic Compounds

Compound	VOC ?	RfDo, mg/Kg/d	Exposure Concentration, mg/Kg	Incremental Hazard Index
Total Xylenes	Y	2.00E+00	1.48E+01	4.35E-07
Acetone	Y	1.00E-01	1.16E+00	6.82E-07
2-Butanone (MEK)	Y	6.00E-01	4.55E-01	4.45E-08
Toluene	Y	2.00E-01	1.10E-01	3.23E-08
Ethylbenzene	Y	1.00E-01	1.17E-01	6.86E-08
Isopropylbenzene	Y	4.00E-02	4.56E-01	6.70E-07
1,3,5-Trimethylbenzene	Y	4.00E-04	1.07E+00	1.57E-04
1,2,4-Trimethylbenzene	Y	5.00E-05	3.09E+00	3.62E-03
Naphthalene	Y	4.00E-02	1.01E+01	1.48E-05
Mercury	N	3.00E-04	1.00E-01	1.96E-05
Selenium	N	5.00E-03	5.00E-01	5.87E-06
n-Propylbenzene	Y	*4.00E-02*	4.56E+02	6.70E-04
2-Methylnaphthalene	Y	*4.00E-02*	2.46E+01	3.60E-05
Bis(2-ethylhexyl) Phthalate	N	2.00E-02	5.94E-01	1.74E-06
Di-n-octyl Phthalate	N	2.00E-02	7.50E-01	2.20E-06

Note: major metal cations (Al, Ca, Fe, Mg, Mn, K, Na) eliminated from risk calculations.

Total Hazard Index **4.53E-03**

Italicized dose-response factors are proxies

BACKGROUND

SURFACE SOIL (< 2 ft deep); RESIDENTIAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, Kg-d/mg	Exposure Concentration, mg/Kg	Incremental Carcinogenic Risk
4,4'-DDT	N	3.40E-01	1.10E-02	3.35E-09
Arsenic	N	1.75E+00	6.01E+00	9 41E-06
Total DIOXINS	N	1.56E+05	5.37E-06	7.50E-07
Total TCDD	N	1.56E+05	1.68E-07	2.35E-08
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	N	1.56E+04	5.12E-07	7.15E-09
OCDD	N	1.56E+02	3.20E-06	4.47E-10
2,3,4,7,8-Pentachlorodibenzofuran	N	7.80E+04	1.87E-07	1.31E-08
1,2,3,4,6,7,8-Heptachlorodibenzofuran	N	1.56E+03	1.63E-07	2.28E-10
OCDF	N	1.56E+02	2.00E-07	2.79E-11

Total Carcinogenic Risk **1.02E-05**

Noncarcinogenic Compounds

Compound	VOC ?	RfDo, mg/Kg/d	Exposure Concentration, mg/Kg	Incremental Hazard Index
Chromium	N	1.00E+00	3.53E+01	2.65E-04
Nickel	N	2.00E-02	5.30E+01	1.94E-02
4-Isopropyltoluene	N	4.00E-04	1.00E+01	1.83E-01

Note: major metal cations (Al, Ca, Fe, Mg, Mn, K, Na) eliminated from risk calculations.

Total Hazard Index **2.02E-01**

SUBSURFACE SOIL (>2 FT DEEP) RESIDENTIAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, Kg-d/mg	Exposure Concentration, mg/Kg	Incremental Carcinogenic Risk
4,4'-DDT	N	3.40E-01	4.88E-02	2.97E-09
Arsenic	N	1.75E+00	5.48E+00	1.72E-06
Total DIOXINS	N	1.56E+05	1.39E-05	3.88E-07
Total TCDD	N	1.56E+05	1.35E-03	3.77E-05
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	N	1.56E+04	8.72E-07	2.43E-09
OCDD	N	1.56E+02	4.70E-06	1.31E-10
2,3,4,7,8-Pentachlorodibenzofuran	N	7.80E+04	3.30E-07	4.61E-09
1,2,3,4,6,7,8-Heptachlorodibenzofuran	N	1.56E+03	4.80E-07	1.34E-10
OCDF	N	1.56E+02	3.60E-07	1.01E-11

Total Carcinogenic Risk **3.98E-05**

Noncarcinogenic Compounds

Compound	VOC ?	RfDo, mg/Kg/d	Exposure Concentration, mg/Kg	Incremental Hazard Index
Chromium	N	1.00E+00	3.19E+01	4.66E-05
Nickel	N	2.00E-02	6.08E+01	4.44E-03
4-Isopropyltoluene	N	4.00E-04	4.96E+01	1.81E-01

Note: major metal cations (Al, Ca, Fe, Mg, Mn, K, Na) eliminated from risk calculations.

Total Hazard Index **1.86E-01**

Italicized dose-response factors are proxies

BACKGROUND

SURFACE SOIL (< 2 ft deep); OCCUPATIONAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, Kg-d/mg	Exposure Concentration, mg/Kg	Incremental Carcinogenic Risk
4,4'-DDT	N	3.40E-01	1.10E-02	3.93E-10
Arsenic	N	1.75E+00	6.01E+00	1.10E-06
Total DIOXINS	N	1.56E+05	5.37E-06	8.80E-08
Total TCDD	N	1.56E+05	1.68E-07	2.75E-09
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	N	1.56E+04	5.12E-07	8.39E-10
OCDD	N	1.56E+02	3.20E-06	5.24E-11
2,3,4,7,8-Pentachlorodibenzofuran	N	7.80E+04	1.87E-07	1.53E-09
1,2,3,4,6,7,8-Heptachlorodibenzofuran	N	1.56E+03	1.63E-07	2.67E-11
OCDF	N	1.56E+02	2.00E-07	3.28E-12
		Total Carcinogenic Risk		1.20E-06

Noncarcinogenic Compounds

Compound	VOC ?	RfDo, mg/Kg/d	Exposure Concentration, mg/Kg	Incremental Hazard Index
Chromium	N	1.00E+00	3.63E+01	1.07E-05
Nickel	N	2.00E-02	5.30E+01	7.79E-04
4-Isopropyltoluene	N	4.00E-04	1.00E+01	7.35E-03

Note: major metal cations (Al, Ca, Fe, Mg, Mn, K, Na) eliminated from risk calculations.

Total Hazard Index **8.14E-03**

SUBSURFACE SOIL (>2 FT DEEP) OCCUPATIONAL

Carcinogenic Compounds

Compound	VOC ?	CSFo, Kg-d/mg	Exposure Concentration, mg/Kg	Incremental Carcinogenic Risk
4,4'-DDT	N	3.40E-01	4.88E-02	3.48E-10
Arsenic	N	1.75E+00	5.48E+00	2.01E-07
Total DIOXINS	N	1.56E+05	1.39E-05	4.55E-08
Total TCDD	N	1.56E+05	1.35E-03	4.43E-06
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	N	1.56E+04	8.72E-07	2.86E-10
OCDD	N	1.56E+02	4.70E-06	1.54E-11
2,3,4,7,8-Pentachlorodibenzofuran	N	7.80E+04	3.30E-07	5.41E-10
1,2,3,4,6,7,8-Heptachlorodibenzofuran	N	1.56E+03	4.80E-07	1.57E-11
OCDF	N	1.56E+02	3.60E-07	1.18E-12
		Total Carcinogenic Risk		4.67E-06

Noncarcinogenic Compounds

Compound	VOC ?	RfDo, mg/Kg/d	Exposure Concentration, mg/Kg	Incremental Hazard Index
Chromium	N	1.00E+00	3.19E+01	1.87E-06
Nickel	N	2.00E-02	6.08E+01	1.78E-04
4-Isopropyltoluene	N	4.00E-04	4.96E+01	7.28E-03

Note: major metal cations (Al, Ca, Fe, Mg, Mn, K, Na) eliminated from risk calculations.

Total Hazard Index **7.46E-03**

Italicized dose-response factors are proxies

BUILDING 35-752 WIPE SAMPLES
SUMMARY STATISTICS FOR RISK ASSESSMENT

METHOD	COMPOUND	UNITS	MRL	N	Hits	MIN	MAX	MEAN	95% UCL
PCB	Aroclor 1254	µg/wipe	1	32	32	6.0	750.0	122.9	179.1
PCB	Aroclor 1260	µg/wipe	1	32	19	0.5	39.0	10.2	14.0
PCB	TOTAL PCBs	µg/wipe		32	19	9.0	753.0	135.6	193.1

BUILDING 35-752
SUMMARY STATISTICS FOR RISK ASSESSMENT

				SHALLOW (0-2')						DEEP (> 2')					
METHOD	COMPOUND	UNITS	MRL	N	Hits	MIN	MAX	MEAN	95% UCL	N	Hits	MIN	MAX	MEAN	95% UCL
PETHYDRO	Toluene	µg/Kg	5	20	3	2.5	8.0	3.0	3.6	36	2	2.5	650	37.3	78.0
PETHYDRO	Ethylbenzene	µg/Kg	5	20	1	2.5	6.0	2.7	3.0	36	2	2.5	2700	141.3	305.2
PETHYDRO	Total Xylenes	µg/Kg	5	20	7	2.5	38.0	6.3	9.5	36	7	2.5	15000	808.4	1757.4
PETHYDRO	GRO	mg/Kg	5	20	1	2.5	8.0	2.8	3.3	36	2	2.5	920	53.2	112.9
PETHYDRO	DRO	mg/Kg	10	20	17	5	778	151	240	36	18	5	8150	295	679
PETHYDRO	TPH	mg/Kg	10	20	19	5	1700	281	438	36	21	5	6900	295	626
PESTICIDES	4,4'-DDD	mg/Kg	0.01	20	1	0.005	0.050	0.015	0.021	36	1	0.005	0.075	0.009	0.013
PESTICIDES	4,4'-DDT	mg/Kg	0.01	20	2	0.005	0.120	0.029	0.043	36	5	0.005	0.250	0.023	0.037
PCBS	Aroclor 1260	mg/Kg	0.1	20	12	0.05	8.70	1.25	2.06	36	9	0.05	18.60	1.17	2.29
PCBs	TOTAL PCBs	mg/Kg		20	12	0	15.6	2	3	36	9	0	19	1	--
VOAs	Acetone	µg/Kg	50	20	2	25	710	79	146	36	2	25	6500	373	781
VOAs	Methylene Chloride	µg/Kg	10	20	1	5	20	6	7	36	0	5	1300	78	159
VOAs	2-Butanone (MEK)	µg/Kg	20	20	2	10	120	20	31	36	0	10	2650	153	320
VOAs	cis-1,2-Dichloroethene	µg/Kg	5	20	1	2.5	6.0	2.7	3.0	36	0	2.5	650	37.1	77.8
VOAs	Trichloroethene (TCE)	µg/Kg	5	20	2	2.5	34.0	4.5	7.2	36	6	2.5	650	39.1	79.8
VOAs	Toluene	µg/Kg	5	20	3	2.5	8.0	3.0	3.6	36	2	2.5	650	37.3	78.0
VOAs	Ethylbenzene	µg/Kg	5	20	1	2.5	6.0	2.7	3.0	36	2	2.5	2700	141.3	305.2
VOAs	Total Xylenes	µg/Kg	5	20	7	2.5	38.0	6.3	9.5	36	7	2.5	15000	808.4	1757.4
VOAs	1,3,5-Trimethylbenzene	µg/Kg	20	20	0	10	10	10	10	36	2	10	7800	382	826
VOAs	1,2,4-Trimethylbenzene	µg/Kg	20	20	3	10	46	13	16	36	2	10	18000	898	1953
VOAs	4-Isopropyltoluene	µg/Kg	20	20	1	10	21	11	12	36	0	10	2650	153	320
VOAs	1,4-Dichlorobenzene	µg/Kg	5	20	0	3	3	3	3	36	1	3	650	37	78
VOAs	Naphthalene	µg/Kg	20	20	1	10	36	11	14	36	1	10	5300	228	497
Semi-VOAs	Naphthalene	mg/Kg	0.3	20	0	0.150	0.350	0.175	0.199	36	1	0.150	3.000	0.271	0.421
Semi-VOAs	2-Methylnaphthalene	mg/Kg	0.3	20	0	0.15	0.35	0.18	0.20	36	2	0.15	10.00	0.54	1.04
Semi-VOAs	Fluoranthene	mg/Kg	0.3	20	0	0.15	0.35	0.18	0.20	36	2	0.15	3	0.28	0.42
Semi-VOAs	Pyrene	mg/Kg	0.3	20	0	0.15	0.35	0.18	0.20	36	2	0.15	3	0.28	0.41
Semi-VOAs	Bis(2-ethylhexyl) Phthalate	mg/Kg	0.3	20	1	0.15	0.80	0.20	0.26	36	0	0.15	3.00	0.25	0.38
Semi-VOAs	Chrysene	mg/Kg	0.3	20	0	0.15	0.35	0.18	0.20	36	3	0.15	3.00	0.29	0.43
Semi-VOAs	Di-n-octyl Phthalate	mg/Kg	0.3	20	3	0.15	1.32	0.26	0.37	36	4	0.15	3	0.29	0.43
Semi-VOAs	Benzo(b)fluoranthene	mg/Kg	0.3	20	1	0.15	0.70	0.20	0.25	36	2	0.15	3	0.29	0.43
Semi-VOAs	Benzo(k)fluoranthene	mg/Kg	0.3	20	1	0.15	0.70	0.20	0.25	36	2	0.15	3	0.28	0.41
Semi-VOAs	Benzo(a)pyrene	mg/Kg	0.3	20	0	0.15	0.35	0.18	0.20	36	2	0.15	3	0.25	0.39
Semi-VOAs	Indeno(1,2,3-cd)pyrene	mg/Kg	0.3	20	0	0.15	0.35	0.18	0.20	36	1	0.15	3	0.25	0.39
METALS	Arsenic	mg/Kg	1	20	20	4	8	6	6	36	36	4	10	5	6
METALS	Barium	mg/Kg	1	20	20	47	99	73	80	36	36	37	220	68	77
METALS	Chromium	mg/Kg	2	20	20	20	38	31	32	36	36	21	42	31	33
METALS	Lead	mg/Kg	1	20	20	5	94	15	23	36	36	4	36	8	9

BUILDING 35-752
SUMMARY STATISTICS FOR RISK ASSESSMENT

				SHALLOW (0-2')						DEEP (> 2')					
METHOD	COMPOUND	UNITS	MRL	N	Hits	MIN	MAX	MEAN	95% UCL	N	Hits	MIN	MAX	MEAN	95% UCL
METALS	Nickel	mg/Kg	10	20	20	24	44	33	35	36	36	23	49	34	35
METALS	Aluminum	mg/Kg	10	1	1	17000	17000	17000	--	9	9	8620	19200	15169	17181
METALS	Calcium	mg/Kg	10	1	1	5620	5620	5820	--	9	9	3150	7220	4581	5372
METALS	Cobalt	mg/Kg	2	1	1	12	12	12	--	9	9	7	13	11	12
METALS	Copper	mg/Kg	2	1	1	29	29	29	--	9	9	20	39	28	32
METALS	Iron	mg/Kg	4	1	1	28800	28800	28800	--	9	9	18500	30900	25311	27976
METALS	Magnesium	mg/Kg	2	1	1	7840	7840	7840	--	9	9	5930	10300	7651	8518
METALS	Manganese	mg/Kg	1	1	1	628	628	628	--	9	9	383	720	532	598
METALS	Potassium	mg/Kg	400	1	1	570	570	570	--	9	7	200	810	450	547
METALS	Sodium	mg/Kg	20	1	1	134	134	134	--	9	9	65	171	120	139
METALS	Vanadium	mg/Kg	2	1	1	50	50	50	--	9	9	28	60	46	52
METALS	Zinc	mg/Kg	2	1	1	63	63	63	--	9	9	47	86	63	71

NOTE: Shaded lines indicate compound was not detected in that depth range.

NOTE : -- indicates not calculable due to low number of samples in that depth range.

Continued from previous page

BUILDING 35-752- SEDIMENT SAMPLES
SUMMARY STATISTICS FOR RISK ASSESSMENT

				SHALLOW (0-2')					
METHO	COMPOUND	UNITS	MRL	N	Hits	MIN	MAX	MEAN	95% UCL
PetHydro	TPH	mg/Kg	10	9	9	83.00	440.00	265.44	333.75
Pesticide	4,4'-DDD	mg/Kg	0.01	9	5	0.02	0.10	0.04	0.06
Pesticide	4,4'-DDT	mg/Kg	0.01	9	1	0.01	0.15	0.05	0.08
PCB	Aroclor 1260	mg/Kg	0.1	9	9	0.10	4.50	1.41	2.39
PCBs	TOTAL PCBs	mg/Kg		9	9	0.40	4.80	1.71	2.69
VOA	Acetone	µg/Kg	50	9	9	110.00	420.00	212.22	266.24
VOA	2-Butanone (MEK)	µg/Kg	20	9	6	10.00	58.00	30.11	41.39
VOA	1,1,1-Trichloroethane (TCA	µg/Kg	5	9	3	2.50	18.00	6.89	10.48
VOA	1,4-Dichlorobenzene	µg/Kg	5	9	2	2.50	15.00	4.56	7.12
SVOA	Phenanthrene	mg/Kg	0.3	9	5	0.15	2.20	0.97	1.49
SVOA	Fluoranthene	mg/Kg	0.3	9	6	0.15	4.40	1.76	2.76
SVOA	Pyrene	mg/Kg	0.3	9	4	0.15	5.40	1.25	2.31
SVOA	Benz(a)anthracene	mg/Kg	0.3	9	2	0.15	2.00	0.58	1.01
SVOA	Bis(2-ethylhexyl) Phthalate	mg/Kg	0.3	9	1	0.15	2.00	0.41	0.79
SVOA	Chrysene	mg/Kg	0.3	9	3	0.15	2.00	0.74	1.20
SVOA	Benzo(b)fluoranthene	mg/Kg	0.3	9	3	0.15	2.00	0.68	1.16
SVOA	Benzo(k)fluoranthene	mg/Kg	0.3	9	3	0.15	2.00	0.58	0.98
SVOA	Benzo(a)pyrene	mg/Kg	0.3	9	1	0.15	2.00	0.50	0.91
SVOA	Indeno(1,2,3-cd)pyrene	mg/Kg	0.3	9	1	0.15	2.00	0.42	0.80
SVOA	Benzo(g,h,i)perylene	mg/Kg	0.3	9	1	0.15	2.00	0.42	0.80
Metals	Arsenic	mg/Kg	1	9	9	3.00	5.00	4.00	4.54
Metals	Barium	mg/Kg	1	9	9	44.00	114.00	80.89	97.69
Metals	Chromium	mg/Kg	2	9	9	26.00	46.00	37.56	41.83
Metals	Lead	mg/Kg	1	9	9	14.00	61.00	31.33	40.56
Metals	Nickel	mg/Kg	10	9	9	29.00	44.00	36.44	39.86

BUILDING 35-752 WATER SAMPLE
STATISTICAL SUMMARY FOR RISK ASSESSMENT

METHOD	COMPOUND	UNITS	MRL	N	HITS	MIN	MAX	MEAN	95% UCL
PetHydro	Benzene	µg/L	0.5	7	2	0.25	46.00	6.98	19.62
PetHydro	Toluene	µg/L	0.5	7	1	0.25	2.80	0.61	1.32
PetHydro	Ethylbenzene	µg/L	0.5	7	1	0.25	22.00	3.36	9.39
PetHydro	Total Xylenes	µg/L	0.5	7	1	0.25	58.00	8.21	23.69
PetHydro	GRO	µg/L	50	7	1	25.00	292.00	63.14	137.28
PetHydro	DRO	µg/L	50	8	5	25.00	1310.00	296.38	596.54
PetHydro	TPH	µg/L	200	8	1	100.00	500.00	150.00	244.73
PCB	Aroclor 1260	µg/L	0.2	8	1	0.10	0.70	0.18	0.32
PCBs	TOTAL PCBs	µg/L		10	3	0.70	1.30	0.78	0.90
VOA	1,1-Dichloroethane	µg/L	0.5	7	1	0.25	0.60	0.30	0.40
VOA	1,1,1-Trichloroethane (TCA)	µg/L	0.5	7	2	0.25	9.70	2.05	4.87
VOA	Benzene	µg/L	0.5	7	2	0.25	46.00	6.98	19.62
VOA	Trichloroethene (TCE)	µg/L	0.5	7	4	0.25	0.60	0.44	0.67
VOA	Toluene	µg/L	0.5	7	1	0.25	2.80	0.61	1.32
VOA	Ethylbenzene	µg/L	0.5	7	1	0.25	22.00	3.36	9.39
VOA	Total Xylenes	µg/L	0.5	7	1	0.25	58.00	8.21	23.69
VOA	1,3,5-Trimethylbenzene	µg/L	2	7	1	1.00	2.00	1.14	1.42
VOA	1,2,4-Trimethylbenzene	µg/L	2	7	1	1.00	11.00	2.43	5.20
VOA	Naphthalene	µg/L	2	7	1	1.00	9.00	2.14	4.38
SVOA	Bis(2-ethylhexyl) Phthalate	µg/L	10	8	1	5.00	11.00	5.75	7.17
Metal	Arsenic	µg/L	5	8	8	5.00	52.00	31.25	40.92
Metal	Barium	µg/L	5	8	8	129.00	1480.00	831.00	907.56
Metal	Cadmium	µg/L	3	8	1	1.50	6.00	2.06	3.13
Metal	Chromium	µg/L	5	8	8	17.00	402.00	169.88	248.88
Metal	Lead	µg/L	2	8	8	5.00	112.00	50.50	71.21
Metal	Mercury	µg/L	0.5	8	7	0.25	1.80	1.06	1.39
Metal	Nickel	µg/L	20	8	8	25.00	546.00	250.75	359.64

SHIP CREEK
SUMMARY STATISTICS FOR RISK ASSESSMENT

				SHALLOW (0-2')					
METHOD	COMPOUND	UNITS	MRL	N	HITS	MIN	MAX	MEAN	95% UCL
PetHydro	DRO	mg/Kg	10	8	1	5	16	6.4	9.0
PetHydro	TPH	mg/Kg	10	8	2	5	29	9.0	14.7
METAL	Arsenic	mg/Kg	1	8	8	3	5	4.0	4.5
METAL	Barium	mg/Kg	1	8	8	31	52	39.3	43.9
METAL	Chromium	mg/Kg	2	8	8	28	37	31.6	33.7
METAL	Lead	mg/Kg	1	8	8	4	7	4.9	5.5
METAL	Nickel	mg/Kg	10	8	8	21	30	25.3	27.3

BUILDING 718
SUMMARY STATISTICS FOR RISK ASSESSMENT

				SHALLOW (< 2')						DEEP (> 2')					
METHOD	COMPOUND	UNITS	MRL	N	HITS	MIN	MAX	MEAN	95% UCL	N	HITS	MIN	MAX	MEAN	95% UCL
PETHYDRO	Toluene	µg/Kg	5	21	5	2.5	250.0	27.0	54.9	8	0	2.5	2.5	2.5	2.5
PETHYDRO	Total Xylenes	µg/Kg	5	21	6	2.5	250.0	27.4	55.3	8	0	2.5	2.5	2.5	2.5
PETHYDRO	GRO	mg/Kg	5	21	4	2.5	177.0	28.4	46.6	8	0	2.5	2.5	2.5	2.5
PETHYDRO	DRO	mg/Kg	10	21	21	12	24000	2189	4294	8	1	5	73	14	30
PETHYDRO	TPH	mg/Kg	10	21	21	30	34000	4248	7936	8	1	5	200	29	76
PEST	4,4'-DDD	mg/Kg	0.01	21	1	0.005	0.01	0.006	0.01	8	0	0.005	0.01	0.005	0.01
PEST	4,4'-DDT	mg/Kg	0.01	21	13	0.005	0.25	0.035	0.06	8	0	0.005	0.01	0.005	0.01
PEST	4,4'-DDE	mg/Kg	0.01	21	1	0.005	0.01	0.006	0.01	8	0	0.005	0.01	0.005	0.01
PCB	Aroclor 1260	mg/Kg	0.1	21	2	0.050	0.20	0.064	0.08	8	0	0.050	0.06	0.050	0.06
PCBs	TOTAL PCBs	mg/Kg		21	2	0.350	0.550	0.388	0.413	8	0	0	0	0	0
VOA	Acetone	µg/Kg	50	21	0	25	2500	261	541	8	3	25	68	39	52
VOA	Toluene	µg/Kg	5	21	5	2.5	250.0	27.0	54.9	8	0	2.5	2.5	2.5	2.5
VOA	Tetrachloroethene (PCE)	µg/Kg	5	21	1	2.5	250.0	30.7	59.3	8	0	2.5	2.5	2.5	2.5
VOA	Total Xylenes	µg/Kg	5	21	6	2.5	250.0	27.4	55.3	8	0	2.5	2.5	2.5	2.5
METAL	Arsenic	mg/Kg	1	21	21	5	9	7	7	8	8	5	9	7	8
METAL	Barium	mg/Kg	1	21	21	32	69	52	55	8	8	30	59	43	50
METAL	Chromium	mg/Kg	2	21	21	22	42	29	31	8	8	26	50	33	38
METAL	Lead	mg/Kg	1	21	21	5	287	24	46	8	8	5	6	5	6
METAL	Nickel	mg/Kg	10	21	21	27	63	38	42	8	8	28	63	38	46

NOTE: Shaded lines indicate compound was not detected in that depth range.

BUILDING 704
SUMMARY STATISTICS FOR RISK ASSESSMENT

				SHALLOW (< 2')						DEEP (> 2')					
METHOD	COMPOUND	UNITS	MRL	N	HITS	MIN	MAX	MEAN	95% UCL	N	HITS	MIN	MAX	MEAN	95% UCL
PETHYDRO	Toluene	µg/Kg	5	18	3	2.5	12.0	3.5	4.5	12	1	2.5	8.0	3.0	3.8
PETHYDRO	Total Xylenes	µg/Kg	5	18	3	2.5	12.0	3.6	4.7	12	3	2.5	9.0	3.6	4.7
PETHYDRO	GRO	mg/Kg	5	18	2	2.5	11.0	3.1	4.0	12	0	2.5	2.6	2.6	2.6
PETHYDRO	DRO	mg/Kg	10	18	15	5	1454	248	392	12	6	5	133	30	52
PETHYDRO	TPH	mg/Kg	10	18	17	5	1600	419	578	12	5	5	400	67	137
PEST	4,4'-DDD	mg/Kg	0.01	18	14	0.005	0.08	0.031	0.04	12	2	0.005	0.03	0.008	0.01
PEST	4,4'-DDT	mg/Kg	0.01	18	17	0.005	1.54	0.401	0.57	12	4	0.005	0.58	0.083	0.18
PEST	4,4'-DDE	mg/Kg	0.01	18	5	0.005	0.09	0.018	0.03	12	1	0.005	0.05	0.009	0.02
PEST	Chlordane	mg/Kg	0.1	18	3	0.050	2.50	0.331	0.64	12	1	0.050	0.40	0.088	0.14
VOA	Acetone	µg/Kg	50	18	1	25	88	29	35	12	3	25	69	35	44
VOA	Toluene	µg/Kg	5	18	3	2.5	12.0	3.5	4.5	12	1	2.5	8.0	3.0	3.8
VOA	Tetrachloroethene (PCE)	µg/Kg	5	18	0	2.5	2.5	2.5	2.5	12	1	2.5	6.0	2.8	3.3
VOA	Total Xylenes	µg/Kg	5	18	3	2.5	12.0	3.6	4.7	12	3	2.5	9.0	3.6	4.7
METAL	Arsenic	mg/Kg	1	18	18	5	12	7	8	12	12	4	18	7	9
METAL	Barium	mg/Kg	1	18	18	28	109	64	73	12	12	26	98	50	60
METAL	Chromium	mg/Kg	2	18	18	24	40	32	34	12	12	17	44	29	34
METAL	Lead	mg/Kg	1	18	18	6	65	26	34	12	12	4	28	9	13
METAL	Nickel	mg/Kg	10	18	18	26	48	39	42	12	12	25	50	37	41

NOTE: Shaded lines indicate compound was not detected in that depth range.

BUILDING 796
SUMMARY STATISTICS FOR RISK ASSESSMENT

				SHALLOW (0-2')						DEEP (> 2')					
METHOD	COMPOUND	UNITS	MRL	N	HITS	MIN	MAX	MEAN	95% UCL	N	HITS	MIN	MAX	MEAN	95% UCL
PETHYDRO	Toluene	µg/Kg	5	3	0	2.5	2.5	2.5	2.5	19	2	2.5	10.0	3.1	3.8
PETHYDRO	Total Xylenes	µg/Kg	5	3	0	2.5	2.5	2.5	2.5	19	3	2.5	14.0	3.7	5.0
PETHYDRO	DRO	mg/Kg	10	1	0	5	5	5	--	18	7	5	364	46	89
PETHYDRO	TPH	mg/Kg	10	1	1	950	950	950	--	18	12	5	730	71	142
PEST	4,4'-DDT	mg/Kg	0.01	1	1	0.01	0.01	0.01	--	15	0	0.005	0.01	0.005	0.01
VOA	Acetone	µg/Kg	50	3	0	25	25	25	25	19	4	25	83	34	42
VOA	Chloroform	µg/Kg	5	3	0	2.5	2.5	2.5	2.5	19	1	2.5	5.0	2.6	2.9
VOA	Carbon Tetrachloride	µg/Kg	5	3	0	2.5	2.5	2.5	2.5	19	1	2.5	30.0	3.9	6.5
VOA	Trichloroethene (TCE)	µg/Kg	5	3	0	2.5	2.5	2.5	2.5	19	1	2.5	8.0	2.8	3.3
VOA	Toluene	µg/Kg	5	3	0	2.5	2.5	2.5	2.5	19	2	2.5	10.0	3.1	3.8
VOA	Total Xylenes	µg/Kg	5	3	0	2.6	2.5	2.5	2.5	19	3	2.5	14.0	3.7	5.0
VOA	1,2,4-Trichlorobenzene	µg/Kg	20	3	0	10	10	10	10	19	2	10	25	11	13
METAL	Arsenic	mg/Kg	1	1	1	10	10	10	--	20	20	4	12	6	7
METAL	Barium	mg/Kg	1	1	1	55	55	55	--	20	20	26	72	48	53
METAL	Chromium	mg/Kg	2	1	1	37	37	37	--	20	20	20	129	37	46
METAL	Lead	mg/Kg	1	1	1	10	10	10	--	20	20	5	357	39	71
METAL	Nickel	mg/Kg	10	1	1	51	51	51	--	20	20	13	94	41	49
OTHER	pH	none	--	1	1	7.47	7.47	7.47	--	20	20	4.73	7.77	6.84	7.14
OTHER	Oxidation-Reduction Potential	none	--	0	0	0.000	0.00	--	--	11	11	200	310	242	262
OTHER	Sulfate	mg/Kg	3	1	1	5.2	5.2	5.2	--	20	20	6.3	3500.0	529.4	883.6

NOTE: Shaded lines indicate compound was not detected in that depth range.

NOTE : -- Indicates not calculable due to low number of samples in that depth range.

NOTE: Shallow includes 2 samples taken 0-9' (3rd sample taken at 0-2').

BUILDING 955
SUMMARY STATISTICS FOR RISK ASSESSMENT

				SHALLOW (0-2')						DEEP (> 2')					
METHOD	COMPOUND	UNITS	MRL	N	HITS	MIN	MAX	MEAN	95% UCL	N	HITS	MIN	MAX	MEAN	95% UCL
PETHYDRO	Toluene	µg/Kg	5	6	2	2.5	9.0	4.5	7.1	12	4	2.5	700.0	91.3	203.3
PETHYDRO	Total Xylenes	µg/Kg	5	6	3	2.5	7.0	4.3	5.9	12	6	2.5	700.0	92.0	203.8
PETHYDRO	GRO	mg/Kg	5	6	0	2.5	2.5	2.5	2.5	12	2	2.5	60.0	8.8	17.5
PETHYDRO	DRO	mg/Kg	10	6	4	5	353	78	190	12	5	5	1720	244	510
PETHYDRO	TPH	mg/Kg	10	6	4	5	260	62	142	12	4	5	740	107	221
PEST	4,4'-DDT	mg/Kg	0.01	6	6	0.01	95.00	15.94	47.80	12	3	0.005	0.400	0.050	0.109
PEST	4,4'-DDE	mg/Kg	0.01	6	3	0.005	1.270	0.221	0.644	12	0	0.005	0.005	0.005	0.005
VOA	Acetone	µg/Kg	50	6	2	25	79	41	62	12	1	25	7000	899	2021
VOA	Toluene	µg/Kg	5	6	2	2.5	9.0	4.5	7.1	12	4	2.5	700.0	91.3	203.3
VOA	Total Xylenes	µg/Kg	5	6	3	2.5	7.0	4.3	5.9	12	6	2.5	700.0	92.0	203.8
SVOA	Bis(2-ethylhexyl) Phthalate	mg/Kg	0.3	6	1	0.15	2.00	0.46	1.08	12	0	0.15	0.75	0.20	0.29
METAL	Arsenic	mg/Kg	1	6	6	5	8	6	7	12	12	4	7	6	6
METAL	Barium	mg/Kg	1	6	6	52	167	102	144	12	12	46	70	58	60
METAL	Chromium	mg/Kg	2	6	6	31	41	35	38	12	12	21	47	33	37
METAL	Lead	mg/Kg	1	6	6	5	9	7	8	12	12	4	8	6	6
METAL	Nickel	mg/Kg	10	6	6	38	49	43	47	12	12	31	59	42	47

NOTE: Shallow range includes samples from the following depths: 0-4', 0-6', and 0-8'.

NOTE: Shaded lines indicate compound was not detected in that depth range.

DUST PALLATIVE ROADWAY
SUMMARY STATISTICS FOR RISK ASSESSMENT

METHOD	COMPOUND	UNITS	MRL	SHALLOW (0-2')					
				N	HITS	MIN	MAX	MEAN	95% UCL
PETHYDRO	TPH	mg/Kg	10	14	14	39.000	260.00	101.571	127.84
PEST	4,4'-DDT	mg/Kg	0.01	14	9	0.005	0.18	0.051	0.08
SVOA	Bis(2-ethylhexyl) Phthalate	mg/Kg	0.3	14	2	0.150	0.90	0.246	0.35
METAL	Arsenic	mg/Kg	1	14	14	5.000	8.00	6.286	6.68
METAL	Barium	mg/Kg	1	14	14	41.000	81.00	56.357	62.78
METAL	Chromium	mg/Kg	2	14	14	16.000	43.00	27.643	31.89
METAL	Lead	mg/Kg	1	14	14	7.000	27.00	14.000	17.04
METAL	Nickel	mg/Kg	10	14	14	22.000	42.00	34.071	37.19

FIRE TRAINING PITS
SUMMARY STATISTICS FOR RISK ASSESSMENT

				SHALLOW (0-2')						DEEP (> 2')					
METHOD	COMPOUND	UNITS	MRL	N	HITS	MIN	MAX	MEAN	95% UCL	N	HITS	MIN	MAX	MEAN	95% UCL
PETHYDRO	Benzene	µg/Kg	5	11	3	2.5	5200.0	1031.0	1993.5	16	2	2.5	1000.0	189.7	339.8
PETHYDRO	Toluene	µg/Kg	5	11	9	7	240000	40974	87398	16	13	2.5	1900	267	496
PETHYDRO	Ethylbenzene	µg/Kg	5	11	8	2.5	39000.0	6006.1	12493.7	16	8	2.5	7500.0	671.6	1494.2
PETHYDRO	Total Xylenes	µg/Kg	5	11	11	7	380000	73386	142112	16	15	2.5	68000	8180	16636
PETHYDRO	GRO	mg/Kg	5	11	9	2.5	12000.0	2515.3	4422.4	16	7	2.5	1800.0	257.8	487.1
PETHYDRO	DRO	mg/Kg	10	11	11	64	5370	1526	2440	16	11	5	3610	683	1158
PETHYDRO	TPH	mg/Kg	10	11	11	89	8100	2383	3786	16	14	5	17000	2185	4078
PEST	4,4'-DDD	mg/Kg	0.01	11	0	0.005	0.005	0.005	0.005	16	2	0.005	0.040	0.009	0.013
PEST	4,4'-DDE	mg/Kg	0.01	11	0	0.005	0.005	0.005	0.005	16	1	0.005	0.070	0.010	0.017
PCB	Aroclor 1232	mg/Kg	0.1	11	0	0.05	0.05	0.05	0.05	16	1	0.05	3.60	0.43	0.85
PCB	Aroclor 1248	mg/Kg	0.1	11	0	0.05	0.05	0.05	0.05	16	1	0.05	0.75	0.13	0.20
PCB	Aroclor 1254	mg/Kg	0.1	11	0	0.05	0.05	0.05	0.05	16	1	0.05	0.40	0.13	0.18
PCB	Aroclor 1260	mg/Kg	0.1	11	0	0.05	0.05	0.05	0.05	16	1	0.05	0.50	0.10	0.16
PCBs	TOTAL PCBs	mg/Kg		11	0	0.4	0.4	0.4	0.4	16	1	0.35	6.05	1.24	2.04
VOA	Acetone	µg/Kg	50	11	1	25	7000	3074	4606	16	12	52	7000	2032	3305
VOA	Methylene Chloride	µg/Kg	10	11	2	5	1350	607	905	16	2	5	1350	297	531
VOA	2-Butanone (MEK)	µg/Kg	20	11	1	10	2700	1210	1809	16	8	10	3200	954	1480
VOA	Benzene	µg/Kg	5	11	3	2.5	5200.0	1031.0	1993.5	16	2	2.5	1000.0	189.7	339.8
VOA	2-Hexanone	µg/Kg	20	11	1	10	41000	4813	11399	16	1	10	2700	593	1062
VOA	Toluene	µg/Kg	5	11	9	7	240000	40974	87398	16	13	2.5	1900.0	266.8	496.2
VOA	4-Methyl-2-pentanone (MIBK)	µg/Kg	20	11	0	10	2700	1204	1806	16	3	10	2700	595	1063
VOA	Ethylbenzene	µg/Kg	5	11	8	2.5	39000.0	6006.1	12493.7	16	8	2.5	7500.0	671.6	1494.2
VOA	Total Xylenes	µg/Kg	5	11	11	7	380000	73386	142112	16	15	3	68000	8180	16636
VOA	Isopropylbenzene	µg/Kg	20	11	4	10	9200	2316	3846	16	1	10	2700	591	1060
VOA	n-Propylbenzene	µg/Kg	20	11	4	10	17000	3589	6421	16	3	10	5700	864	1592
VOA	1,3,5-Trimethylbenzene	µg/Kg	20	11	6	10	36000	11173	18382	16	7	10	30000	4812	9079
VOA	1,2,4-Trimethylbenzene	µg/Kg	20	11	8	10	93000	29995	48828	16	9	10	39000	7367	13339
VOA	sec-Butylbenzene	µg/Kg	20	11	4	10	5800	1982	3083	16	0	10	2700	589	1058
VOA	4-Isopropyltoluene	µg/Kg	20	11	3	10	4400	1644	2479	16	3	10	5600	781	1475
VOA	1,4-Dichlorobenzene	µg/Kg	5	11	0	2.6	700.0	305.6	459.9	16	2	2.5	2900.0	293.8	615.2
VOA	Naphthalene	µg/Kg	20	11	8	10	31000	10633	17250	18	3	10	12000	1584	3108
SVOA	Naphthalene	mg/Kg	0.3	11	7	0.15	17.00	5.17	8.27	16	6	0.15	9.00	1.17	2.19
SVOA	2-Methylnaphthalene	mg/Kg	0.3	11	8	0.15	13.00	5.77	8.35	16	4	0.15	8.00	1.06	1.97
SVOA	Diethyl Phthalate	mg/Kg	0.3	11	0	0.15	1.50	0.87	1.21	16	1	0.15	1.00	0.34	0.48
SVOA	Di-n-butyl Phthalate	mg/Kg	0.3	11	0	0.15	1.50	0.87	1.21	18	1	0.15	1.00	0.35	0.49
SVOA	Butylbenzyl Phthalate	mg/Kg	0.3	11	0	0.15	1.50	0.87	1.21	16	2	0.15	4.90	0.61	1.13
SVOA	Bis(2-ethylhexyl) Phthalate	mg/Kg	0.3	11	0	0.15	1.50	0.87	1.21	16	2	0.15	1.70	0.43	0.63
SVOA	3- and 4-Methylphenol*	mg/Kg	0.3	11	0	0.15	1.50	0.87	1.21	16	2	0.15	2.70	0.49	0.78

FIRE TRAINING PITS
SUMMARY STATISTICS FOR RISK ASSESSMENT

				SHALLOW (0-2')						DEEP (> 2')					
METHOD	COMPOUND	UNITS	MRL	N	HITS	MIN	MAX	MEAN	95% UCL	N	HITS	MIN	MAX	MEAN	95% UCL
METAL	Arsenic	mg/Kg	1	11	11	4	9	7	7	16	16	5	. 10	7	7
METAL	Barium	mg/Kg	1	11	11	46	89	65	73	16	16	38	100	65	74
METAL	Cadmium	mg/Kg	1	11	0	0.5	0.5	0.5	0.6	16	1	0.5	4.0	0.7	1.1
METAL	Chromium	mg/Kg	2	11	11	30	46	38	41	16	16	22	42	34	37
METAL	Lead	mg/Kg	1	11	11	9	29	13	17	16	16	6	111	21	34
METAL	Mercury	mg/Kg	0.2	11	0	0.1	0.1	0.1	0.1	16	2	0.1	0.3	0.1	0.2
METAL	Nickel	mg/Kg	10	11	11	37	78	44	51	16	16	26	56	40	43
METAL	Silver	mg/Kg	2	11	0	1	1	1	1	16	1	1	2	1	1
DIOXIN	2,3,7,8-Tetrachlorodibenzo-p-dioxin	pg/g	varies	11	0	0.09	1.20	0.21	0.39	16	1	0.08	1.60	0.23	0.39
DIOXIN	Total TCDD	pg/g	varies	11	0	0.10	1.20	0.23	0.40	16	1	0.100	21.000	1.450	3.735
DIOXIN	1,2,3,7,8-Pentachlorodibenzo-p-dioxin	pg/g	varies	11	0	0.04	0.65	0.19	0.27	16	1	0.03	5.50	0.56	1.15
DIOXIN	Total PeCDD	pg/g	varies	11	0	0.04	1.15	0.49	0.73	16	1	0.03	42.00	3.44	7.96
DIOXIN	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	pg/g	varies	11	0	0.09	0.47	0.25	0.32	16	1	0.085	7.400	0.738	1.523
DIOXIN	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	pg/g	varies	11	1	0.14	0.54	0.30	0.38	16	5	0.08	100.00	7.97	18.94
DIOXIN	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	pg/g	varies	11	0	0.08	0.42	0.24	0.31	16	2	0.08	25.00	2.14	4.88
DIOXIN	Total HxCDD	pg/g	varies	11	3	0.20	2.30	0.77	1.19	16	6	0.1	480.0	37.8	90.6
DIOXIN	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	pg/g	varies	11	11	3.3	11.0	5.3	6.7	16	11	0.065	1200.000	105.242	238.409
DIOXIN	Total HpCDD	pg/g	varies	11	11	6.3	21.0	10.8	13.5	16	11	0.065	2000.000	179.161	401.225
DIOXIN	OCDD	pg/g	varies	11	11	24	110	46	60	16	16	1.0	10000.0	956.5	2074.1
DIOXIN	2,3,7,8-Tetrachlorodibenzofuran	pg/g	varies	11	0	0.04	0.15	0.09	0.11	16	1	0.055	4.400	0.416	0.893
DIOXIN	Total TCDF	pg/g	varies	11	5	0.08	2.70	0.80	1.30	16	2	0.06	61.00	4.32	10.97
DIOXIN	1,2,3,7,8-Pentachlorodibenzofuran	pg/g	varies	11	0	0.04	0.24	0.15	0.19	16	1	0.037	2.500	0.342	0.624
DIOXIN	2,3,4,7,8-Pentachlorodibenzofuran	pg/g	varies	11	2	0.07	0.45	0.23	0.30	16	2	0.08	4.30	0.51	0.96
DIOXIN	Total PeCDF	pg/g	varies	11	9	0.19	5.70	2.00	3.00	16	7	0.120	61.000	5.183	11.819
DIOXIN	1,2,3,4,7,8-Hexachlorodibenzofuran	pg/g	varies	11	0	0.04	0.18	0.11	0.13	16	2	0.031	10.000	1.007	2.177
DIOXIN	1,2,3,6,7,8-Hexachlorodibenzofuran	pg/g	varies	11	0	0.04	0.18	0.11	0.13	16	1	0.031	14.000	1.035	2.556
DIOXIN	2,3,4,6,7,8-Hexachlorodibenzofuran	pg/g	varies	11	2	0.135	0.550	0.235	0.314	16	6	0.12	11.00	1.12	2.33
DIOXIN	1,2,3,7,8,9-Hexachlorodibenzofuran	pg/g	varies	11	0	0.027	0.170	0.107	0.135	16	1	0.027	2.200	0.271	0.514
DIOXIN	Total HxCDF	pg/g	varies	11	8	0.140	3.600	1.550	2.138	16	10	0.12	680.00	53.89	128.83
DIOXIN	1,2,3,4,6,7,8-Heptachlorodibenzofuran	pg/g	varies	11	10	0.295	2.400	1.490	1.797	16	10	0.06	560.00	43.70	105.20
DIOXIN	1,2,3,4,7,8,9-Heptachlorodibenzofuran	pg/g	varies	11	0	0.035	0.335	0.142	0.188	16	2	0.040	17.000	1.550	3.471
DIOXIN	Total HpCDF	pg/g	varies	11	11	1.5	8.0	4.3	5.3	16	10	0.06	2200.00	172.94	414.82
DIOXIN	OCDF	pg/g	varies	11	10	1.200	5.200	3.600	4.250	16	11	0.120	2200.000	177.204	420.503
DIOXIN	TOTAL DIOXINs	pg/g	--	11	11	37.0	149.8	70.1	88.5	16	16	2.96	17745.00	1591.87	3560.03

NOTE: Shaded lines indicate compound was not detected in that depth range.

Continued from previous page

GREASE PITS
SUMMARY STATISTICS FOR RISK ASSESSMENT

				DEEP (> 2')					
METHOD	COMPOUND	UNITS	MRL	N	HITS	MIN	MAX	MEAN	95% UCL
PetHydro	Total Xylenes	µg/Kg	5	3	1	2.5	19000.0	2716.4	14821.5
PetHydro	GRO	mg/Kg	5	2	1	2.5	800.0	136.0	1588.3
PetHydro	DRO	mg/Kg	10	2	1	2.5	3600.0	602.5	7158.5
PetHydro	TPH	mg/Kg	10	3	1	5	5600	839	4379
VOA	Acetone	µg/Kg	50	26	9	5	6000	589	1161
VOA	2-Butanone (MEK)	µg/Kg	20	26	1	0.005	2500.00	214.172	455.32
VOA	Benzene	µg/Kg	5	26	3	0.005	600.00	60.785	118.82
VOA	Toluene	µg/Kg	5	26	3	0.005	600.00	52.172	109.97
VOA	Tetrachloroethene (PCE)	µg/Kg	5	26	1	0.05	600.00	51.50	109.37
VOA	Ethylbenzene	µg/Kg	5	26	2	3	600	60	117
VOA	Total Xylenes	µg/Kg	5	26	6	2.5	19000.0	1586.9	3423.9
VOA	Isopropylbenzene	µg/Kg	20	26	1	2.5	2500.0	215.3	458.3
VOA	n-Propylbenzene	µg/Kg	20	26	1	2.5	2500.0	215.3	458.3
VOA	1,3,5-Trimethylbenzene	µg/Kg	20	26	2	6	5900	500	1070
VOA	1,2,4-Trimethylbenzene	µg/Kg	20	26	2	10	17000	1444	3085
VOA	Naphthalene	µg/Kg	20	26	1	10	2500	226	466
SVOA	Naphthalene	mg/Kg	0.3	23	2	0.15	28.00	6.68	10.07
SVOA	2-Methylnaphthalene	mg/Kg	0.3	23	2	0.15	48.00	17.08	24.57
SVOA	Bis(2-ethylhexyl) Phthalate	mg/Kg	0.3	23	3	0.15	1.50	0.40	0.59
SVOA	Di-n-octyl Phthalate	mg/Kg	0.3	23	5	0.15	1.60	0.57	0.75
Metals	Arsenic	mg/Kg	1	15	15	4	7	6	7
Metals	Barium	mg/Kg	1	15	15	32	69	46	55
Metals	Chromium	mg/Kg	2	15	13	28	53	39	45
Metals	Lead	mg/Kg	1	15	15	7	22	13	16
Metals	Mercury	mg/Kg	0.2	15	2	0.1	0.1	0.1	0.1
Metals	Nickel	mg/Kg	10	15	13	41	48	44	46
Metals	Selenium	mg/Kg	1	15	2	0.5	0.5	0.5	0.5
Other	Ammonia as Nitrogen	mg/Kg	0.2	17	11	0.1	0.4	0.2	0.3
Other	Nitrate + Nitrite as Nitrogen	mg/Kg	varies	20	2	0.45	12	3	5

BACKGROUND
SUMMARY STATISTICS FOR RISK ASSESSMENT

					DEEP (> 2')					
METHOD	COMPOUND	UNITS	MRL	95% UCL	N	HITS	MIN	MAX	MEAN	95% UCL
PETHYDRO	Toluene	µg/Kg	5	3.5	19	4	2.5	81.0	7.1	14.3
PETHYDRO	Ethylbenzene	µg/Kg	5	2.5	19	1	2.5	8.0	2.8	3.3
PETHYDRO	Total Xylenes	µg/Kg	5	6.3	19	11	2.5	13.0	5.8	7.2
PETHYDRO	DRO	mg/Kg	10	41	19	8	5	195	37	59
PETHYDRO	TPH	mg/Kg	10	30	19	12	5	111	25	38
PESTICIDE	4,4'-DDD	mg/Kg	0.01	0.006	19	1	0.005	0.02	0.006	0.007
PESTICIDE	4,4'-DDT	mg/Kg	0.01	0.011	19	6	0.005	0.19	0.029	0.049
PESTICIDE	4,4'-DDE	mg/Kg	0.01	0.005	19	4	0.005	0.04	0.009	0.013
VOA	Acetone	µg/Kg	50	43	19	7	25	1400	146	275
VOA	Methylene Chloride	µg/Kg	10	11	19	3	5	51	9	13
VOA	2-Butanone (MEK)	µg/Kg	20	10	19	3	10	150	20	33
VOA	Toluene	µg/Kg	5	3.5	19	4	2.5	81.0	7.1	14.3
VOA	Ethylbenzene	µg/Kg	5	2.5	19	1	2.5	8.0	2.8	3.3
VOA	Total Xylenes	µg/Kg	5	6.3	19	11	2.5	13.0	5.8	7.2
VOA	n-Propylbenzene	µg/Kg	20	10	19	2	10	39	12	15
VOA	4-Isopropyltoluene	µg/Kg	20	10	19	2	10	260	26	50
SVOA	Di-n-octyl Phthalate	mg/Kg	0.3	0.26	19	1	0.15	0.60	0.17	0.21
SVOA	3- and 4-Methylphenol*	mg/Kg	0.3	0.15	19	1	0.15	0.40	0.16	0.19
METALS	Arsenic	mg/Kg	1	6	19	19	4	8	5	5
METALS	Barium	mg/Kg	1	62	19	19	32	125	60	72
METALS	Chromium	mg/Kg	2	36	19	19	10	45	29	32
METALS	Lead	mg/Kg	1	7	19	19	4	15	6	7
METALS	Nickel	mg/Kg	10	53	19	18	5	235	42	61
OTHER	Ammonia as Nitrogen	mg/Kg		11.90	19	9	0.11	110.00	6.97	16.99
OTHER	Sulfate	mg/Kg		14.0	19	19	2.8	31.0	8.7	11.8
DIOXIN	Total TCDD	PPT		0.168	19	2	0.075	1.400	0.223	0.351
DIOXIN	Total HxCDD	PPT		0.15	19	1	0.05	2.30	0.23	0.43
DIOXIN	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	PPT		0.512	19	7	0.065	3.600	0.543	0.872
DIOXIN	Total HpCDD	PPT		0.825	19	7	0.065	6.800	0.683	1.516
DIOXIN	OCDD	PPT		3.2	19	10	0.3	16.0	3.0	4.7
DIOXIN	Total TCDF	PPT		0.17	19	3	0.04	10.00	0.93	1.94
DIOXIN	2,3,4,7,8-Pentachlorodibenzofuran	PPT		0.187	19	1	0.04	1.60	0.19	0.33
DIOXIN	Total PeCDF	PPT		0.472	19	2	0.05	18.00	1.23	2.66
DIOXIN	Total HxCDF	PPT		0.21	19	2	0.095	6.400	0.624	1.235
DIOXIN	1,2,3,4,6,7,8-Heptachlorodibenzofuran	PPT		0.163	19	3	0.03	1.70	0.28	0.48
DIOXIN	Total HpCDF	PPT		0.193	19	3	0.030	2.800	0.393	0.689
DIOXIN	OCDF	PPT		0.20	19	1	0.08	1.20	0.26	0.36
DIOXIN	TOTAL DIOXINs			5.37	19	10	0.96	65.11	7.92	13.88

NOTE: Shaded lines indicate compound was not detected in that depth range.

B

APPENDIX B

BUILDING 35-752

- Laboratory Results
- Soil Boring Summary
- Boring Logs and Monitoring Well Completion Diagrams
- Monitoring Well Development Records
  Groundwater Sample Collection Records
- Resurvey Elevation Data for all Monitoring Wells (August 4, 1995)
  Monitoring Well Measurements to Groundwater
  August 7, 1995 Monitoring Well Sounding Summary
- Soil Classifications

Ft. Richardson OU D Site

Building 35-752 Sediment Sample Analytical Results

Petroleum Hydrocarbons

dry weight basis				Analysis:	Benzene		Toluene		Ethylbenzene		Total Xylenes		GRO		DRO		TPH	
				EPA Method:	8260		8260		8260		8260		5030/8015		3540/8100		9071/418.1	
				Units:	µg/Kg		µg/Kg		µg/Kg		µg/Kg		mg/Kg		mg/Kg		mg/Kg	
Location	Sample Depth	Sample ID	Lab Code	Date Collected	MRL	Result	MRL	Result	MRL	Result	MRL	Result	MRL	Result	MRL	Result	MRL	Result
COOLING PONDS																		
A	0-6"	94575240SD	K947714-001	12/8/94	5	ND	5	ND	5	ND	5	ND	5	NA	10	NA	10	230
A	0-6"	94575241SD	K947714-002	12/8/94	5	ND	5	ND	5	ND	5	ND	5	NA	10	NA	10	240
B	0-6"	94575242SD	K947714-003	12/8/94	5	ND	5	ND	5	ND	5	ND	5	NA	10	NA	10	240
C	0-6"	94575243SD	K947714-004	12/8/94	5	<10	5	<10	5	<10	5	<10	5	NA	10	NA	10	420
D	0-6"	94575244SD	K947714-005	12/8/94	5	ND	5	ND	5	ND	5	ND	5	NA	10	NA	10	290
E	0-6"	94575245SD	K947714-006	12/8/94	5	ND	5	ND	5	ND	5	ND	5	NA	10	NA	10	83
F	0-6"	94575246SD	K947714-007	12/8/94	5	ND	5	ND	5	ND	5	ND	5	NA	10	NA	10	186
G	0-6"	94575247SD	K947714-008	12/8/94	5	<10	5	<10	5	<10	5	<10	5	NA	10	NA	10	440
H	0-6"	94575248SD	K947714-009	12/8/94	5	ND	5	ND	5	ND	5	ND	5	NA	10	NA	10	260

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL).

NA = Not analyzed.

< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.

Ft. Richardson OU D Site
Building 35-752 Sediment Sample Analytical Results
Pesticides and PCBs

dry weight basis mg/Kg		COOLING PONDS								
Location:		A		B	C	D	E	F	G	H
Sample Depth:		0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"
Sample ID:		94575240SD	94575241SD	94575242SD	94575243SD	94575244SD	94575245SD	94575246SD	94575247SD	94575248SD
Lab Code:		K947714-001	K947714-002	K947714-003	K947714-004	K947714-005	K947714-006	K947714-007	K947714-008	K947714-009
Date Collected:		12/8/94	12/8/94	12/8/94	12/8/94	12/8/94	12/8/94	12/8/94	12/8/94	12/8/94
Organochlorine Pesticides (EPA Methods 3540/8080)	MRL									
Alpha-BHC	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND
Beta-BHC	0.03	ND	ND	ND	ND	ND	ND	ND	ND	ND
Delta-BHC	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aldrin	0.01	ND	ND	ND	ND	ND	ND	ND	<0.02	ND
Gamma-BHC (Lindane)	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor Epoxide	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan I	0.01	ND	ND	ND	ND	ND	ND	<0.1	ND	ND
Endrin	0.01	ND	<0.02	ND	<0.03	ND	<0.04	<0.1	<0.08	<0.8
Endosulfan II	0.01	ND	ND	ND	ND	ND	<0.04	<0.1	<0.08	<0.05
4,4'-DDD	0.01	0.03	0.1	0.03	0.02	0.07	<0.04	<0.1	<0.08	<0.05
Endrin Aldehyde	0.01	ND	ND	ND	<0.02	ND	<0.04	<0.1	<0.08	<0.07
Endosulfan Sulfate	0.01	ND	ND	ND	ND	ND	<0.04	<0.1	<0.08	<0.05
4,4'-DDT	0.01	<0.2	<0.3	<0.02	<0.04	0.04	<0.04	<0.1	<0.08	<0.07
4,4'-DDE	0.01	ND	ND	ND	ND	ND	ND	<0.1	<0.08	<0.05
Dieldrin	0.01	ND	ND	ND	ND	ND	ND	<0.1	<0.08	<0.05
Methoxychlor	0.02	ND	ND	ND	ND	ND	<0.15	<0.4	<0.3	<0.20
Toxaphene	0.3	ND	ND	ND	ND	ND	<0.8	<5	<5	<3
Chlordane	0.1	ND	ND	ND	ND	ND	ND	<0.8	<0.6	<0.4
Polychlorinated Biphenyls (EPA Methods 3540/8080)	MRL									
Aroclor 1016	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1260	0.1	0.3	0.5	0.4	0.8	0.1	0.5	2.2	4.5	3.4

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL).
< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.

Ft. Richardson OU D Site
Building 35-752 Sediment Sample Analytical Results
Volatile Organic Compounds

dry weight basis		COOLING PONDS								
µg/Kg Location:		A		B	C	D	E	F	G	H
Sample Depth:		0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"
Sample ID:		94575240SD	94575241SD	94575242SD	94575243SD	94575244SD	94575245SD	94575246SD	94575247SD	94575248SD
Lab Code:		K947714-001	K947714-002	K947714-003	K947714-004	K947714-005	K947714-006	K947714-007	K947714-008	K947714-009
Date Collected:		12/8/94	12/8/94	12/8/94	12/8/94	12/8/94	12/6/94	12/6/94	12/6/94	12/8/94
Volatile Organic Compounds (EPA Method 8260)	MRL									
Dichlorodifluoromethane (CFC 12)	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
Chloromethane	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
Vinyl Chloride	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
Bromomethane	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
Chloroethane	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
Trichlorofluoromethane (CFC 11)	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
Acetone	50	160	170	190	420	210	240	110	180	230
1,1-Dichloroethene	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
Carbon Disulfide	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
Methylene Chloride	10	ND	ND	ND	<20	ND	ND	ND	<20	ND
trans-1,2-Dichloroethene	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
1,1-Dichloroethane	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
2-Butanone (MEK)	20	47	43	ND	58	33	20	ND	40	ND
2,2-Dichloropropane	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
cis-1,2-Dichloroethene	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
Chloroform	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
Bromochloromethane	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
1,1,1-Trichloroethane (TCA)	5	18	ND	ND	<10	ND	14	10	<10	ND
1,1-Dichloropropene	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
Carbon Tetrachloride	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
1,2-Dichloroethane	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
Benzene	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
Trichloroethene (TCE)	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
1,2-Dichloropropane	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
Bromodichloromethane	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
Dibromomethane	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
2-Hexanone	20	ND	ND	ND	<40	ND	ND	ND	<40	ND
cis-1,3-Dichloropropene	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
Toluene	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
trans-1,3-Dichloropropene	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
1,1,2-Trichloroethane	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
4-Methyl-2-pentanone (MIBK)	20	ND	ND	ND	<40	ND	ND	ND	<40	ND
1,3-Dichloropropane	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
Tetrachloroethene (PCE)	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
Dibromochloromethane	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
1,2-Dibromoethane (EDB)	20	ND	ND	ND	<40	ND	ND	ND	<40	ND
Chlorobenzene	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
1,1,1,2-Tetrachloroethane	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
Ethylbenzene	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
Total Xylenes	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
Styrene	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
Bromoform	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
Isopropylbenzene	20	ND	ND	ND	<40	ND	ND	ND	<40	ND
1,1,2,2-Tetrachloroethane	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
1,2,3-Trichloropropane	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
Bromobenzene	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
n-Propylbenzene	20	ND	ND	ND	<40	ND	ND	ND	<40	ND
2-Chlorotoluene	20	ND	ND	ND	<40	ND	ND	ND	<40	ND
4-Chlorotoluene	20	ND	ND	ND	<40	ND	ND	ND	<40	ND
1,3,5-Trimethylbenzene	20	ND	ND	ND	<40	ND	ND	ND	<40	ND
tert-Butylbenzene	20	ND	ND	ND	<40	ND	ND	ND	<40	ND
1,2,4-Trimethylbenzene	20	ND	ND	ND	<40	ND	ND	ND	<40	ND
sec-Butylbenzene	20	ND	ND	ND	<40	ND	ND	ND	<40	ND
1,3-Dichlorobenzene	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
4-Isopropyltoluene	20	ND	ND	ND	<40	ND	ND	ND	<40	ND
1,4-Dichlorobenzene	5	ND	ND	ND	<10	ND	ND	ND	15	6
n-Butylbenzene	20	ND	ND	ND	<40	ND	ND	ND	<40	ND
1,2-Dichlorobenzene	5	ND	ND	ND	<10	ND	ND	ND	<10	ND
1,2-Dibromo-3-chloropropane (DBCP)	20	ND	ND	ND	<40	ND	ND	ND	<40	ND
1,2,4-Trichlorobenzene	20	ND	ND	ND	<40	ND	ND	ND	<40	ND
1,2,3-Trichlorobenzene	20	ND	ND	ND	<40	ND	ND	ND	<40	ND
Naphthalene	20	ND	ND	ND	<40	ND	ND	ND	<40	ND
Hexachlorobutadiene	20	ND	ND	ND	<40	ND	ND	ND	<40	ND

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL).

< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.

Ft. Richardson OU D Site
Building 35-752 Sediment Sample Analytical Results
Semivolatile Organic Compounds

dry weight basis		COOLING PONDS								
mg/Kg Location:		A		B	C	D	E	F	G	H
Sample Depth:		0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"
Sample ID:		94575240SD	94575241SD	94575242SD	94575243SD	94575244SD	94575245SD	94575246SD	94575247SD	94575248SD
Lab Code:		K947714-001	K947714-002	K947714-003	K947714-004	K947714-005	K947714-006	K947714-007	K947714-008	K947714-009
Date Collected:		12/8/94	12/8/94	12/8/94	12/8/94	12/8/94	12/8/94	12/8/94	12/8/94	12/8/94
Semivolatile Organic Compounds EPA Methods 3550/8270	MRL									
N-Nitrosodimethylamine	2	ND	ND	ND	<24	ND	ND	ND	<4.5	ND
Aniline	1	ND	ND	ND	<12	ND	ND	ND	<2.4	ND
Bis(2-chloroethyl) Ether	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
1,2-Dichlorobenzene	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
1,3-Dichlorobenzene	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
1,4-Dichlorobenzene	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
Bis(2-chloroisopropyl) Ether	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
N-Nitrosodi-n-propylamine	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
Hexachloroethane	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
Nitrobenzene	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
Isophorone	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
Bis(2-chloroethoxy)methane	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
1,2,4-Trichlorobenzene	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
Naphthalene	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
4-Chloroaniline	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
Hexachlorobutadiene	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
2-Methylnaphthalene	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
Hexachlorocyclopentadiene	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
2-Chloronaphthalene	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
2-Nitroaniline	2	ND	ND	ND	<24	ND	ND	ND	<4.5	ND
Dimethyl Phthalate	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
Acenaphthylene	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
3-Nitroaniline	2	ND	ND	ND	<24	ND	ND	ND	<4.5	ND
Acenaphthene	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
Dibenzofuran	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
2,4-Dinitrotoluene	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
2,6-Dinitrotoluene	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
Diethyl Phthalate	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
4-Chlorophenyl Phenyl Ether	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
Fluorene	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
4-Nitroaniline	2	ND	ND	ND	<24	ND	ND	ND	<4.5	ND
N-Nitrosodiphenylamine	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
4-Bromophenyl Phenyl Ether	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
Hexachlorobenzene	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
Phenanthrene	0.3	ND	ND	ND	<4	0.4	2.2	1.5	1.5	0.7
Anthracene	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
Di-n-butyl Phthalate	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
Fluoranthene	0.3	ND	0.3	ND	<4	0.5	3.9	2.1	2.3	4.4
Pyrene	0.3	ND	ND	ND	<4	0.4	0.7	1.9	<0.8	5.4
Butylbenzyl Phthalate	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
3,3'-Dichlorobenzidine	2	ND	ND	ND	<24	ND	ND	ND	<4.5	ND
Benz(a)anthracene	0.3	ND	ND	ND	<4	ND	0.6	ND	<0.8	1.5
Bis(2-ethylhexyl) Phthalate	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	0.4
Chrysene	0.3	ND	ND	ND	<4	ND	1.1	0.8	<0.8	1.8
Di-n-octyl Phthalate	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
Benzo(b)fluoranthene	0.3	ND	ND	ND	<4	ND	0.7	0.4	<0.8	2
Benzo(k)fluoranthene	0.3	ND	ND	ND	<4	ND	0.4	0.5	<0.8	1.3
Benzo(a)pyrene	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	1.2
Indeno(1,2,3-cd)pyrene	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	0.5
Dibenz(a,h)anthracene	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
Benzo(g,h,i)perylene	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	0.5
Phenol	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
2-Chlorophenol	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
Benzyl Alcohol	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
2-Methylphenol	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
3- and 4-Methylphenol*	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
2-Nitrophenol	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
2,4-Dimethylphenol	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
Benzoic Acid	2	ND	ND	ND	<24	ND	ND	ND	<4.5	ND
2,4-Dichlorophenol	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
4-Chloro-3-methylphenol	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
2,4,6-Trichlorophenol	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
2,4,5-Trichlorophenol	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	ND
2,4-Dinitrophenol	2	ND	ND	ND	<24	ND	ND	ND	<4.5	ND
4-Nitrophenol	2	ND	ND	ND	<24	ND	ND	ND	<4.5	ND
2-Methyl-4,6-dinitrophenol	2	ND	ND	ND	<24	ND	ND	ND	<4.5	ND
Pentachlorophenol	2	ND	ND	ND	<24	ND	ND	ND	<4.5	ND

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL).

< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.

Ft. Richardson OU D Site

Building 35-752 Sediment Sample Analytical Results

Total Metals

dry weight basis					Analyte:	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Nickel	Selenium	Silver
mg/Kg					Method:	7060	6010A	6010A	6010A	7421	7471	6010A	7740	6010A
Location	Sample Depth	Sample ID	Lab Code	Date Collected	MRL:	1	1	1	2	1	0.2	10	1	2
COOLING PONDS														
A	0-6"	94575240SD	K771401	12/8/94		4	103	ND	34	22	ND	29	ND	ND
A	0-6"	94575241SD	K771402	12/8/94		4	114	ND	35	26	ND	30	ND	ND
B	0-6"	94575242SD	K771403	12/8/94		4	113	ND	43	48	ND	37	ND	ND
C	0-6"	94575243SD	K771404	12/8/94		3	65	ND	33	23	ND	31	ND	ND
D	0-6"	94575244SD	K771405	12/8/94		5	96	ND	46	21	ND	42	ND	ND
E	0-6"	94575245SD	K771406	12/8/94		3	44	ND	33	14	ND	35	ND	ND
F	0-6"	94575246SD	K771407	12/8/94		3	49	ND	26	31	ND	40	ND	ND
G	0-6"	94575247SD	K771408	12/8/94		5	83	ND	45	61	ND	44	ND	ND
H	0-6"	94575248SD	K771409	12/8/94		5	61	ND	43	36	ND	40	ND	ND

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL).

Ft. Richardson OU D Site

Building 35-752 Soil Sample Analytical Results

Petroleum Hydrocarbons

dry weight basis				Analysis:	Benzene		Toluene		Ethylbenzene		Total Xylenes		GRO		DRO		TPH	
				EPA Method:	8260		8260		8260		8260		5030/8015		3540/8100		9071/418.1	
				Units:	µg/Kg		µg/Kg		µg/Kg		µg/Kg		mg/Kg		mg/Kg		mg/Kg	
Location	Sample Depth	Sample ID	Lab Code	Date Collected	MRL	Result	MRL	Result	MRL	Result	MRL	Result	MRL	Result	MRL	Result	MRL	Result
COOLING PONDS																		
SB AP 3501	5'-7'	94575240SL	K947108-001	11/11/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	100	10	137
MW AP 3502	0-4'	94575227SL	K946995-001	11/7/94	5	ND	5	ND	5	ND	5	16	5	8	10	107 J	10	71
MW AP 3502	0-4'	94575228SL	K946995-002	11/7/94	5	ND	5	ND	5	ND	5	11	5	ND	10	151 J	10	183
MW AP 3502	4'-6'	94575229SL	K946995-003	11/7/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	24 J	10	26
MW AP 3502	9'-13'	94575230SL	K946995-004	11/7/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	ND	10	ND
MW AP 3503	0-6'	94575231SL	K947040-001	11/8/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	55	10	64
MW AP 3503	6'-8'	94575232SL	K947040-002	11/8/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	34	10	18
MW AP 3503	8'-12'	94575233SL	K947040-003	11/8/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	ND	10	ND
MW AP 3503	8'-12'	94575234SL	K947040-004	11/8/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	ND	10	ND
MW AP 3504	0-2'	94575235SL	K947072-001	11/9/94	5	ND	5	ND	5	ND	5	8	5	ND	10	51	10	89
MW AP 3504	4'-10'	94575236SL	K947072-002	11/9/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	ND	10	12
MW AP 3504	4'-10'	94575237SL	K947072-003	11/9/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	ND	10	20
MW AP 3504	10'-14'	94575238SL	K947072-004	11/9/94	5	ND	5	ND	5	ND	5	ND	6	ND	10	ND	10	13
MW AP 3504	14'-16'	94575239SL	K947072-005	11/9/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	29	10	13

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL).

J = Value is considered an estimate.

Ft. Richardson OU D Site
Building 35-752 Soil Sample Analytical Results
Pesticides/PCBs and Chlorinated Herbicides

dry weight basis		COOLING PONDS							
mg/Kg	Location:	MW AP 3502				MW AP 3503			
	Sample Depth:	0-4'	0-4'	4'-6'	9'-13'	0-6'	6'-8'	8'-12'	8'-12'
	Sample ID:	94575227SL	94575228SL	94575229SL	94575230SL	94575231SL	94575232SL	94575233SL	94575234SL
	Lab Code:	K946995-001	K946995-002	K946995-003	K946995-004	K947040-001	K947040-002	K947040-003	K947040-004
	Date Collected:	11/7/94	11/7/94	11/7/94	11/7/94	11/8/94	11/8/94	11/8/94	11/8/94
Organochlorine Pesticides									
(EPA Methods 3540/8080)									
-	MRL								
Alpha-BHC	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Beta-BHC	0.03	ND	ND	ND	ND	ND	ND	ND	ND
Delta-BHC	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Aldrin	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Gamma-BHC (Lindane)	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor Epoxide	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan I	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Endrin	0.01	< 0.1	< 0.2	< 0.02	ND	ND	ND	ND	ND
Endosulfan II	0.01	< 0.1	< 0.1	ND	ND	ND	ND	ND	ND
4,4'-DDD	0.01	< 0.1	< 0.1	ND	ND	ND	ND	ND	ND
Endrin Aldehyde	0.01	< 0.1	< 0.1	ND	ND	ND	ND	ND	ND
Endosulfan Sulfate	0.01	< 0.1	< 0.1	ND	ND	ND	ND	ND	ND
4,4'-DDT	0.01	< 0.1	< 0.2	< 0.02	ND	0.12	<0.04	ND	ND
4,4'-DDE	0.01	< 0.1	< 0.1	ND	ND	ND	ND	ND	ND
Dieldrin	0.01	< 0.1	< 0.1	ND	ND	ND	ND	ND	ND
Methoxychlor	0.02	ND	ND	ND	ND	ND	ND	ND	ND
Toxaphene	0.3	< 3	< 6	< 1	ND	<0.6	<0.6	ND	ND
Chlordane	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Polychlorinated Biphenyls									
(EPA Methods 3540/8080)									
	MRL								
Aroclor 1016	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	0.1	ND	< 3	ND	ND	ND	ND	ND	ND
Aroclor 1254	0.1	ND	< 6	ND	ND	ND	ND	ND	ND
Aroclor 1260	0.1	2.3	8.7	0.7	ND	0.5	0.2	ND	ND
Chlorinated Herbicides									
(EPA Method 8150A Modified)									
	MRL								
Dalapon	1	ND	ND	<2	ND	ND	ND	<2	<2
MCPP	20	ND	ND	ND	ND	ND	ND	ND	ND
Dicamba	0.1	ND	ND	ND	ND	ND	ND	ND	ND
MCPA	20	ND	ND	ND	ND	ND	ND	ND	ND
Dichloroprop	0.1	ND	ND	ND	ND	ND	ND	ND	ND
2,4-D	0.2	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-TP (Silvex)	0.05	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-T	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Dinoseb	0.5	ND	ND	ND	ND	ND	ND	ND	ND
2,4-DB	0.5	ND	ND	ND	ND	ND	ND	ND	ND

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL).
< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.

Ft. Richardson OU D Site
Building 35-752 Soil Sample Analytical Results
Pesticides/PCBs and Chlorinated Herbicides

dry weight basis		COOLING PONDS (cont.)						
mg/Kg Location:		MW AP 3504					SB AP 3501	
Sample Depth:		0-2'	4'-10'	4'-10'	10'-14'	14'-16'	5'-7'	
Sample ID:		94575235SL	94575236SL	94575237SL	94575238SL	94575239SL	94575240SL	
Lab Code:		K947072-001	K947072-002	K947072-003	K947072-004	K947072-005	K7108-001	
Date Collected:		11/9/94	11/9/94	11/9/94	11/9/94	11/9/94	11/11/94	
Organochlorine Pesticides (EPA Methods 3540/8080)	**MRL**							
Alpha-BHC	0.01	ND	ND	ND	ND	ND	ND	
Beta-BHC	0.03	ND	ND	ND	ND	ND	ND	
Delta-BHC	0.01	ND	ND	ND	ND	ND	ND	
Heptachlor	0.01	ND	ND	ND	ND	ND	ND	
Aldrin	0.01	ND	ND	ND	ND	ND	ND	
Gamma-BHC (Lindane)	0.01	ND	ND	ND	ND	ND	ND	
Heptachlor Epoxide	0.01	ND	ND	ND	ND	ND	ND	
Endosulfan I	0.01	ND	ND	ND	ND	ND	<0.03	
Endrin	0.01	<0.02	ND	ND	ND	ND	<0.03	
Endosulfan II	0.01	<0.04	ND	ND	ND	ND	<0.08	
4,4'-DDD	0.01	<0.08	ND	0.03	ND	ND	<0.15	
Endrin Aldehyde	0.01	ND	ND	ND	ND	ND	<0.30	
Endosulfan Sulfate	0.01	<0.08	ND	ND	ND	ND	<0.03	
4,4'-DDT	0.01	0.1	ND	0.03	ND	ND	<0.30	
4,4'-DDE	0.01	ND	ND	ND	ND	ND	<0.10	
Dieldrin	0.01	ND	ND	ND	ND	ND	<0.03	
Methoxychlor	0.02	ND	ND	ND	ND	ND	<0.10	
Toxaphene	0.3	<0.6	ND	ND	ND	ND	<0.6	
Chlordane	0.1	ND	ND	ND	ND	ND	ND	
Polychlorinated Biphenyls (EPA Methods 3540/8080)	**MRL**							
Aroclor 1016	0.1	ND	ND	ND	ND	ND	ND	
Aroclor 1221	0.1	ND	ND	ND	ND	ND	ND	
Aroclor 1232	0.1	ND	ND	ND	ND	ND	ND	
Aroclor 1242	0.1	ND	ND	ND	ND	ND	ND	
Aroclor 1248	0.1	ND	ND	ND	ND	ND	ND	
Aroclor 1254	0.1	ND	ND	ND	ND	ND	ND	
Aroclor 1260	0.1	0.6	ND	ND	ND	ND	18.6	
Chlorinated Herbicides (EPA Method 8150A Modified)	**MRL**							
Dalapon	1	ND	ND	ND	ND	ND	ND	
MCPP	20	ND	ND	ND	ND	ND	ND	
Dicamba	0.1	ND	ND	ND	ND	ND	ND	
MCPA	20	ND	ND	ND	ND	ND	ND	
Dichloroprop	0.1	ND	ND	ND	ND	ND	ND	
2,4-D	0.2	ND	ND	ND	ND	ND	ND	
2,4,5-TP (Silvex)	0.05	ND	ND	ND	ND	ND	ND	
2,4,5-T	0.05	ND	ND	ND	ND	ND	ND	
Dinoseb	0.5	ND	ND	ND	ND	ND	ND	
2,4-DB	0.5	ND	ND	ND	ND	ND	ND	

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL).
< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.

Ft. Richardson OU D Site
Building 35-752 Soil Sample Analytical Results
Volatile Organic Compounds

dry weight basis		COOLING PONDS								
µg/Kg **Location:**		SB AP 3501	MW AP 3502				MW AP 3503			
Sample Depth:		5'-7'	0-4'	0-4'	4'-6'	9'-13'	0-6'	6'-8'	8'-12'	8'-12'
Sample ID:		94575240SL	94575227SL	94575228SL	94575229SL	94575230SL	94575231SL	94575232SL	94575233SL	94575234SL
Lab Code:		K947108-001	K946995-001	K946995-002	K946995-003	K946995-004	K947040-001	K947040-002	K947040-003	K947040-004
Date Collected:		11/11/94	11/7/94	11/7/94	11/7/94	11/7/94	11/8/94	11/8/94	11/8/94	11/8/94
Volatile Organic Compounds (EPA Method 8260)	**MRL**									
Dichlorodifluoromethane (CFC 12)	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane (CFC 11)	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	50	58	420	710	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	10	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	20	ND	90	120	ND	ND	ND	ND	ND	ND
2,2-Dichloropropane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	5	ND	6	ND	ND	ND	ND	ND	ND	ND
Chloroform	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromochloromethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane (TCA)	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloropropene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene (TCE)	5	ND	ND	ND	6	ND	ND	ND	ND	ND
1,2-Dichloropropane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromomethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichloropropane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene (PCE)	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromoethane (EDB)	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1,2-Tetrachloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	5	ND	16	11	ND	ND	ND	ND	ND	ND
Styrene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichloropropane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromobenzene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Propylbenzene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chlorotoluene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Chlorotoluene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butylbenzene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	20	ND	21	44	ND	ND	ND	ND	ND	ND
sec-Butylbenzene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Isopropyltoluene	20	ND	ND	21	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	5	7	ND	ND	ND	ND	ND	ND	ND	ND
n-Butylbenzene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-chloropropane (DBCP)	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichlorobenzene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	20	ND	ND	36	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL).

Ft. Richardson OU D Site
Building 35-752 Soil Sample Analytical Results
Volatile Organic Compounds

dry weight basis		COOLING PONDS (cont.)								
µg/Kg Location:		MW AP 3504								
Sample Depth:		0-2'	4'-10'	4'-10'	10'-14'	14'-16'				
Sample ID:		94575235SL	94575236SL	94575237SL	94575238SL	94575239SL				
Lab Code:		K947072-001	K947072-002	K947072-003	K947072-004	K947072-005				
Date Collected:		11/9/94	11/9/94	11/9/94	11/9/94	11/9/94				
Volatile Organic Compounds (EPA Method 8260)	MRL									
Dichlorodifluoromethane (CFC 12)	5	ND	ND	ND	ND	ND				
Chloromethane	5	ND	ND	ND	ND	ND				
Vinyl Chloride	5	ND	ND	ND	ND	ND				
Bromomethane	5	ND	ND	ND	ND	ND				
Chloroethane	5	ND	ND	ND	ND	ND				
Trichlorofluoromethane (CFC 11)	5	ND	ND	ND	ND	ND				
Acetone	50	ND	ND	ND	ND	ND				
1,1-Dichloroethene	5	ND	ND	ND	ND	ND				
Carbon Disulfide	5	ND	ND	ND	ND	ND				
Methylene Chloride	10	20	ND	ND	ND	ND				
trans-1,2-Dichloroethene	5	ND	ND	ND	ND	ND				
1,1-Dichloroethane	5	ND	ND	ND	ND	ND				
2-Butanone (MEK)	20	ND	ND	ND	ND	ND				
2,2-Dichloropropane	5	ND	ND	ND	ND	ND				
cis-1,2-Dichloroethene	5	ND	ND	ND	ND	ND				
Chloroform	5	ND	ND	ND	ND	ND				
Bromochloromethane	5	ND	ND	ND	ND	ND				
1,1,1-Trichloroethane (TCA)	5	ND	ND	ND	ND	ND				
1,1-Dichloropropene	5	ND	ND	ND	ND	ND				
Carbon Tetrachloride	5	ND	ND	ND	ND	ND				
1,2-Dichloroethane	5	ND	ND	ND	ND	ND				
Benzene	5	ND	ND	ND	ND	ND				
Trichloroethene (TCE)	5	ND	12	19	ND	ND				
1,2-Dichloropropane	5	ND	ND	ND	ND	ND				
Bromodichloromethane	5	ND	ND	ND	ND	ND				
Dibromomethane	5	ND	ND	ND	ND	ND				
2-Hexanone	20	ND	ND	ND	ND	ND				
cis-1,3-Dichloropropene	5	ND	ND	ND	ND	ND				
Toluene	5	ND	ND	ND	ND	ND				
trans-1,3-Dichloropropene	5	ND	ND	ND	ND	ND				
1,1,2-Trichloroethane	5	ND	ND	ND	ND	ND				
4-Methyl-2-pentanone (MIBK)	20	ND	ND	ND	ND	ND				
1,3-Dichloropropane	5	ND	ND	ND	ND	ND				
Tetrachloroethene (PCE)	5	ND	ND	ND	ND	ND				
Dibromochloromethane	5	ND	ND	ND	ND	ND				
1,2-Dibromoethane (EDB)	20	ND	ND	ND	ND	ND				
Chlorobenzene	5	ND	ND	ND	ND	ND				
1,1,1,2-Tetrachloroethane	5	ND	ND	ND	ND	ND				
Ethylbenzene	5	ND	ND	ND	ND	ND				
Total Xylenes	5	6	ND	ND	ND	ND				
Styrene	5	ND	ND	ND	ND	ND				
Bromoform	5	ND	ND	ND	ND	ND				
Isopropylbenzene	20	ND	ND	ND	ND	ND				
1,1,2,2-Tetrachloroethane	5	ND	ND	ND	ND	ND				
1,2,3-Trichloropropane	5	ND	ND	ND	ND	ND				
Bromobenzene	5	ND	ND	ND	ND	ND				
n-Propylbenzene	20	ND	ND	ND	ND	ND				
2-Chlorotoluene	20	ND	ND	ND	ND	ND				
4-Chlorotoluene	20	ND	ND	ND	ND	ND				
1,3,5-Trimethylbenzene	20	ND	ND	ND	ND	ND				
tert-Butylbenzene	20	ND	ND	ND	ND	ND				
1,2,4-Trimethylbenzene	20	ND	ND	ND	ND	ND				
sec-Butylbenzene	20	ND	ND	ND	ND	ND				
1,3-Dichlorobenzene	5	ND	ND	ND	ND	ND				
4-Isopropyltoluene	20	ND	ND	ND	ND	ND				
1,4-Dichlorobenzene	5	ND	ND	ND	ND	ND				
n-Butylbenzene	20	ND	ND	ND	ND	ND				
1,2-Dichlorobenzene	5	ND	ND	ND	ND	ND				
1,2-Dibromo-3-chloropropane (DBCP)	20	ND	ND	ND	ND	ND				
1,2,4-Trichlorobenzene	20	ND	ND	ND	ND	ND				
1,2,3-Trichlorobenzene	20	ND	ND	ND	ND	ND				
Naphthalene	20	ND	ND	ND	ND	ND				
Hexachlorobutadiene	20	ND	ND	ND	ND	ND				

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL).

Ft. Richardson OU D Site
Building 35-752 Soil Sample Analytical Results
Semivolatile Organic Compounds

dry weight basis		COOLING PONDS							
mg/Kg Location:		MW AP 3502				MW AP 3503			
Sample Depth:		0-4'	0-4'	4'-6'	9'-13'	0-6'	6'-8'	8'-12'	8'-12'
Sample ID:		94575227SL	94575228SL	94575229SL	94575230SL	94575231SL	94575232SL	94575233SL	94575234SL
Lab Code:		K946995-001	K946995-002	K946995-003	K946995-004	K947040-001	K947040-002	K947040-003	K947040-004
Date Collected:		11/7/94	11/7/94	11/7/94	11/7/94	11/8/94	11/8/94	11/8/94	11/8/94
Semivolatile Organic Compounds EPA Methods 3550/8270	MRL								
N-Nitrosodimethylamine	2	ND	ND	ND	ND	ND	ND	ND	ND
Aniline	1	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-chloroethyl) Ether	0.3	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-chloroisopropyl) Ether	0.3	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodi-n-propylamine	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Hexachloroethane	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Nitrobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Isophorone	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-chloroethoxy)methane	0.3	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
4-Chloroaniline	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorocyclopentadiene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloronaphthalene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
2-Nitroaniline	2	ND	ND	ND	ND	ND	ND	ND	ND
Dimethyl Phthalate	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthylene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
3-Nitroaniline	2	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzofuran	0.3	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Diethyl Phthalate	0.3	ND	ND	ND	ND	ND	ND	ND	ND
4-Chlorophenyl Phenyl Ether	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Fluorene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
4-Nitroaniline	2	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine	0.3	ND	ND	ND	ND	ND	ND	ND	ND
4-Bromophenyl Phenyl Ether	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Anthracene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Di-n-butyl Phthalate	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Pyrene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Butylbenzyl Phthalate	0.3	ND	ND	ND	ND	ND	ND	ND	ND
3,3'-Dichlorobenzidine	2	ND	ND	ND	ND	ND	ND	ND	ND
Benz(a)anthracene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-ethylhexyl) Phthalate	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Chrysene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Di-n-octyl Phthalate	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(a)pyrene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Dibenz(a,h)anthracene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(g,h,i)perylene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Phenol	0.3	ND	ND	ND	ND	ND	ND	ND	ND
2-Chlorophenol	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Benzyl Alcohol	0.3	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylphenol	0.3	ND	ND	ND	ND	ND	ND	ND	ND
3- and 4-Methylphenol*	0.3	ND	ND	ND	ND	ND	ND	ND	ND
2-Nitrophenol	0.3	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dimethylphenol	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Benzoic Acid	2	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dichlorophenol	0.3	ND	ND	ND	ND	ND	ND	ND	ND
4-Chloro-3-methylphenol	0.3	ND	ND	ND	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	0.3	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	0.3	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dinitrophenol	2	ND	ND	ND	ND	ND	ND	ND	ND
4-Nitrophenol	2	ND	ND	ND	ND	ND	ND	ND	ND
2-Methyl-4,6-dinitrophenol	2	ND	ND	ND	ND	ND	ND	ND	ND
Pentachlorophenol	2	ND	ND	ND	ND	ND	ND	ND	ND

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL).

Ft. Richardson OU D Site
Building 35-752 Soil Sample Analytical Results
Semivolatile Organic Compounds

dry weight basis		COOLING PONDS (cont.)							
mg/Kg Location:		MW AP 3504					SB AP 3501		
Sample Depth:		0-2'	4'-10'	4'-10'	10'-14'	14'-16'	5'-7'		
Sample ID:		94575235SL	94575236SL	94575237SL	94575238SL	94575239SL	94575240SL		
Lab Code:		K947072-001	K947072-002	K947072-003	K947072-004	K947072-005	K947106-001		
Date Collected:		11/9/94	11/9/94	11/9/94	11/9/94	11/9/94	11/11/94		
Semivolatile Organic Compounds EPA Methods 3550/8270	MRL								
N-Nitrosodimethylamine	2	ND	ND	ND	ND	ND	ND		
Aniline	1	ND	ND	ND	ND	ND	ND		
Bis(2-chloroethyl) Ether	0.3	ND	ND	ND	ND	ND	ND		
1,2-Dichlorobenzene	0.3	ND	ND	ND	ND	ND	ND		
1,3-Dichlorobenzene	0.3	ND	ND	ND	ND	ND	ND		
1,4-Dichlorobenzene	0.3	ND	ND	ND	ND	ND	ND		
Bis(2-chloroisopropyl) Ether	0.3	ND	ND	ND	ND	ND	ND		
N-Nitrosodi-n-propylamine	0.3	ND	ND	ND	ND	ND	ND		
Hexachloroethane	0.3	ND	ND	ND	ND	ND	ND		
Nitrobenzene	0.3	ND	ND	ND	ND	ND	ND		
Isophorone	0.3	ND	ND	ND	ND	ND	ND		
Bis(2-chloroethoxy)methane	0.3	ND	ND	ND	ND	ND	ND		
1,2,4-Trichlorobenzene	0.3	ND	ND	ND	ND	ND	ND		
Naphthalene	0.3	ND	ND	ND	ND	ND	ND		
4-Chloroaniline	0.3	ND	ND	ND	ND	ND	ND		
Hexachlorobutadiene	0.3	ND	ND	ND	ND	ND	ND		
2-Methylnaphthalene	0.3	ND	ND	ND	ND	ND	ND		
Hexachlorocyclopentadiene	0.3	ND	ND	ND	ND	ND	ND		
2-Chloronaphthalene	0.3	ND	ND	ND	ND	ND	ND		
2-Nitroaniline	2	ND	ND	ND	ND	ND	ND		
Dimethyl Phthalate	0.3	ND	ND	ND	ND	ND	ND		
Acenaphthylene	0.3	ND	ND	ND	ND	ND	ND		
3-Nitroaniline	2	ND	ND	ND	ND	ND	ND		
Acenaphthene	0.3	ND	ND	ND	ND	ND	ND		
Dibenzofuran	0.3	ND	ND	ND	ND	ND	ND		
2,4-Dinitrotoluene	0.3	ND	ND	ND	ND	ND	ND		
2,6-Dinitrotoluene	0.3	ND	ND	ND	ND	ND	ND		
Diethyl Phthalate	0.3	ND	ND	ND	ND	ND	ND		
4-Chlorophenyl Phenyl Ether	0.3	ND	ND	ND	ND	ND	ND		
Fluorene	0.3	ND	ND	ND	ND	ND	ND		
4-Nitroaniline	2	ND	ND	ND	ND	ND	ND		
N-Nitrosodiphenylamine	0.3	ND	ND	ND	ND	ND	ND		
4-Bromophenyl Phenyl Ether	0.3	ND	ND	ND	ND	ND	ND		
Hexachlorobenzene	0.3	ND	ND	ND	ND	ND	ND		
Phenanthrene	0.3	ND	ND	ND	ND	ND	ND		
Anthracene	0.3	ND	ND	ND	ND	ND	ND		
Di-n-butyl Phthalate	0.3	ND	ND	ND	ND	ND	ND		
Fluoranthene	0.3	ND	ND	ND	ND	ND	ND		
Pyrene	0.3	ND	ND	ND	ND	ND	ND		
Butylbenzyl Phthalate	0.3	ND	ND	ND	ND	ND	ND		
3,3'-Dichlorobenzidine	2	ND	ND	ND	ND	ND	ND		
Benz(a)anthracene	0.3	ND	ND	ND	ND	ND	ND		
Bis(2-ethylhexyl) Phthalate	0.3	ND	ND	ND	ND	ND	ND		
Chrysene	0.3	ND	ND	ND	ND	ND	ND		
Di-n-octyl Phthalate	0.3	ND	ND	ND	ND	ND	ND		
Benzo(b)fluoranthene	0.3	ND	ND	ND	ND	ND	ND		
Benzo(k)fluoranthene	0.3	ND	ND	ND	ND	ND	ND		
Benzo(a)pyrene	0.3	ND	ND	ND	ND	ND	ND		
Indeno(1,2,3-cd)pyrene	0.3	ND	ND	ND	ND	ND	ND		
Dibenz(a,h)anthracene	0.3	ND	ND	ND	ND	ND	ND		
Benzo(g,h,i)perylene	0.3	ND	ND	ND	ND	ND	ND		
Phenol	0.3	ND	ND	ND	ND	ND	ND		
2-Chlorophenol	0.3	ND	ND	ND	ND	ND	ND		
Benzyl Alcohol	0.3	ND	ND	ND	ND	ND	ND		
2-Methylphenol	0.3	ND	ND	ND	ND	ND	ND		
3- and 4-Methylphenol*	0.3	ND	ND	ND	ND	ND	ND		
2-Nitrophenol	0.3	ND	ND	ND	ND	ND	ND		
2,4-Dimethylphenol	0.3	ND	ND	ND	ND	ND	ND		
Benzoic Acid	2	ND	ND	ND	ND	ND	ND		
2,4-Dichlorophenol	0.3	ND	ND	ND	ND	ND	ND		
4-Chloro-3-methylphenol	0.3	ND	ND	ND	ND	ND	ND		
2,4,6-Trichlorophenol	0.3	ND	ND	ND	ND	ND	ND		
2,4,5-Trichlorophenol	0.3	ND	ND	ND	ND	ND	ND		
2,4-Dinitrophenol	2	ND	ND	ND	ND	ND	ND		
4-Nitrophenol	2	ND	ND	ND	ND	ND	ND		
2-Methyl-4,6-dinitrophenol	2	ND	ND	ND	ND	ND	ND		
Pentachlorophenol	2	ND	ND	ND	ND	ND	ND		

FOOTNOTES: ND = Non-detected at the Method Reporting Limit (MRL).

Ft. Richardson OU D Site
Building 35-752 Soil Sample Analytical Results
Total Metals

dry weight basis mg/Kg					Analyte:	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Nickel	Selenium	Silver
					Method:	7060	6010A	6010A	6010A	7421	7471	6010A	7740	6010A
Location	Sample Depth	Sample ID	Lab Code	Date Collected	MRL:	1	1	1	2	1	0.2	10	1	2
COOLING PONDS														
SB AP 3501	5'-7'	94575240SL	K710801	11/11/94		5	57	ND	38	13 J	ND	33	ND	ND
MW AP 3502	0-4'	94575227SL	K699501	11/7/94		5	99	ND	33	9	ND	30	ND	ND
MW AP 3502	0-4'	94575228SL	K699502	11/7/94		5	91	ND	34	11	ND	34	ND	ND
MW AP 3502	4'-6'	94575229SL	K699503	11/7/94		5	89	ND	37	7	ND	37	ND	ND
MW AP 3502	9'-13'	94575230SL	K699504	11/7/94		5	46	ND	25	6	ND	30	ND	ND
MW AP 3503	0-6'	94575231SL	K704001	11/8/94		5	47	ND	27	9	ND	38	ND	ND
MW AP 3503	6'-8'	94575232SL	K704002	11/8/94		4	54	ND	21	5	ND	44	ND	ND
MW AP 3503	8'-12'	94575233SL	K704003	11/8/94		4	69	ND	30	7	ND	36	ND	ND
MW AP 3503	8'-12'	94575234SL	K704004	11/8/94		4	58	ND	29	6	ND	31	ND	ND
MW AP 3504	0-2'	94575235SL	K707201	11/9/94		5 J	79	ND	32	12	ND	29	ND	ND
MW AP 3504	4'-10'	94575236SL	K707202	11/9/94		4 J	60	ND	38	5	ND	36	ND	ND
MW AP 3504	4'-10'	94575237SL	K707203	11/9/94		5 J	44	ND	31	6	ND	30	ND	ND
MW AP 3504	10'-14'	94575238SL	K707204	11/9/94		4 J	64	ND	38	5	ND	45	ND	ND
MW AP 3504	14'-16'	94575239SL	K707205	11/9/94		6 J	63	ND	36	6	ND	38	ND	ND

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL).

J = Value is considered an estimate.

Ft. Richardson OU D Site
Building 35-752 Soil Sample Analytical Results
Petroleum Hydrocarbons

dry weight basis				Analysis:	Benzene		Toluene		Ethylbenzene		Total Xylenes		GRO		DRO		TPH	
				EPA Method:	8260		8260		8260		8260		5030/8015		3540/8100		9071/418.1	
				Units:	µg/Kg		µg/Kg		µg/Kg		µg/Kg		mg/Kg		mg/Kg		mg/Kg	
Location	Sample Depth	Sample ID	Lab Code	Date Collected	MRL	Result	MRL	Result	MRL	Result	MRL	Result	MRL	Result	MRL	Result	MRL	Result
FORMER UST LOCATION																		
SB AP 3497	0-4'	94575273SL	K946882-006	11/2/94	5	ND	5	ND	5	ND	5	6	5	ND	10	487	10	610
SB AP 3497	4'-10'	94575274SL	K946882-007	11/2/94	5	ND	5	ND	5	ND	5	6	5	ND	10	ND	10	ND
SB AP 3497	4'-10'	94575275SL	K946882-008	11/2/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	ND	10	ND
SB AP 3497	14'-16'	94575276SL	K946882-009	11/2/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	ND	10	ND
SB AP 3497	18'-20'	94575278SL	K946882-010	11/2/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	ND	10	ND
SB AP 3498	0-4'	94575279SL	K946882-011	11/2/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	15	10	ND
SB AP 3498	4'-8'	94575280SL	K946882-001	11/2/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	ND	10	ND
SB AP 3498	10'-12'	94575281SL	K946882-002	11/2/94	5	<1200	5	<1200	5	2300	5	14000	5	920	10	8150	10	6900
SB AP 3499	0-2'	94575282SL	K946882-003	11/2/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	352	10	430
SB AP 3499	4'-8'	94575283SL	K946882-004	11/2/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	74	10	91
SB AP 3499	8'-12'	94575284SL	K946882-005	11/2/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	50	10	27
SB AP 3500	0-4'	94575286SL	K946921-005	11/3/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	10	10	35
SB AP 3500	0-4'	94575287SL	K946921-006	11/3/94	5	ND	5	ND	5	ND	5	5	5	ND	10	15	10	24
SB AP 3500	4'-8'	94575288SL	K946921-007	11/3/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	40	10	40
SB AP 3500	8'-12'	94575289SL	K946921-008	11/3/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	ND	10	ND
SB AP 3500	14'-16'	94575290SL	K946921-009	11/3/94	5	<1300	5	<1300	5	2700	5	15000	5	910	10	1310	10	1800

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL).

< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.

Ft. Richardson OU D Site
Building 35-752 Soil Sample Analytical Results
Pesticides/PCBs and Chlorinated Herbicides

dry weight basis		FORMER UST LOCATION							
mg/Kg Location:		SB AP 3497					SB AP 3498		
Sample Depth:		0-4'	4'-10'	4'-10'	14'-16'	18'-20'	0-4'	4'-8'	10'-12'
Sample ID:		94575273SL	94575274SL	94575275SL	94575276SL	94575278SL	94575279SL	94575280SL	94575281SL
Lab Code:		K946882-006	K946882-007	K946882-008	K946882-009	K946882-010	K946882-011	K946882-001	K946882-002
Date Collected:		11/2/94	11/2/94	11/2/94	11/2/94	11/2/94	11/2/94	11/2/94	11/2/94
Organochlorine Pesticides (EPA Methods 3540/8080)	**MRL**								
Alpha-BHC	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Beta-BHC	0.03	ND	ND	ND	ND	ND	ND	ND	ND
Delta-BHC	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Aldrin	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Gamma-BHC (Lindane)	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor Epoxide	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan I	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Endrin	0.01	<0.08	ND	ND	ND	ND	ND	ND	ND
Endosulfan II	0.01	<0.03	ND	ND	ND	ND	ND	ND	ND
4,4'-DDD	0.01	<0.04	ND	ND	ND	ND	ND	ND	ND
Endrin Aldehyde	0.01	<0.07	ND	ND	ND	ND	ND	ND	ND
Endosulfan Sulfate	0.01	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDT	0.01	<0.07	ND	ND	ND	ND	<0.02	ND	ND
4,4'-DDE	0.01	<0.03	ND	ND	ND	ND	ND	ND	ND
Dieldrin	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Methoxychlor	0.02	ND	ND	ND	ND	ND	ND	ND	ND
Toxaphene	0.3	<0.5	ND	ND	ND	ND	ND	ND	ND
Chlordane	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Polychlorinated Biphenyls (EPA Methods 3540/8080)	**MRL**								
Aroclor 1016	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1260	0.1	4.1	ND	ND	ND	ND	0.7	ND	ND
Chlorinated Herbicides (EPA Method 8150A Modified)	**MRL**								
Dalapon	1	ND	ND	ND	ND	ND	ND	ND	ND
MCPP	20	ND	ND	ND	ND	ND	ND	ND	ND
Dicamba	0.1	ND	ND	ND	ND	ND	ND	ND	ND
MCPA	20	ND	ND	ND	ND	ND	ND	ND	ND
Dichloroprop	0.1	ND	ND	ND	ND	ND	ND	ND	ND
2,4-D	0.2	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-TP (Silvex)	0.05	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-T	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Dinoseb	0.5	ND	ND	ND	ND	ND	ND	ND	ND
2,4-DB	0.5	ND	ND	ND	ND	ND	ND	ND	ND

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL).
< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.

Ft. Richardson OU D Site
Building 35-752 Soil Sample Analytical Results
Pesticides/PCBs and Chlorinated Herbicides

dry weight basis		FORMER UST LOCATION (cont.)							
mg/Kg	Location:	SB AP 3499			SB AP 3500				
	Sample Depth:	0-2'	4'-8'	8'-12'	0-4'	0-4'	4'-8'	8'-12'	14'-16'
	Sample ID:	94575282SL	94575283SL	94575284SL	94575286SL	94575287SL	94575288SL	94575289SL	94575290SL
	Lab Code:	K946882-003	K946882-004	K946882-005	K946921-005	K946921-006	K946921-007	K946921-008	K946921-009
	Date Collected:	11/2/94	11/2/94	11/2/94	11/3/94	11/3/94	11/3/94	11/3/94	11/3/94
Organochlorine Pesticides **(EPA Methods 3540/8080)**	**MRL**								
Alpha-BHC	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Beta-BHC	0.03	ND	ND	ND	ND	ND	ND	ND	ND
Delta-BHC	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Aldrin	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Gamma-BHC (Lindane)	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor Epoxide	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan I	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Endrin	0.01	<0.03	ND	ND	ND	ND	ND	ND	ND
Endosulfan II	0.01	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDD	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Endrin Aldehyde	0.01	<0.03	ND	ND	ND	ND	ND	ND	ND
Endosulfan Sulfate	0.01	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDT	0.01	<0.04	0.01	ND	ND	ND	ND	ND	ND
4,4'-DDE	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Dieldrin	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Methoxychlor	0.02	ND	ND	ND	ND	ND	ND	ND	ND
Toxaphene	0.3	<0.05	ND	ND	ND	ND	ND	ND	ND
Chlordane	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Polychlorinated Biphenyls **(EPA Methods 3540/8080)**	**MRL**								
Aroclor 1016	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1260	0.1	0.9	ND	ND	ND	ND	ND	ND	ND
Chlorinated Herbicides **(EPA Method 8150A Modified)**	**MRL**								
Dalapon	1	ND	ND	ND	ND	ND	ND	ND	ND
MCPP	20	ND	ND	ND	ND	ND	ND	ND	ND
Dicamba	0.1	ND	ND	ND	ND	ND	ND	ND	ND
MCPA	20	ND	ND	ND	ND	ND	ND	ND	ND
Dichloroprop	0.1	ND	ND	ND	ND	ND	ND	ND	ND
2,4-D	0.2	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-TP (Silvex)	0.05	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-T	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Dinoseb	0.5	ND	ND	ND	ND	ND	ND	ND	ND
2,4-DB	0.5	ND	ND	ND	ND	ND	ND	ND	ND

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL).
< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.

Ft. Richardson OU D Site
Building 35-752 Soil Sample Analytical Results
Volatile Organic Compounds

dry weight basis		FORMER UST LOCATION							
µg/Kg Location:		SB AP 3497					SB AP 3498		
Sample Depth:		0-4'	4'-10'	4'-10'	14'-16'	18'-20'	0-4'	4'-8'	10'-12'
Sample ID:		94575273SL	94575274SL	94575275SL	94575276SL	94575278SL	94575279SL	94575280SL	94575281SL
Lab Code:		K946882-006	K946882-007	K946882-008	K946882-009	K946882-010	K946882-011	K946882-001	K946882-002
Date Collected:		11/2/94	11/2/94	11/2/94	11/2/94	11/2/94	11/2/94	11/2/94	11/2/94
Volatile Organic Compounds (EPA Method 8260)	MRL								
Dichlorodifluoromethane (CFC 12)	5	ND	ND	ND	ND	ND	ND	ND	<1200
Chloromethane	5	ND	ND	ND	ND	ND	ND	ND	<1200
Vinyl Chloride	5	ND	ND	ND	ND	ND	ND	ND	<1200
Bromomethane	5	ND	ND	ND	ND	ND	ND	ND	<1200
Chloroethane	5	ND	ND	ND	ND	ND	ND	ND	<1200
Trichlorofluoromethane (CFC 11)	5	ND	ND	ND	ND	ND	ND	ND	<1200
Acetone	50	ND	ND	ND	ND	ND	ND	76	<12000
1,1-Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND	<1200
Carbon Disulfide	5	ND	ND	ND	ND	ND	ND	ND	<1200
Methylene Chloride	10	ND	ND	ND	ND	ND	ND	ND	<2500
trans-1,2-Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND	<1200
1,1-Dichloroethane	5	ND	ND	ND	ND	ND	ND	ND	<1200
2-Butanone (MEK)	20	ND	ND	ND	ND	ND	ND	ND	<5000
2,2-Dichloropropane	5	ND	ND	ND	ND	ND	ND	ND	<1200
cis-1,2-Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND	<1200
Chloroform	5	ND	ND	ND	ND	ND	ND	ND	<1200
Bromochloromethane	5	ND	ND	ND	ND	ND	ND	ND	<1200
1,1,1-Trichloroethane (TCA)	5	ND	ND	ND	ND	ND	ND	ND	<1200
1,1-Dichloropropene	5	ND	ND	ND	ND	ND	ND	ND	<1200
Carbon Tetrachloride	5	ND	ND	ND	ND	ND	ND	ND	<1200
1,2-Dichloroethane	5	ND	ND	ND	ND	ND	ND	ND	<1200
Benzene	5	ND	ND	ND	ND	ND	ND	ND	<1200
Trichloroethene (TCE)	5	34	23	22	ND	ND	ND	ND	<1200
1,2-Dichloropropane	5	ND	ND	ND	ND	ND	ND	ND	<1200
Bromodichloromethane	5	ND	ND	ND	ND	ND	ND	ND	<1200
Dibromomethane	5	ND	ND	ND	ND	ND	ND	ND	<1200
2-Hexanone	20	ND	ND	ND	ND	ND	ND	ND	<5000
cis-1,3-Dichloropropene	5	ND	ND	ND	ND	ND	ND	ND	<1200
Toluene	5	ND	ND	ND	ND	ND	ND	ND	<1200
trans-1,3-Dichloropropene	5	ND	ND	ND	ND	ND	ND	ND	<1200
1,1,2-Trichloroethane	5	ND	ND	ND	ND	ND	ND	ND	<1200
4-Methyl-2-pentanone (MIBK)	20	ND	ND	ND	ND	ND	ND	ND	<5000
1,3-Dichloropropane	5	ND	ND	ND	ND	ND	ND	ND	<1200
Tetrachloroethene (PCE)	5	ND	ND	ND	ND	ND	ND	ND	<1200
Dibromochloromethane	5	ND	ND	ND	ND	ND	ND	ND	<1200
1,2-Dibromoethane (EDB)	20	ND	ND	ND	ND	ND	ND	ND	<5000
Chlorobenzene	5	ND	ND	ND	ND	ND	ND	ND	<1200
1,1,1,2-Tetrachloroethane	5	ND	ND	ND	ND	ND	ND	ND	<1200
Ethylbenzene	5	ND	ND	ND	ND	ND	ND	ND	2300
Total Xylenes	5	8	6	ND	ND	ND	ND	ND	14000
Styrene	5	ND	ND	ND	ND	ND	ND	ND	<1200
Bromoform	5	ND	ND	ND	ND	ND	ND	ND	<1200
Isopropylbenzene	20	ND	ND	ND	ND	ND	ND	ND	<5000
1,1,2,2-Tetrachloroethane	5	ND	ND	ND	ND	ND	ND	ND	<1200
1,2,3-Trichloropropane	5	ND	ND	ND	ND	ND	ND	ND	<1200
Bromobenzene	5	ND	ND	ND	ND	ND	ND	ND	<1200
n-Propylbenzene	20	ND	ND	ND	ND	ND	ND	ND	<5000
2-Chlorotoluene	20	ND	ND	ND	ND	ND	ND	ND	<5000
4-Chlorotoluene	20	ND	ND	ND	ND	ND	ND	ND	<5000
1,3,5-Trimethylbenzene	20	ND	ND	ND	ND	ND	ND	ND	7800
tert-Butylbenzene	20	ND	ND	ND	ND	ND	ND	ND	<5000
1,2,4-Trimethylbenzene	20	ND	ND	ND	ND	ND	ND	ND	18000
sec-Butylbenzene	20	ND	ND	ND	ND	ND	ND	ND	<5000
1,3-Dichlorobenzene	5	ND	ND	ND	ND	ND	ND	ND	<1200
4-Isopropyltoluene	20	ND	ND	ND	ND	ND	ND	ND	<5000
1,4-Dichlorobenzene	5	ND	ND	ND	ND	ND	ND	ND	<1200
n-Butylbenzene	20	ND	ND	ND	ND	ND	ND	ND	<5000
1,2-Dichlorobenzene	5	ND	ND	ND	ND	ND	ND	ND	<1200
1,2-Dibromo-3-chloropropane (DBCP)	20	ND	ND	ND	ND	ND	ND	ND	<5000
1,2,4-Trichlorobenzene	20	ND	ND	ND	ND	ND	ND	ND	<5000
1,2,3-Trichlorobenzene	20	ND	ND	ND	ND	ND	ND	ND	<5000
Naphthalene	20	ND	ND	ND	ND	ND	ND	ND	<5000
Hexachlorobutadiene	20	ND	ND	ND	ND	ND	ND	ND	<5000

FOOTNOTES:
ND = Non-detected at the method reporting limit (MRL).
< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.

Ft. Richardson OU D Site
Building 35-752 Soil Sample Analytical Results
Volatile Organic Compounds

dry weight basis		FORMER UST LOCATION (cont.)							
µg/Kg Location:		SB AP 3499			SB AP 3500				
Sample Depth:		0-2'	4'-8'	8'-12'	0-4'	0-4'	4'-8'	8'-12'	14'-16'
Sample ID:		94575282SL	94575283SL	94575284SL	94575286SL	94575287SL	94575288SL	94575289SL	94575290SL
Lab Code:		K946882-003	K946882-004	K946882-005	K946921-005	K946921-006	K946921-007	K946921-008	K946921-009
Date Collected:		11/2/94	11/2/94	11/2/94	11/3/94	11/3/94	11/3/94	11/3/94	11/3/94
Volatile Organic Compounds (EPA Method 8260)	MRL								
Dichlorodifluoromethane (CFC 12)	5	ND	ND	ND	ND	ND	ND	ND	<1300
Chloromethane	5	ND	ND	ND	ND	ND	ND	ND	<1300
Vinyl Chloride	5	ND	ND	ND	ND	ND	ND	ND	<1300
Bromomethane	5	ND	ND	ND	ND	ND	ND	ND	<1300
Chloroethane	5	ND	ND	ND	ND	ND	ND	ND	<1300
Trichlorofluoromethane (CFC 11)	5	ND	ND	ND	ND	ND	ND	ND	<1300
Acetone	50	ND	ND	ND	ND	ND	ND	ND	<13000
1,1-Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND	<1300
Carbon Disulfide	5	ND	ND	ND	ND	ND	ND	ND	<1300
Methylene Chloride	10	ND	ND	ND	ND	ND	ND	ND	<2600
trans-1,2-Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND	<1300
1,1-Dichloroethane	5	ND	ND	ND	ND	ND	ND	ND	<1300
2-Butanone (MEK)	20	ND	ND	ND	ND	ND	ND	ND	<5300
2,2-Dichloropropane	5	ND	ND	ND	ND	ND	ND	ND	<1300
cis-1,2-Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND	<1300
Chloroform	5	ND	ND	ND	ND	ND	ND	ND	<1300
Bromochloromethane	5	ND	ND	ND	ND	ND	ND	ND	<1300
1,1,1-Trichloroethane (TCA)	5	ND	ND	ND	ND	ND	ND	ND	<1300
1,1-Dichloropropene	5	ND	ND	ND	ND	ND	ND	ND	<1300
Carbon Tetrachloride	5	ND	ND	ND	ND	ND	ND	ND	<1300
1,2-Dichloroethane	5	ND	ND	ND	ND	ND	ND	ND	<1300
Benzene	5	ND	ND	ND	ND	ND	ND	ND	<1300
Trichloroethene (TCE)	5	ND	ND	ND	ND	ND	ND	ND	<1300
1,2-Dichloropropane	5	ND	ND	ND	ND	ND	ND	ND	<1300
Bromodichloromethane	5	ND	ND	ND	ND	ND	ND	ND	<1300
Dibromomethane	5	ND	ND	ND	ND	ND	ND	ND	<1300
2-Hexanone	20	ND	ND	ND	ND	ND	ND	ND	<1300
cis-1,3-Dichloropropene	5	ND	ND	ND	ND	ND	ND	ND	<1300
Toluene	5	ND	ND	ND	ND	ND	ND	ND	<1300
trans-1,3-Dichloropropene	5	ND	ND	ND	ND	ND	ND	ND	<1300
1,1,2-Trichloroethane	5	ND	ND	ND	ND	ND	ND	ND	<1300
4-Methyl-2-pentanone (MIBK)	20	ND	ND	ND	ND	ND	ND	ND	<5300
1,3-Dichloropropane	5	ND	ND	ND	ND	ND	ND	ND	<1300
Tetrachloroethene (PCE)	5	ND	ND	ND	ND	ND	ND	ND	<1300
Dibromochloromethane	5	ND	ND	ND	ND	ND	ND	ND	<1300
1,2-Dibromoethane (EDB)	20	ND	ND	ND	ND	ND	ND	ND	<5300
Chlorobenzene	5	ND	ND	ND	ND	ND	ND	ND	<1300
1,1,1,2-Tetrachloroethane	5	ND	ND	ND	ND	ND	ND	ND	<1300
Ethylbenzene	5	ND	ND	ND	ND	ND	ND	ND	2700
Total Xylenes	5	ND	ND	ND	ND	5	ND	ND	15000
Styrene	5	ND	ND	ND	ND	ND	ND	ND	<1300
Bromoform	5	ND	ND	ND	ND	ND	ND	ND	<1300
Isopropylbenzene	20	ND	ND	ND	ND	ND	ND	ND	<5300
1,1,2,2-Tetrachloroethane	5	ND	ND	ND	ND	ND	ND	ND	<1300
1,2,3-Trichloropropane	5	ND	ND	ND	ND	ND	ND	ND	<1300
Bromobenzene	5	ND	ND	ND	ND	ND	ND	ND	<1300
n-Propylbenzene	20	ND	ND	ND	ND	ND	ND	ND	<5300
2-Chlorotoluene	20	ND	ND	ND	ND	ND	ND	ND	<5300
4-Chlorotoluene	20	ND	ND	ND	ND	ND	ND	ND	<5300
1,3,5-Trimethylbenzene	20	ND	ND	ND	ND	ND	ND	ND	5600
tert-Butylbenzene	20	ND	ND	ND	ND	ND	ND	ND	<5300
1,2,4-Trimethylbenzene	20	ND	ND	ND	ND	ND	ND	ND	14000
sec-Butylbenzene	20	ND	ND	ND	ND	ND	ND	ND	<5300
1,3-Dichlorobenzene	5	ND	ND	ND	ND	ND	ND	ND	<1300
4-Isopropyltoluene	20	ND	ND	ND	ND	ND	ND	ND	<5300
1,4-Dichlorobenzene	5	ND	ND	ND	ND	ND	ND	ND	<1300
n-Butylbenzene	20	ND	ND	ND	ND	ND	ND	ND	<5300
1,2-Dichlorobenzene	5	ND	ND	ND	ND	ND	ND	ND	<1300
1,2-Dibromo-3-chloropropane (DBCP)	20	ND	ND	ND	ND	ND	ND	ND	<5300
1,2,4-Trichlorobenzene	20	ND	ND	ND	ND	ND	ND	ND	<5300
1,2,3-Trichlorobenzene	20	ND	ND	ND	ND	ND	ND	ND	<5300
Naphthalene	20	ND	ND	ND	ND	ND	ND	ND	5300
Hexachlorobutadiene	20	ND	ND	ND	ND	ND	ND	ND	<5300

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL).

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Ft. Richardson OU D Site
Building 35-752 Soil Sample Analytical Results
Semivolatile Organic Compounds

dry weight basis mg/Kg		FORMER UST LOCATION							
Location:		SB AP 3497					SB AP 3498		
Sample Depth:		0-4'	4'-10'	4'-10'	14'-16'	18'-20'	0-4'	4'-8'	10'-12'
Sample ID:		94575273SL	94575274SL	94575275SL	94575276SL	94575278SL	94575279SL	94575280SL	94575281SL
Lab Code:		K946882-006	K946882-007	K946882-008	K946882-009	K946882-010	K946882-011	K946882-001	K946882-002
Date Collected:		11/2/94	11/2/94	11/2/94	11/2/94	11/2/94	11/2/94	11/2/94	11/2/94
Semivolatile Organic Compounds EPA Methods 3550/8270	MRL								
N-Nitrosodimethylamine	2	ND	ND	ND	ND	ND	ND	ND	<40
Aniline	1	ND	ND	ND	ND	ND	ND	ND	<20
Bis(2-chloroethyl) Ether	0.3	ND	ND	ND	ND	ND	ND	ND	<6
1,2-Dichlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	<6
1,3-Dichlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	<6
1,4-Dichlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	<6
Bis(2-chloroisopropyl) Ether	0.3	ND	ND	ND	ND	ND	ND	ND	<6
N-Nitrosodi-n-propylamine	0.3	ND	ND	ND	ND	ND	ND	ND	<6
Hexachloroethane	0.3	ND	ND	ND	ND	ND	ND	ND	<6
Nitrobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	<6
Isophorone	0.3	ND	ND	ND	ND	ND	ND	ND	<6
Bis(2-chloroethoxy)methane	0.3	ND	ND	ND	ND	ND	ND	ND	<6
1,2,4-Trichlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	<6
Naphthalene	0.3	ND	ND	ND	ND	ND	ND	ND	<6
4-Chloroaniline	0.3	ND	ND	ND	ND	ND	ND	ND	<6
Hexachlorobutadiene	0.3	ND	ND	ND	ND	ND	ND	ND	<6
2-Methylnaphthalene	0.3	ND	ND	ND	ND	ND	ND	ND	10
Hexachlorocyclopentadiene	0.3	ND	ND	ND	ND	ND	ND	ND	<6
2-Chloronaphthalene	0.3	ND	ND	ND	ND	ND	ND	ND	<6
2-Nitroaniline	2	ND	ND	ND	ND	ND	ND	ND	<40
Dimethyl Phthalate	0.3	ND	ND	ND	ND	ND	ND	ND	<6
Acenaphthylene	0.3	ND	ND	ND	ND	ND	ND	ND	<6
3-Nitroaniline	2	ND	ND	ND	ND	ND	ND	ND	<40
Acenaphthene	0.3	ND	ND	ND	ND	ND	ND	ND	<6
Dibenzofuran	0.3	ND	ND	ND	ND	ND	ND	ND	<6
2,4-Dinitrotoluene	0.3	ND	ND	ND	ND	ND	ND	ND	<6
2,6-Dinitrotoluene	0.3	ND	ND	ND	ND	ND	ND	ND	<6
Diethyl Phthalate	0.3	ND	ND	ND	ND	ND	ND	ND	<6
4-Chlorophenyl Phenyl Ether	0.3	ND	ND	ND	ND	ND	ND	ND	<6
Fluorene	0.3	ND	ND	ND	ND	ND	ND	ND	<6
4-Nitroaniline	2	ND	ND	ND	ND	ND	ND	ND	<40
N-Nitrosodiphenylamine	0.3	ND	ND	ND	ND	ND	ND	ND	<6
4-Bromophenyl Phenyl Ether	0.3	ND	ND	ND	ND	ND	ND	ND	<6
Hexachlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	<6
Phenanthrene	0.3	ND	ND	ND	ND	ND	ND	ND	<6
Anthracene	0.3	ND	ND	ND	ND	ND	ND	ND	<6
Di-n-butyl Phthalate	0.3	ND	ND	ND	ND	ND	ND	ND	<6
Fluoranthene	0.3	ND	ND	ND	ND	ND	ND	ND	<6
Pyrene	0.3	ND	ND	ND	ND	ND	ND	ND	<6
Butylbenzyl Phthalate	0.3	ND	ND	ND	ND	ND	ND	ND	<6
3,3'-Dichlorobenzidine	2	ND	ND	ND	ND	ND	ND	ND	<40
Benz(a)anthracene	0.3	ND	ND	ND	ND	ND	ND	ND	<6
Bis(2-ethylhexyl) Phthalate	0.3	ND	ND	ND	ND	ND	ND	ND	<6
Chrysene	0.3	ND	ND	ND	ND	ND	ND	ND	<6
Di-n-octyl Phthalate	0.3	0.7	ND	ND	ND	ND	0.36	ND	<6
Benzo(b)fluoranthene	0.3	ND	ND	ND	ND	ND	ND	ND	<6
Benzo(k)fluoranthene	0.3	ND	ND	ND	ND	ND	ND	ND	<6
Benzo(a)pyrene	0.3	ND	ND	ND	ND	ND	ND	ND	<6
Indeno(1,2,3-cd)pyrene	0.3	ND	ND	ND	ND	ND	ND	ND	<6
Dibenz(a,h)anthracene	0.3	ND	ND	ND	ND	ND	ND	ND	<6
Benzo(g,h,i)perylene	0.3	ND	ND	ND	ND	ND	ND	ND	<6
Phenol	0.3	ND	ND	ND	ND	ND	ND	ND	<6
2-Chlorophenol	0.3	ND	ND	ND	ND	ND	ND	ND	<6
Benzyl Alcohol	0.3	ND	ND	ND	ND	ND	ND	ND	<6
2-Methylphenol	0.3	ND	ND	ND	ND	ND	ND	ND	<6
3- and 4-Methylphenol*	0.3	ND	ND	ND	ND	ND	ND	ND	<6
2-Nitrophenol	0.3	ND	ND	ND	ND	ND	ND	ND	<6
2,4-Dimethylphenol	0.3	ND	ND	ND	ND	ND	ND	ND	<6
Benzoic Acid	2	ND	ND	ND	ND	ND	ND	ND	<40
2,4-Dichlorophenol	0.3	ND	ND	ND	ND	ND	ND	ND	<6
4-Chloro-3-methylphenol	0.3	ND	ND	ND	ND	ND	ND	ND	<6
2,4,6-Trichlorophenol	0.3	ND	ND	ND	ND	ND	ND	ND	<6
2,4,5-Trichlorophenol	0.3	ND	ND	ND	ND	ND	ND	ND	<6
2,4-Dinitrophenol	2	ND	ND	ND	ND	ND	ND	ND	<40
4-Nitrophenol	2	ND	ND	ND	ND	ND	ND	ND	<40
2-Methyl-4,6-dinitrophenol	2	ND	ND	ND	ND	ND	ND	ND	<40
Pentachlorophenol	2	ND	ND	ND	ND	ND	ND	ND	<40

FOOTNOTES:
ND = Non-detected at the method reporting limit (MRL).
< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.

Ft. Richardson OU D Site
Building 35-752 Soil Sample Analytical Results
Semivolatile Organic Compounds

dry weight basis		FORMER UST LOCATION (cont.)							
mg/Kg Location:		SB AP 3499			SB AP 3500				
Sample Depth:		0-2'	4'-6'	8'-12'	0-4'	0-4'	4'-8'	8'-12'	14'-16'
Sample ID:		94575282SL	94575283SL	94575284SL	94575286SL	94575287SL	94575288SL	94575289SL	94575290SL
Lab Code:		K946882-003	K946882-004	K946882-005	K946921-005	K946921-006	K946921-007	K946921-008	K946921-009
Date Collected:		11/2/94	11/2/94	11/2/94	11/3/94	11/3/94	11/3/94	11/3/94	11/3/94
Semivolatile Organic Compounds EPA Methods 3550/8270	MRL								
N-Nitrosodimethylamine	2	ND	ND	ND	ND	ND	ND	ND	<10
Aniline	1	ND	ND	ND	ND	ND	ND	ND	<5
Bis(2-chloroethyl) Ether	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
1,2-Dichlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
1,3-Dichlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
1,4-Dichlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
Bis(2-chloroisopropyl) Ether	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
N-Nitrosodi-n-propylamine	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
Hexachloroethane	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
Nitrobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
Isophorone	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
Bis(2-chloroethoxy)methane	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
1,2,4-Trichlorobenzene	0.3	- ND	ND	ND	ND	ND	ND	ND	<1.5
Naphthalene	0.3	ND	ND	ND	ND	ND	ND	ND	1.66
4-Chloroaniline	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
Hexachlorobutadiene	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
2-Methylnaphthalene	0.3	ND	ND	ND	ND	ND	ND	ND	4.48
Hexachlorocyclopentadiene	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
2-Chloronaphthalene	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
2-Nitroaniline	2	ND	ND	ND	ND	ND	ND	ND	<10
Dimethyl Phthalate	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
Acenaphthylene	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
3-Nitroaniline	2	ND	ND	ND	ND	ND	ND	ND	<10
Acenaphthene	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
Dibenzofuran	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
2,4-Dinitrotoluene	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
2,6-Dinitrotoluene	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
Diethyl Phthalate	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
4-Chlorophenyl Phenyl Ether	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
Fluorene	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
4-Nitroaniline	2	ND	ND	ND	ND	ND	ND	ND	<10
N-Nitrosodiphenylamine	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
4-Bromophenyl Phenyl Ether	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
Hexachlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
Phenanthrene	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
Anthracene	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
Di-n-butyl Phthalate	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
Fluoranthene	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
Pyrene	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
Butylbenzyl Phthalate	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
3,3'-Dichlorobenzidine	2	ND	ND	ND	ND	ND	ND	ND	<10
Benz(a)anthracene	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
Bis(2-ethylhexyl) Phthalate	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
Chrysene	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
Di-n-octyl Phthalate	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
Benzo(b)fluoranthene	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
Benzo(k)fluoranthene	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
Benzo(a)pyrene	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
Indeno(1,2,3-cd)pyrene	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
Dibenz(a,h)anthracene	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
Benzo(g,h,i)perylene	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
Phenol	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
2-Chlorophenol	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
Benzyl Alcohol	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
2-Methylphenol	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
3- and 4-Methylphenol*	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
2-Nitrophenol	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
2,4-Dimethylphenol	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
Benzoic Acid	2	ND	ND	ND	ND	ND	ND	ND	<10
2,4-Dichlorophenol	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
4-Chloro-3-methylphenol	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
2,4,6-Trichlorophenol	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
2,4,5-Trichlorophenol	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
2,4-Dinitrophenol	2	ND	ND	ND	ND	ND	ND	ND	<10
4-Nitrophenol	2	ND	ND	ND	ND	ND	ND	ND	<10
2-Methyl-4,6-dinitrophenol	2	ND	ND	ND	ND	ND	ND	ND	<10
Pentachlorophenol	2	ND	ND	ND	ND	ND	ND	ND	<10

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL).

< = Less than. Analytical reporting limit has been elevated due to matrix interferences of sample requiring dilution.

Ft. Richardson OU D Site
Building 35-752 Soil Sample Analytical Results
Total Metals

dry weight basis mg/Kg					Analyte: Method:	Arsenic 7060	Barium 6010A	Cadmium 6010A	Chromium 6010A	Lead 7421	Mercury 7471	Nickel 6010A	Selenium 7740	Silver 6010A
Location	Sample Depth	Sample ID	Lab Code	Date Collected	MRL:	1	1	1	2	1	0.2	10	1	2
Former UST Location														
SB AP 3497	0-4'	94575273SL	K688206	11/2/94		6	66	ND	27	20	ND	31	1 UJ	ND
SB AP 3497	4'-10'	94575274SL	K688207	11/2/94		4	50	ND	36	6	ND	32	1 UJ	ND
SB AP 3497	4'-10'	94575275SL	K688208	11/2/94		4	46	ND	35	7	ND	37	1 UJ	ND
SB AP 3497	14'-16'	94575276SL	K688209	11/2/94		5	42	ND	30	7	ND	34	1 UJ	ND
SB AP 3497	16'-20'	94575278SL	K688210	11/2/94		5	37	ND	31	5	ND	35	1 UJ	ND
SB AP 3498	0-4'	94575279SL	K688211	11/2/94		4	59	ND	26	5	ND	29	1 UJ	ND
SB AP 3498	4'-8'	94575280SL	K688201	11/2/94		5	72	ND	42	6	ND	37	1 UJ	ND
SB AP 3498	10'-12'	94575281SL	K688202	11/2/94		5	44	ND	26	6	ND	30	1 UJ	ND
SB AP 3499	0-2'	94575282SL	K688203	11/2/94		6	56	ND	20	94	ND	24	1 UJ	ND
SB AP 3499	4'-8'	94575283SL	K688204	11/2/94		5	84	ND	31	6	ND	30	1 UJ	ND
SB AP 3499	6'-12'	94575284SL	K688205	11/2/94		5	50	ND	30	6	ND	30	1 UJ	ND
SB AP 3500	0-4'	94575286SL	K692105	11/3/94		6	75	ND	26	6	ND	35	1 UJ	ND
SB AP 3500	0-4'	94575287SL	K692106	11/3/94		5	61	ND	32	5	ND	33	1 UJ	ND
SB AP 3500	4'-8'	94575288SL	K692107	11/3/94		6	90	ND	32	5	ND	36	1 UJ	ND
SB AP 3500	8'-12'	94575289SL	K692108	11/3/94		5	56	ND	28	5	ND	29	1 UJ	ND
SB AP 3500	14'-16'	94575290SL	K692109	11/3/94		5	57	ND	31	5	ND	35	1 UJ	ND

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL).
UJ = The analyte was not detected at the MRL, however, the MRL is considered an estimate.

Ft. Richardson OU D Site
Building 35-752 Soil Sample Analytical Results
Petroleum Hydrocarbons

dry weight basis				Analysis:	Benzene		Toluene		Ethylbenzene		Total Xylenes		GRO		DRO		TPH	
				EPA Method:	8260		8260		8260		8260		5030/8015		3540/8100		9071/418.1	
				Units:	µg/Kg		µg/Kg		µg/Kg		µg/Kg		mg/Kg		mg/Kg		mg/Kg	
Location	Sample Depth	Sample ID	Lab Code	Date Collected	MRL	Result	MRL	Result	MRL	Result	MRL	Result	MRL	Result	MRL	Result	MRL	Result
DRUM ACCUMULATION AREA																		
SB AP 3505	0-4'	94575219SL	K946921-001	11/3/94	5	ND	5	5	5	ND	5	9	5	ND	10	81	10	146
SB AP 3505	4'-8'	94575220SL	K946921-002	11/3/94	5	ND	5	ND	5	ND	5	6	5	ND	10	61	10	56
SB AP 3505	9'-11'	94575221SL	K946921-003	11/3/94	5	ND	5	ND	5	ND	5	7	5	ND	10	ND	10	ND
SB AP 3505	12'-16'	94575222SL	K946921-004	11/3/94	5	ND	5	ND	5	ND	5	ND	5	·ND	10	ND	10	ND
SB AP 3506	0-2'	94575223SL	K946921-010	11/3/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	83	10	350
SB AP 3506	4'-8'	94575224SL	K946921-011	11/3/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	ND	10	ND
SB AP 3506	8'-12'	94575225SL	K946921-012	11/3/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	ND	10	ND
SB AP 3506	14'-16'	94575226SL	K946921-013	11/3/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	ND	10	ND
SS 1	6"	94575201SL	K946240-001	10/6/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	55	10	182
SS 1	8"	94575202SL	K946240-002	10/6/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	50	10	27
SS 1	2'	94575218SL	K946306-008	10/10/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	ND	10	13 J
SS 2	6"	94575203SL	K946240-003	10/6/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	18	10	28
SS 2	2'	94575217SL	K946306-007	10/10/94	5	ND	5	8	5	6	5	38	5	ND	10	15	10	27 J
SS 3	6"	94575204SL	K946240-004	10/6/94	5	ND	5	6	5	ND	5	6	5	ND	10	70	10	43
SS 3	2'	94575216SL	K946306-006	10/10/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	ND	10	16 J
SS 4	6"	94575205SL	K946240-005	10/6/94	5	ND	5	6	5	ND	5	6	5	ND	10	92	10	270
SS 4	2'	94575215SL	K946306-005	10/10/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	61	10	35 J
SS 5	6"	94575206SL	K946243-001	10/6/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	192	10	740
SS 5	2'	94575213SL	K946306-003	10/10/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	778	10	1300 J
SS 5	2'	94575214SL	K946306-004	10/10/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	669	10	1700 J
SS 6	6"	94575207SL	K946243-002	10/6/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	97	10	41
SS 6	2'	94575212SL	K946306-002	10/10/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	52	10	87 J
SS 7	6"	94575208SL	K946243-003	10/6/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	ND	10	ND
SS 7	2'	94575211SL	K946306-001	10/10/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	17	10	14 J
SS 8	6"	94575209SL	K946243-004	10/6/94	5	ND	5	ND	5	ND	5	ND	5	ND	10	100	10	48
SS 8	2'	94575210SL	K946243-005	10/6/94	5	ND	5	5	5	ND	5	ND	5	ND	10	ND	10	13

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL).
J = Value is considered an estimate.

Ft. Richardson OU D Site
Building 35-752 Soil Sample Analytical Results
Pesticides/PCBs and Chlorinated Herbicides

dry weight basis		DRUM ACCUMULATION AREA							
mg/Kg	Location:	SB AP 3505				SB AP 3506			
	Sample Depth:	0-4'	4'-6'	9'-11'	12'-16'	0-2'	4'-8'	8'-12'	14'-16'
	Sample ID:	94575219SL	94575220SL	94575221SL	94575222SL	94575223SL	94575224SL	94575225SL	94575226SL
	Lab Code:	K946921-001	K946921-002	K946921-003	K946921-004	K946921-010	K946921-011	K946921-012	K946921-013
	Date Collected:	11/3/94	11/3/94	11/3/94	11/3/94	11/3/94	11/3/94	11/3/94	11/3/94
Organochlorine Pesticides (EPA Methods 3540/8080)									
	MRL								
Alpha-BHC	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Beta-BHC	0.03	ND	ND	ND	ND	ND	ND	ND	ND
Delta-BHC	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Aldrin	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Gamma-BHC (Lindane)	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor Epoxide	0.01	<0.1	<0.06	ND	ND	ND	ND	ND	ND
Endosulfan I	0.01	<0.1	<0.06	ND	ND	ND	ND	ND	ND
Endrin	0.01	<0.1	<0.06	ND	ND	ND	ND	ND	ND
Endosulfan II	0.01	<0.1	<0.1	ND	ND	ND	ND	ND	ND
4,4'-DDD	0.01	<0.1	<0.06	ND	ND	ND	ND	ND	ND
Endrin Aldehyde	0.01	<0.1	<0.06	ND	ND	ND	ND	ND	ND
Endosulfan Sulfate	0.01	<0.1	<0.06	ND	ND	ND	ND	ND	ND
4,4'-DDT	0.01	<0.1	<0.1	ND	ND	<0.02	ND	ND	ND
4,4'-DDE	0.01	<0.1	<0.06	ND	ND	ND	ND	ND	ND
Dieldrin	0.01	<0.1	<0.06	ND	ND	ND	ND	ND	ND
Methoxychlor	0.02	<0.3	<0.2	ND	ND	ND	ND	ND	ND
Toxaphene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Chlordane	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Polychlorinated Biphenyls (EPA Methods 3540/8080)									
	MRL								
Aroclor 1016	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1260	0.1	3.4	1.1	ND	ND	0.3	ND	ND	ND
Chlorinated Herbicides (EPA Method 8150A Modified)									
	MRL								
Dalapon	1	ND	ND	ND	ND	ND	ND	ND	ND
MCPP	20	ND	ND	ND	ND	ND	ND	ND	ND
Dicamba	0.1	ND	ND	ND	ND	ND	ND	ND	ND
MCPA	20	ND	ND	ND	ND	ND	ND	ND	ND
Dichloroprop	0.1	ND	ND	ND	ND	ND	ND	ND	ND
2,4-D	0.2	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-TP (Silvex)	0.05	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-T	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Dinoseb	0.5	ND	ND	ND	ND	ND	ND	ND	ND
2,4-DB	0.5	ND	ND	ND	ND	ND	ND	ND	ND

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL).
< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.

Ft. Richardson OU D Site
Building 35-752 Soil Sample Analytical Results
Pesticides/PCBs and Chlorinated Herbicides

dry weight basis		DRUM ACCUMULATION AREA (cont.)						
mg/Kg	Location:	SS 1			SS 2		SS 3	
	Sample Depth:	6"	6"	2'	6"	2'	6"	2'
	Sample ID:	94575201SL	94575202SL	94575218SL	94575203SL	94575217SL	94575204SL	94575216SL
	Lab Code:	K945240-001	K945240-002	K946306-008	K945240-003	K946306-007	K945240-004	K946306-006
	Date Collected:	10/6/94	10/6/94	10/10/94	10/6/94	10/10/94	10/6/94	10/10/94
Organochlorine Pesticides								
(EPA Methods 3540/8080)								
	MRL							
Alpha-BHC	0.01	ND	ND	ND	ND	ND	ND	ND
Beta-BHC	0.03	ND	ND	ND	ND	ND	ND	ND
Delta-BHC	0.01	ND	ND	ND	ND	ND	ND	ND
Heptachlor	0.01	ND	ND	ND	ND	ND	ND	ND
Aldrin	0.01	ND	ND	ND	ND	ND	ND	ND
Gamma-BHC (Lindane)	0.01	ND	ND	ND	ND	ND	ND	ND
Heptachlor Epoxide	0.01	ND	ND	ND	ND	ND	ND	ND
Endosulfan I	0.01	ND	ND	ND	ND	ND	ND	ND
Endrin	0.01	ND	ND	ND	ND	ND	ND	ND
Endosulfan II	0.01	ND	ND	ND	ND	ND	ND	ND
4,4'-DDD	0.01	ND	ND	ND	ND	ND	ND	ND
Endrin Aldehyde	0.01	ND	ND	ND	ND	ND	ND	ND
Endosulfan Sulfate	0.01	ND	ND	ND	ND	ND	ND	ND
4,4'-DDT	0.01	ND	0.04	ND	ND	ND	0.02	ND
4,4'-DDE	0.01	ND	ND	ND	ND	ND	ND	ND
Dieldrin	0.01	ND	ND	ND	ND	ND	ND	ND
Methoxychlor	0.02	ND	ND	ND	ND	ND	ND	ND
Toxaphene	0.3	ND	ND	ND	ND	ND	ND	ND
Chlordane	0.1	ND	ND	ND	ND	ND	ND	ND
Polychlorinated Biphenyls								
(EPA Methods 3540/8080)								
	MRL							
Aroclor 1016	0.1	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	0.1	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	0.1	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	0.1	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	0.1	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	0.1	ND	ND	ND	ND	ND	ND	ND
Aroclor 1260	0.1	ND	ND	ND	ND	ND	ND	ND
Chlorinated Herbicides								
(EPA Method 8150A Modified)								
	MRL							
Dalapon	1	ND	ND	ND	ND	ND	ND	ND
MCPP	20	ND	ND	ND	ND	ND	ND	ND
Dicamba	0.1	ND	ND	ND	ND	ND	ND	ND
MCPA	20	ND	ND	ND	ND	ND	ND	ND
Dichloroprop	0.1	ND	ND	ND	ND	ND	ND	ND
2,4-D	0.2	ND	ND	ND	ND	ND	ND	ND
2,4,5-TP (Silvex)	0.05	ND	ND	ND	ND	ND	ND	ND
2,4,5-T	0.05	ND	ND	ND	ND	ND	ND	ND
Dinoseb	0.5	ND	ND	ND	ND	ND	ND	ND
2,4-DB	0.5	ND	ND	ND	ND	ND	ND	ND

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL).

Ft. Richardson OU D Site
Building 35-752 Soil Sample Analytical Results
Pesticides/PCBs and Chlorinated Herbicides

dry weight basis		DRUM ACCUMULATION AREA (cont.)						
mg/Kg	Location:	SS 4		SS 5			SS 6	
	Sample Depth:	6"	2'	6"	2'	2'	6"	2'
	Sample ID:	94575205SL	94575215SL	94575206SL	94575213SL	94575214SL	94575207SL	94575212SL
	Lab Code:	K945240-005	K946306-005	K946242-001	K946306-003	K946306-004	K946242-002	K946306-002
	Date Collected:	10/6/94	10/10/94	10/6/94	10/10/94	10/10/94	10/6/94	10/10/94
Organochlorine Pesticides								
(EPA Methods 3540/8080)								
	MRL							
Alpha-BHC	0.01	ND	ND	ND	ND	ND	ND	ND
Beta-BHC	0.03	ND	ND	ND	ND	ND	ND	ND
Delta-BHC	0.01	ND	ND	ND	ND	ND	ND	ND
Heptachlor	0.01	ND	ND	ND	ND	ND	ND	ND
Aldrin	0.01	ND	ND	ND	ND	ND	ND	ND
Gamma-BHC (Lindane)	0.01	ND	ND	ND	ND	ND	ND	ND
Heptachlor Epoxide	0.01	ND	ND	ND	ND	ND	ND	ND
Endosulfan I	0.01	ND	ND	ND	ND	ND	ND	ND
Endrin	0.01	ND	ND	ND	ND	ND	ND	<0.02
Endosulfan II	0.01	ND	ND	ND	ND	ND	ND	ND
4,4'-DDD	0.01	ND	ND	ND	ND	ND	ND	ND
Endrin Aldehyde	0.01	ND	ND	<0.03	ND	ND	<0.03	<0.02
Endosulfan Sulfate	0.01	ND	ND	ND	ND	ND	ND	ND
4,4'-DDT	0.01	0.12	ND	ND	ND	ND	ND	<0.04
4,4'-DDE	0.01	ND	ND	ND	ND	ND	ND	ND
Dieldrin	0.01	ND	ND	<0.01	ND	ND	<0.02	ND
Methoxychlor	0.02	ND	ND	ND	ND	ND	ND	ND
Toxaphene	0.3	ND	ND	ND	ND	ND	ND	ND
Chlordane	0.1	ND	ND	ND	ND	ND	ND	ND
Polychlorinated Biphenyls								
(EPA Methods 3540/8080)								
	MRL							
Aroclor 1016	0.1	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	0.1	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	0.1	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	0.1	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	0.1	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	0.1	ND	ND	ND	ND	ND	ND	ND
Aroclor 1260	0.1	0.5	ND	1.1	ND	ND	1.1	0.6
Chlorinated Herbicides								
(EPA Method 8150A Modified)								
	MRL							
Dalapon	1	ND	ND	ND	ND	ND	ND	ND
MCPP	20	ND	ND	ND	ND	ND	ND	ND
Dicamba	0.1	ND	ND	ND	ND	ND	ND	ND
MCPA	20	ND	ND	ND	ND	ND	ND	ND
Dichloroprop	0.1	ND	ND	ND	ND	ND	ND	ND
2,4-D	0.2	ND	ND	ND	ND	ND	ND	ND
2,4,5-TP (Silvex)	0.05	ND	ND	ND	ND	ND	ND	ND
2,4,5-T	0.05	ND	ND	ND	ND	ND	ND	ND
Dinoseb	0.5	ND	ND	ND	ND	ND	ND	ND
2,4-DB	0.5	ND	ND	ND	ND	ND	ND	ND

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL).
< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.

Ft. Richardson OU D Site
Building 35-752 Soil Sample Analytical Results
Pesticides/PCBs and Chlorinated Herbicides

dry weight basis		DRUM ACCUMULATION AREA (cont.)						
mg/Kg	Location:	SS 7		SS 8				
	Sample Depth:	6"	2'	6"	2'			
	Sample ID:	94575208SL	94575211SL	94575209SL	94575210SL			
	Lab Code:	K946242-003	K946306-001	K946242-004	K946242-005			
	Date Collected:	10/6/94	10/10/94	10/6/94	10/6/94			
Organochlorine Pesticides								
(EPA Methods 3540/8080)								
	MRL							
Alpha-BHC	0.01	ND	ND	ND	ND			
Beta-BHC	0.03	ND	ND	ND	ND			
Delta-BHC	0.01	ND	ND	ND	ND			
Heptachlor	0.01	ND	ND	ND	ND			
Aldrin	0.01	ND	ND	ND	ND			
Gamma-BHC (Lindane)	0.01	ND	ND	ND	ND			
Heptachlor Epoxide	0.01	ND	ND	ND	ND			
Endosulfan I	0.01	ND	ND	ND	ND			
Endrin	0.01	<0.05	ND	ND	<0.4			
Endosulfan II	0.01	ND	ND	ND	<0.02			
4,4'-DDD	0.01	ND	ND	<0.06	0.01			
Endrin Aldehyde	0.01	<0.03	ND	<0.30	<0.04			
Endosulfan Sulfate	0.01	ND	ND	ND	ND			
4,4'-DDT	0.01	<0.04	<0.02	<0.50	<0.04			
4,4'-DDE	0.01	ND	ND	<0.07	ND			
Dieldrin	0.01	ND	ND	ND	ND			
Methoxychlor	0.02	ND	ND	ND	ND			
Toxaphene	0.3	ND	ND	ND	ND			
Chlordane	0.1	ND	ND	ND	ND			
Polychlorinated Biphenyls								
(EPA Methods 3540/8080)								
	MRL							
Aroclor 1016	0.1	ND	ND	ND	ND			
Aroclor 1221	0.1	ND	ND	ND	ND			
Aroclor 1232	0.1	ND	ND	ND	ND			
Aroclor 1242	0.1	ND	ND	ND	ND			
Aroclor 1248	0.1	ND	ND	ND	ND			
Aroclor 1254	0.1	ND	ND	<1	ND			
Aroclor 1260	0.1	1.9	0.5	15.6	1.9			
Chlorinated Herbicides								
(EPA Method 8150A Modified)								
	MRL							
Dalapon	1	ND	ND	ND	ND			
MCPP	20	ND	ND	ND	ND			
Dicamba	0.1	ND	ND	ND	ND			
MCPA	20	ND	ND	ND	ND			
Dichloroprop	0.1	ND	ND	ND	ND			
2,4-D	0.2	ND	ND	ND	ND			
2,4,5-TP (Silvex)	0.05	ND	ND	ND	ND			
2,4,5-T	0.05	ND	ND	ND	ND			
Dinoseb	0.5	ND	ND	ND	ND			
2,4-DB	0.5	ND	ND	ND	ND			

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL).
< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.

Ft. Richardson OU D Site
Building 35-752 Soil Sample Analytical Results
Volatile Organic Compounds

dry weight basis		DRUM ACCUMULATION AREA							
µg/Kg Location:		SB AP 3505				SB AP 3506			
Sample Depth:		0-4'	4'-6'	9'-11'	12'-16'	0-2'	4'-6'	8'-12'	14'-16'
Sample ID:		94575219SL	94575220SL	94575221SL	94575222SL	94575223SL	94575224SL	94575225SL	94575226SL
Lab Code:		K946921-001	K946921-002	K946921-003	K946921-004	K946921-010	K946921-011	K946921-012	K946921-013
Date Collected:		11/3/94	11/3/94	11/3/94	11/3/94	11/3/94	11/3/94	11/3/94	11/3/94
Volatile Organic Compounds (EPA Method 8260)	MRL								
Dichlorodifluoromethane (CFC 12)	5	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	5	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	5	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	5	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane (CFC 11)	5	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	50	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	5	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	10	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	20	ND	ND	ND	ND	ND	ND	ND	ND
2,2-Dichloropropane	5	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	5	ND	ND	ND	ND	ND	ND	ND	ND
Bromochloromethane	5	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane (TCA)	5	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloropropene	5	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	5	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	5	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene (TCE)	5	10	6	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	5	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	5	ND	ND	ND	ND	ND	ND	ND	ND
Dibromomethane	5	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	20	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	5	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	5	5	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	5	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	20	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichloropropane	5	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene (PCE)	5	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	5	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromoethane (EDB)	20	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	5	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1,2-Tetrachloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	5	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	5	9	6	7	ND	ND	ND	ND	ND
Styrene	5	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	5	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	20	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichloropropane	5	ND	ND	ND	ND	ND	ND	ND	ND
Bromobenzene	5	ND	ND	ND	ND	ND	ND	ND	ND
n-Propylbenzene	20	ND	ND	ND	ND	ND	ND	ND	ND
2-Chlorotoluene	20	ND	ND	ND	ND	ND	ND	ND	ND
4-Chlorotoluene	20	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	20	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butylbenzene	20	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	20	ND	ND	ND	ND	ND	ND	ND	ND
sec-Butylbenzene	20	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	5	ND	ND	ND	ND	ND	ND	ND	ND
4-Isopropyltoluene	20	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	5	ND	ND	ND	ND	ND	ND	ND	ND
n-Butylbenzene	20	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	5	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-chloropropane (DBCP)	20	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	20	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichlorobenzene	20	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	20	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	20	ND	ND	ND	ND	ND	ND	ND	ND

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL).

Ft. Richardson OU D Site
Building 35-752 Soil Sample Analytical Results
Volatile Organic Compounds

Page 2

dry weight basis		DRUM ACCUMULATION AREA (cont.)								
µg/Kg Location:		SS 1			SS 2		SS 3		SS 4	
Sample Depth:		6"	6"	2'	6"	2'	6"	2'	6"	2'
Sample ID:		94575201SL	94575202SL	94575218SL	94575203SL	94575217SL	94575204SL	94575216SL	94575205SL	94575215SL
Lab Code:		K946240-001	K946240-002	K946306-008	K946240-003	K946306-007	K946240-004	K946306-006	K946240-005	K946306-005
Date Collected:		10/6/94	10/6/94	10/10/94	10/6/94	10/10/94	10/6/94	10/10/94	10/6/94	10/10/94
Volatile Organic Compounds (EPA Method 8260)	MRL									
Dichlorodifluoromethane (CFC 12)	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane (CFC 11)	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	50	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	10	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,2-Dichloropropane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromochloromethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane (TCA)	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloropropene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene (TCE)	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromomethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	5	ND	ND	ND	ND	8	6	ND	6	ND
trans-1,3-Dichloropropene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichloropropane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene (PCE)	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromoethane (EDB)	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1,2-Tetrachloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	5	ND	ND	ND	ND	6	ND	ND	ND	ND
Total Xylenes	5	ND	ND	ND	ND	38	6	ND	6	ND
Styrene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichloropropane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromobenzene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Propylbenzene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chlorotoluene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Chlorotoluene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butylbenzene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	20	ND	ND	ND	ND	23	ND	ND	ND	ND
sec-Butylbenzene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Isopropyltoluene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Butylbenzene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-chloropropane (DBCP)	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichlorobenzene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL).

Ft. Richardson OU D Site
Building 35-752 Soil Sample Analytical Results
Volatile Organic Compounds

dry weight basis		DRUM ACCUMULATION AREA (cont.)								
µg/Kg Location:		SS 5			SS 6		SS 7		SS 8	
Sample Depth:		6"	2'	2'	6"	2'	6"	2'	6"	2'
Sample ID:		94575206SL	94575213SL	94575214SL	94575207SL	94575212SL	94575208SL	94575211SL	94575209SL	94575210SL
Lab Code:		K946243-001	K946306-003	K946306-004	K946243-002	K946306-002	K946243-003	K946306-001	K946243-004	K946243-005
Date Collected:		10/6/94	10/10/94	10/10/94	10/6/94	10/10/94	10/6/94	10/10/94	10/6/94	10/6/94
Volatile Organic Compounds (EPA Method 8260)	MRL									
Dichlorodifluoromethane (CFC 12)	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane (CFC 11)	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	50	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	10	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,2-Dichloropropane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromochloromethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane (TCA)	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloropropene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene (TCE)	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromomethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	5	ND	ND	ND	ND	ND	ND	ND	ND	5
trans-1,3-Dichloropropene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichloropropane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene (PCE)	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromoethane (EDB)	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1,2-Tetrachloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichloropropane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromobenzene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Propylbenzene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chlorotoluene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Chlorotoluene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butylbenzene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
sec-Butylbenzene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Isopropyltoluene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Butylbenzene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-chloropropane (DBCP)	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichlorobenzene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	20	ND	ND	ND	ND	ND	ND	ND	ND	ND

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL).

Ft. Richardson OU D Site
Building 35-752 Soil Sample Analytical Results
Semivolatile Organic Compounds

dry weight basis		DRUM ACCUMULATION AREA							
mg/Kg	Location:	SB AP 3505				SB AP 3506			
	Sample Depth:	0-4'	4'-6'	8'-11'	12'-16'	0-2'	4'-8'	8'-12'	14'-16'
	Sample ID:	94575219SL	94575220SL	94575221SL	94575222SL	94575223SL	94575224SL	94575225SL	94575226SL
	Lab Code:	K946921-001	K946921-002	K946921-003	K946921-004	K946921-010	K946921-011	K946921-012	K946921-013
	Date Collected:	11/3/94	11/3/94	11/3/94	11/3/94	11/3/94	11/3/94	11/3/94	11/3/94
Semivolatile Organic Compounds EPA Methods 3550/8270	MRL								
N-Nitrosodimethylamine	2	<4	ND	ND	ND	<4	ND	ND	ND
Aniline	1	<2	ND	ND	ND	<2	ND	ND	ND
Bis(2-chloroethyl) Ether	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
1,2-Dichlorobenzene	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
1,3-Dichlorobenzene	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
1,4-Dichlorobenzene	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
Bis(2-chloroisopropyl) Ether	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
N-Nitrosodi-n-propylamine	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
Hexachloroethane	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
Nitrobenzene	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
Isophorone	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
Bis(2-chloroethoxy)methane	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
1,2,4-Trichlorobenzene	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
Naphthalene	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
4-Chloroaniline	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
Hexachlorobutadiene	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
2-Methylnaphthalene	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
Hexachlorocyclopentadiene	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
2-Chloronaphthalene	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
2-Nitroaniline	2	<4	ND	ND	ND	<4	ND	ND	ND
Dimethyl Phthalate	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
Acenaphthylene	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
3-Nitroaniline	2	<4	ND	ND	ND	<4	ND	ND	ND
Acenaphthene	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
Dibenzofuran	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
2,4-Dinitrotoluene	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
2,6-Dinitrotoluene	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
Diethyl Phthalate	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
4-Chlorophenyl Phenyl Ether	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
Fluorene	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
4-Nitroaniline	2	<4	ND	ND	ND	<4	ND	ND	ND
N-Nitrosodiphenylamine	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
4-Bromophenyl Phenyl Ether	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
Hexachlorobenzene	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
Phenanthrene	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
Anthracene	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
Di-n-butyl Phthalate	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
Fluoranthene	0.3	<0.6	0.73	ND	ND	<0.6	ND	ND	ND
Pyrene	0.3	<0.6	0.69	ND	ND	<0.6	ND	ND	ND
Butylbenzyl Phthalate	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
3,3'-Dichlorobenzidine	2	<4	ND	ND	ND	<4	ND	ND	ND
Benz(a)anthracene	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
Bis(2-ethylhexyl) Phthalate	0.3	<0.6	ND	ND	ND	0.80	ND	ND	ND
Chrysene	0.3	<0.6	0.85	ND	ND	<0.6	ND	ND	ND
Di-n-octyl Phthalate	0.3	<0.6	0.97	ND	ND	1.32	0.36	0.41	0.3
Benzo(b)fluoranthene	0.3	0.7	0.93	ND	ND	<0.6	ND	ND	ND
Benzo(k)fluoranthene	0.3	0.7	0.65	ND	ND	<0.6	ND	ND	ND
Benzo(a)pyrene	0.3	<0.6	0.31	ND	ND	<0.6	ND	ND	ND
Indeno(1,2,3-cd)pyrene	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
Dibenz(a,h)anthracene	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
Benzo(g,h,i)perylene	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
Phenol	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
2-Chlorophenol	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
Benzyl Alcohol	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
2-Methylphenol	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
3- and 4-Methylphenol*	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
2-Nitrophenol	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
2,4-Dimethylphenol	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
Benzoic Acid	2	<4	ND	ND	ND	<4	ND	ND	ND
2,4-Dichlorophenol	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
4-Chloro-3-methylphenol	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
2,4,6-Trichlorophenol	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
2,4,5-Trichlorophenol	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND
2,4-Dinitrophenol	2	<4	ND	ND	ND	<4	ND	ND	ND
4-Nitrophenol	2	<4	ND	ND	ND	<4	ND	ND	ND
2-Methyl-4,6-dinitrophenol	2	<4	ND	ND	ND	<4	ND	ND	ND
Pentachlorophenol	2	<4	ND	ND	ND	<4	ND	ND	ND

FOOTNOTES:
ND = Non-detected at the method reporting limit (MRL).
< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.

Ft. Richardson OU D Site
Building 35-752 Soil Sample Analytical Results
Semivolatile Organic Compounds

dry weight basis		DRUM ACCUMULATION AREA (cont.)								
mg/Kg Location:		SS 1			SS 2		SS 3		SS 4	
Sample Depth:		6"	6"	2'	6"	2'	6"	2'	6"	2'
Sample ID:		94575201SL	94575202SL	94575218SL	94575203SL	94575217SL	94575204SL	94575216SL	94575205SL	94575215SL
Lab Code:		K946240-001	K946240-002	K946306-008	K946240-003	K946306-007	K946240-004	K946306-006	K946240-005	K946306-005
Date Collected:		10/6/94	10/6/94	10/10/94	10/6/94	10/10/94	10/6/94	10/10/94	10/6/94	10/10/94
Semivolatile Organic Compounds EPA Methods 3550/8270	MRL									
N-Nitrosodimethylamine	2	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aniline	1	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-chloroethyl) Ether	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-chloroisopropyl) Ether	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodi-n-propylamine	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachloroethane	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nitrobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isophorone	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-chloroethoxy)methane	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Chloroaniline	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorocyclopentadiene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloronaphthalene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Nitroaniline	2	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dimethyl Phthalate	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthylene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
3-Nitroaniline	2	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzofuran	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Diethyl Phthalate	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Chlorophenyl Phenyl Ether	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluorene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Nitroaniline	2	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Bromophenyl Phenyl Ether	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Anthracene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Di-n-butyl Phthalate	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pyrene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Butylbenzyl Phthalate	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
3,3'-Dichlorobenzidine	2	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benz(a)anthracene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-ethylhexyl) Phthalate	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chrysene	0.3	ND	ND	ND	ND	ND	ND	ND	0.3	ND
Di-n-octyl Phthalate	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(a)pyrene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibenz(a,h)anthracene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(g,h,i)perylene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenol	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chlorophenol	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzyl Alcohol	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylphenol	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
3- and 4-Methylphenol*	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Nitrophenol	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dimethylphenol	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzoic Acid	2	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dichlorophenol	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Chloro-3-methylphenol	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dinitrophenol	2	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Nitrophenol	2	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Methyl-4,6-dinitrophenol	2	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pentachlorophenol	2	ND	ND	ND	ND	ND	ND	ND	ND	ND

FOOTNOTES: ND = Non-detected at the method reporting level (MRL).

Ft. Richardson OU D Site
Building 35-752 Soil Sample Analytical Results
Semivolatile Organic Compounds

dry weight basis		DRUM ACCUMULATION AREA (cont.)								
mg/Kg Location:		SS 5			SS 6		SS 7		SS 8	
Sample Depth:		6"	2'	2'	6"	2'	6"	2'	6"	2'
Sample ID:		94575206SL	94575213SL	94575214SL	94575207SL	94575212SL	94575208SL	94575211SL	94575209SL	94575210SL
Lab Code:		K946243-001	K946306-003	K946306-004	K946243-002	K946306-002	K946243-003	K946306-001	K946243-004	K946243-005
Date Collected:		10/6/94	10/10/94	10/10/94	10/6/94	10/10/94	10/6/94	10/10/94	10/6/94	10/6/94
Semivolatile Organic Compounds EPA Methods 3550/8270	MRL									
N-Nitrosodimethylamine	2	ND	ND	<4	ND	ND	ND	ND	ND	ND
Aniline	1	ND	ND	<2	ND	ND	ND	ND	ND	ND
Bis(2-chloroethyl) Ether	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
Bis(2-chloroisopropyl) Ether	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
N-Nitrosodi-n-propylamine	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
Hexachloroethane	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
Nitrobenzene	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
Isophorone	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
Bis(2-chloroethoxy)methane	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
Naphthalene	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
4-Chloroaniline	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
Hexachlorocyclopentadiene	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
2-Chloronaphthalene	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
2-Nitroaniline	2	ND	ND	<4	ND	ND	ND	ND	ND	ND
Dimethyl Phthalate	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
Acenaphthylene	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
3-Nitroaniline	2	ND	ND	<4	ND	ND	ND	ND	ND	ND
Acenaphthene	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
Dibenzofuran	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
Diethyl Phthalate	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
4-Chlorophenyl Phenyl Ether	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
Fluorene	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
4-Nitroaniline	2	ND	ND	<4	ND	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
4-Bromophenyl Phenyl Ether	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
Hexachlorobenzene	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
Phenanthrene	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
Anthracene	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
Di-n-butyl Phthalate	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
Fluoranthene	0.3	ND	ND	<0.7	ND	ND	ND	ND	0.8	ND
Pyrene	0.3	ND	ND	<0.7	ND	ND	ND	ND	0.7	ND
Butylbenzyl Phthalate	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
3,3'-Dichlorobenzidine	2	ND	ND	<4	ND	ND	ND	ND	ND	ND
Benz(a)anthracene	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
Bis(2-ethylhexyl) Phthalate	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
Chrysene	0.3	ND	ND	<0.7	ND	ND	ND	ND	0.8	ND
Di-n-octyl Phthalate	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	0.3	ND	ND	<0.7	ND	ND	ND	ND	0.8	ND
Benzo(k)fluoranthene	0.3	ND	ND	<0.7	ND	ND	ND	ND	0.7	ND
Benzo(a)pyrene	0.3	ND	ND	<0.7	ND	ND	ND	ND	0.3	ND
Indeno(1,2,3-cd)pyrene	0.3	ND	ND	<0.7	ND	ND	ND	ND	0.3	ND
Dibenz(a,h)anthracene	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
Benzo(g,h,i)perylene	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
Phenol	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
2-Chlorophenol	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
Benzyl Alcohol	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
2-Methylphenol	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
3- and 4-Methylphenol*	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
2-Nitrophenol	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
2,4-Dimethylphenol	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
Benzoic Acid	2	ND	ND	<4	ND	ND	ND	ND	ND	ND
2,4-Dichlorophenol	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
4-Chloro-3-methylphenol	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	0.3	ND	ND	<0.7	ND	ND	ND	ND	ND	ND
2,4-Dinitrophenol	2	ND	ND	<4	ND	ND	ND	ND	ND	ND
4-Nitrophenol	2	ND	ND	<4	ND	ND	ND	ND	ND	ND
2-Methyl-4,6-dinitrophenol	2	ND	ND	<4	ND	ND	ND	ND	ND	ND
Pentachlorophenol	2	ND	ND	<4	ND	ND	ND	ND	ND	ND

FOOTNOTES:
ND = Non-detected at the method reporting limit (MRL).
< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.

Ft. Richardson OU D Site
Building 35-752 Soil Sample Analytical Results
Total Metals

dry weight basis mg/Kg					Analyte:	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Nickel	Selenium	Silver
					Method:	7060	6010A	6010A	6010A	7421	7471	6010A	7740	6010A
Location	Sample Depth	Sample ID	Lab Code	Date Collected	MRL:	1	1	1	2	1	0.2	10	1	2
DRUM ACCUMULATION AREA														
SB AP 3505	0-4'	94575219SL	K692101	11/3/94		6	69	ND	26	18	ND	31	1 UJ	ND
SB AP 3505	4'-6'	94575220SL	K692102	11/3/94		7	76	ND	28	8	ND	30	1 UJ	ND
SB AP 3505	9'-11'	94575221SL	K692103	11/3/94		4	44	ND	30	4	ND	25	1 UJ	ND
SB AP 3505	12'-16'	94575222SL	K692104	11/3/94		6	37	ND	27	5	ND	32	1 UJ	ND
SB AP 3506	0-2'	94575223SL	K692110	11/3/94		5	70	ND	30	24	ND	33	1 UJ	ND
SB AP 3506	4'-8'	94575224SL	K692111	11/3/94		4	63	ND	40	6	ND	33	1 UJ	ND
SB AP 3506	8'-12'	94575225SL	K692112	11/3/94		8	44	ND	31	6	ND	30	1 UJ	ND
SB AP 3506	14'-16'	94575226SL	K692113	11/3/94		6	44	ND	32	6	ND	39	1 UJ	ND
SS 1	6"	94575201SL	K624001	10/6/94		6 J	77	ND	29	5	ND	33	1 UJ	ND
SS 1	6"	94575202SL	K624002	10/6/94		10 J	97	ND	35	8	ND	42	1 UJ	ND
SS 1	2'	94575218SL	K630608	10/10/94		5	58	ND	30	6	ND	37	ND	ND
SS 2	6"	94575203SL	K624003	10/6/94		7 J	64	ND	29	8	ND	33	1 UJ	ND
SS 2	2'	94575217SL	K630607	10/10/94		7	57	ND	38	8	ND	44	ND	ND
SS 3	6"	94575204SL	K624004	10/6/94		8 J	99	ND	36	12	ND	49	1 UJ	ND
SS 3	2'	94575216SL	K630606	10/10/94		6	49	ND	24	5	ND	27	ND	ND
SS 4	6"	94575205SL	K624005	10/6/94		7 J	110	ND	30	10	ND	30	1 UJ	ND
SS 4	2'	94575215SL	K630605	10/10/94		5	81	ND	36	10	ND	36	ND	ND
SS 5	6"	94575206SL	K624301	10/6/94		5	220 J	ND	23	36	ND	23	1 UJ	ND
SS 5	2'	94575213SL	K630603	10/10/94		6	61	ND	31	11	ND	32	ND	ND
SS 5	2'	94575214SL	K630604	10/10/94		8	93	ND	38	18	ND	38	ND	ND
SS 6	6"	94575207SL	K624302	10/6/94		7	73 J	ND	25	8	ND	27	1 UJ	ND
SS 6	2'	94575212SL	K630602	10/10/94		6	93	ND	34	10	ND	34	ND	ND
SS 7	6"	94575208SL	K624303	10/6/94		7	67 J	ND	30	8	ND	30	1 UJ	ND
SS 7	2'	94575211SL	K630601	10/10/94		8	90	ND	34	16	ND	40	ND	ND
SS 8	6"	94575209SL	K624304	10/6/94		7	83 J	ND	33	13	ND	34	1 UJ	ND
SS 8	2'	94575210SL	K624305	10/6/94		7	92 J	ND	32	7	ND	29	1 UJ	ND

FOOTNOTES:
ND = Non-detected at the method reporting limit (MRL).
J = Value is considered an estimate.
UJ = The analyte was not detected at the MRL, however, the MRL is considered an estimate.

Ft. Richardson OU D Site

Building 35-752 Soil Sample Analytical Results

Total Metals

dry weight basis mg/Kg					Analyte:	Aluminum	Antimony	Beryllium	Calcium	Cobalt	Copper	Iron	Magnesium	Manganese
					Method:	6010A	6010A	6010A	6010A	6010A	6010A	6010A	6010A	6010A
Location	Sample Depth	Sample ID	Lab Code	Date Collected	MRL:	10	10	1	10	2	2	4	2	1
DRUM ACCUMULATION AREA														
SS 1	6"	94575201SL	K624001	10/6/94		15100	ND	ND	4360	11	28	25100	7420	564
SS 1	6"	94575202SL	K624002	10/6/94		19200	ND	ND	5230	13	39	30800	9240	720
SS 2	6"	94575203SL	K624003	10/6/94		13300	ND	ND	3940	10	28	22000	7300	477
SS 3	6"	94575204SL	K624004	10/6/94		18700	ND	ND	5670	13	31	30900	10300	669
SS 4	6"	94575205SL	K624005	10/6/94		17300	ND	ND	3150	11	20	22700	5930	472
SS 5	6"	94575206SL	K624301	10/6/94		8620	ND	ND	7220	7	22	18500	6820	383
SS 6	6"	94575207SL	K624302	10/6/94		13300	ND	ND	3310	10	24	22400	6250	455
SS 7	6"	94575208SL	K624303	10/6/94		14800	ND	ND	4110	10	28	26600	7430	502
SS 8	6"	94575209SL	K624304	10/6/94		16200	ND	ND	4240	12	34	28800	8170	544
SS 8	2'	94575210SL	K624305	10/6/94		17000	ND	ND	5620	12	29	28800	7840	628

dry weight basis mg/Kg					Analyte:	Potassium	Sodium	Thallium	Vanadium	Zinc				
					Method:	6010A	6010A	7841	6010A	6010A				
Location	Sample Depth	Sample ID	Lab Code	Date Collected	MRL:	400	20	1	2	2				
DRUM ACCUMULATION AREA														
SS 1	6"	94575201SL	K624001	10/6/94		440	122	ND	45	57				
SS 1	6"	94575202SL	K624002	10/6/94		590	158	ND	57	72				
SS 2	6"	94575203SL	K624003	10/6/94		440	108	ND	41	52				
SS 3	6"	94575204SL	K624004	10/6/94		590	171	ND	60	72				
SS 4	6"	94575205SL	K624005	10/6/94		ND	116	ND	46	47				
SS 5	6"	94575206SL	K624301	10/6/94		ND	65	ND	28	86				
SS 6	6"	94575207SL	K624302	10/6/94		450	111	ND	41	53				
SS 7	6"	94575208SL	K624303	10/6/94		610	118	ND	47	61				
SS 8	6"	94575209SL	K624304	10/6/94		530	112	ND	50	68				
SS 8	2'	94575210SL	K624305	10/6/94		570	134	ND	50	63				

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL).

Ft. Richardson OU D Site

Building 35-752 Cooling Pond Groundwater Sample Analytical Results

Petroleum Hydrocarbons

			Analysis:	Benzene		Toluene		Ethylbenzene		Total Xylenes		GRO		DRO		TPH	
			EPA Method:	8260		8260		8260		8260		5030/8015		3540/8100		9071/418.1	
			Units:	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
Location	Sample ID	Lab Code	Date Collected	MRL	Result	MRL	Result	MRL	Result	MRL	Result	MRL	Result	MRL	Result	MRL	Result
MW AP 3502	9457528AGW	K948015-003	12/21/94	0.5	ND	0.5	ND	0.5	ND	0.5	ND	50	ND	50	105	200	ND
MW AP 3503	9457525AGW	K947974-005	12/20/94	0.5	ND	0.5	ND	0.5	ND	0.5	ND	50	ND	50	89 J	200	ND
MW AP 3504	9457521AGW	K947938-001	12/19/94	0.5	ND	0.5	ND	0.5	ND	0.5	ND	50	ND	50	ND	200	ND
MW AP 3504	9457522AGW	K947938-002	12/19/94	0.5	NA	0.5	NA	0.5	NA	0.5	NA	50	NA	50	ND	200	ND
MW AP 2982	9457523AGW	K948015-001	12/20/94	0.5	46	0.5	2.8	0.5	22	0.5	56	50	292	50	226	200	ND
MW AP 2983	9457526AGW	K947974-001	12/20/94	0.5	ND	0.5	ND	0.5	ND	0.5	ND	50	ND	50	ND	200	ND
MW AP 2986	9457527AGW	K947974-007	12/20/94	0.5	ND	0.5	ND	0.5	ND	0.5	ND	50	ND	50	566 J	200	500
MW AP 2987	9457524AGW	K947974-003	12/20/94	0.5	1.6	0.5	ND	0.5	ND	0.5	ND	50	ND	50	1310	200	ND
MW AP 3502	Trip Blank	K948015-004	-	0.5	ND	0.5	ND	0.5	ND	ND	ND	50	ND	50	NA	200	NA
MW AP 3503	Trip Blank	K947974-006	-	0.5	ND	0.5	ND	0.5	ND	0.6	ND	50	ND	50	NA	200	NA
MW AP 3504	Trip Blank	K947938-003	-	0.5	ND	0.5	ND	0.5	ND	0.5	ND	50	ND	50	NA	200	NA
MW AP 2982	Trip Blank	K948015-002	-	0.5	ND	0.5	ND	0.5	ND	0.5	ND	50	ND	50	NA	200	NA
MW AP 2983	Trip Blank	K947974-002	-	0.5	ND	0.5	ND	0.5	ND	0.5	ND	50	ND	50	NA	200	NA
MW AP 2986	Trip Blank	K947974-008	-	0.5	ND	0.5	ND	0.5	ND	0.5	ND	50	ND.	50	NA	200	NA
MW AP 2987	Trip Blank	K947974-004	-	0.5	ND	0.5	ND	0.5	ND	0.5	ND	50	ND	50	NA	200	NA

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL).
NA = Not analyzed.
J = Value is considered an estimate.

Ft. Richardson OU D Site
Building 35-752 Cooling Pond Groundwater Sample Analytical Results
Pesticides/PCBs and Chlorinated Herbicides

µg/L	Location:	MW AP 3502	MW AP 3503	MW AP 3504		MW AP 2982	MW AP 2983	MW AP 2986	MW AP 2987
	Sample ID:	9457528AGW	9457525AGW	9457521AGW	9457522AGW	9457523AGW	9457526AGW	9457527AGW	9457524AGW
	Lab Code:	K948015-003	K947974-005	K947938-001	K947938-002	K948015-001	K947974-001	K947974-007	K947974-003
	Date Collected:	12/21/94	12/20/94	12/19/94	12/19/94	12/20/94	12/20/94	12/20/94	12/20/94
Organochlorine Pesticides **EPA Methods 3510/8080**	**MRL**								
Alpha-BHC	0.04	ND	ND	ND	NA	ND	NA	ND	0.04 UJ
Beta-BHC	0.1	ND	ND	ND	NA	ND	NA	ND	0.1 UJ
Delta-BHC	0.04	ND	ND	ND	NA	ND	NA	ND	0.04 UJ
Heptachlor	0.04	ND	ND	ND	NA	ND	NA	ND	0.04 UJ
Aldrin	0.04	ND	ND	ND	NA	ND	NA	ND	0.04 UJ
Gamma-BHC (Lindane)	0.04	ND	ND	ND	NA	ND	NA	ND	0.04 UJ
Heptachlor Epoxide	0.04	ND	ND	ND	NA	ND	NA	ND	0.04 UJ
Endosulfan I	0.04	ND	ND	ND	NA	ND	NA	ND	0.04 UJ
Endrin	0.04	ND	ND	ND	NA	ND	NA	ND	0.04 UJ
Endosulfan II	0.04	ND	ND	ND	NA	ND	NA	ND	0.04 UJ
4,4'-DDD	0.04	ND	ND	ND	NA	ND	NA	ND	0.04 UJ
Endrin Aldehyde	0.04	ND	ND	ND	NA	ND	NA	ND	0.04 UJ
Endosulfan Sulfate	0.04	ND	ND	ND	NA	ND	NA	ND	0.04 UJ
4,4'-DDT	0.04	ND	ND	ND	NA	ND	NA	<0.5	0.04 UJ
4,4'-DDE	0.04	ND	ND	ND	NA	ND	NA	ND	0.04 UJ
Dieldrin	0.04	ND	ND	ND	NA	ND	NA	ND	0.04 UJ
Methoxychlor	0.1	ND	ND	ND	NA	ND	NA	ND	0.1 UJ
Toxaphene	1	ND	ND	ND	NA	ND	NA	ND	1 UJ
Chlordane	0.5	ND	ND	ND	NA	ND	NA	ND	0.5 UJ
Polychlorinated Biphenyls (PCBs) **EPA Methods 3510/8080**									
Aroclor 1016	0.2	ND	ND	ND	ND	ND	ND	ND	0.2 UJ
Aroclor 1221	0.2	ND	ND	ND	ND	ND	ND	ND	0.2 UJ
Aroclor 1232	0.2	ND	ND	ND	ND	ND	ND	ND	0.2 UJ
Aroclor 1242	0.2	ND	ND	ND	ND	ND	ND	ND	0.2 UJ
Aroclor 1248	0.2	ND	ND	ND	ND	ND	ND	ND	0.2 UJ
Aroclor 1254	0.2	ND	ND	ND	ND	ND	ND	ND	0.2 UJ
Aroclor 1260	0.2	ND	ND	ND	ND	ND	ND	0.7	0.2 UJ
Chlorinated Herbicides **EPA Method 8150A Modified**									
Dalapon	5	ND	ND	ND	ND	ND	ND	ND	ND
MCPP	200	ND	ND	ND	ND	ND	ND	ND	ND
Dicamba	0.5	ND	ND	ND	ND	ND	ND	ND	ND
MCPA	200	ND	ND	ND	ND	ND	ND	ND	ND
Dichloroprop	0.6	ND	ND	ND	ND	ND	ND	ND	ND
2,4-D	1	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-TP (Silvex)	0.2	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-T	0.2	ND	ND	ND	ND	ND	ND	ND	ND
Dinoseb	2	ND	ND	ND	ND	ND	ND	ND	ND
2,4-DB	2	ND	ND	ND	ND	ND	ND	ND	ND

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL).

UJ = The analyte was not detected at the MRL, however, the MRL is considered an estimate.

NA = not analyzed.

Ft. Richardson OU D Site
Building 35-752 Cooling Pond Groundwater Sample Analytical Results
Volatile Organic Compounds

µg/L	Location:	MW AP 3502	MW AP 3503	MW AP 3504	MW AP 2982	MW AP 2983	MW AP 2986	MW AP 2987
	Sample ID:	9457528AGW	9457525AGW	9457521AGW	9457523AGW	9457526AGW	9457527AGW	9457524AGW
	Lab Code:	K948015-003	K947974-005	K947938-001	K948015-001	K947974-001	K947974-007	K947974-003
	Date Collected:	12/21/94	12/20/94	12/19/94	12/20/94	12/20/94	12/20/94	12/20/94
Volatile Organic Compounds (EPA Method 8260)	MRL							
Dichlorodifluoromethane (CFC 12)	0.5	ND	ND	ND	ND	ND	ND	ND
Chloromethane	0.5	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	0.5	ND	ND	ND	ND	ND	ND	ND
Bromomethane	0.5	ND	ND	ND	ND	ND	ND	ND
Chloroethane	0.5	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane (CFC 11)	0.5	ND	ND	ND	ND	ND	ND	ND
Acetone	20	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	0.5	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	0.5	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	1	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	0.5	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.5	ND	ND	ND	0.5	ND	ND	ND
2-Butanone (MEK)	20	ND	ND	ND	ND	ND	ND	ND
2,2-Dichloropropane	0.5	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	0.5	ND	ND	ND	ND	ND	ND	ND
Chloroform	0.5	ND	ND	ND	ND	ND	ND	ND
Bromochloromethane	0.5	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane (TCA)	0.5	ND	ND	3.4	9.7	ND	ND	ND
1,1-Dichloropropene	0.5	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	0.5	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	0.5	ND	ND	ND	ND	ND	ND	ND
Benzene	0.5	ND	ND	ND	46	ND	ND	1.6
Trichloroethene (TCE)	0.5	ND	ND	0.6	0.8	0.5	ND	0.6
1,2-Dichloropropane	0.5	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	0.5	ND	ND	ND	ND	ND	ND	ND
Dibromomethane	0.5	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	20	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	0.5	ND	ND	ND	ND	ND	ND	ND
Toluene	0.5	ND	ND	ND	2.8	ND	ND	ND
trans-1,3-Dichloropropene	0.5	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	0.5	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	20	ND	ND	ND	ND	ND	ND	ND
1,3-Dichloropropane	0.5	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene (PCE)	0.5	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	0.5	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromoethane (EDB)	2	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	0.5	ND	ND	ND	ND	ND	ND	ND
1,1,1,2-Tetrachloroethane	0.5	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	0.5	ND	ND	ND	22	ND	ND	ND
Total Xylenes	0.5	ND	ND	ND	56	ND	ND	ND
Styrene	0.5	ND	ND	ND	ND	ND	ND	ND
Bromoform	0.5	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	2	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.5	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichloropropane	0.5	ND	ND	ND	ND	ND	ND	ND
Bromobenzene	0.5	ND	ND	ND	ND	ND	ND	ND
n-Propylbenzene	2	ND	ND	ND	ND	ND	ND	ND
2-Chlorotoluene	2	ND	ND	ND	ND	ND	ND	ND
4-Chlorotoluene	2	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	2	ND	ND	ND	2	ND	ND	ND
tert-Butylbenzene	2	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	2	ND	ND	ND	11	ND	ND	ND
sec-Butylbenzene	2	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	0.5	ND	ND	ND	ND	ND	ND	ND
4-Isopropyltoluene	2	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	0.5	ND	ND	ND	ND	ND	ND	ND
n-Butylbenzene	2	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	0.5	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-chloropropane (DBCP)	2	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	2	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichlorobenzene	2	ND	ND	ND	ND	ND	ND	ND
Naphthalene	2	ND	ND	ND	8	ND	ND	ND
Hexachlorobutadiene	2	ND	ND	ND	ND	ND	ND	ND

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL).

Ft. Richardson OU D Site

Building 35-752 Cooling Pond Groundwater Sample Analytical Results

Volatile Organic Compounds

µg/L	Location:	MW AP 3502	MW AP 3503	MW AP 3504	MW AP 2982	MW AP 2963	MW AP 2986	MW AP 2987
	Sample ID:	Trip Blank	Trip Blank	Trip Blank	Trip Blank	Trip Blank	Trip Blank	Trip Blank
	Lab Code:	K948015-004	K947974-006	K947938-003	K948015-002	K947974-002	K947974-008	K947974-004
	Date Collected:							
Volatile Organic Compounds (EPA Method 8260)	MRL							
Dichlorodifluoromethane (CFC 12)	5	ND	ND	ND	ND	ND	ND	ND
Chloromethane	5	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	5	ND	ND	ND	ND	ND	ND	ND
Bromomethane	5	ND	ND	ND	ND	ND	ND	ND
Chloroethane	5	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane (CFC 11)	5	ND	ND	ND	ND	ND	ND	ND
Acetone	50	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	5	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	10	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	5	ND	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	20	ND	ND	ND	ND	ND	ND	ND
2,2-Dichloropropane	5	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND
Chloroform	5	ND	ND	ND	ND	ND	ND	ND
Bromochloromethane	5	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane (TCA)	5	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloropropene	5	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	5	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	5	ND	ND	ND	ND	ND	ND	ND
Benzene	5	ND	ND	ND	ND	ND	ND	ND
Trichloroethene (TCE)	5	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	5	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	5	ND	ND	ND	ND	ND	ND	ND
Dibromomethane	5	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	20	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	5	ND	ND	ND	ND	ND	ND	ND
Toluene	5	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	5	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	5	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	20	ND	ND	ND	ND	ND	ND	ND
1,3-Dichloropropane	5	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene (PCE)	5	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	5	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromoethane (EDB)	20	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	5	ND	ND	ND	ND	ND	ND	ND
1,1,1,2-Tetrachloroethane	5	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	5	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	5	ND	ND	ND	ND	ND	ND	ND
Styrene	5	ND	ND	ND	ND	ND	ND	ND
Bromoform	5	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	20	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	5	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichloropropane	5	ND	ND	ND	ND	ND	ND	ND
Bromobenzene	5	ND	ND	ND	ND	ND	ND	ND
n-Propylbenzene	20	ND	ND	ND	ND	ND	ND	ND
2-Chlorotoluene	20	ND	ND	ND	ND	ND	ND	ND
4-Chlorotoluene	20	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	20	ND	ND	ND	ND	ND	ND	ND
tert-Butylbenzene	20	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	20	ND	ND	ND	ND	ND	ND	ND
sec-Butylbenzene	20	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	5	ND	ND	ND	ND	ND	ND	ND
4-Isopropyltoluene	20	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	5	ND	ND	ND	ND	ND	ND	ND
n-Butylbenzene	20	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	5	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-chloropropane (DBCP)	20	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	20	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichlorobenzene	20	ND	ND	ND	ND	ND	ND	ND
Naphthalene	20	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	20	ND	ND	ND	ND	ND	ND	ND

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL).

Ft. Richardson OU D Site
Building 35-752 Cooling Pond Groundwater Sample Analytical Results
Semivolatile Organic Compounds

Page 1

µg/L	Location:	MW AP 3502	MW AP 3503	MW AP 3504		MW AP 2982	MW AP 2983	MW AP 2986	MW AP 2987
	Sample ID:	9457528AGW	9457525AGW	9457521AGW	9457522AGW	9457523AGW	9457526AGW	9457527AGW	9457524AGW
	Lab Code:	K948015-003	K947974-005	K947938-001	K947938-002	K948015-001	K947974-001	K947974-007	K947974-003
	Date Collected:	12/21/94	12/20/94	12/19/94	12/19/94	12/21/94	12/20/94	12/20/94	12/20/94
Semivolatile Organic Compounds EPA Methods 3550/8270	MRL								
N-Nitrosodimethylamine	25	ND	ND	ND	ND	ND	ND	ND	ND
Aniline	25	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-chloroethyl) Ether	10	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	10	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	10	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	10	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-chloroisopropyl) Ether	10	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodi-n-propylamine	10	ND	ND	ND	ND	ND	ND	ND	ND
Hexachloroethane	10	ND	ND	ND	ND	ND	ND	ND	ND
Nitrobenzene	10	ND	ND	ND	ND	ND	ND	ND	ND
Isophorone	10	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-chloroethoxy)methane	10	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	10	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	10	ND	ND	ND	ND	ND	ND	ND	ND
4-Chloroaniline	10	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	10	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	10	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorocyclopentadiene	10	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloronaphthalene	10	ND	ND	ND	ND	ND	ND	ND	ND
2-Nitroaniline	25	ND	ND	ND	ND	ND	ND	ND	ND
Dimethyl Phthalate	10	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthylene	10	ND	ND	ND	ND	ND	ND	ND	ND
3-Nitroaniline	25	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthene	10	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzofuran	10	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	10	ND	ND	ND	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	10	ND	ND	ND	ND	ND	ND	ND	ND
Diethyl Phthalate	10	ND	ND	ND	ND	ND	ND	ND	ND
4-Chlorophenyl Phenyl Ether	10	ND	ND	ND	ND	ND	ND	ND	ND
Fluorene	10	ND	ND	ND	ND	ND	ND	ND	ND
4-Nitroaniline	25	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine	10	ND	ND	ND	ND	ND	ND	ND	ND
4-Bromophenyl Phenyl Ether	10	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobenzene	10	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	10	ND	ND	ND	ND	ND	ND	ND	ND
Anthracene	10	ND	ND	ND	ND	ND	ND	ND	ND
Di-n-butyl Phthalate	10	ND	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	10	ND	ND	ND	ND	ND	ND	ND	ND
Pyrene	10	ND	ND	ND	ND	ND	ND	ND	ND
Butylbenzyl Phthalate	10	ND	ND	ND	ND	ND	ND	ND	ND
3,3'-Dichlorobenzidine	25	ND	ND	ND	ND	ND	ND	ND	ND
Benz(a)anthracene	10	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-ethylhexyl) Phthalate	10	ND	ND	ND	ND	ND	ND	11	ND
Chrysene	10	ND	ND	ND	ND	ND	ND	ND	ND
Di-n-octyl Phthalate	10	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	10	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	10	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(a)pyrene	10	ND	ND	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	10	ND	ND	ND	ND	ND	ND	ND	ND
Dibenz(a,h)anthracene	10	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(g,h,i)perylene	10	ND	ND	ND	ND	ND	ND	ND	ND
Phenol	10	ND	ND	ND	ND	ND	ND	ND	ND
2-Chlorophenol	10	ND	ND	ND	ND	ND	ND	ND	ND
Benzyl Alcohol	10	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylphenol	10	ND	ND	ND	ND	ND	ND	ND	ND
3- and 4-Methylphenol*	10	ND	ND	ND	ND	ND	ND	ND	ND
2-Nitrophenol	10	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dimethylphenol	10	ND	ND	ND	ND	ND	ND	ND	ND
Benzoic Acid	25	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dichlorophenol	10	ND	ND	ND	ND	ND	ND	ND	ND
4-Chloro-3-methylphenol	10	ND	ND	ND	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	10	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	10	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dinitrophenol	25	ND	ND	ND	ND	ND	ND	ND	ND
4-Nitrophenol	25	ND	ND	ND	ND	ND	ND	ND	ND
2-Methyl-4,6-dinitrophenol	25	ND	ND	ND	ND	ND	ND	ND	ND
Pentachlorophenol	25	ND	ND	ND	ND	ND	ND	ND	ND

FOOTNOTES: ND = Non-detected at the method reporting limit (MRL).

Ft. Richardson OU D Site

Building 35-752 Cooling Pond Groundwater Sample Analytical Results

Total Metals

µg/L				Analyte:	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Nickel	Selenium	Silver
				Method:	7060	6010A	6010A	6010A	7421	7470	6010A	7740	6010A
Location	Sample ID	Lab Code	Date Collected	MRL:	5	5	3	5	2	0.5	20	5	10
MW AP 3502	9457528AGW	K948015-003	12/21/94		5	129	ND	17	5	ND	25	<10	ND
MW AP 3503	9457525AGW	K947974-005	12/20/94		52 J	1480	6	402	112	1.8	546	<10	<20
MW AP 3504	9457521AGW	K947938-001	12/19/94		29	683	ND	206	48	1.2	316	<20	ND
MW AP 3504	9457522AGW	K947938-002	12/19/94		34	722	ND	229	53	1.2	345	ND	ND
MW AP 2982	9457523AGW	K948015-001	12/20/94		27	424	ND	97	26	0.7	153	<10	ND
MW AP 2983	9457526AGW	K947974-001	12/20/94		28 J	761	ND	162	64	1.6	290	ND	ND
MW AP 2986	9457527AGW	K947974-007	12/20/94		48 J	245	ND	72	44	0.7	102	ND	ND
MW AP 2987	9457524AGW	K947974-003	12/20/94		27 J	604	ND	164	52	1.1	229	ND	ND

FOOTNOTES:

< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.

J = Value is considered an estimate.

Ft. Richardson OU D Site
Building 35-752 Concrete Floor Wipe Sample Analytical Results
PCBs

µg/wipe Sample ID:		94575249MI	94575250MI	94575251MI *	94575252MI	94575253MI	94575254MI	94575255MI	94575256MI	94575257MI	94575258MI	94575259MI
Lab Code:		K947753-001	K947753-002	K947753-003	K947753-004	K947753-005	K947753-006	K947753-007	K947753-008	K947753-009	K947753-010	K947753-011
Date Collected:		12/9/94	12/9/94	12/9/94	12/9/94	12/9/94	12/9/94	12/9/94	12/9/94	12/9/94	12/9/94	12/9/94
Polychlorinated Biphenyls (PCBs) EPA Method 3540/8080	MRL											
Aroclor 1016	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	1	750	16	37	41	41	82	76	6	88	64	130
Aroclor 1260	1	ND	ND	ND	6	24	14	ND	ND	ND	ND	ND

FOOTNOTES: *: Duplicate of preceding sample.
ND = Non-detected at the method reporting limit (MRL).

\QAQC\COMMON\RICH\FINAL8\REPTABLES\B35752FW.XLS|PCBs-Wipe

4/18/95

Ft. Richardson OU D Site
Building 35-752 Concrete Floor Wipe Sample Analytical Results
PCBs

µg/wipe	Sample ID:	94575260MI	94575261MI *	94575262MI	94575263MI	94575264MI	94575265MI *	94575266MI	94575267MI	94575268MI	94575269MI	94575270MI
	Lab Code:	K947753-012	K947753-013	K947753-014	K947753-015	K947753-016	K947753-017	K947753-018	K947753-019	K947753-020	K947753-021	K947753-022
	Date Collected:	12/9/94	12/9/94	12/9/94	12/9/94	12/9/94	12/9/94	12/9/94	12/9/94	12/9/94	12/9/94	12/9/94
Polychlorinated Biphenyls (PCBs) **EPA Method 3540/8080**	MRL											
Aroclor 1016	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	1	40	19	38	33	34	19	71	140	71	680	120
Aroclor 1260	1	ND	ND	3	ND	4	2	12	13	17	28	24

FOOTNOTES: *: Duplicate of preceding sample.

ND = Non-detected at the method reporting limit (MRL).

Ft. Richardson OU D Site
Building 35-752 Concrete Floor Wipe Sample Analytical Results
PCBs

µg/wipe	Sample ID:	94575271MI	94575291MI	94575292MI	94575293MI	94575294MI *	94575295MI	94575296MI	94575297MI	94575298MI	94575299MI	
	Lab Code:	K947753-023	K947753-024	K947753-025	K947753-026	K947753-027	K947753-028	K947753-029	K947753-030	K947753-031	K947753-032	
	Date Collected:	12/9/94	12/9/94	12/9/94	12/9/94	12/9/94	12/9/94	12/9/94	12/9/94	12/9/94	12/9/94	
Polychlorinated Biphenyls (PCBs) EPA Method 3540/8080	MRL											
Aroclor 1016	1	ND	ND	ND	ND	ND	ND	ND	ND	<5	ND	
Aroclor 1221	1	ND	ND	ND	ND	ND	ND	ND	ND	<5	ND	
Aroclor 1232	1	ND	ND	ND	ND	ND	ND	ND	ND	<5	ND	
Aroclor 1242	1	ND	ND	ND	ND	ND	ND	ND	ND	<5	ND	
Aroclor 1248	1	ND	ND	ND	ND	ND	ND	ND	ND	<5	ND	
Aroclor 1254	1	63	22	140	610	160	62	9	27	58	73	
Aroclor 1260	1	35	32	27	39	ND	8	ND	10	31	24	

FOOTNOTES: *: Duplicate of preceding sample.

ND = Non-detected at the method reporting limit (MRL).

< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.

Building 35-752 - Soil Boring Summary

ENSR Field Designation	COE Permanent Designation	Date Completed
SB-1	AP 3497	11/2/94
SB-2	AP 3498	11/2/94
SB-3	AP 3499	11/2/94
SB-4	AP 3500	11/2/94
SB-5	AP 3501	12/8/94
MW-1	AP 3502	11/7/94
MW-2	AP 3503	11/8/94
MW-3	AP 3504	11/7/94
BH-9	AP 3505	11/3/94
BH-10	AP 3506	11/3/94

BORING LOG

BORING NUMBER:AP-3497

OUD 0025776

CLIENT: United States Army Corps of Engineers
PROJECT NAME: Fort Richardson, Operable Unit D
PROJECT LOCATION: Building 35-752
JOB NUMBER: 9000-036
LOGGED BY: J. Winkler APPROVED BY: S. Wing
DRILLED BY: Hughes Drilling Co.
METHOD: 4.25" ID HSA
FILENAME: AP3497

BORING DEPTH (ft): 20
BORING DIAMETER (in): 6
WELL DEPTH (ft): NA
WELL DIAMETER (in): NA
REFERENCE ELEVATION (ft): 262.7
CASING STICKUP (ft): NA
FIELD PARTY: H. Kent

SCREEN LENGTH (ft): NA
SCREEN TYPE: NA
SLOT SIZE (in): NA
FILTER PACK: NA
DATE STARTED: 11-2-94
DATE COMPLETED: 11-2-94
NORTHING: 113156.78
EASTING: 125670.72

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
					7			GW		
					7				Medium orangish-brown SANDY GRAVEL (GW), coarse rounded to subangular gravel, fine to medium sand, slight coarse sand, dry, loose, no odor.	
					6	166.6				
					5					
					5				same as above	
					7					
					11	233.3			same as above	
					15					
5					6					
					9	6.6				
					10				Brownish-gray SANDY GRAVEL (GW), medium to coarse subrounded gravel, fine sand, slight medium to coarse sand, slight silt, dry, loose, no odor.	
					10					
					8	19.9				
					10				same as above	
					14					
					16	33.3				
10					8					
					23					
					21					
					23				Drilling very hard, GRAVEL (GW)	
					6			SW	Medium gray SAND (SW), medium to coarse, slight fine sand, silt, gravel, very moist, loose, moderate to strong hydrocarbon odor.	
15					12					
					20	233.4				
					18				same as above, Very strong hydrocarbon odor, very moist.	
					15					
					17					
					14					
					16				Medium brownish-gray SAND (SW), medium to coarse, slight fine sand and silt, some rounded medium gravel, bottom 2" angular to rounded gravel, saturated to wet, slight hydrocarbon odor	
					12					
20					18	2.7				
					23					
					32				Total depth = 20 feet	
25										
30										

Page 1 of 1

BORING LOG

BORING NUMBER:AP-3498

CLIENT: United States Army Corps of Engineers
PROJECT NAME: Fort Richardson, Operable Unit D
PROJECT LOCATION: Building 35-752
JOB NUMBER: 9000-036
LOGGED BY: J. Winkler APPROVED BY: S. Wing
DRILLED BY: Hughes Drilling Co.
METHOD: 4.25" ID HSA
FILENAME: AP3498

BORING DEPTH (ft): 16
BORING DIAMETER (in): 6
WELL DEPTH (ft): NA
WELL DIAMETER (in): NA
REFERENCE ELEVATION (ft): 264.6
CASING STICKUP (ft): NA
FIELD PARTY: H. Kent

SCREEN LENGTH (ft): NA
SCREEN TYPE: NA
SLOT SIZE (in): NA
FILTER PACK: NA
DATE STARTED: 11-2-94
DATE COMPLETED: 11-2-94
NORTHING: 113116.16
EASTING: 125711.42

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
					1 3 5	2.2		GW	Dark brown SANDY GRAVEL (GW), medium sand, medium to coarse rounded gravel, slight fine sand and silt, moist, no odor.	
					5 5 8 8	3.6			same as above, color change to medium orangish-brown at 3.5',increase in fine sand and silt	
5					9 5 11	1.8			Medium orangish-brown SANDY GRAVEL (GW), coarse rounded to subrounded gravel, fine to medium sand, some coarse sand with depth, moist, no odor.	
					11 9 16 17 28 8	6.2			same as above	
10					7 11 14 15	1242		SW	Medium gray SAND (SW), medium to coarse, slight fine sand, silt, and medium gravel, very moist, loose, strong hydrocarbon odor.	
15					5 11 16 17	13.9		GW ∇	Medium gray SANDY GRAVEL (GW), coarse sand, subrounded to angular gravel, very strong hydrocarbon odor, sheen on sampler, very moist.	
									Total depth = 16 feet	
20										
25										
30										

BORING LOG

BORING NUMBER:AP-3499

CLIENT: United States Army Corps of Engineers
PROJECT NAME: Fort Richardson, Operable Unit D
PROJECT LOCATION: Building 35-752
JOB NUMBER: 9000-036
LOGGED BY: J. Winkler APPROVED BY: S. Wing
DRILLED BY: Hughes Drilling Co.
METHOD: 4.25" ID HSA
FILENAME: AP3499

BORING DEPTH (ft): 16
BORING DIAMETER (in): 6
WELL DEPTH (ft): NA
WELL DIAMETER (in): NA
REFERENCE ELEVATION (ft): 264.6
CASING STICKUP (ft): NA
FIELD PARTY: H. Kent

SCREEN LENGTH (ft): NA
SCREEN TYPE: NA
SLOT SIZE (in): NA
FILTER PACK: NA
DATE STARTED: 11-2-94
DATE COMPLETED: 11-2-94
NORTHING: 113122.18
EASTING: 125674.32

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
					1 2 5 6	8.7		GW	Dark brown SANDY GRAVEL (GW), medium to coarse sand, medium to coarse rounded gravel, slight silt, moist, no odor.	
5					4 2 4 6 2 2 2	5.5 22.5		SM	Medium orangish-brown SANDY SILT (SM), fine sand, slight medium sand and gravel, few pockets of light gray clay, some wood, moist same as above, clay increasing with depth and sand decreasing.	
10 15					1 1 2 6 11 5 12 15 12 13 12 15 33	5.5 8.0 8.7		SW ▽	Medium orangish-brown SAND (SW), medium to coarse sand, slight rounded gravel, very moist, no odor. same as above, some silt, some gravel, moist to wet. same as above, soil gray, strong hydrocarbon odor, saturated Medium gray SAND (SW), medium to coarse sand, some subrounded to angular gravel, saturated, strong hydrocarbon odor	
20 25 30					8 11 21 18				Total depth = 16 feet	

BORING LOG

BORING NUMBER:AP-3500

CLIENT: United States Army Corps of Engineers
PROJECT NAME: Fort Richardson, Operable Unit D
PROJECT LOCATION: Building 35-752
JOB NUMBER: 9000-036
LOGGED BY: J. Winkler APPROVED BY: S. Wing
DRILLED BY: Hughes Drilling Co.
METHOD: 4.25" ID HSA
FILENAME: AP3500

BORING DEPTH (ft): 18
BORING DIAMETER (in): 6
WELL DEPTH (ft): NA
WELL DIAMETER (in): NA
REFERENCE ELEVATION (ft): 262.5
CASING STICKUP (ft): NA
FIELD PARTY: H. Kent

SCREEN LENGTH (ft): NA
SCREEN TYPE: NA
SLOT SIZE (in): NA
FILTER PACK: NA
DATE STARTED: 11-2-94
DATE COMPLETED: 11-2-94
NORTHING: 113153.19
EASTING: 125735.07

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
					1 3 4 3 3 4 3	16.4 30.9		GW	Dark brown SANDY GRAVEL (GW), fine to medium sand, medium to coarse rounded gravel, slight coarse sand and silt, very moist, no odor.	
5					3 2 2	8.0		SM	Medium brown SANDY SILT/SILTY SAND (SM), fine sand, slight gravel at top, clay at bottom, homogeneous, very moist to wet, moderate hydrocarbon (diesel?) odor	
10					4 10 11 13 14 14 7 12 17 22 10 22 25	17.5 302		GW	Medium brownish-gray SANDY GRAVEL (GW), medium to coarse sand, slight fine sand, rounded to subrounded gravel, dry to moist, no odor. same as above	
15					17 31 28 27 27 33	OR OR		SW ▽	Medium gray SAND (SW), medium to coarse sand, some subrounded to angular gravel, very moist to wet, very strong hydrocarbon odor. Medium orange-brown SAND (SW), medium to coarse sand, very moist, very strong hydrocarbon odor.	
20 25 30					25 28 31				Total depth = 18 feet	

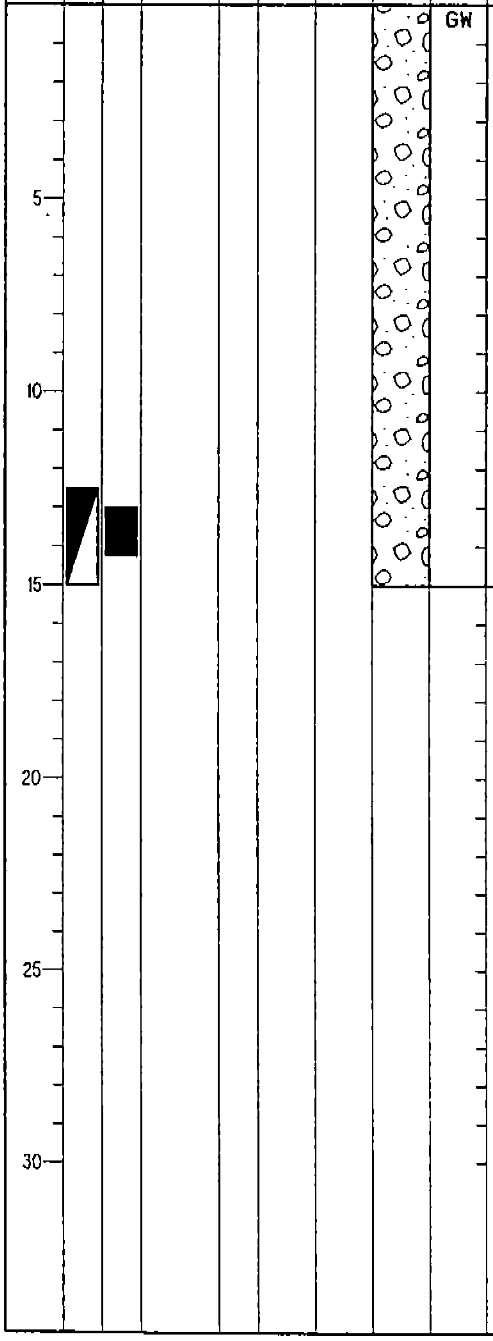
BORING LOG

BORING NUMBER:AP-3501

CLIENT: U.S. Army Corps of Engineers
PROJECT NAME: Fort Richardson, Operable Unit D
PROJECT LOCATION: Building 35-752
JOB NUMBER: 9000-036
LOGGED BY: J. Winkler APPROVED BY: S. Wing
DRILLED BY: Hughes Drilling
METHOD: 4.25" ID HSA
FILENAME: AP3501

BORING DEPTH (ft): 15
BORING DIAMETER (in): 6
WELL DEPTH (ft): NA
WELL DIAMETER (in): NA
REFERENCE ELEVATION (ft): 262.4
CASING STICKUP (ft): NA
FIELD PARTY: H. Kent

SCREEN LENGTH (ft): NA
SCREEN TYPE: NA
SLOT SIZE (in): NA
FILTER PACK: NA
DATE STARTED: 12/8/95
DATE COMPLETED: 12/8/95
NORTHING: 125620.33
EASTING: 113126.81



DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								GW	Angle boring: deviated 45 degrees from vertical, beginning at grade level. SANDY GRAVEL, dark brown to black, fine to medium sandy gravel, medium to coarse gravel, saturated at 4 ft bgs. GRAVEL, sandy to coarse, medium to dark-brown, wet, no odors.	
15									Total measured depth = 15' Approximate true vertical depth = 10.6'	

BORING LOG BORING NUMBER:AP-3502

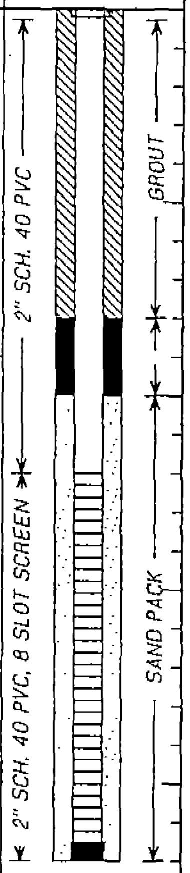
CLIENT: United States Army Corps of Engineers
PROJECT NAME: Operable Unit D
PROJECT LOCATION: Building 35-752
JOB NUMBER: 9000-036
LOGGED BY: J. Winkler APPROVED BY: S. Wing
DRILLED BY: Hughes Drilling Co.
METHOD: 4.25" ID HSA
FILENAME: B752MW-1

BORING DEPTH (ft): 22
BORING DIAMETER (in): 6
WELL DEPTH (ft): 80
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 261.3
TOP OF PVC ELEVATION (ft): 261.05
FIELD PARTY: H. Kent

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.020
FILTER PACK: 10-20 silica
DATE STARTED: 11-7-94
DATE COMPLETED: 11-7-94
NORTHING: 113150.70
EASTING: 125618.86

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
					1	9.8		SM	
					1				Dark to medium brown SILTY SAND (SM), fine sand, homomgeneous, very moist, slight natural (organic) odor.
					2				
					4	0.6			same as above
					4				
					4				
					9	0.5			same as above, grain size increasing with depth, very moist, no odor.
5					15				
					3				
					4				
					13				
					15				
					9	0.6		SW	
10					17				Medium brown SAND (SW), fine to medium with slight coarse sand, some interbedded gravel, some iron oxidation staining (orange), moist, no odor
					21				
					20	0.4			
					20				
					25				same as above
					28	2			
					22				
					6				same as above, saturated at 15'
15					24			∇	
					28				
					24				drill ahead
20									
									Total depth = 22 feet.
25									
30									

WELL DIAGRAM



BORING LOG BORING NUMBER:AP-3503

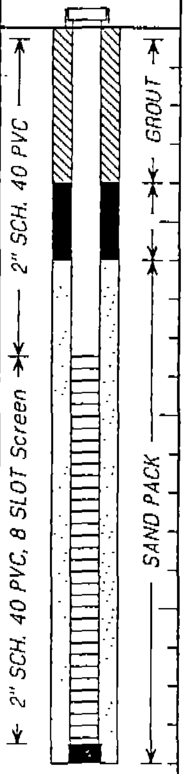
CLIENT: United States Army Corps of Engineers
PROJECT NAME: Operable Unit D
PROJECT LOCATION: Building 35-752
JOB NUMBER: 9000-036
LOGGED BY: J. Winkler APPROVED BY: S. Wing
DRILLED BY: Hughes Drilling Co.
METHOD: 4.25" ID HSA
FILENAME: B752MW-2

BORING DEPTH (ft): 19
BORING DIAMETER (in): 6
WELL DEPTH (ft): 80
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 260.9
TOP OF PVC ELEVATION (ft): 263.66
FIELD PARTY: H. Kent

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.020
FILTER PACK: 10-20 silica
DATE STARTED: 11-8-94
DATE COMPLETED: 11-8-94
NORTHING:
EASTING:

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
					2 1 2 3	2.4		GW	SANDY GRAVEL (GW), possible fill
					3 2 2 3	2.1		SM	Med. brown SANDY SILT to SILTY SAND (SM), fine to medium sand, trace coarse rounded gravel, moist, no odor.
5					3 4 3 3	2.2			same as above, sand grain size increasing with depth, very moist, no odor
					4 4 4 7	1.9		SW	Med. brown SAND (SW), fine to medium with slight coarse sand, some silt, slight gravel, very moist, no odor.
					6 9 16 23	1.9			same as above, increase in gravel (6" gravel layer @8.5').
10					7 37 30 35	1.1		▽	Med. brown SAND (SW), fine to medium sand, subangular to rounded interbedded gravel, saturated @11', no odor. drill ahead
15									
20									Total depth = 19 feet
25									
30									

WELL DIAGRAM



BORING LOG BORING NUMBER:AP-3504

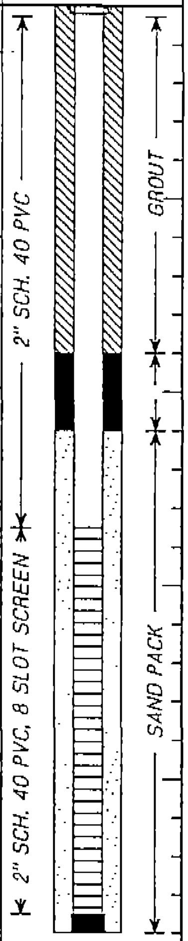
CLIENT: United States Army Corps of Engineers
PROJECT NAME: Operable Unit 2
PROJECT LOCATION: Building 35-752
JOB NUMBER: 9000-036
LOGGED BY: J. Winkler APPROVED BY: S. Wing
DRILLED BY: Hughes Drilling Co.
METHOD: 4.25" ID HSA
FILENAME: B752MW-3

BORING DEPTH (ft): 24
BORING DIAMETER (in): 6
WELL DEPTH (ft): 24
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 261.6
TOP OF PVC ELEVATION (ft): 261.54
FIELD PARTY: H. Kent

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.020
FILTER PACK: 10-20 silica
DATE STARTED: 11-7-94
DATE COMPLETED: 11-7-94
NORTHING: 113208.25
EASTING: 125603.48

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
					48 42 18	2.4		GW	SANDY GRAVEL (GW), possible FILL, bottom 1' SILTY SAND (SM)
					10			SM	Medium brown SILTY SAND (SM), fine sand, homomgeneous, soil has orange tint (possible iron oxidation staining), dry, no odor.
5					3 4 9	1.8			same as above
					10 8 14	0.9		GW	Grayish brown to medium brown SANDY GRAVEL (GW), fine to medium sand, angular to subrounded gravel, dry, no odor.
					14 20 9	0.4			same as above, with slight orange staining (iron oxidation).
10					14 18 22 8	0.4			same as above, gravel layer (4") @11.5'
					24 29 27	0.2			same as above, with fine to coarse sand, abundant orange staining (iron oxidation), dry, no odor.
15					8 16 19	0.2			same as above, coarse sand increasing with depth.
					25 16 12 21 26			▽	same as above, saturated at 16'
20									
25									Total depth = 24 feet
30									

WELL DIAGRAM



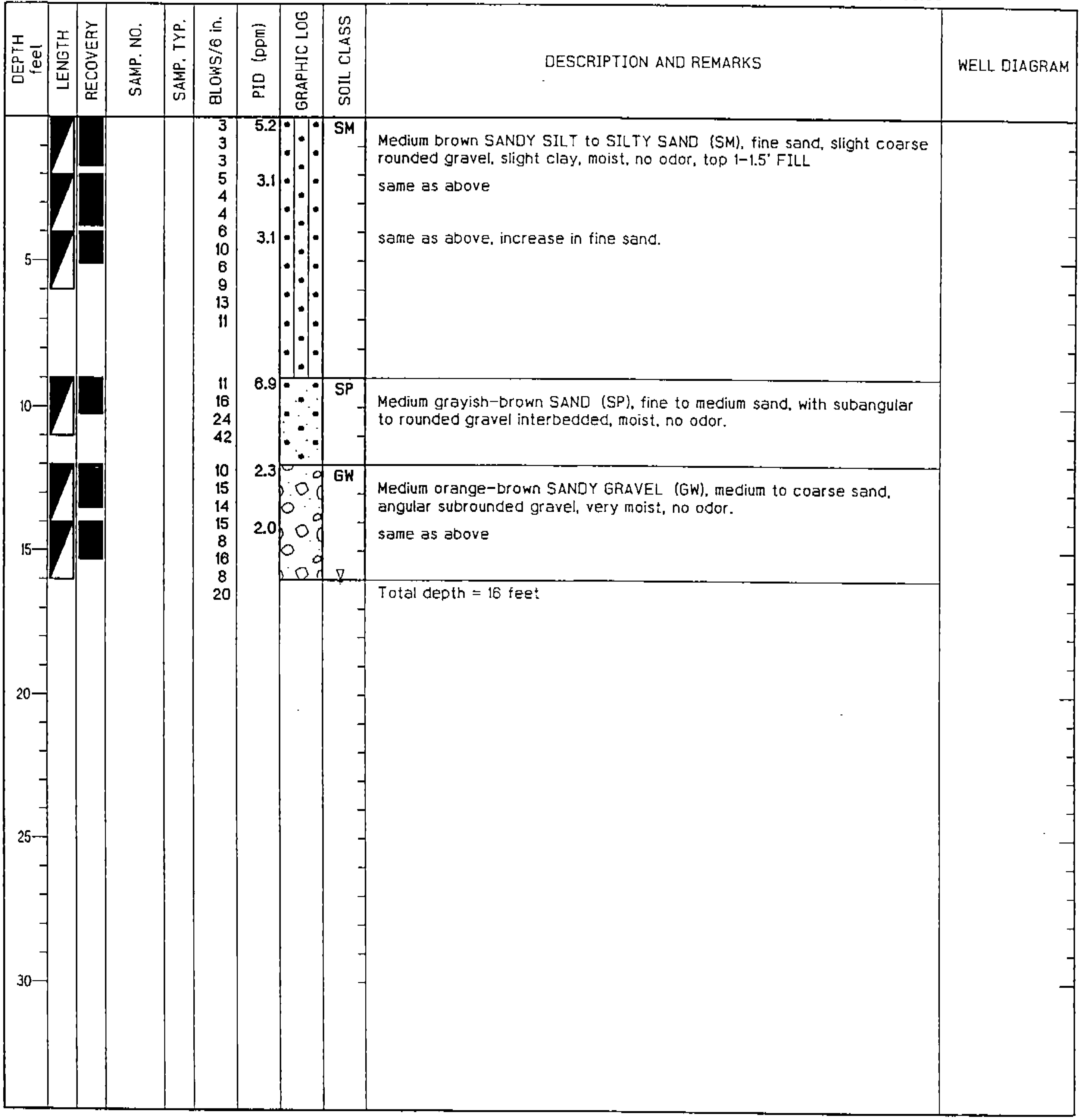
BORING LOG

BORING NUMBER:AP-3505

CLIENT: United States Army Corps of Engineers
PROJECT NAME: Fort Richardson, Operable Unit D
PROJECT LOCATION: Building 35-752
JOB NUMBER: 9000-036
LOGGED BY: J. Winkler APPROVED BY: S. Wing
DRILLED BY: Hughes Drilling Co.
METHOD: 4.25" ID HSA
FILENAME: AP3505

BORING DEPTH (ft): 16
BORING DIAMETER (in): 6
WELL DEPTH (ft): NA
WELL DIAMETER (in): NA
REFERENCE ELEVATION (ft): 262.9
CASING STICKUP (ft): NA
FIELD PARTY: H. Kent

SCREEN LENGTH (ft): NA
SCREEN TYPE: NA
SLOT SIZE (in): NA
FILTER PACK: NA
DATE STARTED: 11-3-94
DATE COMPLETED: 11-3-94
NORTHING: 113175.73
EASTING: 125783.00



DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
					3	5.2		SM	Medium brown SANDY SILT to SILTY SAND (SM), fine sand, slight coarse rounded gravel, slight clay, moist, no odor, top 1-1.5' FILL	
					3					
					3					
					5	3.1			same as above	
					4					
					4					
					6	3.1			same as above, increase in fine sand.	
5					10					
					6					
					9					
					13					
					11					
					11	6.9		SP	Medium grayish-brown SAND (SP), fine to medium sand, with subangular to rounded gravel interbedded, moist, no odor.	
10					16					
					24					
					42					
					10	2.3		GW	Medium orange-brown SANDY GRAVEL (GW), medium to coarse sand, angular subrounded gravel, very moist, no odor.	
					15					
					14					
					15	2.0			same as above	
15					8					
					16					
					8			▽		
					20				Total depth = 16 feet	
20										
25										
30										

BORING LOG

BORING NUMBER:AP-3506

CLIENT: United States Army Corps of Engineers
PROJECT NAME: Fort Richardson, Operable Unit D
PROJECT LOCATION: Building 35-752
JOB NUMBER: 9000-036
LOGGED BY: J. Winkler APPROVED BY: S. Wing
DRILLED BY: Hughes Drilling Co.
METHOD: 4.25" ID HSA
FILENAME: AP3506

BORING DEPTH (ft): 16
BORING DIAMETER (in): 6
WELL DEPTH (ft): NA
WELL DIAMETER (in): NA
REFERENCE ELEVATION (ft): 263.3
CASING STICKUP (ft): NA
FIELD PARTY: H. Kent

SCREEN LENGTH (ft): NA
SCREEN TYPE: NA
SLOT SIZE (in): NA
FILTER PACK: NA
DATE STARTED: 11-3-94
DATE COMPLETED: 11-3-94
NORTHING: 113172.32
EASTING: 125771.18

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
					2 3 4 7	5.2		SM	Medium brown SANDY SILT to SILTY SAND (SM), fine sand, slight coarse rounded gravel, slight clay, moist, no odor, top 1' FILL	
5					5 10 18 6 6 11 16	3.6 4.1		SW	Medium grayish-brown SAND (SW), fine to medium sand, with interbedded subangular to rounded gravel, moist, no odor. same as above	
10					18 9 18 15 13 9 10 10 13	3.6 3.6		GW	Medium orange-brown SANDY GRAVEL (GW), medium to coarse sand, angular subrounded gravel, very moist, no odor. same as above	
15					16 24 28 24	5.2		SW ▽	Medium gray SAND (SW), medium to coarse, no odor. Total depth = 16 feet	
20										
25										
30										

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project FT RICHARDSON, AK
UST REMEDIATION
Sheet 1 of 1

Location Coordinates
Northing 113,158 Easting 125,665

Drilling Agency XXX Corps of Engineers
☐ Other Alaska District

Hole Number Field BH-12 Permanent AP-2982	Name of Driller K. Mitchell	Weather Overcast, 60°

Type of Hole ☐ Test Pit XXX Auger Hole ☐	Depth To 0.0	Depth Drilled 24.0	Total Depth 24.0

Size and Type of Bit 12" Hollow Stem	Elevation Datum XXX MSL ☐	Type of Equipment Acker Soil Max

Number of Samples 4	Type of Samples Grab and Drive	Depth to Groundwater 16.0	Date 21 August 1990

Top of Hole Elevation 262.20	Inspector T. Reed	Chief, Soils Section J. Raychel	Chief, Geotechnical Branch D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
					3"	brown, moist, rounded gravel, coarse to fine sand
5		1	GC-GM	Silty, Clayey GRAVEL with Sand and Cobbles	4"	56%Gr 27%Sa 17%Fines F2 brown, moist, rounded gravel, coarse to fine sand, LL=22, PI=4, HNu<1 *11/14/11
10		2	GW	Well-Graded GRAVEL with Sand	3"	65%Gr 30%Sa 5%Fines S1 gray to brown, moist, subangular gravel, medium to coarse sand, HNu=0 *23/49/52
15	▽	3	GW-GM	Well-Graded GRAVEL with Silt and Sand	2"	53%Gr;38%Sa;9%Fines S1 brown to gray, wet, rounded gravel, medium to coarse sand, HNu=2.0 *14/23/29
20		4	GM	Silty GRAVEL with Sand	1½"	44%Gr 41%Sa 15%Fines F2 brown, wet, rounded gravel, medium to coarse sand, HNu=0 *16/12/14
25						Bottom of hole 24.0 Elevation 238.2 Groundwater elev. 246.2 estimated during drilling *Number of blows to drive a 2.5" I.D. split spoon sampler each 6" increment with a 300-pound hammer falling 30" Monitoring well installed (see installation log)
30						

Project FT RICHARDSON, AK
UST REMEDIATION
Hole Number AP-2982

Piezometer

U.S. Army Engineer District

INSTALLATION LOG

Drilling Agency
☐ Other Alaska District

Hole Number
Field BH-12 Permanent AP-2982

Name of Driller K. Mitchell

Weather Overcast, 60°

Type of Hole ☐ Test Pit ☒ Auger Hole

Depth To 0.0

Depth Drilled 24.0

Total Depth 24.0

Size and Type of Bit 12" Hollow Stem

Elevation Datum ☒ MSL ☐

Type of Equipment Acker Soil Max

Number of Samples 0

Type of Samples

Depth to Groundwater 16.0

Date 21 August 1990

Top of Hole Elevation 262.20

Inspector T. Reed

Chief, Soils Section J. Raychel

Chief, Geotechnical Branch D. Thomas

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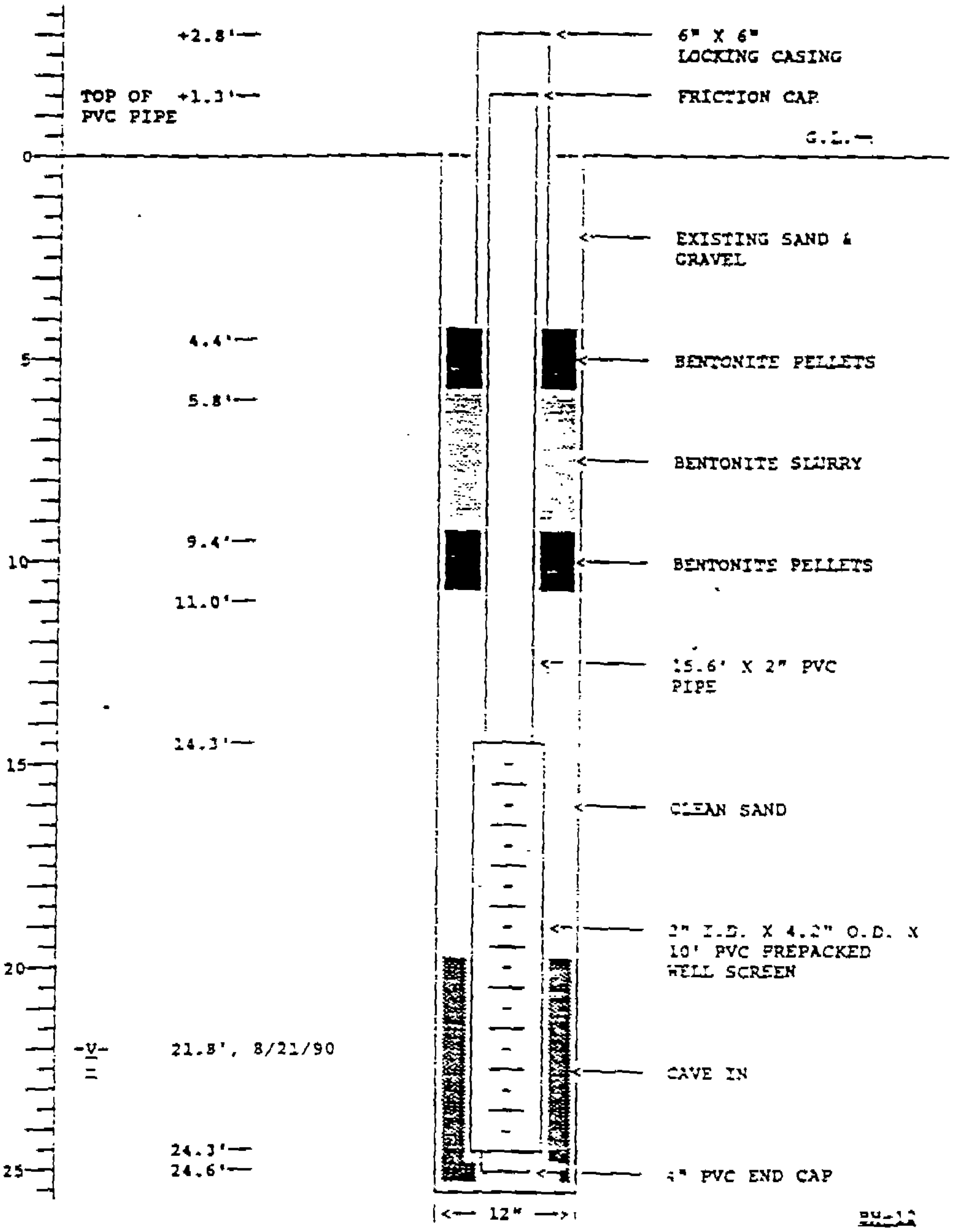


Project FT RICHARDSON, AK
UST REMEDIATION

Hole Number
AP- 2

Piezometer

AP-2984

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

UST REMEDIATION			Sheet 1 of 1
Location Coordinates	Northing 113,158	Easting 125,767	
Drilling Agency	☒ Corps of Engineers	☐ Other	Alaska District
Hole Number: Field BH-13 Permanent AP-2983	Name of Driller: K. Mitchell	Weather: Overcast, 65°	
Type of Hole: ☐ Test Pit ☒ Auger Hole ☐	Depth To: 0.0	Depth Drilled: 24.0	Total Depth: 24.0
Size and Type of Bit: 12" Hollow Stem	Elevation Datum: ☒ MSL ☐	Type of Equipment: Acker Soil Max	
Number of Samples: 4	Type of Samples: Grab and Drive	Depth to Groundwater: 17.0	Date: 21 August 1990
Top of Hole Elevation: 262.70	Inspector: T. Reed	Chief, Soils Section: J. Raychel	Chief, Geotecnnical Branch: D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
					3"	brown, moist, rounded gravel, medium to coarse sand, HNu=0
5		1	GP-GM	Poorly Graded GRAVEL with Silt, Sand, and Cobbles	3½"	70%Gr 24%Sa 6%Fines S1 brown, moist, rounded gravel, medium to coarse sand, HNu=0 *10/18/19
10		2	GP-GM	Poorly Graded GRAVEL with Silt, Sand, and Cobbles	4"	47%Gr 46%Sa 7%Fines S1 brown, moist, rounded gravel, medium to coars sand, HNu=0 *33/34/45
15		3	GW	Well-Graded GRAVEL with Sand and Cobbles	5"	61%Gr 36%Sa 3%Fines PFS brown, wet, semi-rounded gravel, medium to coarse sand, HNu=0 *11/28/39
	▽					
20		4	SP	Poorly Graded SAND with Gravel and Cobbles	5"	45%Gr 50%Sa 5%Fines NFS brown, wet, rounded gravel, fine to coarse sand, HNu=7 *19/30/24
25						Bottom of hole 24.0 Elevation 238.7 Groundwater elev. 245.7 estimated during drilling *Number of blows to drive a 2½" I.D. split spoon sampler each 6" increme with a 300-pound hammer falling 30"
30						Monitoring well installed (see installation log)

Project FT RICHARDSON, AK UST REMEDIATION	Hole Number AP-2983 Piezometer

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

INSTALLATION LOG

Project FT RICHARDSON, AK
UST REMEDIATION

Sheet 2 **of** 0

Location Coordinates
Northing 113,158 **Easting** 125,767

Drilling Agency ☒ Corps of Engineers ☐ Other Alaska District

Hole Number
Field BH-13 **Permanent** AP-2983

Name of Driller K. Mitchell

Weather Overcast, 65°

Type of Hole ☐ Test Pit ☒ Auger Hole

Depth To 0.0

Depth Drilled 24.0

Total Depth 24.0

Size and Type of Bit 12" Hollow Stem

Elevation Datum ☒ MSL ☐

Type of Equipment Acker Soil Max

Number of Samples 0

Type of Samples

Depth to Groundwater 17.0

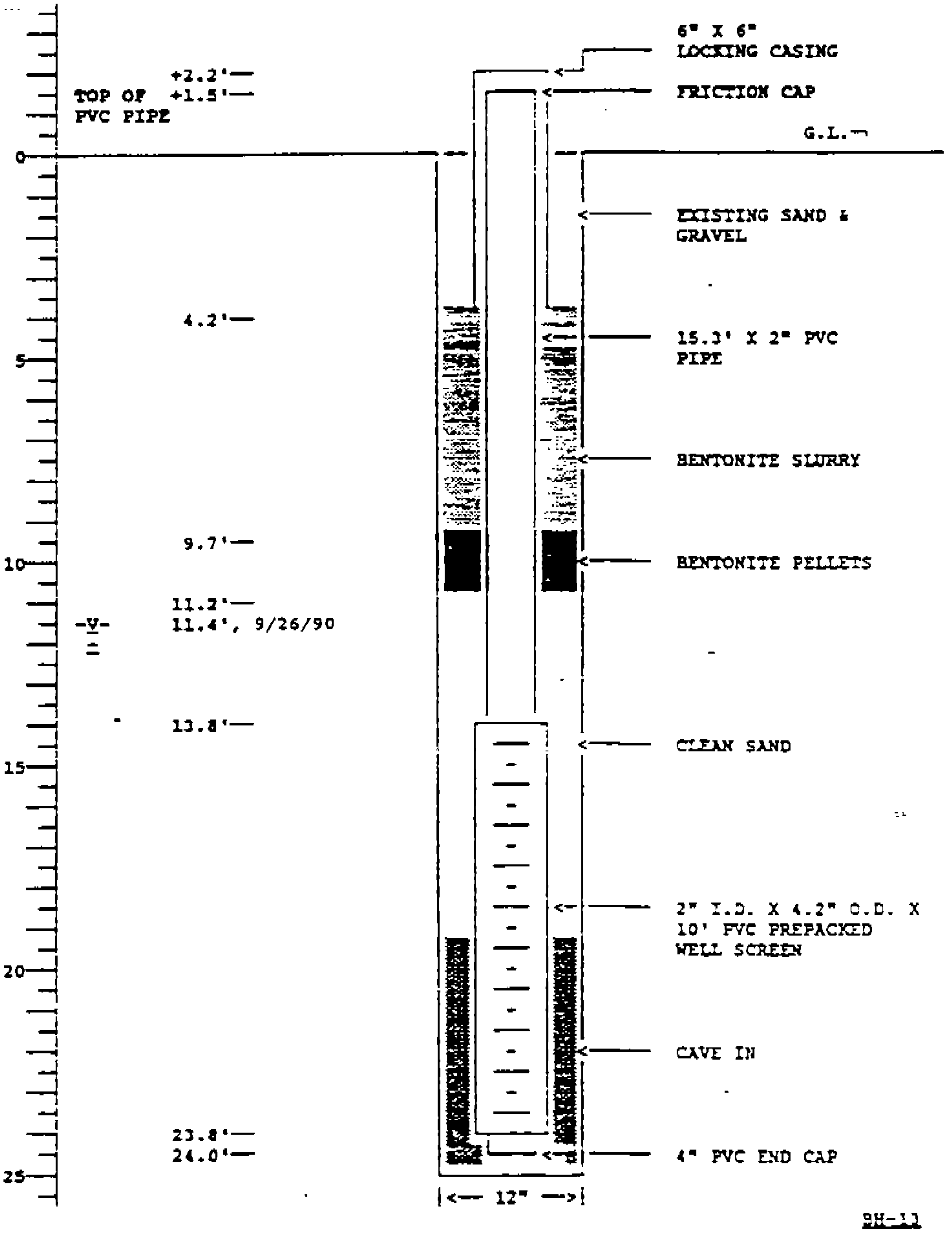
Date 22 August 1990

Top of Hole Elevation 262.70

Inspector T. Reed

Chief, Soils Section J. Raychel

Chief, Geotechnical Branch D. Thomas



Project FT RICHARDSON, AK
UST REMEDIATION

Hole Number AP-2983

Piezometer

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project FT RICHARDSON, AK
UST REMEDIATION

Sheet 1 of 1

Location Coordinates
Northing 113,118 Easting 125,767

Drilling Agency ☒ Corps of Engineers ☐ Other Alaska District

Hole Number Field BH-14 Permanent AP-2984

Name of Driller K. Mitchell

Weather Overcast, 65°

Type of Hole ☐ Test Pit ☒ Auger Hole ☐

Depth To 0.0

Depth Drilled 19.0

Total Depth 19.0

Size and Type of Bit 12" Hollow Stem

Elevation Datum ☒ MSL ☐

Type of Equipment Acker Soil Max

Number of Samples 4

Type of Samples Drive

Depth to Groundwater 14.0

Date 22 August 1990

Top of Hole Elevation 259.50

Inspector T. Reed

Chief, Soils Section J. Raychel

Chief, Geotechnical Branch D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
		1			4"	no soil sample taken, brown, moist, sandy gravel, HNu=0, Fill
5		2	ML	SILT with Sand	½"	23%Sa 77%Fines F4 brown, moist, traces of gravel, fine sand, HNu=1 *4/6/8
10		3	GW	Well-Graded GRAVEL with Sand	2½"	64%Gr 32%Sa 4%Fines S1 brown, moist, angular gravel, medium to coarse sand, HNu=0 *8/18/22
15	▽	4	GW-GM	Well-Graded GRAVEL with Silt and Sand	2"	52%Gr 37%Sa 11%Fines F1 brown, wet gravel, medium to coarse sand, HNu=0 *9/18/25
20						Bottom of hole 19.0 Elevation 240.5 Groundwater elev. 245.5 estimated during drilling *Number of blows to drive a 2.5" I.D. split spoon sampler each 6" increment with a 300-pound hammer falling 30" Monitoring well installed (see installation log)
25						
30						

Project FT RICHARDSON, AK

Hole Number AP-2984

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

INSTALLATION LOG

UST REMEDIATION

Location Coordinates
Northing 11,311 Easting 125,767

Drilling Agency
XXX Corps of Engineers
Other Alaska District

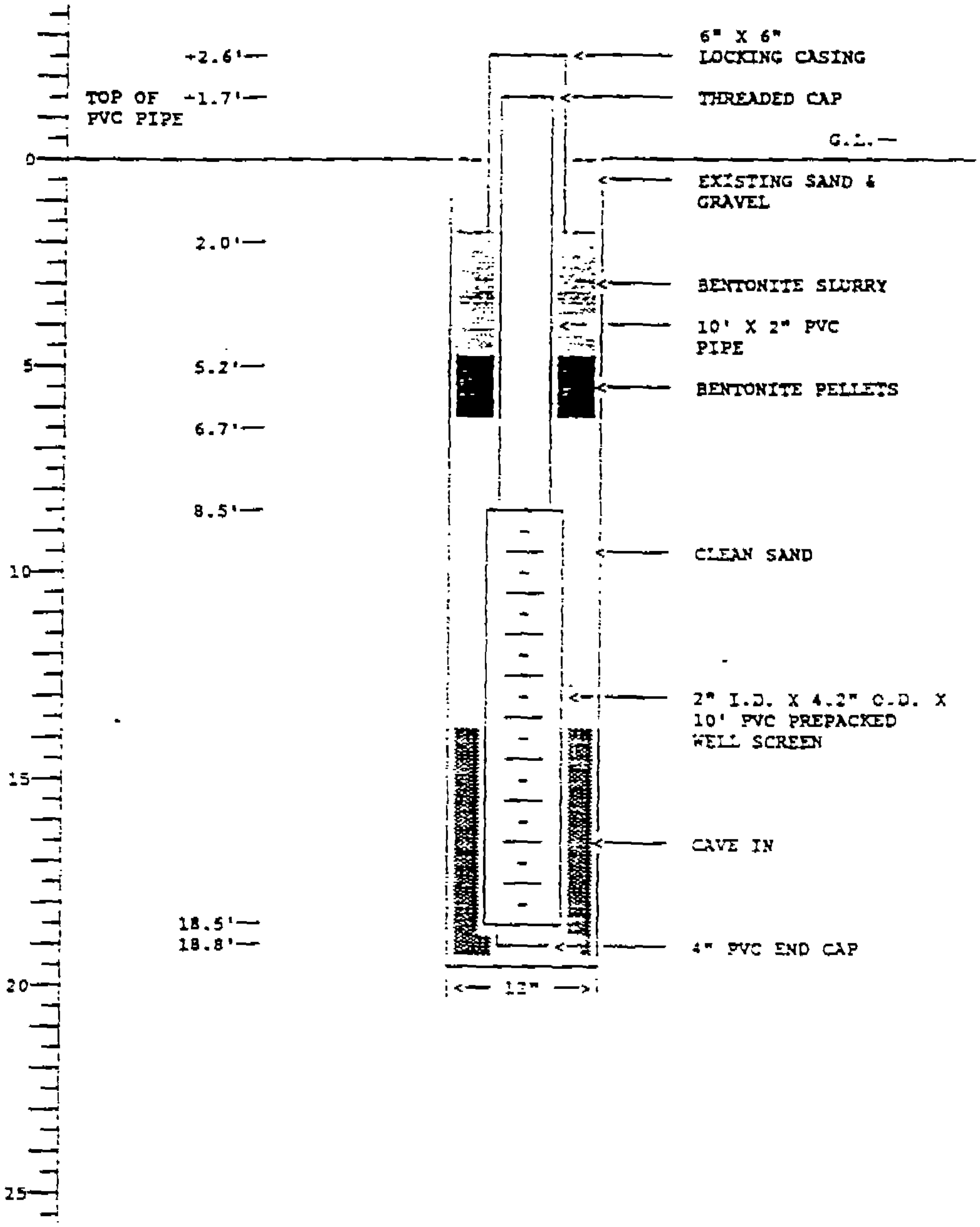
Hole Number Field BH-14 Permanent AP-2984	Name of Driller K. Mitchell	Weather Overcast, 65°

Type of Hole ☐ Test Pit ☒ Auger Hole	Depth To 0.0	Depth Drilled 19.0	Total Depth 19.0

Size and Type of Bit 12" Hollow Stem	Elevation Datum XXX MSL	Type of Equipment Acker Soil Max

Number of Samples 0	Type of Samples	Depth to Groundwater 14.0	Date 22 August 1990

Top of Hole Elevation 259.50	Inspector T. Reed	Chief, Soils Section J. Raychel	Chief, Geotechnical Branch D. Thomas



BH-14

Project FT RICHARDSON, AK
UST REMEDIATION

Hole Number
AP-2984
Piezometer

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

UST REMEDIATION Sheet 1 of 1

Location Coordinates
Northing 113,086 Easting 125,718

Drilling Agency XXX Corps of Engineers
☐ Other Alaska District

Hole Number
Field BH-15 Permanent AP-2985

Name of Driller K. Mitchell

Weather Light rain, 65°

Type of Hole ☐ Test Pit XXX Auger Hole

Depth To 0.0

Depth Drilled 14.0

Total Depth 14.0

Size and Type of Bit 12" Hollow Stem

Elevation Datum XXX MSL ☐

Type of Equipment Acker Soil Max

Number of Samples 2

Type of Samples Drive

Depth to Groundwater 10.5

Date 23 August 1990

Top of Hole Elevation 257.20

Inspector T. Reed

Chief, Soils Section J. Raychel

Chief, Geotechnical Branch D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
						brown, moist silt with gravel, HNu=0 at 2' depth
5		1	GW	Well-Graded GRAVEL with Sand	3"	65%Gr 30%Sa 5%Fines PFS brown to gray, moist, rounded gravel, medium to coarse sand, HNu=0 *6/26/34
10	▽	2	SP	Poorly Graded SAND with Gravel and Cobbles	4"	33%Gr 62%Sa 5%Fines S2 brown to gray, wet, subrounded gravel, medi to coarse sand, HNu=0 *12/37/37
15						Bottom of hole 14.0 Elevation 243.2 Groundwater elev. 246.7 estimated during drilling *Number of blows to drive a 2½" I.D. split spoon sampler each 6" increment with a 300-pound hammer falling 30" Monitoring well installed (see installation well)
20						
25						
30						

Project FT RICHARDSON, AK
UST REMEDIATION

Hole Number AP-2985 -Piezometer

DEPARTMENT OF THE ARMY
North Pacific Division
U.S. Army Engineer District Alaska

INSTALLATION LOG

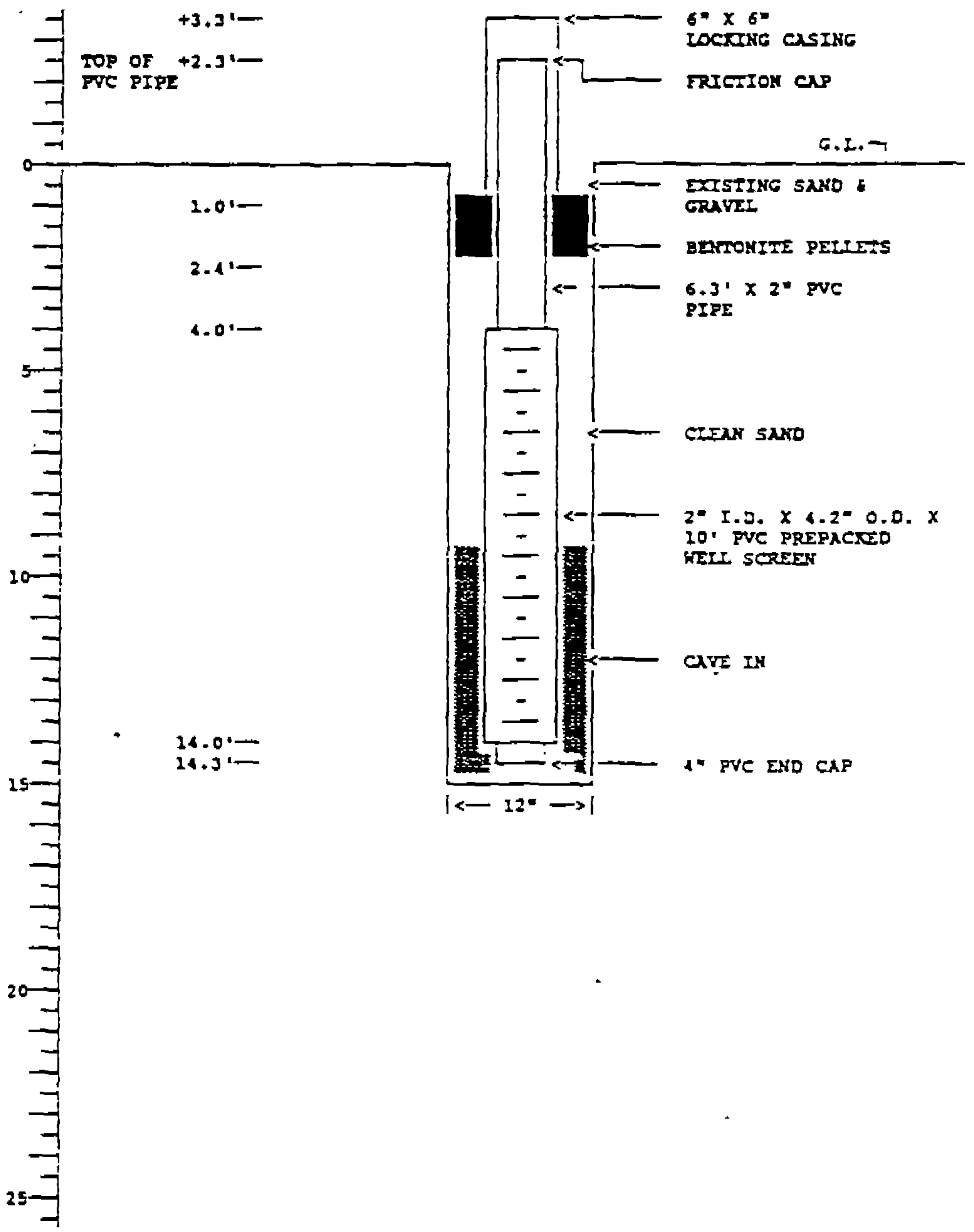
UST REMEDIATION

Location Coordinates
Northing 113,086 Easting 125,718

Drilling Agency ☒ Corps of Engineers
☐ Other Alaska District

Hole Number Field BH-15 Permanent AP-2985		Name of Driller K. Mitchell	Weather Light rain, 65°	
Type of Hole ☐ Test Pit ☒ Auger Hole ☐		Depth To 0.0	Depth Drilled 14.0	Total Depth 14.0
Size and Type of Bit 12" Hollow Stem	Elevation Datum ☒ MSL ☐		Type of Equipment Acker Soil Max	
Number of Samples 0	Type of Samples	Depth to Groundwater 10.5	Date 23 August 1990	
Top of Hole Elevation 257.20	Inspector T. Reed	Chief, Soils Section J. Raychel	Chief, Geotechnical Branch D. Thomas	

OUD 0025793



BH-15

Project FT RICHARDSON, AK UST REMEDIATION	Hole Number AP-2985

Piezometer

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project FT RICHARDSON, AK UST REMEDIATION
Sheet 1 of 1

Location Coordinates
Northing 113,113 Easting 125,715

Drilling Agency ☒ Corps of Engineer
☐ Other Alaska District

Hole Number
Field BH-16 Permanent AP-2986

Name of Driller K. Mitchell

Weather Overcast, 60°

Type of Hole ☐ Test Pit ☒ Auger Hole

Depth To 0.0
Depth Drilled 19.0
Total Depth 19.0

Size and Type of Bit 12" Hollow Stem

Elevation Datum ☒ MSL ☐

Type of Equipment Acker Soil Max

Number of Samples 3

Type of Samples Drive

Depth to Groundwater 14.0

Date 23 August 1990

Top of Hole Elevation 259.20

Inspector T. Reed

Chief, Soils Section J. Raychel

Chief, Geotechnical Branch D. Thomas

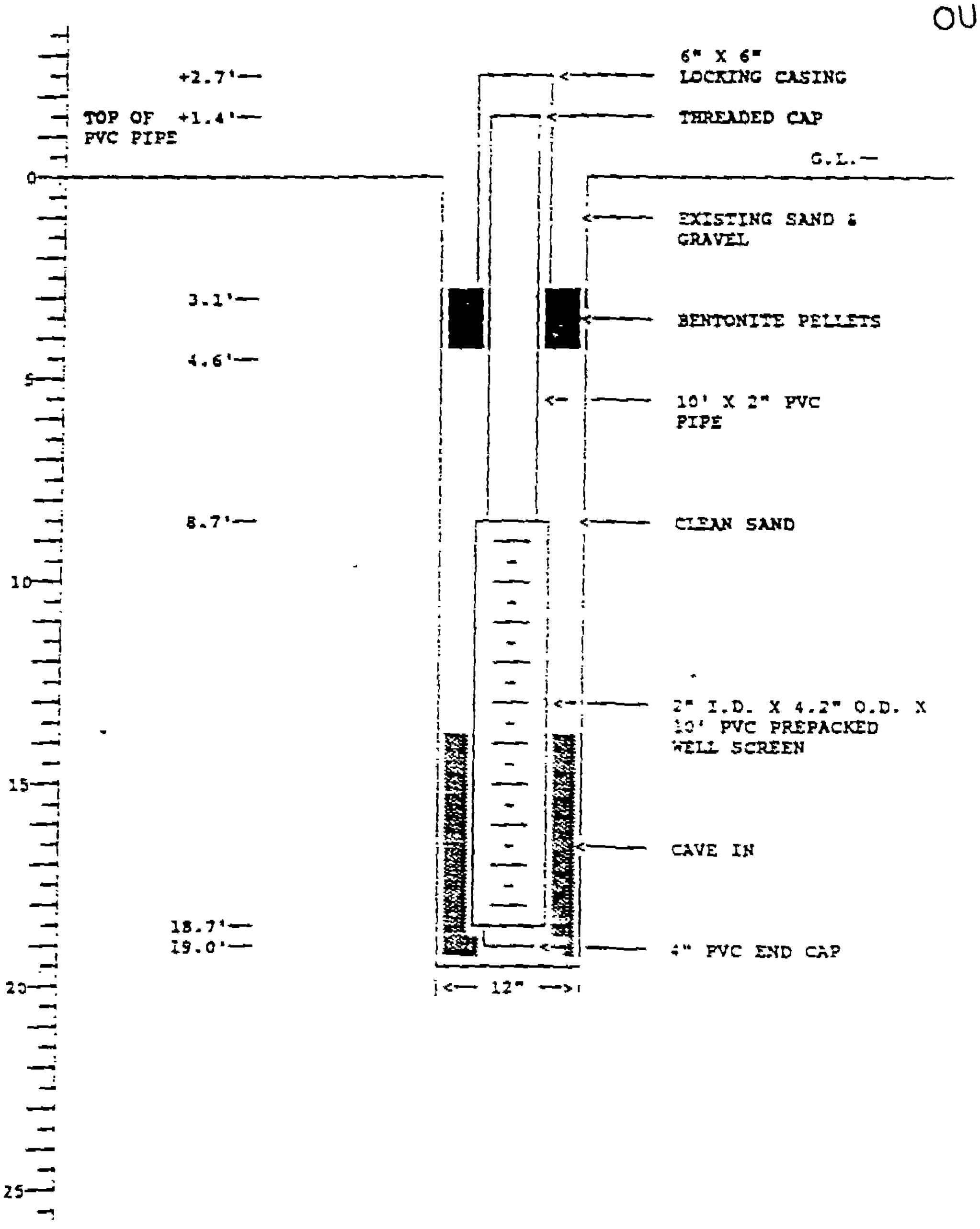
Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
					4"	brown, moist, rounded sandy gravel, medium to coarse sand with cobbles, HNu=0, Fill
5		1	GW	Well-Graded GRAVEL with Sand and Cobbles	4"	75%Gr 23%Sa 2%Fines NFS brown, moist, angular gravel, medium to coarse sand, HNu=0, may be Fill *9/30/21
10		2	GW	Well-Graded GRAVEL with Sand	3"	61%Gr 34%Sa 5%Fines S1 brown to gray, wet, rounded gravel, medium to coarse sand, strong petro odor, HNu=200 *13/27/32
15	▽	3	GW-GM	Well-Graded GRAVEL with Silt and Sand	2"	51%Gr 43%Sa 6%Fines S1 brown to gray, wet, angular gravel, medium to coarse sand, HNu=0 *19/22/22
20						Bottom of hole 19.0 Elevation 240.2 Groundwater elev. 245.2 estimated during drilling *Number of blows to drive a 2.5" I.D. split spoon sampler each 6" increment with a 300-pound hammer falling 30" Monitoring well installed (see installation log)
25						
30						

Project FT RICHARDSON, AK UST REMEDIATION
Hole Number AP-2986

North Pacific Division
U.S. Army Engineer District Alaska

INSTALLATION LOG

Location Coordinates Northing 113,113	Easting 125,715		
Drilling Agency	☒ Corps of Engineers ☐ Other Alaska District		
Hole Number Field BH-16 Permanent AP-2986	Name of Driller K. Mitchell	Weather Overcast, 60°	
Type of Hole ☐ Test Pit ☒ Auger Hole	Depth To 0.0	Depth Drilled 19.0	Total Depth 19.0
Size and Type of Bit 12" Hollow Stem	Elevation Datum ☒ MSL ☐	Type of Equipment Acker Soil Max	
Number of Samples 0	Type of Samples	Depth to Groundwater 14.0	Date 23 August 1990
Top of Hole Elevation 259.20	Inspector T. Reed	Chief, Soils Section J. Raychel	Chief, Geotechnical Branch D. Thomas



BH-16

Project FT RICHARDSON, AK UST REMEDIATION	Hole Number AP-2986

Piezometer

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Projec

UST REMEDIATION

Sheet 1 Of

Location Coordinates
Northing 113,123 Easting 125,664

Drilling Agency ☒ Corps of Engineers
☐ Other Alaska District

Hole Number
Field BH-17 Permanent AP-2987

Name of Driller K. Mitchell

Weather Overcast, 60°

Type of Hole ☐ Test Pit ☒ Auger Hole ☐

Depth To 0.0

Depth Drilled 19.0

Total Depth 19.0

Size and Type of Bit 12" Hollow Stem

Elevation Datum ☒ MSL ☐

Type of Equipment Acker Soil Max

Number of Samples 3

Type of Samples Grab and Drive

Depth to Groundwater 13.5

Date 24 August 1990

Top of Hole Elevation 260.10

Inspector T. Reed

Chief, Soils Section J. Raychel

Chief, Geotecnnical Branch D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
					4"	brown, moist, rounded sandy gravel w/ cobbles, medium to coarse sand, HNu=0 at 2' depth, Fill
5		1	GP-GM	Poorly Graded GRAVEL with Silt, Sand, and Cobbles	5"	69%Gr 23%Sa 8%Fines S1 brown, moist, subangular gravel, fine to medium Sand, HNu=0 *32/60 for 4"
10		2	GW	Well-Graded GRAVEL with Sand	3"	66%Gr 29%Sa 5%Fines S1 gray, wet, subrounded gravel, medium to coar Sand, HNu=0 *13/23/20
15	▽	3	SP	Poorly Graded SAND with Gravel and Cobbles	6"	43%Gr 53%Sa 4%Fines NFS gray, wet, rounded gravel, medium to coarse Sand, HNu=0 *12/25/59
20						Bottom of hole 19.0 Elevation 241.1 Groundwater elev. 246.6 estimated during drilling *Number of blows to drive a 2½" I.D. split spoon sampler each 6" increment with a 300-pound hammer falling 30" Monitoring well installed (see installation log)
25						
30						

Project FT RICHARDSON, AK
UST REMEDIATION

Hole Number AP-2987
Piezometer

Piezometer

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

INSTALLATION LOG

Project FT RICHARDSON, AK
UST REMEDIATION

Sheet 2 of 0

Location Coordinates
Northing 113,123 Easting 125,664

Drilling Agency ☒ Corps of Engineers
☐ Other Alaska District

Hole Number
Field BH-17 Permanent AP-2987

Name of Driller K. Mitchell

Weather Overcast, 60°

Type of Hole ☐ Test Pit ☒ Auger Hole ☐

Depth To 0.0

Depth Drilled 19.0

Total Depth 19.0

Size and Type of Bit 12" Hollow Stem

Elevation Datum ☒ MSL ☐

Type of Equipment Acker Soil Max

Number of Samples 0

Type of Samples

Depth to Groundwater 13.5

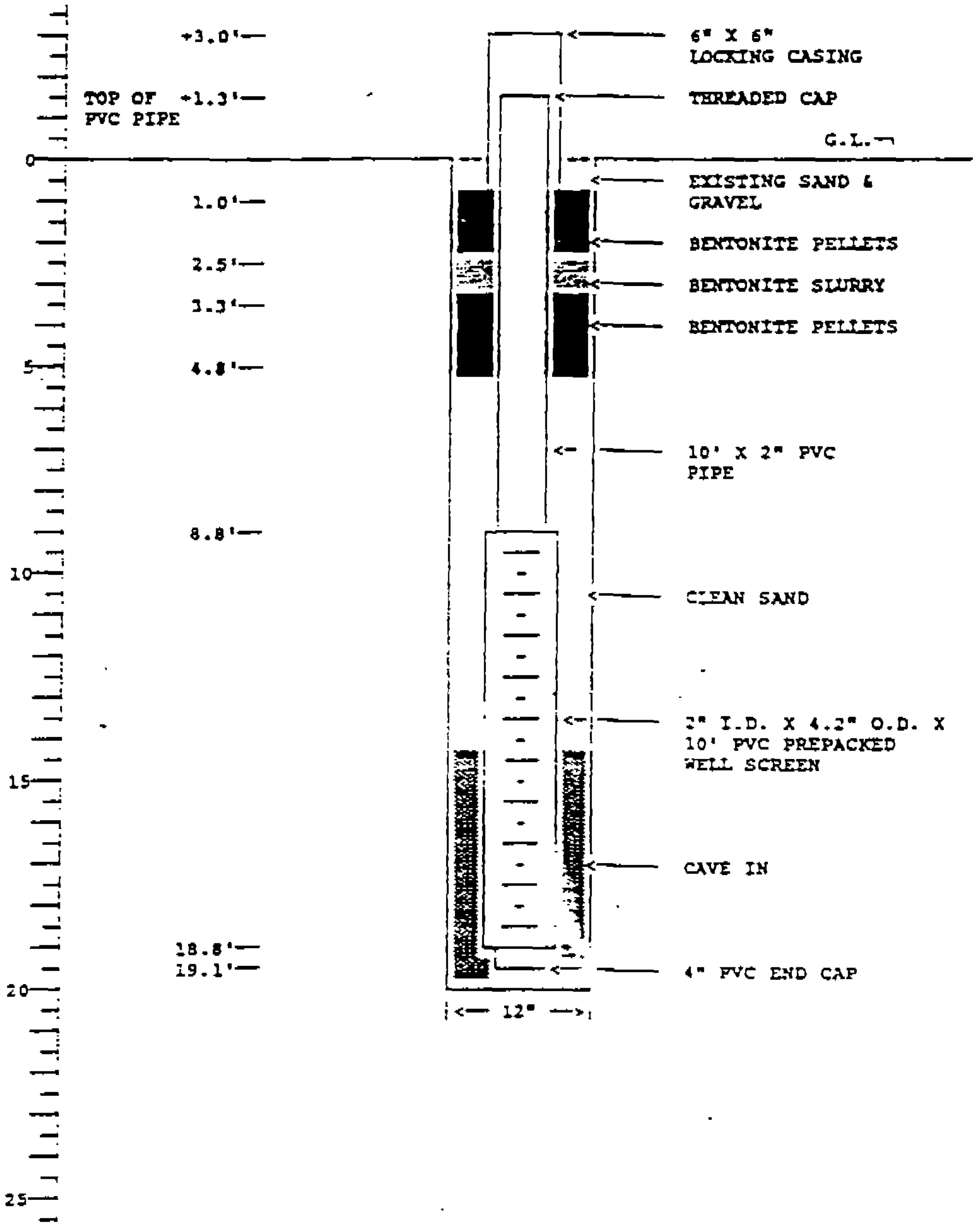
Date 243 August 1990

Top of Hole Elevation 260.10

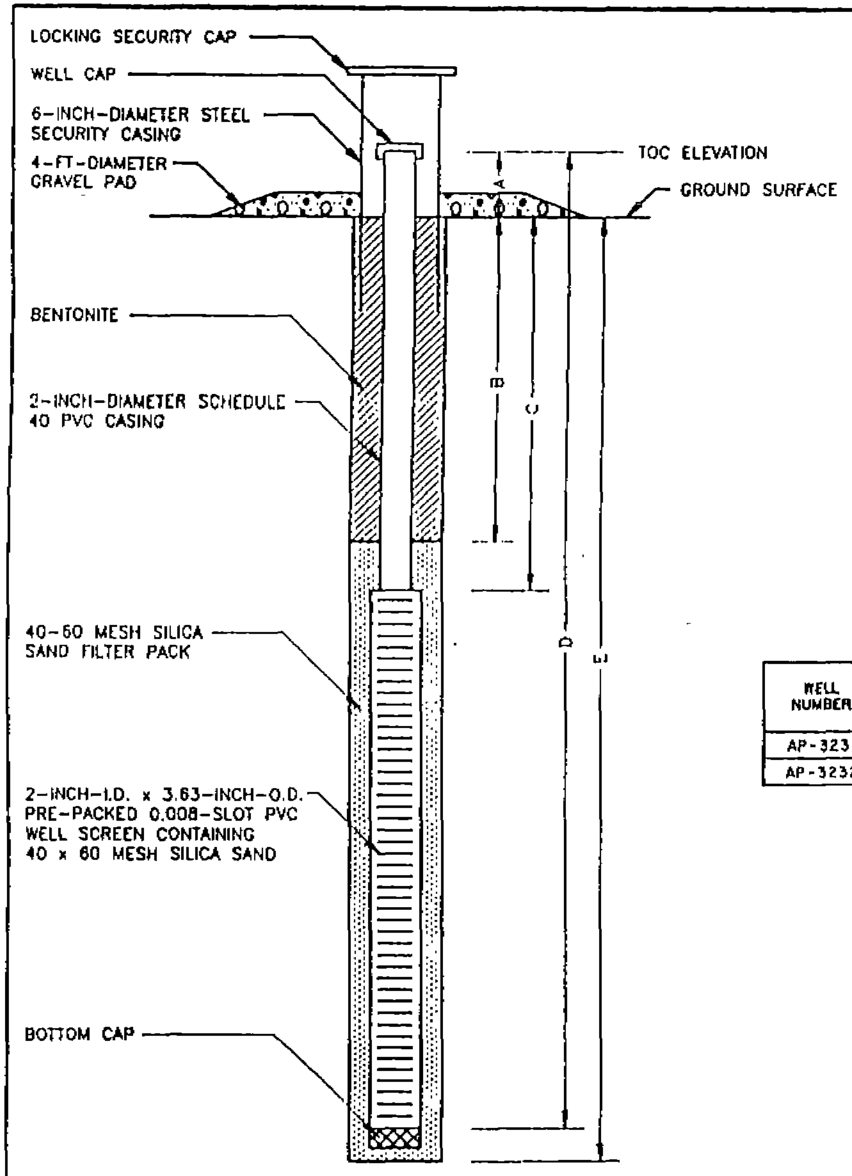
Inspector T. Reed

Chief, Soils Section J. Raychel

Chief, Geotechnical Branch D. Thomas



BH-17



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

NOT TO SCALE

Harding Lawson Associates
Engineering and
Environmental Services

Monitoring Well Completion Details

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

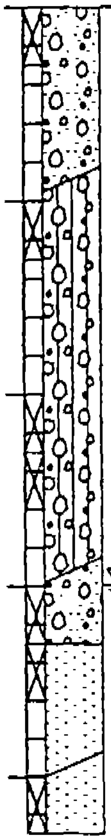
PLATE 4

DRAWN	PROJECT NUMBER	APPROVED	DATE	FILE NAME
DC	24212	KKG	10/93	0247j

LOG OF BORING AP-3227

Drilling Co. S P Enterprises Driller R. Wagster
Field Engineer J. Mitchell Drill Rig Mobile B-61
Elevation (ft) 260.70 Date Drilled 8/23/93
Northing (ft) 113133.40 Easting (ft) 125742.84

Sampling Method	Blows/ Foot*	Moisture Content (%)	PSA -200 (%)	Atterberg Limits	Headspace VOC (ppm)	Sample Number**	Depth (ft)
SS	11						0
SS	14				>70	001SL	5
SS	18	8.8	20.8	NP	120	002SL	10
SS	46						
SS	68				70	003SL	15
SS	64				6		
SS	57				8		20



SANDY GRAVEL (GP)
loose, dry, brown
gravel to 3-inch diameter

SILTY SAND WITH GRAVEL (SM)
loose, moist, brown to gray
gravel to 2-inch diameter

Fill

medium dense

∇ water level during drilling

SANDY GRAVEL (GP)
dense, wet, gray
fuel odor noted in sample

SAND (SP)
dense, wet, brown
fuel odor noted in sample

GRAVELLY SAND (SP)
dense, wet, brown to gray

boring backfilled with bentonite

Notes: * Blow counts obtained by driving a 4-inch O.D. split-spoon sampler 18 inches with a 300-pound hammer falling 30 inches. The blow count is the number of blows required to advance the sampler the final 12 inches unless otherwise noted.

** The prefix 93RTS has been omitted for brevity. QA/QC duplicate samples in italics

Harding Lawson Associates
Engineering and
Environmental Services

Log of Boring AP-3227

DRAFT

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

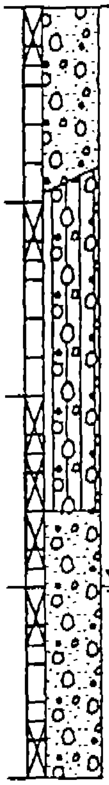
PLATE C1

DRAWN	PROJECT NUMBER	APPROVED	DATE	FILE NAME
DC	24212		11/93	118d

LOG OF BORING AP-3228

Drilling Co. S P Enterprises Driller R. Wagster
Field Engineer J. Mitchell Drill Rig Mobile B-61
Elevation (ft) 261.56 Date Drilled 8/24/93
Northing (ft) 113138.88 Easting (ft) 125693.63

Sampling Method	Blows/Foot*	Moisture Content (%)	PSA -200(%)	Atterberg Limits	Headspace VOC (ppm)	Sample Number**	Depth (ft)	
SS	12				2		0	SANDY GRAVEL (GP) loose, moist, brown
SS	54				65	004SL	5	SILTY GRAVEL (GM) medium dense, moist, brown to gray gravel to 3-inch diameter
SS	14				10		10	
SS	58				550			dense
SS	155				1000			GRAVEL WITH SILT AND SAND (GP-GM) very dense, moist to wet, gray
SS	97				250	005SL *006SL* *007SL*	15	▽ water level during drilling
SS	132	5.6	7.6	NP		008SL		brown
							20	boring backfilled with bentonite



Fill

Notes: * Blow counts obtained by driving a 4-inch O.D. split-spoon sampler 18 inches with a 300-pound hammer falling 30 inches. The blow count is the number of blows required to advance the sampler the final 12 inches unless otherwise noted.
** The prefix 93RTS has been omitted for brevity. QA/QC duplicate samples in italics

Harding Lawson Associates
Engineering and
Environmental Services

Log of Boring AP-3228

DRAFT

PLATE
C2

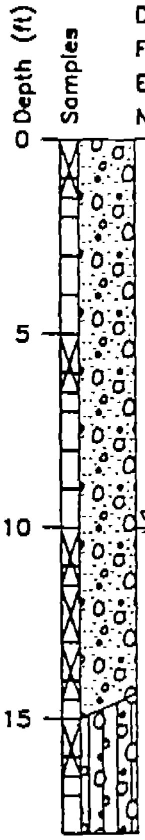
Site Assessment/Remedial Investigation and Corrective Action Plan
Fort Richardson, Alaska

DRAWN	PROJECT NUMBER	APPROVED	DATE	FILE NAME
DC	24212	AAG	11/93	118d

LOG OF BORING AP-3230

Drilling Co. S P Enterprises Driller R. Wagster
Field Engineer J. Mitchell Drill Rig Mobile B-61
Elevation (ft) 257.90 Date Drilled 8/26/93
Northing (ft) 113104.04 Easting (ft) 125743.11

Sampling Method	Blows/ Foot *	Moisture Content (%)	PSA -200 (%)	Atterberg Limits	Headspace VOC (ppm)	Sample Number **	Depth (ft)
SS	17				0		0
SS	84				0	020SL	5
SS	62				66		10
SS	85				0		
SS	61	6.1	5.2	NP		021SL *022SL* *023SL*	
SS	59				8	024SL	15



GRAVEL WITH SILT AND SAND (GW-GM)
loose, moist to wet, brown
gravel to 1.5-inch diameter
organics noted in sample

dense

∇ water level during drilling

SILTY GRAVEL (GM)
dense, wet, brown

boring backfilled with bentonite

Notes: * Blow counts obtained by driving a 4-inch O.D. split-spoon sampler 18 inches with a 300-pound hammer falling 30 inches. The blow count is the number of blows required to advance the sampler the final 12 inches unless otherwise noted.

** The prefix 93RTS has been omitted for brevity. QA/QC duplicate samples in italics

Harding Lawson Associates
Engineering and
Environmental Services

Log of Boring AP-3230

DRAFT

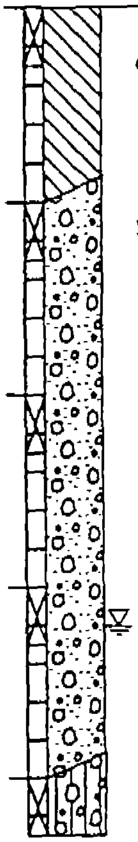
PLATE C4

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

DRAWN	PROJECT NUMBER	APPROVED	DATE	FILE NAME
DC	24212		11/93	118d

LOG OF BORING AP-3231

Drilling Co. S P Enterprises Driller R. Wagster
Field Engineer J. Mitchell Drill Rig Mobile B-61
Elevation (ft) 262.75 Date Drilled 8/26/93
Northing (ft) 113231.42 Easting (ft) 125746.40



Sampling Method	Blows/ Foot *	Moisture Content (%)	PSA -200 (%)	Atterberg Limits	Headspace VOC (ppm)	Sample Number **	Depth (ft)	
SS	16				6		0	GRAVELLY SILT (ML) loose, moist, brown organics noted in sample
SS	40						5	SANDY GRAVEL (GP) medium dense, moist to wet, brown
SS	61				2	017SL	10	dense gravel to 3-inch diameter
SS	51				2	018SL	15	medium dense water level during drilling
SS	43	8.1	20.3	NP	2	019SL	20	SILTY GRAVEL WITH SAND (GM) medium dense, wet, brown monitoring well installed

Notes: * Blow counts obtained by driving a 4-inch O.D. split-spoon sampler 18 inches with a 300-pound hammer falling 30 inches. The blow count is the number of blows required to advance the sampler the final 12 inches unless otherwise noted.

** The prefix 93RST has been omitted for brevity. QA/QC duplicate samples in italics

Harding Lawson Associates
Engineering and
Environmental Services

Log of Boring AP-3231

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

DRAFT

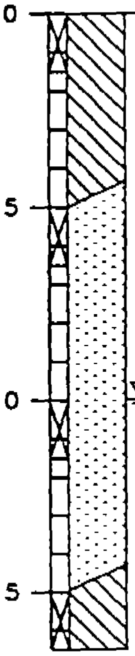
PLATE
C5

DRAWN	PROJECT NUMBER	APPROVED	DATE	FILE NAME
DC	24212		11/93	118d

LOG OF BORING AP-3232

Drilling Co. S P Enterprises Driller R. Woaster
Field Engineer J. Mitchell Drill Rig Mobile B-61
Elevation (ft) 257.37 Date Drilled 8/25/93
Northing (ft) 113059.72 Easting (ft) 125661.57

Sampling Method	Blows/Foot *	Moisture Content (%)	PSA -200 (%)	Atterberg Limits	Headspace VOC (ppm)	Sample Number **	Depth (ft)
SS	18				4		0
SS	43				4	014SL	5
SS	88	8.9	3.3	NP	4	015SL	10
SS	38					016SL	15



SILT (ML)
loose, dry, brown
organics noted in sample

SAND WITH GRAVEL (SP)
medium dense, moist to wet, brown
gravel to 1.5-inch diameter

▽ water level during drilling
dense

GRAVELLY SILT (ML)
medium dense, wet, brown

monitoring well installed

Notes: * Blow counts obtained by driving a 4-inch O.D. split-spoon sampler 18 inches with a 300-pound hammer falling 30 inches. The blow count is the number of blows required to advance the sampler the final 12 inches unless otherwise noted.

** The prefix 93RTS has been omitted for brevity. QA/QC duplicate samples in italics

Harding Lawson Associates
Engineering and
Environmental Services

Log of Boring AP-3232

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

DRAFT

PLATE C6

DRAWN	PROJECT NUMBER	APPROVED	DATE	FILE NAME
DC	24212	AH	11/93	118d

ENSR Consulting and Engineering

Monitoring Well Development Record

Job No.: 9000-036 Job Site: AR 0U0 B35752 Date: 12-19-94 Beginning Time:

Well No.: MW 1 Well Location: EAST SIDE OF POND Developers: H. KENT, W. WILBER

Likely Contaminants: HERBICIDES, PESTICIDES, OIL, GREASE, SOLVENTS

Development Method: DISPOSABLE HAND BAILER

Well I.D. (in./ft) 2" / 0.167' = d_w

Screen Interval (ft)

Predevelopment Volume (gal) = (V)

Depth to Water (ft) 16.55'

Saturated Interval (ft) 5.69' = b

Water Added During Drilling/ Installation (gal) = v_1

Aquifer Lithology

Casing Volume (gal) $V_2 = .124\ ft^3 = .93$ gal

= $v_2 = \pi (0.5\ d_w)^2\ b$

Estimated Hydraulic Conductivity (gal/(day x ft^2))

Annular Volume (gal) $V = 3(.93$ gal$) = 2.8$

= $v_3 = 0.35\ [(\pi\ (0.5d_b)^2\ b - v_2)]$

Notes:
$V = v_1 + 6\ (v_2 + v_3)$
7.48 gal = 1 ft^3
0.35 = porosity of filter pack

Borehole Diameter (in./ft) / = d_b

Production Rate (gal/min)	Cumulative Volume (gal)	pH	Conductivity (µmhos)	T (°C)	Silt (ml/l)	Color/Odor
	.5 gal					CLEAR
	.9 gal					SLIGHTY CLOUDY
			BAILED DRY			

Signature

Date

Disposition of Development Water

ENSR

ENSR Consulting and Engineering

Monitoring Well Development Record

Job No.: 9000-036 Job Site: FTR OUD B35-752 Date: 12-20-94 Beginning Time:

Well No.: MW 1 Well Location: EAST SIDE OF POND Developers: H. Kent, W. Wilber

Likely Contaminants:

Development Method: HAND BAILER

Well I.D. (in./ft) / 0.167' = d_w

Screen Interval (ft)

Predevelopment Volume (gal) = (V)

Depth to Water (ft) 16.68'

Saturated Interval (ft) 5.48' = b

Water Added During Drilling/ Installation (gal) = v_1

Ac Lithology

Casing Volume (gal) $V_2 = 2.69$ gAL

$= v_2 = \pi (0.5\, d_w)^2\, b$

Estimated Hydraulic Conductivity (gal/(day x ft^2))

Annular Volume (gal)

$= v_3 = 0.35\, [(\pi\, (0.5 d_b)^2\, b - v_2)]$

Notes:

$V = v_1 + 6\, (v_2 + v_3)$

7.48 gal = 1 ft^3

0.35 = porosity of filter pack

Borehole Diameter (in./ft) / = d_b

Production Rate (gal/min)	Cumulative Volume (gal)	pH	Conductivity (µmhos)	T (°C)	Silt (ml/l)	Color/Odor
	.8 gAL		Dry			CLEAR/NONE
	~~[illegible]~~ 1.3 gAL		Dry			CLOUDY/NONE
	2.05 gAL	~~[illegible]~~ 7.22	Dry 268	5.8		
		6.89	269	5.6		
		7.16	267	5.6		

Signature

Date

Disposition of Development Water

ENSR

ENSR Consulting and Engineering

Monitoring Well Development Record

Job No.: 9000-036 Job Site: AR OUD B35-752 Date: 12·19·94 Beginning Time: 10:40

Well No.: MW2 Well Location: BUILDING 35-752 Developers: H. KENT, W. WILBER

Likely Contaminants: HERBICIDES PESTICIDES, OIL GREASE SOLVENTS

Development Method: HAND BAILER

Well I.D. (in./ft) 8" / 0.167' = d_w

Screen Interval (ft)

Predevelopment Volume (gal) = (V)

Depth to Water (ft) 17.78'

Saturated Interval (ft) 4.42' = b

Water Added During Drilling/Installation (gal) 0 = v_1

Aquifer Lithology

Casing Volume (gal) V_2 = 0.968 ft³ = .724 GA

= $v_2 = \pi (0.5\ d_w)^2\ b$

Estimated Hydraulic Conductivity (gal/(day x ft²))

Annular Volume (gal) V = 3(.724)

= $v_3 = 0.35\ [(\pi\ (0.5d_b)^2\ b - v_2)]$

Notes:

$V = v_1 + 6\ (v_2 + v_3)$

7.48 gal = 1 ft³

0.35 = porosity of filter pack

Borehole Diameter (in./ft) 8" / .667' = d_b

Production Rate (gal/min)	Cumulative Volume (gal)	pH	Conductivity (µmhos)	T (°C)	Silt (ml/l)	Color/Odor
	.8		BAILED DRY			

Signature

Date

Disposition of Development Water

ENSR

ENSR Consulting and Engineering

Monitoring Well Development Record

No.: 9000-036 Job Site: FTR BLDG 35752 Date: 12-9-94 Beginning Time: 9:15

all No.: MW 3 Well Location: MIDDLE of PARKING LOT Developers: Holly KENT / WENDE WILBER

ely Contaminants: PCB, DIESEL.

velopment Method:

ell I.D. (in./ft) 2" / ~~[illegible]~~ .167 = d_w .0835

th to Bottom ~~een Interval~~ (ft) 22.56' Predevelopment Volume (gal) = (V) 6.2

pth to Water (ft) 16.24'

turated Interval (ft) 6.32 = b Water Added During Drilling/Installation (gal) 0 = v_1 .138

uifer ology Casing Volume (gal) π(.5)( )) b V_2 = ~~[illegible]~~

$= v_2 = \pi (0.5 d_w)^2 b$

imated Hydraulic nductivity al/(day x ft²)) Annular Volume (gal) V_3 (= .169) 1.26

$= v_3 = 0.35 [(\pi (0.5 d_b)^2 b - v_2)]$

Notes:

$V = v_1 + 6 (v_2 + v_3)$

7.48 gal = 1 ft³

0.35 = porosity of filter pack

3.14

ehole Diameter (in./ft) 4.25 / 12 = d_b = .354

roduction Rate al/min)	Cumulative Volume (gal)	pH	Conductivity (µmhos)	T (°C)	Silt (ml/l)	Color/Odor
.25/MIN	3 GAL/DRY	10:35 AM.				SILTY/LIGHT BROWN
.5/MIN	16 GAL	~~[illegible]~~ 1:30				NO ODOR
1:35	16.25	8.05	215	4.5		SLIGHTLY CLOUDY
1:40	16.50	8.09	184	4.6		NO ODOR
1:45	16.75	7.80	182	4.9		

gnat

e 12-8-94

Disposition of Development Water

13 GAL

ENSR

Groundwater Water Sample Collection Record

Well No. MW 3

Job No. 9000-036 Date: 12-19-94 Samplers: H KENT

Location: FTROUD B35-752 Time: S ______ W WEBER

F ______

Weather Conditions: ______

1. WATER LEVEL DATA: (from ToC) ToC Elevation (from LS) ______

a. Total Well Length (+ TC) 22.56' (known, [✓ meas.]) Tape Corr. (TC) ______

b. Water Table Elev. (+ TC) 16.16' Well Dia. 0.167'

c. Length of Water Column 6.4' (a-b)

2. WELL PURGING DATA:

a. Purge Method HAND BAILER

b. Required Purge Volume (@ 3 well volumes) 3.14 GAL

c. Field Testing: Equipment Used ______

Volume Removed	T° C	pH	Spec. Cond.	Color
3.14 GAL	5.3	8.05	170	
	5.4	7.69	172	
	5.5	7.57	173	

3. SAMPLE COLLECTION: Method HAND BAILER

Container Type	Preservation	Required EPA Test Method
1 l AMBER GLASS (2)	HCL	(9071/418.1) (3510/8100M
40 ml VOA VIALS (6)	HCL	(5030/8015) (8260)
1 l AMBER GLASS (3)	NONE	(3510/8270) (3510/8080) (815
HDPE (1)	HNO_3	(3050/6010)

Comments: ______

ENSR

Groundwater Water Sample Collection Record

Well No. MW 2

Job No. 9000-036 Date: 12·20·94 Samplers: H. KENT

Location: Time: S

W. WILSON

F

Weather Conditions:

1. WATER LEVEL DATA: (from ToC)

a. Total Well Length (+ TC) 22.38' (known, meas.)

b. Water Table Elev. (+ TC) 17·86'

c. Length of Water Column 4.52' (a-b)

ToC Elevation (from LS)

Tape Corr. (TC)

Well Dia.

2. WELL PURGING DATA:

a. Purge Method HAND BAILER

b. Required Purge Volume (@ ___ well volumes) 2.22 GAL

c. Field Testing: Equipment Used

olume Removed	T°	pH	Spec. Cond.	Color
1.2 GAL			Dry	SANDY/NO ODOR
0.8 GAL			Dry	
1.0 GAL	37	6.88	Dry 207	SLIGHTY CLOUDY/NO ODOR
	4.0	6.93	210	"
	4.2	6.90	211	"

3. SAMPLE COLLECTION: Method

Container Type	Preservation	Required EPA Test Method
1 l AMBER GLASS (2)	HCL	(9071/418.1)(3510/8100M)
40 ml VOA VIALS (6)	HCL	(5030/8015)(8260)
1 l AMBER GLASS (3)	NONE	(3510/8270)(3510/8080)(8150)
HDPE (1)	HNO_3	(3050/6010)

Comments:

ENSR

Groundwater Water Sample Collection Record

Well No. AP 2982

Job No. 9000 - 036 Date: 12·20·94 Samplers: H. KENT

Location: FIR ON B35-752 Time: S W. WILBER

F

Weather Conditions:

1. WATER LEVEL DATA: (from ToC) ToC Elevation (from LS)

a. Total Well Length (+ TC) 2538' (known, meas.) Tape Corr. (TC)

b. Water Table Elev. (+ TC) 17.88' Well Dia.

c. Length of Water Column 7.5' (a-b)

2. WELL PURGING DATA:

a. Purge Method HAND BAILER

b. Required Purge Volume (@ well volumes) 3.68 gAL

c. Field Testing: Equipment Used

Volume Removed	T°	pH	Spec. Cond.	Color
3.68	5.7	7.85	203	SLIGHT ODOR, NOT PETROL ORANGE PARTICLES FLOATING ON T
	5.9	7.69	202	
	6.0	7.75	201	

3. SAMPLE COLLECTION: Method

Container Type	Preservation	Required EPA Test Method
1 l AMBER GLASS (2)	HCL	(9071/418.1) (3510/8100 M
40 ml VOA VIALS (6)	HCL	(5030/8015) (8260)
1 l AMBER GLASS (3)	NONE	(3510/8270)(3510/8080)(8
HDPE (1)	HNO3	(3050/6010)

Comments: AFTER SAMPLING:

	T°	pH	COND.
	5.0	7.61	179
	5.2	7.25	185
	6.0	7.10	188

ENSR

Groundwater Water Sample Collection Record

Well No. AP 2987

Job No. 9000 · 036

Date: 12·20·94

Samplers: H. KENT

W. WILBER

Location: FTR ON B35-752

Time: S

F

Weather Conditions:

1. WATER LEVEL DATA: (from ToC)

ToC Elevation (from LS)

a. Total Well Length (+ TC) 20.46' (known, meas.)

Tape Corr. (TC)

b. Water Table Elev. (+ TC) 15.92'

Well Dia. 0.167'

c. Length of Water Column 4.54' (a-b)

2. WELL PURGING DATA:

a. Purge Method HAND BAILER

b. Required Purge Volume (@ ____ well volumes) 2.23 GAL

c. Field Testing: Equipment Used

olume Removed	T°	pH	Spec. Cond.	Color
2.23 GAL	4.5 5.0 5.3	7.4 7.25 7.16	213 211 207	CLOUDY, SLIGHT HYDROCARBON ODOR
	5.3	7.15	207	
	5.9	6.61	207	
	5.8 5.8	6.64 6.63	211 211	

3. SAMPLE COLLECTION: Method

Container Type	Preservation	Required EPA Test Method
1 l AMBER GLASS (2)	HCL	(9071/418.1) (3510/8100 M)
40 ml VOA VIALS (6)	HCL	(5030/8015) (8260)
1 l AMBER GLASS (3)	NONE	(3510/8270) (3510/8080) (8150)
HDPE (1)	HNO3	(3050/6010)

Comments:

ENSR

Groundwater Water Sample Collection Record

Well No. AP 2983

Job No. 9000-036
Date: 12·20 94
Samplers: H. KUNS

Location: PTR OW B35-752
Time: S
W. WILBER

F

Weather Conditions:

1. WATER LEVEL DATA: (from ToC)
   - a. Total Well Length (+ TC) 25.02' (known, meas.)
   - b. Water Table Elev. (+ TC) 18.44'
   - c. Length of Water Column 6.58' (a-b)

ToC Elevation (from LS)

Tape Corr. (TC)

Well Dia.

2. WELL PURGING DATA:
   - a. Purge Method HAND BAILER
   - b. Required Purge Volume (@ well volumes) 3.23 GAL
   - c. Field Testing: Equipment Used

Volume Removed	T°	pH	Spec. Cond.	Color
3 GAL	4.4	6.60	203	
	4.6	6.64	203	
	4.6	6.55	205	

3. SAMPLE COLLECTION: Method HAND BAILER

Container Type	Preservation	Required EPA Test Method
1 l AMBER GLASS (2)	HCL	(9071/418.1)(3510/8100M)
40 ml VOA VIALS (6)	HCL	(5030/8015) (8260)
1 l AMBER GLASS (3)	NONE	(3510/8270)(3510/8080)(81
HDPE (1)	HNO_3	(3050/6010)

Comments: AFTER SAMPLING:

T°	pH	COND.
4.9	7.36	203
4.4	7.30	204
4.6	7.10	202

ENSR

Groundwater Water Sample Collection Record

Well No. MW1

Job No. 9000 - 036

Date: 12·21·94

Samplers: H. KENT

Location: FTROUD B35·752

Time: S

W. WILBER

F

Weather Conditions:

1. WATER LEVEL DATA: (from ToC)

ToC Elevation (from LS)

a. Total Well Length (+ TC) 22.16' (known, [✓ meas.])

Tape Corr. (TC)

b. Water Table Elev. (+ TC) 16.68'

Well Dia. 0.167'

c. Length of Water Column 5.48' (a-b)

2. WELL PURGING DATA:

a. Purge Method HAND BAILER

b. Required Purge Volume (@ ___ well volumes) NO PURGING DONE PRIOR TO SAMPLING

c. Field Testing: Equipment Used DUE TO LOW RECOVERY.

'olume Removed	T°	pH	Spec. Cond.	Color

3. SAMPLE COLLECTION: Method

Container Type	Preservation	Required EPA Test Method
1 l AMBER GLASS (2)	HCL	(9071/418.1)(3510)(8100M)
40 ml VOA VIALS (6)	HCL	(5030/8015) (8260)
1 l AMBER GLASS (3)	NONE	(3510/8270)(3510/8080)(8150)
HDPE (1)	HNO_3	(3050/6010)

Comments:

ENSR

Groundwater Water Sample Collection Record

Well No. AP 2986

Job No. 9000-036

Date: 12.21.94

Samplers: H. KENT

W. WILSON

Location: FTR OUD 735-757

Time:S

F

Weather Conditions:

1. WATER LEVEL DATA: (from ToC)

a. Total Well Length (+ TC) 20.46 (known, meas.)

b. Water Table Elev. (+ TC) 15.13'

c. Length of Water Column 5.33' (a-b)

ToC Elevation (from LS)

Tape Corr. (TC)

Well Dia. 0.167'

2. WELL PURGING DATA:

a. Purge Method HAND BAILER

b. Required Purge Volume (@ ___ well volumes) 2.62 gal

c. Field Testing: Equipment Used

Volume Removed	T°	pH	Spec. Cond.	Color
2.5 gal	6.1	8.02	183	
	5.5	7.78	183	
	5.4	7.41	182	
	5.3	7.33	183	

3. SAMPLE COLLECTION: Method HAND BAILER

Container Type	Preservation	Required EPA Test Method
1 l AMBER GLASS (2)	HCL	(9071/418.1)(3510) (8100M)
40 ml VOA VIALS (6)	HCL	(5030/8015) (8260)
1 l AMBER GLASS (3)	NONE	(3510/8270) (3510/8080)(8
HDPE (1)	HNO3	(3050/6010)

Comments: AFTER SAMPLING:

	T °C	pH	COND
	4.8	7.23	173
	5.2	7.05	175
	5.2	7.03	174
	5.1	6.90	175

Building 35-752: Survey Elevation Data for Monitoring Wells.

ENSR requested resurveying of monitoring well elevations at Building 35-752. The COE (Jerry Zuspan) completed this resurvey on August 4, 1995. The results of this survey are to replace elevation data provided in previous reports and on the original boring logs and monitoring well completion diagrams. Compiled by Stephen Wing, August 8, 1995.

Well No.	Description	Depth (feet)
AP 2982	Top of PVC	263.61
	Top of Casing[1]	264.96
	Ground at Well	262.5
AP 2987	Top of PVC (New)	261.75
	Top of Casing[1]	262.66
	Ground at Well[2]	260.3
	Joint at PVC[3]	261.39
AP 3232	Top of PVC	259.79
	Top of Casing[1]	260.72
	Ground at Well[2]	257.6
AP 2985	Top of PVC	259.54
	Top of Casing[1]	259.85
	Ground at Well[2]	257.35
AP 2984	Top of PVC (New)	261.80
	Top of Casing[1]	261.90
	Ground at Well[2]	260.05
	Joint at PVC[3]	261.44
AP 2986	Top of PVC (New)	260.98
	Top of Casing[1]	261.23
	Ground at Well[2]	259.3
	Joint at PVC[3]	260.62
AP 2983	Top of PVC	264.24
	Top of Casing[1]	264.55
	Ground at Well[2]	263.0
AP 3502	Top of PVC	261.05
	Top of Casing[1]	261.40
	Ground at Well[2]	261.3

Building 35-752: Survey Elevation Data for Monitoring Wells (Cont'd).

Well No.	Description	Depth (feet)
AP 3503	Top of PVC Top of Casing[1] Ground at Well[2]	263.66 263.88 260.9
AP 3504	Top of PVC Top of Casing[1] Ground at Well[2]	261.54 261.67 261.6
AP 3231	Top of PVC Top of Casing[1] Ground at Well[2]	265.62 266.07 262.8

[1] With well cover open.
[2] Average ground elevation at well.
[3] 4.32 inches of PVC piping has been added to the original PVC piping. This elevation is to the PVC joint without the additional PVC piping added.

Building 35-752: Monitoring Well Measurements to Groundwater.

Conducted by Merlin Peterson, COE, August 7, 1995; faxed to ENSR August 8, 1995.

Well No.	Date	Time	Top of PVC to Groundwater (feet)	Notes
AP 2982	8/7/95	11:37	13.28	
AP 2987	8/7/95	11:40	11.12	
AP 3232	8/7/95	11:44	9.24	
AP 2985	8/7/95	11:48	8.67	
AP 2986	8/7/95	11:54	10.29	
AP 2984	8/7/95	11:59	10.24	
AP 2983	8/7/95	12:03	13.19	
AP 3502	8/7/95	12:06	11.16	
AP 3503	8/7/95	12:10	13.92	
AP 3504	8/7/95	12:15	12.18	
AP 3231	8/7/95	12:21	14.94	

Building 35-752: August 7, 1995, Monitoring Well Sounding Summary.

Well	Top of PVC[1]	Terminal Depth	8/7/95 DTW	Lithologic Contacts	8/7/95 SWL
AP 3502	+261.05	22.5	11.16	SM → 9, SP → 22	+249.89
AP 3504	+261.54	24	12.18	GW → 2, SM → 6, SW → 24	+249.36
AP 3503	+263.66	19.0	13.92	GW → 2, SM → 6, SW → 19	+249.74
AP 2982	+263.61	24.6	13.28	GC → 7.5, GW/GM →	+250.33
AP 2983	+264.24	24.0	13.19	GP/GW → 17, SP → 24	+251.05
AP 2987	+261.75	19.1	11.12	GP/GM/GW → 12.5, SP → 19	+250.63
AP 3232	+259.79	16.5	9.24	ML → 4.5, SP → 14.5, ML → 16.5	+250.55
AP 2985	+259.54	14.3	8.67	GW → 7.5, SP → 14	+250.87
AP 2986	+260.98	19.0	10.29	GW/GM → 19	+250.69
AP 2984	+261.80	19.0	10.24	ML → 7.5, GW → 19	+251.56
AP 3231	+265.62	21.5	14.94	GP → 5, GM → 20	+250.68

Notes: DTW = Depth to water.
SWL = Static water level.

[1] Top of PVC elevations: Jerry Zaspan, COE, 8/4/95.
[2] DTW measurements: Merlin Peterson, COE, 8/7/95.

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION LABORATORY
CORPS OF ENGINEERS
1491 N.W. GRAHAM AVENUE
TROUTDALE, OREGON 97060-9503

February 15, 1995

Wende Wilber/Steve Wing
ENSR Consulting and Engineering
4600 Business Park Blvd., Suite 22
Anchorage, Alaska 99503-7143

1. Enclosed is report of mechanical analysis for 17 soil samples submitted from the Ft. Richardson OUD-Bldg 35-752 project sampled by ENSR Engineering and Consulting from 2 through 11 November 1994. Included are:

a) Enclosure 1, Summary of Water Content and Soil Classification.

b) Enclosures 2 through 18, Report of Particle Size Analysis and Classification Tests, one for each sample submitted.

2. Samples tested by Braun Intertec Northwest, Portland, Oregon.

3. This completes all physical analysis requested to date for this project.

Sincerely,

Enclosures

JAMES K. HINDS, PE
Deputy Director
North Pacific Division Laboratory

CENPD-ET-PL (95-016)

FT. RICHARDSON OUD - BLDG 35-752
Ft. Richardson, Alaska

Summary of Water Content and Soil Classification

Sample Id.		Water	Soil Classification	Frost Classification
Location	No.	Content, %	ASTM D-2487	TM5-818-2
94-5752	19SL	13.7	ML	F4
	22SL	4.9	GW	S1
	24SL	1.2	GP	PFS
	25SL	2.0	GW	PFS
	27SL	14.1	GM	F3
	30SL	4.2	GP	S1
	38SL	6.9	SW-SM	F2
	39SL	5.1	SP-SM	S2
	40SL	6.2	GP-GM	F1
	77SL	7.8	GP-GM	S1
	78SL	5.2	SP-SM	S2
	79SL	4.6	GW	S1
	80SL	6.5	GW	S1
	83SL	19.0	SM	F4
	85SL	11.0	GW-GM	S1
	88SL	4.9	GP-GM	S1
	89SL	1.7	GP-GM	S1

North Pacific Division Laboratory nos. 5078, 5083, 5085 and 5090. Samples received 4 through 21 November 1994.

* * * CORPS OF ENGINEERS - NORTH PACIFIC DIVISION LABORATORY * * *
FT. RICHARDSON OUD - BLDG 35-752 95-016
Boring: **94-5752** Sample: **19SL** Depth: -- Lab No.: 016001

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	0.00	100.0
1 In.	52.90	98.4
3/4 In.	76.80	97.7
1/2 In.	175.80	94.7
3/8 In.	231.20	93.0
No. 4	331.90	89.9
No. 10	449.80	86.4
Pan	3297.70	0.0
No. 16	2.18	84.5
No. 30	4.88	82.1
No. 50	7.84	79.5
No. 100	18.99	69.8
No. 200	35.59	55.3
Pan	98.89	0.0

----------- Hydrometer Analysis -----------

Sample Weight:98.89 gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	50.9	0.0378	44.4
3	20.0	43.4	0.0235	38.0
10	20.0	34.4	0.0138	30.2
100	20.0	23.1	0.0061	20.4
200	20.0	19.7	0.0044	17.5

D85: 1.36 D60: .092 D50: .054 D30: .014 mm

Liquid Limit: NP Plasticity Index: NP
Fines Type Used for Classification: ML, SILT

Gravel: 10.1% Sand: 34.6% Fines: 55.3%

------------------------- ASTM D 2487 Classification -------------------------

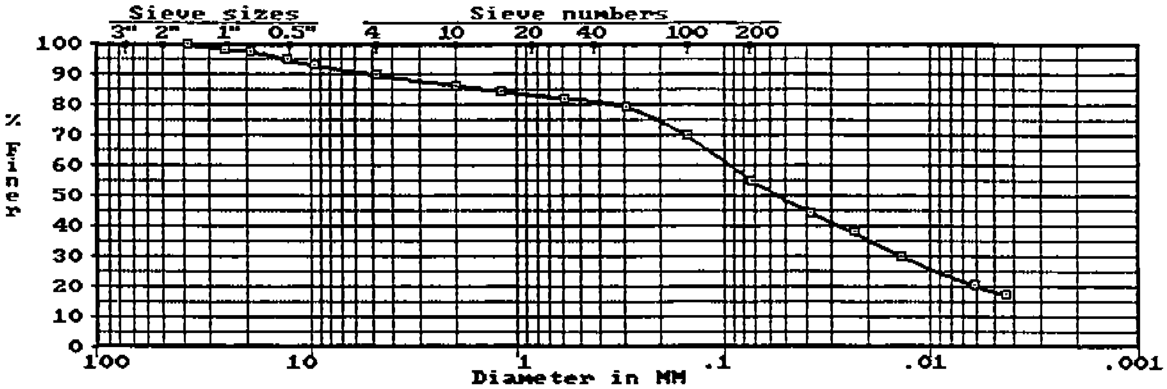
ML Sandy SILT

---------------------- TM 5-818-2 Frost Classification ----------------------

Percent finer than 0.02 mm: 35.6 Frost Classification: F4

---------------------------------- Comments ----------------------------------

WATER CONTENT=13.7%



* * * CORPS OF ENGINEERS - NORTH PACIFIC DIVISION LABORATORY * * *

FT. RICHARDSON OUD - BLDG 35-752 95-016

Boring: 94-5752 Sample: 22SL Depth: -- Lab No.: 016002

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	194.60	95.5
1 In.	579.20	86.5
3/4 In.	887.60	79.3
1/2 In.	1553.20	63.8
3/8 In.	1824.60	57.4
No. 4	2452.90	42.8
No. 10	3081.60	28.1
Pan	4284.90	0.0
No. 16	16.32	23.5
No. 30	40.80	16.6
No. 50	65.08	9.8
No. 100	78.18	6.1
No. 200	83.70	4.5
Pan	99.88	0.0

----------- Hydrometer Analysis -----------

Sample Weight:99.88 gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
3	20.0	13.6	0.0290	3.9
10	20.0	11.1	0.0161	3.2
100	20.0	8.1	0.0067	2.4
200	20.0	6.6	0.0048	2.0

D85: 23.8 D60: 10.8 D50: 6.76 D30: 2.29 D15: 0.51 D10: 0.30 mm

Cu: 35.6 Cc: 1.60

Liquid Limit: NP Plasticity Index: NP

Fines Type Used for Classification: ML, SILT

Gravel: 57.2% Sand: 38.3% Fines: 4.5%

------------------------- ASTM D 2487 Classification -------------------------

GW Well-graded GRAVEL with sand

---------------------- TM 5-818-2 Frost Classification ----------------------

Percent finer than 0.02 mm: 3.5 Frost Classification: S1

---------------------------------- Comments ----------------------------------

-WATER CONTENT=4.9%

-COULD NOT TAKE 1 MIN. HYDRO. READING DUE TO EXCESSIVE FOAMING OF SAMPLE